TS100A, TS110A, TS115A, TS125A, TS130A AND TS135A REPAIR AND T6010, T6020, T6030, T6050, T6070 REPAIR

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The following pages are the collation of the contents pages from each section and chapter of the TS100A, TS110A, TS115A, TS125A, TS130A, TS135A and T6010, T6020, T6030, T6050, T6070 Repair manual. Complete Repair part # 87693272.

The sections used through out all New Holland product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books. Each book will be labeled as to which sections are in the overall Repair manual and which sections are in each book.

The sections listed above are the sections utilized for the TSA Series and T6000 Series Tractors.

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87693277 6/07
Replaces 87515329

Some sections of this Repair Manual have been revised to include the New T6000 Delta and Plus Series Models T6010, T6020, T6030, T6050, and T6070.

Please note the following to locate new T6000 Tractor Model Repair information:

For complete engine repair information for the new T6000 Series Tractors use Engine Repair Manual # 87661796.

Most all repairs can be carried out by following the Tractor's systems and specific product configurations in the repair manual. Example; 16 x16 Transmission, Air Conditioning and TSA Standard Series Closed Center Hydraulic System.

"TSA Standard" Repair Information also applies to the New T6000 Delta Series Models.

Where specific T6000 Tractor Models are not identified use the following TSA to T6000 cross reference:

T6000 Tractor Models	Use TSA tractor Model
T6010	TS100A
T6020	TS110A
T6030	TS115A
T6050	TS125A
T6070	TS135A

INFORMATION

With the introduction of the T6000 Series Tractors, controller identifications codes have changed. Also, the location of the diagnostic connector has changed. The updated Repair Manual # 87693272 does not contain the new controller ID's or the new location of the diagnostic connector. This page shows the T6000 Series controller identification codes and the diagnostic connector location.

NOTE: *Please insert a copy of this page in the front of each Repair Manual Volume for your reference.*

Models covered are:

T6000 DELTA TRACTORS
T6020, T6030, T6050

T6000 PLUS SERIES TRACTORS
T6010, T6020, T6030, T6050, T6070

CONTROLLER IDENTIFICATION CODES

The controller identifiers change with the introduction of the T6000 range of tractors, eg., Controller DA for TS-A will become Controller DR for T6000 range. This is required to be remembered throughout this Repair Manual. See table below:

Identifier	Identifier	Controller Function(s)
TS-A	**T6000**	
DA	**DR**	24x24 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
DB	**DS**	16x16 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
DD	**DU**	(Options) Front PTO, Front Hitch, Front Axle Suspension, Electronic Hydraulic Remotes
EDC7	**EDC16**	Engine Control (Engine Side)
HA	**HJ**	Enhanced Analogue Digital Instrument Cluster (ADIC)
HB	**HK**	Basic ADIC
GA		12x12 PTO Controller – Rear PTO, Differential Lock, Four Wheel Drive
JA		Keypad

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CONTROLLER FUNCTIONS

	Electronic Module				
Model/Type	24x24	16x16	24x24 16x16	12x12	24x24 16x16
Function	DA(DR)	DB(DS)	DD(DU)	GA	EDC7 (EDC16)
Rear PTO	✓	✓		✓	
Differential Lock	✓	✓		✓	
Four Wheel Drive	✓	✓		✓	
Engine Control (vehicle side)	✓	✓			
Auto Headland Turn Sequence (HTS)	✓	✓			
Electronic Draft Control	✓	✓			
Front Suspension			✓		
Front PTO			✓		
Front Lift			✓		
Electro-Hydraulic Remotes			✓		
Transmission 24x24	✓				
Transmission 16x16		✓			
Engine Control (engine side)					✓

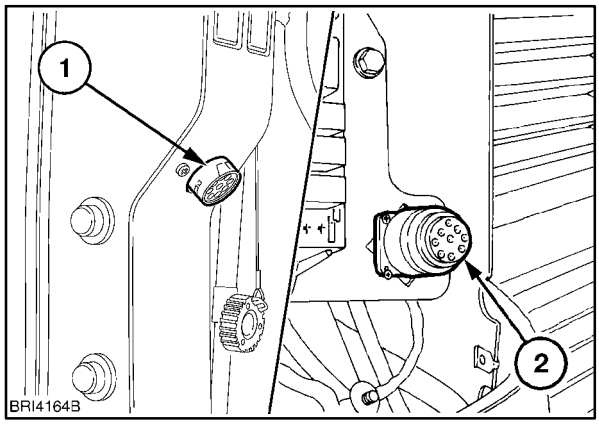
The controller type is identified by a code which is attached to each module. The code, for example, 'DB/DS' identifies it as the module used on a tractor with a 16x16 transmission controlling those functions highlighted in the table above.

All the modules on the tractor are linked by the CAN harness and this also links in the instrument cluster, gear display (16x16 only) and diagnostic connector.

Refer to the system diagrams in Section 55, Chapter 1 of this repair manual for full controller details and inter connectivity.

DIAGNOSTIC CONNECTORS (ADDITIONAL "C" PILLAR LOCATION)

A single diagnostic port, 2, located behind the trim under the transmission control levers, or on the right hand "C" pillar, 1, to interrogate all of the controllers is incorporated into the wiring harness. With the aid of special service tool **380000843**, the port can be used to gain access to the on-board H-menu diagnostics, see Section 55, Chapter 1 of this Repair Manual for full details, to download software or to connect in more specialized diagnostic equipment such as the E.S.T. (Electronic Service Tool).



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GENERAL INSTRUCTIONS

IMPORTANT NOTICE

All maintenance and repair operations described in this manual should be carried out exclusively by authorised workshops. All instructions should be carefully observed and special equipment where indicated should be used.

Anyone who carries out service operations described without carefully observing these instructions will be directly responsible for any damage caused.

NOTES FOR EQUIPMENT

Equipment shown in this manual is:

- designed expressly for use on these tractors;
- necessary to make a reliable repair;
- accurately built and strictly tested to offer efficient and long-lasting working life.

NOTICES

The words “front”, “rear”, “right hand”, and “left hand” refer to the different parts as seen from the operator’s seat oriented to the normal direction of movement of the tractor.

PRECAUTIONARY STATEMENTS

PERSONAL SAFETY

Throughout this manual and on machine decals, you will find precautionary statements ("**DANGER**", "**WARNING**", and "**CAUTION**") followed by specific instructions. These precautions are intended for the personal safety of you and those working with you. Please take the time to read them.

DANGER

This word "DANGER" indicates an immediate hazardous situation that, if not avoided, will result in death or serious injury. The color associated with Danger is RED.

WARNING

This word "WARNING" indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. The color associated with Warning is ORANGE.

CAUTION

This word "CAUTION" indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. The color associated with Caution is YELLOW.

FAILURE TO FOLLOW THE "DANGER", "WARNING", AND "CAUTION" INSTRUCTIONS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH.

MACHINE SAFETY

The precautionary statement ("**IMPORTANT**") is followed by specific instructions. This statement is intended for machine safety.

IMPORTANT: IMPORTANT: *The word "IMPORTANT" is used to inform the reader of something he needs to know to prevent minor machine damage if a certain procedure is not followed.*

INFORMATION

NOTE: NOTE: *Instructions used to identify and present supplementary information.*

IMPORTANT WARNINGS

The machine is designed and produced exclusively for agricultural use.

All other use will be considered to be contrary to the use specified by CNH AMERICA LLC, who cannot be held liable for damage to property or the machine, or for personal injuries which may result.

Persons who risk improper use will therefore assume the responsibility for any consequences arising from such use.

Compliance with the instructions for use, maintenance and repairs described in this manual, are the essential preconditions for use specified by CNH AMERICA LLC.

The machine must only be used, serviced or repaired by personnel trained in the relevant working methods and safety regulations and who have been authorized to work on the machine.

The user must also observe the rules concerning general safety and accident prevention, including the Highway Code when driving on public highways.

Any arbitrary modifications made to this machine will release CNH AMERICA LLC from any liability resulting from damage or injury.

CNH AMERICA LLC and all its distribution organizations, inclusive of, but not restrict to, national, regional or local distributors, cannot be held liable for damage resulting from the malfunction of parts and/or components not approved by CNH AMERICA LLC.

Under no circumstances will a guarantee be issued for products made or sold by CNH AMERICA LLC that are damaged as a result of the malfunction of parts and/or components not approved by CNH AMERICA LLC.

TO PREVENT ACCIDENTS

Most accidents and personal injuries taking place in workshops are due from non-observance of some essential rules and safety precautions.

The possibility that an accident might occur with any type of machines should not be disregarded, no matter how well the machine in question was designed and built.

A wise and careful service technician is the best precautions against accidents.

Careful observance of this basic precaution would be enough to avoid many severe accidents.

DANGER

Never carry out any cleaning, lubrication or maintenance operations when the engine is running.

SAFETY RULES

Generalities

- Carefully follow specified repair and maintenance procedures.
- Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get caught on moving parts. Use approved safety clothing such as anti-slipping footwear, gloves, safety goggles, helmets, etc.
- Wear safety glasses with side guards when cleaning parts using compressed air.
- Damaged or frayed wires and chains are unreliable. Do not use them for lifting or towing.
- Wear suitable protection such as approved eye protection, helmets, special clothing, gloves and footwear whenever welding. All persons standing in the vicinity of the welding process should wear approved eye protection. **NEVER LOOK AT THE WELDING ARC IF YOUR EYES ARE NOT SUITABLY PROTECTED.**
- Never carry out any repair on the machine if someone is sitting on the operator's seat, except if they are qualified operators assisting in the operation to be carried out.
- Never operate the machine or use attachments from a place other than sitting at the operator's seat or at the side of the machine when operating the fender switches.
- Never carry out any operation on the machine when the engine is running, except when specifically indicated. Stop the engine and ensure that all pressure is relieved from hydraulic circuits before removing caps, covers, valves, etc.
- All repair and maintenance operations should be carried out with the greatest care and attention.
- Disconnect the batteries and label all controls to warn that the tractor is being serviced. Block the machine and all equipment which should be raised.
- Never check or fill fuel tanks or batteries, nor use starting liquid if you are smoking or near open flames as such fluids are flammable.
- The fuel filling gun should always remain in contact with the filler neck. Maintain this contact until the fuel stops flowing into the tank to avoid possible sparks due to static electricity build-up.
- To transfer a failed tractor, use a trailer or a low loading platform trolley if available.
- To load and unload the machine from the transportation means, select a flat area providing a firm support to the trailer or truck wheels. Firmly tie the machine to the truck or trailer platform and block wheels as required by the transporter.
- Always use lifting equipment of appropriate capacity to lift or move heavy components.
- Chains should always be safely fastened. Ensure that fastening device is strong enough to hold the load foreseen. No persons should stand near the fastening point.
- The working area should be always kept CLEAN and DRY. Immediately clean any spillage of water or oil.
- Never use gasoline, diesel oil or other flammable liquids as cleaning agents. Use non-flammable non-toxic proprietary solvents.
- Do not pile up grease or oil soaked rags, as they constitute a great fire hazard. Always place them into a metal container.

START UP

- Never run the engine in confined spaces which are not equipped with adequate ventilation for exhaust gas extraction.
- Never bring your head, body, arms, legs, feet, hands, fingers near fans or rotating belts.

ENGINE

- Always loosen the radiator cap very slowly before removing it to allow pressure in the system to dissipate. Coolant should be topped up only when the engine is stopped.
- Do not fill up fuel tank when the engine is running.
- Never adjust the fuel injection pump when the tractor is moving.
- Never lubricate the tractor when the engine is running.

ELECTRICAL SYSTEMS

- If it is necessary to use auxiliary batteries, cables must be connected at both sides as follows: (+) to (+) and (-) to (-). Avoid short-circuiting the terminals. GAS RELEASED FROM BATTERIES IS HIGHLY FLAMMABLE. During charging, leave the battery compartment uncovered to improve ventilation. Avoid sparks or flames near the battery area. Do no smoke.
- Do not charge batteries in confined spaces.
- Always disconnect the batteries before performing any type of service on the electrical system.

HYDRAULIC SYSTEMS

- Some fluid coming out from a very small port can be almost invisible and be strong enough to penetrate the skin. For this reason, NEVER USE YOUR HANDS TO CHECK FOR LEAKS, but use a piece of cardboard or a piece of wood for this purpose. If any fluid is injected into the skin, seek medical aid immediately. Lack of immediate medical attention may result in serious infections or dermatitis.
- Always take system pressure readings using the appropriate gauges.

WHEELS AND TYRES

- Check that the tyres are correctly inflated at the pressure specified by the manufacturer. Periodically check for possible damage to the rims and tyres.
- Stay at the tyre side when inflating.
- Check the pressure only when the tractor is unloaded and tyres are cold to avoid wrong readings due to over-pressure.
- Never cut, nor weld a rim with the inflated tyre assembled.
- To remove the wheels, block both front and rear tractor wheels. Raise the tractor and install safe and stable supports under the tractor in accordance with regulations in force.
- Deflate the tyre before removing any object caught into the tyre tread.
- Never inflate tyres using flammable gases as they may originate explosions and cause injuries to bystanders.

REMOVAL AND INSTALLATION

- Lift and handle all heavy components using lifting equipment of adequate capacity. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. Take care of the persons near the loads to be lifted.

HEALTH AND SAFETY

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HEALTH AND SAFETY PRECAUTIONS

Many of the procedures associated with vehicle maintenance and repair involve physical hazards or other risks to health. This section lists, alphabetically, some of these hazardous operations and the materials and equipment associated with them. The precautions necessary to avoid these hazards are identified.

The list is not exhaustive and all operations and procedures and the handling of materials, should be carried out with health and safety in mind.

ACIDS AND ALKALIS – see Battery acids, e.g. caustic soda, sulphuric acid.

Used in batteries and cleaning materials.

Irritant and corrosive to the skin, eyes, nose and throat. Causes burns.

Avoid splashes to the skin, eyes and clothing. Wear suitable protective gloves and goggles. Can destroy ordinary protective clothing. Do not breathe mists.

Ensure access to water and soap is readily available for splashing accidents.

ADHESIVES AND SEALERS – see Fire

Highly Flammable, Flammable, combustible.

Generally should be stored in "No Smoking" areas; cleanliness and tidiness in use should be observed, e.g. disposable paper covering benches; should be dispensed from applicators where possible; containers, including secondary containers, should be labelled.

Solvent based Adhesives/Sealers – See Solvents.

Follow manufacturers instructions.

Water based Adhesives/Sealers

Those based on polymer emulsions and rubber lattices may contain small amounts of volatile toxic and harmful chemicals. Skin and eye contact should be avoided and adequate ventilation provided during use.

Follow manufacturers instructions.

Resin based Adhesives/Sealers – e.g. epoxide and formaldehyde resin based.

Mixing should only be carried out in well ventilated areas as harmful or toxic volatile chemicals may be released.

Skin contact with uncured resins and hardeners can result in irritation; dermatitis and absorption of toxic or harmful chemicals through the skin. Splashes can damage the eyes.

Provide adequate ventilation and avoid skin and eye contact. Follow manufacturers instructions.

Anaerobic, Cyanoacrylate and other Acrylic Adhesives

Many are irritant, sensitizing or harmful to the skin. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturers instructions followed.

Cyanoacrylate adhesives (super–glues) must not contact the skin or eyes. If skin or eye tissue is bonded cover with a clean moist pad and get medical attention. do not attempt to pull tissue apart. Use in well ventilated areas as vapours can cause irritation of the nose and eyes.

For two–pack systems see Resin based adhesives/sealers.

Isocyanate (Polyurethane) Adhesives/ Sealers – see Resin based Adhesives.

Individuals suffering from asthma or respiratory allergies should not work with or near these materials as sensitivity reactions can occur.

Any spraying should preferably be carried out in exhaust ventilated booths removing vapours and spray droplets from the breathing zone. Individuals working with spray applications should wear supplied air respirators.

ANTIFREEZE – see Fire, Solvents e.g. Isopropanol, Ethylene Glycol, Methanol.

Highly Flammable, Flammable, Combustible.

Used in vehicle coolant systems, brake air pressure systems, screenwash solutions.

Vapours given off from coolant antifreeze (glycol) arise only when heated.

Antifreeze may be absorbed through the skin in toxic or harmful quantities. Antifreeze if swallowed is fatal and medical attention must be found immediately.

ARC WELDING – see Welding.

BATTERY ACIDS – see Acids and Alkalis.

Gases released during charging are explosive. Never use naked flames or allow sparks near charging or recently charged batteries.

BRAKE AND CLUTCH FLUIDS (Polyalkylene Glycols) - see Fire.

Combustible.

Splashes to the skin and eyes are slightly irritating. Avoid skin and eye contact as far as possible. Inhalation of vapour hazards do not arise at ambient temperatures because of the very low vapour pressure.

BRAZING - see Welding.

CHEMICAL MATERIALS - GENERAL - see Legal Aspects.

Chemical materials such as solvents, sealers, adhesives, paints, resin foams, battery acids, antifreeze, brake fluids, oils and grease should always be used with caution and stored and handled with care. They may be toxic, harmful, corrosive, irritant or highly inflammable and give rise to hazardous fumes and dusts.

The effects of excessive exposure to chemicals may be immediate or delayed; briefly experienced or permanent; cumulative; superficial; life threatening; or may reduce life-expectancy.

DO'S

Do remove chemical materials from the skin and clothing as soon as practicable after soiling. Change heavily soiled clothing and have it cleaned.

Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, poster or other instructions. Material health and safety data sheets can be obtained from Manufacturers.

Do organise work practices and protective clothing to avoid soiling of the skin and eyes; breathing vapours/aerosols/dusts/fumes; inadequate container labelling; fire and explosion hazards.

Do wash before job breaks; before eating, smoking, drinking or using toilet facilities when handling chemical materials.

Do keep work areas clean, uncluttered and free of spills.

Do store according to national and local regulations.

Do keep chemical materials out of reach of children.

DO NOTS

Do Not mix chemical materials except under the manufacturers instructions; some chemicals can form other toxic or harmful chemicals; give off toxic or harmful fumes; be explosive when mixed together.

Do Not spray chemical materials, particularly those based on solvents, in confined spaces e.g. when people are inside a vehicle.

Do Not apply heat or flame to chemical materials except under the manufacturers' instructions. Some are highly inflammable and some may release toxic or harmful fumes.

Do Not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits etc.

Do Not transfer chemical materials to unlabelled containers.

Do Not clean hands or clothing with chemical materials. Chemicals, particularly solvents and fuels will dry the skin and may cause irritation with dermatitis. Some can be absorbed through the skin in toxic or harmful quantities.

Do Not use emptied containers for other materials, except when they have been cleaned under supervised conditions.

Do Not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be toxic or harmful.

Clutch Fluids - see Brake and Clutch Fluids.

Clutch Linings and Pads - see Brake and Clutch Linings and Pads.

CORROSION PROTECTION MATERIALS - see Solvents, Fire.

Highly flammable, flammable.

These materials are varied and the manufacturers instructions should be followed. They may contain solvents, resins, petroleum products etc. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Cutting - see Welding.

De-Waxing - see Solvents and Fuels (Kerosene).

DUSTS

Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

ELECTRIC SHOCK

Electric shocks can result from the use of faulty electrical equipment or from the misuse of equipment even in good condition.

Ensure that electrical equipment is maintained in good condition and frequently tested.

Ensure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.

Ensure that electric equipment is protected by the correct rated fuse.

Never misuse electrical equipment and never use equipment which is in any way faulty. The results could be fatal.

Use reduced voltage equipment (110 volt) for inspection and working lights where possible.

Ensure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

Use air operated mobile equipment where possible in preference to electrical equipment.

In cases of electrocution:-

- switch off electricity before approaching victim
- if this is not possible, push or drag victim from source of electricity using dry non-conductive material
- commence resuscitation if trained to do so
- SUMMON MEDICAL ASSISTANCE

EXHAUST FUMES

These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, lead and aromatic hydrocarbons. Engines should only be run under conditions of adequate extraction or general ventilation and not in confined spaces.

Gasolene (Petrol) Engine

There may not be adequate warning properties of odour or irritation before immediate and delayed toxic or harmful effects arise.

Diesel Engine

Soot, discomfort and irritation usually give adequate warning of hazardous fume concentrations.

FIBRE INSULATION - see Dusts.

Used in noise and sound insulation.

The fibrous nature of surfaces and cut edges can cause skin irritation. This is usually a physical and not a chemical effect.

Precautions should be taken to avoid excessive skin contact through careful organisation of work practices and the use of gloves.

FIRE - see Welding, Foams, Legal Aspects.

Many of the materials found on or associated with the repair of vehicles are highly flammable. Some give off toxic or harmful fumes if burnt.

Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.

Ensure before using electrical or welding equipment but that there is no fire hazard present.

Have a suitable fire extinguisher available when using welding or heating equipment.

FIRST AID

Apart from meeting any legal requirements it is desirable for someone in the workshop to be trained in first aid procedures.

Splashes in the eye should be flushed with clean water for at least ten minutes.

Soiled skin should be washed with soap and water.

Inhalation affected individuals should be removed to fresh air immediately.

If swallowed or if effects persist consult a doctor with information (label) on material used.

Do not induce vomiting (unless indicated by manufacturer).

FOAMS - Polyurethane - see Fire.

Used in sound and noise insulation. Cured foams used in seat and trim cushioning.

Follow manufacturers instructions.

Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

Individuals with chronic respiratory diseases, asthma, bronchial medical problems or histories of allergic diseases should not work with or near uncured materials.

The components, vapours, spray mists can cause direct irritation, sensitivity reactions and may be toxic or harmful.

Vapours and spray mists must not be breathed. These materials must be applied with adequate ventilation and respiratory protection. Do not remove respirator immediately after spraying, wait until vapour/ mists have cleared.

Burning of the uncured components and the cured foams can generate toxic and harmful fumes.

Smoking, open flames or the use of electrical equipment during foaming operations and until vapours/mists have cleared should not be allowed. Any heat cutting of cured foams or partially cured foams should be conducted with extraction ventilation (see Body Section 44 Legal and Safety Aspects).

FUELS - see Fire, Legal Aspects, Chemicals - General, Solvents.

Used as fuels and cleaning agents.

Gasolene (Petrol).

Highly flammable.

Swallowing can result in mouth and throat irritation and absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Aspiration of liquid into the lungs, e.g. through vomiting, is a very serious hazard.

Gasolene dries the skin and can cause irritation and dermatitis on prolonged or repeated contact. Liquid in the eye causes severe smarting.

Motor gasolene may contain appreciable quantities of benzene, which is toxic upon inhalation and the concentrations of gasolene vapours must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.

Ensure there is adequate ventilation when handling and using gasolene. Great care must be taken to avoid the serious consequences of inhalation in the event of vapour build up arising from spillages in confined spaces.

Special precautions apply to cleaning and maintenance operations on gasolene storage tanks.

Gasolene should not be used as a cleaning agent. It must not be siphoned by mouth.

Kerosene (Paraffin)

Used also as heating fuel, solvent and cleaning agent.

Flammable.

Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs. Liquid contact dries the skin and can cause irritation or dermatitis. Splashes in the eye may be slightly irritating.

In normal circumstances the low volatility does not give rise to harmful vapours. Exposure to mists and vapours from kerosene at elevated temperatures should be avoided (mists may arise in de-waxing). Avoid skin and eye contact and ensure there is adequate ventilation.

Gas-Oil (Diesel Fuel) - see Fuels (Kerosene).

Combustible.

Gross or prolonged skin contact with high boiling gas oils may also cause serious skin disorders including skin cancer.

GAS CYLINDERS - see Fire.

Gases such as oxygen, acetylene, carbon dioxide, argon and propane are normally stored in cylinders at pressures of up to 140 bar (2000 lb/in^2) and great care should be taken in handling these cylinders to avoid mechanical damage to them or to the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.

Cylinders should be stored in well ventilated enclosures, and protected from ice and snow, or direct sunlight. Fuel gases (e.g. acetylene and propane) should not be stored in close proximity to oxygen cylinders.

Care should be exercised to prevent leaks from gas cylinders and lines, and to avoid sources of ignition.

Only trained personnel should undertake work involving gas cylinders.

Gases - see Gas Cylinders.

Gas Shielded Welding - see Welding.

Gas Welding - see Welding.

GENERAL WORKSHOP TOOLS AND EQUIPMENT

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment used where required.

Never use tools or equipment for any purpose other than that for which they were designed.

Never overload equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.

Do not use damaged or defective tools or equipment, particularly high speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.

Wear suitable eye protection when using grinding, chiselling or sand blasting equipment.

Wear a suitable breathing mask when using sand blasting equipment, working with asbestos based materials or using spraying equipment.

Glues - see Adhesives and Sealers.

High Pressure Air, Lubrication and Oil Test Equipment - see Lubricants and Greases.

Always keep high pressure equipment in good condition and regularly maintained, particularly at joints and unions.

Never direct a high pressure nozzle at the skin as the fluid may penetrate to the underlying tissue etc. and cause serious injury.

LEGAL ASPECTS

Many laws and regulations make requirements relating to health and safety in the use of materials and equipment in workshops. Always conform to the laws and regulations applicable to the country in which you are working.

Workshops should be familiar, in detail, with the associated laws and regulations. Consult the local factory inspectorate or appropriate authority if in any doubt.

LUBRICANTS AND GREASES

Avoid all prolonged and repeated contact with mineral oils, especially used oils. Used oils contaminated during service (e.g. routine service change sump oils) are more irritating and more likely to cause serious effects including skin cancer in the event of gross and prolonged skin contact.

Wash skin thoroughly after work involving oil. Proprietary hand cleaners may be of value provided they can be removed from the skin with water. Do not use petrol, paraffin or other solvents to remove oil from the skin.

Lubricants and greases may be slightly irritating to the eyes.

Repeated or prolonged skin contact should be avoided by wearing protective clothing if necessary. Particular care should be taken with used oils and greases containing lead. Do not allow work clothing to be contaminated with oil. Dry clean or launder such clothing at regular intervals. Discard oil soaked shoes.

Do not employ used engine oils as lubricants or for any application where appreciable skin contact is likely to occur. Used oils may only be disposed of in accordance with local regulations.

Noise Insulation Materials - see Foams, Fibre Insulation.

PAINTS - see Solvents and Chemical Materials - General.

Highly Flammable, Flammable.

One Pack. Can contain harmful or toxic pigments, driers and other components as well as solvents. Spraying should only be carried out with adequate ventilation.

Two Pack. Can also contain harmful and toxic unreacted resins and resin hardening agents. The manufacturers instructions should be followed and the section of page 5 on resin based adhesives, isocyanate containing Adhesives and Foams should be consulted.

Spraying should preferably be carried out in exhausted ventilated booths removing vapour and spray mists from the breathing zone. Individuals working in booths should wear respiratory protection. Those doing small scale repair work in the open shop should wear supplied air respirators.

Paint Thinners - see Solvents.

Petrol - see Fuels (Gasolene).

Pressurised Equipment - see High Pressure Air, Lubrication and Oil Test Equipment.

Resistance Welding - see Welding.

Sealers - see Adhesives and Sealers.

SOLDER - see Welding.

Solders are mixtures of metals such that the melting point of the mixture is below that of the constituent metals (normally lead and tin). Solder application does not normally give rise to toxic lead fumes, provided a gas/air flame is used. Oxy-acetylene flames should not be used, as they are much hotter and will cause lead fumes to be evolved.

Some fumes may be produced by the application of any flame to surfaces coated with grease etc. and inhalation of these should be avoided.

Removal of excess solder should be undertaken with care, to ensure that fine lead dust is not produced, which can give toxic effects if inhaled. Respiratory protection may be necessary.

Solder spillage and filing should be collected and removed promptly to prevent general air contamination by lead.

High standards of personal hygiene are necessary in order to avoid indigestion of lead or inhalation of solder dust from clothing.

SOLVENTS - see Chemical Materials - General Fuels (Kerosene), Fire.

e.g. Acetone, white spirit, toluene, xylene, trichlorethane.

Used in cleaning materials, de-waxing, paints, plastics, resins, thinners etc.

Highly Inflammable, Flammable.

Skin contact will degrease the skin and may result in irritation and dermatitis following repeated or prolonged contact. Some can be absorbed through the skin in toxic or harmful quantities.

Splashes in the eye may cause severe irritation and could lead to loss of vision.

Brief exposure to high concentrations of vapours or mists will cause eye and throat irritation, drowsiness, dizziness, headaches and in the worst circumstances, unconsciousness.

Repeated or prolonged exposures to excessive but lower concentrations of vapours or mists, for which there might not be adequate warning indications, can cause more serious toxic or harmful effects.

Aspiration into the lungs (e.g. through vomiting) is the most serious consequence of swallowing.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing if necessary.

Ensure good ventilation when in use, avoid breathing fumes, vapours and spray mists and keep containers tightly sealed. Do not use in confined spaces.

When the spraying material contains solvents, e.g. paints, adhesives, coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

Do not apply heat or flame except under specific and detailed manufacturers instructions.

Sound Insulation - see Fibre Insulation, Foams.

Spot Welding - see Welding.

SUSPENDED LOADS

There is always a danger when loads are lifted or suspended. Never work under an unsupported suspended or raised load, e.g. jacked up vehicle, suspended engine, etc.

Always ensure that lifting equipment such as jacks, hoists, axle stands, slings, etc. are adequate and suitable for the job, in good condition and regularly maintained.

Never improvise lifting tackle.

Underseal - see Corrosion Protection.

WELDING - see Fire, Electric Shock, Gas Cylinders.

Welding processes include Resistance Welding (Spot Welding), Arc Welding and Gas Welding.

Resistance Welding

This process may cause particles of molten metal to be emitted at high velocity and the eyes and skin must be protected.

Arc Welding

This process emits a high level of ultraviolet radiation which may cause eye and skin burns to the welder and to other persons nearby. Gas-shielded welding processes are particularly hazardous in this respect. Personal protection must be worn, and screens used to shield other people.

Metal spatter will also occur and appropriate eye and skin protection is necessary.

The heat of the welding arc will produce fumes and gases from the metals being welded and from any applied coatings or contamination on the surfaces being worked on. These gases and fumes may be toxic and inhalation should always be avoided. The use of extraction ventilation to remove the fumes from the working area may be necessary, particularly in cases where the general ventilation is poor, or where considerable welding work is anticipated. In extreme cases where adequate ventilation cannot be provided, supplied air respirators may be necessary.

Gas Welding

Oxy-acetylene torches may be used for welding and cutting and special care must be taken to prevent leakage of these gases, with consequent risk of fire and explosion.

The process will produce metal spatter and eye and skin protection is necessary.

The flame is bright and eye protection should be used, but the ultra-violet emission is much less than that from arc welding, and lighter filters may be used.

The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts and inhalation of the fumes should be avoided.

In brazing, toxic fumes may be evolved from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, E.G. BOILING OR STEAMING OUT OF FUEL TANKS.

White Spirit - see Solvents.

ECOLOGY AND THE ENVIRONMENT

Soil, air and water are vital factors of agriculture and life in general. Where legislation does not yet rule the treatment of some of the substances which are required by advanced technology, common sense should govern the use and disposal of products of a chemical and petrochemical nature.

The following are recommendations which may be of assistance:

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.

- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti freeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances. Agricultural consultants will, in many cases, be able to help you as well.

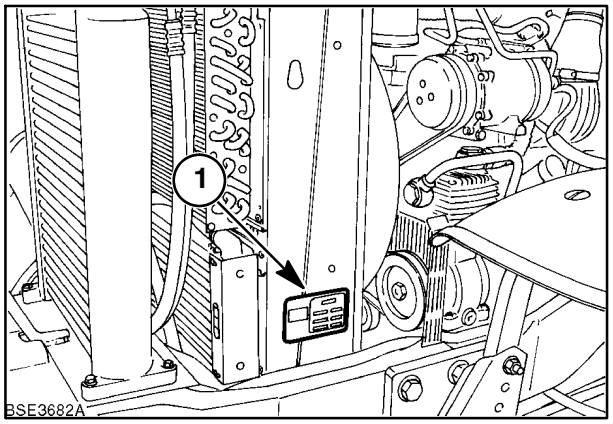
HELPFUL HINTS

1. Avoid filling tanks using unsuitable containers or inappropriate pressurised fuel delivery systems which may cause considerable spillage.
2. In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances which can be harmful to your health.
3. Modern oils contain additives. Do not burn contaminated fuels and/or waste oils in ordinary heating systems.
4. Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
5. Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of safely.
6. Do not open the air-conditioning system yourself. It contains gases which should not be released into the atmosphere. Your dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system anyway.
7. Repair any leaks or defects in the engine cooling or hydraulic system immediately.
8. Do not increase the pressure in a pressurised circuit as this may lead to the components exploding.
9. Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, causing the loss of oils, coolant, etc.

PRODUCT IDENTIFICATION

The tractor and major components are identified using serial numbers and/or manufacturing codes. Tractor identification data must be supplied to the dealer when requesting parts or service and will also be needed to aid in identifying the tractor if it is ever stolen.

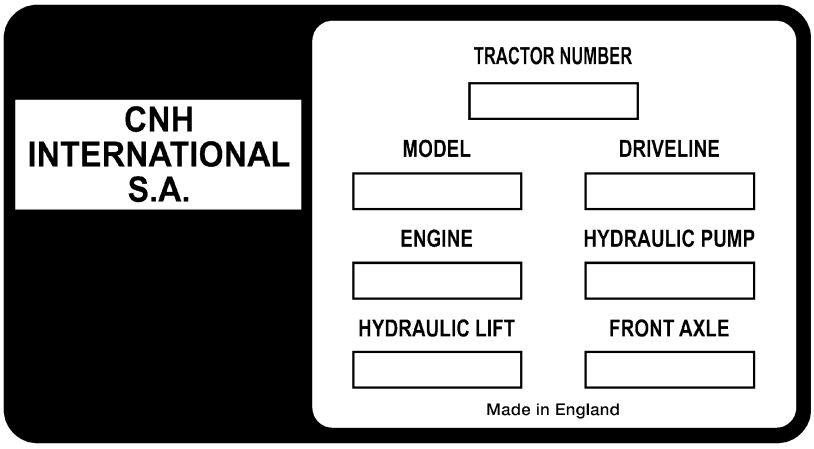
The following provides the locations of the identification data.



1

Vehicle Identification Plate

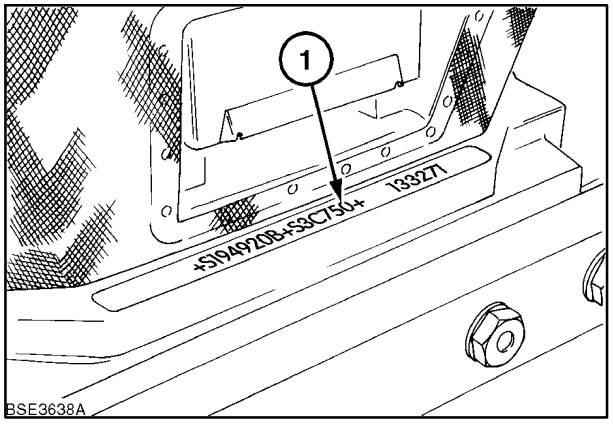
The vehicle identification plate, (1) Figure 1 is located on the left-hand radiator support. Record the information on the sample identification plate provided below.



2

Tractor Identification

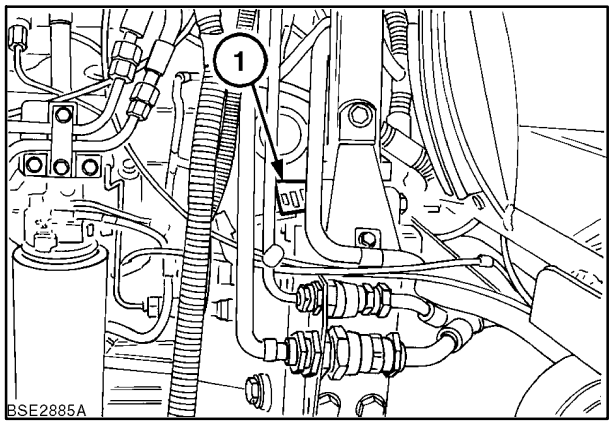
The serial number and model identification information is stamped on the top of the front support (1). These numbers are also repeated on the vehicle identification plate reproduced above.



3

Engine Identification

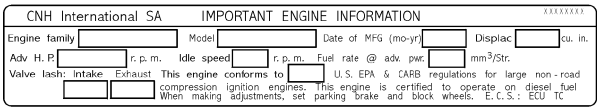
The engine serial number and date code are stamped on a plate (1) attached to the flywheel housing on the left-hand side of the engine adjacent to the fuel injection pump. This information is repeated on the emission control decal located on the engine oil pan, and on the vehicle identification plate reproduced on page16.



4

Emission Control Decal

Located on the right-hand side of the engine oil pan, the Emission Control Decal provides information on engine adjustments and compliance with emission regulations where required.


CNH International SA IMPORTANT ENGINE INFORMATION

Engine family [ ] Model [ ] Date of MFG (mo-yr) [ ] Displac [ ] cu. in.

Adv H.P. [ ] r.p.m. Idle speed [ ] r.p.m. Fuel rate @ adv. pwr. [ ] mm^3/Str.

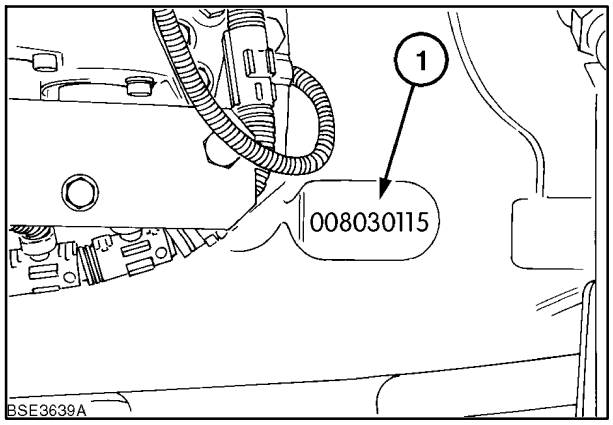
Valve lash: Intake [ ] Exhaust [ ] This engine conforms to [ ] U.S. EPA & CARB regulations for large non-road compression ignition engines. This engine is certified to operate on diesel fuel When making adjustments, set parking brake and block wheels. E.C.S.: ECU TC

5

BSE3611A

Driveline Identification

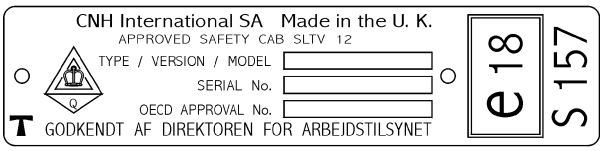
The serial number (1) is stamped on the right-hand side of the transmission casing. Access to the number can be gained by swinging out the battery carrier. This information is repeated on the vehicle identification plate.



6

Cab Identification

The cab serial number and other information is on the OECD certification plate. This plate can be found on the right-hand side of the cab trim panel, below the rear window.



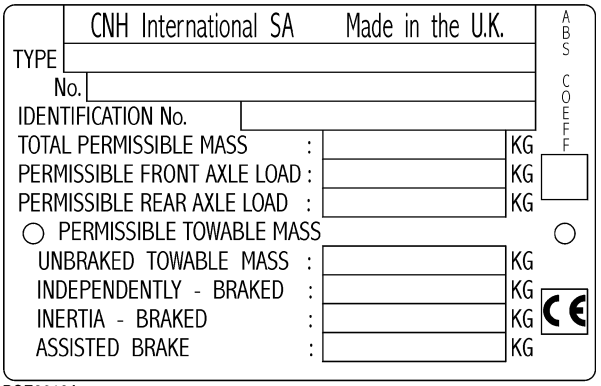
7

BSE3610A

Vehicle Weight Information

The Vehicle Weighting Plate provides important information on tractor and towed equipment weight combinations. This plate can be found on the right-hand side of the cab trim panel, below the rear window.

The figures shown are the maximum permissible weights and should not be exceeded, to do so may affect the safe operation of the tractor.



BSE3612A

8

INTERNATIONAL SYMBOLS

As a guide to the operation of the tractor, various universal symbols have been utilised on the instruments, controls, switches, and fuse box. The symbols are shown below with an indication of their meaning.

Thermostart starting aid

Alternator charge

Fuel level

Automatic Fuel shut-off

Engine speed (rev/min x 100)

Hours recorded

Engine oil pressure

Engine coolant temperature

Coolant level

Tractor lights

Headlamp main beam

Headlamp dipped beam

Work lamps

Stop lamps

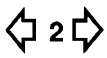
Horn

Radio

KAM
Keep alive memory

Turn signals

Turn signals -one trailer



Turn signals -two trailers

Front wind-screen wash/wipe

Rear wind-screen wash/wipe

Heater temp-erature control

Heater fan

Air conditioner

Air filter blocked

Parking brake

Brake fluid level

Trailer brake

Roof beacon

Warning! Corrosive substance

P.T.O.

N
Transmission in neutral

Creeper gears

Slow or low setting

Fast or high setting

Ground speed

Differential lock

Rear axle oil tem-perature

Transmission oil pressure

FWD engaged

FWD dis-engaged

Warning!

Hazard warning lights

Variable control

Pressurised! Open carefully

Position Control

Draft Control

Accessory socket

Implement socket

%age slip

Hitch raise (rear)

Hitch lower (rear)

Hitch height limit (rear)

Hitch height limit (front)

Hitch dis-abled

Hydraulic and transmission filters

Remote valve extend

Remote valve retract

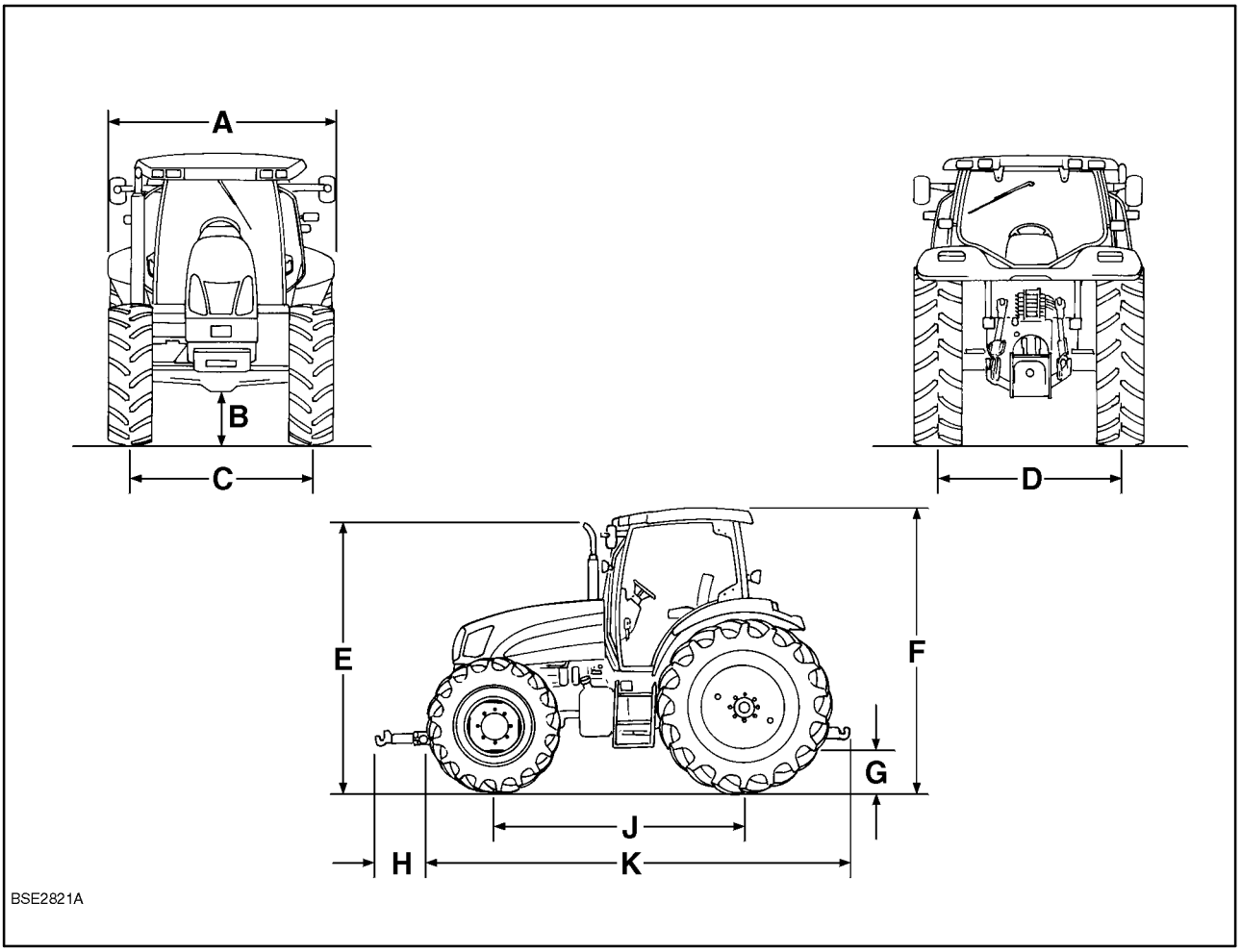
Remote valve float

Malfunction! See Operator's Manual

Malfunction! (alter-native symbol)

SPECIFICATIONS – PLUS/DELUXE MODELS

GENERAL DIMENSIONS — TS100A AND TS110A

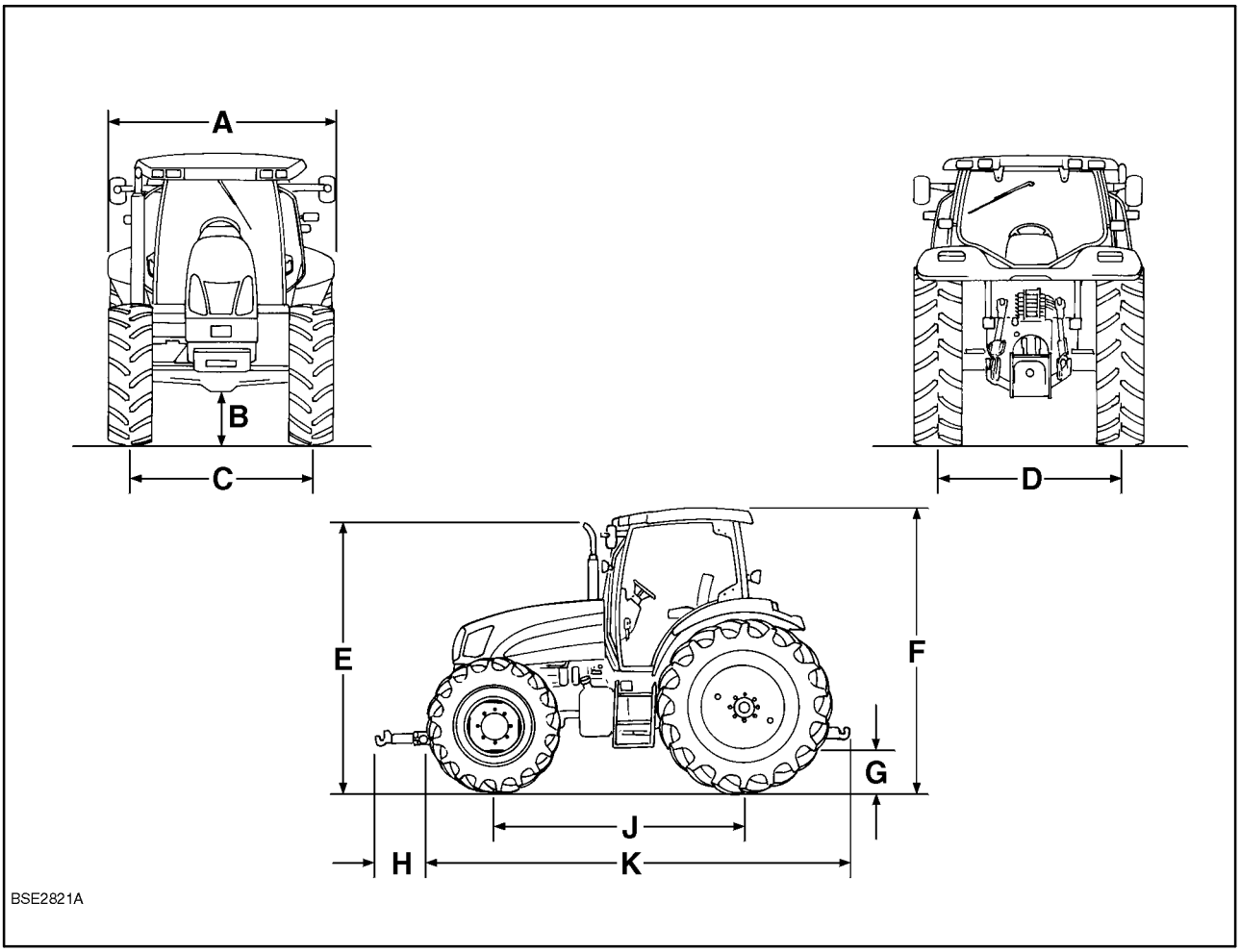


NOTE:*The following dimensions are based on* ***standard*** *tractors fitted with tyre sizes as shown. Allowance must be made for tyres of larger or smaller dimensions:*

		TS100A and TS110A		
		2WD	**4WD**	**4WD SuperSteer™**
The following dimensions are based	Front	7.50 x 16	14.9 R24	14.9 R24
on tractors with tyre sizes shown:	Rear	16.9 R38	16.9 R38	16.9 R38
A. Width across fenders				
Standard fenders	mm	_____	2170	_____
	in	_____	85.4	_____
Extended fenders	mm	_____	2550	_____
	in	_____	100.3	_____

GENERAL DIMENSIONS		TS100A and TS110A		
		2WD	4WD	4WD SuperSteer™
B. Ground clearance below front axle	mm	472 Std / 522 HD	427	407
	in	18.5 Std / 20.5 HD	16.8	16.0
C. Front track setting	mm	1422 - 2134	1407 - 2108	1407 - 2108
	in	56.0 - 84.0	55.4 - 83.0	55.4 - 83.0
D. Rear track setting	mm	1426 - 2026	1426 - 2026	1426 - 2026
	in	56.1 - 79.8	56.1 - 79.8	56.1 - 79.8
E. Height to top of exhaust	mm	———	2876	———
	in	———	113.2	———
F. Height to:				
- Top of standard cab	mm	———	2856	———
	in	———	112.4	———
- Top of suspended cab	mm	———	2921	———
	in	———	115.0	———
- Top of ROPS	mm	———	2856	———
	in	———	112.4	———
G. Ground clearance below drawbar	mm	———	426	———
	in	———	16.7	———
H. Front hitch projection	mm	-	725	595
	in	-	28.5	23.4
J. Wheelbase	mm	2370	2412	2520
	in	93.3	94.9	99.2
K. Overall length to end of lower links	mm	4145	4182	4290
	in	163.1	164.6	168.8
Minimum turn radius (with brakes)	mm	3277	3540	2800
	in	129.0	139.3	110.2
(without brakes)	mm	3660	4940	3630
	in	144.0	194.4	142.9

NOTE: *If your tractor has tyres of a different size then the above dimensions will vary due to the difference in the rolling radius and section width of the tyres fitted.*



NOTE:*The following dimensions are based on* ***standard*** *tractors fitted with tyre sizes as shown. Allowance must be made for tyres of larger or smaller dimensions:*

		TS115A, TS125A and TS135A		
		2WD	**4WD**	**4WD SuperSteer™**
The following dimensions are based on tractors with tyre sizes shown:	Front	10.00 x 16	14.9 R28	14.9 R28
	Rear	18.4 R38	18.4 R38	18.4 R38
A. Width across fenders				
Standard fenders	mm	_____	2170	_____
	in	_____	85.4	_____
Extended fenders	mm	_____	2550	_____
	in	_____	100.3	_____

	GENERAL DIMENSIONS		TS115A, TS125A and TS135A		
			2WD	4WD	4WD SuperSteer™
B.	**Ground clearance below front axle**	mm	507 Std / 557 HD	478	458
		in	19.9 Std / 21.9 HD	18.8	18.0
C.	**Front track setting**	mm	1422 - 2134	1407 - 2108	1407 - 2108
		in	56.0 - 84.0	55.4 - 83.0	55.4 - 83.0
D.	**Rear track setting**	mm	1426 - 2026	1426 - 2026	1426 - 2026
		in	56.1 - 79.8	56.1 - 79.8	56.1 - 79.8
E.	**Height to top of exhaust**	mm	———	2920	———
		in	———	114.9	———
F.	**Height to:**				
	- Top of standard cab	mm	———	2900	———
		in	———	114.1	———
	- Top of suspended cab	mm	———	2965	———
		in	———	116.7	———
	- Top of ROPS (n/a TS135A)	mm	———	2900	———
		in	———	114.1	———
G.	**Ground clearance below drawbar**	mm	———	470	———
		in	———	18.5	———
H.	**Front hitch projection**	mm	-	675	545
		in	-	26.5	21.4
J.	**Wheelbase**	mm	2652	2661	2760
		in	104.4	104.7	108.6
K.	**Overall length to end of lower links**	mm	4385	4481	4580
		in	172.6	176.4	180.3
	Minimum turn radius (with brakes)	mm	3277	3720	3610
		in	129.0	146.4	142.1
	(without brakes)	mm	3660	5360	4560
		in	144.0	211.0	179.5

NOTE: *If your tractor has tyres of a different size then the above dimensions will vary due to the difference in the rolling radius and section width of the tyres fitted.*

WEIGHTS		TS100A	TS110A	TS115A	TS125A	TS135A
2WD - with cab						
On front axle	kg	1362	1431	1482	1494	1500
	lb	3002	3154	3267	3293	3306
On rear axle	kg	3178	3339	3458	3486	3500
	lb	7006	7361	7623	7685	7716
Total weight	kg	4540	4770	4940	4980	5000
	lb	10008	10515	10890	10978	11022
4WD - with cab, standard axle						
On front axle	kg	1884	1976	2044	2056	2060
	lb	4153	4356	4506	4532	4541
On rear axle	kg	2826	2964	3066	3084	3090
	lb	6230	6534	6759	6798	6812
Total weight	kg	4710	4940	5110	5140	5150
	lb	10383	10890	11265	11331	11353
4WD - with cab, SuperSteer axle						
On front axle	kg	1936	2028	2096	2108	2112
	lb	4268	4470	4620	4647	4656
On rear axle	kg	2904	3042	3144	3162	3168
	lb	6402	6706	6931	6970	6984
Total weight	kg	4840	5070	5240	5270	5280
	lb	10670	11177	11552	11618	11640
4WD - with cab, Suspended axle						
On front axle	kg	1948	2040	2116	2128	2132
	lb	4294	4497	4664	4691	4700
On rear axle	kg	2922	3060	3174	3192	3198
	lb	6441	6746	6997	7037	7050
Total weight	kg	4870	5100	5290	5320	5330
	lb	10736	11243	11662	11728	11750
2WD - less cab						
On front axle	kg	1233	1302	1359	1368	-
	lb	2718	2870	2996	3015	-
On rear axle	kg	2877	3038	3171	3192	-
	lb	6342	6697	6990	7037	-
Total weight	kg	4110	4340	4530	4560	-
	lb	9060	9567	9986	10052	-

WEIGHTS (continued)		TS100A	TS110A	TS115A	TS125A	TS135A
4WD - less cab, Standard axle						
On front axle	kg	1712	1804	1880	1892	-
	lb	3774	3977	4144	4171	-
On rear axle	kg	2568	2706	2820	2838	-
	lb	5661	5965	6216	6256	-
Total weight	kg	4280	4510	4700	4730	-
	lb	9435	9942	10361	10427	-
4WD - less cab, SuperSteer axle						
On front axle	kg	1764	1856	1932	1944	-
	lb	3888	4091	4259	4285	-
On rear axle	kg	2646	2784	2898	2916	-
	lb	5833	6137	6388	6428	-
Total weight	kg	4410	4640	4830	4860	-
	lb	9722	10229	10648	10714	-
4WD - less cab, Suspended axle						
On front axle	kg	1776	1868	1944	1956	-
	lb	3915	4118	4285	4315	-
On rear axle	kg	2664	2802	2916	2934	-
	lb	5873	6177	6428	6468	-
Total weight	kg	4440	4670	4860	4890	-
	lb	9788	10295	10714	10780	-

NOTE: The above weights are based on standard production tractors with full fuel tank, but without driver, ballast or additional equipment.

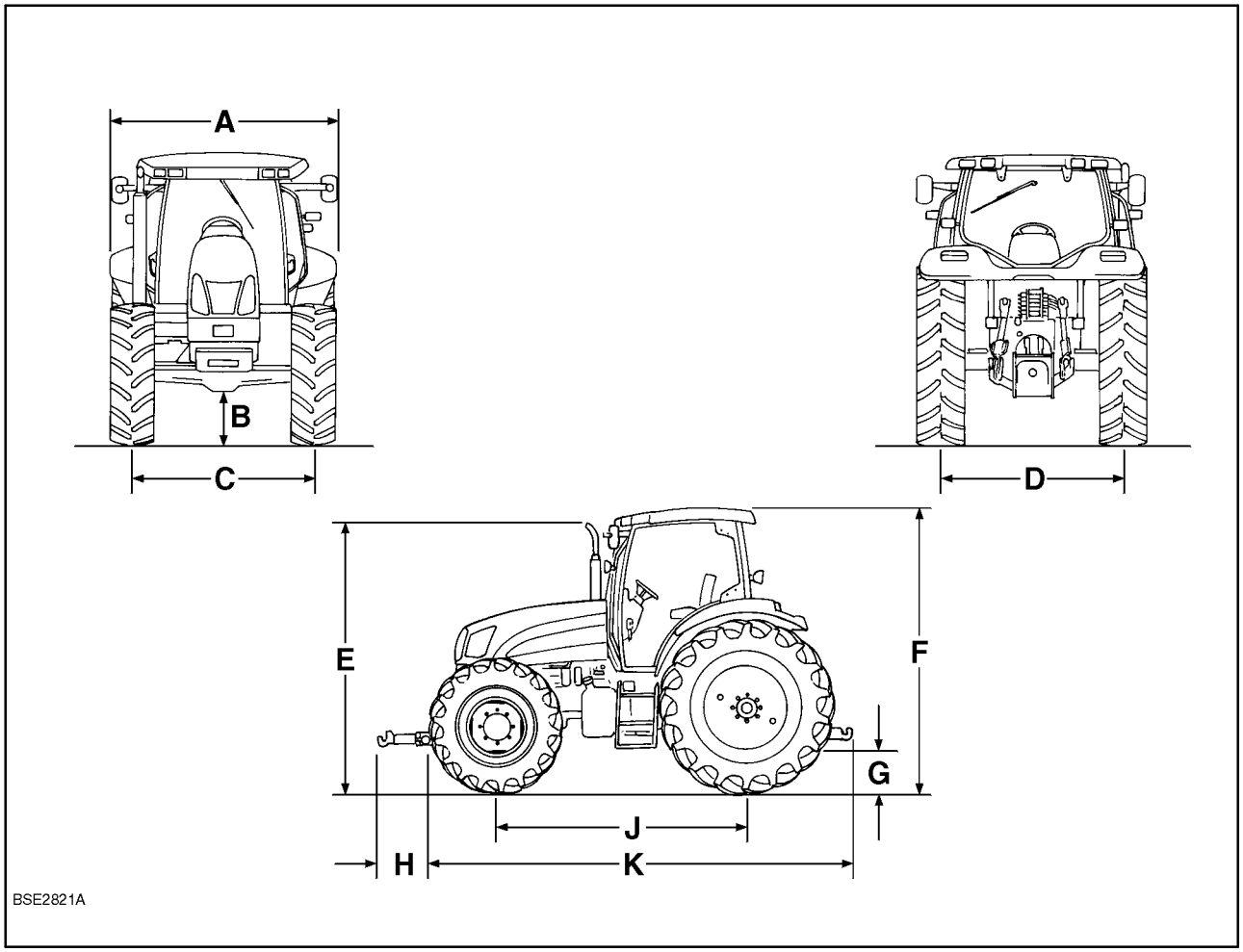
CAPACITIES		TS100A	TS110A	TS115A	TS125A	TS135A
Fuel tank	Litres	177	177	220	220	220
	US gals	46.7	46.7	58.1	58.1	58.1
Cooling system	Litres	23	23	25	25	25
(with cab)	US gals	6.07	6.07	6.6	6.6	6.6
Cooling system	Litres	21	21	23	23	n/a
(less cab)	US gals	5.54	5.54	6.07	6.07	n/a
Engine	Litres	10	10	15	15	15
(including filter)	US gals	2.64	2.64	3.96	3.96	3.96
Transmission/rear axle						
(with 12x12, Light Duty axle)	Litres	58	–	–	–	–
	US gals	15.3		–		
(with 12x12, Heavy Duty axle)	Litres	65	–	65	–	–
	US gals	17.1		17.1		
(with 24x24, Light Duty axle)	Litres	—	58.5	–	–	–
	US gals	—	15.4	–	–	–
(with 24x24, Heavy Duty axle)	Litres	—		65.5	—	
	US gals	—		17.3	—	
(with 16x16, Light Duty axle)	Litres	—	55	–	–	–
	US gals	—	14.5	–	–	–
(with 16x16, Heavy Duty axle)	Litres	—		62	—	
	US gals	—		16.3	—	
4WD Front hubs (w/o brakes)	Litres	—		1.25	—	
(quantity for **one** hub only)	US qts	—		1.3	—	
4WD Front hubs (with brakes)	Litres	—		3.0	—	
(quantity for **one** hub only)	US qts	—		3.2	—	
4WD Front axle differential	Litres	—	7.5	—	—	9.0 —
(All axles)	US qts	—	7.92	—	—	9.5 —

NOTE: *When operating remote cylinders, the rear axle oil level will be affected. When topping up the rear axle to accommodate the oil requirement of remote cylinders, no more than 20 litres (5.28 U.S. gallons) should be added to bring the oil level up to the upper mark on the dipstick when all rams are fully extended.*

Alternatively, remote cylinders with an oil capacity of up to 18 litres (4.75 U.S. gallons) may be connected to the tractor hydraulic system without adding oil, provided the tractor is being operated on level ground.

SPECIFICATIONS - STANDARD MODELS

GENERAL DIMENSIONS — TS100A and TS110A,

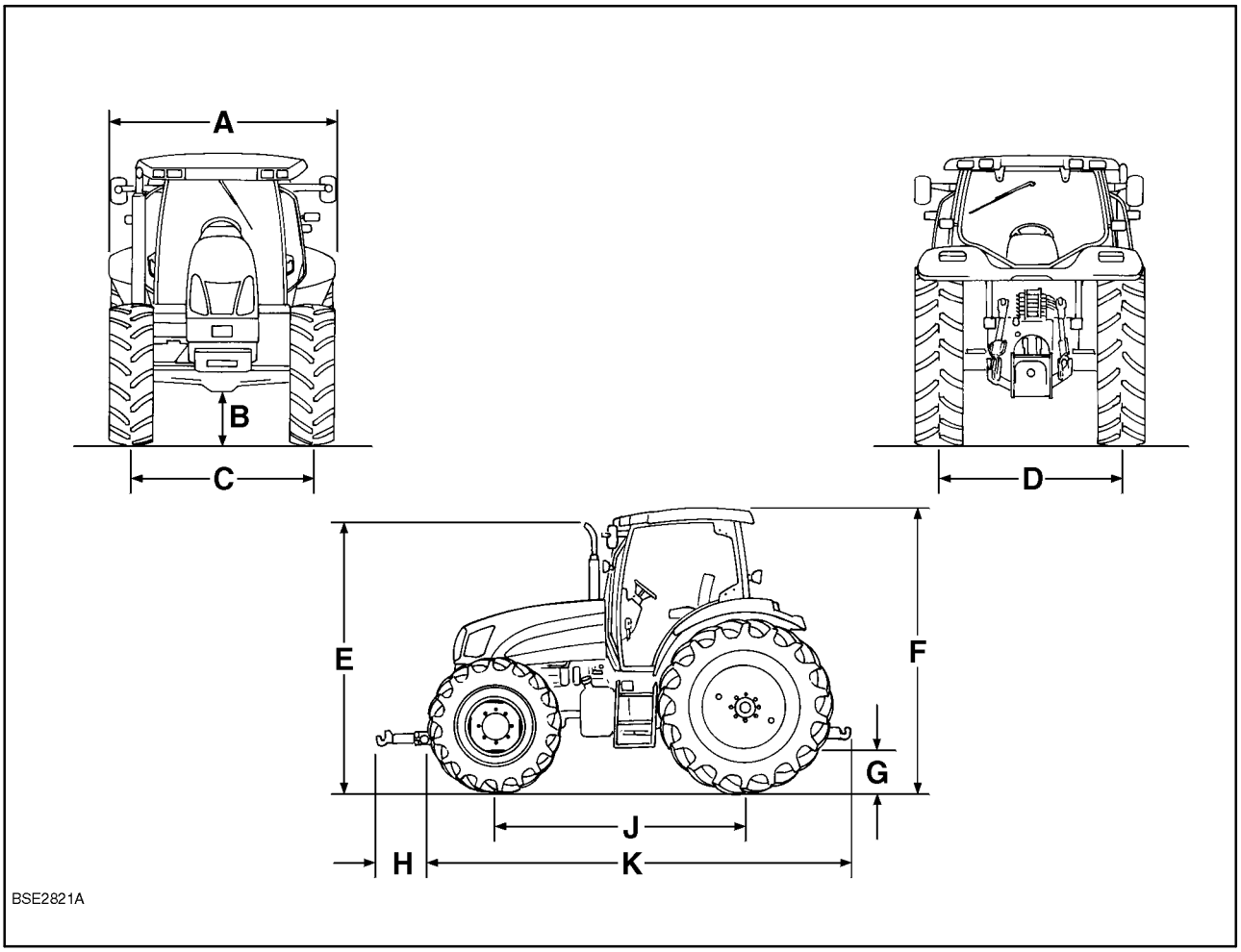


NOTE:*The following dimensions are based on* ***standard*** *tractors fitted with tyre sizes as shown. Allowance must be made for tyres of larger or smaller dimensions:*

		TS100A and TS110A	
		2WD	**4WD**
The following dimensions are based on tractors with tyre sizes shown:	Front	7.50 x 16	14.9 R24
	Rear	16.9 R38	16.9 R38
A. Width across fenders			
Standard fenders	mm	2170	2170
	in	85.4	85.4
Extended fenders	mm	2550	2550
	in	100.3	100.3

GENERAL DIMENSIONS		TS100A and TS110A	
		2WD	4WD
B. Ground clearance below front axle	mm	472 Std / 522 HD	427
	in	18.5 Std / 20.5 HD	16.8
C. Front track setting	mm	1422 - 2134	1407 - 2108
	in	56.0 - 84.0	55.4 - 83.0
D. Rear track setting	mm	1426 - 2026	1426 - 2026
	in	56.1 - 79.8	56.1 - 79.8
E. Height to top of exhaust (with Standard Cab)	mm	2876	2876
	in	113.2	113.2
(with Low Profile Cab)	mm	2726	2726
	in	107.3	107.3
F. Height to:			
- Top of Standard Cab	mm	2856	2856
	in	115.0	115.0
- Top of Low Profile Cab	mm	2775	2775
	in	109.2	109.2
- Top of ROPS	mm	2856	2856
	in	112.4	112.4
G. Ground clearance below drawbar	mm	426	426
	in	16.7	16.7
H. Front hitch projection	mm	-	725
	in	-	28.5
J. Wheelbase	mm	2370	2412
	in	93.3	94.9
K. Overall length to end of lower links	mm	4145	4182
	in	163.1	164.6
Minimum turn radius (with brakes)	mm	3277	3540
	in	129.0	139.3
(without brakes)	mm	3660	4940
	in	144.0	194.4

NOTE: *If your tractor has tyres of a different size then the above dimensions will vary due to the difference in the rolling radius and section width of the tyres fitted.*



NOTE:*The following dimensions are based on* ***standard*** *tractors fitted with tyre sizes as shown. Allowance must be made for tyres of larger or smaller dimensions:*

		TS115A and TS130A	
		2WD	**4WD**
The following dimensions are based on tractors with tyre sizes shown:	Front	10.00 x 16	14.9 R28
	Rear	18.4 R38	18.4 R38
A. Width across fenders			
Standard fenders	mm	2170	2170
	in	85.4	85.4
Extended fenders	mm	2550	2550
	in	100.3	100.3

	GENERAL DIMENSIONS		TS115A and TS130A	
			2WD	4WD
B.	**Ground clearance below front axle**	mm	507 Std / 557 HD	478
		in	19.9 Std / 21.9 HD	18.8
C.	**Front track setting**	mm	1422 - 2134	1407 - 2108
		in	56.0 - 84.0	55.4 - 83.0
D.	**Rear track setting**	mm	1426 - 2026	1426 - 2026
		in	56.1 - 79.8	56.1 - 79.8
E.	**Height to top of exhaust** (with Standard Cab)	mm	2920	2920
		in	114.9	114.9
	(with Low Profile Cab)	mm	2770	2770
		in	109.0	109.0
F.	**Height to:**			
	- Top of Standard Cab	mm	2900	2900
		in	116.7	116.7
	- Top of Low Profile Cab	mm	2819	2819
		in	111.0	111.0
	- Top of ROPS	mm	2900	2900
		in	114.1	114.1
G.	**Ground clearance below drawbar**	mm	470	470
		in	18.5	18.5
H.	**Front hitch projection**	mm	-	675
		in	-	26.5
J.	**Wheelbase**	mm	2652	2661
		in	104.4	104.7
K.	**Overall length to end of lower links**	mm	4385	4481
		in	172.6	176.4
	Minimum turn radius (with brakes)	mm	3277	3720
		in	129.0	146.4
	(without brakes)	mm	3660	5360
		in	144.0	211.0

NOTE: *If your tractor has tyres of a different size then the above dimensions will vary due to the difference in the rolling radius and section width of the tyres fitted.*

WEIGHTS		TS100A	TS110A	TS115A	TS130A
2WD - with Standard Cab					
On front axle	kg	1362	1431	1482	1482
	lb	3002	3154	3267	3267
On rear axle	kg	3178	3339	3458	3458
	lb	7006	7361	7623	7623
Total weight	kg	4540	4770	4940	4940
	lb	10008	10515	10890	10890
2WD - with Low Profile Cab					
On front axle	kg	1500	1500	ina	ina
	lb	3807	3807		
On rear axle	kg	2710	2710	ina	ina
	lb	5974	5974		
Total weight	kg	4210	4210	ina	ina
	lb	9281	9281		
4WD - with Standard Cab					
On front axle	kg	1884	1976	2044	2044
	lb	4153	4356	4506	4506
On rear axle	kg	2826	2964	3066	3066
	lb	6230	6534	6759	6759
Total weight	kg	4710	4940	5110	5110
	lb	10383	10890	11265	11265
4WD - with Low Profile Cab					
On front axle	kg	1872	1872	2008	2008
	lb	4127	4127	4426	4426
On rear axle	kg	2706	2706	3134	3134
	lb	5966	5966	6909	6909
Total weight	kg	4578	4578	5142	5142
	lb	10093	10093	11336	11336

NOTE: The above weights are based on standard production tractors with full fuel tank, but without driver, ballast or additional equipment.

WEIGHTS (continued)		TS100A	TS110A	TS115A	TS130A
2WD – with ROPS					
On front axle	kg	1233	1302	1359	1359
	lb	2718	2870	2996	2996
On rear axle	kg	2877	3038	3171	3171
	lb	6342	6697	6990	6990
Total weight	kg	4110	4340	4530	4530
	lb	9060	9567	9986	9986
4WD – with ROPS					
On front axle	kg	1712	1804	1880	1880
	lb	3774	3977	4144	4144
On rear axle	kg	2568	2706	2820	2820
	lb	5661	5965	6216	6216
Total weight	kg	4280	4510	4700	4700
	lb	9435	9942	10361	10361

NOTE: The above weights are based on standard production tractors with full fuel tank, but without driver, ballast or additional equipment.

CAPACITIES		TS100A	TS110A	TS115A	TS130A
Fuel tank	Litres	180	180	254	254
	US gals	47.5	47.5	67.0	67.0
Cooling system	Litres	23	23	25	25
(with cab)	US gals	6.07	6.07	6.6	6.6
Cooling system	Litres	21	21	23	23
(less cab)	US gals	5.54	5.54	6.07	6.07
Engine	Litres	10	10	15	15
(including filter)	US gals	2.64	2.64	3.96	3.96
Transmission/rear axle					
(with 12x12, Light Duty axle)	Litres	58	58	-	-
	US gals	15.3	15.3	-	-
(with 12x12, Heavy Duty axle)	Litres	65	65	65	-
	US gals	17.1	17.1	17.1	-
(with 24x24, Light Duty axle)	Litres	58.5	58.5	-	-
	US gals	15.4	15.4	-	-
(with 24x24, Heavy Duty axle)	Litres	65.5	65.5	65.5	65.5
	US gals	17.3	17.3	17.3	17.3
(with 16x16, Light Duty axle)	Litres	55	55	-	-
	US gals	14.5	14.5	-	-
(with 16x16, Heavy Duty axle)	Litres	62	62	62	62
	US gals	16.3	16.3	16.3	16.3
4WD Front axle differential	Litres	7.5	7.5	7.5	-
(Class II axles)	US qts	7.92	7.92	7.92	-
4WD Front axle differential	Litres	9.0	9.0	9.0	9.0
(Class III axles)	US qts	9.5	9.5	9.5	9.5
4WD Front hubs	Litres	1.25	1.25	1.25	1.25
(quantity for **one** hub only)	US qts	1.3	1.3	1.3	1.3

NOTE: *When operating remote cylinders, the rear axle oil level will be affected. When topping up the rear axle to accommodate the oil requirement of remote cylinders, no more than 20 litres (5.28 U.S. gallons) should be added to bring the oil level up to the upper mark on the dipstick when all rams are fully extended.*

Alternatively, remote cylinders with an oil capacity of up to 18 litres (4.75 U.S. gallons) may be connected to the tractor hydraulic system without adding oil, provided the tractor is being operated on level ground.

MINIMUM HARDWARE TIGHTENING TORQUES

IN NEWTON-METERS (FOOT POUNDS) FOR NORMAL ASSEMBLY APPLICATIONS

INCH NON-FLANGED HARDWARE AND LOCKNUTS

NOMINAL SIZE	SAE GRADE 2		SAE GRADE 5		SAE GRADE 8		LOCKNUTS		NOMINAL SIZE
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	GR.B w/GR5 BOLT	GR.C w/GR8 BOLT	
1/4	6.2 (55)*	8.1 (72)*	9.7 (86)*	13 (112)*	14 (121)*	18 (157)*	8.5 (75)*	12.2 (109)*	1/4
5/16	13 (115)*	17 (149)*	20 (178)*	26 (229)*	28 (250)*	37 (324)*	17.5 (155)*	25 (220)*	5/16
3/8	23 (17)	30 (22)	35 (26)	46 (34)	50 (37)	65 (48)	31 (23)	44 (33)	3/8
7/16	37 (27)	47 (35)	57 (42)	73 (54)	80 (59)	104 (77)	50 (37)	71 (53)	7/16
1/2	57 (42)	73 (54)	87 (64)	113 (83)	123 (91)	159 (117)	76 (56)	108 (80)	1/2
9/16	81 (60)	104 (77)	125 (92)	163 (120)	176 (130)	229 (169)	111 (82)	156 (115)	9/16
5/8	112 (83)	145 (107)	174 (128)	224 (165)	244 (180)	316 (233)	153 (113)	215 (159)	5/8
3/4	198 (146)	256 (189)	306 (226)	397 (293)	432 (319)	560 (413)	271 (200)	383 (282)	3/4
7/8	193 (142)	248 (183)	495 (365)	641 (473)	698 (515)	904 (667)	437 (323)	617 (455)	7/8
1	289 (213)	373 (275)	742 (547)	960 (708)	1048 (773)	1356 (1000)	654 (483)	924 (681)	1

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION
CAP SCREWS AND CARRIAGE BOLTS

SAE GRADE 2

SAE GRADE 5

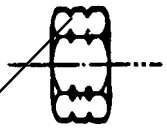
SAE GRADE 8

REGULAR NUTS

SAE GRADE 5 HEX NUTS

SAE GRADE 8 HEX NUTS

LOCKNUTS



GRADE IDENTIFICATION

GRADE A NO NOTCHES

GRADE B ONE CIRCUMFERENTIAL NOTCH

GRADE C TWO CIRCUMFERENTIAL NOTCHES

GRADE IDENTIFICATION

GRADE A NO MARKS

GRADE B THREE MARKS

GRADE C SIX MARKS

MARKS NEED NOT BE LOCATED AT CORNERS

GRADE A NO MARK
GRADE B LETTER B
GRADE C LETTER C

GRADE IDENTIFICATION

MINIMUM HARDWARE TIGHTENING TORQUES

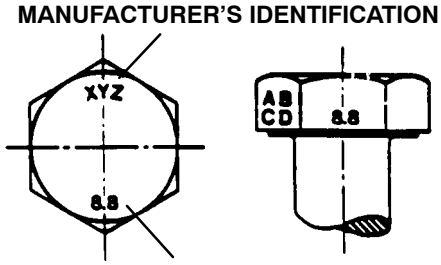
IN NEWTON-METERS (FOOT POUNDS) FOR NORMAL ASSEMBLY APPLICATIONS

METRIC NON-FLANGED HARDWARE AND LOCKNUTS

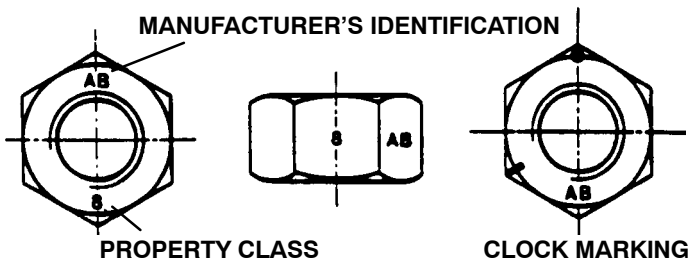
NOMINAL SIZE	CLASS 5.8		CLASS 8.8		CLASS 10.9		LOCKNUT CL.8 W/CL8.8 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	
M4	1.7 (15)*	2.2 (19)*	2.6 (23)*	3.4 (30)*	3.7 (33)*	4.8 (42)*	2.3 (20)*
M6	5.8 (51)*	7.6 (67)*	8.9 (79)*	12 (102)*	13 (115)*	17 (150)*	7.8 (69)*
M8	14 (124)*	18 (159)*	22 (195)*	28 (248)*	31 (274)*	40 (354)*	19 (169)*
M10	28 (21)	36 (27)	43 (32)	56 (41)	61 (45)	79 (58)	38 (28)
M12	49 (36)	63 (46)	75 (55)	97 (72)	107 (79)	138 (102)	66 (49)
M16	121 (89)	158 (117)	186 (137)	240 (177)	266 (196)	344 (254)	164 (121)
M20	237 (175)	307 (226)	375 (277)	485 (358)	519 (383)	671 (495)	330 (243)
M24	411 (303)	531 (392)	648 (478)	839 (619)	897 (662)	1160 (855)	572 (422)

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION
HEX CAP SCREW AND CARRIAGE BOLTS
CLASSES 5.6 AND UP



HEX NUTS AND LOCKNUTS
CLASSES 05 AND UP



SECTION 01 - SEPARATING THE TRACTOR

Chapter 1 - Separating Front Axle and Front Support from the Engine

CONTENT

Section	Description	Page
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	Special Tools	2
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10 001	Front Axle and Front Support	3
	Removal	3
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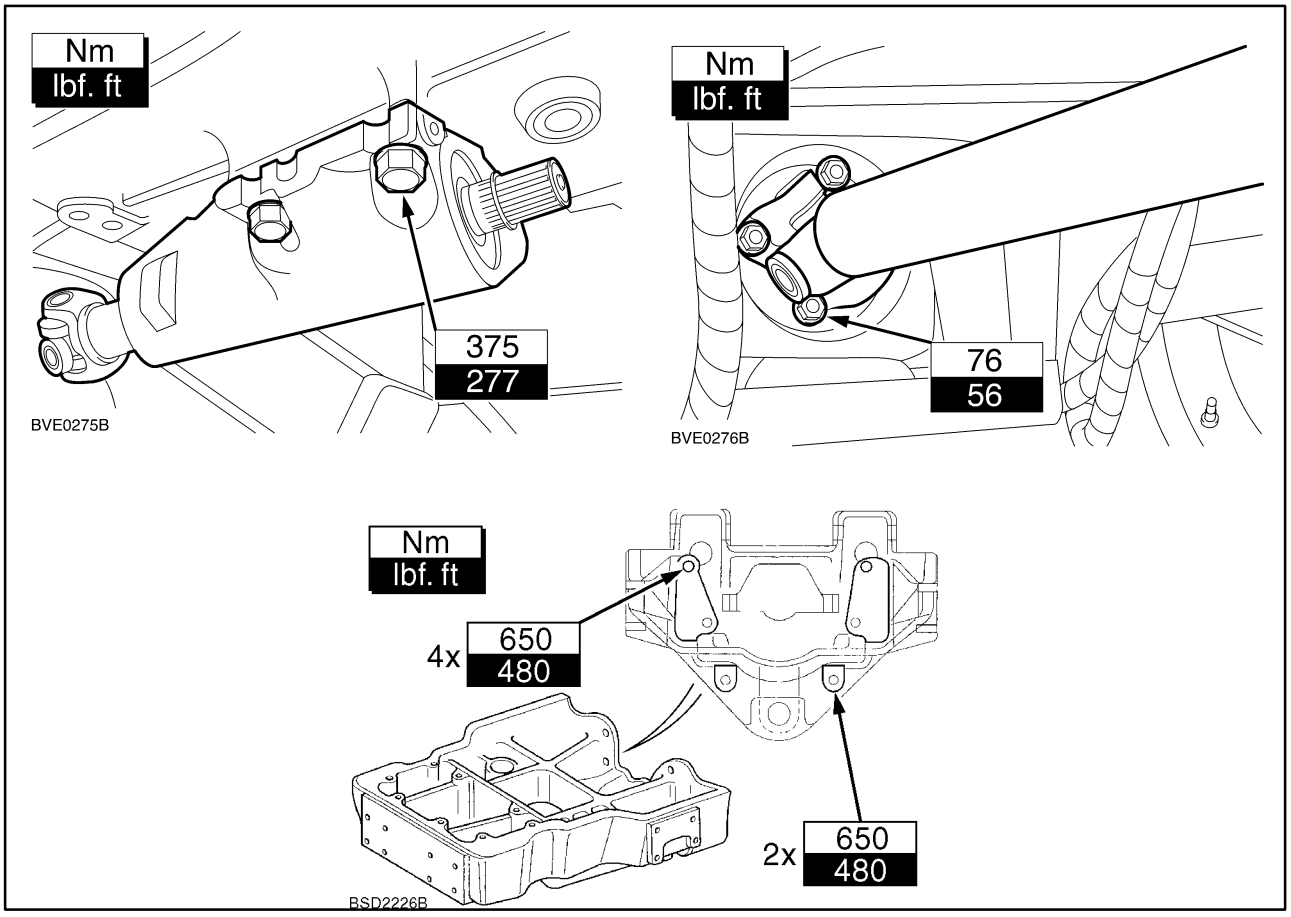
TIGHTENING TORQUES



1

SPECIAL TOOLS

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

297471	Tractor splitting kit.
297617	Engine support brackets (with **297471**).
380000844	Engine support adaptor plate (with **297617**).

OVERHAUL

FRONT AXLE AND FRONT SUPPORT

(Op. 10 001)

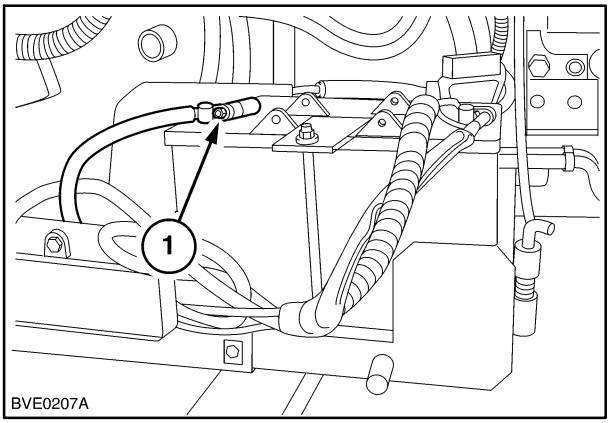
Removal

All Tractors

DANGER

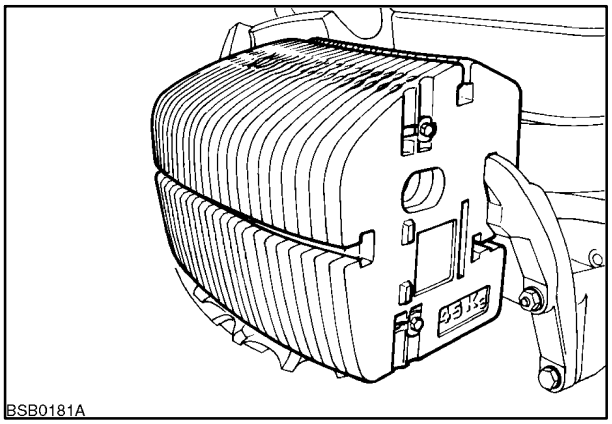
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

1. Drain the cooling system (refer to cooling system drain in the cooling chapter of the engine section).
2. Remove the battery cover and disconnect the battery negative cable (1).



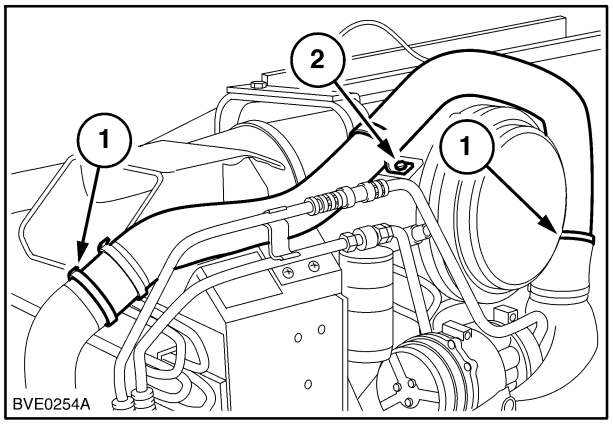
2

3. Using a suitable sling, connect the front weights to a hoist and remove the front weights (if fitted).



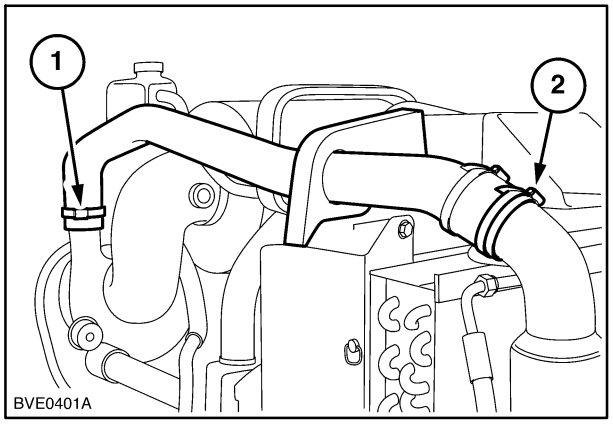
3

4. Loosen the hose clamps (1), remove the pipe clamp retaining bolt (2) and remove the air cooler outlet pipe.



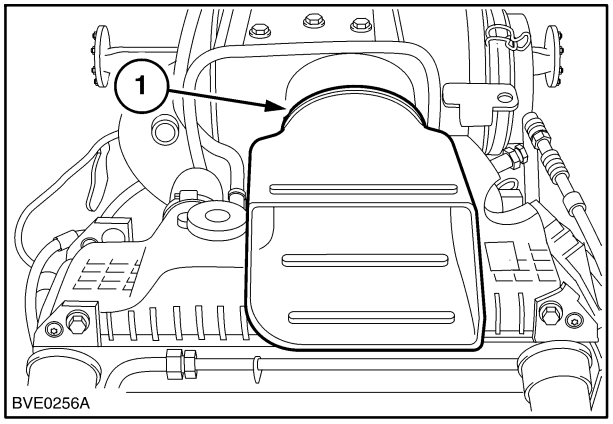
4

5. Loosen the pipe clamp (1), hose clamp (2) and remove the air cooler inlet pipe.



5

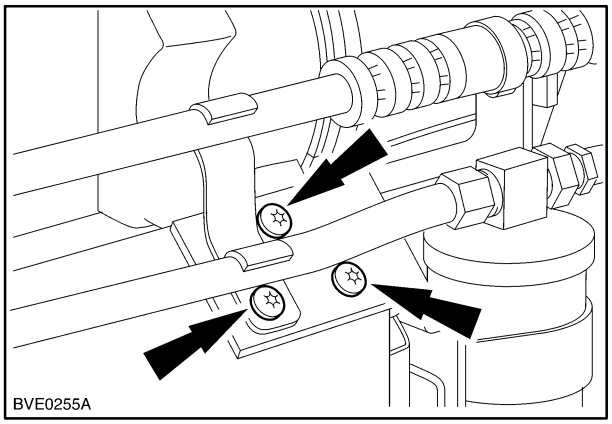
6. Loosen the clamp (1) and remove the air cleaner inlet.



6

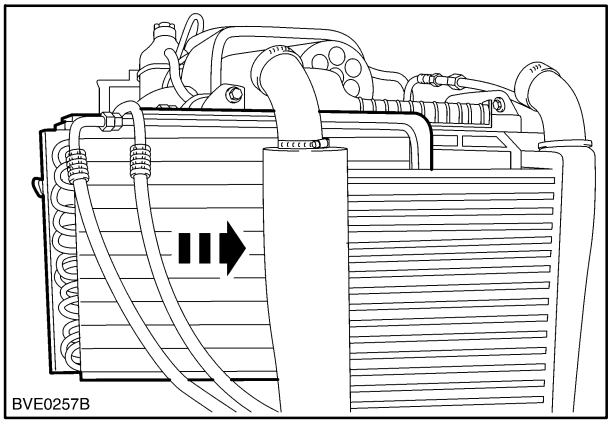
Tractors with Air Conditioning

7. Remove the receiver dryer retaining screws from the retaining bracket.



7

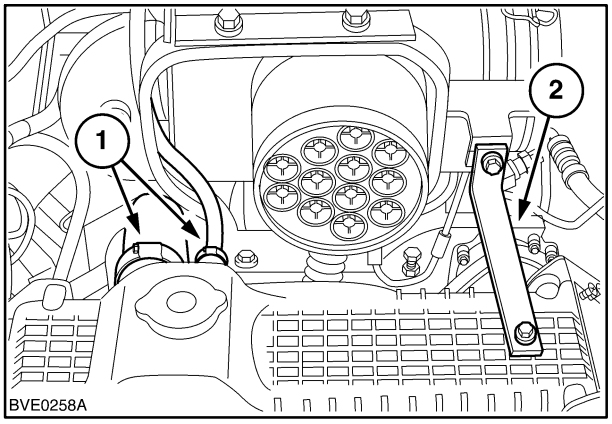
8. Slide out the air conditioning condenser from the radiator and reposition with the hoses still attached.



8

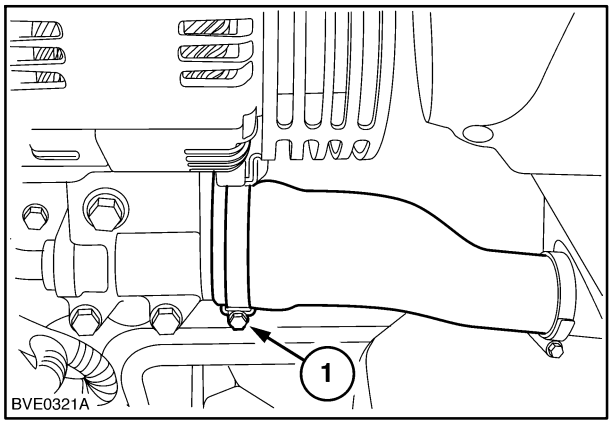
All Tractors

9. Loosen the hose clamps (1) and disconnect the coolant hoses from the radiator.
10. Remove the radiator support (2).



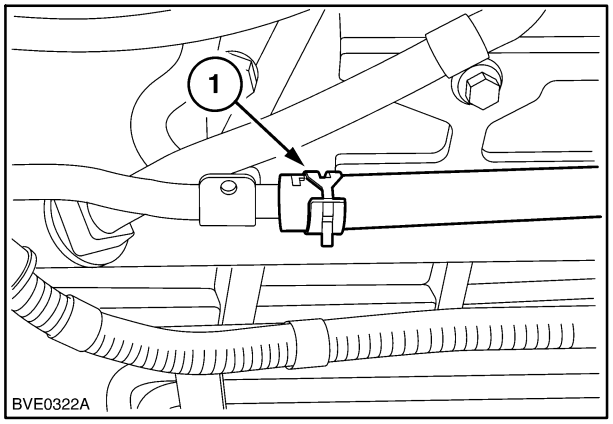
9

11. Loosen the hose clamp (1) and disconnect the coolant hose.



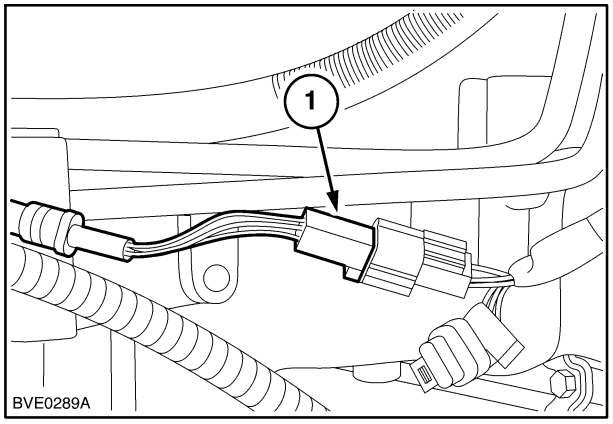
10

12. Loosen the coolant hose clamp (1) and disconnect the coolant hose connecting the cab heater to the radiator.



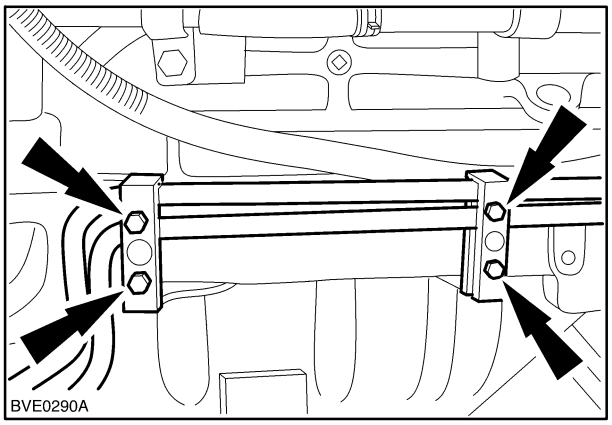
11

13. Disconnect the steering sensor electrical connector (if fitted).



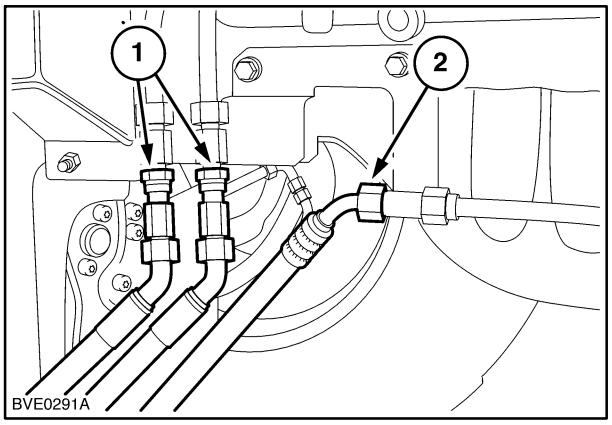
12

14. Detach the driveline oil cooler supply and return pipes from the retaining clamps.



13

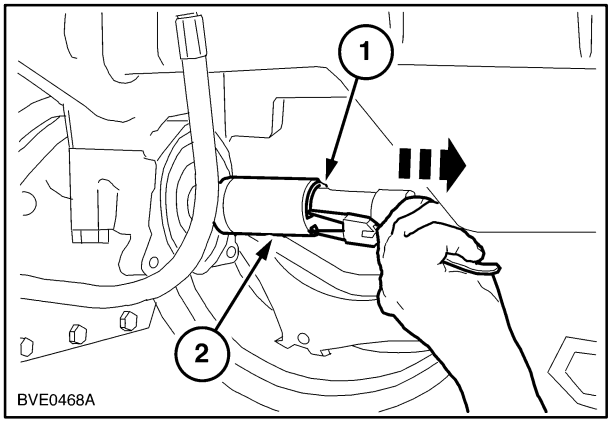
15. Disconnect the steering cylinder supply and return pipes (1).
16. Disconnect the differential lock oil supply pipe (2) (if fitted).



14

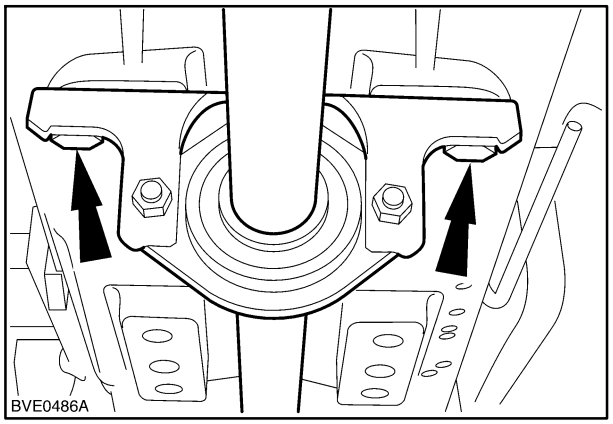
Tractors with Standard Front Axle

17. Remove the four wheel driveshaft guard.
18. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel drive shaft.



15

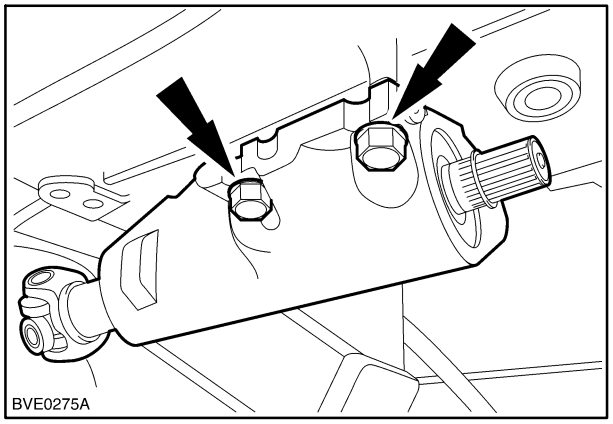
19. Remove the four wheel driveshaft and the central support.



16

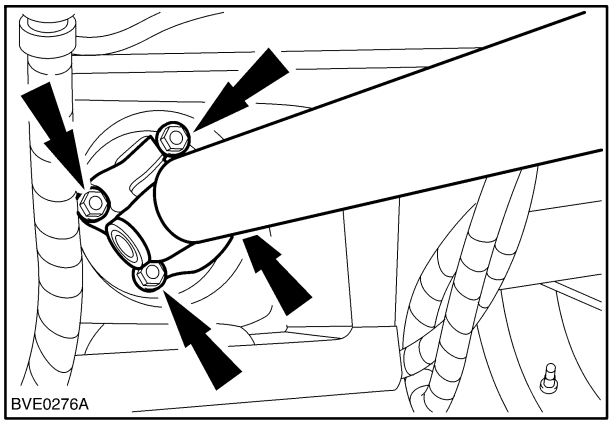
Tractors with SuperSteer Front Axle

20. Remove the four wheel driveshaft retaining nuts.



17

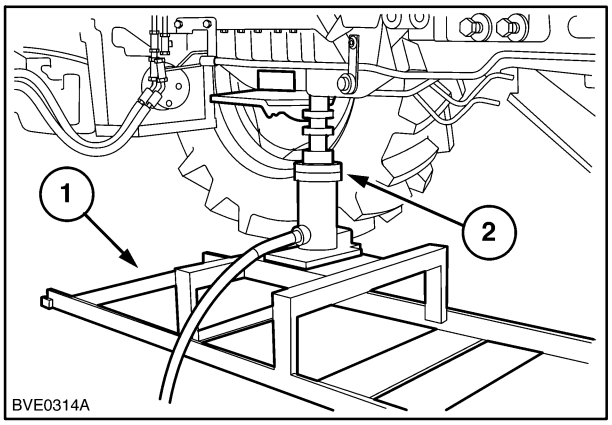
21. Remove the support and the four wheel driveshaft.



18

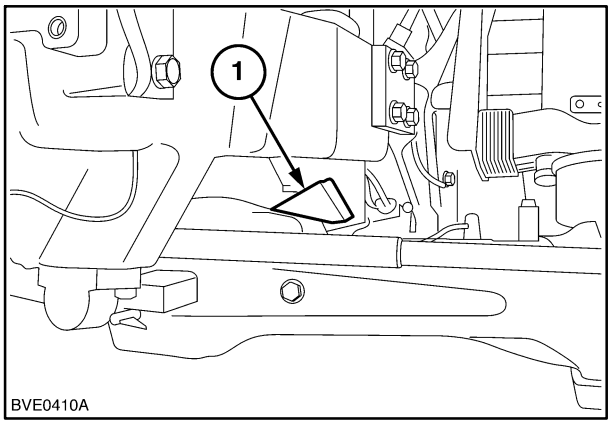
All Tractors

22. Position the splitting kit (1) **297471** beneath the tractor.
23. Use the supports (2), in the the splitting kit to support the engine on the splitting stand.



19

24. Position wooden wedges (1) between the front axle and the front support. These prevent articulation of the axle.



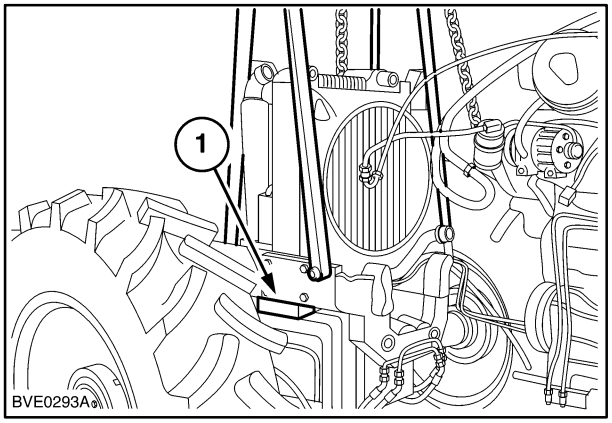
20

25. Using a spreader bar and suitable chains or slings, attach the front and rear of the support assembly to a moveable overhead hoist.

⚠ WARNING ⚠

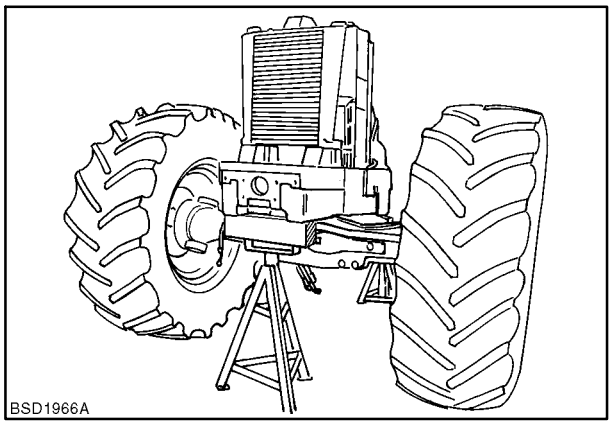
Always ensure the support is adequately supported and will remain stable when seperated from the engine. Failure to provide adequate support may cause the assembly to be unstable with possible personal injury if the support tips forwards or backwards.

26. Remove the front support retaining bolts and separate the front support from the engine.



21

27. Support the assembly on axle stands at the front and the rear of the support.



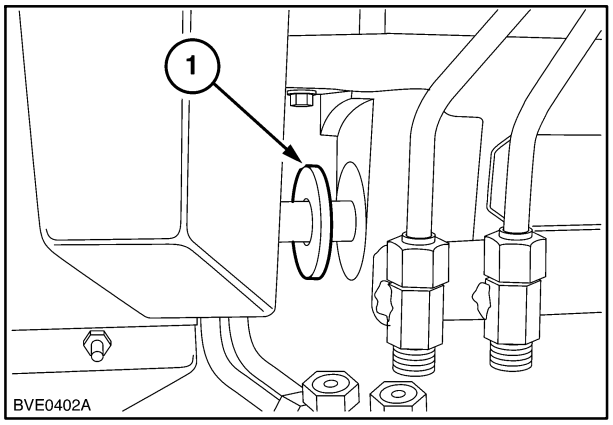
22

Installation

NOTE: *If a new front support or the engine oil pan has been removed and replaced during overhaul it is necessary to recalculate the new shim thickness to be installed (refer to front axle to support shim thickness calculation in this chapter).*

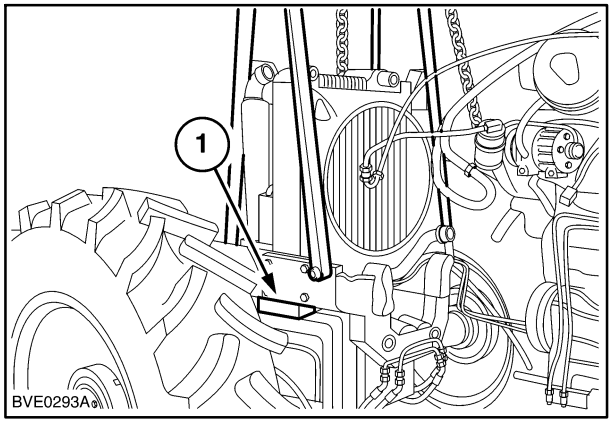
All Tractors

1. Make sure the shims (1) are re-positioned in the same location as when removed.



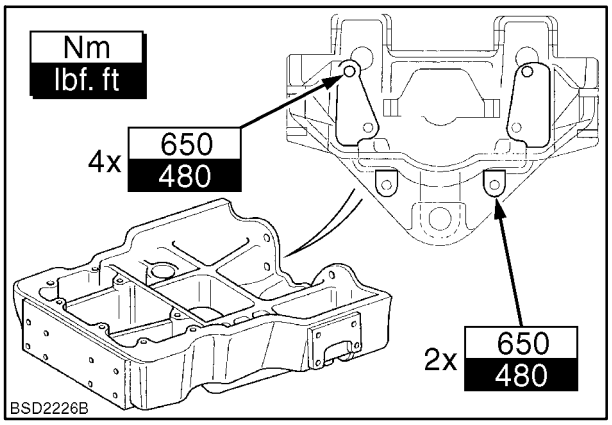
23

2. Make sure the wooden wedges (1) are between the front axle and the front support. These prevent articulation of the axle.
3. Using a spreader bar and suitable chains or slings, attach the front and rear of the support assembly to a moveable overhead hoist.



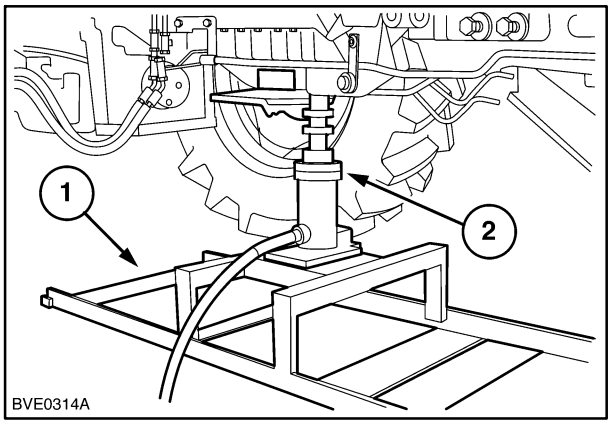
24

4. Align the front support to the engine and install the front support to engine retaining bolts. Tighten to the specified torque value.



25

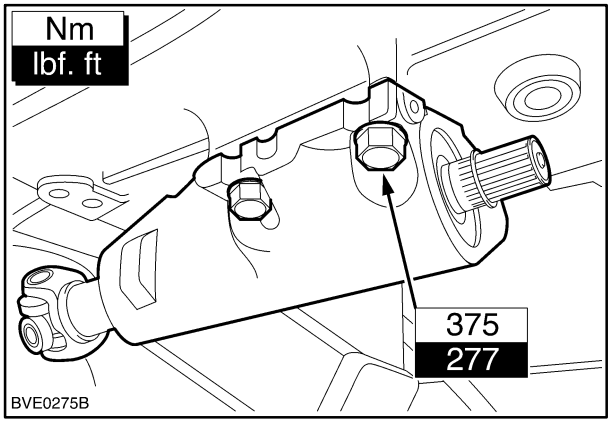
5. Remove the supports (2) and the splitting kit (1).



26

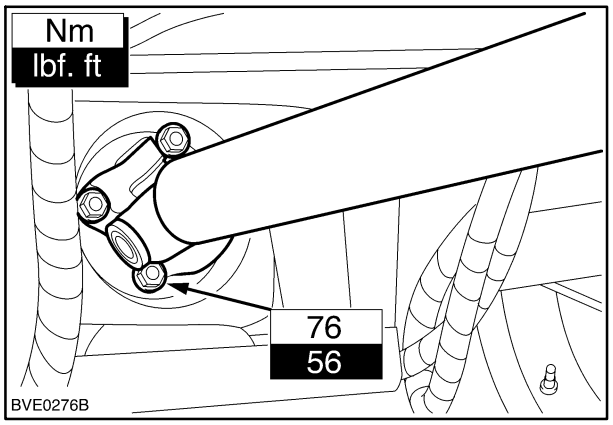
Tractors with SuperSteer Front Axle

6. Install the four wheel driveshaft and the support. Tighten the retaining bolts to the specified torque value.



27

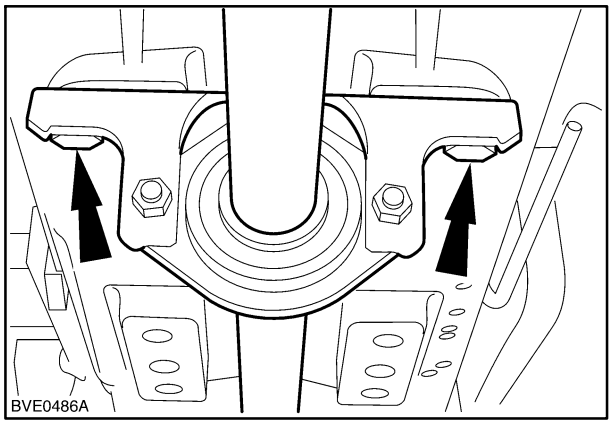
7. Install the four wheel driveshaft retaining nuts. Tighten the retaining bolts to the specified torque value.



28

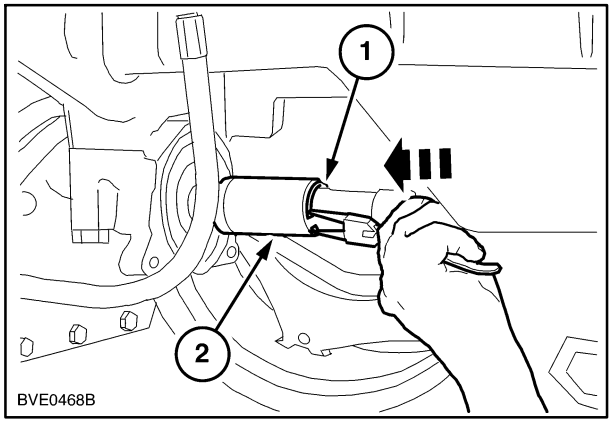
Tractors with Standard Front Axle

8. Install the four wheel driveshaft and the central support.



29

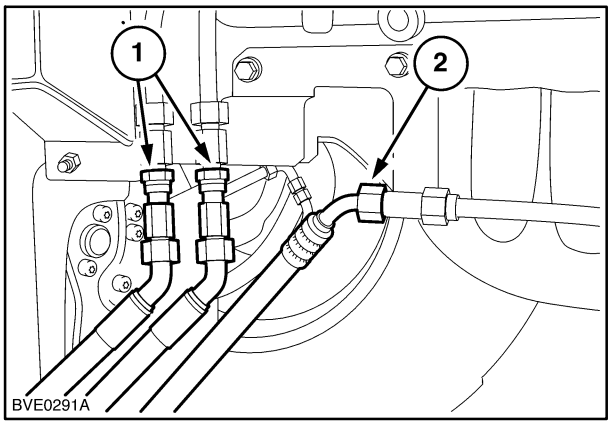
9. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel driveshaft.
10. Install the four wheel driveshaft guard.



30

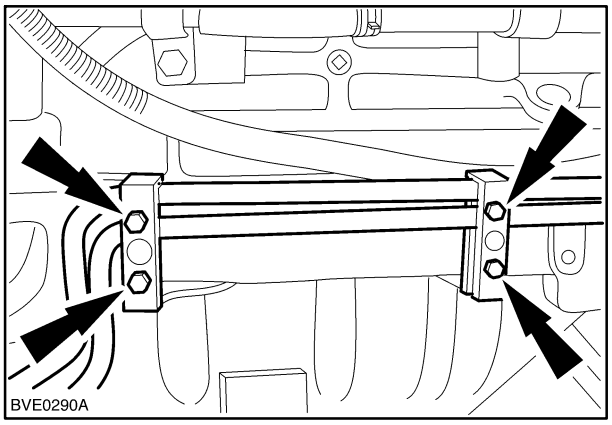
All Tractors

11. Connect the steering cylinder supply and return pipes (1).
12. Connect the differential lock oil supply pipe (2) (if fitted).



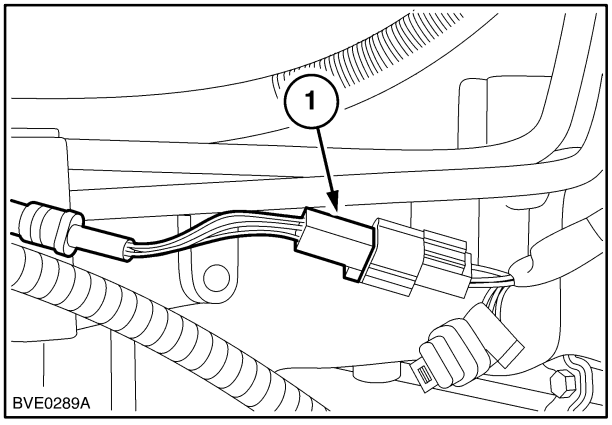
31

13. Attach the driveline oil cooler supply and return pipes to the retaining clamps.



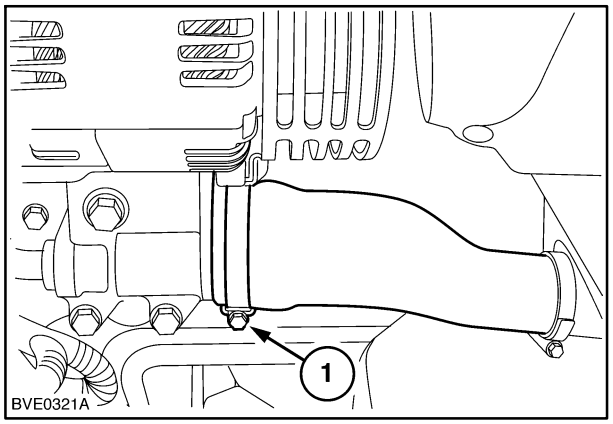
32

14. Connect the steering sensor electrical connector (if fitted).



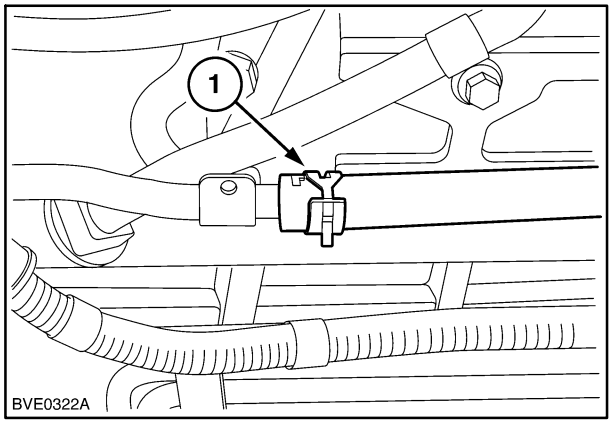
33

15. Connect the coolant hose and tighten the hose clamp (1).



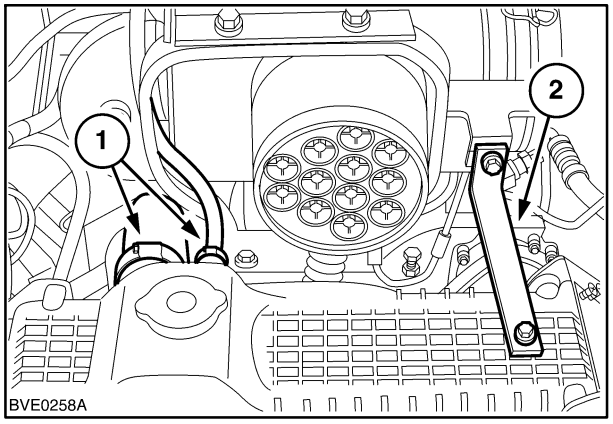
34

16. Connect the coolant hose connecting the cab heater to the radiator and tighten the hose clamp (1).



35

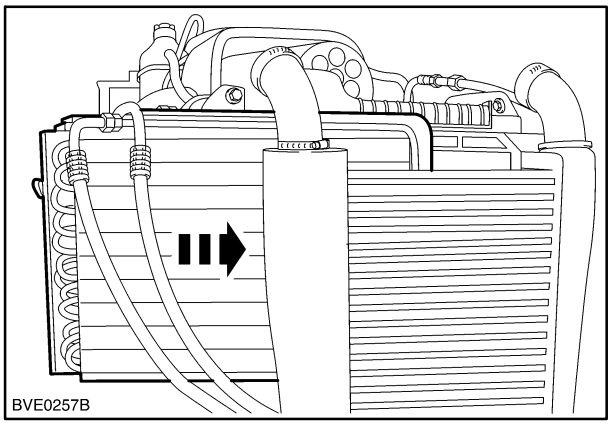
17. Connect the coolant hoses to the radiator and tighten the hose clamps (1).
18. Install the radiator support (2).



36

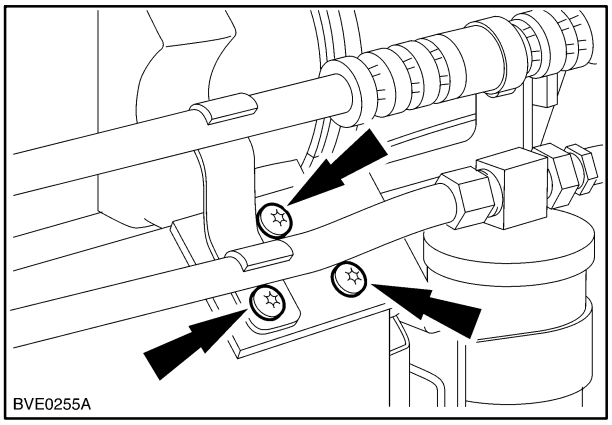
Tractors with Air Conditioning

19. Slide the air conditioning condensor on to the radiator.



37

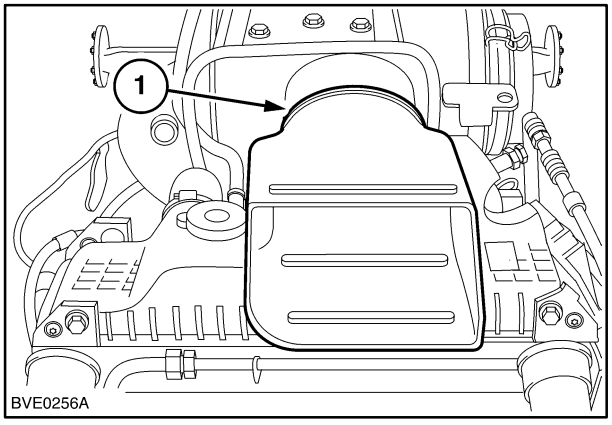
20. Install the receiver dryer retaining screws to the retaining bracket.



38

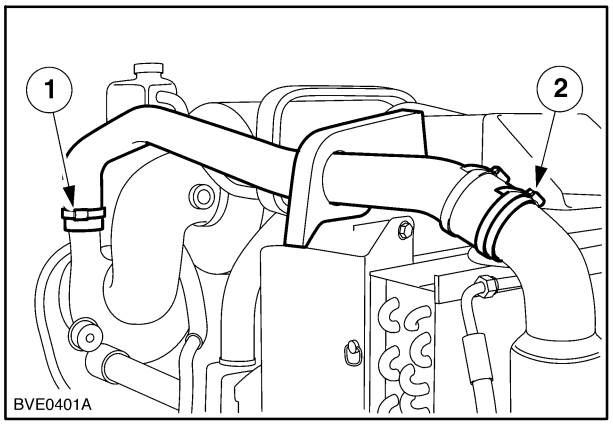
All Tractors

21. Install the air intake pipe and tighten the clamp (1).



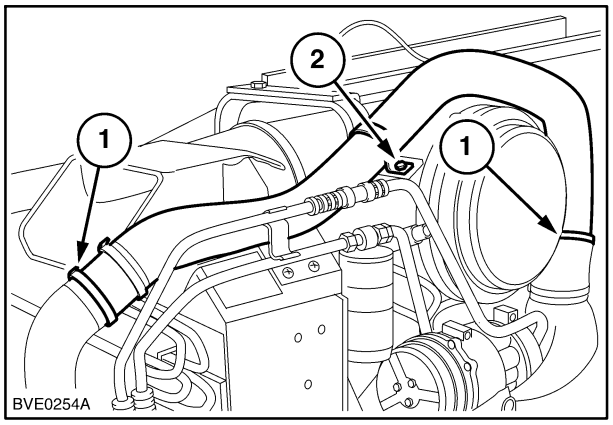
39

22. Install the air cooler inlet pipe. Tighten the pipe clamp (1) and the hose clamp (2).



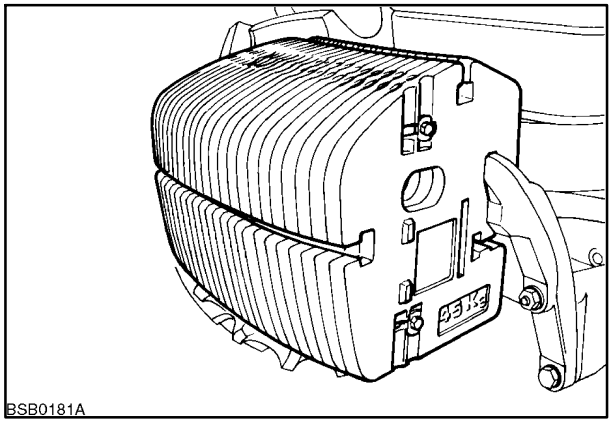
40

23. Install the air cooler outlet pipe. Tighten the hose clamps (1) and install the pipe clamp retaining bolt (2).



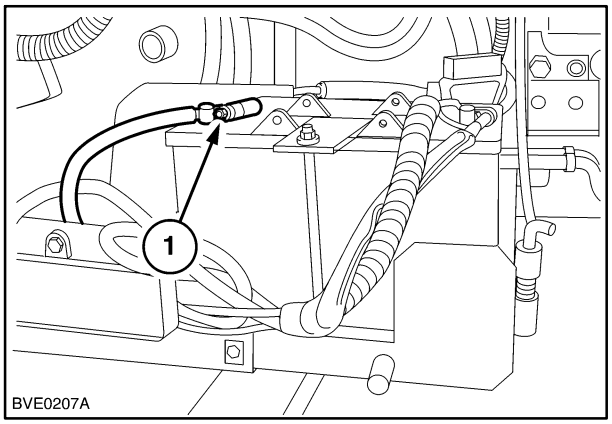
41

24. Using a suitable sling, connect the front weights to a hoist and install the front weights (if fitted).



42

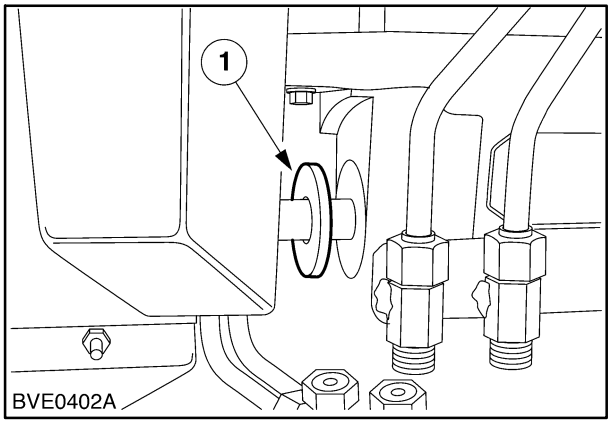
25. Connect the battery negative cable (1) and install the battery cover.
26. Refill the cooling system (refer to cooling system refill in the cooling chapter of the engine section).
27. Refill the driveline with the correct specification oil.



43

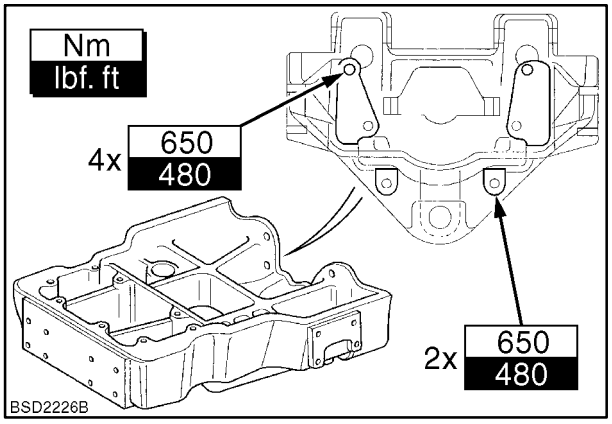
FRONT AXLE TO SUPPORT SHIM THICKNESS CALCULATION

1. Install a 4.5 mm yellow shim (1) part number 82026240 onto each of the engine mounting studs.



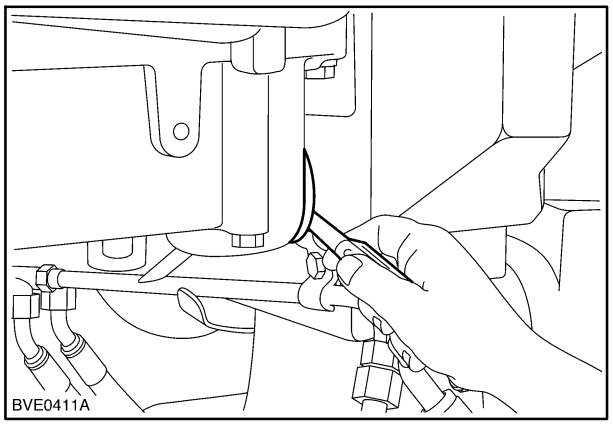
44

2. Align the front support to the engine and install the four upper retaining bolts. Tighten to the specified torque value.



45

3. Using feeler gauges measure space between each shim and the front support.



46

4. Add feeler gauge dimension to the 4.5 mm shim thickness already installed and select the appropriate shim(s) from the following list.

Colour Code	Shim Thickness	Part Number
Yellow	4.5 mm	82026240
Green	4.8 mm	82026241
Red	5.1 mm	82026242
Blue	5.4 mm	82026243
White	5.7 mm	82026244
Black	6.0 mm	82026245
Pink	6.3 mm	82026246
Light Blue	6.6 mm	82026247
Gold	6.9 mm	82026248
Lime	7.2 mm	82026249
Orange	7.5 mm	82026250
Blue/Grey	7.8 mm	82026251

5. Separate the front support from the engine and replace the 4.5 mm shims with shims of calculated thickness.
6. Reinstall the front support and tighten the retaining bolts to specified torque value.

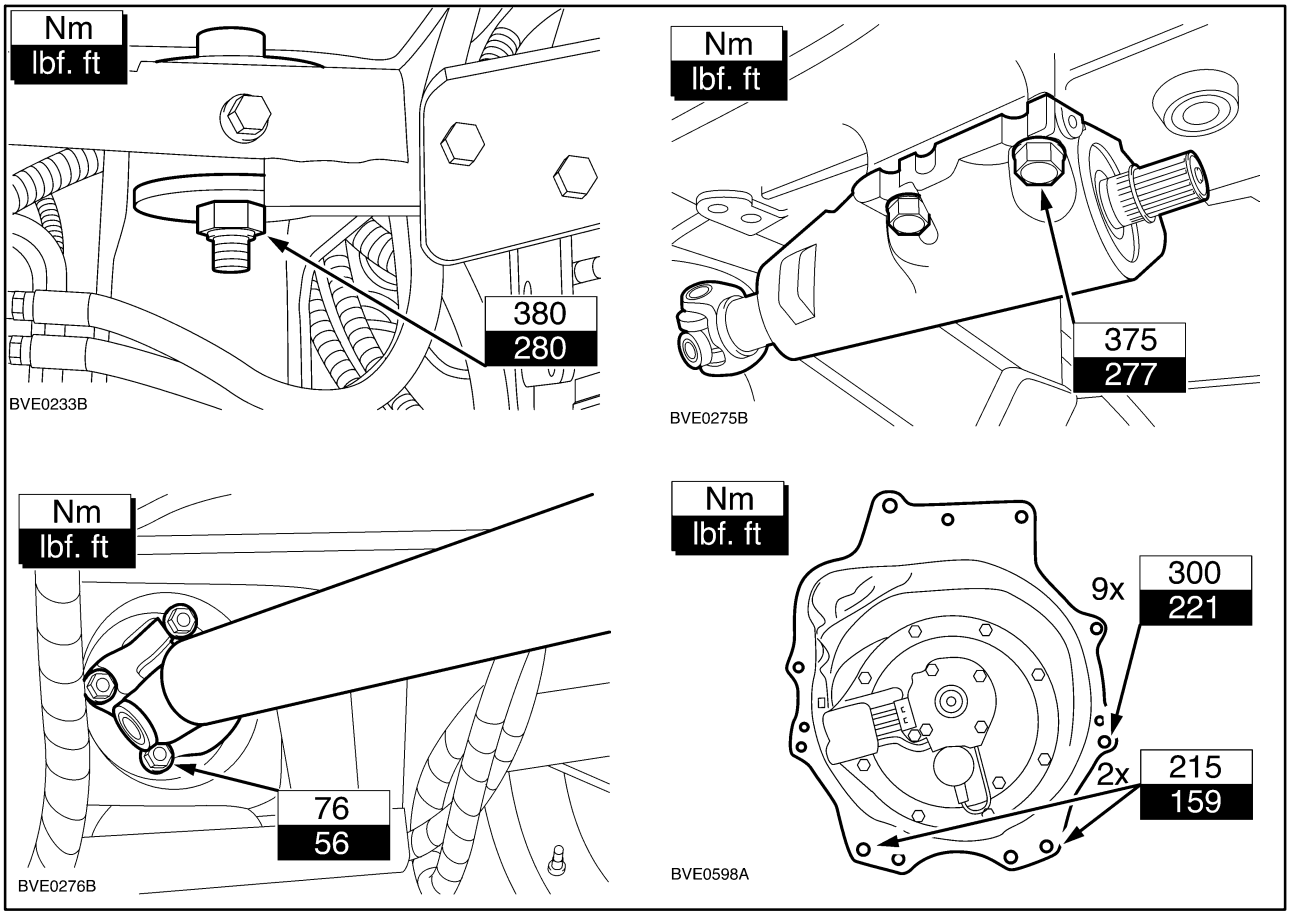
SECTION 01 - SEPARATING THE TRACTOR

Chapter 2 - Separating Engine and Front Support from the Transmission

CONTENT

Section	Description	Page
	Tightening Torques	2
	Special Tools	2
	Overhaul	4
	Engine and Front Support from the Transmission	4
	Removal	4
	Installation	13

TIGHTENING TORQUES



1

SPECIAL TOOLS

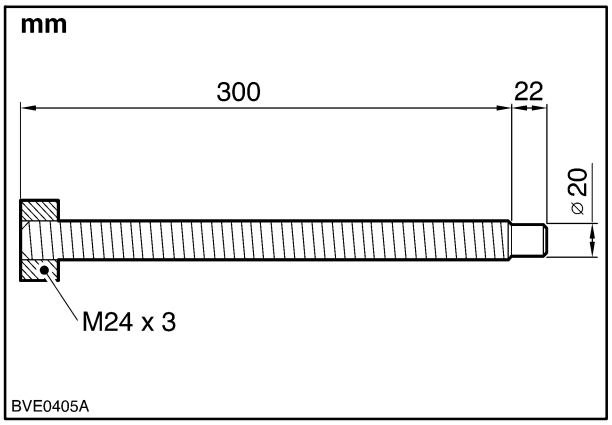
⚠ CAUTION ⚠

The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

297471	Tractor splitting kit.
297617	Engine support brackets (with **297471**).
380000844	Engine support adaptor plate (with **297617**).

Locally Fabricated Tools



2

Cab Jacking Tool x2 (Tractors with standard cab)

OVERHAUL

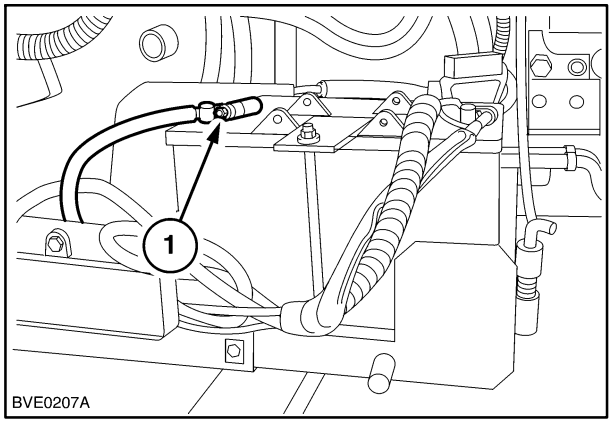
ENGINE AND FRONT SUPPORT FROM THE TRANSMISSION

Removal

⚠ DANGER ⚠

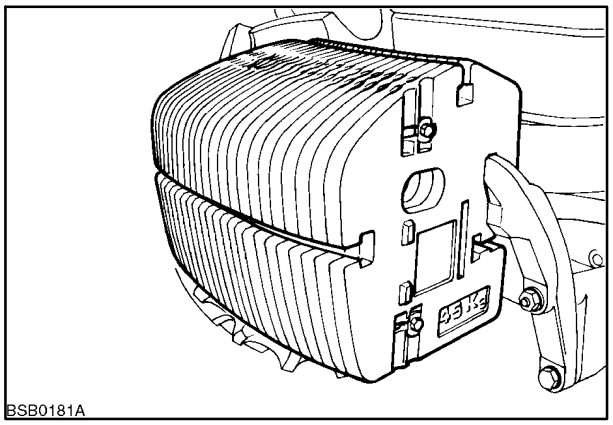
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

1. Drain the cooling system (refer to cooling system drain in the cooling chapter of the engine section).
2. Remove the battery cover and disconnect the battery negative cable (1).



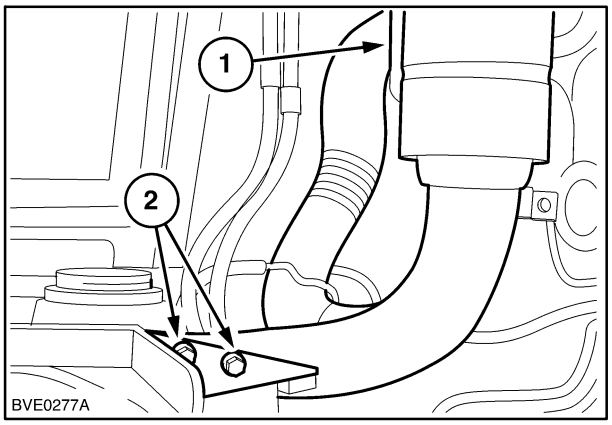
3

3. Using a suitable sling, connect the front weights to a hoist and remove the front weights (if fitted).



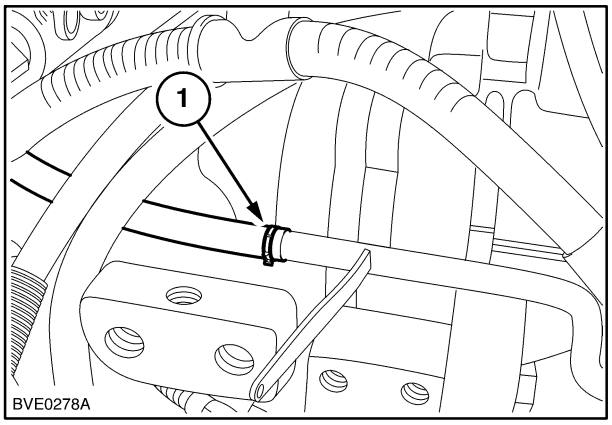
4

4. Disconnect the exhaust manifold from the turbocharger (1). Remove the exhaust support retaining bolts (2) and remove the exhaust manifold.



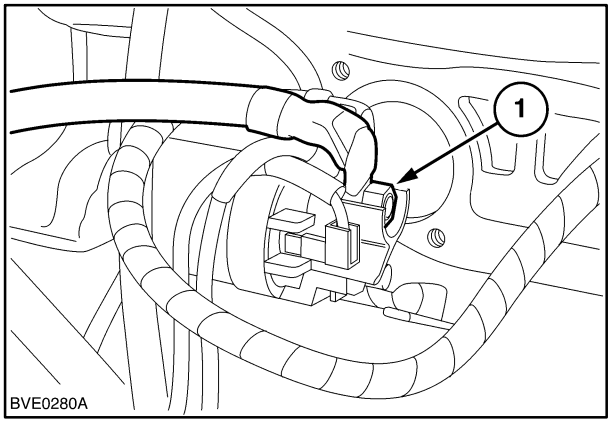
5

5. Loosen the hose clamp (1) and disconnect the coolant hose connecting the cab heater to the radiator.



6

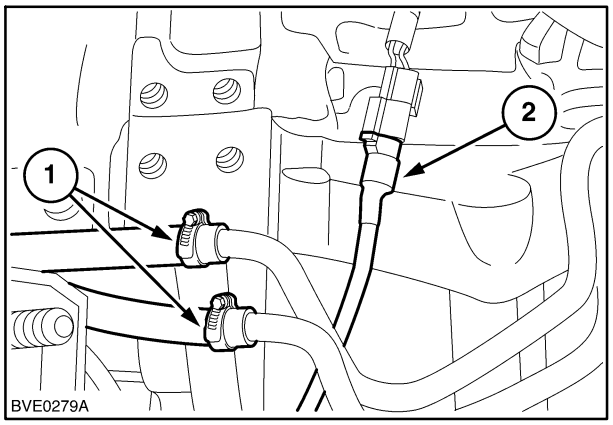
6. Disconnect the battery positive cable (1) from the starter motor.



7

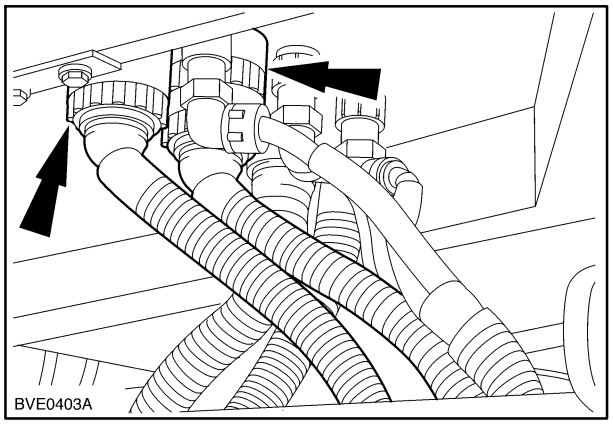
NOTE: *Note the position of the driveline oil cooler hoses.*

7. Loosen the hose clamps (1) and disconnect the driveline oil cooler hoses.
8. Disconnect the tractor performance monitor radar electrical connector (2) (if fitted).



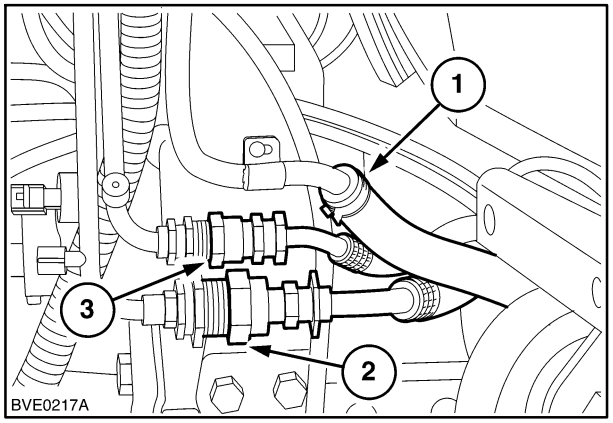
8

9. Disconnect the engine harness electrical connectors.



9

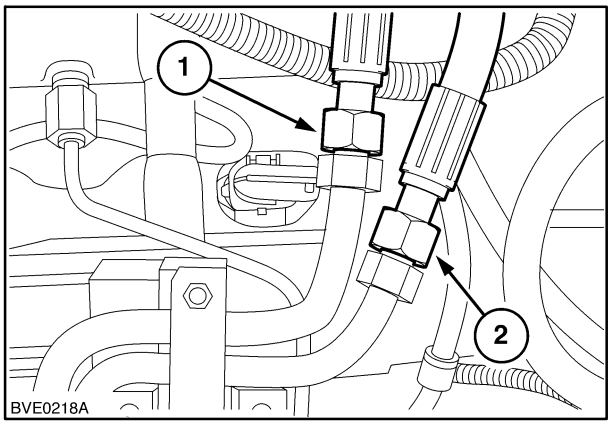
10. Disconnect the cab heater coolant hose (1).
11. Disconnect the air conditioning hoses (2) and (3).



10

NOTE: *Note the position of the steering cylinder oil supply hoses.*

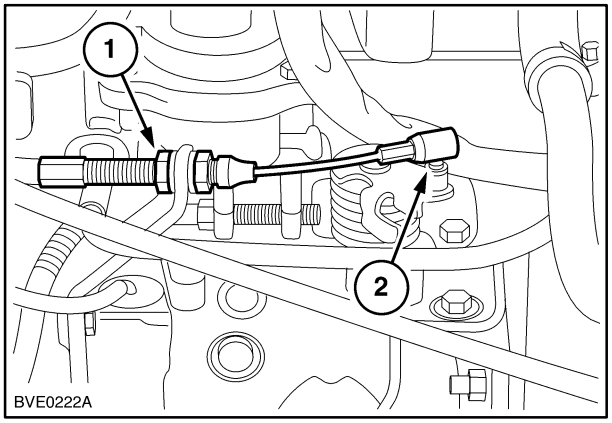
12. Disconnect the steering cylinder oil supply hoses (1) and (2).



11

Tractors with Mechanical Fuel Injection Pump

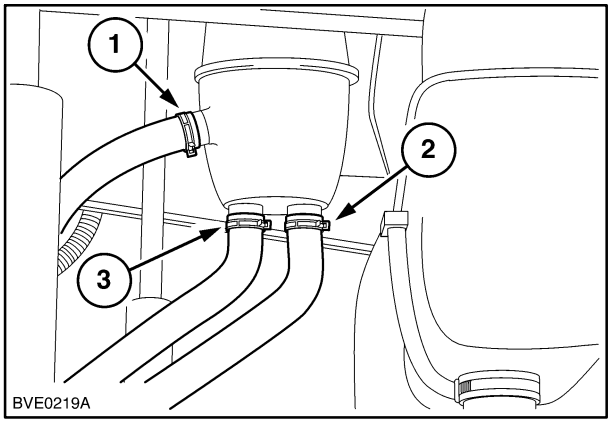
13. Loosen the retaining nut (1) and detach the throttle cable from the fuel injection pump (2).



12

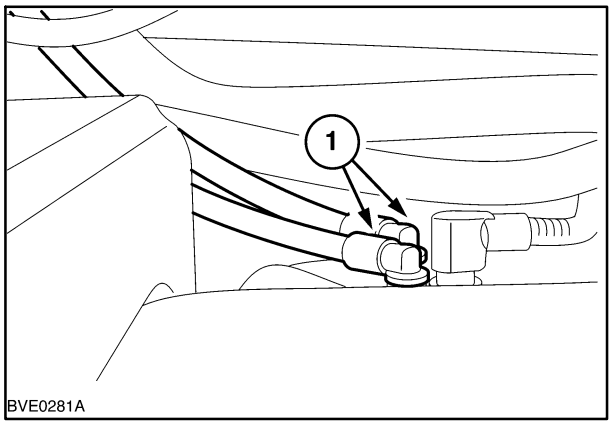
All Tractors

14. Disconnect the brake fluid lines (1), (2) and (3) from the brake fluid reservoir.



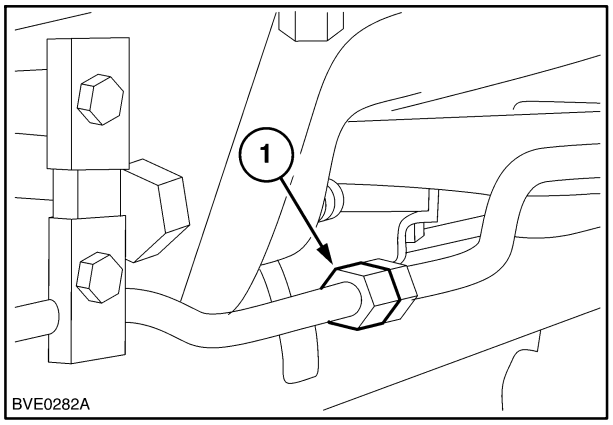
13

15. Disconnect the fuel supply and fuel return lines (1) from the fuel tank level sender.



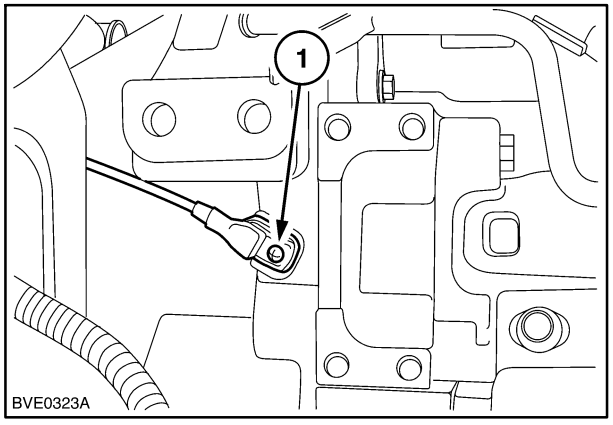
14

16. Disconnect the differential lock oil supply pipe (1).



15

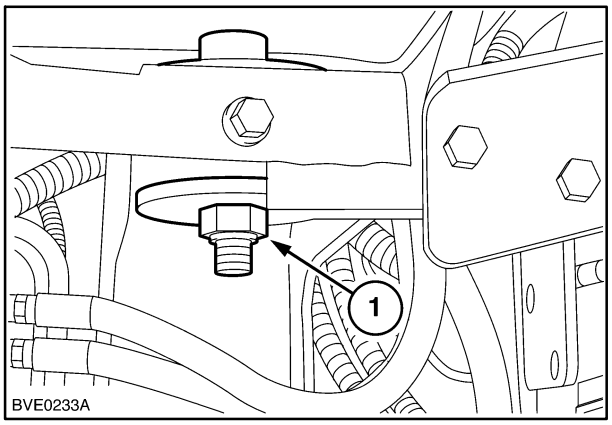
17. Remove the retaining screw (1) and detach the flywheel speed sensor (if fitted).



16

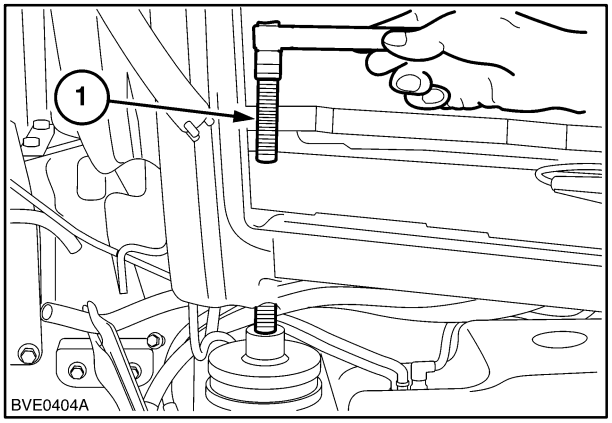
Tractors with Standard Cab

18. Loosen the cab front mounting bolt while holding the nut (1) under the cab floor. Remove the bolt and washers. Repeat this step for the left hand side of the cab.



17

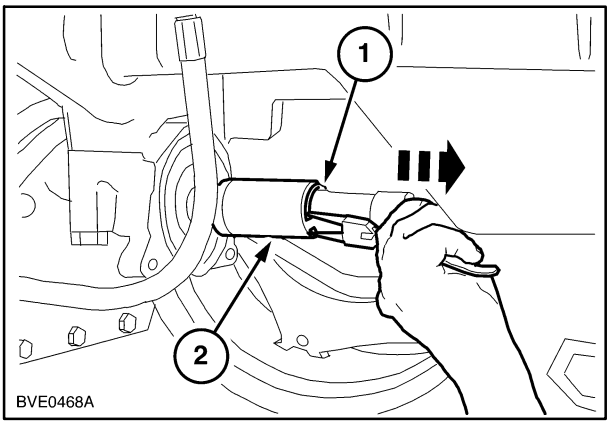
19. Using locally fabricated tool (1), raise the cab evenly.



18

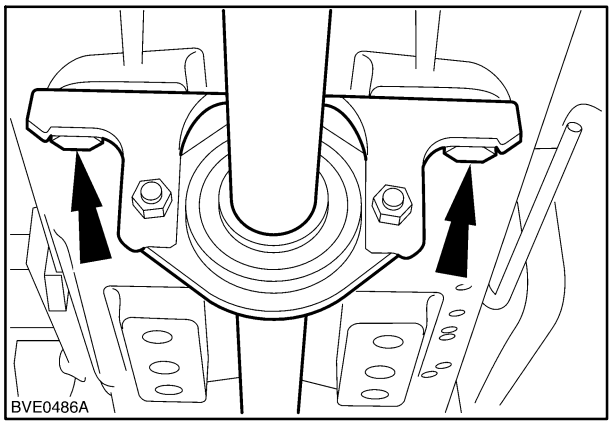
Tractors with Standard Front Axle

20. Remove the four wheel driveshaft guard.
21. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel driveshaft.



19

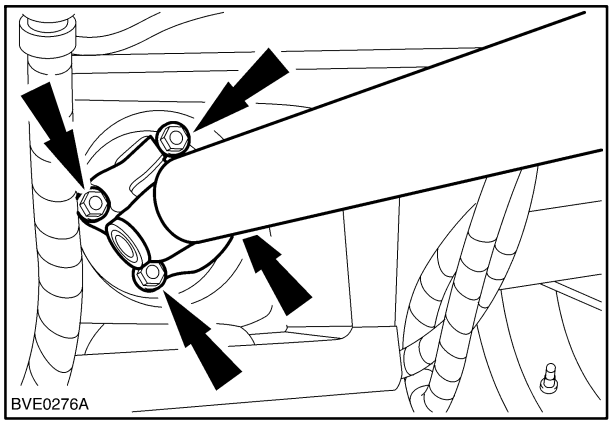
22. Remove the four wheel driveshaft and the central support.



20

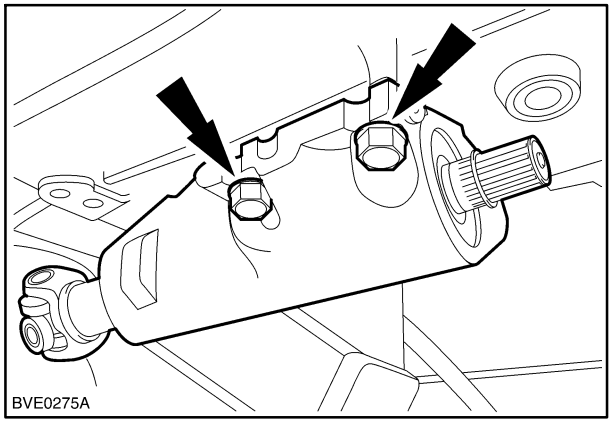
Tractors with SuperSteer Front Axle

23. Remove the four wheel driveshaft retaining bolts.



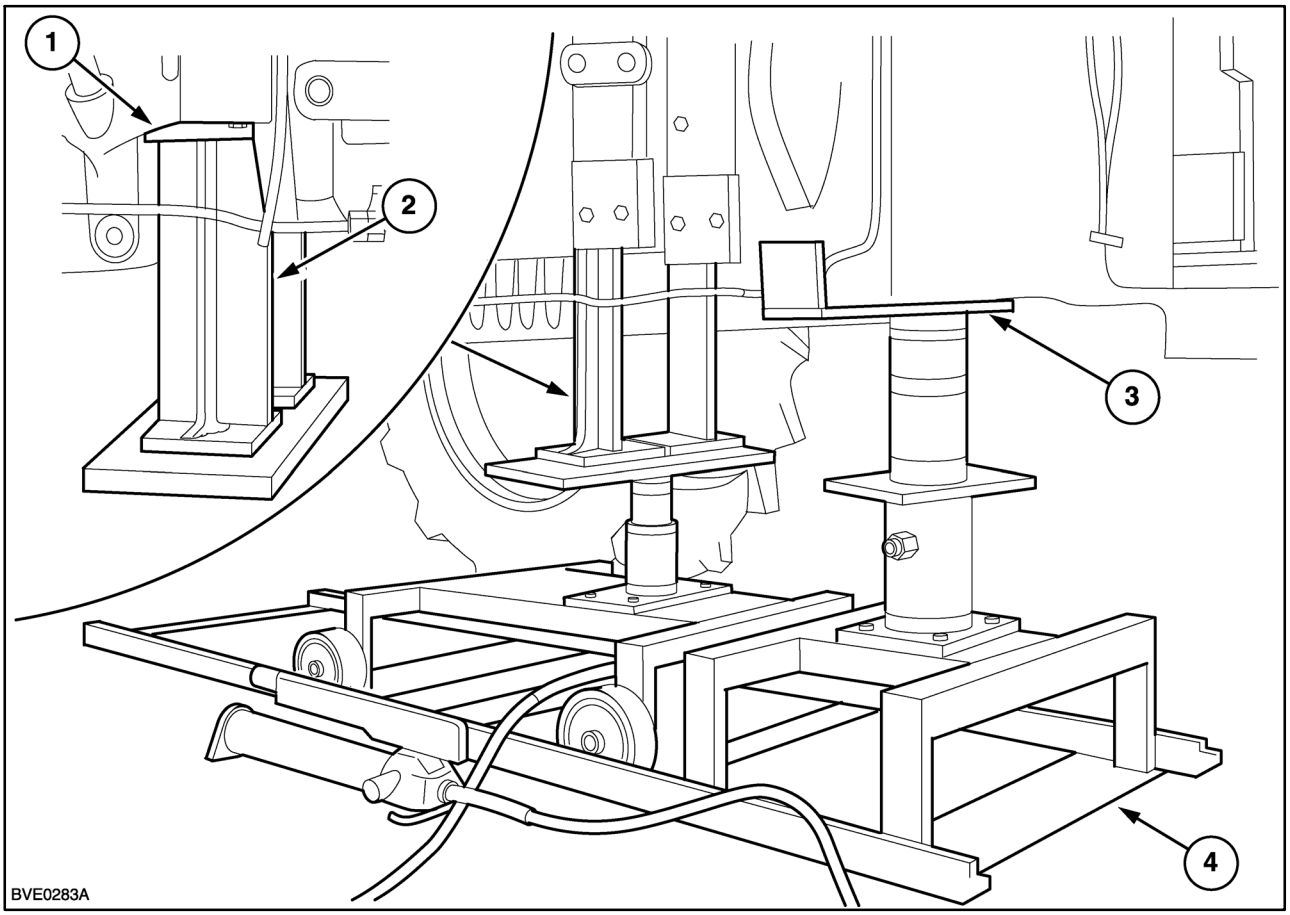
21

24. Remove the support and the four wheel driveshaft.



22

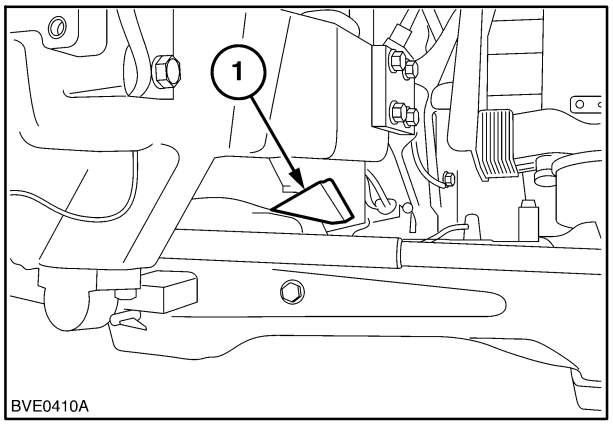
All Tractors



23

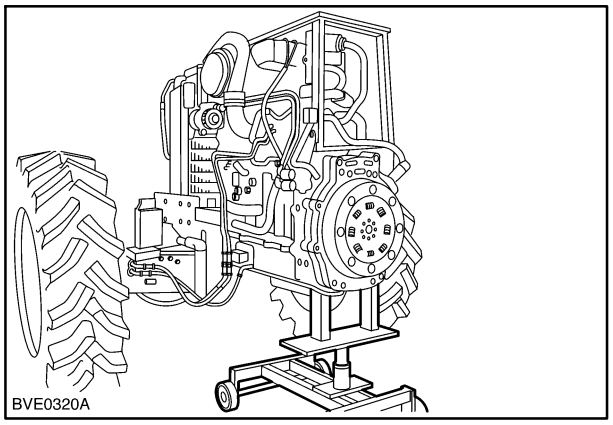
25. Position splitting kit (4) **297471** underneath the tractor.
26. Use the supports (3), in the splitting kit to support the transmission on the splitting stand.
27. Remove the engine to transmission lower retaining bolts.
28. Remove two rear oil pan retaining bolts from the left hand side. Repeat this step for the right hand side.
29. Install the adaptor plate (1) **380000844** and the engine support brackets (2) **297617** between the engine and the wheeled splitting trolley.

30. Position wooden wedges (1) between the front axle and the front support. These prevent articulation of the front axle.



24

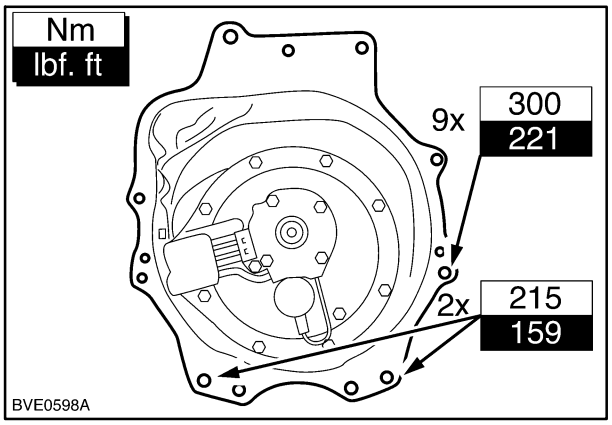
31. Check that all necessary hoses tubes and electrical connectors have been disconnected. It may be necessary to disconnect additional items due to other optional equipment that has been installed on the tractor.
32. Re-check that the engine and transmission are safely supported on the splitting stand. Remove the engine to transmission retaining bolts.
33. Remove the front support and engine from the transmission.



25

Installation

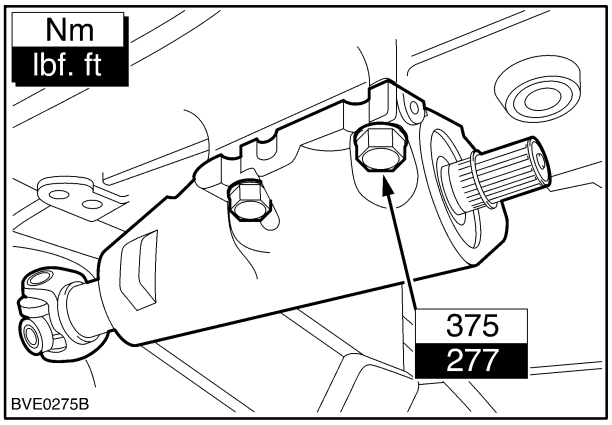
1. Align the front support and engine assembly to the transmission and install the engine to transmission retaining bolts. Tighten to the specified torque value.
2. Remove the tractor splitting kit.



26

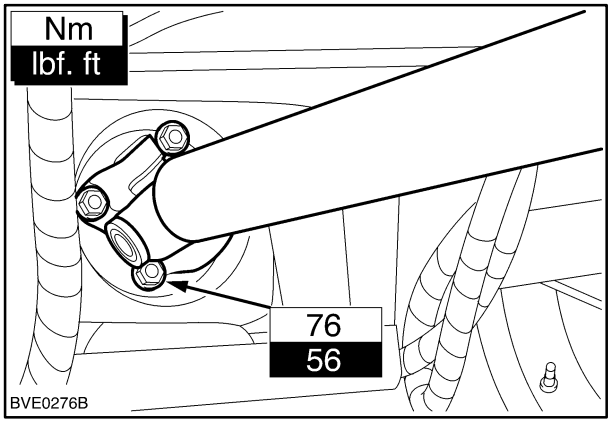
Tractors with SuperSteer Front Axle

3. Install the four wheel driveshaft and the support. Tighten the retaining bolts to the specified torque value.



27

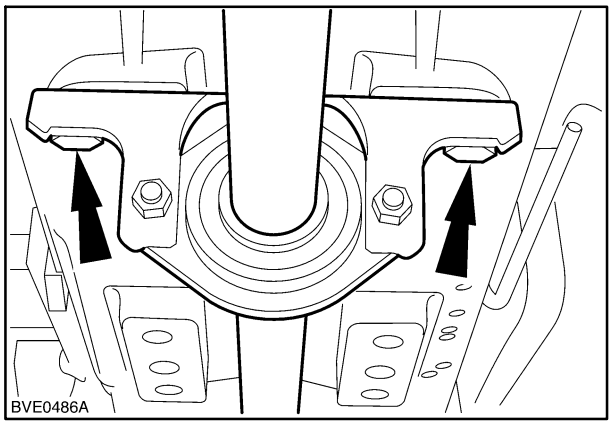
4. Install the four wheel driveshaft retaining nuts. Tighten the retaining bolts to the specified torque value.



28

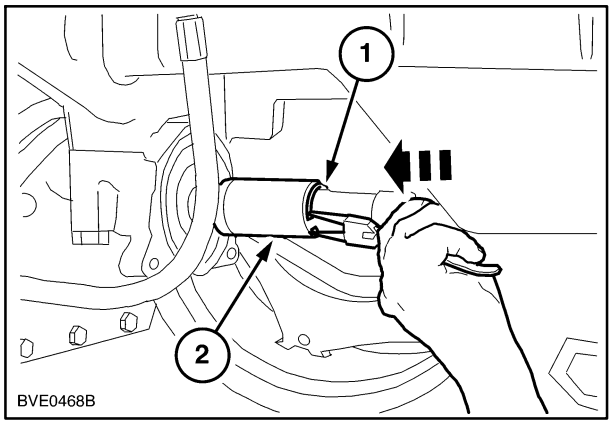
Tractors with Standard Front Axle

5. Install the four wheel driveshaft and the central support.



29

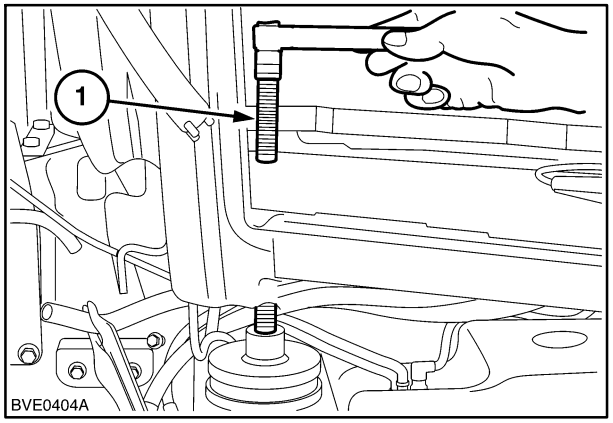
6. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel drive shaft.
7. Install the four wheel drive shaft guard.



30

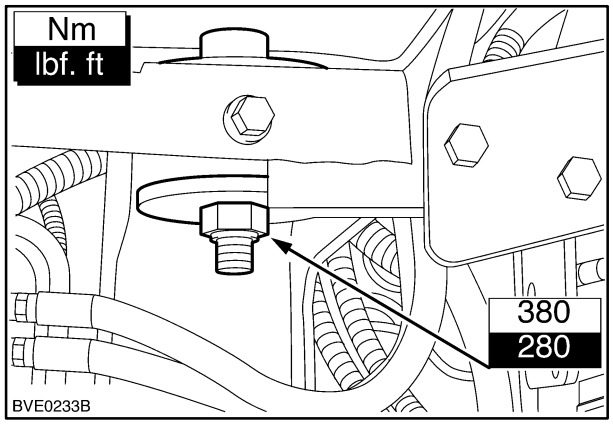
Tractors with Standard Cab

8. Using the locally fabricated tool (1), lower the cab evenly.



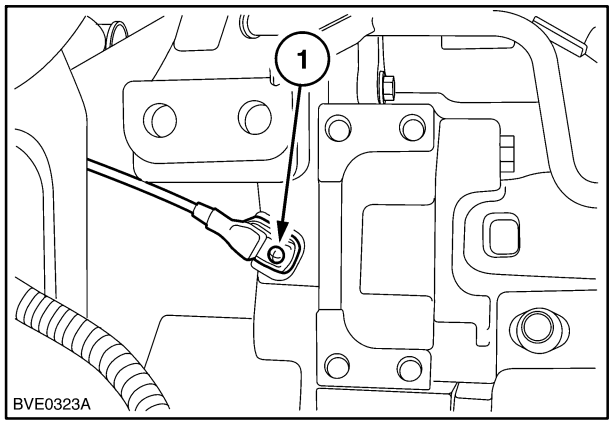
31

9. Install the cab front mounting bolt, washers and nut. Tighten to the specified torque value. Repeat this step for the left hand side of the cab.



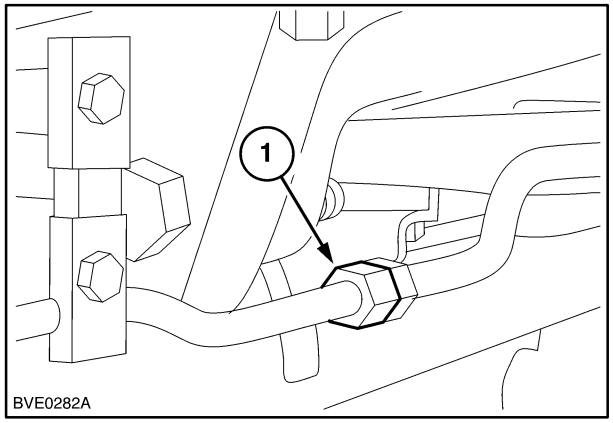
32

10. Attach the flywheel speed sensor and install the retaining screw (1) (if fitted).



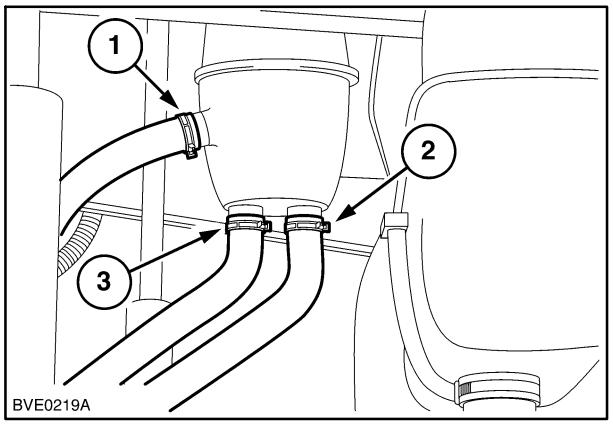
33

11. Connect the differential lock oil supply pipe (1).



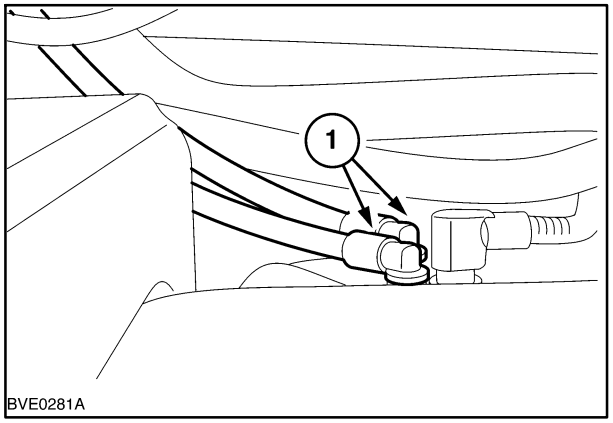
34

12. Connect the brake fluid lines (1), (2) and (3) to the brake fluid reservoir.



35

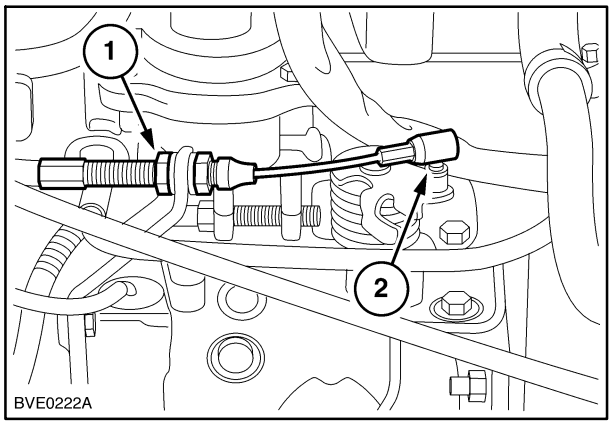
13. Connect the fuel supply and fuel return lines (1) to the fuel tank level sender.



36

Tractors with Mechanical Fuel Injection Pump

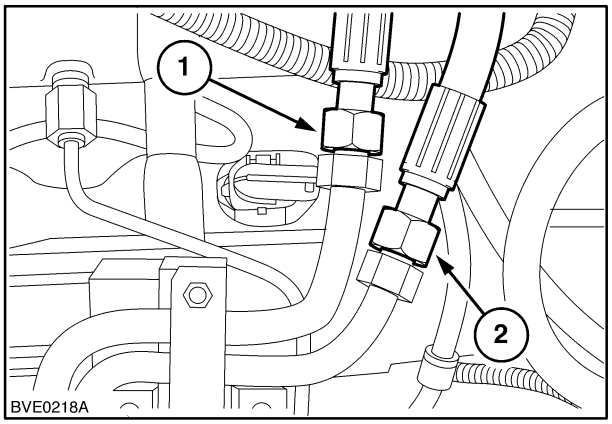
14. Attach the throttle cable to the fuel injection pump (2) and tighten the retaining nut (1).



37

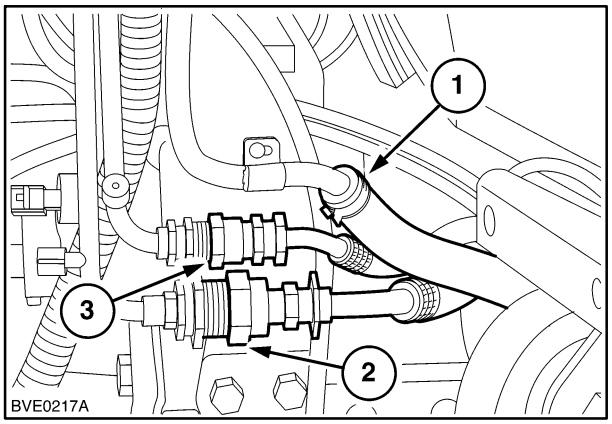
All Tractors

15. Connect the steering cylinder oil supply hoses (1) and (2).



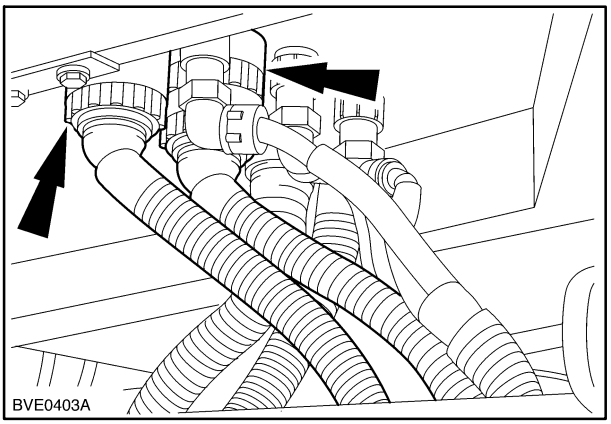
38

16. Connect the cab heater hose (1).
17. Connect the air conditioning hoses (2) and (3).



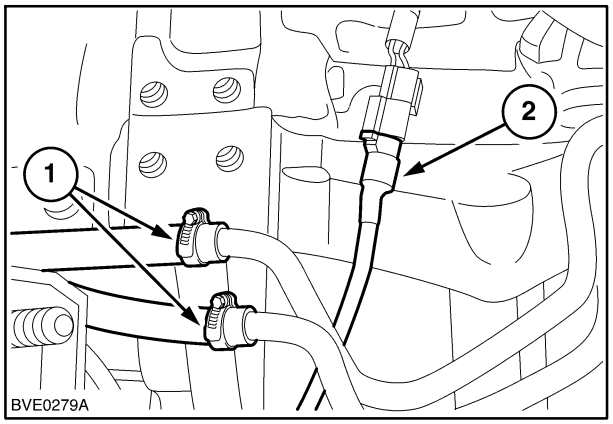
39

18. Connect the engine harness electrical connectors.



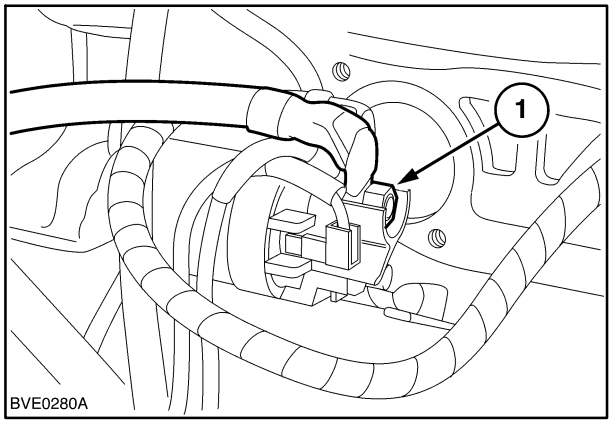
40

19. Connect the driveline oil cooler hoses and tighten the hose clamps (1).
20. Connect the tractor performance monitor radar electrical connector (2) (if fitted).



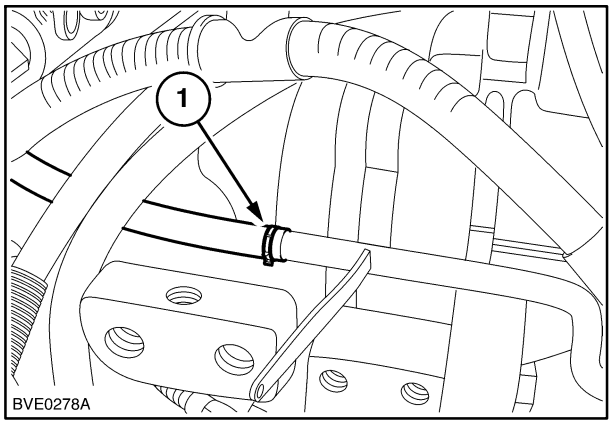
41

21. Connect the battery positive cable (1) to the starter motor.



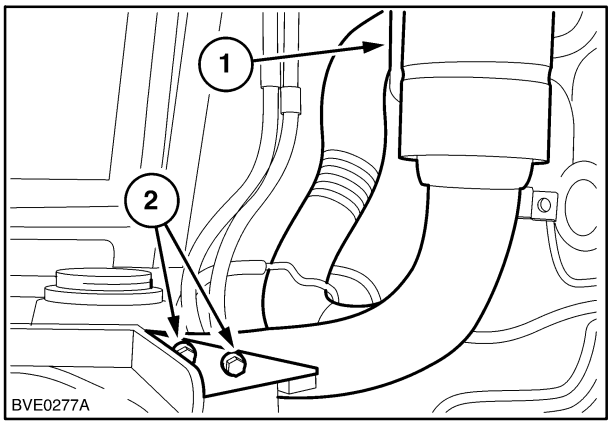
42

22. Connect the hose connecting the cab heater to the radiator and tighten the hose clamp (1).



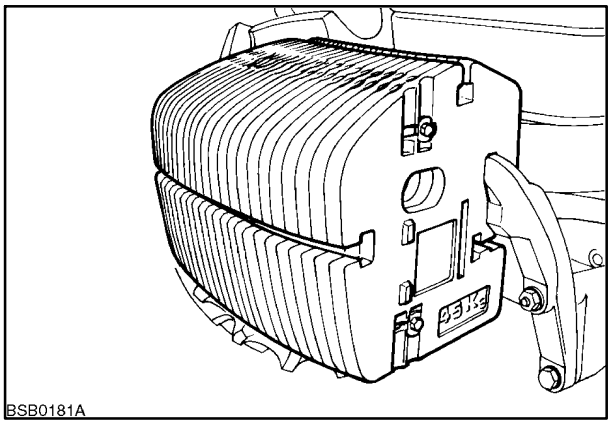
43

23. Install the exhaust manifold and the retaining bolts (2). Connect the exhaust to the turbocharger (1).



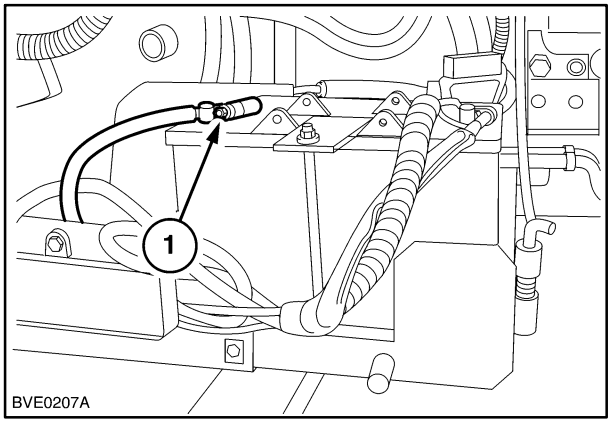
44

24. Using a suitable sling, connect the front weights to a hoist and install the front weights (if fitted).



45

25. Connect the battery negative cable (1) and install the battery cover.
26. Refill the cooling system (refer to cooling system refill in the cooling chapter of the engine section).
27. Refill the driveline with the correct specification oil.
28. Bleed the brakes (refer to bleeding the brakes and controls section).



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NOTES

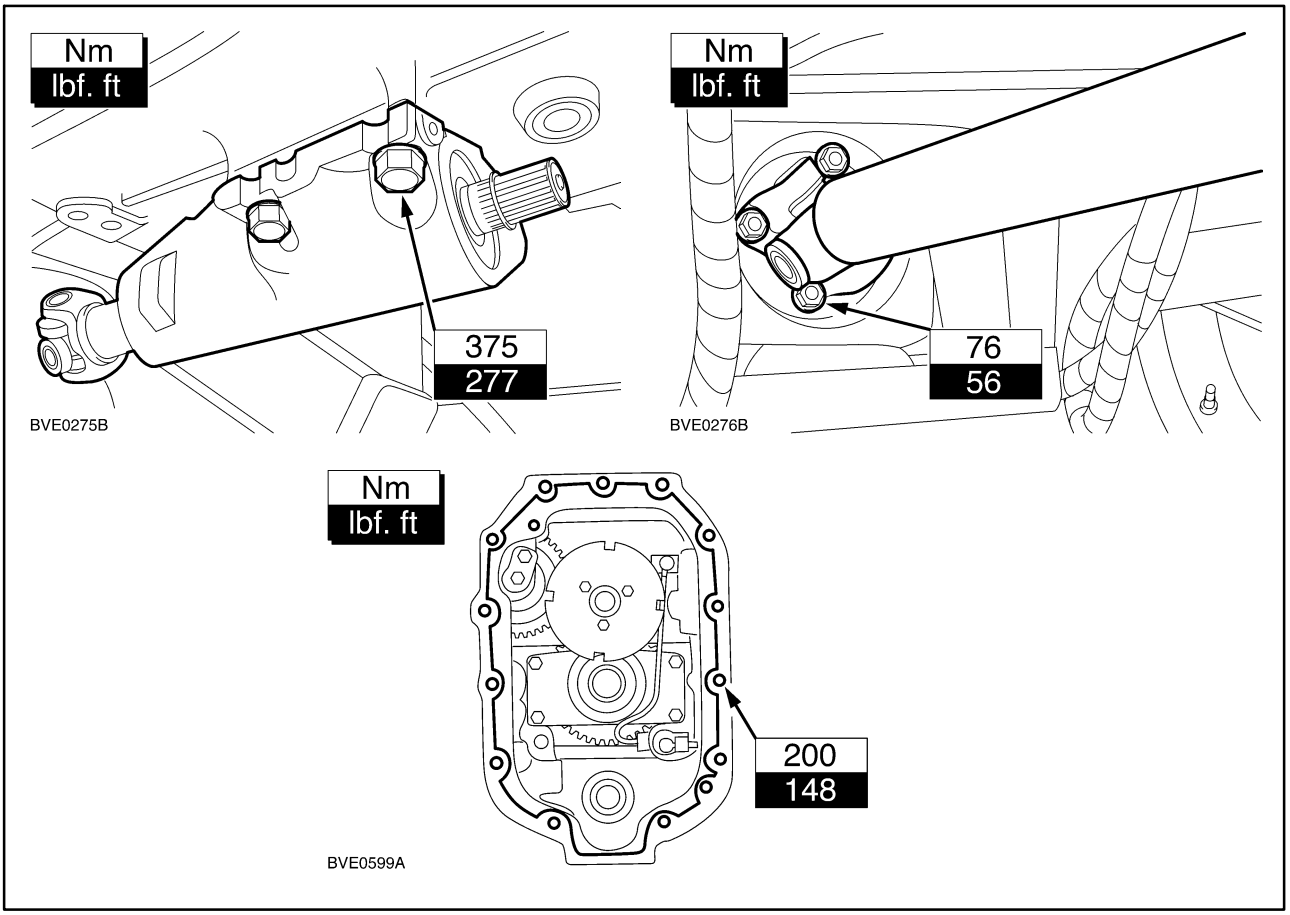
SECTION 01 - SEPARATING THE TRACTOR

Chapter 3 - Separating Transmission, Engine and Front Support from the Rear Axle

CONTENT

Section	Description	Page
	Tightening Torques	2
	Special Tools	2
	Overhaul	3
	Transmission, Engine and Front Support from the Rear Axle	3
	Removal	3
	Installation	8

TIGHTENING TORQUES



1

SPECIAL TOOLS

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

297471	Tractor splitting kit.

OVERHAUL

TRANSMISSION, ENGINE AND FRONT SUPPORT FROM THE REAR AXLE

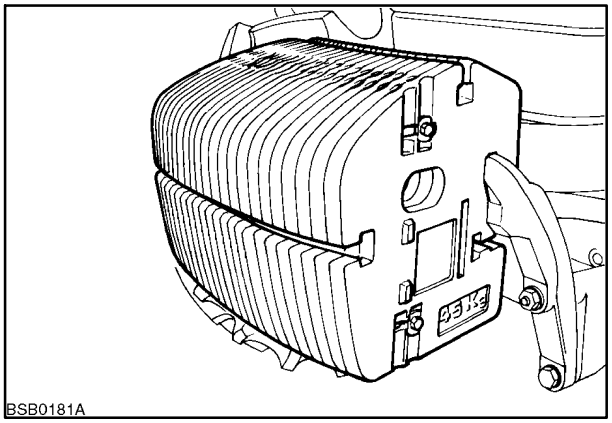
Removal

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

All Tractors

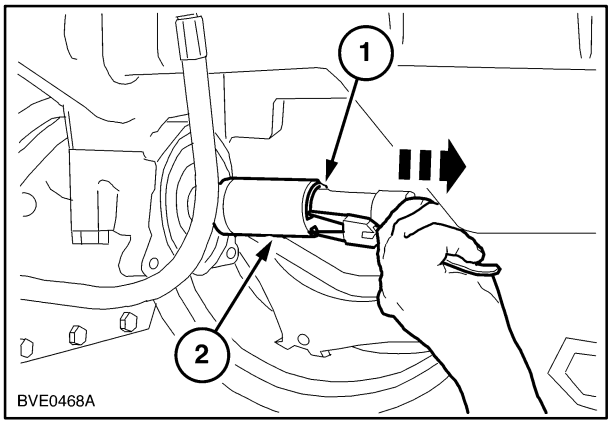
1. Remove the cab (refer to cab removal in this section).
2. Remove the fuel tank (refer to fuel tank removal in the fuel system chapter of the engine section).
3. Disconnect the wiring harness as required to enable the separation of the transmission from the rear axle.
4. Using a suitable sling, connect the front weights to a hoist and remove the front weights (if fitted).



2

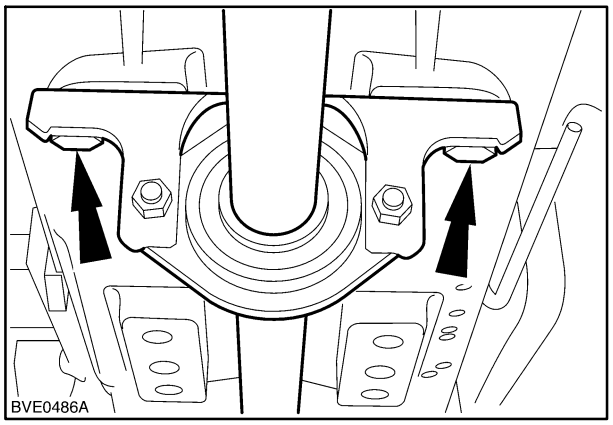
Tractors with Standard Front Axle

5. Remove the four wheel driveshaft guard.
6. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel driveshaft.



3

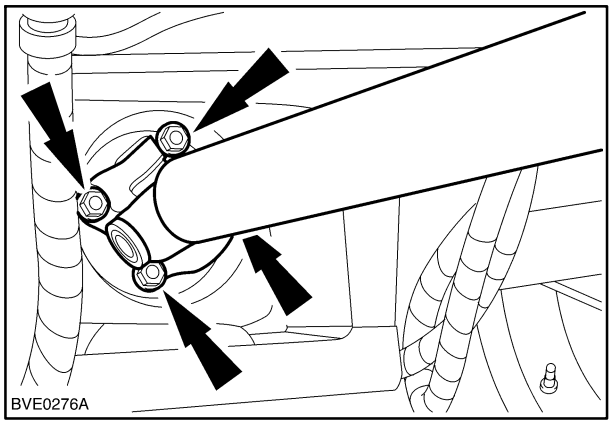
7. Remove the four wheel driveshaft and the central support.



4

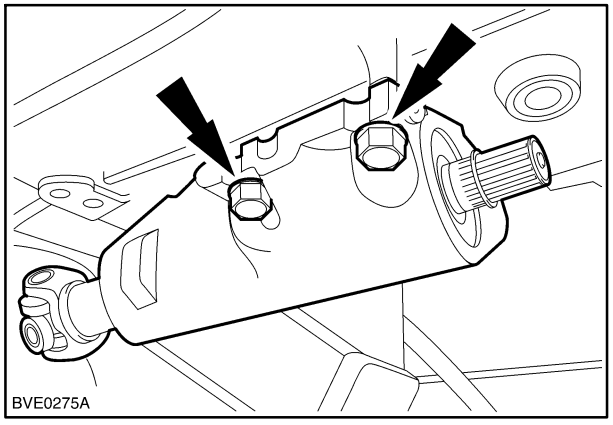
Tractors with SuperSteer Front Axle

8. Remove the four wheel driveshaft retaining nuts.



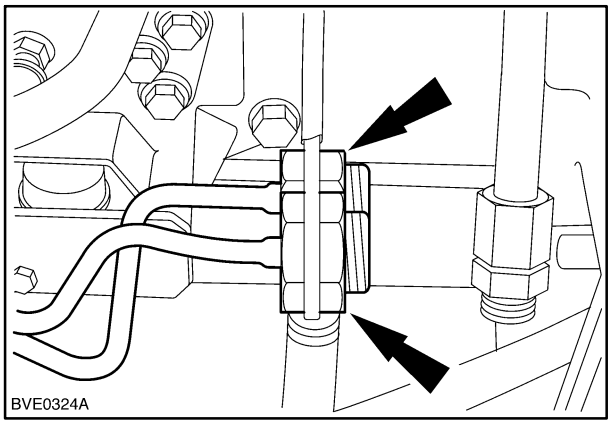
5

9. Remove the support and the four wheel driveshaft.



6

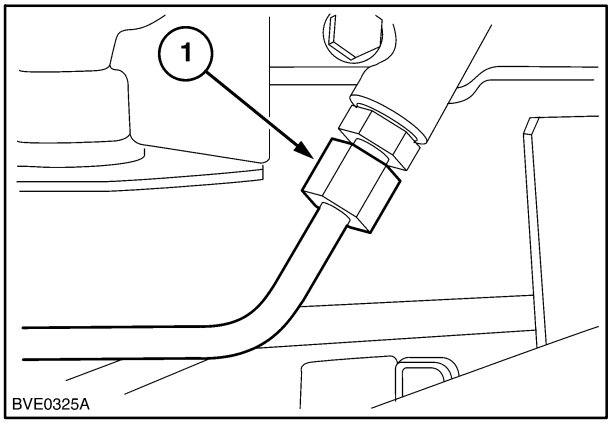
10. Detach the brake tubes from the support bracket.



7

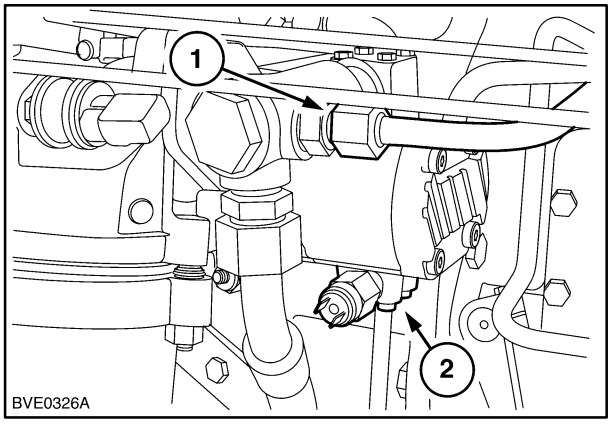
Tractors with 16 x 16 Transmission

11. Disconnect the transmission oil supply pipe (1).



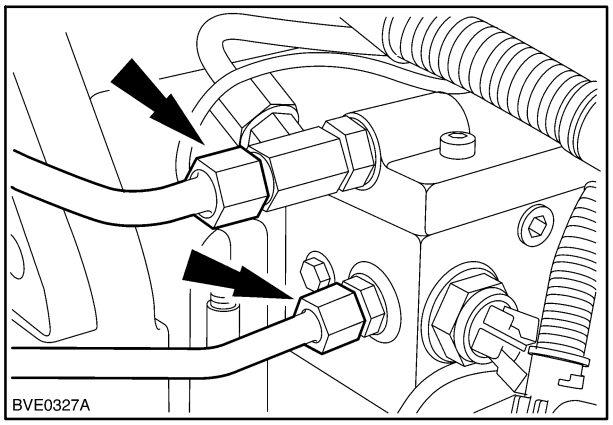
8

12. Disconnect the oil supply pipes (1) and (2) from the hydraulic pump.



9

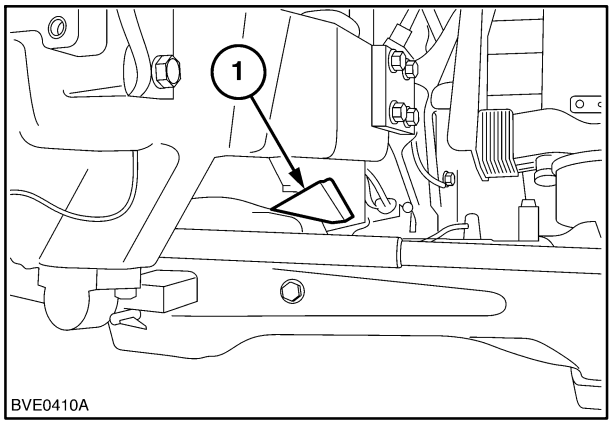
13. Disconnect the oil supply pipes from the low pressure distribution block.



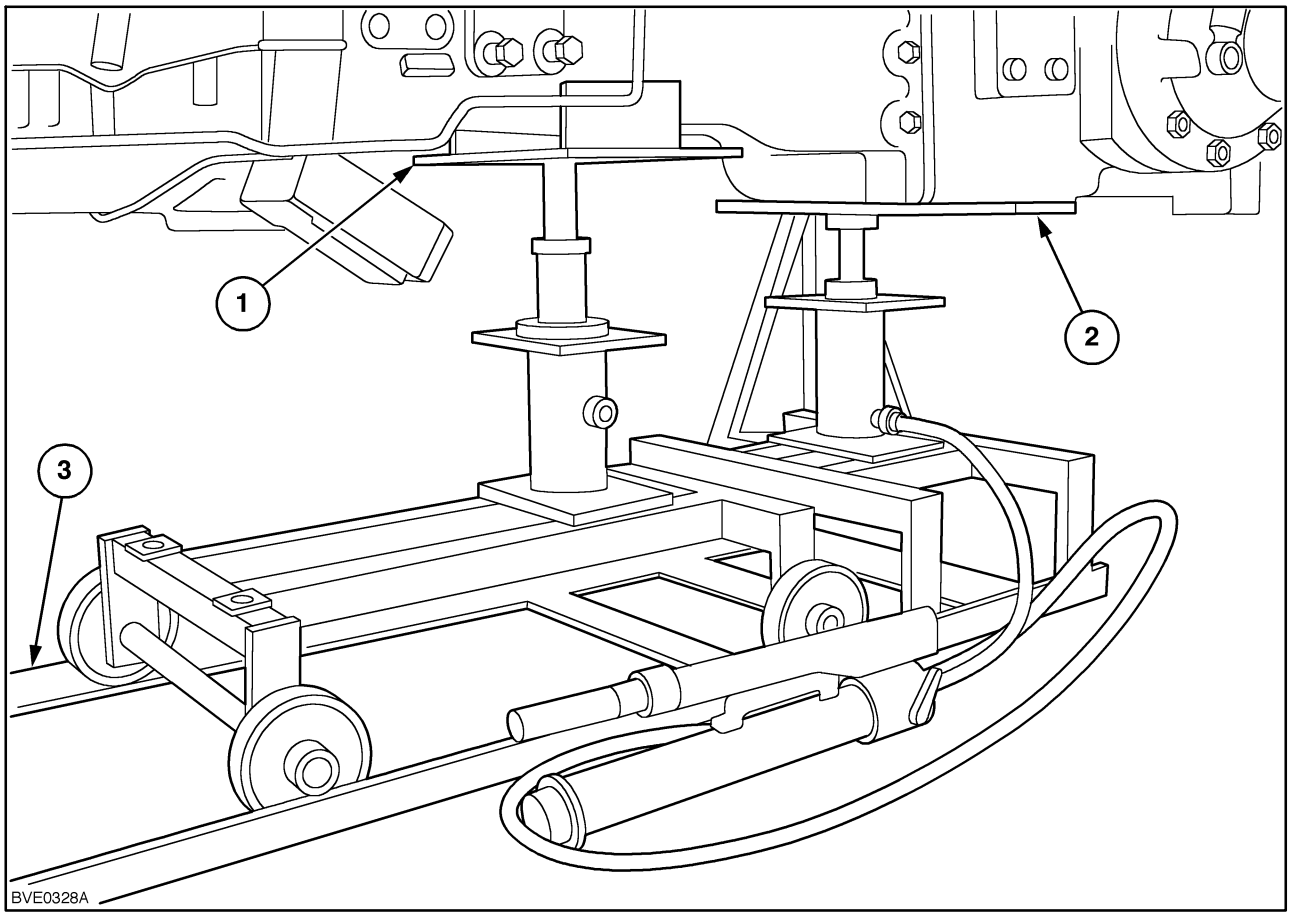
10

All Tractors

14. Position wooden wedges (1) between the front axle and the front support. These prevent articulation of the front axle.



11



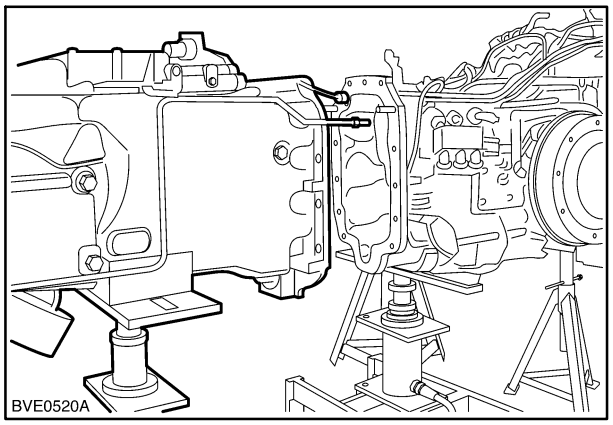
12

15. Position the splitting kit (3) 297471 underneath the tractor.
16. Use the support (2), in the splitting kit to support the rear axle on the splitting stand.
17. Use the support (1), in the splitting kit to support the transmission on the wheeled splitting trolley.
18. Check that all necessary hoses tubes and electrical connectors have been disconnected. It may be necessary to disconnect additional items due to other optional equipment that has been installed on the tractor.

WARNING

Always ensure transmission and rear axle sections of the tractor are fully supported to prevent any movement when the transmission is removed.

19. Remove the transmission to rear axle retaining bolts.
20. Remove the transmission and engine from the rear axle.



13

Installation

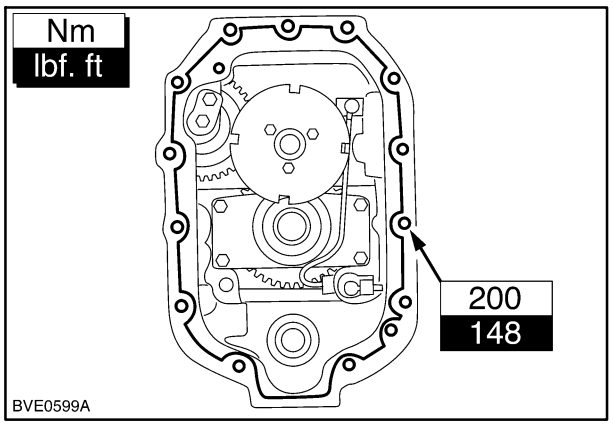
DANGER

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

WARNING

Always ensure transmission and rear axle sections of the tractor are fully supported to prevent any movement when the transmission is installed.

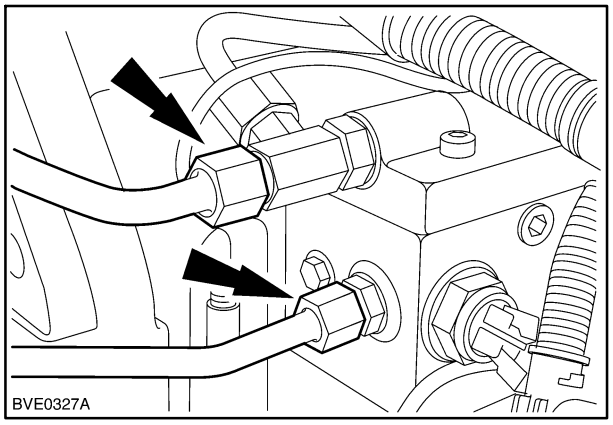
1. Thoroughly clean and degrease the mating sufaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.
2. Align the transmission to the rear axle and install the transmission to rear axle retaining bolts. Tighten to the specified torque value.



14

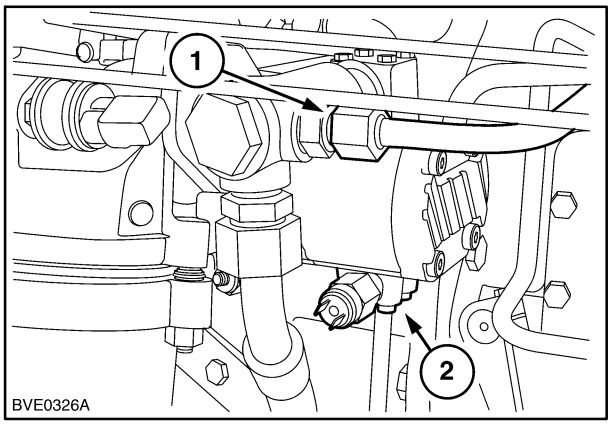
Tractors with 16 x 16 Transmission

3. Connect the oil supply pipes to the low pressure distribution block.



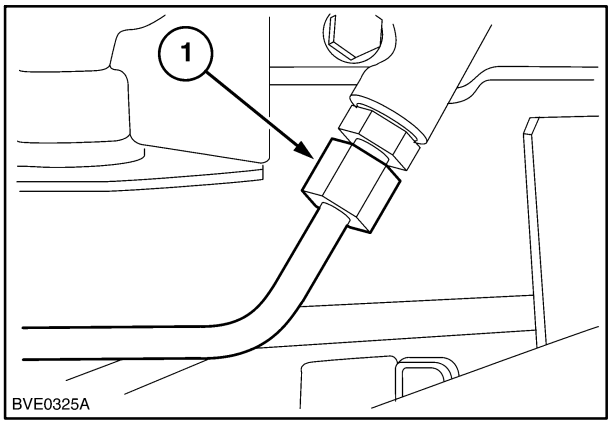
15

4. Connect the oil supply pipes (1) and (2) to the hydraulic pump.



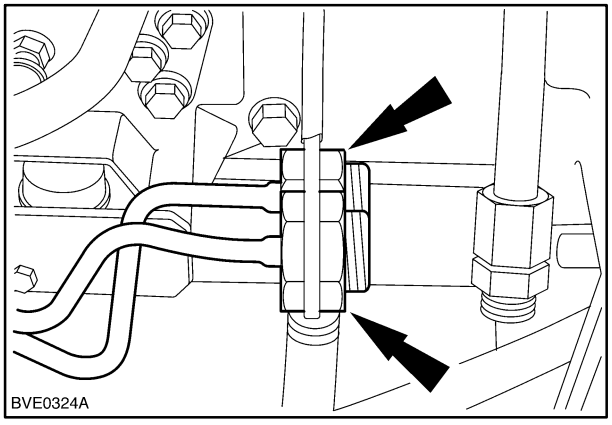
16

5. Connect the transmission oil supply pipe (1).



17

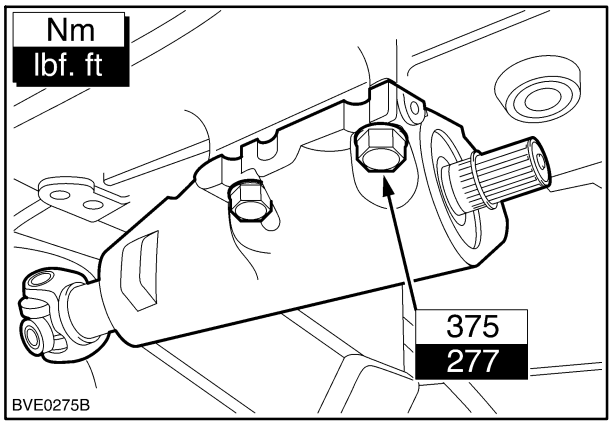
6. Attach the brake tubes to the support bracket.



18

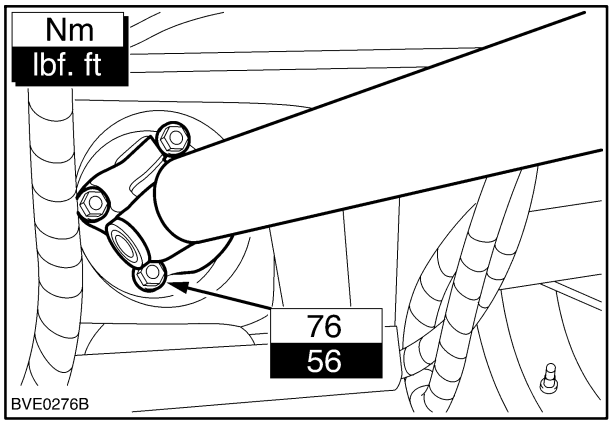
Tractors with SuperSteer Front Axle

7. Install the four wheel driveshaft and the support. Tighten the retaining bolts to the specified torque value.



19

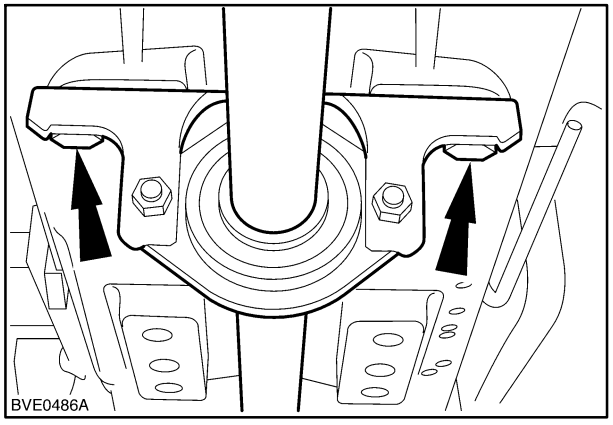
8. Install the four wheel driveshaft retaining nuts. Tighten the retaining bolts to the specified torque value.



20

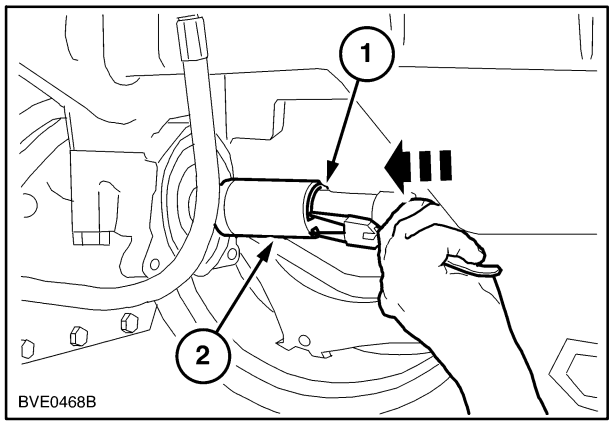
Tractors with Standard Front Axle

9. Install the four wheel driveshaft and the central support.



21

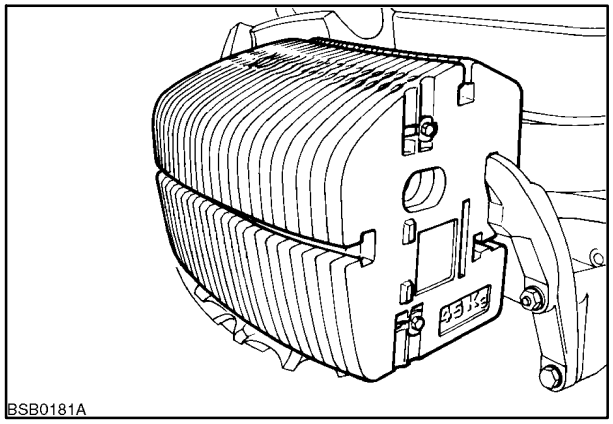
10. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel driveshaft.
11. Install the four wheel driveshaft guard.



22

All Tractors

12. Using a suitable sling, connect the front weights to a hoist and install the front weights (if fitted).
13. Connect or Install the wiring harness.
14. Install the fuel tank (refer to fuel tank installation in the fuel system chapter of the engine section).
15. Install the cab (refer to cab installation in this section).



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NOTES

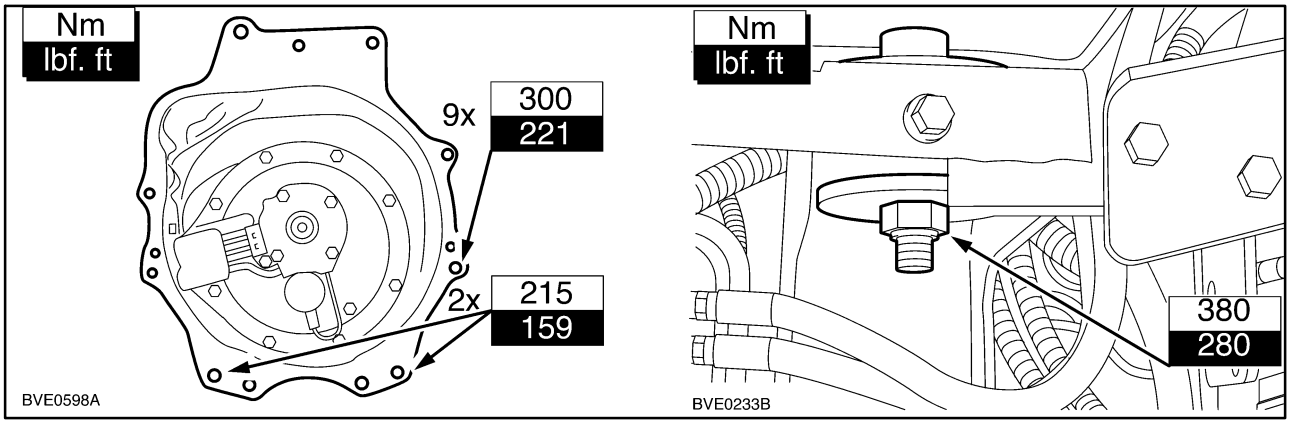
SECTION 01 - SEPARATING THE TRACTOR

Chapter 4 - Engine Removal

CONTENT

Section	Description	Page
	Tightening Torques	2
	Special Tools	2
	Overhaul	3
	Engine	3
	Removal	3
	Installation	15

TIGHTENING TORQUES



1

SPECIAL TOOLS

⚠ CAUTION ⚠

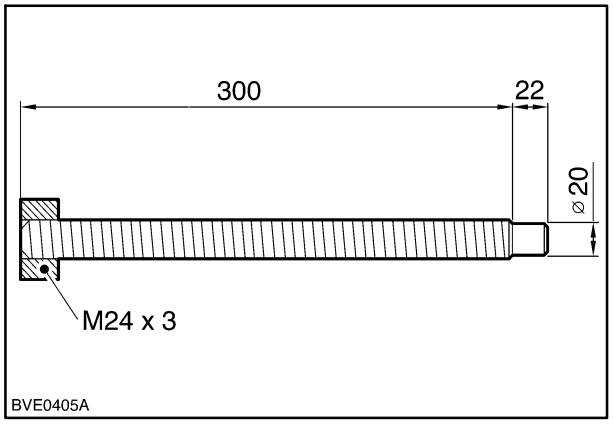
The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

3800001073 Engine lifting brackets

297471 Tractor splitting kit

Locally Fabricated Tools



2

Cab Jacking Tool x2 (Tractors with standard cab)

OVERHAUL

ENGINE

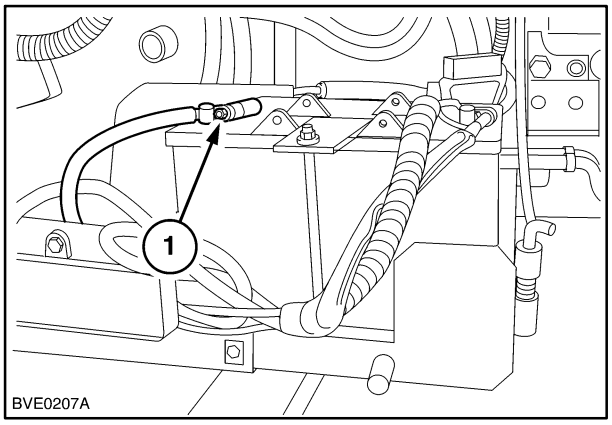
Removal

DANGER

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

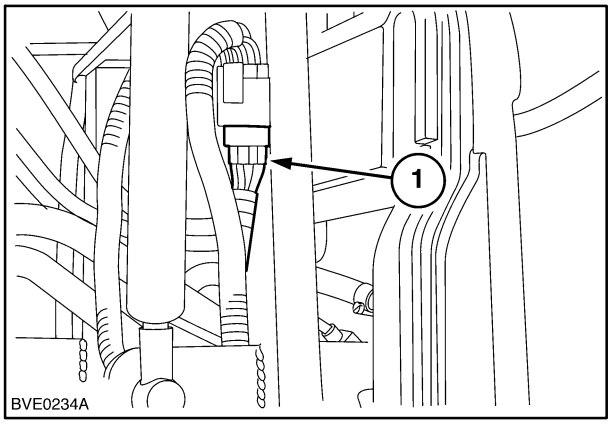
All Tractors

1. Separate the front axle and front support from the engine (refer to separating front axle and front support from the engine in this section).
2. Remove the battery cover and disconnect the battery negative cable (1).



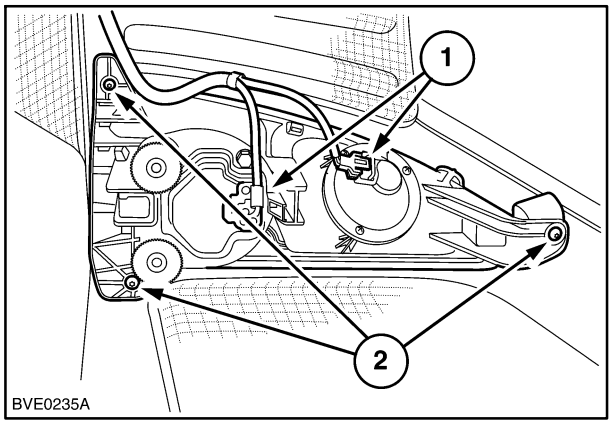
3

3. Disconnect the lighting harness electrical connector (1).



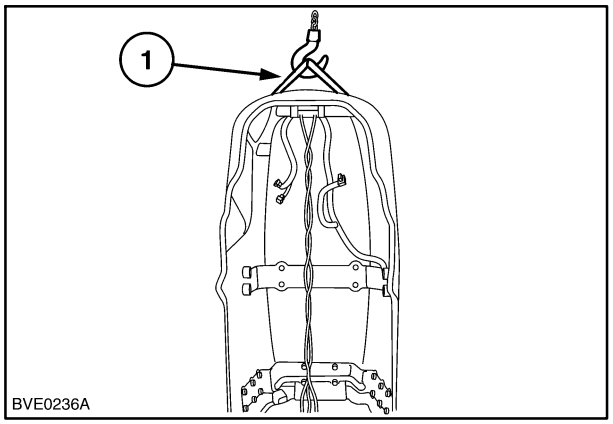
4

4. Disconnect the headlamp electrical connectors (1), remove the retaining screws (2) and remove the headlamp. Repeat this step for the remaining headlamp.



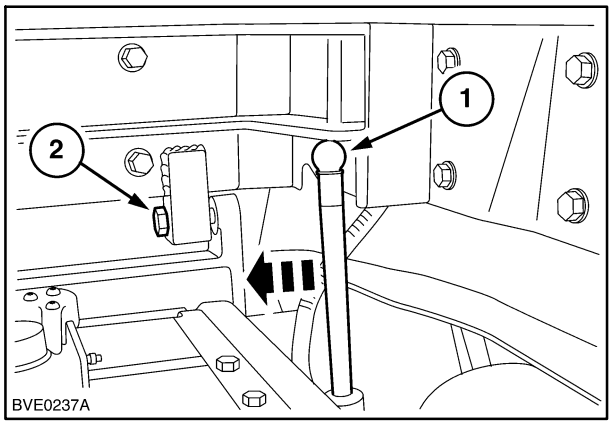
5

5. Connect the engine hood to a hoist using a nylon cable (1) through the headlamp openings.



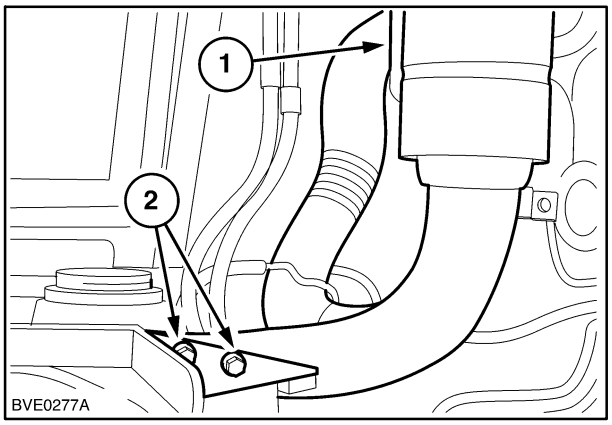
6

6. Remove the retaining clip (1) and disconnect the strut. Repeat this step for the remaining retaining clip and the strut.
7. Remove the hood retaining bolt (2). Repeat this step for the remaining hood retaing bolt.
8. Raise the engine hood slowly and make sure that all cables are free of obstruction.



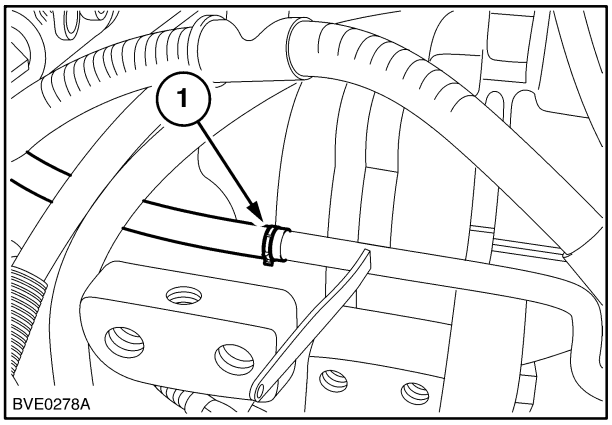
7

9. Disconnect the exhaust manifold from the turbocharger (1). Remove the exhaust support retaining bolts (2) and remove the exhaust manifold.



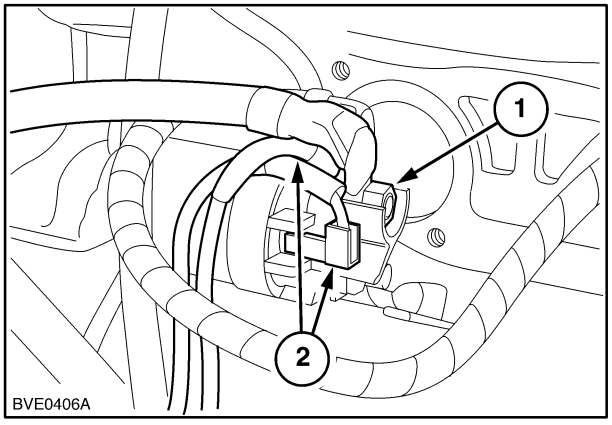
8

10. Loosen the hose clamp (1) and disconnect the coolant hose connecting the cab heater to the radiator.



9

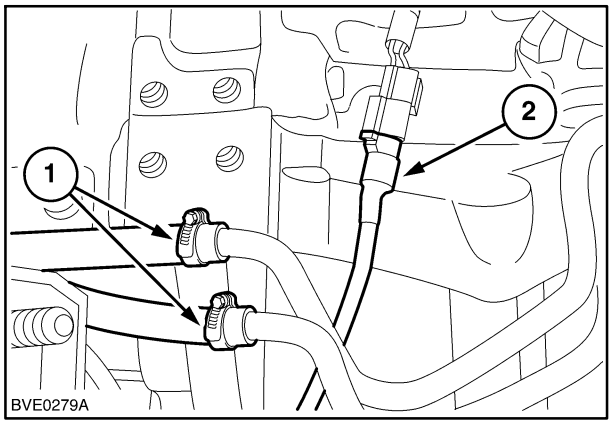
11. Disconnect the battery positive cable (1) and the electrical connectors (2) from the starter motor.



10

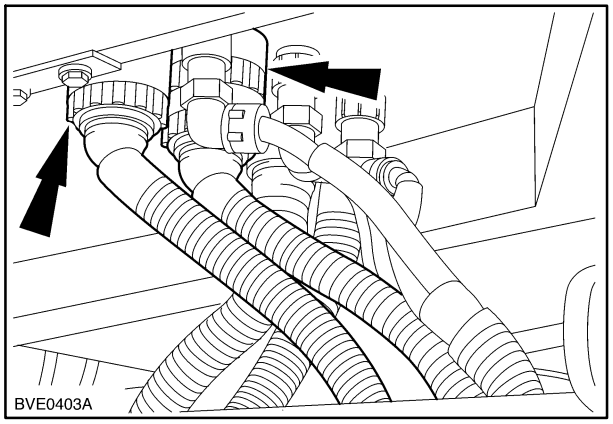
NOTE: *Note the position of the driveline oil cooler hoses.*

12. Loosen the hose clamps (1) and disconnect the driveline oil cooler hoses.
13. Disconnect the tractor performance monitor radar electrical connector (2) (if fitted).



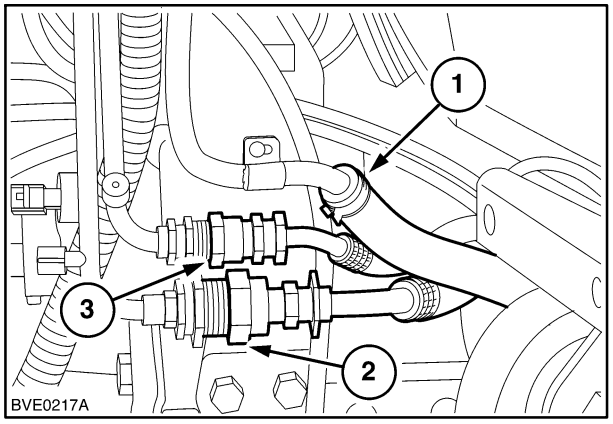
11

14. Disconnect the engine harness electrical connectors.



12

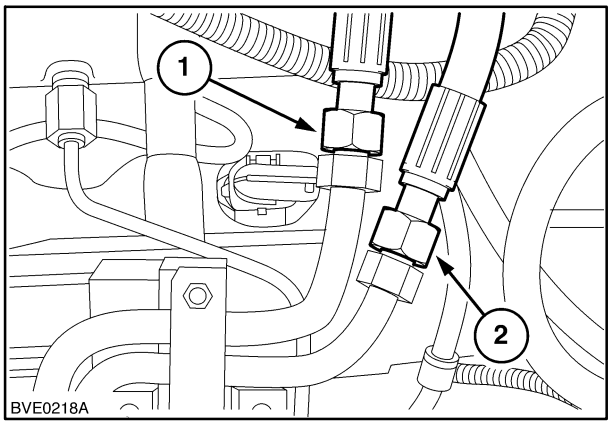
15. Disconnect the cab heater coolant hose (1).
16. Disconnect the air conditioning hoses (2) and (3).



13

NOTE: *Note the position of the steering cylinder oil supply hoses.*

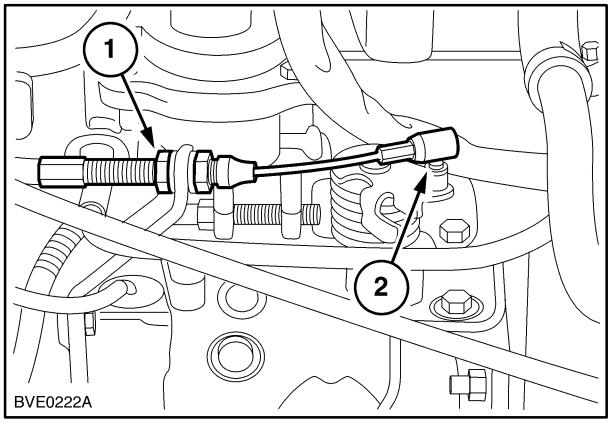
17. Disconnect the steering cylinder oil supply hoses (1) and (2).



14

Tractors with Mechanical Fuel Injection Pump

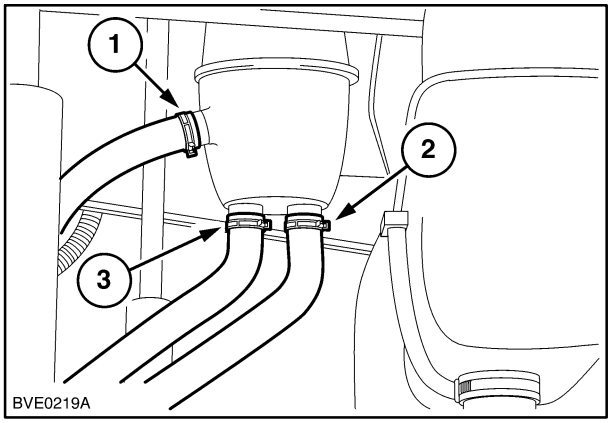
18. Loosen the retaining nut (1) and detach the throttle cable from the fuel injection pump (2).



15

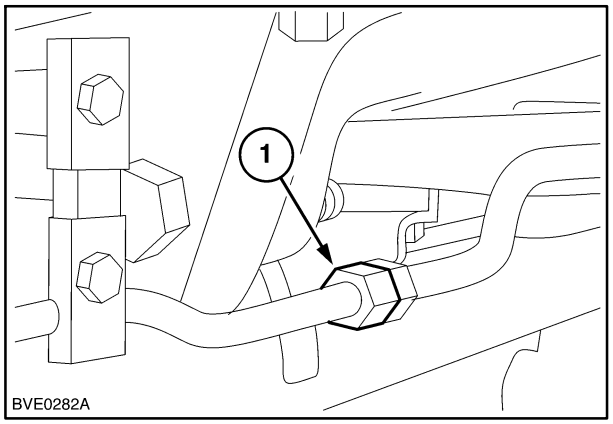
All Tractors

19. Disconnect the brake fluid lines (1), (2) and (3) from the brake fluid reservoir.



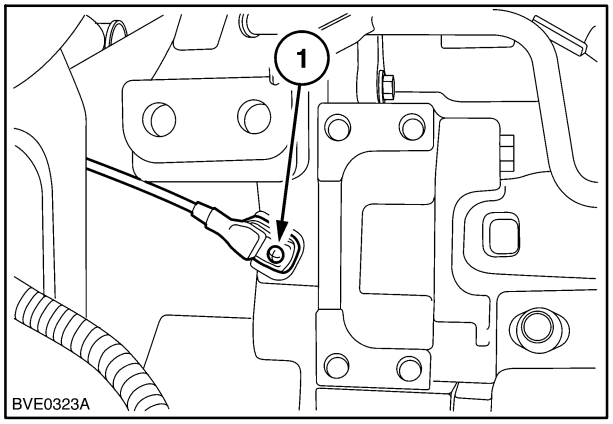
16

20. Disconnect the differential lock oil supply pipe (1).



17

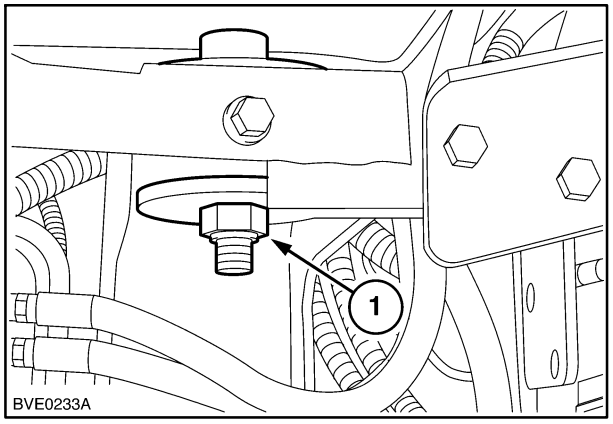
21. Remove the retaining screw (1) and detach the flywheel speed sensor (if fitted).



18

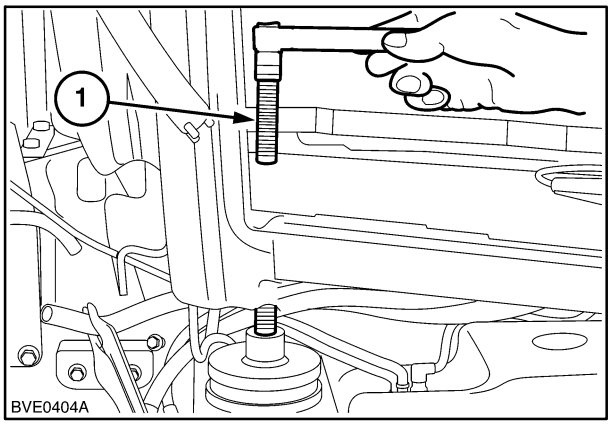
Tractors with Standard Cab

22. Loosen the cab front mounting bolt while holding the nut (1) under the cab floor. Remove the bolt and washers. Repeat this step for the left hand side of the cab.



19

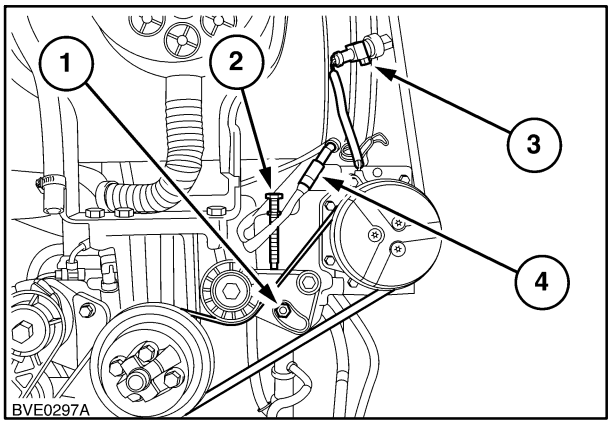
23. Using the locally fabricated tool (1), raise the cab evenly.



20

Tractors with Air Conditioning

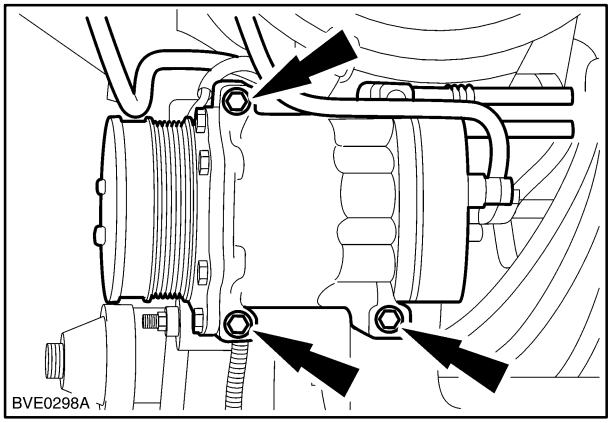
24. Loosen the drive belt tensioner securing nut (1), tensioner bolt (2) and remove the air conditioning compressor drive belt.
25. Disconnect the air conditioning pressure sensor electrical connector (3) and the air conditioning air compressor clutch electrical connector (4).



21

26. Remove the air conditioning compressor, condenser, receiver dryer and pipe work from the engine as a complete assembly without disconnecting the pipe work.

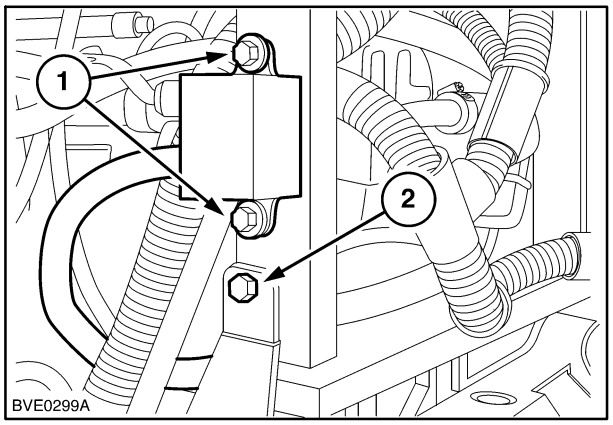
IMPORTANT: *If it is not possible to remove the air conditioning components as a complete assembly, the air conditioning system must be evacuated (refer to the climate control section).*
It is an offence to vent the air conditioning system into the atmosphere.



22

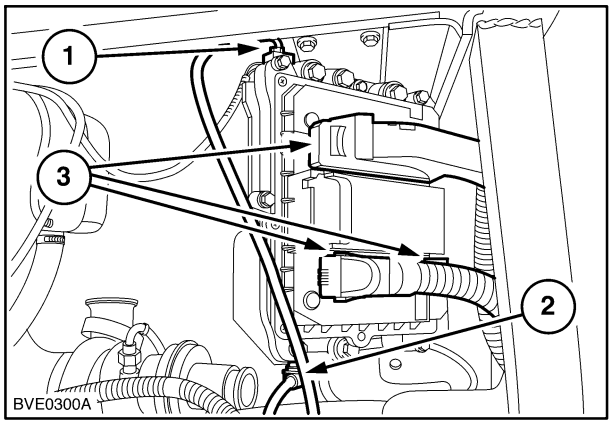
All Tractors

27. Remove the relay retaining bolts (1) and detach the relay.
28. Remove the cab heater pipe support retaining bolt (2).



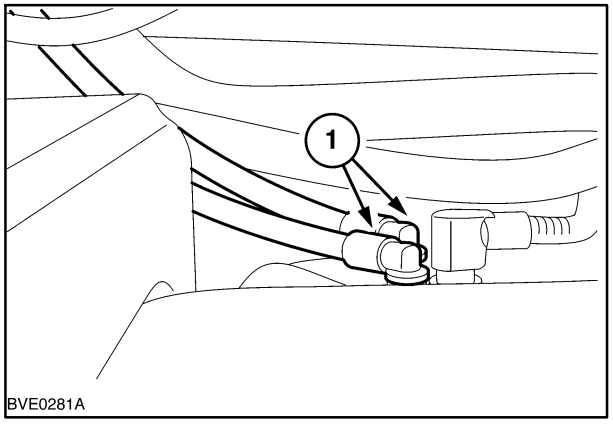
23

29. Disconnect the fuel tank to fuel cooler supply line (1) from the fuel cooler and allow the fuel to drain back into the fuel tank.
30. Disconnect the fuel cooler to fuel filter supply line (2) from the fuel cooler.
31. Disconnect the engine controller electrical connectors (3).



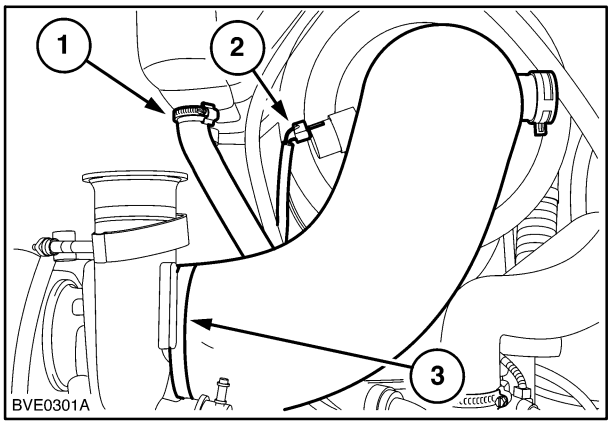
24

32. Disconnect the fuel supply and return lines (1) from the fuel tank level sender.



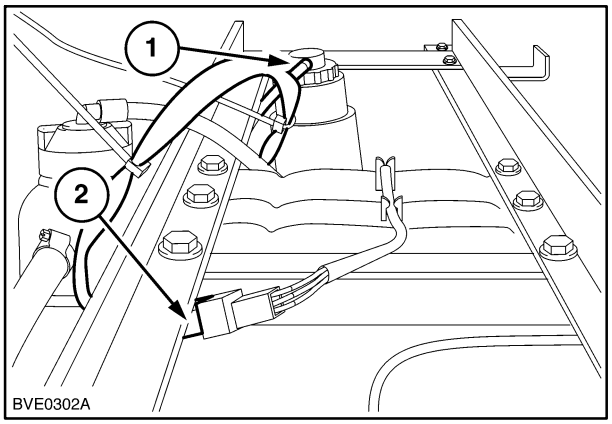
25

33. Loosen the hose clamp (1) and disconnect the coolant hose from the expansion tank.
34. Disconnect the air cleaner vacuum switch electrical connector (2).
35. Loosen the hose clamp (3) and disconnect the air cleaner hose from the turbocharger.



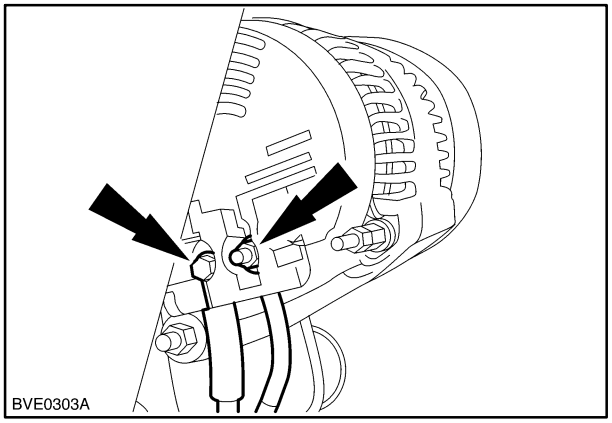
26

36. Disconnect the brake reservoir electrical connectors (1) and the coolant level sender electrical connector (2).



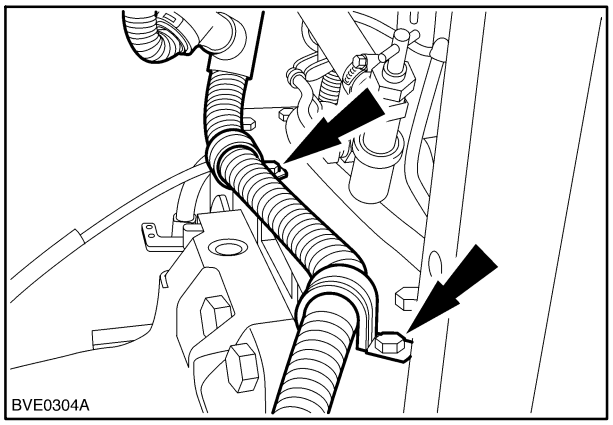
27

37. Disconnect the alternator electrical connectors.



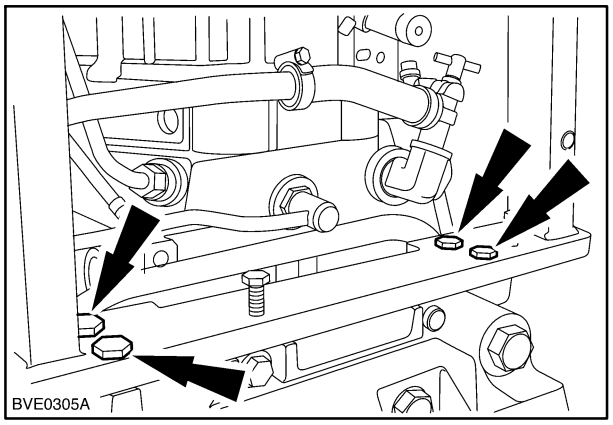
28

38. Remove the engine harness clamp retaining bolts and reposition the engine harness on top of the engine.



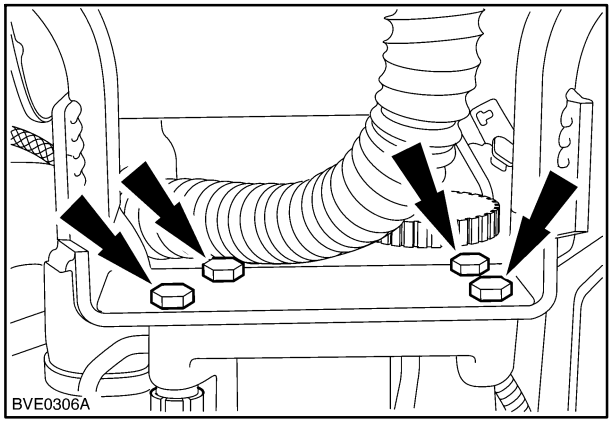
29

39. Remove the air cleaner mounting frame retaining bolts.



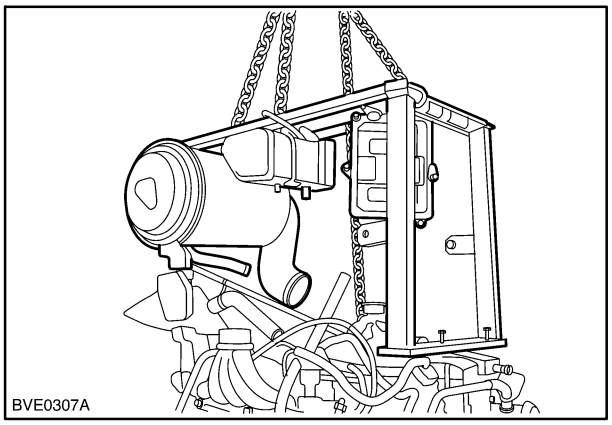
30

40. Remove the air cleaner mounting frame retaining bolts.



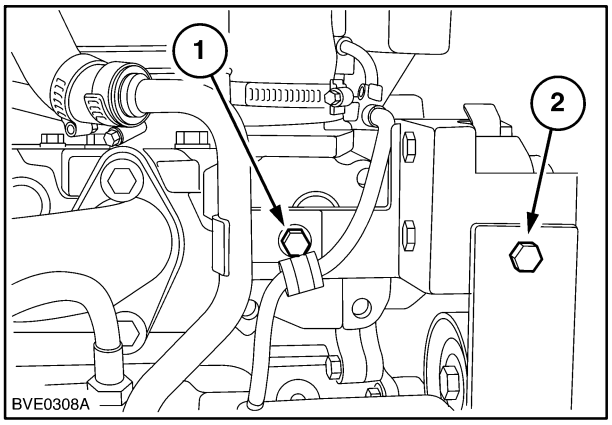
31

41. Using a suitable chain, connect the air cleaner mounting frame to a hoist and remove the air cleaner mounting frame.



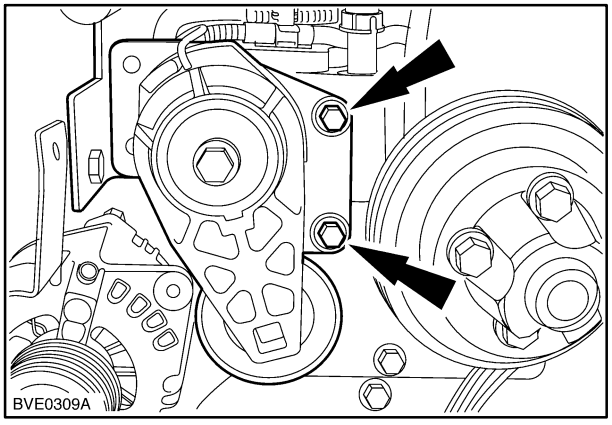
32

42. Remove the coolant expansion tank pipe support bracket retaining bolt (1) and the alternator guard retaining bolt (2).



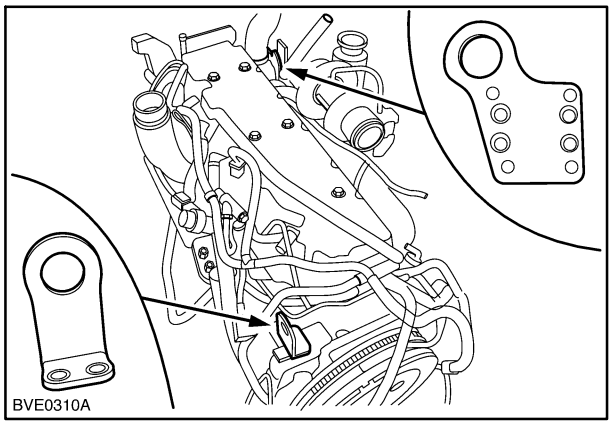
33

43. Remove the fan belt tensioner and the support bracket.



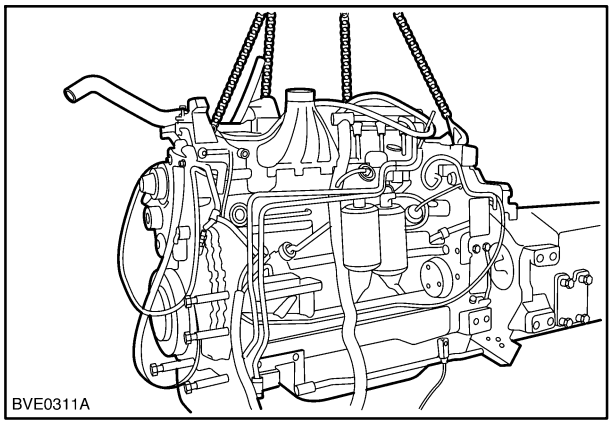
34

44. Attach the lifting brackets to the engine.



35

45. Using a suitable chain, connect the engine to a hoist.
46. Remove the engine to transmission retaining bolts and remove the engine.



36

Installation

DANGER

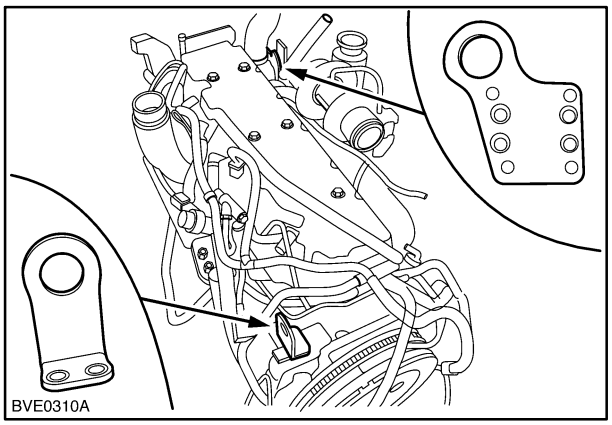
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

WARNING

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

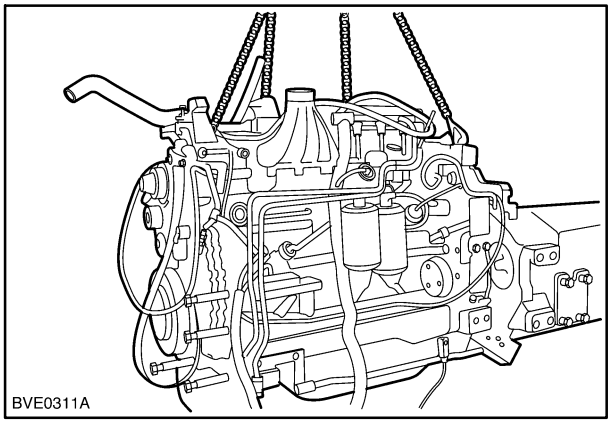
All Tractors

1. Attach the lifting brackets to the engine.



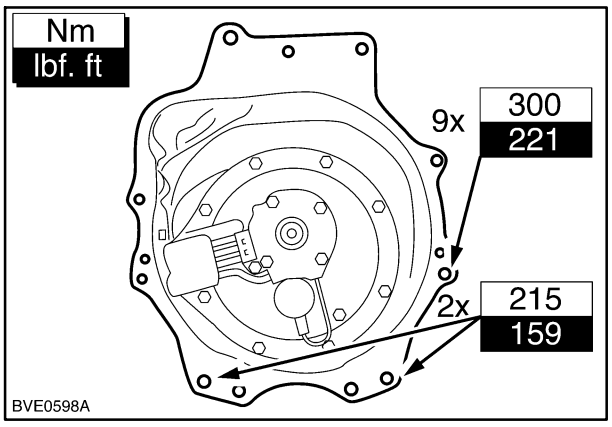
37

2. Using a suitable chain, connect the engine to a hoist.



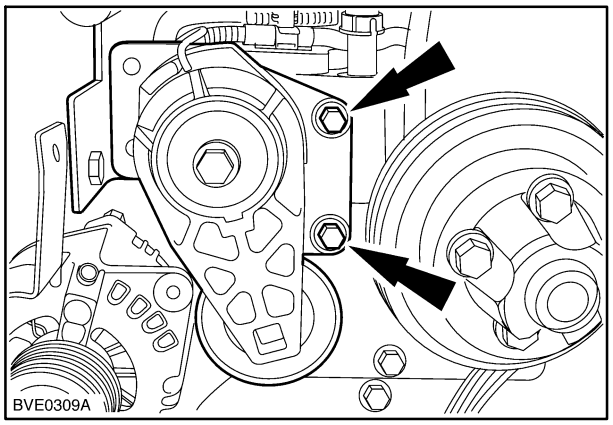
38

3. Align the engine to the transmission and install the engine to transmission retaining bolts. Tighten to the specified torque value.



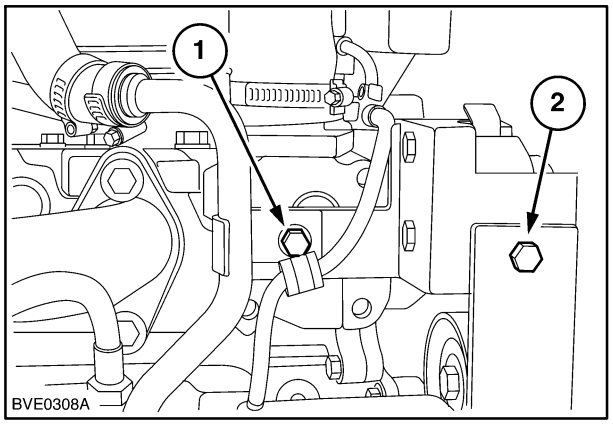
39

4. Install the fan belt tensioner and the support bracket.



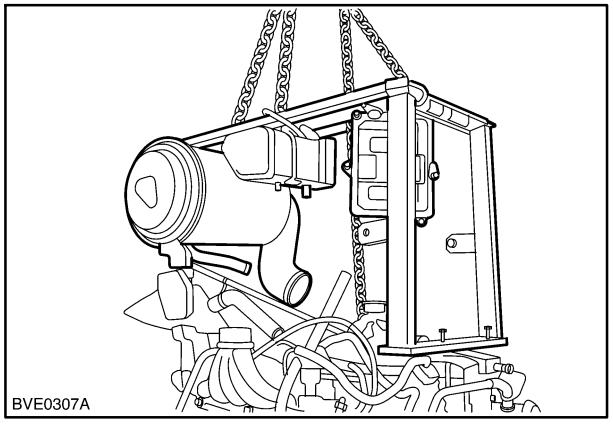
40

5. Install the coolant expansion tank pipe support bracket retaining bolt (1) and the alternator guard retaining bolt (2).



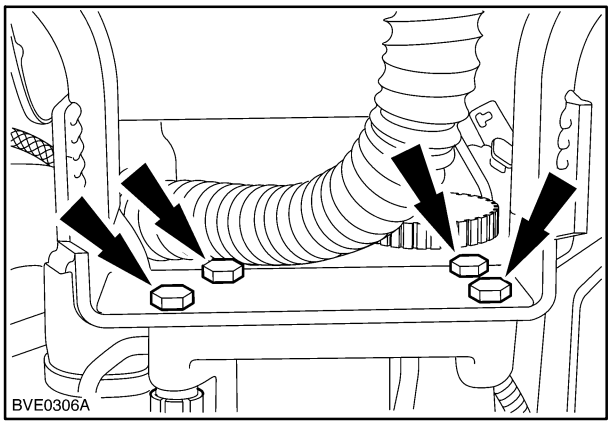
41

6. Using a suitable chain, connect the air cleaner mounting frame to a hoist and install the air cleaner mounting frame.



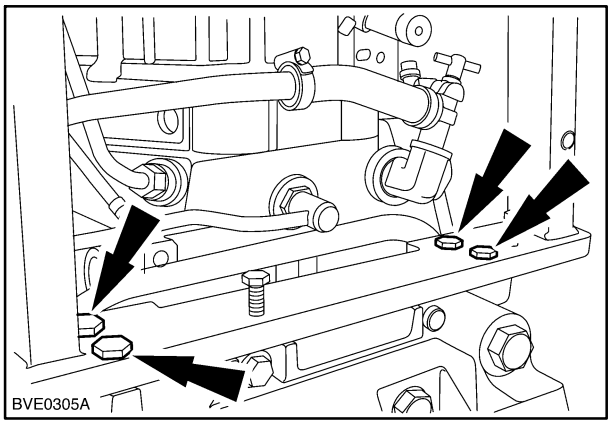
42

7. Install the air cleaner mounting frame retaining bolts.



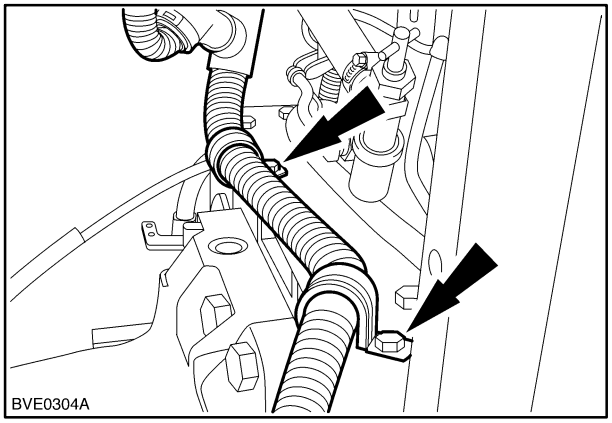
43

8. Install the air cleaner mounting frame retaining bolts.



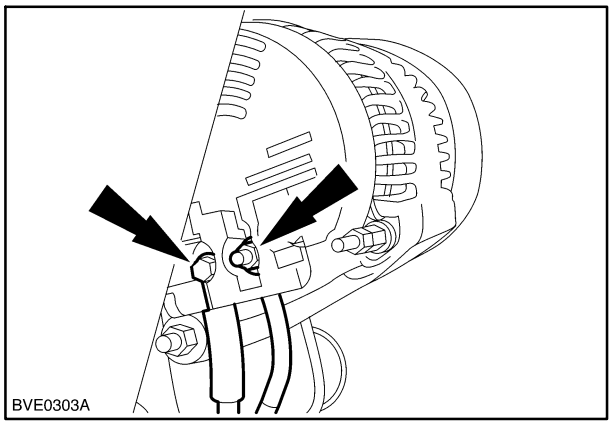
44

9. Install the engine harness clamp retaining bolts.



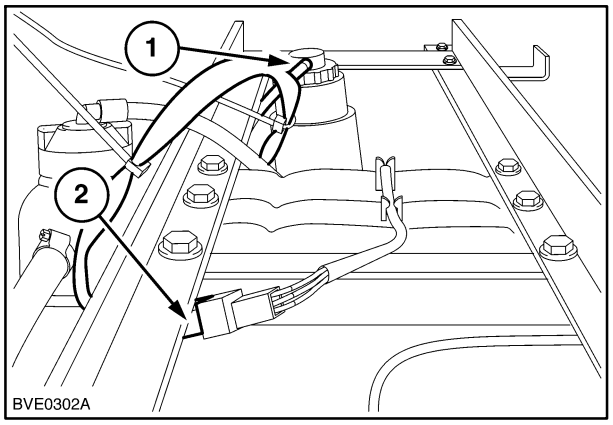
45

10. Connect the alternator electrical connectors.



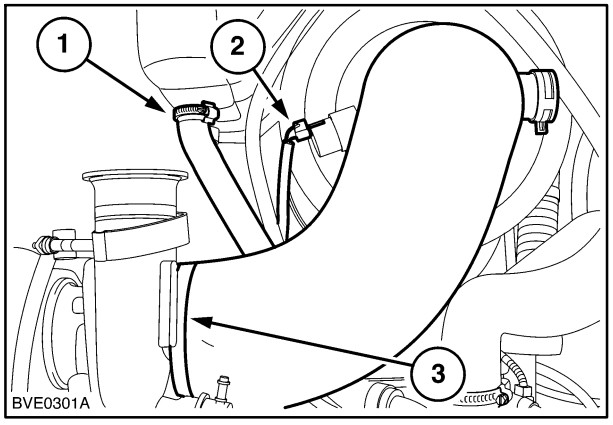
46

11. Connect the brake reservoir electrical connectors (1) and the coolant level sender electrical connector (2).



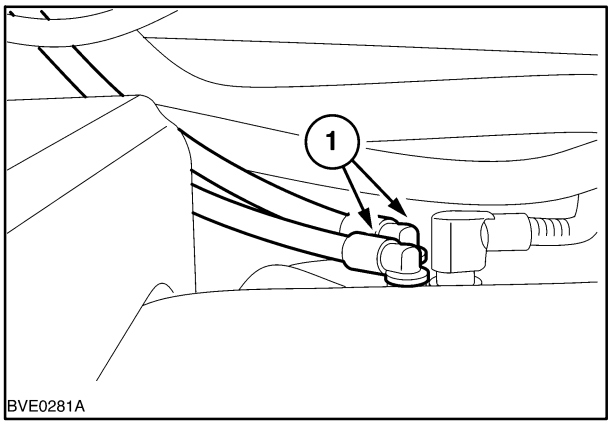
47

12. Connect the coolant hose to the expansion tank and tighten the hose clamp (1).
13. Connect the air cleaner vacuum switch electrical connector (2).
14. Connect the air cleaner hose to the turbocharger and tighten the hose clamp (3).



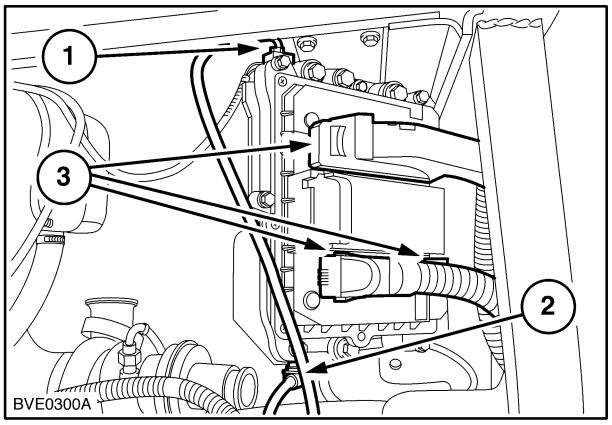
48

15. Connect the fuel supply and return lines (1) to the fuel tank level sender.



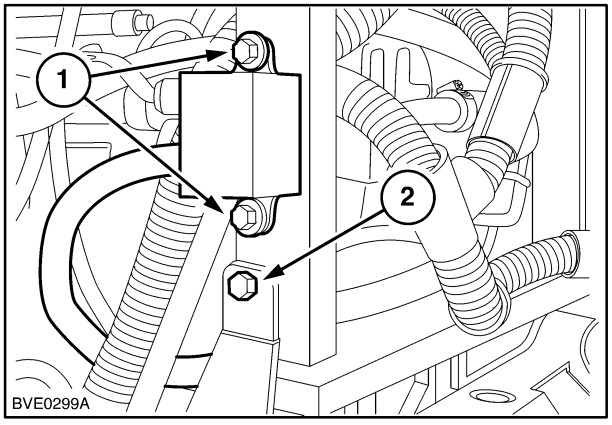
49

16. Connect the fuel supply lines (1) and (2) to the fuel cooler.
17. Connect the engine controller electrical connectors (3).



50

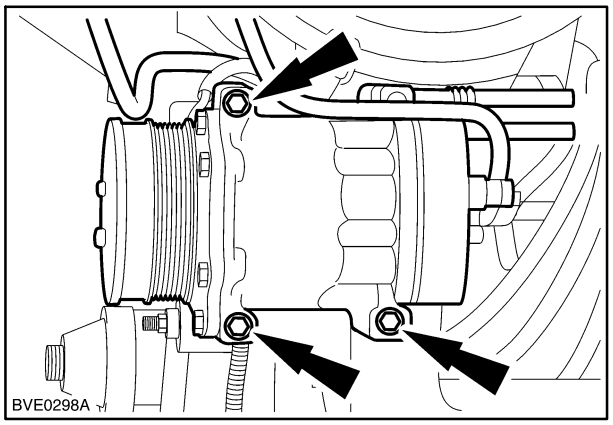
18. Attach the relay and tighten the relay retaining bolts (1).
19. Install the cab heater pipe support retaining bolt (2).



51

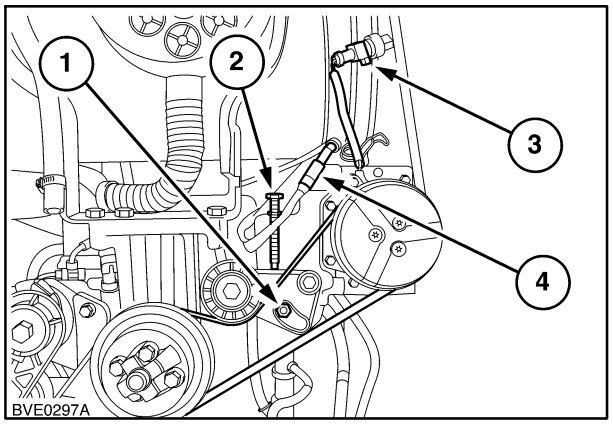
Tractors with Air Conditioning

20. Install the air conditioning compressor, condenser, receiver dryer and pipe work to the engine as a complete assembly without disconnecting the pipe work.



52

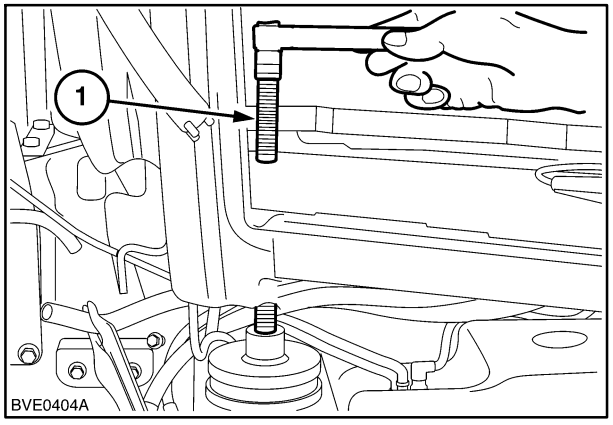
21. Install the air conditioning compressor drive belt. Tighten the tensioner bolt (2), and the tensioner securing nut (1).
22. Connect the air conditioning pressure sensor electrical connector (3) and the air conditioning compressor clutch electrical connector (4).



53

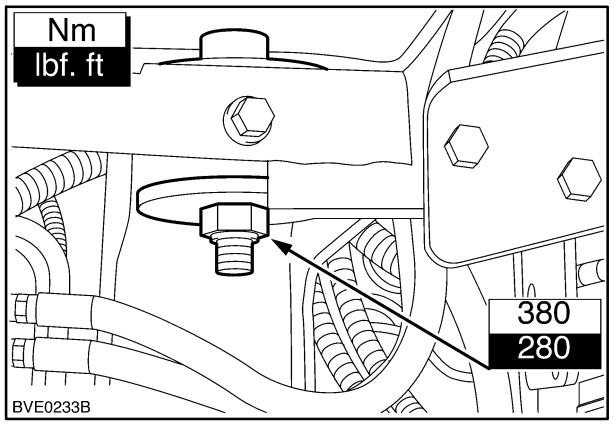
Tractors with Standard Cab

23. Using the locally fabricated tool (1), lower the cab evenly.



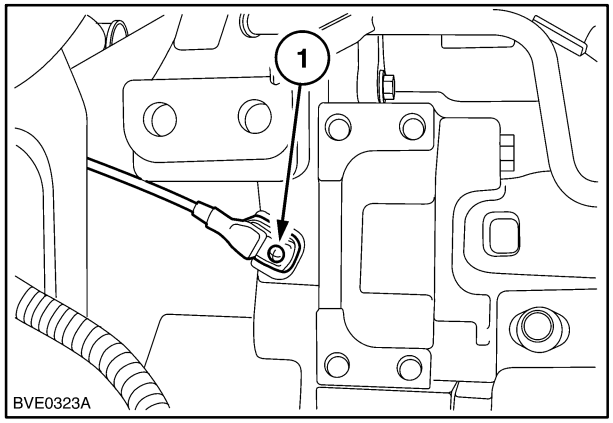
54

24. Install the cab front mounting bolt, washers and nut. Tighten to the specified torque value. Repeat this step for the left hand side of the cab.



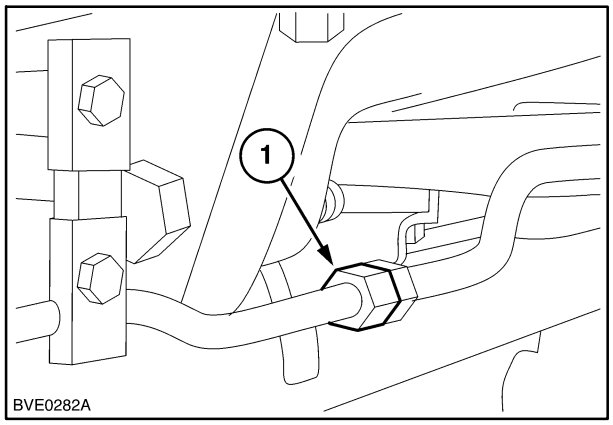
55

25. Attach the flywheel speed sensor and install the retaining screw (1) (if fitted).



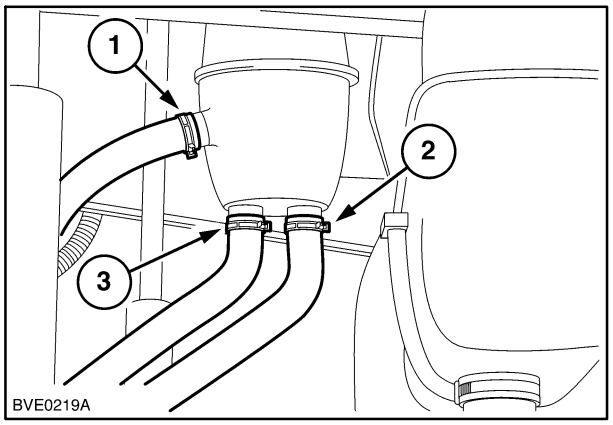
56

26. Connect the differential lock oil supply pipe (1).



57

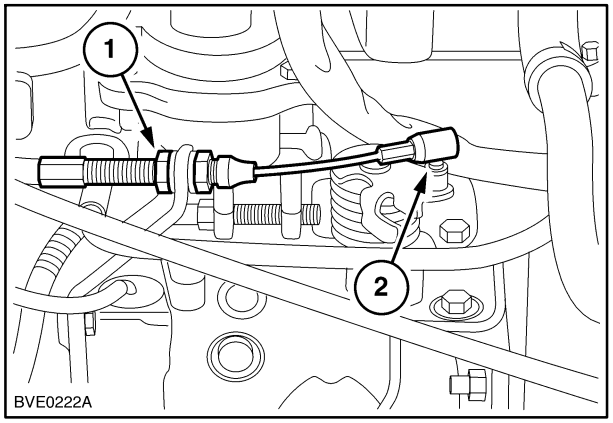
27. Connect the brake fluid lines (1), (2) and (3) to the brake fluid reservoir.



58

Tractors with Mechanical Fuel Injection Pump

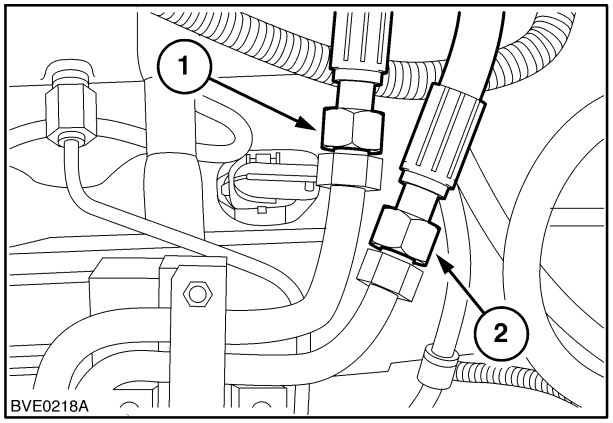
28. Attach the throttle cable to the fuel injection pump (2) and tighten the retaining nut (1).



59

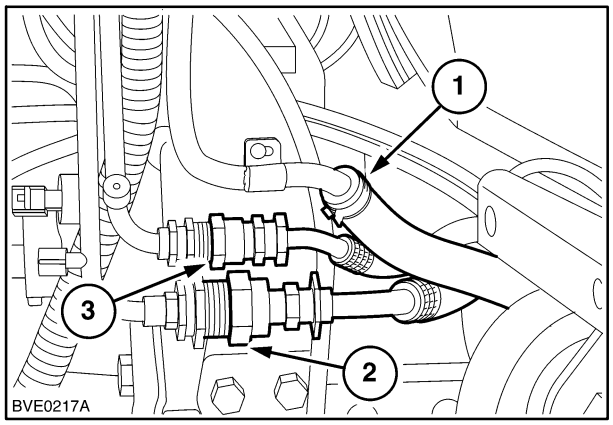
All Tractors

29. Connect the steering cylinder oil supply hoses (1) and (2).



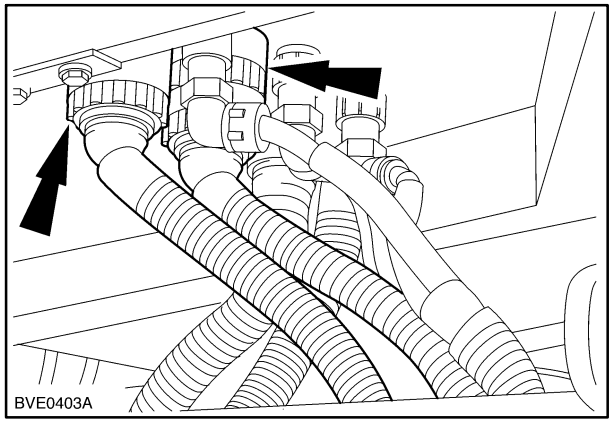
60

30. Connect the cab heater hose (1).
31. Connect the air conditioning hoses (2) and (3).



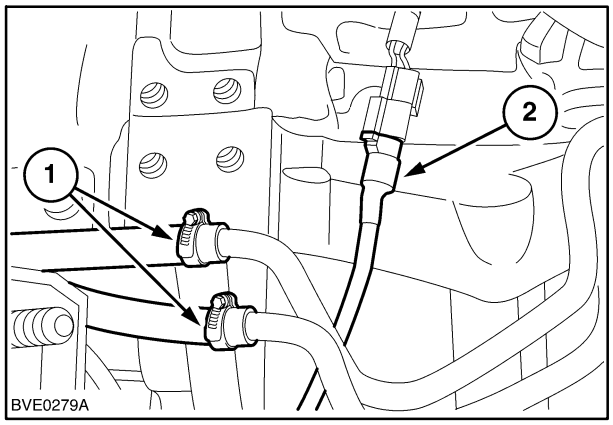
61

32. Connect the engine harness electrical connectors.



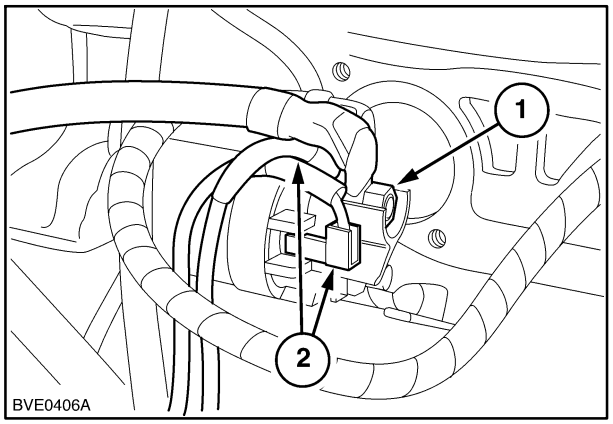
62

33. Connect the driveline oil cooler hoses and tighten the hose clamps (1).
34. Connect the tractor performance monitor radar electrical connector (2) (if fitted).



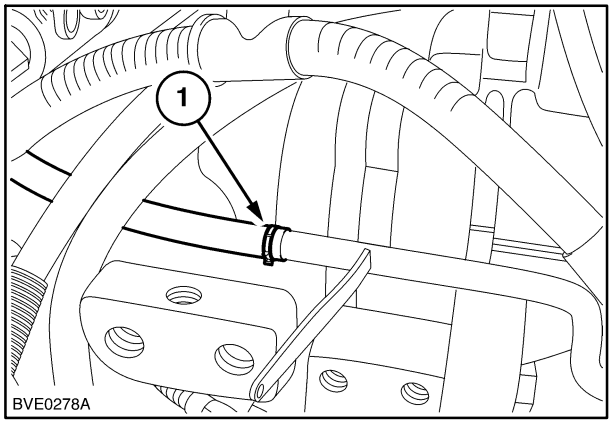
63

35. Connect the battery positive cable (1) and the electrical connectors (2) to the starter motor.



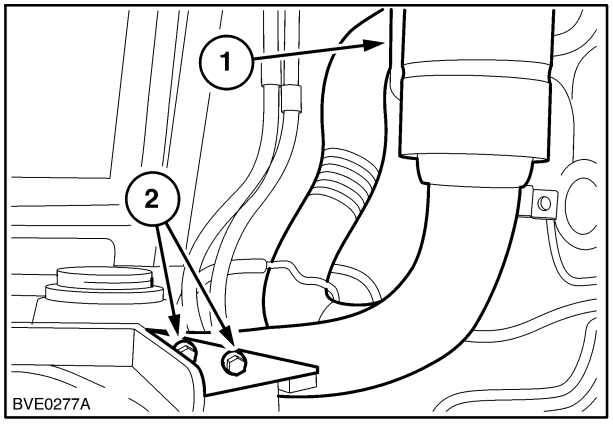
64

36. Connect the hose connecting the cab heater to the radiator and tighten the hose clamp (1).



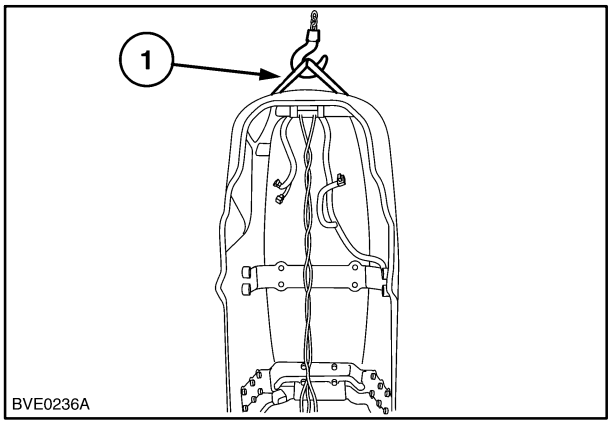
65

37. Install the exhaust manifold and the retaining bolts (2). Connect the exhaust to the turbocharger (1).



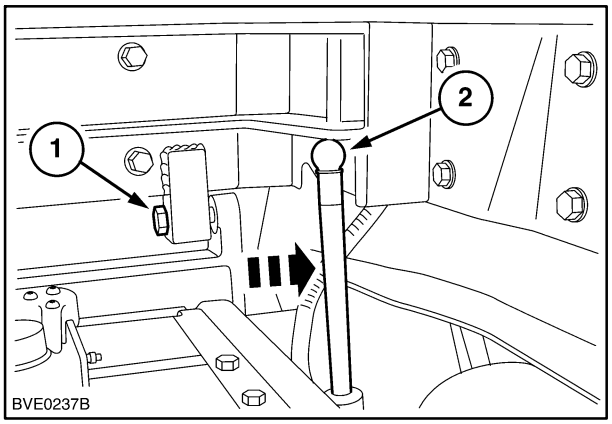
66

38. Connect the engine hood to a hoist using a nylon cable (1) through the headlamp openings.



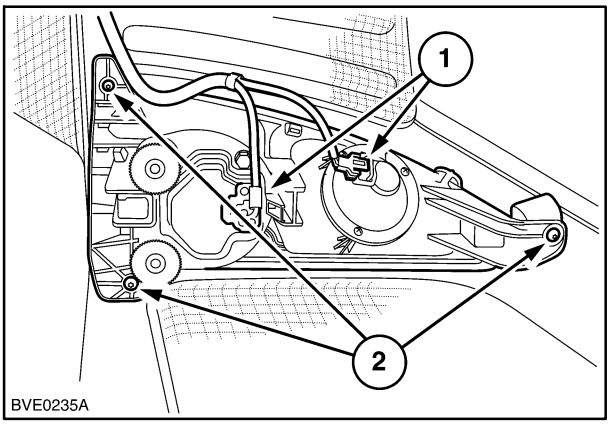
67

39. Lower the engine hood slowly, ensure that all cables are free of obstruction.
40. Install the hood retaining bolt (1). Repeat this step for the remaining hood retaining bolt.
41. Connect the strut and install the retaining clip (2). Repeat this step for the remaining retaining clip and the strut.



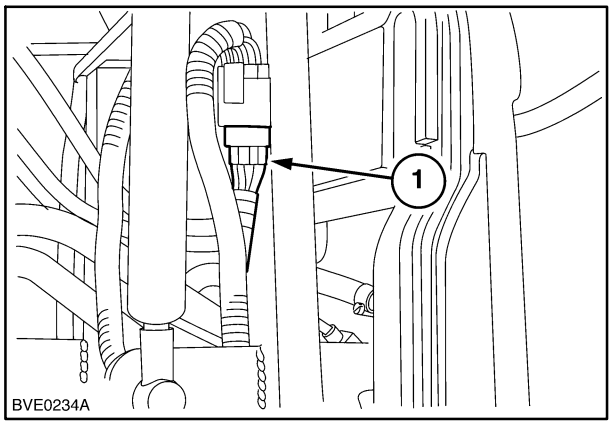
68

42. Install the headlamp and the retaining screws (2). Connect the headlamp electrical connectors (1). Repeat this step for the remaining headlamp.



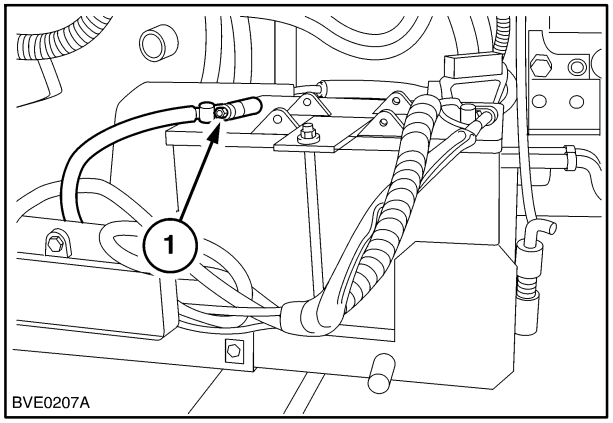
69

43. Connect the lighting harness electrical connector (1).
44. Install the front axle and front support to the engine (refer to Installing front axle and front support to the engine in this section).



70

45. Connect the battery negative cable (1) and install the battery cover.
46. Bleed the brake system (refer to bleeding the brakes in the brakes and controls section).



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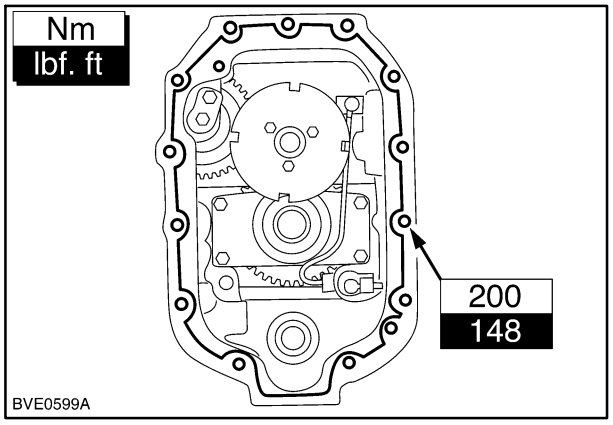
SECTION 01 - SEPARATING THE TRACTOR

Chapter 5 - Transmission Removal

CONTENT

Section	Description	Page
	Tightening Torques	2
	Special Tools	2
	Overhaul	3
	Transmission	3
	Removal	3
	Installation	6

TIGHTENING TORQUES



1

SPECIAL TOOLS

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

297471 Tractor splitting kit.

X 380001116 Transmission lifting eyebolt

OVERHAUL

TRANSMISSION

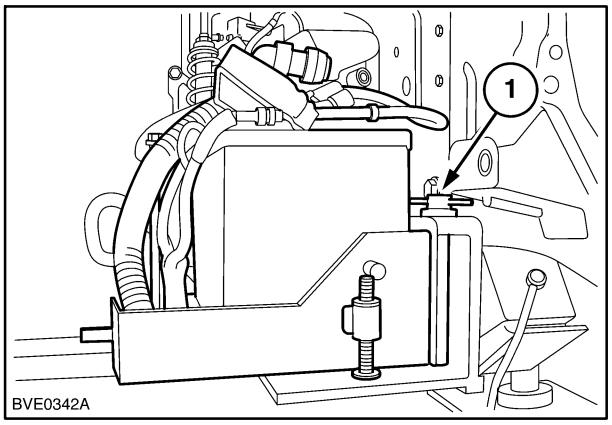
Removal

DANGER

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

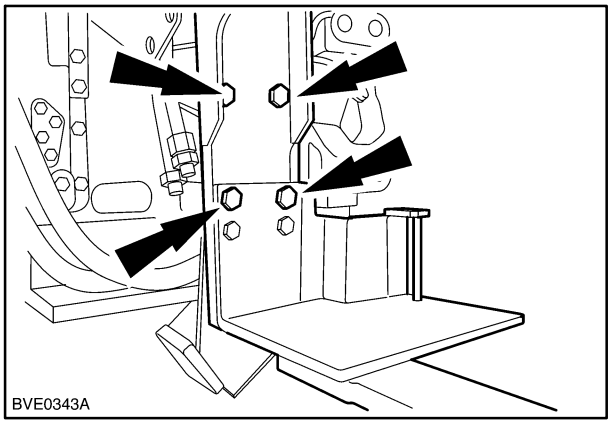
All Tractors

1. Remove the cab (refer to cab removal in this section).
2. Separate the engine and front support from the transmission (refer to separating the engine and front support from the transmission in this section).
3. Disconnect the wiring harness as required to enable the separation of the transmission from the rear axle.
4. Remove the battery tray swivel pin (1) and remove the battery tray and battery.



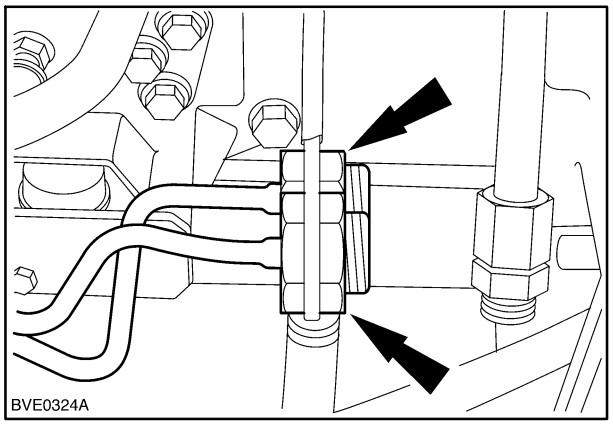
2

5. Remove the cab support.



3

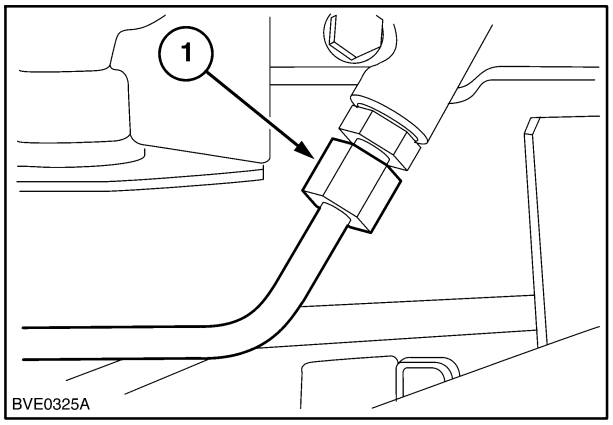
6. Detach the brake tubes from the support bracket.



4

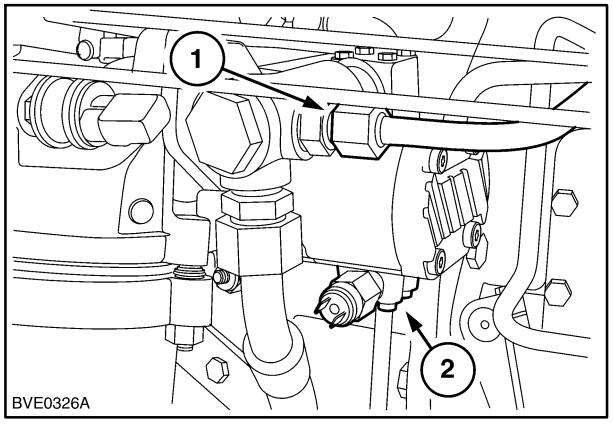
Tractors with 16 x 16 Transmission

7. Disconnect the transmission oil supply pipe (1).



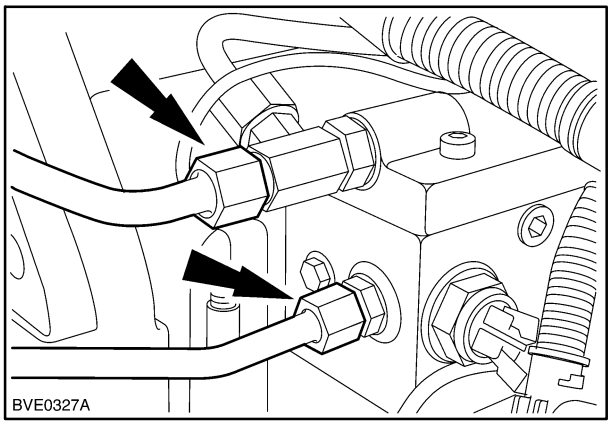
5

8. Disconnect the oil supply pipes (1) and (2) from the hydraulic pump.



6

9. Disconnect the oil supply pipes from the low pressure distribution block.



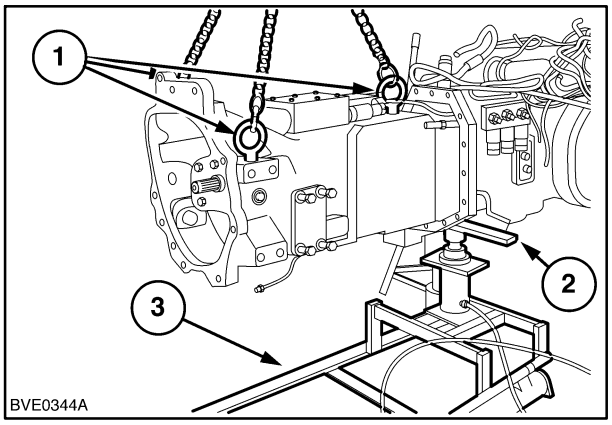
7

All Tractors

⚠ WARNING ⚠

Always ensure the transmission and rear axle sections of the tractor are fully supported to prevent any movement when the transmission is removed.

10. Install Special tool No. **380001116** (transmission lifting eyebolts), (1).
11. Using a suitable chain, attach the transmission to a hoist.
12. Position the splitting kit (3) 297471 underneath the tractor.
13. Use the supports (2), in the splitting kit to support the rear axle on the splitting stand.
14. Remove the transmission to rear axle retaining bolts.
15. Remove the transmission from the rear axle.



8

Installation

⚠ DANGER ⚠

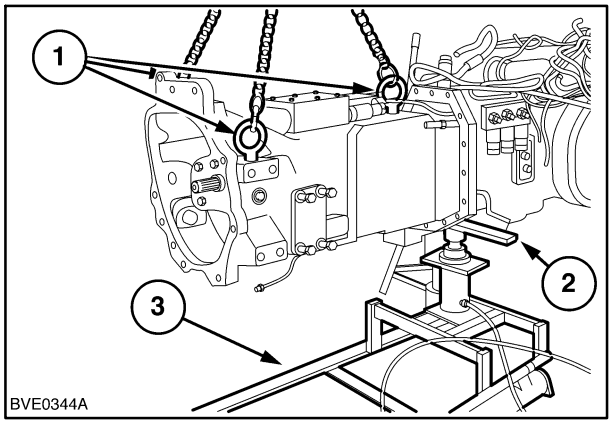
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

⚠ WARNING ⚠

Always ensure the transmission and rear axle sections of the tractor are fully supported to prevent any movement when the transmission is installed.

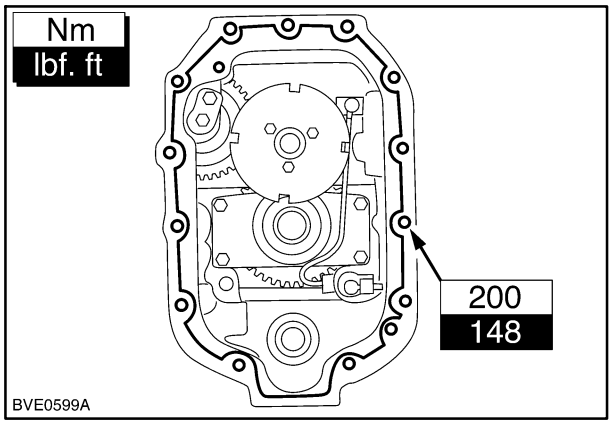
All Tractors

1. Install Special tool No. **380001116** (transmission lifting eyebolts), (1).
2. Using a suitable chain, attach the transmission to a hoist.



9

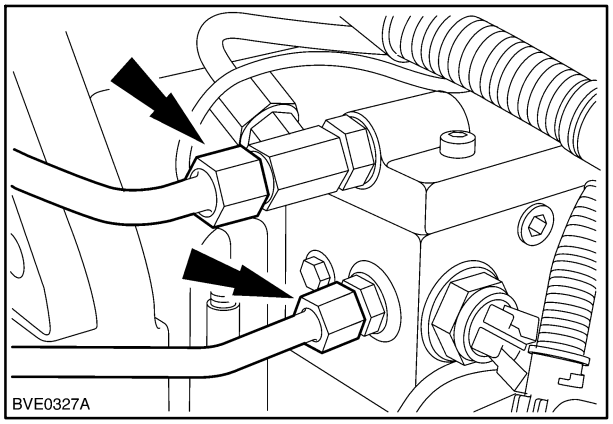
3. Thoroughly clean and degrease the mating sufaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.
4. Align the transmission to the rear axle and install the transmission to rear axle retaining bolts. Tighten to the specified torque value.



10

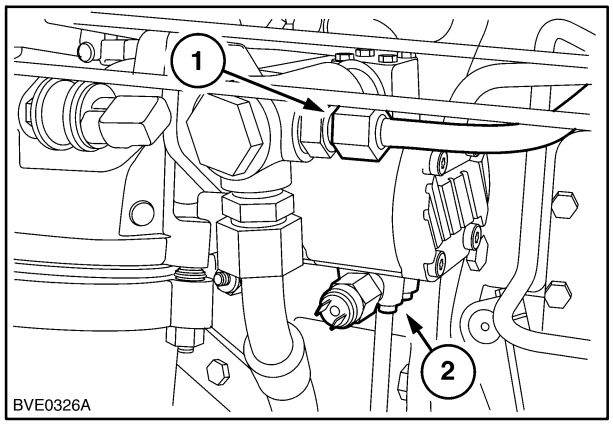
Tractors with 16 x 16 Transmission

5. Connect the oil supply pipes to the low pressure distribution block.



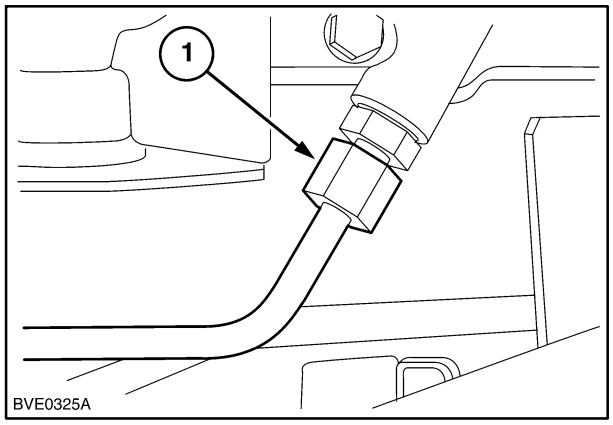
11

6. Connect the oil supply pipes (1) and (2) to the hydraulic pump.



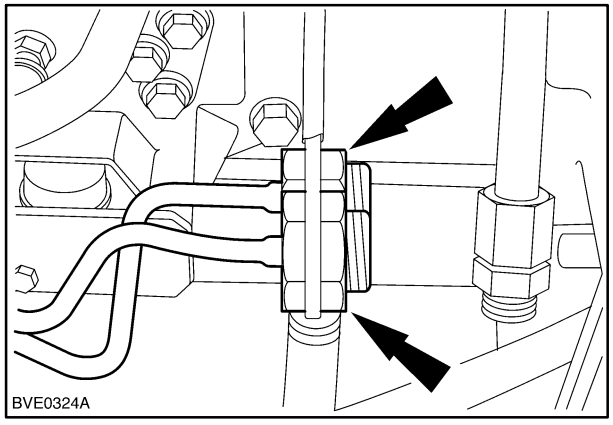
12

7. Connect the transmission oil supply pipe (1).



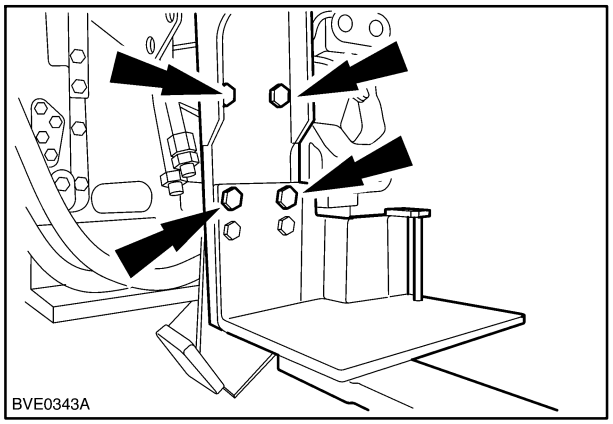
13

8. Attach the brake tubes to the support bracket.



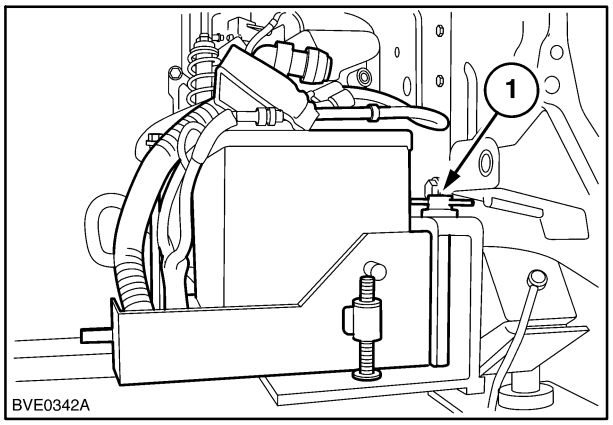
14

9. Install the cab support.



15

10. Install the battery tray and battery. Install the battery tray swivel pin (1).
11. Connect or Install the wiring harness as required.
12. Install the engine and front support to the transmission (refer to installing the engine and front support to the transmission in this section).
13. Install the cab (refer to cab installation in this section).



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SECTION 01 - SEPARATING THE TRACTOR

Chapter 6 - Cab Removal

CONTENT

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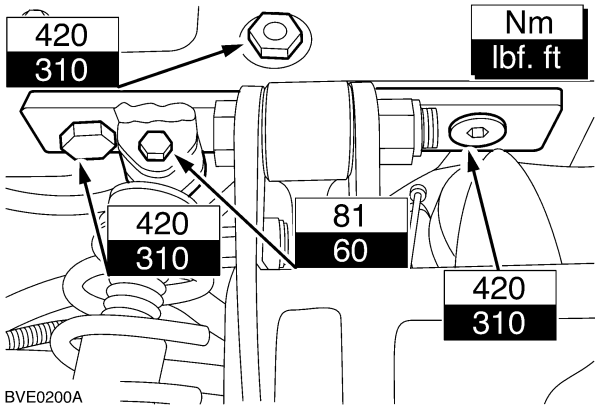
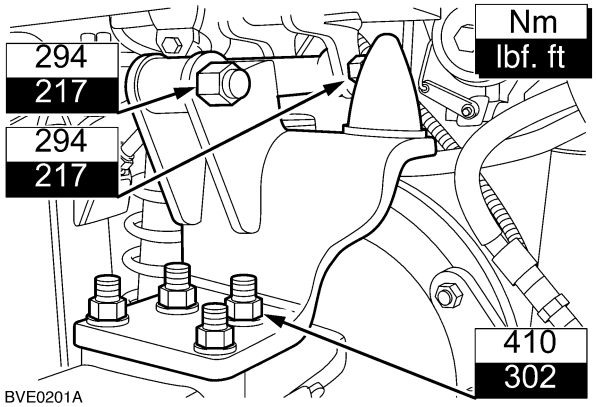
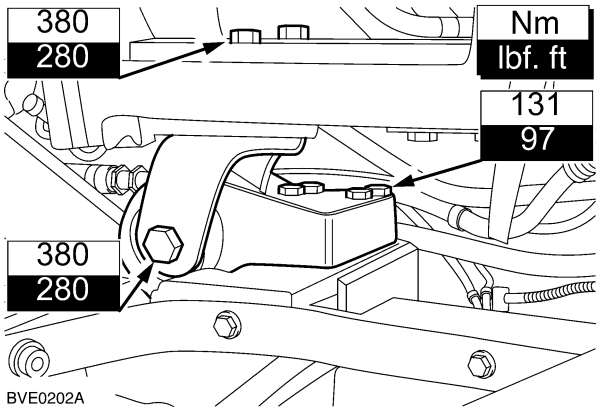
	Tightening Torques	2
	Tractors with Cab Suspension	2
	Tractors with Standard Cab	3
	Special Tools	3
	Overhaul	4
	Cab	4
90 150	Removal	4
	Installation	15

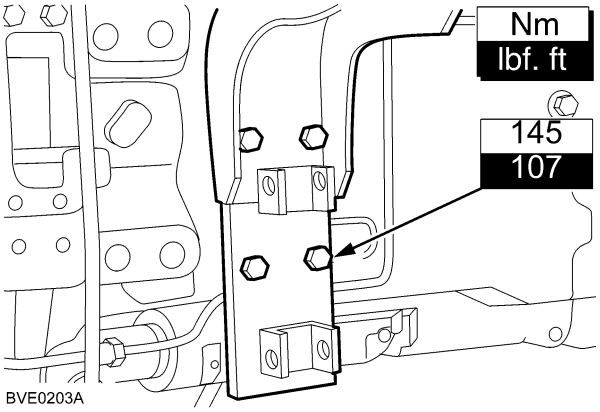
TIGHTENING TORQUES

TRACTORS WITH CAB SUSPENSION



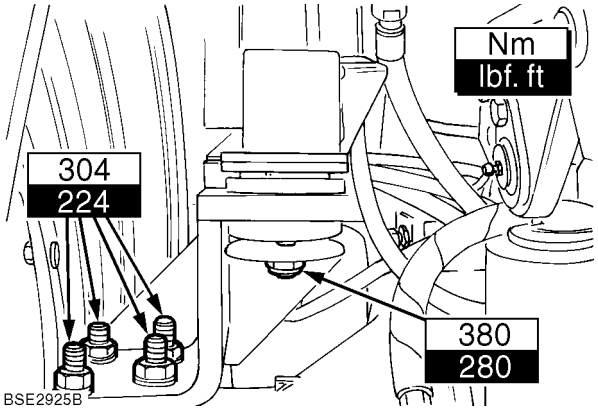


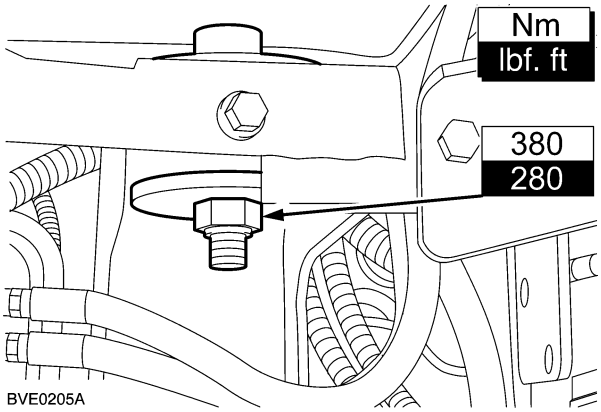


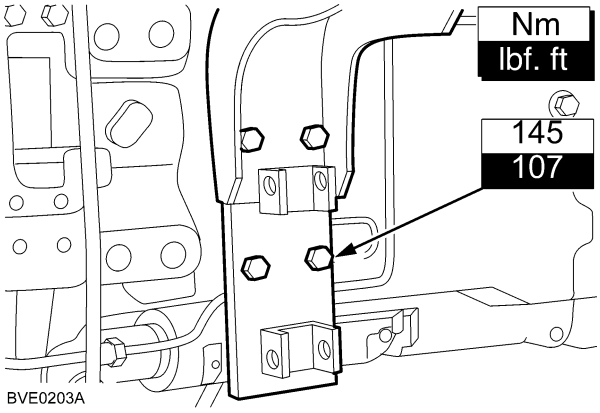


1

TRACTORS WITH STANDARD CAB







2

SPECIAL TOOLS

380001157 Cab lifting bracket

OVERHAUL

CAB

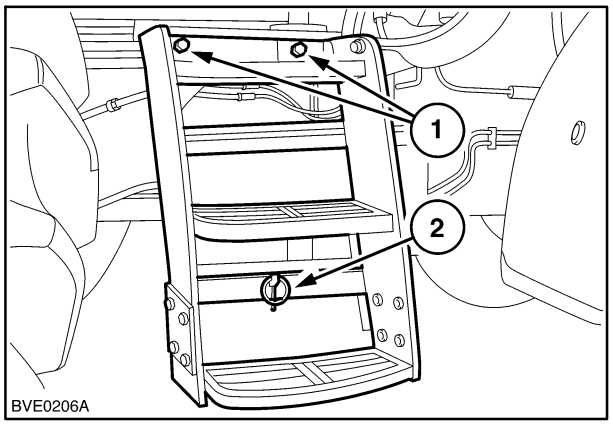
Removal

(Op. 90 150)

DANGER

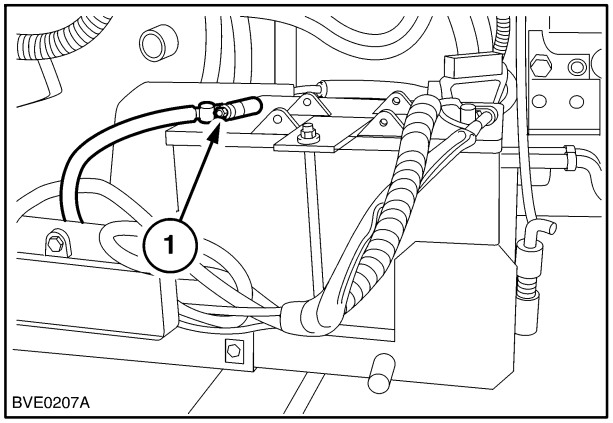
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

1. Ensure that the tractor is parked on a level surface.
2. Chock the front wheels using suitable wheel stops.
3. Remove the retaining bolts (1), the retaning pin (2) and remove the steps.



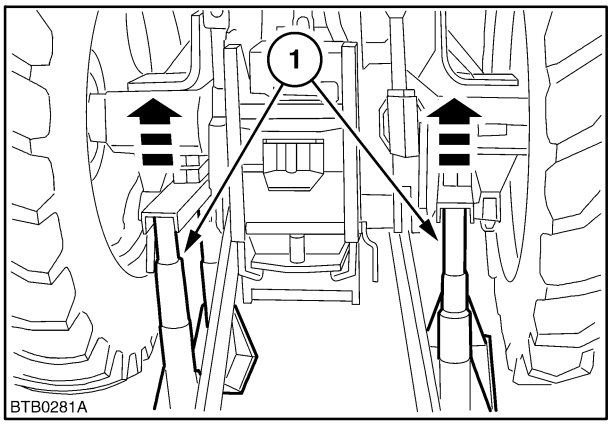
3

4. Remove the battery cover and disconnect the battery negative cable (1).



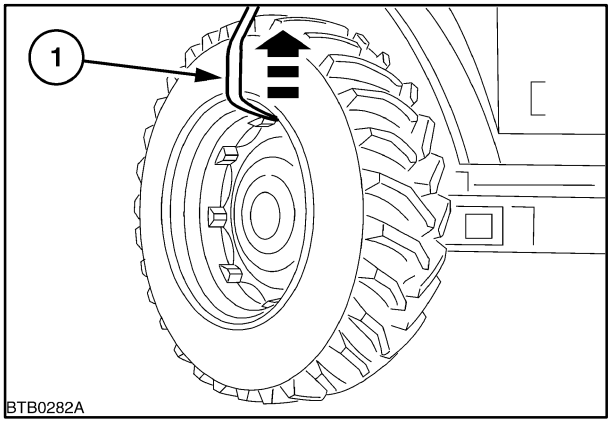
4

5. Raise the rear of the tractor and place two suitable axle stands (1) under the final drive cases. If required, detach the lift rods from the lower links.



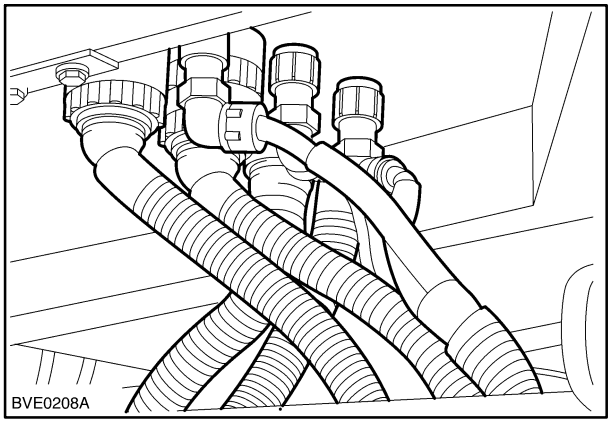
5

6. Using a suitable sling (1), connect the rear right wheel to a hoist and remove the rear right hand wheel. Repeat this step for the rear left hand wheel.



6

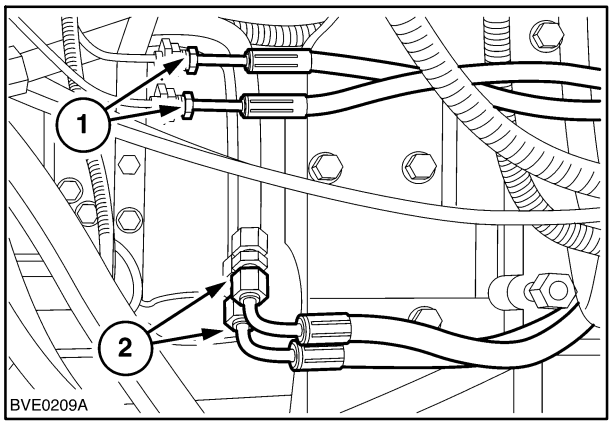
7. Disconnect the cab electrical connectors.



7

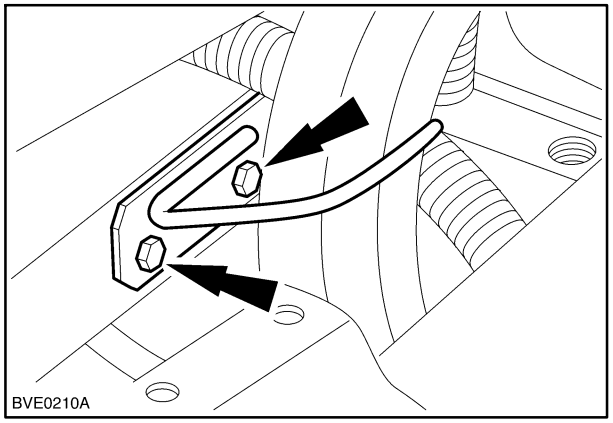
NOTE: *Note the position of the brake lines.*

8. Disconnect the brake fluid supply lines (1) and the steering oil supply and oil return hoses (2).



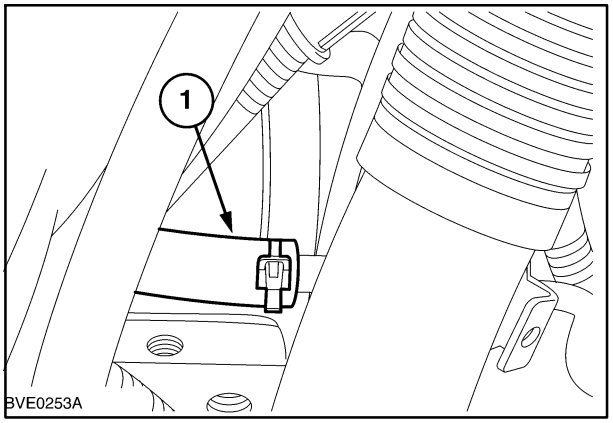
8

9. Remove the brake and steering pipe retaining bracket.



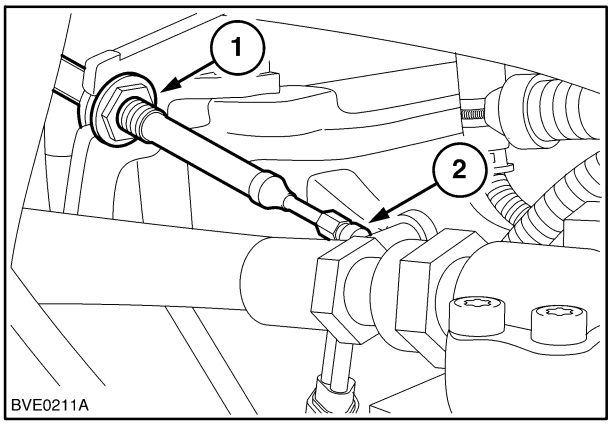
9

10. Install a clamp to the coolant hose and disconnect the coolant hose (1) connecting the cab heater to the radiator.



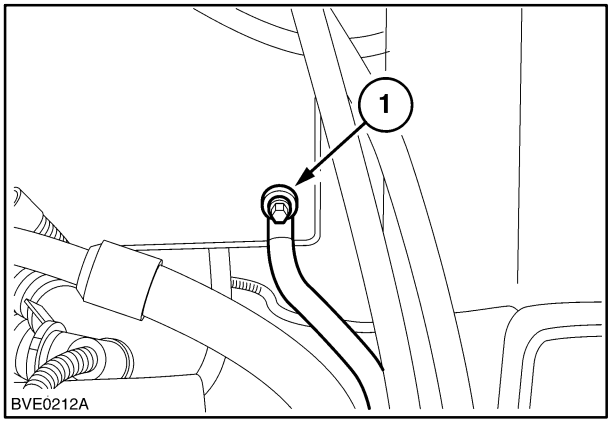
10

11. Loosen the retaining nut (1), remove the retaining clip (2) and detach the ground speed power take-off (PTO) select cable.



11

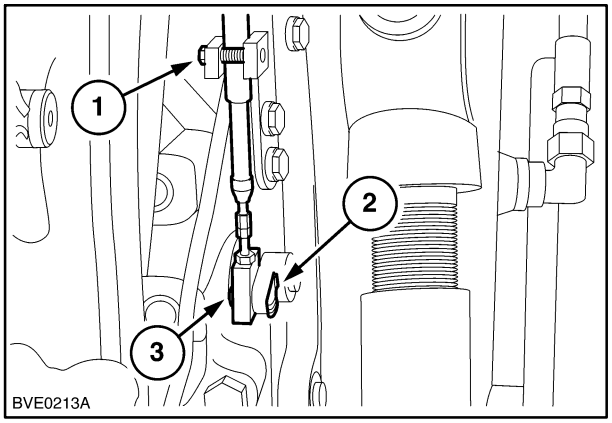
12. Detach the cab to chassis earth strap (1).



12

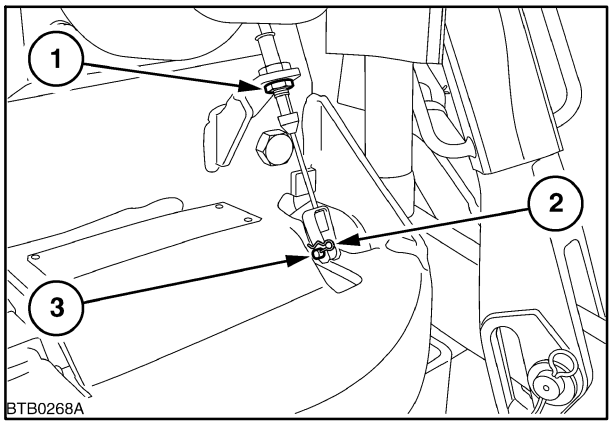
NOTE: *PTO speed must be set to 1000 RPM to allow the pin to be removed.*

13. Remove the retaining bolt (1), retaining clip (2) and the cotter pin (3). Detach the PTO speed select cable.



13

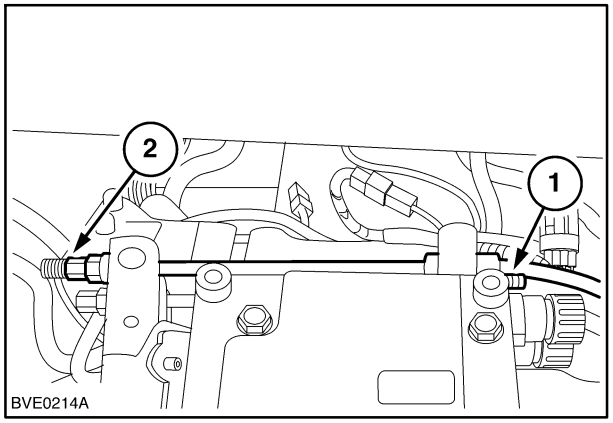
14. Loosen the retaining nut (1), remove the R-clip (2), and the cotter pin (3). Detach the pick-up hitch release cable.



14

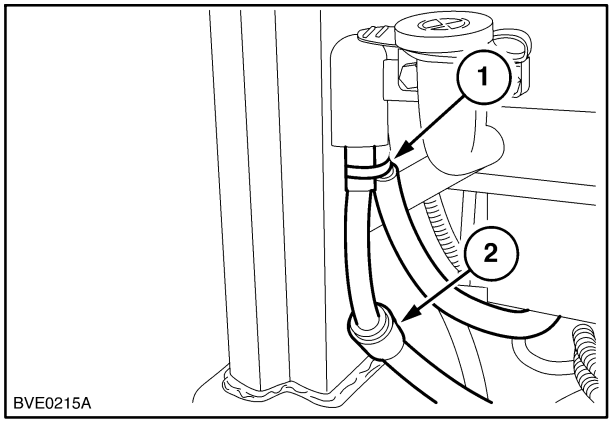
NOTE: *Ensure the remote control valve lever in the cab is in the neutral position to aid removal.*

15. Remove the remote control valve cable clamp nut (1), locknut (2) and release the cable from the adjusting nut. Detach the remote control valve cable. Repeat this step for the remaining remote control valve cables.



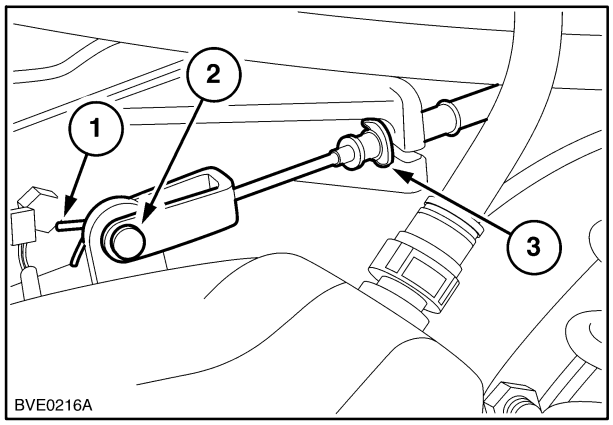
15

16. Remove the transmission vent tube clamp bolt (1) and disconnect the fuel tank vent tube (2).



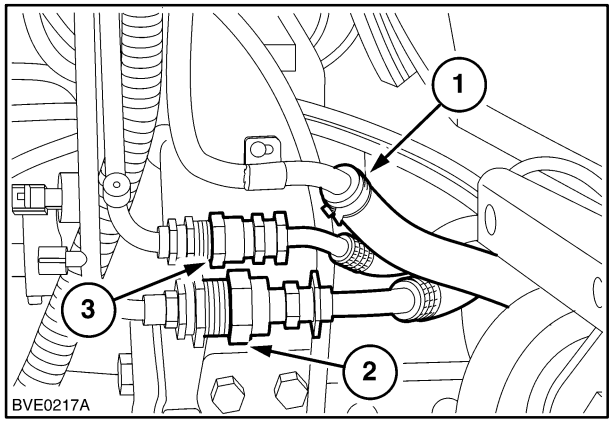
16

17. Remove the split pin (1) and the cotter pin (2) from the parking brake lever. Remove the retaining clip (3) and detach the parking brake cable.



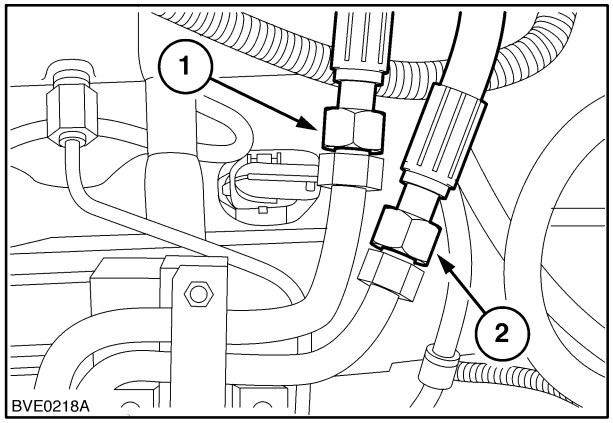
17

18. Disconnect the cab coolant heater hose (1).
19. Disconnect the air conditioning hoses (2) and (3).



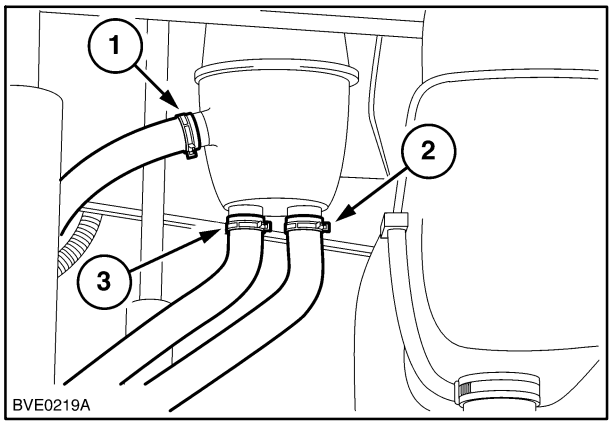
18

20. Disconnect the steering cylinder oil supply hoses (1) and (2).



19

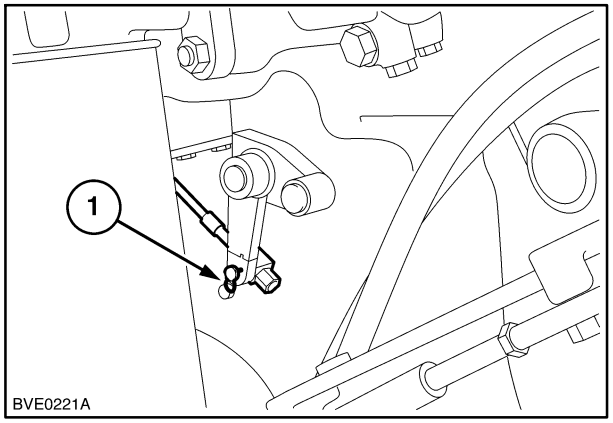
21. Disconnect the brake fluid lines (1), (2) and (3) from the brake fluid reservoir.



20

NOTE: *Note the position of the steering cylinder oil supply hoses.*

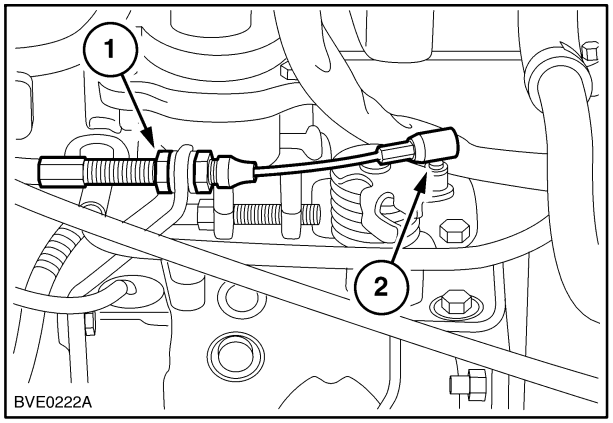
22. Remove the R-clip (1) and detach the creeper gear cable.



21

Tractors with Mechanical Fuel Injection Pump

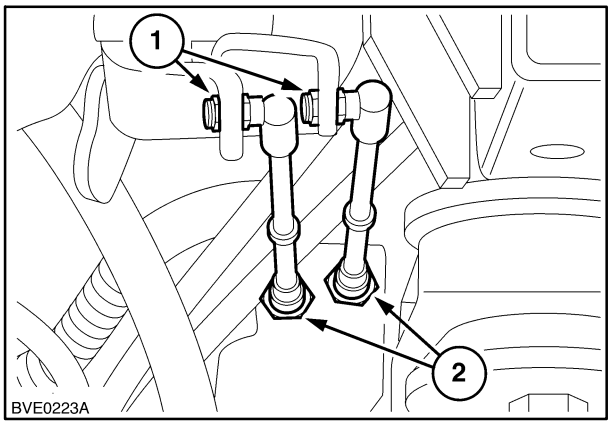
23. Loosen the retaining nut (1) and detach the throttle cable from the fuel injection pump (2).



22

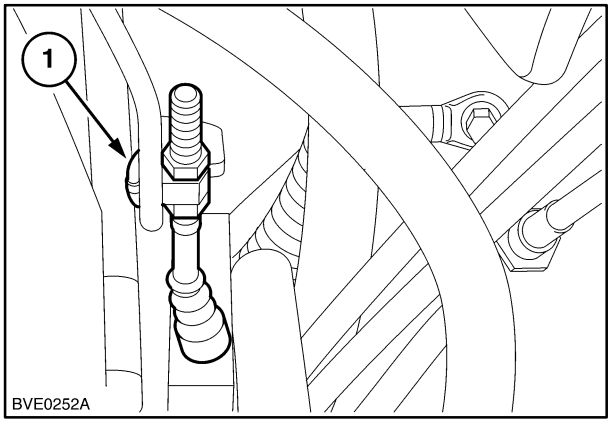
Tractors with Mechanical Draft Control

24. Remove the draft cable and the position cable retaining nuts (1). Loosen the nuts securing the cables to the retaining bracket (2) and detach the draft cable and the position cable.



23

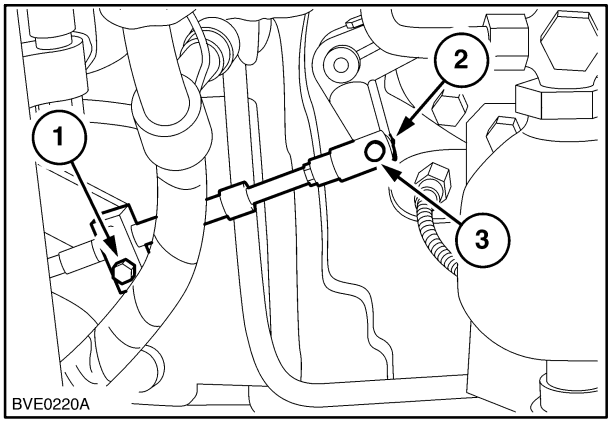
25. Remove the retaining clip (1) and detach the Lift-O-Matic cable.



24

Tractors with 16 x 16 Transmission

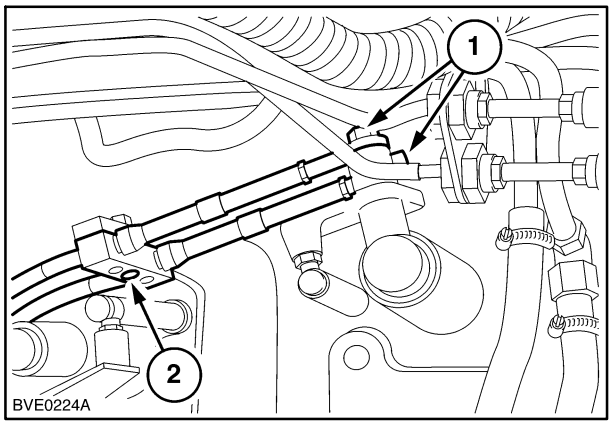
26. Remove the retaining bolt (1), retaining clip (2), and the cotter pin (3). Detach the Hi / Lo range selector cable.



25

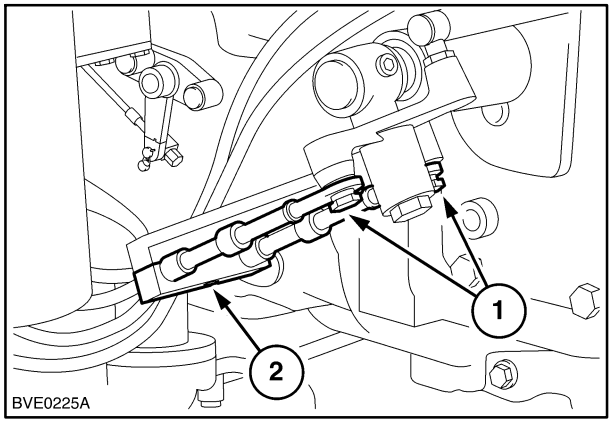
All except Tractors with 16 x 16 Transmission

27. Remove the cable retaining bolts (1), retaining bracket (2) and detach the gear selector cables.



26

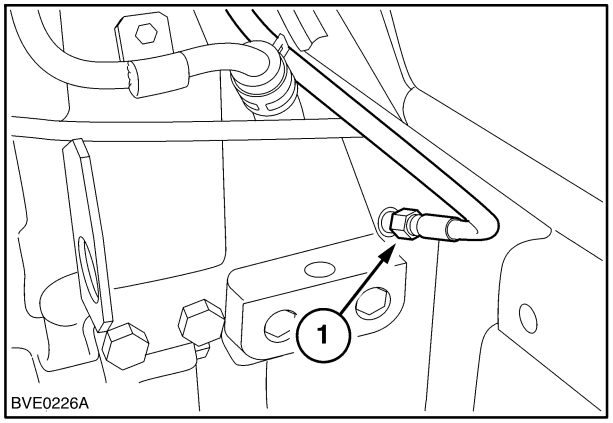
28. Remove the cable retaining bolts (1), retaining bracket (2) and detach the range selector cables.



27

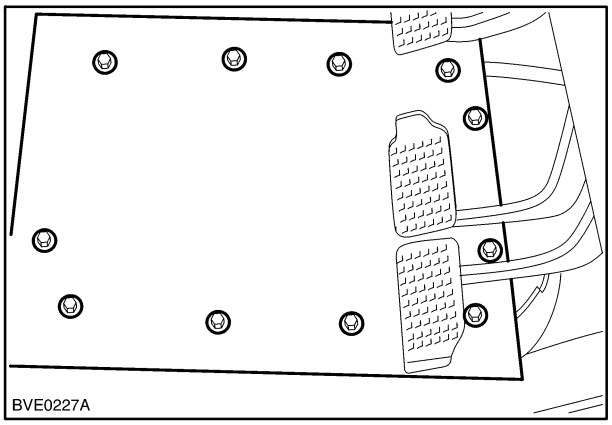
Tractors with 12 x 12 Transmission

29. Disconnect the clutch slave cylinder hose (1).



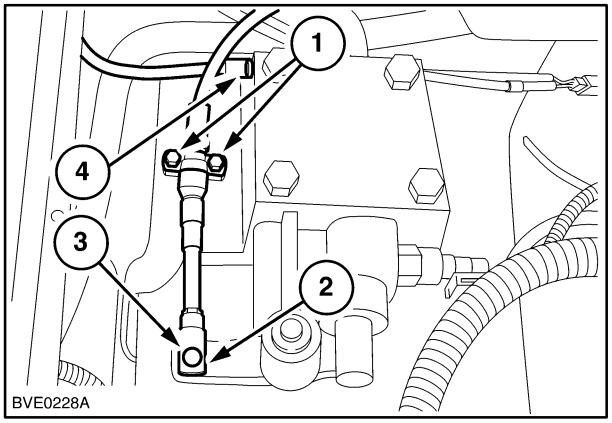
28

30. Slide the operator seat fully rearward.
31. Remove the rubber mat from the cab floor.
32. Remove the cab floor panel from the cab.



29

33. Remove the cable bracket retaining bolts (1), retaining clip (2), and the cotter pin (3). Detach the shuttle lever selector cable.
34. Remove the retaining bolts (4) and detach the interlock cable.



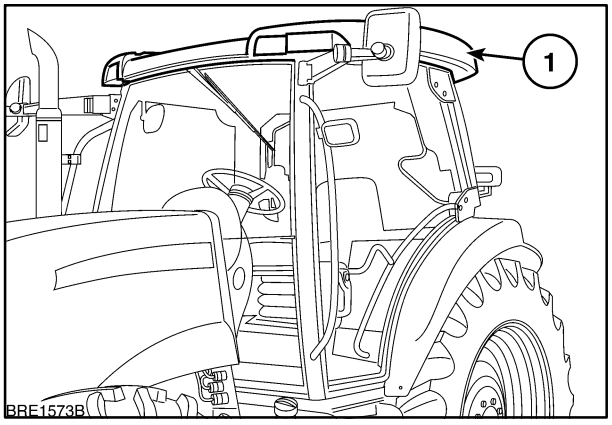
30

High roof Cab

35. Remove the cab roof panel (1)
36. Install the cab lifting bracket **380001157**.
37. Using a suitable chain, attach the cab to a hoist.

Low Profile Cab

38. Remove the cab roof liner and disconnect the roof harness wiring.
39. Remove the 4 bolts retaining the cab roof and lift the cab roof away.
40. Install the cab lifting bracket **380001157.**
41. Using a suitable chain, attach the cab to a hoist.

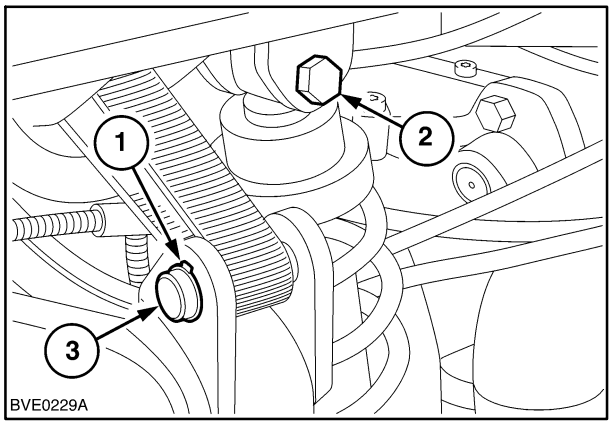


31

Tractors with Cab Suspension

NOTE: *It may not be possible to remove the damper/spring assembly upper bolt until the cab is being raised.*

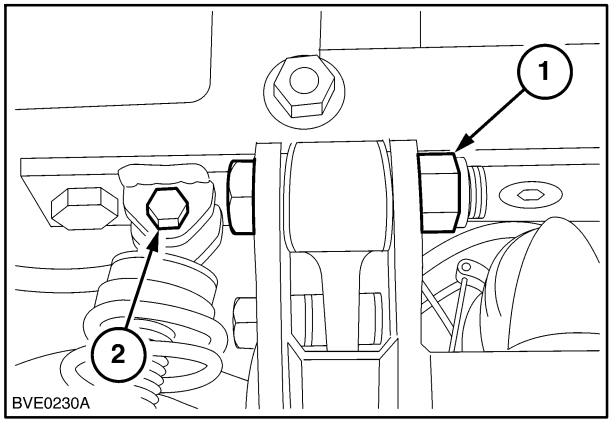
42. Remove the circlip (1), cab strap retaining pin (3).
43. Remove the damper/spring assembly upper retaining nut (2).



32

NOTE: *It may not be possible to remove the damper/spring assembly upper bolt (2) until the cab is being raised.*

44. Remove the retaining nut (1) and the bolt from the panhard rod.
45. Remove the damper/spring assembly upper retaining nut (2).



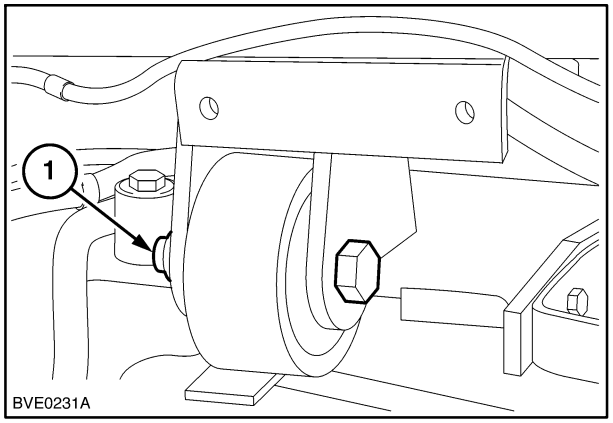
33

NOTE: *It may not be possible to remove the cab mounting bolts until the cab is being raised.*

46. Remove the left hand side front cab mounting nut (1). Repeat this step for the right hand side of the cab.
47. Raise the cab and remove the cab front mounting bolts and the damper/spring assembly bolts.

NOTE: *Make sure that all cables and hydraulic hoses are free from obstruction.*

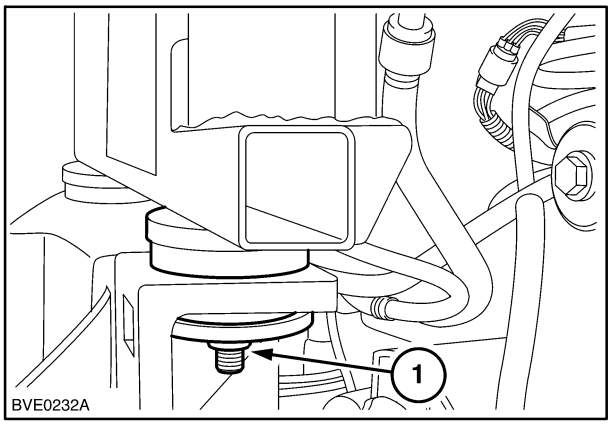
48. Raise the cab slowly.
49. Remove the cab and place on a secure stand.



34

Tractors with Standard Cab

50. Remove the left hand side cab rear mounting nut (1) while holding the bolt in the cab frame. Repeat this step for the right hand side of the cab.

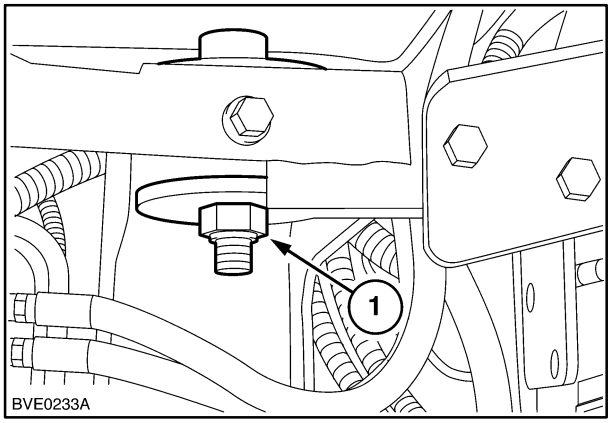


35

51. Loosen the cab front mounting bolt while holding the nut (1) under the cab floor. Remove the bolt and washers. Repeat this step for the left hand side of the cab.

NOTE: *Make sure that all cables and hydraulic hoses are free from obstruction.*

52. Raise the cab slowly.
53. Remove the cab and place on a secure stand.



36

Installation

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

⚠ WARNING ⚠

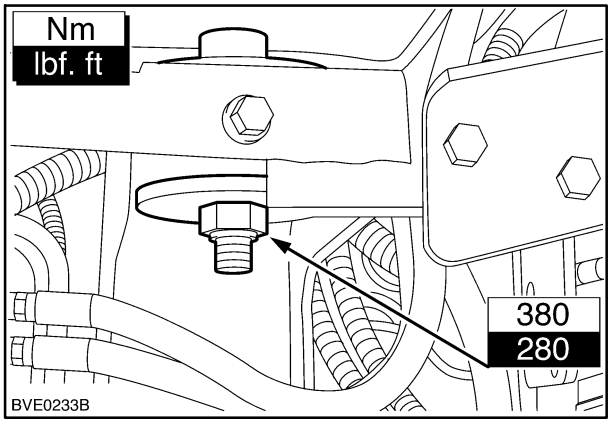
Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

1. Install the cab lifting bracket **380001157** (1).
2. Using a suitable chain, attach the cab to a hoist.

Tractors with Standard Cab

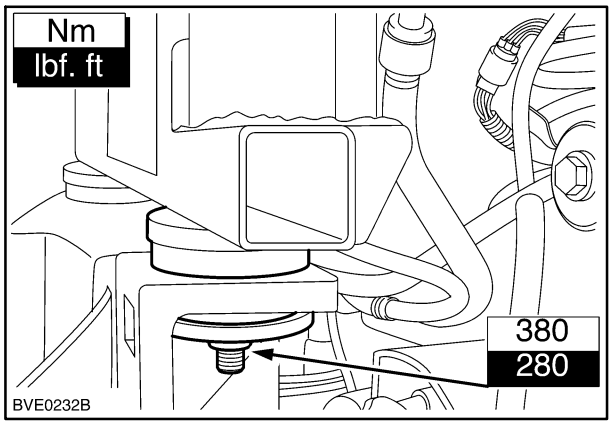
NOTE: *Make sure that all cables and hydraulic hoses are free from obstruction.*

3. Position the cab to the tractor and lower the cab slowly.
4. Install the cab front mounting bolt, washers and nut. Tighten to the specified torque value. Repeat this step for the left hand side of the cab.



37

5. Install the left hand side cab rear mounting nut (1) while holding the bolt in the cab frame. Tighten to the specified torque value. Repeat this step for the right hand side of the cab.

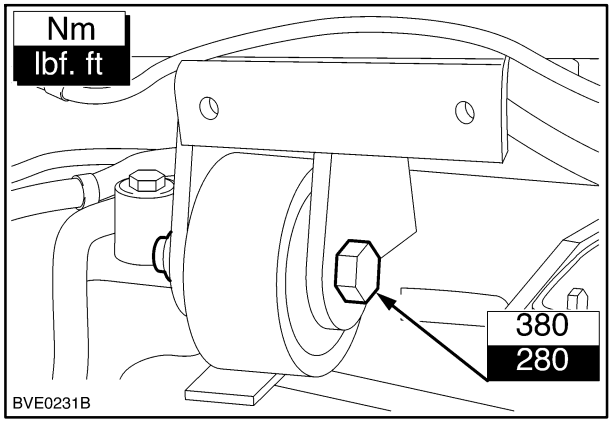


38

Tractors with Cab Suspension

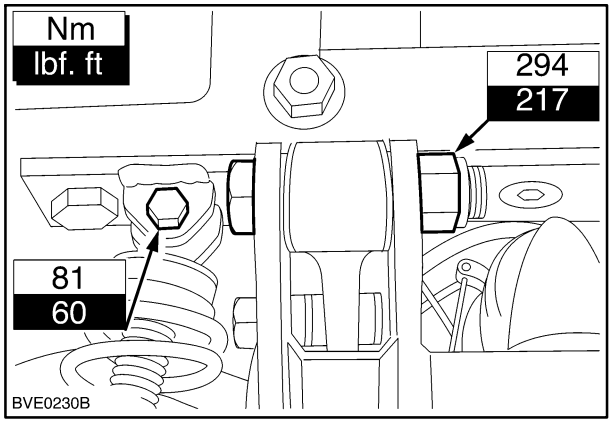
NOTE: *Make sure that all cables and hydraulic hoses are free from obstruction.*

6. Position the cab to the tractor and lower the cab slowly.
7. Install the left hand side front cab mounting bolt and nut. Tighten to the specified torque. Repeat this step for the right hand side of the cab.



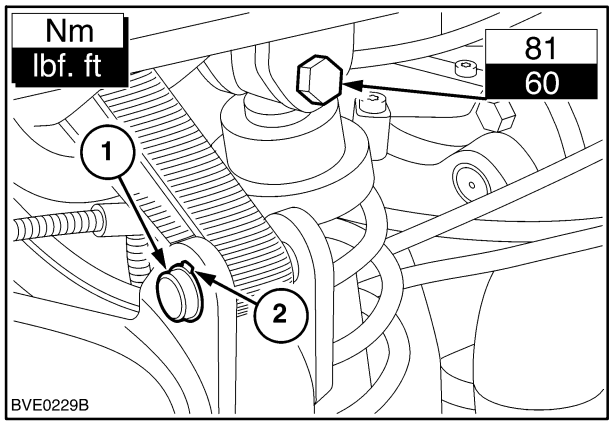
39

8. Install the left hand side damper/spring assembly upper retaining bolt and nut. Tighten to the specified torque value.
9. Install the panhard rod retaining bolt and nut. Tighten to the specified torque value.



40

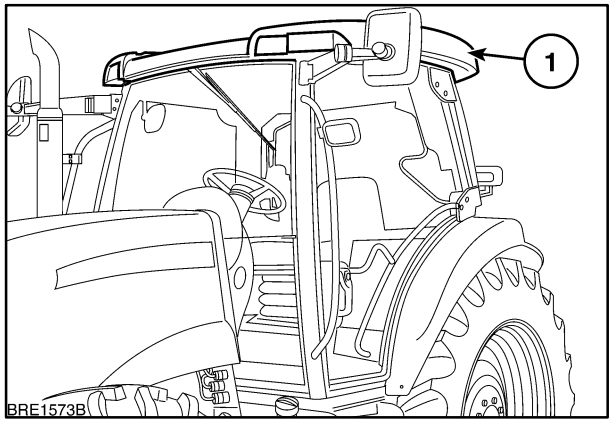
10. Install the right hand side damper/spring assembly upper retaining bolt and nut. Tighten to the specified torque value.
11. Install the cab strap, cab strap retaining pin (1) and the circlip (2).



41

High roof cab

12. Install the cab roof panel (1).



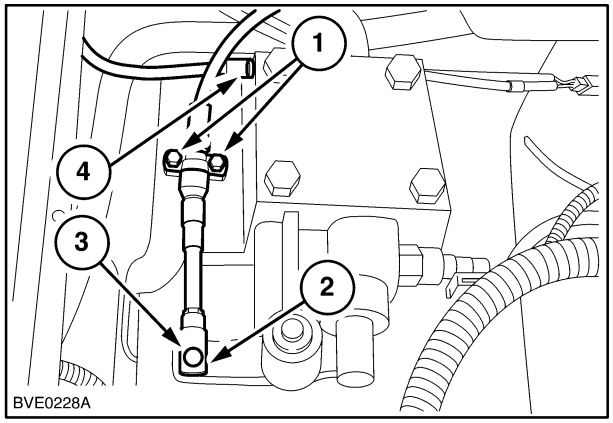
42

Low profile cab only

Install the cab roof, reconnect the roof harness wiring and refit the cab roof liner.

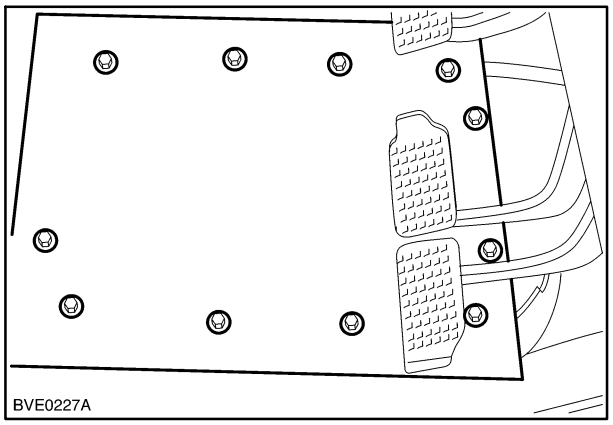
Tractors with 12 x 12 Transmission

13. Attach the interlock cable and install the retaining bolts (4).
14. Attach the shuttle lever selector cable. Install the cotter pin (3), retaining clip (2) and the cable bracket retaining bolts (1).



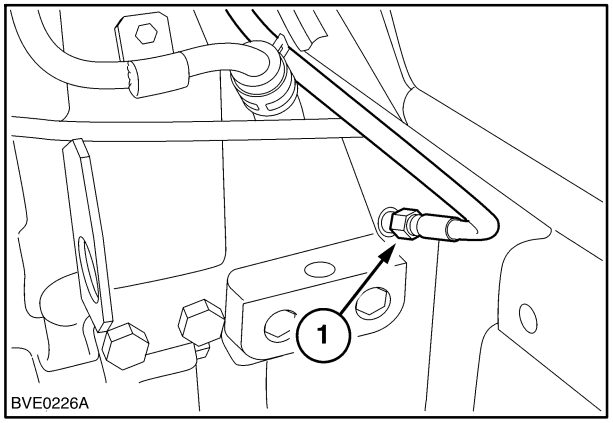
43

15. Install the cab floor panel to the cab.
16. Install the cab floor rubber mat.



44

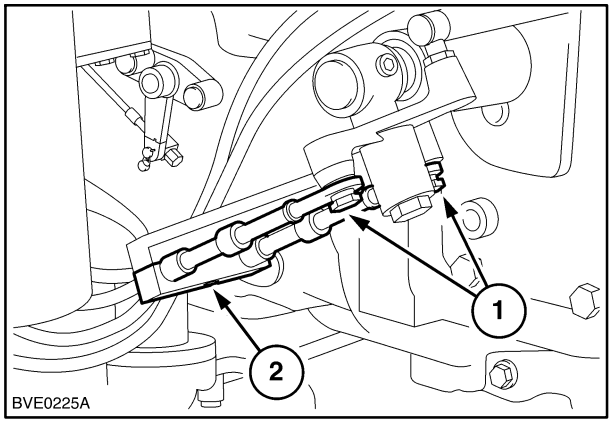
17. Connect the clutch slave cylinder hose (1).



45

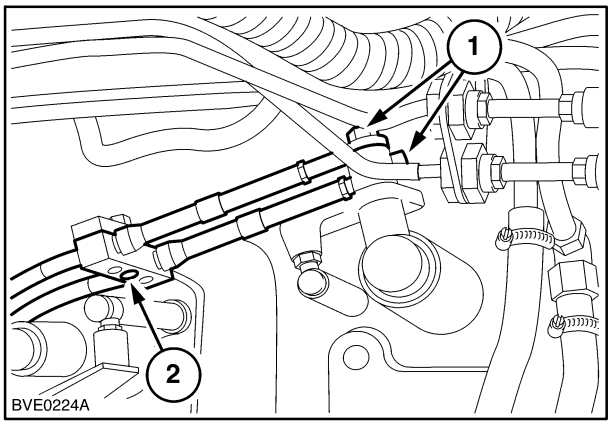
All except Tractors with 16 x 16 Transmission

18. Attach the range selector cables. Install the retaining bracket (2) and the retaining bolts (1).



46

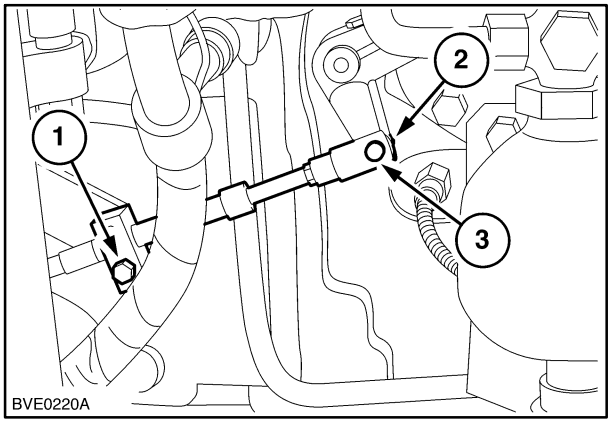
19. Attach the gear selector cables. Install the retaining bracket (2) and the retaining bolts (1).



47

Tractors with 16 x 16 Transmission

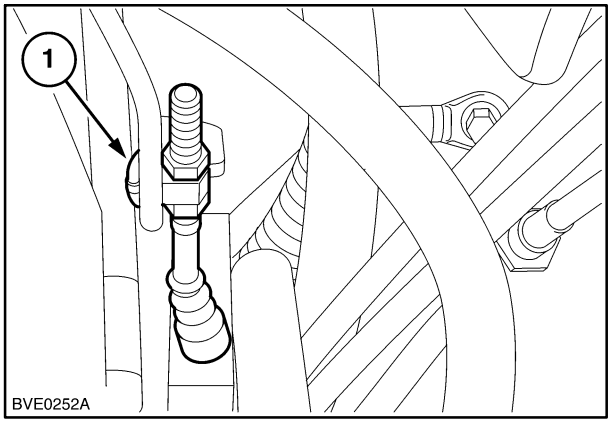
20. Attach the Hi / Lo range selector cable. Install the cotter pin (3), retaining clip (2) and the retaining bolt (1).



48

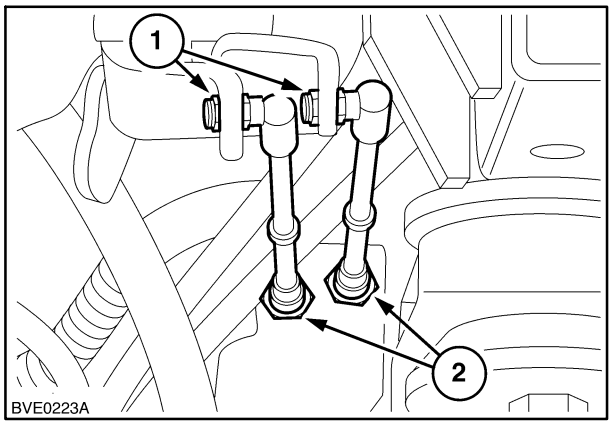
Tractors with Mechanical Draft Control

21. Attach the Lift-O-Matic cable and install the retaining clip (1).



49

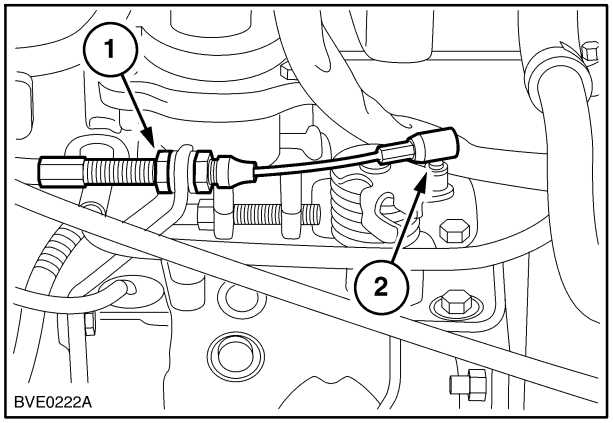
22. Attach the draft cable and the position cable. Install the draft cable and the position cable retaining nuts (1). Tighten the nuts securing the cables to the retaining bracket (2).



50

Tractors with Mechanical Fuel Injection Pump

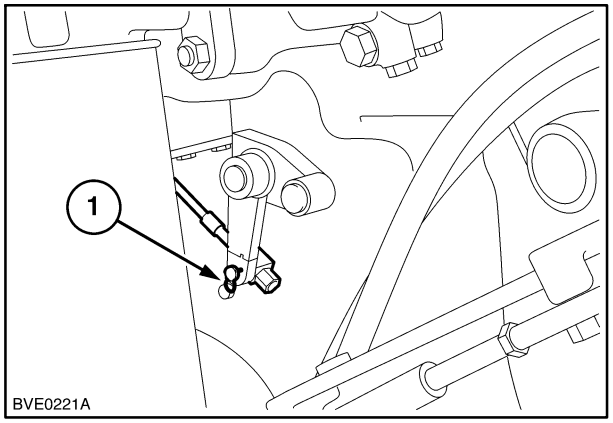
23. Attach the throttle cable to the fuel injection pump (2) and tighten the retaining nut (1).



51

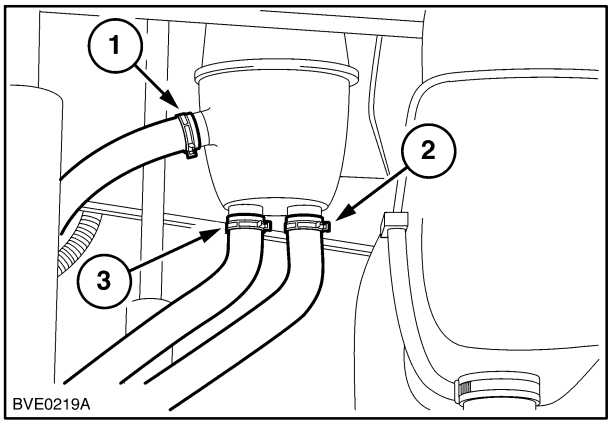
All Tractors

24. Attach the creeper gear cable and install the R-clip (1) (if fitted).



52

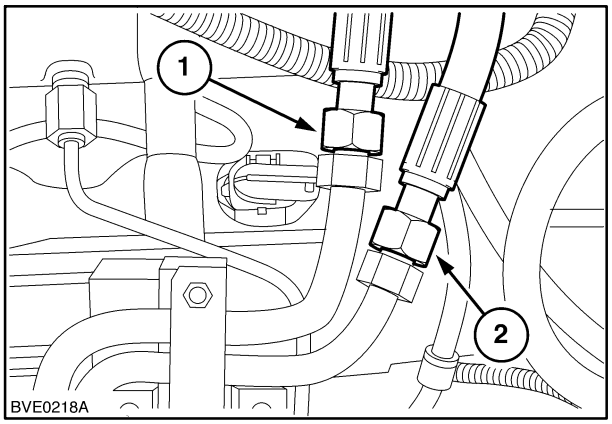
25. Connect the brake fluid lines (1), (2) and (3) to the brake fluid reservoir.



53

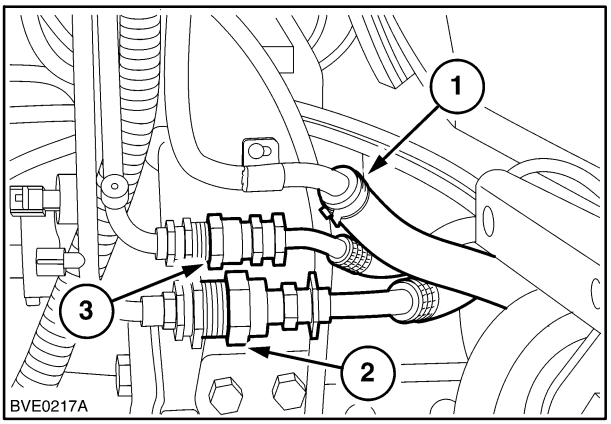
NOTE: *Make sure the steering lines are installed in the same position as they were removed.*

26. Connect the steering cylinder oil supply hoses (1) and (2).



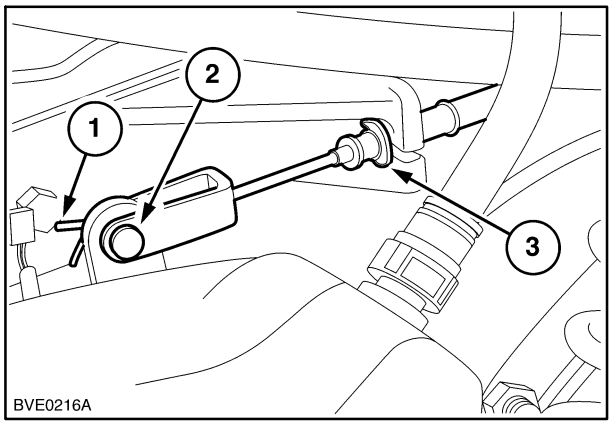
54

27. Connect the cab heater hose (1).
28. Connect the air conditioning hoses (2) and (3).



55

29. Attach the parking brake cable. Install the retaining clip (3), cotter pin (2) and the split pin (1).



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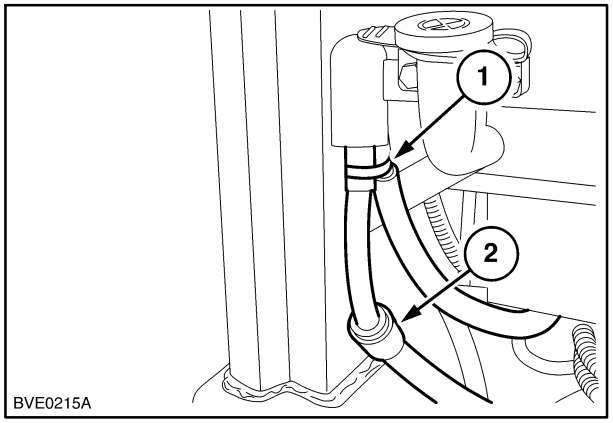
30. Connect the fuel tank vent tube (2) and install the transmission vent tube clamp bolt (1).



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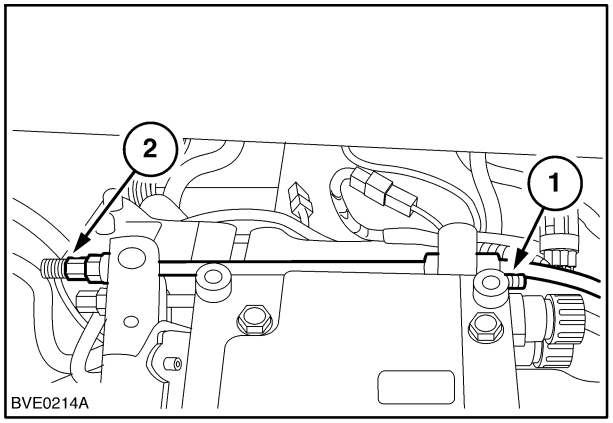
NOTE: *Ensure the remote valve lever in the cab is in the neutral position to aid installation.*

31. Attach the remote control valve cable and install the cable clamp nut (1). Loosely install the locknut (2) and adjust the remote control valve cable (refer to remote control valve cable adjustment in the remote control valves chapter of the hydraulic systems section). Repeat this step for the remaining remote control valves.



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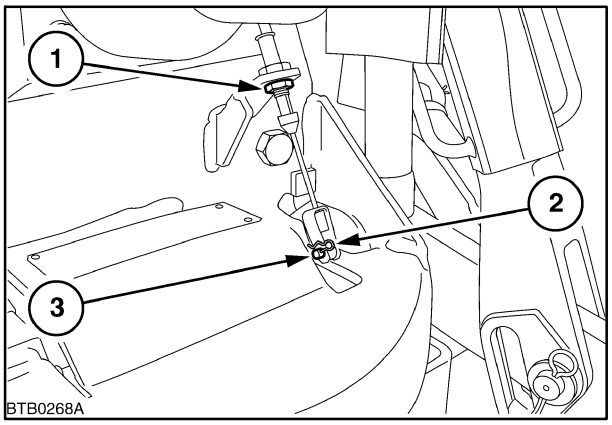
32. Attach the pick up hitch release cable. Install the cotter pin (3), R-clip (2) and tighten the retaining nut (1).



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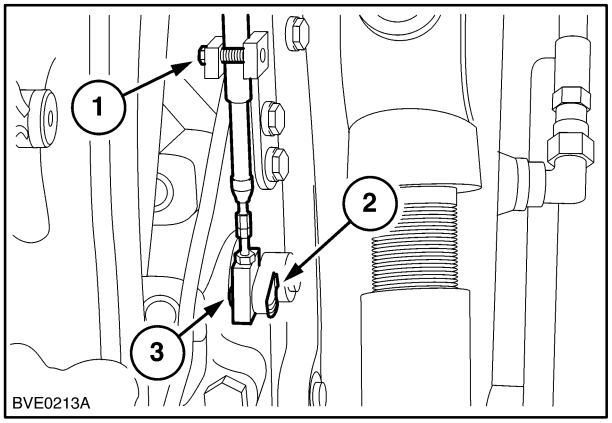
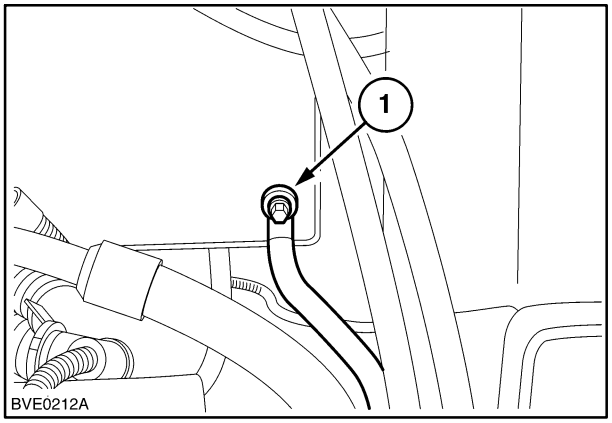
NOTE: *PTO speed must be set to 1000 RPM to allow the pin to be installed.*

33. Attach the PTO speed selector cable. Install the cotter pin (3), retaining clip (2) and the retaining bolt (1).



60

34. Attach the cab to chassis earth strap (1).



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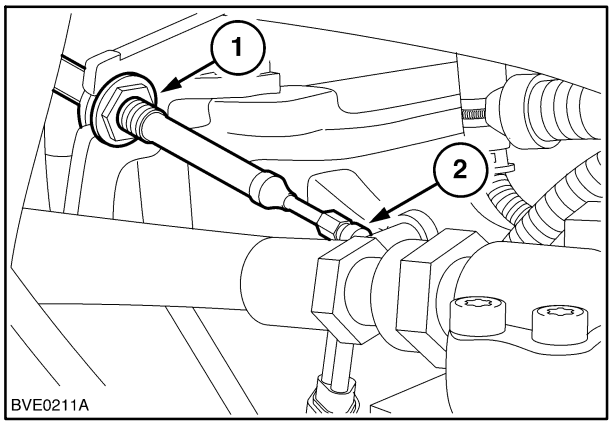
35. Attach the ground speed PTO cable. Install the clip (2) and tighten the retaining nut (1).



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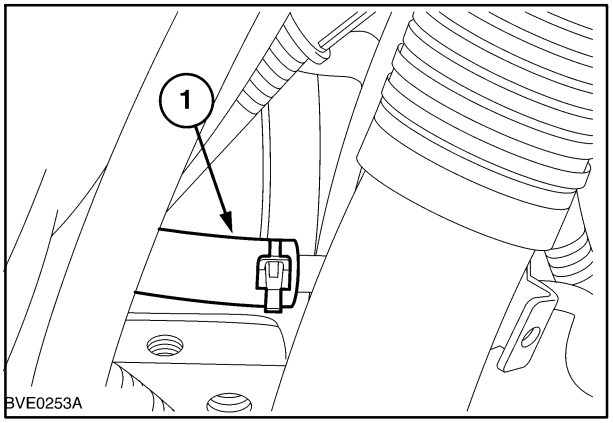
36. Connect the coolant hose (1) connecting the cab heater to the radiator. Remove the clamp from coolant hose.



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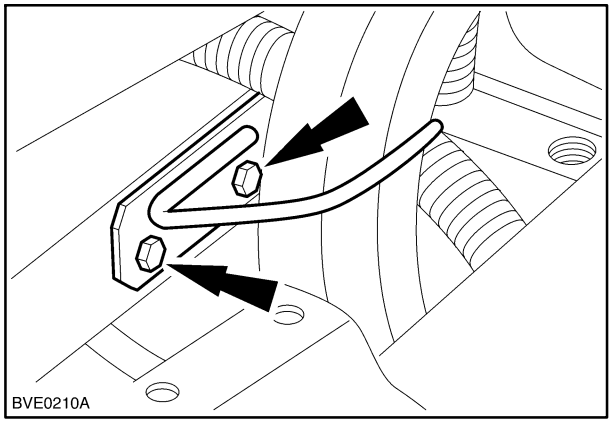
37. Install the brake and steering pipe retaining bracket.



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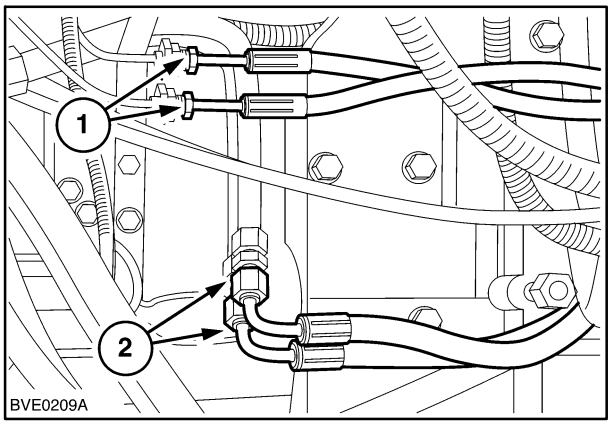
NOTE: *Make sure the brake lines are installed in the same position as they were removed.*

38. Connect the brake fluid supply lines (1) and the steering oil supply and oil return hoses (2).



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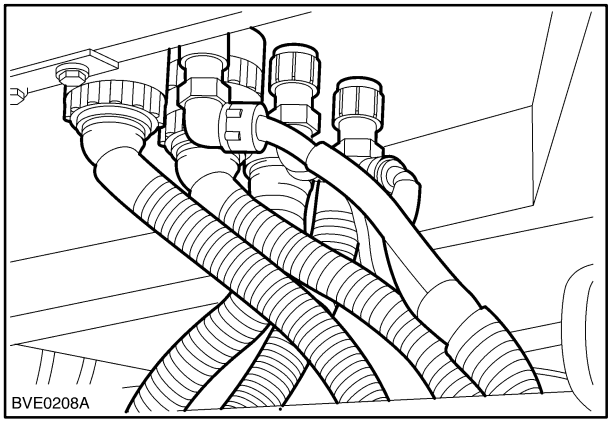
39. Connect the cab electrical connectors.



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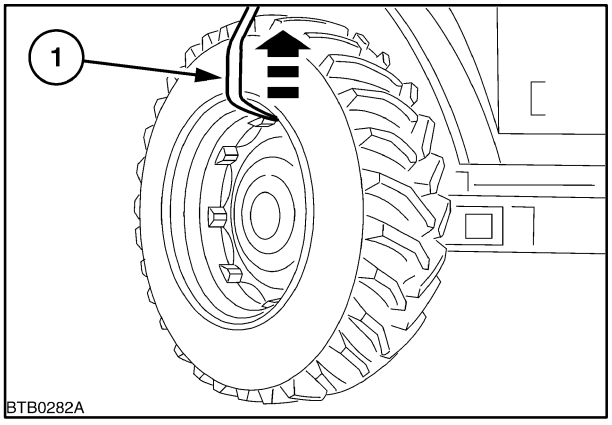
40. Using a suitable sling (1), connect the right hand rear wheel to a hoist and install the right hand rear wheel. Repeat this step for the left hand rear wheel.



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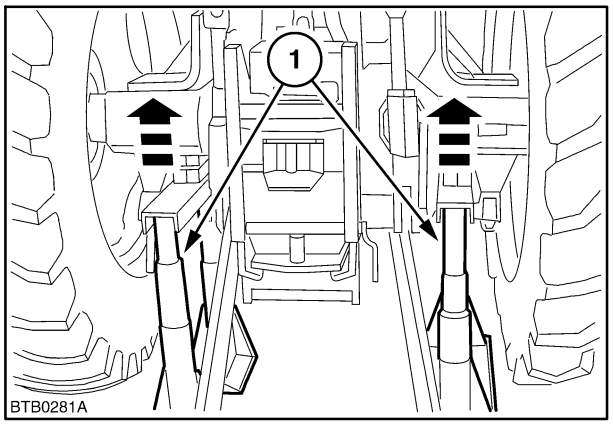
41. Raise the rear of the tractor and remove the axle stands (1). If required, attach the lift rods to the lower links.



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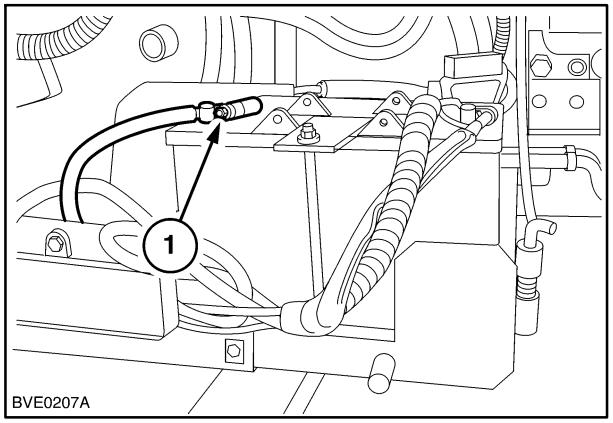
42. Connect the battery negative cable (1) to the battery and install the battery cover.



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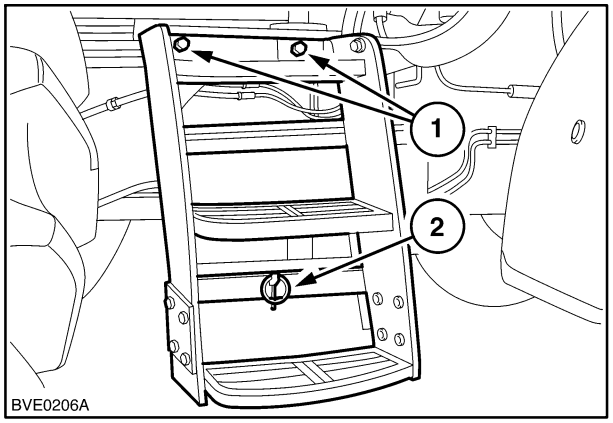
43. Install the steps, retaining bolts (1) and the retaning pin (2).
44. Remove the chocks from the front wheels.
45. Refill the cooling system (refer to cooling system refill in the cooling chapter of the engine section).
46. Refill the driveline with the correct specification oil.
47. Bleed the brake system (refer to bleeding the brakes and controls section).



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SECTION 10 – ENGINE

Chapter 1 – CNH Engine – F4DE0484A (4 Cylinder Common Rail Electronic)

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SPECIFICATIONS

Engine, type:	F4DE0484A, 4 cylinders
Compression ratio	17,1
Maximum power at rated engine speed kW (HP) rpm	85 115 2200
Maximum torque Nm (lb ft) rpm	557 (410.822) 1600
Slow idling speed of engine without load rpm	650
Fast idling speed of engine without load rpm	2360
Boost feeding	With intercooler
Turbocharger type	HOLSET
Lubrication	Forced via lobe pump, pressure relief valve, oil filter
Oil pressure with engine hot	
- at slow idling bar (psi)	0,7 (10.1526)
- at fast idling bar (psi)	4,0 (58.0148)
Cooling system	Fluid-based
Coolant pump drive:	Via belt
Thermostat:	
- temperature start ° C (° F)	82,2 (179.96)
Filling	
- engine sump litres (gall. imp)	min 7 (1.539) max 10 (2.1998)
- engine sump + filter litres (gall. imp)	11 (2.4197)

(continued)

Type	4-cylinder
Cycle	Diesel, 4-stroke
Fuel system	Turbocharged with intercooler
Fuel injection	Direct
Number of cylinders	4
Bore mm (in.)	104 (4.095)
Stroke mm (in.)	132 (5.1968)
Total displacement cm^3 ($in.^3$)	4485 (273)
Valve Timing	
Inlet Start before T.D.C (Top Dead Centre)	8,5°
Inlet End after B.D.C. (Bottom Dead Centre)	8,5°
Exhaust Start before B.D.C.	51°
Exhaust End after T.D.C.	12,5°
Valve Clearance (engine cold) Inlet mm (in.)	0,20 to 0,30 (0.0079 to 0.0118)
Valve Clearance (engine cold) Exh mm (in.)	0,45 to 0,55 (0.0177 to 0.0217)
Fuel system . .	
Injection: Bosch	High pressure, Common Rail, control unit EDC7CI
Nozzles	Electro-injectors
Injection order	1 - 3 - 4 - 2
Injection pressure bar (psi)	300-1400 (4315-20305)

(continued)

Assembly Clearances

Type	4-cylinder
CRANK GEAR AND CYLINDER ASSEMBLY DATA	
Cylinder liners ..... ∅ 1	104,0 to 104,024 (4.0945 to 4.1039)
Cylinder liners:	
outside diameter ..... ∅ 2	-
length L	-
Cylinder liners - crankcase seats (interference)	-
Outside diameter ..... ∅ 2	-
Cylinder liners:	
inside diameter ..... ∅ 2	-
Pistons supplied as spare parts:	-
measurement X	55,9 (2.2008)
outside diameter ..... ∅ 1	103,730 to 103,748 (4.0839 to 4.0846)
seat for pin ..... ∅ 2	38,010 to 38,016 (1.4965 to 1.4967)
Piston - cylinder liners	0,252 to 0,294 (0.0099 to 0.0116)
Piston diameter ..... ∅ 1	0,5 (0.0197)
Piston location from crankcase X	0,28 to 0,42 (0.0110 to 0.0165)
Piston pin ..... ∅ 3	37,999 to 38,000 (1.4960 to 1.4961)
Piston pin - pin seat	0,011 to 0,016 (0.0004 to 0.0006)
Piston ring grooves { X1*	2,705 to 2,735 (0.1065 to 0.1077)
Piston ring grooves { X2	2,44 to 2,46 (0.0961 to 0.0969)
Piston ring grooves { X3	4,03 to 4,05 (0.1587 to 0.1594)
Piston rings { S1*	2,560 to 2,605 (0.1008 to 0.1026)
Piston rings { S2	2,350 to 2,380 (0.0925 to 0.0937)
Piston rings { S3	3,970 to 3,990 (0.1563 to 0.1571)
* measured on ∅ of 58 mm (2.2835 in.) 4 cylinders	
Piston rings - grooves { 1	0,100 to 0,175 (0.0039 to 0.0069)
Piston rings - grooves { 2	0,040 to 0,900 (0.0016 to 0.0354)
Piston rings - grooves { 3	0,020 to 0,065 (0.0008 to 0.0026)
Piston rings	0,5 (0.0197)
Piston ring end opening in cylinder liner:	
{ X1	0,3 to 0,4 (0.0118 to 0.0157)
{ X2	0,6 to 0,8 (0.0236 to 0.0315)
{ X3	0,30 to 0,55 (0.0118 to 0.0217)

(continued)

Type	4-cylinder
Small end bushing seat . . . . . ∅ 1	40,987 to 41,013 (1.6137 to 1.6147)
Connecting rod bearing seat . . . . . ∅ 2	72,987 to 73,013 (2.8735 to 2.8745)
Small end bushing diameter:	
outside . . . . . ∅ 4	43,279 to 43,553 (1.7039 to 1.7147)
inside . . . . . ∅ 3	38,019 to 38,033 (1.4968 to 1.4974)
Connecting rod half-bearings supplied as spares . . . . . S	1,955 to 1,968 (0.0770 to 0.0775)
Connecting rod bushing - seat	0,266 to 0,566 (0.0105 to 0.0223)
Piston pin - bushing	0,019 to 0,033 (0.0007 to 0.0013)
Connecting rod half bearings>	0,250 to 0,500 (0.0098 to 0.0197)
Measurement X	-
Maximum error on alignment of connecting rod axes . . . . . =	-
Main journals . . . . . ∅ 1	82,990 to 83,001 (3.2673 to 3.2677)
Crankpins . . . . . ∅ 2	68,987 to 69,013 (2.7160 to 2.7170)
Main journal half bearings S1	2,456 to 2,464 (0.0967 to 0.0970)
Connecting rod half bearings S2	1,955 to 1,968 (0.0770 to 0.0775)
Main bearings	
no. 1 - 5 . . . . . ∅ 3	87,982 to 88,008 (3.4639 to 3.4649)
no. 2 - 3 - 4 . . . . . ∅ 4	87,977 to 88,013 (3.4637 to 3.4651)
Half bearings - main journals	
no. 1 - 5	0,041 to 0,119 (0.0016 to 0.0047)
no. 2 - 3 - 4	0,041 to 0,103 (0.0016 to 0.0041)
Half bearings - crankpins	0,033 to 0,041 (0.0013 to 0.0016)
Main journal half bearings	+ 0,250 (+0.0098); + 0,500 (+0.0197)
Connecting rod half bearings	
Main journal for thrust X1	37,475 to 37,550 (1.4754 to 1.4783)
Main bearing for thrust X2	25,98 to 26,48 (1.0228 to 1.0425)
Semi-circular thrust washers X3	37,28 to 37,38 (1.4677 to 1.4717)
Crankshaft thrust	0,068 to 0,410 (0.0027 to 0.0161)
CYLINDER HEAD	
Valve guide bores in the cylinder head . . . . . ∅ 1	7,051 to 7,053 (0.2776 to 0.2777)
. . . . . ∅ 2	-
Valve guide	
. . . . . ∅ 3	-
Valve guide and bores in head	-
Valve guide	-

(continued)

Type	4-cylinder
Valves:	
∅ 4	6,970 to 6,999 (0.2744 to 0.2756)
α	60° ± 0,25°
∅ 4	6,970 to 6,999 (0.2744 to 0.2756)
α	45° ± 0,25°
Valve stem and relative guide	0,052 to 0,092 (0.0020 to 0.0036)
Bore in head for valve seat:	
Intake ∅ 1	34,837 to 34,863 (1.3725 to 1.3726)
Exhaust ∅ 1	34,837 to 34,863 (1.3725 to 1.3726)
Valve seat outside diameter; angle of valve seats in cylinder head	
Intake ∅ 2	34,917 to 34,931 (1.3747 to 1.3752)
α	60°
Exhaust ∅ 2	34,917 to 34,931 (1.3747 to 1.3752)
α	45°
Recessing	
Intake X	0,59 to 1,11 (0.0232 to 0.0437)
Exhaust X	0,96 to 1,48 (0.0378 to 0.0452)
Between valve seat and head	
Intake	0,054 to 0,094 (0.0021 to 0.0037)
Exhaust	0,054 to 0,094 (0.0021 to 0.0037)
Valve seats	-
Valve spring height:	-
free spring H	47,75 (1.8799)
under a load of:	
329 N H1	35,33 (1.3909)
641 N H2	25,2 (0.9921)
Injector protrusion X	-
Seats for camshaft bushings no. 1 - 5	59,222 to 59,248 (2.3316 to 2.3326)
Camshaft seats no. 2 - 3 - 4	54,089 ÷ 54,139 (2.1292 to 2.1315)
Camshaft support journals	
1 ⇒ 5	53,995 to 54,045 (2.1258 to 2.1278)
Camshaft bushing outside diameter: ∅	59,222 to 59,248 (2.3316 to 2.3326)
Bushing inside diameter: ∅	54,083 to 54,147 (2.1292 to 2.1318)
Bushings and seats in crankcase	-
Bushings and support journals	0,038 to 0,162 (0.0015 to 0.0064)
Useful cam lift: H	6,045 (0.2380)
H	7,582 (0.2985)
Tappet cap seat in crankcase ∅ 1	16,000 to 16,030 (0.6299 to 0.6311)
Tappet cap outside diameter:	
∅ 2	15,924 to 15,954 (0.6269 to 0.6281)
∅ 3	15,960 to 15,975 (0.6283 to 0.6289)
Between tappets and seats	0,025 to 0,070 (0.0010 to 0.0028)
Tappets	-
Rocker arm shaft ∅ 1	21,965 to 21,977 (0.8648 to 0.8652)
Rocker arms: ∅ 2	21,001 to 22,027 (0.8268 to 0.8672)
Between rocker arms and shafts	0,024 to 0,162 (0.0009 to 0.0064)

(continued)

TIGHTENING TORQUES

PART		TORQUE Nm (lb ft)
Bolts securing bench:	1st Stage 2nd Stage 3rd Stage	50 ± 6 (36.8781 ± 4.4254) 80 ± 6 (59.0050 ± 4.4254) 90° ± 5°
Bolts securing connecting rod caps:	1st Stage 2nd Stage 3rd Stage	30 ± 3 (22.1269 ± 2.2127) 60 ± 5 (44.2537 ± 3.6878) 60° ± 5°
Nuts securing engine cover (Figure 114) (M8 125)		25 ± 5 (18.4391 ± 3.6878)
Bolts securing engine flywheel:		30 ± 3 (22.1269 ± 2.9502) 60° ± 5°
Bolts securing pulley and damper:		50 ± 5 (36.8781 ± 3.6878)
Bolts securing injectors on cylinder head:		110 ± 5 (81.1318 ± 3.6878)
Nut securing P.A.P. gear:		105 ± 7 (77.4440 ± 5.1629)
Nut securing compressor gear:		125 ± 19 (92.1953 ± 14.0137)
Bolts securing timing gear:		36 ± 4 (26.5522 ± 2.9502)
Unions securing piston lubrication nozzles:		15 ± 3 (11.0634 ± 2.2127)
Bolts securing timing system casing M8 1.25x40 M10 1.5x30		 24 ± 4 (17.7015 ± 2.9502) 47 ± 5 (34.6654 ± 3.6878)
Bolts securing front cover M10 1,5x30		 24 ± 4 (17.7015 ± 2.9502)
Bolts securing main bearing caps M12 1.50 12.9	1st Stage 2nd Stage 3rd Stage	 50 ± 6 (36.8781 ± 4.4254) 80 ± 6 (59.0050 ± 4.4254) + 90° ± 5°
Viti fissaggio Ladder Frame: M10 1,5x25		 43 ± 5 (31.7152 ± 3.6878)
Bolts securing lifting brackets: M12 1.75x25 M10		 7 ± 12 (5.1629 ± 8.8507) 43 ± 5 (31.7152 ± 3.6878)
Bolts securing oil cooler (5, Figure 85) M8 1.25x35 M8 1.25x100 M12 Connector		 25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878)
Bolts securing valve cover M8 Nuts		 24 ± 4 (17.7015 ± 2.9502)
Engine Vent Fastener (Ccv) M8 1.25x45 M8 1.25x35		 24 ± 4 (17.7015 ± 2.9502) 24 ± 4 (17.7015 ± 2.9502)
Bolts securing oil sump (2, Figure 81) Tightening Bolts Nº 26-23 M10 1.5x45 Tightening Bolts Nº 3-10; 13-20; 24-25 M10 1.5x90 Tightening Bolts Nº 1-2-21-22 M10 1.5x125 Tightening Bolts Nº 11-12 M10 15x190		 50 ± 5 (36.8781 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878)
Bolts / Plugs On Head 1/2" Nptf 3/4" Nptf 1/4 Inch Nptf		 24 ± 4 (17.7015 ± 2.9502) 36 ± 5 (26.5522 ± 3.6878) 12 ± 2 (8.8507 ± 1.4751)

♦ Lubricate With Engine Oil Before Assembly

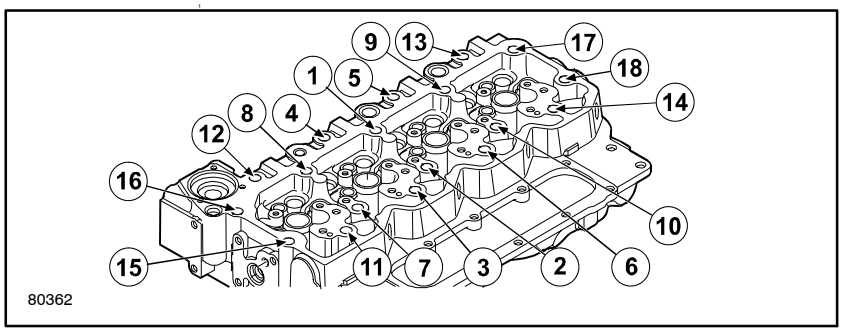
PART	TORQUE	
	Nm (lb ft)	
Bolts securing cylinder head (2, Figure 93) ♦ Tightening bolts Nº 16-15-8-7-1-2-9-10-17-18 M12 1.75x150 ..... Tightening bolts Nº 12-11-4-3-5-6-13-14 M12 1.75x130 ...	1st Stage 2nd Stage 3rd Stage	55 ± 5 (40.5659 ± 3.6878) 35 ± 5 (25.8147 ± 3.6878) + 90° ± 5°
Bolts securing heater grille: M6		10 ± 2 (7.3756 ± 1.4751)
Bolts securing intake manifold: M8 1.25x25 ..... M8 1.25x60		25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878)
Bolts securing exhaust manifold on head: (3, Figure 115) M8 1.25x25 Mm ..... M8 1.25x14 Mm		25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878)
Bolts securing connecting rod caps: M11 1.25 (1, Fig. 65) ..... Torque/Angle		30 ± 3 (22.1269 ± 2.2127) 60 ± 5 (44.2537 ± 3.6878) + 90° ± 5°
Bolts securing flywheel M12 ..... M10		85 ± 10 (62.6928 ± 7.3756) 49 ± 5 (36.1405 ± 3.6878)
Bolts securing camshaft thrust plate: M8 1.25x25 (2, Fig. 54)		24 ± 4 (17.7015 ± 2.9502)
Bolts securing camshaft gear: M8 1.25x20 (1, Fig. 68)		36 ± 4 (26.5522 ± 2.9502)
Bolts securing rocker arms:		36 ± 5 (26.5522 ± 3.6878)
Bolts securing rocker arm adjusters: 3/8 24 Unf Hex Nut		24 ± 4 (17.7015 ± 2.9502)
Bolts securing rocker arm casing:		24 ± 4 (17.7015 ± 2.9502)
Bolts securing phonic wheel: M12 1.25 ..... Hex		50 ± 5 (36.8781 ± 3.6878)
Fuel connector fastener on head side		50 ± 5 (36.8781 ± 3.6878)
Fuel connector fastener on Common Rail side		20 ± 2
Common Rail fastener (1, Fig. 107) M8 1.25x10 ..... M8 1.25x50 ..... M8 1.25x90		24 ± 4 (17.7015 ± 2.9502)
Fastener for high-pressure pipes from Common Rail to cylinder head M14 1.5		20 ± 2 (14.7512 ± 1.4751)
Fastener for fuel filter mounting on crankcase M12 1.75x25		77 ± 8 (56.7923 ± 5.9005)
Turbine / exhaust manifold fastener (2, Figure 115) M8 1.25		25 ± 5 (18.4391 ± 3.6878)
Oil delivery/return pipe fastener M12 1.5		35 ± 5 (25.8147 ± 3.6878)
Oil dipstick pipe fastener:		24 ± 4 (17.7015 ± 2.9502)
Bolts securing oil pump: M8 1.25x30 8.8 Hex		8 ± 1 (5.9005 ± 0.7376) 24 ± 4 (17.7015 ± 2.9502)
Main oil delivery bolts (plugs) M10 – 1 ..... M14 – 1.5		6 ± 1 (4.4254 ± 0.7376) 11 ± 2 (8.1132 ± 1.4751)

♦ Lubricate With Engine Oil Before Assembly

PART	TORQUE
	Nm (lb ft)
Oil cooler / oil filter assembly fastener:	24 ± 4 (17.7015 ± 2.9502)
Coolant pump / crankcase fastener: M8 1.25x25 8.8 Hex	24 ± 4 (17.7015 ± 2.9502) 43 ± 6 (31.7152 ± 4.4254)
Fan mounting fastener M10	33 ± 5 (24.3395 ± 3.6878)
Fan pulley fastener	—
Fan spacer or accessory pulley fastener (when required) M6 M10 M12	 10 ± 2 (7.3756 ± 1.4751) 43 ± 6 (31.7152 ± 4.4254) 77 ± 12 (56.7923 ± 8.8507)
Additional counterweight fastener (2, Figure 78) M10 1.50x80 M10 1.50x100	 48 ± 8 (35.4030 ± 5.9005) 48 ± 8 (35.4030 ± 5.9005)
Alternator fastener (2, Fig 88) M8 1.25x30 M12 1.75x120 M12 Nut 1.75 M10 1.5x25 M10 1.5x40 M10 Nut 1.5 M16 1.5	 24 ± 4 (17.7015 ± 2.9502) 43 ± 6 (31.7152 ± 4.4254) 24 ± 4 (17.7015 ± 2.9502) — — — —
Stud bolts for mounting fuel pump: M8	12 ± 2 (8.8507 ± 1.4751)
Bolts securing injection pump: M8 1.5	24 ± 4 (17.7015 ± 2.9502)
Tightening nut fixing injection pump gear M18 1.5	105 ± 5 (77.4440 ± 3.6878)
Fastener for fittings from injection pump to Common Rail: M12 1.5	20 ± 2 (14.7512 ± 1.4751)
Bolts securing injectors:	8,5 ± 0,8 (6.269 ± 0.59)
Bolts securing injector connectors:	1,5 ± 0,25 (1.1063 ± 0.1844)
Oil pressure regulator sensor fastener:	8 ± 2 (5.9005 ± 1.4751)
Camshaft speed sensor fastener in gearbox: M6	8 ± 2 (5.9005 ± 1.4751)
Crankshaft speed sensor fastener on front cover M6	8 ± 2 (5.9005 ± 1.4751)
Temperature sensor fastener on cylinder head: M14 1.5x12 Hex	20 ± 3 (14.7512 ± 2.2127)
Air temperature sensor fastener on intake manifold: M6 1x20	3 ± 1 (2.2127 ± 0.7376)
Air pressure and temperature sensor fastener on intake manifold: M5	3 ± 1 (2.2127 ± 0.7376)
Fuel pressure sensor fastener:	35 ± 5 (25.8147 ± 3.6878)
Fuel temperature sensor fastener: M14 1.5x12 Hex	20 ± 3 (14.7512 ± 2.2127)
Gear fastener on air compressor: 5/8 Inch 18 Unf	125 ± 19 (92.1953 ± 14.0137)
Air compressor fastener on crankcase: M12 Nut	81 ± 12 (59.7425 ± 8.8507)

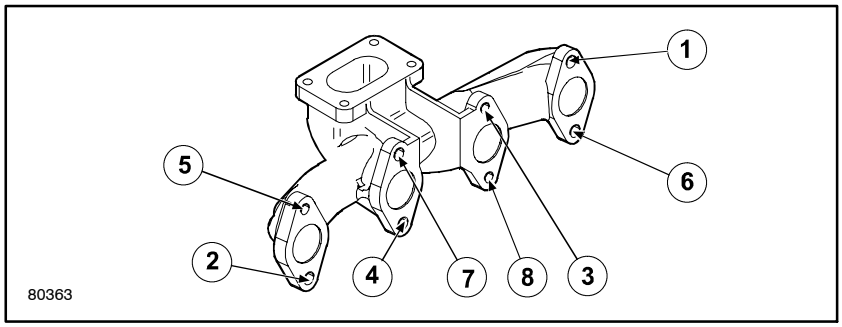
♦ Lubricate with engine oil before assembly

Tightening sequence for cylinder head bolts



1

Tightening sequence for exhaust manifold bolts

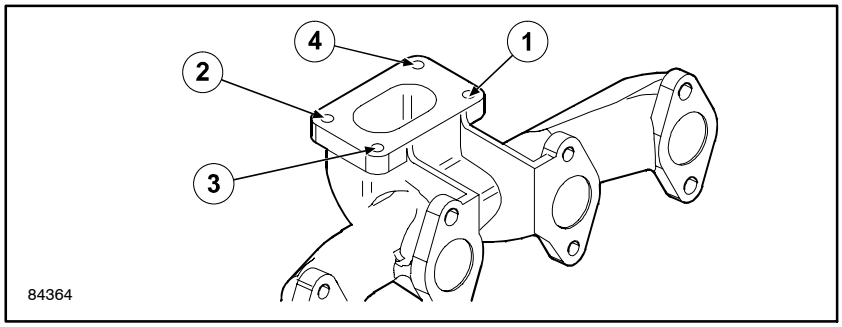


2

Tightening sequence for turbocharger nuts and bolts

Sequence:

- Pre-tightening 4-3-1-2
- Tightening 1-4-2-3



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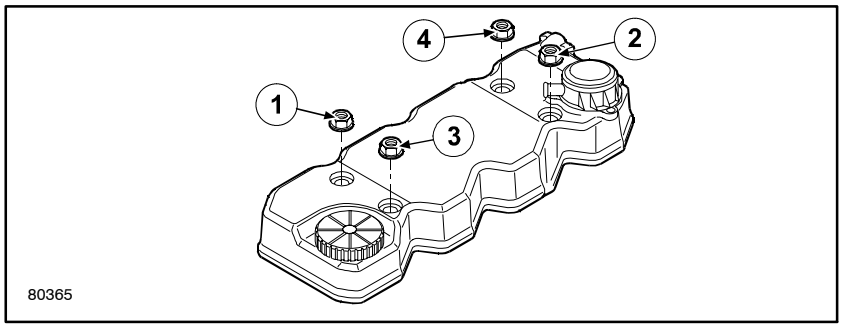
Tightening sequence for engine cover bolts



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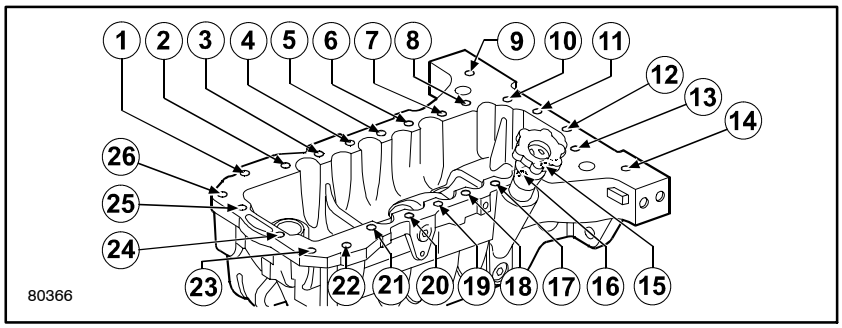
Tightening sequence for engine oil sump bolts

- First phase: from 1 to 16
- Second phase: from 17 to 32



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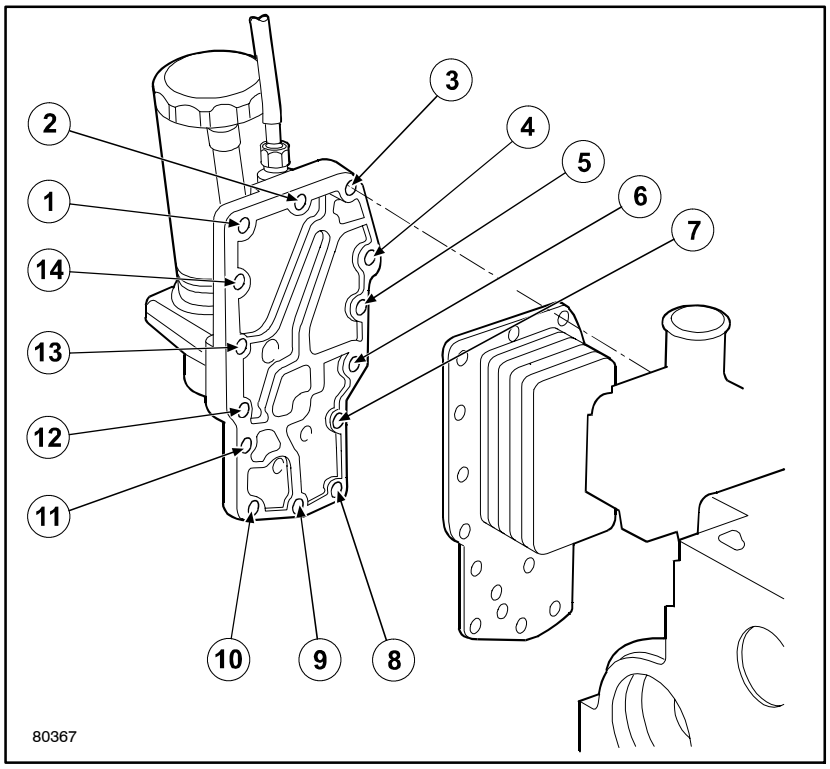
Tightening sequence for cooler bolts



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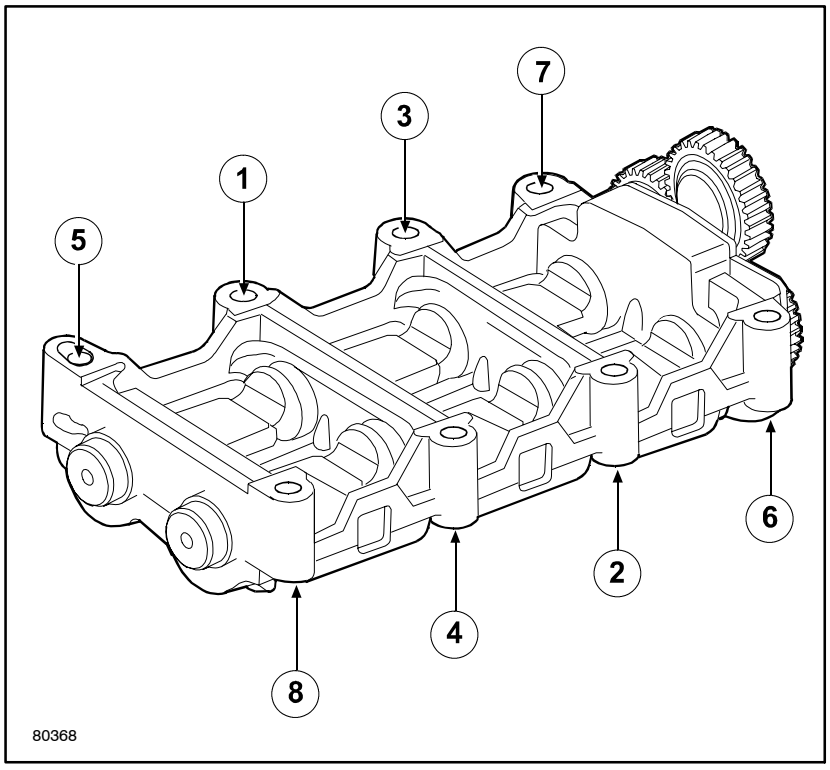
Tightening sequence for additional counterweight bolts



7

SPECIAL TOOLS

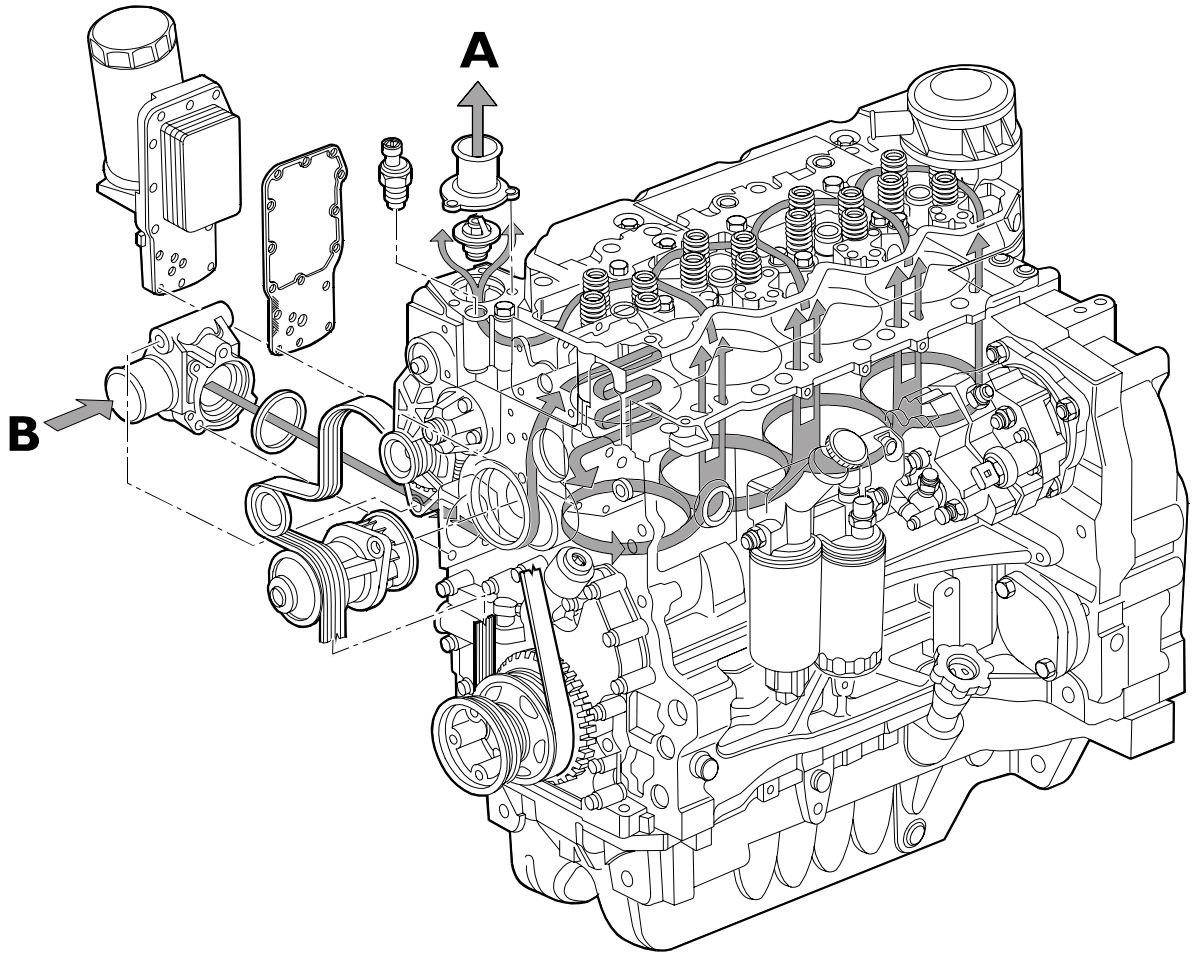
No. TOOL	NAME
380000979	Puller for engine injection pump union gear
380000665	Tool to extract crankshaft front seal
380000663	Tool to extract crankshaft rear seal
380001099	Injector extractor
380000666	Splining tool for fitting front seals on crankshaft
380000664	Splining tool for fitting rear seal on crankshaft
380000988	Plate for engine flywheel rotation tool with flywheel timing pin (use with 380000732)
380000732	Tool for engine flywheel rotation (use with 380000988)
380000667	Drift for camshaft bushing disassembly and reassembly
380000158	Torque screwdriver for injector solenoid valve connector nut setting
380001003	Complete square to check for connecting rod distortion
380000301	Engine stand (revolving)
380001298	Engine stand to Cylinder block brackets
380001073	Engine lifting brackets

DESCRIPTION OF OPERATION

COOLING

The forced circulation, closed-circuit engine cooling system is composed of the following components:

- Expansion tank: its location, shape and size may change depending on the engine version.
- Radiator, whose job is to dissipate the heat taken by the coolant from the engine. This component, too, is a feature of the version as regards both positioning and engine.
- Viscostatic fan, with the task of increasing the radiator's dissipating capacity: this, too, belongs to the specific engine version.
- A lubricating oil cooler: this, too, belongs to the specific engine version.
- A centrifugal coolant pump housed at the front of the crankcase.
- A thermostat governing coolant circulation.
- The circuit may also extend to the compressor if the version includes it.



A = TO THE RADIATOR
B = FROM THE RADIATOR

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COOLING SYSTEM DIAGRAM

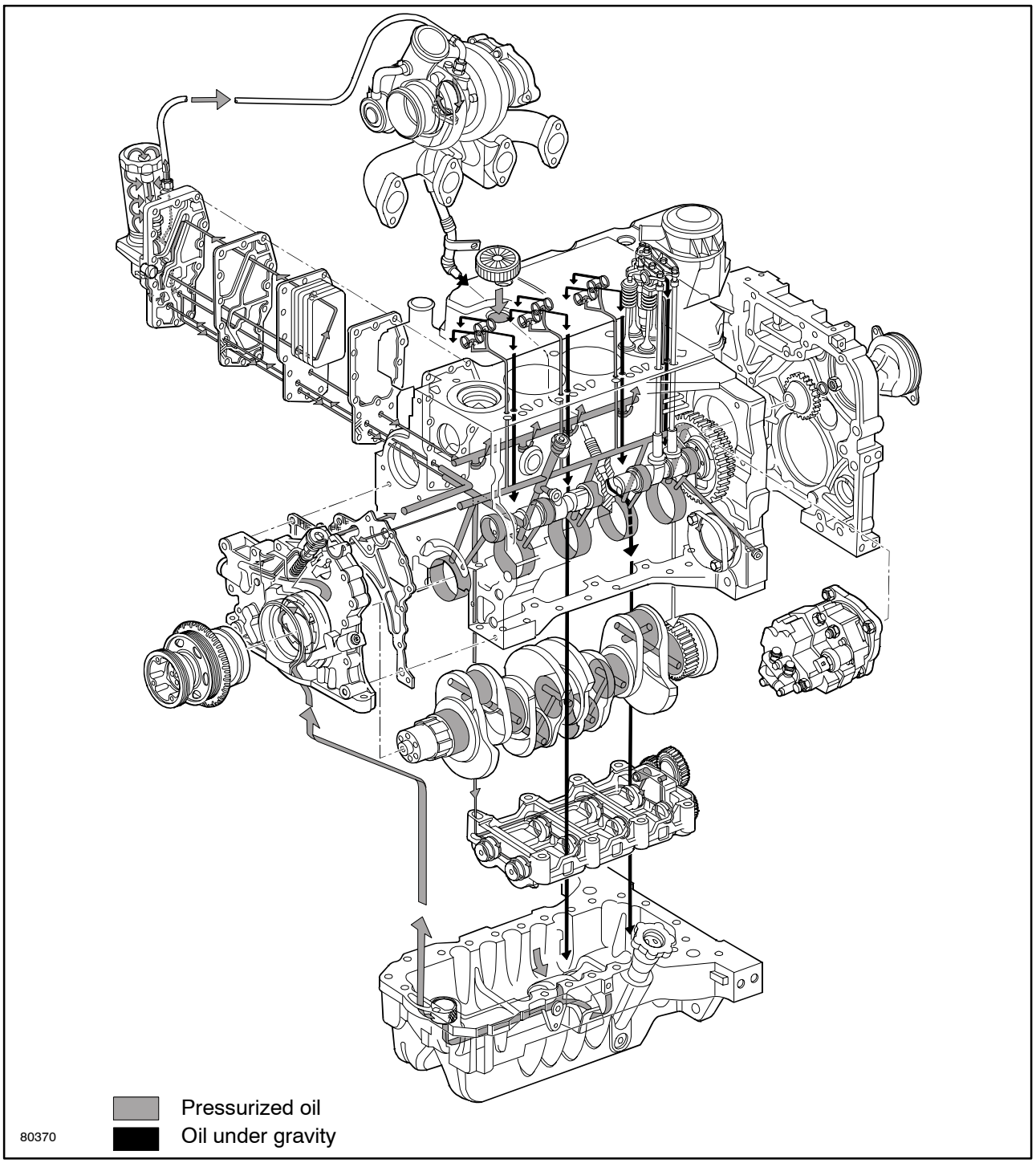
LUBRICATION

Forced-circulation lubrication is accomplished by the oil pump, housed at the front of the crankcase.

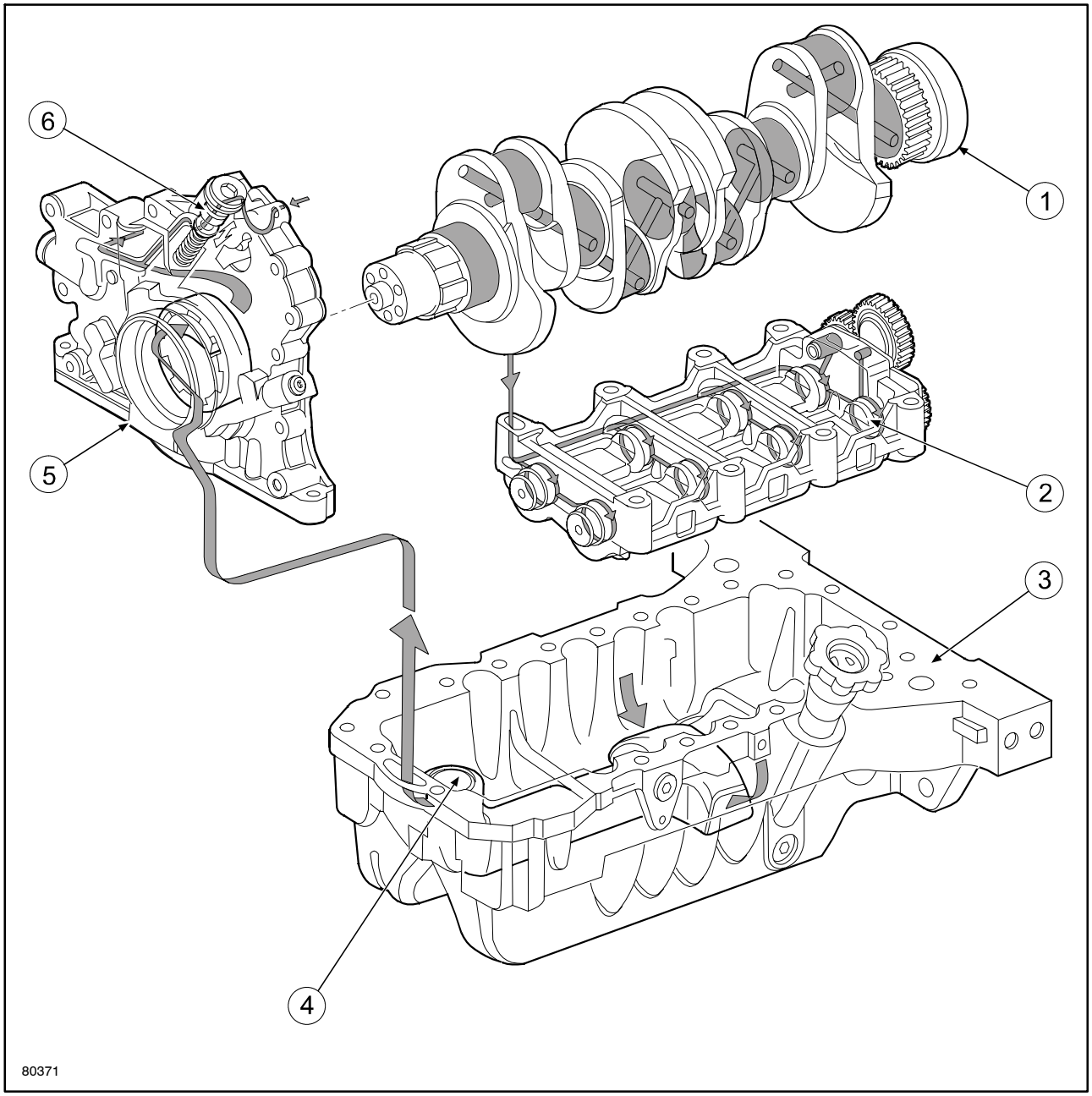
The lubricating oil is sent from the oil sump to the crankshaft, camshaft and valve control.

Lubrication also includes the cooler, turbo-blower and compressor for the compressed air system if there is one.

All these components often change according to use and will therefore be covered under the specific heading.



LUBRICATION SYSTEM COMPONENTS



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1. Crankshaft – 2. Balancing weight – 3. Oil sump with suction rose – 4. Suction rose in oil sump – 5. Oil pump – 6. Relief valve.

ENGINE OVERHAUL

INTRODUCTION

Removal

To remove engine from tractor see Section 01 “Separating the Tractor.”

DISASSEMBLY

Some of the operations described in this section can be carried out directly with the engine fitted on the vehicle, depending on access to the engine bay and on the version.

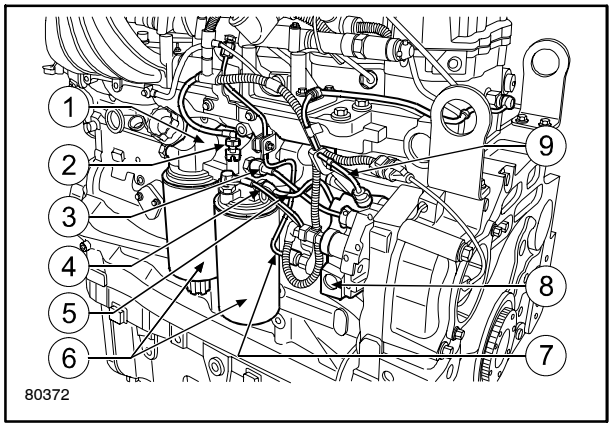
⚠ CAUTION ⚠

The operations for removing the engine, as those for overhaul, must be performed by skilled personnel using specific tools.

Fuel System/Preparing Engine to Mount on Rotating Stand

To be able to fit the brackets **380001298** (for fixing the engine to the overhaul stand, **380000301**) to the crankcase, it is necessary to work from the left-hand side of the engine:

1. Remove the fuel filters (6) from the mounting (1);
2. Disconnect the electrical connection (2) from the mounting (1) and the one to the heater (again located on the filter mounting);
3. Disconnect the fuel pipes (3 - 4 - 5) from the mounting (1);
4. Remove the bracket supporting the mounting (1) from the crankcase.



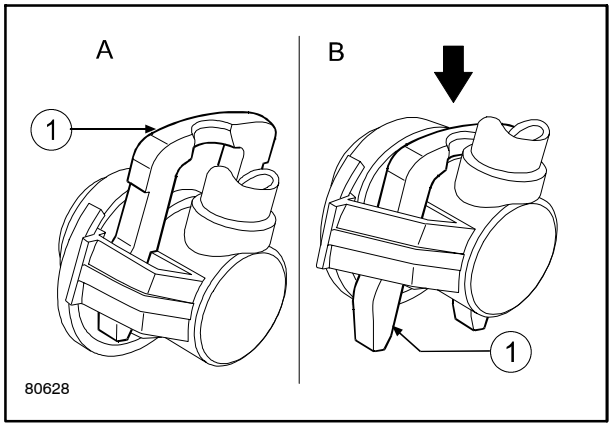
11

⚠ CAUTION ⚠

To disconnect the fuel pipes (3 – 4 – 5, Figure 11) from the relevant fittings, you need to press the clip (1) as shown in Figure 12, B.

After disconnecting the piping, put the clip (1) back in its locking position (Figure 12, A) to prevent it getting buckled.

5. Disconnect the high-pressure fuel pipe (7, Figure 1) from the rail choke tube and from the high-pressure pump (8) and remove it from the crankcase by taking out the bracket.
6. Disconnect the pipe 9 from the high-pressure pump (8).



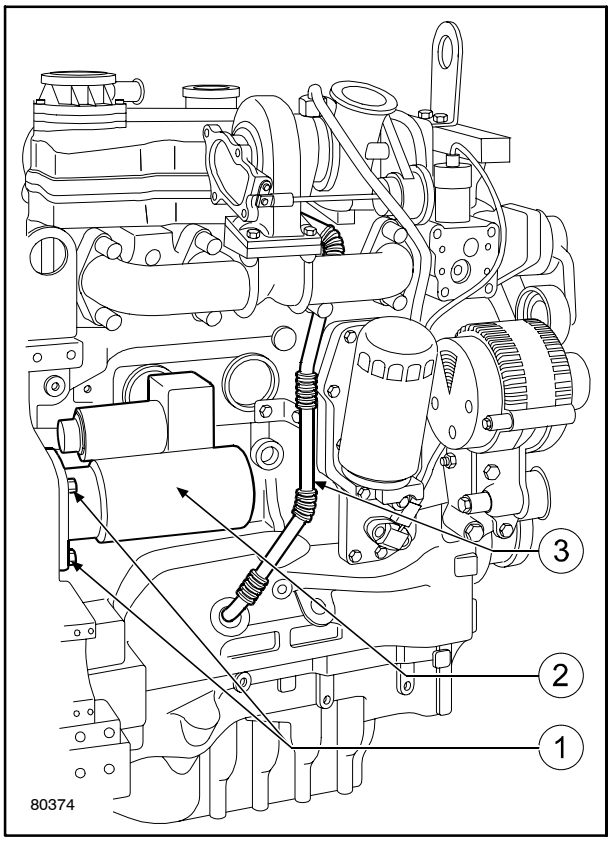
12

⚠ CAUTION ⚠

Depending on the high pressure in the piping from the high-pressure pump to the rail and from here to the electro-injectors, **never**:

- disconnect the pipes with the engine running,
- reuse disconnected pipes.

7. Remove the oil filler pipe (3).
8. Unscrew the fixing screws (1) and remove the starter motor (2) from its seat.



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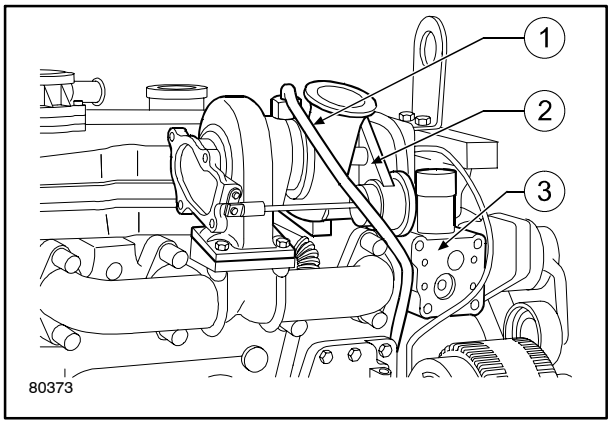
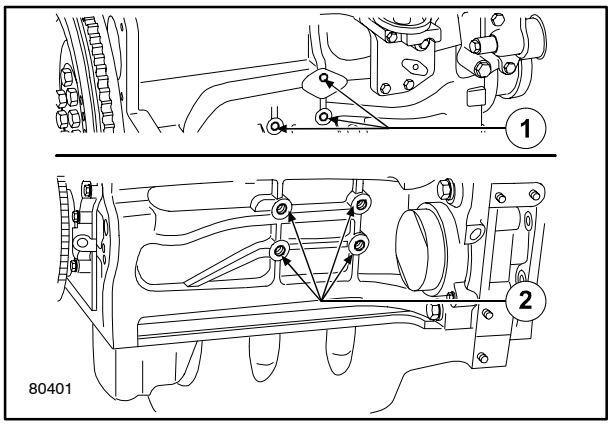
9. Working from the right-hand side of the engine, disconnect the lubricating pipe (1) from the top of the cooler to the turbo-blower (2).
10. Remove the thermostat body (3) together with the seal.



14

11. Fit brackets **380001298** into the holes (1) and (2) in the crankcase on both sides and, using these brackets, secure the engine to the rotating stand **380000301**. Drain off the engine oil by removing the plug from the sump.



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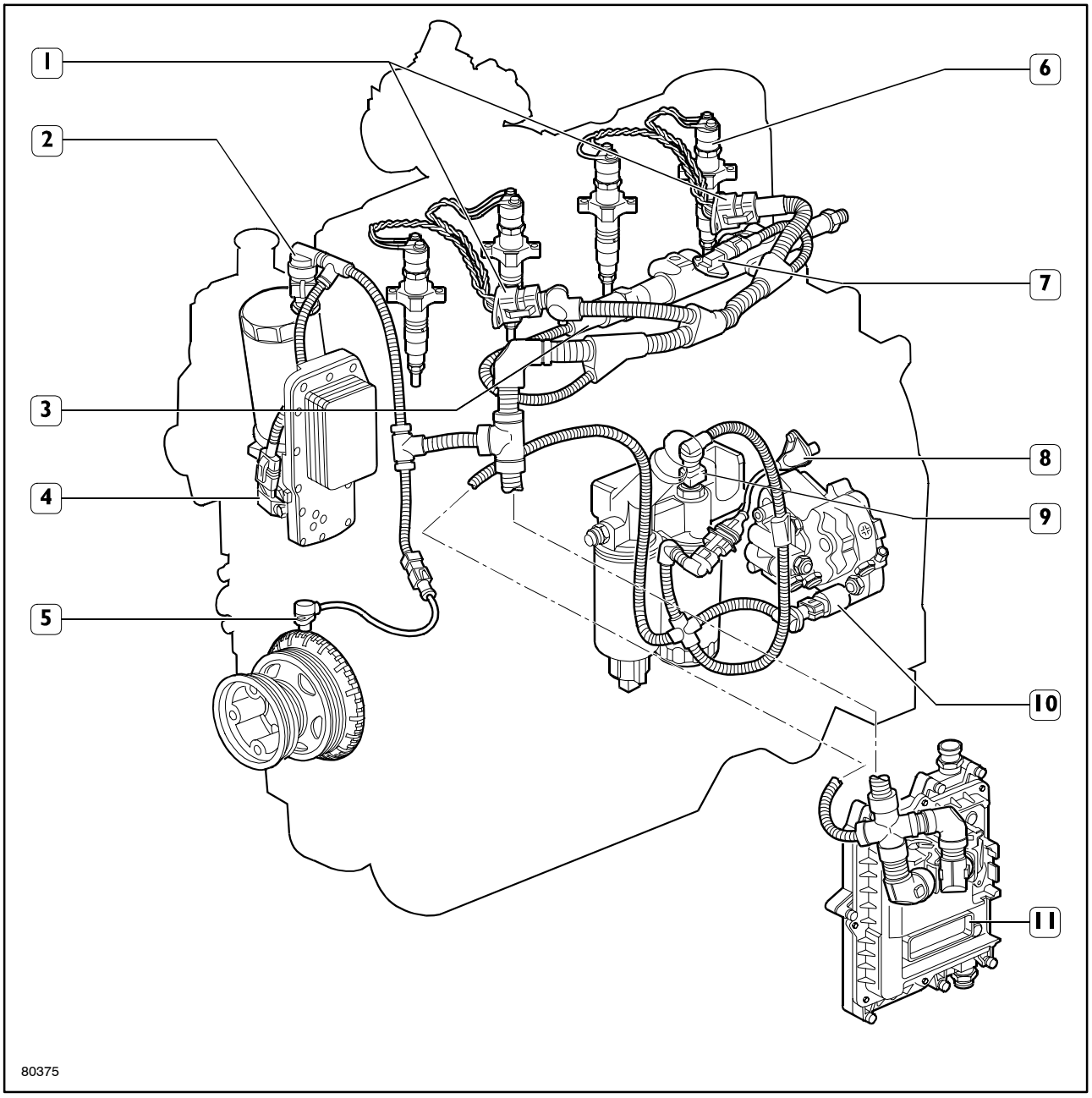


16

REMOVING COMPONENTS OF THE APPLICATION
1. Connection for electro-injectors - 2. Engine coolant temperature sensor - 3. Fuel pressure sensor cable - 4. Engine oil pressure and temperature sensor - 5. Crankshaft sensor - 6. Electro-injector - 7. Air pressure temperature sensor - 8. Timing system phase sensor - 9. Fuel temperature sensor - 10. Pressure regulator wiring - 11. EDC7C control unit

Electrical Connections

12. Disconnect the engine cable from the connectors: (1) electro-injector wiring (6); (7) air pressure/temperature sensor; (3) fuel pressure sensor; (11) EDC control unit; (10 high-pressure pump sensor; (8) timing system phase sensor; (2) engine coolant temperature sensor on thermostat; (5) crankshaft speed sensor.

Fuel Rail

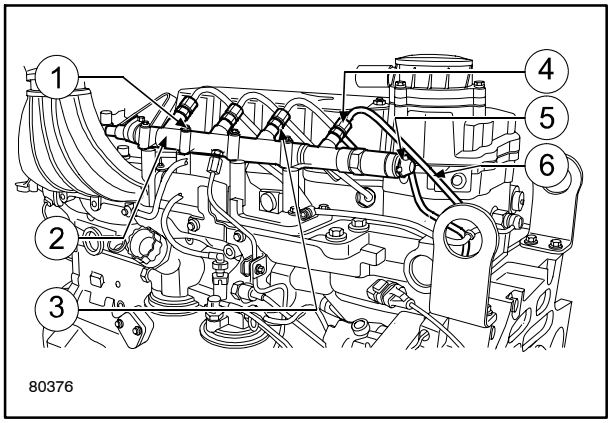
13. Take off the clamps fastening it to the crankcase and remove it completely.

14. Disconnect the fuel pipes (5) from the rail (2) and from the manifolds (6) for the electro-injectors.

⚠ CAUTION ⚠

When locking the fittings (4) securing the pipes (6) to the rail (2), using an appropriate wrench, you must prevent the flow limiters, if fitted, (3) from turning.

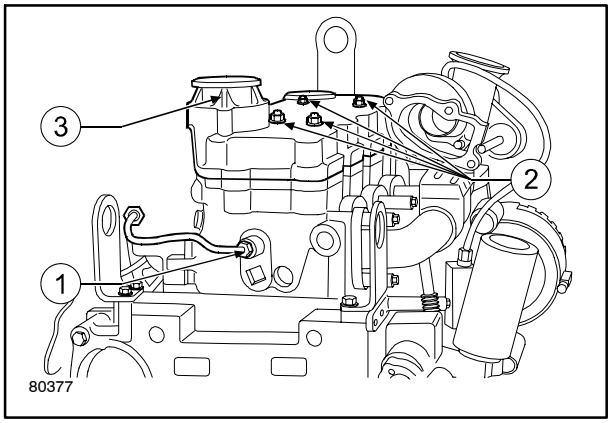
15. Remove the screws (1) and detach the rail (2).



17

Cylinder Head

16. Disconnect the piping from the fuel return pressure limiter (1).
17. Undo the nuts (2) and take off the tappet cover (3).

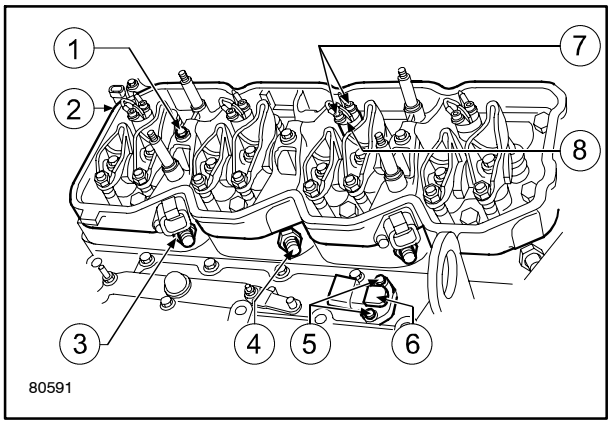


18

18. Remove the nuts (7) and disconnect the electric cables from the electro-injectors (8).
19. Take out the screws (1) and remove the electro-injector wiring mounting (2) together with its seal.
20. Take out the screws (5), remove the air temperature/pressure sensor (6).
21. Remove the nuts (3) and extract the fuel manifolds (4).

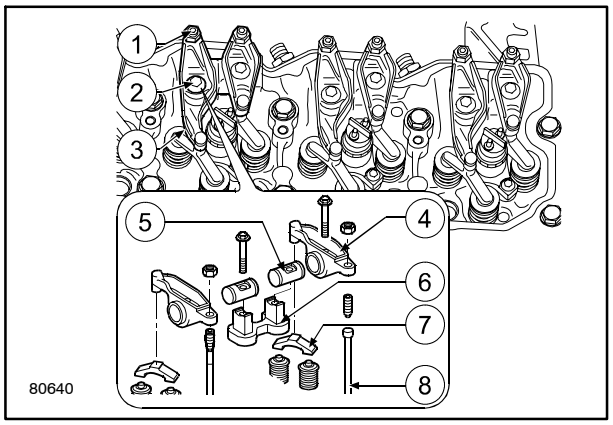
⚠ CAUTION ⚠

Once removed, the fuel manifolds (4) must not be reused; they must be replaced with new ones.



19

22. Loosen the tappet adjuster fixing nuts (1) and unscrew the adjusters.
23. Take out the screws (2), remove the rocker-arm assembly (3) comprising the mounting (6), rocker arms (4) and spindles (5) then remove the bridges (7) from the valves.
24. Remove the rods (8).



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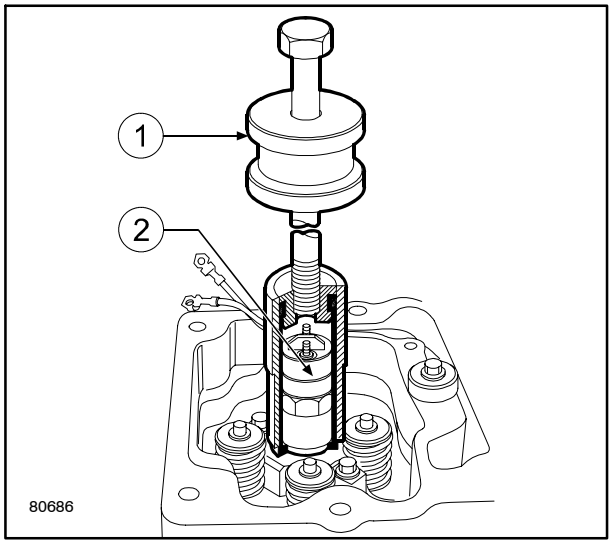
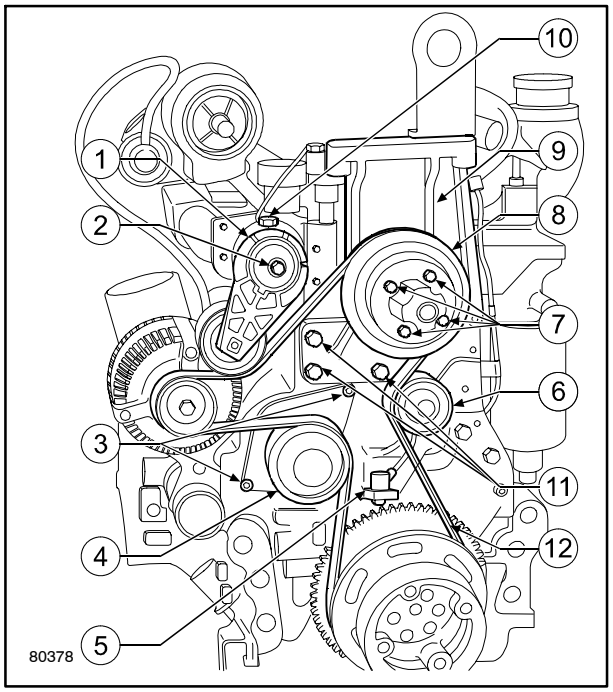
25. Take out the screws securing the electro-injectors and, using tool **380001099** (1), extract the electro-injectors (2) from the cylinder head.



21

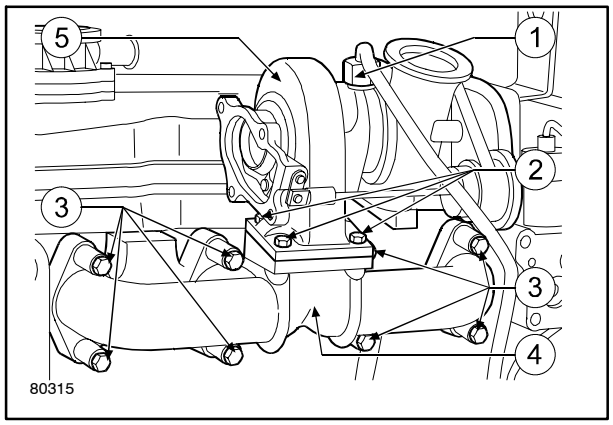
26. Working on the tightener (1), extract the belt (12) from the pulleys of the alternator, coolant pump and snub pulleys.
27. Unscrew the bolt (2) and remove the tightener;
28. Remove the snub pulley (6), unscrew the bolts (7) and remove the pulley (8) from the mounting beneath.
29. Unscrew the bolts (10) and remove the tightener mounting.
30. Unscrew the bolts (11) and remove the mounting (9) from the crankcase.
31. Unscrew the bolts (3) and remove the coolant pump (4).
32. Unscrew the bolt and remove the engine speed sensor (5)



22

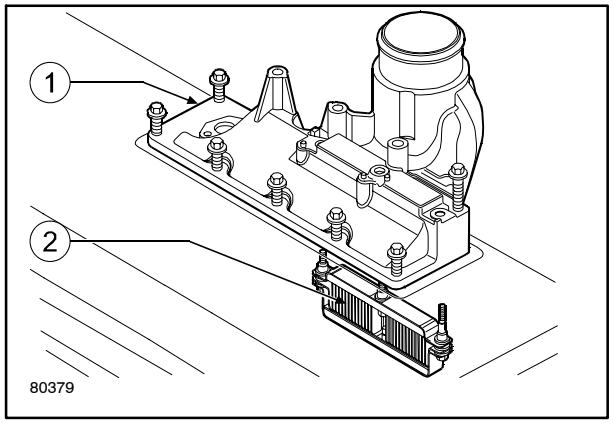
Proceed to remove the turbocharger:

33. Unscrew the ring nut (1) and remove the lubrication piping of the turbo-blower.
34. Unscrew the nuts (2) securing the turbo-blower on the exhaust manifold (4).
35. Support the turbo-blower (5) and, lifting it, remove the seal.
36. Unscrew the retaining nuts (3) and remove the exhaust manifold (4).



23

37. From the opposite side, unscrew the bolts securing the intake manifold (1) and remove it together with the air heater (2) for cold starts.



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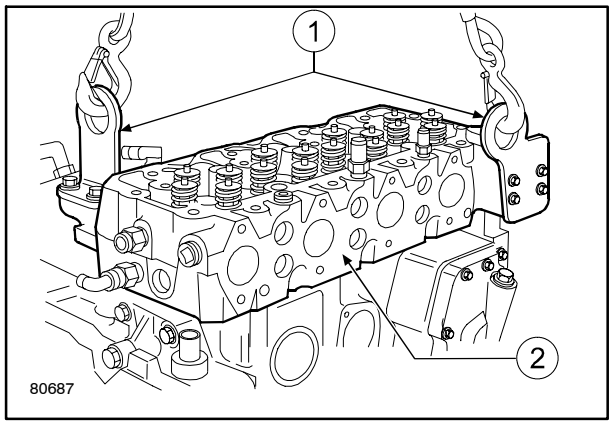
38. Hook up the brackets, **380001073** (1) with a suitable sling and, using a hoist, remove the cylinder head (2) from the crankcase.



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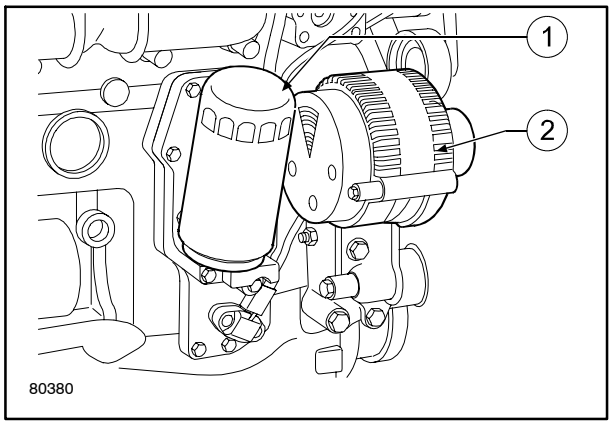
Crankcase - External Components

39. Remove the oil filter (1).
40. Unscrew the retaining bolts and remove the alternator (2).



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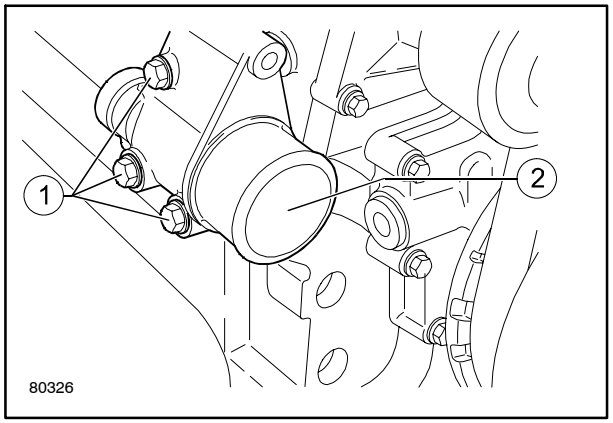
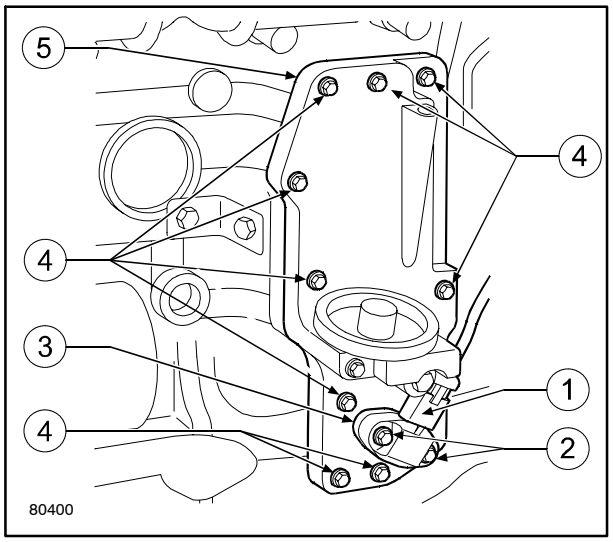
41. Unscrew the retaining bolts (1) and remove the pipe fitting (2).



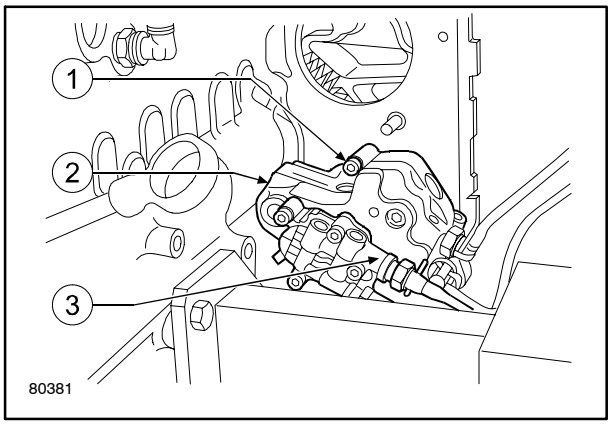
27

42. Disconnect the connector (1) from the oil pressure-temperature sensor.
43. Unscrew the bolts (2) and remove the oil pressure-temperature sensor (3).
44. Unscrew the bolts (4) and remove the oil filter mounting (5) from the crankcase together with its seals.
45. Remove the cooler from its seat.



28

46. Remove the nuts (1) and detach the high-pressure pump (2) together with the feed pump (3).

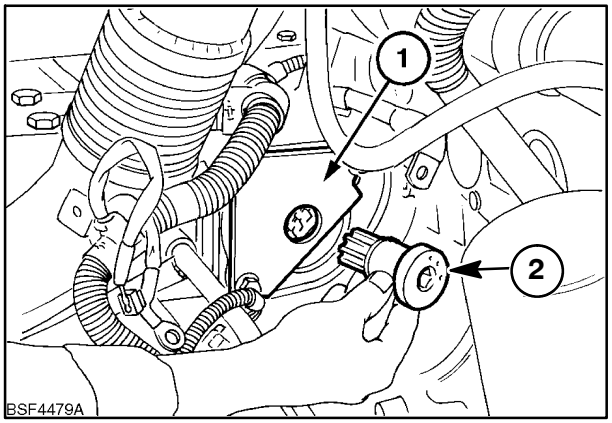


29

Crank Shaft Seals

47. Install the engine turning / locking tool, **380000988,** (1) and **380000732,** (2).

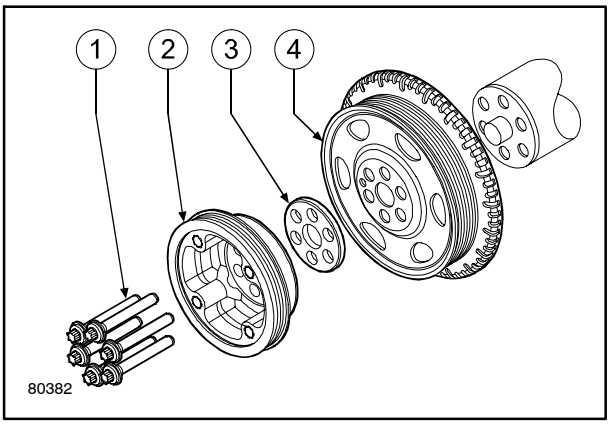
48. Loosen the screws fixing the flywheel to the crankshaft.



30

49. Unscrew the bolts (1), remove the pulley (2), spacer (3) and pulley (4).

50. The engine flywheel locking tool can help with disassembly of the damper flywheel (2) fitted on the pulley (4).



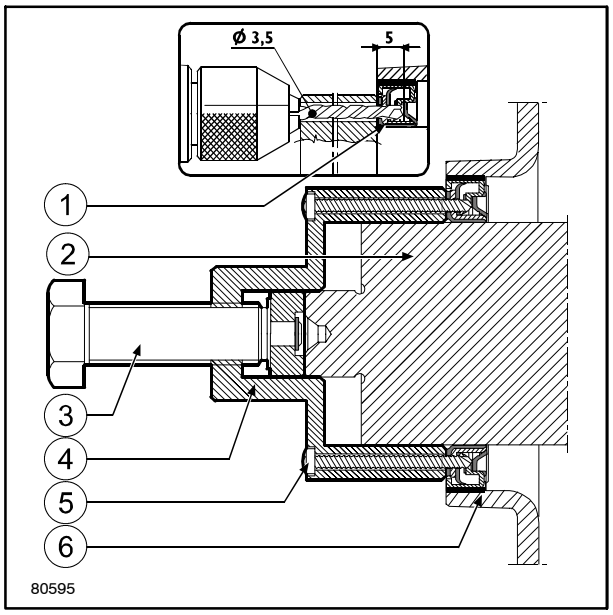
31

51. Extract the front cover shaft seal.

52. Apply tool **380000665** (4) on the front tang (2) of the crankshaft.

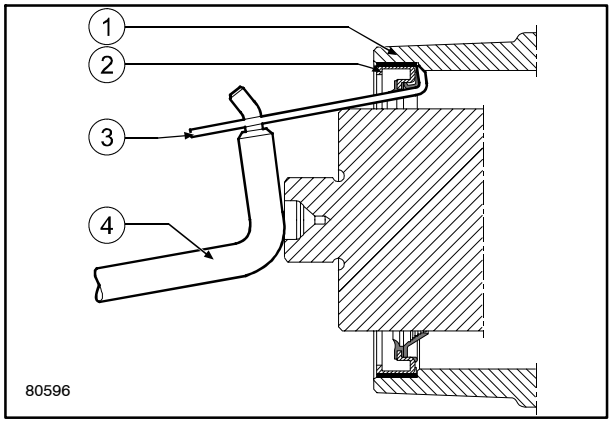
53. Perforate the inner seal (1) with a drill bit (∅ 3.5 mm (0.1378 in.)) through the tool's guide holes, for a depth of 5 mm (0.1969 in.).

54. Secure the tool to the seal by screwing down the 6 screws supplied. Extract the seal (1) by screwing down the screw (3).



32

55. Use a suitable hooked device (3) with the aid of the lever (4) extract the outer seal (2) from the front cover (1).

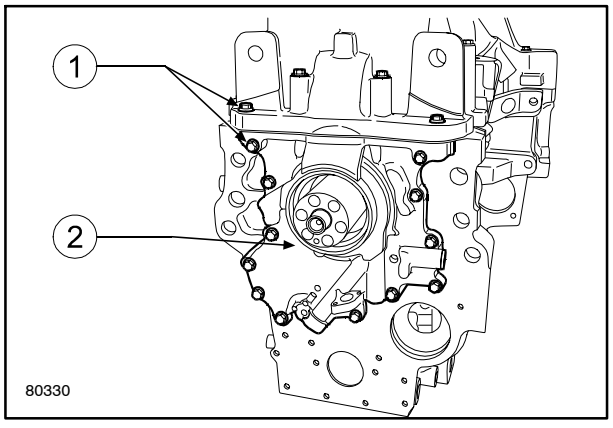


33

56. Take out the screws (1) and remove the oil pump (2).

⚠ CAUTION ⚠

Note down the assembly position of the screws (1) as they have different lengths.

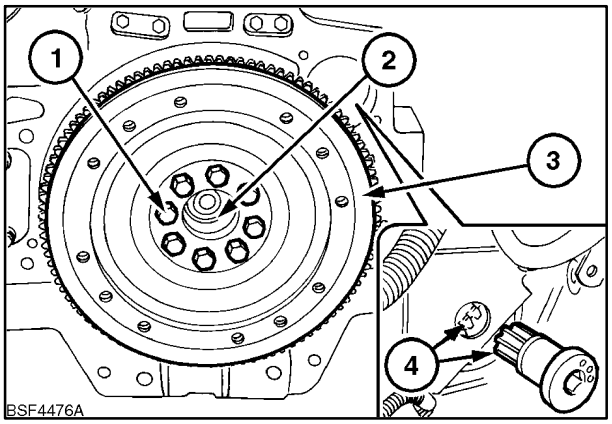


34

57. Remove two opposing screws (1) where the extraction pins are to go in (see figure 36).

58. Unscrew the remaining screws securing the flywheel (3) from the crankshaft (2).

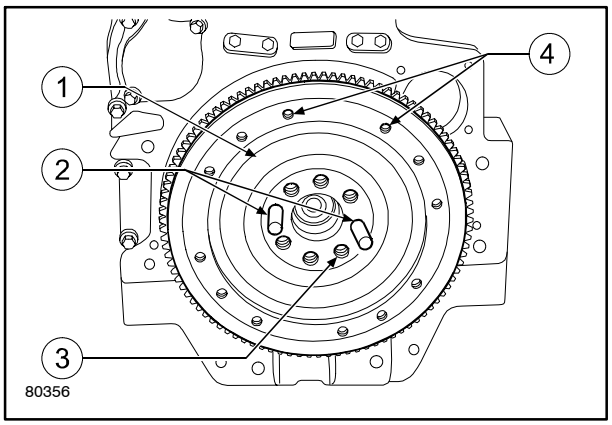
59. Remove the tool locking the flywheel (4).



35

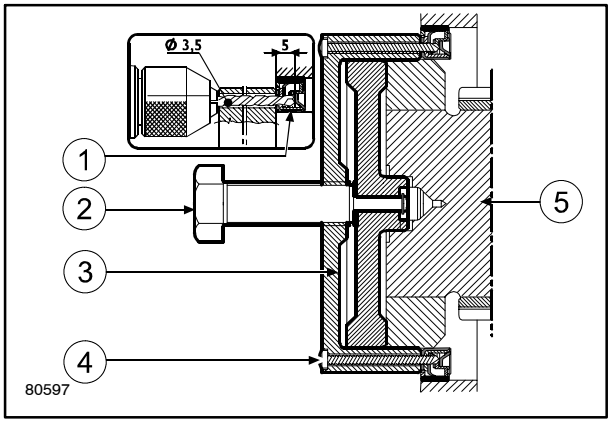
60. Screw two screws of suitable length into the holes (4) to sling the flywheel with a lift.

61. Using the two guide pins (2) previously screwed into the holes of the crankshaft (3), guide the extraction of the engine flywheel (1) with the aid of a lift.



36

62. Extract the seal, applying tool **380000663** (3) onto the rear tang (5) of the crankshaft.
63. Perforate the inner seal with a drill bit (∅ 3.5 mm (0.1378 in.)) through the tool's guide holes, for a depth of 5 mm (0.1969 in.).
64. Secure the tool **380000663** (3) to the seal (1) by screwing down the 6 screws supplied (4). Extract the seal (1) by screwing down the screw (2).
65. Using an appropriate hooked device and a lever, extract the outer seal from the timing box.



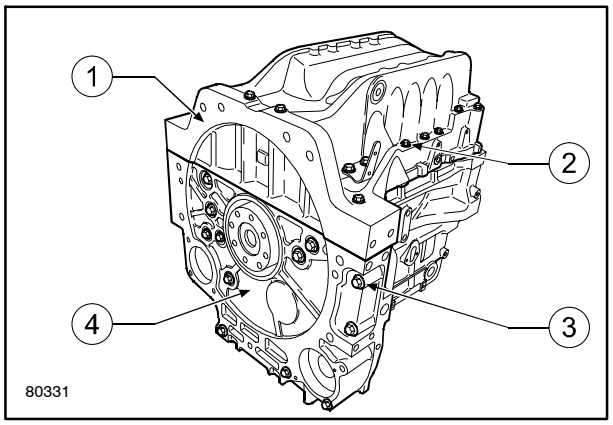
37

Sump

66. Turn the engine over.
    Take out the screws (2) and remove the oil sump (1).

67. Disconnect the high-pressure pump phase sensor.

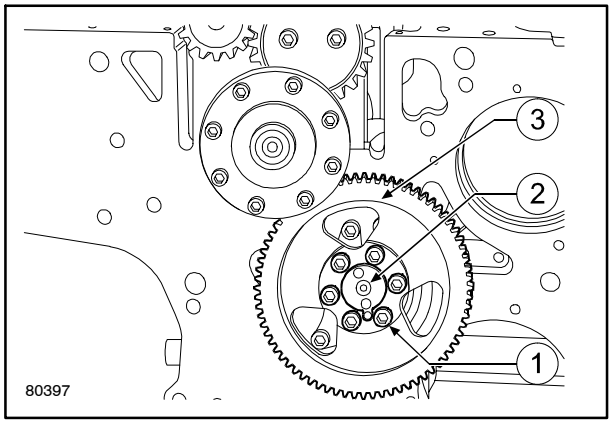
68. Unscrew the bolts (3) and remove the timing gear box (4) from the crankcase.



38

Rotating Counter Weights

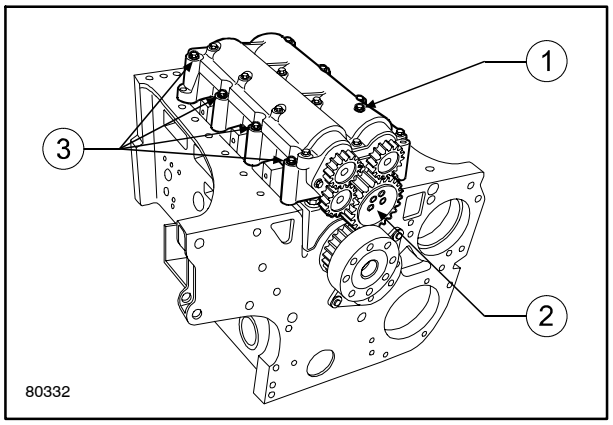
69. Take out the screws (1) and remove the gear (3) from the camshaft (2).



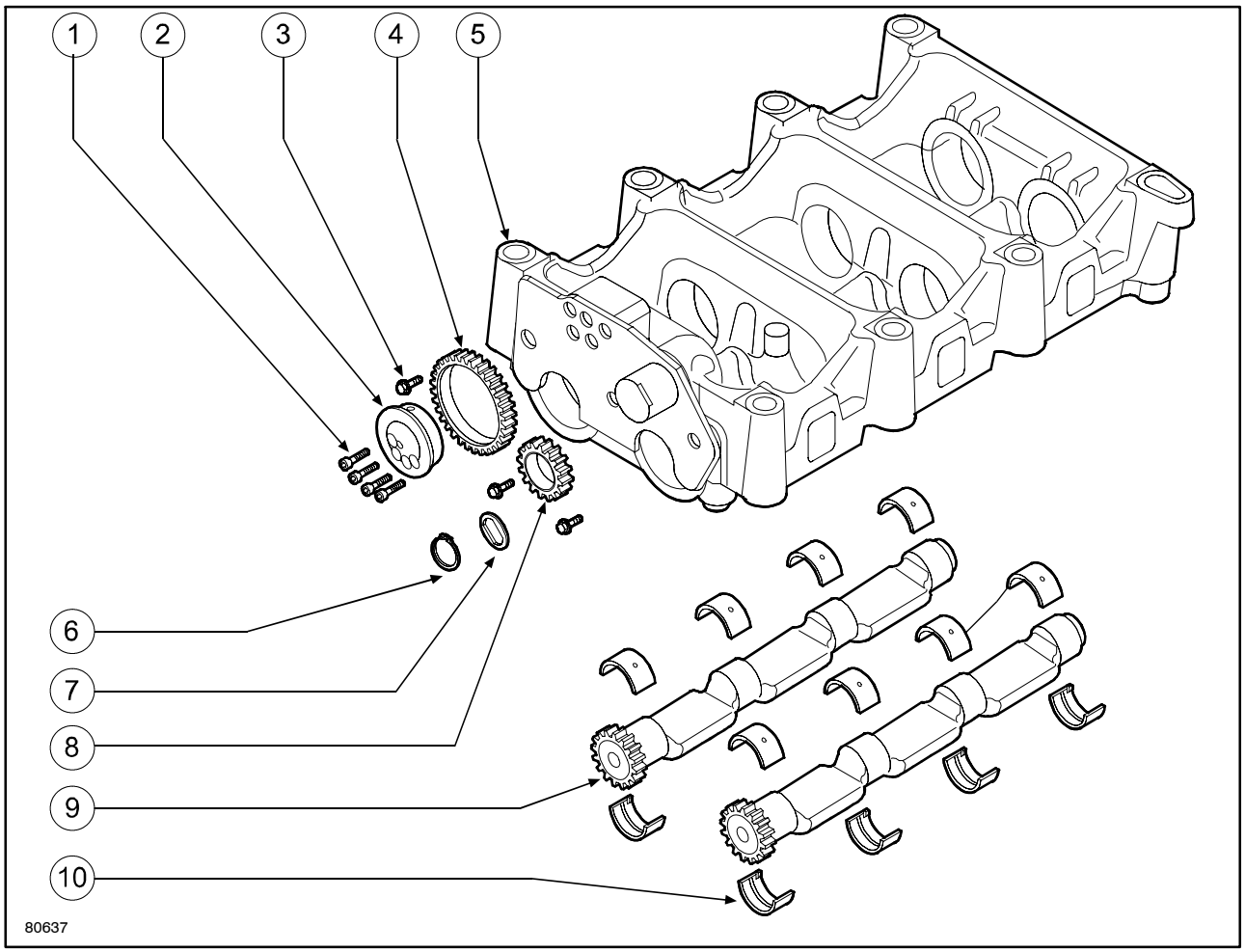
39

70. Using the pin (1), lock the additional counterweights (2) at the T.D.C.

71. Unscrew the retaining bolts (3) and remove the additional counterweights (2).



40



41

ROTATING COUNTERWEIGHT COMPONENTS
1. Retaining bolts - 2. Mounting - 3. Retaining bolts - 4. Gear - 5. Balancing weight - 6. O-ring - 7. Ring - 8. Gear - 9. Counter-shaft - 10. Half bearings

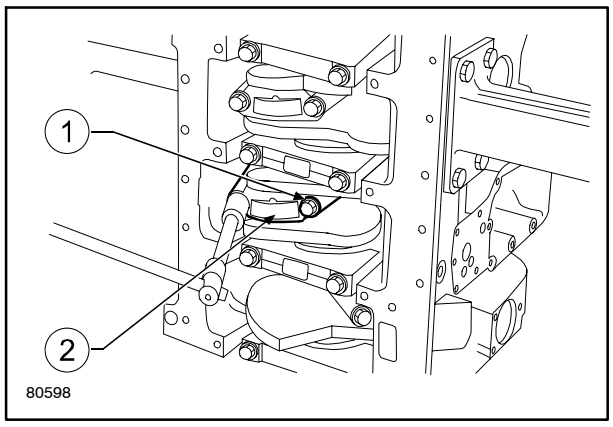
Crankshaft

72. Take out the screws (1) securing the connecting rod caps (2) and remove them.

73. Extract the pistons together with the connecting rods from the top of the crankcase.

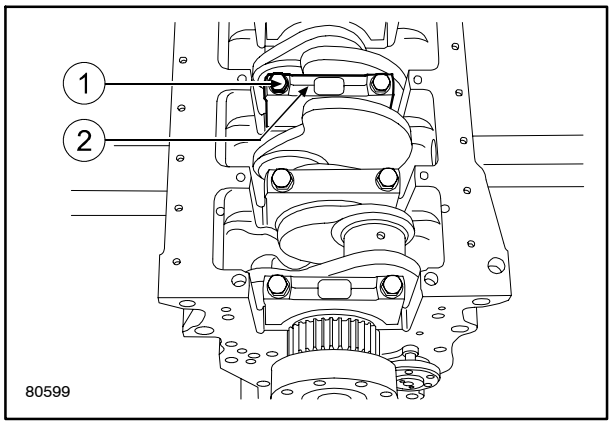
⚠ CAUTION ⚠

Keep the half bearings in their respective housings since, if they are used, they must be mounted in the position found upon disassembly.



42

74. Take out the screws (1) and remove the main bearing caps (2).

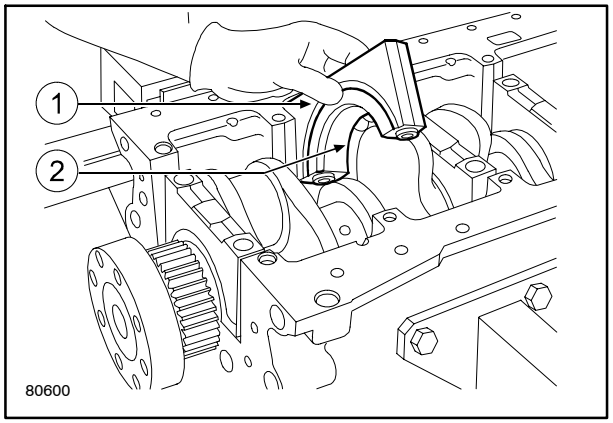


43

75. The penultimate main bearing cap (1) and the related mounting have the half bearing (2) equipped with a shoulder.

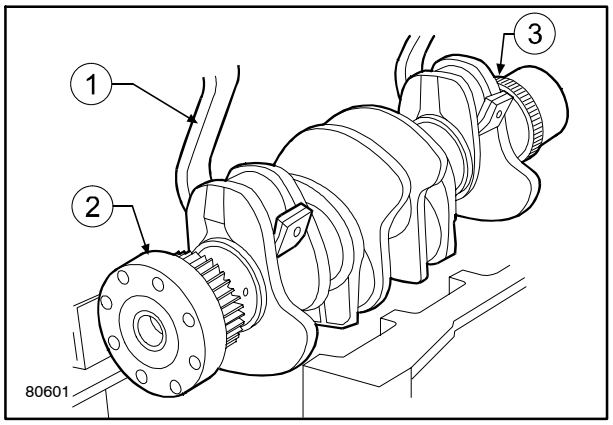
⚠ CAUTION ⚠

Note down the assembly position of the top and bottom half bearings since, if they are reused, they must be mounted in the position found upon disassembly.



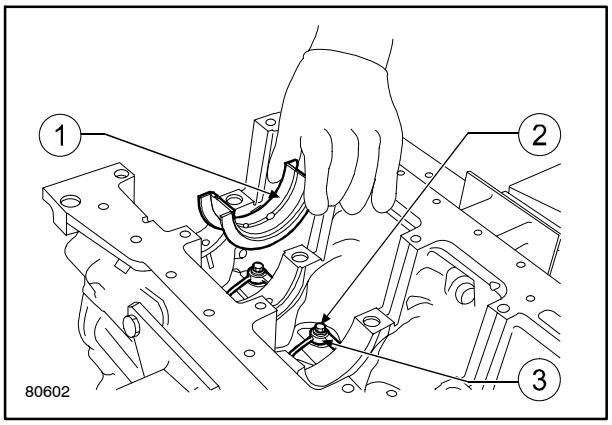
44

76. Using suitable lifting hooks (1) lift and remove the crankshaft (2) from the cylinder block.



45

77. Remove the main half bearings (1); take out the screws (2) and remove the oil nozzles (3).



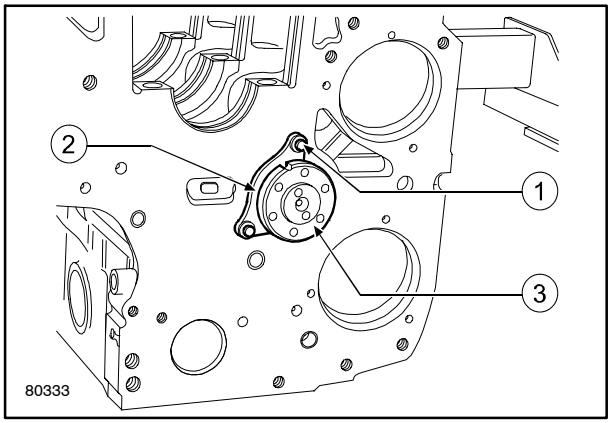
46

Camshaft

78. Take out the screws (1) and remove the plate (2) retaining the camshaft (3).

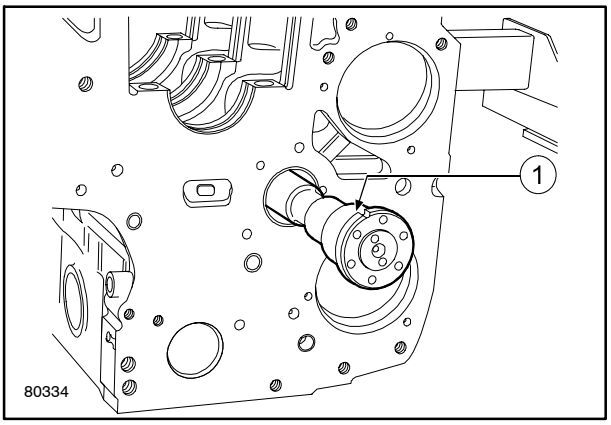
⚠ CAUTION ⚠

Note down the assembly position of the plate (2).



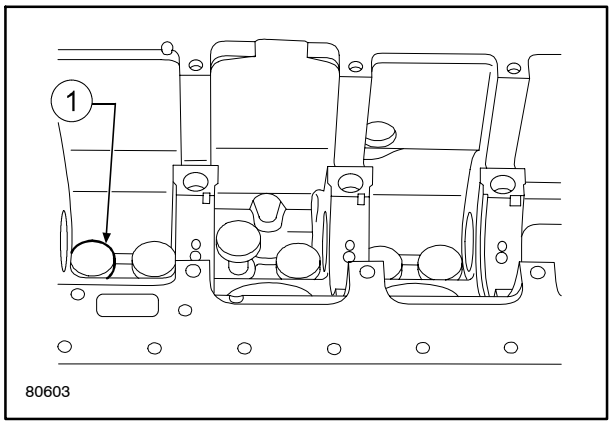
47

79. Carefully extract the camshaft (1) from the crankcase.



48

80. Extract the tappets (1) from the crankcase.

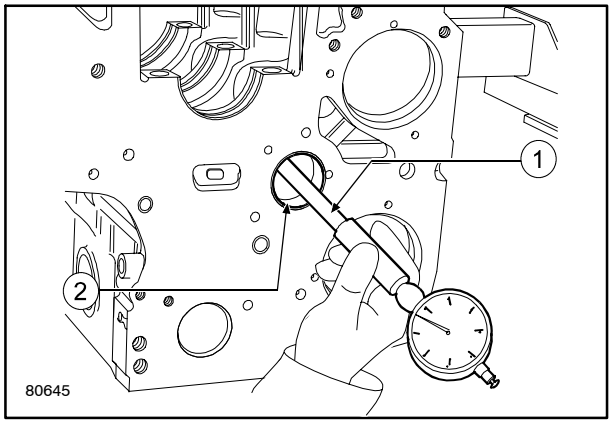


49

Bushings

81. The camshaft bushings (2) must be forced into their respective seats.
The internal surfaces must show no sign of seizure or wear.

82. Using the bore meter (1), measure the diameter of the front and rear bushings (2) and of the intermediate seats for the camshaft.
Measurements must be made at two perpendicular points.



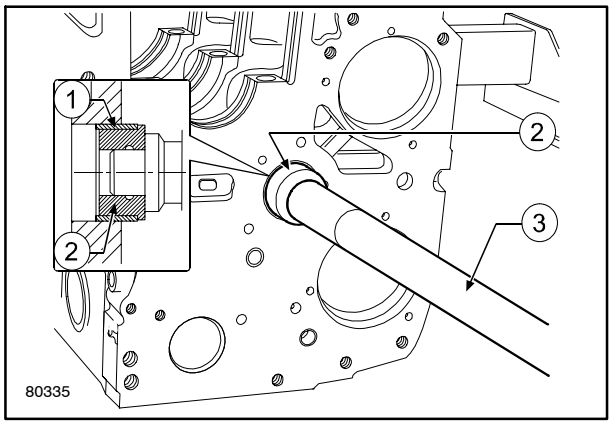
50

Changing bushings on the crankcase

83. To change the front bushing (1), use a suitable drift for its disassembly and assembly.

⚠ CAUTION ⚠

Upon assembly, the bushing (1) must be directed so that the lubrication holes coincide with the holes in the seats in the crankcase.

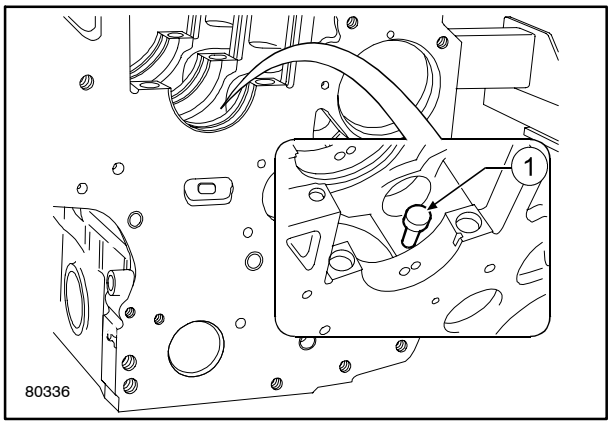


51

ASSEMBLY

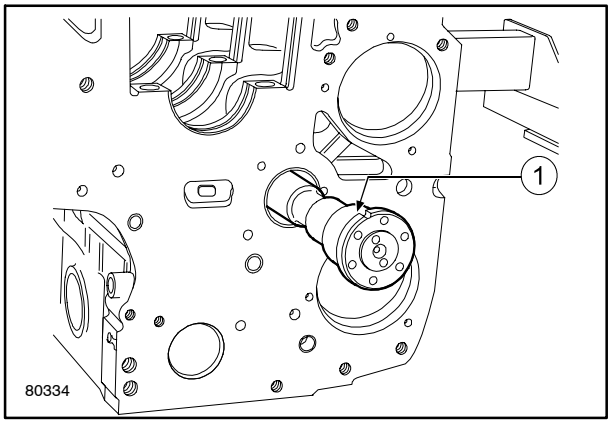
Installing the Tappets – Camshaft

84. Lubricate the tappets (1) and fit them in their seats in the crankcase.



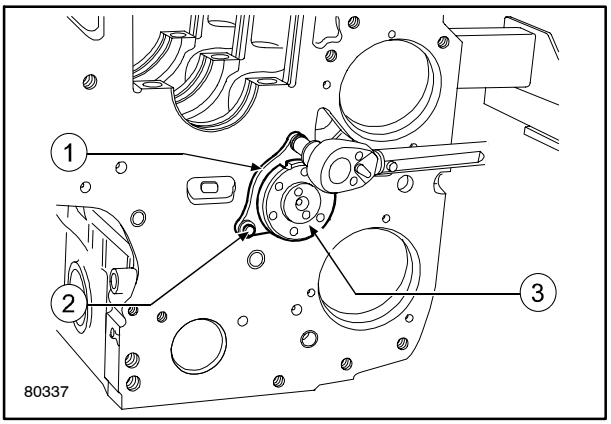
52

85. Lubricate the bushing supporting the camshaft and mount the camshaft (1) taking care that, during this process, the bushing or the supporting seats do not get damaged.



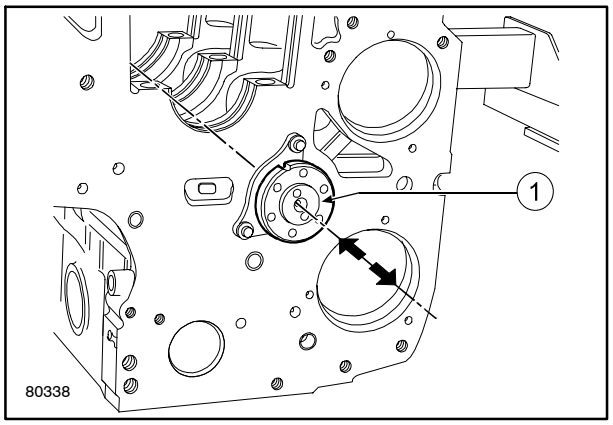
53

86. Position the plate (1) retaining the camshaft (3) with the slot facing towards the top of the crankcase and the punchmark facing the operator. Tighten the screws (2) to the prescribed torque.



54

87. Check the end float of the camshaft (1); it must be 0.23 ± 0.13 mm (0.0091 ± 0.0051 in.).



55

Main Bearing Assembly

⚠ CAUTION ⚠

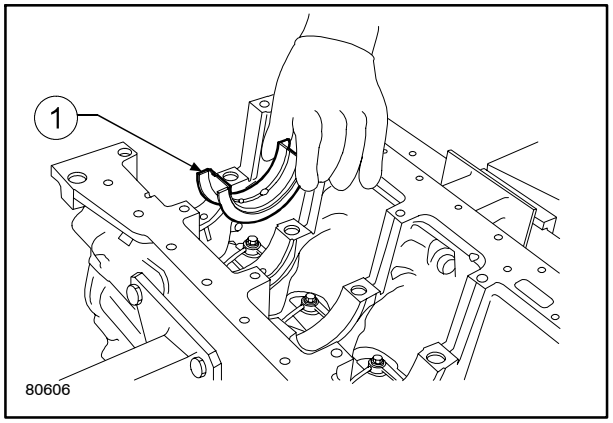
If you have not found it necessary to change the main bearings, you must fit them back on in exactly the same order and positions found upon disassembly.

NOTE: *The main bearings (1) are supplied with spare parts with an undersized inside diameter of 0.250 – 0.500 mm (0.0098 - 0.0197 in.).*

⚠ CAUTION ⚠

Do not modify the bearings in any way.

Carefully clean the main half bearings (1) with a lubrication hole and fit them into their respective seats.
The penultimate main half bearing (1) is equipped with semi-circular thrust washers.

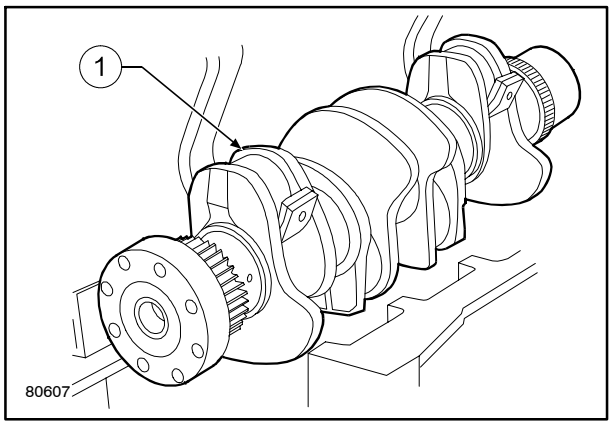


56

Crankshaft Assembly

88. Fit the crankshaft (1) in its seat.

89. Check the clearance between the main journals of the crankshaft and their respective bearings, proceeding as described in the following operations.

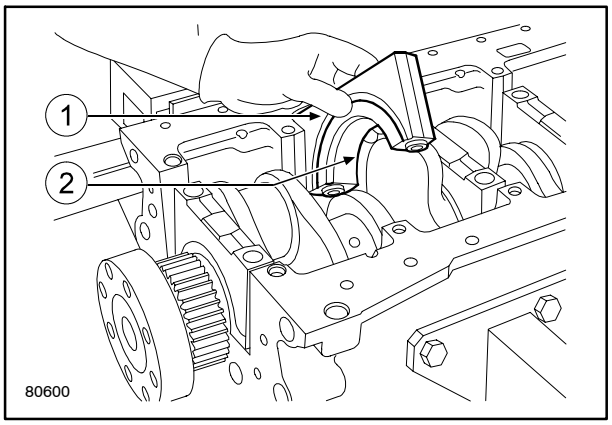


57

Main Bearing Cap Assembly

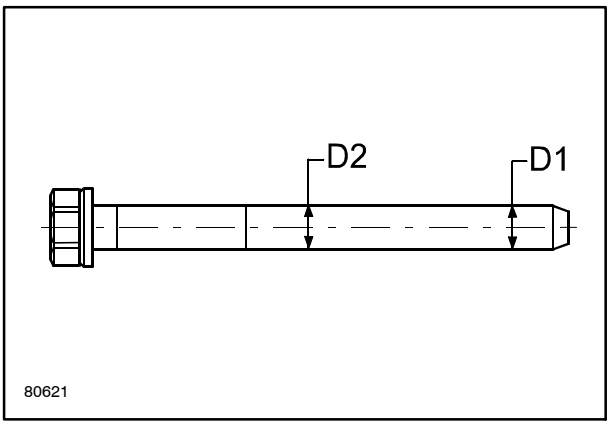
90. Make sure that all parts are perfectly clean and remove all traces of oil.
91. Fit the caps (1) complete with half bearings (2) on their supports.

NOTE: *To measure the main journal assembly clearance, refer to the CHECKS AND MEASUREMENTS section.*



58

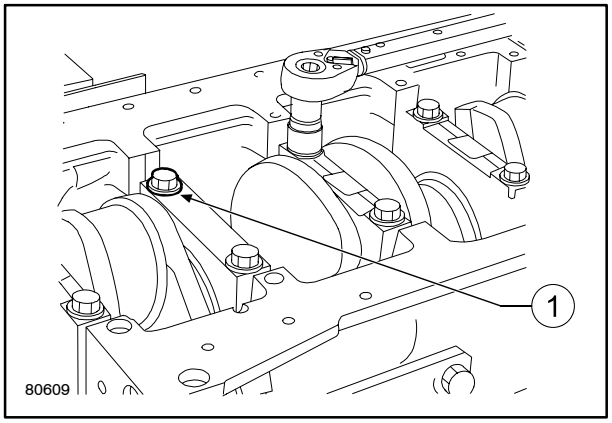
92. Before reusing the retaining bolts for the main bearing caps and connecting rods, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



59

93. Screw down the pre-lubricated screws (1) and tighten them in three successive stages.
1st stage with a torque wrench to 50 ± 6 Nm (36.8781 ± 4.4254 lb ft).
2nd stage with a torque wrench to 80 ± 6 Nm (59.0050 ± 4.4254 lb ft).
94. 3rd stage, with an angle gauge installed, further tighten the screws (1) an additional angle of 90° ± 5°.

NOTE: *Crankshaft thrust ring clearance check, see CHECKS AND MEASUREMENTS section.*



60

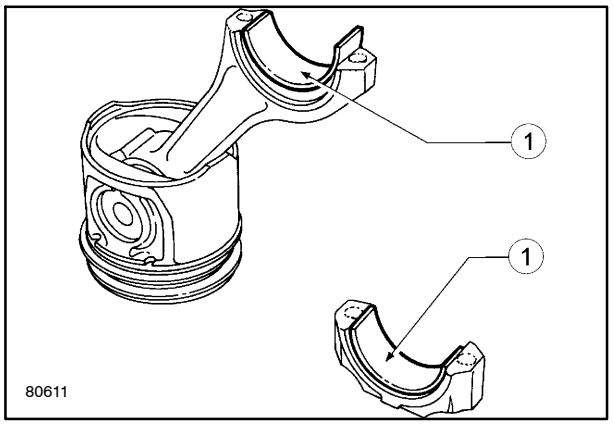
Connecting Rod and Piston Assembly

95. Fit the half bearings (1) on the connecting rod and cap.

⚠ CAUTION ⚠

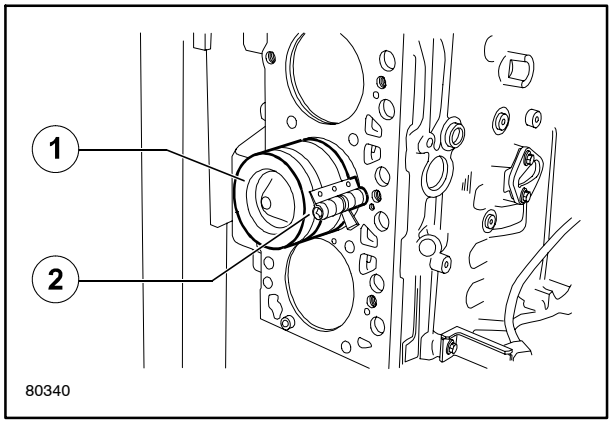
If you have not found it necessary to change the connecting rod bearings, you must fit them back on in exactly the same order and positions found upon disassembly. The rods are manufactured using a fracture breaking technique making each rod and cap unique, and having only one way of installation.

Do not modify the half bearings in any way.



61

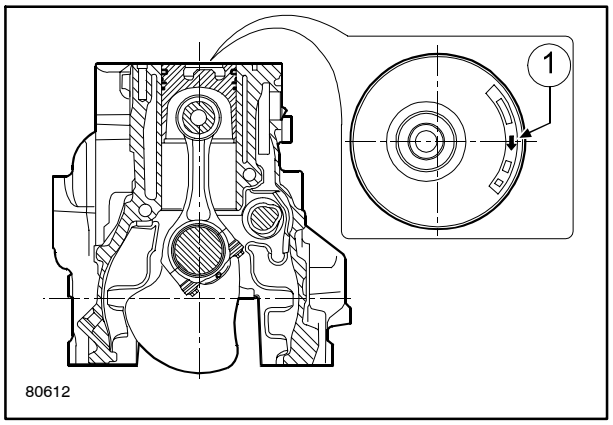
96. Lubricate the pistons well, including the piston rings and the inside of the cylinder liners.
97. With the aid of a ring clamp (2), fit the connecting rod–piston assemblies (1) in the cylinder liners, checking that the number of each connecting rod corresponds to the cap coupling number.



62

INSTALLATION OF THE CONNECTING ROD AND PISTON ASSEMBLY INTO THE CYLINDER BORE

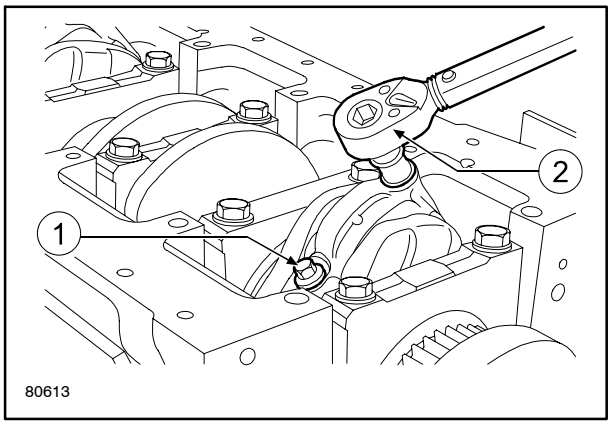
98. The openings of the piston rings must be staggered 120° apart.
99. The connecting rod/piston assemblies must all have the same weight.
100. The arrow stamped on the crown of the pistons must face the front side of the crankcase, or the recess in the piston skirt must correspond to the position of the oil nozzles.



63

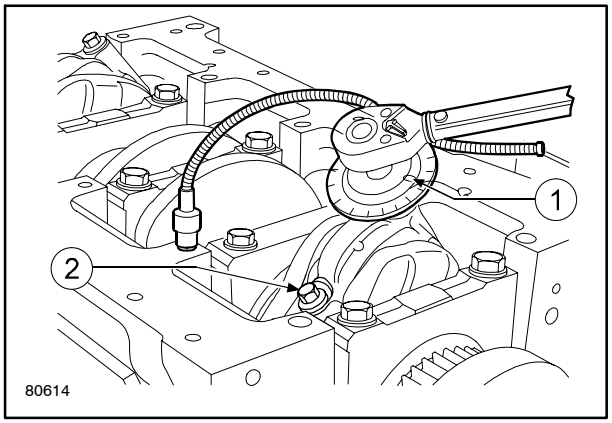
101. Tighten the screws (1) previously lubricated with engine oil to the prescribed torque with a torque wrench (2).

NOTE: *To measure the connecting rod cap assembly clearance, refer to the CHECKS AND MEASUREMENTS section.*



64

102. Fit an angle gauge (1) on the socket wrench and further tighten the bolts (2) by 60° ± 5°.



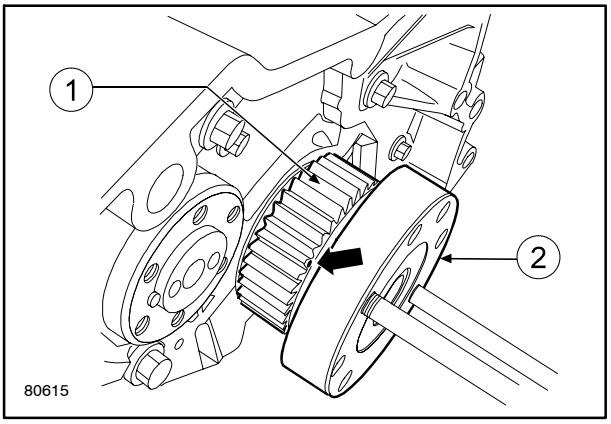
65

Timing

103. Use a marker pen to mark the tooth of the driving gear (1) mounted on the crankshaft (2) on the side of which the reference mark (→) is stamped for timing.

⚠ CAUTION ⚠

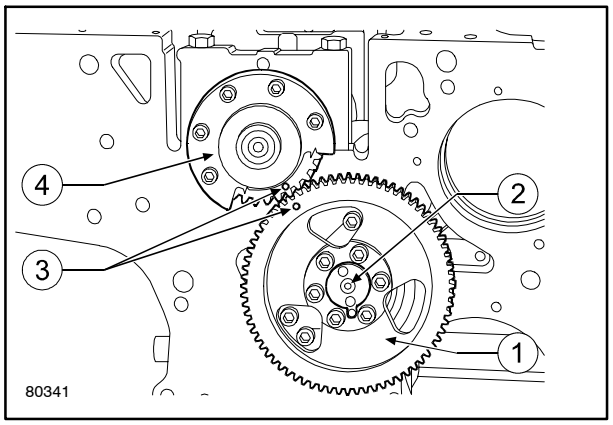
Screw in two pins to help in the operation of turning the crankshaft.



66

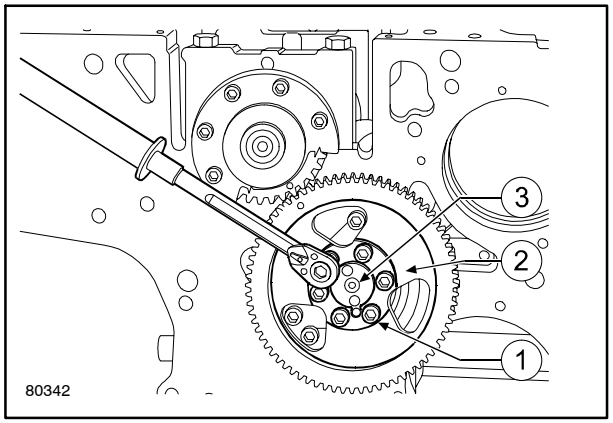
104. Rotate the crankshaft (4) and camshaft (2) so that when mounting the driven gear (1) on the camshaft, the marks stamped on the gears (3) align.

NOTE: *The electronic 4 cylinder driven camshaft gear (1), hs five (5) speed sensor cutouts.*



67

105. Screw down the bolts (1) securing the gear (2) to the camshaft (3) and tighten to the prescribed torque (36 Nm ± 4 Nm (26.5522 ± 2.9502 lb ft)).



68

DIAGRAM OF ZONE FOR APPLYING LOCTITE 5205 SEALANT ON THE GEAR COVER

106. Carefully clean the timing gear cover and the crankcase.

⚠ CAUTION ⚠

Cleaning the surface to seal is both necessary and unavoidable in order to obtain an effective seal.

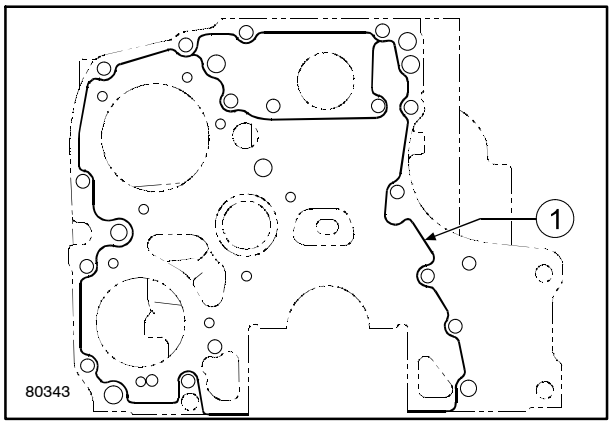
Apply **LOCTITE 5205** sealant onto the casing to form a bead (1) with a diameter of a few mm.

It must be uniform (no lumps), with no air bubbles, thin areas or breaks.

Any flaws must be corrected in as short a time as possible.

Avoid using excess material to seal the joint. Too much sealant would tend to come out on both sides of the joint and clog the lubricant passageways.

After applying the sealant, the joints require immediate assembly (10 – 20 minutes).



69

TIGHTENING SEQUENCE FOR GEAR COVER BOLTS

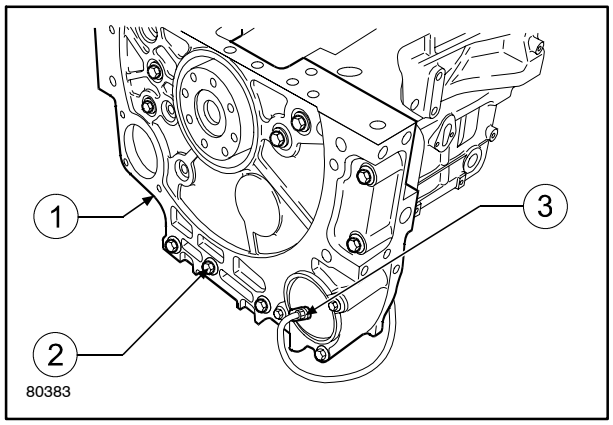
107. Refit the cover (1) to the crankcase.
108. Screw down the retaining bolts (2) in the position found during disassembly and tighten the bolts to the following torque wrench settings.

M8 bolts	20 to 28 Nm (14.7512 to 20.6517 lb ft)
M10 bolts	42 to 52 Nm (30.9776 to 38.3532 lb ft)

CAUTION

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.

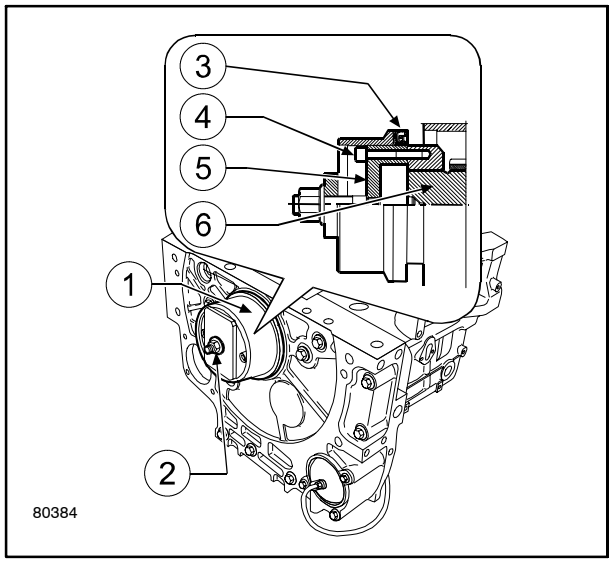
109. Refit the phase sensor (3) of the high-pressure pump.



70

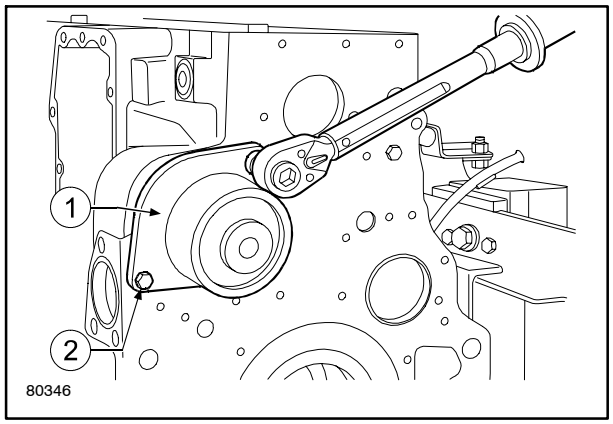
Crankshaft Seals and Covers

110. Fit part (5) of tool **380000666** on the rear tang (6) of the crankshaft. Secure it with the screws (4) and spline the new seal (3) onto it.
111. Position part (1) on part (5), screw down the nut (2) until the seal (3) is completely fitted in the box.



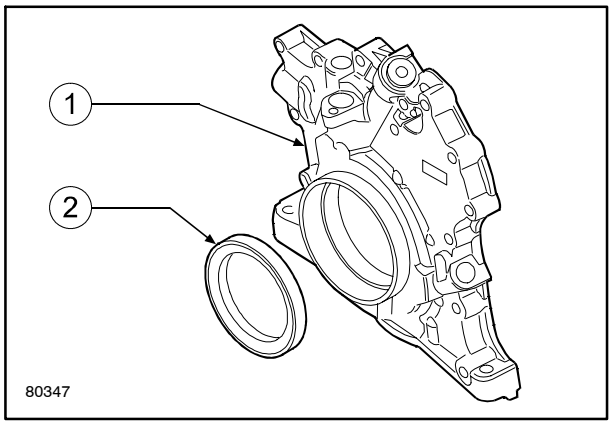
71

112. Fit a new seal onto the coolant pump.
113. Mount the coolant pump (1); screw down the bolts (2) and tighten them to the prescribed torque.



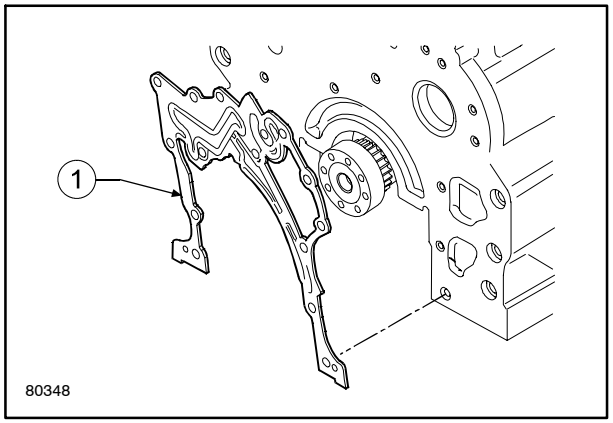
72

114. Remove the seal (2) from the front cover (1). Carefully clean the mating surface.



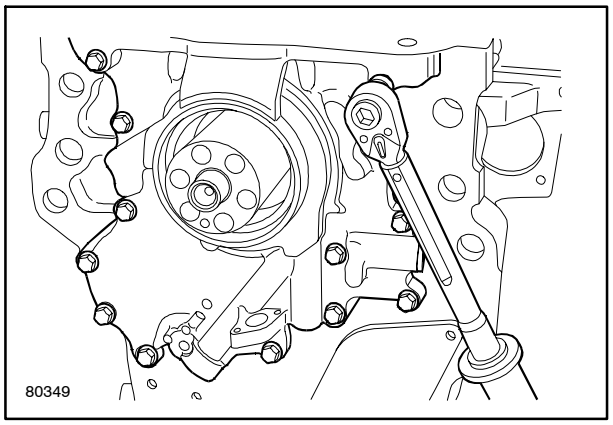
73

115. Carefully clean the contact surface on the engine block and position the gasket (1) on the crankcase.



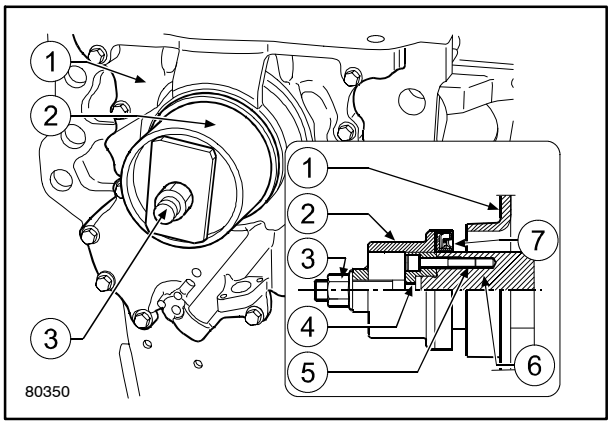
74

116. Mount the oil pump (2) on the engine block and screw down the bolts, tightening them to the prescribed torque.



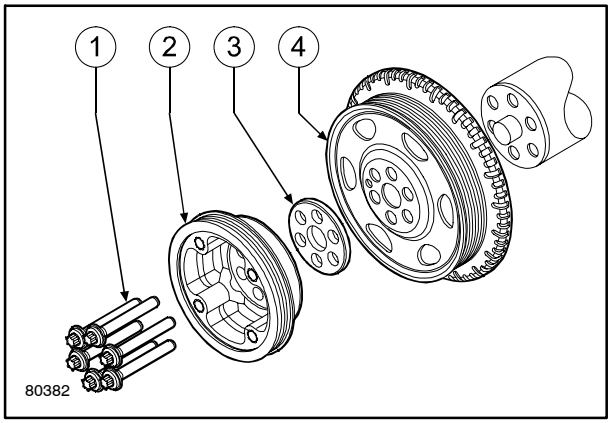
75

117. Fit part (4) of tool **380000666** on the front tang (6) of the crankshaft. Secure it with the screws (5) and spline the new seal (7) onto it.
118. Position part (2) on part (4), screw down the nut (3) until the seal (7) is completely fitted in the front cover (1).



76

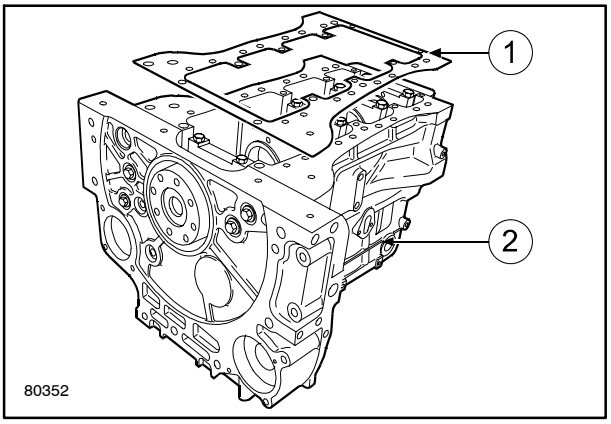
119. Spline the pulley (4), spacer (3) and pulley (2) onto the crankshaft.
120. Screw down the bolts (1) and tighten them to a torque of 50 ± 5 Nm (36.8781 ± 3.6878 lb ft).
121. Mount a new seal on the speed sensor.
122. Mount the speed sensor in the front cover and tighten the retaining bolt to the prescribed torque.



77

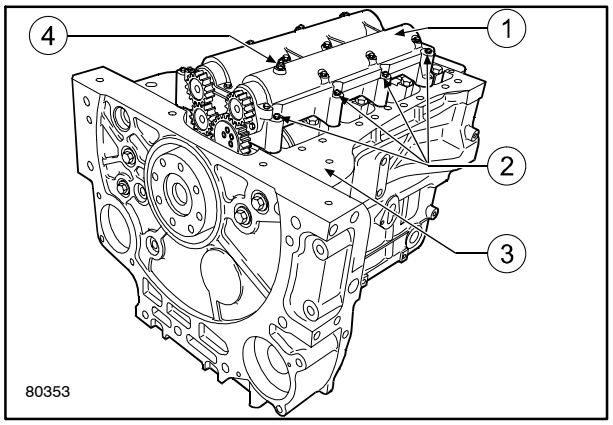
Rotating Counter Weights

123. Place the new gasket (1) on the crankcase (2).

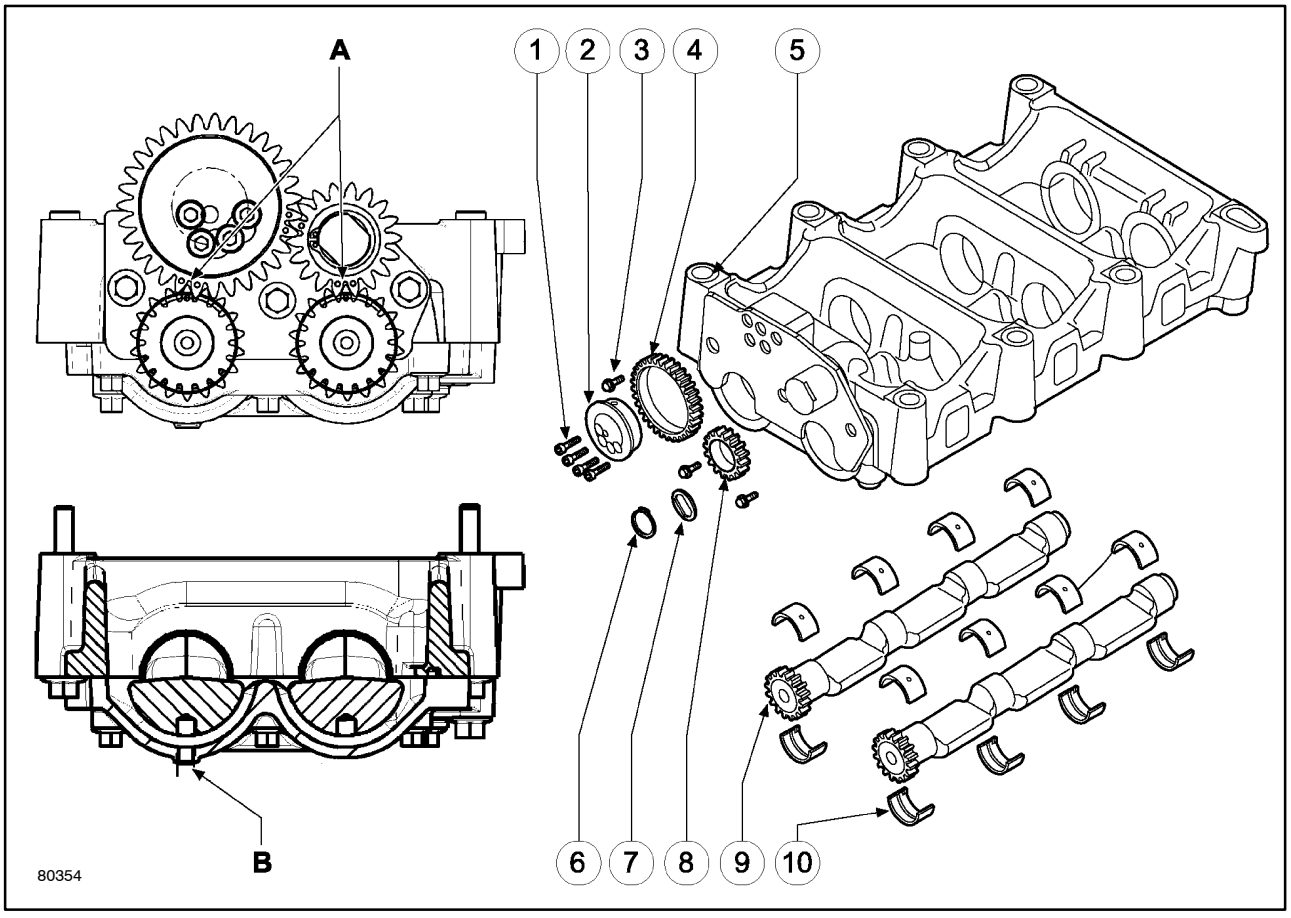


78

124. Mount the counterweights (1) and screw down the bolts (2) on the crankcase (3).
125. Check that the first cylinder is at T.D.C. and remove the additional counterweight locking pin (4).



79



80

Additional counterweight timing operations

126. Make the marks (A) stamped on the gears for doing the timing coincide. Insert the pin into the hole (B) in the balancing weight.

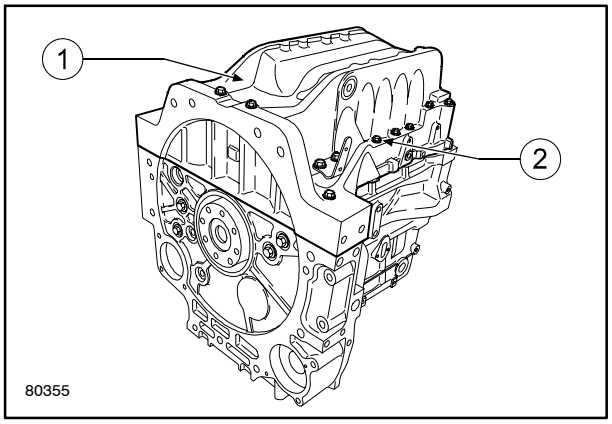
1. Retaining bolts - 2. Support - 3. Retaining bolts - 4. Gear - 5. Balancing weight - 6. O-Ring - 7. Ring - 8. Gear - 9. Counter-shaft - 10. Half bearings

Sump

127. Mount the oil sump (1), screw down the bolts (2) and tighten them to the prescribed torque.

⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



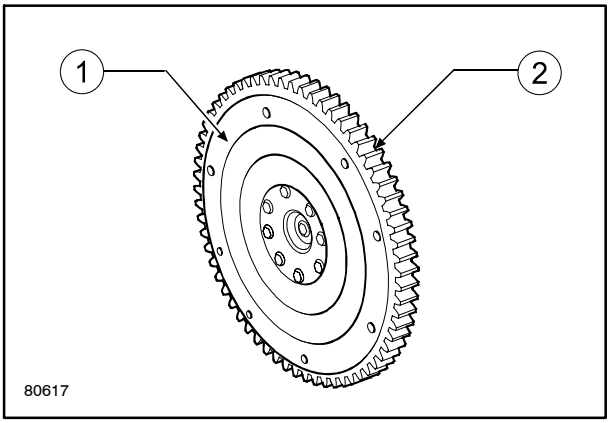
81

Flywheel

⚠ CAUTION ⚠

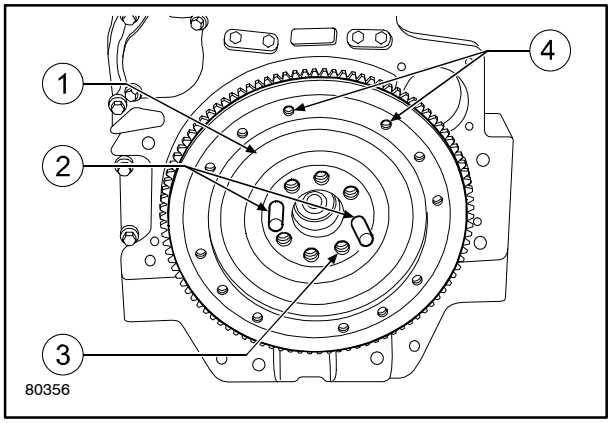
When coupling the engine with mechanical gearboxes with a clutch, check the state of the surface of the flywheel and if necessary machine them to keep a nominal thickness of the engine flywheel of 49.6 ± 0.13 mm (1.9528 ± 0.0051 in.).

128. Check the condition of the teeth of the ring gear (2). If you find any breakage or excessively worn teeth, remove it from the engine flywheel (1) with a general drift and mount the new one, previously heated to a temperature of 150 °C (302 °F) for 15 to 20 min.; the bevel, made on the inside diameter of the ring gear, must face the engine side of the flywheel.



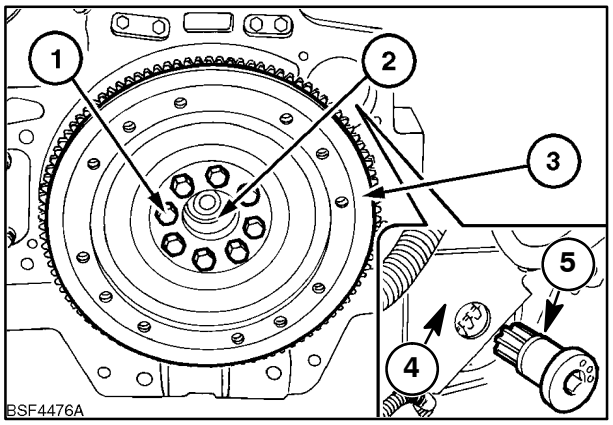
82

129. Screw two hooks or eyebolts onto the flywheel (1) using the holes (4).
130. With the aid of a lift, operate to bring the flywheel near its seat in the flywheel housing.
131. Screw two pins (2) of the appropriate length into the holes in the shaft (3) and, using them as a guide, mount the engine flywheel (1) suitably housing it in the flywheel housing.



83

132. Screw down the bolts (1) securing the engine flywheel (3) to the crankshaft. Fit the tool, **380000988** (4), and **380000732** (5) to lock rotation of the engine flywheel.

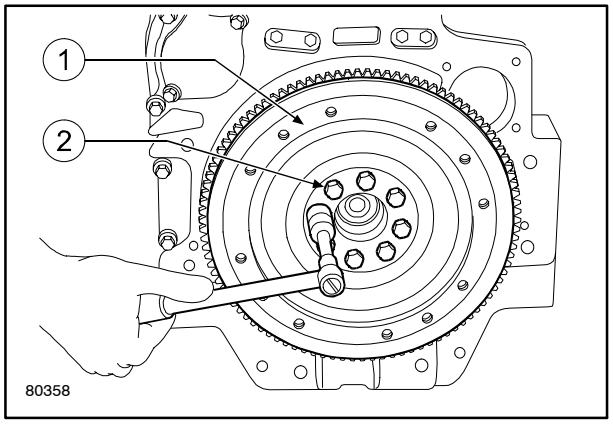


84

133. Tighten the bolts (2) retaining the engine flywheel (1) to the correct specification.

⚠ CAUTION ⚠

Use a suitable angle gauge to perform fnal tightening. Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



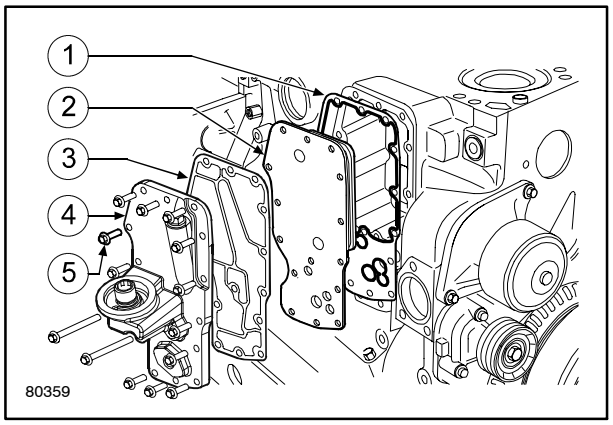
85

Oil Filter/Cooler

134. Fit onto the cylinder block: a new gasket (1), the cooler (2), a new gasket (3) and the oil filter mounting (4).
135. Screw down the bolts (5) and tighten them to the prescribed torque.

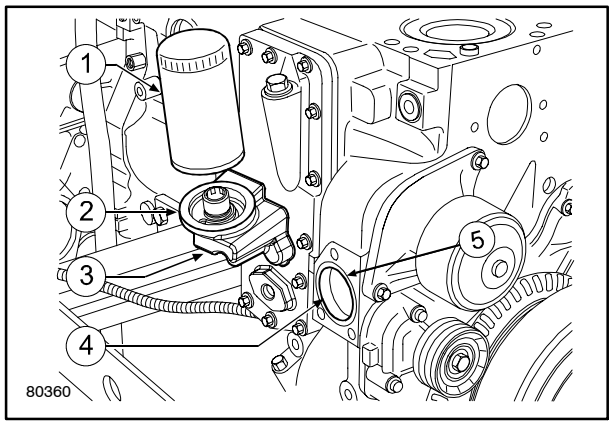
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



86

136. Lubricate the seal (2) with engine oil and position it on the mounting (3).
137. Manually screw the oil filter (1) onto the mounting (3) to the bottom and screw the oil filter (1) by another 3/4 of a turn.
138. Fit a new seal onto the oil temperature/pressure sensor (4) and mount it on the support (3) tightening the retaining bolts to the prescribed torque.
139. Position a new seal (5) in the crankcase seat.



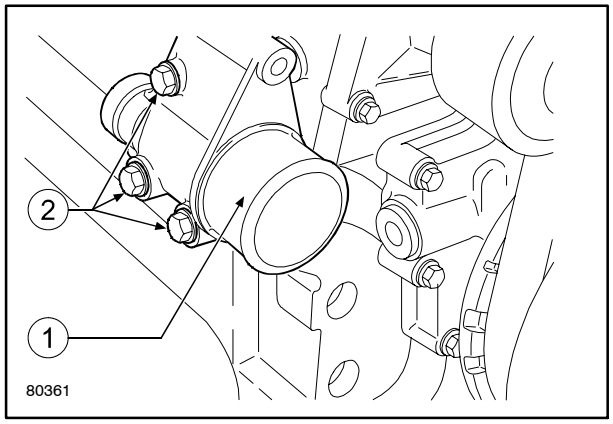
87

Crankcase - External Components

140. Mount the pipe fitting (1) and tighten the screws (2) to the prescribed torque.

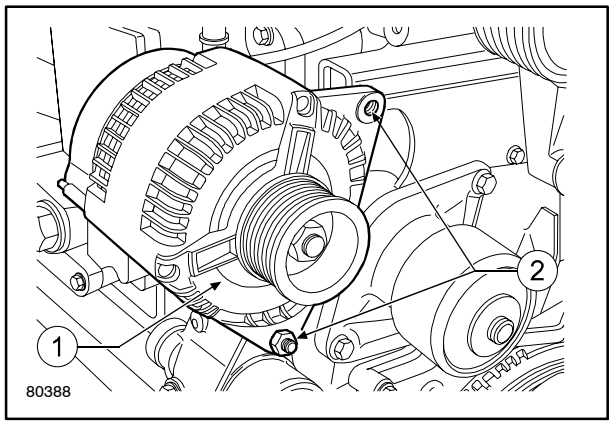
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



88

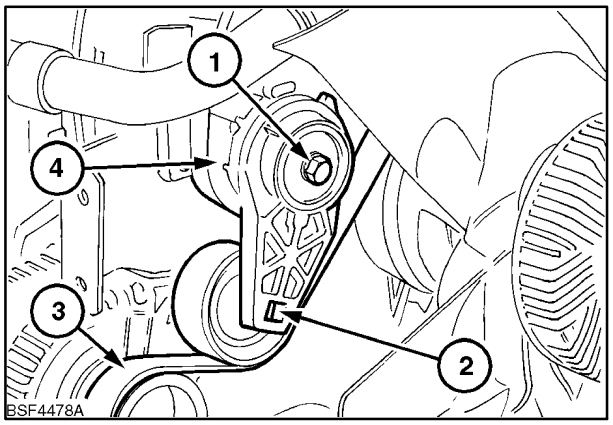
141. Fit the alternator (1) back on.
142. Screw down the bolt (2) and tighten it to the prescribed torque.



89

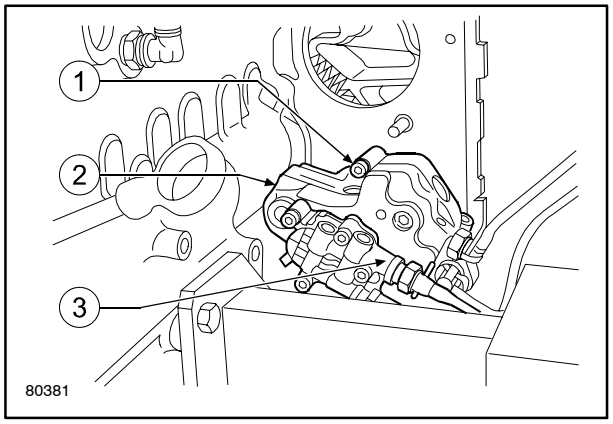
143. Fit the automatic tightener (4) back on. Screw down the bolt (1) and tighten it to the prescribed torque.

144. Turn the automatic tightener (2) to allow the installation of the belt (3) onto the pulleys and guide rollers.



90

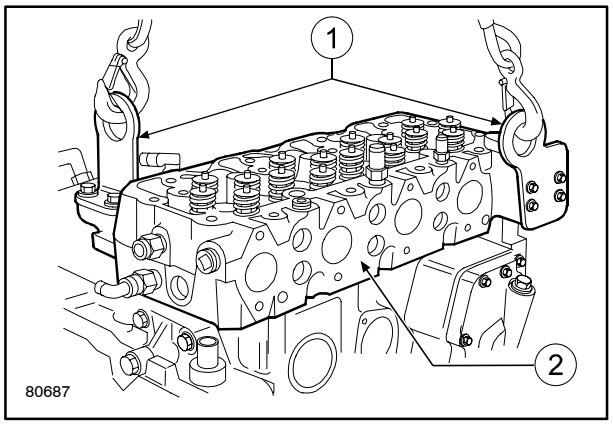
145. Refit the high-pressure pump (2) together with the feed pump (3) and tighten the nuts (1) to the prescribed torque.



91

Cylinder Head/Fuel System

146. Position a new gasket onto the cylinder block and place the cylinder head (2) onto it, slung with the brackets, Tool No. **380001073** (1).

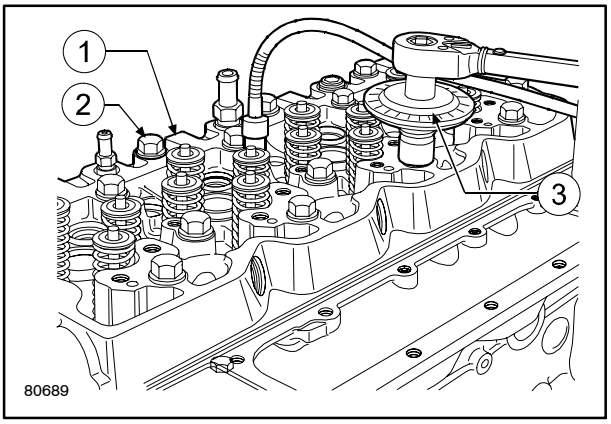


92

147. Mount the cylinder head (1), screw down the bolts (2) and tighten them in three successive stages, following the sequence and methods indicated below, (Fig. 95) in the following figure. Use a suitable angle gauge to perform the final tightening.

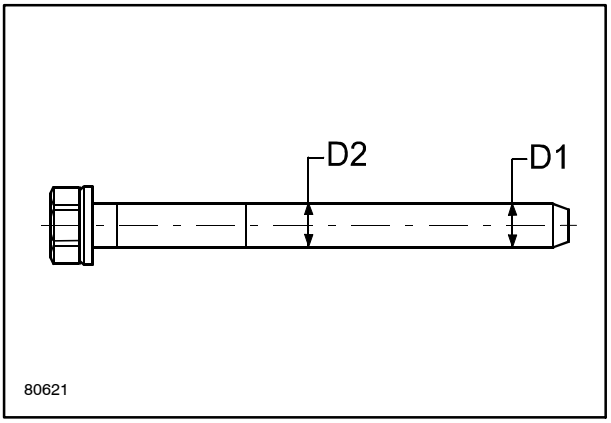
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



93

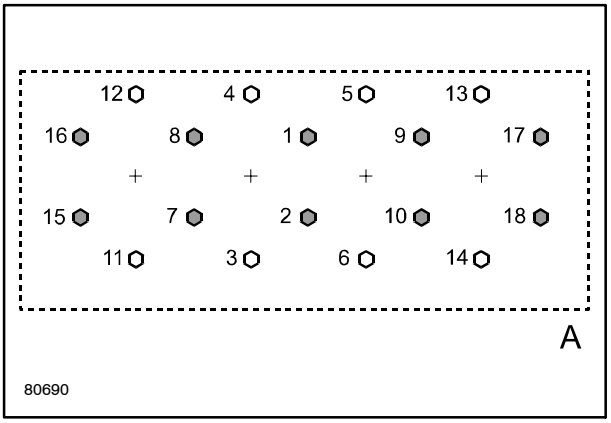
148. Insert the tappet rods and the rocker arm assembly. Before reusing the retaining bolts, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



94

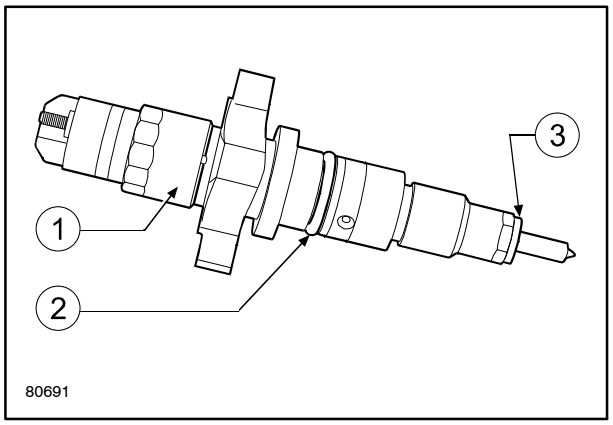
149. Tightening sequence for cylinder head bolts:
- 1st stage pre-tightening with a torque wrench:
  - Bolt 12x1.75x130 (⬢) 35 ± 5 Nm (25.8147 ± 3.6878 lb ft)
  - Bolt 12x1.75 x 150 (⬡) 55 ± 5 Nm (25.8147 ± 3.6878 lb ft

  A = Front side
- 2nd stage, angle closed 90° ± 5°
- 3rd stage, angle closed 90° ± 5°



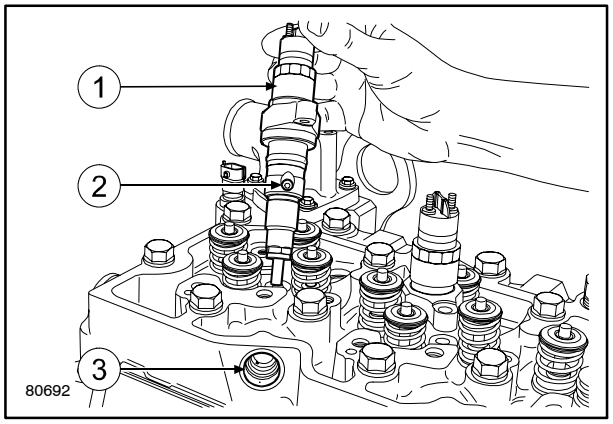
95

150. On the electro-injector (1), mount a new seal (2) lubricated with Vaseline and a new washer (3).



96

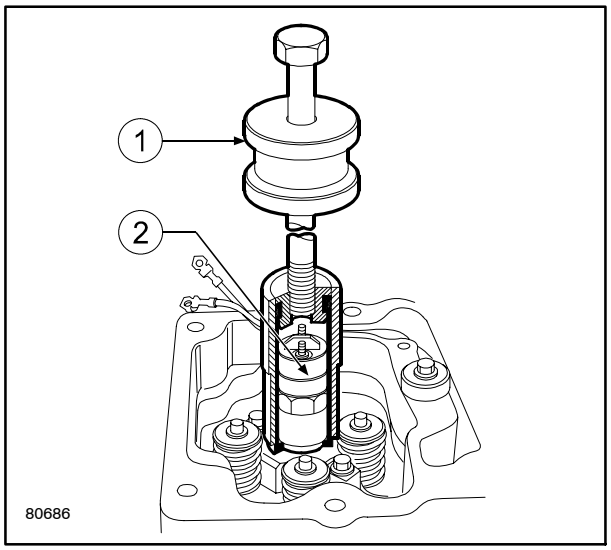
151. Fit the electro-injectors (1) in the seats on the cylinder head, directed so that the fuel inlet orifice (2) faces the fuel manifold seat side (3).



97

152. Using tool **380001099** (1), settle the electro-injector (2) in its seat.

Screw down the electro-injector retaining bolts without tightening them.



98

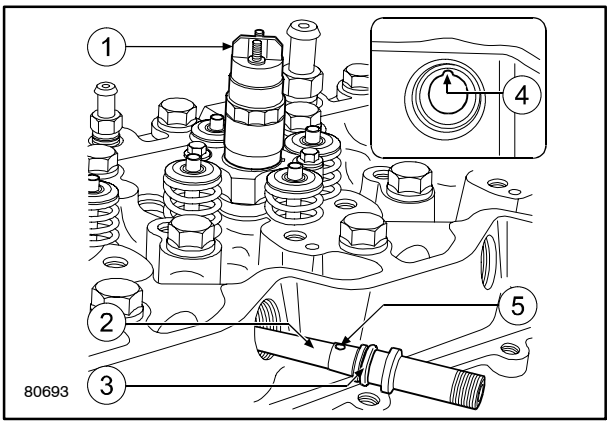
153. Mount a new seal (3). lubricated with petroleum jelly, on the fuel manifold (2) and insert it into the cylinder head seat so that the positioning ball (5) coincides with the relevant housing (4).

⚠ CAUTION ⚠

Once removed, the fuel manifolds (2) must not be re-used; they must be replaced with new ones.

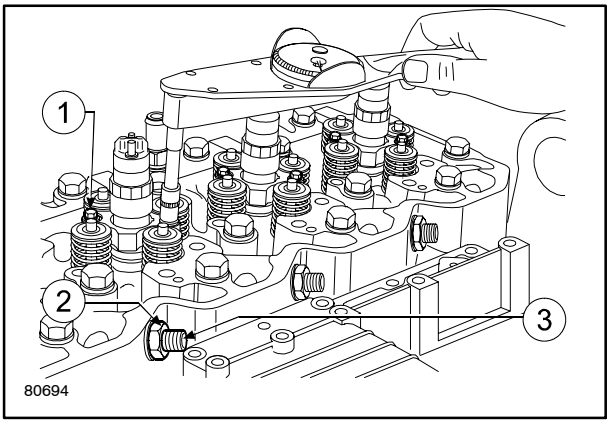
⚠ CAUTION ⚠

During this operation, manoeuvre the electro-injector (1) so that its fuel inlet orifice (2, Figure 97) correctly receives the manifold (2, Figure 99).



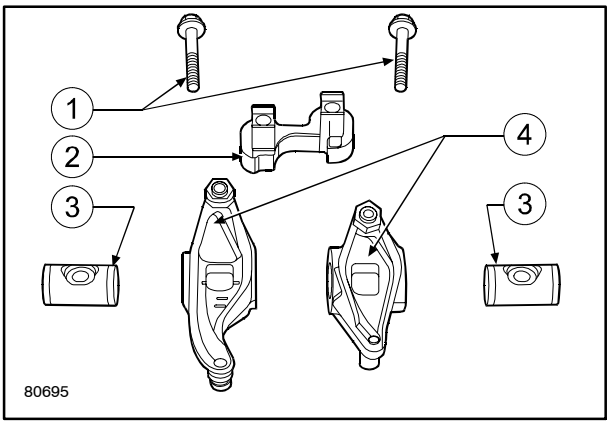
99

154. Screw down the retaining nuts (2) without locking them.
155. Using a torque wrench, gradually and alternately tighten the electro-injector retaining bolts (1) to a torque of 8.5 ± 0.8 Nm (0.59 lb ft).
156. Tighten the fuel manifold (3) retaining nuts (2) to a torque of 50 Nm (36.8781 lb ft).
157. Mount the rocker arm assembly after checking the parts.



100

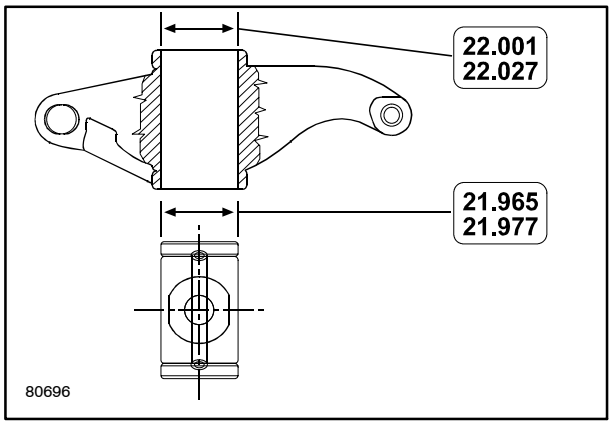
COMPONENT PARTS OF THE ROCKER ARM ASSEMBLY:
1. Bolts - 2. Support - 3. Spindles - 4. Rocker arms.



101

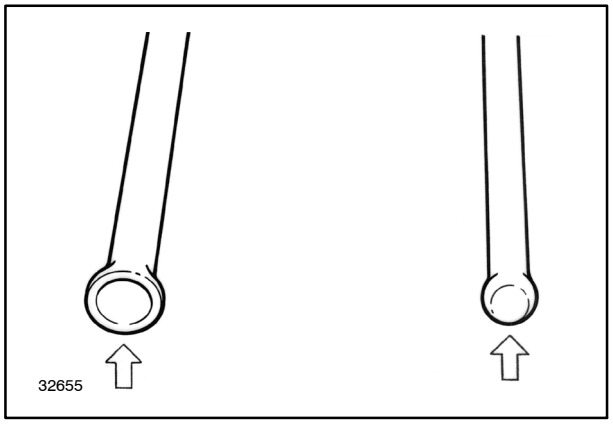
SPINDLE-ROCKER ARM DATA

158. Check that the spindle/rocker arm coupling surfaces are neither too worn nor damaged.



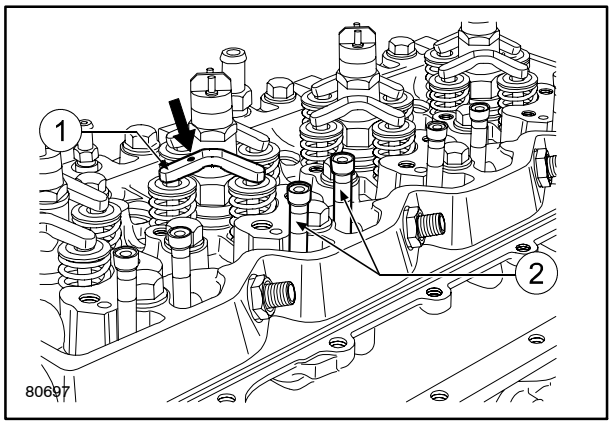
102

159. Before assembly, check the rocker-arm control rods: they must have no deformation; there should be no signs of seizure or wear on the contact surfaces on the ball seats, rocker arm adjuster screw and tappets (arrows); if there are, then change them. The intake and exhaust valve control rods are identical and can therefore be interchanged.



103

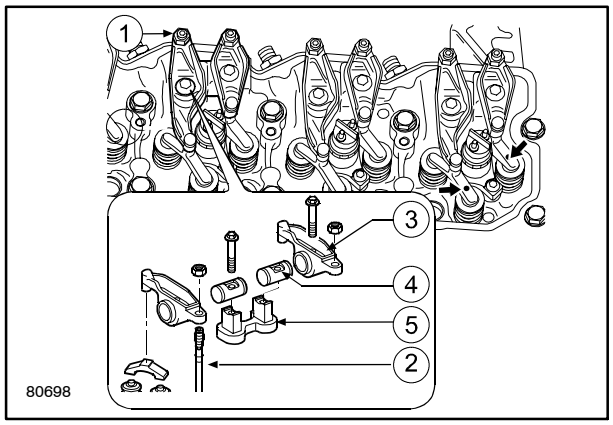
160. Fit the rods (2).
161. Position the bridges (1) on the valves with the reference marks (→) facing the exhaust manifold.



104

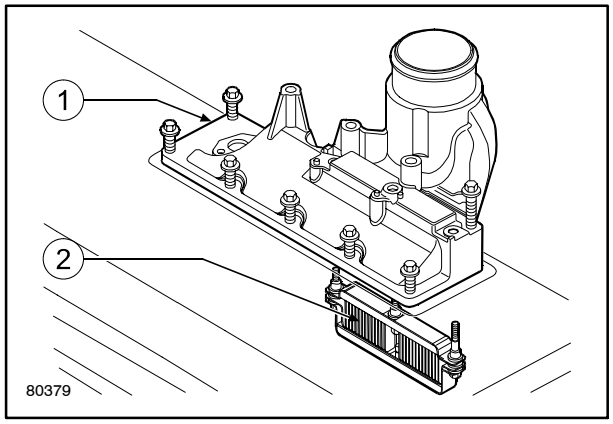
162. Check that the tappet adjusters (1) are unscrewed to prevent them from sticking on the rods when fitting the rocker arm assembly.
163. Then mount the rocker arm assemblies comprising the support (5), rocker arms (3) and spindles (4) and secure them to the cylinder head, tightening the retaining bolts to a torque of 36 Nm (26.5522 lb ft).

NOTE: *Adjust the clearance between the rocker arms and valves. See under "Cylinder Head I Overhaul".*



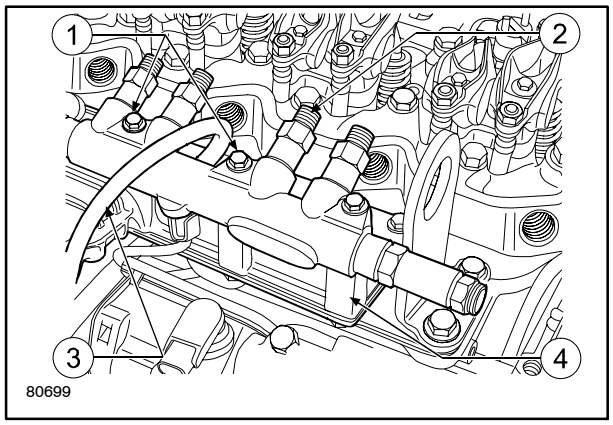
105

164. Apply a sufficient layer of **LOCTITE 5999** onto the mating surface of the intake manifold (1) complete with heater (2) and tighten the screws to the prescribed torque.
165. Install the sensor with a new gasket.



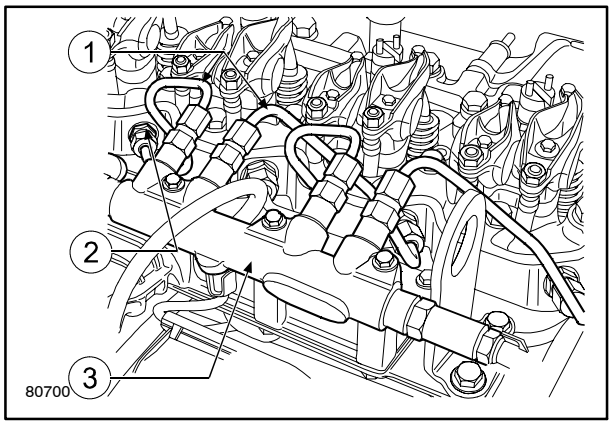
106

166. Mount the rail (2) and tighten the retaining bolts (1) to the prescribed torque. Connect the ground cable (3) to the intake manifold (4) tightening the retaining nut to the prescribed torque.



107

167. Connect new fuel pipes (1) to the rail (3) and to the electro-injector manifolds (2).

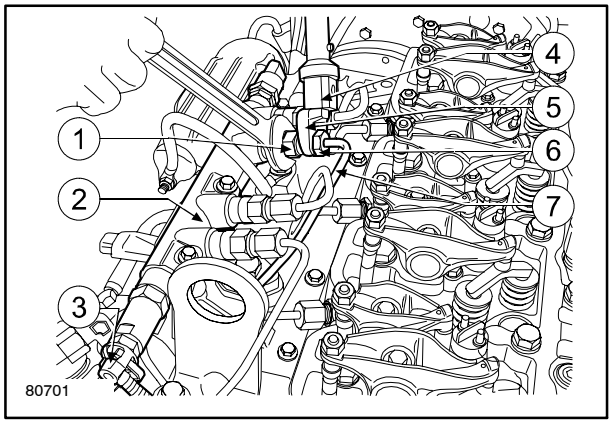


108

⚠ CAUTION ⚠

The pipe fittings (7) must be tightened to a torque of 20 Nm.
The fittings (6) must be tightened while keeping the flow limiter valves, if fitted, still with a wrench (1).

168. Connect the fuel pipe (3) to the rail (2) following the procedures described in the following figure.

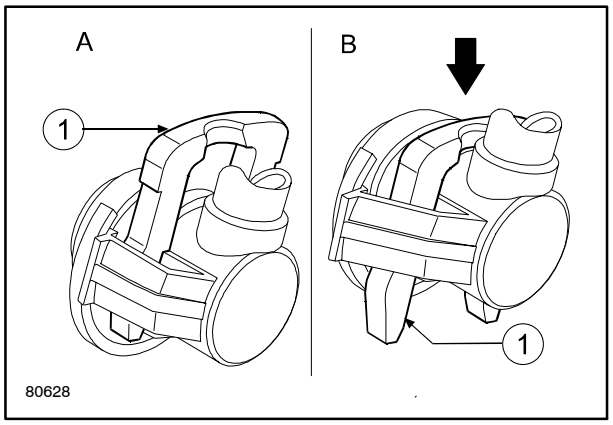


109

169. Press the clip (1) in the direction of the arrow (Figure 110, B) and connect the pipe to the rail. Bring the clip back into its initial locking position "A".

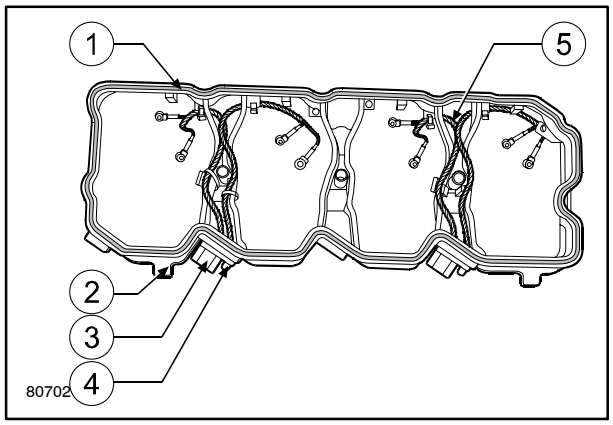
⚠ CAUTION ⚠

Make sure the fuel pipe is properly connected.



110

170. Check the condition of the electric cables (5) and change them if they are damaged, cutting the clamps fastening them to the support (2) and taking out the screws (4) securing it with the connectors (3).
171. Fit a new gasket (1) onto the support (2).

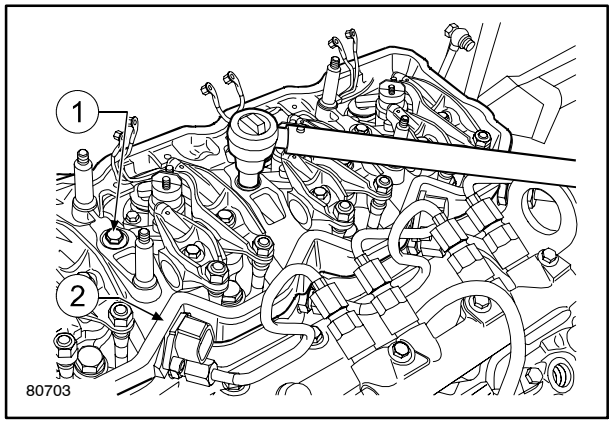


111

172. Mount the wiring support (2), screw down the bolts (1) and tighten them to the prescribed torque.

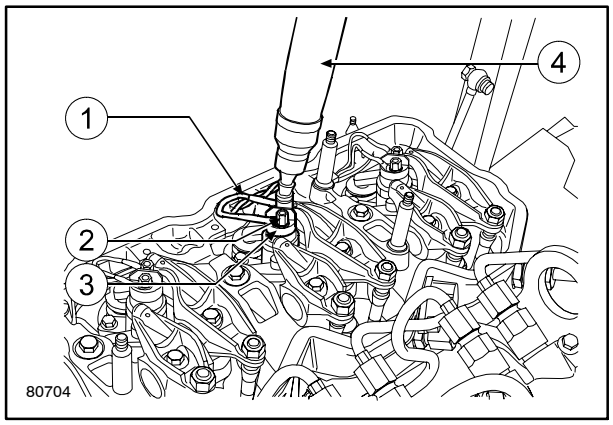
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



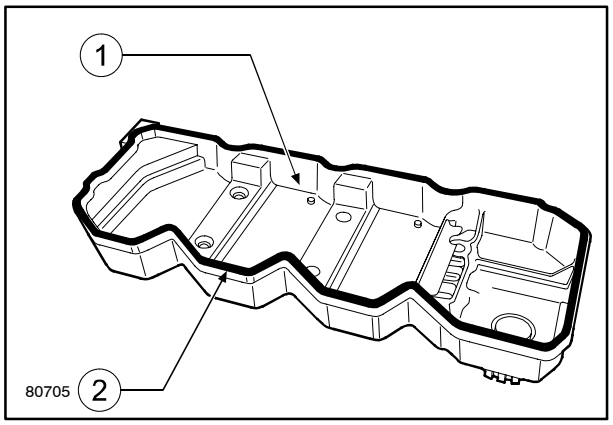
112

173. Connect the electric cables (1) to the electro-injectors (3) and, using the torque wrench **380000158** (4), tighten the retaining nuts (2), to the prescribed torque.



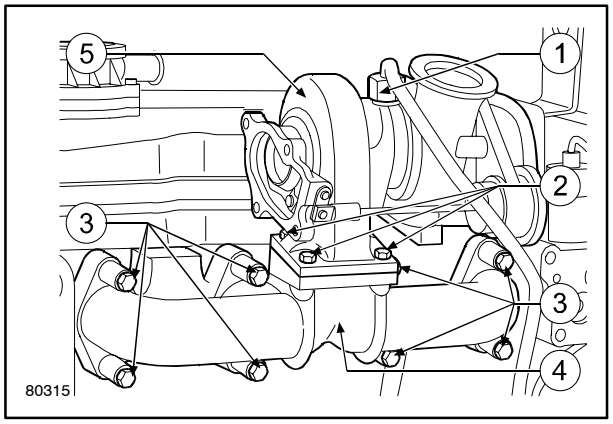
113

174. Put a new gasket (2) on the tappet cover (1).
175. Mount the tappet cover, screw on the nuts and tighten them to the prescribed torque.



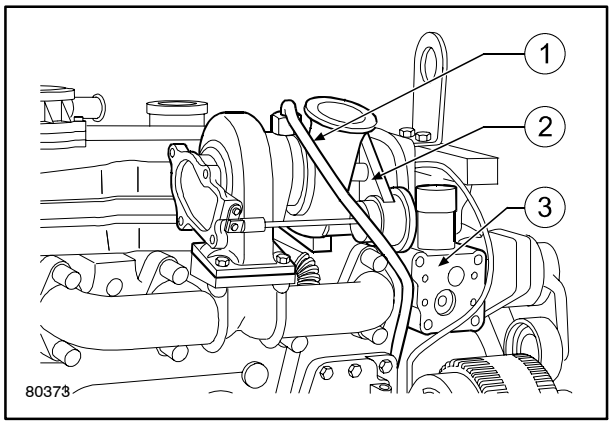
114

176. Mount the exhaust manifold (4) with a new gasket, tightening the retaining bolts (3) to the prescribed torque.
177. Sling the turbocharger (5) and position it above the manifold after placing a new gasket in between. Tighten the bolts (2) to the prescribed torque.
178. Connect the oil pipe to the oil filter/cooler mounting. Secure the pipe to the fitting (1) on the turbocharger and with the retaining clamp and the screw to the crankcase.



115

179. After connecting the pipe (1) to the turbocharger (2), mount the thermostat body (3).
180. Connect the fuel return pipe to the pressure limiter (1) (Figure 18).



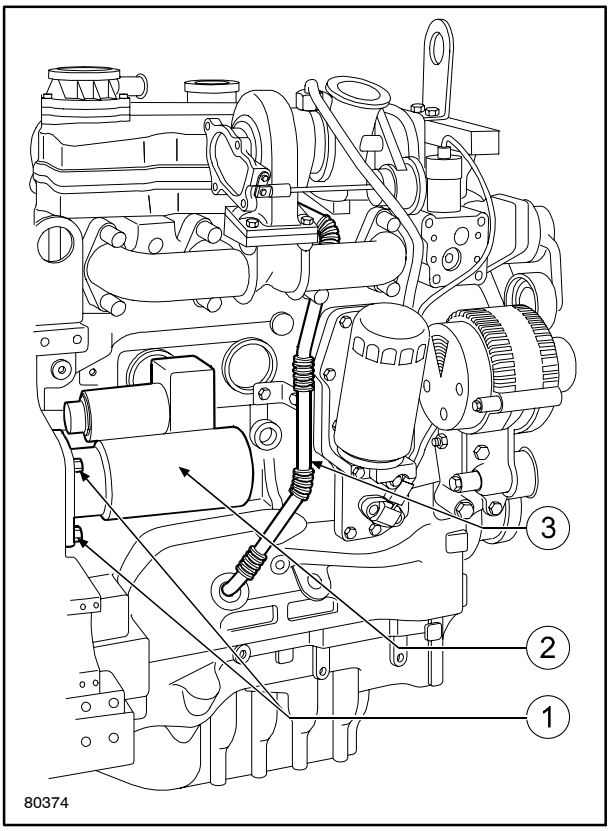
116

Completing the Engine

Suitably support the engine with the lift, free it from the rotating stand, remove the brackets **380001298** and put it onto a suitable support for completion.

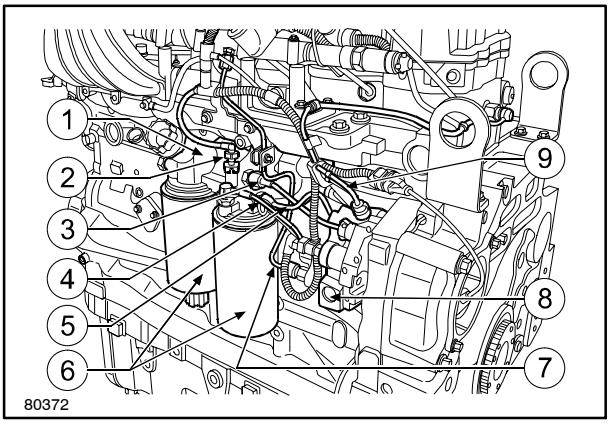
181. Fit the oil filler pipe (3).

182. Screw on the retaining bolts (1) and mount the starter motor (2) in its seat.



117

183. Mount the bracket and the support (1) for the fuel filter (6).
184. Then connect the pipes (9, 3, 4 and 5 in sequence) of the support (1) to the high-pressure pump (8).
185. Connect the pipe (7) from the high-pressure pump to the rail choke tube.

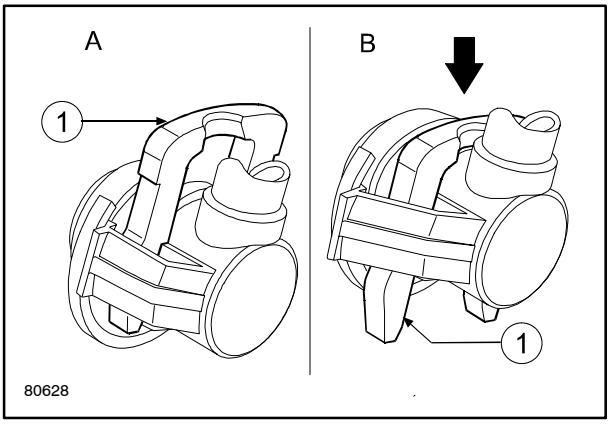


118

186. All the fuel pipes are secured with the clips illustrated in the figure.
187. To connect the pipes, press the clip (1) in the direction of the arrow (Figure 119, B) and connect the pipe to the socket on the high-pressure pump or to the fuel filter mounting.
188. Move the clip back into its initial locking position "A".

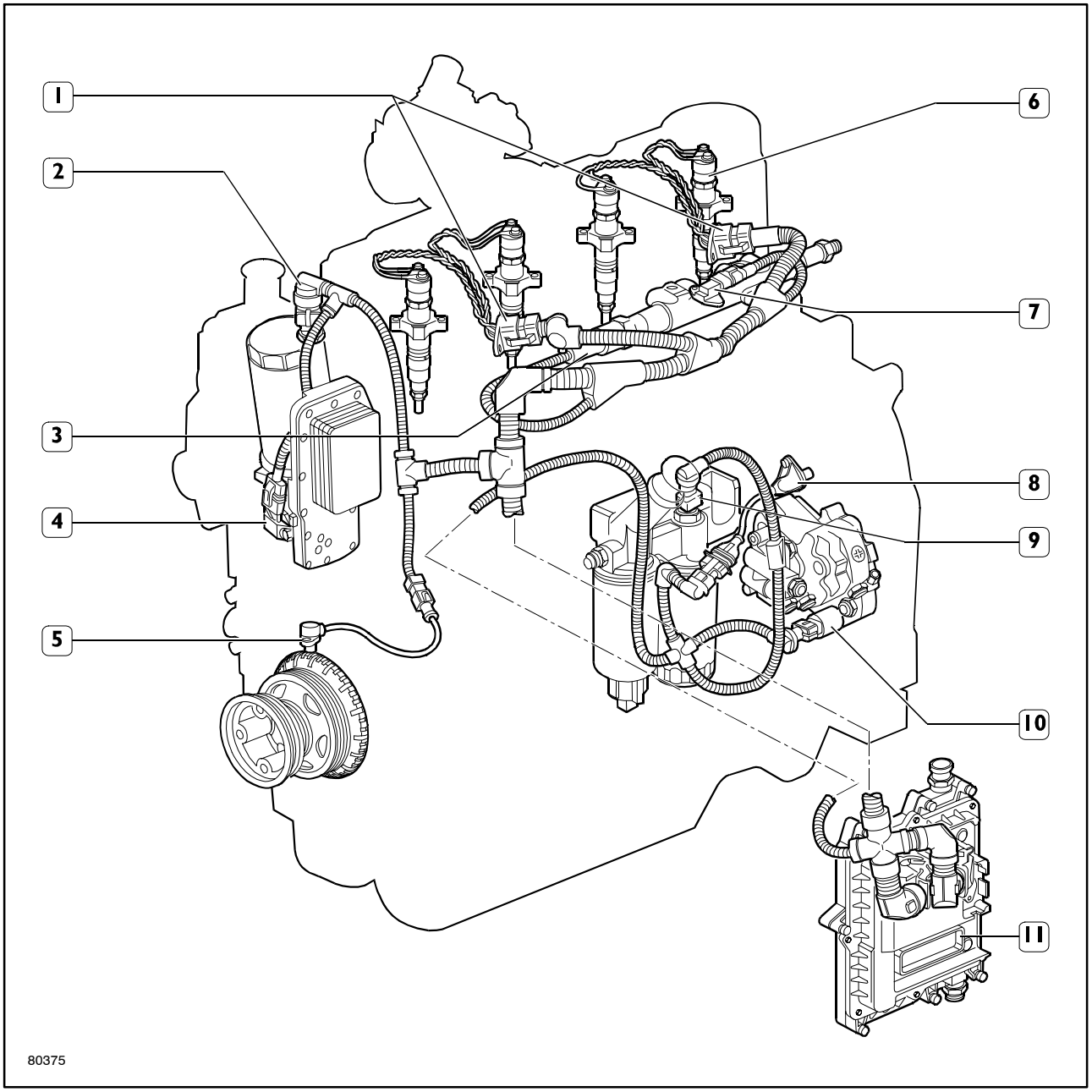
⚠ CAUTION ⚠

If reused, the pipes must have their ends closed with plugs.
Make sure the fuel pipe is properly connected.



119

189. Mount the engine wiring.



120

Application components

1. Connection for electro-injectors - 2. Engine coolant temperature sensor - 3.Fuel pressure sensor cable - 4. Engine oil pressure and temperature sensor - 5. Crankshaft sensor - 6. Electro-injector - 7. Air pressure temperature sensor - 8. Timing system phase sensor - 9. Fuel temperature sensor- 10. Pressure regulator wiring - 11. EDC7C control unit

CHECKS, DIMENSIONS AND REPAIRS

CYLINDER BLOCK

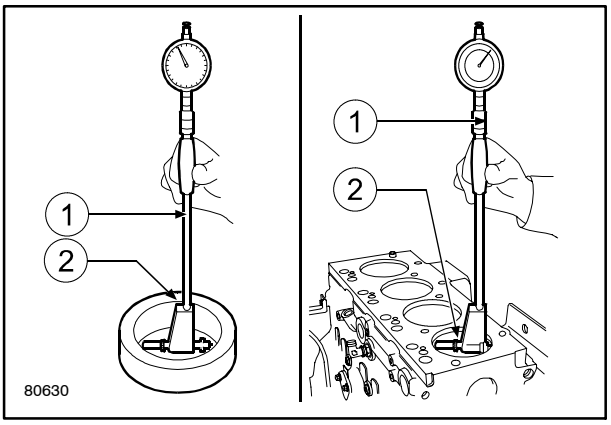
⚠ CAUTION ⚠

After disassembling the engine, thoroughly clean the cylinder-crankcase assembly. Use the appropriate rings for transporting the cylinder assembly.

Carefully check the crankcase is not cracked.

Check the condition of the plugs. If they are rusty or if there is the slightest doubt about their seal, change them.

Examine the surfaces of the cylinder liners; They should show no sign of seizure, scoring, ovality, taper or excessive wear.



121

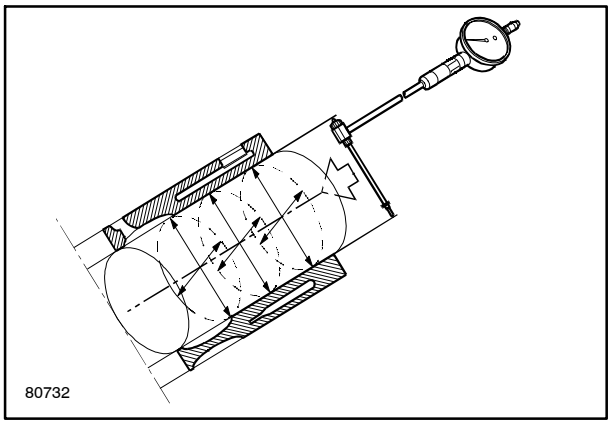
To check the internal diameter of the cylinder liners for ovality, taper and wear, use a bore gauge (1), fitted with a dial gauge zero-set on the ring gauge (2) of the diameter of the cylinder liner.

⚠ CAUTION ⚠

If the ring gauge is not available, use a micrometer.

Measurements must be taken for each single cylinder at three different heights on the liner and on two orthogonal faces: one parallel to the longitudinal axis of the engine and the other perpendicular; maximum wear is generally found on this face in correspondence with the first measurement.

If ovality, taper or general wear is noted, bore and recondition the cylinder liners. The cylinder liners must be reground in relation to the diameter of the pistons supplied as spare parts oversized by 0.5 mm (0.0197 in.) over the nominal value and to the prescribed assembly clearance.



122

CAUTION

If regrinding, all the liners must have the same oversize (0.5 mm (0.0197 in.)).

Check the main bearing seats, proceeding as follows:

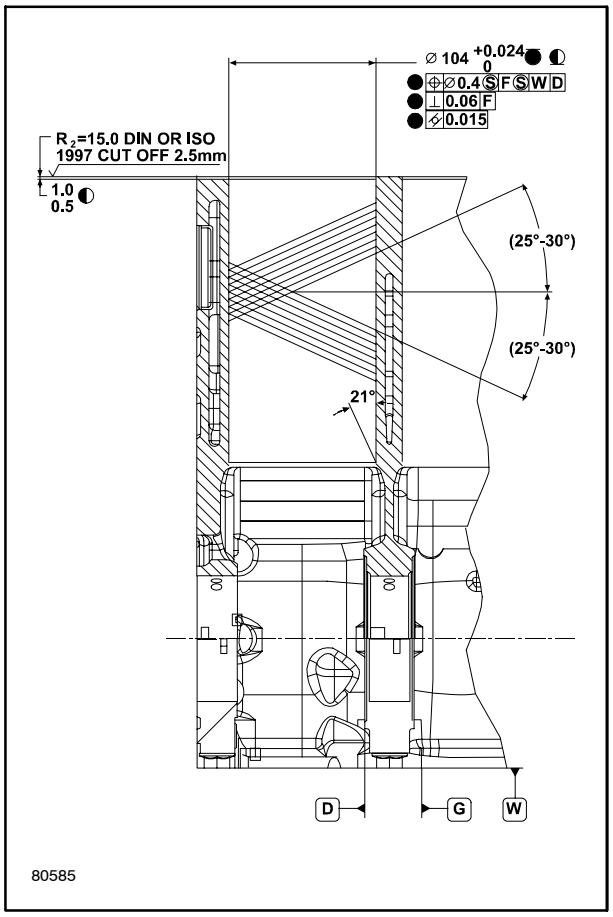
- fit the main bearing caps on the supports without bearings;
- tighten the retaining bolts to the prescribed torque;
- using an appropriate dial gauge for interiors, check that the diameter of the seats is as prescribed.

If the measurement is any greater, change the crankcase.

Cylinder Head Mating Surface Check

After having located any deformed areas, level off the mating surface using a grinding machine.

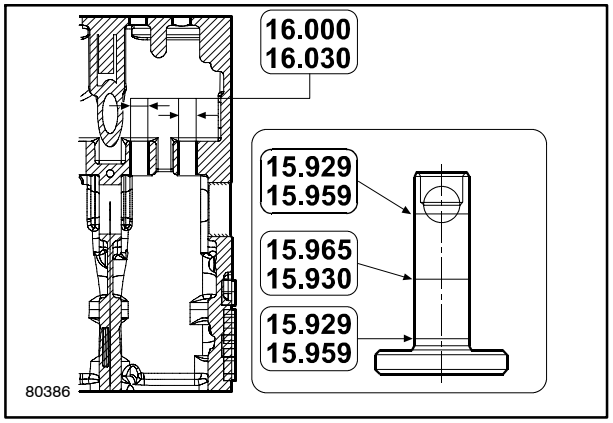
The flatness error must be no greater than 0.075 mm (0.0030 in.). Check the condition of the cylinder block plugs (1); if they are rusty or if there is the slightest doubt about their seal, change them.



123

Tappets

Tappets and bores on cylinder block data.



124

CRANKSHAFT, BEARINGS

If any sign of seizure, scoring or ovality is found on the main journals or crankpins, they must be reground. Before reconditioning the pins (2), use a micrometer (1) to measure the pins of the shaft to define the diameter to which the pins must be reduced.

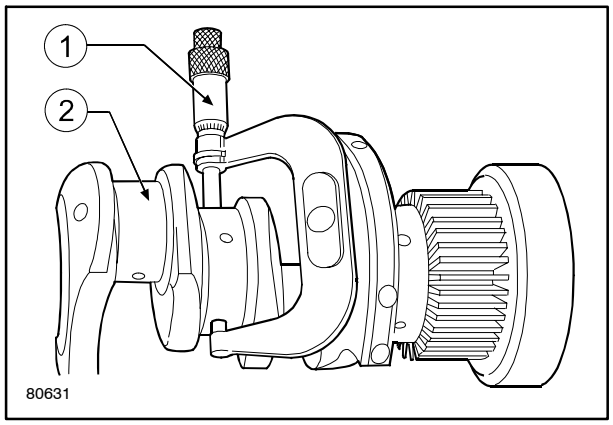
⚠ CAUTION ⚠

It is advisable to note the values on a chart.

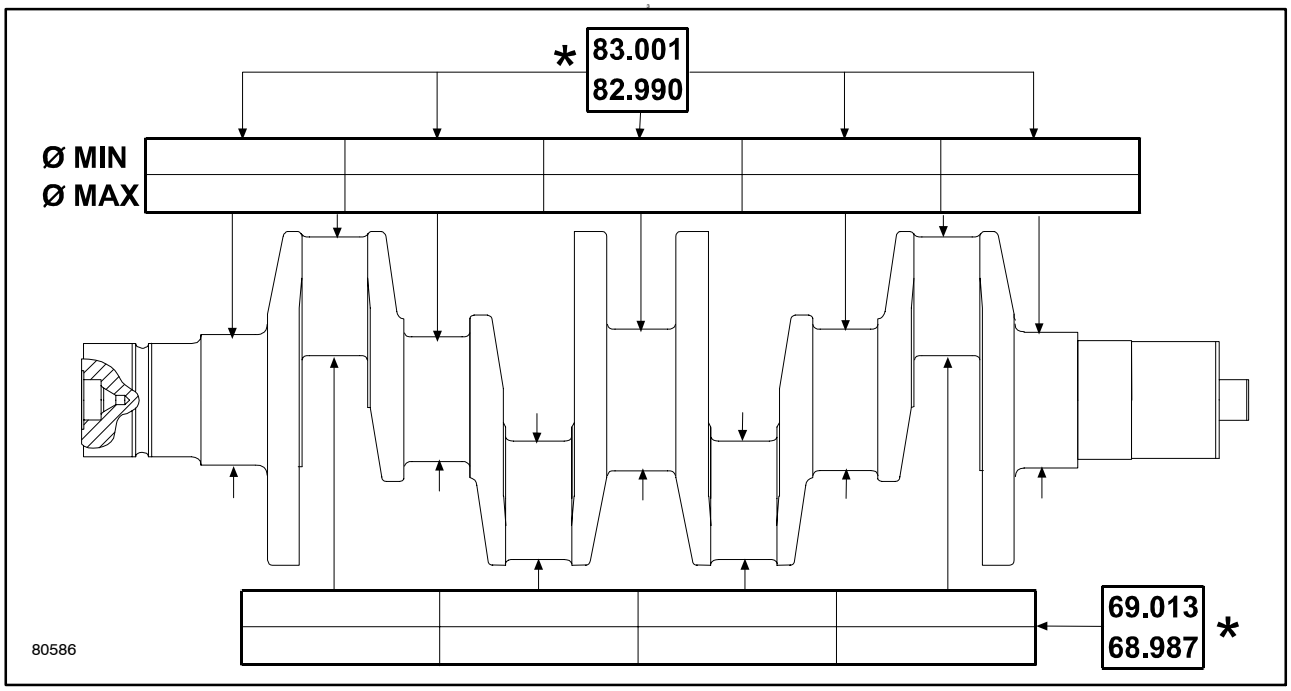
The undersize classes are: 0.250 – 0.500 mm (0.0098 - 0.0197 in.).

⚠ CAUTION ⚠

The main journals and crankpins must always be reconditioned to the same undersize class. After undersizing, mark the main journal and the crankpin with a stamp on the side of the crank No. 1.
Undersized crankpins with the letter M.
Undersized main journals with the letter B.
Undersized crankpins and main journals with the letters MB.



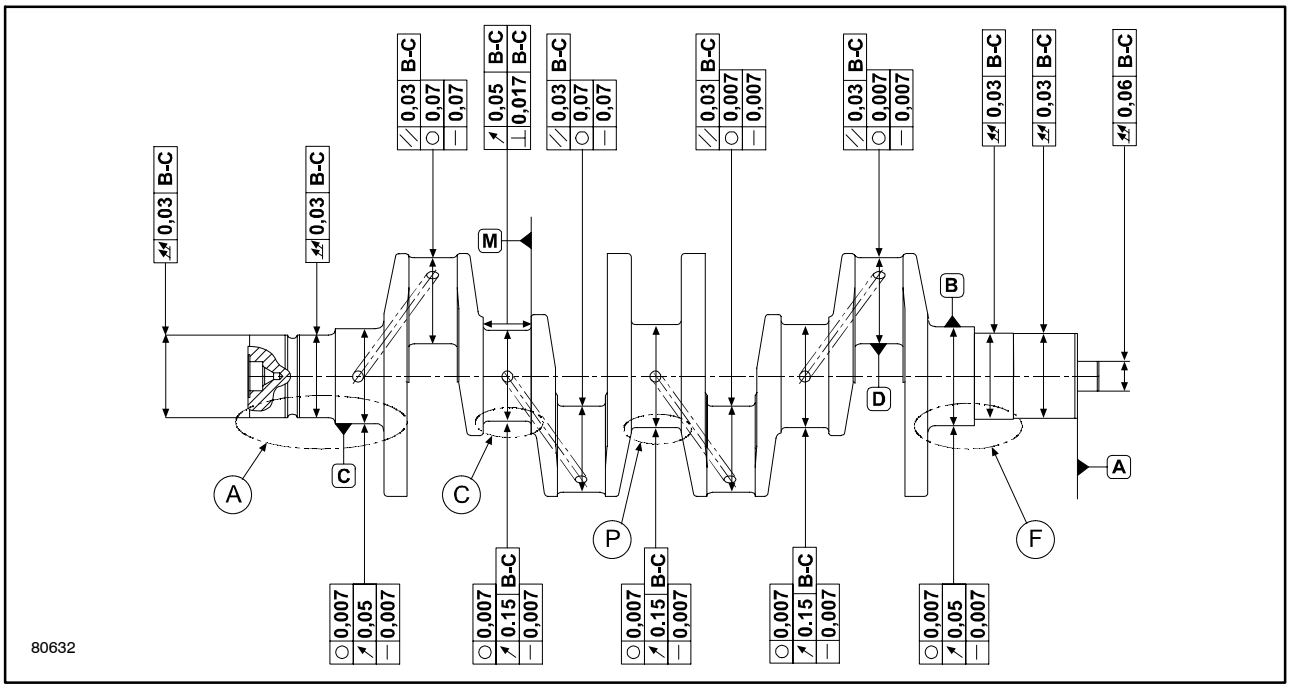
125



126

NOTE THE CRANKSHAFT (4 CYLINDER) MAIN JOURNAL AND CRANKPIN MEASUREMENTS ON THE TABLE

* Nominal value



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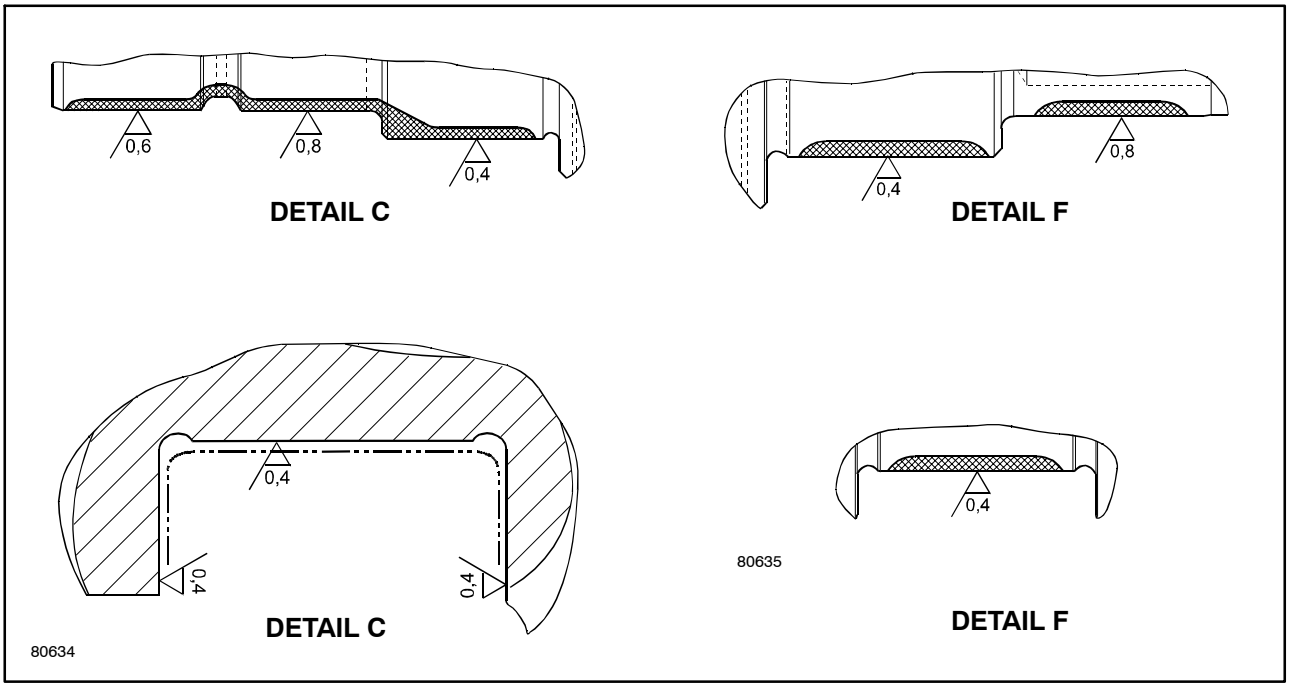
MAIN CRANKSHAFT TOLERANCES

TOLERANCES	CHARACTERISTIC SUBJECT OF TOLERANCE	GRAPHIC SYMBOL
SHAPE	Circularity	○
	Cilindricity	/○/
ORIENTATION	Parallelism	//
	Perpendicularity	⊥
	Straightness	—
POSITION	Concentricity or coaxiality	⓪
OSCILLATION	Circular oscillation	↗
	Total oscillation	⌰
	Taper	⌓

CLASS OF IMPORTANCE ASSIGNED TO PRODUCT CHARACTERISTICS	GRAPHIC SYMBOL
CRITICAL	©
IMPORTANT	⊕
SECONDARY	⊖

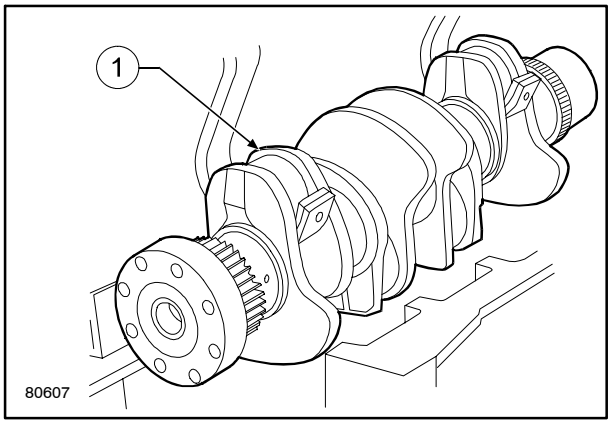


128

Main Journal Assembly Clearance

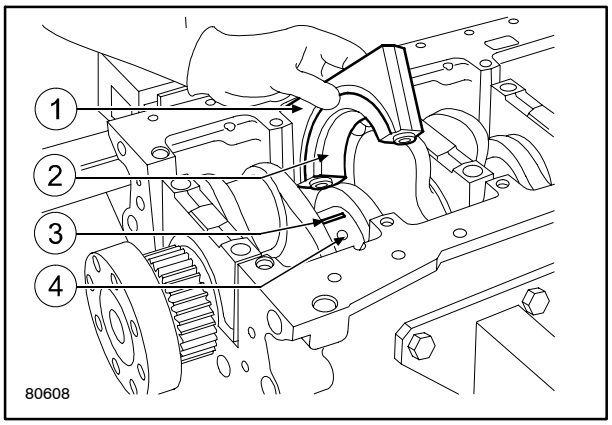
Mount the crankshaft (2).

Check the clearance between the main journals of the crankshaft and their respective bearings, proceeding as follows.



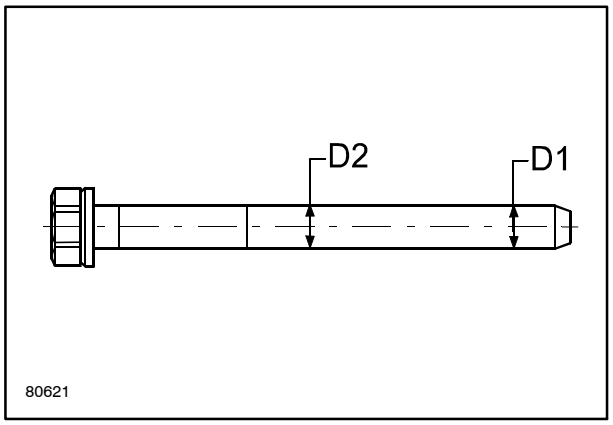
129

- Make sure that all parts are perfectly clean and remove all traces of oil.
- Position a length of calibrated wire (3) on the crankshaft journals (4), parallel to the crankshaft centerline.
- Fit the caps (1) complete with half bearings (2) on the relevant supports.



130

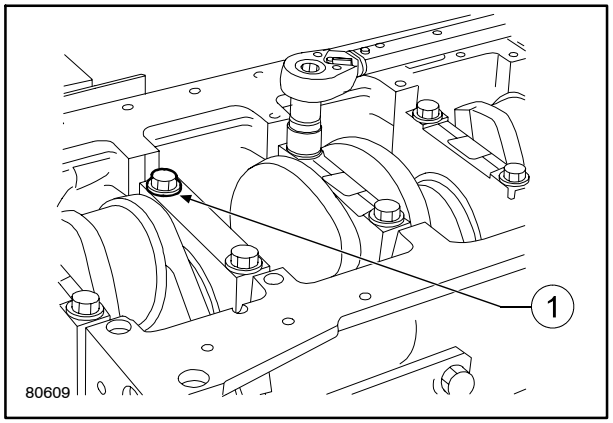
188. Before reusing the retaining bolts for the main bearing caps, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



131

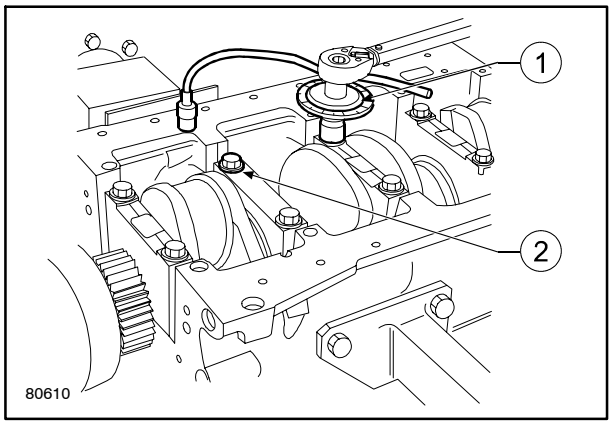
Screw down the pre-lubricated screws (1) and tighten them in three successive stages:

- 1st stage with a torque wrench to 50 ± 6 Nm (36.8781 ± 4.4254 lb ft).
- 2nd stage with a torque wrench to 80 ± 6 Nm (59.0050 ± 4.4254 lb ft).



132

- 3rd stage, further tighten the screws (2) with an angle of 90° ± 5°, using a suitable angle gauge on the torque wrench.



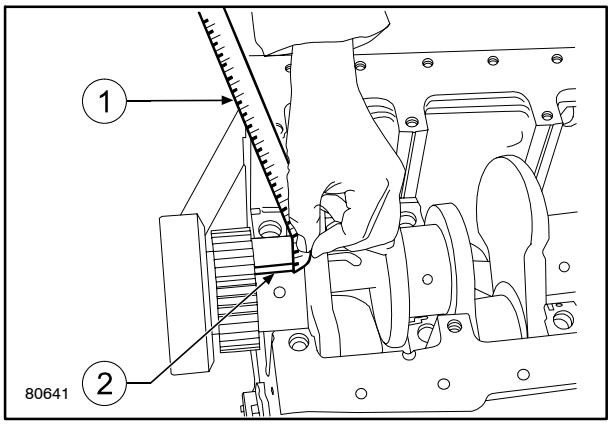
133

- Remove the support caps.

The clearance between the main bearings and the relevant journals is measured by comparing the width of the calibrated wire (2), at the point of greatest crushing, with the graduation of the scale on the case (1) containing the calibrated wire.

The numbers shown on the scale indicate the mating clearance in millimetres.

If the clearance is found to be other than as prescribed, change the half bearings and repeat the check; after obtaining the prescribed clearance, lubricate the main bearings and permanently mount the supports, tightening the retaining bolts as described above.

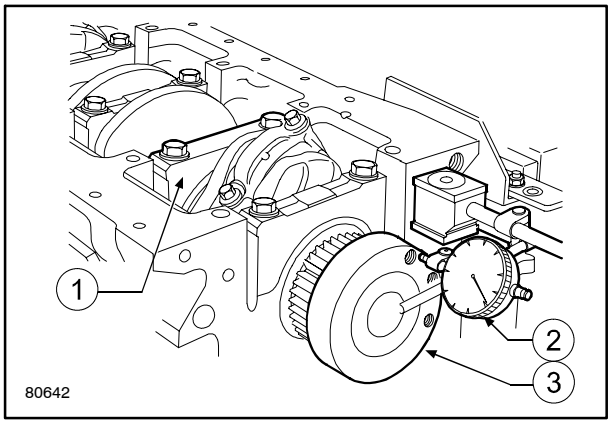


134

Crankshaft Thrust ring Clearance Check

The thrust ring clearance is checked by setting a dial gauge (2) with a magnetic base on the crankshaft (3) as shown in the figure, the normal assembly clearance is 0.068 to 0.410 mm (0.0027 to 0.0161 in.).

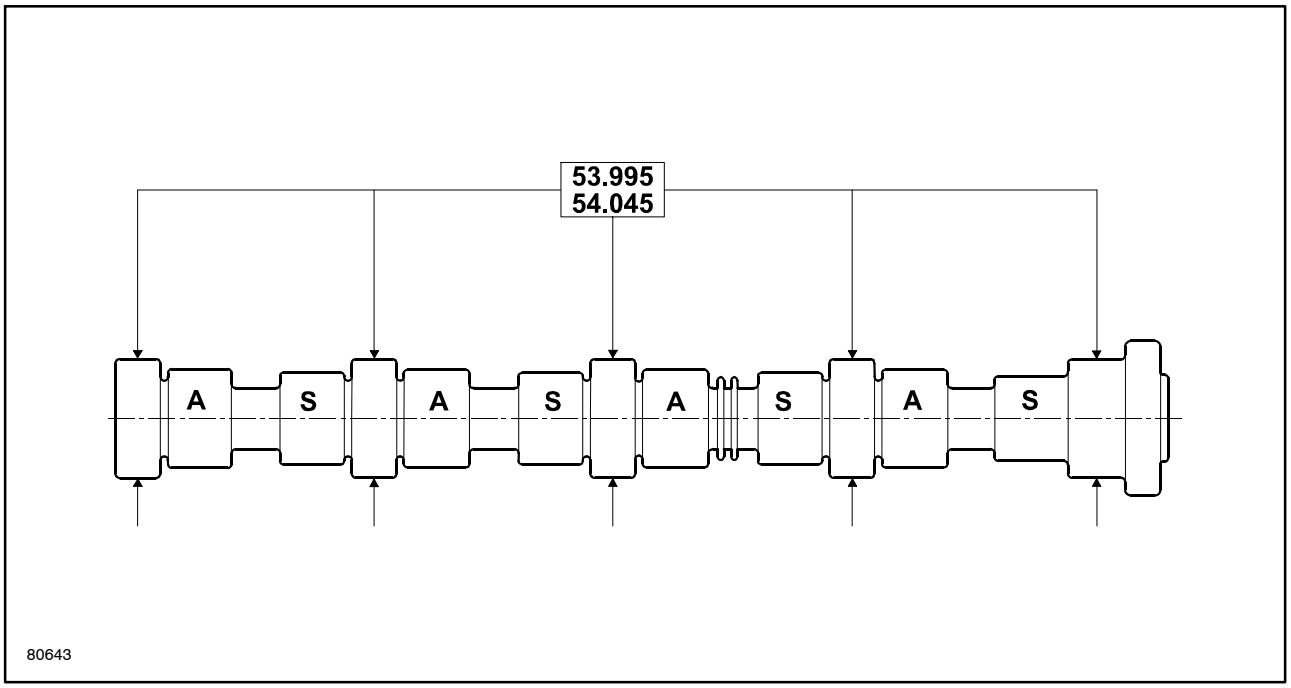
If the clearance is found to be any greater, change the main half bearings of the penultimate rear thrust bearing support (1) and check the clearance again between the crankshaft journals and main half bearings.



135

TIMING SYSTEM

Camshaft



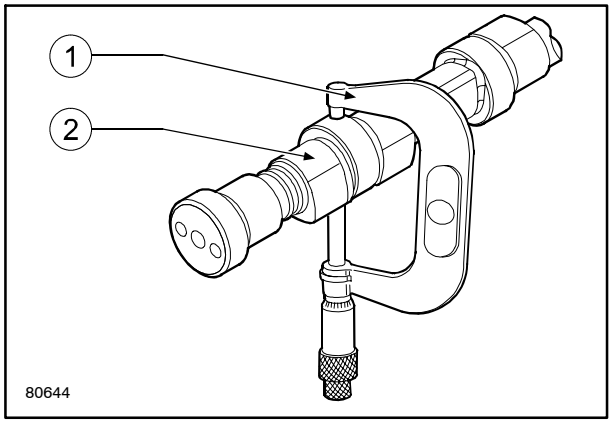
136

CAMSHAFT DATA
The data given refer to the normal pin diameter

Checking Cam Lift and Pin Alignment

Set the shaft on tailstocks and, using a dial gauge with a 1/100 mm scale placed on the central support, check that the alignment error is no greater than 0.04 mm (0.0016 in.): change the shaft if it is. In addition, check the cam lift: it must be 6.045 mm (0.2380 in.) for the exhaust cams and 7.582 mm (0.2985 in.) for the intake ones; change the shaft if the measurements are any different.

Check the diameter of the supporting pins of the camshaft (2) with the micrometer (1) on two perpendicular axis.



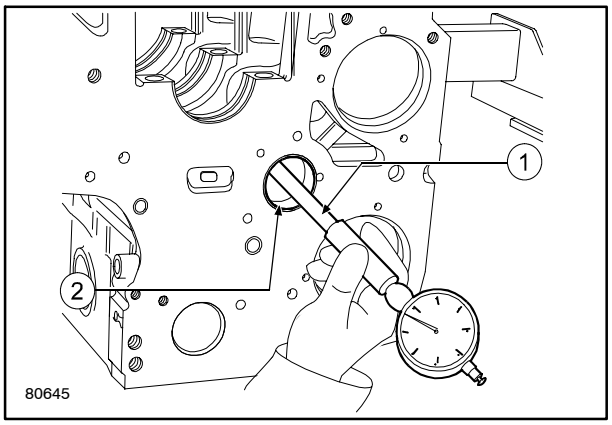
137

BUSHINGS

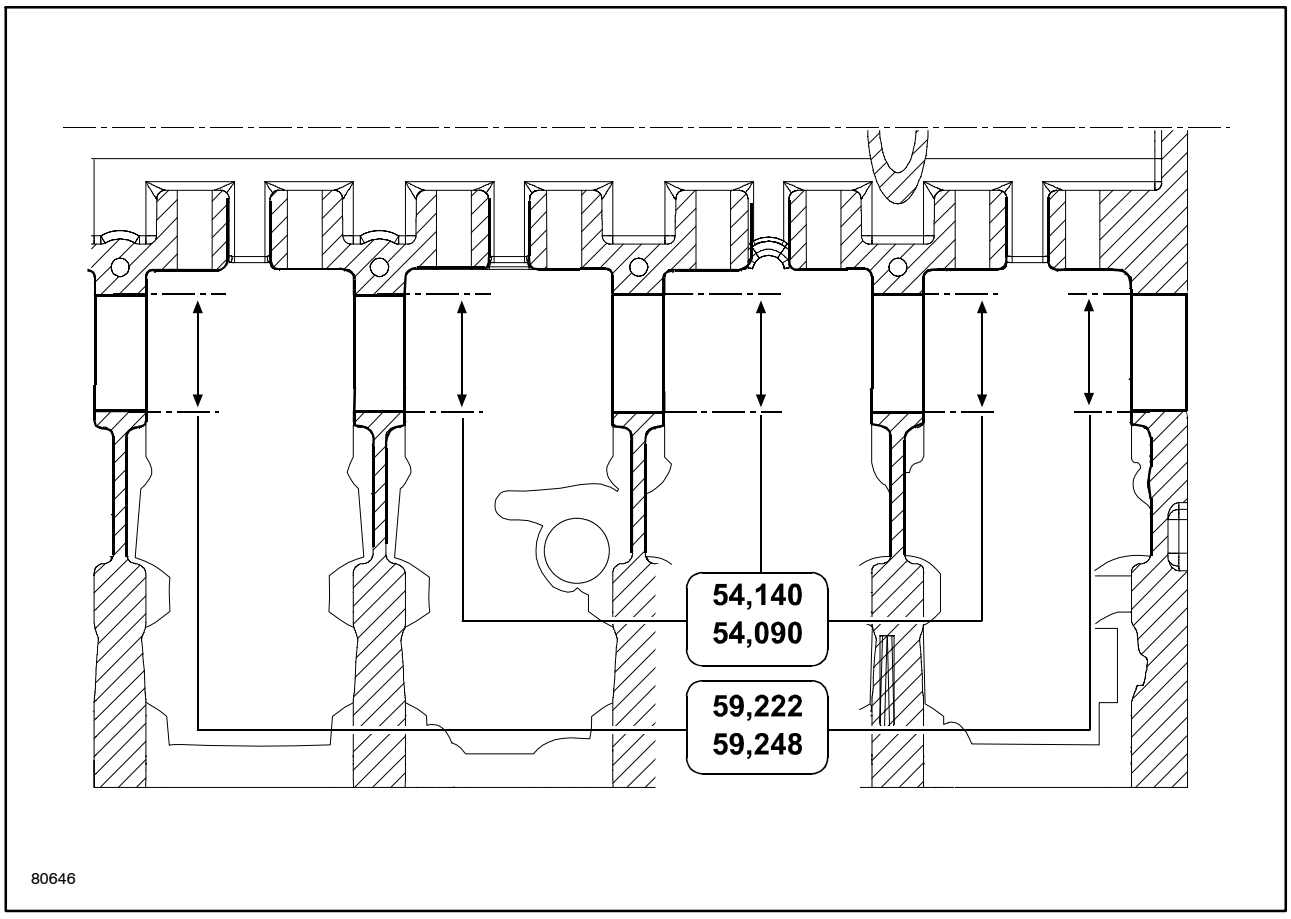
The camshaft bushings (2) must be forced into their respective seats. The internal surfaces must show no sign of seizure or wear.

Using the bore meter (3), measure the diameter of the front and rear bushings (2) and of the intermediate seats (1) for the camshaft.

Measurements must be made on two perpendicular axis.



138



139

CAMSHAFT BUSHING AND RELEVANT SEAT DATA
* Measured with bushings installed

PISTONS/CONNECTING RODS

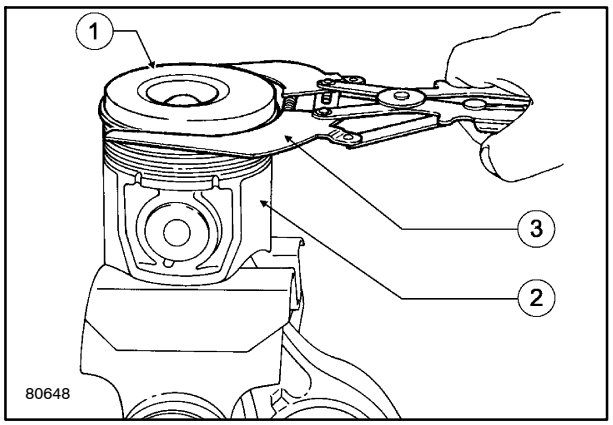
⚠ CAUTION ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

Clean all parts carefully before proceeding with the operations described below.

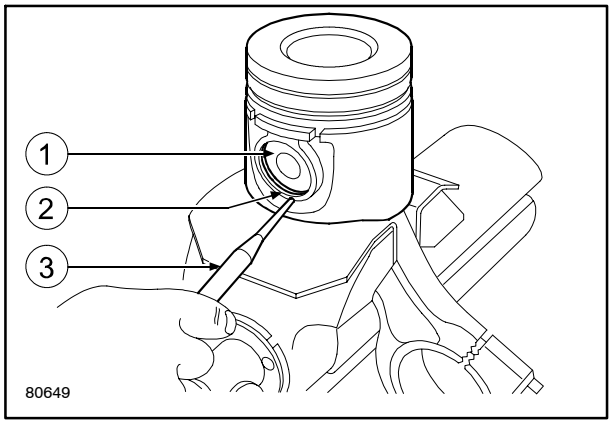
Check that the pistons show no signs of seizure, scoring, cracking or excessive wear; change them if they do.

Removing the rings (1) from the piston (2) with suitable piston ring pliers (3).

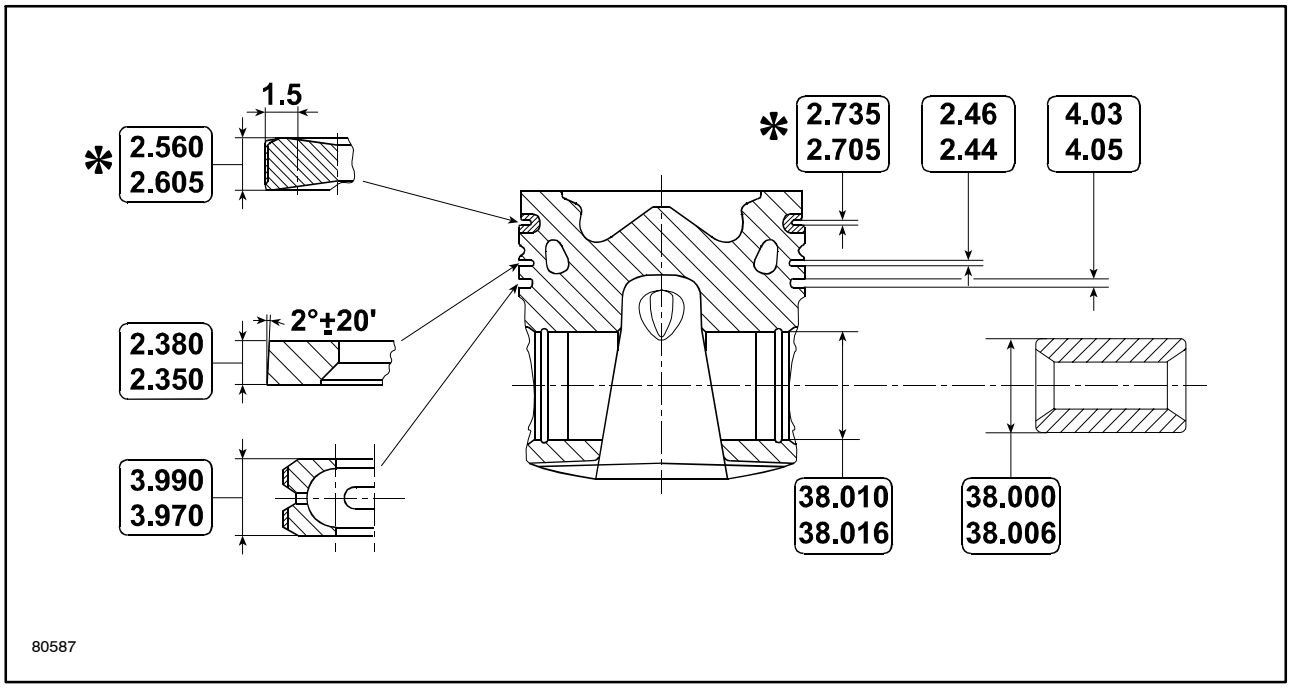


140

The piston pin (1) retaining rings (2) should be removed using a marking tool (3).



141



142

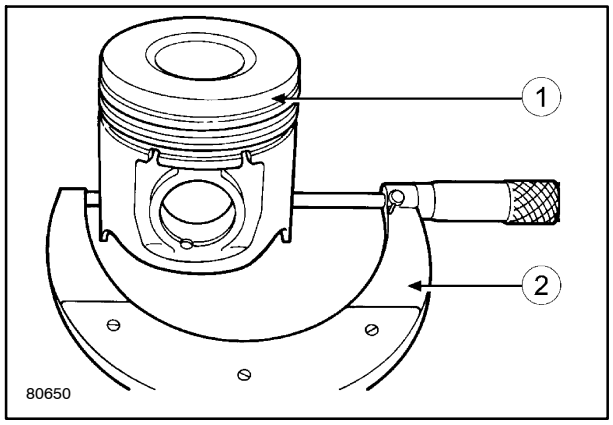
KS PISTON, PIN AND RING DATA
* Measurement obtained on a diameter of 92 mm (3.6220 in.)

Measuring the Piston Diameter

Measuring the piston (1) diameter using a micrometer (2) to determine the assembly clearance.

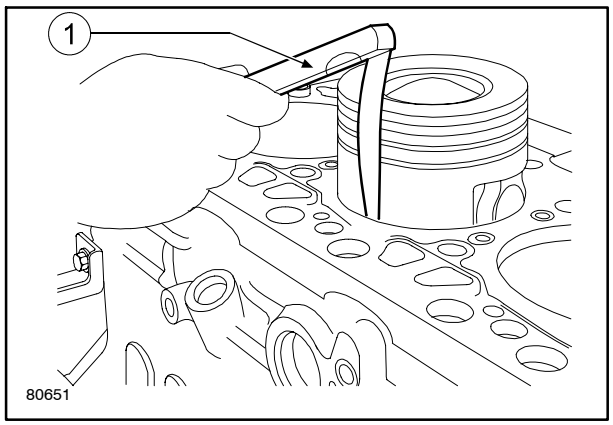
⚠ CAUTION ⚠

The diameter must be measured at a distance of 12 mm (0.4724 in.) from the base of the piston skirt.



143

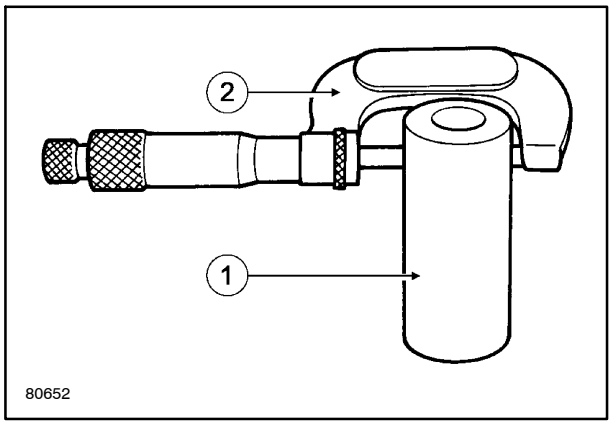
Clearance between the piston and the cylinder liner can be measured with a feeler gauge (1), as shown in the figure.



144

Piston Pins

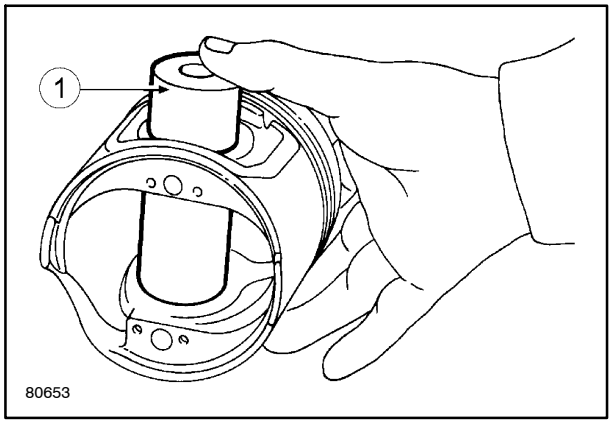
Measuring the piston pin (1) diameter using a micrometer (2).



145

Conditions for Correct Pin-Piston Coupling

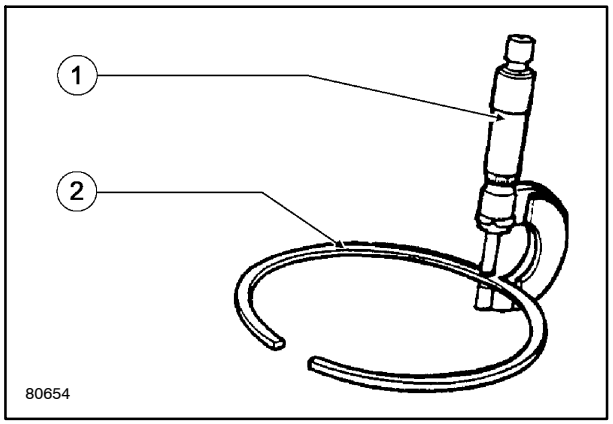
Lubricate the pin (1) and the piston pin boss seat with engine oil; the pin must go into the piston with a light pressure of the fingers and must not drop out.



146

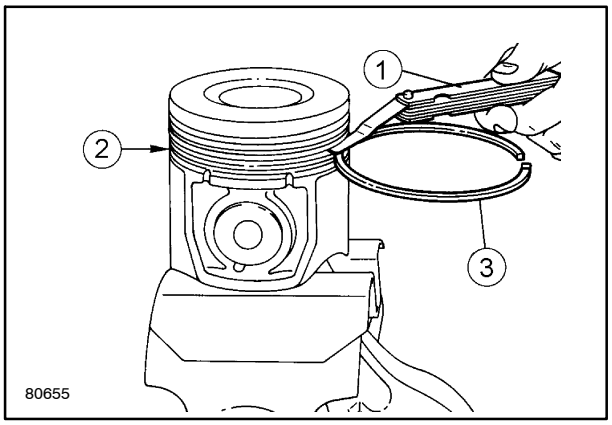
Piston Rings

Check the thickness of the seals (2) with a micrometer (1).



147

Check the clearance between the seals (3) of the 2nd and 3rd groove and the relevant seats in the piston (2) with a feeler gauge (1).

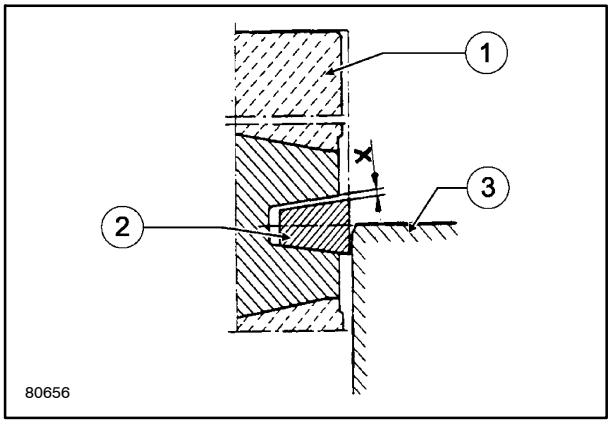


148

MEASURING THE CLEARANCE X BETWEEN THE FIRST PISTON GROOVE AND THE V-RING

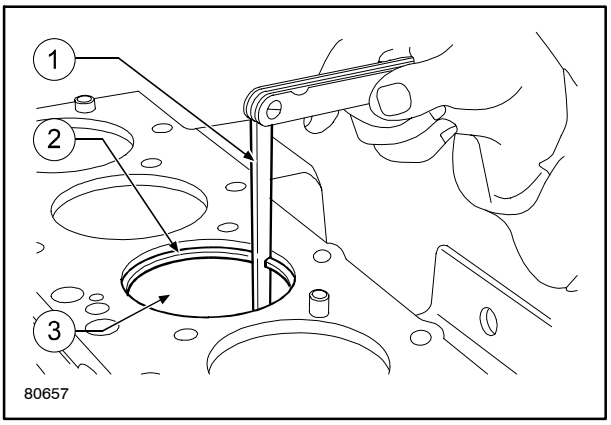
Due to the special shape of the first seal with a trapezoidal cross-section, the clearance between the groove and the ring should be measured as follows; Make the piston (1) protrude from the crankcase so that the ring (2) at issue comes approximately halfway out of the cylinder liner (3).

In this position, using a feeler gauge, check the clearance (X) between the ring and the groove: this clearance must be as prescribed.



149

Measuring the clearance between the ends of the piston rings (2) introduced in the cylinder liner (3) using a feeler gauge (1).



150

Connecting Rods

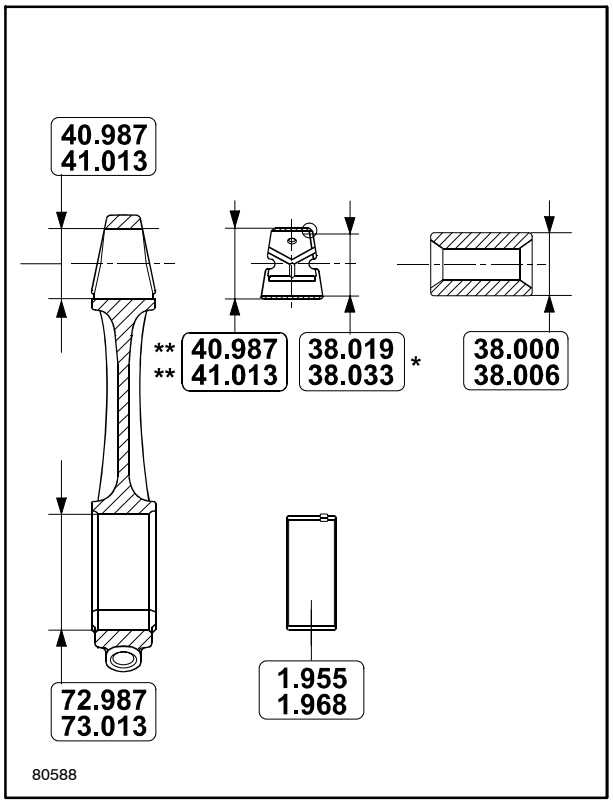
CONNECTING ROD, PISTON PIN BUSHING AND HALF BEARING DATA

* Inside diameter to be measured after installing in the small end and regrinding with a reamer.

** Cannot be measured free.

⚠ CAUTION ⚠

The connecting rod – connecting rod cap mating surface is knurled for a better coupling. It is therefore recommended not to remove the knurling.



151

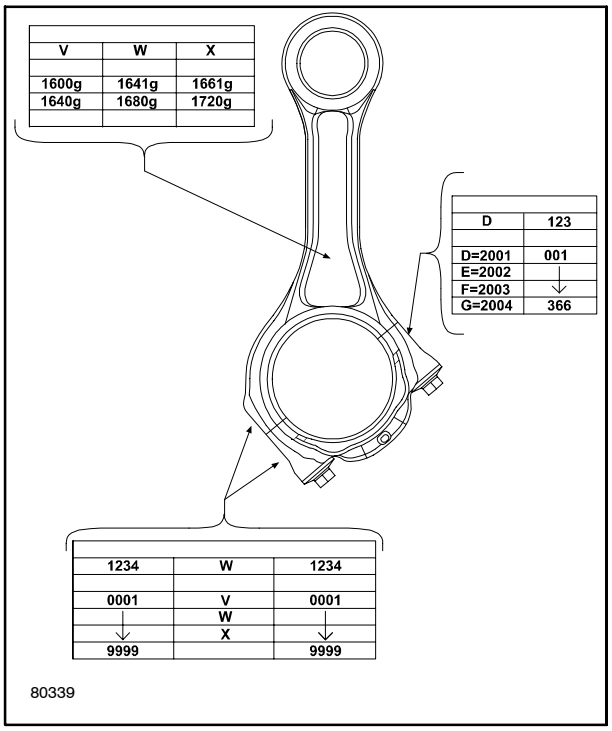
CAUTION

Each connecting rod is marked:

- On the body and cap with a number indicating their coupling and the cylinder in which it is mounted. In the event of replacement, number the new rod with the same number as the replaced connecting rod.
- On the body of the connecting rod with a letter indicating the weight class of the connecting rod mounted in production:
  - V, 1600 to 1640 g (3.5274 to 3.6156 lb) (marked in yellow);
  - W, 1641 to 1680 g (3.6178 to 3.7038 lb) (marked in green);
  - X, 1681 to 1720 g (3.7060 to 3.7920 lb) (marked in blue);

Connecting rods are supplied as spare parts in class W and marked in green*.

Removing material is not permissible.



152

Bushings

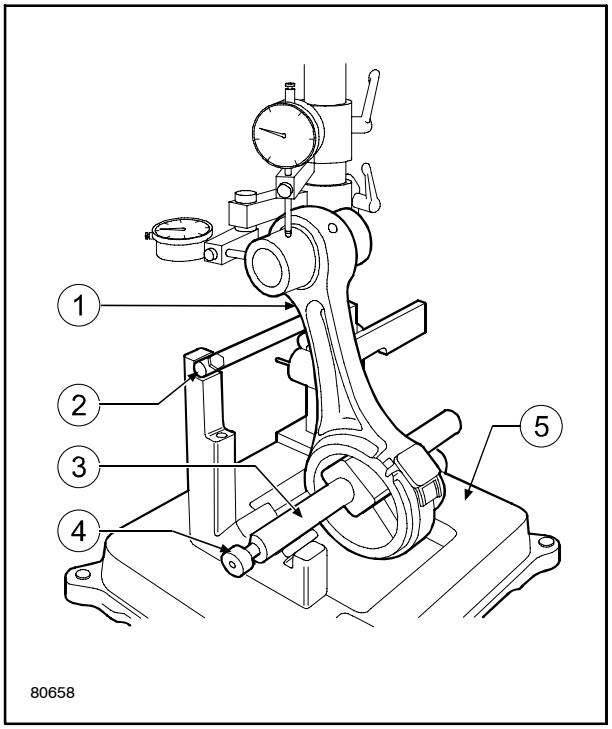
Check that the bushing in the small end has not come loose and shows no sign of scoring or seizure. If this is not so, change it.
Disassembly and assembly are performed with a suitable drift.

When driving in, make sure that the oilways in the bushing and small end coincide. Using a reamer, regrind the bushing to obtain the prescribed diameter.

Checking Connecting Rods

Check the parallelism of the connecting rod (1) axes using instrument **380001003** (5) as follows:

- Fit the connecting rod (1) on the spindle of tool **380001003** (5) and lock it with the screw (4);
- Put the spindle (3) on the “V” prisms, setting the connecting rod (1) on the stop bar (2).

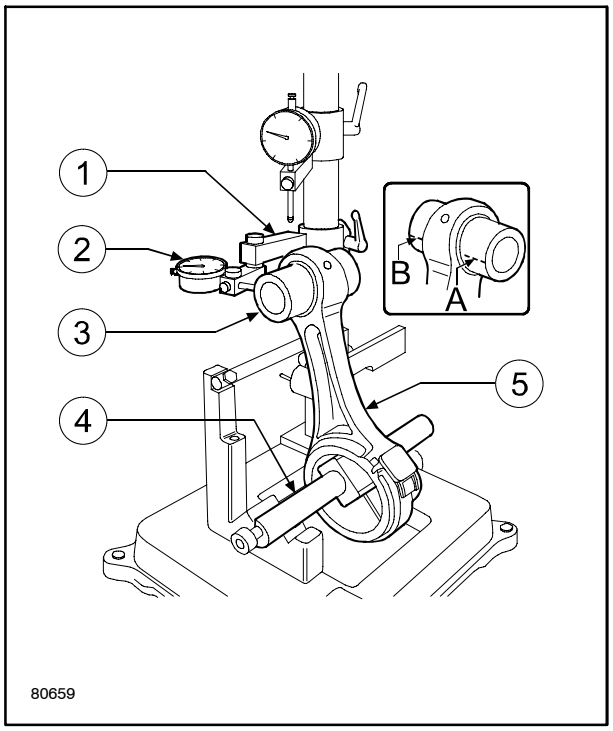


153

Checking Twisting

Check the twist of the connecting rod (5) by comparing two points (A and B) of the pin (3) on the horizontal plane of the connecting rod axis.

Position the support (1) of the dial gauge (2) so that this pre-loads by ~ 0.5 mm (0.0197 in.) on the pin (3) at point A and reset the dial gauge (2). Move the spindle (4) with the connecting rod (5) and on the opposite side (B) of the pin (3) compare any deviation: the difference between A and B must be no greater than 0.08 mm (0.0031 in.).



154

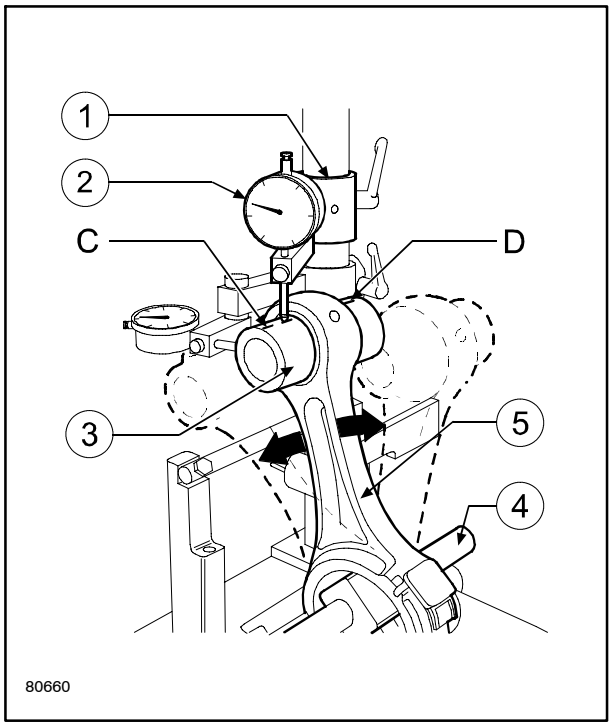
Checking Bending

Check the bend of the connecting rod (5) by comparing two points (C and D) of the pin (3) on the vertical plane of the connecting rod axis.

Position the vertical support (1) of the dial gauge (2) so that this rests on the pin (3) at point C.

Swing the connecting rod to and fro, seeking the highest position of the pin and reset the dial gauge (2) in this condition.

Move the spindle with the connecting rod (5) and on the opposite side (D) of the pin (3) repeat the check for the highest point. The difference between points C and D must be no greater than 0.08 mm (0.0031 in.).

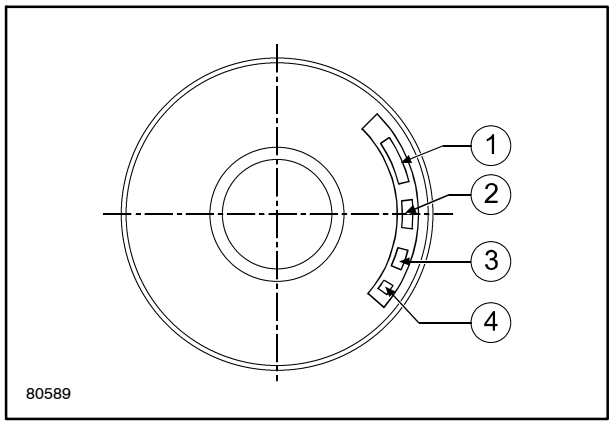


155

Connecting Rod – Piston Assembly

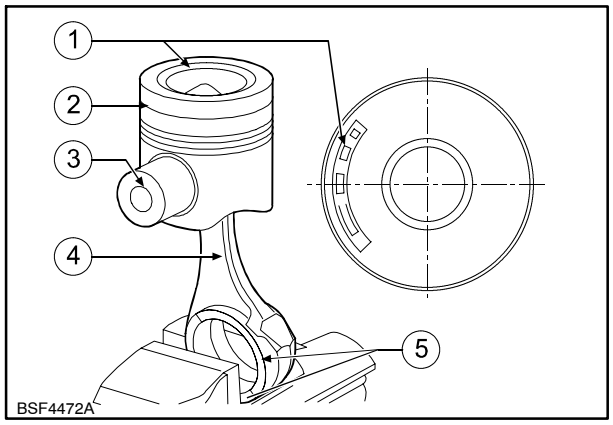
The following references are cut into the crown of the piston:

1. Spare part number and design modification number;
2. Arrow showing the direction of assembly of the piston in the cylinder liner, it must face the front of the crankcase;
3. Date of manufacture;
4. Stamping indicating testing of the 1st groove insert.



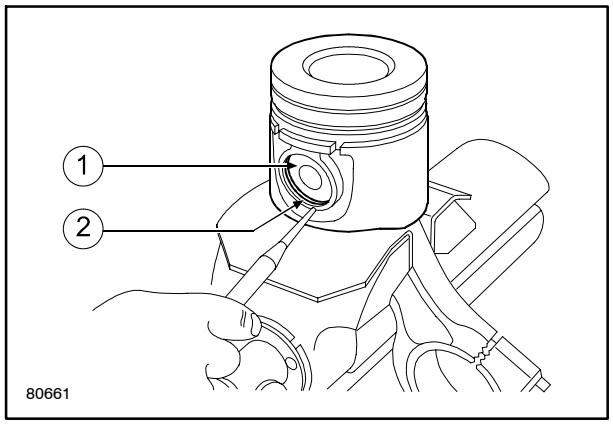
156

Using the pin (3) connect the piston (2) to the connecting rod (4) so that the reference arrow (1) for fitting the piston (2) in the cylinder liner and the numbers (5) stamped on the connecting rod (4) are observed as shown in the figure.



157

Insert the rings (2) retaining the pin (1).



158

Fitting Piston Rings

To fit the rings (1) on the piston (2) use suitable piston ring pliers (3).

The rings must be fitted with the word “TOP” facing upwards and positioned so that the openings of the piston rings are staggered 120° apart.

⚠ CAUTION ⚠

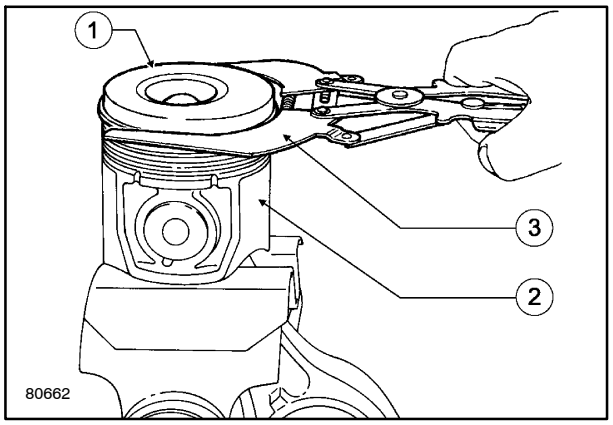
Piston rings are supplied as spare parts in the following sizes:

- standard, marked with yellow paint;
- oversized by 0.5 mm (0.0197 in.) and marked with yellow/green paint.

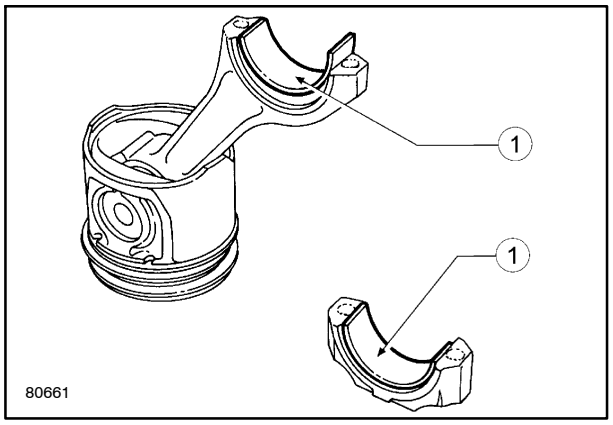
Fit the half bearings (1) on the connecting rod and cap.

⚠ CAUTION ⚠

If you have not found it necessary to change the connecting rod bearings, you must fit them back on in exactly the same order and positions found upon disassembly. The rods are manufactured using a fracture breaking technique making each rod and cap unique and having only one way of installation. Do not modify the half bearings in any way.



159

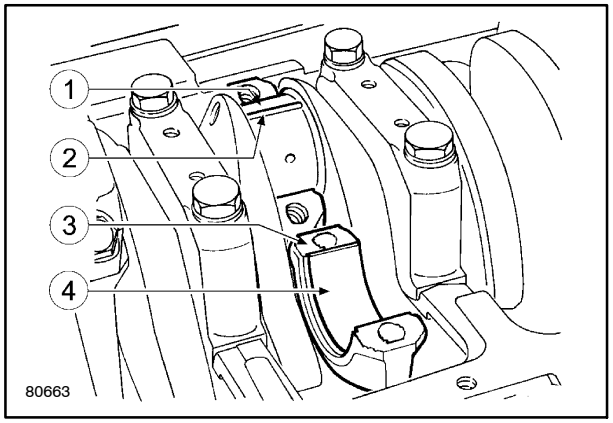


160

Connecting Rod Pin Assembly Clearance

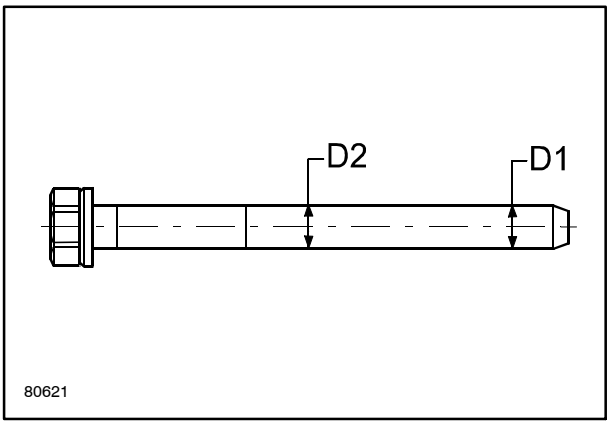
To measure the clearance proceed as follows:

- Carefully clean the parts and remove all traces of oil;
- Position a length of calibrated wire (2) on the crankshaft journals (1);
- Fit the connecting rod caps (3) with the relevant half bearings (4).



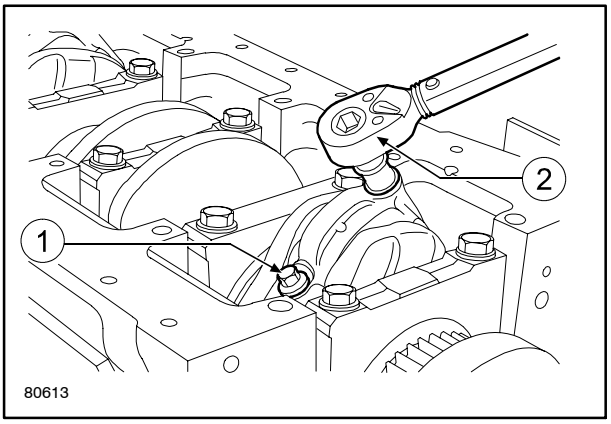
161

189. Before reusing the retaining bolts for the main bearing caps, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



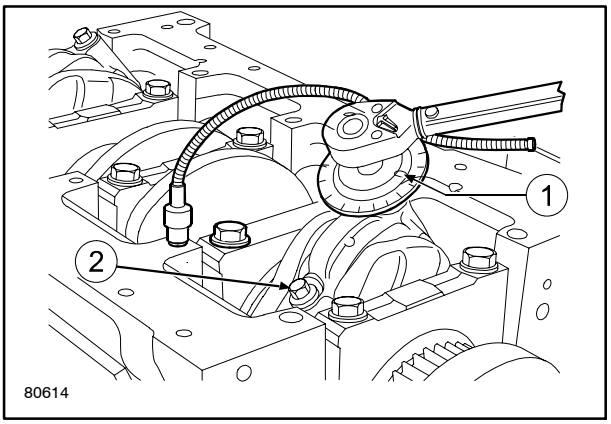
162

- Tighten the screws (1) previously lubricated with engine oil to the prescribed torque with a torque wrench (2).



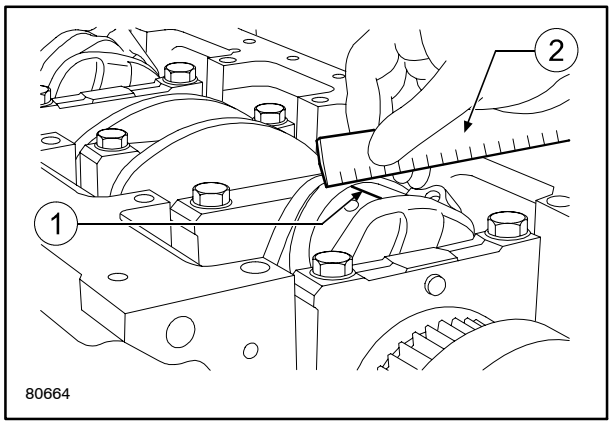
163

- Fit a suitable angle gauge, (1) on the socket wrench and further tighten the bolts (2) by 60°.



164

- Remove the cap and determine the clearance by comparing the width of the calibrated wire (1) against the graduated scale printed on the packet (2) containing the wire.



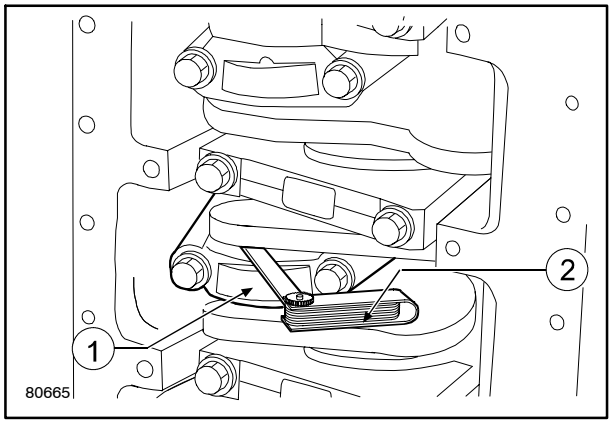
165

If the clearance is found to be other than as prescribed, change the half bearings and repeat the check.

After obtaining the prescribed clearance, lubricate the connecting rod bearings and permanently mount them, tightening the connecting rod cap retaining bolts as described.

CAUTION

Before permanently fitting the connecting rod cap retaining bolts, check that their diameter, measured at the centre of the length of the thread, is no less than 0.1 mm (0.0039 in.) of the diameter measured at approximately 10 mm (0.3937 in.) from the end of the bolt.



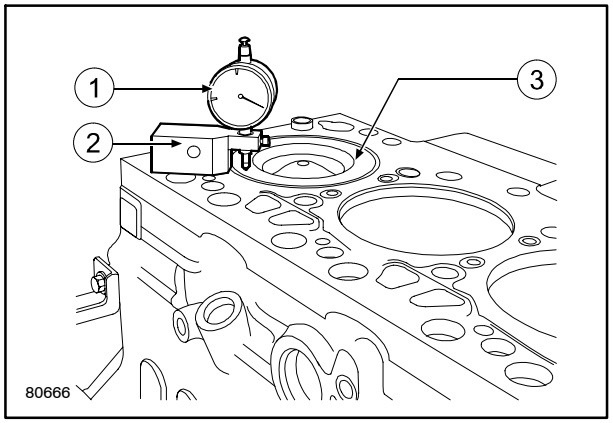
166

Check by hand that the connecting rods (1) run axially on the crankshaft journals and their end float measured with a feeler gauge (2) is 0.10 to 0.33 mm (0.0039 to 0.130 in.).

Checking Piston Protrusion

After fitting the connecting rod – piston assemblies, using a dial gauge (1) fitted with a magnetic base (2), check the protrusion of the pistons (3) at T.D.C.. from the top surface of the cylinder block.

It must be 0.28 to 0.52 mm (0.110 to 0.0205 in.).



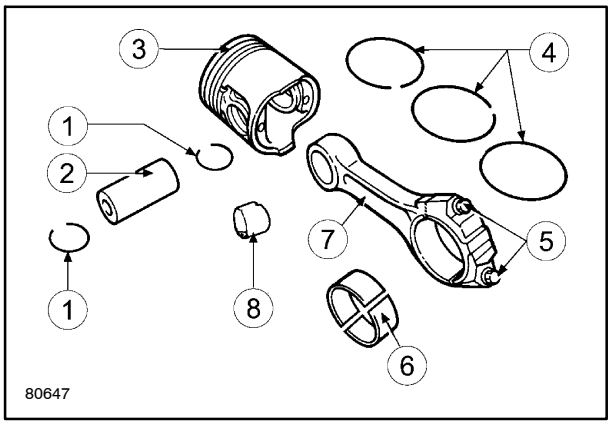
167

Connecting Rod-Piston Assembly

Connecting rod-piston component parts
1. Retaining rings – 2. Pin – 3. Piston –
4. Piston rings – 5. Screws – 6. Half bearings –
7. Connecting rod – 8. Bushing

CAUTION

The pistons are supplied as spare parts oversized by 0.5 mm (0.0197 in.).



168

CYLINDER HEAD

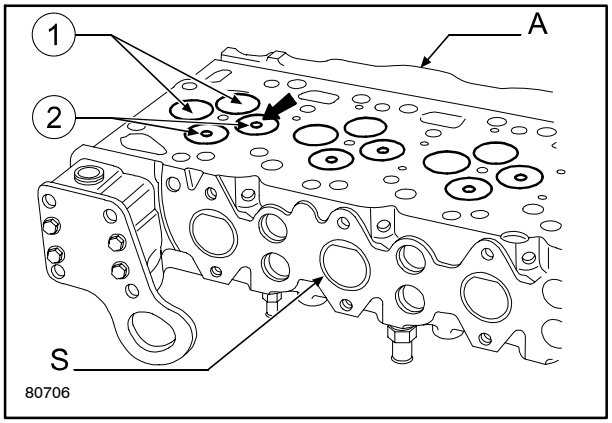
Valve Disassembly

The intake (1) and exhaust (2) valve heads have the same diameter.

The central recess (→) of the head of the exhaust valve (2) distinguishes it from the intake one.

CAUTION

Before removing the valves from the cylinder head, number them so as to fit them back on, if they are not replaced, in the positioned found upon disassembly.
A = intake side - **S** = exhaust side

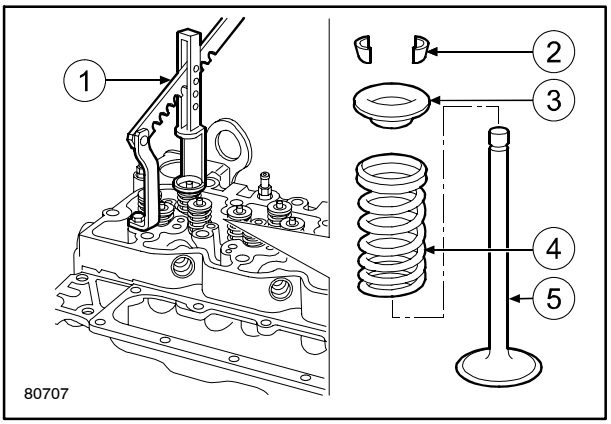


169

Valves are removed using a general valve spring compresor tool, (1), applying pressure on the cap (3) so that, by compressing the springs (4), it is possible to remove the cotters (2). Then remove the cap (3) and springs (4).

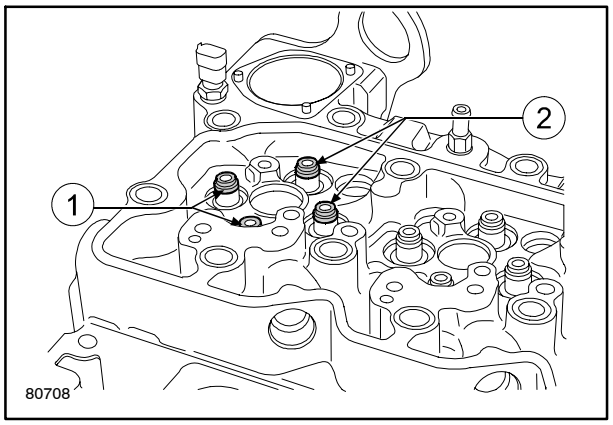
Repeat this operation on all valves.

Overturn the cylinder head and extract the valves (5).



170

Remove the seals (1 and 2) from the relevant valve guides.



171

Cylinder Head Hydraulic Seal Check

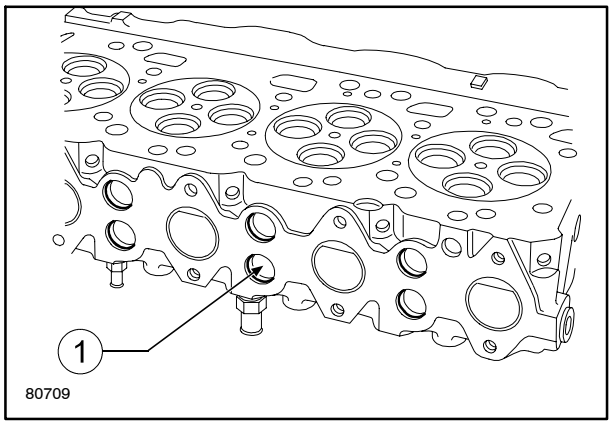
Check the hydraulic seal using the appropriate tools.

Using a pump, introduce water heated to ~90°C (194°F) at a pressure of 2 to 3 bar (29.0074 to 43.5111 psi).

If there is any leakage from the cup plugs (1), replace them, using a suitable drift for their disassembly – assembly.

⚠ CAUTION ⚠

Before fitting the plugs, apply a water-reactive sealant on their sealing surface.



172

If you find any leakage from the cylinder head, it must be changed.

Cylinder Head Mating Surface Check

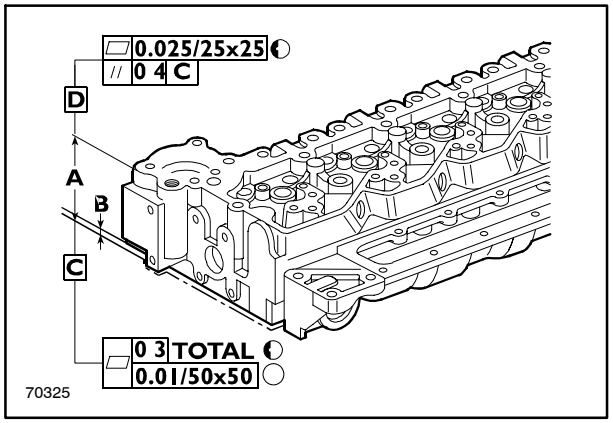
The deformation measured on the full length of the cylinder head must be no greater than 0.20 mm (0.0079 in.).

If it is any higher, regrind the cylinder head according to the dimensions and warnings given in the figure.

The nominal thickness A of the cylinder head is 105 ± 0.25 mm (4.1339 ± 0.0098 in.); the maximum permissible amount of metal removed must not exceed the thickness B of 0.13 mm (0.0051 mm).

⚠ CAUTION ⚠

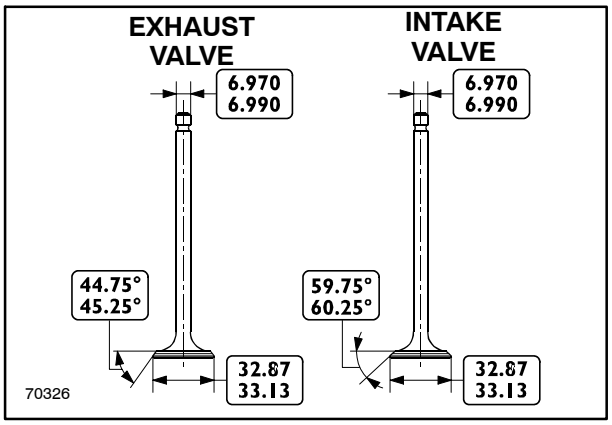
After regrinding, check the valve recessing and if necessary regrind the valve seats to obtain the prescribed valve recessing.



173

Valve Dimensions

INTAKE AND EXHAUST VALVE DATA



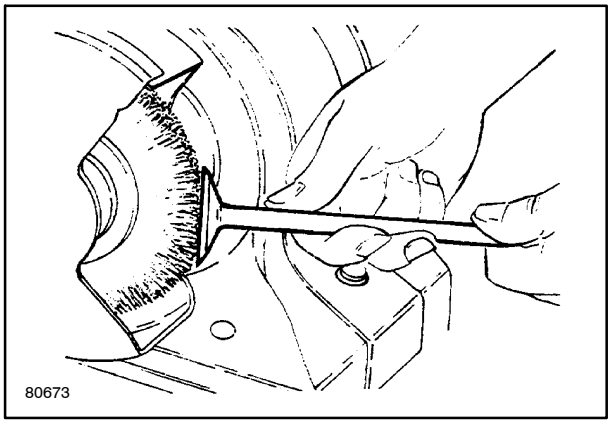
174

Decarbonizing, Checking and Grinding Valves

Remove all carbon deposits from the valves using a wire brush.

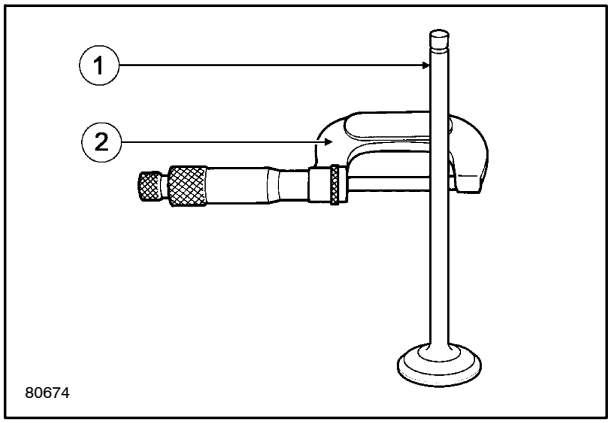
Check that the valves show no signs of seizure, cracking or burning.

If necessary, re-grind the valve seats, removing as little material as possible.



175

Using a micrometer (2), measure the valve stem (1): it must be 6.970 to 6.999 mm (0.2744 to 0.2756 in.).

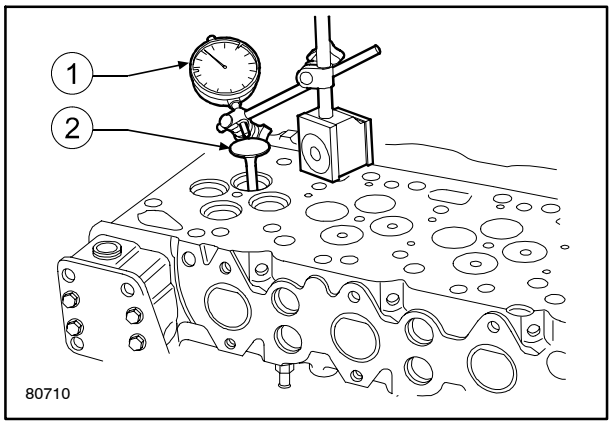


176

Checking the Clearance between the Valve Stem and Guide and Valve Centring

The checks are made with a dial gauge (1) with a magnetic base, positioned as illustrated. The assembly clearance is 0.052 to 0.092 mm (0.0020 to 0.0036 in.).

Making the valve (2) turn, check that the centring error is no greater than 0.03 mm (0.0012 in.).



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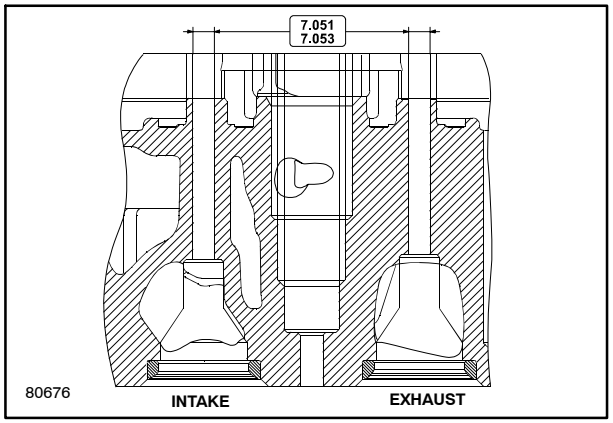
Valve Guides

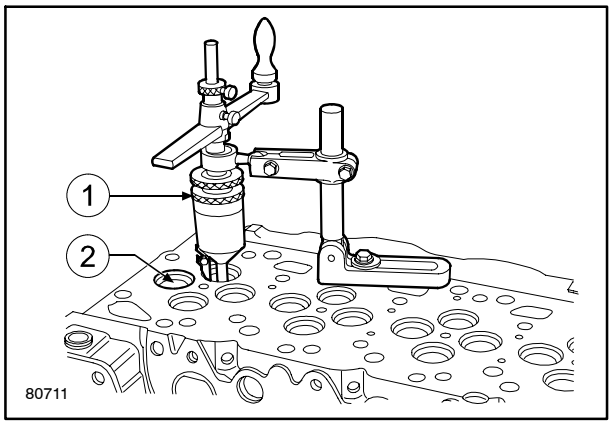
Using a bore gauge, measure the inside diameter of the valve guides; it must be as indicated in the figure.



178

Regrinding – Replacing Valve Seats

Check the valve seats (2). On finding any slight scoring or burns, regrind, using a suitable valve grinding tool (1) according to the angles indicated in the figure below.



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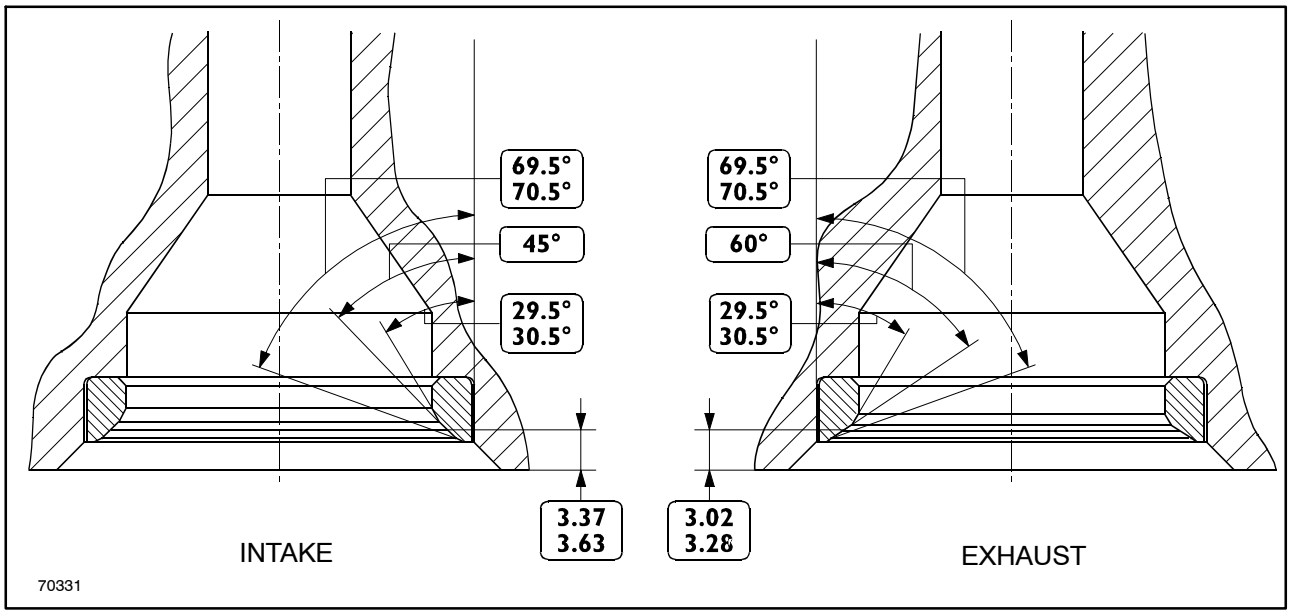

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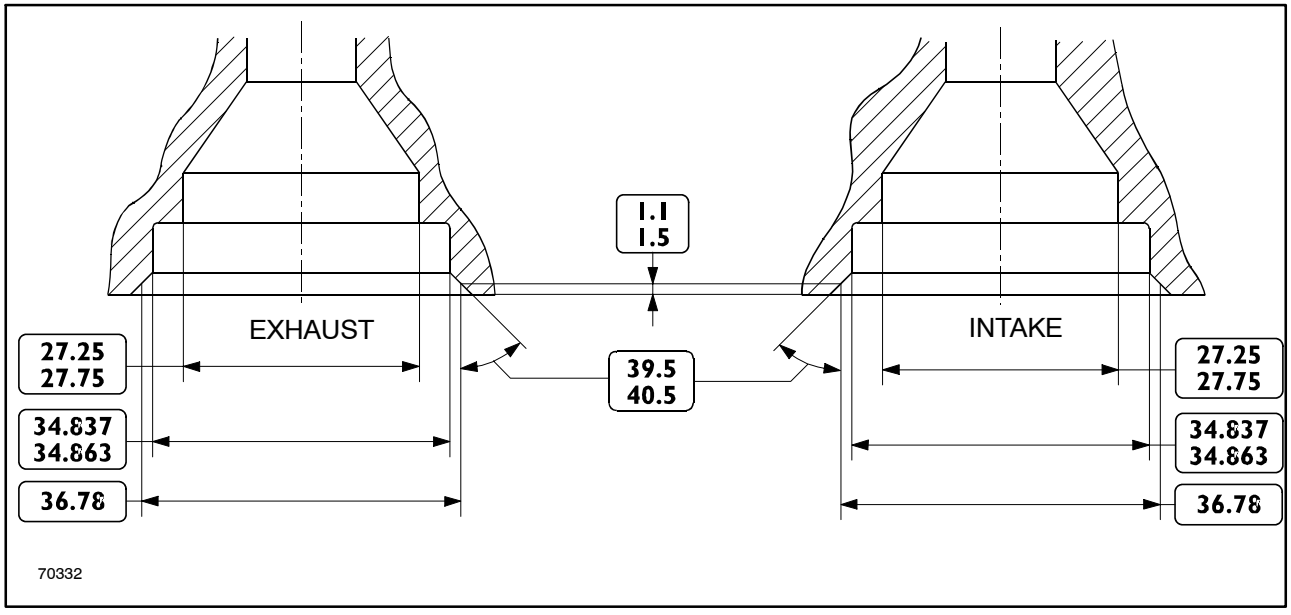
VALVE SEAT DATA



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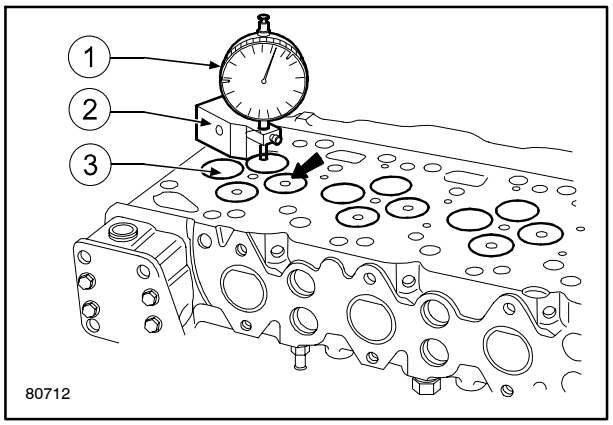
4-CYLINDER ENGINE CYLINDER HEAD SEAT DATA

If the valve seats cannot be reconditioned by just regrinding, they can be replaced with the ones supplied as spare parts. Take care not to nick the cylinder head, remove as little material as possible from the valve seats until it is possible to extract them from the cylinder head with the aid of a punch.
Heat the cylinder head to 80° to 100 °C (176° to 212 °F) and, using a suitable drift, insert the new valve seats, previously cooled.
Then regrind the valve seats according to the values given on previous page.

After regrinding check that the valve recessing (3) is as prescribed using a suitable dial guage (1) with a magnetic base (2).



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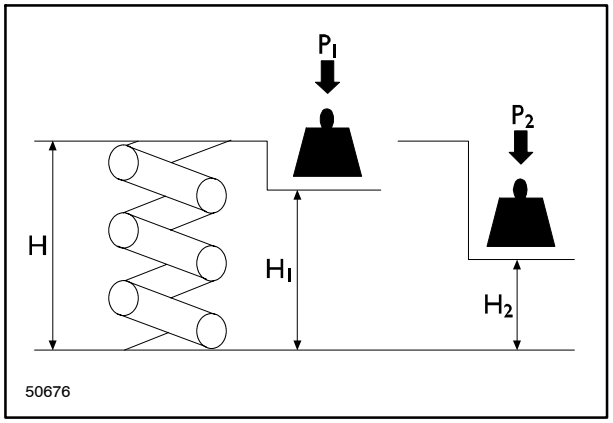
Valve Springs

DATA FOR CHECKING THE INTAKE AND EXHAUST VALVE SPRINGS

Before assembly, check the valve spring flexibility. Compare the elastic deformation and load data with those of the new springs.

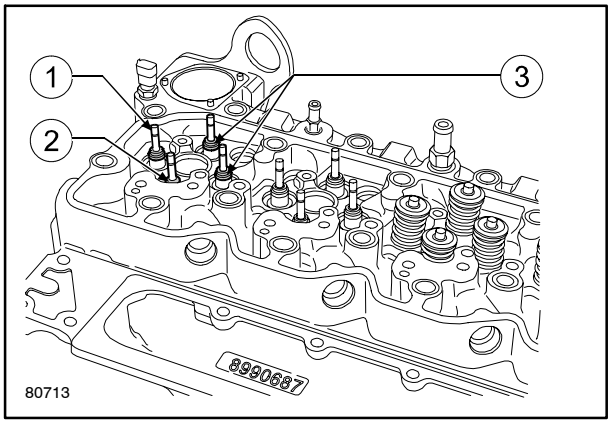


183

Valve Installation

Lubricate the valve stem (1) and insert into the relevant valve–guides according to the position marked during disassembly.

Fit the seals (2 and 3) onto the valve guide.



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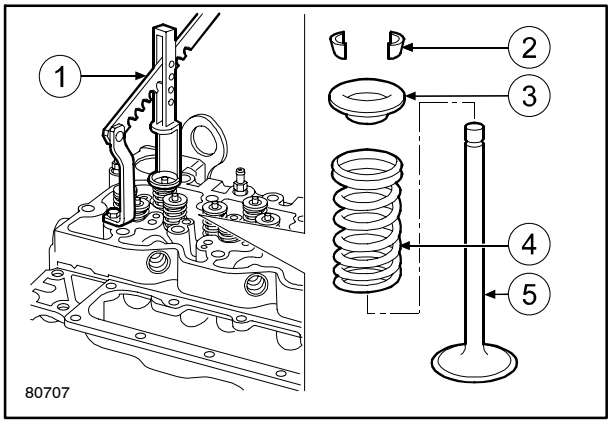
Position the following parts on the cylinder head: spring (4) and top cap (3): using a general valve spring compressor tool, (1), compress the spring (4) and retain the parts to the valve (5) with the cotters (2).



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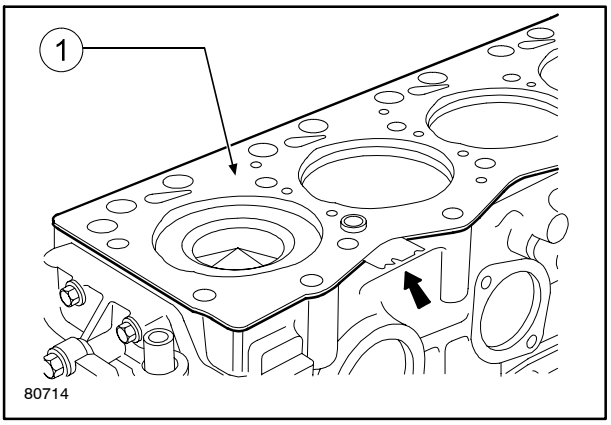
Installing the Cylinder Head

Check that the mating surfaces of the cylinder head and crankcase are clean. Do not dirty the cylinder head gasket. Set the cylinder head gasket (1) with the word "TOP" (1) facing the head.

The arrow indicates the point where the thickness of the gasket is given. The gasket is available in 2 thicknesses, 1.15mm and 1.25mm, select the correct one depending on the piston protrusion dimension.

⚠ CAUTION ⚠

Before reusing the cylinder head retaining bolts, check they show no sign of deterioration or deformation and replace them if they do.



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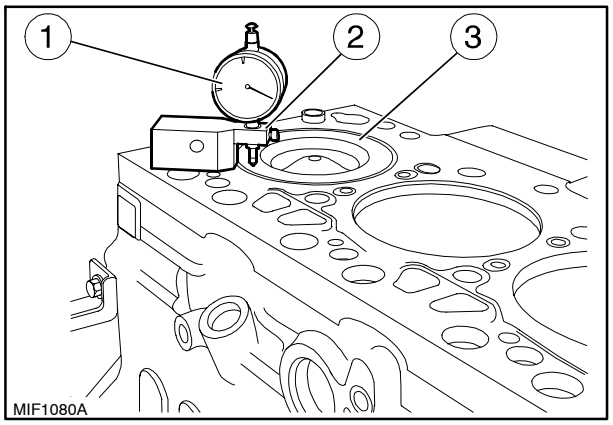
Using the dial gauge **380000228** (1) fitted with its base **380000364** (2), check the protrusion of the pistons (3) at T.D.C. from the cylinder block face.



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Since there are two type of head gasket, to choose its thickness (1.25 mm (0.049 in.) Type A and 1.15 mm (0.045 in.) Type B) make the following measurements:

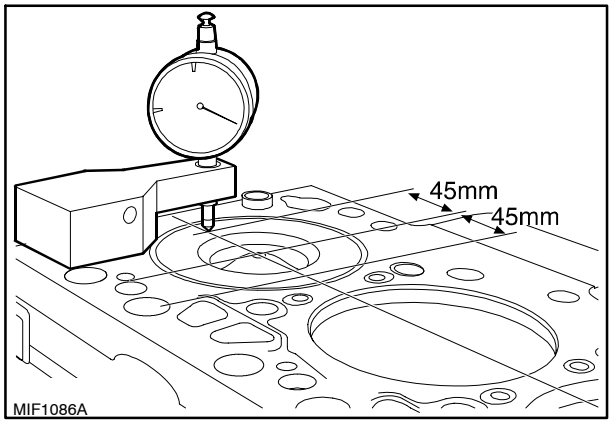
- for each piston, as shown in the figure, at a distance of 45 mm (1.77 in.) from the centre of the piston, measure its protrusions S1 and S2 from the top face of the crankcase and then calculate the mean:

$$S_{cyl1} = \frac{S1 + S2}{2}$$

Repeat this operation for pistons 2, 3 and 4 and calculate the mean value:

$$S = \frac{S_{cyl1} + S_{cyl2} + S_{cyl3} + S_{cyl4}}{4}$$

If S is > 0.40 mm (0.015 in.) use the gasket type A.
If S is < 0.40 mm (0.015 in.) use the gasket type B.



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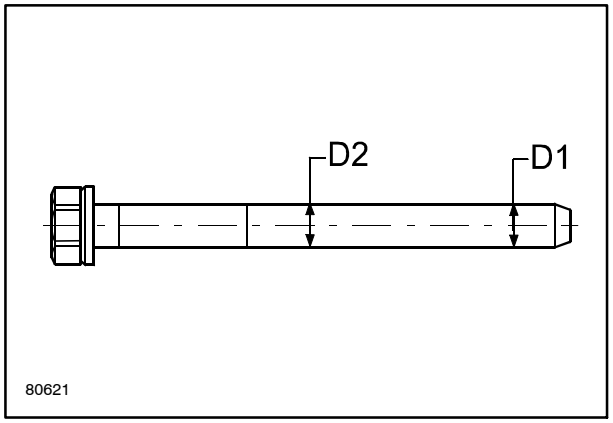
NOTE: *Before reusing the cylinder head retaining bolts, check for signs of deterioration or deformation and replace as necessary. See instructions below.*

Insert the tappet rods and the rocker arm assembly. Before reusing the retaining bolts, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



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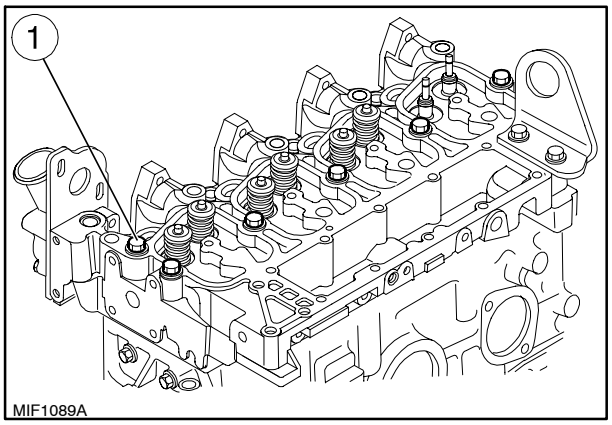
- After installing the gasket, fit the cylinder head on the crankcase, screwing down the screws (1) without tightening them to torque.



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Checking and Adjusting Tappet Clearance

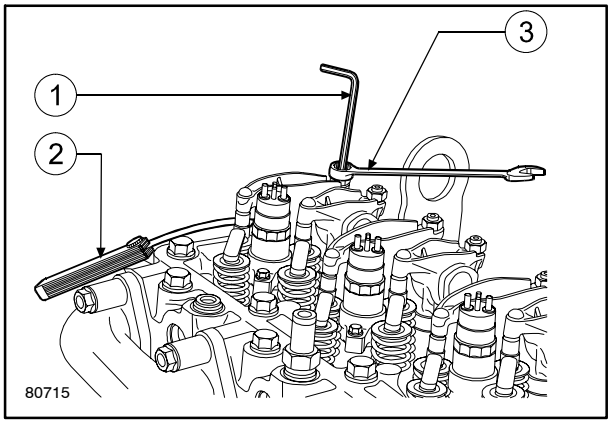
⚠ CAUTION ⚠

Complete cylinder head assembly as stated on page 32 and following.

Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

The working clearance should be:

- intake valves 0.25 ± 0.05 mm (0.0098 ± 0.0020 in.)
- exhaust valves 0.51 ± 0.05 mm (0.0201 ± 0.0020 in.)



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⚠ CAUTION ⚠

To adjust the rocker arm – valve working clearance more quickly, proceed as follows:

For the 4-cylinder engine, turn the crankshaft, balance the valves of cylinder n° 1 and adjust the valves marked with an asterisk as indicated in the table:

no. cylinder	1	2	3	4
intake	-	*	*	*
exhaust	-	-	-	*

Turn the crankshaft, balance the valves on cylinder n° 4 and adjust the valves marked with an asterisk as shown in the diagram:

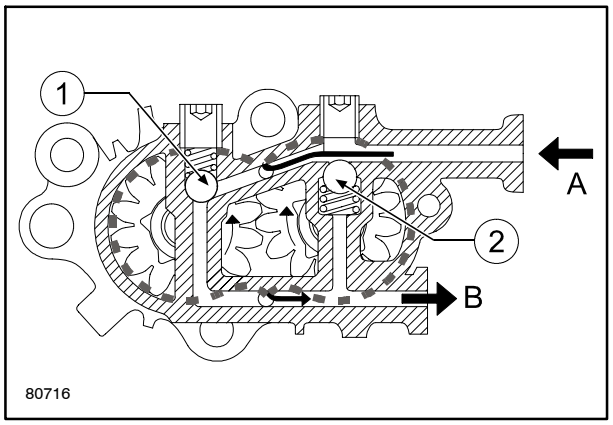
no. cylinder	1	2	3	4
intake	*	-	-	-
exhaust	*	*	*	-

FUEL SUPPLY GEAR PUMP

The gear pump, mounted on the rear of the high-pressure pump, has the function of feeding the pump. It is governed by the shaft of the high-pressure pump.

Normal Operating Condition

A Fuel inlet from the tank, B fuel outlet to the filter, 1 - 2 By-pass valves in closed position.



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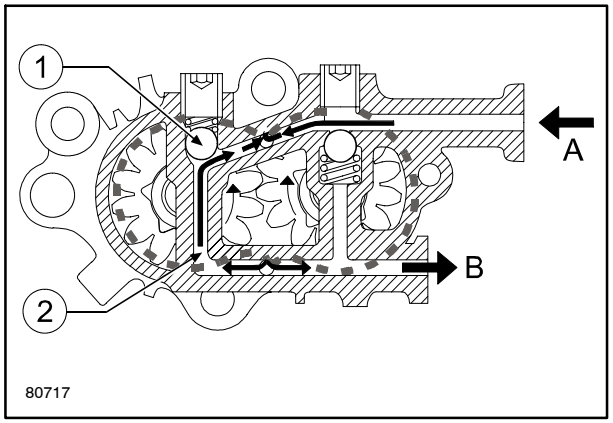
Condition of Overpressure at Outlet

The by-pass valve (1) trips when overpressure is generated at the outlet B. The pressure, overcoming the elastic resistance of the spring of the valve (1), sets the outlet in communication with the inlet through the duct (2).



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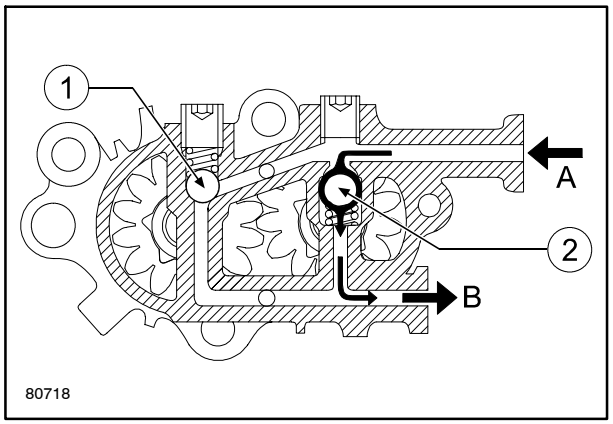
Bleed Conditions

The by-pass valve (2) trips when, with the engine switched off, you want to fill the feed system through the priming pump. In this situation, the by-pass valve (1) stays shut and the by-pass valve (2) opens due to the effect of the inlet pressure and the fuel flows out via outlet B.

⚠ CAUTION ⚠

The mechanical fuel supply pump cannot be replaced on its own; therefore it must not be removed from the high-pressure pump.



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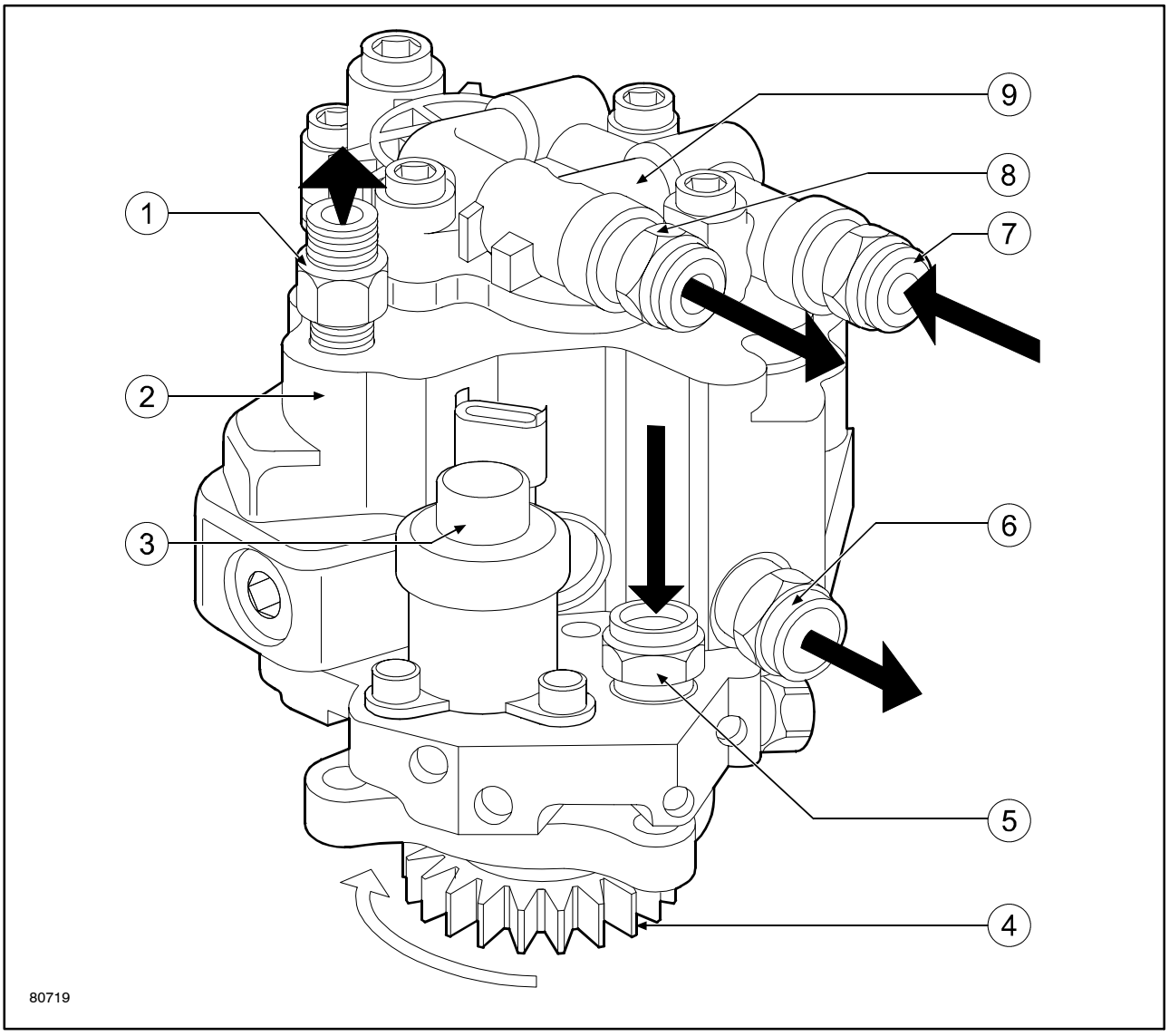
HIGH-PRESSURE PUMP CP3

This pump with 3 radial pumping elements governed by the timing gear does not need timing. The mechanical fuel supply pump governed by the shaft of the high-pressure pump is mounted on the back of the pump.

⚠ CAUTION ⚠

The high-pressure / fuel supply pump assembly cannot be overhauled and therefore it must not be removed and the retaining bolts must not be tampered with.
The only permissible action is to change the drive gear.



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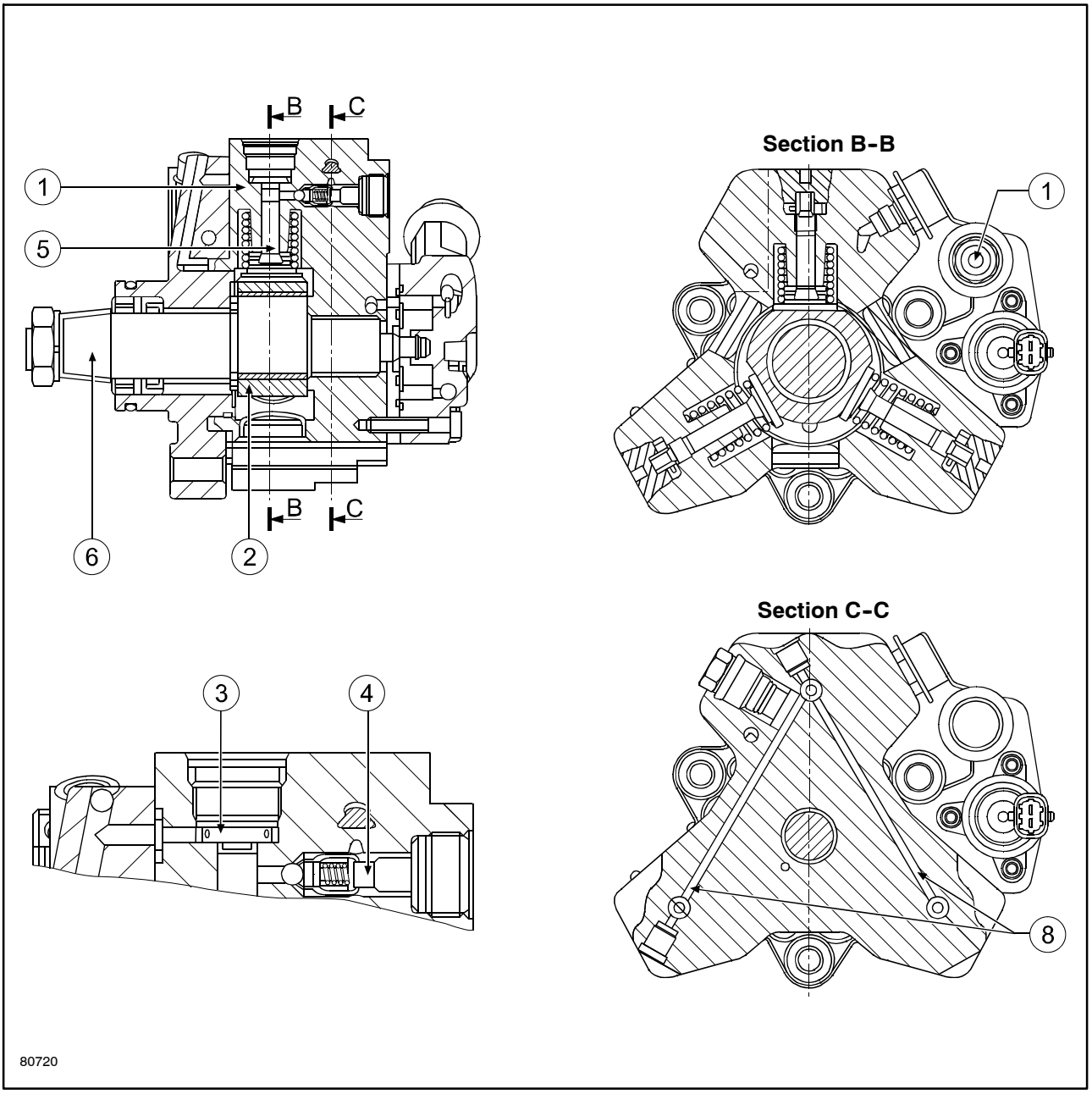
1. FUEL OUTLET FITTING TO RAIL - 2. HIGH-PRESSURE PUMP - 3. PRESSURE REGULATOR - 4. DRIVE GEAR -
5. FUEL FILTER INLET FITTING FROM FILTER - 6. FUEL OUTLET FITTING TO FILTER MOUNTING -
7. FUEL INLET FITTING FROM THE COOLER OF THE PACK - 8. FUEL OUTLET FITTING FROM THE MECHANICAL PUMP TO THE FILTER -
9. MECHANICAL SUPPLY PUMP.

High-Pressure Pump Internal Structure



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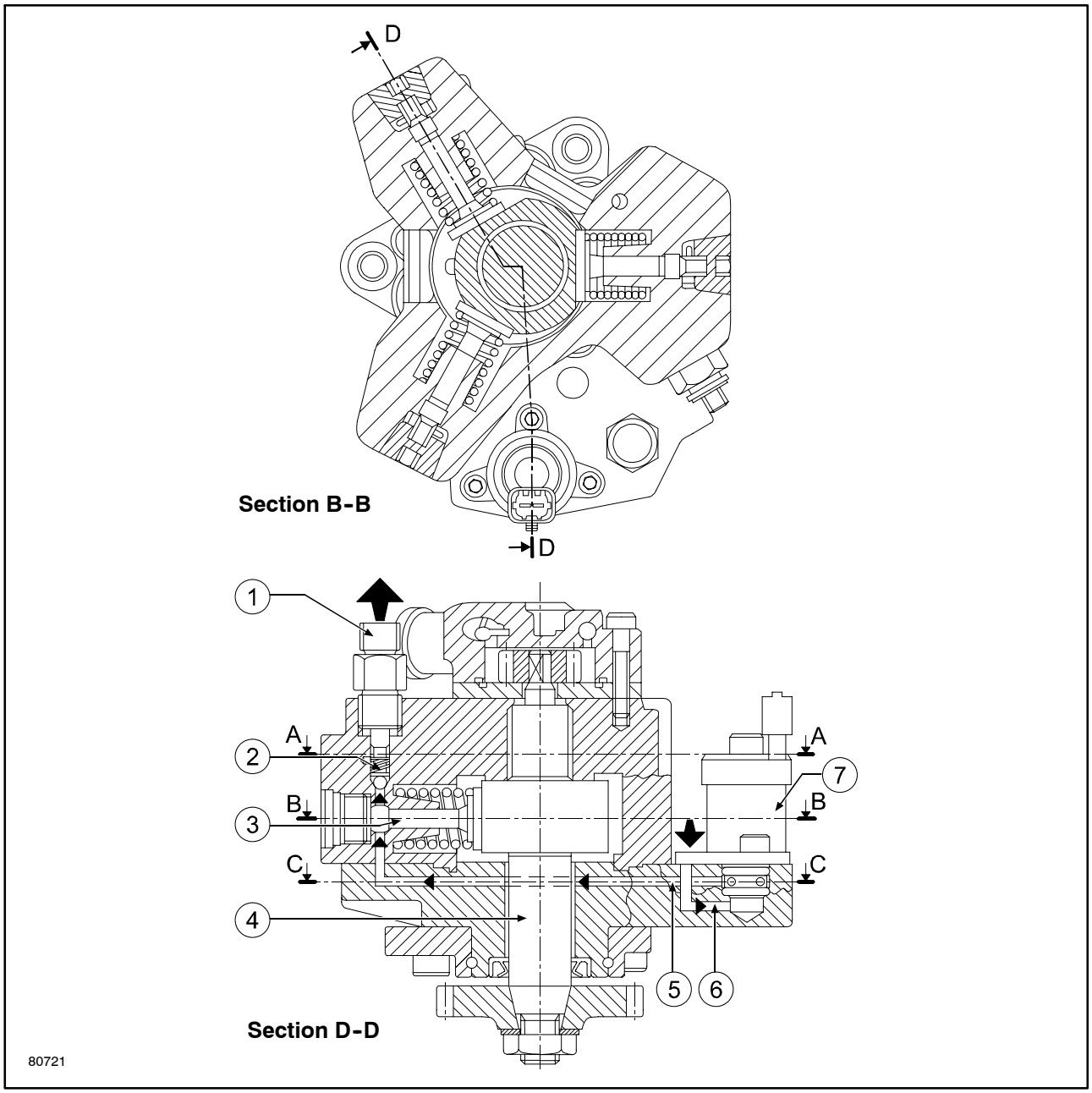
1. CYLINDER. - 2. THREE-LOBE ELEMENT - 3. INLET CAP VALVE. - 4. DELIVERY BALL VALVE. - 5. PISTON. -
6. PUMP SHAFT. - 7. LOW PRESSURE FUEL INLET. - 8. FUEL CHANNELS TO SUPPLY PUMPING ELEMENTS.

Each pumping assembly comprises:

- a piston (5) operated by a three-lobe element (2) floating on the pump shaft (6). Since the element (2) floats on a misaligned portion of the shaft (6), when the shaft rotates it does not turn with it, but is only moved in a circular fashion on a wider radius, with the result of operating the three pumping elements alternately;
- an inlet cap valve (3);
- a delivery ball valve (4).

Operating Principle



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1. FUEL OUTLET FITTING TO RAIL - 2. DELIVERY VALVE TO RAIL - 3. PUMPING ELEMENT - 4. PUMP SHAFT -
5. PUMPING ELEMENT SUPPLY PIPE - 6. PRESSURE REGULATOR SUPPLY PIPE - 7. PRESSURE REGULATOR.

The pumping element (3) is oriented on the cam on the pump shaft (4). In the inlet phase, the pumping element is fed through the supply pipe (5). The amount of fuel to send to the pumping element is established by the pressure regulator (7). The pressure regulator, on the base of the PWM control received from the control unit, chokes the flow of fuel to the pumping element. During the compression phase of the pumping element, the fuel, on reaching such a pressure as to open the delivery valve to the common rail (2), supplies it through the outlet (1).

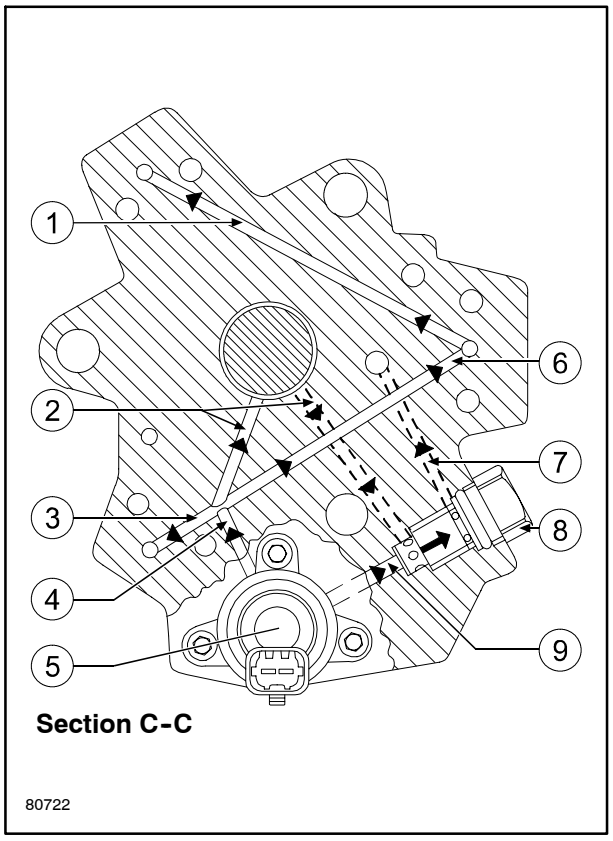
1. INLET TO THE PUMPING ELEMENT - 2. PUMP LUBRICATION PIPES - 3. INLET TO THE PUMPING ELEMENT - 4. MAIN PUMPING ELEMENT SUPPLY PIPE - 5. PRESSURE REGULATOR - 6. INLET TO THE PUMPING ELEMENT - 7. REGULATOR OUTLET PIPE - 8. 5 BAR (72.5185 PSI) RELIEF VALVE - 9. FUEL OUTLET FROM REGULATOR INLET.

The low-pressure fuel lines in the pump are shown; the main supply pipe of the pumping elements (4), the supply pipes of the pumping elements (1 - 3- 6), the pipes used to lubricate the pump (2), the pressure regulator (5), the 5 bar (72.5185 psi) relief valve (8) and the fuel outlet (7) are shown.

The pump shaft is lubricated by the fuel through the delivery and return pipes (2).

The pressure regulator (5) determines the amount of fuel with which to supply the pumping elements; the excess fuel flows out through the pipe (9).

The 5 bar (72.5185 psi) relief valve, besides acting as a manifold for the fuel outlets, has the function of keeping the pressure constant at the regulator inlet at 5 bar (72.5185 psi).



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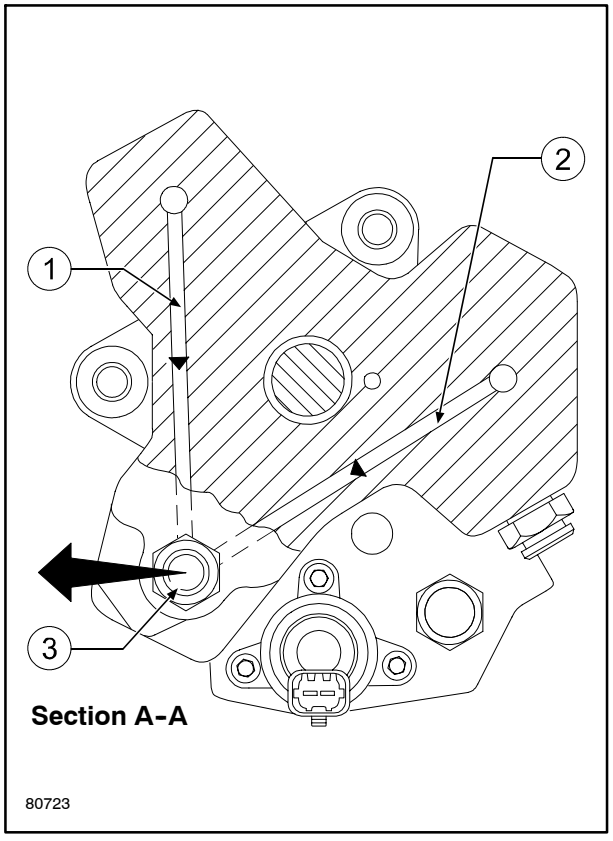
1. FUEL OUTLET PIPE - 2. FUEL OUTLET PIPE - 3. FUEL OUTLET FROM THE PUMP WITH THE HIGH-PRESSURE PIPE FITTING FOR THE COMMON RAIL.

The flow of fuel at high pressure through the pumping element outlet pipes is shown.



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Operation

The cylinder is filled through the inlet cap valve only if the supply pressure is able to open the delivery valves on the pumping elements (approximately 2 bar (29.0074 psi)).

The amount of fuel feeding the high-pressure pump is metered by the pressure regulator, located on the low-pressure system. The pressure regulator is governed by the EDC 7 control unit via a PWM signal.

When fuel is sent to the pumping element, the relevant piston is moving downwards (intake stroke). When the piston stroke reverses, the intake valve closes and the fuel left in the pumping element chamber, not being able to get out, is compressed above the level of the supply pressure in the rail.

The pressure generated in this way causes the exhaust valve to open and the compressed fuel reaches the high-pressure circuit.

The pumping element compresses the fuel to reach the top dead centre (delivery stroke). The pressure then decreases until the exhaust valve closes.

The plunger of the pumping element goes back towards the bottom dead centre and the remaining fuel decompresses.

When the pressure in the chamber of the pumping element becomes less than the supply pressure, the intake valve opens again and the cycle is repeated.

The delivery valves must always be free to move, with no debris or oxidation.

The delivery pressure to the rail is modulated between 250 and 1350 bar (3625.9250 and 19579.9950 psi) by the electronic control unit via the solenoid valve of the pressure regulator.

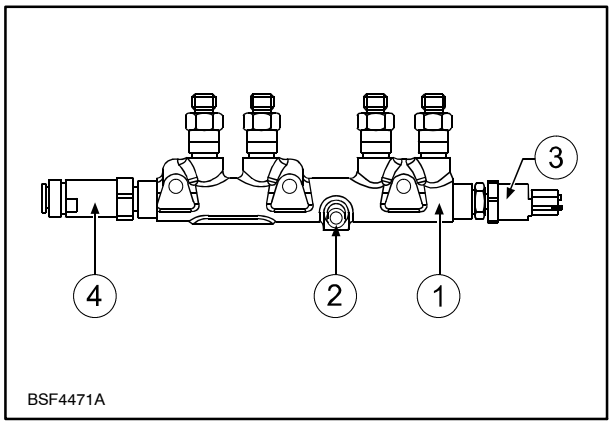
The pump is lubricated and cooled by the fuel itself.

The time for removing - installing the radialjet pump on the engine is considerably shorter than for conventional injection pumps as it does not need timing.

If disassembling - reassembling the piping between the fuel filter and the high-pressure pump, make sure your hands and the components are clean.

RAIL (PRESSURE ACCUMULATOR)

1. RAIL. - 2. FUEL INLET FROM THE HIGH-PRESSURE PUMP. - 3. PRESSURE SENSOR. - 4. PRESSURE RELIEF VALVE.



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The rail volume is smaller to permit fast pressurization when starting, at slow idling and when there are high flow rates.

However, its volume is sufficient to minimize the phenomena caused by the injectors opening and closing and the pump working at high pressure. This function is helped further by a calibrated orifice downstream from the high-pressure pump.

Screwed onto the rail there is a fuel pressure sensor (3). The signal sent from this sensor to the electronic control unit is feedback on the basis of which the level of pressure in the rail is checked and, if necessary, corrected.

Pressure Relief Valve

The pressure relief valve (**1750 bar** (**25381.3500 psi**)) on the rail is used to protect the system components if there is too great an increase in the pressure in the high-pressure system.

It may have a single stage (shown below) or two stages with a double operating threshold (1750 bar and 800 bar (25381.3500 psi and 11602.9600 psi)).

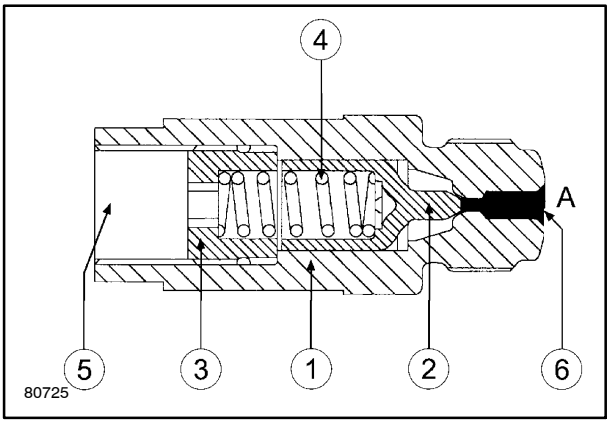
In the second case, the high-pressure system pressure reaches 1750 bar (25381.3500 psi), the valve trips as the single-stage one to make the fuel flow off and accordingly lower the pressure within safe limits. Then, mechanically adjust the pressure in the rail to approximately 800 bar (11602.9600 psi).

In this way, the valve lets the engine operate for extended periods at limited performance, preventing the fuel from overheating and protecting the outlet piping.

If this valve trips, the control unit turns off the control of the pressure regulator and saves fault 8.4. The valve will supply the maximum delivery to the rail.

1. Body - 2. Plunger - 3. Stop - 4. Spring -
5. Outlet to tank - 6. Seat on rail.

A Normally, the tapered end of the plunger keeps the outlet to the tank closed.



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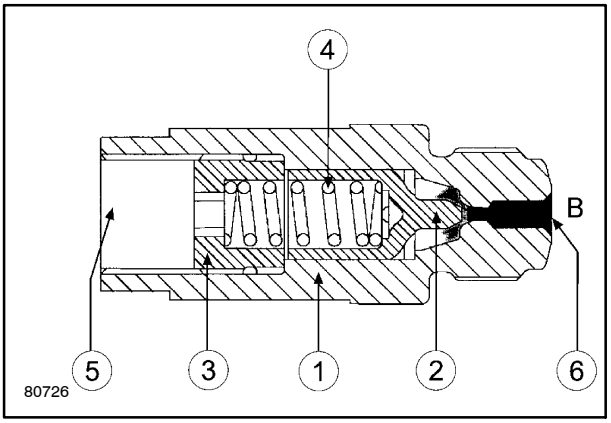
5. Outlet to tank - 6. Seat on rail.

B If the pressure of 1750 bar (25381.3500 psi) of the fuel in the rail is exceeded, the plunger is shifted and the excess pressure is discharged into the tank.



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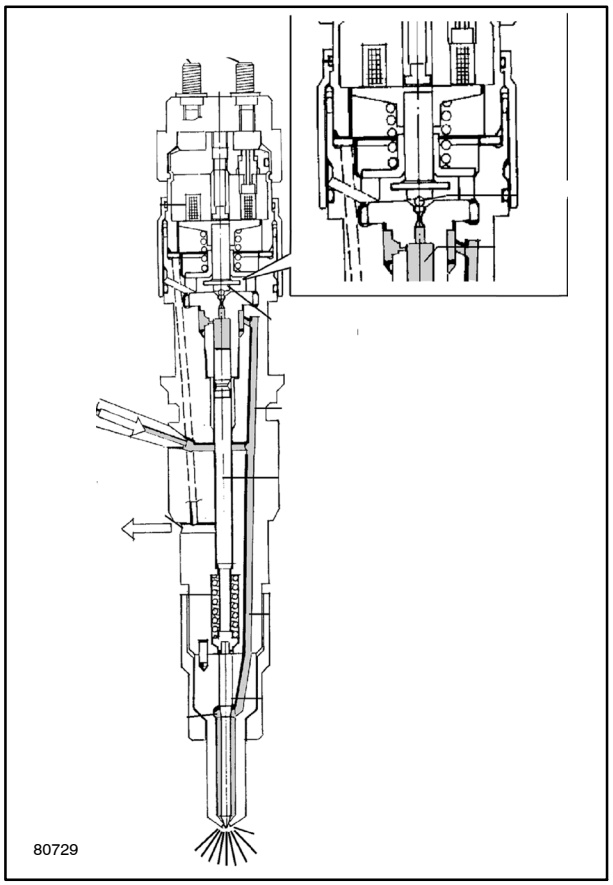
ELECTRO-INJECTOR

The construction of the injector is similar to that of conventional ones, except that there are no needle return springs.

The electro-injector can be considered to comprise two parts:

- actuator - nozzle composed of a pressure rod, needle and nozzle;
- control solenoid valve composed of coil and pilot valve.

The solenoid valve controls the lift of the needle of the nozzle.



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InjectionStart

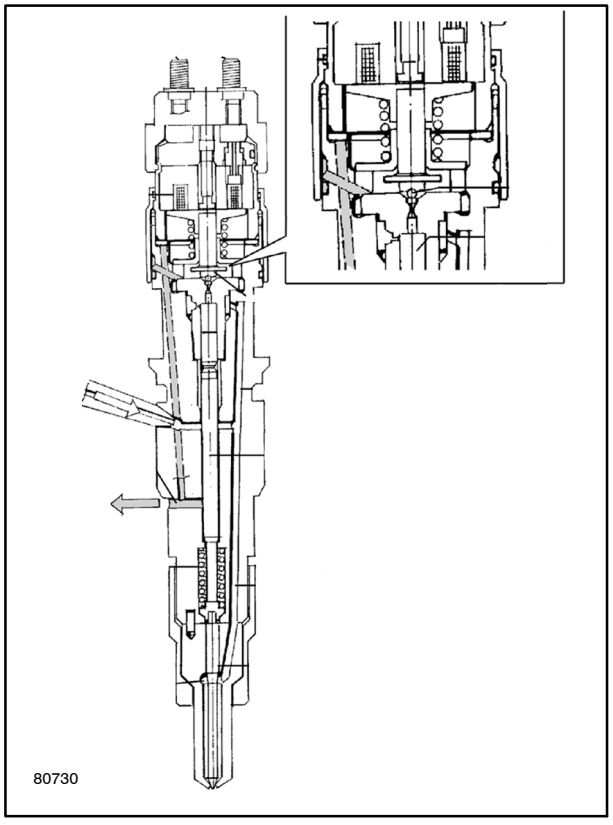
When the coil is energized, it causes the shutter to move upwards. The fuel of the control volume flows out towards the backflow pipe, causing a drop in pressure in the control volume. At the same time, the pressure of the fuel in the pressure chamber causes the needle to rise, with fuel getting injected into the cylinder as a result.

Injection End

When the coil is de-energized, the shutter goes back into its closed position to form such a balance of forces as to make the needle go back into its closed position and end injection.

⚠ CAUTION ⚠

The electro-injector cannot be overhauled and therefore must not be removed.



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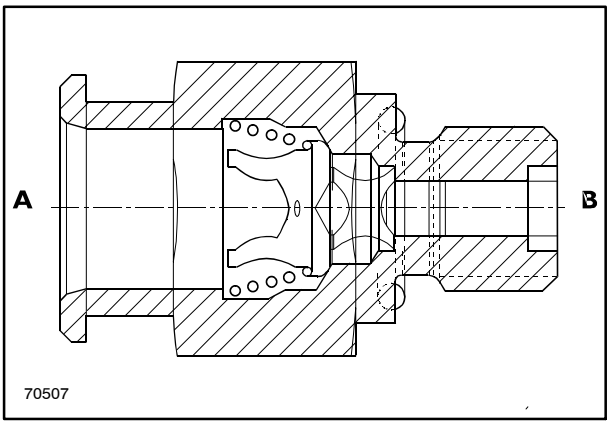
FUEL RETURN PRESSURE LIMITER

Housed on the back of the cylinder head, it governs the pressure of the fuel returning from the injectors at a pressure of between 1.3 to 2 bar (18.8548 to 29.0074 psi). By ensuring this pressure for the return fuel, no fuel vapours form in the electro-injectors, optimizing the spray of fuel and its combustion.

A To the tank - **B** From the electro-injectors



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SECTION 10 - ENGINE

Chapter 2 - CNH Engine - F4DE0684A/F4DE0684B (6 Cylinder Common Rail Electronic)

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SPECIFICATIONS

Engine	F4DE0684A	F4DE0684B
Type	6 cylinders	
Compression ratio	17,1	
Maximum power at rated engine speed ... kW ... (HP)	101 133	93 124
... rev/min	2200	
Maximum torque ... Nm (lb ft)	604 (445.4874)	606 (446.9626)
... rpm	650	
Slow idling speed of engine without load ... rpm	650	
Fast idling speed of engine without load ... rpm	2360	
Boost feeding	With intercooler	
Turbocharger type	HOLSET	
Lubrication	Forced via lobe pump, pressure relief valve, oil filter	
Oil pressure with engine hot		
- at slow idling ... bar (psi)	0,7 (10.1526)	
- at fast idling ... bar (psi)	4,0 (58.0148)	
Cooling system	Fluid-based	
Coolant pump drive:	Via belt	
Thermostat:		
- temperature start ... ° C (° F)	82,2 (179.96)	
Filling		
- engine sump ... litres (gall imp.)	min 11 (1.539) max 15 (2.1998)	
- engine sump + filter ... litres (gall imp.)	16 (2.4197)	

(continued)

Engine			F4DE0684A	F4DE0684B
Type			6 cylinders	
Cycle			Diesel, 4-stroke	
Fuel system			Turbocharged with intercooler	
Fuel injection			Direct	
Number of cylinders			6	
Bore		mm (in.)	104 (4.095)	
Stroke		mm (in.)	132 (5.1968)	
Total displacement		cm^3 ($in.^3$)	6726 (410)	
Timing system				
Inlet Start before T.D.C. (Top Dead Centre)			8,5°	
Inlet End after B.D.C. (Bottom Dead Centre)			8,5°	
Exhaust Start before B.D.C.			51°	
Exhaust End after T.D.C.			12,5°	
Valve Clearance (engine cold)	Inlet	mm (in.)	0,20 to 0,30 (0.0079 to 0.0118)	
	Exhaust	mm (in.)	0,45 to 0,55 (0.0177 to 0.0217)	
Fuel system . .			High pressure, Common Rail	
Injection:		Bosch	EDC7CI control unit	
Nozzles			Electro-injectors	
Injection order			1 - 5 - 3 - 6 - 2 - 4	
Injection pressure		bar (psi)	300-1400 (4315-20305)	

(continued)

Assembly Clearances

Engine	F4DE0684A	F4DE0684B
Type	6 cylinders	
CRANK GEAR AND CYLINDER ASSEMBLY DATA		
Cylinder liners . . . . . ∅ 1	104,0 to 104,024 (4.0945 to 4.1039)	
Cylinder liners:		
outside diameter . . . . . ∅ 2	–	
length L	–	
Cylinder liners – crankcase seats (interference)	–	
Outside diameter . . . . . ∅ 2	–	
Cylinder liners:		
inside diameter . . . . . ∅ 2	–	
Pistons supplied as spare parts:	–	
measurement X	55,9 (2.2008)	
outside diameter . . . . . ∅ 1	103,730 to 103,748 (4.0839 to 4.0846)	
seat for pin . . . . . ∅ 2	38,010 to 38,016 (1.4965 to 1.4967)	
Piston – cylinder liners	0,252 to 0,294 (0.0099 to 0.0116)	
Piston diameter . . . . . ∅ 1	0,5 (0.0197)	
Piston location from crankcase X	0,28 to 0,42 (0.0110 to 0.0165)	
Piston pin . . . . . ∅ 3	37,999 to 38,000 (1.4960 to 1.4961)	
Piston pin – pin seat	0,011 to 0,016 (0.0004 to 0.0006)	
Piston ring grooves X1*	2,705 to 2,735 (0.1065 to 0.1077)	
Piston ring grooves X2	2,44 to 2,46 (0.0961 to 0.0969)	
Piston ring grooves X3	4,03 to 4,05 (0.1587 to 0.1594)	
Piston rings S1*	2,560 to 2,605 (0.1008 to 0.1026)	
Piston rings S2	2,350 to 2,380 (0.0925 to 0.0937)	
Piston rings S3	3,970 to 3,990 (0.1563 to 0.1571)	
* measured on ∅ of 58 mm (2.2835 in.) 4 cylinders		
Piston rings – grooves 1	0,100 to 0,175 (0.0039 to 0.0069)	
Piston rings – grooves 2	0,040 to 0,900 (0.0016 to 0.0354)	
Piston rings – grooves 3	0,020 to 0,065 (0.0008 to 0.0026)	
Piston rings	0,5 (0.0197)	
Piston ring end opening in cylinder liner:		
X1	0,3 to 0,4 (0.0118 to 0.0157)	
X2	0,6 to 0,8 (0.0236 to 0.0315)	
X3	0,30 to 0,55 (0.0118 to 0.0217)	

(continued)

Engine	F4DE0684A	F4DE0684B
Type	6 cylinders	
Small end bushing seat ..... ∅ 1	40,987 to 41,013 (1.6137 to 1.6147)	
Connecting rod bearing seat ..... ∅ 2	72,987 to 73,013 (2.8735 to 2.8745)	
Small end bushing diameter:		
outside ..... ∅ 4	43,279 to 43,553 (1.7039 to 1.7147)	
inside ..... ∅ 3	38,019 to 38,033 (1.4968 to 1.4974)	
Connecting rod half-bearings supplied as spares ..... S	1,955 to 1,968 (0.0770 to 0.0775)	
Connecting rod bushing - seat	0,266 to 0,566 (0.0105 to 0.0223)	
Piston pin - bushing	0,019 to 0,033 (0.0007 to 0.0013)	
Connecting rod half bearings	0,250 to 0,500 (0.0098 to 0.0197)	
Measurement X	-	
Maximum error on alignment of connecting rod axes ..... =	-	
Main journals ..... ∅ 1	82,990 to 83,001 (3.2673 to 3.2677)	
Crankpins ..... ∅ 2	68,987 to 69,013 (2.7160 to 2.7170)	
Main journal half bearings S1	2,456 to 2,464 (0.0967 to 0.0970)	
Connecting rod half bearings S2	1,955 to 1,968 (0.0770 to 0.0775)	
Main bearings		
no. 1 - 5 ..... ∅ 3	87,982 to 88,008 (3.4639 to 3.4649)	
no. 2 - 3 - 4 ..... ∅ 4	87,977 to 88,013 (3.4637 to 3.4651)	
Half bearings - main journals		
no. 1 - 7	0,041 to 0,119 (0.0016 to 0.0047)	
no. 2 - 3 - 4 - 5- 6	0,041 to 0,103 (0.0016 to 0.0041)	
Half bearings - crankpins	0,033 to 0,041 (0.0013 to 0.0016)	
Main journal half bearings	+ 0,250 (+0.0098); + 0,500 (+0.0197)	
Connecting rod half bearings		
Main journal for thrust X1	37,475 to 37,550 (1.4754 to 1.4783)	
Main bearing for thrust X2	25,98 to 26,48 (1.0228 to 1.0425)	
Semi-circular thrust washers X3	37,28 to 37,38 (1.4677 to 1.4717)	
Crankshaft thrust	0,068 to 0,410 (0.0027 to 0.0161)	
CYLINDER HEAD		
Valve guide bores in the cylinder head ..... ∅ 1	7,051 to 7,053 (0.2776 to 0.2777)	
..... ∅ 2	-	
Valve guide		
..... ∅ 3	-	
Valve guide and bores in head	-	
Valve guide	-	

(continued)

Engine	F4DE0684A	F4DE0684B
Type	6 cylinders	
Valves:		
∅ 4	6,970 to 6,999 (0.2744 to 0.2756)	
α	60° ± 0,25°	
∅ 4	6,970 to 6,999 (0.2744 to 0.2756)	
α	45° ± 0,25°	
Valve stem and relative guide	0,052 to 0,092 (0.0020 to 0.0036)	
Bore in head for valve seat:		
Intake ∅ 1	34,837 to 34,863 (1.3725 to 1.3726)	
Exhaust ∅ 1	34,837 to 34,863 (1.3725 to 1.3726)	
Valve seat outside diameter; angle of valve seats in cylinder head		
Intake ∅ 2	34,917 to 34,931 (1.3747 to 1.3752)	
α	60°	
Exhaust ∅ 2	34,917 to 34,931 (1.3747 to 1.3752)	
α	45°	
Recessing		
Intake X	0,59 to 1,11 (0.0232 to 0.0437)	
Exhaust X	0,96 to 1,48 (0.0378 to 0.0452)	
Between valve seat and head		
Intake	0,054 to 0,094 (0.0021 to 0.0037)	
Exhaust	0,054 to 0,094 (0.0021 to 0.0037)	
Valve seats	-	
Valve spring height:	-	
free spring H	47,75 (1.8799)	
under a load of:		
329 N H1	35,33 (1.3909)	
641 N H2	25,2 (0.9921)	
Injector protrusion X	-	
Seats for camshaft bushings no. 1 - 5	59,222 to 59,248 (2.3316 to 2.3326)	
Camshaft seats no. 2 - 3 - 4	54,089 ÷ 54,139 (2.1292 to 2.1315)	
Camshaft support journals		
1 ⇒ 5	53,995 to 54,045 (2.1258 to 2.1278)	
Camshaft bushing outside diameter: ∅	59,222 to 59,248 (2.3316 to 2.3326)	
Bushing inside diameter: ∅	54,083 to 54,147 (2.1292 to 2.1318)	
Bushings and seats in crankcase	-	
Bushings and support journals	0,038 to 0,162 (0.0015 to 0.0064)	
Useful cam lift: H	6,045 (0.2380)	
H	7,582 (0.2985)	
Tappet cap seat in crankcase ∅ 1	16,000 to 16,030 (0.6299 to 0.6311)	
Tappet cap outside diameter:		
∅ 2	15,924 to 15,954 (0.6269 to 0.6281)	
∅ 3	15,960 to 15,975 (0.6283 to 0.6289)	
Between tappets and seats	0,025 to 0,070 (0.0010 to 0.0028)	
Tappets	-	
Rocker arm shaft ∅ 1	21,965 to 21,977 (0.8648 to 0.8652)	
Rocker arms: ∅ 2	21,001 to 22,027 (0.8268 to 0.8672)	
Between rocker arms and shafts	0,024 to 0,162 (0.0009 to 0.0064)	

TIGHTENING TORQUES

PART	TORQUE	
	Nm (lb ft)	
Bolts securing bench:	1st Stage 2nd Stage 3rd Stage	50 ± 6 (36.8781 ± 4.4254) 80 ± 6 (59.0050 ± 4.4254) 90° ± 5°
Bolts securing connecting rod caps:	1st Stage 2nd Stage 3rd Stage	30 ± 3 (22.1269 ± 2.2127) 60 ± 5 (44.2537 ± 3.6878) 60° ± 5°
Nuts securing engine cover (Figure 2) (M8 125)		25 ± 5 (18.4391 ± 3.6878)
Bolts securing engine flywheel:		30 ± 4 (22.1269 ± 2.9502) 60° ± 5°
Bolts securing pulley and damper:		50 ± 5 (36.8781 ± 3.6878) 90° ± 5°
Bolts securing injectors on cylinder head:		110 ± 5 (81.1318 ± 3.6878)
Nut securing P.A.P. gear:		105 ± 7 (77.4440 ± 5.1629)
Nut securing compressor gear:		125 ± 19 (92.1953 ± 14.0137)
Bolts securing timing gear:		36 ± 4 (26.5522 ± 2.9502)
Unions securing piston lubrication nozzles:		15 ± 3 (11.0634 ± 2.2127)
Bolts securing timing system casing M8 1.25x40 M10 1.5x30		 24 ± 4 (17.7015 ± 2.9502) 47 ± 5 (34.6654 ± 3.6878)
Bolts securing front cover M10 1.5x30		 24 ± 4 (17.7015 ± 2.9502)
Bolts securing main bearing caps M12 1.50 12.9	1st Stage 2nd Stage 3rd Stage	50 ± 6 (36.8781 ± 4.4254) 80 ± 6 (59.0050 ± 4.4254) + 90° ± 5°
Viti fissaggio Ladder Frame: M10 1.5x25		 43 ± 5 (31.7152 ± 3.6878)
Bolts securing lifting brackets: M12 1.75x25 M10		 7 ± 12 (5.1629 ± 8.8507) 43 ± 5 (31.7152 ± 3.6878)
Bolts securing oil cooler (Figure 4) M8 1.25x35 M8 1.25x100 M12 Connector		 25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878)
Bolts securing valve cover M8 Nuts		 24 ± 4 (17.7015 ± 2.9502)
Engine Vent Fastener (Ccv) M8 1.25x45 M8 1.25x35		 24 ± 4 (17.7015 ± 2.9502) 24 ± 4 (17.7015 ± 2.9502)
Bolts securing oil sump (Figure 5) ♦ Tightening Bolts Nº 26-23 M10 1.5x45 Tightening Bolts Nº 3-10; 13-20; 24-25 M10 1.5x90 Tightening Bolts Nº 1-2-21-22 M10 1.5x125 Tightening Bolts Nº 11-12 M10 15x190		 50 ± 5 (36.8781 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878)
Bolts / Plugs On Head 1/2" Nptf 3/4" Nptf 1/4 Inch Nptf		 24 ± 4 (17.7015 ± 2.9502) 36 ± 5 (26.5522 ± 3.6878) 12 ± 2 (8.8507 ± 1.4751)

♦ Lubricate With Engine Oil Before Assembly

(continued)

PART	TORQUE	
	Nm (lb ft)	
Bolt torque sequence for securing cylinder head (Figure 1) Tightening bolts Nº 16-15-8-7-1-2-9-10-17-18 M12 1.75x150 Tightening bolts Nº 12-11-4-3-5-6-13-14 M12 1.75x130	 1st Stage 1st Stage 2nd Stage 3rd Stage	 55 ± 5 (40.5659 ± 3.6878) 35 ± 5 (25.8147 ± 3.6878) + 90° ± 5° + 90° ± 5°
Bolts securing heater grille: M6		10 ± 2 (7.3756 ± 1.4751)
Bolts securing intake manifold: M8 1.25x25 M8 1.25x60		 25 ± 5 (18.4391 ± 3.6878) 25 ± 5 (18.4391 ± 3.6878)
Bolt torque sequence for securing exhaust manifold on head: (Figure 3) M12 M12 1.75x25		80 ± 5 (62.6928 ± 3.6878)
Bolts securing connecting rod caps: M11 1.25 Torque/Angle	1st Stage 2nd Stage 3rd Stage	30 ± 3 (22.1269 ± 2.2127) 60 ± 5 (44.2537 ± 3.6878) + 90° ± 5°
Bolts securing flywheel M12 M10		 85 ± 10 (62.6928 ± 7.3756) 49 ± 5 (36.1405 ± 3.6878)
Bolts securing camshaft thrust plate: M8 1.25x25		24 ± 4 (17.7015 ± 2.9502)
Bolts securing camshaft gear: M8 1.25x20		36 ± 4 (26.5522 ± 2.9502)
Bolts securing rocker arms:		36 ± 5 (26.5522 ± 3.6878)
Bolts securing rocker arm adjusters: 3/8 24 Unf Hex Nut		24 ± 4 (17.7015 ± 2.9502)
Bolts securing rocker arm casing:		24 ± 4 (17.7015 ± 2.9502)
Bolts securing phonic wheel: M12 1.25 Hex		 50 ± 5 (36.8781 ± 3.6878) 90° ± 5°
Fuel connector fastener on head side		50 ± 5 (36.8781 ± 3.6878)
Fuel connector fastener on Common Rail side		20 ± 2 (14.7512 ± 1.4751)
Common Rail fastener M8 1.25x10 M8 1.25x50 M8 1.25x90		24 ± 4 (17.7015 ± 2.9502)
Fastener for high-pressure pipes from Common Rail to cylinder head M14 1.5		20 ± 2 (14.7512 ± 1.4751)
Fastener for fuel filter mounting on crankcase M12 1.75x25 9.8 Fig Hex		77 ± 8 (56.7923 ± 5.9005)
Turbine / exhaust manifold, bolt torque sequence (Figure 6) M8 1.25		25 ± 5 (18.4391 ± 3.6878)
Oil delivery/return pipe fastener M12 1.5		35 ± 5 (25.8147 ± 3.6878)
Oil dipstick pipe fastener:		24 ± 4 (17.7015 ± 2.9502)
Bolts securing oil pump: M8 1.25x30 8.8 Hex		8 ± 1 (5.9005 ± 0.7376) 24 ± 4 (17.7015 ± 2.9502)
Main oil delivery bolts (plugs) M10 – 1 M14 – 1.5		 6 ± 1 (4.4254 ± 0.7376) 11 ± 2 (8.1132 ± 1.4751)

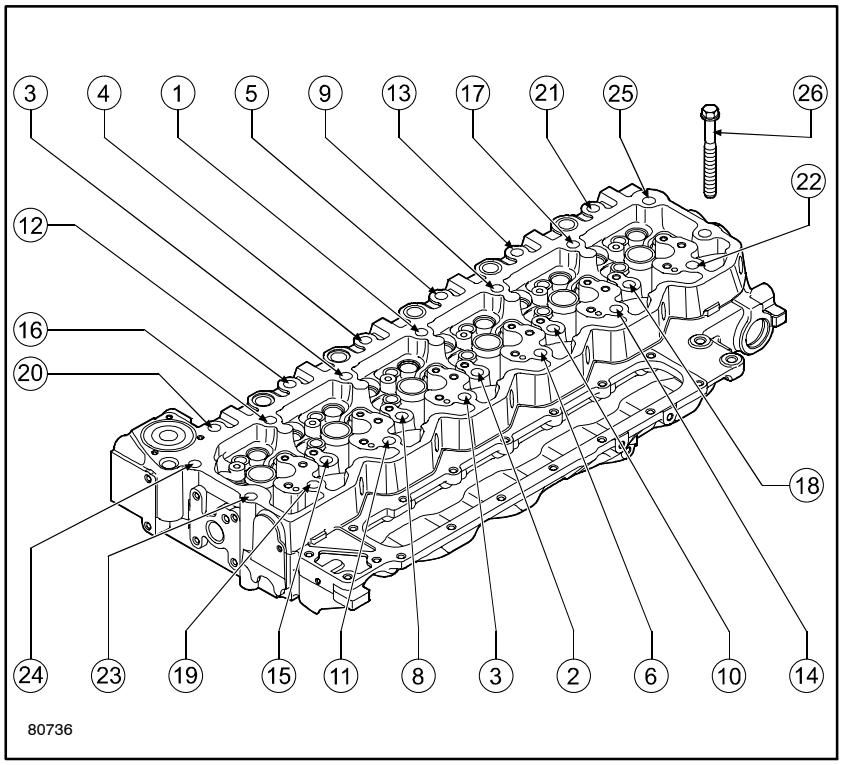
♦ Lubricate With Engine Oil Before Assembly

(continued)

PART	TORQUE
	Nm (lb ft)
Oil cooler / oil filter assembly fastener:	24 ± 4 (17.7015 ± 2.9502)
Coolant pump / crankcase fastener: M8 1.25x25 8.8 Hex	24 ± 4 (17.7015 ± 2.9502) 43 ± 6 (31.7152 ± 4.4254)
Fan mounting fastener M10	33 ± 5 (24.3395 ± 3.6878)
Fan pulley fastener	—
Fan spacer or accessory pulley fastener (when required) M6 M10 M12	10 ± 2 (7.3756 ± 1.4751) 43 ± 6 (31.7152 ± 4.4254) 77 ± 12 (56.7923 ± 8.8507)
Alternator fastener M8 1.25x30 M12 1.75x120 M12 Nut 1.75 M10 1.5x25 M10 1.5x40 9. M10 Nut 1.5 9 M16 1.5 Hex	24 ± 4 (17.7015 ± 2.9502) 43 ± 6 (31.7152 ± 4.4254) 24 ± 4 (17.7015 ± 2.9502) — — — —
Stud bolts for mounting fuel pump: M8	12 ± 2 (8.8507 ± 1.4751)
Bolts securing injection pump: M8 1.5	24 ± 4 (17.7015 ± 2.9502)
Tightening nut fixing injection pump gear M18 1.5	105 ± 5 (77.4440 ± 3.6878)
Fastener for fittings from injection pump to Common Rail: M12 1.5	20 ± 2 (14.7512 ± 1.4751)
Bolts securing injectors:	8,5 ± 0,8
Bolts securing injector connectors:	1,5 ± 0,25 (1.1063 ± 0.1844)
Oil pressure regulator sensor fastener:	8 ± 2 (5.9005 ± 1.4751)
Camshaft speed sensor fastener in gearbox: M6	8 ± 2 (5.9005 ± 1.4751)
Crankshaft speed sensor fastener on front cover M6	8 ± 2 (5.9005 ± 1.4751)
Temperature sensor fastener on cylinder head: M14 1.5x12 Hex	20 ± 3 (14.7512 ± 2.2127)
Air temperature sensor fastener on intake manifold: M6 1x20	3 ± 1 (2.2127 ± 0.7376)
Air pressure and temperature sensor fastener on intake manifold: M5	3 ± 1 (2.2127 ± 0.7376)
Fuel pressure sensor fastener:	35 ± 5 (25.8147 ± 3.6878)
Fuel temperature sensor fastener: M14 1.5x12 Hex	20 ± 3 (14.7512 ± 2.2127)
Gear fastener on air compressor: 5/8 Inch 18 Unf	125 ± 19 (92.1953 ± 14.0137)
Air compressor fastener on crankcase: M12 Nut	81 ± 12 (59.7425 ± 8.8507)

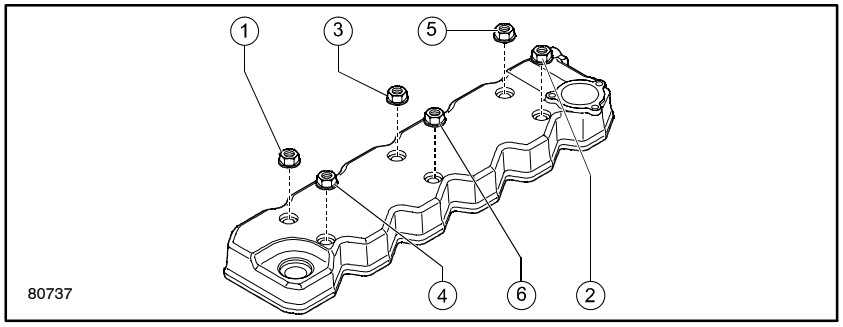
♦ Lubricate with engine oil before assembly

Tightening sequence for cylinder head bolts



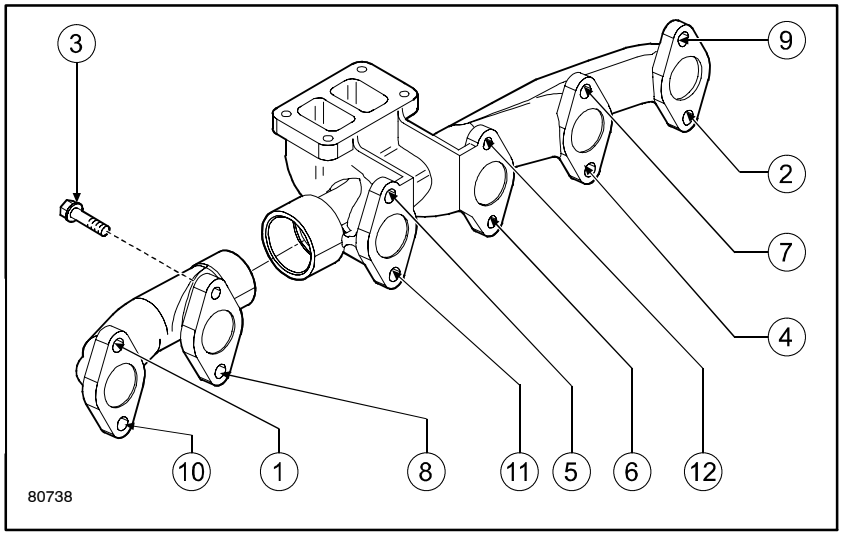
1

Tightening sequence for engine cover bolts



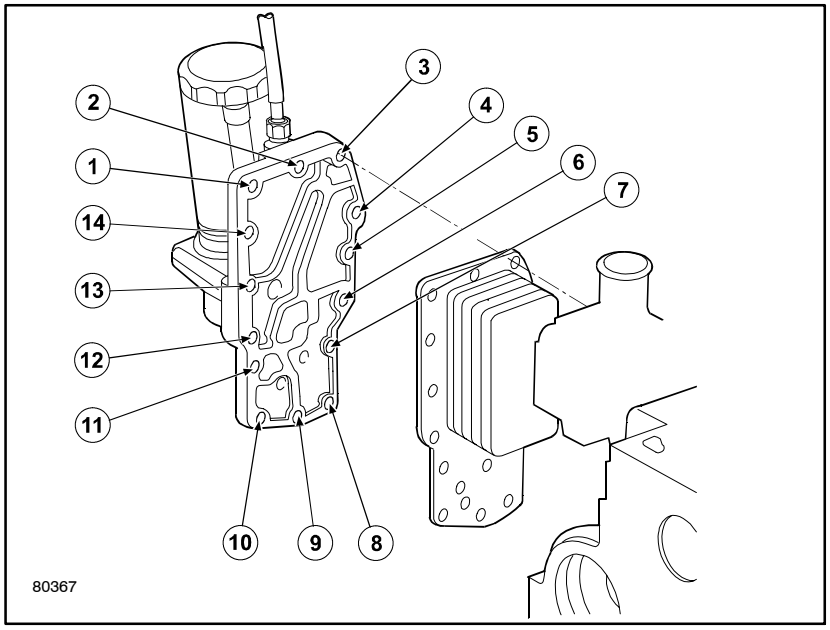
2

Tightening sequence for exhaust manifold bolts



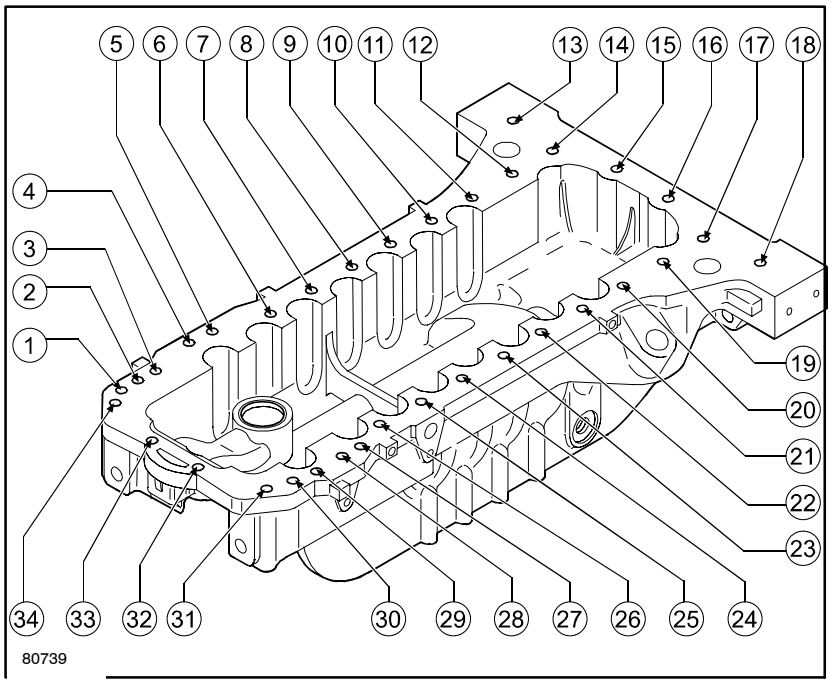
3

Tightening sequence for cooler bolts



4

Tightening sequence for engine oil sump bolts

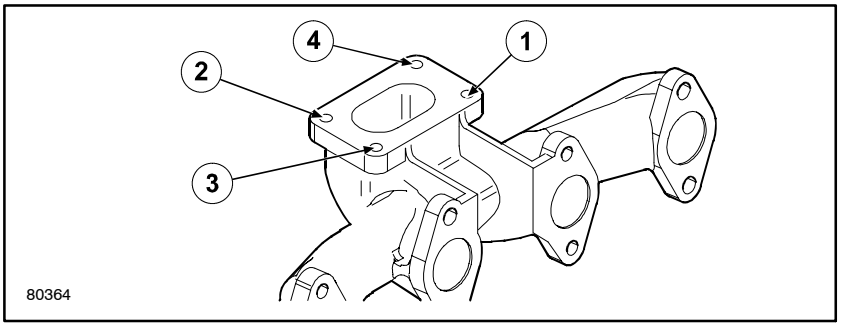


5

Tightening sequence for turbocharger nuts and bolts

Sequence:

- Pre-tightening 4-3-1-2
- Tightening 1-4-2-3



6

SPECIAL TOOLS

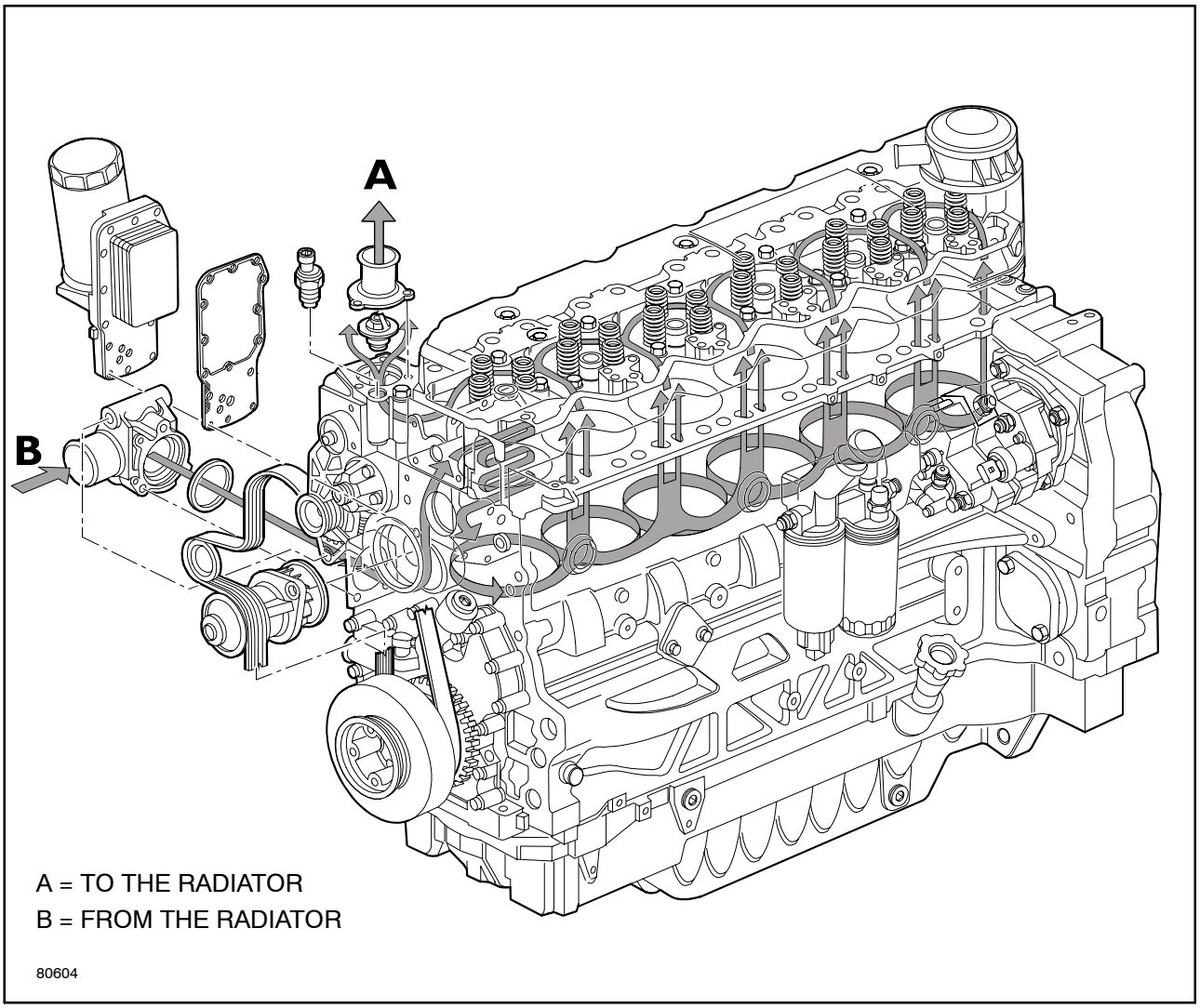
No. TOOL	NAME
380000979	Puller for engine injection pump union gear
380000665	Tool to extract crankshaft front seal
380000663	Tool to extract crankshaft rear seal
380001099	Injector extractor
380000666	Splining tool for fitting front seals on crankshaft
380000664	Splining tool for fitting rear seal on crankshaft
380000988	Plate for engine flywheel rotation tool with engine timing pin (use with 380000732)
380000732	Tool for engine flywheel rotation (use with 380000988)
380000667	Drift for camshaft bushing disassembly and reassembly
380000158	Torque screwdriver for injector solenoid valve connector nut setting
380001003	Complete square to check for connecting rod distortion
380000301	Engine stand (revolving)
380001298	Engine stand to Cylinder block brackets
380001073	Engine lifting brackets

DESCRIPTION OF OPERATION

COOLING

The forced circulation, closed–circuit engine cooling system is composed of the following components:

- Expansion tank: its location, shape and size may change depending on the engine version.
- Radiator, whose job is to dissipate the heat taken by the coolant from the engine. This component, too, is a feature of the version as regards both positioning and engine.
- Viscostatic fan, with the task of increasing the radiator's dissipating capacity: this, too, belongs to the specific engine version.
- A lubricating oil cooler: this, too, belongs to the specific engine version.
- A centrifugal coolant pump housed at the front of the crankcase.
- A thermostat governing coolant circulation.
- The circuit may also extend to the compressor if the version includes it.



7

COOLING SYSTEM DIAGRAM

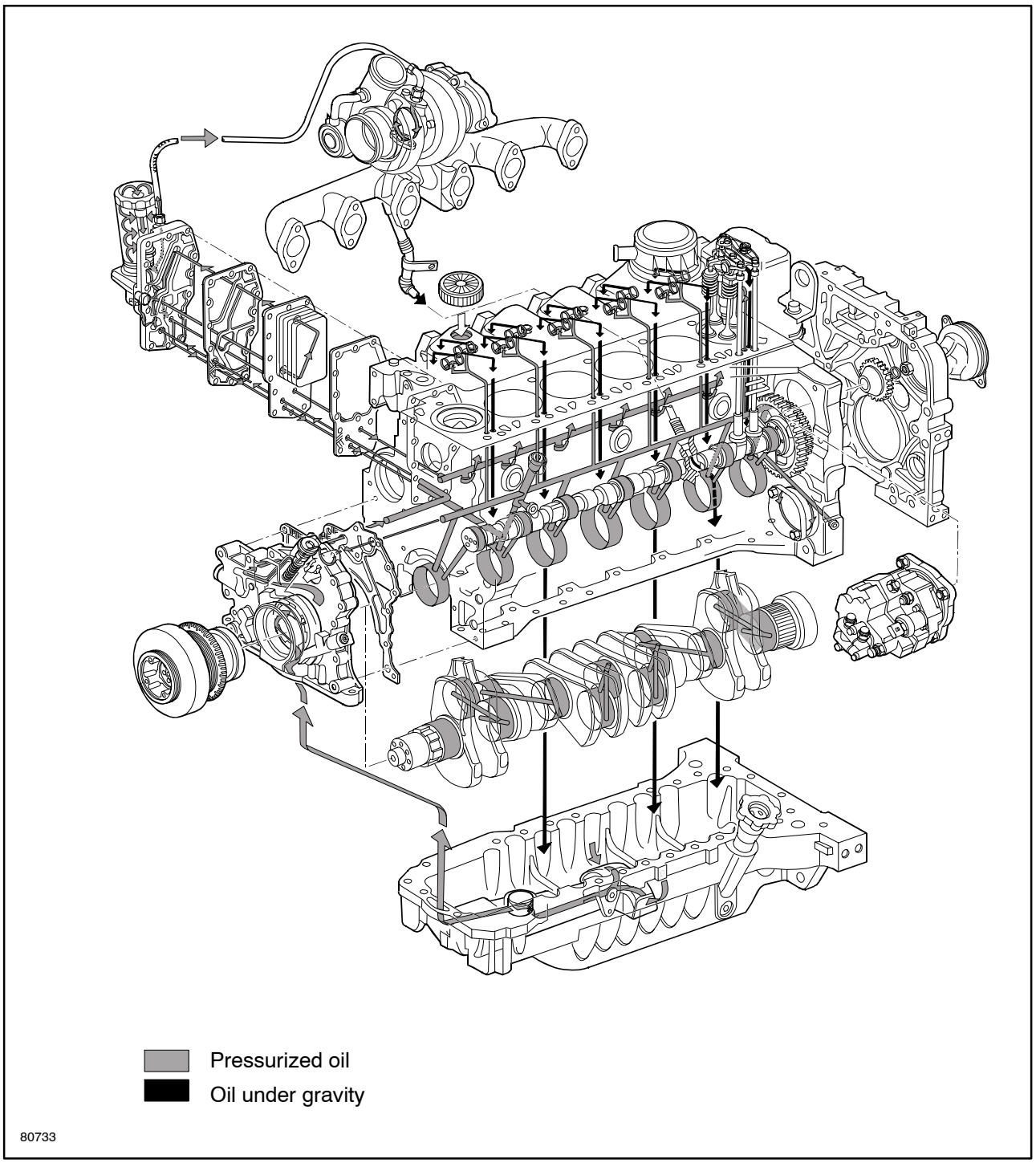
LUBRICATION

Forced-circulation lubrication is accomplished by the oil pump, housed at the front of the crankcase.

The lubricating oil is sent from the oil sump to the crankshaft, camshaft and valve control.

Lubrication also includes the cooler, turbo-blower and compressor for the compressed air system if there is one.

All these components often change according to use and will therefore be covered under the specific heading.



OVERHAUL

ENGINE

For any topics that are not covered here, please refer to the 4-cylinder electronic engine, Section 10, Chapter 1.

⚠ CAUTION ⚠

For any topics that are not covered here, please refer to the 4-cylinder electronic engine, Section 10, Chapter 1

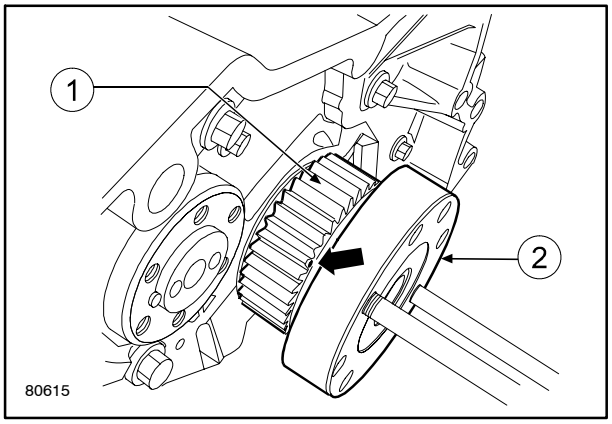
CHECKS, REPAIRS, DIMENSIONS AND ADJUSTMENTS

CAMSHAFT TIMING OPERATIONS

1. Use a marker pen to mark the tooth of the driving gear (1) mounted on the crankshaft (2) on the side of which the reference mark (→) is stamped for timing.

⚠ CAUTION ⚠

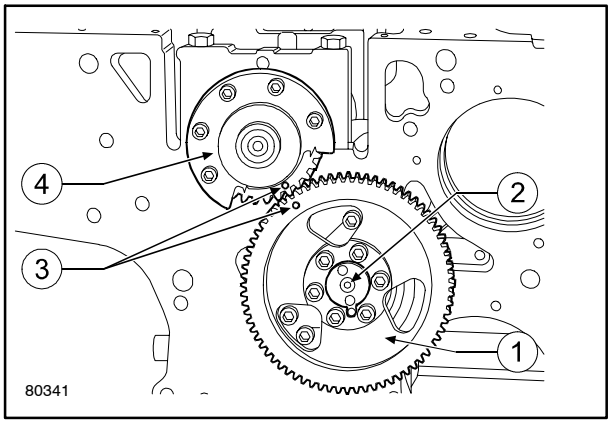
Screw in two pins to help in the operation of turning the crankshaft.



9

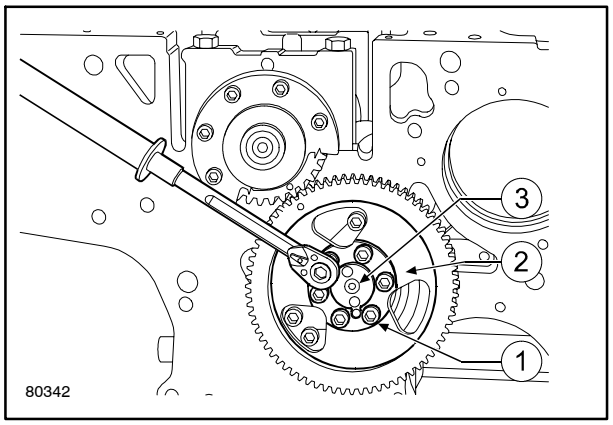
2. Direct the crankshaft (4) and camshaft (2) so that when mounting the driven gear (1) on the camshaft, the marks stamped on the gears (3) coincide.

NOTE: *The electronic 6 cylinder driven camshaft gear (1), has seven (7) speed sensor cutouts.*



10

3. Screw down the bolts (1) securing the gear (2) to the camshaft (3) and tighten to the prescribed torque (36 Nm ± 4 Nm (26.5522 ± 2.9502 lb ft)).

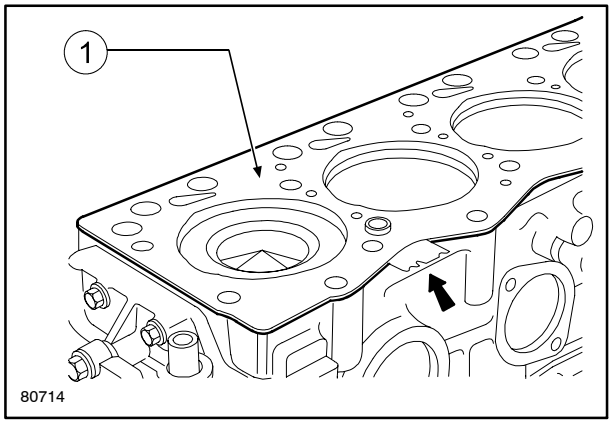


11

FITTING THE CYLINDER HEAD

4. Position the gasket (1) on the engine block. The thickness of the gasket must be chosen according to the measured piston protrusion over the top face of the crankcase.

The arrow indicates the point where the thickness of the gasket is given. The gasket is available in 2 thicknesses, 1.15mm and 1.25mm, select the correct one depending on the piston protrusion dimension.



12

⚠ CAUTION ⚠

Check that the mating surface of the engine block is clean. Do not grease the gasket.

It is recommended to keep the gasket in its wrapping until the head is to be fitted on.

The gasket must be fitted so that the writing stamped on it can be read.

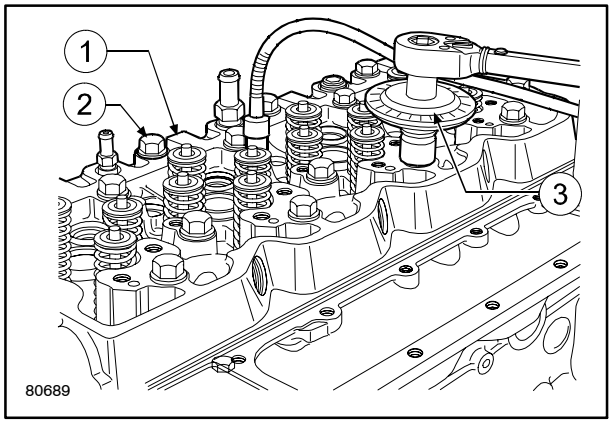
5. Mount the cylinder head (1), screw down the bolts (2) and tighten them in three successive stages, following the sequence and methods indicated.

⚠ CAUTION ⚠

Angle closing is performed using a suitable angle gauge on the wrench (3).

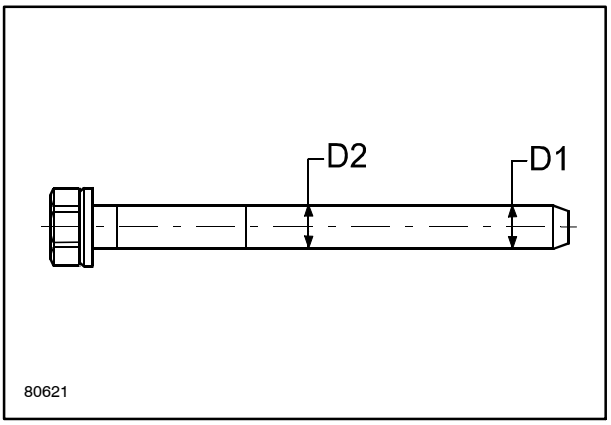
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



13

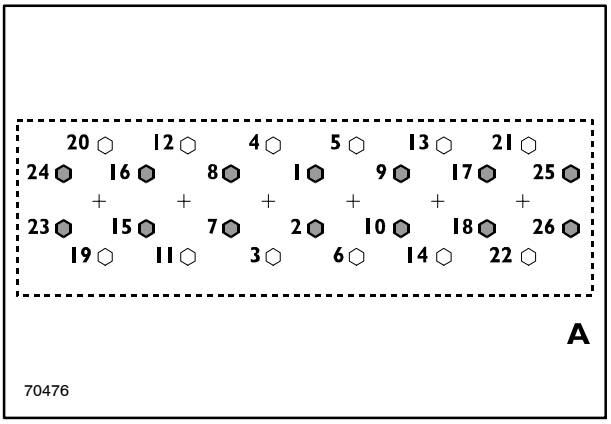
6. Insert the tappet rods and the rocker arm assembly. Before reusing the retaining bolts, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
   if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
   if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



14

7. Lubricate the bolts and fit them on the cylinder head.
8. The bolts must be tightened following a “stitching” pattern, starting from the middle bolts and moving outwards. Tighten the bolts in several stages until they are all tightened precisely. Lastly, turn through 180 degrees.
9. Tightening sequence for cylinder head bolts:
   - 1st stage pre-tightening with a torque wrench:
     - Bolt 12x1.75x130 (⬢) 35 ± 5 Nm (25.8140 ± 3.6878 lb ft)
     - Bolt 12x1.75 x 150 (⬡) 55 ± 5 Nm (40.5659 ± 3.6878 lb ft)
   - 2nd stage, angle closed 90° ± 5°
   - 3rd stage, angle closed 90° ± 5°

   A = Front side



15

REPAIRS - CYLINDER BLOCK

Checks and Measurements

⚠ CAUTION ⚠

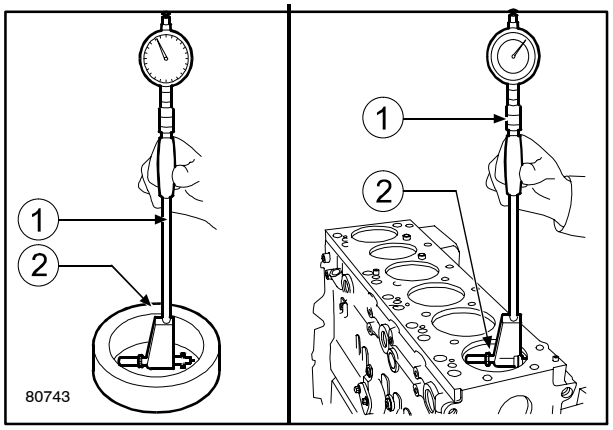
10. After disassembling the engine, thoroughly clean the cylinder-crankcase assembly. Use the appropriate rings for transporting the cylinder assembly.
11. Carefully check the crankcase is not cracked.
12. Check the condition of the plugs. If they are rusty or if there is the slightest doubt about their seal, change them.
13. Examine the surfaces of the cylinder liners; They should show no sign of seizure, scoring, ovality, taper or excessive wear.

14. To check the internal diameter of the cylinder liners for ovality, taper and wear, use a bore gauge (1), fitted with a dial gauge zero-set on the ring gauge (2) of the diameter of the cylinder liner.

⚠ CAUTION ⚠

If the ring gauge is not available, use a micrometer.

15. Measurements must be taken for each single cylinder at three different heights on the liner and on two perpendicular faces: one parallel to the longitudinal axis of the engine and the other perpendicular; maximum wear is generally found on this face in correspondence with the first measurement.
16. If ovality, taper or general wear is noted, bore and recondition the cylinder liners. The cylinder liners must be reground in relation to the diameter of the pistons supplied as spare parts oversized by 0.5 mm (0.0197 in.) over the nominal value and to the prescribed assembly clearance.



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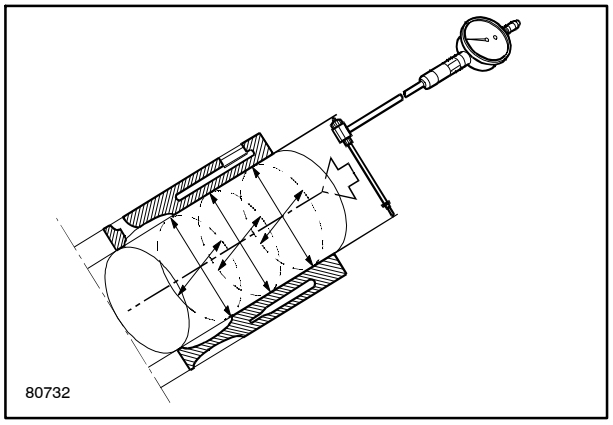


17

⚠ CAUTION ⚠

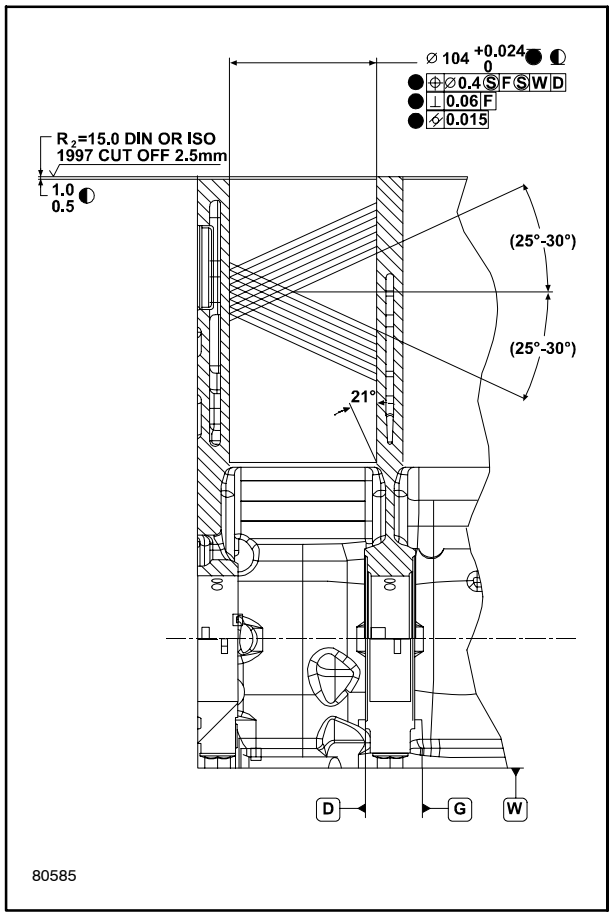
If regrinding, all the liners must have the same oversize (0.5 mm (0.0197 in.)).

17. Check the main bearing seats, proceeding as follows:
    - fit the main bearing caps on the supports without bearings;
    - tighten the retaining bolts to the prescribed torque;
    - using an appropriate dial gauge for interiors, check that the diameter of the seats is as prescribed.

If the measurement is any greater, change the crankcase.

Cylinder Head Mating Surface Check

18. After having located any deformed areas, level off the mating surface using a grinding machine.
19. The flatness error must be no greater than 0.075 mm (0.0030 in.). Check the condition of the cylinder block plugs (1); if they are rusty or if there is the slightest doubt about their seal, change them.



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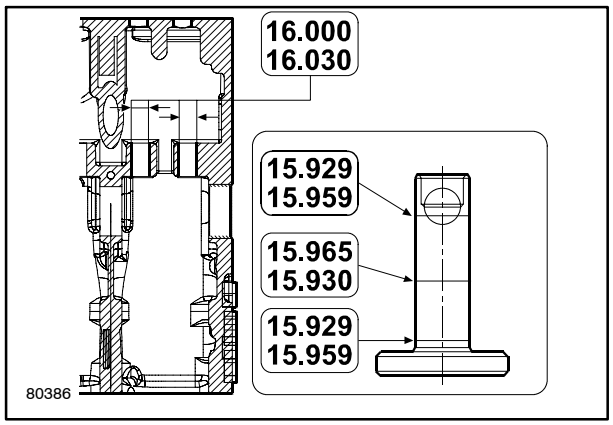
Tappets

Tappets and bores on cylinder block data.



19

CRANKSHAFT

Main and Connecting Rod Journal Dimensions

If any sign of seizure, scoring or ovality is found on the main journals or crankpins, they must be reground. Before reconditioning the pins (2), use a micrometer (1) to measure the pins of the shaft to define the diameter to which the pins must be reduced.

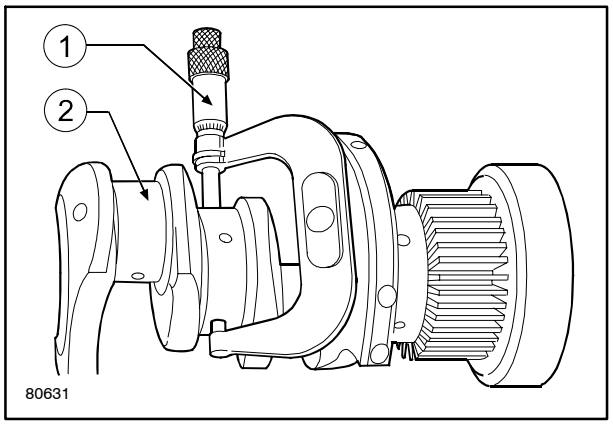
⚠ CAUTION ⚠

It is advisable to note the values on a chart.

The undersize classes are: 0.250 – 0.500 mm (0.0098 - 0.0197 in.).

⚠ CAUTION ⚠

The main journals and crankpins must always be reconditioned to the same undersize class. After undersizing, mark the main journal and the crankpin with a stamp on the side of the crank No. 1.



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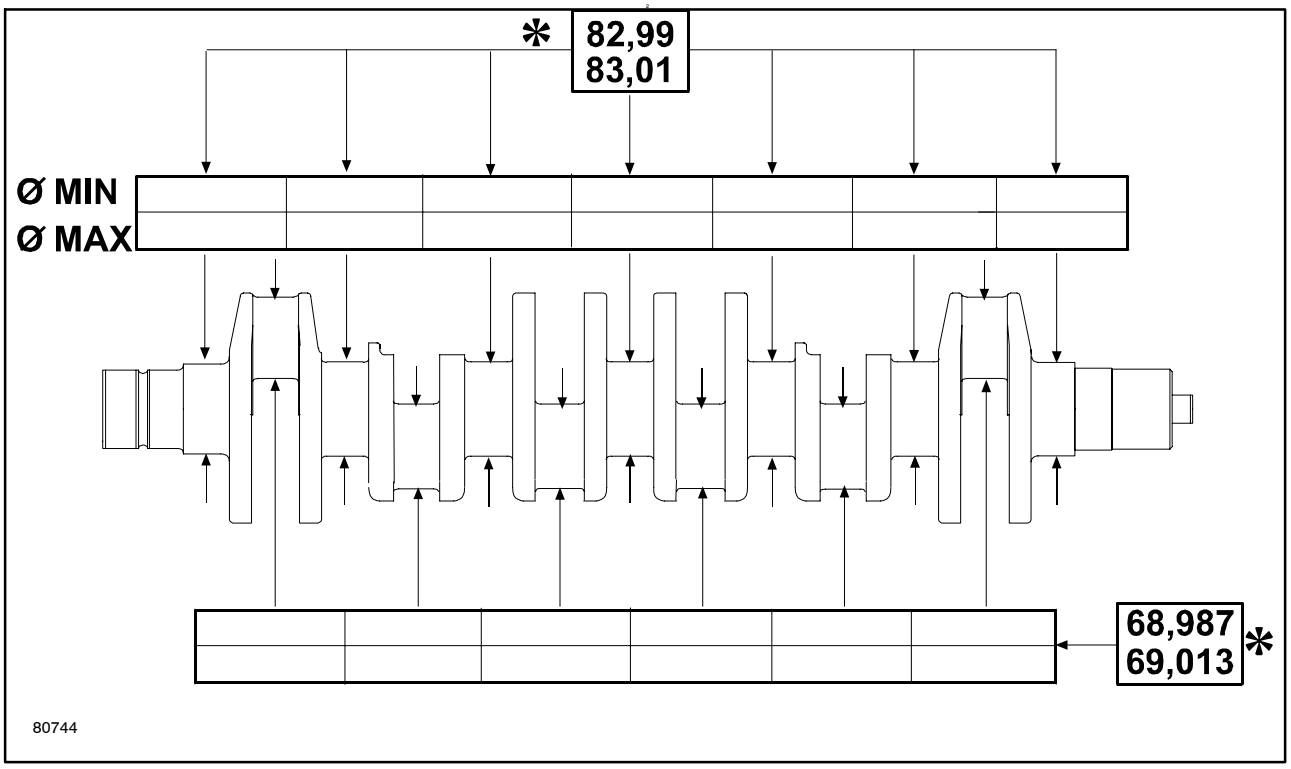
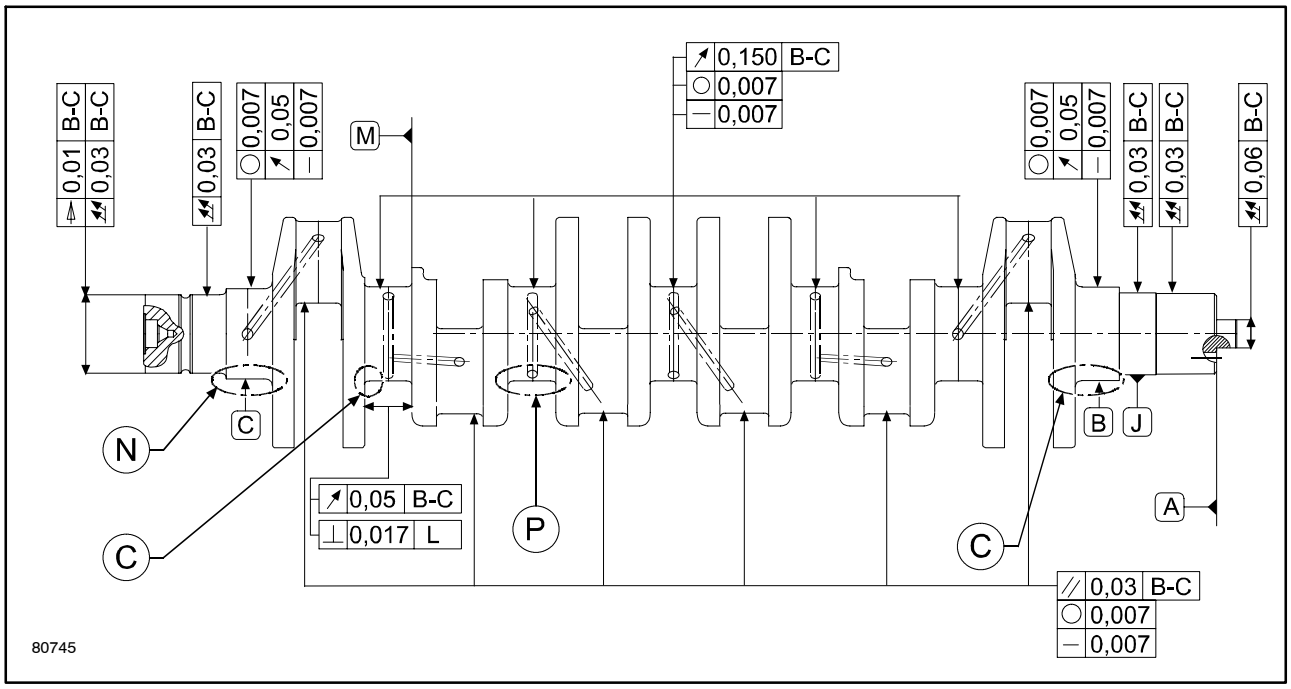


21

NOTE THE CRANKSHAFT (4 CYLINDER) MAIN JOURNAL AND CRANKPIN MEASUREMENTS ON THE TABLE

* Nominal value



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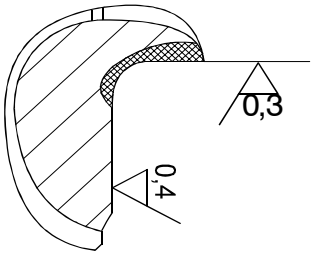
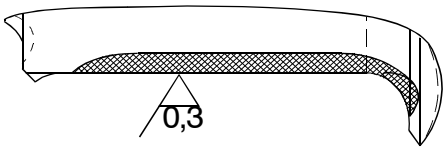
MAIN CRANKSHAFT TOLERANCES

TOLERANCES	CHARACTERISTIC SUBJECT OF TOLERANCE	GRAPHIC SYMBOL
SHAPE	Circularity	○
	Cilindricity	/○/
ORIENTATION	Parallelism	//
	Perpendicularity	⊥
	Straightness	—
POSITION	Concentricity or coaxiality	⓪
OSCILLATION	Circular oscillation	↗
	Total oscillation	⌰
	Taper	⌯

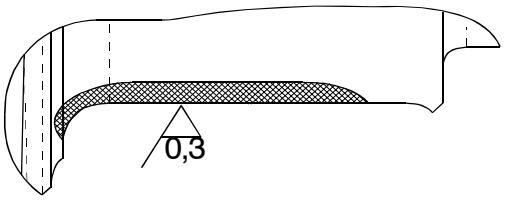
CLASS OF IMPORTANCE ASSIGNED TO PRODUCT CHARACTERISTICS	GRAPHIC SYMBOL
CRITICAL	Ⓒ
IMPORTANT	⊕
SECONDARY	⊖



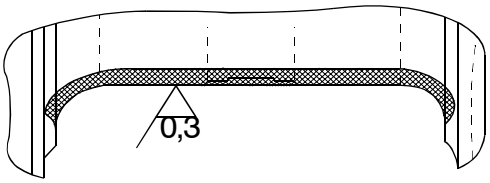
DETAIL C



DETAIL F



DETAIL C



DETAIL F

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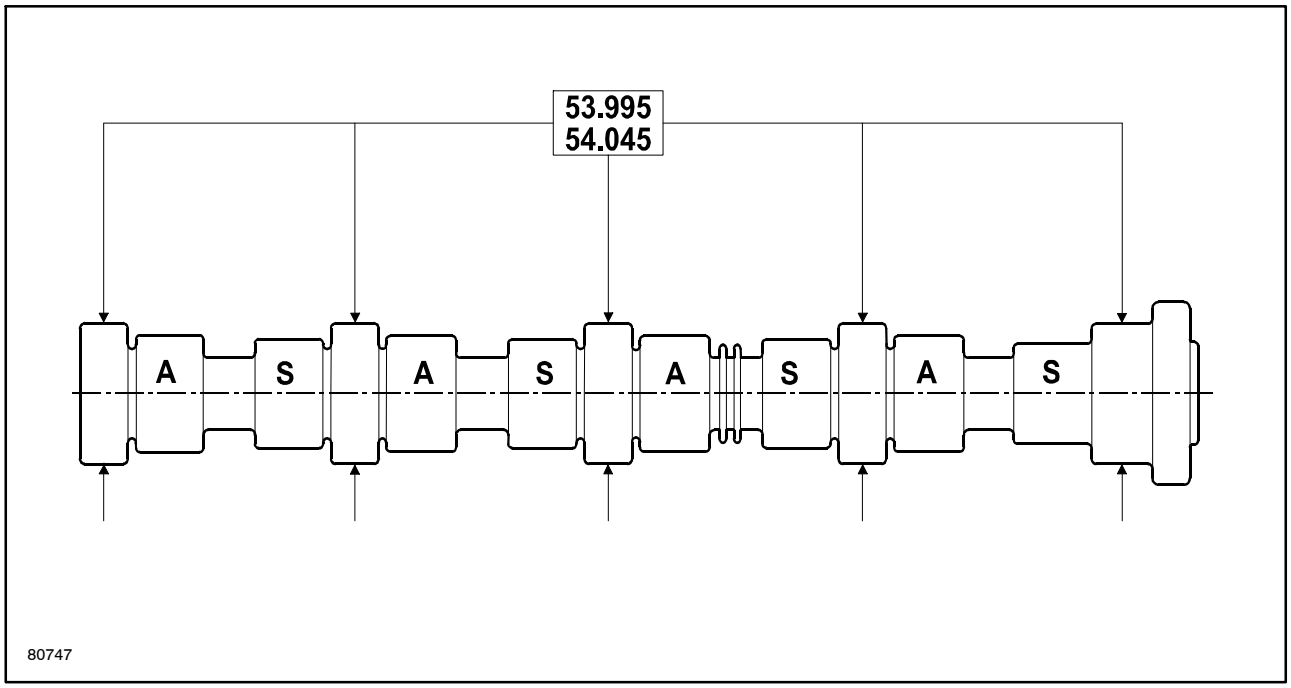
TIMING SYSTEM

Camshaft



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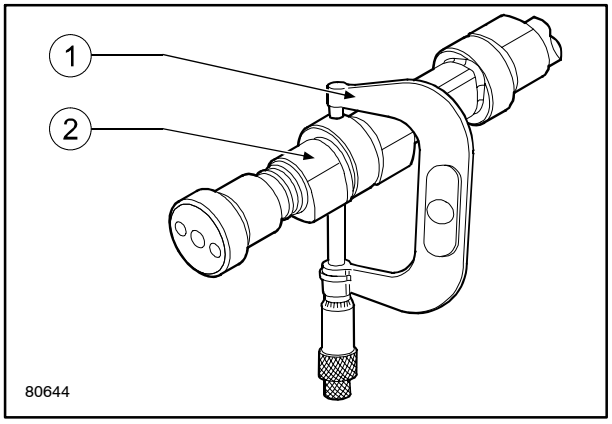
CAMSHAFT DATA
The data given refer to the normal pin diameter

20. The support journal surfaces on the shaft and cams must be finely honed; if there are signs of seizing or scoring, replace the shaft and relative bushings.

Checking Cam Lift and Pin Alignment

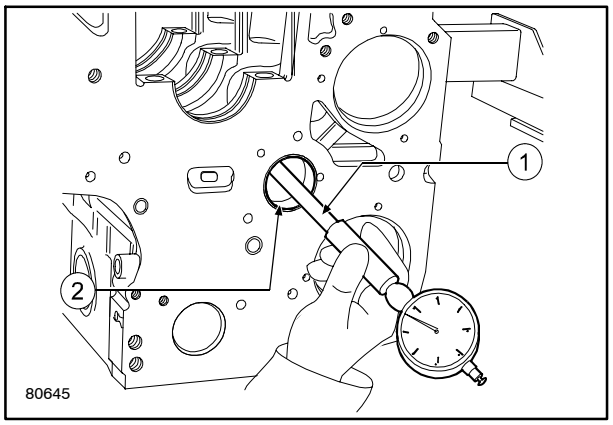
21. Set the shaft on tailstocks and, using a dial gauge with a 1/100 mm scale placed on the central support, check that the alignment error is no greater than 0.04 mm (0.0016 in.); change the shaft if it is. In addition, check the cam lift: it must be 6.045 mm (0.2380 in.) for the exhaust cams and 7.582 mm (0.2985 in.) for the intake ones; change the shaft if the measurements are any different.
22. Check the diameter of the supporting pins of the camshaft (2) with the micrometer (1) on two perpendicular axis.



25

BUSHINGS

23. The camshaft bushing (2) must have been forced into its seat.
24. The internal surfaces must show no sign of seizure or wear.
25. Using the bore meter (1), measure the diameter of the rear bushing (2) and of the intermediate seats for the camshaft.
26. Measurements must be made on two perpendicular axis.



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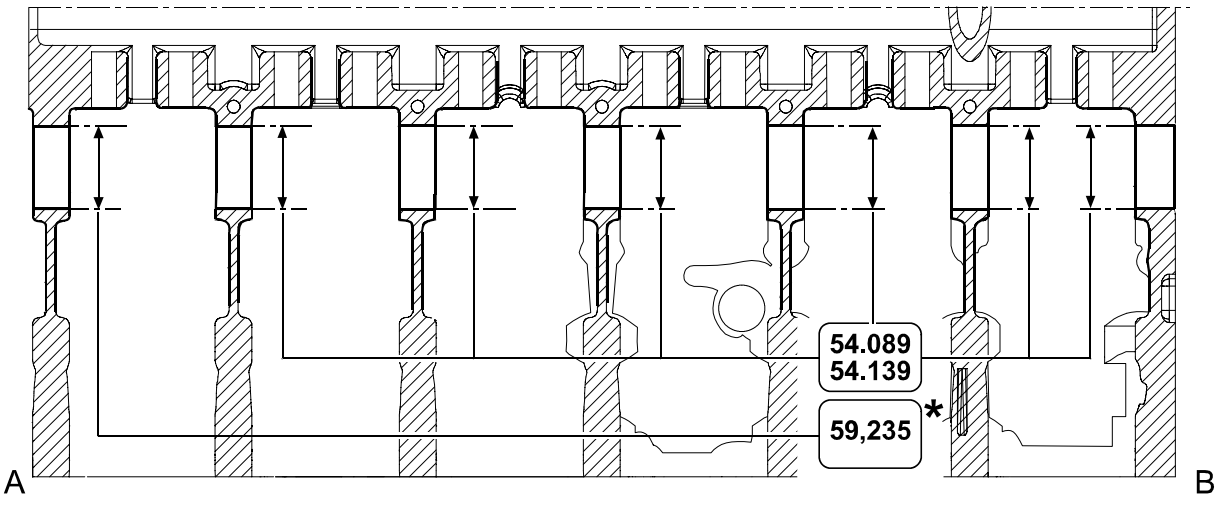


A = REAR FACE
B = FRONT FACE
* Fitting bushing on crankcase

80748

27

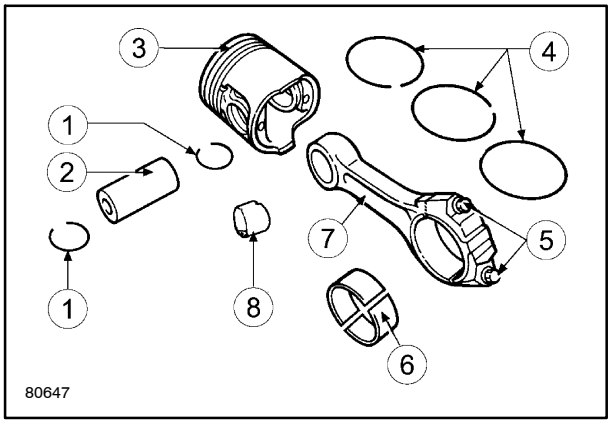
CAMSHAFT BUSHING AND RELEVANT SEAT DATA
* Measured with bushings installed

CONNECTING ROD-PISTON ASSEMBLY

Connecting rod-piston component parts
1. Retaining rings – 2. Pin – 3. Piston – 4. Piston rings – 5. Screws – 6. Half bearings – 7. Connecting rod – 8. Bushing

⚠ CAUTION ⚠

The pistons are supplied as spare parts oversized by 0.5 mm (0.0197 in.).



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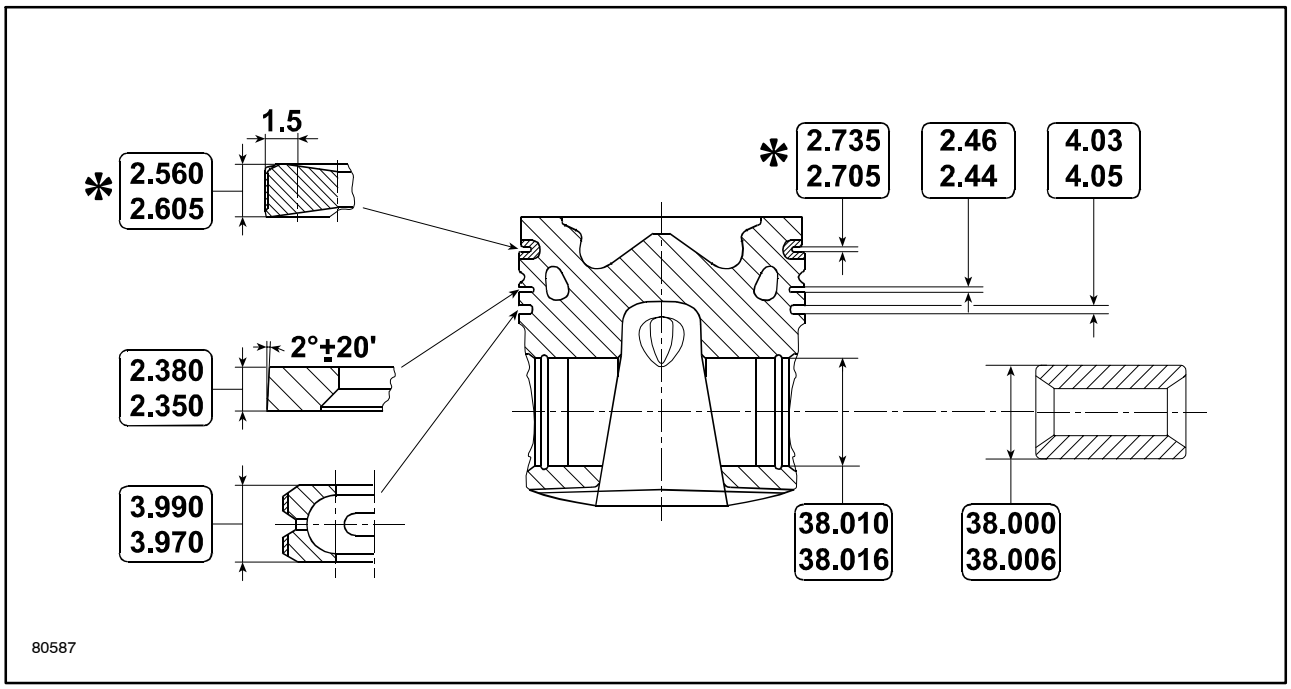


29

MONDIAL PISTON, PIN AND RING DATA
* Measurement obtained on a diameter of 92 mm (3.6220 in.)

Connecting Rods

CONNECTING ROD, PISTON PIN BUSHING AND HALF BEARING DATA

* Inside diameter to be measured after installing in the small end and regrinding with a reamer.

** Cannot be measured free.

CAUTION

The connecting rod – connecting rod cap mating surfaces are knurled for a better coupling. It is therefore recommended not to remove the knurling.

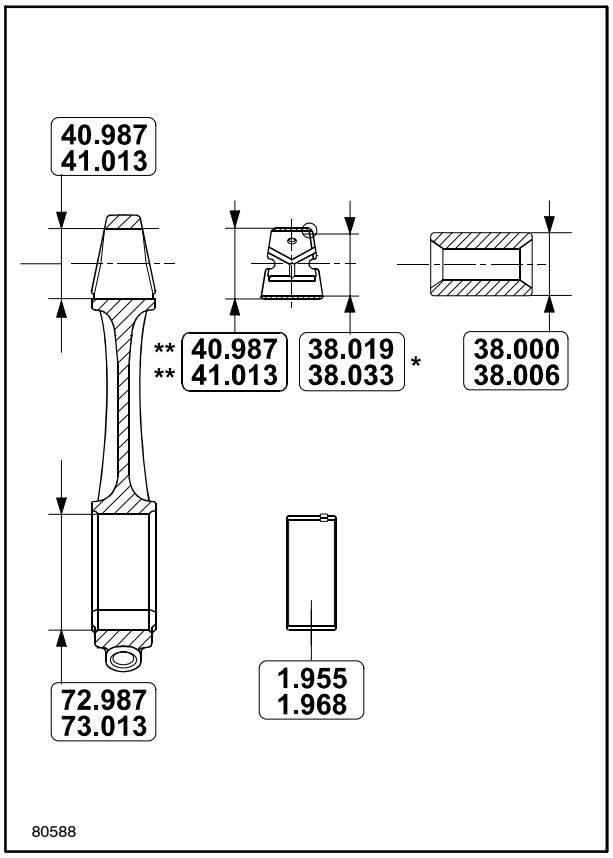
CAUTION

Each connecting rod is marked:

- On the body and cap with a number indicating their coupling and the cylinder in which it is mounted. In the event of replacement, number the new rod with the same number as the replaced connecting rod.
- On the body of the connecting rod with a letter indicating the weight class of the connecting rod mounted in production:
  - V, 1600 ÷ 1640 (3.5274 to 3.6156 lb) (marked in yellow);
  - V, 1641 ÷ 1680 (3.6178 to 3.7038 lb) (marked in green);
  - V, 1681 ÷ 1720 (3.7060 to 3.7920 lb) (marked in blue);

Connecting rods are supplied as spare parts in class W and marked in green*.

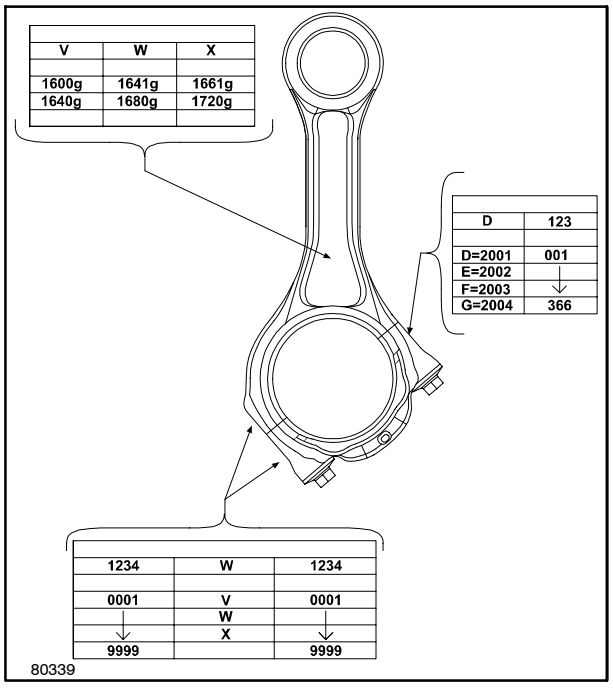
Removing material is not permissible.



30

Bushings

27. Check that the bushing in the small end has not come loose and shows no sign of scoring or seizure. If this is not so, change it.
28. Disassembly and assembly are performed with a suitable drift.
29. When driving in, make sure that the oilways in the bushing and small end coincide. Using a reamer, regrind the bushing to obtain the prescribed diameter.



31

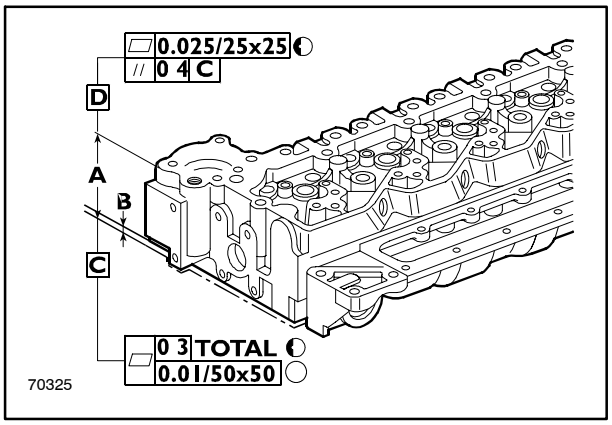
CYLINDER HEAD

Cylinder Head Mating Surface Check

30. The deformation measured on the full length of the cylinder head must be no greater than 0.20 mm (0.0079 in.).
31. If it is any higher, regrind the cylinder head according to the dimensions and warnings given in Figure 32.
32. The nominal thickness A of the cylinder head is 105 ± 0.25 mm (4.1339 ± 0.0098 in.) the maximum permissible amount of metal removed must not exceed the thickness B of 0.13 mm (0.0051 in.).

CAUTION

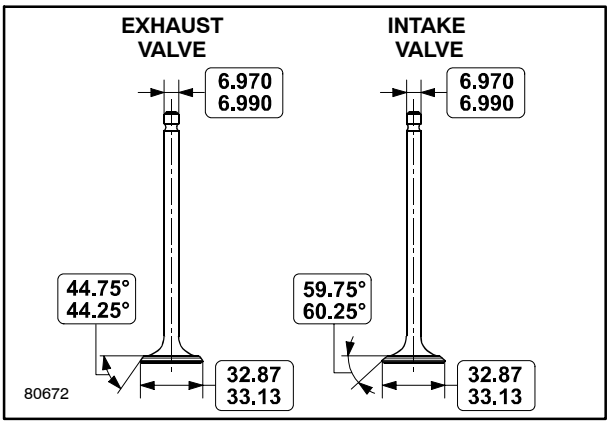
After regrinding, check the valve recessing and if necessary regrind the valve seats to obtain the prescribed valve recessing.



32

Valves

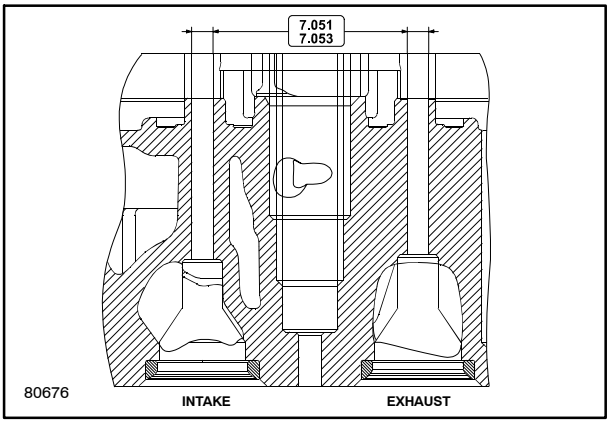
INTAKE AND EXHAUST VALVE DATA



33

Valve Guides

33. Using a bore gauge, measure the inside diameter of the valve guides; it must be as indicated.

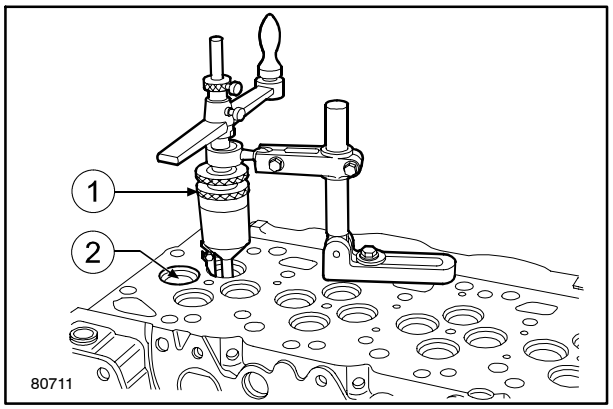


34

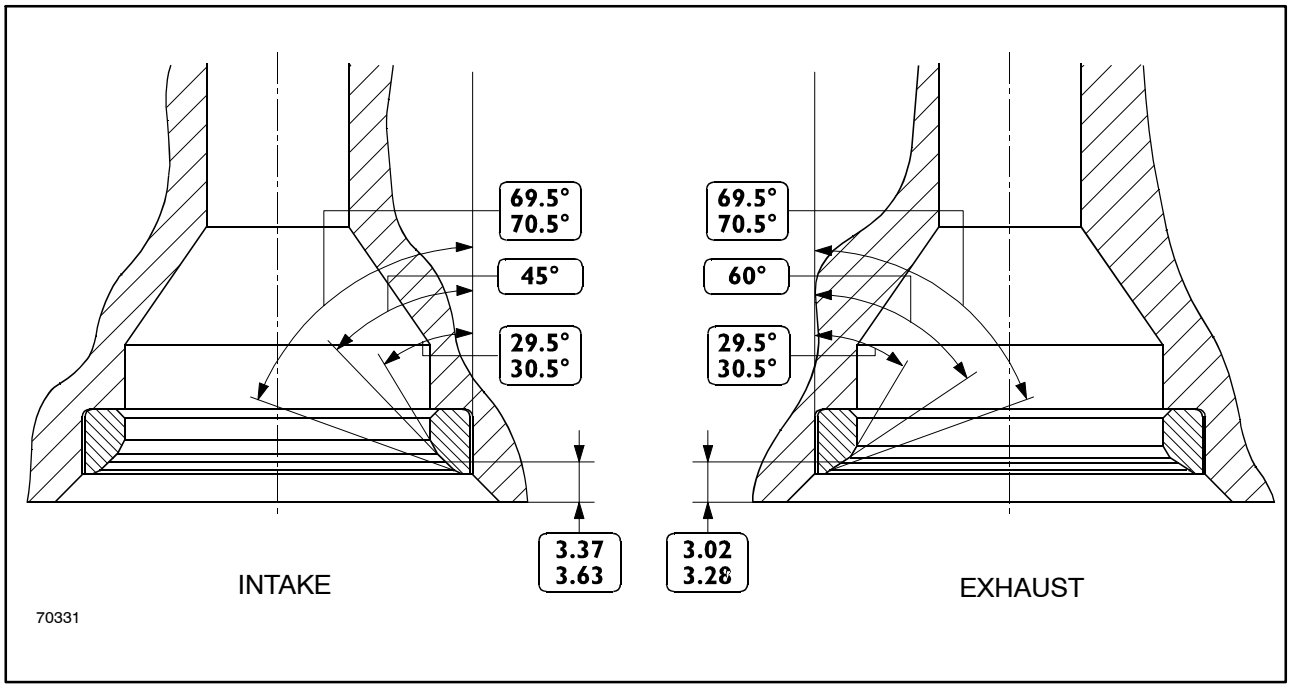
Valve Seats

Regrinding – replacing valve seats

34. Check the valve seats (2). On finding any slight scoring or burns, regrind using a suitable valve grinding tool (1) according to the angles indicated.

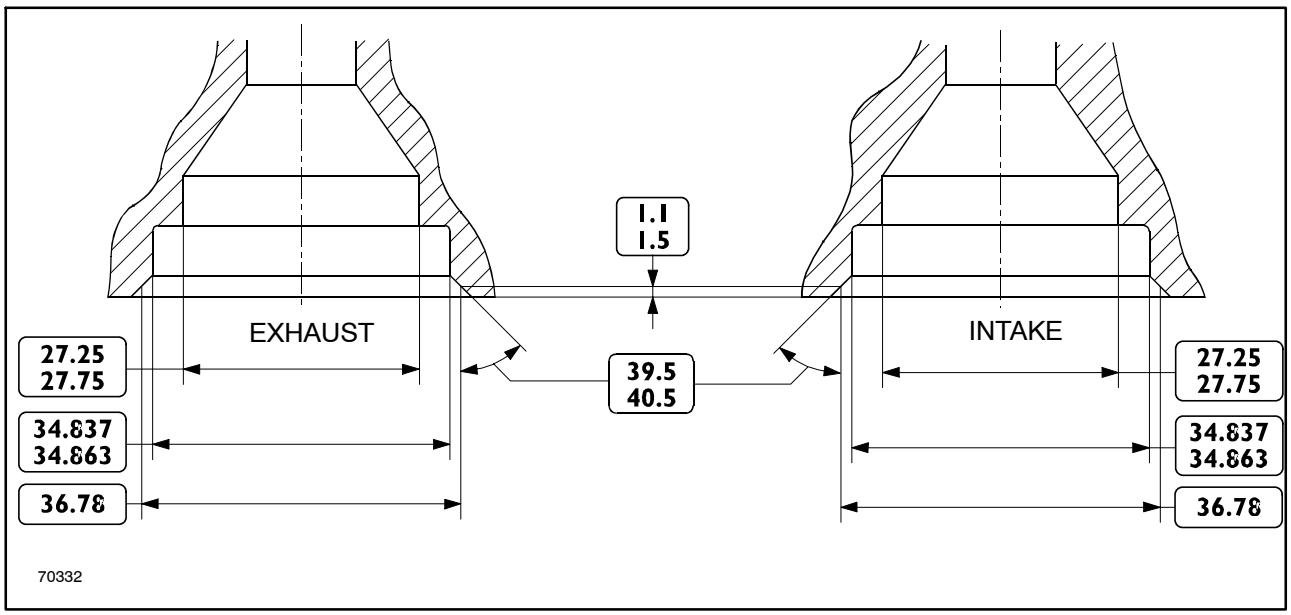


35



36

VALVE SEAT DATA



37

ENGINE CYLINDER HEAD SEAT DATA

35. If the valve seats cannot be reconditioned by just regrinding, they can be replaced with the ones supplied as spare parts. Take care not to nick the cylinder head, remove as little material as possible from the valve seats until it is possible to extract them from the cylinder head with the aid of a punch.
Heat the cylinder head to 80° to 100 °C (176° to 212 °F) and, using a suitable drift, insert the new valve seats, previously cooled.
Then regrind the valve seats according to the values given in Figure 36.

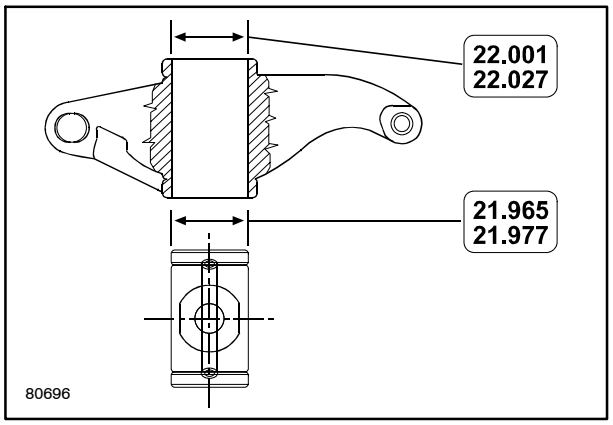
36. After regrinding, with the magnetic base (2) and dial gauge (1), check that the valve recessing (3) is as prescribed.

Rocker Arm–Spindle

NOTE: *The check and adjustment are made only after fitting the cylinder head on the crankcase and mounting the camshaft.*

ROCKER ARM - SPINDLE DATA

Check the mating surfaces of the mounting and spindle: there must be no sign of any damage or excess wear. Replace if necessary.



38

Adjusting Tappet Clearance

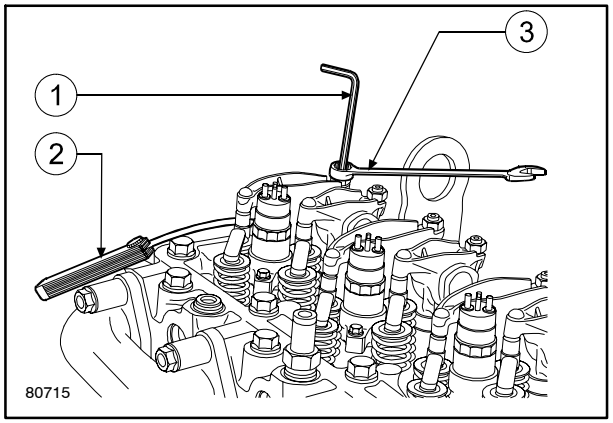
CAUTION

Complete cylinder head assembly as stated on page 32 and following.

Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

The working clearance should be:

- intake valves 0.25 ± 0.05 mm (0.00987 ± 0.0197 in.)
- exhaust valves 0.51 ± 0.05 mm (0.0201 ± 0.0197 in.)



39

CAUTION

To adjust the rocker arm – valve working clearance more quickly, proceed as follows:

For the 4-cylinder engine, turn the crankshaft, balance the valves of cylinder n° 1 and adjust the valves marked with an asterisk as indicated in the table:

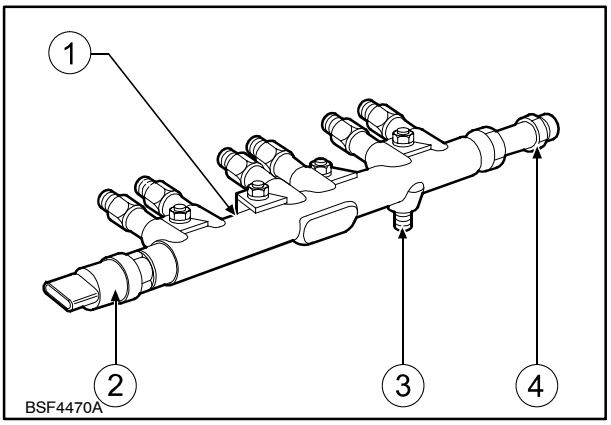
no. cylinder	1	2	3	4	5	6
intake	-	-	*	-	*	*
exhaust	-	*	-	*	-	*

Turn the crankshaft, balance the valves on cylinder n° 4 and adjust the valves marked with an asterisk as shown in the diagram:

no. cylinder	1	2	3	4	5	6
intake	*	*	-	*	-	-
exhaust	*	-	*	-	*	-

HIGH-PRESSURE PUMP CP3

This pump with 3 radial pumping elements governed by the timing gear does not need timing. The mechanical fuel supply pump governed by the shaft of the high-pressure pump is mounted on the back of the pump.



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1. RAIL. - 2. FUEL INLET FROM THE HIGH-PRESSURE PUMP. - 3. PRESSURE SENSOR. -
4. PRESSURE RELIEF VALVE.

The rail volume is smaller to permit fast pressurization when starting, at slow idling and when there are high flow rates.

However, its volume is sufficient to minimize the phenomena caused by the injectors opening and closing and the pump working at high pressure. This function is helped further by a calibrated orifice downstream from the high-pressure pump.

Screwed onto the rail there is a fuel pressure sensor (3). The signal sent from this sensor to the electronic control unit is feedback on the basis of which the level of pressure in the rail is checked and, if necessary, corrected.

SECTION 10 – ENGINE

Chapter 3 – CNH Engine – F4CE0484B/F4CE0454*D/F4CE0484*D/ (4 Cylinder Mechanical Engine)

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SPECIFICATIONS

Engine, type:	F4CE0484B/F4CE0454F*D/ F4CE0484A*D 4 cylinders
Compression ratio	17,5
Maximum power kW (HP) rpm	74/74/82 100/100/110 2200
Maximum torque Nm (lb ft) rpm	435/398/480 (320.84)/(293.55)/(354.03) 1400
Slow idling speed of engine without load rpm	800
Fast idling speed of engine without load rpm	2400
Boost feeding	With intercooler
Turbocharger type	HOLSET
Lubrication	Forced via lobe pump, pressure relief valve, oil filter
Oil pressure with engine hot	
- at slow idling bar (psi)	1,2 (17.4044)
- at fast idling bar (psi)	3,8 (55.1141)
Cooling system	Fluid-based
Coolant pump drive:	Via belt
Thermostat:	
- temperature start ° C (° F)	81 ± 2 (177.8 ± 35.6)
Filling	15W40 ACEA-E5
- engine sump litres (Imp gall.)	min 7 (1.539) max 10 (2.1998)
- engine sump + filter litres (Imp gall.)	11 (2.4197)

(continued)

Type	4-cylinder
Cycle	Diesel, 4-stroke
Fuel system	Turbocharged with intercooler
Fuel injection	Direct
Number of cylinders	4
Bore mm (in.)	104 (4.095)
Stroke mm (in.)	132 (5.1968)
Total displacement cm^3 ($in.^3$)	4485 (273.6747)
Timing system	-
Inlet Start before T.D.C. (Top Dead Centre)	-
Inlet End after B.D.C. (Botom Dead Centre)	-
Exhaust Start before B.D.C.	-
Exhaust End after T.D.C.	-
Valve Clearance (engine cold) Inlet mm (in.)	0,20 to 0,30 (0.0079 to 0.0118)
Exhaust mm (in.)	0,46 to 0,56 (0.0181 to 0.0220)
Fuel system	
Injection: Bosch	Bosch
Nozzles	Bosch
Injection order	1 - 3 - 4 - 2
Injection pressure bar (psi)	245 (3553.4065)
Injection pump timing (pump plunger lift)	1,00 +/- 0,05mm @TDC

(continued)

Assembly Clearances - Data

Type	4-cylinder
CRANK GEAR AND CYLINDER ASSEMBLY DATA	
Cylinder liners ..... ∅ 1	104,0 to 104,024 (4.0945 to 4.1039)
Cylinder liners:	
outside diameter ..... ∅ 2	-
length L	-
Cylinder liners - crankcase seats (interference)	-
Outside diameter ..... ∅ 2	-
Cylinder liners:	
inside diameter ..... ∅ 2	-
Pistons supplied as spare parts:	-
measurement X	55,9 (2.2008)
outside diameter ..... ∅ 1	103,730 to 103,748 (4.0839 to 4.0846)
seat for pin ..... ∅ 2	38,010 to 38,016 (1.4965 to 1.4967)
Piston - cylinder liners	0,252 to 0,294 (0.0099 to 0.0116)
Piston diameter ..... ∅ 1	0,5 (0.0197)
Piston location from crankcase X	0,28 to 0,42 (0.0110 to 0.0165)
Piston pin ..... ∅ 3	38,000 to 38,006 (1.4961 to 1.4963)
Piston pin - pin seat	0,004 to 0,016 (0.0002 to 0.0006)
Piston ring grooves X1*	2,690 (0.1059)
Piston ring grooves X2	2,44 to 2,46 (0.0961 to 0.0969)
Piston ring grooves X3	4,03 to 4,05 (0.1587 to 0.1594)
Piston rings S1*	2,560 to 2,605 (0.1008 to 0.1026)
Piston rings S2	2,350 to 2,340 (0.0925 to 0.0921)
Piston rings S3	3,970 to 3,990 (0.1563 to 0.1571)
* measured on ∅ of 58 mm (2.2835 in.) 4 cylinders	
Piston rings - grooves 1	0,245 to 0,265 (0.0096 to 0.0104)
Piston rings - grooves 2	0,100 to 0,110 (0.0039 to 0.0043)
Piston rings - grooves 3	0,004 to 0,008 (0.0002 to 0.0003)
Piston rings	0,5 (0.0197)
Piston ring end opening in cylinder liner:	
X1	0,3 to 0,4 (0.0118 to 0.0157)
X2	0,25 to 0,55 (0.0098 to 0.0217)
X3	0,25 to 0,55 (0.0098 to 0.0217)

(continued)

Type	4-cylinder
Small end bushing seat . . . . . ∅ 1	40,987 to 41,013 (1.6137 to 1.6147)
Connecting rod bearing seat . . . . . ∅ 2	72,987 to 73,013 (2.8735 to 2.8745)
Small end bushing diameter:	
outside . . . . . ∅ 4	40,987 to 41,013 (1.6137 to 1.6147)
inside . . . . . ∅ 3	38,019 to 38,033 (1.4968 to 1.4974)
Connecting rod half-bearings supplied as spares . . . . . S	1,955 to 1,968 (0.0770 to 0.0775)
Connecting rod bushing - seat	-
Piston pin - bushing	0,013 to 0,033 (0.0005 to 0.0013)
Connecting rod half bearings	0,250 to 0,500 (0.0098 to 0.0197)
Measurement X	-
Maximum error on alignment of connecting rod axes . . . . . =	-
Main journals . . . . . ∅ 1	82,990 to 83,001 (3.2673 to 3.2677)
Crankpins . . . . . ∅ 2	68,987 to 69,013 (2.7160 to 2.7170)
Main journal half bearings S1	2,456 to 2,464 (0.0967 to 0.0970)
Connecting rod half bearings S2	1,955 to 1,968 (0.0770 to 0.0775)
Main bearings	
no. 1 - 5 . . . . . ∅ 3	87,982 to 88,008 (3.4639 to 3.4649)
no. 2 - 3 - 4 . . . . . ∅ 4	87,977 to 88,013 (3.4637 to 3.4651)
Half bearings - main journals	
no. 1 - 5	0,064 to 0,095 (0.0025 to 0.0037)
no. 2 - 3 - 4	0,059 to 0,100 (0.0023 to 0.0039)
Half bearings - crankpins	0,064 to 0,090 (0.0025 to 0.0035)
Main journal half bearings	+ 0,250 (+0.0098); + 0,500 (+0.0197)
Connecting rod half bearings	
Main journal for thrust X1	37,475 to 37,550 (1.4754 to 1.4783)
Main bearing for thrust X2	31,730 to 32,280 (1.2492 to 1.2709)
Semi-circular thrust washers X3	37,28 to 37,38 (1.4677 to 1.4717)
Crankshaft thrust	0,095 to 0,270 (0.0037 to 0.0106)
CYLINDER HEAD	
Valve guide bores in the cylinder head . . . . . ∅ 1	8,019 to 8,039 (0.3157 to 0.3165)
. . . . . ∅ 2	-
Valve guides	
. . . . . ∅ 3	-
Valve guides and bores in head	-
Valve guides	-

(continued)

Type	4-cylinder
Valves:	
∅ 4	7,963 to 7,943 (0.3135 to 0.3127)
α	60°
∅ 4	7,963 to 7,943 (0.3135 to 0.3127)
α	45°
Valve stem and relative guide	0,052 to 0,092 (0.0020 to 0.0036)
Bore in head for valve seat:	46,987 to 47,013 (1.8499 to 1.8509)
Intake ∅ 1	43,637 to 43,663 (1.7180 to 1.7190)
Exhaust ∅ 1	
Valve seat outside diameter; angle of valve seats in cylinder head	
Intake ∅ 2	47,063 to 47,089 (1.8529 to 1.8539)
α	60°
Exhaust ∅ 2	47,713 to 43,739 (1.8785 to 1.7220)
α	45°
Recessing	
Intake X	0,356 to 1,102 (0.0140 to 0.0434)
Exhaust X	0,104 to 0,84 (0.0041 to 0.0315)
Between valve seat and head	
Intake	0,050 to 0,102 (0.0020 to 0.0040)
Exhaust	0,050 to 0,102 (0.0020 to 0.0040)
Valve seats >	-
Valve spring height:	-
free spring H	63,05 (2.4823)
under a load of:	
329 N H1	49,02 (1.9299)
641 N H2	38,20 (1.5039)
Injector protrusion X	not adjustable
Seats for camshaft bushings no. 1 - 5	59,222 to 59,248 (2.3316 to 2.3326)
Camshaft seats no. 2 - 3 - 4	54,089 to 54,140 (2.1295 to 2.1315)
Camshaft support journals	
1 ⇒ 5	53,995 to 54,045
Camshaft bushing outside diameter: ∅	59,222 to 59,248 (2.3316 to 2.3326)
Bushing inside diameter: ∅	54,083 to 54,147 (2.1292 to 2.1318)
Bushings and seats in crankcase	-
Bushings and support journals	0,038 to 0,162 (0.0015 to 0.0064)
Useful cam lift: H	-
H	-
Tappet cap seat in crankcase ∅ 1	-
Tappet cap outside diameter:	
∅ 2	15,929 to 15,959 (0.6271 to 0.6283)
∅ 3	15,965 to 15,930 (0.6285 to 0.6272)
Between tappets and seats	0,025 to 0,070 (0.0010 to 0.0028)
Tappets	-
Rocker arm shaft ∅ 1	18,963 to 18,975 (0.7466 to 0.7470)
Rocker arms: ∅ 2	19,000 to 19,026 (0.7480 to 0.7491)
Between rocker arms and shafts	0,025 to 0,063 (0.0010 to 0.0025)

(continued)

TIGHTENING TORQUES

PART	TORQUE	
	Nm (lb ft)	
Cooling nozzles (M 8x 1.25x 10)		15 ± 3 (11.0634 ± 2.2127)
Main bearings	1st stage 2nd stage 3rd stage	50 ± 6 (36.8781 ± 4.4254) 80 ± 6 (59.0050 ± 4.4254) 90° ± 5°
Timing gear casing (M 8x 1.25x 40) (M 10x 1.5x 30)		 24 ± 4 (17.7015 ± 2.9502) 47 ± 5 (34.6654 ± 3.6878)
Oil pump (M 8x 1.25x 30)	1st stage 2nd stage	8 ± 1 (5.9005 ± 0.7376) 24 ± 4 (17.7015 ± 2.9502)
Big end cap bolts (M 11x 1.25)	1st stage 2nd stage 3rd stage	30 ± 3 (22.1269 ± 2.2127) 60 ± 5 (44.2537 ± 3.6878) 60° ± 5°
Oil sump installation Tightening Bolts Nº 23 & 26 M10 1.5x45 Tightening Bolts Nº 3-10; 13&20; 24-25 M10 1.5x90 Tightening Bolts Nº 1-2-21-22 M10 1.5 x 125 Tightening Bolts Nº 23 11-12 M10 15 x 190		 50 ± 5 (36.8781 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878)
Fuel pump installation M8 Bolts M6 Bolts M6 Nuts		 24 ± 4 (17.7015 ± 2.9502) 10 ± 1 (7.3756 ± 0.7376 10 ± 1 (7.3756 ± 0.7376
Nuts securing fuel pump M 10x 1.5 for tightening	final torque	10 - 15 (7.3756 - 11.0634) 50 - 55 (36.8781 - 40.565)
Rocker arm / head fastening (M 8)		36 ± 4 (26.5522 ± 2.9502)
Rocker arm adjuster fastening (3/4 24)		24 ± 4 (17.7015 ± 2.9502)
Bolts securing cylinder head Step 1 (M 12x 1.75 10.9x 70) Bolts 3, 6, 11 & 14 Step 2 Step 1 (M 12x 1.75 10.9x 140) Bolts 1, 2, 7, 8, 9, 10, 15, 16, 17 & 18 Step 2 Step 3 Step 1 (M 12x 1.75 10.9x 180) Bolts 4, 5, 12 & 13 Step 2 Step 3		 50 (35.71429) +90° 40 (28.57143) +90° +90° 70(50) +90° +90°
Rocker arm cover (M 8x 1.25x 25)		24 ± 4 (17.7015 ± 2.9502)
Intake manifold fastening (M 8x 1.25)		24 ± 4 (17.7015 ± 2.9502)
Air intake union assembly (M 8x 1.25)		24 ± 4 (17.7015 ± 2.9502)
Exhaust manifold fastening (M 10x 1.5x 65)		43 ± 6 (31.7152 ± 4.4254)
Water pump fastening (M 8x 1.25x 25)	1st stage 2nd stage	24 ± 4 (17.7015 ± 2.9502) 43 ± 6 (31.7152 ± 4.4254)
Fan pulley fastening (M 6) (M10)		 10 ± 2 (7.3756 ± 1.4751) 43 ± 6 (31.7152 ± 4.4254)
Fan mounting fastening (M10)		33 ± 5 (24.3395 ± 3.6878)

PART	TORQUE	
	Nm (lb ft)	
Lifting bracket fastening (M 12x 1.75x 25) . . . . . . (M 10)		7 ± 12 (5.1629 ± 8.8507) 43 ± 5 (31.7152 ± 3.6878)
Crankshaft pulley (M 12x 1.75x 10.9)		50 ± 5 (36.8781 ± 3.6878) 90° ± 5°
Flywheel / crankshaft fastening (M 12x 1.25)	1st stage	85 ± 10 (62.6928 ± 7.3756)
Injector / cylinder head fastening		60 ± 5 (48.8571 ± 3.6878)
Fuel priming pump fastening		24 ± 4 (17.7015 ± 2.9502)
Turbo-blower / exhaust manifold fastening (M 10)		43 ± 6 (31.7152 ± 4.4254)
Lubrication piping / turbo-blower fastening (M 12x 1.5)		35 ± 5 (25.8147 ± 3.6878)
Timing gear fastening (M8 1.25x 20)		36 ± 4 (26.5522 ± 2.9502)
Camshaft thrust plate fastening (M8 1.25x 20)		24 ± 4 (17.7015 ± 2.9502)
Phonic wheel fastening (M12 1.25)		50 ± 5 (36.8781 ± 3.6878) 90° ± 5°

Tightening Sequence for Cylinder Head Bolts:

1st stage of tightening with a torque wrench:
M12 x 1.75 x 70 bolt: 50 Nm
(ref. 3-6-11-14) (35.71429 lbf)

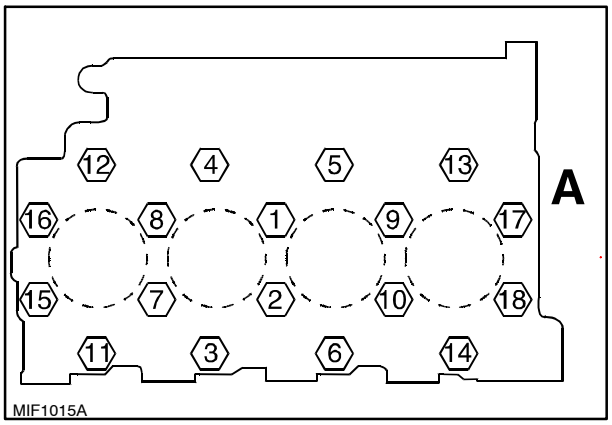
M12 x 1.75 x 140 bolt: 40 Nm
(28.57143 lbf)
(ref. 1-2-7-8-9-10-15-16-17-18)

M12 x 1.75 x 180 bolt: 70 Nm
(ref. 4-5-12-13) (50 lbf)

2nd stage tightening to an angle of 90° for all the screws

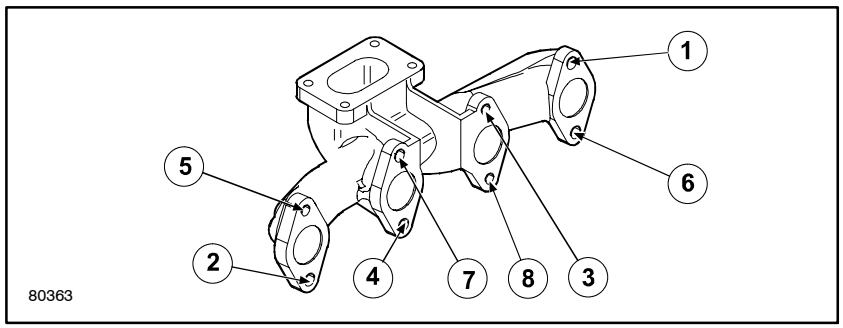
3rd stage additional tightening to an angle of 90° for 140 and 180 mm long bolts only.

A = fan side



1

Tightening sequence for exhaust manifold bolts



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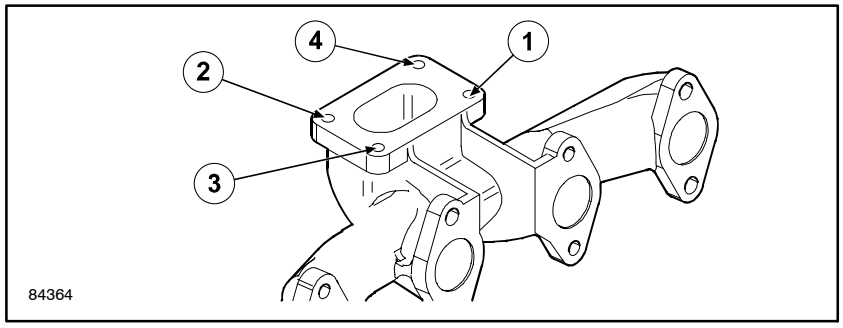
Tightening sequence for turbocharger nuts and bolts

Sequence:

- Pre-tightening 4-3-1-2
- Tightening 1-4-2-3



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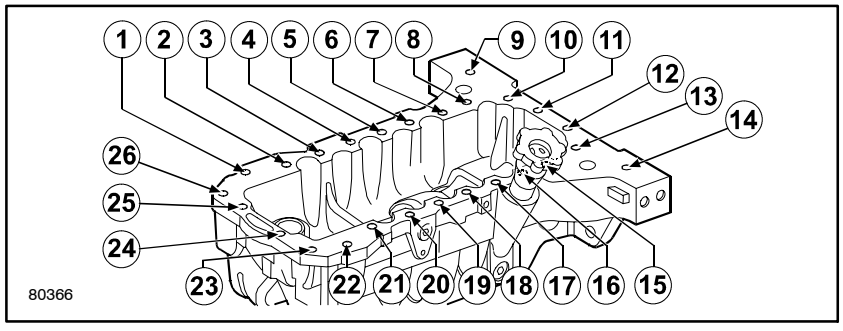
Tightening sequence for engine oil sump bolts

- First stage: from 1 to 16
- Second stage: from 17 to 32



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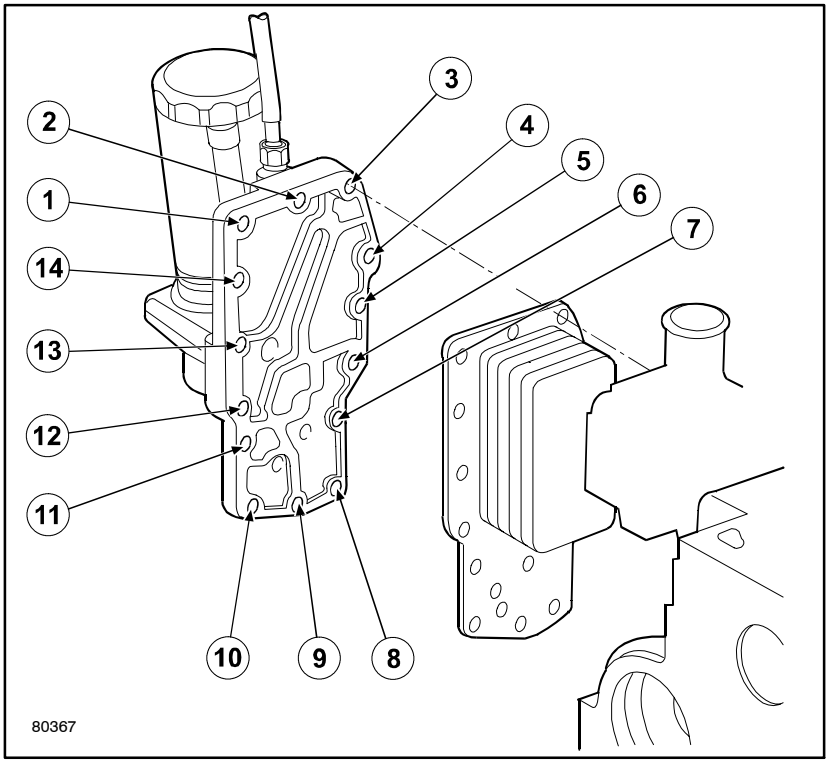
Tightening sequence for cooler bolts



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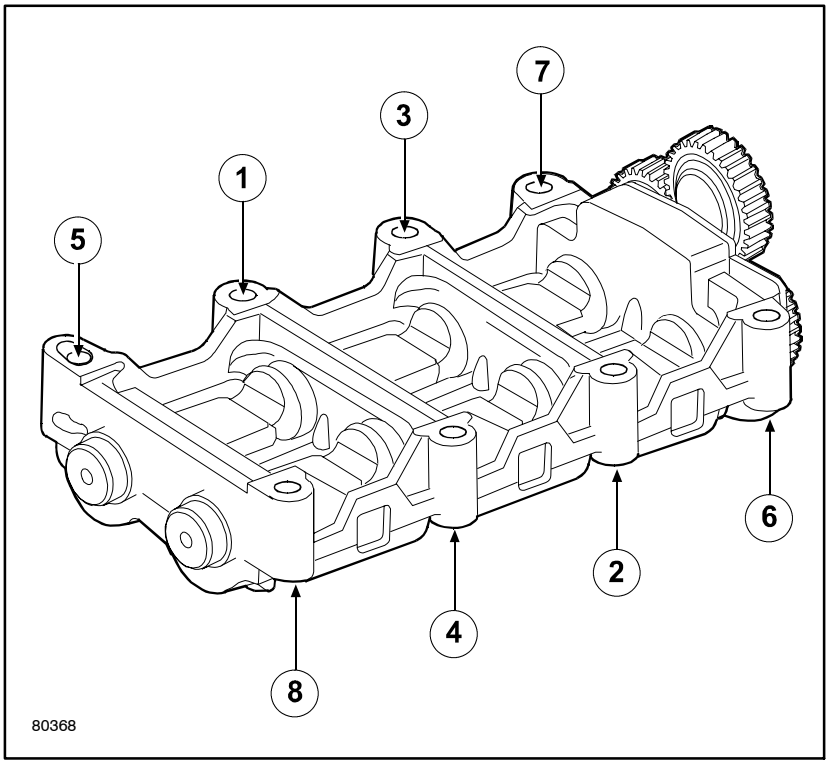
Tightening sequence for additional counterweight bolts



6

SPECIAL TOOLS

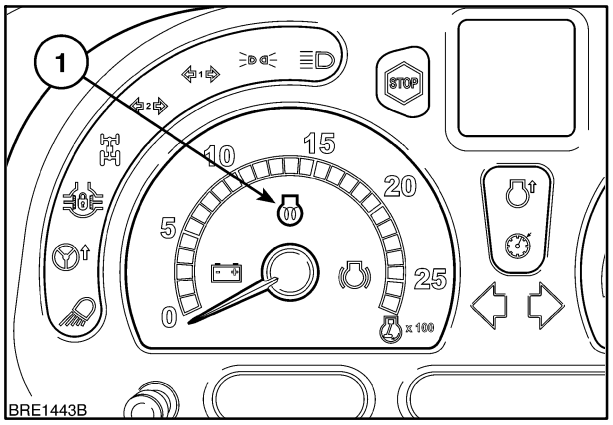
No. TOOL	NAME
380000979	Puller for engine injection pump union gear
380000228	Dial gauge for injection pump timing (use with adaptor 380001601)
380001601	Adaptor for injection pump timing (use with dial gauge 380000228)
380000665	Tool to extract crankshaft front seal
380000663	Tool to extract crankshaft rear seal
380000671	Injector extractor
380000666	Splining tool for fitting front seals on crankshaft
380000664	Splining tool for fitting rear seal on crankshaft
380000988	Plate for engine flywheel rotation tool with engine timing pin (use with 380000732)
380000732	Tool for engine flywheel rotation (use with 380000988)
380000667	Drift for camshaft bushing disassembly and reassembly
380000158	Torque screwdriver for injector solenoid valve connector nut setting
380001003	Complete square to check for connecting rod distortion
380000301	Engine stand (revolving)
380001298	Engine stand to Cylinder block brackets
380001073	Engine lifting brackets

DESCRIPTION OF OPERATION

MECHANICAL GRID HEATER OPERATION

The grid heater, which is effective in ambient temperatures down to -18° C (0° F), consists of a heating element installed in the intake manifold. Operation of the grid heater is automatic when the the engine coolant temperature falls to 0° (32° F) on 100 and 115 models or -3° C (26.6° F) on110, 125 and 135 models.

Turning the key-start switch to position 4 (ON) will activate the grid heater raising the temperature of the indrawn air prior to it being drawn into the combustion chamber. The engine should be cranked when the grid heater warning lamp is extinguished. The cold start warning light (1) will illuminate to confirm operation.



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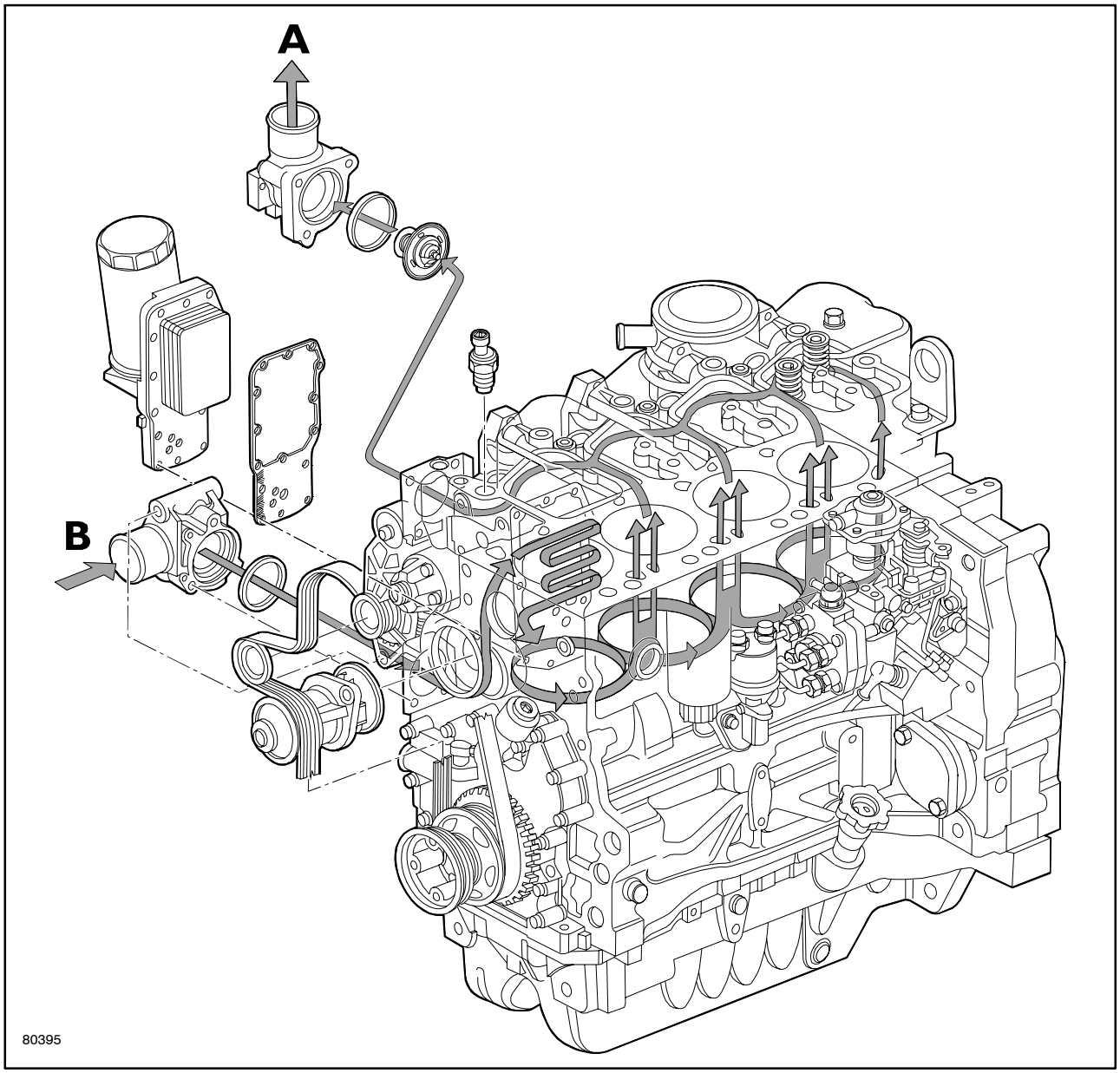
For the mechanical engines, the grid heater is activated by the grid heater control module, which must detect a resistance between 6.4 and 30.4 ohms at the engine temperature sensor, which will equate to the coolant temperature being below 0 to -3°C (32 to 26.6°F) approximately.

COOLING

The forced circulation, closed-circuit engine cooling system is composed of the following components:

- Expansion tank: its location, shape and size may change depending on the engine version.
- Radiator, whose job is to dissipate the heat taken by the coolant from the engine. This component, too, is a feature of the version as regards both positioning and engine.
- Viscostatic fan, with the task of increasing the radiator's dissipating capacity: this, too, belongs to the specific engine version.
- A lubricating oil cooler: this, too, belongs to the specific engine version.
- A centrifugal coolant pump housed at the front of the crankcase.
- A thermostat governing coolant circulation.
- The circuit may also extend to the compressor if the version includes it.



COOLING SYSTEM DIAGRAM

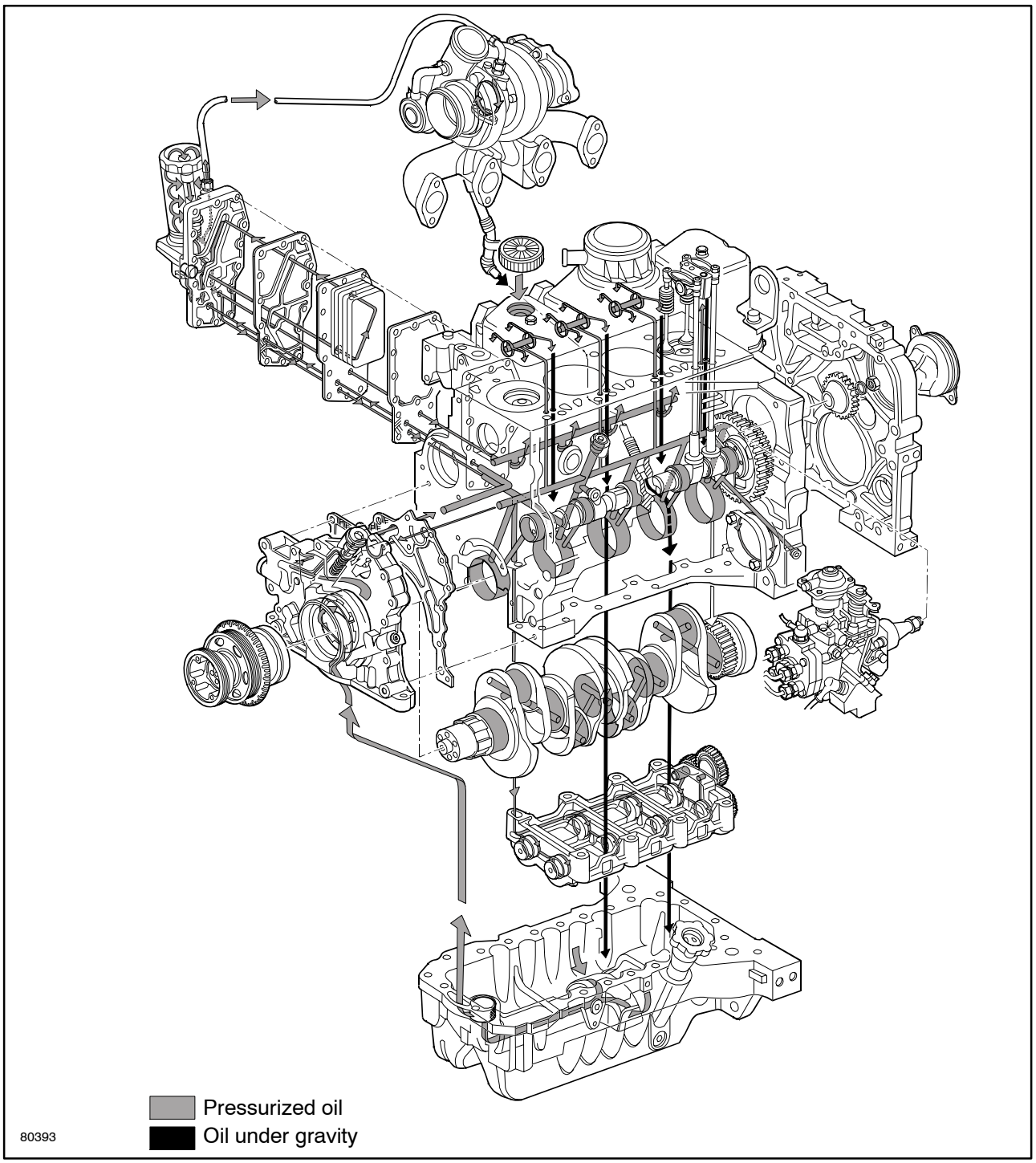
LUBRICATION

Forced-circulation lubrication is accomplished by the oil pump, housed at the front of the crankcase.

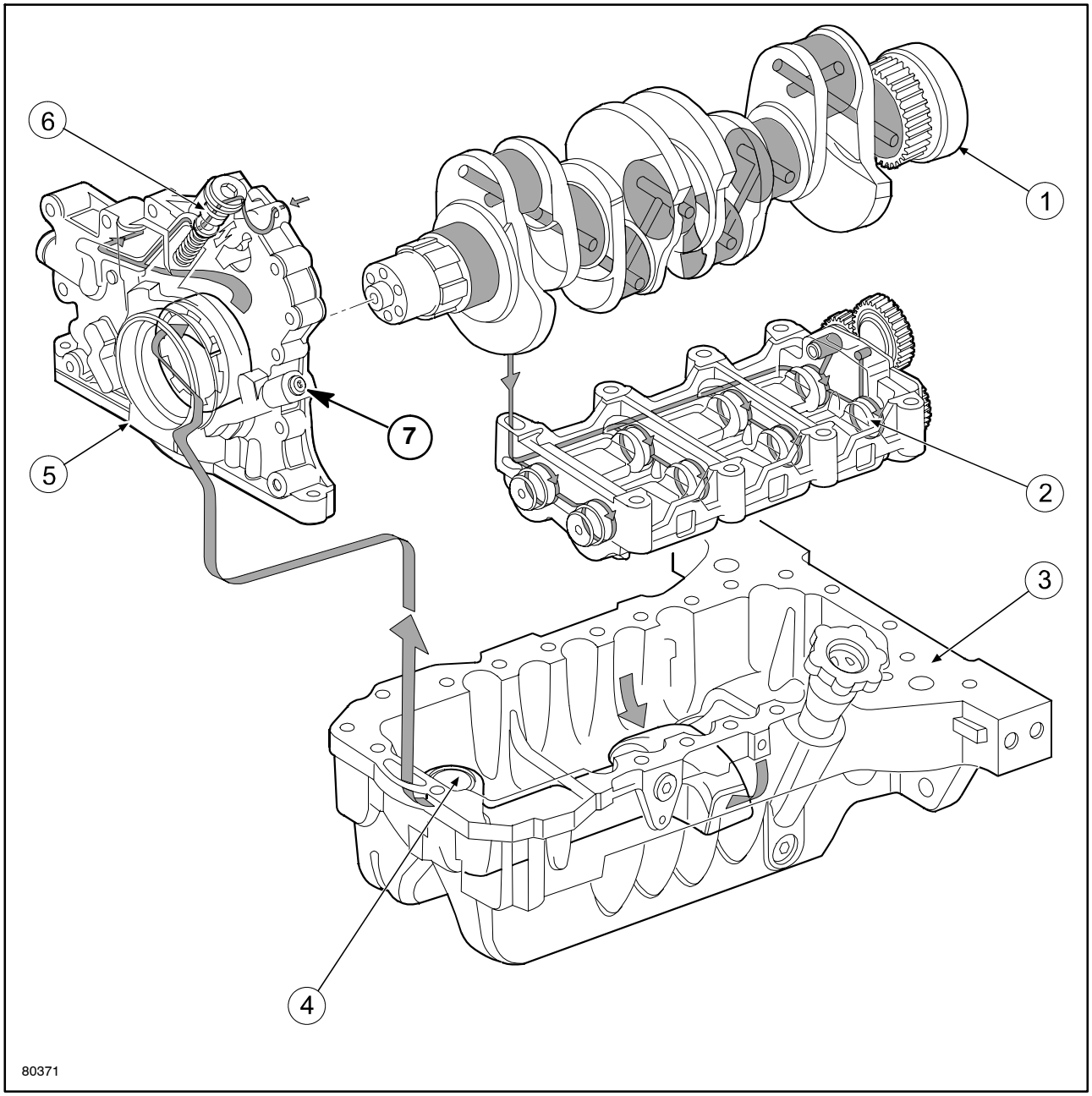
The lubricating oil is sent from the oil sump to the crankshaft, camshaft and valve control.

Lubrication also includes the cooler, turbo-blower and compressor for the compressed air system if there is one.

All these components often change according to use and will therefore be covered under the specific heading.



LUBRICATION SYSTEM COMPONENTS



10

1. - Crankshaft – 2. Balancing weight – 3. Oil sump with suction rose – 4. Suction rose in oil sump – 5. Oil pump – 6. Relief Valve - 7. Safety Valve.

OVERHAUL

INTRODUCTION

Removal

To remove engine from tractor see Section 01 “Separating the Tractor.”

Disassembly

Some of the operations described in this section can be carried out directly with engine fitted on the vehicle, depending on access to the engine bay and on the version.

⚠ CAUTION ⚠

Both the engine removal and overhaul operations must be carried out by skilled personnel using specific tools.

⚠ CAUTION ⚠

Due to requirements dictated by the application, some assemblies may be located on the engine in different positions.

Preparing Engine for Installation on Rotary Stand

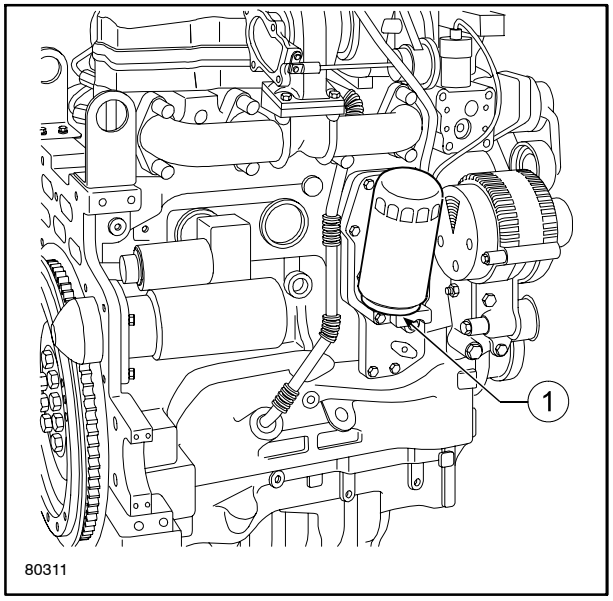
To be able to fit bracket **380001298** for fixing the engine to the stand **380000301** and do the overhaul, proceed as follows.

From the right-hand side, remove:

1. Remove the oil filter (1) located on the cooler.

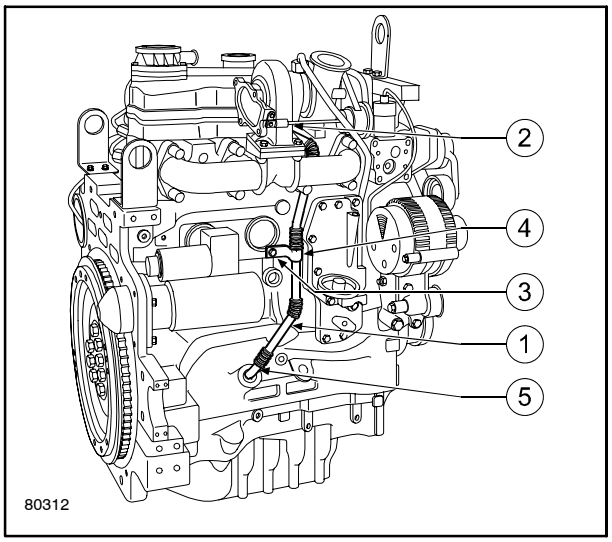
⚠ CAUTION ⚠

Note that the oil filter contains approximately 1 kg (2.2046 lb) of engine oil.
Collect and dispose of the engine oil in accordance with current regulations.
Appropriately position a container to hold the fluid.
Caution! Avoid skin contact with engine oil: in the event of contact, wash the area of skin under running water.



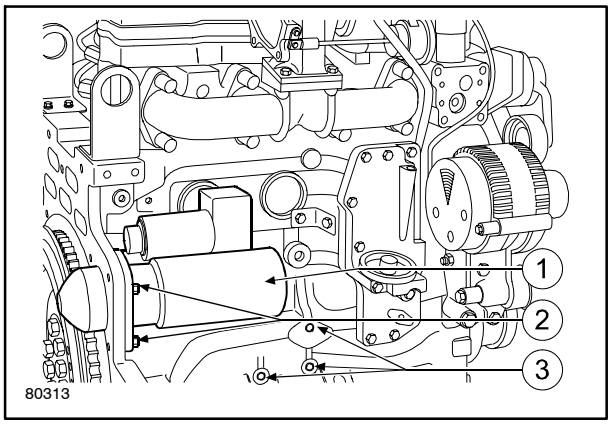
11

2. Disconnect the lubricating oil drain pipe (1) from the turbo-blower:
   - from under the turbo-blower, unscrew the 2 bolts (2);
   - unscrew the bolt (3) fastening the pipe to the block with the retaining collar (4);
   - lastly, unscrew the union (5) from the block; plug the ends of the pipe and the outlet on the turbo-blower.



12

3. Support the motor (1) appropriately and unscrew the two retaining bolts (2); fit the supporting bracket **380001298** using the threaded holes (3).

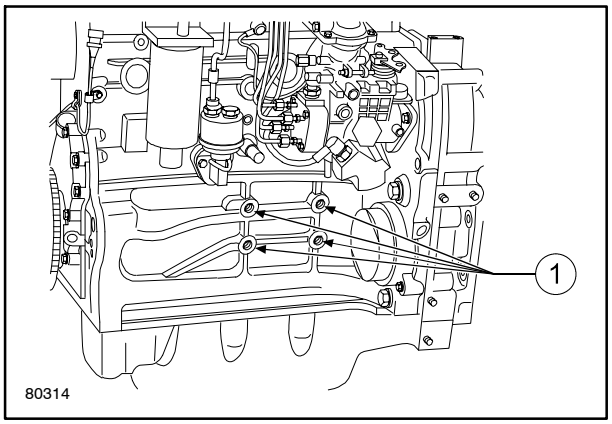


13

4. Connect the second bracket **380001298** using the threaded holes (1).
5. Lift the engine and place it on the rotating stand **380000301**.
6. Drain the oil off through the plug under the sump.

⚠ CAUTION ⚠

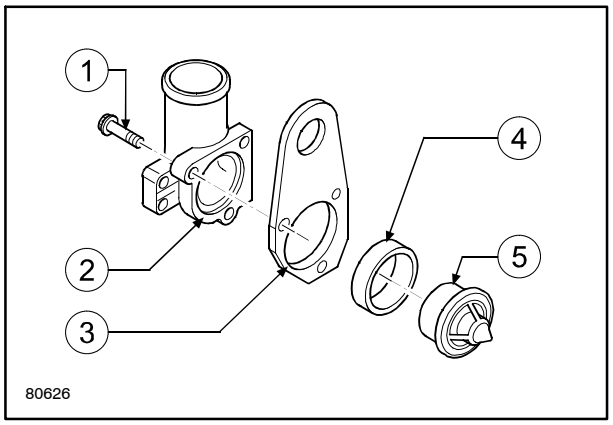
Caution! Avoid skin contact with engine oil: in the event of contact, wash the area of skin under running water.
Engine oil is highly polluting: dispose of it in accordance with current regulations.



14

Thermostat Housing

7. Remove the thermostat body (2) together with the thermostat (5), seal (4) and bracket (3) by unscrewing the bolts (1).

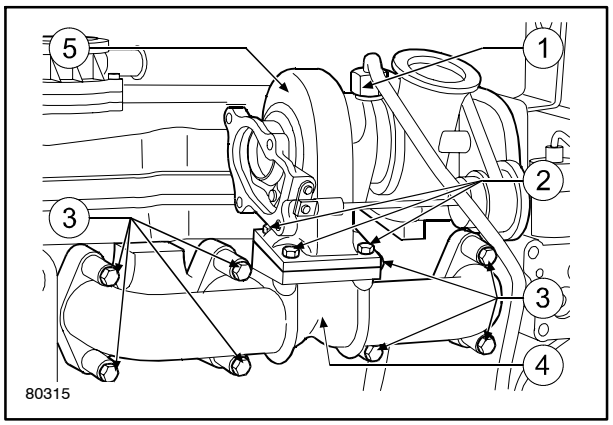


15

Turbocharger

Proceed to remove the turbocharger:

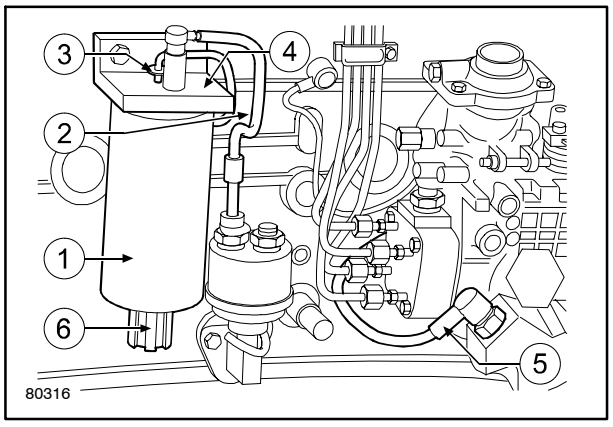
8. Unscrew the ring nut (1) and disconnect the lubrication piping of the turbo-blower.
   Work in a similar way at the other end of the piping and disconnect it from the top of the cooler.
9. Unscrew the nuts (2) securing the turbo-blower on the exhaust manifold.
10. Support the turbo-blower (5) and, lifting it, remove the seal.
    Unscrew the retaining nuts (3) and remove the exhaust manifold (4).



16

Fuel System

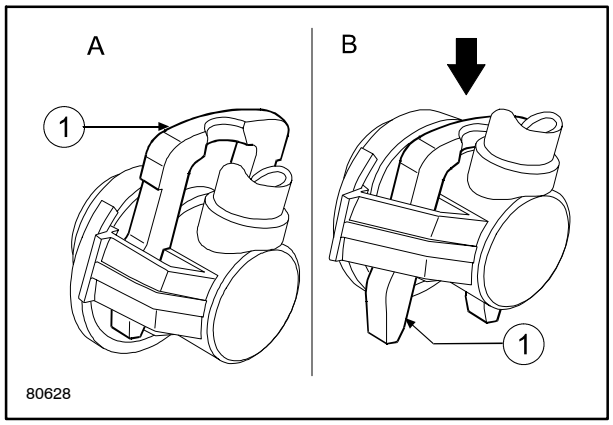
11. Place a container under the diesel filter and unscrew the condensation bleed cock (6) located under the filter; drain off all the diesel it contains.
12. Fully unscrew the cock and remove the diesel filter (1).
13. Disconnect the fuel pipes (2 and 3) respectively from the priming pump to the filter mounting and from here to the fuel pump.
14. Remove the fuel filter mounting (4) from the bracket secured to the cylinder head.
15. Disconnect the electric cable (5) from the mechanical pump.



17

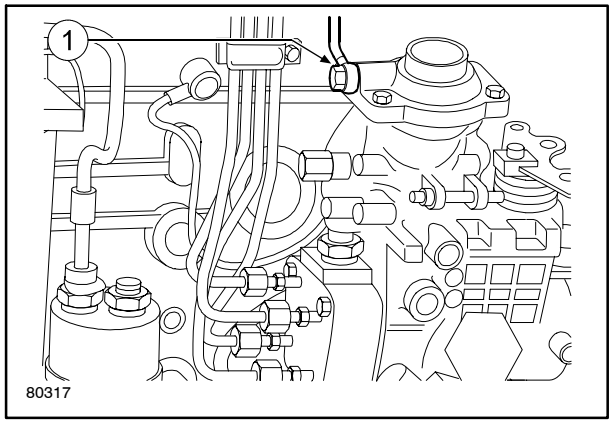
⚠ CAUTION ⚠

To disconnect the low-pressure fuel pipes (2 and 3) from the relevant fittings, you need to press the clip (1) as shown in Figure 18, **B**.
After disconnecting the piping, put the clip (1) back in its locking position (Figure 18, **A**) to prevent it getting buckled.



18

16. Disconnect the piping (1) of the LDA of the head and of the fuel pump; put plugs on the ends of the piping, on the fuel pump and on the cylinder head.



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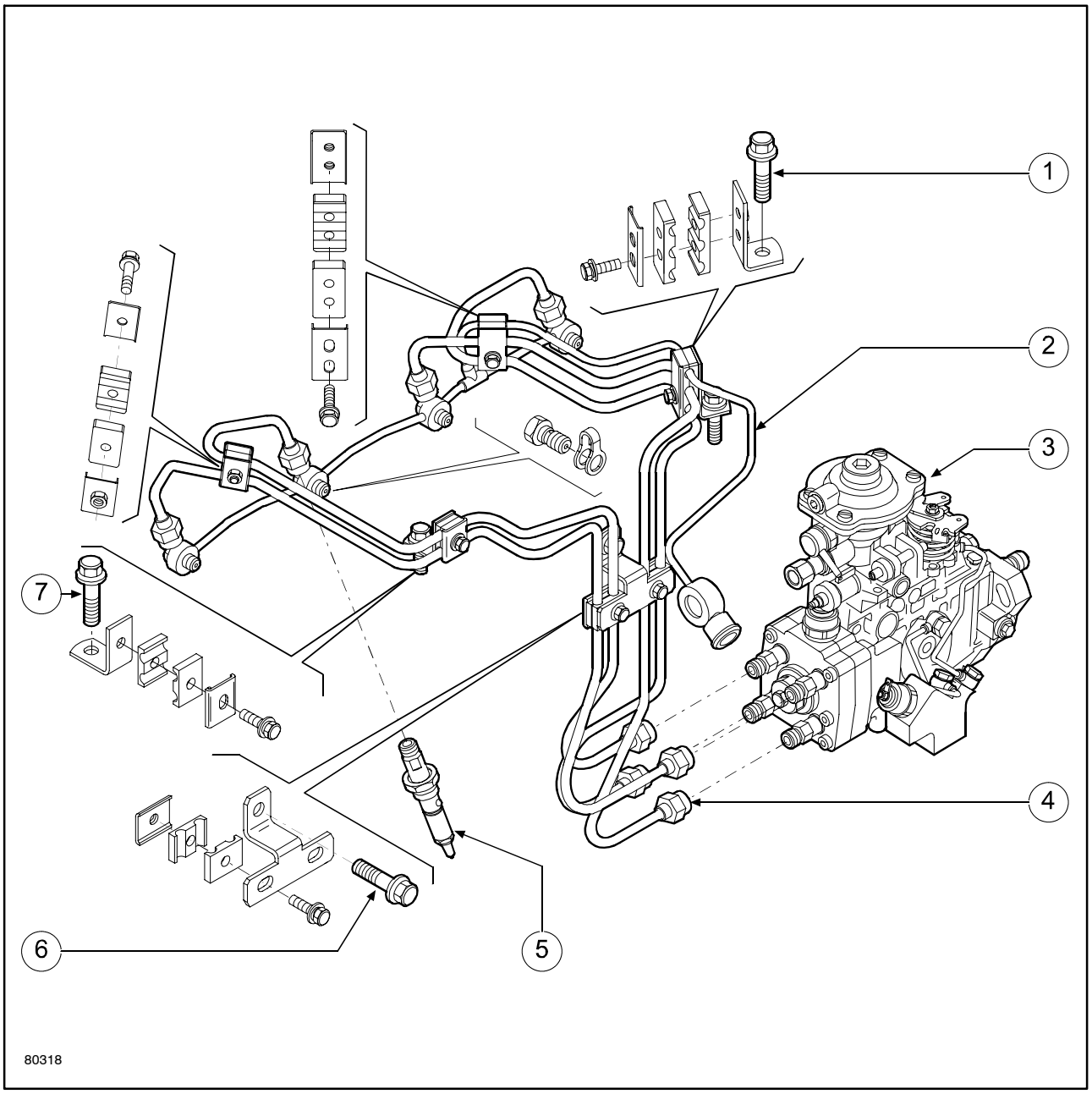
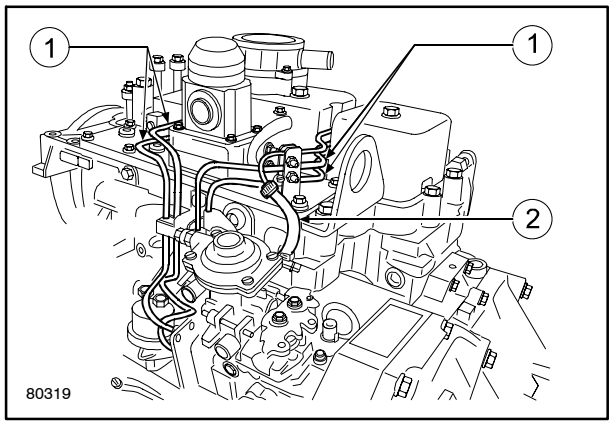


20

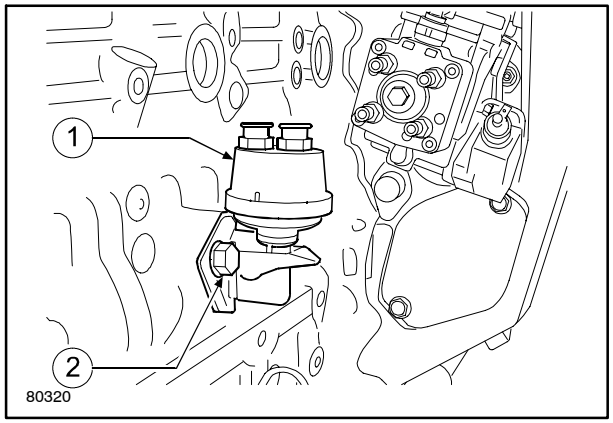
1. Rear bracket retaining bolts (on the intake manifold plate) – 2. Fuel return pipe to the pump – 3. Rotary fuel pump – 4. Pumping element connecting ring nut – 5. Injector – 6. Bracket retaining bolt on injection pump side – 7. Front bracket retaining bolt (on the intake manifold plate)

17. Remove the pipes (1) and (2) forming the fuel recovery and supply between the pump and the injectors: unscrew the ring nuts fastening the pipes to the pumping elements; unfasten the collar of the fuel recovery pipe returning to the injection pump; unscrew the ring nuts mounted on the injectors and unscrew the bolts securing the fuel recovery pipe; unscrew the bolts fastening the brackets retaining the above-mentioned pipes (1, 6 and 7, figure 20). Put plugs on the ends of the pipes.
18. Remove the injectors and extract them from their seat: recover the seals.



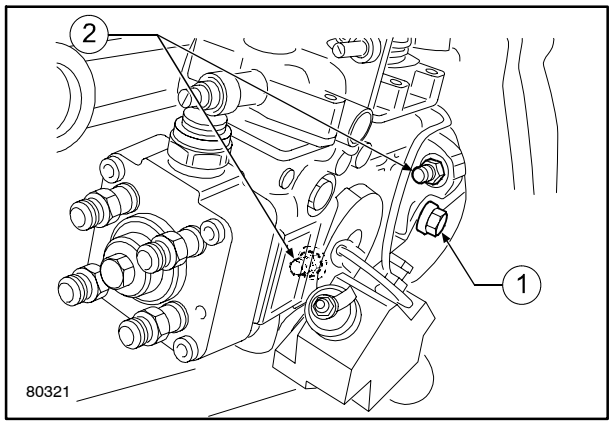
21

19. Unscrew the two retaining bolts (2) and remove the priming pump (1).



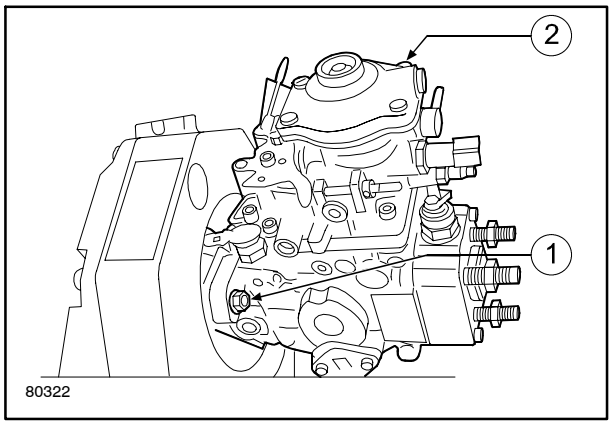
22

20. With the engine at T.D.C. (See the procedure on page 74), loosen the nut (1), remove the spacer washer, then screw down the bolt (1) and lock the fuel pump shaft.
21. Unscrew the nuts (2) securing the pump to the crankcase.



23

22. Unscrew the nut (1) securing the pump (2) to the cylinder block and extract it from its seat.



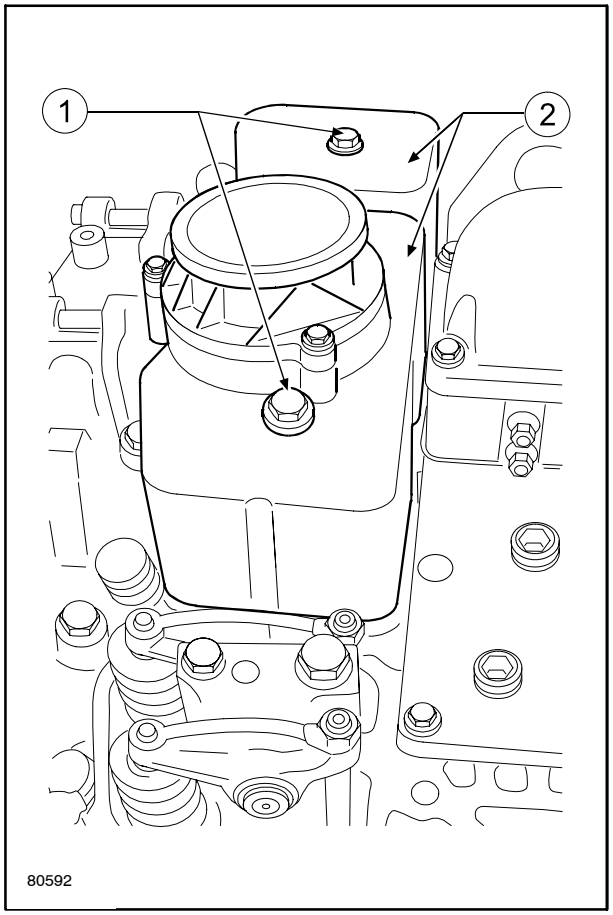
24

Cylinder Head

23. Remove the tappet covers: unscrew the retaining bolts (1) and lift the covers (2); recover the seals.

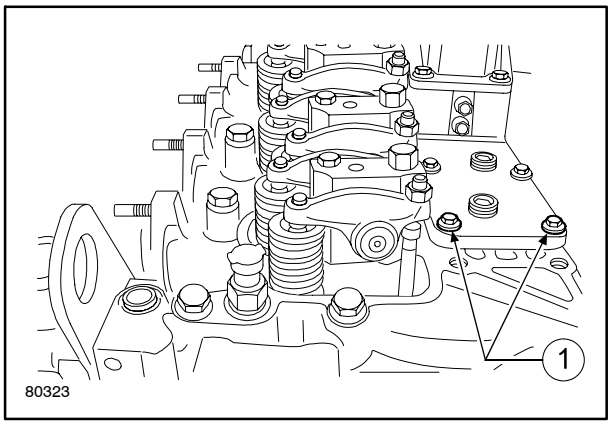
⚠ CAUTION ⚠

The front cover has already been removed in the figure.
The central cover contains the lubricating oil vapour vent valve (blow – by).
All the seals must always be replaced during assembly.



25

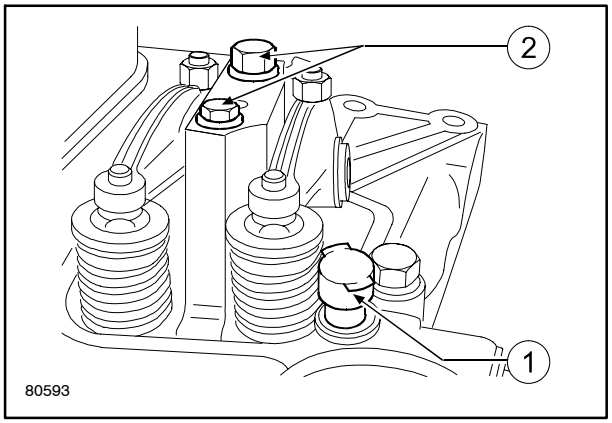
24. Remove the intake manifold: unscrew the eight bolts (1) securing the intake manifold plate to the cylinder head (two of these have already been unscrewed as they secure the pipe brackets to the injectors).



26

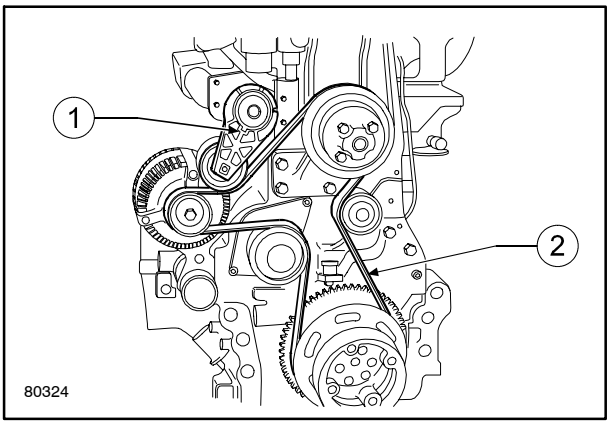
25. Remove the rocker arm mountings: unscrew the two retaining bolts (2) and remove the mounting together with the rocker arms; extract the tappet rods.
Repeat this operation for the remaining rocker arm mountings.

26. Remove the water temperature transmitter (1).



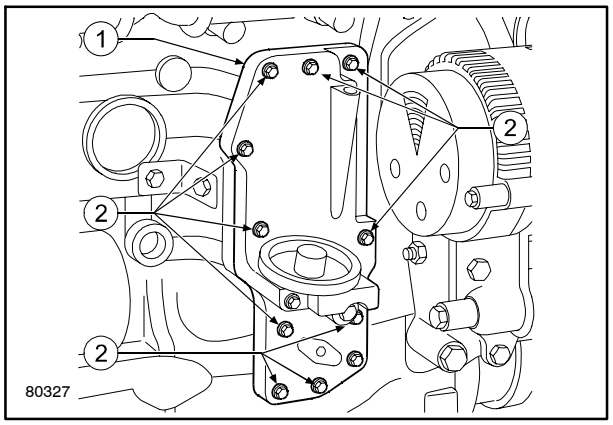
27

27. Using a 1/2in. square drive wrench, loosen the tension of the tightener (1), remove the timing belt (2).



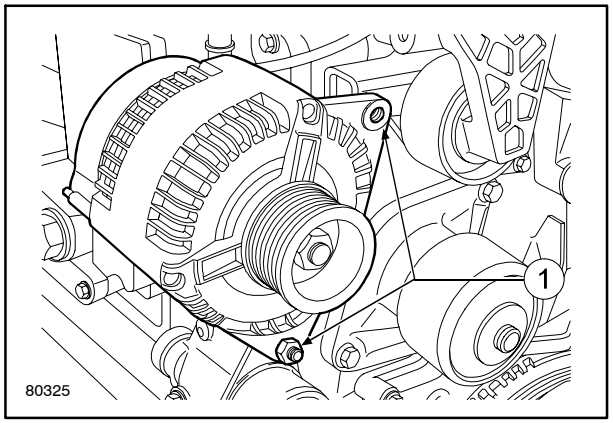
28

28. Unscrew the bolts (2) and remove the oil filter mounting (1) from the crankcase; remove the relevant seal and the cooler.



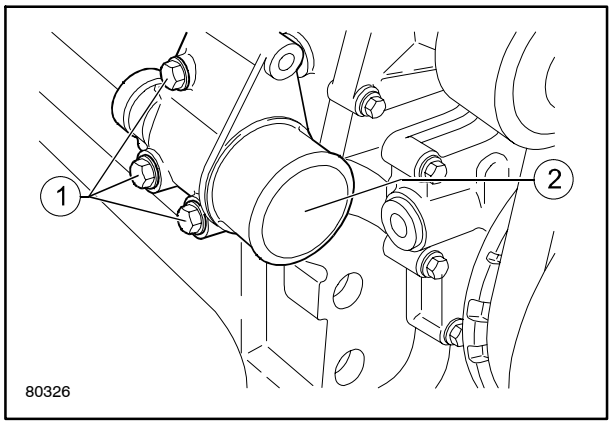
29

29. Unscrew the retaining bolts (1) and remove the alternator from the engine.



30

30. Unscrew the bolts (1) securing the coolant inlet sleeve (2).



31

31. Remove the snub pulley (1) from the front.

32. Unscrew the four bolts (2) and remove the pulley (3) from the mounting beneath.

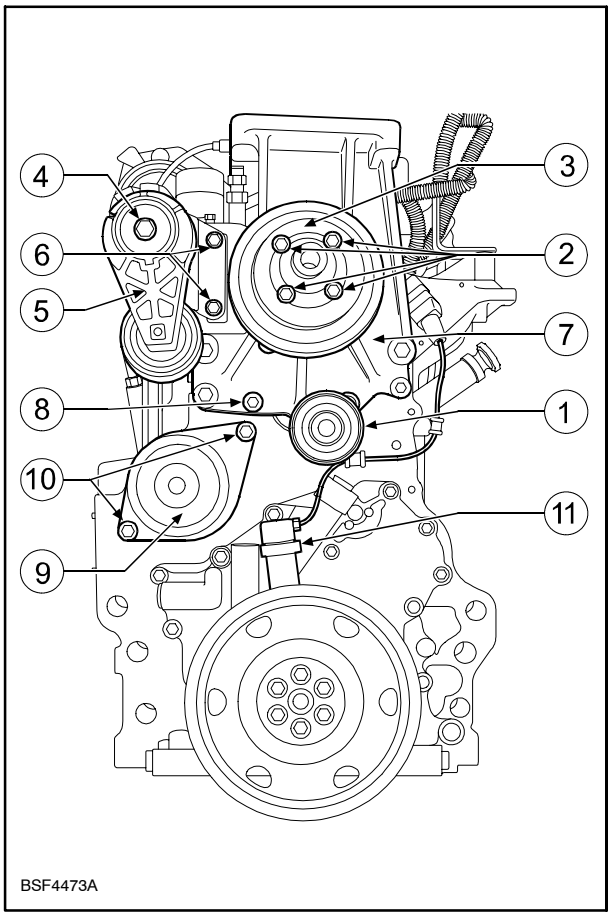
33. Unscrew the bolt (4) and remove the tightener (5).

34. Unscrew the bolts (6) and remove the tightener mounting.

35. Unscrew the bolts (8) and remove the mounting (7) from the crankcase.

36. Unscrew the bolts (10) and remove the coolant pump (9) from the crankcase.

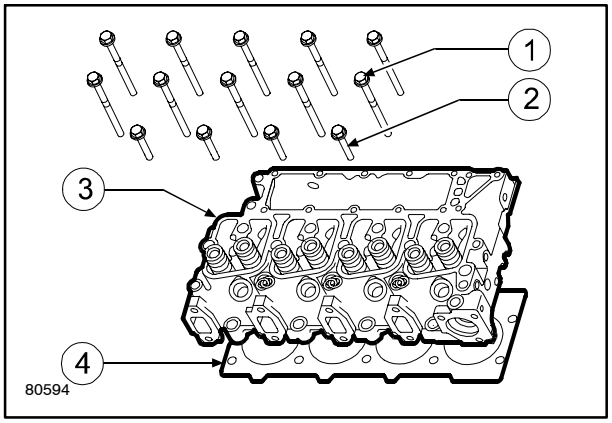
37. Unscrew the bolt and remove the engine speed sensor (11).



32

38. Remove the cylinder head.

39. Unscrew the bolts (1) and (2) securing the cylinder head (3); hook up the brackets with metal ropes and, using a lift, remove the cylinder head from the crankcase; remove the gasket (4) from the crankcase.

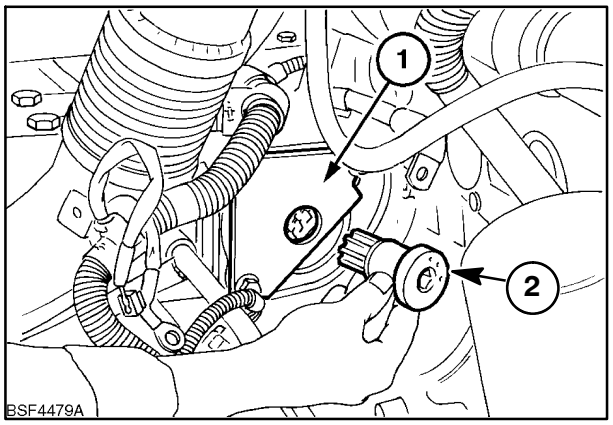


33

Crankshaft Seals

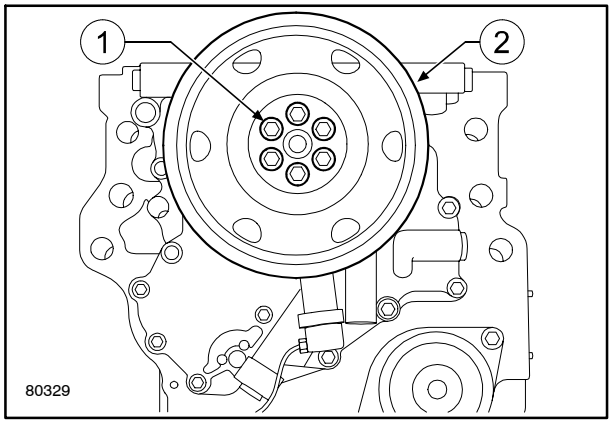
40. Install the engine locking / turning tool, **380000988** (1), and **380000732** (2) to lock rotation of the flywheel.

41. Loosen the screws fixing the flywheel to the crankshaft.



34

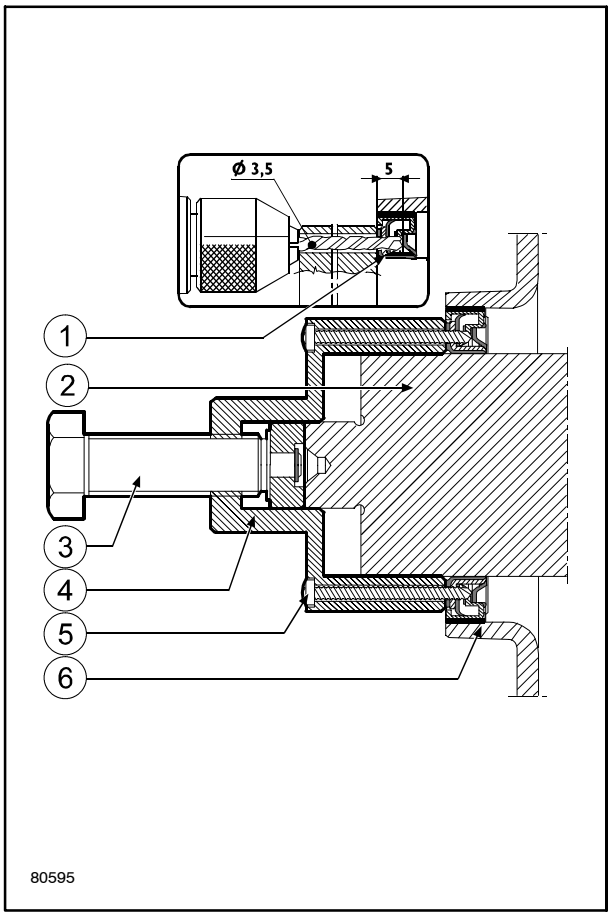
42. Unscrew the bolts (1) and remove the pulley (2).



35

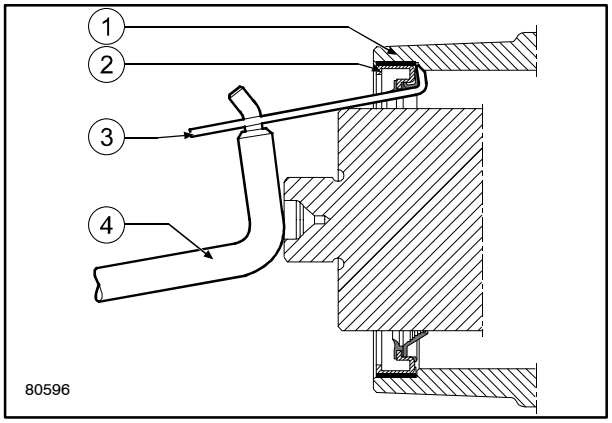
43. Extract the front cover shaft seal. Apply tool **380000665** (4) on the front tang (2) of the crankshaft. Perforate the inner seal (1) with a drill bit (∅ 3.5 mm (0.0138 in.)) through the tool's guide holes, for a depth of 5 mm (0.1969 in.).

44. Secure the tool to the seal by screwing down the 6 screws supplied. Extract the seal (1) by screwing down the screw (3).



36

45. Use a suitable hooked device (3) with the aid of the lever (4) extract the outer seal (2) from the front cover (1).

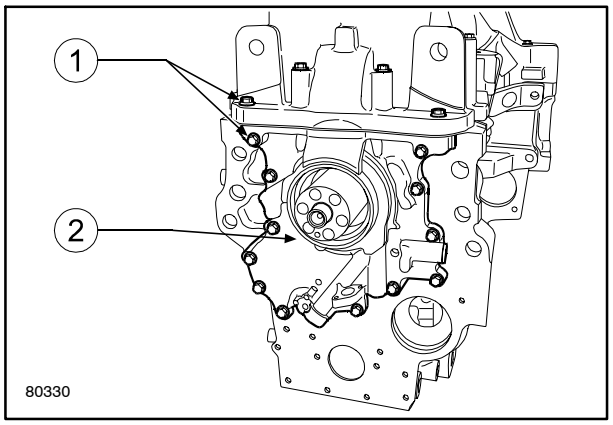


37

46. Take out the screws (1) and remove the oil pump (2).

CAUTION

Note down the assembly position of the screws (1) as they have different lengths.

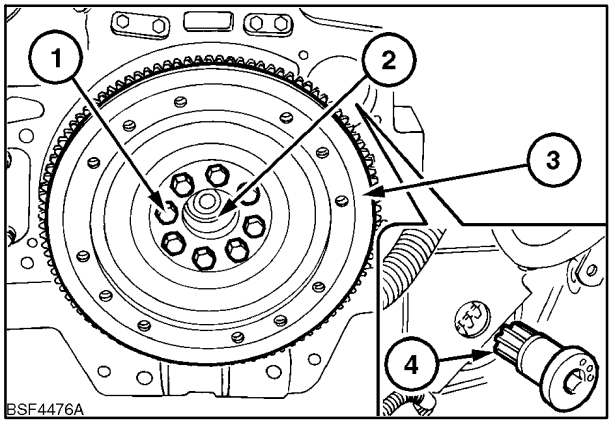


38

47. Remove two opposing screws (1) where the extraction pins are to go in (see following figure).

48. Unscrew the remaining screws securing the flywheel (3) from the crankshaft (2).

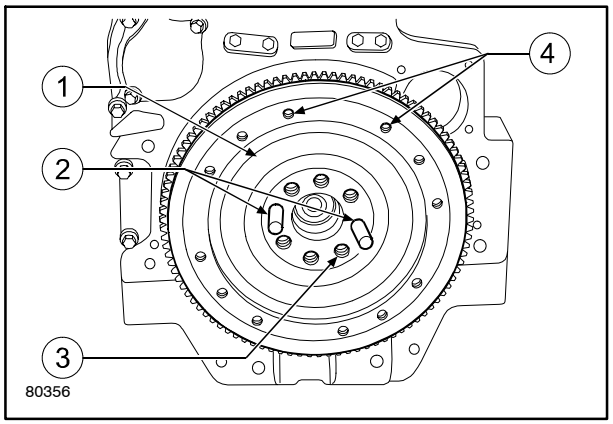
49. Remove the tool locking the flywheel (4).



39

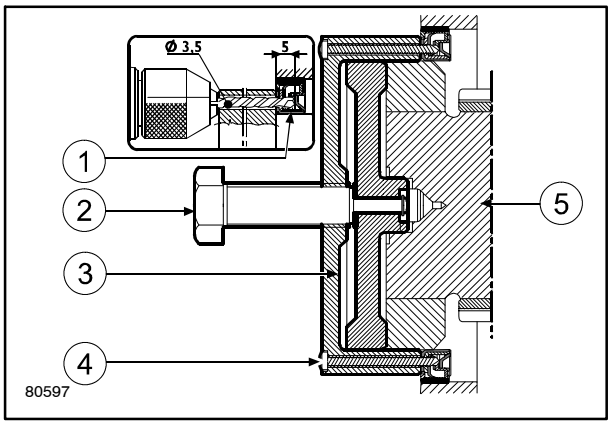
50. Screw two screws of suitable length into the holes (4) to sling the flywheel with a lift.

51. Using the two guide pins (2) previously screwed into the holes of the crankshaft (3), guide the extraction of the engine flywheel (1) with the aid of a lift.



40

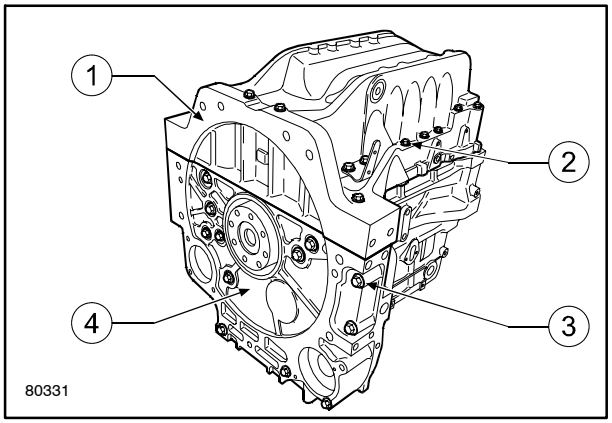
52. Extract the seal, applying tool **380000663** (3) onto the rear tang (5) of the crankshaft.
53. Perforate the inner seal with a drill bit (∅ 3.5 mm (0.0138 in.)) through the tool's guide holes, for a depth of 5 mm (0.1969 in.).
54. Secure the tool **380000663** (3) to the seal (1) by screwing down the 6 screws supplied (4). Extract the seal (1) by screwing down the screw (2).
55. Use a suitable hooked device with the aid of the lever extract the outer seal from the front cover.



41

Sump

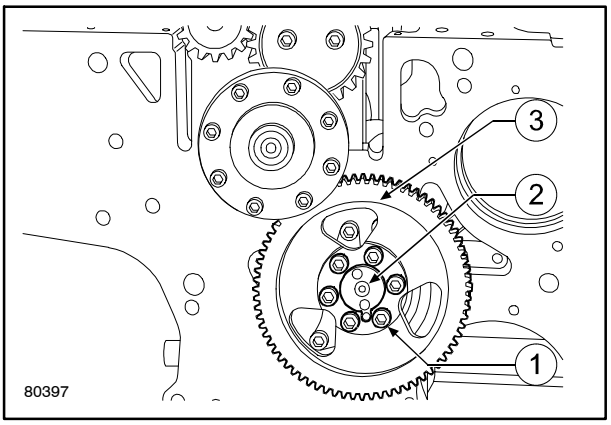
56. Turn the engine over.
57. Take out the screws (2) and remove the oil sump (1).
58. Unscrew the bolts (3) and remove the timing gear box (4) from the crankcase.



42

Rotating Counter Weights

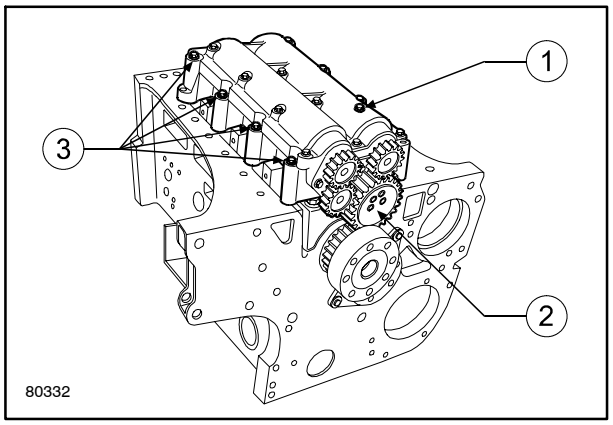
59. Take out the screws (1) and remove the gear (3) from the camshaft (2).



43

60. Using the pin (1), lock the additional counterweights (2) at the T.D.C.

61. Unscrew the retaining bolts (3) and remove the additional counterweights (2).



44

Crankshaft

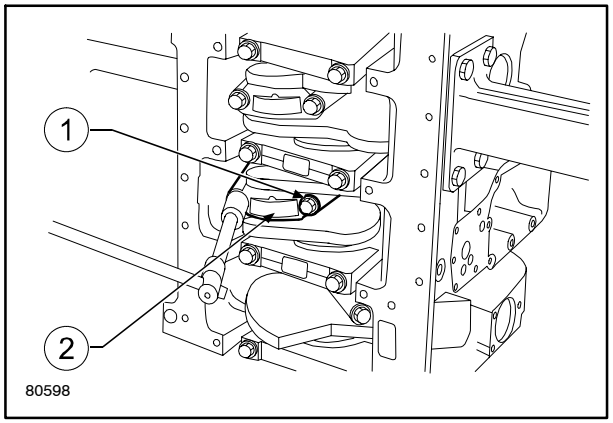
62. Take out the screws (1) securing the connecting rod caps (2) and remove them.

NOTE: *Mark the caps to ensure that they are refitted to the original rod in the original position.*

63. Extract the pistons together with the connecting rods from the top of the crankcase.

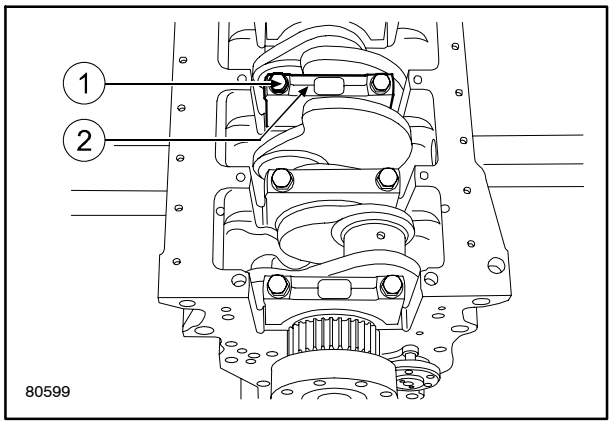
⚠ CAUTION ⚠

Keep the half bearings in their respective housings since, if they are used, they must be mounted in the position found upon disassembly.



45

64. Take out the screws (1) and remove the main bearing caps (2).

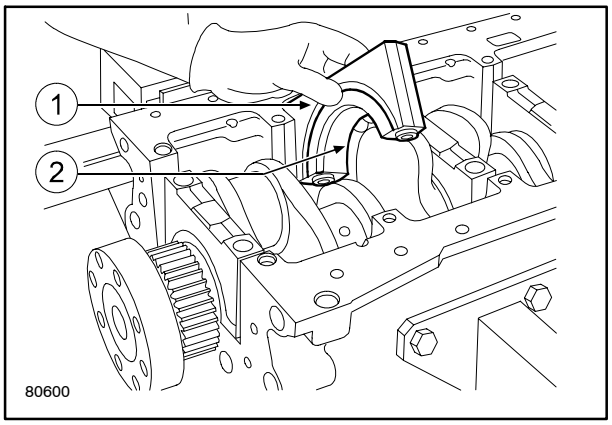


46

65. The penultimate main bearing cap (1) and the related mounting have the half bearing (2) equipped with a shoulder.

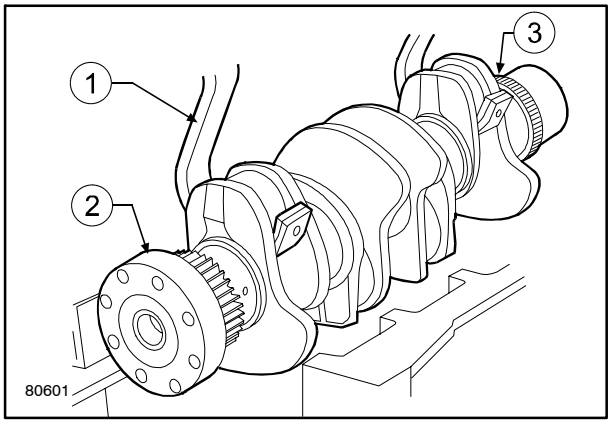
⚠ CAUTION ⚠

Note down the assembly position of the top and bottom half bearings since, if they are reused, they must be mounted in the position found upon disassembly.



47

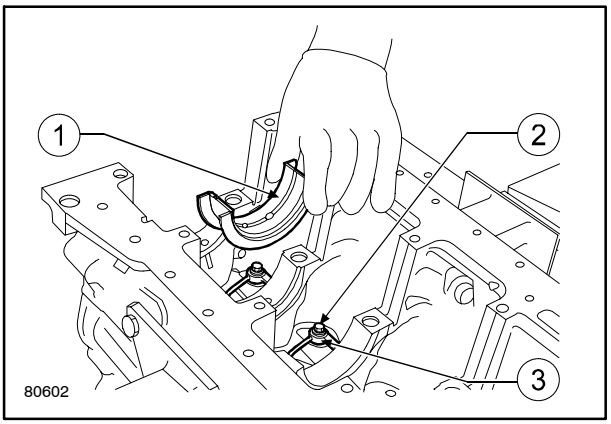
66. Using suitable lifting hooks (1) lift and remove the crankshaft (2) from the cylinder block.



48

Bushings

67. Remove the main half bearings (1); take out the screws (2) and remove the oil nozzles (3).



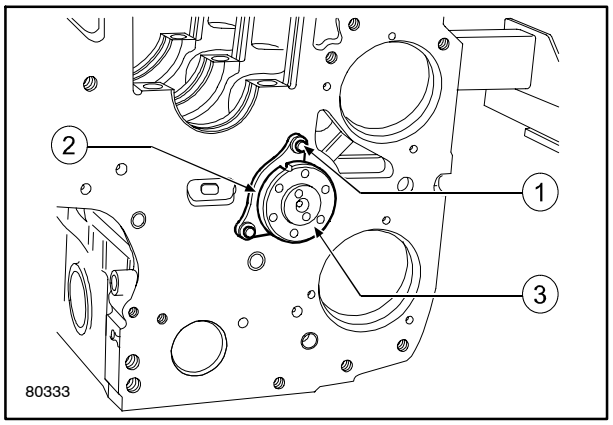
49

Camshaft

68. Take out the screws (1) and remove the plate (2) retaining the camshaft (3).

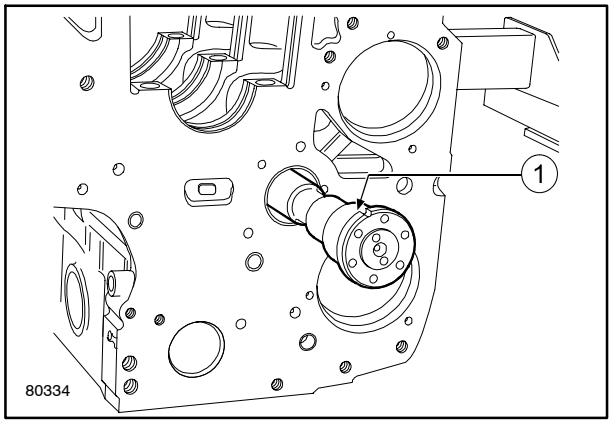
⚠ CAUTION ⚠

Note down the assembly position of the plate (2).



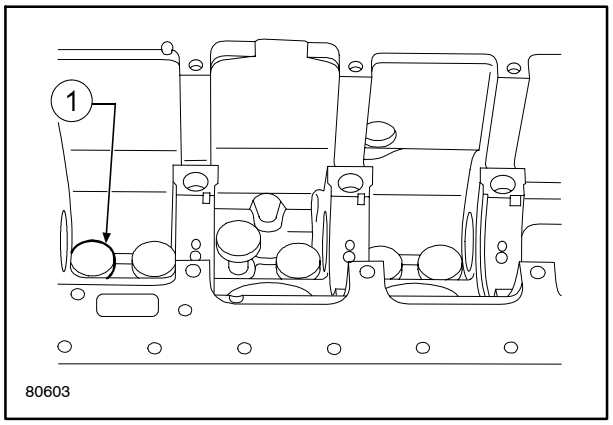
50

69. Carefully extract the camshaft (1) from the crankcase.



51

70. Extract the tappets (1) from the crankcase.



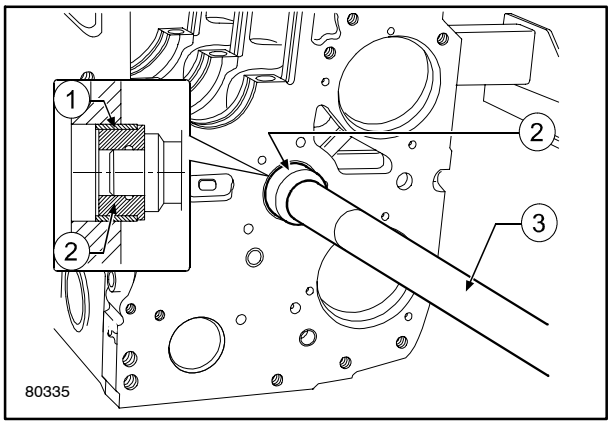
52

Changing bushings on the crankcase

71. To change the front bushing (1), use a suitable drift for its disassembly and assembly.

⚠ CAUTION ⚠

Upon assembly, the bushing (1) must be directed so that the lubrication holes coincide with the holes in the seats in the crankcase.

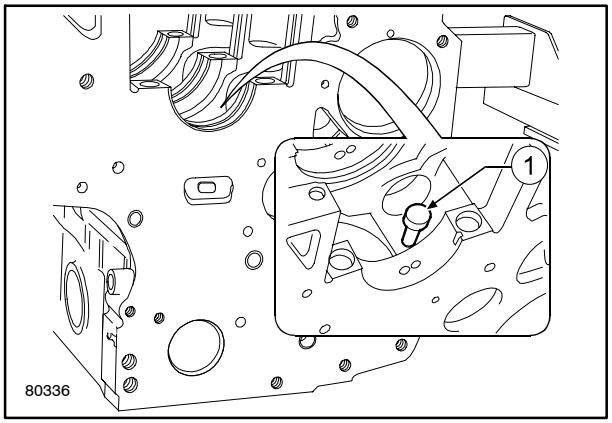


53

ASSEMBLY

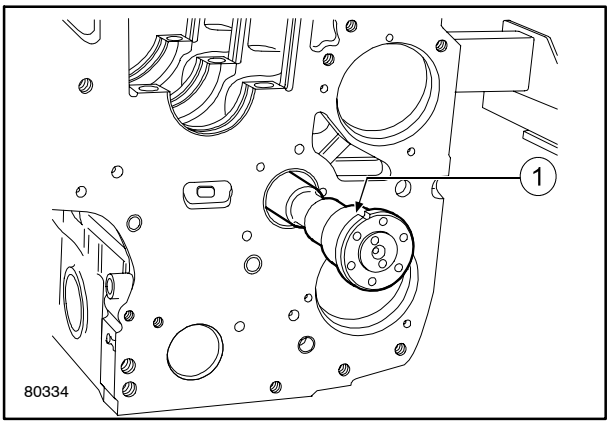
Installing the Tappets – Camshaft

72. Lubricate the tappets (1) and fit them in their seats in the crankcase.



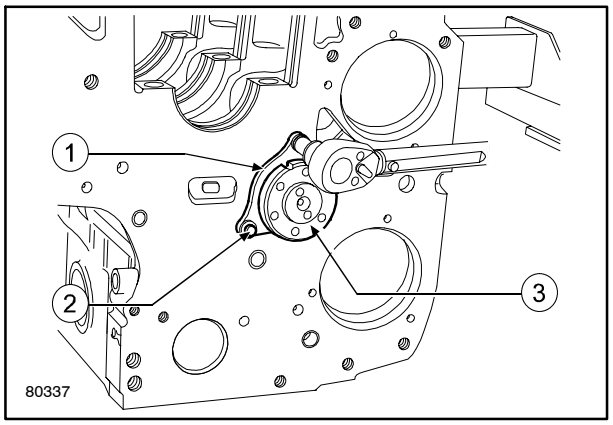
54

73. Lubricate the bushing supporting the camshaft and install the camshaft (1) taking care that, during this process, the bushing or the supporting seats do not get damaged.



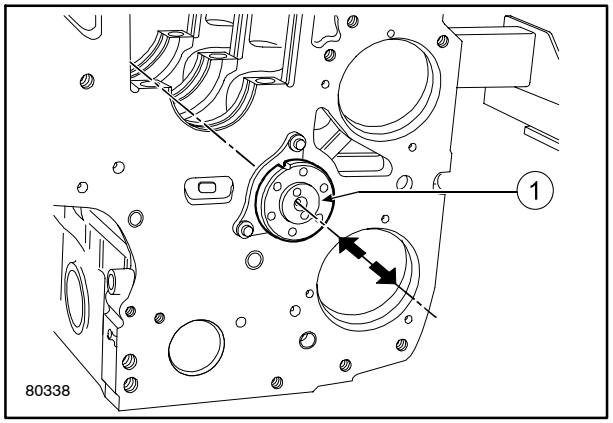
55

74. Position the plate (1) retaining the camshaft (3) with the slot facing towards the top of the crankcase and the punchmark facing the operator. Tighten the screws (2) to the prescribed torque.



56

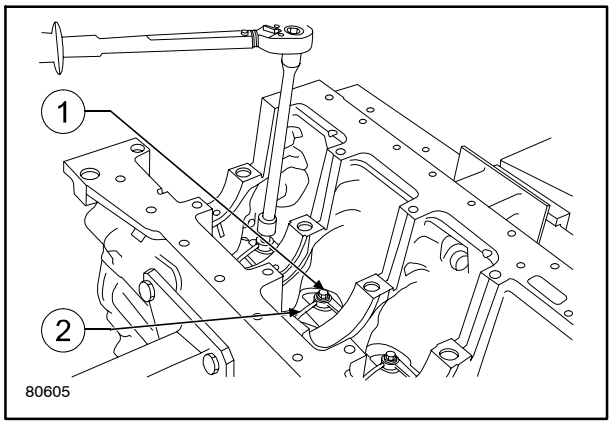
75. Check the end float of the camshaft (1); it must be 0.23 ± 0.13 mm (0.0091 ± 0.0051 in.).



57

Fitting the Oil Nozzles

76. Fit the nozzles (2) and tighten the retaining bolts (1) to the prescribed torque (15 Nm ± 3 Nm (1.0634 ± 2.2127 lb ft)).



58

Main Bearing Assembly

CAUTION

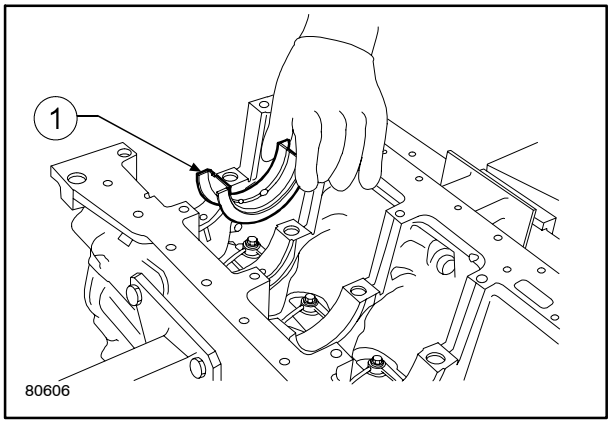
If you have not found it necessary to change the main bearings, you must fit them back on in exactly the same order and positions found upon disassembly.

NOTE: *The main bearings (1) are supplied with spare parts with an undersized inside diameter of 0.250 – 0.500 mm (0.0098 - 0.0197 in.).*

CAUTION

Do not modify the bearings in any way.

Carefully clean the main half bearings (1) with a lubrication hole and fit them into their respective seats.
The penultimate main half bearing (1) is equipped with semi-circular thrust washers.

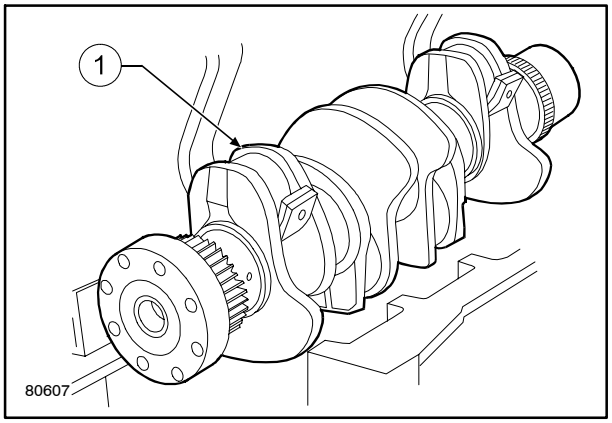


59

Crankshaft Assembly

77. Fit the crankshaft (1) in its seat.

78. Check the clearance between the main journals of the crankshaft and their respective bearings, proceeding as described in the following operations.

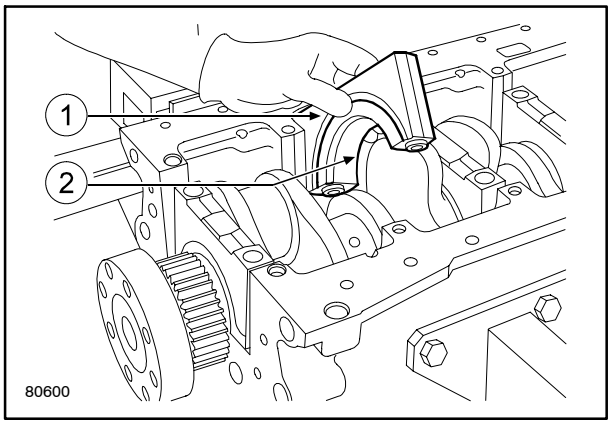


60

Main Bearing Cap Assembly

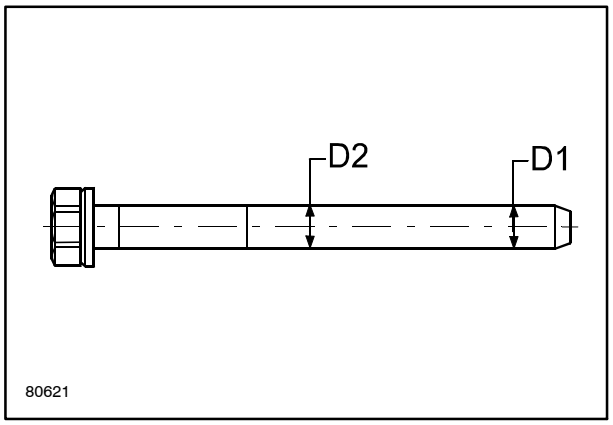
79. Make sure that all parts are perfectly clean and remove all traces of oil.
80. Fit the caps (1) complete with half bearings (2) on the relevant supports.

NOTE: *To measure the main journal assembly clearance, refer to the CHECKS AND MEASUREMENTS section.*



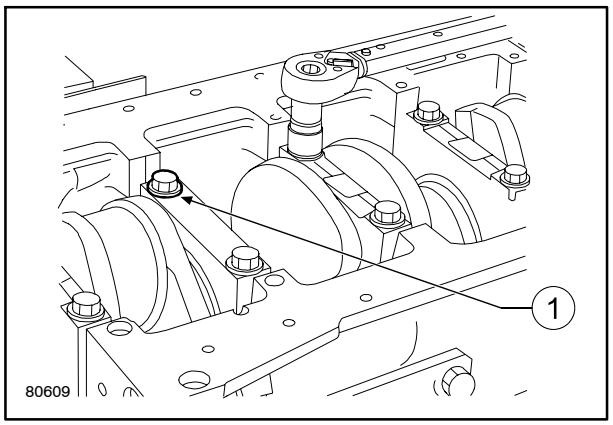
61

81. Before reusing the retaining bolts for the main bearing caps, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



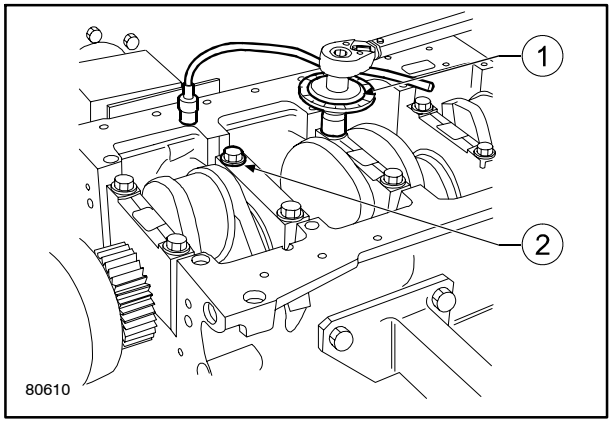
62

82. Screw down the pre-lubricated screws (1) and tighten them in three successive stages.
1st stage with a torque wrench to 50 ± 6 Nm (36.8781 ± 4.4254 lb ft).
2nd stage with a torque wrench to 80 ± 6 Nm (59.0050 ± 4.4254 lb ft).



63

83. 3rd stage with an angle gauge installed (1) positioned as in the figure, further tighten the screws (2) with an angle of 90° ± 5°.



64

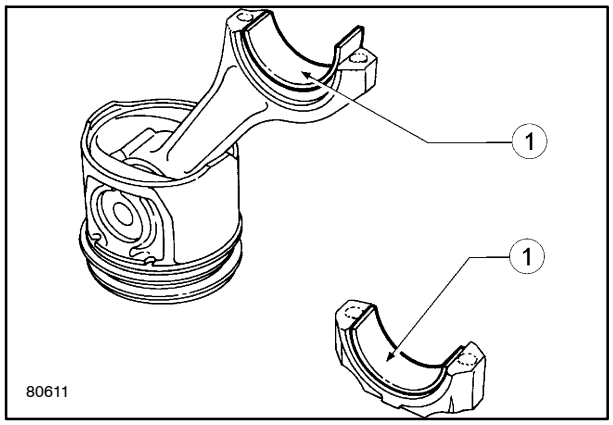
Fitting the Connecting Rod Half Bearings

84. Fit the half bearings (1) on the connecting rod and cap.

⚠ CAUTION ⚠

If you have not found it necessary to change the connecting rod bearings, you must fit them back on in exactly the same order and positions found upon disassembly. The rods are manufactured using a fracture breaking technique making each rod and cap unique, and having only one way of installation.

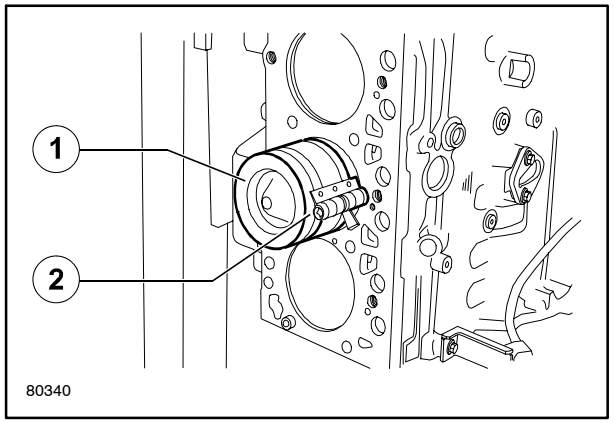
Do not modify the half bearings in any way.



65

Fitting the Piston - Connecting Rod Assemblies in the Cylinder Liners

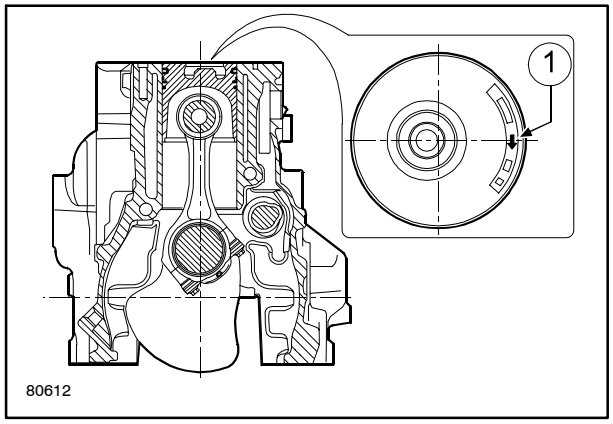
85. Lubricate the pistons well, including the piston rings and the inside of the cylinder liners. With the aid of a ring clamp (2), fit the connecting rod-piston assemblies (1) in the cylinder liners, checking that the number of each connecting rod corresponds to the cap coupling number.



66

DIAGRAM FOR FITTING THE CONNECTING ROD-PISTON ASSEMBLY IN THE BORE

86. The openings of the piston rings must be staggered 120° apart.
87. The connecting rod/piston assemblies must all have the same weight.
88. The arrow stamped on the crown of the pistons must face the front side of the crankcase, or the recess in the piston skirt must correspond to the position of the oil nozzles.

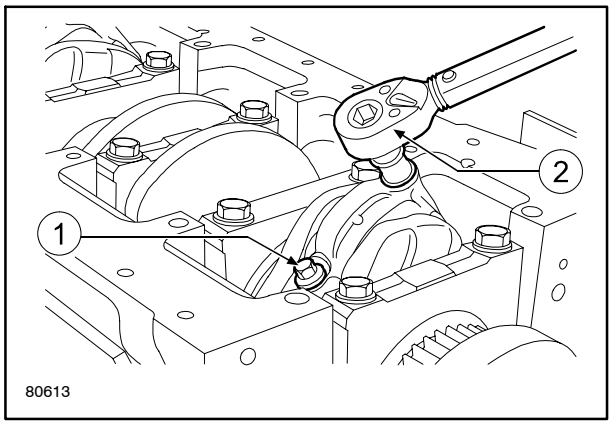


67

Fitting the Connecting Rod Caps

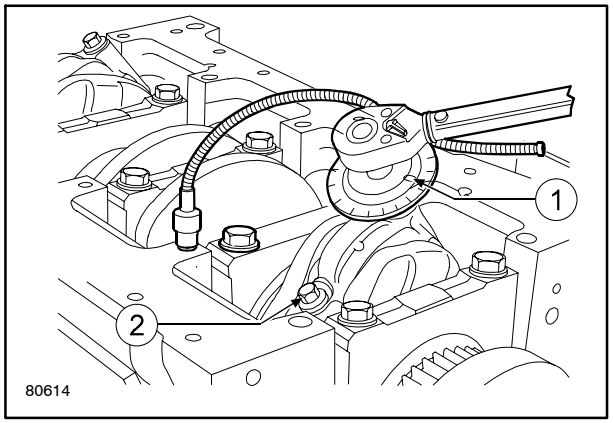
89. Tighten the screws (1) previously lubricated with engine oil to the prescribed torque with a torque wrench (2).
    1st stage with a torque wrench 30 ± 3 Nm (22.1269 ± 2.2127 lb ft).
    2nd stage with a torque wrench 60 ± 3 Nm (44.2537 ± 2.2127 lb ft).

NOTE: *To measure the connecting rod cap assembly clearance, refer to the CHECKS AND MEASUREMENTS section.*



68

90. Fit an angle gauge (1) on the socket wrench and further tighten the bolts (2) by 60° ± 5°.



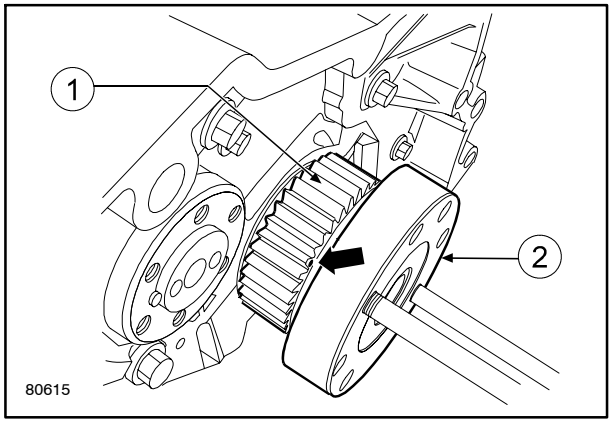
69

Camshaft Timing Operations

91. Use a marker pen to mark the tooth of the driving gear (1) mounted on the crankshaft (2) on the side of which the reference mark (→) is stamped for timing.

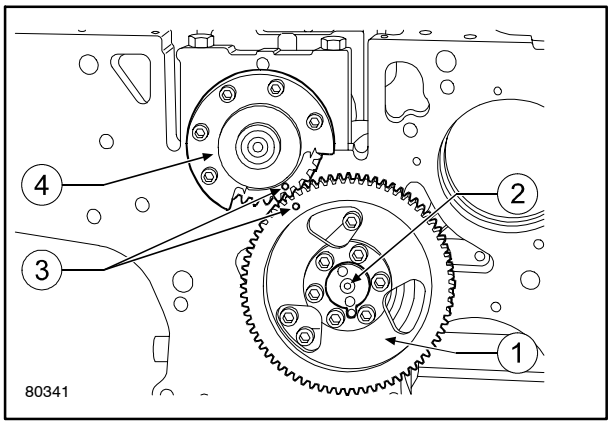
⚠ CAUTION ⚠

Screw in two pins to help in the operation of turning the crankshaft.



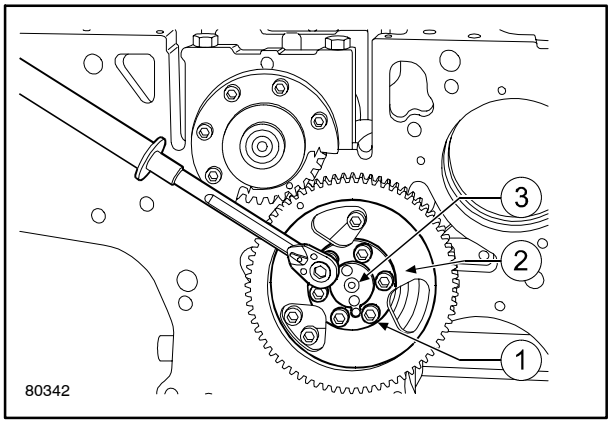
70

92. Direct the crankshaft (4) and camshaft (2) so that when mounting the driven gear (1) on the camshaft, the marks stamped on the gears (3) coincide.



71

93. Screw down the bolts (1) securing the gear (2) to the camshaft (3) and tighten to the prescribed torque 36 Nm ± 4 Nm (26.5522 ± 2.9502 lb ft).



72

Fitting the Timing Gear Casing

DIAGRAM OF ZONE FOR APPLYING LOCTITE 5205 SEALANT ON THE ADAPTOR PLATE

94. Carefully clean the adaptor plate and the crankcase.

⚠ CAUTION ⚠

Cleaning the surface to seal is both necessary and unavoidable in order to obtain an effective seal.

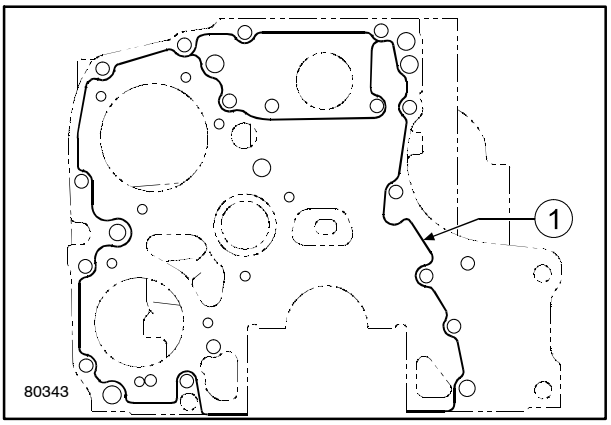
Apply **LOCTITE 5205** sealant onto the box to form a bead (1) with a diameter of a few mm.

It must be uniform (no lumps), with no air bubbles, thin areas or breaks.

Any flaws must be corrected in as short a time as possible.

Avoid using excess material to seal the joint. Too much sealant would tend to come out on both sides of the joint and clog the lubricant passageways.

After applying the sealant, the joints require immediate assembly (10 – 20 minutes).



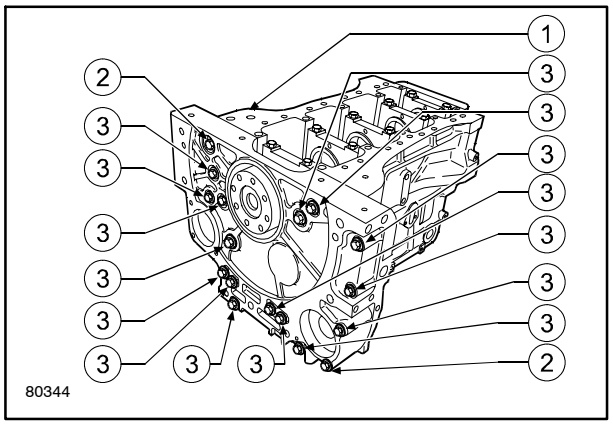
73

TIGHTENING SEQUENCE FOR ADAPTOR PLATE BOLTS

95. Refit the plate to the crankcase (1).
96. Screw down two retaining bolts (2) to lock the timing gear casing (1); using a torque wrench, tighten the bolts (2–3) to the prescribed torque, passing alternately from one bolt to the diametrically opposite one.
    M8 bolts 20 to 28 Nm (14.7512 to 20.6517 lb ft)
    M10 bolts 42 to 52 Nm (30.9776 to 38.35.32 lb ft)

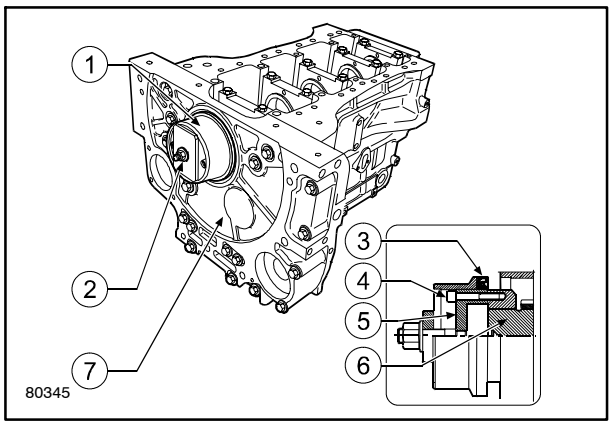
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



74

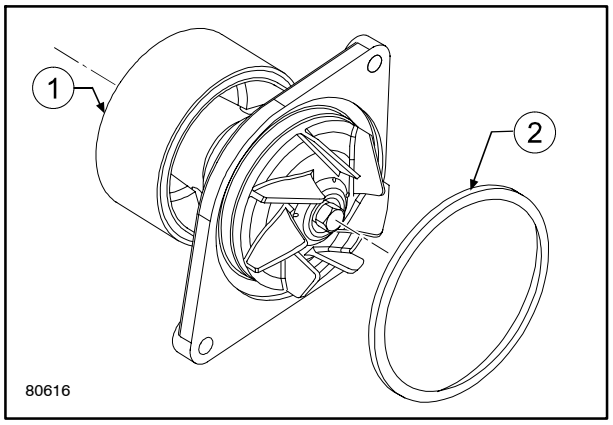
97. Fit part (5) of tool **380000664** on the rear tang (6) of the crankshaft. Secure it with the screws (4) and spline the new seal (3) onto it.
98. Position part (1) on part (5), screw down the nut (2) until the seal (3) is completely fitted in the gearbox (7).



75

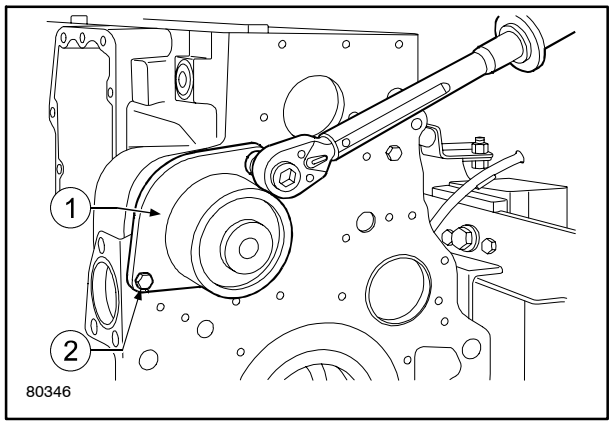
Fitting the Coolant Pump

99. Fit a new seal (2) onto the coolant pump (1).



76

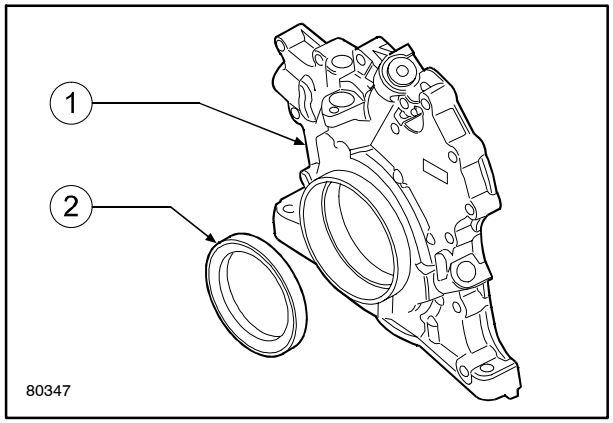
100. Mount the coolant pump (1); screw down the bolts (2) and tighten them to the prescribed torque.



77

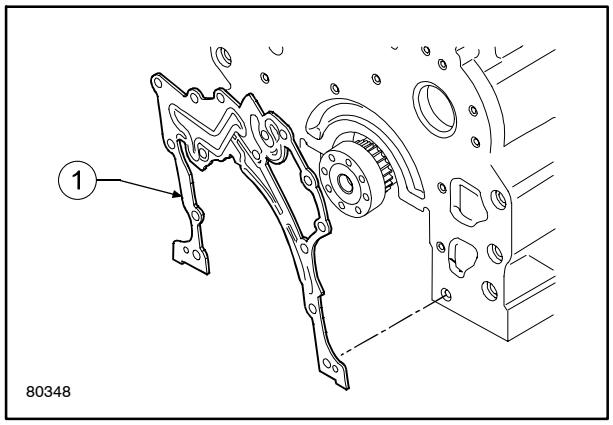
Fitting the Oil Pump

101. Remove the seal (2) from the front cover (1). Carefully clean the mating surface.



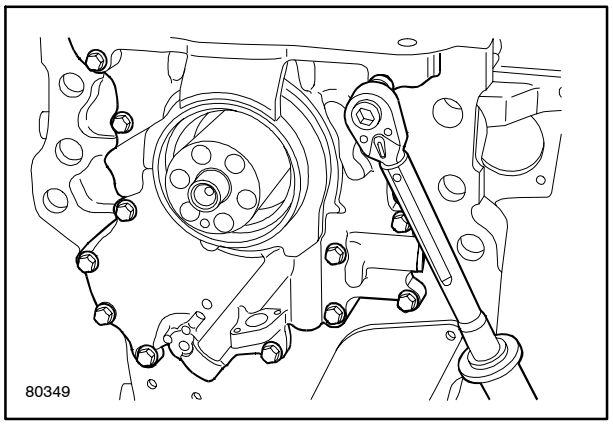
78

102. Carefully clean the contact surface on the engine block and position the gasket (1) on the crankcase.



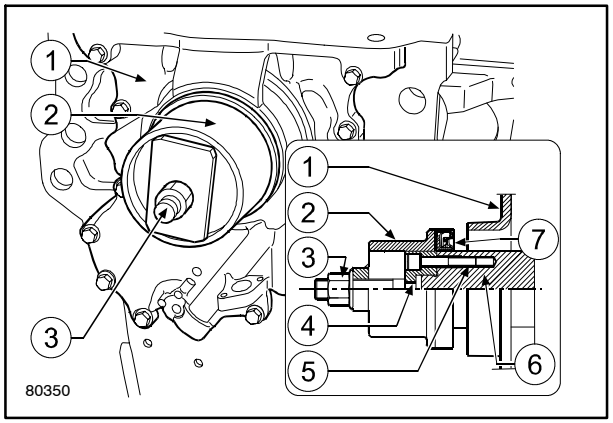
79

103. Mount the front cover on the engine block and screw down the bolts, tightening them to the prescribed torque.



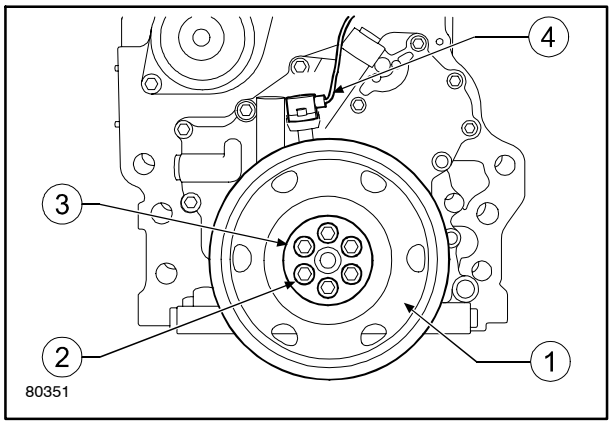
80

104. Fit part (4) of tool **380000664** on the front tang (6) of the crankshaft. Secure it with the screws (5) and spline the new seal (7) onto it.
105. Position part (2) on part (4), screw down the nut (3) until the seal (7) is completely fitted in the front cover (1).



81

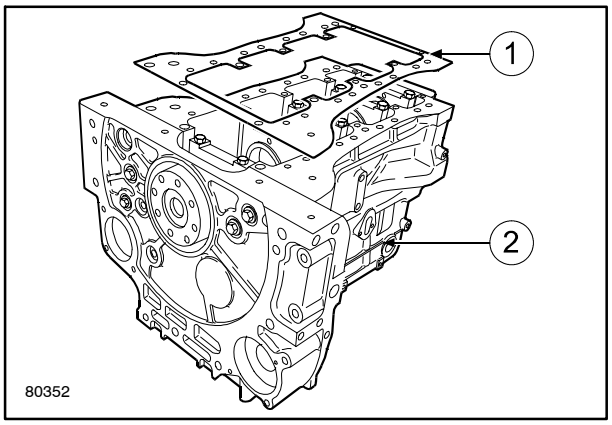
106. Place the pulley (1) and the spacer ring (3) on the crankshaft.
107. Screw down the retaining bolts (2) and tighten them to a torque of 50 ± 5 Nm (36.8781 ± 3.6878 lb ft).
108. Mount the engine speed sensor (4) in its seat.



82

Fitting the Oil Sump Seal

109. Place the new seal (1) on the crankcase (2).

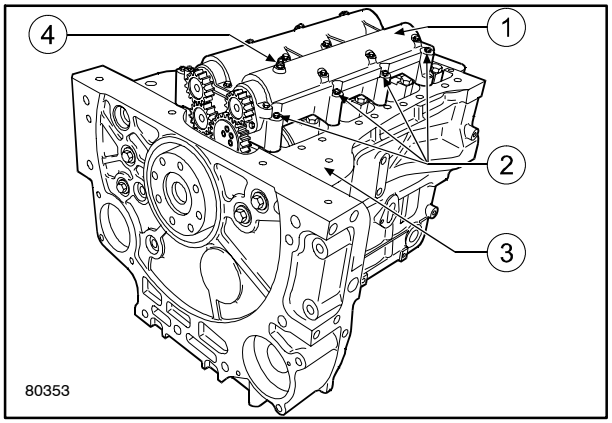


83

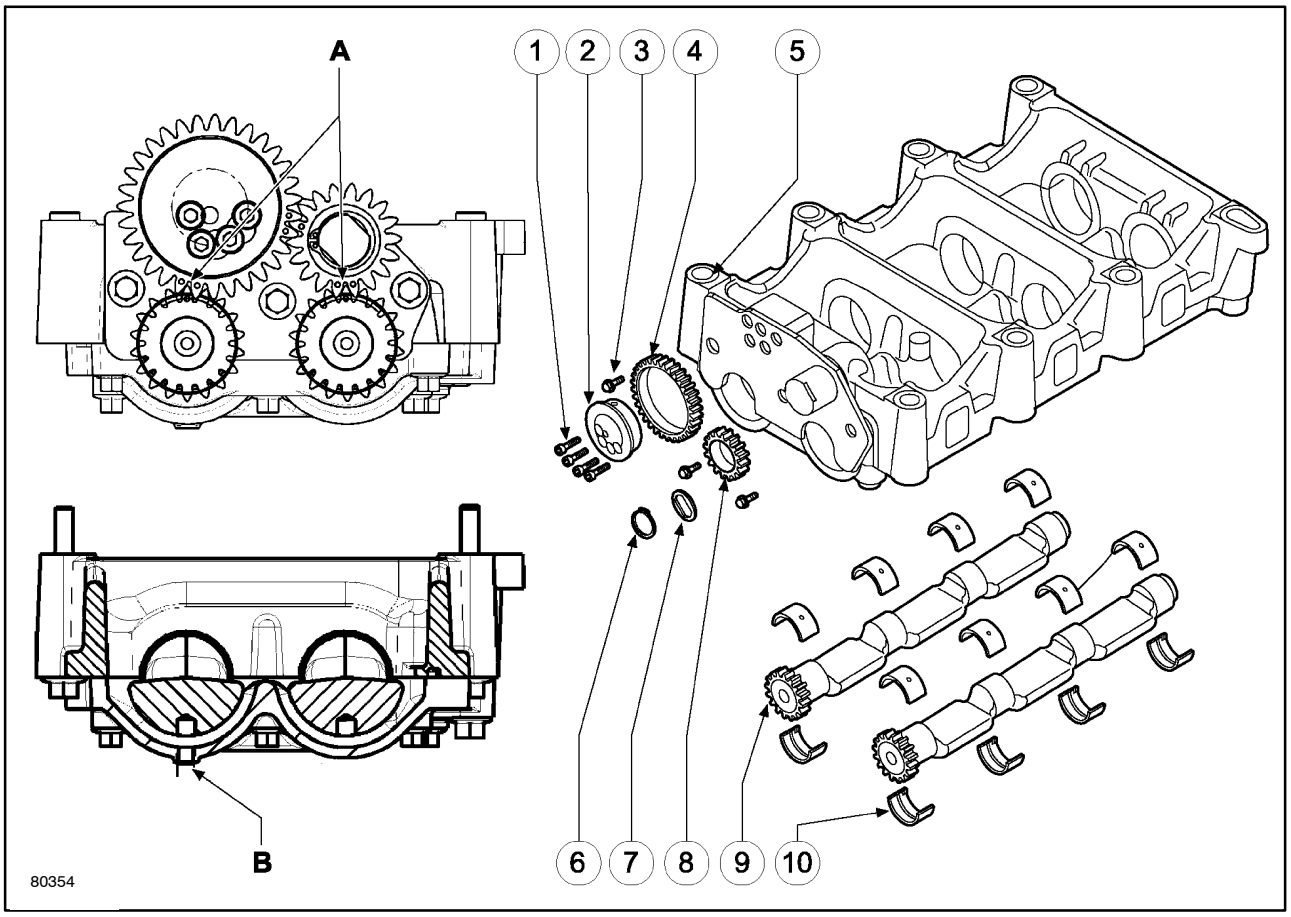
Fitting the Counterweights

110. Mount the counterweights (1) and screw down the bolts (2) on the crankcase (3).

111. Check that the first cylinder is at T.D.C. and remove the additional counterweight locking pin (4).



84



85

Counterweight Timing Operations

112. Make the marks (A) stamped on the gears for doing the timing coincide. Insert the pin into the hole (B) in the balancing weight.

1. Retaining bolts - 2. Mounting - 3. Retaining bolts - 4. Gear - 5. Balancing weight - 6. O-Ring - 7. Ring - 8. Gear - 9. Counter-shaft - 10. Half bearings

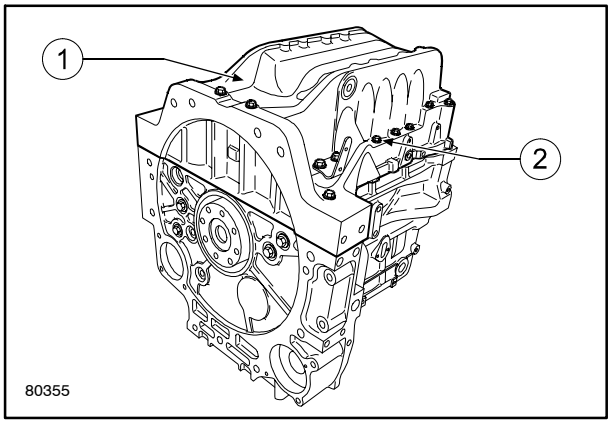
Fitting the Oil Sump

113. Mount the oil sump (1), screw down the bolts (2) and tighten them to the prescribed torque.

⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.

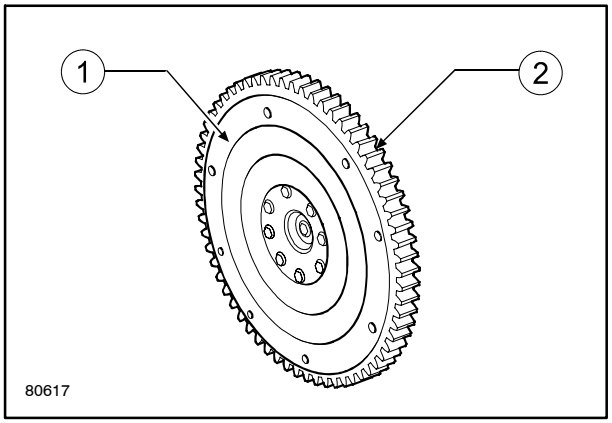
NOTE: *For the tightening sequence, see page 9.*



86

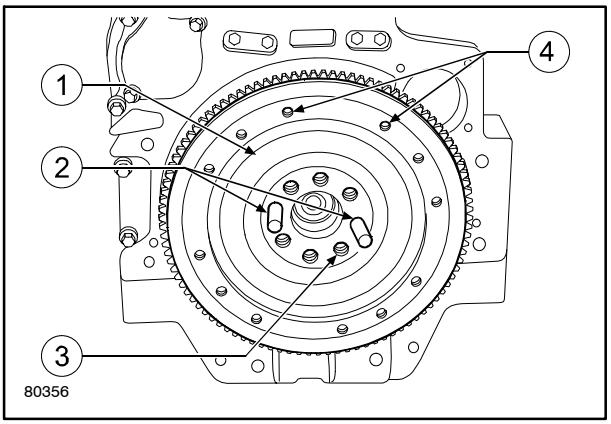
Fitting the Flywheel

114. Check the conditions of the teeth of the ring gear (2). If you find any breakage or excessively worn teeth, remove it from the engine flywheel (1) with a general drift and mount the new one, previously heated to a temperature of 150 °C (302 °F) for 15 to 20 min.; the bevel, made on the inside diameter of the ring gear, must face the engine side of the flywheel.



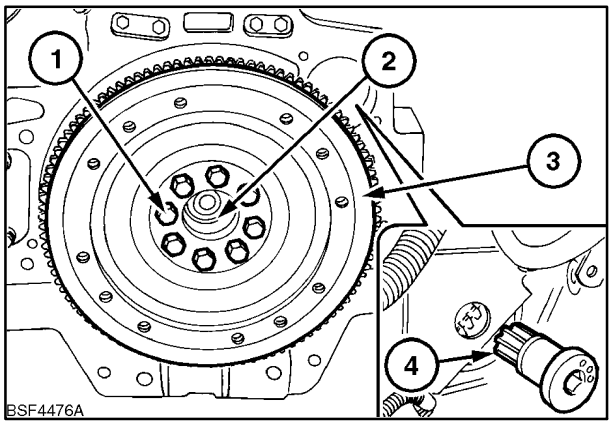
87

115. Screw two hooks or eyebolts onto the flywheel (1) using the holes (4).
116. With the aid of a lift, operate to bring the flywheel near its seat.
117. Screw two pins (2) of the appropriate length into the holes in the shaft (3) and, using them as a guide, mount the engine flywheel (1) suitably housing it in its seat.



88

118. Screw down the bolts (1) securing the engine flywheel (3) to the crankshaft (2), fit the holding / turning tool, (4) to prevent engine rotation.

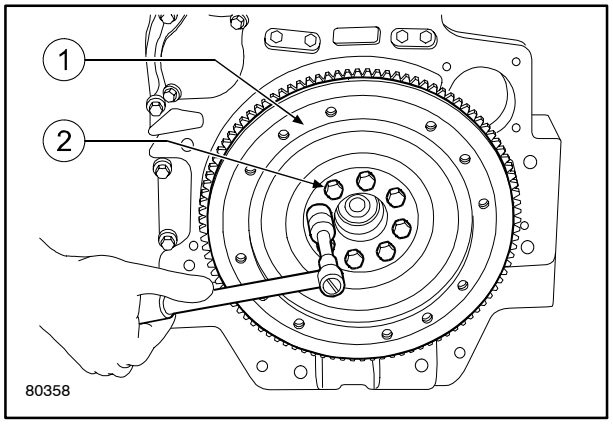


89

119. Tighten the bolts (2) securing the engine flywheel (1) in two stages:
1st stage, tightening with a torque wrench to a torque of 30 to 4 Nm (22.1269 to 2.9502 lb ft).
2nd stage, angle closed 60° ± 5°.

⚠ CAUTION ⚠

Use a suitable angle gauge to perform final tightening. Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



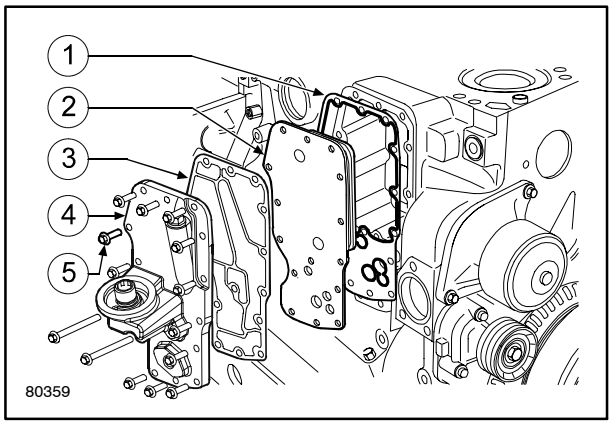
90

Fitting the Oil Filter Mounting

120. Fit onto the cylinder block: a new gasket (1), the cooler (2), a new gasket (3) and the oil filter mounting (4).
121. Screw down the bolts (5) and tighten them to the prescribed torque.

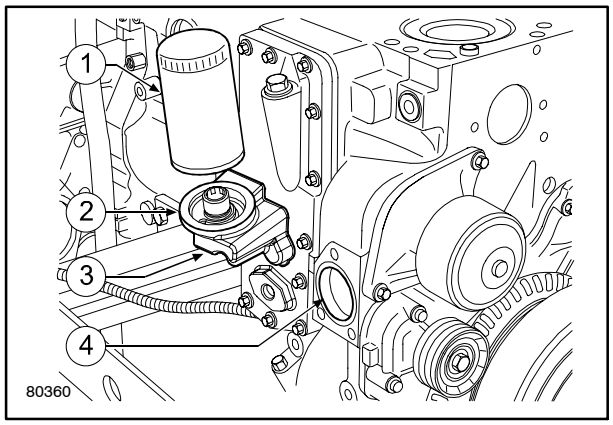
⚠ CAUTION ⚠

Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



91

122. Lubricate the seal (2) with engine oil and position it on the mounting (3).
123. Manually screw the oil filter (1) onto the support of the mounting (3) to the bottom and screw the oil filter (1) by another 3/4 of a turn.
124. Position a new seal (4) in the crankcase seat.

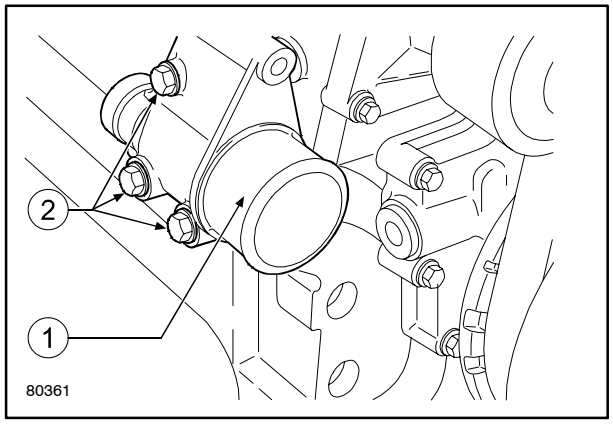


92

125. Mount the pipe fitting (1) and tighten the screws (2) to the prescribed torque.

⚠ CAUTION ⚠

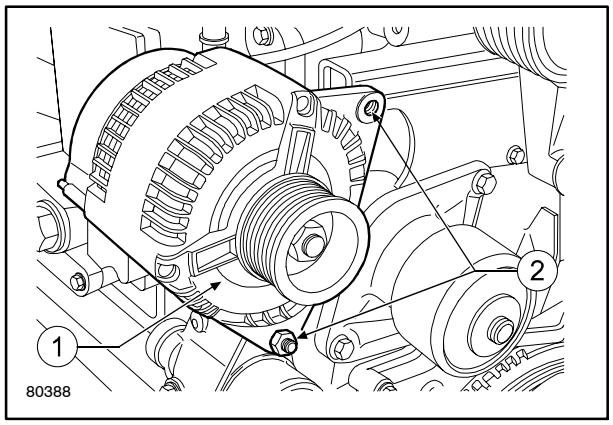
Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.



93

Fitting the Alternator

126. Fit the alternator (1) back on.
127. Screw down the bolt (2) and tighten it to the prescribed torque.



94

Fitting the Cylinder Heads

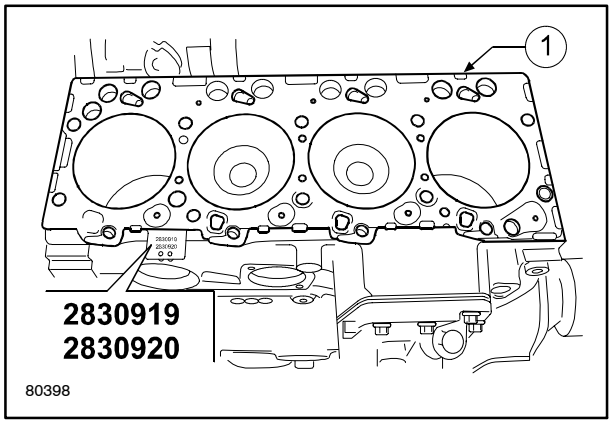
128. Position the gasket (1) on the engine block. The thickness of the gasket must be chosen according to the measured piston protrusion over the top face of the crankcase. The gasket is available in 2 thicknesses, 1.15mm and 1.25mm, select the correct one depending on the piston protrusion dimension.

⚠ CAUTION ⚠

Check that the mating surface of the engine block is clean. Do not grease the gasket.

It is recommended to keep the gasket in its wrapping until the head is to be fitted on.

The gasket must be fitted so that the writing stamped on it can be read, as shown in the figure.

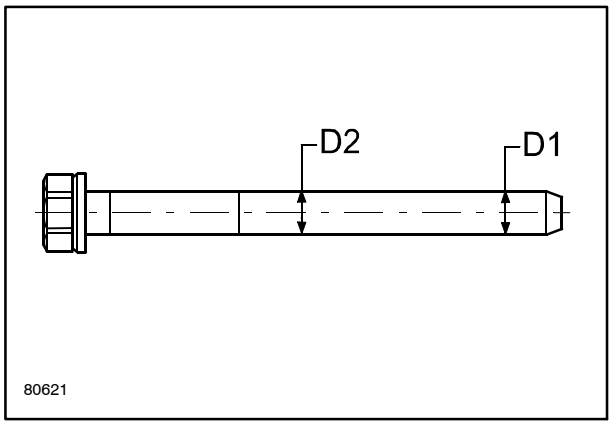


95

IMPORTANT: *Before reusing the head bolts for the cylinder head, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:*

IMPORTANT: *If D1 - D2 < 0.1 mm (0.0039 in.), the bolt can be reused.*

IMPORTANT: *If D1 - D2 > 0.1 mm (0.0039 in.), the bolt must be changed*

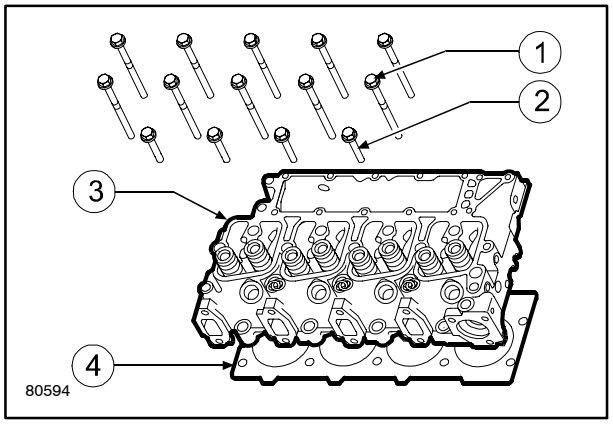


96

129. Place the head (3) on the engine block and insert the bolts (1) and (2).

⚠ CAUTION ⚠

If the valves have been removed from the head, it is necessary to fit them before assembling the head on the engine block.



97

130. Lubricate the bolts and fit them on the cylinder head.

131. The bolts must be tightened following a “stitching” pattern, starting from the middle bolts and moving outwards.

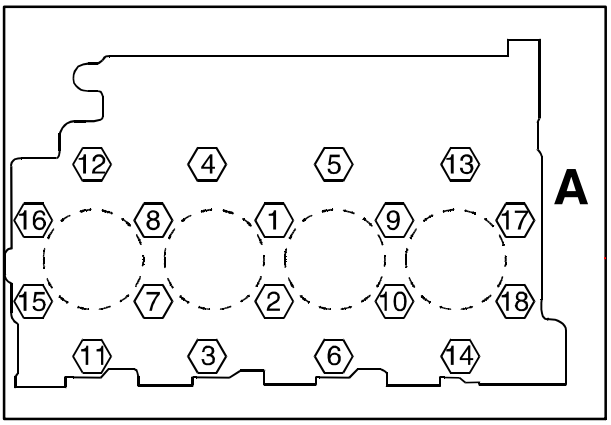
1st stage of tightening with a torque wrench:

M12 x 1.75 x 70 bolt: (ref. 3-6-11-14)	50 Nm (35.71429 lbf)
M12 x 1.75 x 140 bolt: (ref. 1-2-7-8-9-10-15-16-17-18)	40 Nm (28.57143 lbf)
M12 x 1.75 x 180 bolt: (ref. 4-5-12-13)	70 Nm (50 lbf)

2nd stage tightening to an angle of 90° for all the screws

3rd stage additional tightening to an angle of 90° for 140 and 180 mm long bolts only.

A = fan side

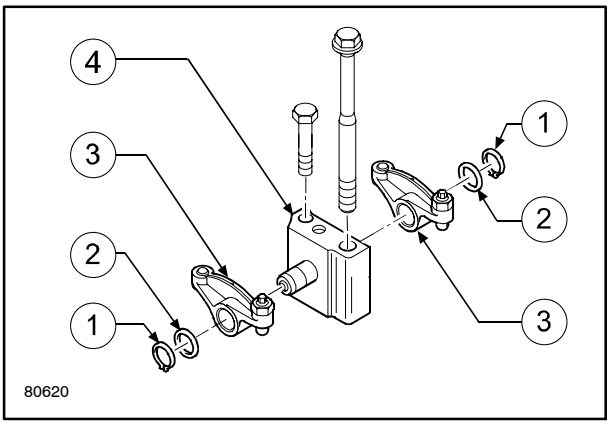


98

Fitting the Rocker Arm Assembly

132. Mount the rocker arm assembly after checking the parts.

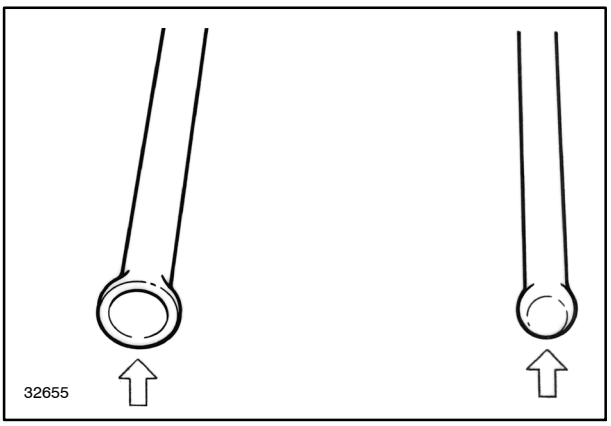
Component parts of the rocker arm assembly:
1. Snap ring - 2. Spacer - 3. Rocker arms - 4. Mounting



99

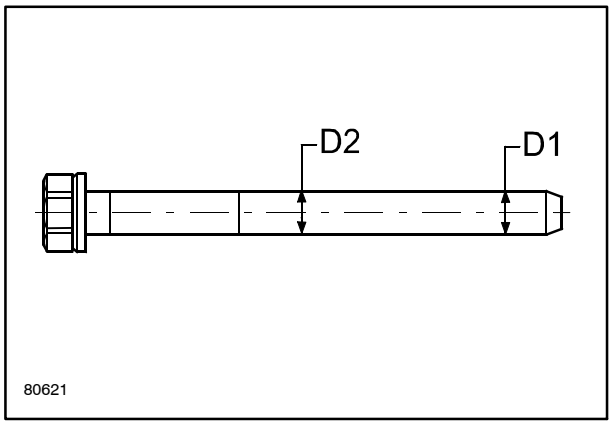
133. Before assembly, check the rocker-arm control rods: they must have no deformation; there should be no signs of seizure or wear on the contact surfaces on the ball seats, rocker arm adjuster screw and tappets (arrows); if there are, then change them.

134. The intake and exhaust valve control rods are identical and can therefore be interchanged.



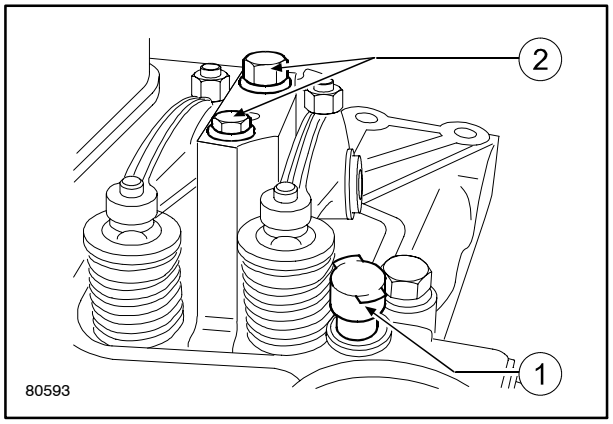
100

135. Insert the tappet rods and the rocker arm assembly. Before reusing the retaining bolts, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:
if D1 – D2 < 0,1 mm (0.0039 in.), the bolt can be reused
if D1 – D2 > 0.1 mm (0.0039 in.), the bolt must be changed



101

136. Tighten the bolts (2) to the prescribed torque and fit the coolant temperature sensor (1).



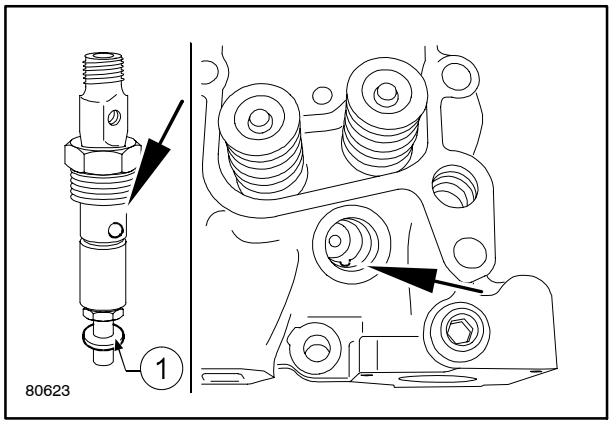
102

Fitting the Injectors

137. Fit the injectors after changing the seal (1).

⚠ CAUTION ⚠

When fitting the injectors, check that the ball on the injector is in its seat on the cylinder head.



103

Fitting the Tappet Covers

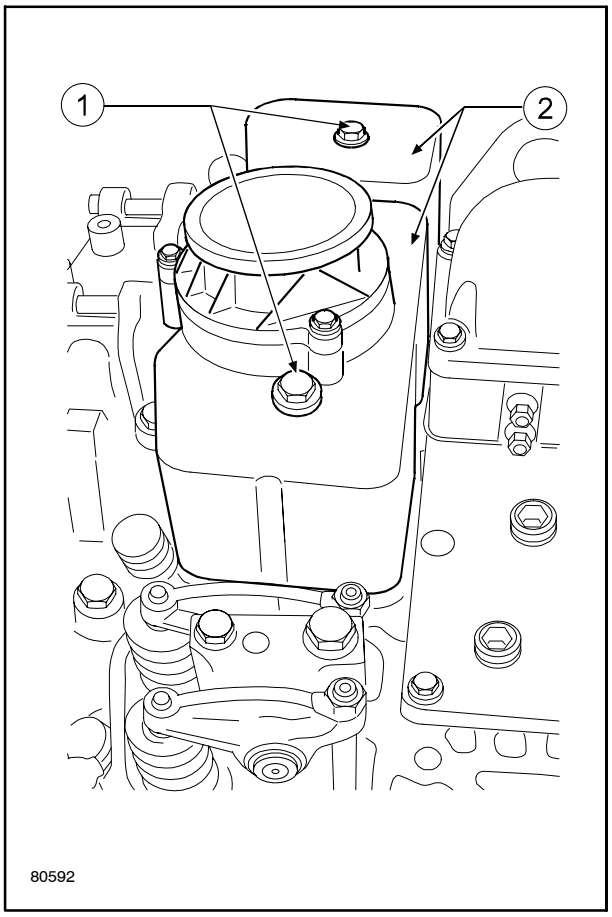
138. Fit the cylinder covers (2) with their respective seals. Insert the seal plugs and tighten the bolts (1) to the prescribed torque.

⚠ CAUTION ⚠

Always use new seals.

Check the threads of the retaining bolts: they must show no sign of wear or accumulation of dirt.

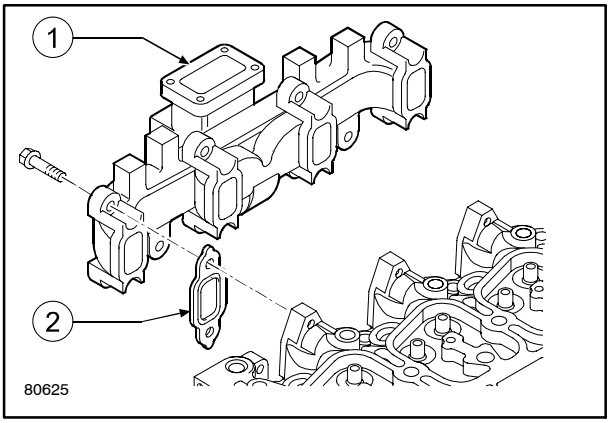
The seal plugs must show no sign of obvious deformation. Replace them with new parts if they do.



104

Fitting the Exhaust Manifold

139. Fit the exhaust manifold (1) together with new seals (2).



105

Fitting the Thermostat

140. Fit the thermostat body (2) together with the thermostat (5) and seal (4).

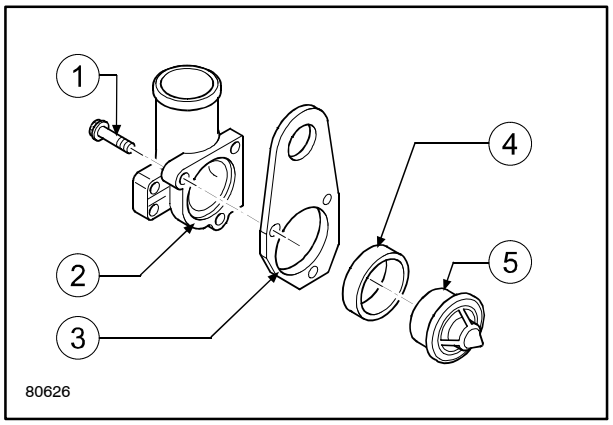
141. Tighten the bolts to the prescribed torque.

⚠ CAUTION ⚠

The bolts (1) have been used for retaining the bracket (3).

Remove the bracket and refit the parts from 1 to 5 as shown in the figure.

The seal (4) must be a new one.



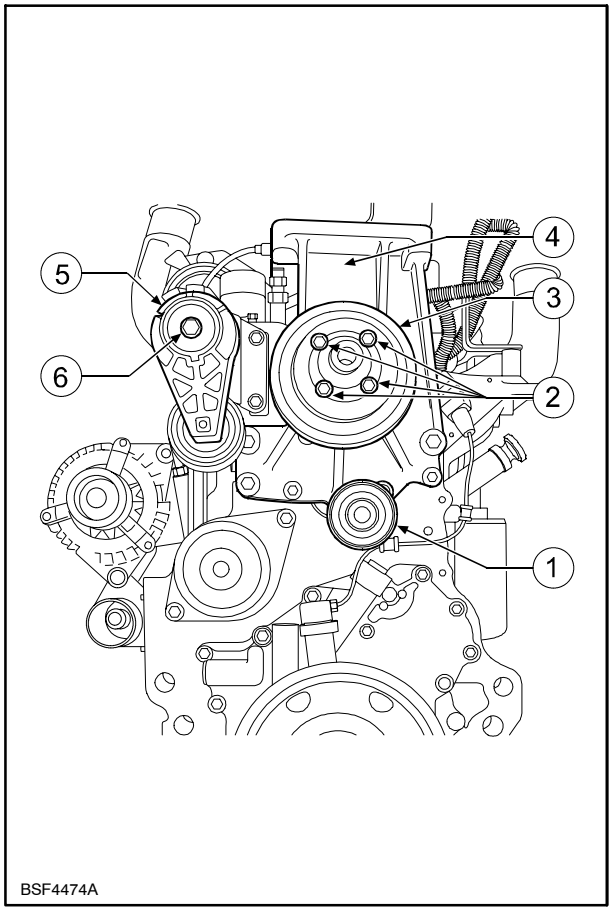
106

Fitting the Fan Pulley Mounting

142. Fit the fan pulley mounting (4) tightening the bolts to the prescribed torque.

143. Fit the pulley (3) and secure it with the bolts (2) to the mounting.

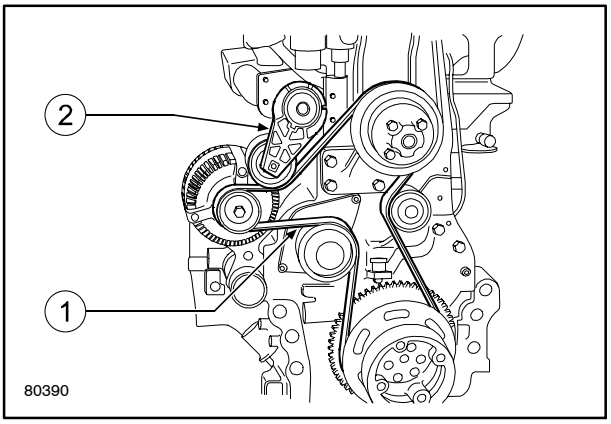
144. Fit the idler pulley (1).
Fit the automatic tightener (5) and secure it with the bolt (6), tightening it to the prescribed torque.



107

Fitting the Alternator Belt

145. Fit the coolant pump alternator drive belt (1) moving the tensioner (2) into the untensioned position.
146. Turn the engine a few times for the drive belt to settle.



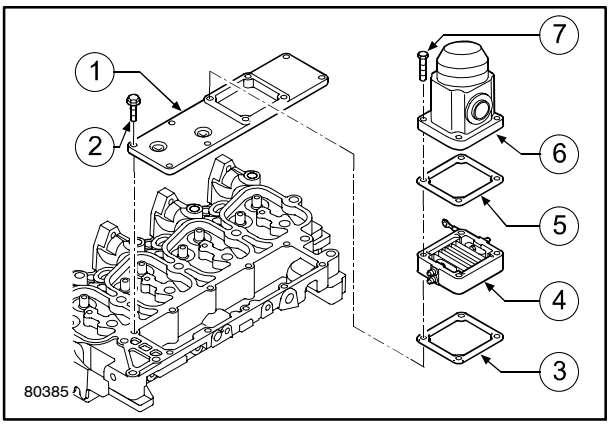
108

Fitting the Intake Manifold

147. Apply a sufficient layer of **Loctite 5999** onto the mating surface of the intake manifold plate (1) and tighten the screws (2) to the prescribed torque.
148. If pipe (6) has been removed from the intake manifold plate (1), fit it back on after inserting a new seal (5).
149. Tighten the bolts (7) to the prescribed torque.

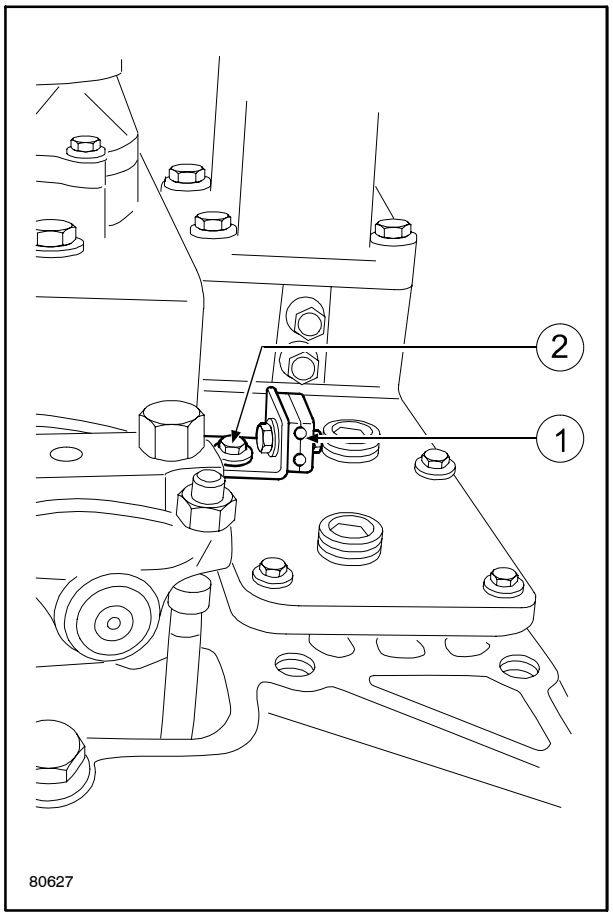
⚠ CAUTION ⚠

For versions equipped with a heater, fit parts (3) and (4) too.



109

150. Fit the brackets (1) securing the fuel pipes to the injectors: use the same bolts (2) for retaining the manifold plate as shown in the figure.

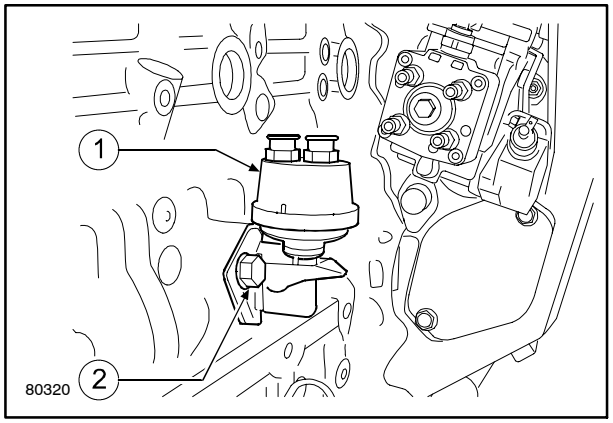


110

Fitting the Priming Pump

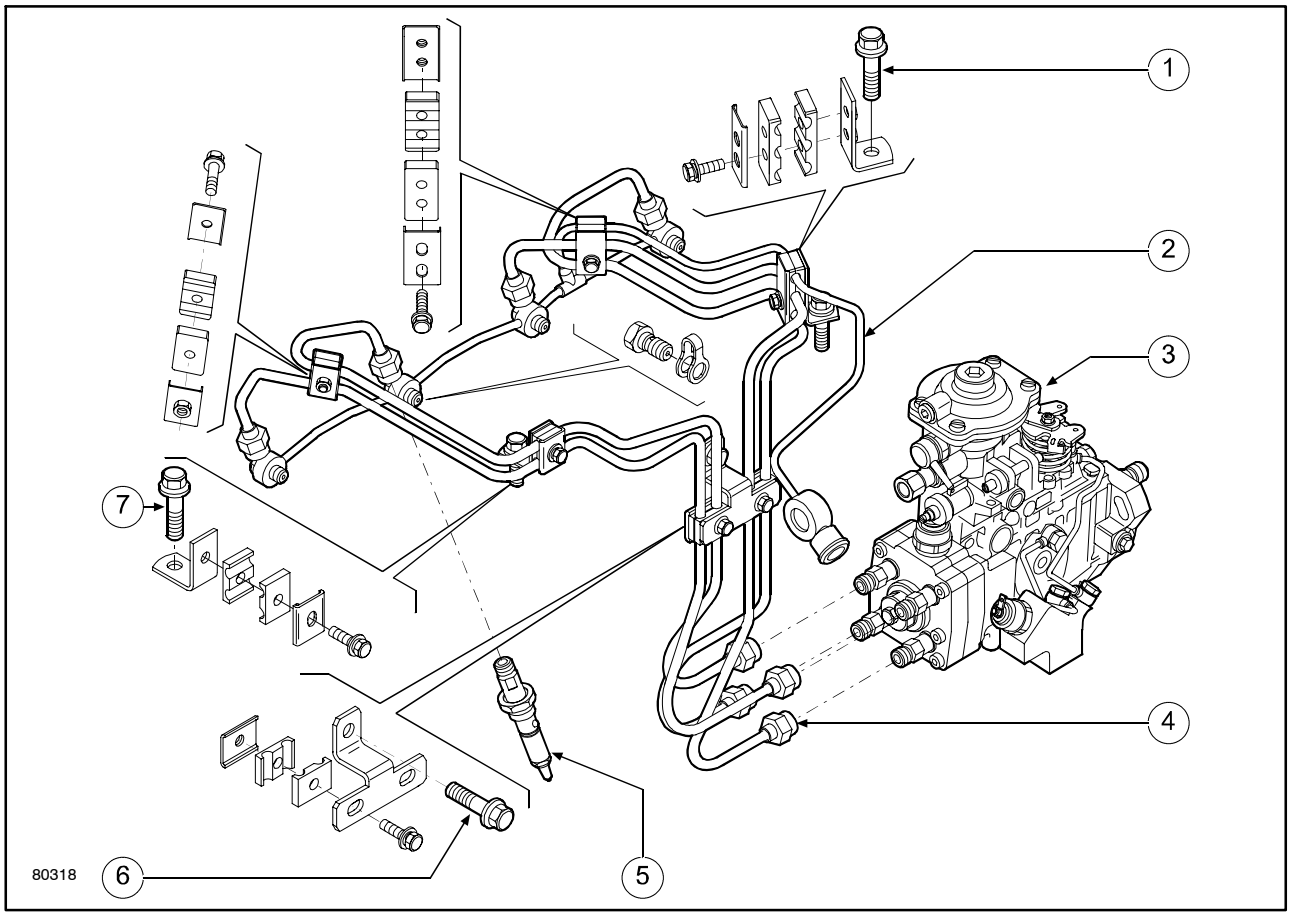
151. Fit the priming pump (1) together with a new seal and tighten the bolts (2) to the prescribed torque.

152. In addition, fit the fuel pump (see the specific procedure on page 74).



111

Fitting the Fuel Pipes

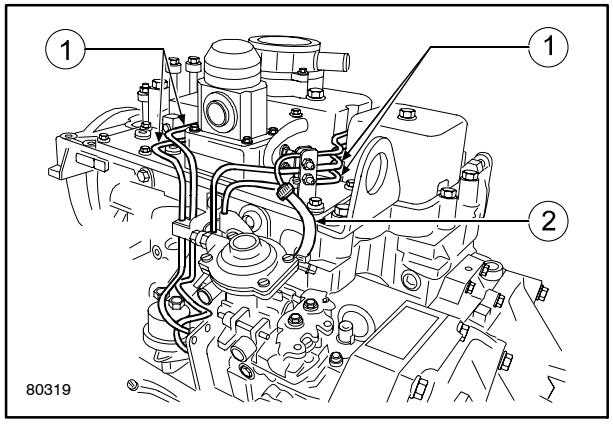


112

1. Rear bracket retaining bolt (on the intake manifold plate) – 2. Diesel return piping to the pump – 3. Rotary fuel pump – 4. Pumping element connecting ring nut – 5. Injector – 6. Bracket retaining bolt on injection pump side – 7. Front bracket retaining bolt (on the intake manifold plate)

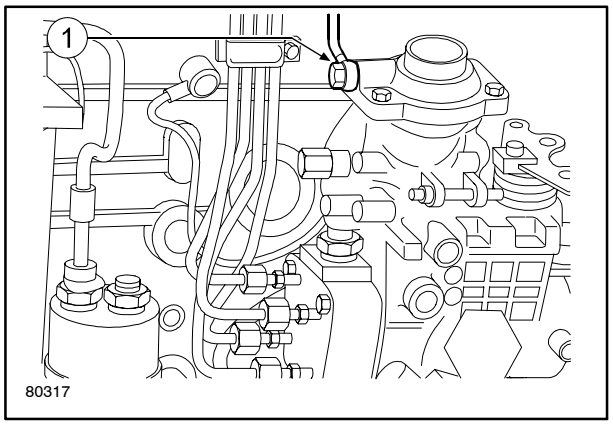
153. Remove the pipes (1) and (2) forming the fuel recovery and supply between the pump and the injectors.

154. Screw down the ring nuts fastening the pipes to the pumping elements; fasten the collar of the fuel recovery pipe returning to the injection pump; tighten the ring nuts on the injectors and screw down the bolts securing the fuel recovery pipe; secure the pipes to the injectors with the brackets fitted beforehand.



113

155. If fitted, secure the LDA pipe (1) on the cylinder head and on the fuel pump.



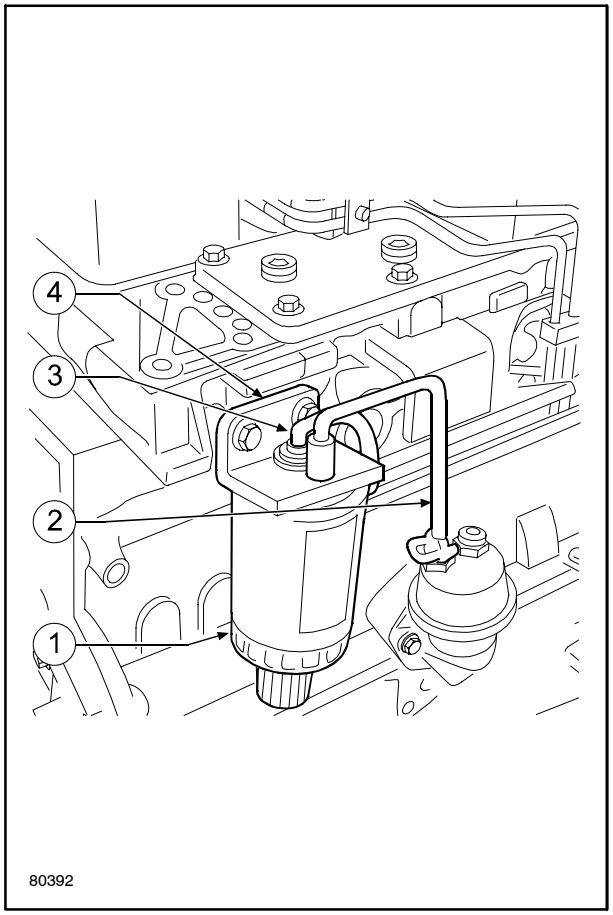
114

Fitting the Fuel Filter

156. Fit the fuel filter mounting (4).
157. Connect the fuel pipes (2 and 3) respectively from the priming pump to the filter mounting and from here to the fuel pump.
158. Fit the diesel filter (1).

⚠ CAUTION ⚠

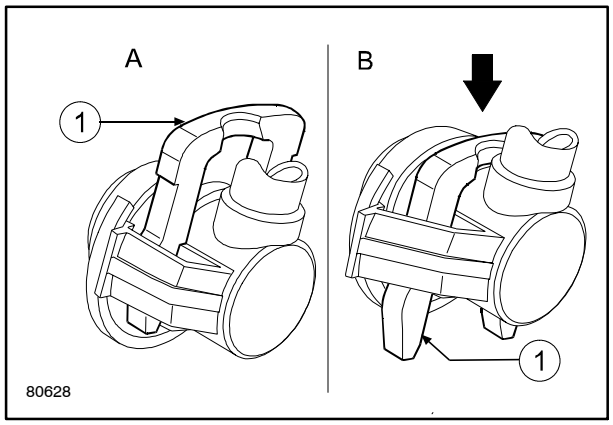
The diesel filter must beforehand be filled with fuel to facilitate the operations of bleeding the fuel system.



115

⚠ CAUTION ⚠

To connect the low-pressure fuel pipes (2 and 3, Figure 115) from the relevant fittings, you need to press the clip (1) as shown in Figure **B**.



116

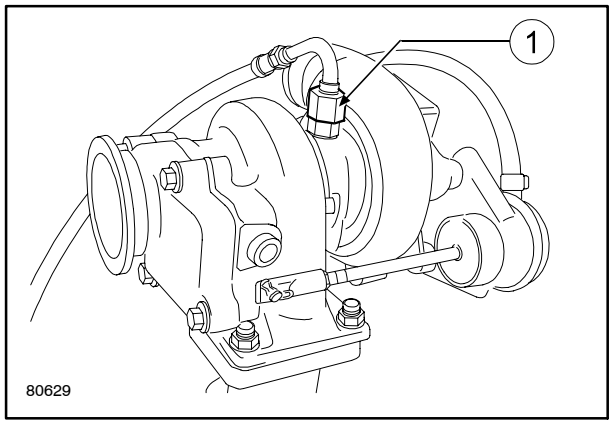
Fitting the Turbo-Blower

To fit the turbo-blower:

159. Support the turbo-blower and place it on the exhaust manifold after inserting the seal.
160. Screw down the turbo-blower retaining bolts on the exhaust manifold, tightening them to the prescribed torque.
161. Screw down the ring nut (1) of the lubricating piping. Work in a similar way at the other end of the piping and connect it from the top of the cooler.

To complete engine assembly, it is necessary to remove it from the rotating stand.

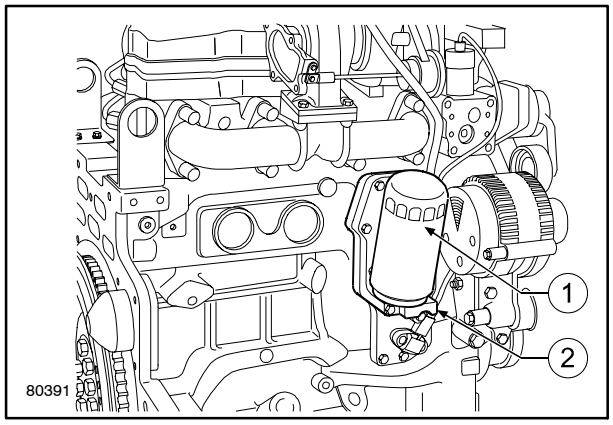
162. Suitably support the engine with the lift, free it from the rotating stand,
163. Remove the brackets from the engine after appropriately placing it on a wooden support.



117

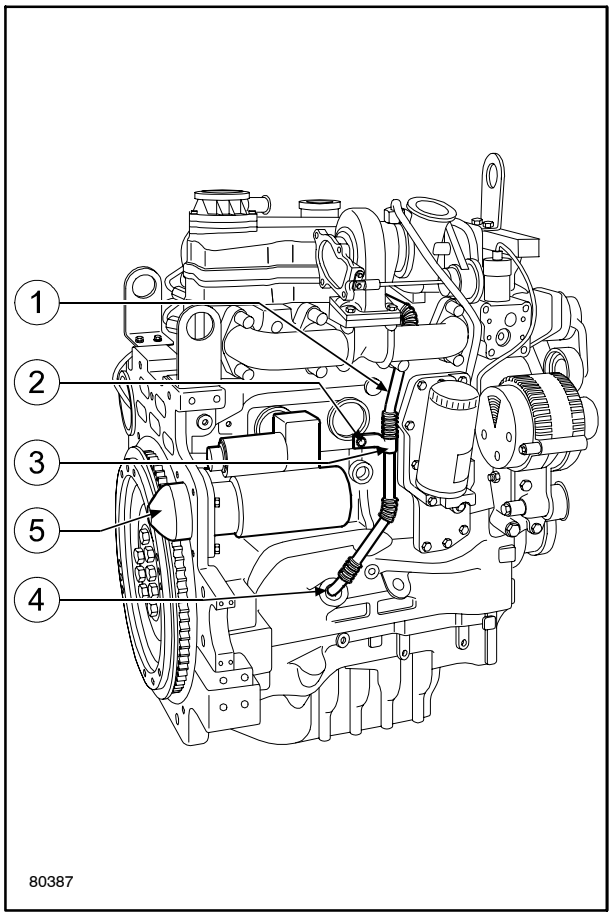
Completing the Engine

164. Fit the oil filter (1) on the mounting (2).



118

165. Fit the turbo-blower lubricating oil drain pipe (1): screw down the two bolts from under the turbo-blower; screw down the bolt (2) fastening the pipe to the block with the retaining collar (3); lastly, screw the union (4) onto the block.
166. Fit the starter motor; support the motor (1) appropriately and screw down the two retaining bolts to the prescribed torque.



119

CHECKS, DIMENSIONS AND REPAIRS

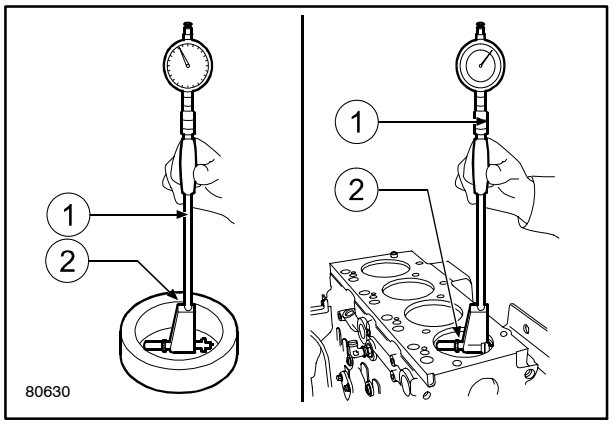
CYLINDER BLOCK

Cylinders

167. After disassembling the engine, thoroughly clean the cylinder-crankcase assembly. Use the appropriate rings for transporting the cylinder assembly.
168. Carefully check the crankcase is not cracked.
169. Check the condition of the plugs. If they are rusty or if there is the slightest doubt about their seal, change them.
170. Examine the surfaces of the cylinder liners; they should show no sign of enlargement, scoring, ovality, taper or excessive wear.
171. To check the internal diameter of the cylinder liners for ovality, taper and wear, use a bore gauge (1), fitted with a dial gauge zero-set on the ring gauge (2) of the diameter of the cylinder liner.

⚠ CAUTION ⚠

If the ring gauge is not available, use a micrometer.



120

172. Measurements must be taken for each single cylinder at three different heights on the liner and on two orthogonal faces: one parallel to the longitudinal axis of the engine and the other perpendicular; maximum wear is generally found on this face in correspondence with the first measurement.
173. If ovality, taper or general wear is noted, bore and recondition the cylinder liners. The cylinder liners must be reground in relation to the diameter of the pistons supplied as spare parts oversized by 0.5 mm (0.0197 in.) over the nominal value and to the prescribed assembly clearance.

⚠ CAUTION ⚠

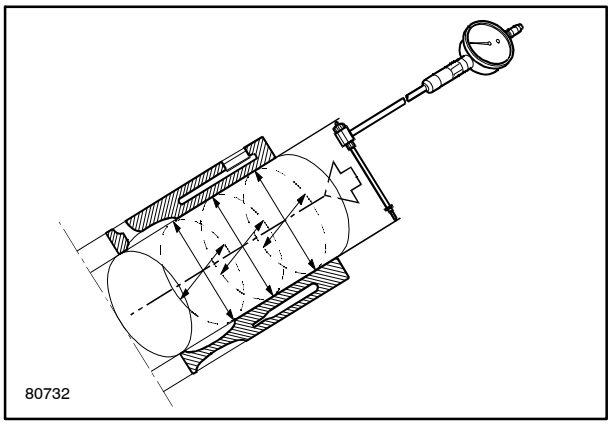
If regrinding, all the liners must have the same oversize (0.5 mm (0.0197 in.)).

174. Check the main bearing seats, proceeding as follows:
    - fit the main bearing caps on the supports without bearings;
    - tighten the retaining bolts to the prescribed torque;
    - using an appropriate dial gauge for interiors, check that the diameter of the seats is as prescribed.

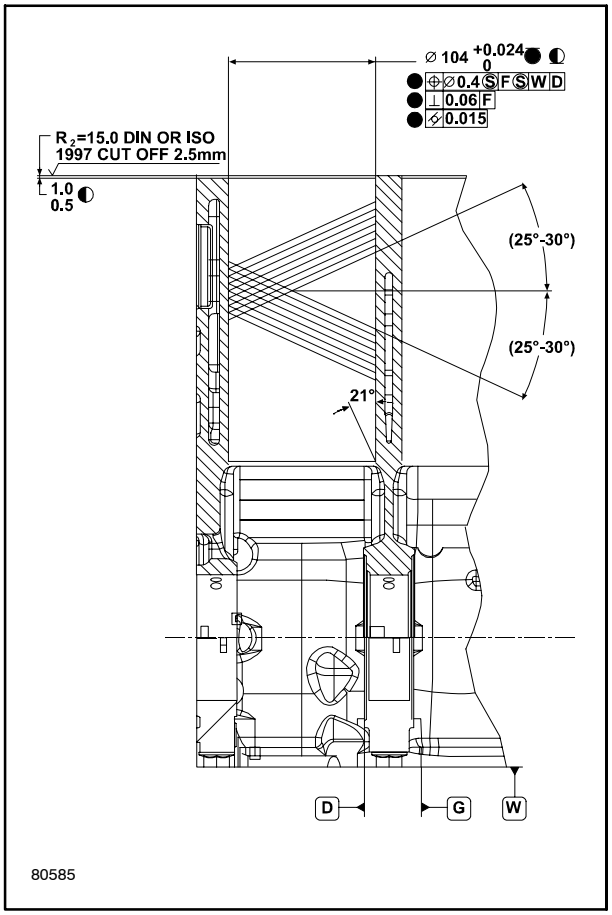
If the measurement is any greater, change the crankcase.

Cylinder Head Mating Surface Check

175. After having located any deformed areas, level off the mating surface using a grinding machine.
176. The flatness error must be no greater than 0.075 mm (0.0030 in.). Check the condition of the cylinder block plugs (1); if they are rusty or if there is the slightest doubt about their seal, change them.



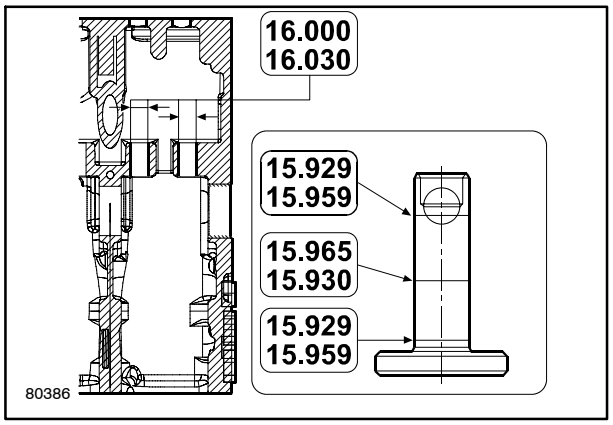
121



122

Tappets

Tappets and bores on cylinder block data.



123

CRANKSHAFT, BEARINGS

Main and Connecting Rod Journal Dimensions

177. If any sign of seizure, scoring or ovality is found on the main journals or crankpins, they must be reground. Before reconditioning the pins (2), use a micrometer (1) to measure the pins of the shaft to define the diameter to which the pins must be reduced.

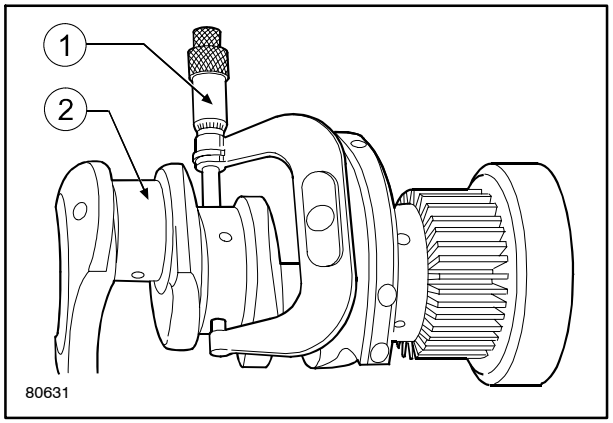
⚠ CAUTION ⚠

It is advised to note the values on a chart (see page NO TAG).

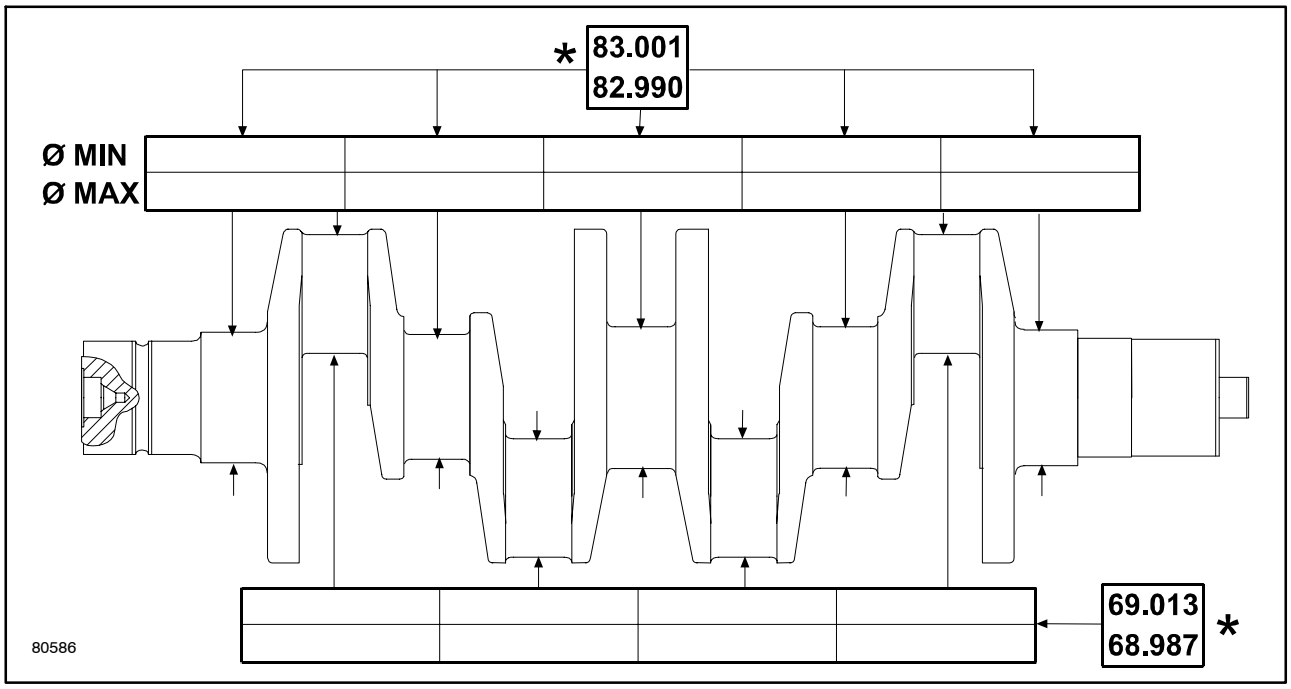
The undersize classes are: 0.250 – 0.500 mm (0.0098 - 0.0197 in.)

⚠ CAUTION ⚠

The main journals and crankpins must always be reconditioned to the same undersize class. After undersizing, mark the main journal and the crankpin with a stamp on the side of the crank No. 1.

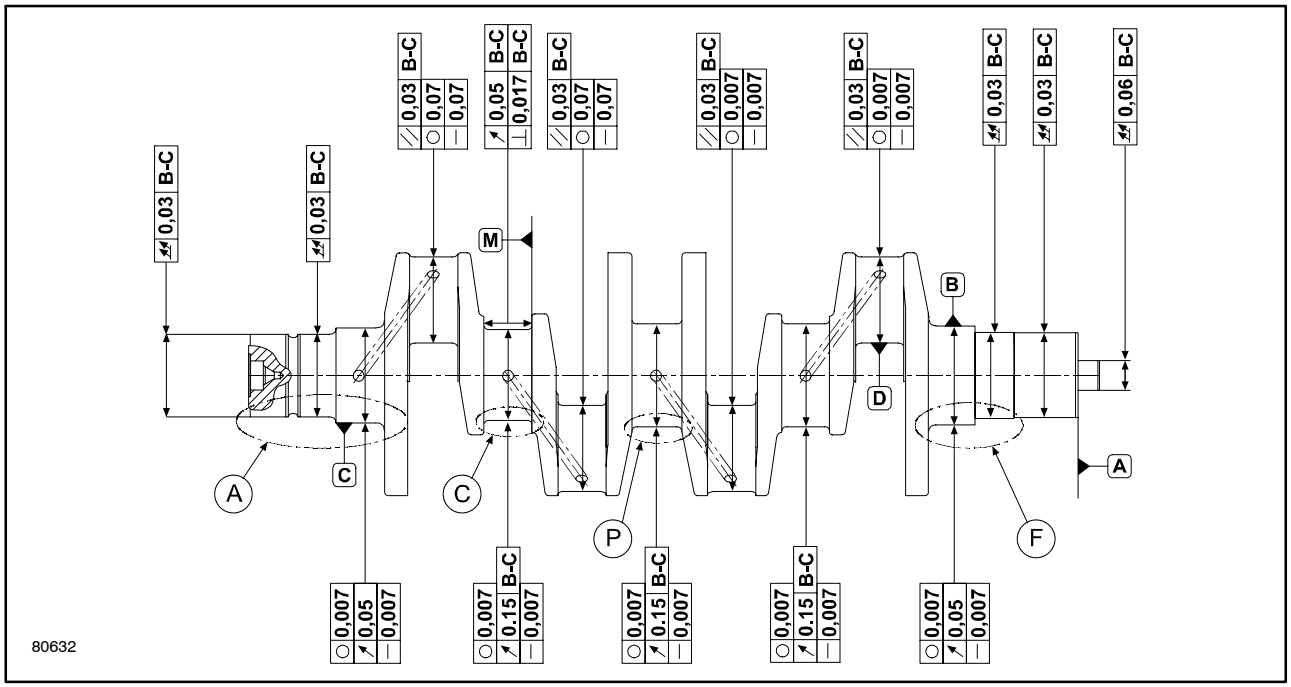


124



125

NOTE THE CRANKSHAFT MAIN JOURNAL AND CRANKPIN MEASUREMENTS ON THE TABLE
* Nominal value

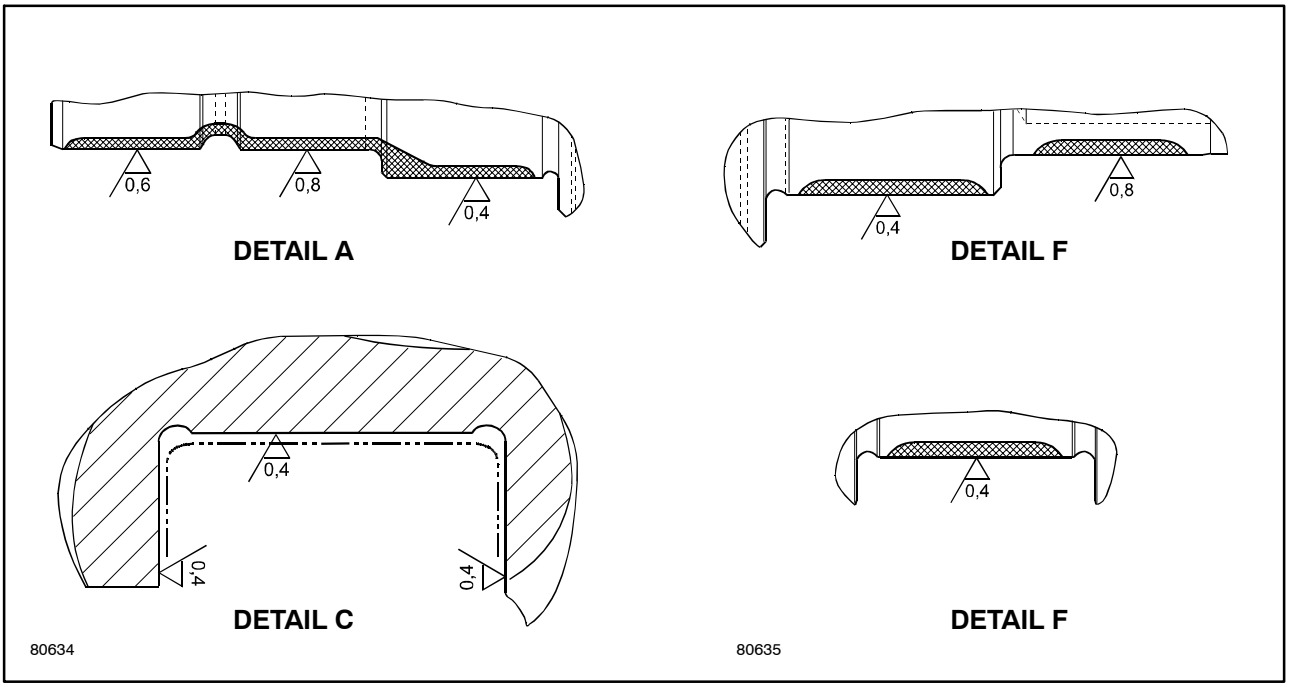


126

MAIN CRANKSHAFT TOLERANCES

TOLERANCES	CHARACTERISTIC SUBJECT OF TOLERANCE	GRAPHIC SYMBOL
SHAPE	Circularity	○
	Cilindricity	/○/
ORIENTATION	Parallelism	//
	Perpendicularity	⊥
	Straightness	—
POSITION	Concentricity or coaxiality	◎
OSCILLATION	Circular oscillation	↗
	Total oscillation	⌰
	Taper	⌯

CLASS OF IMPORTANCE ASSIGNED TO PRODUCT CHARACTERISTICS	GRAPHIC SYMBOL
CRITICAL	●
IMPORTANT	◐
SECONDARY	△



127

Main Bearing Assembly

CAUTION

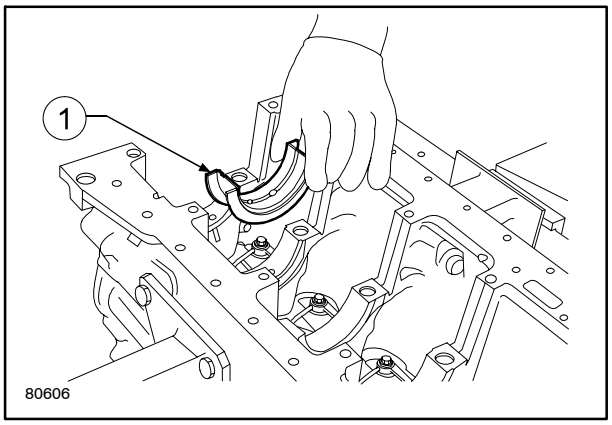
If you have not found it necessary to change the main bearings, you must fit them back on in exactly the same order and positions found upon disassembly.

NOTE: *The main bearings (1) are supplied with spare parts with an undersized inside diameter of 0.250 – 0.500 mm (0.098 - 0.197 in.).*

CAUTION

Do not modify the bearings in any way.

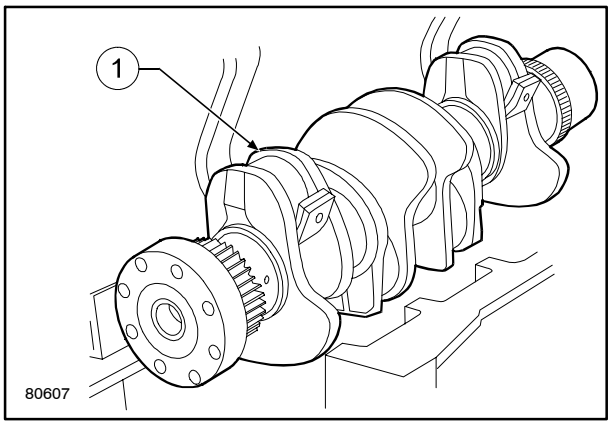
178. Carefully clean the main half bearings (1) with a lubrication hole and fit them into their respective seats.
The penultimate main half bearing (1) is equipped with semi-circular thrust washers.



128

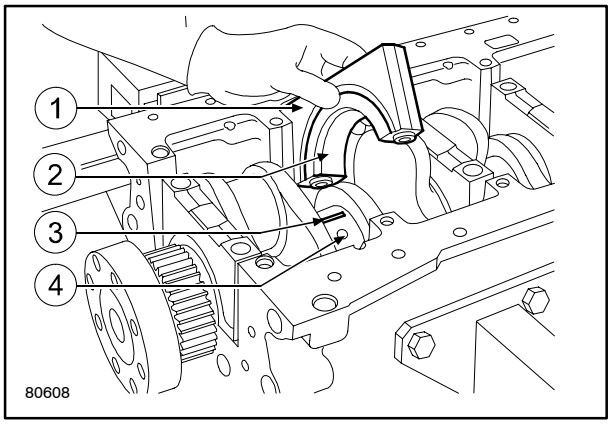
Main Journal Assembly Clearance

179. Fit the crankshaft (1).
180. Check the clearance between the main journals of the crankshaft and their respective bearings, proceeding as follows.



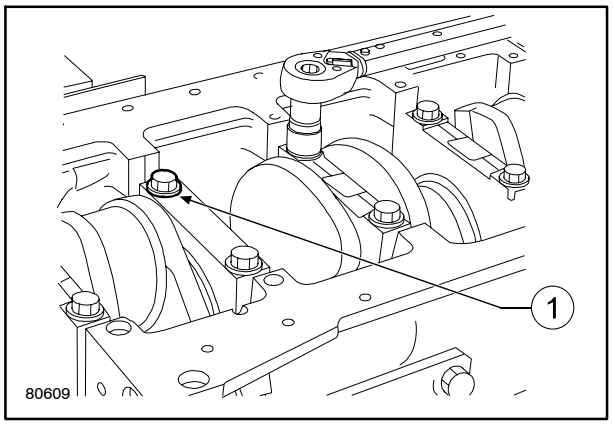
129

181. Make sure that all parts are perfectly clean and remove all traces of oil.
182. Position a length of calibrated wire (3) on the crankshaft journals (4), parallel to the crankshaft centerline.
183. Fit the caps (1) complete with half bearings (2) on the relevant supports.



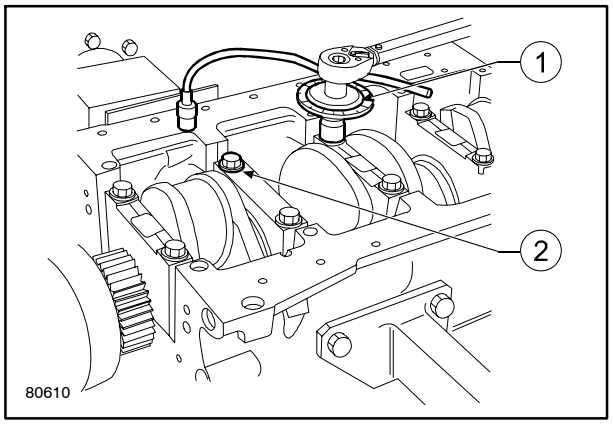
130

184. Screw down the pre-lubricated screws (1) and tighten them in three successive stages:
   - 1st stage with a torque wrench to 50 ± 3 Nm (36.8781 ± 2.2127 lb ft).
   - 2nd stage with a torque wrench to 80 ± 5 Nm (59.0050 ± 3.6878 lb ft).



131

185. 3rd stage using a suitable angle gauge (1) positioned as in the figure, further tighten the screws (2) with an angle of 90° ± 5°.

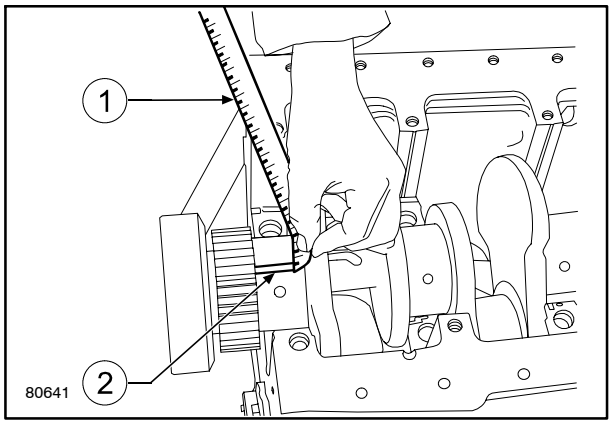


132

186. Remove the caps from the mountings.
The clearance between the main bearings and the relevant journals is measured by comparing the width of the calibrated wire (2), at the point of greatest crushing, with the graduation of the scale on the case (1) containing the calibrated wire.

187. The numbers shown on the scale indicate the mating clearance in millimetres.

188. If the clearance is found to be other than as prescribed, change the half bearings and repeat the check; after obtaining the prescribed clearance, lubricate the main bearings and permanently mount the supports, tightening the retaining bolts as described above.

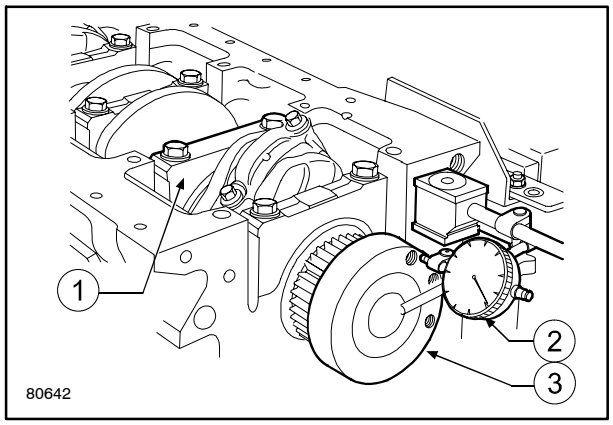


133

Crankshaft Thrust Ring Clearance Check

189. The thrust ring clearance is checked by setting a dial gauge (2) with a magnetic base on the crankshaft (3) as shown in the figure, the normal assembly clearance is 0.068 to 0.410 mm (0.0027 to 0.0161 lb ft).

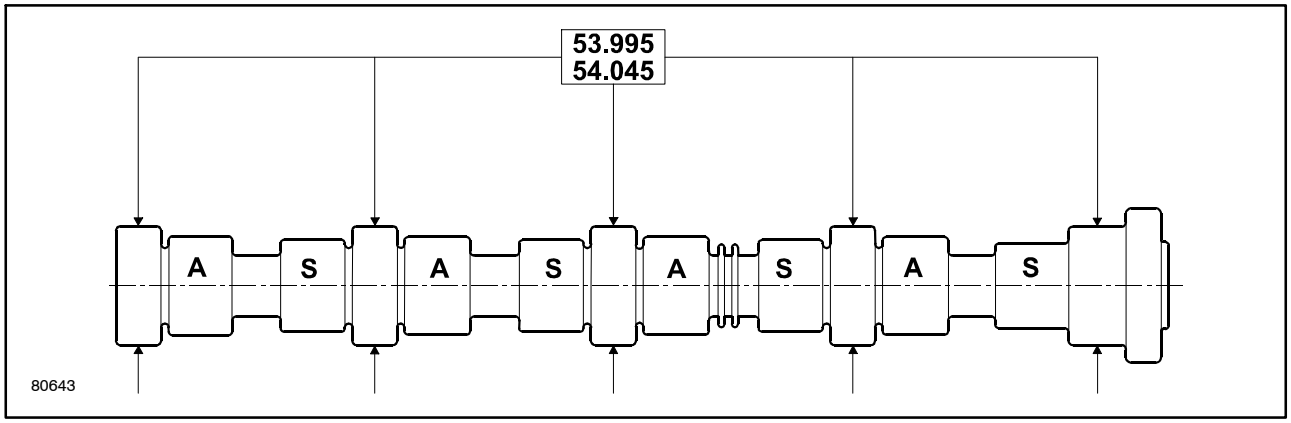
190. If the clearance is found to be any greater, change the main half bearings of the penultimate rear thrust bearing support (1) and check the clearance again between the crankshaft journals and main half bearings.



134

TIMING SYSTEM

Camshaft



135

CAMSHAFT DATA

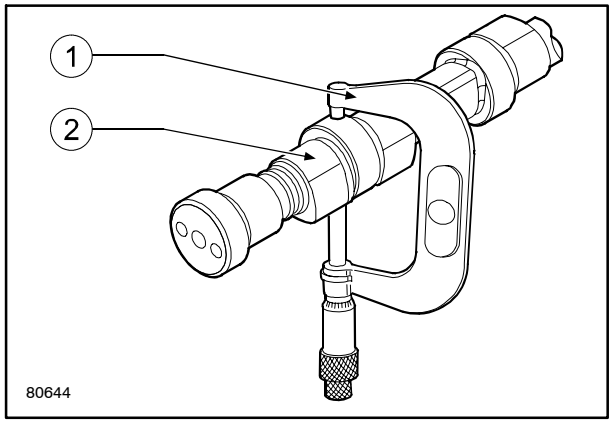
The data given refer to the normal pin diameter

191. The support journal surfaces on the shaft and cams must be finely honed; if there are signs of seizing or scoring, replace the shaft and relative bushings.

Checking Cam Lift and Pin Alignment

192. Set the shaft on tailstocks and, using a dial gauge with a 1/100 mm scale placed on the central support, check that the alignment error is no greater than 0.04 mm (0.0016 in.); change the shaft if it is. In addition, check the cam lift: it must be 6.045 mm (0.2380 in.) for the exhaust cams and 7.582 mm (0.2985 in.) for the intake ones; change the shaft if the measurements are any different.

193. Check the diameter of the supporting pins of the camshaft (2) with the micrometer (1) on two perpendicular axis.



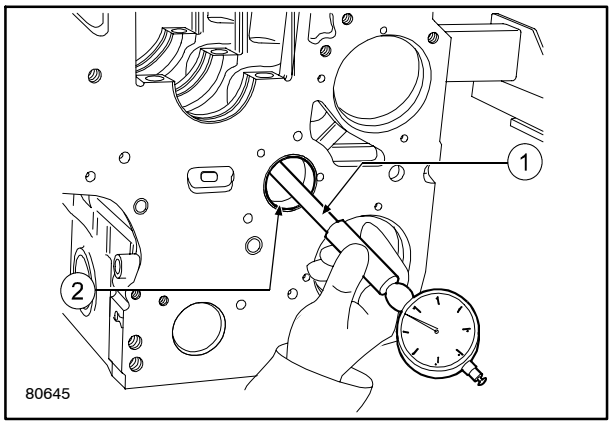
136

Bushings

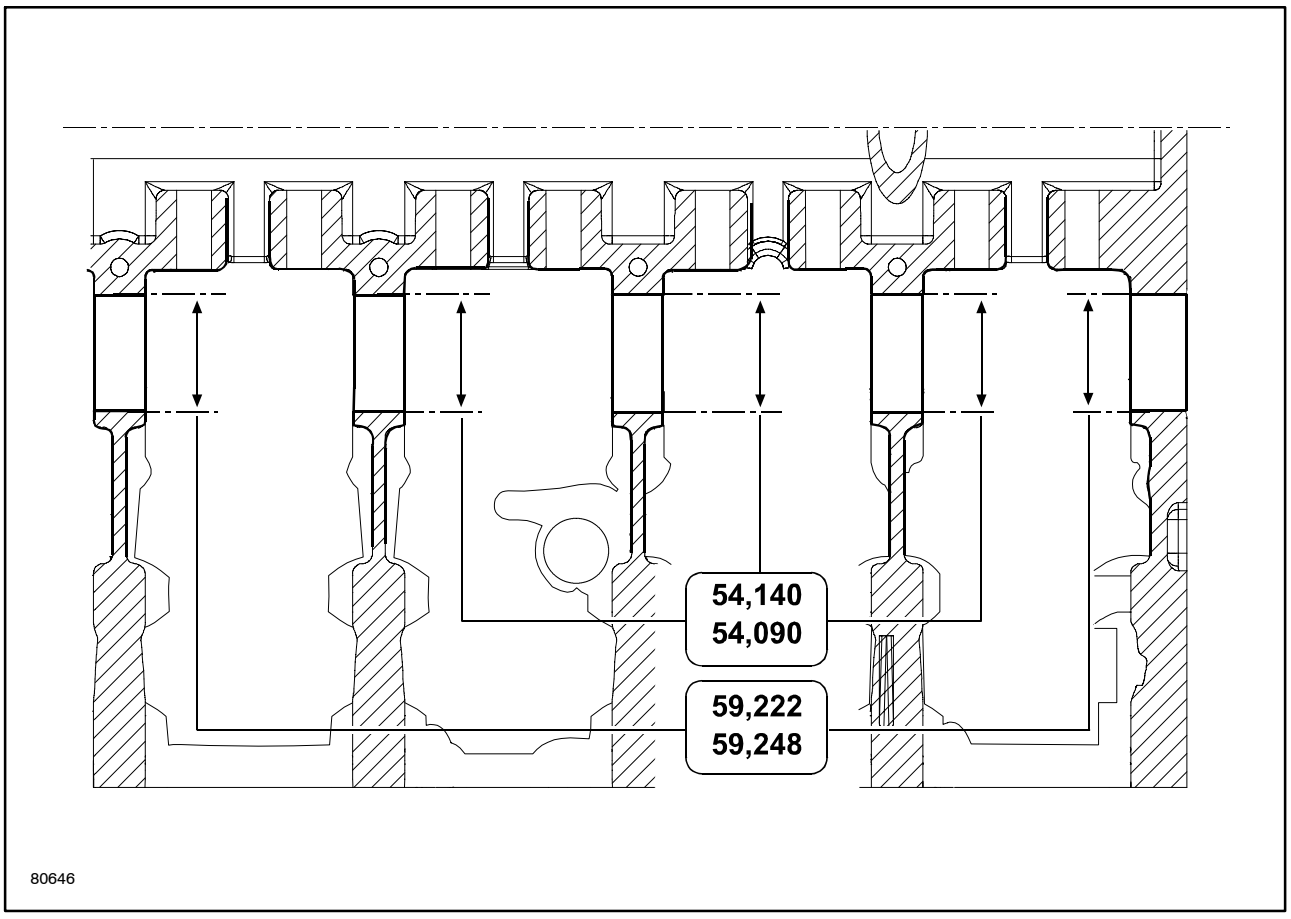
194. The camshaft bushings (2) must be forced into their respective seats. The internal surfaces must show no sign of seizure or wear.

195. Using the bore meter (1), measure the diameter of the front and rear bushings (2) and of the intermediate seats for the camshaft.

196. Measurements must be made on two perpendicular axis.



137



138

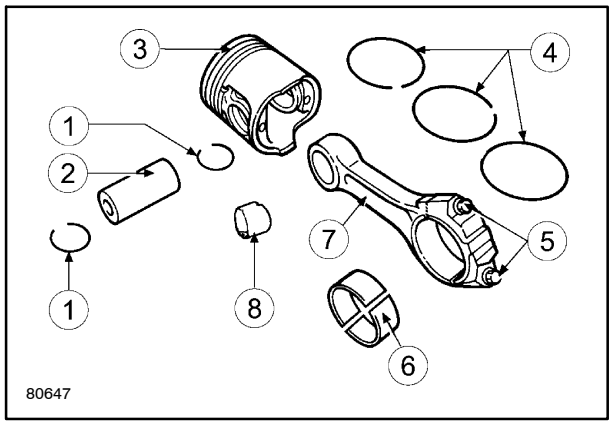
CAMSHAFT BUSHING AND RELEVANT SEAT DATA (4 cylinders)
* Measured with bushings installed

PISTON/CONNECTING RODS

Connecting rod–piston component parts
1. Retaining rings – 2. Pin – 3. Piston – 4. Piston rings – 5. Screws – 6. Half bearings – 7. Connecting rod – 8. Bushing

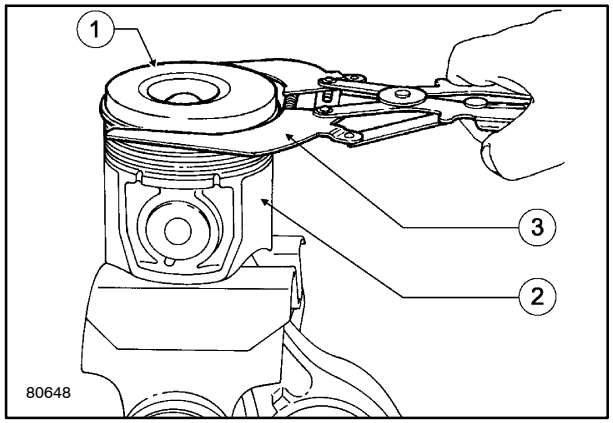
CAUTION

The pistons are supplied as spare parts oversized by 0.5 mm.



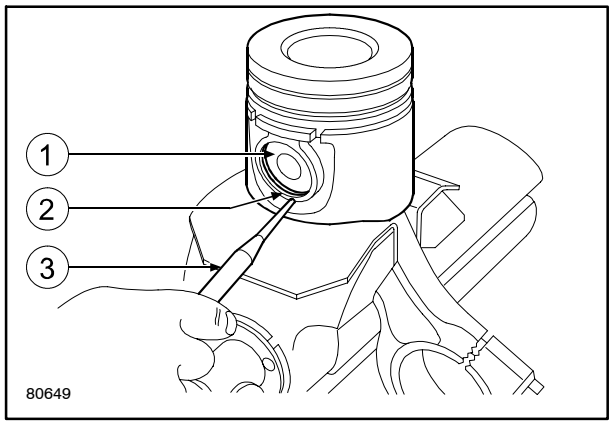
139

197. Removing the rings (1) from the piston (2) with suitable piston ring pliers (3).

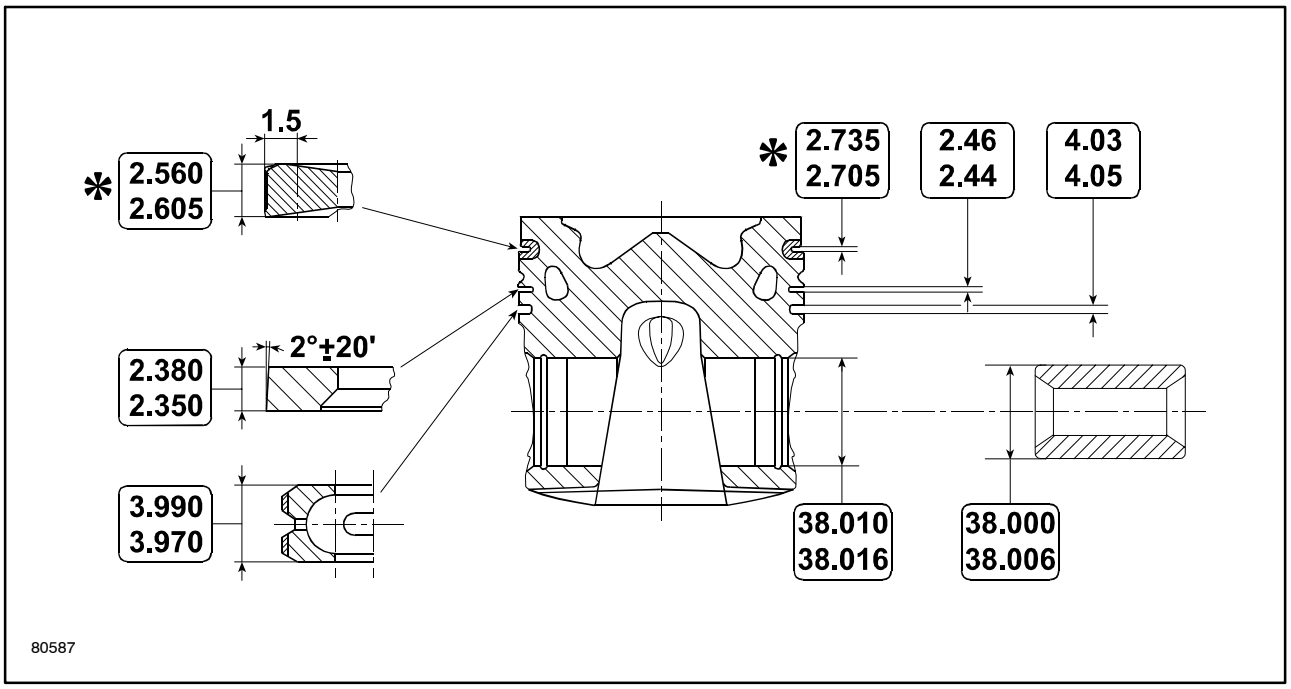


140

198. The piston pin (1) retaining rings (2) should be removed using a marking tool (3).



141



142

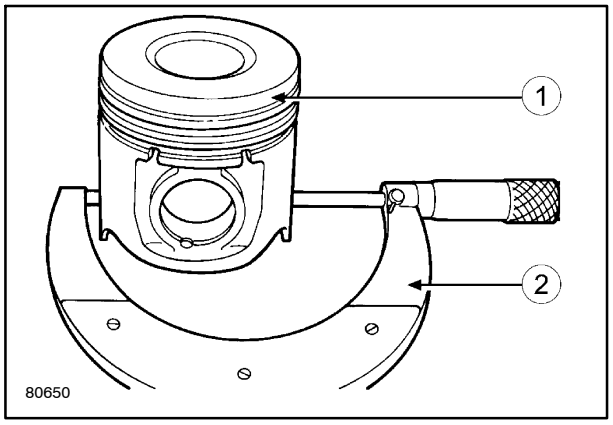
MONDIAL PISTON, PIN AND RING DATA
* Measurement obtained on a diameter of 92 mm (3.6220 in.)

Measuring the Piston Diameter

199. Measuring the piston (1) diameter using a micrometer (2) to determine the assembly clearance.

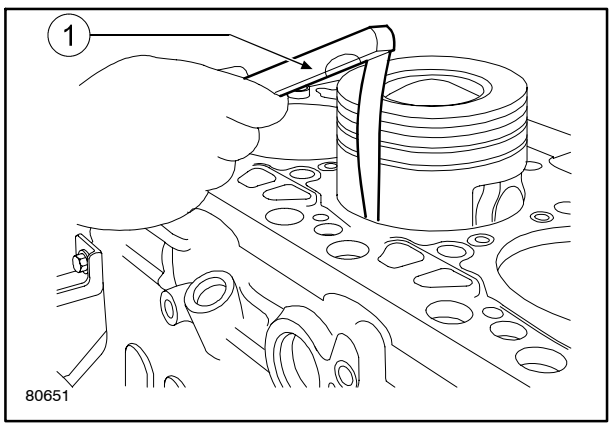
⚠ CAUTION ⚠

The diameter must be measured at a distance of 12 mm (0.4724 in.) from the base of the piston skirt.



143

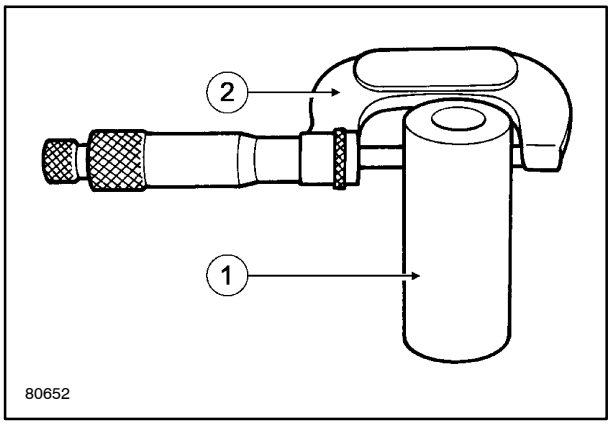
200. Clearance between the piston and the cylinder liner can be measured with a feeler gauge (1), as shown in the figure.



144

Piston Pins

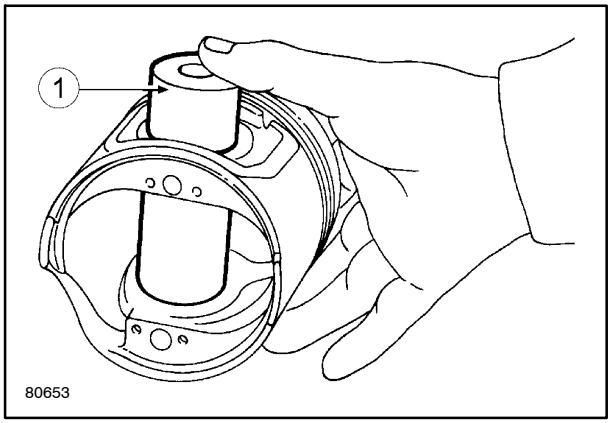
201. Measuring the piston pin (1) diameter using a micrometer (2).



145

Conditions for Correct Pin-Piston Coupling

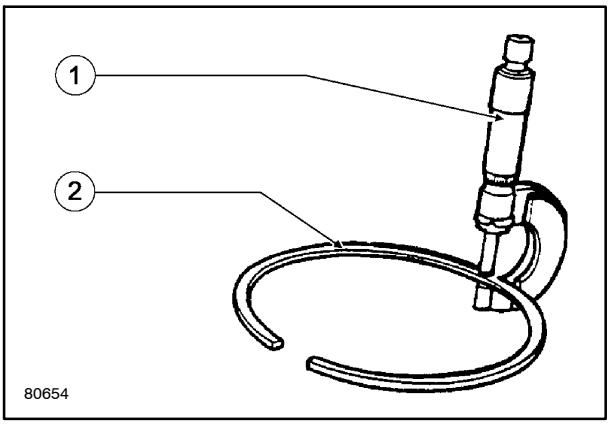
202. Lubricate the pin (1) and the piston pin boss seat with engine oil; the pin must go into the piston with a light pressure of the fingers and must not drop out.



146

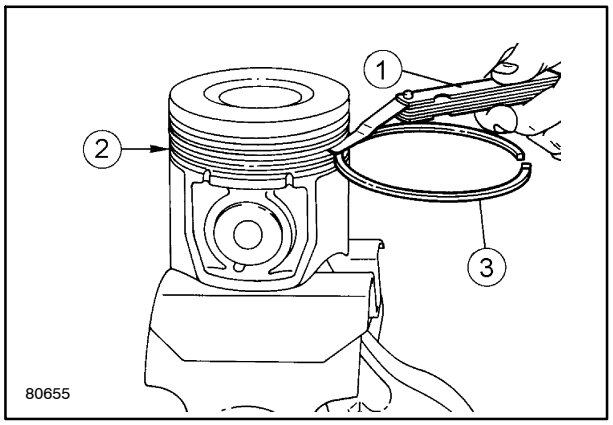
Piston Rings

203. Check the thickness of the seals (2) with a micrometer (1).



147

204. Check the clearance between the seals (3) of the 2nd and 3rd groove and the relevant seats in the piston (2) with a feeler gauge (1).

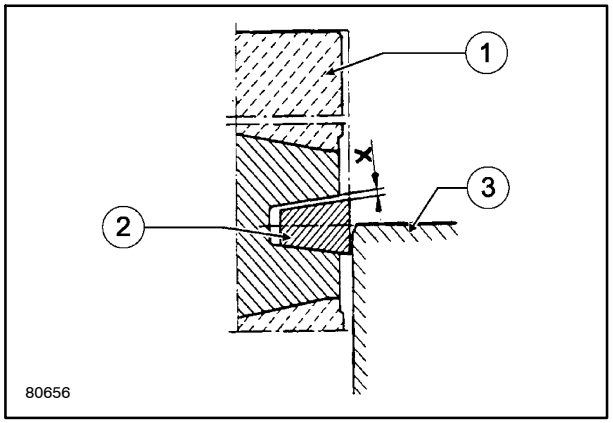


148

MEASURING THE CLEARANCE X BETWEEN THE FIRST PISTON GROOVE AND THE V-RING

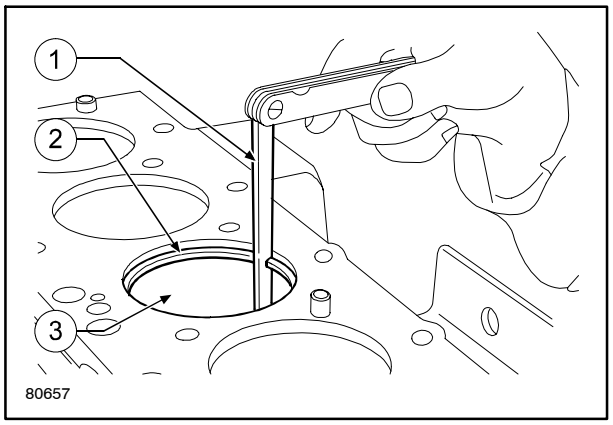
205. Due to the special shape of the first seal with a trapezoidal cross-section, the clearance between the groove and the ring should be measured as follows; Make the piston (1) protrude from the crankcase so that the ring (2) at issue comes approximately halfway out of the cylinder liner (3).

206. In this position, using a feeler gauge, check the clearance between the ring and the groove: this clearance must be as prescribed.



149

207. Measuring the clearance between the ends of the piston rings (2) introduced in the cylinder liner (3) using a feeler gauge (1).



150

Connecting Rod Data

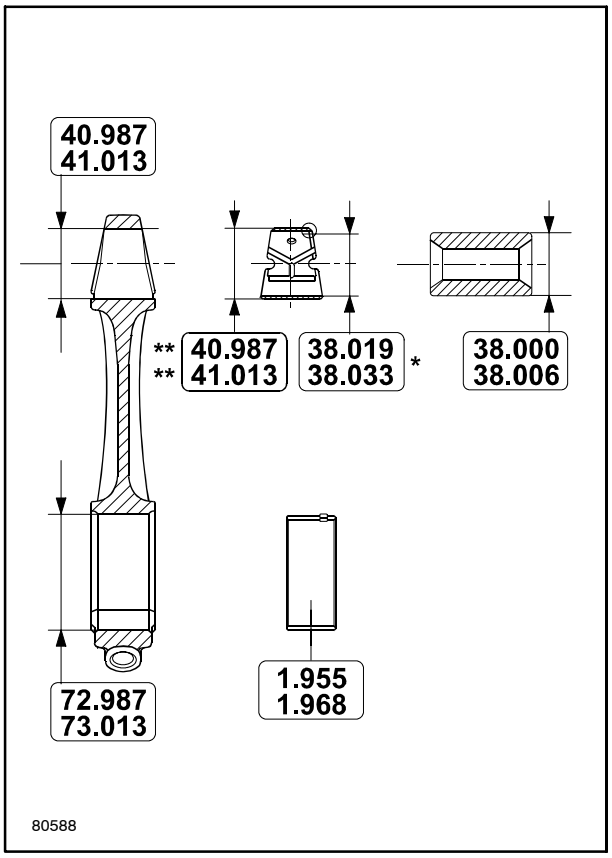
CONNECTING ROD, PISTON PIN BUSHING AND HALF BEARING DATA

* Inside diameter to be measured after installing in the small end and regrinding with a reamer.

** Cannot be measured free.

CAUTION

The connecting rod – connecting rod cap mating surfaces are knurled for a better coupling. It is therefore recommended not to remove the knurling. The rods are manufactured using a fracture breaking technique making each rod and cap unique and having only one way of installation.



151

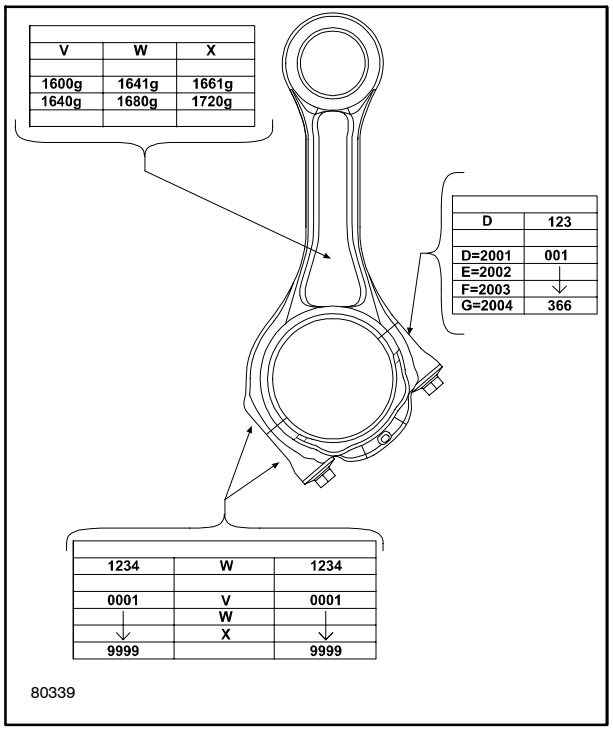
⚠ CAUTION ⚠

Each connecting rod is marked:

- On the body and cap with a number indicating their coupling and the cylinder in which it is mounted. In the event of replacement, number the new rod with the same number as the replaced connecting rod.
- On the body of the connecting rod with a letter indicating the weight class of the connecting rod mounted in production:
  - V, 1600 to 1640 (3.5274 to 3.6156 lb) (marked in yellow);
  - V, 1641 to 1680 (3.6178 to 3.7038 lb) (marked in green);
  - V, 1681 to 1720 (3.7060 to 3.7920 lb) (marked in blue);

Connecting rods are supplied as spare parts in class W and marked in green*.

Removing material is not permissible.



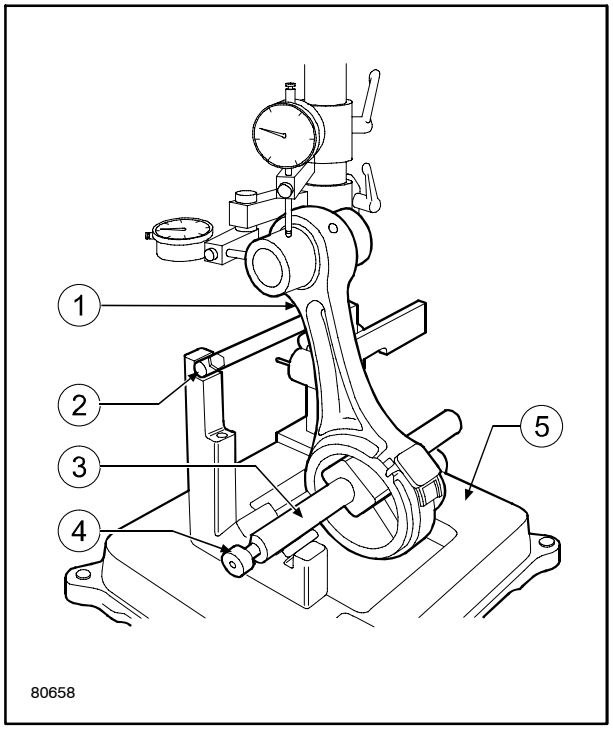
152

Bushings

208. Check that the bushing in the small end has not come loose and shows no sign of scoring or seizure. If this is not so, change it.
209. Disassembly and assembly are performed with a suitable drift.
210. When driving in, make sure that the oilways in the bushing and small end coincide. Using a reamer, regrind the bushing to obtain the prescribed diameter.

Checking Connecting Rods

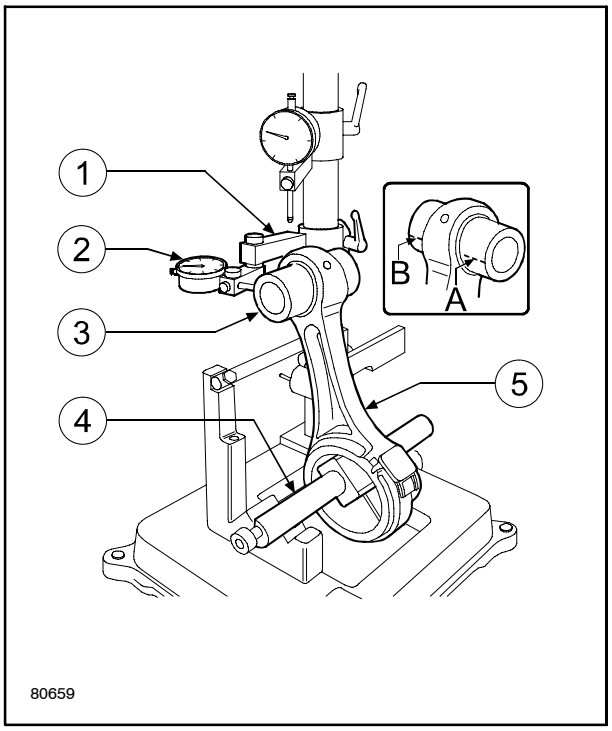
211. Check the parallelism of the connecting rod (1) axes using instrument **380001003** (5) as follows:
    - Fit the connecting rod (1) on the spindle of tool **380001003** (5) and lock it with the screw (4);
    - Put the spindle (3) on the "V" prisms, setting the connecting rod (1) on the stop bar (2).



153

Checking Twisting

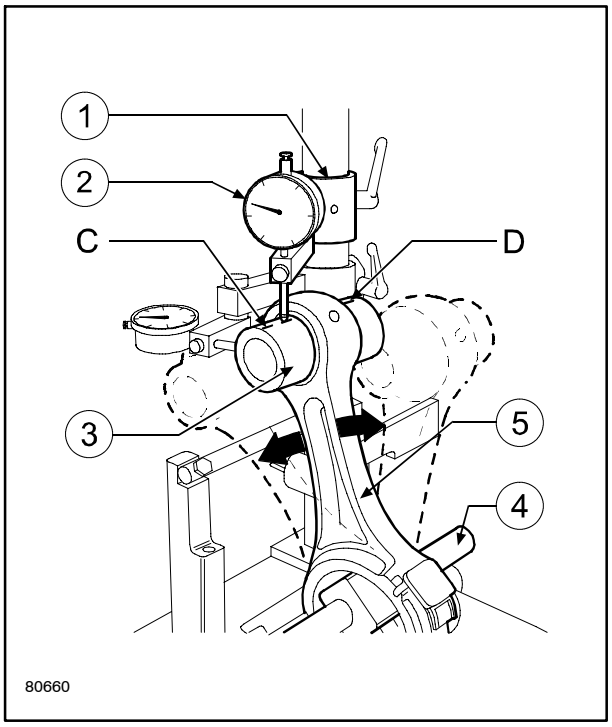
212. Check the twist of the connecting rod (5) by comparing two points (A and B) of the pin (3) on the horizontal plane of the connecting rod axis.
213. Position the support (1) of the dial gauge (2) so that this pre-loads by ~ 0.5 mm (0.0197 in.) on the pin (3) at point A and reset the dial gauge (2). Move the spindle (4) with the connecting rod (5) and on the opposite side (B) of the pin (3) compare any deviation: the difference between A and B must be no greater than 0.08 mm (0.0031 in.).



154

Checking Bending

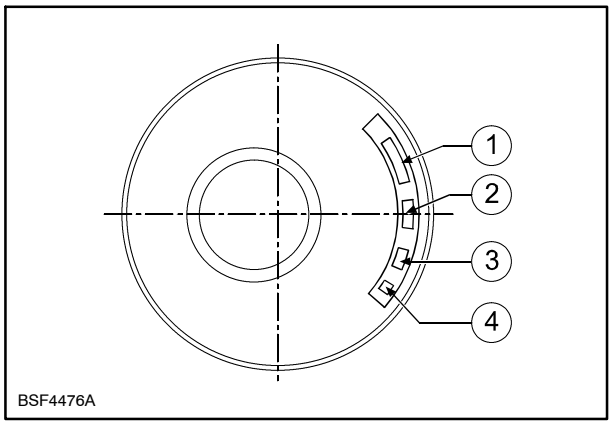
214. Check the bend of the connecting rod (5) by comparing two points (C and D) of the pin (3) on the vertical plane of the connecting rod axis.
215. Position the vertical support (1) of the dial gauge (2) so that this rests on the pin (3) at point C.
216. Swing the connecting rod to and fro, seeking the highest position of the pin and reset the dial gauge (2) in this condition.
217. Move the spindle with the connecting rod (5) and on the opposite side (D) of the pin (3) repeat the check for the highest point. The difference between points C and D must be no greater than 0.08 mm (0.0031 in.).



155

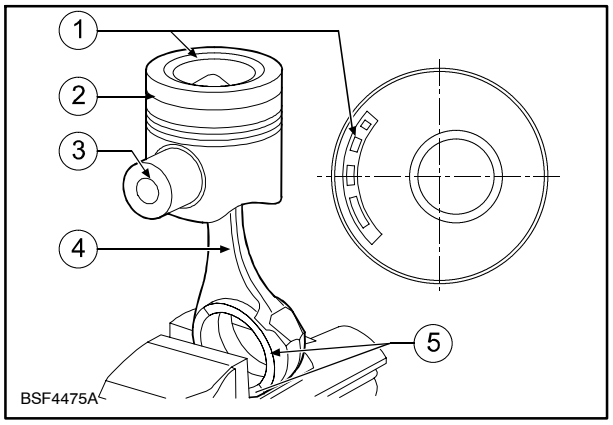
Connecting Rod – Piston Assembly

218. The following references are cut into the crown of the piston:
    1. Spare part number and design modification number.
    2. Arrow showing the direction of assembly of the piston in the cylinder liner, it must face the front of the crankcase.
    3. Date of manufacture.
    4. Stamping indicating testing of the 1st groove insert.



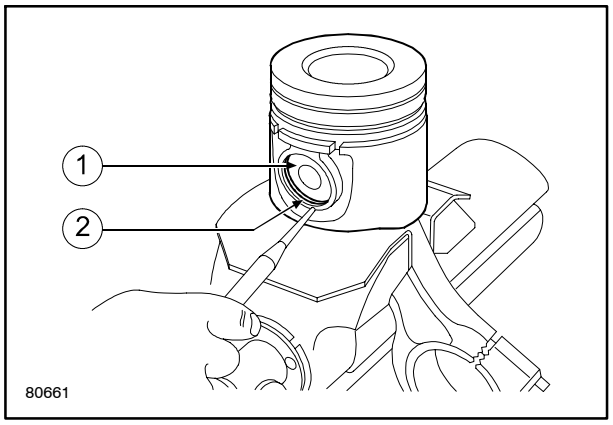
156

219. Using the pin (3) connect the piston (2) to the connecting rod (4) so that the reference arrow (1) for fitting the piston (2) in the cylinder liner and the numbers (5) stamped on the connecting rod (4) are observed as shown in the figure.



157

220. Insert the rings (2) retaining the pin (1).



158

Fitting Piston Rings

221. To fit the rings (1) on the piston (2) use suitable piston ring pliers (3).

222. The rings must be fitted with the word “TOP” facing upwards and positioned so that the openings of the piston rings are staggered 120° apart.

⚠ CAUTION ⚠

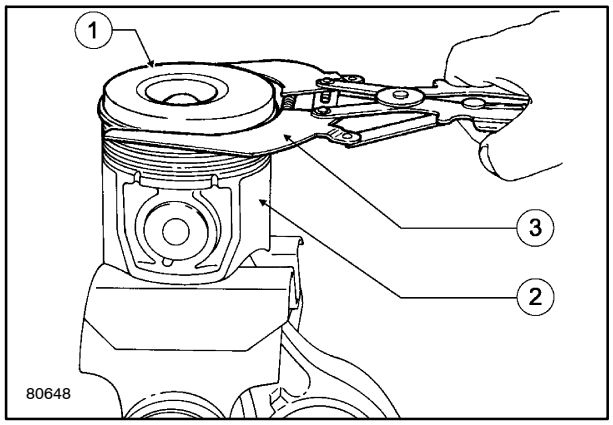
Piston rings are supplied as spare parts in the following sizes:

- standard, marked with yellow paint;
- oversized by 0.5 mm (0.0197 in.) and marked with yellow/green paint.

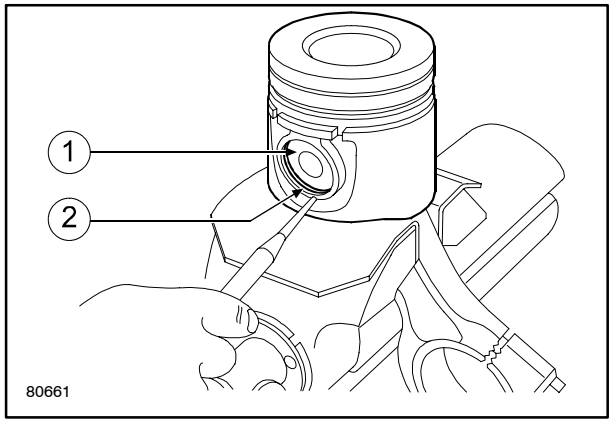
223. Fit the half bearings (1) on the connecting rod and cap.

⚠ CAUTION ⚠

If you have not found it necessary to change the connecting rod bearings, you must fit them back on in exactly the same order and positions found upon disassembly. Do not modify the half bearings in any way.



159

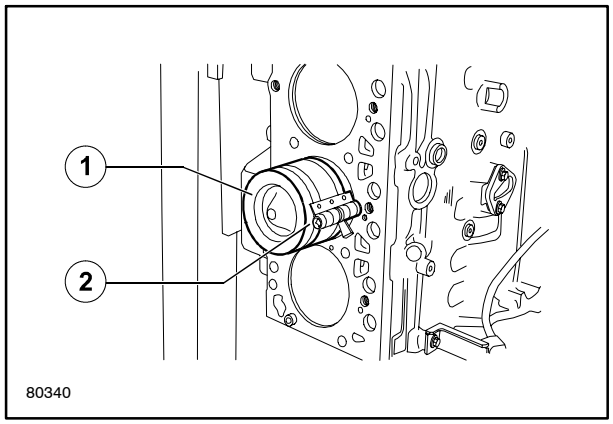


160

Fitting the Piston - Connecting Rod Assemblies in the Cylinder Liners

224. Lubricate the pistons well, including the piston rings and the inside of the cylinder liners.

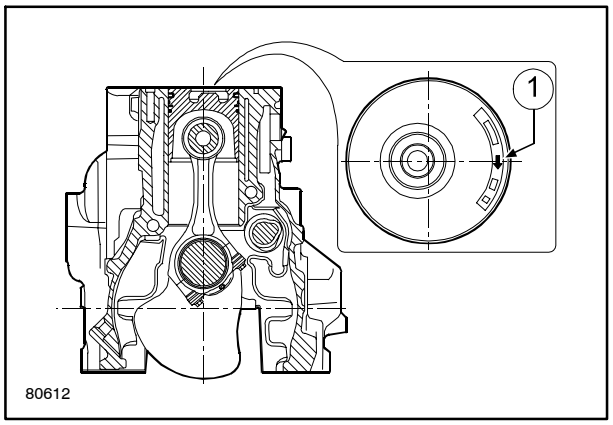
225. With the aid of the ring clamp (2), fit the connecting rod–piston assemblies (1) in the cylinder liners, checking that:
   - the number of each connecting rod corresponds to the cap coupling number.



161

Diagram for fitting the connecting rod-piston assembly in the pit

- The openings of the piston rings must be staggered 120° apart.
- The connecting rod/piston assemblies must all have the same weight.
- The arrow stamped on the crown of the pistons must face the front side of the crankcase, or the recess in the piston skirt must correspond to the position of the oil nozzles.

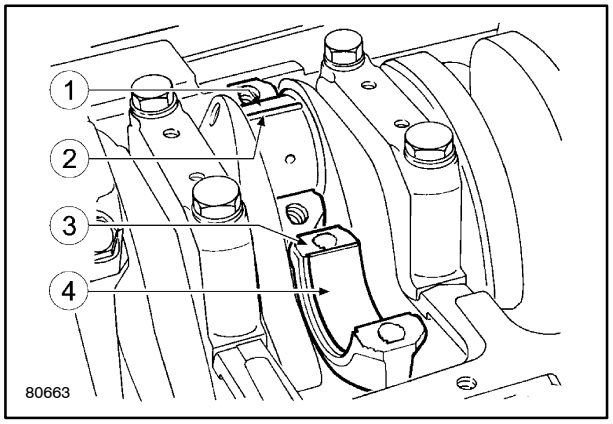


162

Connecting Rod Pin Assembly Clearance

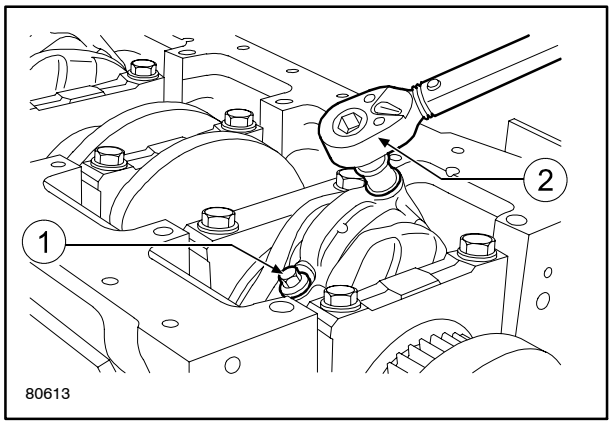
To measure the clearance proceed as follows:

226. Carefully clean the parts and remove all traces of oil.
227. Position a length of calibrated wire (2) on the crankshaft journals (1).
228. Fit the connecting rod caps (3) with the relevant half bearings (4).



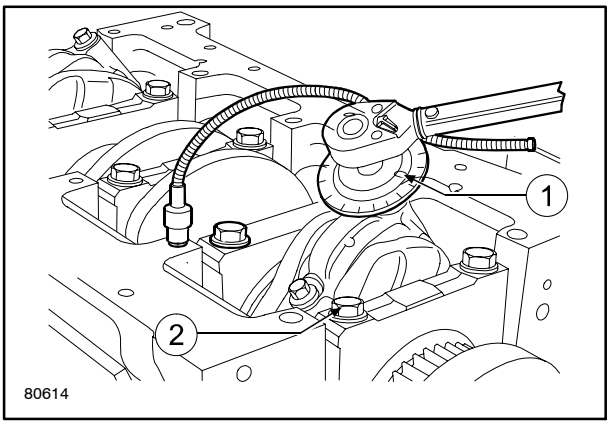
163

229. Using a torque wrench (2), tighten the screws (1) previously lubricated with engine oil to the prescribed torque (60 ± 5 Nm (2.3622 ± 0.1969 lb ft)).



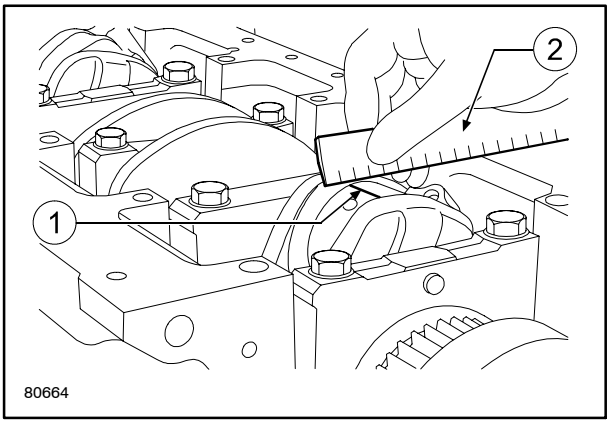
164

230. Fit a suitable angle gauge (1) on the socket wrench and further tighten the bolts (2) by 60°.



165

231. Remove the cap and determine the clearance by comparing the width of the calibrated wire (1) against the graduated scale printed on the packet (2) containing the wire.

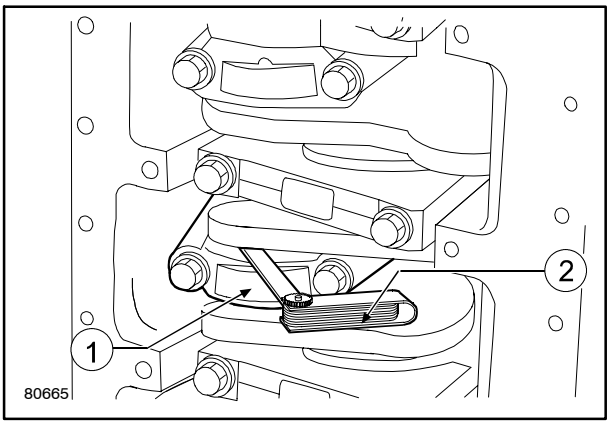


166

232. If the clearance is found to be other than as prescribed, change the half bearings and repeat the check.
233. After obtaining the prescribed clearance, lubricate the connecting rod bearings and permanently mount them, tightening the connecting rod cap retaining bolts as described.

⚠ CAUTION ⚠

Before permanently fitting the connecting rod cap retaining bolts, check that their diameter, measured at the centre of the length of the thread, is no less than 0.1 mm of the diameter measured at approximately 10 mm from the end of the bolt.

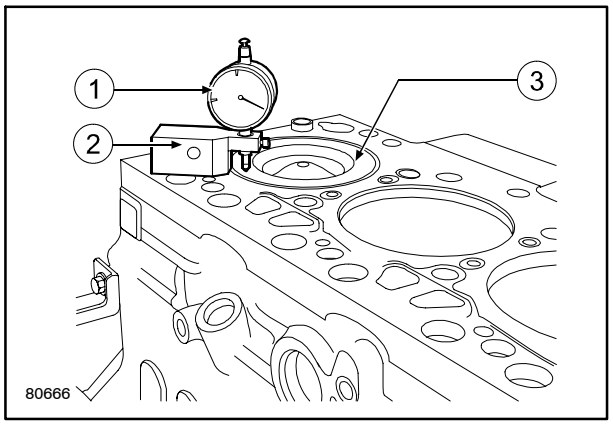


167

234. Check by hand that the connecting rods (1) run axially on the crankshaft journals and their end float measured with a feeler gauge (2) is 0.250 to 0.275 mm (0.0098 to 0.108 in.).

Checking Piston Protrusion

235. After fitting the connecting rod –piston assemblies, using a dial gauge (1) fitted with a magnetic base (2), check the protrusion of the pistons (3) at T.D.C. from the top surface of the crankcase.
236. It must be 0.30 ± 0.12 mm(0.0118 ± 0.0047 in.).



168

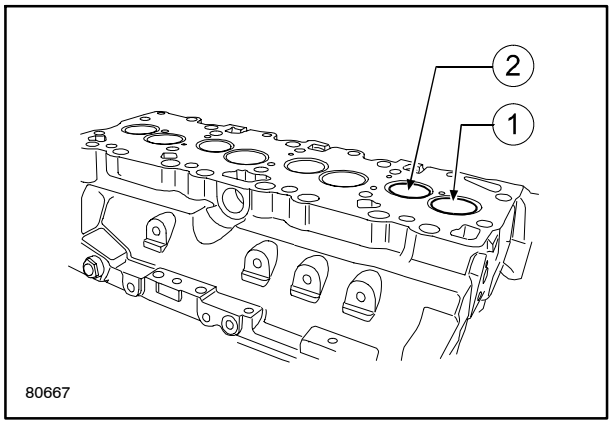
CYLINDER HEAD

Valve Disassembly

237. The intake (1) and exhaust (2) valve heads have different diameters.

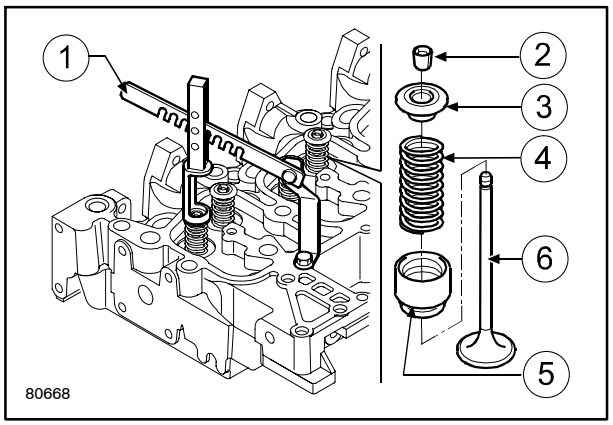
⚠ CAUTION ⚠

Before removing the valves from the cylinder head, number them so as to fit them back on, if they are not replaced, in the position found upon disassembly.
A = intake side



169

238. Valves are removed using a general valve spring compressor tool (1), applying pressure on the cap (3) so that, by compressing the springs (4), it is possible to remove the cotters (2). Then remove the cap (3) and springs (4).
239. Repeat this operation on all valves.
240. Overturn the cylinder head and extract the valves (5).



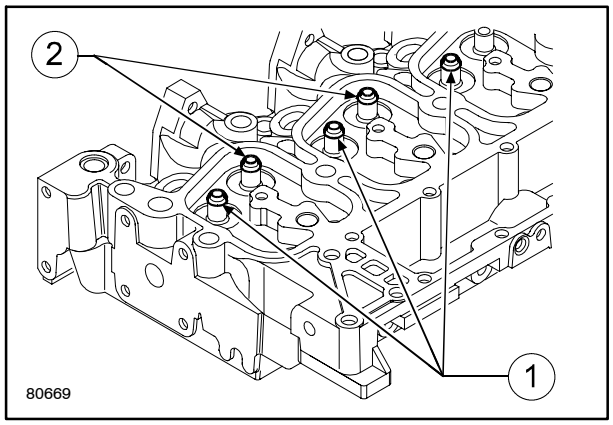
170

241. Remove the seals (1 and 2) from the relevant valve guides.

⚠ CAUTION ⚠

The seals (1) for the intake valves are yellow.

The seals (2) for the exhaust valves are green.



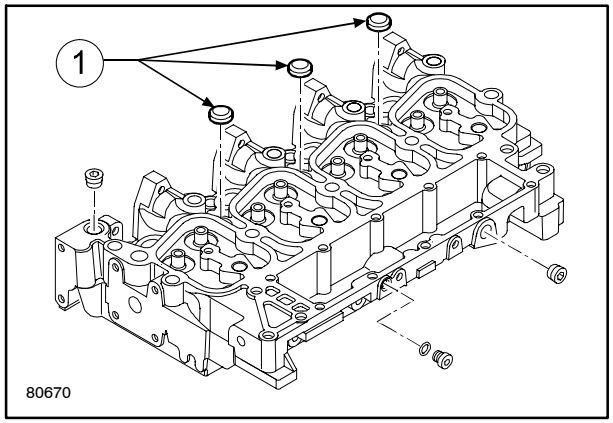
171

Cylinder head hydraulic seal check

242. Check the hydraulic seal using the appropriate tools.

243. Using a pump, introduce water heated to ~ 90°C (194°F) at a pressure of 2 ÷ 3 bar (29.0074 to 43.5111 psi).

244. If there is any leakage from the cup plugs (1), replace them, using a suitable drift for their disassembly – assembly.



172

⚠ CAUTION ⚠

Before fitting the plugs, apply a water-reactive sealant on their sealing surface.

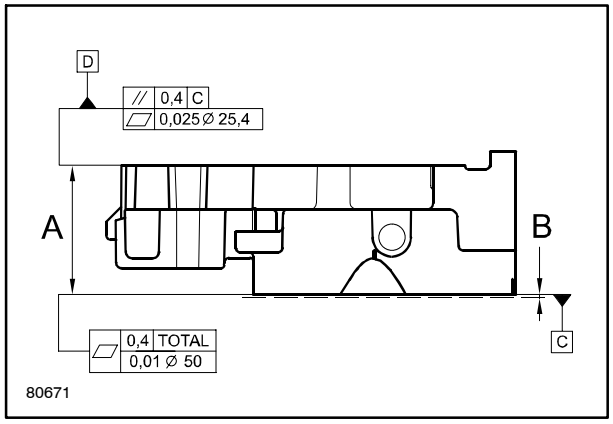
245. If you find any leakage from the cup plugs, it must be changed.

Cylinder Head Mating Surface Check

246. The deformation measured on the full length of the cylinder head must be no greater than 0.20 mm.

247. If it is any higher, regrind the cylinder head according to the dimensions and warnings given in the following figure.

248. The nominal thickness A of the cylinder head is 95 ± 0.25 mm (3.7402 ± 0.0098 in.) the maximum permissible amount of metal removed must not exceed the thickness B of 0.13 mm (0.0051 in.).



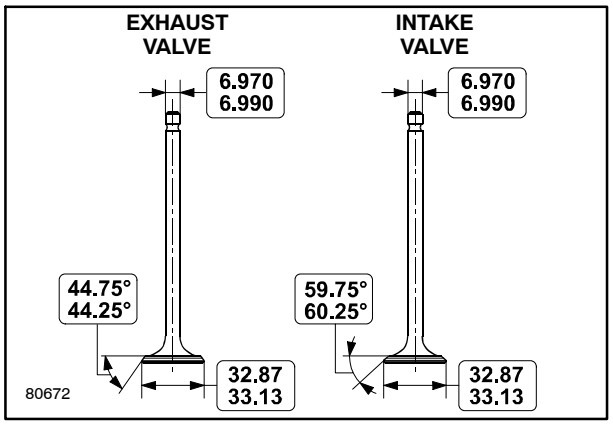
173

⚠ CAUTION ⚠

After regrinding, check the valve recessing and if necessary regrind the valve seats to obtain the prescribed valve recessing.

Valve Data

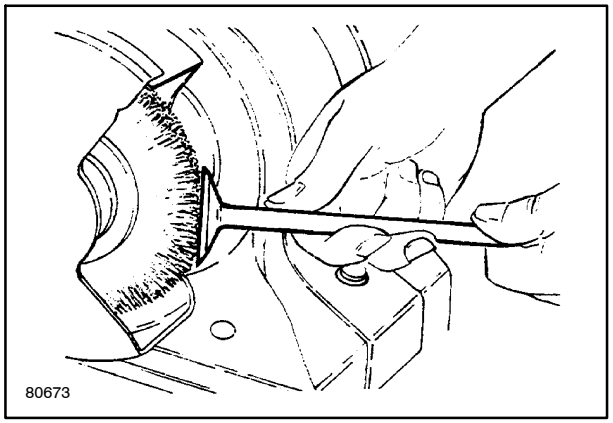
INTAKE AND EXHAUST VALVE DATA



174

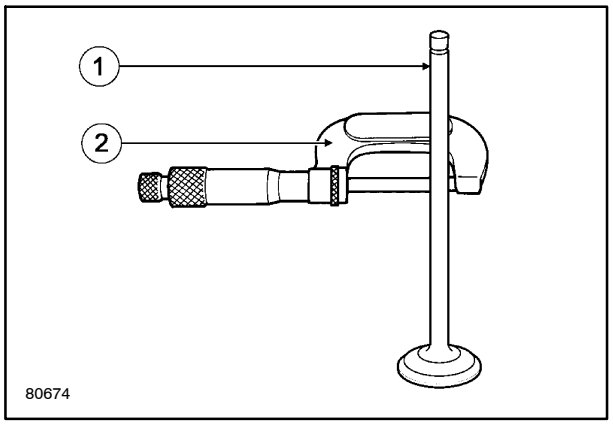
Decarbonizing, Checking and Grinding Valves

249. Remove all carbon deposits from the valves using a wire brush.
250. Check that the valves show no signs of seizure, cracking or burning.
251. If necessary, re-grind the valve seats, removing as little material as possible.



175

252. Using a micrometer (2), measure the valve stem (1): it must be 7.960 to 7.980 (0.3134 to 0.3142 in.).

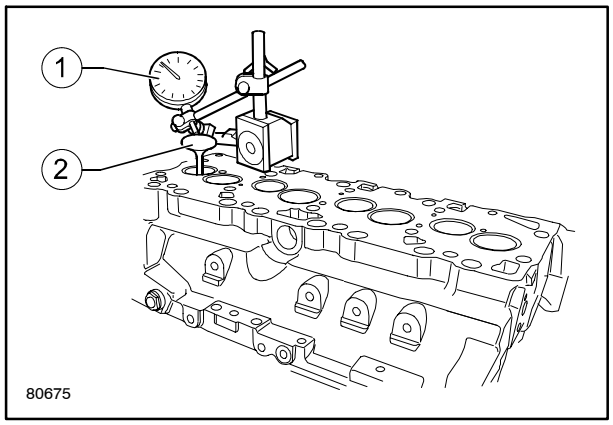


176

Checking the Clearance Between the Valve Stem and Guide and Valve Centring

253. The checks are made with a dial gauge (1) with a magnetic base, positioned as illustrated. The assembly clearance is 0.052 to 0.092 mm (0.0020 to 0.0036 in.).

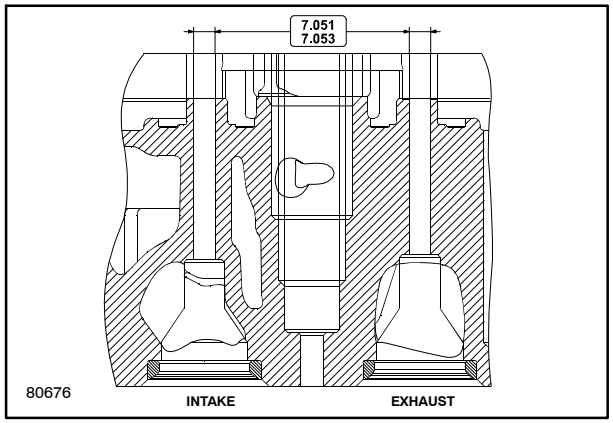
254. Making the valve (2) turn, check that the centring error is no greater than 0.03 mm (0.0012 in.).



177

Valve Guides

255. Using a bore gauge, measure the inside diameter of the valve guides; it must be as indicated in the figure.

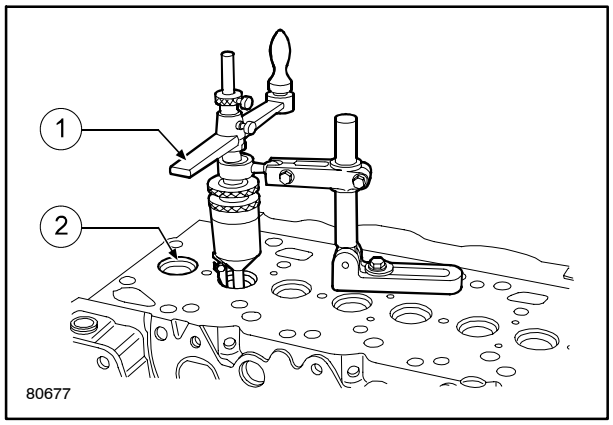


178

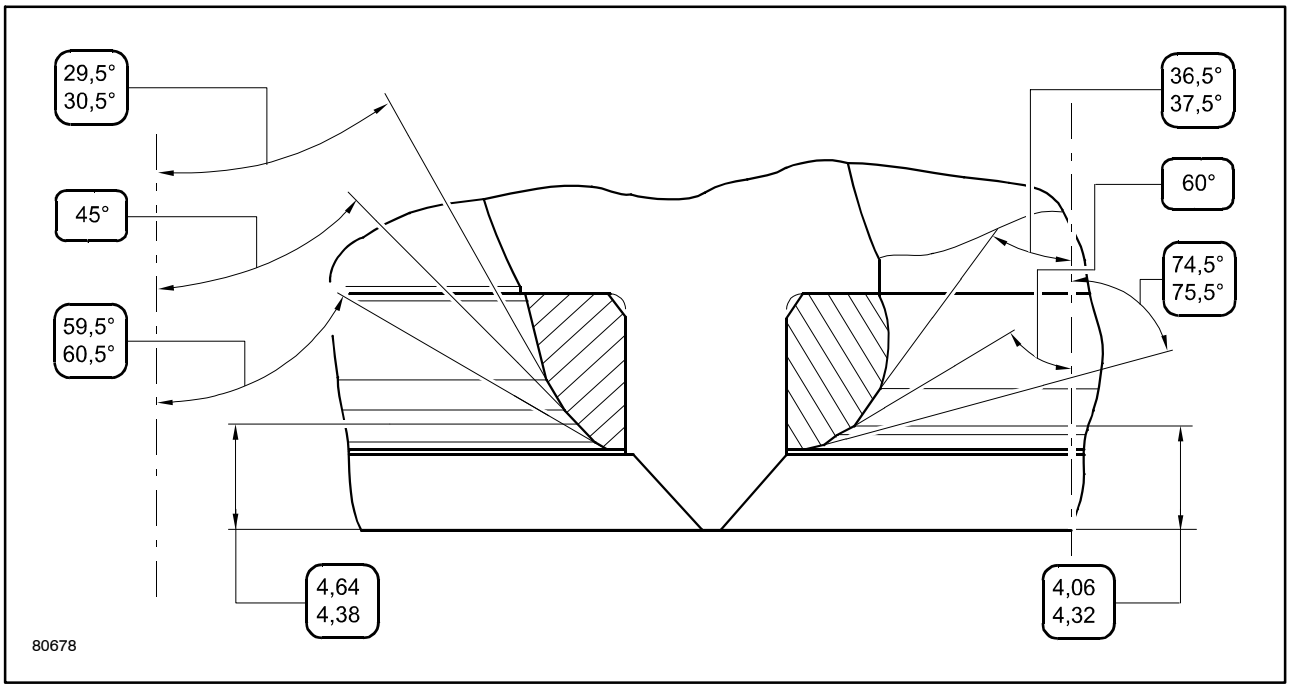
Valve Seats

Regrinding – replacing valve seats

256. Check the valve seats (2). On finding any slight scoring or burns, regrind, using a suitable valve grinding tool (1) according to the angles indicated in the following figure.



179

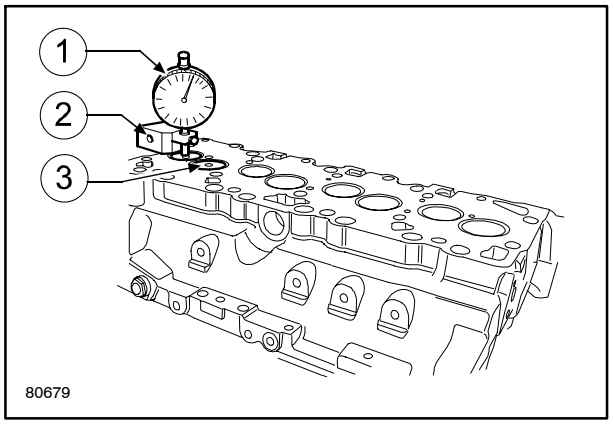


180

VALVE SEAT DATA

257. If the valve seats cannot be reconditioned by just regrinding, they can be replaced with the ones supplied as spare parts. Using the same tool 99305018 (1, Figure 179) and taking care not to nick the cylinder head, remove as much material as possible from the valve seats until it is possible to extract them from the cylinder head with the aid of a punch.
Heat the cylinder head to 80° to 100 °C (176° to 212 °F) and, using a suitable drift, insert the new valve seats, previously cooled.
Then, using tool 99305018, regrind the valve seats according to the values given in Figure 180.

258. After regrinding check that the valve recessing (3) is as prescribed using a suitable dial guage (1) with a magnetic base (2).

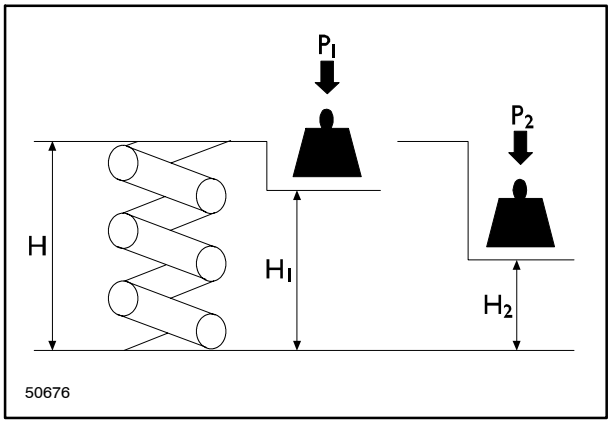


181

Valve Springs

DATA FOR CHECKING THE INTAKE AND EXHAUST VALVE SPRINGS

259. Before assembly, check the valve spring flexibility. Compare the elastic deformation and load data with those of the new springs.

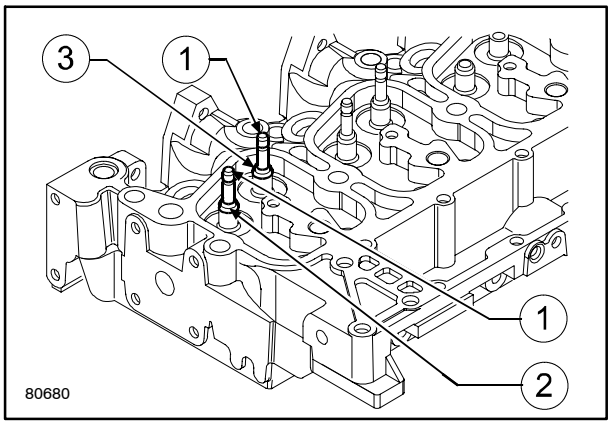


182

Assembling the Cylinder Head

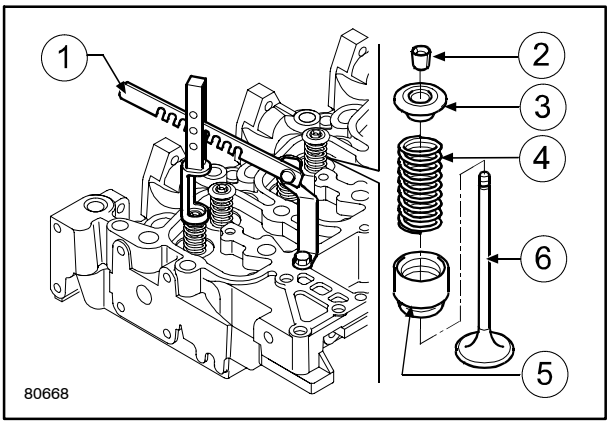
260. Lubricate the valve stem (1) and insert into the relevant valve–guides according to the position marked during disassembly.

261. Fit the seals (2 and 3) onto the valve guide.



183

262. Position the following parts on the cylinder head: protective cap (5), spring (4) and top cap (3): using a general valve spring compressor tool, (1) compress the spring (4) and retain the parts to the valve (6) with the cotters (2).

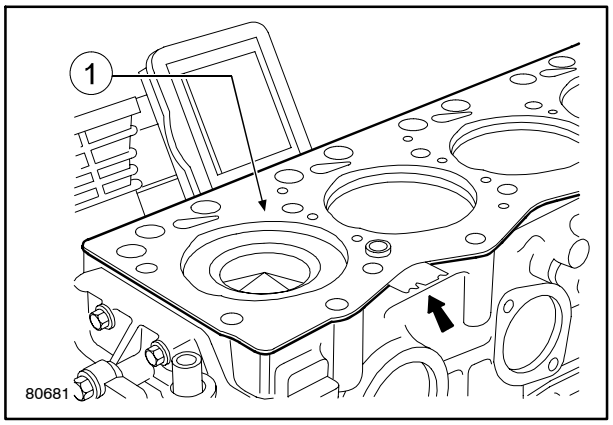


184

Installing the Cylinder Head

263. Check that the mating surfaces of the cylinder head and crankcase are clean. Do not dirty the cylinder head gasket. Set the cylinder head gasket (1) with the word “TOP” (1) facing the head.

264. The arrow indicates the point where the thickness of the gasket is given. The gasket is available in 2 thicknesses, 1.15mm and 1.25mm, select the correct one depending on the piston protrusion dimension.

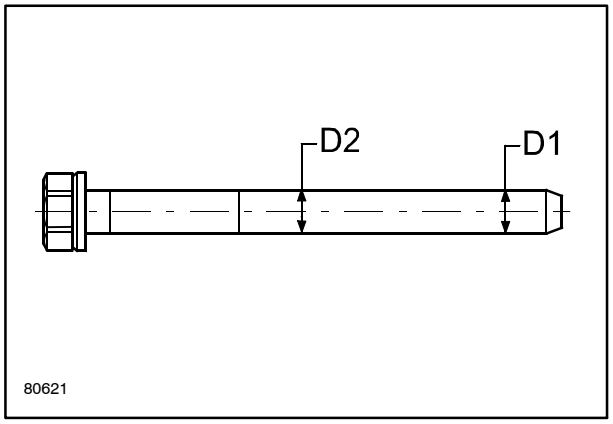


185

IMPORTANT: *Before reusing the head bolts for the cylinder head, make two measurements on the diameter as shown in the figure, measuring the diameters D1 and D2:*

If D1 - D2 < 0.1 mm (0.0039 in.), the bolt can be reused.

If D1 - D2 > 0.1 mm (0.0039 in.), the bolt must be changed



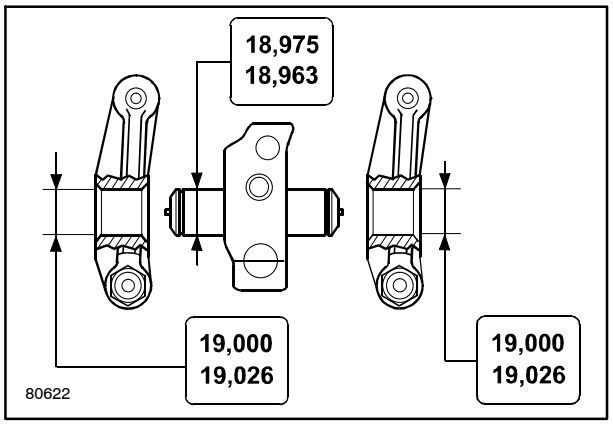
186

Rocker Arm–Spindle

NOTE: *The check and adjustment are made only after fitting the cylinder head on the crankcase and mounting the camshaft.*

ROCKER ARM - SPINDLE DATA

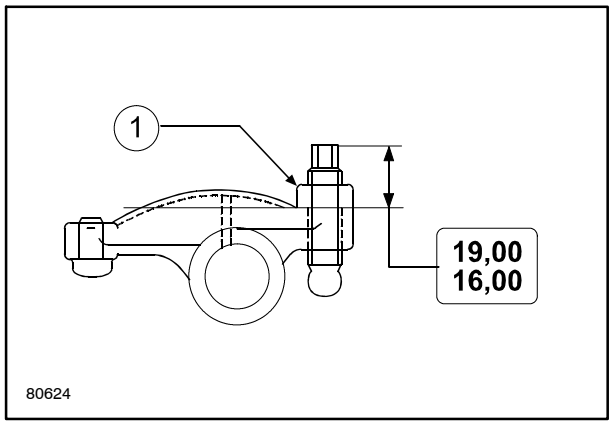
Check the mating surfaces of the mounting and spindle: there must be no sign of any damage or excess wear. Replace if necessary.



187

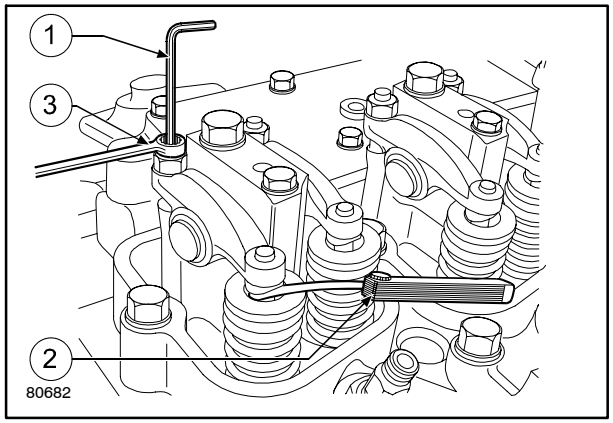
ROCKER ARM ADJUSTMENT SCREW DATA

265. If removed, check the adjustment.
Tighten the nut (1) to a torque of 0.25 – 0.75 Nm (0.1844 - 0.5532 lb ft)



188

266. Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).
267. The working clearance should be:
- intake valves 0.25 ± 0.05 mm (0.0098 ± 0.0020 in.)
- exhaust valves 0.51 ± 0.05 mm (0.0201 ± 0.0020 in.)



189

CAUTION

To adjust the rocker arm – valve working clearance more quickly, proceed as follows:
turn the crankshaft, balance the valves of cylinder n° 1 and adjust the valves marked with an asterisk as indicated in the table:

no. cylinder	1	2	3	4
intake	*	-	-	-
exhaust	*	*	*	-

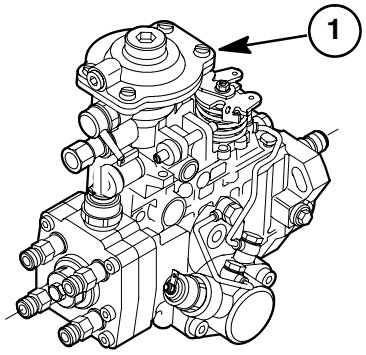
Turn the crankshaft, balance the valves on cylinder n° 4 and adjust the valves marked with an asterisk as shown in the diagram:

no. cylinder	1	2	3	4
intake	-	*	*	*
exhaust	-	-	-	*

BOSCH ROTARY FUEL INJECTION PUMP

Manifold Pressure Compensator (LDA)

The fuel injection system on TS100A and TS115A (Plus/Deluxe models) turbocharged diesel engines includes a manifold pressure compensator (LDA). The LDA (1), mounted on top of the fuel injection pump, reacts to the changing air pressure in the intake manifold generated by the exhaust gas turbocharger, and adapts the full-load delivery to the air pressure accordingly.

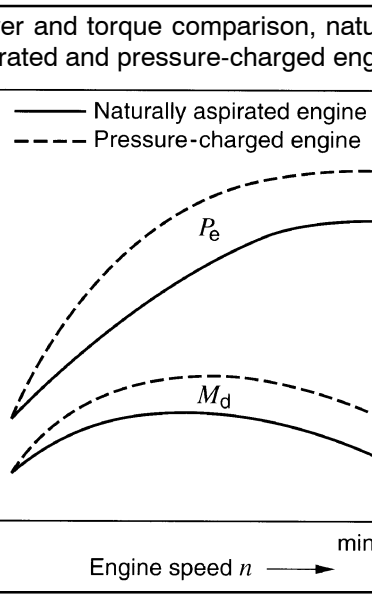


190

Description

The top portion of the LDA incorporates the air pressure connection and the vent bore. Internally, the LDA contains two separate airtight chambers divided by a diaphragm. A compression spring applies pressure on the diaphragm to match the LDA response point to the air pressure of the turbocharger. The opposite end of the spring contains an adjusting nut, which sets spring pre-load. The diaphragm connects to a tapered sliding pin. A guide pin transfers the movement of the sliding pin to a reverse lever, which in turn changes the setting of the full-load stop. An adjusting screw at the top of the LDA allows for the initial setting of the diaphragm and the sliding pin.

IMPORTANT: *The LDA is adjusted and set by Bosch. If the LDA requires any type of adjustment, the injection pump with the LDA must be brought to an authorized Bosch specialist.*



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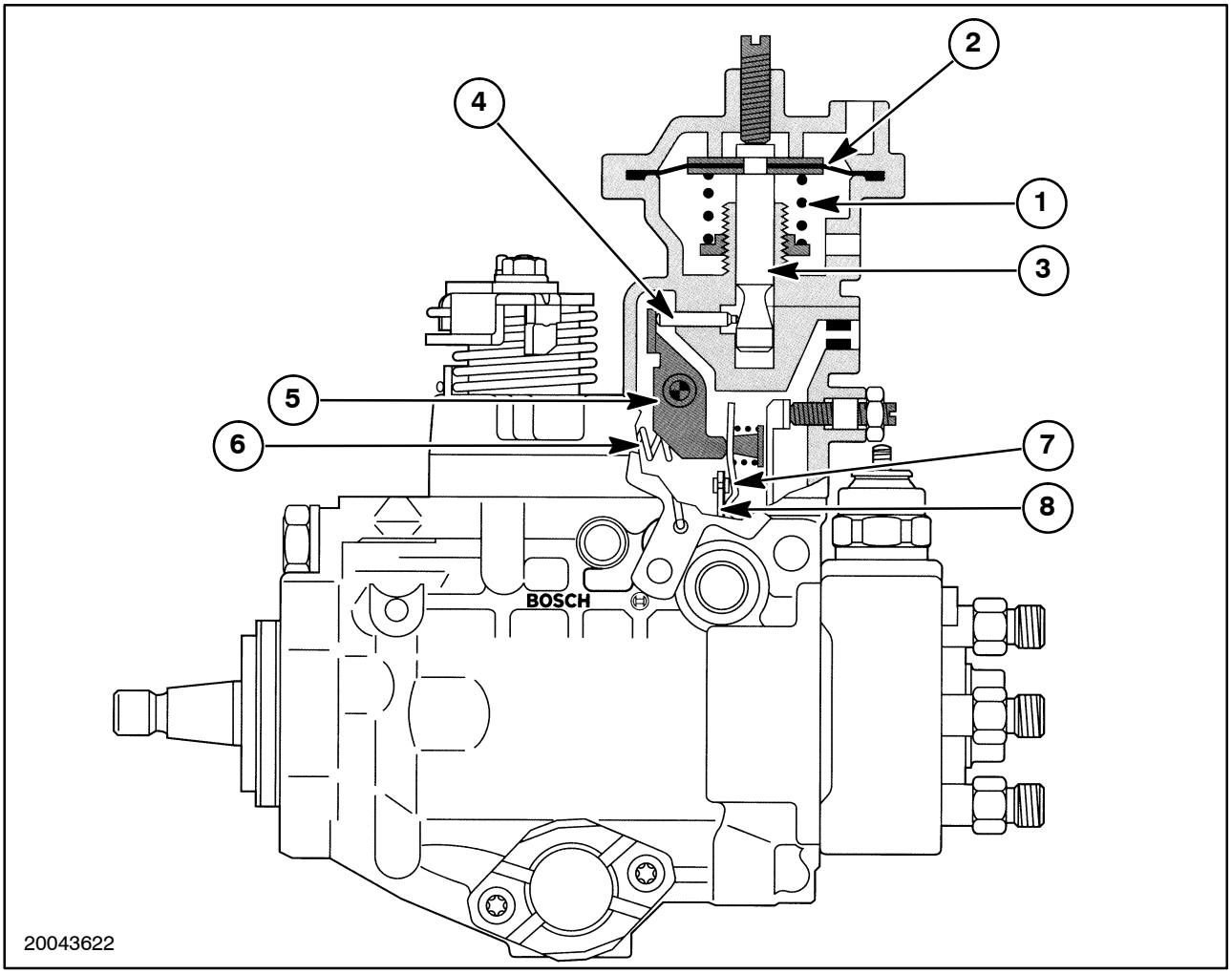
Operation

In the lower speed range of the engine, the air pressure generated by the turbocharger is insufficient to overcome the pressure of the compression spring (1) under the diaphragm (2). Therefore, the diaphragm remains in the initial position. When the air pressure becomes sufficient to overcome spring force, the diaphragm and sliding pin (3) shift against the force of the compression spring. The guide pin (4) changes position and causes the reverse lever (5) to swivel around a pivot. Due to the force exerted by the governor spring (6), a non-positive connection between the tensioning lever (7), reverse lever (5), guide pin (4) and sliding pin (3) exists. This action results in the tensioning lever following the swivel movement of the reverse lever, causing the starting lever (8) and tensioning lever to swivel around pivots to shift the control collar in the direction of increased fuel delivery. Fuel delivery adapts in response to increased air mass in the combustion chamber.

When air mass decreases, the compression spring pushes the diaphragm upward with the sliding pin. The compensation of the governor lever mechanism reverses direction, which adapts the fuel quantity to the change in air pressure.

In case of turbocharger failure, the LDA reverts to the initial position, and the engine operates normally without developing smoke.



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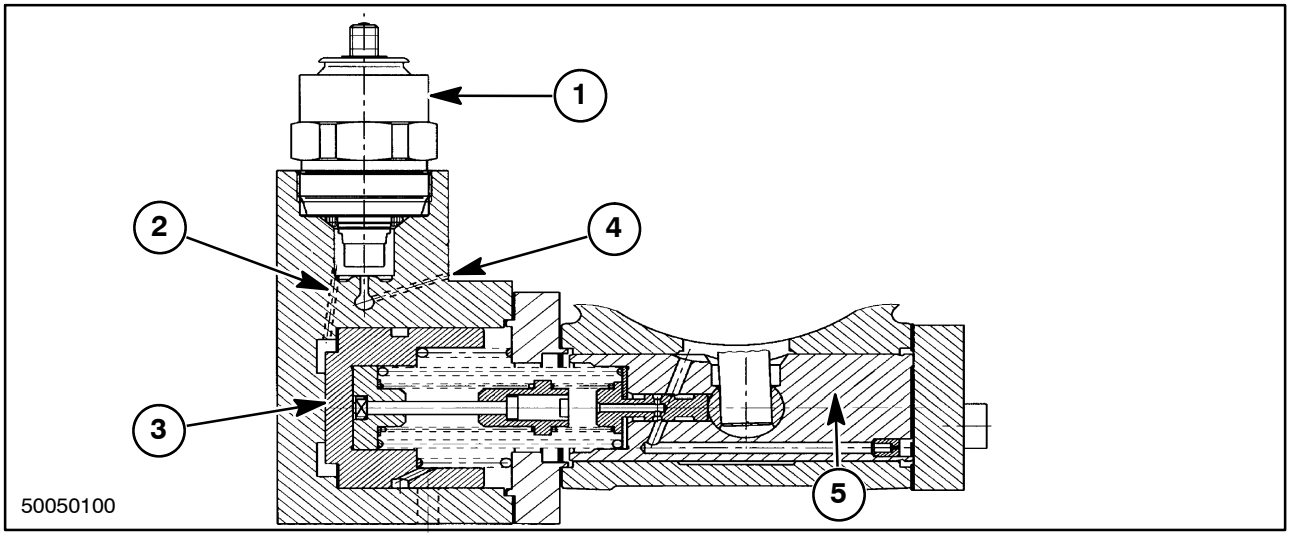
Manifold Pressure Compensator (LDA)

1. Compression Spring
2. Diaphram
3. Sliding Pin
4. Guide Pin
5. Reverse Lever
6. Governor Spring
7. Tensioning Lever
8. Starting Lever



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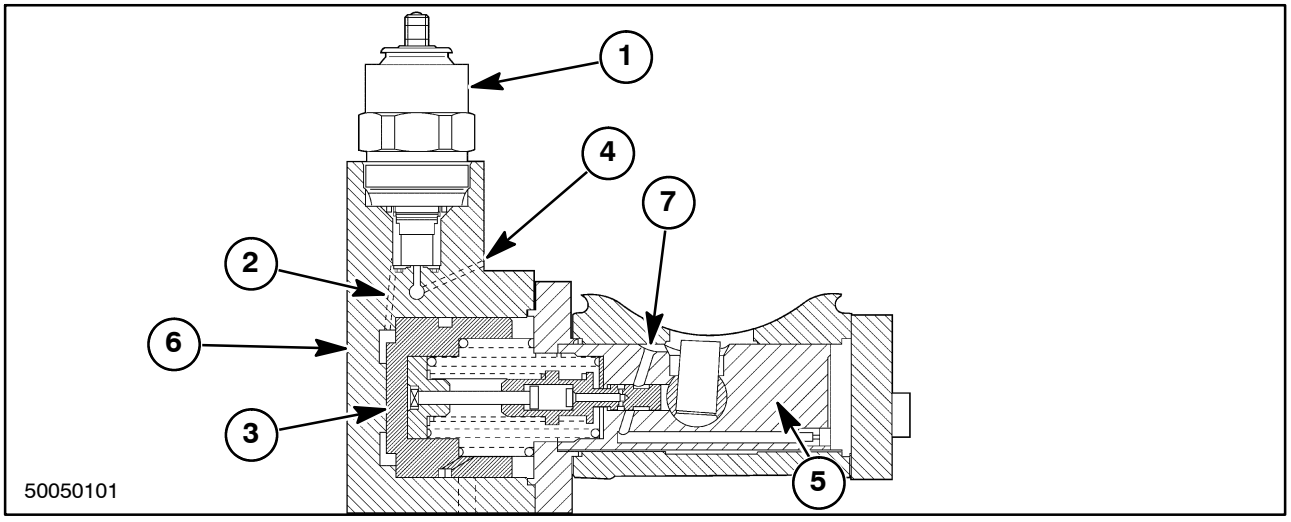
Sectional View of KKSB (Engine Off and Cold)

Electrical Cold-start Accelerator (KKSB)

During engine start-up, the KKSB advances the injection pump timing to reduce white smoke and emissions until the cylinders warm to normal operating temperature. By shifting the start of injection in the advanced direction, the KKSB improves the cold-start characteristics of the emissionized engine. Operation is triggered automatically by means of a temperature sensitive thermostatic switch, which is located in the engine block.

When the engine is not operating, and the coolant temperature inside the block is below 53°C (127.4°F) the thermostatic switch is closed, and the KKSB solenoid (1) is de-energized due to the ignition switch being in the OFF position. In this configuration, the KKSB plunger is retracted, and port (2) is open, providing a path from the control piston (3) to the injection pump crankcase (4). Spring tension within the control piston forces the timing piston (5) to the right against the valve housing.



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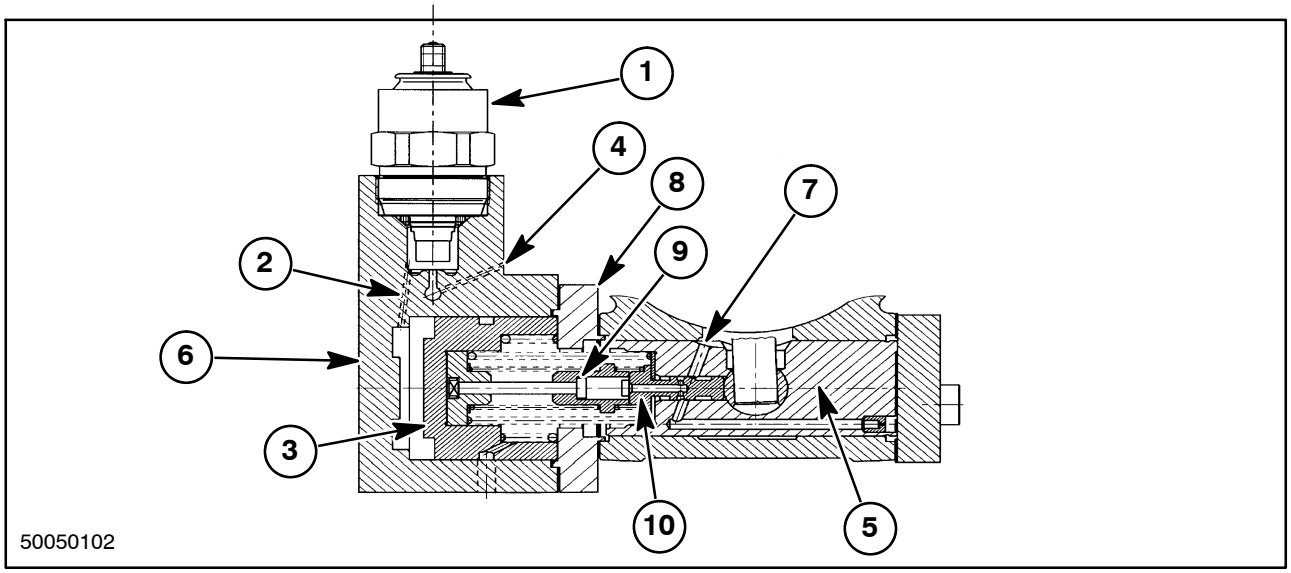
Sectional View of KKSB (Engine Cold Starting Phase)

During the cold start phase of the engine, 12 volts passes through the thermostatic switch, which is still closed, to energize the KKSB solenoid (1). The plunger within the solenoid moves downward and blocks port (2), which prevents fuel from the pump crankcase (4) from reaching the pressure side of the control piston (3). The control piston remains relaxed, and rests against the valve housing (6). Fuel from the pump crankcase is now allowed to pass through port (7) to the pressure side of the timing piston (5). The fuel forces the piston to the left, which moves the cam ring in the pump to advance the timing.



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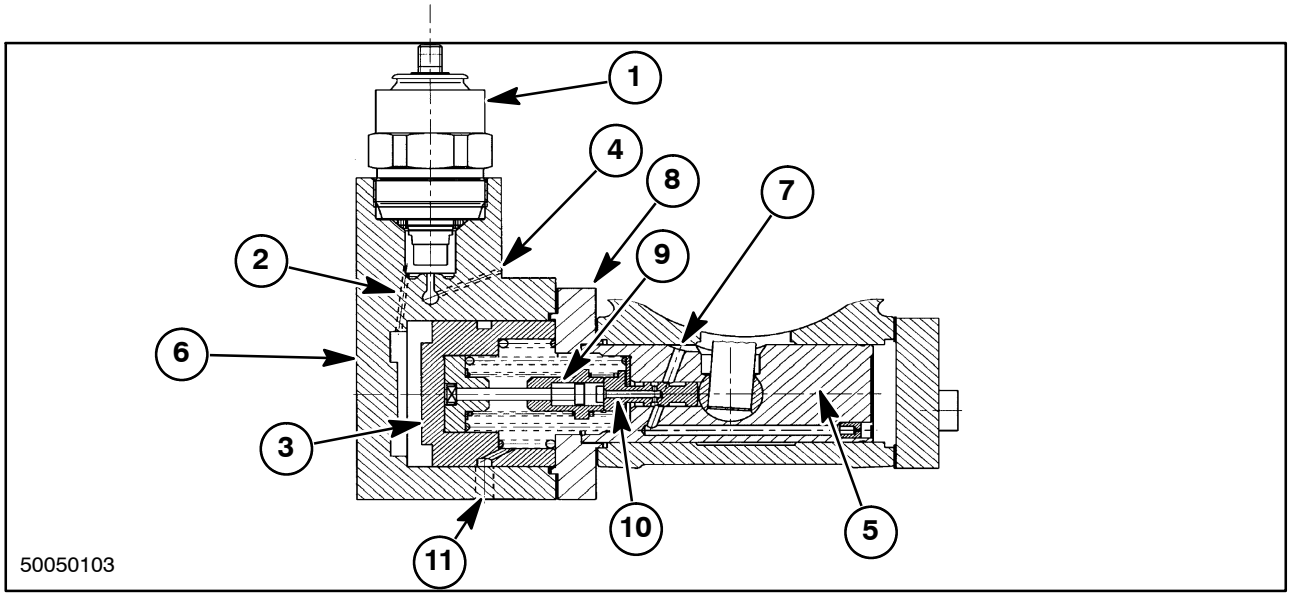
Sectional View of KKSB (Engine Warm/Advance Timing Withdrawn)

When water temperature in the engine block rises above app. 63°C (145.4°F), the thermostatic switch opens to cut off 12 volts to the KKSB solenoid (1). With the solenoid de-energized, the plunger retracts to open port (2), allowing fuel from the pump crankcase to reach the control piston (3). The fuel forces the control piston to the right until it contacts the intermediate plate (8), and the sleeve (9) rests on the control spool (10). Advanced timing withdraws.



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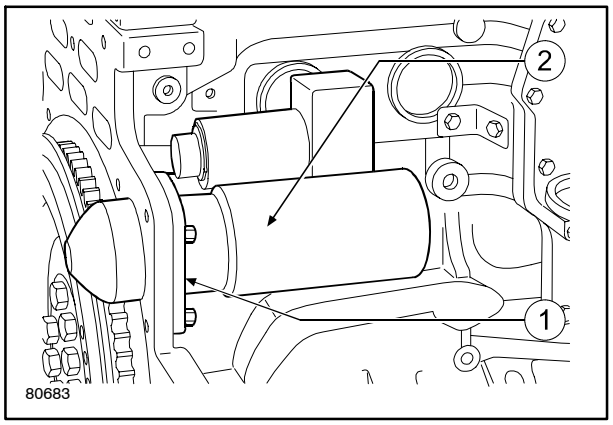
Sectional View of KKSB (Engine Warm/Normal Timing)

With the engine warm, timing depends on engine rpm. Pump fuel pressure is communicated to the suction side of the timing piston (5) through the orifice (11) in the control piston (3).

Injection Pump Removal

268. If it is necessary to change the injection pump, it is supplied already pre-set as a spare part.
269. Whereas, if the pump has to be removed and re-fitted later, without undergoing repair, it must be pre-set while still fitted on the engine and re-moved only afterwards.
270. The following procedure includes this second hypothesis as it is more complex.
271. Remove the starter motor (1) from the mounting (2).



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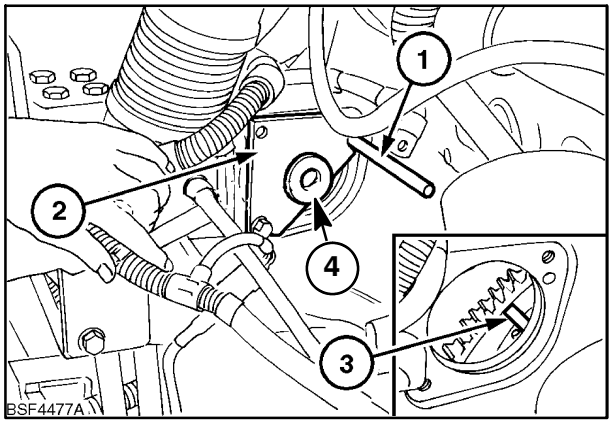
272. Fit tool **380000988** (2) and **380000732** (4) to be able to turn the flywheel .
273. Carefully turn the flywheel in its direction of rotation to cancel the clearances of the gears.
274. Turn the engine until the pin (1) engages through the slot in the plate (2) with the recess in the flywheel (3).



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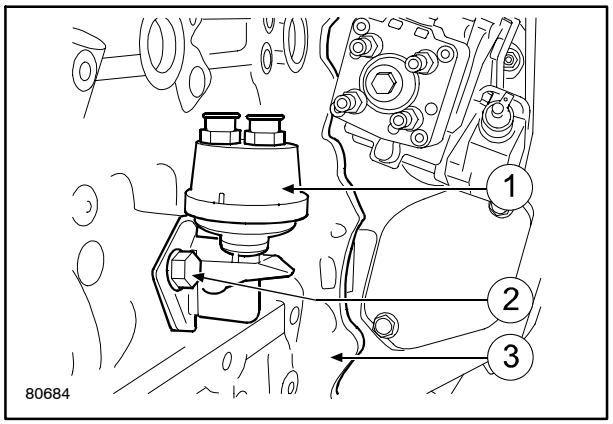
275. Unscrew the retaining bolts (2) and remove the priming pump (1) from the crankcase (3).



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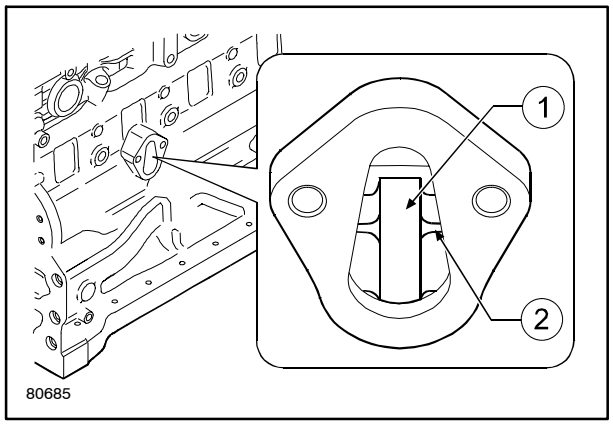
276. Check through the seat of the priming pump that the camshaft (1) is in step (at TDC) using the reference marks (2) on the shaft.

    If the marks are not evident, withdraw the pin from the gear and rotate the engine 360° until the reference marks are visible. Re-insert the pin to lock.



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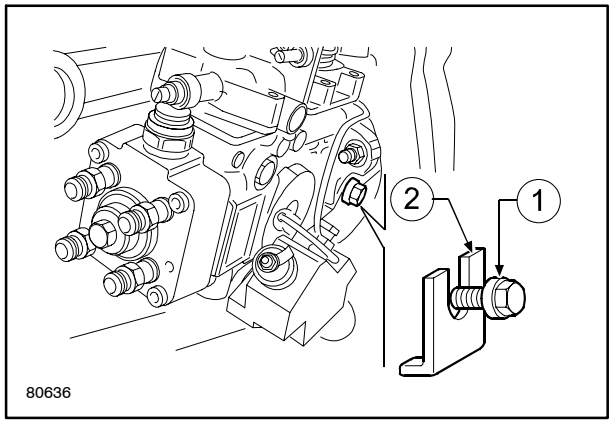
277. Partly unscrew the side bolt (1) and remove the spacer washer (2). This must be re-used (it is recommended to secure it to the pump with a clamp or a metal wire).

278. Screw down the side bolt (1) locking pump spindle rotation.



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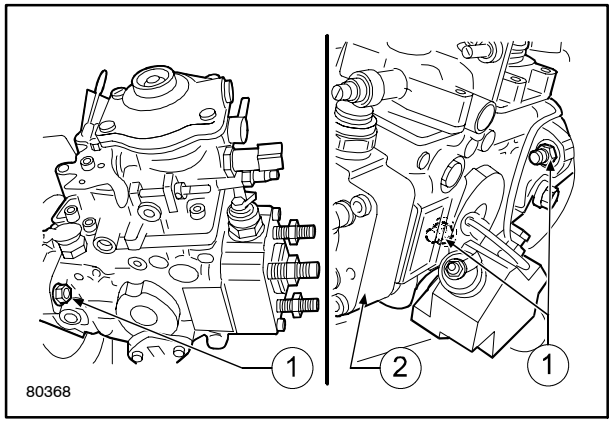
279. Unscrew the retaining bolts (1) and disconnect the fuel pump (2).



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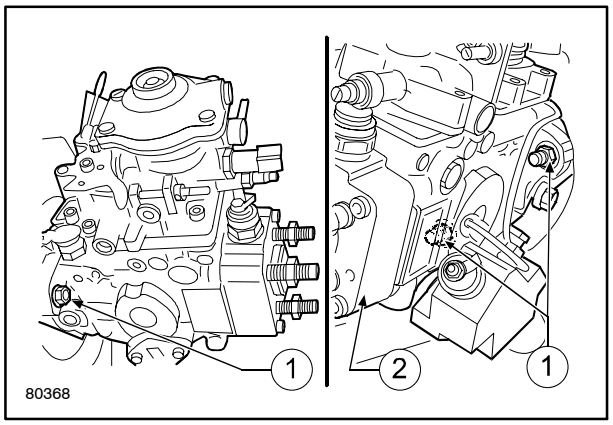
Injection Pump Installation

280. When fitting the fuel pump on the engine, it is necessary to bring about the condition of T.D.C. on cylinder No. 1 as described on the previous page.
281. Fit the rotary pump (pre-set) (2) tightening the retaining bolts (1).

NOTE: *If the pump is unlocked off of the engine and the driveshaft allowed to rotate, or the the pump is removed when the engine is not at TDC and the engine subsequently rotated, it will be necessary to have an authorised Bosch agent reset the pump and lock it.*

⚠ CAUTION ⚠

The seal removed at the time of pump disassembly must not be reused. Always use genuine spare parts.



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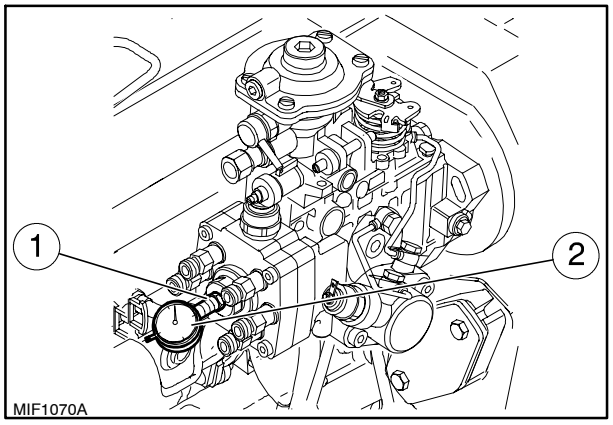
Checking Injection Pump Timing

- With the injection pump in position but with the mounting bolts loose, remove the plug on the pump cover.
- Fit adapter 380001601 (1) in the injection pump where the plug was removed.
- Fit the dial gauge **380000228** (2) into the adaptor and pre-load the shaft by 2.5 mm (0.098 in).
- Turn the crankshaft counterclockwise [viewed from the fan side] until the injection pump reaches a pre-stroke position, which is obtained when the dial gauge movement stops and is at the lowest point.
  Reset the dial gauge to zero and turn the crankshaft in the opposite direction to bring No.1 cylinder to TDC of the compression stroke.
  In this position the dial gauge on the pump must read off a value of 1 mm (0.039 in.).
- Turn the pump anti-clockwise if the plunger has completed a stroke of less than 1 mm (0.039 in.), and clockwise if the stroke is greater than 1 mm (0.039 in.), repeating the test until the correct stroke is obtained.
- After obtaining the correct stroke value, tighten the pump mounting hardware to the torque shown on page 7 of this chapter.



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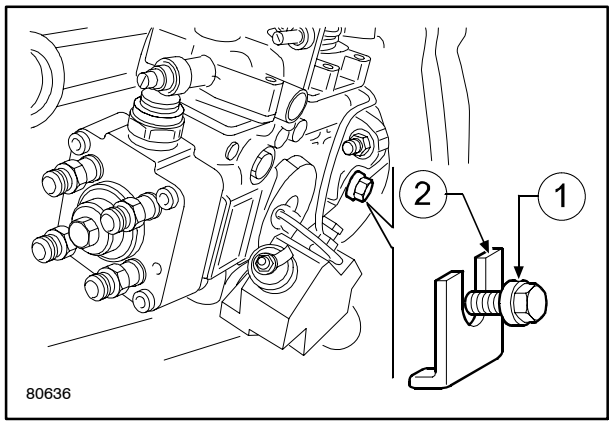
282. Partly unscrew the bolt (1) locking pump spindle rotation and insert the spacer washer (2). Screw down the bolt, locking the above-mentioned washer: in this way, the fuel pump spindle is free to turn.
283. Withdraw the engine flywheel locking pin outwards.
284. Remove tool **380000988** for flywheel locking/rotation; place the starter motor in its seat.
285. Connect all the pipes (from the pumping elements to the injectors, for blow-by recovery from the injectors to the pump, the LDA piping and the supply from the priming pump).
286. Connect any electrical connections.



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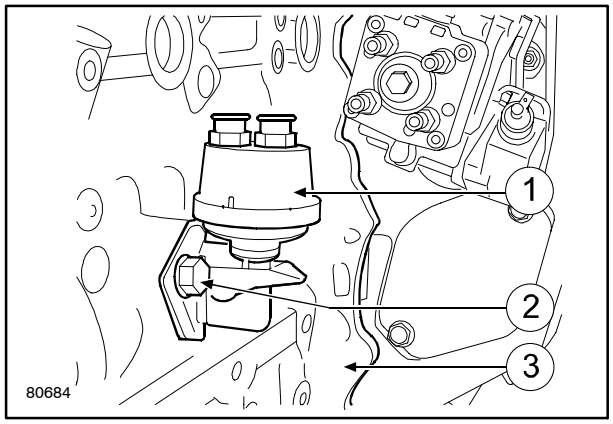
287. Fit the priming pump (1) on the crankcase (3) and tighten the retaining bolts (2) to the prescribed torque.



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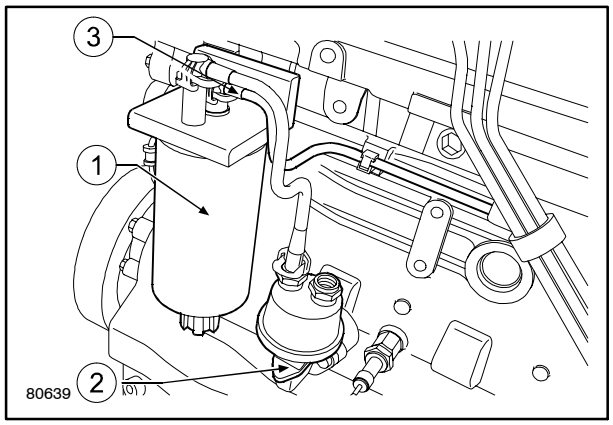
288. If any work has been done on the supply circuit components, it is necessary to bleed the air from the system.
289. Disconnect the filter fuel piping (3) and repeatedly operate the bleed lever of the priming pump (2).
290. Continue operating until fuel comes out.
291. Connect the piping (3) to the filter.



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FINAL CHECKS

CAUTION

The following checks must be made after fitting the engine on the vehicle.

First check that the fluid levels have been restored correctly.

Start the engine, leave it running at just over idling speed and wait for the coolant temperature to reach the thermostat opening setting, then check that:

292. No coolant leaks from the coupling sleeves of the engine cooling and cab heating circuit piping, tightening the collars further if necessary.
293. Meticulously check the fuel piping connections with the unions.
294. No oil leaks between the cylinder head and cover, between the oil sump and crankcase, between the cooler oil filter and the relevant seats between the various pipes of the lubricating circuit.
295. No oil leaks from the piping.
296. No air leaks from the pneumatic piping (if applicable).
297. Check that the indicator lights on the instrument panel and the devices disconnected at the time of removing the engine all work properly.
298. Check and very carefully deaerate the engine cooling system with repeated bleeding operations.

SECTION 10 - ENGINE

Chapter 4 - CNH Engine - F4CE0684C/F4CE0684F*D (6 Cylinder Mechanical Engine)

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SPECIFICATIONS

Engine, type:	F4CE0684C/F4CE0684F*D, 6 cylinders
Compression ratio	17,5
Maximum power at rated engine speed kW (HP) rpm	85/96 115/130 2200
Maximum torque Nm (lb ft) rpm	520/583 (383.5322)/ (429.9081) 1400
Slow idling speed of engine without load rpm	800
Fast idling speed of engine without load rpm	2400
Boost feeding	With intercooler
Turbocharger type	HOLSET
Lubrication	Forced via lobe pump, pressure relief valve, oil filter
Oil pressure with engine hot	
- at slow idling bar (psi)	1,2 (17.4044)
- at fast idling bar (psi)	3,8 (55.1141)
Cooling system	Fluid-based
Coolant pump drive:	Via belt
Thermostat:	
- temperature start ° C (° F)	81 ± 2 (177.8 ± 35.6)
Filling	
- engine sump litres (Imp gall.)	min 11 (2.4197) max 15 (3.2996)
- engine sump + filter litres (Imp gall.)	16 (3.5196)

(continued)

Type	6 cylinders
Cycle	Diesel, 4-stroke
Fuel system	Turbocharged with intercooler
Fuel injection	Direct
Number of cylinders	6
Bore mm (in.)	104 (4.095)
Stroke mm (in.)	132 (5.1968)
Total displacement cm^3 ($in.^3$)	6728 (410.5426)
Timing system	-
Inlet Start before T.D.C. (Top Dead Centre)	-
Inlet End after B.D.C. (Bottom Dead Centre)	-
Exhaust Start before B.D.C.	-
Exhaust End after T.D.C.	-
Valve Clearance (engine cold) Inlet mm	0,25 to 0,35
Valve Clearance (engine cold) Inlet (in.)	0.0098 to 0.0138
\Exhaust mm	0,50 to 0,60
\Exhaust (in.)	0.0197 to 0.0236
Fuel system . .	
Injection: Bosch	Bosch
Nozzles	Bosch
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection pressure bar (psi)	245 (3553.4065)
Injection pump timing (pump plunger lift)	1,00 +/- 0,05mm @TDC

(continued)

Assembly Clearances - Data

Type	6-cylinder
CRANK GEAR AND CYLINDER ASSEMBLY DATA	
Cylinder liners ∅ 1	104,0 to 104,024 (4.0945 to 4.1039)
Cylinder liners:	
outside diameter ∅ 2	-
length L	-
Cylinder liners - crankcase seats (interference)	-
Outside diameter ∅ 2	-
Cylinder liners:	
inside diameter ∅ 2	-
Pistons supplied as spare parts:	-
measurement X	55,9 (2.2008)
outside diameter ∅ 1	103,730 to 103,748 (4.0839 to 4.0846)
seat for pin ∅ 2	38,010 to 38,016 (1.4965 to 1.4967)
Piston - cylinder liners	0,252 to 0,294 (0.0099 to 0.0116)
Piston diameter ∅ 1	0,5 (0.0197)
Piston location from crankcase X	0,28 to 0,42 (0.0110 to 0.0165)
Piston pin ∅ 3	38,000 to 38,006 (1.4961 to 1.4963)
Piston pin - pin seat	0,004 to 0,016 (0.0002 to 0.0006)
Piston ring grooves X1*	2,690 (0.1059)
Piston ring grooves X2	2,44 to 2,46 (0.0961 to 0.0969)
Piston ring grooves X3	4,03 to 4,05 (0.1587 to 0.1594)
Piston rings S1*	2,560 to 2,605 (0.1008 to 0.1026)
Piston rings S2	2,350 to 2,340 (0.0925 to 0.0921)
Piston rings S3	3,970 to 3,990 (0.1563 to 0.1571)
* measured on ∅ of 58 mm (2.2835 in.) 4 cylinders	
Piston rings - grooves 1	0,245 to 0,265 (0.0096 to 0.0104)
Piston rings - grooves 2	0,100 to 0,110 (0.0039 to 0.0043)
Piston rings - grooves 3	0,004 to 0,008 (0.0002 to 0.0003)
Piston rings	0,5 (0.0197)
Piston ring end opening in cylinder liner:	
X1	0,3 to 0,4 (0.0118 to 0.0157)
X2	0,25 to 0,55 (0.0098 to 0.0217)
X3	0,25 to 0,55 (0.0098 to 0.0217)

(continued)

Type	6-cylinder
Small end bushing seat ..... ∅ 1	40,987 to 41,013 (1.6137 to 1.6147)
Connecting rod bearing seat ..... ∅ 2	72,987 to 73,013 (2.8735 to 2.8745)
Small end bushing diameter:	
outside ..... ∅ 4	40,987 to 41,013 (1.6137 to 1.6147)
inside ..... ∅ 3	38,019 to 38,033 (1.4968 to 1.4974)
Connecting rod half-bearings supplied as spares ..... S	1,955 to 1,968 (0.0770 to 0.0775)
Connecting rod bushing - seat	-
Piston pin - bushing	0,013 to 0,033 (0.0005 to 0.0013)
Connecting rod half bearings	0,250 to 0,500 (0.0098 to 0.0197)
Measurement X	-
Maximum error on alignment of connecting rod axes ..... =	-
Main journals ..... ∅ 1	82,990 to 83,001 (3.2673 to 3.2677)
Crankpins ..... ∅ 2	68,987 to 69,013 (2.7160 to 2.7170)
Main journal half bearings S1	2,456 to 2,464 (0.0967 to 0.0970)
Connecting rod half bearings S2	1,955 to 1,968 (0.0770 to 0.0775)
Main bearings	
no. 1 - 5 ..... ∅ 3	87,982 to 88,008 (3.4639 to 3.4649)
no. 2 - 3 - 4 ..... ∅ 4	87,977 to 88,013 (3.4637 to 3.4651)
Half bearings - main journals	
no. 1 - 7	0,064 to 0,095 (0.0025 to 0.0037)
no. 2 - 3 - 4 - 5 - 6	0,059 to 0,100 (0.0023 to 0.0039)
Half bearings - crankpins	0,064 to 0,090 (0.0025 to 0.0035)
Main journal half bearings	+ 0,250 (+0.0098); + 0,500 (+0.0197)
Connecting rod half bearings	
Main journal for thrust X1	37,475 to 37,550 (1.4754 to 1.4783)
Main bearing for thrust X2	31,730 to 32,280 (1.2492 to 1.2709)
Semi-circular thrust washers X3	37,28 to 37,38 (1.4677 to 1.4717)
Crankshaft thrust	0,095 to 0,270 (0.0037 to 0.0106)
CYLINDER HEAD	
Valve guide bores in the cylinder head ..... ∅ 1	8,019 to 8,039 (0.3157 to 0.3165)
..... ∅ 2	-
Valve guides	
..... ∅ 3	-
Valve guides and bores in head	-
Valve guides	-

(continued)

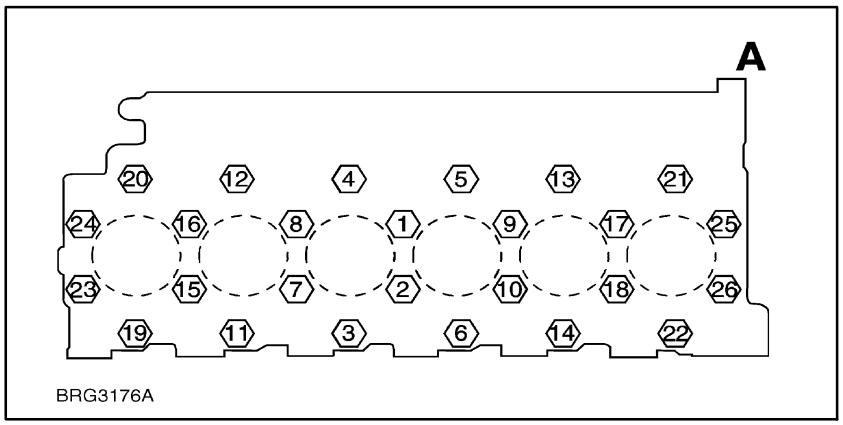
Type	6-cylinder
Valves:	
∅ 4	7,963 to 7,943 (0.3135 to 0.3127)
α	60°
∅ 4	7,963 to 7,943 (0.3135 to 0.3127)
α	45°
Valve stem and relative guide	0,052 to 0,092 (0.0020 to 0.0036)
Bore in head for valve seat:	46,987 to 47,013 (1.8499 to 1.8509)
Intake ∅ 1	43,637 to 43,663 (1.7180 to 1.7190)
Exhaust ∅ 1	
Valve seat outside diameter; angle of valve seats in cylinder head	
Intake ∅ 2	47,063 to 47,089 (1.8529 to 1.8539)
α	60°
Exhaust ∅ 2	47,713 to 43,739 (1.8785 to 1.7220)
α	45°
Recessing	
Intake X	0,356 to 1,102 (0.0140 to 0.0434)
Exhaust X	0,104 to 0,84 (0.0041 to 0.0315)
Between valve seat and head	
Intake	0,050 to 0,102 (0.0020 to 0.0040)
Exhaust	0,050 to 0,102 (0.0020 to 0.0040)
Valve seats >	-
Valve spring height:	-
free spring H	63,05 (2.4823)
under a load of:	
329 N H1	49,02 (1.9299)
641 N H2	38,20 (1.5039)
Injector protrusion X	not adjustable
Seats for camshaft bushings no. 1 - 7	59,222 to 59,248 (2.3316 to 2.3326)
Camshaft seats no. 2 - 3 - 4 - 5 - 6	54,089 to 54,140 (2.1295 to 2.1315)
Camshaft support journals	
1 ⇒ 5	
1 ⇒ 7	53,995 to 54,045
Camshaft bushing outside diameter: ∅	59,222 to 59,248 (2.3316 to 2.3326)
Bushing inside diameter: ∅	54,083 to 54,147 (2.1292 to 2.1318)
Bushings and seats in crankcase	-
Bushings and support journals	0,038 to 0,162 (0.0015 to 0.0064)
Useful cam lift: H	-
H	-
Tappet cap seat in crankcase ∅ 1	-
Tappet cap outside diameter:	
∅ 2	15,929 to 15,959 (0.6271 to 0.6283)
∅ 3	15,965 to 15,930 (0.6285 to 0.6272)
Between tappets and seats	0,025 to 0,070 (0.0010 to 0.0028)
Tappets	-
Rocker arm shaft ∅ 1	18,963 to 18,975 (0.7466 to 0.7470)
Rocker arms: ∅ 2	19,000 to 19,026 (0.7480 to 0.7491)
Between rocker arms and shafts	0,025 to 0,063 (0.0010 to 0.0025)

TIGHTENING TORQUES

PART	TORQUE	
	Nm (lb ft)	
Cooling nozzles (M 8x 1.25x 10)		15 ± 3 (11.0634 ± 2.2127)
Main bearings	1st Stage 2nd Stage 3rd Stage	50 ± 6 (36.8781 ± 4.4254) 80 ± 6 (59.0050 ± 4.4254) 90° ± 5°
Timing gear casing (M 8x 1.25x 40) (M 10x 1.5x 30)		 24 ± 4 (17.7015 ± 2.9502) 47 ± 5 (34.6654 ± 3.6878)
Oil pump (M 8x 1.25x 30)	1st Stage 2nd Stage	8 ± 1 (5.9005 ± 0.7376) 24 ± 4 (17.7015 ± 2.9502)
Big end cap bolts (M 11x 1.25)	1st Stage 2nd Stage 3rd Stage	30 ± 3 (22.1269 ± 2.2127) 60 ± 5 (44.2537 ± 3.6878) 60° ± 5°
Oil sump torque sequence Tightening Bolts Nº 31 & 34 M10 1.5x45 Tightening Bolts Nº 4-14; 17-27; 32-33 M10 1.5x90 Tightening Bolts Nº 1-3, 28-30 M10 1.5 x 125 Tightening Bolts Nº 15-16 M10 15 x 190		 50 ± 5 (36.8781 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878) 70 ± 5 (51.6293 ± 3.6878)
Fuel pump installation M8 Bolts M6 Bolts M6 Nuts		 24 ± 4 (17.7015 ± 2.9502) 10 ± 1 (7.3756 ± 0.7376 10 ± 1 (7.3756 ± 0.7376
Nuts securing fuel pump M 10x 1.5 . . for tightening	final torque	10 – 15 (7.3756 - 11.0634) 50 – 55 (36.8781 - 40.565)
Rocker arm / head fastening (M 8)		36 ± 4 (26.5522 ± 2.9502)
Rocker arm adjuster fastening (3/4 24)		24 ± 4 (17.7015 ± 2.9502)
Bolts securing cylinder head Step 1 (M 12x 1.75 10.9x 70) Step 2 Step 1 (M 12x 1.75 10.9x 140) Step 2 Step 3 Step 1 (M 12x 1.75 10.9x 180) Step 2 Step 3		 50 (35.71429) +90° 40 (28.57143) +90° +90° 70(50) +90° +90°
Rocker arm cover (M 8x 1.25x 25)		24 ± 4 (17.7015 ± 2.9502)
Intake manifold fastening (M 8x 1.25)		24 ± 4 (17.7015 ± 2.9502)
Air intake union assembly (M 8x 1.25)		24 ± 4 (17.7015 ± 2.9502)
Exhaust manifold torque sequence (M 10x 1.5x 65) (see figure 2)		43 ± 6 (31.7152 ± 4.4254)
Water pump fastening (M 8x 1.25x 25)	1st Stage 2nd Stage	24 ± 4 (17.7015 ± 2.9502) 43 ± 6 (31.7152 ± 4.4254)
Fan pulley fastening (M 6) (M10)		 10 ± 2 (7.3756 ± 1.4751) 43 ± 6 (31.7152 ± 4.4254)
Fan mounting fastening (M10)		33 ± 5 (24.3395 ± 3.6878)

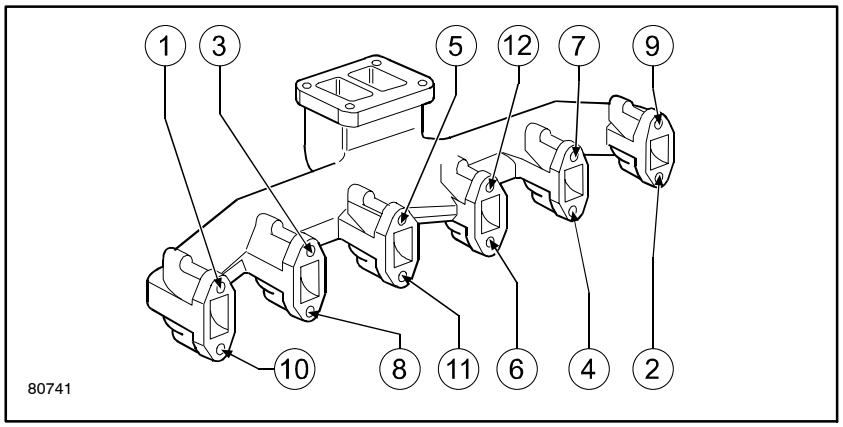
PART	TORQUE	
	Nm (lb ft)	
Lifting bracket fastening (M 12x 1.75x 25) . . . . . . (M 10)		 7 ± 12 (5.1629 ± 8.8507) 43 ± 5 (31.7152 ± 3.6878)
Crankshaft pulley (M 12x 1.75x 10.9)		110 ± 5 (81.1318 ± 3.6878)
Flywheel / crankshaft fastening (M 12x 1.25)	1st Stage	85 ± 10 (62.6928 ± 7.3756)
Injector / cylinder head fastening		24 ± 4 (17.7015 ± 2.9502)
Fuel priming pump fastening		24 ± 4 (17.7015 ± 2.9502)
Turbo-blower / exhaust manifold fastening (M 10)		43 ± 6 (31.7152 ± 4.4254)
Lubrication piping / turbo-blower fastening (M 12x 1.5)		35 ± 5 (25.8147 ± 3.6878)
Timing gear fastening (M8 1.25x 20)		36 ± 4 (26.5522 ± 2.9502)
Camshaft thrust plate fastening (M8 1.25x 20)		24 ± 4 (17.7015 ± 2.9502)
Phonic wheel fastening (M12 1.25)	1st Stage 2nd Stage	50 ± 5 (36.8781 ± 3.6878) 90° ± 5°

Tightening sequence for cylinder head bolts



1

Tightening sequence for exhaust manifold bolts

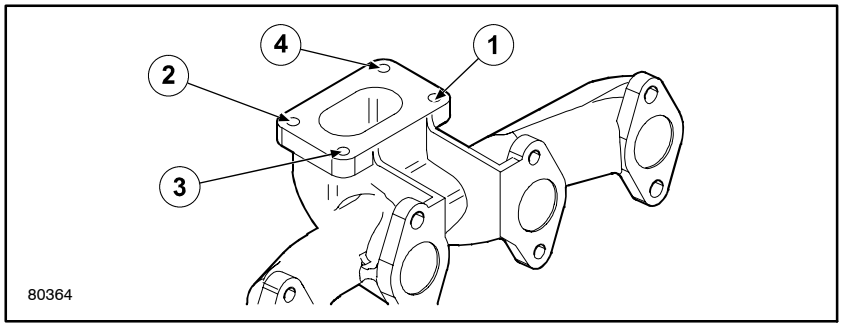


2

Tightening sequence for turbocharger nuts and bolts

Sequence:

- Pre-tightening 4-3-1-2
- Tightening 1-4-2-3



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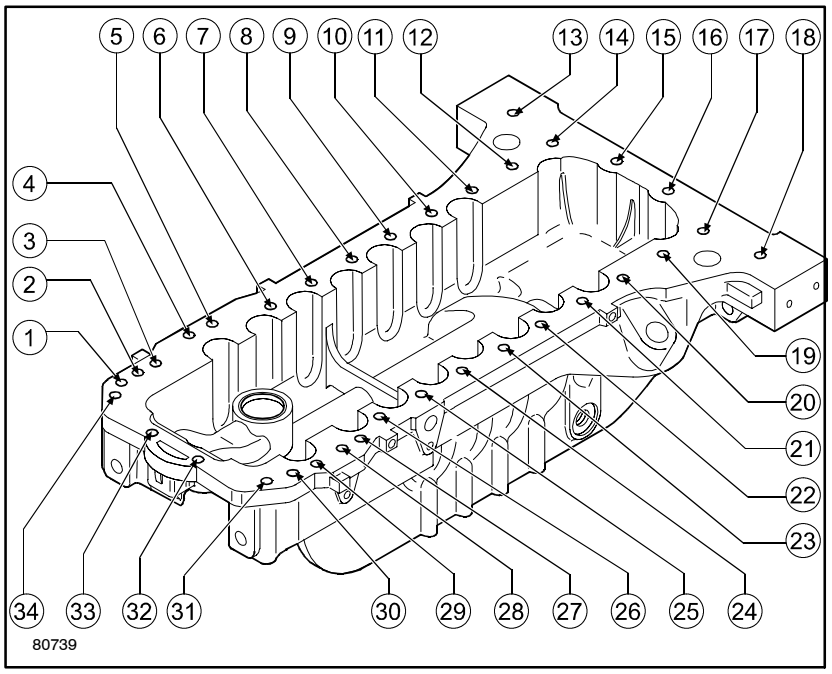
Tightening sequence for engine oil sump bolts



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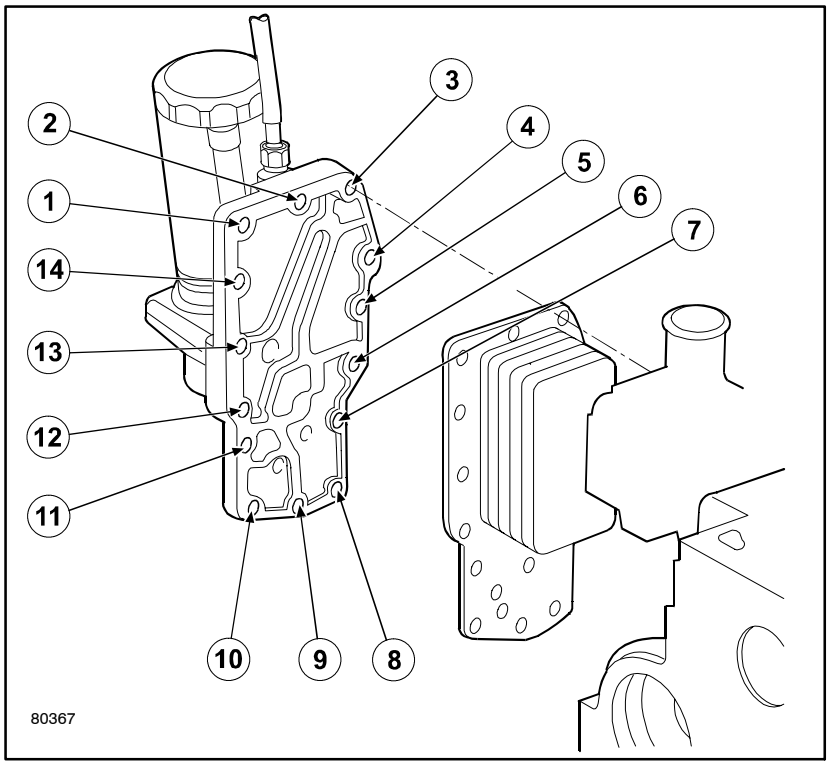
Tightening sequence for cooler bolts



5

SPECIAL TOOLS

No. TOOL	NAME
380000979	Puller for engine injection pump union gear
380000228	Dial gauge for injection pump timing (use with adaptor 3800001601)
380001601	Adaptor for injection pump timing (use with dial gauge 380000228)
380000665	Tool to extract crankshaft front seal
380000663	Tool to extract crankshaft rear seal
380000671	Injector extractor
380000666	Splining tool for fitting front seals on crankshaft
380000664	Splining tool for fitting rear seal on crankshaft
380000988	Plate for engine flywheel rotation tool with engine timing pin (use with 380000732)
380000732	Tool for engine flywheel rotation (use with 380000988)
380000667	Drift for camshaft bushing disassembly and reassembly
380000158	Torque screwdriver for injector solenoid valve connector nut setting
380001003	Complete square to check for connecting rod distortion
380000301	Engine stand (revolving)
380001298	Engine stand to Cylinder block brackets
380001073	Engine lifting brackets

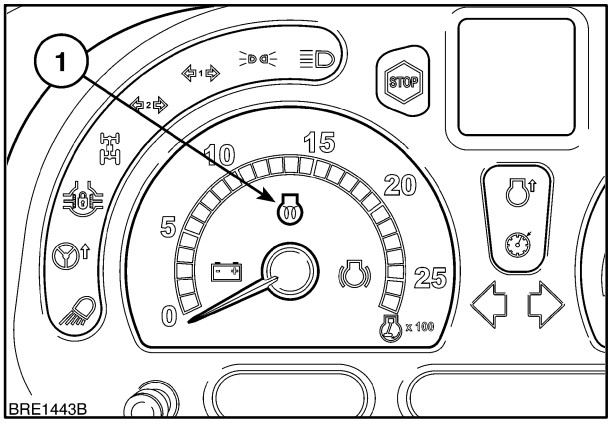
DESCRIPTION OF OPERATION

MECHANICAL GRID HEATER OPERATION

The grid heater, which is effective in ambient temperatures down to -18° C (0° F), consists of a heating element installed in the intake manifold. Operation of the grid heater is automatic when the the engine coolant temperature falls to 0° (32° F) on 100 and 115 models or -3° C (26.6° F) on110, 125 and 135 models.

Turning the key-start switch to position 4 (ON) will activate the grid heater raising the temperature of the indrawn air prior to it being drawn into the combustion chamber. The engine should be cranked when the grid heater warning lamp is extinguished. The cold start warning light (1) will illuminate to confirm operation.

For the mechanical engines, the grid heater is activated by the grid heater control module, which must detect a resistance between 6.4 and 30.4 ohms at the engine temperature sensor, which will equate to the coolant temperature being below 0 to -3°C (32 to 26.6°F) approximately.

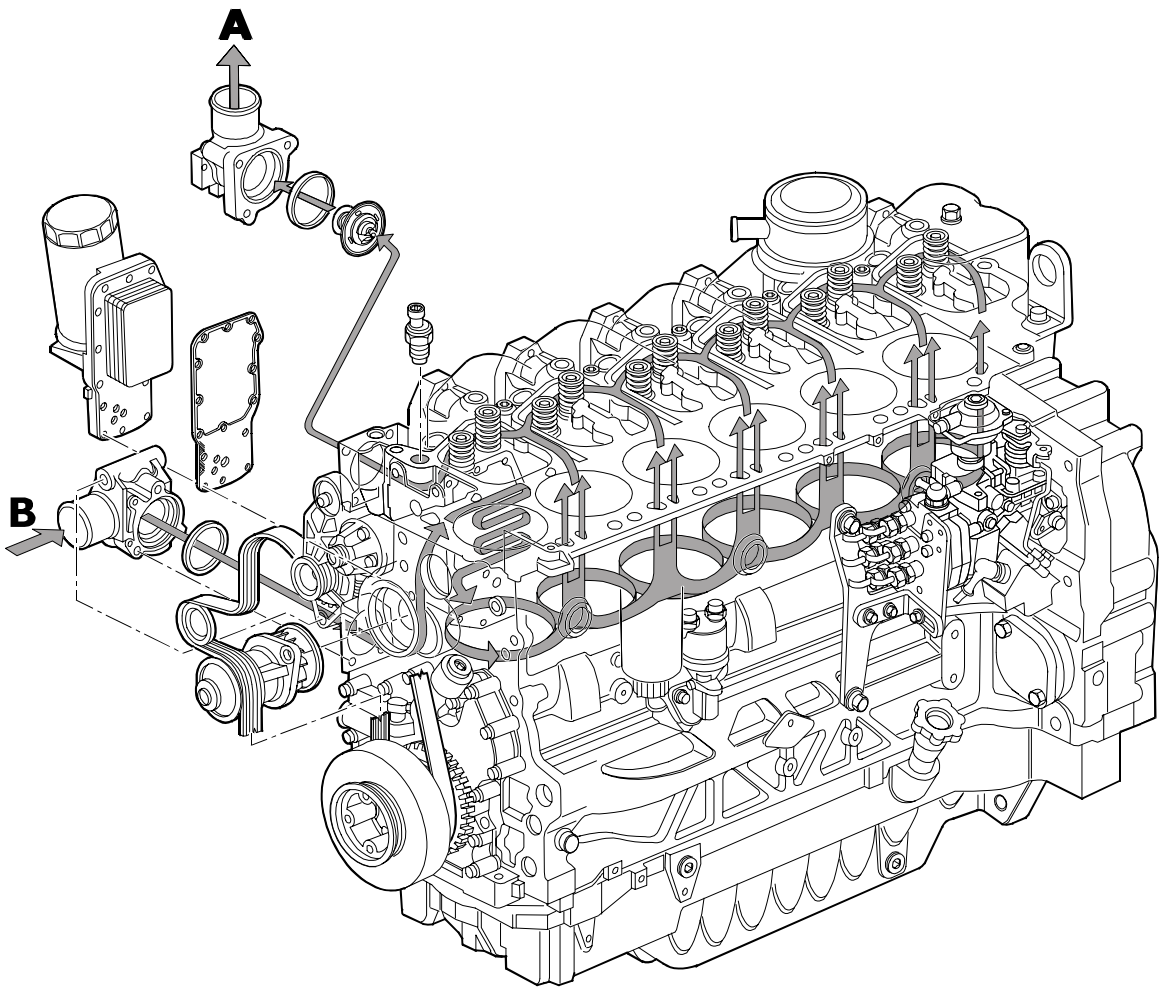


6

COOLING

The forced circulation, closed-circuit engine cooling system is composed of the following components:

- Expansion tank: its location, shape and size may change depending on the engine version.
- Radiator, whose job is to dissipate the heat taken by the coolant from the engine. This component, too, is a feature of the version as regards both positioning and engine.
- Viscostatic fan, with the task of increasing the radiator's dissipating capacity: this, too, belongs to the specific engine version.
- A lubricating oil cooler: this, too, belongs to the specific engine version.
- A centrifugal coolant pump housed at the front of the crankcase.
- A thermostat governing coolant circulation.
- The circuit may also extend to the compressor if the version includes it.



80734 A = To the radiator
B = From the radiator

COOLING SYSTEM DIAGRAM

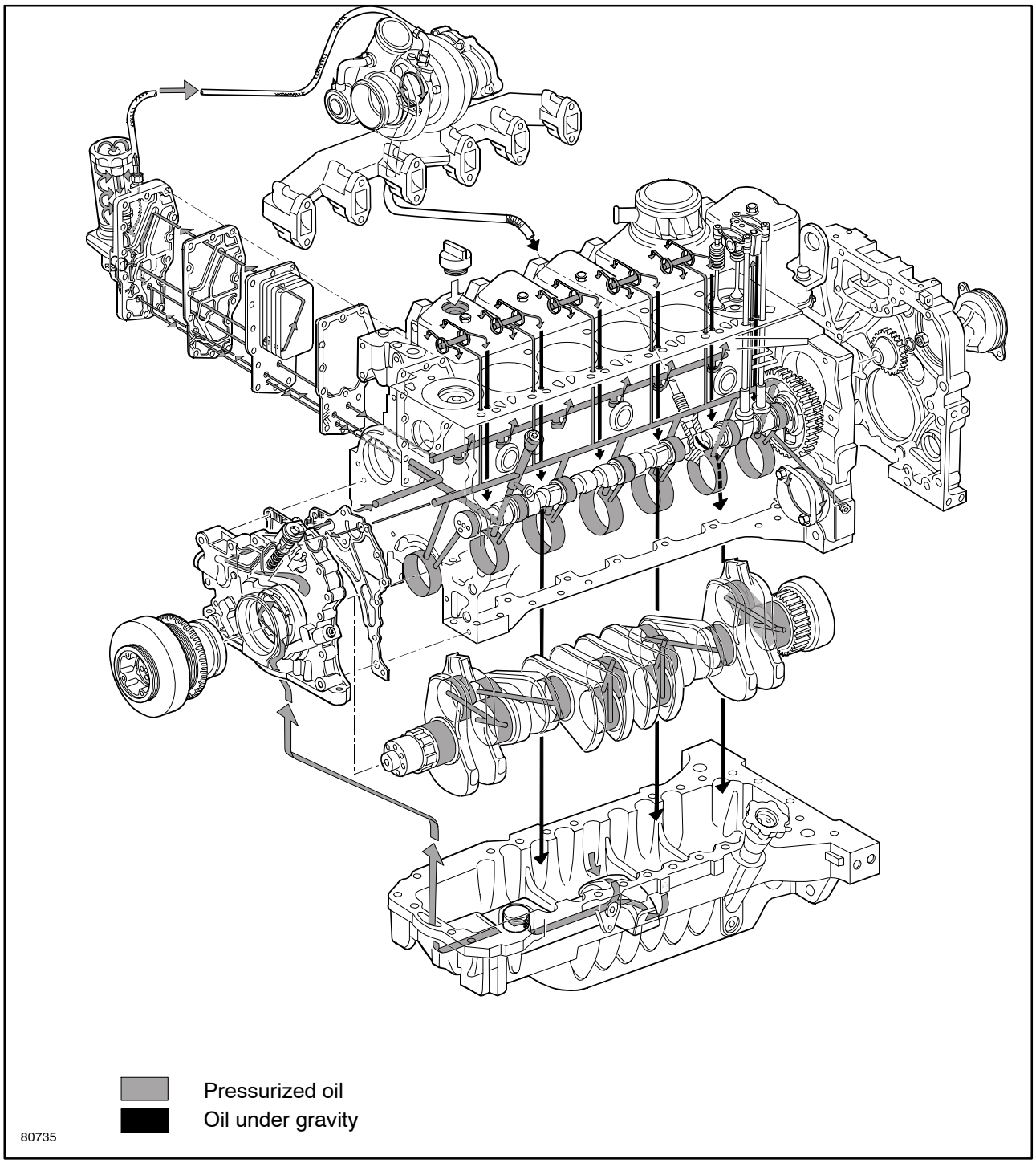
LUBRICATION

Forced-circulation lubrication is accomplished by the oil pump, housed at the front of the crankcase.

The lubricating oil is sent from the oil sump to the crankshaft, camshaft and valve control.

Lubrication also includes the cooler, turbo-blower and compressor for the compressed air system if there is one.

All these components often change according to use and will therefore be covered under the specific heading.



OVERHAUL

ENGINE

For any topics that are not covered here, please refer to the 4-cylinder mechanical engine, Section 10, Chapter 3.

CHECKS, REPAIRS, DIMENSIONS AND ADJUSTMENTS

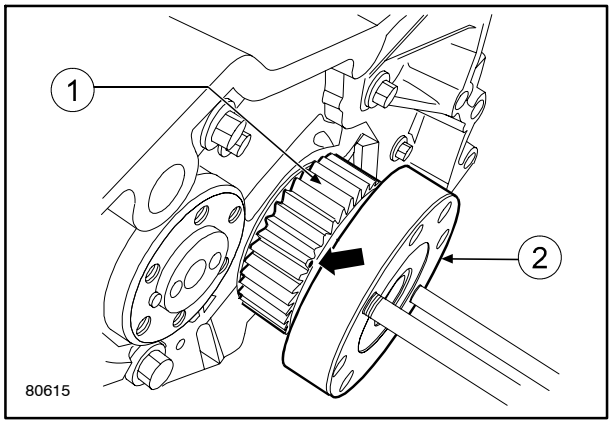
CAMSHAFT TIMING OPERATIONS

NOTE: *For any topics that are not covered here, please refer to the 4-cylinder engine FACE0484B.*

1. Use a marker pen to mark the tooth of the driving gear (1) mounted on the crankshaft (2) on the side of which the reference mark (→) is stamped for timing.

⚠ CAUTION ⚠

Screw in two pins to help in the operation of turning the crankshaft.



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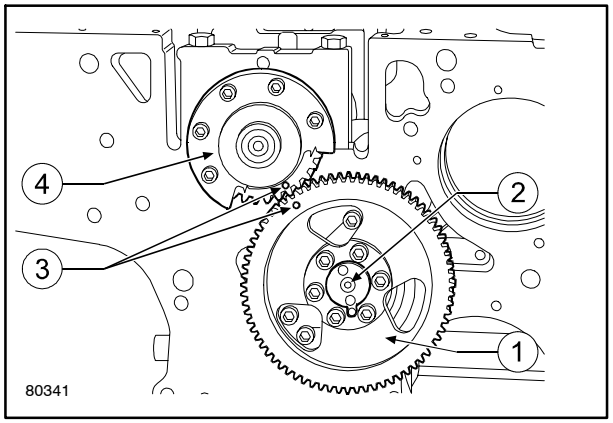
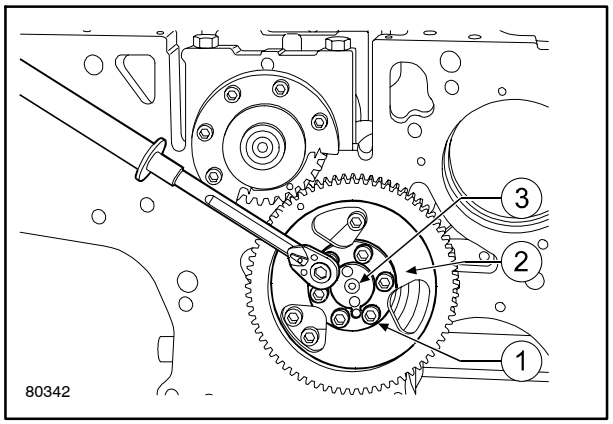
2. Direct the crankshaft (4) and camshaft (2) so that when mounting the driven gear (1) on the camshaft, the marks stamped on the gears (3) coincide.



10

3. Screw down the bolts (1) securing the gear (2) to the camshaft (3) and tighten to the prescribed torque.



11

FITTING THE CYLINDER HEAD

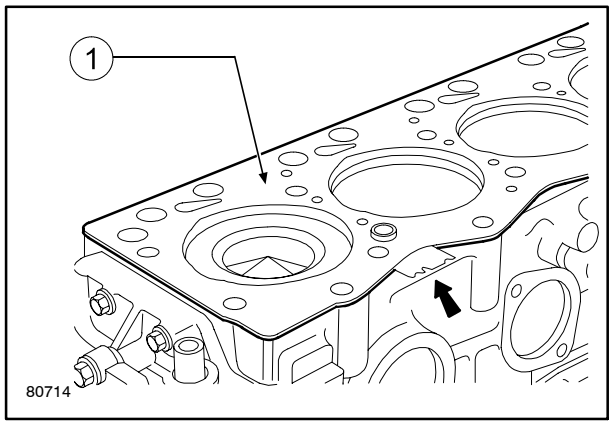
4. Position the gasket (1) on the engine block. The thickness of the gasket must be chosen according to the measured piston protrusion over the top face of the crankcase. The gasket is available in 2 thicknesses, 1.15mm and 1.25mm, select the correct one depending on the piston protrusion dimension.

⚠ CAUTION ⚠

Check that the mating surface of the engine block is clean. Do not grease the gasket.

It is recommended to keep the gasket in its wrapping until the head is to be fitted on.

The gasket must be fitted so that the writing stamped on it can be read, as shown.

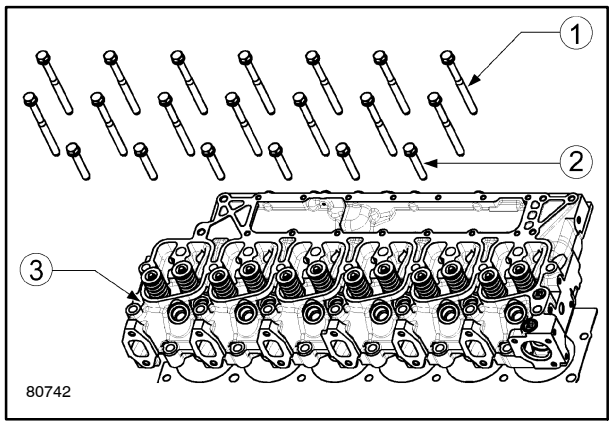


12

5. Place the head (3) on the engine block and insert the bolts (1) and (2).

⚠ CAUTION ⚠

If the valves have been removed from the head, it is necessary to fit them before assembling the head on the engine block.



13

6. Lubricate the bolts and fit them on the cylinder head.
7. The bolts must be tightened following a "stitching" pattern, starting from the middle bolts and moving outwards.

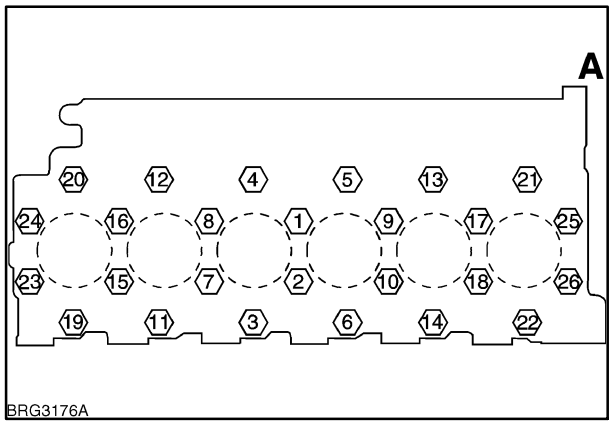
   1st stage of tightening with a torque wrench:

M12 x 1.75 x 70 bolt: (ref.3-6-11-14-19-22)	50 Nm (35.71429 lbf)
M12 x 1.75 x 140 bolt: (ref.1-2-7-8-9-10-15-16-17-18-23-24-25-26)	40 Nm (28.57143 lbf)
M12 x 1.75 x 180 bolt: (ref. 4-5-12-13-20-21)	70 Nm (50 lbf)

   2nd stage tightening to an angle of 90° for all the screws

   3rd stage additional tightening to an angle of 90° for 140 and 180 mm long bolts only.

   A = fan side



14

REPAIRS - CYLINDER BLOCK

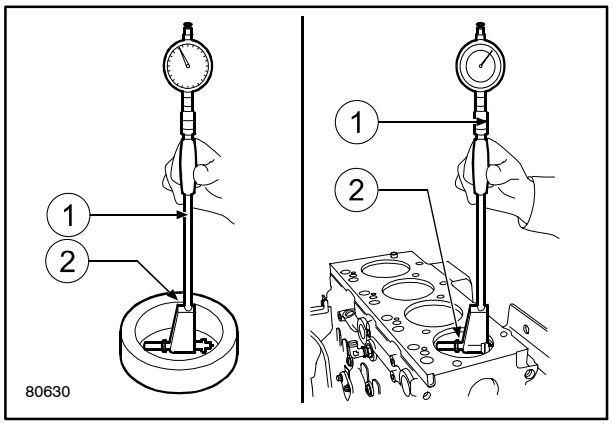
Checks and Measurements

8. After disassembling the engine, thoroughly clean the cylinder-crankcase assembly. Use the appropriate rings for transporting the cylinder assembly.
9. Carefully check the crankcase is not cracked.
10. Check the condition of the plugs. If they are rusty or if there is the slightest doubt about their seal, change them.
11. Examine the surfaces of the cylinder liners; they should show no sign of enlargement, scoring, ovality, taper or excessive wear.
12. To check the internal diameter of the cylinder liners for ovality, taper and wear, use a bore gauge (1), fitted with a dial gauge zero-set on the ring gauge (2) of the diameter of the cylinder liner.

⚠ CAUTION ⚠

If the ring gauge is not available, use a micrometer.

13. Measurements must be taken for each single cylinder at three different heights on the liner and on two perpendicular faces: one parallel to the longitudinal axis of the engine and the other perpendicular; maximum wear is generally found on this face in correspondence with the first measurement.
14. If ovality, taper or general wear is noted, bore and recondition the cylinder liners. The cylinder liners must be reground in relation to the diameter of the pistons supplied as spare parts oversized by 0.5 mm (0.0197 in.) over the nominal value and to the prescribed assembly clearance.



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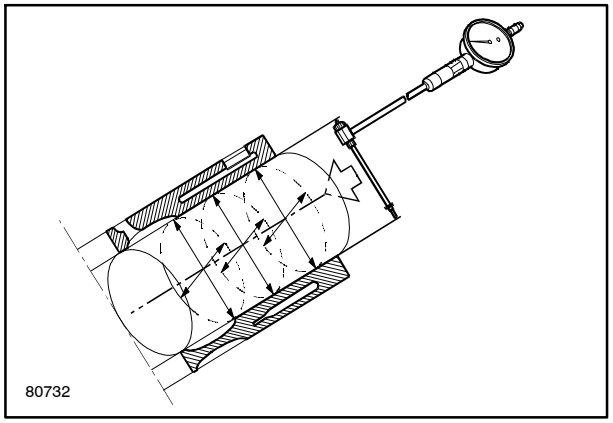

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CAUTION

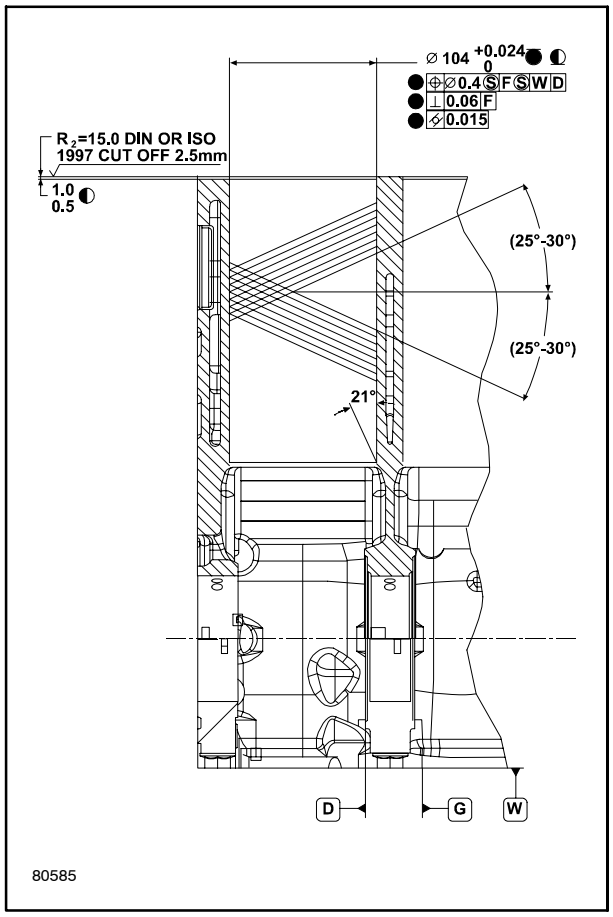
If regrinding, all the liners must have the same oversize (0.5 mm (0.0197 in.)).

15. Check the main bearing seats, proceeding as follows:
    - fit the main bearing caps on the supports without bearings;
    - tighten the retaining bolts to the prescribed torque;
    - using an appropriate dial gauge for interiors, check that the diameter of the seats is as prescribed.

If the measurement is any greater, change the crankcase.

Cylinder Head Mating Surface Check

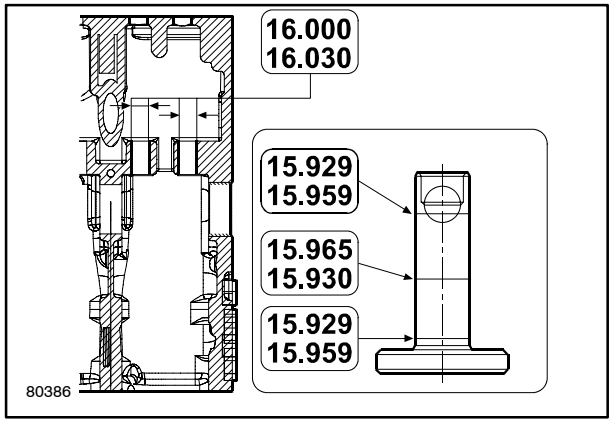
16. After having located any deformed areas, level off the mating surface using a grinding machine.
17. The flatness error must be no greater than 0.075 mm (0.0295 in.). Check the condition of the cylinder block plugs (1); if they are rusty or if there is the slightest doubt about their seal, change them.



17

Tappets

Tappets and bores on cylinder block data.



18

CRANKSHAFT

Main and Connecting Rod Journal Dimensions

18. If any sign of seizure, scoring or ovality is found on the main journals or crankpins, they must be reground. Before reconditioning the pins (2), use a micrometer (1) to measure the pins of the shaft to define the diameter to which the pins must be reduced.

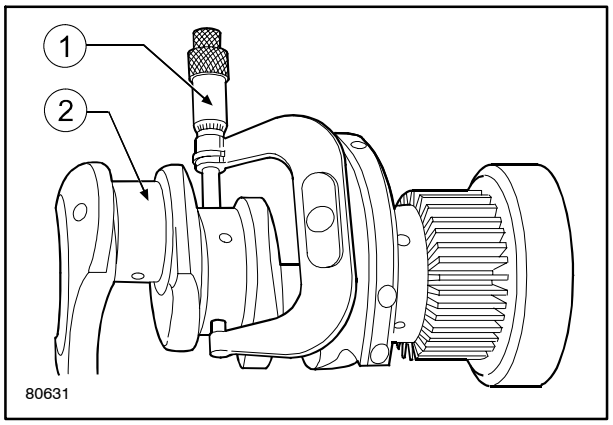
⚠ CAUTION ⚠

It is advisable to note the values on a chart shown in figure 30.

The undersize classes are: 0.250 – 0.500 mm (0.0098 - 0.0197 in.)

⚠ CAUTION ⚠

The main journals and crankpins must always be reconditioned to the same undersize class. After undersizing, mark the main journal and the crankpin with a stamp on the side of the crank No. 1.



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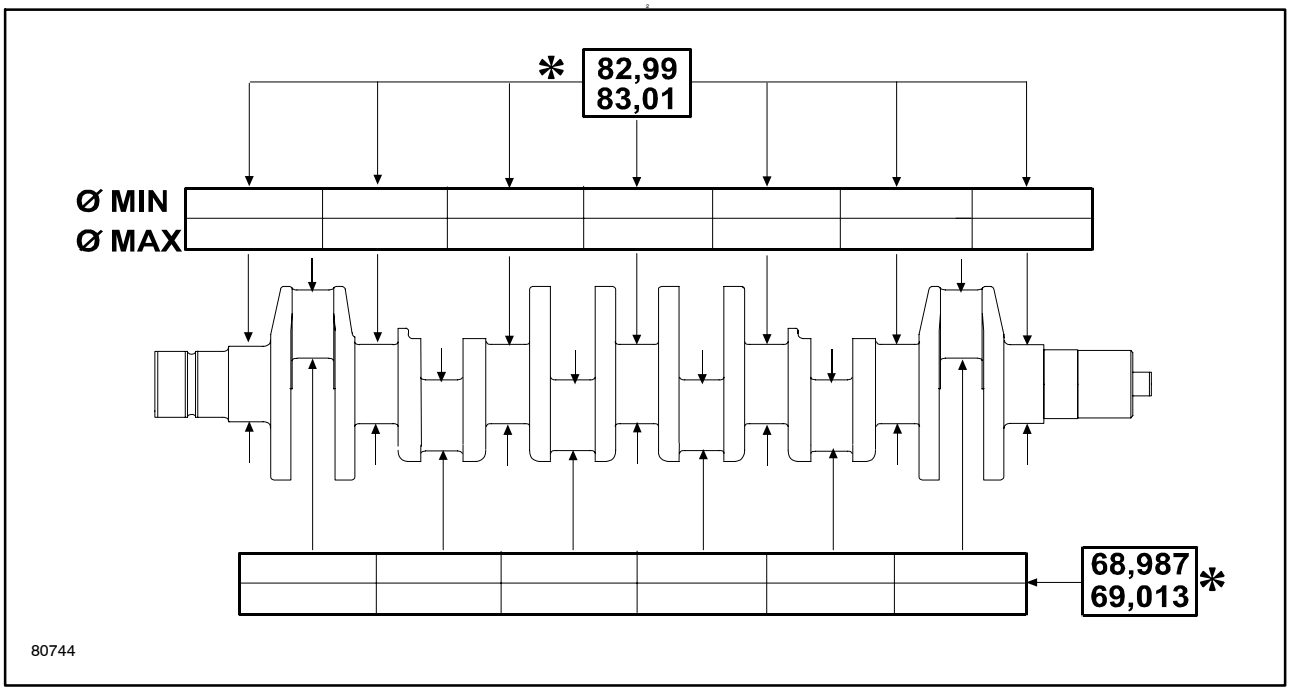

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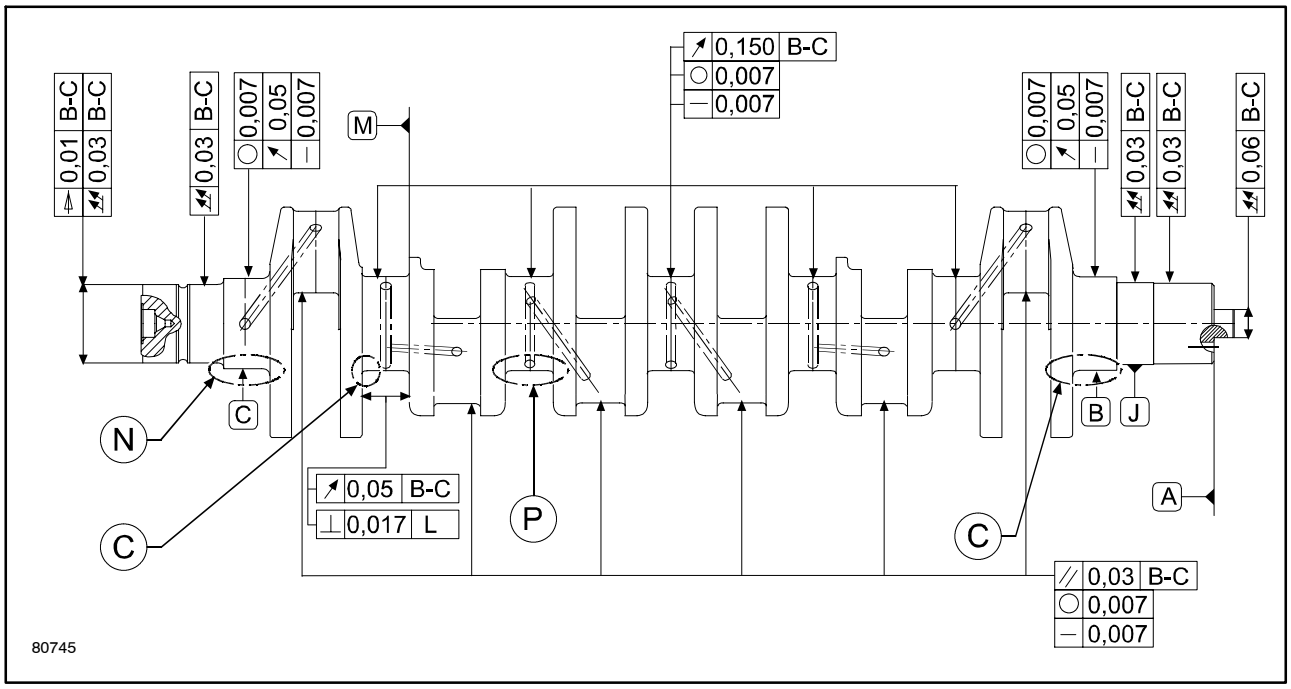
NOTE THE CRANKSHAFT MAIN JOURNAL AND CRANKPIN MEASUREMENTS ON THE TABLE
* Nominal value



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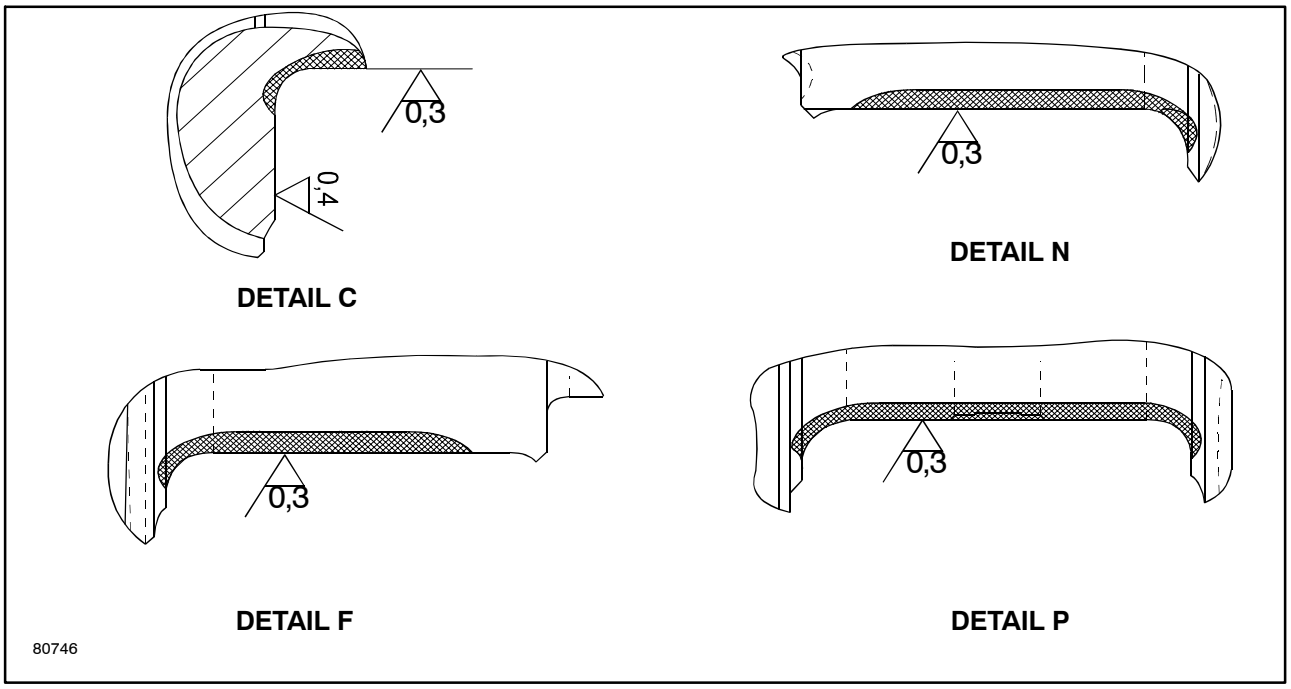
MAIN CRANKSHAFT TOLERANCES

TOLERANCES	CHARACTERISTIC SUBJECT OF TOLERANCE	GRAPHIC SYMBOL
SHAPE	Circularity	○
	Cilindricity	/○/
ORIENTATION	Parallelism	//
	Perpendicularity	⊥
	Straightness	—
POSITION	Concentricity or coaxiality	◎
OSCILLATION	Circular oscillation	↗
	Total oscillation	⌰
	Taper	⌯

CLASS OF IMPORTANCE ASSIGNED TO PRODUCT CHARACTERISTICS	GRAPHIC SYMBOL
CRITICAL	●
IMPORTANT	◐
SECONDARY	△



DETAIL C

DETAIL N

DETAIL F

DETAIL P

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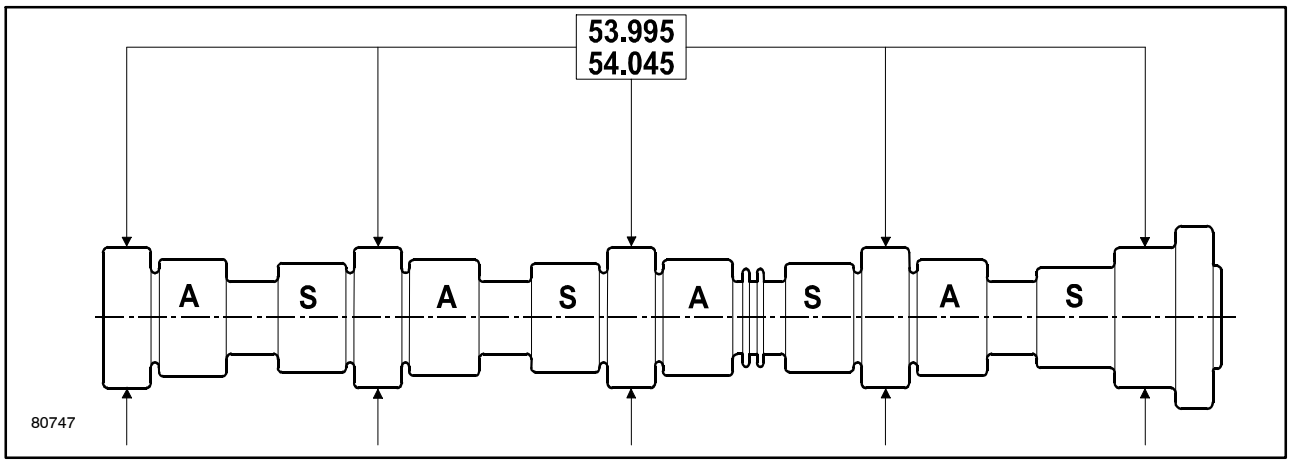
TIMING SYSTEM

Camshaft



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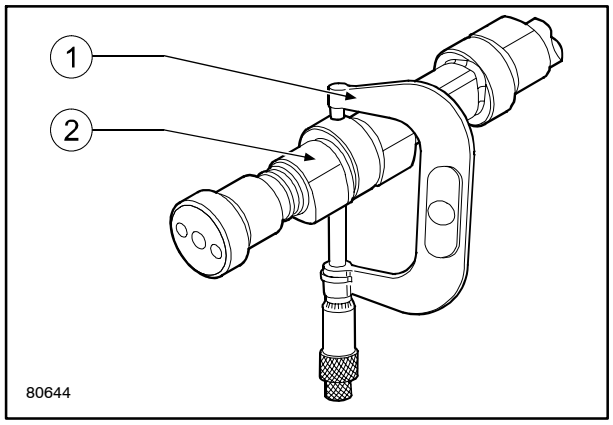
CAMSHAFT DATA

The data given refer to the normal pin diameter

19. The support journal surfaces on the shaft and cams must be finely honed; if there are signs of seizing or scoring, replace the shaft and relative bushings.

Checking Cam Lift and Pin Alignment

20. Set the shaft on tailstocks and, using a dial gauge with a 1/100 mm scale placed on the central support, check that the alignment error is no greater than 0.04 mm (0.0016 in.); change the shaft if it is. In addition, check the cam lift: it must be 6.045 mm (0.2380 in.) for the exhaust cams and 7.582 mm (0.2985 in.) for the intake ones; change the shaft if the measurements are any different.
21. Check the diameter of the supporting pins of the camshaft (2) with the micrometer (1) on two perpendicular axis.



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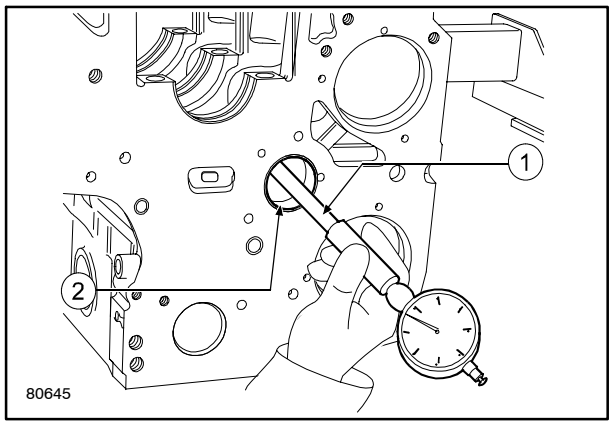
BUSHINGS

22. The camshaft bushing (2) must have been forced into its seat.
23. The internal surfaces must show no sign of seizure or wear.
24. Using the bore meter (1), measure the diameter of the rear bushing (2) and of the intermediate seats for the camshaft.
25. Measurements must be made on two perpendicular axis.



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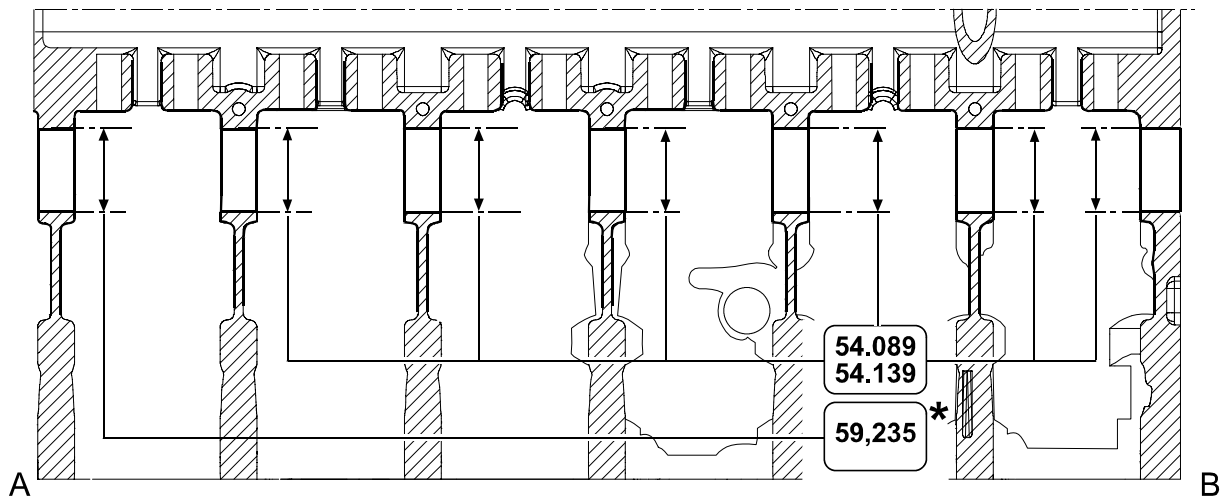

A = REAR FACE
B = FRONT FACE
* Fitting bushing on crankcase

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26

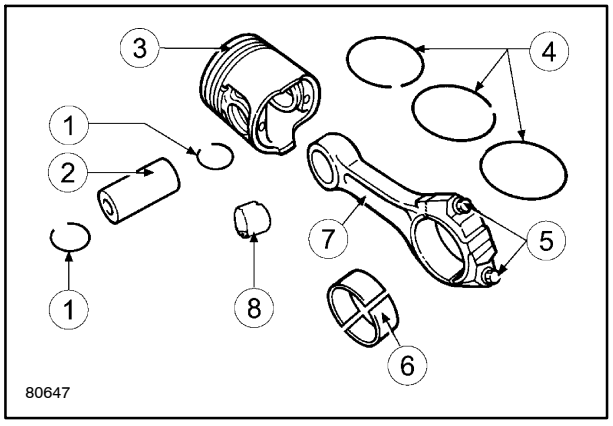
CAMSHAFT BUSHING AND RELEVANT SEAT DATA (4 cylinders)
* Measured with bushings installed

CONNECTING ROD-PISTON ASSEMBLY

Connecting rod-piston component parts
1. Retaining rings – 2. Pin – 3. Piston – 4. Piston rings – 5. Screws – 6. Half bearings – 7. Connecting rod – 8. Bushing

⚠ CAUTION ⚠

The pistons are supplied as spare parts oversized by 0.5 mm (0.0197 in.).



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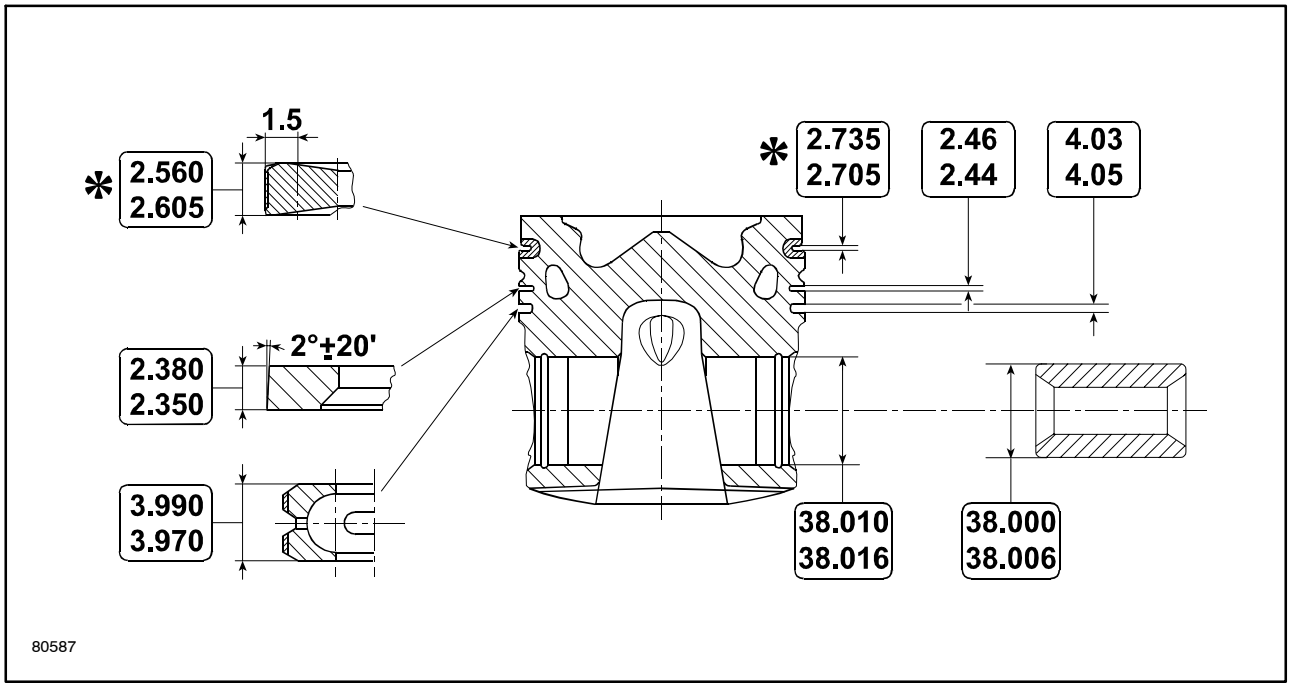


28

MONDIAL PISTON, PIN AND RING DATA
* Measurement obtained on a diameter of 92 mm (3.6220 in.)

Connecting Rods

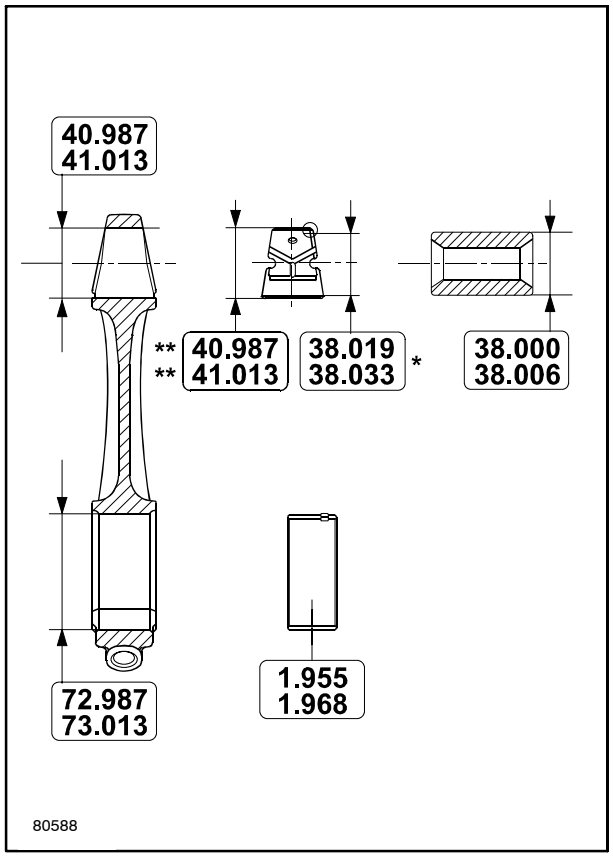
CONNECTING ROD, PISTON PIN BUSHING AND HALF BEARING DATA

* Inside diameter to be measured after installing in the small end and regrinding with a reamer.

** Cannot be measured free.

⚠ CAUTION ⚠

The connecting rod – connecting rod cap mating surfaces are knurled for a better coupling. It is therefore recommended not to remove the knurling. The rods are manufactured using a fracture breaking technique making each rod and cap unique and having only one way of installation.



29

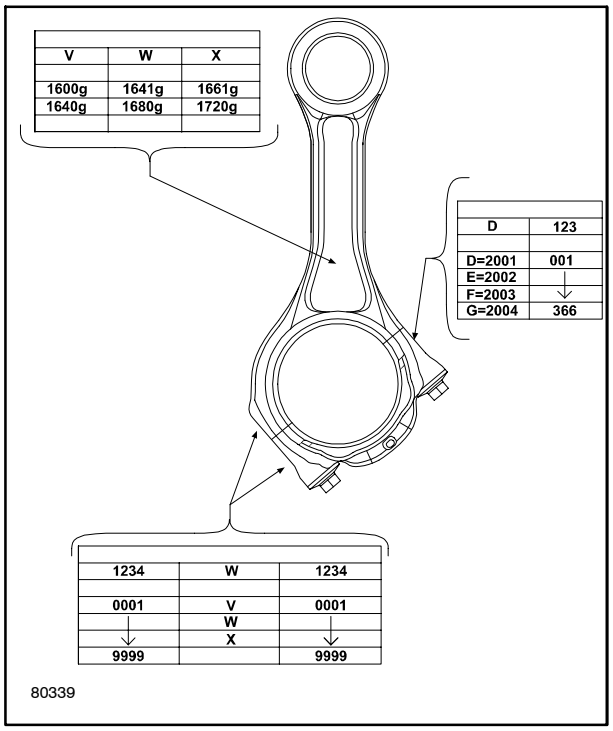
CAUTION

Each connecting rod is marked:

- On the body and cap with a number indicating their coupling and the cylinder in which it is mounted. In the event of replacement, number the new rod with the same number as the replaced connecting rod.
- On the body of the connecting rod with a letter indicating the weight class of the connecting rod mounted in production:
  - V, 1600 to 1640 (3.5274 to 3.6156 lb) (marked in yellow);
  - V, 1641 to 1680 (3.6178 to 3.7038 lb) (marked in green);
  - V, 1681 to 1720 (3.7060 to 3.7920 lb) (marked in blue);

Connecting rods are supplied as spare parts in class W and marked in green*.

Removing material is not permissible.



30

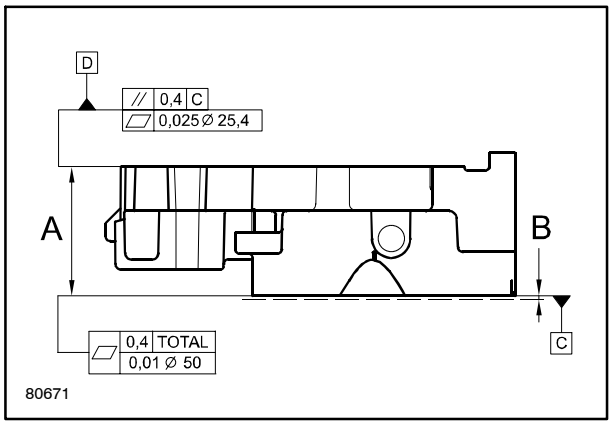
Bushings

26. Check that the bushing in the small end has not come loose and shows no sign of scoring or seizure. If this is not so, change it.
27. Disassembly and assembly are performed with a suitable drift.
28. When driving in, make sure that the oilways in the bushing and small end coincide. Using a boring machine, regrind the bushing to obtain the prescribed diameter.

CYLINDER HEAD

Cylinder Head Mating Surface Check

29. The deformation measured on the full length of the cylinder head must be no greater than 0.20 mm.
30. If it is any higher, regrind the cylinder head according to the dimensions and warnings.
31. The nominal thickness A of the cylinder head is 95 ± 0.25 mm (3.7402 ± 0.0098 in.) the maximum permissible amount of metal removed must not exceed the thickness B of 0.13 mm (0.0051 in.).



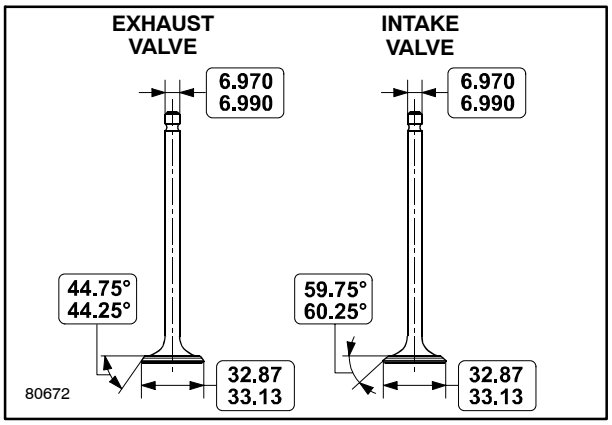
31

CAUTION

After regrinding, check the valve recessing and if necessary regrind the valve seats to obtain the prescribed valve recessing.

Valves

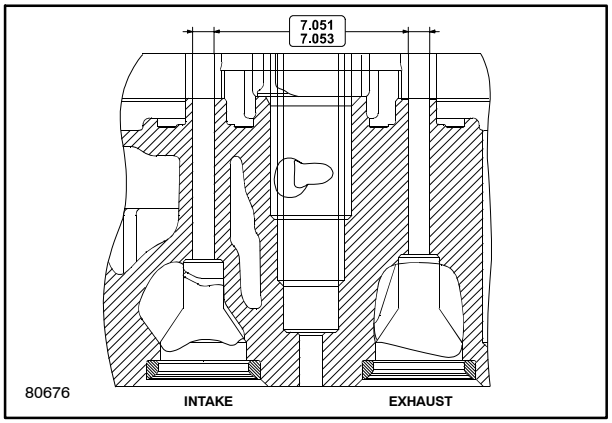
INTAKE AND EXHAUST VALVE DATA



32

Valve Guides

32. Using a bore gauge, measure the inside diameter of the valve guides; it must be as indicated.

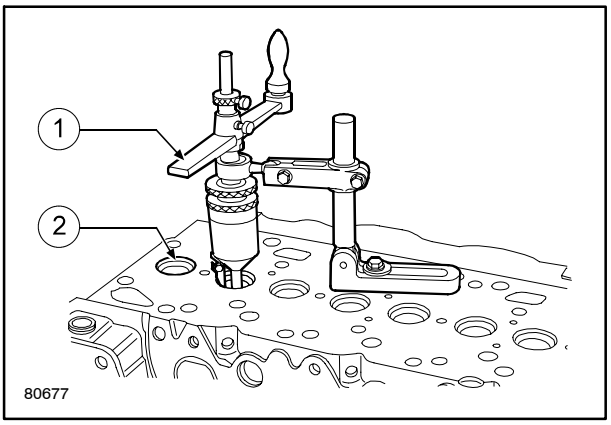


33

Valve Seats

Regrinding – Replacing Valve Seats

33. Check the valve seats (2). On finding any slight scoring or burns, regrind using a suitable valve grinding tool (1) according to the angles indicated.



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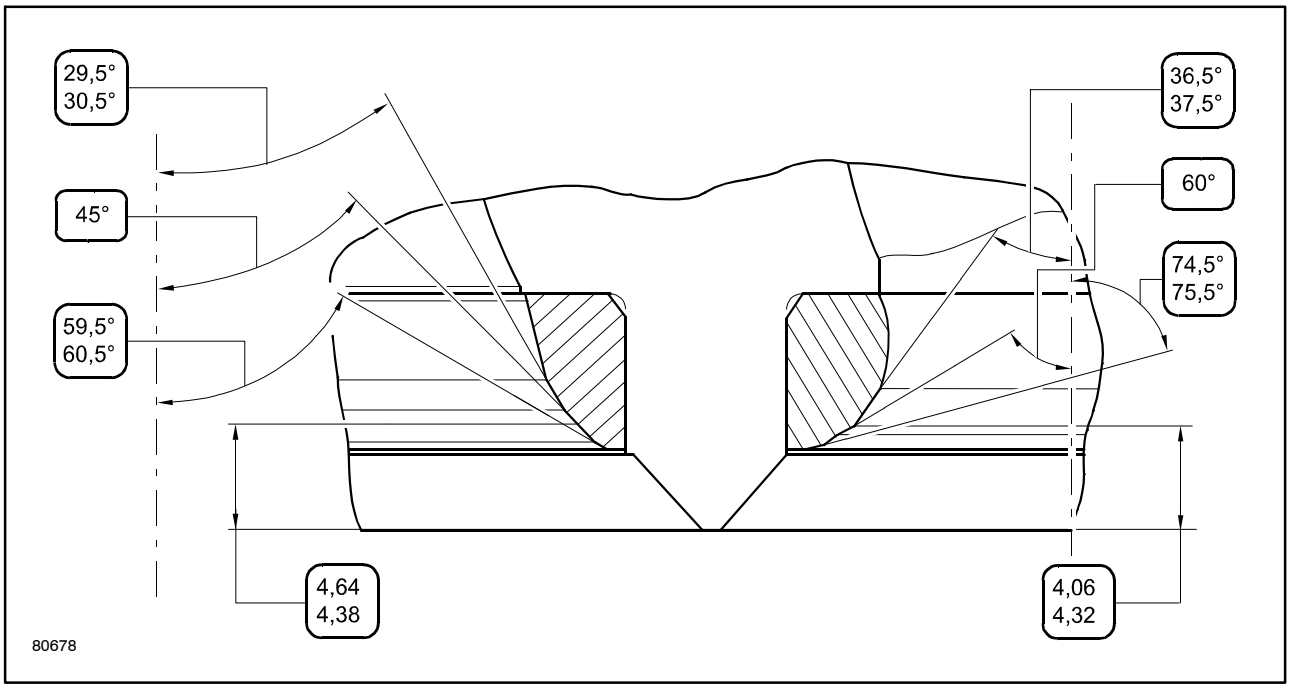


35

VALVE SEAT DATA

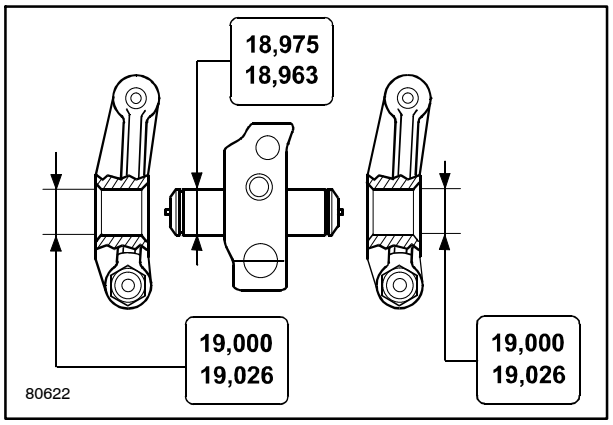
34. If the valve seats cannot be reconditioned by just regrinding, they can be replaced with the ones supplied as spare parts. Using the same tool 99305018 (1, Figure 34) and taking care not to nick the cylinder head, remove as much material as possible from the valve seats until it is possible to extract them from the cylinder head with the aid of a punch.
Heat the cylinder head to 80° to 100 °C (176° to 212 °F) and, using a suitable drift, insert the new valve seats, previously cooled.
Then, using tool 99305018, regrind the valve seats according to the values given in Figure 35.

Rocker Arm–Spindle

NOTE: *The check and adjustment are made only after fitting the cylinder head on the crankcase and mounting the camshaft.*

ROCKER ARM - SPINDLE DATA

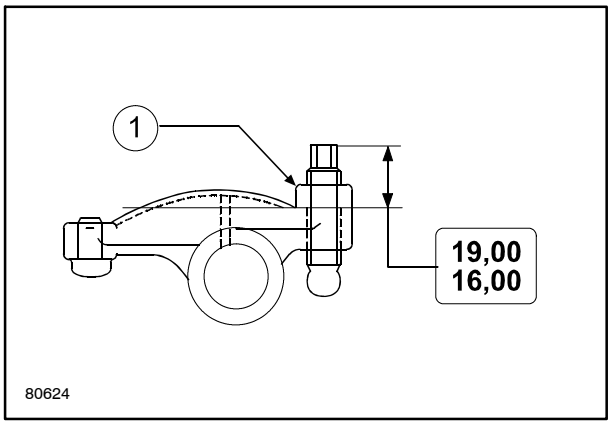
Check the mating surfaces of the mounting and spindle: there must be no sign of any damage or excess wear. Replace if necessary.



36

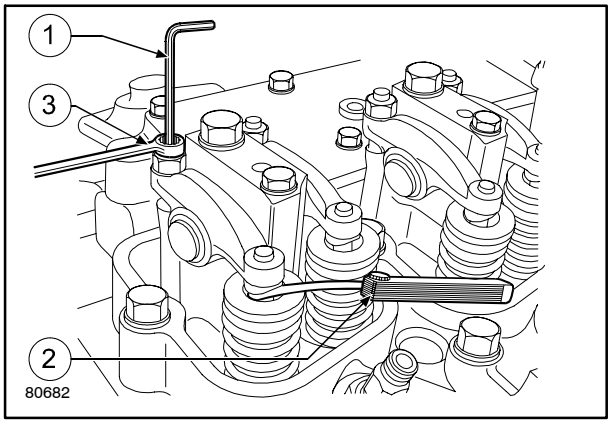
ROCKER ARM ADJUSTMENT SCREW DATA

35. If removed, check the adjustment.
Tighten the nut (1) to a torque of 0.25 – 0.75 Nm (0.1844 - 0.5532 lb ft)



37

36. Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).
37. The working clearance should be:
    - intake valves 0.25 ± 0.05 mm (0.0098 ± 0.0020 in.)
    - exhaust valves 0.51 ± 0.05 mm (0.0201 ± 0.0020 in.)



38

CAUTION

To adjust the rocker arm – valve working clearance more quickly, proceed as follows:
turn the crankshaft, balance the valves of cylinder n° 1 and adjust the valves marked with an asterisk as indicated in the table:

no cylinder	1	2	3	4	5	6
intake	*	*	-	*	-	-
exhaust	*	-	*	-	*	-

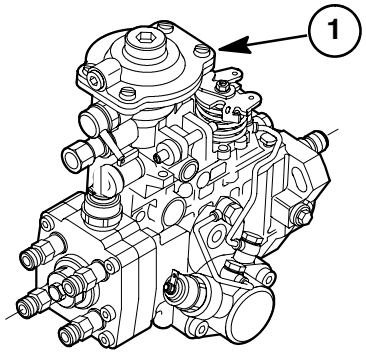
Turn the crankshaft, balance the valves on cylinder n° 4 and adjust the valves marked with an asterisk as shown in the diagram:

no cylinder	1	2	3	4	5	6
intake	-	-	*	-	*	*
exhaust	-	*	-	*	-	*

BOSCH ROTARY FUEL INJECTION PUMP

Manifold Pressure Compensator (LDA)

The fuel injection system on TS100A and TS115A (Plus/Deluxe models) turbocharged diesel engines includes a manifold pressure compensator (LDA). The LDA (1), mounted on top of the fuel injection pump, reacts to the changing air pressure in the intake manifold generated by the exhaust gas turbocharger, and adapts the full-load delivery to the air pressure accordingly.

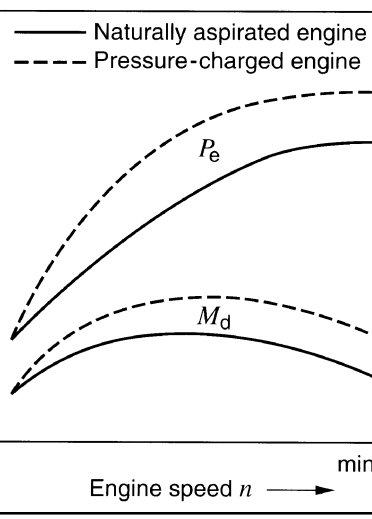


39

Description

The top portion of the LDA incorporates the air pressure connection and the vent bore. Internally, the LDA contains two separate airtight chambers divided by a diaphragm. A compression spring applies pressure on the diaphragm to match the LDA response point to the air pressure of the turbocharger. The opposite end of the spring contains an adjusting nut, which sets spring pre-load. The diaphragm connects to a tapered sliding pin. A guide pin transfers the movement of the sliding pin to a reverse lever, which in turn changes the setting of the full-load stop. An adjusting screw at the top of the LDA allows for the initial setting of the diaphragm and the sliding pin.

IMPORTANT: *The LDA is adjusted and set by Bosch. If the LDA requires any type of adjustment, the injection pump with the LDA must be brought to an authorized Bosch specialist.*



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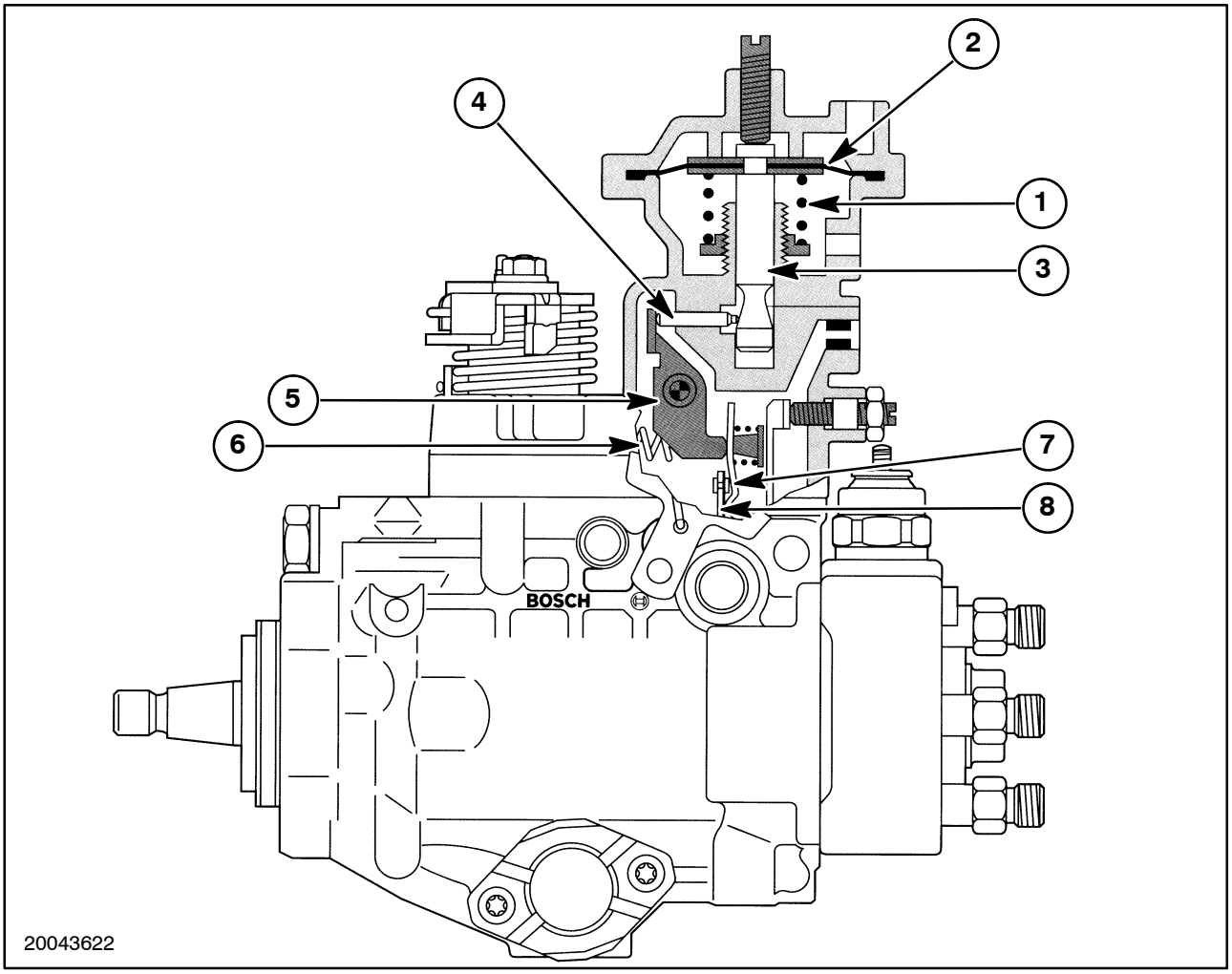
Operation

In the lower speed range of the engine, the air pressure generated by the turbocharger is insufficient to overcome the pressure of the compression spring (1) under the diaphragm (2). Therefore, the diaphragm remains in the initial position. When the air pressure becomes sufficient to overcome spring force, the diaphragm and sliding pin (3) shift against the force of the compression spring. The guide pin (4) changes position and causes the reverse lever (5) to swivel around a pivot. Due to the force exerted by the governor spring (6), a non-positive connection between the tensioning lever (7), reverse lever (5), guide pin (4) and sliding pin (3) exists. This action results in the tensioning lever following the swivel movement of the reverse lever, causing the starting lever (8) and tensioning lever to swivel around pivots to shift the control collar in the direction of increased fuel delivery. Fuel delivery adapts in response to increased air mass in the combustion chamber.

When air mass decreases, the compression spring pushes the diaphragm upward with the sliding pin. The compensation of the governor lever mechanism reverses direction, which adapts the fuel quantity to the change in air pressure.

In case of turbocharger failure, the LDA reverts to the initial position, and the engine operates normally without developing smoke.



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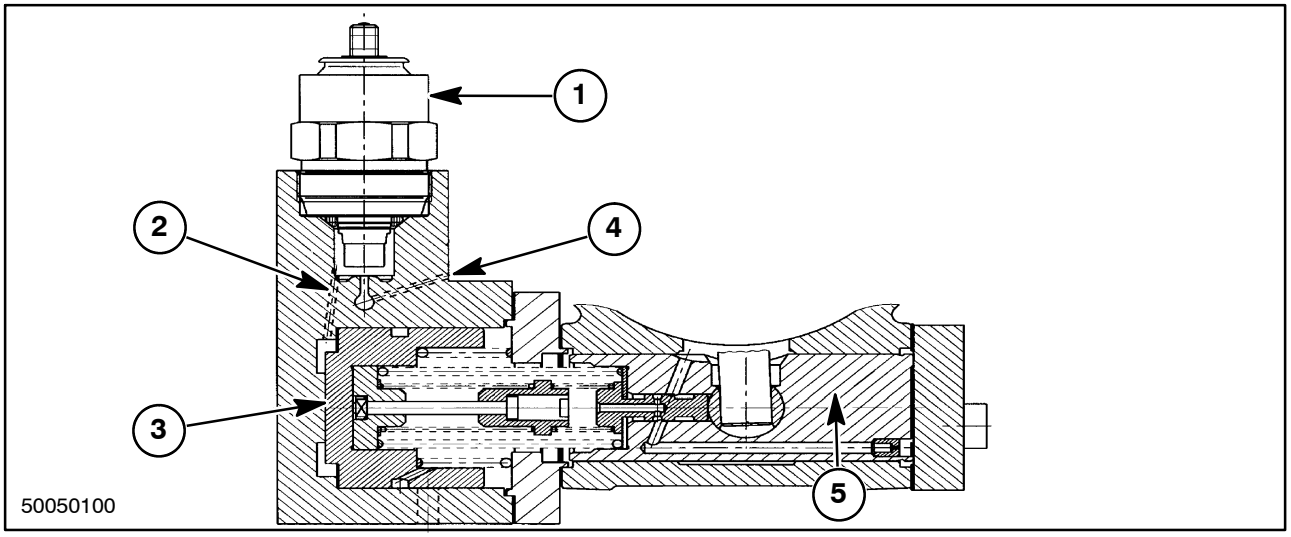
Manifold Pressure Compensator (LDA)

1. Compression Spring
2. Diaphram
3. Sliding Pin
4. Guide Pin
5. Reverse Lever
6. Governor Spring
7. Tensioning Lever
8. Starting Lever



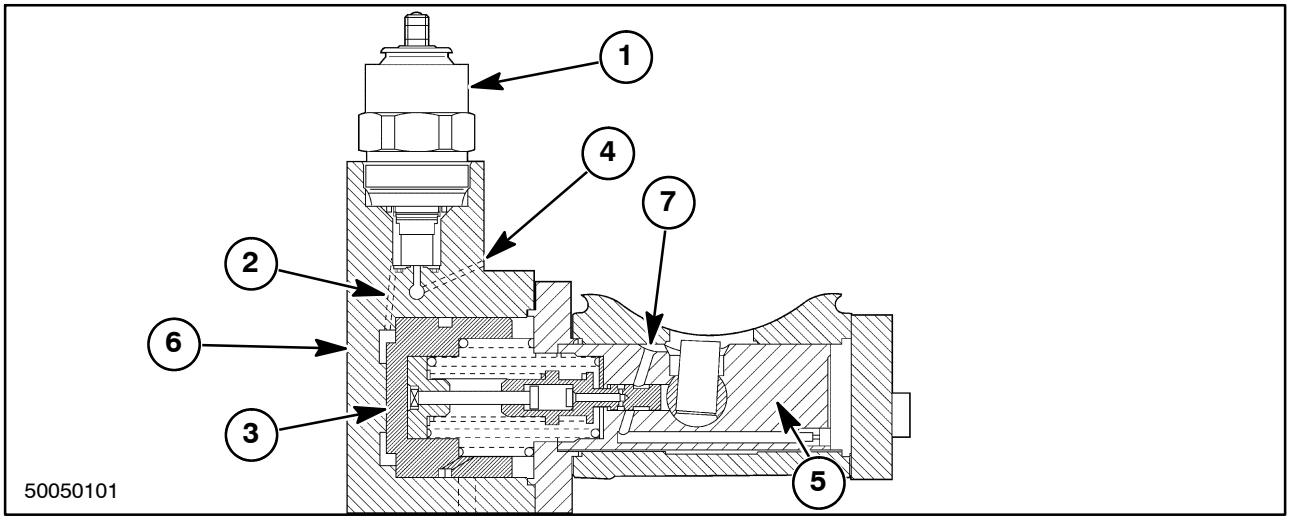
42

Sectional View of KKSB (Engine Off and Cold)

Electrical Cold-start Accelerator (KKSB)

During engine start-up, the KKSB advances the injection pump timing to reduce white smoke and emissions until the cylinders warm to normal operating temperature. By shifting the start of injection in the advanced direction, the KKSB improves the cold-start characteristics of the emissionized engine. Operation is triggered automatically by means of a temperature sensitive thermostatic switch, which is located in the engine block.

When the engine is not operating, and the coolant temperature inside the block is below 53°C (127.4°F) the thermostatic switch is closed, and the KKSB solenoid (1) is de-energized due to the ignition switch being in the OFF position. In this configuration, the KKSB plunger is retracted, and port (2) is open, providing a path from the control piston (3) to the injection pump crankcase (4). Spring tension within the control piston forces the timing piston (5) to the right against the valve housing.



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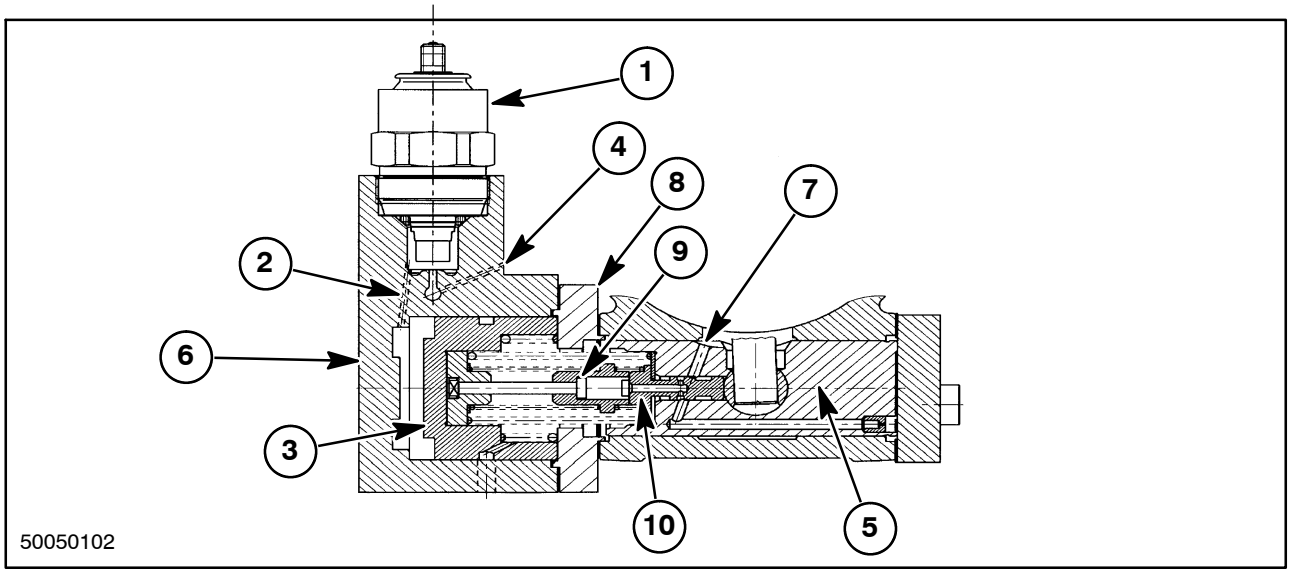
Sectional View of KKSB (Engine Cold Starting Phase)

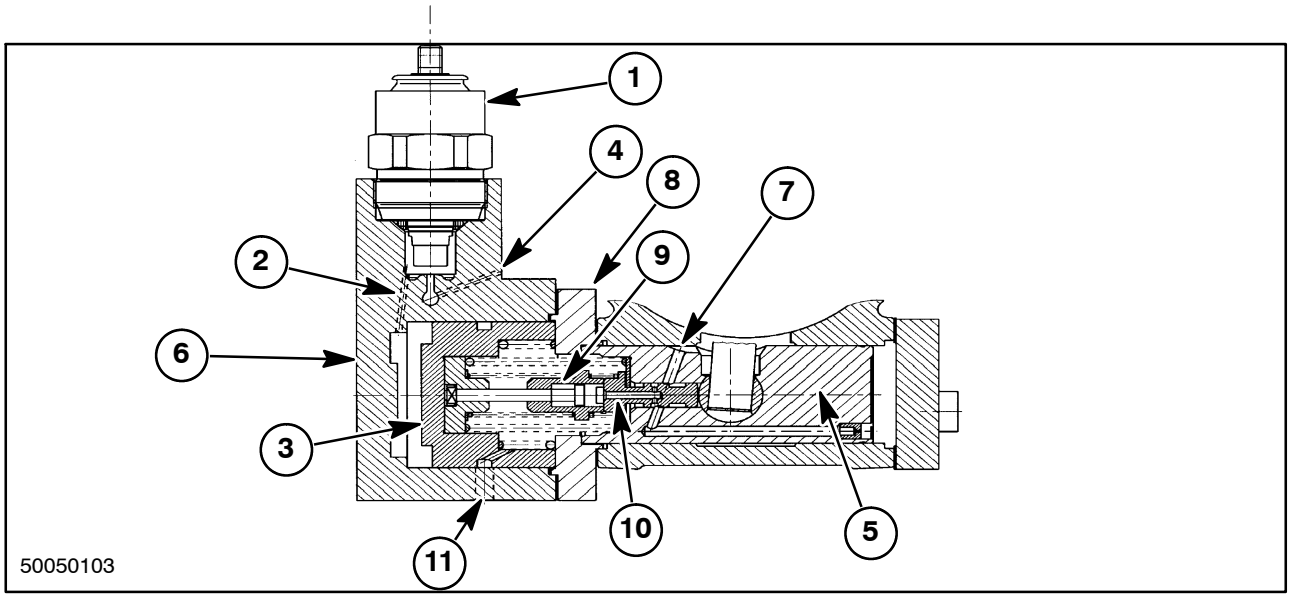
During the cold start phase of the engine, 12 volts passes through the thermostatic switch, which is still closed, to energize the KKSB solenoid (1). The plunger within the solenoid moves downward and blocks port (2), which prevents fuel from the pump crankcase (4) from reaching the pressure side of the control piston (3). The control piston remains relaxed, and rests against the valve housing (6). Fuel from the pump crankcase is now allowed to pass through port (7) to the pressure side of the timing piston (5). The fuel forces the piston to the left, which moves the cam ring in the pump to advance the timing.



44

Sectional View of KKSB (Engine Warm/Advance Timing Withdrawn)

When water temperature in the engine block rises above app. 63°C (145.4°F), the thermostatic switch opens to cut off 12 volts to the KKSB solenoid (1). With the solenoid de-energized, the plunger retracts to open port (2), allowing fuel from the pump crankcase to reach the control piston (3). The fuel forces the control piston to the right until it contacts the intermediate plate (8), and the sleeve (9) rests on the control spool (10). Advanced timing withdraws.



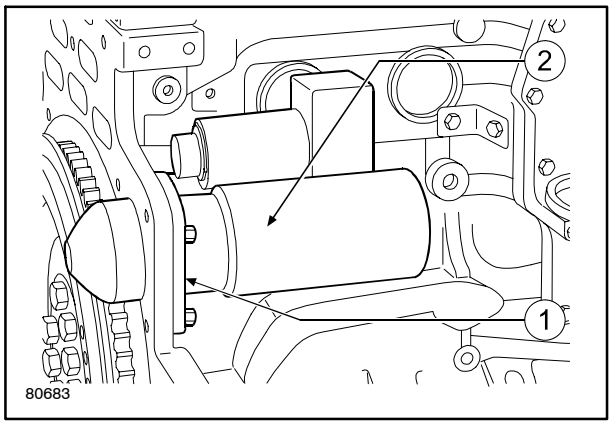
45

Sectional View of KKSB (Engine Warm/Normal Timing)

With the engine warm, timing depends on engine rpm. Pump fuel pressure is communicated to the suction side of the timing piston (5) through the orifice (11) in the control piston (3).

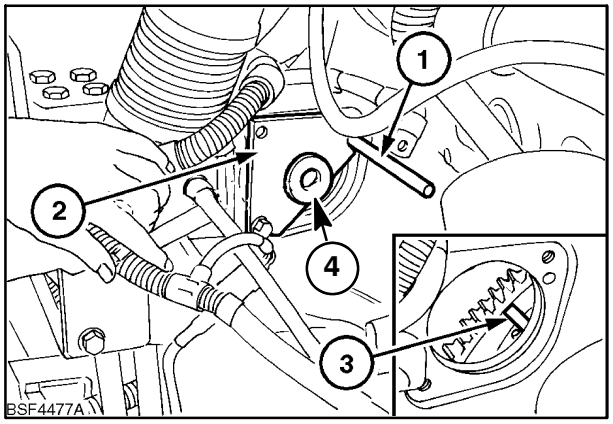
Injection Pump Removal

38. If it is necessary to change the injection pump, it is supplied already pre-set as a spare part.
39. Whereas, if the pump has to be removed and re-fitted later, without undergoing repair, it must be pre-set while still fitted on the engine and re-moved only afterwards.
40. The following procedure includes this second hypothesis as it is more complex.
41. Remove the starter motor (1) from the mounting (2).



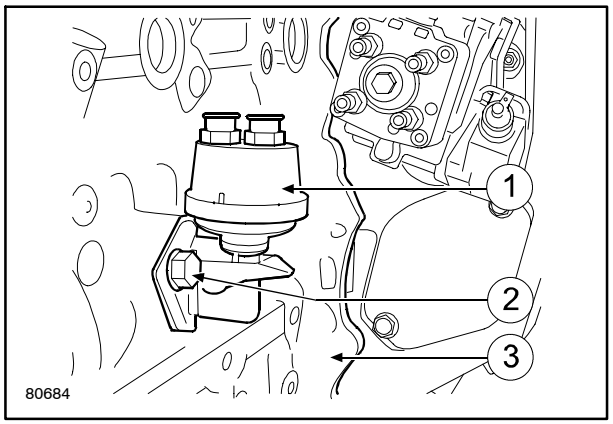
46

42. Fit tool **380000988** (2) and **380000732** (4) to be able to turn the flywheel .
43. Carefully turn the flywheel in its direction of rotation to cancel the clearances of the gears.
44. Turn the engine until the pin (1) engages through the slot in the plate (2) with the recess in the flywheel (3).



47

45. Unscrew the retaining bolts (2) and remove the priming pump (1) from the crankcase (3).



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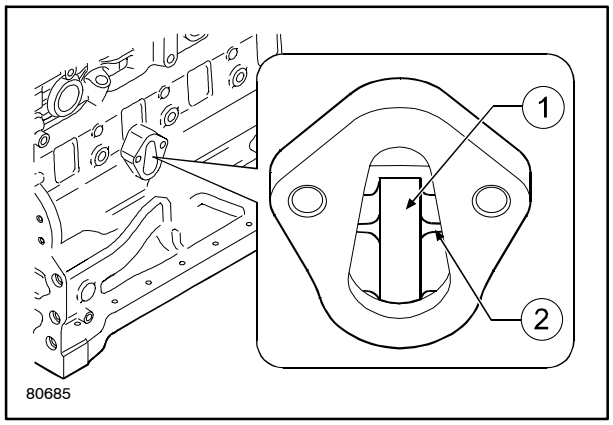
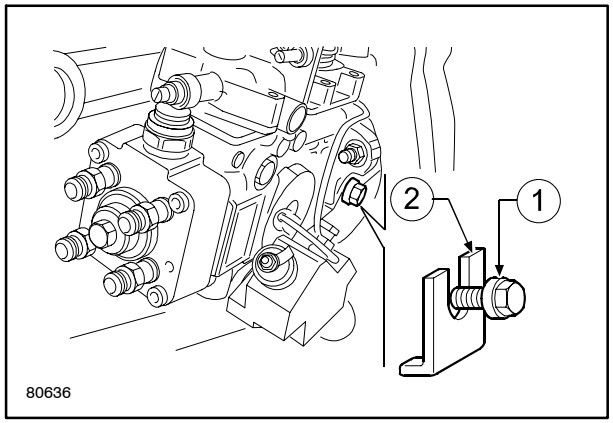
46. Check through the seat of the priming pump that the camshaft (1) is in step (at TDC) using the reference marks (2) on the shaft.

    If the marks are not evident, withdraw the pin from the gear and rotate the engine 360° until the reference marks are visible. Re-insert the pin to lock.



49

47. Partly unscrew the side bolt (1) and remove the spacer washer (2). This must be re-used (it is recommended to secure it to the pump with a clamp or a metal wire).
48. Screw down the side bolt (1) locking pump spindle rotation.



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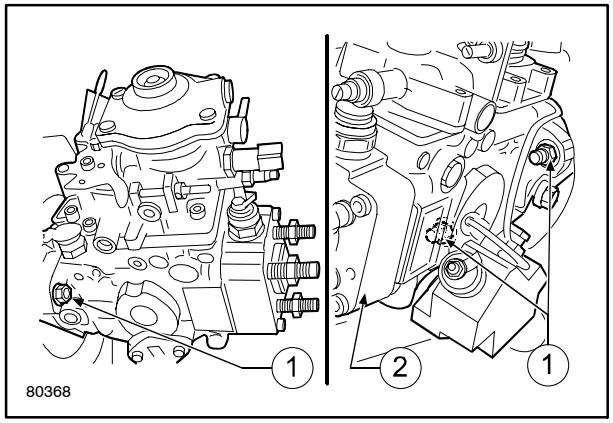
49. Unscrew the retaining bolts (1) and disconnect the fuel pump (2).



51

Injection Pump Installation

50. When fitting the fuel pump on the engine, it is necessary to bring about the condition of T.D.C. on cylinder No. 1 as described on the previous page.
51. Fit the rotary pump (pre-set) (2) tightening the retaining bolts (1).

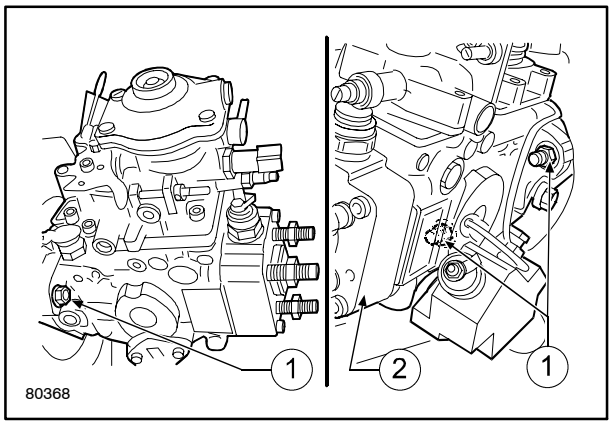
NOTE: *If the pump is unlocked off of the engine and the driveshaft allowed to rotate, or the the pump is removed when the engine is not at TDC and the engine subsequently rotated, it will be necessary to have an authorised Bosch agent reset the pump and lock it.*

⚠ CAUTION ⚠

The seal removed at the time of pump disassembly must not be reused. Always use genuine spare parts.

Checking Injection Pump Timing

- With the injection pump in position but with the mounting bolts loose, remove the plug on the pump cover.
- Fit adapter 380001601 (1) in the injection pump where the plug was removed.
- Fit the dial gauge **380000228** (2) into the adaptor and pre-load the shaft by 2.5 mm (0.098 in).
- Turn the crankshaft counterclockwise [viewed from the fan side] until the injection pump reaches a pre-stroke position, which is obtained when the dial gauge movement stops and is at the lowest point.
  Reset the dial gauge to zero and turn the crankshaft in the opposite direction to bring No.1 cylinder to TDC of the compression stroke.
  In this position the dial gauge on the pump must read off a value of 1 mm (0.039 in.).
- Turn the pump anti-clockwise if the plunger has completed a stroke of less than 1 mm (0.039 in.), and clockwise if the stroke is greater than 1 mm (0.039 in.), repeating the test until the correct stroke is obtained.
- After obtaining the correct stroke value, tighten the pump mounting hardware to the torque shown on page 7 of this chapter.



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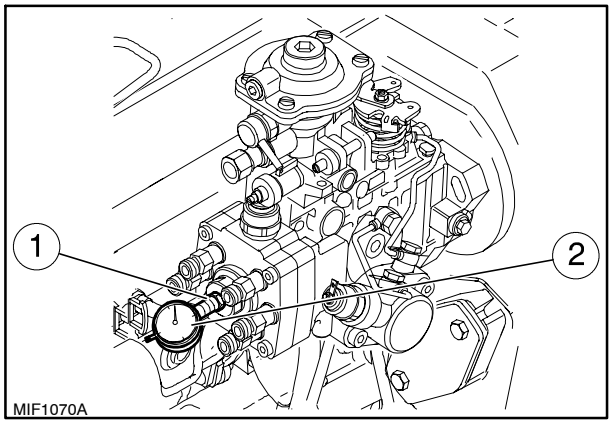
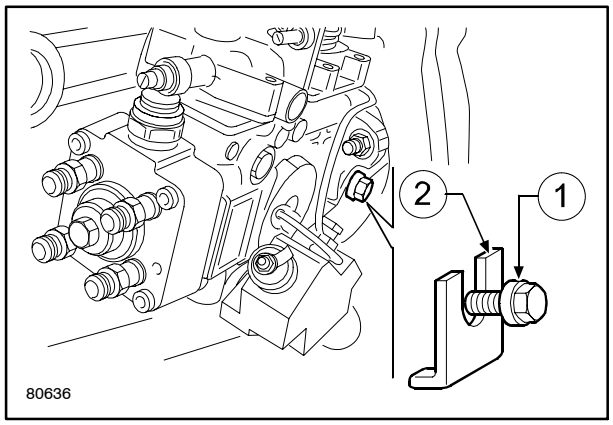


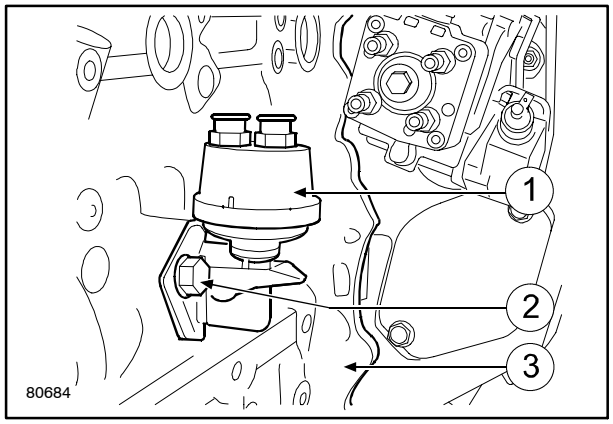
53

52. Partly unscrew the bolt (1) locking pump spindle rotation and insert the spacer washer (2). Screw down the bolt, locking the above-mentioned washer: in this way, the fuel pump spindle is free to turn.
53. Withdraw the engine flywheel locking pin outwards.
54. Remove tool **380000988** for flywheel locking/rotation; place the starter motor in its seat.
55. Connect all the pipes (from the pumping elements to the injectors, for blow-by recovery from the injectors to the pump, the LDA piping and the supply from the priming pump).
56. Connect any electrical connections.



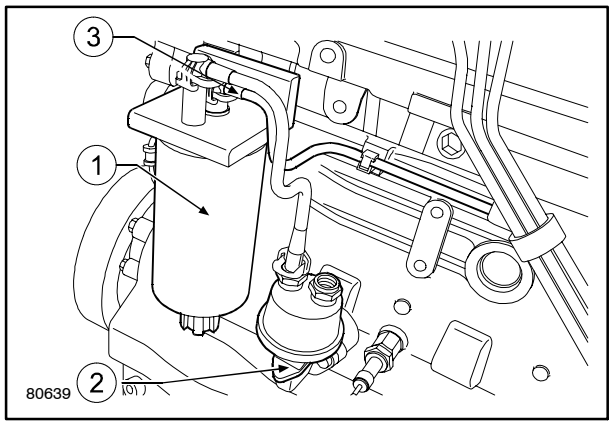
54

57. Fit the priming pump (1) on the crankcase (3) and tighten the retaining bolts (2) to the prescribed torque.



55

58. If any work has been done on the supply circuit components, it is necessary to bleed the air from the system.
59. Disconnect the filter fuel piping (3) and repeatedly operate the bleed lever of the priming pump (2).
60. Continue operating until fuel comes out.
61. Connect the piping (3) to the filter.



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FINAL CHECKS

CAUTION

The following checks must be made after fitting the engine on the vehicle.

First check that the fluid levels have been restored correctly.

Start the engine, leave it running at just over idling speed and wait for the coolant temperature to reach the thermostat opening setting, then check that:

62. No coolant leaks from the coupling sleeves of the engine cooling and cab heating circuit piping, tightening the collars further if necessary.
63. Meticulously check the fuel piping connections with the unions.
64. No oil leaks between the cylinder head and cover, between the oil sump and crankcase, between the cooler oil filter and the relevant seats between the various pipes of the lubricating circuit.
65. No oil leaks from the piping.
66. No air leaks from the pneumatic piping (if applicable).
67. Check that the indicator lights on the instrument panel and the devices disconnected at the time of removing the engine all work properly.
68. Check and very carefully deaerate the engine cooling system with repeated bleeding operations.

SECTION 10 - ENGINE

Chapter 5 - Cooling

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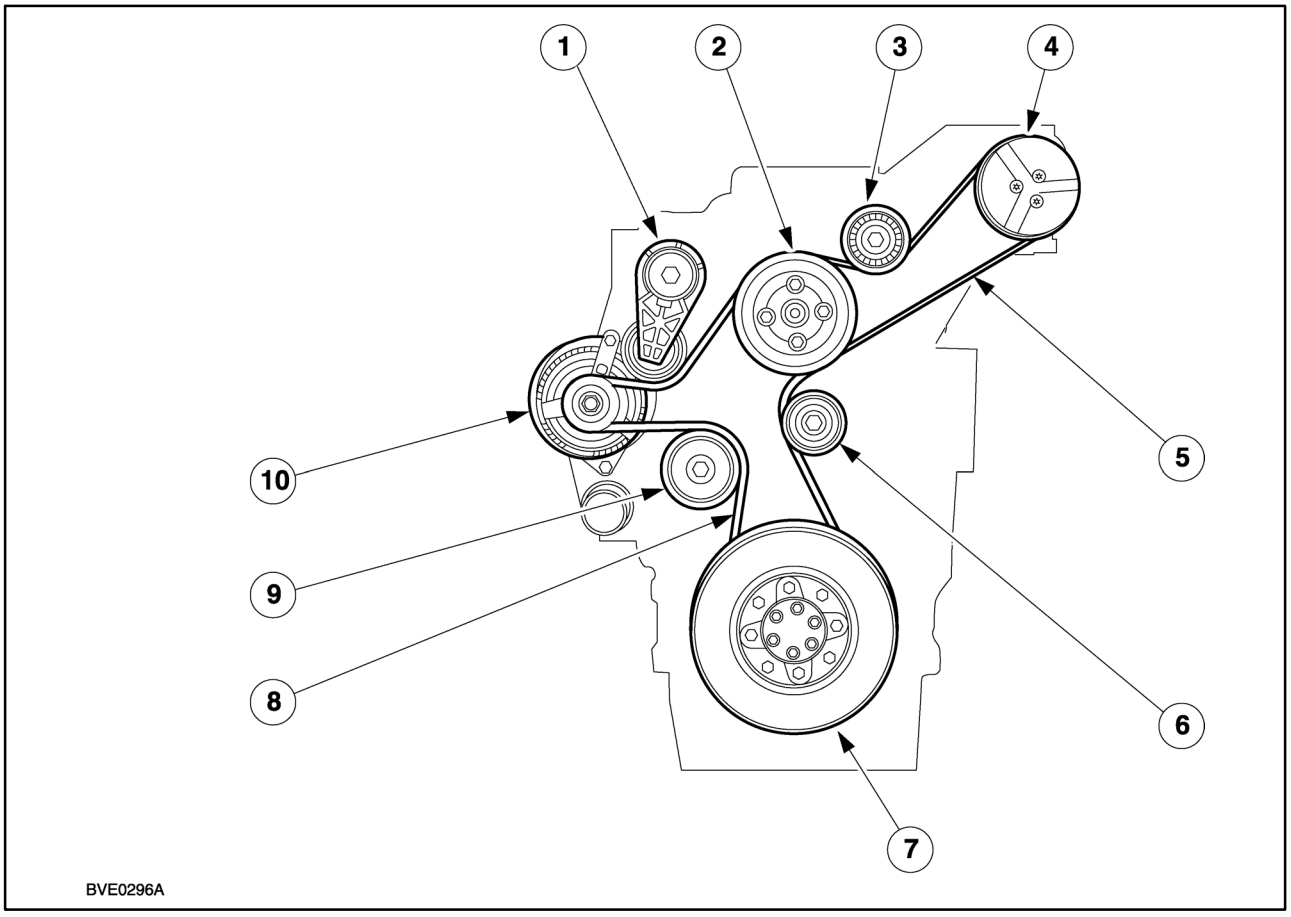
SPECIFICATIONS

Coolant Pump	
Type	Centrifugal
Drive	Poly V-Belt
Fan Belt	
Belt Tension	Spring-Loaded Automatic Fan Belt Tensioner
Thermostat	
Starts to open at: °C	81 ± 2
Expansion Tank Cap	
Opening Pressure bar (psi)	1.0 (14.5)
Cooling Fluid	See Operators Manual
Cooling Capacities	See Operators Manual

TIGHTENING TORQUES

	Thread size	Torque Values	
		Nm	ft-lb
Coolant pump retaining bolts	M 8 x 1.25	25 ± 5	18 ± 4
Spring-loaded automatic fan belt tensioner	M 10 x 1.5	43 ± 5	32 ± 4
Fan belt fixed pulley(s) retaining bolt(s)	M 10 x 1.5	43 ± 5	32 ± 4
Thermostat housing retaining bolts (Engines with mechanical fuel injection)	M8 x 1.25	25 ± 5	18 ± 4
Thermostat housing retaining bolts (Engines with common rail fuel injection)	M6 x 1.0	10 ± 2	7 ± 1
Coolant temperature sensor / sender	M 14 x 1.5	12 - 20	9 - 15
Fan blade to viscous coupling retaining nuts	M 8	17	23
Viscous coupling to mounting pulley	-	78	105

DESCRIPTION AND OPERATION



1

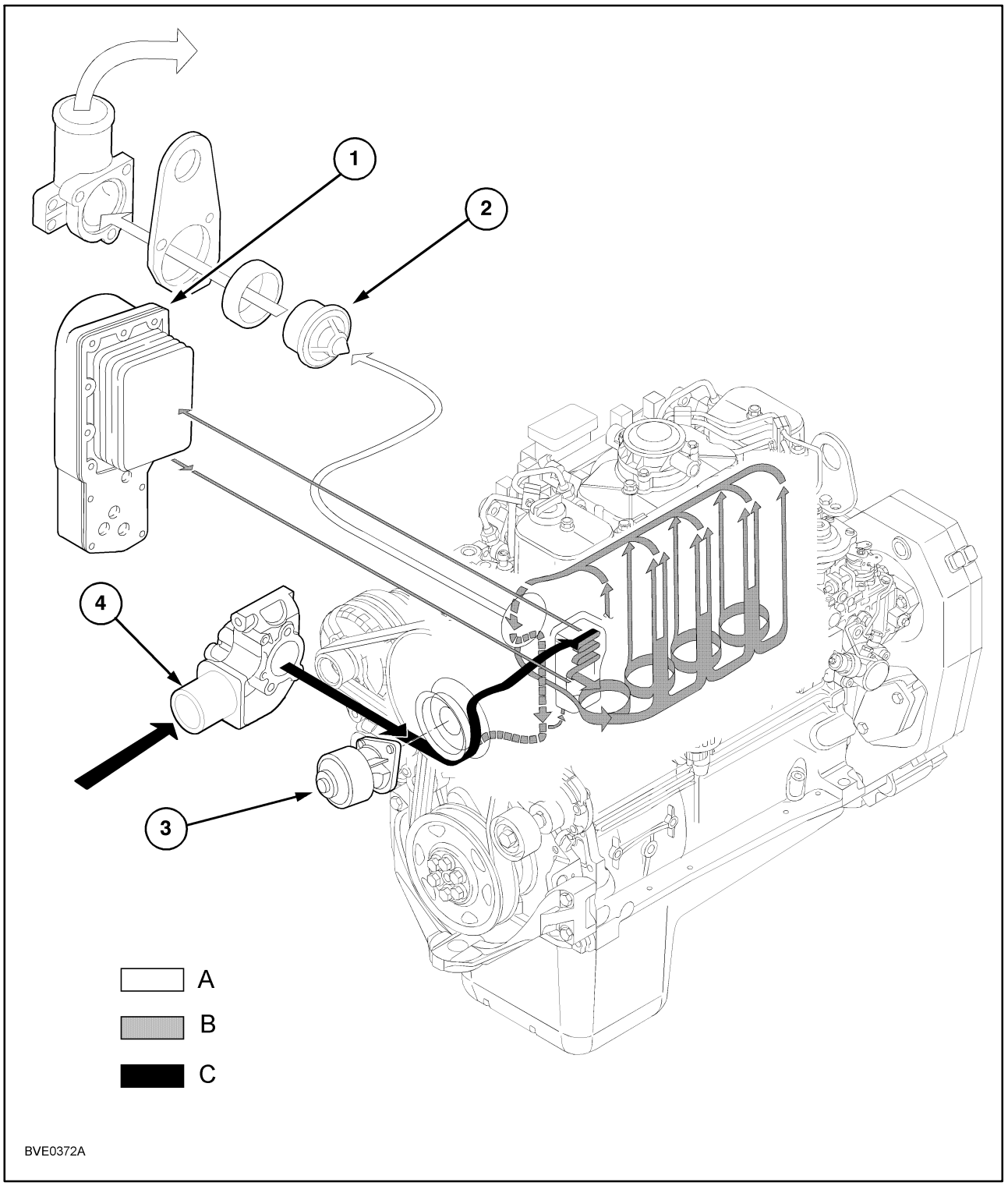
Fan Belt Layout

1. Spring-loaded automatic fan belt tensioner
2. Viscous fan mounting pulley
3. Air conditioning belt tensioner
4. Air conditioning compressor (if fitted)
5. Air conditioning drive belt
6. Fan belt fixed idler pulley
7. Crankshaft pulley
8. Fan belt
9. Coolant pump
10. Alternator

MECHANICAL FUEL INJECTED ENGINES

The function of the coolant pump (9) mounted at the front of the engine is to maintain a continuous flow of coolant around the cooling system. This is essential to ensure correct engine coolant temperature.

The coolant pump is driven by a Poly V-belt from the crankshaft pulley (7). The fan belt tension is maintained by a spring-loaded automatic fan belt tensioner (1).

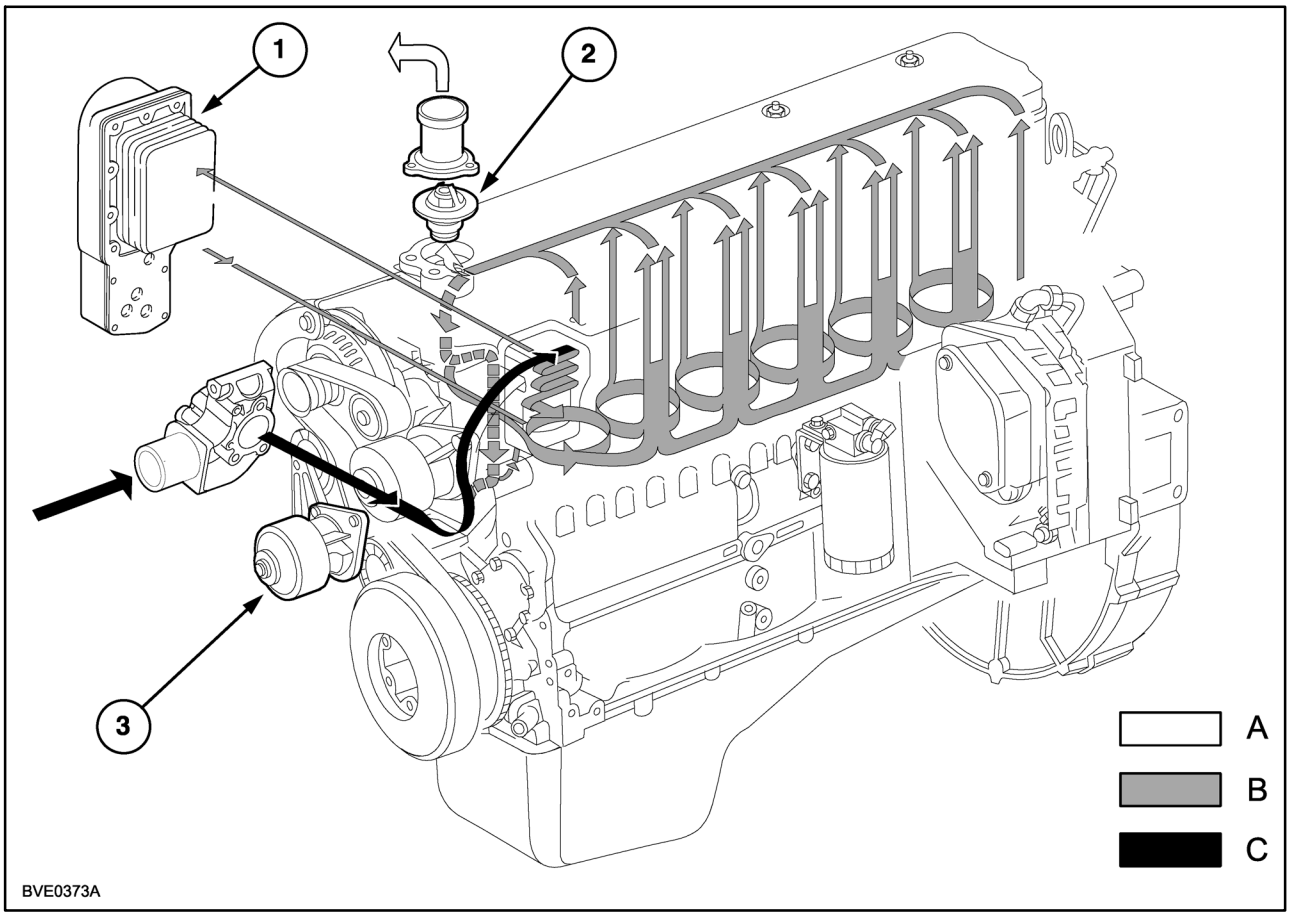


2

Engines with Mechanical Fuel Injection

A. Coolant flow from the thermostat
B. Coolant flow circulating in the engine
C. Coolant flow to the coolant pump

1. Heat exchanger
2. Thermostat
3. Coolant pump
4. Coolant inlet connector



3

Engines with Common Rail Fuel Injection

A. Coolant flow from the thermostat
B. Coolant flow circulating in the engine
C. Coolant flow to the coolant pump

1. Heat exchanger
2. Thermostat
3. Coolant pump
4. Coolant inlet connector

ELECTRONIC FUEL INJECTED ENGINES

The engine cooling system is a closed circuit forced circulation type composed of the following components:

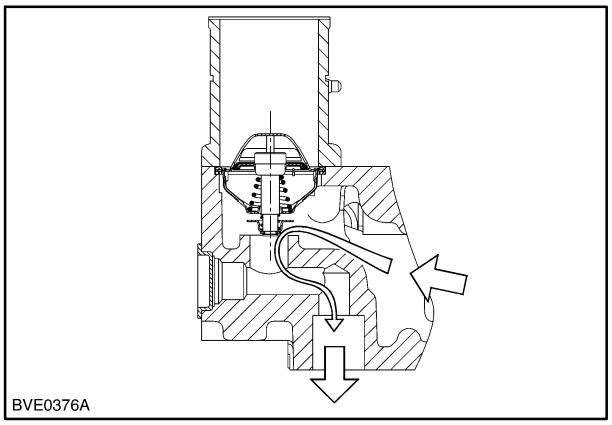
- Heat exchanger (1) to cool lubrication oil.
- Thermostat (2) controlling coolant circulation.
- Centrifugal coolant pump (3) to circulate the coolant.

The coolant is drawn from the bottom of the radiator by the coolant pump (3) which passes the coolant to the cylinder block. The coolant then flows through cored galleries to cool the cylinder walls.

Galleries in the cylinder head gasket allow coolant to flow from the cylinder block into the cylinder head. Cored galleries also direct the coolant to the fuel injector nozzle locations before entering the thermostat housing.

Dependent upon coolant temperature, coolant either re-enters the coolant pump or is circulated through the radiator for cooling.

When the thermostat is closed, a recirculating bypass gallery allows the coolant to recirculate from the cylinder head to the block, to allow faster engine coolant warm-up.



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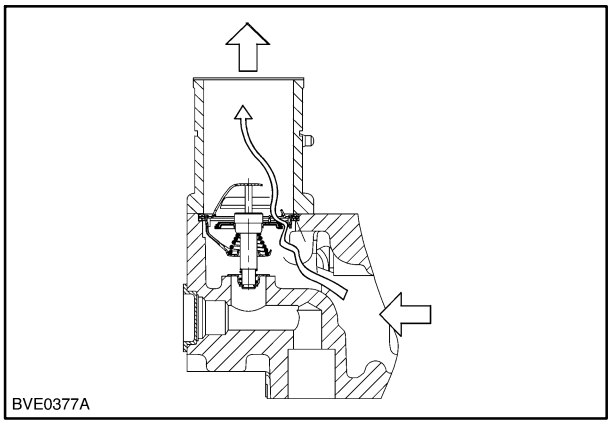
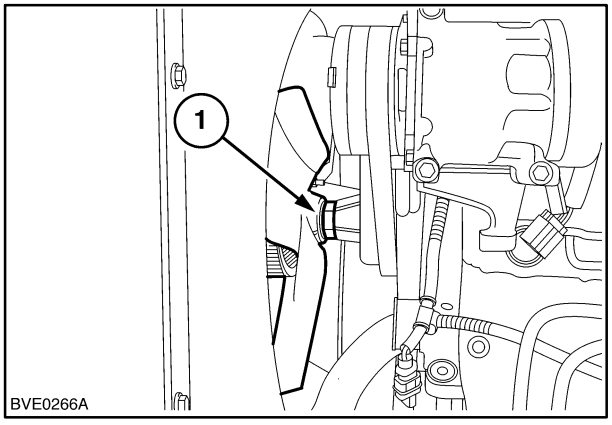
When the coolant has reached normal operating temperature, the thermostat will open and allow coolant to be drawn through the radiator by the coolant pump. Cooled coolant then returns to the engine.



5

Cooling occurs as the coolant passes down through the radiator cores which are exposed to the cooling system. Air is drawn through the radiator fins by a viscous fan (1) situated between the radiator and the engine block.



6

TROUBLESHOOTING

IMPORTANT: *Whenever effecting a repair, the cause of the problem must be identified and corrected to avoid repeat failures. The following table lists problems and their possible causes with recommended remedial action.*

PROBLEM	POSSIBLE CAUSES	CORRECTION
Engine overheats	Hose(s) connection leaking or collapsed	Tighten hose(s) connection(s) Replace hose(s) if damaged
	Radiator cap defective or not sealing	Replace expansion tank cap
	Radiator leakage	Repair/replace radiator
	Improper fan belt adjustment	Check tensioner Check belt
	Radiator fins restricted	Clean with compressed air
	Faulty thermostat	Replace thermostat
	Internal engine leakage	Check for source of leakage
	Coolant pump faulty	Overhaul / replace coolant pump
	Exhaust gas leakage into cooling system	Replace cylinder head gasket Check cylinder head for damage or distortion
	Coolant aeration	Tighten all connections and check coolant level is correct Make sure cylinder head gasket is not blown
	Cylinder head gasket	Replace cylinder head gasket
	Hot spot due to rust and scale or clogged water jackets	Reverse flush the entire cooling system
	Obstruction to radiator air flow	Remove the obstruction
	Extended engine idling	Do not allow the engine to idle for too long a period
	Oil cooler tube blocked	Clean
	Radiator core tubes blocked	Check free flow
Water temperature gauge fails to reach normal operating temperature	Faulty coolant temperature sensor / sender	Replace coolant temperature sensor / sender
	Incorrect or faulty thermostat	Replace thermostat
	Faulty coolant temperature gauge	Replace temperature gauge

OVERHAUL

COOLING SYSTEM DRAIN

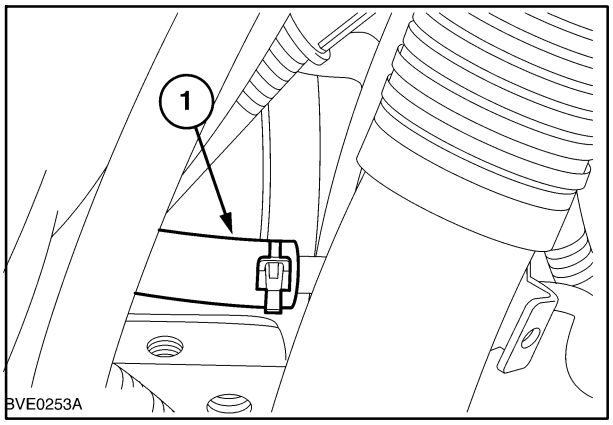
1. Open the engine hood.

⚠ WARNING ⚠

Do not allow antifreeze to contact skin. Adhere to instructions detailed on antifreeze container.

Tractors with Cab Heater

2. Clamp hose (1) connecting the cab heater to the radiator and turn the heater control knob in the cab to the coldest setting.



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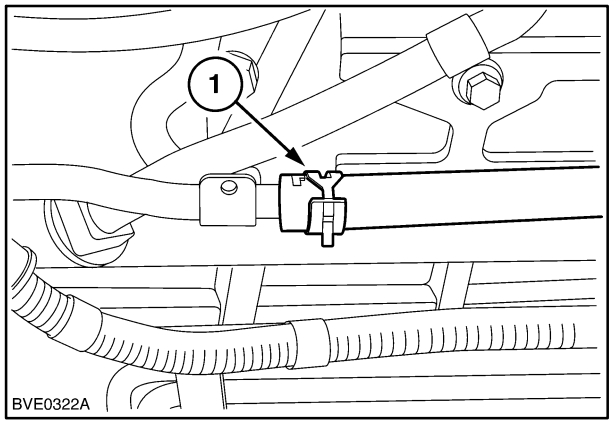
3. Loosen the clamp (1), disconnect the hose connecting the cab heater to the radiator and drain the cooling system into a suitable container.



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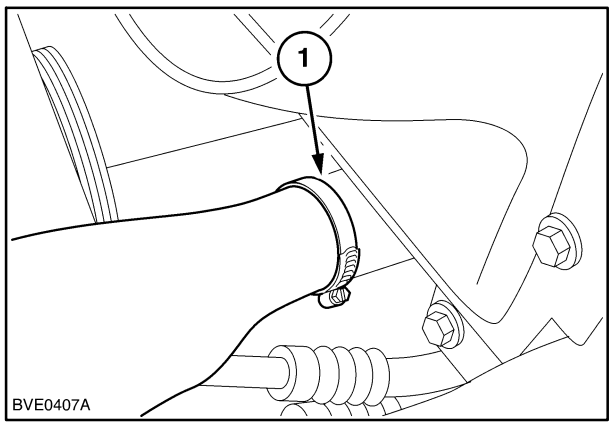
Tractors Less Cab Heater

4. Place a suitable container under the tractor.
5. Loosen the hose clamp (1) and disconnect the coolant hose from the radiator.



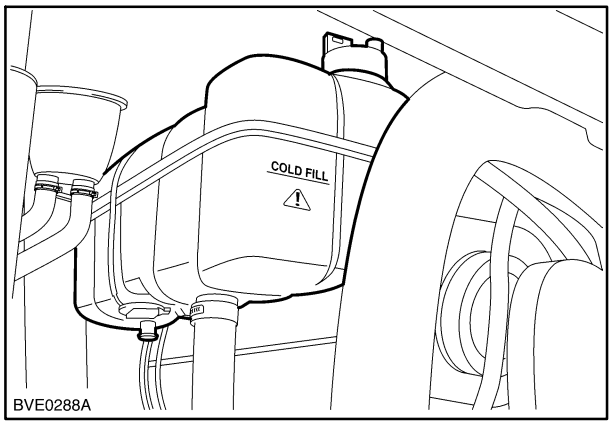
9

All Tractors

6. Remove the expansion tank cap.
7. Connect the disconnected coolant hose when the cooling system has finished draining.

COOLING SYSTEM REFILL

1. Make sure the correct grade, and quantity of antifreeze is added to the water. Recommended content mixture is 50% water, with 50% antifreeze.
2. Refill the cooling system through the radiator cap until completely full. Re-install the radiator cap and refill the expansion tank to the COLD FILL mark.
3. Start the engine and run until the normal engine operating temperature is achieved. Check for leaks, allow to cool and then re-check the coolant level.

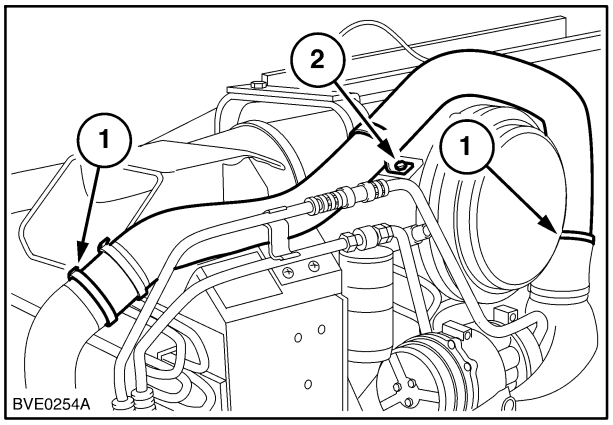


10

RADIATOR REMOVAL

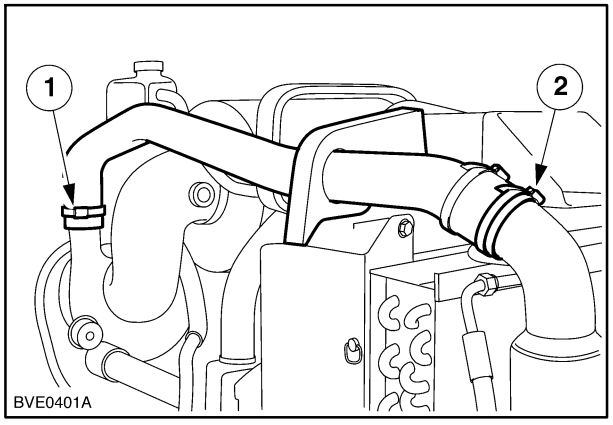
All Tractors

1. Drain the cooling system (refer to cooling system drain in this chapter).
2. Loosen the hose clamps (1), remove the pipe clamp retaining bolt (2) and remove the air cooler outlet pipe.



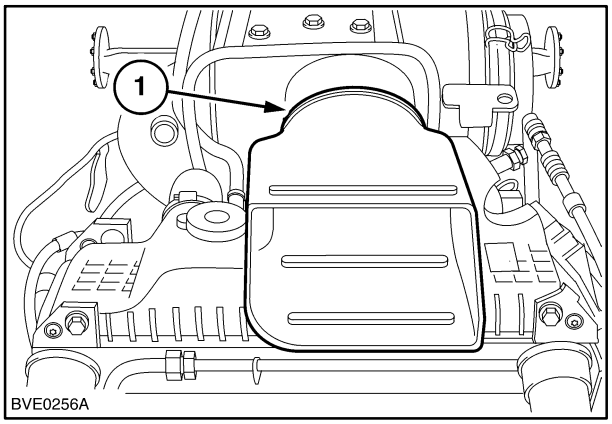
11

3. Loosen the pipe clamp (1), hose clamp (2) and remove the air cooler inlet pipe.



12

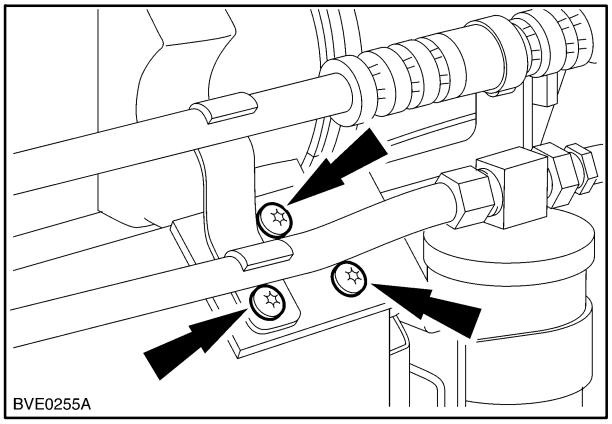
4. Loosen the clamp (1) and remove the air cleaner inlet.



13

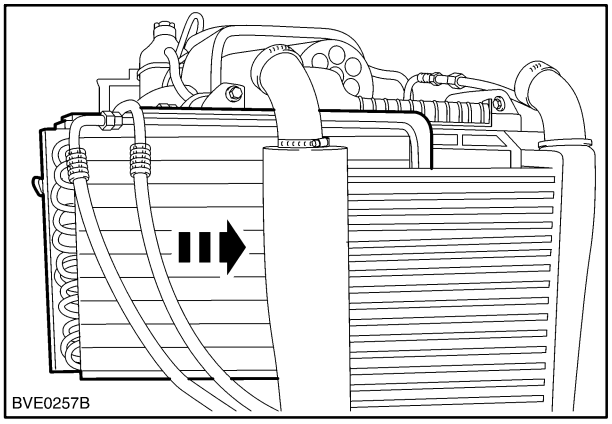
Tractors with Air Conditioning

5. Remove the receiver dryer retaining screws from the retaining bracket.



14

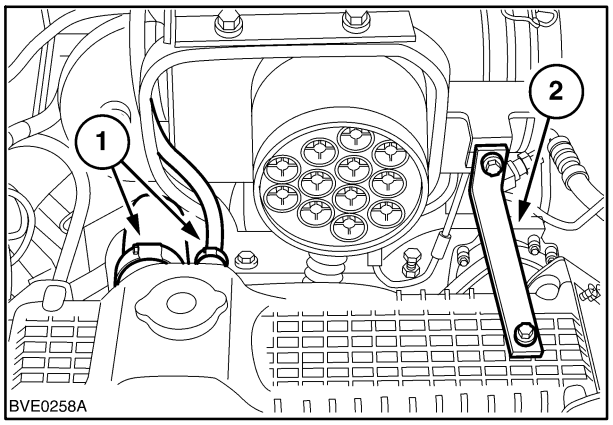
6. Slide out the air conditioning condenser from the radiator and reposition with the hoses still attached.



15

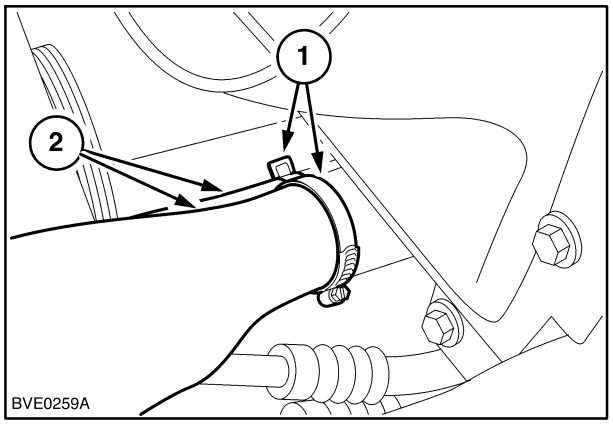
All Tractors

7. Loosen the hose clamps (1) and disconnect the coolant hoses from the radiator.
8. Remove the radiator support (2).



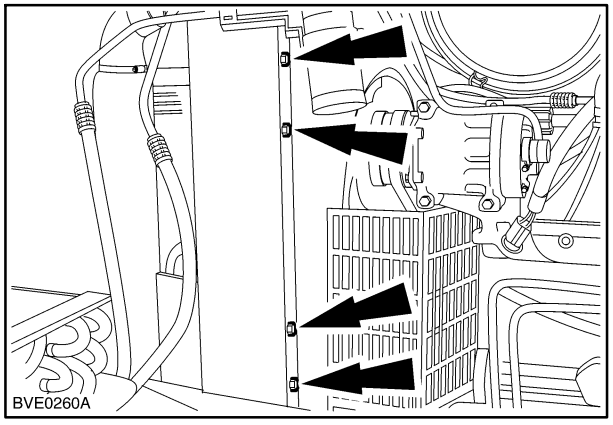
16

9. Loosen the hose clamps (1) and disconnect the coolant hoses (2) from the radiator.



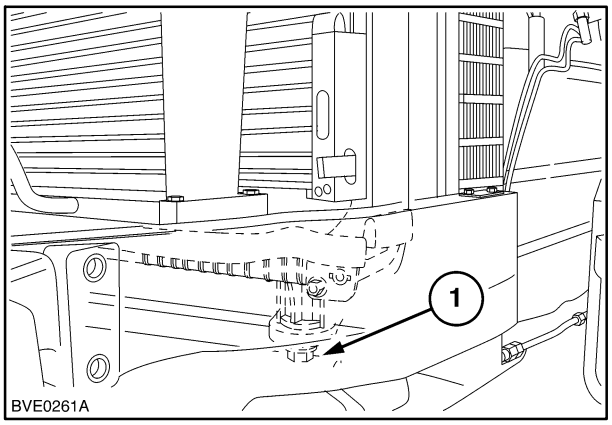
17

10. Remove the cooling fan shroud retaining bolts.



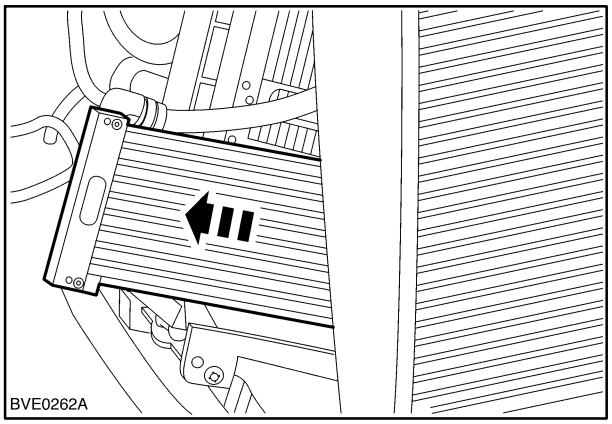
18

11. Remove the retaining bolt (1) securing the radiator to the front support. Repeat this step for the remaining radiator retaining bolt.



19

12. Reposition the radiator and slide out the driveline oil cooler from the radiator and reposition with the hoses still attached.
13. Remove the radiator from the vehicle.

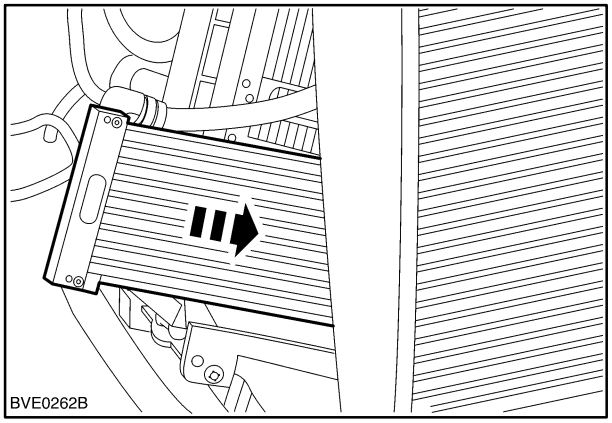


20

RADIATOR INSTALLATION

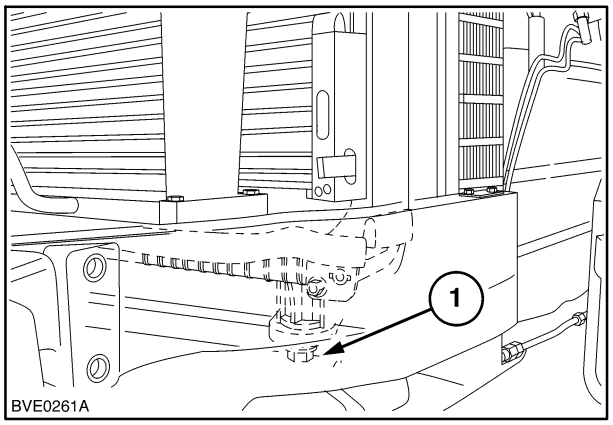
All Tractors

1. Install the radiator to the vehicle.
2. Reposition the radiator and slide in the driveline oil cooler to the radiator.



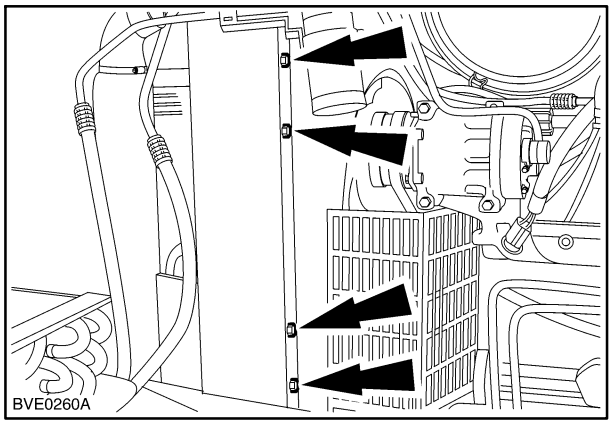
21

3. Install the retaining bolt (1) securing the radiator to the front support. Repeat this step for the remaining radiator retaining bolt.



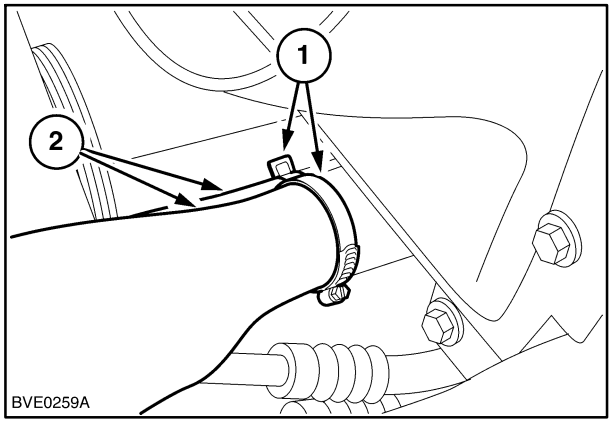
22

4. Install the cooling fan shroud retaining bolts.



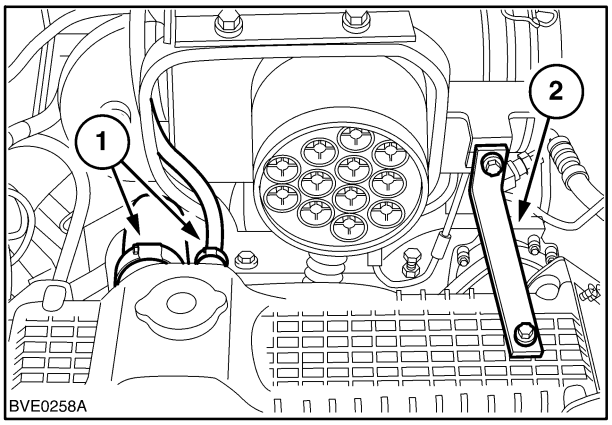
23

5. Connect the coolant hoses (2) to the radiator and tighten the hose clamps (1).



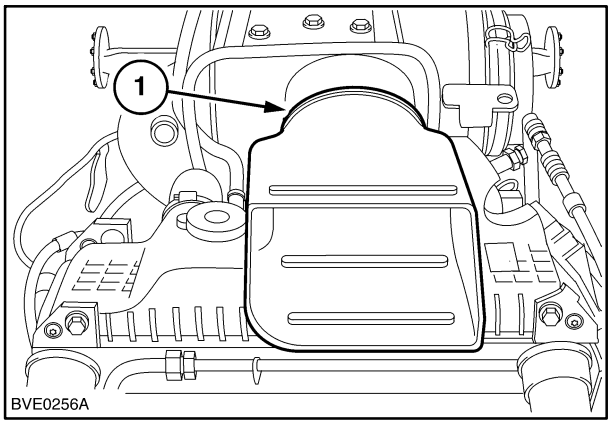
24

6. Connect the coolant hoses to the radiator and tighten the hose clamps (1).
7. Install the radiator support (2).



25

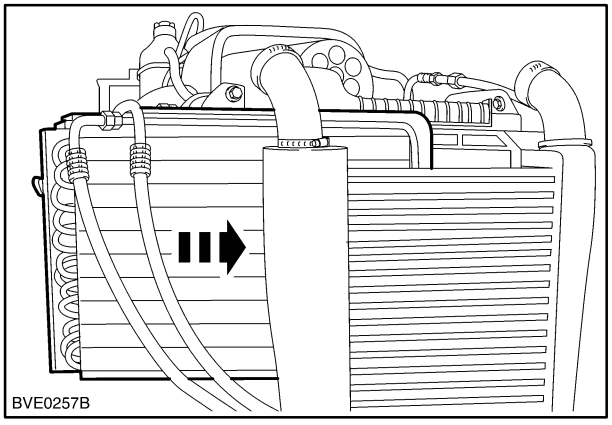
8. Install the air intake pipe and tighten the clamp (1).



26

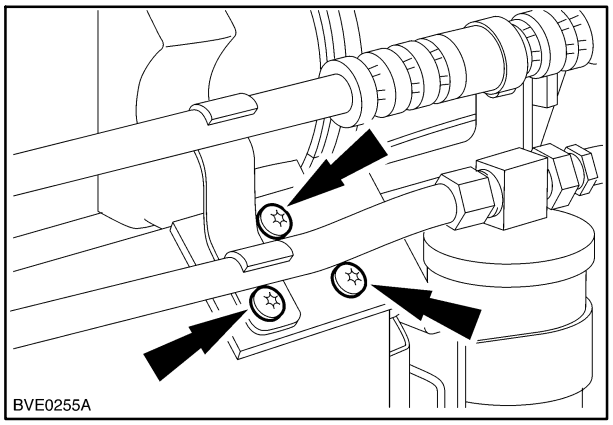
Tractors with Air Conditioning

9. Slide the air conditioning condenser on to the radiator.



27

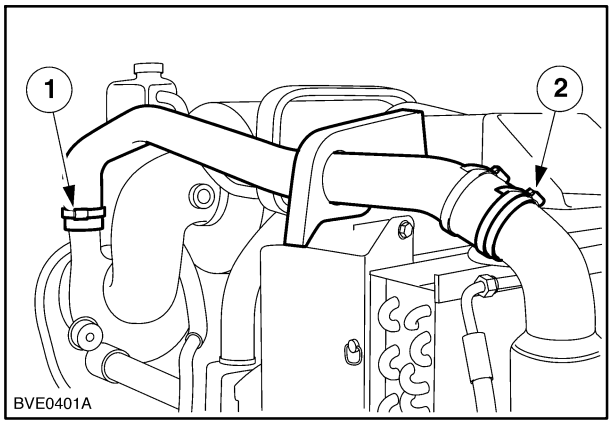
10. Install the receiver dryer retaining screws to the retaining bracket.



28

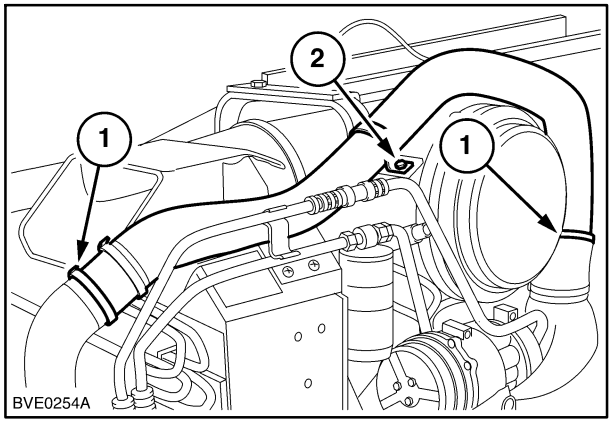
All Tractors

11. Install the air cooler inlet pipe. Tighten the pipe clamp (1) and the hose clamp (2).



29

12. Install the air cooler outlet pipe. Tighten the hose clamps (1) and install the pipe clamp retaining bolt (2).
13. Refill the cooling system (refer to cooling system refill in this chapter).



30

RADIATOR INSPECTION AND REPAIR

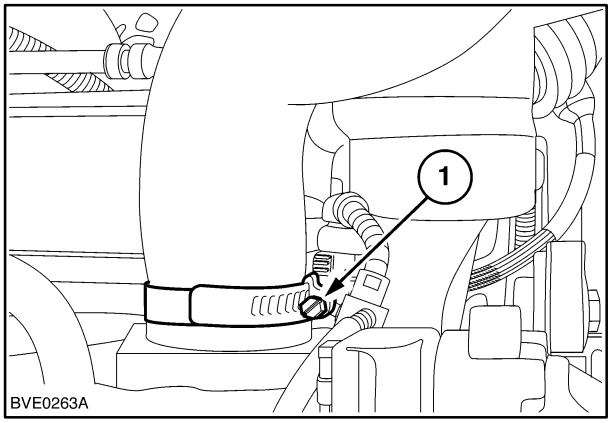
1. Inspect the fins for damage and repair as required, ensuring they are free from any obstruction.
2. Check the radiator for leaks, and repair as required.

THERMOSTAT

Electronic Fuel Injected Engines

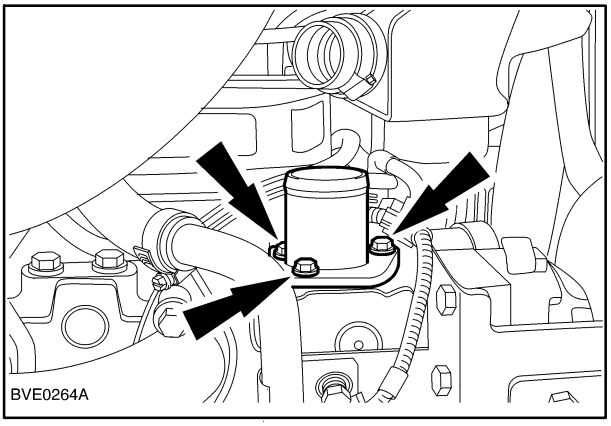
Removal

1. Drain the cooling system (refer to cooling system drain in this chapter).
2. Loosen the hose clamp (1) and disconnect the coolant hose from the thermostat housing.



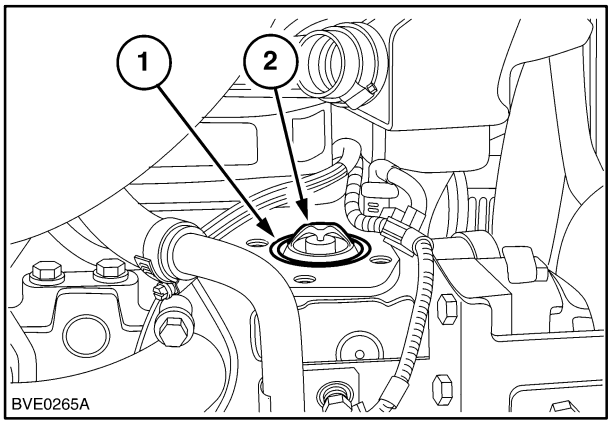
31

3. Remove the thermostat housing from the cylinder block.



32

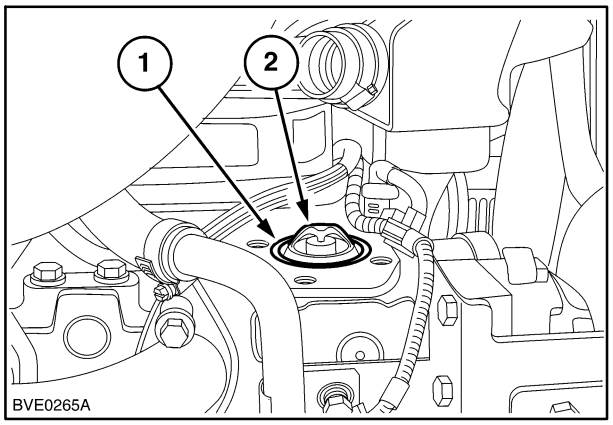
4. Remove the thermostat seal (1) and the thermostat (2).



33

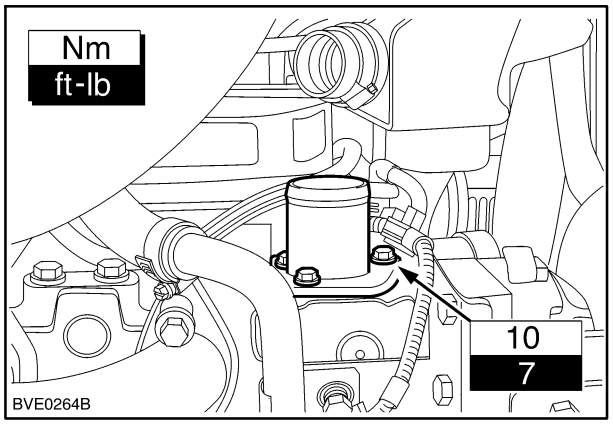
Installation

1. Make sure the mating surfaces are clean.
2. Install the thermostat (2) and a new thermostat seal (1).



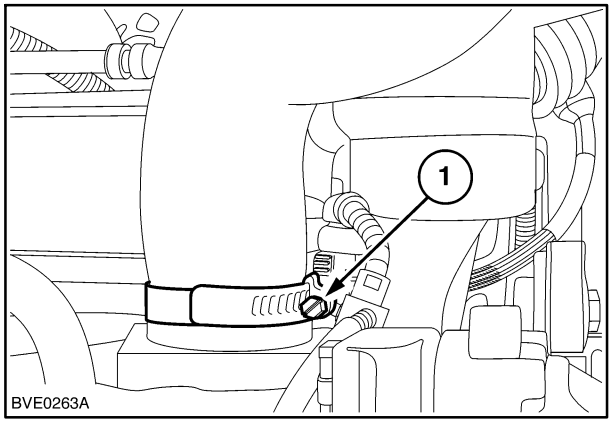
34

3. Install the thermostat housing to the cylinder block. Tighten the retaining bolts to the specified torque value.



35

4. Connect the coolant hose to the thermostat housing and tighten the hose clamp (1)
5. Refill the cooling system (refer to cooling system refill in this chapter).



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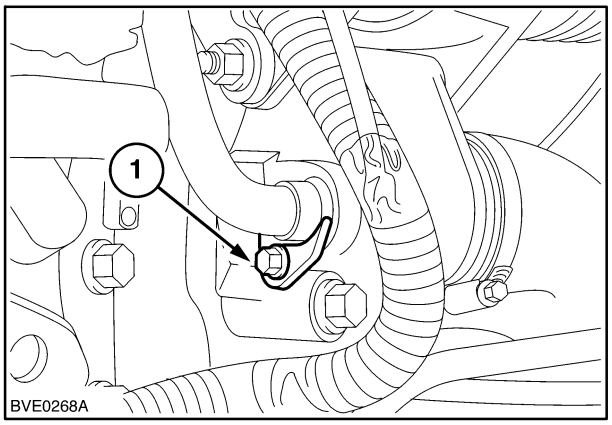
Mechanical Fuel Injection Engines

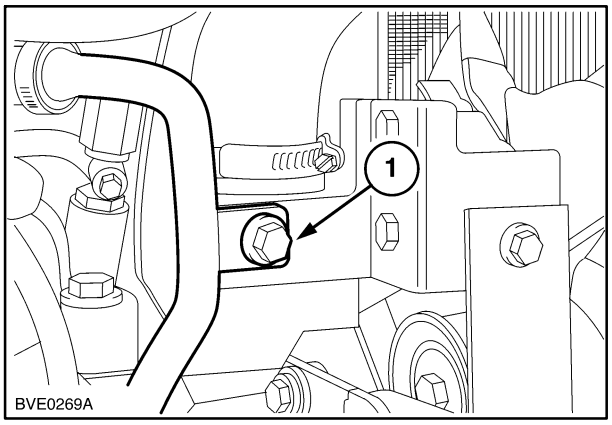
Removal

1. Drain the cooling system (refer to cooling system drain in this chapter).
2. Remove the retaining bolt (1) and remove the coolant pipe retaining bracket.



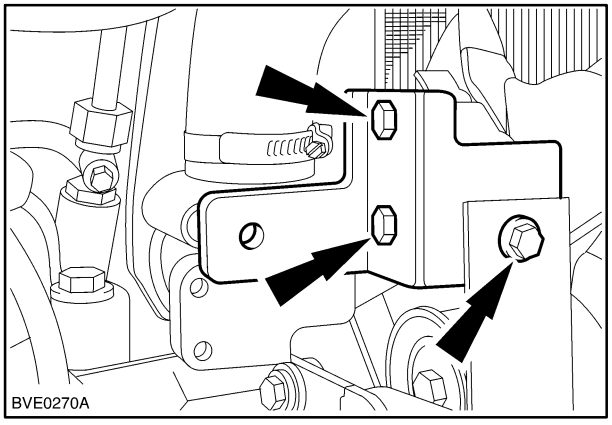
37

3. Remove the retaining bolt (1) and reposition the coolant pipe.



38

4. Remove the alternator guard bracket.



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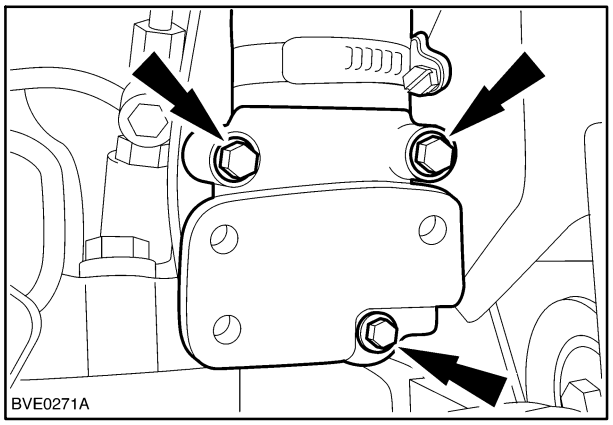
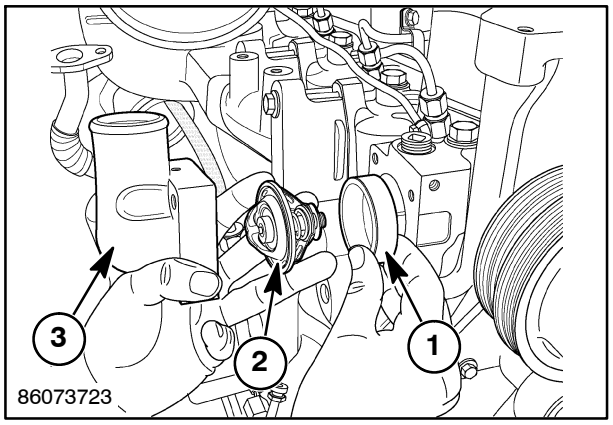
5. Detach the thermostat housing with the coolant hose attached and reposition.



40

6. Remove the thermostat seal (1) and the thermostat (2) from the thermostat housing (3).

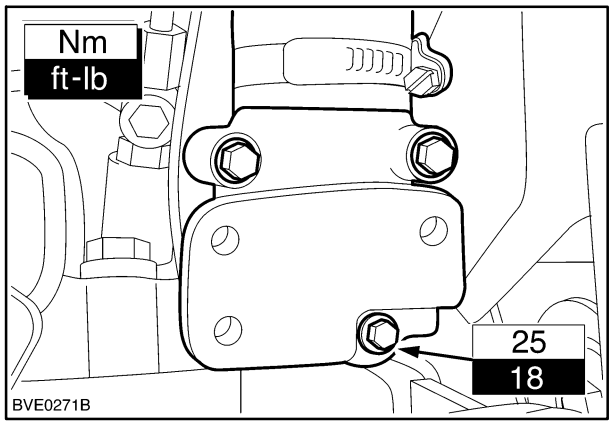


41

Installation

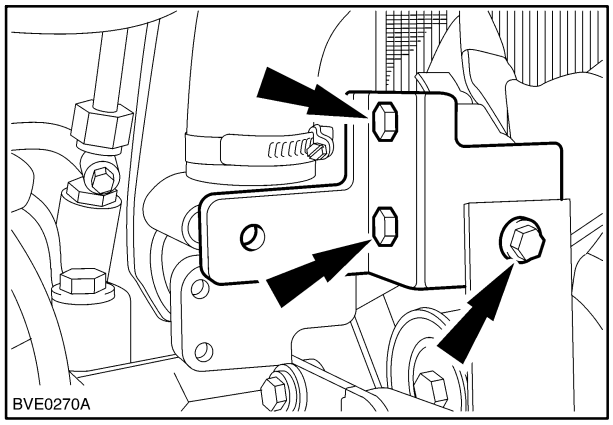
1. Make sure the mating surfaces are clean.
2. Install the thermostat and a new thermostat seal.
3. Apply sealant to the mating surfaces.

4. Attach the thermostat housing. Tighten the retaining bolts to the specified torque value.



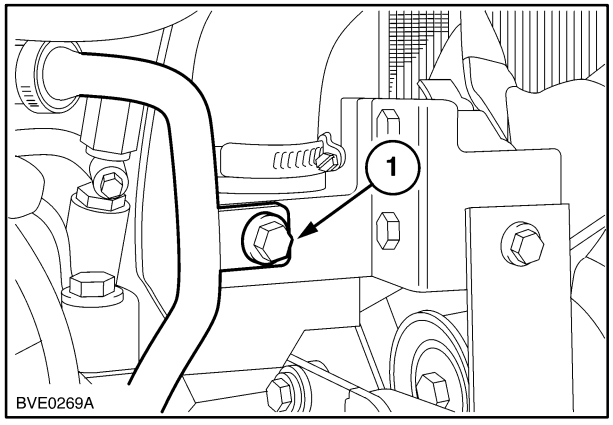
42

5. Install the alternator guard bracket.



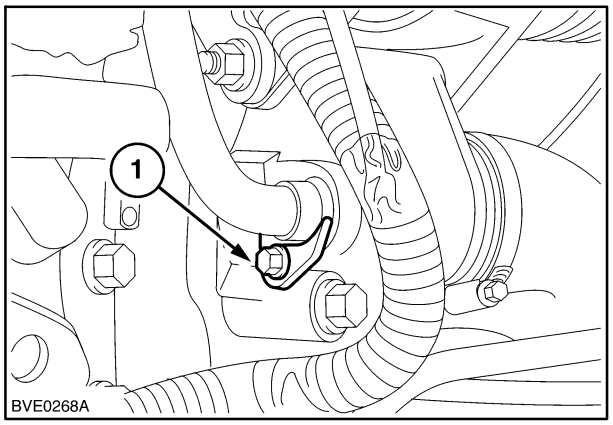
43

6. Install the coolant pipe and the retaining bolt (1).



44

7. Install the coolant pipe retaining bracket and the retaining bolt (1).
8. Refill the cooling system (refer to cooling system refill in this chapter).



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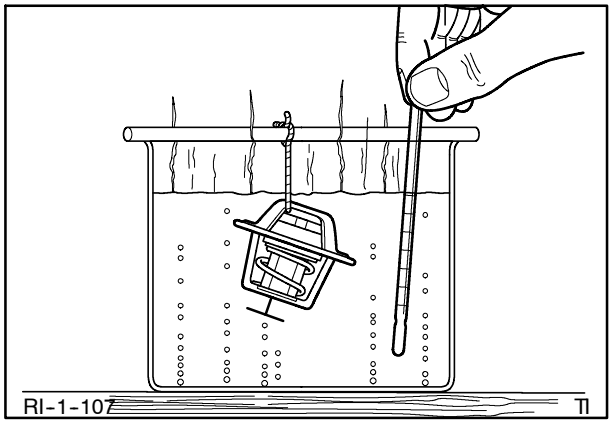
Thermostat Inspection

1. Place the thermostat in a container of water, and raise the temperature to 212°F (100°C). If the thermostat fails to open when hot, or fails to close properly when cooled, it must be replaced.

NOTE: *A faulty thermostat may cause the engine to operate at a too hot or too cold operating temperature. If the thermostat is not replaced, this could result in damage to the engine or impaired engine performance.*

IMPORTANT: Do not operate an engine without a thermostat.



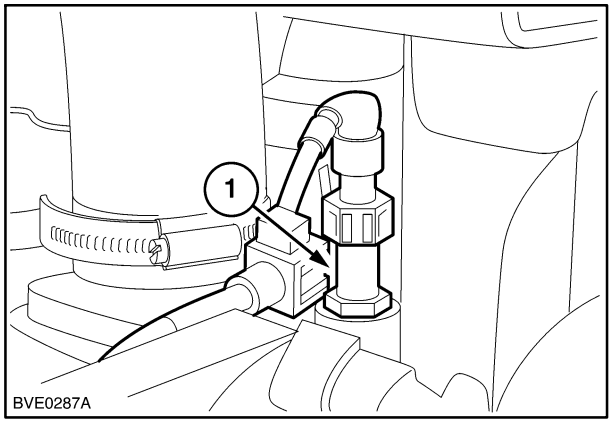
46

COOLANT TEMPERATURE SENSOR

Electronic Fuel Injection Engines

Removal

1. Disconnect the coolant temperature sensor electrical connector and remove the coolant temperature sensor (1).



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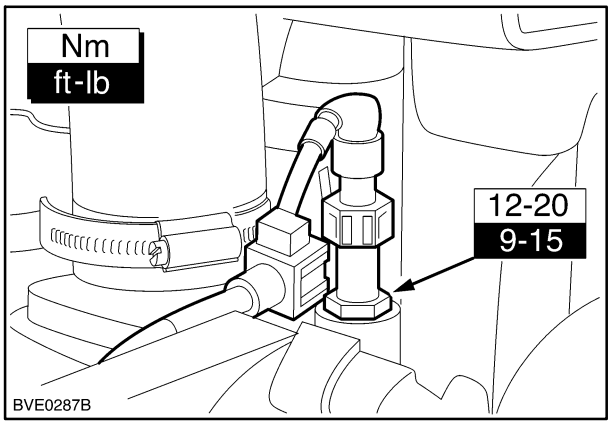
Installation

1. Apply sealant to the threaded portion of the new coolant temperature sensor body and tighten the coolant temperature sensor to the specified torque value.



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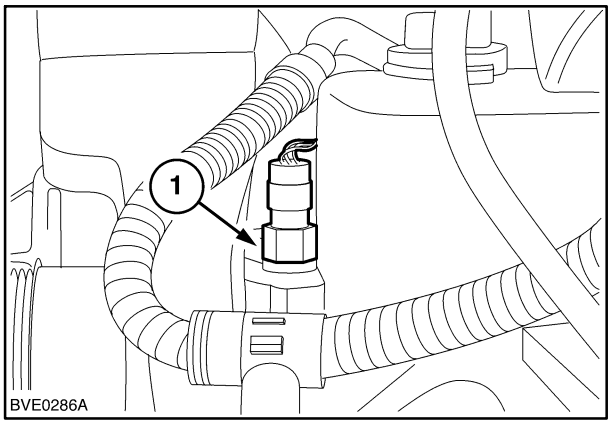
Mechanical Fuel Injection Engines

Removal

1. Disconnect the coolant temperature sender electrical connector and remove the coolant temperature sender (1).



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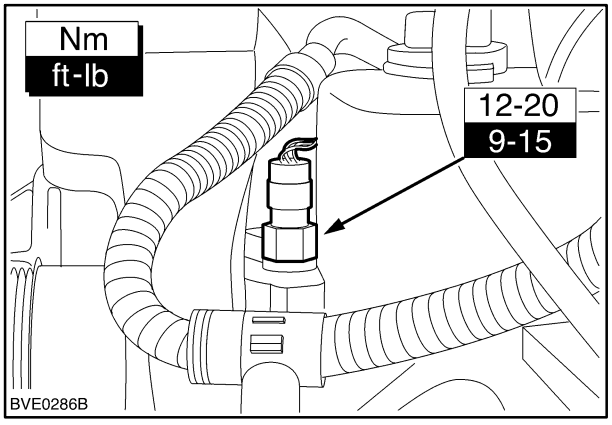
Installation

1. Apply sealant to the threaded portion of the new coolant temperature sender body and tighten the coolant temperature sender to the specified torque value.



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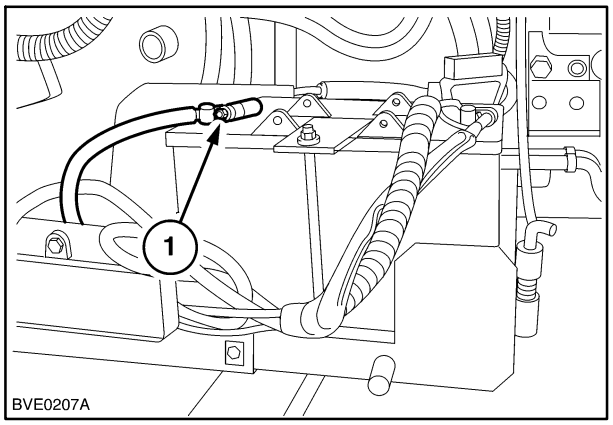
VISCOUS FAN

Removal

1. Remove the battery cover and disconnect the battery negative cable (1).



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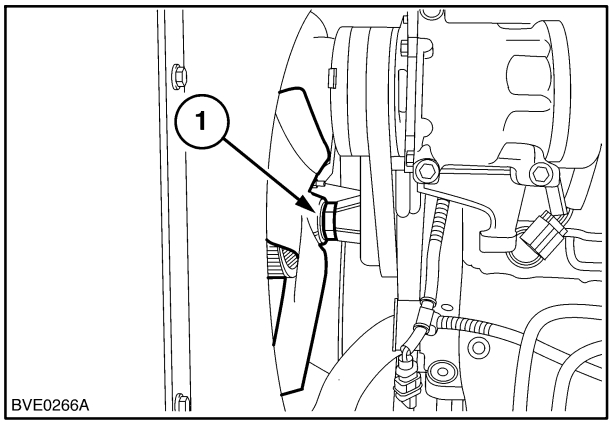
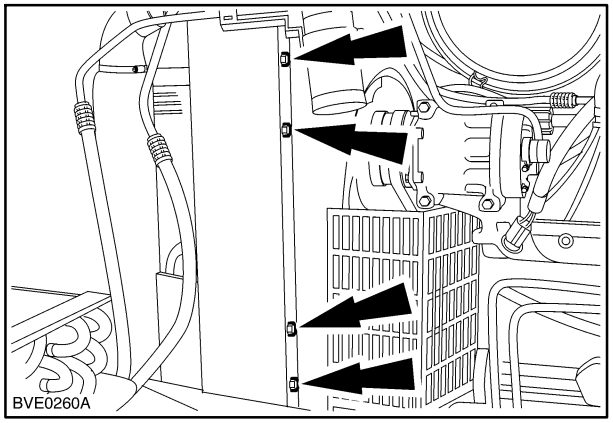
NOTE: *The fan clutch has a left hand thread. It will be necessary to hold the fan pulley to remove the viscous fan assembly, use a strap wrench to prevent the pulley rotating.*

2. Remove the viscous fan assembly (1).



52

3. Remove the cooling fan shroud retaining bolts.



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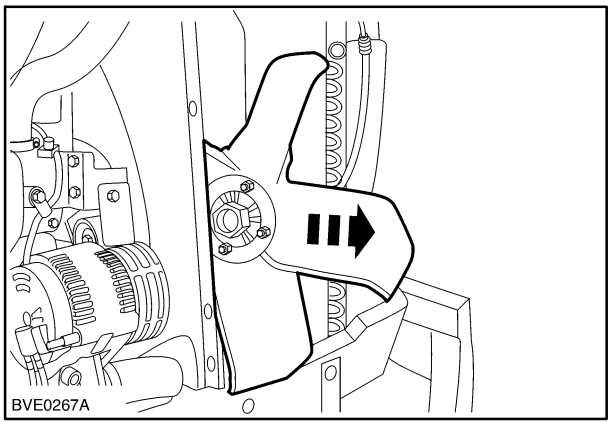
4. Remove the viscous fan assembly.



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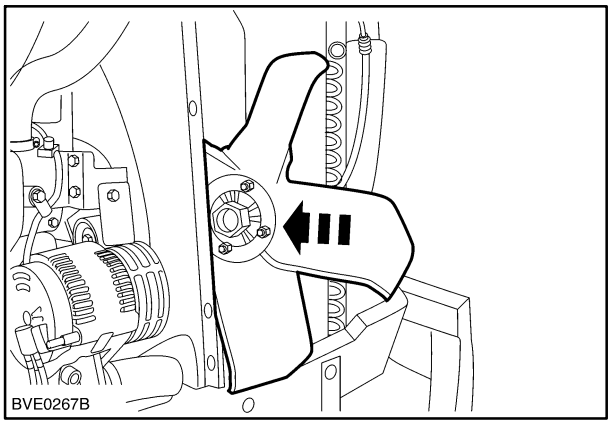
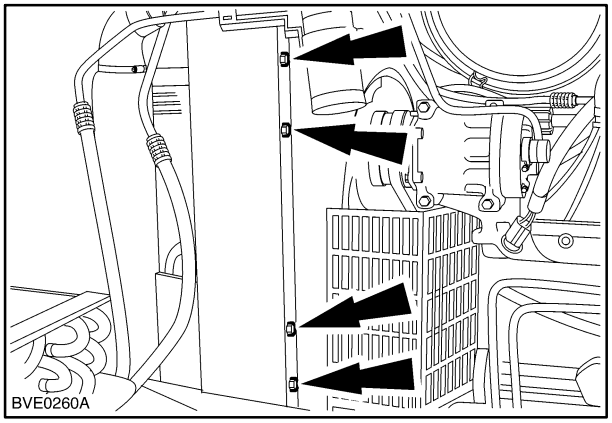
Installation

1. Install the viscous fan assembly.



55

2. Install the cooling fan shroud retaining bolts.



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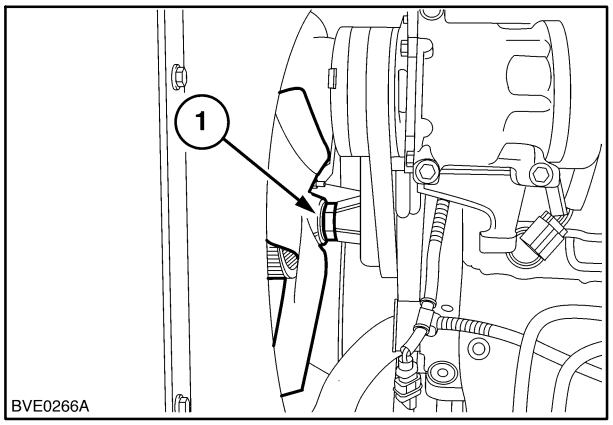
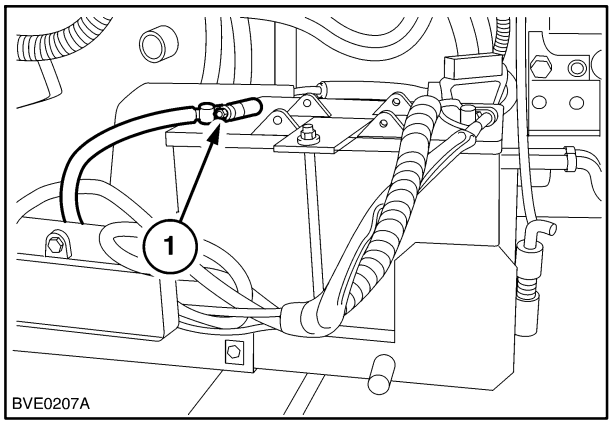
NOTE: *The fan clutch has a left hand thread. It will be necessary to hold the fan pulley to install the viscous fan assembly, use a strap wrench to prevent the pulley rotating.*

3. Install the viscous fan assembly (1) and tighten to the specified torque value.



57

4. Connect the battery negative cable (1) and install the battery cover.



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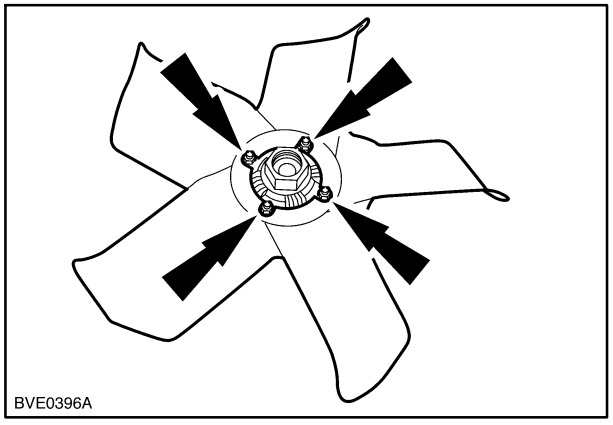
Fan Blade Removal

1. Remove the viscous fan assembly (refer to viscous fan assembly removal in this chapter).
2. Remove the fan blade from the viscous coupling.

Fan Blade Installation

1. Install the fan blade to the viscous coupling and tighten the nuts to the specified torque value.
2. Install the viscous fan assembly (refer to viscous fan assembly installation in this chapter).



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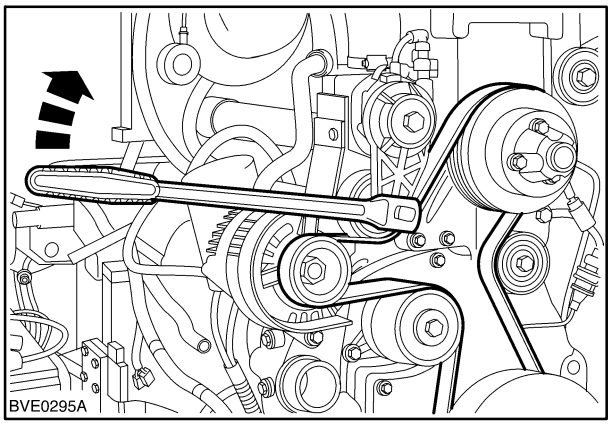
FAN BELT

Removal

1. Remove the air conditioning and air compressor drive belt(s) (if fitted).
2. Attach a 1/2in. square drive bar to the automatic fan belt tensioner arm. Rotate clockwise and remove the fan belt from the pulleys.
3. Carefully feed the fan belt between the cooling fan and the radiator shroud.



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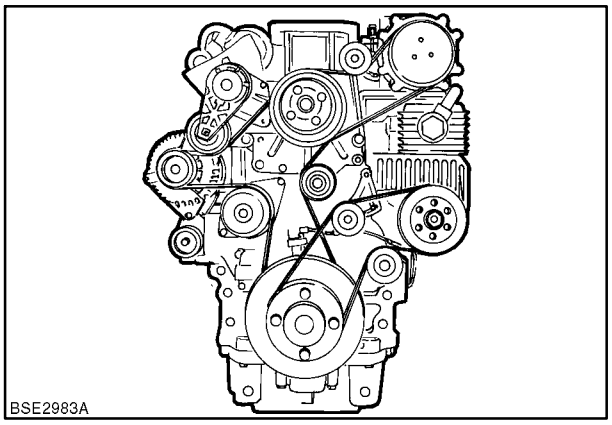
Installation

1. Carefully feed the fan belt between the cooling fan and the radiator shroud.
2. Attach a 1/2in. square drive bar to the automatic fan belt tensioner arm. Rotate clockwise and refit the fan belt onto the pulleys.
3. Install the air conditioning and air compressor belt(s) (if fitted).



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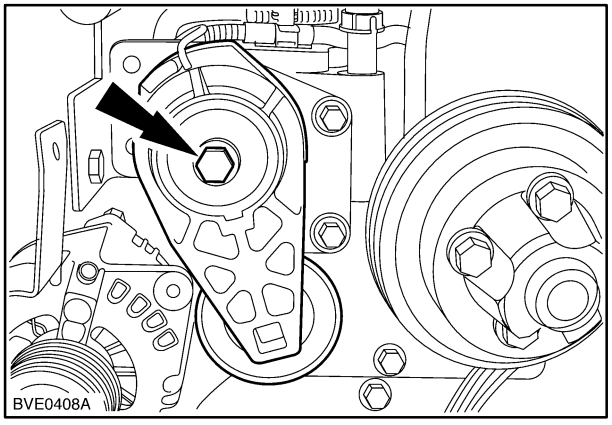
BELT TENSIONER

Removal

1. Remove the fan belt (refer to fan belt removal in this chapter).
2. Remove the retaining bolt and remove the fan belt tensioner.



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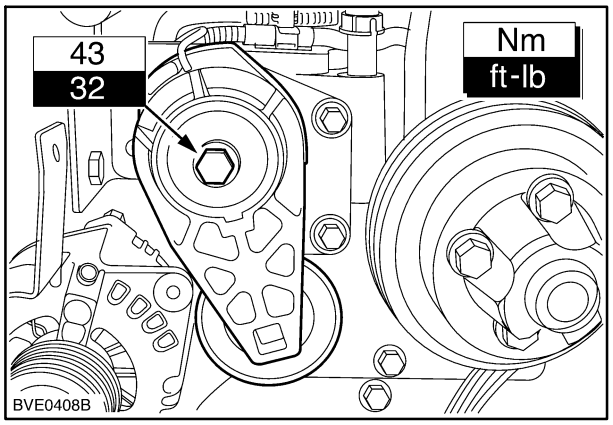
Installation

1. Fit a new pulley to the automatic fan belt tensioner if required and tighten the retaining bolt to the specified torque value.
2. Install the fan belt tensioner retaining bolt (1) and tighten to the specified torque value.
3. Install the fan belt (refer to fan belt installation in this chapter).



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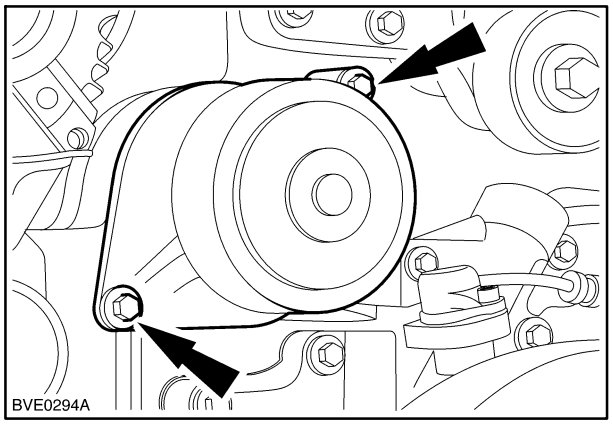
Inspection and Repair

1. Checking of the tensioner assembly operation should be carried out, with the tensioner assembly still attached to the front cover. To check the spring load, place a "break back" torque bar pre-set to, 70–85 Nm (52–63 ft-lb) on to the pulley attaching bolt. Raise the lever up through an arc of 20° maximum. If the torque bar does not "break" within the range a new tensioner assembly is required.
2. Ensure the tensioner pulley, rotates freely by hand. If not replace with new parts.

COOLANT PUMP

Removal

1. Drain the cooling system (refer to cooling system drain in this chapter).
2. Remove the fan belt (refer to fan belt removal in this section).
3. Remove the coolant pump.



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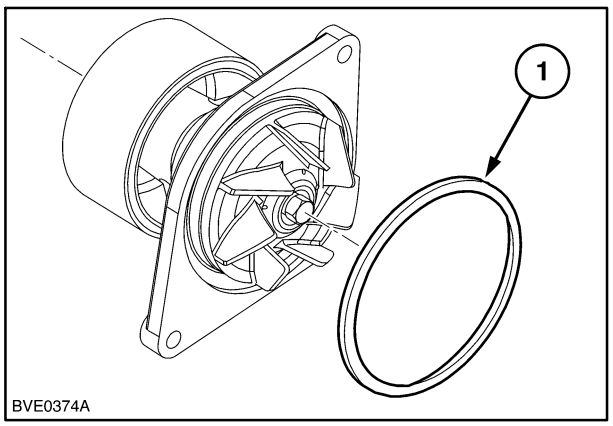
Installation

Make sure the mating surfaces are clean.

4. Replace the seal (1) and lubricate with clean engine oil.



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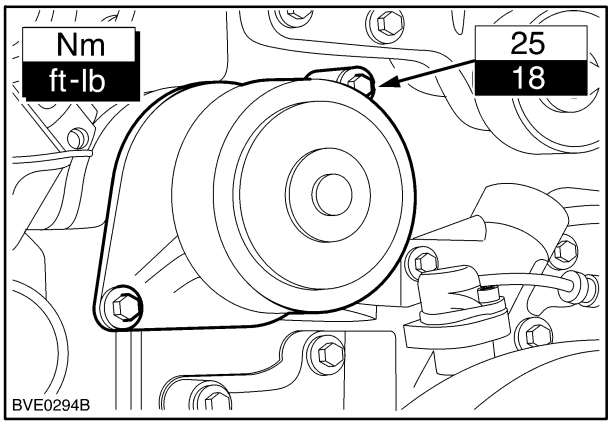
5. Install the coolant pump and tighten the retaining bolts to the specified torque value.
6. Install the fan belt (refer to fan belt installation in this chapter).
7. Refill the cooling system (refer to cooling system refill in this chapter).



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SECTION 10 - ENGINE

Chapter 6 - Fuel Tank Removal

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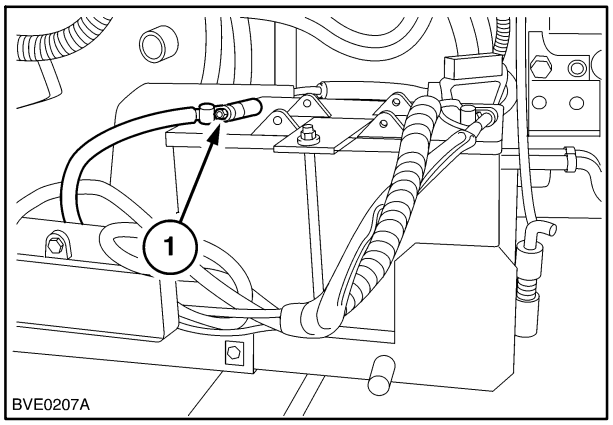
	Installation	4

FUEL TANK

Removal

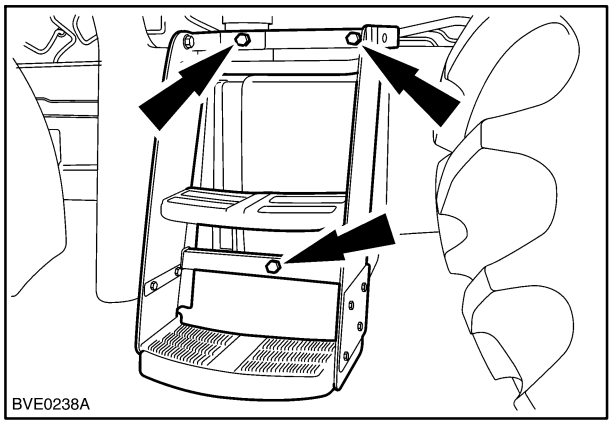
NOTE: *It is recommended that the fuel tank is drained prior to removal from the tractor. Drainage points are provided.*

1. Remove the battery cover and disconnect the battery negative cable (1).
2. Drain the fuel tank into a suitably sized fuel container.



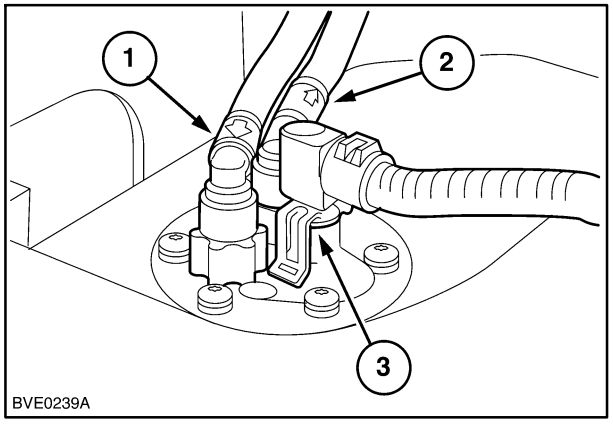
1

3. Remove the left hand side steps.
4. Remove the left hand rear wheel.



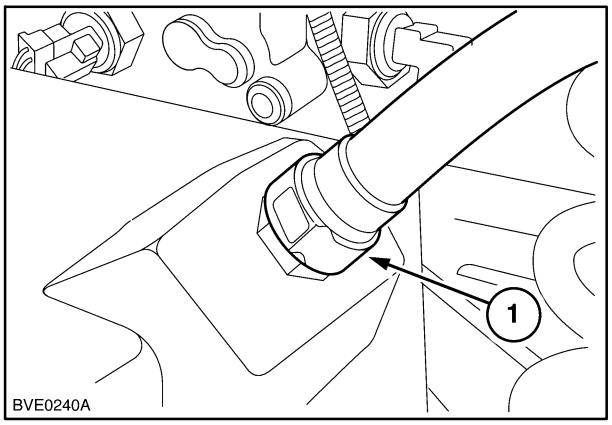
2

5. Disconnect the fuel tank return line (1), fuel tank supply line (2) and the fuel tank sender unit electrical connector (3).



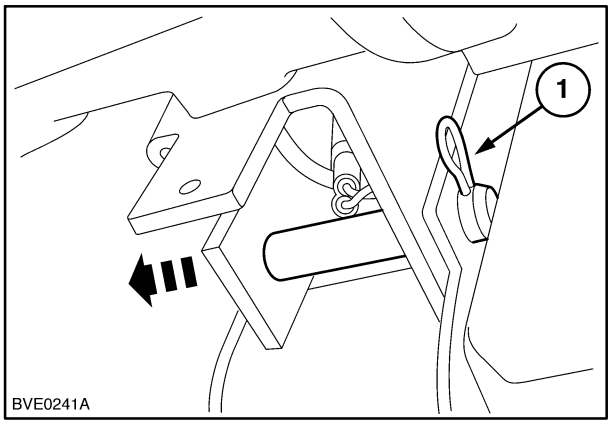
3

6. Disconnect the fuel tank vent tube (1) from the rear of the fuel tank.



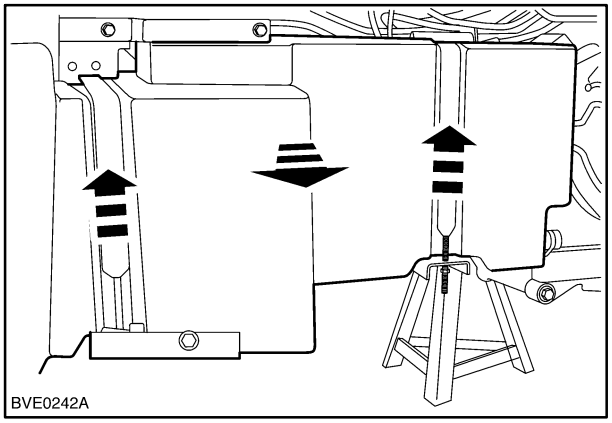
4

7. Remove the R-clip (1) and remove the fuel tank retaining pin. Repeat this step for the remaining fuel tank retaining pin.



5

8. With the aid of an assistant or a trolley jack, raise the fuel tank clear of the retaining brackets and remove the fuel tank.



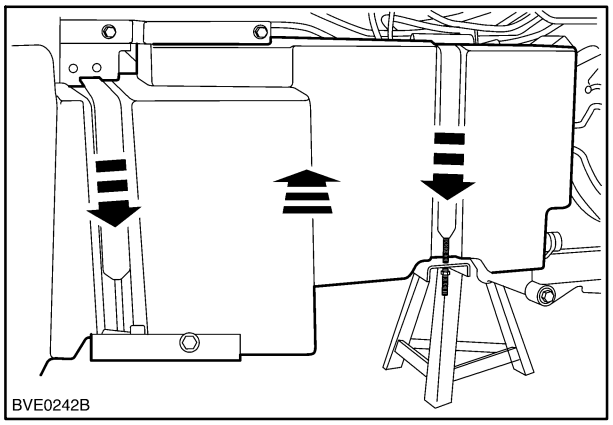
6

Installation

WARNING

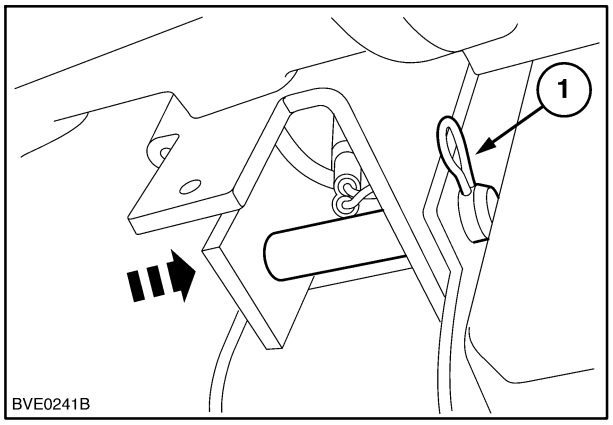
Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

1. With the aid of an assistant or a trolley jack, lower the fuel tank onto the retaining brackets.



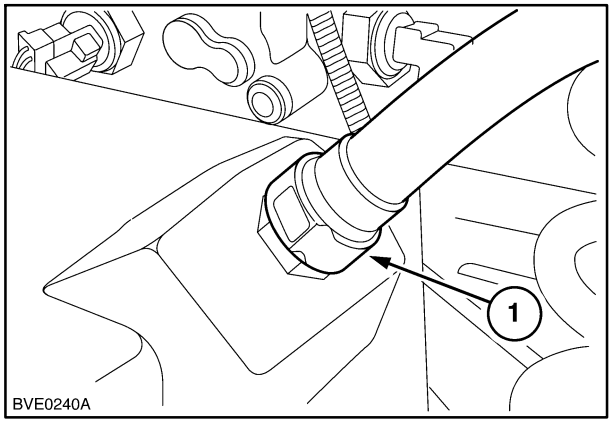
7

2. Install the fuel tank retaining pin and the R-clip (1). Repeat this step for the remaining fuel tank retaining pin.



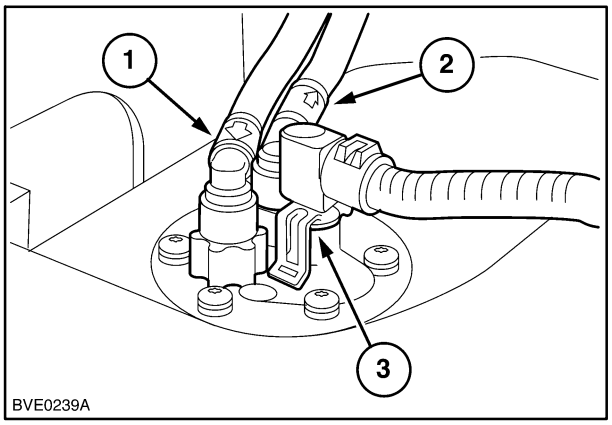
8

3. Connect the fuel tank vent tube (1) to the rear of the fuel tank.



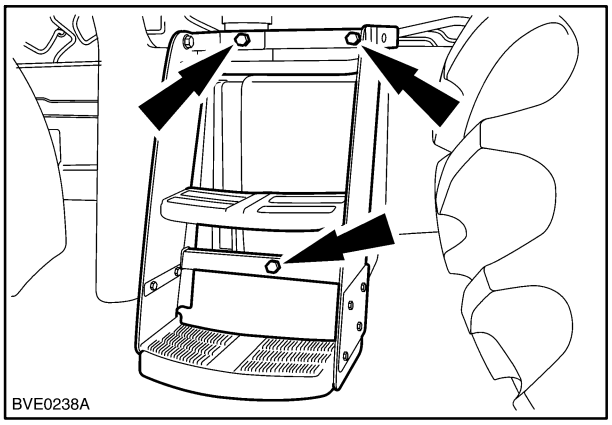
9

4. Connect the fuel tank return line (1), fuel tank supply line (2) and the fuel tank sender unit electrical connector (3).



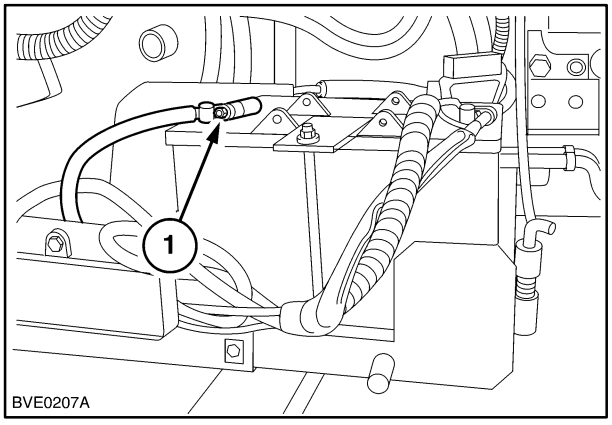
10

5. Install the left hand side steps.
6. Install the left hand rear wheel.



11

7. Refill the fuel tank.
8. Connect the battery negative cable (1) and install the battery cover.



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SECTION 10 – ENGINE

Chapter 7 – Fuel Injection Pump
4 Cylinder TS-A Delta Models (06–2005)/ T6010 Delta/ T6010 Plus, with Delphi Pumps
(Refer to Chapters 3 and 4 for 6 cylinder TS-A Delta models)

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Section	Description	Page
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	Injection Pump Static Timing – Adjustment	11
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SPECIFICATIONS

Pump Type	Delphi DP210
Pump rotation	Counter-Clockwise (viewed from rear of engine)
Firing Order	1 3 4 2
Injection pump timing	±0.15mm of pump stamped value

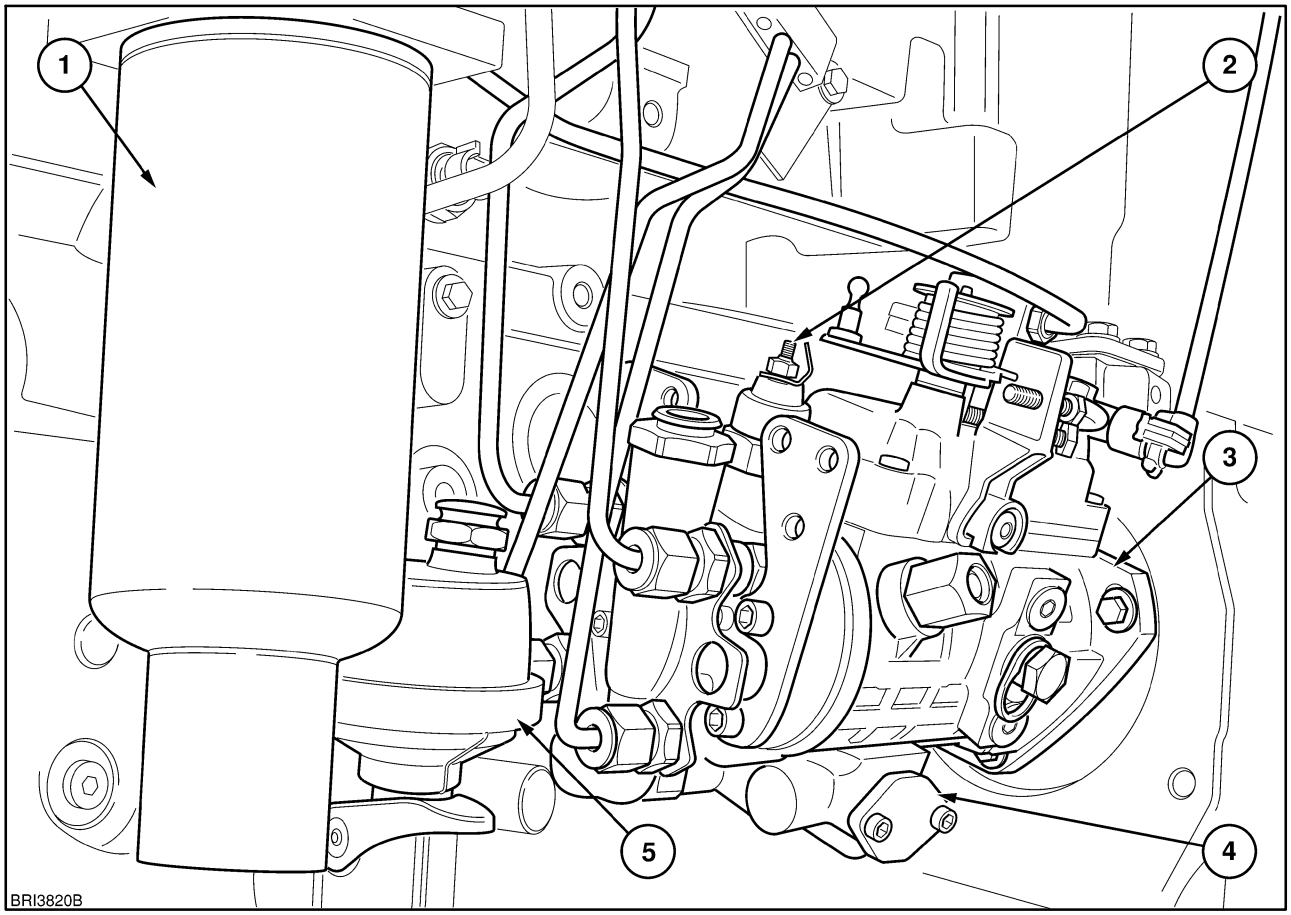
TORQUES

Fuel Injection Pump to Casing	24 Nm	18 ft-lb
Pump Locking Bolt	13 Nm	10 ft-lb
Drive Gear retaining Nut	90 Nm	65 ft-lb
Fuel Lift pump retaining bolts	24 Nm	18 ft-lb
Pump Drive Gear Cover Plate	24 Nm	18 ft-lb

SPECIAL TOOLS

380000979 Fuel injection pump drive gear puller
380000988 Engine turning / locking tool
380002734 Fuel injection pump timing pins

DESCRIPTION AND OPERATION



1

The TS-A Delta range of tractors are installed with a Delphi rotary injection pump (3), on the 4 cylinder engines and the Bosch VE rotary injection pump on the 6 cylinder engines.

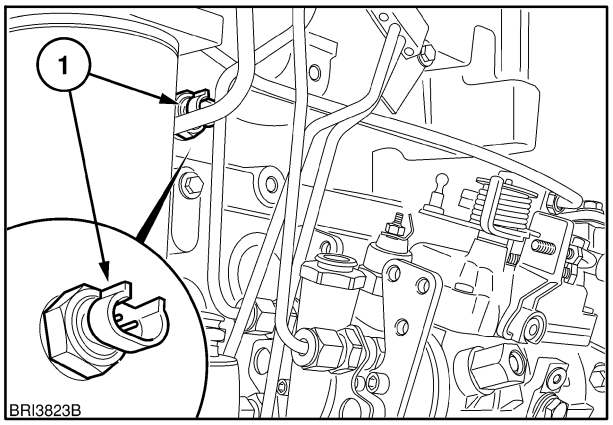
The pumps for both the 4 and 6 cylinder engines are basically sealed items with only minimal parts being supplied in service.

If the fuel injection pump is suspected of being faulty the pump assembly should be taken to a specialist agent for repair. Without specialized equipment these pumps cannot be correctly set up. Unauthorized repair will void warranty and may cause the vehicle to break local emissions regulations.

A lift pump (5) mounted on the left hand side of the engine block draws fuel from the fuel tank and feeds pressurized fuel to the filter (1). The pressurized fuel is then fed into the fuel injection pump via the electrically operated fuel shut off solenoid valve (2).

Both injection pump types are fitted with a thermally operated device (4) which responds to engine coolant temperature and automatically adjusts the pump timing after the engine has been started from a cold condition.

When the engine coolant temperature reaches normal operating temperature the temperature sensor (1) on the engine closes and energizes a heating element. The element causes the motor mechanism to advance the pump engine timing. The pump timing is now regulated in accordance with operating temperature as well as speed for improved emissions.



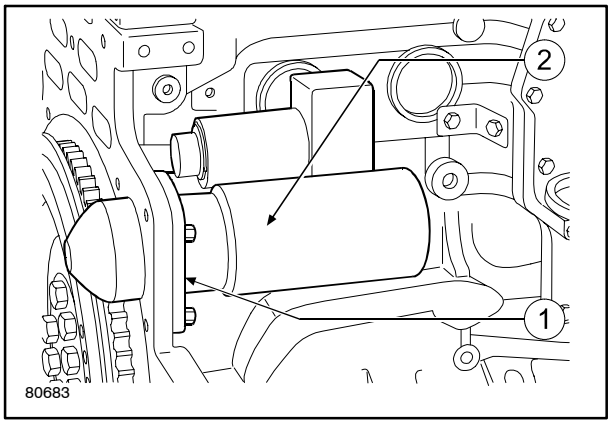
2

DELPHI ROTARY FUEL PUMP REMOVAL AND INSTALLATION

IMPORTANT: *Due to stringent emission regulations in most locations the Delphi fuel injection pump is supplied as a spare part preset from the manufacturer. If, for whatever reason the pump timing is lost, ie, the removal and installation procedure is not followed correctly or the pump is allowed to be unlocked and rotated while off of the engine, then it will be necessary to return the pump to an authorized agent to have it reset. This is necessary to maintain the high level of accuracy required to comply with the emission regulations and provide the vehicle with the optimum performance and economy.*

Removal

1. If it is necessary to change the fuel pump, it is supplied already pre-set as a spare part.
2. Whereas, if the pump has to be removed and refitted later, without undergoing repair, it must be pre-set while still fitted on the engine and removed only afterwards.
3. The following procedure includes this second condition as it is more complex:-
4. Disconnect the battery negative cable and raise the engine hood.
5. Remove the starter motor (1) from the mounting (2).
6. Fit tool **380000988** (2) to be able to turn the flywheel .
7. Carefully turn the flywheel in its direction of rotation to cancel the clearances of the gears.
8. Turn the engine until the pin (1) engages through the slot in the plate (2) with the recess in the flywheel (3).



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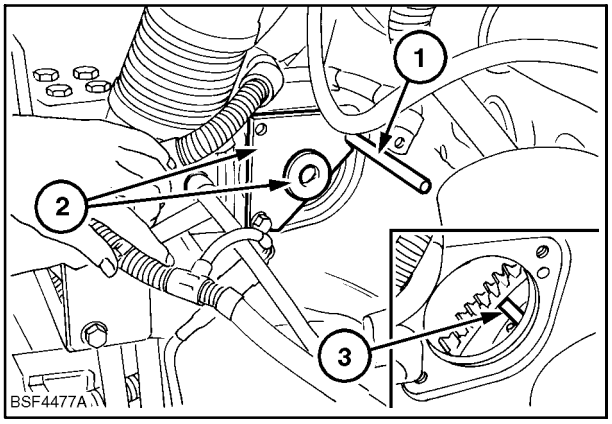

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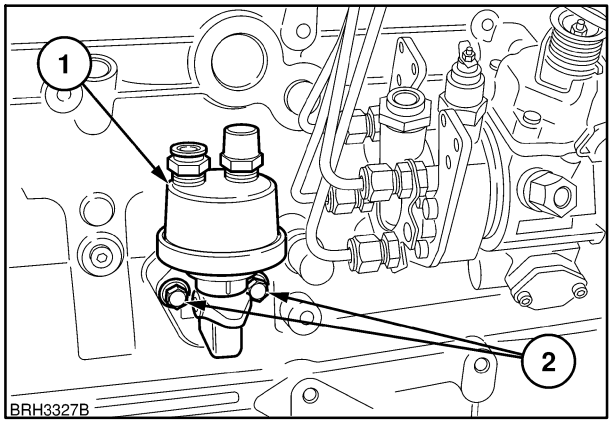
9. Unscrew the retaining bolts (2) and remove the priming pump (1) from the engine block.



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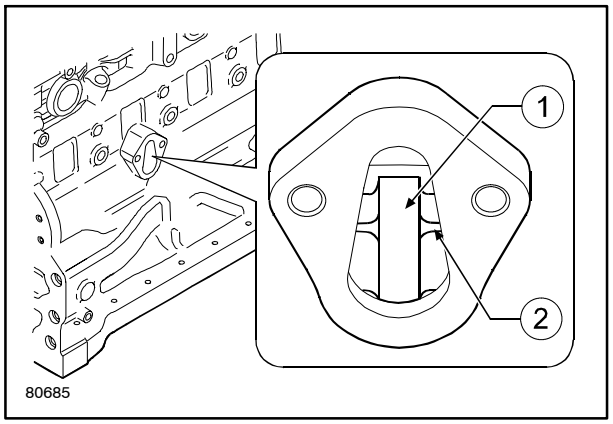
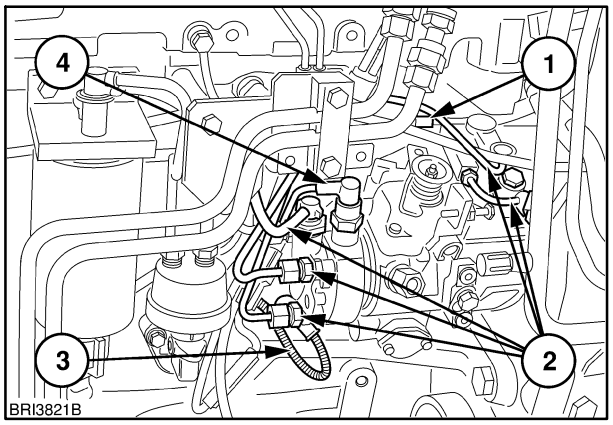
10. Check through the opening of the priming pump location that the camshaft (1) is on the correct cycle (at TDC) using the **raised** reference marks (2) on the shaft.

    If the marks are not evident, withdraw the pin from the flywheel and rotate the engine 360° until the reference marks are visible. Re-insert the pin to lock.



6

11. Disconnect the throttle cable (1).
12. Disconnect the electrical connections to the fuel shut off solenoid (4) and cold start advance unit (3).
13. Remove the fuel feed and return pipes and the outlet pipes to the injectors from the pump (2).



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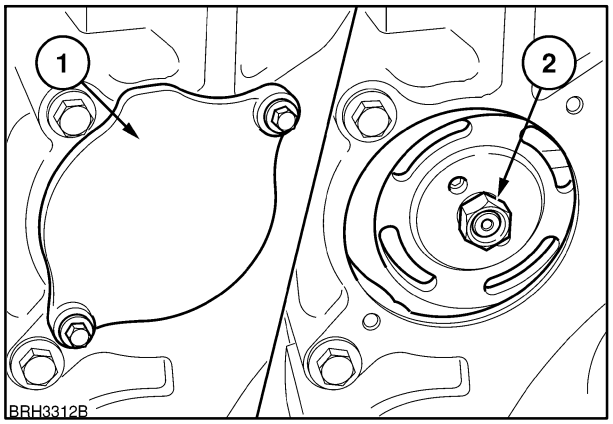
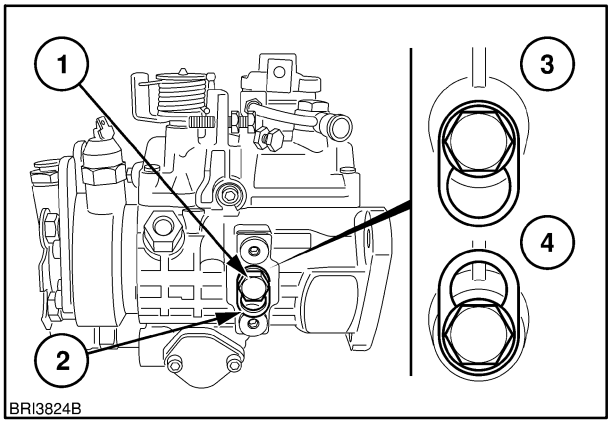
14. Remove the cover plate (1) from the rear gear casing for the fuel injection pump drive gear.
15. Prevent the engine from turning using the turning/holding tool (**380000988**) and loosen the fuel injection pump gear retaining nut (2).



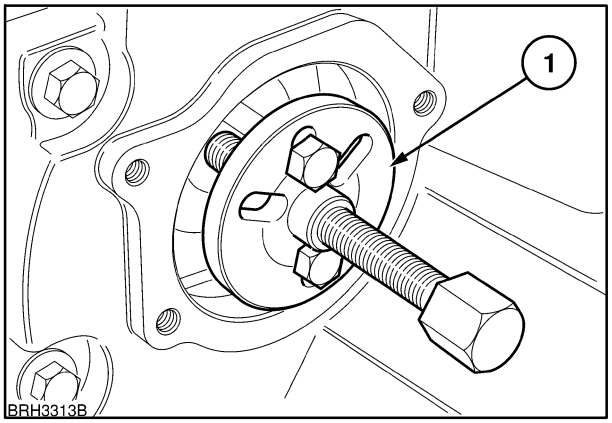
8

16. Partly unscrew the side bolt (1), move the spacer washer (2), to allow the bolt to lock the shaft
(3) Shaft unlocked
(4) Shaft locked
Retighten the side bolt (1).



9

17. Remove the pump drive gear retaining nut.
18. Using special tool **380000979** (1), remove the gear from the pump shaft.



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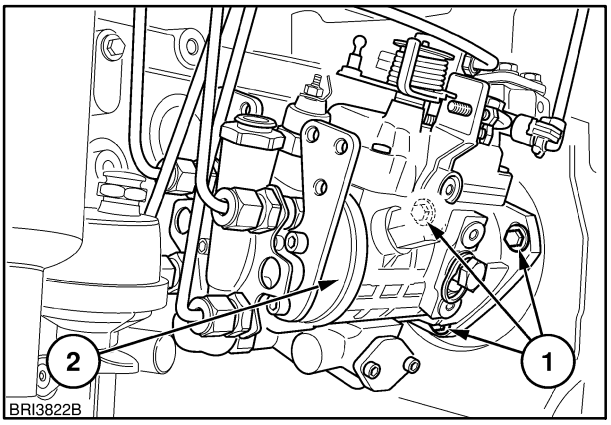
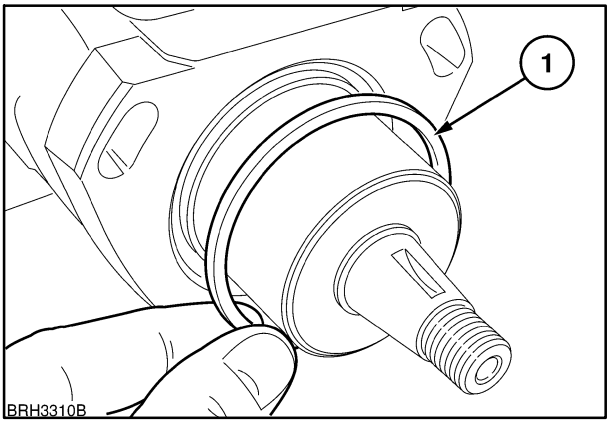
19. Unscrew the pump retaining bolts (1) and withdraw the fuel pump (2).



11

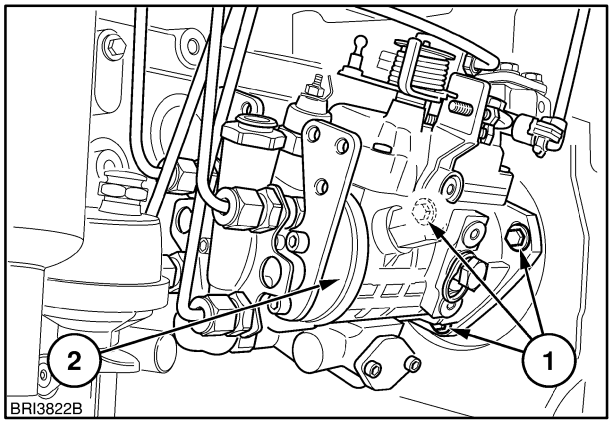
Installation

1. When fitting the fuel pump on the engine, it is necessary to bring about the condition of T.D.C. on cylinder No. 1 as described on the previous page.
2. Inspect the square section seal (1) on the pump casing. Replace if damaged.



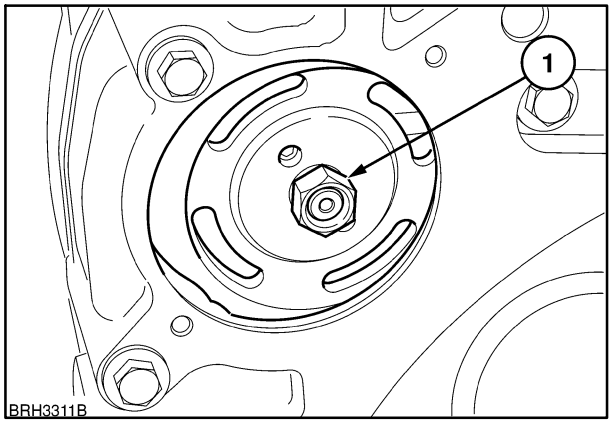
12

3. Install the pump (2) onto the engine and tighten the retaining nuts (1), to 24 Nm (18 ft-lb).



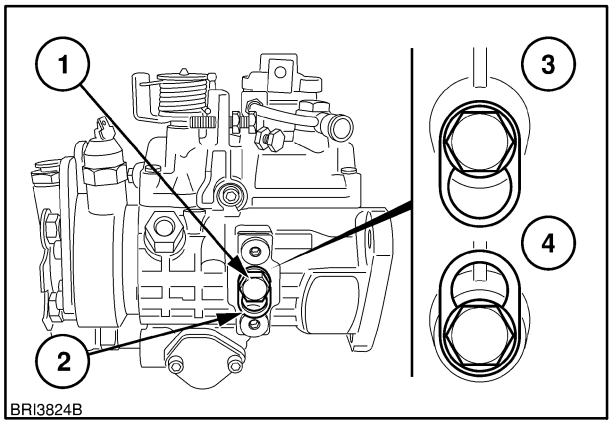
13

4. Install the pump drive gear retaining nut (1) and initially tighten to 20 Nm (15 ft-lb).



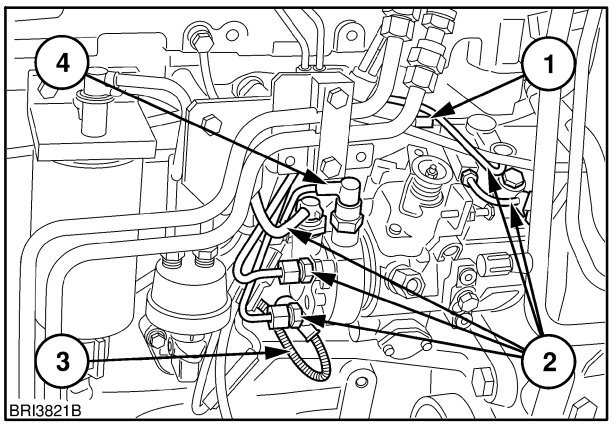
14

5. Partly unscrew the bolt (1), reposition the spacer washer (2) to the unlock position (3). Screw down the bolt, locking the above-mentioned washer: in this way, the fuel pump spindle is free to turn.
6. Fully tighten the pump drive gear retaining nut to 90Nm (65 ft-lb).
7. Install the rear casing cover.



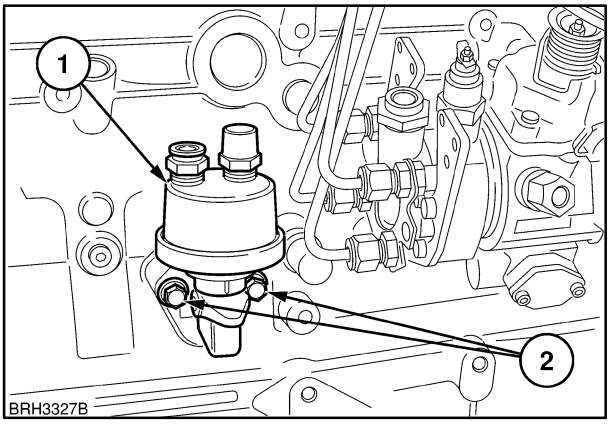
15

8. Withdraw the engine flywheel locking pin.
9. Remove tool **380000988** for flywheel locking/rotation; refit the starter motor.
10. Connect the injector pipes and the fuel feed and return pipes (2).
11. Connect the throttle cable (1).
12. Connect the electrical connections to the fuel shut off solenoid (4) and cold start advance device (3).



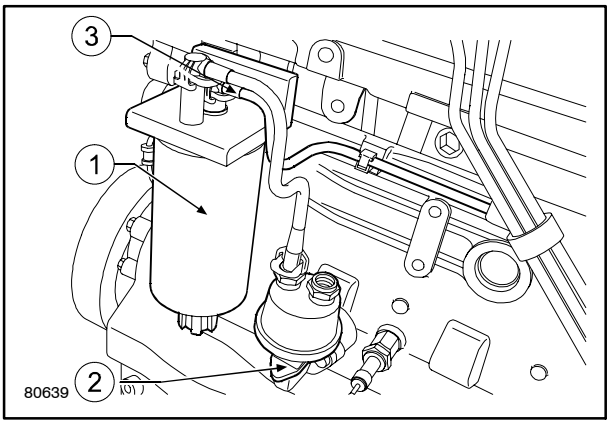
16

13. Fit the priming pump (1), using a new gasket, onto the crankcase and tighten the retaining bolts (2) to the prescribed torque.



17

14. If any work has been done on the supply circuit components, it is necessary to bleed the air from the system.
15. Disconnect the filter fuel piping (3) and repeatedly operate the bleed lever of the priming pump (2).
16. Continue operating until fuel comes out.
17. Connect the piping (3) to the filter.
18. Reconnect the battery negative lead.



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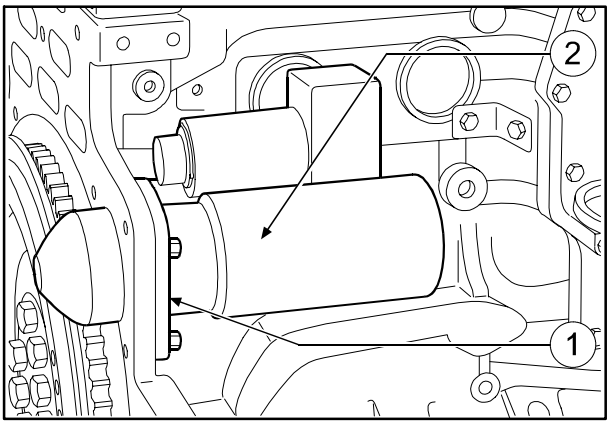
Checking Injection Pump Static Timing

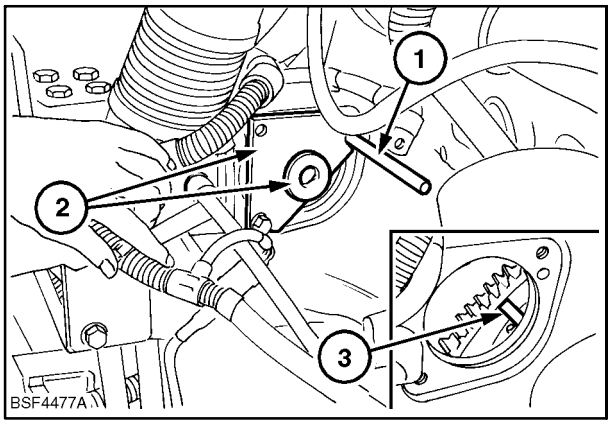
The pump timing is determined by the position of the pump shaft when the engine is set to TDC on the injection cycle of No.1 cylinder. This position is ascertained by performing the following measurements.

1. Disconnect the battery negative cable and raise the engine hood.
2. Remove the starter motor (1) from the mounting (2).



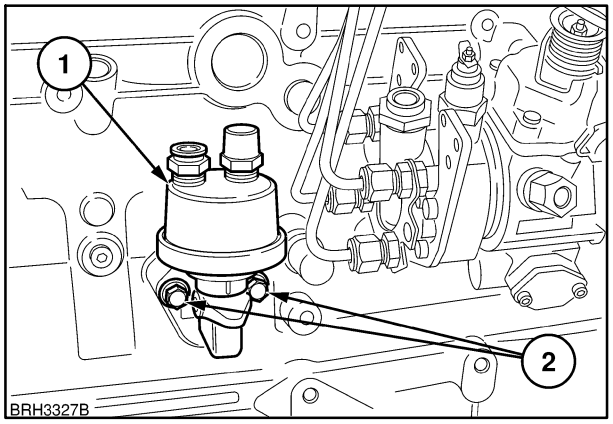
19

3. Fit tool **380000988** (2) to be able to turn the flywheel.
4. Carefully turn the flywheel in its direction of rotation to cancel the clearances of the gears.
5. Turn the engine until the pin (1) engages through the slot in the plate (2) with the recess in the flywheel (3).



20

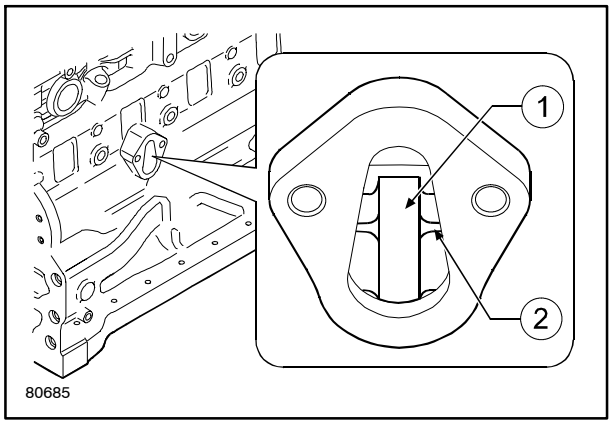
6. To verify that the engine is on the correct cycle, unscrew the retaining bolts (2) and remove the priming pump (1) from the engine block.



21

7. Check through the opening of the priming pump location that the camshaft (1) is on the correct cycle (at TDC) using the **raised** reference marks (2) on the shaft.

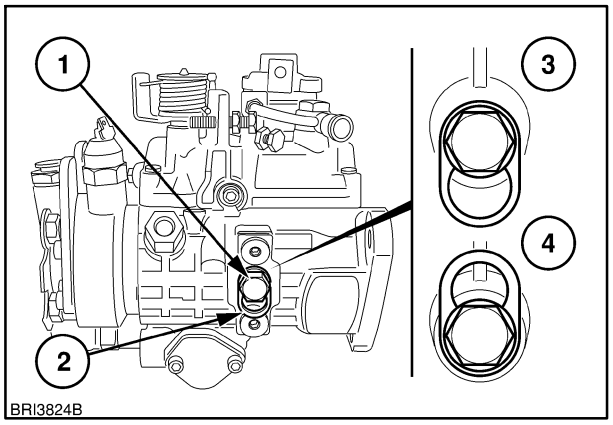
   If the marks are not evident, withdraw the pin from the flywheel and rotate the engine 360° until the reference marks are visible. Re-insert the pin to lock.



22

8. Partly unscrew the side bolt (1), move the spacer washer (2), to allow the bolt to lock the shaft
   (3) Shaft unlocked
   (4) Shaft locked
   Retighten the side bolt (1)

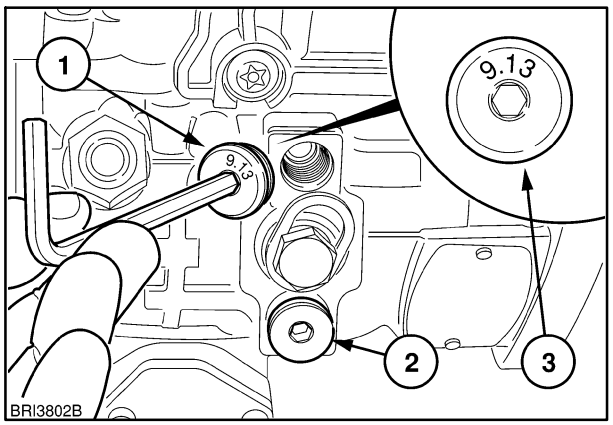
NOTE: *Do not attempt or allow the engine to be rotated while the pump is in the locked condition.*



23

9. Remove the two access plugs for the timing checking pins, items 1 and 2.

NOTE: *The value, 3, stamped onto one of the plugs is unique to the pump and must not be interchanged with other pumps.*



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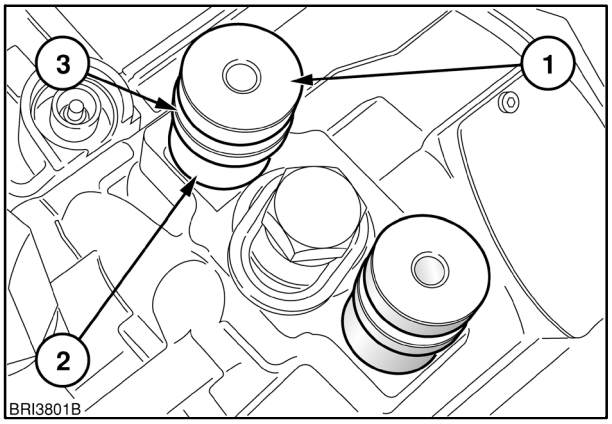
10. Using special tool **380002734** (consisting of 2 checking pin assemblies), check the position of the pump shaft using the following procedure:
11. Unscrew the threaded pin of the tool (1) to provide sufficient clearance to fully install the main body (2) of the tool into the pump. With the tool body fully installed, carefully screw in the pin, (1), until contact is made with the pump shaft. Lock the tool in this position by tightening the collar (3) onto the main body.
12. Repeat the above procedure using the second pin in the other access hole.
13. Carefully remove the pin assemblies from the pump by unscrewing at the main body of the tool.

NOTE: *Make a note of which pin was in which access hole.*

14. Using a suitable vernier caliper gauge measure the internal clearance of each tool between the collar and pin faces. See figure 26.



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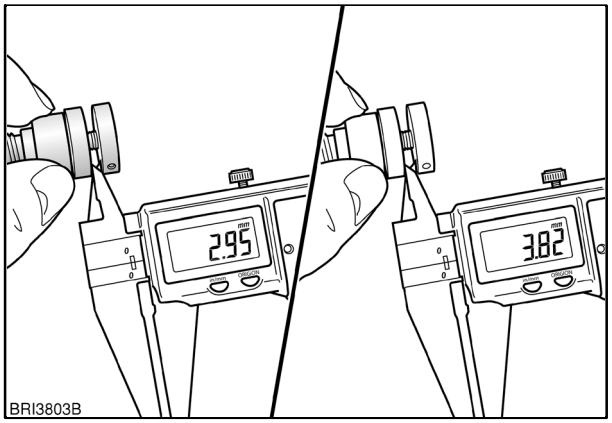

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15. Use the following formula to determine if the pump timing is within specification:-

(10) + (bottom pin clearance) - (top pin clearance)

Example:
10 + 2.95 - 3.82 = 9.13

If the result is ± 0.15mm of the value stamped on the access plug the pump timing is within specification.

Injection Pump Static Timing - Adjustment

It is recommended that the procedure described above is repeated before pump adjustment is carried out. If the static timing is not to specification after a repeat test, perform the following operations:

1. Determine the dimensions required to bring the pump shaft position into specification using the following formulas:

If the measured value is Lower than the stamped value:

$$\frac{\text{(Stamped Value) - (Measured Value) -}}{2} = \text{Difference}$$

Then : Add the difference to the **Bottom** measured value and deduct the difference from the **top** measured value.

Example:
(10 + Bottom value - Top Value)
10 + 2.5 - 4.27 = 8.23 (measured value)
9.13 = stamped value

$$\frac{9.13 - 8.23}{2} = 0.45$$

2.5 + 0.45 = 2.95 (required bottom value)
4.27 - 0.45 = 3.82 (required top value)

27

If the measured value is Higher than the stamped value:

$$\frac{\text{(Measured Value) - (Stamped Value)}}{2} = \text{Difference}$$

Then : Add the difference to the **top** measured value and deduct the difference from the **bottom** measured value.

Example:
(10 + Bottom value - Top Value)
10 + 3.1 - 3.67 = 9.43 (measured value)
9.13 = stamped value

$$\frac{9.43 - 9.13}{2} = 0.15$$

3.1 - 0.15 = 2.95 (required bottom value)
3.67 + 0.15 = 3.82 (required top value)

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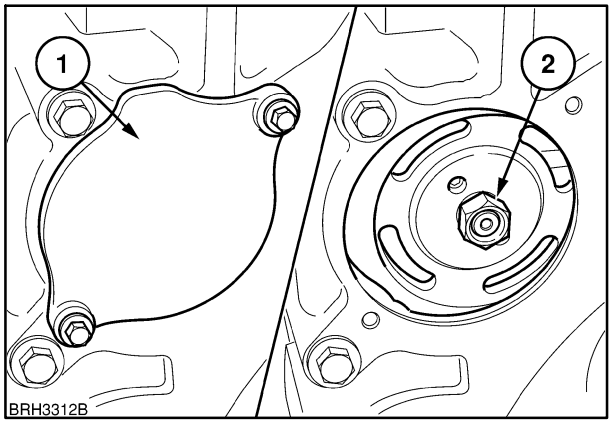
2. Remove the cover plate (1) from the rear gear casing for the fuel injection pump drive gear.
3. Prevent the engine from turning using the turning/holding tool (**380000988**) and loosen the fuel injection pump gear retaining nut (2).



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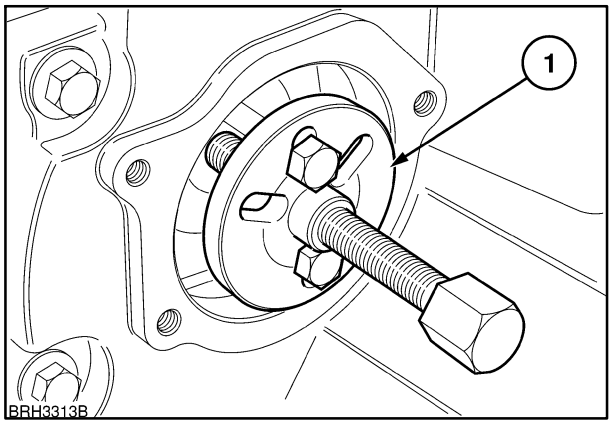
4. Using special tool **380000979** (1), loosen the gear from the pump shaft.



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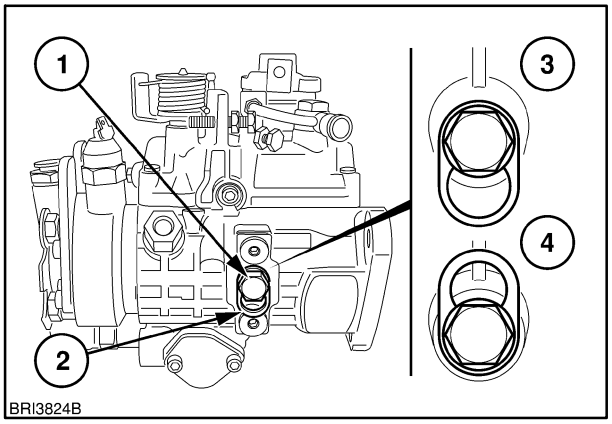
5. Ensure that the pump is unlocked. Loosen the pump locking bolt, (1), and move the spacer, (2), to position, (3).



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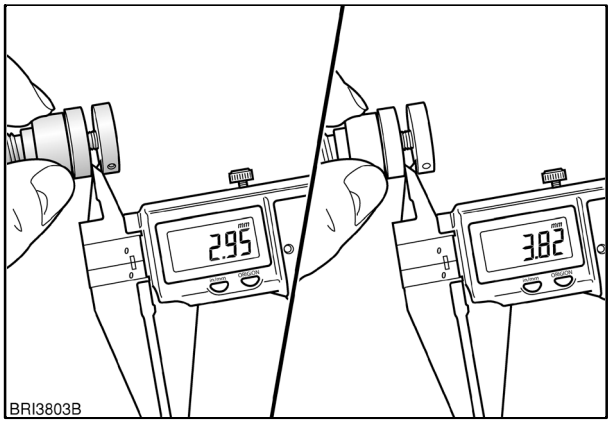
6. Adjust the timing checking pin clearances to the new values, as determined by the previous calculation, lock into position and carefully install into the respective pump access hole.

NOTE: *The checking pin with the reduced value will be used to rotate the pump shaft to its new position and will require more effort to install.*



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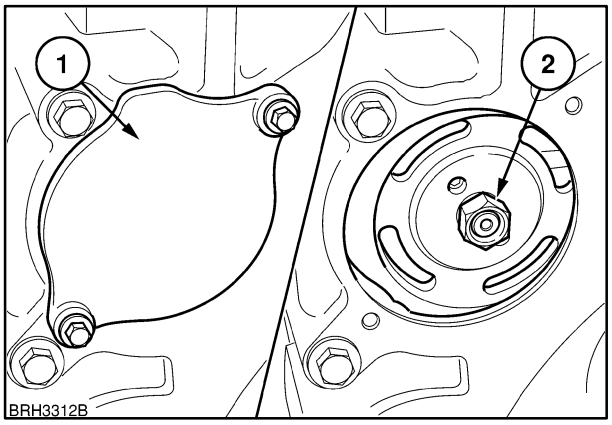
7. With both checking pins fully installed, lock the pump shaft and tighten the pump drive gear nut, (2), initially to 20 Nm (15 ft-lb).
8. Remove the two checking pins, unlock the pump shaft and remove the engine timing pin from the flywheel. Fully tighten the pump drive gear retaining nut to 90 Nm (65 ft-lb).
9. Install the rear casing cover (1).
10. It is recommended that the timing is checked again after rotating the engine several times, if necessary repeat the checking and adjusting procedure until the timing is within specification.



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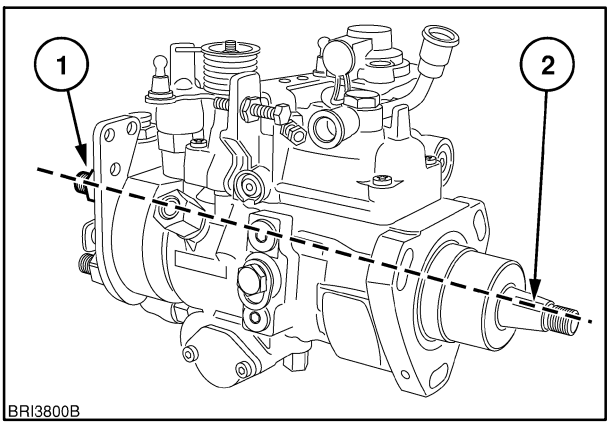
Setting Pump Timing on an Untimed Pump (After pump removal without locking)

1. Determine the fuel outlet of the pump to the number 1 cylinder. Install the pump drive gear nut and rotate the pump shaft until the shaft keyway (2) aligns with the No.1 outlet (1). Lock the pump in this position.



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2. Use the procedures described in '**Checking injection pump static timing**' and '**Injection pump static timing - Adjustment**' to set the pump timing.
3. The pump should then remain in a locked condition and installed onto the engine which has been set to the correct position with the timing pin installed.

SECTION 10 - ENGINE

Chapter 8 - CNH Engine - Tier 3 (T6000 Series Tractors)

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	4 Cylinder Electronic Boosted Engine - F4DE9487B*J / F4DE9487A*J / F4DE9484A*J100	4
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Please Note:

For ALL other information required as to the contents of the engines, please refer to the relevant Chapters of this section.

GENERAL SPECIFICATIONS

4 Cylinder Mechanical Engine - F4CE0484B*D / F4CE9484B*J600

	#100	#110
Engine Type	F4CE0484B*D	F4CE9484B*J600
Emission level	Tier 2	Tier 3
Compression ratio	17.5:1	17.5:1
Max. Power at rated engine speed (2200rpm)	74kw	82kw
CV Rated Power @ 2200rpm	101	112
Max Torque Nm (lbs) @rpm	400 (295) @1400	455 (335) @1400
Slow idling speed (rpm) without load.	850	850
Fast idling speed (rpm) without load.	2400(T2)	2375
Aspiration	Turbocharged	Turbocharged with Aftercooler
Bore x Stroke (mm x mm)	104 x 132	104 x 132
Firing Order	1, 3, 4, 2.	1, 3, 4, 2.
Displacement cm^3 (cu-in)	4485 (273)	4485 (273)
Number of valves per cylinder	2	2
Fuel injection pump type	Mechanical (Delphi)	Mechanical (Bosch)
Fuel tank capacity Litres (Gal)	180 (47.5)	180 (47.5)
Engine oil capacity Litres (Gal)	10 (2.64)	10 (2.64)
Intake valves tappet clearance*	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in
Exhaust valves tappet clearance*	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in

***Tappet Adjustment**

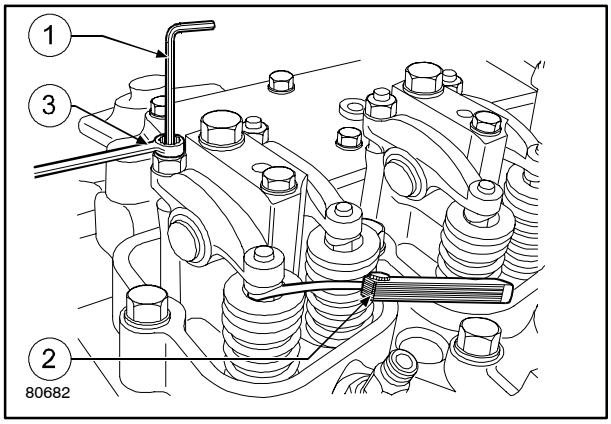
Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

⚠ WARNING ⚠

With tier 3 engines with internal EGR standard valve lash setting procedure will lead to wrong valve clearances and serious engine damage.

EACH cylinder must be checked by putting the engine to TDC firing for that cylinder and setting both valve clearances on that cylinder ONLY.

NO SHORT CUTS INVOLVING THE SETTING OF VALVES ON ONE CYLINDER WHILE ENGINE IS AT TDC OF ANOTHER CYLINDER ARE ALLOWED!



1

6 Cylinder Mechanical Engine - F4CE9684L*J600 / F4CE9684K*J601 / F4CE9684J*J601

	#115	#125	#140
Engine Type	F4CE9684L*J600	F4CE9684K*J601	F4CE9684J*J601
Emission level	Tier 3	Tier 3	Tier 3
Compression ratio	17.5:1	17.5:1	17.5:1
Max. Power at rated engine speed (2200rpm)	86kw	93kw	104kw
CV Rated Power @ 2200rpm	117	126	141
Max Torque Nm (lbs) @rpm	516 (380) @1250	560 (413) @1250	625 (460) @1250
Slow idling speed (rpm) without load.	850	850	850
Fast idling speed (rpm) without load.	2375	2375	2375
Aspiration	Turbocharged with Aftercooler	Turbocharged with Aftercooler	Turbocharged with Aftercooler
Bore x Stroke (mm x mm)	104 x 132	104 x 132	104 x 132
Firing Order	1, 5, 3, 6, 2, 4.	1, 5, 3, 6, 2, 4.	1, 5, 3, 6, 2, 4.
Displacement cm^3 (cu-in)	6728 (411)	6728 (411)	6728 (411)
Number of valves per cylinder	2	2	2
Fuel injection pump type	Mechanical (Bosch)	Mechanical (Bosch)	Mechanical (Bosch
Fuel tank capacity Litres (Gal)	254 (67)	254 (67)	254 (67)
Engine oil capacity Litres (Gal)	15 (3.96)	15 (3.96)	15 (3.96)
Intake valves tappet clearance*	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in
Exhaust valves tappet clearance*	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in

***Tappet Adjustment**

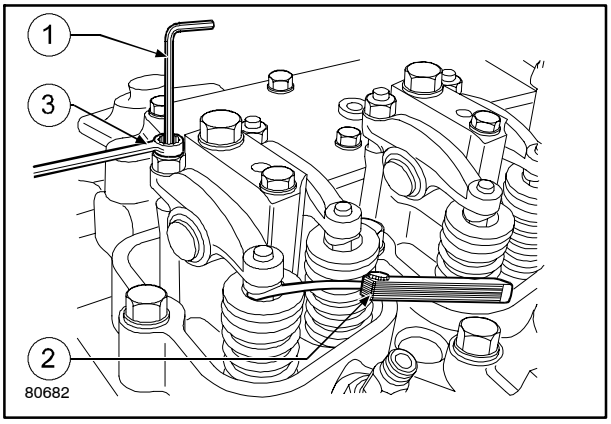
Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

⚠ WARNING ⚠

With tier 3 engines with internal EGR standard valve lash setting procedure will lead to wrong valve clearances and serious engine damage.

EACH cylinder must be checked by putting the engine to TDC firing for that cylinder and setting both valve clearances on that cylinder ONLY.

NO SHORT CUTS INVOLVING THE SETTING OF VALVES ON ONE CYLINDER WHILE ENGINE IS AT TDC OF ANOTHER CYLINDER ARE ALLOWED!



2

4 Cylinder Electronic Boosted Engine - F4DE9487B*J / F4DE9487A*J / F4DE9484A*J100

	#110	#120	#130
Engine Type	F4DE9487B*J	F4DE9487A*J	F4DE9484A*J100
Emission level	Tier 3	Tier 3	Tier 3
Compression ratio	16.5:1	16.5:1	16.5:1
Max. Power at rated engine speed (2200rpm)	97kw	104kw	104kw
CV Rated Power @ 2200rpm	132	141	141
Max Torque Nm (lbs) @rpm	550 (405) @1600	573 (423)@1600	608 (448)@1600
Slow idling speed (rpm) without load.	800	800	800
Fast idling speed (rpm) without load.	2375	2375	2375
Aspiration	Turbocharged with Aftercooler	Turbocharged with Aftercooler	Turbocharged with Aftercooler
Bore x Stroke (mm x mm)	104 x 132	104 x 132	104 x 132
Firing Order	1, 3, 4, 2.	1, 3, 4, 2.	1, 3, 4, 2.
Displacement cm^3 (cu-in)	4485 (273)	4485 (273)	4485 (273)
Number of valves per cylinder	4	4	4
Fuel injection pump type	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)
Fuel tank capacity Litres (Gal)	180 (47.5)	180 (47.5)	180 (47.5)
Engine oil capacity Litres (Gal)	10 (2.64)	10 (2.64)	10 (2.64)
Intake valves tappet clearance*	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in
Exhaust valves tappet clearance*	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in

***Tappet Adjustment**

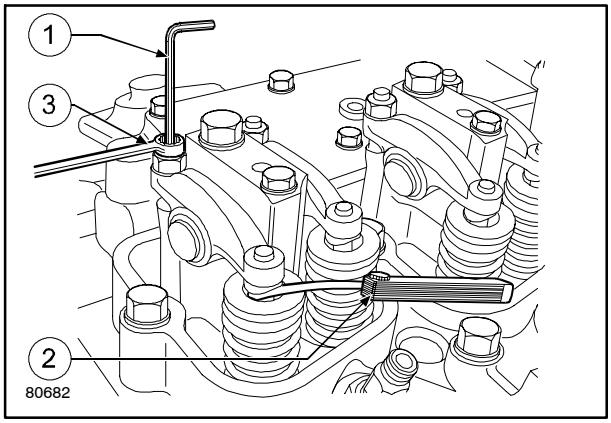
Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

⚠ WARNING ⚠

With tier 3 engines with internal EGR standard valve lash setting procedure will lead to wrong valve clearances and serious engine damage.

EACH cylinder must be checked by putting the engine to TDC firing for that cylinder and setting both valve clearances on that cylinder ONLY.

NO SHORT CUTS INVOLVING THE SETTING OF VALVES ON ONE CYLINDER WHILE ENGINE IS AT TDC OF ANOTHER CYLINDER ARE ALLOWED!

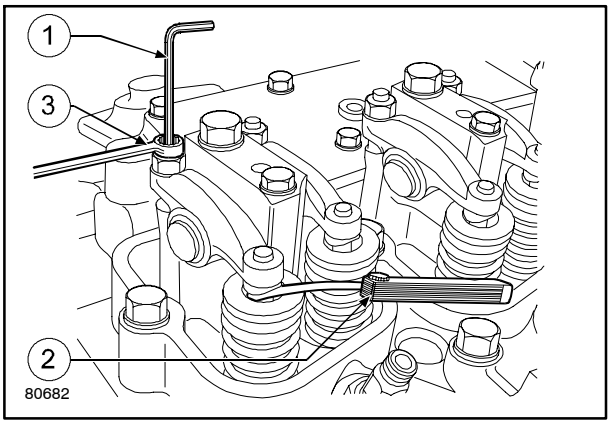


4 Cylinder Electronic Un-Boosted Engine - F4DE9484E*J / F4DE9484D*J / F4DE9484B*J

	#110	#120	#130
Engine Type	F4DE9484E*J	F4DE9484D*J	F4DE9484B*J
Emission level	Tier 3	Tier 3	Tier 3
Compression ratio	16.5:1	16.5:1	16.5:1
Max. Power at rated engine speed (2200rpm)	82kw	89kw	97kw
CV Rated Power @ 2200rpm	112	121	132
Max Torque Nm (lbs) @rpm	520 (384) @1600	563 (415) @1600	594 (438) @1600
Slow idling speed (rpm) without load.	800	800	800
Fast idling speed (rpm) without load.	2375	2375	2375
Aspiration	Turbocharged with Aftercooler	Turbocharged with Aftercooler	Turbocharged with Aftercooler
Bore x Stroke (mm x mm)	104 x 132	104 x 132	104 x 132
Firing Order	1, 3, 4, 2.	1, 3, 4, 2.	1, 3, 4, 2.
Displacement cm^3 (cu-in)	4485 (273)	4485 (273)	4485 (273)
Number of valves per cylinder	4	4	4
Fuel injection pump type pp	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)
Fuel tank capacity Litres (Gal)	180 (47.5)	180 (47.5)	180 (47.5)
Engine oil capacity Litres (Gal)	10 (2.64)	10 (2.64)	10 (2.64)
Intake valves tappet clearance*	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in
Exhaust valves tappet clearance*	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in

***Tappet Adjustment**

Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).



⚠ WARNING ⚠

With tier 3 engines with internal EGR standard valve lash setting procedure will lead to wrong valve clearances and serious engine damage.

EACH cylinder must be checked by putting the engine to TDC firing for that cylinder and setting both valve clearances on that cylinder ONLY.

NO SHORT CUTS INVOLVING THE SETTING OF VALVES ON ONE CYLINDER WHILE ENGINE IS AT TDC OF ANOTHER CYLINDER ARE ALLOWED!

6 Cylinder Electronic Boosted Engine - F4DE9684R*J102 / F4DE9687X*J / F4DE9687J*J

	#115	#125	#140
Engine Type	F4DE9684R*J102	F4DE9687X*J	F4DE9687J*J
Emission level	Tier 3	Tier 3	Tier 3
Compression ratio	17.5:1	17.5:1	17.5:1
Max. Power at rated engine speed (2200rpm)	104kw	112kw	123kw
CV Rated Power @ 2200rpm	141	152	167
Max Torque Nm (lbs) @rpm	575 (424) @1600	620 (457) @1600	678 (500) @1600
Slow idling speed (rpm) without load.	800	800	800
Fast idling speed (rpm) without load.	2375	2375	2375
Aspiration	Turbocharged with Aftercooler	Turbocharged with Aftercooler	Turbocharged with Aftercooler
Bore x Stroke (mm x mm)	104 x 132	104 x 132	104 x 132
Firing Order	1, 5, 3, 6, 2, 4.	1, 5, 3, 6, 2, 4.	1, 5, 3, 6, 2, 4.
Displacement cm^3 (cu-in)	6728 (411)	6728 (411)	6728 (411)
Number of valves per cylinder	4	4	4
Timing. Inlet start before TDC	14°	14°	14°
Inlet end after BDC	20°	20°	20°
Exhaust start before BDC	61°	61°	61°
Exhaust end after TDC	20°	20°	20°
Fuel injection pump type	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)
Bosch Injection Control unit	EDC16C39	EDC16C39	EDC16C39
Injection pressure bar (psi)	300-1800 (4350-26100)	300-1800 (4350-26100)	300-1800 (4350-26100)
Fuel tank capacity Litres (Gal)	254 (67)	254 (67)	254 (67)
Engine oil capacity Litres (Gal)	15 (3.96)	15 (3.96)	15 (3.96)
Intake valves tappet clearance*	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in
Exhaust valves tappet clearance*	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in

***Tappet Adjustment**

Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

⚠ WARNING ⚠

With tier 3 engines with internal EGR standard valve lash setting procedure will lead to wrong valve clearances and serious engine damage.

EACH cylinder must be checked by putting the engine to TDC firing for that cylinder and setting both valve clearances on that cylinder ONLY.

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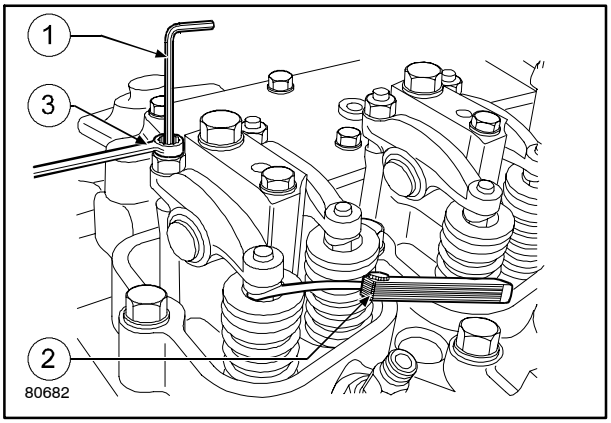

5

6 Cylinder Electronic Un-Boosted Engine - F4DE9684G*J101 / F4DE9684F*J100 / F4DE9687R*J

	#115	#125	#140
Engine Type	F4DE9684G*J101	F4DE9684F*J100	F4DE9687R*J
Emission level	Tier 3	Tier 3	Tier 3
Compression ratio	17.5:1	17.5:1	17.5:1
Max. Power at rated engine speed (2200rpm)	86kw	93kw	104kw
CV Rated Power @ 2200rpm	117	126	141
Max Torque Nm (lbs) @rpm	543 (400) @1600	593 (437) @1600	613 (452) @1600
Slow idling speed (rpm) without load.	800	800	800
Fast idling speed (rpm) without load.	2375	2375	2375
Aspiration	Turbocharged with Aftercooler	Turbocharged with Aftercooler	Turbocharged with Aftercooler
Bore x Stroke (mm x mm)	104 x 132	104 x 132	104 x 132
Firing Order	1, 5, 3, 6, 2, 4.	1, 5, 3, 6, 2, 4.	1, 5, 3, 6, 2, 4.
Displacement cm^3 (cu-in)	6728 (411)	6728 (411)	6728 (411)
Number of valves per cylinder	4	4	4
Timing. Inlet start before TDC	14°	14°	14°
Inlet end after BDC	20°	20°	20°
Exhaust start before BDC	61°	61°	61°
Exhaust end after TDC	20°	20°	20°
Fuel injection pump type	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)	Electronic High Pressure Common Rail (Bosch)
Bosch Injection Control unit	EDC16C39	EDC16C39	EDC16C39
Injection pressure bar (psi)	300-1800 (4350-26100)	300-1800 (4350-26100)	300-1800 (4350-26100)
Fuel tank capacity Litres (Gal)	254 (67)	254 (67)	254 (67)
Engine oil capacity Litres (Gal)	15 (3.96)	15 (3.96)	15 (3.96)
Intake valves tappet clearance*	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in	0.25mm +/- 0.05mm 0.010 in +/- 0.002 in
Exhaust valves tappet clearance*	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in	0.50mm +/- 0.05mm 0.010 in +/- 0.002 in

***Tappet Adjustment**

Adjust the clearance between the rocker arms and valves using an Allen wrench (1), box wrench (3) and feeler gauge (2).

⚠ WARNING ⚠

With tier 3 engines with internal EGR standard valve lash setting procedure will lead to wrong valve clearances and serious engine damage.

EACH cylinder must be checked by putting the engine to TDC firing for that cylinder and setting both valve clearances on that cylinder ONLY.

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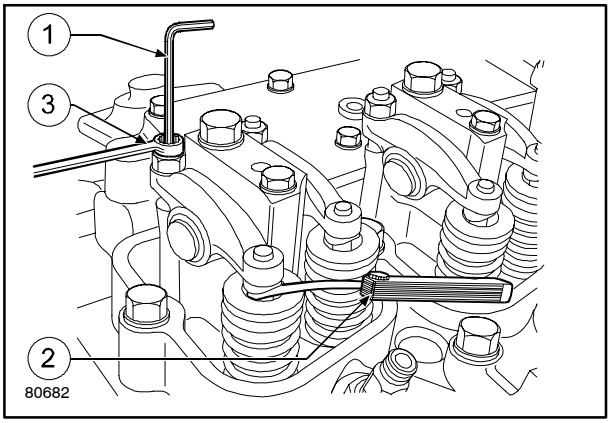

6

NOTES

SECTION 18 - CLUTCH

Chapter 1 - Clutch

CONTENT

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	Troubleshooting	3
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	Hydraulic Release Bearing / Slave Cylinder	8
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	Assembly Overhaul	8

SPECIFICATIONS

Components	
Disc Assembly Type	13in (327 mm) or14in (348 mm) Single Disc Dry Plate
Material	Ceramettallic
Pressure Plate Assembly Type	Belleville (diaphragm) Spring (Self Adjusting - No Maintenance)
Release Bearing Type	Hydraulically Operated with 12x12 Transmission
Transmission Input Shaft Lubricant	Ambra Multipurpose Lithium grease GR75MD
Hydraulic Clutch oil	Ambra brake LHM (NH 160 A)
Master Cylinder Push Rod to Plunger Clearance	0.6 mm (0.024 in) Minimum

TIGHTENING TORQUES

Components	lbf.ft	Nm
Clutch Cover to Flywheel Bolts	26	35
Clutch Pedal Operating Rod Turnbuckle Locknut	25	34
P.T.O. Drive Plate Bolts	95	129
Cross shaft Release Bearing fork Retaining Bolt	35	47
Hydraulic Slave Cylinder Retaining Bolts	18	25
Master Cylinder Retaining Bolts	17	23
Hydraulic Tube Connections	16	22

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	REMEDY
No drive when gear selected and clutch pedal released	1. Rear axle or transmission faulty	1. Engage differential lock. If tractor drives, fault indicated from output of differential unit. If still no drive, possible transmission or rear axle fault. **Note:** If FWD fitted, engage FWD, if tractor drives, transmission O.K.
	2. Clutch bearing not releasing	1. a). Pedal not releasing fully on hydraulic system, keeping bearing engaged. b). Fault in master or slave cylinders.
	3. Friction disc completely worn	1. Replace friction disc
	4. Pressure plate faulty	1. Repair or replace pressure plate
Engine speed increases without a corresponding rise in road speed, clutch pedal released.	1. Clutch friction disc slipping	1. Check clutch adjustment 2. Worn friction disc 3. Pressure plate faulty 4. a). Release bearing of hydraulic clutch not fully releasing, check that pedal to master cylinder rod has some free play b). Master or slave cylinder faulty
Difficulty engaging gears	1. Clutch Dragging (not fully disengaging)	1. Check clutch adjustment 2. Worn friction disc 3. Faulty pressure plate 4. On hydraulic systems: a). Air in system, bleed system b). Faulty seals in either master or slave cylinder

PROBLEM	POSSIBLE CAUSES	REMEDY
Impossible to engage gears, engine stalls when tractor halted, clutch pedal depressed	1. Clutch not disengaging	1. Check clutch adjustment 2. Linkage disconnected / faulty (mechanical) 3. No / low oil (hydraulic system) 4. Faulty seals in master or slave cylinder (hydraulic) 5. Clutch disc seized onto flywheel, pressure plate or input shaft splines 6. Pressure plate faulty, repair or replace as necessary
Noise from transmission bell housing, noise changes when pedal is depressed and released	1. Release bearing worn 2. Clutch pilot bearing worn	1. Replace release bearing 2. Replace pilot bearing
Clutch fails to engage smoothly	1. Defective clutch friction disc 2. Defective pressure plate 3. Worn clutch pilot bearing 4. Defective flywheel	1. Replace friction disc 2. Replace pressure plate 3. Replace pilot bearing 4. Inspect flywheel as detailed in the Engine Section

DESCRIPTION AND OPERATION

The TS range of tractors utilises two methods of clutch operation.The clutch system of the 12x12 transmission is a hydraulically operated single plate clutch with a 13 in. (327 mm) or 14 in.(348 mm) non asbestos dry friction disc, designed for high durability and low effort operation. The clutch is conventionally located at the front of the transmission, connecting the engine to the transmission input shaft. The hydraulic actuation is provided with a simple master/slave cylinder arrangement. This provides self adjustment of the clutch system to maintain optimum clutch performance. The pressure plate is a diaphragm spring type also self adjusting and requiring no maintenance.

The 12 x 12 has a safety start switch, linked to the clutch pedal, which ensures the tractor will not start unless the clutch pedal is depressed.

The 16x16 transmission does not use a conventional clutch arrangement. Engine power is transmitted to the transmission via a damper assembly attached to the engine flywheel. The function and operation of the clutch pedal is described in detail in the 16 $\times$ 16 Section.

In the clutch 'engaged' position the spring loaded pressure plate forces the clutch disc into contact with the engine flywheel.

The frictional contact between the clutch disc material and the surfaces of the flywheel and pressure plate enables drive from the flywheel to be transmitted via the clutch disc to the input shaft of the transmission.

A clutch operating pedal is connected hydraulically to a release bearing. The release bearing contacts the operating fingers of the pressure plate.

Depression of the clutch pedal causes the release bearing to move forward and depress the pressure plate diaphragm, thus drawing the pressure plate away from the clutch disc and releasing the disc from contact with the flywheel. The frictional drive from the engine to the transmission is thereby disconnected.

When the clutch pedal is released a spring returns the pedal to its free position and the release bearing is drawn away from the release levers of the pressure plate assembly.

The main springs of the pressure plate assembly then re-assert pressure on the pressure plate moving it towards the friction disc and into contact with the flywheel, re-establishing the drive between engine and gearbox.

OVERHAUL

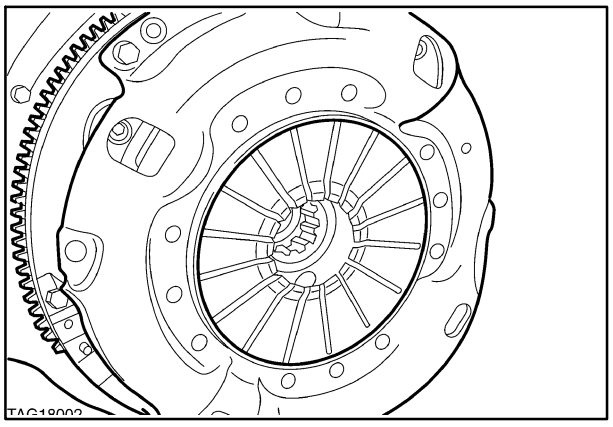
CLUTCH

Removal

1. Separate the tractor between the engine and transmission, refer to the section, 'SEPARATING THE TRACTOR'.
2. Remove the bolts securing the clutch pressure plate and cover assembly to the flywheel and remove the pressure plate assembly together with the clutch disc.

NOTE: *The bolts must be slackened evenly and diagonally across the clutch to prevent distortion of the cover assembly.*

3. At the front of the transmission, remove the two tubes (2) from the hydraulic release bearing (1), Figure 2. Remove the three bolts securing the release bearing assembly to the transmission front plate and withdraw the release bearing assembly.
4. To remove the clutch pedal, remove the upper instrument panel console and then the lower panel. Disconnect the rod to the master cylinder. Carefully lever off the pedal return spring, remove the clutch pedal shaft retaining snap ring, withdraw the shaft and pull the pedal from the tractor.



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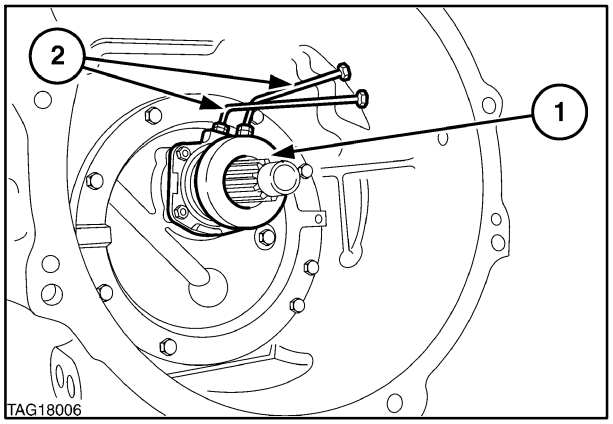


2

Inspection and Repair

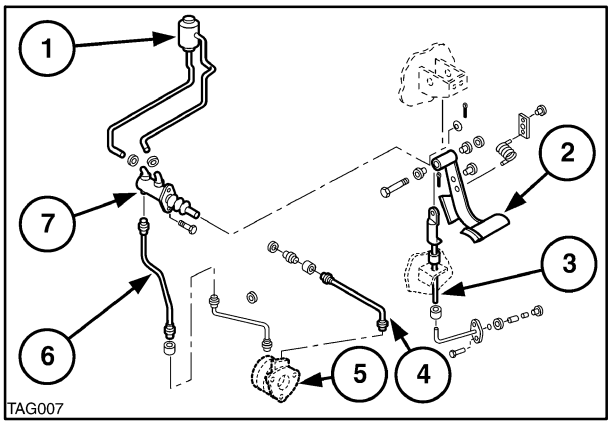
Friction Disc

5. nspect the clutch disc to ensure the linings are not loose, cracked, worn or contaminated with oil. Check that the rivets are secure. If signs of overheating due to clutch slippage or excessive wear are evident, the disc must be discarded and a new one installed.

IMPORTANT: *Investigate the source of any oil or grease on the facings and rectify before installing a new disc.*

Clutch - Components

1. Hydraulic Oil Reservoir
2. Clutch Pedal
3. Interlock Cable
4. Slave Cylinder Bleed Tube
5. Slave Cylinder Assembly
6. Slave Cylinder Oil Supply Tube
7. Master Cylinder



3

Pressure Plate

1. Examine the pressure plate assembly, ensure the diaphragm fingers are all at the same height, there is no discolouration due to excessive heat and that the assembly operates smoothly. Check the face of the pressure plate for cracks, scoring or distortion. Discard the pressure plate if any faults are found.

NOTE: *The diaphragm type clutch has no serviceable components. A new assembly will be required if any faults are found during inspection*

HYDRAULIC RELEASE BEARING / SLAVE CYLINDER

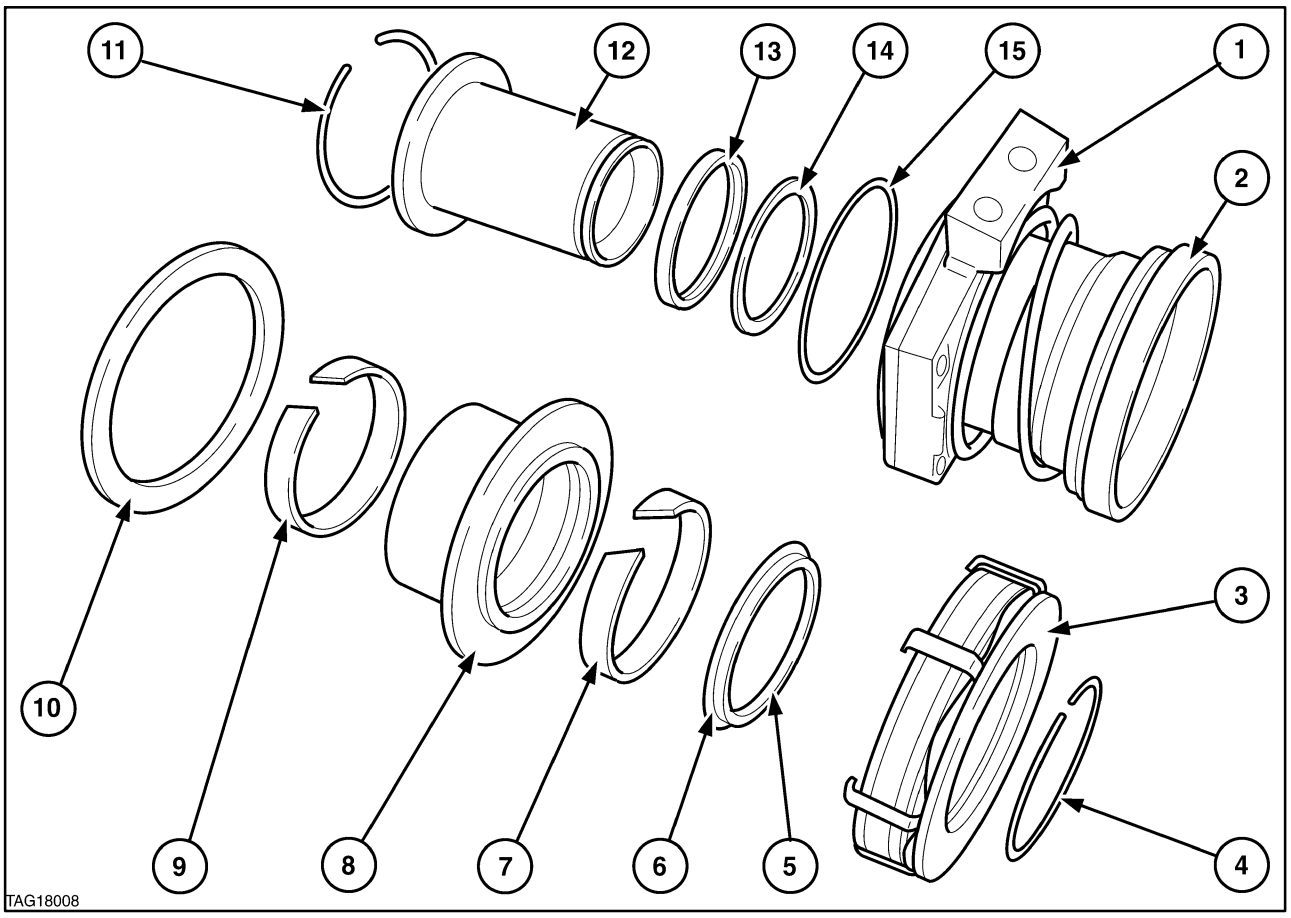
Inspection

1. Inspect the release bearing for the following, oil leakage, weak or broken return spring and wear or damage to the release bearing. Repair kits are available should seals or the bearing assembly require servicing.

Assembly Overhaul

With reference to Figure 4

1. Remove bearing retaining snap ring, item 4, and withdraw the bearing assembly.
2. Carefully pry the bearing cage claws open and withdraw the piston assembly.
3. In the dismantled condition it is wise to replace the seals with new items as a precautionary measure against future failure. Inspect the remaining components for wear or damage and replace as necessary.
4. When re-assembling coat all seals with clean brake oil of the correct specification as they are installed and assembled.



4

Release Bearing/Slave Cylinder Assembly

1. Housing
2. "O" Ring
3. Bearing Assembly
4. Snap Ring
5. Wiper Seal
6. "O" Ring
7. Guide Ring
8. Piston
9. Guide Ring
10. Seal Ring
11. Snap Ring
12. Guide Sleeve
13. Seal
14. Back up Seal
15. "O" ring

SECTION 21 - TRANSMISSION SYSTEMS

Chapter 1 - 16 x 16 Transmission

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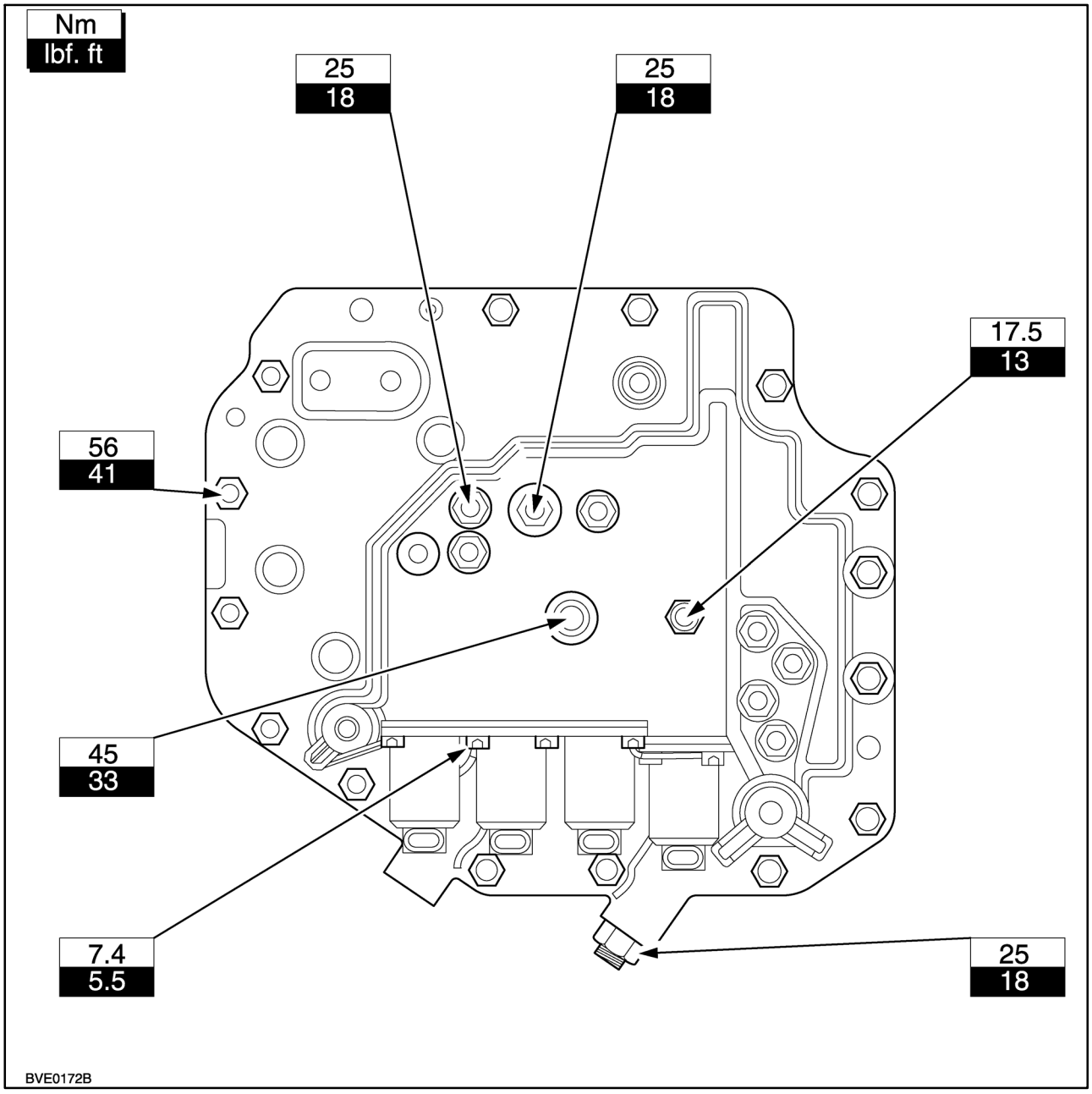
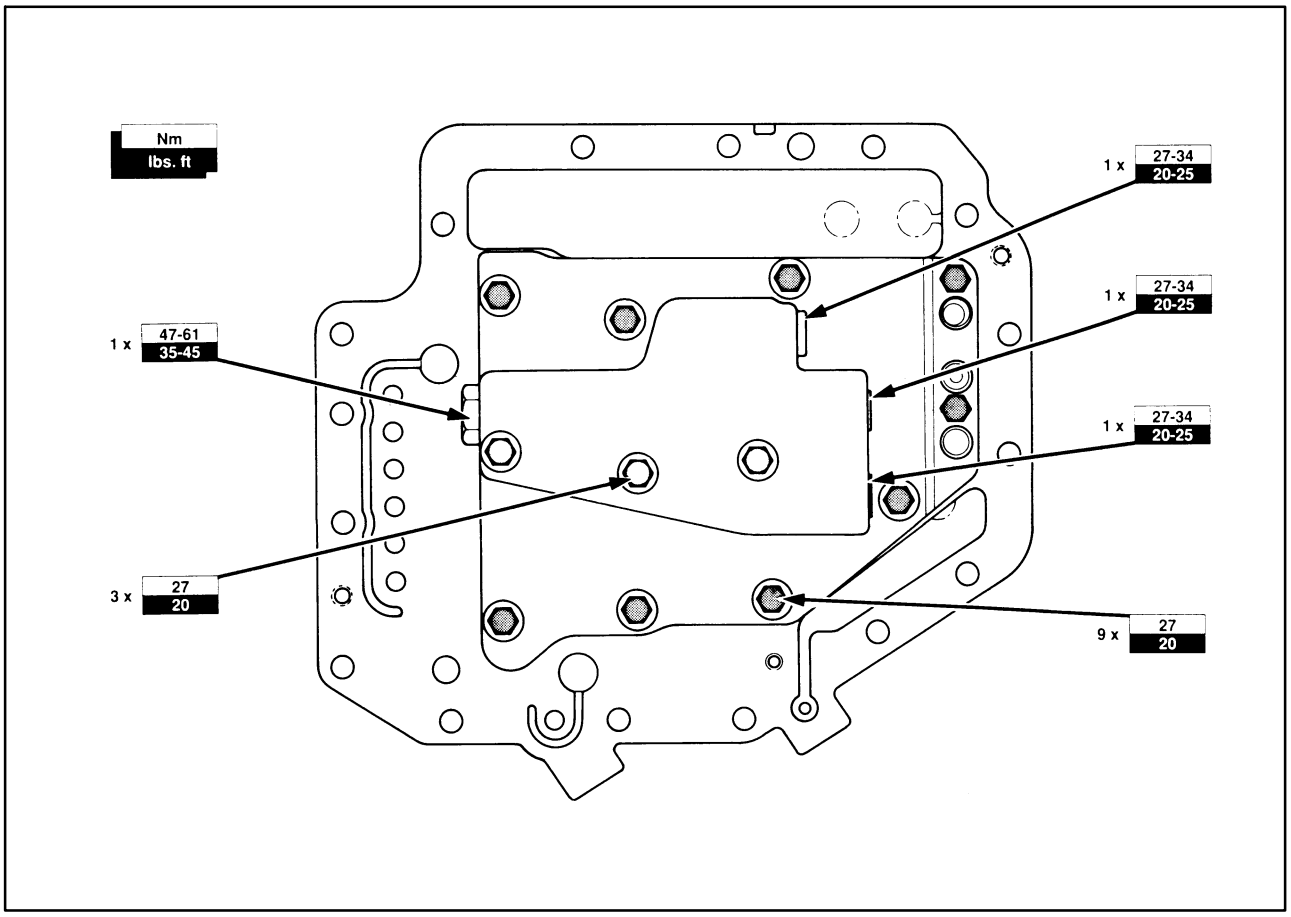
SPECIFICATIONS

Transmission Type	16 forward and 16 reverse speeds using straight cut gears, four multi-wet plate clutches, one forward reverse friction cone synchronizer and one main range friction cone synchronizer
Control System	Electro-hydraulic with Electronic Management System
Hydraulic Control Valve	
Type	Separate Casting, multi spool with internal cast-in galleries
Control	By electrically operated Pulse Width Modulated (PWM) solenoid coils signalled by Electronic Management System
Hydraulic Accumulator	
Type	Diaphragm type, nitrogen charged with 0.7 litre hydraulic oil capacity
Charge Pressure	10 bar (145 lbf.in^2)
Multi-Wet Plate Clutches	
Type	Constant running, pressure lubricated, pressure applied, spring released
C1 and C2 clutches	
Number of Friction Plates	4 in each clutch
Number of Steel Plates	4 in each clutch
Number of wavy springs	4 in each clutch
C3 and C4 clutches	
Number of Friction Plates	9 in each clutch
Number of Steel Plates	9 in each clutch
Number of Belleville Washers	4 pairs in each clutch
Belleville washer stack height	24 mm
Pressure Lubrication	Maximum 7 bar (100 lbf.in^2) supplied by the steering gear pump
Lubricant Capacity (Transmission / Rear Axle)	
Heavy Duty Rear Axle	62.0 Litres
Light Duty Rear Axle	55.5 Litres
Lubricant	
Type	AKCELA Nexplore (MAT 3525)
Lubricant Operating Temperature	65°C (150°F)
Forward / Reverse synchronizer End-Float Adjustment Shim Sizes	mm 1.00 0.30 0.10 0.05
Synchronizer Wear Check	Minimum Gap
Main synchronizer 1-4, 5-8	mm 0,5 / inches 0.020
Foward / Reverse synchronizer	0,8 / 0.0315
Hi / Lo synchronizer	0,85 / 0.0335

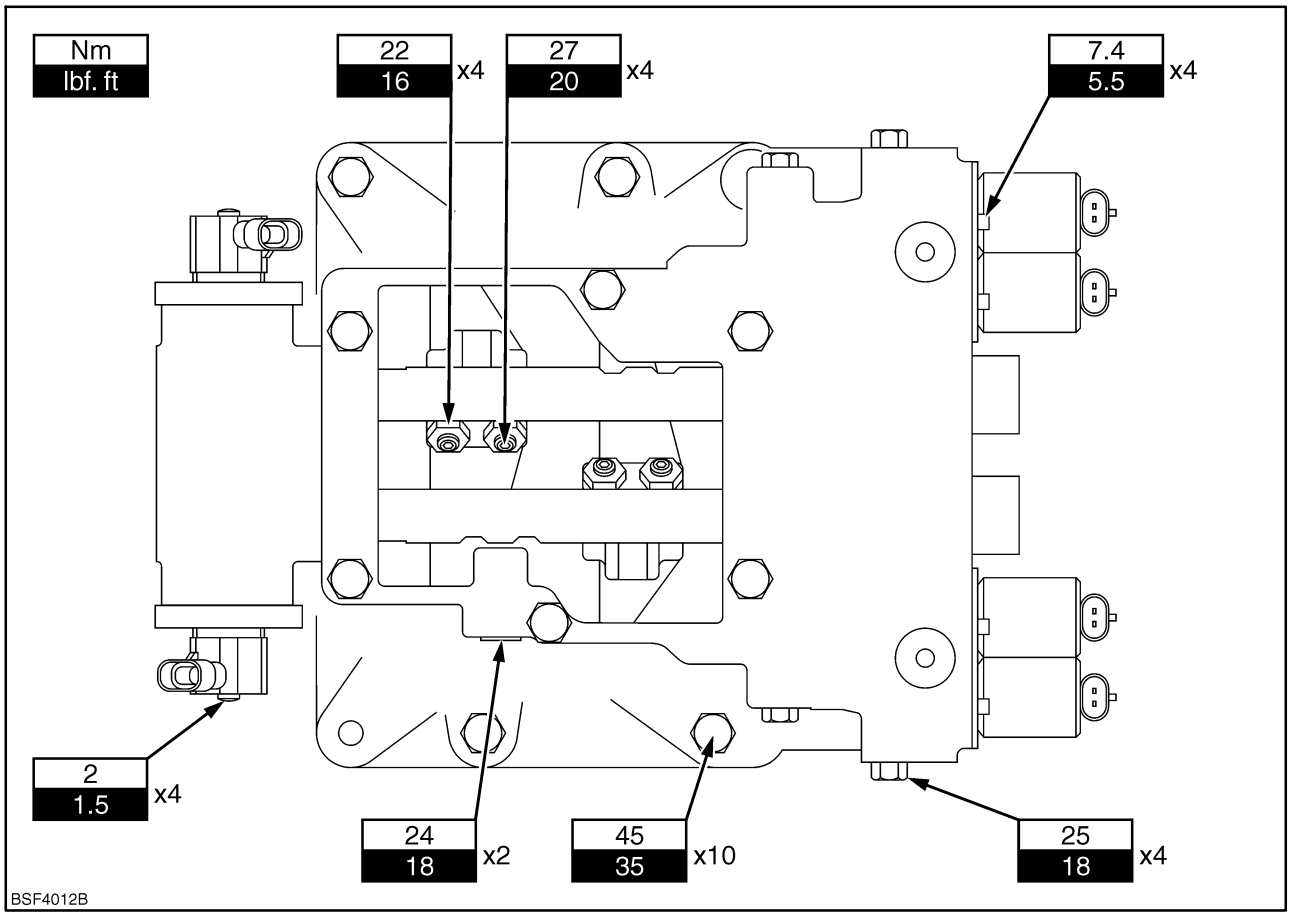
TIGHTENING TORQUES



1


Nm
lbs. ft
1 x 27-34 20-25
1 x 27-34 20-25
1 x 27-34 20-25
1 x 47-61 35-45
3 x 27 20
9 x 27 20

2


Nm
lbf. ft
22
16
x4
27
20
x4
7.4
5.5
x4
2
1.5
x4
24
18
x2
45
35
x10
25
18
x4
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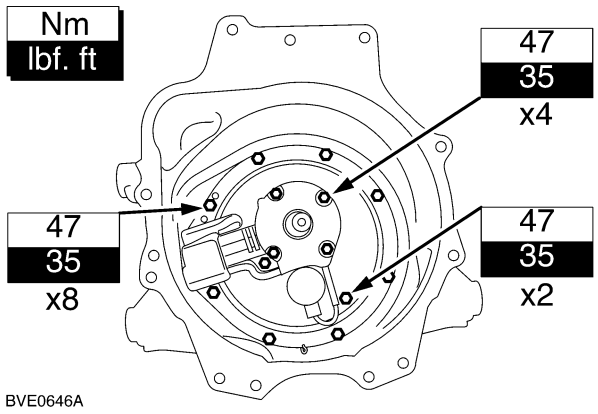
3



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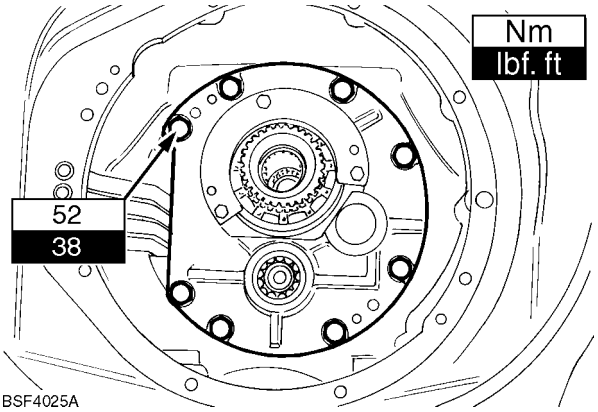

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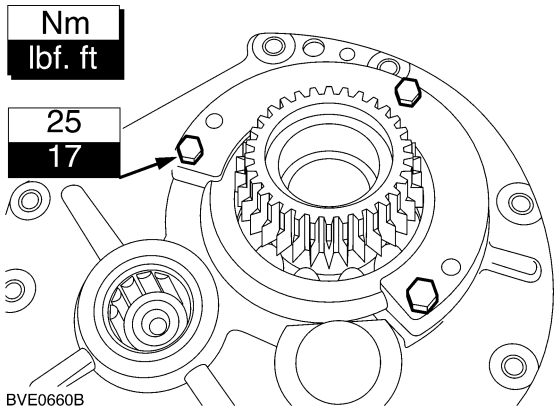

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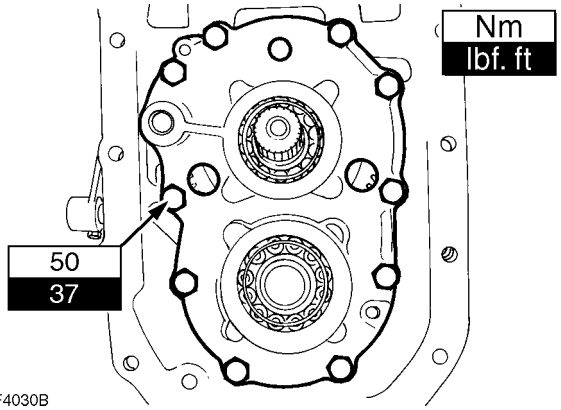

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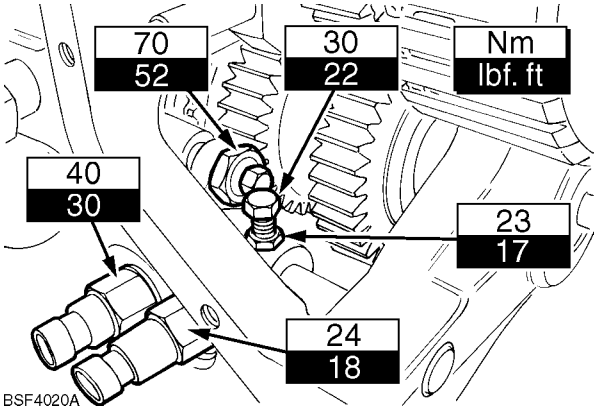

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SPECIAL TOOLS

⚠ CAUTION ⚠

Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly on this Manual.

List of special tools necessary to carry out the different operations described in this Section.

Transmission stand bracket

4FT512 Gauge rolled in tube expander

X 4FT500 16x16 transmission overhaul kit

The special tool **4FT500** includes the following:

X 4FT501 Handle (for use with the re-sizer tool)

X 4FT502 Tapered sleeve, C3 / C4 piston seal expander

X 4FT503 Tapered sleeve, C1 / C2 piston seal expander

X 4FT504 Piston installer (pusher)

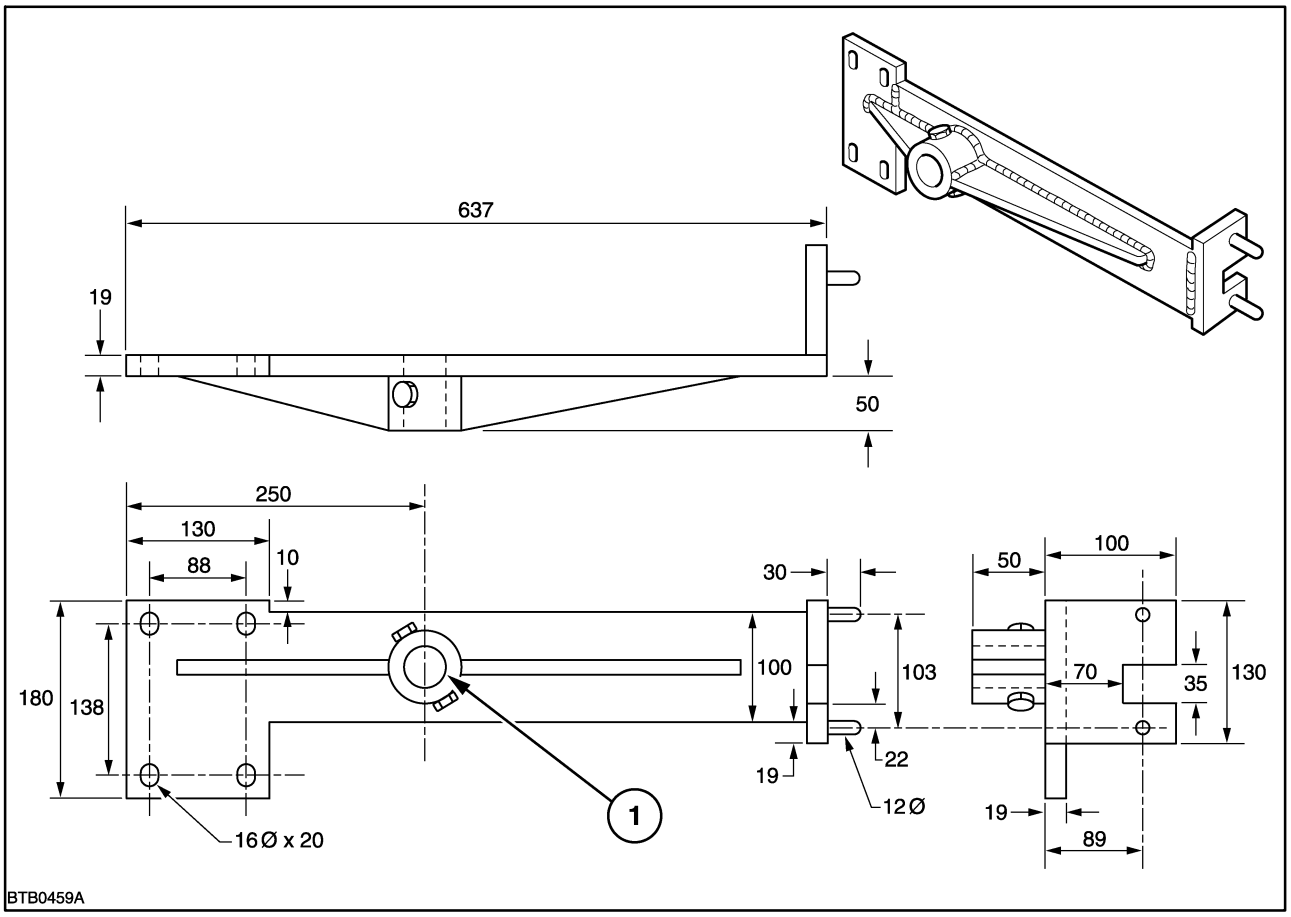
X 4FT505 Tapered sleeve, C3 / C4 piston seal installer

X 4FT506 Tapered sleeve, C1 / C2 piston seal installer

X 4FT507 Seal re-sizer C1 / C2 / C3 / C4 piston seal

X 4FT508 Clutch piston return spring compressor

X 4FT511 Gauge rolled in tube replacement



5

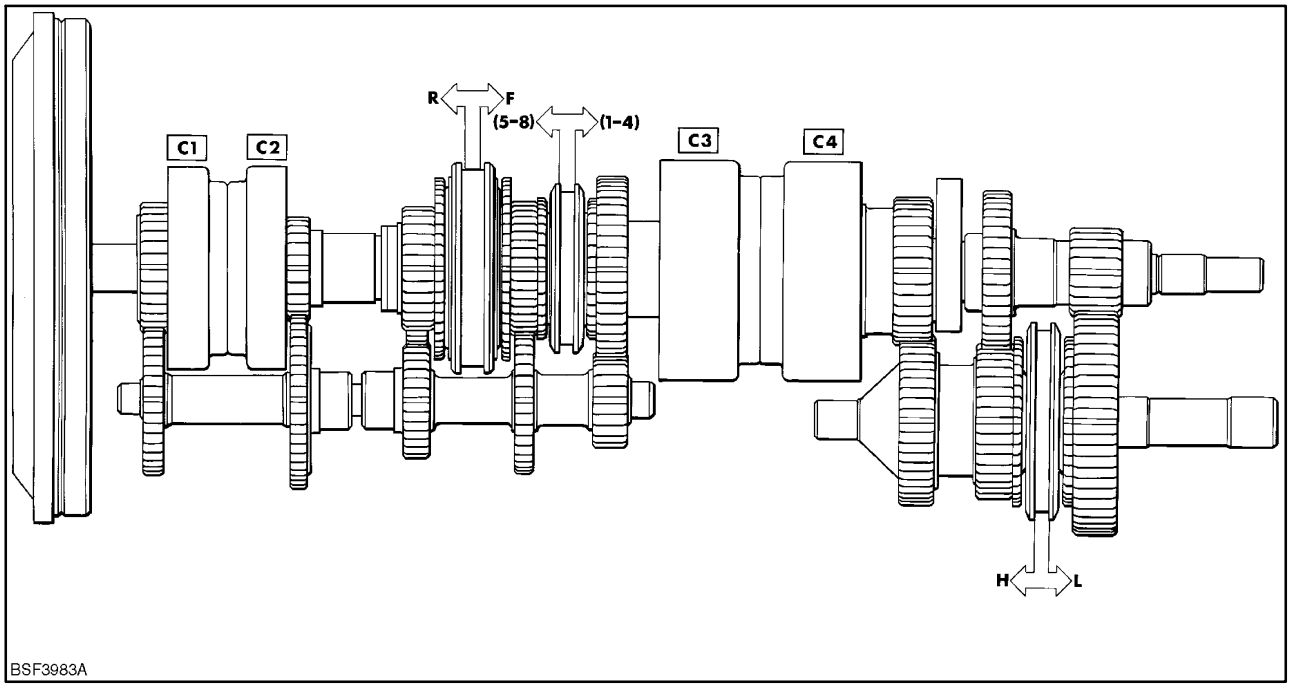
Transmission to Stand Attachment Bracket - Constructional Detail

1. Main Bracket (made from 19mm mild steel plate)

NOTE: *Strengthening plate should be of similar material and welds should be secure, preferably continuous.*

2. Centre spigot (locally adjust to suit base stand)

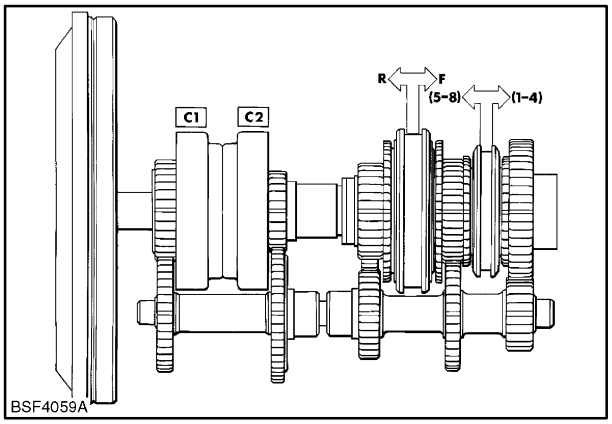
DESCRIPTION AND OPERATION



6

The transmission drive can be split into three sections as follows:

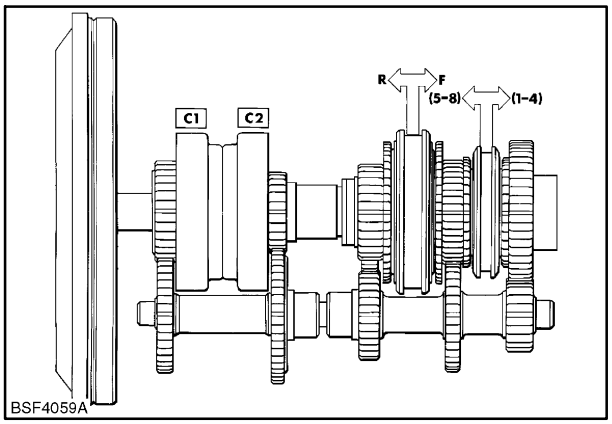
C1 and C2 clutches - located at the front of the transmission to work in conjunction with C3 and C4 to give 4 basic ratios.



7

The forward and reverse synchronizer - located in the middle section of the transmission is used to select forward or reverse drive, and is electro-hydraulically operated by PWM solenoid valves.

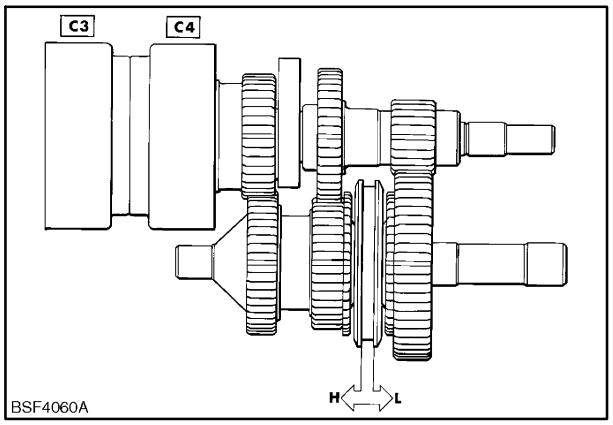
1-4 and 5-8 synchronizer - located just behind the forward and reverse synchronizer for range selection.



8

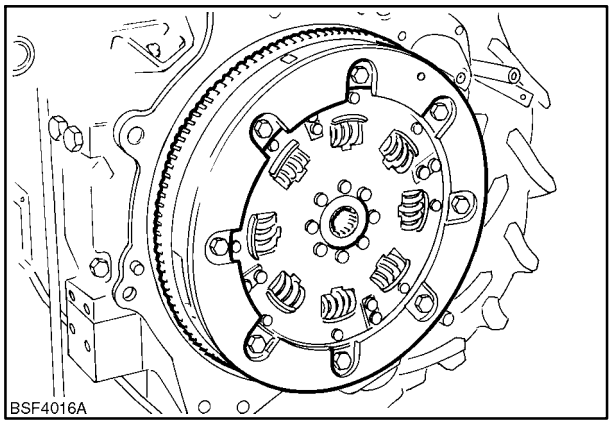
C3 and C4 clutches located in the rear section of the transmission each supplying a single speed in conjunction with C1 and C2 to give 4 basic ratios.

High and low synchronizer located at the rear of the transmission when combined with C1, C2, C3, C4 clutches and 1-4 / 5-8 synchronizer provide 16 forward and 16 reverse ratios.



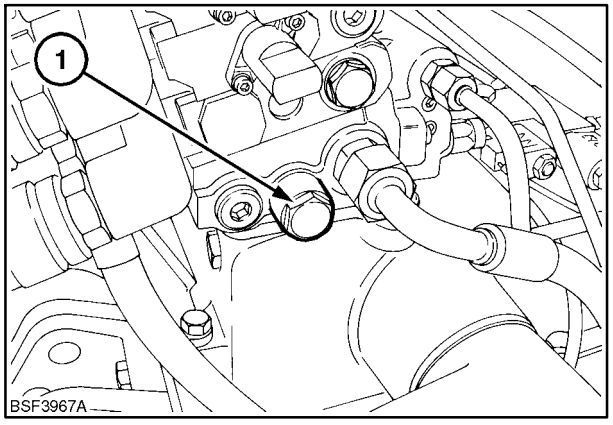
9

The transmission is powered through a flywheel damper and has no conventional clutch.



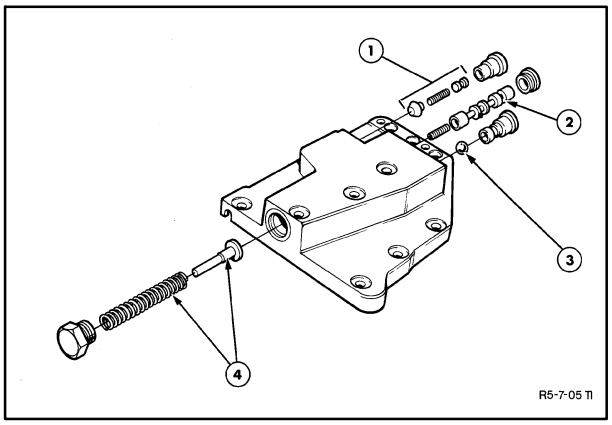
10

The pressure oil to engage the clutches is supplied from the low pressure hydraulic circuit, which is maintained at 17 to 19 bar by the low pressure regulating valve (1), located in the valve block in the base of the remote control valve assembly.



11

Transmission lubrication oil is supplied through the steering circuit and is controlled to a maximum pressure of approximately 7 bar by the lubrication relief valve (4) located in the transmission side cover.



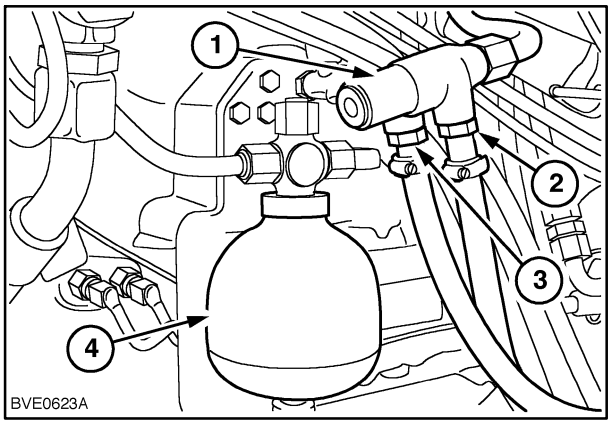
12

An oil cooler by-pass valve (1), ensures that the excessive oil pressure generated at cold start up, or if the oil cooler becomes blocked, by-passes the oil cooler until the the oil warms up (oil pressure below 5.8 bar).

Oil supply to cooler (2).

Oil return from cooler (3).

The low pressure circuit incorporates a hydraulic accumulator (4). This provides instant additional oil to fill possible voids when shifts involving multiple clutches are performed.



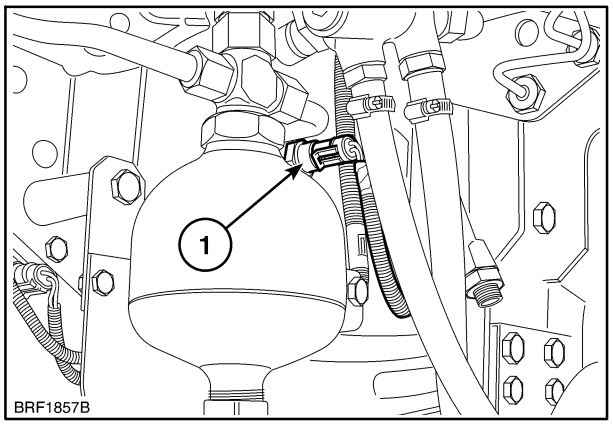
13

INPUT SENSORS

The engagement of the clutches are controlled by inputs from various sensors and switches:-

Transmission Oil Temperature Sensor

The transmission oil temperature sensor (1) measures the temperature of the oil to provide compensation for hot / cold oil conditions.

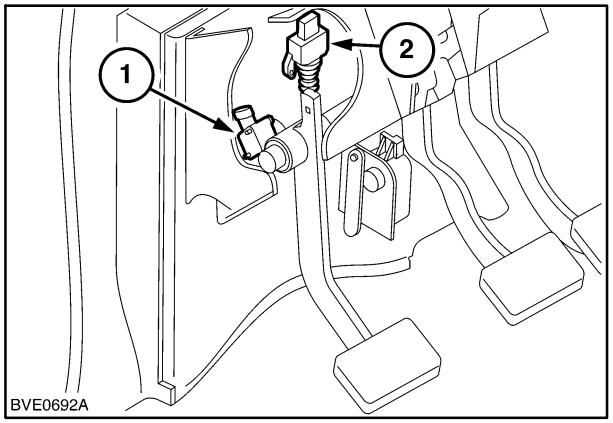


14

Clutch Pedal Potentiometer and Disconnect Switch

The clutch pedal potentiometer (1), provides the operator with controlled engagement of the feathering (C3,C4) clutches.

The clutch pedal disconnect switch (2) disengages power to the feathering clutches (C3 / C4) PWM valves which disengages drive.

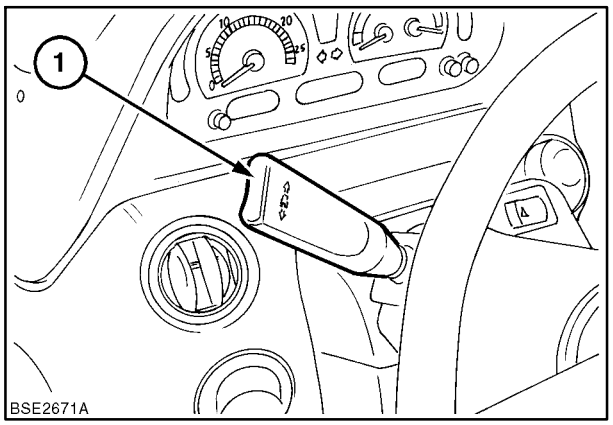


15

Shuttle Lever

The shuttle lever (1), provides information to the controller, via switches, for forward, reverse and neutral transmission drive selection.

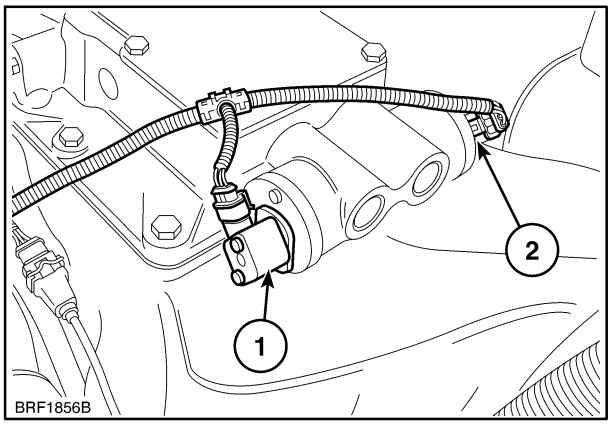
Disengages power to all transmission PWM valves when in neutral.



16

Forward / Reverse and 1-4 / 5-8 Potentiometers

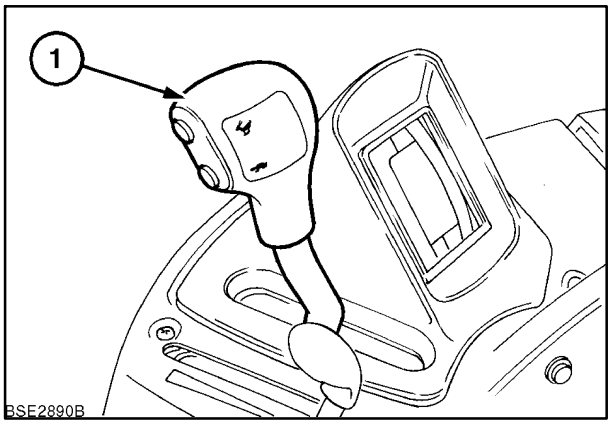
Provide information to the controller on the position of the forward and reverse synchronizer, potentiometer (1) and the 1-4 / 5-8 synchronizer, potentiometer (2).



17

Gear Shift Lever

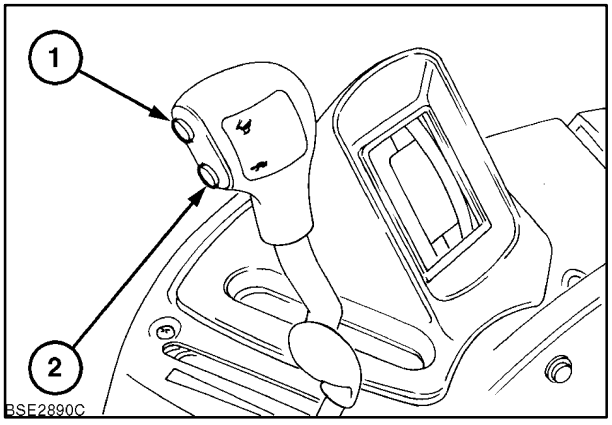
The main shift lever (1), is used to select both range gears and main gears. When selecting High or Low ranges (moving the lever forwards or rearwards) the clutch pedal must always be depressed.



18

Gear Selector Switches

The upshift switch (1) and downshift switch (2) allows the operator to change between 8 basic ratios by sending a signal to the controller, without using the clutch pedal.

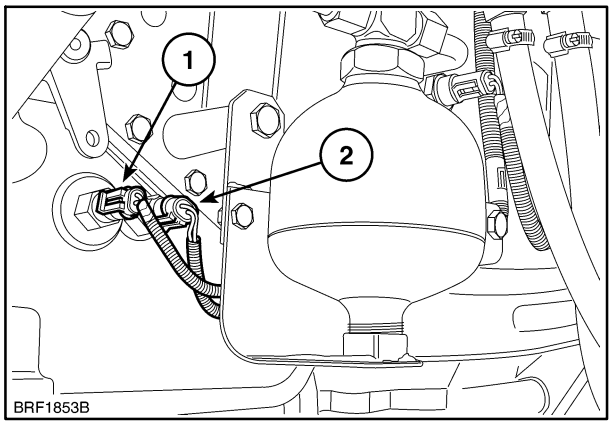


19

Synchronizer Status Switches

Provide information to the controller on the position of the High / Low synchronizer.

Low status switch (1) and high status switch (2).

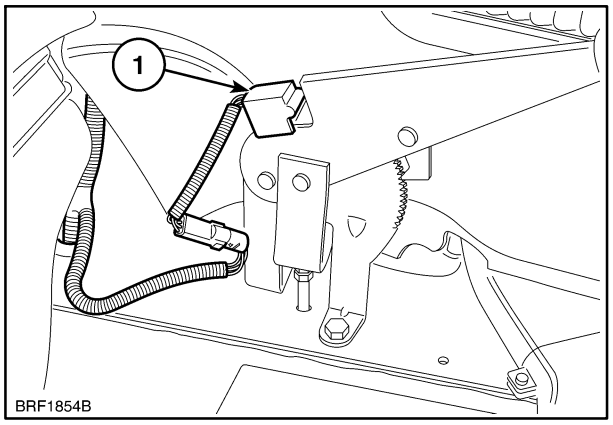


20

Parking Brake Switch

The parking brake has to be applied during calibration, if it is not applied an error code will be displayed.

The tractor will drive if the handbrake is applied but an audible alarm will be heard.

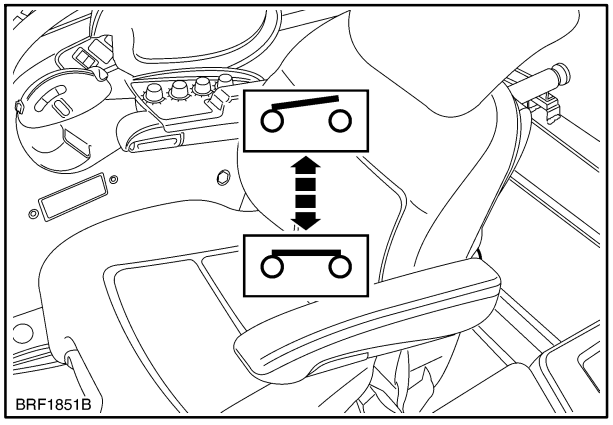


21

Seat Switch

The seat switch must be operated, i.e. operator seated, before the controller allows the engagement of the forward or reverse drive.

NOTE: *The clutch pedal will override a faulty seat switch.*

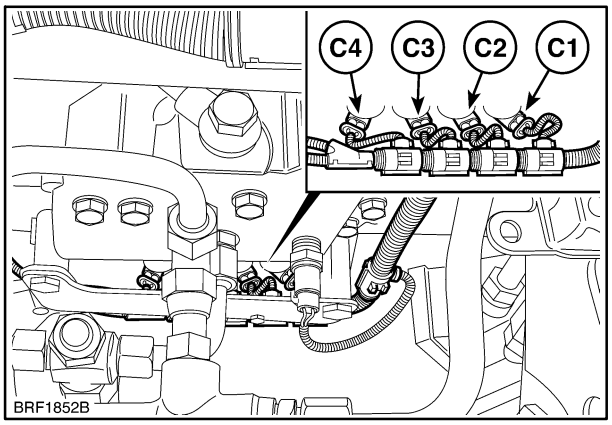


22

OUTPUT DEVICES

Clutch PWM Valves,C1, C2, C3 and C4

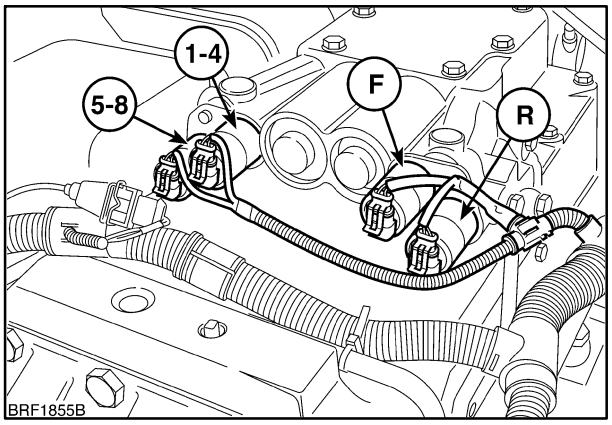
Controls the oil supply to the clutches allowing the engagement / disengagement of the clutches via a signal supplied from the transmission controller.



23

Forward, Reverse, 1-4 and 5-8 PWM Valves

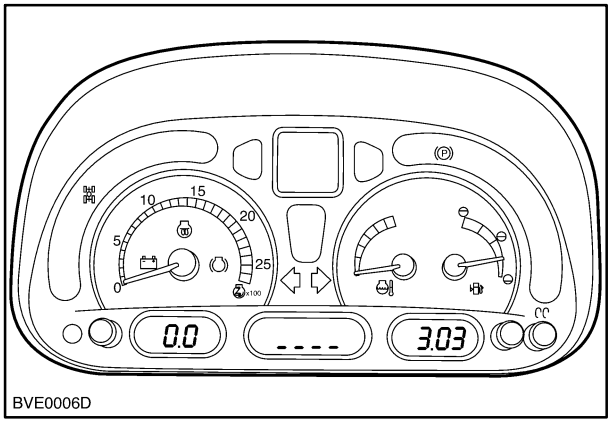
Controls the oil supply to the transmission top cover allowing the engagement / disengagement of the synchronizer to select forward, reverse, 1-4 and 5-8 via a signal from the transmission controller.



24

Analogue Digital Instrument Cluster (ADIC)

Provides information to the operator if a critical fault occurs with the transmission operation.

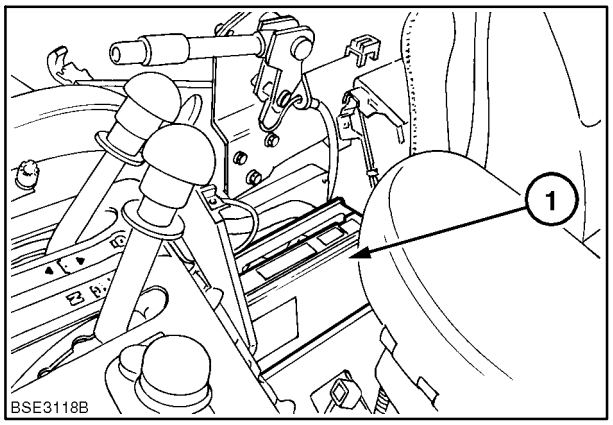


25

CONTROL DEVICE

Controller

The controller gives accurate control, via PWM valves, of the four multi-wet plate clutches. This also enables clutchless shuttle operations, speed matching of the gears, sequential power-shifting and high range gear logic. The transmission controller has a diagnostic facility that can interpret a number of system faults which can be displayed or stored depending on how critical the fault detected is.

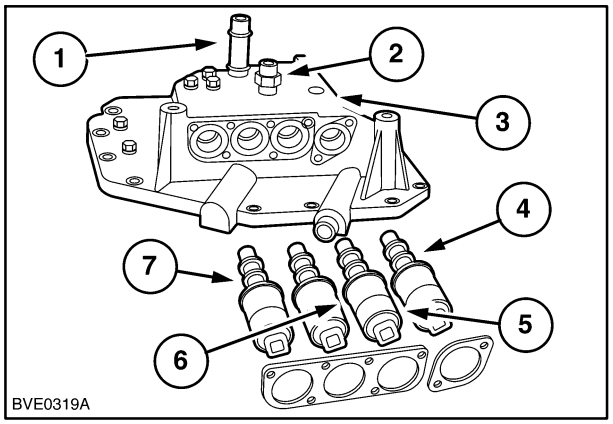


26

The control valve assembly is mounted on the side of the transmission. The control valve assembly is supplied with low pressure oil through point (2) at (17-19 bar) through an accumulator (see fig. 13).

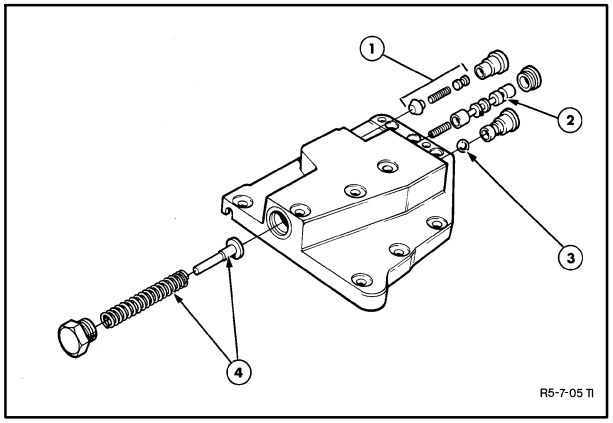
The accumulator is necessary to ensure minimum drop in oil pressure when changing gear, particularly when changing two clutches at once. Oil for lubrication enters at point (1).

The control valve assembly incorporates four PWM valves (4,5,6,7), and a transmission oil temperature sensor installed at point (3).



27

Mounted on the rear of the control valve assembly is the lubrication combining valve pack. This incorporates the lubrication regulating valve (1). The lubrication combining valve (2) with valve spool and spring (4) and the lubrication shuttle valve (3).This valve pack combines lubrication oil at 5 bar with low pressure / transmission control oil at 17-19 bar to increase clutch lubrication during clutch feathering.



28

16X16 TRANSMISSION

This transmission offers 16 or 17 forward, and 16 reverse ratios. An optional reduction gear set (creeper gears) offers a further 16 ratios, forward and reverse.

In the following text, operational information is based on the 16 x 16 transmission (30 and 40 Km / h). However, the 17 x 16 transmission (50 Km / h) functions in exactly the same way.

The transmission is controlled by a main shift lever, two powershift buttons and a range change button. A shuttle lever mounted to the left hand side of the steering wheel selects forward or reverse drive. Transmission and throttle controls are colour-coded orange.

The transmission provides four power-shift gears in each of the four intermediate ranges A, B, C, and D. clutchless shifts between gears 4 and 5, 12 and 13 are made by using the range button in conjunction with the powershift buttons. Range shifts between low and high (8th and 9th gears), can only be made with the clutch pedal fully depressed.

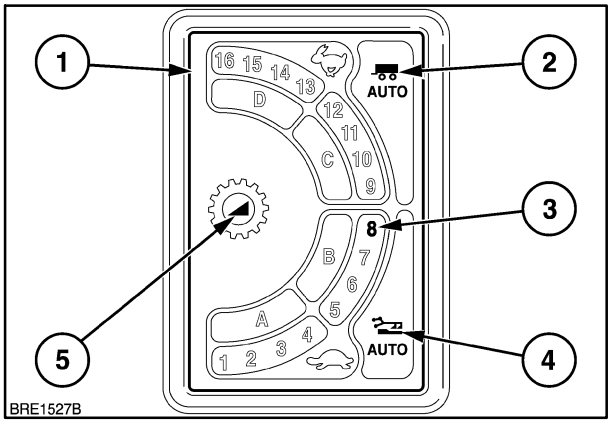
Gear Shift Displays

Depending on the tractor specification, two types of gear shift display may be fitted.

LED Gear Display

An illuminated display (1), to the right of the main shift lever indicates the selected gear.

As each gear is selected, the appropriate number (3) will be illuminated in the display. With Auto Shift activated, the symbols for the Road range (2) and Field range (4) will also be illuminated. When changing the Auto Shift point, symbol (5) will flash during the programming procedure.



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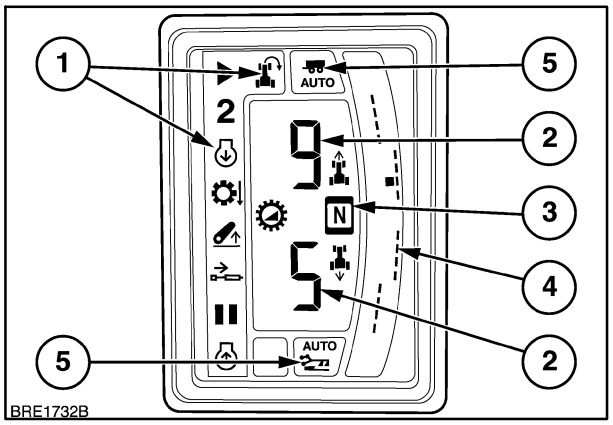
Digital Gear Shift Display



30

The digital display provides a comprehensive range of information that includes:

Headland turn symbols (1). (where fitted)

Forward and reverse gears (2). The display shows the current forward gear and the corresponding reverse or 'shuttle' gear.

Shuttle lever position. Forward, neutral and reverse (3).

Gear span for each range (4).

Field and road auto shift (5) symbols.

Speed Matching

Speed matching will normally only permit a downshift to a lower gear. It will however, select a higher gear if the engine attempts to overspeed.

When travelling on the road in High range, gears 13 to 16, the transmission will automatically select a gear to match the engine speed to the road speed if the following method is adopted:

To upshift: Depress the clutch pedal then decrease engine speed with the foot throttle. When the clutch pedal is released, the transmission will automatically select a higher gear ratio (provided 16th speed is not already selected) to approximately match engine speed to road speed.

To downshift: Decrease engine speed, depress the clutch pedal while simultaneously increasing engine speed by pressing the foot throttle further down. When the clutch pedal is released, the transmission will automatically select a lower gear ratio (provided 13th. speed is not already selected) matching engine speed to road speed.

NOTE: *When operating in Auto Shift high range, the lowest downshift gear will become 9th.*

In high range, the operator can manually select another gear without affecting the speed matching function.

With the range lever placed in low, speed matching will operate down to 5th gear.

NOTE: *The speed matching function will be disabled if the operator manually selects a gear when in the low range.*

Sequential Powershifting

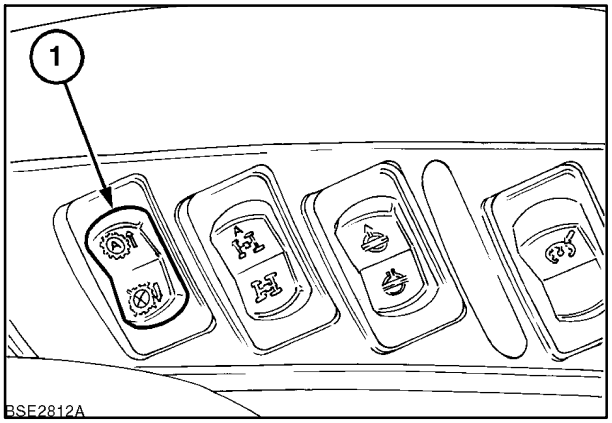
If the Powershift button is depressed and held, the transmission will make sequential ratio changes until the button is released or until the 16th / 17th gear is selected.

Auto Shift Function (where fitted)

With Auto Shift engaged, the transmission will automatically upshift and downshift within the four gears of each range.

Auto Shifting in Field Gears

In the field range, auto shifts can be made within gear spans 1-4 or 5-8. With the main shift lever in the low range (lever fully rearward), momentarily depress the top of the Auto Shift button (1). The field auto symbol (plough) in the gear display and the Auto symbol on the switch will illuminate to confirm engagement of the field gear.



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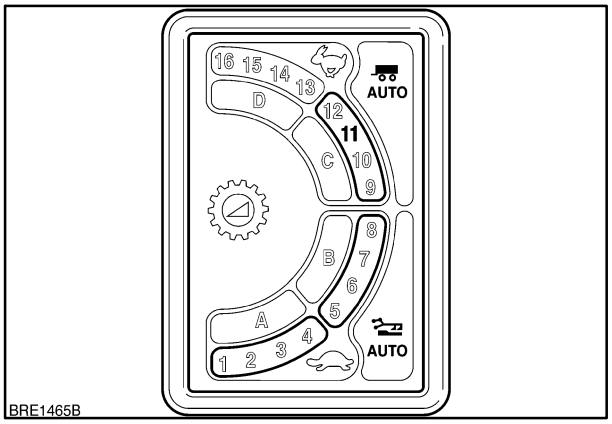
Moving off in 1st gear, the transmission will automatically upshift through gears 2 and 3 until 4th gear is engaged. To Auto Shift through gears 5 to 8, select 5th gear using the range change button and depress the Auto Shift button again, the transmission will now automatically upshift through gears 5 to 8.

As the tractor speed reduces, or the load on the engine increases, the transmission will automatically downshift to a lower gear.

If necessary Auto Shift field range can be extended to include gears 9 to 12. To activate, move the main shift lever fully forward and select any gear in range 'C', then depress the Auto Shift button again. To confirm engagement, both field and road auto symbols will illuminate.



32

In ranges 1-4, 5-8 and 9-12, Auto Shift may be linked to 3-point hitch operation. Raising the 3-point hitch with the fast raise switch will put Auto Shift into standby mode, lowering the hitch will re-activate Auto Shift.

NOTE: *If the 3-point hitch was in the raised position when the Auto Shift function was activated and has not been moved, then Auto Shift will operate without lowering the hitch.*

Auto Shift will also enter standby mode if the clutch pedal is depressed or the shuttle lever is moved from the forward drive position.

To cancel Auto Shift press and release the switch or operate the upshift or downshift button.

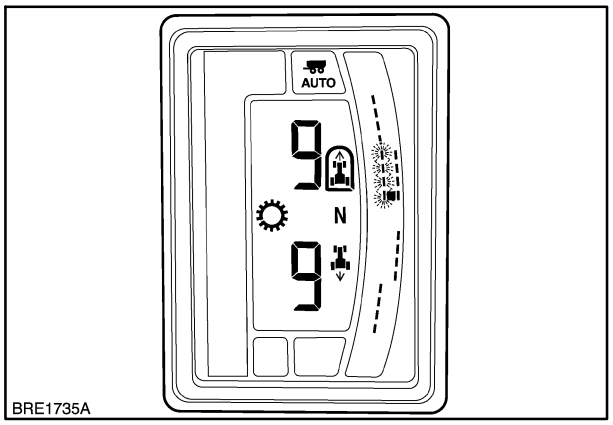
NOTE: *When using engine braking to slow the tractor, operating the upshift or downshift buttons will not disable Auto Shift unless the selected gear is outside the Auto Shift range.*

Auto Shifting in Road Gears

In the road range, Auto Shift will make upshifts or downshifts through gears 9–12 or 13–16. With the main shift lever moved fully forward, momentarily depress the top of the Auto Shift button (1), the road auto symbol (trailer) will illuminate in the gear display to confirm engagement.

The transmission will now make automatic shifts through gears 9 to 12 or 13 to 16 dependant on the range selected.

By depressing the Auto Shift button twice, the transmission can be programmed to automatically upshift or downshift through gears 9 to 16 including the range change from 12th to 13th gear.



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Changing the Shift Point

To suit different applications, the point at which the transmission makes an automatic gear shift may be adjusted from the default setting of 20%. Auto Shift gear changes are related to an increase or decrease in engine speed which can be set at 5, 10, 15, 20 or 25 percent.

NOTE: *For transport operations the shift point will automatically default to 20% if a lower figure has been set. If the shift point is set at 25%, it will remain at that setting.*

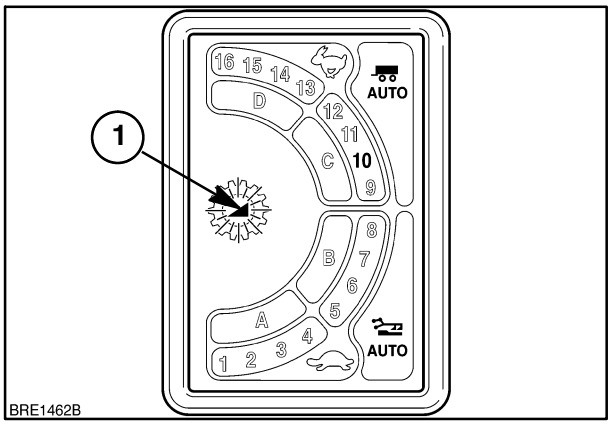
With the shift point set at 10%, a transmission upshift will occur every time the engine speed increases by 10%. Consequently, as the engine speed decreases by the same amount, the transmission will make a downshift.

It is recommended that during field operations the shift point is set at a low percentage, and for road transport applications, set at a higher figure.

To change the shift point, depress and hold the top of the Auto Shift button for at least one second. The current shift point figure appears in the Display of Gears and the 'ramp' symbol (1) begins to flash. Depress the Auto Shift button repeatedly to scroll through the shift points.

With the new shift point selected, release the Auto Shift button and pause for five seconds. The new setting will be memorised and the display will return to normal.

IMPORTANT: *At key-off (engine stop), electronic programme settings made during tractor operation are transferred from the operating memory to the main memory. To provide sufficient time for the data to transfer, allow a minimum of five seconds delay before turning the key on again.*



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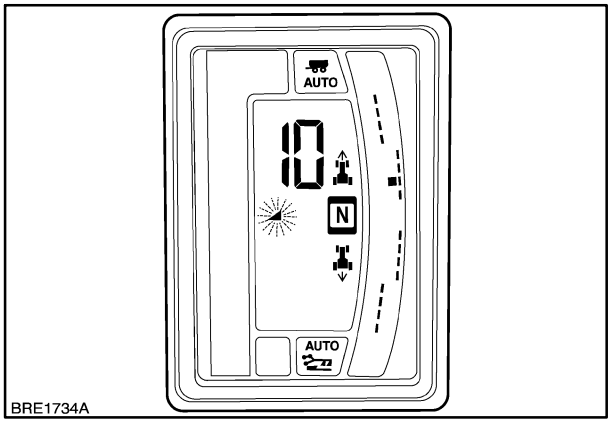

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Auto Take Off (ATO)

The ATO feature allows the operator to engage drive without using the clutch pedal by simply moving the shuttle lever from neutral to the forward or reverse position.

The ATO function is automatically enabled under normal starting conditions. i.e. operator in the driving seat, clutch pedal depressed, shuttle lever in neutral.

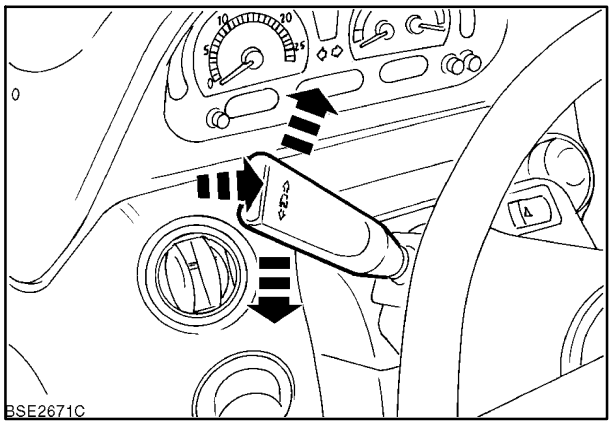
After selecting the appropriate gear ranges with the main shift lever simply move the shuttle lever to the forward or reverse position without depressing the clutch pedal. The ATO function will provide a controlled start from a stationary position.

NOTE: *The ATO function will be disabled if the vehicle is at rest with the shuttle lever in the neutral position and the operator leaves the seat.*

If the ATO should be disabled for any reason, the operator should carry out the following procedure to re-enable this function.

Sit in the seat, release the parking brake and cycle the clutch pedal. The vehicle will then move off in the direction selected on the shuttle lever.

When enabled, the ATO function will continue to function as long as the operator remains in the seat.



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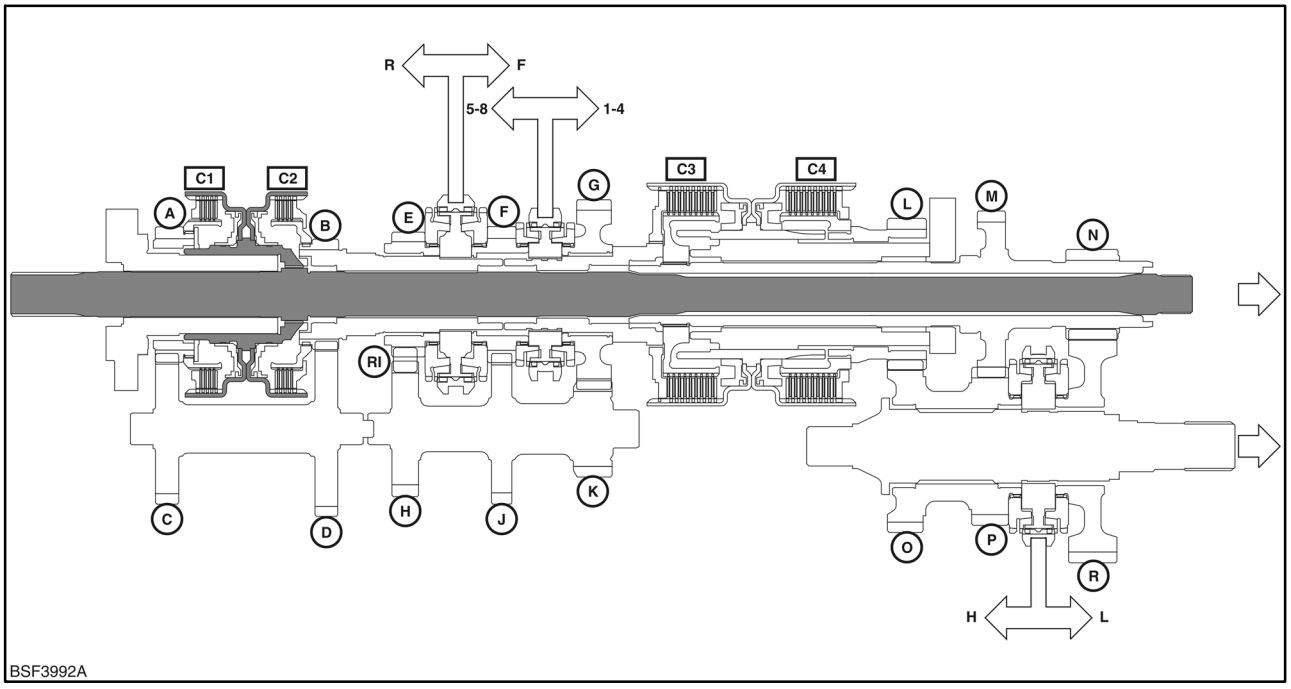
Transmission Gear Teeth

Gear	Description	Number Of Teeth	
		40 Kph	30 Kph
A	C1 Clutch Output Gear	37	
B	C2 Clutch Output Gear	28	
C	Front Bottom Shaft Gear	41	
D	Front Bottom Shaft Gear	48	
E	Reverse Gear	33	
F	Forward Gear and / or Coupler	37	
G	Low Main Gear	53	
H	Intermediate Bottom Shaft Gear	37	
J	Intermediate Bottom Shaft Gear	41	
K	Intermediate Bottom Shaft Gear	25	
L	C4 Clutch Output Gear	41	37
M	C3 Clutch (High) Output Gear	45	41
N	C3 Clutch (Low) Output Gear	22	22
O	Output Gear	38	43
P	High Range Output Gear	34	39
R	Low Range Output Gear	65	

Power Flows - Neutral



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Power Flow

- Engine power is transmitted from the flywheel mounted damper to the input / PTO drive shaft and C1 / C2 clutch housing which is splined to the shaft.

Hydraulic Clutches Engaged

- No clutches applied.

	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		○	○		10-14
3-7	○			○	11-15
4-8	○		○		12-16

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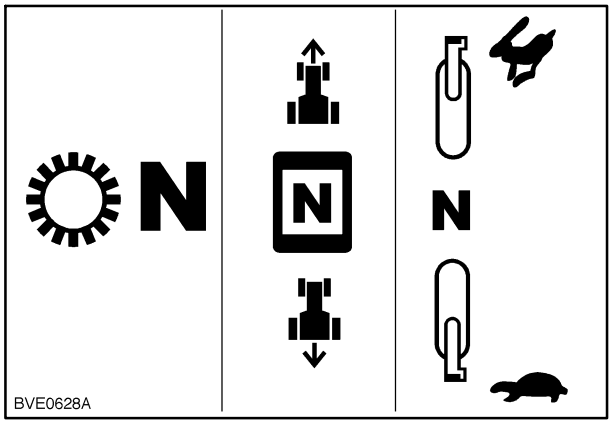
Gear Lever Positions

- In Neutral, clutches C1 and C2 are disengaged, drive is therefore not transmitted beyond the C1 / C2 clutch housing.
- All synchronizers are shown in neutral.



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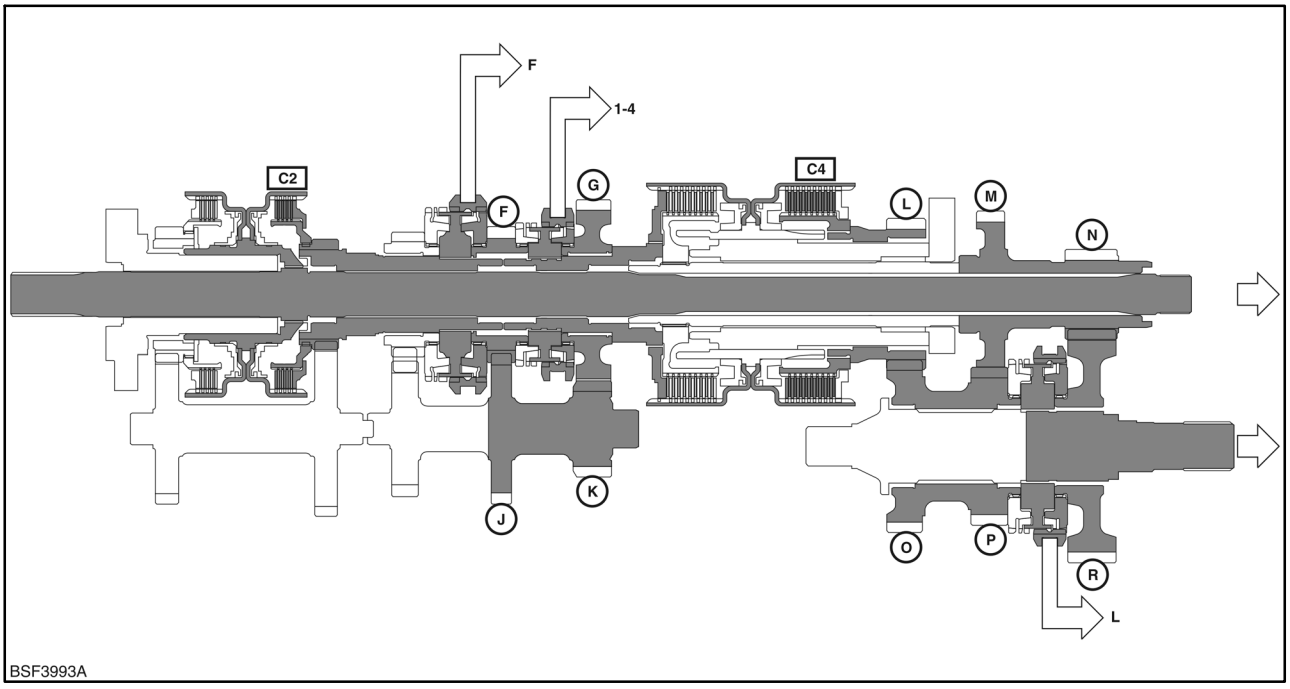
Power Flows - 1st Gear



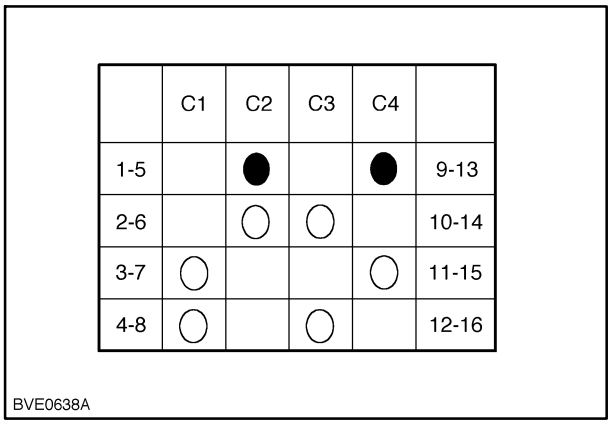
40

Power Flow

- Input shaft - C2 - Forward / Reverse synchronizer - gears F-J-K-G - 1-4 / 5-8 synchronizer - C4 - gears L-O-P-M-N-R - Hi / Lo synchronizer - output shaft.

Hydraulic Clutches Engaged

- Clutches C2 and C4 applied.



	C1	C2	C3	C4	
1-5		●		●	9-13
2-6		○	○		10-14
3-7	○			○	11-15
4-8	○		○		12-16

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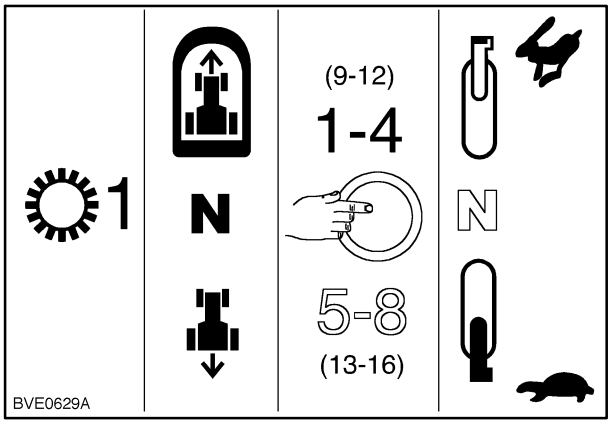
Gear Lever Positions

- Forward, 1-4 and Lo engaged.
- If inching pedal is depressed clutch C4 is disengaged.



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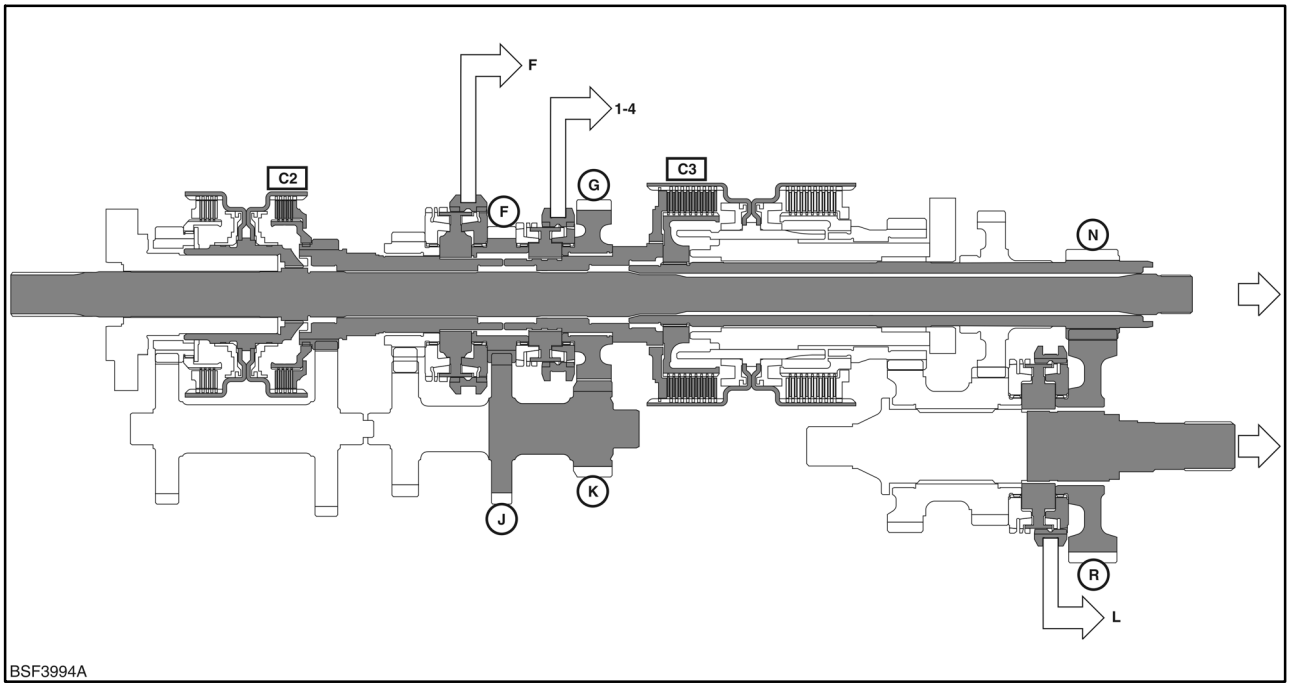
Power Flows - 2nd Gear



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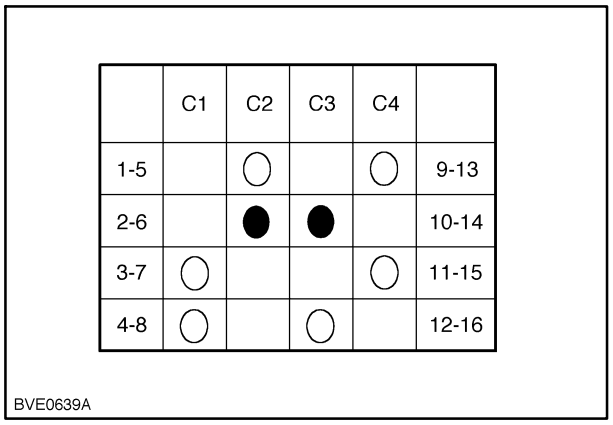
Power Flow

- Input shaft - C2 - Forward / Reverse synchronizer - gears F-J-K-G - 1-4 / 5-8 synchronizer - C3 - gears N-R - Hi / Lo synchronizer - output shaft.

Hydraulic Clutches Engaged

- Clutches C2 and C3 applied.



	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		●	●		10-14
3-7	○			○	11-15
4-8	○		○		12-16

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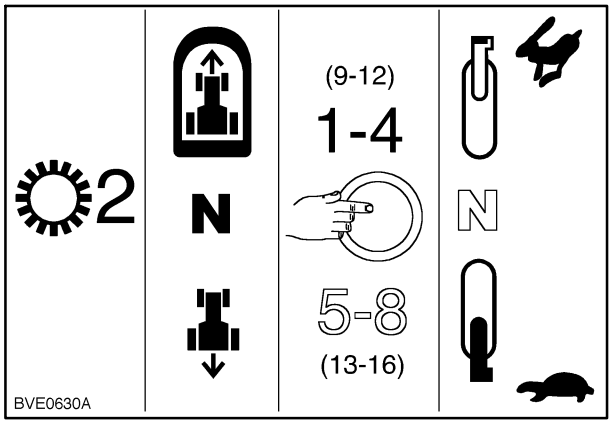
Gear Lever Positions

- Forward, 1-4 and Lo engaged.
- If inching pedal is depressed clutch C4 is disengaged.
- Powershifting from 1st to 2nd gear, engages clutch C3 and disengages clutch C4, changing the power-flow at the rear of the transmission.



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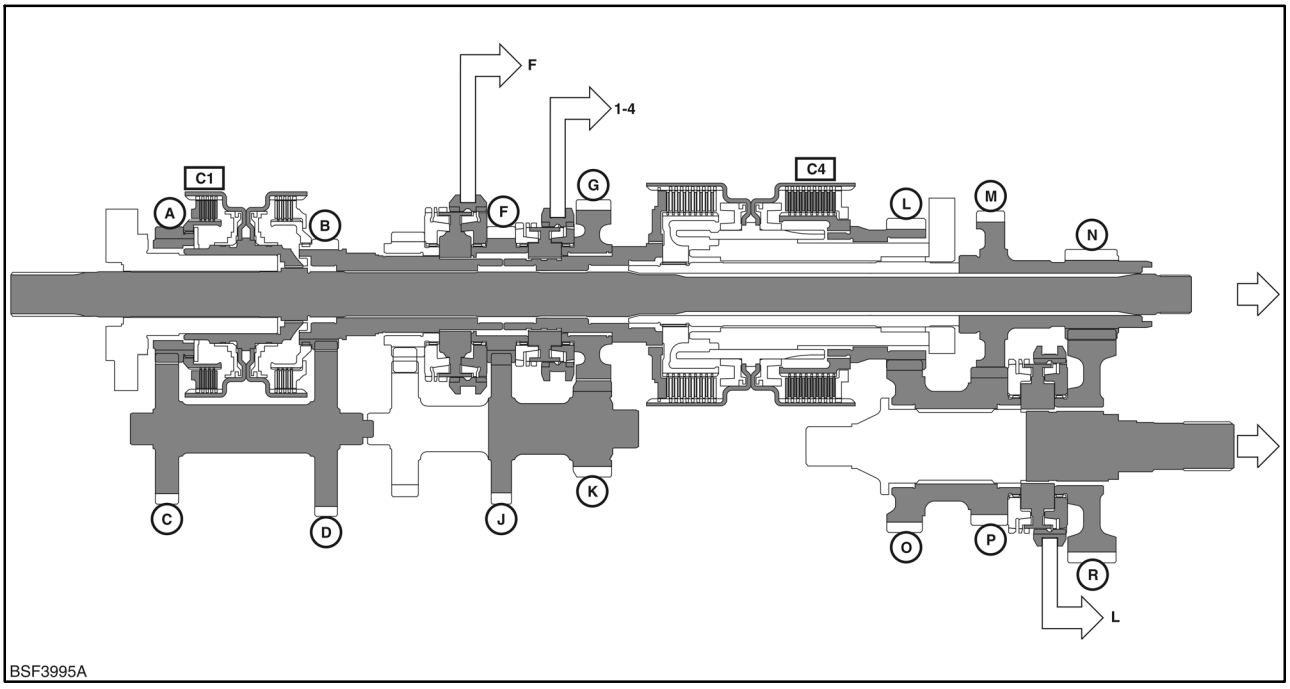
Power Flows - 3rd Gear



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Power Flow

- Input shaft - C1 - gears A-C-D-B - Forward / Reverse synchronizer - gears H-L-M-J - 1-4 / 5-8 synchronizer - C4 - gears L-O-P-M-N-R - Hi / Lo synchronizer - input shaft.

Hydraulic Clutches Engaged

- Clutches C1 and C4 applied.

	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		○	○		10-14
3-7	●			●	11-15
4-8	○		○		12-16

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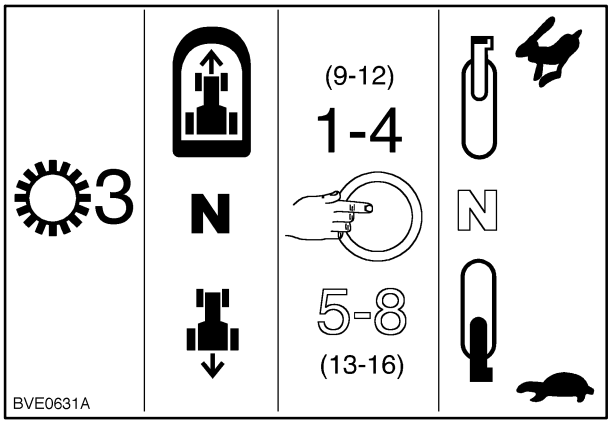
Gear Lever Positions

- Forward, 1-4 and Lo engaged.
- Powershifting from 2nd to 3rd gear involves two clutch changes:

  C2 to C1

  C3 to C4



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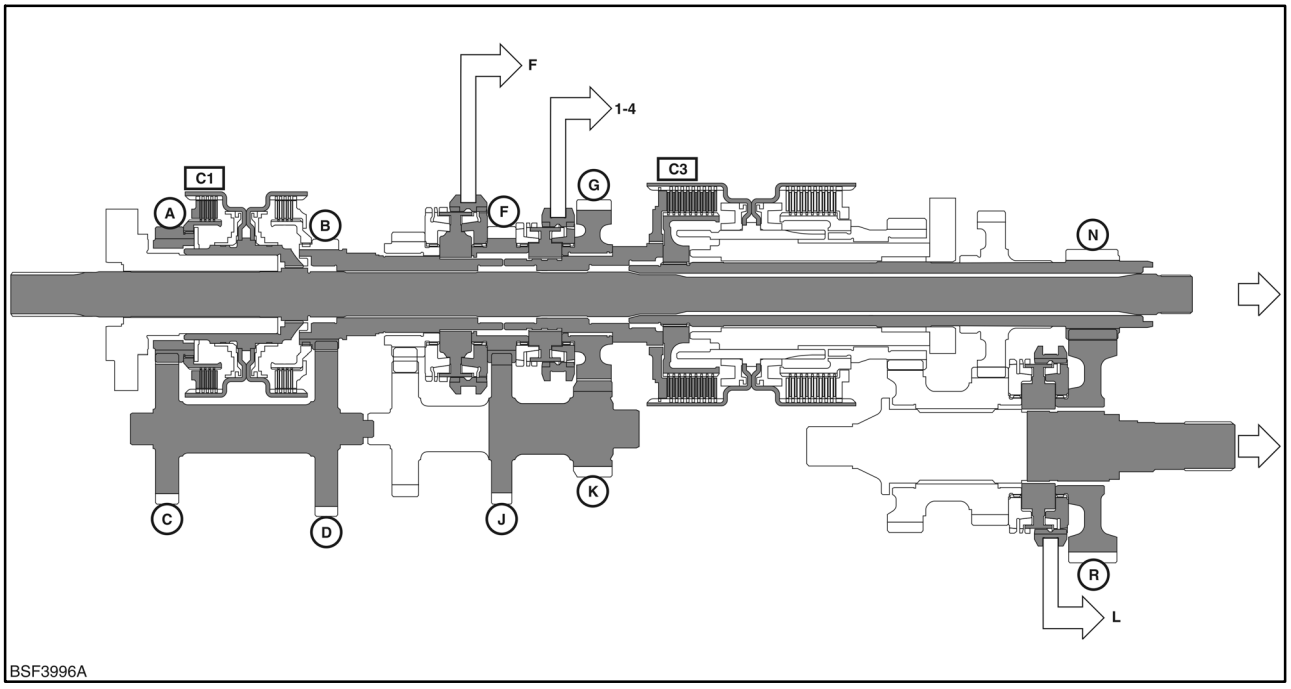
Power Flows - 4th Gear



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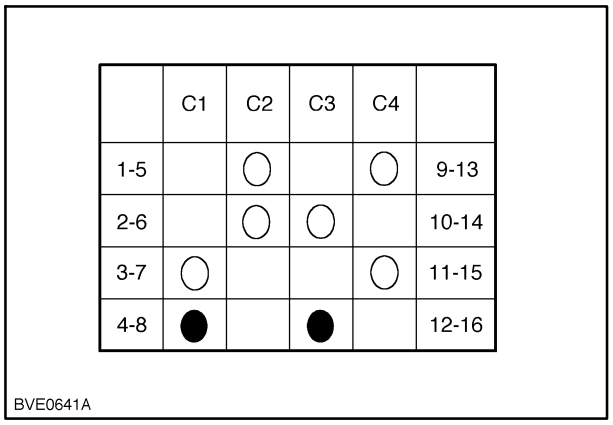
Power Flow

- Input shaft - C1 - gears A-C-D-B - Forward / Reverse synchronizer - gears F-J-K-G- 1-4 / 5-8 synchronizer - C3 - gears N-R - Hi / Lo synchronizer - output shaft.

Hydraulic Clutches Engaged

- Clutches C1 and C3 applied.



	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		○	○		10-14
3-7	○			○	11-15
4-8	●		●		12-16

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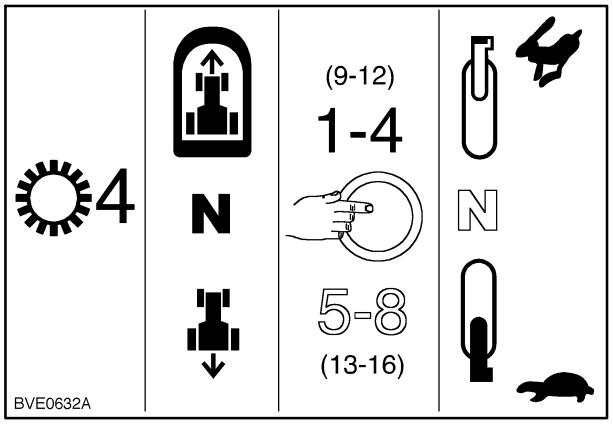
Gear Lever Positions

- Forward,1-4 and Lo engaged.
- Powershifting from 3rd to 4th gear engages clutch C3 disengages clutch C4.



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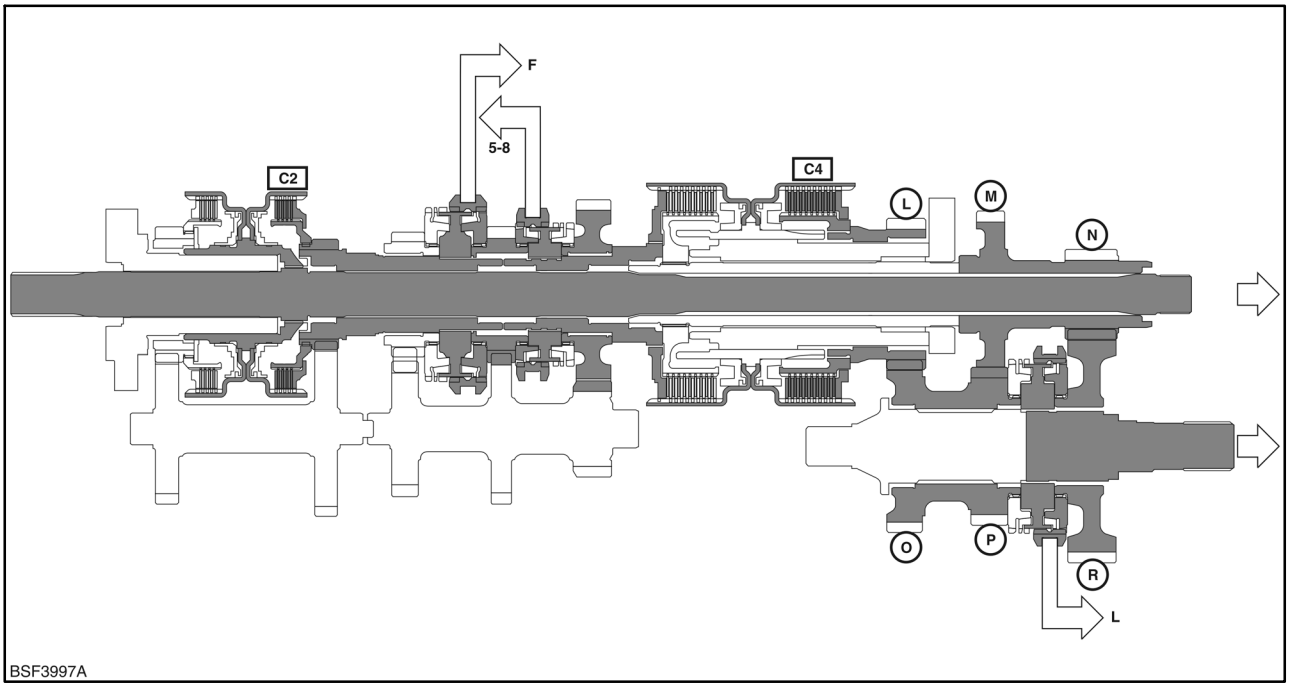
Power Flows - 5th Gear



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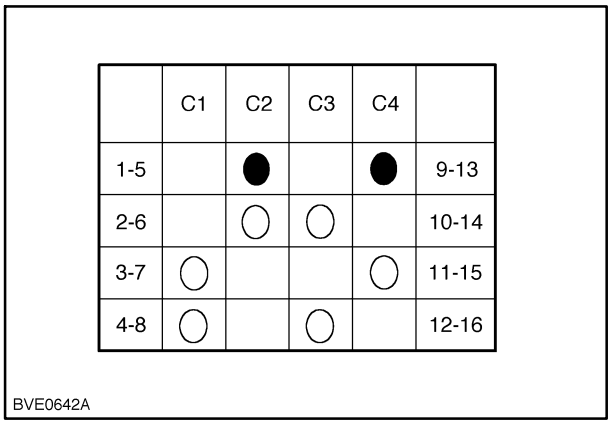
Power Flow

- Input shaft - C2 - Forward / Reverse synchronizer - 1-4 / 5-8 synchronizer - C4 - gears L-O-P-M-N-R - Hi / Lo synchronizer - output shaft.

Hydraulic Clutches Engaged

- Clutches C2 and C4 applied.



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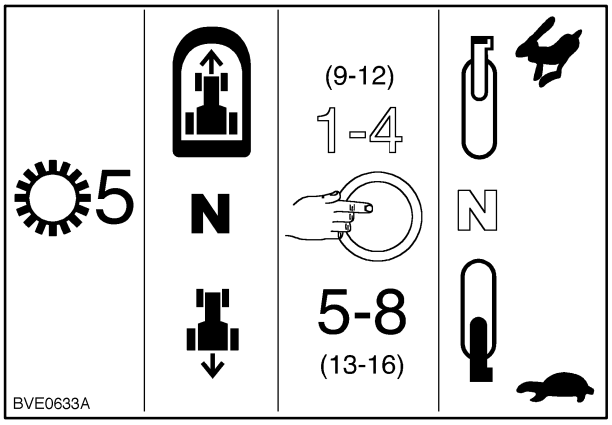
Gear Lever Positions

- Forward, 5-8 and Lo engaged.
- Synchroshift from 1-4 to 5-8 with the range change button, transmission controller releases clutches C1 and C3, then engages clutches C2 and C4.



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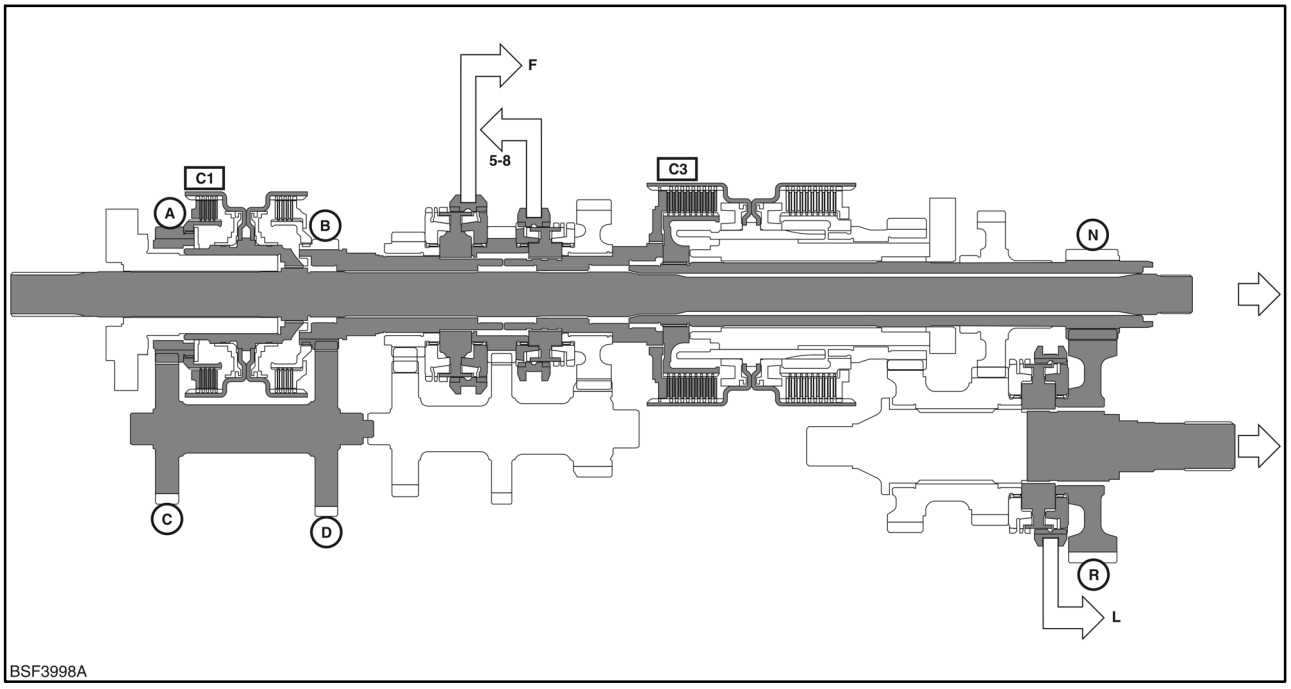
Power Flows - 8th Gear



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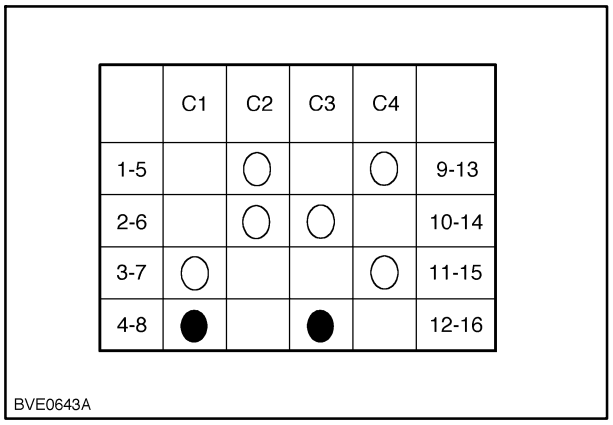
Power Flow

- Input shaft - C1 - gears A-C-D-B - Forward / Reverse synchronizer - 1-4 / 5-8 synchronizer - C3 - gears N-R - Hi / Lo synchronizer - output shaft.

Hydraulic Clutches Engaged

- C1 and C3 clutches applied.



	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		○	○		10-14
3-7	○			○	11-15
4-8	●		●		12-16

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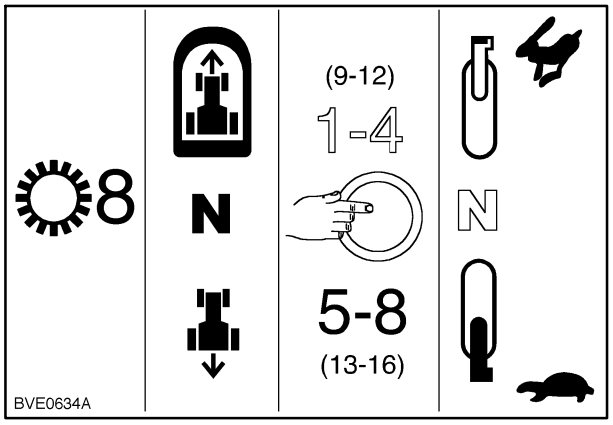
Gear Lever Positions

- Forward, 5-8 and Lo engaged.



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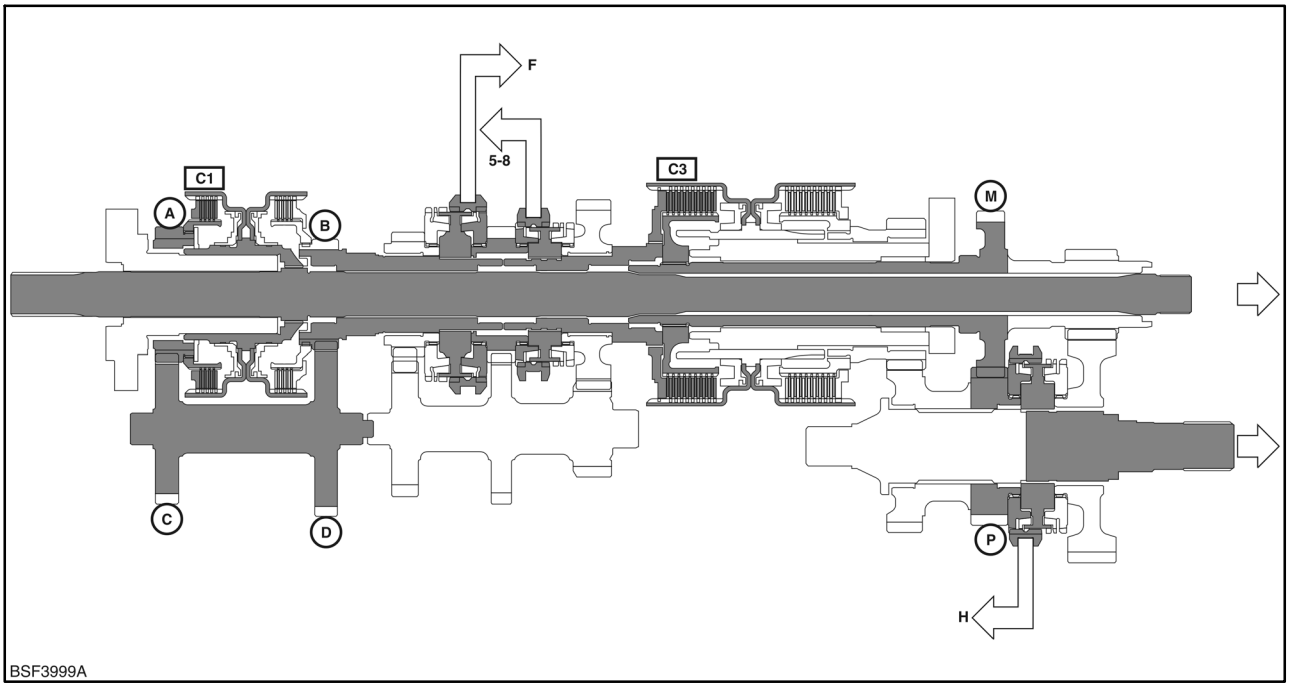
Power Flows - 16th Gear



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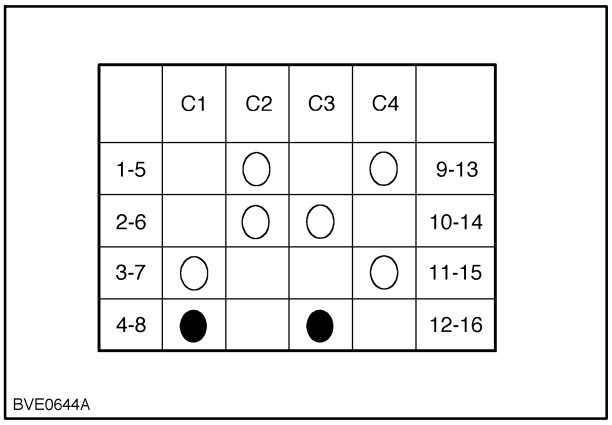
Power Flow

- Input shaft - C1 - gears A-C-B-D - Forward / Reverse synchronizer - 1-4 / 5-8 synchronizer - C3 - gears M-P - Hi / Lo synchronizer - output shaft.

Hydraulic Clutches Engaged

- C1 and C3 clutches applied.



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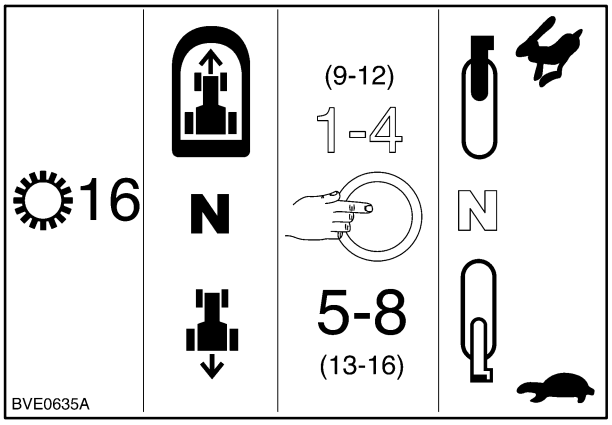
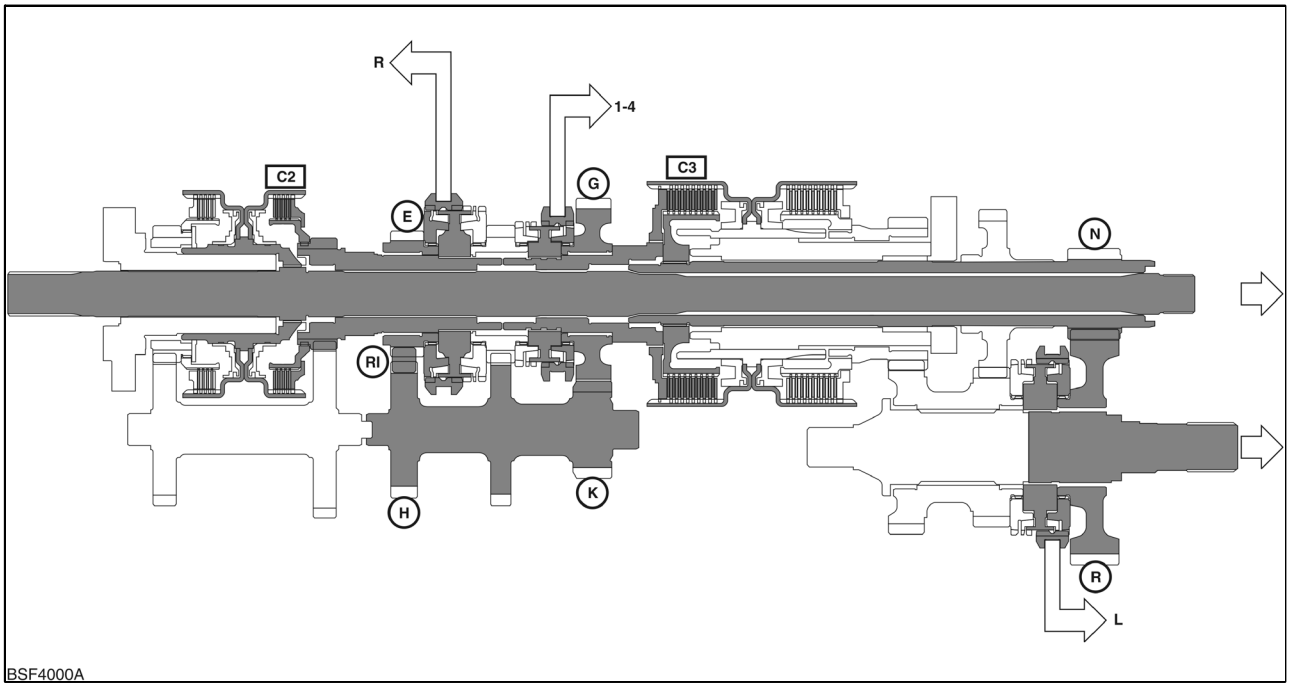
Gear Lever Positions

- In the high range speeds the Hi / Lo synchronizer is engaged with the output shaft gear (P) providing a higher ratio drive from the clutch C3 and C4 output.



60

Power Flows - 2nd Reverse Gear



61

Power Flow

- Moving the Forward / Reverse synchronizer into reverse engages gear E. Output from the C2 clutch will be transmitted through gears E–R1–H–K–G reversing the drive into clutch C3.

Hydraulic Clutches Engaged

- C2 and C3 clutches applied.

	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		●	●		10-14
3-7	○			○	11-15
4-8	○		○		12-16

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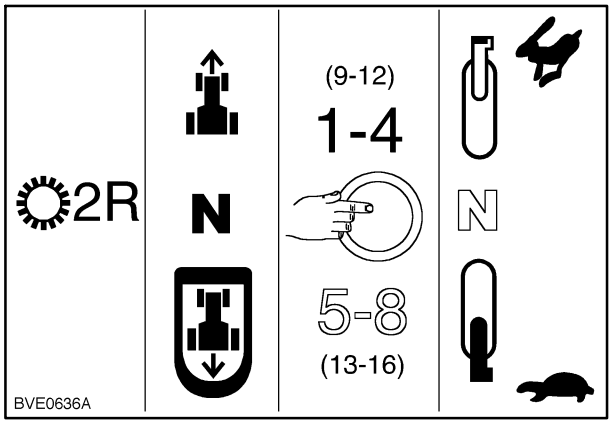
Gear Lever Positions

- The Forward / Reverse synchronizer provides a reverse drive for all forward speeds (1–16).



63

TRANSMISSION HYDRAULIC CIRCUIT SCHEMATIC ILLUSTRATIONS

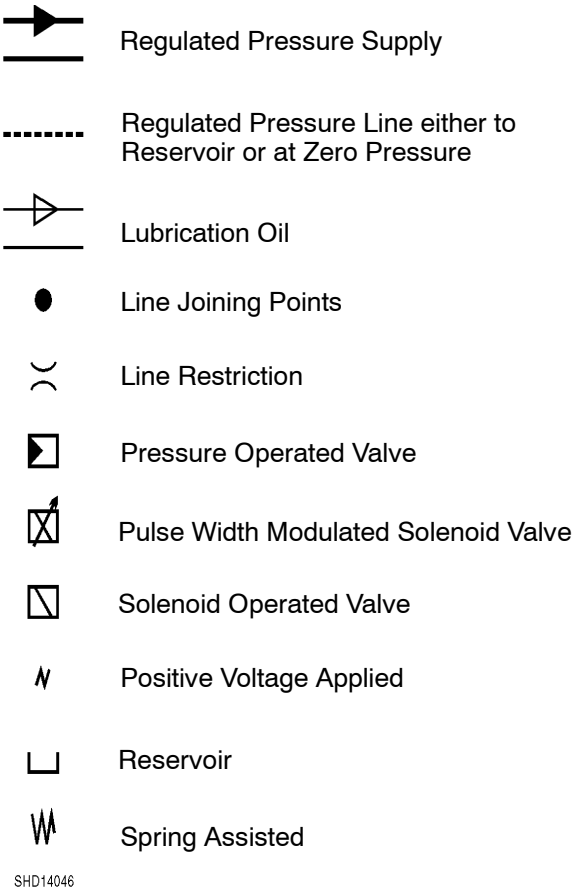
TRANSMISSION SCHEMATIC KEY

1. Regulated Pressure Supply from the Variable Displacement Closed Centre Load Sensing Hydraulic Pump 18-20 bar
2. Lubrication Supply from Steering Motor Return
3. Lubrication Combining Valve
4. Lubrication Shuttle Valve
5. Lubrication Supply to PTO Clutch
6. Lubrication Supply to Transmission Shafts and Synchronisers
7. Lubrication Proportioning Valve C3/C4 Clutches
8. Lubrication Proportioning Valve C1/C2 Clutches
9. Accumulator 10 bar/0.7 litres
10. Lubrication Relief Valve

C1 Clutch 1
C2 Clutch 2
C3 Clutch 3
C4 Clutch 4

PWM=Pulse Width Modulation

Symbols



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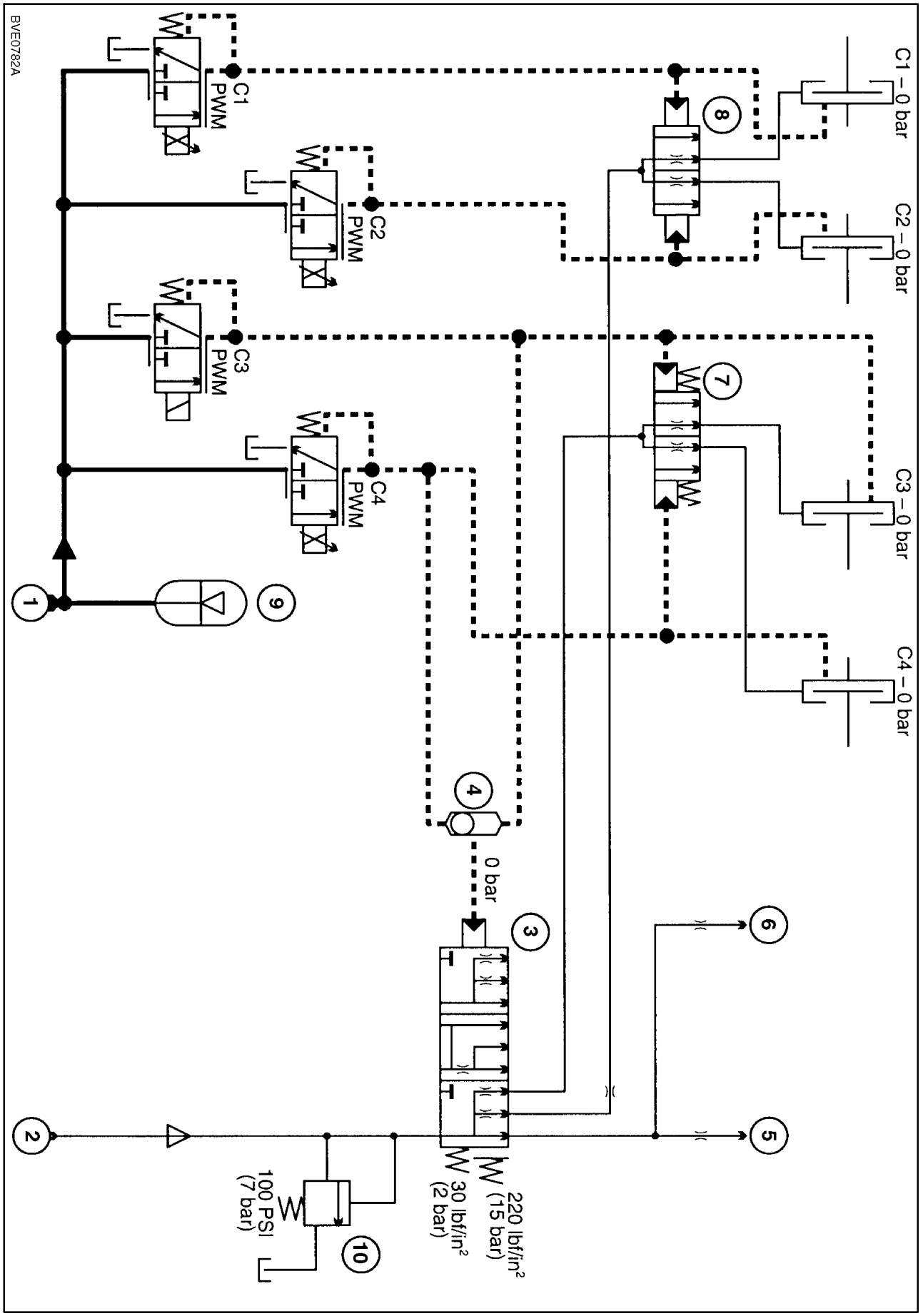
START UP

- Regulated pressured oil at 18-20 bar (260-290 lbf/in^2) is supplied to the transmission side cover assembly by the variable displacement closed centre load sensing hydraulic piston pump (1).
- Lubrication oil is supplied to the transmission side cover assembly from the steering motor/cooler return (2). Maximum oil pressure is limited by the lubrication relief valve (10) to 7 bar (100 lbf/in^2).
- Regulated pressure oil is directed to:-
  - C1 PWM Valve
  - C2 PWM Valve
  - C3 PWM Valve
  - C4 PWM Valve
  - Lubrication Combining Valve (3)

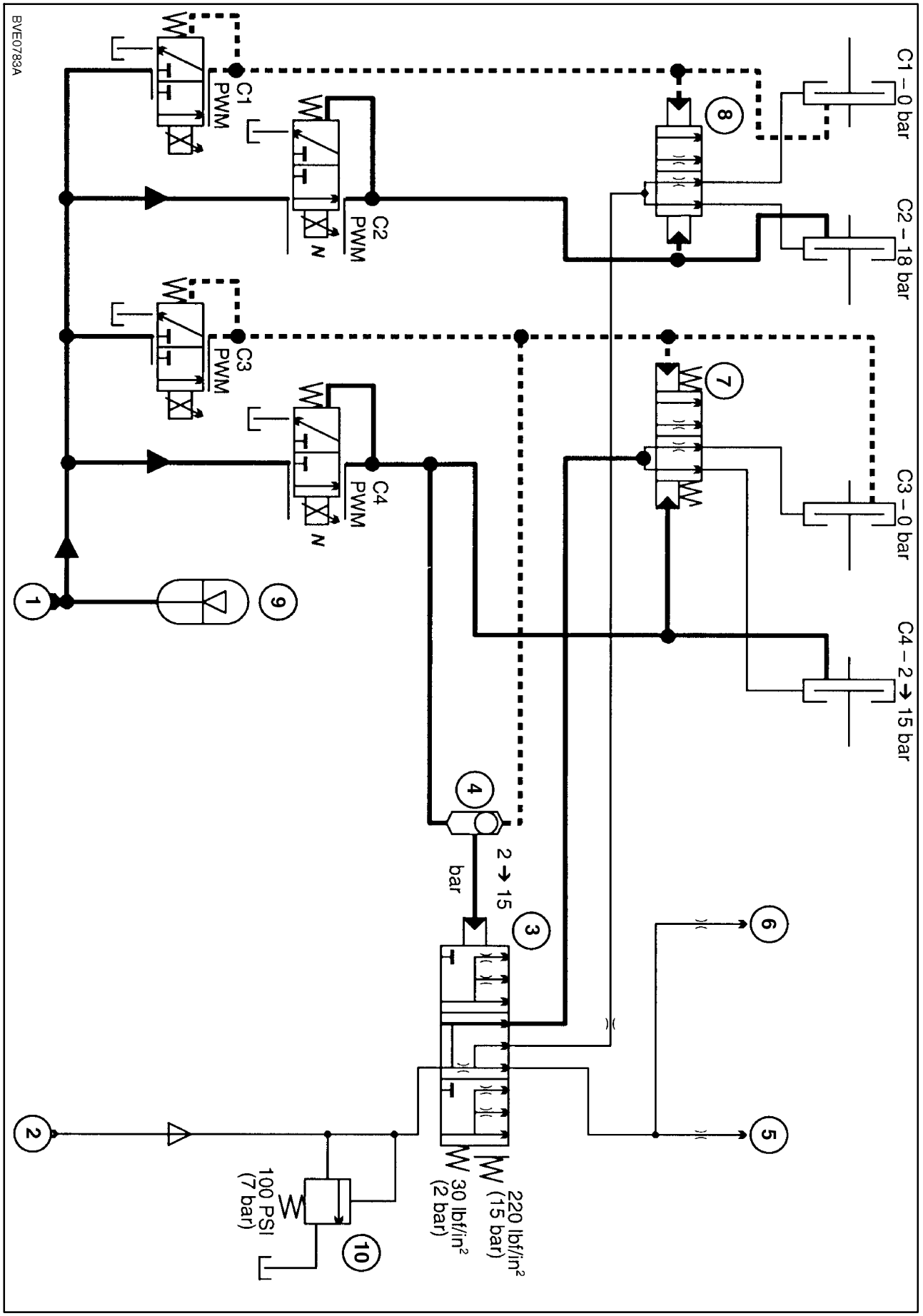
Since the PWM and solenoid valves are not energised there is no flow of regulated pressure oil.

- Lubrication oil is directed to the lubrication combining valve, spring pressure moves the valve to the left.
- The lubrication oil from the lubrication combining valve is directed to:-
  - C1/C2 Clutches
  - C3/C4 Clutches
  - Transmission Shafts and Synchronisers
  - PTO Clutch


BVE0782A
C1 PWM
C2 PWM
C3 PWM
C4 PWM
C1 – 0 bar
C2 – 0 bar
C3 – 0 bar
C4 – 0 bar
0 bar
220 lbf/in² (15 bar)
30 lbf/in² (2 bar)
100 PSI (7 bar)
1
2
3
4
5
6
7
8
9
10

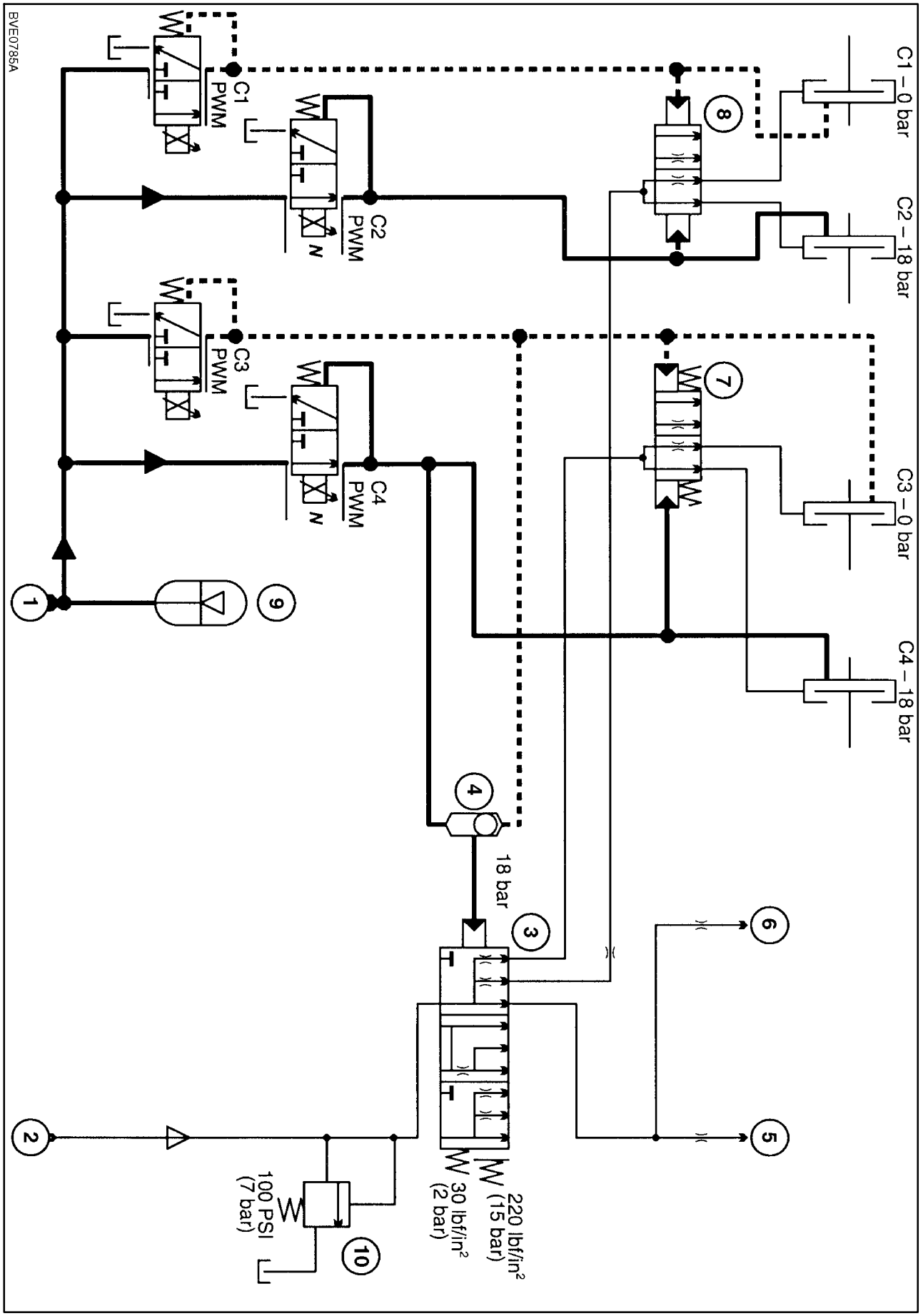
GEAR 1 SELECTED, INCHING PEDAL PARTIALLY RAISED

- As the inching pedal is partially raised C2 PWM valve opens fully, allowing full pressure 18 bar (260 lbf/in^2) into clutch C2.
- C1/C2 lubrication proportioning valve (8) is moved to the left by C2 clutch pressure, increasing C2 clutch lubrication, reducing C1 clutch lubrication.
- As the inching pedal is released further, C4 PWM valve is progressively energised. As C4 clutch apply pressure increases from zero to 2 bar, oil flows past the lubrication shuttle valve (6) to the left end of the lubrication combining valve (5), moving it right to its central position. Pressure regulated oil is combined with existing C3/C4 lubrication oil to increase lubrication oil flow during clutch apply. Lubrication to transmission and PTO is reduced during clutch apply.
- C3/C4 lubrication proportioning valve (7) is moved to the left by C4 clutch apply pressure to increase C4 clutch lubrication.


BVE0783A
C1 – 0 bar
C2 – 18 bar
C3 – 0 bar
C4 – 2 → 15 bar
C1 PWM
C2 PWM
C3 PWM
C4 PWM
N
2 → 15 bar
220 lbf/in² (15 bar)
30 lbf/in² (2 bar)
100 PSI (7 bar)
1
2
3
4
5
6
7
8
9
10

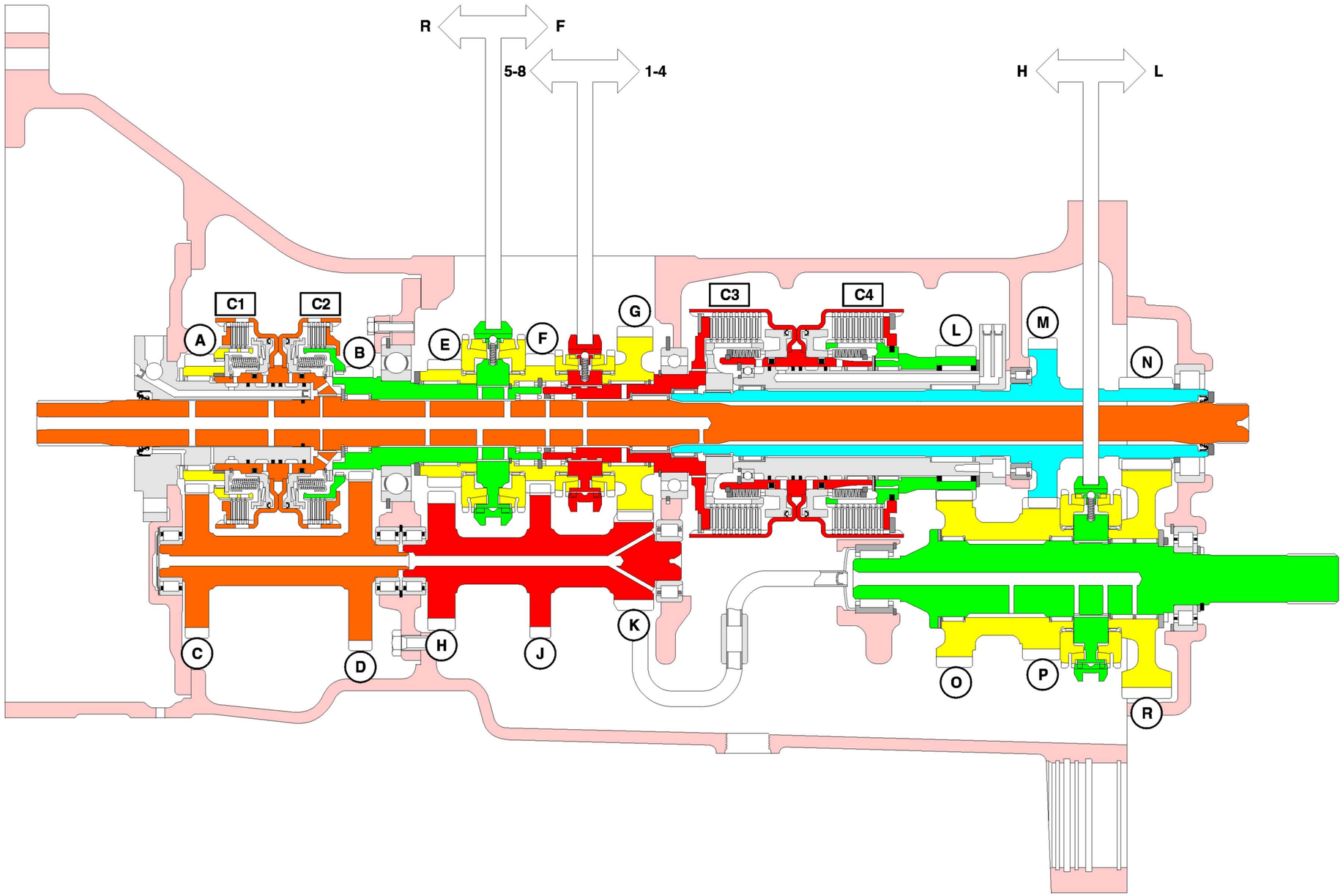
GEAR 1 SELECTED, INCHING PEDAL FULLY RELEASED

- As the inching pedal is fully released C4 PWM valve is fully energised.
- When C4 clutch apply pressure increases above 15 bar the lubrication combining valve is moved fully to the right. Pressure regulated oil is no longer combined with lubrication oil. Transmission and PTO lubrication is restored.
- Clutch apply pressure increases to full pressure 18 bar (260 lbf/in^2).


BVE0785A
C1 – 0 bar
C2 – 18 bar
C3 – 0 bar
C4 – 18 bar
C1 PWM
C2 PWM
C3 PWM
C4 PWM
N
18 bar
220 lbf/in² (15 bar)
30 lbf/in² (2 bar)
100 PSI (7 bar)
1
2
3
4
5
6
7
8
9
10

TRANSMISSION GEAR TEETH

Gear	Description	Number Of Teeth	
		40 Kph	30 Kph
A	C1 clutch output gear	37	
B	C2 clutch output gear	28	
C	Front lower shaft gear	41	
D	Front lower shaft gear	48	
E	Reverse gear	33	
F	Forward gear and/or coupler	37	
G	Low main gear	53	
H	Intermediate lower shaft gear	37	
J	Intermediate lower shaft gear	41	
K	Intermediate lower shaft gear	25	
L	C4 clutch output gear	41	37
M	C3 clutch (High) output gear	45	41
N	C3 clutch (Low) output gear	22	22
O	Output gear	38	43
P	High range output gear	34	39
R	Low range output gear	65	



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16x16 TRANSMISSION GEAR IDENTIFICATION

NOTES

TROUBLESHOOTING DIAGRAMS

NOTE: *These faults are not related to error codes*

1. Tractor does not drive in any gear
2. Incorrect gear shift sequence or gears missing
3. Powershifts jerky / loss of drive
4. Poor clutch feathering
5. Clutch potentiometer calibration check
6. Holding in gear / jumping out of gear / clashing
7. Clutches squeal / whine during inching
8. Transmission is noisy in operation
9. Transmission ‘clunks’ during inching

DIAGRAM 1 - TRACTOR DOES NOT DRIVE IN ANY GEAR

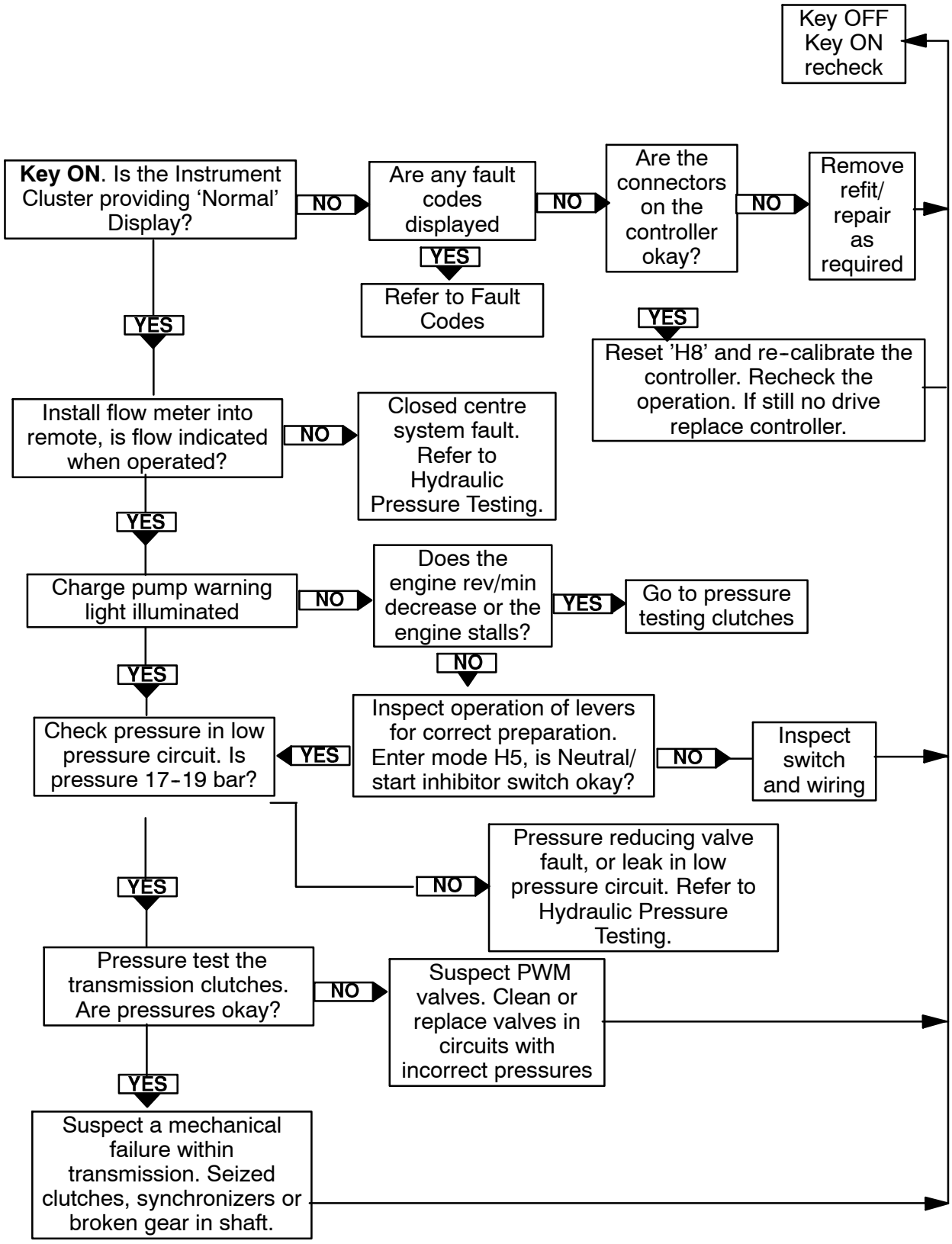
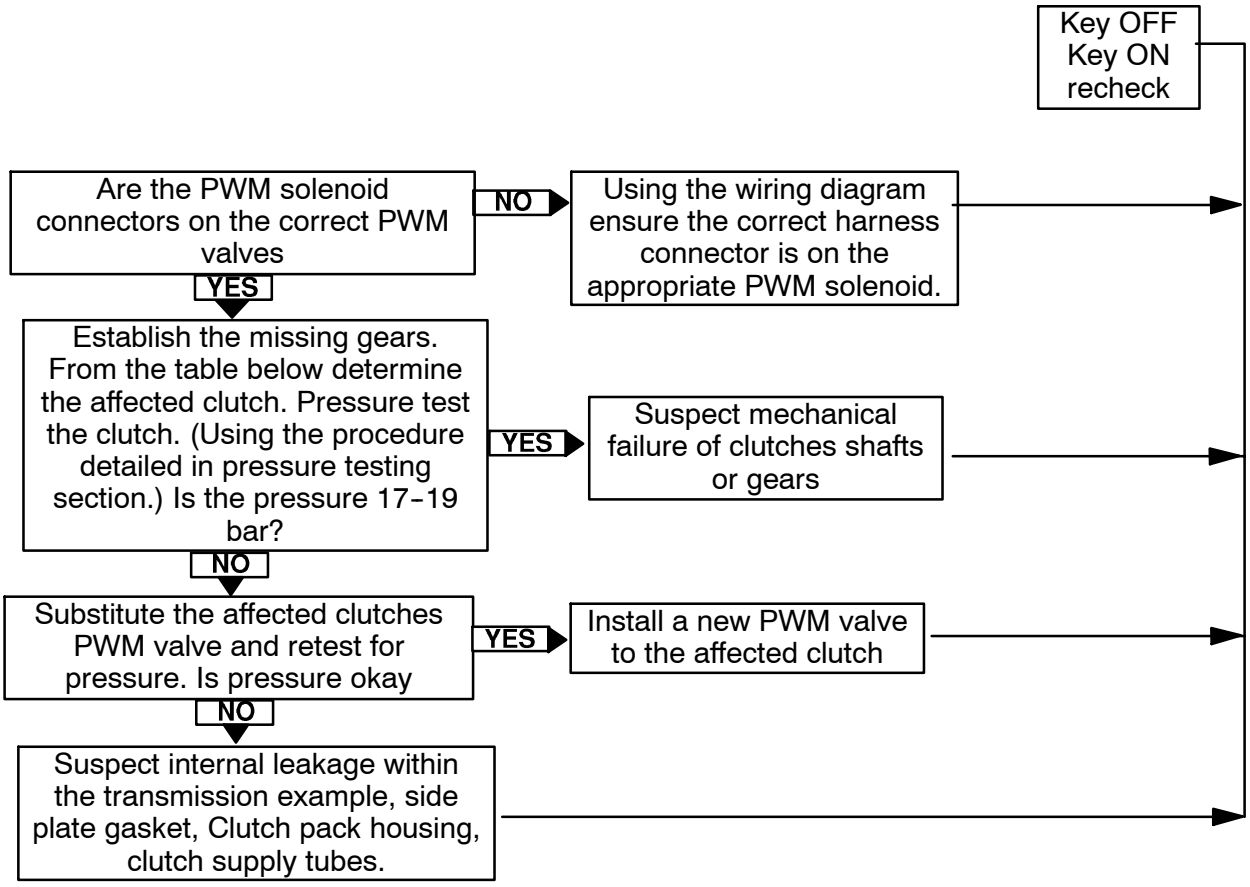
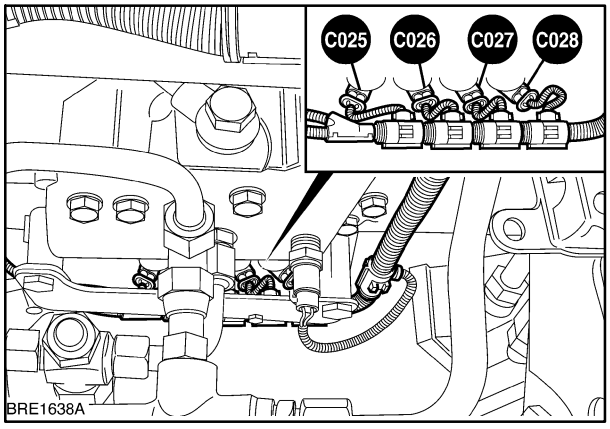


DIAGRAM 2 - TRACTOR DRIVES IN RANGES BUT HAS FOLLOWING FAULT:

- Powershift function operates but the shift sequence is incorrect or gears missing





	C1	C2	C3	C4	
1-5		○		○	9-13
2-6		○	○		10-14
3-7	○			○	11-15
4-8	○		○		12-16

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DIAGRAM 3 - THE POWERSHIFTS ARE NOT SMOOTH OR THE TRACTOR LOSES DRIVE BETWEEN POWERSHIFTS (IN WORK TRACTOR STOPS OR COULD BE JERKY)

Key OFF
Key ON
recheck

Perform complete transmission calibration.
1) spring calibration
2) fill time adjustment
is transmission still performing poorly?

NO → Tractor okay

YES

NO ← Is feathering performance poor?

YES

Suspect PWM valves 3 or 4. Clean or replace and repeat spring calibration. Is powershift performance poor?

NO →

YES

NO ← Are only double swap shifts poor? (i.e. 2 to 3 or 6 to 7 gear changes. 3 to 2 or 7 to 6 gear changes)

YES

Suspect PWM valves 1 or 2. Clean or replace. Repeat spring calibration and fill time adjustment. Is powershift performance still poor?

YES

Remove and test accumulator (see testing section) Is accumulator okay?

NO → Repair/replace accumulator perform fill time adjustment

YES

Suspect damaged clutch plates. Inspect and replace as required. (See overhaul) re-calibrate after assembly

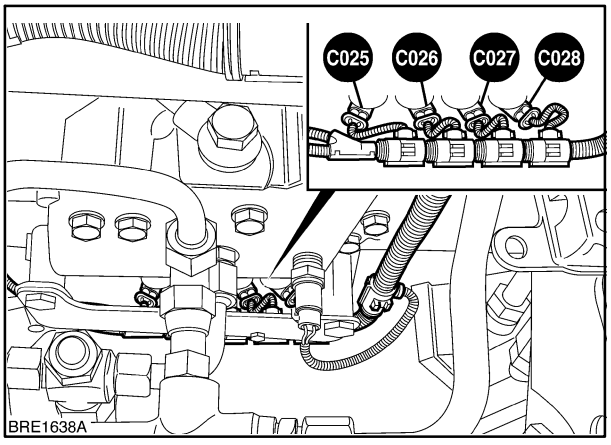


DIAGRAM 4 - THE TRACTOR DRIVES IN ALL GEARS BUT HAS THE FOLLOWING FAULT:

- Poor clutch pedal feathering / inching performance

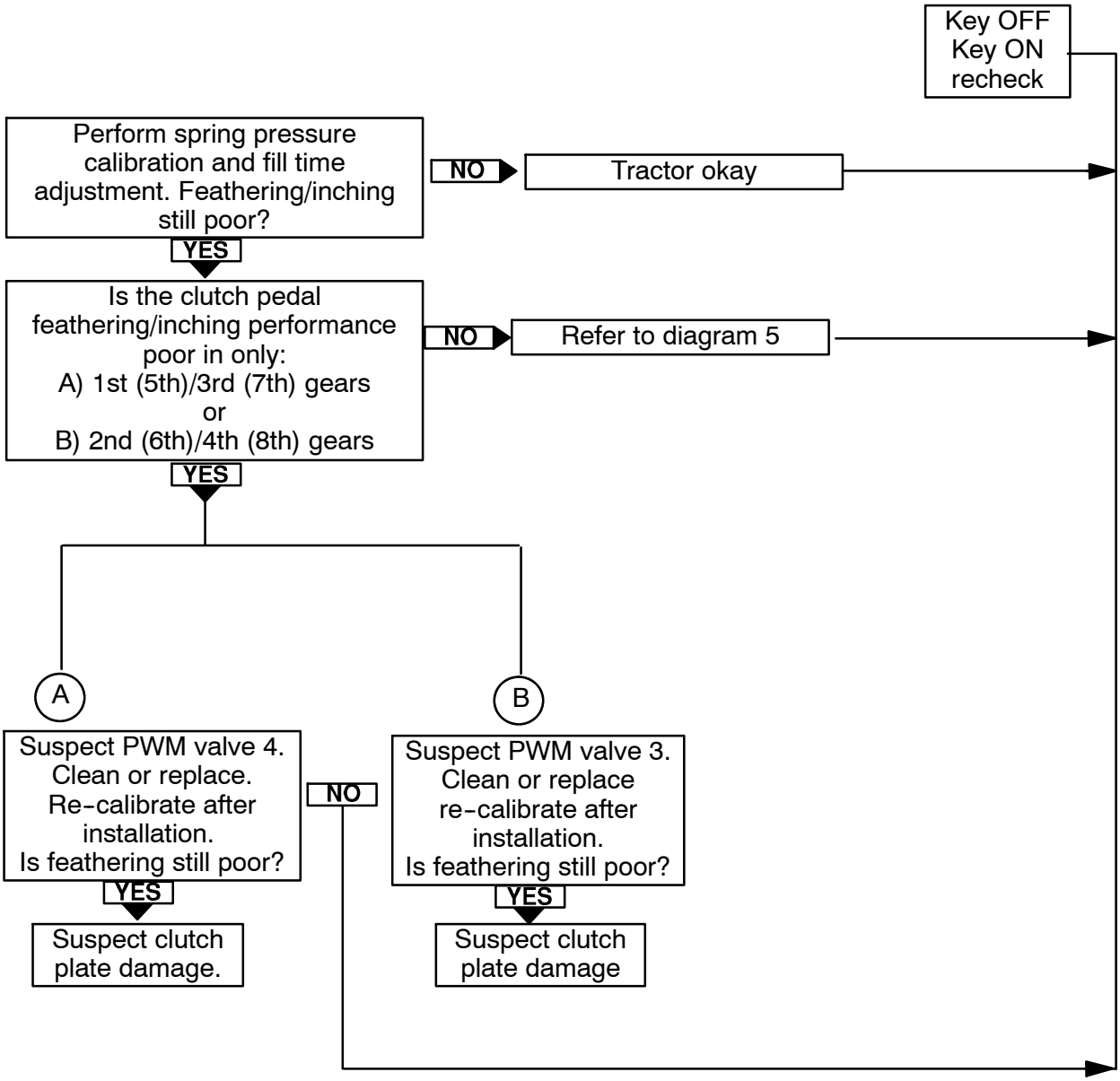
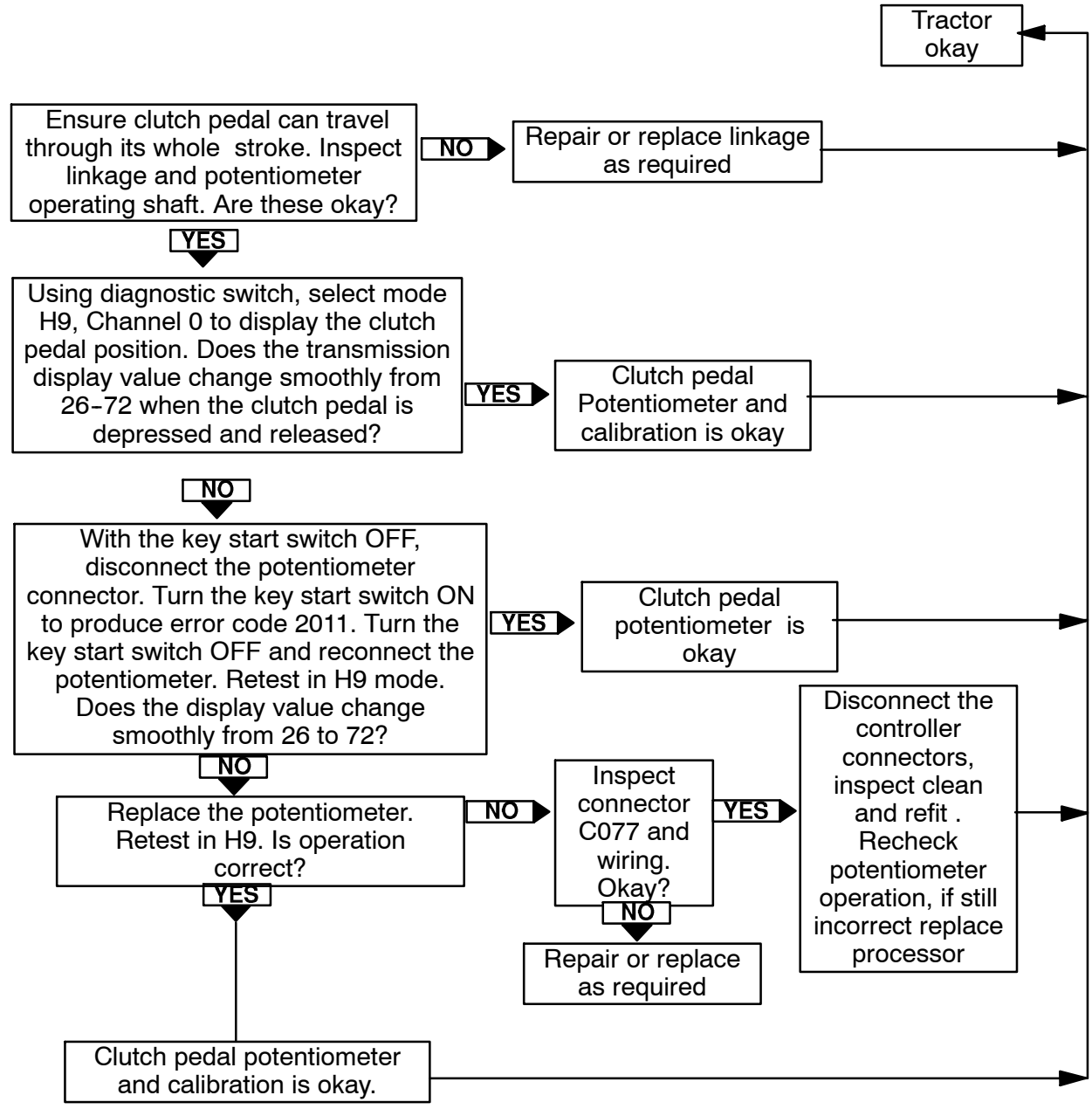
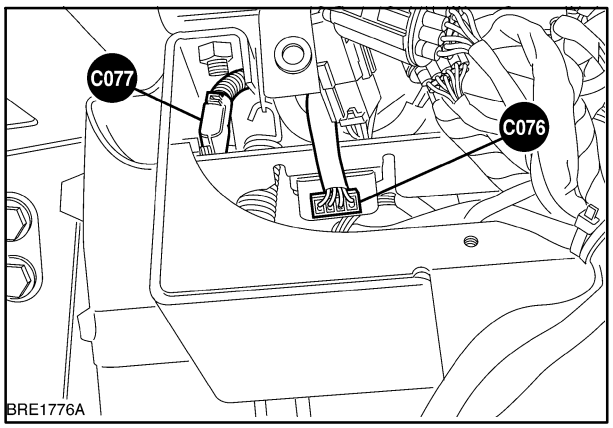


DIAGRAM 5 - CLUTCH PEDAL POTENTIOMETER CALIBRATION CHECK





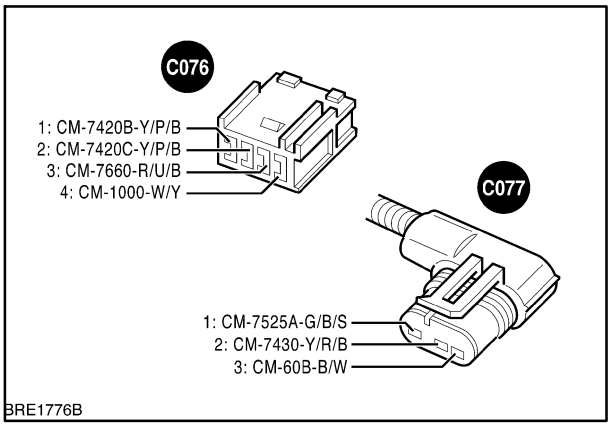


DIAGRAM 6: THE TRACTOR DRIVES IN ALL GEARS AND RANGES BUT HAS THE FOLLOWING FAULT:

- Transmission jumps out of gear, holds in gear or gears clash when shifting

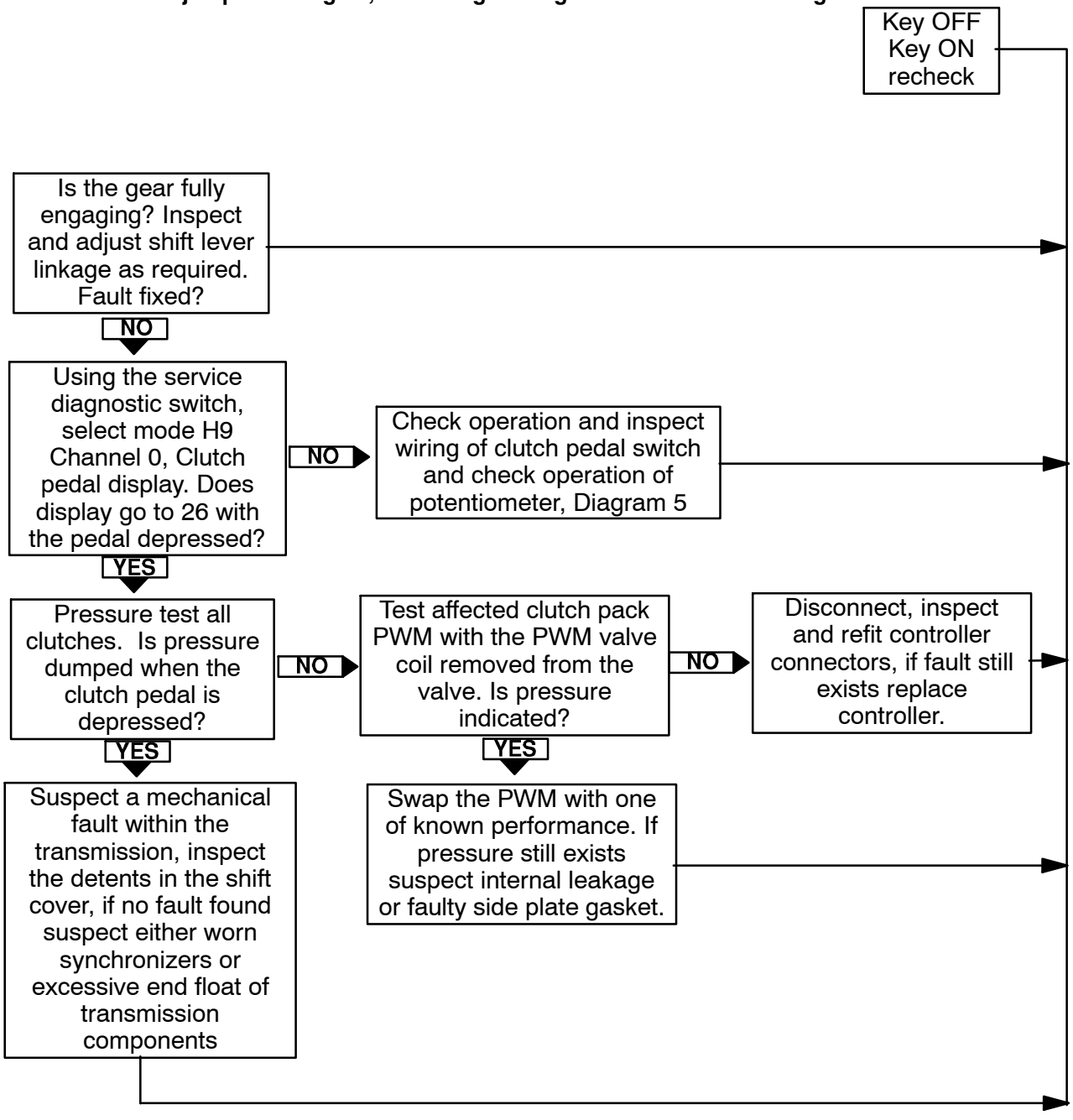


DIAGRAM 7: THE TRACTOR DRIVES IN ALL GEARS AND RANGES BUT HAS THE FOLLOWING FAULT:

- Clutches squeal / whine during inching

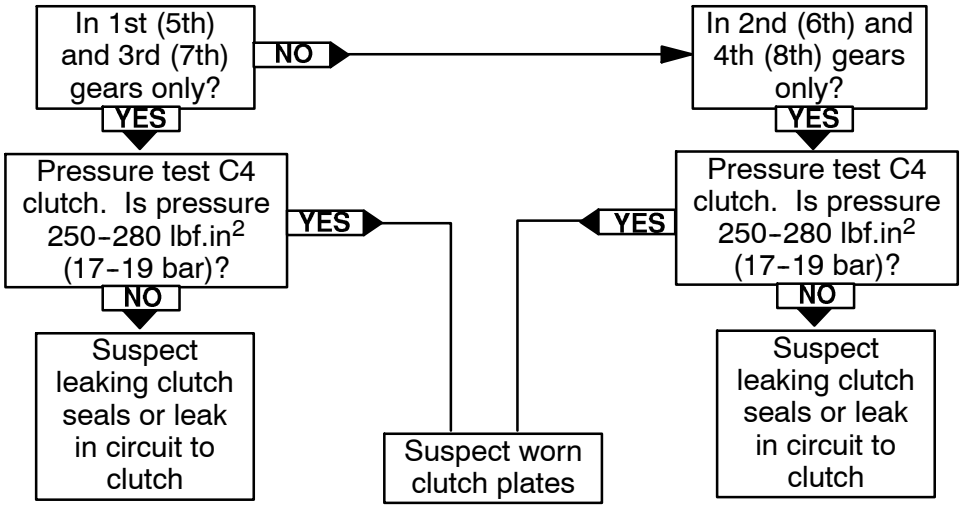


DIAGRAM 8: THE TRACTOR DRIVES IN ALL GEARS AND RANGES BUT HAS THE FOLLOWING FAULT:

- Transmission is noisy in operation

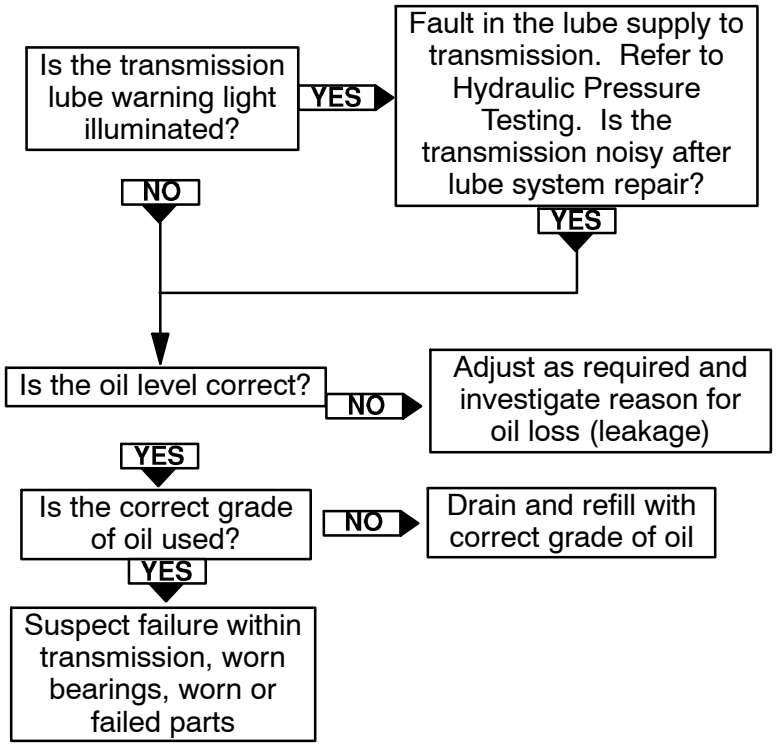
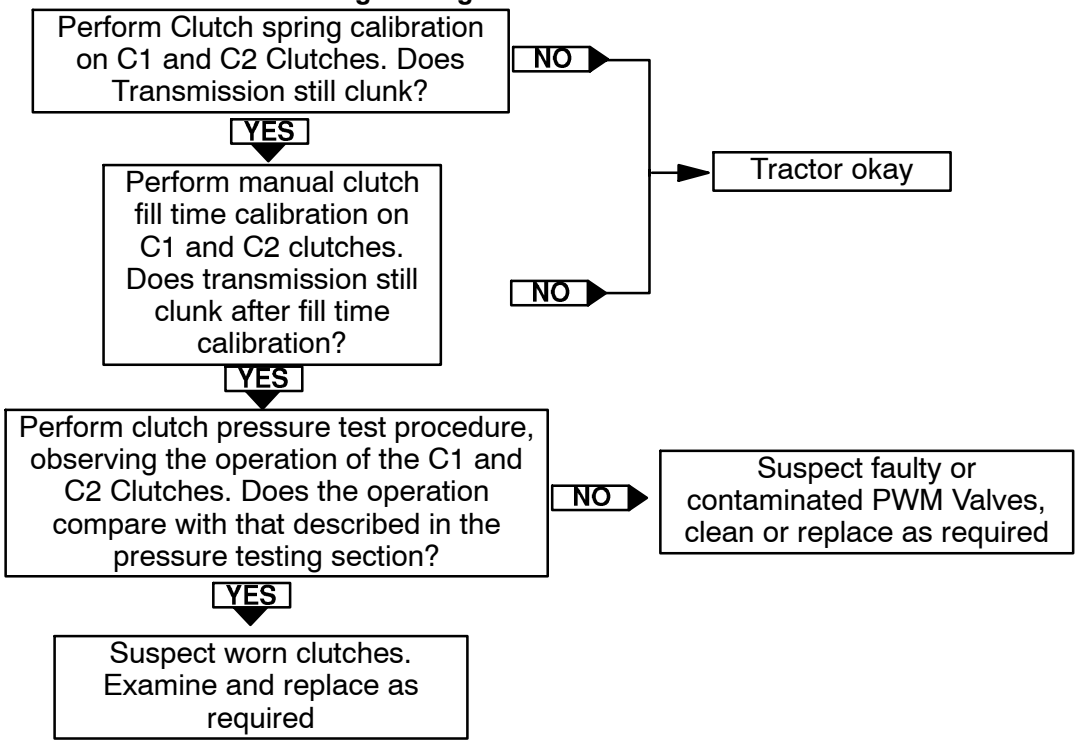


DIAGRAM 9: THE TRACTOR DRIVES IN ALL GEARS AND RANGES BUT HAS THE FOLLOWING FAULT:

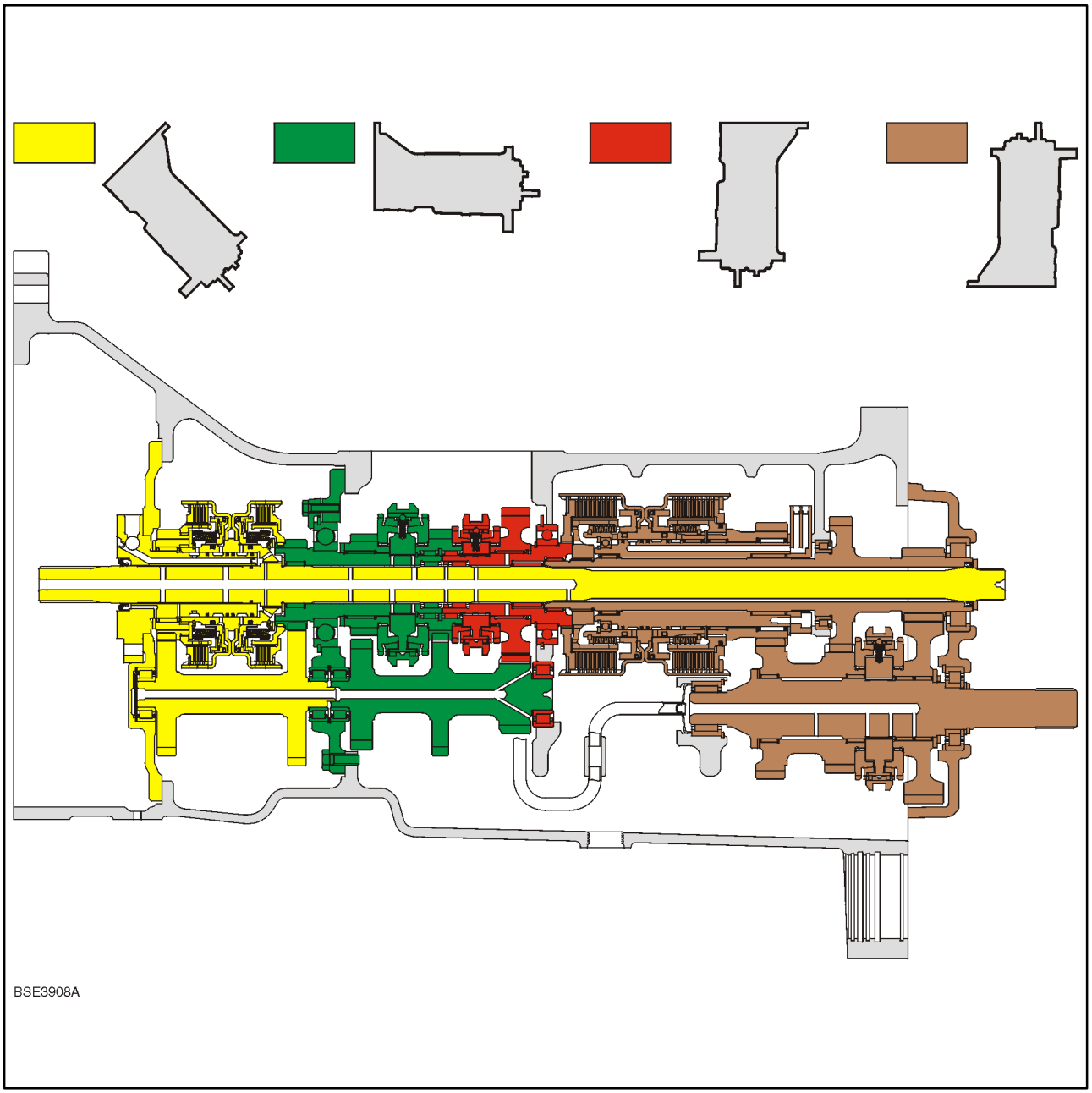
- Transmission clunks during inching



OVERHAUL

TRANSMISSION DISASSEMBLY / ASSEMBLY INFORMATION

It is recommended that the transmission is disassembled in the sequence indicated. Removal of components of the transmission with the transmission oriented as shown in the colour diagram will facilitate operations.



64

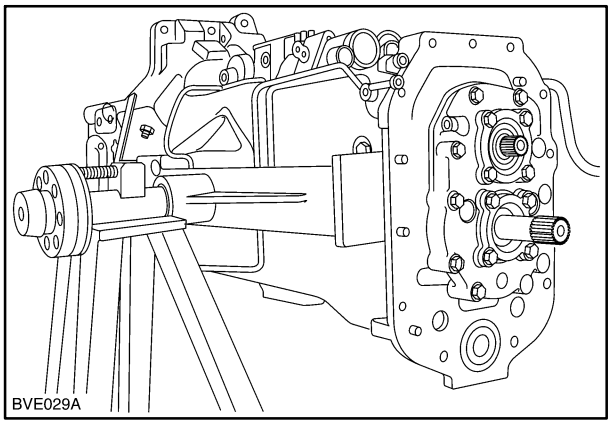
Yellow- Front Section
Green / Red- Middle Section
Brown- Rear Section

IMPORTANT: *Cleanliness during overhaul is important. Ensure during the rebuilding stage that all contaminant is eliminated, the transmission uses hydraulically actuated components and that cleanliness and the removal of any contaminant is paramount to a successful overhaul. Pay particular attention to the control valve when this is removed during this overhaul stage.*

The transmission must be removed from the tractor before commencing overhaul. Should any single component be identified as requiring removal refer to the relevant area within the overhaul procedure and consider if replacement of this single item can be achieved without complete disassembly.

During disassembly and re-assembly it is necessary to place the transmission in the horizontal and vertical positions, therefore a suitable stand is a necessary. See Section under 'Special Tools' for details.

Alternatively an engine stand of sufficient strength together with a suitable bracket may be used.



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Inspection

General

Before commencing a detailed inspection of the transmission components, consider the history of the transmission. If disassembly and overhaul has been dictated by a specific failure at relatively low service hours, a thorough examination of components will identify re-usable bearing seals and other such items. If, however, the transmission has operated considerable service hours, then replacement of all bearings and seals would be recommended.

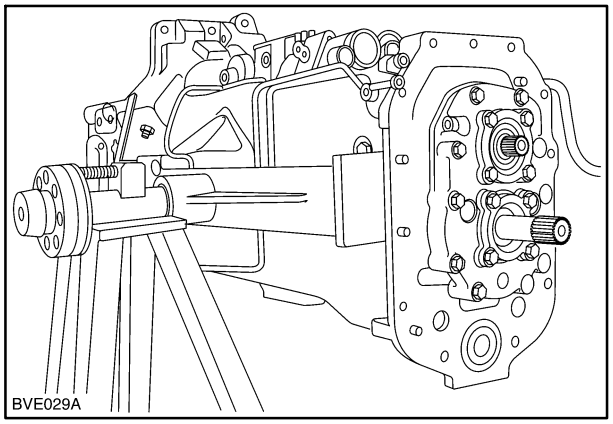
Wash all components, including the transmission housing, in a suitable solvent and dry using a lint free cloth or compressed air. During re-assembly of any item in this chapter use clean transmission oil as a lubricant unless otherwise stated.

Disassembly

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

1. Remove the transmission (refer to the transmission removal chapter of the separating the tractor section).
2. Using the locally fabricated stand attachment bracket, install the transmission to a suitable stand.



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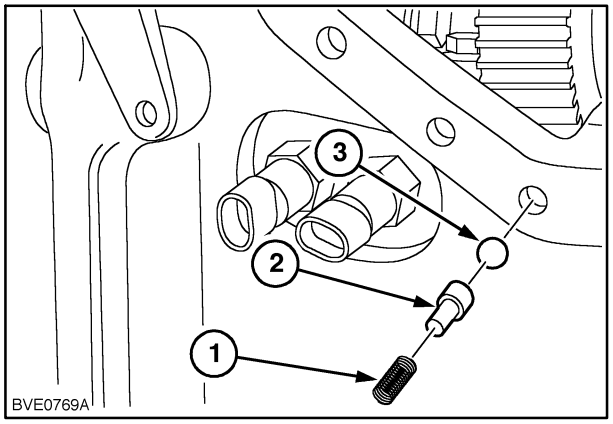
3. Remove the transmission top cover (refer to transmission top cover overhaul in this chapter).
4. Remove the transmission control valve (refer to transmission control valve overhaul in this chapter).
5. Remove the high / low rail detent spring (1), detent ball actuator (2) and the detent ball (3).



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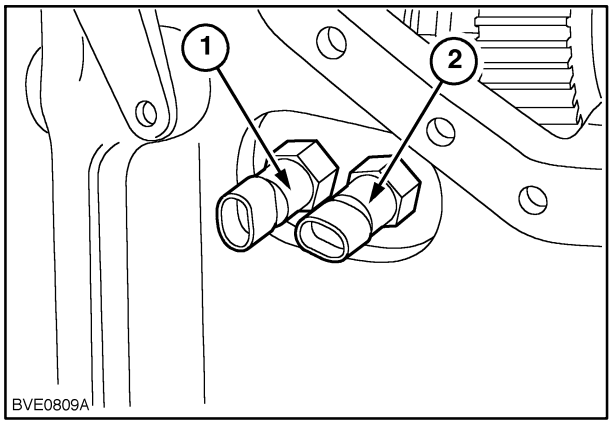
NOTE: *The range switches have different thread diameters and cannot be interchanged.*

6. Remove the low range (1) and high range (2) switches from the transmission housing.



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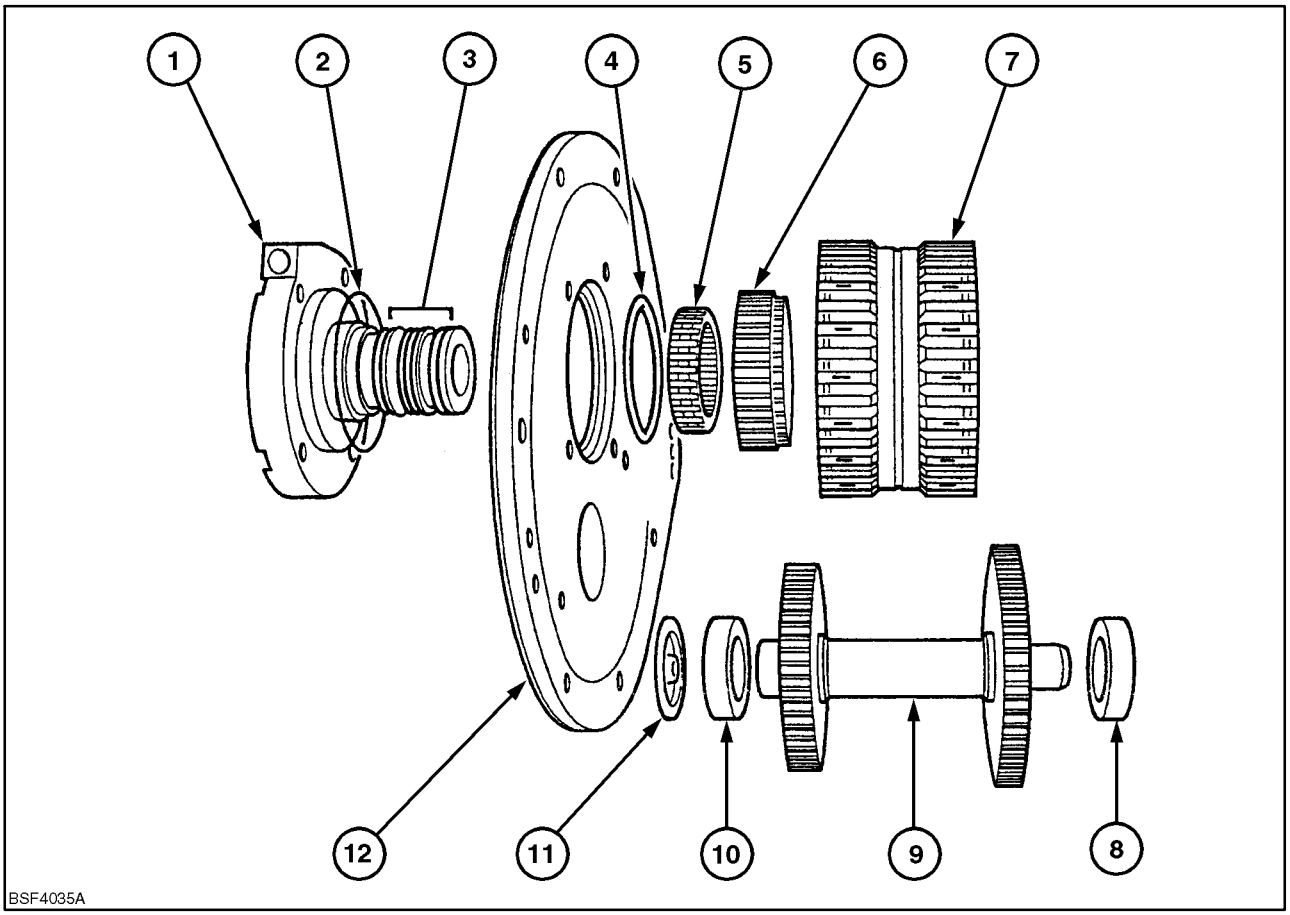
Front Section Removal



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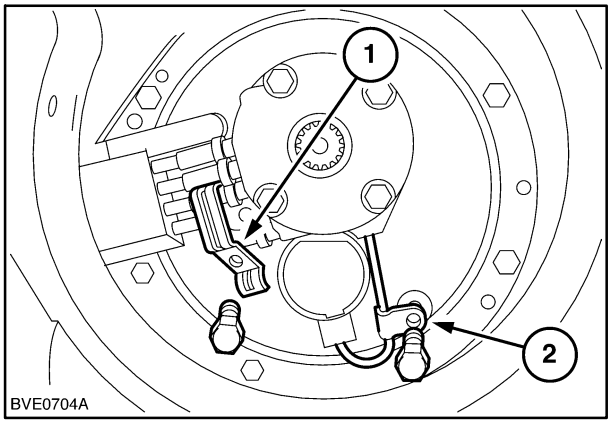
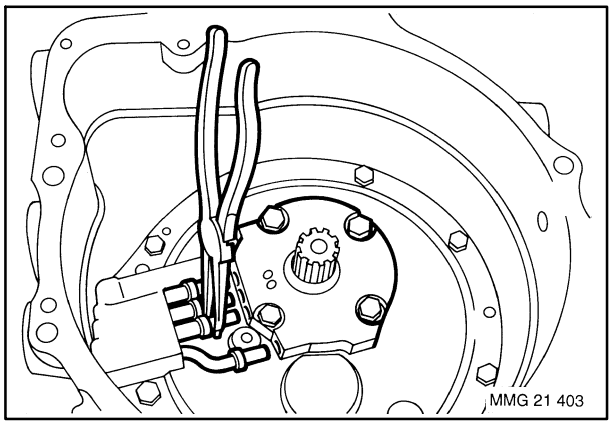
1. C1 / C2 clutch support shaft
2. 'O' ring seal
3. Clutch annular sealing rings
4. Polyimide thrust washer
5. C1 clutch needle roller bearing
6. C1 clutch output gear (34 teeth)
7. C1 / C2 clutch assembly
8. Support shaft roller bearing
9. Front bottom support shaft
10. Support shaft roller bearing
11. Lubrication oil baffle
12. Front cover plate

1. Rotate the transmission to a vertical position.
2. Remove the oil transfer tube retaining bracket (1) and the lubrication oil supply tube (2).



70

3. Reposition the oil transfer tubes back into the front cover distribution block.



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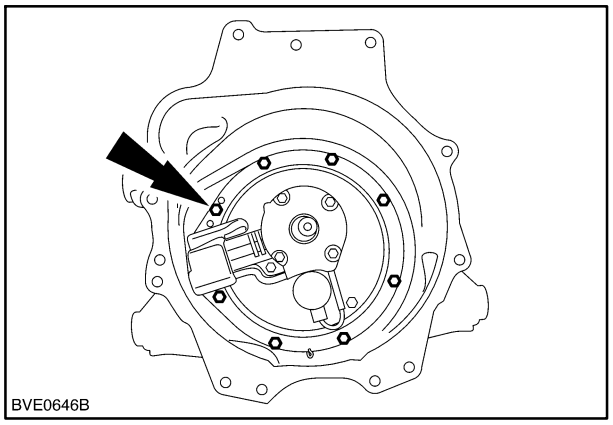
4. Remove the front cover retaining bolts.



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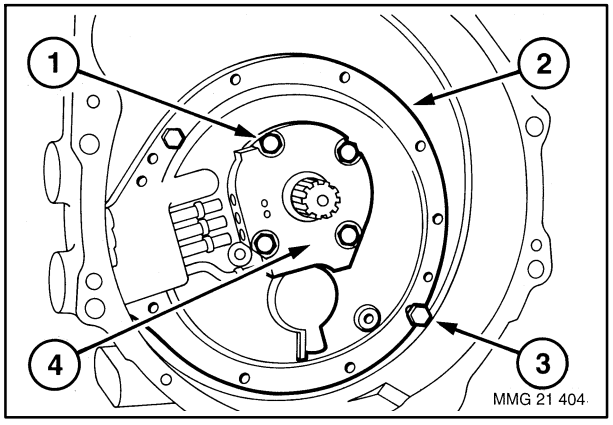
5. Remove the C1 / C2 clutch support manifold retaining bolts (1).
6. Remove the C1 / C2 clutch support manifold (4).
7. Install two bolts into the separating holes (3) and separate the front cover plate (2) from the transmission housing.



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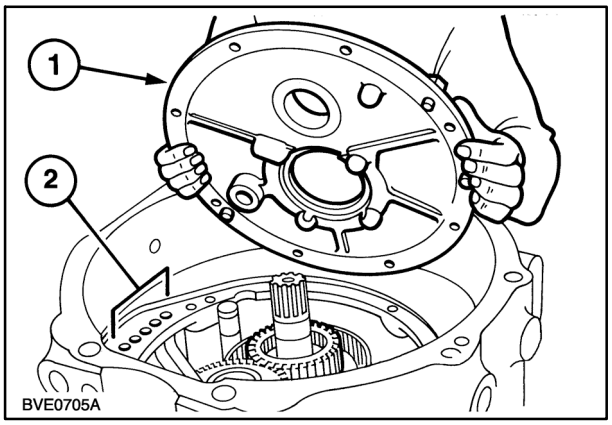
8. Remove the front cover plate (1) and the O-rings (2).



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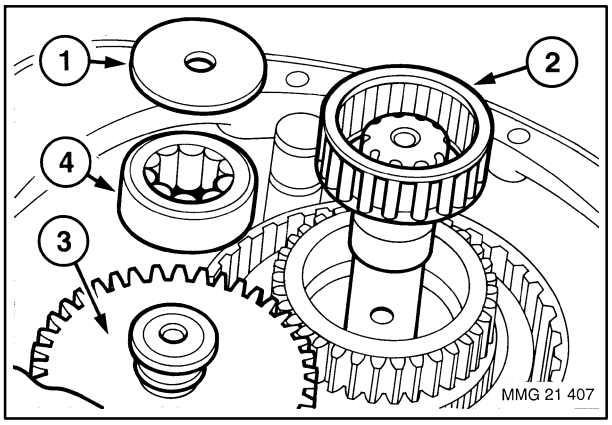
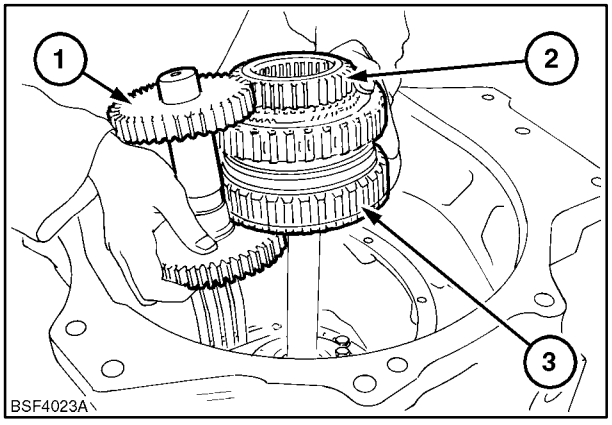
NOTE: *The front roller bearing (4) and the baffle plate (1) may remain in the front cover plate.*

9. Remove the baffle plate (1) and the front roller bearing (4) from the front lower support shaft (3).
10. Remove the needle roller bearing (2).



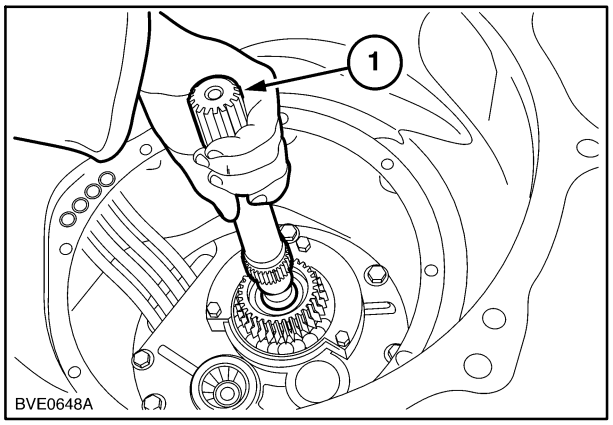
75

11. Remove the C1 / C2 clutch (3), output gear (2) and the front lower support shaft (1).



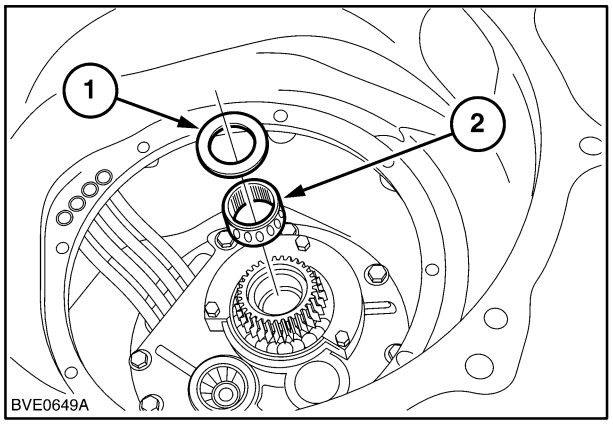
76

12. Remove the PTO / input shaft (1).



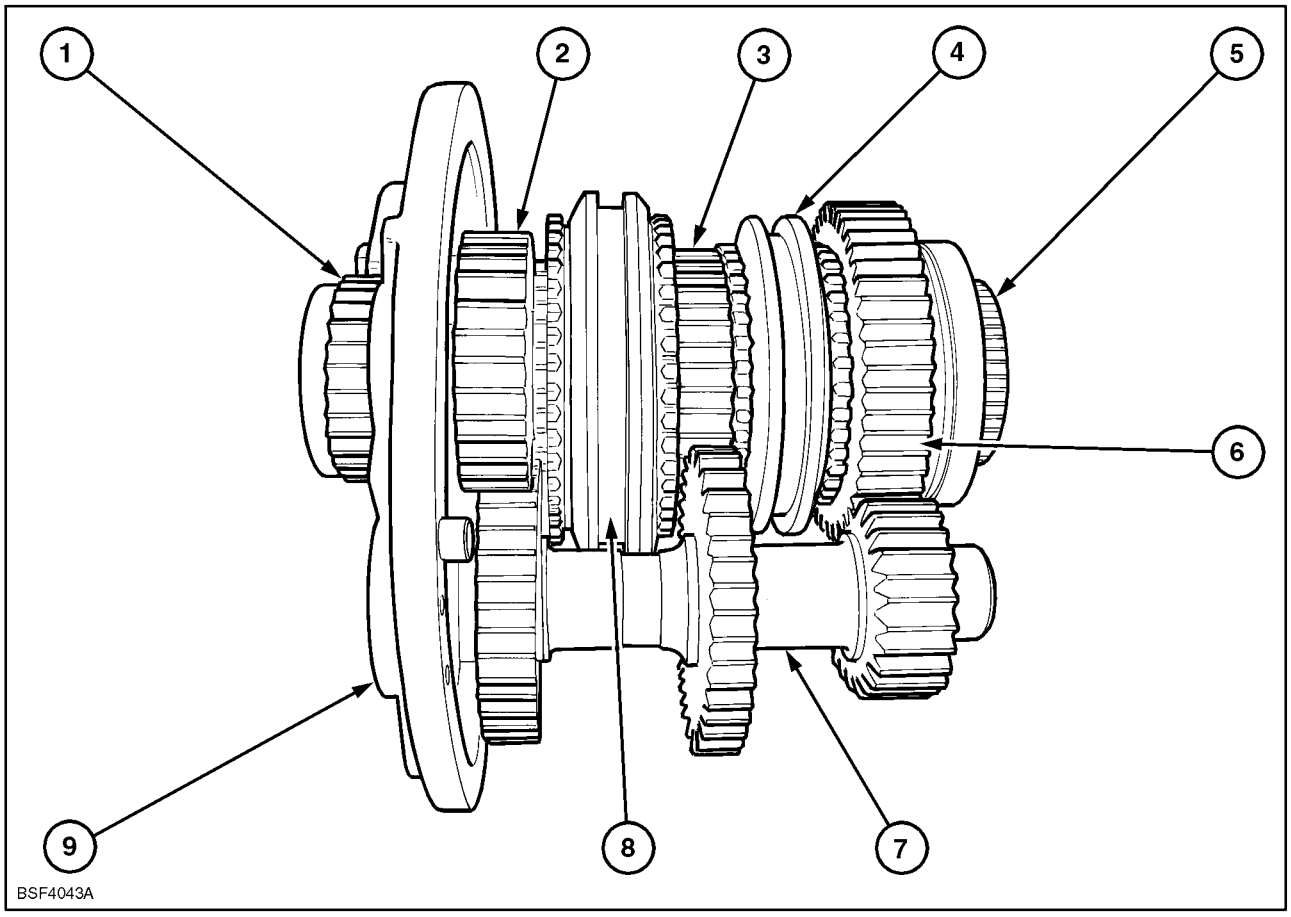
77

13. Remove the steel thrust washer (1) and the PTO input shaft needle roller bearing (2).



78

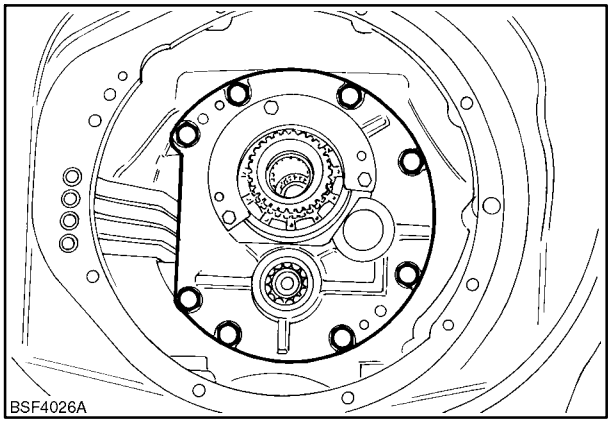
Middle Section Removal



79

1. C2 clutch output gear (37 teeth)
2. Reverse gear (33 teeth)
3. Forward gear (37 teeth)
4. Main range synchronizer (1-4 / 5-8)
5. Main range synchronizer support shaft
6. Main low gear (53 teeth)
7. Lower shaft
8. Forward / reverse synchronizer
9. Inner cover plate

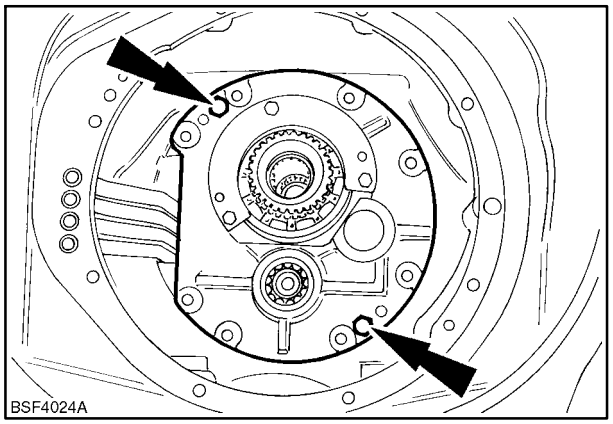
1. Remove the inner cover plate retaining bolts.



80

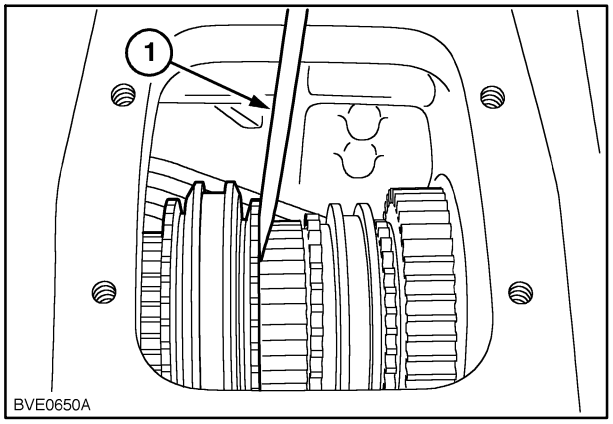
NOTE: *Do not tighten the bolts at this stage.*

2. Install two of the retaining bolts into the separating holes.



81

3. Rotate the transmission to a horizontal position.
4. While tightening the separating bolts previously installed in the separating holes, use a suitable lever (1) to separate the forward / reverse synchronizer from the forward gear.

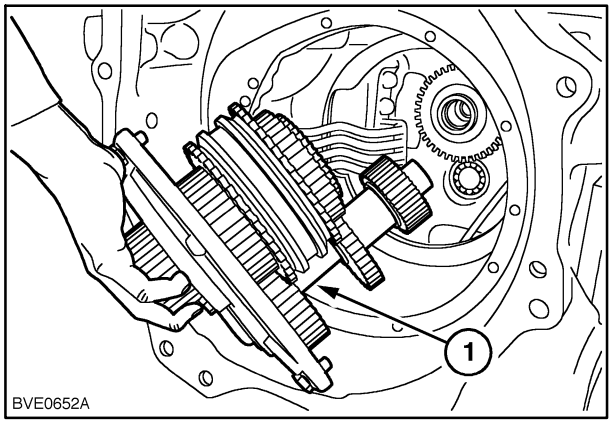


82

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

5. Remove the inner cover assembly (1) from the transmission housing.

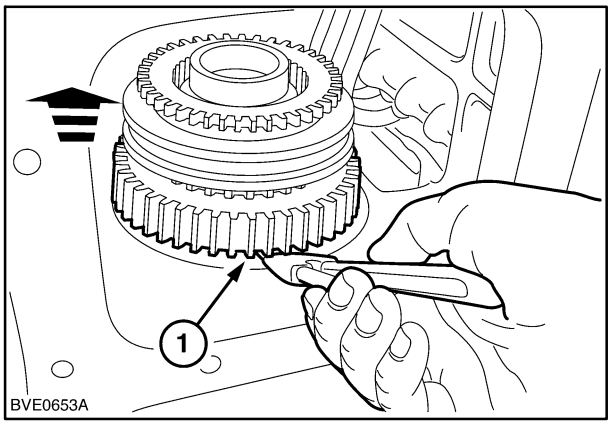


83

6. Rotate the transmission to a vertical position.

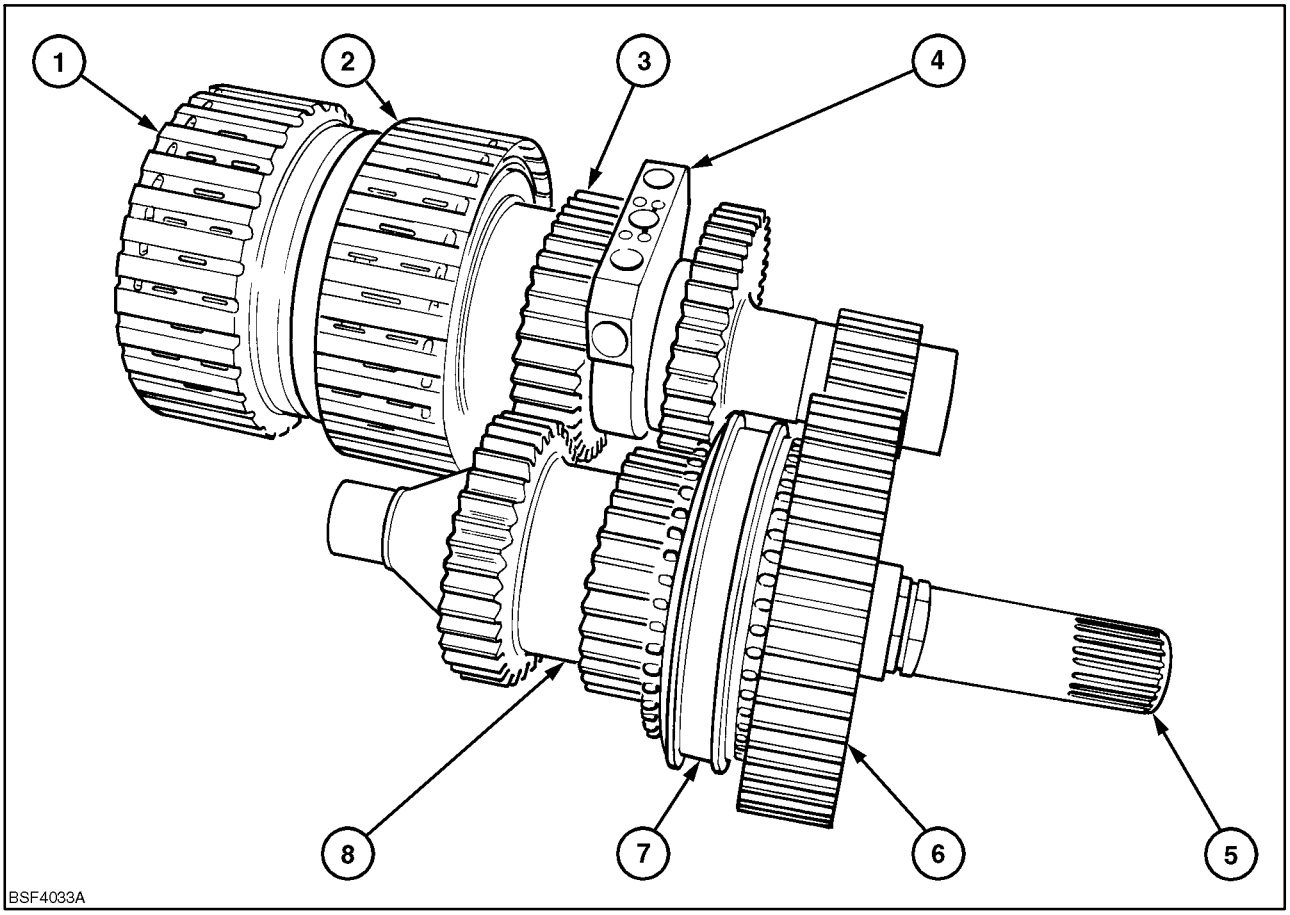
NOTE: *Use a suitable lever to release the main low gear assembly while expanding the snap ring.*

7. Using suitable snap ring pliers, expand the snap ring (1) and remove the synchronizer and main low gear assembly.



84

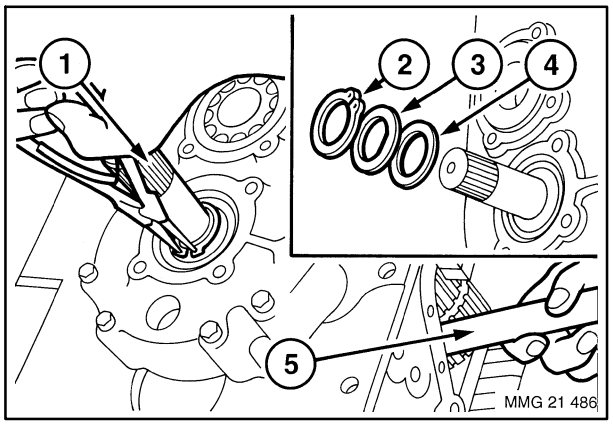
Rear Section Removal



85

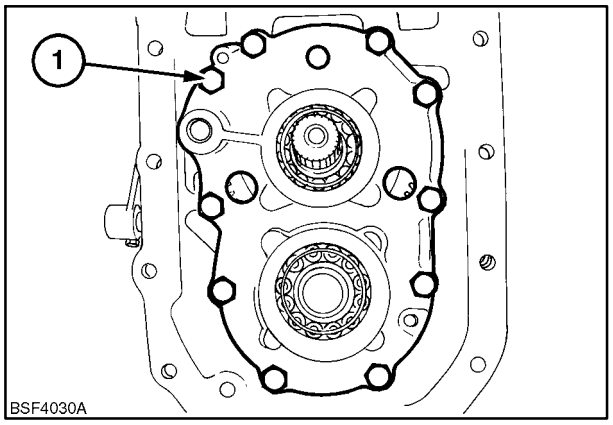
1. Clutch C3
2. Clutch C4
3. Clutch C4 output gear (41 or 37 teeth)
4. Clutch C3 / C4 support assembly
5. Output shaft
6. Low range gear (65 teeth)
7. Hi / Lo synchronizer
8. Cluster gear

1. Rotate the transmission until the rear of the transmission is in a vertical position.
2. Using a suitable lever (5), raise the output shaft assembly (1) to release the tension on the circlip (2).
3. Remove the circlip (2), 'D' shaped washer (3) and the roller bearing thrust washer (4).



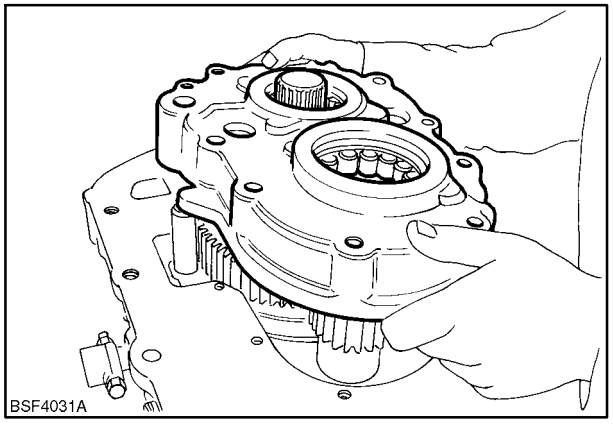
86

4. Remove the rear cover retaining bolts (1).



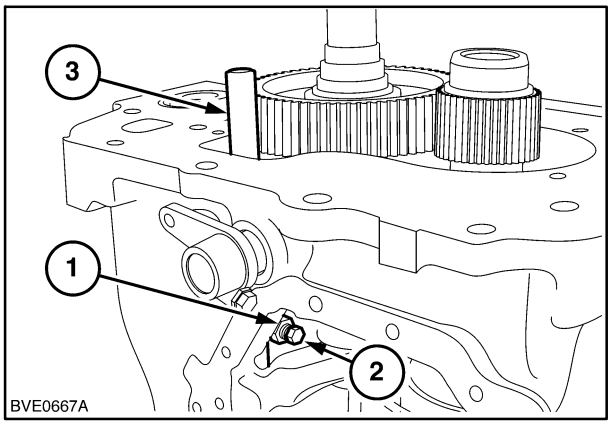
87

5. Remove the rear cover assembly.



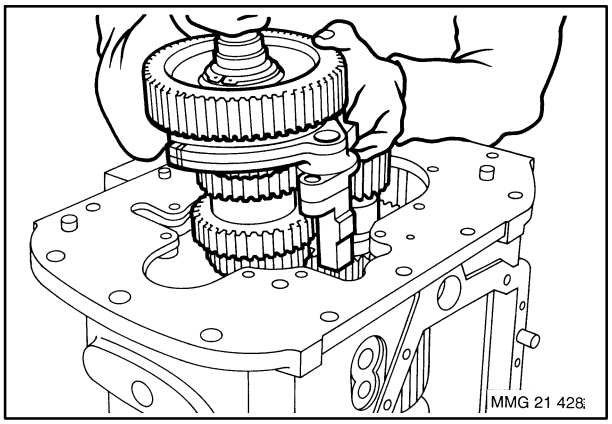
88

6. Loosen the locknut (1) and remove the Hi / Lo selector fork rail locking bolt (2).
7. Remove the Hi / Lo selector fork rail (3).



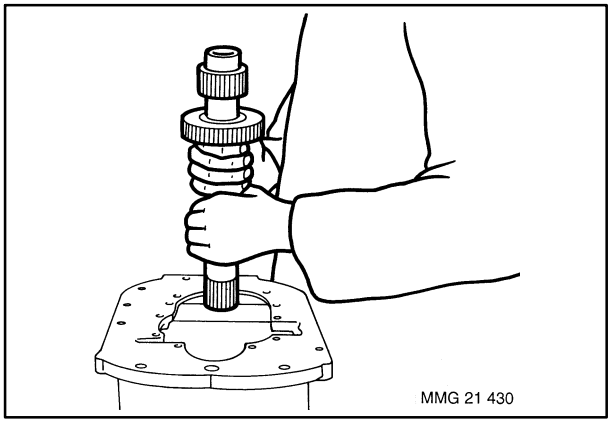
89

8. Remove the output shaft, Hi / Lo synchronizer and shift fork as a complete assembly.



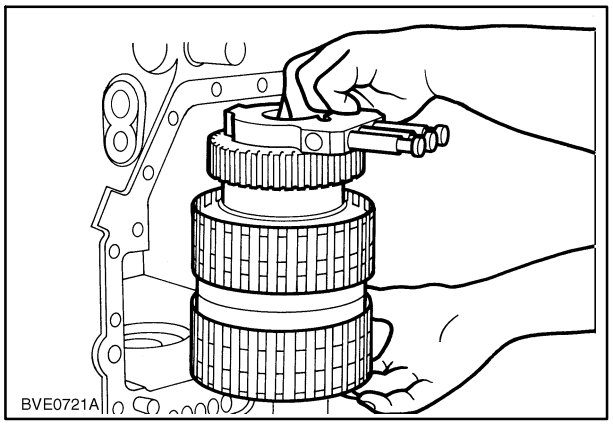
90

9. Remove the C3 clutch output shaft.



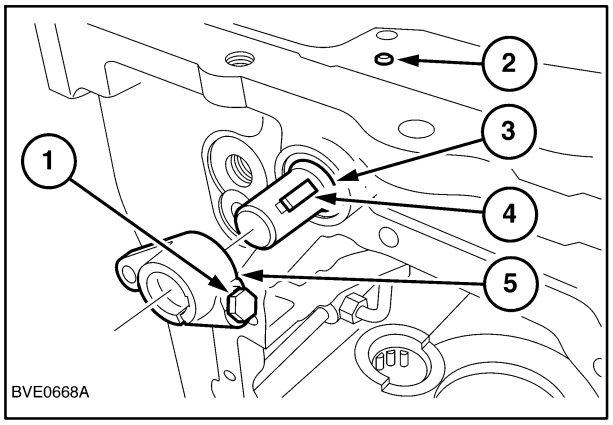
91

10. Remove the C3 / C4 clutch and oil supply manifold assembly.



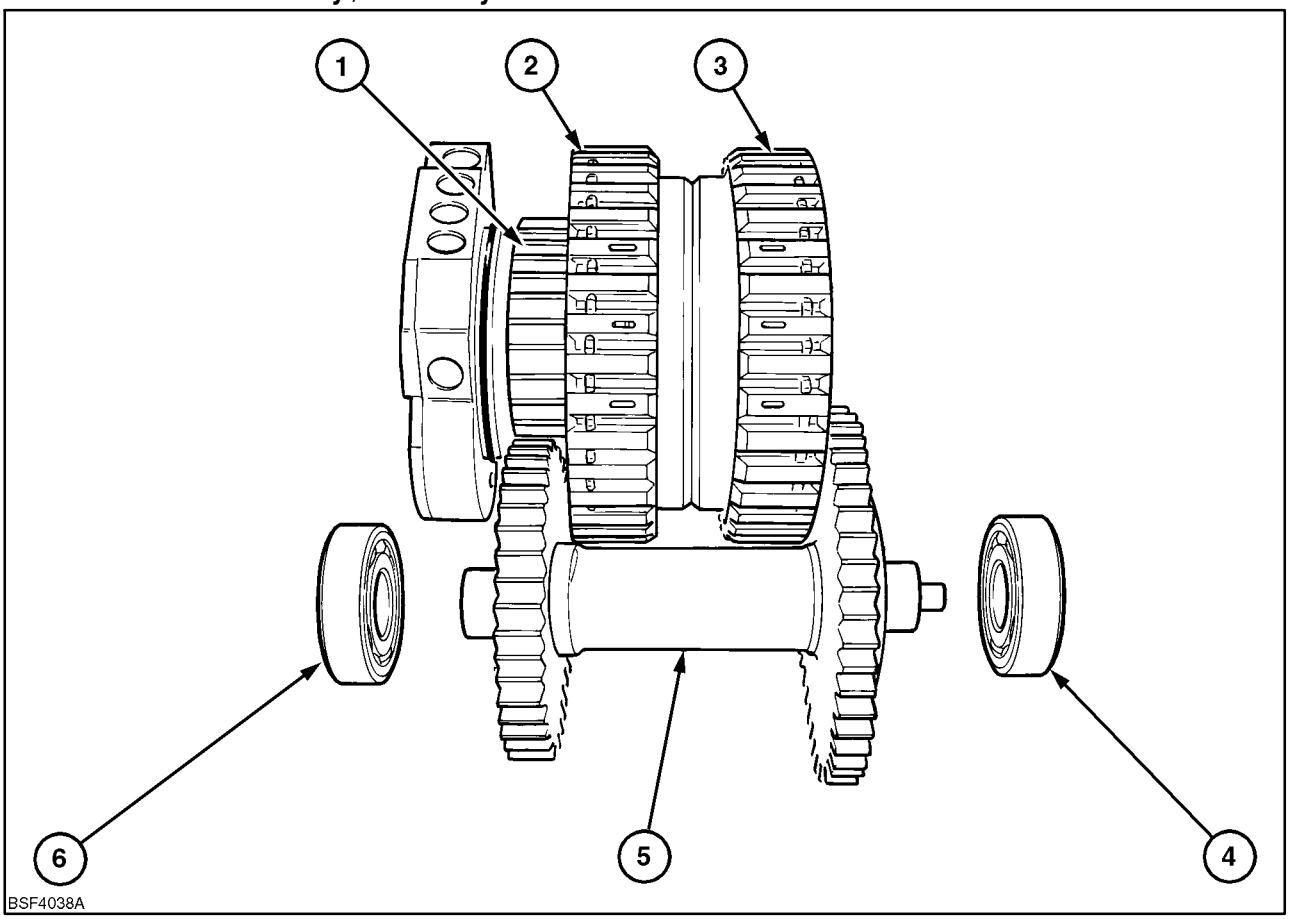
92

11. Loosen the clamping bolt (1) and remove the selector actuator (5).
12. Remove the woodruff key (4), locking pin (2) and remove the shaft (3).
13. Remove and inspect any bearings which may remain in the transmission housing.



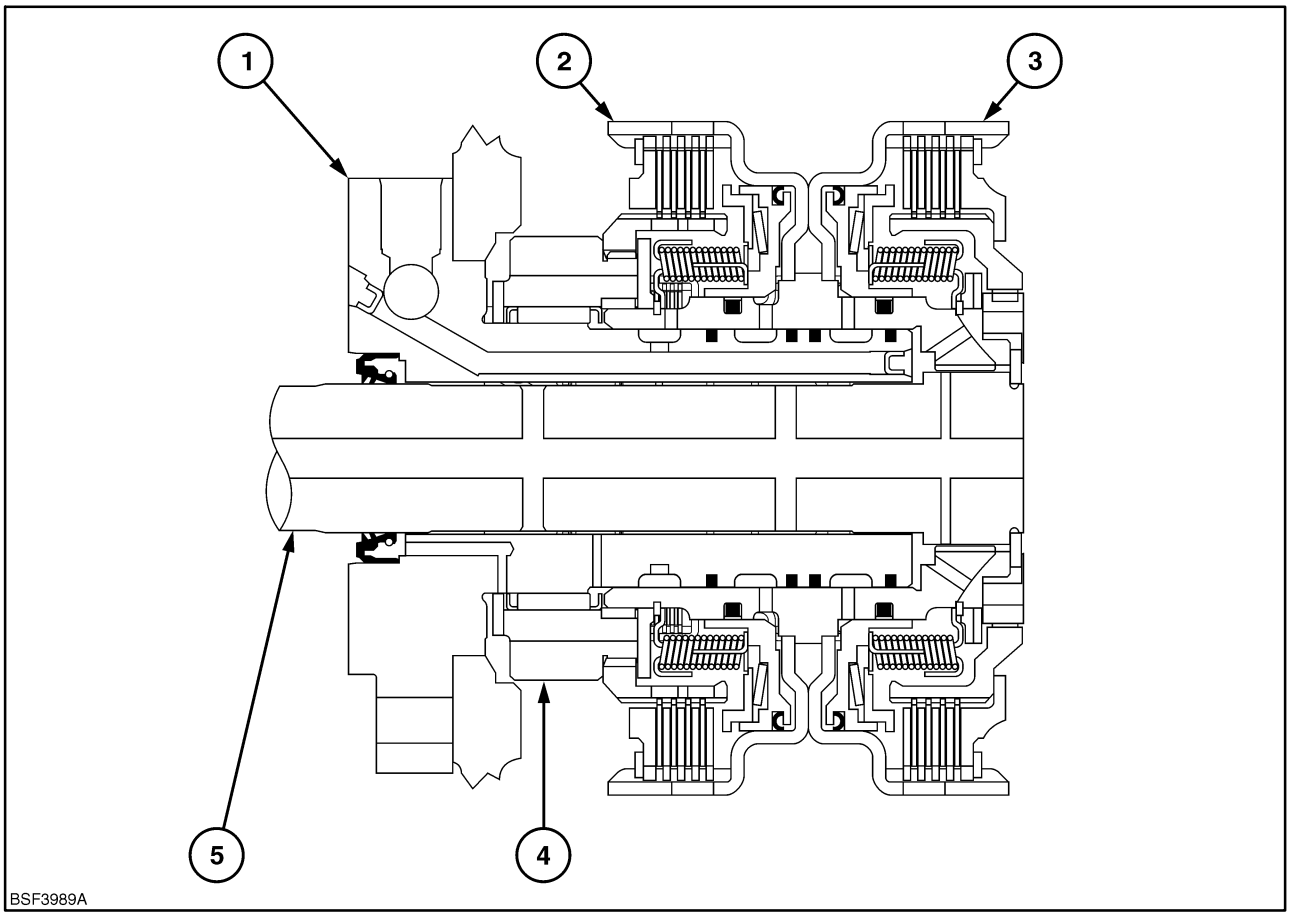
93

Front Section Disassembly / Assembly



94

1. C1 clutch output gear (34 teeth)
2. Clutch C1
3. Clutch C2
4. Lower shaft bearing
5. Lower shaft
6. Lower shaft bearing



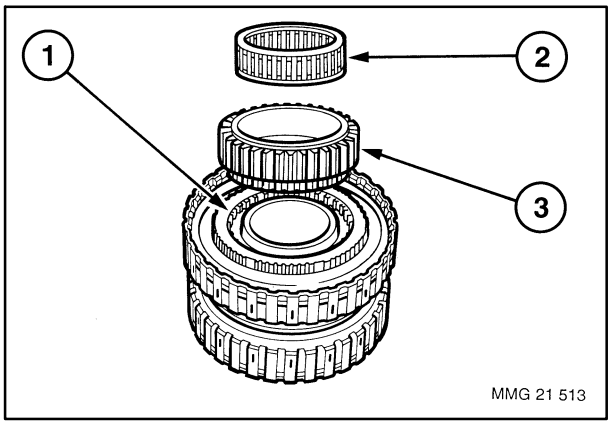
95

Cross Sectional View - Clutch C1 / C2

1. Clutch support
2. Clutch C1
3. Clutch C2
4. C1 clutch output gear (34 teeth)
5. PTO / input shaft

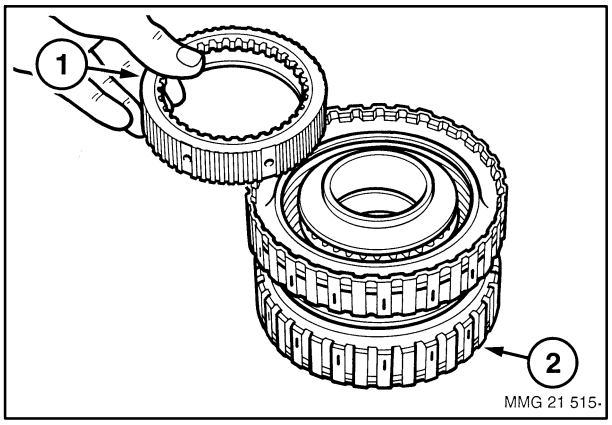
C1 Clutch Disassembly

1. Remove the needle roller bearing (2) and the C1 clutch output gear (3) from the centre of the C1 clutch (1).



96

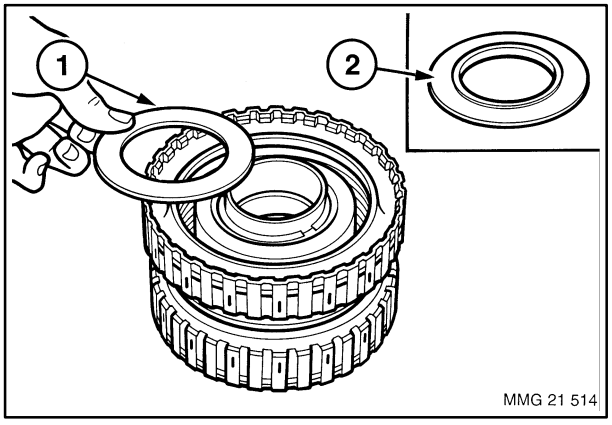
2. Remove the clutch hub (1) from the C1 / C2 clutch housing (2).



97

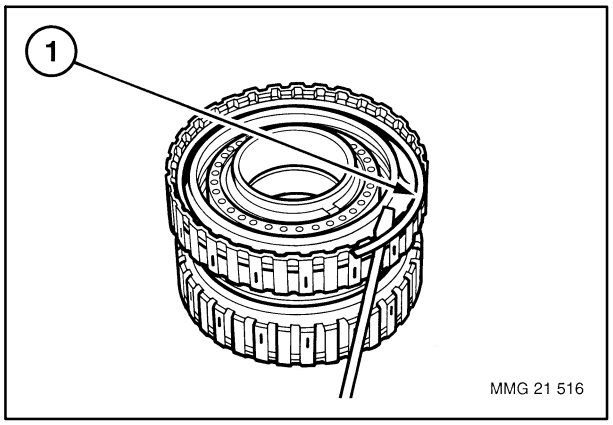
NOTE: *The inner face of the thrust washer is raised (2).*

3. Remove the steel thrust washer (1).



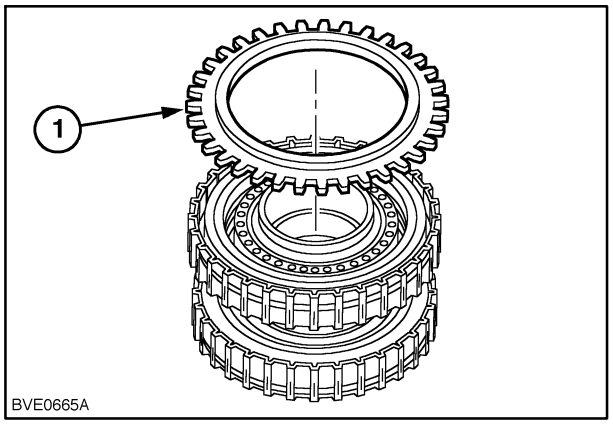
98

4. Using a suitable lever, remove the snap ring (1).



99

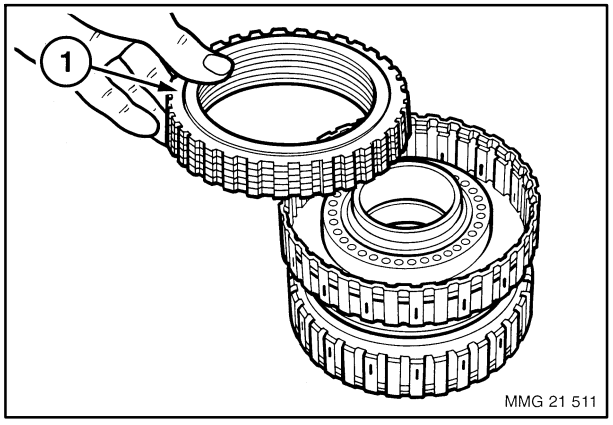
5. Remove the end plate (1).



100

NOTE: *It is not possible to remove the components (1) as a complete assembly.*

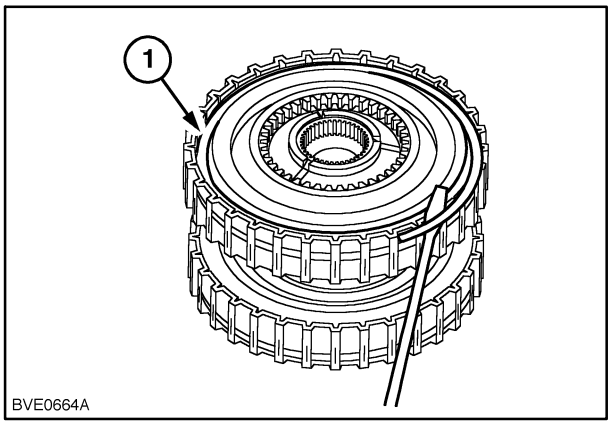
6. Remove the four friction plates, the four separating springs and the four steel plates (1).
7. Inspect the clutch friction and steel plates for excessive wear. The friction plate material should have a clear distinctive pattern. All plates should be flat without warping and there should be no excessive discolouration. Replace parts as necessary.
8. Inspect the clutch separating springs for distortion or discolouration. Compare each spring shape and height with a new spring. Replace parts as necessary.



101

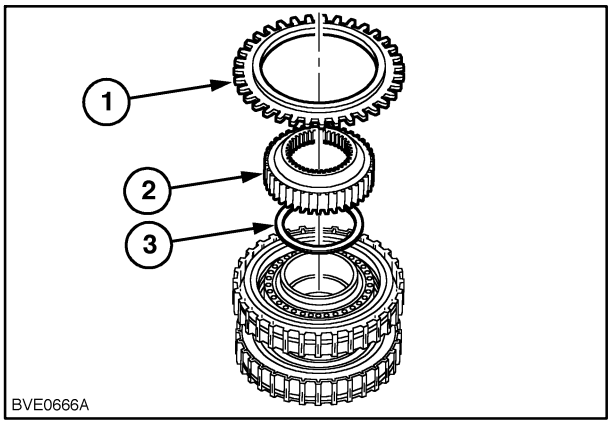
C2 Clutch Disassembly

1. Using a suitable lever, remove the snap ring (1).



102

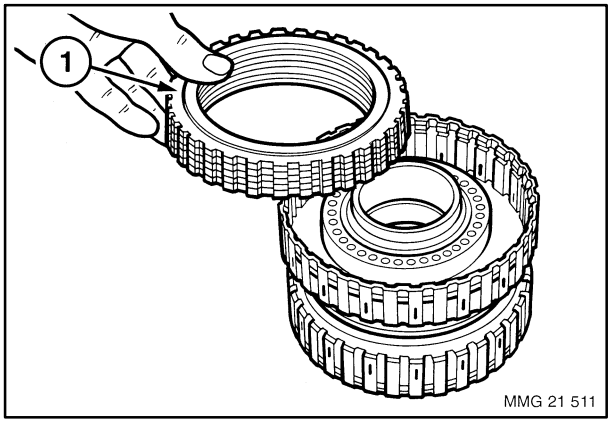
2. Remove the end plate (1), the clutch centre hub (2) and the steel thrust washer (3).



103

NOTE: *It is not possible to remove the components (1) as a complete assembly.*

3. Remove the four friction plates, the four separating springs and the four steel plates (1).
4. Inspect the clutch friction and steel plates for excessive wear. The friction plate material should have a clear distinctive pattern. All plates should be flat without warping and there should be no excessive discolouration. Replace parts as necessary.
5. Inspect the clutch separating springs for distortion or discolouration. Compare each spring shape and height with a new spring. Replace parts as necessary.



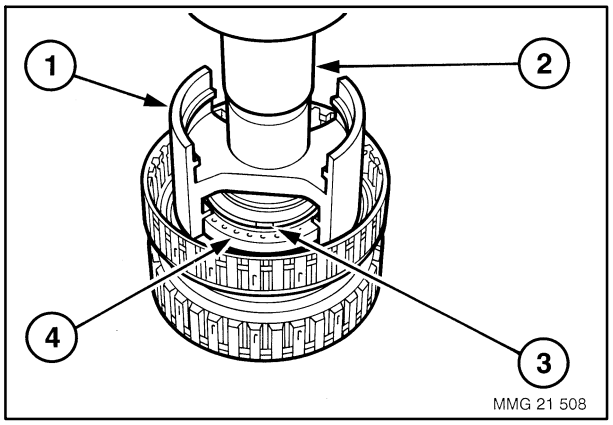
104

C1 / C2 Clutch Housing Disassembly / Assembly

⚠ WARNING ⚠

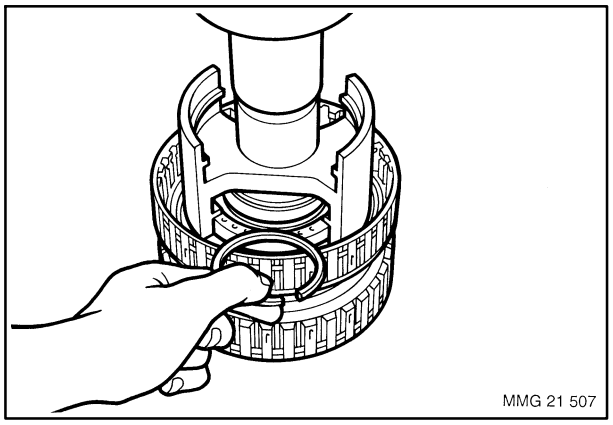
Take care when compressing springs.

1. Using a suitable hydraulic press (2) and the special tool **4FT 508** (1), compress the piston return spring retainer assembly (4) to allow the removal of the snap ring (3).



105

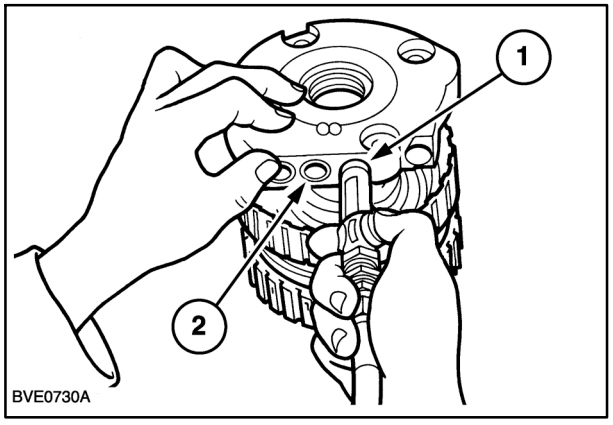
2. Remove the piston return spring retainer snap ring.
3. Release the hydraulic press and remove the piston return spring assembly.
4. Repeat steps 1 to 3 for the C2 clutch housing.



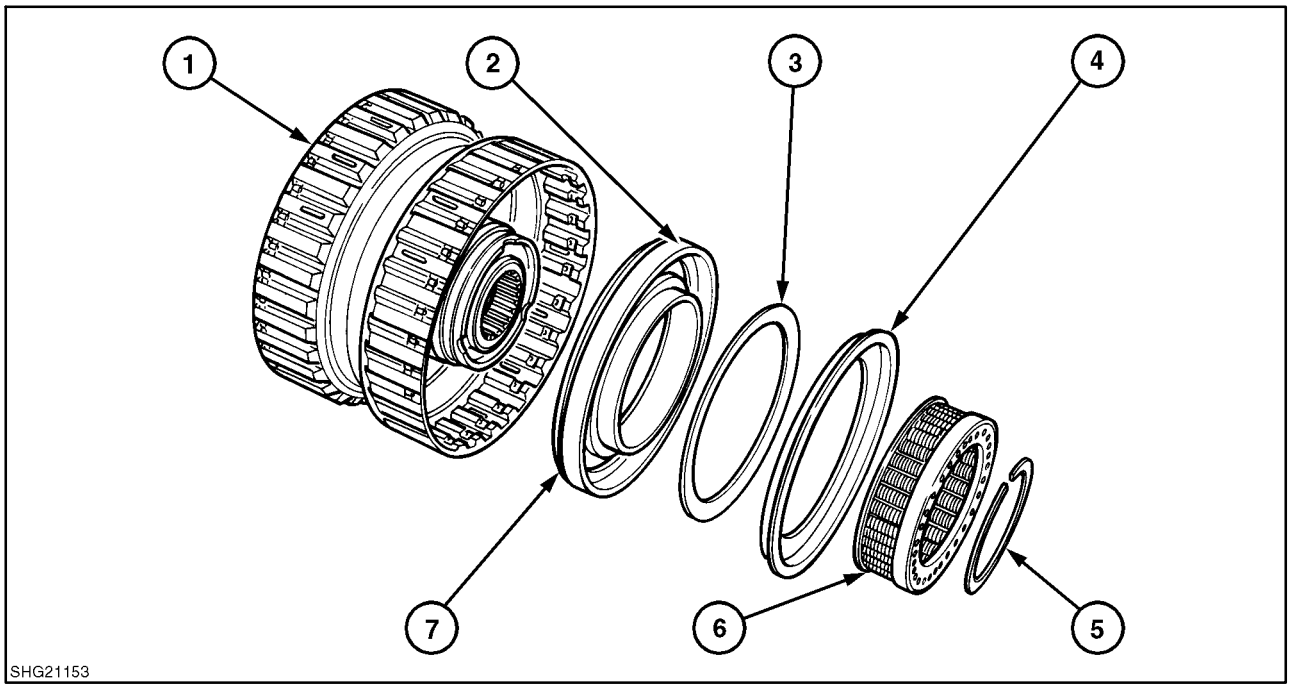
106

NOTE: *Temporarily install the C1 / C2 support manifold (2) to aid the application of compressed air.*

5. Remove the pistons by applying compressed air of not more than 3 bar (50 lbf / in^2) to the C2 clutch piston oil feed port (1) and the C1 clutch piston oil feed port (2).



107



108

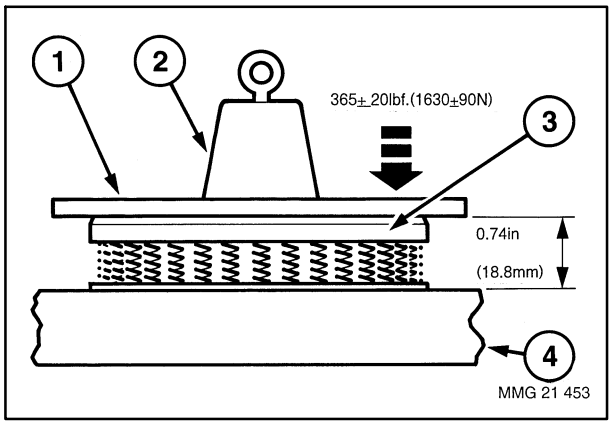
1. Clutch housing
2. Piston
3. Belleville washer
4. Piston adaptor
5. Circlip
6. Return spring assembly
7. Piston oil seal

NOTE: *The belleville washer is concave. Note the position of the washer when removing.*

6. Inspect the piston inner and outer components for scoring or damage. Inspect the piston belleville washer for distortion. Replace parts as necessary.
7. Inspect the clutch housing for scratches, scores, excessive wear and piston scuffing. Replace parts as necessary.
8. Remove the piston outer oil seals from the clutch pistons.
9. Remove the piston inner oil seals and oil seal energisers from the clutch housing.
10. Inspect the clutch driven hubs for wear or damage. Replace parts as necessary.
11. Inspect the front lower shaft gears and gear teeth for damage. Replace parts as necessary.
12. Inspect the clutch engagement spring assemblies for cracked coils or distortion. Replace parts as necessary.

13. Inspect the C1 and C2 clutch spring assembly loaded height as shown, or compare with a new item. Replace the spring assembly as required.

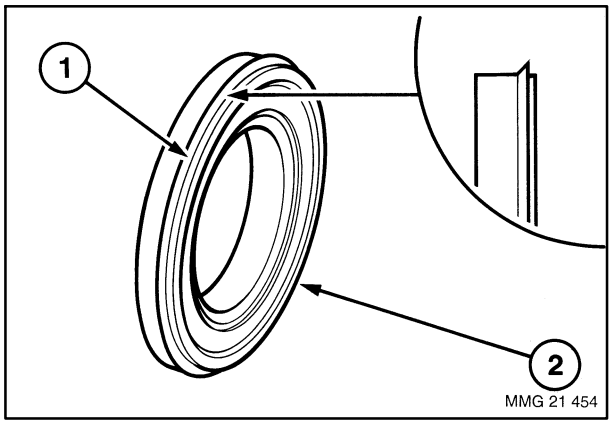
1. Load Spreader (flat disc)
2. Weight (or load)
3. Piston Return Spring Assembly
4. Base Plate



109

NOTE: *Make sure the lip of the oil seal is facing the inner or rear face of the piston (2).*

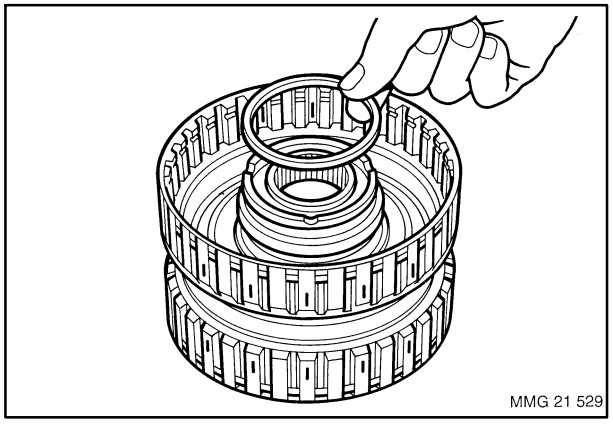
14. Install the C1 clutch piston outer oil seal (1) onto the piston. Repeat this step for the C2 clutch piston.



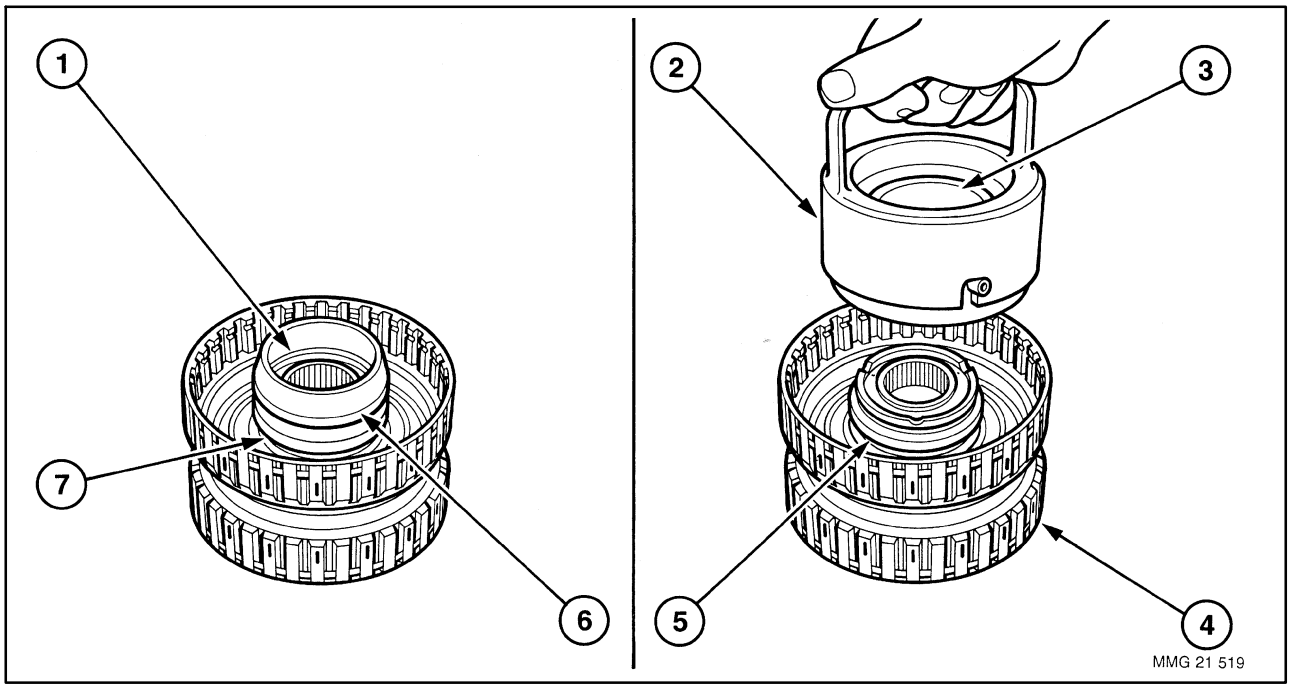
110

NOTE: *Make sure the oil seal is seated correctly and the lip has not 'rolled' in the groove.*

15. Install the C1 clutch piston inner oil seal energiser into the groove on the clutch housing. Repeat this step for the C2 clutch piston inner seal energiser.



111



112

Installation and Re-sizing of the Inner Seals

1. Special tool **4FT 503** (tapered sleeve expander)
2. Special tool **4FT 501** (handle)
3. Special tool **4FT 507** (re-sizer)
4. C1 / C2 clutch housing assembly
5. Seal positioned in groove on top of seal energiser
6. Seal positioned on expander
7. Seal groove with energiser already installed

16. Lubricate the piston inner oil seal and the special tool **4FT 503** (1) with petroleum jelly and position the expander sleeve on the clutch housing centre (4) and the oil seal (6) on the sleeve as shown.

NOTE: *Perform the operation quickly so that the seal is not subjected to the stretching action for too long.*

17. Push the piston inner oil seal up the taper, dropping the oil seal on top of the seal energiser, already in position on the clutch housing (5).

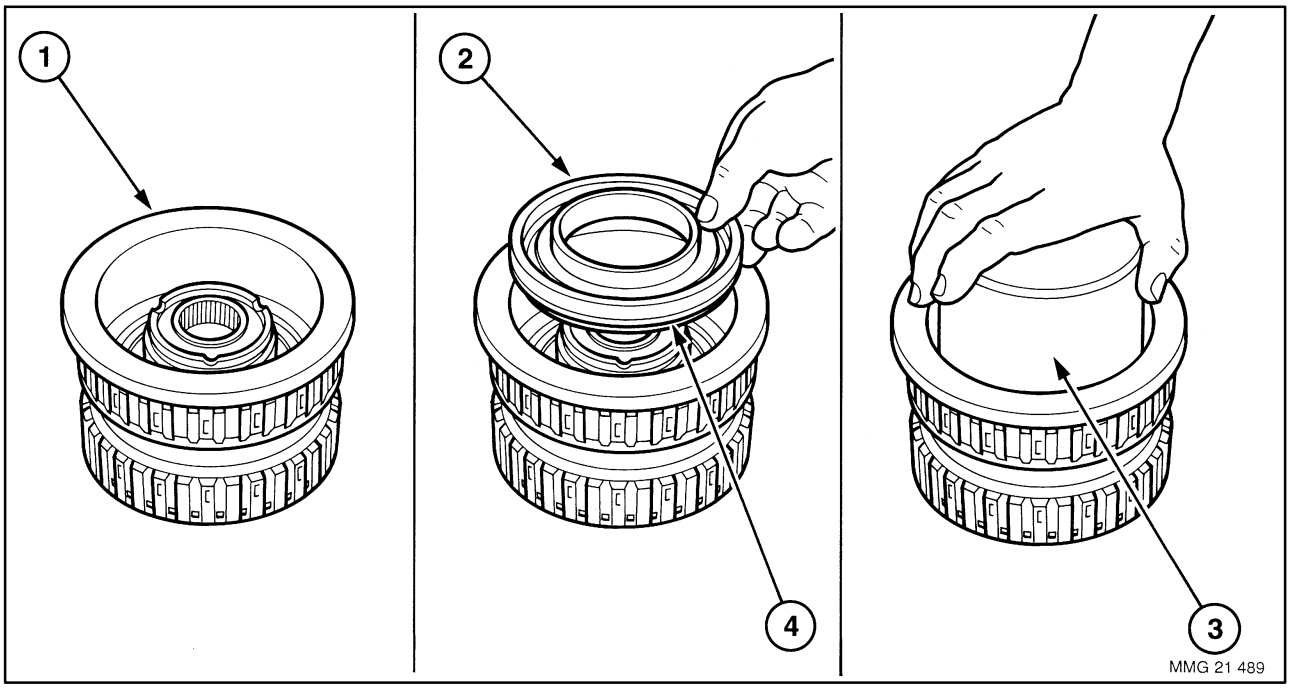
18. Place the clutch housing with the inner oil seal installed into a suitable cooling device for approximately 30 minutes.

IMPORTANT: *As the tool is positioned over the oil seal, ensure that the tool slides smoothly and squarely over the oil seal. When the process is completed, inspect the oil seal to ensure that no damage has occurred.*

19. Ensure the oil seal is lubricated. Assemble the re-sizer special tool **4FT 507** (3) onto the handle of special tool **4FT 501** (2), so that the smaller diameter is at the opening. Lubricate the re-sizer with petroleum jelly and using the handle, firmly push the re-sizer over the oil seal to compress and re-size the oil seal.

20. Place the clutch housing with the special tool still in position into a suitable cooling device for approximately 30 minutes.

21. Repeat the installation and re-sizing process of the second clutch piston inner seal.



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Installation of the Pistons into the C1 / C2 Clutch Housing

1. Piston guide sleeve special tool **4FT 506**
2. Piston
3. Piston pusher special tool **4FT 504**
4. Piston outer seal

22. Lubricate the C1 piston inner oil seal inside the clutch housing with petroleum jelly and check that the oil seal is resized.

23. Position the piston guide sleeve special tool **4FT 506** (1), on top of the C1 clutch housing and lubricate the inside of the special tool with petroleum jelly.

IMPORTANT: *Do not use more than hand pressure to install the piston, or damage to the seal(s) may occur.*

24. Position the piston (2), in the guide sleeve and using the piston pusher special tool **4FT 504** (3), evenly and firmly, push the piston into the housing.

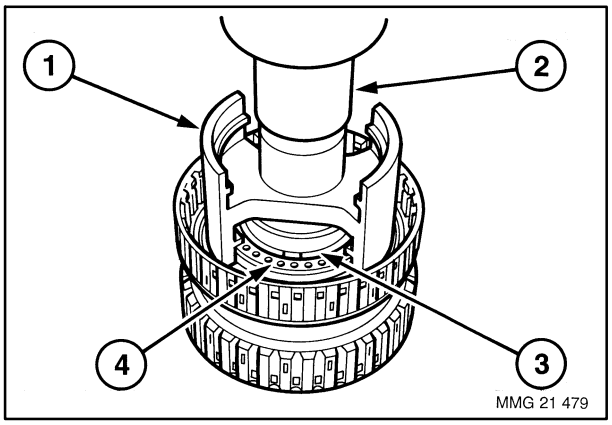
25. Remove the special tools **4FT 504** (3) and **4FT 506** (1).

26. Position the piston belleville washer on top of the main piston making sure the outer edge of the belleville is facing upwards and that the inner diameter is resting on the piston. Install the outer part of the piston, refer to Figure 108.

27. Repeat the piston installation process on the second clutch piston.

28. Assemble the clutch return spring assembly (4), onto the clutch housing and using a suitable hydraulic press (2), and spring compressor special tool **4FT 508** (1), compress the spring assembly and install the snap ring (3). Release the hydraulic press and remove the special tool.

29. Repeat the above procedure for the second clutch.

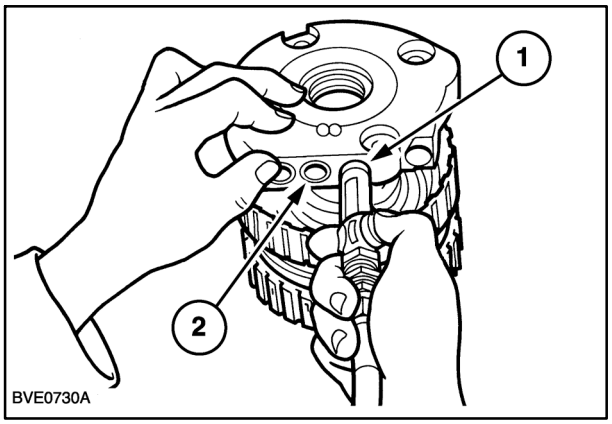


114

NOTE: *Temporarily install the C1 / C2 support manifold (2) to aid the application of compressed air.*

NOTE: *Coat the pistons with transmission oil to indicate any leakage.*

30. Check the piston oil seals by applying compressed air of not more than 3 bar (50 lbf / in^2) to the C2 clutch piston oil feed port (1) and the C1 clutch piston oil feed port (2). Make sure the pistons have no signs of leakage.

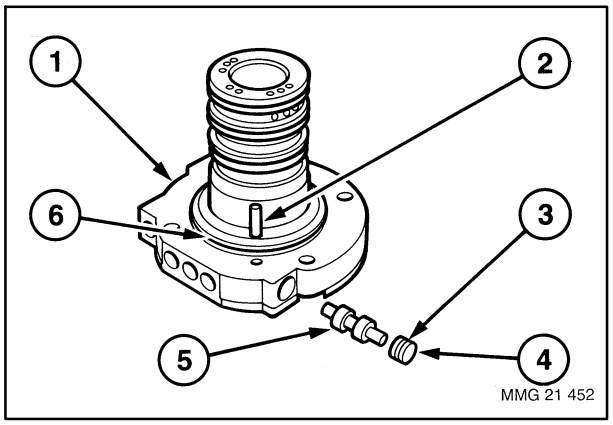


115

C1 / C2 Clutch Support Manifold Inspection and Assembly

NOTE: *The C1 / C2 clutch assembly support shaft (1) contains the lubrication proportional selector valve (5).*

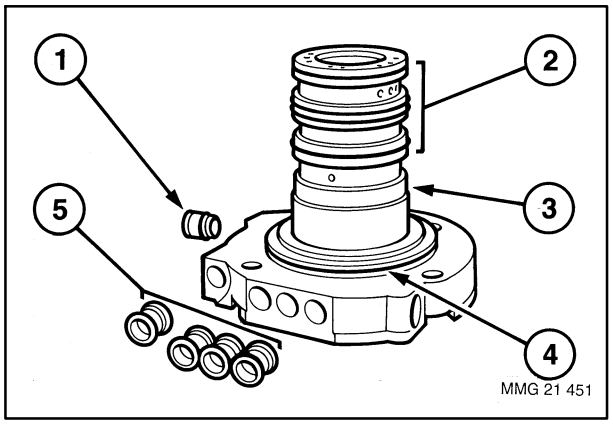
1. Remove the valve spring retaining pin (2), valve retaining plug (4) and the proportional selector valve (5).
2. Inspect the components for wear or damage, thoroughly clean and re-assemble using a new quad seal (3) and 'O' ring (6).



116

3. The support shaft also contains rubber adaptors (1) and (5), these adaptors join the C1 / C2 clutch oil transfer tubes and the front lower shaft lubrication oil supply tube.

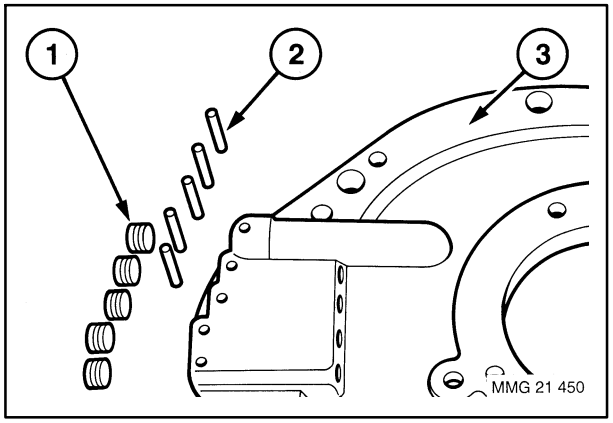
1. Rubber Adaptor x 1 (small)
2. Annular Seals
3. Support Shaft
4. 'O' Ring Seal
5. Rubber Adaptors x 4 (large)



117

4. The front cover (3), contains similar rubber adaptors and plugs to the C1 / C2 clutch oil transfer tubes and the front lower shaft lubrication oil supply tube. These can be removed and new items installed by removing the plug retaining pins (2) and plugs (1). Install new quad seals as necessary.

5. Inspect all bearings for wear and damage, if necessary remove the bearings from the front lower shaft and install new components as necessary.



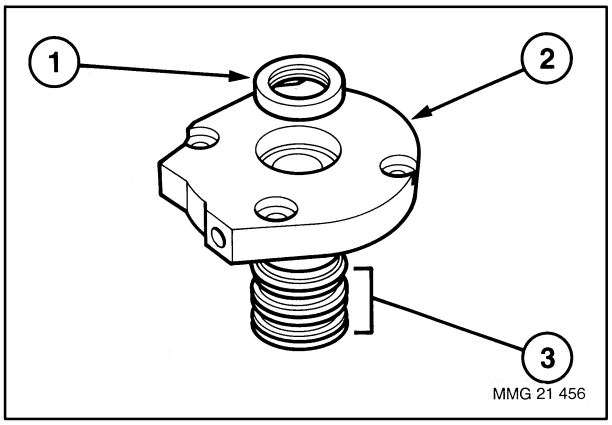
118

C1 / C2 Clutch Support Manifold Inspection and Assembly

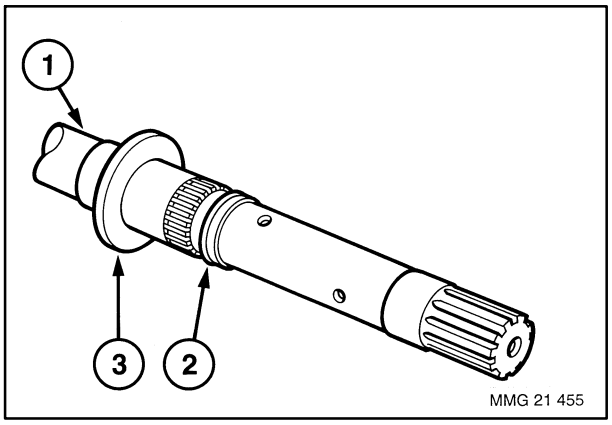
1. Remove the PTO input shaft oil seal (1) from the C1 / C2 clutch support manifold (2).
2. Install a new oil seal by gently pressing it into the centre of the support shaft (ensure the oil seal lip is facing inwards towards the transmission).
3. Remove and discard the four annular groove sealing rings (3) and inspect the shaft for wear and damage. Replace parts as necessary.
4. Install new annular groove sealing rings (3) to the support manifold. Ensure the annular groove sealing ring ends are correctly positioned.
5. Inspect the PTO input shaft (1) for damage, evidence of binding, pick-up etc. Replace parts as necessary.
6. Inspect the splined areas for damage. Replace parts as necessary.
7. Make sure all of the oil galleries are thoroughly clean.

NOTE: *It is important the lubrication oil seal (2) is held down in its groove during re-assembly. If the oil seal is damaged, lubrication oil will not be correctly distributed.*

8. Renew the lubrication oil seal (2).
9. Inspect the steel washer (3), snap rings and their grooves for distortion and damage. Replace parts as necessary.

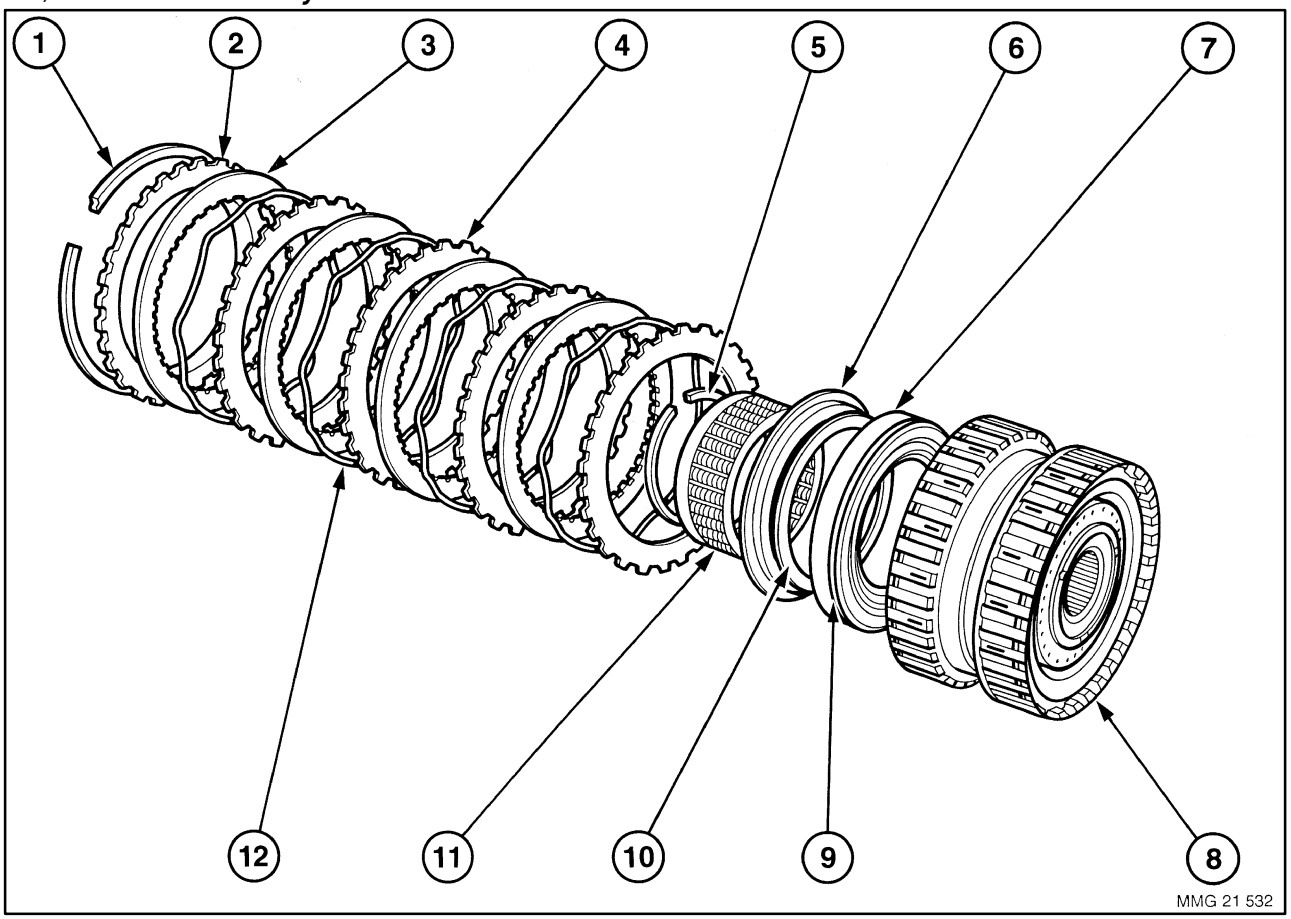


119



120

C1 / C2 Clutch Assembly



121

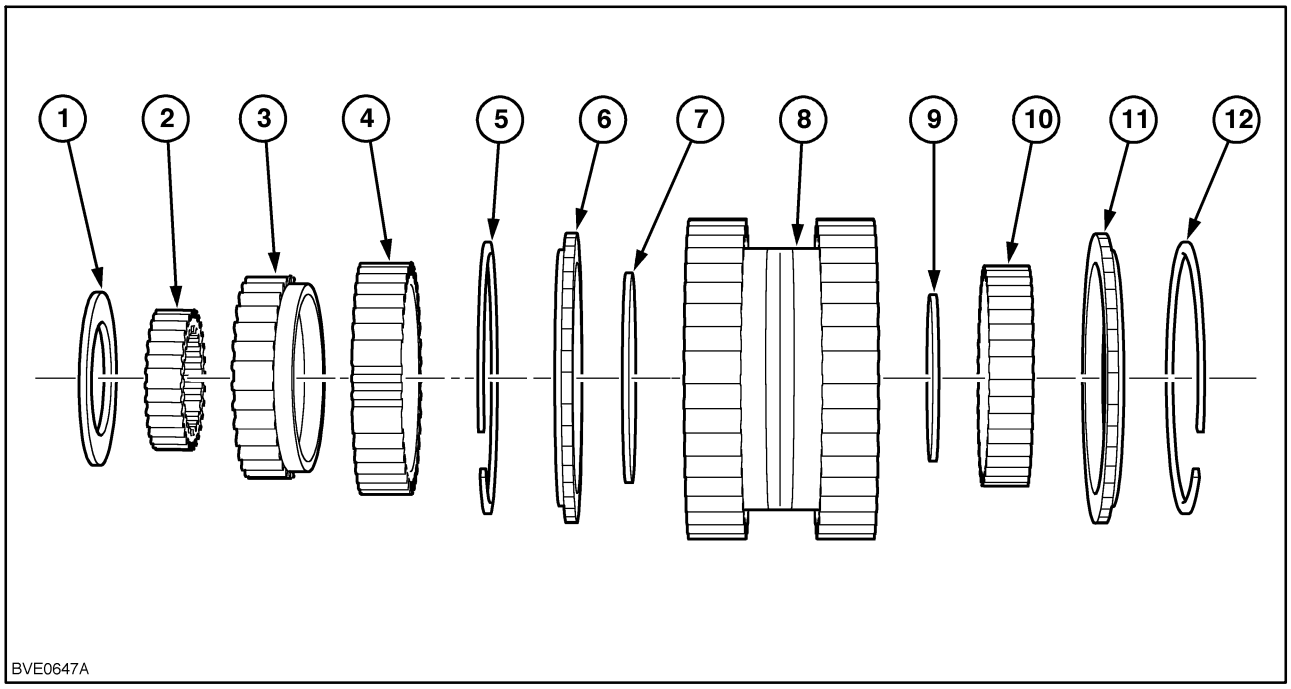
1. Snap ring
2. End plate
3. Friction plate x 4
4. Steel plate x 4
5. Snap ring
6. Outer piston half
7. Inner piston half
8. C1 / C2 clutch housing
9. Piston outer seal
10. Belleville washer
11. Piston return spring assembly
12. Separating spring x 4

NOTE: *Make sure the openings on the separator springs are all aligned.*

1. Install the steel plates (4), friction plates (3) and the separating springs (12).

NOTE: *Make sure the last separating spring does not become hooked in the snap ring groove.*

2. Install the end plate (2).
3. Apply a small amount of pressure to the end plate and install the retaining snap ring (1).
4. Repeat the above procedure for the second clutch.



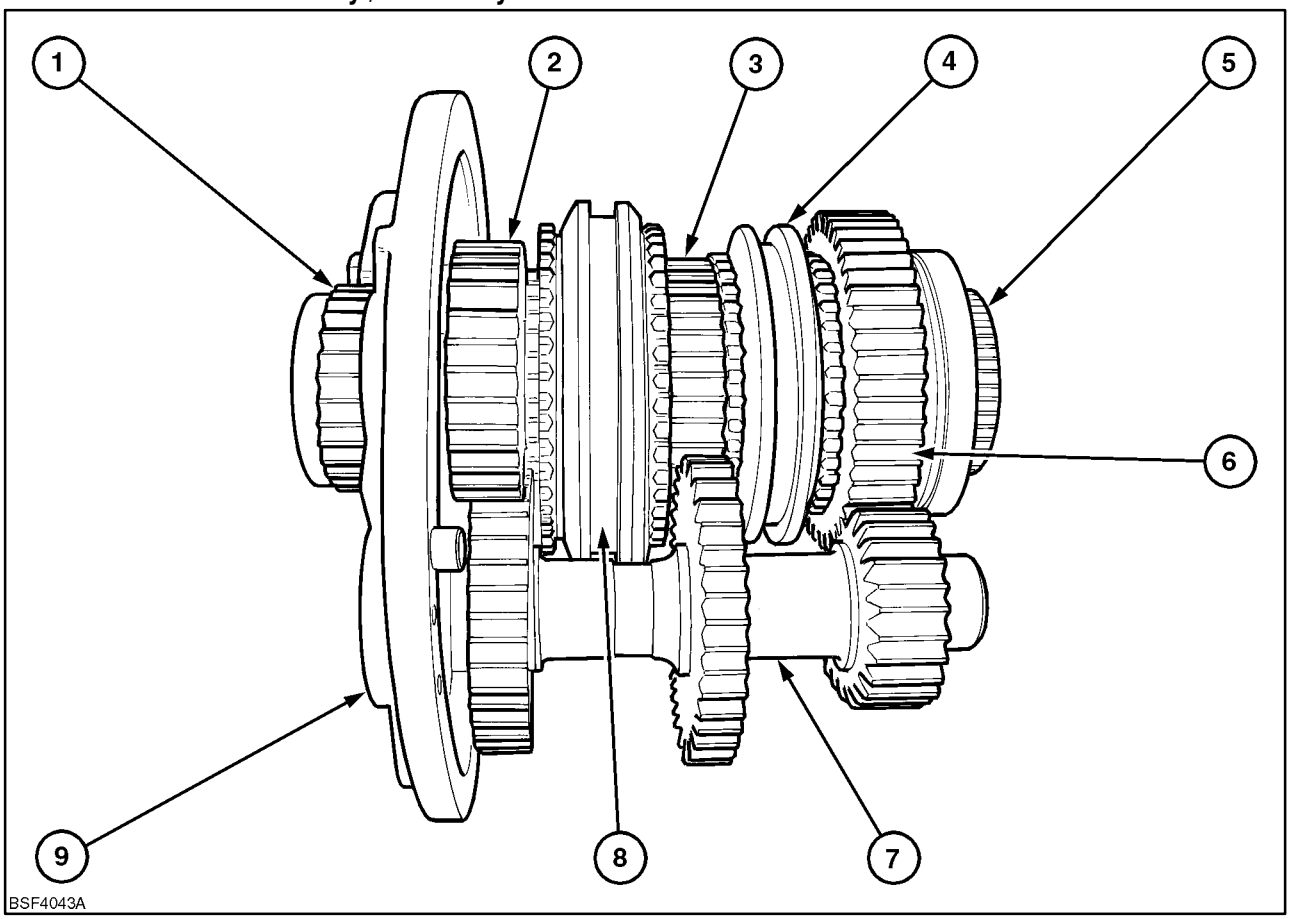
122

C1 / C2 Clutch Hubs and Gears - Exploded View

1. Thrust washer
2. Needle roller bearing
3. C1 clutch output gear
4. C1 clutch hub
5. Circlip
6. C1 end plate
7. Steel washer (note: step on inner face)
8. C1 / C2 clutch housing
9. Steel washer (note: step on inner face)
10. C2 clutch hub
11. C2 end plate
12. Circlip

5. Install the C2 clutch hub (10) into the C2 clutch housing (8).
6. Install the steel washer (9) (ensure the step on the inner face is against the piston return spring assembly of the C1 clutch).
7. Install the C1 clutch hub (4) into the C1 clutch housing.

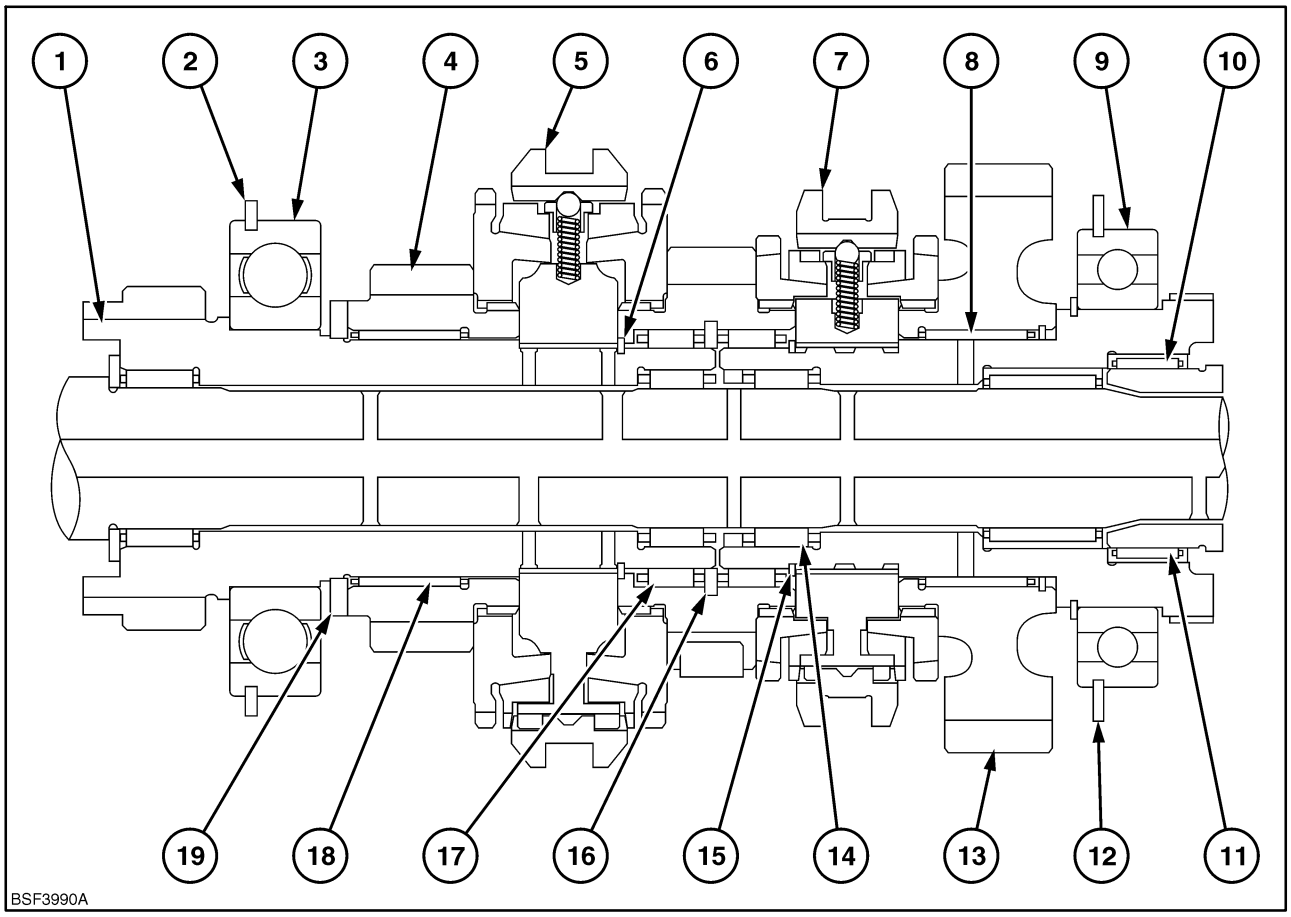
Middle Section Disassembly / Assembly



123

Drive Line Components

1. C2 clutch output gear
2. Reverse gear (33 teeth)
3. Forward gear (37 teeth)
4. Main range synchronizer (1-4 / 5-8)
5. Main range synchronizer support shaft
6. Main low gear (53 teeth)
7. Lower shaft
8. Forward / reverse synchronizer
9. Inner cover plate



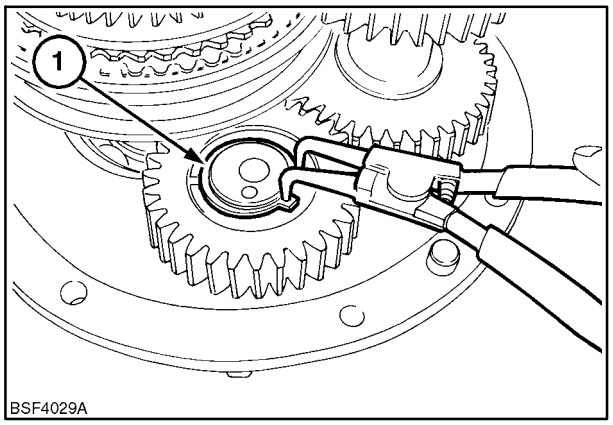
124

Cross Sectional View

1. Support shaft
2. Snap ring
3. Roller bearing
4. Reverse gear (33 teeth)
5. Forward / reverse synchronizer
6. Forward / reverse synchronizer retaining circlp
7. Main range synchronizer (1-4 / 5-8)
8. Needle roller bearing
9. Roller bearing
10. Needle roller bearing
11. Needle roller bearing
12. Snap ring
13. Low main gear (53 teeth)
14. Needle roller bearing
15. Main range synchronizer (1-4 / 5-8) retaining circlip
16. Thrust washer
17. Needle roller bearing
18. Needle roller bearing
19. Thrust washer

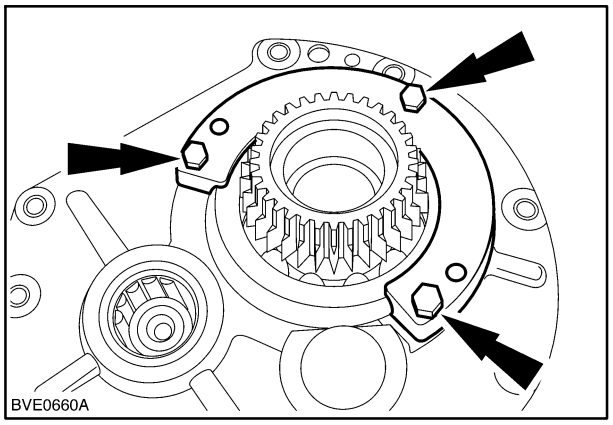
Middle Section Disassembly

1. Using suitable circlip pliers, remove the reverse idler gear circlip (1).



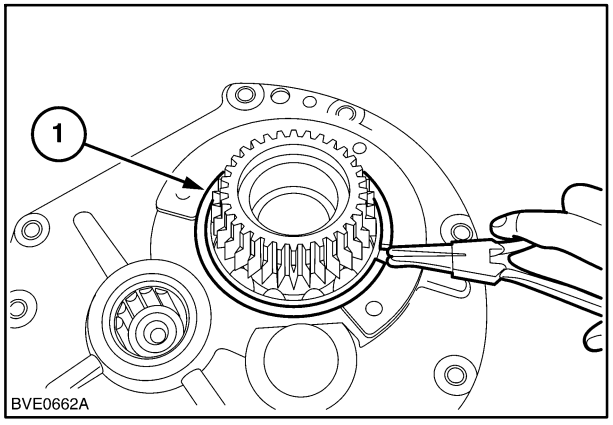
125

2. Remove the front bearing retaining plate.



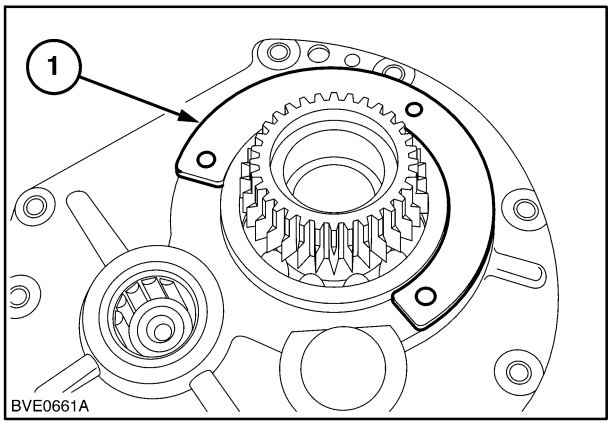
126

3. Using suitable snap ring pliers, remove the front bearing retaining snap ring (1).



127

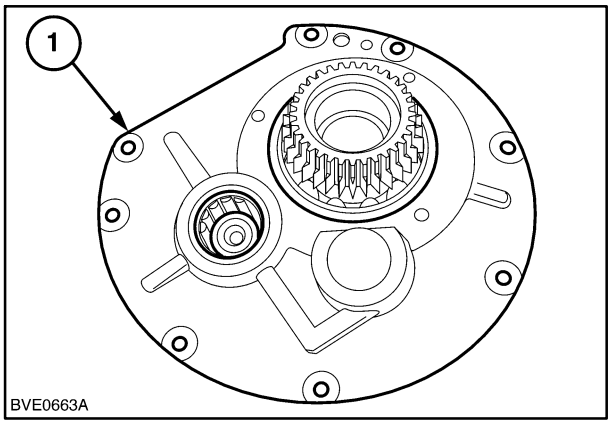
4. Remove the forward / reverse synchronizer end float adjustment shims (1).



128

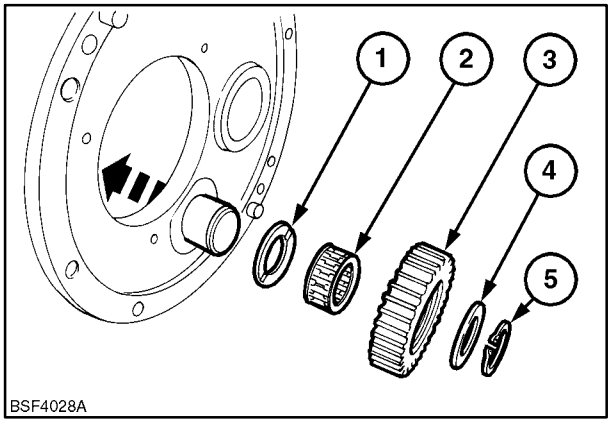
NOTE: *Support the lower shaft, synchronizer assembly and the reverse idler gear.*

5. Remove the inner cover plate (1).



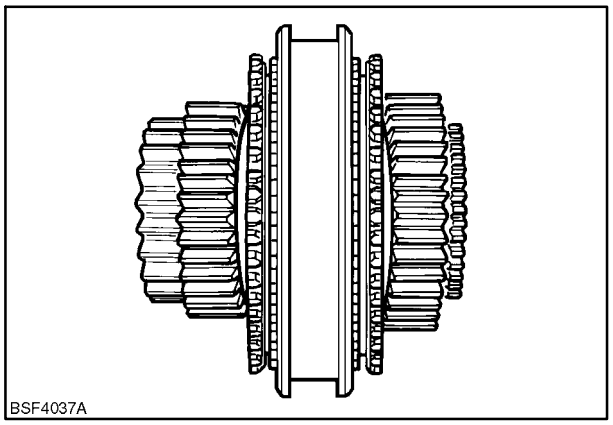
129

6. Remove the steel thrust washer (4), reverse idler gear (3), needle roller bearing (2) and the steel thrust washer (1).
7. Remove the support shaft if necessary.



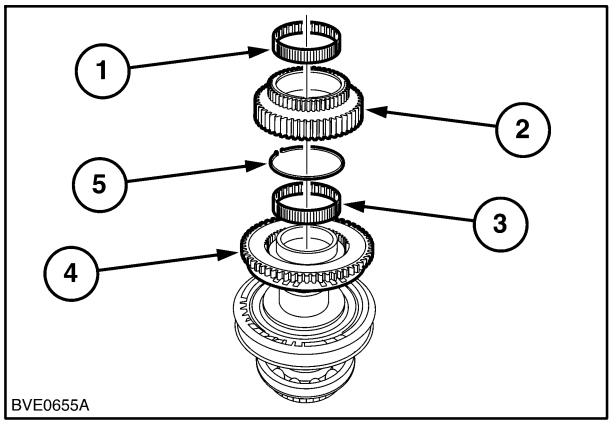
130

Forward / Reverse Synchronizer and Related Parts Disassembly



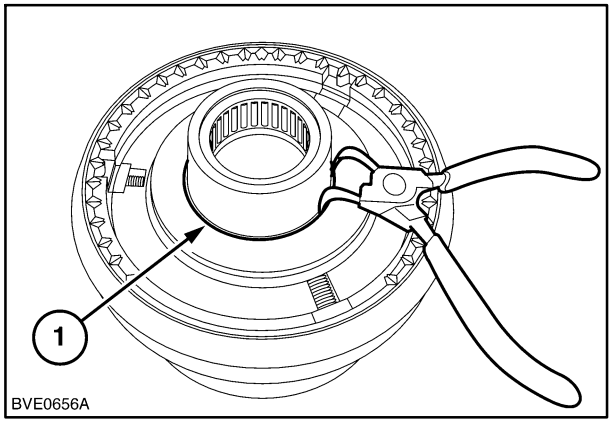
131

1. Remove the needle roller bearing (1), forward gear (2), circlip (5), needle roller bearing (3) and the synchronizer gears (4).



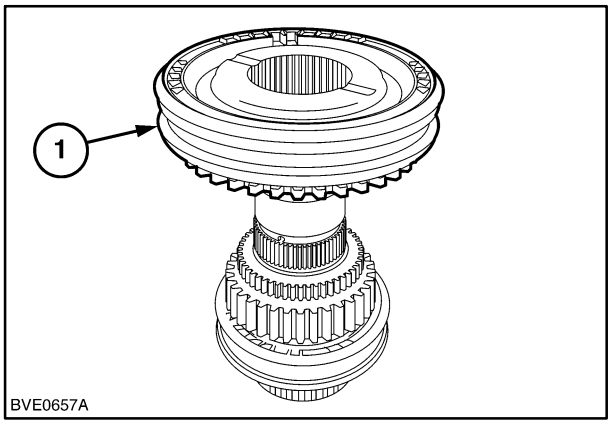
132

2. Using suitable circlip pliers, remove the forward / reverse synchronizer retaining circlip (1).



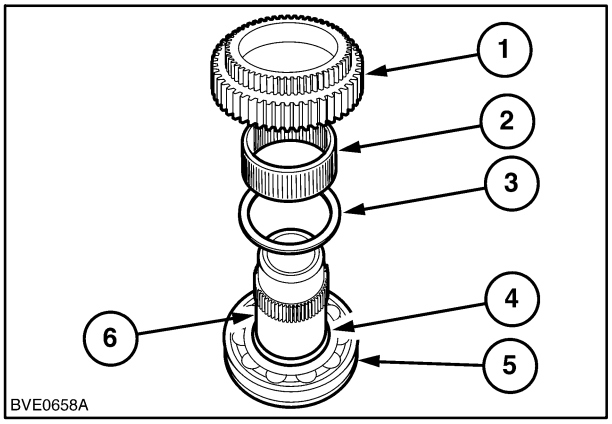
133

3. Remove the forward / reverse synchronizer (1).

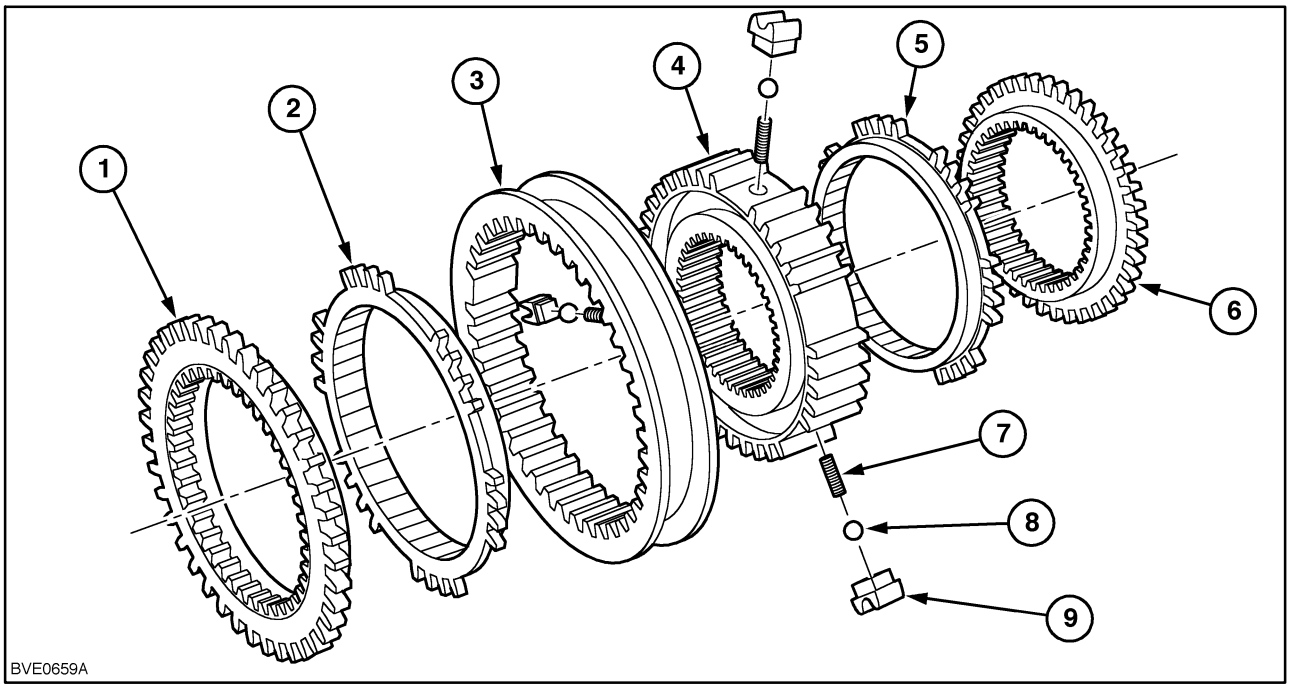


134

4. Remove the reverse gear (1), needle roller bearing (2), 'D' shaped washer (3) and the circlip (4).
5. Using a suitable hydraulic press, remove the roller bearing (5) from the forward / reverse synchronizer support shaft (6).



135



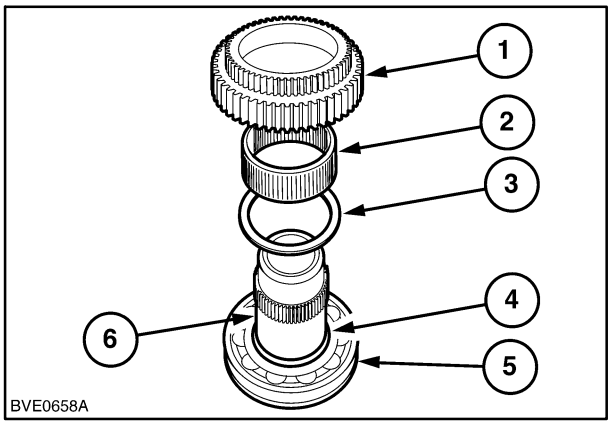
136

Forward / Reverse synchronizer Exploded View

1. Outer cone / coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone / coupling
7. Spring
8. Detent ball
9. Detent guide

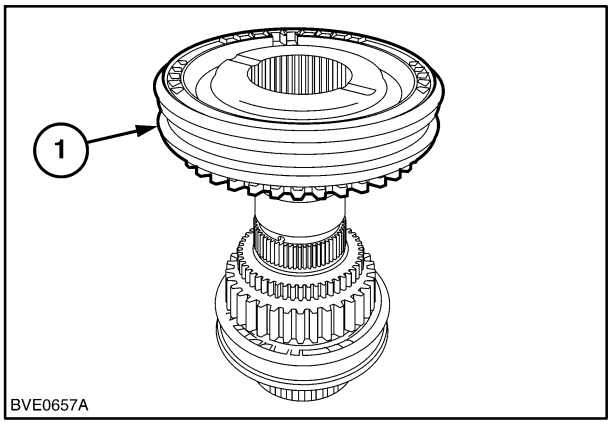
Forward / Reverse Synchronizer and Related Parts Assembly

1. Using a suitable hydraulic press, install the roller bearing (5) onto the forward / reverse synchronizer support shaft (6).
2. Install the circlip (4), 'D' shaped washer (3), needle roller bearing (2), and the reverse gear (1).



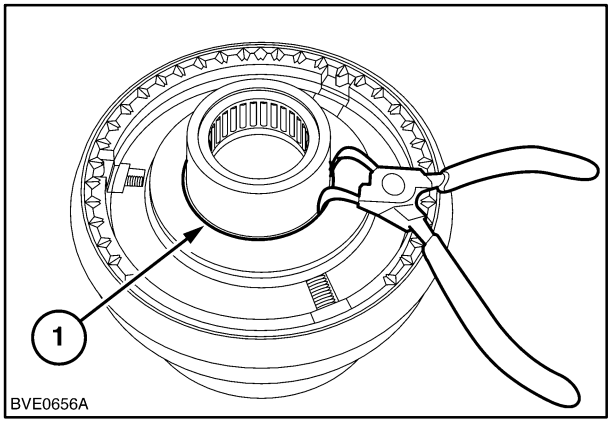
137

3. Install the forward / reverse synchronizer (1).



138

4. Using suitable circlip pliers, install the forward / reverse synchronizer retaining circlip (1).

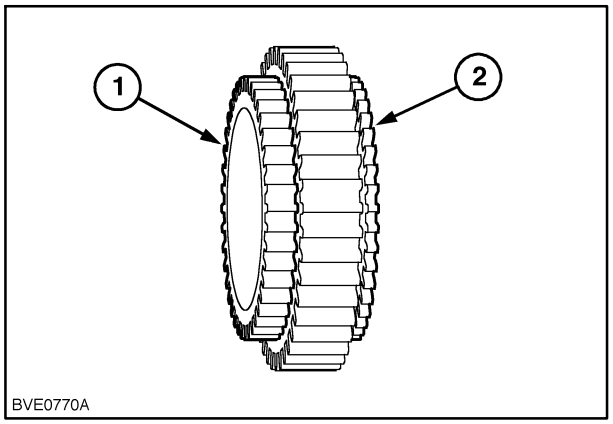


139

IMPORTANT: *When assembling the synchronizer assemblies, it is essential that the forward gear is installed correctly.*

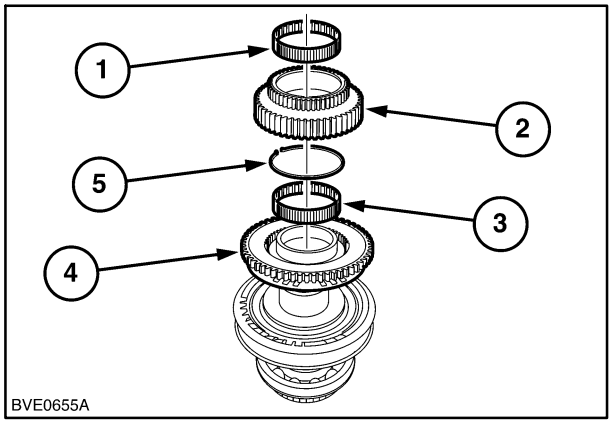
1. Forward / Reverse synchronizer side

2. 1-4 / 5-8 synchronizer side



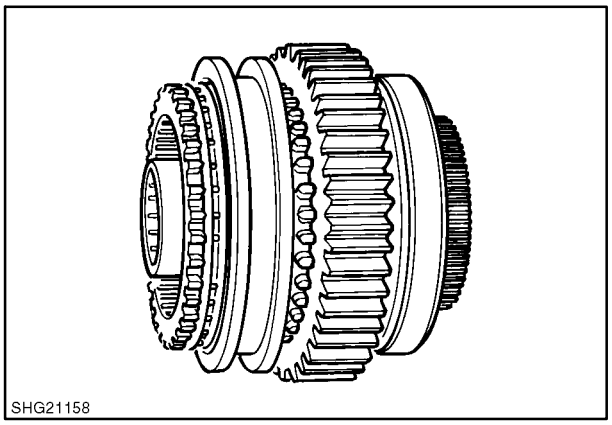
140

5. Install the synchronizer gears (4), needle roller bearing (3), circlip (5), forward gear (2), and the needle roller bearing (1).



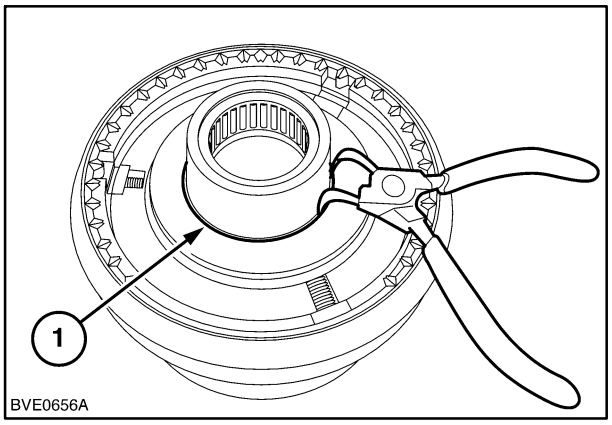
141

Main Range (1-4 / 5-8) Synchronizer and Related Parts Disassembly / Assembly

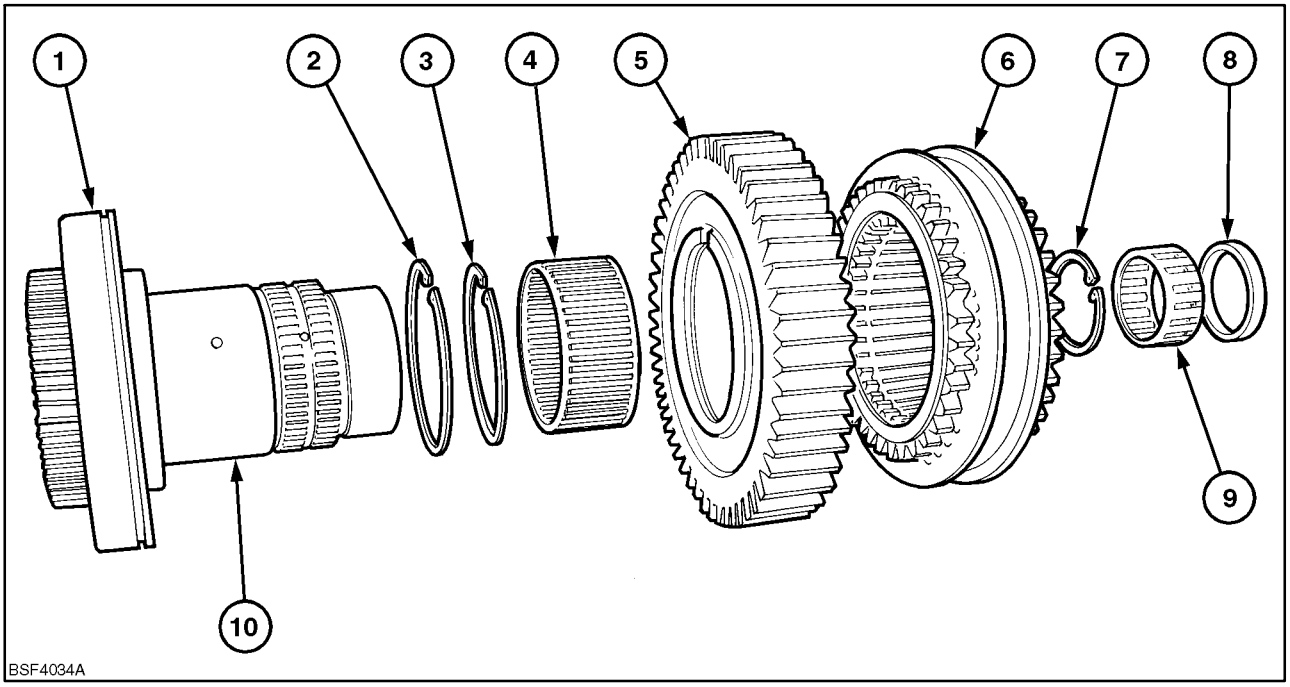


142

1. Remove the outer cone / coupling and friction cone from the main range (1-4 / 5-8) synchronizer.
2. Using suitable circlip pliers, remove the main range (1-4 / 5-8) synchronizer retaining circlip (1).



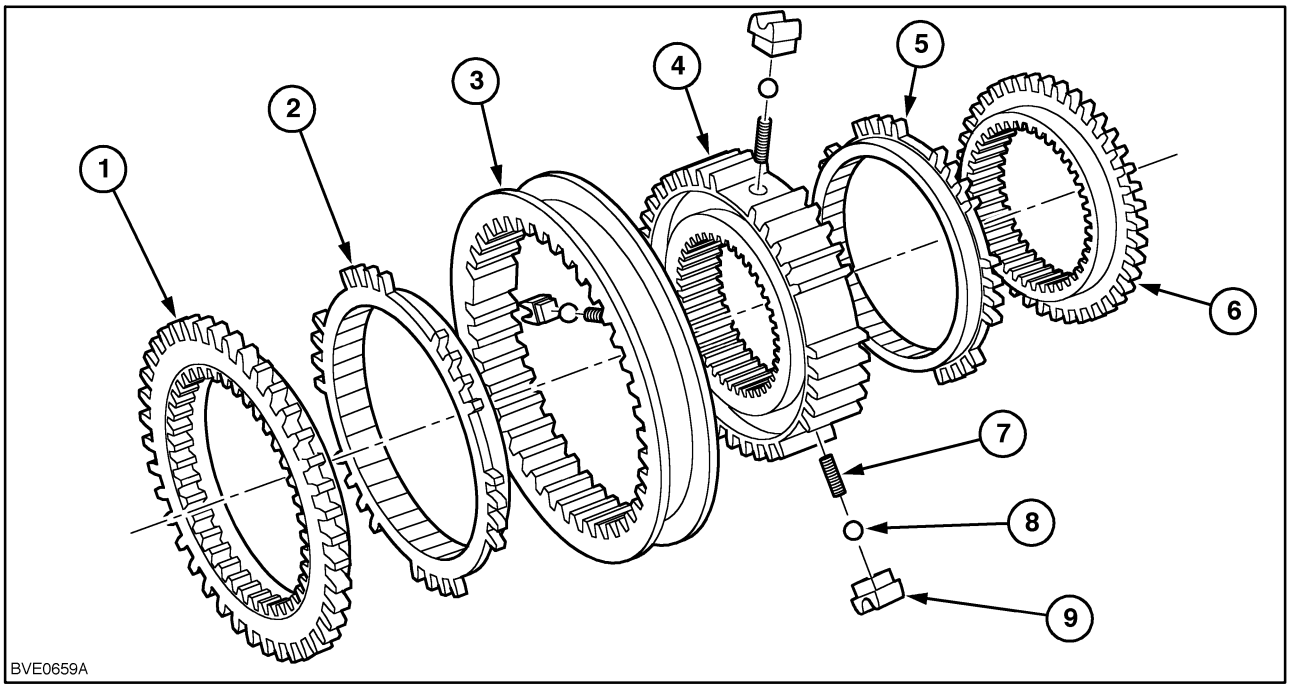
143



144

Main Range (1-4 / 5-8) Synchronizer And Related Parts

1. Roller bearing
2. Circlip
3. Needle roller bearing retaining snap ring
4. Needle roller bearing
5. Main low gear (53 teeth)
6. Main range (1-4 / 5-8) synchronizer
7. Circlip
8. Needle roller bearing
9. Washer
10. Main range (1-4 / 5-8) synchronizer support shaft

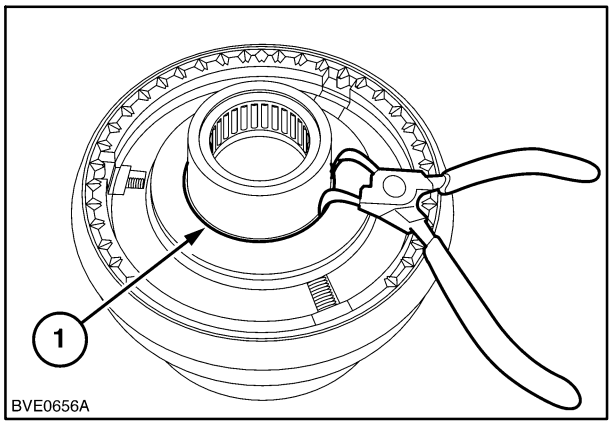


145

Main Range (1-4 / 5-8) Synchronizer

1. Outer cone / Coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone / coupling
7. Spring
8. Detent ball
9. Detent guide

3. Using suitable circlip pliers, install the main range (1-4 / 5-8) synchronizer retaining circlip (1).
4. Install the outer cone / coupling and friction cone to the main range (1-4 / 5-8) synchronizer.

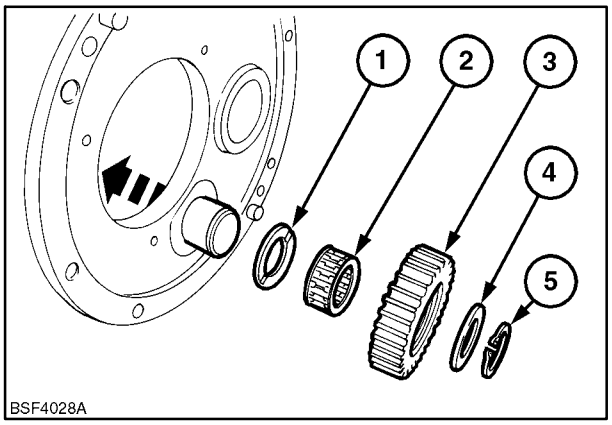


146

Middle Section Assembly

1. Install the support shaft if necessary.
2. Install the steel thrust washer (1), needle roller bearing (2) reverse idler gear (3), and the steel thrust washer (1).

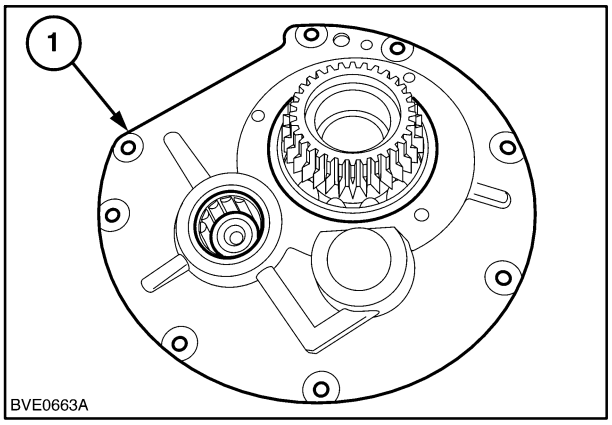
NOTE: *Do not install the circlip (5) at this stage.*



147

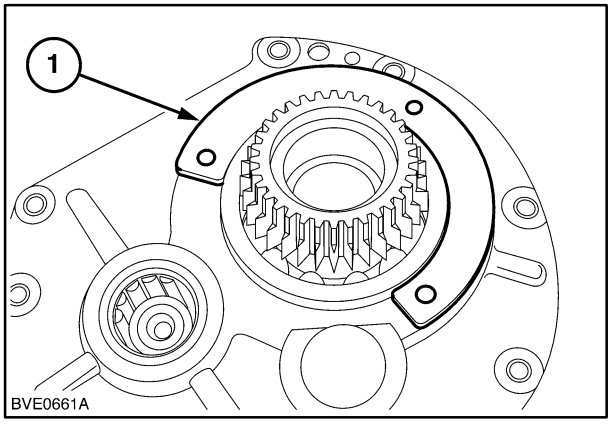
NOTE: *Support the lower shaft, synchronizer assembly and the reverse idler gear.*

3. Install the inner cover plate (1).



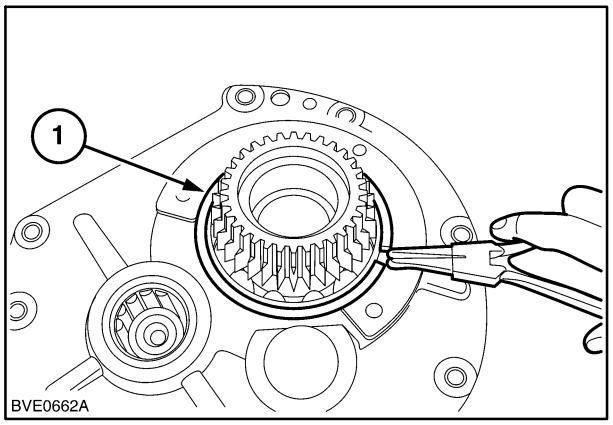
148

4. Install the forward / reverse synchronizer end float adjustment shims (1).



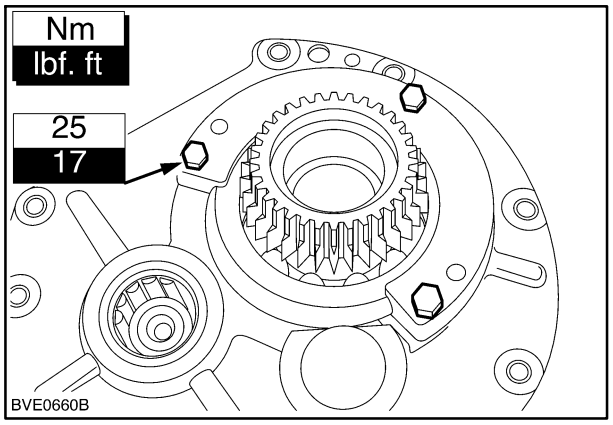
149

5. Using suitable circlip pliers, install the front bearing retaining snap ring (1).



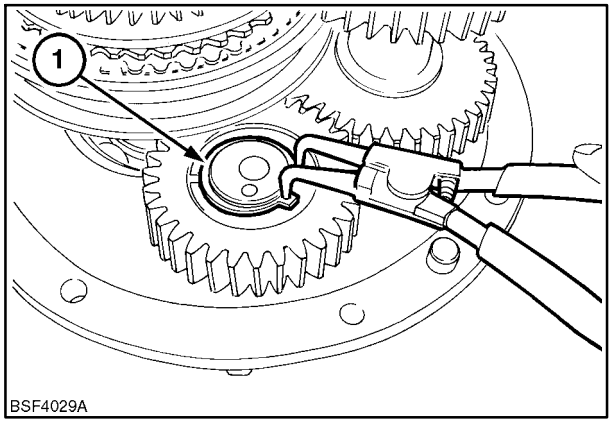
150

6. Install the front bearing retaining plate and tighten the retaining bolts to the specified torque value.



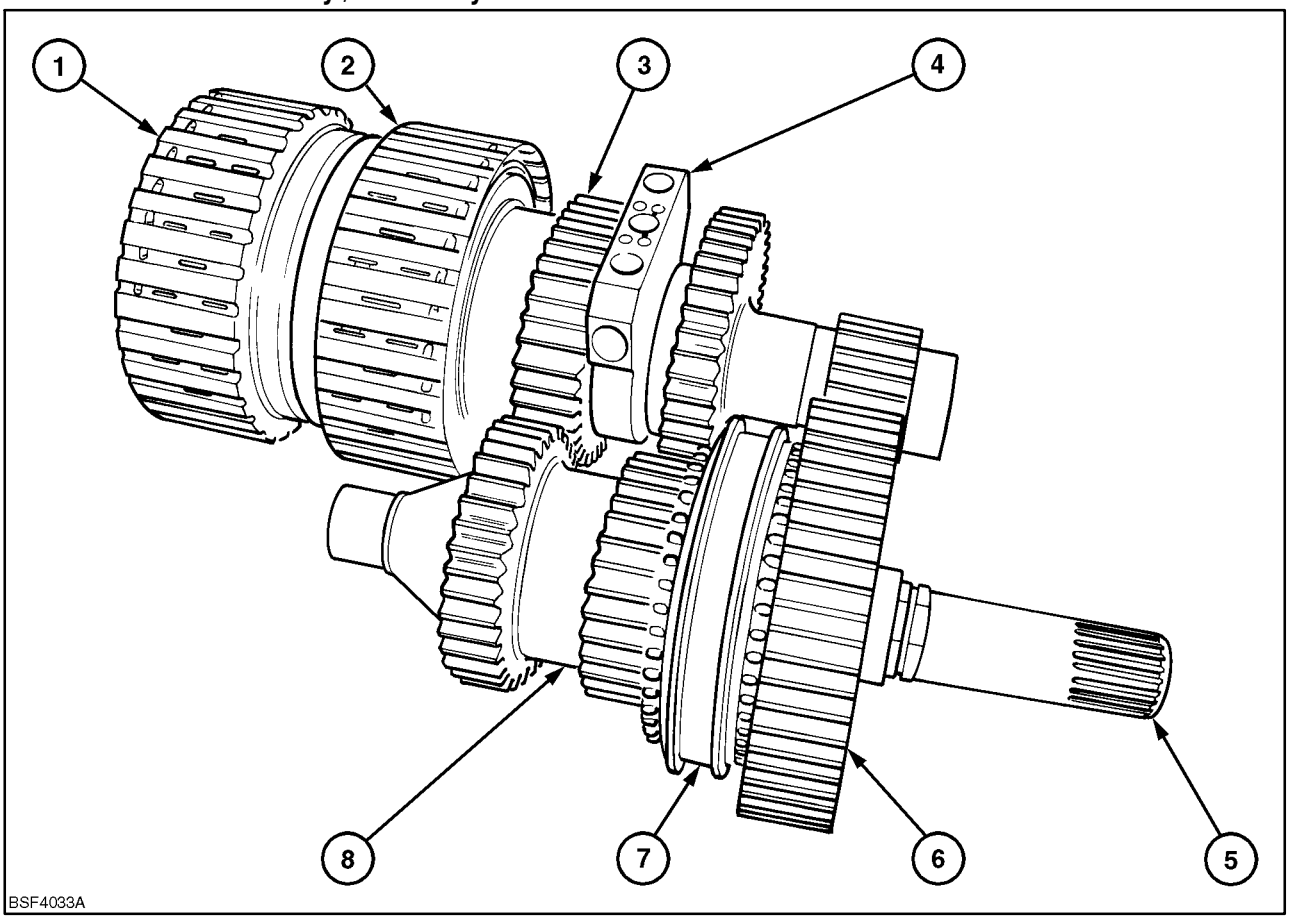
151

7. Using suitable circlip pliers, install the reverse idler gear circlip (1).



152

Rear Section Disassembly / Assembly

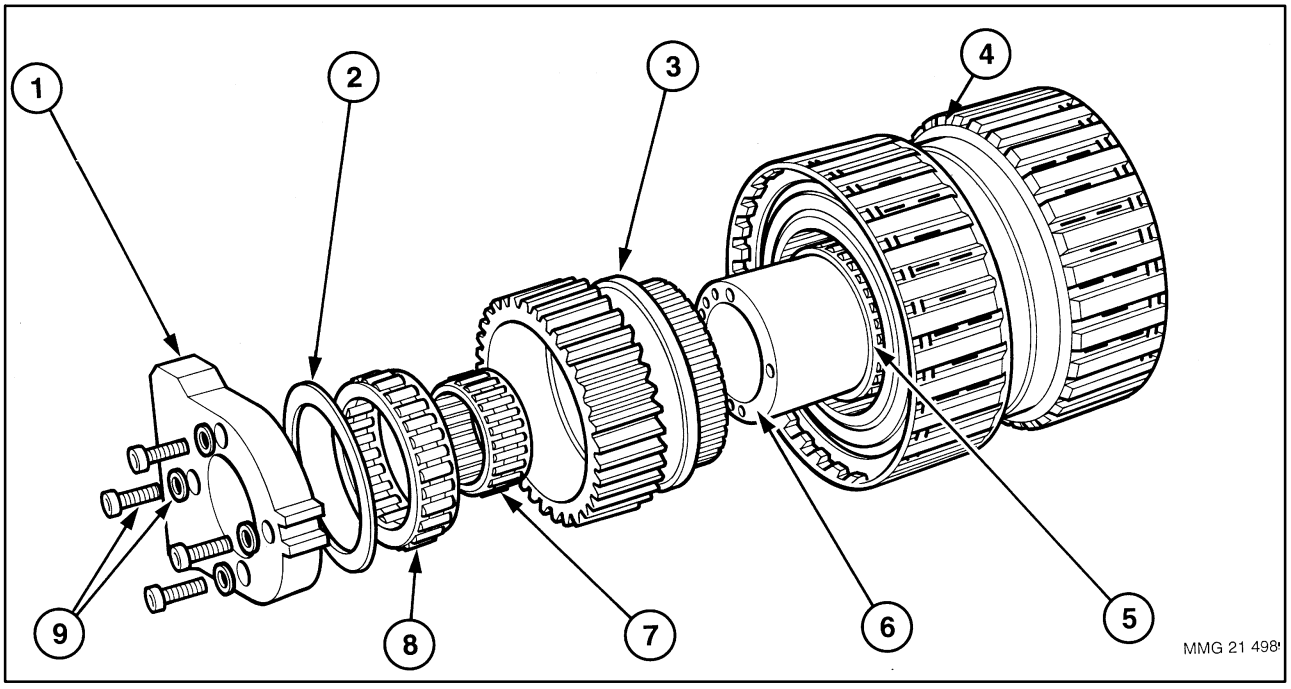


153

Drive Line Components - Rear Section

1. Clutch C3
2. Clutch C4
3. Clutch C4 output gear (41 or 37 teeth)
4. Clutch C3 / C4 support assembly
5. Output shaft
6. Low range gear (65 teeth)
7. Hi / Lo synchronizer
8. Cluster gear

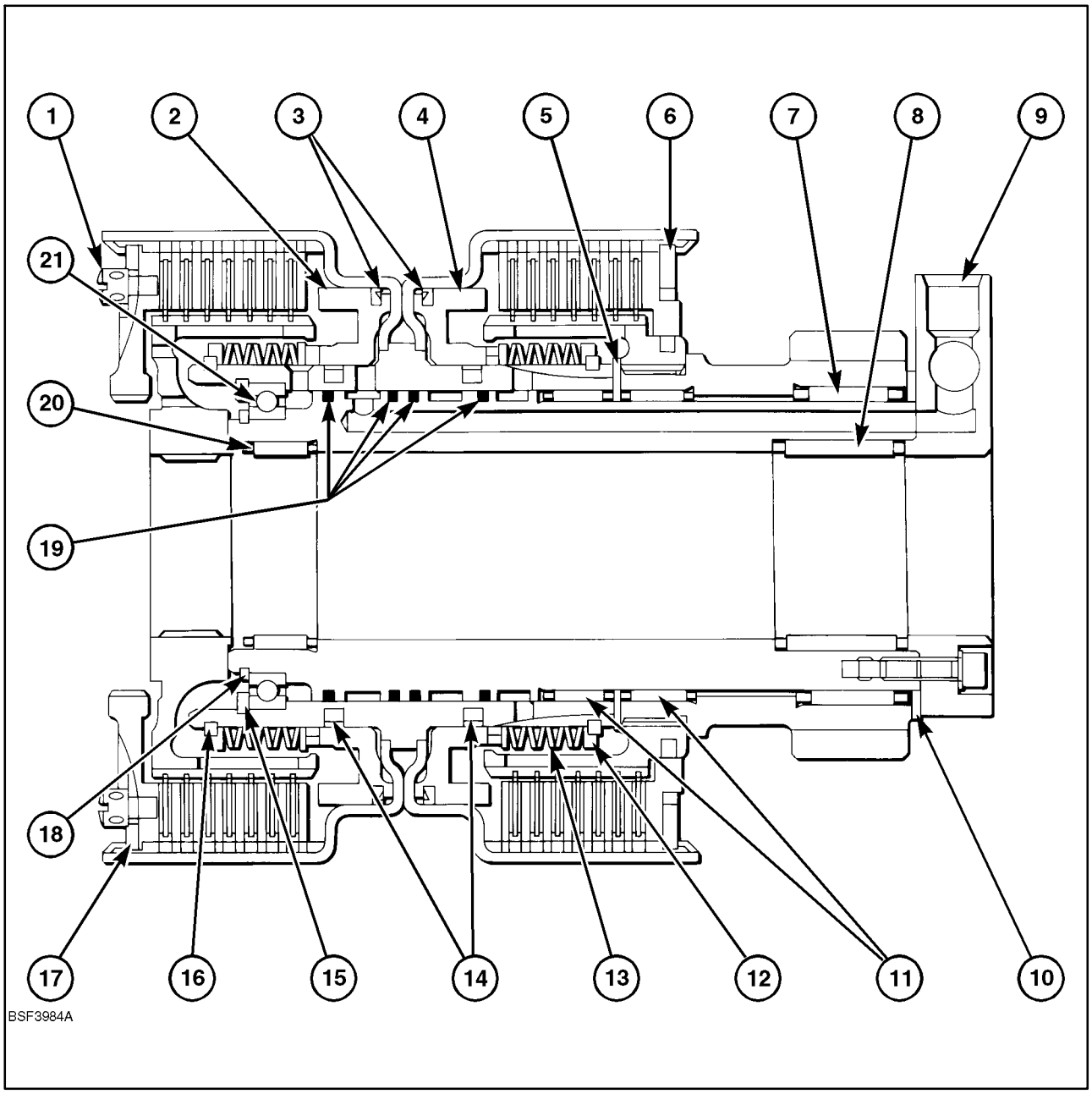
C3 / C4 Clutches



154

C4 Clutch Driven Gear, Gear Bearing, C3 Driven Gear Bearing and Polyimide Thrust Washer

1. Manifold
2. Polyimide thrust washer
3. C4 driven gear
4. C3 / C4 clutch assembly
5. C4 driven gear front bearing
6. Support shaft
7. C3 driven gear to support shaft rear bearing
8. C4 driven gear rear bearing
9. Manifold retaining screws and washers



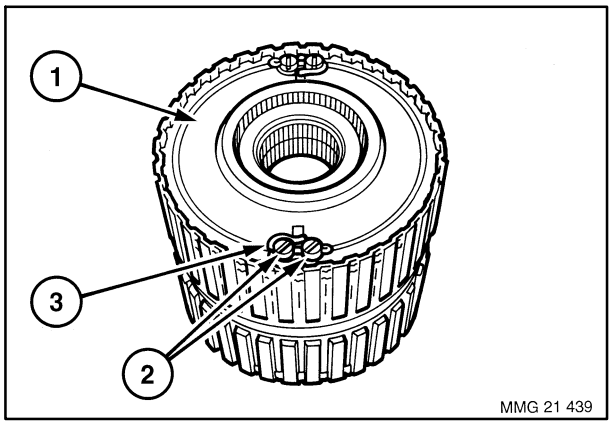
155

Cross Sectional View - C3 / C4

1. Retaining ring screw
2. C3 piston
3. Piston outer oil seals
4. C4 piston
5. Steel washer
6. C4 end plate
7. C4 output gear needle roller bearing
8. C3 output gear needle roller bearing
9. Oil transfer manifold
10. Polyimide thrust washer
11. Needle roller bearing
12. Belleville washer snap ring retainer
13. Belleville washers
14. Inner piston oil seals
15. Snap ring
16. Snap ring
17. Clutch plate retaining ring
18. Snap ring
19. Support shaft annular sealing rings
20. Support shaft needle roller bearing
21. Roller bearing

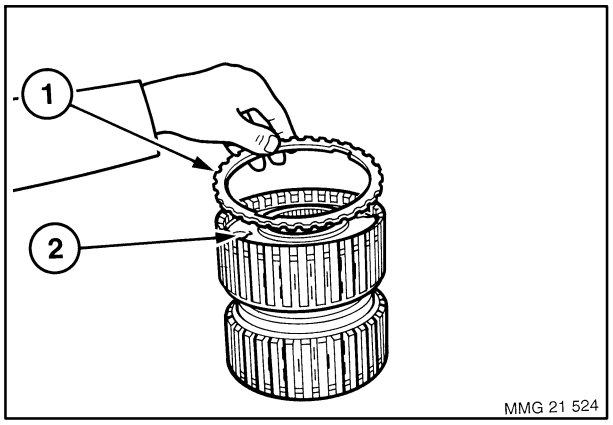
C3 / C4 Clutches - Disassembly

1. Remove the two split pins (3).
2. Remove the four end plate (1) retaining ring screws (2).



156

3. Apply hand pressure and rotate the locking ring (1) until the outer teeth align with the stamped grooves in the housing (2).
4. Remove the retaining ring (1).



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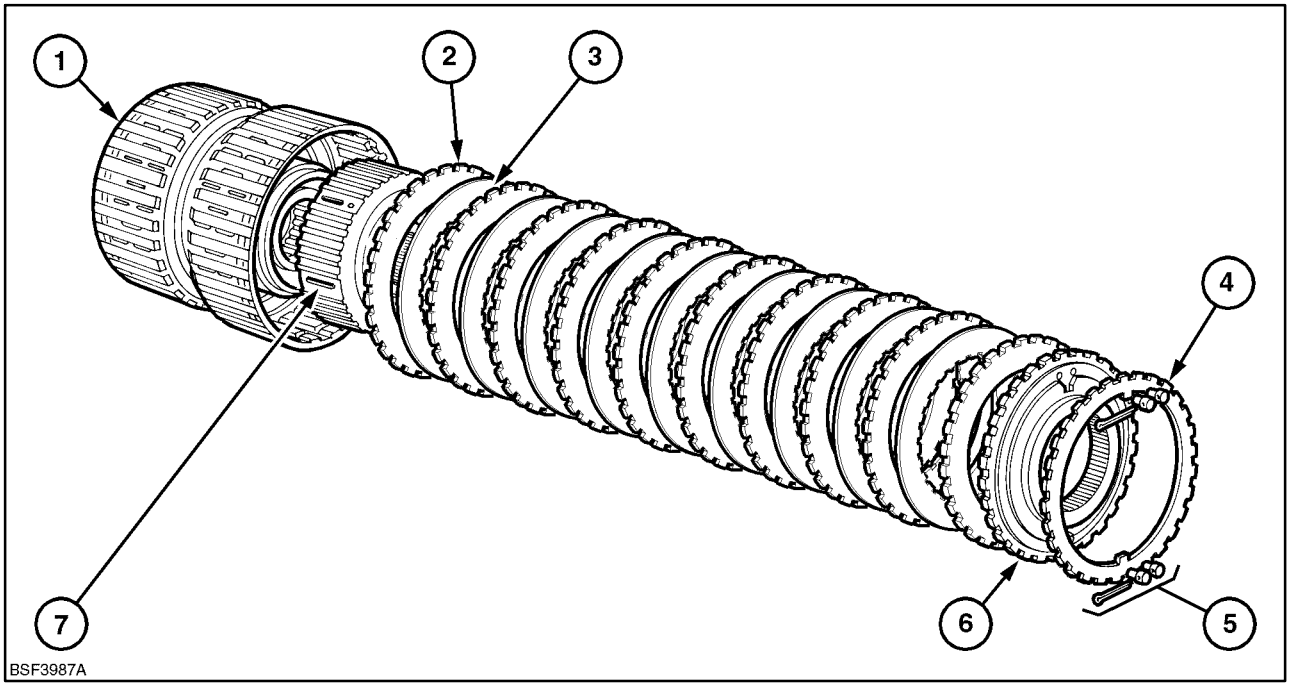


158

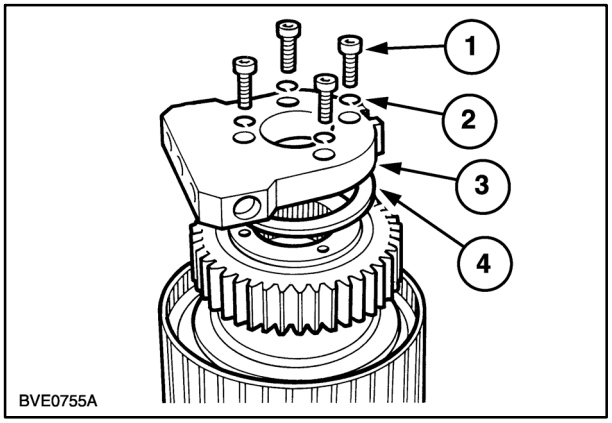
C3 Clutch Friction and Steel Plates - Assembly Order

1. C3 / C4 clutch housing
2. Steel plates x 9
3. Friction plates x 9
4. End plate locking ring
5. Locking ring retaining screws and split pins
6. End plate
7. C3 clutch hub

5. Remove the C3 clutch end plate (6), clutch hub (8), friction plates (3) and the steel plates (2).
6. Remove the two Polyimide thrust washers (7) positioned either side of the hub.

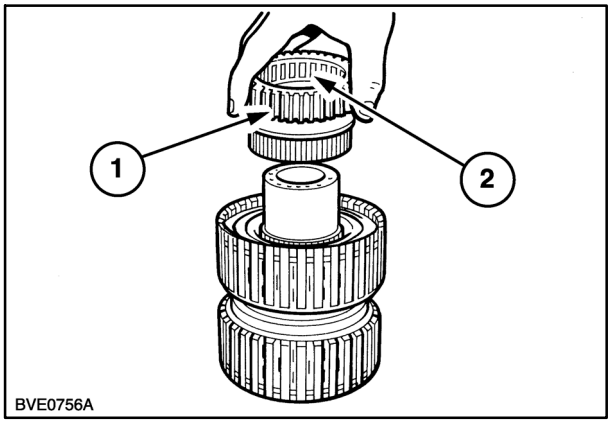
NOTE: *The support shaft inner front needle roller bearings are an interference fit and will remain in the shaft.*

7. Rotate the assembly 180°.
8. Remove the four manifold retaining bolts (1) and the washers (2).
9. Remove the manifold (3).
10. Remove the Polyimide thrust washer (4).



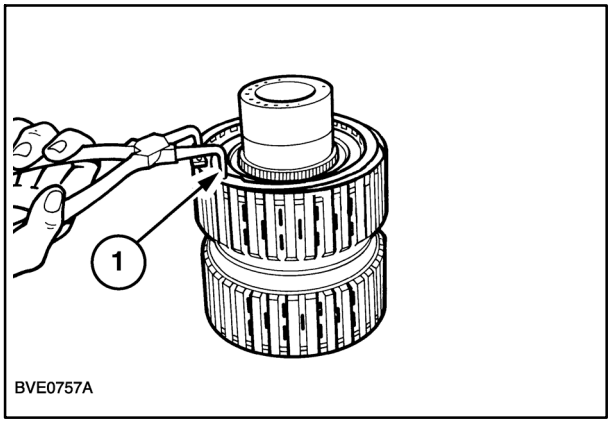
159

11. Remove the C4 output gear (1) and the C4 output gear rear needle roller bearings (2).



160

12. Using suitable circlip pliers, remove the circlip (1).



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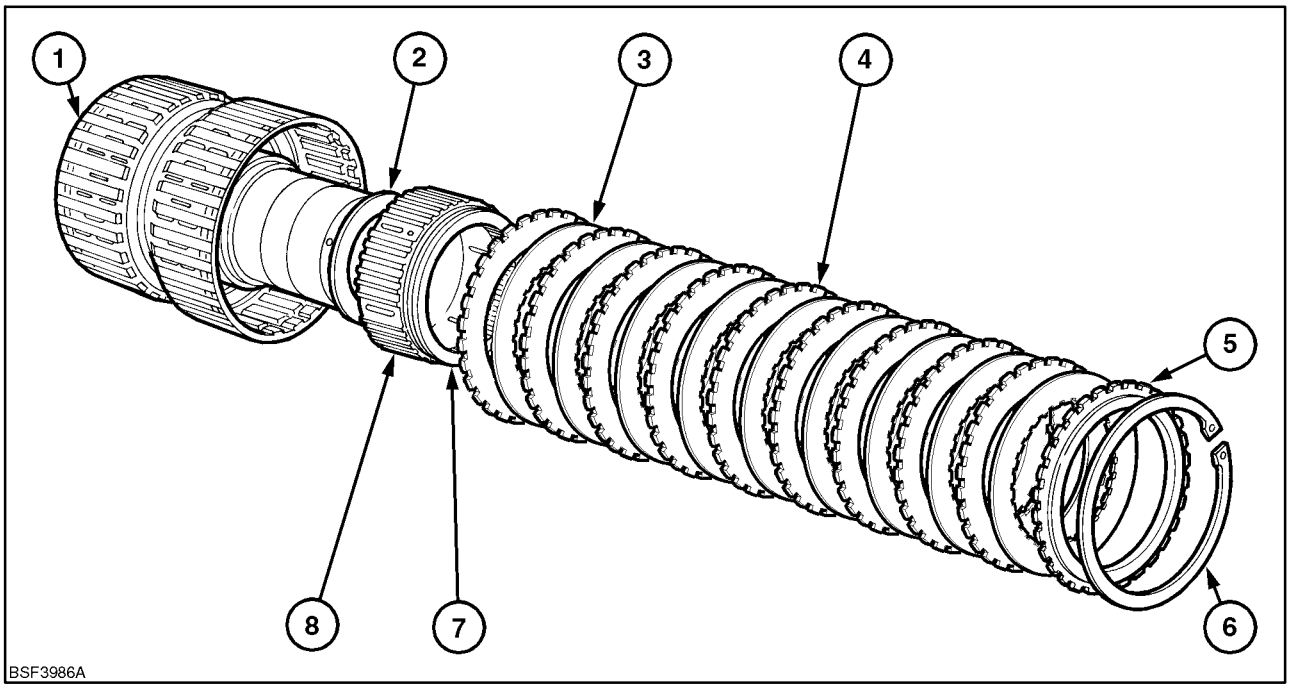

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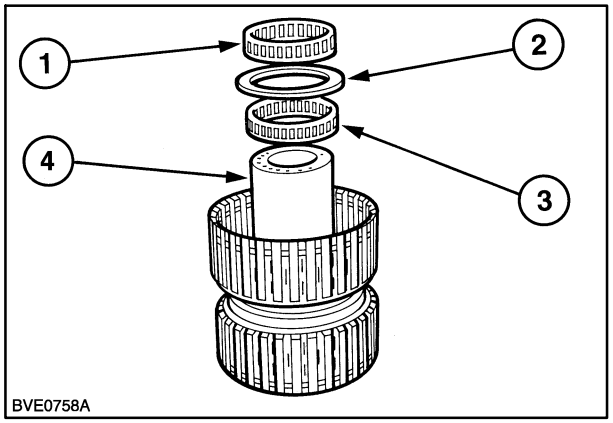
C4 Clutch Pressure Plate, Hub, Friction and Steel Plates - Exploded View

1. C3 / C4 clutch housing
2. Steel washer
3. Friction plates x 9
4. Steel plates x 9
5. End plate
6. Circlip
7. Lubrication seal
8. Clutch hub

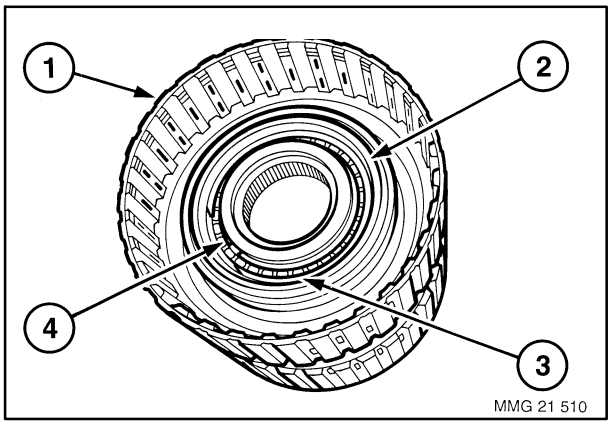
NOTE: *A hub oil seal is positioned in the clutch hub, sealing against the pressure plate.*

13. Remove the C3 clutch end plate (5), clutch hub (8), friction plates (3) steel plates (4) and the steel washer (2).
14. Remove the C4 output gear front needle roller bearing (1), steel thrust washer (2) and the C4 clutch to support shaft needle roller bearing (3), from the support shaft (4).



163

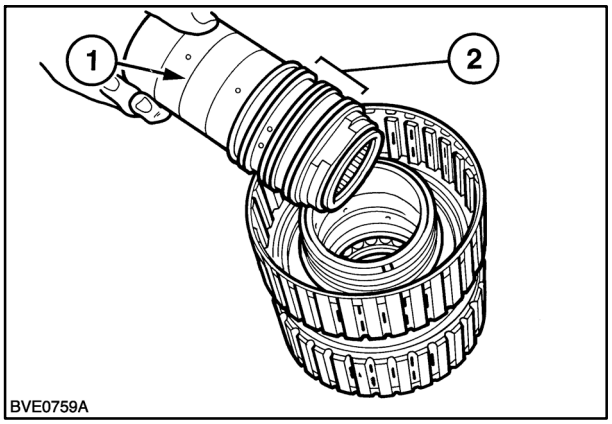
15. Remove the clutch support shaft front bearing (4) and the retaining snap rings (2) and (3) from the C4 clutch housing (1).



164

NOTE: *Removing the support shaft from the C4 end of the housing will prevent damage occurring to the annular sealing rings (2).*

16. Remove the support shaft (1) from the bearing by removing from the C4 end of the housing.

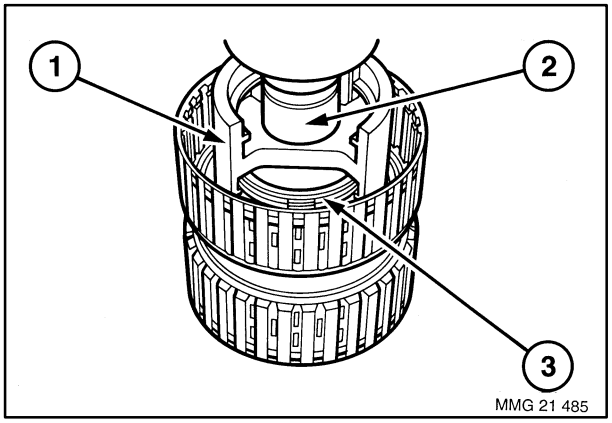


165

17. Using a suitable hydraulic press (2) and the special tool **4FT 508** (1), depress the clutch piston return belleville washers and remove the retaining snap ring (3).

NOTE: *The retainer is shaped to provide a 'lock' for the snap ring.*

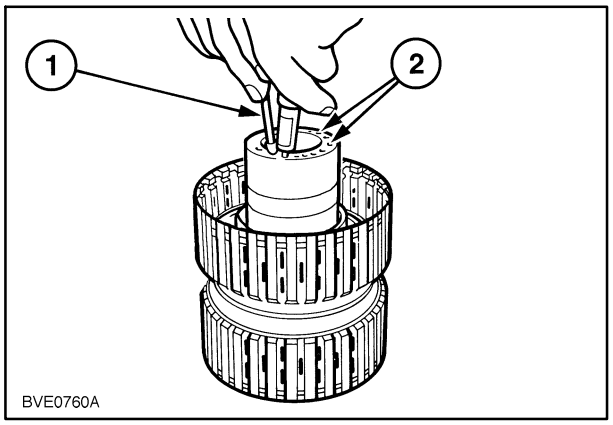
18. Release the hydraulic press and collect the belleville washers and the snap ring retainer.
19. Repeat the above procedure for the second clutch piston return belleville washers.



166

NOTE: *Each piston is fed by two drillings. Apply compressed air to one of these and plug the other (1).*

20. Remove the pistons by applying compressed air of not more than 3 bar (50 lbf / in^2) to the clutch piston oil feed ports (2).



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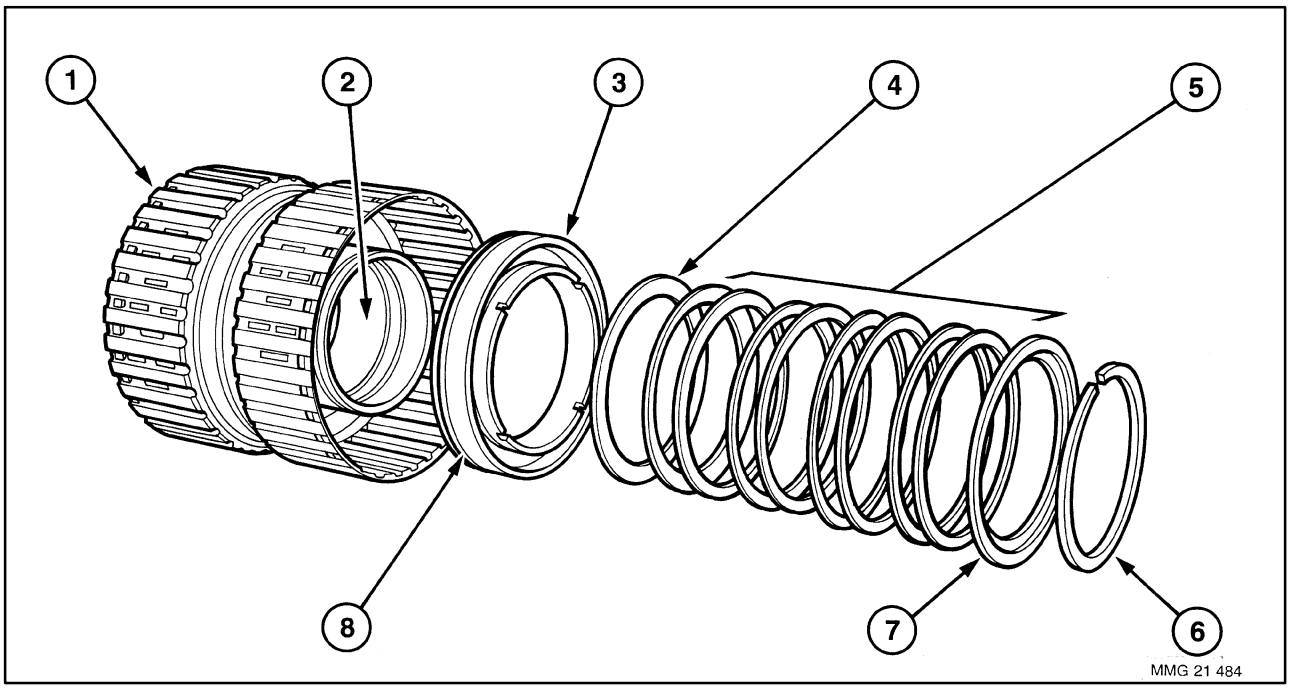

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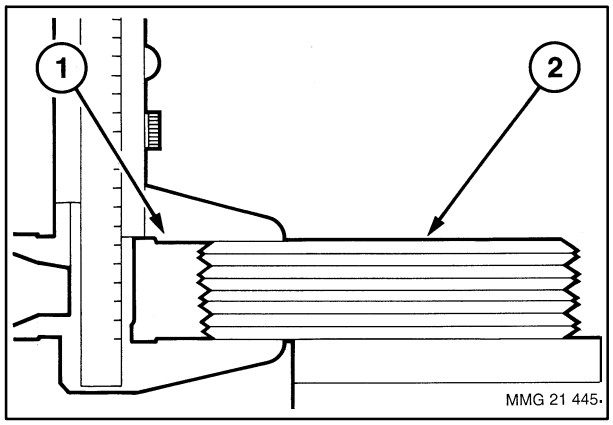
Piston Return Spring and Retainer - Exploded View

1. C3 / C4 clutch body
2. Snap ring groove
3. Piston
4. Flat washer
5. Belleville washers
6. Snap ring
7. Snap ring retainer
8. Piston outer oil seal

21. Inspect each of the belleville spring washers for cracks and deformation.
22. Assemble the belleville springs to form a stack (2).

NOTE: *Alternatively compare the measured height with that of new items.*

23. Measure the height as shown (1). The height should be approximately 24mm. If the specified height is incorrect, replace parts as necessary.



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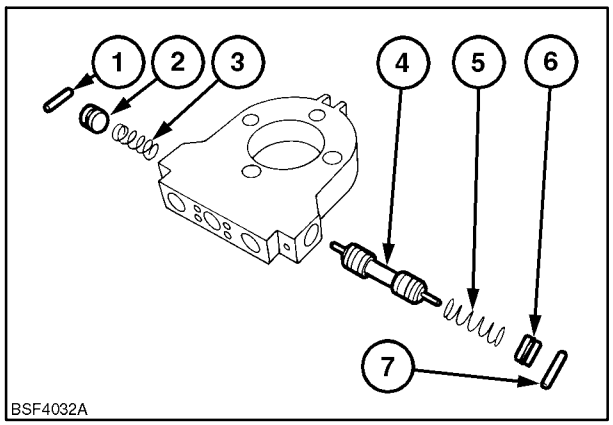
24. Check that the splined areas of the input hub and the output gear are undamaged.
25. Inspect the clutch driven hubs for wear, damage or pitting.
26. Install a new lubrication oil seal into the groove of the C4 clutch hub, ensure that it is correctly seated.
27. Ensure all of the oil galleries are free and thoroughly clean.
28. Inspect all snap rings and their grooves for deformation and damage.
29. Check the clutch friction and steel plates for excessive wear, the friction plate material should have a clear distinctive pattern. All plates should be flat without warping and there should not be excessive discolouration.
30. Ensure all components are lubricated with transmission oil prior to re-assembly.
31. Using a suitable punch, remove the retaining pins (1) and (7).
32. Remove the plug (2), spring (3), lubrication proportional valve (4), spring (5) and the plug (6).



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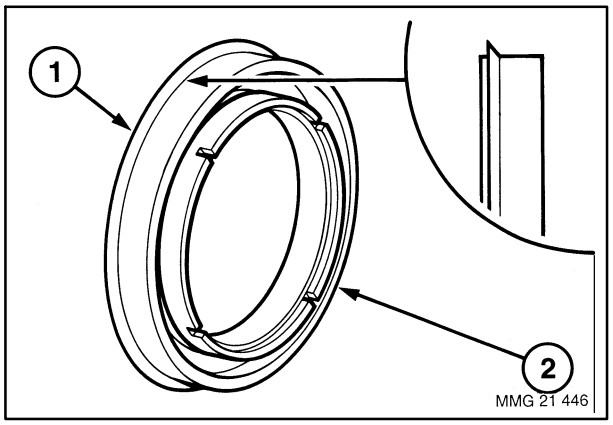
C3 / C4 Clutches - Assembly

NOTE: *Make sure the lip of the oil seal is facing the inner or rear face of the piston (2).*

33. Install the C3 clutch piston outer oil seal (1) onto the piston. Repeat this step for the C3 clutch piston.



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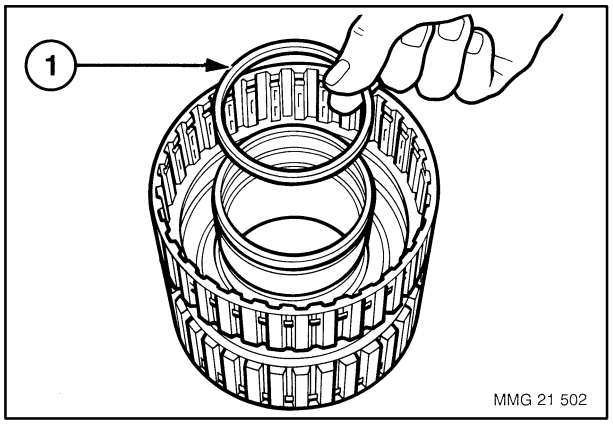
NOTE: *Make sure the oil seal is seated correctly and the lip has not 'rolled' in the groove.*

34. Install the C3 clutch piston inner oil seal energiser into the groove on the clutch housing. Repeat this step for the C4 clutch piston inner seal energiser.



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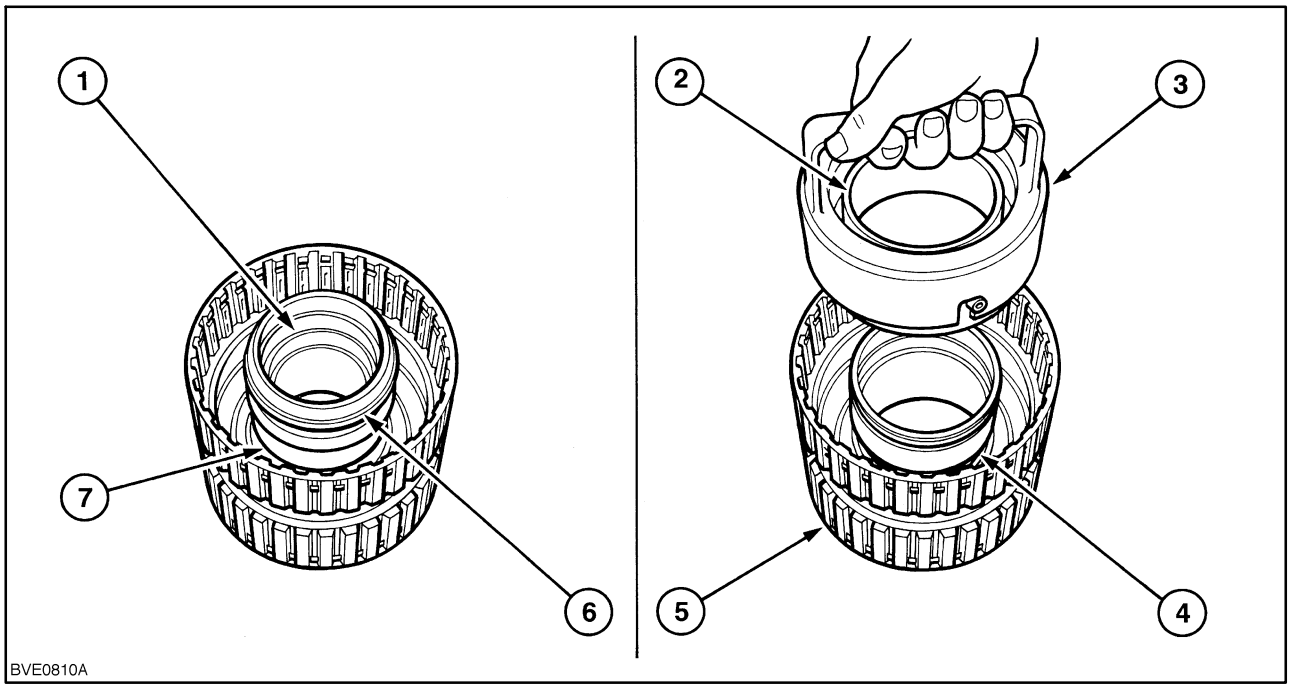

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Installation and Re-sizing of the Inner Oil Seals

1. Special tool **4FT 502** (tapered sleeve expander)
2. Special tool **4FT 507** (re-sizer)
3. Special tool **4FT 501** (handle)
4. Piston inner oil seal in groove
5. C3 / C4 clutch housing
6. Piston inner seal on tapered sleeve expander
7. Seal energizer in position in groove

35. Lubricate the piston inner oil seal and the special tool **4FT 502** (1) with petroleum jelly and position the expander sleeve on the clutch housing centre and the oil seal (6) on the sleeve as shown.

NOTE: *Perform the operation quickly so that the oil seal is not subjected to the stretching action for too long.*

36. Push the piston inner oil seal up the taper, dropping the seal on top of the oil seal energiser already in position on the clutch housing.

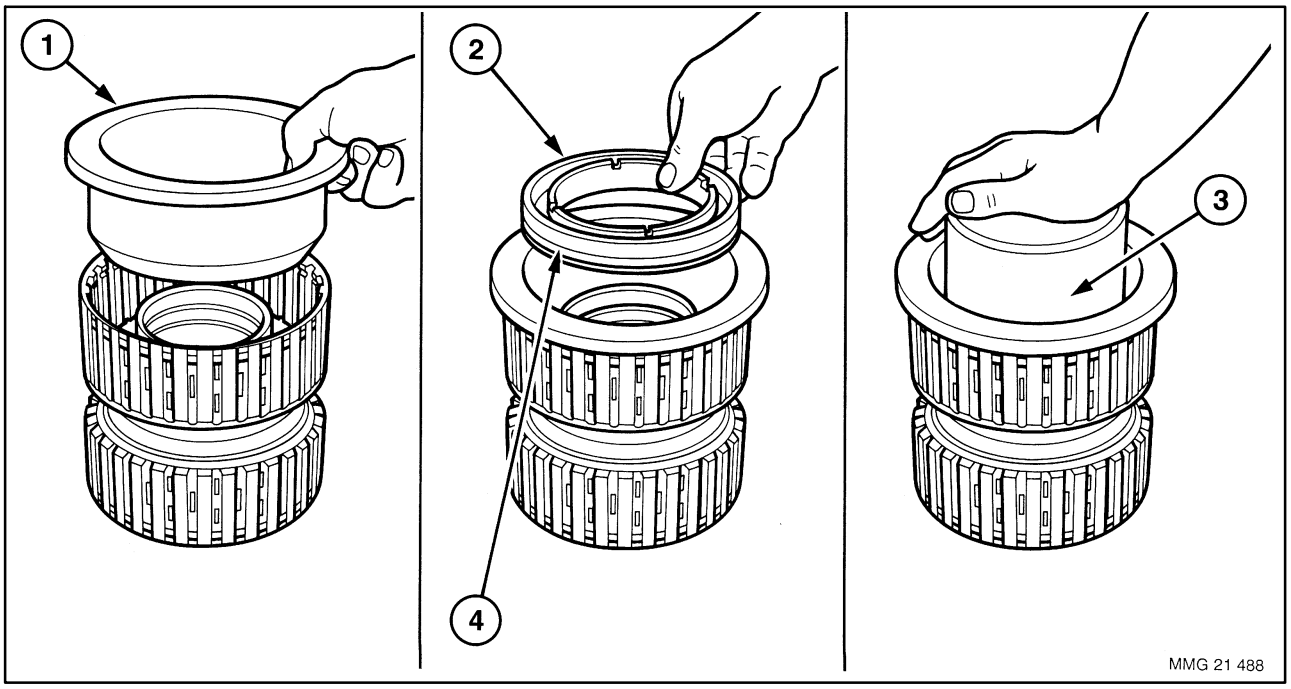
37. Place the clutch housing with the inner oil seal installed into a suitable cooling device for approximately 30 minutes.

IMPORTANT: *As the tool is positioned over the oil seal, ensure that the tool slides smoothly and squarely over the oil seal. When the process is completed, inspect the oil seal to ensure that no damage has occurred.*

38. Ensure the oil seal is fully lubricated. Assemble the re-sizer special tool **4FT 507** (2) onto the handle of special tool **4FT 501** (3) so that the larger diameter is at the opening. Lubricate the re-sizer with petroleum jelly and with the handle, firmly push the re-sizer over the oil seal to compress and re-size the oil seal.

39. Place the clutch housing with the special tool still in position into a suitable cooling device for approximately 30 minutes.

40. Repeat the installation and re-sizing process on the second clutch piston inner oil seal.



174

Installing Pistons into C3 / C4 Clutch Housing

1. Piston guide sleeve special tool **4FT 505**
2. Piston
3. Piston pusher special tool **4FT 504**
4. Piston oil seal

41. Lubricate the piston inner oil seal inside the clutch housing with petroleum jelly and check that the oil seal is resized.

42. Position the piston guide sleeve special tool **4FT 505** (1), on top of the clutch housing and lubricate the inside of the special tool with petroleum jelly.

43. Position the piston (2), in the guide sleeve and using the piston pusher special tool **4FT 504** (3), evenly and firmly, push the piston into the housing. Remove the guide sleeve and the pusher.

IMPORTANT: *Do not use more than hand pressure to install the piston, or damage to the oil seal(s) may occur.*

44. Repeat the piston installation process on the second clutch piston.

C3 / C4 Clutch Piston Movement Adjustment

IMPORTANT: *C3 and C4 must be adjusted to achieve optimum piston movement or running clearance.*

45. Assemble the friction plates, steel plates, end plates and the circlip / locking ring.

NOTE: *Do not install the locking ring retaining screws or the clutch hubs as this will interfere with the measurement.*

46. Using a suitable dial gauge and a suitable air line, supply compressed air through the piston oil supply ports and measure the clutch pack (C3) free movement.

47. The free movement should be 2.40–4.10 mm.

48. If the measurement is not within specification it will be necessary to install one or more alternate sized separator plates to achieve the correct free movement.

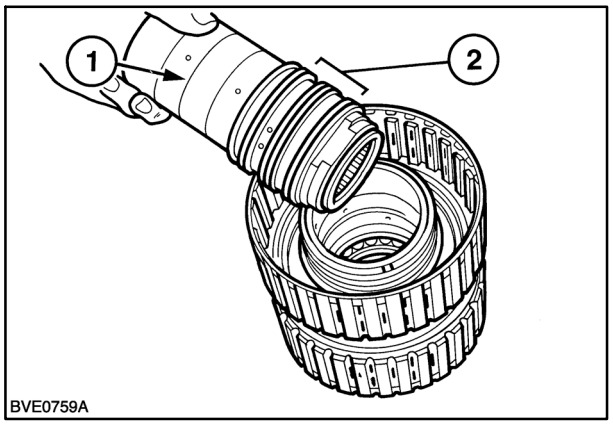
    These separator plates are available in two thicknesses 2.76–2.80mm and 2.26–2.30mm.

49. Repeat the above procedure on the second clutch.

50. Disassemble both the C3 and C4 clutches, removing the end plates, steel plates and the friction plates. Keep the C3 and C4 clutch components matched to the respective clutches. Continue with the following assembly procedure.

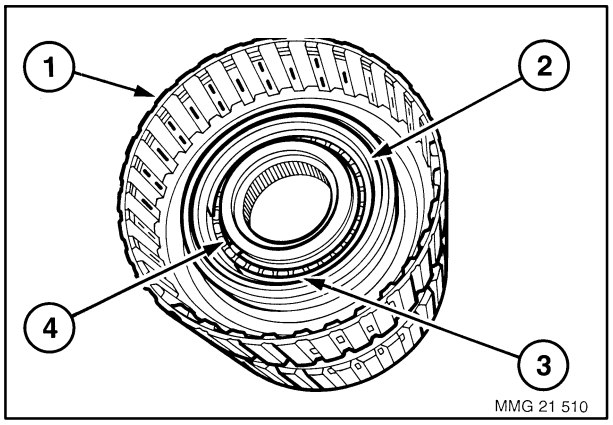
NOTE: *Assemble the support shaft (1) through the clutch assembly from the C4 end so as not to damage the annular sealing rings (2).*

51. Install the support shaft (1), with new annular sealing rings (2).



175

52. Install the clutch support shaft front bearing (4) and the retaining snap rings (2) and (3) to the C4 clutch housing (1).



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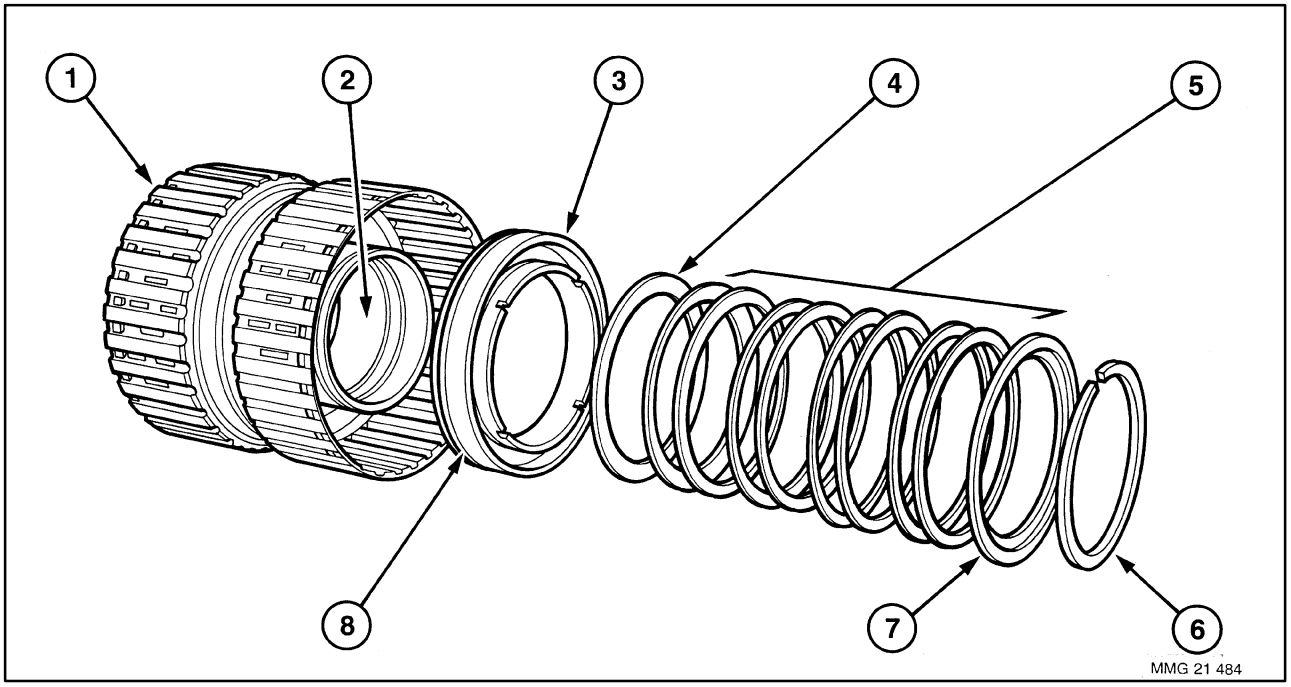


177

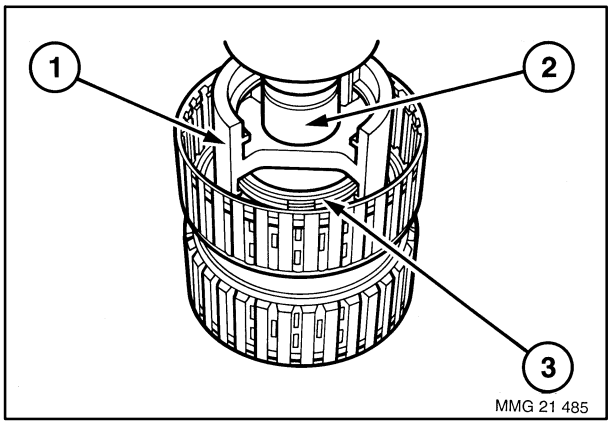
Piston Return Spring and Retainer - Exploded View

1. C3 / C4 clutch body
2. Snap ring groove
3. Piston
4. Flat washer
5. Belleville washers
6. Snap ring
7. Snap ring retainer
8. Piston outer oil seal

53. Using a suitable hydraulic press (2) and special tool **4FT 508** (1), depress the clutch piston return belleville washers and install the retaining snap ring (3).

NOTE: *The retainer is shaped to provide a 'lock' for the snap ring.*

54. Release the hydraulic press.
55. Repeat the process on the second clutch piston return belleville washers.

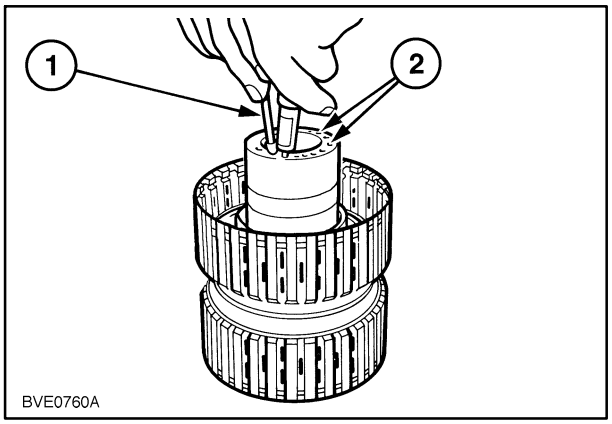


178

NOTE: *Each piston is fed by two drillings (2) apply compressed air to one of these and plug the other (1).*

NOTE: *Coat the pistons with transmission oil to indicate any leakage.*

56. Check the piston oil seals by applying compressed air of not more than 3 bar (50 lbf / in^2) to the C3 / C4 clutch piston oil feed ports. Make sure the pistons have no signs of leakage.



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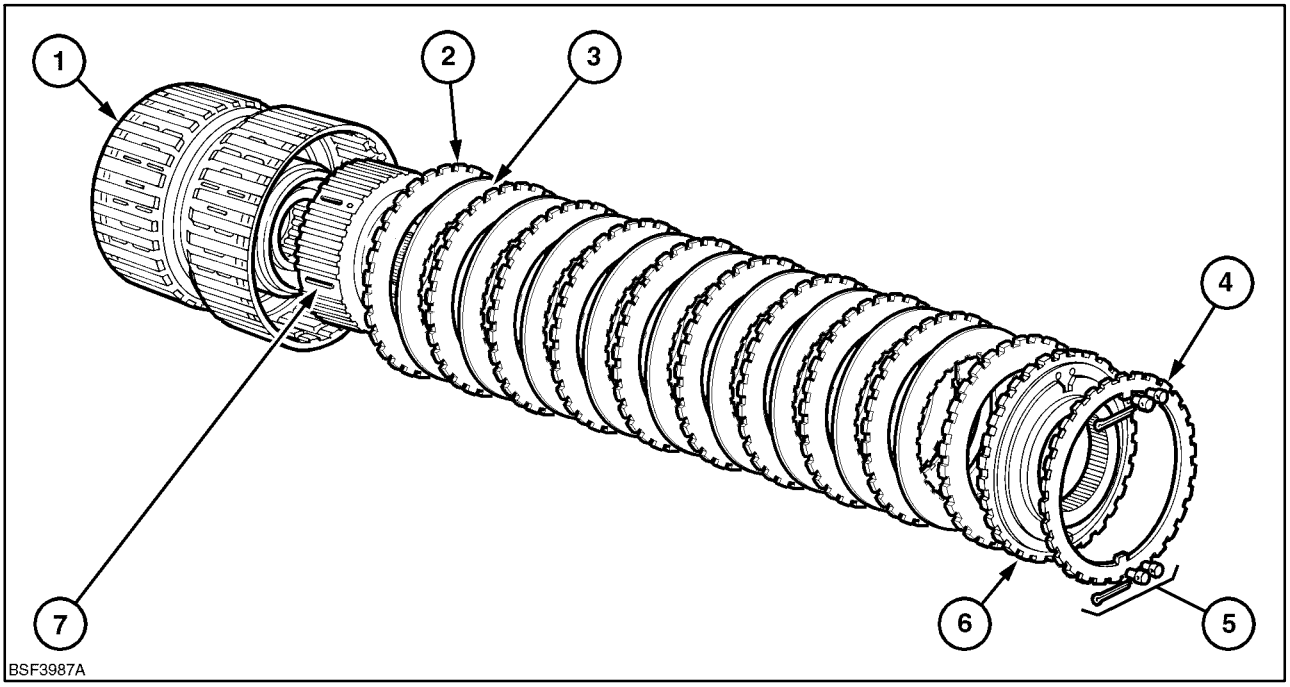
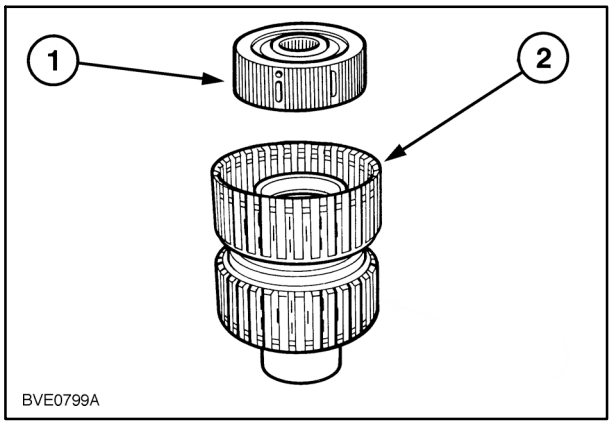


180

C3 Clutch Friction and Separator Plates - Assembly Order

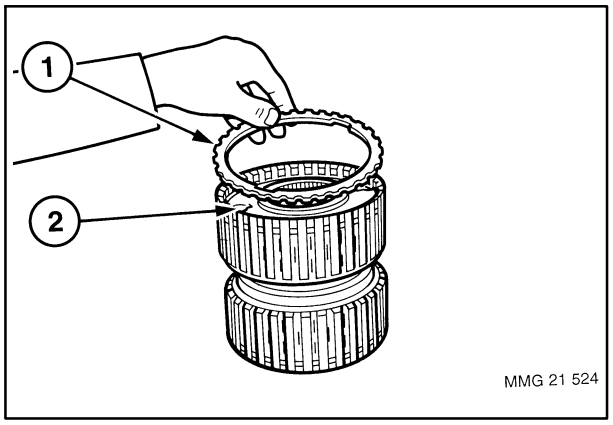
1. C3 / C4 clutch housing
2. Steel plates x 9
3. Friction plates x 9
4. End plate locking ring
5. Locking ring retaining screws and split pins
6. End plate
7. C3 clutch hub

57. Install the clutch hub (1) into the clutch housing (2).
58. Install the steel plates and friction plates in the order as shown in Figure 180.



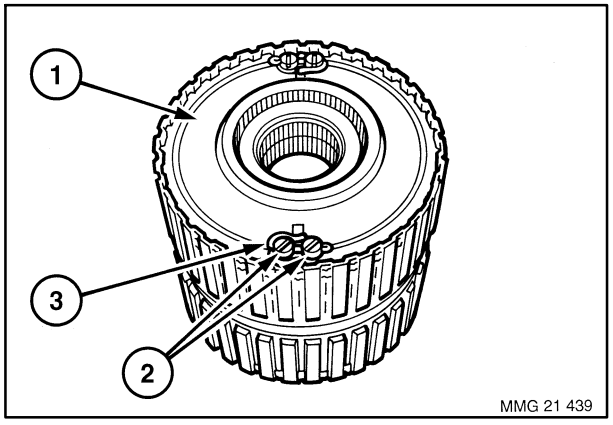
181

59. Install the retaining ring (1).
60. Apply hand pressure and rotate the locking ring (1) until the locking ring screw holes line up with the end plate (2).



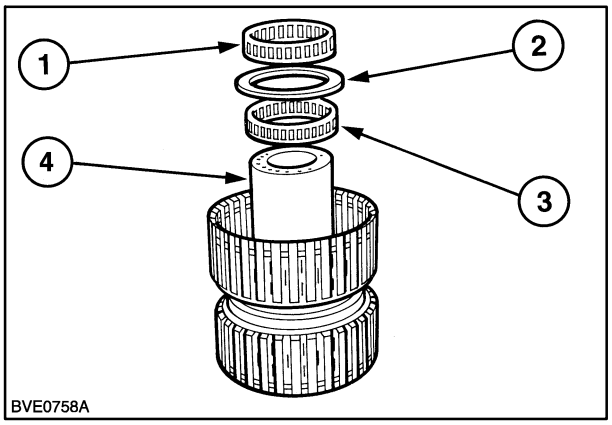
182

61. Install the four end plate (1) retaining ring screws (2).
62. Install the two split pins (3).



183

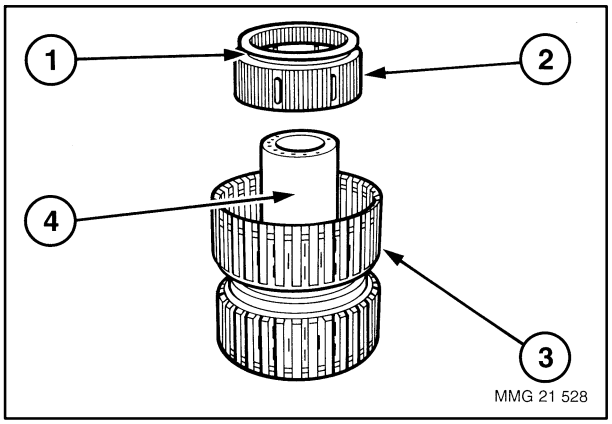
63. Rotate the C3 / C4 clutch housing 180°.
64. Install onto the support shaft (4) the C4 clutch to support shaft needle roller bearing (3), steel thrust washer (2) and the C4 output gear front needle roller bearing (1).



184

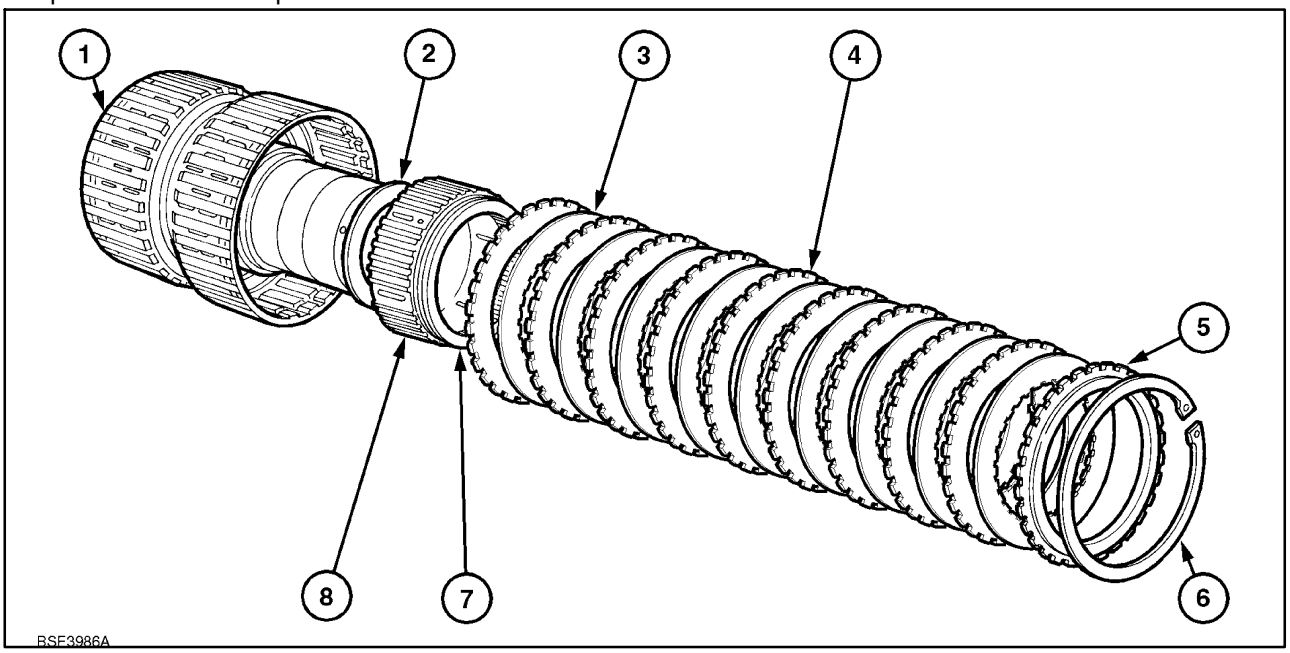
NOTE: *Ensure that the previously assembled lubrication oil seal (1), is in place.*

65. Install the C4 clutch hub (2) into C4 clutch housing (3) over the support shaft (4),



185

66. Assemble the C4 clutch steel plates, friction plates and the end plate as shown below.

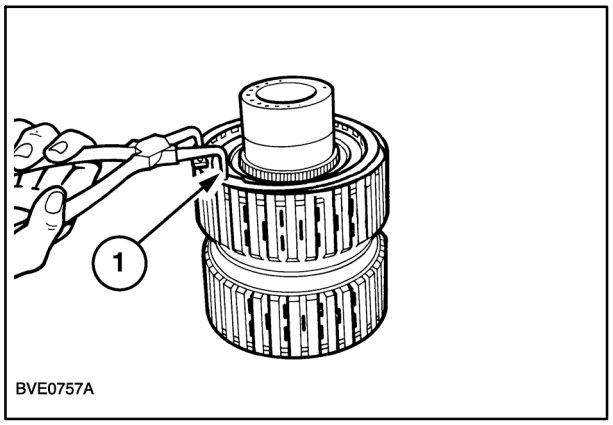


186

C4 Clutch Pressure Plate, Hub, Friction and Steel Plates - Exploded View

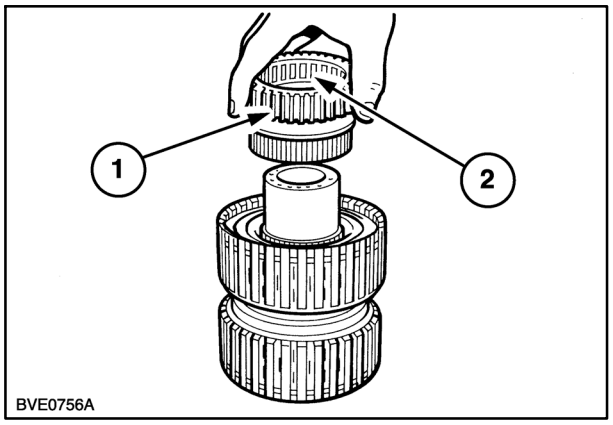
1. C3 / C4 clutch housing
2. Steel washer
3. Friction plates x 9
4. Steel plates x 9
5. End plate
6. Snap ring
7. Lubrication oil seal
8. Clutch hub

67. Using suitable circlip pliers, install the circlip (1).



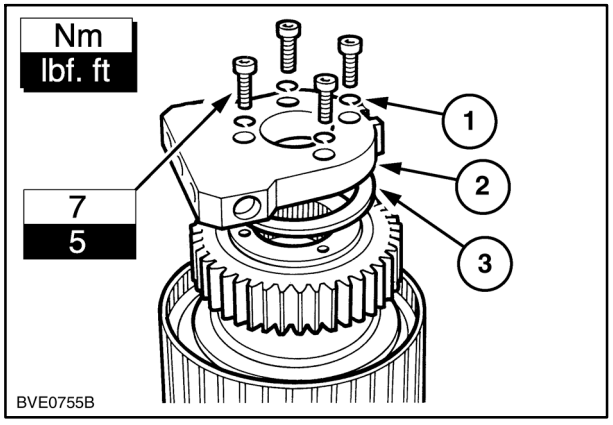
187

68. Install the C4 output gear rear needle roller bearing (2) and the C4 output gear (1).



188

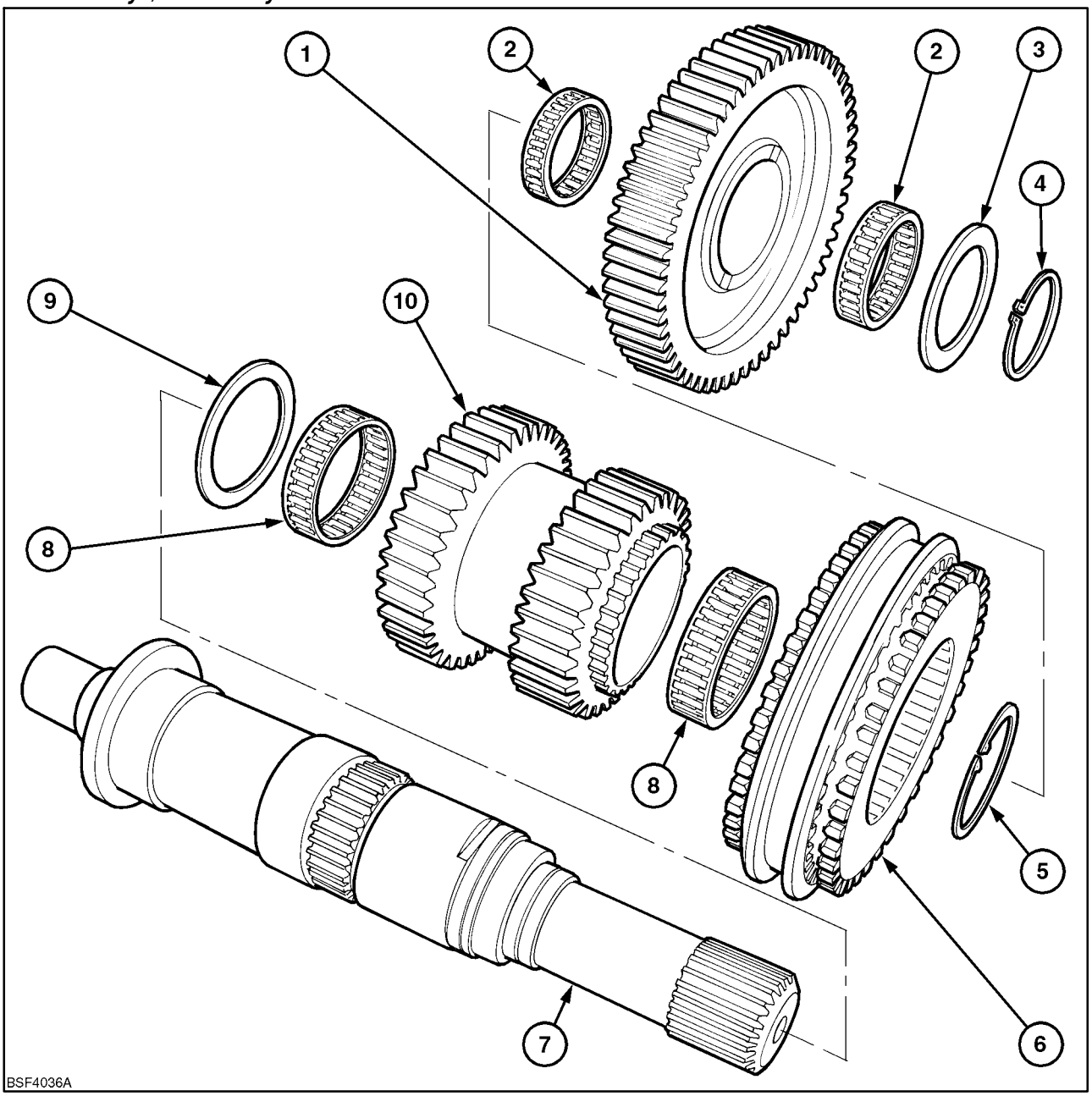
69. Install the polyimide thrust washer (3).
70. Install the manifold (2).
71. Install the washers (1), four retaining bolts and tighten to the specified torque value.



189

NOTE: *Ensure the clutch assembly is free to rotate on its support shaft without binding and that a small amount of axial end float for the C4 driven gear is present.*

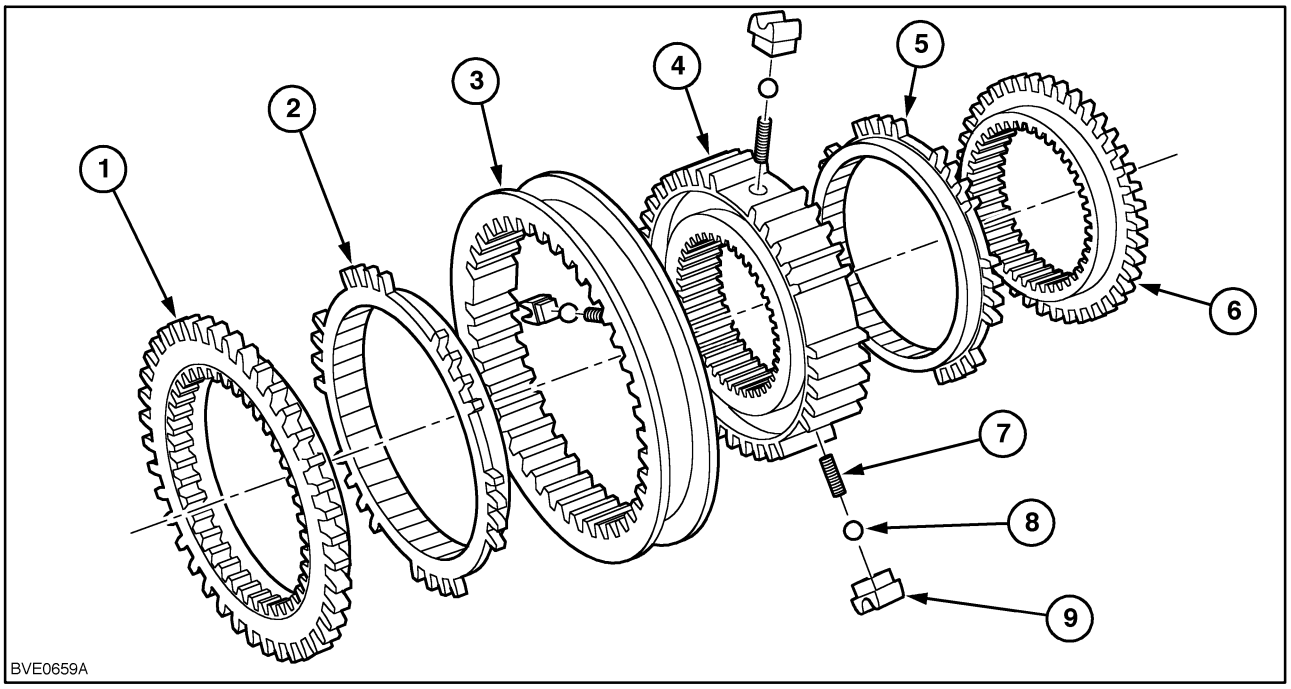
Output Shaft, Hi / Lo Range Synchronizer - Disassembly / Assembly



190

Output Shaft and High / Low Range Synchronizer - Exploded View

1. Low range output gear
2. Needle roller bearing
3. 'D' shaped steel washer
4. Circlip
5. Circlip
6. High / Low synchronizer
7. Output shaft
8. Needle roller bearing
9. Polyimide thrust washer
10. Two gear cluster

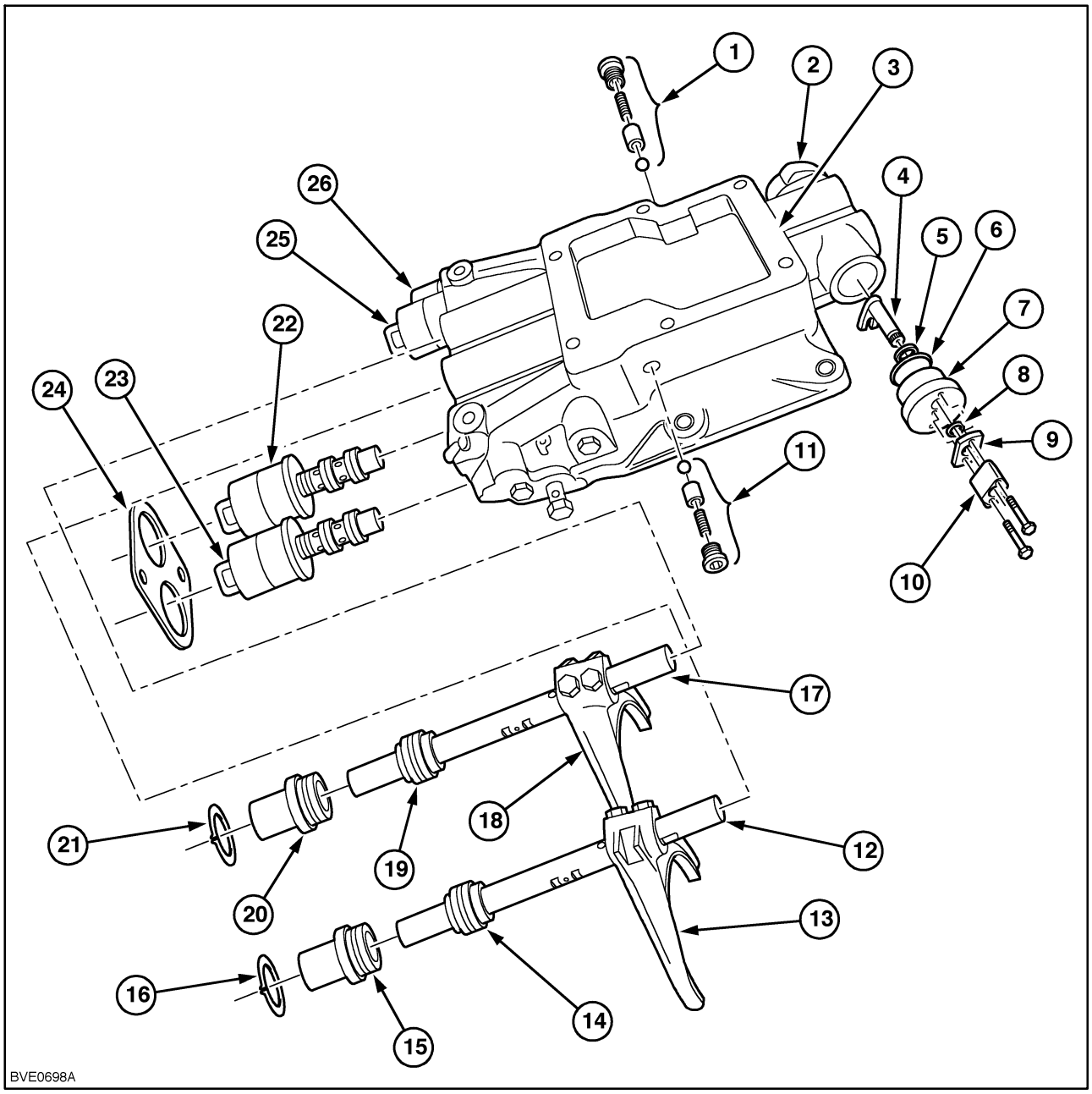


191

Hi / Lo Range Synchronizer

1. Outer cone / coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone / coupling
7. Spring
8. Detent ball
9. Detent guide

TRANSMISSION TOP COVER



192

Top Cover Exploded View

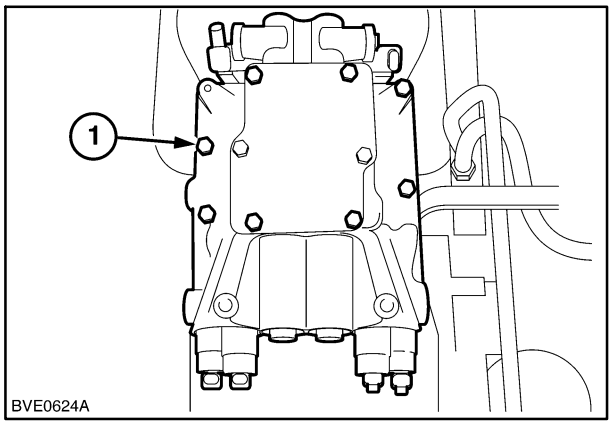
1. 1-4 / 5-8 rail detent assembly
2. 1-4 / 5-8 potentiometer
3. Transmission top cover
4. Potentiometer operating shaft
5. Shaft spacer
6. 'O' ring seal
7. Shaft support
8. 'O' ring seal
9. Potentiometer spacer
10. Forward / reverse potentiometer
11. Forward / reverse detent assembly
12. Forward / reverse fork rail
13. Forward / reverse shift fork
14. Forward / reverse piston and oil seal
15. End cap
16. Circlip
17. 1-4 / 5-8 shift fork
18. 1-4 / 5-8 fork rail
19. 1-4 / 5-8 piston and oil seal
20. End cap
21. Circlip
22. Reverse PWM solenoid
23. Forward PWM solenoid
24. PWM solenoid retaining plate
25. 1-4 PWM solenoid
26. 5-8 PWM solenoid

Removal

1. Remove the cab mat and floor.
2. Disconnect the wiring harness to the forward, reverse, 1-4 and 5-8 PWM solenoids and the synchronizer position potentiometers.
3. Disconnect the hydraulic oil supply tube.
4. Remove the transmission top cover retaining bolts (1).
5. Remove the transmission top cover.

⚠ WARNING ⚠

The top cover assembly is heavy. If necessary remove with the aid of another technician.



193

Disassembly (refer to figure 192)

6. Remove the two detent assemblies.
7. Remove the two synchronizer position potentiometers, shaft housings and operating shafts.
8. Remove the four PWM solenoid valve assemblies.
9. Remove the 1-4 / 5-8 shift rail. Remove the circlip and the end cap of the forward / reverse rail. Loosen the shift fork retaining screws. Through the potentiometer housing orifice carefully pry the 1-4 / 5-8 shift rail from the top cover.
10. Remove the forward / reverse shift rail. Remove the circlip and the end cap of the forward / reverse rail. Loosen the shift fork retaining screws. Through the potentiometer housing orifice carefully lever the forward / reverse shift rail from the top cover.

Inspection

1. Thoroughly clean the top cover, ensuring that the oil galleries from the PWM valves to the shift rail pistons are free from any obstructions.
2. Inspect the shift rails and forks. Replace if bent and in the case of the forks, the fork tips appear excessively worn.
3. Inspect all the 'O' ring seals. It is advisable to replace all of the 'O' rings as standard practice. If the oil seals on the forward / reverse or 1-4 / 5-8 pistons appear in anyway damaged or suspect they should be replaced.

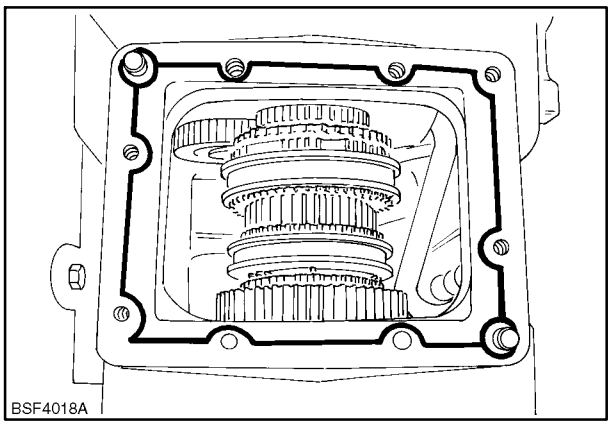
Assembly

Reassembly is the reverse of the disassembly, noting the following items:

1. Coat the piston oil seals with transmission oil prior to assembly.
2. Adjust the fork positions on their rails (refer to adjustment of forward / reverse and main (1-4 / 5-8) synchronizers in this chapter).

Installation

1. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.

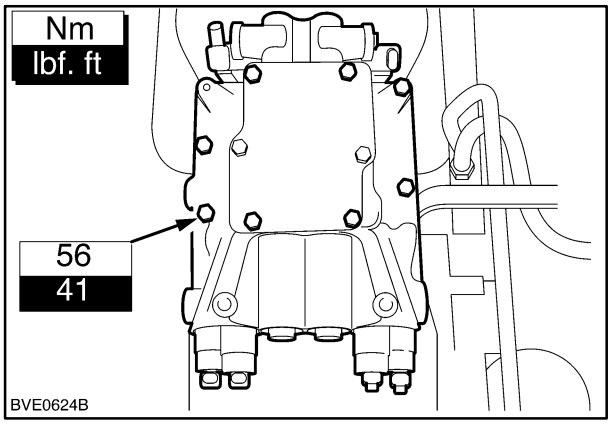


194

⚠ WARNING ⚠

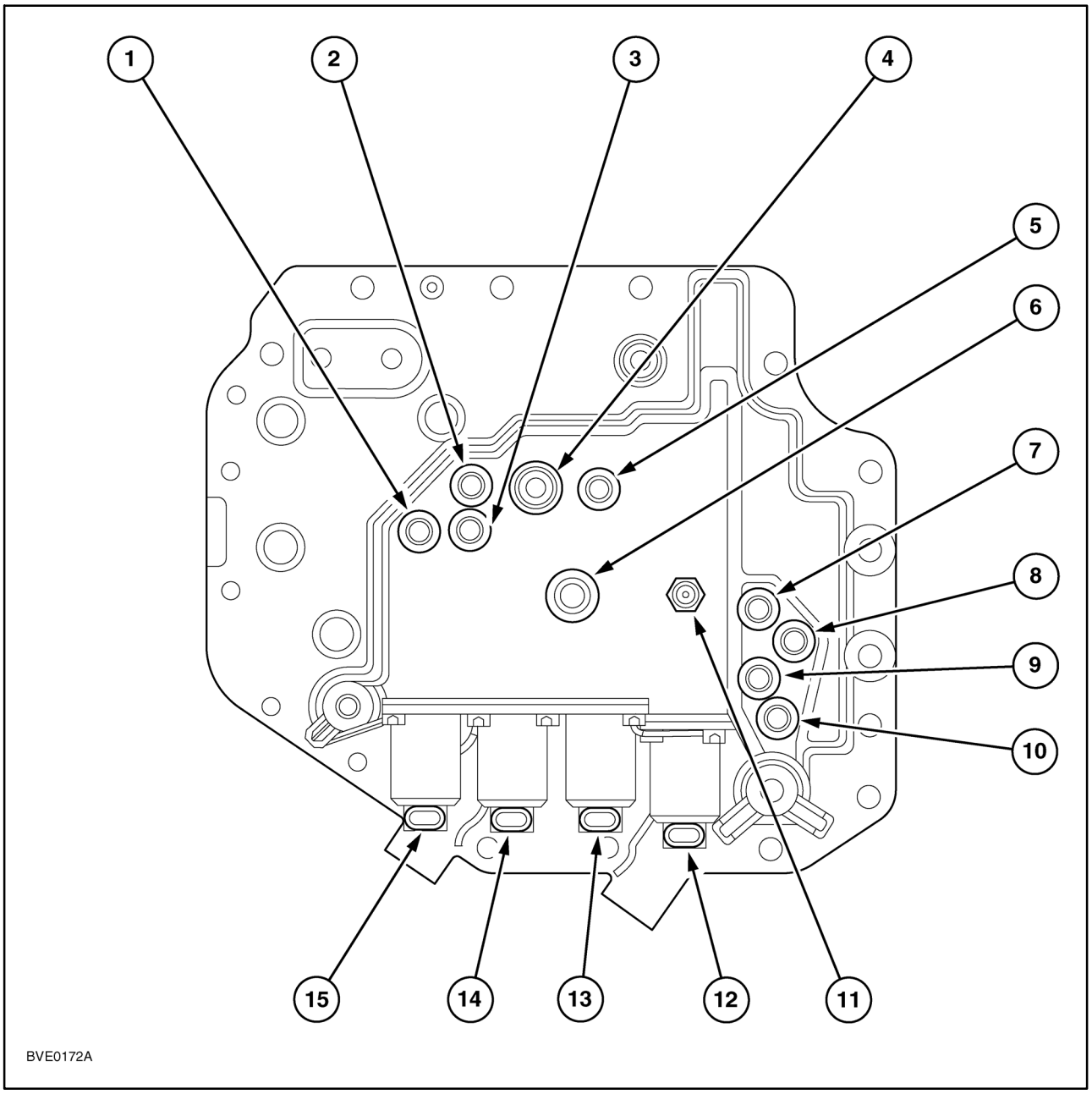
The top cover assembly is heavy. If necessary remove with the aid of another technician.

2. Install the transmission top cover and tighten the retaining bolts to the specified torque value.
3. Connect the hydraulic oil supply tube.
4. Connect the wiring harness to the forward, reverse, 1-4 and 5-8 PWM solenoids and the synchronizer position potentiometers.
5. Install the cab floor and mat.



195

TRANSMISSION CONTROL VALVE



196

Control Valve Pressure Test Ports and Solenoid Valve Identification

1. C4 Pressure test port
2. C3 Pressure test port
3. C3 / C4 Lube pressure test port
4. Lube inlet connector
5. Lube supply pressure test port
6. Regulated pressure inlet
7. C2 Pressure test port
8. C1 / C2 Lube pressure test port
9. C1 pressure test port
10. Transmission bearing / synchroniser lube pressure
11. Oil temperature sender
12. C1 PWM solenoid valve
13. C2 PWM solenoid valve
14. C3 PWM solenoid valve
15. C4 PWM solenoid valve

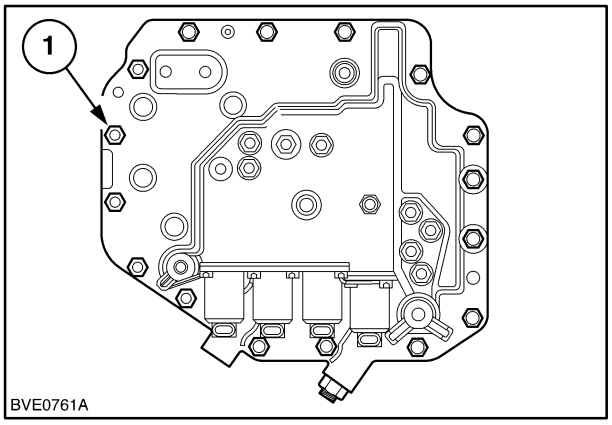
The following procedure treats the transmission as removed from the tractor. It is possible to remove the control valve assembly from the transmission without removing the transmission from the tractor. Removal of the surrounding oil supply tubing, the accumulator and other peripheral hardware is necessary.

It should be noted that unless contaminant is suspected to be within the control valve cover oil galleries or there is a suspected fault within the lubrication control valve, it is not necessary to remove the valve cover to remove any of the PWM solenoids.

NOTE: *During removal of the control valve and the connecting hardware, it is essential that outside contaminant is not permitted to enter the inside of the transmission. If necessary steam clean the outside of the control valve area before proceeding to remove the valve assembly.*

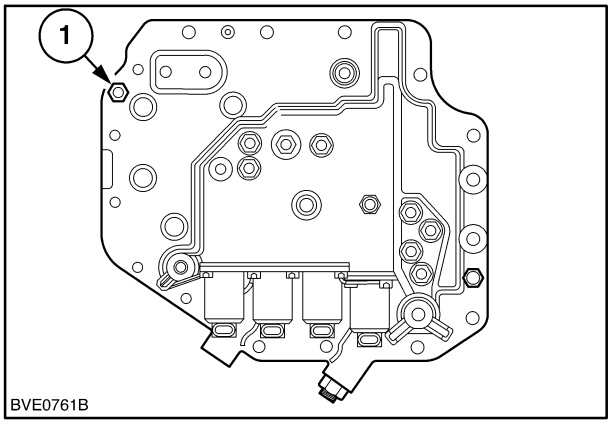
Removal

1. Drain the transmission / rear axle oil into a suitable container.
2. Remove the surrounding oil supply tubing, accumulator and other peripheral hardware.
3. Remove the control valve cover retaining bolts (1).



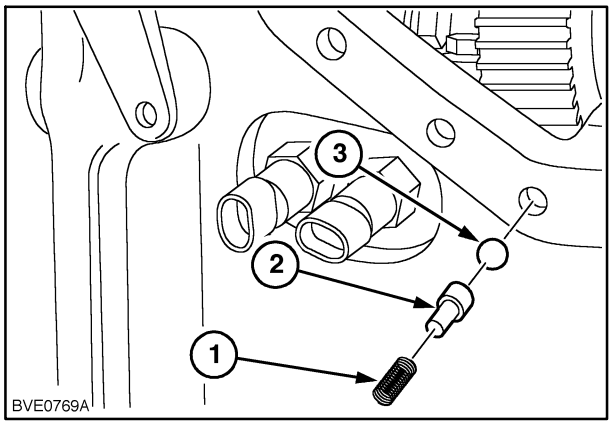
197

4. Using the separating holes (1) separate the transmission control valve from the transmission housing.



198

5. Remove the Hi / Lo rail detent spring (1), detent ball actuator (2) and the detent ball (3).



199

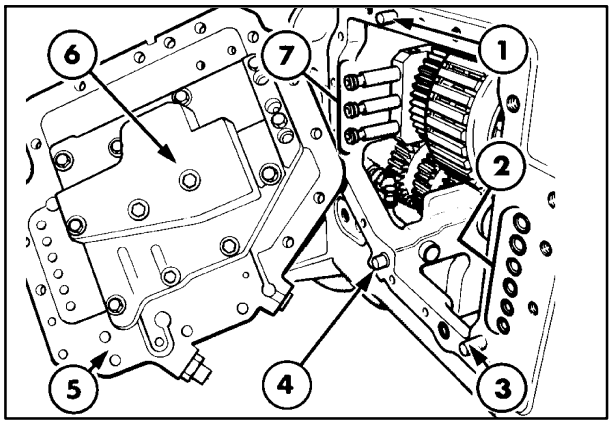
NOTE: *Absolute cleanliness is essential during disassembly and reassembly of the control valve. Ensure the working area is clean and not likely to be contaminated by other working operations being performed alongside. It is recommended that only a clean, dust free environment is used for the overhaul.*

LUBRICATION VALVE

Removal and Disassembly

Place the control valve face down on a clean surface and remove the retaining bolts retaining the lubrication valve assembly to the side cover. Carefully lift off the lubrication valve, noting the gasket between the two castings.

Remove the end plugs and withdraw the spools and springs as shown in Figure 201.



200

Side Cover Assembly Removal

1. Dowel
2. 'O' Ring
3. Dowel
4. High / Low Detent
5. Side Cover
6. Lubrication Control Valve
7. C3 / C4 Supply Tubes

NOTE: *Note if any contamination is expelled when cleaning, which may have caused an oil blockage or a sticking valve.*

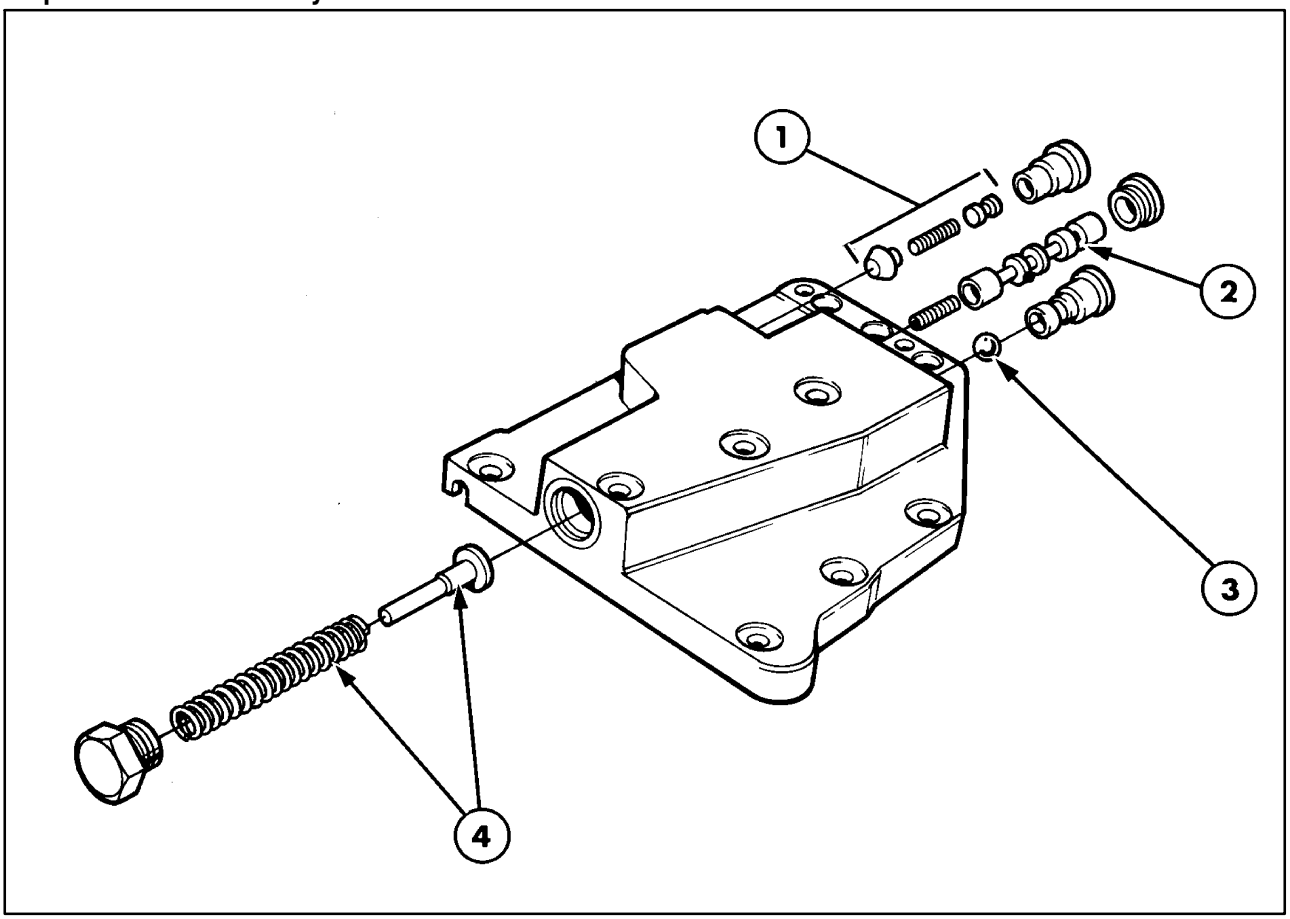
Clean the valve body in a suitable cleaning solvent and use compressed air to dry.

Examine the valves and bores for wear or damage, replace parts as necessary.

Assembly is the reverse of the disassembly. Coat all components with clean transmission oil of the correct specification just prior to assembly.

Prior to assembling the lubrication valve to the cover, ensure the mating faces are clean and fit a new gasket. **Do not use a liquid gasket sealant between these surfaces.**

Inspection and Assembly



201

Lubrication Valve Assembly

1. Lubrication Pressure Relief Valve
2. Lubrication Control Valve Spool
3. Lubrication Shuttle Valve Ball
4. Lubrication Valve Spool Spring (220 lb) and Plunger

CONTROL VALVE COVER

Disassembly

Remove the four PWM solenoid valves and the oil temperature sender.

Inspection and Assembly

NOTE: *Note if any contamination is expelled when cleaning, which may have caused an oil blockage or a sticking valve.*

Clean the cover in a suitable cleaning solvent and dry with compressed air.

Carefully examine the cover for hairline cracks or other damage which may have caused oil leakage. Replace the cover if any damage or cracks are found, do not attempt a repair.

Clean the complete PWM valve assemblies, less the solenoids, in a suitable cleaning solvent. It is not recommended to disassemble the PWM valves further to clean. If the performance of the valve is suspect and no contaminant is found during cleaning, but the solenoid is within specification, the valve should be replaced with a new one.

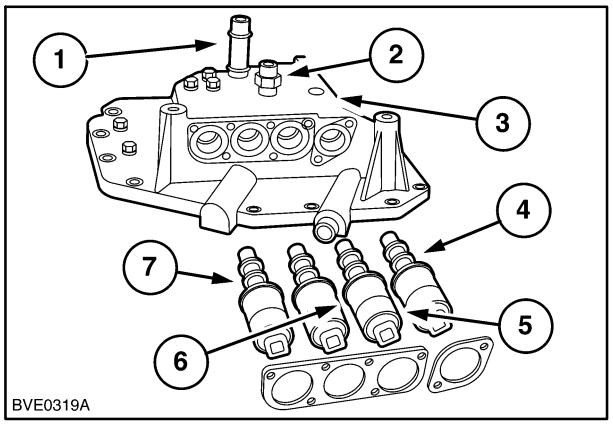
Assembly is the reverse of the disassembly. Ensure the 'O' rings of all the solenoid valve assemblies are in good condition prior to installation. Coat the valve components with clean transmission oil of the correct specification prior to assembly.

Tighten the retaining bolts to a torque value of 27 Nm (20 lbf.ft).

CONTROL VALVE

Assembly

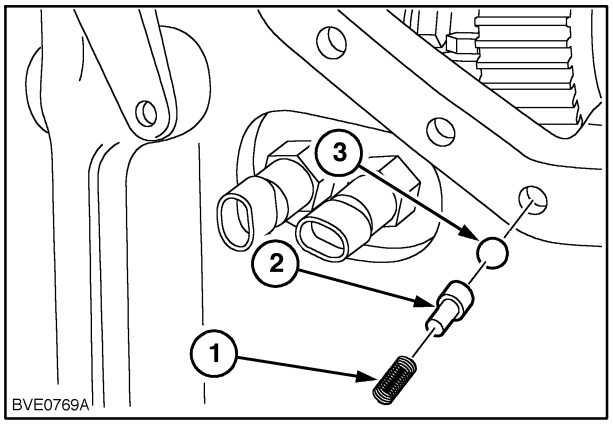
1. Lubrication Supply Inlet Connector
2. Regulated / Pressure Supply Inlet Connector
3. Transmission Oil Temperature Sender
4. C1 PWM Solenoid and Valve Assembly
5. C2 PWM Solenoid and Valve Assembly
6. C3 PWM Solenoid and Valve Assembly
7. C4 PWM Solenoid and Valve Assembly



202

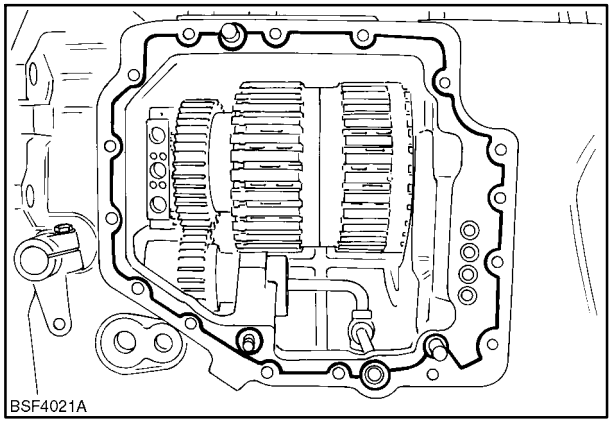
Installation

1. Install the Hi / Lo detent ball (3), detent ball actuator (2) and the Hi / Lo rail detent spring (1).



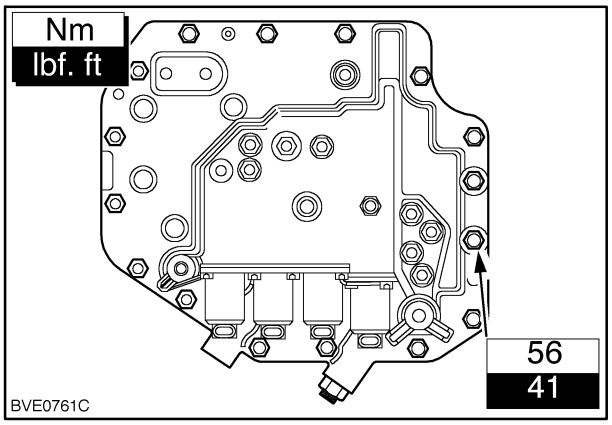
203

2. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2 mm diameter following the pattern shown.



204

3. Install the control valve cover and tighten the retaining bolts to the specified torque value.
4. Install the surrounding oil supply tubing, accumulator and other peripheral hardware.
5. Refill the transmission / rear axle with the correct specification oil.

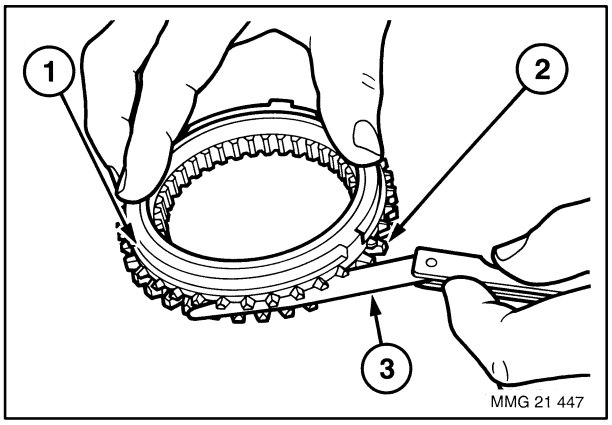


205

SYNCHRONIZER

Inspection

1. Inspect the main range and forward / reverse synchronizer components for wear and damage as follows:-
   - Inspect the cone (1) for wear and damage and discolouration, if excessive renew the synchronizer.
   - Check the gap between the cone and end plate,(2), if the gap is less than that specified renew the synchronizer.



206

Measuring Main Range synchronizer for Serviceable Life

1. Friction cone
2. Outer cone / coupling
3. Feeler blade

	Minimum Gap	
Main synchronizer 1-4, 5-8	mm 0,5	inches 0.020
Foward / Reverse synchronizer	0,8	0.0315
Hi / Lo synchronizer	0,85	0.0335

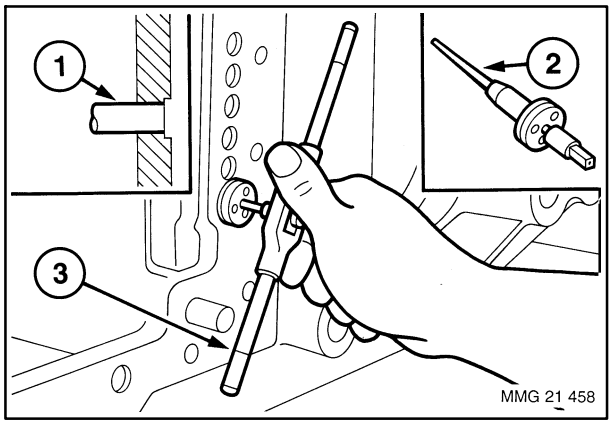
TRANSMISSION HOUSING TRANSFER TUBES

Removal / Installation

1. Cut the tube with a hacksaw at a convenient distance from the rolled in location.

2. Very gently tap the sawn end to drive the rolled in area out of the housing.

3. Thoroughly clean the housing and install the new tube easing it into its location points. The tube ends should be flush with the bottom of the counterbore in the transmission housing, as shown in Figure 207.



207

4. Using the special 'rolled in' tube rolling tool and gauge, roll in the tube, shown in Figure 207, as follows:-

   a). Position the tool,(2), so that the rollers of the tool are fully entered in the tube and using a conventional tap wrench,(3) Figure 207, 'screw in' the centre portion until all looseness is removed. Check that the tube ends are still flush with the bottom of the counterbore in the housing,(1) Figure 207.

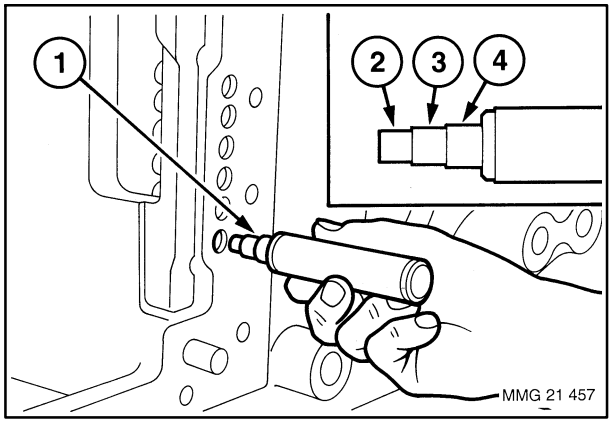
   b). Continue to turn the 'centre screw' of the tool to expand the tube against the housing. Firm pressure will be required on the end of the tool. Remove the tool.

IMPORTANT: *Do not allow the tube to be over rolled (last section of gauge will enter tube) as this could lead to flaking and over stressing of the seal. If the last diameter of the gauge enters the tube, the tube has been over rolled and is not fit for use. Remove the tube, use a new tube and repeat the process.*

   c). Use special tool **4FT 511**, 'Go / No Go' Gauge, (1), Figure 208, and establish if the 'Go' portion (centre diameter) of the gauge will enter the bore of the tube. The first diameter indicates that rolling has begun.

   d). Continue steps b and c until the 'Go' area (middle diameter) of the Special Tool, just enters the tube.

Thoroughly clean the tube along its entire length. Repeat the process on the other end of the tube.



208

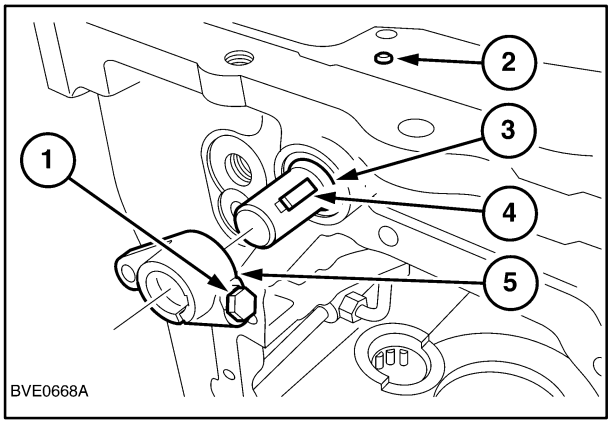
Using 'Go' and 'No Go' Gauge to Check Amount of Rolling

1. Gauge special tool **4FT 511**
2. 'Go' and continue rolling diameter
3. 'Go' stop rolling
4. Over rolled diameter (take new tube and start again)

TRANSMISSION

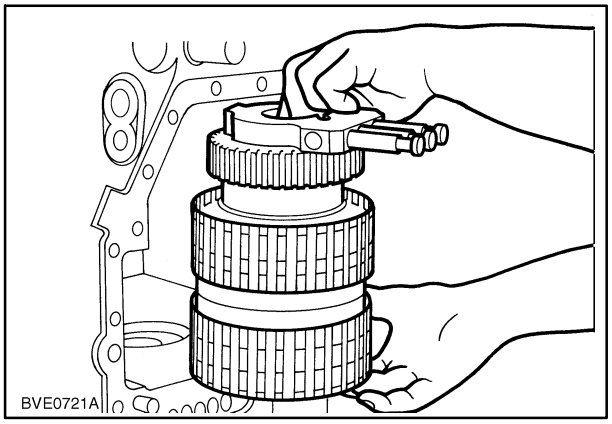
Assembly

1. Install the shaft (3), locking pin (2) and the woodruff key (4).
2. Install the selector actuator (5) and tighten the clamping bolt (1).



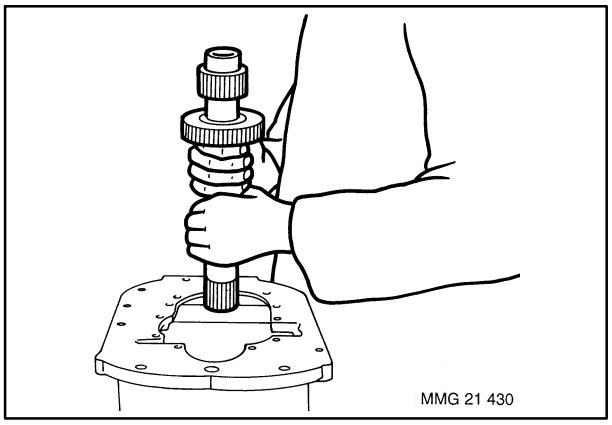
209

3. Install the C3/C4 clutch and oil supply manifold assembly into the transmission housing.



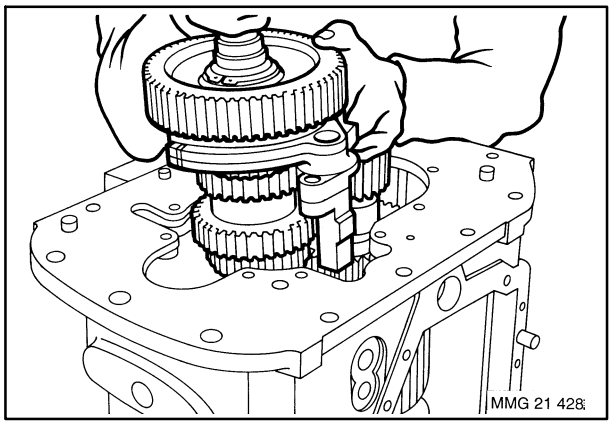
210

4. Install the C3 clutch output shaft.



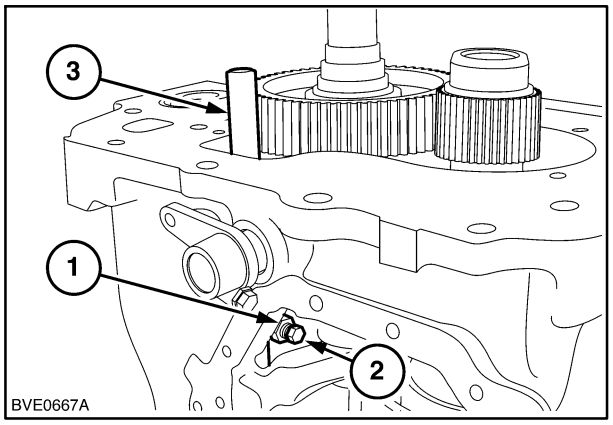
211

5. Install the output shaft, high/low synchronizer and shift fork into the transmission housing as a complete assembly.



212

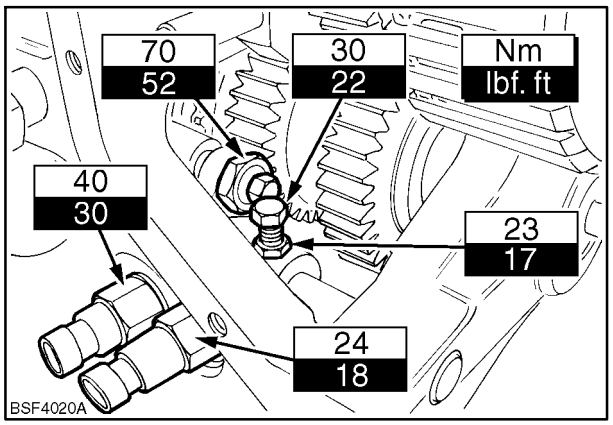
6. Install the high/low selector fork rail (3).
7. Install the rail locking bolt (2), locknut (1) and tighten to the specified torque value.



213

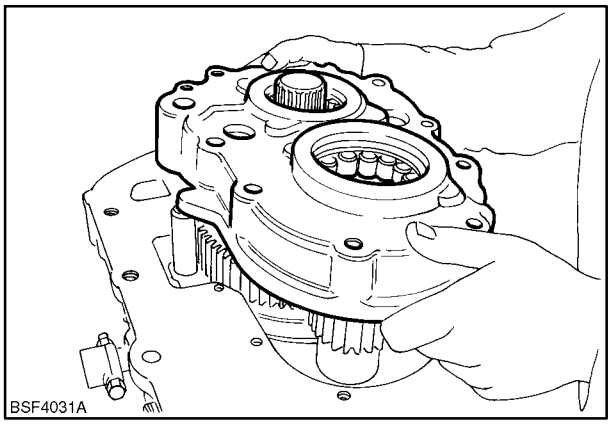
NOTE: *Note that the switches have differing thread sizes and cannot be interchanged.*

8. Install the high range and low range switches. Tighten to the specified torque value.



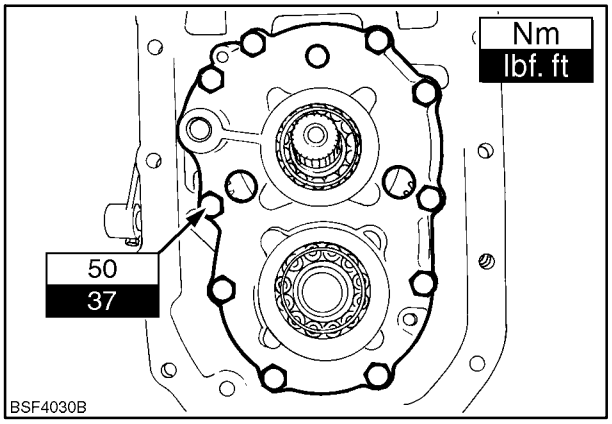
214

9. Install the rear cover assembly.



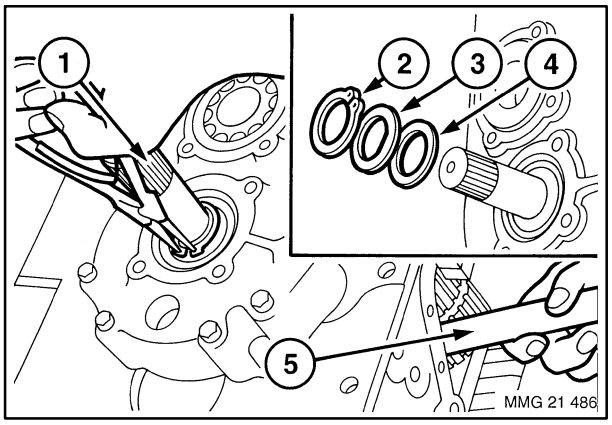
215

10. Install the rear cover retaining bolts and tighten to the specified torque value.



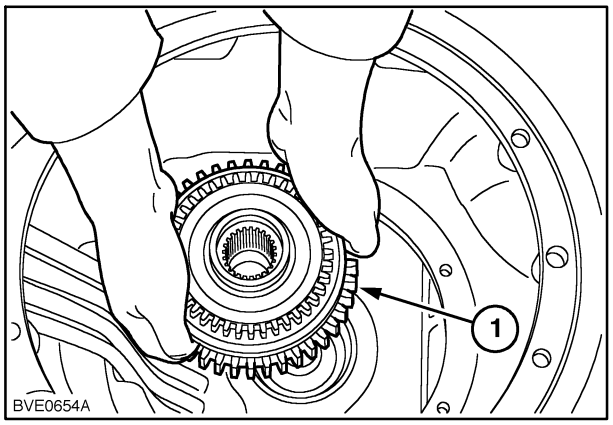
216

11. Rotate the transmission until the rear of the transmission is in a vertical position.
12. Using a suitable lever (5), raise the output shaft assembly (1) to enable the installation of the circlip.
13. Install the roller bearing thrust washer (4), 'D' shaped washer (3) and the circlip (2).



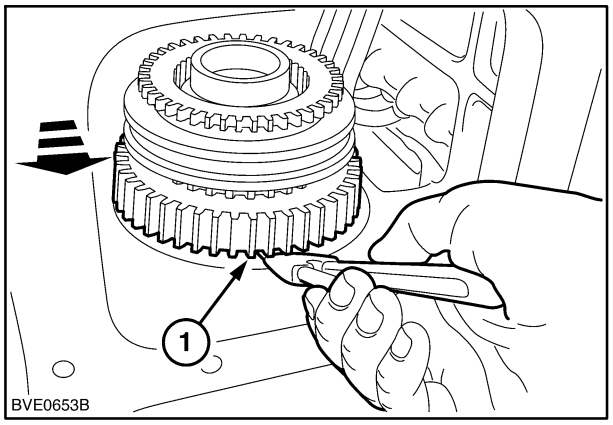
217

14. Rotate the transmission to a vertical position.
15. Install the main synchronizer and low main gear assembly (1).



218

16. Using suitable snap ring pliers, expand the snap ring (1) and install the main synchronizer into the transmission housing.



219

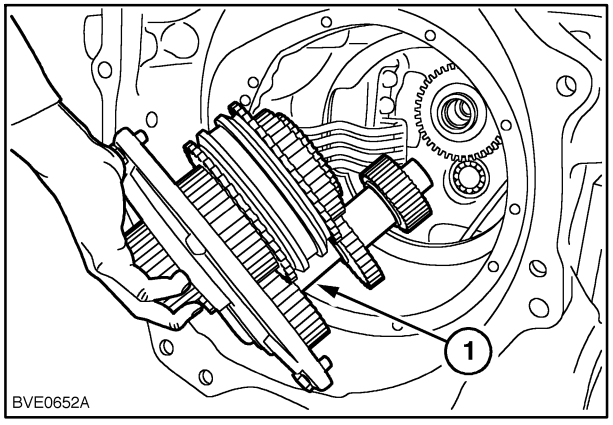
17. Rotate the transmission to a horizontal position.

⚠ WARNING ⚠

Take care when lifting heavy components.

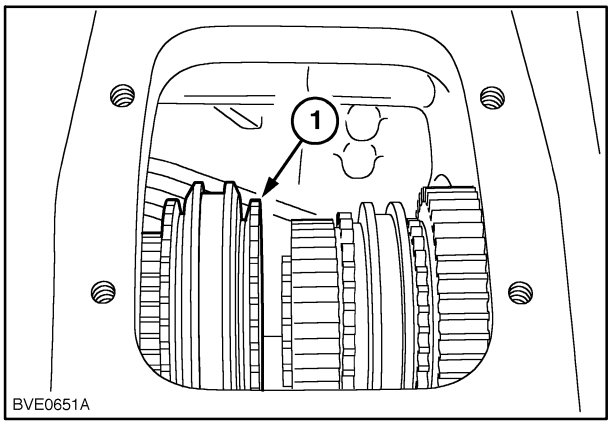
NOTE: *It may be necessary to apply petroleum jelly to the synchronizer components and needle roller bearings to aid assembly.*

18. Loosely install the inner cover assembly (1) into the transmission housing.



220

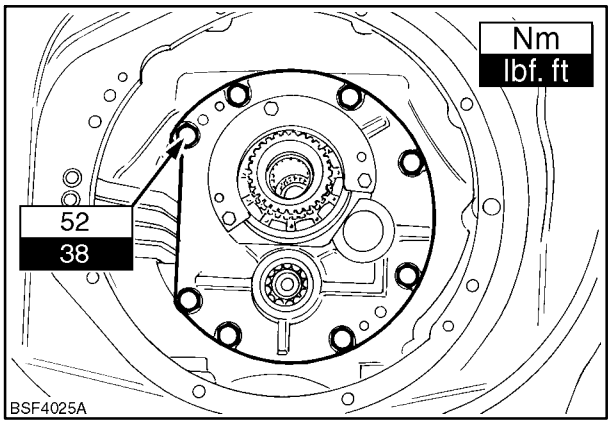
19. Align the inner cover assembly (1) with the synchronizer, lower shaft and reverse idler gear.



221

NOTE: *Make sure the inner cover assembly is aligned with the synchronizer, lower shaft and reverse gear idler.*

20. Rotate the transmission to a vertical position.
21. Install the inner cover plate retaining bolts and tighten to the specified torque value.



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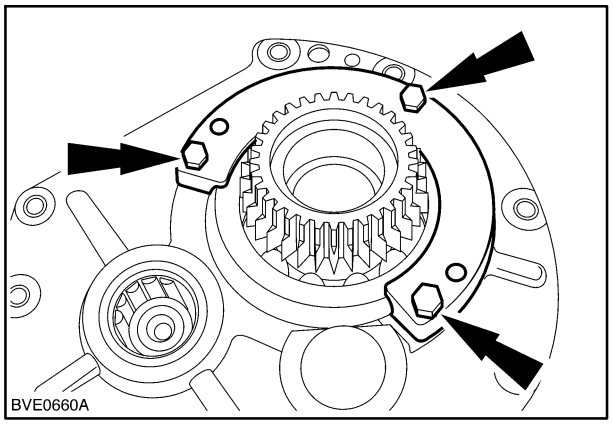
ADJUSTMENTS

FORWARD / REVERSE SYNCHRONIZER END-FLOAT

NOTE: *It is necessary to adjust the running clearance of the components on the forward/reverse synchronizer support shaft. The clearance is obtained by the placement of shim(s) behind the forward/reverse synchronizer support shaft front bearing retaining snap ring.*

IMPORTANT: *The transmission must remain in the vertical position during this operation. The rear end components must have been installed and the rear top shaft rear bearing retainer must be in position and fully secured.*

22. Remove the forward/reverse synchronizer bearing retaining plate.



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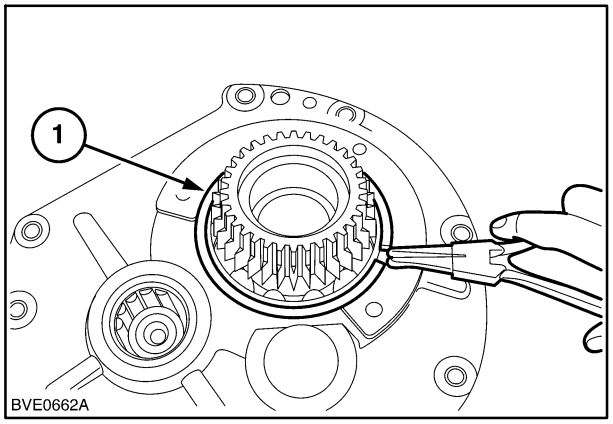
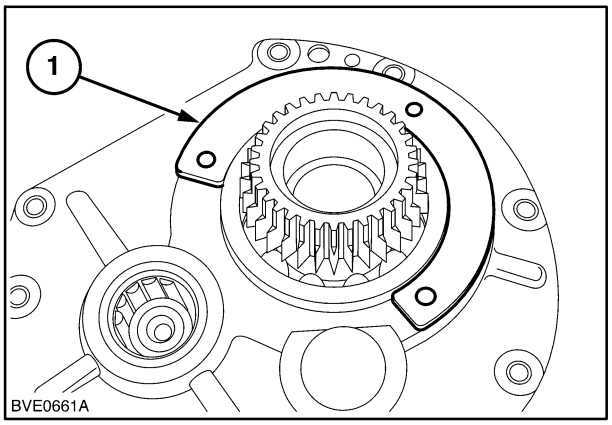
23. Using suitable snap ring pliers, remove the forward/reverse synchronizer bearing retaining snap ring (1).



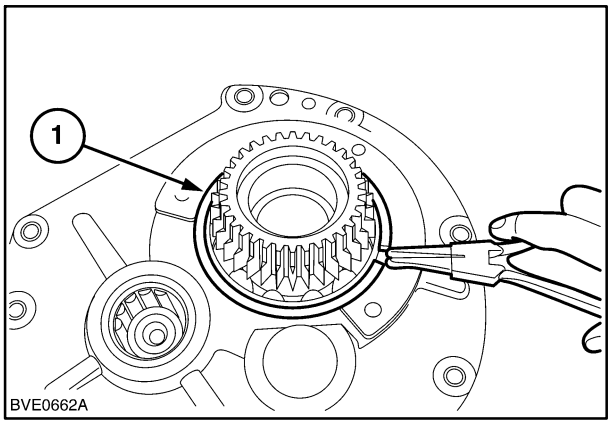
224

24. Remove the forward/reverse synchronizer end float adjustment shims (1).



225

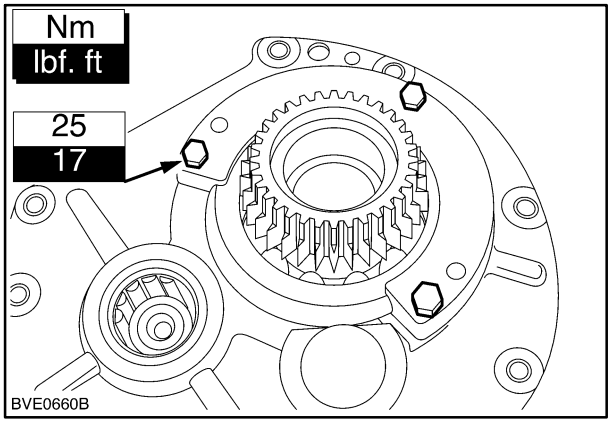
25. Using suitable snap ring pliers, install the forward/reverse synchronizer bearing retaining snap ring (1).



226

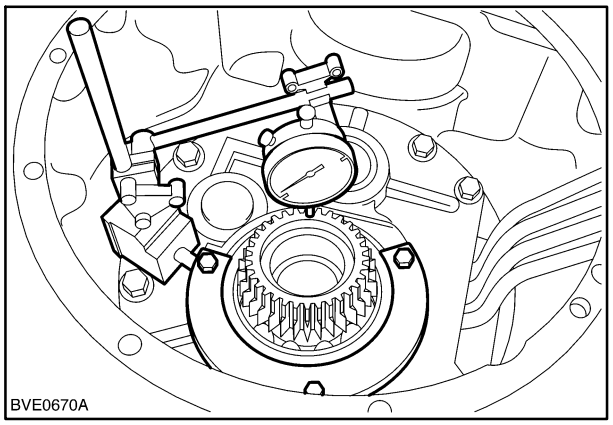
NOTE: *Using a suitable soft faced mallet, gently tap the synchronizer support shaft downward to seat the components. Be careful not to damage any components.*

26. Install the forward/reverse synchronizer bearing retaining plate and tighten the retaining bolts to the specified torque value.



227

27. Using a suitable dial gauge, measure the end-float of the forward/reverse synchronizer.



228

28. Do this by raising the forward/reverse synchronizer at the positions indicated.

This measurement is H1

29. Determine the forward/reverse synchronizer end-float adjustment shim(s) (**S**) as follows:

S = H1 - 0.5 mm

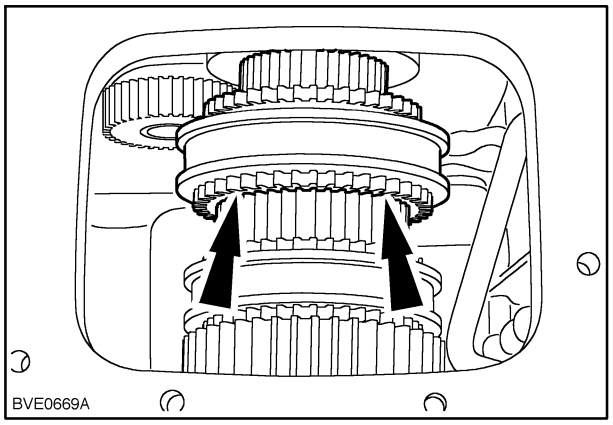
Where:

H1 = End-float of the forward/reverse synchronizer

0.5 mm = Average of the specified end-float 0.4 to 0.6

S = Forward/reverse synchronizer end-float adjustment shim(s)

30. Install the calculated adjustment shim(s).
31. Tighten the retaining bolts to the specified torque value.



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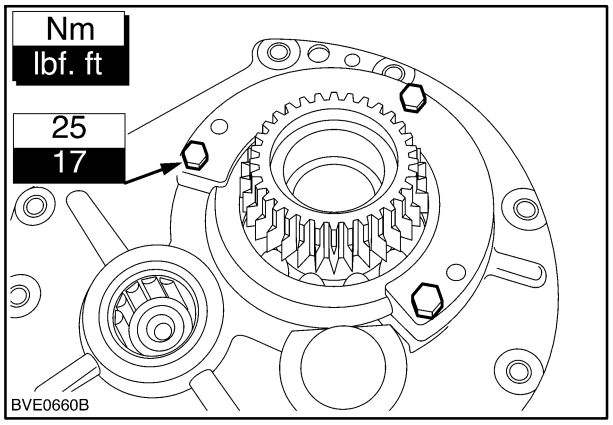

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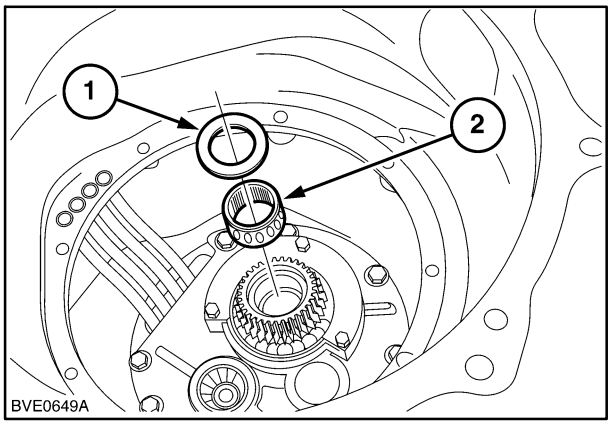
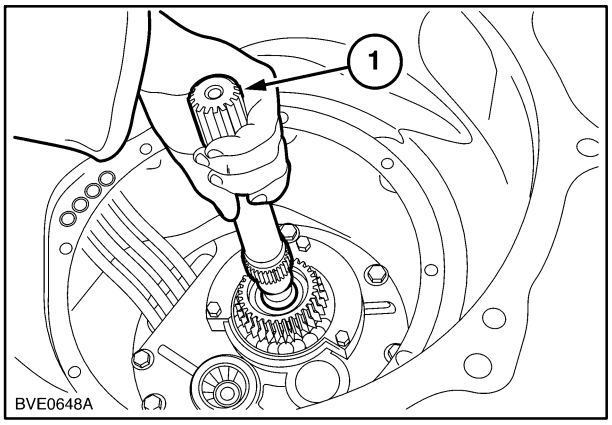
32. Install the needle roller bearing (2) and the steel thrust washer (1).



231

33. Install the PTO input shaft (1).



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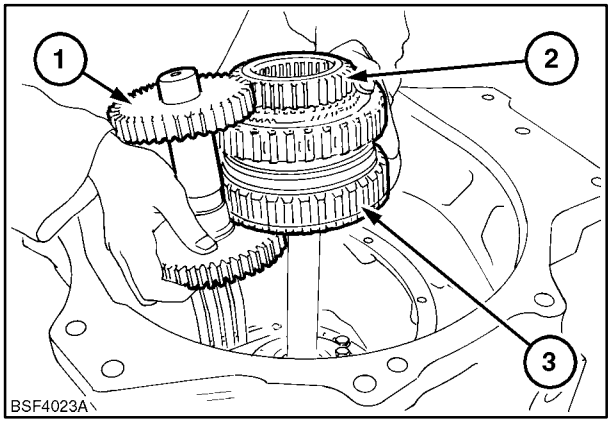
34. Install the C1/C2 clutch (3), output gear (2) and the front lower shaft (1).



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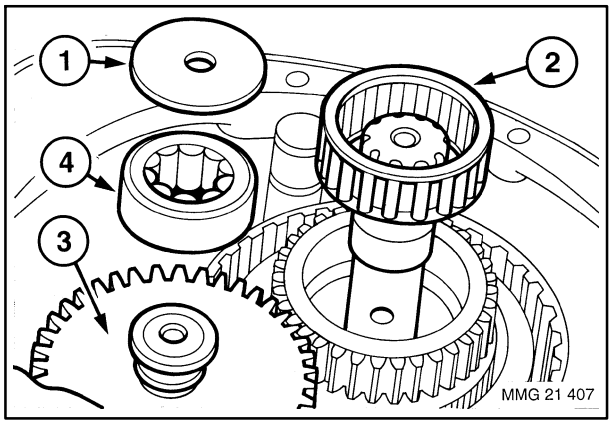
35. Install the C1 clutch output gear needle roller bearing (2), front roller bearing (4) and the baffle plate (1).



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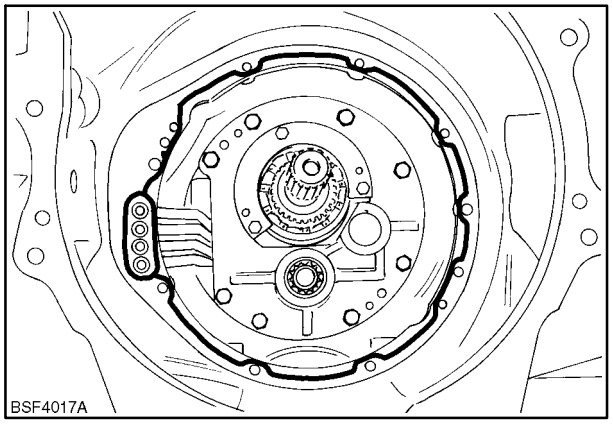
36. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



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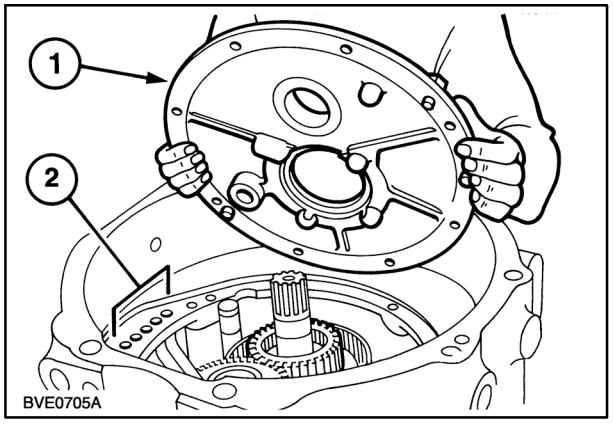
37. Install the O-rings (2) and the front cover plate (1).



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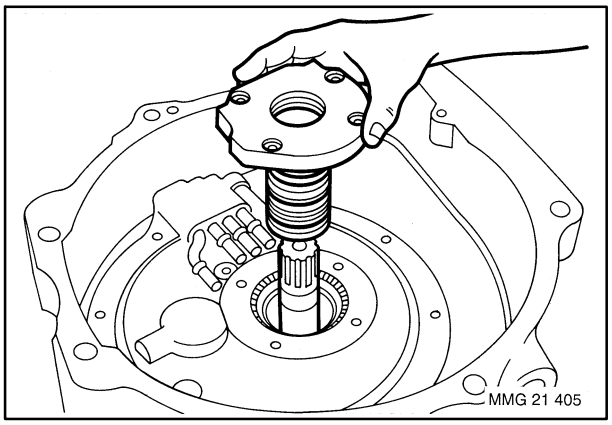
38. Loosely install the C1/C2 clutch support manifold.

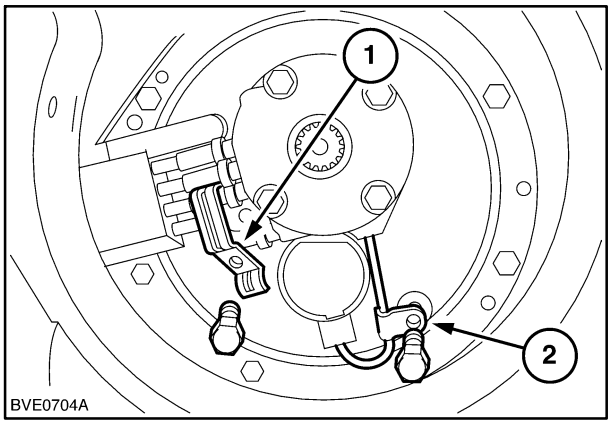
NOTE: *Do not tighten the bolts at this stage.*

39. Install the C1/C2 clutch support manifold retaining bolts.



237

40. Install the oil transfer tube retaining bracket (1) and the lubrication oil supply tube (2).



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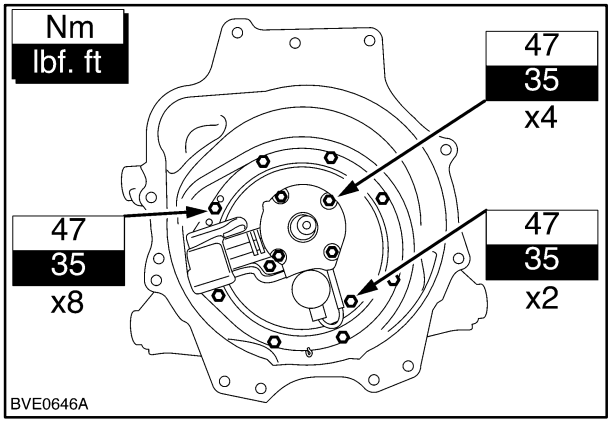
41. Tighten the front cover, clutch support manifold and the bracket retaining bolts to the specified torque value.
42. Install the transmission control valve (refer to transmission control valve overhaul in this chapter).
43. Install the transmission top cover (refer to transmission top cover overhaul in this chapter).



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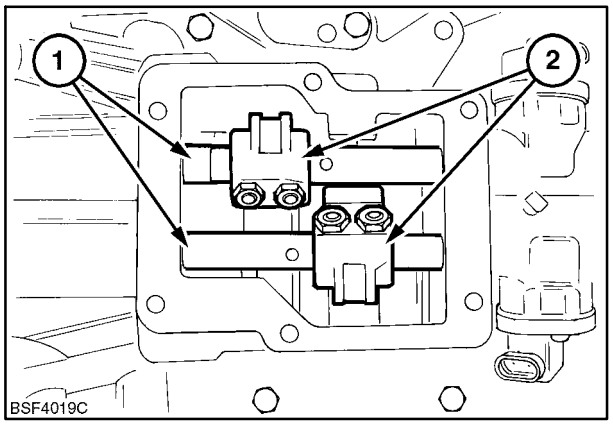
FORWARD/REVERSE AND MAIN (1-4/5-8) SYNCHRONIZERS

To gain access to the synchronizer forks and rails it is necessary to remove the cab mat and floor.

Remove the transmission cover plate to expose the shift rails (1) and forks (2).

Remove the detent spring, plunger and ball from the transmission cover.



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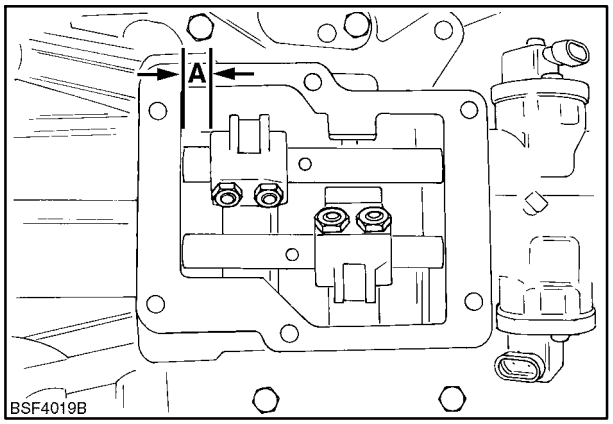
The adjustment procedure is the same for both synchronizers.

Using a suitable lever, fully position the synchronizer in the engaged position and measure the distance A.



241

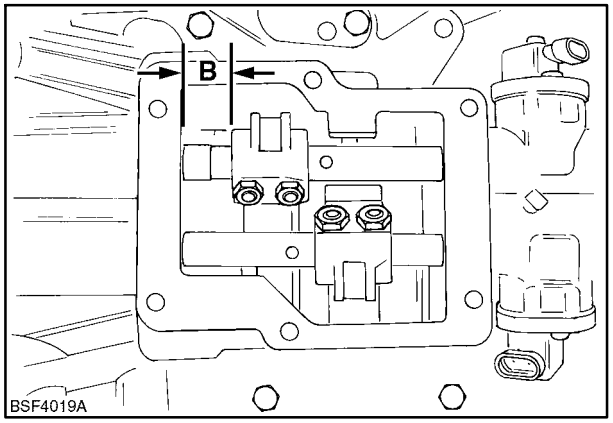
Now fully position the synchronizer in the opposite fully engaged position and measure distance B.

Replace the detent spring, plunger and ball. Set the shift rail to neutral.

Adjust the fork to its neutral position.

Neutral N = $\frac{A + B}{2}$

Tighten the fork lock screws.



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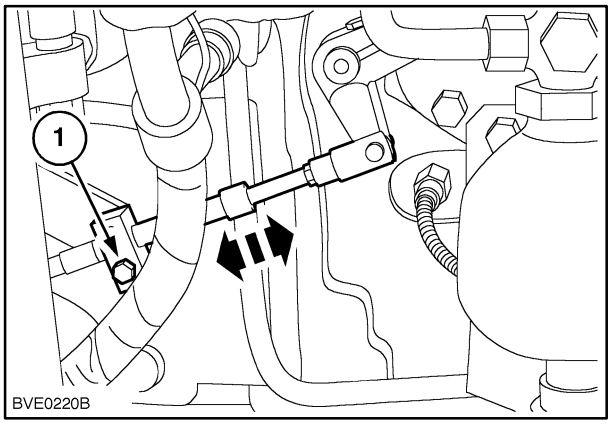
HIGH/LOW RANGE CABLE

1. Place the high/low synchronizer in the neutral position.
2. Loosen clamp bolt (1).
3. Position the high/low selector lever in the cab centrally.
4. Tighten clamp bolt (1).
5. Operate the high/low selector lever and ensure that the synchronizer fully engages. If the lever travel contacts the console slot, repeat the adjustment procedure.



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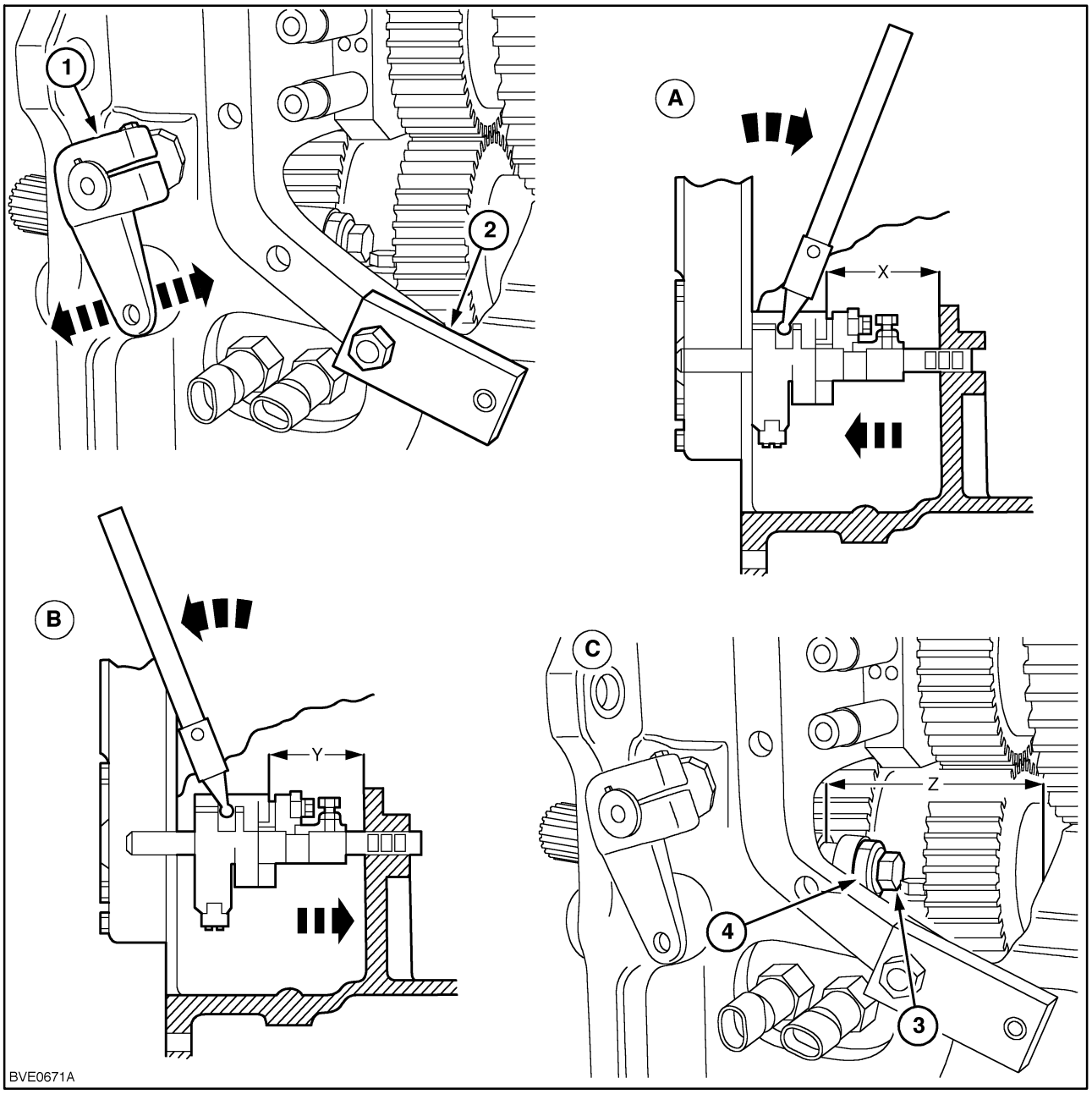
HIGH/LOW SYNCHRONIZER



244

Centralising high/low range synchronizer selector fork

A. High/Low fork moved fully rearward
B. High/Low fork moved fully forward
C. High/Low fork in neutral and adjusting mid-point
1. High/Low selector actuator
2. Detent ball spring retainer (**Note:** hole to allow stem of detent to protrude)
3. Adjuster screw
4. Adjuster screw locking nut

Position the high/low synchronizer fork rail in neutral and install the rail detent ball, the ball actuator and the spring.

Fabricate a simple plate from 3mm (0.125") strip steel so that the plate straddles the rail detent bore and allows the stem of the detent ball actuator to protrude (only the spring needs to be compressed). Bolt the plate across the control valve retaining bolt holes so that it compresses the detent spring and holds the rail in neutral, Figure 244.

Ensure the rail to fork set screw and locknut are installed and tightened. Also ensure that the adjustable high/low fork adjusting screw is tightened.

Using an adjustable wrench to act on the high/low range selector actuator (1), Figure 244, move the synchronizer backward and forward to engage the high and low ranges several times, in order to seat all the components.

Using the selector actuator (1), move the fork and synchronizer into the engaged low range position, shown at A in Figure 244 and hold the lever fully hard in this position (beyond the natural point of detent). Establish a datum point and from that datum using a vernier caliper, measure the distance to the selector fork in the low range position. Record the measured distance, **X** in Figure 244.

Again using the lever move the fork and synchronizer into the fully engaged high range position, shown at B in Figure 244 and hold hard in that position (again possibly beyond the natural point of detent) and from the previously established datum point, measure the distance to the fork in the high range position. Ensure that the point of measurement on the fork is exactly the same as when the fork was measured in the low range position. Record this distance, **Y** in Figure 244.

Neutral (mid-point) Z = (X + Y) ÷ 2

This resultant measurement **Z**, shown at C in Figure 244, is the neutral position for the high/low synchronizer.

Move the fork and rail so that the neutral detented position is selected.

Loosen the adjustable fork adjusting screw locknut and by rotating the screw, adjust the position of the fork relative to the rail to achieve the previously calculated mid-point position. Tighten the adjuster locknut to 58-80 Nm (43-59 lbf. ft).

Move the fork and synchronizer in and out of high and low range several times and re-check the adjustment.

NOTES

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Chapter 2 - 24 x 24 Transmission

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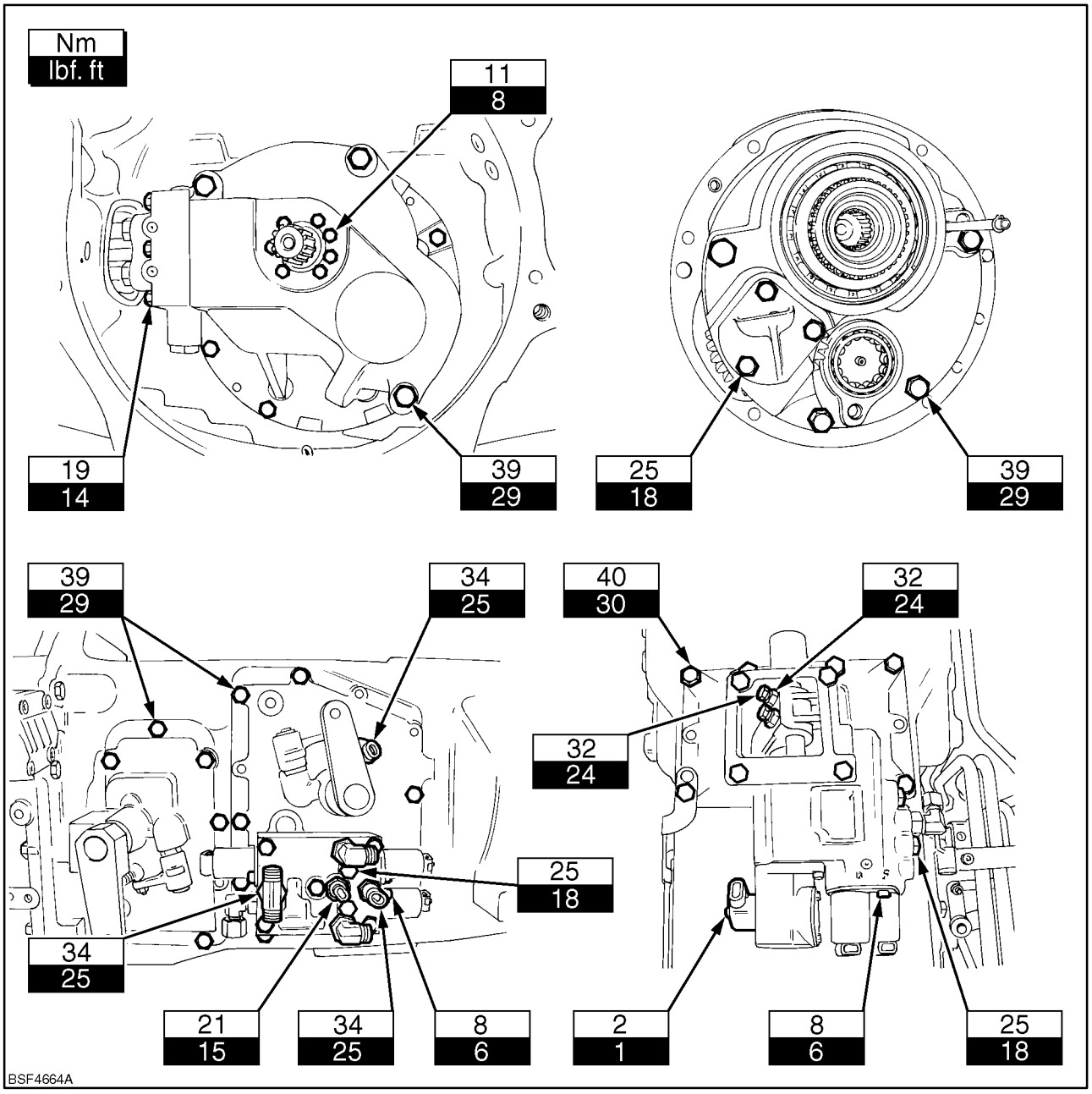
SPECIFICATIONS

24 x 24 Transmission	
Type	24 forward and 24 reverse speeds, using straight cut gears, two multi-wet plate clutches and friction cone synchronizers
Control system	Electro-hydraulic with electronic management system
Hydraulic Control Valve	
Type	Separate casting, with internal cast-in galleries
Control	Electronically operated solenoid coils controlled by electronic management system
Multi-Wet Plate Clutches	
Type	Constant running, pressure lubricated, pressure applied, spring released
Number of friction plates	6 in each clutch
Number of steel plates	5 in each clutch
Number of belleville washers	7 in each clutch
Belleville washer stack height check ..... Free Height	25.9mm
..... 2400N Loaded Height	12.6mm
Number of separating springs	6 in each clutch
Separating spring height check ..... Free Height	5.08mm
..... 180N Loaded Height	2.67mm
..... 422N Loaded Height	1.88mm
Operating pressure ..... bar	17 - 19
..... $lbf.in^2$	247 - 276

Driveline Oil	
Specification	Ambra Multi-G (NH 410B)
Capacity (transmission/rear axle) with light duty rear axle	Litres - 58.8 Imp. Gallons - 12.8 U.S. Gallons - 15.4
Capacity (transmission/rear axle) with heavy duty rear axle	Litres - 65.5 Imp. Gallons - 14.4 U.S. Gallons - 17.3
Adjustments	
Output shaft end float mm	0.038 - 0.089
Output shaft end float adjustment shims available mm	0.076, 0.125, 0.305, 0.762
C1 cluster gear shaft end float mm	0.050 - 0.075
C1 cluster gear shaft end float adjustment shims available mm	0.076, 0.125, 0.305, 0.762
Clutch plate set height mm	24.2 ±0.1
Clutch steel plate thicknesses available mm	2.0, 2.2
Adjustable link rod mm	83.5 - 84.9

TIGHTENING TORQUES



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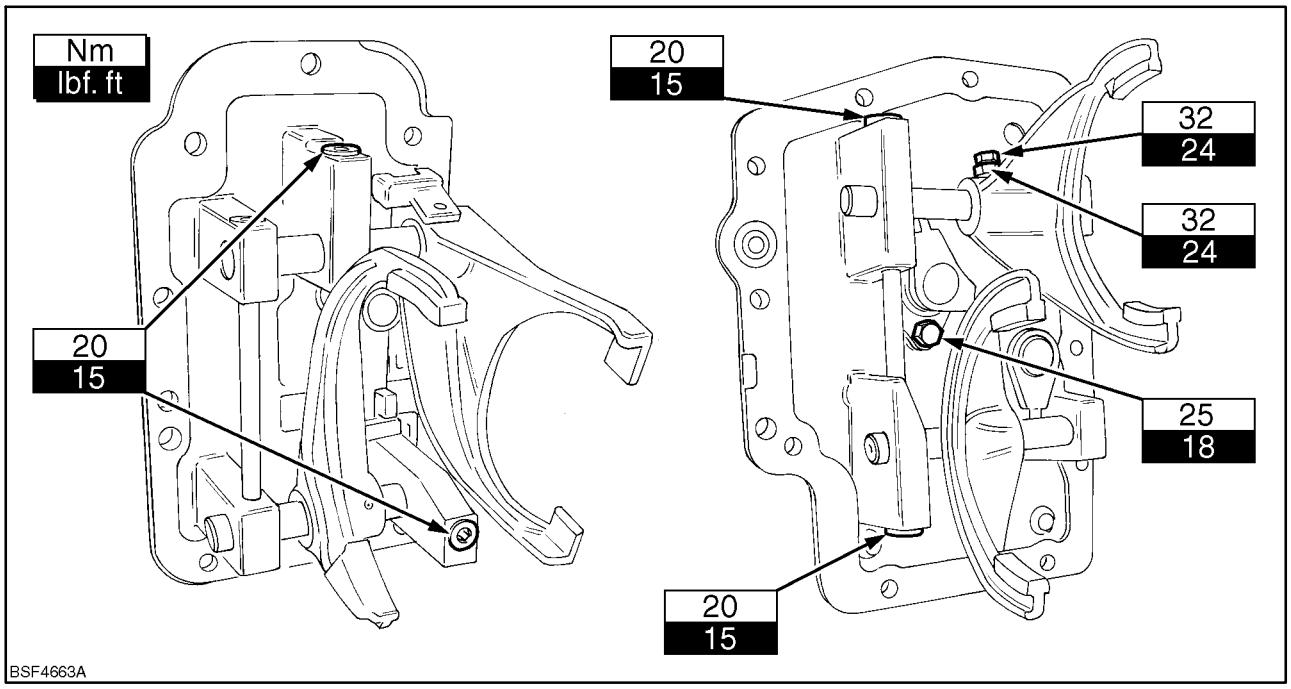


2

SPECIAL TOOLS

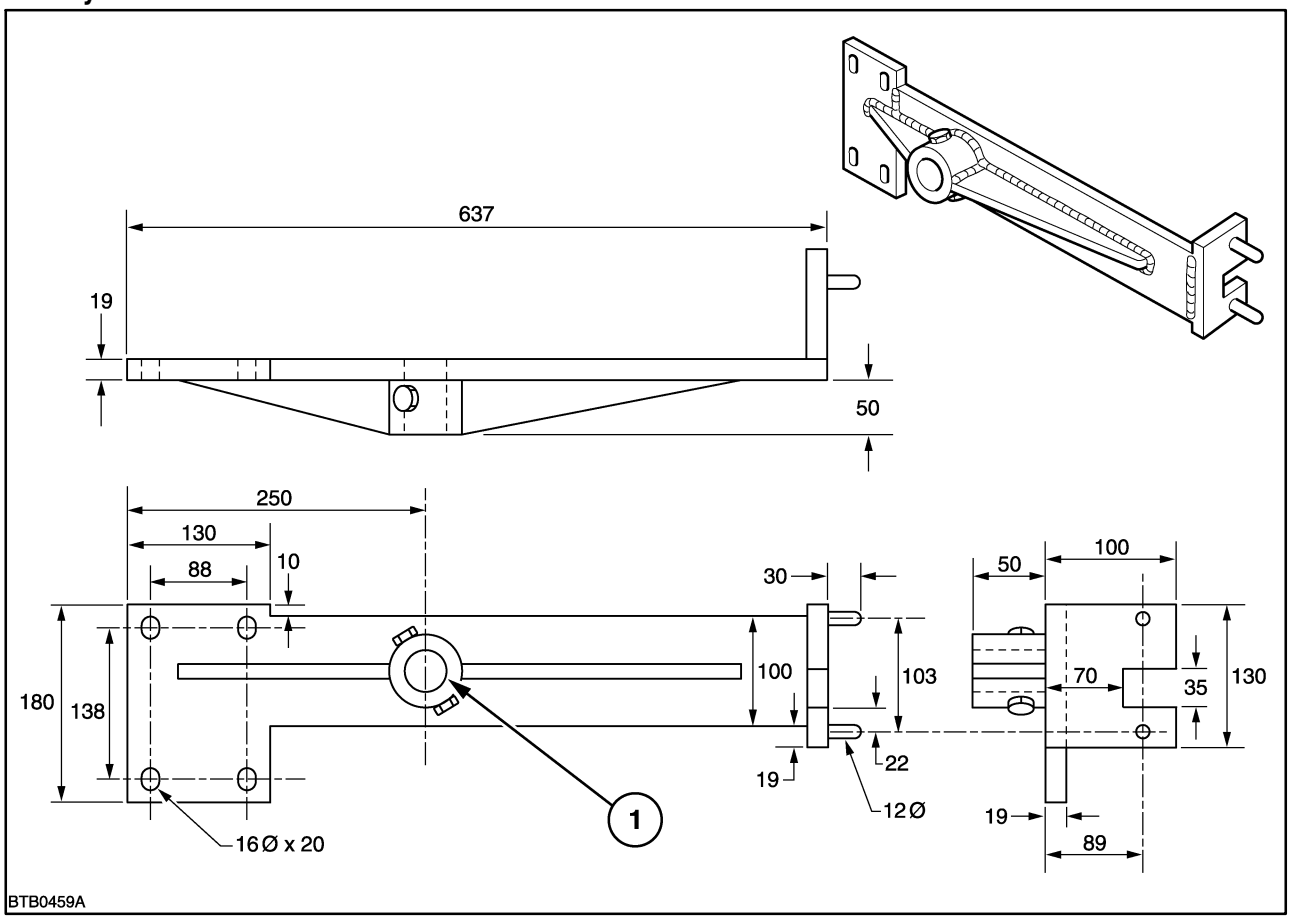
⚠ CAUTION ⚠

Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly in this Manual.

List of special tools necessary to carry out the different operations described in this Section.

X 295021 Clutch piston return spring compressor

Locally Fabricated Tools



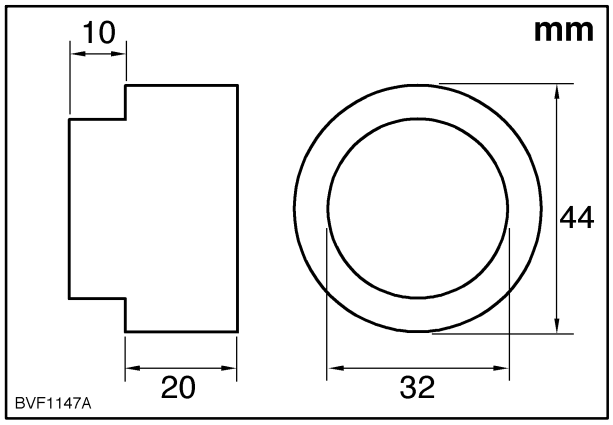
3

Transmission to Stand Attachment Bracket - Constructional Detail

Main bracket made from 19mm mild steel plate.

NOTE: *Strengthening plate should be of similar material and welds should be secure, preferably continuous.*

1. Center spigot (locally adjust to suit base stand)



4

Range Cluster Bearing Adapter Tool

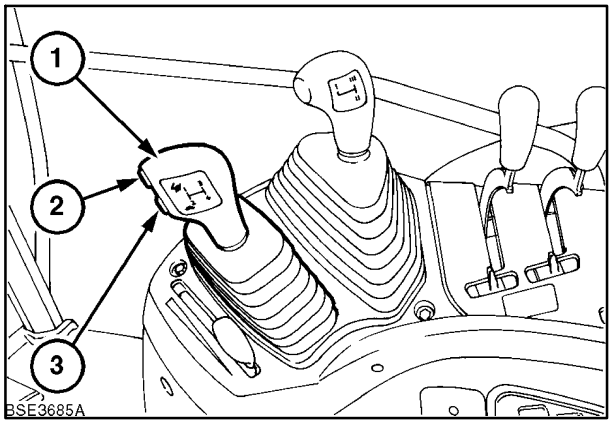
DESCRIPTION AND OPERATION

The 24 x 24 transmission consists of a dual, multi-wet plate clutch assembly, known as C1 (under drive) and C2 (direct drive), located directly between the flywheel damper and the input shaft of the transmission. This eliminates the need for a conventional clutch.

The Dual Command unit provides an under drive to all of the standard direct drive ratios, reducing road speed by 18% and increasing torque by 22%, providing the transmission with 24 forward and 24 reverse gears.

Selection of either under drive or direct drive modes is by switches (2 and 3) located on the main shift lever (1). The selection is carried out by PWM solenoid valves, which are controlled by a controller. This system provides independent electronic control of the pressure on each clutch.

For convenience, a duplicate set of shift buttons (1) are located on the right-hand control panel.



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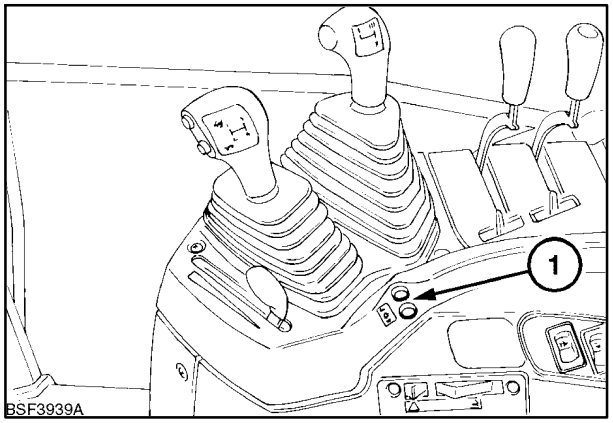
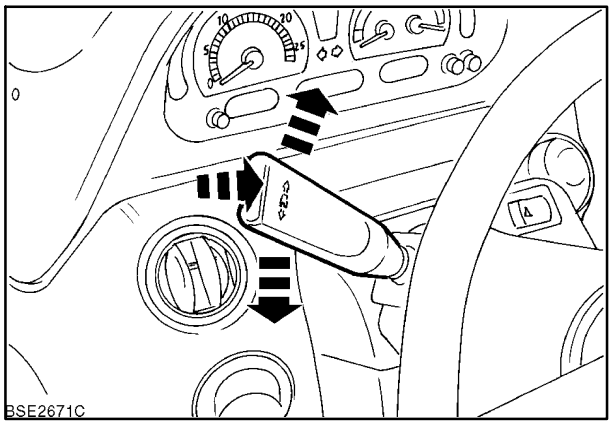


6

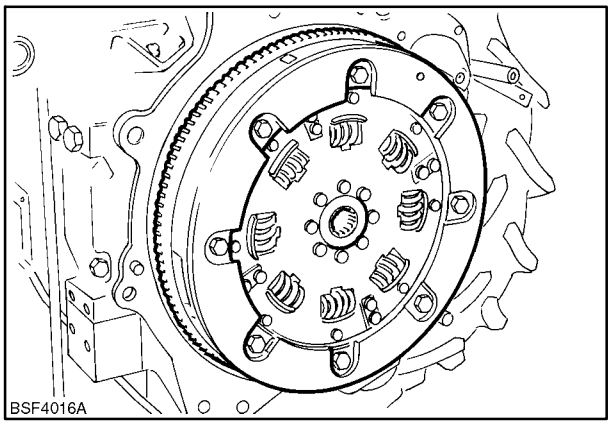
A shuttle lever located under the left hand side of the steering wheel is used to select forward, reverse or neutral. Lever position is communicated to the controller via switches located in the shuttle lever.

NOTE: *A warning sound will be heard, and the symbol 'N' will flash in the instrument cluster if shuttle shifting when the speed is greater than 9 Km/h (5 MPH).*



7

The transmission is powered through a flywheel damper and has no conventional clutch.

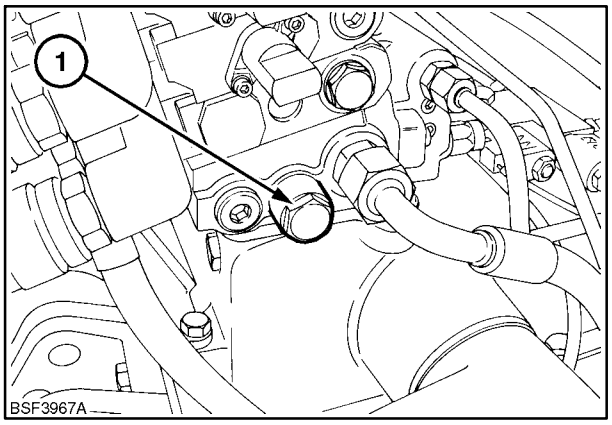


8

VALVES

Low Pressure Regulating Valve with Variable Displacement Load Sensing Hydraulic Pump

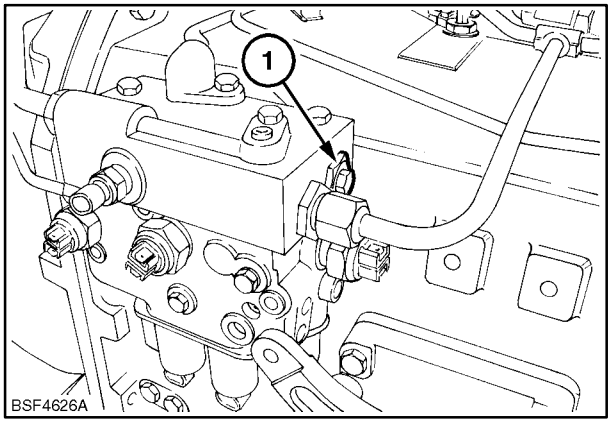
The pressure oil to engage the clutches is supplied from the low pressure hydraulic circuit, which is maintained at 17 - 19 bar (247 - 276 lbf/in^2) by the low pressure regulating valve (1), located in the valve block in the base of the remote control valve assembly.



9

Low Pressure Regulating Valve with Fixed Displacement Hydraulic Gear Pump

The pressure oil to engage the clutches is supplied from the low pressure hydraulic circuit, which is maintained at 17 - 19 bar (247 - 276 lbf/in^2) by the low pressure regulating valve (1), located in the valve block on top of the low pressure distribution block.

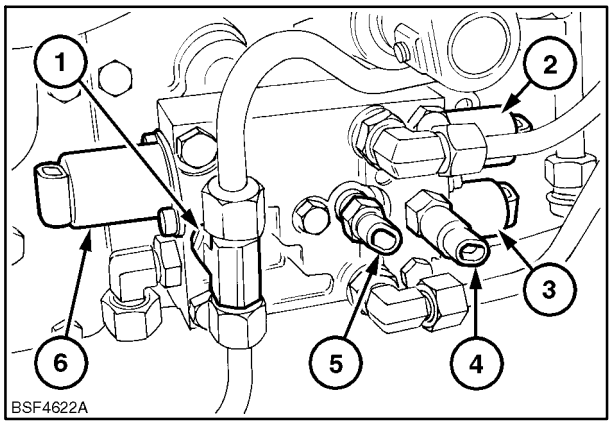


10

Transmission Control Valve

The control valve assembly is mounted on the right hand side of the transmission. The control valve is supplied with low pressure oil through point (1) at 17–19 bar (247 - 276 lbf/in2).

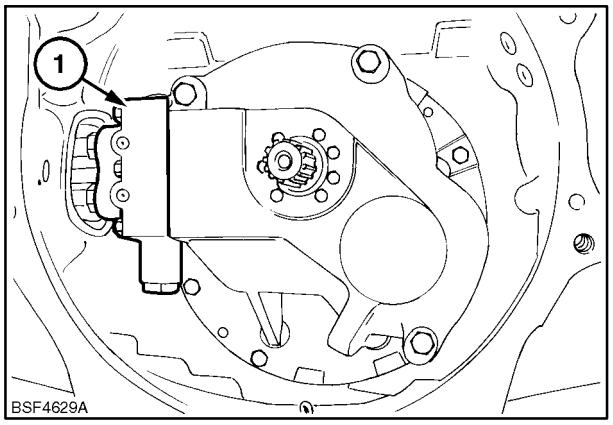
The control valve assembly incorporates C1 PWM solenoid valve (2), C2 PWM solenoid valve (3), 1/2 synchronizer status switch (4) transmission oil temperature sensor (5) and the dump solenoid valve (6).



11

Lubrication Control Valve

Mounted on the C1 and C2 clutch housing is the lubrication control valve (1). This proportions the transmission lubrication oil depending on the operating state of the C1/C2 clutches. This ensures adequate lubrication to the clutches especially during inching/feathering.



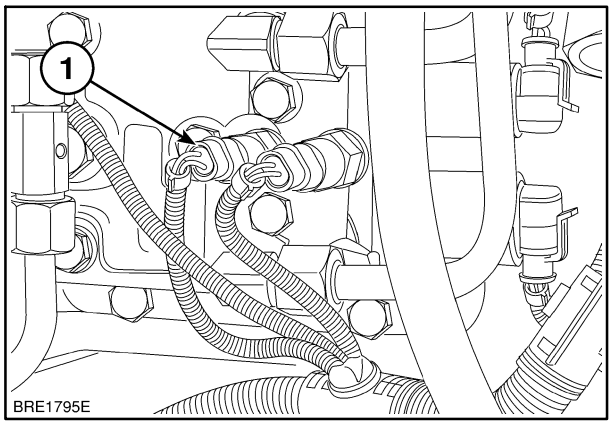
12

INPUT SENSORS

The engagement of the clutches are controlled by inputs from various sensors and switches:-

Transmission Oil Temperature Sensor

The transmission oil temperature sensor (1) measures the temperature of the oil to provide compensation for hot/cold oil conditions.

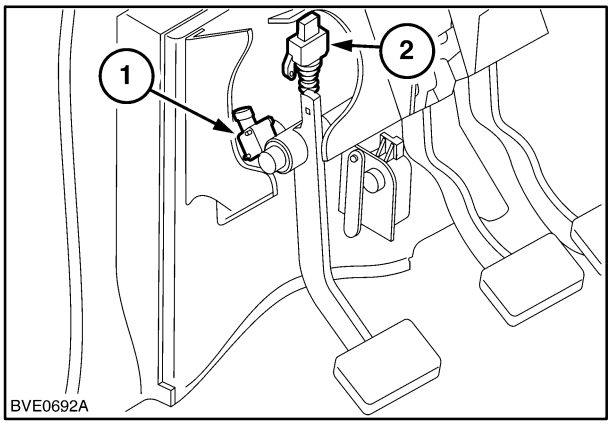


13

Clutch Pedal Potentiometer and Disconnect Switch

The clutch pedal potentiometer (1) provides the operator with controlled engagement of the feathering clutches (C1 or C2).

The clutch pedal disconnect switch (2) de-energizes the dump solenoid valve which disengages drive.

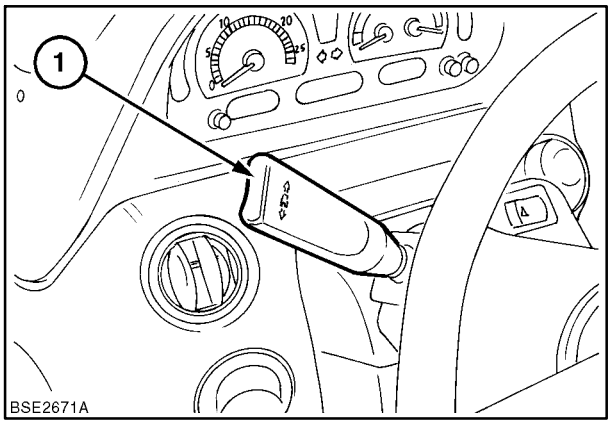


14

Shuttle Lever

The shuttle lever (1) provides information to the controller, via switches, for forward, reverse and neutral transmission drive selection.

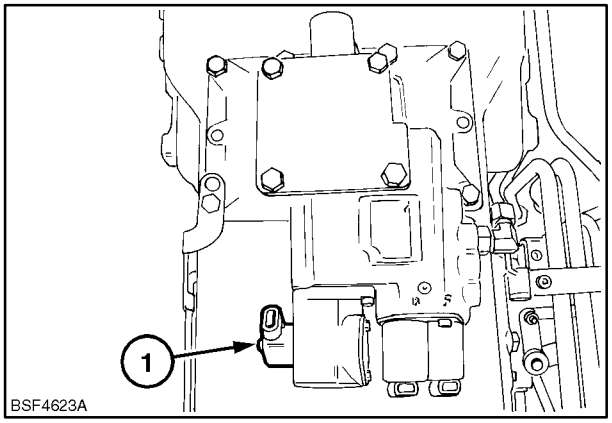
The neutral switch is open when the shuttle lever is in neutral, cutting off 12 VD power supply to the controller. This supply is used for C1 and C2 clutch PWM solenoid valves.



15

Forward / Reverse Potentiometer

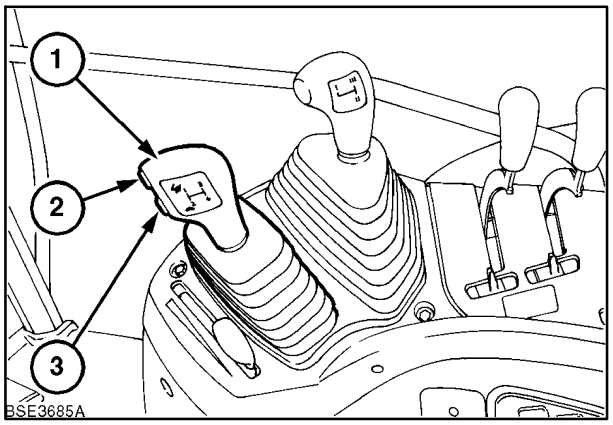
Provides information to the controller on the position of the forward and reverse synchronizer.



16

Upshift and Downshift Switches

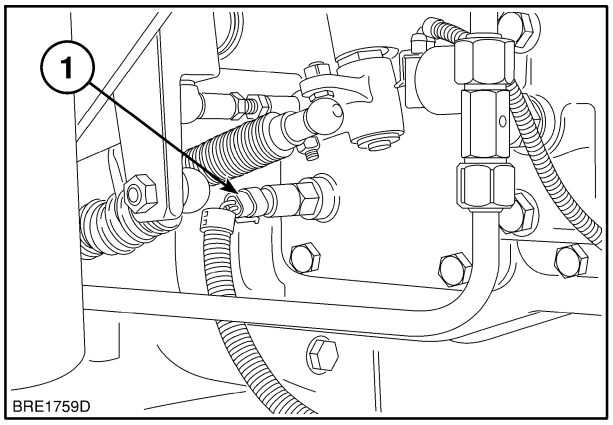
Located on the main shift lever (1) is the upshift switch (2) and the downshift switch (3). These switches allow the operator to change between C1 (under drive) and C2 (direct drive) by sending a signal to the controller, without using the clutch pedal.



17

High / Medium Synchronizer Status Switch

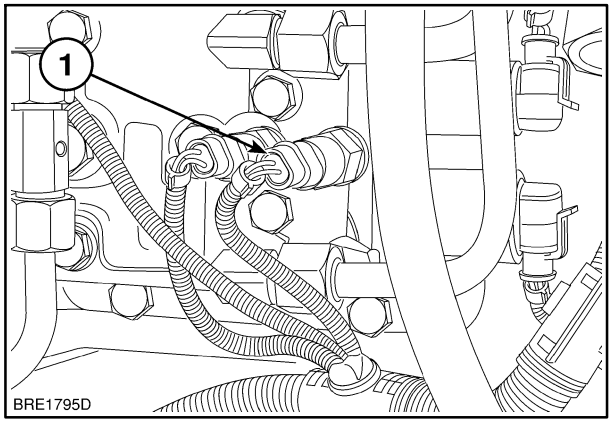
Provides information to the controller on the position of the high/medium synchronizer.



18

First / Second Synchronizer Status Switch

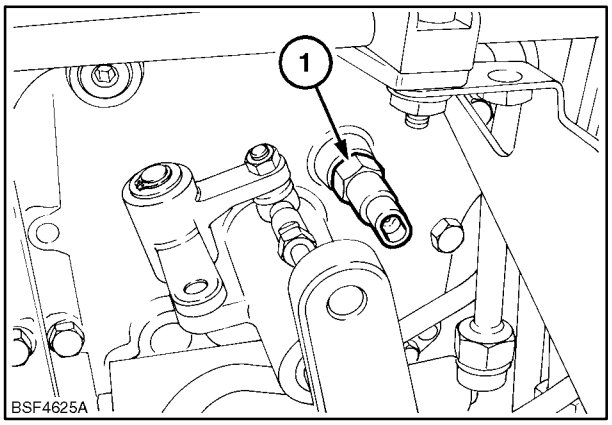
Provides information to the controller on the position of the first/second synchronizer.



19

Third / Fourth Synchronizer Status Switch

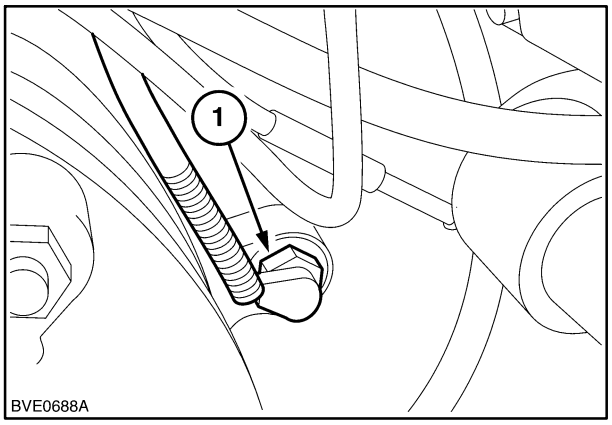
Provides information to the controller on the position of the third/fourth synchronizer.



20

Rear Axle Speed Sensor

The rear axle speed sensor (1) provides information of transmission output speed to the controller.

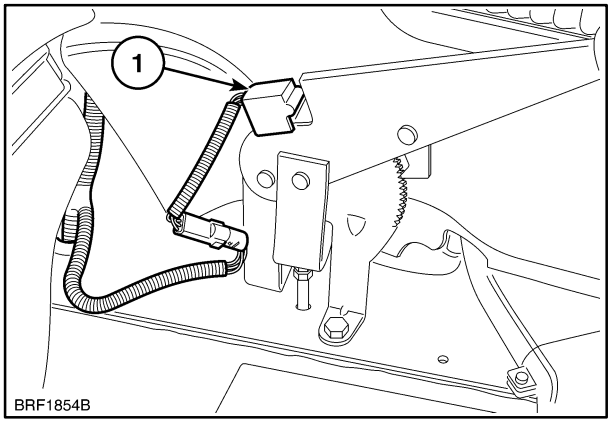


21

Parking Brake Switch

The parking brake switch (1) is located on the parking brake lever. The parking brake has to be applied during calibration, if it is not applied an error code will be displayed.

The tractor will drive if the parking brake is applied but an audible alarm will be heard.

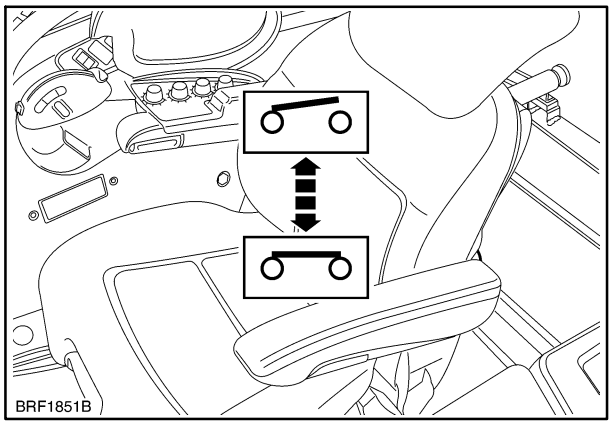


22

Seat Switch

The seat switch must be operated, i.e. operator seated, before the controller allows the engagement of the forward or reverse drive.

NOTE: *The clutch pedal will override a faulty seat switch.*



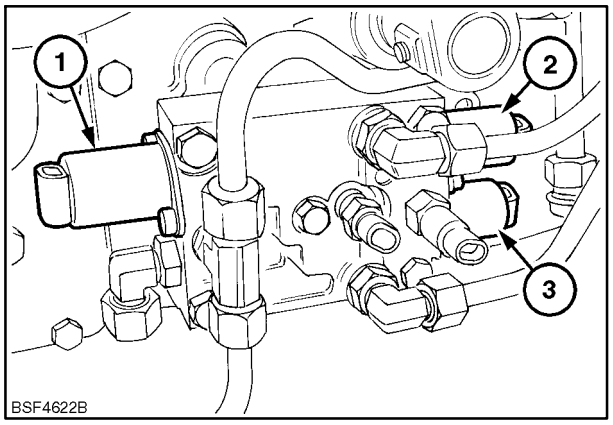
23

OUTPUT DEVICES

C1 and C2 Clutch PWM Solenoid Valves and Dump Solenoid Valve

The dump solenoid valve (1) stops the oil supply to the C1 and C2 clutch PWM solenoid valves.

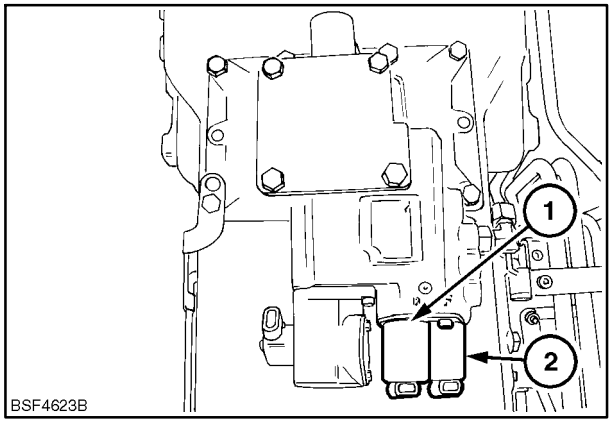
The C1 (2) and C2 (3) clutch PWM solenoid valves control the oil supply to the clutches allowing the engagement/disengagement of the clutches via a signal supplied from the transmission controller.



24

Forward/Reverse PWM Solenoid Valves

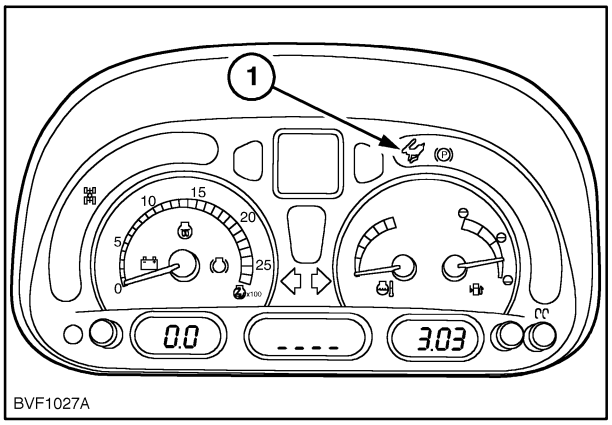
The reverse (1) and foward (2) PWM solenoid valves control the oil supply to the forward/reverse synchronizer shift rail, allowing the selection of forward or reverse via a signal from the transmission controller.



25

Analogue Digital Instrument Cluster (ADIC)

Provides information to the operator when C2 (direct drive) is engaged with the symbol (1) and if a critical fault occurs with the transmission operation.

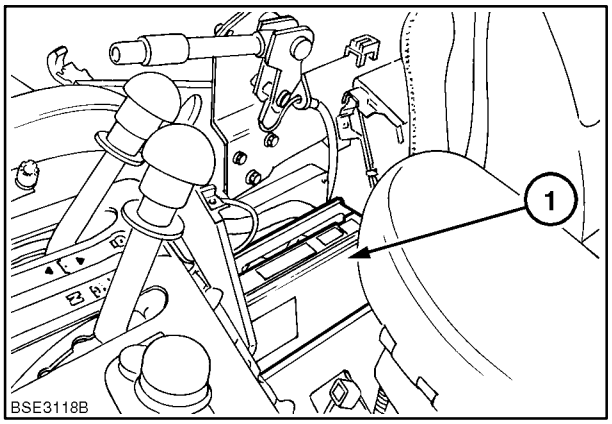


26

CONTROL DEVICE

Controller

The controller (1) gives accurate control, via PWM solenoid valves, of the two multi-wet plate clutches. This also enables clutchless shuttle operations and sequential power-shifting. The transmission controller has a diagnostic facility that can interpret a number of system faults, which can be displayed or stored depending on how critical the fault detected is.



27

ELECTRICAL OPERATION

Neutral

The forward/reverse shuttle lever must be in neutral to allow engine start up. The other status switches, located on the High/Medium, 1/2 and 3/4 shift rails provide the controller with the transmission status. Drive will not be permitted if any of the shift levers are engaged without the clutch pedal being depressed.

With the transmission in neutral the dump solenoid valve is not energized and prevents oil supply from reaching the C1 and C2 PWM solenoid valves. The controller always defaults the transmission to the C1 (under drive) selection on start up.

Gear Selection

The clutch pedal must be depressed prior to any shift lever engagement, if not error code 'CP' will be displayed on the instrument cluster and drive will not be permitted by the controller. When the clutch pedal is fully depressed and a gear/range/direction selection is made, the dump solenoid valve remains de-energized by the action of the fully depressed clutch pedal operating the disconnect switch. The C1 and C2 PWM solenoid valves are also de-energized with the clutch pedal fully depressed.

Inching / Feathering

As the clutch pedal is raised from the fully depressed position the dump solenoid valve is energized, allowing oil supply to the appropriate PWM solenoid valve. With the system in the default, C1 (under drive) mode, the C1 PWM solenoid valve becomes energized. As the clutch pedal is raised the clutch potentiometer provides increased voltage to the controller, and the controller in turn provides increased current to the C1 PWM solenoid valve, which regulates the oil pressure to the C1 clutch. As the clutch pedal and therefore current, is raised the pressure to the C1 clutch is raised correspondingly until full pressure/engagement is achieved.

Gear Shifting

As the clutch is depressed drive is disengaged between the engine and the transmission as the dump solenoid valve is de-energized. Shifts are completed in the normal manner and drive is gradually re-established as the pedal is raised as described in 'inching/feathering'. The system has an electronic override feature where if the clutch pedal is released quickly or accidentally the controller will take over and control the engagement speed of the clutch to prevent sudden and possibly damaging engagements.

Drive

During continuous drive mode, clutch pedal fully released, the appropriate PWM solenoid valve is fully open allowing full unrestricted oil pressure to the corresponding clutch.

C1 (Under Drive) to C2 (Direct Drive)

Operation of the upshift switch, located on the main shift lever, de-energizes the C1 PWM solenoid valve and energizes the C2 PWM solenoid valve, pressure oil is switched to the C2 clutch. The clutch engagement time is still controlled by the controller during this changeover to ensure a smooth shift.

Auto Take Off (ATO)

The ATO feature allows the operator to engage drive without using the clutch pedal by simply moving the shuttle lever from neutral to the forward or reverse position.

The ATO function is automatically enabled under normal starting conditions. i.e. operator in the driving seat, clutch pedal depressed, shuttle lever in neutral.

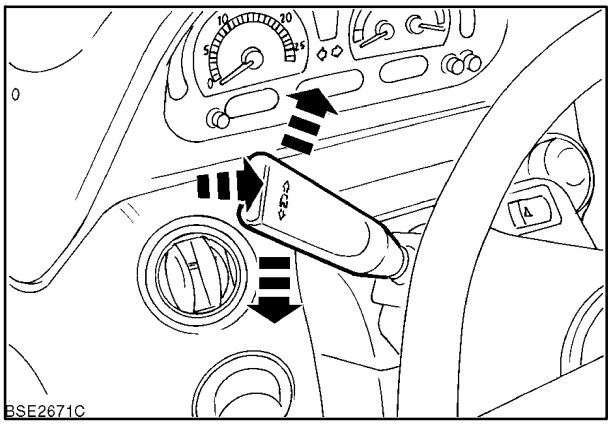
After selecting the appropriate gear ranges with the main shift lever, simply move the shuttle lever to the forward or reverse position without depressing the clutch pedal. The ATO function will provide a controlled start from a stationary position.

NOTE: *The ATO function will be disabled if the vehicle is at rest with the shuttle lever in the neutral position and the operator leaves the seat.*

If the ATO should be disabled for any reason, the operator should carry out the following procedure to re-enable this function.

Sit in the seat, release the parking brake and cycle the clutch pedal. The vehicle will then move off in the direction selected on the shuttle lever.

When enabled, the ATO function will continue to function as long as the operator remains in the seat.



28

HYDRAULIC OPERATION

Neutral

Pressure oil supplied by the hydraulic pump enters the transmission control valve. The oil is channeled directly to the dump solenoid valve, which, with the transmission in neutral, is de-energized (closed), preventing the oil supply from going through to the C1 and C2 PWM solenoid valves.

Inching / Feathering

With the clutch pedal depressed and the gear/range/direction selected the transmission is still immobilized due to the dump solenoid valve remaining de-energized by the action of the clutch pedal in the fully depressed position. As the clutch pedal is raised the dump valve is energized allowing oil supply to the C1 and C2 PWM solenoid valves. Further lifting of the clutch pedal provides a corresponding increase in oil flow through the appropriate PWM solenoid valve and a gradual engagement of the clutch.

Drive

With the clutch pedal fully released, full pressure is applied to the appropriate clutch to transfer drive to the forward/reverse synchronizer.

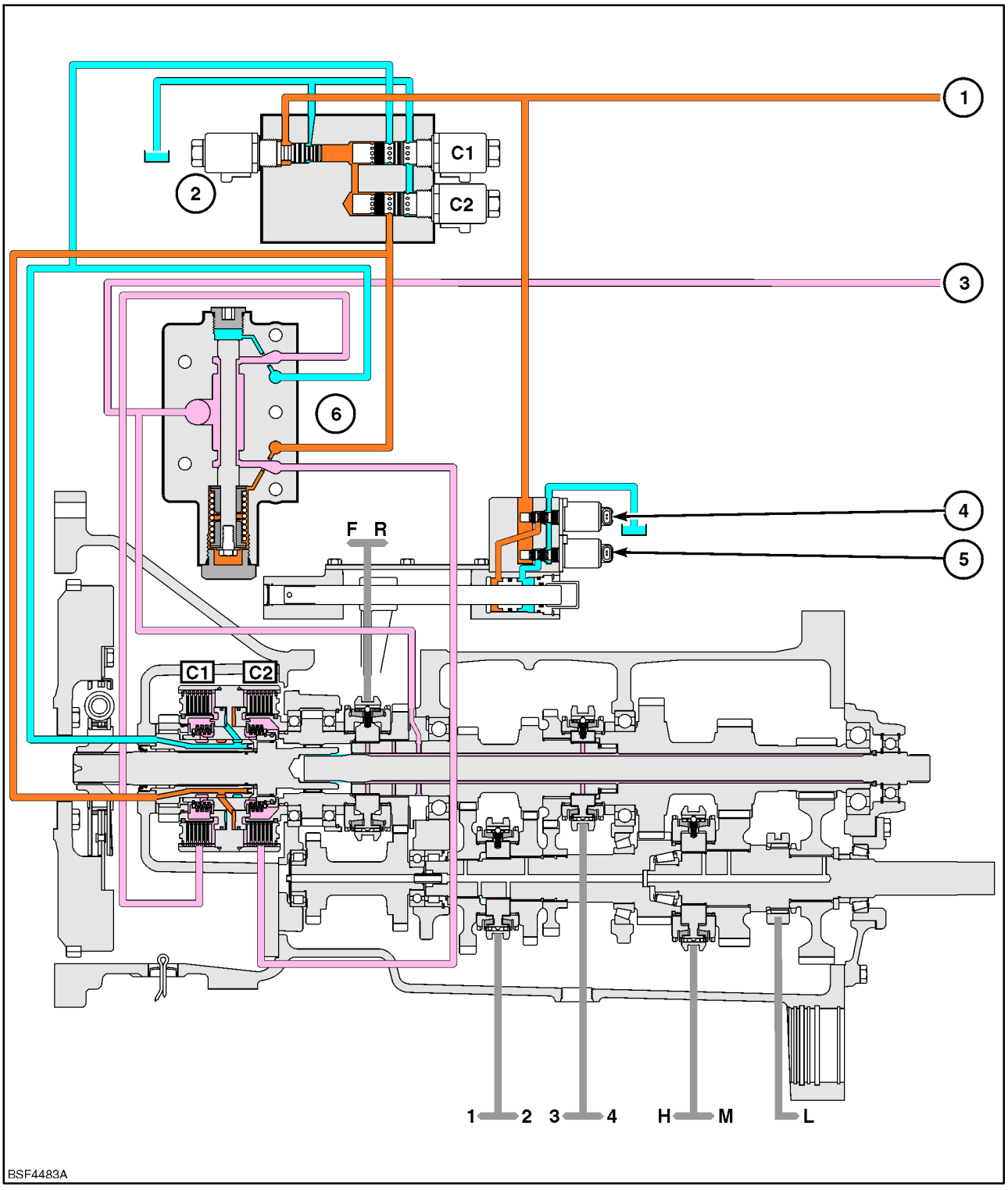
Gear Shifting

When shifting gear, the action of fully depressing the clutch pedal de-energizes the dump solenoid valve, and the oil pressure to C1 and C2 PWM solenoid valves is cut, which disconnects the drive between the engine and the transmission. As the clutch pedal is raised the hydraulic pressure is progressively restored to the clutch to continue driving.

C1 (Under Drive) to C2 (Direct Drive)

Operation of the upshift switch, located on the main shift lever, de-energizes the C1 PWM solenoid valve and energizes the C2 PWM solenoid valve, pressure oil is switched to the C2 clutch. The clutch engagement time is still controlled by the controller during this changeover to ensure a smooth shift.

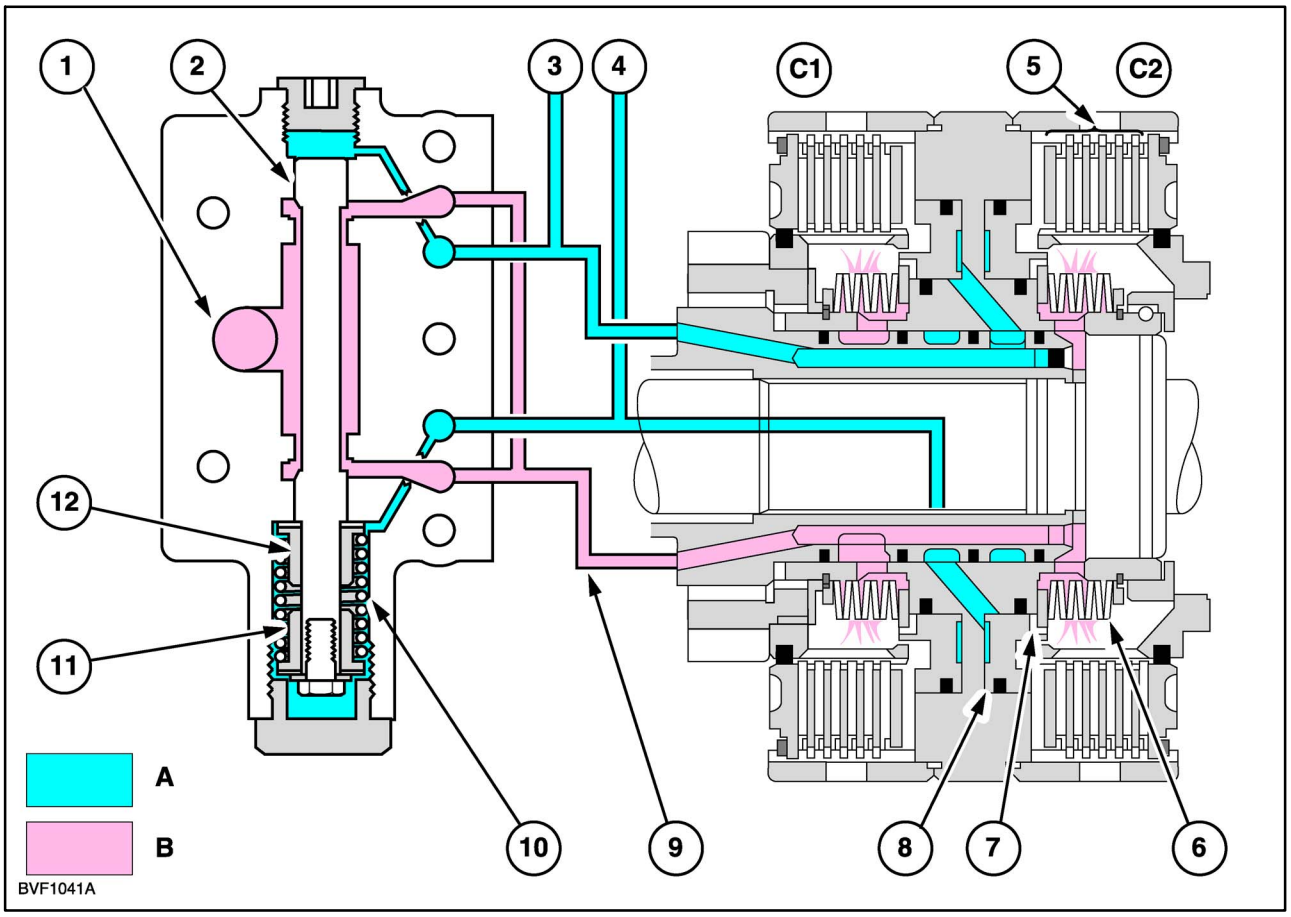
SECTIONAL VIEWS



29

Transmission Hydraulic Circuit

1. Low pressure circuit oil supply
2. Dump solenoid valve
3. Lubrication oil supply
4. Reverse PWM solenoid valve
5. Forward PWM solenoid valve
6. Lubrication control valve



30

Lubrication Control Valve Operation - Clutch Pedal Fully Depressed

1. Transmission lubrication oil supply
2. Spool
3. C1 clutch engagement oil supply
4. C2 clutch engagement oil supply
5. Clutch friction and steel plates
6. Belleville washers
7. Lubrication oil restriction
8. Control piston
9. C1/C2 clutch lubrication oil supply
10. Spool centralizing spring
11. Stop sleeve
12. Stop sleeve

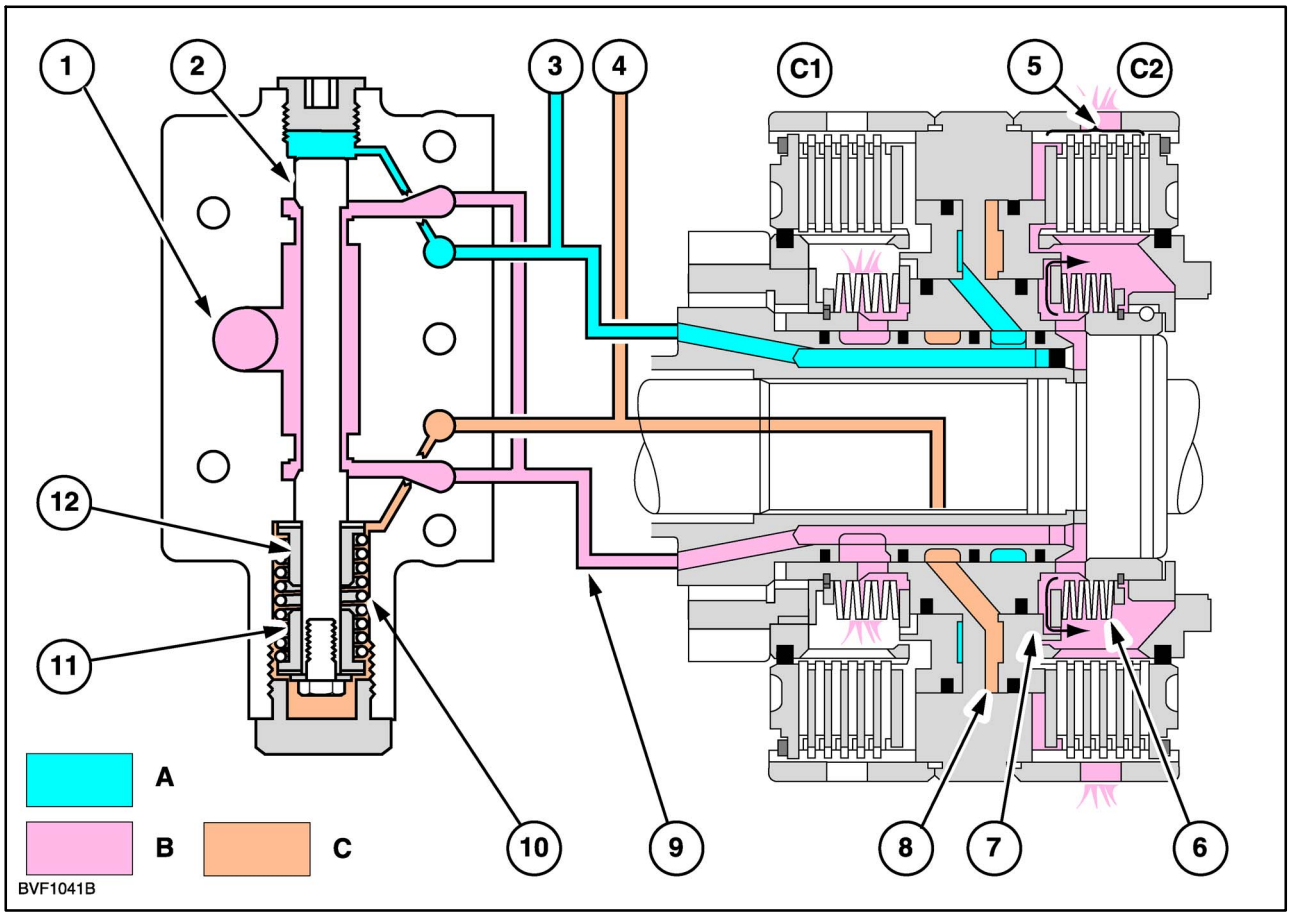
Figure Colour Key

A. Return to reservoir
B. Lubrication circuit

The spool (2) is centred in the neutral position by the spool centralizing spring (10).

Lubrication oil (1) is supplied at full flow to both the C1 and C2 clutches, transmission bearings and the synchronizers.

The flow of lubrication oil through the clutch friction and steel plates (5) is restricted in the clutch at the lubrication oil restriction (7).



31

Lubrication Control Valve Operation - Inching/Feathering C2 (Direct Drive)

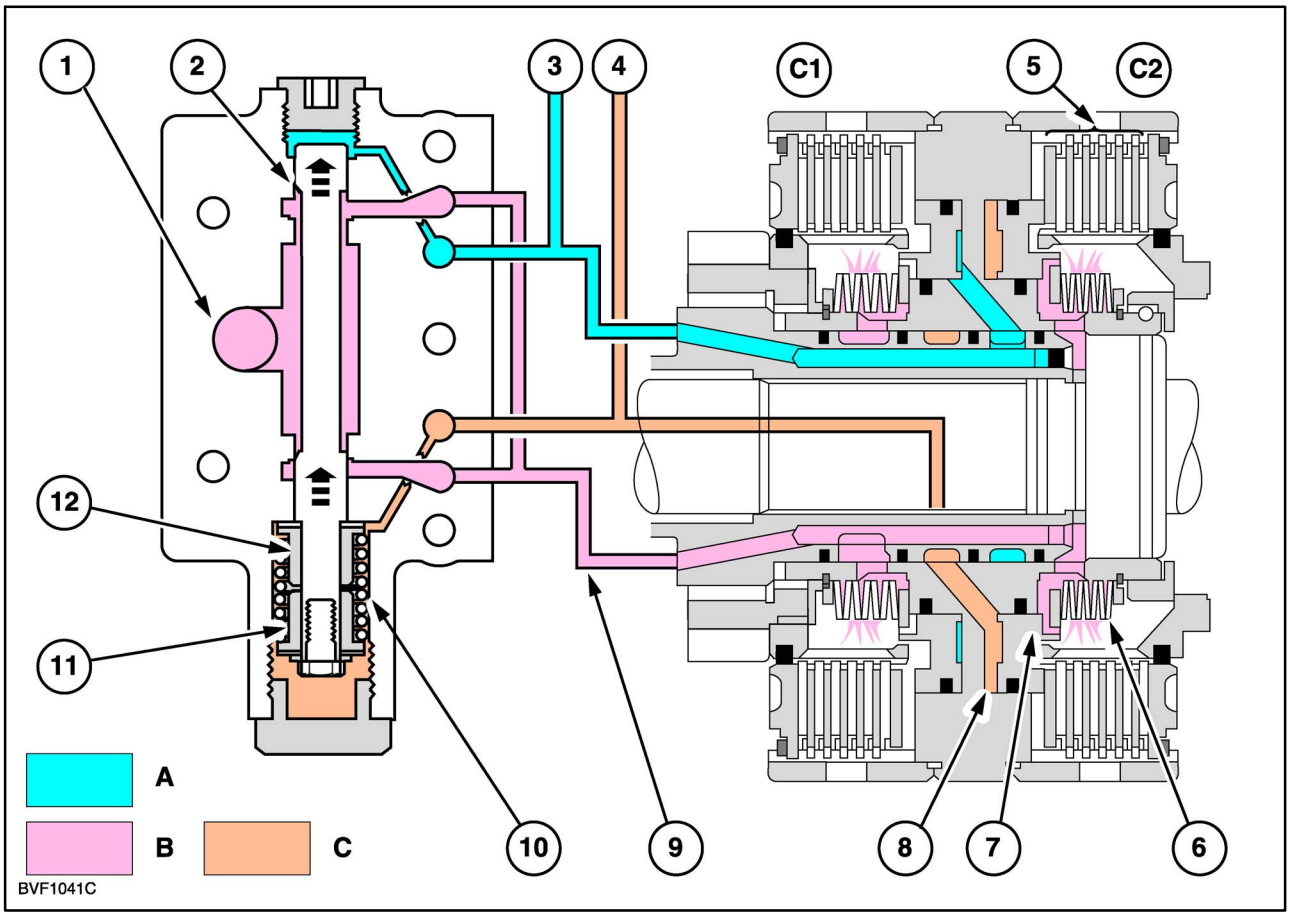
1. Transmission lubrication oil supply
2. Spool
3. C1 clutch engagement oil supply
4. C2 clutch engagement oil supply
5. Clutch friction and steel plates
6. Belleville washers
7. Lubrication oil restriction
8. Control piston
9. C1/C2 clutch lubrication oil supply
10. Spool centralizing spring
11. Stop sleeve
12. Stop sleeve

Figure Colour Key

- **A.** Return to reservoir
- **B.** Lubrication circuit
- **C.** Low pressure circuit

The lubrication spool (2) is controlled by the oil pressure from the clutch engagement oil supply (4). As the oil pressure increases, the control piston (8) will apply a force onto the clutch friction and steel plates (5) and begin to transmit drive (inching/feathering).

The spool (2) will remain centred in the neutral position by the spool centralizing spring (10), which is rated at 13 bar (189 lbf/in^2). This allows a full flow of lubrication oil to the clutches. The lubrication oil restriction (7) is open fully, allowing full flow of lubrication oil past the restriction (7), to the clutch friction and steel plates (5).



32

Lubrication Control Valve Operation - Driving C2 (Direct Drive)

1. Transmission lubrication oil supply
2. Spool
3. C1 clutch engagement oil supply
4. C2 clutch engagement oil supply
5. Clutch friction and steel plates
6. Belleville washers
7. Lubrication oil restriction
8. Control piston
9. C1/C2 clutch lubrication oil supply
10. Spool centralizing spring
11. Stop sleeve
12. Stop sleeve

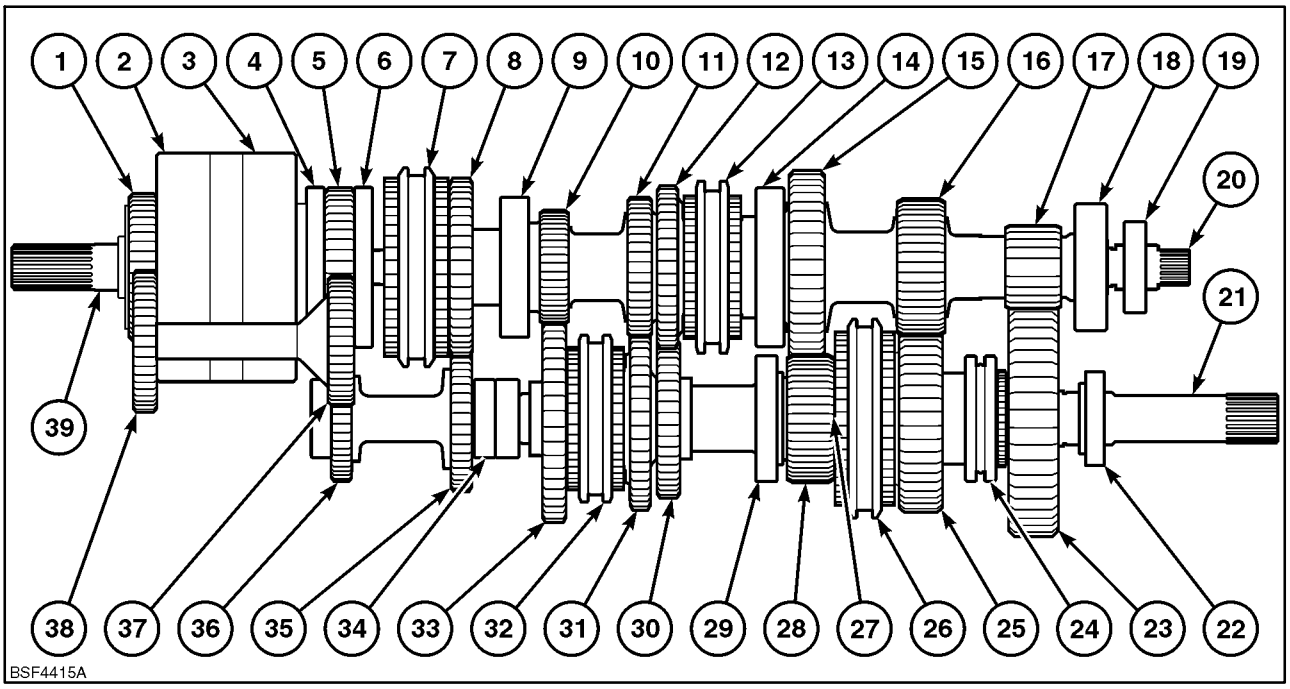
Figure Colour Key

- **A.** Return to reservoir
- **B.** Lubrication circuit
- **C.** Low pressure circuit

As the engagement oil supply (4) pressure increases to 13 bar (189 lbf/in^2), the spool (2) will start to restrict the lubrication oil flow to the clutches. As the engagement oil supply pressure increases to 15 bar (218 lbf/in^2) the spool (2) will have moved completely until the stop sleeve (11) touches the stop sleeve (12). The lubrication oil flow is now restricted due to only one supply from the lubrication control valve.

The lubrication oil on the engaged C2 clutch can not flow past the engaged friction and steel plates therefore the released clutch will still receive a restricted oil flow through the friction and steel plates.

24X24 TRANSMISSION



33

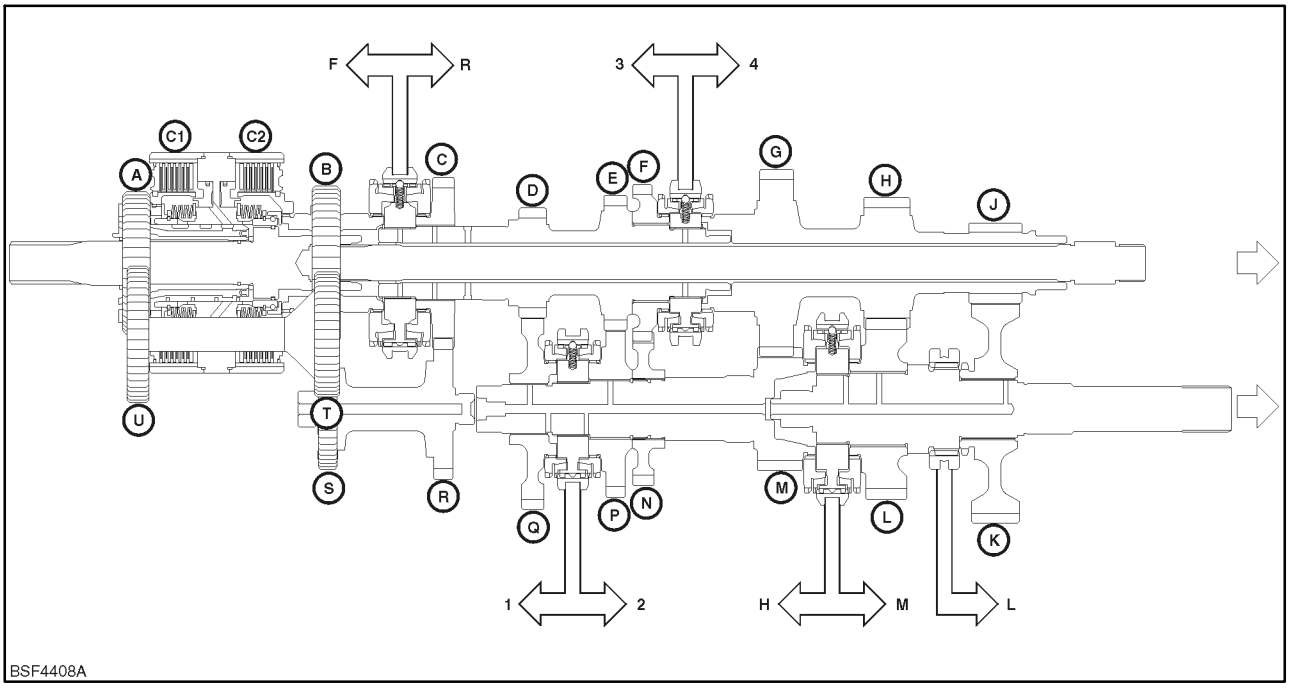
24 x 24 Transmission Components

1. C1 clutch gear drive (A)
2. C1 clutch
3. C2 clutch
4. Bearing
5. Reverse drive gear (B)
6. Bearing
7. Forward/Reverse synchronizer
8. Reverse gear driven (C)
9. Bearing
10. 1st gear drive (D)
11. 2nd gear drive (E)
12. 3rd gear drive (F)
13. 3/4 gears synchronizer
14. Bearing
15. High range gear drive (G)
16. Medium range gear drive (H)
17. Low range gear drive(J)
18. Bearing
19. Bearing
20. PTO shaft
21. Output shaft
22. Bearing
23. Low range gear driven (K)
24. Low range synchronizer
25. Medium range gear driven (L)
26. High/medium synchronizer
27. Taper roller bearing
28. High range gear driven (M)
29. Taper roller bearing
30. 3rd gear driven (N)
31. 2nd gear driven (P)
32. 1/2 gears synchronizer
33. 1st gear driven (Q)
34. Bearing
35. Reverse cluster gear drive (R)
36. Reverse cluster gear driven (S)
37. C1 cluster gear drive (T)
38. C1 cluster gear driven (U)
39. Input shaft

Transmission Gear Teeth

Gear	Description	Number Of Teeth	
		40 Km/h	30 Km/h
A	C1 gear drive	36	36
B	Reverse gear drive	33	33
C	Reverse gear driven	39	39
D	1st gear drive	31	27
E	2nd gear drive	38	34
F	3rd gear drive	45	40
G	High range gear drive	52	49
H	Medium range gear drive	35	33
J	Low range gear drive	19	19
K	Low range gear driven	60	60
L	Medium range gear driven	44	46
M	High range gear driven	27	31
N	3rd gear driven	34	39
P	2nd gear driven	41	45
Q	1st gear driven	49	52
R	Reverse cluster gear drive	40	40
S	Reverse cluster gear driven	33	33
T	C1 cluster gear drive	35	35
U	C1 cluster gear driven	30	30

Power Flows - Neutral



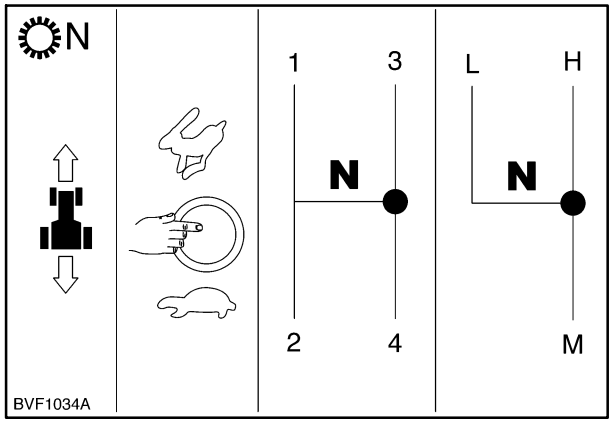
34

Power Flow

- Engine power is transmitted from the flywheel mounted damper to the input/PTO driveshaft and C1/C2 clutch housing which is splined to the shaft.

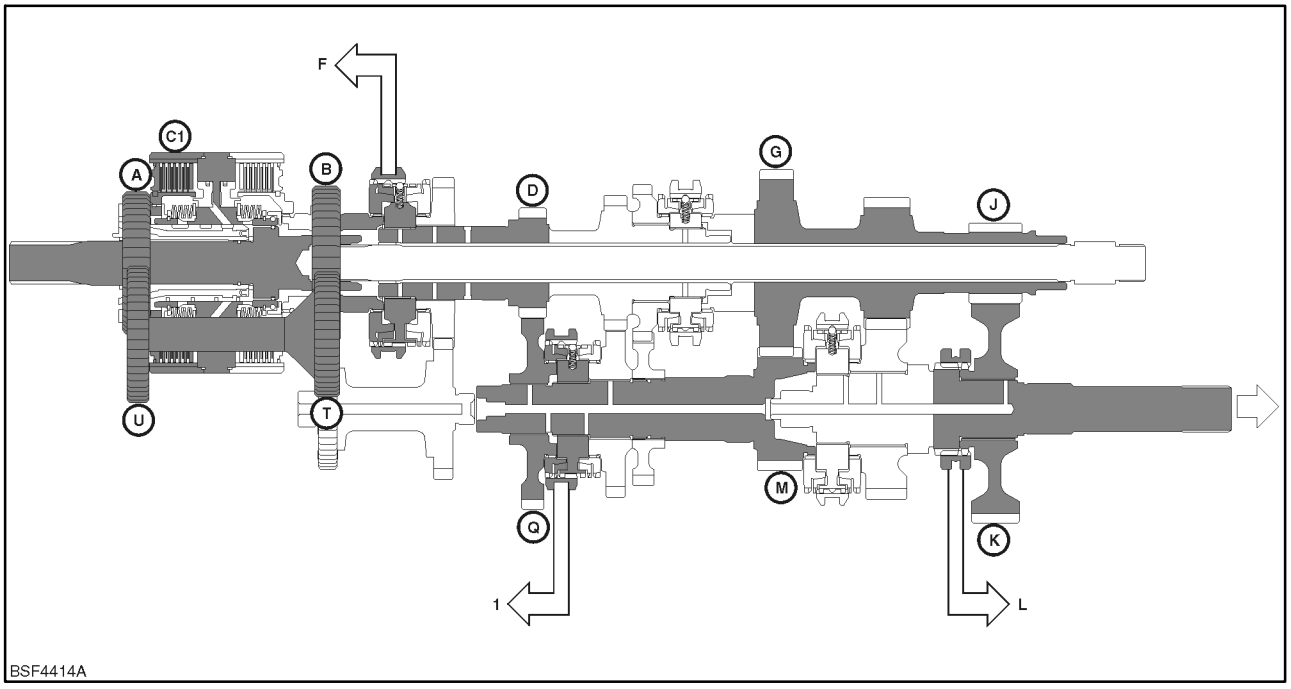
Gear Lever Positions

- Shuttle lever in neutral, main shift lever in neutral and range lever in neutral.
- C1 and C2 clutches are disengaged.



35

Power Flows - 1st Gear



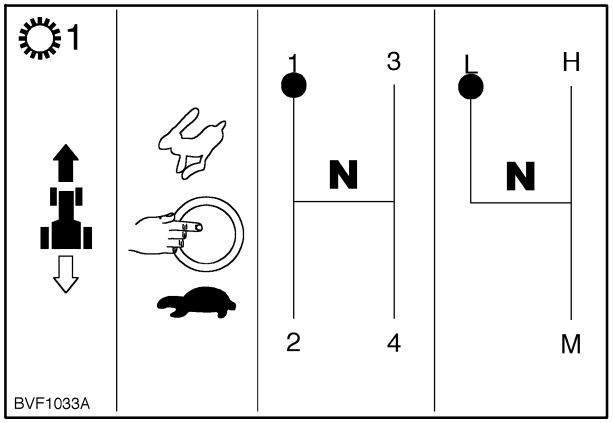
36

Power Flow

- Input shaft - C1 - gears A-U-T-B - forward/reverse synchronizer - gears D-Q - 1/2 synchronizer - gears M-G-J-K - low synchronizer - output shaft.

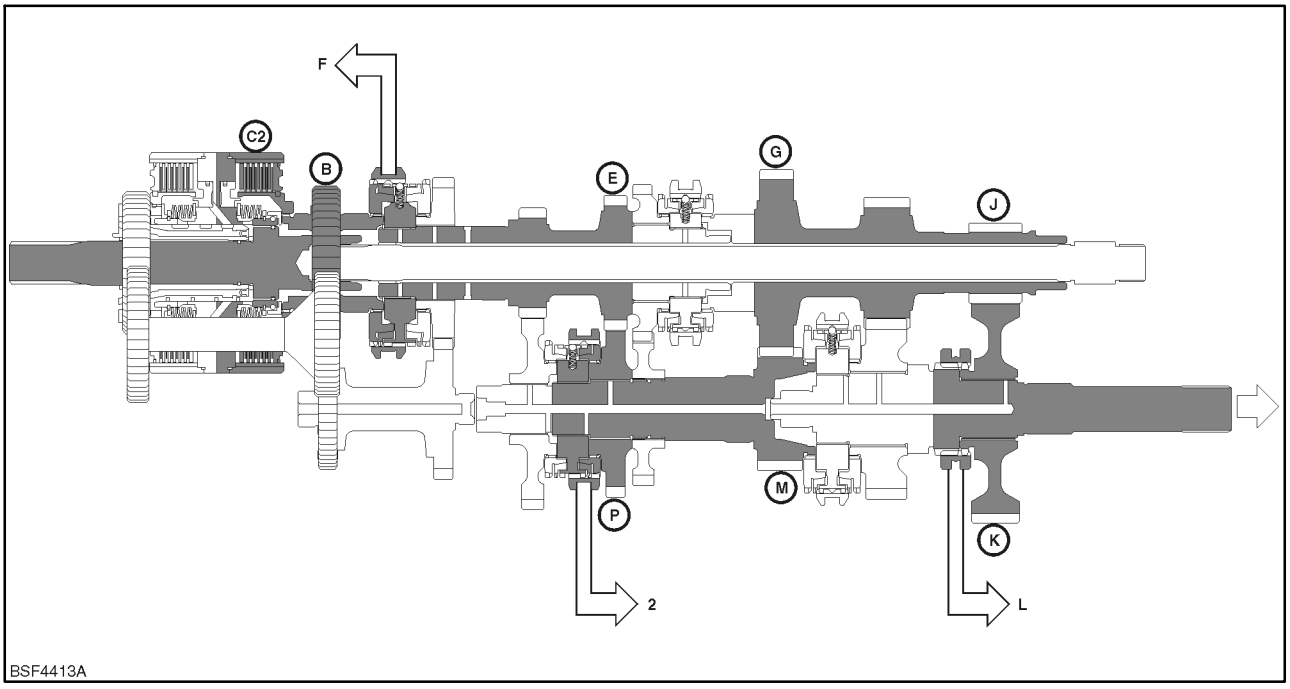
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 1st gear and range lever in low range.
- C1 (under drive) clutch engaged.



37

Power Flows - 4th Gear



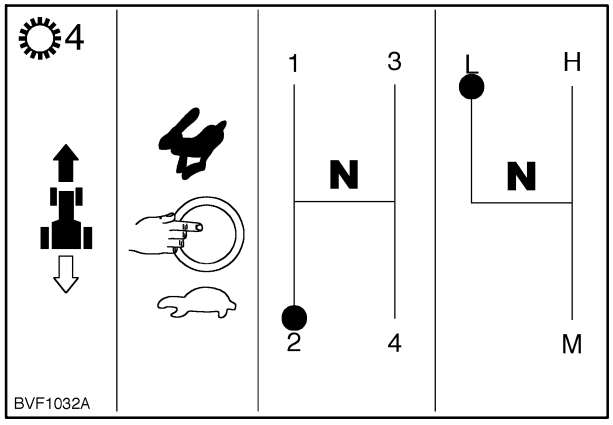
38

Power Flow

- Input shaft - C2 - gear B - forward/reverse synchronizer - gears E-P - 1/2 synchronizer - gears M-G-J-K - low synchronizer - output shaft.

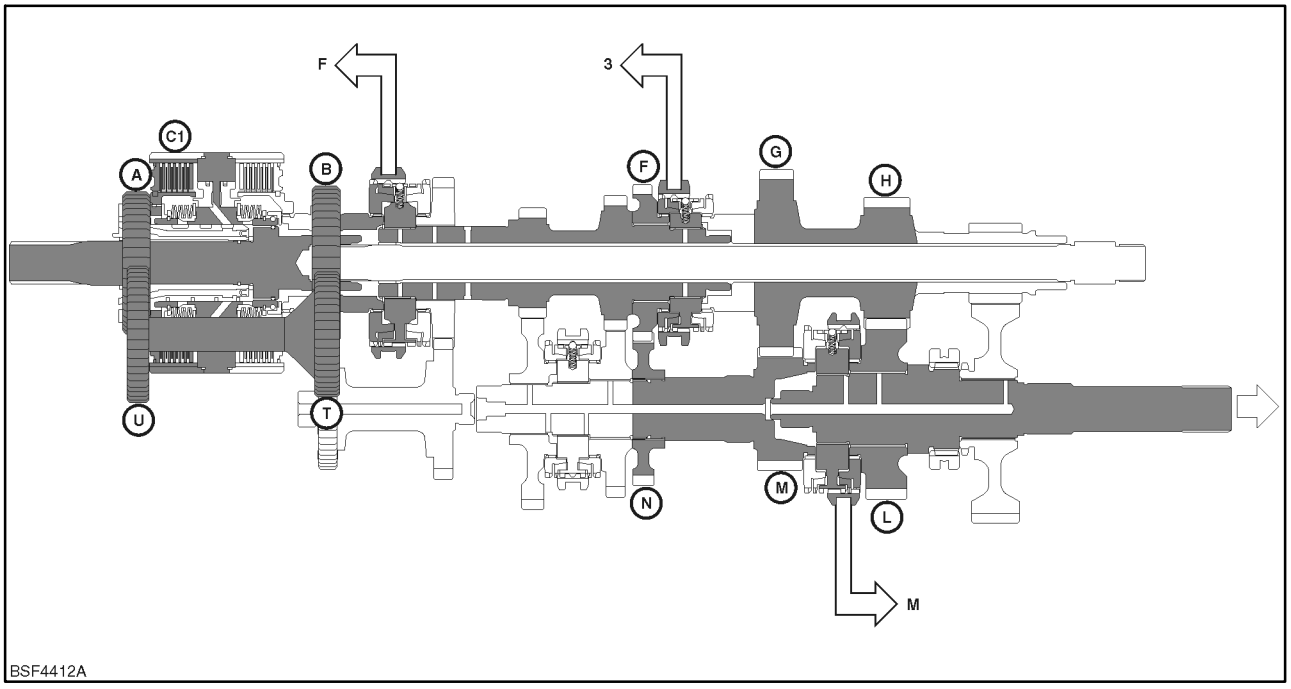
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 2nd gear and range lever in low range.
- C2 (direct drive) clutch engaged.



39

Power Flows - 13th Gear



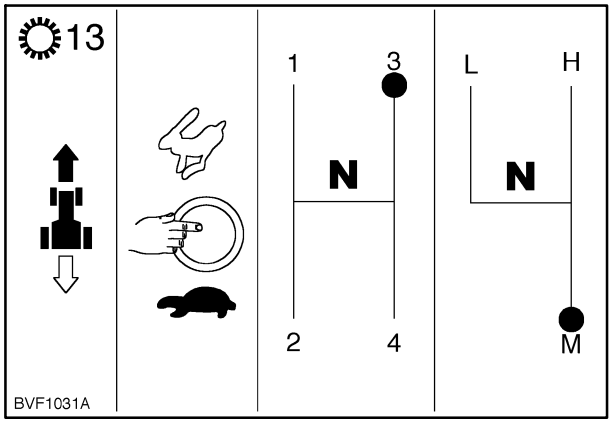
40

Power Flow

- Input shaft - C1 - gears A-U-T-B - forward/reverse synchronizer - gear F - 3/4 synchronizer - gears N-M-G-H-L - high/medium synchronizer - output shaft.

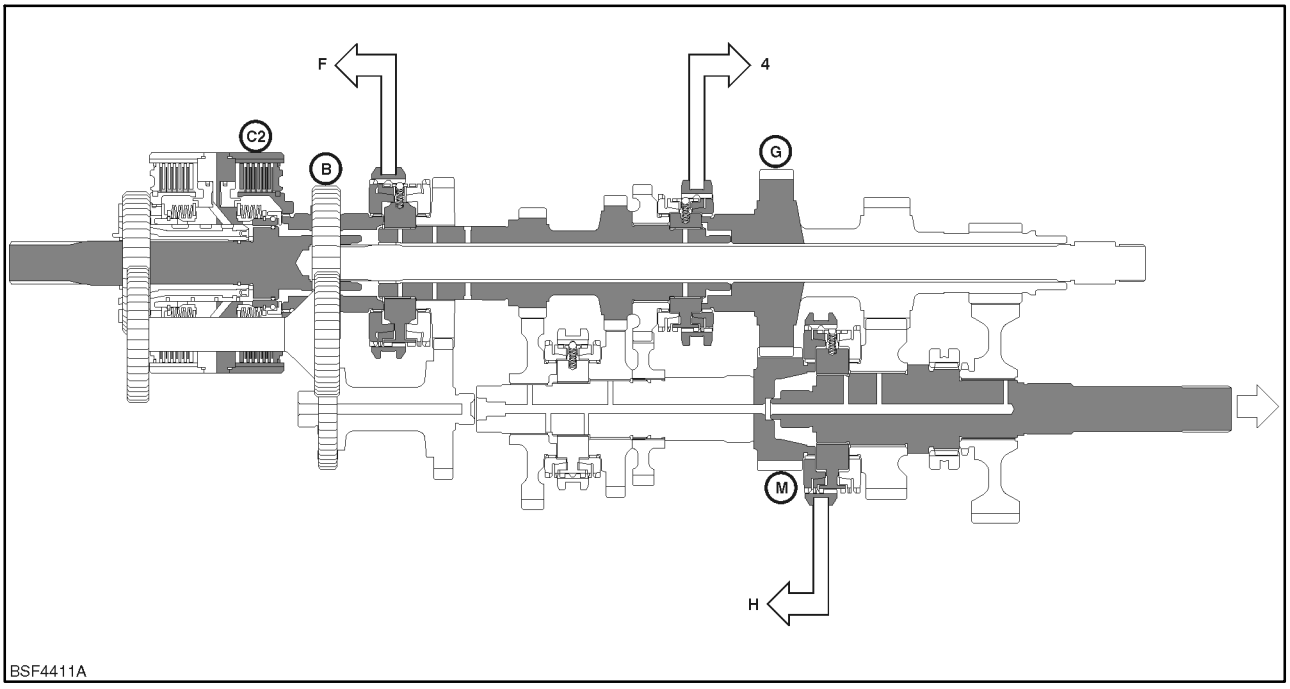
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 3rd gear and range lever in medium range.
- C1 (under drive) clutch engaged.



41

Power Flows - 24th Gear



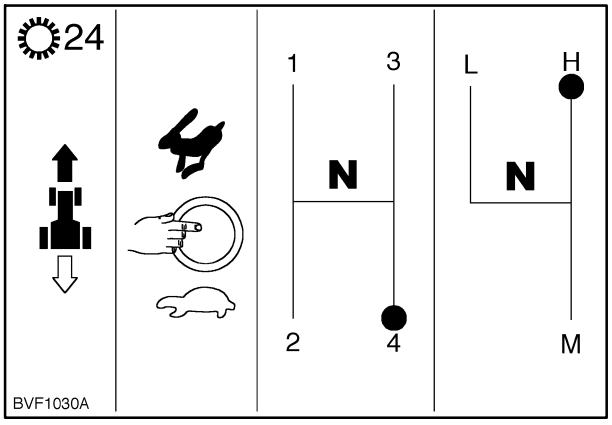
42

Power Flow

- Input shaft - C2 - gear B - forward/reverse synchronizer - 3/4 synchronizer - gear G-M - high/medium synchronizer - output shaft.

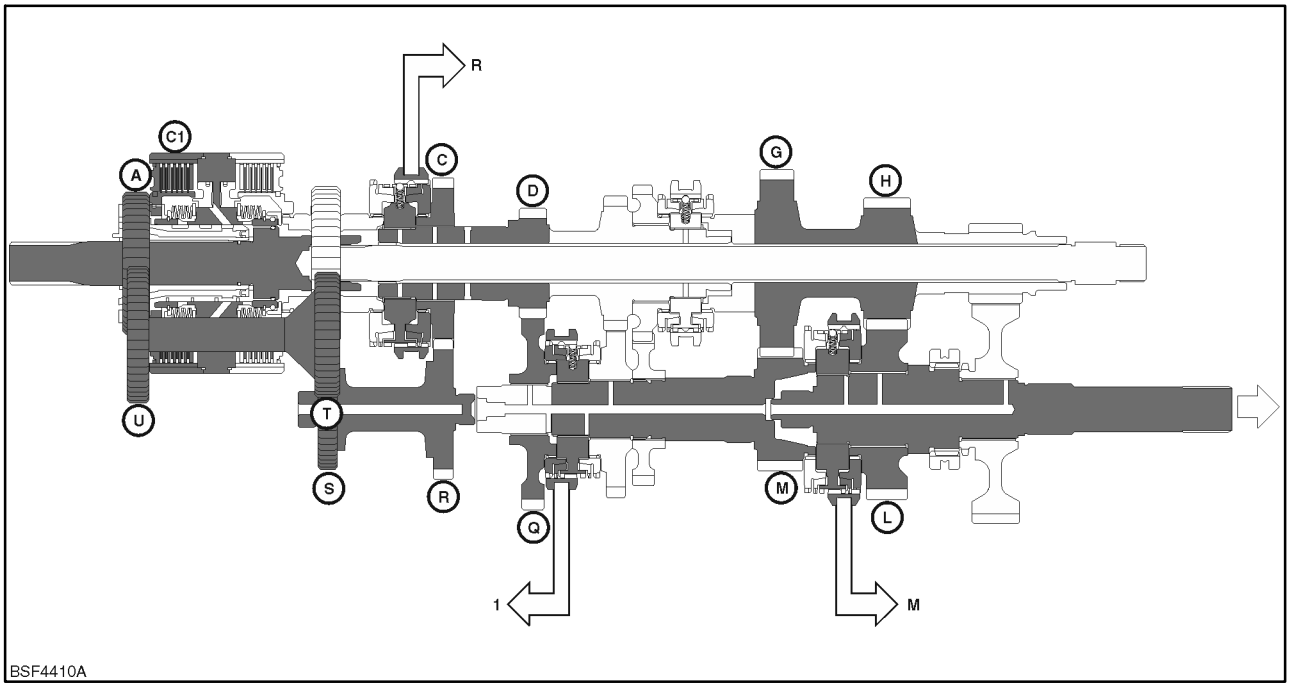
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 4th gear and range lever in high range.
- C2 (direct drive) clutch engaged.



43

Power Flows - Reverse 9th Gear



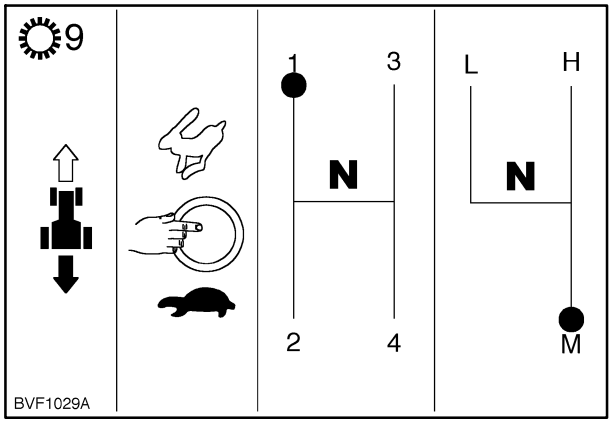
44

Power Flow

- Input shaft - C1 - gears A-U-T-S-R-C - forward/reverse synchronizer - gears D-Q - 1/2 synchronizer - gears M-G-H-L - high/medium synchronizer - output shaft.

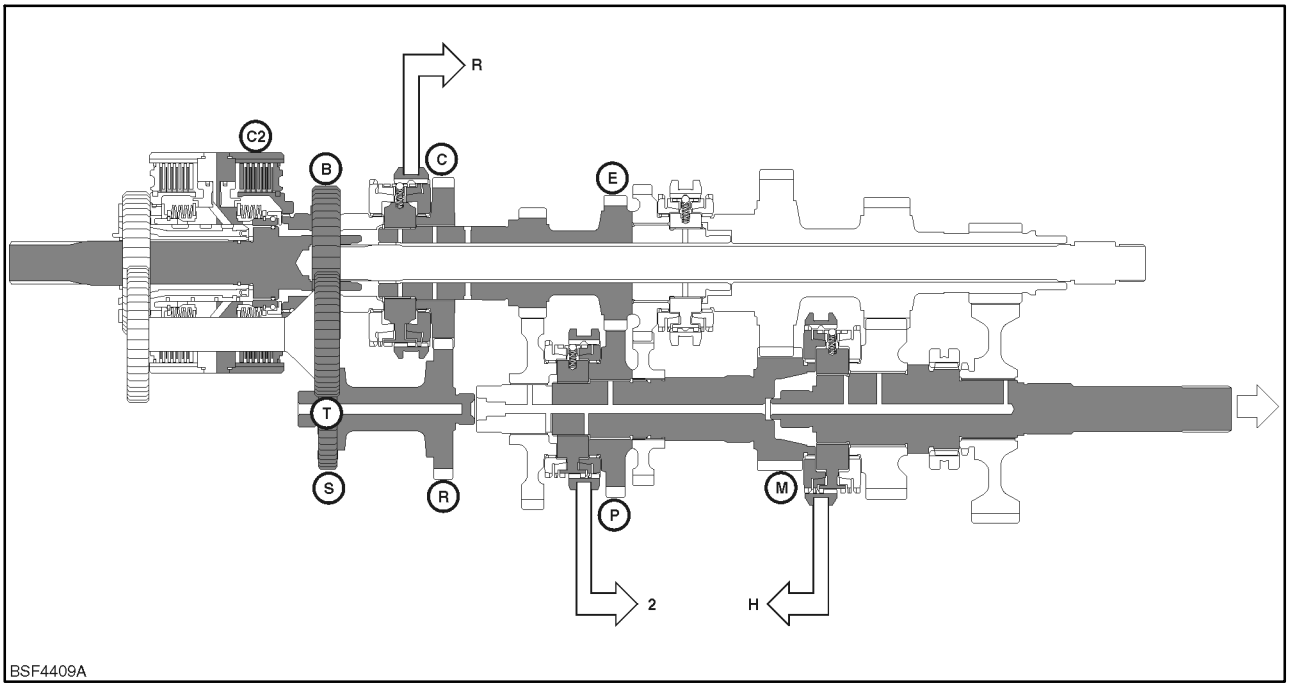
Gear Lever Positions

- Shuttle lever in reverse, main shift lever in 1st gear and range lever in medium range.
- C1 (under drive) clutch engaged.



45

Power Flows - Reverse 20th Gear



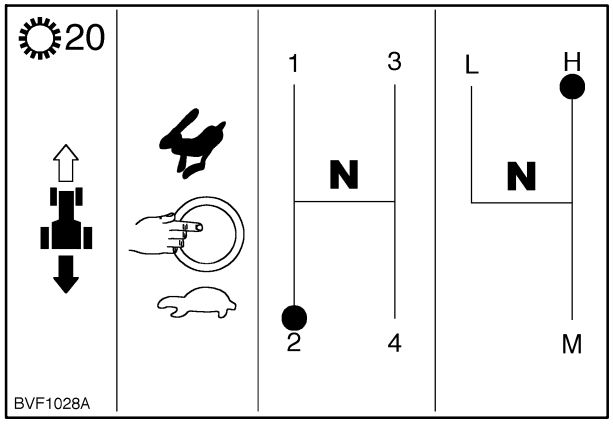
46

Power Flow

- Input shaft - C2 - gears B-T-S-R-C - forward/reverse synchronizer - gears E-P - 1/2 synchronizer - gear M - high/medium synchronizer - output shaft.

Gear Lever Positions

- Shuttle lever in reverse, main shift lever in 2nd gear and range lever in high range.
- C2 (direct drive) clutch engaged.



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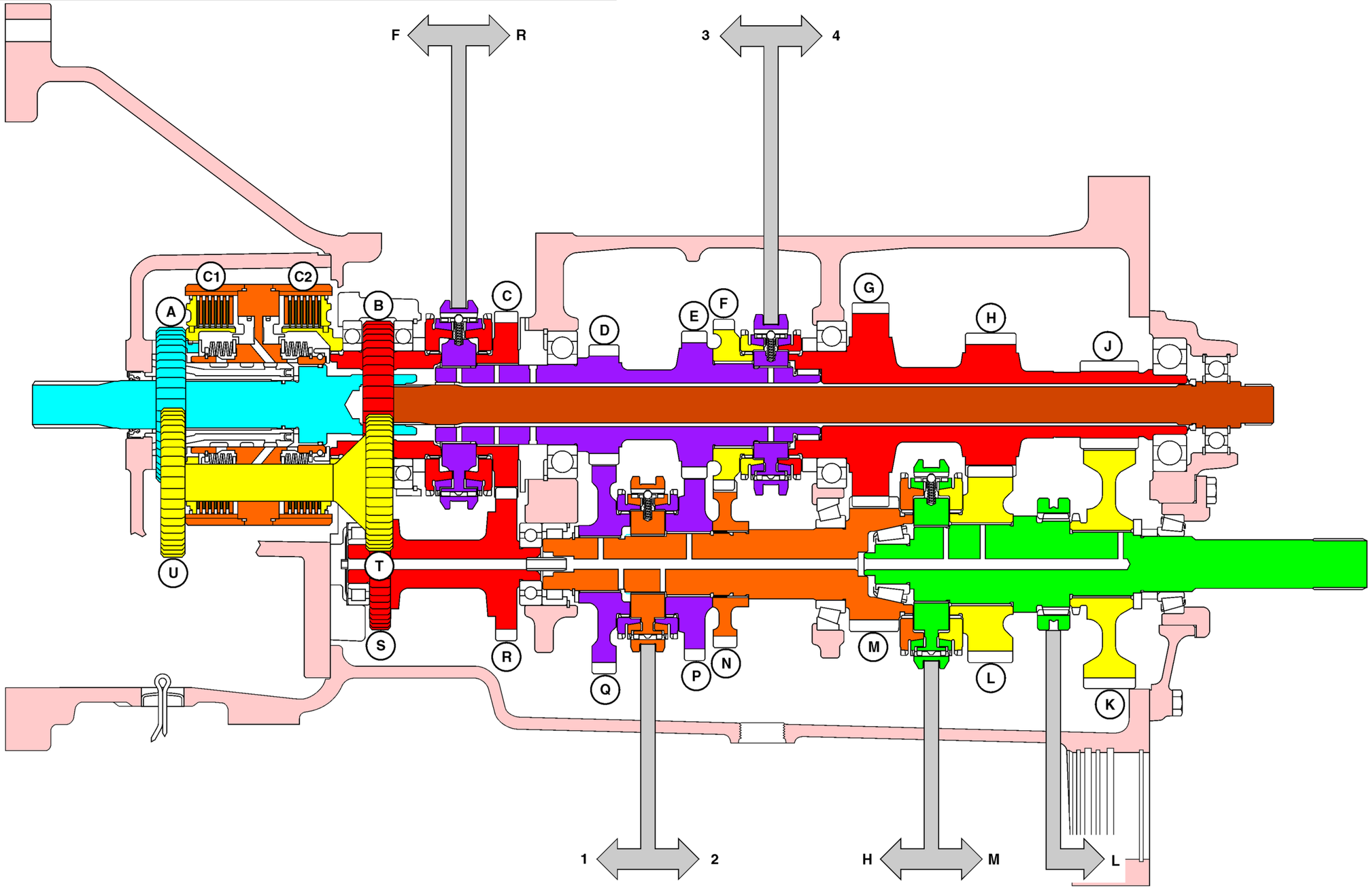
TRANSMISSION GEAR TEETH

Gear	Description	Number Of Teeth	
		40 Km/h	30 Km/h
A	C1 gear drive	36	36
B	Reverse gear drive	33	33
C	Reverse gear driven	39	39
D	1st gear drive	31	27
E	2nd gear drive	38	34
F	3rd gear drive	45	40
G	High range gear drive	52	49
H	Medium range gear drive	35	33
J	Low range gear drive	19	19
K	Low range gear driven	60	60
L	Medium range gear driven	44	46
M	High range gear driven	27	31
N	3rd gear driven	34	39
P	2nd gear driven	41	45
Q	1st gear driven	49	52
R	Reverse cluster gear drive	40	40
S	Reverse cluster gear driven	33	33
T	C1 cluster gear drive	35	35
U	C1 cluster gear driven	30	30



BSF4397B

24x24 TRANSMISSION GEAR IDENTIFICATION

NOTES

TROUBLESHOOTING

If the creeper is not functioning correctly, check for any electronic error codes which may be stored. These are defined by the error code range of 2001 to 3000. To retrieve error codes and review appropriate fault finding diagnostic charts refer to the relevant chapter in the electrical systems section.

PROBLEM	POSSIBLE CAUSES	CORRECTION
Tractor does not drive in any gear	Low or no hydraulic pump oil pressure or flow.	Pressure test the hydraulic pump (refer to pressure testing in the hydraulic systems section).
	Low or no low pressure circuit oil pressure.	Pressure test the low pressure circuit (refer to pressure testing in the hydraulic systems section).
	Low or no oil pressure to the transmission clutch(es).	Pressure test the clutch(es) (refer to pressure testing in the hydraulic systems section).
	Low or no oil pressure to the forward or reverse synchronizer rail piston.	Pressure test the forward or reverse synchronizer (refer to pressure testing in the hydraulic systems section).
	Shuttle lever faulty.	Check the shuttle lever in H5, replace the shuttle lever as necessary.
	Wiring harness faulty.	Repair or replace the wiring harness.
	Loose or damaged electrical connector(s).	Refit or repair the electrical connector(s) as necessary.
	Dump solenoid valve faulty.	Replace the dump solenoid valve.
	PWM solenoid valve(s) faulty.	Replace the PWM solenoid valve(s) and re-calibrate the clutch(es).
	Corrupt transmission software.	Clear the EEPROM using H8 and re-calibrate. If the fault persists download the correct level of software and re-calibrate.
	Faulty transmission controller.	Replace the transmission controller.
	Mechanical failure in the transmission.	Inspect clutches for seizure, broken synchronizers or broken gears. Replace part(s) as necessary.

PROBLEM	POSSIBLE CAUSES	CORRECTION
Poor clutch pedal feathering/inching performance	Incorrect clutch disconnect switch adjustment.	Adjust the clutch disconnect switch (refer to H7 in the diagnostic H routines chapter in the electrical systems section).
	Clutch pedal potentiometer faulty.	Check the clutch pedal potentiometer (refer to H9 in the diagnostic H routines chapter in the electrical systems section), replace as necessary.
	Clutches require calibration.	Calibrate the clutches. Manually adjust the calibration value to move the clutch engagement point to 35% clutch pedal travel.
	Quickfill adjustment incorrect.	Adjust the quickfill time as necessary (refer to H3 in the diagnostic H routines chapter in the electrical systems section).
	PWM solenoid valve(s) faulty.	Replace the PWM solenoid valve(s) and re-calibrate the clutch(es).
	Clutch plates worn or damaged.	Replace part(s) as necessary.
Transmission jumps out of gear, holds in gear or gears clash when shifting	Incorrect selector cable(s) adjustment.	Adjust selector cable(s).
	Clutch pedal potentiometer faulty.	Check the clutch pedal potentiometer (refer to H9 in the diagnostic H routines chapter in the electrical systems section), replace as necessary.
	Clutch disconnect switch faulty.	Check the disconnect switch (refer to H5 in the diagnostic H routines chapter in the electrical systems section), replace as necessary.
	Clutch oil pressure is still present when the clutch pedal is fully depressed.	Pressure test the clutch(es) (refer to pressure testing in the hydraulic systems section).
	PWM solenoid valve(s) faulty.	Replace the PWM solenoid valve(s) and re-calibrate the clutch(es).
	Internal oil leakage, maintaining clutch engagement.	Check internal clutch components for damage or wear, replace parts as necessary.
	Mechanical failure in the transmission.	Inspect the detents in the shift cover, synchronizers for wear or excessive end float of transmission components. Replace part(s) as necessary.

PROBLEM	POSSIBLE CAUSES	CORRECTION
Transmission is noisy in operation	Low driveline oil level.	Refill with the specified oil to the correct level. Locate oil leakage.
	Incorrect driveline oil specification.	Drain and refill with the specified oil to the correct level.
	Low or no lubrication oil pressure.	Pressure test the lubrication circuit (refer to pressure testing in the hydraulic systems section).
	Mechanical failure in the transmission.	Inspect the bearings and for worn or damaged parts. Replace part(s) as necessary.
Transmission clunks during feathering/inching	Clutches require calibration.	Calibrate the clutches. Manually adjust the calibration value to move the clutch engagement point to 35% clutch pedal travel.
	Quickfill adjustment incorrect.	Adjust the quickfill time as necessary (refer to H3 in the diagnostic H routines chapter in the electrical systems section).
	Clutch engagement oil pressure erratic.	Pressure test the clutch(es) (refer to pressure testing in the hydraulic systems section).
	PWM solenoid valve(s) faulty.	Replace the PWM solenoid valve(s) and re-calibrate the clutch(es).
	Clutch plates worn or damaged.	Replace part(s) as necessary.

OVERHAUL

C1 / C2 CLUTCH HOUSING

Removal

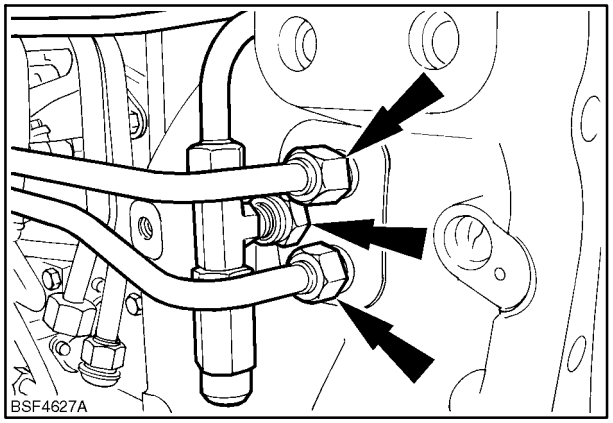
⚠ WARNING ⚠

Handle all components with the greatest of care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

⚠ WARNING ⚠

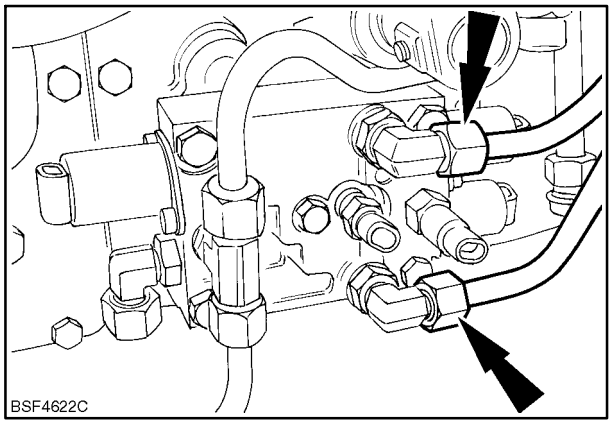
Lift and handle all heavy components using lifting equipment of appropriate capacity.

1. Disconnect the C1/C2 clutch housing oil supply pipes.



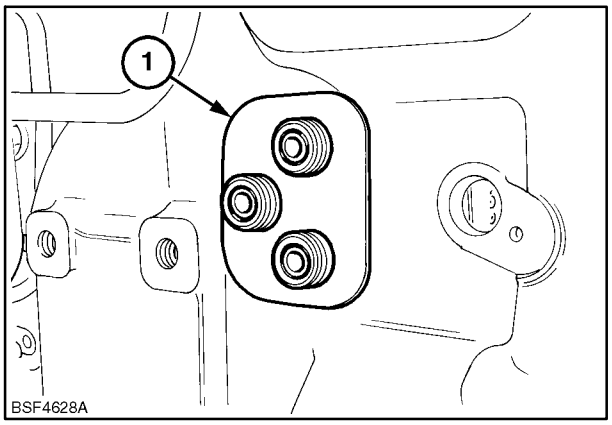
48

2. Loosen the oil supply pipe unions and reposition the pipes.



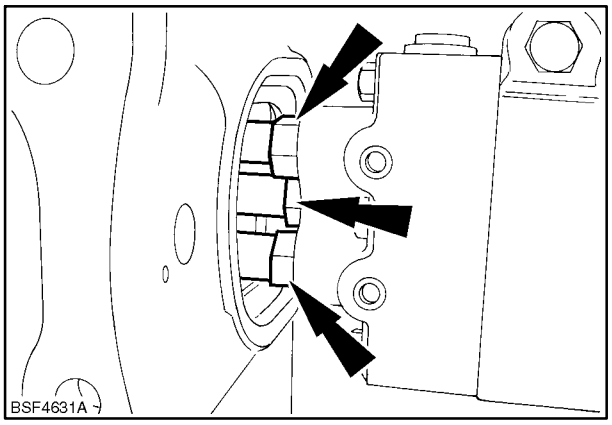
49

3. Remove the rubber gromet (1).



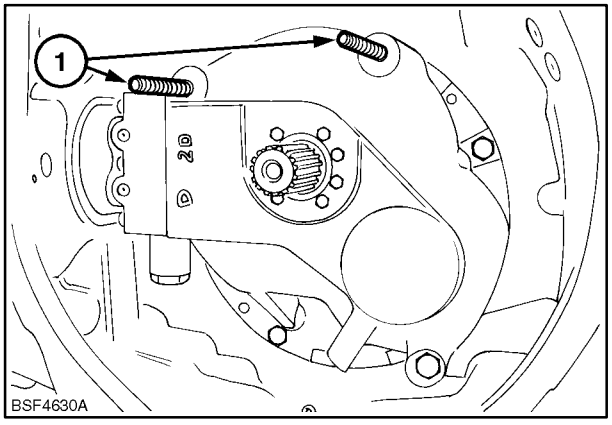
50

4. Remove the C1/C2 clutch housing oil supply unions.



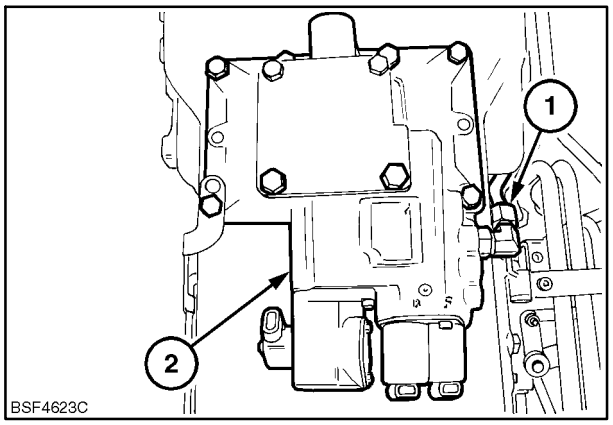
51

5. Remove the two upper retaining bolts and install two suitable threaded aligning rods (1) (M10x1.25x300mm).



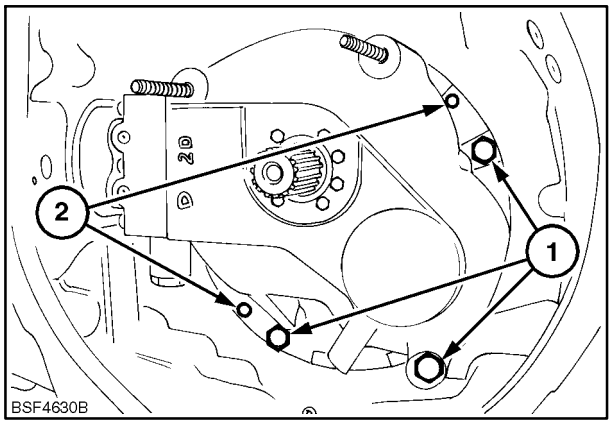
52

6. Disconnect the oil supply pipe (1).
7. Remove the forward/reverse synchronizer control cover (2).



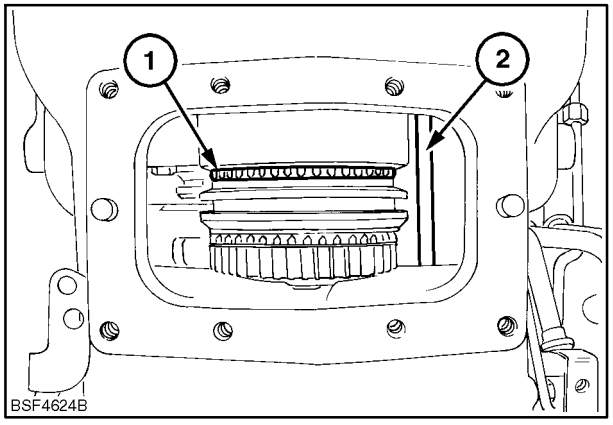
53

8. Remove the lower retaining bolts (1).
9. Install two bolts into the separating holes (2) and separate the C1/C2 clutch housing from the transmission housing.



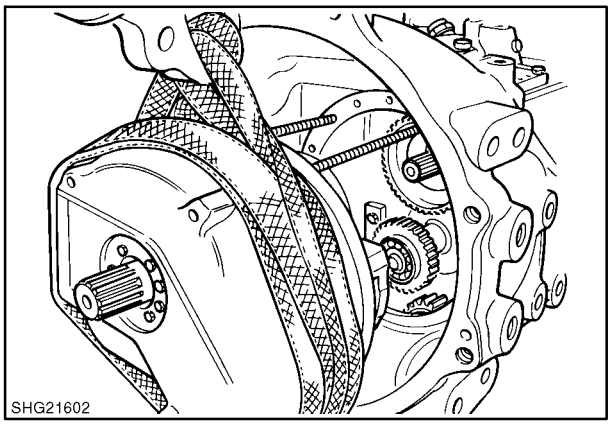
54

10. Ensure the synchronizer rings (1) and the lubrication oil supply tube (2) are not damaged when removing the C1/C2 clutch housing.



55

11. Caerfully reposition the C1/C2 clutch housing and attach a suitable hoist and lifting strap. Remove the C1/C2 clutch housing from the transmission housing.



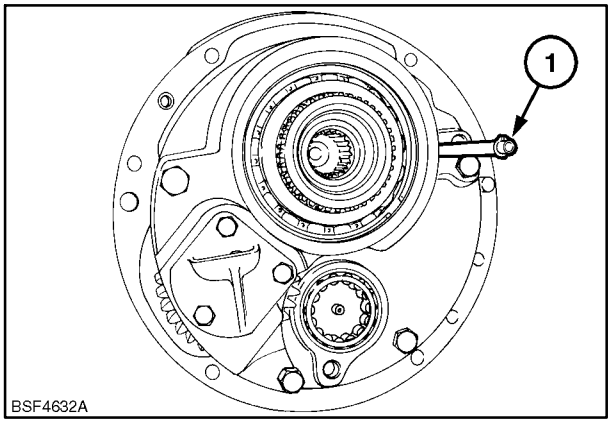
56

Disassembly

⚠ WARNING ⚠

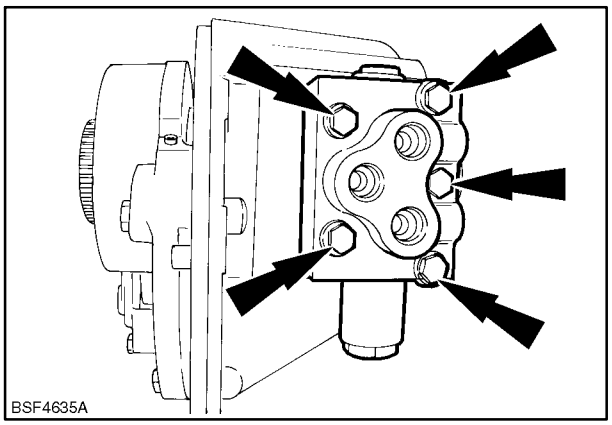
Handle all components with the greatest of care. Do not insert hands or fingers between the parts.Wear suitable protective clothing, including goggles, gloves and footwear.

1. Remove the lubrication oil supply tube (1).



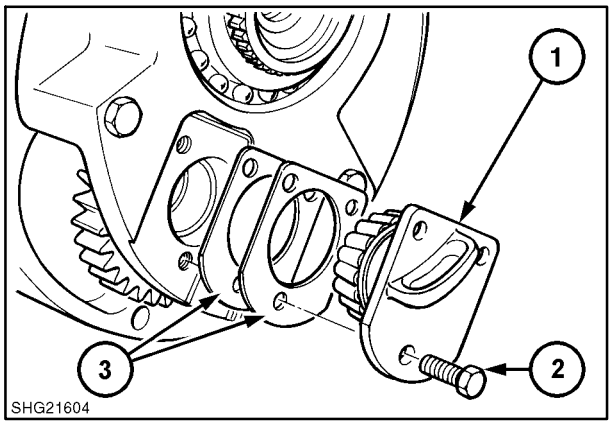
57

2. Remove the lubrication control valve block.



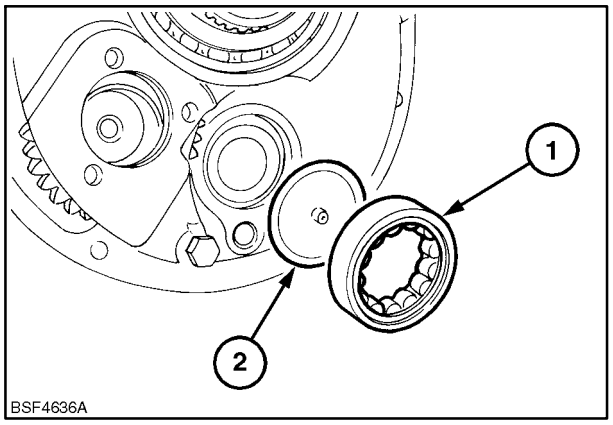
58

3. Remove the retaining bolts (2), C1 clutch cluster gear shaft bearing retaining plate (1) and the shim(s) (3).



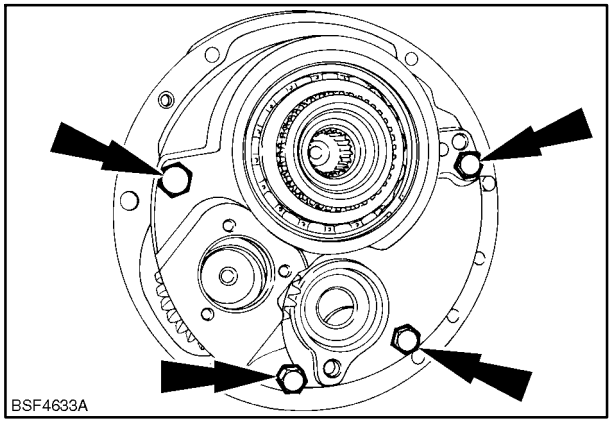
59

4. Remove the bearing (1) and the baffle plate (2).



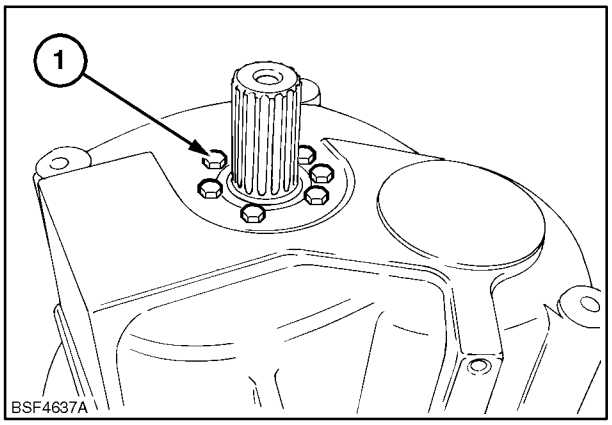
60

5. Remove the rear plate retaining bolts.



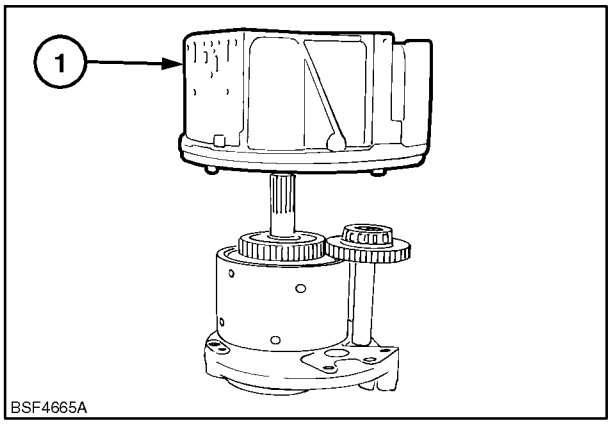
61

6. Rotate the C1/C2 clutch housing 90°.
7. Remove the clutch support manifold retaining bolts.



62

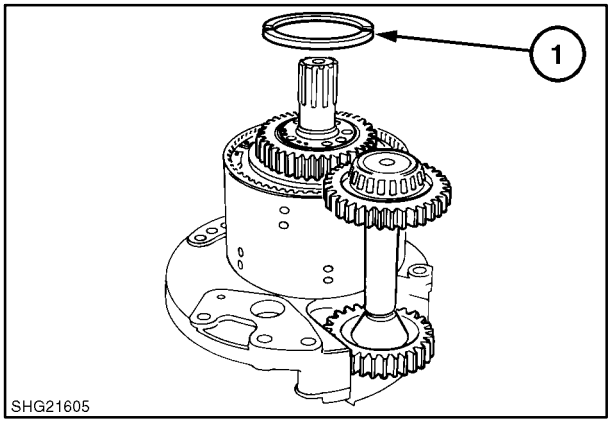
8. Remove the outer housing from the rear plate.



63

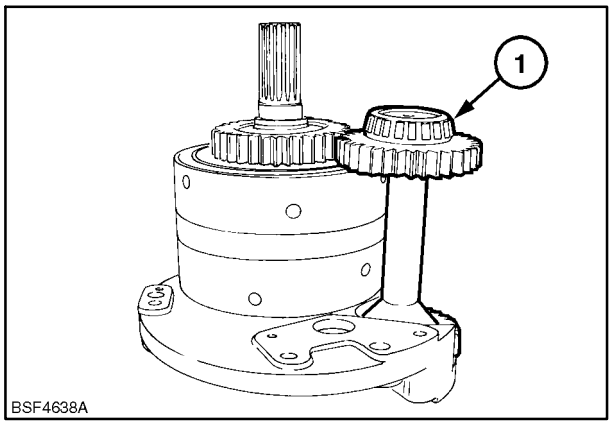
NOTE: *The polyimide washer may still be located in the outer housing.*

9. Remove the polyimide washer (1).



64

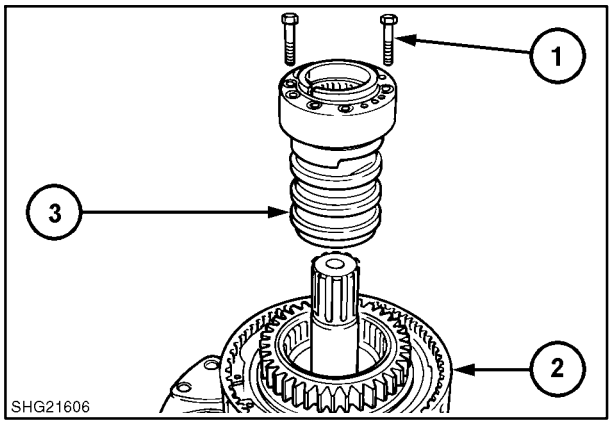
10. Remove the C1 clutch cluster gear shaft (1).



65

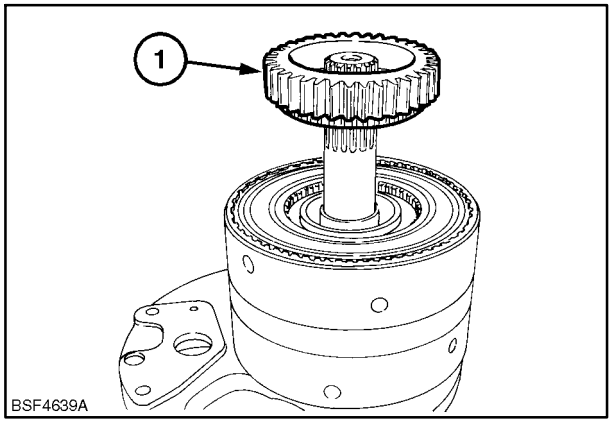
NOTE: *To aid removal, install two clutch support manifold retaining bolts (1) into the clutch support manifold (3).*

11. Remove the clutch support manifold (3) from the clutch (2).



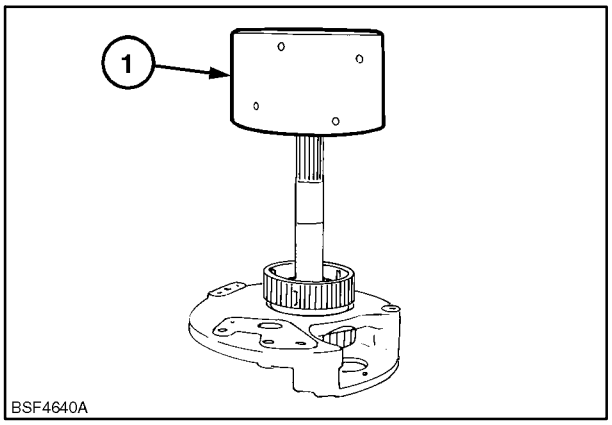
66

12. Remove the C2 clutch drive gear (1).



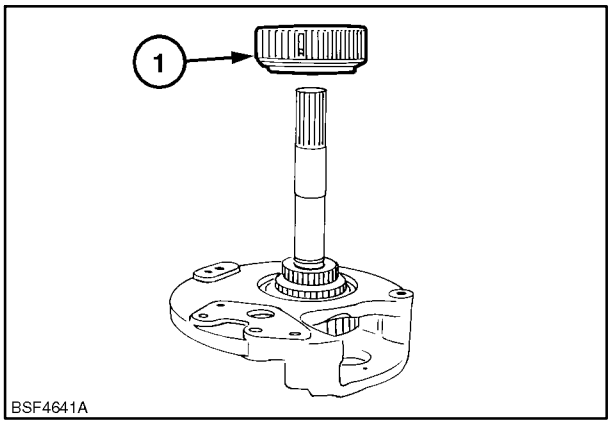
67

13. Remove the C1/C2 clutch assembly (1).



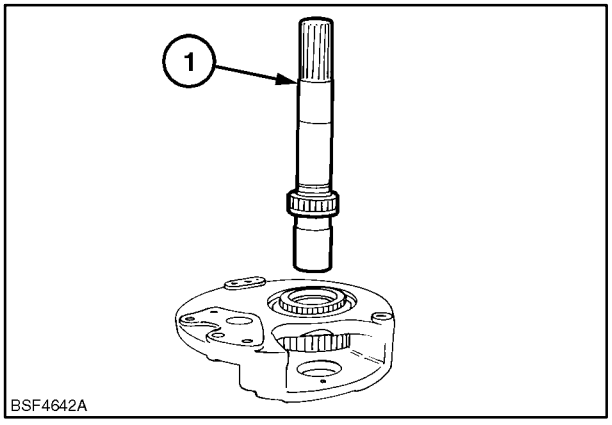
68

14. Remove the C2 clutch hub (1).



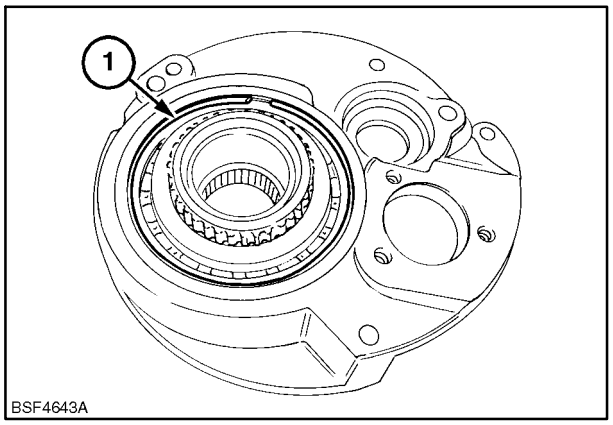
69

15. Remove the input driveshaft (1).



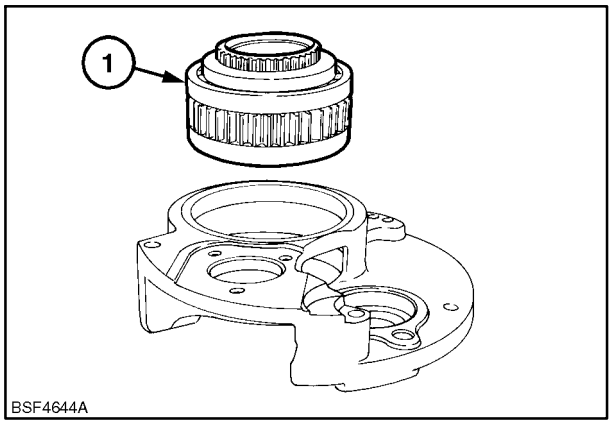
70

16. Rotate the back plate 180°.
17. Using suitable snap ring pliers, remove the C1 clutch drive gear retaining snap ring (1).



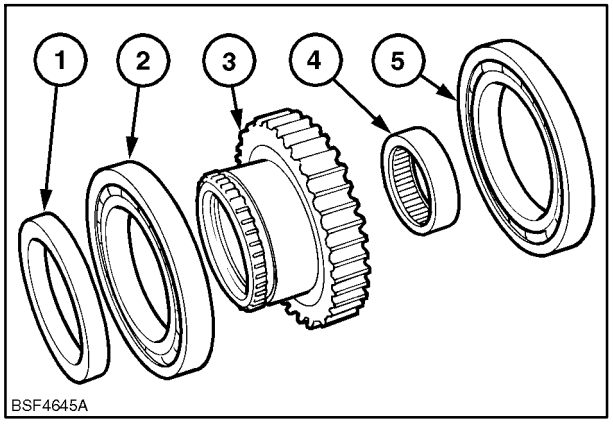
71

18. Remove the C2 clutch drive gear assembly (1).



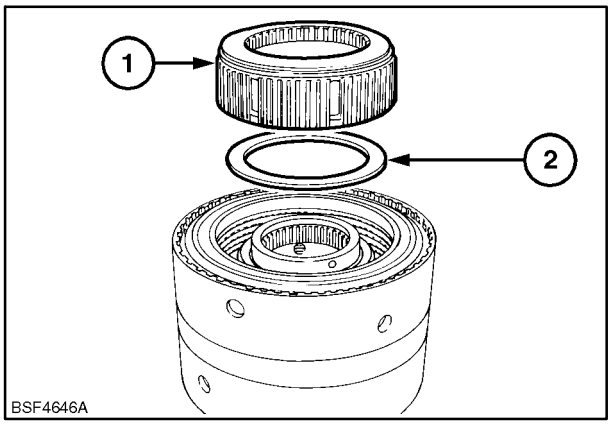
72

19. Using a suitable universal puller or hydraulic press, remove the bearing (2) and the spacer (1), bearing (5) and the needle roller bearing (4) from the C2 clutch drive gear (3).



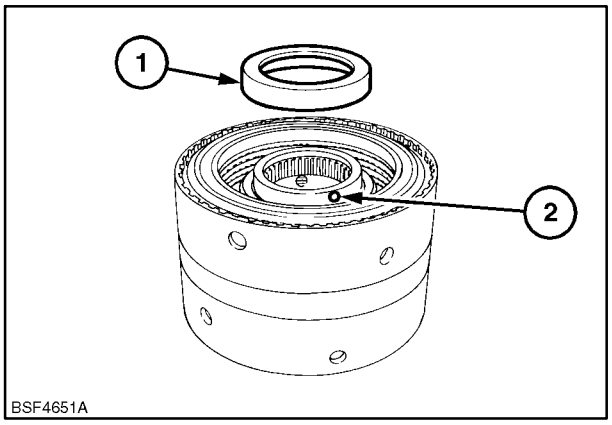
73

20. Remove the C1 clutch hub (1) and the steel thrust washer (2).



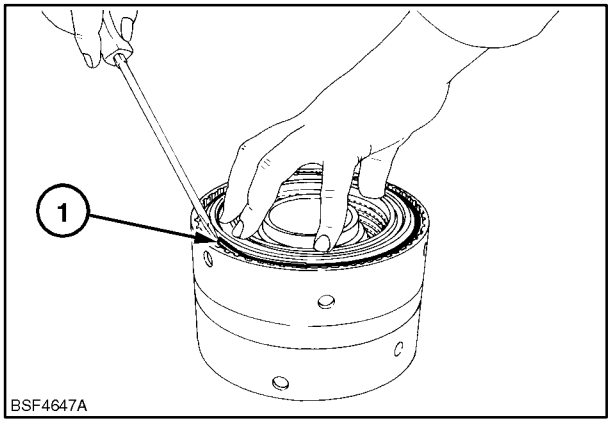
74

21. Rotate the clutch housing 180°.
22. Remove the C2 thrust cup (1) and the locating ball (2).



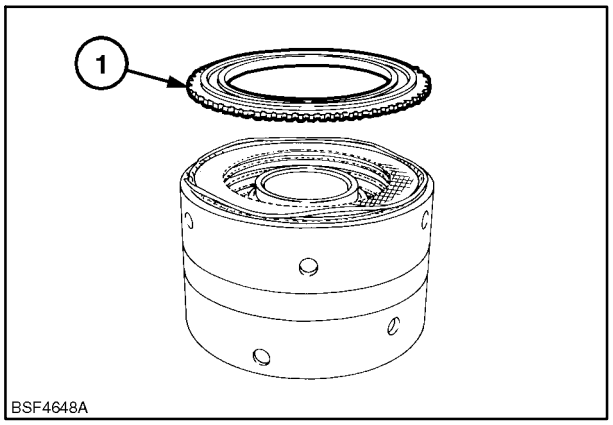
75

23. Compress the clutch housing end plate and using a suitable lever remove the snap ring (1).



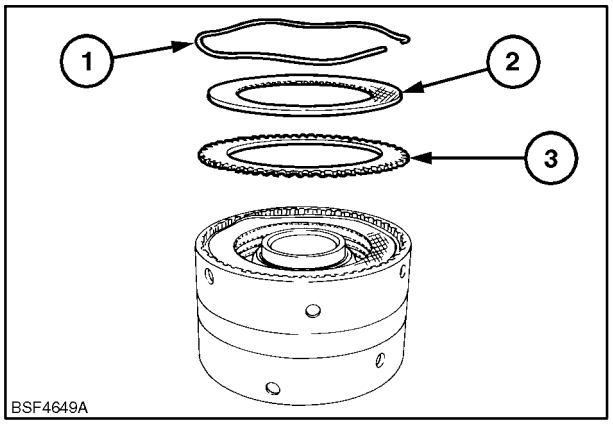
76

24. Remove the clutch housing end plate (1).



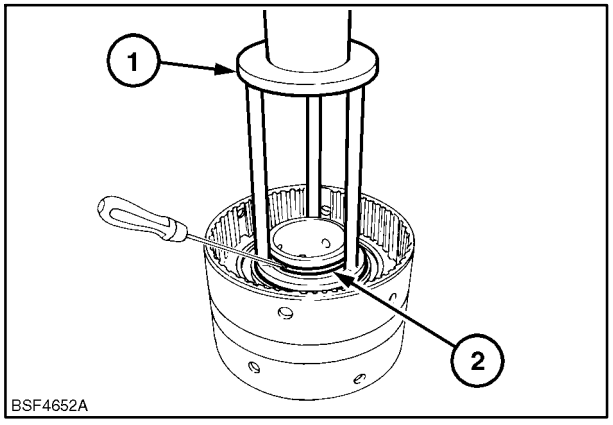
77

25. Remove the six separating springs (1), six friction plates (2), five steel plates (3) and one pressure steel plate against the clutch control piston.
26. Repeat the clutch plate removal process on the second clutch.



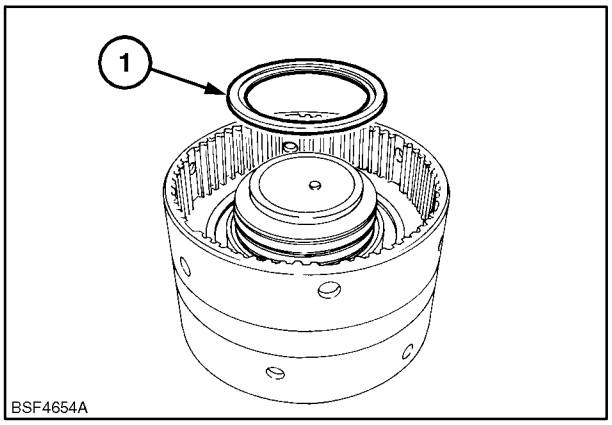
78

27. Using the special tool **295021** (1) and a suitable hydraulic press, compress the belleville washers and remove the snap ring (2).



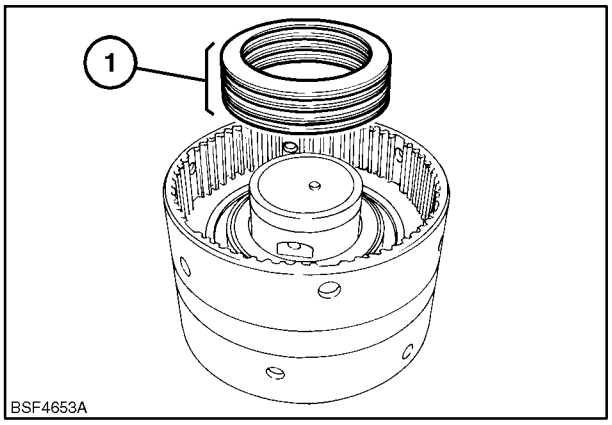
79

28. Remove the snap ring retainer (1).



80

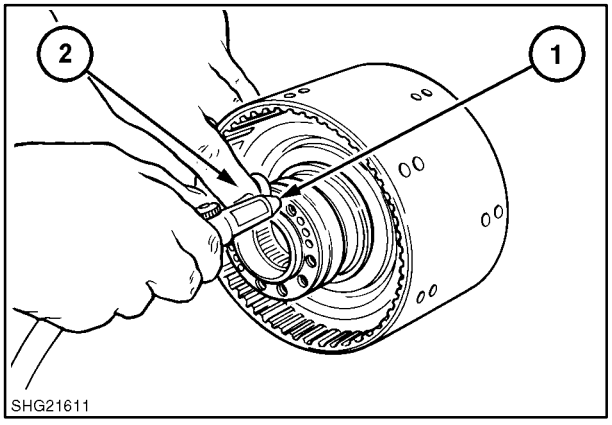
29. Remove the seven belleville washers (1).
30. Repeat the bellville washer removal process on the second clutch.



81

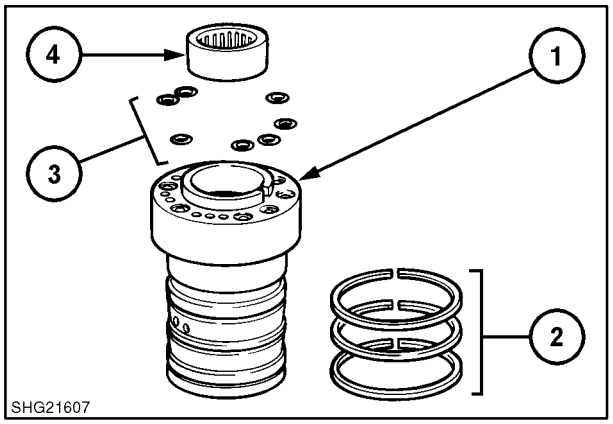
NOTE: *Temporarily install the C1/C2 clutch support manifold to aid the application of compressed air.*

31. Remove the clutch control pistons by applying compressed air into the oil supply port (1) and blanking the exhaust port with a suitable bung (2).



82

32. Remove the annular sealing rings (2), O-rings (3) and the internal needle roller bearing (4) from the C1/C2 support manifold (1).



83

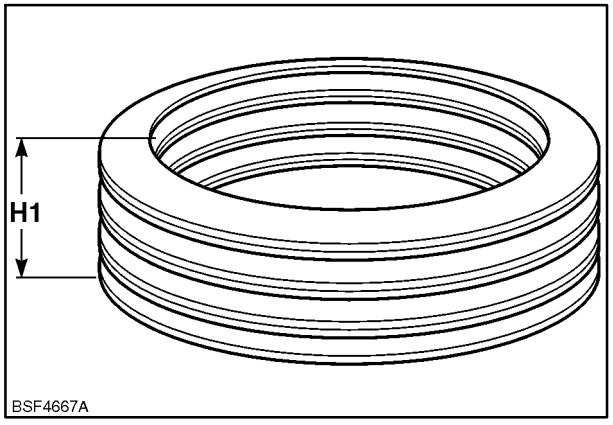
Inspection

1. Inspect the clutch separating springs for distortion or discoloration. Compare each spring shape and height with a new spring. Replace parts as necessary.
2. Inspect the piston inner and outer components for scoring or damage. Replace parts as necessary.
3. Inspect the clutch housing for scratches, scores, excessive wear and piston scuffing. Replace parts as necessary.
4. Inspect the clutch friction and steel plates for excessive wear. The friction plate material should have a clear distinctive pattern. All plates should be flat without warping and there should be no excessive discolouration. Replace parts as necessary.
5. The belleville washer set can be checked by measuring the free height and the loaded height (**H1**) as follows:

   Free height = 25.9mm

   Loaded height = 12.6mm
   With a load of 2400N (244Kg)

6. If the measured heights are not to specification, replace parts as necessary.



84

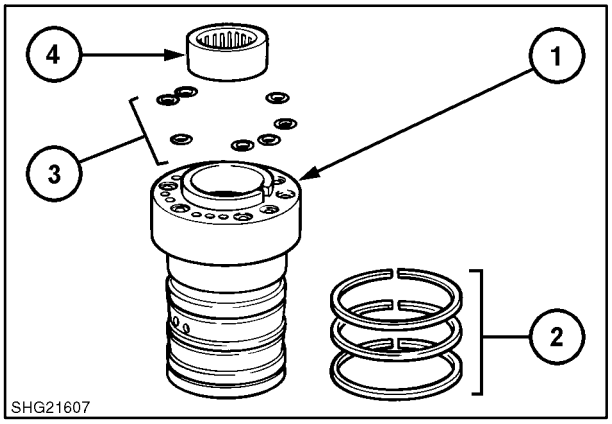
Assembly

⚠ WARNING ⚠

Handle all components with the greatest of care. Do not insert hands or fingers between the parts.Wear suitable protective clothing, including goggles, gloves and footwear.

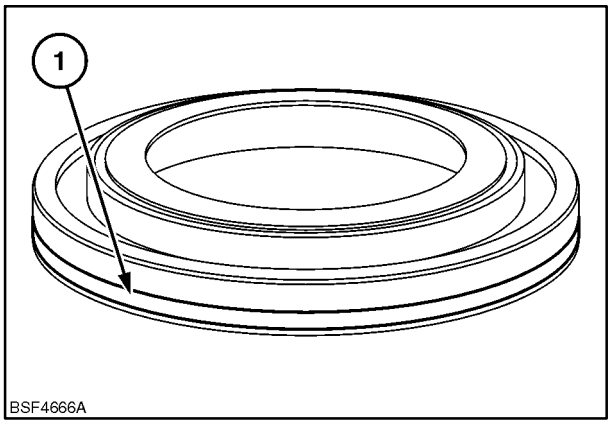
IMPORTANT: *The internal needle roller bearing (4) must be installed 3.2mm away from the internal shoulder. Do not press the bearing up to the internal shoulder or bearing distortion may occur.*

1. Install a new internal needle roller bearing (4), O-rings (3), and the annular sealing rings (2) into the C1/C2 clutch support manifold (1).



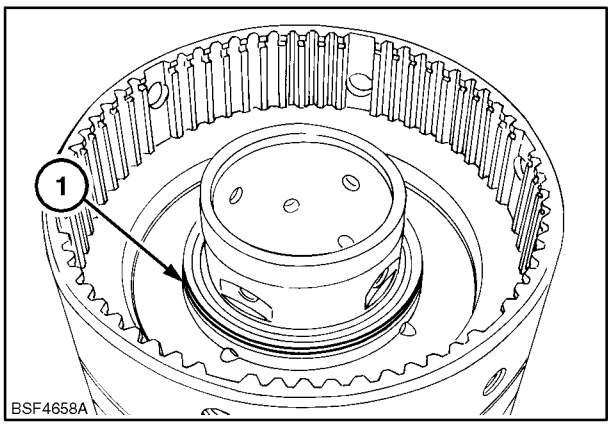
85

2. Install a new clutch control piston oil seal (1). Repeat this step for the second control piston oil seal.



86

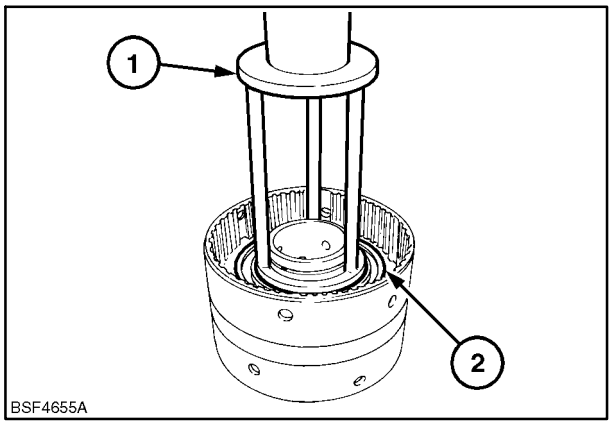
3. Install a new clutch control piston inner oil seal (1). Repeat this step for the second control piston inner oil seal.



87

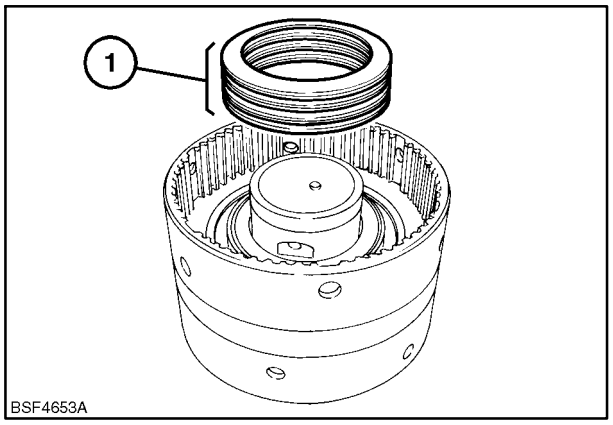
NOTE: *Allow the oil seals to settle in their seats for at least 15 minutes before installing the clutch control pistons.*

4. Lubricate both oil seals with petroleum jelly.
5. Using the special tool **295021** (1) and a suitable hydraulic press, install the control piston (2).
6. Repeat the control piston installation process on the second clutch control piston.



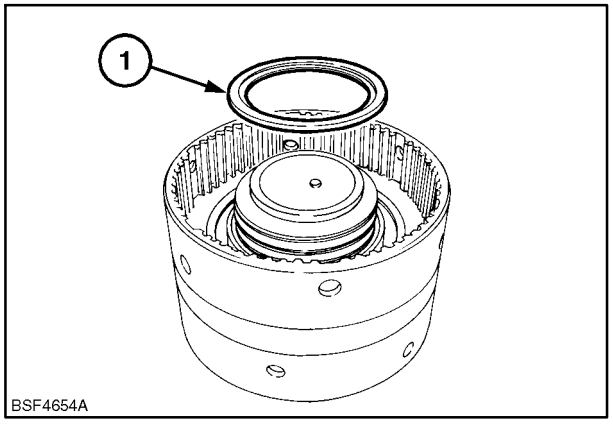
88

7. Install the seven belleville washers (1).



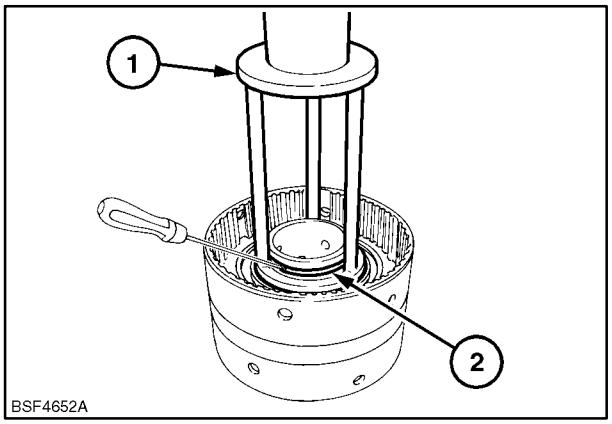
89

8. Install the snap ring retainer (1).



90

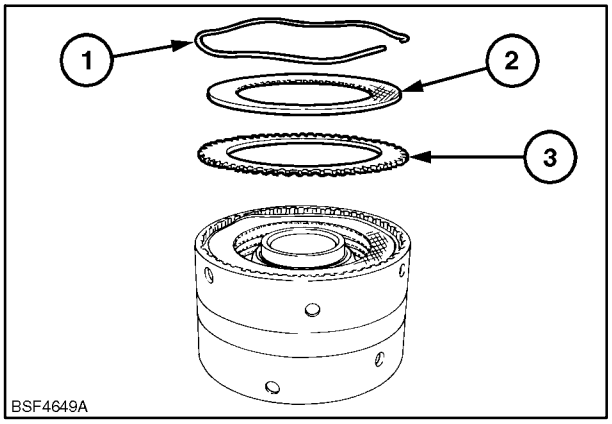
9. Using the special tool **295021** (1) and a suitable hydraulic press, compress the belleville washers and install the snap ring (2).
10. Repeat the belleville washer installation process for the second clutch.



91

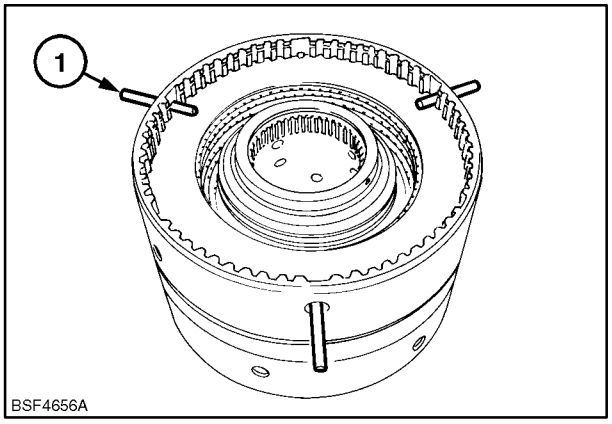
11. Check the clutch plate set height (refer to clutch plate set adjustment in this chapter).
12. Install the pressure steel plate against the clutch control piston.
13. Install the five steel plates (3), six friction plates (2) and six separating springs (1).

NOTE: *Ensure that the separating springs are installed with all the gaps aligned and the ends of the gaps facing towards the piston.*



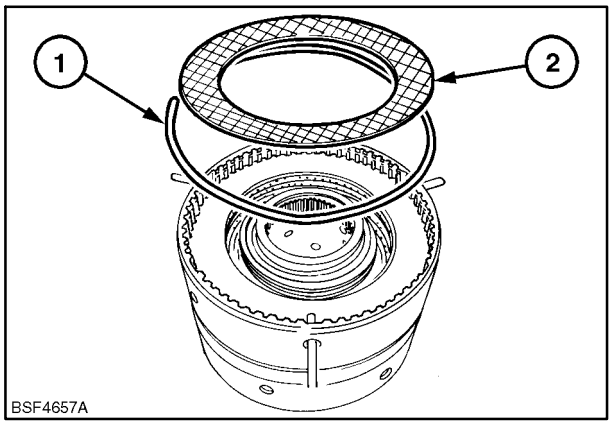
92

14. Compress the clutch plates and secure in place using three rods positioned through the top lubrication oil outlet holes.



93

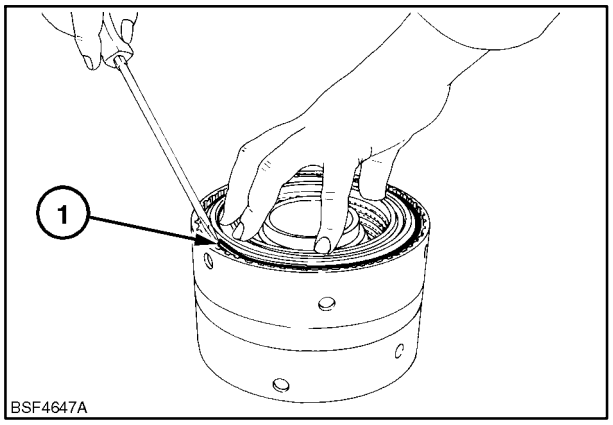
15. Install the last separating spring (1) and the friction plate (2).



94

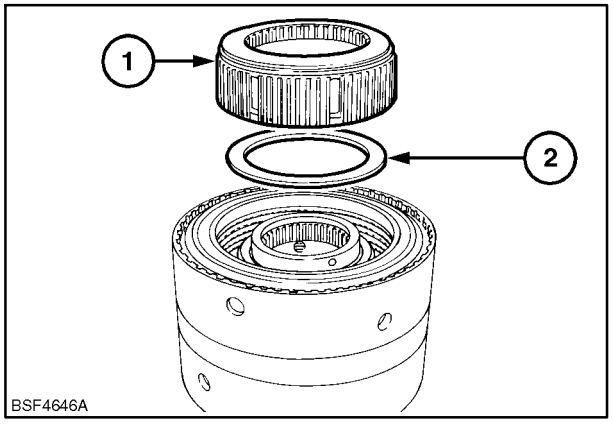
NOTE: *When compressing the end plate remove the securing rods.*

16. Install and compress the end plate and using a suitable lever install the snap ring (1).
17. Repeat the clutch plate installation process for the second clutch.



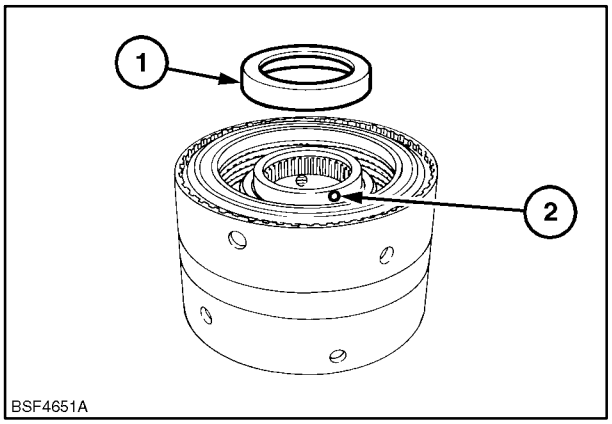
95

18. Install the steel thrust washer (2) and the C1 clutch hub (1).



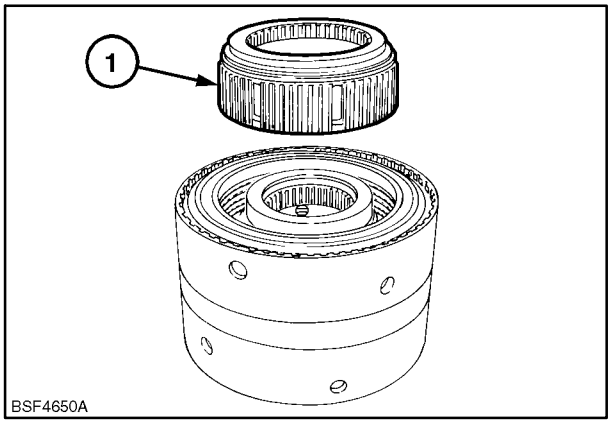
96

19. Rotate the clutch housing 180°.
20. Install the locating ball (2) and the C2 thrust cup (1).



97

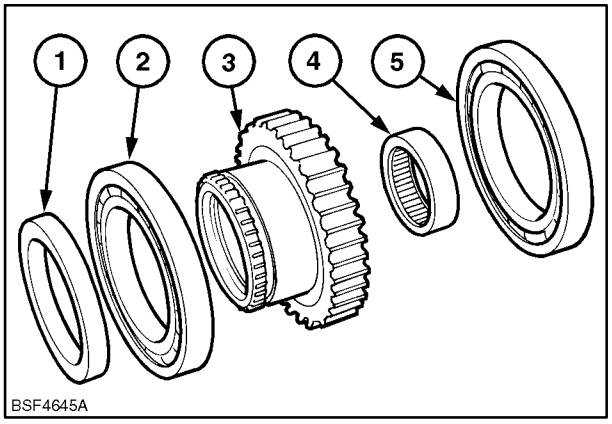
21. Install the C2 clutch hub (1).



98

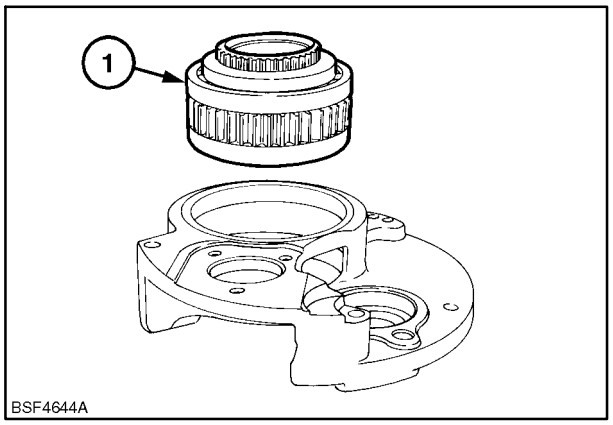
NOTE: *The use of an electronic induction heater will assist in the installation of the bearing without the need for a hydraulic press.*

22. Install the bearing (2) and the spacer (1), bearing (5) and the needle roller bearing (4) onto the C2 clutch drive gear (3).



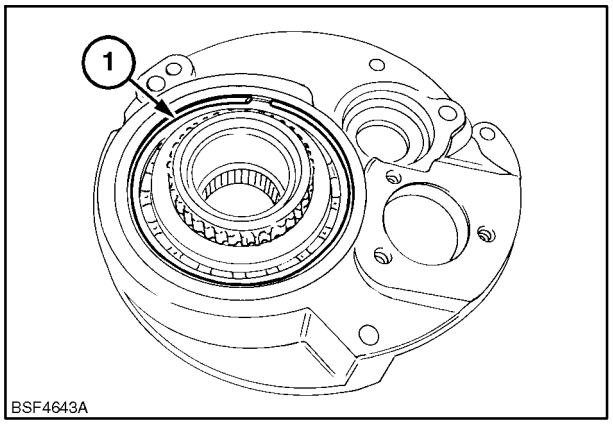
99

23. Install the C2 clutch drive gear assembly (1) into the rear plate.



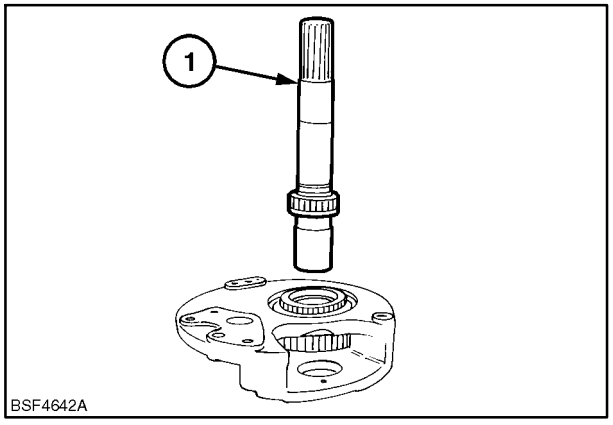
100

24. Install the C2 clutch drive gear retaining snap ring (1).



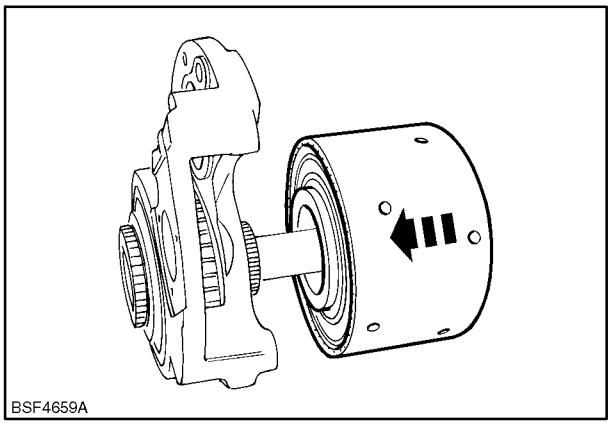
101

25. Rotate the rear plate 180°.
26. Install the input driveshaft (1).



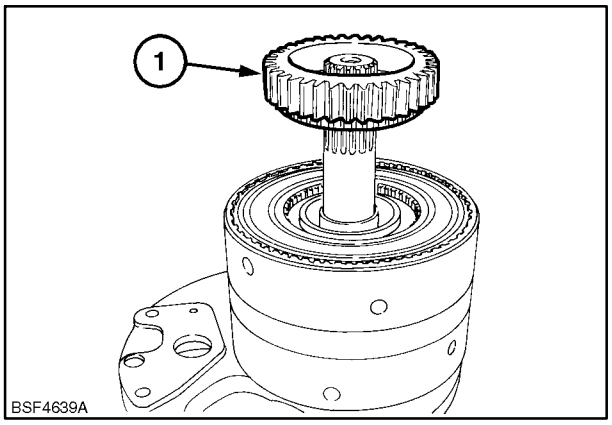
102

27. Position the rear plate on its side.
28. Install the C1/C2 clutch assembly onto the input shaft gear splines.



103

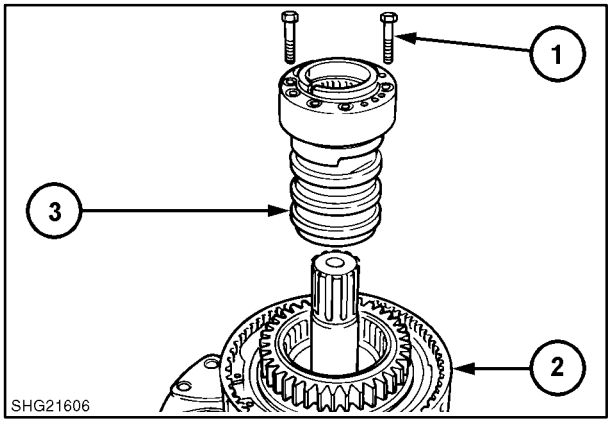
29. Install the C2 clutch drive gear (1).



104

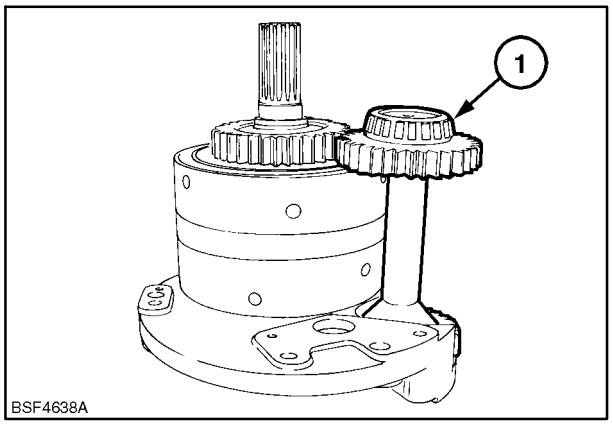
NOTE: *To aid installation, install two clutch support manifold retaining bolts (1) into the clutch support manifold (3).*

30. Install the clutch support manifold (3) into the clutch (2).



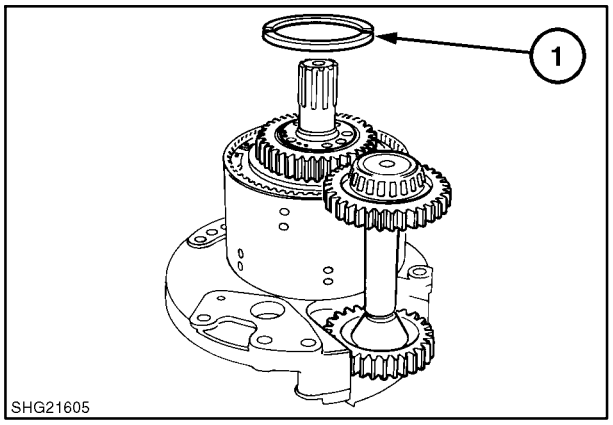
105

31. Install the C1 clutch cluster gear shaft (1).



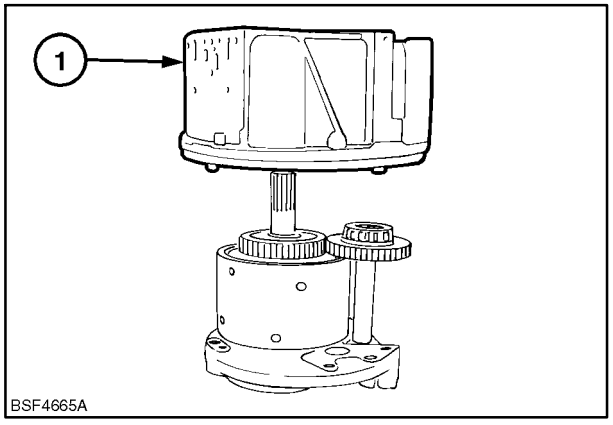
106

32. Install the polyimide washer (1).



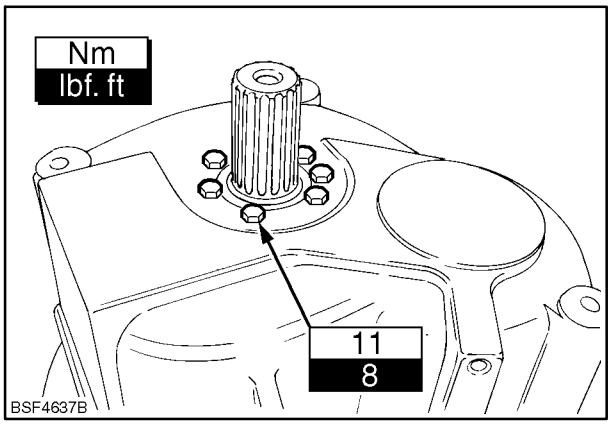
107

33. Install the outer housing onto the rear plate.



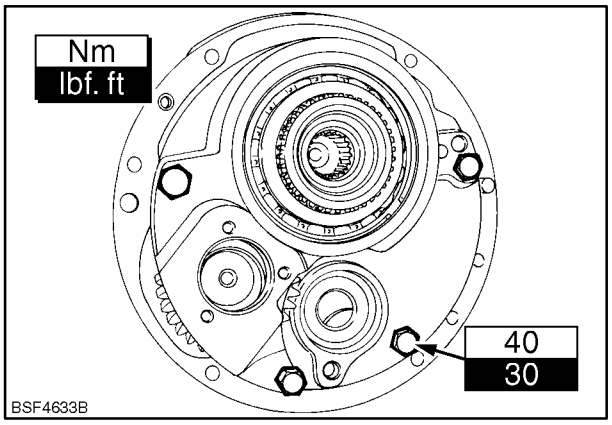
108

34. Install the clutch support manifold retaining bolts and tighten to the specified torque value.



109

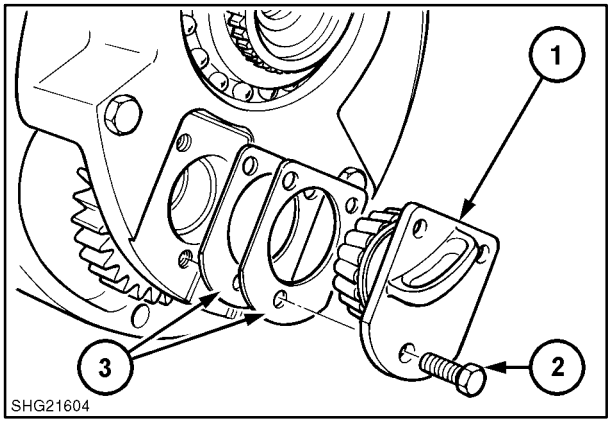
35. Rotate the C1/C2 clutch housing 90°.
36. Install the rear plate retaining bolts and tighten to the specified torque value.



110

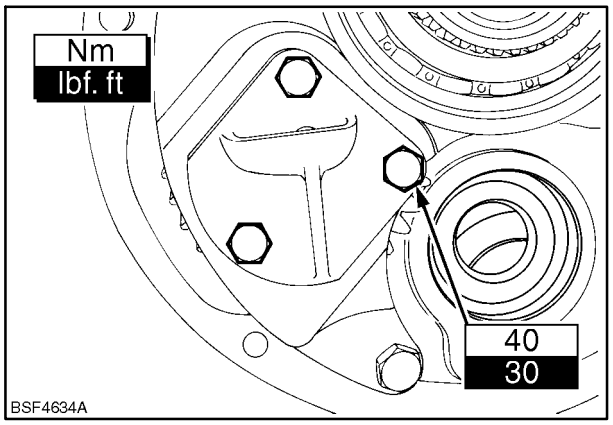
IMPORTANT: *Adjust the C1 clutch cluster gear shaft end float (refer to C1 clutch cluster gear shaft end float adjustment in this chapter).*

37. Install the shim(s) (3), cluster gear shaft bearing retaining plate (1), and the retaining bolts (2)



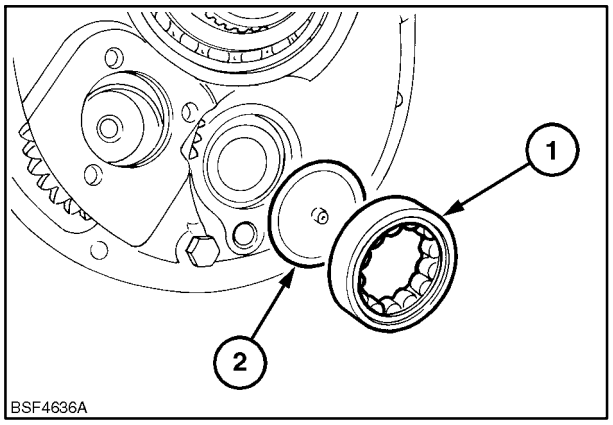
111

38. Tighten the retaining bolts to the specified torque value.



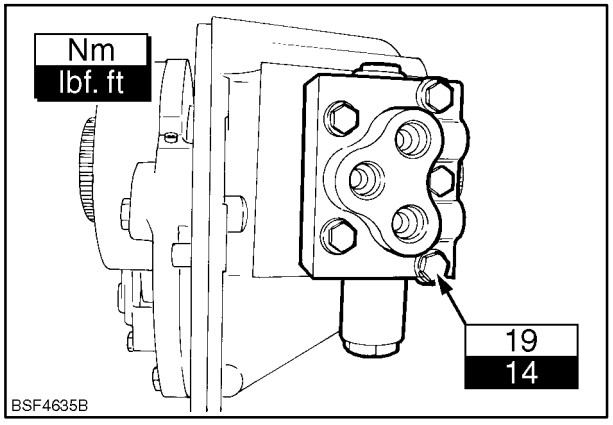
112

39. Install the baffle plate (2) and the bearing (1).



113

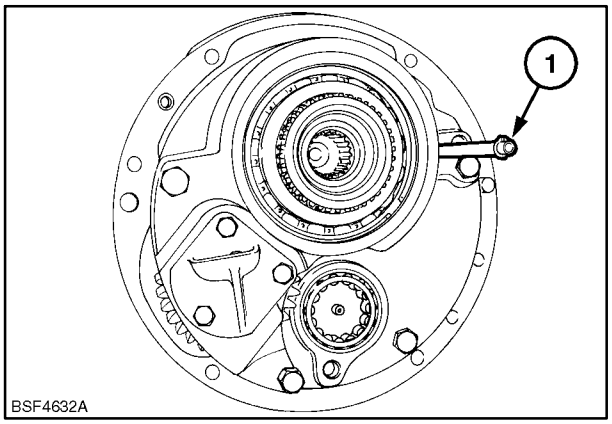
40. Install the lubrication control valve block with a new gasket. Tighten the retaining bolts to the specified torque value.



114

IMPORTANT: *If the lubrication oil supply tube is not installed fully, lubrication oil flow into the transmission may be restricted.*

41. Install the lubrication oil supply tube (1).



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CLUTCH PLATE SET

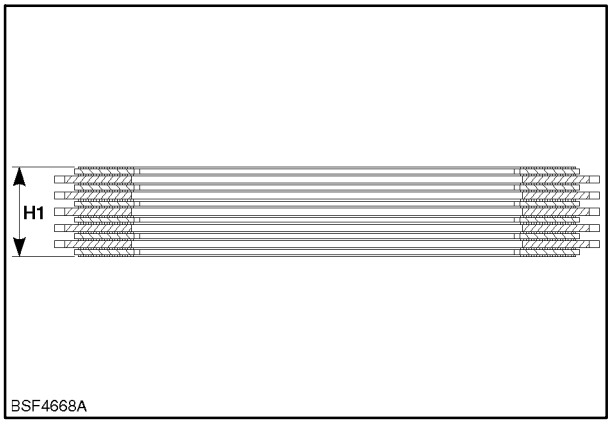
Adjustment

1. The clutch plate set (five steel plates and six friction plates) must be checked by measuring the loaded height (**H1)** as follows:

   Loaded height = 24.2 ±0.1mm
   With a load of 1600N (163Kg)

2. If the measured height is not to specification, change the steel plate(s) thickness to obtain the specified height.

   Steel plates available are 2.0mm or 2.2mm thick.

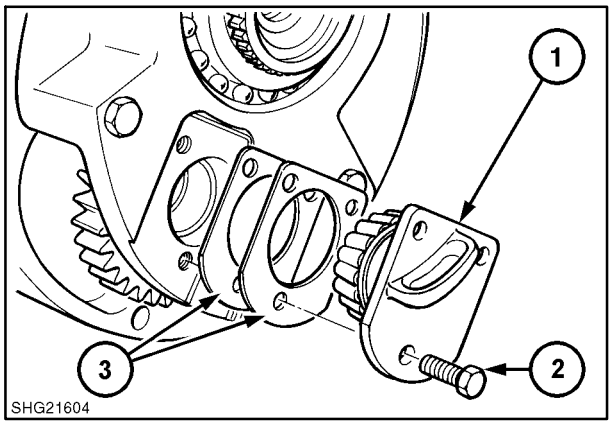


116

C1 CLUTCH CLUSTER GEAR SHAFT END FLOAT

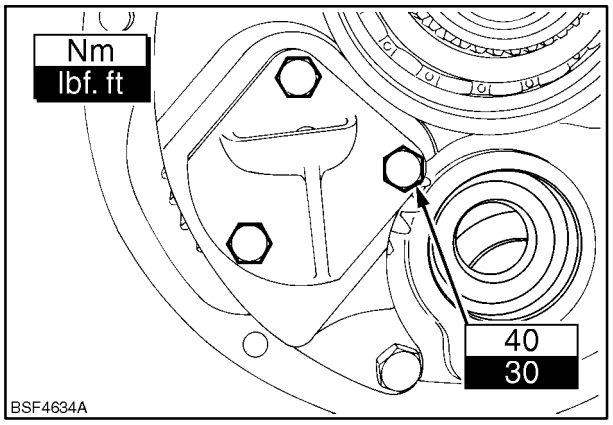
Adjustment

1. Install a number of adjustment shims (**S1**) (3) of a known dimension to achieve C1 clutch cluster gear shaft end float. Install the cluster gear shaft bearing retaining plate (1), and the retaining bolts (2).



117

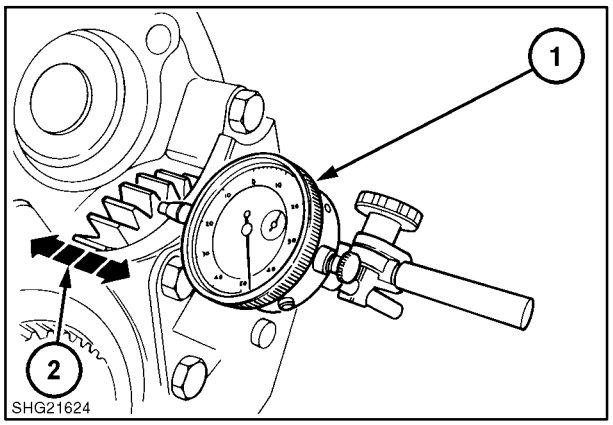
2. Tighten the retaining bolts to the specified torque value.



118

3. The C1 clutch cluster gear shaft end float required is 0.050 - 0.075 mm. To achieve this, carry out the following:
4. Rotate the cluster gear shaft several times to seat the bearing rollers.
5. Using a suitable dial gauge (1), measure the output shaft end float (2).

This measurement is M1



119

6. Determine the thickness of the shim(s) to be installed as follows:

NOTE: *If required decrease* ***(R1)*** *to the nearest available shim size.*

NOTE: *Increasing shim thickness increases end float, decreasing shim thickness decreases end float.*

R1 = S1-(M1-0.062)

Where:

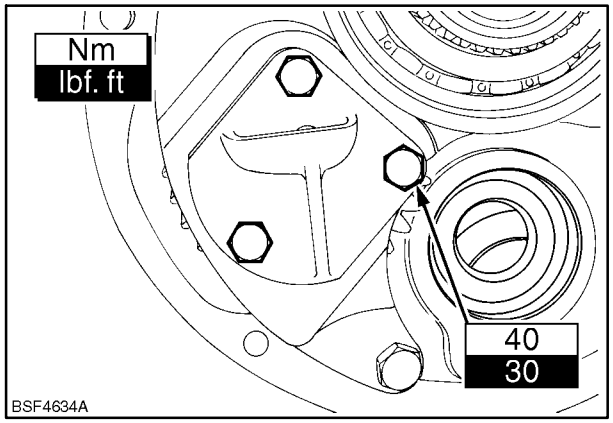
R1 = Required shim(s) thickness

S1 = Test shim(s) thickness

M1 = Measured output shaft end float (with test shim(s) **(S1)** installed)

0.062 = Mean of required end float (0.050 - 0.075)

7. Remove the test shim(s) **(S1)** and install the calculated shim(s) **(R1)**.
8. Install the cluster gear shaft bearing retaining plate and tighten the retaining bolts to the specified torque value.



120

C1 / C2 CLUTCH HOUSING

Installation

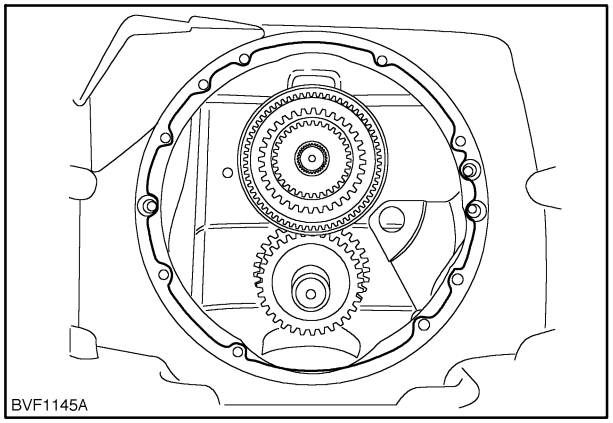
WARNING

Handle all components with the greatest of care. Do not insert hands or fingers between the parts.Wear suitable protective clothing, including goggles, gloves and footwear.

WARNING

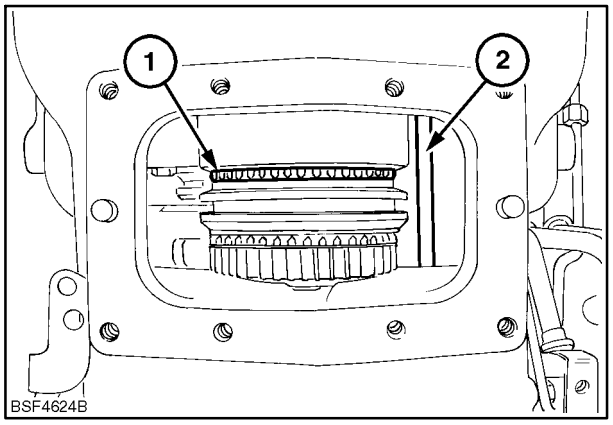
Lift and handle all heavy components using lifting equipment of appropriate capacity.

1. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



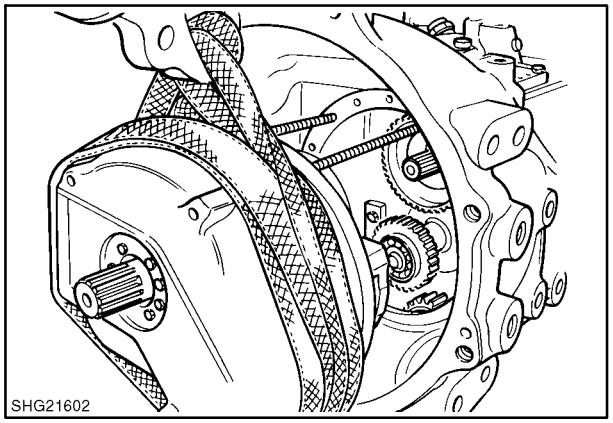
121

2. Enure the synchronizer rings (1) and the lubrication oil supply tube (2) are not damaged when installing the C1/C2 clutch housing.



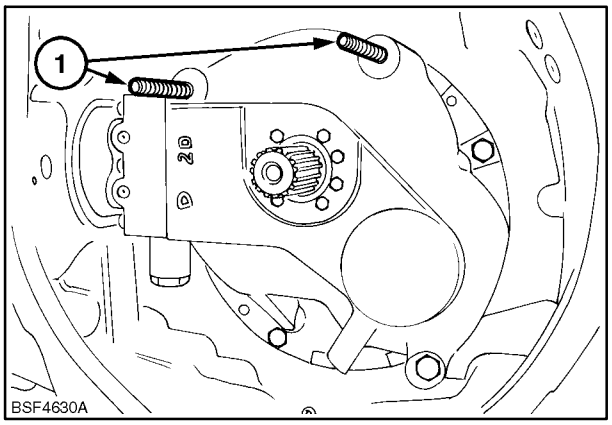
122

3. Using a suitable hoist and lifting strap. install the C1/C2 clutch housing into the transmission housing.



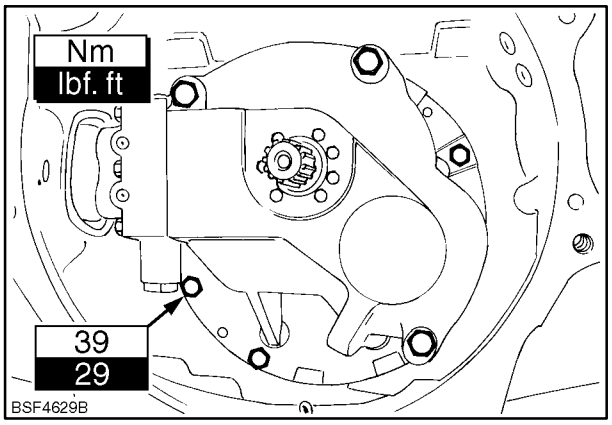
123

4. Remove the two threaded aligning rods (1) and install the two upper retaining bolts.



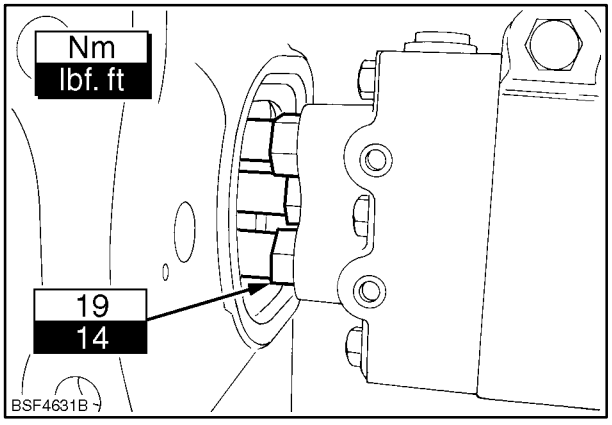
124

5. Install the lower retaining bolts and tighten to the specified torque value.



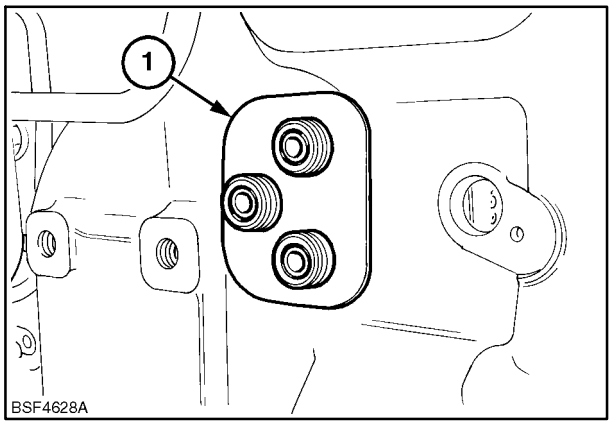
125

6. Install the C1/C2 clutch housing oil supply unions and tighten to the specified torque value.



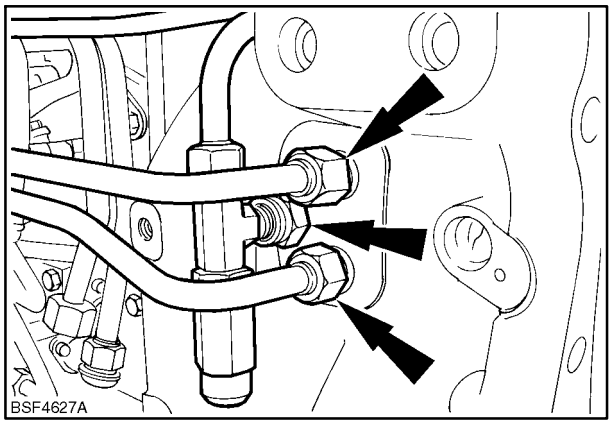
126

7. Install the rubber gromet (1).



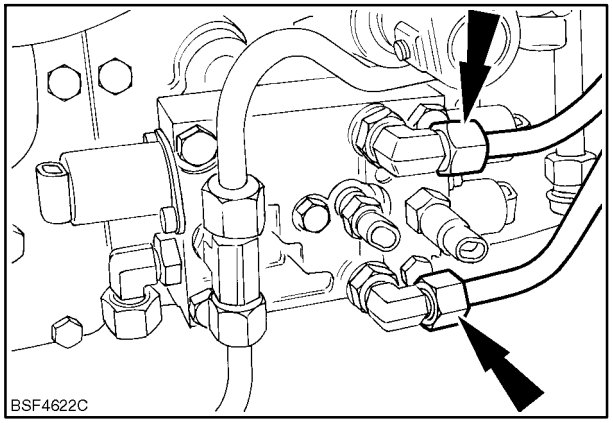
127

8. Connect the oil supply pipes.



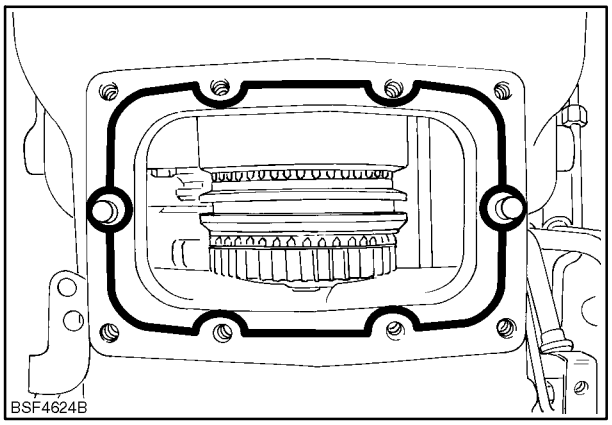
128

9. Tighten the oil supply pipes.



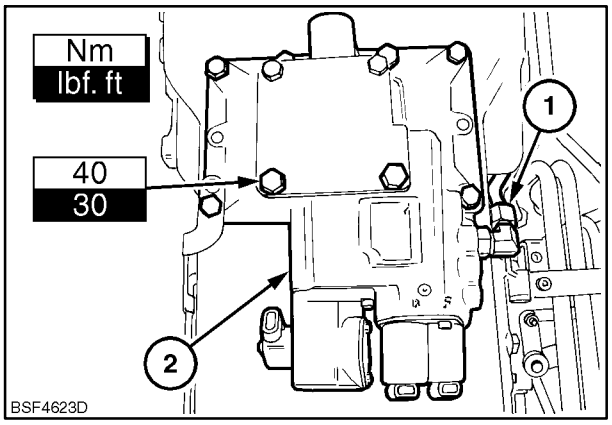
129

10. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



130

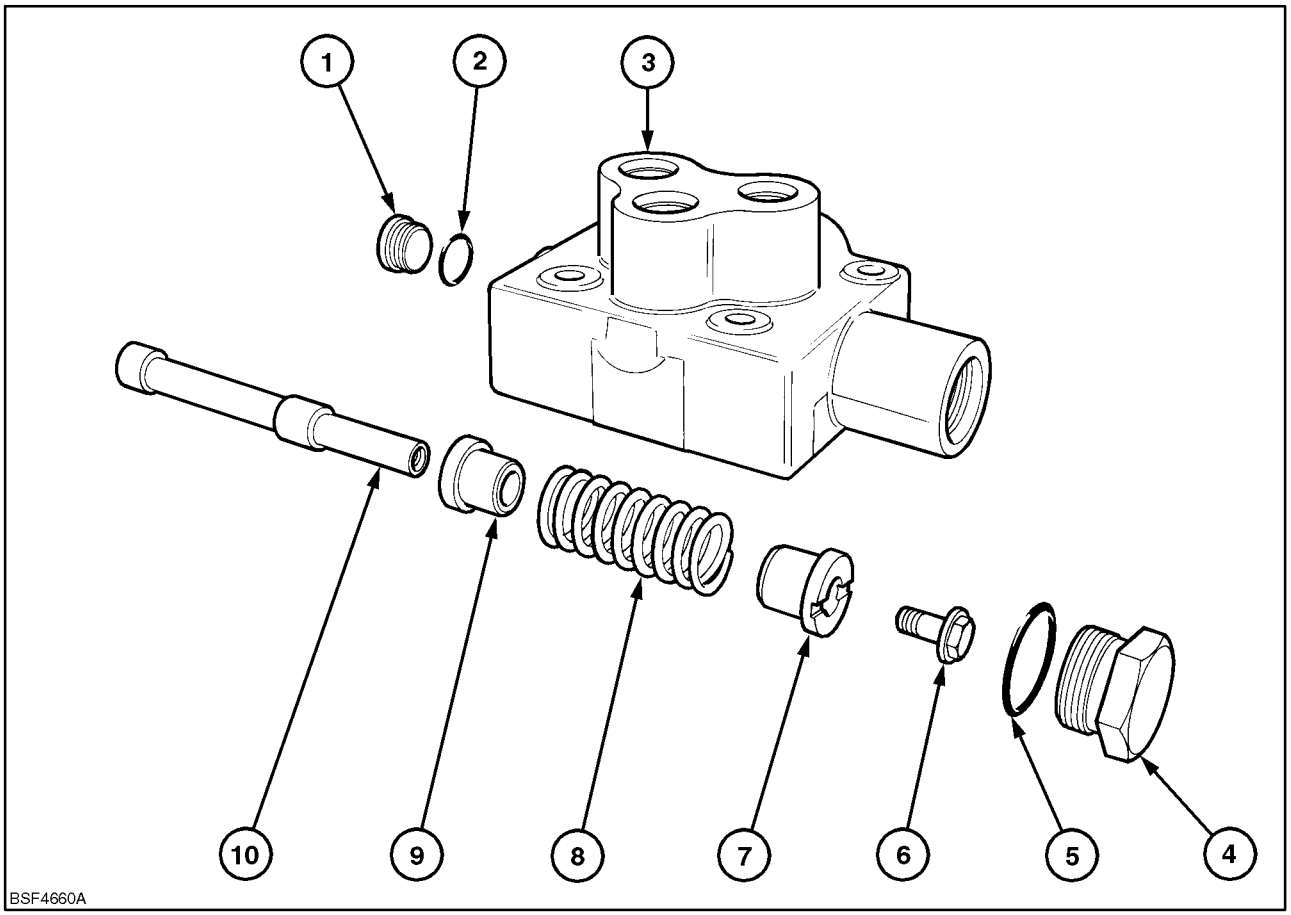
11. Install the forward/reverse synchronizer control cover (2) and tighten the retaining bolts to the specified torque value.
12. Connect the oil supply pipe (1).



131

LUBRICATION OIL CONTROL VALVE

Disassembly / Assembly



132

Lubrication Oil Control Valve Exploded View

1. End cap
2. O-ring
3. Valve block
4. End cap
5. O-ring
6. Retaining bolt and washer
7. Stop sleeve
8. Spring
9. Stop sleeve
10. Spool

NOTE: *Apply loctite 270 onto the retaining bolt (6) when assembling.*

TRANSMISSION

Disassembly

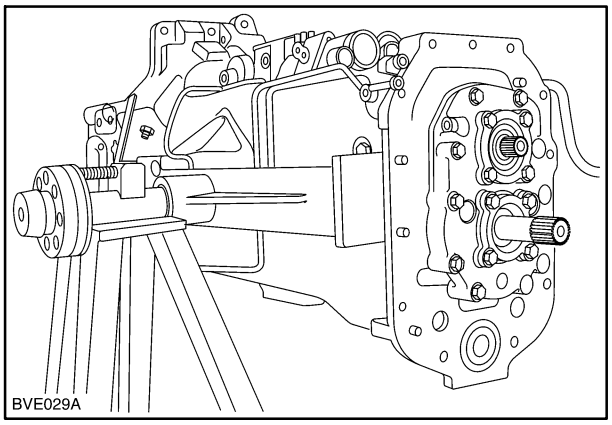
WARNING

Handle all components with the greatest of care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

WARNING

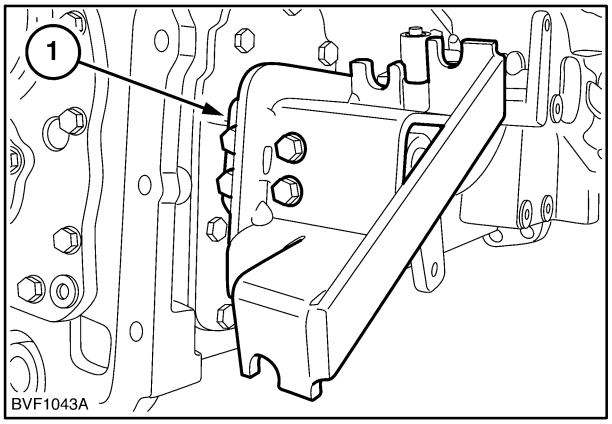
Lift and handle all heavy components using lifting equipment of appropriate capacity.

1. Remove the transmission (refer to the transmission removal chapter of the separating the tractor section)
2. Using the locally fabricated stand attachment bracket, install the transmission to a suitable stand.



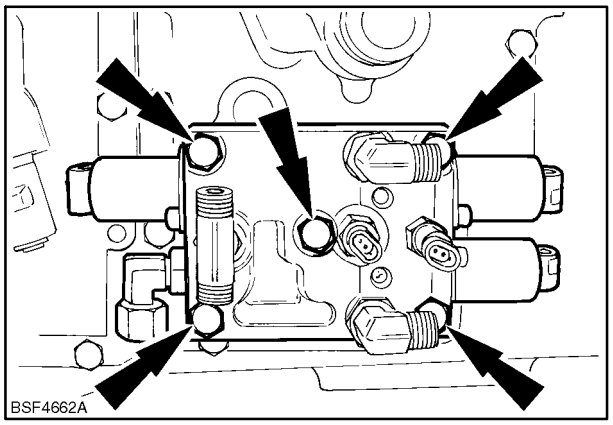
133

3. Remove the C1/C2 clutch housing (refer to C1/C2 clutch housing removal in this chapter).
4. Remove the gearshift cable retaining bracket.



134

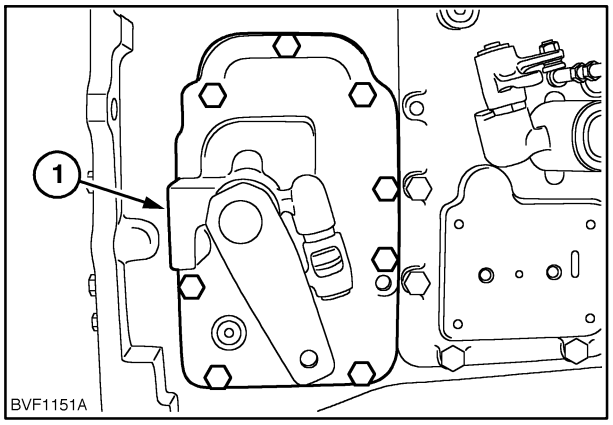
5. Remove the transmission control valve.



135

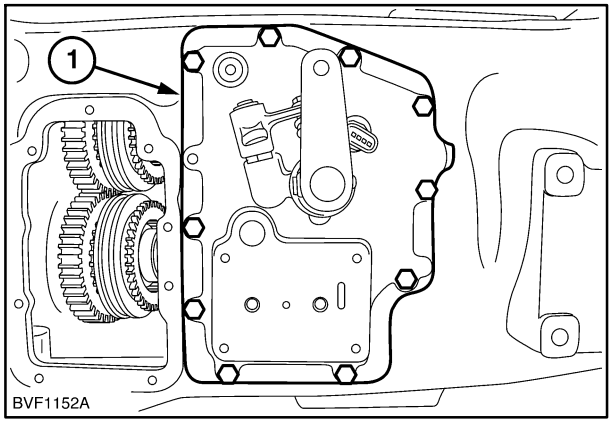
NOTE: *Ensure all gears are in neutral.*

6. Remove the high/medium and low synchronizer control cover (1).



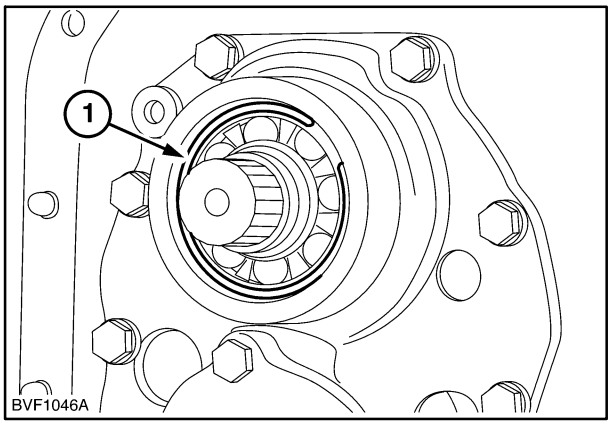
136

7. Remove the 1/2 and 3/4 synchronizer control cover (1).



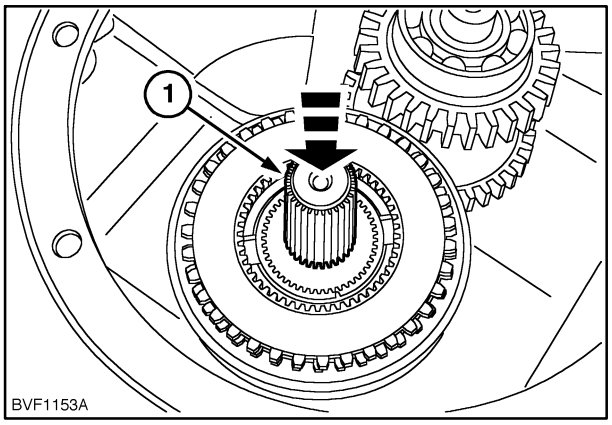
137

8. Using suitable snap ring pliers, remove the PTO shaft bearing retaining snap ring (1).



138

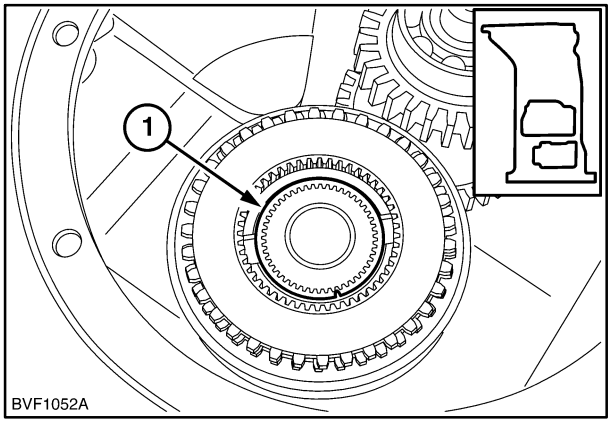
9. Remove the PTO shaft (1).



139

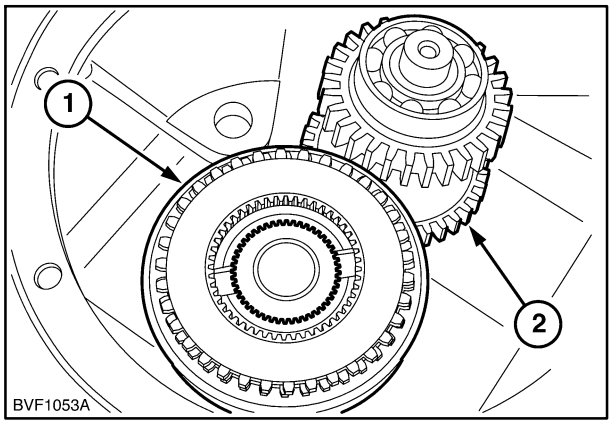
Front Section Removal

10. Rotate the transmission 90°.
11. Remove the forward/reverse synchronizer retaining snap ring (1).



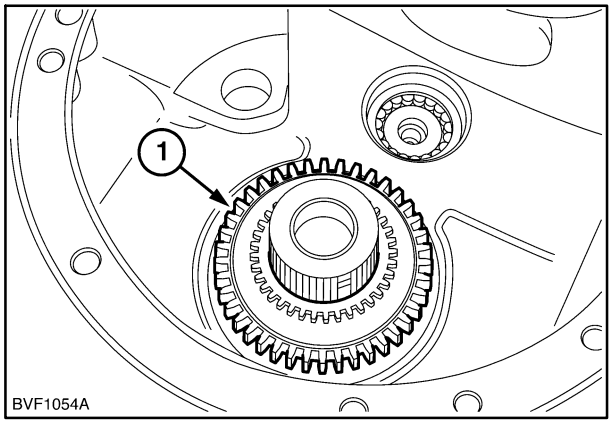
140

12. Remove the forward/reverse synchronizer (1) with the reverse cluster (2).



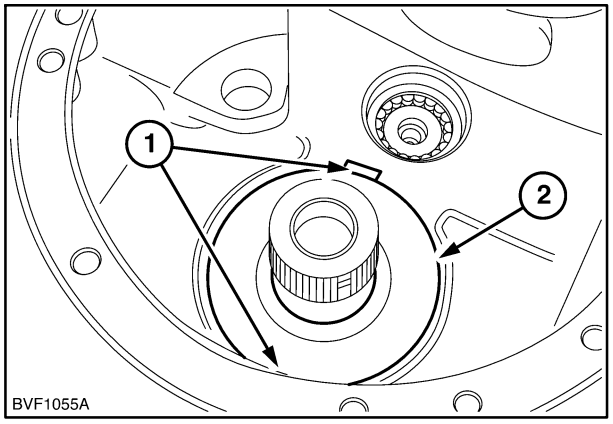
141

13. Remove the reverse driven gear (1).



142

14. Using a suitable lever in the cut-outs provided (1), remove the lubrication oil supply manifold (2).



143

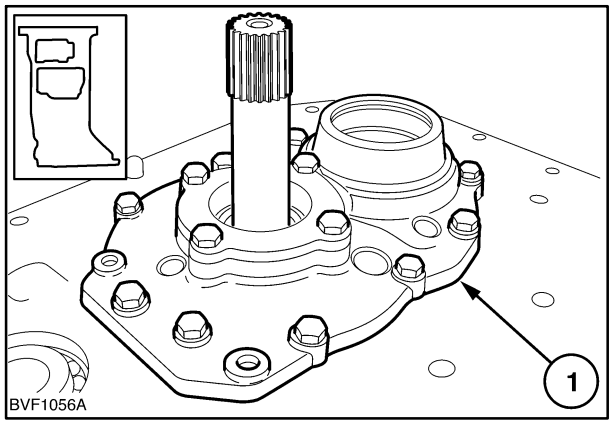
Rear Section Removal

NOTE: *The countershaft front bearing may fall out when the transmission is rotated.*

15. Rotate the transmission 180°.

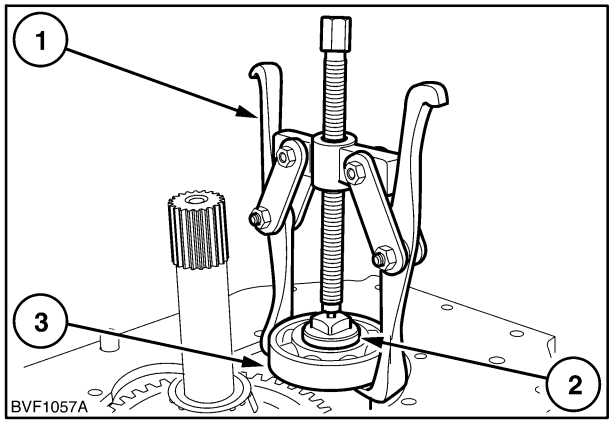
NOTE: *Ensure the range gear cluster remains in the transmission while removing the rear plate.*

16. Remove the rear plate (1).



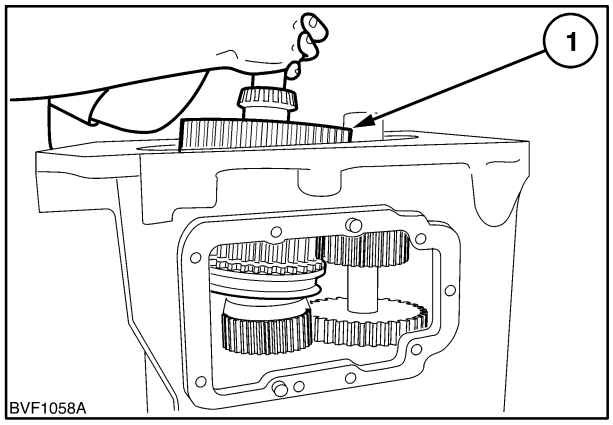
144

17. Using a suitable universal puller (1) and the locally fabricated tool (2), remove the range gear cluster bearing (3).



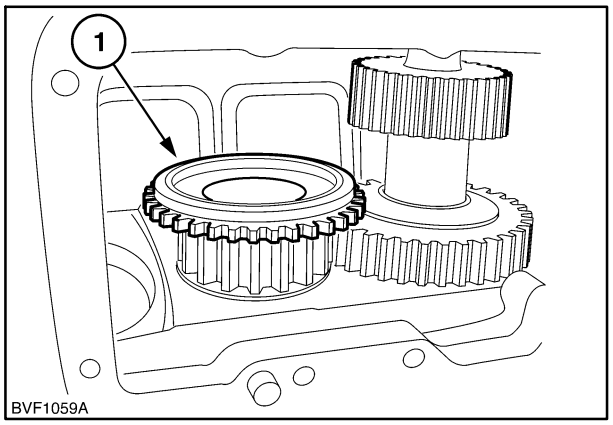
145

18. Remove the output shaft assembly (1).



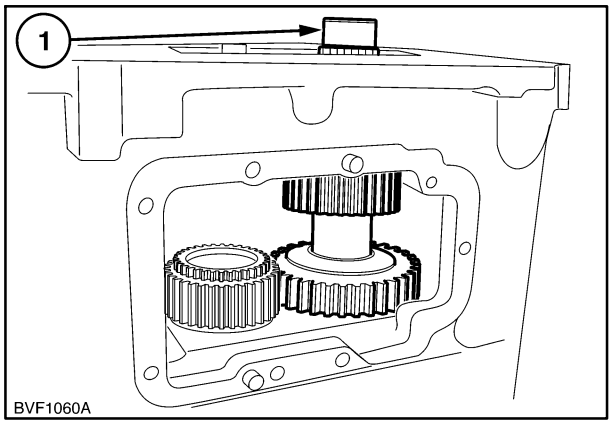
146

19. Remove the high/medium synchronizer rings (1).



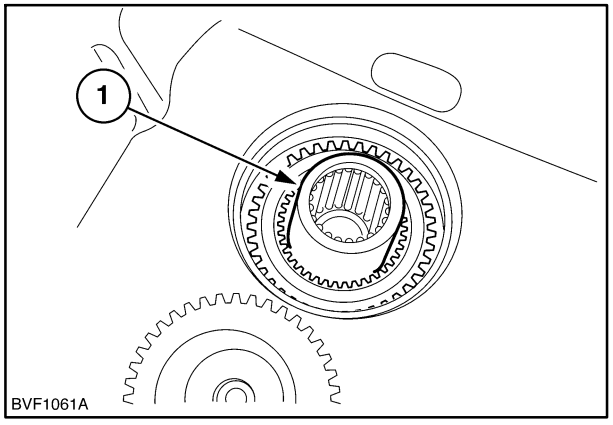
147

20. Remove the range gear cluster shaft (1).



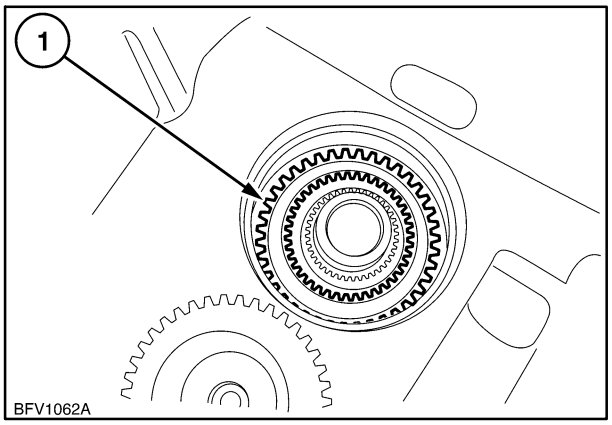
148

21. Remove the needle roller bearing (1).



149

22. Remove the 3/4 synchronizer rings (1).

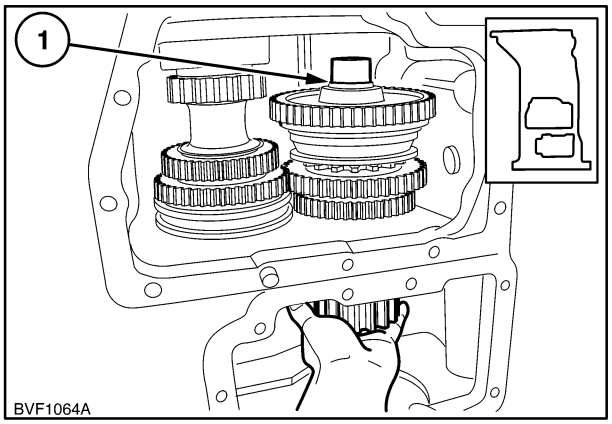


150

Middle Section Removal

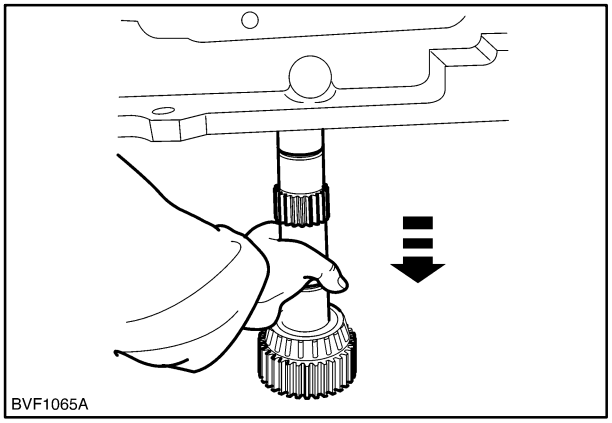
NOTE: *Support the 1/2 and 3/4 synchronizers while rotating the transmission.*

23. Rotate the transmission 180°.
24. Support the countershaft and remove the retaining circlip (1).



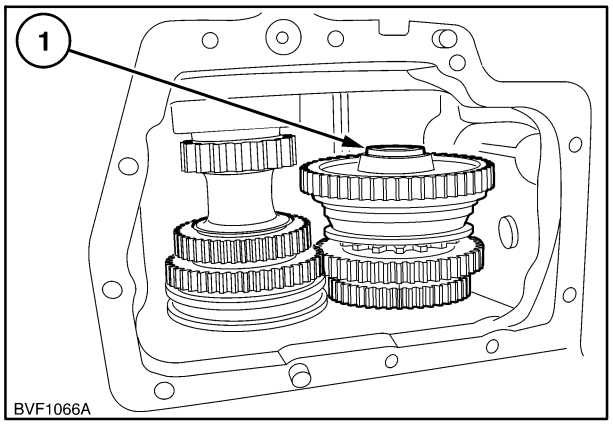
151

25. Remove the countershaft (1) from the rear end of the transmission.



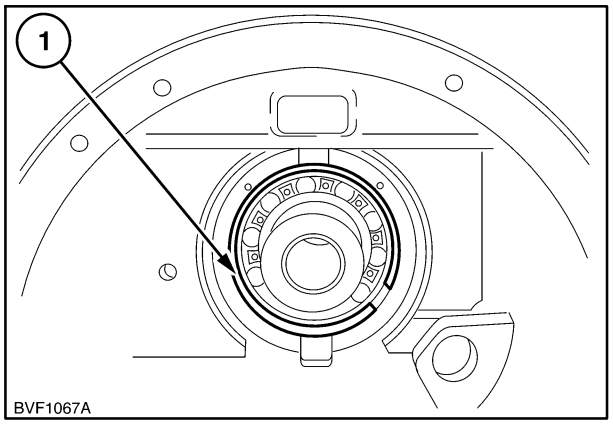
152

26. Remove the 1/2 synchronizer, gears and the D-washer.



153

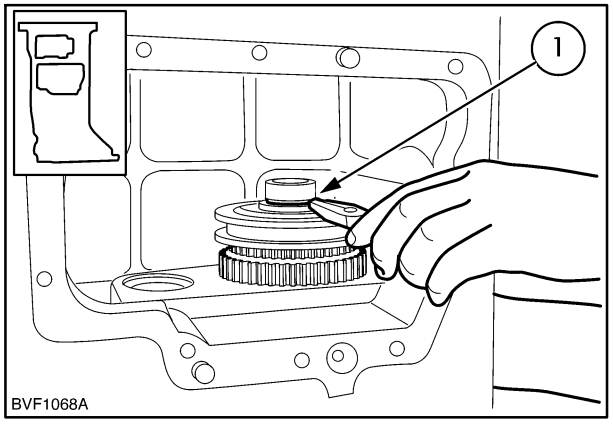
27. Using suitable snap ring pliers, remove the main shaft bearing snap ring (1).



154

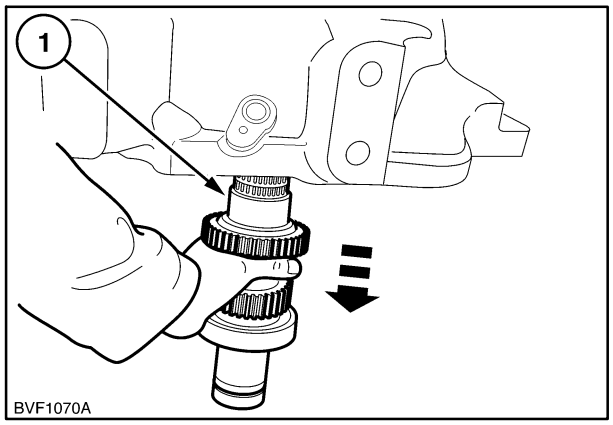
NOTE: *Support the 3/4 synchronizer while rotating the transmission.*

28. Rotate the transmission 180°.
29. Support the main shaft through the top cover aperture and remove the 3/4 synchronizer retaining snap ring (1).



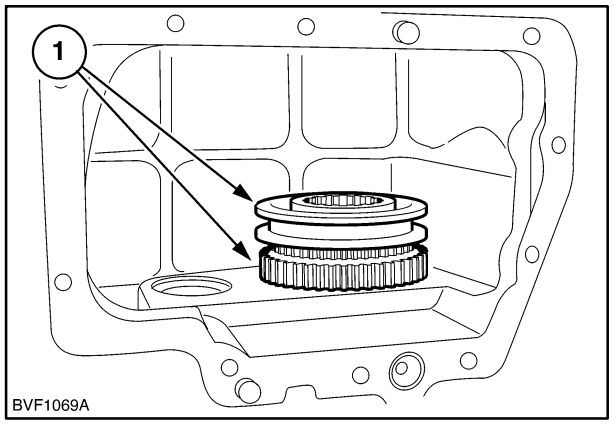
155

30. Remove the main shaft (1) through the bell-housing.



156

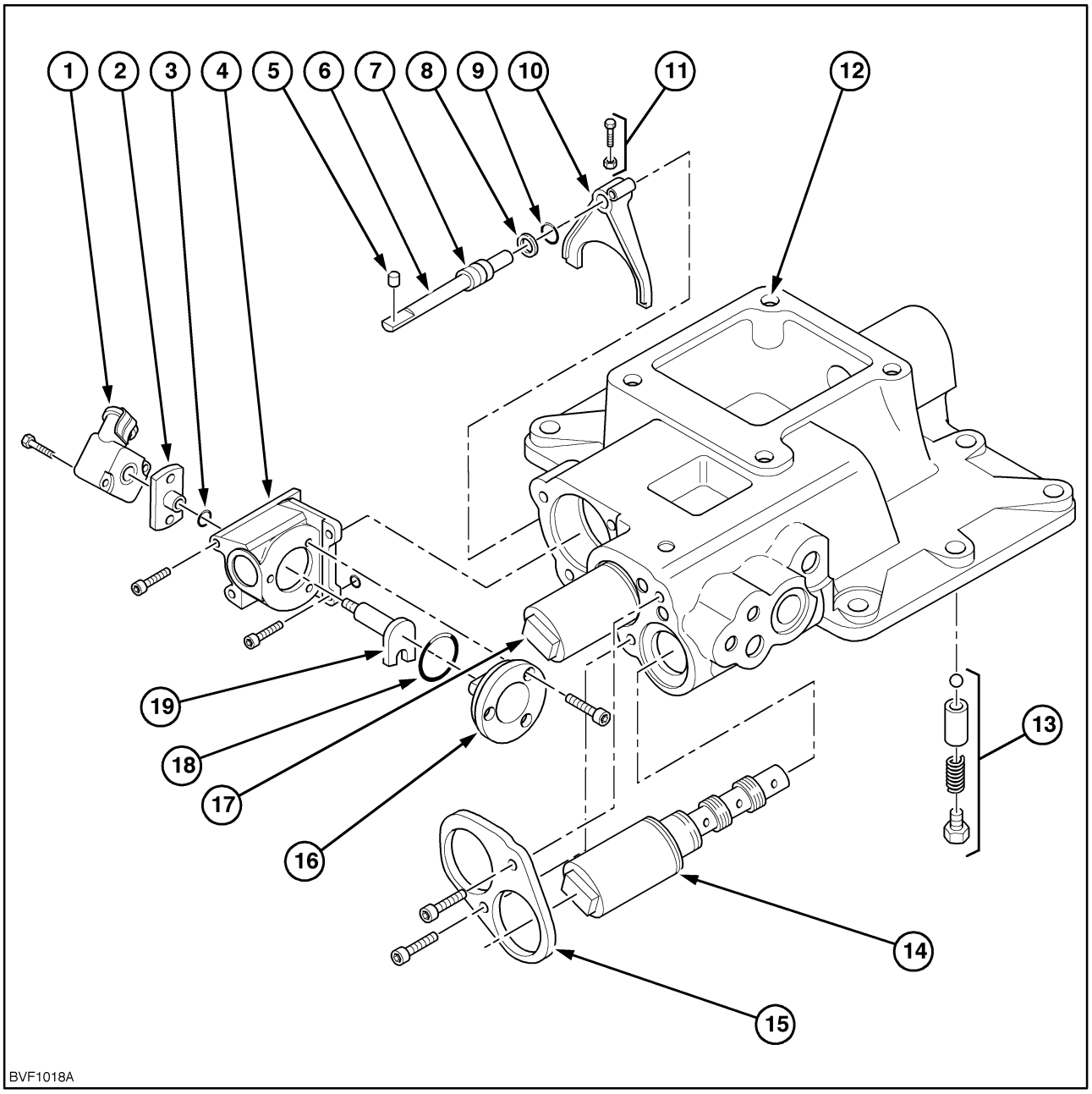
31. Remove the 3/4 synchronizer and 3rd gear drive assembly (1).



157

TRANSMISSION COMPONENT

Disassembly / Assembly



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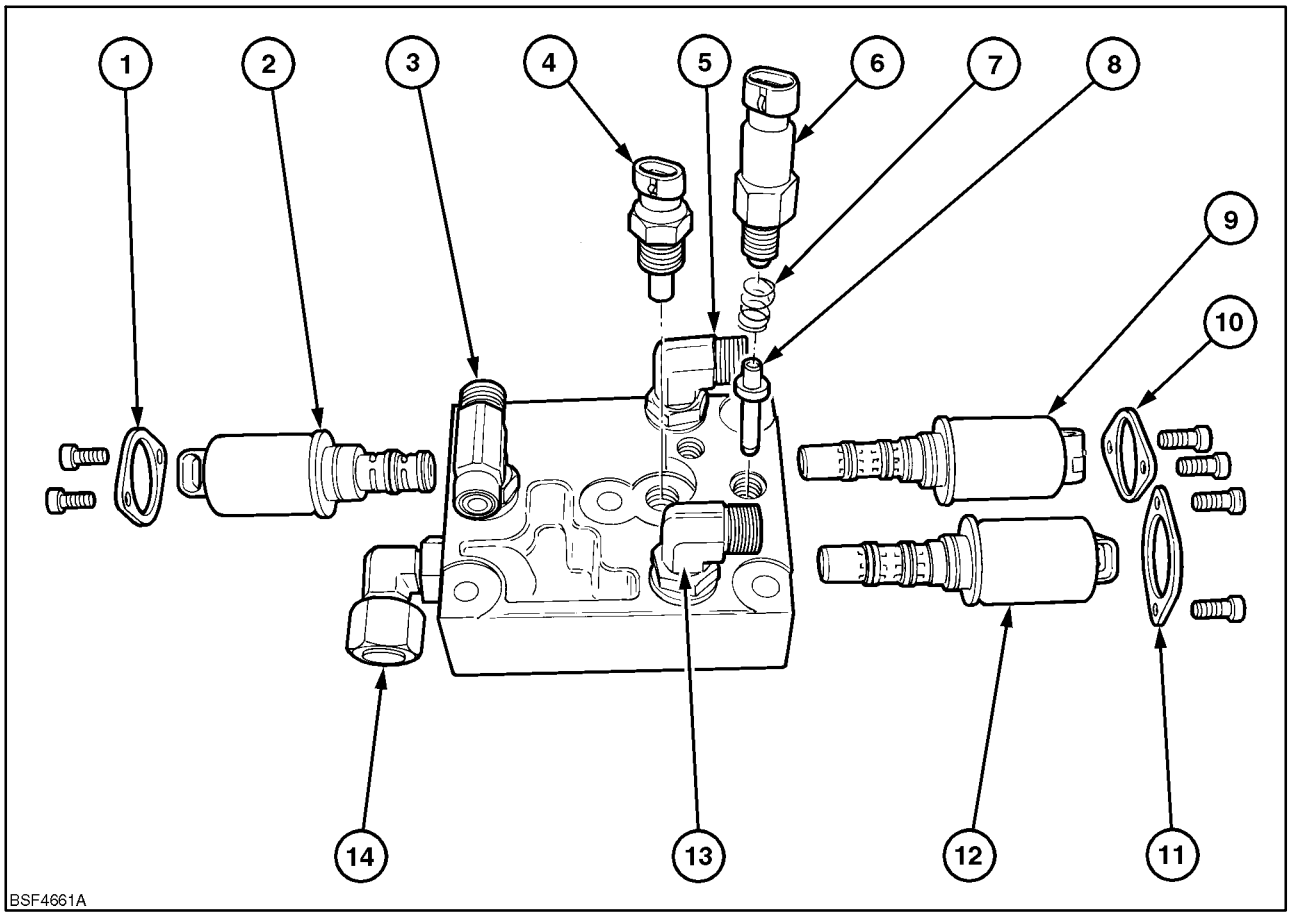
Forward/Reverse Control Cover Exploded View

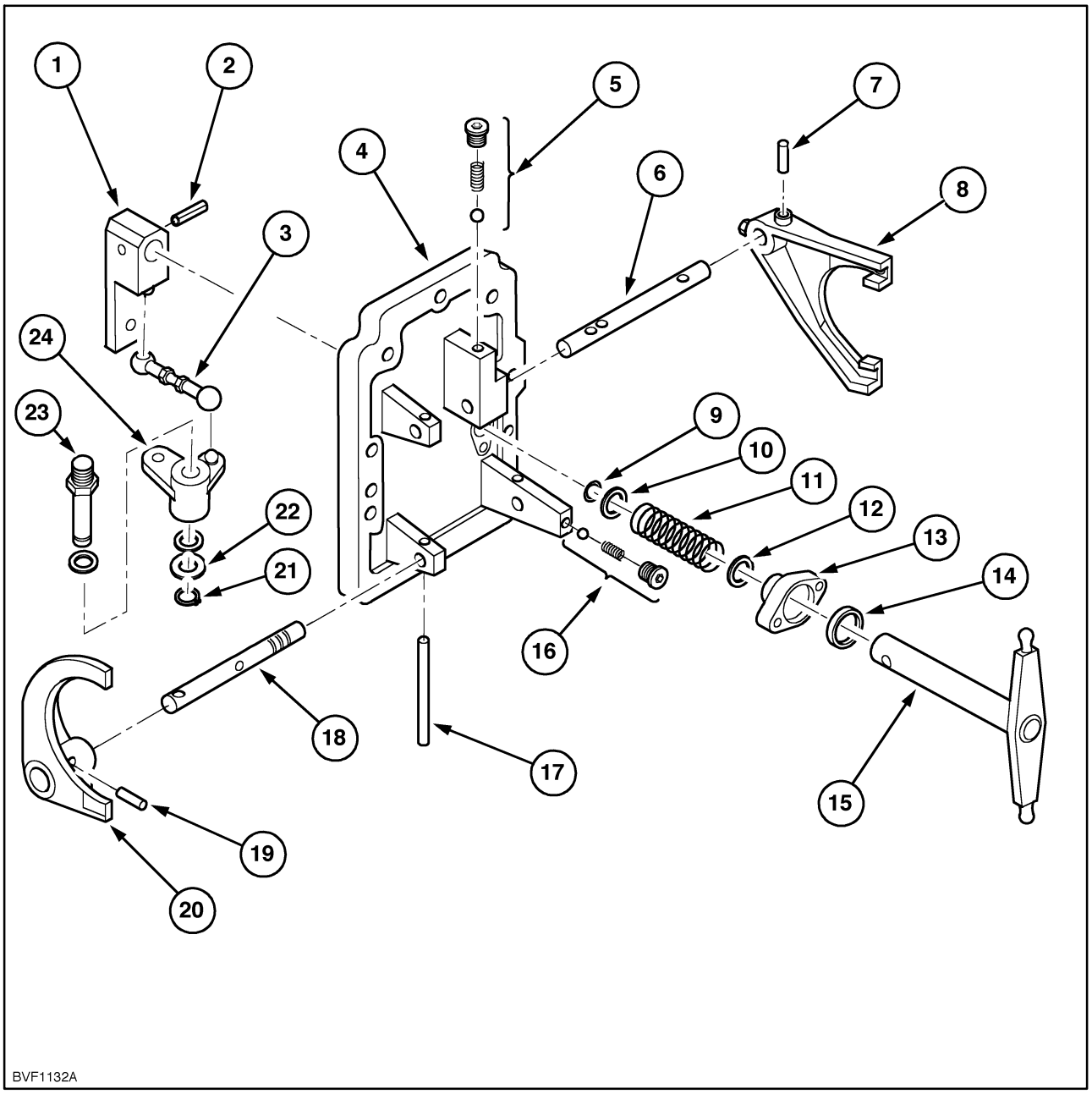
1. Forward/reverse potentiometer
2. Potentiometer spacer
3. O-ring
4. Forward/reverse shift rail end cover
5. Potentiometer operating shaft locating pin
6. Forward/reverse shift rail
7. Forward/reverse piston
8. Oil seal
9. O-ring
10. Forward/reverse shift fork
11. Shift fork retaining bolt and nut
12. Forward/reverse synchronizer control cover
13. Forward/reverse detent assembly
14. Forward PWM solenoid valve
15. PWM solenoid valve retaining plate
16. Forward/reverse shift rail end cover plate
17. Reverse PWM solenoid valve
18. O-ring
19. Potentiometer operating shaft



159

Transmission Control Valve Exploded View

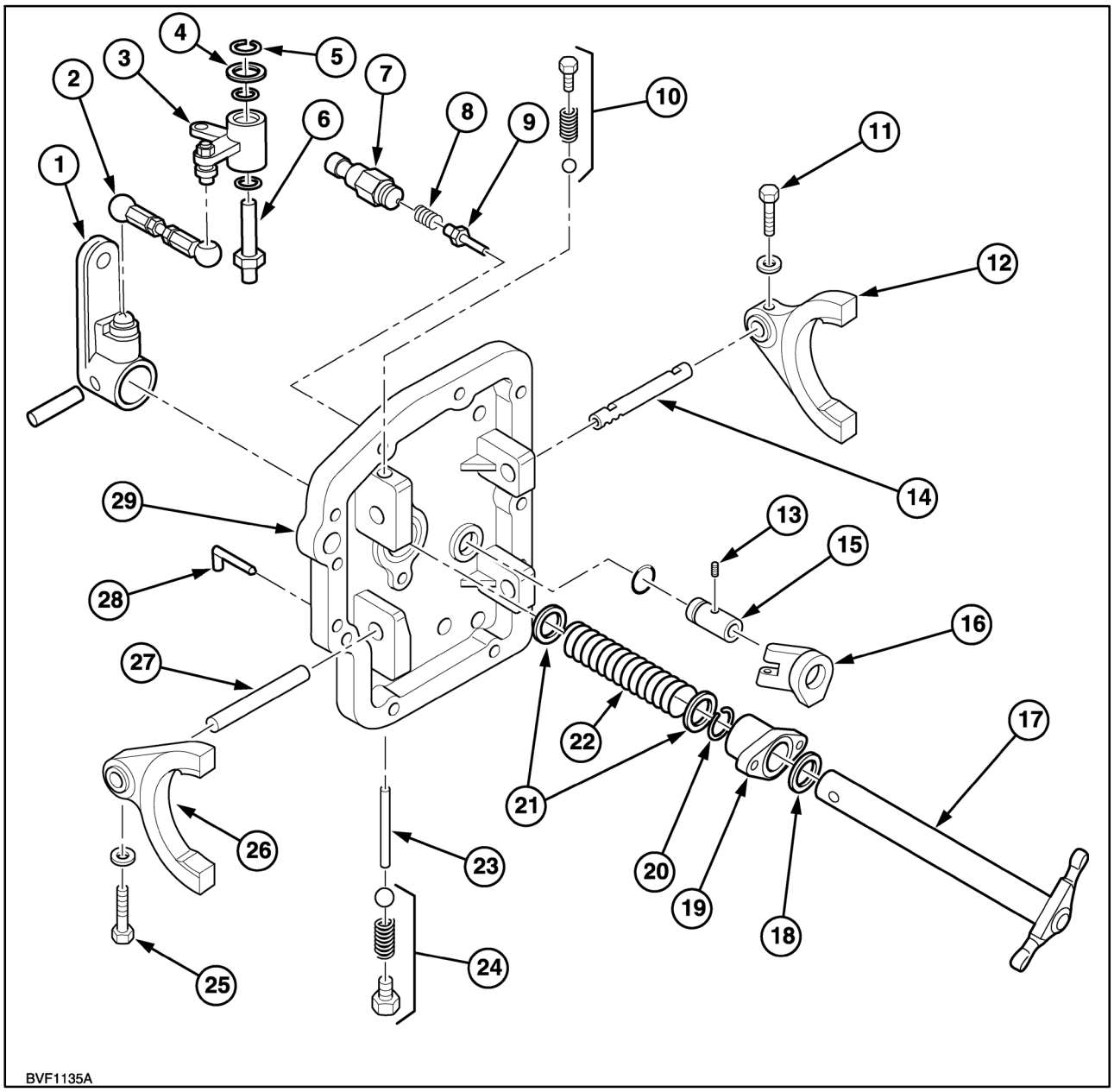
1. Solenoid valve retaining plate
2. Dump solenoid valve
3. Low pressure oil supply
4. Transmission oil temperature sensor
5. C1 low pressure oil supply
6. 1/2 synchronizer status switch
7. Spring
8. Plunger
9. C1 PWM solenoid valve
10. Solenoid valve retaining plate
11. Solenoid valve retaining plate
12. C2 PWM solenoid valve
13. C2 low pressure oil supply
14. Additional low pressure oil supply



160

High / Medium and Low Synchronizer Control Cover Exploded View

1. Actuator lever
2. Rollpin
3. Adjustable link rod
4. Synchronizer control housing
5. High/medium detent assembly
6. High/medium synchronizer shift rail
7. Rollpin
8. High/medium synchronizer shift fork
9. Circlip
10. Washer
11. Return spring
12. Washer
13. Actuator shaft retainer
14. Spacer
15. Actuator shaft
16. Low detent assembly
17. Interlock rod
18. Low sliding coupler shift rail
19. Rollpin
20. Low sliding coupler shift fork
21. Circlip
22. Washer
23. Support shaft
24. Link rod actuator

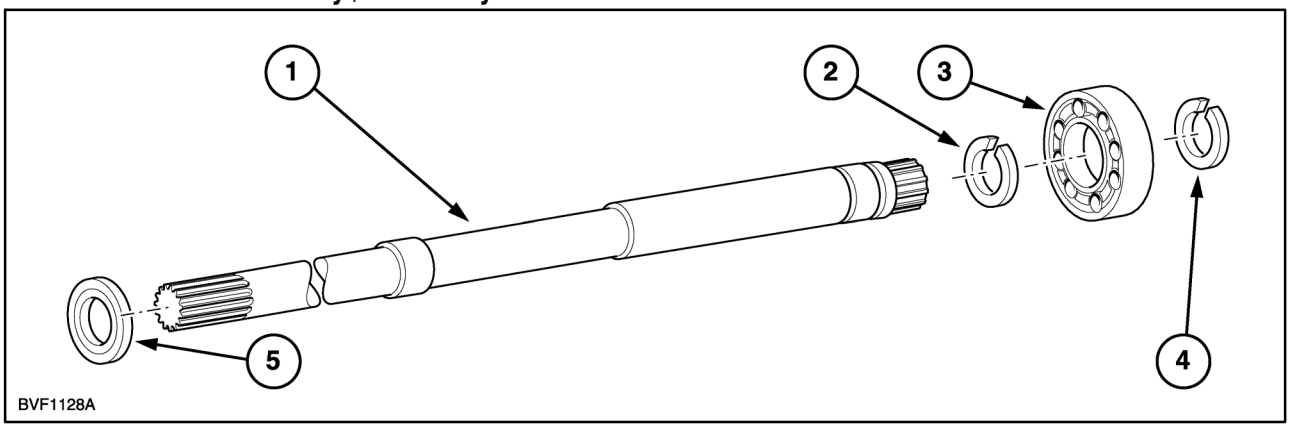


161

1/2 and 3/4 Synchronizer Control Cover Exploded View

1. Actuator lever
2. Adjustable link rod
3. Link rod actuator
4. Washer
5. Circlip
6. Support shaft
7. 3/4 synchronizer status switch
8. Spring
9. Actuator rod
10. 3/4 synchronizer detent assembly
11. Locking bolt
12. 3/4 synchronizer shift fork
13. Grub screw
14. 3/4 synchronizer shift rail
15. Support shaft
16. Actuator
17. Actuator shaft
18. Spacer
19. Actuator shaft retainer
20. Circlip
21. Washers
22. Spring
23. Interlock rod
24. 1/2 synchronizer detent assembly
25. Locking bolt
26. 1/2 synchronizer shift fork
27. 1/2 synchronizer shift rail
28. 1/2 synchronizer status switch actuator
29. Synchronizer control housing

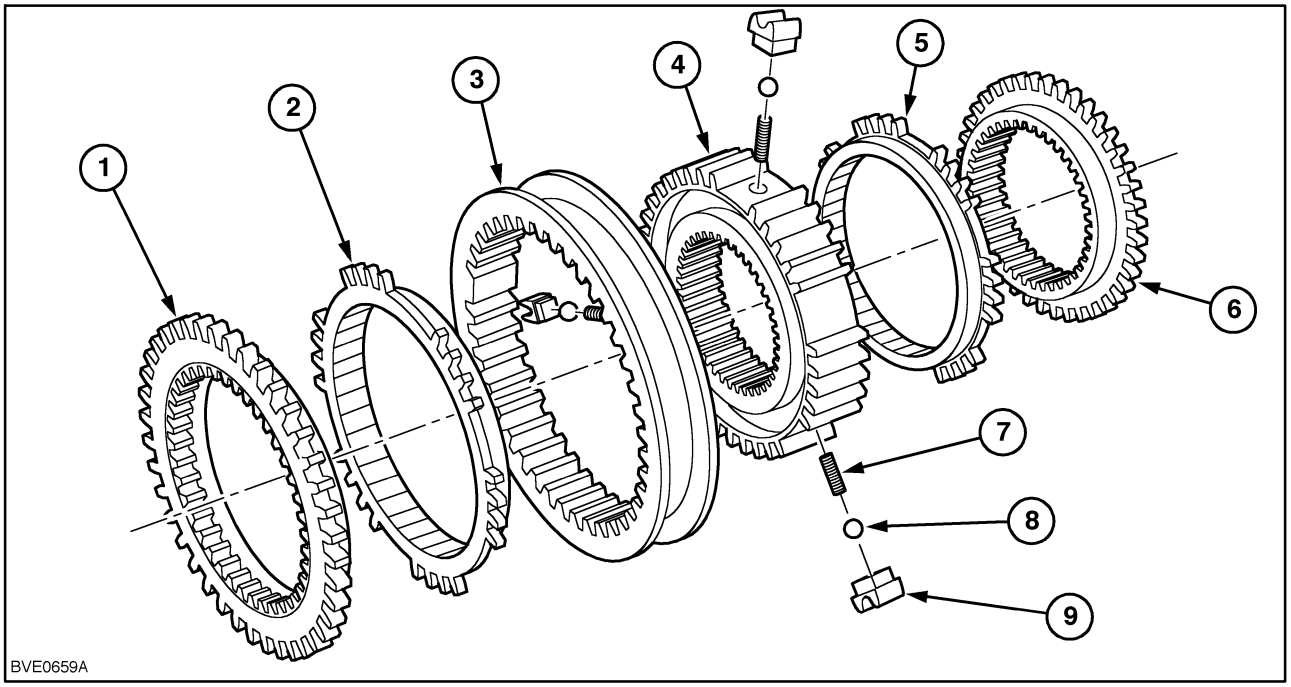
Front Section Disassembly / Assembly



162

PTO Shaft Assembly Exploded View

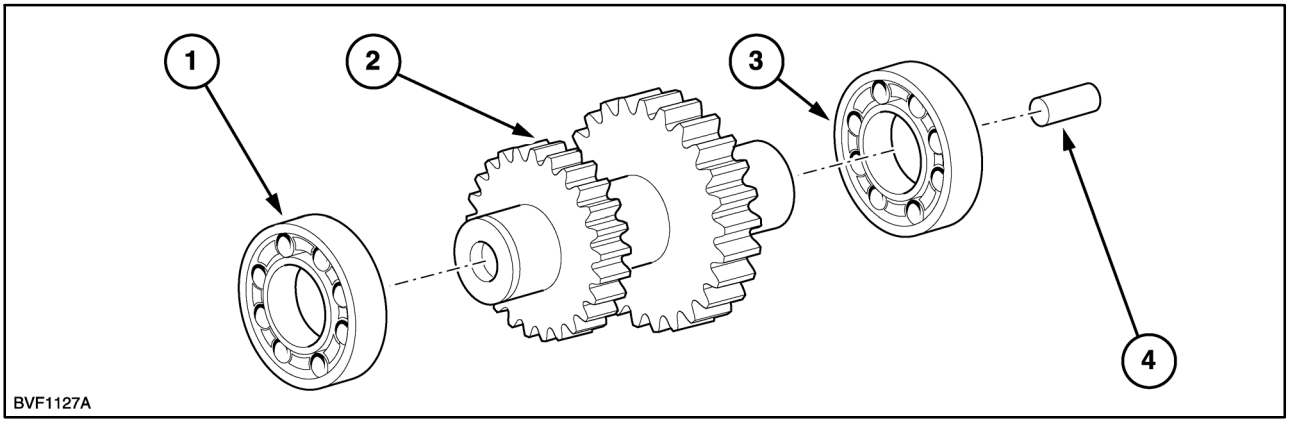
1. PTO shaft
2. Circlip
3. Bearing
4. Circlip
5. Oil seal



163

Forward / Reverse Synchronizer Exploded View

1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide

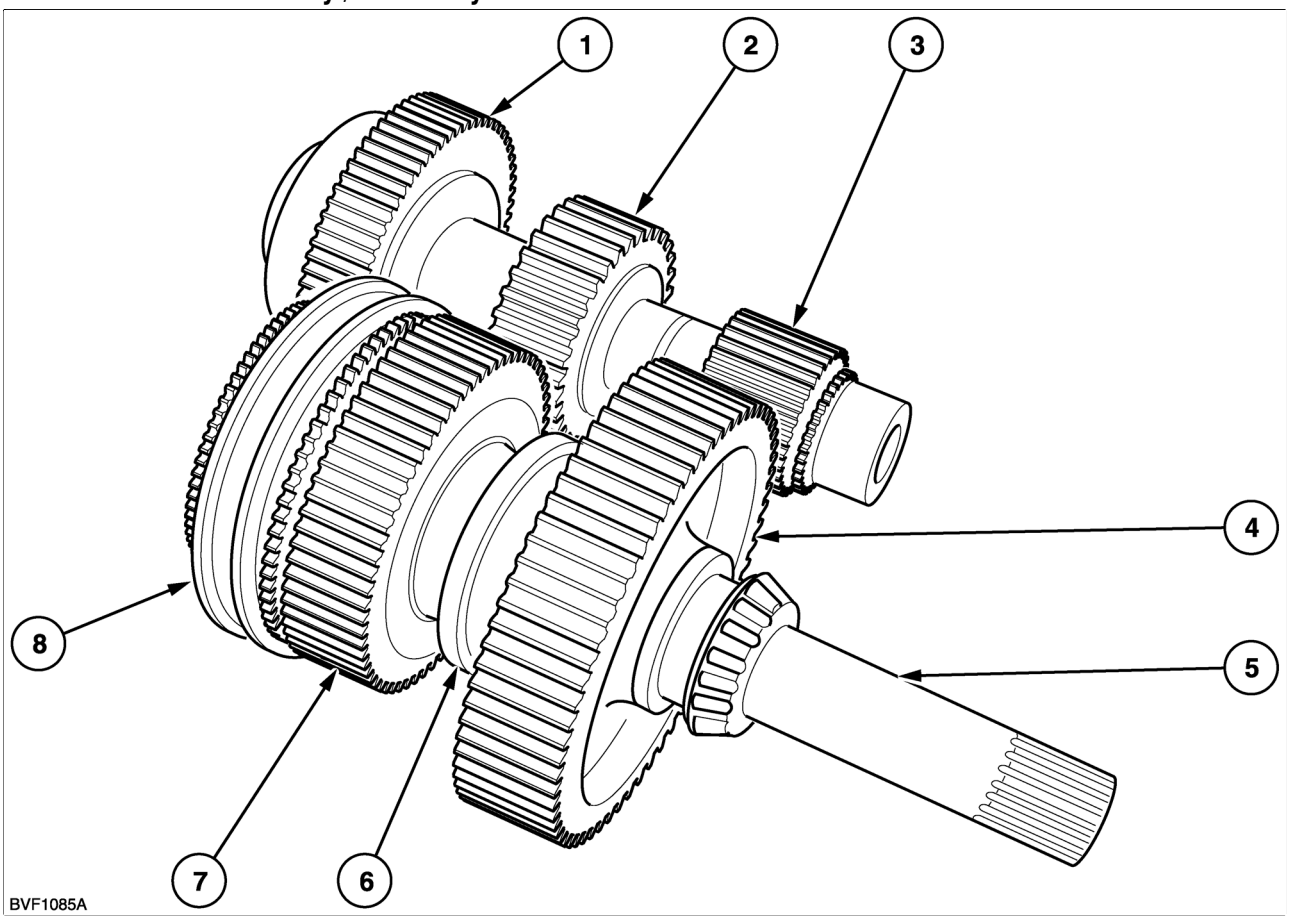


164

Reverse Gear Cluster Exploded View

1. Bearing
2. Reverse gear cluster gears
3. Bearing
4. Lubrication oil transfer tube

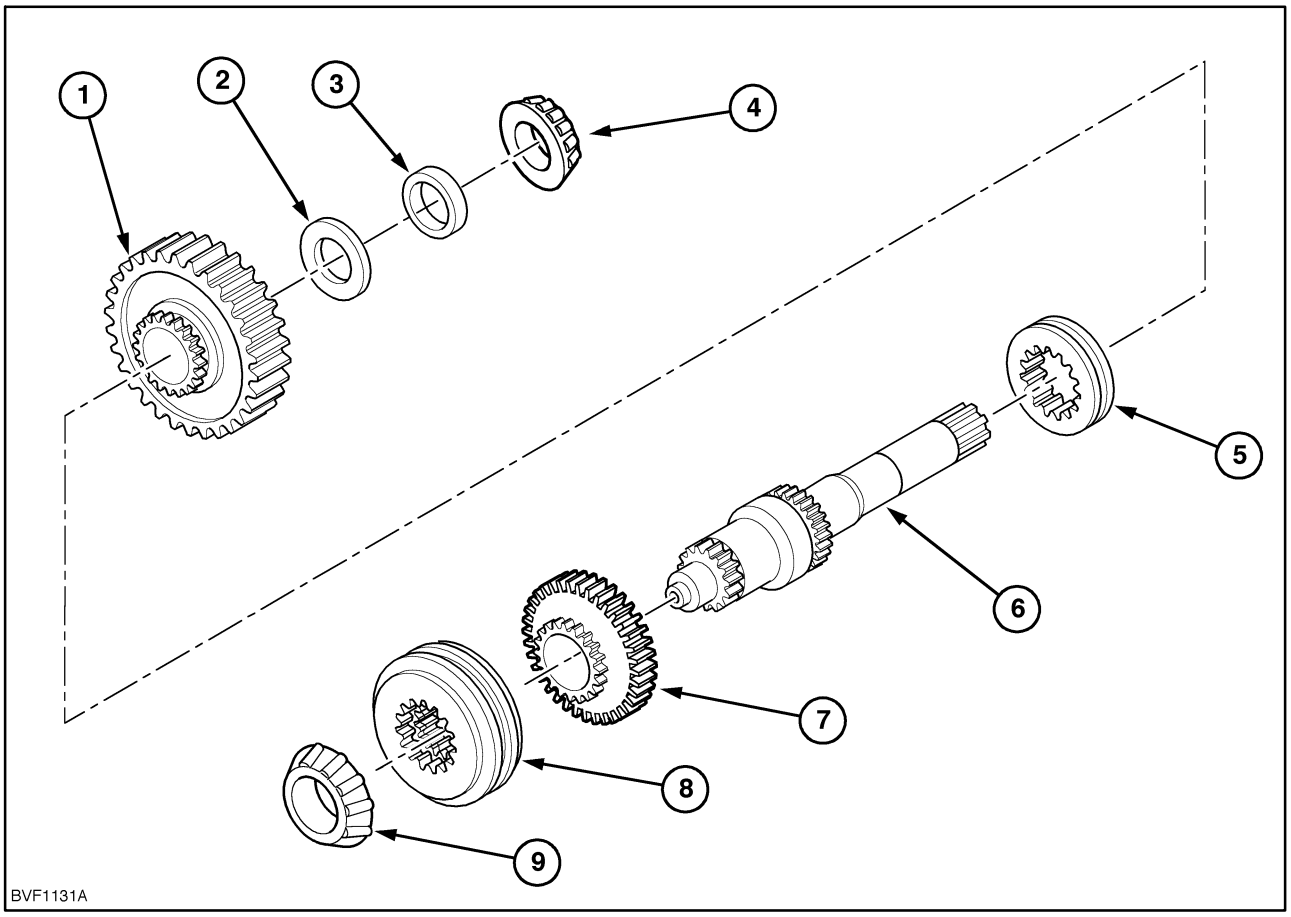
Rear Section Disassembly / Assembly



165

Rear Section Overview

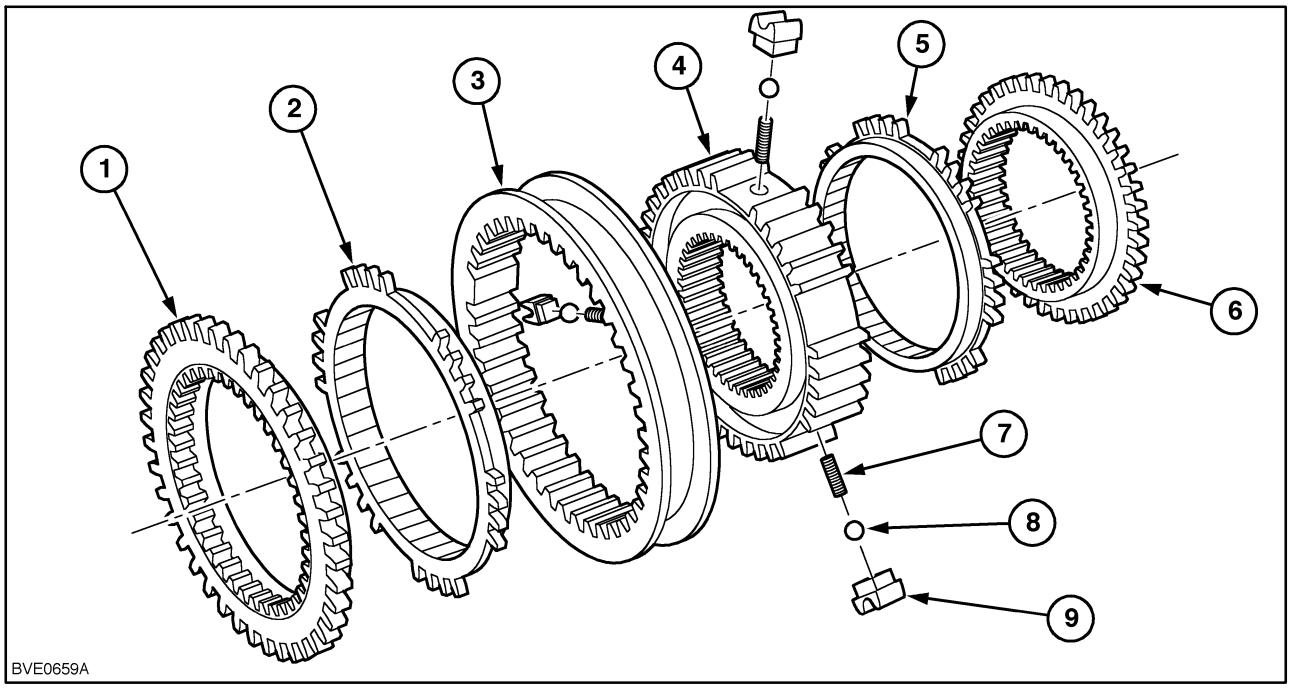
1. High range gear drive (52/49 teeth)
2. Medium range gear drive (35/33 teeth)
3. Low range gear drive (19 teeth)
4. Low range gear driven (60 teeth)
5. Output shaft
6. Low sliding coupler
7. Medium range gear driven (44/46 teeth)
8. High/medium synchronizer



166

Output Shaft Assembly Exploded View

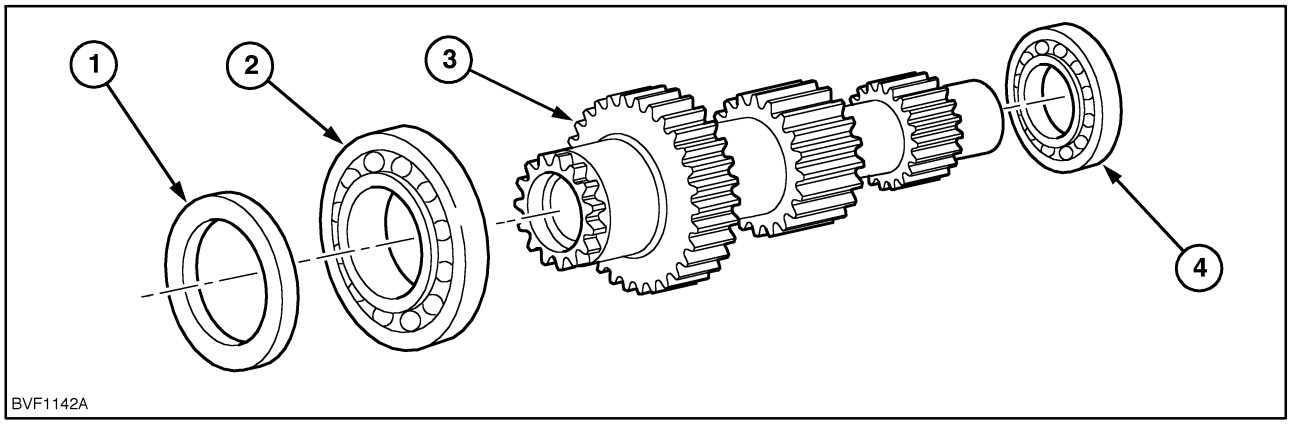
1. Low range gear driven (60 teeth)
2. Washer
3. Spacer
4. Taper roller bearing
5. Low range sliding coupler
6. Output shaft
7. Medium range gear driven (44/46 teeth)
8. High/medium synchronizer
9. Taper roller bearing



167

High / Medium Synchronizer Exploded View

1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide

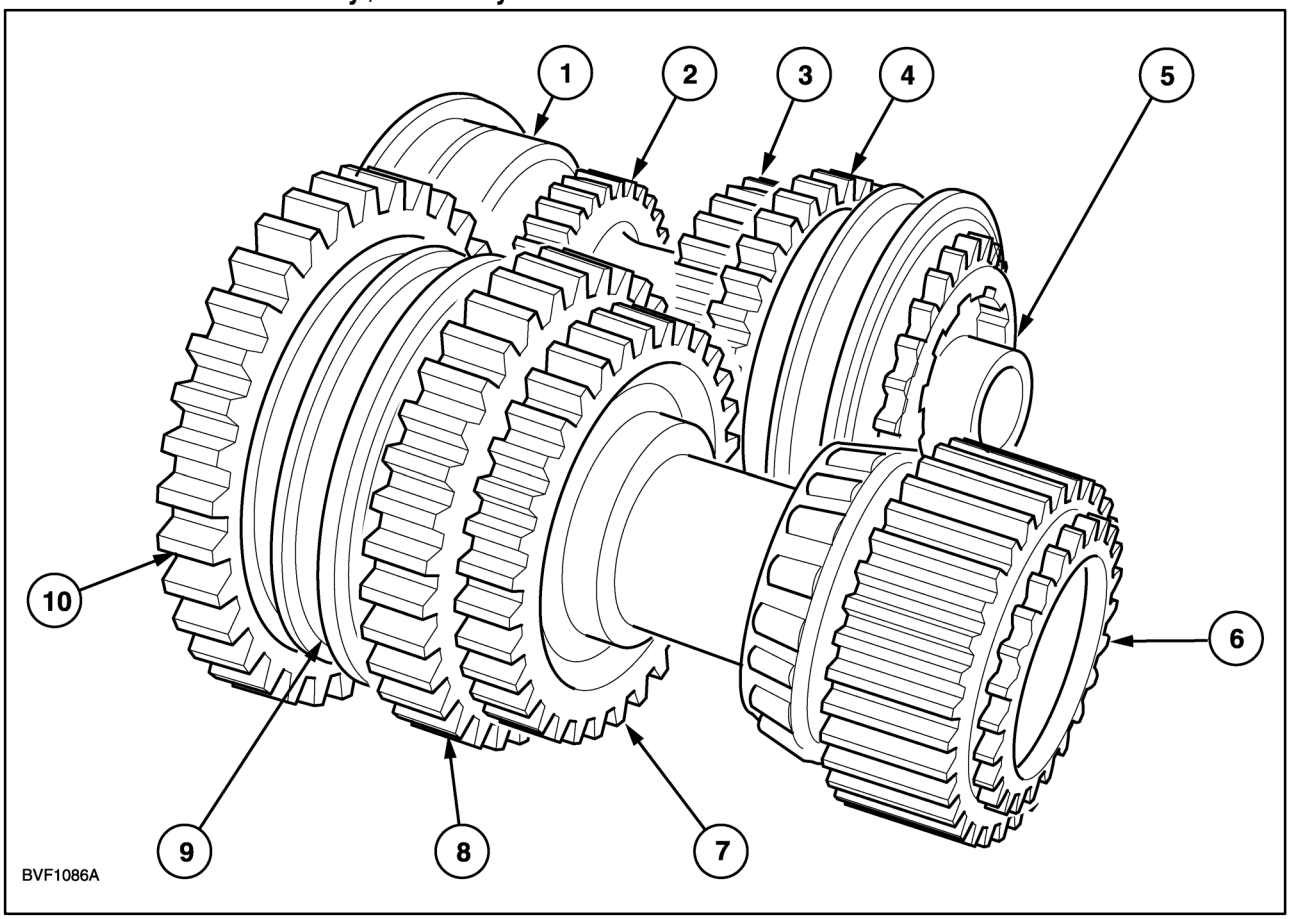


168

High / Medium and Low Range Cluster Shaft Exploded View

1. Spacer ring
2. Bearing
3. Cluster shaft
4. Bearing

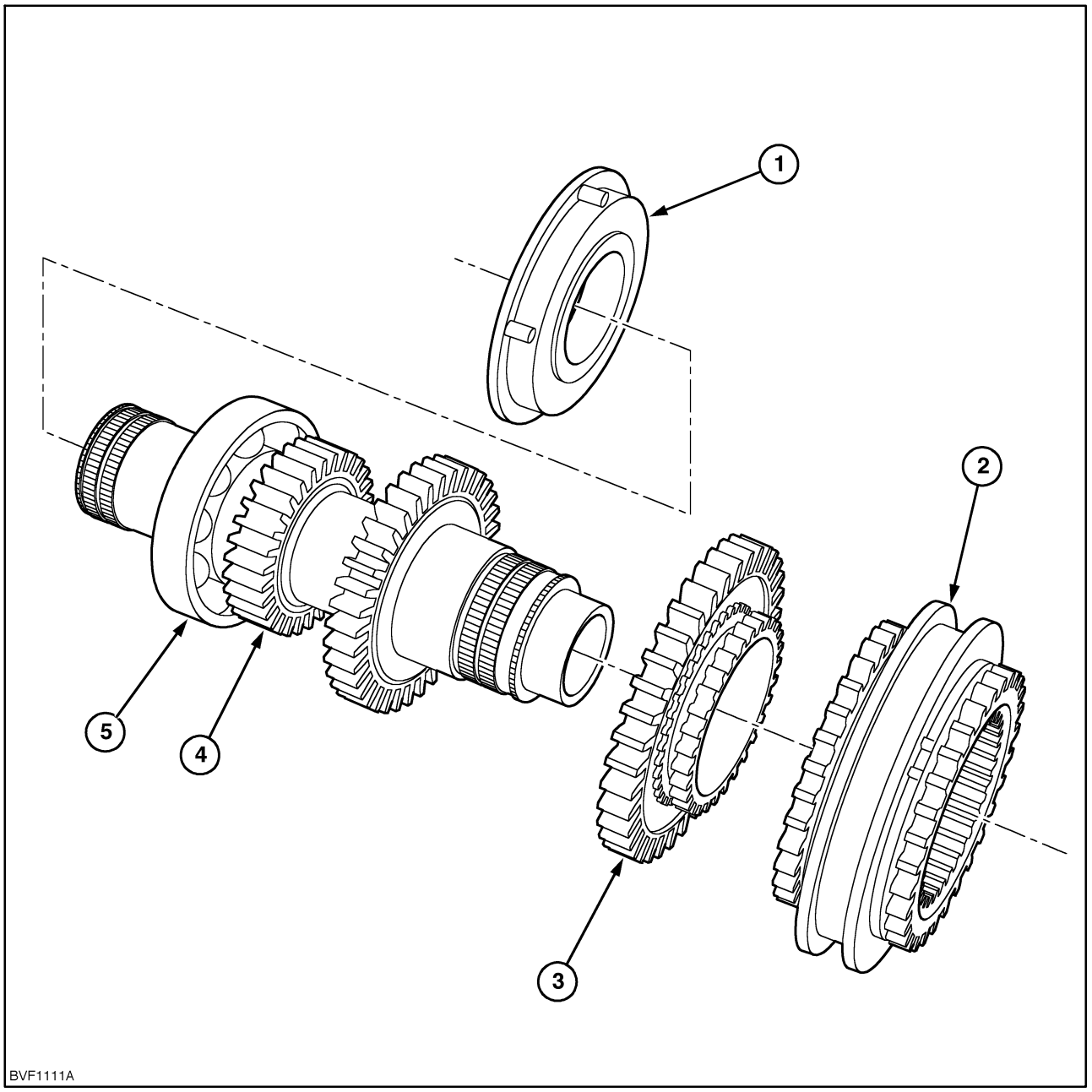
Middle Section Disassembly / Assembly



169

Middle Section Overview

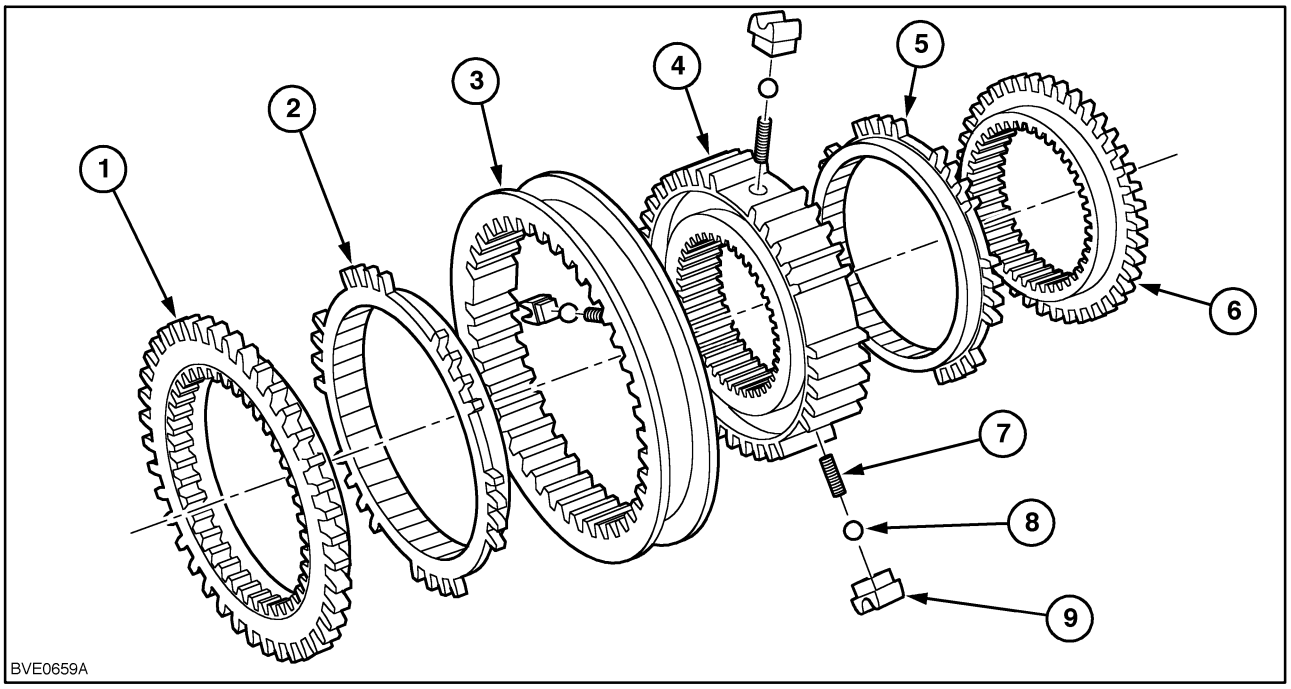
1. Lubrication oil supply manifold
2. 1st gear drive (31/27 teeth)
3. 2nd gear drive (38/34 teeth)
4. 3rd gear drive (45/40 teeth)
5. 3/4 synchronizer
6. High range gear driven (27/31 teeth)
7. 3rd gear driven (34/39 teeth)
8. 2nd gear driven (41/52 teeth)
9. 1/2 synchronizer
10. 1st gear driven (49/52 teeth)



170

Main Shaft Exploded View

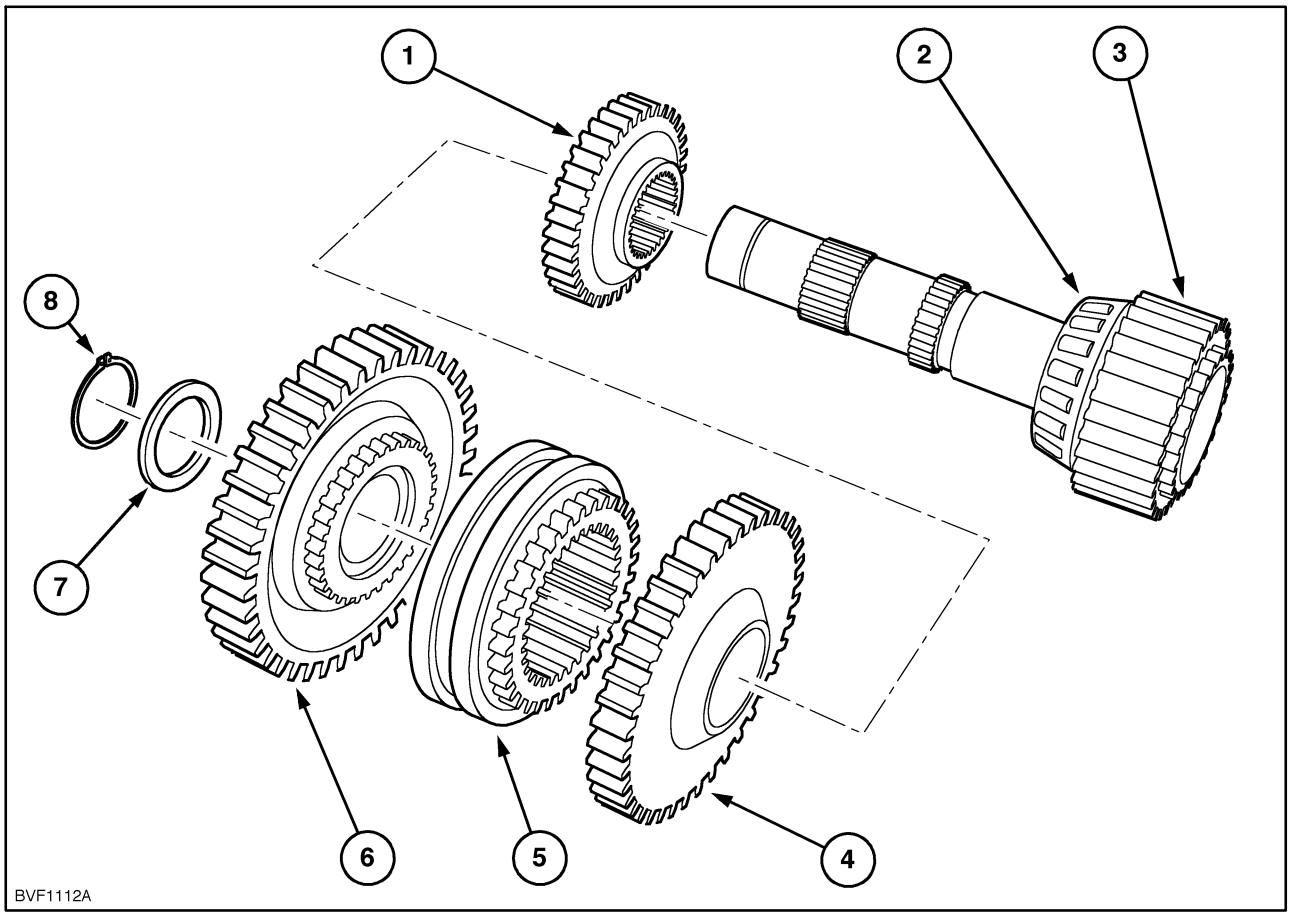
1. Lubrication oil supply manifold
2. 3/4 synchronizer
3. 3rd gear drive (45/40 teeth)
4. Main shaft
5. Bearing



171

3/4 Synchronizer Exploded View

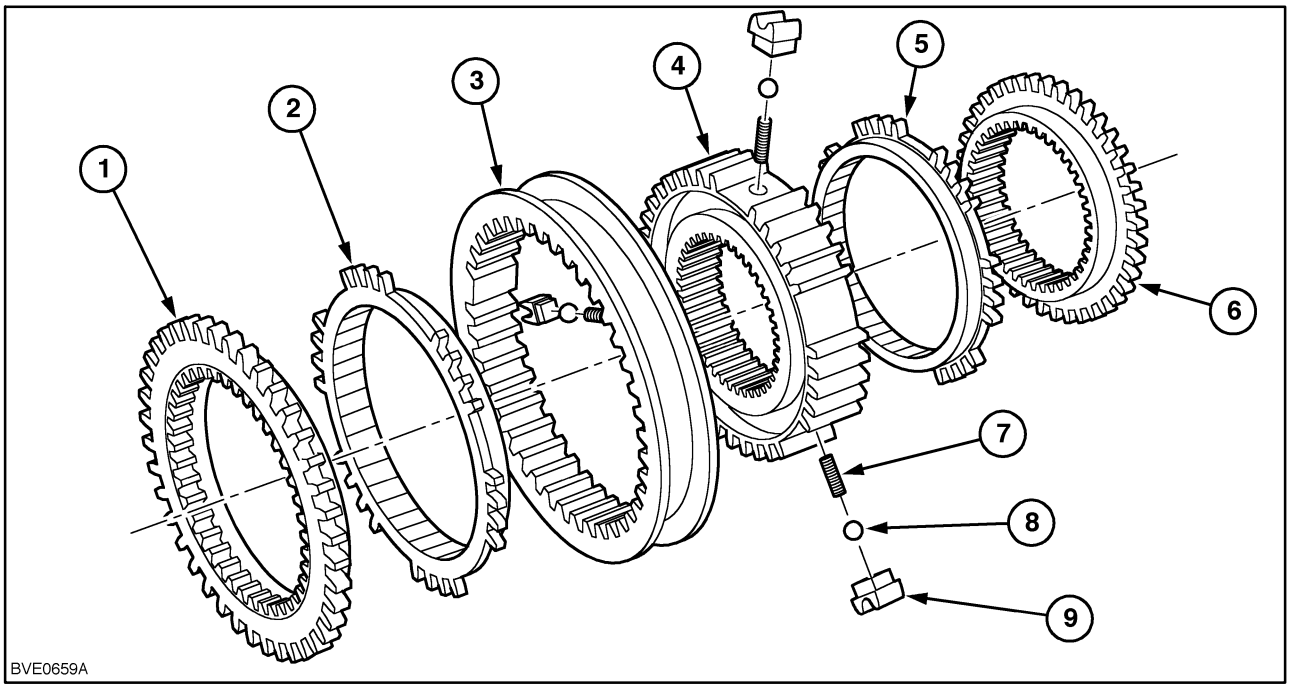
1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide



172

Countershaft Exploded View

1. 3rd gear driven (34/39 teeth)
2. Bearing
3. High range gear driven (27/31 teeth)
4. 2nd gear driven (41/45 teeth)
5. 1/2 synchronizer
6. 1st gear driven (49/52 teeth)
7. Steel thrust washer
8. Circlip



173

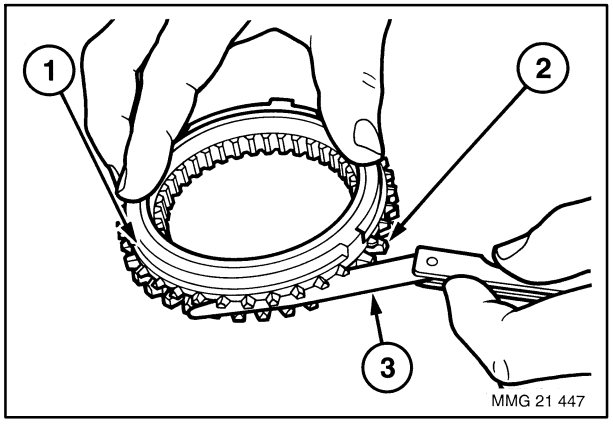
1/2 Synchronizer Exploded View

1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide

SYNCHRONIZER

Inspection

1. Inspect the High/Medium range, forward/reverse and 1-2 and 3-4 synchronizer components for wear and damage as follows:-
   - Inspect the cone (1) for wear and damage and discolouration, if excessive renew the synchronizer.
   - Check the gap between the cone and end plate,(2), using a feeler gauge (3), if the gap is less than that specified renew the synchronizer.



174

	Minimum Gap	
1-2 & 3-4 synchronizers	mm 0,5	inches 0.020
Foward/Reverse synchronizer	0,8	0.0315
Hi/Med synchronizer	0,85	0.0335

TRANSMISSION

Assembly

⚠ WARNING ⚠

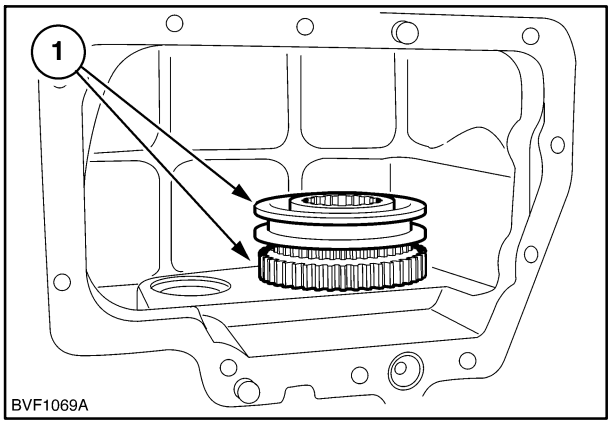
Handle all components with the greatest of care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

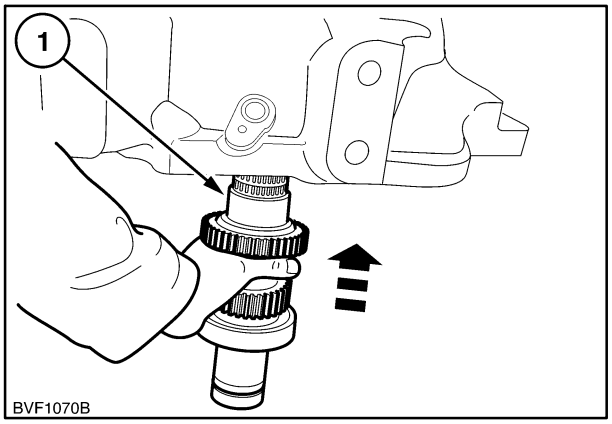
Middle Section Installation

1. Install the 3/4 synchronizer and 3rd gear drive assembly (1).



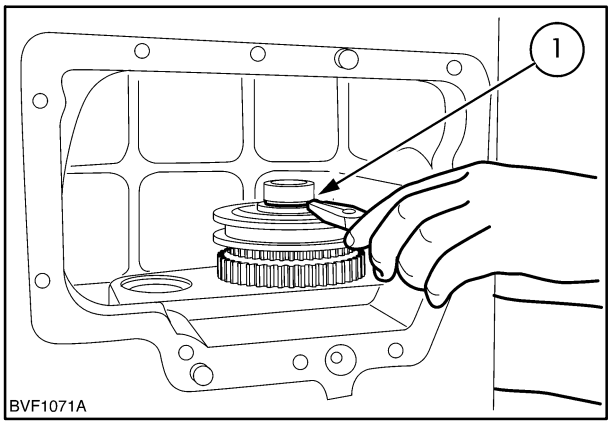
175

2. Install the main shaft (1) through the bell-housing.



176

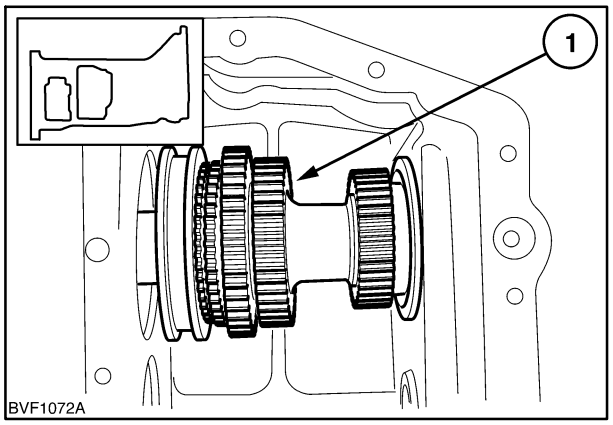
3. Support the main shaft through the top cover aperture and using suitable circlip pliers install the 3/4 synchronizer retaining snap ring (1).



177

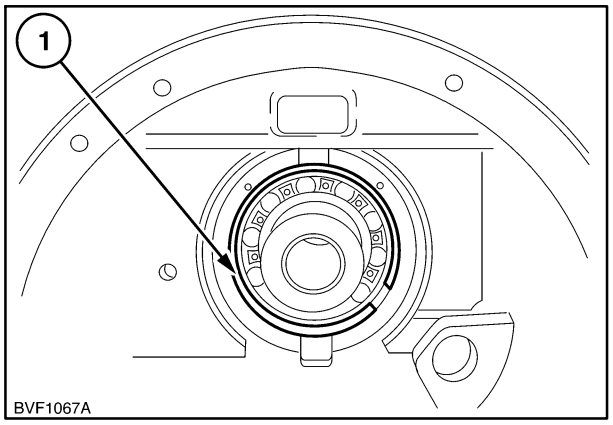
NOTE: *Support the 3/4 synchronizer and main shaft while rotating the transmission.*

4. Rotate the transmission 90°.
5. Install the 3/4 synchronizer and main shaft assembly (1) into the housing.



178

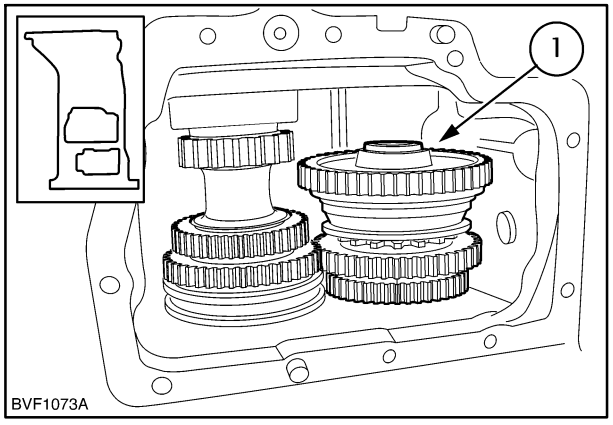
6. Using suitable snap ring pliers install the main shaft bearing retaining snap ring (1).



179

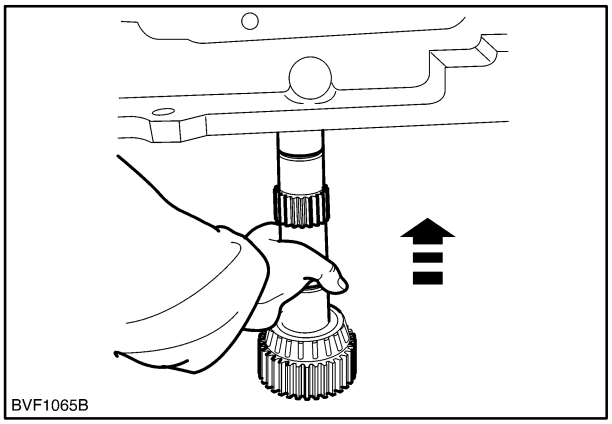
NOTE: *Support the 3/4 synchronizer and main shaft while rotating the transmission.*

7. Rotate the transmission 90°.
8. Install the 1/2 synchronizer and gears into the housing.



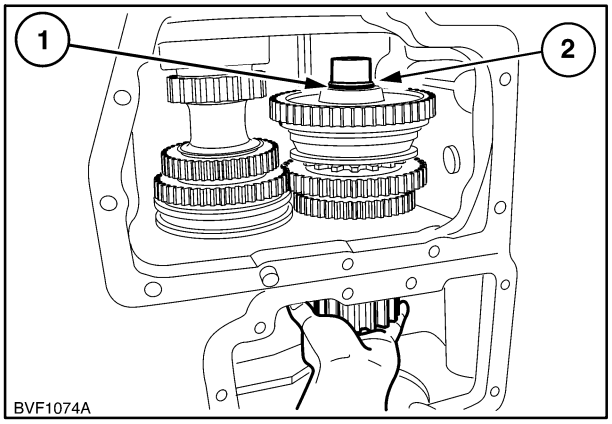
180

9. Install the countershaft (1) through the rear end of the housing.



181

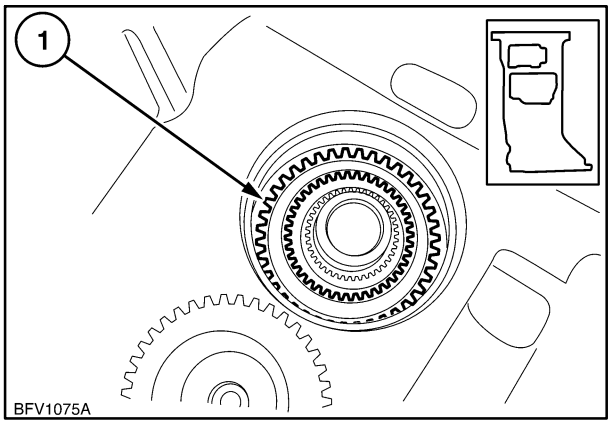
10. Support the countershaft, install the D-washer (1) and using suitable circlip pliers install the counter shaft retaining circlip (2).



182

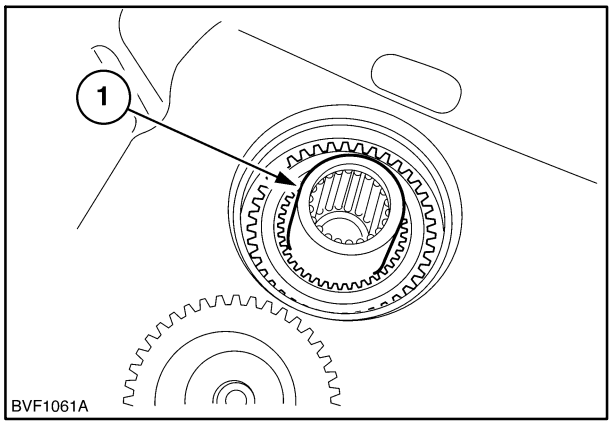
NOTE: *Position the two shafts so the main shaft bearing is seated on its snap ring and the countershaft bearing is seated in its cup.*

11. Rotate the transmission 180°.
12. Install the 3/4 synchronizer rings (1).



183

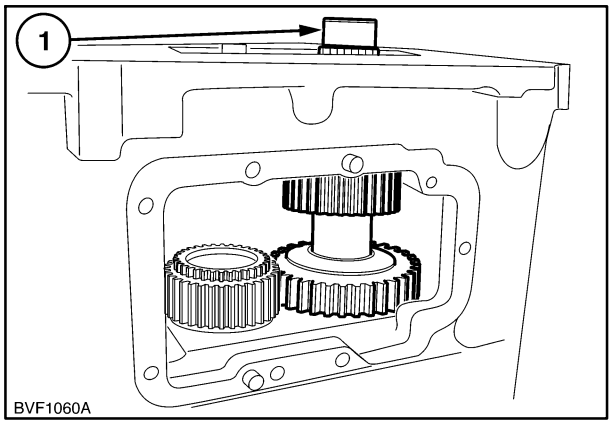
13. Install the needle roller bearing (1).



184

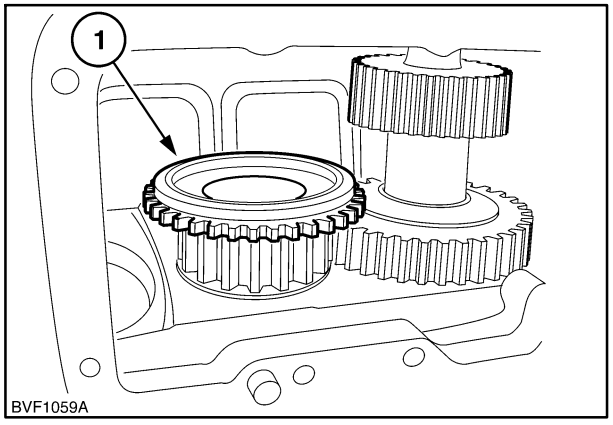
Rear Section Installation

14. Install the range cluster gear shaft (1).



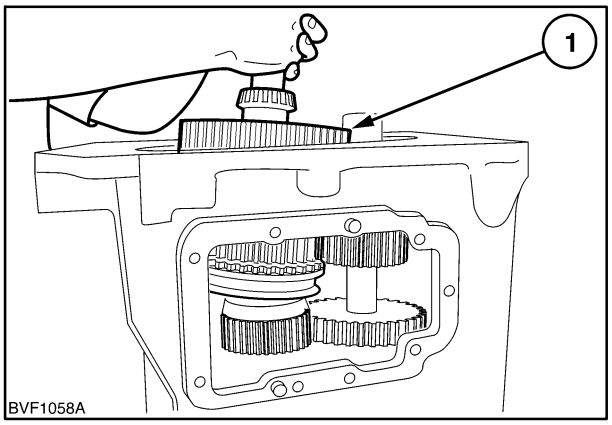
185

15. Install the high/medium synchronizer rings (1).



186

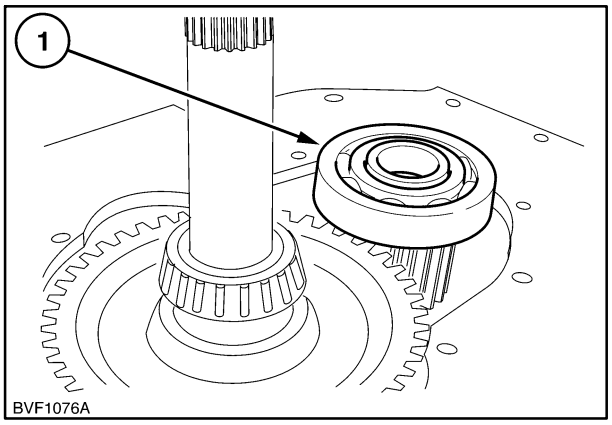
16. Install the output shaft assembly (1).



187

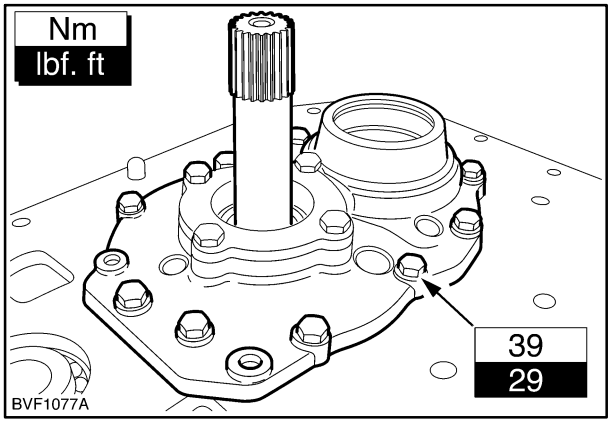
NOTE: *The use of an electronic induction heater will assist in the installation of the bearing without the need for a hydraulic press.*

17. Install the range cluster gear bearing (1).



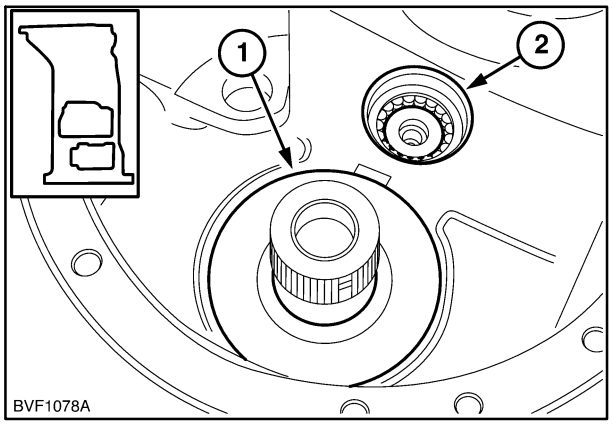
188

18. Install the rear plate assembly. Tighten the retaining bolts to the specified torque value.



189

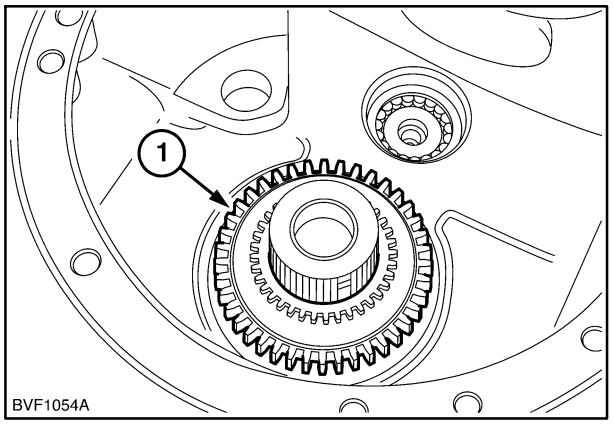
19. Rotate the transmission 180°.
20. Install the lubrication oil supply manifold (1) and the output shaft rear bearing (2).



190

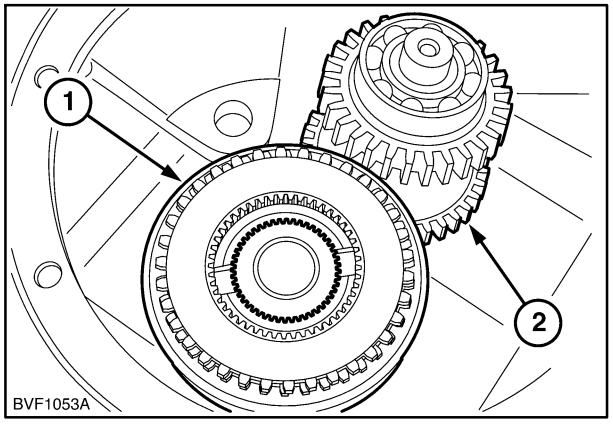
Front Section Installation

21. Install the reverse driven gear (1).



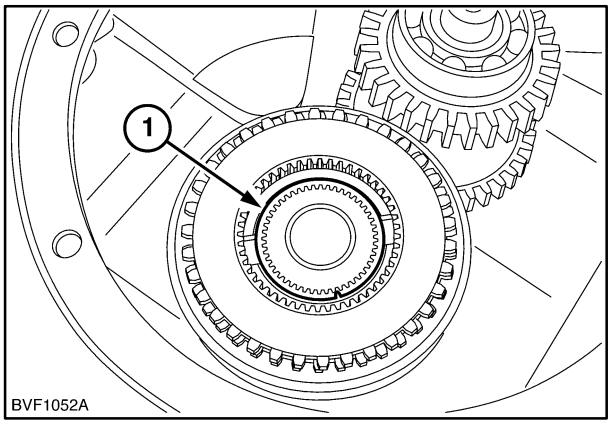
191

22. Install the forward/reverse synchronizer (1) with the reverse gear cluster (2).



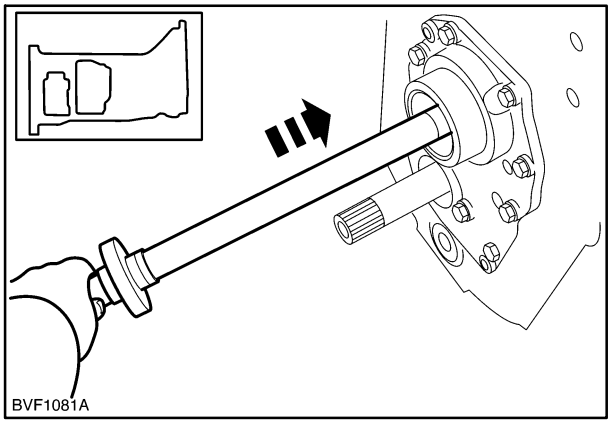
192

23. Install the forward/reverse synchronizer retaining snap ring (1).



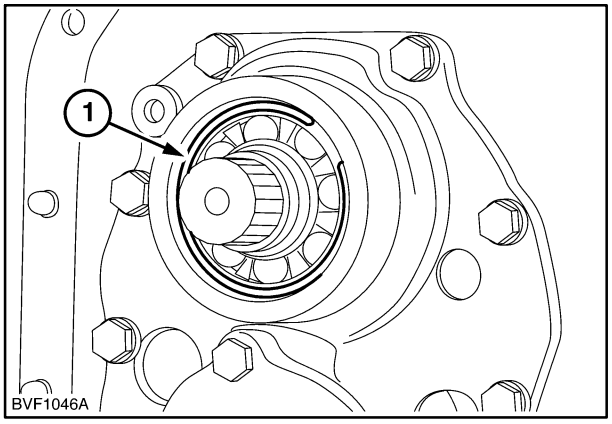
193

24. Rotate the transmission 90°.
25. Install the PTO shaft into the transmission.



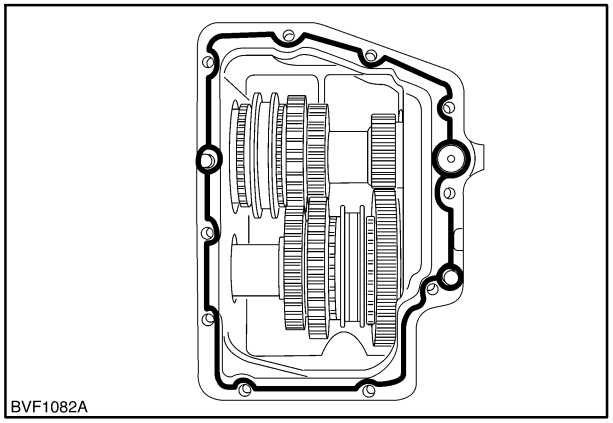
194

26. Install the PTO shaft bearing retaining snap ring (1).



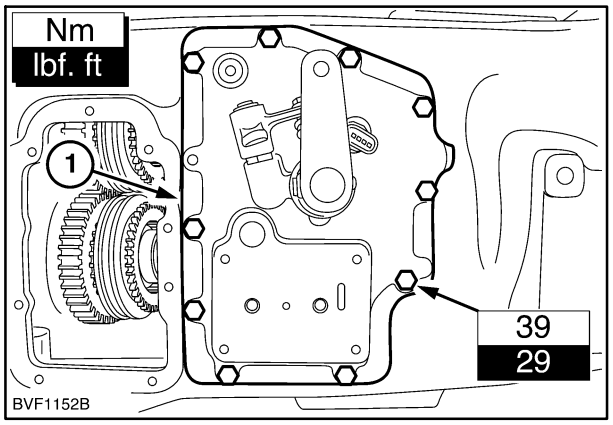
195

27. Adjust the output shaft end float (refer to the output shaft end float adjustment in this chapter).
28. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



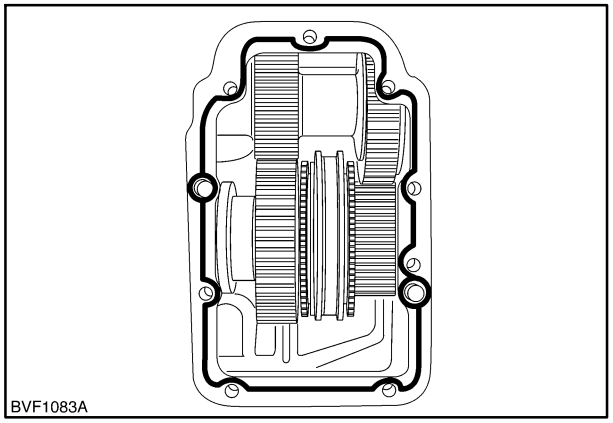
196

29. Install the 1/2 and 3/4 synchronizer control cover (1). Tighten the retaining bolts to the specified torque value.



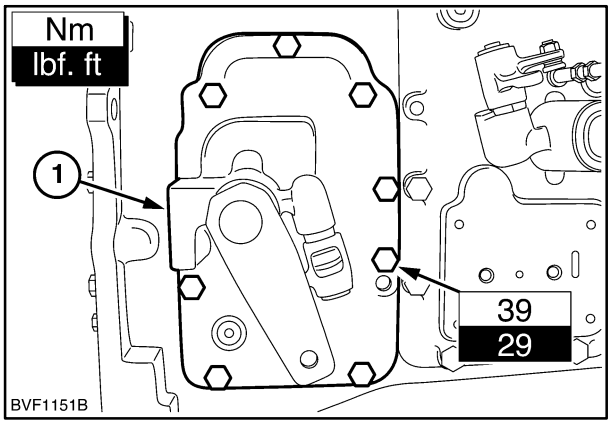
197

30. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



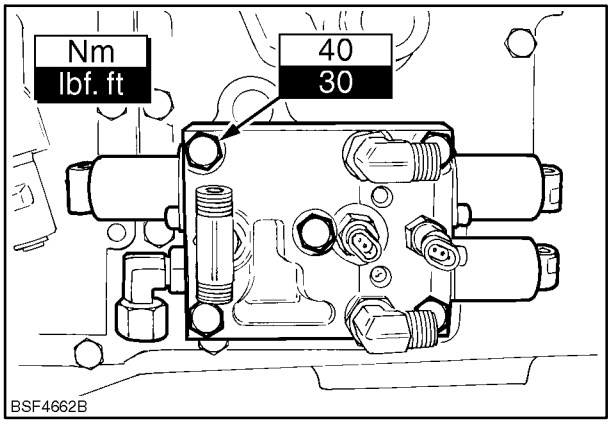
198

31. Install the high/medium and low synchronizer control cover (1). Tighten the retaining bolts to the specified torque value.



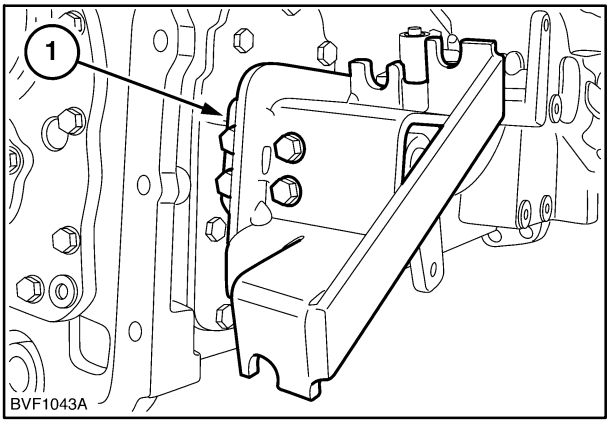
199

32. Install the transmission control valve and tighten the retaining bolts to the specified torque value.



200

33. Install the gearshift cable retaining bracket.
34. Install the C1/C2 clutch housing (refer to C1/C2 clutch housing installation in this chapter).



201

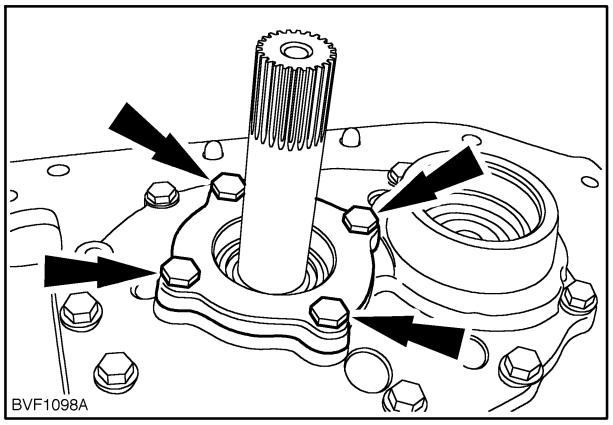
OUTPUT SHAFT END FLOAT

Adjustment

NOTE: *It is necessary to adjust the running clearance of the components on the output shaft. The clearance is obtained by the placement of shim(s) behind the output shaft front taper roller bearing retainer.*

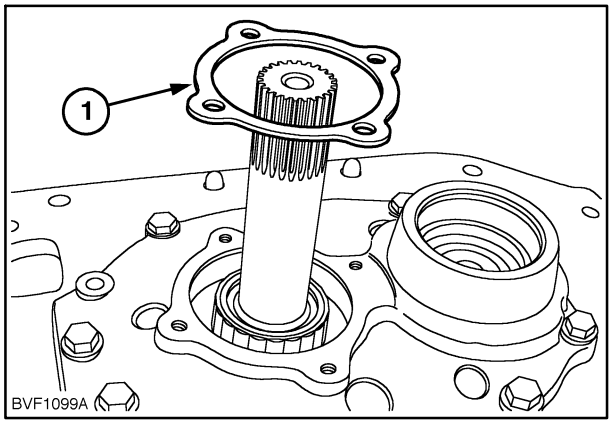
IMPORTANT: *The transmission must remain in the vertical position during this operation.*

1. Remove the output shaft front taper roller bearing retainer.



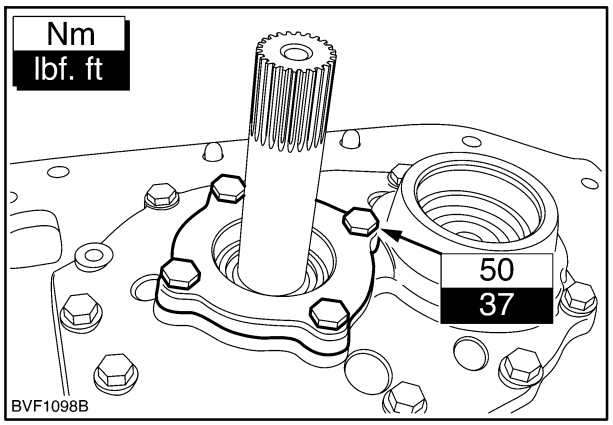
202

2. Install a number of adjustment shims (**S1**) (1) of a known dimension to achieve output shaft end float.



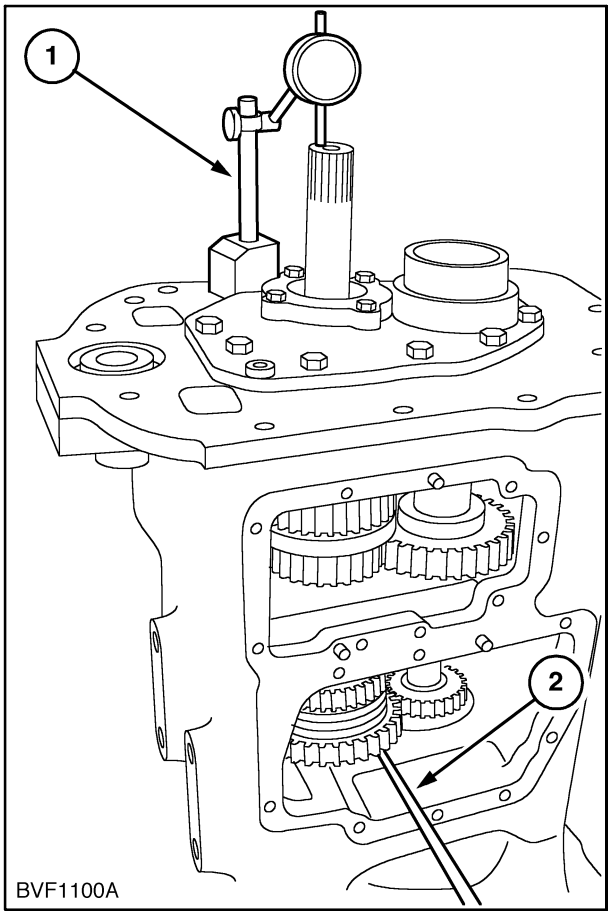
203

3. Install the output shaft front taper roller bearing retainer. Tighten the retaining bolts to the specified torque value.



204

4. The output shaft end float required is 0.038–0.089 mm. To achieve this, carry out the following:



205

5. Rotate the output shaft several times to seat the bearing rollers.
6. Using a suitable dial gauge (1) and lever (2), measure the output shaft end float.

This measurement is M1

7. Determine the thickness of the shim(s) to be installed as follows:

NOTE: *If required decrease* ***(R1)*** *to the nearest available shim size.*

NOTE: *Increasing shim thickness increases end float, decreasing shim thickness decreases end float.*

R1 = S1-(M1-0.063)

Where:

R1 = Required shim(s) thickness

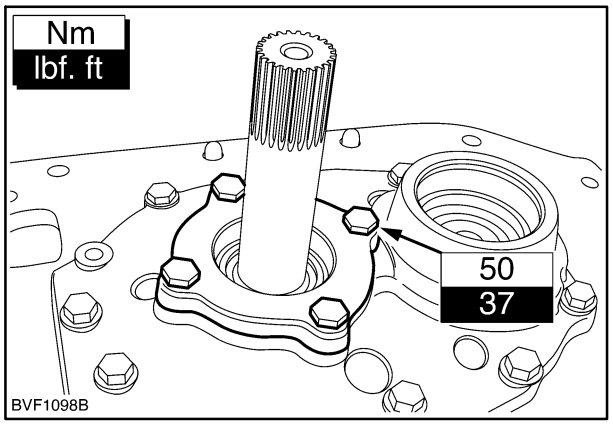
S1 = Test shim(s) thickness

M1 = Measured output shaft end float (with test shim(s) **(S1)** installed)

0.063 = Mean of required end float (0.038 - 0.089)

8. Remove the test shim(s) **(S1)** and install the calculated shim(s) **(R1)**.

9. Install the output shaft front taper roller bearing retainer. Tighten the retaining bolts to the specified torque value.



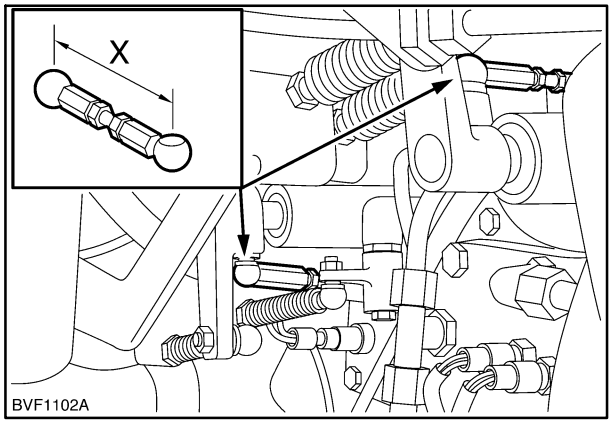
206

GEARSHIFT CABLE

Adjustments

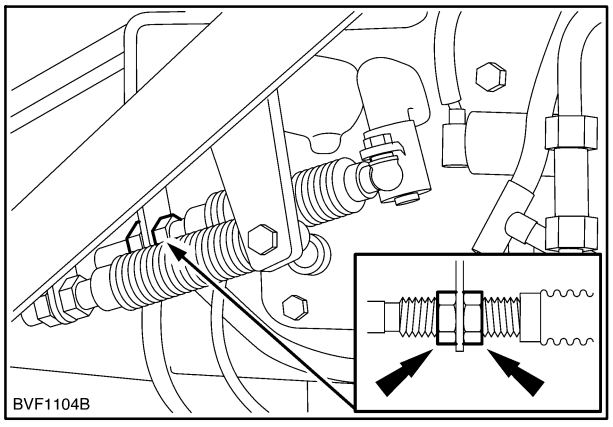
1. Ensure the tractor is not in gear and the main shift and range levers are in the neutral position.
2. Check and if necessary adjust the length of both of the adjustable link rods.

X = 83.5 - 84.9 mm



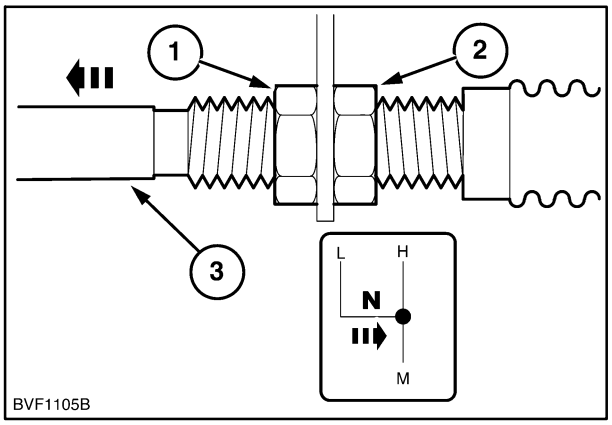
207

3. Loosen the range selection cable adjustment nuts.



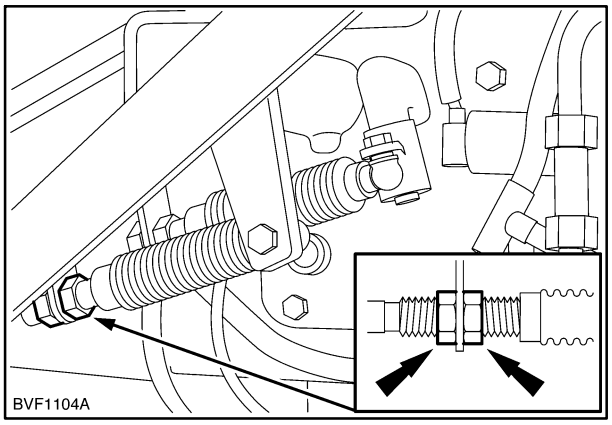
208

4. Move the range selection cable (3) to remove the freeplay until the range lever in the cab is in the position shown.
5. Tighten the adjustment nut (1) to the bracket and tighten the adjustment nut (2).



209

6. Loosen the range shift cable adjustment nuts.

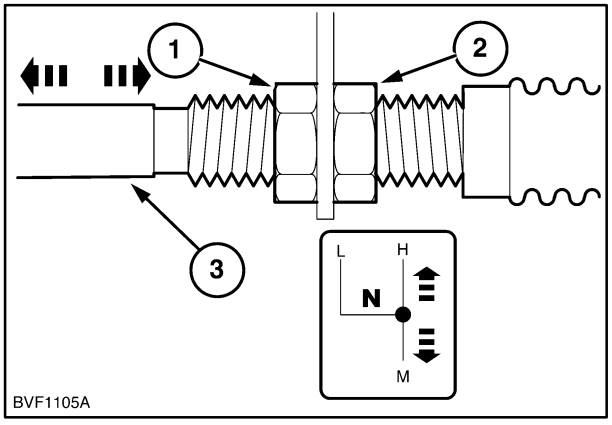


210

NOTE: *Ensure the range lever in the cab is still located in the detent position.*

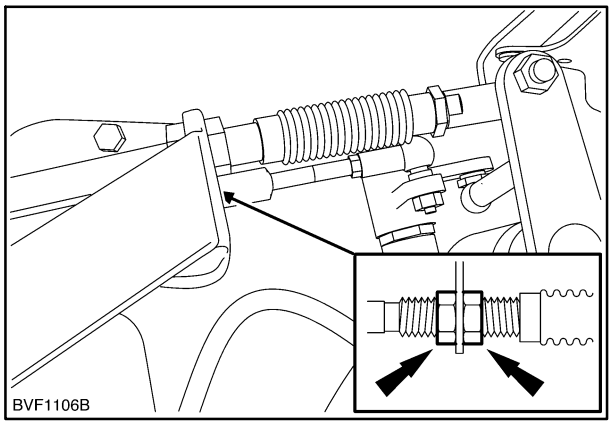
NOTE: *Ensure the range shift lever in the cab is not obstructed by the console when selecting a gear.*

7. Move the range shift cable (3) to equally distribute the freeplay until the range lever in the cab is in the position shown.
8. Tighten the adjustment nuts (1) and (2).



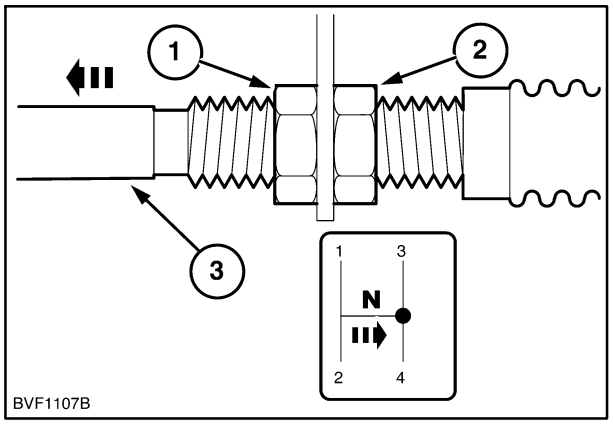
211

9. Loosen the main shift selection cable adjustment nuts.



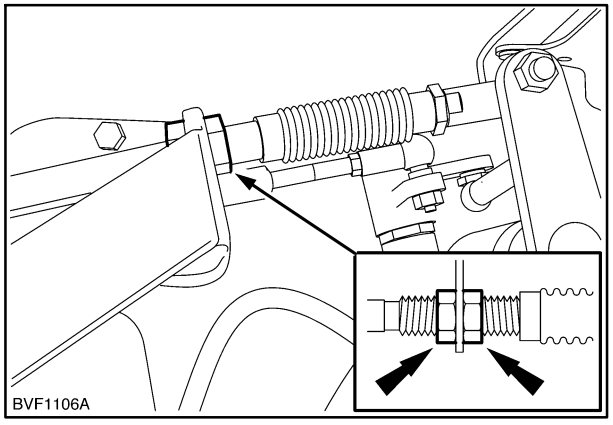
212

10. Move the main shift selection cable (3) to remove the freeplay until the main shift lever in the cab is in the position shown.
11. Tighten the adjustment nut (1) to the bracket and tighten the adjustment nut (2).



213

12. Loosen the main shift cable adjustment nuts.

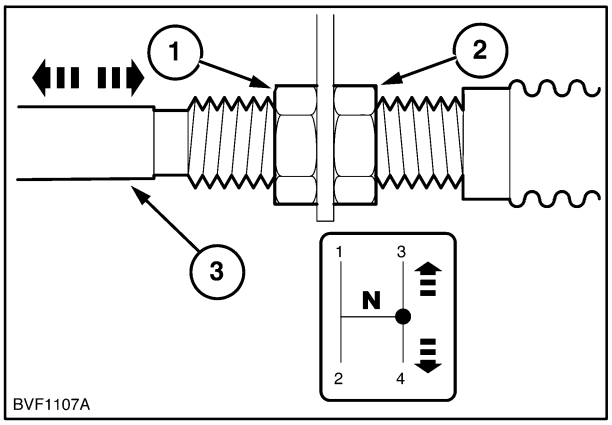


214

NOTE: *Ensure the main shift lever in the cab is still located in the detent position.*

NOTE: *Ensure the main shift lever in the cab is not obstructed by the console when selecting a gear.*

13. Move the main shift cable (3) to equally distribute the freeplay until the main shift lever in the cab is in the position shown.
14. Tighten the adjustment nuts (1) and (2).



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NOTES

SECTION 21 - TRANSMISSION SYSTEMS

Chapter 3 - 12 x 12 Transmission

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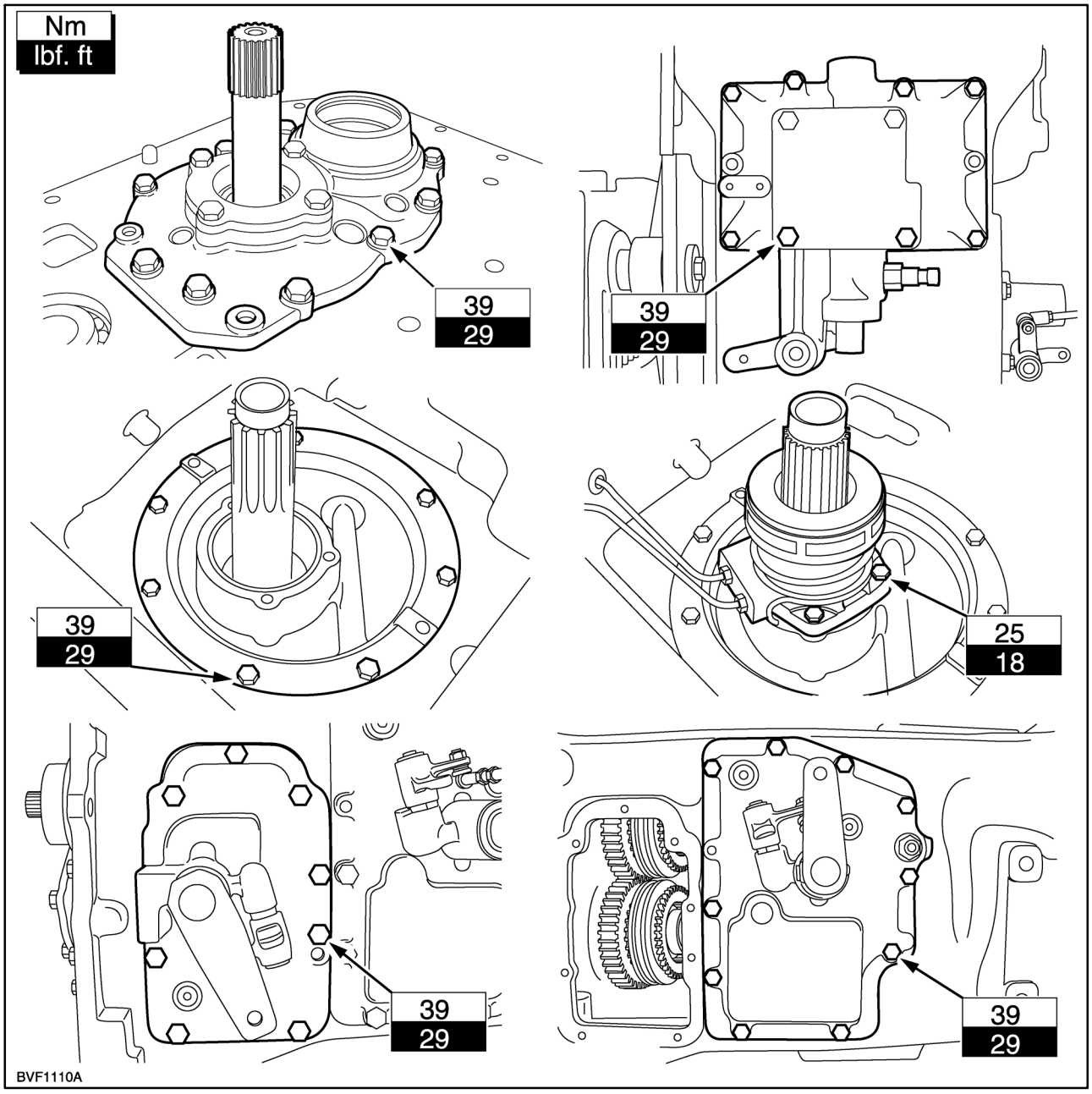
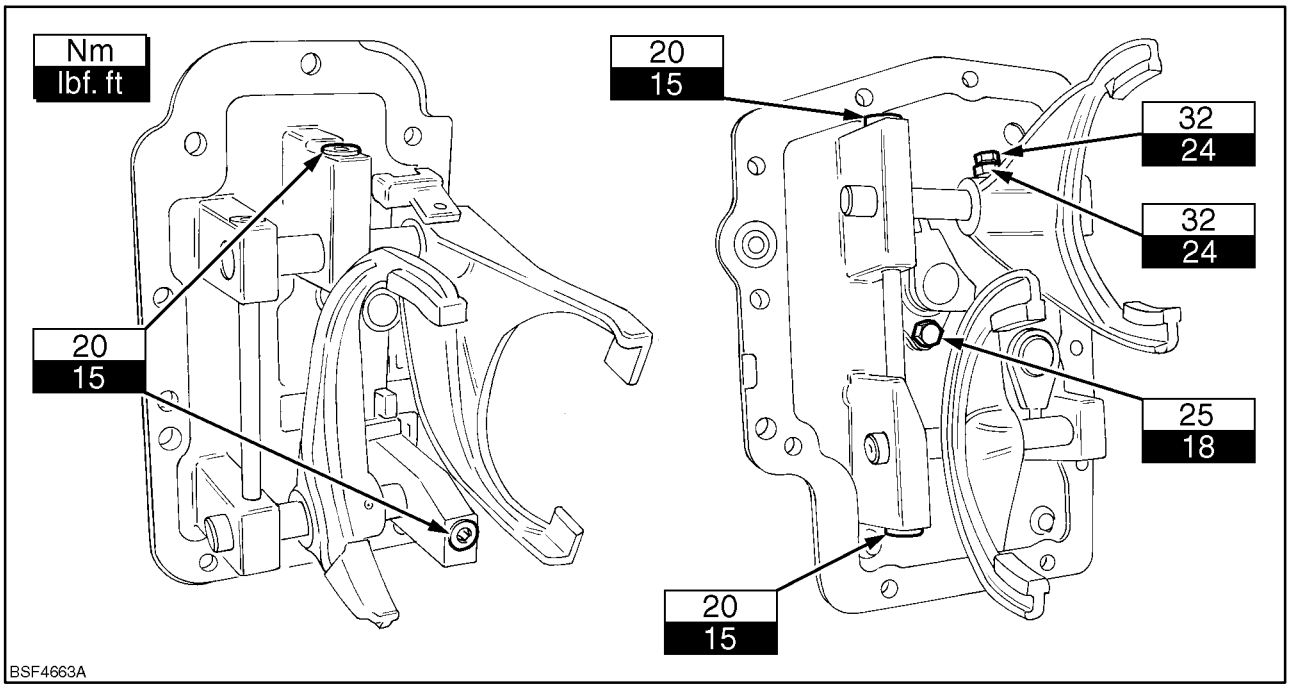
SPECIFICATIONS

12 x 12 Transmission	
Type	12 forward and 12 reverse speeds, using straight cut gears, and friction cone synchronizers
Control system	Mechanical levers and linkage
Driveline Oil	
Specification	Ambra Multi-G (NH 410B)
Capacity (transmission/rear axle) with light duty rear axle	Litres - 58.8 Imp. Gallons - 12.8 U.S. Gallons - 15.4
Capacity (transmission/rear axle) with heavy duty rear axle	Litres - 65 Imp. Gallons - 14.3 U.S. Gallons - 17.1
Adjustments	
Output shaft end float mm	0.038 - 0.089
Output shaft end float adjustment shims available mm	0.076, 0.125, 0.305, 0.762
Adjustable link rod mm	83.5-84.9

TIGHTENING TORQUES



1



2

SPECIAL TOOLS

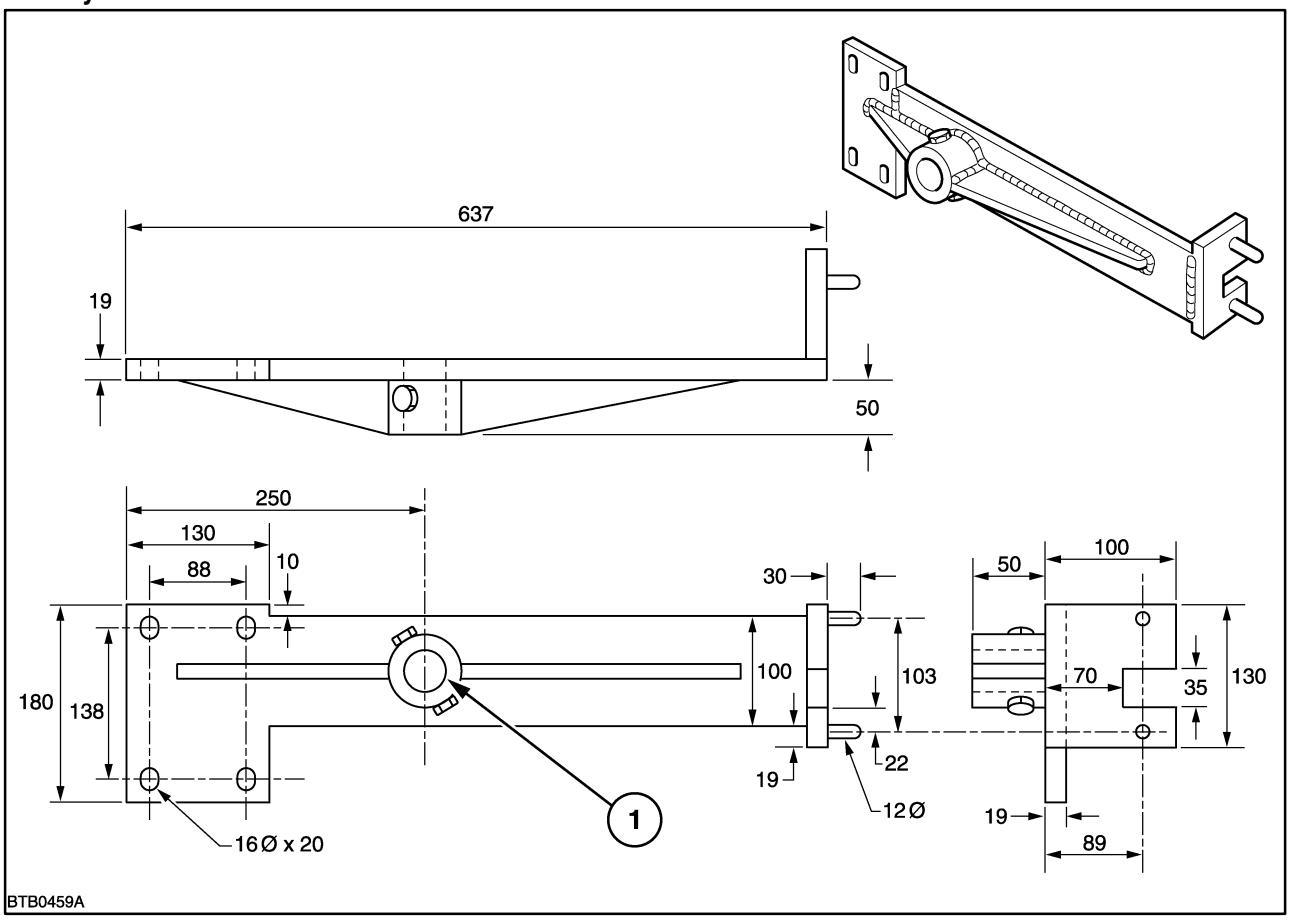
⚠ CAUTION ⚠

Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly in this Manual.

List of special tools necessary to carry out the different operations described in this Section.

.. Transmission stand bracket

Locally Fabricated Tools



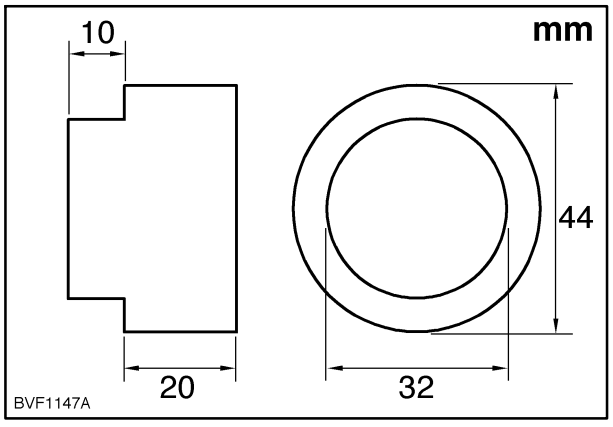
3

Transmission to Stand Attachment Bracket - Constructional Detail

Main bracket made from 19mm mild steel plate.

NOTE: *Strengthening plate should be of similar material and welds should be secure, preferably continuous.*

1. Center spigot (locally adjust to suit base stand)



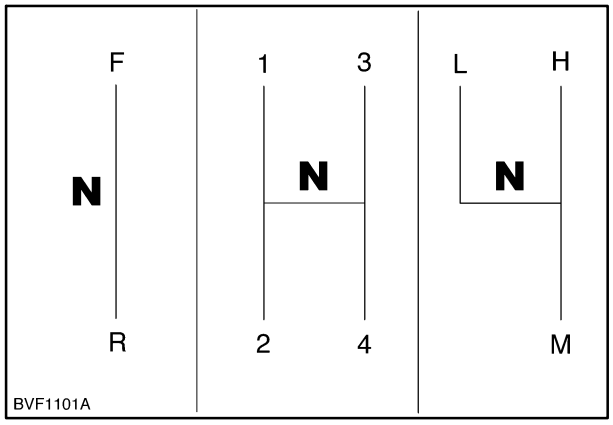
4

Range Cluster Bearing Adapter Tool

DESCRIPTION AND OPERATION

The transmission provides three selectable ranges. Within each of these ranges a further four ratios may be selected. This in effect provides a three times four (3x4=12) transmission resulting in 12 ratios, providing twelve forward and twelve reverse speeds. All shifts except down shifting into low range are synchronized.

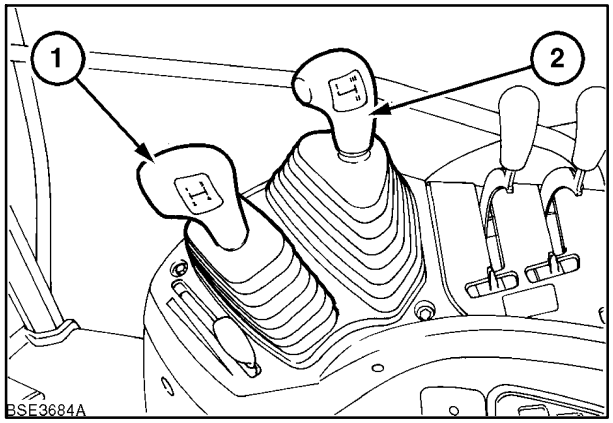
The basic transmission can be specified with the 40 km/h option in place of the standard 30 km/h.



5

MAIN SHIFT LEVER

The main shift lever (1) operates in a conventional H-pattern and, in conjunction with the clutch pedal, is used to select any of four gear ratios, whether the tractor is stationary or moving.



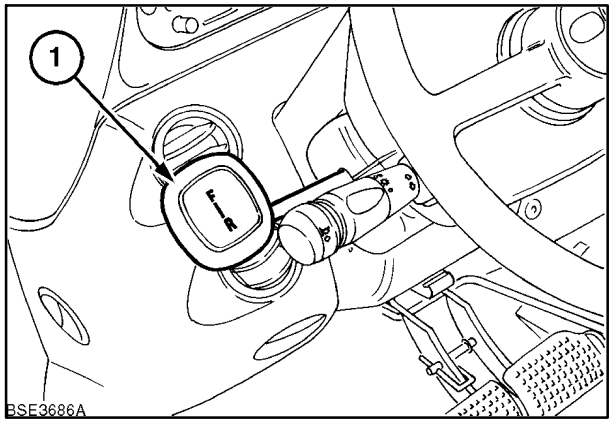
6

RANGE LEVER

The right-hand lever (2) is the range lever which, in conjunction with the clutch pedal, is used to select any one of three ranges (L – the lowest speed range, M– medium range and H – the highest speed range). This has the effect of tripling the number of gears, both in forward and reverse, from 4 to 12. The design of the transmission permits easy changes between the medium and high ranges while the tractor is moving. The tractor must be stopped to change between the medium and low ranges.

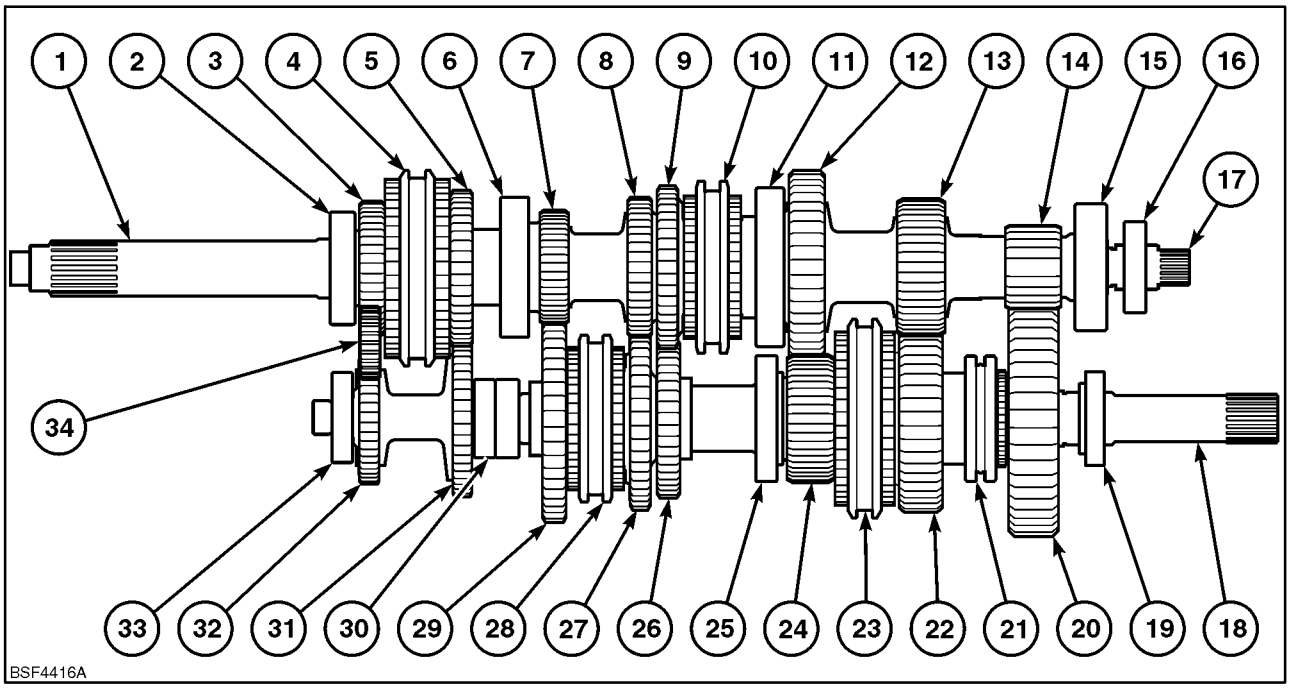
SHUTTLE LEVER

The shuttle lever (1) is used to select forward or reverse travel when any one of the twelve gears is engaged, provided that the clutch pedal is depressed. To reverse the direction of travel, reduce engine and tractor speed to a minimum, depress the clutch and move the shuttle lever rearwards. Re-engage the clutch and increase engine speed, as required.



7

12X12 TRANSMISSION



8

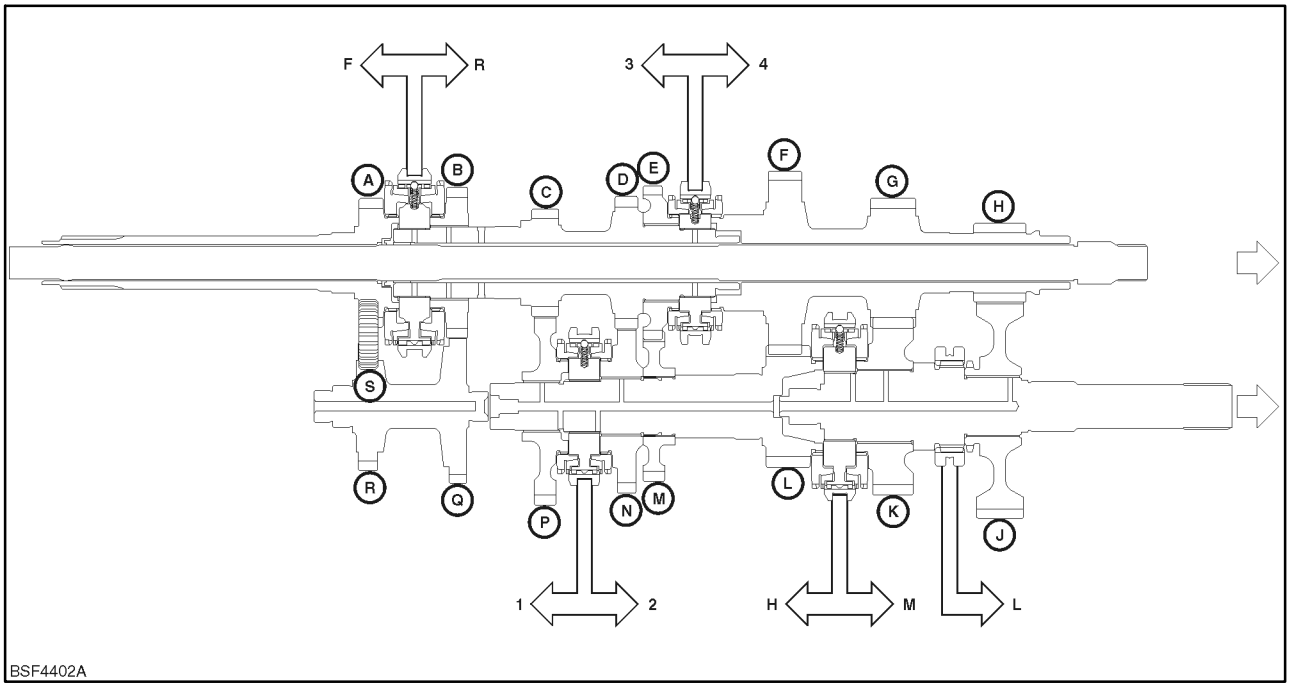
12 x 12 Transmission Components

1. Input shaft
2. Bearing
3. Forward drive gear
4. Forward/Reverse synchronizer
5. Reverse drive gear
6. Bearing
7. 1st gear drive (C)
8. 2nd gear drive (D)
9. 3rd gear drive (E)
10. 3/4 synchronizer
11. Bearing
12. High range gear drive (F)
13. Medium range gear drive (G)
14. Low range gear drive (H)
15. Bearing
16. Bearing
17. PTO shaft
18. Output shaft
19. Taper roller bearing
20. Low range gear driven (J)
21. Low range sliding coupling
22. Medium range gear driven (K)
23. High/Medium synchronizer
24. High range gear driven (L)
25. Bearing
26. 3rd gear driven (M)
27. 2nd gear driven (N)
28. 1/2 gears synchronizer
29. 1st gear driven (P)
30. Bearing
31. Reverse cluster gear drive (Q)
32. Reverse cluster gear driven (R)
33. Bearing
34. Reverse Gear Idler (S)

Transmission Gear Teeth

Gear	Description	Number of Teeth	
		40 Km/h	30 Km/h
A	Forward/reverse gear drive	33	33
B	Reverse gear driven	39	39
C	1st gear drive	31	27
D	2nd gear drive	38	34
E	3rd gear drive	45	40
F	High range gear drive	52	49
G	Medium range gear drive	35	33
H	Low range gear drive	19	19
J	Low range gear driven	60	60
K	Medium range gear driven	44	46
L	High range gear driven	27	31
M	3rd gear driven	34	39
N	2nd gear driven	41	45
P	1st gear driven	49	52
Q	Reverse cluster gear drive	40	40
R	Reverse cluster gear driven	33	33
S	Reverse gear idler	35	35

Power Flows - Neutral



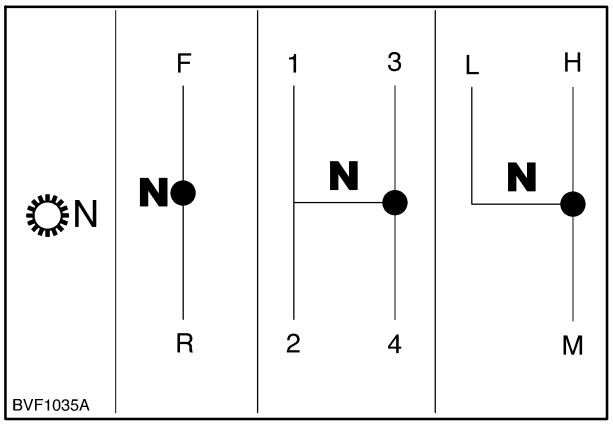
9

Power Flow

- Engine power is transmitted from the flywheel mechanical clutch to the transmission input driveshaft.

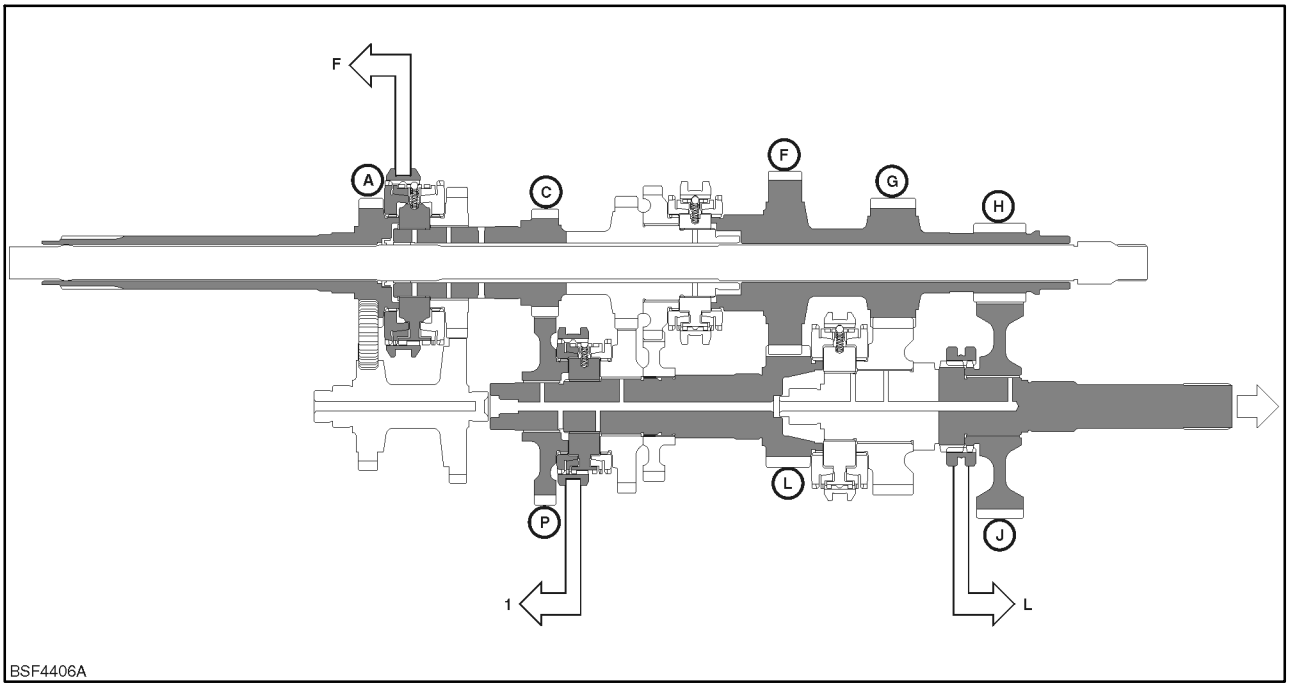
Gear Lever Positions

- Shuttle lever in neutral, main shift lever in neutral and range lever in neutral.



10

Power Flows - 1st Gear



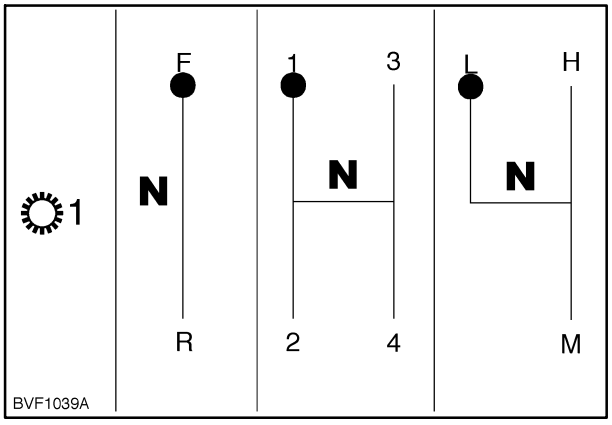
11

Power Flow

- Input shaft - gear A - forward/reverse synchronizer - gears C-P - 1/2 synchronizer - gears L-F-H-J - low sliding coupler - output shaft.

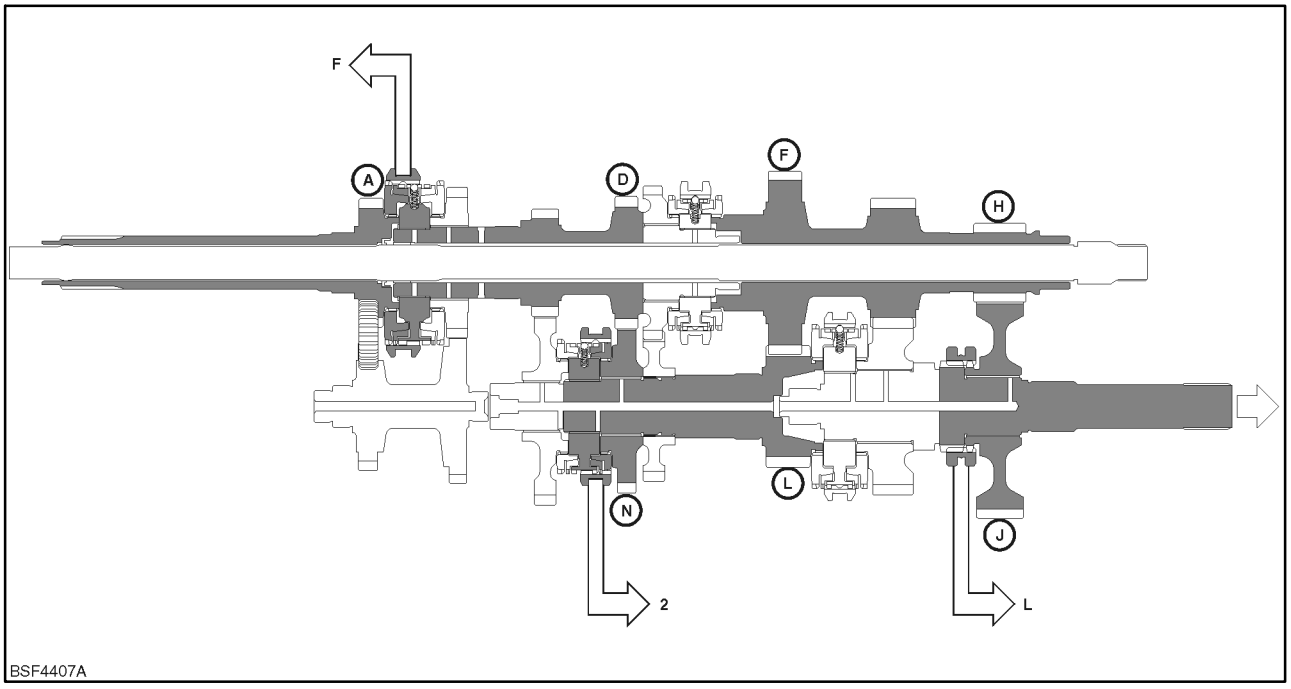
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 1st gear and range lever in low range.



12

Power Flows - 2nd Gear



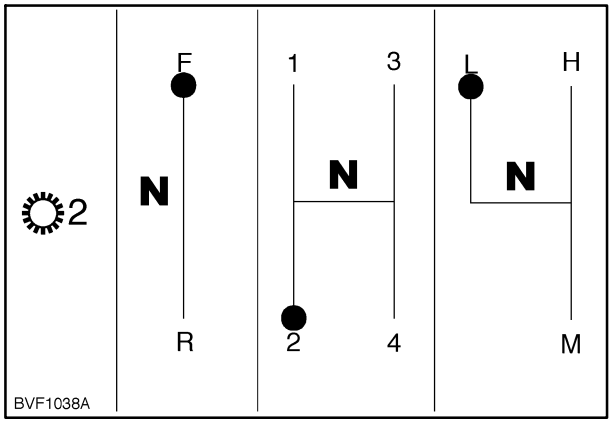
13

Power Flow

- Input shaft - gear A - forward/reverse synchronizer - gears D-N - 1/2 synchronizer - gears L-F-H-J - low sliding coupler - output shaft.

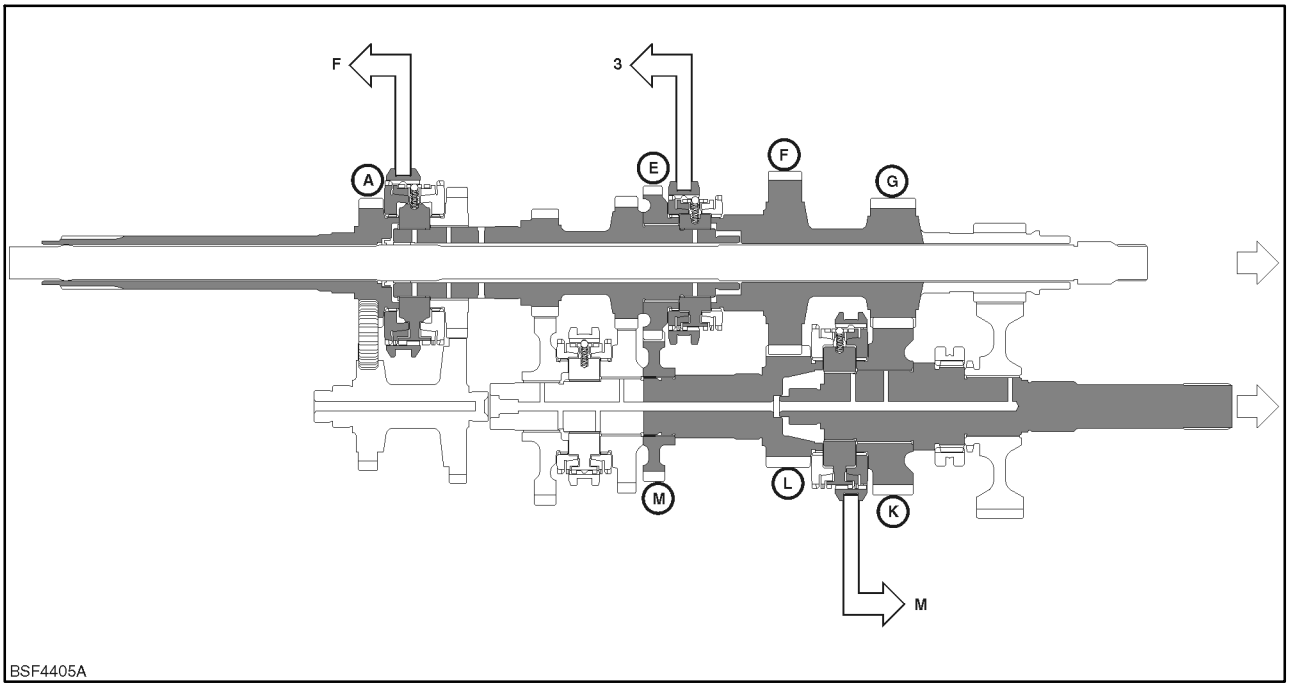
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 2nd gear and range lever in low range.



14

Power Flows - 7th Gear



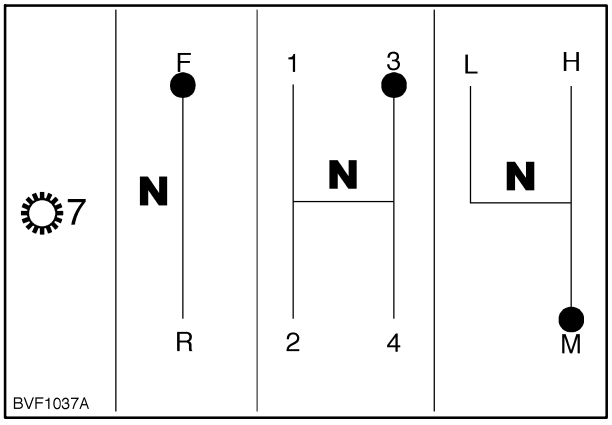
15

Power Flow

- Input shaft - gear A - forward/reverse synchronizer - 3/4 synchronizer - gears E-M-L-F-G-K - high/medium synchronizer - output shaft.

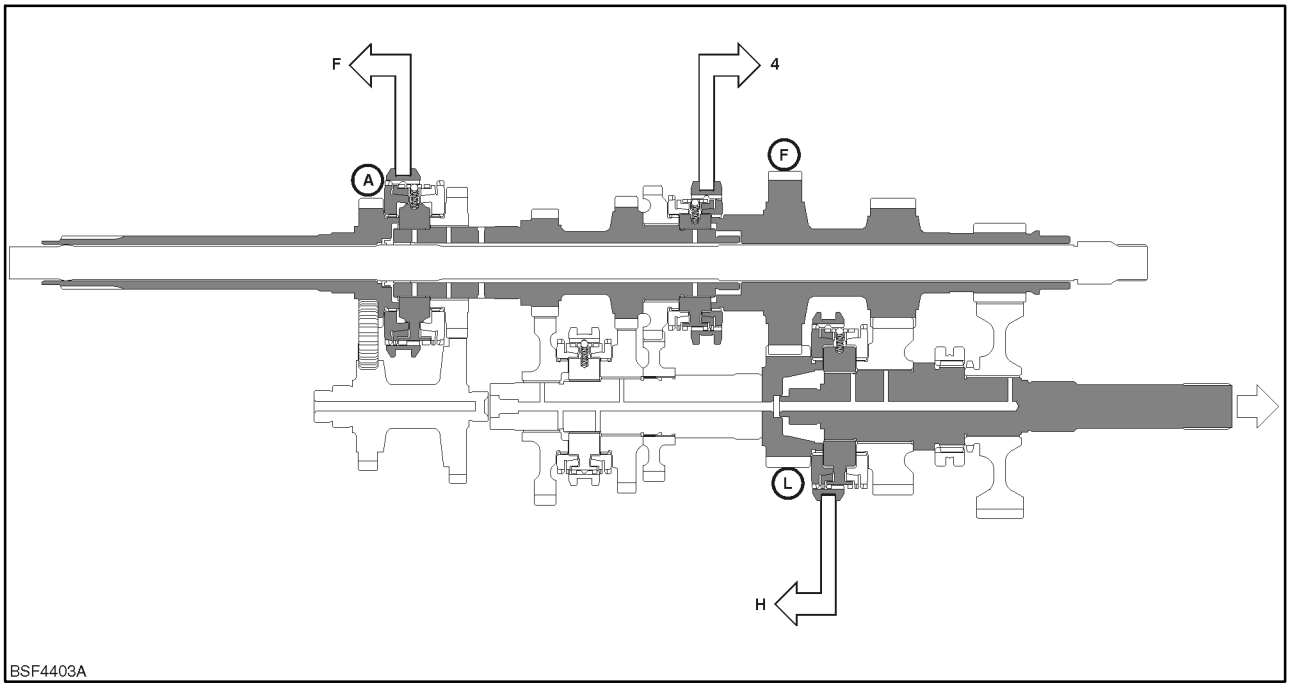
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 3rd gear and range lever in medium range.



16

Power Flows - 12th Gear



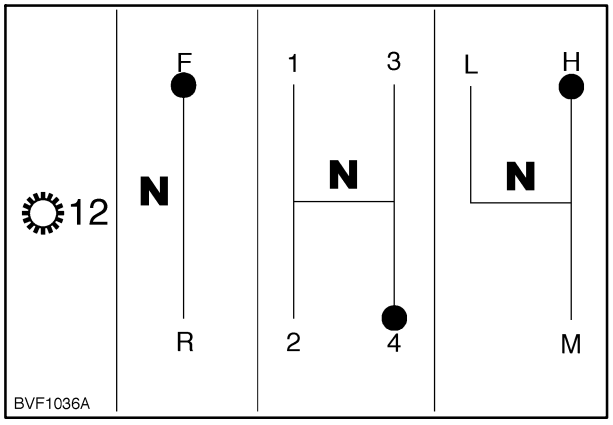
17

Power Flow

- Input shaft – gear A – forward/reverse synchronizer – 3/4 synchronizer – gears F–L – high/medium synchronizer – output shaft.

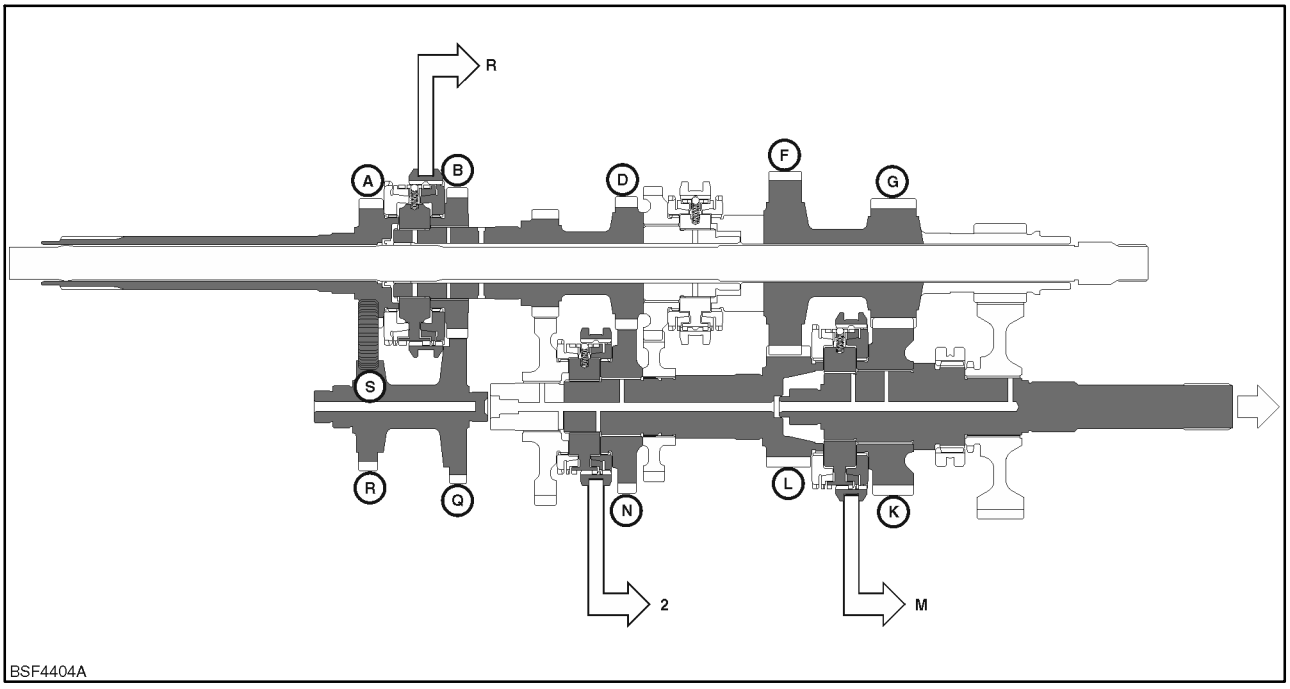
Gear Lever Positions

- Shuttle lever in forward, main shift lever in 4th gear and range lever in high range.



18

Power Flows - Reverse 6th Gear



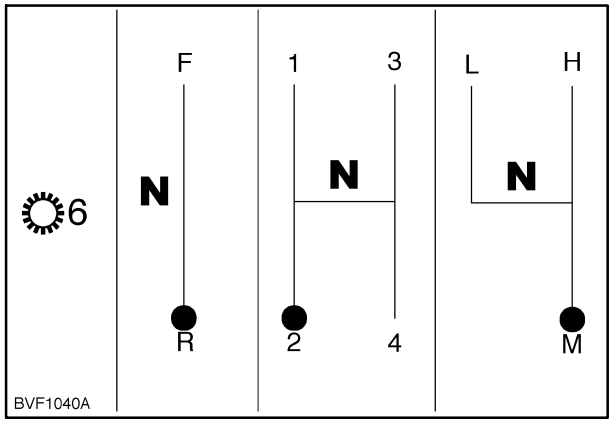
19

Power Flow

- Input shaft - gears A-S-R-Q-B - forward/reverse synchronizer - gears D-N - 1/2 synchronizer - gears L-F-G-K - high/medium synchronizer - output shaft.

Gear Lever Positions

- Shuttle lever in reverse, main shift lever in 2nd gear and range lever in medium range.



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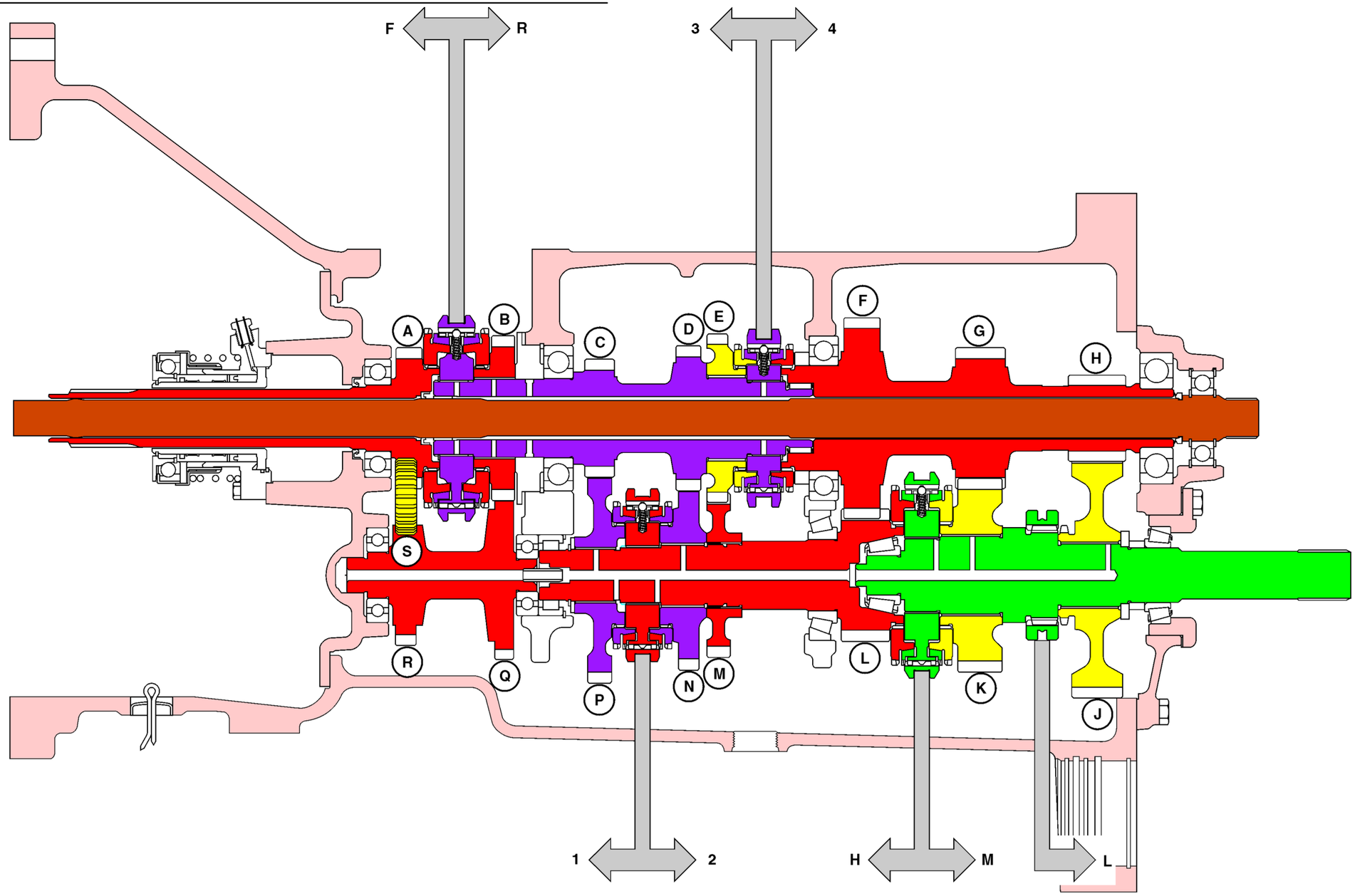
TRANSMISSION GEAR TEETH

Gear	Description	Number of Teeth	
		40 Km/h	30 Km/h
A	Forward/reverse gear drive	33	33
B	Reverse gear driven	39	39
C	1st gear drive	31	27
D	2nd gear drive	38	34
E	3rd gear drive	45	40
F	High range gear drive	52	49
G	Medium range gear drive	35	33
H	Low range gear drive	19	19
J	Low range gear driven	60	60
K	Medium range gear driven	44	46
L	High range gear driven	27	31
M	3rd gear driven	34	39
N	2nd gear driven	41	45
P	1st gear driven	49	52
Q	Reverse cluster gear drive	40	40
R	Reverse cluster gear driven	33	33
S	Reverse gear idler	35	35



BSF4396B

12x12 TRANSMISSION GEAR IDENTIFICATION

NOTES

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	CORRECTION
Transmission is noisy during operation	Low driveline oil level.	Refill with the specified oil to the correct level. Locate oil leakage.
	Incorrect driveline oil specification.	Drain and refill with the specified oil to the correct level.
	Low or no lubrication oil pressure.	Pressure test the lubrication circuit (refer to pressure testing in the hydraulic systems section).
	Mechanical failure in the transmission.	Inspect the bearings for worn or damaged parts. Replace part(s) as necessary.
Oil leak from the split pin located in the bottom of the transmission case	Engine crankshaft rear main oil seal leakage.	Replace oil seal.
	Worn or damaged input shaft oil seal, PTO drive shaft oil seal, transmission front plateseal or reverse idler retaining bolt oil seal leakage.	Replace oil seal(s) or re-apply liquid gasket as necessary.
	Hydraulic release bearing oil seal(s) (brake fluid reservoir requires regular topping up).	Replace oil seal(s) as necessary.
Difficult or failure to engage gears	Incorrect selector cable(s) adjustment.	Adjust selector cable(s).(refer to gearshift cable adjustments in this chapter).
	Damaged or worn shift forks.	Inspect, repair or replace as necessary.
	Worn synchronizers.	Inspect synchronizer ring rubbing surfaces. Replace as necessary if worn.
	Excessive output shaft end float.	Inspect bearings, replace as necessary. Adjust output shaft end float.
	Incorrect clutch operation.	Air in the hydraulic system. Faulty clutch pressure plate.
Failure to change between forward and reverse	Incorrect clutch interlock cable adjustment.	Adjust clutch interlock cable.(refer to gearshift cable adjustments in this chapter).
	Incorrect selector cable adjustment.	Adjust selector cable.(refer to gearshift cable adjustments in this chapter).

PROBLEM	POSSIBLE CAUSES	CORRECTION
Jumping out of gear	Incorrect selector cable(s) adjustment.	Adjust selector cable(s).(refer to gearshift cable adjustments in this chapter).
	Detents in shift covers faulty.	Remove shift covers and inspect detent balls and springs, replace parts as necessary.
	Worn synchronizer	Inspect teeth of synchronizer assembly, replace parts as necessary.
	Excessive output shaft end float.	Inspect bearings, replace as necessary. Adjust output shaft end float.
Holding in gear	Clutch not releasing.	Inspect the clutch and hydraulic release bearing operation, replace parts as necessary.
	Detent(s) in shift covers sticking.	Remove shift covers and inspect detent balls and springs, replace parts as necessary.
	Incorrect selector cable(s) adjustment.	Adjust selector cable(s).(refer to gearshift cable adjustments in this chapter).
	Sliding sleeve coupler tight on shaft splines.	Clean splines or replace shaft and sliding sleeve coupler as necessary.

OVERHAUL

TRANSMISSION

Disassembly

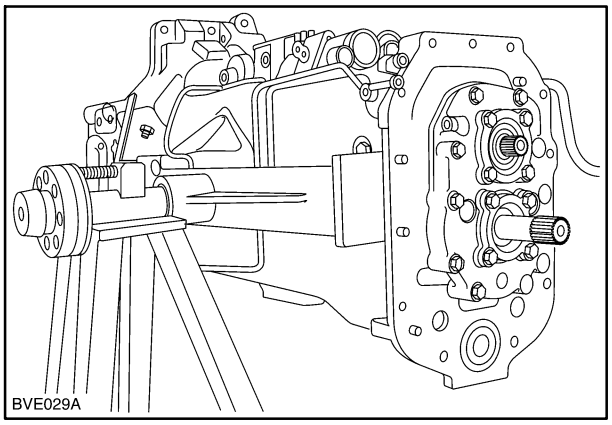
⚠ WARNING ⚠

Handle all components with the greatest of care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

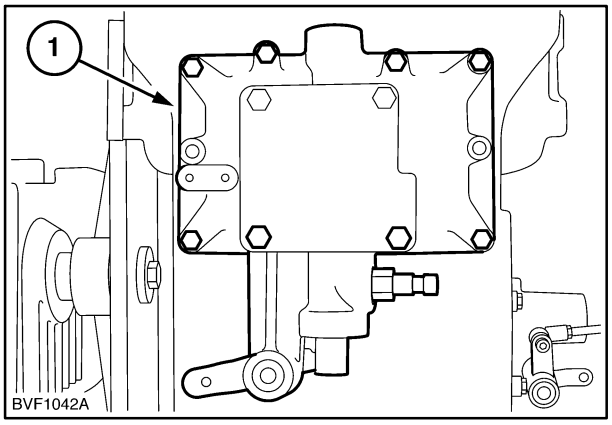
1. Remove the transmission (refer to the transmission removal chapter of the separating the tractor section).
2. Using the locally fabricated stand attachment bracket, install the transmission to a suitable stand.



21

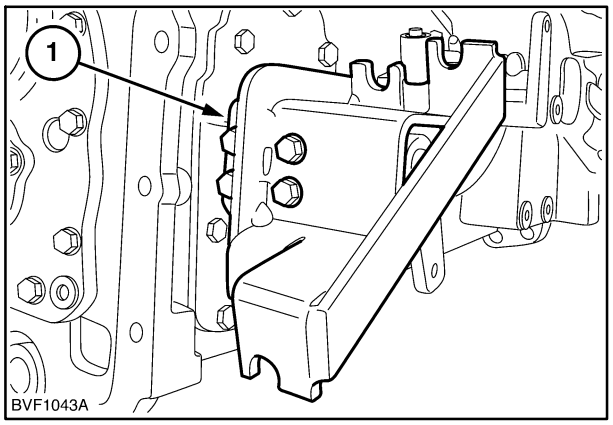
NOTE: *Ensure all gears are in neutral.*

3. Remove the forward/reverse synchronizer control cover (1).



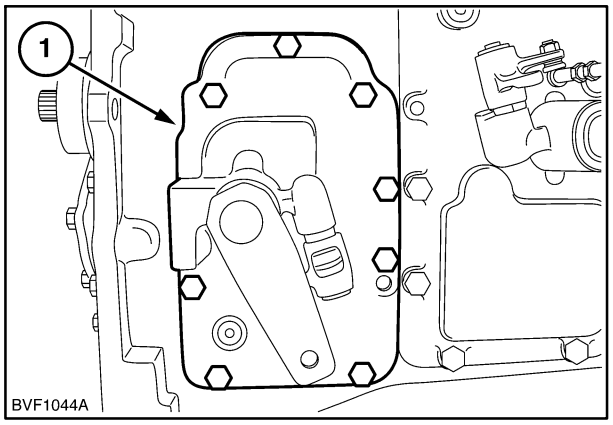
22

4. Remove the gearshift cable retaining bracket (1).



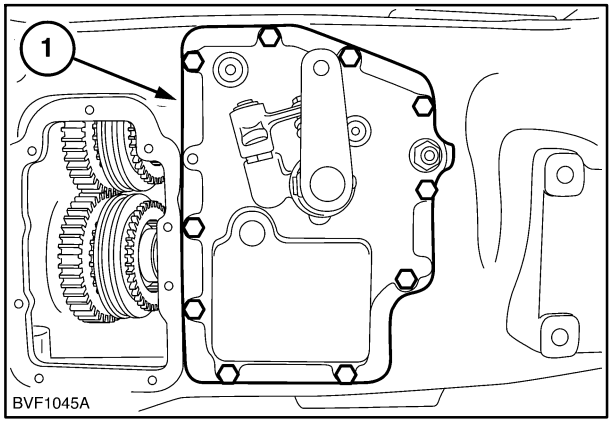
23

5. Remove the high/medium and low synchronizer control cover (1).



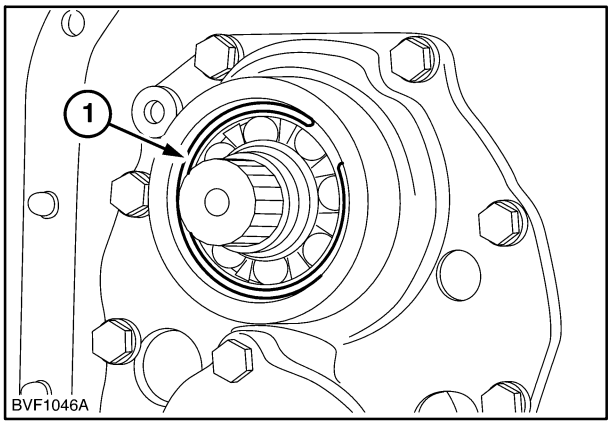
24

6. Remove the 1/2 and 3/4 synchronizer control cover (1).



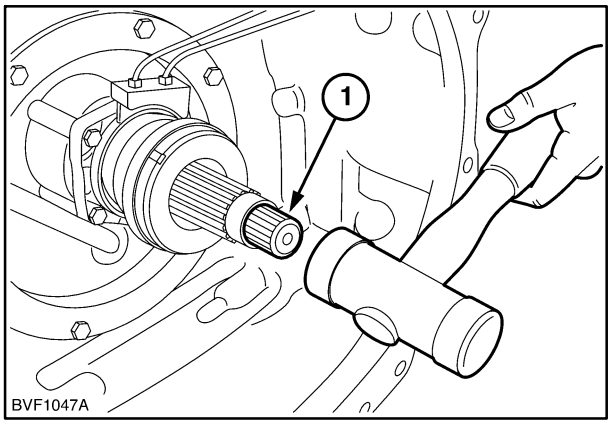
25

7. Using suitable snap ring pliers remove the PTO shaft bearing retaining snap ring (1).



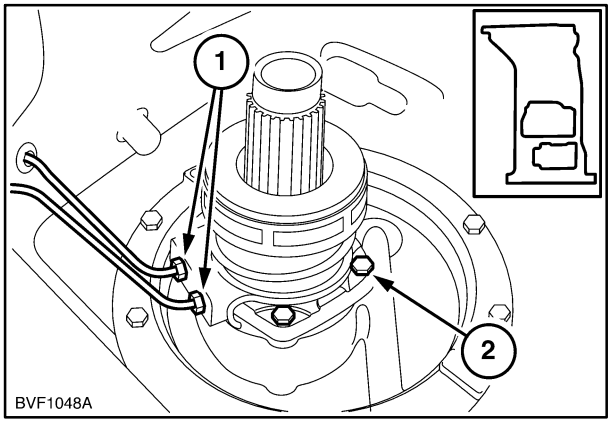
26

8. Using a suitable soft faced hammer, remove the PTO shaft (1).



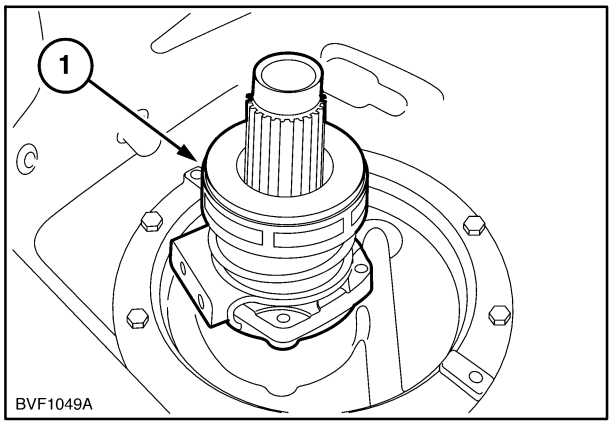
27

9. Rotate the transmission 90°.
10. Remove the hydraulic release bearing oil supply pipes (1) and the hydraulic release bearing retaining bolts (2).



28

11. Remove the hydraulic release bearing (1).



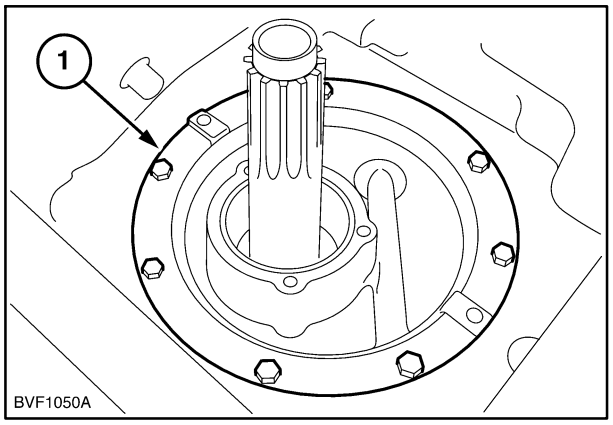
29

⚠ CAUTION ⚠

Ensure the lubrication oil supply pipe is not damaged during removal of the front cover plate.

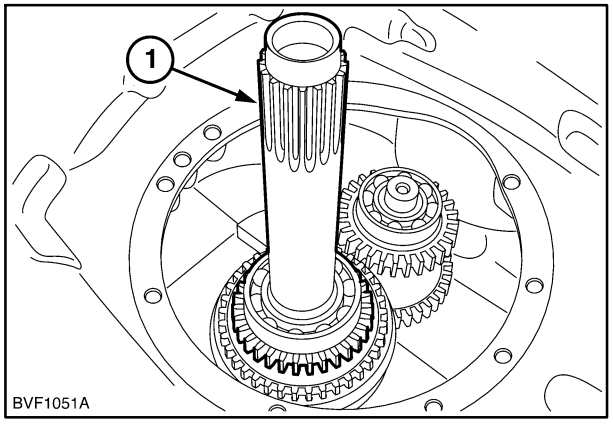
NOTE: *To assist removal, tap the front cover plate through the forward/reverse synchronizer control cover aperture.*

12. Remove the front cover plate (1).



30

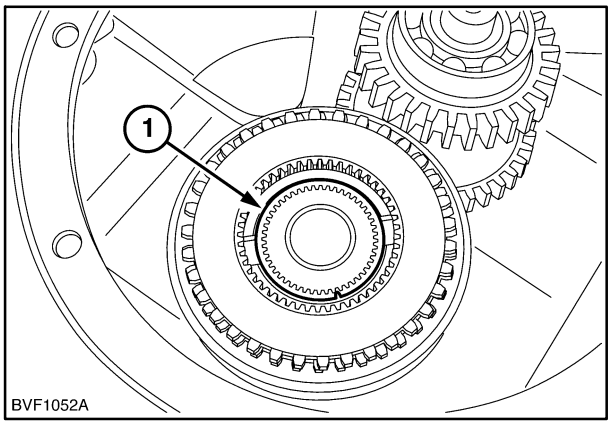
13. Remove the input shaft (1).



31

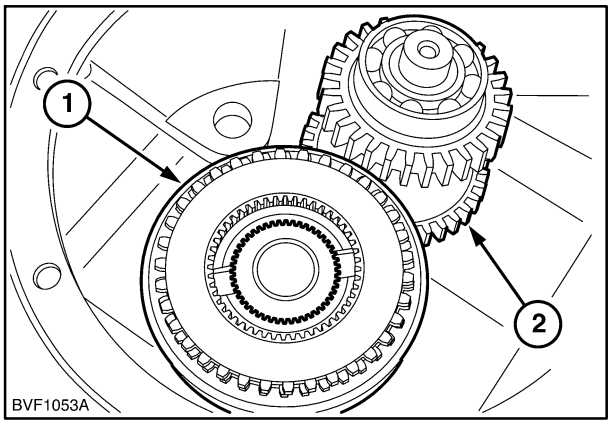
Front Section Removal

14. Remove the forward/reverse synchronizer retaining snap ring (1).



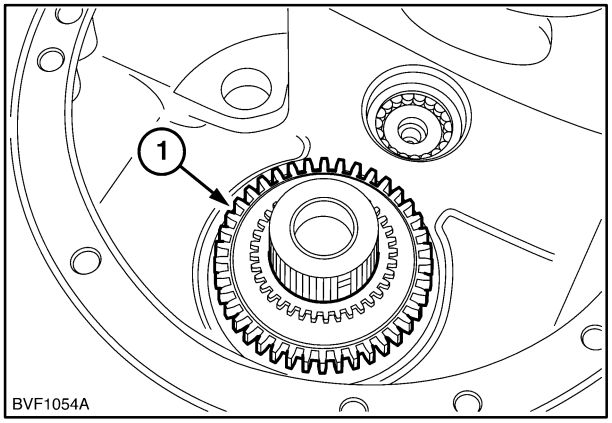
32

15. Remove the forward/reverse synchronizer (1) with the reverse cluster (2).



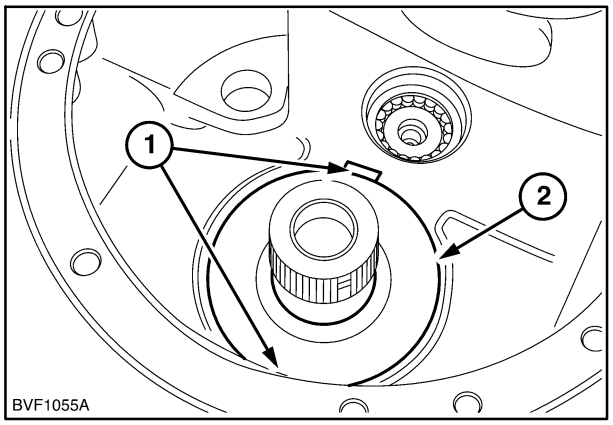
33

16. Remove the reverse driven gear (1).



34

17. Using a suitable lever in the cut-outs provided (1), remove the lubrication oil supply manifold (2).



35

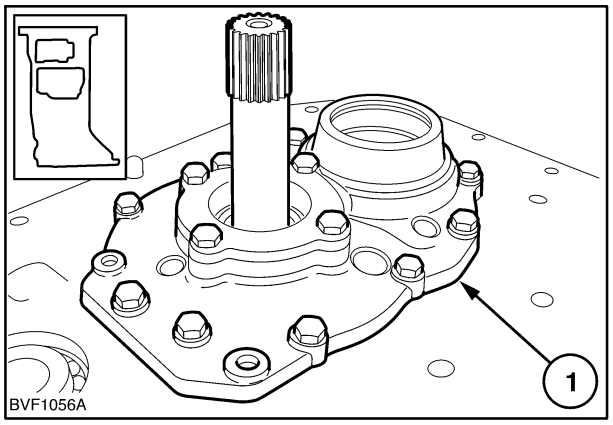
Rear Section Removal

NOTE: *The counter-shaft front bearing may fall out when the transmission is rotated.*

18. Rotate the transmission 180°.

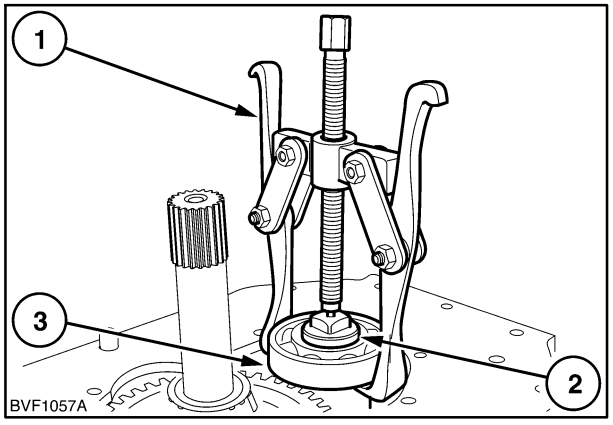
NOTE: *Ensure the range gear cluster remains in the transmission while removing the rear plate.*

19. Remove the rear plate (1).



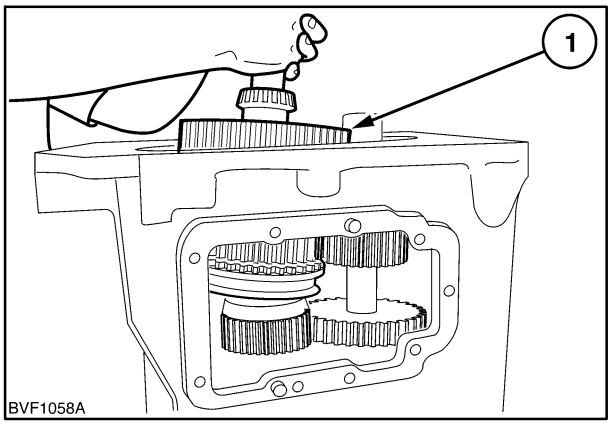
36

20. Using a suitable universal puller (1) and the locally fabricated tool (2), remove the range gear cluster bearing (3).



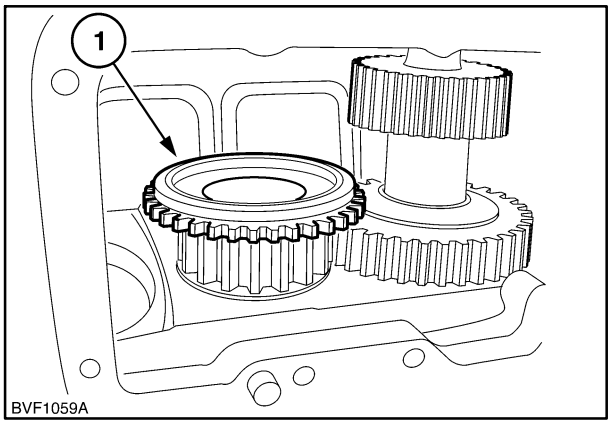
37

21. Remove the output shaft assembly (1).



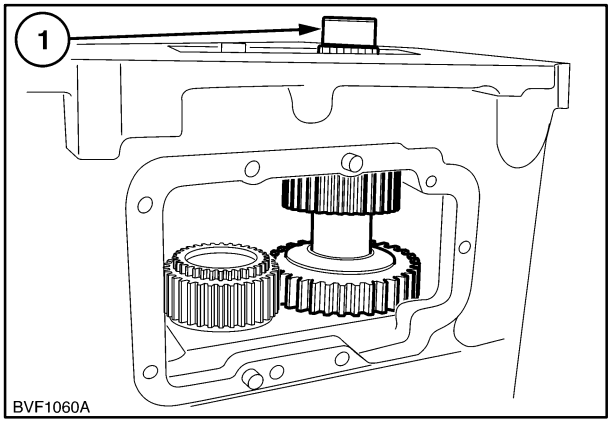
38

22. Remove the high/medium synchronizer rings (1).



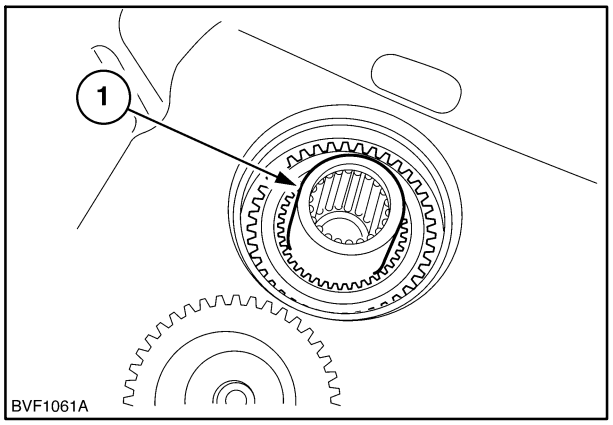
39

23. Remove the range gear cluster shaft (1).



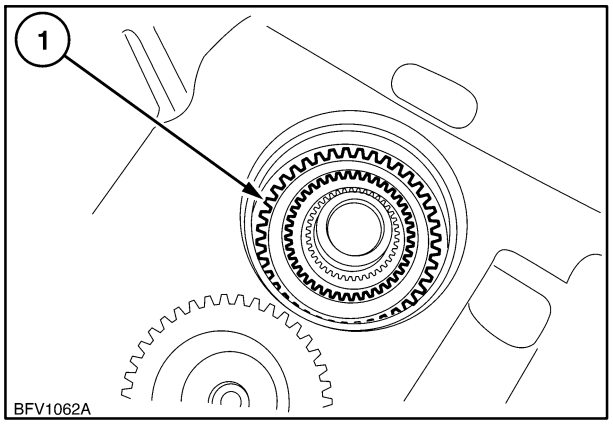
40

24. Remove the needle roller bearing (1).



41

25. Remove the 3/4 synchronizer rings (1).

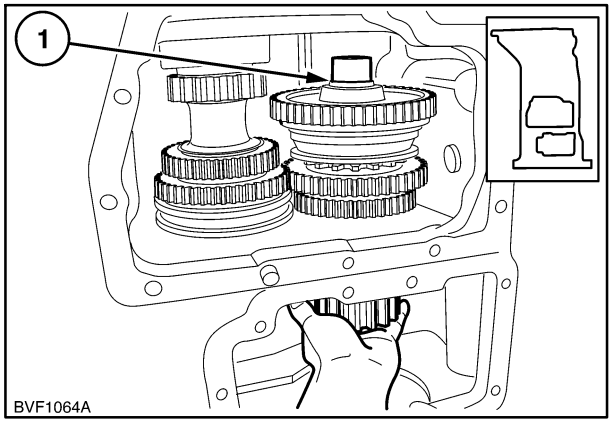


42

Middle Section Removal

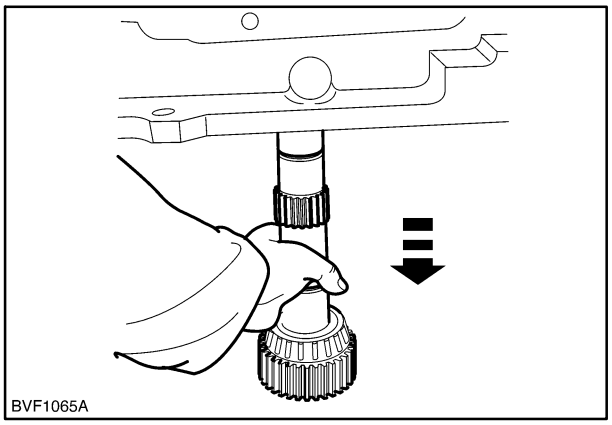
NOTE: *Support the 1/2 and 3/4 synchronizers while rotating the transmission.*

26. Rotate the transmission 180°.
27. Support the countershaft and remove the retaining circlip (1).



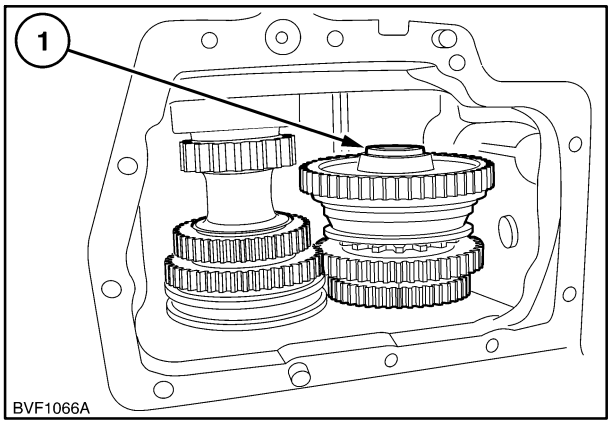
43

28. Remove the countershaft (1) from the rear end of the transmission.



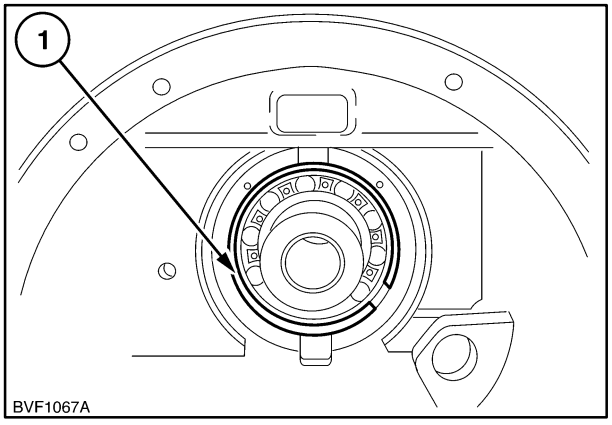
44

29. Remove the 1/2 synchronizer, gears and the D-washer.



45

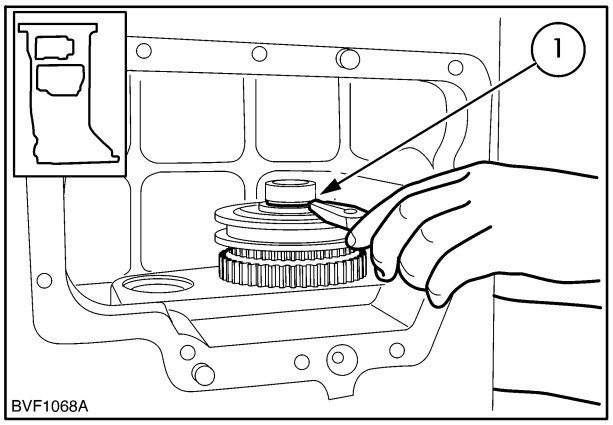
30. Using suitable snap ring pliers, remove the main shaft bearing snap ring (1).



46

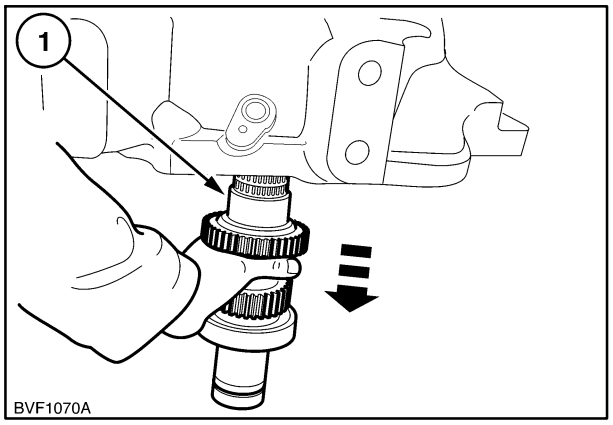
NOTE: *Support the 3/4 synchronizer while rotating the transmission.*

31. Rotate the transmission 180°.
32. Support the main shaft through the top cover aperture and remove the 3/4 synchronizer retaining snap ring (1).



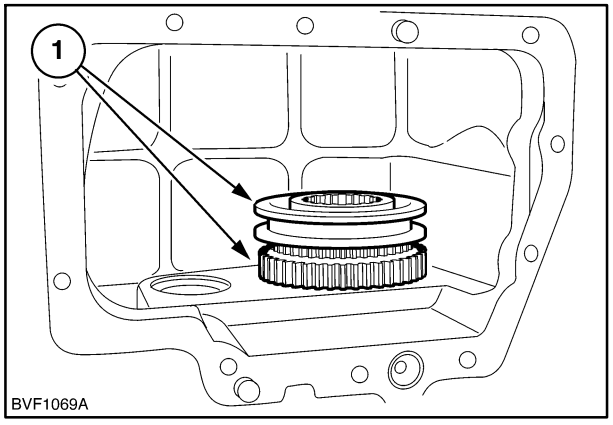
47

33. Remove the main shaft (1) through the bell-housing.



48

34. Remove the 3/4 synchronizer and 3rd gear drive assembly (1).



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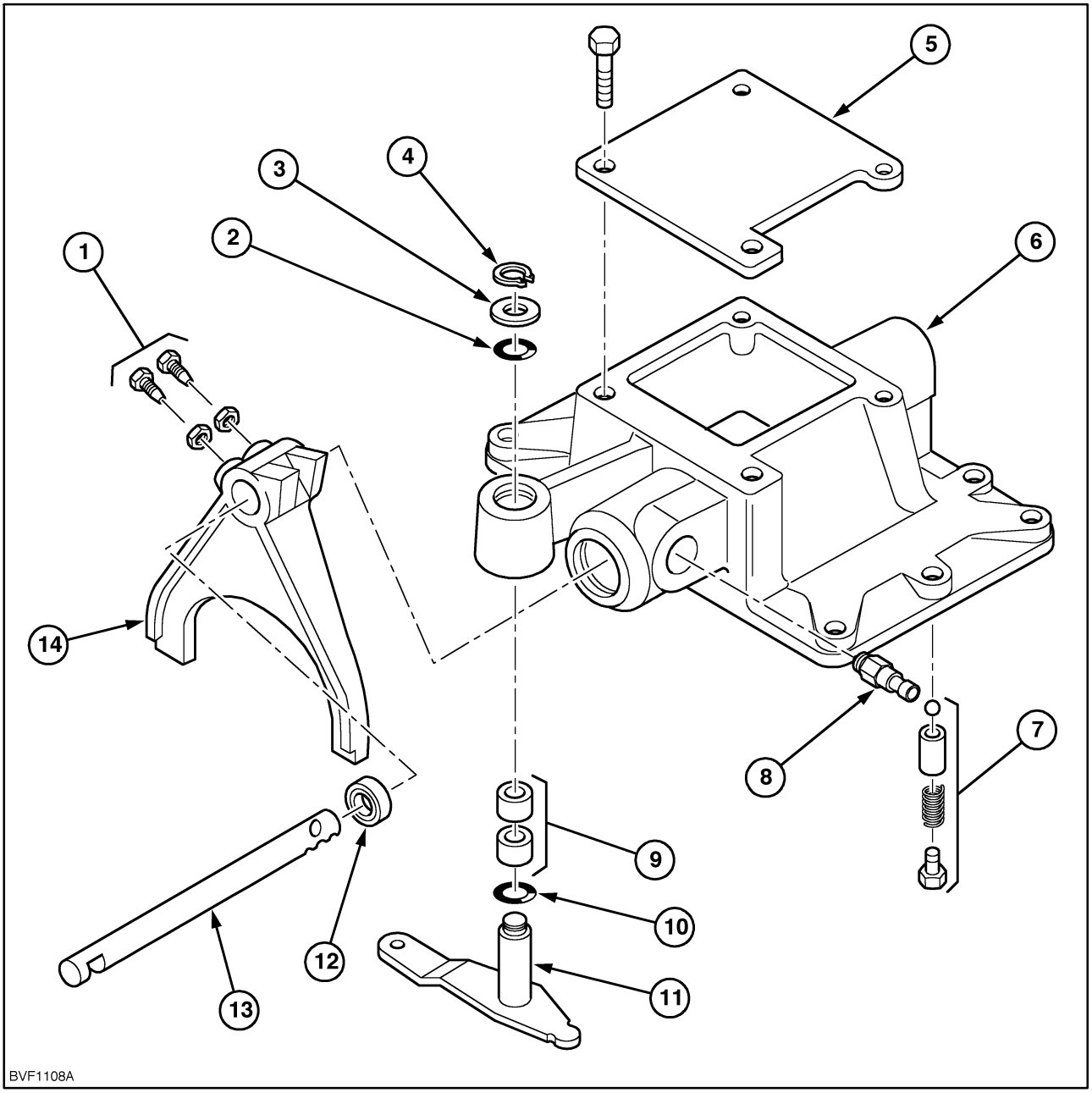
TRANSMISSION COMPONENT

Disassembly / Assembly



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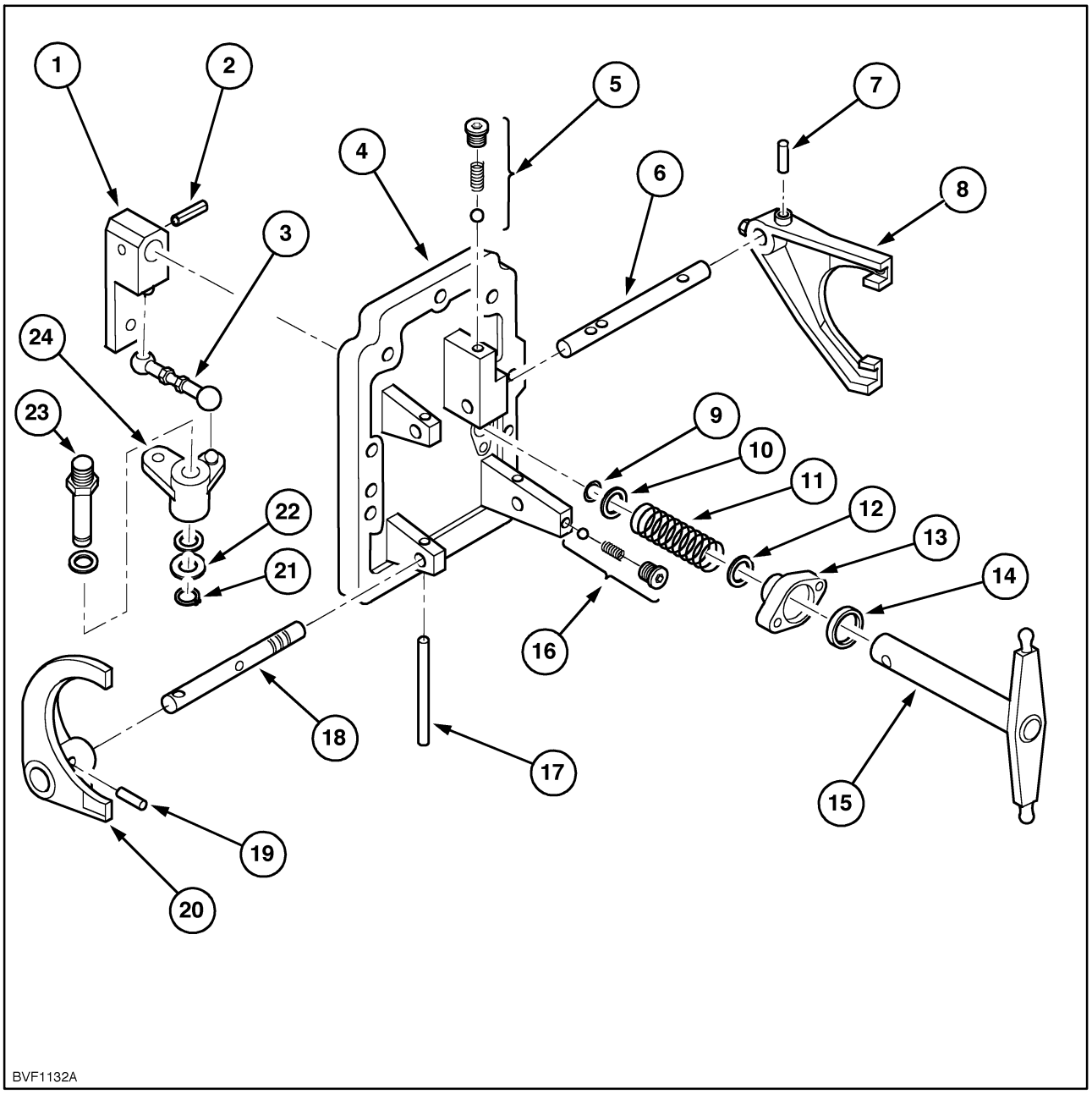
Forward/Reverse Synchronizer Control Cover Exploded View

1. Shift fork retaining bolt and nut (x2)
2. O-ring
3. Washer
4. Shift lever retaining circlip
5. Cover plate
6. Control cover
7. Forward/reverse detent assembly
8. Forward/reverse status switch
9. Shift lever bushings (x2)
10. O-ring
11. Forward/reverse shift lever
12. Oil seal
13. Forward/reverse shift rail
14. Forward/reverse shift fork



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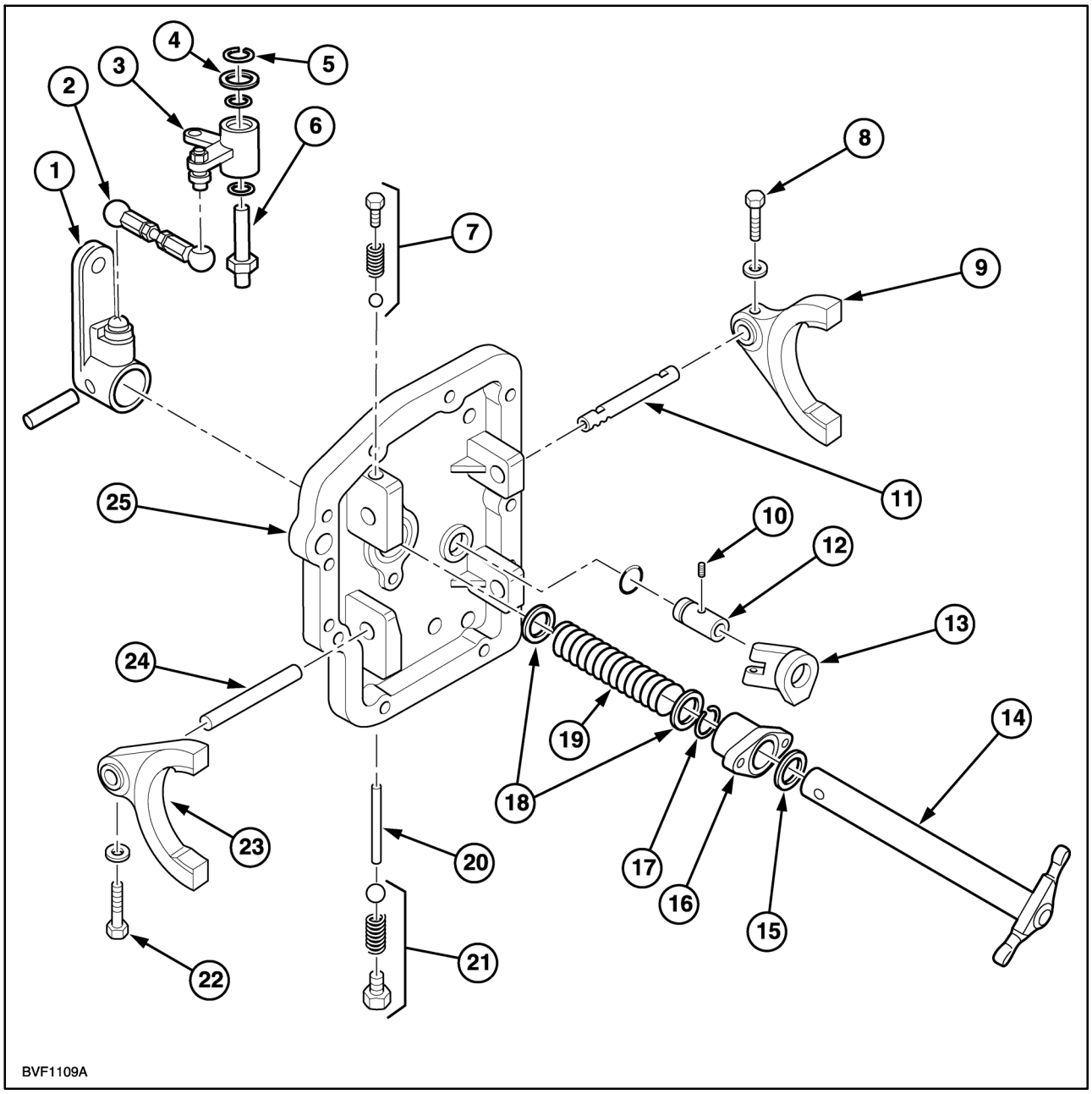
High / Medium and Low Synchronizer Control Cover Exploded View

1. Actuator lever
2. Roll pin
3. Adjustable link rod
4. Synchronizer control housing
5. High/medium detent assembly
6. High/medium synchronizer shift rail
7. Rollpin
8. High/medium synchronizer shift fork
9. Circlip
10. Washer
11. Return spring
12. Washer
13. Actuator shaft retainer
14. Spacer
15. Actuator shaft
16. Low detent assembly
17. Interlock rod
18. Low sliding coupler shift rail
19. Rollpin
20. Low sliding coupler shift fork
21. Circlip
22. Washer
23. Support shaft
24. Link rod actuator



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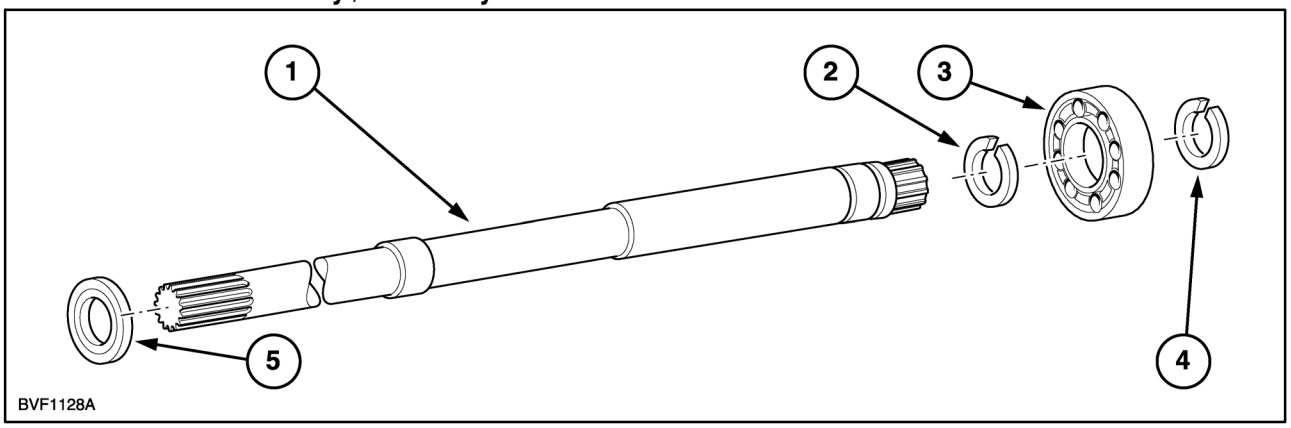
1/2 and 3/4 Synchronizer Control Cover Exploded View

1. Actuator lever
2. Adjustable link rod
3. Link rod actuator
4. Washer
5. Circlip
6. Support shaft
7. 3/4 synchronizer detent assembly
8. Locking bolt
9. 3/4 synchronizer shift fork
10. Grub screw
11. 3/4 synchronizer shift rail
12. Support shaft
13. Actuator
14. Actuator shaft
15. Spacer
16. Actuator shaft retainer
17. Circlip
18. Washers
19. Return spring
20. Interlock rod
21. 1/2 synchronizer detent assembly
22. Locking bolt
23. 1/2 synchronizer shift fork
24. 1/2 synchronizer shift rail
25. Synchronizer control housing

Front Section Disassembly / Assembly



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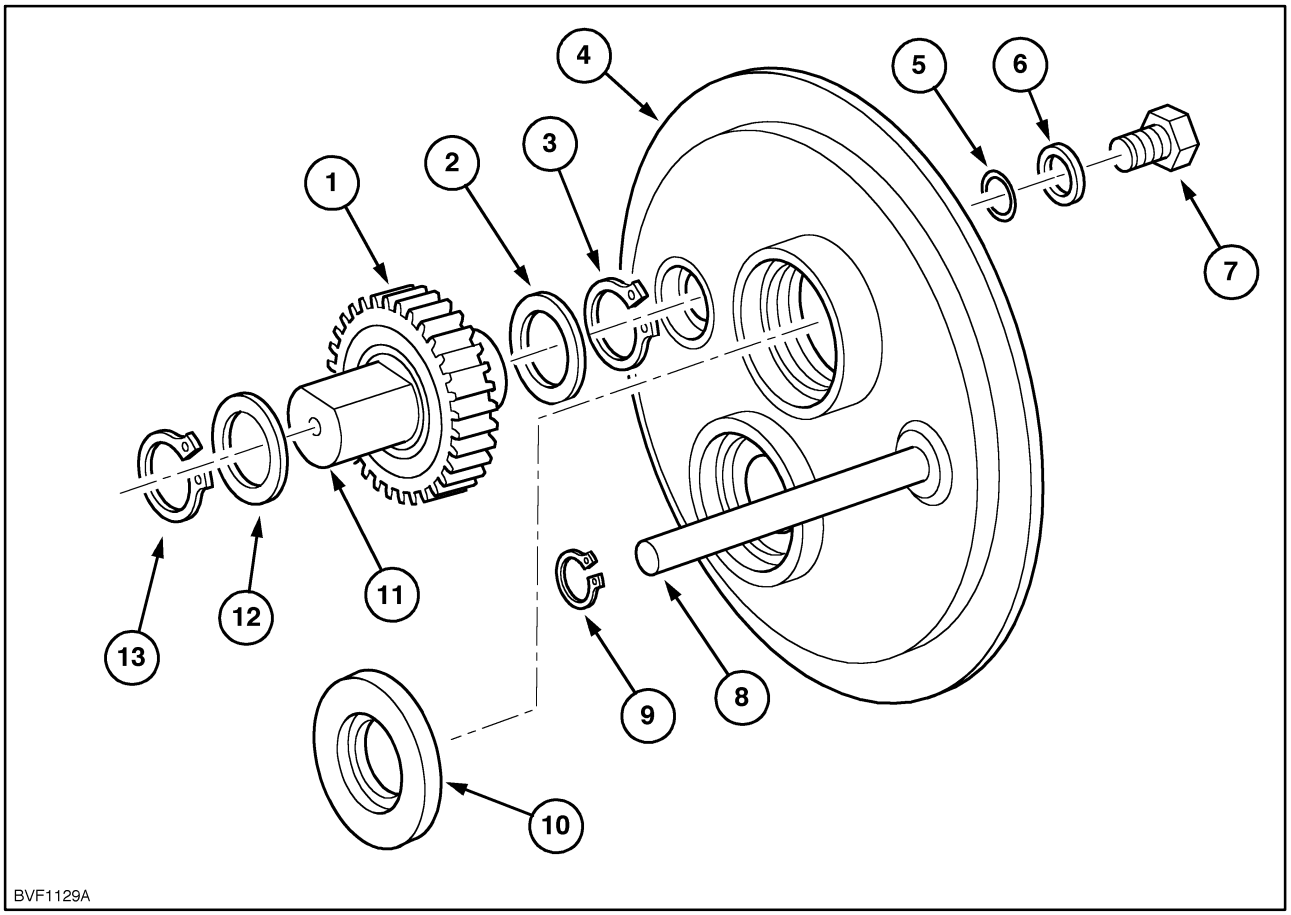
PTO Shaft Assembly Exploded View

1. PTO shaft
2. Circlip
3. Bearing
4. Circlip
5. Oil seal



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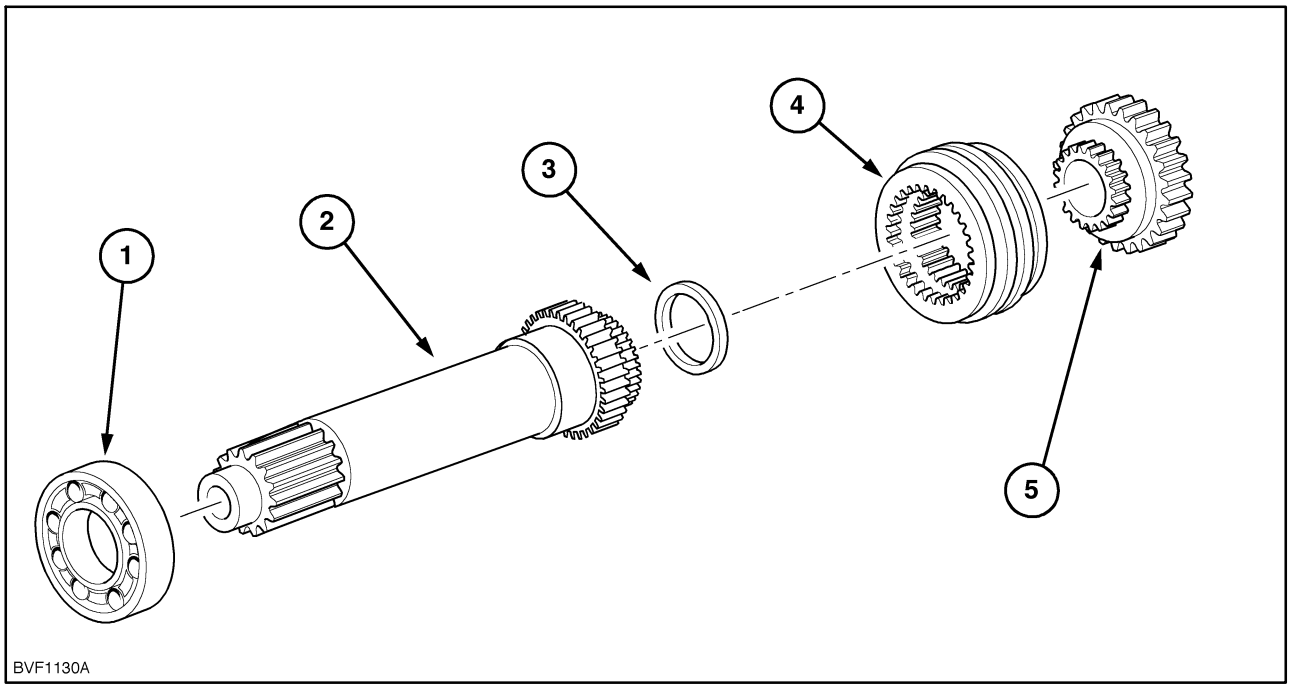
Front Cover Exploded View

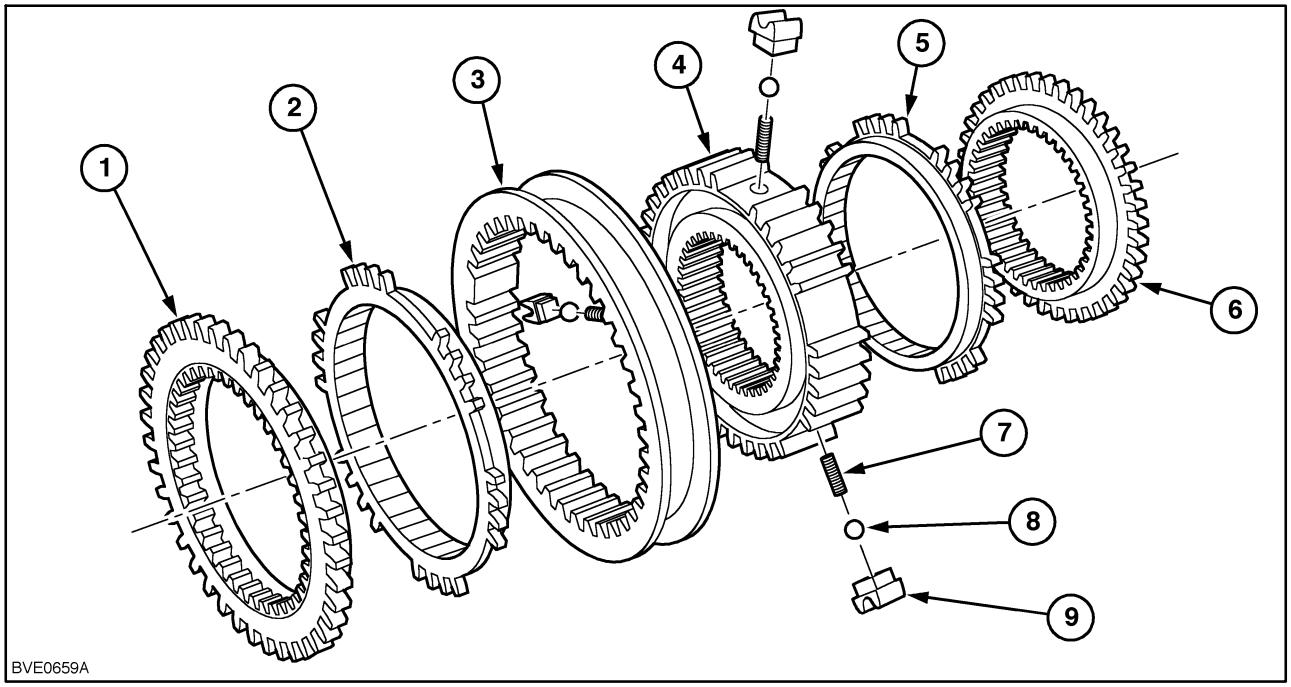
1. Reverse idler gear (35 teeth)
2. Steel washer
3. Circlip
4. Front cover plate
5. O-ring
6. Sealing washer
7. Reverse idler shaft retaining bolt
8. Lubrication oil transfer tube
9. Circlip
10. Input shaft oil seal
11. Reverse idler shaft
12. Steel washer
13. Circlip



55

Input Shaft Exploded View

1. Input shaft support bearing
2. Input shaft
3. Oil seal
4. Forward/reverse synchronizer
5. Reverse gear driven (39 teeth)



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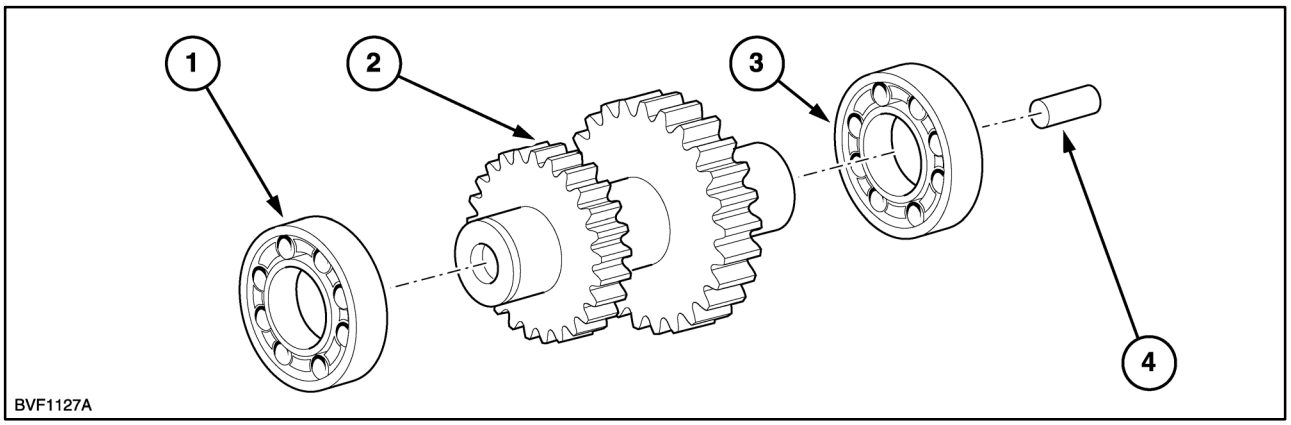
Forward / Reverse Synchronizer Exploded View

1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide

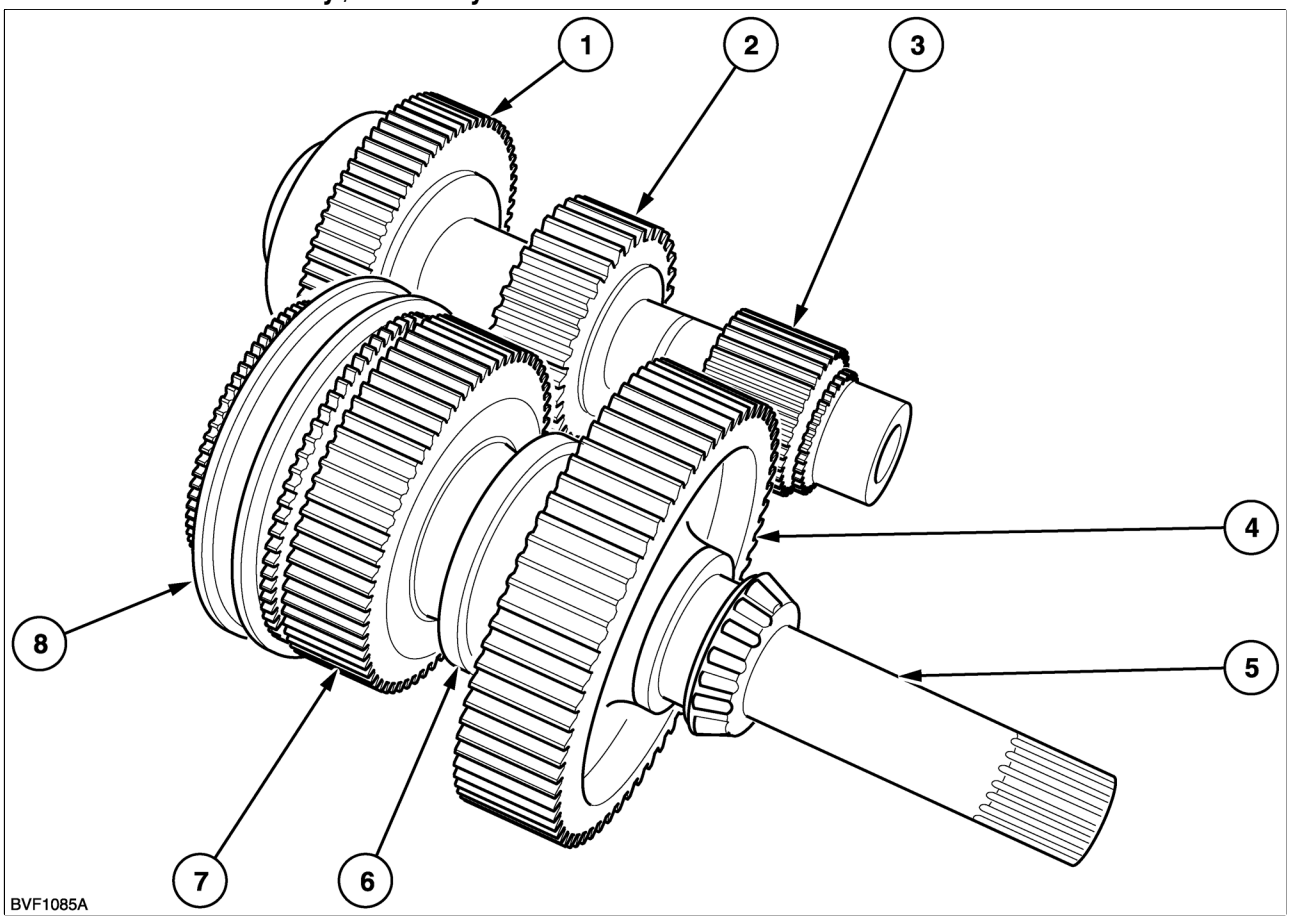


57

Reverse Gear Cluster Exploded View

1. Bearing
2. Reverse gear cluster
3. Bearing
4. Lubrication oil transfer tube

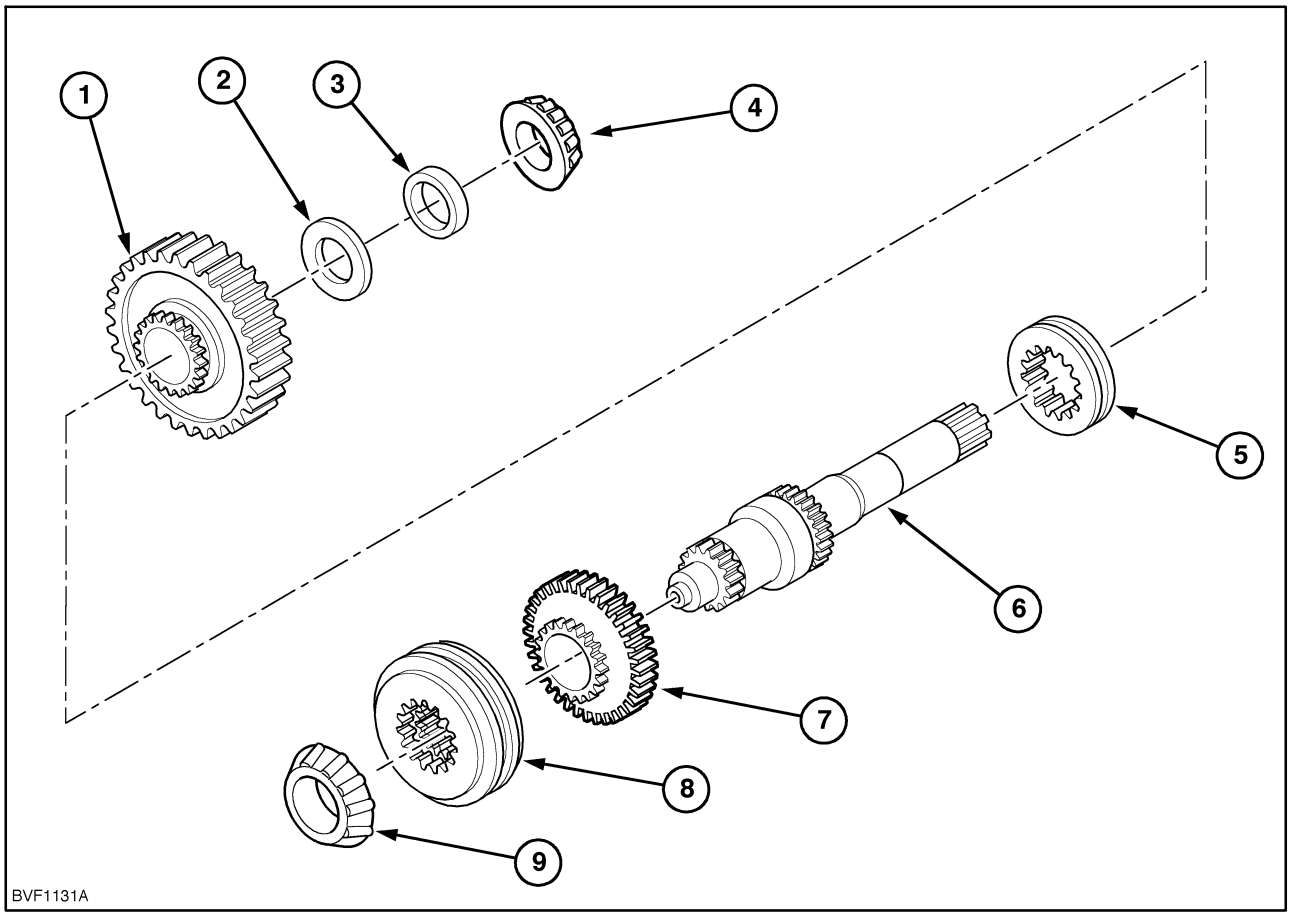
Rear Section Disassembly / Assembly



58

Rear Section Overview

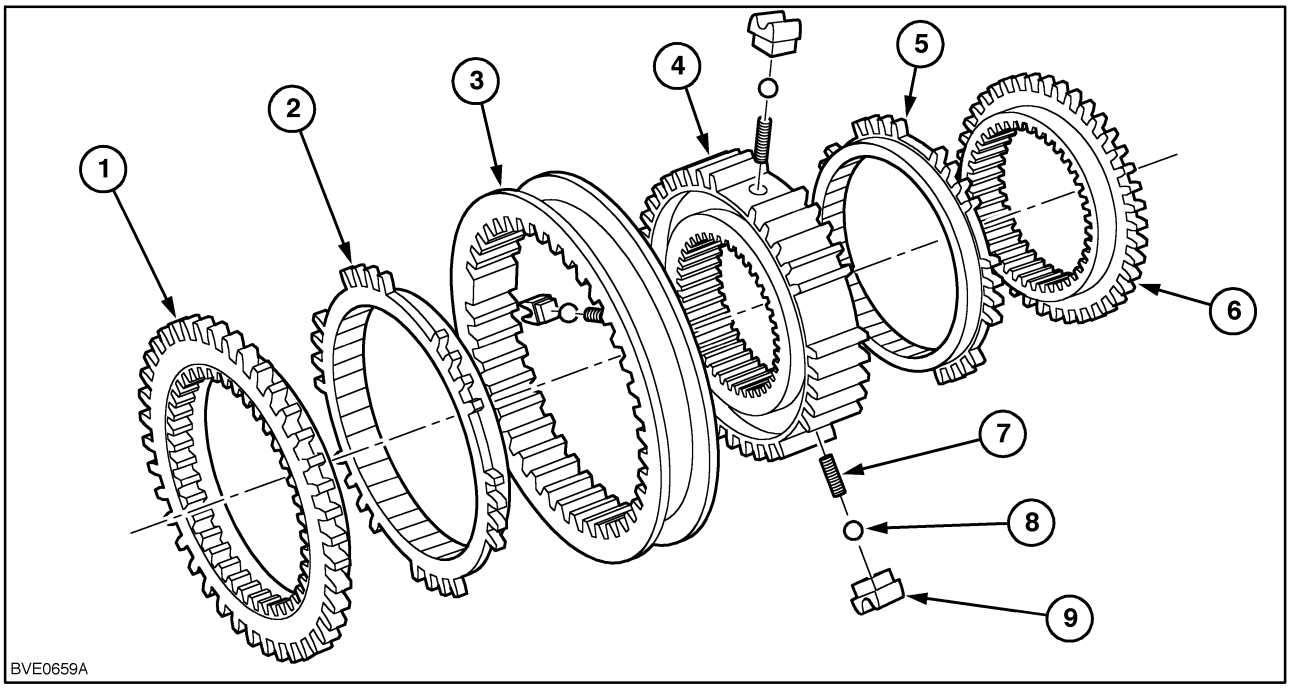
1. High range gear drive (52/49 teeth)
2. Medium range gear drive (35/33 teeth)
3. Low range gear drive (19 teeth)
4. Low range gear driven (60 teeth)
5. Output shaft
6. Low sliding coupler
7. Medium range gear driven (44/46 teeth)
8. High/ medium synchronizer



59

Output Shaft Assembly Exploded View

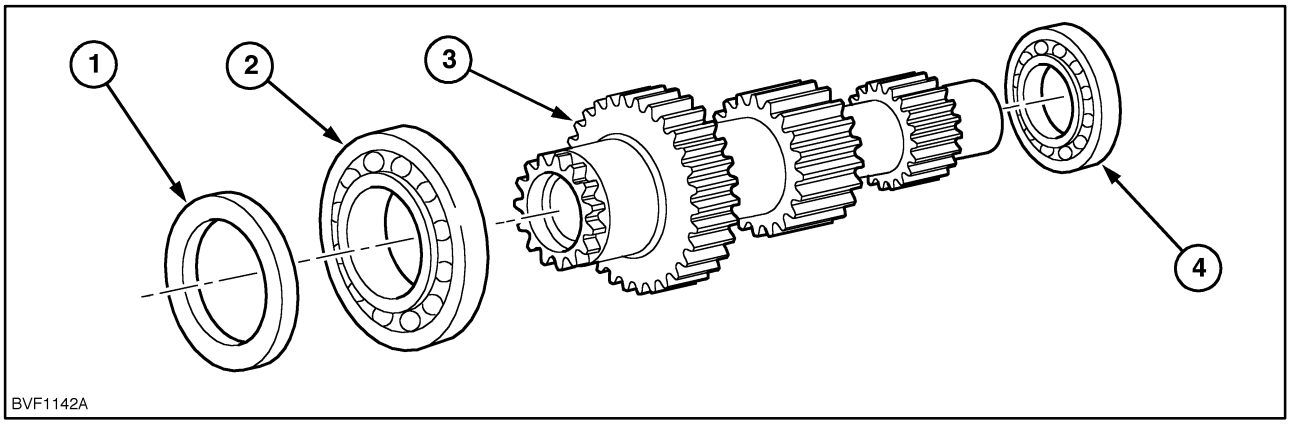
1. Low range gear driven (60 teeth)
2. Washer
3. Spacer
4. Taper roller bearing
5. Low range sliding coupler
6. Output shaft
7. Medium range gear driven (44/46 teeth)
8. High/medium synchronizer
9. Taper roller bearing



60

High / Medium Synchronizer Exploded View

1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide

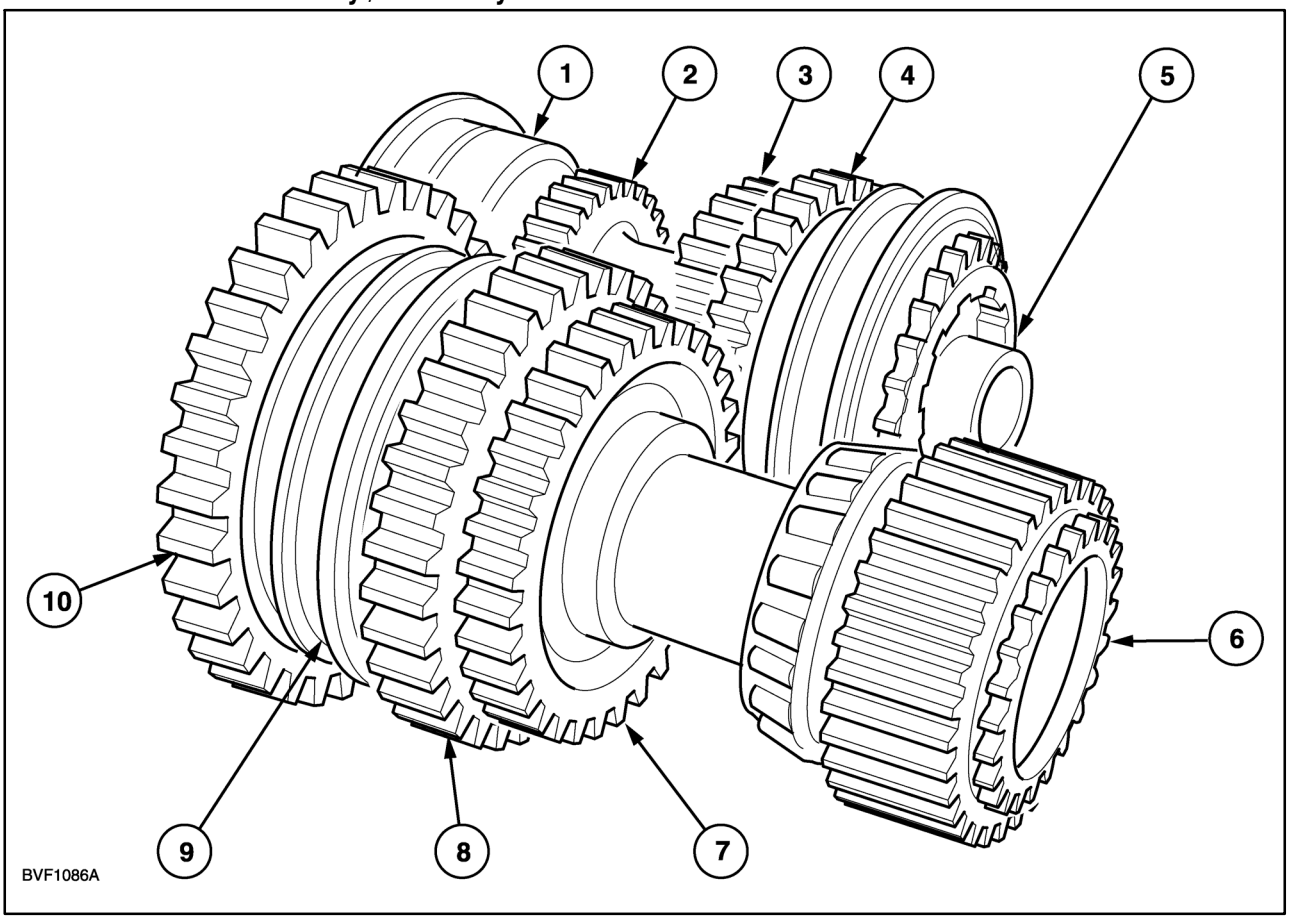


61

High / Medium And Low Range Cluster Shaft Exploded View

1. Spacer ring
2. Bearing
3. Cluster shaft
4. Bearing

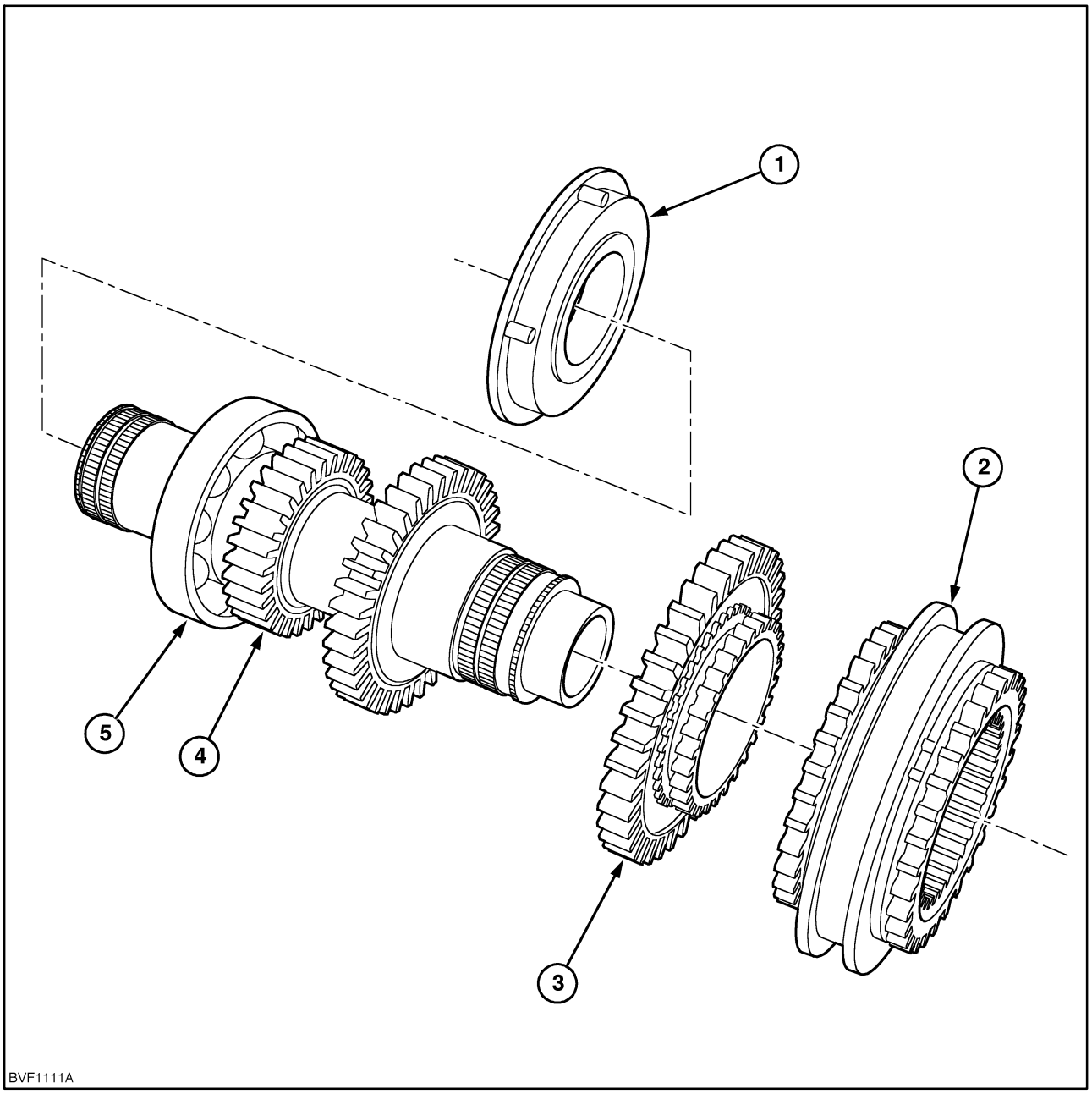
Middle Section Disassembly / Assembly



62

Middle Section Overview

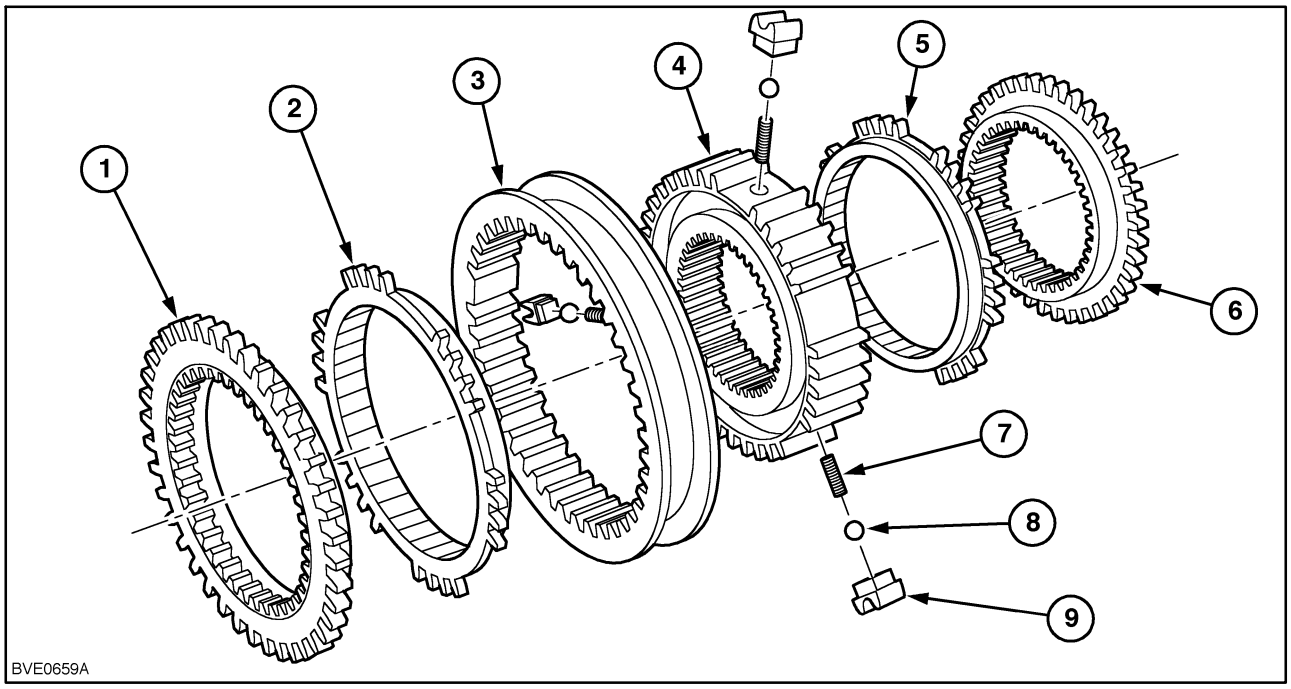
1. Lubrication oil supply manifold
2. 1st gear drive (31/27 teeth)
3. 2nd gear drive (38/34 teeth)
4. 3rd gear drive (45/40 teeth)
5. 3/4 synchronizer
6. High range gear driven (27/31 teeth)
7. 3rd gear driven (34/39 teeth)
8. 2nd gear driven (41/52 teeth)
9. 1/2 synchronizer
10. 1st gear driven (49/52 teeth)



63

Main Shaft Exploded View

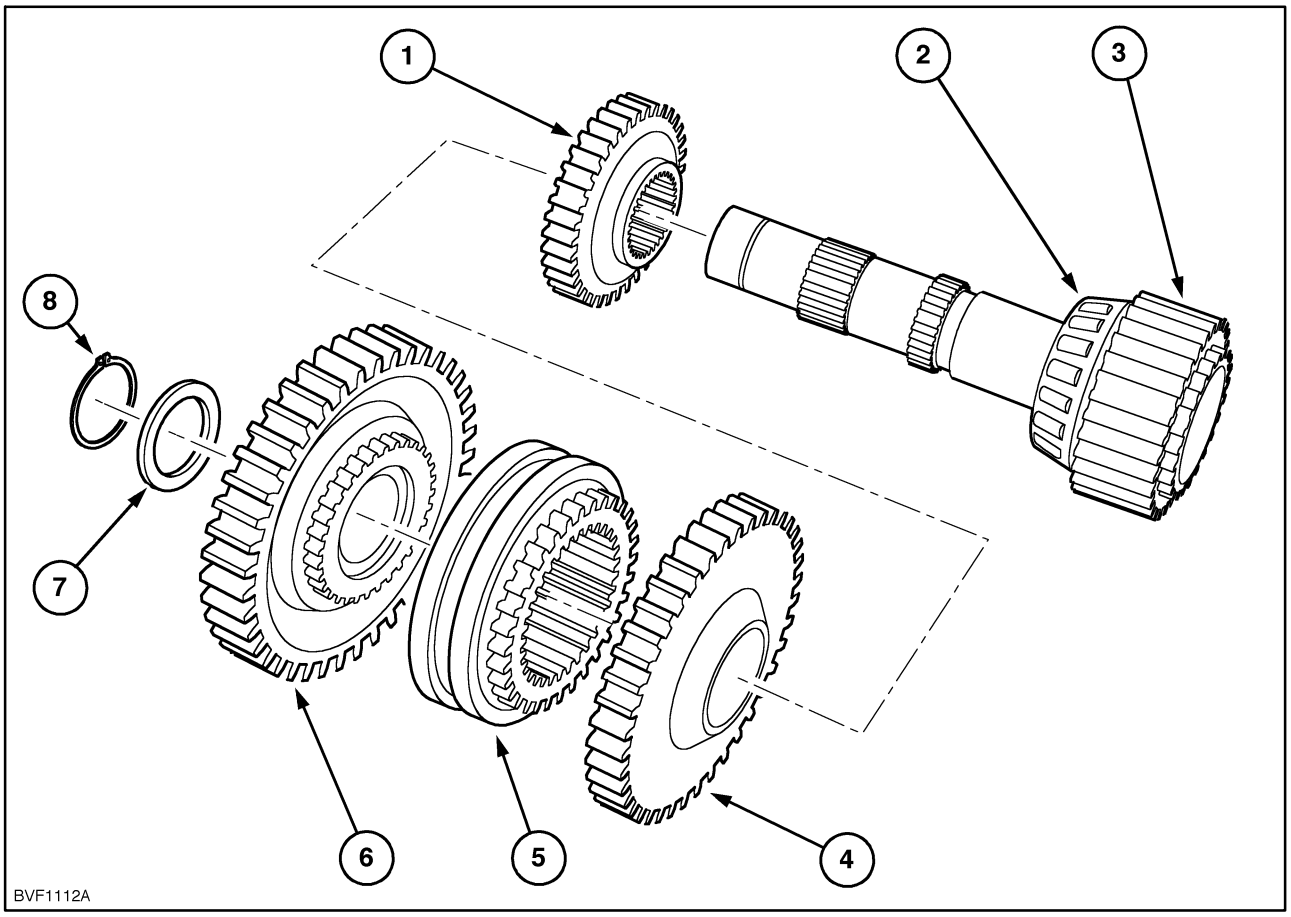
1. Lubrication oil supply manifold
2. 3/4 synchronizer
3. 3rd gear drive (45/40 teeth)
4. Main shaft
5. Bearing



64

3/4 Synchronizer Exploded View

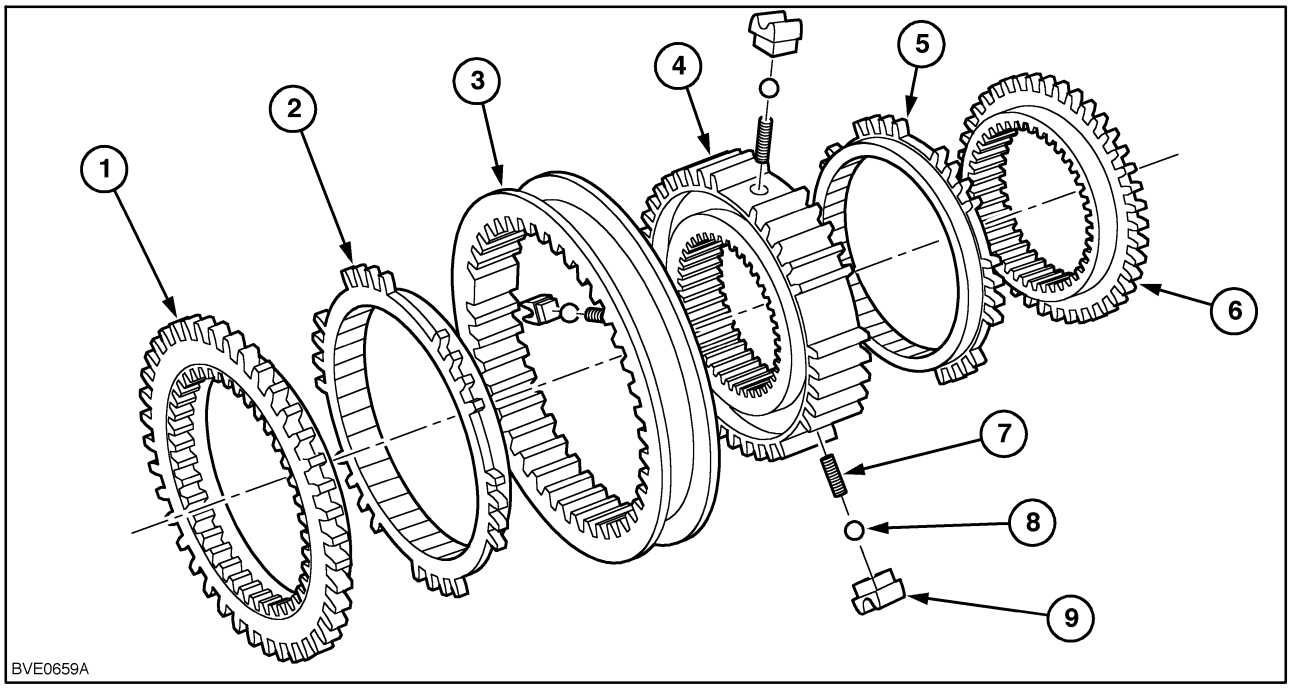
1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide



65

Counter Shaft Exploded View

1. 3rd gear driven (34/39 teeth)
2. Bearing
3. High range gear driven (27/31 teeth)
4. 2nd gear driven (41/45 teeth)
5. 1/2 synchronizer
6. 1st gear driven (49/52 teeth)
7. Steel thrust washer
8. Circlip



66

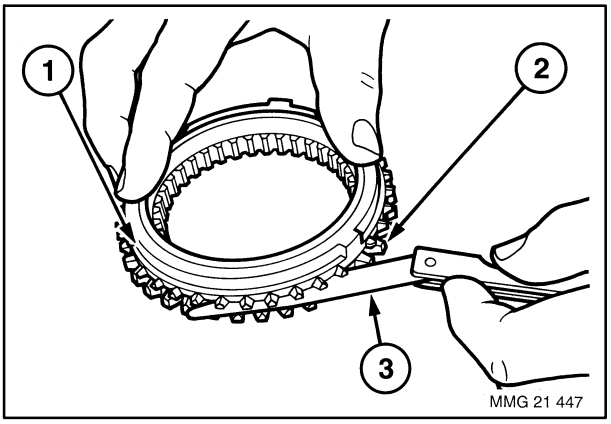
1/2 Synchronizer Exploded View

1. Outer cone/coupling
2. Friction cone
3. Sliding coupler
4. Centre hub
5. Friction cone
6. Outer cone/coupling
7. Spring
8. Detent ball
9. Detent guide

SYNCHRONIZER

Inspection

1. Inspect the High/Medium range, forward/reverse and 1-2 and 3-4 synchronizer components for wear and damage as follows:-
   - Inspect the cone (1) for wear and damage and discolouration, if excessive renew the synchronizer.
   - Check the gap between the cone and end plate,(2), using a feeler gauge (3), if the gap is less than that specified renew the synchronizer.



67

	Minimum Gap	
1-2 & 3-4 synchronizers	mm 0,5	inches 0.020
Foward/Reverse synchronizer	0,8	0.0315
Hi/Med synchronizer	0,85	0.0335

TRANSMISSION

Assembly

⚠ WARNING ⚠

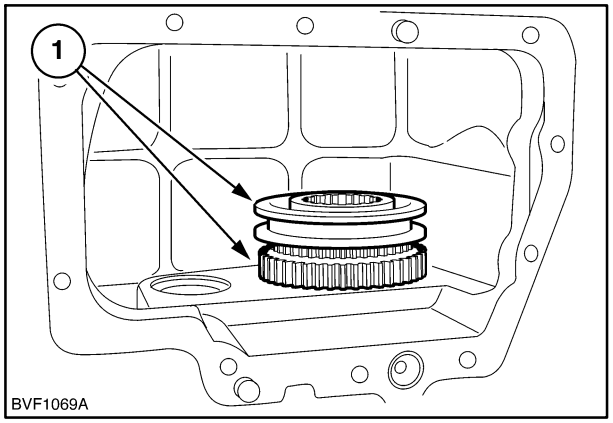
Handle all components with the greatest of care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

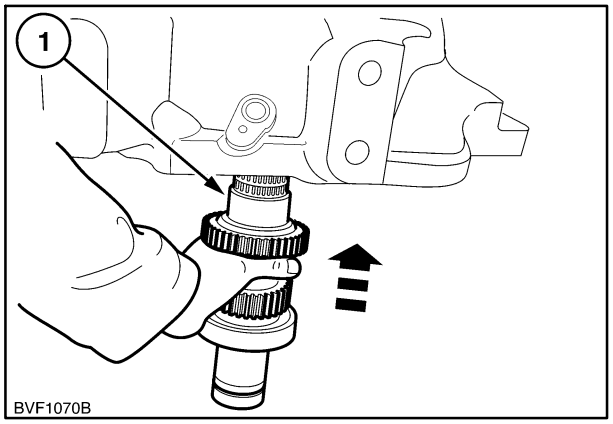
Middle Section Installation

1. Install the 3/4 synchronizer and 3rd gear drive assembly (1).



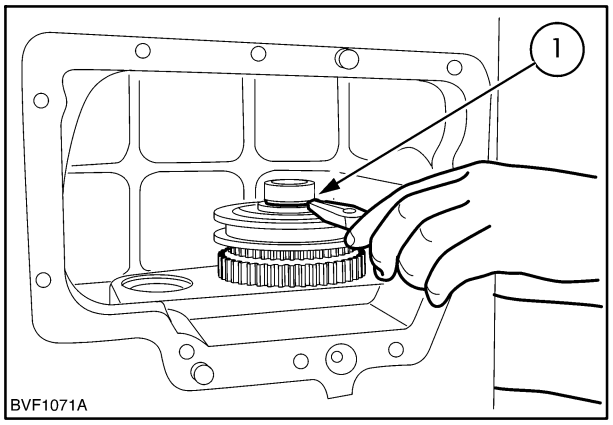
68

2. Install the main shaft (1) through the bell-housing.



69

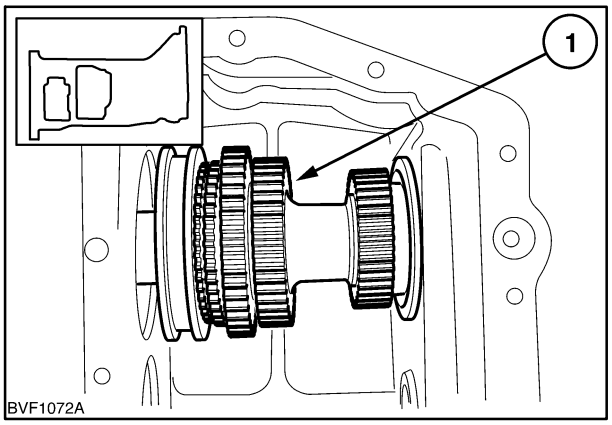
3. Support the main shaft through the top cover aperture and using suitable circlip pliers install the 3/4 synchronizer retaining snap ring (1).



70

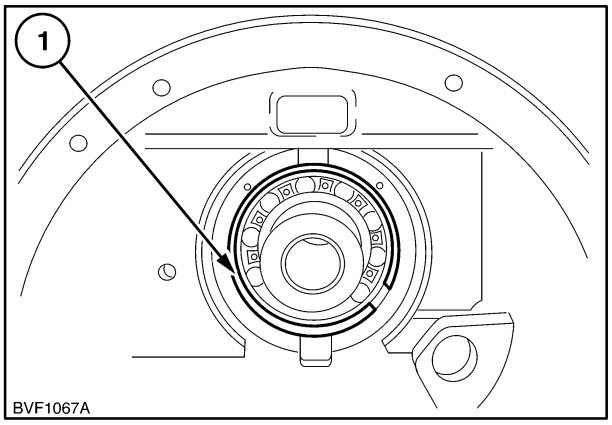
NOTE: *Support the 3/4 synchronizer and main shaft while rotating the transmission.*

4. Rotate the transmission 90°.
5. Install the 3/4 synchronizer and main shaft assembly (1) into the housing.



71

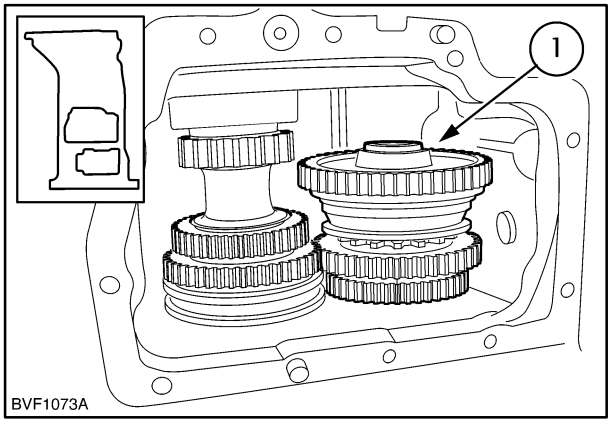
6. Using suitable snap ring pliers install the main shaft bearing retaining snap ring (1).



72

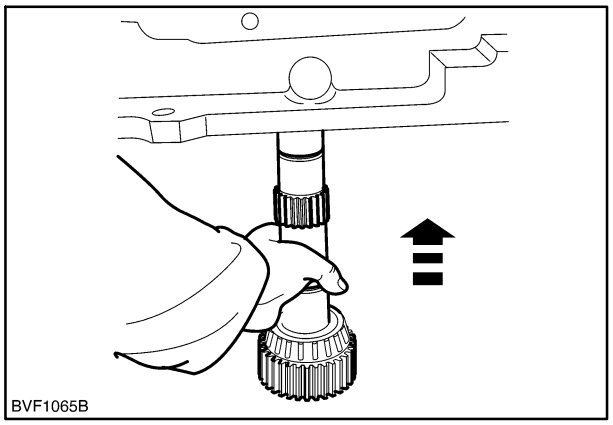
NOTE: *Support the 3/4 synchronizer and main shaft while rotating the transmission.*

7. Rotate the transmission 90°.
8. Install the 1/2 synchronizer and gears into the housing.



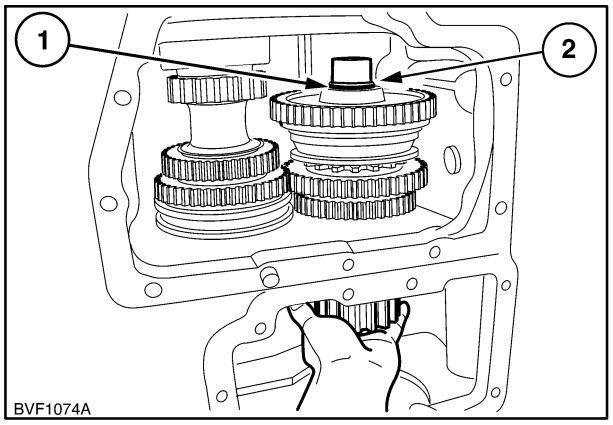
73

9. Install the countershaft (1) through the rear end of the transmission.



74

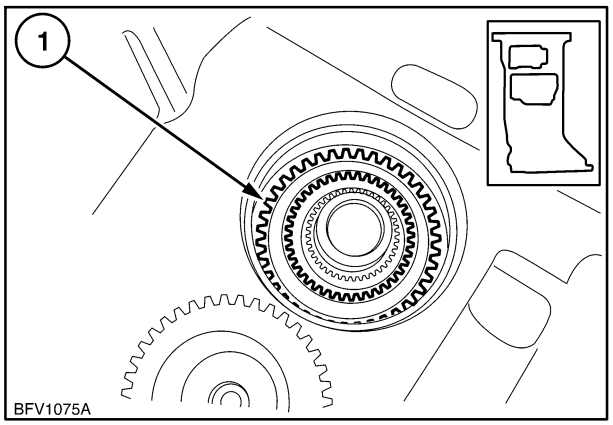
10. Support the countershaft, install the D-washer (1) and using suitable circlip pliers install the countershaft retaining circlip (2).



75

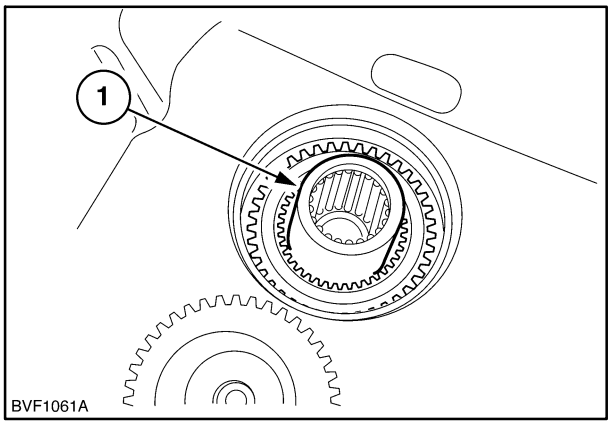
NOTE: *Position the two shafts so the main shaft bearing is seated on its snap ring and the countershaft bearing is seated in its cup.*

11. Rotate the transmission 180°.
12. Install the 3/4 synchronizer rings (1).



76

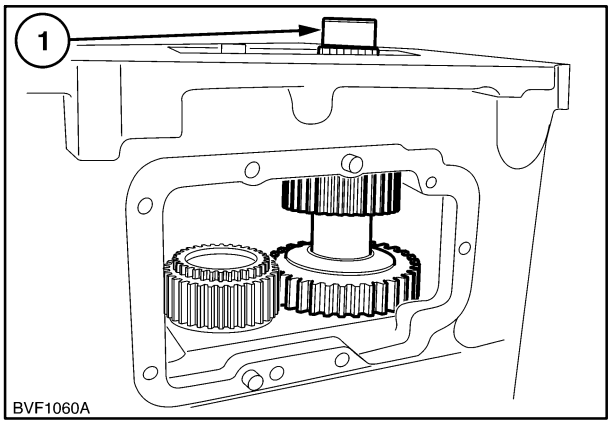
13. Install the needle roller bearing (1).



77

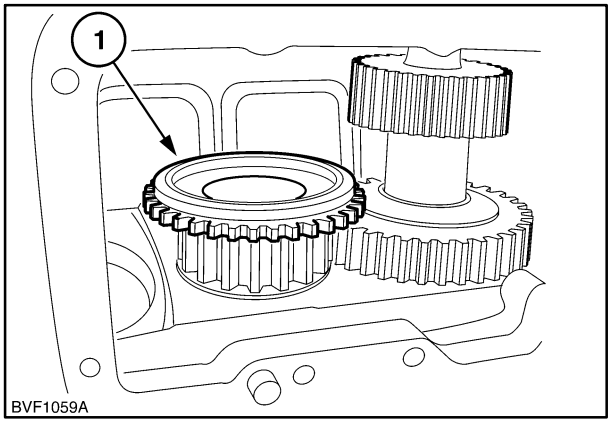
Rear Section Installation

14. Install the range cluster gear shaft (1).



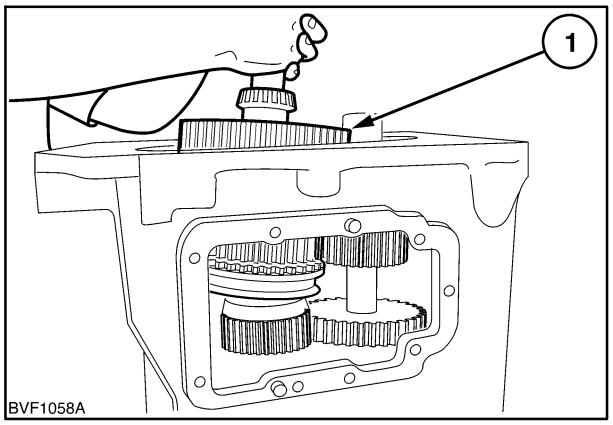
78

15. Install the high/medium synchronizer rings (1).



79

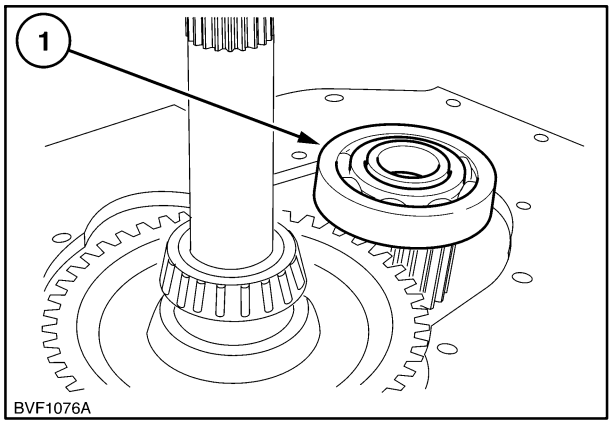
16. Install the output shaft assembly (1).



80

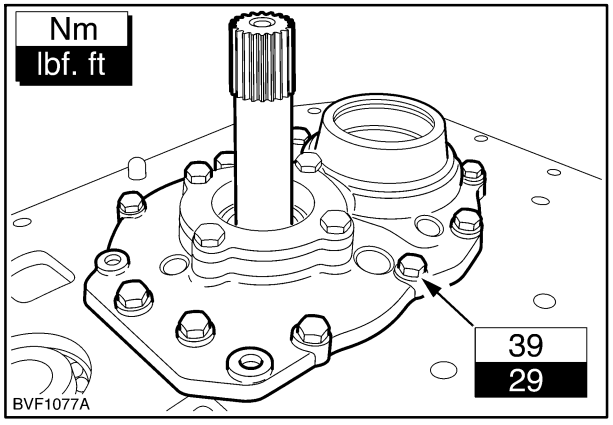
NOTE: *The use of an electronic induction heater will assist in the installation of the bearing without the need for a hydraulic press.*

17. Install the range cluster gear bearing (1).



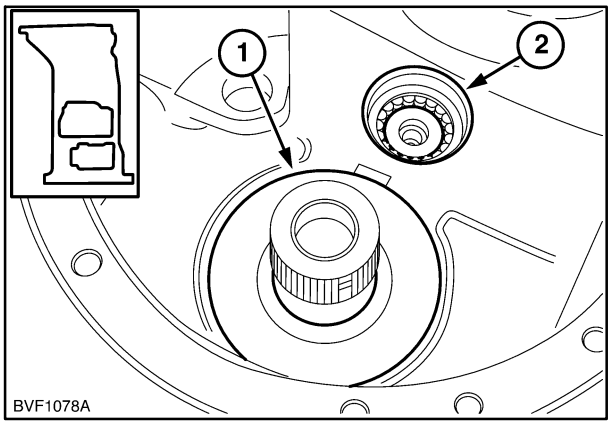
81

18. Install the rear plate assembly. Tighten the retaining bolts to the specified torque value.



82

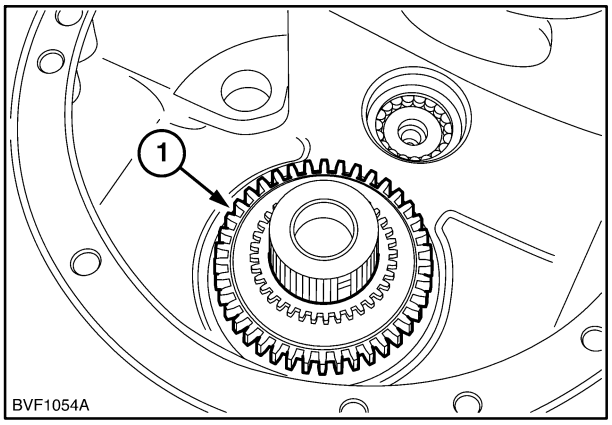
19. Rotate the transmission 180°.
20. Install the lubrication oil supply manifold (1) and the output shaft rear bearing (2).



83

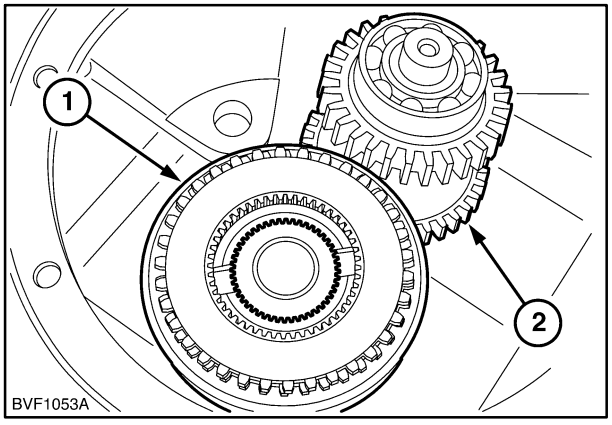
Front Section Installation

21. Install the reverse driven gear (1).



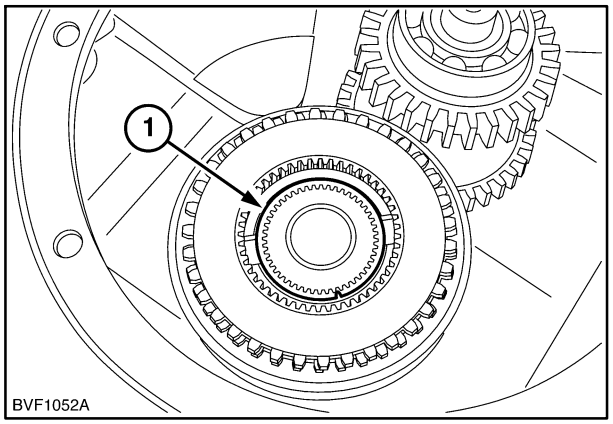
84

22. Install the forward/reverse synchronizer (1) with the reverse gear cluster (2).



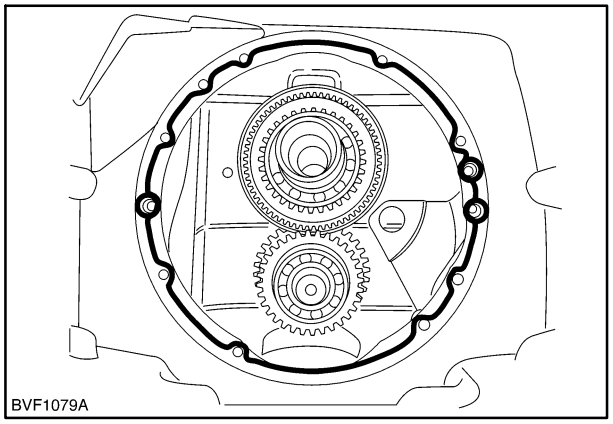
85

23. Install the forward/reverse synchronizer retaining snap ring (1)



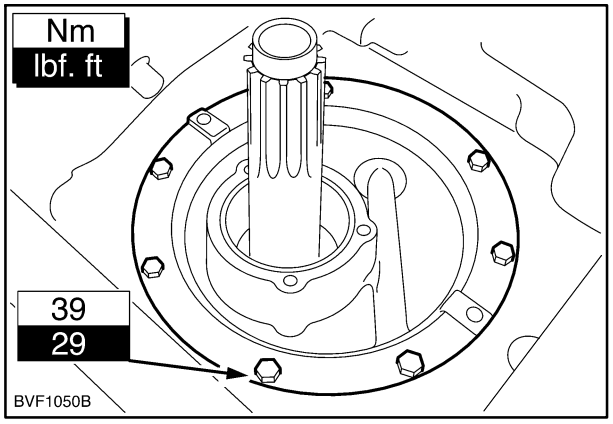
86

24. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



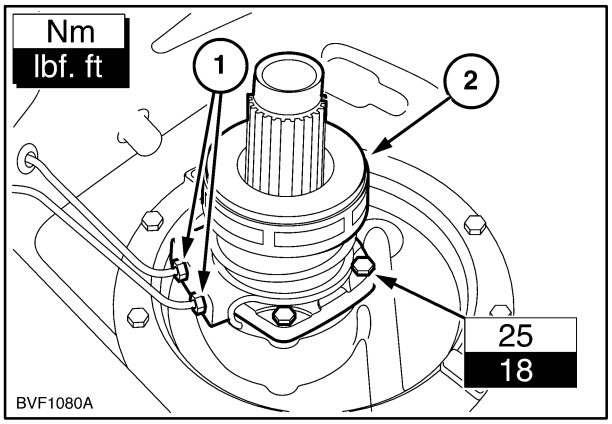
87

25. Install the front plate assembly. Tighten the retaining bolts to the specified torque value.



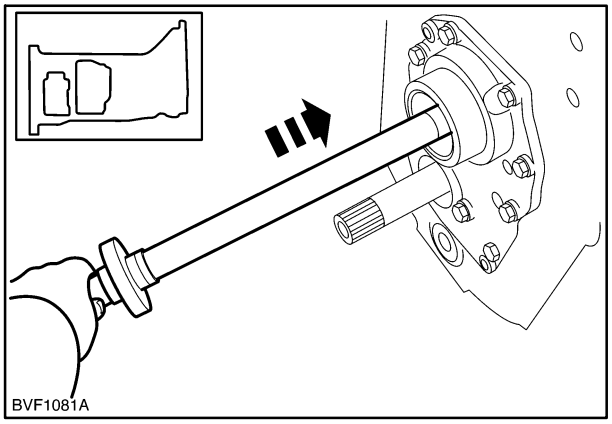
88

26. Install the hydraulic release bearing (2)
27. Install the oil supply pipes (1) and tighten the retaining bolts to the specified torque value.



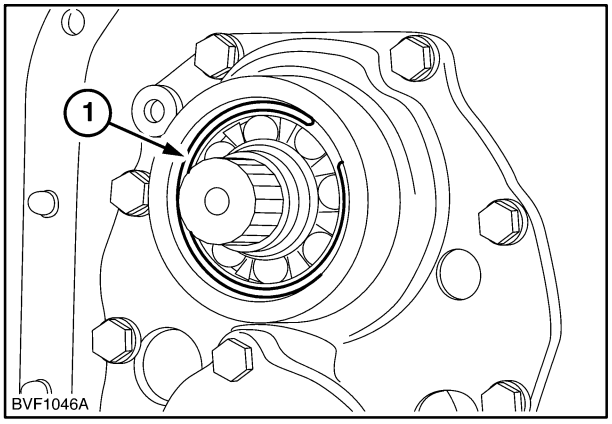
89

28. Rotate the transmission 90°.
29. Install the PTO shaft into the transmission.



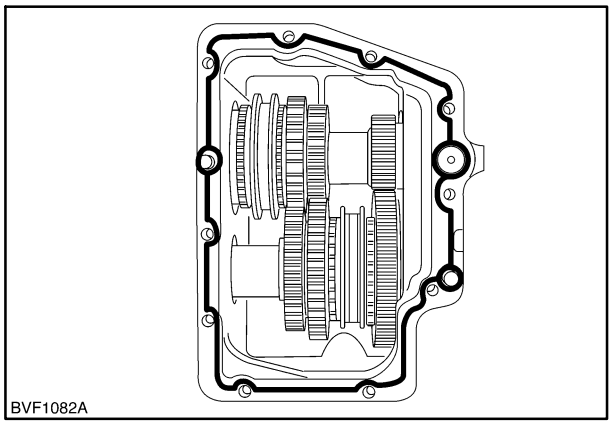
90

30. Install the PTO shaft bearing retaining snap ring (1).



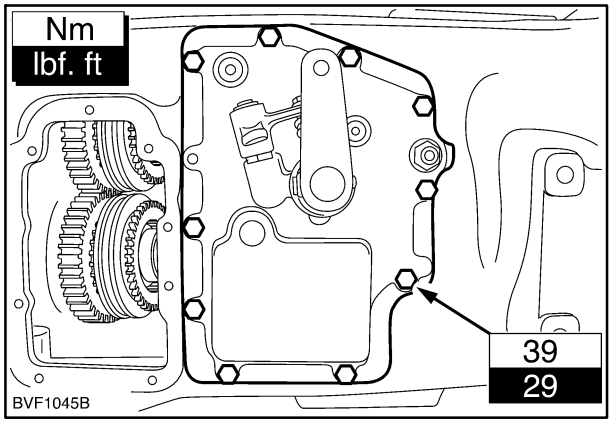
91

31. Adjust the output shaft end float (refer to the output shaft end float adjustment in this chapter).
32. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



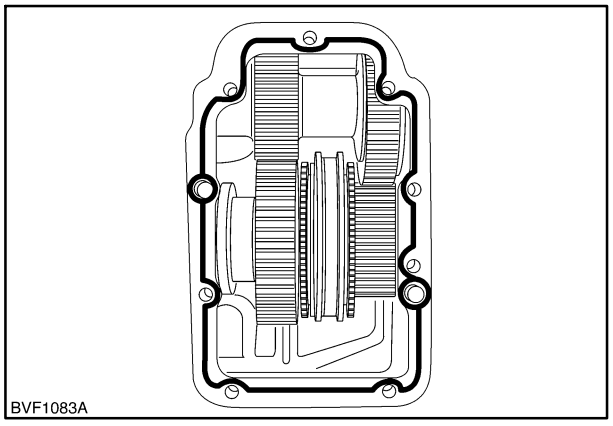
92

33. Install the 1/2 and 3/4 synchronizer control cover. Tighten the retaining bolts to the specified torque value.



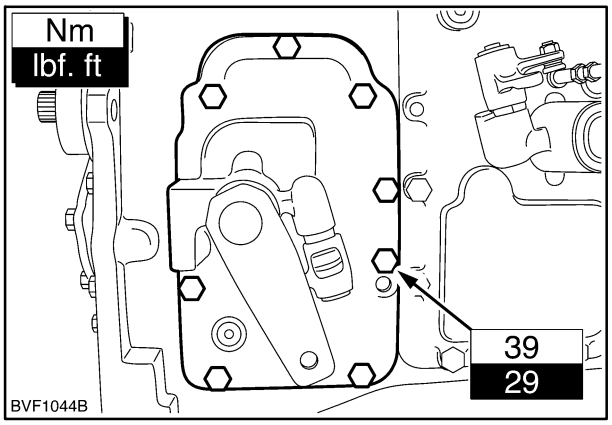
93

34. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



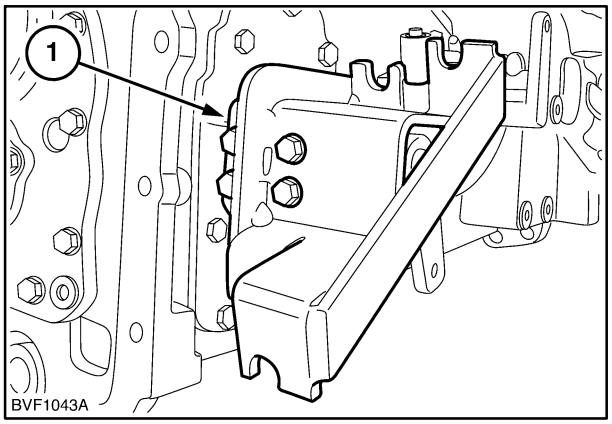
94

35. Install the high/medium and low synchronizer control cover. Tighten the retaining bolts to the specified torque value.



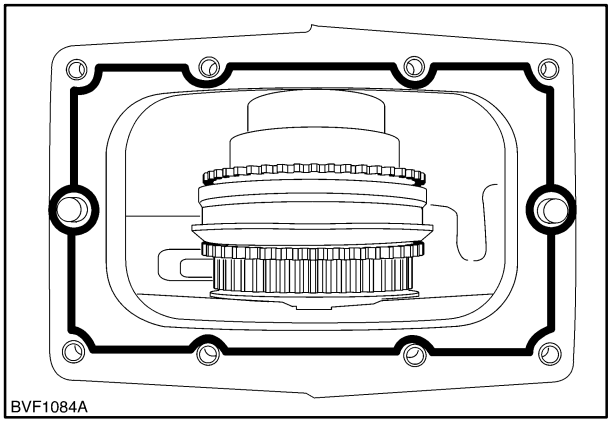
95

36. Install the gearshift cable retaining bracket (1).



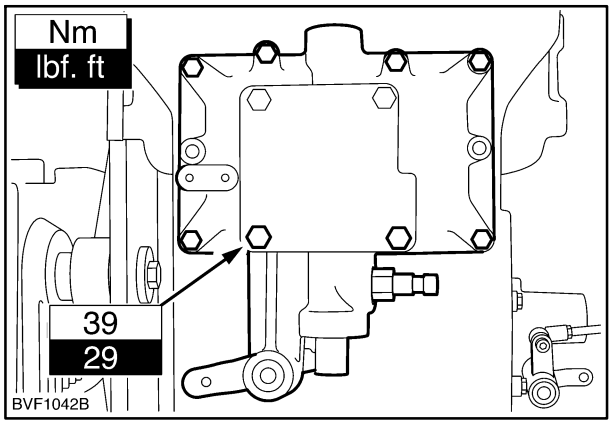
96

37. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



97

38. Install the forward/reverse synchronizer control cover. Tighten the retaining bolts to the specified torque value.



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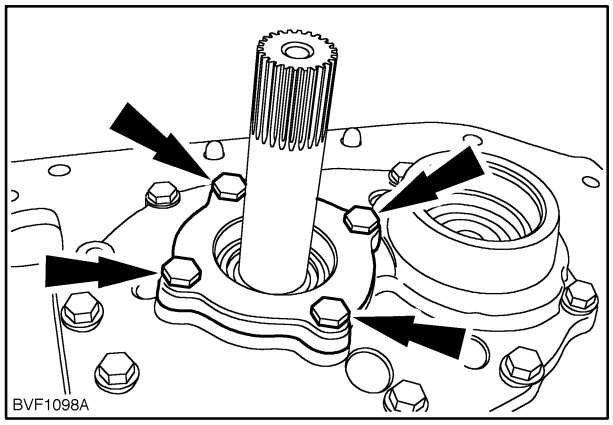
OUTPUT SHAFT END FLOAT

Adjustment

NOTE: *It is necessary to adjust the running clearance of the components on the output shaft. The clearance is obtained by the placement of shim(s) behind the output shaft front taper roller bearing retainer.*

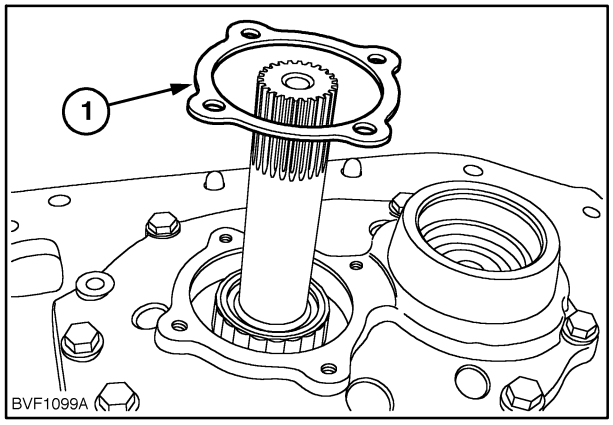
IMPORTANT: *The transmission must remain in the vertical position during this operation.*

1. Remove the output shaft front taper roller bearing retainer.



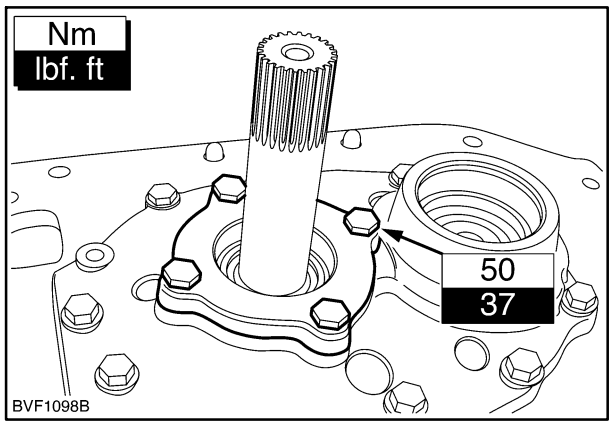
99

2. Install a number of adjustment shims (**S1**) (1) of a known dimension to achieve output shaft end float.



100

3. Install the output shaft front taper roller bearing retainer. Tighten the retaining bolts to the specified torque value.

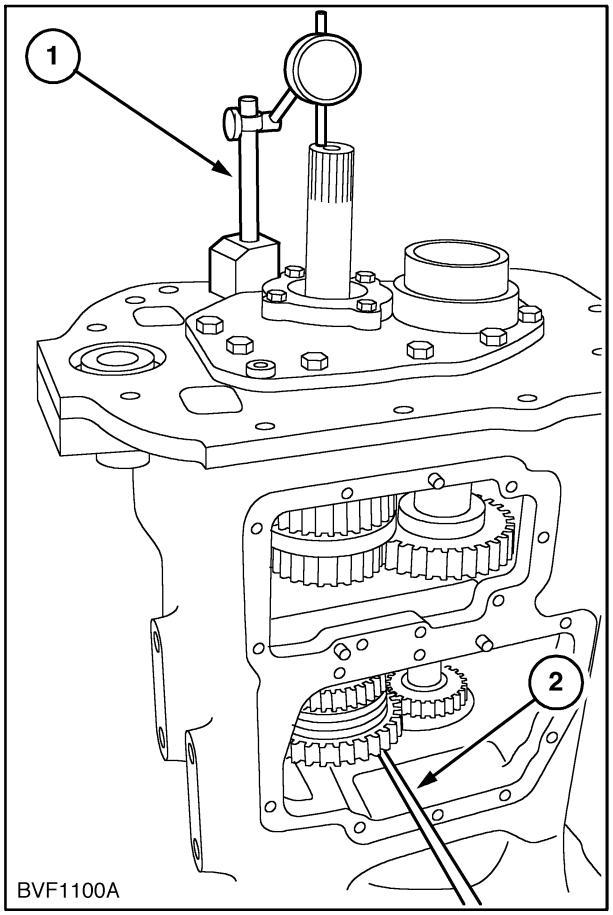


101

4. The output shaft end float required is 0.038–0.089 mm. To achieve this, carry out the following:

5. Rotate the output shaft several times to seat the bearing rollers.
6. Using a suitable dial gauge (1) and lever (2), measure the output shaft end float.

This measurement is M1



102

7. Determine the thickness of the shim(s) to be installed as follows:

NOTE: *If required decrease* ***(R1)*** *to the nearest available shim size.*

NOTE: *Increasing shim thickness increases end float, decreasing shim thickness decreases end float.*

R1 = S1-(M1-0.063)

Where:

R1 = Required shim(s) thickness

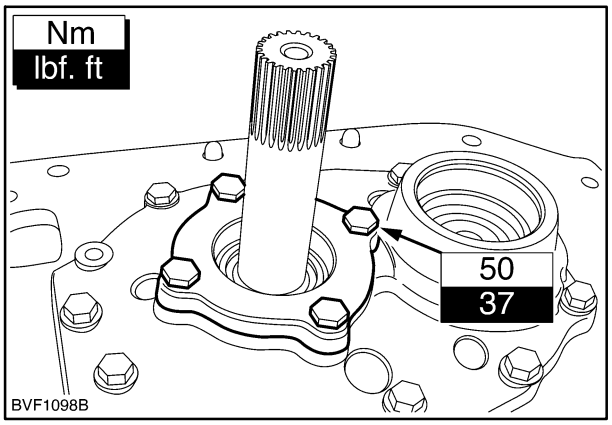
S1 = Test shim(s) thickness

M1 = Measured output shaft end float (with test shim(s) **(S1)** installed)

0.063 = Mean of required end float (0.038 - 0.089)

8. Remove the test shim(s) **(S1)** and install the calculated shim(s) **(R1)**.

9. Install the output shaft front taper roller bearing retainer. Tighten the retaining bolts to the specified torque value.



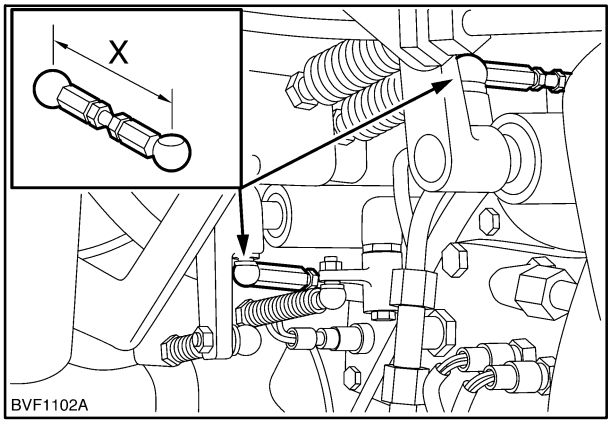
103

GEARSHIFT CABLE

Adjustments

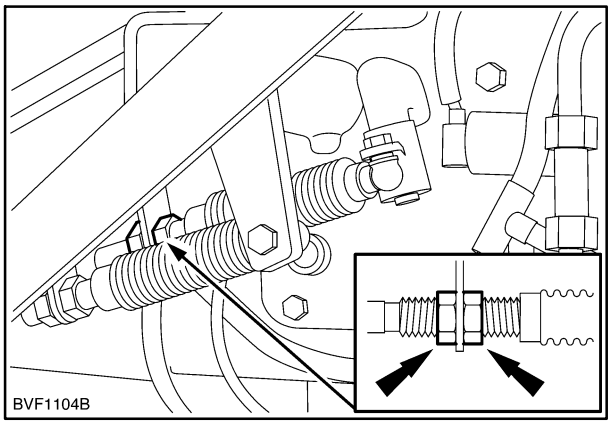
1. Ensure the tractor is not in gear and the main shift and range levers are in the neutral position.
2. Check and if necessary adjust the length of both of the adjustable link rods.

X = 83.5 - 84.9 mm



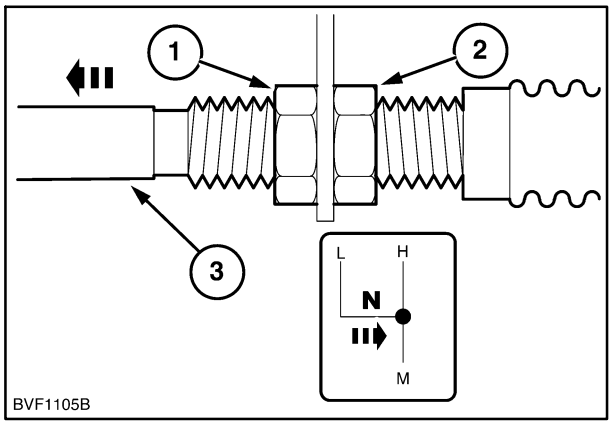
104

3. Loosen the range selection cable adjustment nuts.



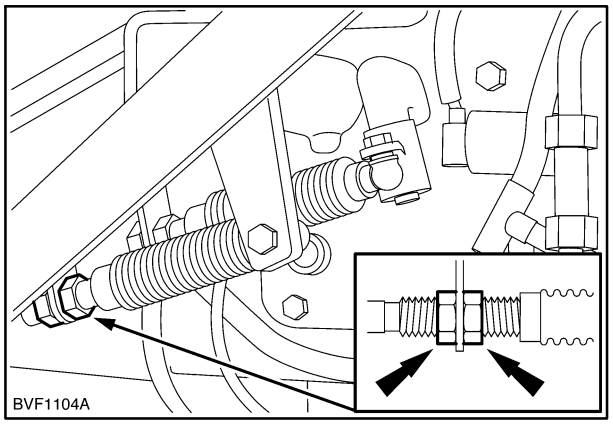
105

4. Move the range selection cable (3) to remove the freeplay until the range lever in the cab is in the position shown.
5. Tighten the adjustment nut (1) to the bracket and tighten the adjustment nut (2).



106

6. Loosen the range shift cable adjustment nuts.

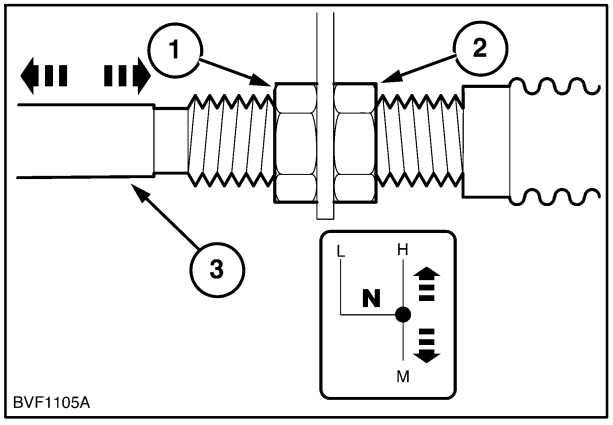


107

NOTE: *Ensure the range lever in the cab is still located in the detent position.*

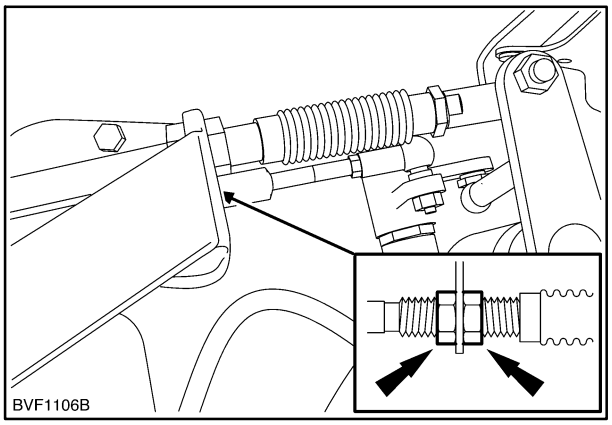
NOTE: *Ensure the range shift lever in the cab is not obstructed by the console when selecting a gear.*

7. Move the range shift cable (3) to equally distribute the freeplay until the range lever in the cab is in the position shown.
8. Tighten the adjustment nuts (1) and (2).



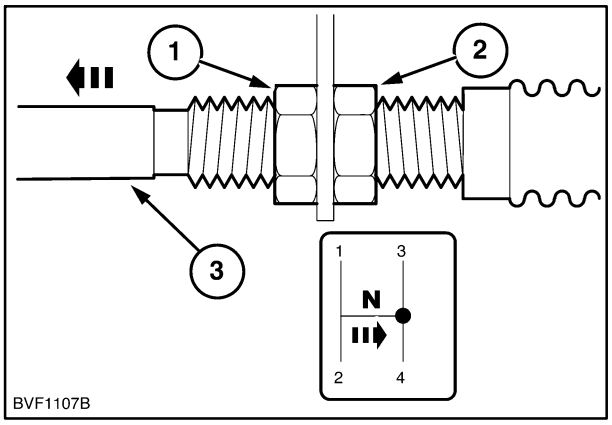
108

9. Loosen the main shift selection cable adjustment nuts.



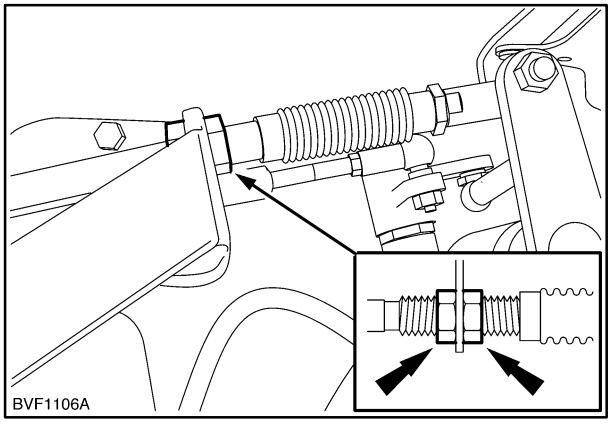
109

10. Move the main shift selection cable (3) to remove the freeplay until the main shift lever in the cab is in the position shown.
11. Tighten the adjustment nut (1) to the bracket and tighten the adjustment nut (2).



110

12. Loosen the main shift cable adjustment nuts.

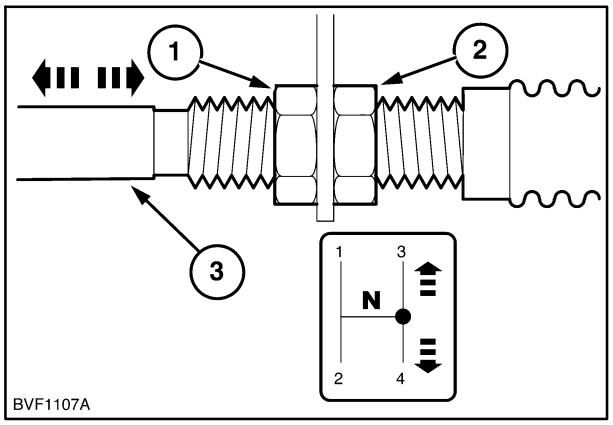


111

NOTE: *Ensure the main shift lever in the cab is still located in the detent position.*

NOTE: *Ensure the main shift lever in the cab is not obstructed by the console when selecting a gear.*

13. Move the main shift cable (3) to equally distribute the freeplay until the main shift lever in the cab is in the position shown.
14. Tighten the adjustment nuts (1) and (2).



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SECTION 21 - TRANSMISSION SYSTEMS

Chapter 4 - Reduction Units

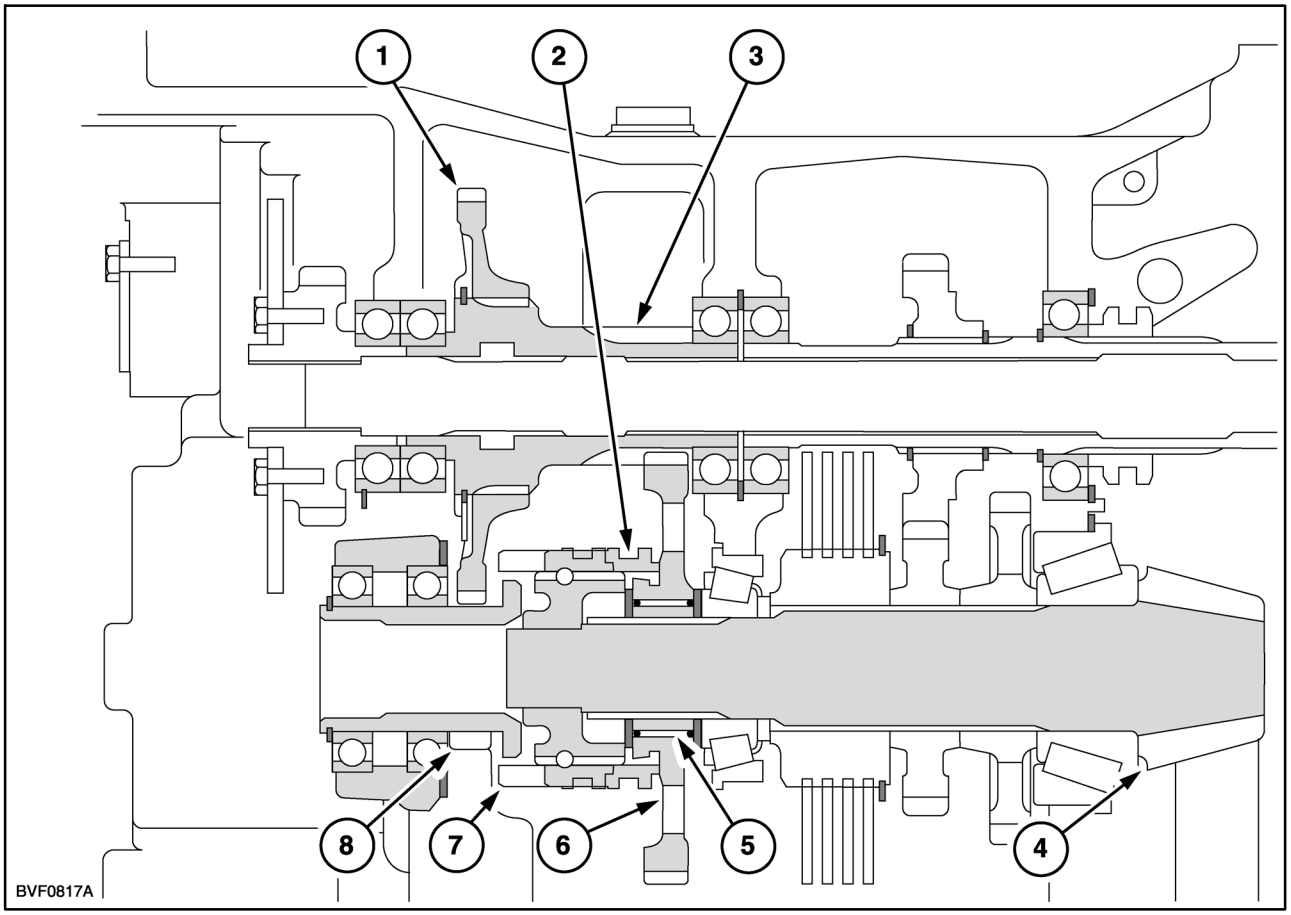
CONTENT

Section	Description	Page
	Specifications	2
	Sectional Views	2
	Description and Operation	4
	Troubleshooting	7
	Electro-Hydraulic Engaged Creeper	7
	Mechanical Engaged Creeper	8

SPECIFICATIONS

Creeper	
Type (16 x 16 and 24 x 24 Transmissions)	Electro-hydraulic actuation of a sliding coupler selector
Type (12 x 12 Transmissions)	Mechanical actuation of a sliding coupler selector
Creeper Speeds	
16 x 16 Transmission m/hr	225
24 x 24 Transmission m/hr	163
12 x 12 Transmission m/hr	200

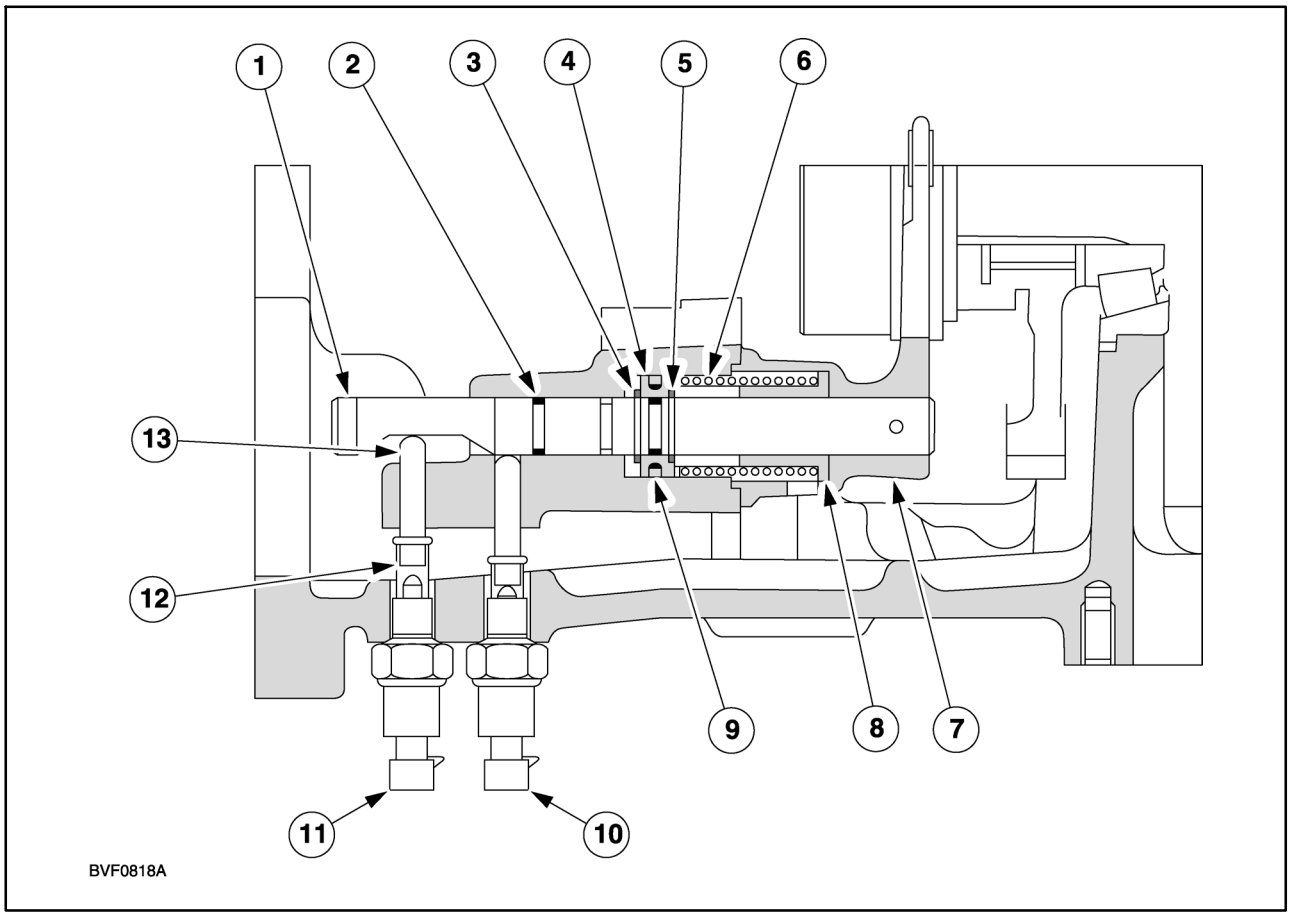
SECTIONAL VIEWS



1

Creeper Speed Drive Sectional View

1. Creeper driven gear
2. Sliding engagement coupler (engaged position)
3. Creeper drive gear
4. Pinion shaft
5. Creeper driven gear bush
6. Creeper driven gear
7. Sliding engagement coupler (disengaged position)
8. Creeper drive gear



2

Hydraulic Operated Creeper Selector Sectional View

1. Selector shaft
2. O-ring
3. Piston retaining ring
4. Selector shaft piston
5. Piston retaining ring
6. Disengagement spring
7. Selector fork
8. Engagement stop sleeve
9. Oil seal
10. Creeper disengaged status switch
11. Creeper engaged status switch
12. Status switch plunger spring
13. Status switch plunger

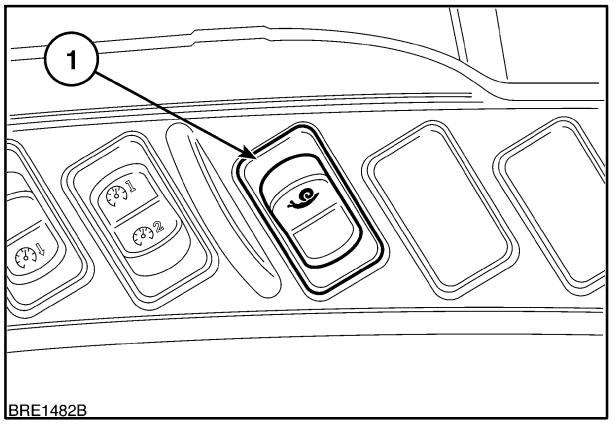
DESCRIPTION OF OPERATION

There are two types of creeper selection available which are installed into the rear axle housing, these are:

- Electro-hydraulic via a two position rocker switch in the cab (16 x 16 and 24 x 24 transmissions)
- Mechanical via a selector lever in the cab and a cable (12 x 12 transmission only)

The electro-hydraulic creeper is activated by the two position rocker switch (1) located in the cab on the right hand control console.

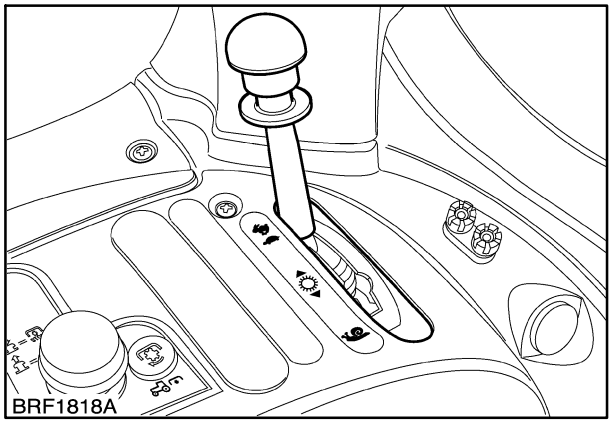
A solenoid valve located on the low pressure distribution block is energized allowing low pressure circuit oil to flow to a control piston which is connected to a shift rail and fork to engage the creeper.



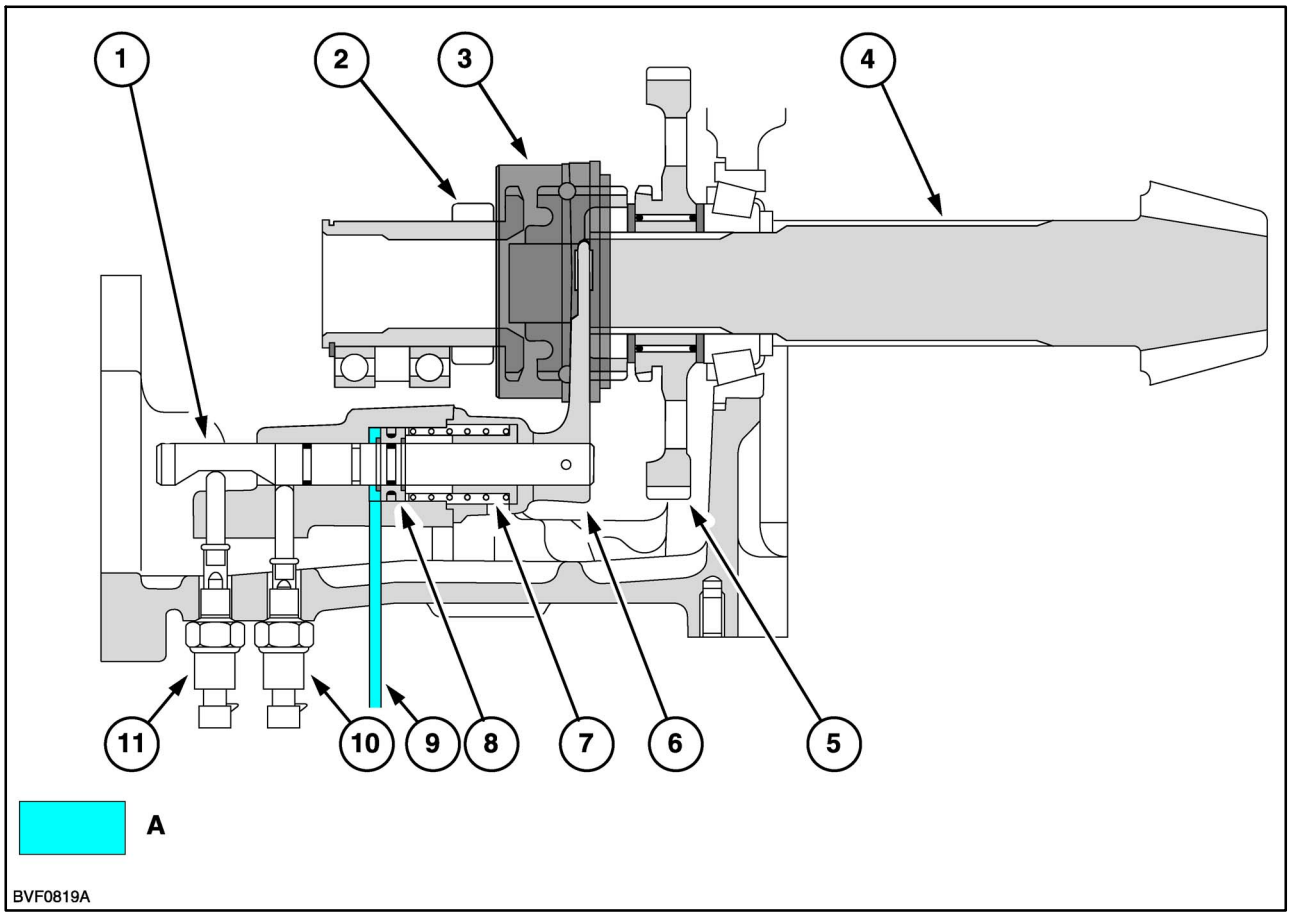
3

The mechanical creeper is selected using the selector lever in the cab.

The selector lever moves a shift rail and fork via a cable to engage the creeper.



4



5

Creeper Disengaged

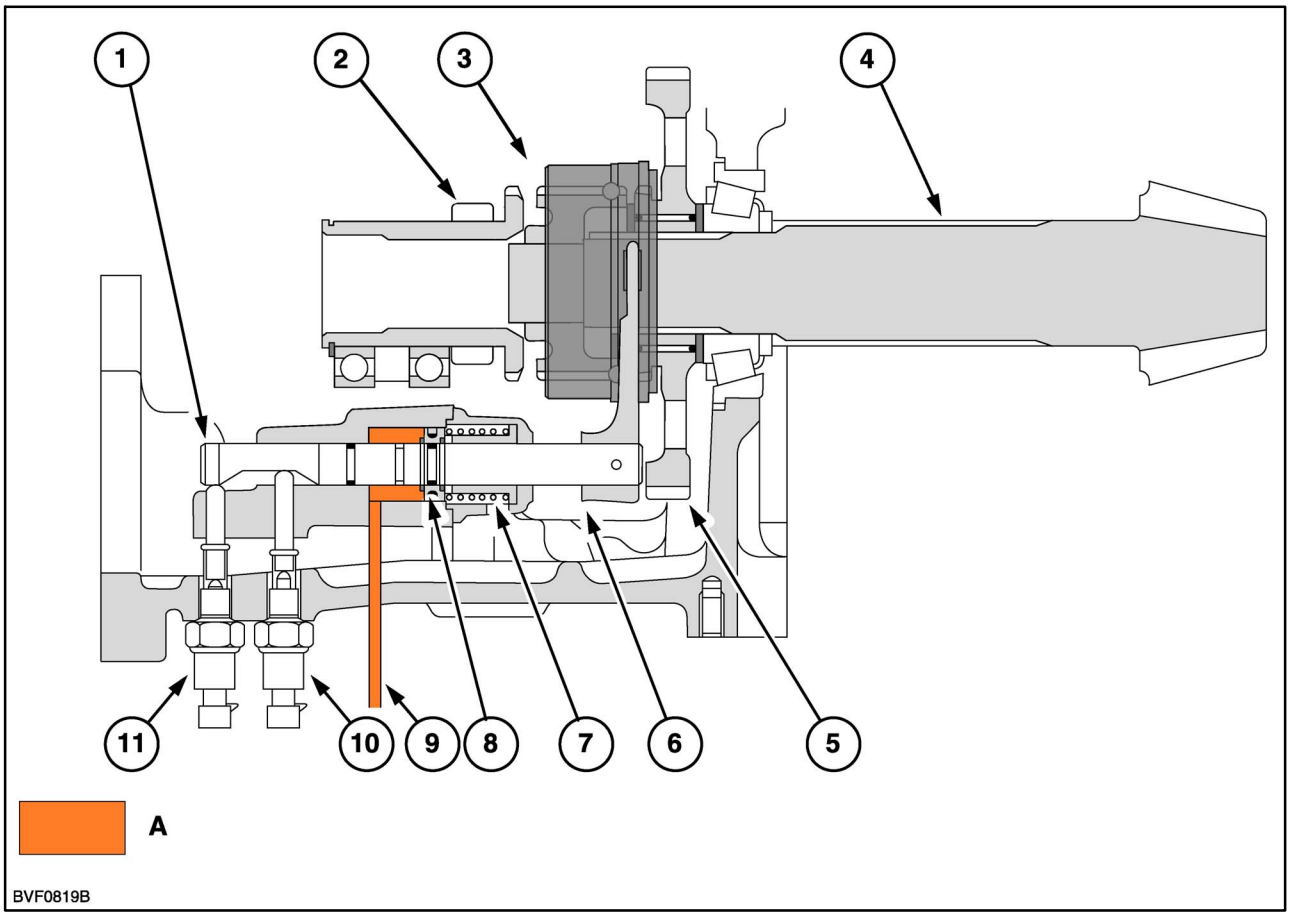
1. Selector shaft
2. Creeper drive gear
3. Sliding engagement coupler
4. Pinion shaft
5. Creeper driven gear
6. Selector fork
7. Disengagement spring
8. Shift rail piston
9. Low pressure oil supply from creeper engagement solenoid
10. Creeper disengaged status switch
11. Creeper engaged status switch

Figure Colour Key

A. Return to reservoir

The creeper solenoid valve is de-energized. The disengagement spring (7) pushes against the shift rail piston (8), which slides the sliding engagement coupler (3) out of the creeper driven gear (5). The creeper driven gear (5) will rotate freely on the shaft.

Drive to the pinion shaft (4) is transferred from the transmission output shaft through the creeper drive gear shaft and the engagement coupler (3) to the pinion shaft (4).



6

Creeper Engaged

1. Selector shaft
2. Creeper drive gear
3. Sliding engagement coupler
4. Pinion shaft
5. Creeper driven gear
6. Selector fork
7. Disengagement spring
8. Shift rail piston
9. Low pressure oil supply from creeper engagement solenoid
10. Creeper disengaged status switch
11. Creeper engaged status switch

Figure Colour Key

A. Low pressure circuit

The creeper solenoid valve is energized. This supplies low pressure circuit oil (9) to flow behind the shift rail piston (8) pushing the sliding engagement coupler (3) onto the driven gear (5). Drive to the pinion shaft is is transferred from the transmission output shaft through the creeper drive gear (2) and down to the driven gear (5) which drives the pinion shaft (4).

TROUBLESHOOTING

ELECTRO-HYDRAULIC ENGAGED CREEPER

If the creeper is not functioning correctly, check for any electronic error codes which may be stored. These are defined by the error code range of 2001 to 3000. To retrieve error codes and review appropriate fault finding diagnostic charts refer to the relevant chapter in the electrical systems section.

PROBLEM	POSSIBLE CAUSES	CORRECTION
Creeper will not engage	Tractor is not stationary.	Make sure the tractor is not moving.
	Creeper engagement switch faulty.	Replace the creeper engagement switch.
	Wiring harness faulty.	Repair or replace the wiring harness.
	Solenoid valve faulty.	Replace the solenoid valve.
	No or low oil pressure to the creeper shift rail piston.	Pressure test the creeper circuit (refer to pressure testing in the hydraulic systems section).
	Shift rail piston oil seals damaged.	Replace the shift rail piston oil seals.
	Shift rail piston loose on the shift rail.	Repair or replace part(s) as necessary.
	Worn selector fork.	Replace the selector fork.
	Selector fork loose on the shift rail.	Tighten the selector fork retaining bolt.
	Sliding engagement coupler is a tight fit on the shaft splines.	Clean the splines or replace the shaft and the sliding engagement coupler.
	Worn sliding engagement coupler.	Replace the sliding engagement coupler.
	Engagement teeth worn on the driven gear.	Replace the driven gear.
Creeper will not disengage	creeper engagement switch faulty.	Replace the creeper engagement switch.
	Electrical circuit faulty.	Repair or replace the electrical harness.
	Solenoid valve faulty.	Replace the solenoid valve.
	Oil pressure still being supplied to the creeper shift rail piston.	Pressure test the creeper circuit (refer to pressure testing in the hydraulic systems section).
	Disengagement spring broken.	Replace the disengagement spring.
	Worn sliding engagement coupler.	Replace the sliding engagement coupler.
	Drive gear shaft engagement teeth worn.	Replace the drive gear shaft.
	Shift rail piston loose on the shift rail.	Repair or replace part(s) as necessary.

MECHANICAL ENGAGED CREEPER

PROBLEM	POSSIBLE CAUSES	CORRECTION
Difficult to engage the creeper	Tractor is not stationary.	Make sure the tractor is not moving.
	Incorrect selector cable adjustment.	Adjust the selector cable.
	Damaged selector cable.	Replace the selector cable.
	Worn selector fork.	Replace the selector fork.
	Worn sliding engagement coupler.	Replace the sliding engagement coupler.
	Selector fork loose on the shift rail.	Tighten the selector fork retaining bolt.
	Sliding engagement coupler is a tight fit on the shaft splines.	Clean the splines or replace the shaft and the sliding engagement coupler.
	Engagement teeth worn on the driven gear.	Replace the driven gear.
Creeper will not remain in the engaged position.	Incorrect selector cable adjustment.	Adjust the selector cable.
	Sliding engagement coupler loose on the shaft splines.	Replace the sliding engagement coupler and/or the shaft.
	Creeper shaft support bearings worn.	Replace the shaft support bearings.

SECTION 23 - DRIVE LINES

Chapter 1 - Drive Lines

CONTENT

Section	Description	Page
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	Four Wheel Drive Off	5
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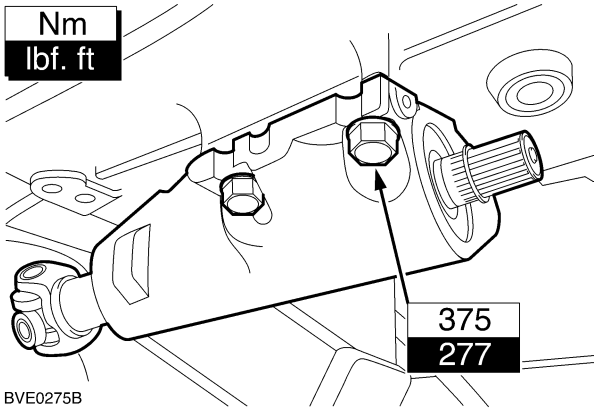
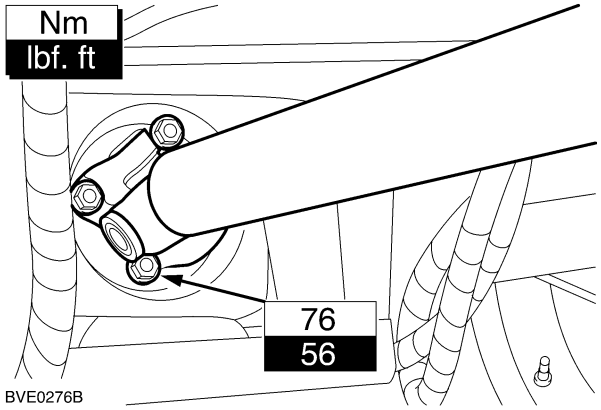
SPECIFICATIONS

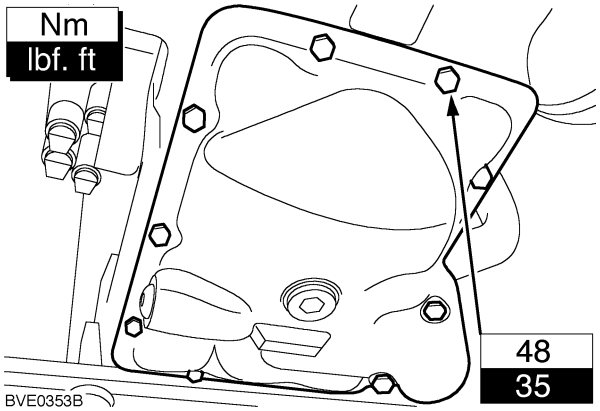
Four Wheel Drive	
Type (16 x 16 transmission)	Mulit-wet plate clutch. Mechanically engaged, electro-hydraulic disengeged
Type (24 x 24 and 12 x 12 transmissions)	Dog clutch. Mechanically engaged, electro-hydraulic disengeged
Drive	From the pinion shaft
Multi Wet plate clutch discs	
Friction Discs	8
Steel Plates	7

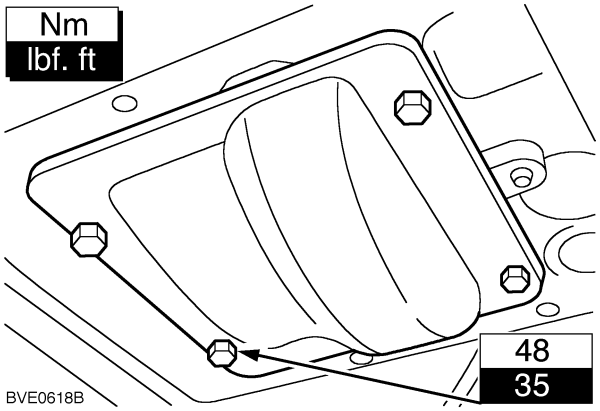
Drive Shaft	
Front Sleeve Positioning Adjust Ring Shims mm	1-1.2-1.5-1.8-2-2.2-2.5-3-3.3-3.7-4-4.3
Front Sleeve End-Play mm	1.2 to 1.7

TIGHTENING TORQUES









1

SPECIAL TOOLS

CAUTION

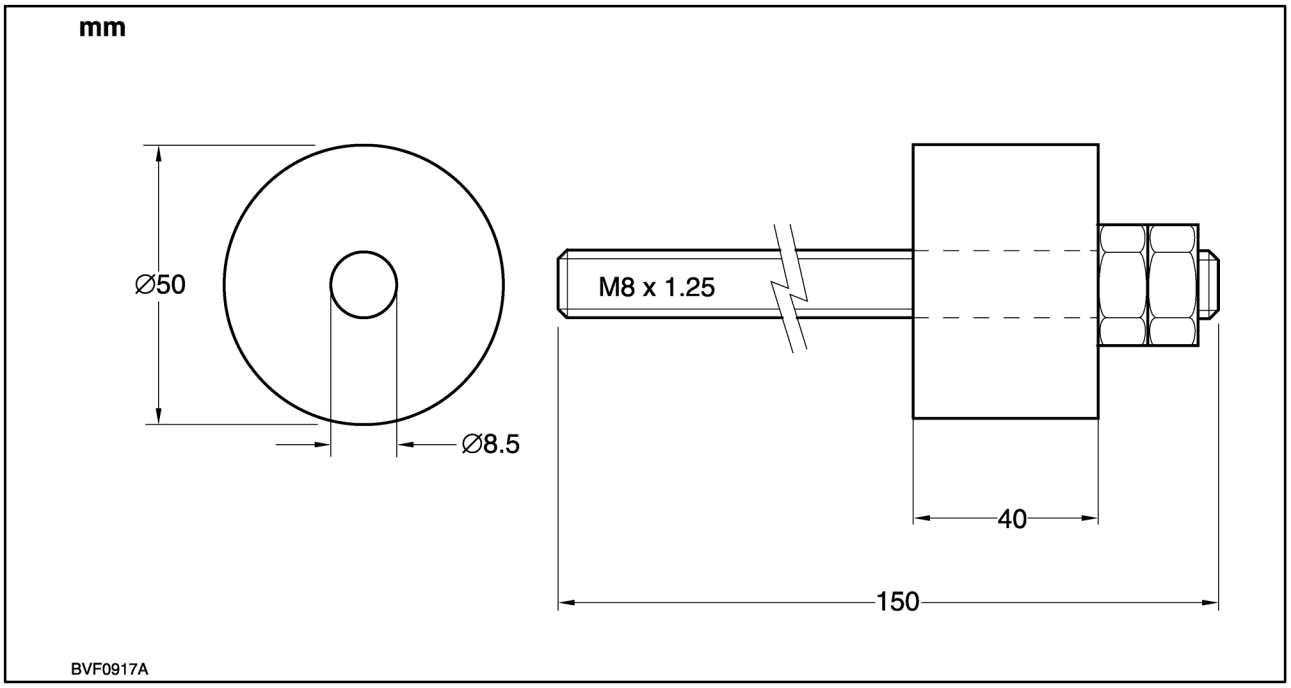
Operations described in this section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly in this Manual.

List of special tools necessary to carry out the different operations described in this section:

295021 Spring pack compressor

380000984 Clutch spring compressor and pin spanner

Locally Fabricated Tools



2

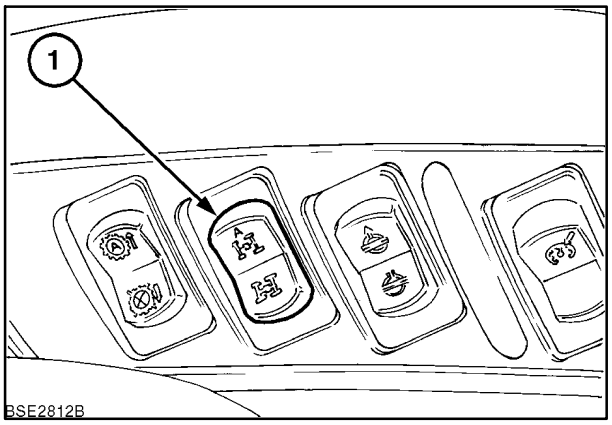
Four wheel driveshaft slide hammer

DESCRIPTION AND OPERATION

There are two types of four wheel drive transfer systems installed in the bottom of the rear axle housing, these are:

- Four wheel drive multi-wet plate clutch (16 x 16 transmission) (see page 6, figure 5)
- Four wheel drive dog clutch (24 x 24 and 12 12 transmissions) (see page 7, figure 6)

The four wheel drive is activated by the three position rocker switch (1) located in the cab on the right hand control console.



3

MANUAL FOUR WHEEL DRIVE

When the rocker switch is in the manual four wheel drive position, four wheel drive is always engaged, regardless of the steering angle and tractor speed.

AUTOMATIC FOUR WHEEL DRIVE

When the rocker switch is in the automatic four wheel drive position, four wheel drive will engage and disengage depending on the steering angle and tractor speed.

The disengagement steering angle and speed values can be changed using the diagnostic H routines, menu H3 - Configurations, (refer to the diagnostic H routines chapter in the electrical systems section).

FOUR WHEEL DRIVE OFF

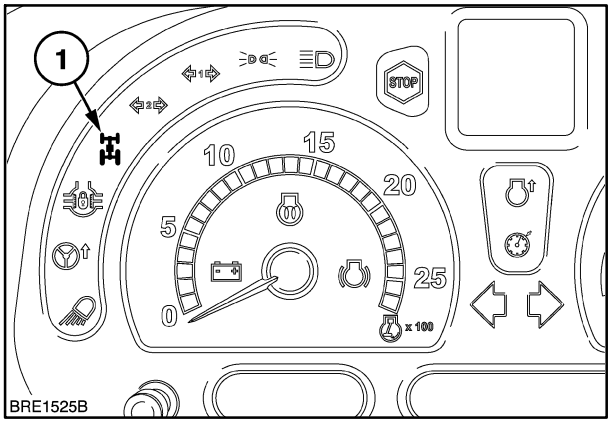
NOTE: *When the parking brake is applied, four wheel drive is engaged.*

When the rocker switch is in the off position, four wheel drive is disengaged and will be engaged when both brake pedal are depressed, to provide four wheel braking.

The four wheel braking engagement speed can be changed using the diagnostic H routines, menu H3 - Configurations, (refer to the diagnostic H routines chapter in the electrical systems section).

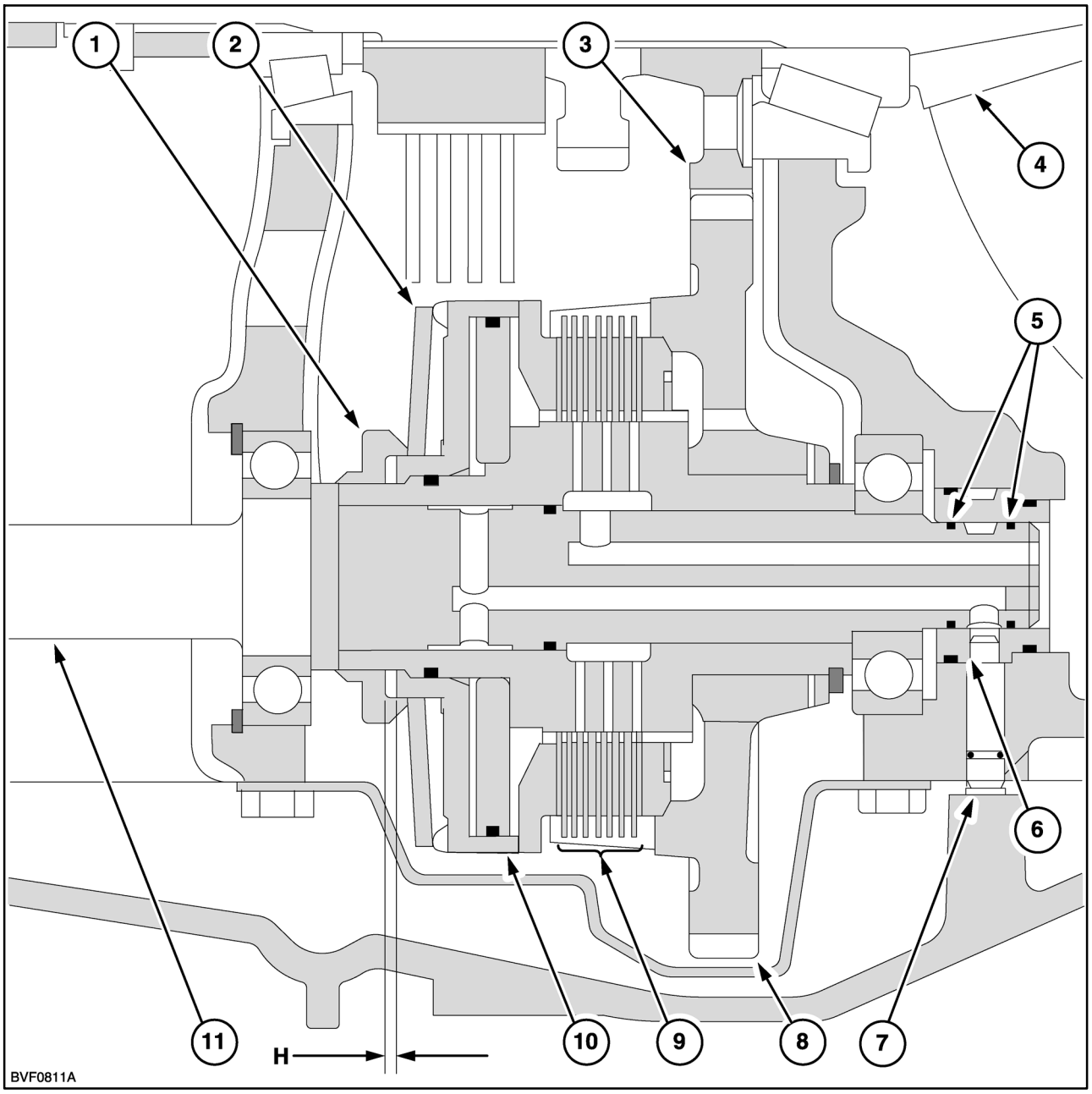
NOTE: *When four wheel drive is engaged and the key start is turned off, four wheel drive will be engaged when the key start is turned on again.*

When four wheel drive is engaged, the four wheel drive solenoid is de-energized. This will close the pressure switch located on the low pressure distribution block and will illuminate the symbol (1) on the instrument cluster.



4

SECTIONAL VIEWS

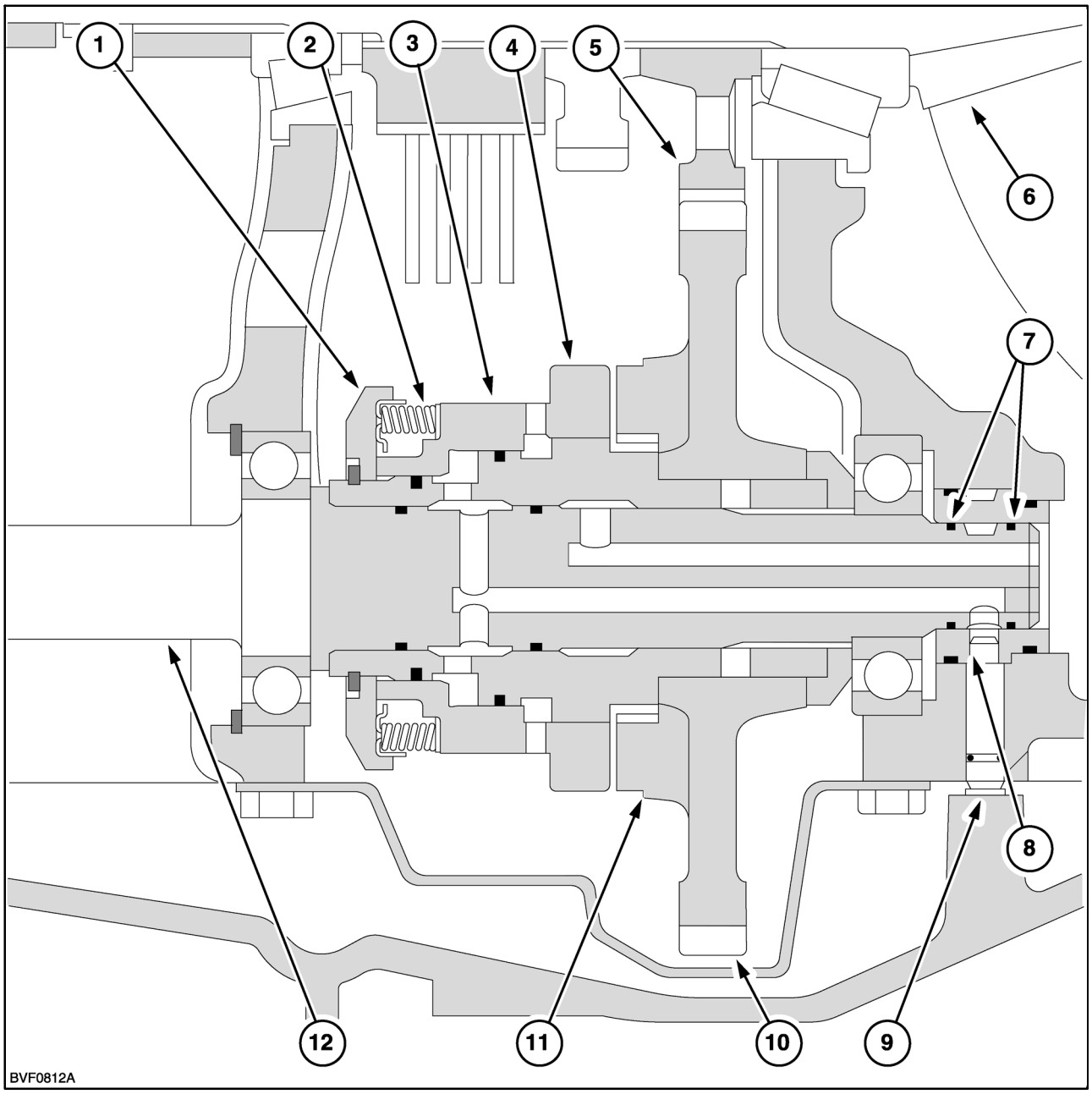


5

Four Wheel Drive Multi-Wet Plate Clutch Sectional View

H = 0.8 to 1.1 mm release travel

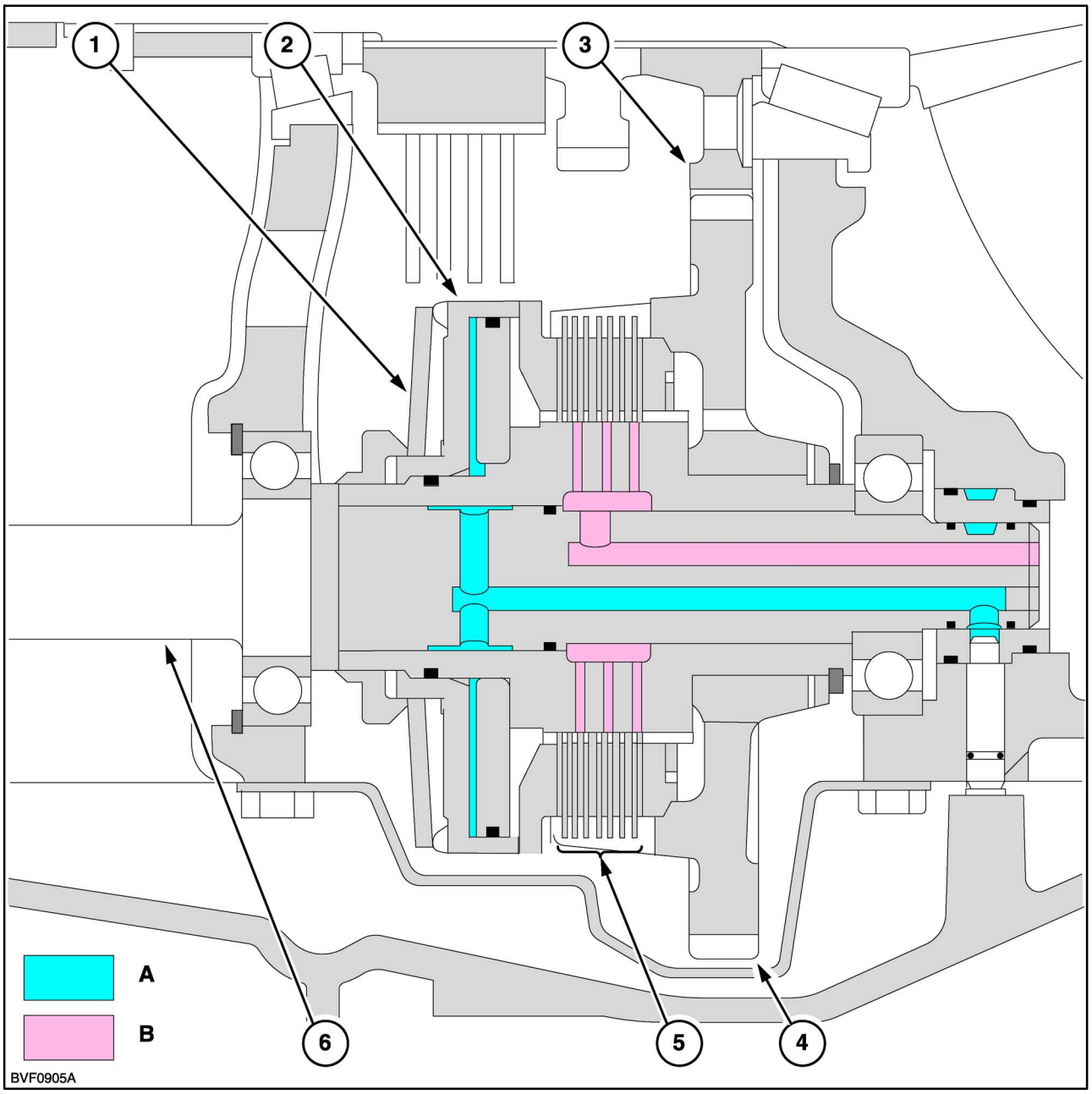
1. Retaining nut
2. Belleville washer
3. Drive gear
4. Pinion shaft
5. Annular sealing rings
6. Oil supply manifold
7. Oil supply manifold retaining pin
8. Driven gear
9. Friction and steel plates
10. Control piston
11. Driveshaft



6

Four Wheel Drive Dog Clutch Sectional View

1. Spring pack retaining washer
2. Spring pack
3. Control piston
4. Control piston dog teeth
5. Drive gear
6. Pinion shaft
7. Annular sealing rings
8. Oil supply manifold
9. Oil supply manifold retaining pin
10. Driven gear
11. Driven gear dog teeth
12. Driveshaft



7

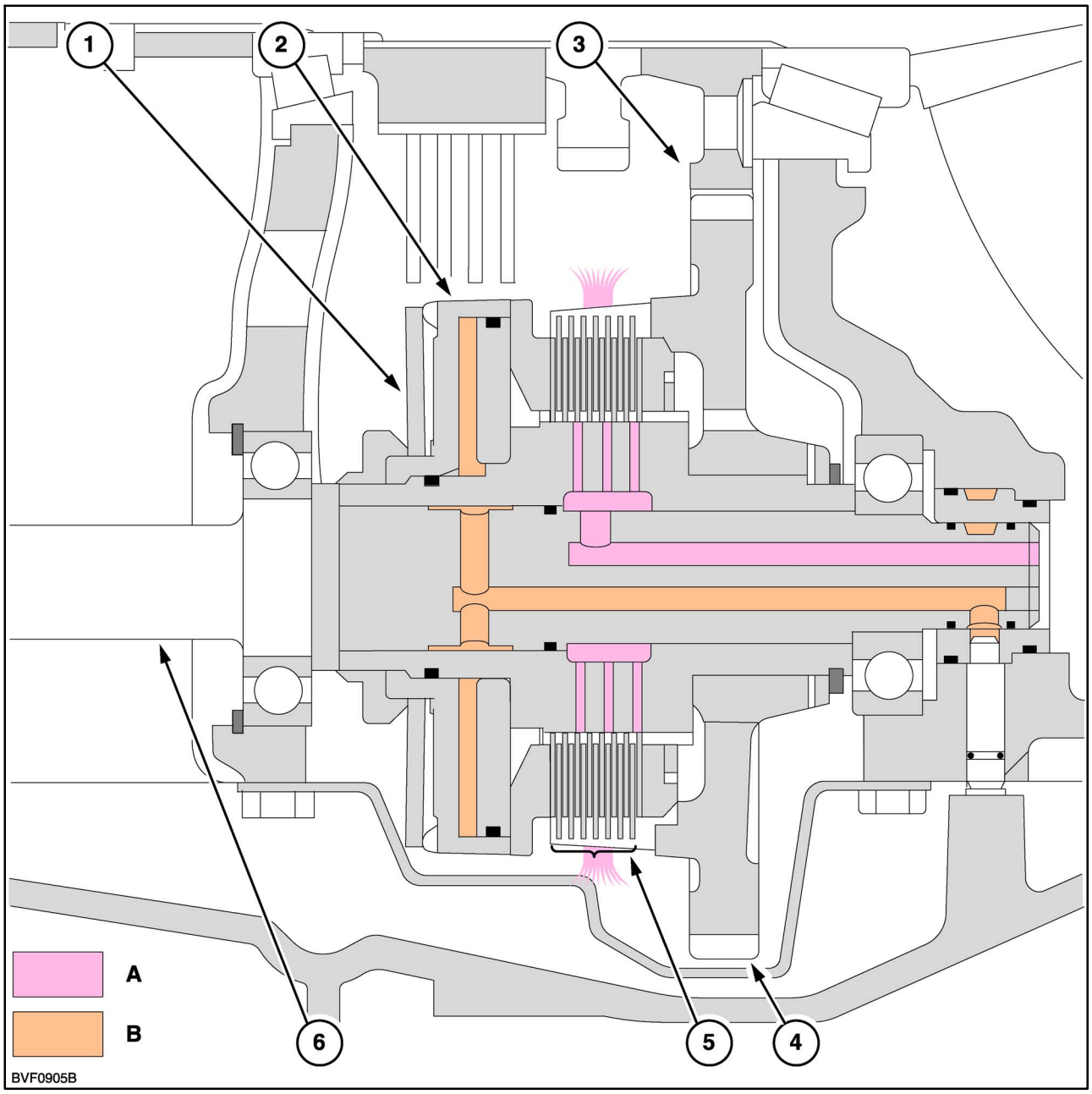
Four Wheel Drive Multi-Wet Plate Clutch (Engaged)

1. Belleville washer
2. Control piston
3. Drive gear
4. Driven gear
5. Friction and steel plates
6. Driveshaft

Figure Colour Key

A. Return to reservoir
B. Lubrication

The four wheel drive clutch solenoid is de-energized and the belleville washer (1) applies a force to the control piston (2) which compresses the friction and steel plates (5). Drive is transferred from the drive gear (3) mounted on the rear axle pinion to the driven gear (4) and through the clutch to the front axle via the driveshaft (6).



8

Four Wheel Drive Multi-Wet Plate Clutch (Disengaged)

1. Belleville washer
2. Control piston
3. Drive gear
4. Driven gear
5. Friction and steel plates
6. Driveshaft

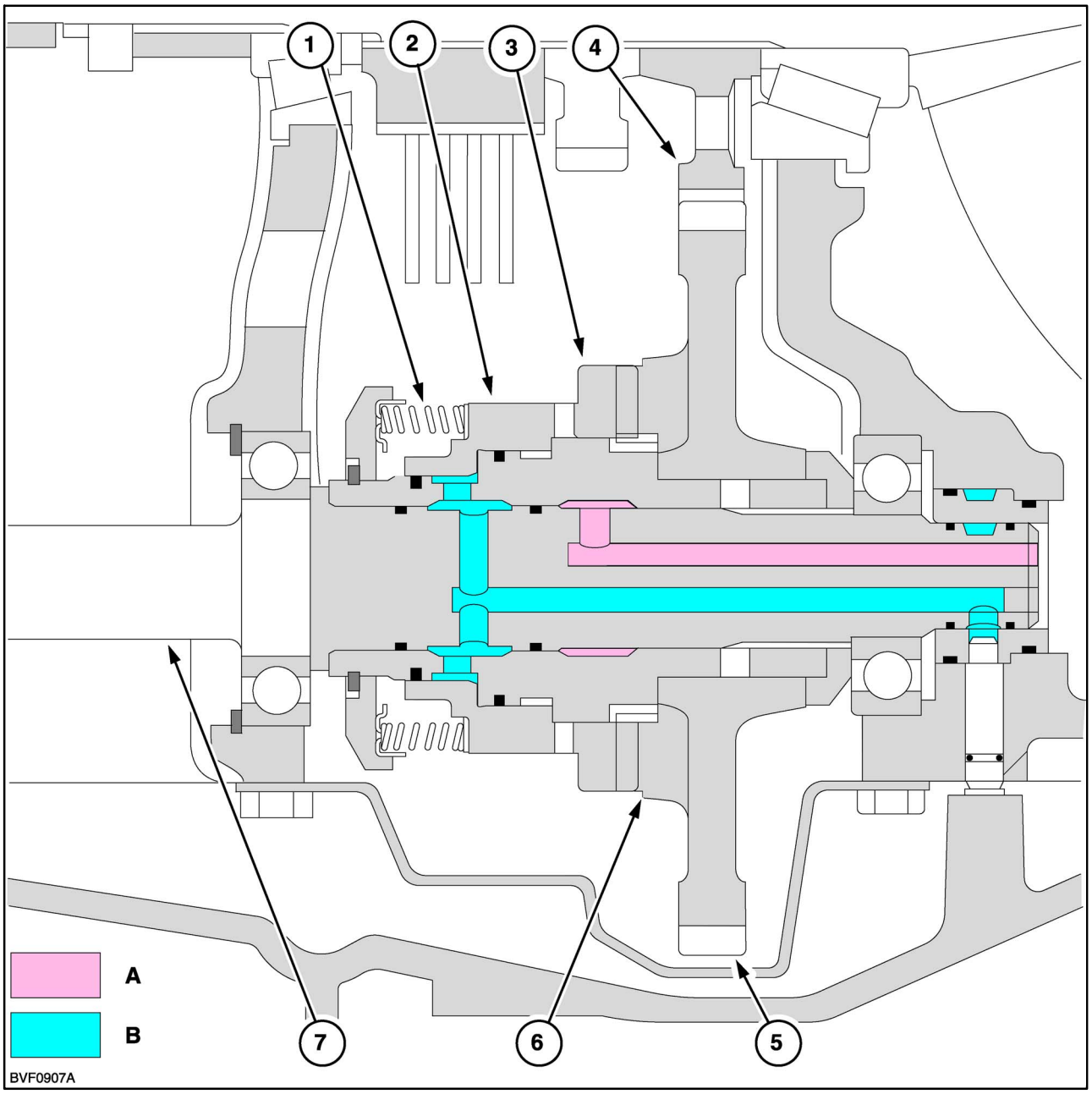
Figure Colour Key

A. Lubrication
B. Low pressure circuit

The four wheel drive clutch solenoid is energized, supplying oil from the low pressure circuit to the face of the control piston (2).

The oil pressure applied to the face of the control piston (2) moves the control piston (2) against the force applied from the belleville washer (1). This releases the force applied by the belleville washer (1) from the friction and steel plates (5).

The driven gear (4) can now rotate freely without transferring the drive through the clutch to the driveshaft (6). Lubrication oil will be supplied through the friction and steel plates (5).



9

Four Wheel Drive Dog Clutch (Engaged)

1. Spring pack
2. Control piston
3. Control piston dog teeth
4. Drive gear
5. Driven gear
6. Driven gear dog teeth
7. Driveshaft

Figure Colour Key

A. Lubrication
B. Return to reservoir

The four wheel drive clutch solenoid is de-energized and the spring pack (1) applies a force to the control piston (2), which moves the control piston dog teeth (3) into the driven gear dog teeth (6). Drive is transferred from the drive gear (4), mounted on the rear axle pinion to the driven gear (5) and through the clutch to the front axle via the driveshaft (7).

10

Four Wheel Drive Dog Clutch (Disengaged)

1. Spring pack
2. Control piston
3. Control piston dog teeth
4. Drive gear
5. Driven gear
6. Driven gear dog teeth
7. Driveshaft

Figure Colour Key

A. Lubrication
B. Low pressure circuit

The four wheel drive clutch solenoid is energized, supplying oil from the low pressure circuit to the face of the control piston (2).

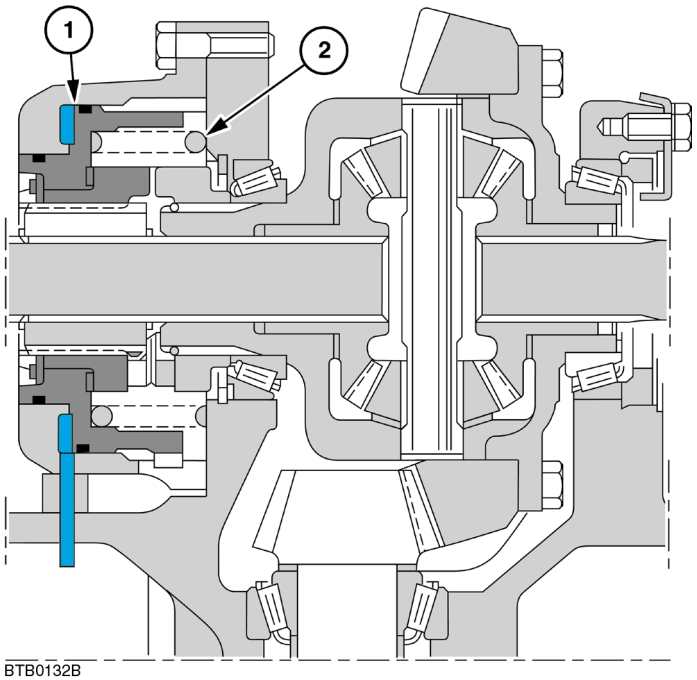
The oil pressure applied to the face of the control piston (2) moves the control piston (2) against the force applied by the spring pack (1). This releases the control piston dog teeth (3) from the driven gear dog teeth (6).

The driven gear (5) can now rotate freely without transferring the drive through the clutch to the driveshaft (7).

TROUBLESHOOTING

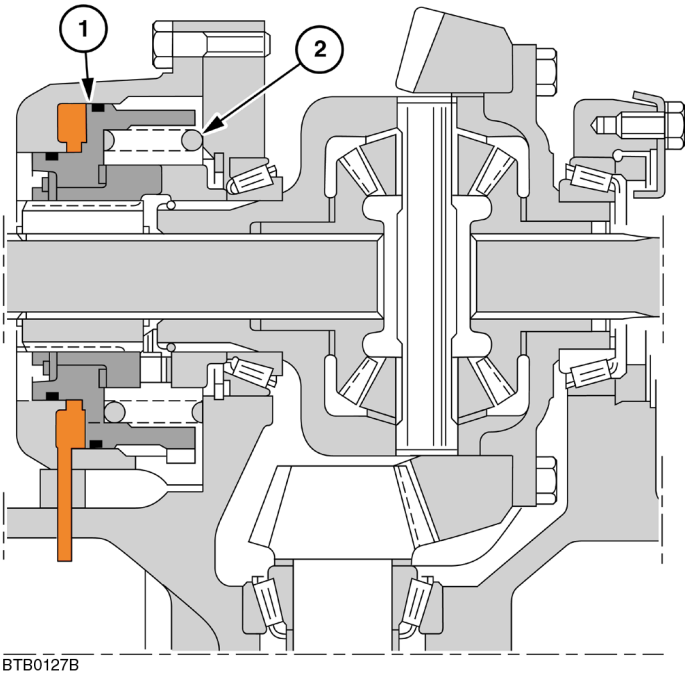
If the front wheel drive is not functioning correctly, check for any electronic error codes which may be stored. These are defined by the error code range of 6001 to 7000. To retrieve error codes and review appropriate fault finding diagnostic charts refer to the relevant chapter in the electrical systems section.

PROBLEM	POSSIBLE CAUSES	CORRECTION
Four wheel drive does not engage	Four wheel drive engagement switch faulty.	Replace the four wheel drive engagement switch.
	Four wheel drive control solenoid valve stuck open.	Repair or replace solenoid valve.
	Worn clutch discs.	Replace the clutch discs.
	Incorrectly set multi-wet plate clutch release travel.	Adjust the release travel.
Four wheel drive does not disengage	Low transmission oil.	Refill to the correct oil level.
	Faulty low pressure circuit.	Pressure test the low pressure circuit (refer to pressure testing in the hydraulic systems section).
	Faulty four wheel drive engagement circuit.	Check the circuit.
	Four wheel drive control solenoid valve stuck closed.	Repair or replace the solenoid valve.
	Oil leaks through the oil seals with consequent pressure drop: hub, piston, and transfer box shaft oil seals.	Replace faulty oil seals.
With the four wheel drive clutch disengaged, the four wheel drive does not engage when the brake pedals are depressed	Incorrectly adjusted brake pedal switches.	Adjust the brake pedal switches.
	Faulty brake pedal switch.	Replace the brake pedal switch.



Front differential lock disengaged

Front differential lock engaged



Trapped oil

Pressure oil

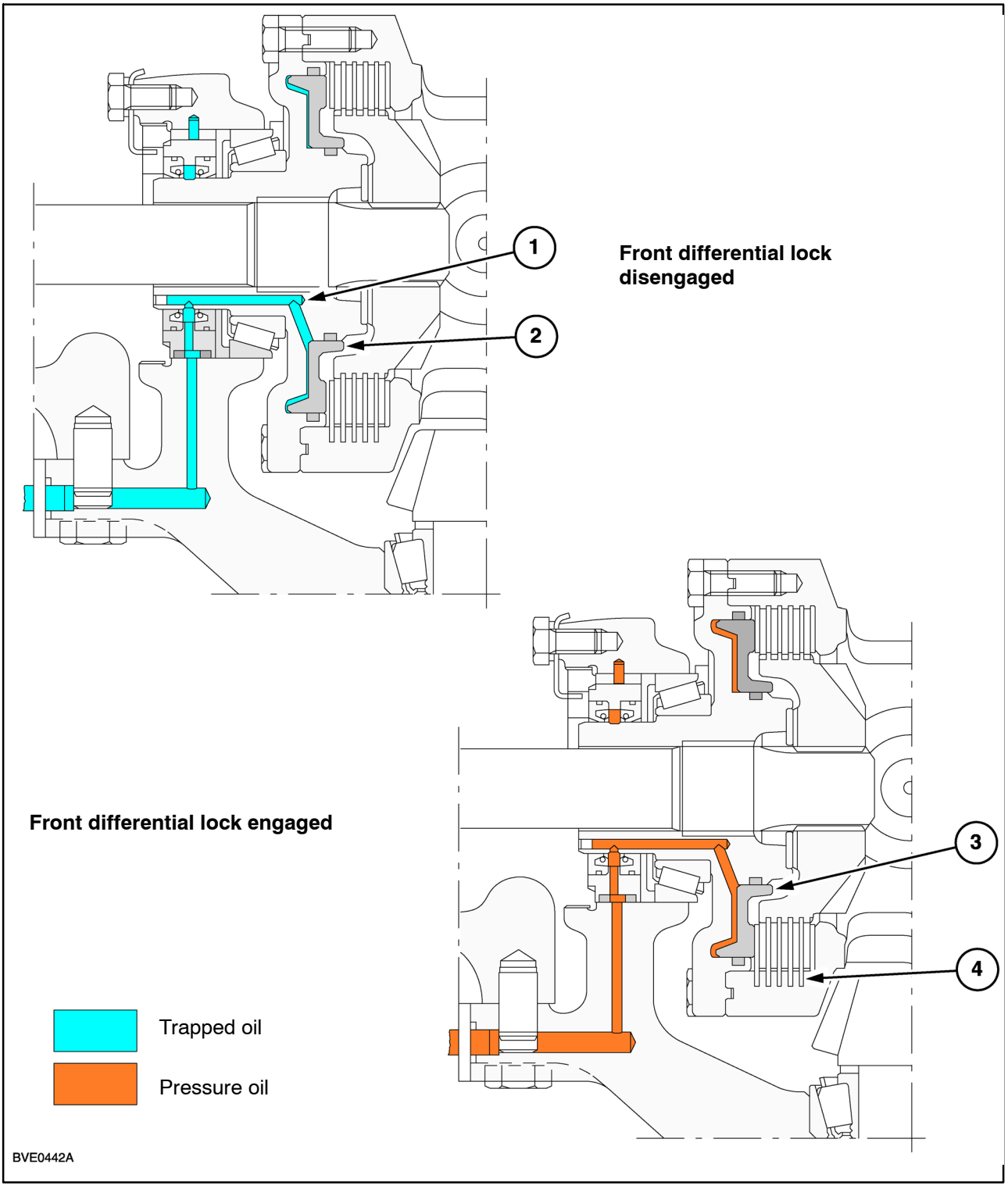
13

FRONT DIFFERENTIAL LOCK ASSEMBLY - DOG CLUTCH

When the differential lock is disengaged, the solenoid valve is in the discharge position (not energised) and therefore the oil is free to return to sump.

Under these conditions, the helix spring (2) keeps the differential lock dog clutch teeth apart.

When the differential lock switch is activated, the solenoid valve opens and directs oil from the low pressure circuit into the drive piston (1), where it creates a pressure greater than the spring (2) force and moves the piston, locking the differential.



14

FRONT DIFFERENTIAL LOCK ASSEMBLY - MULTI-WET PLATE CLUTCH

When the differential lock is disengaged, the solenoid valve is in the discharge position (not energised) and the oil (1) is free to return to the sump.

Under these conditions, the clutch piston (2) and the drive and driven discs remain separated and the differential lock is disengaged.

When the differential lock switch is activated, the solenoid valve opens and directs oil from the low pressure circuit into the clutch piston (3) locking the differential plates (4).

OVERHAUL

STANDARD FRONT AXLE FOUR WHEEL DRIVESHAFT

Removal

(Op. 23 101)

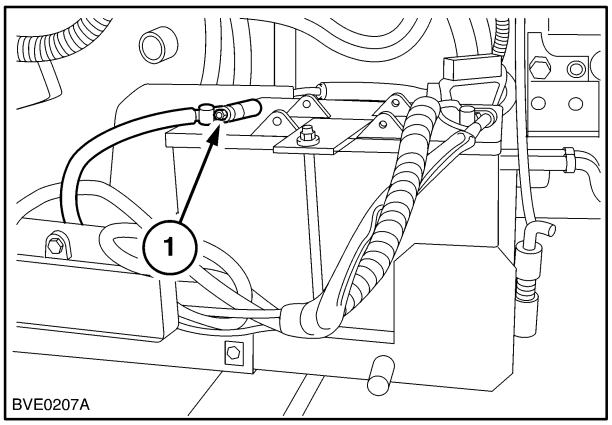
⚠ WARNING ⚠

Handle all components with the greatest care.

Do no insert hands or fingers between the parts.

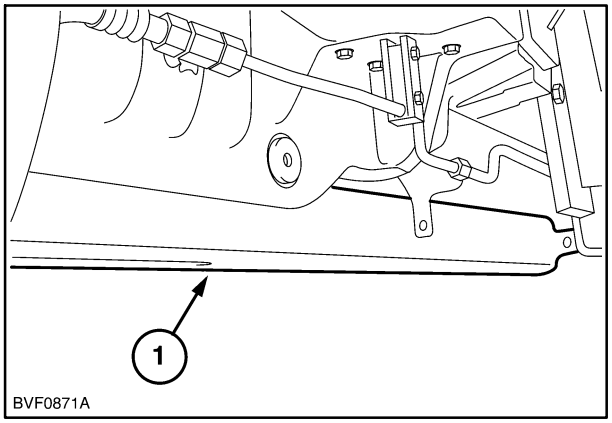
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).



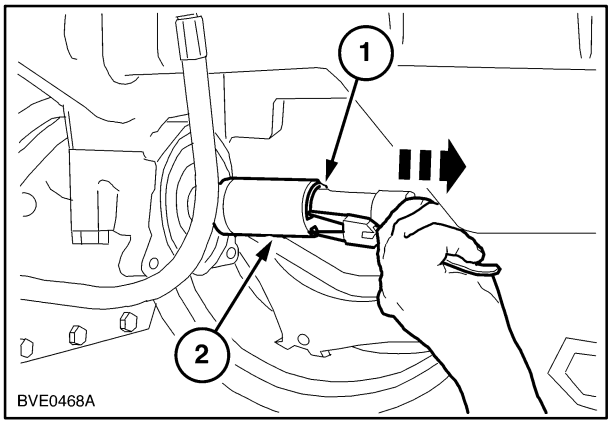
11

2. Remove the four wheel driveshaft guard (1).



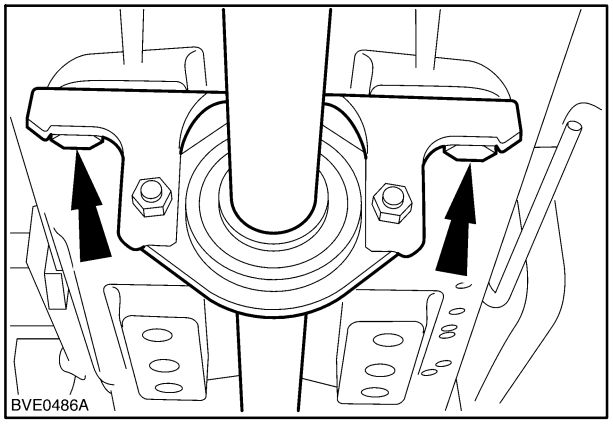
12

3. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel drive shaft.



13

4. Remove the four wheel driveshaft and the central support.



14

Installation

(Op. 23 101)

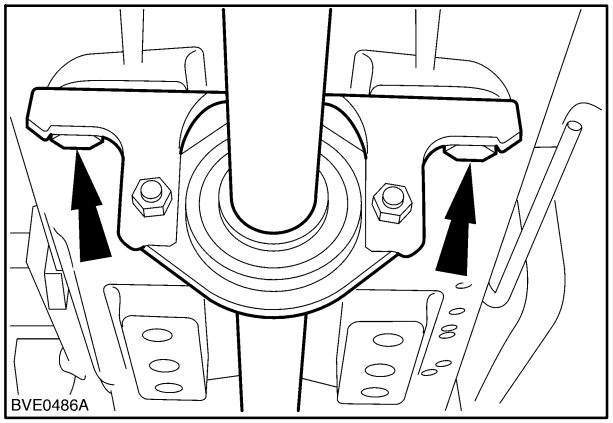
⚠ WARNING ⚠

Handle all components with the greatest care.

Do no insert hands or fingers between the parts.

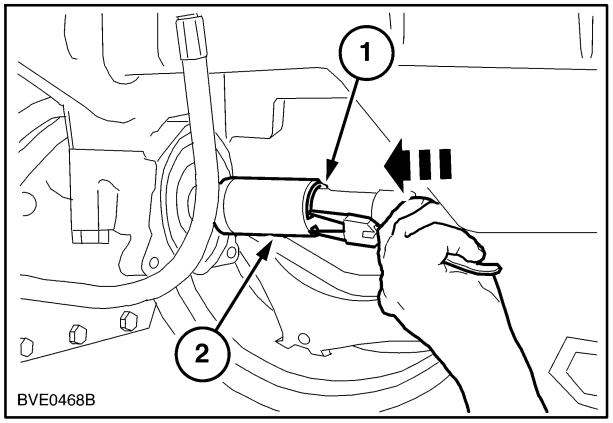
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the four wheel driveshaft and the central support.



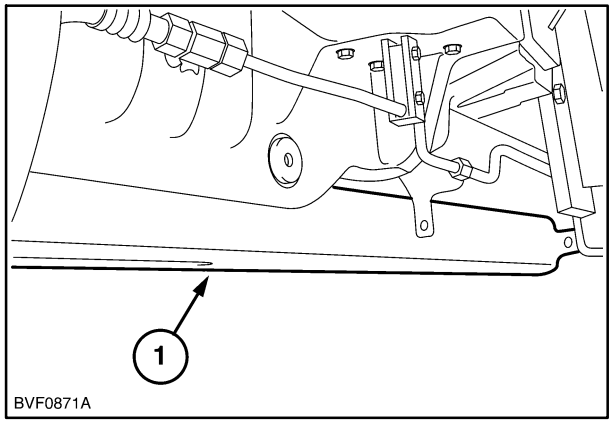
15

2. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel driveshaft.



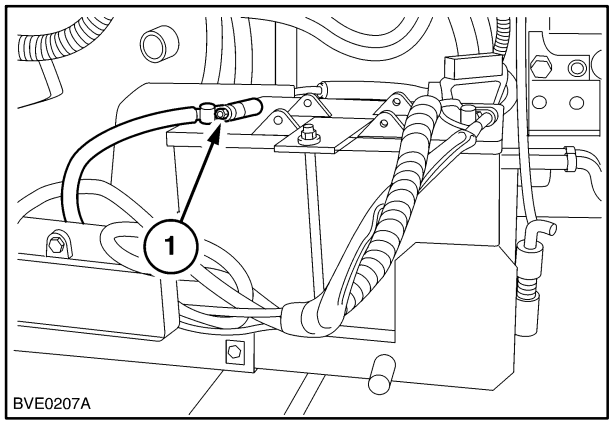
16

3. Install the four wheel driveshaft guard (1).



17

4. Connect the battery negative cable (1) and install the battery cover.



18

SUPERSTEER FRONT AXLE FOUR WHEEL DRIVESHAFT

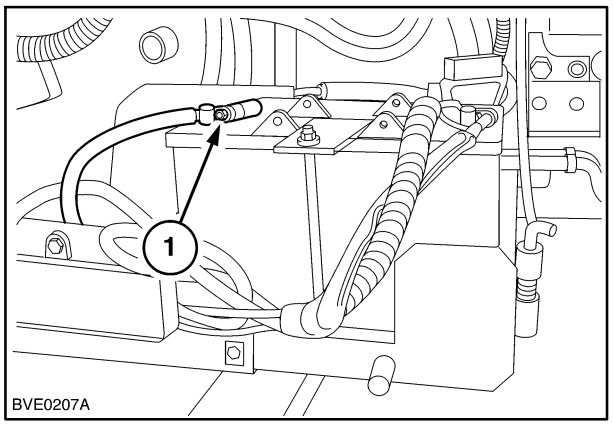
Removal

(Op. 23 101)

⚠ WARNING ⚠

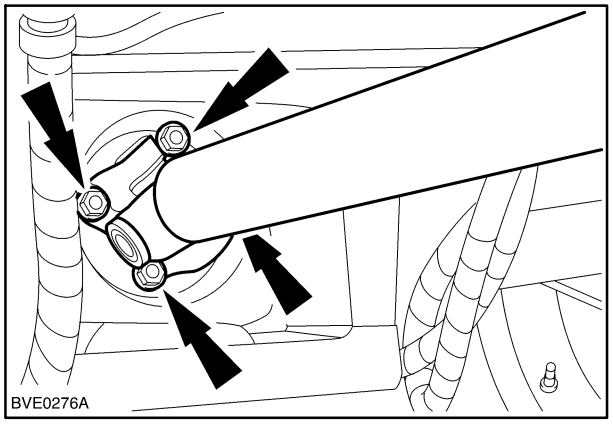
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).



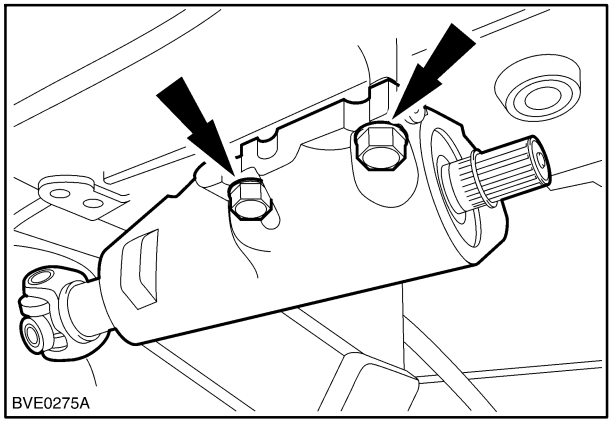
19

2. Remove the four wheel driveshaft retaining nuts.



20

3. Remove the support and the four wheel driveshaft.



21

Installation

(Op. 23 101)

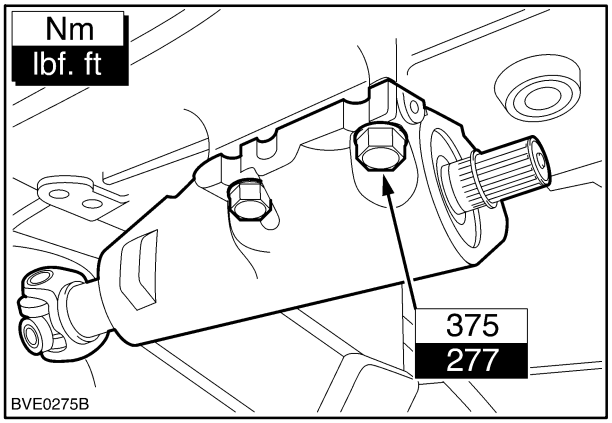
⚠ WARNING ⚠

Handle all components with the greatest care.

Do no insert hands or fingers between the parts.

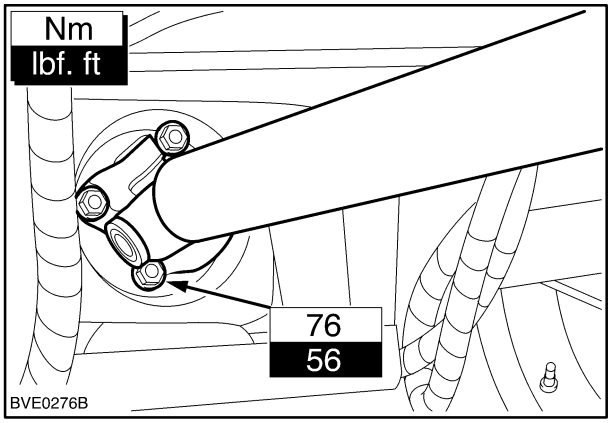
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the four wheel driveshaft and the support. Tighten the retaining bolts to the specified torque value.



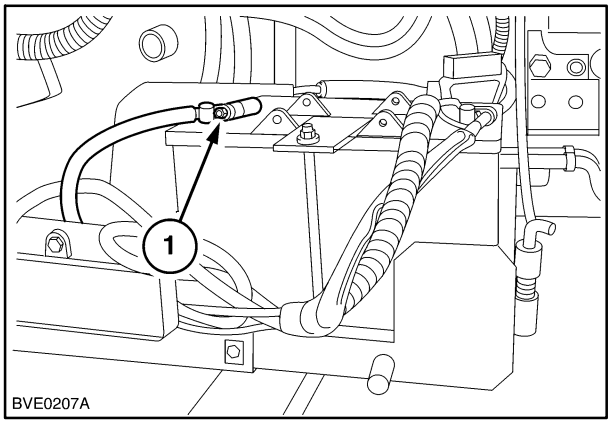
22

2. Install the four wheel driveshaft retaining nuts. Tighten the retaining nuts to the specified torque value.



23

3. Connect the battery negative cable (1) and install the battery cover.



24

FOUR WHEEL DRIVE CLUTCH

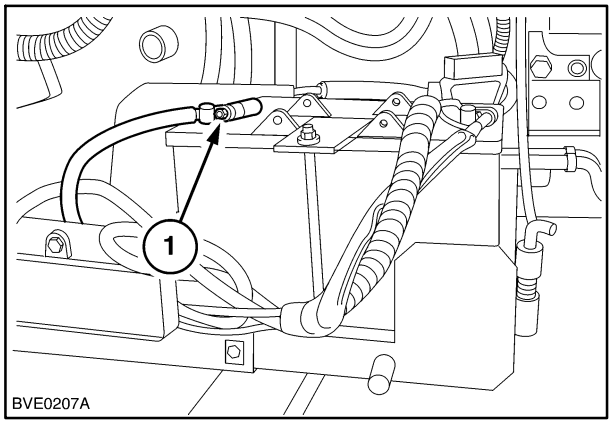
Removal

(Op. 23 202)

WARNING

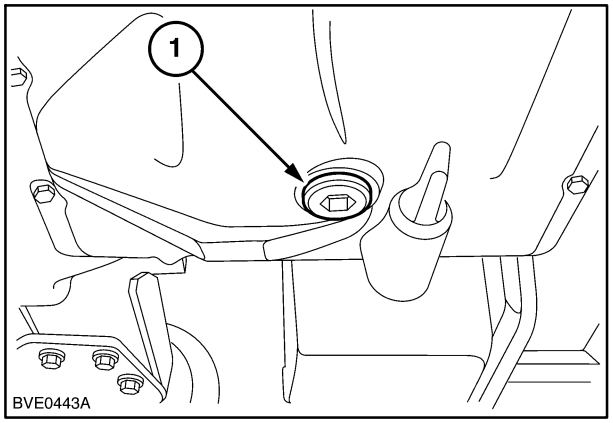
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).
2. Remove the four wheel driveshaft (refer to four wheel driveshaft removal in this chapter).



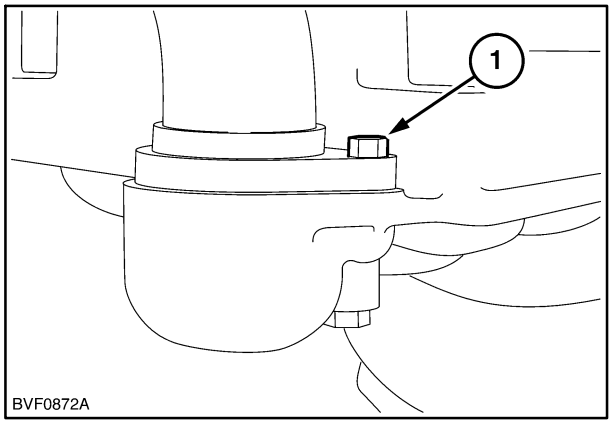
25

3. Remove the drain plug (1) and drain the oil into a suitable container.
4. Install the drain plug after the oil has drained.



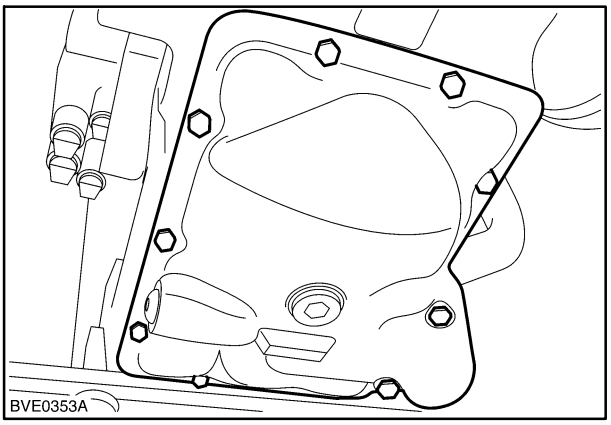
26

5. Remove the oil supply tube retaining bolt (1).



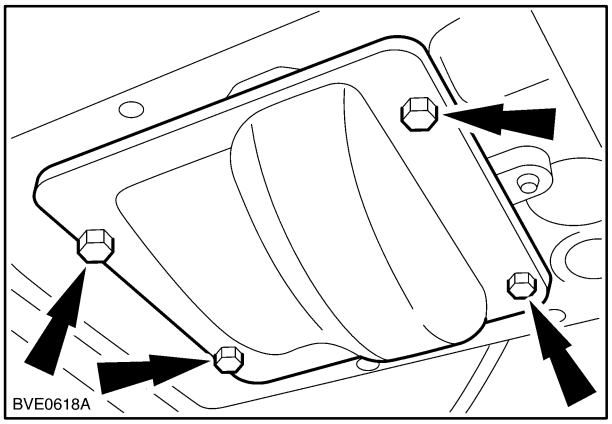
27

6. Remove the rear axle bottom cover.



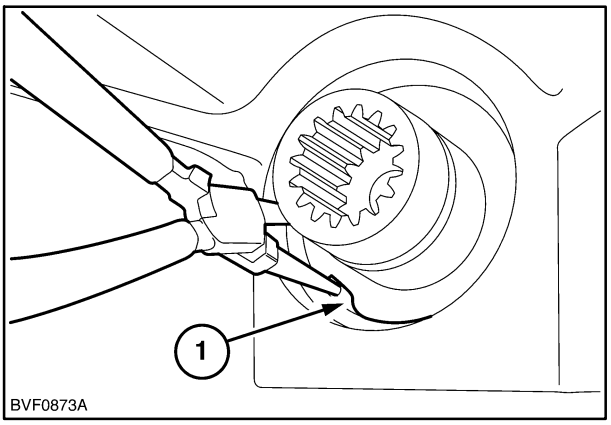
28

7. Remove the four wheel drive clutch inner cover.



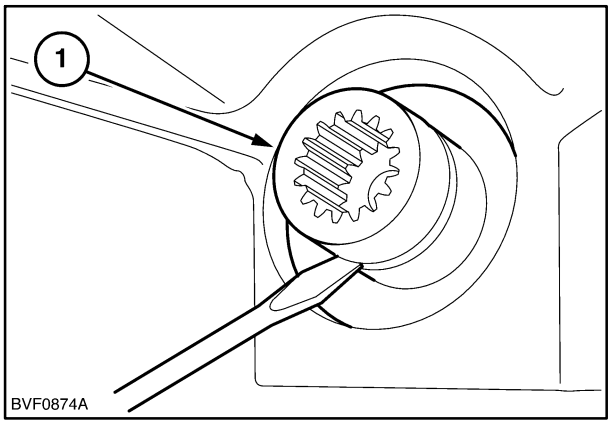
29

8. Using suitable circlip pliers, remove the four wheel driveshaft oil seal carrier retaining circlip (1).



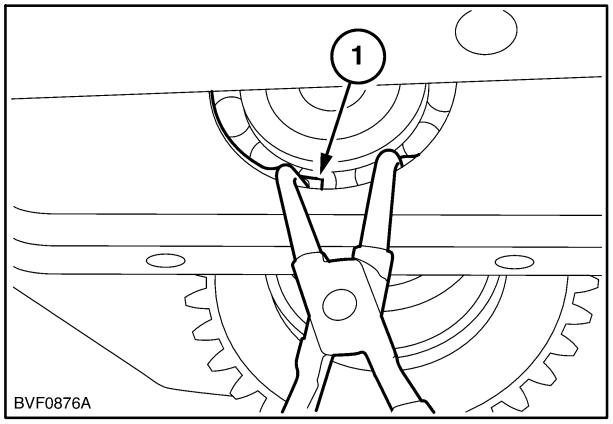
30

9. Using a suitable lever, remove the four wheel driveshaft coupler (1) and the oil seal carrier.



31

10. Using suitable circlip pliers, remove the bearing retaining circlip (1).

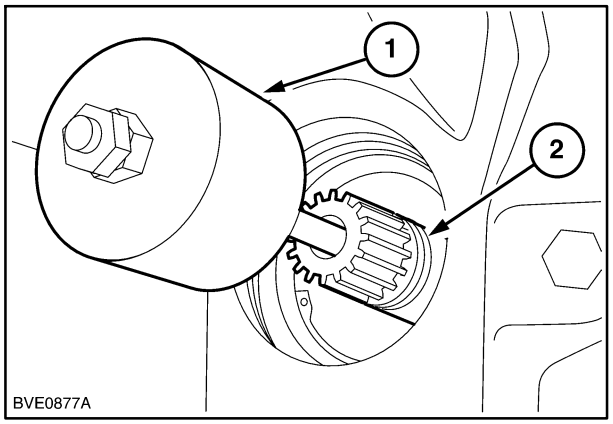


32

NOTE: *Using a suitable hydraulic jack, support the four wheel drive clutch assembly.*

NOTE: *The four wheel driveshaft cannot be fully removed from the rear axle housing. To remove the driveshaft from the rear axle housing, separate the transmission from the rear axle.*

11. Using the locally fabricated slide hammer (1), remove the the four wheel driveshaft (2).
12. Remove the four wheel drive clutch assembly from underneath the rear axle.

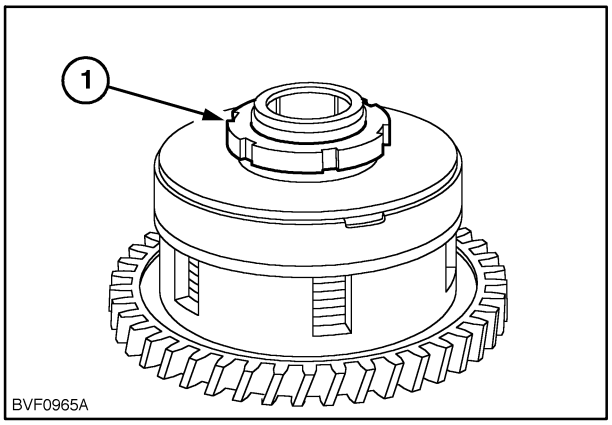


33

FOUR WHEEL DRIVE MULTI-WET PLATE CLUTCH

Disassembly

1. Unstake the retaining nut (1).



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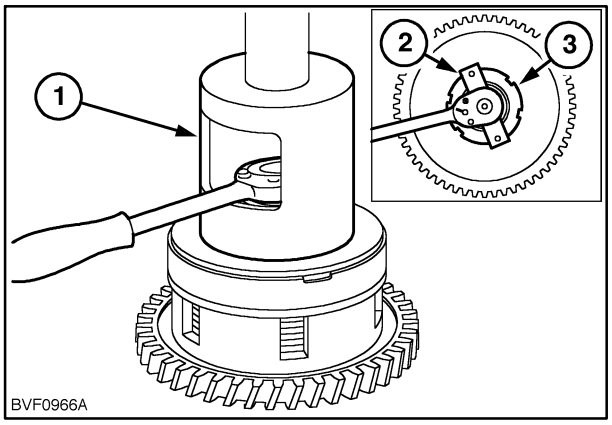
⚠ CAUTION ⚠

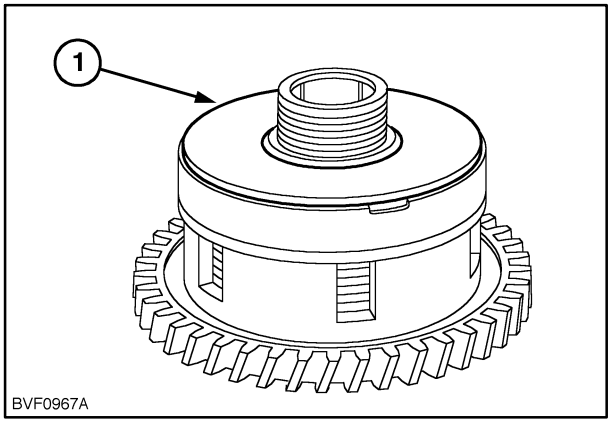
Make sure the retaining nut is fully unstaked or damage to the threads may occur.

2. Using special tool **380000984-1** (1) and a suitable hydraulic press, compress the Belleville washer. Using special tool **380000984-2** (2), remove the retaining nut (3).



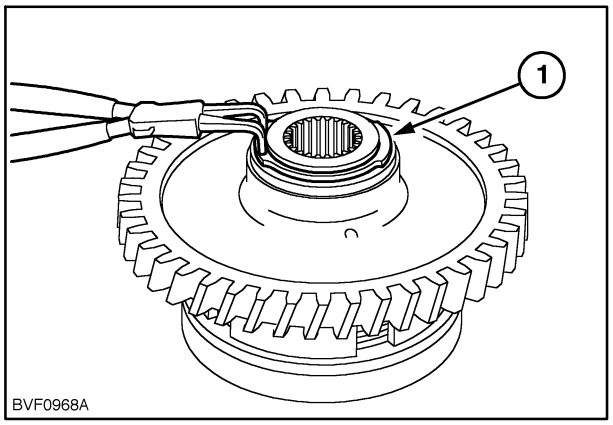
35

3. Remove the special tools and the belleville washer (1).



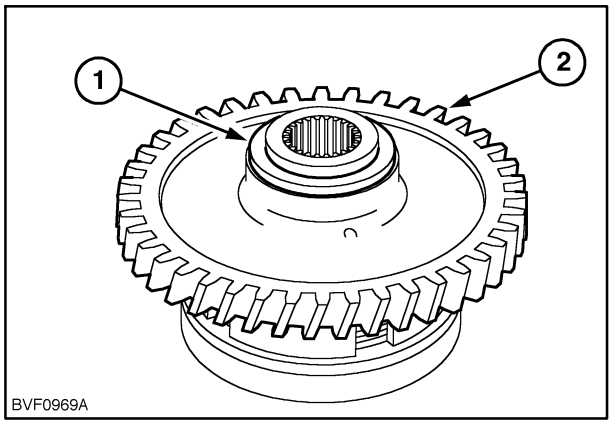
36

4. Rotate the clutch assembly 180°.
5. Using suitable circlip pliers, remove the circlip (1).



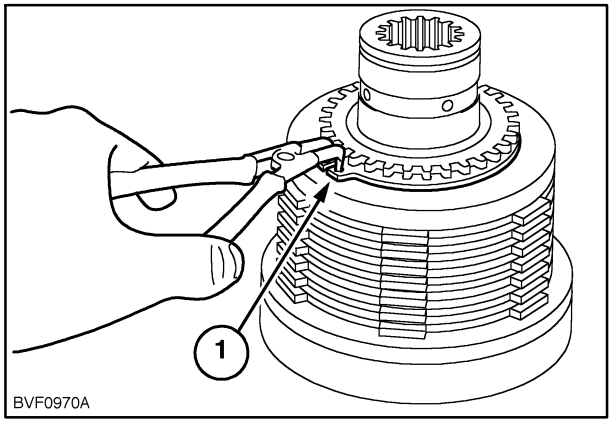
37

6. Remove the 'D' washer (1) and the driven gear (2).

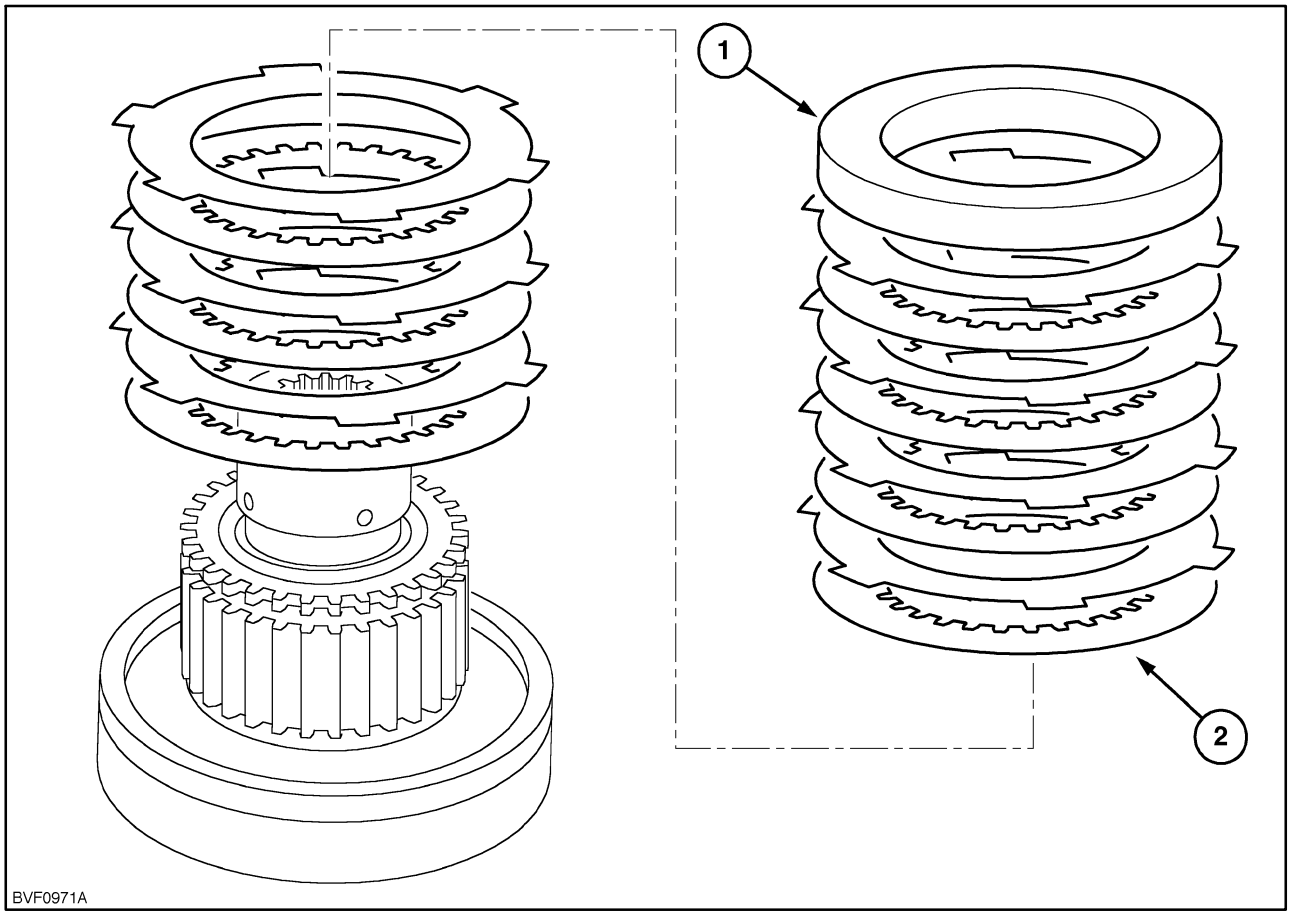


38

7. Using suitable circlip pliers, remove the circlip (1).

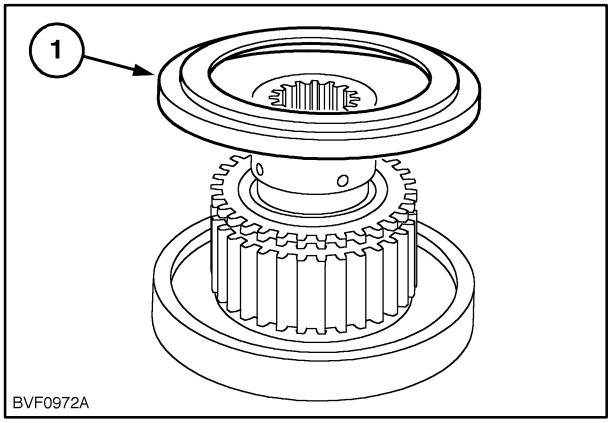


39



40

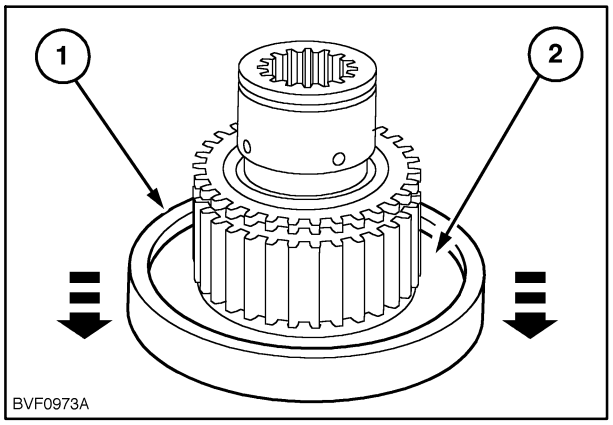
8. Remove the end plate (1) and the friction and steel plates (2).
9. Remove the pressure plate (1).



41

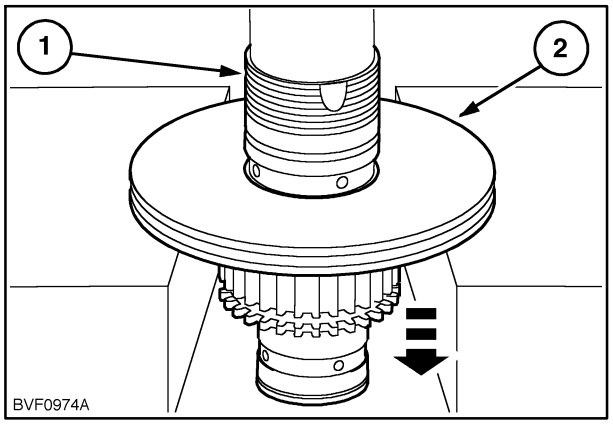
NOTE: *Apply pressure evenly to the piston.*

10. Remove the piston (1) from the oil seal carrier (2).



42

11. Using a suitable hydraulic press, remove the shaft (1) from the oil seal carrier (2).



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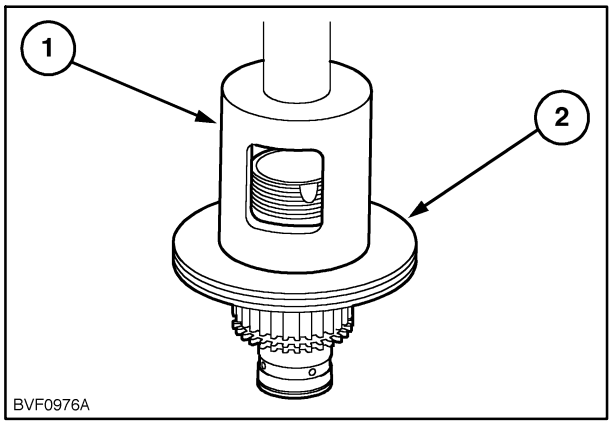
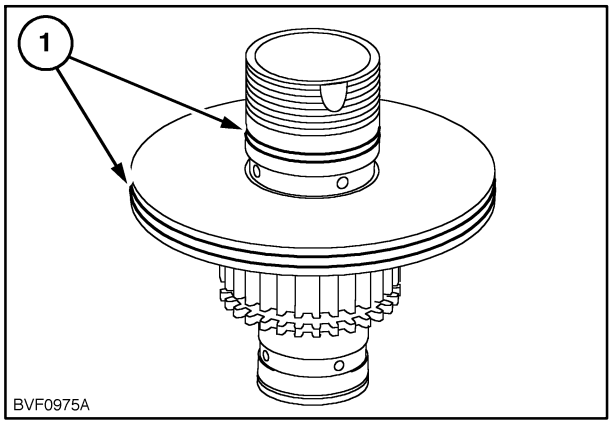
Assembly/Adjustments

1. Using special tool **380000984-1** (1) and a suitable hydraulic press, install the oil seal carrier (2) onto the shaft.



44

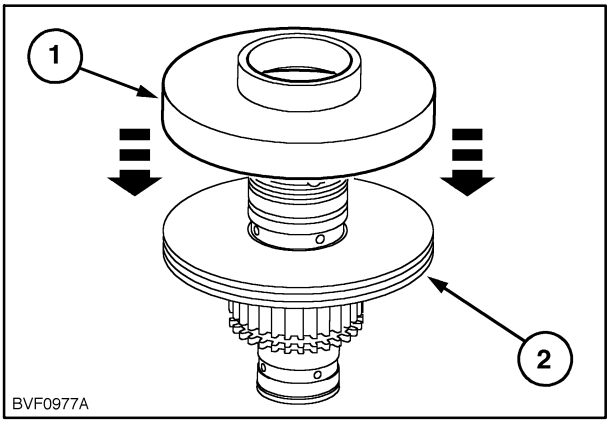
2. Install new oil seals (1) and apply the correct specified driveline oil to the oil seals.



45

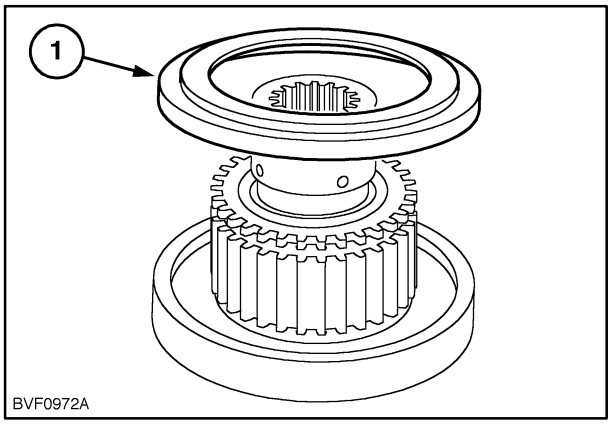
NOTE: *Apply pressure evenly to the piston to avoid damage to the oil seals.*

3. Install the piston (1) onto the oil seal carrier (2).



46

4. Rotate the clutch assembly 180°.
5. Install the pressure plate (1).



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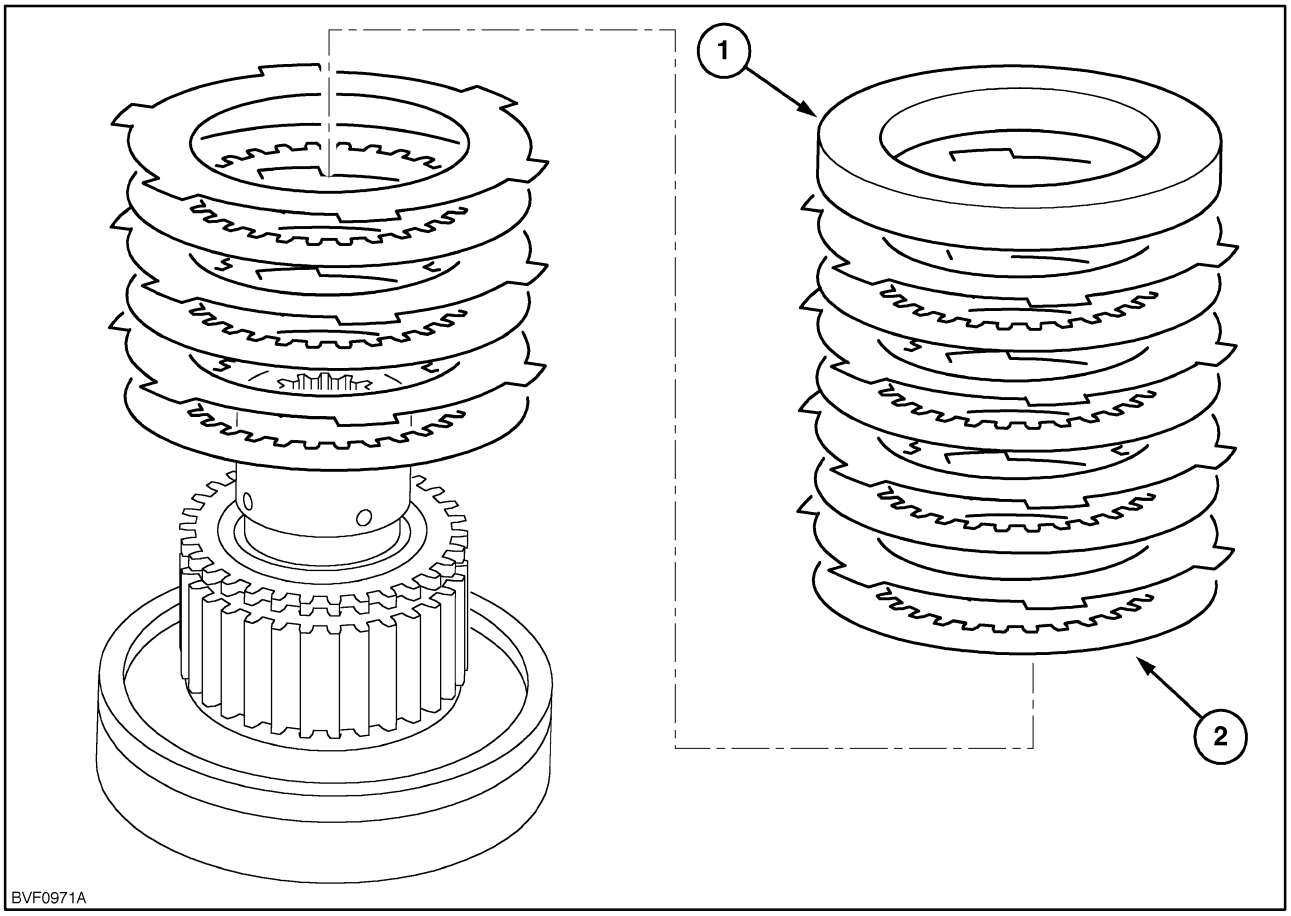
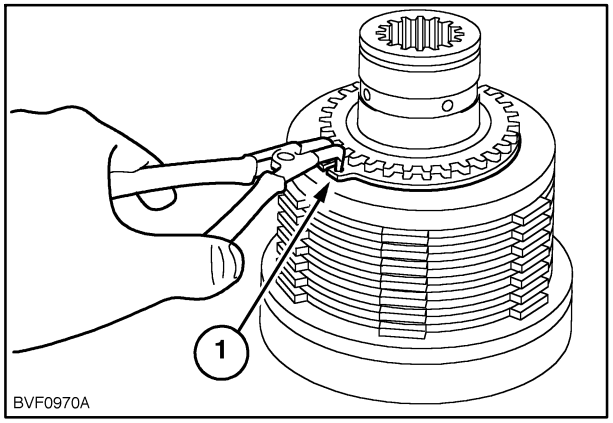


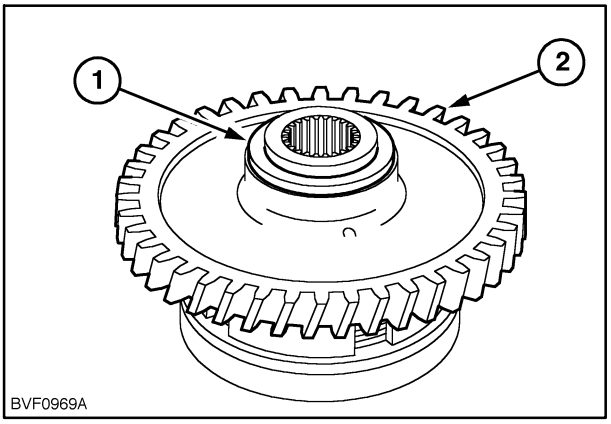
48

6. Install the friction and steel plates (2) and the end plate (1).
7. Using suitable circlip pliers, install the circlip (1).



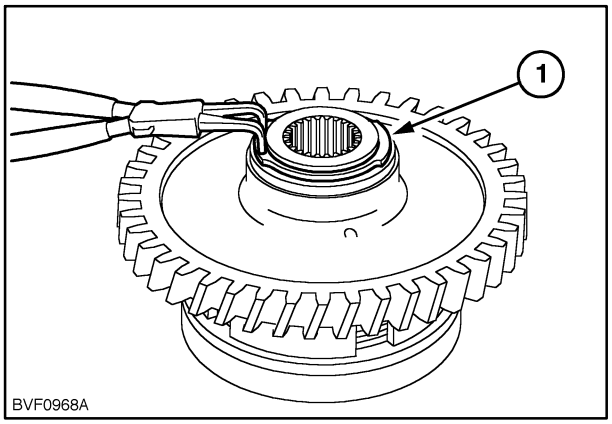
49

8. Install the driven gear (2) and the 'D' washer (1).



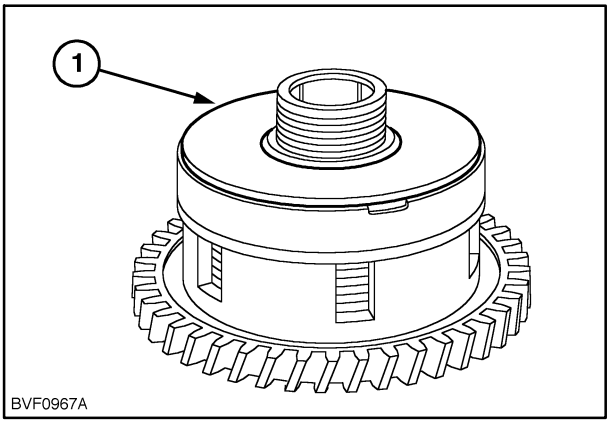
50

9. Using suitable circlip pliers, install the circlip (1).



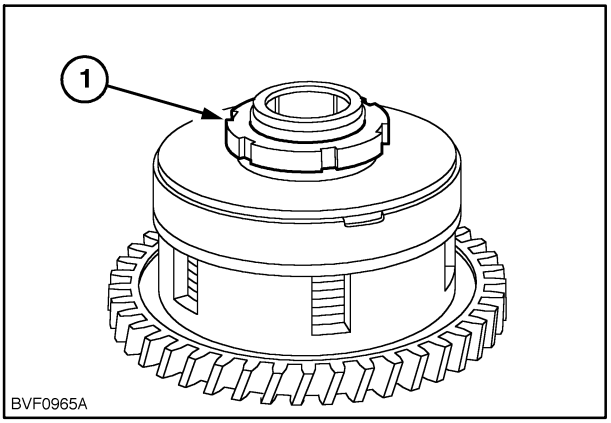
51

10. Rotate the clutch assembly 180°.
11. Install the belleville washer (1).



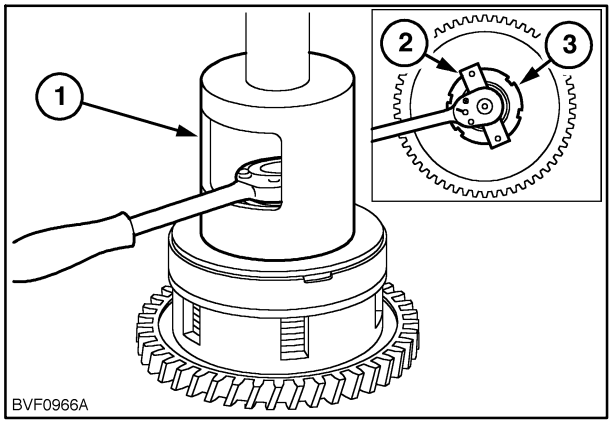
52

12. Loosely install the retaining nut (1).



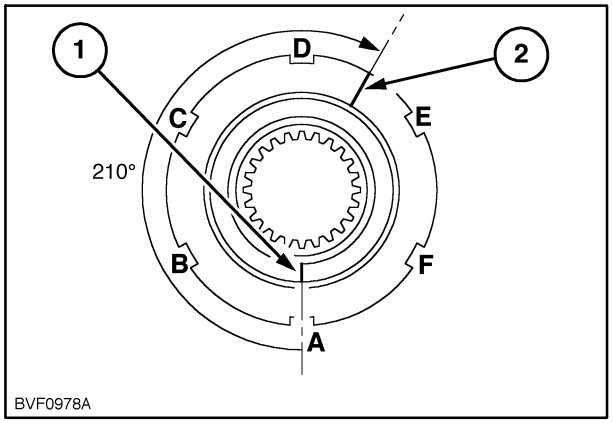
53

13. Using special tool **380000984-1** (1) and a suitable hydraulic press, compress the belleville washer with a force of 2000 - 2200 Kg (4410 - 4850 lbs). Using special tool **380000984-2** (2), tighten the retaining nut (3) to the specified torque value of 15 - 25 Nm (11 - 18 lbf. ft).



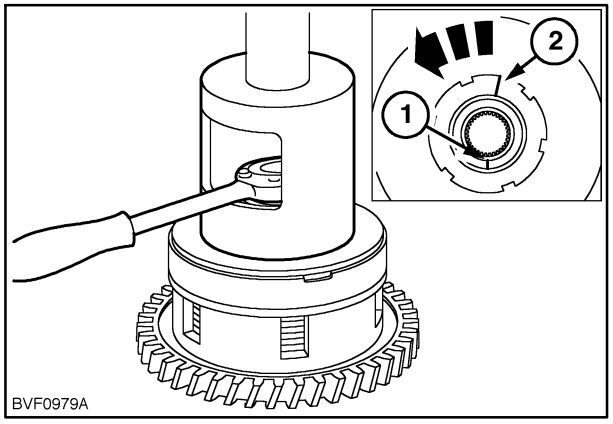
54

14. Remove the special tools.
15. Make a reference mark (1) on the shaft opposite the cut out (A).
16. Make an alignment mark (2) on the retaining nut which is 210° (3.5 flats) clockwise from the reference mark (1) midway between the cut outs (D) and (E).



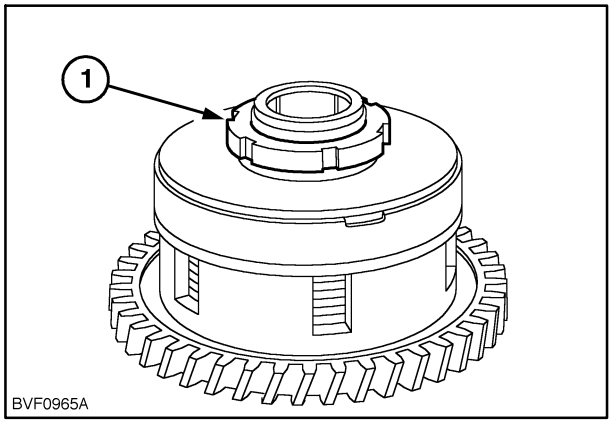
55

17. Using special tool **380000984-1** and a suitable hydraulic press, compress the belleville washer with a force of 2000 - 2200 Kg (4410 - 4850 lbs).
18. Using special tool **380000984-2**, rotate the retaining nut anti-clockwise until the alignment mark (2) is aligned with the reference mark (1).



56

19. Stake the retaining nut (1).



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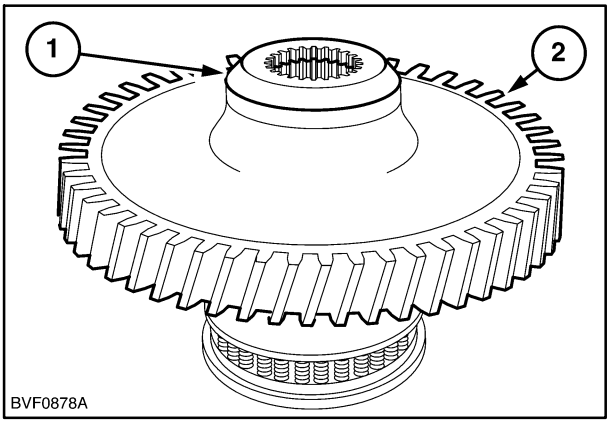
FOUR WHEEL DRIVE DOG CLUTCH

Disassembly

1. Remove the splined washer (1) and the four wheel drive clutch driven gear (2).



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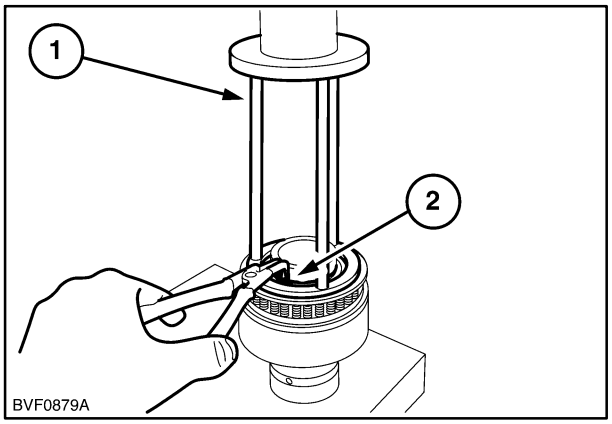
2. Using special tool **295021** (1) and a suitable hydraulic press, compress the spring pack and remove the circlip (2).



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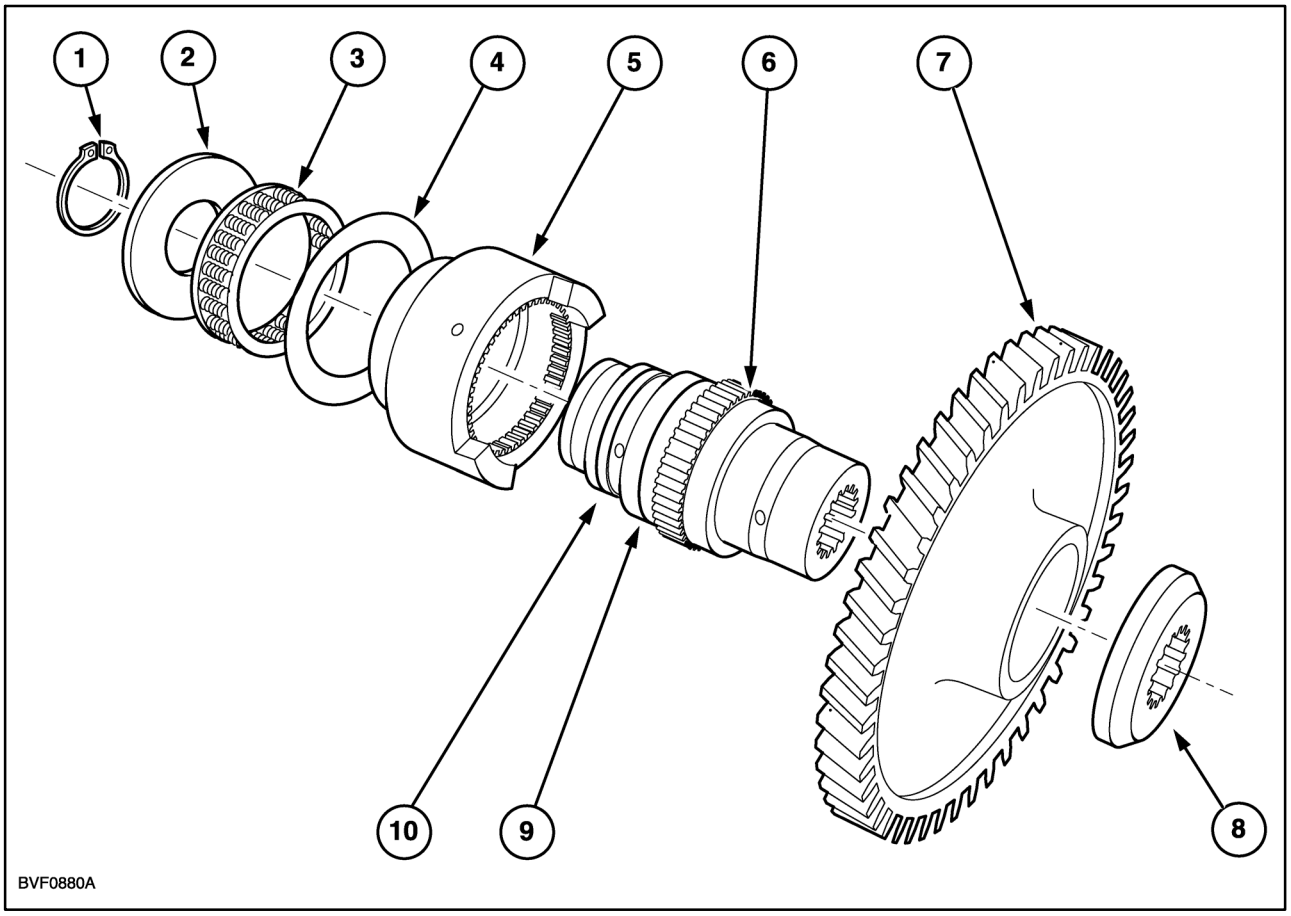

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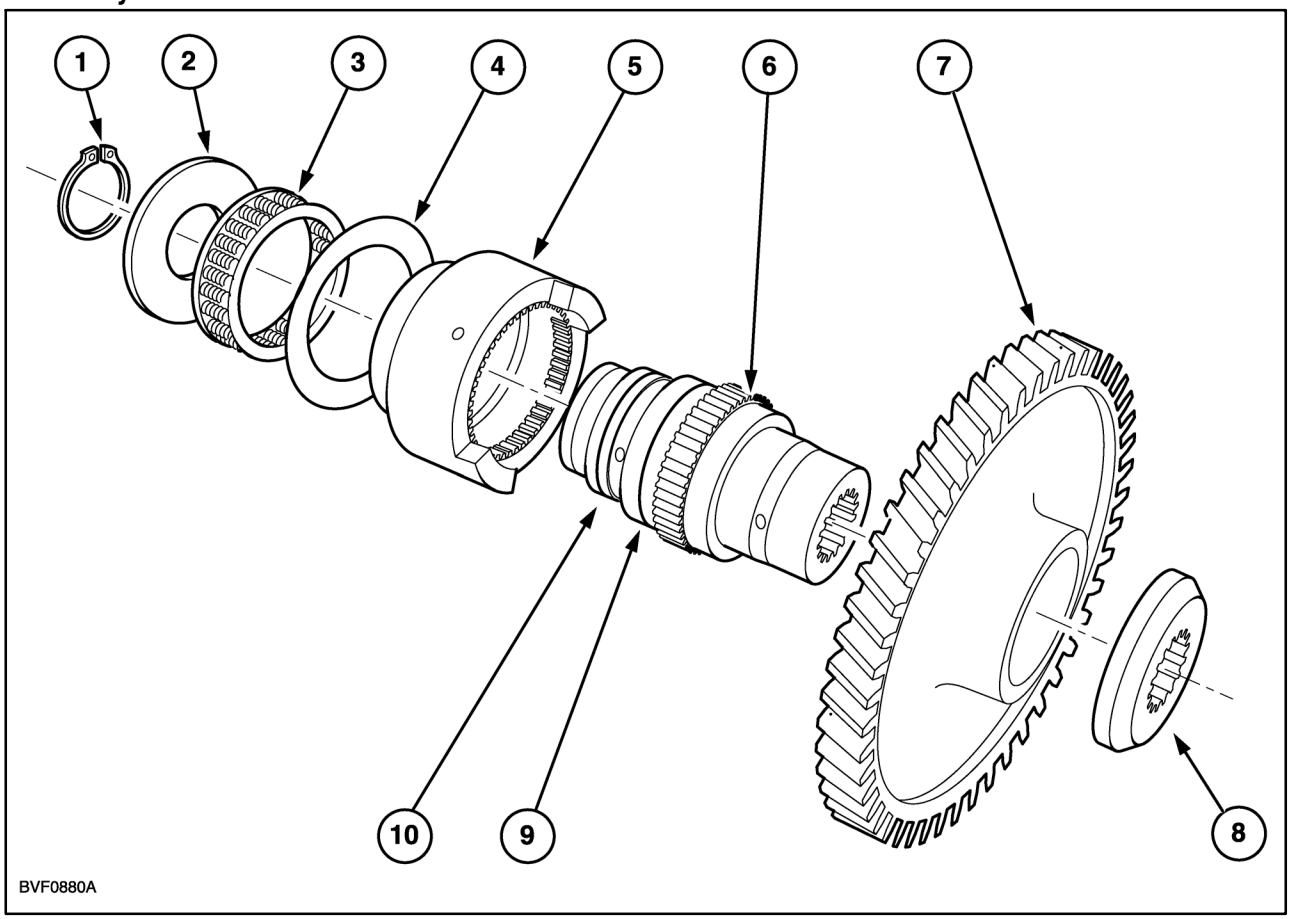
Dog Clutch Four Wheel Drive Exploded View

1. Circlip
2. Spring pack retaining washer
3. Spring pack
4. Washer
5. Control piston with engaging dog teeth
6. Control piston shaft
7. Driven gear with engaging dog teeth
8. Splined washer
9. O-ring
10. O-ring

Assembly



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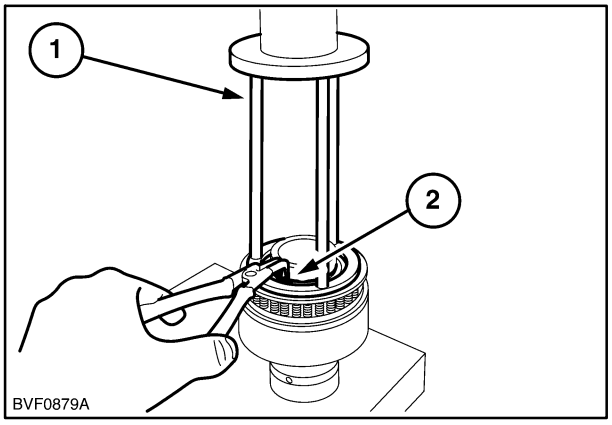
Dog Clutch Four Wheel Drive Exploded View

1. Circlip
2. Spring pack retaining washer
3. Spring pack
4. Washer
5. Control piston with engaging dog teeth
6. Control piston shaft
7. Driven gear with engaging dog teeth
8. Splined washer
9. O-ring
10. O-ring

1. Install new O-rings, items (9) and (10).
2. Apply the specified driveline oil onto the O-rings.
3. Using special tool **295021** (1) and a suitable hydraulic press, compress the spring pack and install the circlip (2).



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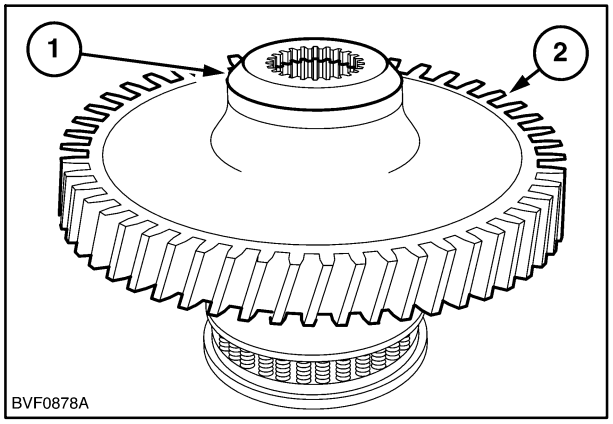
4. Install the four wheel drive clutch driven gear (2) and the splined washer (1).



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FOUR WHEEL DRIVE CLUTCH

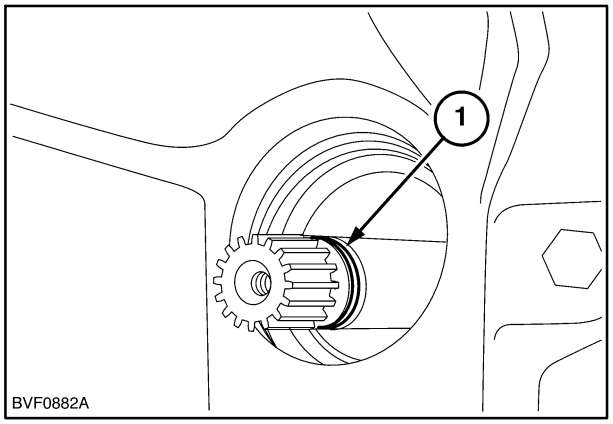
Installation

(Op. 23 202)

⚠ WARNING ⚠

Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install a new O-ring (1) onto the driveshaft.



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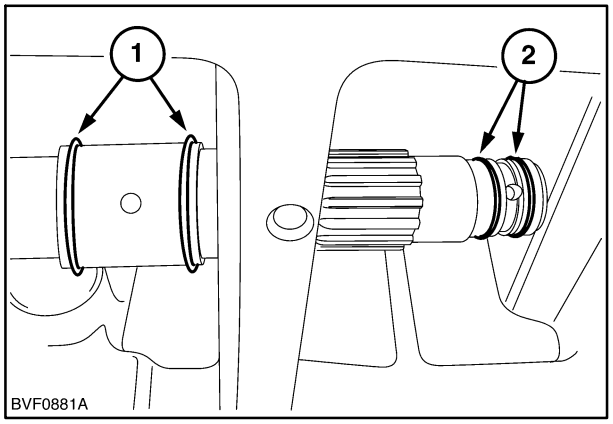
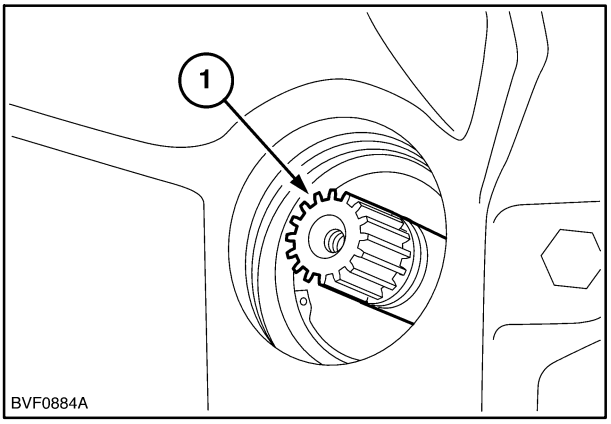
2. Install new O-rings (1) and annular sealing rings (2) onto the driveshaft.
3. Apply the specified driveline oil onto the O-rings and the annular sealing rings.



65

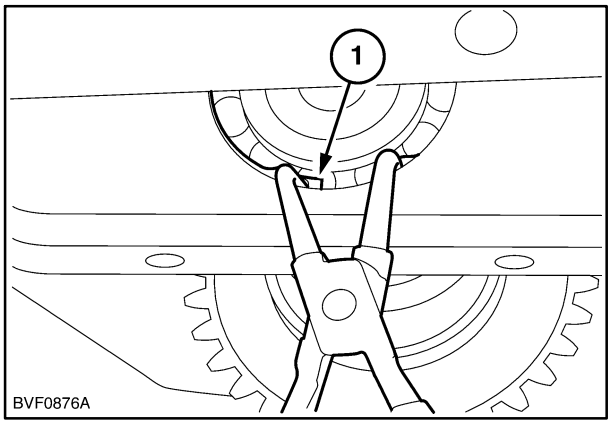
NOTE: *Using a suitable hydraulic jack, support the four wheel drive clutch assembly.*

4. Install the four wheel drive clutch assembly into the rear axle housing.
5. Install the driveshaft (1).



66

6. Using suitable circlip pliers, install the bearing retaining circlip (1).



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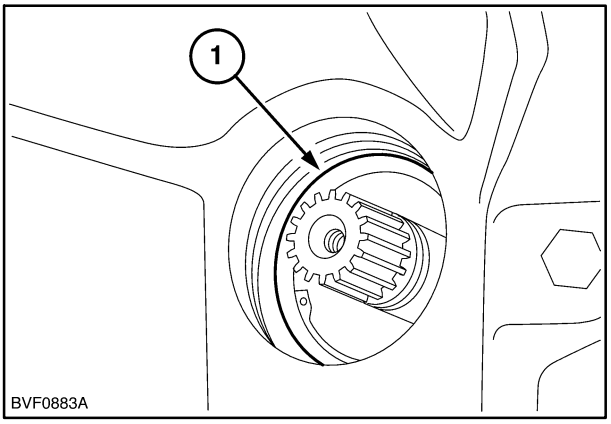
7. Install a new oil seal carrier O-ring (1).



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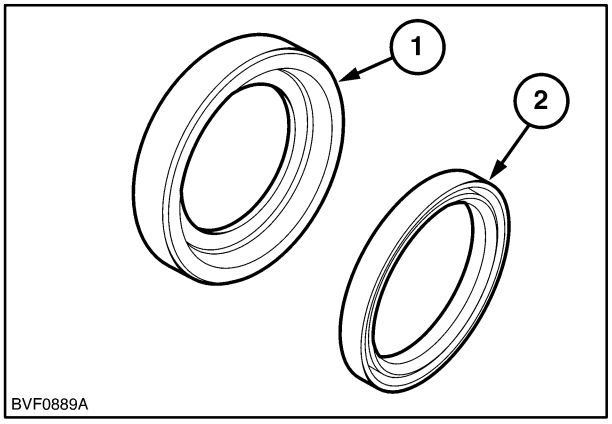
8. Install a new oil seal (2) into the oil seal carrier (1).



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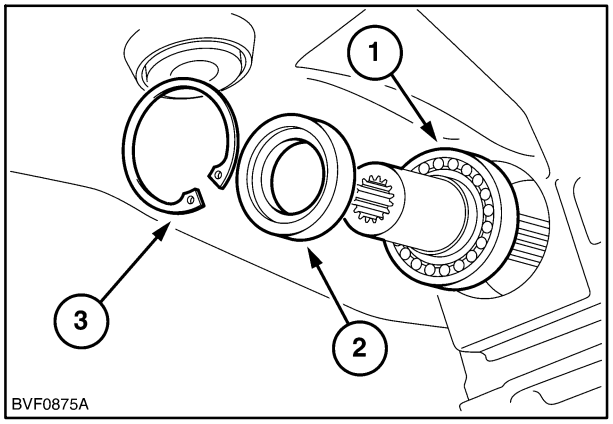
9. Install the four wheel drive coupler (1), oil seal carrier (2), and the oil seal carrier retaining circlip (3).



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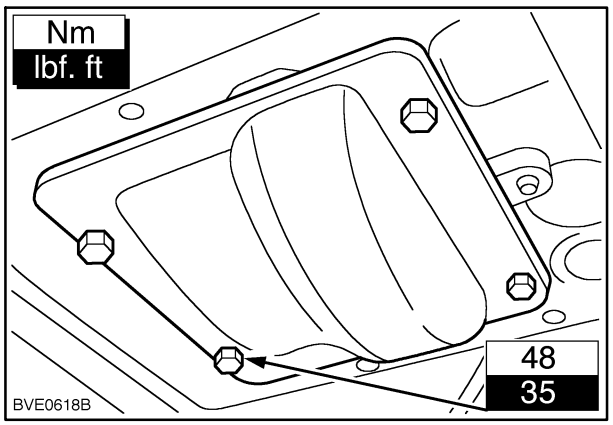
NOTE: *Apply loctite 242 onto the retaining bolt threads.*

10. Install the four wheel drive clutch inner cover. Tighten the retaining bolts to the specified torque value.



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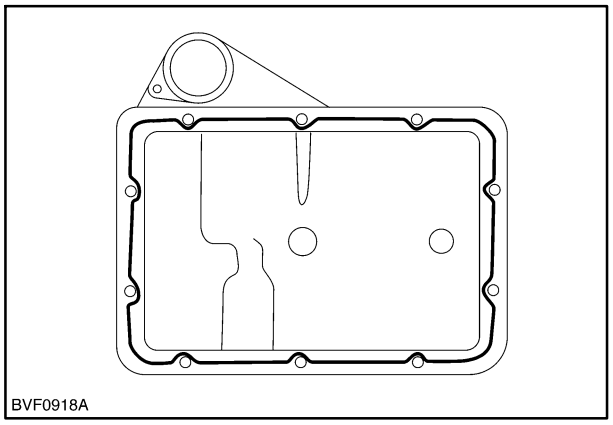
11. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



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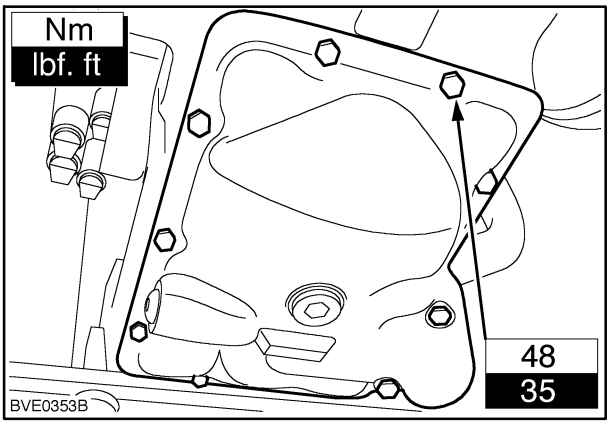
12. Install the rear axle bottom cover. Tighten the retaining bolts to the specified torque value.



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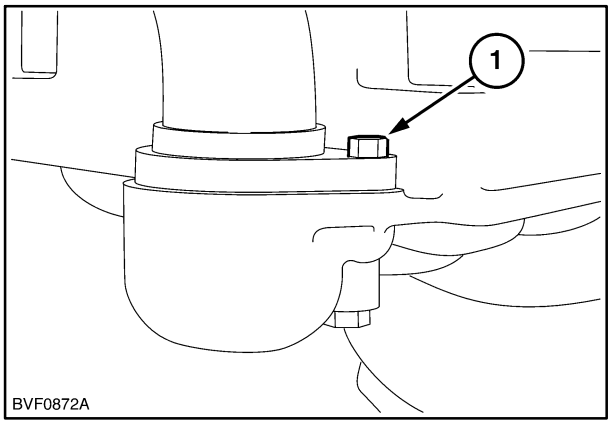
13. Install the oil supply tube retaining bolt (1).



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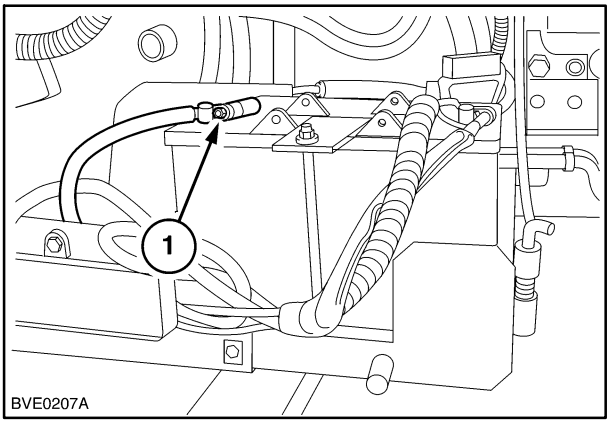
14. Install the four wheel driveshaft (refer to four wheel driveshaft installation in this chapter).
15. Refill the driveline with the correct specified oil.
16. Connect the battery negative cable (1) and install the battery cover.



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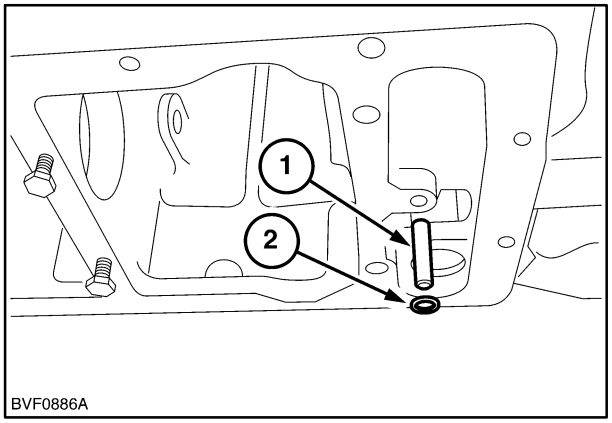
FOUR WHEEL DRIVESHAFT OIL SUPPLY MANIFOLD

Removal

1. Remove the four wheel drive clutch (refer to four wheel drive clutch removal in this chapter).
2. Remove the power take-off (PTO) housing (refer to PTO housing removal in the PTO section.
3. Remove the O-ring (2) and the oil supply manifold retaining pin (1).



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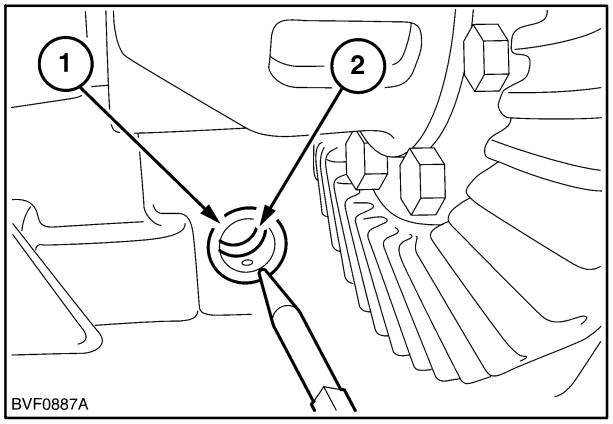
4. Using a suitable punch, remove the oil supply manifold (1) and the bearing (2).



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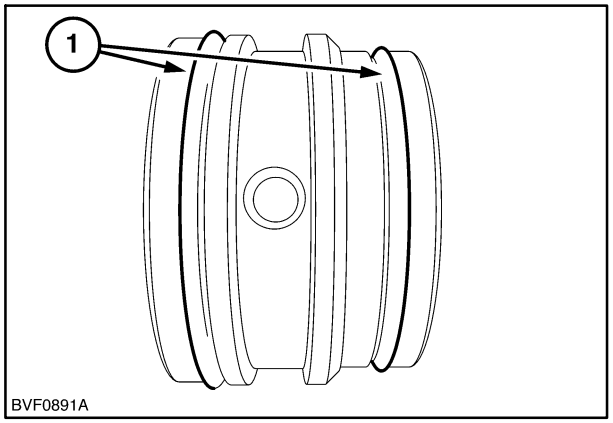
Installation

1. Install new O-rings (1) onto the oil supply manifold.



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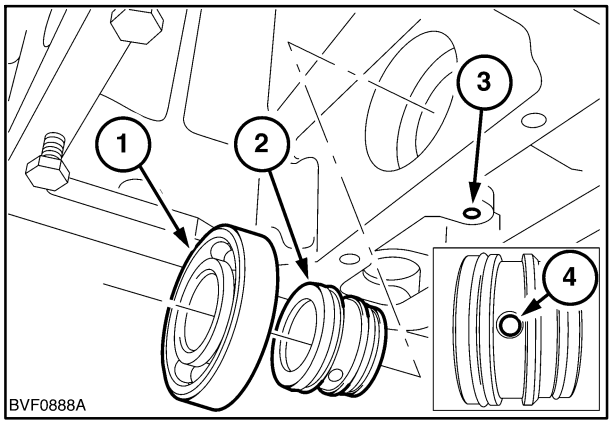
NOTE: *Make sure the hole (4) in the oil supply manifold is aligned with the hole (3) in the rear axle housing.*

2. Install the oil supply manifold (2) and the bearing (1) into the rear axle housing.



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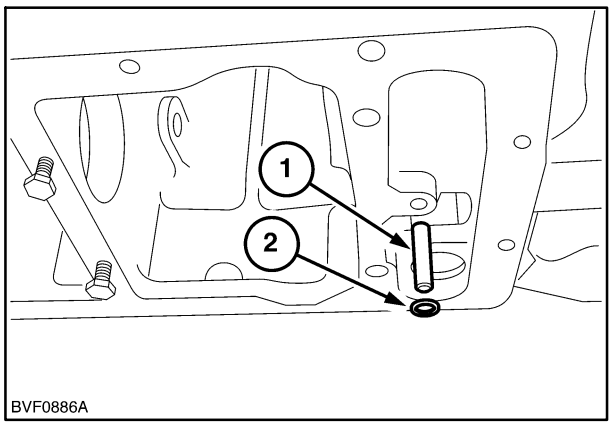
3. Install the oil supply manifold retaining pin (1) and a new O-ring (2).
4. Install the power take-off (PTO) housing (refer to PTO housing installation in the PTO section.
5. Install the four wheel drive clutch (refer to four wheel drive clutch installation in this chapter).



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SECTION 25 - MECHANICAL FRONT AXLE

Chapter 1 - Mechanical Front Axle

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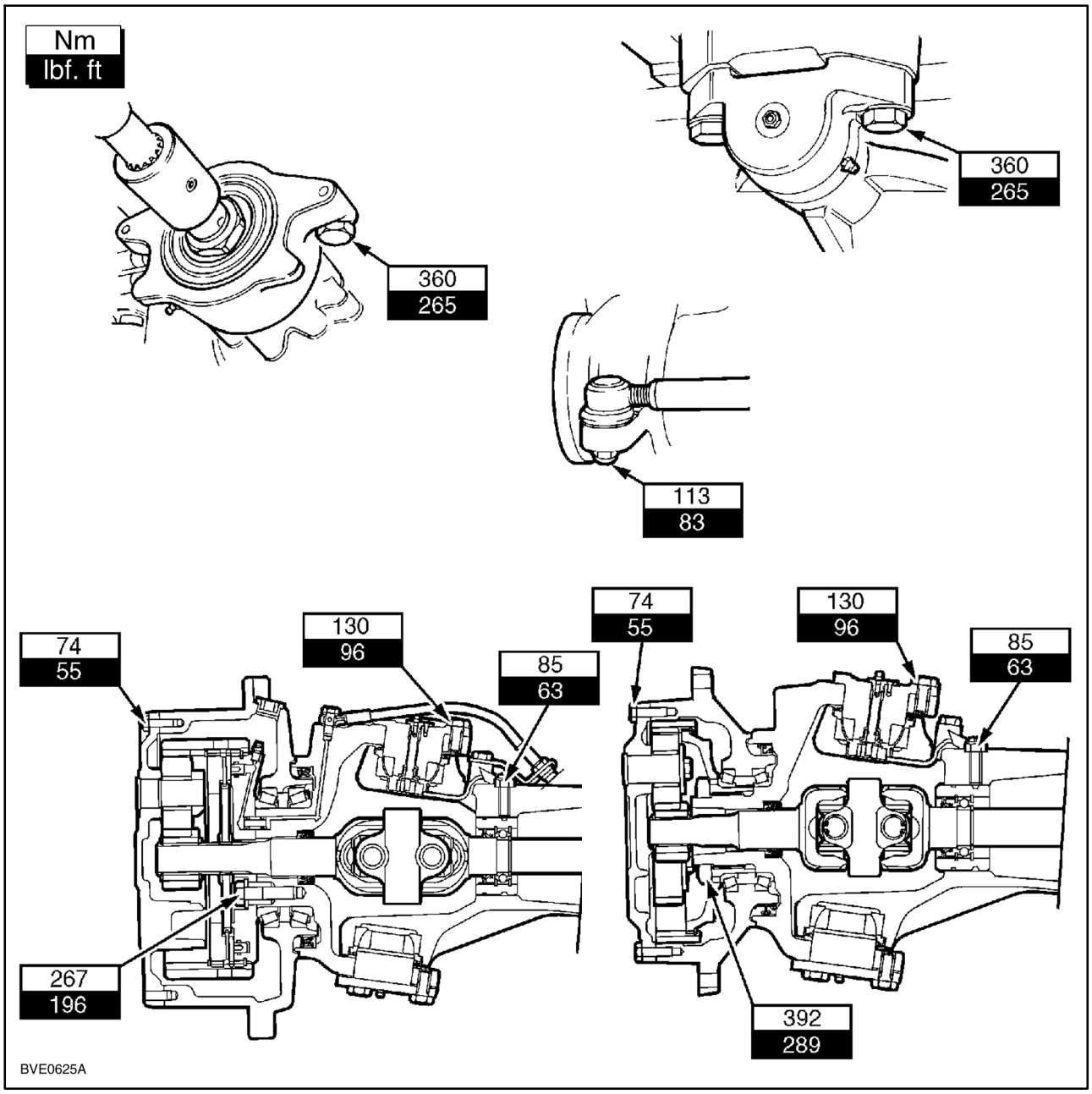
SPECIFICATIONS

Type	steering, stress-supporting, centrally pivoted
Pinion and Crown Wheel - Differential	
Pinion to crown wheel reduction ratio	10/34 = 1:3.4
Pinion to crown wheel backlash mm	0.18 - 0.23
Cone point adjustment shims (8, page 9) mm	2.5 - 2.6 - 2.7 - 2.8 - 2.9 - 3.0 - 3.1 - 3.2 - 3.3 - 3.4 - 3.5 - 3.6 - 3.7
Pinion bearing adjustment shims (12) mm	2.50 - 2.55 - 2.60 - 2.65 - 2.70 - 2.75 - 2.80 - 2.85 - 2.90 - 2.95 - 3.00 - 3.05 - 3.10 - 3.15 - 3.20 - 3.25 - 3.30 - 3.35 - 3.40 - 3.45 - 3.50 - 3.55 - 3.60 - 3.65 - 3.70 - 3.75 - 3.80 - 3.85 - 3.90 - 3.95 - 4.00 - 4.05 - 4.10 - 4.15 - 4.20 - 4.25 - 4.30 - 4.35 - 4.40 - 4.45 - 4.50 - 4.55 - 4.60 - 4.65 - 4.70 - 4.75 - 4.80
Crown wheel point adjustment shims (2) mm	0.9 - 1.0 - 1.1 - 1.2 - 1.3 - 1.4 - 1.5 - 1.6 - 1.7 - 1.8 - 1.9 - 2.0
Side gear to differential gear backlash mm	0.15
Differential gear thrust washer (5) thickness mm	1.470 - 1.530
Side gear thrust washer (3) thickness mm	1.4 - 1.5 - 1.6 - 1.7 - 1.8 - 1.9 - 2.0 - 2.1 - 2.2
Differential gear pin (6) diameter mm	23.939 - 23.960
Pin bore diameter on differential gears (7) mm	24.040 - 24.061
Pins to seats mounting clearance mm	0.080 - 0.122
Side gear hub (4) diameter mm	43.961 - 44.000
Hub bore diameter on differential casing mm	44.019 - 44.080
Side gears to seats mounting clearance mm	0.019 - 0.119
Differential Lock Assembly (Dog Clutch)	
Free spring length (1, page 9) mm	approx. 87
Compressed spring length, under a load of 1888 - 2035 N (192.5 - 207.5 kg) mm	approx. 48
Differential Lock Assembly (Multi-Wet Plate Clutch)	
Drive discs (9) mm	1.75 - 1.855
Drive discs (9) quantity	5
Driven discs (10) mm	2.35 - 2.45
Driven discs (10) quantity	6
Axle-Shafts and Swivel Assemblies	
Outer axle-shaft (7, page 10) dia. at the bushings (8) mm	41.975 - 42.000
Press-fit bushing (8) inner diameter mm	42.100 - 42.175 ([1])
Axle-shafts to bushings mounting clearance mm	0.100 - 0.200
Bushings to seats fitting interference mm	0.064 - 0.129
Swivel pin bearing adjust shims (10) mm	0.10 - 0.15 - 0.20 - 0.25 - 0.30

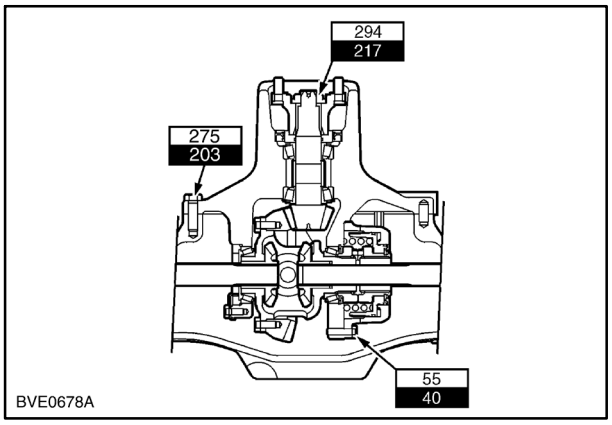
Planetary Reduction Hubs	
Reduction ratio	16:(16+68) = 1:5.25
Planet gear thrust washer (9) thickness . . . . . mm	0.77 – 0.83
Supersteer Swivel Bearing	
Torque required to rotate axle when correctly shimmed	30 – 32 kgm
Supersteer swivel bearing shims . . . . . mm	1.05 – 1.90 in 0.05 increments
Auto 4WD/Difflock	
Auto 4WD will disengage if:	Wheel speed > 20kph When speed ,10kph and steering angle exceeds selected value. When the speed is between 10kph and 20kph and steering angle exceeds selected value
Auto Difflock will disengage if:	Wheel speed > 15kph Wheel speed < 10kph and steering angle exceeds selected value. When the speed is between 10kph and 15kph and steering angle exceeds selected value Rear hitch raise switch is pressed (1 second delay). One brake pedal is pressed (will re–engage when pedal is released)
Inputs required:	Wheel speed sensor/radar. Steering angle sensor. Rear hitch fast raise/lower switch. Brake pedal switches. Auto 4WD or difflock switch.

TIGHTENING TORQUES



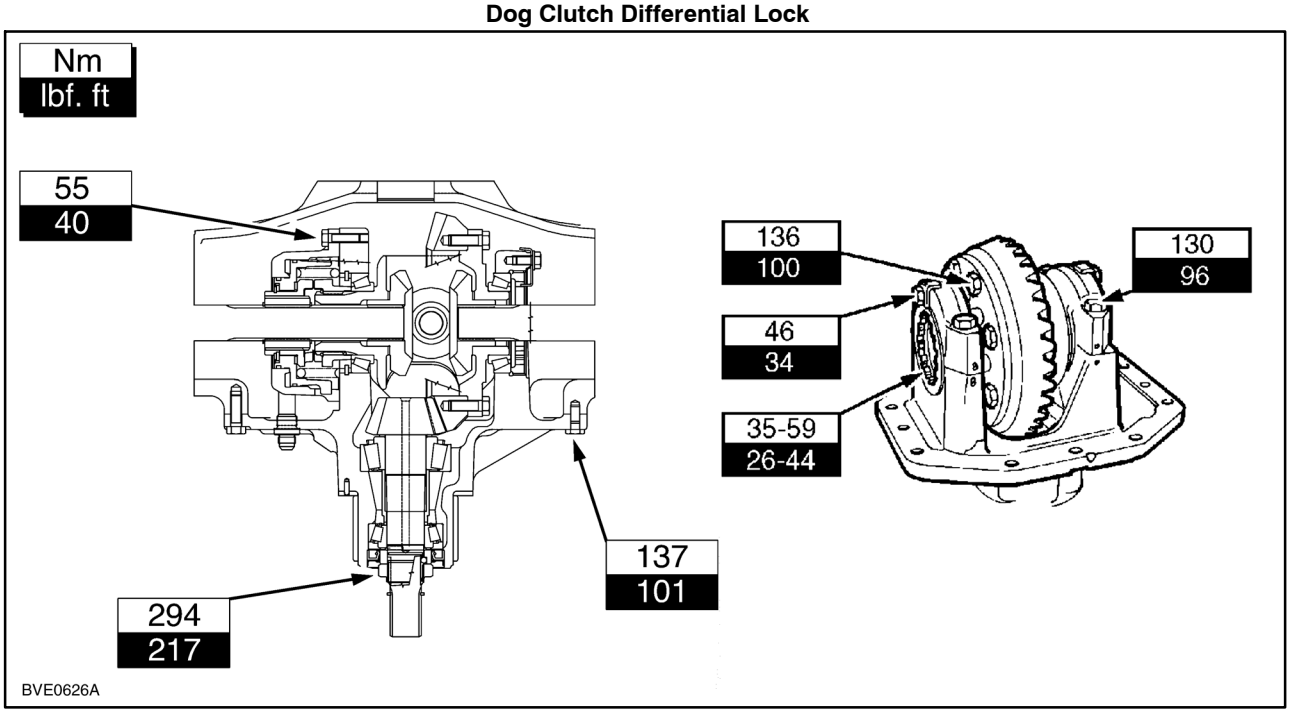
1

Suspended Front Axle



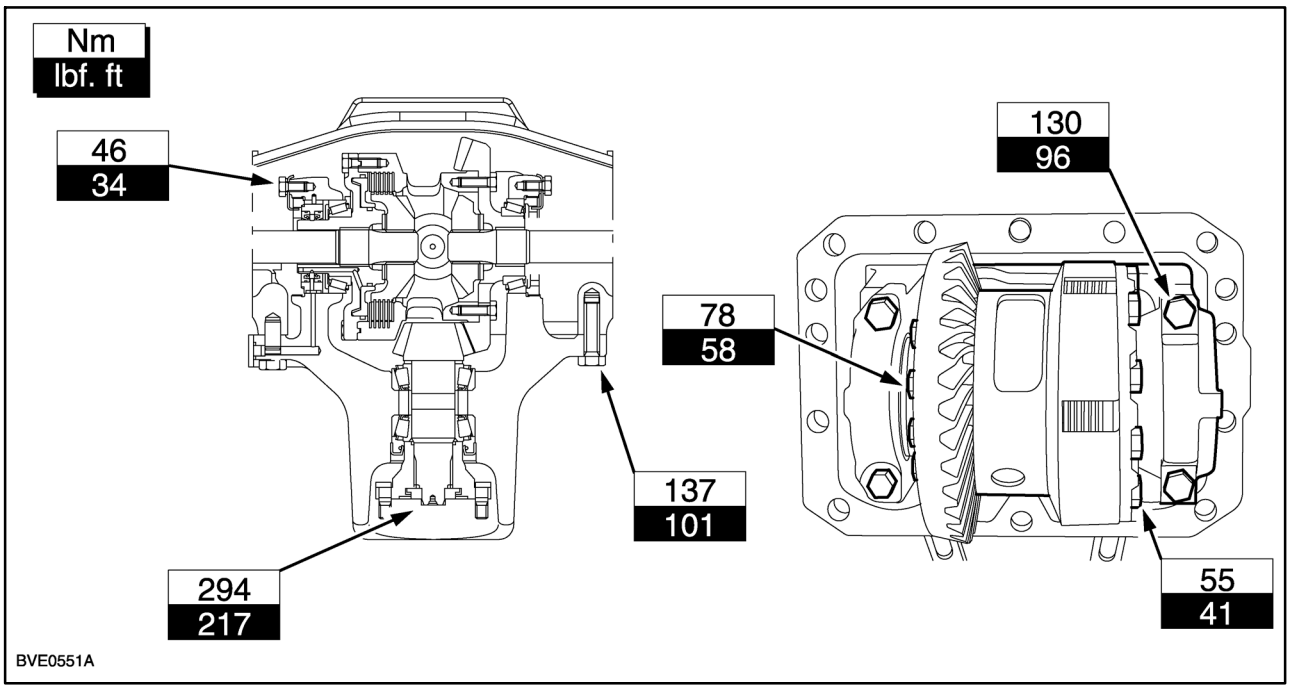
2

Dog Clutch Differential Lock



3

Mulit-Wet Plate Differential Lock



4

SPECIAL TOOLS

⚠ CAUTION ⚠

Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly on this Manual.

List of special tools necessary to carry out the different operations described in this Section.

293460 Front axle overhaul stand

X 291517 Front differential casing removal - installation hook

293743 Front axle differential casing overhaul fixture

X 293878 Front axle drive pinion nut spanner

X 293391/
X 293438 Drive pinion bearing adjustment tool

293876 Front axle drive pinion retaining tool

X 293400 Front axle drive pinion cone point adjustment gauge

293882 Front axle hub bearing pulling aids (two)

292888 Front axle planetary reduction hub alignment pins (M12x1.25)

293857 Front axle swivel pin puller

292161 Front axle swivel pin bearing outer race puller

292220 Front axle bearing rolling torque test tool

293889 Front axle-shaft to swivel housing mounting guide (ClassIII)

292870 Front axle differential engagement oil pressure test kit

X 297132 Front axle drive pinion shimming measurement tool

X 293880 Front wheel hub bearing ring nut spanner (ClassIII)

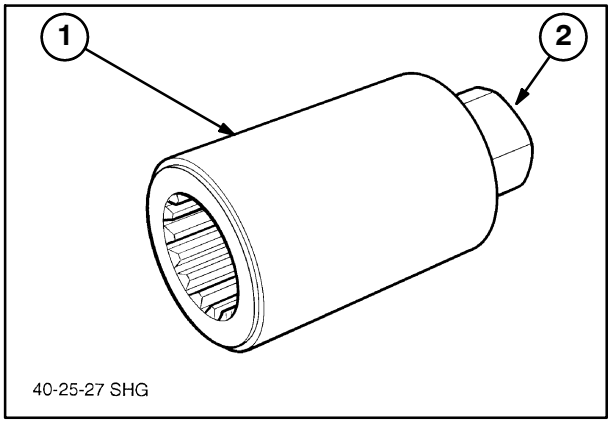
X 293665 Front axle differential casing bearing ring nut spanner

X 380001115 Supersteer/suspended axle differential pinion bearing spacer (use with 293391)

LOCALLY FABRICATED TOOLS

- Front pinion shaft holding tool - fabricate from 4WD shaft coupling
- Supersteer differential vice holding plate
- Supersteer/suspended axle differential casting guide bolts (2 x M16 x 1.5 bolts)
- Supersteer/suspended axle pinion flange holding tool
- Multi-wet plate differential lock depth gauge adaptor plate

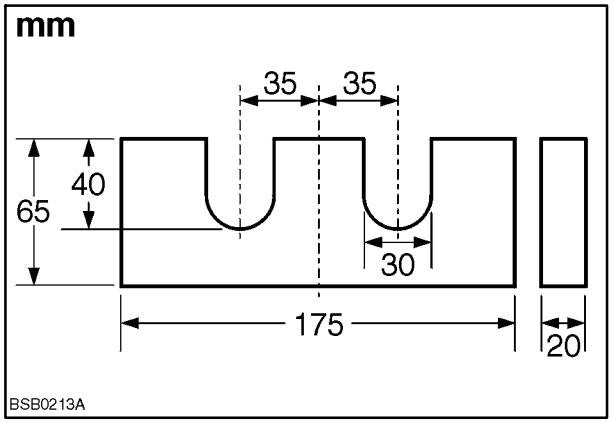
Locally Fabricated Tools



5

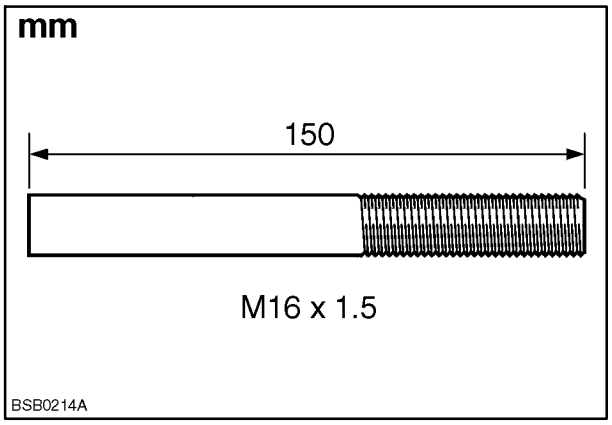
Front Pinion Shaft Holding Tool (Standard Axle)

1. Coupler Part No 81873108
2. 20 mm Nut



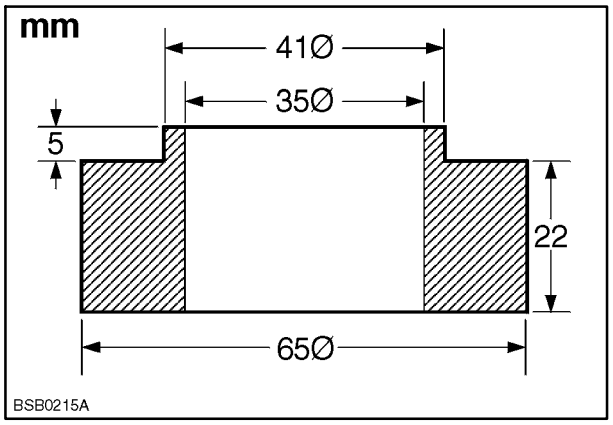
6

Differential Vice Holding Plate (Supersteer Axle)



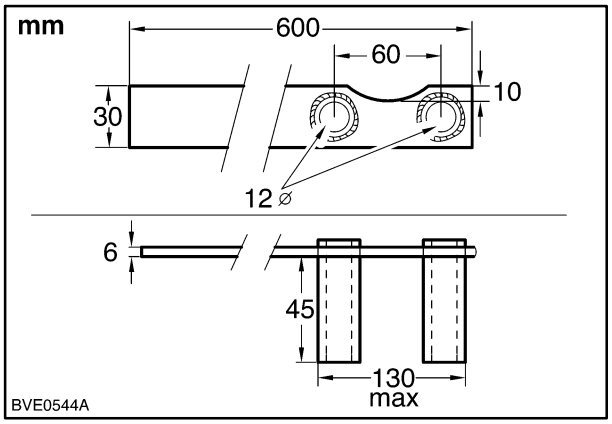
7

Differential Casting Guide Bolts (Supersteer and Suspended Axles)



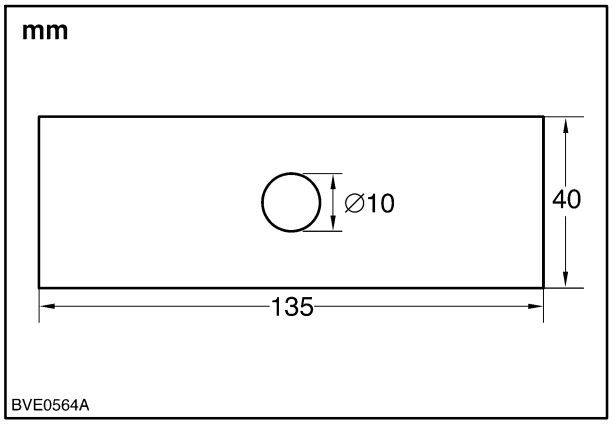
8

Differential Pinion Bearing Setting Spacer (Supersteer and Suspended Axles) Also Available as Special Tool No. 380001115



9

Pinion Flange Holding Tool (Supersteer & Suspended Axle)



10

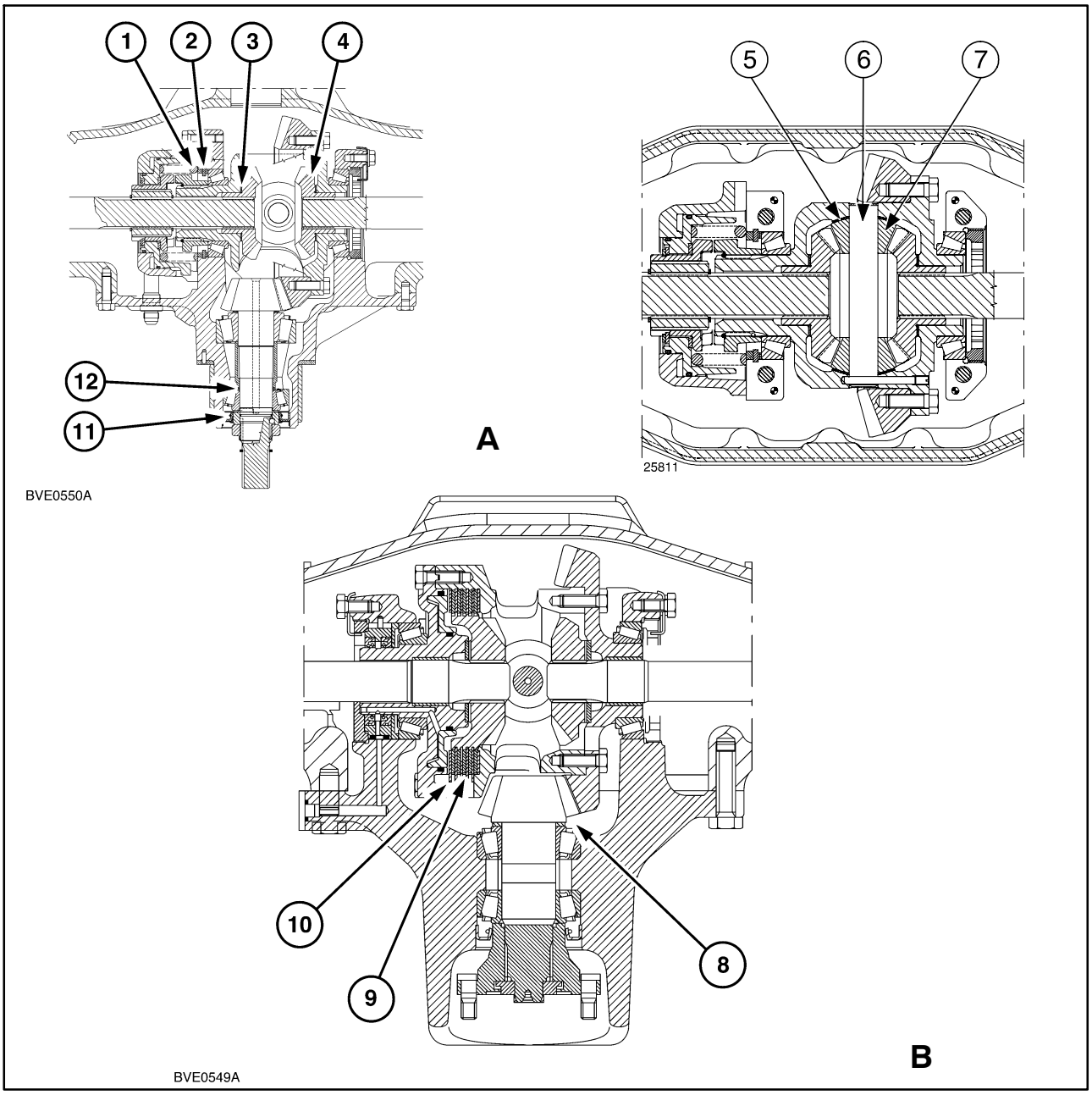
Depth Gauge Adaptor Plate (Multi-Wet Plate Differential Lock)

DESCRIPTION AND OPERATION

The tractors are fitted with a centrally pivoted front axle with support pillars and propshaft parallel to the tractor centreline.

The differential assembly includes two planet gears. Drive is transferred to the epicyclic reduction gear hubs by means of maintenance-free universal joints.

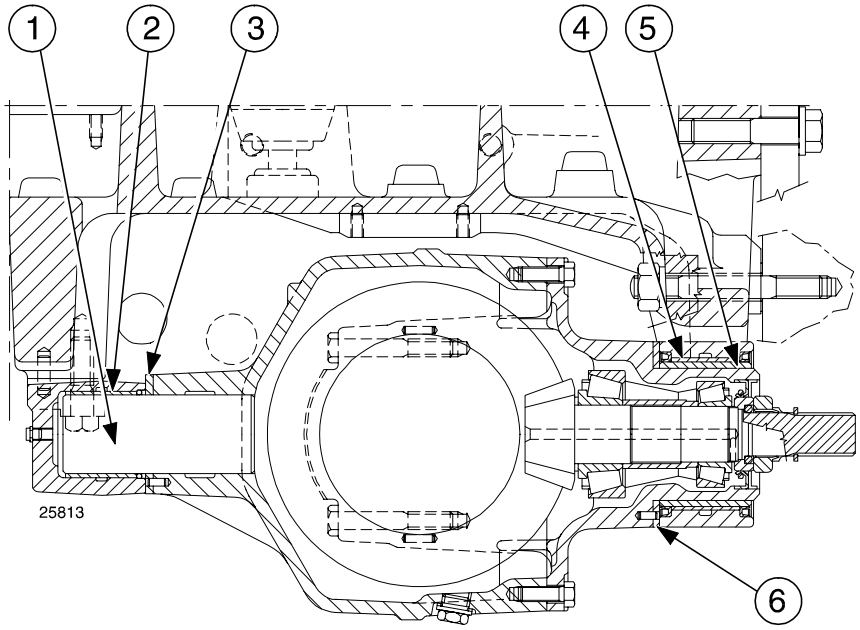
SECTIONAL VIEWS

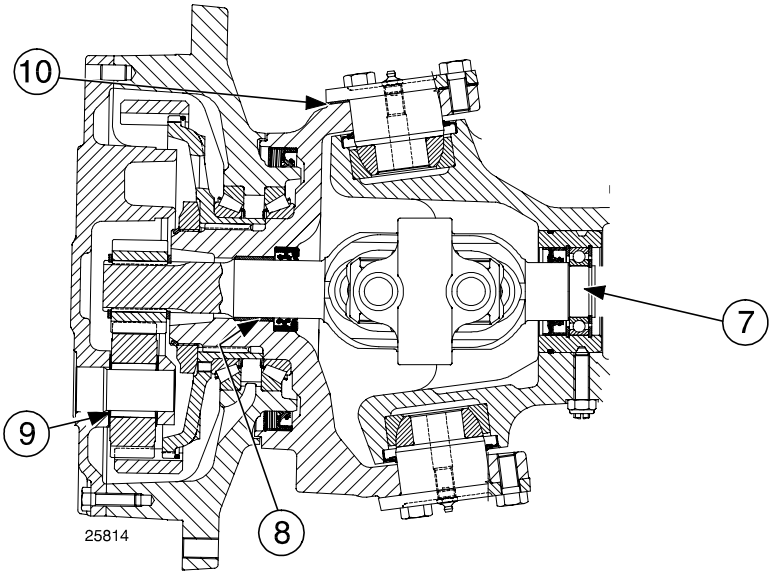


11

Front Axle Cross-Sections

A. Dog Clutch Differential
B. Multi-Wet Plate Clutch Differential
1. Spring
2. Crown wheel bearing adjustment shims
3. Side gear thrust washer shims
4. Side gears
5. Differential gear thrust washer shims
6. Differential gear pin
7. Differential gears
8. Pinion cone point adjustment shims
9. Clutch drive discs
10. Clutch driven discs
11. Oil Seal
12. Pinion bearing adjustment shims





12

Support Pillars and Planetary Reduction Hub Cross-Sections

1. Front support pillar
2. Front support pillar bush
3. Front thrust washer
4. Rear bush (press-fit into support pillar)
5. Rear bush (press-fit into pinion support)
6. Rear thrust washer
7. Outer axle-shafts
8. Bushings
9. Driven gear thrust washers
10. Swivel pin adjustment shims

TROUBLESHOOTING

HYDRAULIC DIFFERENTIAL LOCK

Problem	Possible Cause	Correction
Differential lock not engaging.	1. Rear axle oil level low.	Top up to the correct oil level.
	2. Blocked oil filter.	Replace oil filter.
	3. Faulty hydraulic pump.	Overhaul or replace hydraulic pump.
	4. Faulty differential lock switch.	Replace differential lock switch.
	5. Power supply not reaching the solenoid valve: detached or damaged electrical connectors.	Restore electrical connections and replace faulty parts.
	6. Differential lock solenoid valve stuck on discharge.	Repair or replace differential lock solenoid valve.
	7. Oil leaks through the seals with consequent pressure drop (piston or supply line seals). Multi-wet plate clutch only.	Replace faulty seals.
	8. Worn friction plates (multi wet plate clutch).	Replace friction plates.
Differential lock not disengaging.	1. Differential lock solenoid valve stuck on delivery.	Repair or replace differential lock solenoid valve.
	2. Differential unlock spring broken (dog clutch).	Replace spring.
With differential lock engaged in auto function, the differential lock does not disengage when raising lift arms using the FAST RAISE switch.	1. Faulty controller.	Remove and replace the controller.
With differential lock engaged, the differential lock does not disengage when brake pedals are pressed.	1. Faulty brake pedal switch.	Replace brake pedal switch.

OVERHAUL

STANDARD AXLE

Removal

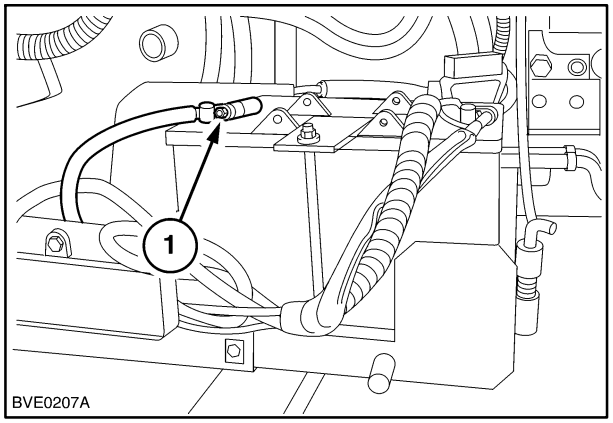
(Op. 25 100 30)

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

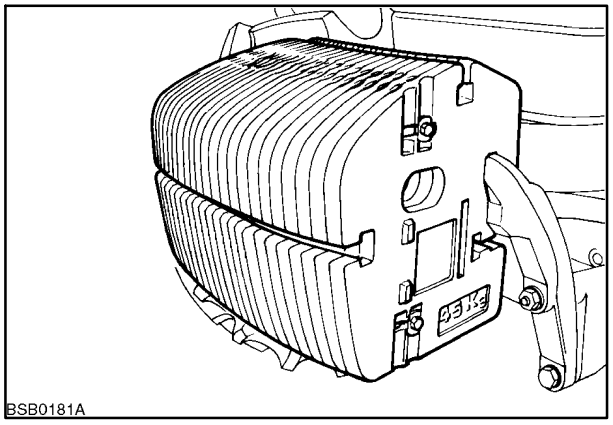
NOTE: *The front axle assembly can be removed from the tractor with either the propshaft removed from or installed in the tractor. The following operations detail how to remove the front axle assembly with the propshaft still in the tractor.*

1. Remove the battery cover and disconnect the battery negative cable (1).



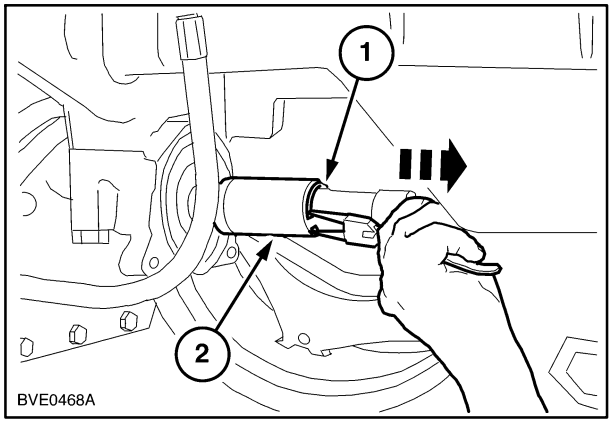
15

2. If front weights are fitted to the front of the tractor remove using a suitable hoist with adequate safe working load.



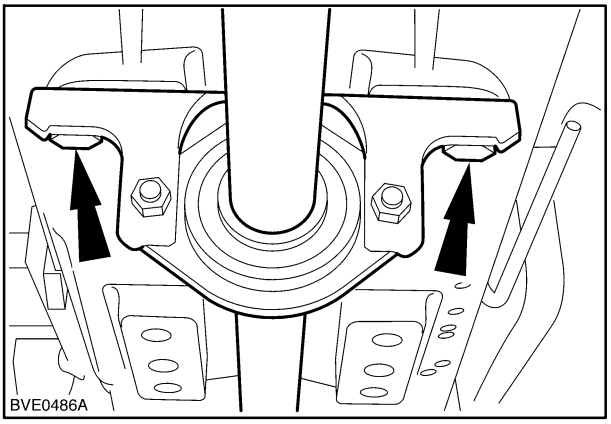
16

3. Remove the four wheel driveshaft guard.
4. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel drive shaft.



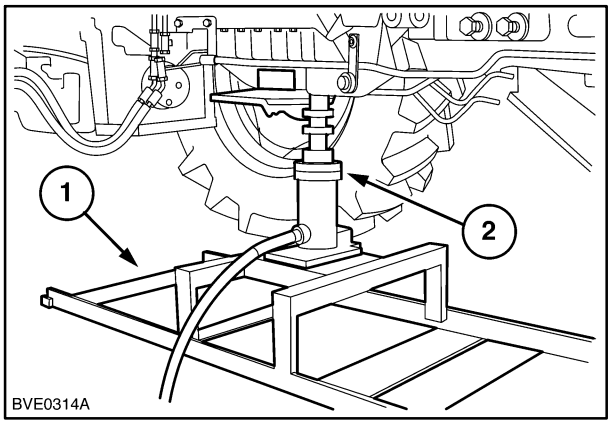
17

5. Remove the four wheel driveshaft and the central support.



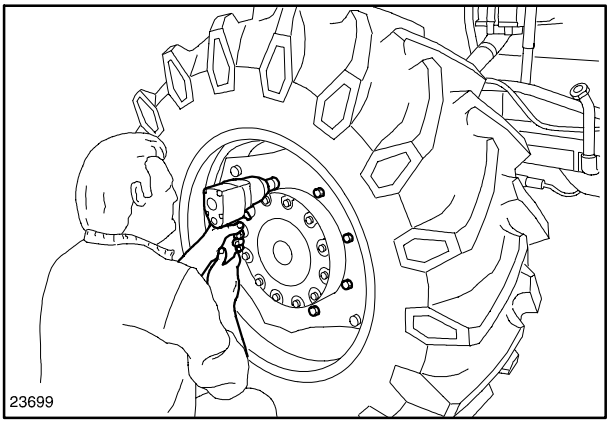
18

6. Position the splitting kit (1) 297471 underneath the tractor.
7. Use the supports (2) in the splitting kit to support the engine on the splitting stand.



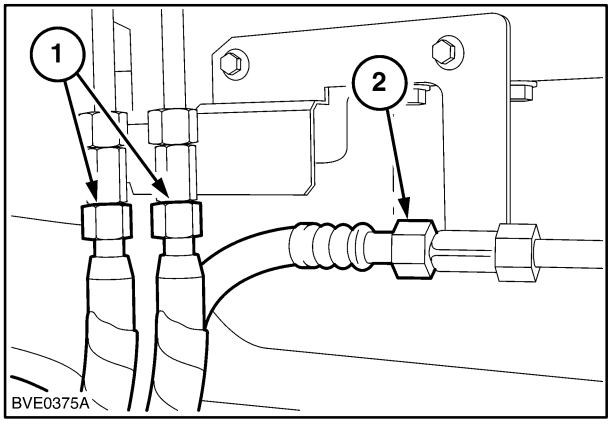
19

8. Lock the front axle relative to the engine using wooden wedges. Remove the front wheels.



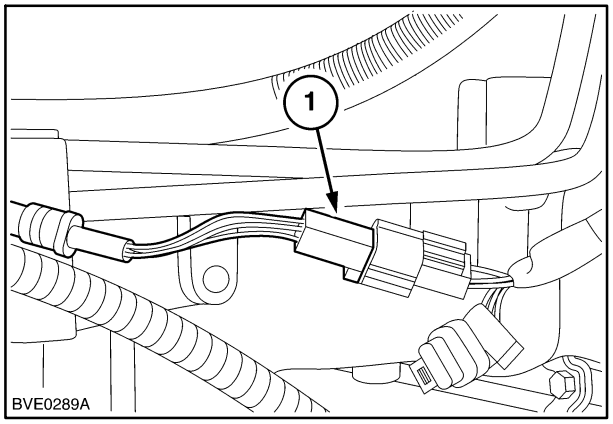
20

9. Disconnect the steering cylinder oil supply and oil return pipes (1).
10. Disconnect the differential lock oil supply pipe (2) (if fitted).



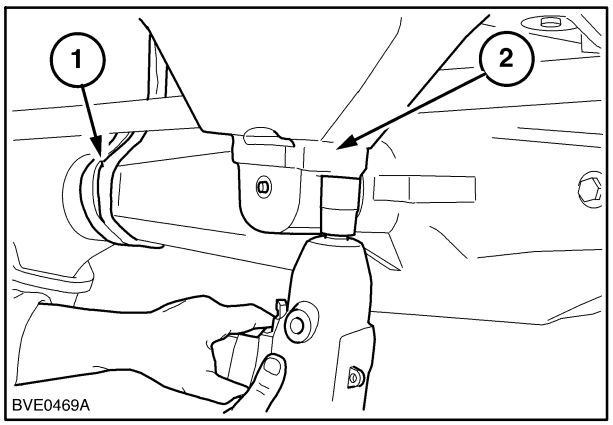
21

11. Disconnect the steering sensor electrical connector (1) (if fitted).



22

12. Using suitable slings (1), attach the axle to a moveable overhead hoist.
13. Remove the front (2) and rear support pillar retaining bolts and remove the front axle.



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Installation

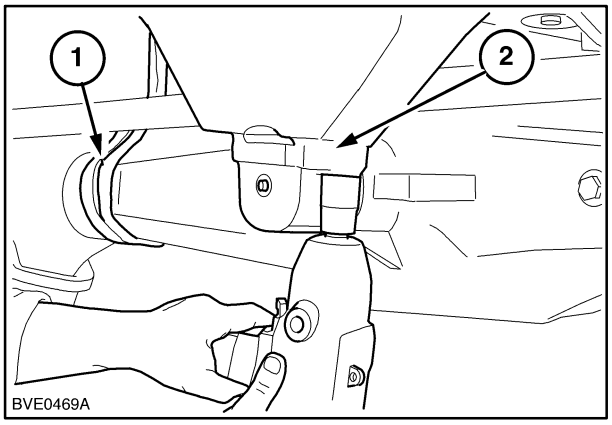
DANGER

Lift and handle all heavy components using lifting equipment of appropriate capacity.Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

WARNING

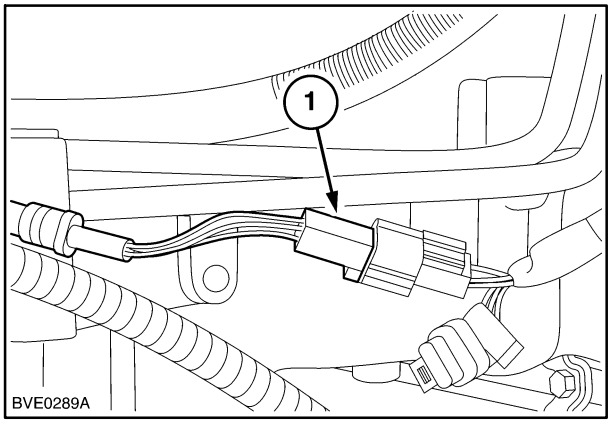
Always use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.

1. Using suitable slings (1), attach the axle to a moveable overhead hoist.
2. Install the front (2) and rear support pillar retaining bolts and tighten to the specified torque value.



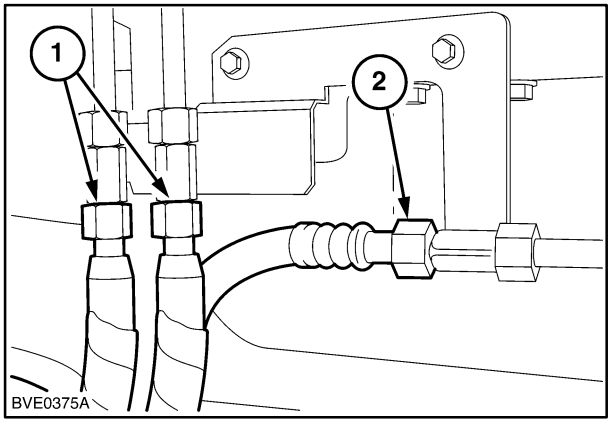
24

3. Connect the steering sensor electrical connector (1) (if fitted).



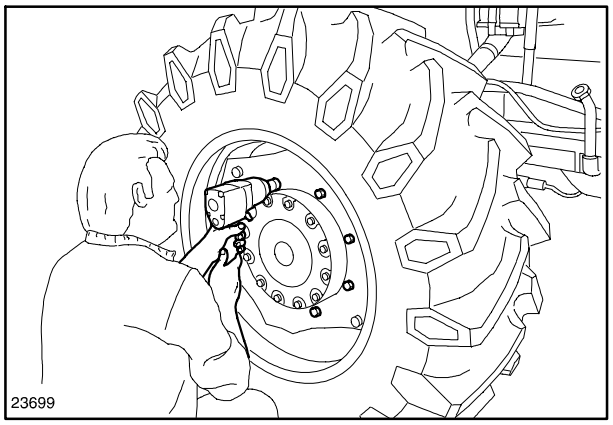
25

4. Connect the steering cylinder oil supply and oil return pipes (1).
5. Connect the differential lock oil supply pipe (2) (if fitted).



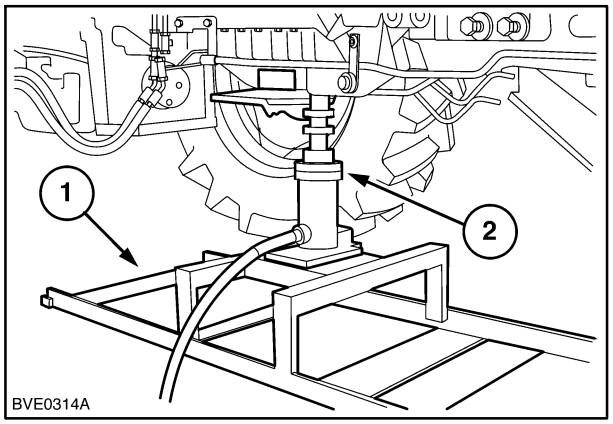
26

6. Install the front wheels and tighten the retaining bolts to the specified torque value. Remove the wooden wedges.



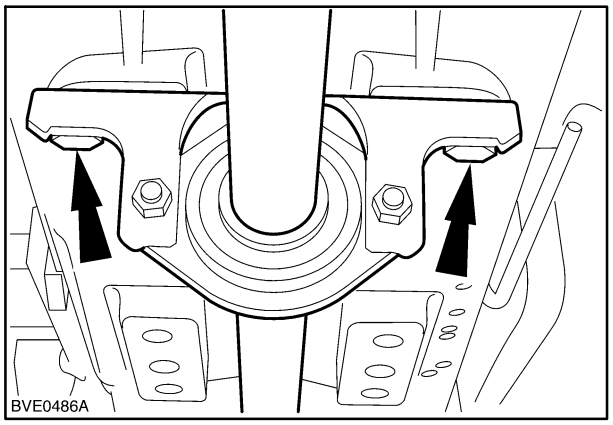
27

7. Remove the supports (2) and the splitting kit (1)



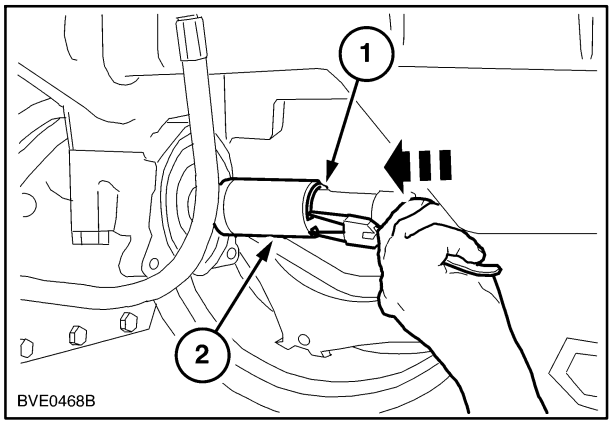
28

8. Install the four wheel driveshaft and the central support.



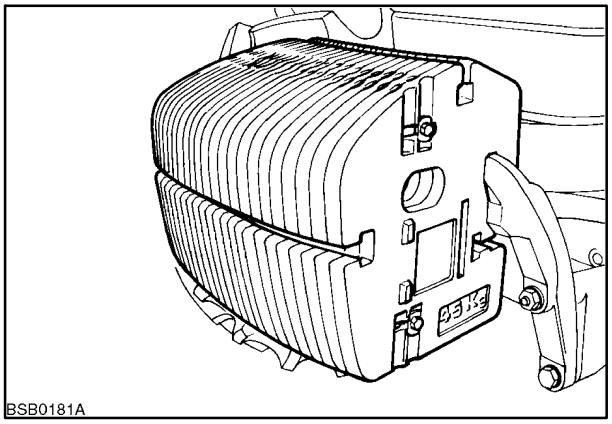
29

9. Expand the circlip (1) and slide the circlip (1) and sleeve (2) along the four wheel driveshaft.
10. Install the four wheel driveshaft guard.



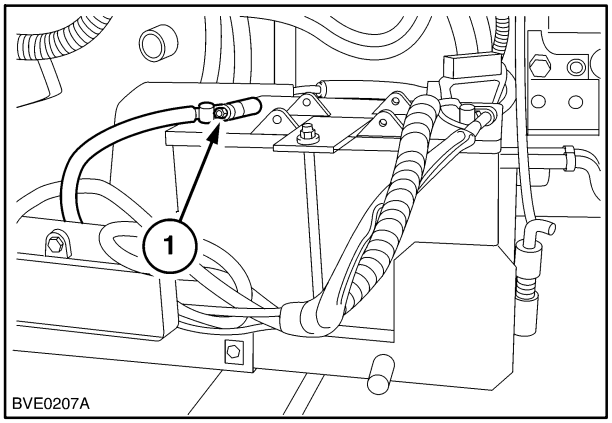
30

11. If front weights are fitted to the front of the tractor install using a suitable hoist with adequate safe working load.



31

12. Connect the battery negative cable (1) and install the battery cover.



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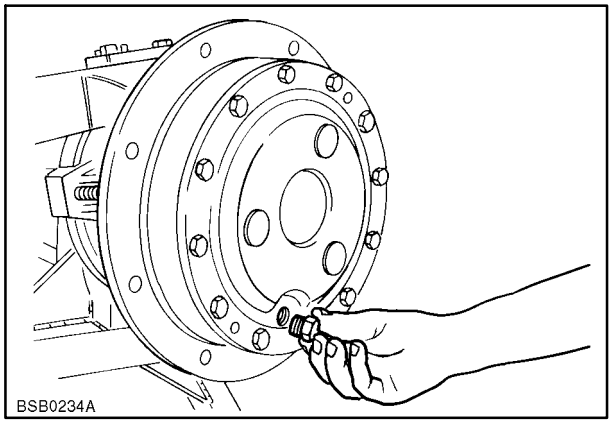
HUB CASSETTE SEAL

Removal

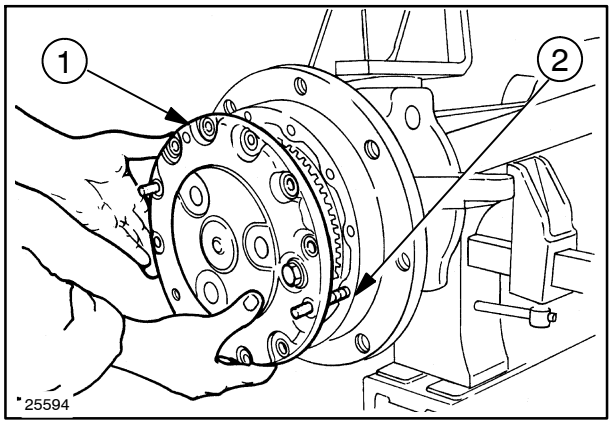
NOTE: *Refer to the Brake section of the Repair Manual for overhaul of front axle brakes if fitted.*

1. Raise the front of the tractor, support the front axle and remove the road wheel.
2. Rotate the hub until the drain plug is at the lowest point and drain the oil from the hub.



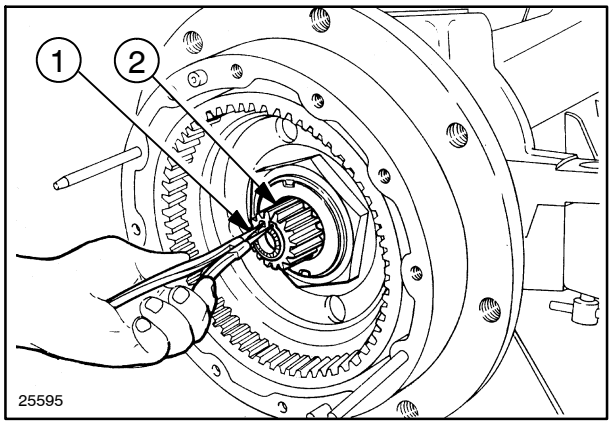
33

3. Remove planetary carrier retaining bolts.
4. Install the special tool **292888** (2).
5. Using a suitable slide hammer screwed into the oil drain plug, remove the planetary cover from the casing.



34

6. Remove the circlip (1) and the sun gear (2).



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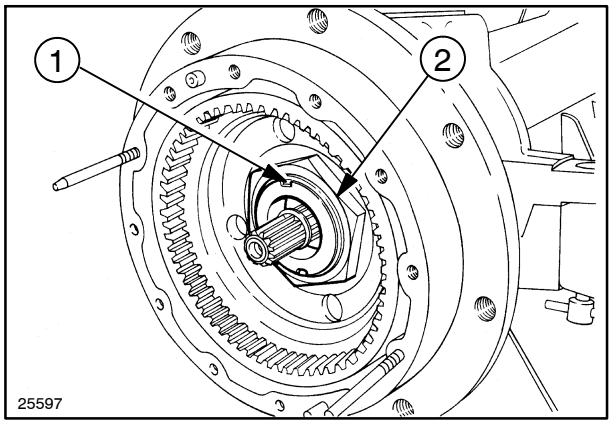
⚠ CAUTION ⚠

Ensure the locking tab is fully released. Failure to follow this caution will result in damage to the thread when removing the ring gear locking nut.

7. Release the locking tab (1) on ring gear locking nut (2).



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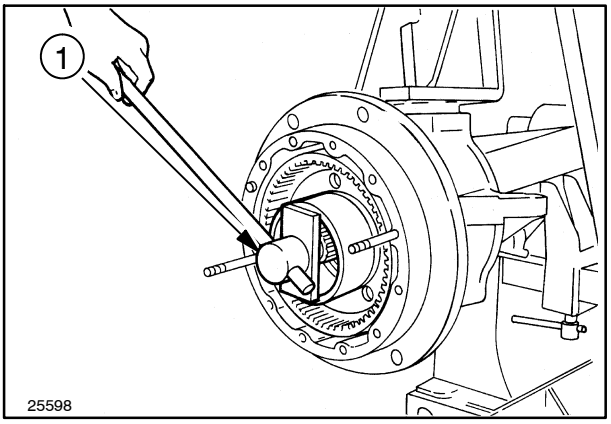
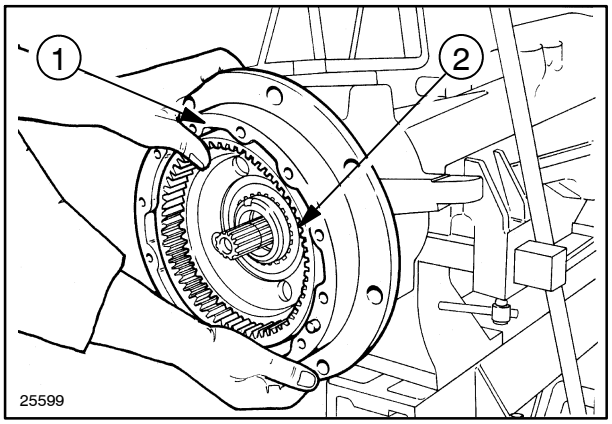
8. Remove the ring gear locking nut using the special tool **293880** (1).



37

9. Remove the wheel hub (1) with the ring gear (2).



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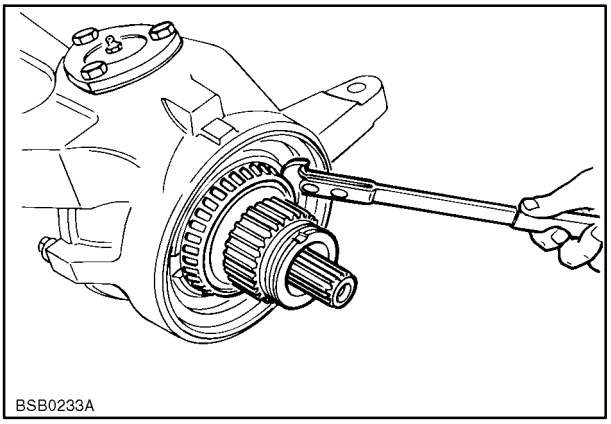
10. Remove the oil seal using a suitable extracting tool.



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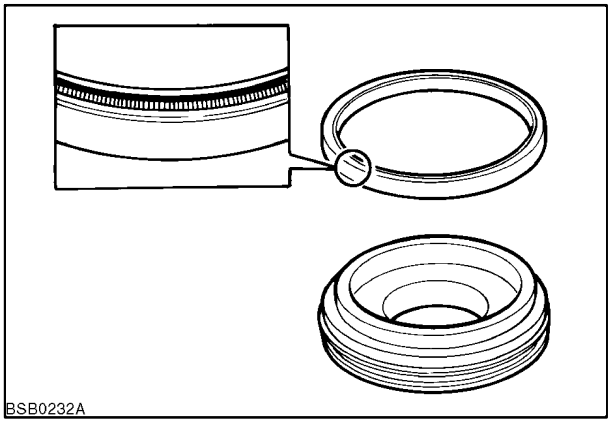
Installation

NOTE: *Ensure the oil seal is positioned onto the special tool with the spiral ring visible.*

1. Position the new oil seal onto the special tool **294094**.



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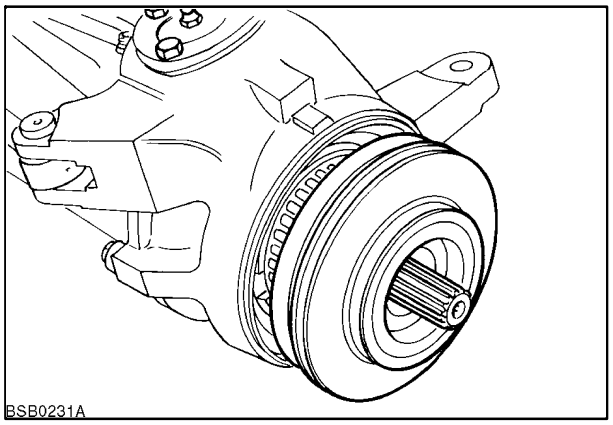
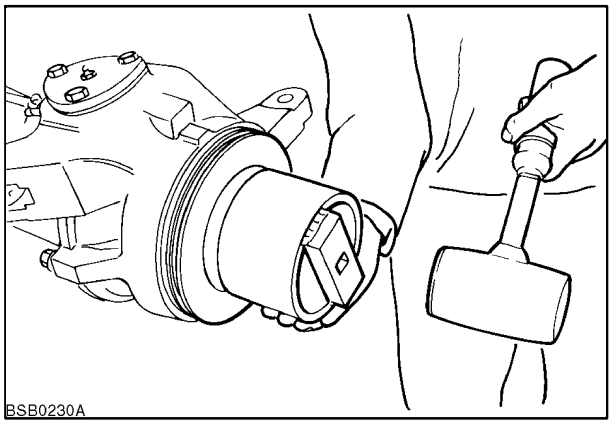
2. Position the special tool and the oil seal over the splines of the swivel housing and gently slide the special tool forward until the oil seal locates in the housing.



41

3. Position a suitable tube on the end of the special tool **294094** and using a **soft** faced hammer, drive the oil seal into the housing. The special tool is designed to accurately position the seal in the housing at the correct depth.

NOTE: *The special tool 293880 can be used when driving in the oil seal. The special tool will not be damaged providing a* ***soft*** *faced hammer is used.*

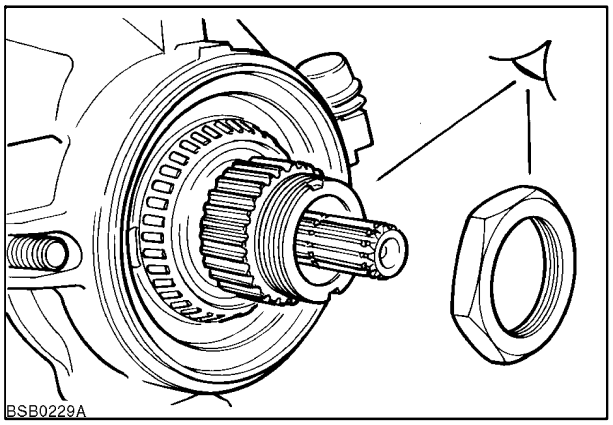


42

4. Re-assemble hub using disassembly procedure in reverse.
5. Install the ring gear and the locking nut.

NOTE: *Before installing the locking nut, ensure there is no swarf in threads on the nut or hub.*

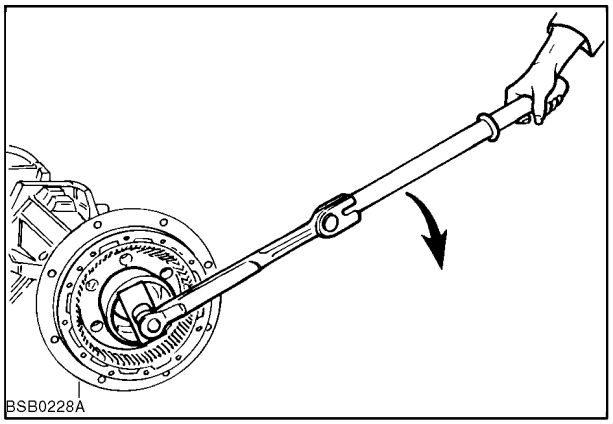
IMPORTANT: *If the locking nut threads are* ***damaged*** *install a new nut, otherwise damage to the thread on the hub will occur when tightening the nut.*



43

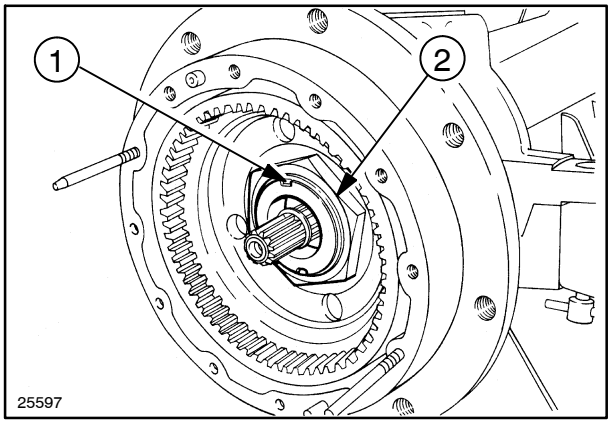
NOTE: *While tightening the nut, continue turning the wheel hub to ensure the bearings are seated.*

6. Tighten ring gear locking nut to the specified torque value of 392 Nm



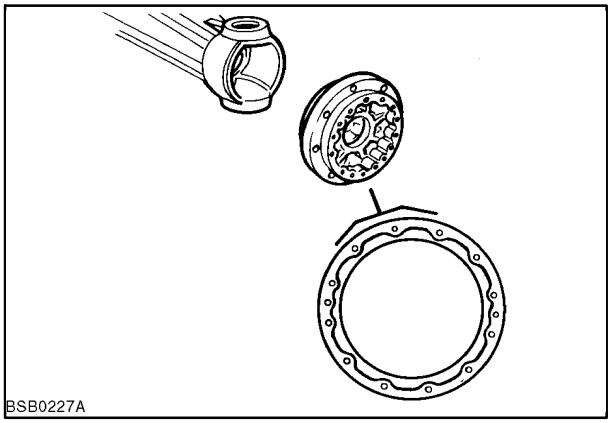
44

7. Bend the locking tab into position on the end of the nut and check that the hub turns without binding.



45

8. Prior to installation of the planetary cover, thoroughly clean the mating surfaces and apply a 2 mm bead of flexible sealing gasket.
9. Refill the hub with oil to the correct specification.

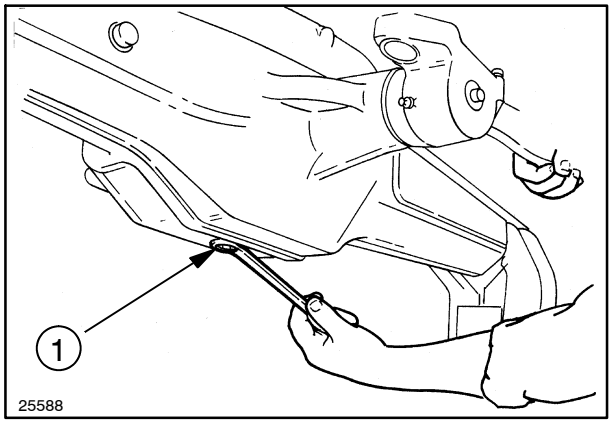


46

FRONT AXLE

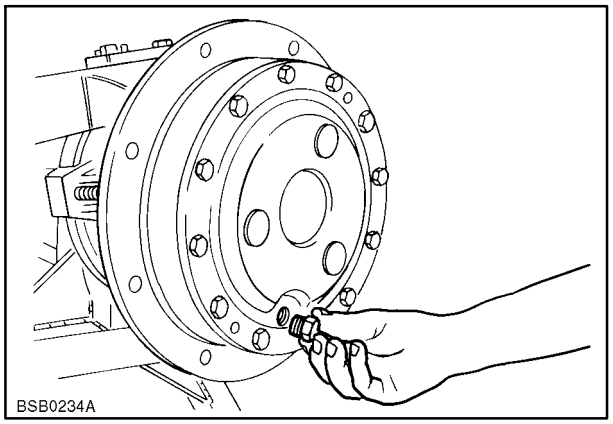
Disassembly

1. Remove the plug (1) and drain the oil from the axle casing.



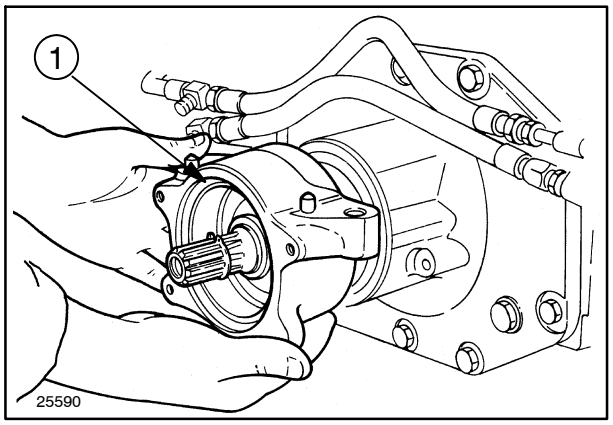
47

2. Rotate the hub until the drain plug is at the lowest point and drain the oil from the hub.



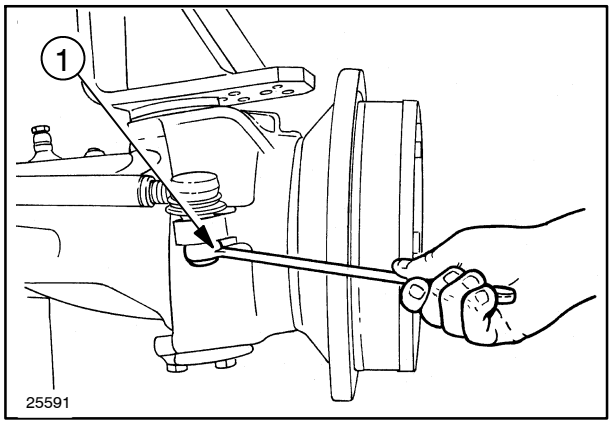
48

3. Remove the rear support (1) from the front axle. Remove the front support and retrieve the washer.



49

4. Unscrew the two track rod end retaining bolts (1).

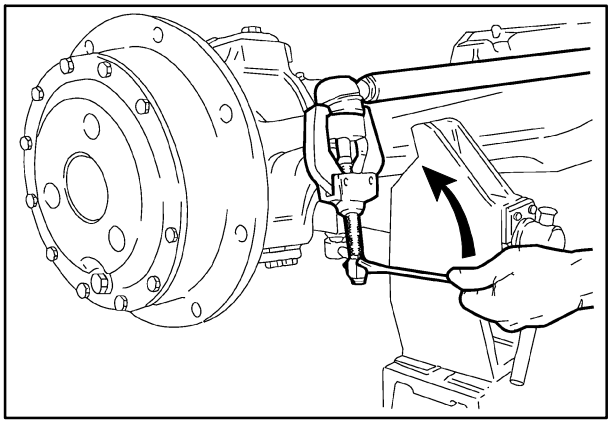


50

⚠ CAUTION ⚠

Prior to the removal of the track rod end ensure that the hubs will not rotate on their swivels, causing the axle to fall from its stand.

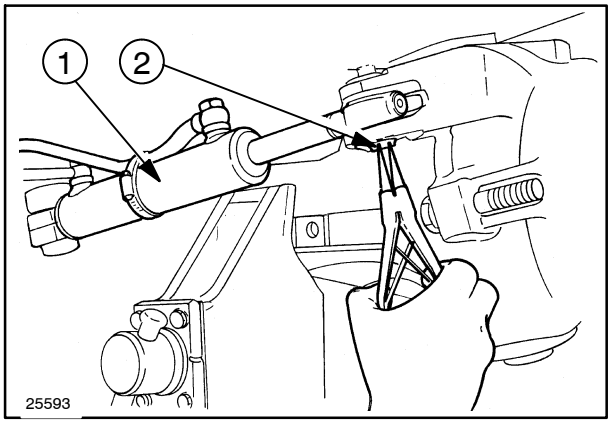
5. Using a removal tool, withdraw the pins from their bores in the stub axle housing, and remove the track rod.



51

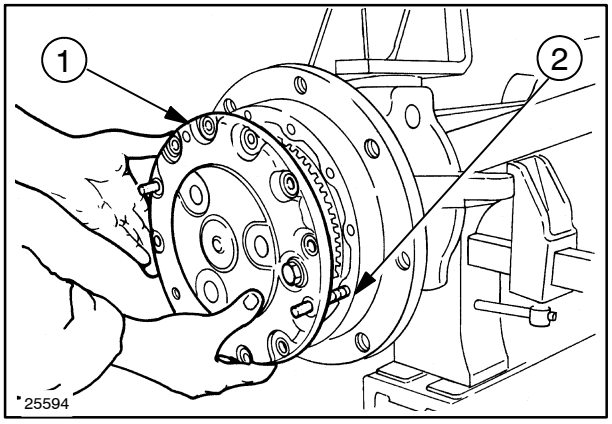
6. Remove the circlips (2) from the cylinder rod pivot pins, unscrew the pin retaining bolts of the cylinder (1), withdraw the pins and detach the two cylinders.

   Retrieve the four pins, washers, spacers and cylinders complete with hoses.



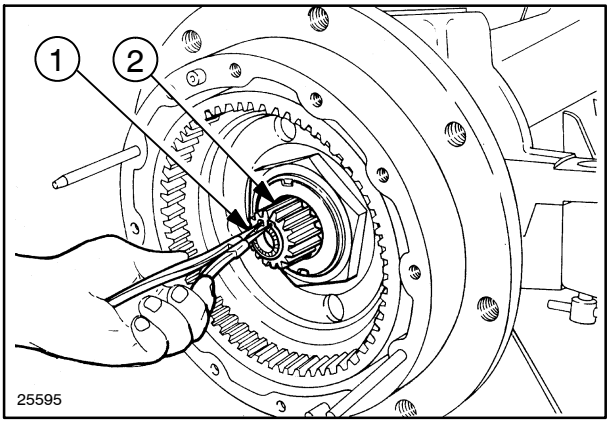
52

7. Remove planetary carrier retaining bolts.
8. Install the special tool **292888** (2).
9. Using a suitable slide hammer screwed into the oil drain plug, remove the planetary cover from the casing.



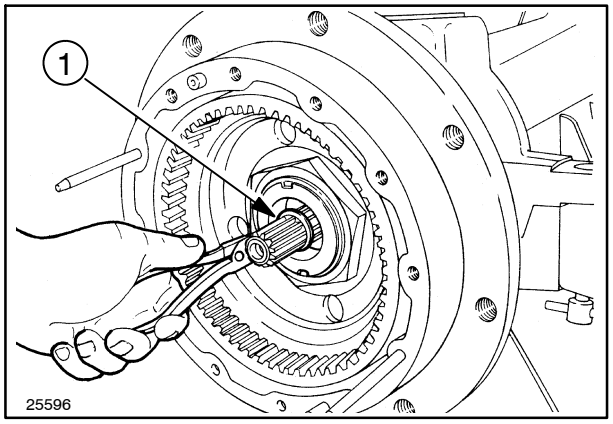
53

10. Remove the circlip (1) and the sun gear (2).



54

11. Remove the inner circlip (1).



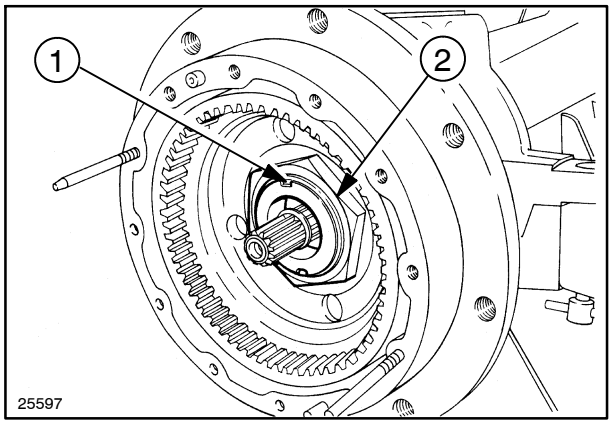
55

NOTE: *It is possible to remove the hub and swivel housing together, without the need to remove the wheel hub bearing lock nut.*

⚠ CAUTION ⚠

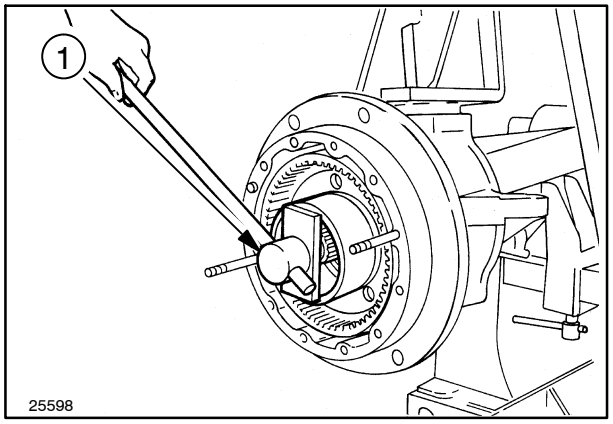
Ensure the locking tab is fully released. Failure to follow this caution will result in damage to the thread when removing the ring gear locking nut.

12. Release the locking tab (1) on ring gear locking nut (2).



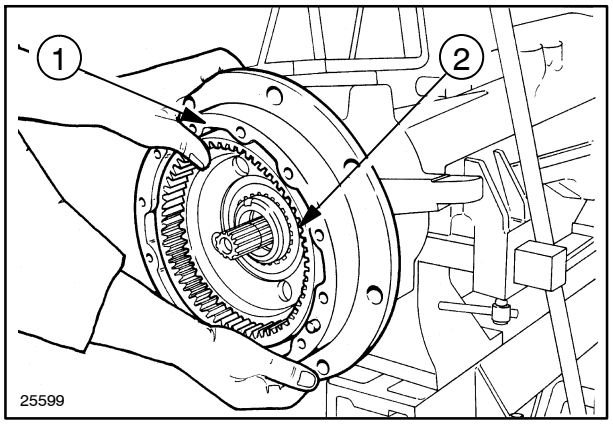
56

13. Remove the ring gear locking nut using the special tool **293880** (1).



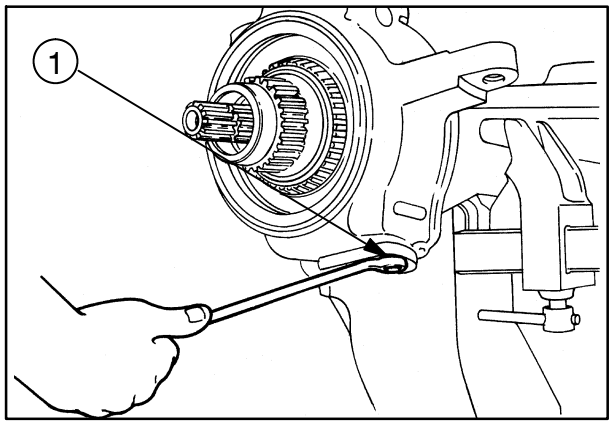
57

14. Remove the wheel hub (1) with the ring gear (2).



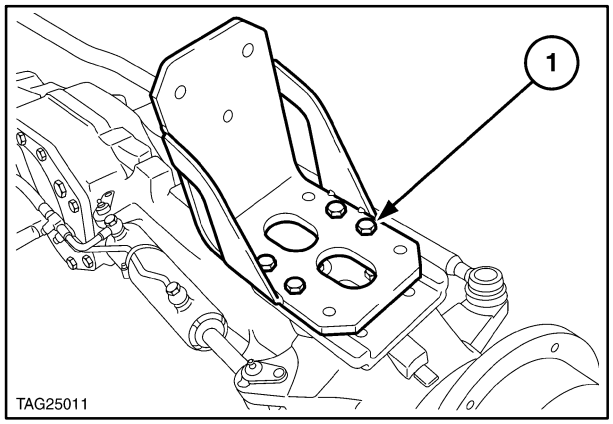
58

15. Remove the lower pivot pin retaining bolts (1).
16. Remove the lower pivot pin and retrieve the lower pivot pin adjustment shims.



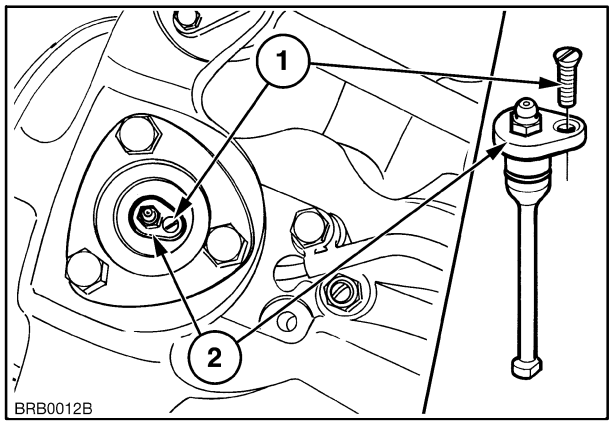
59

17. Remove the four retaining bolts (1) from the mudguard bracket and remove the bracket.



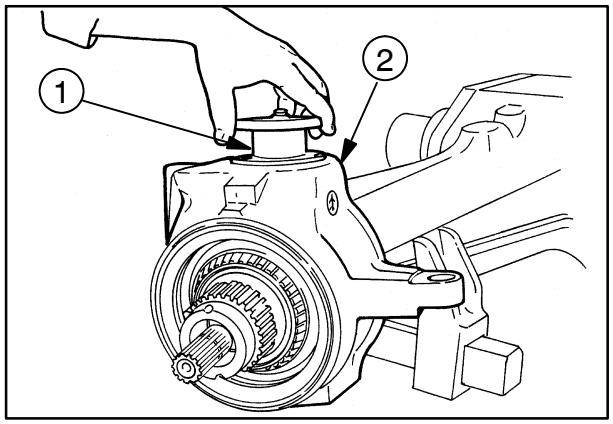
60

18. If fitted, remove the steering sensor pin retaining screw (1) and remove the steering sensor pin (2) from the swivel pin.



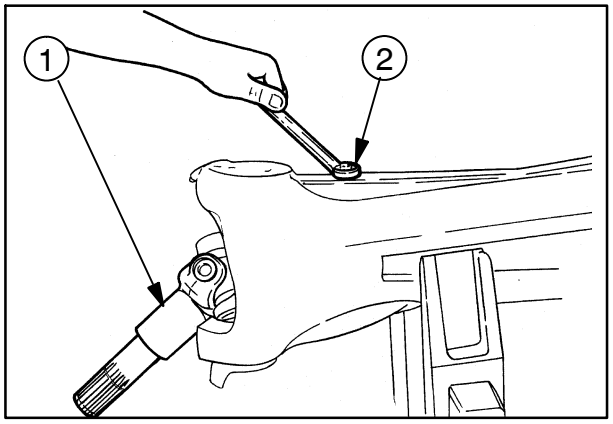
61

19. Remove the three upper pivot pin retaining bolts.
20. Remove the upper pivot pin (1) and remove the stub axle housing (2).
21. If fitted and if necessary, remove the steering angle sensor from the casing. Using a pair of long nosed pliers pull out the red locking tab from the centre of the connector, then using a small screwdriver or pointed instrument, remove each pin from the plug and slide the protective conduit off the wire.



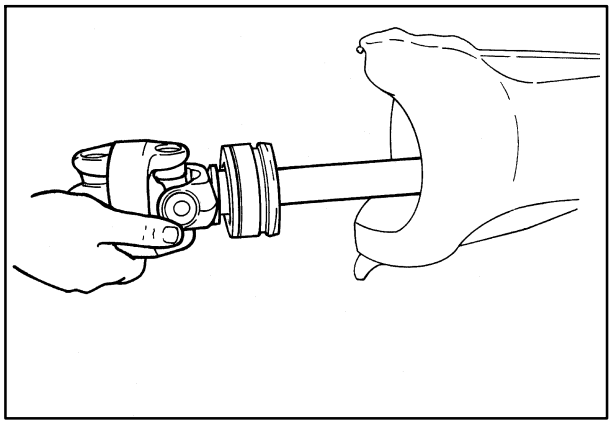
62

22. Remove as much sealant as possible from around the potentiometer and wires from the axle casing. Remove the remaining sealant from the axle and clean.
23. Remove the the axle shaft (1) retaining bolt (2).



63

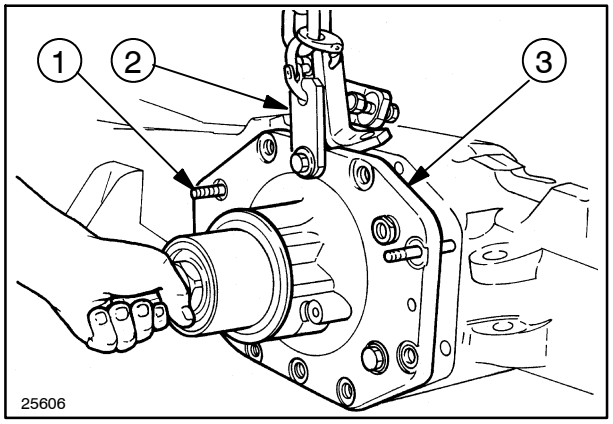
24. Remove the axle shaft from the casing.
25. To disassemble the right-hand final drive unit, follow the same procedure as the left hand final drive unit.



64

NOTE: *SuperSteer Axles require larger diameter alignment studs. These can be manufactured from two M16 x 1.5 mm bolts.*

26. Remove two of the drive-differential support retaining bolts. Install the special tool **292888** (1). Remove the remaining bolts and separate the differential support from the axle casing. Attach a hoist (2) to the support and remove the differential support (3) from the axle casing.

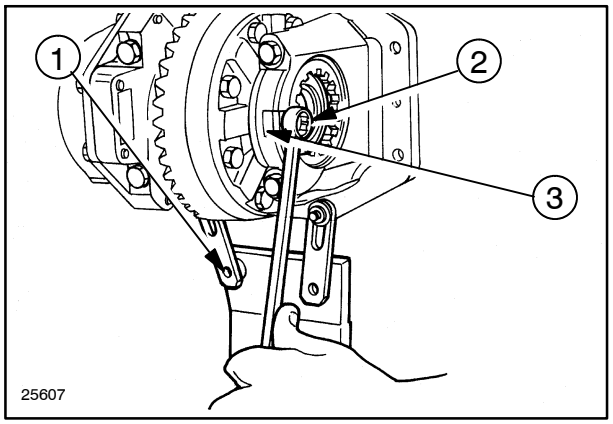


65

27. Install the special tool **293743** (1) in the vice on the work bench. Bolt the differential support onto the special tool and detach the lifting hoist.

NOTE: *The SuperSteer Axle requires a new plate to be manufactured to secure the unit in the vice.*

28. Remove the bolt (2), ring nut lock tab (3) and the internal differential. lock control pipe.



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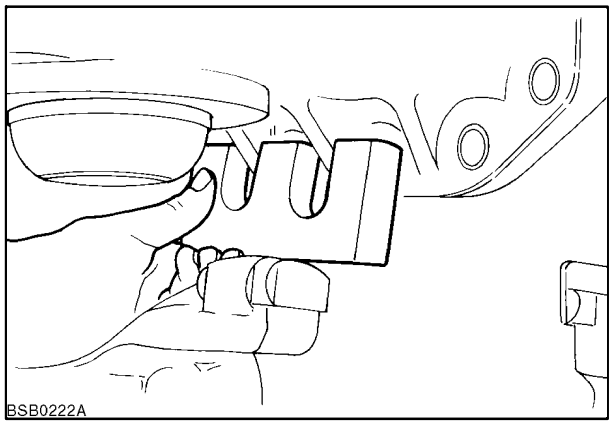
The SuperSteer Axle requires a new plate to be manufactured to secure the unit in the vice, see **Special Tools**.



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MULTI-WET PLATE CLUTCH DIFFERENTIAL

Differential Lock Disassembly

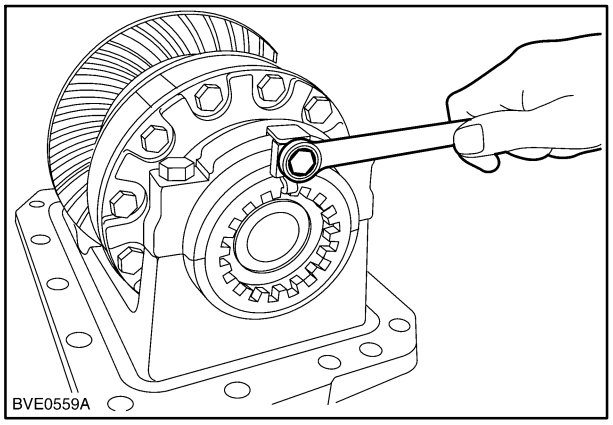
(Op. 25 104 34)

WARNING

Handle all components with the greatest care.

Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. With the pinion and crown wheel carrier placed on the special tool **293743**. Proceed as follows:
2. Remove both locking ring lock tabs.



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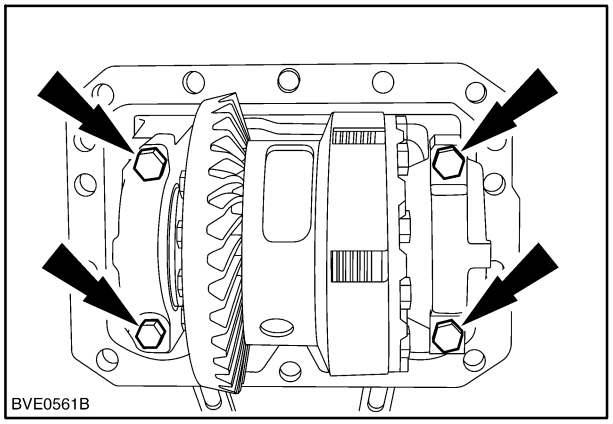
3. Loosen the differential assembly side cap retaining bolts.



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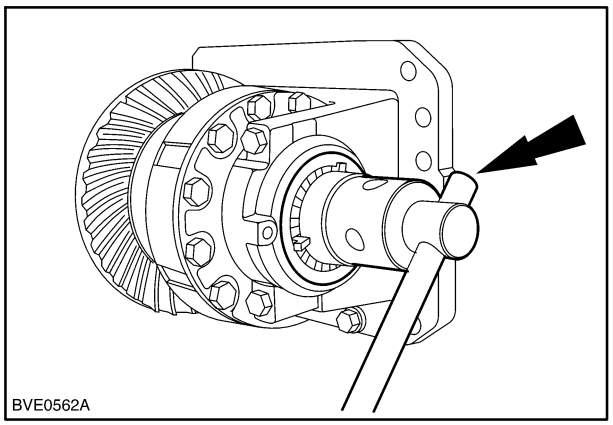
4. Using special tool **293665**, remove the right-hand locking ring.



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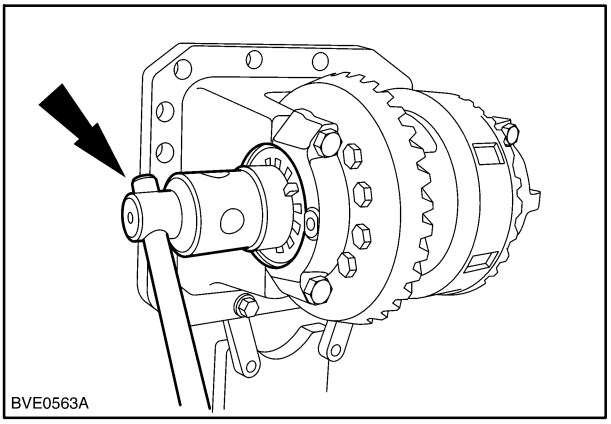
5. Using special tool **293665**, remove the left-hand locking ring.



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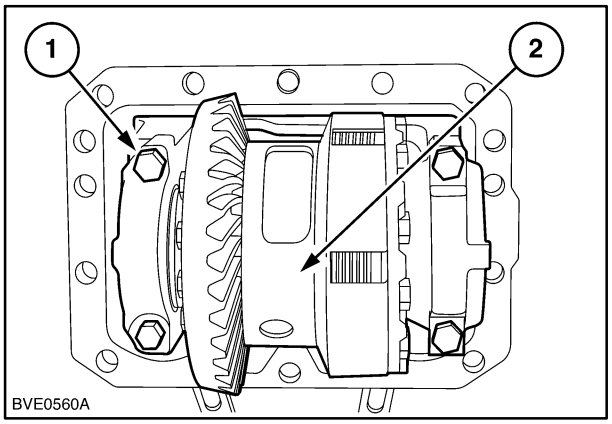
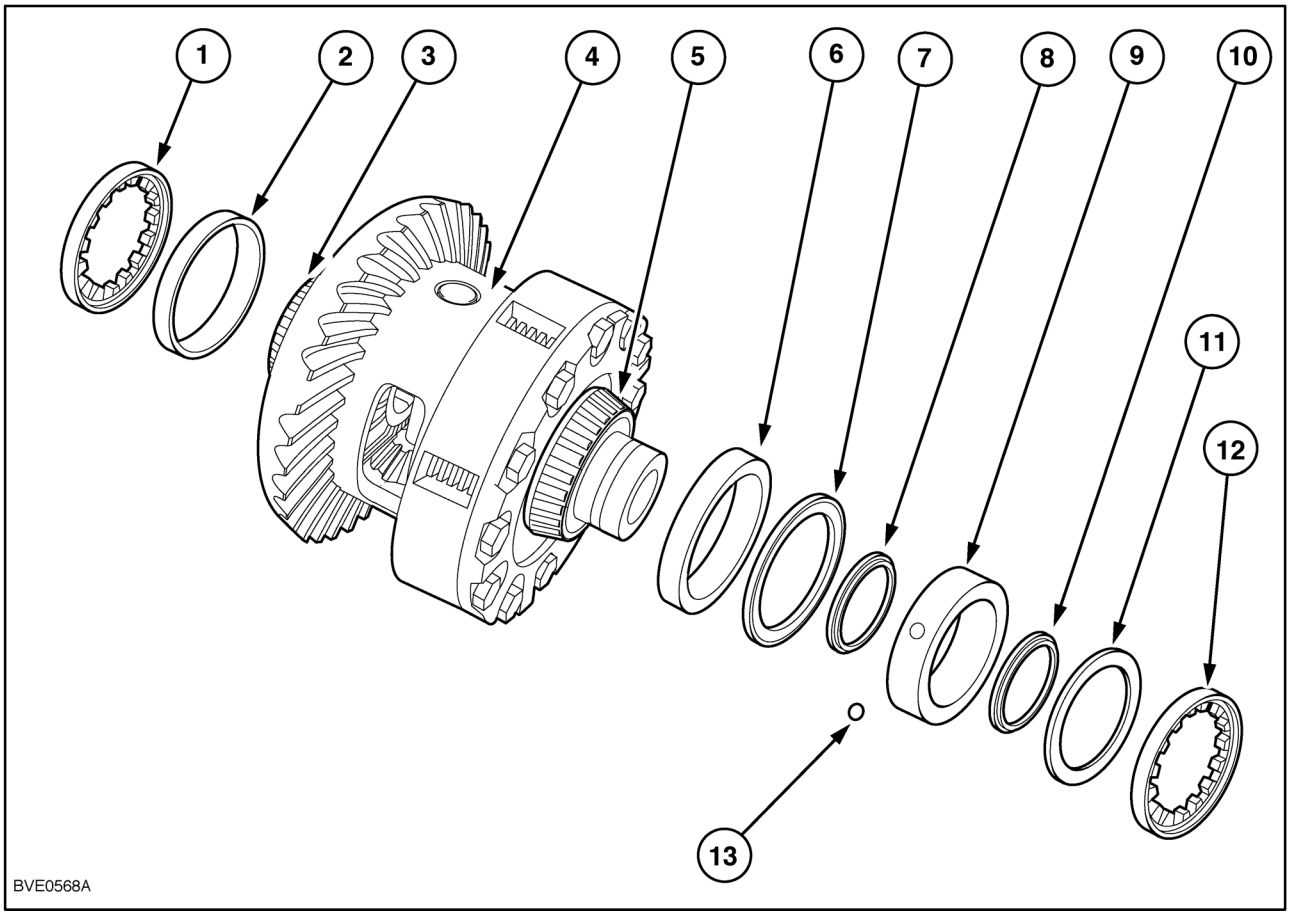
6. Remove both side caps (1) and the differential assembly (2) from the differential casing.



72



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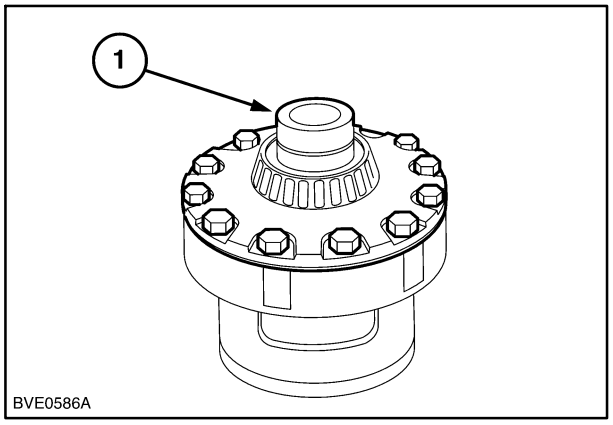
1. Locking ring
2. Bearing cup
3. Bearing
4. Differential housing
5. Bearing
6. Bearing cup
7. Dust cover
8. Oil seal
9. Oil manifold
10. Oil seal
11. Dust cover
12. Locking ring
13. O-ring seal

7. Remove the clutch pack cover from the differential cage.



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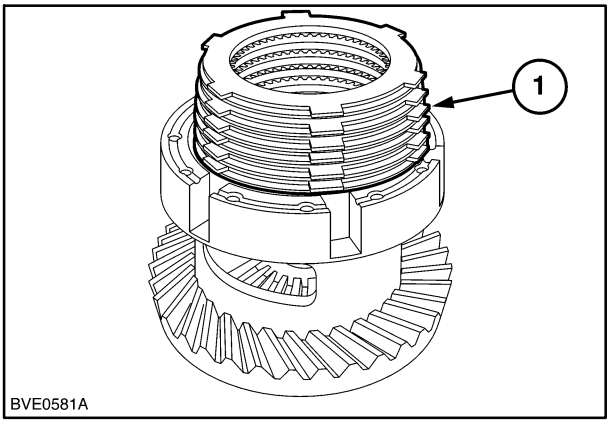
8. Remove the clutch discs (1) from the differential cage.



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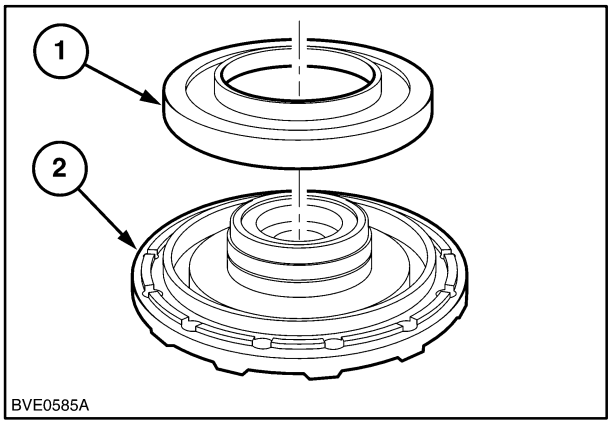
9. Remove the clutch piston (1) from the clutch pack cover (2).



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Differential Lock Assembly

(Op. 25 104 34)

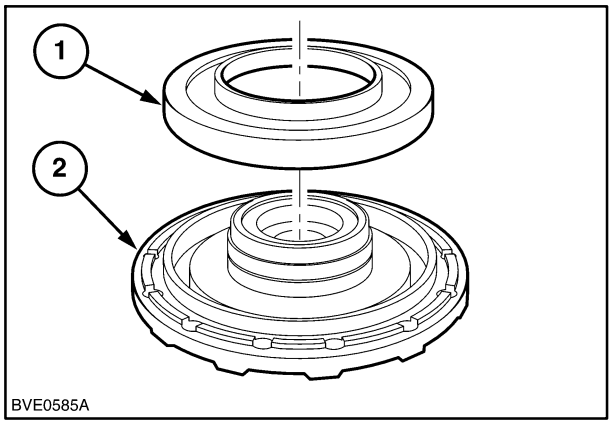
WARNING

Handle all components with the greatest care.

Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

NOTE: *Install new O-ring seals as required.*

1. Apply transmission oil to the O-ring seals. Install the clutch piston (1) to the clutch pack cover (2).



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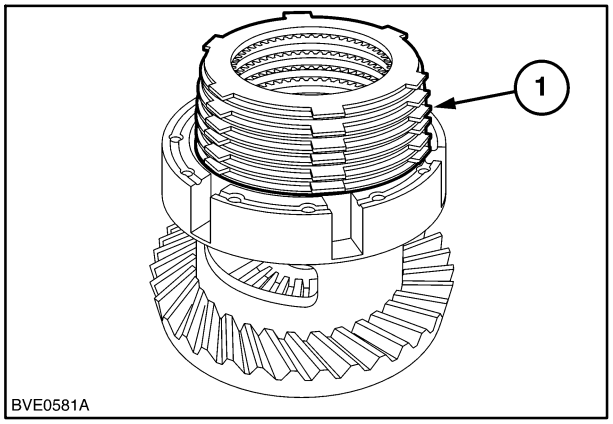
2. Install the clutch discs (1) into the differential cage.



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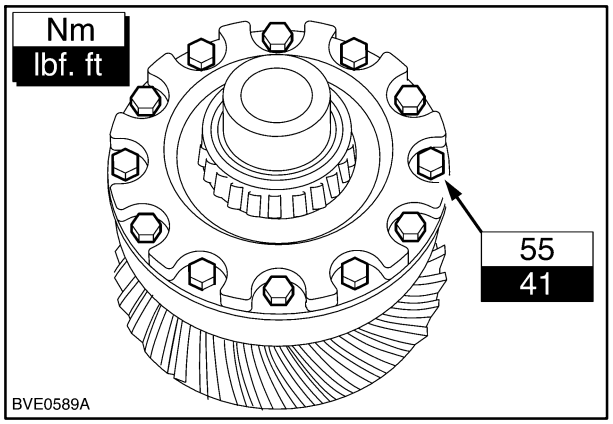
3. Install the clutch pack cover onto the differential cage. Tighten the retaining bolts to the specified torque value.



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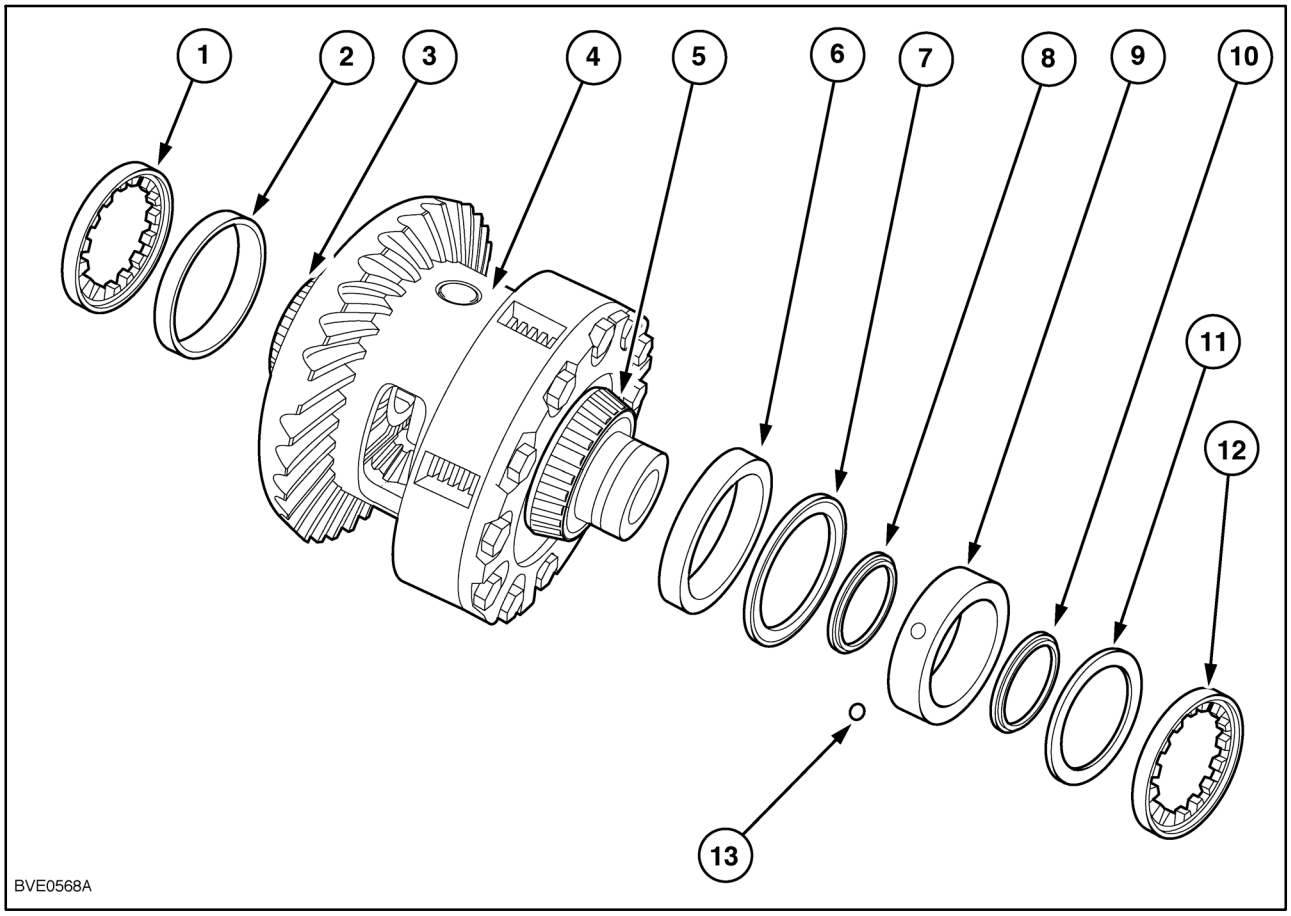

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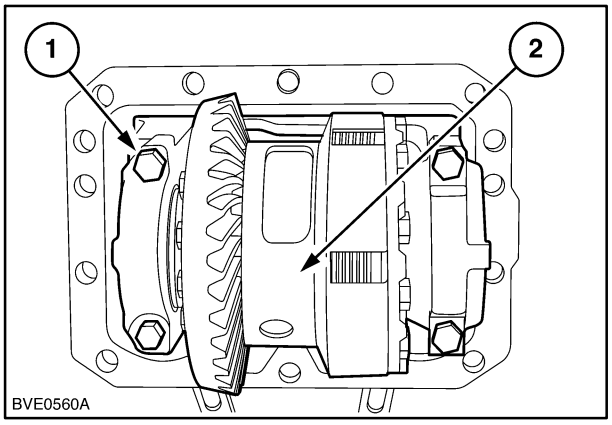
1. Locking ring
2. Bearing cup
3. Bearing
4. Differential housing
5. Bearing
6. Bearing cup
7. Dust cover
8. Oil seal
9. Oil manifold
10. Oil seal
11. Dust cover
12. Locking ring
13. O-ring seal

4. Install the differential assembly (2) and the side caps (1) to the differential casing.
5. Loosely install the right-hand and left-hand locking rings.
6. Adjust the crown wheel, (refer to crown wheel adjustments - multi-wet plate clutch differential lock in this chapter).



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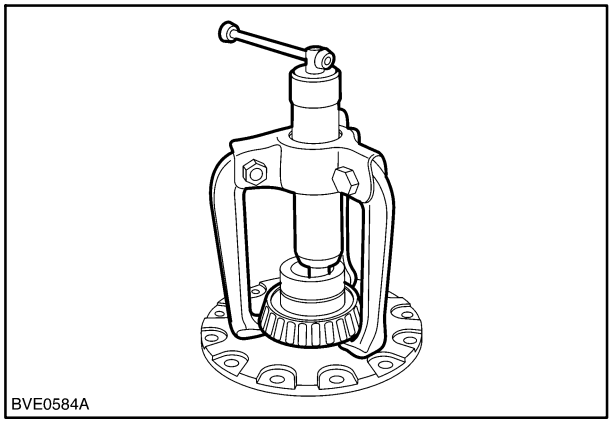
Crown Wheel Differential Cage Disassembly

⚠ WARNING ⚠

Handle all components with the greatest care.

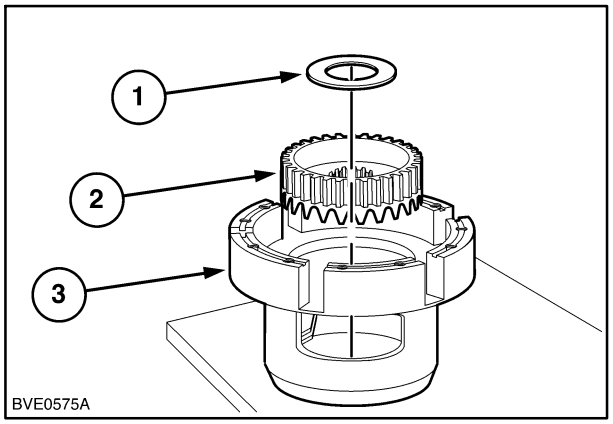
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Disassemble the multi-plate differential lock clutch (refer to multi-plate differential lock clutch - Disassembly in this chapter).
2. Using a suitable puller, remove the clutch pack cover bearing.



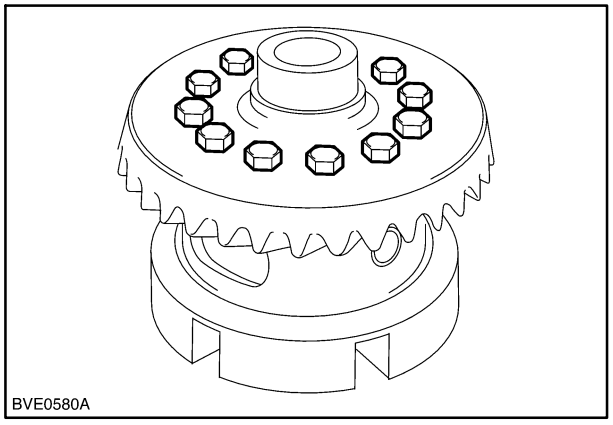
82

3. Remove the thrust washer (1) and sun gear (2) from the differential cage (3).



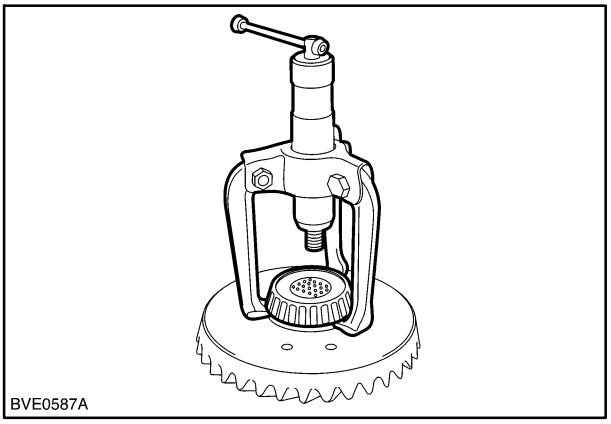
83

4. Remove the crown wheel from the differential cage.



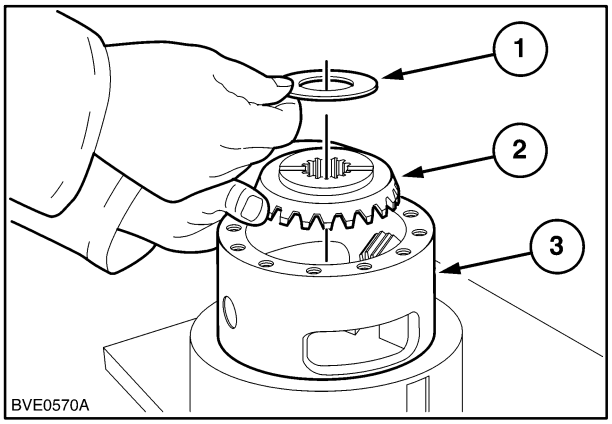
84

5. Using a suitable puller, remove the crown wheel bearing.



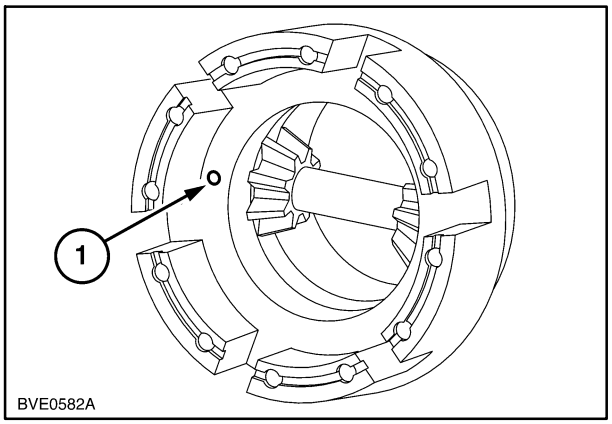
85

6. Remove the thrust washer (1) and sun gear (2) from the differential casing (3).

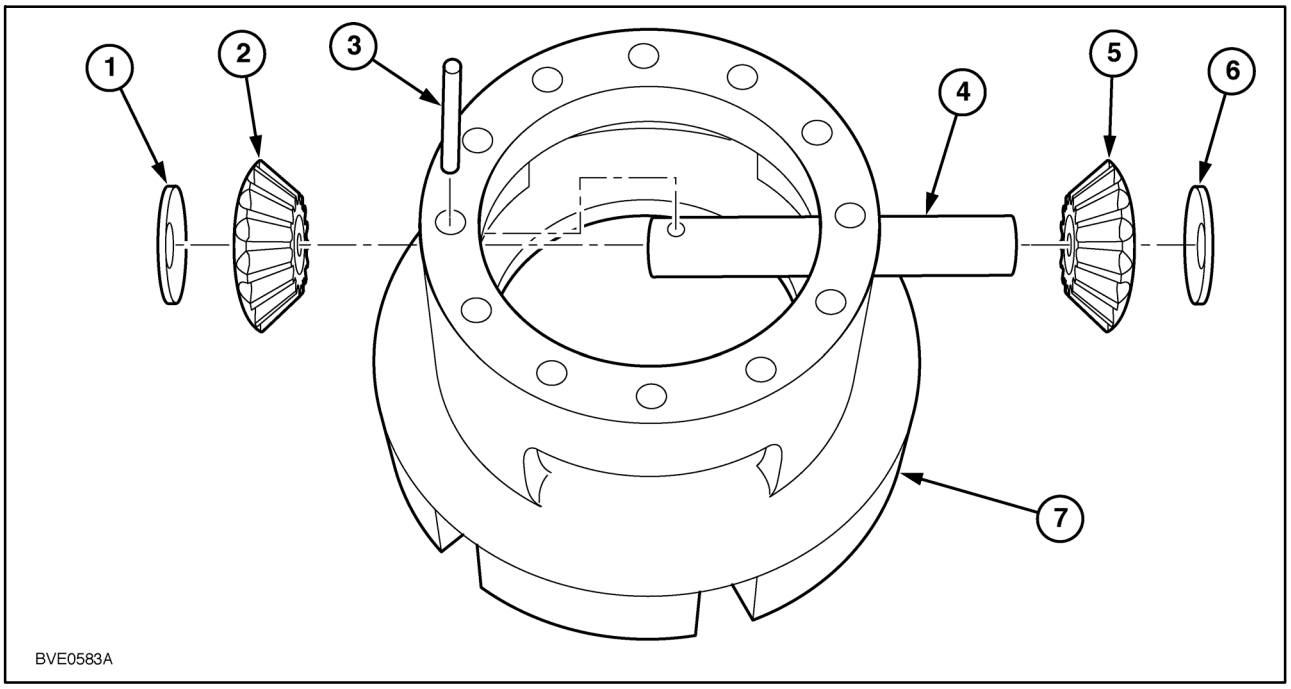


86

7. Using a suitable drift, remove the planet gear shaft locking pin (1) from the differential cage.



87



88

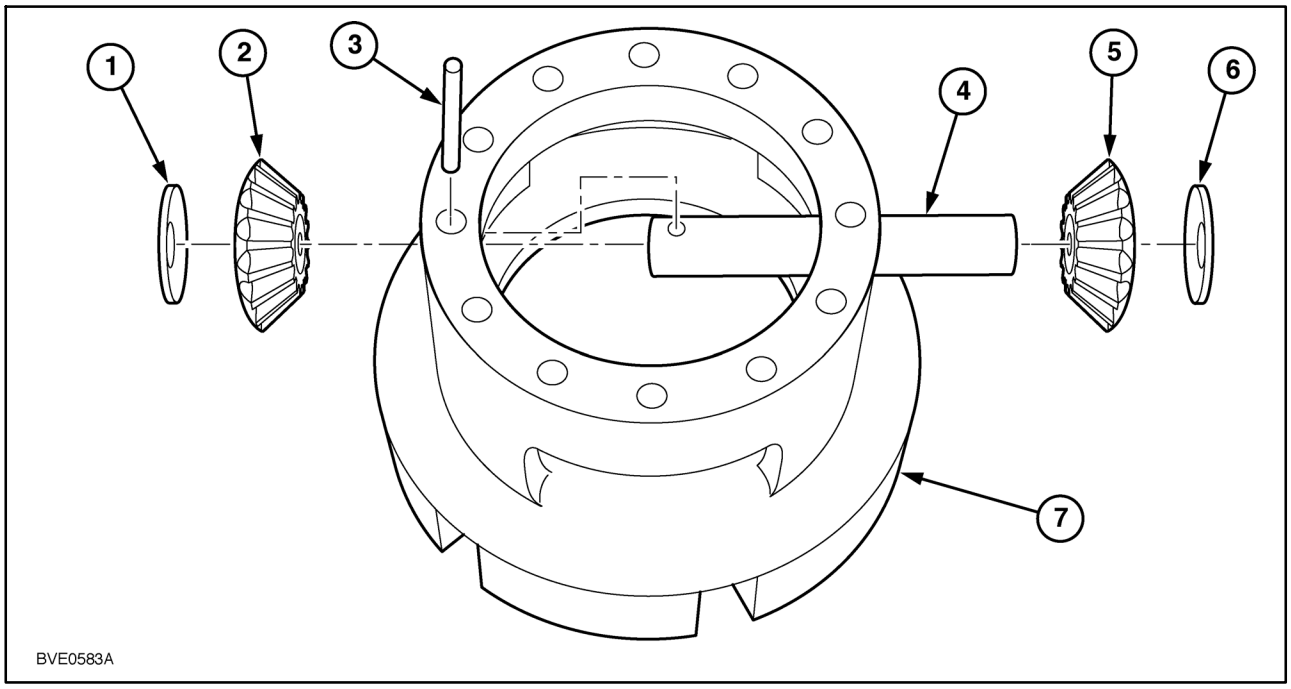
1. Thrust washer
2. Planet gear
3. Planet gear shaft locking pin
4. Planet gear shaft
5. Planet gear
6. Thrust washer
7. Differential cage

Crown Wheel Differential Cage Assembly/Adjustments

⚠ WARNING ⚠

Handle all components with the greatest care.

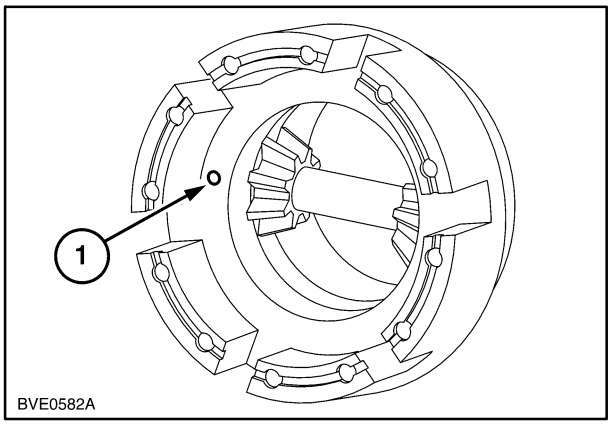
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.



89

1. Thrust washer
2. Planet gear
3. Planet gear shaft locking pin
4. Planet gear shaft
5. Planet gear
6. Thrust washer
7. Differential cage

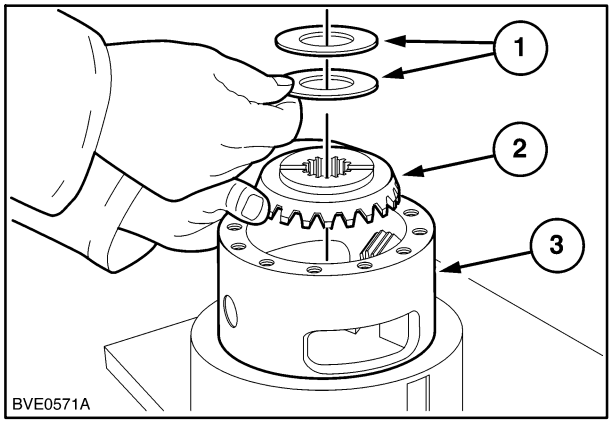
1. Using a suitable drift, install the planet gear shaft locking pin (1) to the differential cage.



90

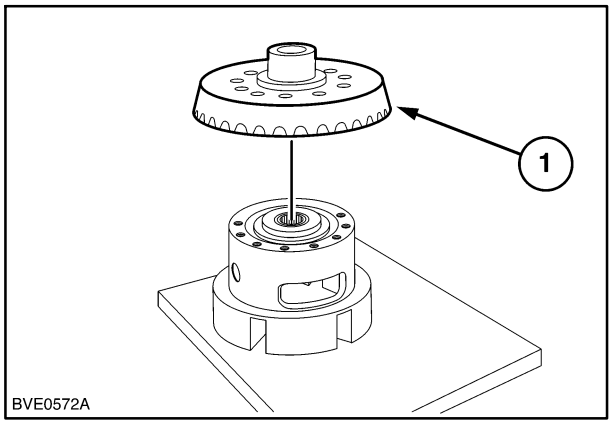
NOTE: *Two thrust washers are required to lock the sun gear against the planet gears.*
These can be the original thrust washer and a new thrust washer or two new thrust washers.

2. Install two thrust washers (1) and the sun gear (2) into the differential cage (3).



91

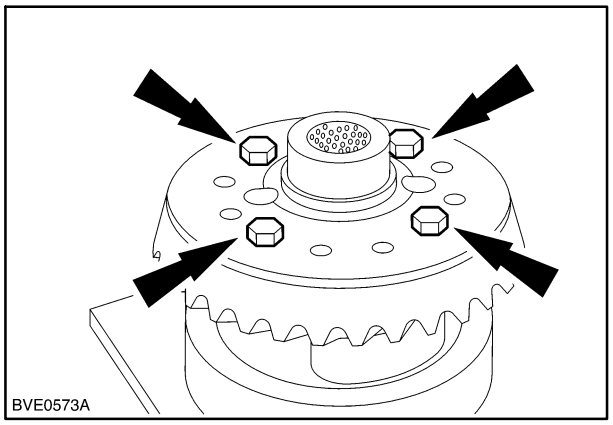
3. Install the crown wheel (1) onto the differential cage.



92

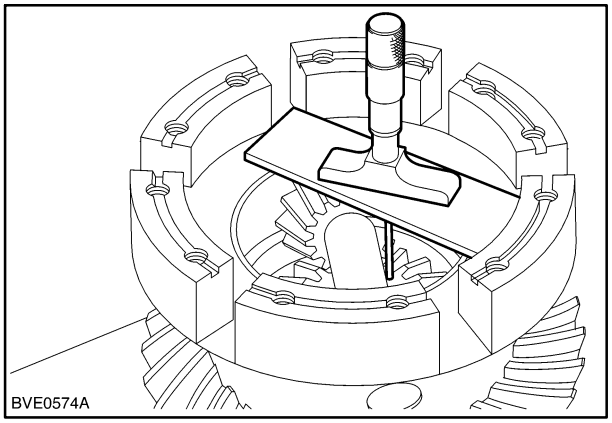
NOTE: *Make sure the clutch pack cover is fitted evenly.*

4. Hand tighten the crown wheel retaining bolts.



93

5. The end float required between the sun and planet gears is 0.25 mm. To calculate the size of thrust washer required, carry out the following:
6. Using a depth gauge and the locally fabricated depth gauge adaptor plate, measure against the front of the sun gear. Do this measurement in two opposite positions and take a mean calculation of the two readings. **This measurement is H1.**



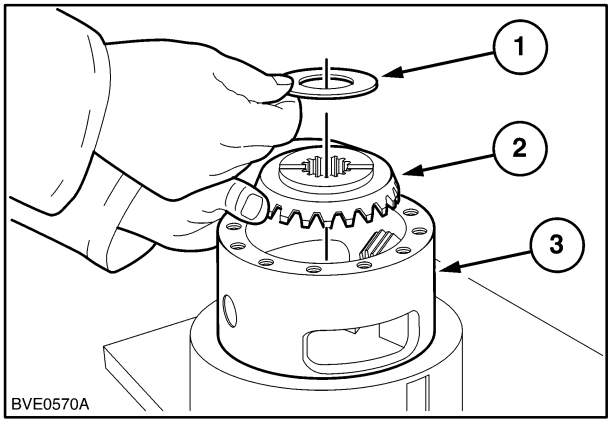
94

7. Carry out the same measurement again but using only one thrust washer as a test shim. **This measurement is H2**
8. Determine the thickness of the shim to be installed as follows:

   Remove the thrust washer and measure the thickness. **This measurement is S1**.

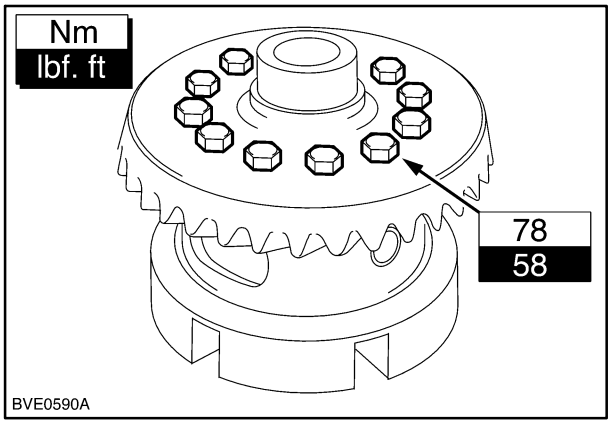
   Thrust washer size = (H2 - H1) + S1 - 0.25 mm

9. Install the new calculated thrust washer (1) and the sun gear (2) into the differential cage (3).



95

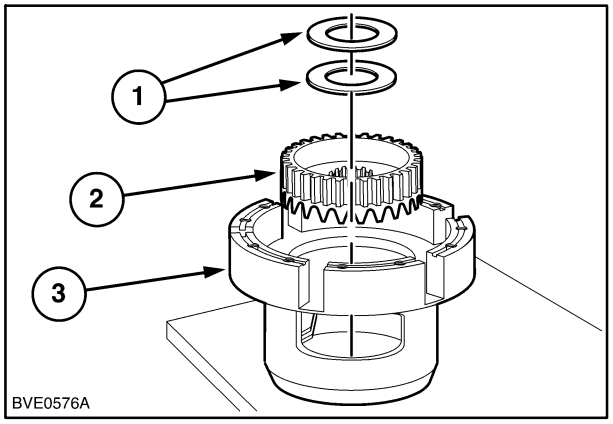
10. Install the crown wheel onto the differential cage. Tighten the retaining bolts to the specified torque value.



96

NOTE: *Two thrust washers are required to lock the sun gear against the planet gears.*
These can be the original thrust washer and a new thrust washer or two new thrust washers.

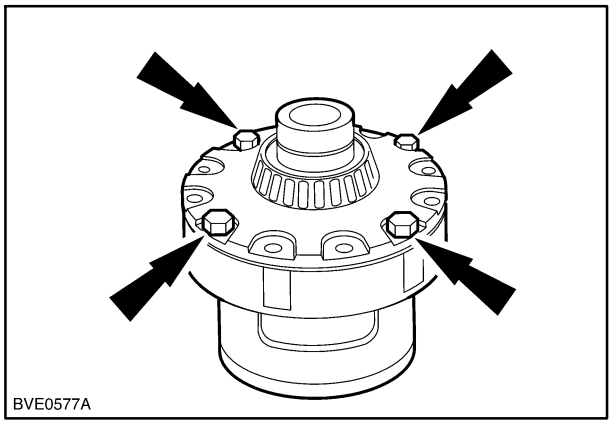
11. Install two thrust washers (1) and the sun gear (2) into the differential cage (3).



97

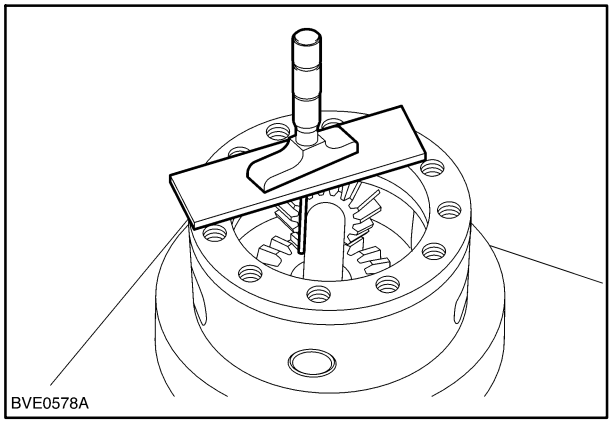
NOTE: *Make sure the clutch pack cover is fitted evenly.*

12. Hand tighten the clutch pack cover retaining bolts.



98

13. The end float required between the sun and planet gears is 0.25 mm. To calculate the size of thrust washer required, carry out the following:
14. Using a depth gauge and the locally fabricated depth gauge adaptor plate, measure against the front of the sun gear. Do this measurement in two opposite positions and take a mean calculation of the two readings. **This measurement is H1**.



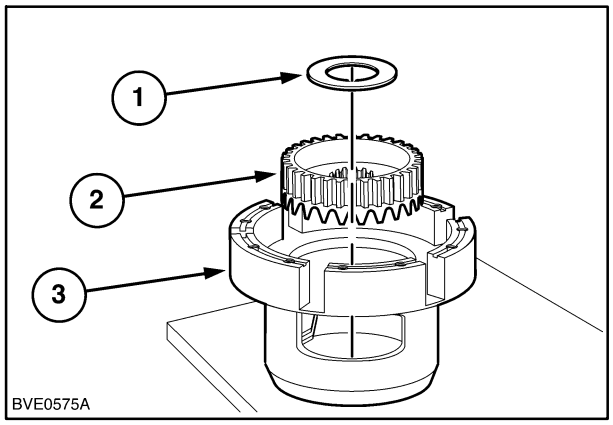
99

15. Carry out the same measurement again but using only one thrust washer as a test shim. **This measurement is H2**.
16. Determine the thickness of the shim to be installed as follows:

    Remove the thrust washer and measure the thickness. **This measurement is S1**.

    Thrust washer size = (H2 - H1) + S1 - 0.25 mm

17. Install the new calculated thrust washer (1) and the sun gear (2) into the differential cage (3).
18. Assemble the multi-wet plate differential lock clutch (refer to multi-wet plate differential lock clutch - Assembly in this chapter).



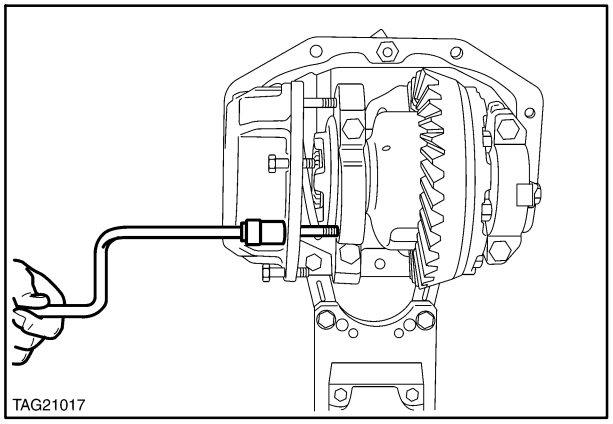
100

DOG CLUTCH DIFFERENTIAL

Differential Lock Disassembly/Assembly

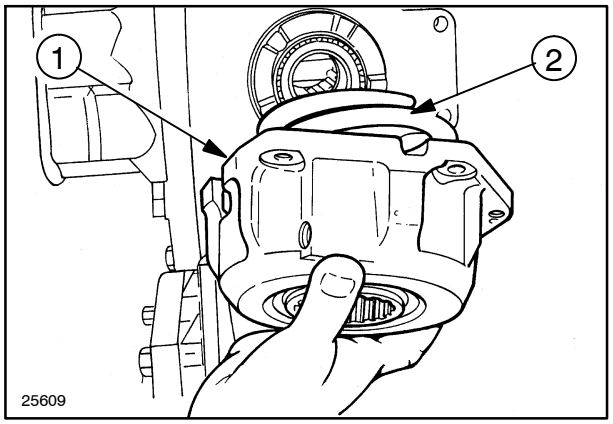
1. Remove the two bolts securing the external bell housing (1) of the differential lock, and fit in their place two bolts with minimum length 70 mm. Gradually remove the four remaining bolts from the external bell housing of the differential lock so as to allow the differential lock release spring to gradually extend.

NOTE: *It is necessary to fit two bolts because the normal bell housing bolts are not sufficiently long to allow the spring to extend to its full free length.*



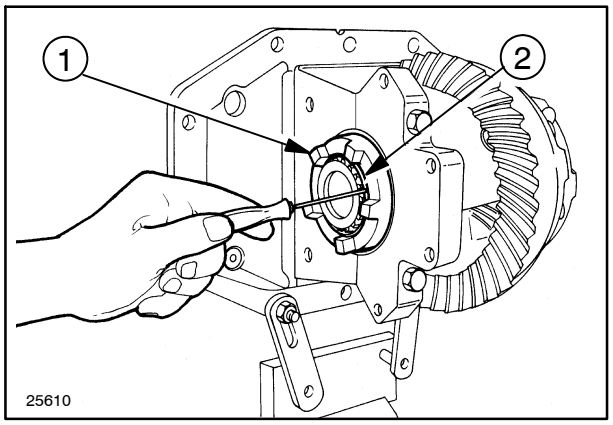
101

2. Remove the last two 70 mm bolts. Remove the bell housing (1), the helical spring (2) and the differential lock piston.



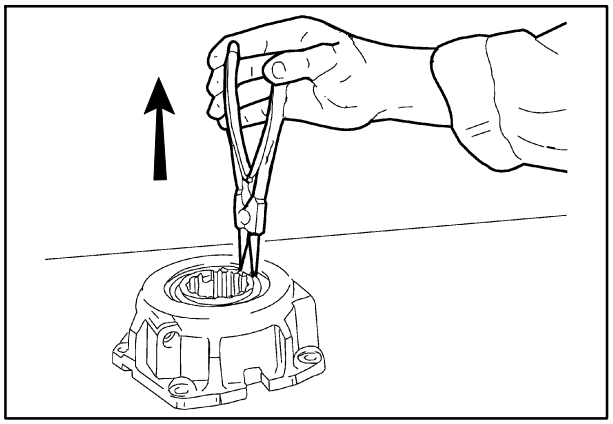
102

3. Remove circlip (2) and remove the differential lock sleeve.



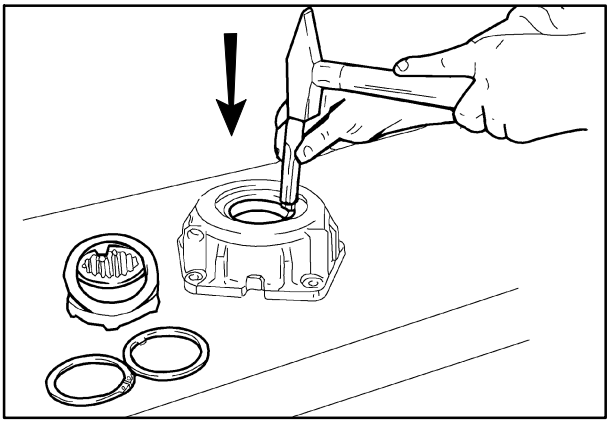
103

4. Remove the circlip securing the differential lock piston, and retrieve the sliding sleeve with the two thrust washers.



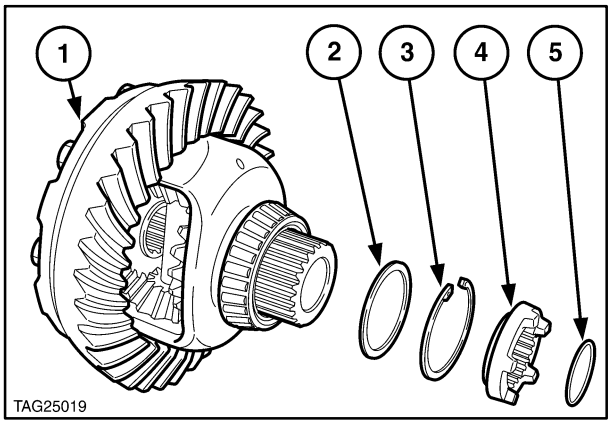
104

5. Using a suitable drift gently tap the piston out of the clutch bell housing.



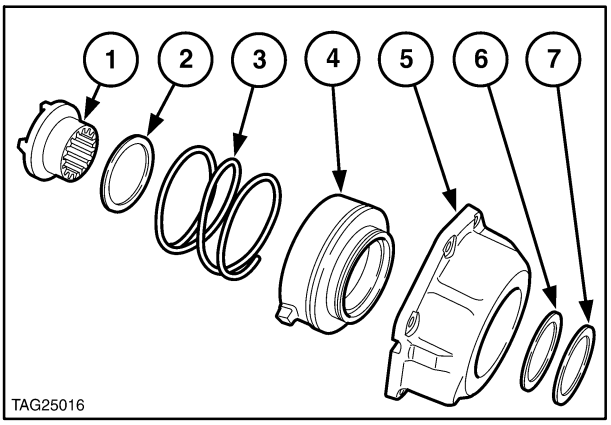
105

1. Differential assembly
2. Shim (Backlash)
3. Circlip
4. Dog clutch
5. Locking ring



106

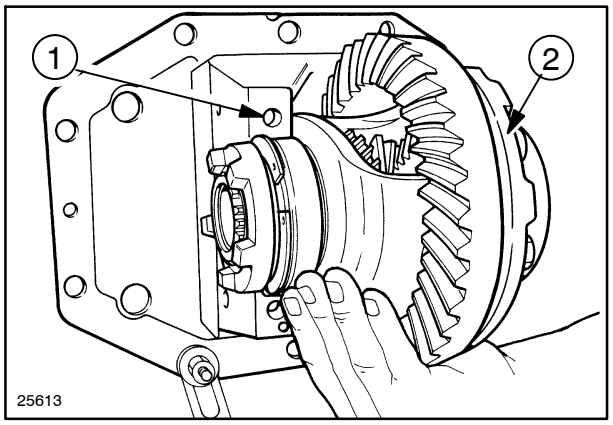
1. Dog clutch
2. Thrust washer
3. Return spring
4. Piston O-ring seals ×2
5. Hub
6. Locking ring
7. Circlip



107

Crown Wheel Differential Cage Disassembly/Assembly

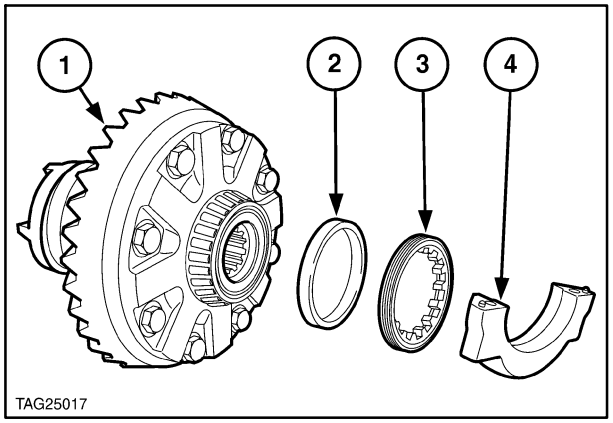
1. Remove the crown wheel-differential assembly (2) from the housing (1).



108

Differential Component Drawings - Dog Clutch

1. Differential assembly
2. Bearing Cup
3. Adjuster Ring
4. Support Cup



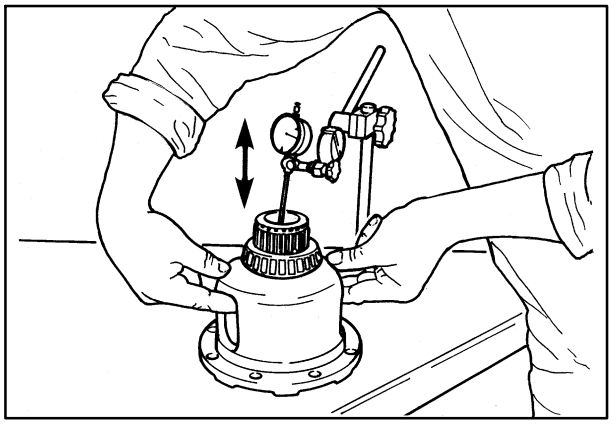
109

Differential Gear Set Up

In case of differential assembly overhaul it is necessary to adjust the backlash between the teeth of the planet pinions and side gears.

Proceed as follows:

1. Thoroughly clean the components of the differential to remove any traces of oil which would otherwise prevent accurate backlash measurement.
2. Install the two side gears without thrust washers.
3. Fit the planet gears complete with thrust washers and pins and screw the pin retaining bolts in by a few turns to hold the pins in place.
4. Position a dial gauge on the differential housing.
5. Move the left-hand side gear to bring it into full contact with the planet pinion and then push it up against the differential housing, reading the end float ($\mathbf{G_S}$) on the dial gauge.



110

6. Repeat the above operations to measure the end float on the right-hand side gear (G_d).

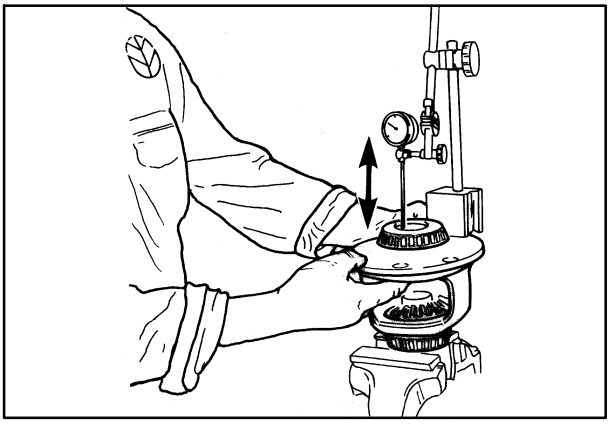
   The end float should be **0.25 mm**.

   Therefore the shims to be inserted in the differential housing are given by:

   $S_{L.H.} = G_s - 0.25$ mm for the left-hand side gear;

   $S_{L.H.} = G_d - 0.25$ mm for the right-hand side gear.

7. Install shims as near as possible to the calculated value, and, using a dial gauge and following the procedure described above, check that the end float of the left and right-hand side gears is approximately 0.25 mm.

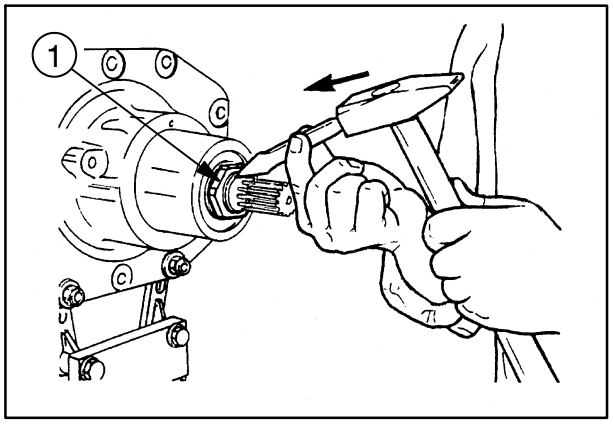


111

PINION SHAFT STANDARD FRONT AXLE

Removal

1. Using a suitable drift, straighten the locking tab on the splined shaft lock nut (1).

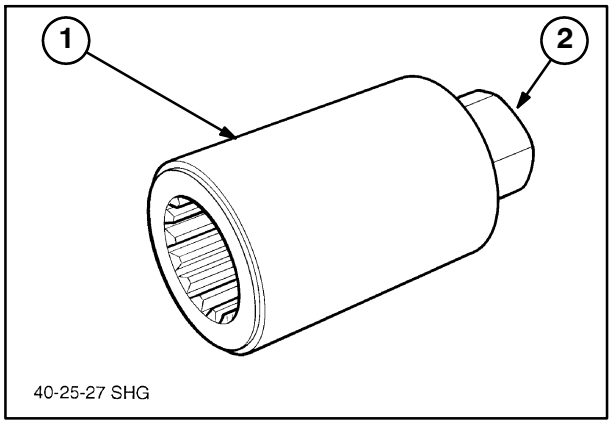


112

2. To loosen the pinion nut it is necessary to manufacture a tool to hold the pinion shaft. This can be manufactured by welding a suitable 20 mm nut to the end of a drive shaft coupling 81873108.

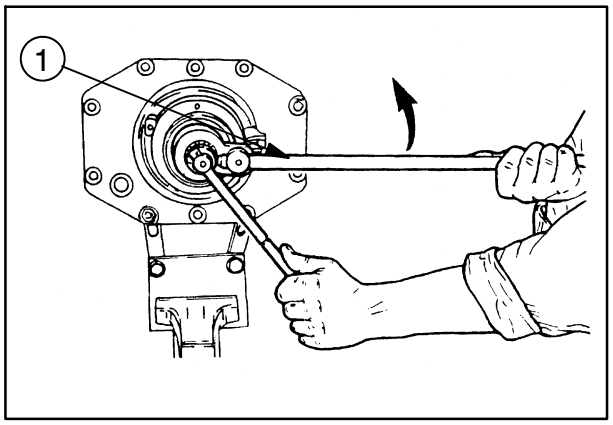
Locally Manufactured Pinion Shaft Tool

1. Coupler Part No 81873108
2. 20 mm Nut



113

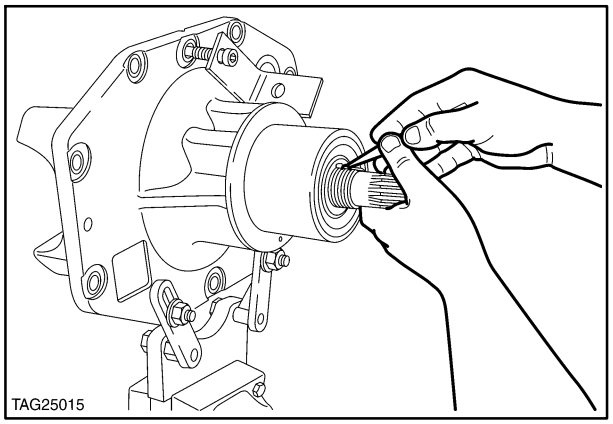
3. Unscrew the nut using wrench **293878** (1), while holding the bevel drive pinion shaft against rotation with the locally fabricated tool.



114

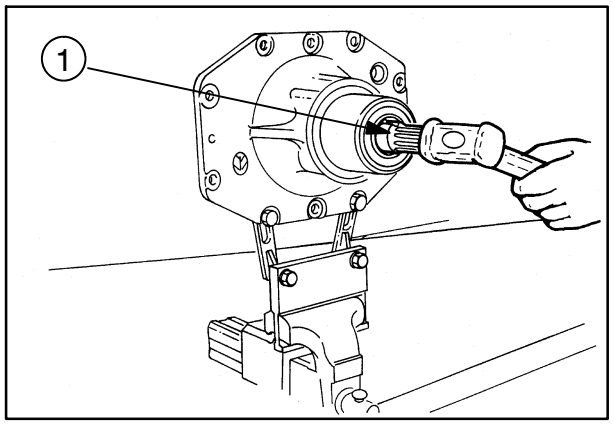
4. Remove the locking ball from the sleeve.

NOTE: *Not applicable for SuperSteer or Suspended Axle Assemblies.*



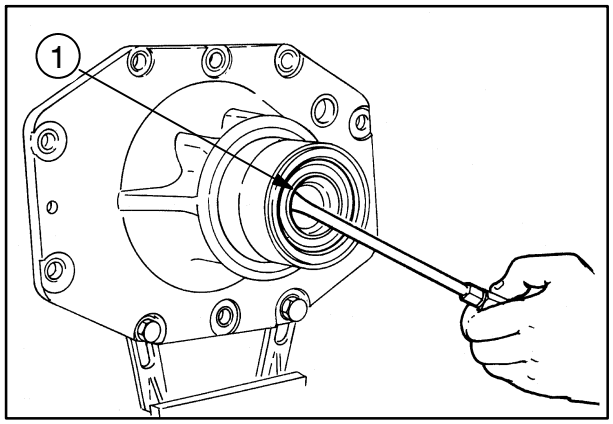
115

5. Remove the pinion shaft (1) from the rear of the casing and remove the spacer, the adjustment shims and the bearing.

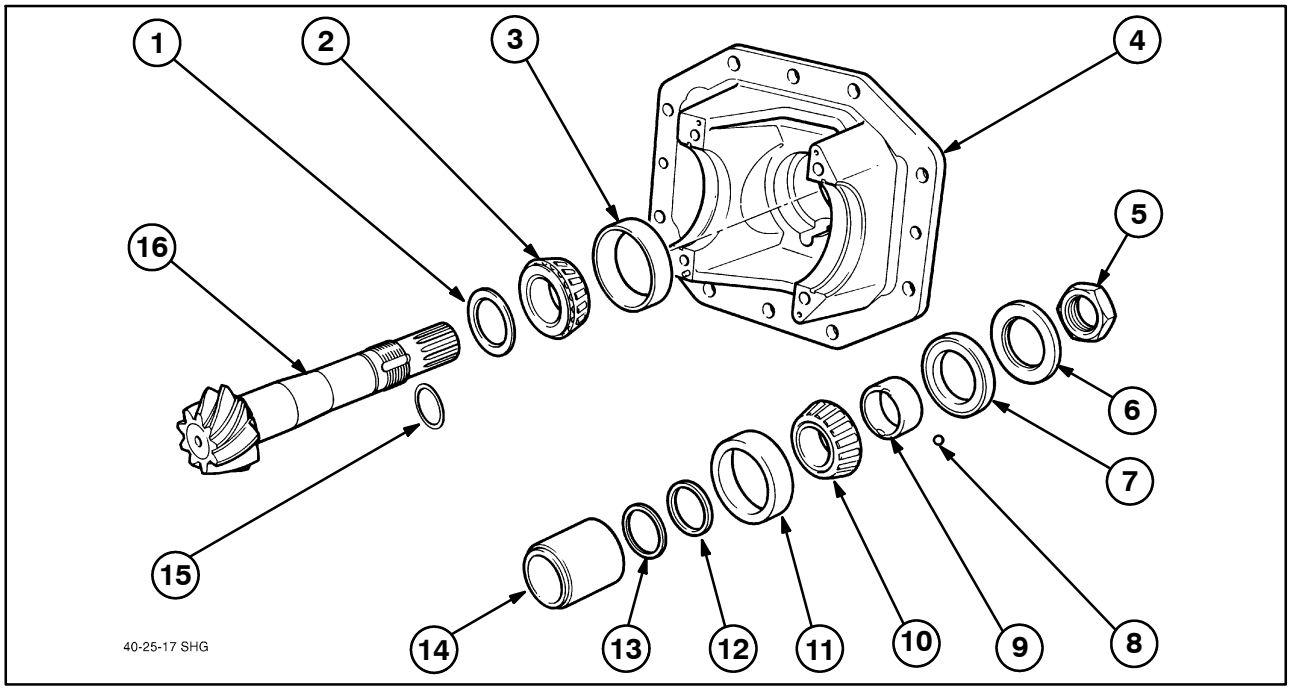


116

6. Remove the dust seal, oil seal (1) and the rear bearing.



117



118

Standard Front Axle Pinion Components

1. Pinion Depth Shim
2. Bearing
3. Bearing Cup
4. Differential Housing
5. Nut
6. Dust Cap
7. Seal
8. Ball Bearing
9. Sleeve
10. Bearing
11. Bearing Cup
12. Shim
13. Shim
14. Spacer
15. 'O' Ring
16. Pinion

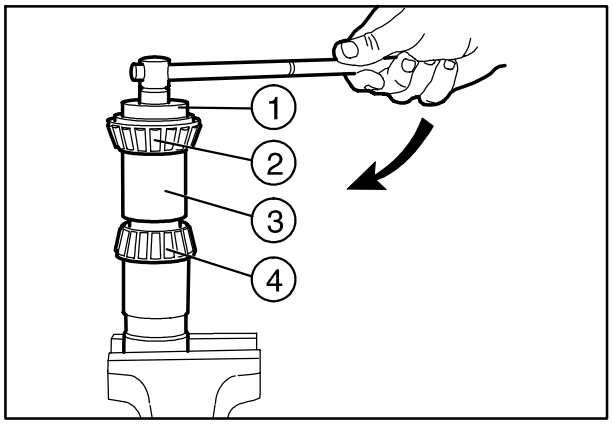
Installation/Adjustments

Pinion Bearing Preload Shimming

⚠ WARNING ⚠

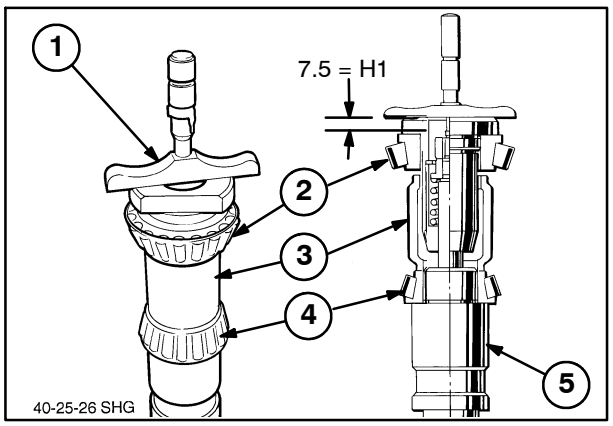
Handle all parts with care.
Do not insert hands or fingers between one part and another. Wear suitable safety clothing, i.e. safety goggles, gloves and footwear.

1. Remove the pinion bearing from the pinion.
2. Clamp the special tool **293391** (1) in the vice, fit the inner races of the bearings (2 and 4) and the bearing spacer (3) and secure the nut on the tool.



119

3. Using a depth micrometer, measure distance (H_1) between the upper surface of the tool and the central threaded pin of the special tool **293391**/**293438** (1).
4. Disassemble the above parts, lubricate the bearings with oil and then re-assemble the parts, excluding the bearing spacer, in the differential housing. Hold the differential housing in the vice using the special tool **293743**.

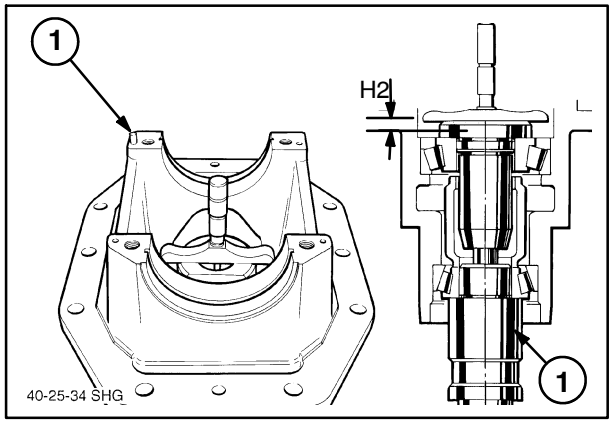


120

5. Tighten the nut of special tool **293391**/**293438** (1), while turning the tool to ensure that the bearings are seated correctly.
6. Using a depth micrometer, measure distance (**H_2**).
7. The thickness of the adjustment shim required is calculated by:
   Shim S_1 = H_2 - H_1 + 0.05 mm

If necessary, round the value obtained up to the nearest 0.05 mm.

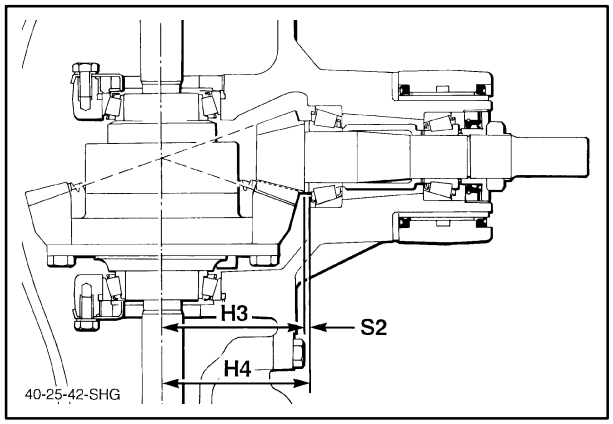
Leave the special tool in the differential housing for pinion depth measurement.



121

Pinion To Crown Wheel Shimming Procedure

The pinion to crown wheel shimming procedure calculates the thickness of shims **S2**, positioned beneath the shoulder of the pinion gear to ensure that the theoretical conical point of the pinion aligns with the centre of the differential crown wheel.



122

Pinion Shimming Dimensions

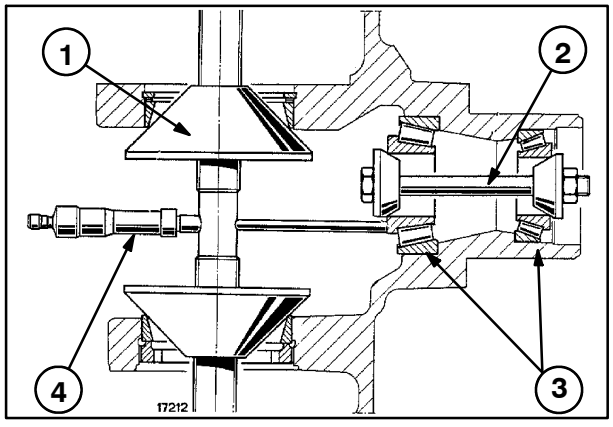
H4 Dimension from Pinion Bearing to Centre line of Differential Casing
H3 115 mm Manufacturers Pinion Dimension ± C (Correction Factor)
S2 Shim Thickness

The dimension **H4** in the calculation of the shim thickness can be determined by using either the pinion adjustment special tool **293400** or VL Churchill special tool **FT3135**.

Both procedures are explained as follows.

Pinion Shimming Using Pinion Adjustment Special Tool 293400

1. Install the pinion bearings in differential support housing and clamp in position using the special tool **293391**/**293438** as used when determining thickness of shims for bearing preload.



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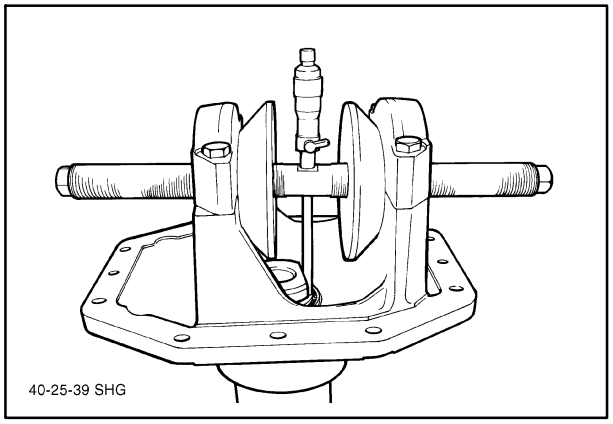
1. Pinion Measuring Gauge special tool **293400**
2. Pinion Bearing Clamp. Use special tool **293391**/**293438** or alternative clamp **50048** as shown
3. Pinion Bearings
4. Micrometer (Part of special tool **293400**)

2. Install the Pinion Setting special tool **293400** complete with bearing cup and adjusting rings. Tighten bearing caps to 113 Nm (83 lbf).

   If the special tool **293391** as described in pinion bearing shimming procedure is not available the Bearing Clamp special tool **50048** may be used to clamp the bearings.

3. Adjust the cones of the tool so that the depth micrometer tip touches the inner race of the bearing and measure the dimension (**H4**).



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4. Determine the thickness of shims to be installed beneath the pinion gear as follows:

   Shim thickness **S2** = **H4**–**H3**

   Where:–

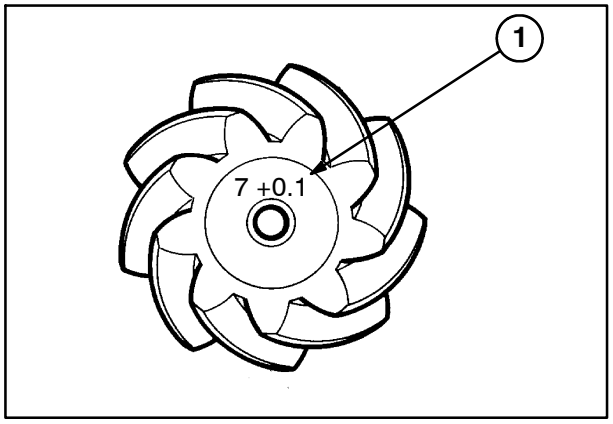
   H4 = Dimension measured using pinion micrometer tool

   H3 = 115 mm ±**C**

   115 mm is the nominal manufacturing dimension from rear face of pinion gear to conical point of pinion.

   C = Manufacturing correction factor stamped on face of pinion.

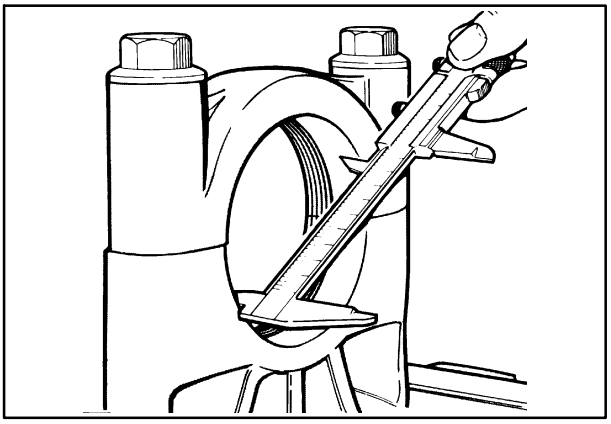
   Example **H4** = 118.27
   C = +0.1 mm
   H3 = 115 + 0.1
   = 115.1 mm
   S2 = **H4** –**H3**
   = 118.27 – 115.1
   Shim Thickness **S2** = 3.17 mm



125

Pinion Shimming Using Special Tool 297132

1. Install bearing caps (less bearing cup) and tighten to a torque of 113 Nm (83 lbf).
2. Measure internal dimension of bearing bore and call this dimension **A**.



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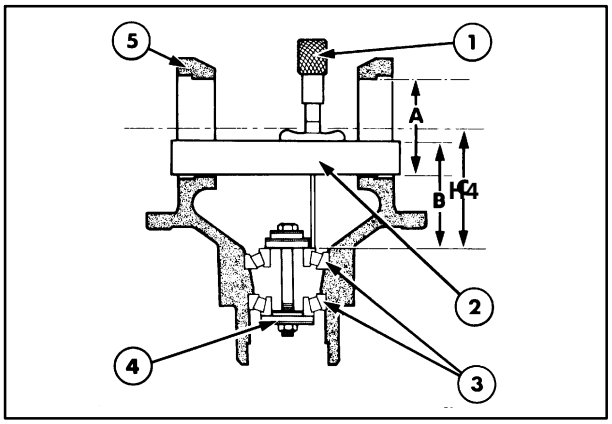
3. Install pinion bearings in the differential support housing and clamp in position using the special tool **297132**.

NOTE: *Tighten the clamp so that the bearing cones can just be turned by hand.*

4. Locate the bar gauge, part of special tool **297132**, across bearing bore and measure dimension **B**.



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1. Depth Gauge
2. Bar Gauge - Part Of Special Tool **297132**
3. Pinion Shaft Bearings
4. Pinion Setting Gauge - Special Tool **297132**
5. Differential Support Casing

5. Calculate Dimension **H4** using the formula

$$\mathbf{H4} = \mathbf{B} - 25^{*} + \left(\frac{\mathbf{A}}{2}\right)$$

NOTE: *FT 3135 *Bar Gauge is 25 mm diameter.*

6. Determine the thickness of shims **S2** to be installed beneath the pinion gear as follows:
   S2 = **H4** - **H3**
   Where:-
   H4 = Dimension calculated in Step 5 above.
   H3 = 115 mm ±**C**
   115 mm is the nominal manufacturing dimension from the rear face of the pinion gear to the conical point of the pinion.
   C = Manufacturing correction factor stamped on the face of the pinion.

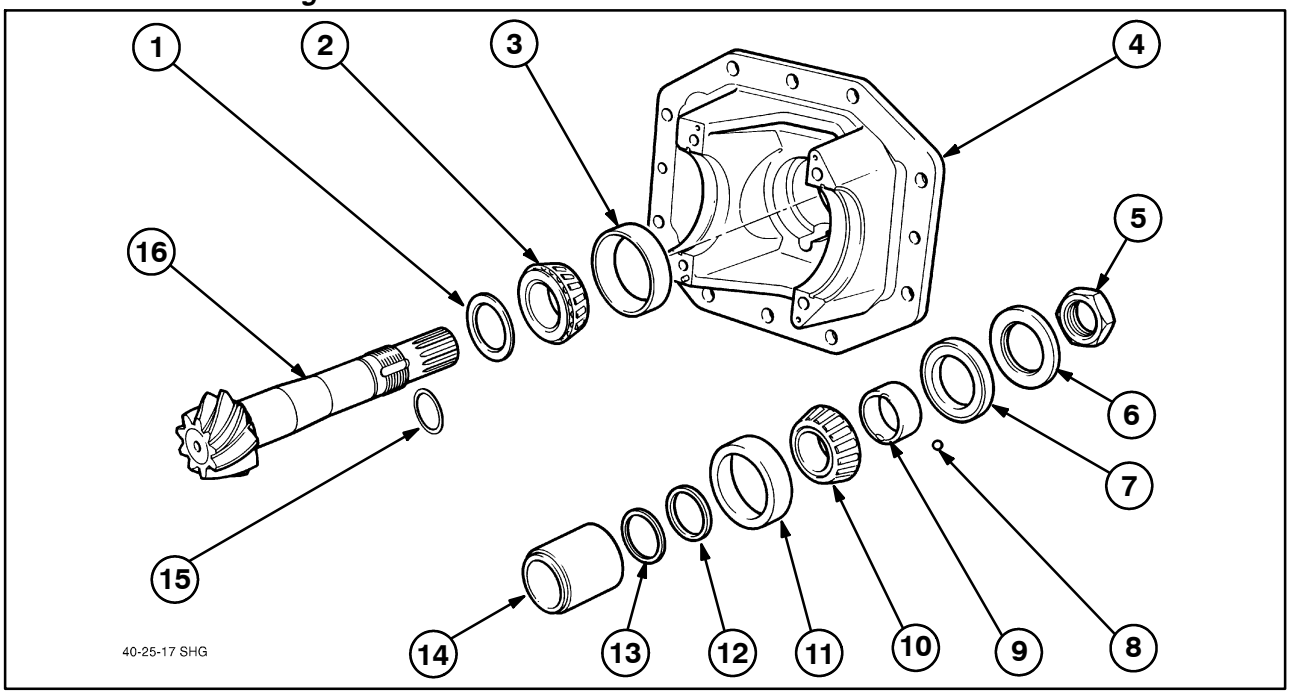
   Example **A** = 95 mm
   B = 95.77 mm

$$\mathbf{H4} = \mathbf{B} - 25^{*} + \left(\frac{\mathbf{A}}{2}\right)$$

$$\mathbf{H4} = 95.77 - 25^{*} + \left(\frac{95}{2}\right)$$

   H4 = 118.27
   C = 0.1 mm
   H3 = 15 + 0.1
   = 115.1
   Shim Thickness **S2** = 118.27 - 115.1
   = 3.17 mm

Pinion Shim and Bearing Installation



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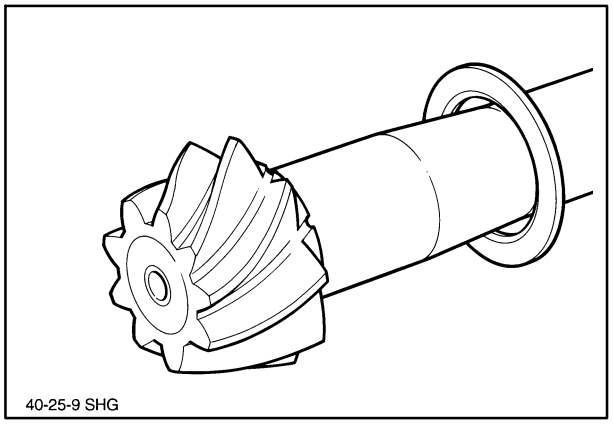
Standard Front Axle Pinion Components

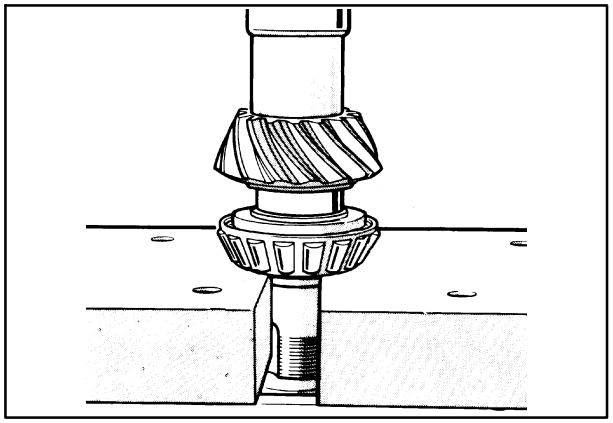
1. Pinion Depth Shim
2. Bearing
3. Bearing Cup
4. Differential Housing
5. Nut
6. Dust Cap
7. Seal
8. Ball Bearing
9. Sleeve
10. Bearing
11. Bearing Cup
12. Shim
13. Shim
14. Spacer
15. 'O' Ring
16. Pinion

7. Install the pinion depth shim selected in pinion to crown wheel shimming procedure in this chapter, between the pinion head and the bearing. Ensure the chamfer on the shim faces towards the pinion head.



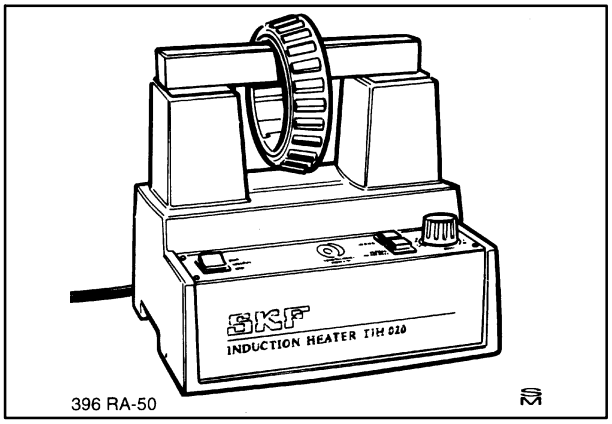
129

8. Install the pinion bearing onto the pinion.



130

NOTE: *The use of a electronic induction heater will assist in the installation of the bearings without the need for a press.*



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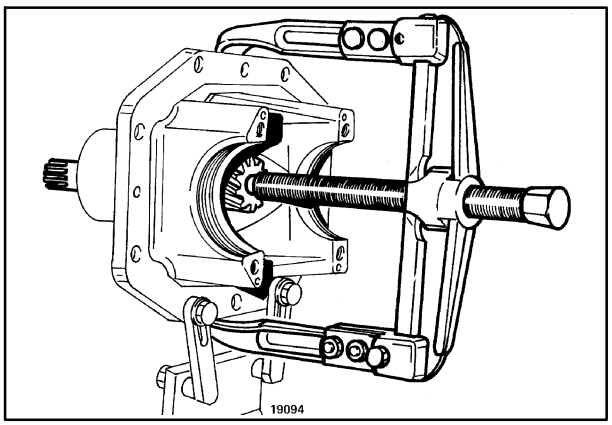
Pinion Bearing Preload Rolling Torque

The pinion bearing preload is measured as the torque or force required to rotate the pinion. The shim selected in the Pinion Bearing preload shimming procedure on page 50 ensures that the correct preload is achieved when the pinion nut is tightened to a torque of 294 Nm (217 lbf. ft).

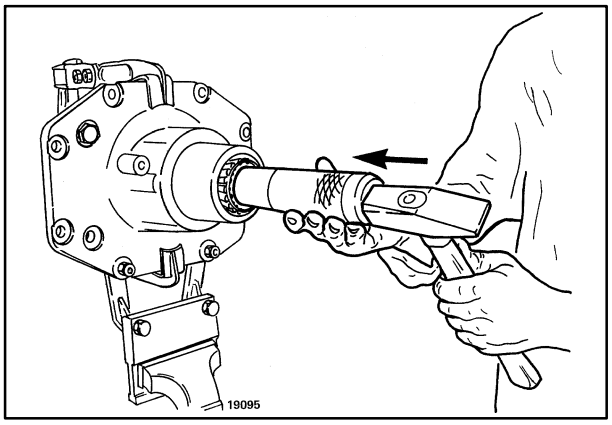
NOTE: *If the special tool required to determine the thickness of preload shim is not available install the same shim as removed during disassembly.*

1. Install the inner pinion bearing onto the pinion and locate the pinion into the differential carrier. Hold the pinion in position with a universal puller.



132

2. Install the spacer and shims onto the pinion shaft. Lubricate and install the pinion outer bearing.



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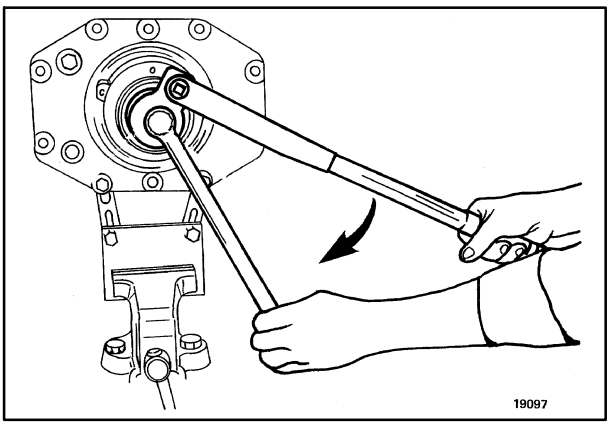
3. Install the sleeve, ball bearing and the pinion nut. Do not install the O-ring seal, oil seal and dust shield at this stage.
4. Tighten the pinion nut to the specified torque value of 294 Nm (217 lbf. ft).



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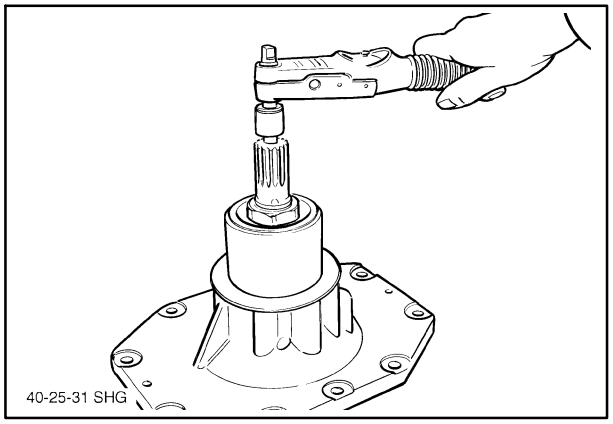
5. Screw an M12 bolt into end of the pinion shaft or use the locally fabricated pinion holding tool. Using a suitable low value torque meter measure the rolling torque of the pinion A1.

   The rolling torque should be 0.5–1.0 Nm (4.5–8.5 lbf in) excluding breakaway torque.

6. If the values recorded during the adjustment procedure are outside the specification adjust the thickness of shim and recheck bearing preload.



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7. When the correct shim thickness has been established remove the pinion nut, sleeve and ball and install the 'O' ring and pinion oil seal.
8. Carefully reinstall the sleeve, ball and pinion nut.

NOTE: *Attempting to fit the oil seal with the sleeve installed may damage the oil seal lip.*

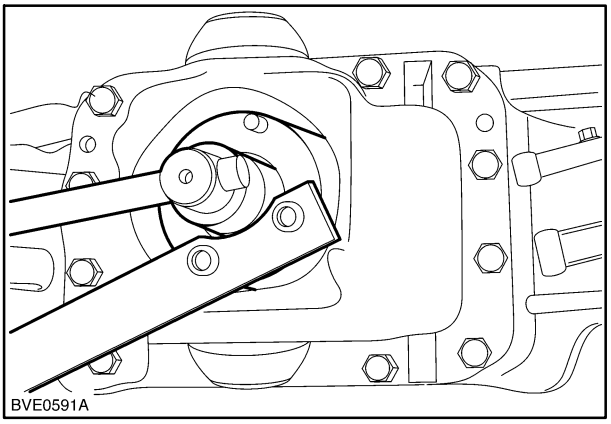
9. Tighten the pinion nut to a torque value of 294 Nm (217 lbf. ft) and bend the locking tab.

   Measure and record the pinion and seals rolling torque A1.

PINION SHAFT - SUPERSTEER AND SUSPENDED FRONT AXLE

Removal

1. Using the locally fabricated pinion flange holding tool, remove the pinion retaining nut and pinion flange.



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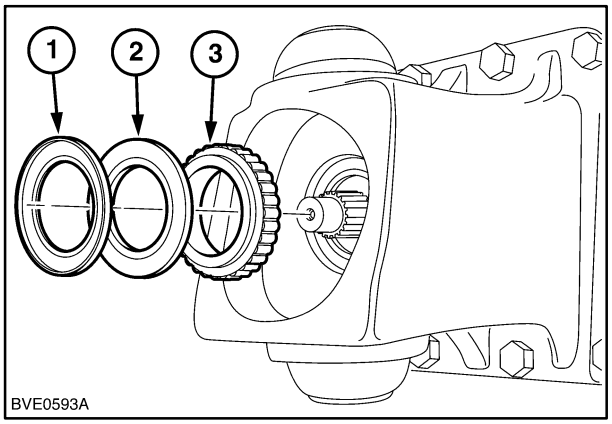
2. Remove the dust cover (1), pinion seal (2) and pinion bearing (3) from the differential casing.



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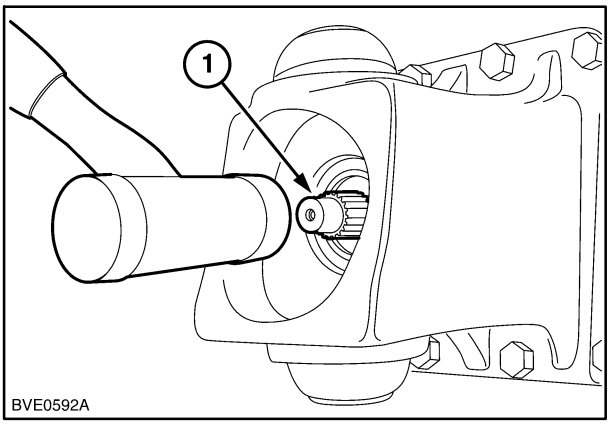
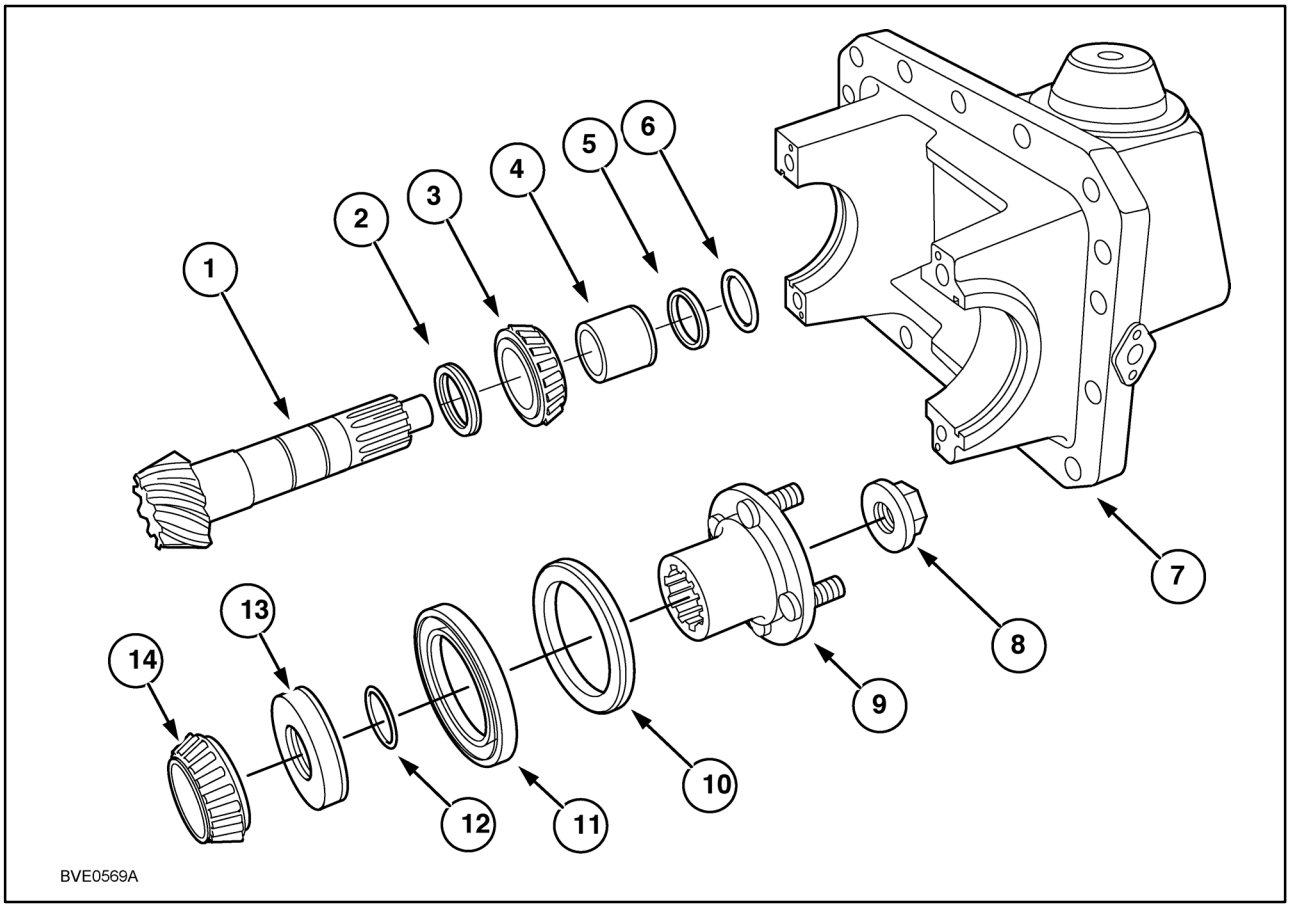
3. Withdraw the pinion shaft (1) from the rear of the differential casing and remove the spacer.



138



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Suspended and SuperSteer Front Axle Pinion Components (SuperSteer Front Axle Shown)

1. Pinion
2. Pinion depth shim
3. Bearing
4. Spacer
5. Shim
6. O-ring seal
7. Differential casing
8. Pinion nut
9. Pinion flange
10. Dust cover
11. Pinion seal
12. O-ring seal
13. O-ring seal carrier
14. Bearing

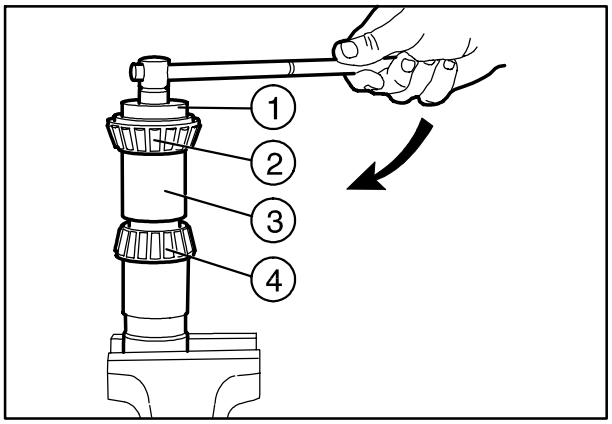
Installation/Adjustments

Pinion Bearing Preload Shimming

⚠ WARNING ⚠

Handle all parts with care.
Do not insert hands or fingers between one part and another. Wear suitable safety clothing, i.e. safety goggles, gloves and footwear.

1. Remove the pinion bearing from the pinion.
2. Clamp the special tool **293391** (1) in the vice, fit the inner races of the bearings (2 and 4) and the bearing spacer (3) and secure the nut on the special tool.



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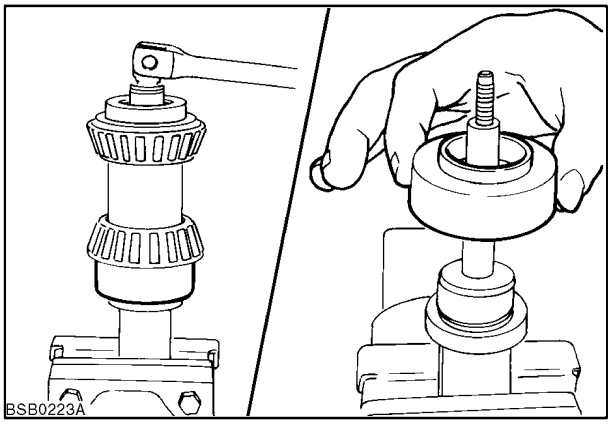
NOTE: *The pinion of all the SuperSteer/Suspended front axles is shorter and special tool 293391 and* ***293438*** *requires a spacer, special tool No.* ***380001115*** *to be inserted under the lower bearing (4). The spacer can be manufactured locally using the dimensions shown in Figure 8, page 8, under Special Tools.*



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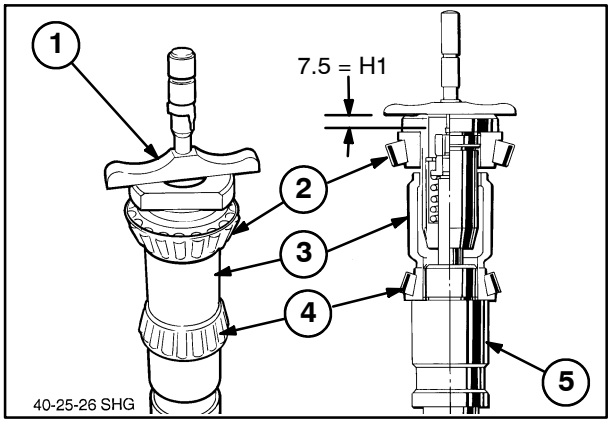
3. Using a depth micrometer, measure the distance (H_1) between the upper surface of the special tool and the central threaded pin of the special tool **293391**/**293438** (1).
4. Disassemble the above parts, lubricate the bearings with oil and then re-assemble the parts, excluding the bearing spacer, in the differential housing.



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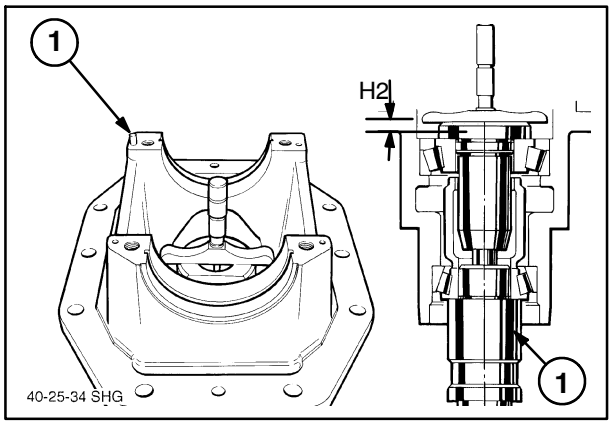
5. Tighten the nut of the special tool **293391**/**293438** (1), while turning the special tool to ensure that the bearings are seated correctly.
6. Install spacer for SuperSteer/Suspended front axle.

7. Using a depth micrometer, measure distance (**H_2**).
8. The thickness of the adjustment shim required is calculated by:
   Shim S_1 = H_2 - H_1 + 0.05 mm

If necessary, round the value obtained up to the nearest 0.05 mm.

Leave the special tool in the differential housing for the pinion depth measurement.



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Pinion To Crown Wheel Shimming Procedure

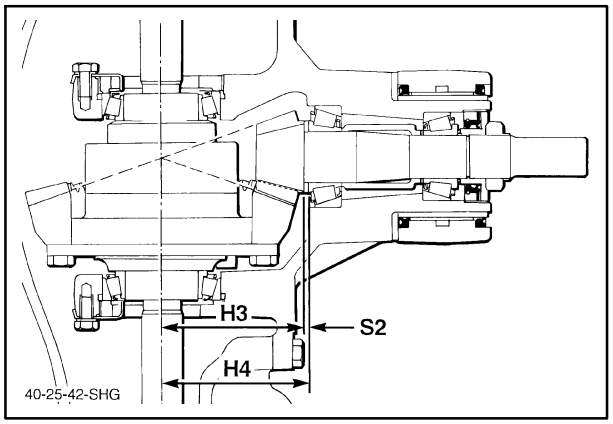
The pinion to crown wheel shimming procedure calculates the thickness of shims **S2**, positioned beneath the shoulder of the pinion gear to ensure that the theoretical conical point of the pinion aligns with the centre of the differential crown wheel.

Pinion Shimming Dimensions

H4 Dimension from Pinion Bearing to Centre line of Differential Casing
H3 115 mm Manufacturers Pinion Dimension ± C (Correction Factor) or 122.5 mm ±C for class IV axles
S2 Shim Thickness

The dimension **H4** in the calculation of the shim thickness can be determined using the pinion adjustment special tool **293400** or VL Churchill tool **FT3135**.

Both procedures are explained as follows.



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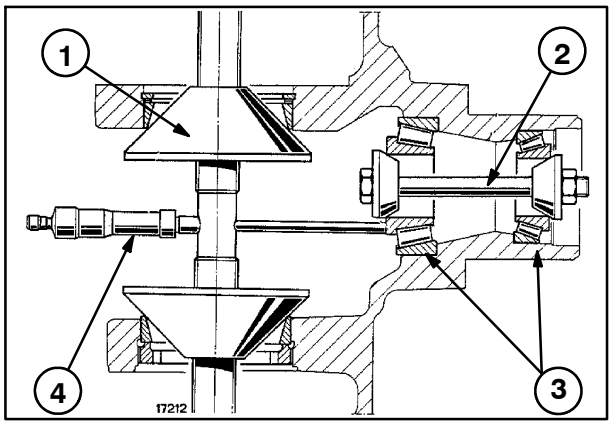
Pinion Shimming Using Pinion Adjustment Tool 293400

1. Install pinion bearings in differential support housing and clamp in position using special tool **293391**/**293438** as used when determining thickness of shims for bearing preload.



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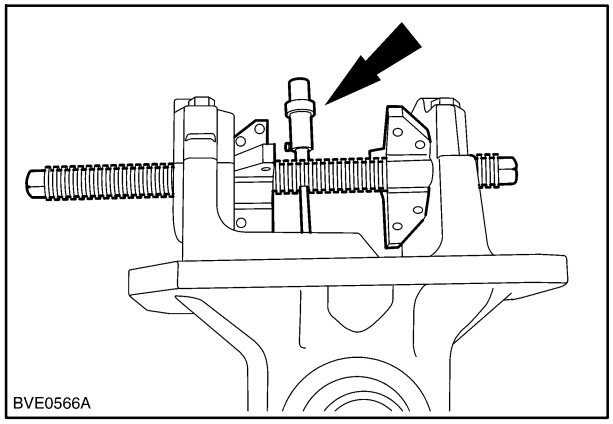
1. Pinion Measuring Gauge special tool **293400**
2. Pinion Bearing Clamp. Use special tool **293391**/**293438** or alternative clamp **50048** as shown
3. Pinion Bearings
4. Micrometer (Part of special tool **293400**)

2. Install the Pinion Setting special tool **293400** complete with bearing cup and adjusting rings. Tighten the bearing caps retaining bolts to the specified torque value of 113 Nm (83 lbf).

   If special tool **293391** as described in pinion bearing shimming procedure is not available the Bearing Clamp special tool **50048** may be used to clamp the bearings.

3. Adjust the cones of the special tool so that the depth micrometer tip touches the inner race of the bearing and measure the dimension (**H4**).



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4. Determine the thickness of shims to be installed beneath the pinion gear as follows:

   Shim thickness **S2** = **H4**-**H3**

   Where:-

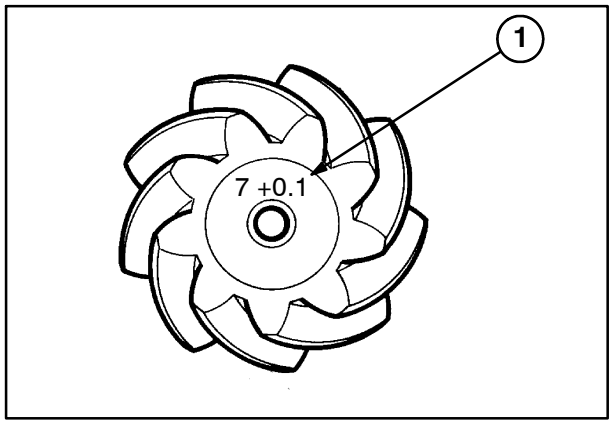
   H4 = Dimension measured using pinion micrometer tool

   H3 = 115 mm ±**C**

   115 mm is the nominal manufacturing dimension from rear face of pinion gear to conical point of pinion.

   C = Manufacturing correction factor stamped on face of pinion.

   Example **H4** = 118.27
   C = +0.1 mm
   H3 = 115 + 0.1
   = 115.1 mm
   S2 = **H4** -**H3**
   = 118.27 - 115.1
   Shim Thickness **S2** = 3.17 mm



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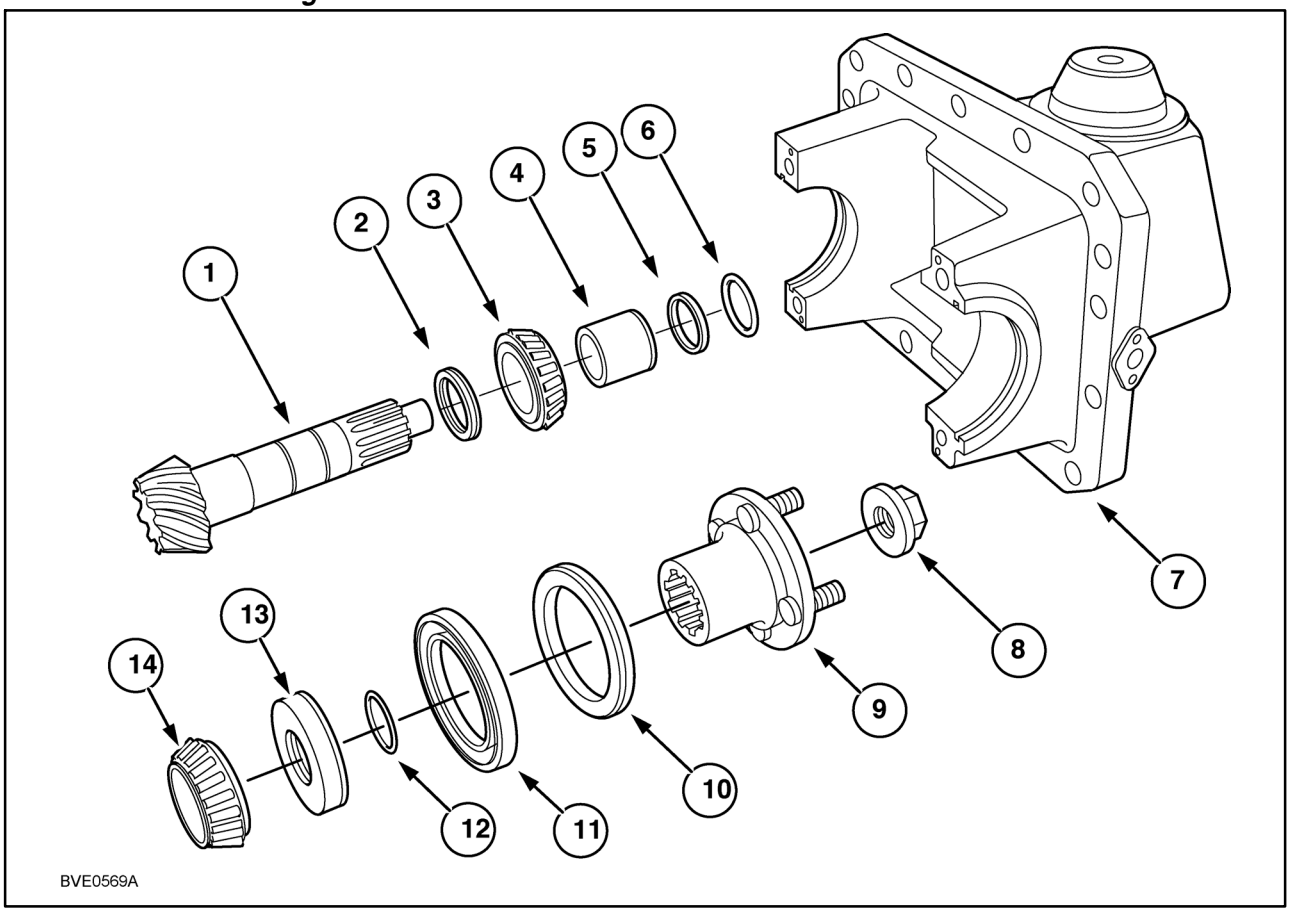
Pinion Shim and Bearing Installation



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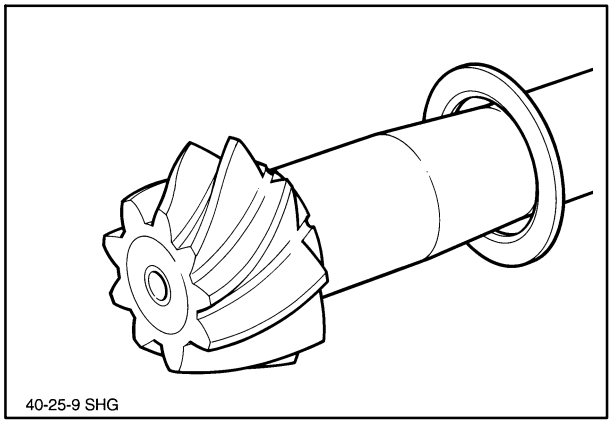
Suspended and SuperSteer Front Axle Pinion Components (SuperSteer Front Axle Shown)

1. Pinion
2. Pinion depth shim
3. Bearing
4. Spacer
5. Shim
6. O-ring seal
7. Differential casing
8. Pinion nut
9. Pinion flange
10. Dust cover
11. Pinion seal
12. O-ring seal
13. O-ring carrier
14. Bearing

5. Install the pinion depth shim selected in pinion to crown wheel shimming procedure in this chapter, between the pinion head and the bearing. Ensure the chamfer on the shim faces towards the pinion head.



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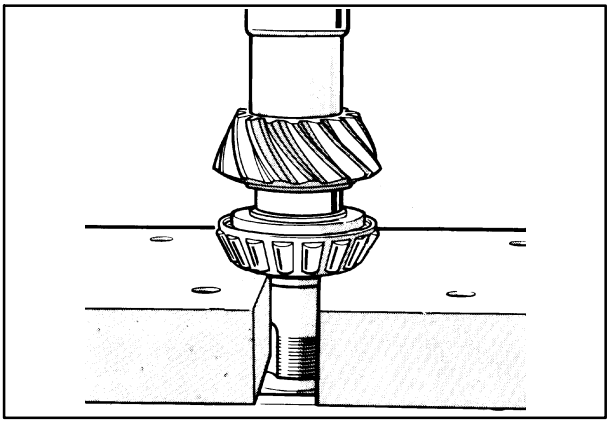
6. Install the pinion bearing onto the pinion.



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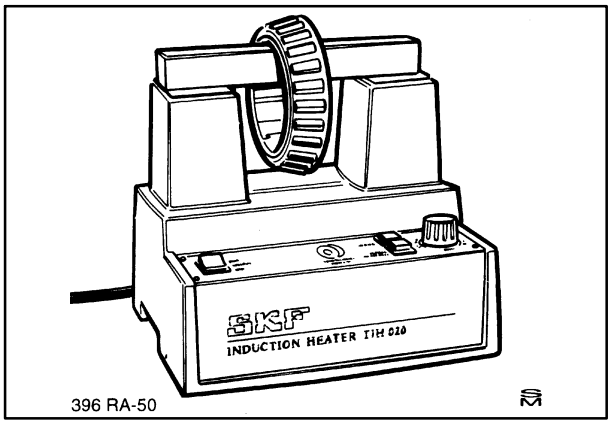
NOTE: *The use of a electronic induction heater will assist in the installation of the bearings without the need for a press.*



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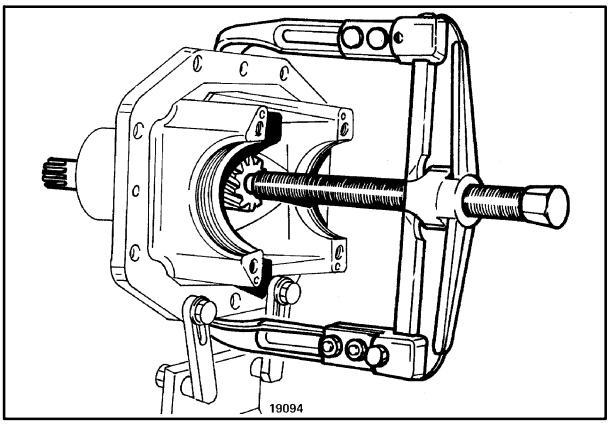
Pinion Bearing Preload Rolling Torque

The pinion bearing preload is measured as the torque or force required to rotate the pinion. The shim selected in the Pinion Bearing preload shimming procedure on page 59 ensures that the correct preload is achieved when the pinion nut is tightened to a torque of 294 Nm (217 lbf. ft).

NOTE: *If the special tool required to determine the thickness of preload shim is not available install the same shim as removed during disassembly.*

1. Install the inner pinion bearing onto the pinion and locate the pinion into the differential carrier. Hold the pinion in position with a universal puller.



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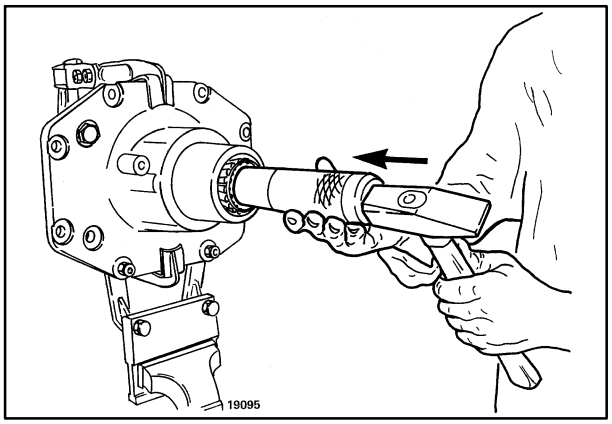
NOTE: *Do not install the pinion seal and dust cover.*

2. Install the spacer and shims onto the pinion shaft. Lubricate and install the pinion outer bearing.



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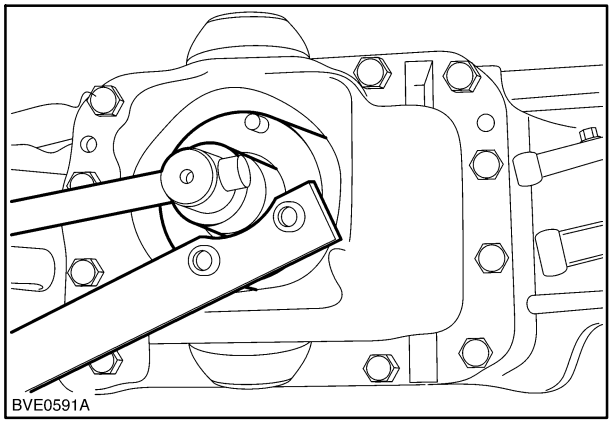
3. Install the pinion flange and retaining nut.
4. Using the locally fabricated pinion flange holding tool. Tighten the retaining nut to the specified torque value of 294 Nm (217 lbf. ft).



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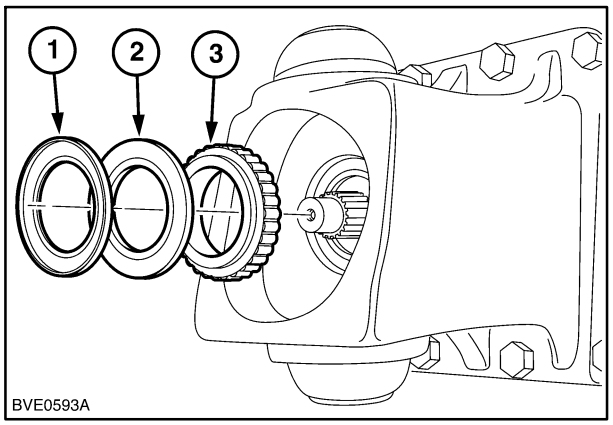
5. Using a suitable low value torque meter measure the rolling torque of the pinion **A1**.

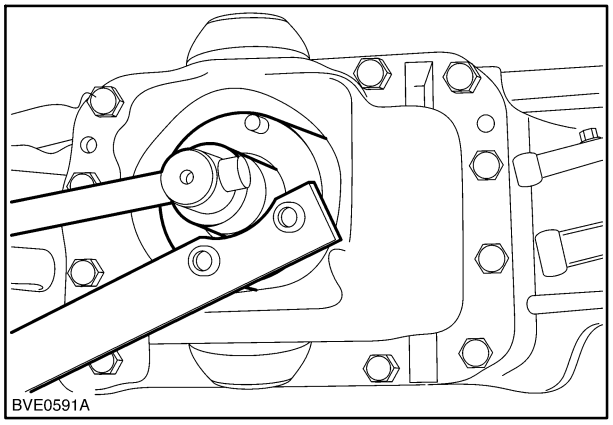
   The rolling torque should be 0.5–1.0 Nm (4.5–8.5 lbf in) excluding breakaway torque.
6. If the values recorded during the adjustment procedure are outside the specification adjust the thickness of shim and recheck bearing preload.
7. When the correct shim thickness has been established, remove the pinion flange retaining nut and the pinion flange.
8. Install the dust cover (1), pinion seal (2) and pinion bearing (3) to the differential casing.



155

9. Install the pinion flange and retaining nut.
10. Using the locally fabricated pinion flange holding tool. Tighten the retaining nut to the specified torque value of 294 Nm (217 lbf. ft).

    Measure and record the pinion and seals rolling torque A1.



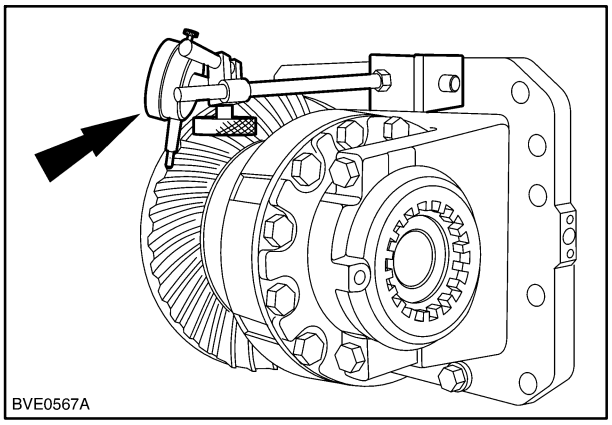
156

CROWN WHEEL MULTI-WET PLATE CLUTCH DIFFERENTIAL LOCK

Adjustments

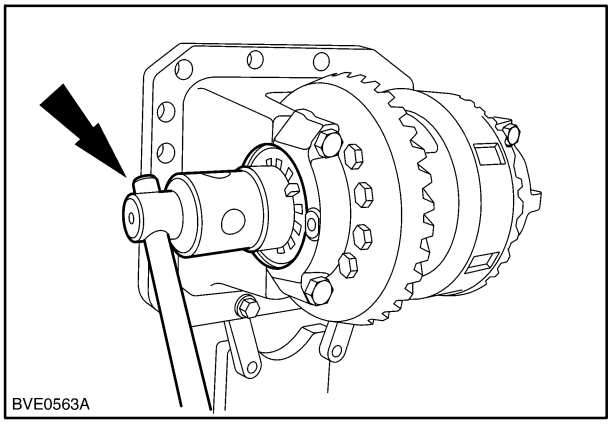
Adjustment of the crown wheel bearings and the backlash between the pinion and crown wheel.

1. Using the locally fabricated flange holding tool, lock the pinion flange to prevent it from rotating.
2. Measure the backlash between the pinion and crown wheel using a dial gauge perpendicular to the outer edge of a tooth on the crown wheel.
3. Repeat the measurement in a further two positions 120° apart and compare the average of the three values **(Gm)** with the specification backlash: 0.15–0.20 mm.



157

4. Adjust the left-hand locking ring until the backlash is between 0.15 mm – 0.20 mm. Rotate the crown wheel 360° between each reading.



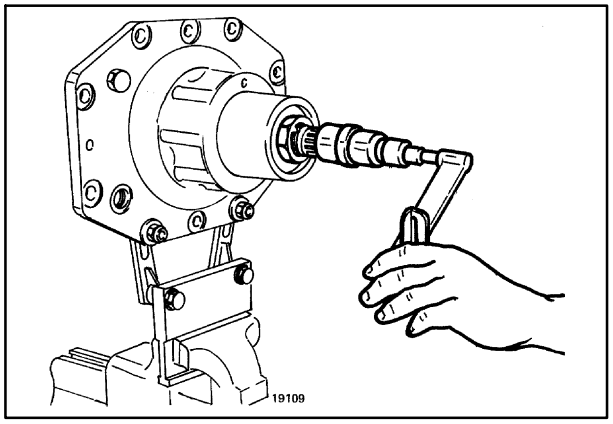
158

DIFFERENTIAL BEARING MULTI-WET PLATE DIFFERENTIAL LOCK

Preload

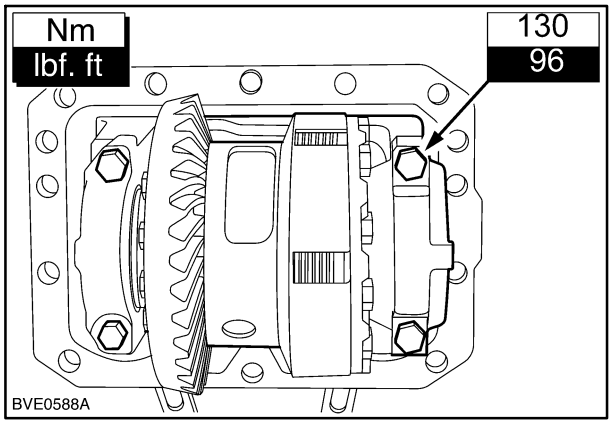
The differential bearing preload is checked by measuring the combined rolling torque of the crown wheel and pinion assembly and comparing it to the pinion and seals rolling torque value **A1** (page 63).

1. Attach a torque meter to the pinion shaft and measure the rolling torque to rotate the pinion and crown wheel **A2**.



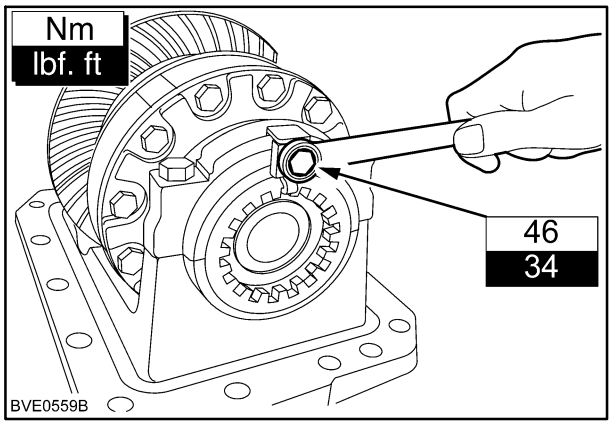
159

2. Subtract from the rolling torque reading **A2**, the pinion and seals rolling torque **A1**. The difference between the two values should be 1 Nm to 1.5 Nm (9 - 13 lbf in).
3. Adjust the right-hand locking ring until the rolling torque is within the specification quoted in the previous step.
4. Rotate the crown wheel and pinion through 360°.
5. Recheck the backlash, adjust as necessary.
6. Rotate the crown wheel and pinion through 360°.
7. Recheck the differential bearing preload, adjust as necessary.
8. Tighten the differential assembly side cap retaining bolts to the specified torque value.



160

9. Install the locking ring lock tabs.
10. Using a lifting hoist, remove the differential support from the tool and remove the special tool **293743** from the vice on the work bench.



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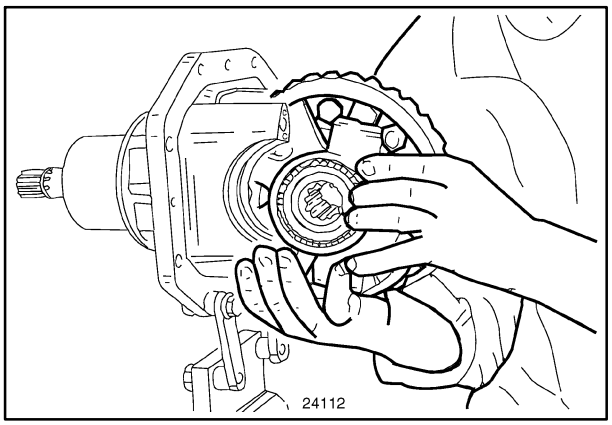
CROWN WHEEL DOG CLUTCH DIFFERENTIAL LOCK

Adjustments

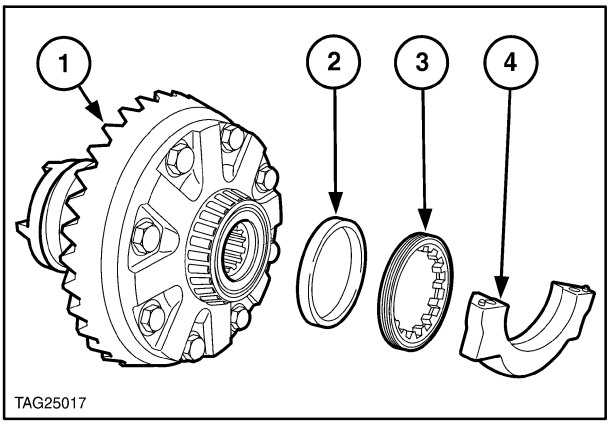
Adjustment of the crown wheel bearings and the backlash between the pinion and crown wheel.

1. Install the differential assembly complete with crown wheel and inner crown wheel bearing rings in the differential housing.



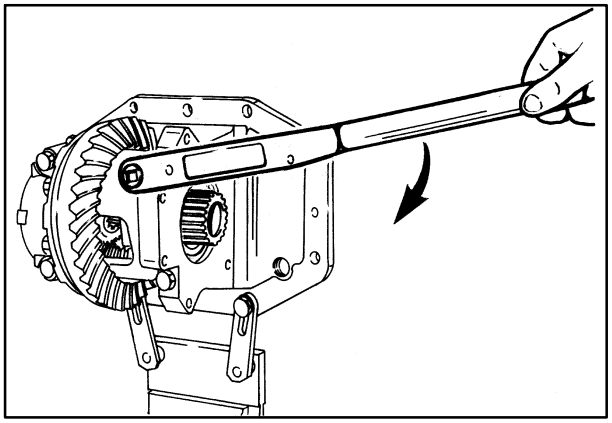
162

2. Insert the outer bearing rings in the differential housing, fit the differential support caps (4), ensuring correct orientation of the threaded adjustment ring (3), smooth edge facing outwards.



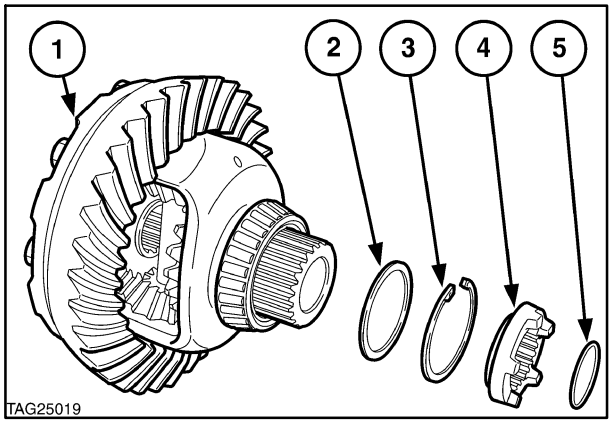
163

3. Tighten the retaining bolt to the specified torque value of 59 Nm, then slacken the retaining bolts and re-tighten to a torque of 20 Nm.



164

4. Measure the thickness **SP** of the adjustment shim (2) which was previously removed during the axle overhaul procedure. Refit the shim and circlip (3).



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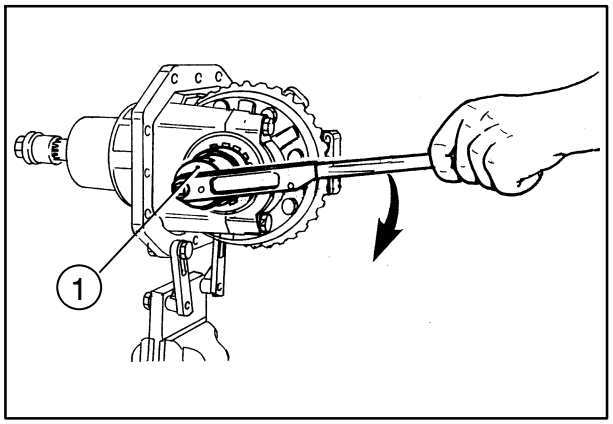
5. With the bearings lubricated, rotate the crown wheel and at the same time tighten the threaded adjustment ring using the special tool **293665** (1) to the specified torque value of 39 - 59 Nm to take up the axial play between the components.



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6. Measure the backlash between pinion and crown wheel, using a dial gauge perpendicular to the outer edge of a tooth on the crown wheel.
7. Repeat the measurement in a further two positions 120° apart and compare the average of the three values **(Gm)** with the specification backlash: 0.15-0.20 mm, with an **average of 0.18 mm**.

   If the **measured backlash exceeds** the specified value, **fit a thinner adjustment shim (2).**

The thickness of the adjustment shim to be fitted in the differential housing is given by:

Shim S = Sp - {(Gm - 0.18) x 1.35}

where:

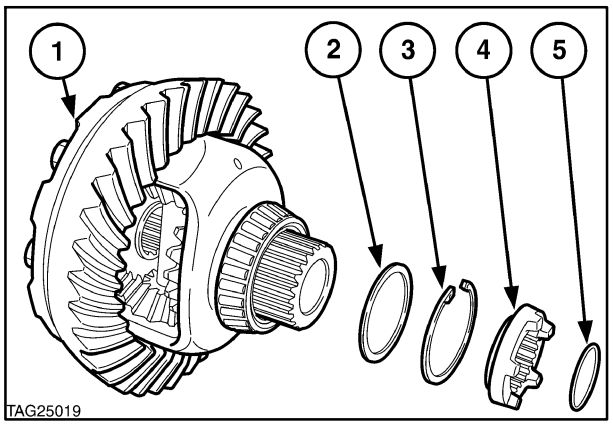
Sp = thickness of test shim installed in the differential housing. i.e. original shim used as a test shim.

Gm = average backlash measured between the pinion and crown wheel

If the **backlash measured is less than** the prescribed value, **fit a thicker adjustment shim (2)**, the value being given by:

Shim S = Sp + {(0.18 - Gm) x 1.35}

Recheck the backlash and adjust shim if necessary.



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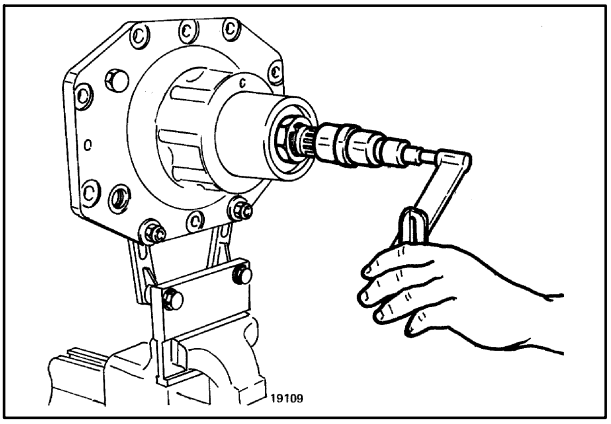
DIFFERENTIAL BEARING DOG CLUTCH DIFFERENTIAL LOCK

Preload

The differential bearing preload is checked by measuring the combined rolling torque of the crown wheel and pinion assembly and comparing it to the pinion and seals rolling torque value **A1** (page 55).

1. Attach a torque meter to the pinion shaft and measure the rolling torque to rotate the pinion and crown wheel **A2**.



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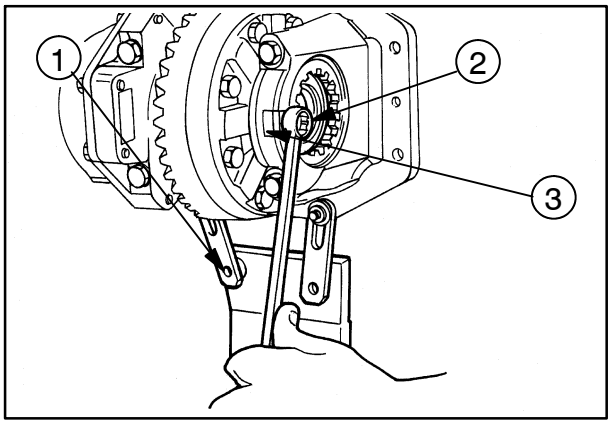
2. Subtract from the rolling torque reading **A2** described above, the pinion only rolling torque **A1**.

   The difference between the two values should be 1 to 1.5 Nm, (9 - 13 lbf in).

3. If the rolling torque of the pinion and differential assembly is not to specification adjust the ring 'opposite' the crown wheel to increase or reduce differential bearing preload. Recheck the rolling torque as detailed above.

   Refit the lock tabs to secure the adjusting ring(s).



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EXAMPLE

Rolling torque of Pinion and Differential

A2 = 2.1 Nm (19 lbf in)

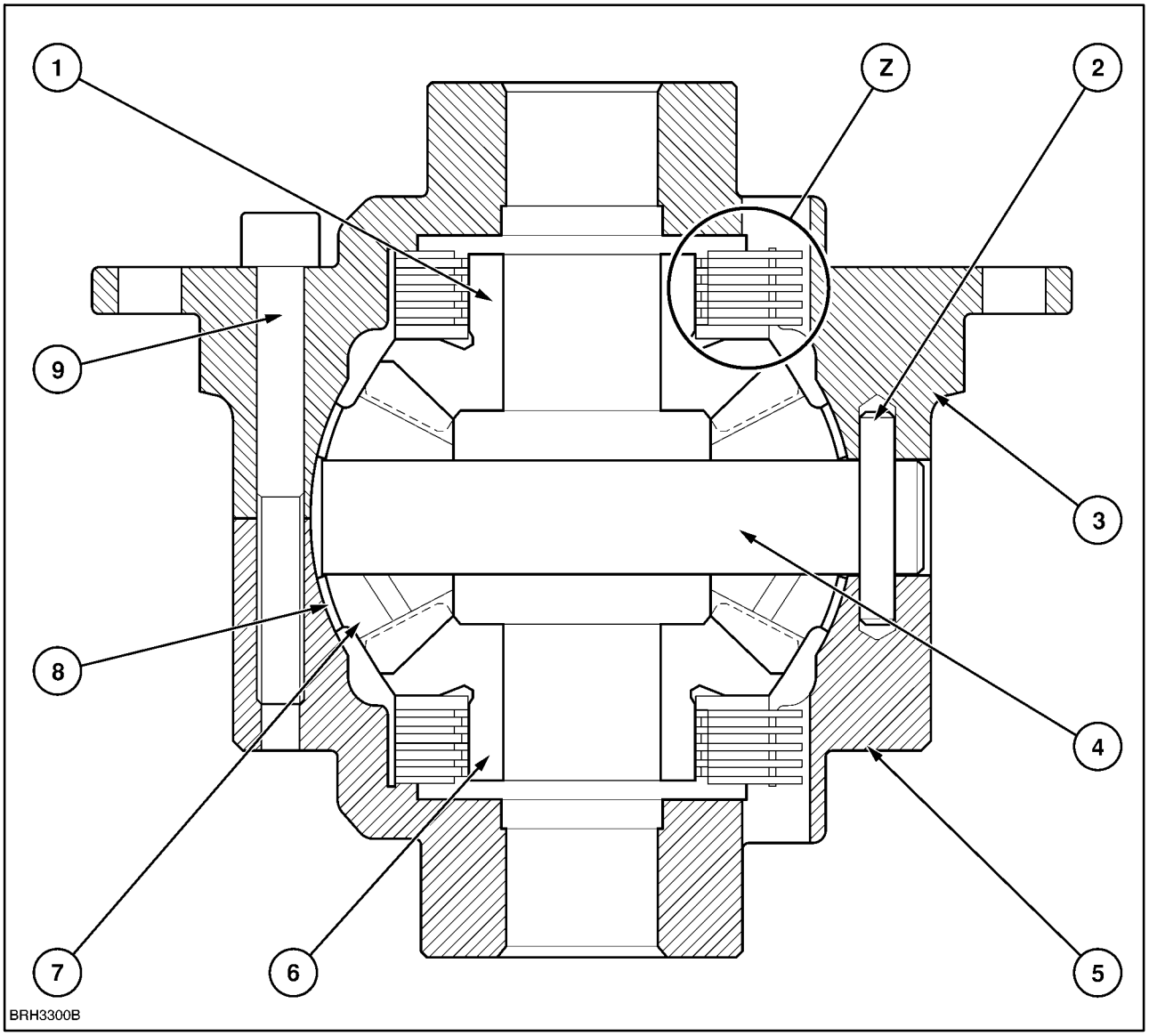
Rolling torque of Pinion

A1 = 0.7 Nm (6 lbf in)

Calculated Rolling Torque of Differential

= 2.1 - 0.7 Nm (19 - 6 lbf in)

=1.4 Nm (13 lbf in)



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LIMITED - SLIP self-locking differential

LIMITED SLIP SELF-LOCKING DIFFERENTIAL

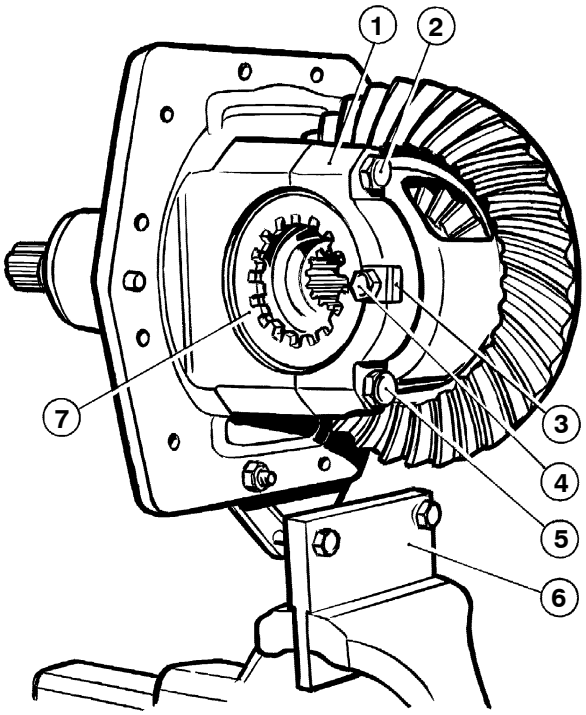
Operation

The differential with limited-slip locking (see figure 170) is of the two planet gear-type, provided with two multi-disk clutch assemblies fitted between the sun gears and the differential casing.

This differential lock device is totally automatic. It does not require any type of manual operation and significantly reduces (but does not completely eliminate) wheel slipping.

The difference in speed, between the sun gears and the differential casing when a wheel begins to slip as a result of grip loss, is impeded by clutch assemblies that are compressed by axial thrusts from the bevel drive torque transmitted to the sun gears by means of the teeth on the two planet gears.

These torque values may be different, according to the nature of the ground and the route followed by the tractor, and may vary in intensity thereby proportionally determining the axial stress on the clutches, allowing the sun gears to mesh with the differential casing which, in turn, permits the axle to maintain drive despite the ground conditions.



MDD1351A

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Front axle differential with LIMITED SLIP

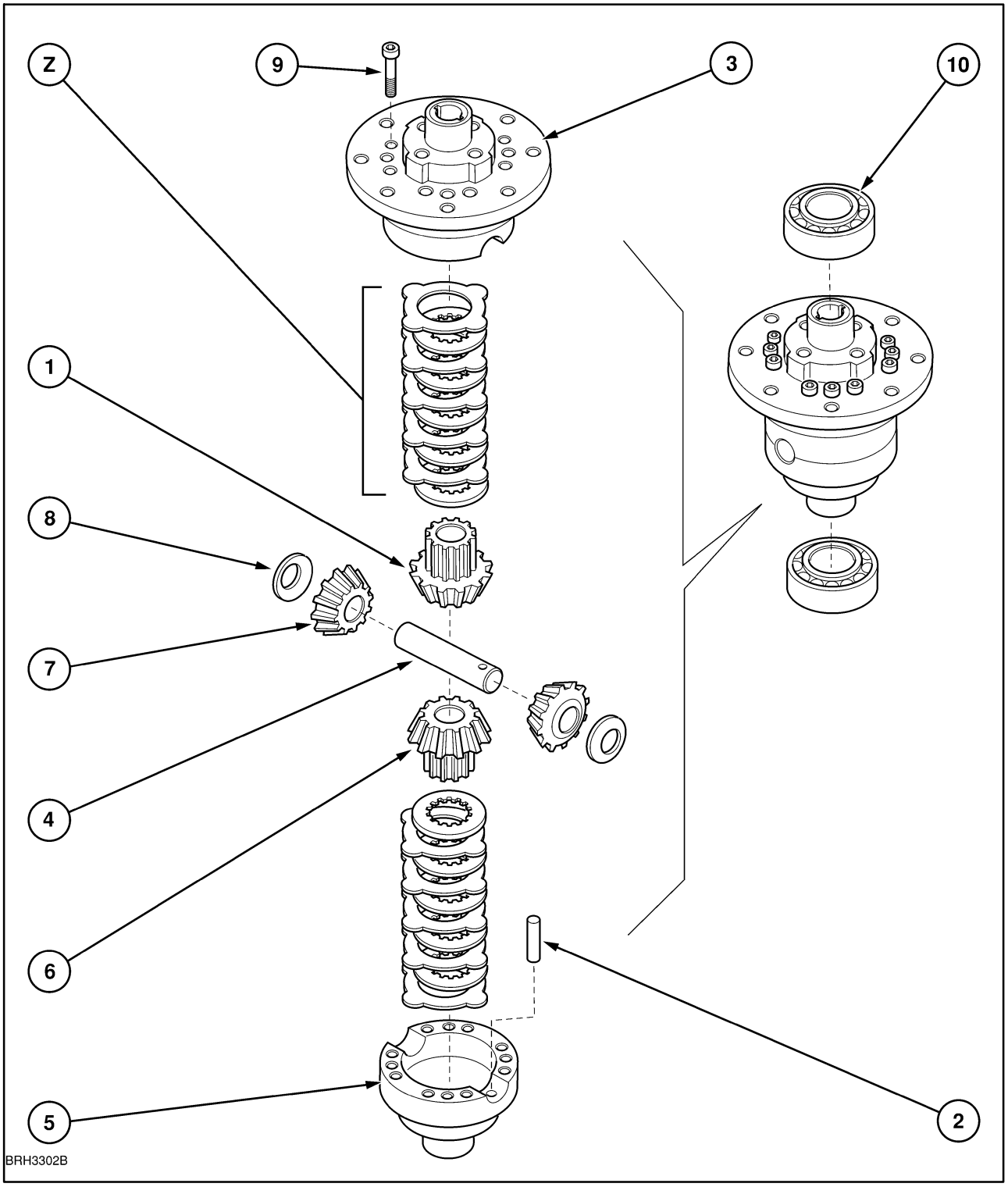
Op. 25 102 27

Removal

⚠ CAUTION ⚠

Handle all parts carefully.
Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

1. Remove the bevel drive-differential casing assembly from the front axle, attach to support **380 000 255** (6), lock in a vice and proceed with disassembly operations as follows.
2. Take out the bolts (4) and the plates (3) retaining the right- and left-hand ring nuts (7).
3. Check that the right- and left-hand caps (1) are clearly marked, so as not to interchange the parts during assembly operations.
4. Remove the right- and left-hand bearing adjustment ring nuts (7) from the crown wheel.
5. Take out the bolts (2) and caps (1) and separate the bevel crown wheel from the bevel pinion support.
6. If necessary, take out the retaining bolts and remove the bevel crown wheel.



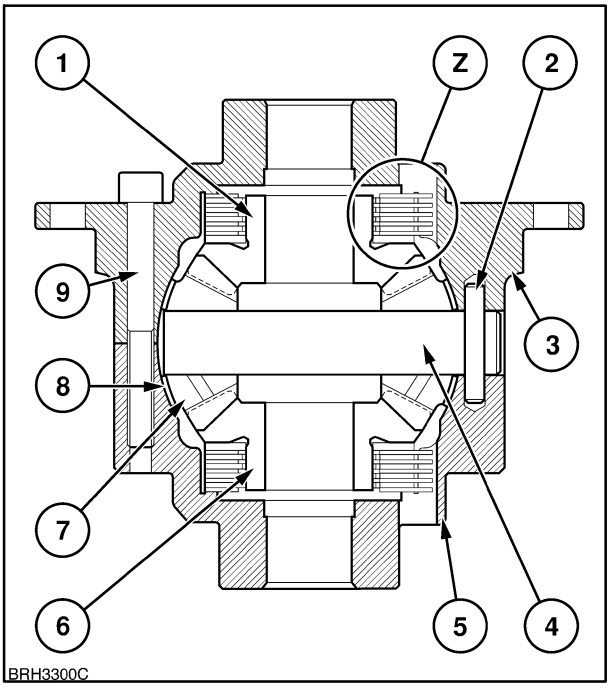
172

Limited Slip - Self Locking Differential

1. Sun gear
2. Pin
3. Half casing
4. Differential pin
5. Half casing
6. Sun gear
7. Planet gear
8. Thrust washer
9. Bolt
10. Bearing

Disassembly

1. Remove the retaining bolts (9) from the differential half-casings.
2. Remove the differential pin (4), complete with planet gears (7), thrust washers (8) and pin (2) from the half-casing (5).
3. Remove the sun gear (6), friction disk (11, fig. 174), metal disks (10) and friction disks (12).
4. Remove the sun gear (1), friction disk (11), metal disks (10) and the friction disks (12) from the half-casing (3).
5. Check the wear on the metal disks (10) and the friction disks (11 and 12, see table below), replacing parts that show signs of wear.
6. Proceed with self-locking differential assembly operations, carrying out the previously described operations in reverse order, apply New Holland Thread lock 82995773 (LOCTITE 270) to the threads on the screws (9) and tighten to a torque value of 50 Nm (5.1 kgm).



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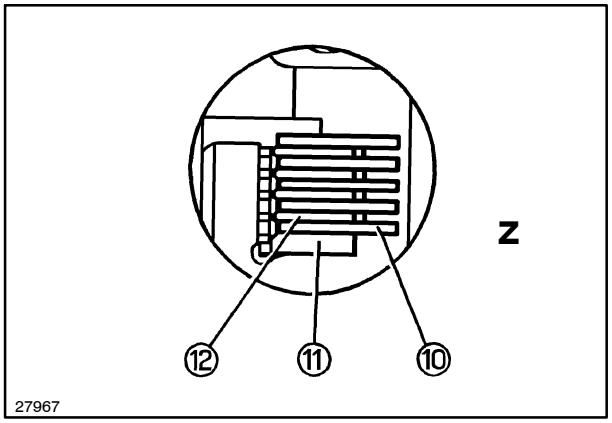
LIMITED-SLIP self-locking differential

7. Refit the bevel crown wheel (if previously disassembled) on the half-casing (3), tightening the bolts to a torque value of 130 Nm (96 lbf.ft).
8. Check the rolling torque of the bevel pinion, as indicated on page 60.
9. Assemble the bevel crown wheel, complete with LIMITED SLIP self-locking differential, on the bevel drive support, remembering to fit the previously marked bevel crown wheel bearing support caps in the correct order and assemble and adjust the bevel crown wheel bearings as indicated on page 67.



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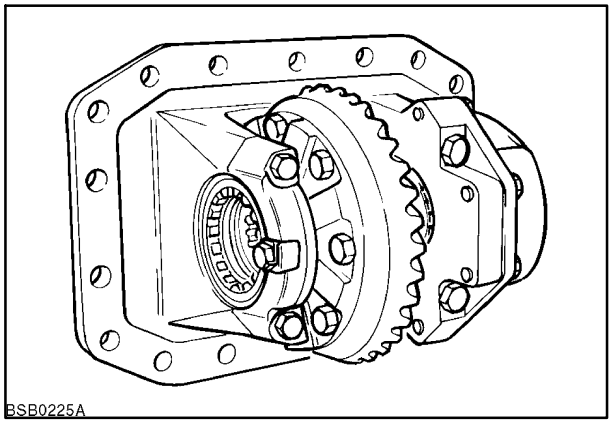
Friction parts detail

LIM-SLIP self-locking differential friction disks				
Item no.	Description	Amount	Thickness in. (mm)	Maximum wear per disk in. (mm)
10	Metal disk	10	0.0590 (1.5)	-
11	Friction disk	2	0.1102 (2.8)	0.0039 (0.10)
12	Friction disk	8	0.0629 (1.6)	0.0059 (0.15)

AXLE COMPONENT - ALL OPTIONS

Assembly

Install the differential assembly to the axle casing after having carefully cleaned and degreased the mating surfaces and applied a bead of gasket sealer approx. 2mm wide along the line shown in the figure below.

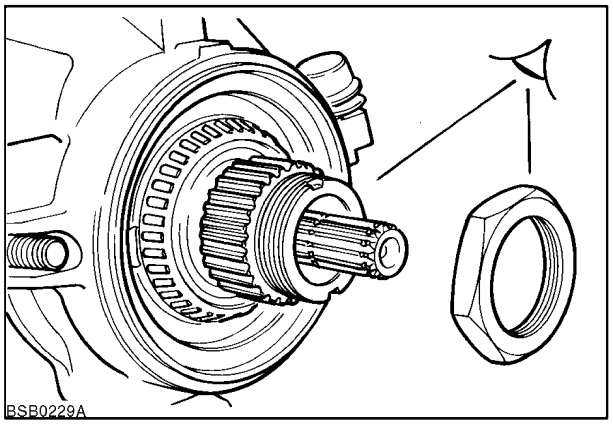


175

- Install the axle shafts and securing bolt.
- Fit the wheel hub, the ring gear of the final drive unit and the lock ring and tighten to the specified torque value, while turning the wheel hub to ensure that the bearings are correctly seated.

NOTE: *It is recommended that a new lock ring is installed and the stub axle thread cleaned before installation.*

- Fit the securing and stop circlips, the driving gear and the cover of the final drive unit.
- Fit the pins, washers, spacers and steering cylinders.
- Fit the track rod, the front and rear supports and the oil drain plugs.
- Refill with oil.



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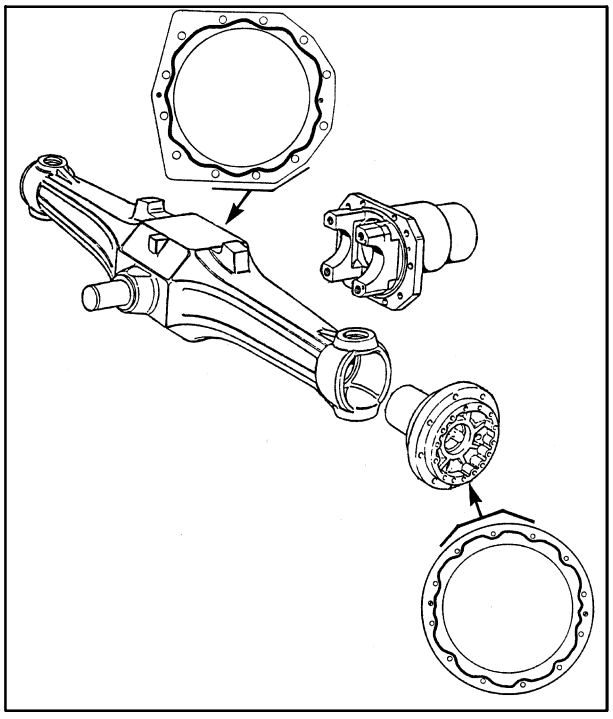
Gasket sealer application diagram for assembly of bevel drive unit and epicyclic final drive unit.

The types of gasket sealer to use are listed in Section 00.



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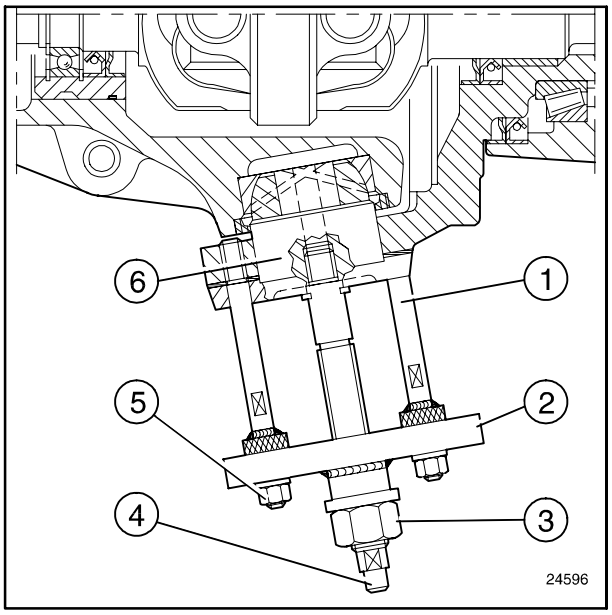
STEERING SWIVEL PINS AND BEARINGS

Replacement

(Op. 25 108 46 or 25 108 47)

In the event that the steering swivel pins prove difficult to remove, proceed as follows.

1. Remove the grease nipples and the steering swivel pin retaining bolts.
2. Fit the bolts (1) of the special tool **293857**.
3. Fit the plate (2) of the tool and fix it to the three bolts with nuts (5).
4. Fit the central tie bolt (4) screwing it fully into the grease nipple bore on the pin (6).
5. Screw in the nut (3) to drive the pin out of its bore.



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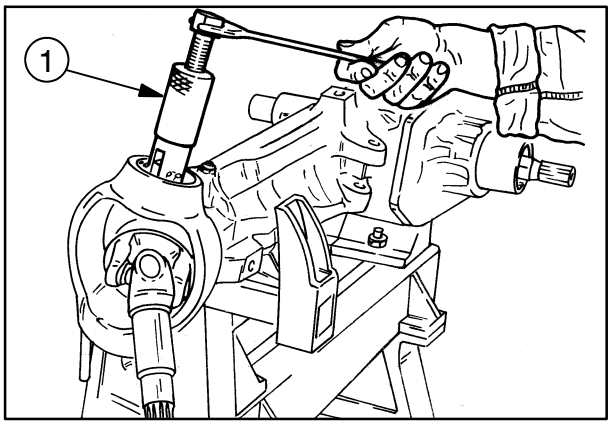
6. Using the extractor special tool **292161** (1) remove the steering swivel bearings.
7. Re-install the steering swivel bearings using a suitable drift.

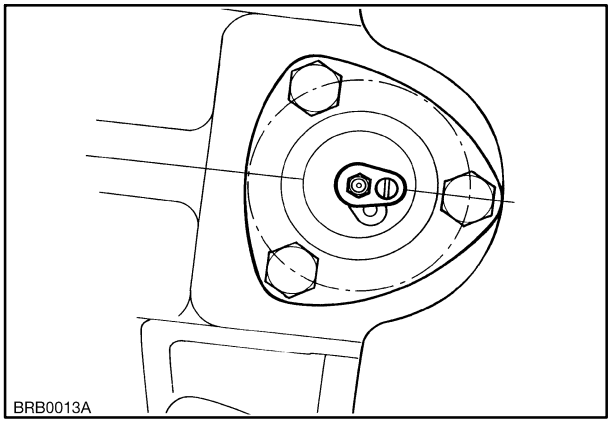


179

SWIVEL PIN AND POTENTIOMETER

Steering Angle Potentiometer Replacement

- Feed the new wires of the potentiometer through the front axle and install the potentiometer ensuring that it is correctly located on the pins. Apply setting silicone around the potentiometer and along the wires where it contacts the axle beam.
- Fit the stub axle, the adjustment shims, the upper and lower pivot pins.



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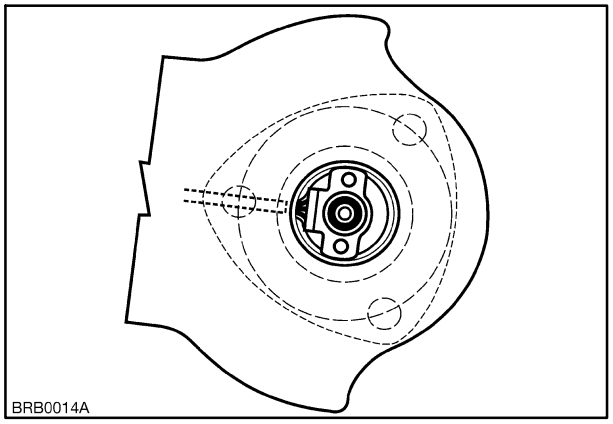
- Position the wheels in the straight ahead position. Install the potentiometer drive pin carefully into the top swivel until it locates in the 'D' section of the potentiometer. When the pin locates it will be approximately 45° from the fixing hole screw. Rotate the pin against spring pressure to enable the retaining screw to be installed.

NOTE: *Calibration of the steering angle sensor must then be carried out.*



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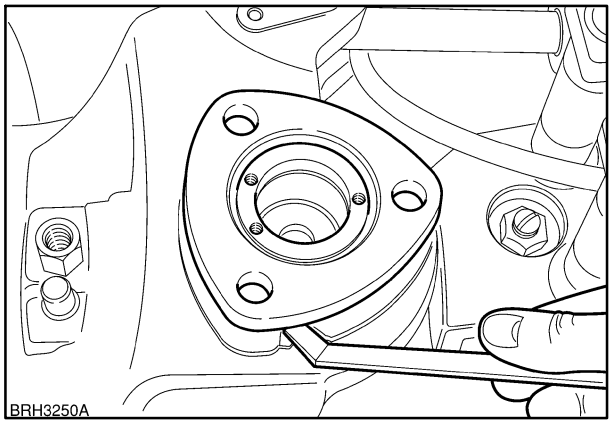
Steering Swivel Pins And Bearings (Models with steering angle sensor)

Replacement

(Op. 25 108 46 or 25 108 47)

In the event that the steering swivel pins prove difficult to remove, proceed as follows.

1. Remove the 3 steering swivel pin retaining bolts.
2. Using suitable pry bars located in the swivel housing casting slots, carefully lever the swivel pin from the housing.
3. Remove the swivel housing. Refer to axle overhaul.



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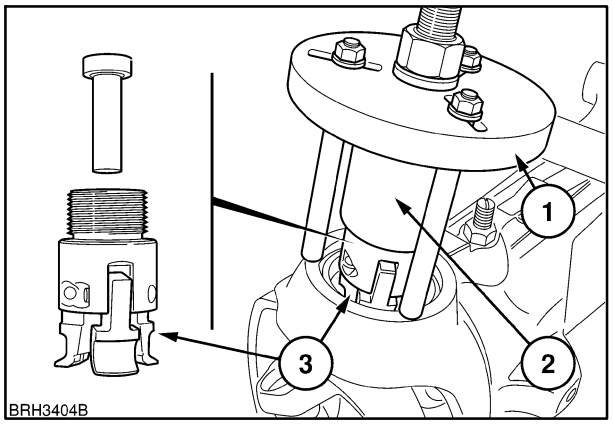
4. Remove the steering angle potentiometer shaft from the axle housing. Refer to potentiometer removal.
5. Using the bearing puller attachment of extractor special tool **292161** (3) with adaptor tool **XXXXXXXXX (2)** couple these to special tool **293857** (1) and remove the steering swivel bearings.
6. Re-install the steering swivel bearings using a suitable drift.

NOTE: *Take care when installing the bearings not to damage the special bearing coating.*



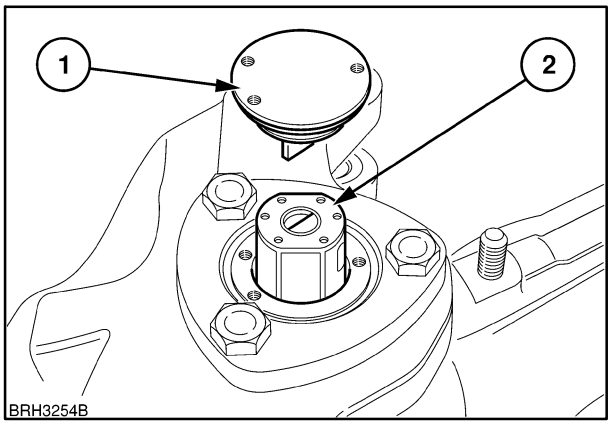
183

Steering Angle Potentiometer Replacement (Models Post 06-2005)

Potentiometer unit only replacement:

1. To replace the potentiometer sensor unit only, remove the potentiometer retaining plate (1) and withdraw the potentiometer (2) from the axle swivel housing.
2. Refit the potentiometer ensuring that the 'D' drive of the shaft and potentiometer are correctly aligned.
3. Check the sealing ring of the retaining plate is in good condition and refit the retaining plate.

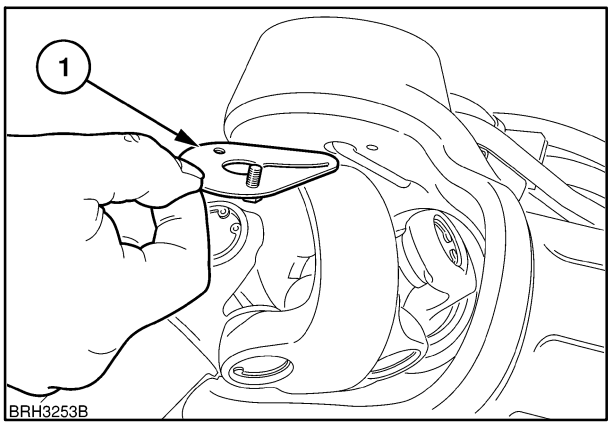
NOTE: *Calibration of the steering angle sensor must then be carried out.*



184

Potentiometer Shaft and wiring replacement:

1. With the swivel housing and axle shaft removed carefully remove the electrical connector from the potentiometer wiring. Remove the wire retaining plate (1) and pull the potentiometer shaft and wiring up through the top of the axle housing.



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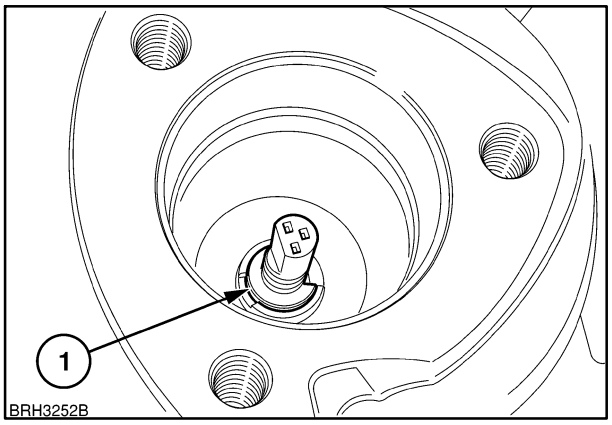
2. Install the new potentiometer shaft (1) and wiring through the axle hole and locate as shown in Figure 186. Refit the wire retaining plate and ensure the rubber grommet for the wiring is correctly installed into the housing. Reconnect the wiring to the connector.



186

STUB AXLE

Adjustment

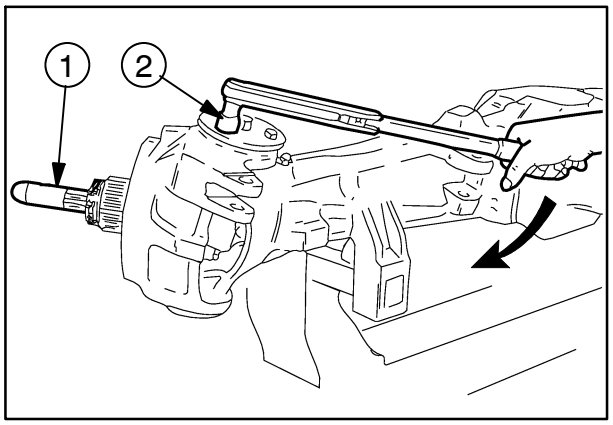
⚠ WARNING ⚠

Handle all parts with great care.

Do not put your fingers or hands between one piece and another. Wear suitable safety clothing, i.e. safety goggles, gloves and footwear.

1. Apply grease **AMBRA GR 75MD** on the outer races of the bearings and fit the upper cover, without the shims, and with special tool **292220** (2) attached. Torque the retaining bolts to the specified torque value of 113 Nm.

NOTE: *To aid installation of the swivel pin, is is recommend that guide **293889** (1) is installed on the axle shaft.*



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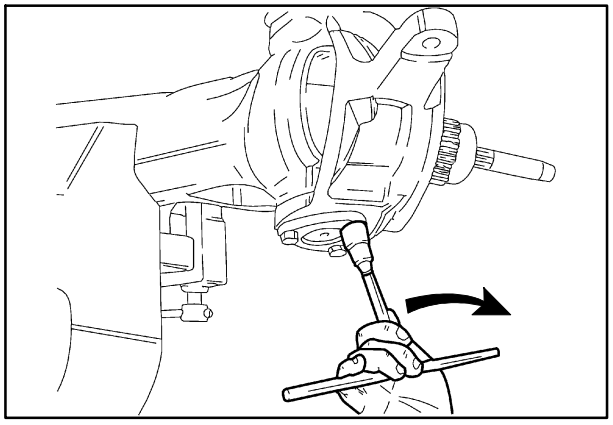
2. Fit the lower cover without shims, lubricate the three retaining bolts with engine oil.
3. Gradually, tighten the lower cover bolts equally while rotating the casing to allow the excess grease to escape.



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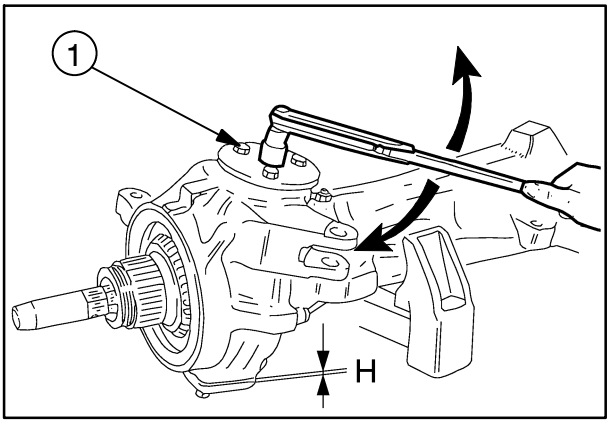
4. Using a torque wrench and special tool **292220** (1), check that the torque required to rotate the casing is 15 - 20 Nm. Adjust the three lower bolts until the correct torque is achieved.
5. Measure the gap (**H**) created between the lower cover and the casing in three places.



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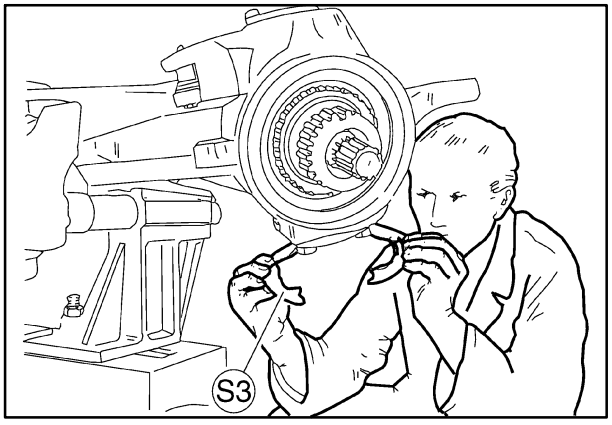
6. Calculate the average of the three values measured. The total thickness of the adjustment shims to be fitted under the lower cover is **Shim S_3= H - 0.20 mm** .
   If necessary, round up the value to the next 0.05 mm.
7. Insert shims under lower swivel cover. Tighten the retaining bolts to the specified torque value of 113 Nm.

8. After having rotated the casing a few times to allow the components to bed down, check that the torque necessary to rotate the casing is 118 - 147 Nm.
9. If the torque value measured is greater than the specified value, increase the thickness of the shims, if it is less than the specified value, reduce the thickness of the shims.
10. Remove the special tool **292220**, fit the grease nipples in the upper and lower covers and grease the assembly.



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STEERING-DRIVE WHEELS

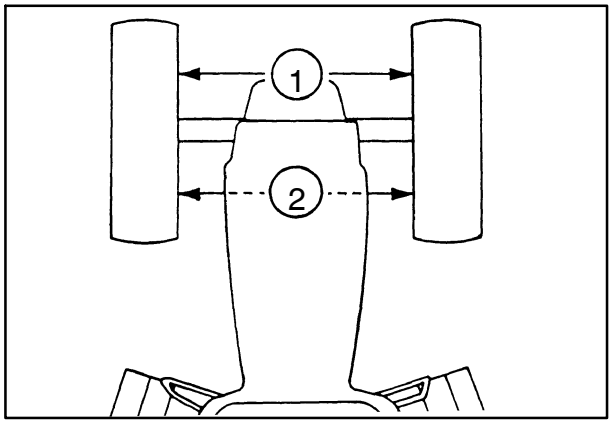
Alignment

(Op. 44 511 80)

When travelling forward in a straight path, the wheels of four-wheel drive tractors must be parallel to the longitudinal axis of the tractor, alternatively a slight toe-in of the front wheels is permissible up to a maximum of 6 mm as measured at the edges of the wheel rims.

To check the exact value of the toe-in setting of four-wheel drive tractors, proceed as follows.

1. Inflate the front tyres to the specified pressure.
2. Position the steering at half-lock with a straight-edge along the longitudinal axis of the tractor.
3. Check that the wheels are parallel to the longitudinal axis of the tractor.
4. Measure the distance (1) between the **front inside edges** of the wheel rims, at the height of the wheel hub centers.
5. Turn both front wheels through 180° then measure, again at the height of the wheel hub centers, the distance (2) between the **rear inside edges** of the wheel rims, checking that this new measurement is equal to or greater than the distance (1) by a maximum of 6 mm. The rotation of the wheels through 180° is necessary to eliminate the effect on the measurement of any wear of the rims.



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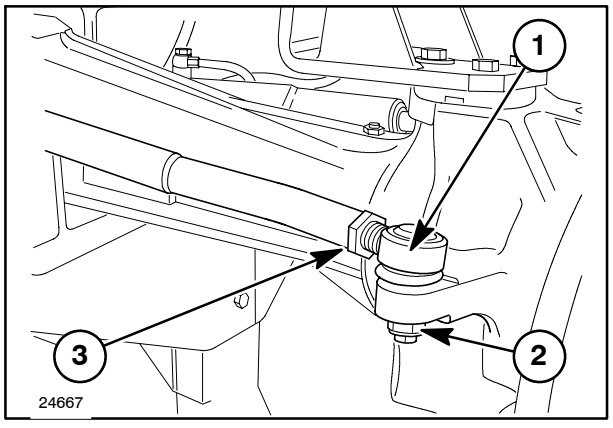
NOTE: *Self-locking nut (2) must be renewed each time it is removed or partially unscrewed.*

6. If it is necessary to correct the wheel alignment, remove nut (2) and pull the track rod end (1) out of its housing. Slacken off locknut (3) and screw the track rod end (1) in or out to increase or decrease the distance (2, fig. 191).

   Install the track rod end (1) in its housing and re-check alignment as described in points 4 and 5.

   After having adjusted the alignment to within the prescribed limits, tighten locknut (3) to the specified torque value of 180 Nm (183 kgm) and nut (2) to 100 Nm (10.2 kgm).



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SECTION 25 - MECHANICAL FRONT AXLE

Chapter 2 - Front Axle Suspension

CONTENT

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	Tightening Torques	2
	Description and Operation	3
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	Raising Suspension	15
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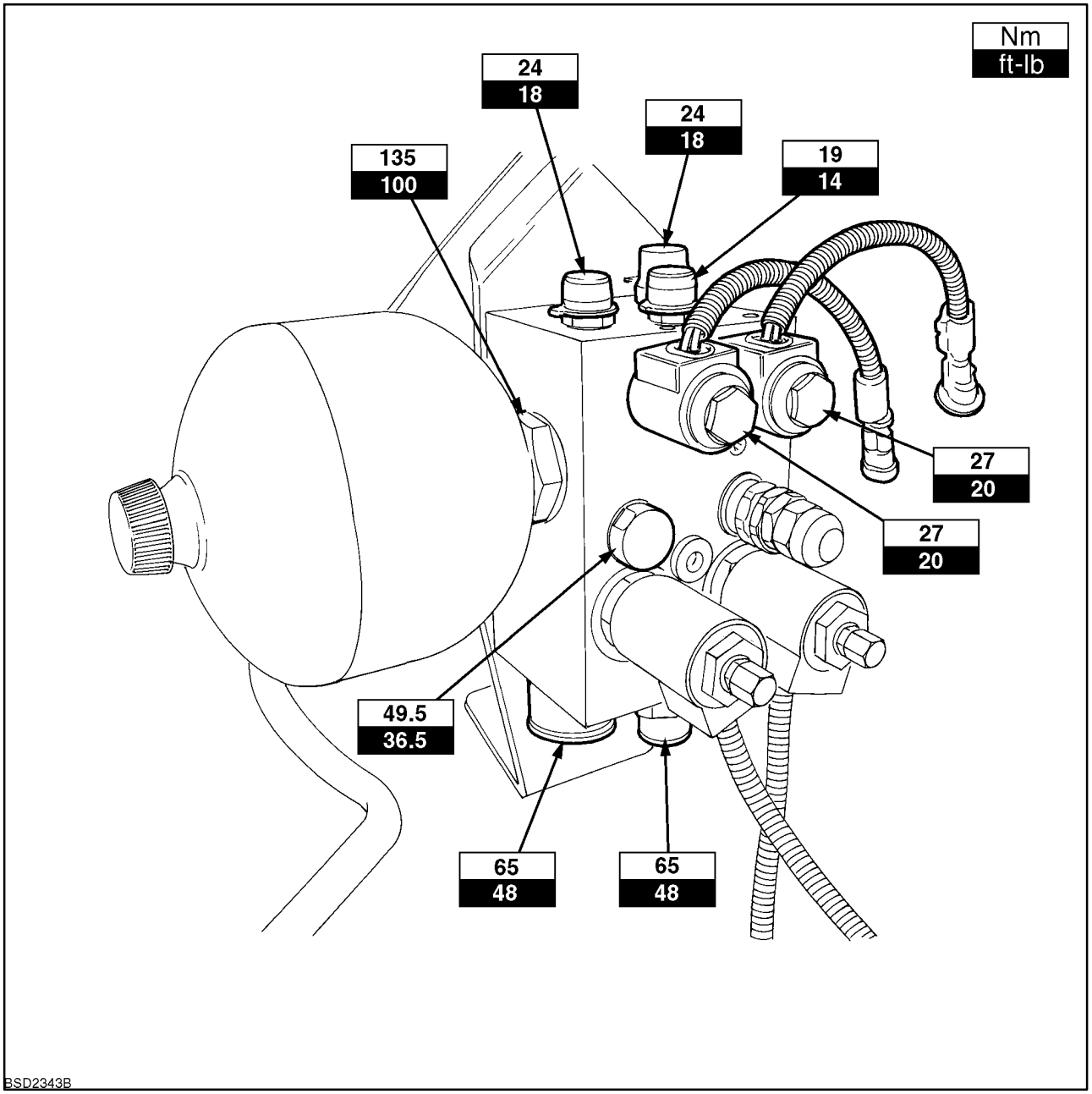
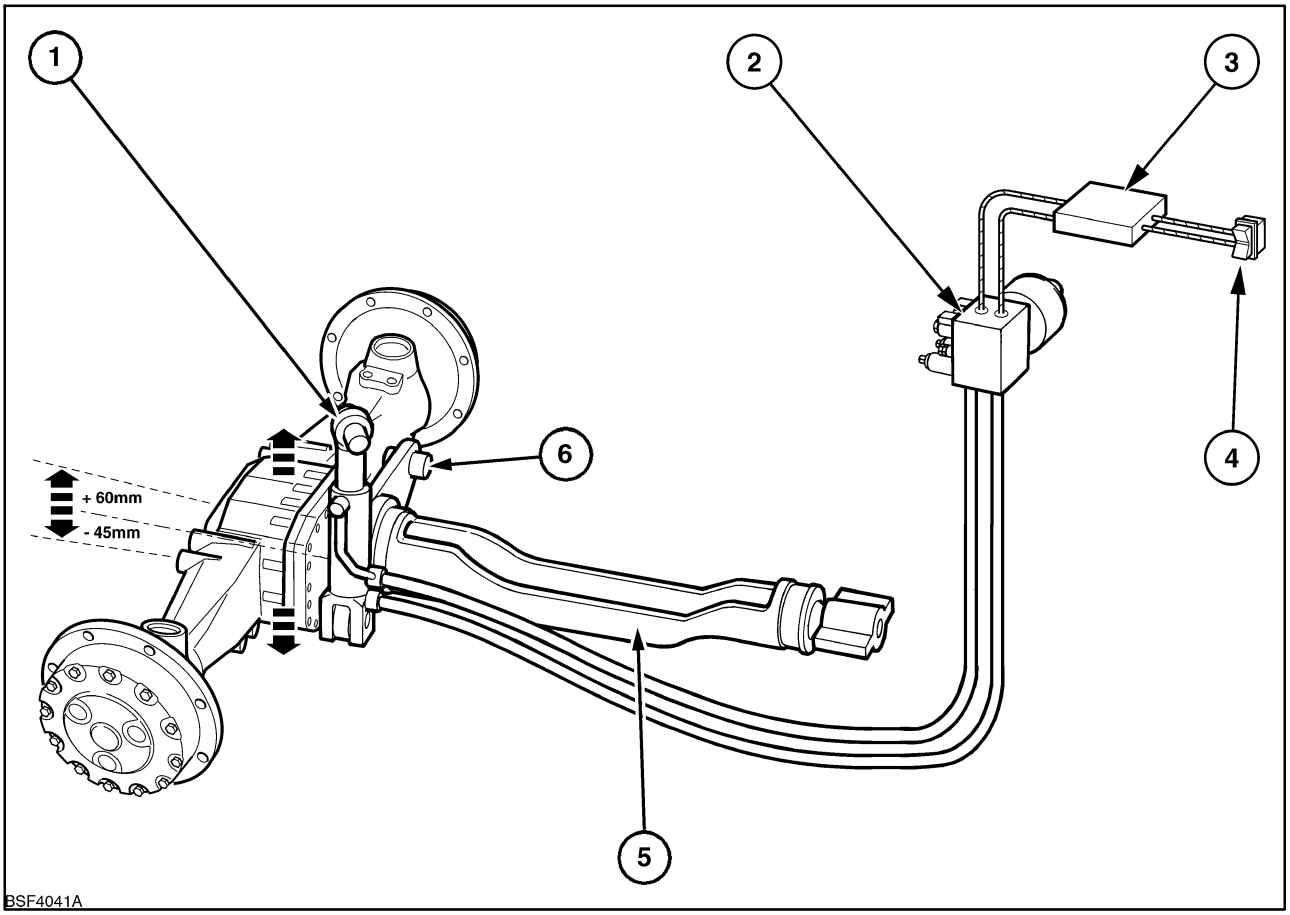
SPECIFICATIONS

System Relief Valve	210 bar (3045 psi)
Low Pressure Standby	26 bar +/- 1 (377 +/- 15 psi)
High Pressure Standby	210 bar +/- 5 (3045 +/- 75 psi)
Hydraulic Accumulator Recharge pressure	20 bar +/- 1 @ 20°C (290 +/- 15 psi @ 68°F)

TIGHTENING TORQUES



DESCRIPTION AND OPERATION



2

Front Suspension System

1. Suspension/Damping Cylinder
2. Control Valve Assembly
3. Microprocessor
4. Lockout/Suspension Activation Switch
5. Suspension Arm
6. Panhard Rod

INTRODUCTION

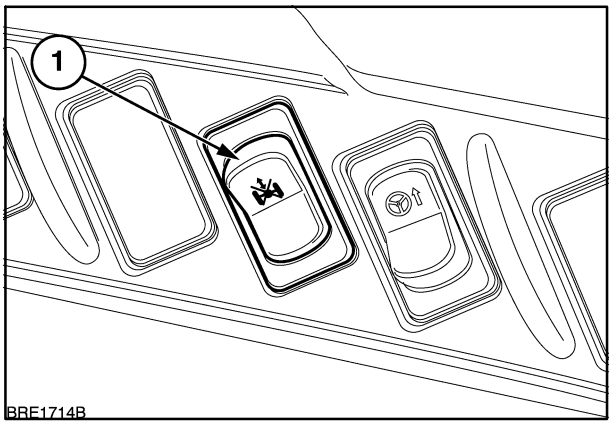
Front Axle Suspension is an optional electronically controlled hydraulic suspension feature fitted to the front axle which allows the axle to raise and lower to absorb shock loads and maintain the tractor in a level plane when variations in weight are applied to the front support. This system is only available on tractors equipped with a variable displacement hydraulic pump.

The system reduces pitching, keeps the front wheels in contact with the ground and improves stability during fast road speeds when ground conditions could make the tractor unstable. This is especially important where the tractor is operating with minimal front axle loads while transporting heavy 3 point hitch implements.

The suspension is automatically engaged each time the tractor is started however when the tractor is stationary or travelling at less than 1.5 kmh (1 mph) the system is automatically ''Locked Out'' for safe mounting of implements or ballast.

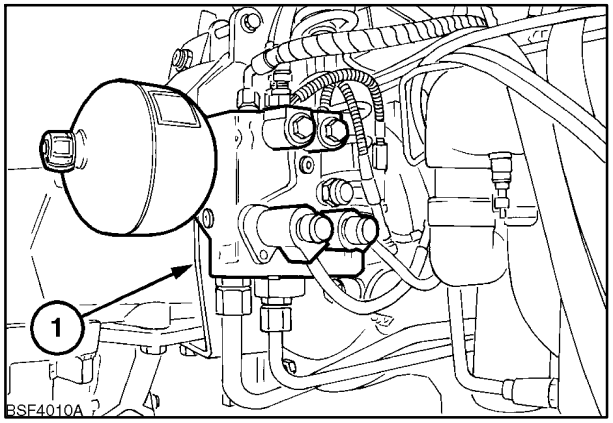
At speeds between 1.5-12 kmh (1-7.5 mph) the operator can turn the suspension off using the switch (1) on the cab pillar. This is ideal for instances where accurate depth control is required with implements mounted on the front linkage or for grading with a front loader.

At speeds above 12 kmh (7.5 mph) the system is automatically engaged.



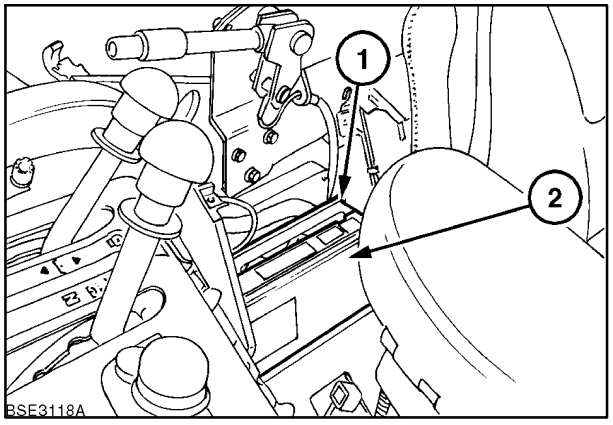
3

The control valve assembly and accumulator(1) which supplies oil to the MFD-suspended suspension/damping system is located on the right hand side of the transmission.



4

The microprocessor which electronically controls the hydraulic control valve is located behind the operators seat (1, Figure 5).

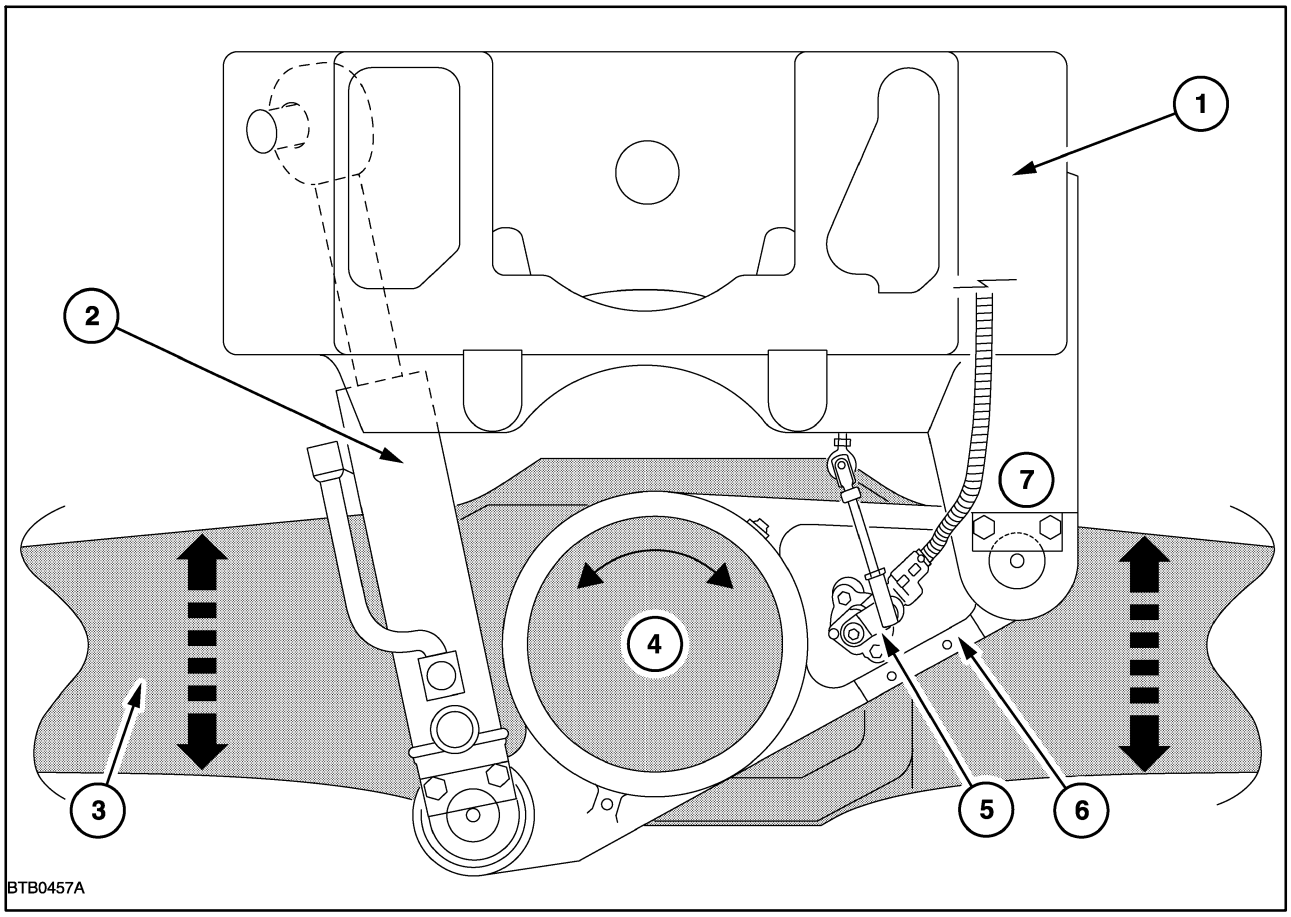


5

To assist in diagnosing faults and achieving optimum performance the microprocessor has a built-in self diagnostic facility and electronic calibration procedure.

All information regarding error codes and calibration data is displayed on the electronic instrument cluster.

Full details on error codes and calibration procedures are described in Chapter 55.



6

Front Axle Installation

1. Front Support
2. Hydraulic Cylinder
3. Axle
4. Axle Pivot Point
5. Potentiometer
6. Pivot Arm (Panhard Rod)
7. Fulcrum Point

The suspension system connects the axle (3) to the tractor front support (1) through a pivot arm (6) referred to as a “Panhard Rod” and the single hydraulic cylinder (2).

Whenever the front axle is subjected to shock loads, vibration or front end weight changes the Panhard rod pivots about the fulcrum point (7) while at the same time the axle oscillates about the pivot point (4). This movement causes the front axle to move up or down in relation to the tractor front support.

The vertical movement of the axle in relation to the front support is measured by the potentiometer (5) which transmits a signal to the controlling microprocessor.

Dependant on the shock loading subjected to the system and the amount of vertical axle movement detected by the microprocessor the hydraulic system responds to absorb the shock loads and adjust the vertical position of the axle so that the tractor continues to operate on a level plane.

HYDRAULIC CONTROL SYSTEM

The hydraulic control system incorporates a Ride Control System and a Levelling System.

The “Ride Control System” controls the suspension damping and absorbs shock loads from the front axle when the tractor is being driven over rough surfaces.

The “Levelling System” controls the height of the front axle in order to maintain that the tractor operates on a level plane by compensating for:-

The addition or removal of weight from the tractor.

Loss of cylinder oil to the reservoir through the system relief valve due to shock pressures above 210 bar (3045 psi) in the system.

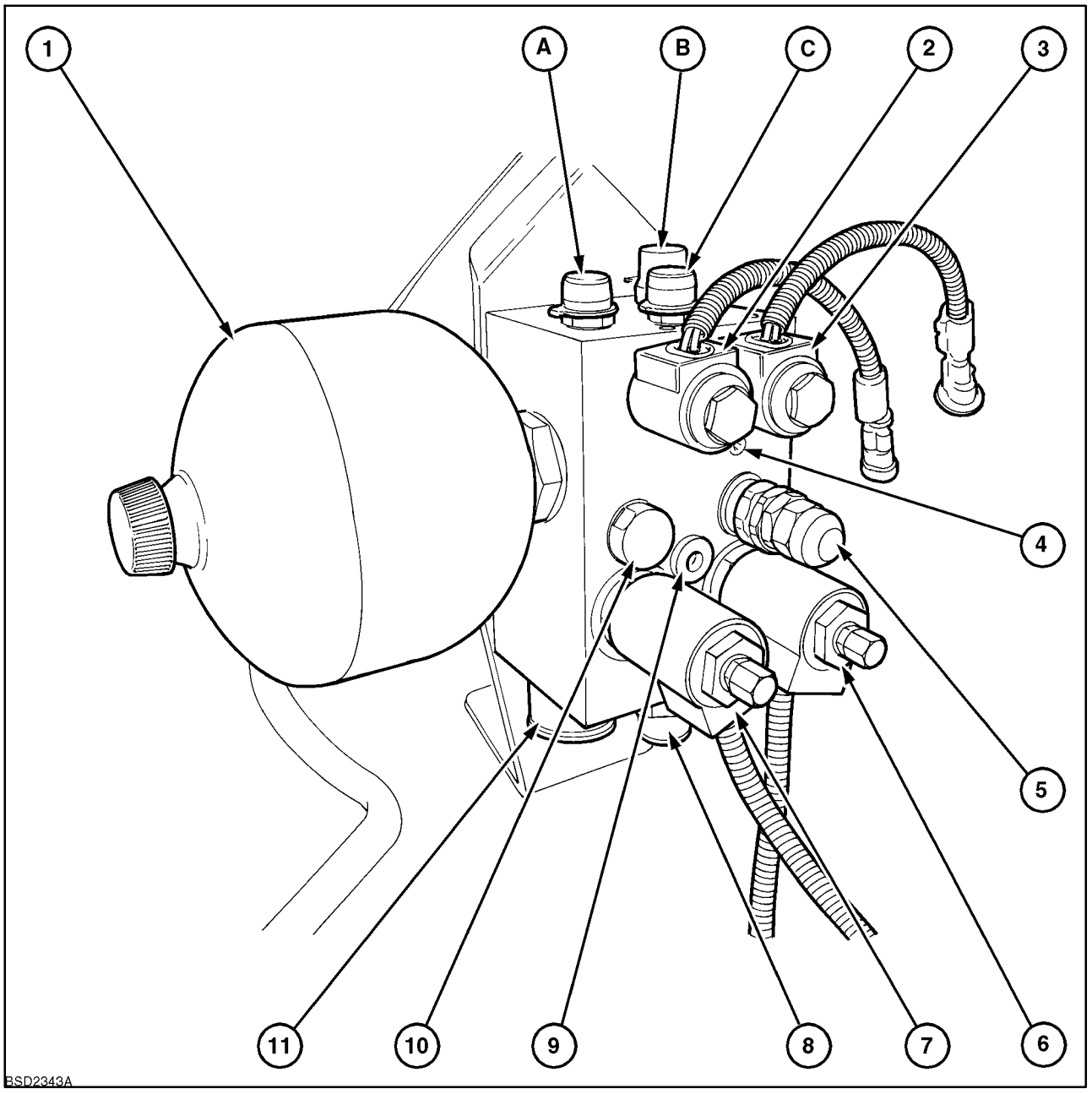
Internal or external system leakage.

The potentiometer (5) Figure 6 measures the vertical position of the front axle in relation to the front support and is linked to the microprocessor. Whenever the microprocessor detects that the vertical height of the axle in relation to the front support is away from the operating parameters set within the software in the microprocessor, hydraulic oil is directed through the control valve to the hydraulic cylinder to adjust the height of the axle accordingly.

NOTE: *Ride control and the levelling system only operate when the suspension is switched on* ***and*** *the tractor is being driven at speeds above 1,5 kph (1 mph).*

Operation of the system for various working situations is described on the following pages.

The location of those specific components referenced in the circuit diagrams which are externally visible on the control valve are identified in Figure 7.



7

Hydraulic Control Valve Assembly

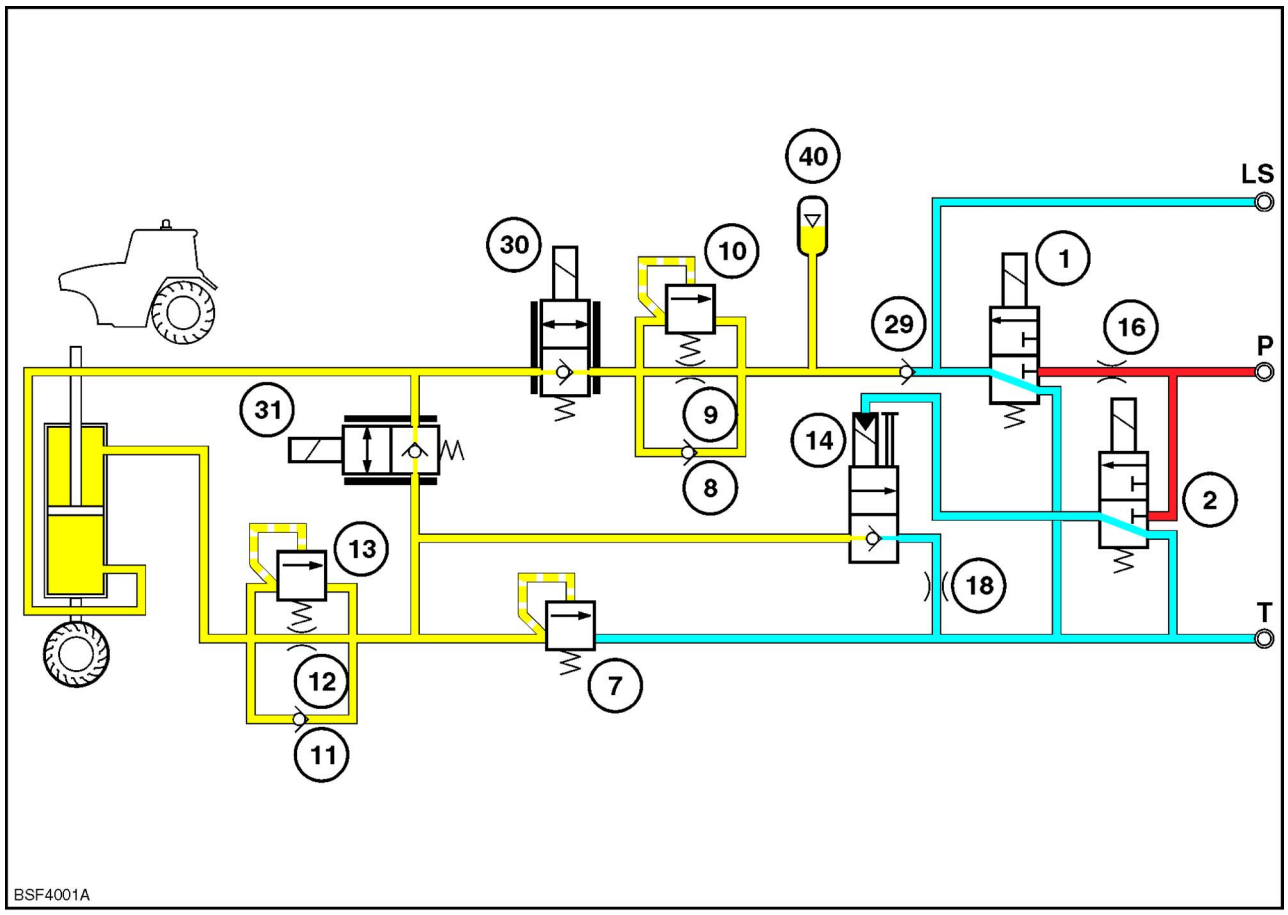
A. Load Sense Line
B. Return to Reservoir
C. Pump Pressure In

1 Accumulator
2 Raise Solenoid
3 Lower Solenoid
4 Manual Bleed Screw
5 Relief Valve
6 Lockout Valve (Rod Side)
7 Lockout Valve (Piston Side)
8 Rod Connection
9 Plug
10 Shut Off Plug
11 Piston Connection

SUSPENSION CONTROL SYSTEM SWITCHED OFF

When the suspension system is 'OFF' (Speed under 1.5 km/h [1 mph]), the raise valve (1) and lower valve (2) are de-energized as are the lockout valves (30 and 31). Oil is then trapped in the circuit by the load check valves (29 and 14).

If excessive pressure above 210 bar (3045 psi) occurs in the system in this state the system relief valve (7) will open.



System Switched Off

Pump Pressure - Low Pressure Standby

Return To Tank

Trapped Oil

OPERATION OF SUSPENSION RIDE CONTROL

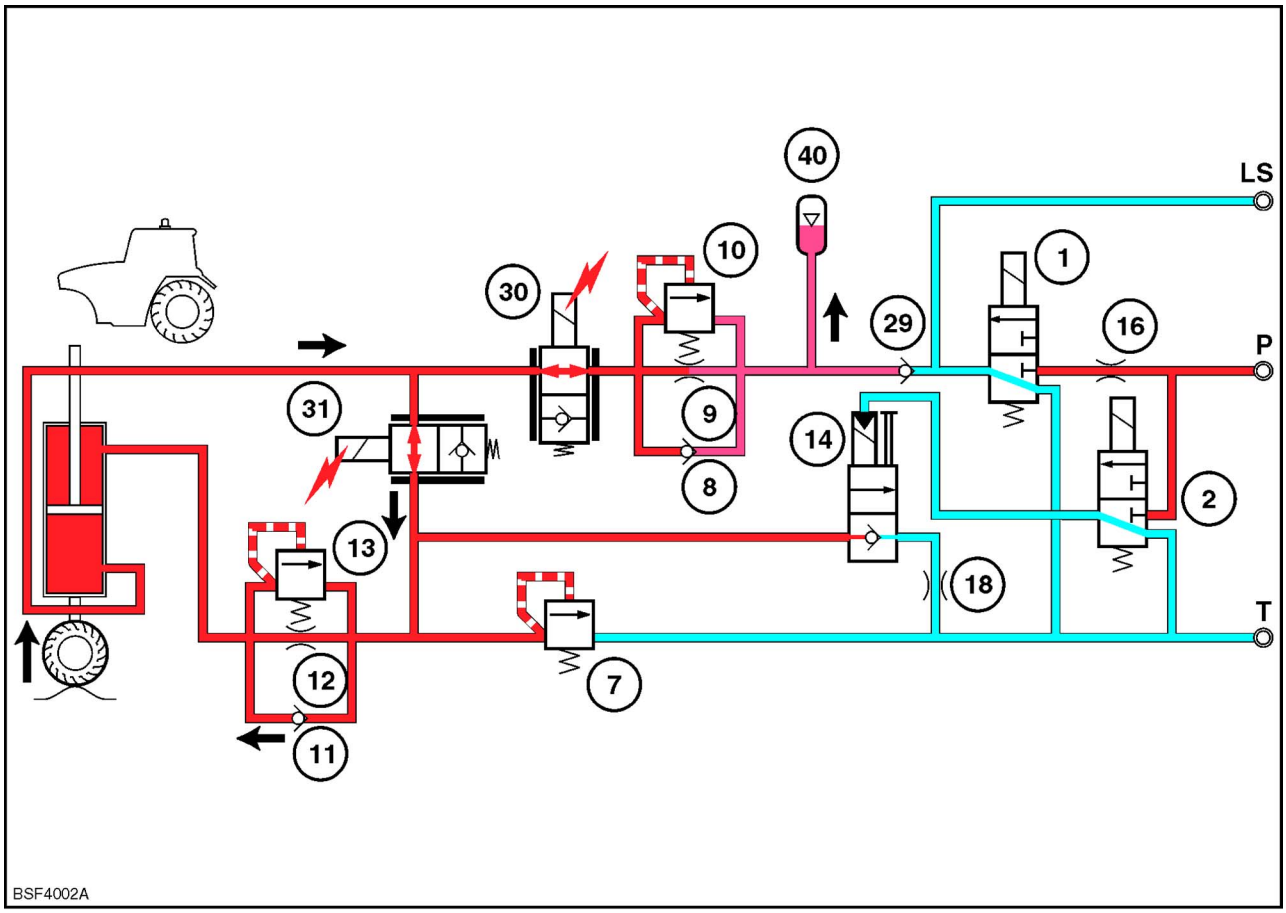
Wheel Hits Small Bump

When the suspension system is 'ON' and tractor speed is above 1.5 km/h (1 mph) the lockout valves 30 and 31 are energized to allow oil flow through the valves.

Compression Stroke

When the tractor hits a small bump the cylinder is compressed forcing oil from the piston end.

As the piston moves in the cylinder some of the displaced oil passes through lockout valve (31) and check valve (11) to the rod end. The excess volume passes through lockout valve (30) into the accumulator (40) through orifice (9).



Compression Stroke

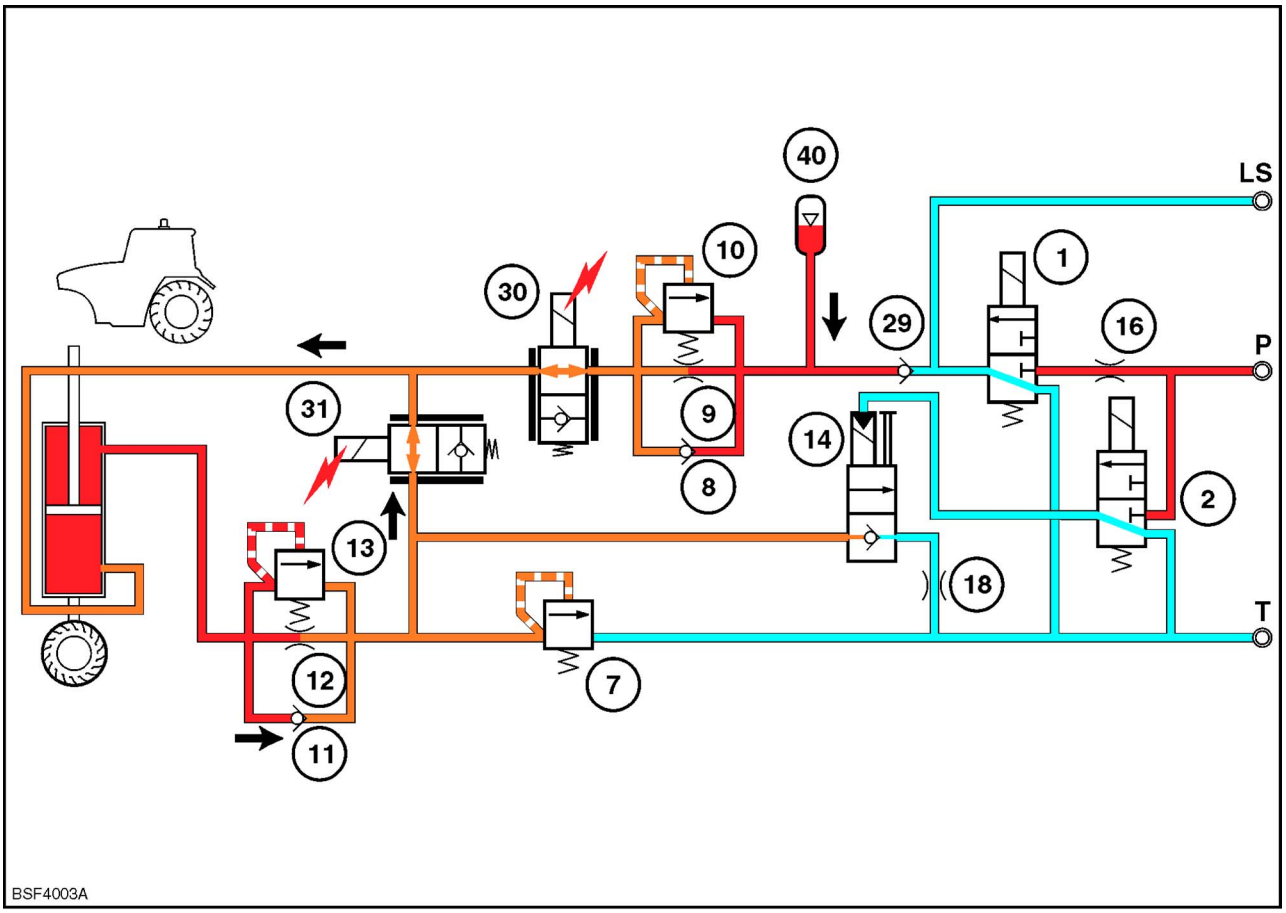
Pump Pressure - Low Pressure Standby

Return To Tank

Cylinder Pressure

Rebound Stroke

When the axle is returning to its mid position , oil from the accumulator flows back to the piston end via the check valve (8). Displaced oil from the cylinder rod side then goes through orifice(12) back to the piston end.



Rebound Stroke

Pump Pressure - Low Pressure Standby

Return To Tank

Piston End Oil Pressure

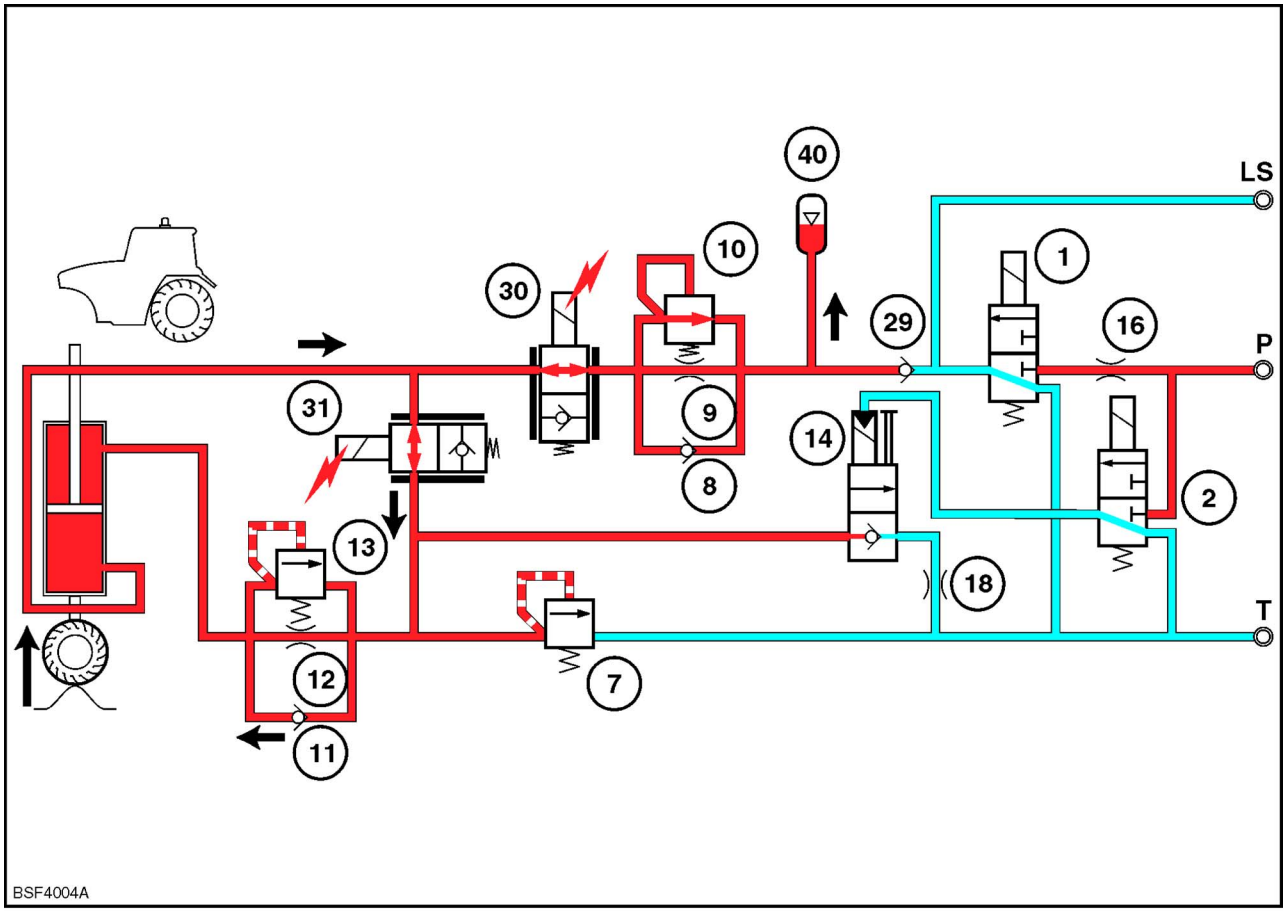
Wheel Hits Medium Size Bump

When the tractor hits a medium size bump lockout valves (30 and 31) are energized.

Compression Stroke

As the wheel goes over the bump the cylinder is compressed forcing oil from the piston end.

As the piston moves in the cylinder some of the displaced oil passes through lockout valve (31) and check valve (11) to the rod end. The excess volume passes through lockout valve (30) but cannot pass through the orifice (8), so pressure is generated which opens relief valve (10) to allow oil to the accumulator (40).



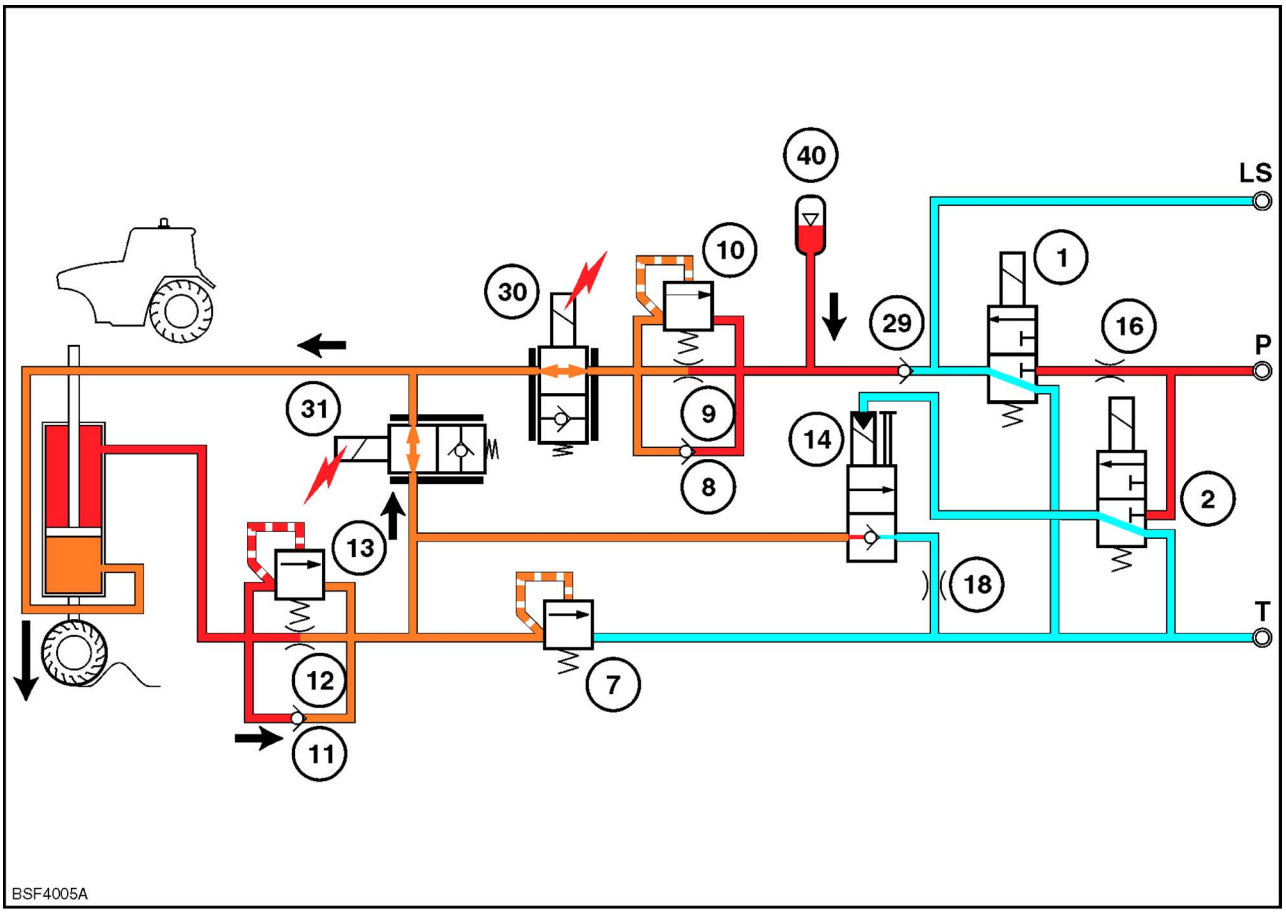
Compression Stroke

Pump Pressure - Low Pressure Standby

Return To Tank

Rebound Stroke

When the axle is returning to its mid position oil from the accumulator flows back to the piston end via the check valve (8). Displaced oil from the cylinder rod side then goes through orifice(12) back to the piston end.



Rebound Stroke

Pump Pressure - Low Pressure Standby

Return To Tank

Piston End Oil

Wheel Hits Large Size Bump

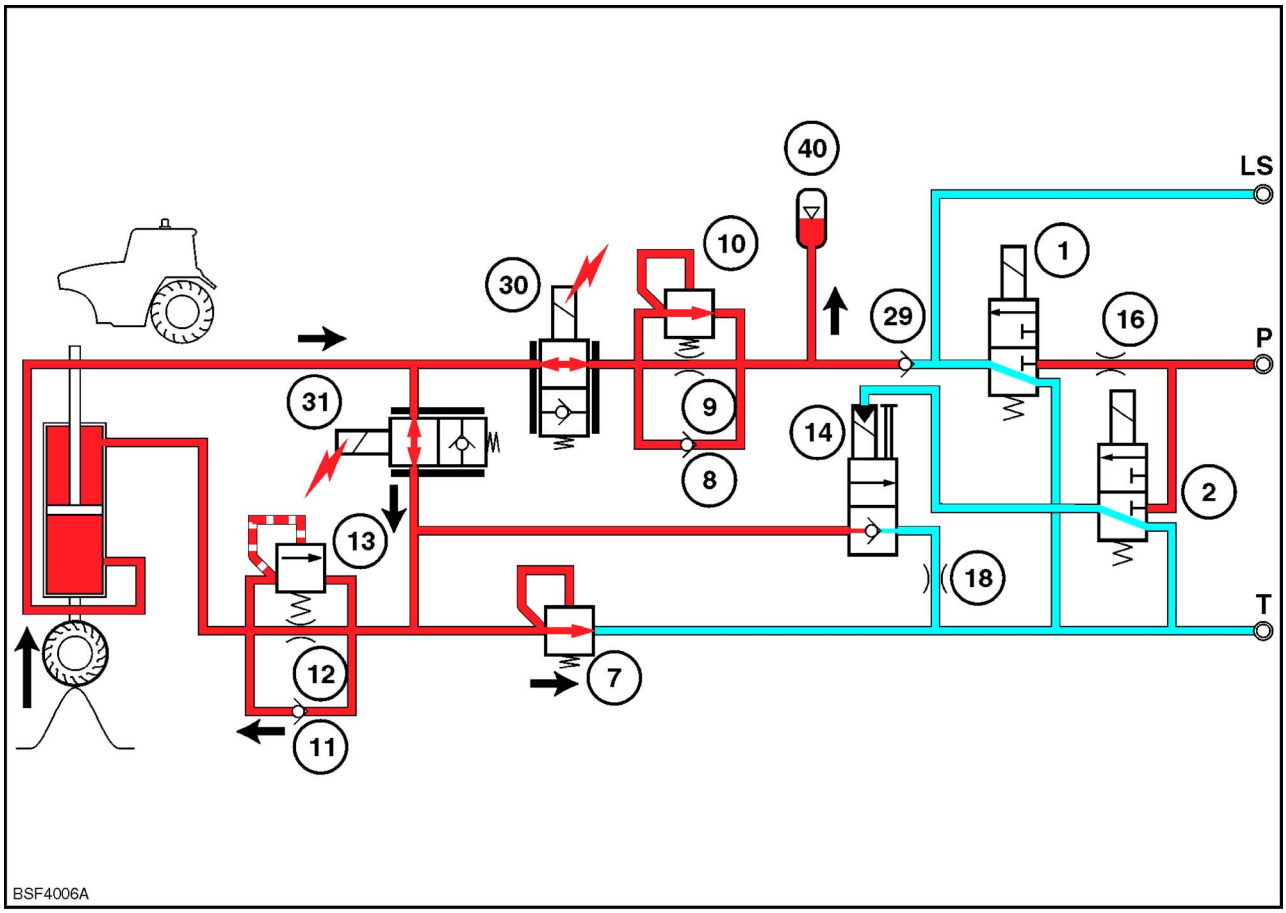
When the tractor hits a large bump the lockout valves (30 and 31) are energized.

Compression Stroke

As the wheel goes over the bump the cylinder is compressed forcing oil from the piston end.

As the piston moves in the cylinder some of the displaced oil passes through lockout valve (31) and check valve (11) to the rod end. The excess volume passes through lockout valve (30) but cannot pass through the orifice (8), so pressure is generated which opens relief valve (10) to allow oil to the accumulator.

The volume is now too great for the accumulator to cope with and so if the pressure exceeds 210 bar (3045 psi) the main relief valve (7) will open.



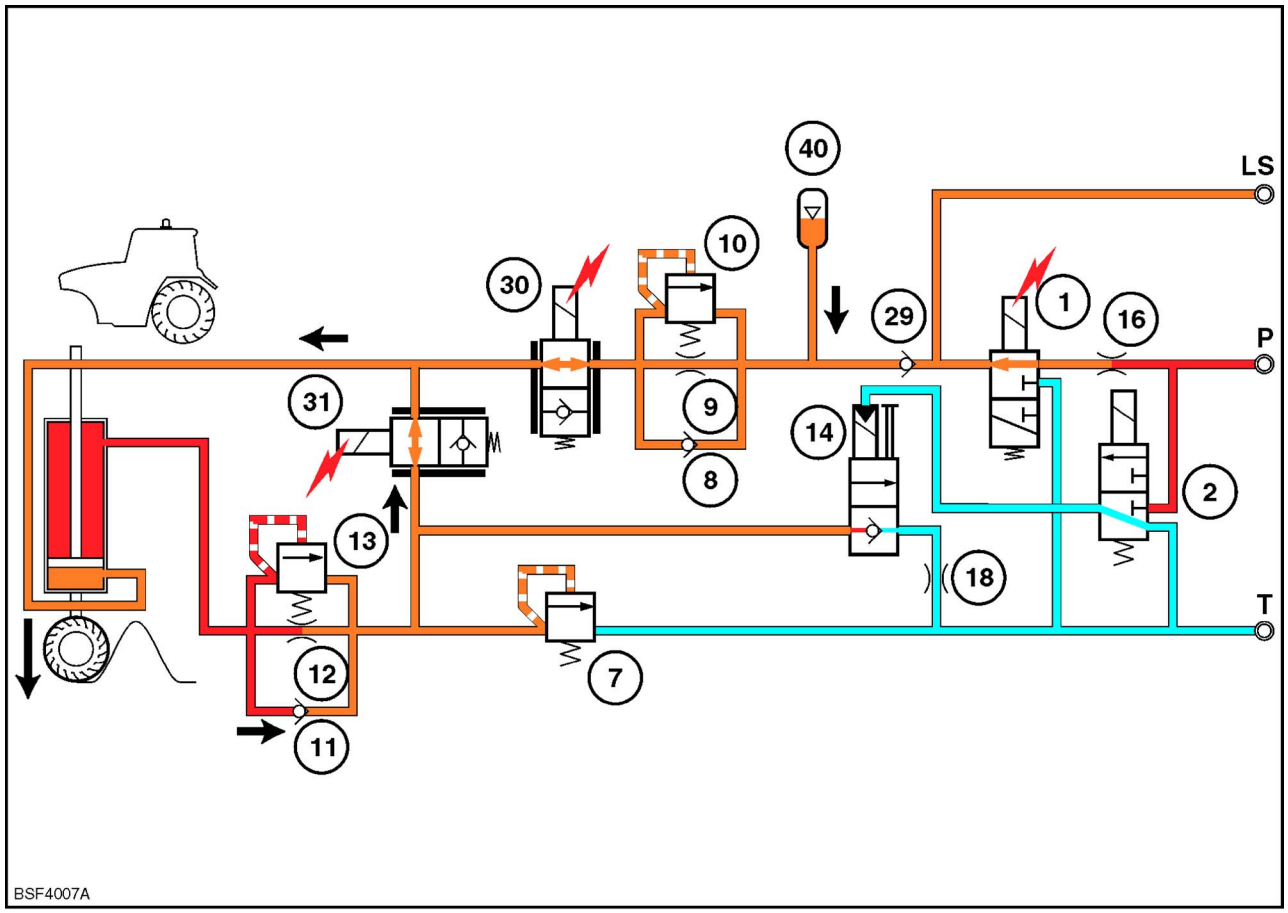
Compression Stroke

Pump Pressure - Low Pressure Standby

Return To Tank

Rebound Stroke

When the axle is returning to its mid position oil from the accumulator flows back to the piston end via the check valve (8) as does the originally displaced oil from the rod end. As some of the oil was lost through the main relief valve the system will now need to "make up" the lost oil (Raising).



Rebound Stroke

Pump Pressure

Piston End Oil

Return To Tank

RAISING SUSPENSION

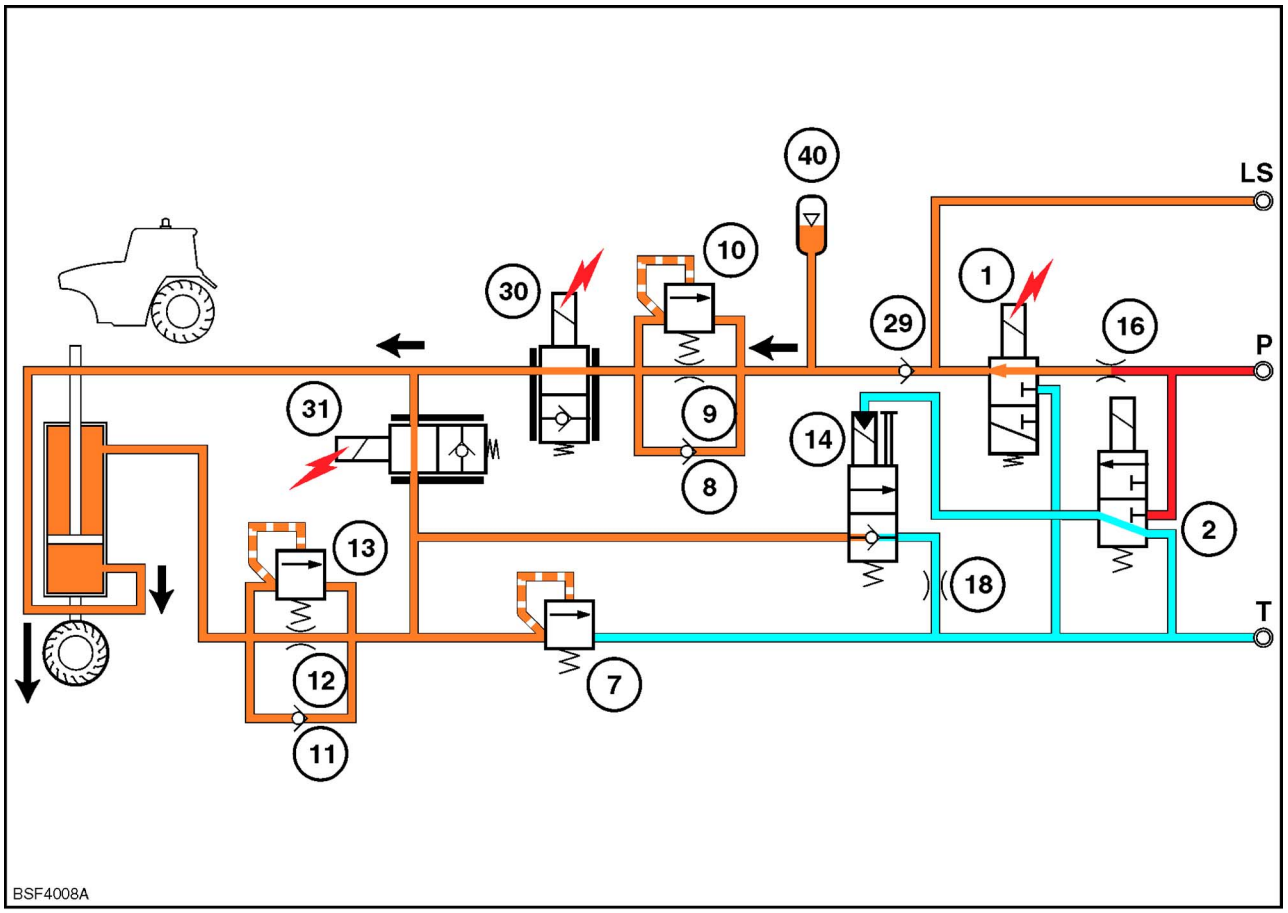
Height Adjustment After Loss of Oil from the System or Additional Weight Added to Front of Tractor

This type of situation can occur when the tractor is stopped to attach a front lift implement, pick up spoil using a front loader or Terraglide is manually switched on by the operator.

The Raise solenoid (1) is energized.

The raise solenoid (1) allows low standby pressure oil into the system and therefore provides a signal to the pump via the load sensing line to increase flow. Oil passes the check valve (29) ,the discpack valve(8)(9)(10), and the energized lockout valve (30) to the piston end of the suspension cylinder to extend the cylinder and raise the tractor. The speed of raising is controlled by orifice (16).

As oil is exhausted from the rod end of the cylinder it combines with the pump oil to the piston end of the cylinder via orifice (12), and the energized lockout valve (31). The piston can move down due to the volume differential in the cylinder between the rod and piston sides.



Raising Suspension

Pump Pressure

Return To Tank

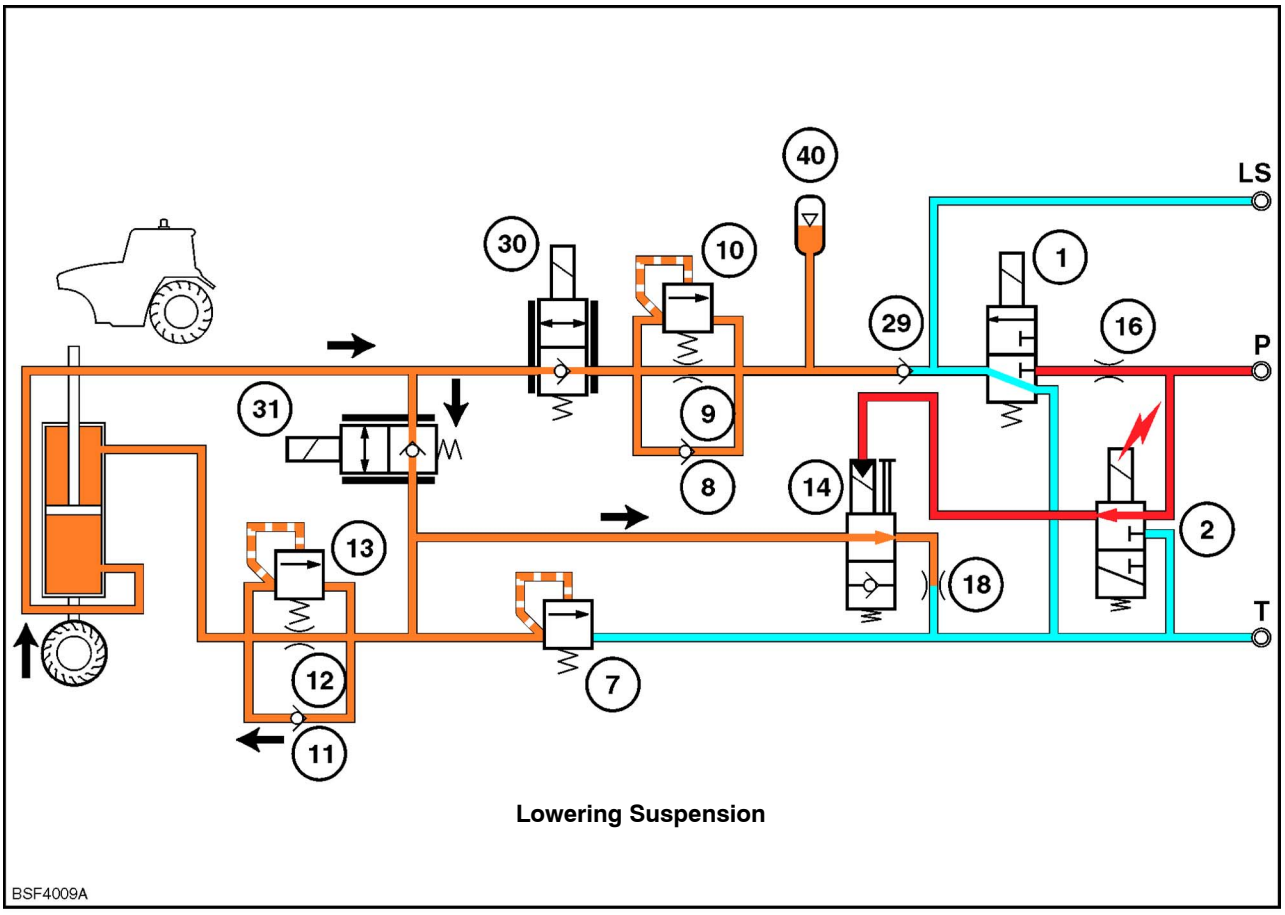
Piston End Oil

LOWERING SUSPENSION

Height Adjustment After Removing Weight from Front of Tractor

The lowering solenoid (2) is energized and allows low standby pressure oil from the pump to open the unload valve (14), which in turn opens the system to return. Minimum pressure required to activate unload valve (14) is 14.5 bar (210 psi).

As the cylinder retracts, oil from the piston side cannot pass the de-energized lock out valve (30), but can pass lockout (31) and allow the oil to return to sump. The speed of lowering is controlled by orifice (18).



Lowering Suspension

Pump Pressure

Piston End Oil

Return To Tank

CALIBRATION (H1)

SUSPENDED FRONT AXLE

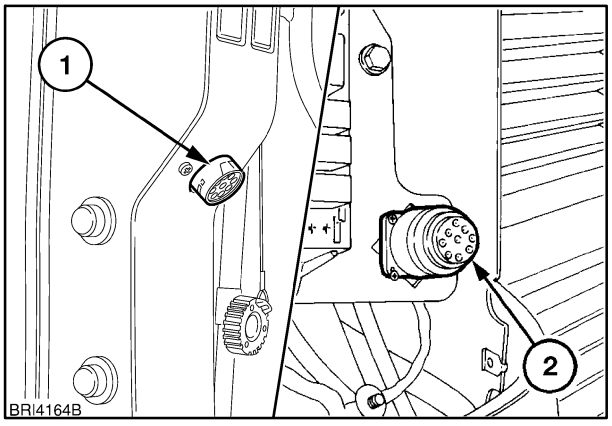
⚠ WARNING ⚠

The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear.

1. Install the diagnostic connector, Tool No. **380000843** and start the engine.

NOTE: *On a new module or after a H8, the controller will default the vehicle to "NO" suspension. Set the option to "YES" in the H3 menu mode.*

2. Using the hour, minute and light dimming buttons on the instrument cluster navigate through to H1 and the suspension symbol on the DD/DU processor.
3. Set the engine to 1200 rev/min.



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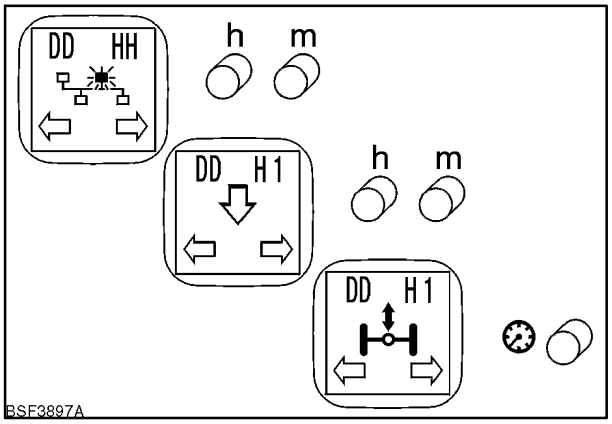
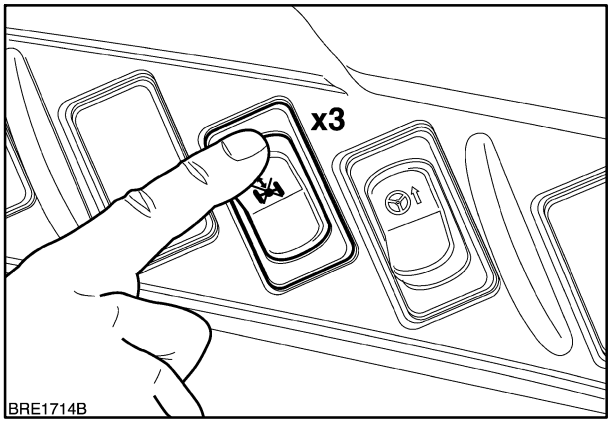


10

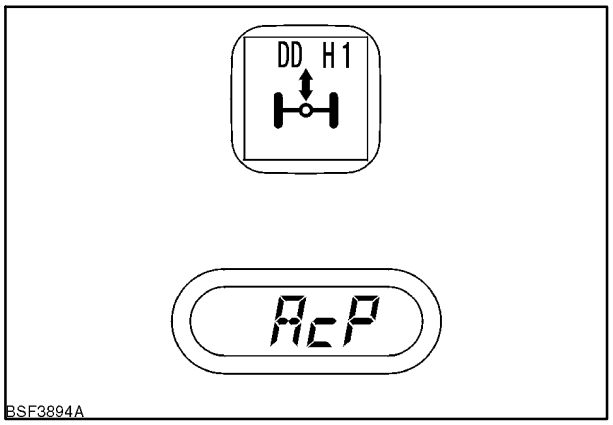
CAL will be displayed. Toggle the suspension switch ON/OFF three times to enter suspension calibration mode,



11

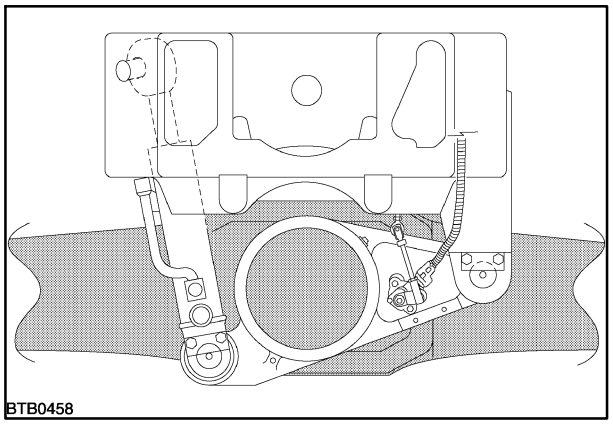
ACP will be displayed.

NOTE: *If the calibration procedure needs to be stopped at any time press the suspension switch once.*



12

The display will show an initial ramping up of the system (approx 290).
The suspension will then fully lower and raise, (display indicating approx 640), and then lower (display showing approx. 290).
The suspension will then raise to an approximate mid point, and the display will change to show END.



13

All components of the suspension system are now calibrated.
Turn OFF the key-start to store the calibration.

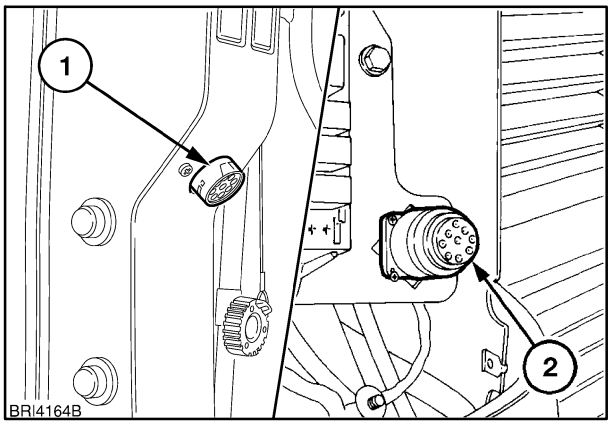
FRONT SUSPENSION DIAGNOSTICS

The Front Suspension system has a built in diagnostic capability.

To gain access to the diagnostic HH Menu routine it is necessary to use the diagnostic test switch. Insert Tool **380000843(1),** into the tractor diagnostic located under the RH Front trim panel or on the right hand “C” pillar.

All information relating to the HH Modes will be displayed in the instrument cluster display.

See Section 55, electrical systems for full details on diagnostics and fault code flow charts.



14

CALIBRATION FAULT CODES

SUSPENDED FRONT AXLE

Fault Code	Fault Description
U01	Front Axle Potentiometer Open circuit • Check wire harness • Change potentiometer (if pot. value <10)
U02	Front axle potentiometer raise value is higher than set limit • Check potentiometer installation • Change potentiometer (if pot. value >972)
U03	Front axle potentiometer short circuit • Check wire harness • Signal ground open circuit • Change potentiometer if value > 990
U04	Front axle potentiometer threshold is lower than set limit • Change potentiometerif value <150
U05	Suspension is not reaching its minimum/maximum position during auto calibration procedure • Check the potentiometer operating values, if the total range between the minimum and maximum position is <350:- • Check the suspension system mechanical components • Check the potentiometer linkage
U06	not used
U07	Suspension is stationary during the raise command in the autocalibration procedure • Check raise solenoid (red harness from solenoids) • Check the suspension system mechanical components • Check hydraulic oil supply pressure • Check pressure of accumulator • Disconnect implement
U08	Suspension is unable to reach maximum height within 20 seconds • Check raise valve installation • Check the unload solenoid, (Green harness from solenoids) • Check the suspension system mechanical components • Check hydraulic oil supply pressure • Disconnect implement
U09	Suspension is stationary during the lowering command in the autocalibration procedure • Check the unload solenoid (Green harness from solenoids) • Check the suspension system mechanical components • Check hydraulic oil supply pressure • Disconnect implement

U10	Suspension unable to reach minimum height within 25 seconds • Check the unload solenoid (”GREEN” harness from solenoids) • Check hydraulic high standby pressure: Place pressure gauge, capable of reading pressure of at least 210 bar (3045 psi), into rear remote coupler. Move and hold remote lever into “Raise” or “Lower” position, to maintain 210 bar (3045 psi)and observe gauge reading of 210 bar (3045 psi)is achieved. • Recalibrate suspension system. • Disconnect implement
U11	Unable to calibrate suspension • Suspension lockout switch activated more than 3 times • Check the suspension system mechanical components • Check hydraulic high standby pressure: Place pressure gauge, capable of reading pressure of at least 210 bar (3045 psi), into rear remote coupler. Move and hold remote lever into “Raise” or “Lower” position, to maintain 210 bar (3045 psi) and observe gauge reading of 210 bar (3045 psi) is achieved. • Recalibrate suspension system.
U12	Auto calibration procedure stopped because vehicle not stationary • Handbrake not applied • Rear axle speed sensor faulty
U13	Front suspension option not activated • Go into H3 and turn on front suspension.

OVERHAUL

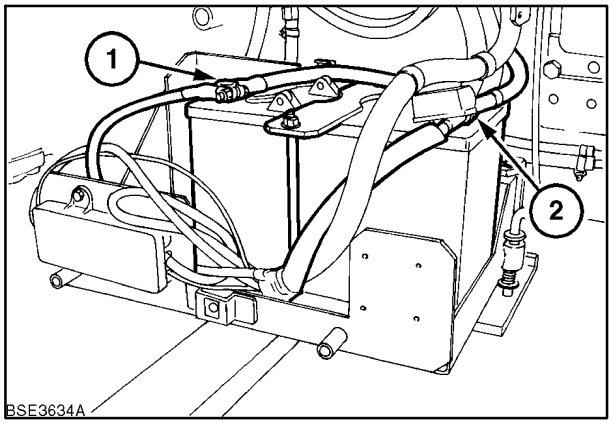
SUSPENSION VALVE BLOCK

Removal

⚠ DANGER ⚠

Exercise extreme caution when performing tasks on the front suspension system. ALWAYS ensure that the system is depressurized and that the axle is at rest on the support stops.

1. Disconnect the battery to prevent accidental tractor start up.



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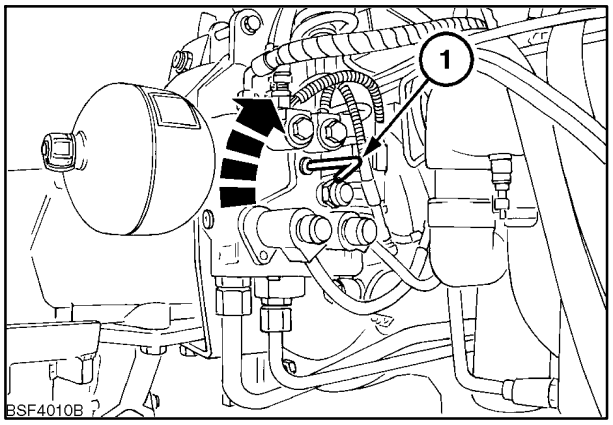
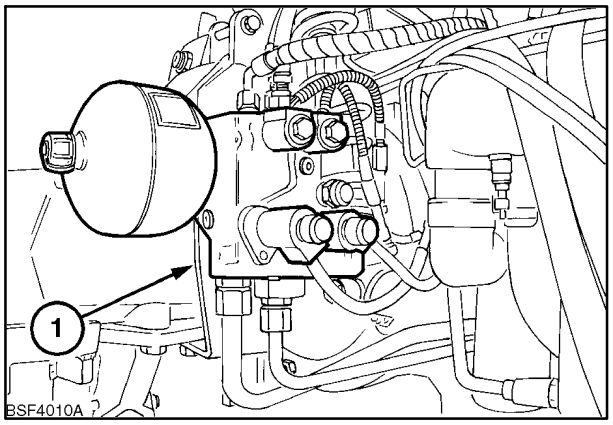
2. Depressurize the suspension system. Locate the screw of the load sense unload valve, on the valve block and rotate clockwise, allow the tractor to lower completely onto the stops then rotate the screw counter-clockwise to return to normal operation.



16

3. Disconnect the wiring to the solenoids. Tag the connectors for reassembly.
4. Place a suitable oil collecting container under the pipe connections and disconnect the pipes to the valve. Make a note of each connection for reassembly.
5. Place a trolley jack under the valve assembly. Undo the bolts from the bracket and carefully remove the valve and bracket assembly away from the tractor.



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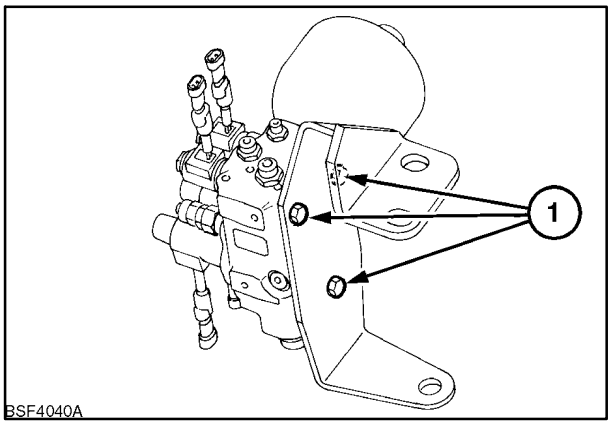
Disassembly/Assembly

It should be noted that due to the complexity of the valve block that only the following major external items are serviced:

Valve Block Assembly Complete with Bracket

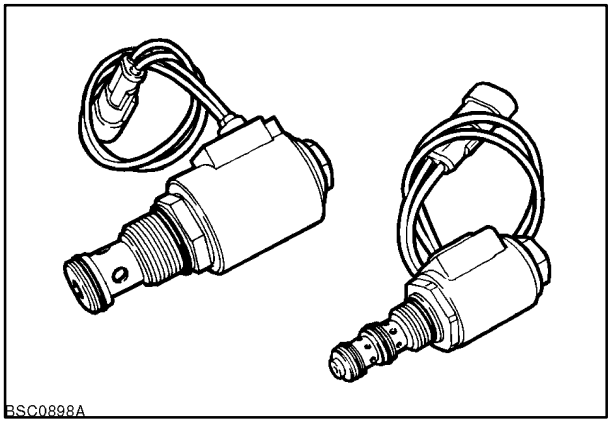
1. Ensure the valve block is clean.
2. Remove the three hexagon headed bolts from the rear of mounting plate for control valve block assembly. When reassembling torque the three hexagon headed bolts to 67 Nm (ft-lb).



18

Electrical Solenoids - ALL

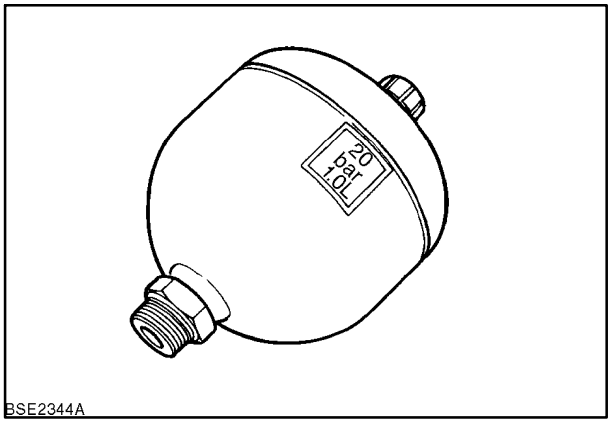
1. Ensure the area around the solenoids is clean.
2. Remove the outer nut and withdraw the solenoid coil, then Unscrew and remove the solenoid valve.
3. Installation is the reversal, install the solenoid valve ensuring that the O-ring is located under the nut followed by the solenoid coil.



19

Hydraulic Accumulator

1. Ensure the area around the accumulator is clean.
2. Unscrew the accumulator counter clockwise to remove and clockwise to install.
3. For recharging pressure, refer to “Specifications” at beginning of this chapter.



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SECTION 25 - MECHANICAL FRONT AXLE

Chapter 3 - SuperSteer Front Axle

CONTENT

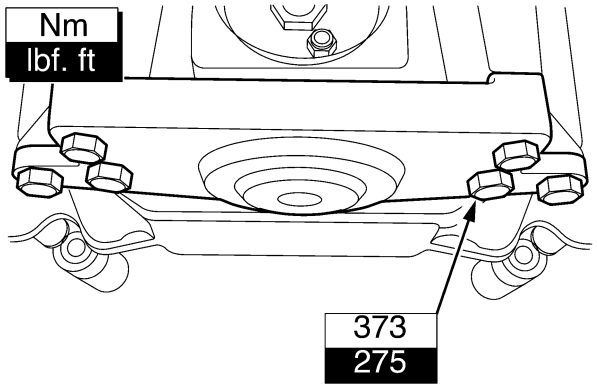
Section	Description	Page
	Specifications	2
	Tightening Torques	3
	Special Tools	4
	Description and Operation	5
	Overhaul	7
	Supersteer Axle	7
	Removal	7
	Installation	11
	Adjustment	16
	Swivel Bearing	16

SPECIFICATIONS

Supersteer Swivel Bearing	
Torque required to rotate axle when correctly shimmed	30 - 32 kgm
Supersteer swivel bearing shims . . . . . mm	1.05 - 1.90 in 0.05 increments

([1]) final dimension without reaming

TIGHTENING TORQUES



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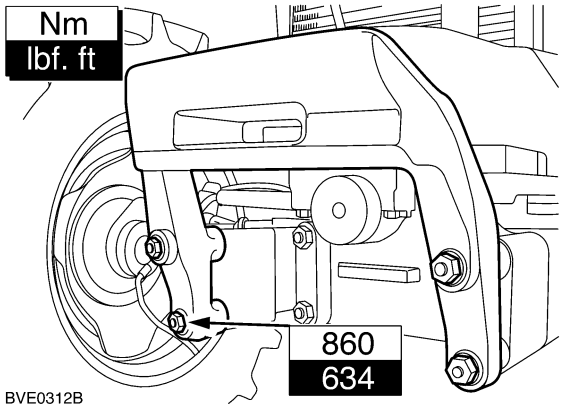

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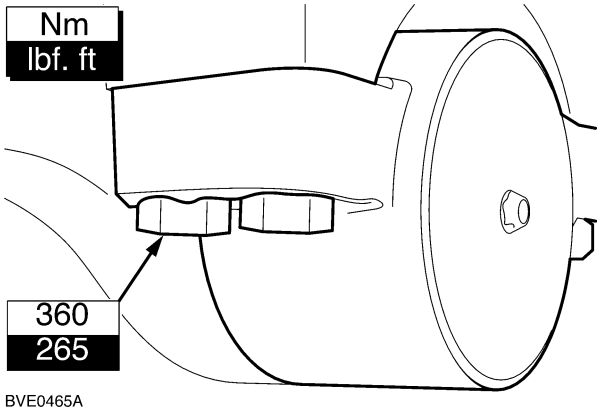

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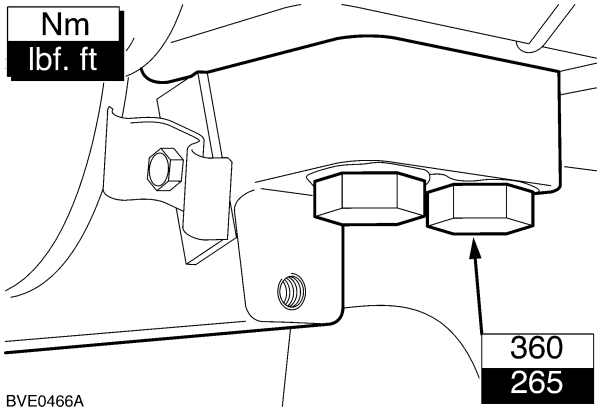

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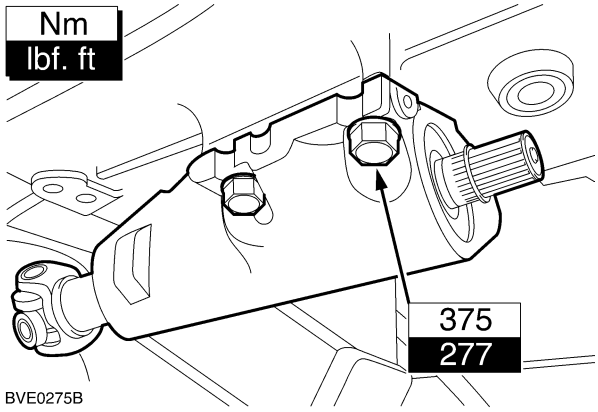

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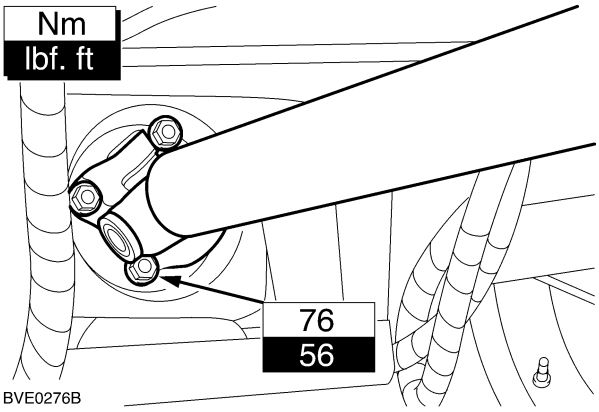

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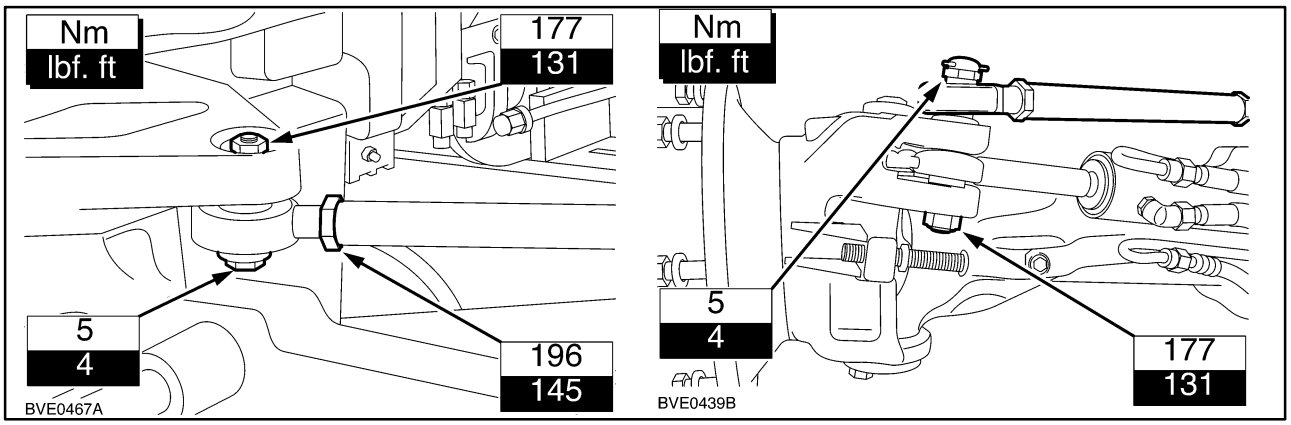

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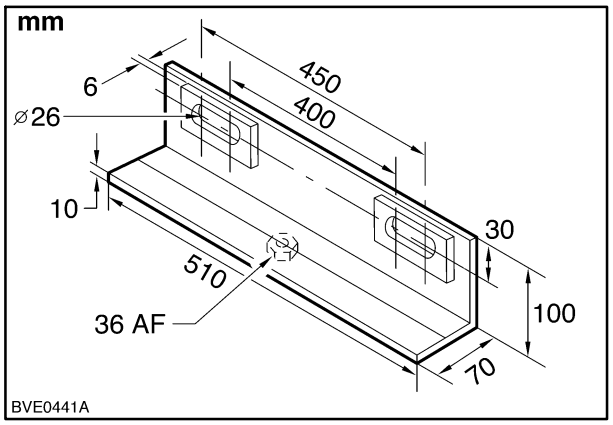
SPECIAL TOOLS

Locally Fabricated Tools

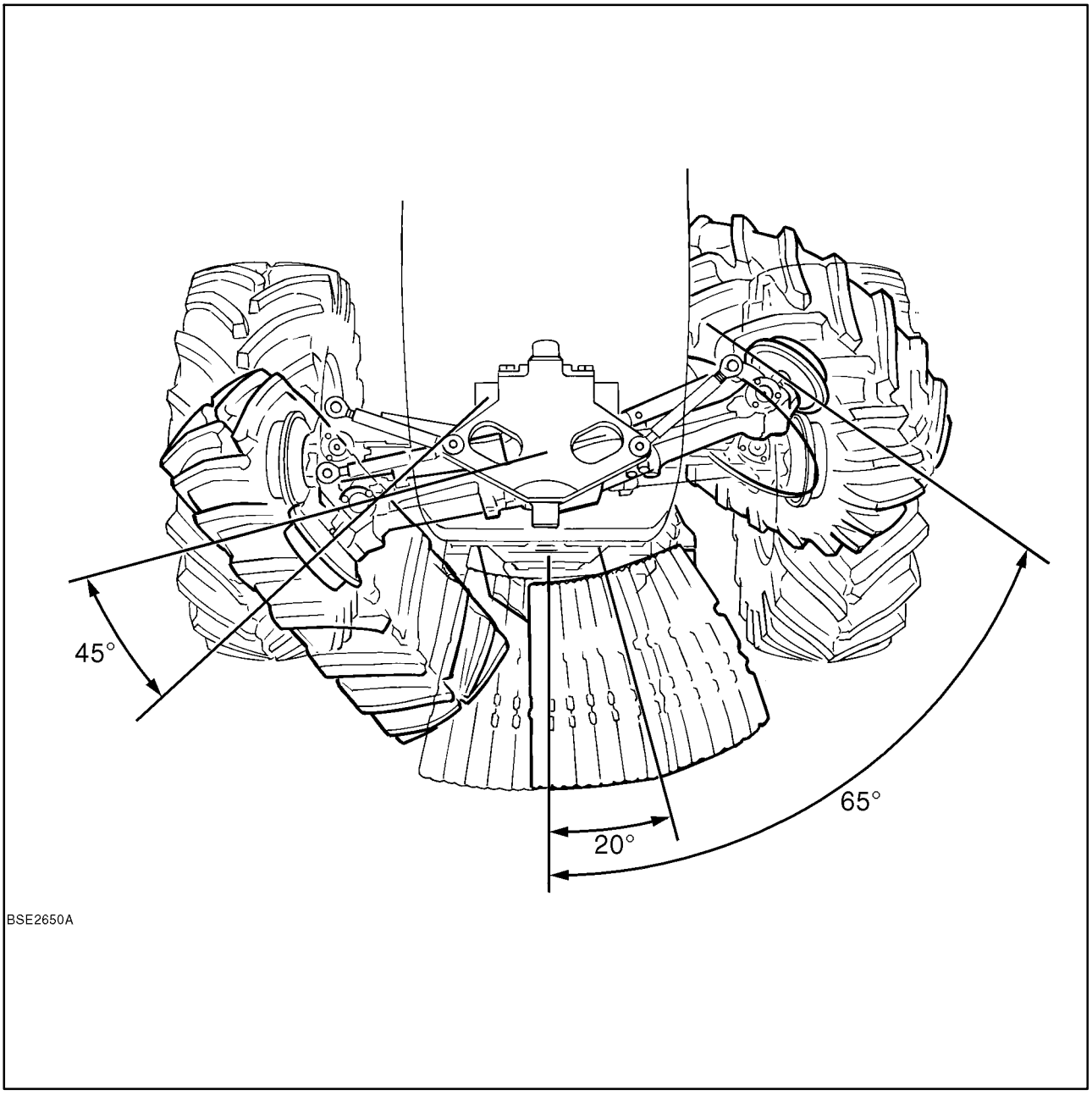


3

Pivot Bearing Turning Tool

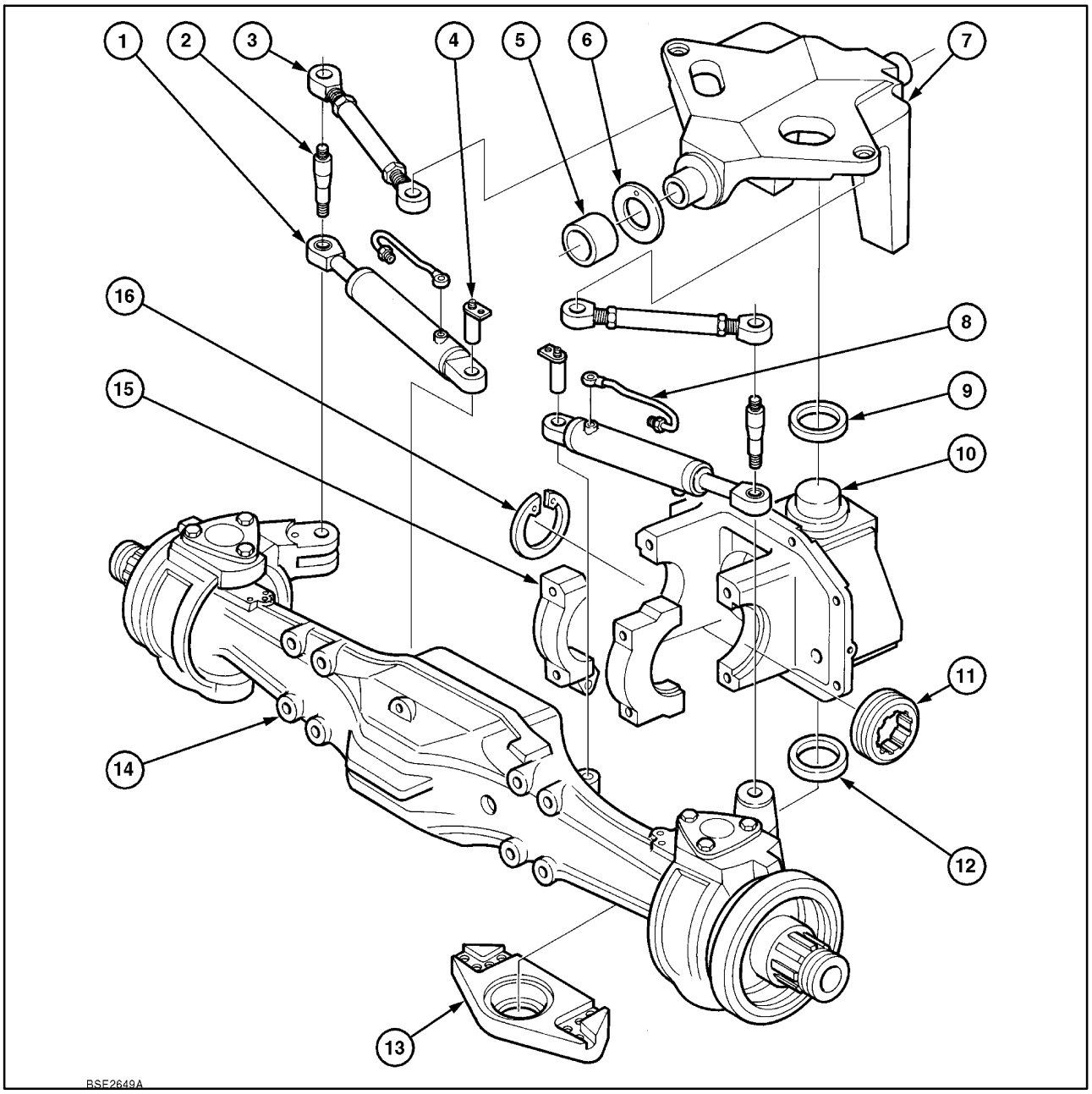
DESCRIPTION AND OPERATION

As the hubs on the axle turn up to 45°, the axle simultaneously articulates up to 20° giving a total turn angle of 65°. This means the operator can turn tighter and more quickly at the end of the field. This results in smaller headlands leading to less compaction and greater productivity. The SuperSteer system ulitises two large diameter steering rams and two tie rods which connect the axle hub to the tractor chassis. As the steering ram extends, the tie rod linking the front axle to the tractor causes the axle to progressively articulate in the direction of wheel turn.



4

SuperSteer Axle Steering Angles



5

SuperSteer Axle Components

1. Steering Cylinder
2. Pin
3. Tie Rod
4. Pin
5. Bushing
6. Spacer
7. Support
8. Tube
9. Bushing
10. Support
11. Ring Nut
12. Bushing
13. Support
14. Axle
15. Bracket
16. Retaining Ring

OVERHAUL

SUPERSTEER AXLE

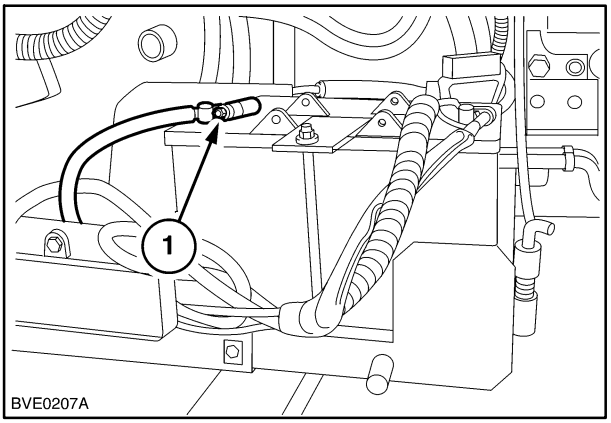
Removal

(Op. 25 100 33)

DANGER

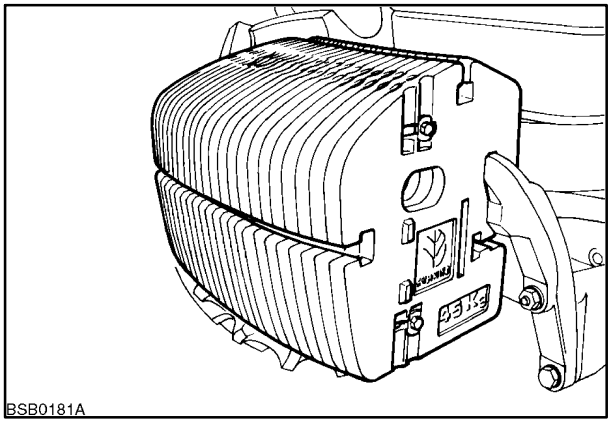
Lift and handle all heavy components using lifting equipment of appropriate capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

1. Remove the battery cover and disconnect the battery negative cable (1).



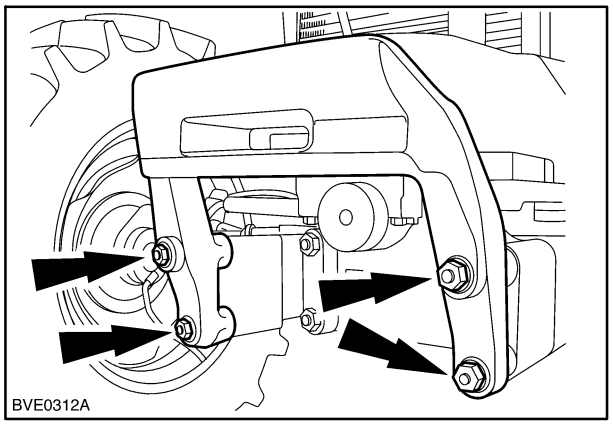
6

2. Using a suitable sling, connect the front weights to a hoist and remove the front weights (if fitted).



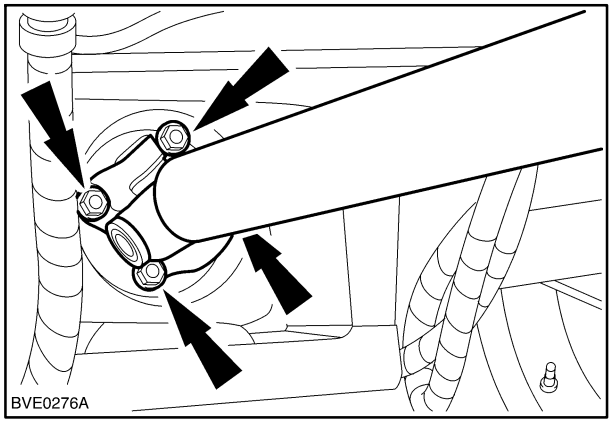
7

3. Remove the front weight carrier.



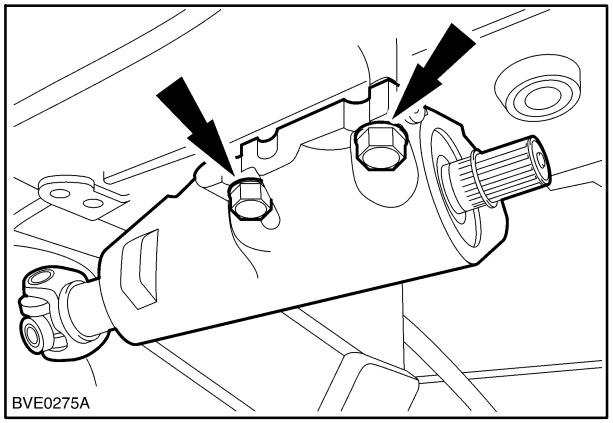
8

4. Remove the four wheel driveshaft retaining nuts.



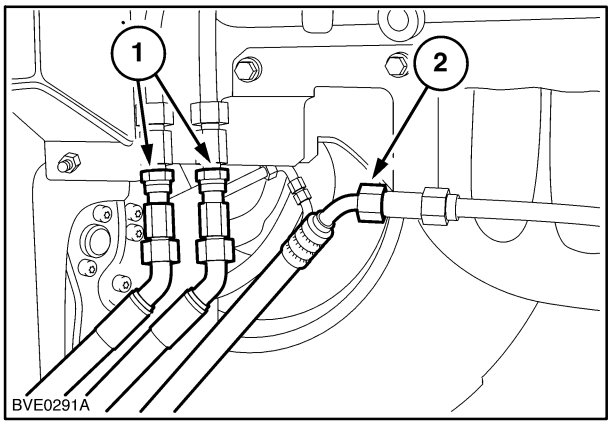
9

5. Remove the support and the four wheel driveshaft.



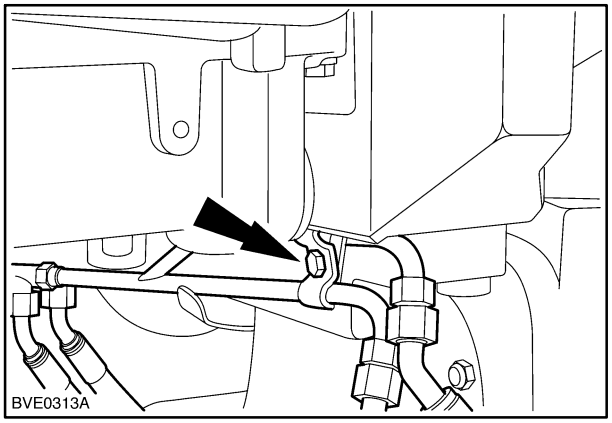
10

6. Disconnect the steering cylinder oil supply and oil return pipes (1).
7. Disconnect the differential lock oil supply pipe (2).



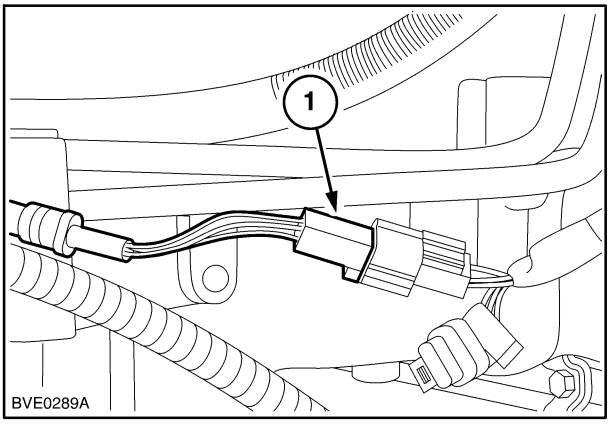
11

8. Detach the steering cylinder oil supply and oil return pipes from the retaining clamp.



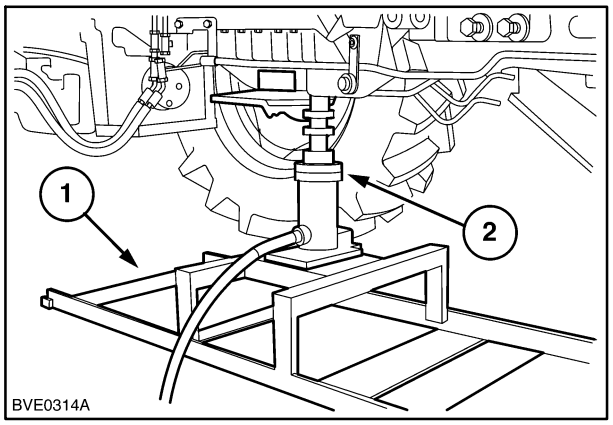
12

9. Disconnect the steering sensor electrical connector (1) (if fitted).



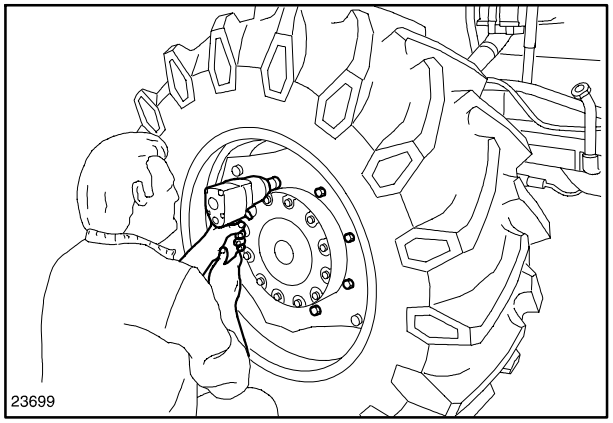
13

10. Position the splitting kit (1) 297471 underneath the tractor.
11. Use the supports (2) in the splitting kit to support the engine on the splitting stand.



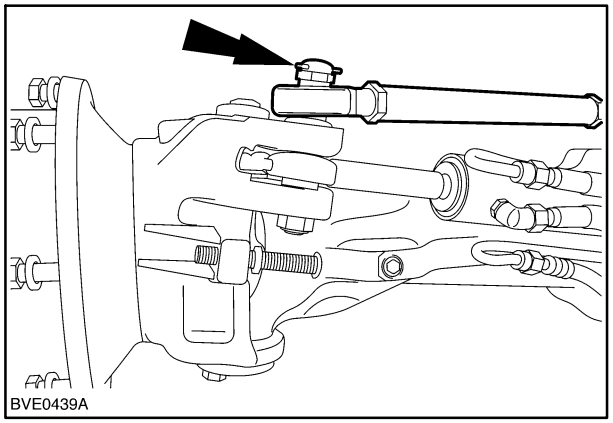
14

12. Lock the front axle relative to the engine using wooden wedges. Remove the retaining bolts and remove the left hand side front wheel. Repeat this step for the right hand side front wheel.



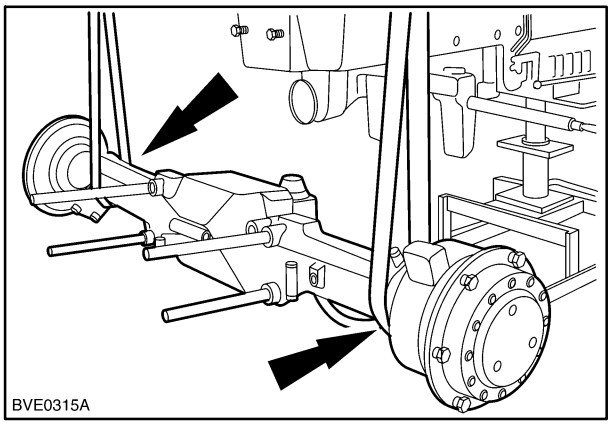
15

13. Detach the steering arm from the stub axle housing and reposition. Repeat this step for the right hand side.



16

14. Using a spreader bar and suitable slings or chains, attach the front axle assembly to a moveable overhead hoist.
15. Remove the six bolts from the supersteer swivel lower plate, note the shims on either side and lower the axle sufficient to remove it from the tractor.



17

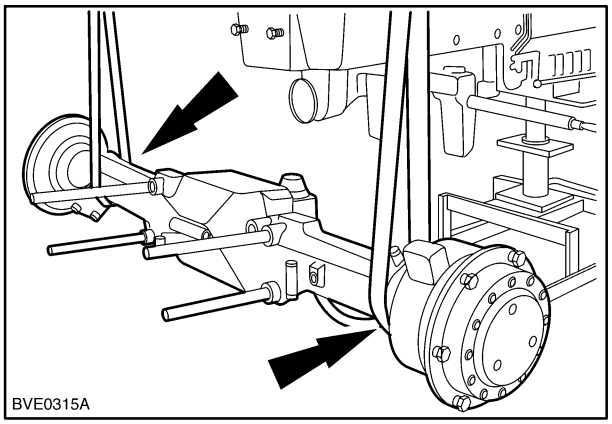
Installation

⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.

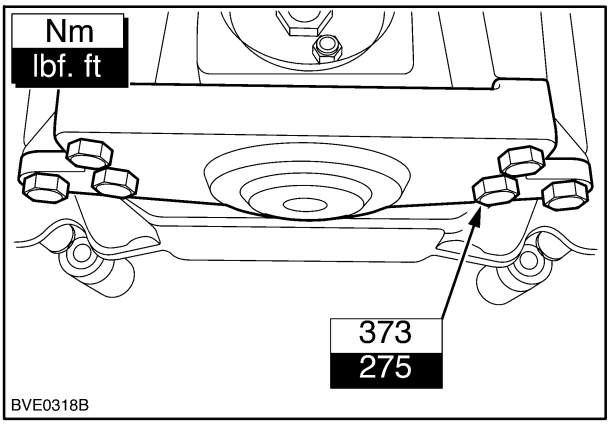
NOTE: *It will be necessary to obtain the correct swivel bearing pre-load setting for the supersteer unit (refer to Swivel Bearing Adjustment in this chapter).*

1. Using a spreader bar and suitable slings or chains, attach the front axle assembly to a moveable overhead hoist.



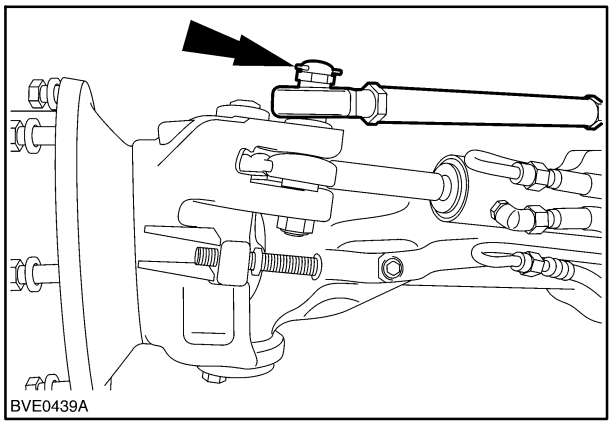
18

2. Install the SuperSteer swivel lower plate and the retaining bolts. Tighten the retaining bolts to the specified torque value.



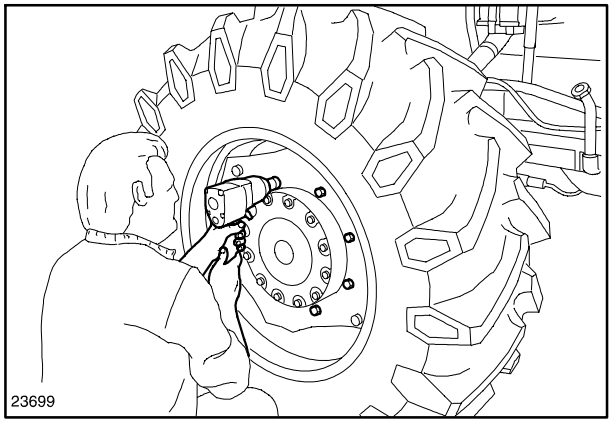
19

3. Attach the steering arm to the stub axle housing. Repeat this step for the right hand side.



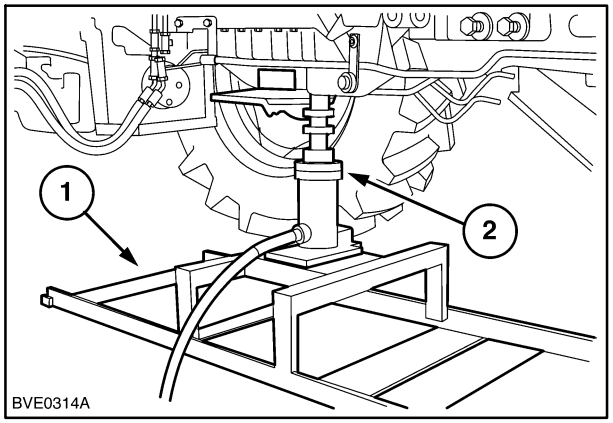
20

4. Install the left hand side front wheel and install the retaining bolts. Remove the wooden wedges. Repeat this step for the right hand side front wheel.



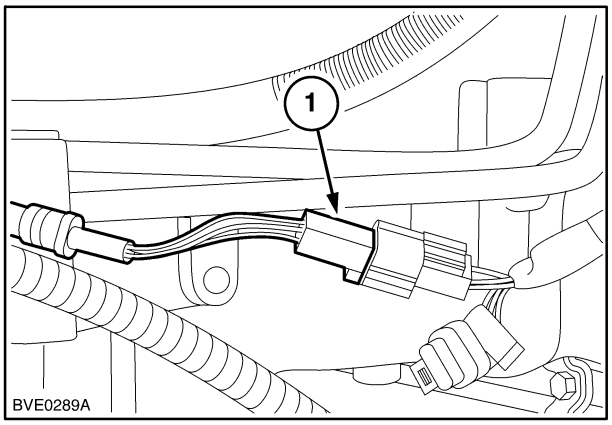
21

5. Remove the supports (2) and the splitting kit (1).



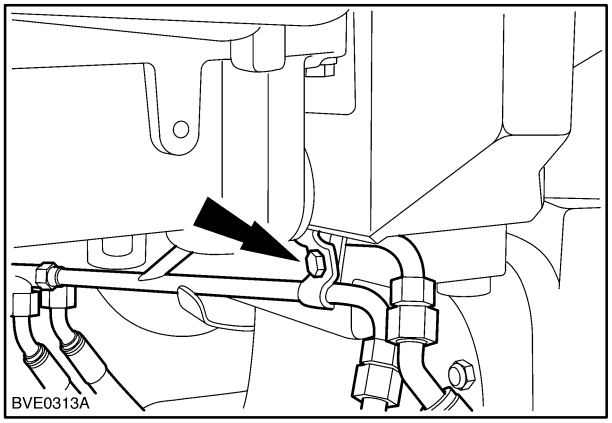
22

6. Connect the steering sensor electrical connector (1) (if fitted).



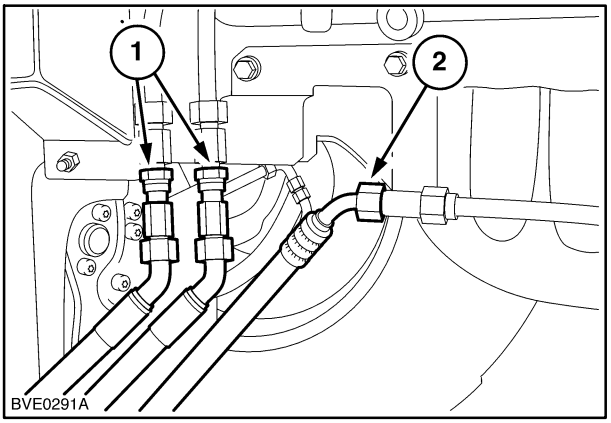
23

7. Attach the steering cylinder oil supply and oil return pipes to the retaining clamp.



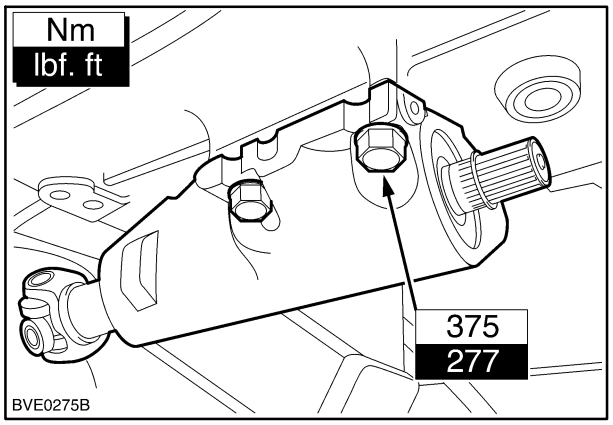
24

8. Connect the steering cylinder oil supply and oil return pipes (1).
9. Connect the differential lock oil supply pipe (2).



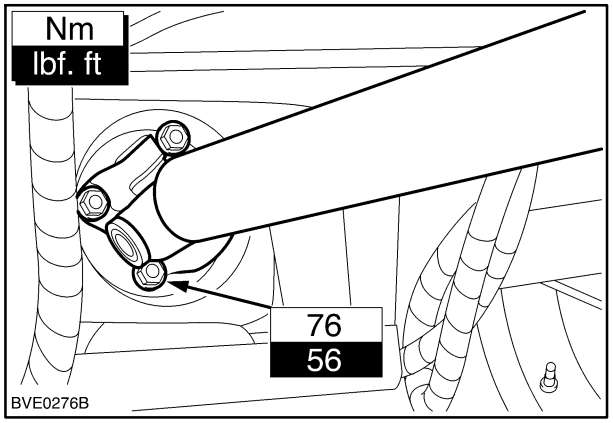
25

10. Install the four wheel driveshaft and the support. Tighten the retaining bolts to the specified torque value.



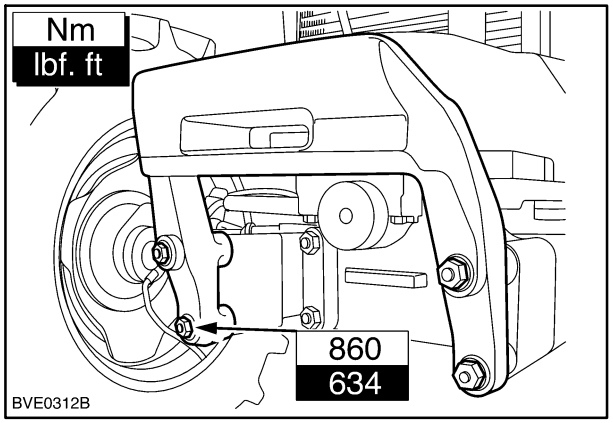
26

11. Install the four wheel driveshaft retaining nuts. Tighten the retaining nuts to the specified torque value.



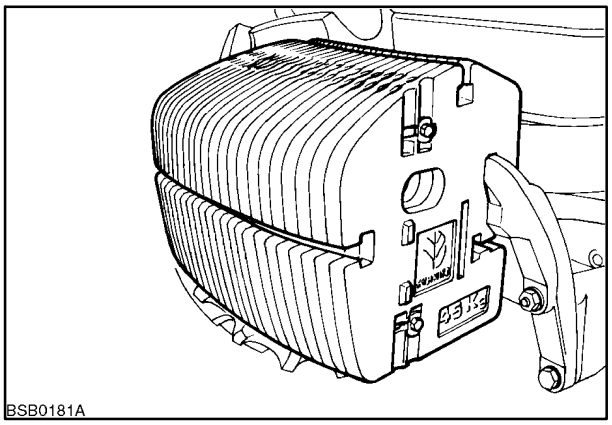
27

12. Install the front weight carrier. Tighten the retaining bolts to the specified torque value.



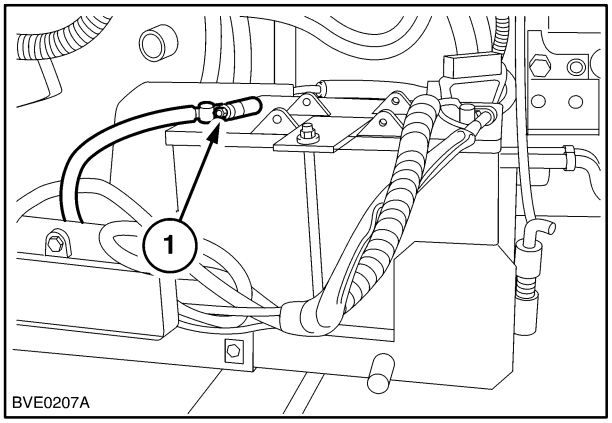
28

13. Using a suitable sling, connect the front weights to a hoist and install the front weights (if fitted).



29

14. Connect the battery negative cable (1) and install the battery cover.
15. Refill the driveline with the correct specification oil.

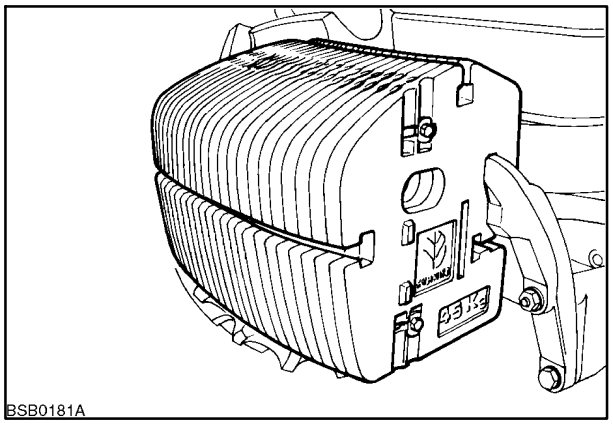


30

ADJUSTMENT

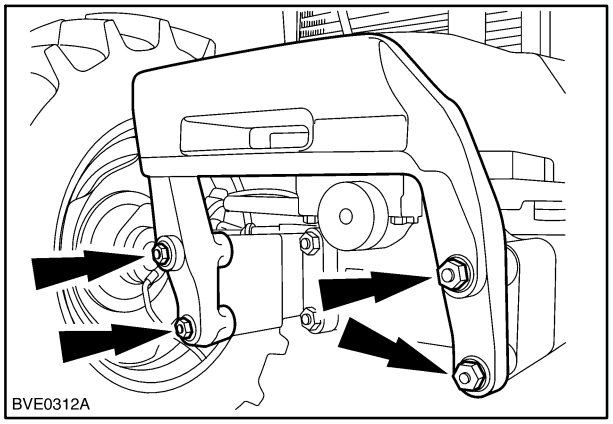
SWIVEL BEARING

1. Using a suitable sling, connect the front weights to a hoist and remove the front weights (if fitted).



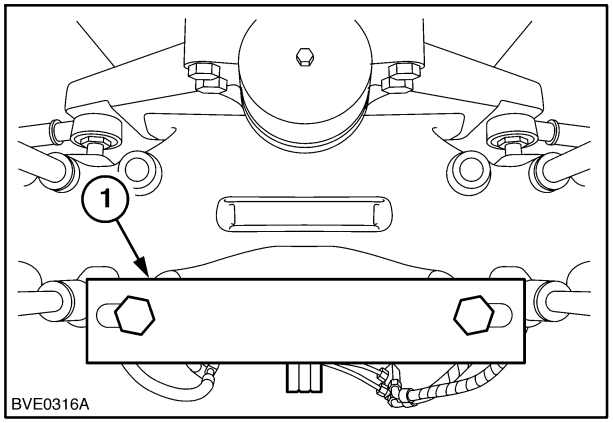
31

2. Remove the front weight carrier.



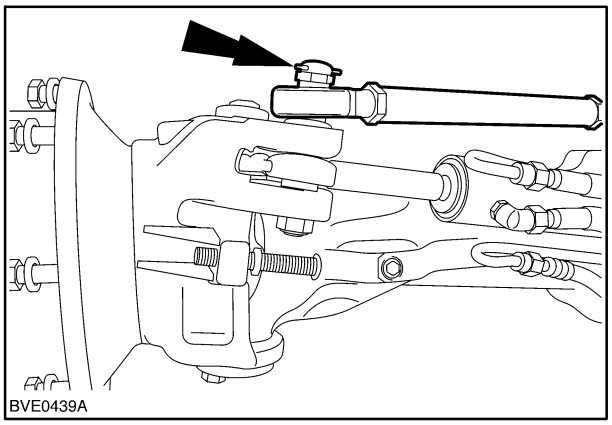
32

3. Attach the locally fabricated tool (1) to the front of the axle using M24 x 2.0 x 75mm bolts.



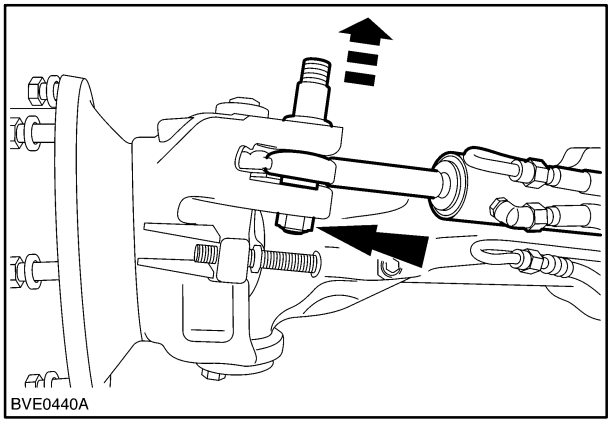
33

4. Detach the steering arm from the stub axle housing and reposition. Repeat for the right hand side.



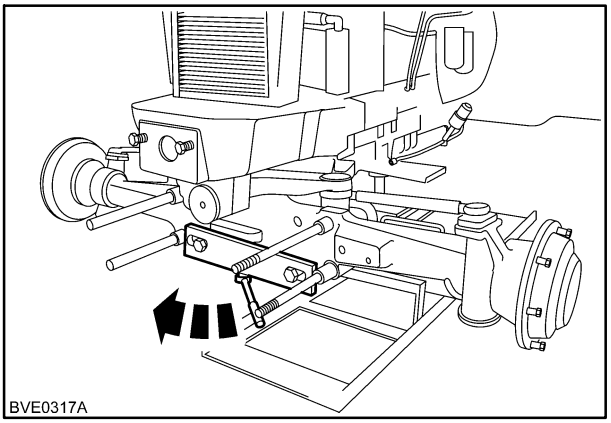
34

5. Remove the retaining nut. Withdraw the steering cylinder pin from the stub axle housing and recover the spacers. Repeat for the right hand side.



35

6. Using a suitable torque wrench, rotate the axle assembly on the nut of the locally fabricated tool. The correct force to rotate the axle on the the swivel, after initial breakaway, should be between 35-38 Kgm.



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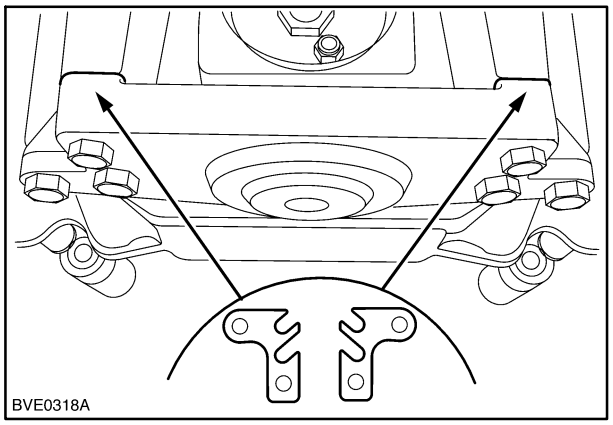
7. If the force required is incorrect adjust the shims to obtain the correct value.

   Increasing the shim thickness will decrease the force required to rotate the axle assembly.

NOTE: *If the correct value cannot be obtained with equal size shims on each side, it is acceptable to raise or lower one side by one shim increment to obtain the correct value.*



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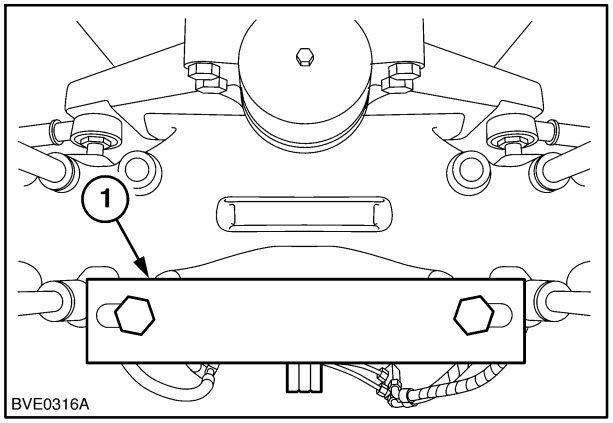
8. When the correct value is obtained remove the locally fabricated tool (1).



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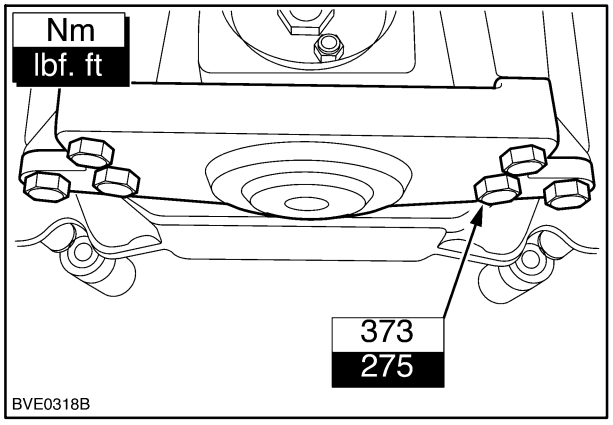
9. Tighten the SuperSteer swivel lower plate retaining bolts to the specified torque value.



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SECTION 27 - MECHANICAL REAR WHEEL DRIVE

Chapter 1 - Mechanical Rear Wheel Drive

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SPECIFICATIONS

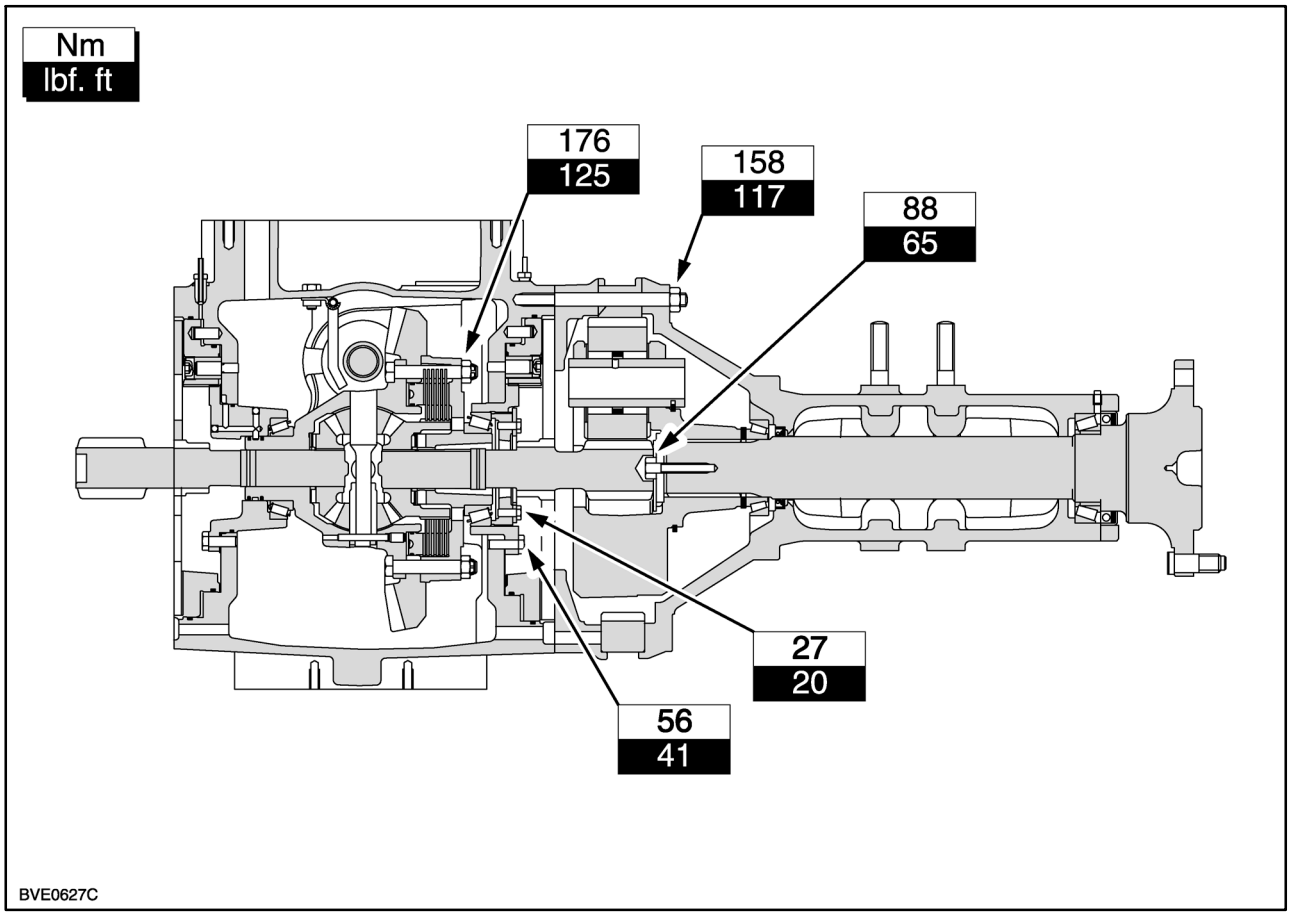
PINION, CROWN WHEEL AND DIFFERENTIAL

Type	
Pinion and Crown Wheel - Differential	
Pinion and crown wheel ratio	9/47 = 1:5.22
Pinion to crown wheel backlash mm	0.20 to 0.30
Differential: Light version	2-planet gears
Differential: Heavy version	4-planet gears
Differential lock control:	
Dog type clutch	Acting through front-meshing, hydraulically operated gears
Multi-wet plate clutch	Acting through a hydraulically controlled multi-pack clutch in an oil bath
Differential Lock Assembly (Multi-Wet Plate Clutch)	
Driven discs .Quantity	6
Drive discs .Quantity	6
Driven disc thickness (each) mm	2.85 - 2.95
Drive disc thickness (each) mm	1.75 - 1.85
Differential pinion bore diameter. mm	28.04 - 28.061
Differential pinion journal diameter. mm	27.939 - 27.960
Differential pinion running clearance mm	0.080 - 0.122
Sun gear hub seat in differential	
Cage diameter mm	80.5 - 82.6
Sun gear hub diameter mm	79.0
Pinion shaft position adjustment	See page 35
Pinion shaft position shimming: Dog type clutch differential lock mm Multi-wet plate clutch differential lock mm	1.40 - 1.45 - 1.50 - 1.55 - 1.60 1.65 - 1.70 - 1.75 - 1.80 - 1.85 1.90 - 1.95 - 2.00 - 2.05 - 2.10 2.15 - 2.20 - 2.25 - 2.30 - 2.35 2.40 - 2.45 - 2.50
Pinion bearing adjustment	See page 35
Pinion bearing shimming mm	4.40-4.50-4.60-4.70-4.80-4.85 4.90-4.95-5.00-5.05-5.10-5.15 5.20-5.25-5.30-5.35-5.40-5.45 5.50-5.55-5.60-5.65-5.70-5.75 5.80-5.85-5.90-5.95-6.00-6.05 6.10-6.15-6.20-6.30-6.40-6.50 6.60
Crown wheel bearing and backlash	See pages 35
shims available mm	0.15-0.20-0.50
Differential sun gear and planet gear backlash mm	0.20
Differential sun gear thrust washer thickness mm	2.70 - 2.75 - 2.80 - 2.85 - 2.90 - 2.95 - 3.00 - 3.05 - 3.10 - 3.15 - 3.20 - 3.25 - 3.30 - 3.35 - 3.40 - 3.45 - 3.50
Differential gear end play (each) mm	0.2 - 0.45
Differential gear end play adjustment mm	See page 60

FINAL DRIVE

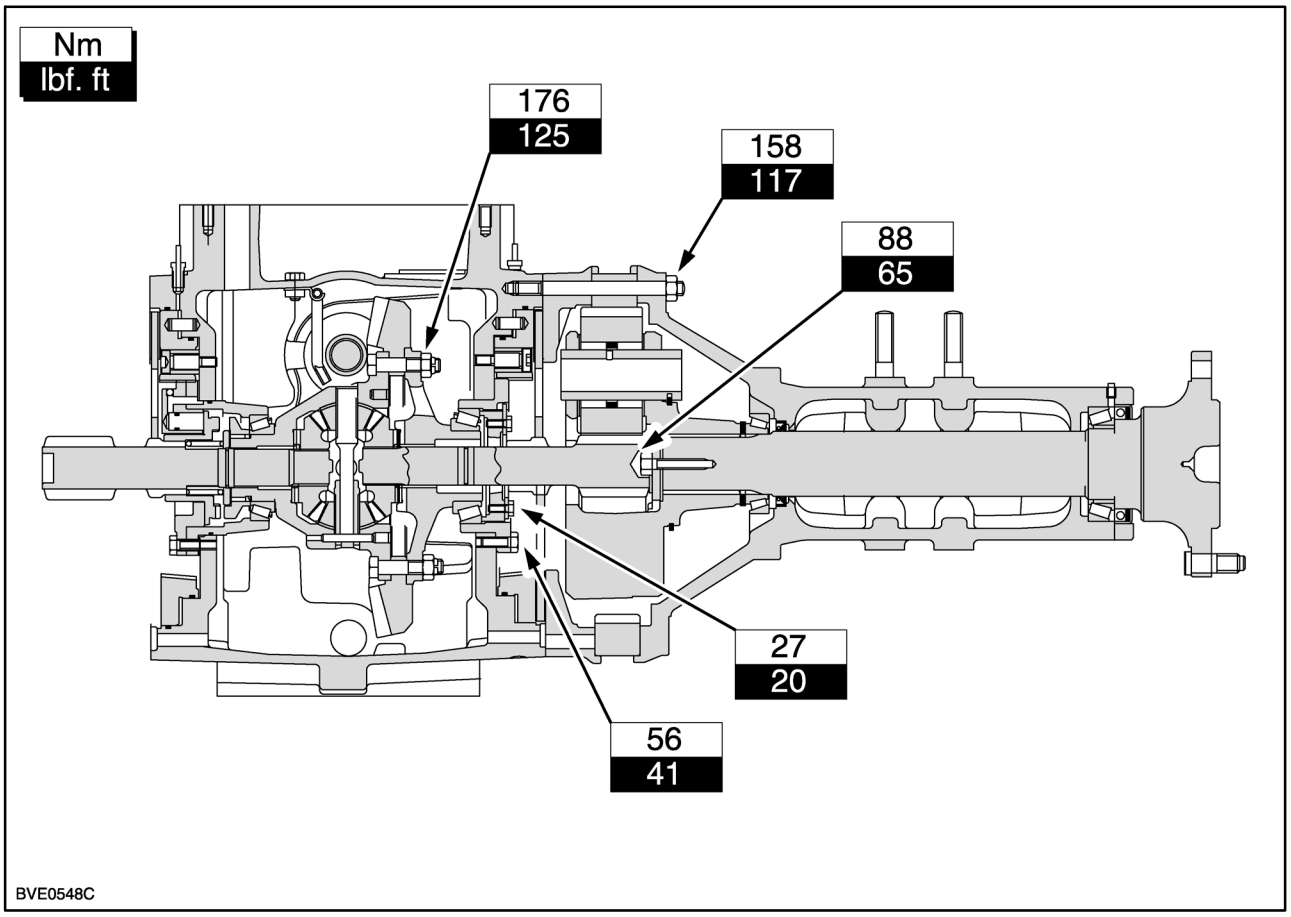
Type	Epicyclic, with planetary spur gears
Reduction ratios:	
Light version	3:(3+65)=1:6
Heavy version	12:(12+69)=1:6.75
Thickness of planetary gear thrust washers mm	1
Thickness of planetary gear roller bearing spacer (9):	
Light version mm	3.95 - 4.00
Heavy version mm	10.95 - 11.00

TIGHTENING TORQUES



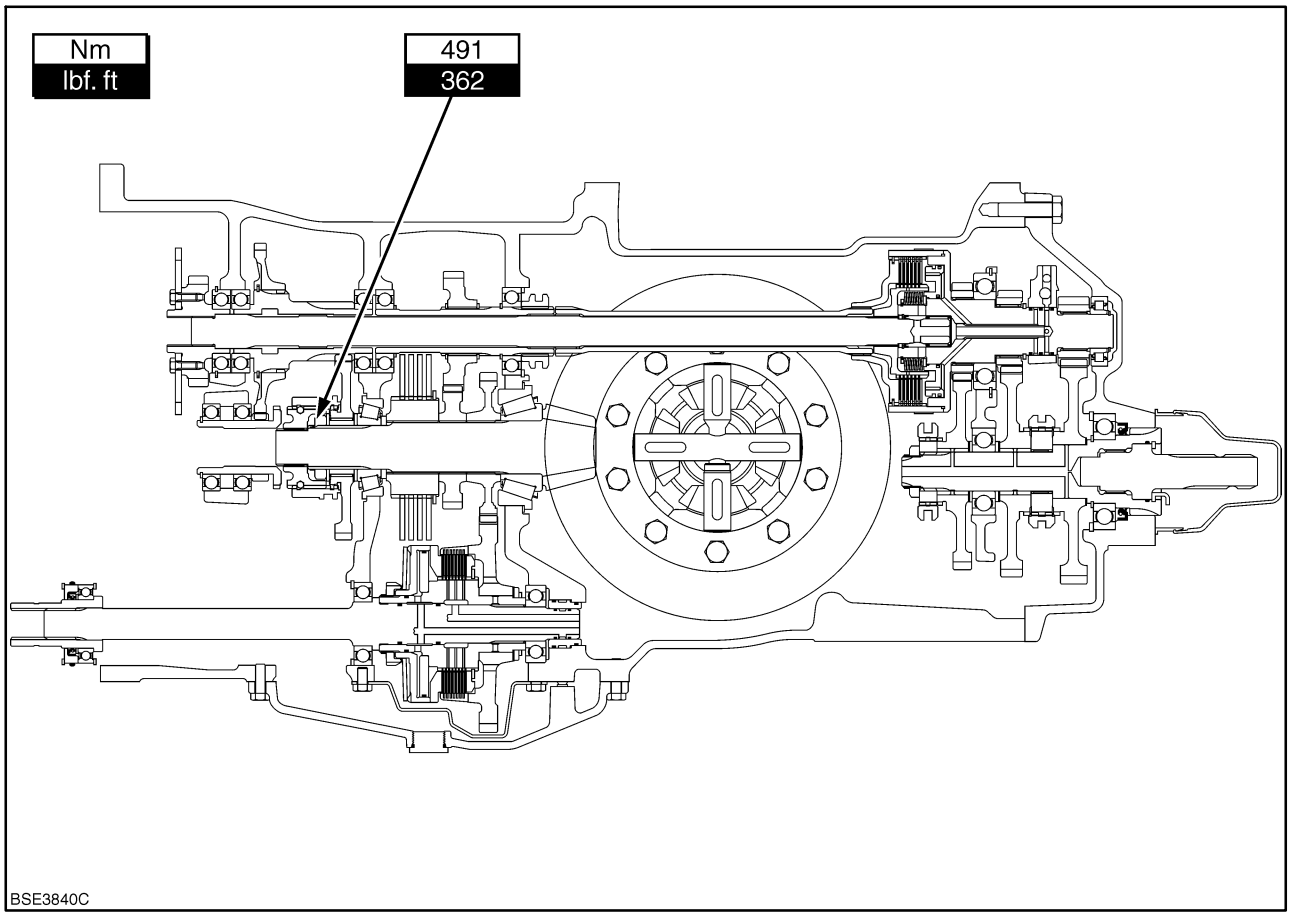
1

Rear Axle Cross-Section - Multi-Wet Plate Clutch



2

Rear Axle Cross-Section - Dog Clutch



3

Rear Axle Longitudinal Cross-Sectional View

SPECIAL TOOLS

⚠ CAUTION ⚠

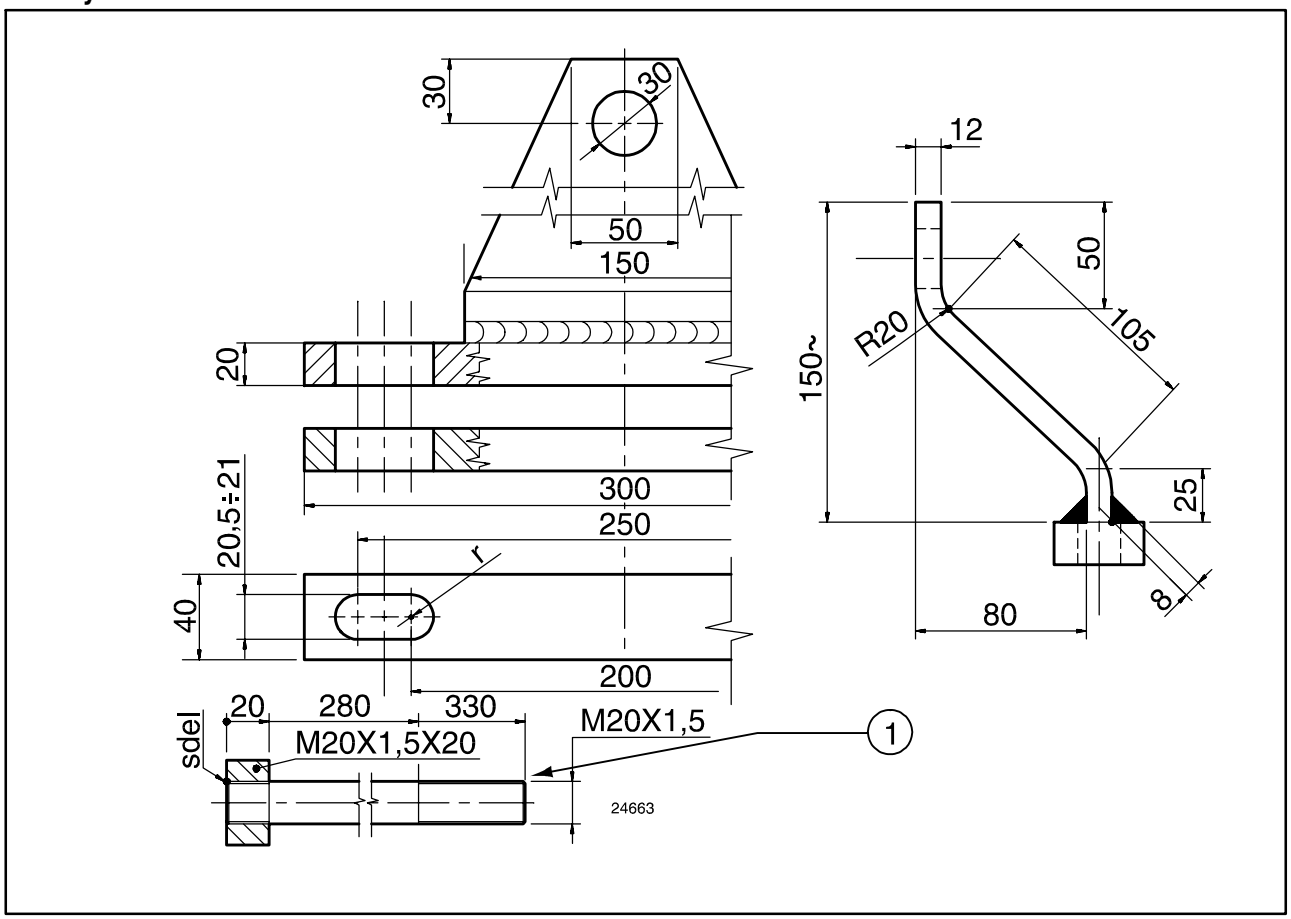
Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X).**

To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools (listed below) and integrated with the locally fabricated tools. Construction drawings and specifications for the locally fabricated tools can be found in this Manual.

List of special tools necessary to carry out the different operations described in this Section.

	290090	Rotary stand
	292320	Tractor separation stand
	291517	Rear axle housing lifting hook
	293972	Front bracket for rear axle overhaul (to be used with **290090**)
	293973	Rear bracket for rear axle overhaul (to be used with **290090**)
	292865	Pinion to crown wheel rolling torque check tool
	293996	Transfer box shaft puller
	293400	Universal pinion installer
X	**293994**	Crown wheel-differential lifting hook
	292870	Universal differential lock pressure test kit
X	**293811**	Reduction gear assembly lifting hook
	292400	Rear wheel lifting hook.
	291221	Differential overhaul stand.
	292927	Slide hammer.
	297471	Tractor splitting kit
	380000403	Rear axle support
	380001113	Final drive case, removal and installation tool.
	380001114	Crown wheel backlash and differential support bearing adjustment tool.

Locally Fabricated Tools



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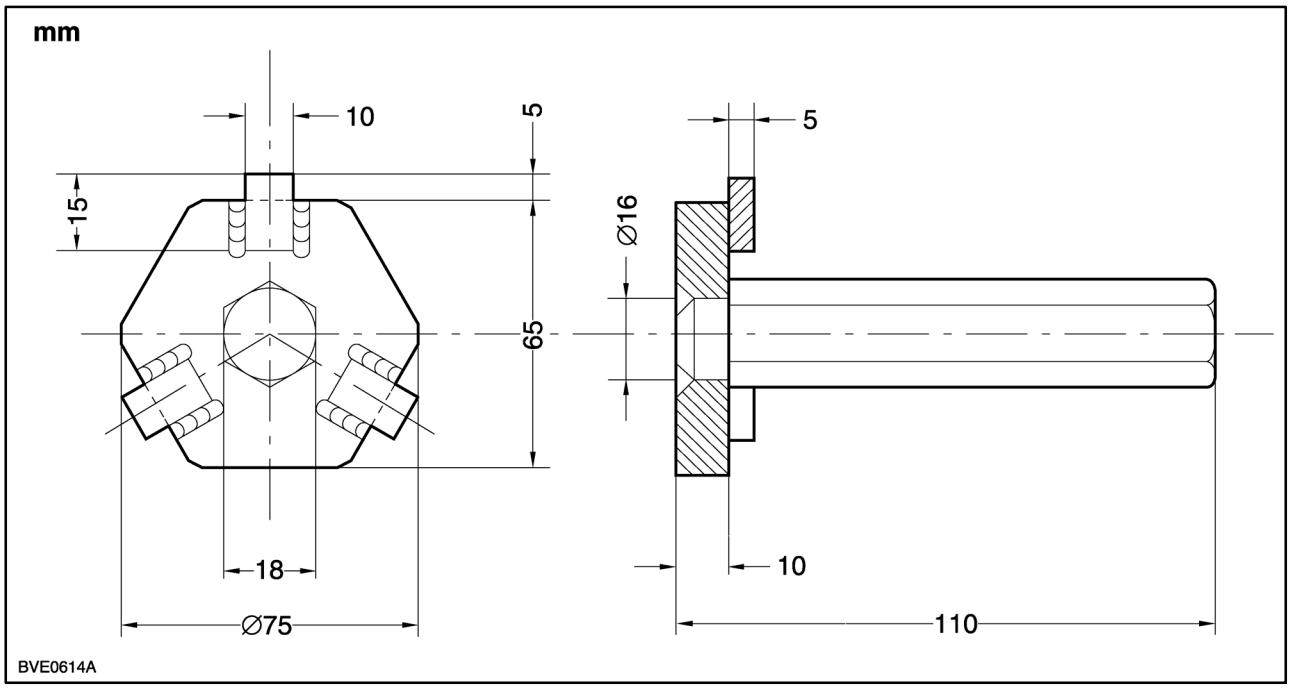
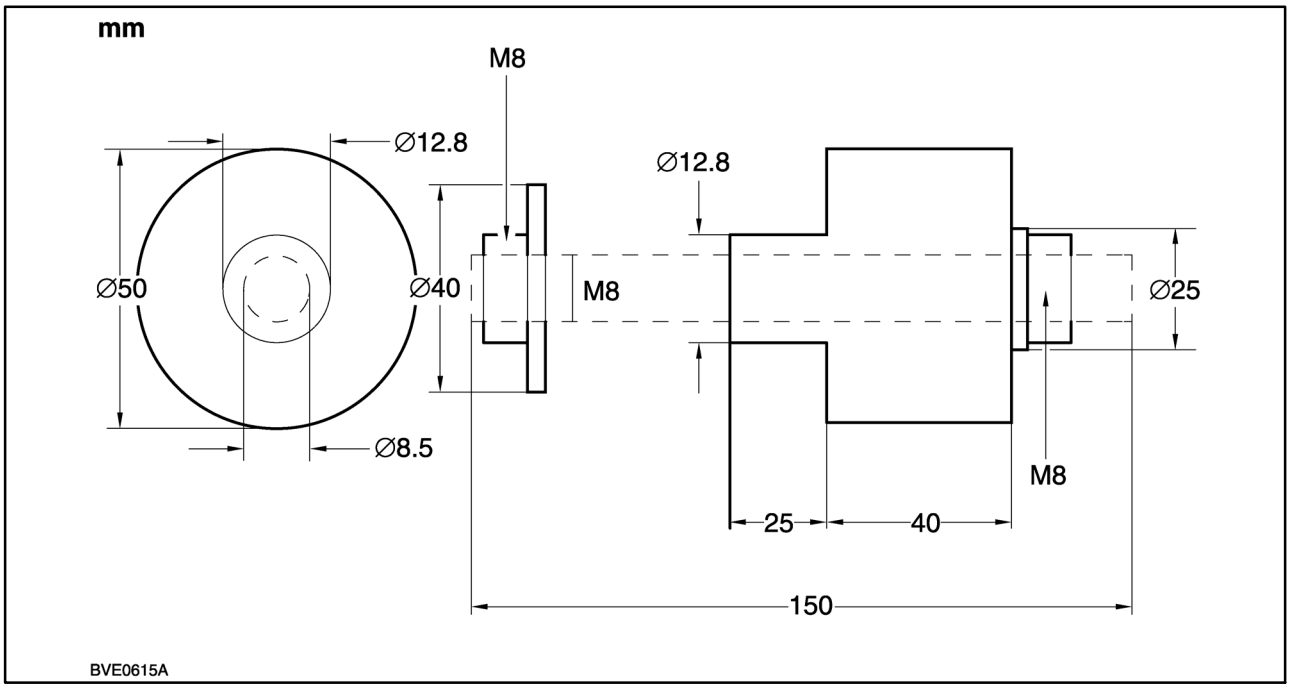
Final Drive Case Removal/Installation Tool



5

Crown Wheel Backlash and Differential Support Bearing Adjustment Tool



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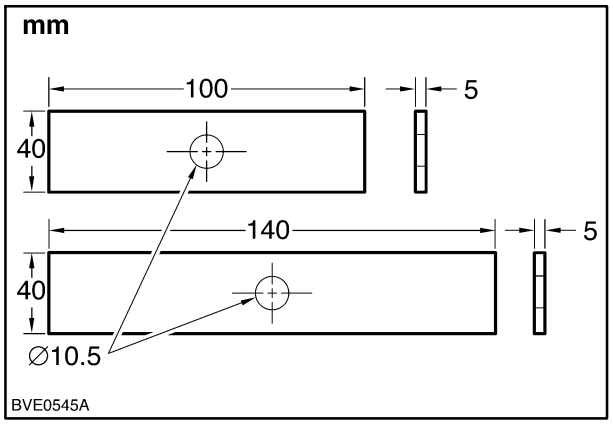
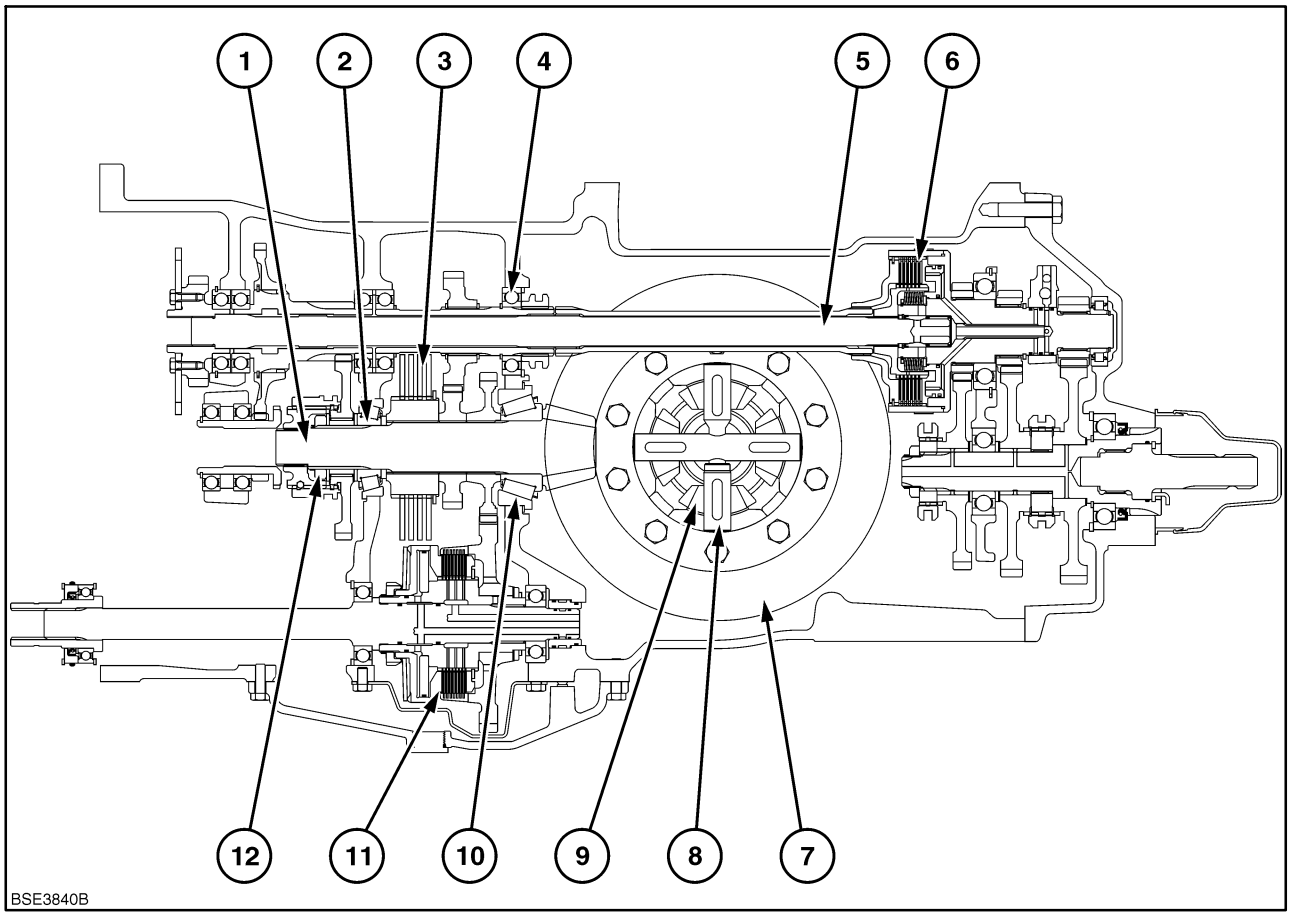
Hydralic Pump Idler Gear Rolling Torque Measurment Tool



7

Pinion Shaft Position Adjustment Tool

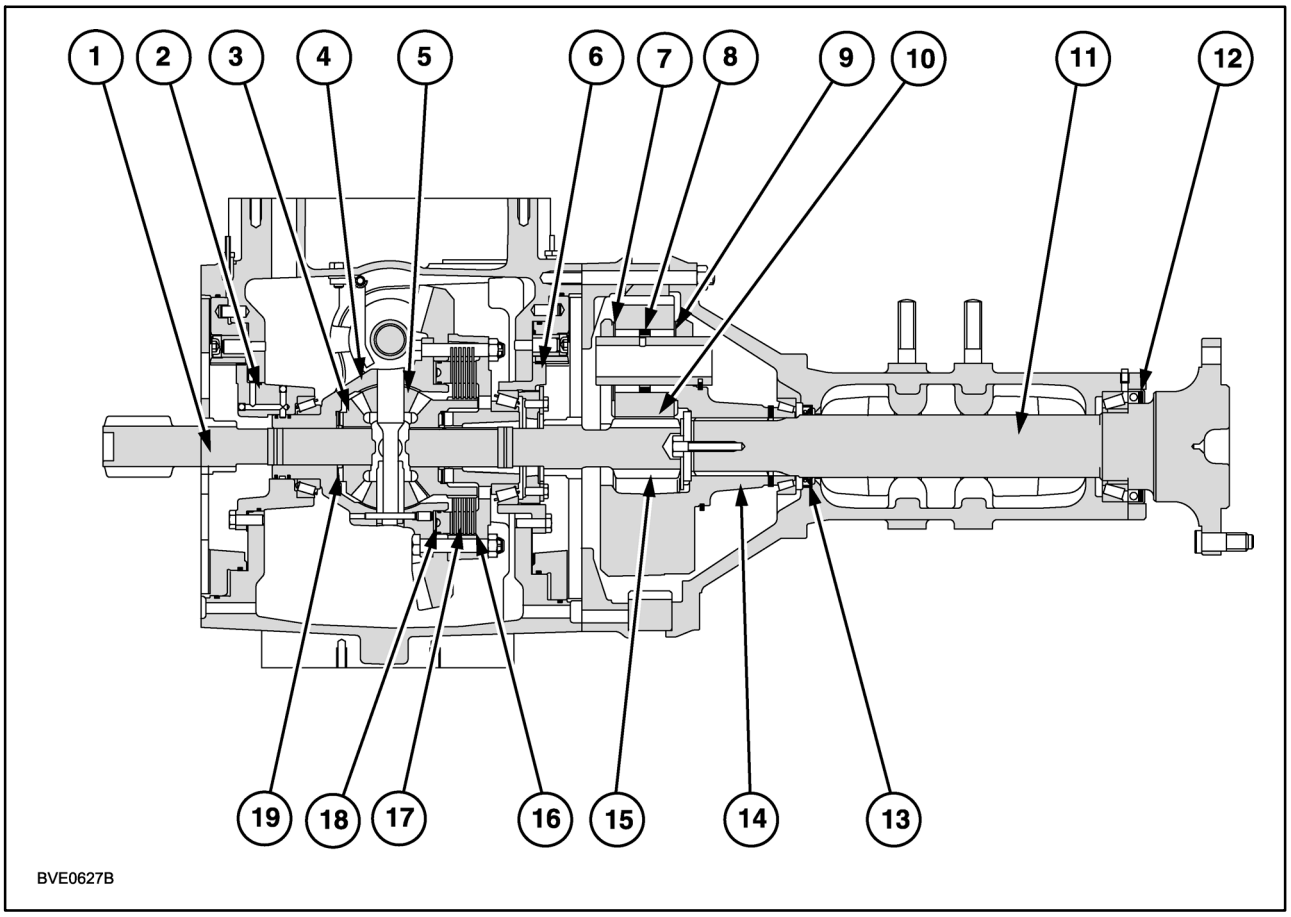
SECTIONAL VIEWS



8

Rear Axle Longitudinal Cross-Sectional View

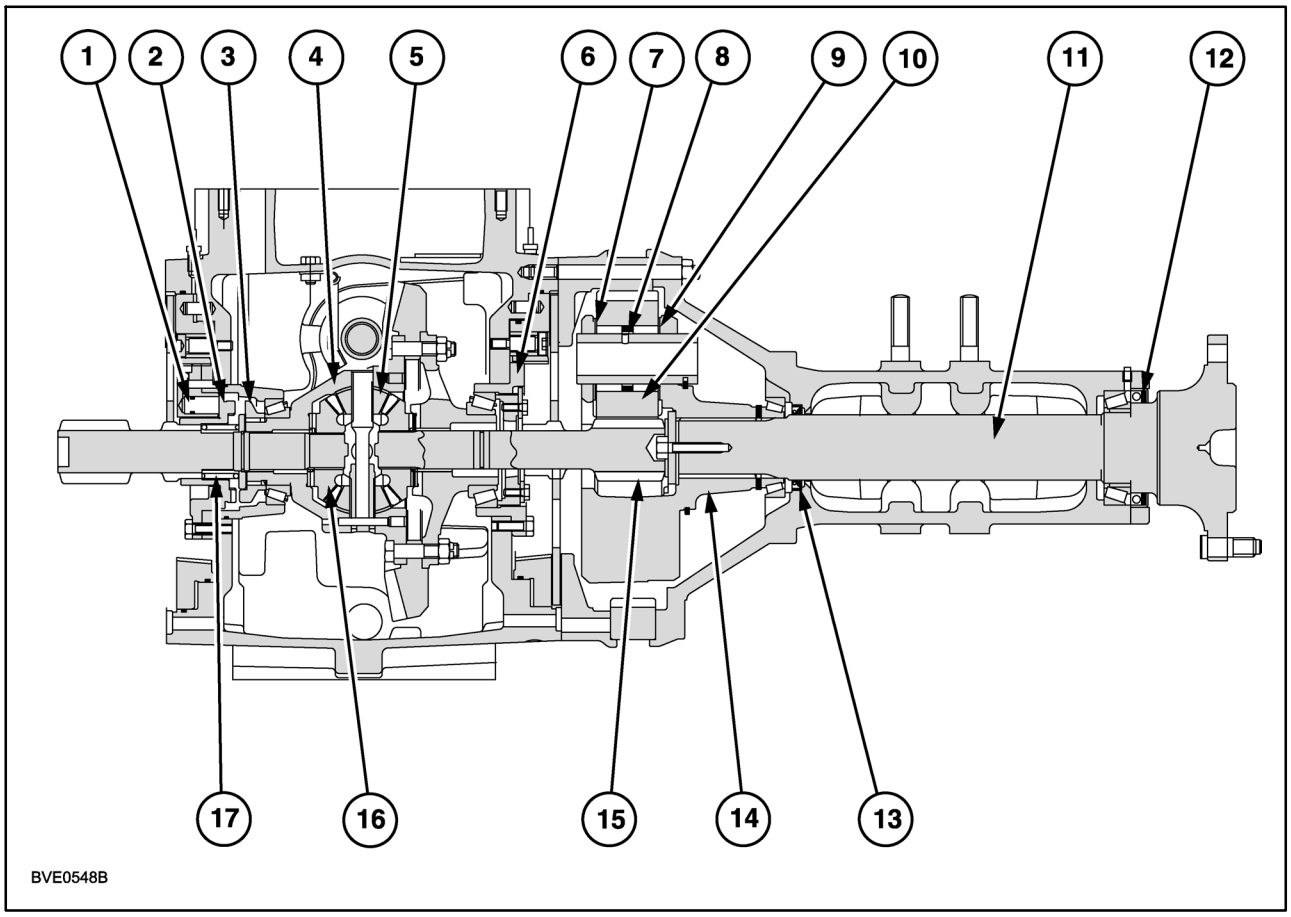
1. Pinion shaft
2. Tapered roller bearing
3. Parking brake discs
4. Roller bearing
5. PTO drive shaft
6. PTO clutch
7. Crown wheel
8. Planet gear shafts
9. Planet gears
10. Pinion shaft position adjustment shim
11. Four wheel drive clutch
12. Pinion shaft retaining nut



9

Rear Axle Cross-Section - Multi-Wet Plate Clutch

1. Differential output half-shaft
2. Differential Support
3. Sun gears
4. Differential cage
5. Planet gears
6. Differential support
7. Thrust washer
8. Planetary gear bearing spacer
9. Thrust washer
10. Planetary final reduction gears
11. Wheel axle shaft
12. Oil seal
13. Oil seal
14. Planetary carrier
15. Differential output half-shaft
16. Drive discs
17. Driven discs
18. Differential lock control piston
19. Sun gear end play adjuster rings



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Rear Axle Cross-Section - Dog Clutch

1. Dog clutch piston
2. Dog clutch sliding coupler
3. Dog clutch fixed gear
4. Differential cage
5. Planet gears
6. Differential support
7. Thrust washer
8. Planetary gear bearing spacer
9. Thrust washer
10. Planetary final reduction gears
11. Wheel axle shaft
12. Oil seal
13. Oil seal
14. Planetary carrier
15. Differential output half-shaft
16. Sun gears
17. Helix spring

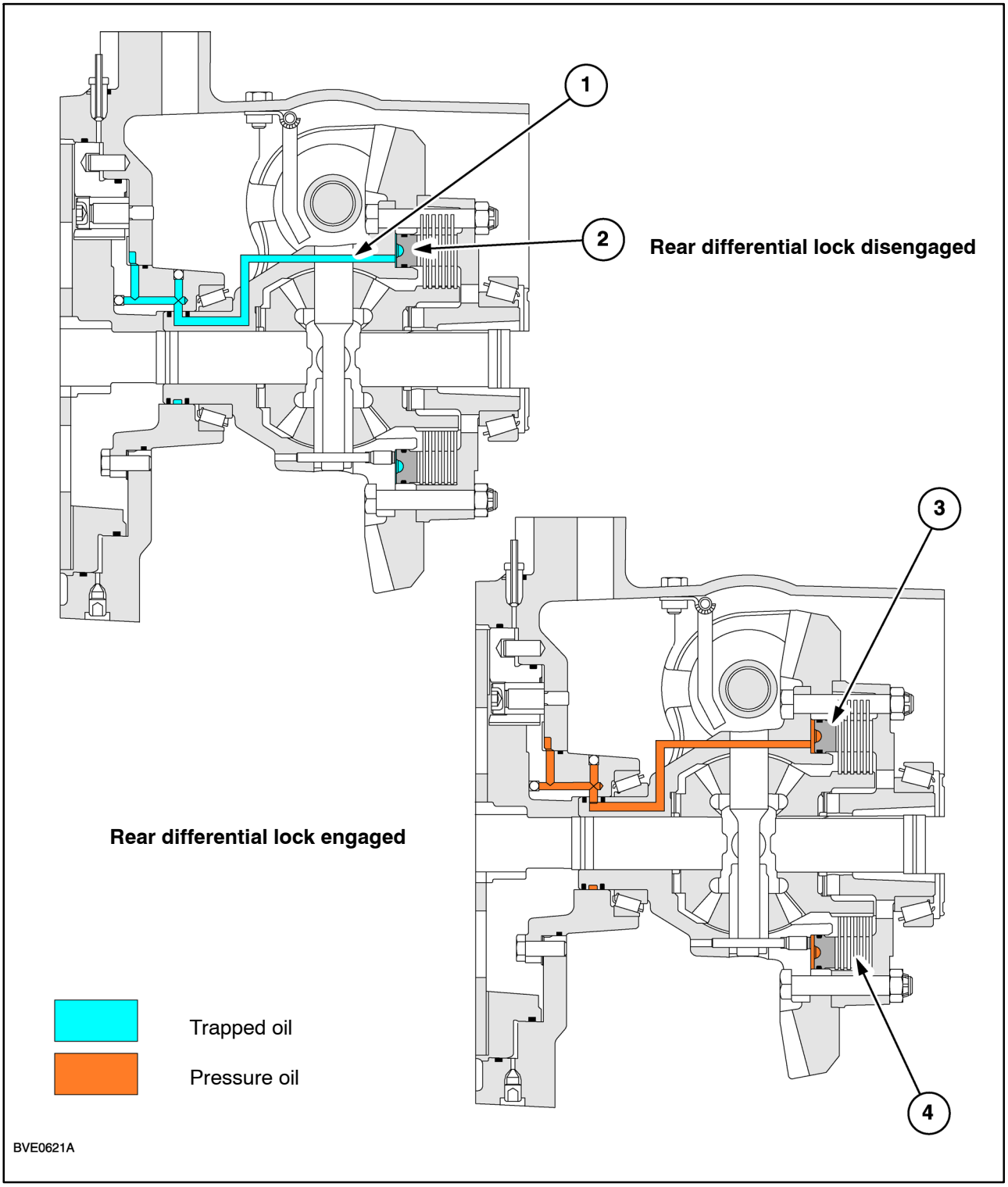
DESCRIPTION AND OPERATION

The rear axle assembly transfers drive from the transmission to the epicyclic final drives through a bevel pinion and crown wheel coupling. The bevel gears are spiral type and are supported by tapered roller bearings.

The differential is fitted with four planetary gears and a hydraulic differential lock. The differential lock being of a multi-plate type.

Refer to index for the locations of descriptions and operations of differential lock.

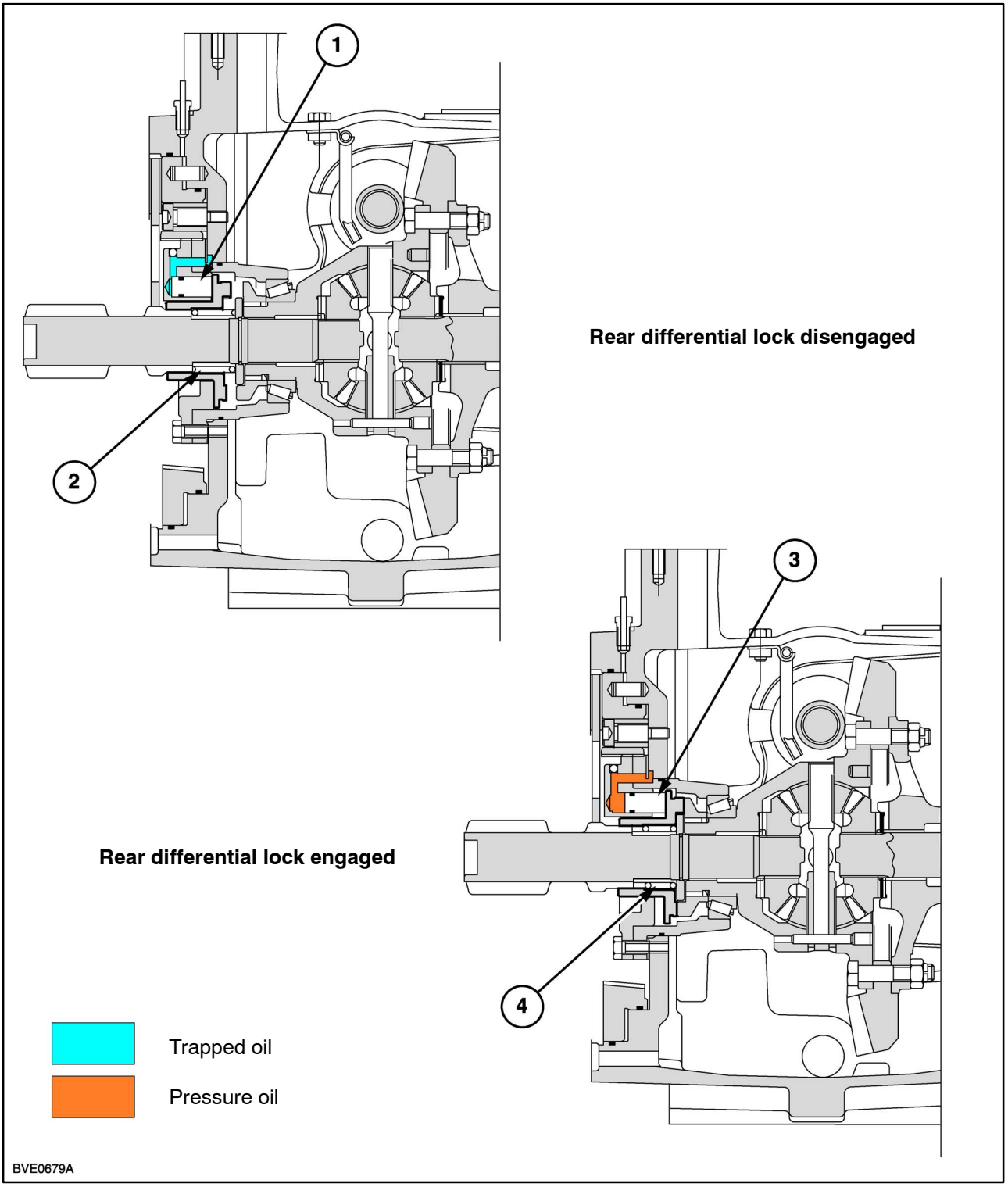
The epicyclic final reduction gear sets are controlled by the bevel pinion and crown wheel output half–shafts, which also control the brakes.



11

REAR DIFFERENTIAL LOCK ASSEMBLY - MULTI-WET PLATE CLUTCH

When the differential lock is disengaged, the solenoid valve is in the discharge position (not engergised) and the oil (1) is free to return to the sump. Under these conditions, the clutch piston (2) and the drive and driven discs remain separated and the differential lock is disengaged. When the differential lock switch is activated, the solenoid valve opens and directs oil from the low pressure circuit into the clutch piston (3) locking the differential plates (4).



12

REAR DIFFERENTIAL LOCK ASSEMBLY – DOG CLUTCH

When the differential lock is disengaged, the solenoid valve is in the discharge position (not engergised) and the oil (1) is free to return to the sump. Under these conditions, the helix spring (2) Keeps the lock dog clutch teeth apart. When the differential lock switch is activated, the solenoid valve opens and directs oil from the low pressure circuit into the drive piston (3), where it creates a pressure greater than the spring (4) force and moves the piston, locking the differential.

TROUBLESHOOTING

PINION, CROWN WHEEL AND DIFFERENTIAL

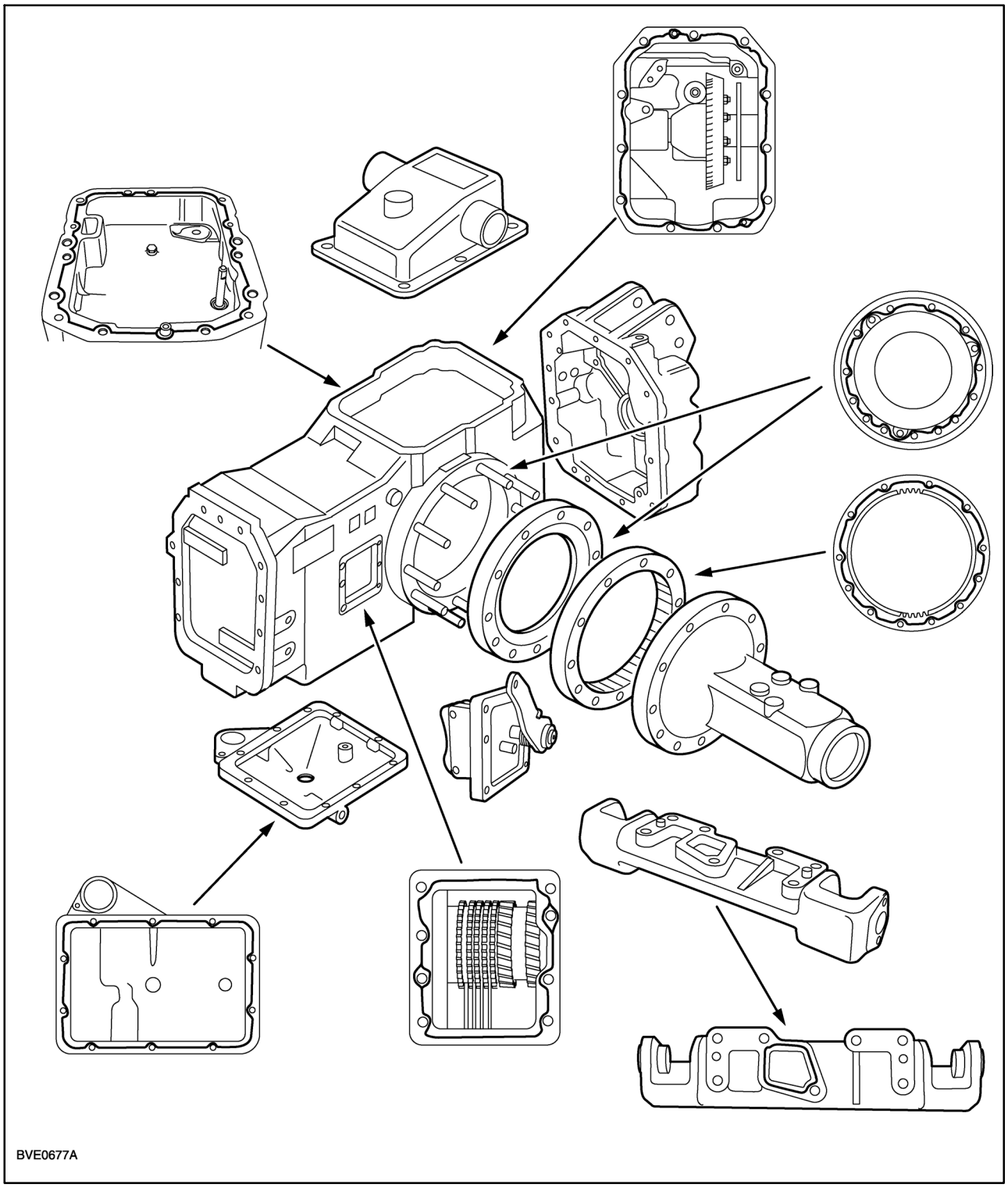
Problem	Possible Cause	Correction
Noisy rear axle when the tractor is moving, and also with transmission in neutral (not originating from final drives)	1. Pinion and/or crown wheel bearing misadjustment	Remove rear axle housing and adjust pinion and crown wheel bearings correctly
	2. Worn or incorrectly adjusted sun and planetary gears	Remove rear axle housing, replace worn parts and adjust the differential gear backlash
	3. Excess differential side gears to half–shaft spline backlash	Remove rear axle housing and replace damaged parts
Noisy rear axle with tractor under load and upon release	1. Excess bevel pinion to crown wheel backlash	Remove rear axle housing and adjust pinion and crown wheel bearings correctly
	2. Faulty or defective inner component	Remove rear axle housing, replace worn parts and adjust differential gear backlash correctly
Noisy rear axle and over–heating	1. Insufficient pinion and/or crown wheel bearing backlash	Remove rear axle housing and adjust pinion and crown wheel bearings correctly
	2. Insufficient bevel pinion to crown wheel tooth backlash	Remove rear axle housing and adjust crown wheel bearings correctly

FINAL DRIVES

Problem	Possible Cause	Correction
Noisy final drives when the tractor is moving and also with transmission in neutral	1. Wheel axle shaft bearing incorrectly adjusted	Remove final drive case and adjust bearings
	2. Faulty or defective internal component.	Remove final drive case and replace damaged parts.
	3. Excess wheel axle shaft to final drive spline backlash	Remove final drive case and replace damaged parts.

HYDRAULIC DIFFERENTIAL LOCK

Problem	Possible Cause	Correction
Differential lock not engaging	1. Low rear axle oil level	Top up to the correct oil level
	2. Blocked oil filter	Replace the oil filter
	3. Faulty hydraulic pump	Overhaul or replace pump
	4. Faulty differential lock switch	Replace the differential lock switch
	5. Power supply not reaching solenoid valve: detached or damaged electrical connectors, faulty remote switch	Restore electrical connection and replace faulty parts. Overhaul or replace solenoid valve
	6. Differential lock control solenoid valve stuck on discharge	Overhaul or replace solenoid valve
	7. Oil leaks through the seals with consequent pressure drop: cylinder piston oil supply line seals	Replace faulty seals
Differential lock not disengaging	1. Faulty differential lock-unlock switch	Replace switch
	2. Power supply not reaching solenoid valve: detached or damaged connectors, faulty remote switch	Repair electrical connection and replace faulty parts
	3. Differential lock control solenoid valve stuck on delivery	Overhaul or replace solenoid valve
	4. Oil leaks through the seals with consequent pressure drop: cylinder piston or supply line seals	Replace faulty seals
With differential lock engaged and control switch on automatic mode, the differential lock does not disengage when raising lift arms using the Fast Raise switch	1. Faulty differential lock switch (connected to the Fast Raise switch)	Replace the differential lock switch
With differential lock engaged, the differential lock does not disengage when brake pedals are pressed	1. Faulty differential lock switch (connected to the brake pressure switches/foot pedal switches)	Replace the differential lock switch



13

Patterns for application of liquid gasket

OVERHAUL

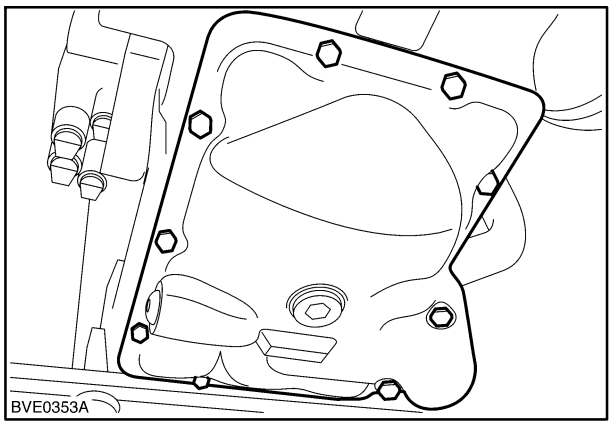
REAR AXLE

Disassembly

⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Separate the transmission, engine and front support from the rear axle. (refer to separating transmission, engine and front support from the rear axle, chapter of the separating the tractor section).
2. Remove both of the final drive cases (refer to final drive case removal in this chapter).
3. Remove the rear axle bottom cover.



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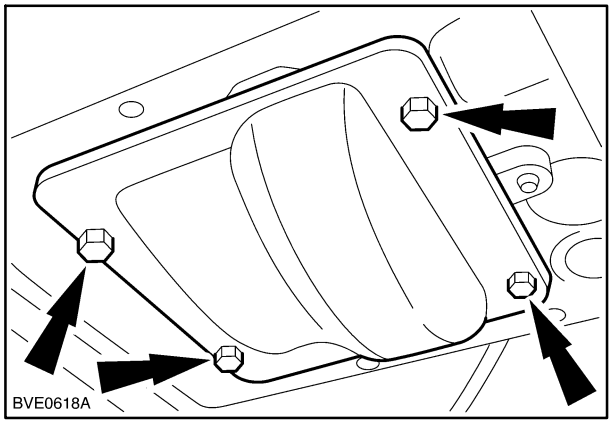
4. Remove the four wheel drive clutch inner cover.



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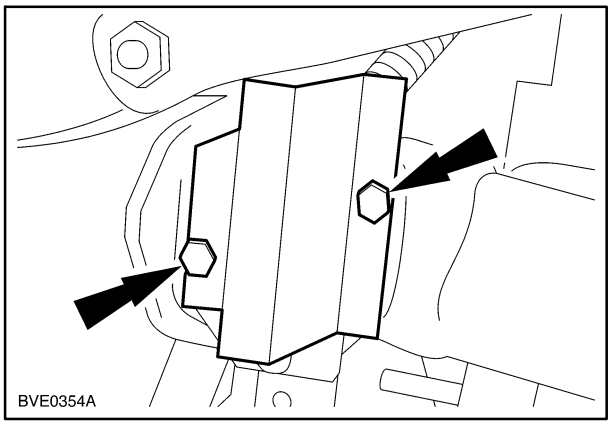
5. Remove the draft sensor protection plate.



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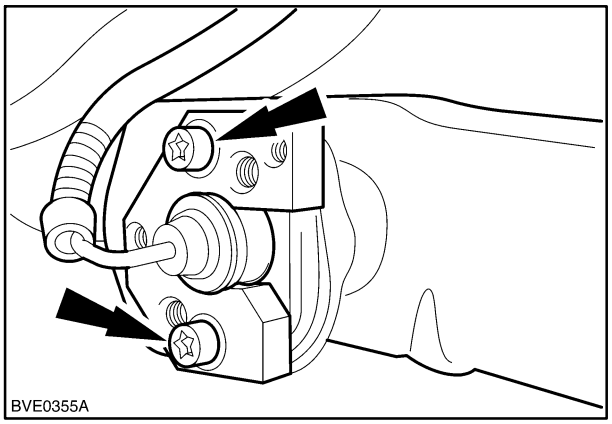
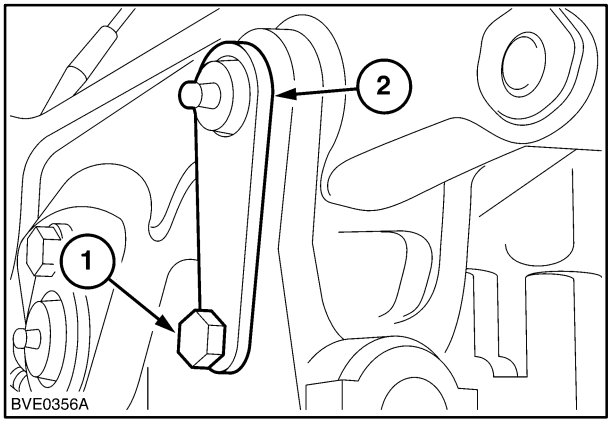
6. Remove the retaining bolts, slide out the draft sensor with its mounting plate and remove the lower link.



17

7. Remove the vertical tie rod pivot pin retaining bolt (1). Remove the vertical tie rod pivot pin (2) and remove the vertical tie rod.



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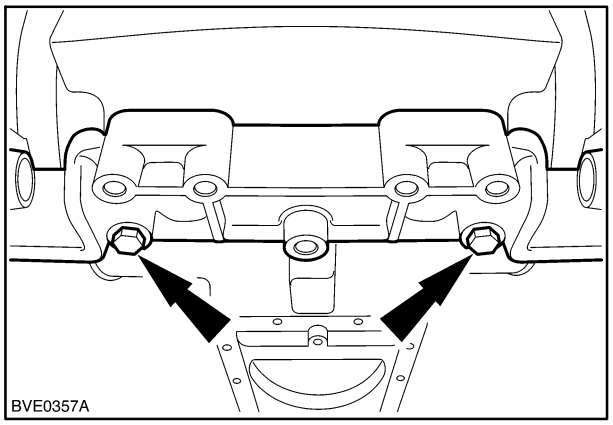
8. Remove the lower link support.



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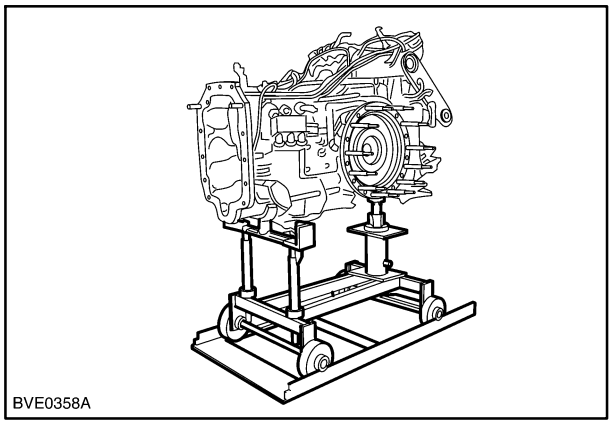
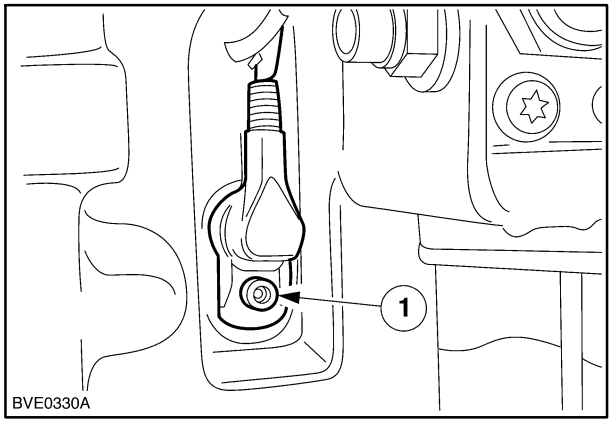
NOTE: *Ensure that the tractor splitting kit support does not obstruct the removal of the four wheel drive hydraulic clutch from underneath the rear axle.*

9. Support the rear axle on the tractor splitting kit special tool **297471** and position the support special tool **380000403** underneath the rear axle center housing.



20

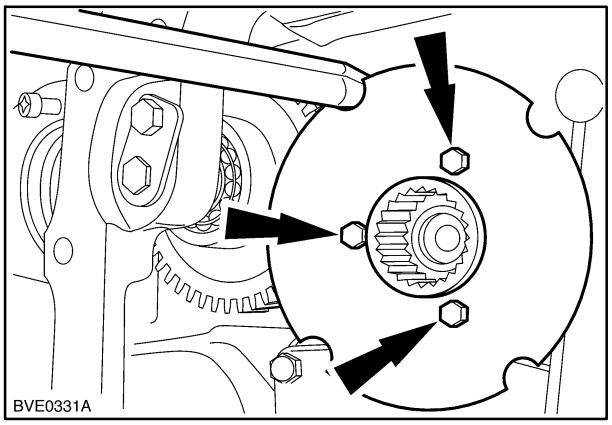
10. Remove the PTO torque sensor (1) (if fitted).



21

NOTE: *Use a suitable bar to hold the PTO torque sensor pick up disc.*

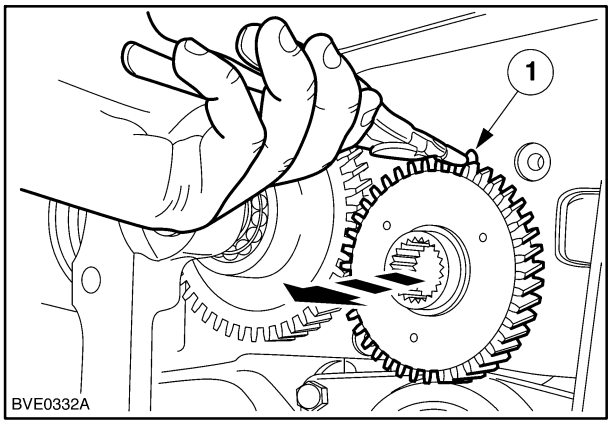
11. Remove the PTO torque sensor pick up disc (if fitted).



22

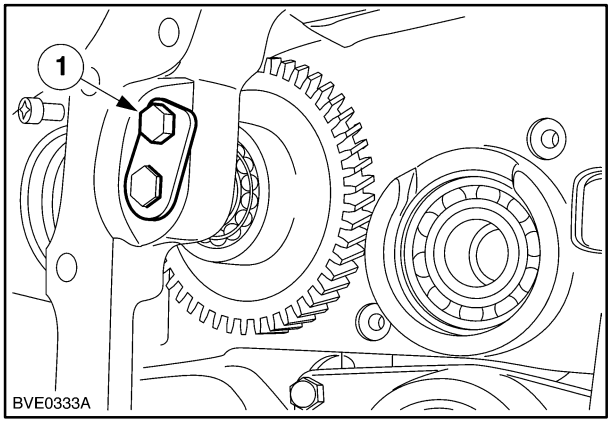
NOTE: *The PTO driveshaft bearing retaining ring must seat fully into the groove of the housing before the PTO driveshaft can be removed.*

12. Release the PTO driveshaft bearing from the housing by expanding the exposed ends of the retaining ring (1) into the groove in the housing and at the same time remove the PTO driveshaft.



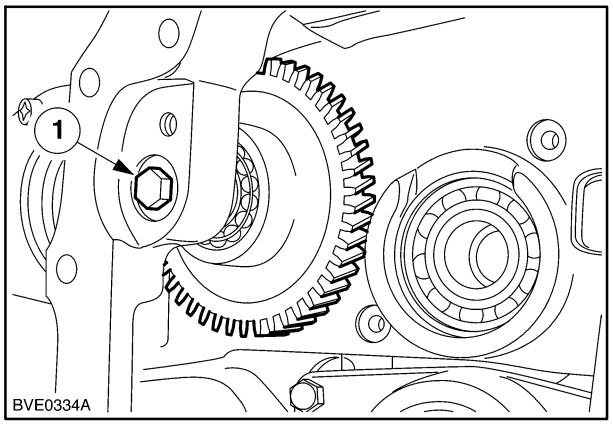
23

13. Remove the hydraulic pump idler gear locking plate (1).



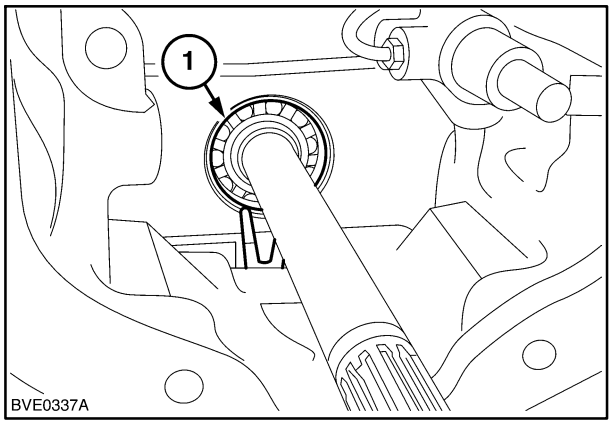
24

14. Remove the hydraulic pump idler gear retaining bolt (1), remove the pin and remove the gear, bearings and the adjustment spacer.



25

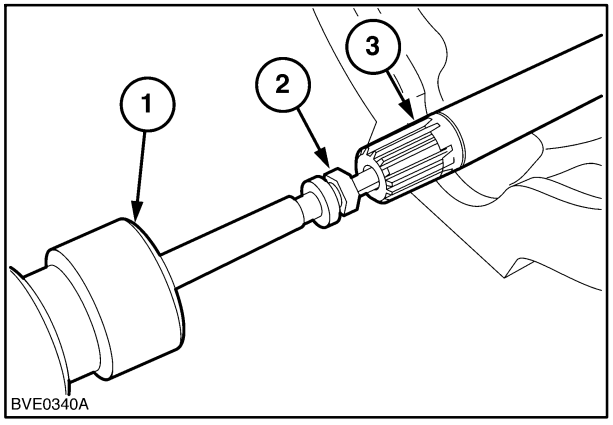
15. Using suitable circlip pliers, remove the four wheel drive clutch driveshaft circlip (1).



26

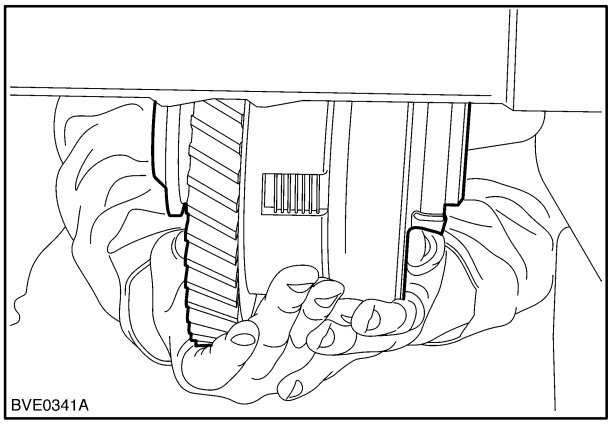
NOTE: *With the aid of another technician, support the four wheel drive clutch assembly.*

16. Using the slide hammer special tool **292927** (1) and the locally fabricated adaptor M8 x 1.25 (2), remove the transfer clutch driveshaft (3).



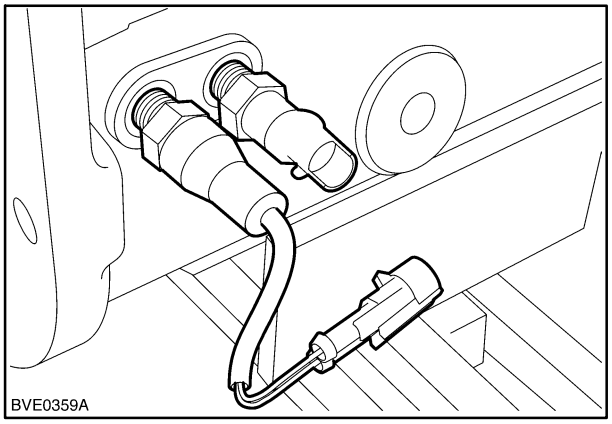
27

17. Remove the four wheel drive clutch assembly from the underneath the rear axle.



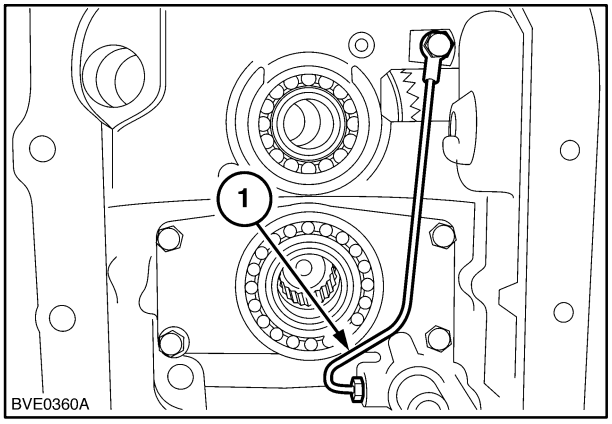
28

18. Remove the creeper status switches and the switch plungers.



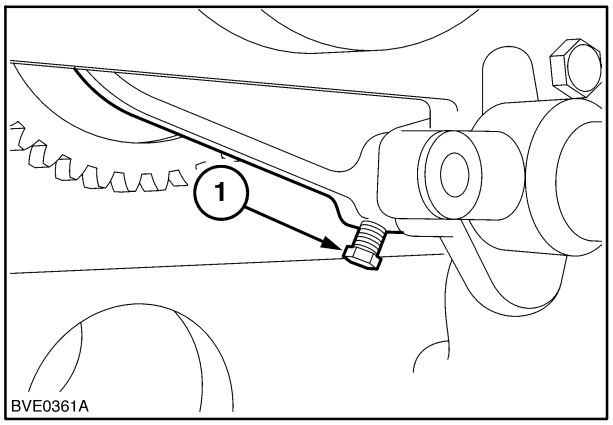
29

19. Remove the creeper oil supply pipe (1).



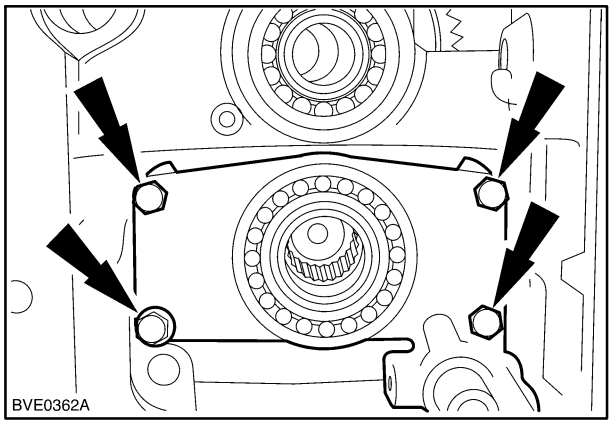
30

20. Remove the creeper gear selector fork retaining bolt (1).



31

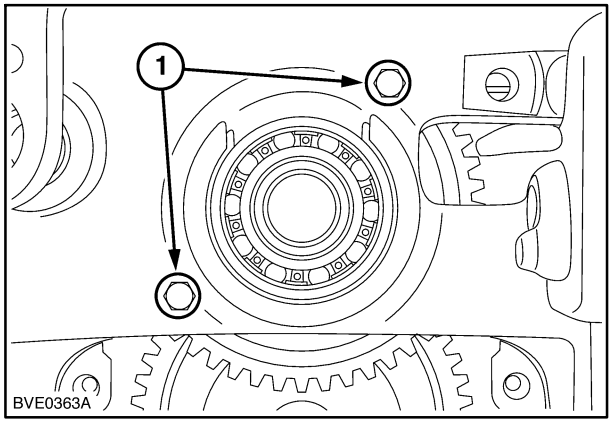
21. Remove the creeper shaft and the bearing support bracket.



32

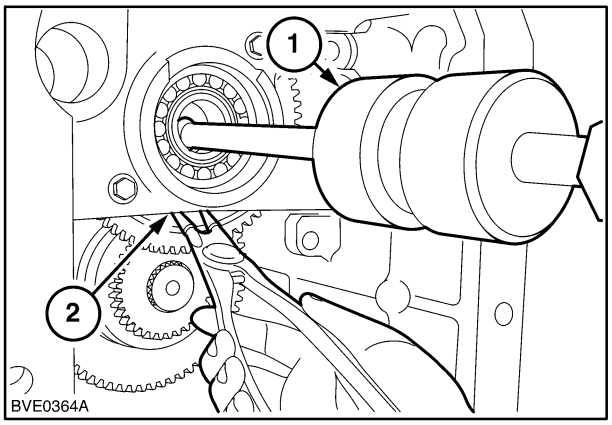
NOTE: *Make sure the creeper gear is in the correct position so the exposed ends of the retaining ring can be seen.*

22. Loosely install two M8 x 1.25 x 50 bolts (1) to support the creeper gear.



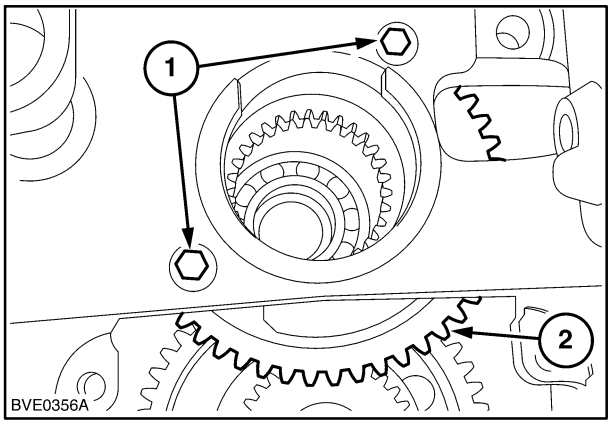
33

23. Using suitable circlip pliers, release the creeper shaft from the casing by expanding the exposed ends of the retaining ring (2) into the groove in the housing and at the same time using a slide hammer special tool **292927** (1) and a locally fabricated adaptor, remove the creeper shaft.



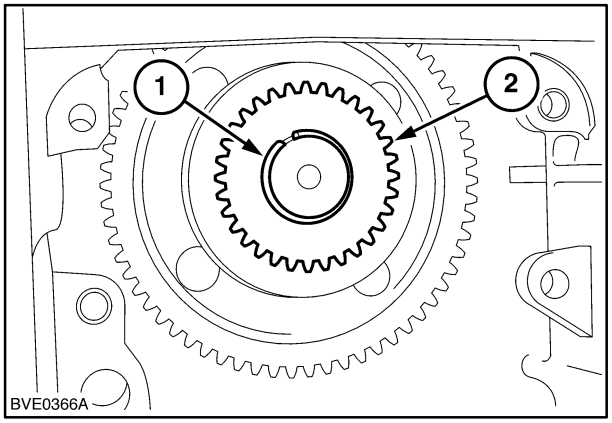
34

24. Remove the creeper gear retaining bolts (1) and remove the creeper gear (2).



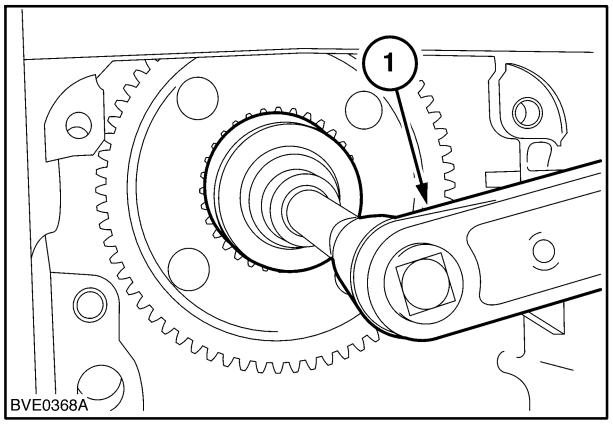
35

25. Using suitable snap ring pliers, remove the snap ring from the pinion shaft (1) and remove the creeper coupler assembly (2) (if fitted).



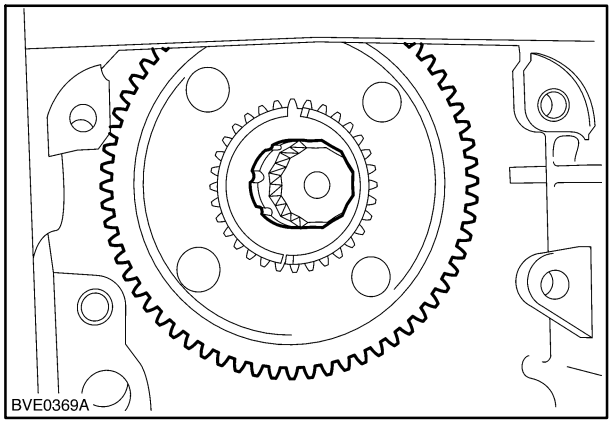
36

26. Using a suitable socket and bar (1), remove the crushed nut.



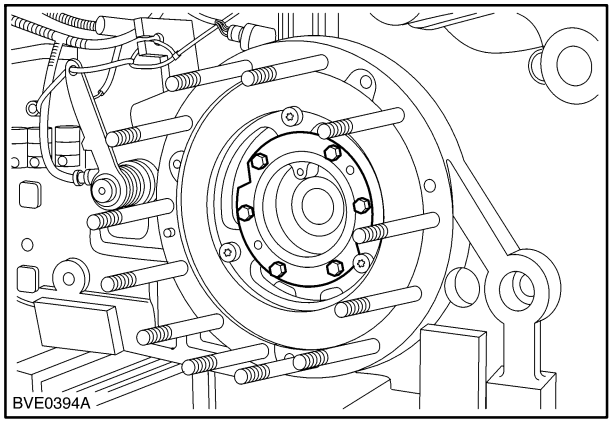
37

27. Remove the creeper gear (if fitted).



38

28. Remove the left hand differential support and the adjustment shims.

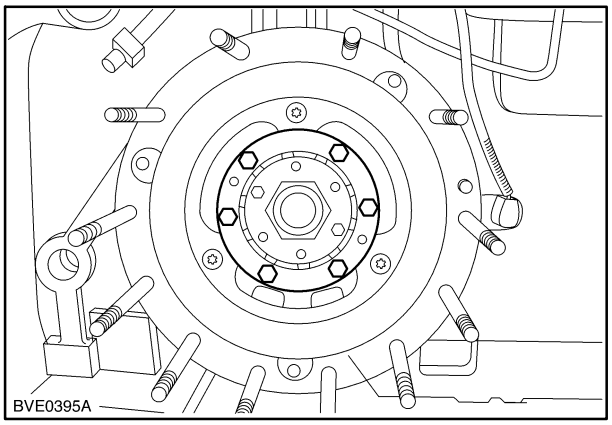


39

⚠ WARNING ⚠

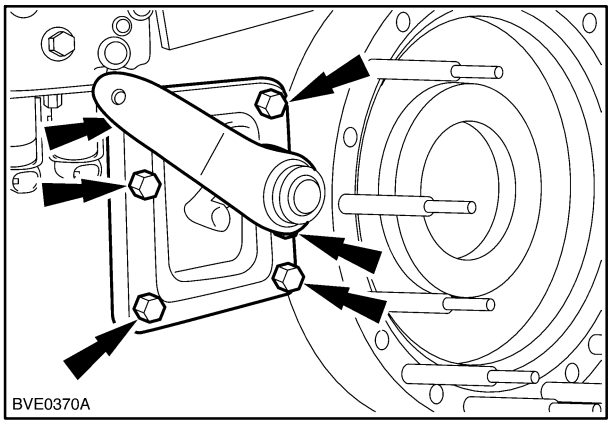
Lift and handle all heavy components using lifting equipment of appropriate capacity.

29. Remove the right hand differential support and remove the differential from the rear axle housing.



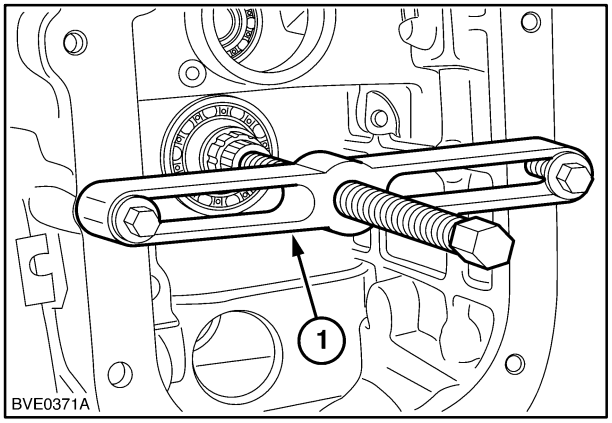
40

30. Remove the parking brake housing.



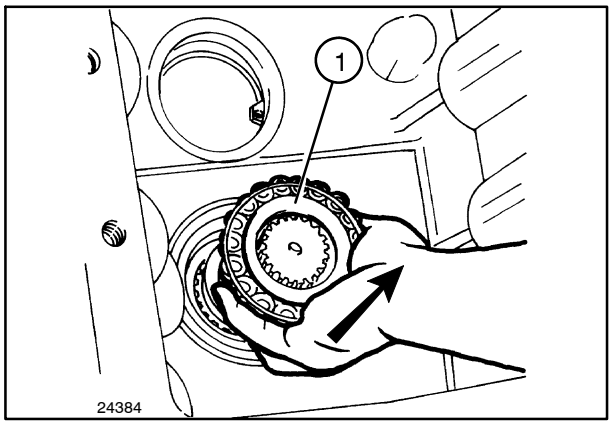
41

31. Using a universal puller (1), partially remove the pinion shaft.



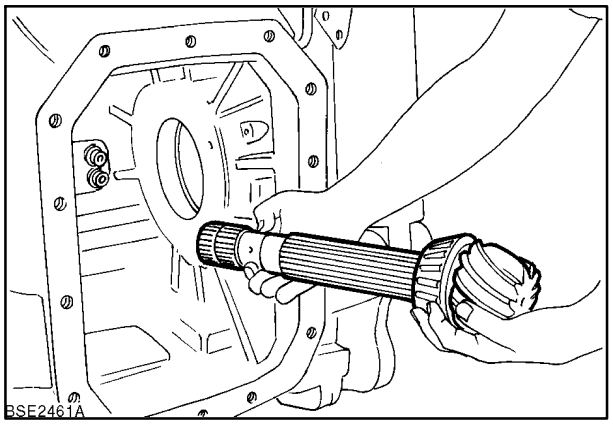
42

32. Remove the universal puller and remove the front bearing (1) from the pinion shaft.



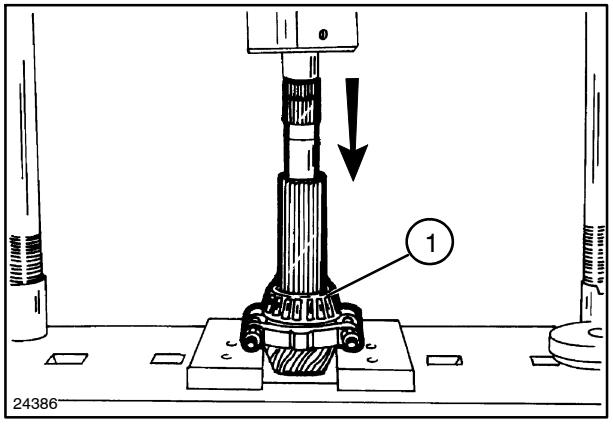
43

33. Remove the pinion shaft and remove the inner parts through the parking brake housing.



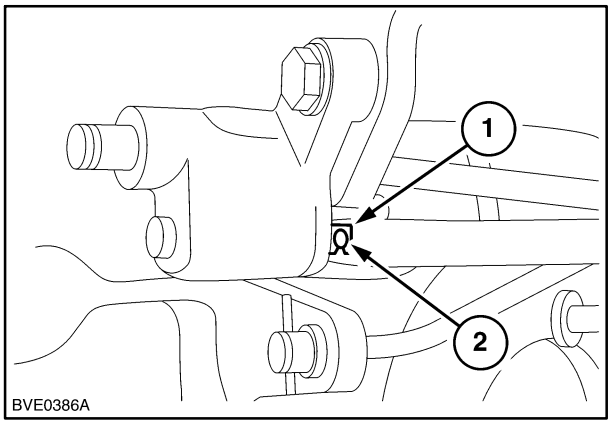
44

34. Remove the bearing (1) from pinion shaft using a hydraulic press.



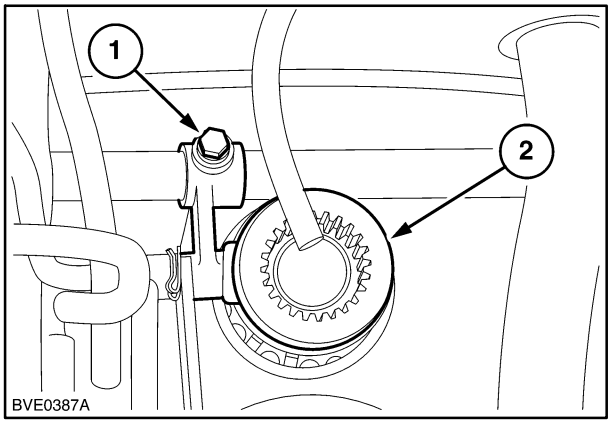
45

35. Remove the retaining clip (1) and remove the pin (2) from the PTO clutch oil supply cut off valve.



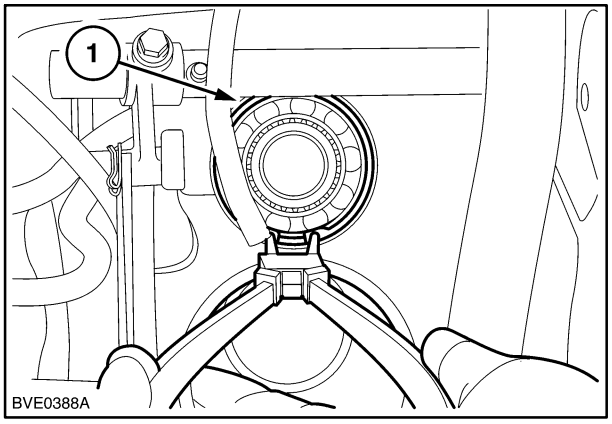
46

36. Remove the PTO ground drive selector fork retaining bolt (1), disengage the PTO ground drive selector fork from the PTO ground drive sliding coupler (2).



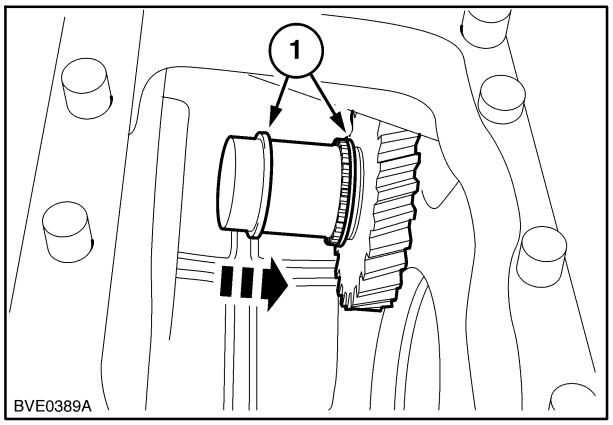
47

37. Using suitable circlip pliers, remove the PTO ground drive shaft circlip (1).



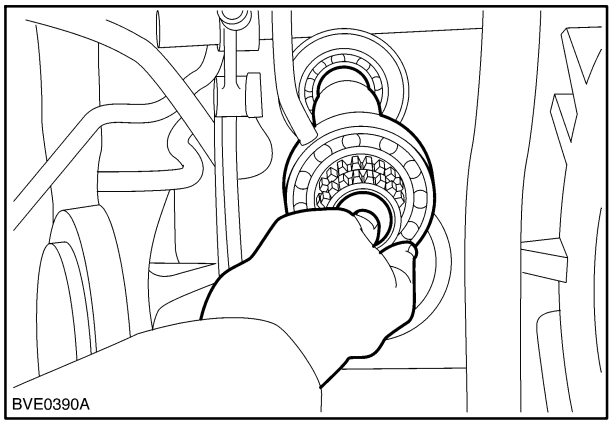
48

38. Partially remove the PTO ground drive shaft and remove the circlips (1).



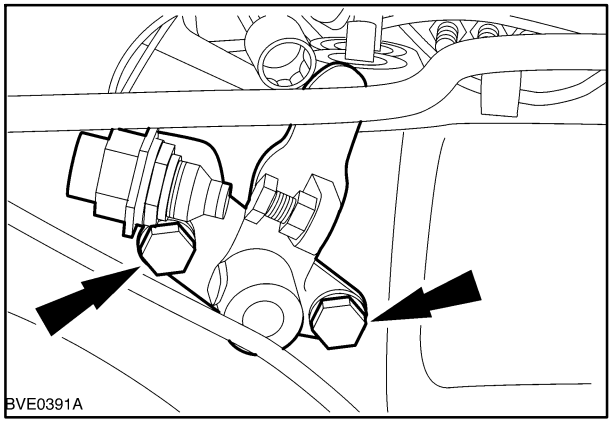
49

39. While supporting the PTO ground drive gear, remove the PTO ground drive shaft.



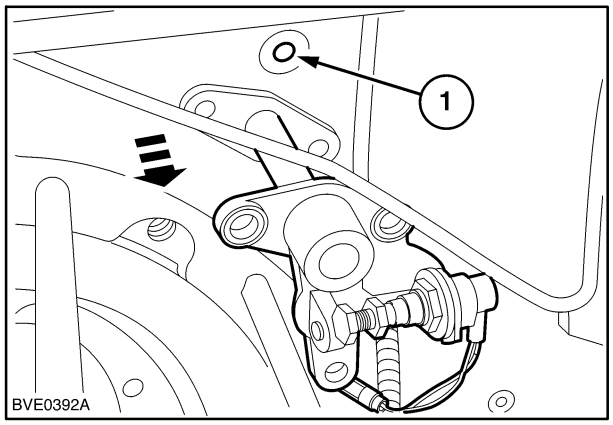
50

40. Remove the PTO ground drive selector shaft retaining bolts.



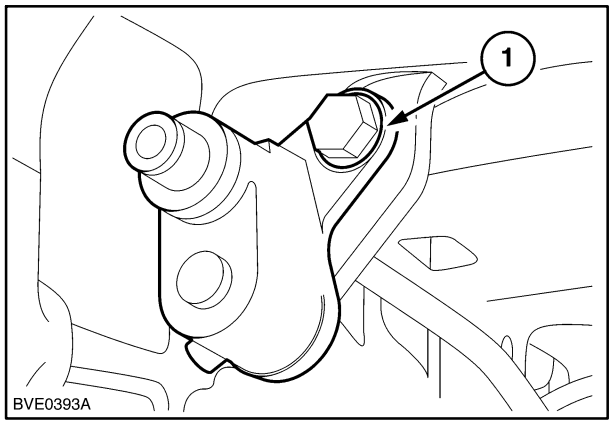
51

41. Remove the PTO ground drive selector shaft and remove the selector fork from the rear axle housing.
42. Remove the detent plunger and spring (1).



52

43. Remove the internal PTO clutch oil supply cut off valve (1).



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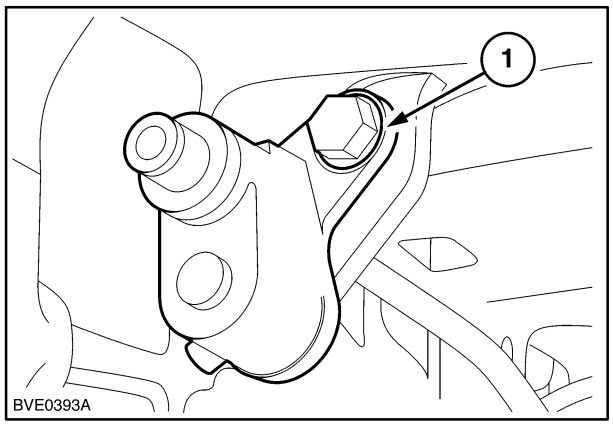
Assembly / Adjustments

⚠ WARNING ⚠

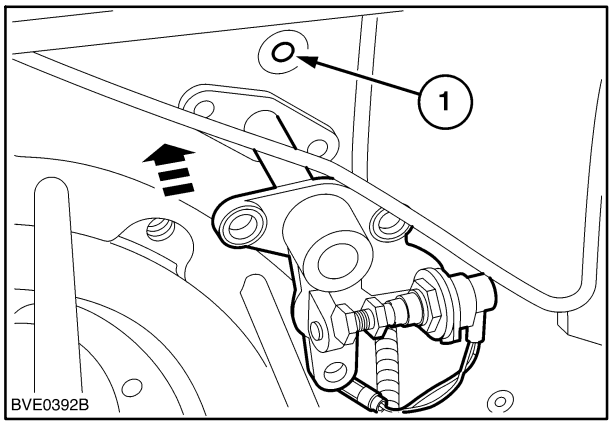
Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the internal PTO clutch oil supply cut off valve (1).



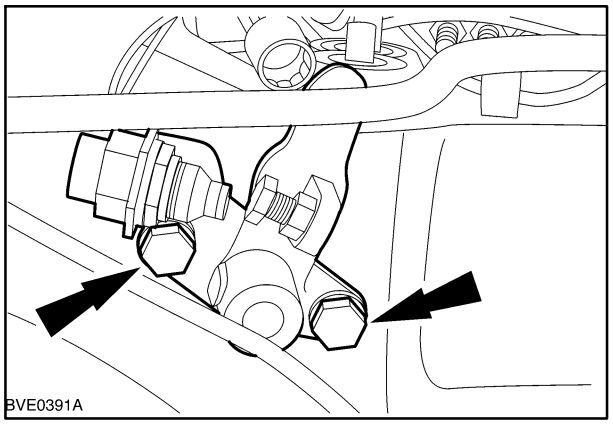
54

2. Install the detent plunger and spring (1).
3. Install the PTO ground drive selector shaft and selector fork into the rear axle housing.



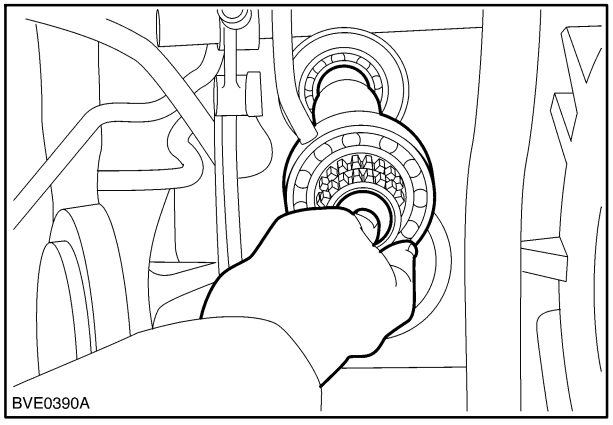
55

4. Install the PTO ground drive selector shaft retaining bolts.



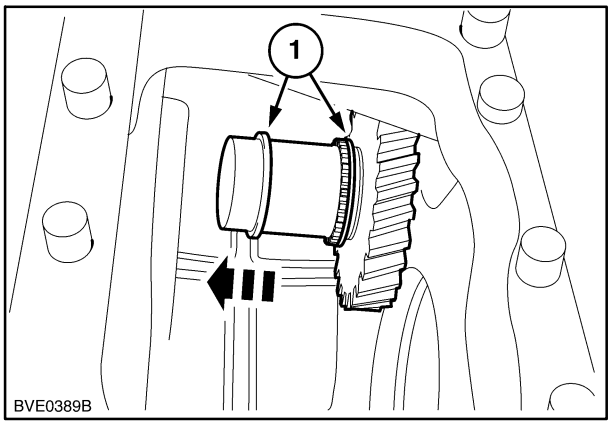
56

5. Install the PTO ground drive, drive shaft and PTO ground drive gear into the rear axle housing.



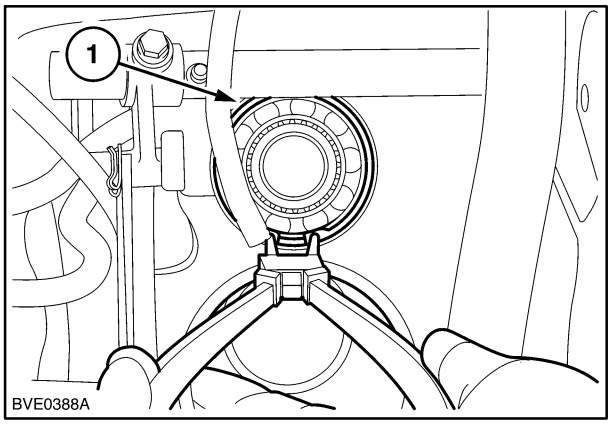
57

6. Install the PTO ground drive gear and install the circlips (1).
7. Install the PTO ground drive shaft.



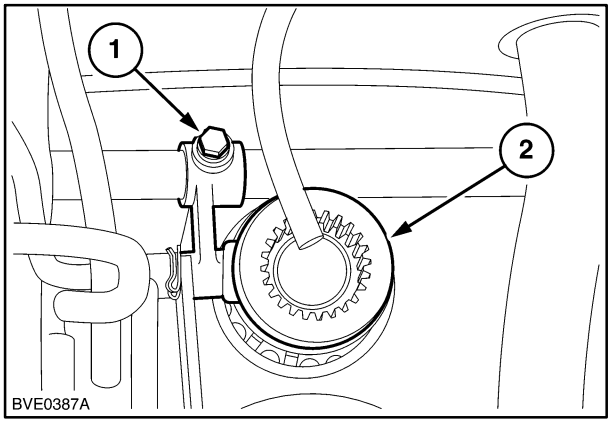
58

8. Using suitable circlip pliers, install the PTO ground drive shaft circlip (1).



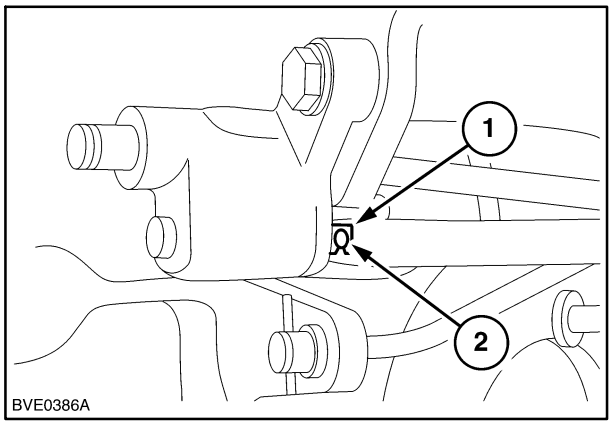
59

9. Engage the PTO ground drive selector fork into the PTO ground drive sliding coupler (2).
10. Install the PTO ground drive selector fork retaining bolt (1).



60

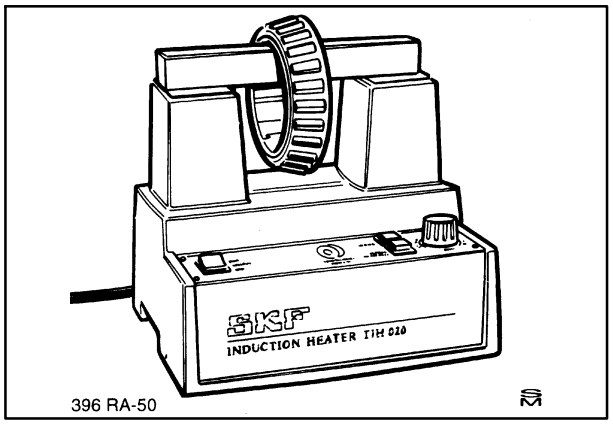
11. Install the pin (1) and install the retaining clip (2) to the PTO clutch oil supply cut off valve.



61

NOTE: *The use of an electronic induction heater will assist in the installation of the bearing without the need for a hydraulic press.*

12. Install the bearing onto the pinion shaft.



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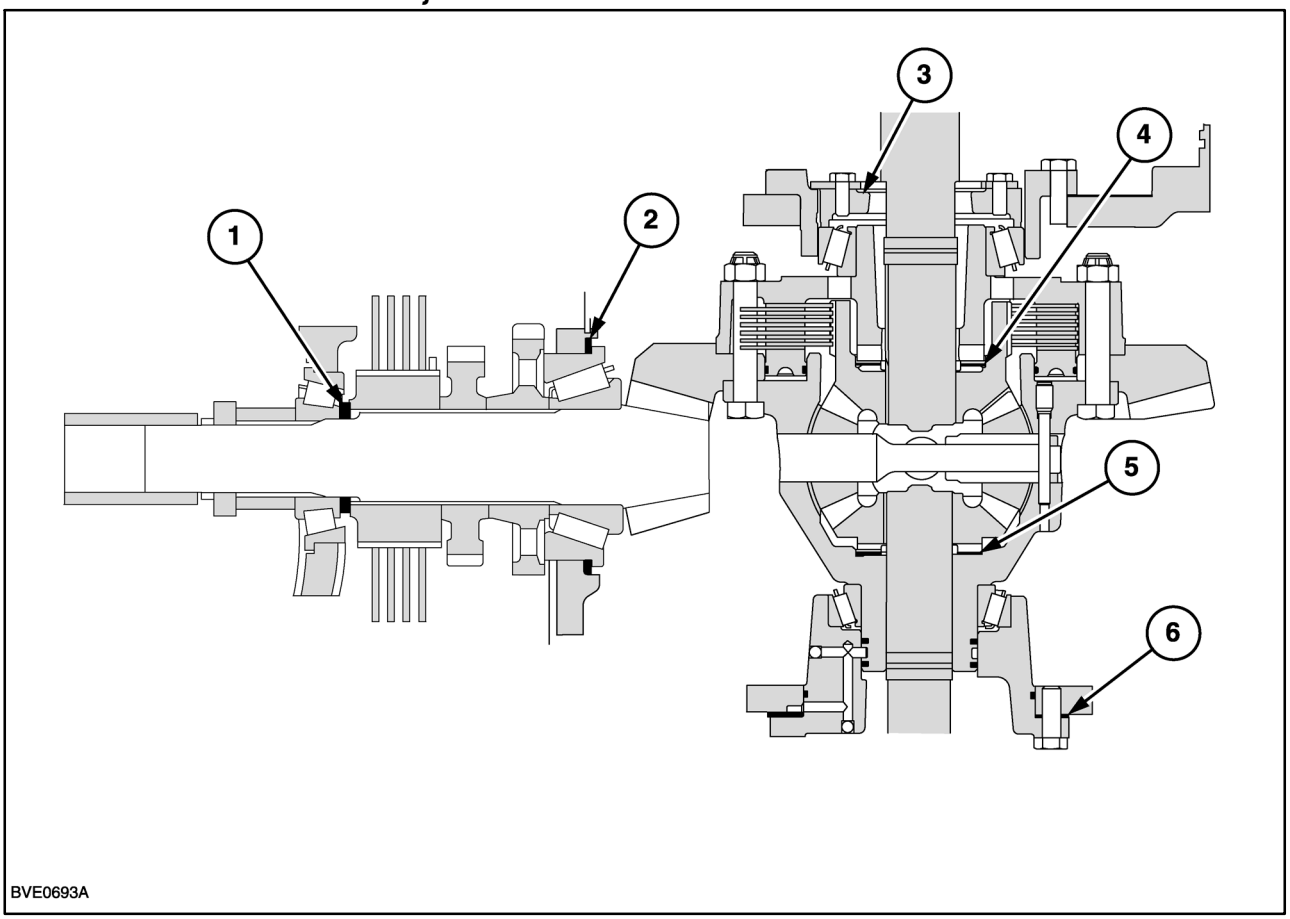
Rear Pinion and Crown Wheel Adjustments



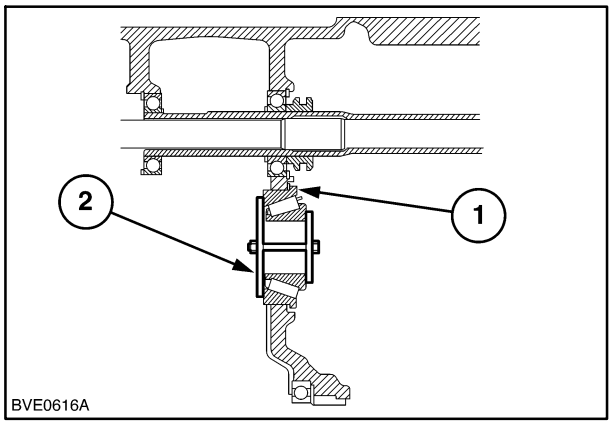
63

1. Pinion shaft bearing pre-load adjustment shim (**Sr**)- Adjusts the pre-load on the pinion shaft bearings and components.
2. Pinion shaft position adjustment shim (**Sp**) – Adjusts the position of the pinion shaft gear relative to the crown wheel.
3. Crown wheel backlash and differential support bearing pre-load adjustment nut – Adjusts the (pre-load) on the differential support bearings.
4. Right hand side differential sun gear adjustment shims – Adjusts the (pre-load) on the differential gear assembly.
5. Left hand side differential sun gear adjustment shims.
6. Crown wheel backlash adjustment shims – Adjusts the radial play (backlash) between the crown wheel and pinion shaft gear.

NOTE: *If ground drive PTO option and/or the 50Kph clutch option are pre-assembled into the rear axle housing, then the rolling torque (**Rp**) measured from the pinion shaft has to be increased by the rotational torque of the option installed.*

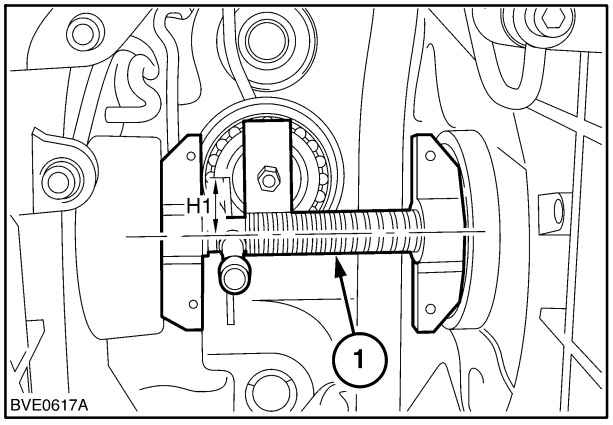
Determining the thickness of the pinion shaft position adjustment shim

13. Install the pinion shaft rear bearing outer cone (1) without the pinion shaft position adjustment shim.
14. Using the locally fabricated pinion shaft position adjustment tool (2), hold the tapper roller bearing into the outer bearing cone (1).



64

15. Install the left and right hand side differential supports into the rear axle housing.
16. Install the special tool **293400** (1) into the differential supports and install the micrometer and the depth rod.
17. Move the depth rod to make contact with the tapper roller bearing and measure the dimension. **This measurement is H1**.
18. Determine the correct nominal dimension (**H2**) between the crown wheel center line and the pinion shaft larger base as follows:



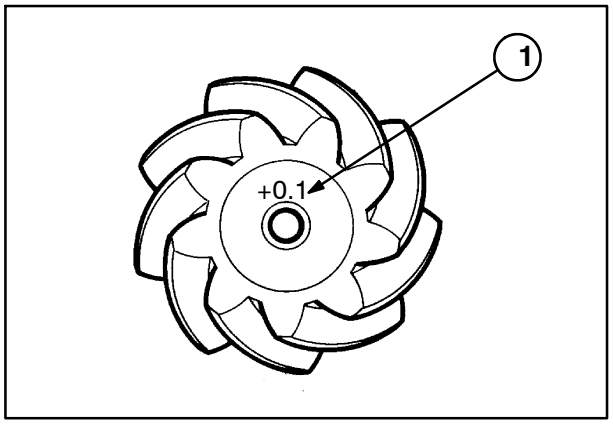
65

H2 = H3 +/- C

Where:

H3 = 180 mm. Nominal manufacturing dimension between the crown wheel center line and the rear face of the pinion shaft gear

C = Manufacturing correction factor (1) stamped on the face of the pinion shaft gear expressed in mm and prefixed by a + or –, to be added or subtracted from the nominal dimension (**H3**)



66

19. Determine the pinion shaft position adjustment shim (**Sp**) as follows:

NOTE: *If required, increase (**Sp**) to the nearest available shim size.*

Sp = H1 - H2

Where:

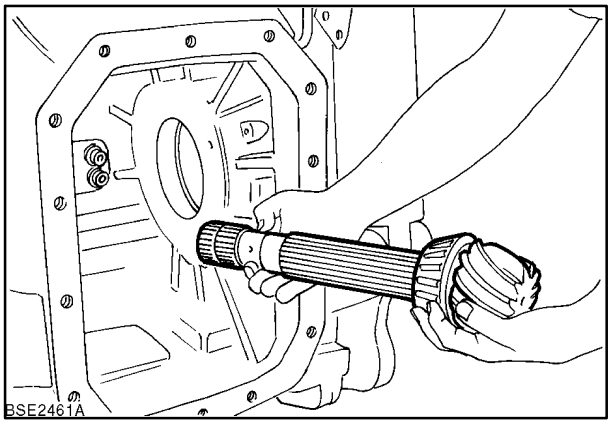
H1 = Depth gauge reading

H2 = Correct nominal dimension between the crown wheel center line and the rear face of the pinion shaft gear

Example

- Depth gauge reading: **H1** = 181.85 mm
- Nominal dimension between the crown wheel center line and the rear face of the pinion shaft gear: **H3** = 180 mm
- Correction factor: **C** = -0.18 mm
- Correct nominal dimension: **H2** = 180 - 0.18 = 179.82 mm
- Shim thickness: **Sp** = 181.85 - 179.82 = 2.03 mm

20. Remove the special tool **293400** and the locally fabricated pinion shaft position adjustment tool from the rear axle housing.
21. Remove the left and right hand side differential supports from the rear axle housing.
22. Install the pinion shaft rear bearing outer cone with the newly calculated position adjustment shim.
23. Position the inner parts through the parking brake compartment and install the pinion shaft.



67

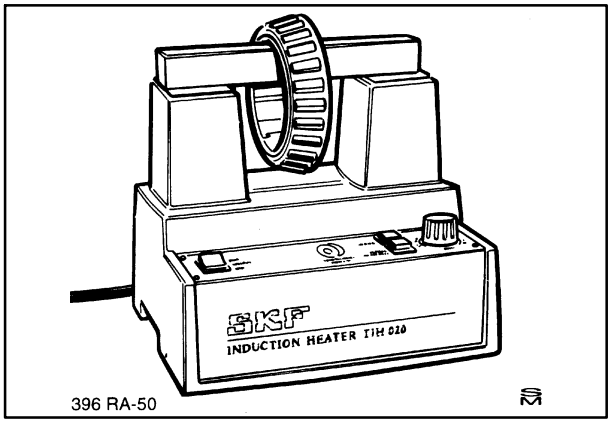
Determining the thickness of the pinion shaft bearings pre-load adjustment shim

NOTE: *Install a temporary pinion shaft bearings pre-load adjustment test shim(s) (item 1, figure 63) to determine the required pinion shaft bearings pre-load adjustment shim thickness.*

24. Measure the thickness of the test shim(s) to be installed. **This measurement is St**.

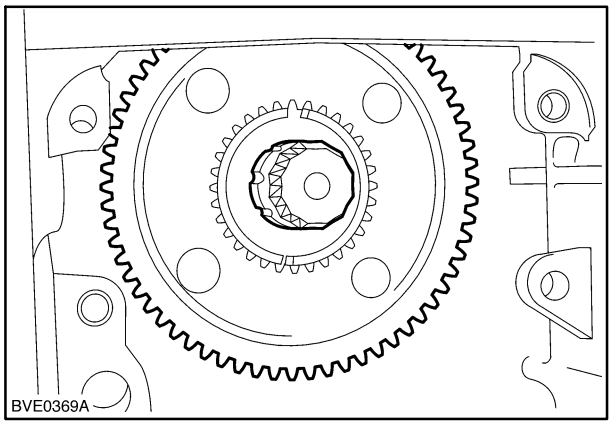
NOTE: *The use of an electronic induction heater will assist in the installation of the bearing without the need for a hydraulic press.*

25. Install the front bearing to the pinion shaft.



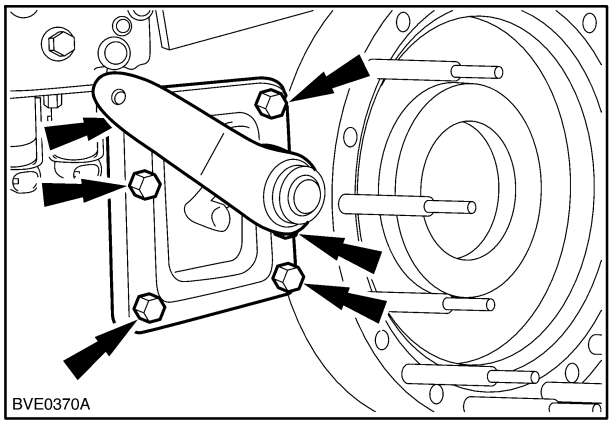
68

26. Install the creeper gear (if fitted).



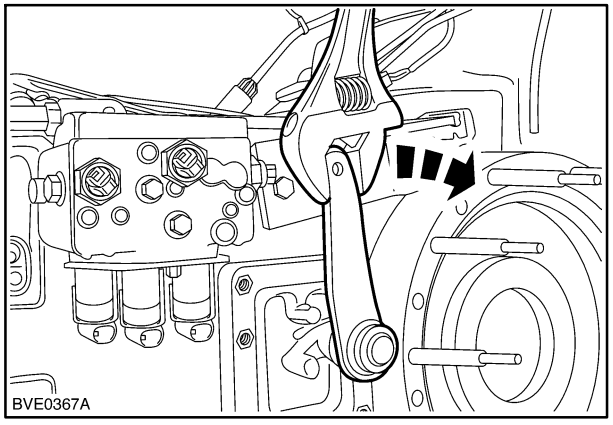
69

27. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2 mm in diameter to the rear axle housing, (refer to page 17, figure 13).
28. Install the parking brake housing.



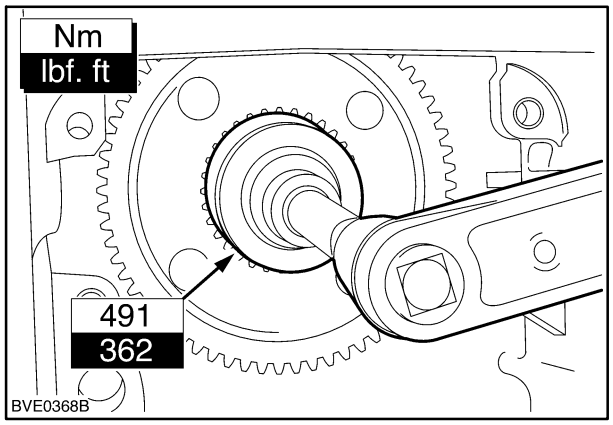
70

29. Using a suitable adjustable spanner, apply and hold the parking brake.



71

30. Install the pinion shaft retaining nut and tighten to the specified torque value.



72

31. Using a suitable dial gauge (1) and a suitable lever (2), measure the pinion shaft assembly end-float. **This measurement is H4**.

32. Determine the pinion shaft pre-load bearing adjustment shim (**Sr**) as follows:

NOTE: *If required, decrease (**Sr**) to the nearest available shim size.*

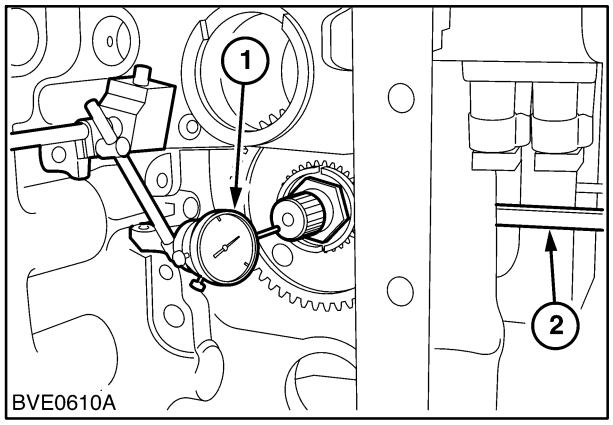
Sr = (St – H4) – 0.20 mm

Where:

St = Thickness of the test shim installed to obtain end-float in the pinion shaft assembly.

H4 = End-float measurement of the pinion shaft assembly

0.20 mm = Decrease necessary to achieve the required bearing pre-load



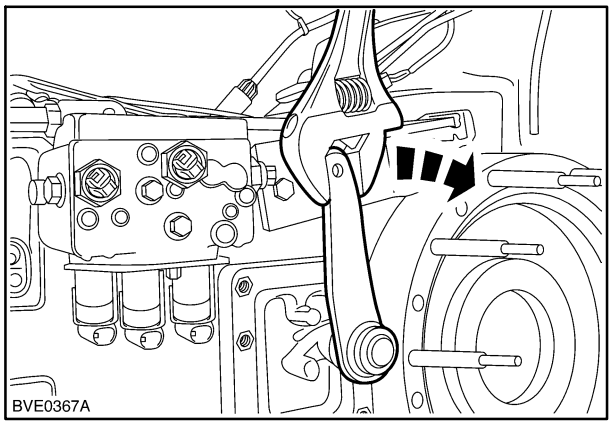
73

Example

- Thickness of the test shim: **St** = 7.8 mm
- End-float measurement: **H4** = 2.03 mm
- Decrease necessary to achieve the required bearing pre-load = 0.20 mm
- Shim thickness: **Sr** = (7.8 – 2.03) – 0.20 = 5.6 mm

33. Remove the test shim and install the calculated pinion shaft bearings pre-load shim.

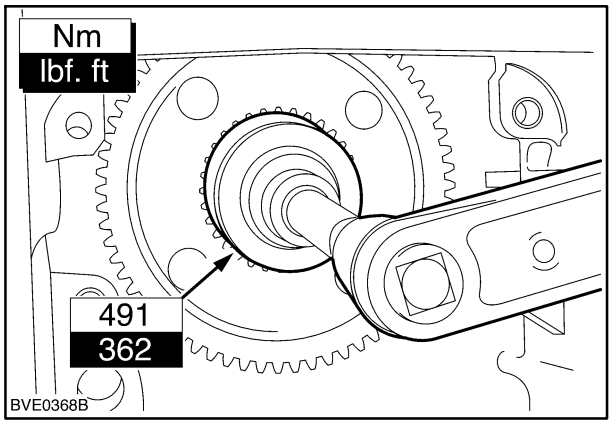
34. Using a suitable adjustable spanner, apply and hold the parking brake.



74

NOTE: *Rotate the pinion shaft while tightening the pinion shaft retaining nut to seat the bearing rollers.*

35. Install the pinion shaft retaining nut and tighten to the specified torque value.



75

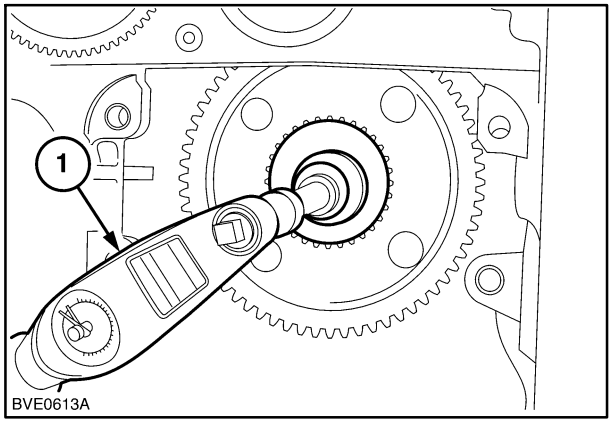
NOTE: *If ground drive PTO option and/or the 50Kph clutch option are pre-assembled into the rear axle housing, then the rolling toque (**Rp**) measured from the pinion shaft has to be increased by the rotational torque of the option installed.*

36. Using a suitable low value torque wrench (1), check the rotational torque of the pinion shaft assembly. **This measurement is Rp**.

    The rotational torque should be 1.0 to 2.0 Nm (9 to 18 lbf. in) excluding breakaway torque.

37. If the values recorded during the adjustment procedure are outside the specification. Adjust the thickness of the pinion shaft adjustment shim and re-check.

38. Secure the pinion shaft retaining nut in four places.



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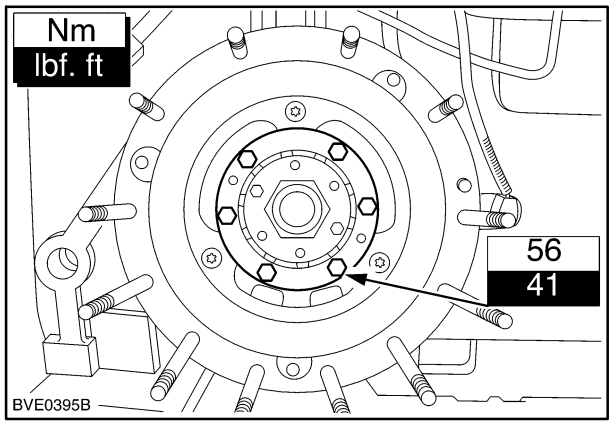
⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

39. Install the differential into the rear axle housing.
40. Install the right hand differential support. Tighten the retaining bolts to the specified torque value.



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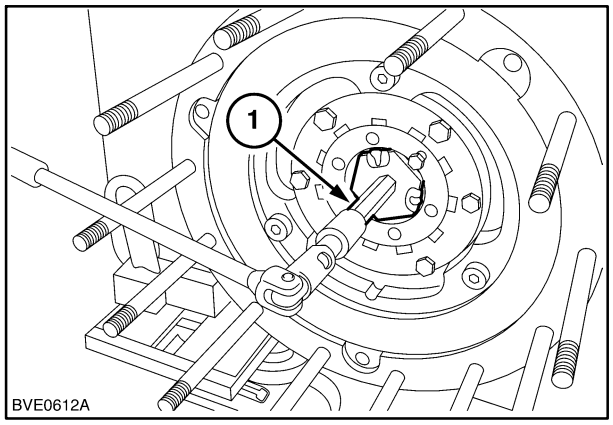
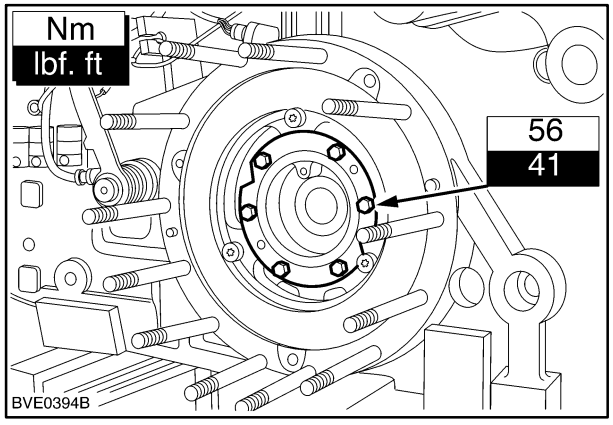
Determining the thickness of the crown wheel backlash and differential support bearing adjustment shims.

41. Using Special tool No. 380001114 (crown wheel backlash and differential support bearing adjustment tool) (1), loosen the adjustment nut.



78

42. Install the left hand differential support with a 0.7 mm test shim (**A**). Tighten the retaining bolts to the specified torque value.



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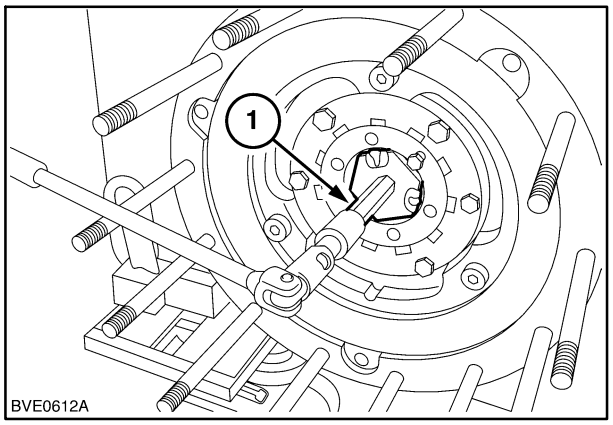
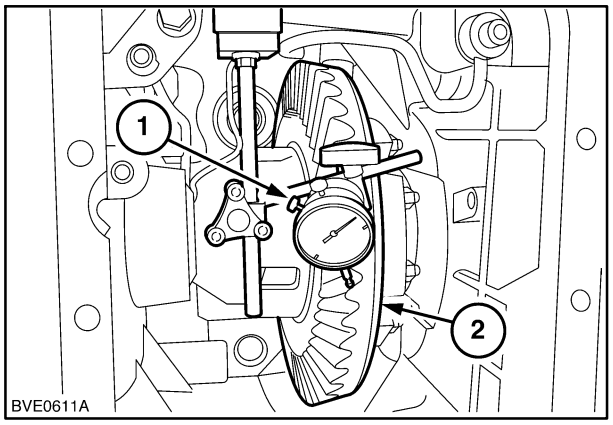
NOTE: *Only tighten the adjustment nut until the bearing free play is removed.*

43. Using Special tool No. 380001114 (crown wheel backlash and differential support bearing adjustment tool) (1), tighten the adjustment nut.



80

44. Using a suitable dial gauge (1), measure the radial movement (backlash) between the pinion and crown wheel perpendicular to the outer edge of a tooth on the crown wheel (2).
45. Repeat the measurement in two further positions 120° apart and calculate the average of the three values. **This measurement is Gm**.



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46. Refer to table A below for the relationship between the measured average radial movement (backlash) (**Gm**) and the thickness of the adjustment shim(s) to be added to the test shim (**A**).

NOTE: *If required, decrease (**A**) to the nearest available shim size.*

Table A	
Ratio 9/47	
Measured average radial movement (backlash) (Gm)	**Adjustment shim to be added to the test shim (A)**
mm	**mm**
0.05	–0.25
0.10	–0.19
0.15	–0.12
0.20	–0.05
0.25	0.01
0.30	0.08
0.35	0.15
0.40	0.21
0.45	0.28
0.50	0.35
0.55	0.41
0.60	0.48
0.65	0.55
0.70	0.61
0.75	0.68
0.80	0.74
0.85	0.81
0.90	0.88
0.95	0.95
1.00	1.01

Example

- Thickness of the test shim: **A** = 0.7 mm
- Average measured radial movement (backlash): **Gm** = 0.94 mm
- Required average radial movement (backlash) = 0.24 mm

NOTE: *If required, decrease (**Gm**) to the nearest measured average radial* movement *(backlash).*

- Shim thickness to be added to the 0.7 mm shim using table A = **0.88 mm**

NOTE: *The adjustment shim to be added to the test shim in table A is calculated using the following formula:*

$$Z = (Gm - 0.24) \times 1.33$$

NOTE: *If required, decrease (**Z**) to the nearest available calculated axial displacement (backlash) reading.*

Where:

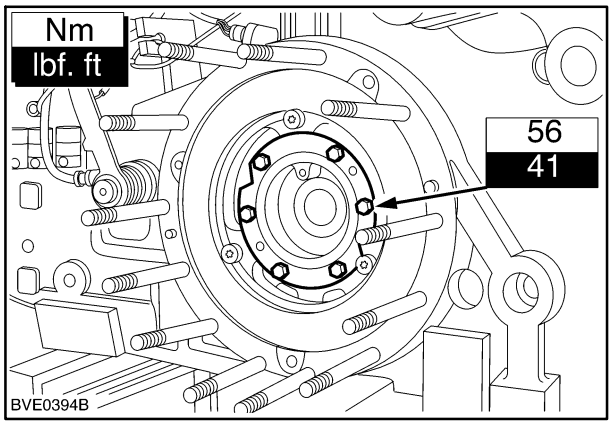
Z = *The adjustment shim to be added to the test shim*

0.24 = required average radial play (backlash)

1.33 = Ratio between the radial movement (backlash) and the horizontal movement of the differential assembly

NOTE: *Apply liquid gasket to the first adjustment shim before installing the calculated adjustment shim(s).*

47. Install the calculated adjustment shim(s) to be added to the test shim (**A**). Tighten the retaining bolts to the specified torque value.



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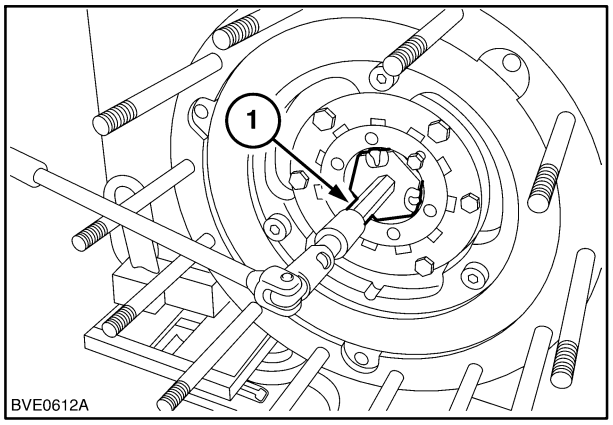
NOTE: *Rotate the differential assembly while tightening the adjustment nut to seat the bearing rollers on their track.*

48. Using Special Tool No. 380001114 (crown wheel backlash and differential support bearing adjustment tool), (1), tighten the adjustment nut while checking the rolling torque at the pinion shaft.



83

NOTE: *If ground drive PTO option and/or the 50Kph clutch option are pre-assembled into the rear axle housing, then the rolling toque (**Rp**) measured from the pinion shaft has to be increased by the rotational torque of the option installed.*

49. Using a suitable low value torque wrench (1), check the total rotational torque of the pinion shaft and the differential assembly. **This measurement is R tot**.

    The total rotational torque should be within the following range excluding breakaway torque:

    R tot = Rp + (0.29 to 0.78 Nm)

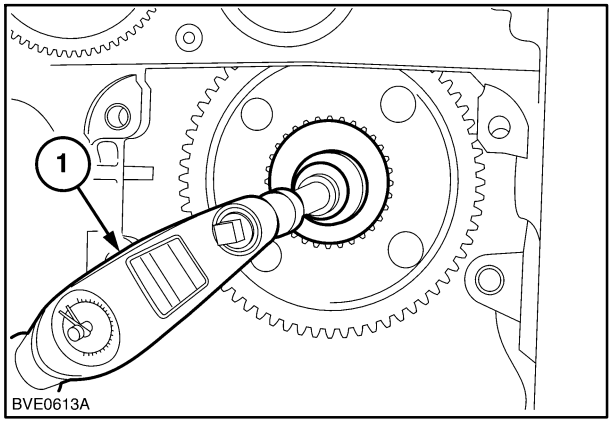
    R tot = Rp + (2.5 to 6.9 lbf. in)

    Where:

    Rp = Rotational torque of the pinion shaft assembly only.

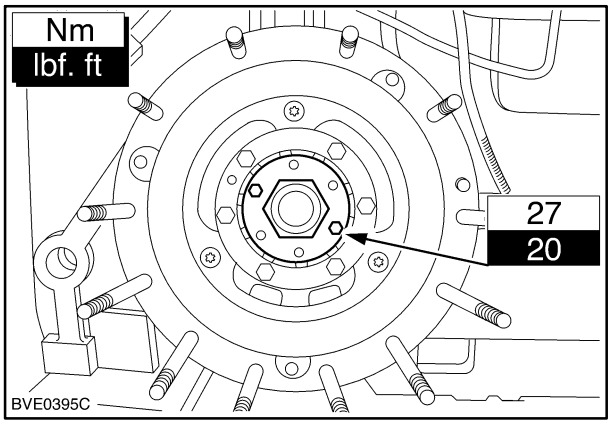
Example

- Rotational torque of the pinion shaft assembly only: **Rp =** 1.2 Nm
- Total rotational torque: **R tot** = 1.7 Nm
- The differential assembly only rotational torque = 1.7 – 1.2 = 0.5 Nm



84

50. Lock the adjustment nut in position with the locking ring and tighten the retaining bolts to the specified torque value.

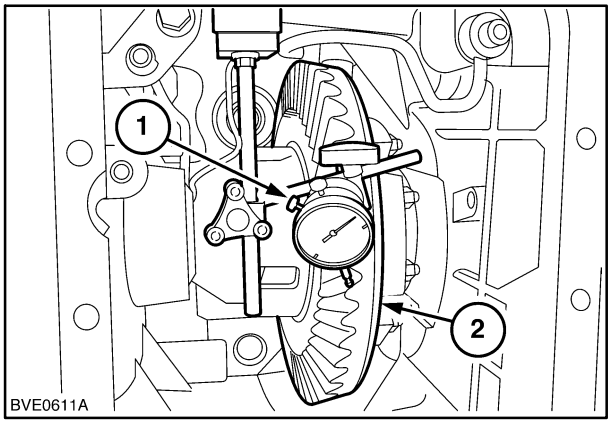


85

51. Using a suitable dial gauge (1), measure the radial movement (backlash) between the pinion and crown wheel perpendicular to the outer edge of a tooth on the crown wheel (2).
52. Repeat the measurement in two further positions 120° apart and calculate the average of the three values. **This measurement is Gm**.

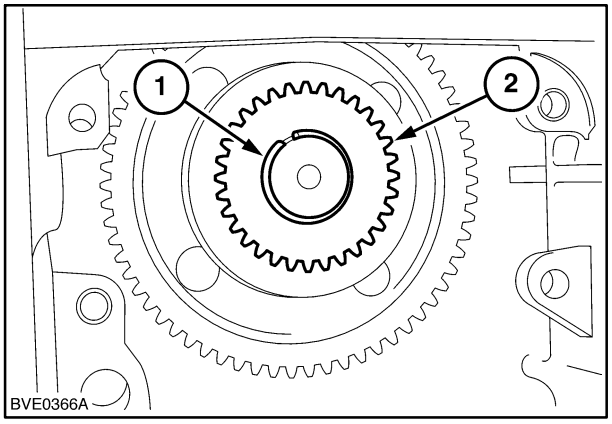
Gm = 0.20 to 0.30 mm

53. If the values recorded during the adjustment procedure are outside the specification, adjust the thickness of the crown wheel backlash adjustment shims and re-check.



86

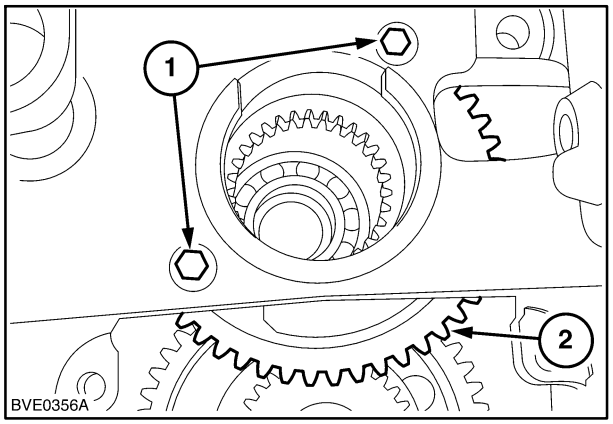
54. Install the creeper coupler assembly (2) and install the snap ring to the pinion shaft (1) (if fitted).



87

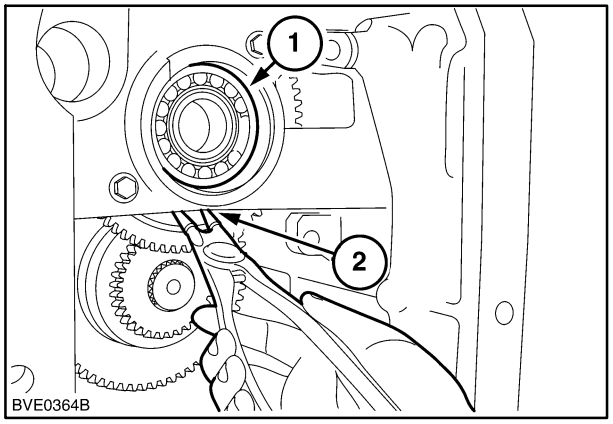
NOTE: *Make sure the creeper gear is in the correct position so the exposed ends of the retaining ring can be seen.*

55. Position the creeper gear (2). Loosely install two M8 x 1.25 x 50 bolts (1) to support the creeper gear (2).



88

56. Using suitable circlip pliers, install the creeper shaft into the housing by expanding the exposed ends of the retaining ring (2) into the groove in the housing and at the same time install the creeper shaft.



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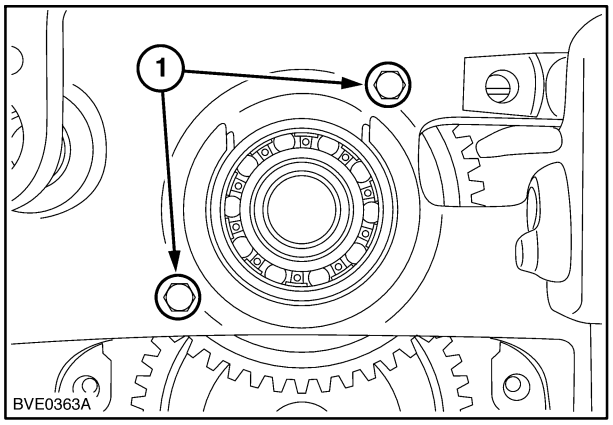
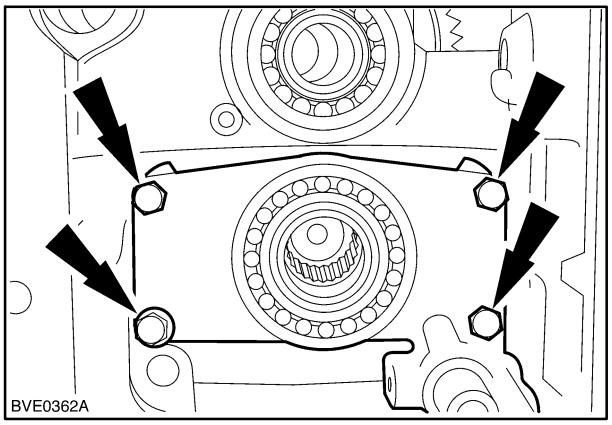
57. Remove the creeper gear support bolts.



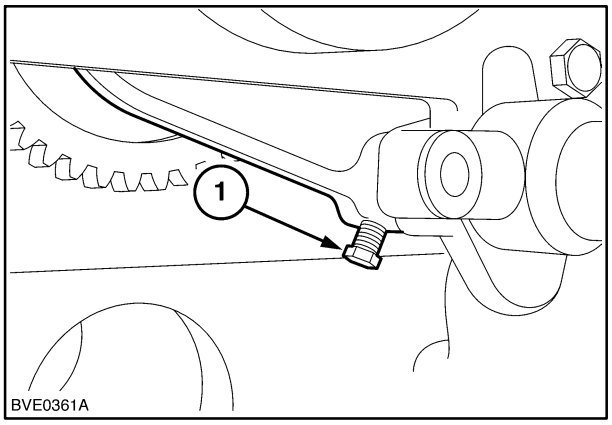
90

58. Install the creeper shaft and bearing support bracket.



91

59. Install the creeper gear selector fork retaining bolt (1).



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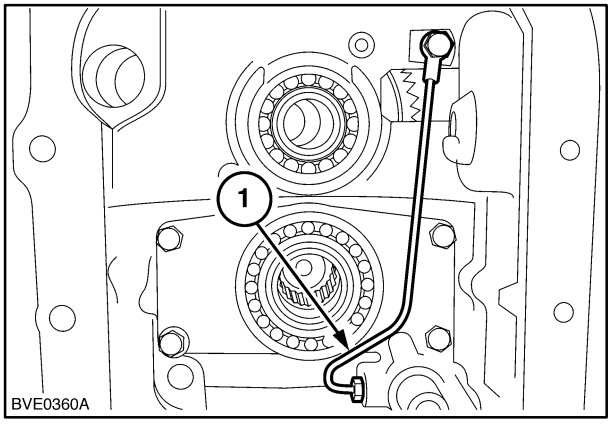
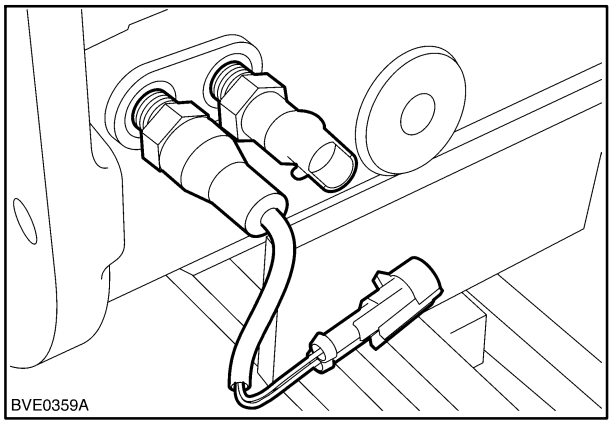
60. Install the creeper oil supply pipe (1).



93

61. Install the switch plungers and the creeper status switches.



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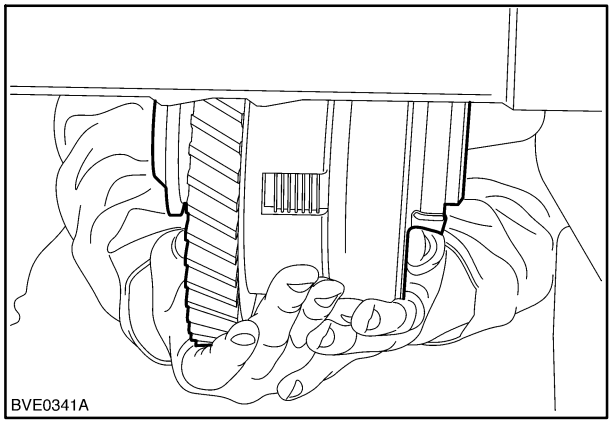
62. With the aid of another technician, install the clutch assembly into the rear axle housing and support.



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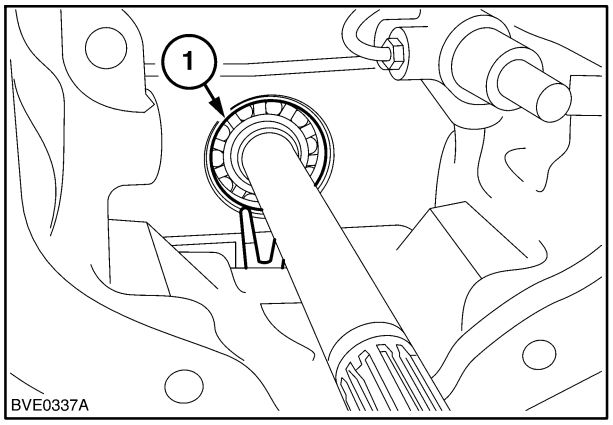
63. Using suitable circlip pliers, install the four wheel drive clutch driveshaft and circlip (1).



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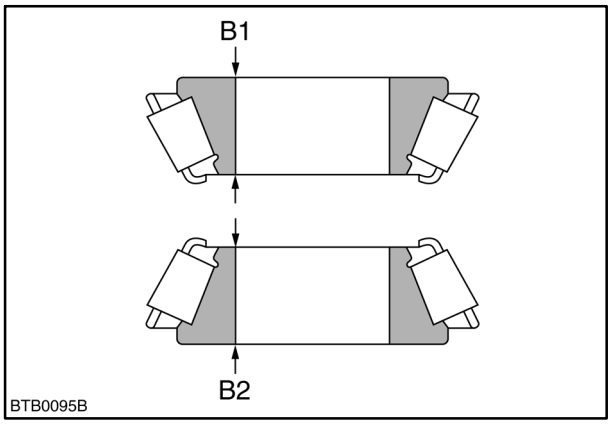
Hydraulic Pump Idler Gear Bearing Adjustment

NOTE: *If new hydraulic pump idler gear or bearings are installed this adjustment must be carried out.*

64. When installing new bearings it will be necessary to calculate the thickness of the spacer (4), (refer to page 50, figure 99) to obtain the correct bearing pre-load. The spacer is available in various thickness of 11.80-12.60 mm in steps of 0.025 mm.
65. Measure the thickness of each bearing and record the measurement as (**B1**) and (**B2**).



97

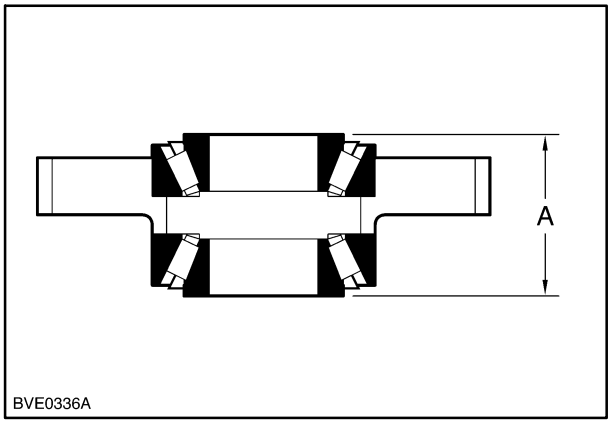
66. Install the bearings into the idler gear and measure dimension (**A**).
67. Calculate thickness of spacer as follows.
    Shim Thickness = A-(B1+B2)-0.15 mm

Example:

B1 = 19.47 mm
B2 = 19.47 mm
A = 55.88 mm

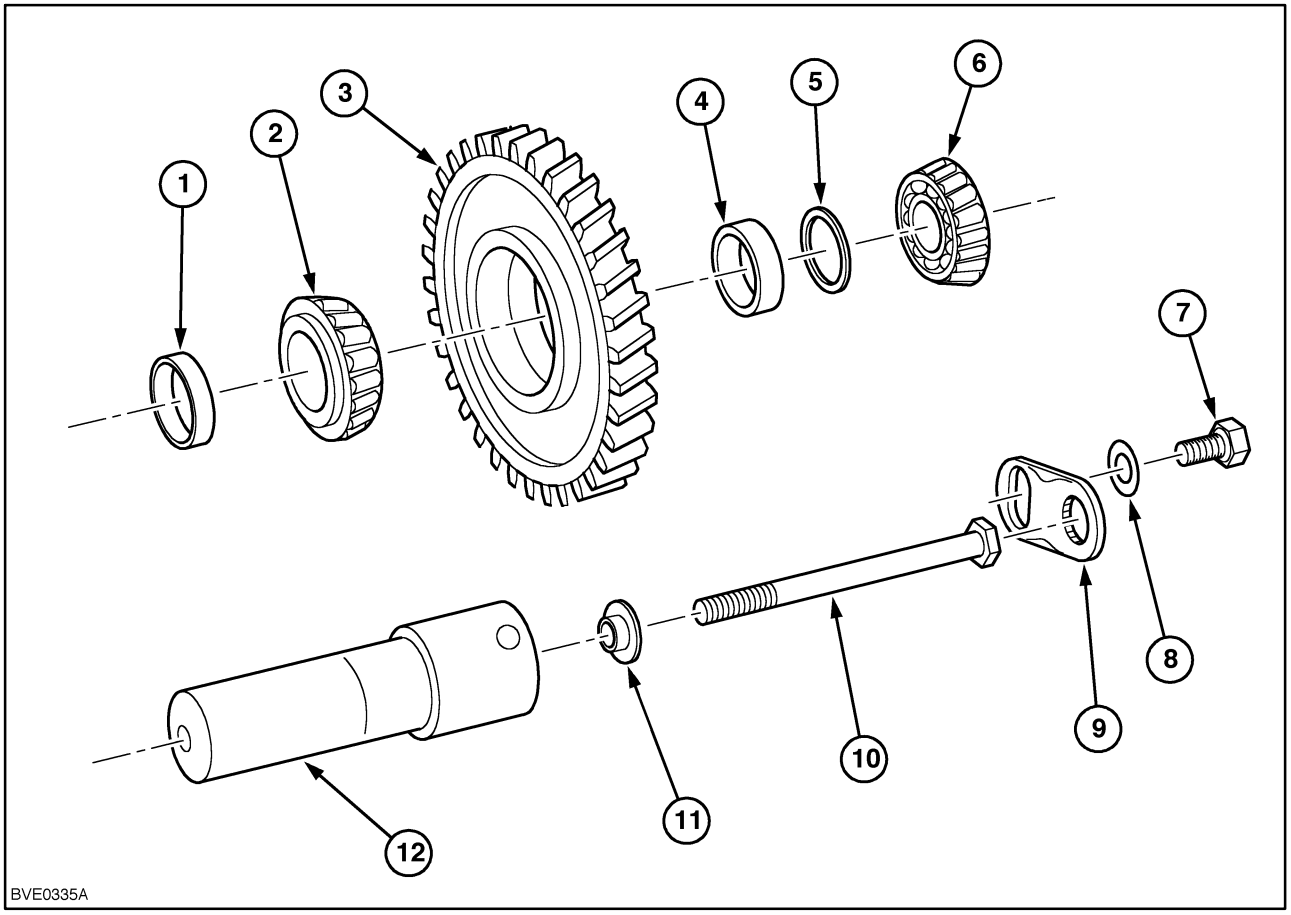
Spacer Thickness

= 55.88-(19.47+19.47)-0.15
= 44.45-31.9-0.15
=16.79 mm



98

68. Install the hydraulic pump idler gear assembly with the calculated spacer.



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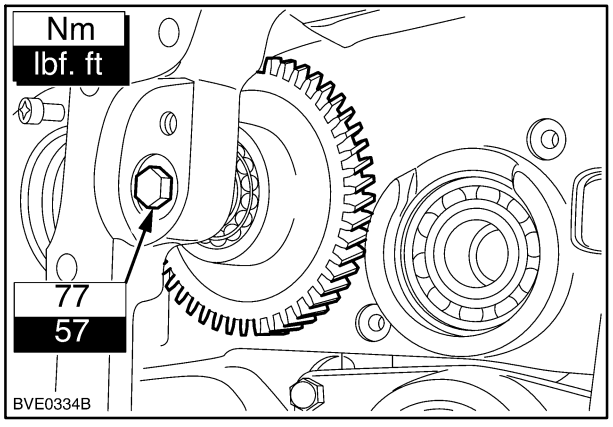
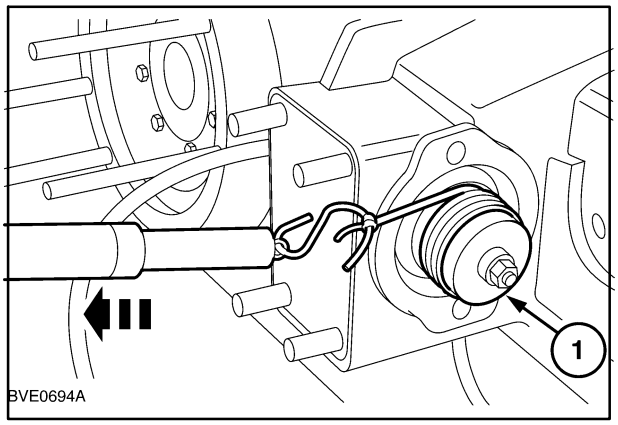
1. Spacer
2. Taper roller bearing
3. Hydraulic pump idler gear
4. Spacer
5. Shim
6. Taper roller bearing
7. Locking tab retaining bolt
8. Washer
9. Locking tab
10. Hydraulic pump idler gear shaft retaining bolt
11. Washer
12. Hydraulic pump idler gear shaft

69. Install the hydraulic pump idler gear retaining bolt and tighten to the specified torque value.



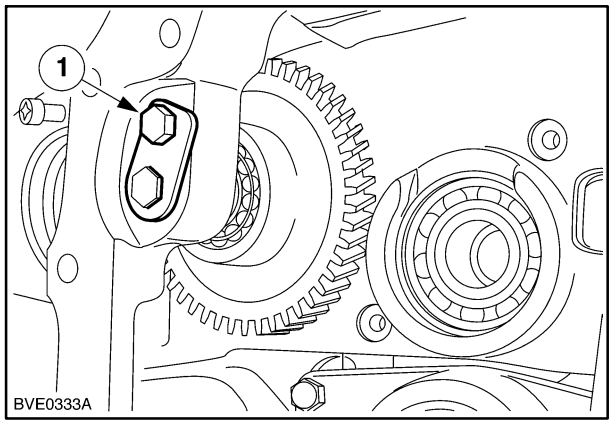
100

70. Install the locally fabricated hydraulic pump idler gear rolling torque measurement tool (1).
71. Wrap a piece of cord around the locally fabricated tool and using a spring balance check if the pull required to turn the idler gear is 0.8–1.4 Kg. If the pull is not within specificities, re–calculate the thickness of the spacer required.



101

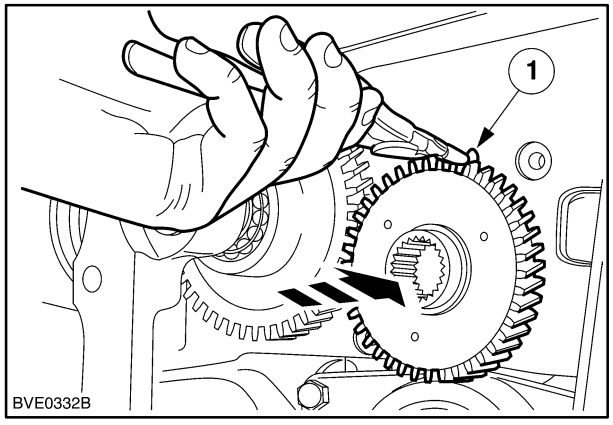
72. Install the hydraulic pump idler gear locking plate (1).



102

NOTE: *The PTO driveshaft bearing retaining ring must seat fully into the groove of the housing before the PTO driveshaft can be installed.*

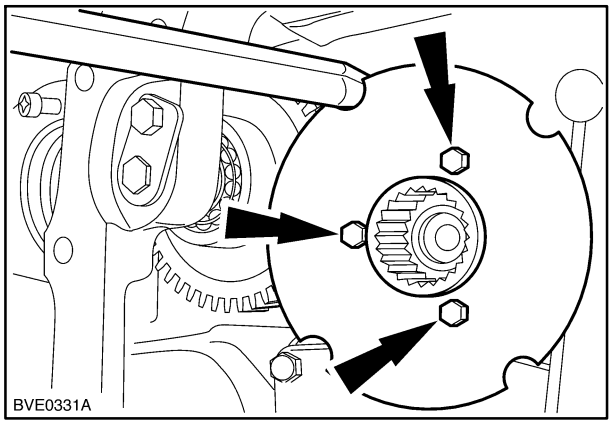
73. Install the PTO driveshaft bearing into the housing by expanding the exposed ends of the retaining ring (1) into the groove in the housing and at the same time pushing the PTO driveshaft.



103

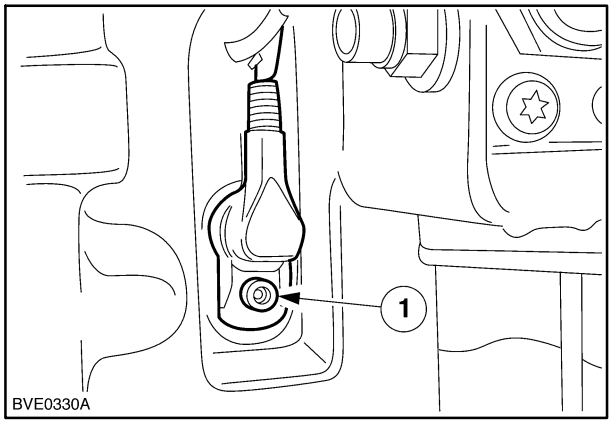
NOTE: *Use a suitable bar to hold the PTO torque sensor pick up disc.*

74. Install the PTO torque sensor pick up disc (if fitted).



104

75. Install the PTO torque sensor (1) (if fitted).

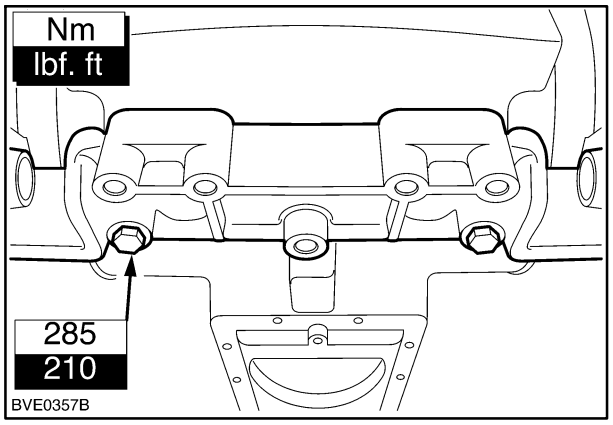


105

76. Install the lower link support to the rear axle housing taking the following into consideration:

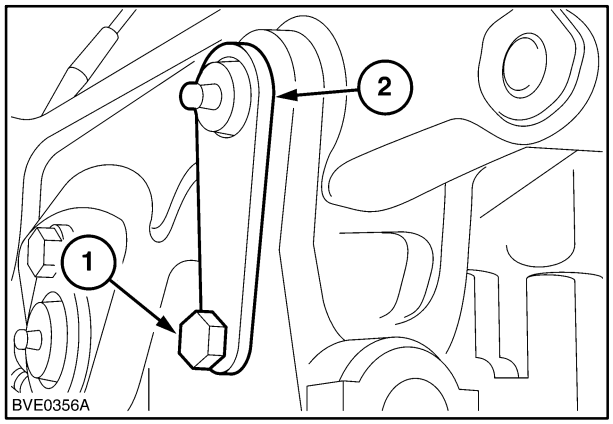
- Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2 mm in diameter to the rear axle casing, (refer to page 17, figure 13).

77. Install the lower link support. Tighten the retaining bolts to the specified torque value.



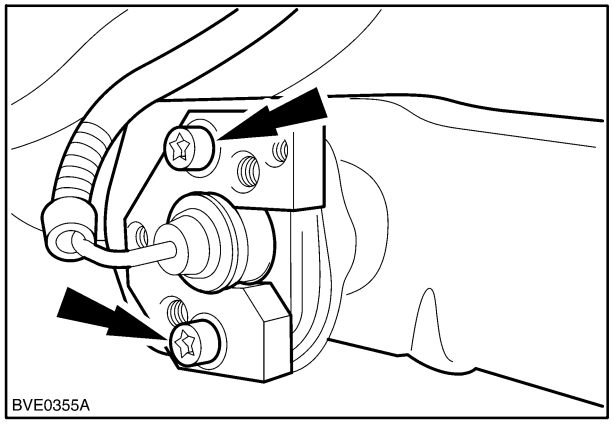
106

78. Position the vertical tie rod. Install the vertical tie rod pivot pin (2). Install the vertical tie rod pivot pin retaining bolt (1).



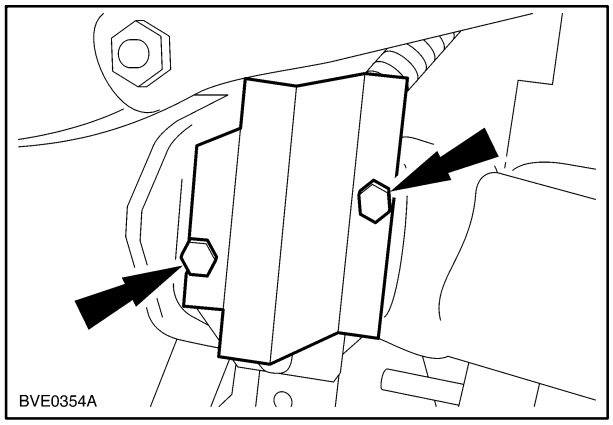
107

79. Position the lower link. Install the draft sensor with its mounting plate and install the retaining bolts.



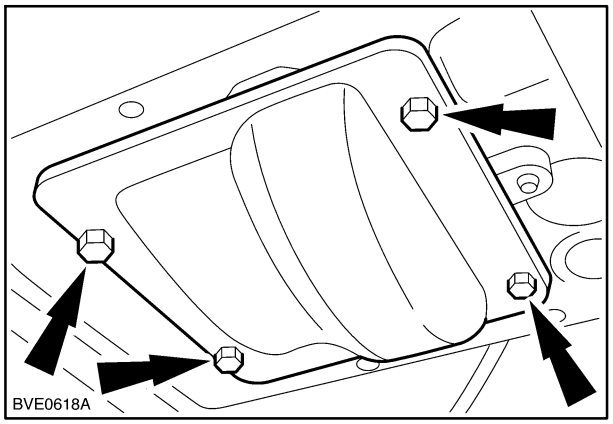
108

80. Install the draft sensor protection plate (1).



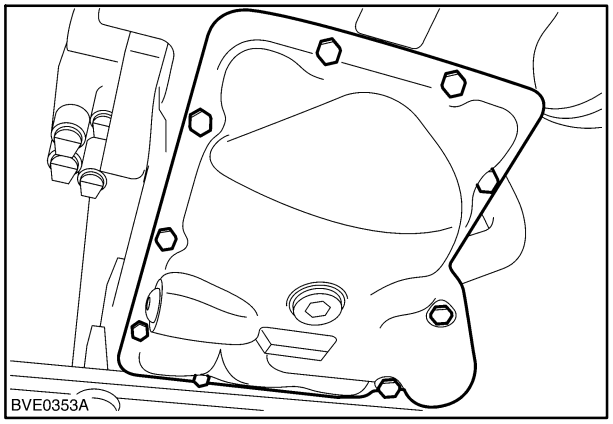
109

81. Install the four wheel drive clutch inner cover.



110

82. Install the rear axle bottom cover.



111

83. Install both final drive cases (refer to final drive case installation in this chapter).
84. Install the transmission, engine and front support to the rear axle. (refer to installing transmission, engine and front support to the rear axle chapter of the separating the tractor section).

HYDRAULIC DIFFERENTIAL LOCK CONTROL UNIT (MULTI-WET PLATE CLUTCH)

Inspection (Op. 27 110 42)

⚠ WARNING ⚠

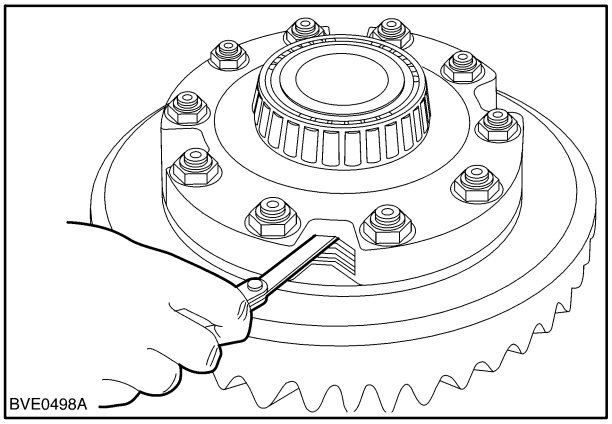
Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear suitable protection clothing, including goggles, gloves and footwear.

With the crown wheel / differential assembly on the bench, proceed as follows:

1. Using suitable feeler gauges, check the clearance between the multi-wet plate clutch drive and driven discs. If the clearance is not between 1.35 to 3.1 mm, replace the multi-wet plate clutch drive and driven discs.



112

Disassembly (Op. 27 110 42)

⚠ WARNING ⚠

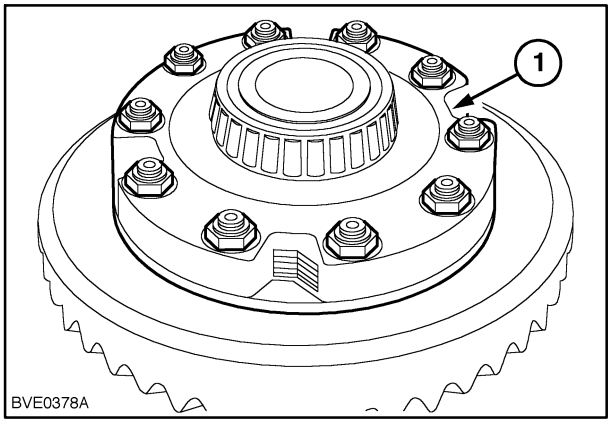
Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear suitable protection clothing, including goggles, gloves and footwear.

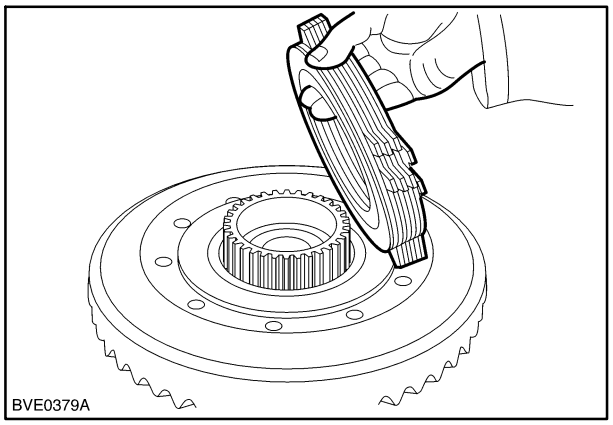
With the crown wheel / differential assembly on the bench, proceed as follows:

1. Remove the multi-wet plate clutch cover (1) from the differential cage.



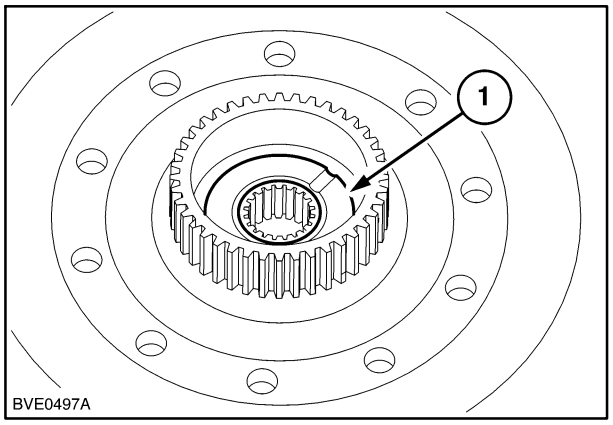
113

2. Remove the multi-wet plate clutch drive and driven discs from the differential cage.



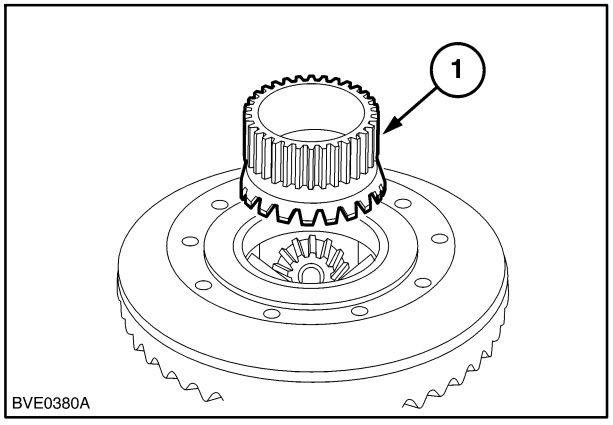
114

3. Remove the thrust washer / shim (1) from the differential cage.



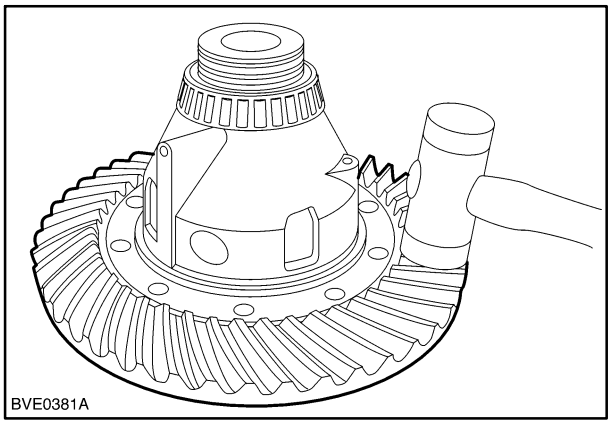
115

4. Remove the sun gear (1) from the differential cage.



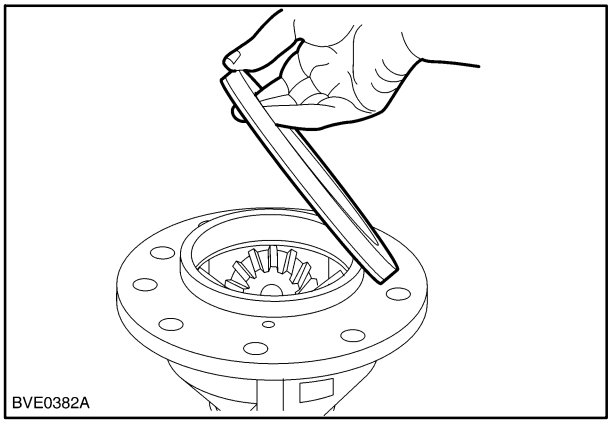
116

5. Remove the crown wheel from the differential cage using a suitable soft faced hammer.



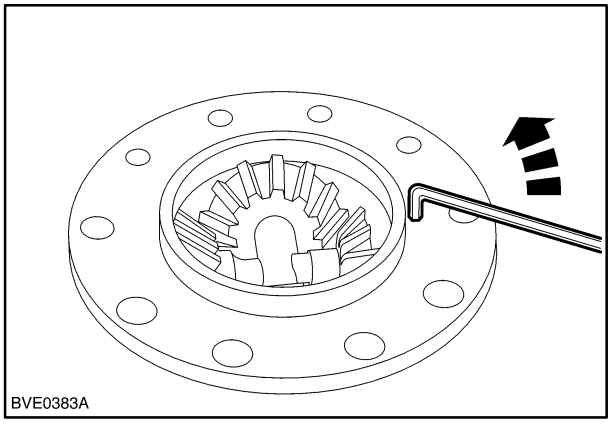
117

6. Remove the piston from the differential cage.



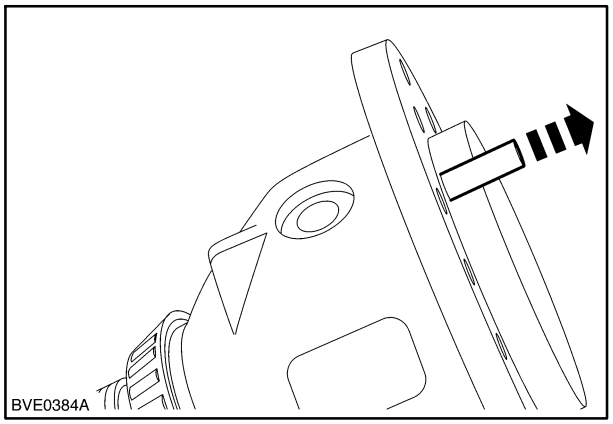
118

7. Remove the grub screw from the differential cage.

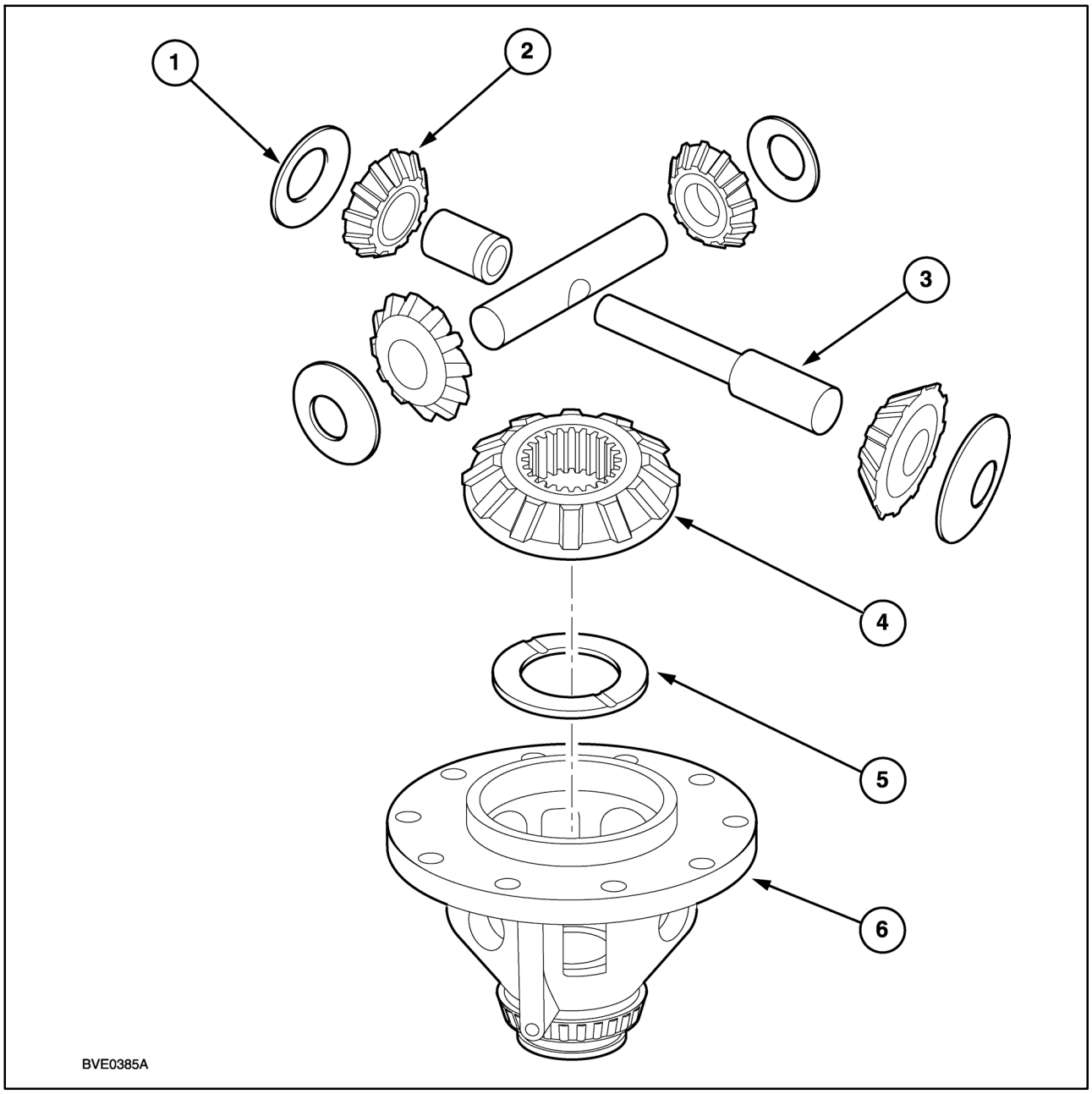


119

8. Remove the planet gear shaft locking pin from the the differential cage.



120



121

1. Thrust washer
2. Planet gear
3. Planet gear shaft
4. Sun gear
5. Thrust washer / shim
6. Differential cage

NOTE: *It is advisable to keep the planet gear shafts and planet gears matched as they are removed.*

Assembly/Adjustments
(Op. 27 120 10 – 27 120 20)

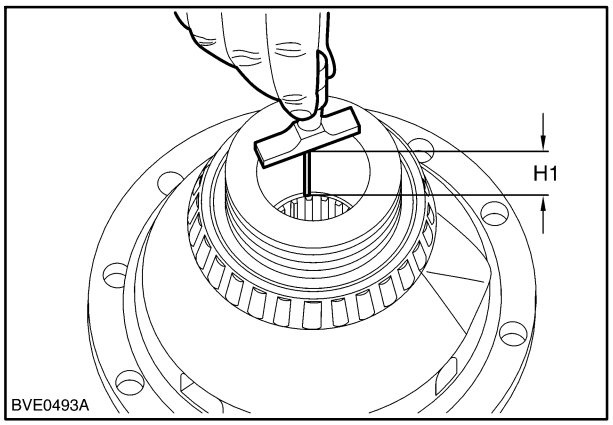
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

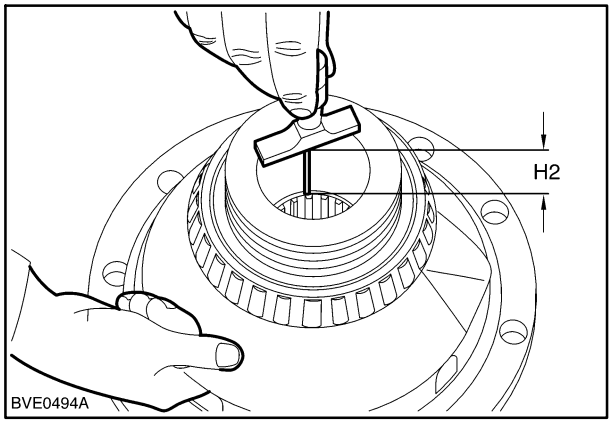
Wear suitable protection clothing, including goggles, gloves and footwear.

1. The end float required between the sun gear and planet gears is 0.20 to 0.45 mm.
2. Install a test thrust washer / shim (**S1**)**.**
3. Assemble the differential cage assembly, (refer to page 59, figure 121).
4. Using a depth gauge, take two measurements 180° apart, between the sun gear and the differential cage. Calculate the average of the two measurements. **This measurement is H1**.



122

5. Raise the sun gear so it comes into contact with the differential cage. Using a depth gauge, take two measurements 180° apart, between the sun gear and the differential cage. Calculate the average of the two measurements. **This measurement is H2**.



123

6. Remove the test thrust washer/shim and measure the thickness. **This measurement is S1.**
7. Determine the thickness of the thrust washer / shim to be installed as follows:

   Thrust washer/shim = (H1 – H2) + S1 – 0.30 mm

   Where:

   0.30 mm = the average calculation of 0.20 to 0.45 mm rounded down to the nearest availble shim size.

Example:

H1 = Average sun gear measurement using the depth gauge = 75.35 mm.

H2 = Average lifted sun gear measurement using the depth gauge = 74.80 mm.

S1 = Test thrust washer / shim = 2.7 mm.

0.30 mm = Specified sun gear end play.

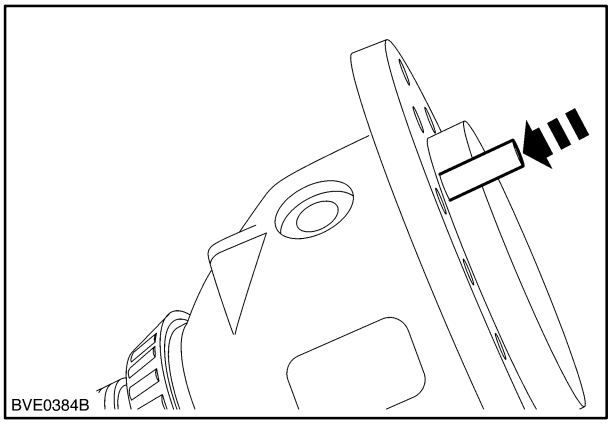
75.35 – 74.80 = 0.55

0.55 + 2.70 = 3.25

3.25 – 0.30 = 2.95

2.95 = **Thrust washer/shim.**

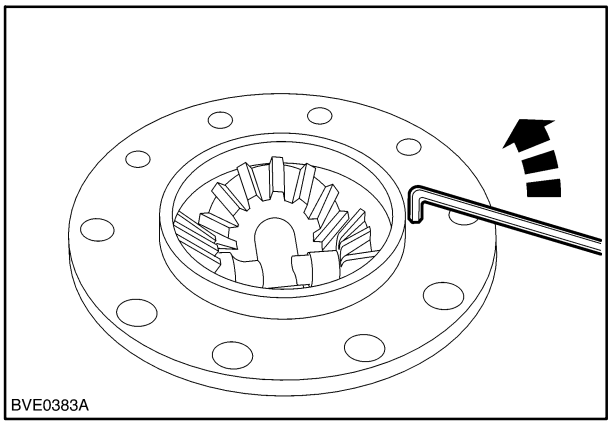
8. Assemble the differential cage assembly with the new calculated thrust washer / shim, (refer to page 59, figure 121).
9. Install the planet gear shaft locking pin.



124

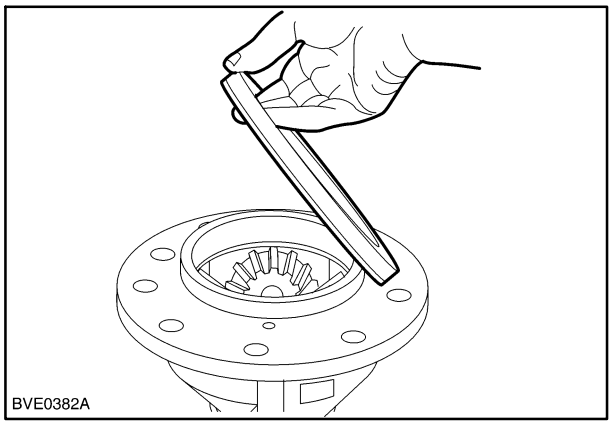
NOTE: *Apply loctite 242 or 243 to the grub screw.*

10. Install the grub screw to the differential cage.



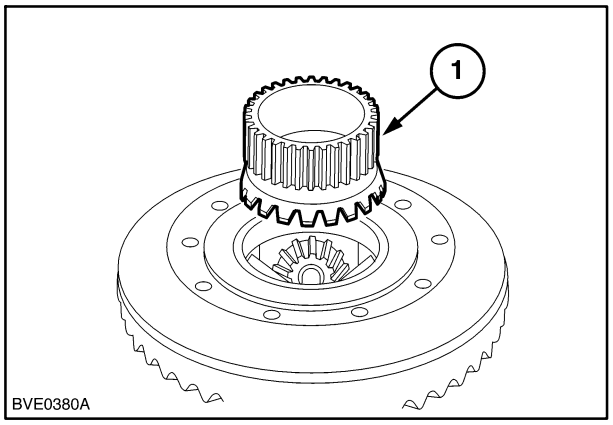
125

11. Install the piston to the differential cage.



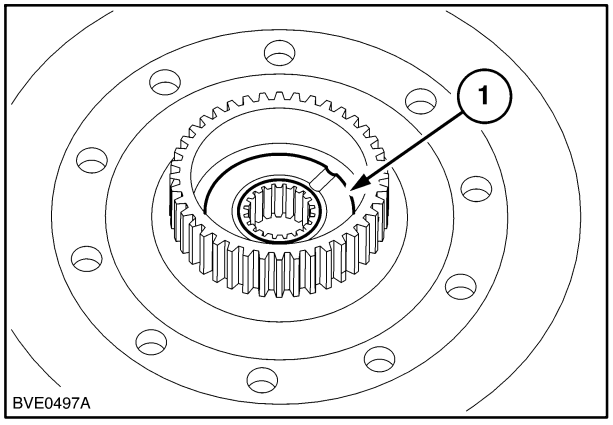
126

12. Install the ring gear from the differential cage.
13. The end float required between the sun gear and planet gears is 0.20 to 0.45 mm.
14. Install the sun gear (1) to the differential cage.



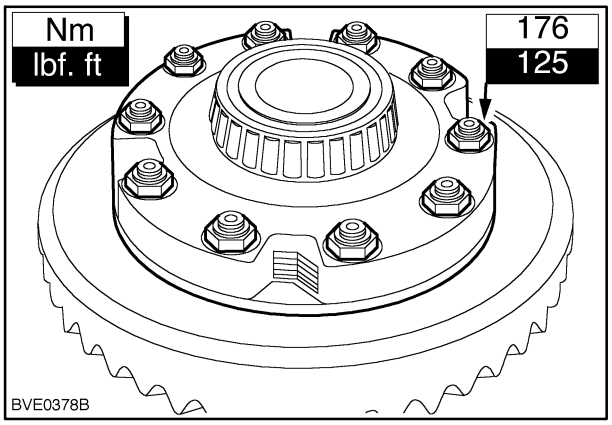
127

15. Install a test thrust washer / shim (**S1**)**.**



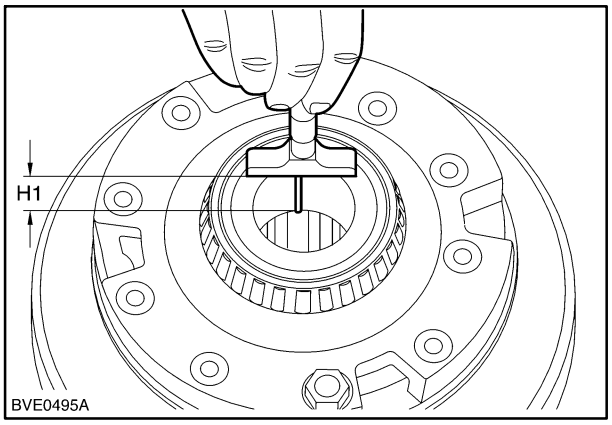
128

16. Install the multi-wet plate clutch cover (1) to the differential cage. Tighten to the specified torque value.



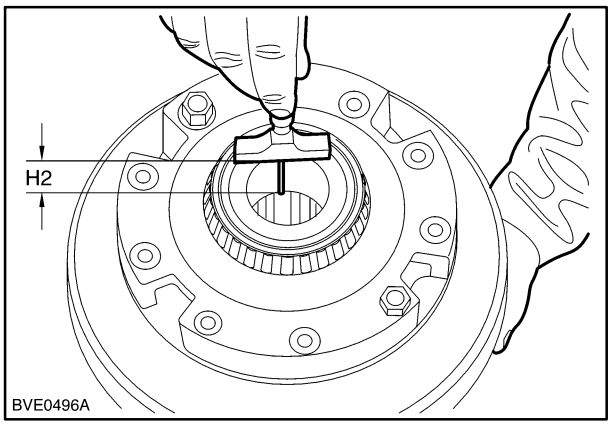
129

17. Using a depth gauge, take two measurements 180° apart, between the sun gear and the differential cage. Calculate the average of the two measurements. **This measurement is H1**.



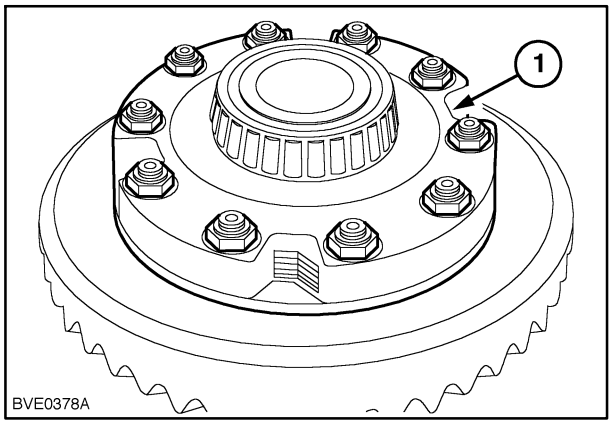
130

18. Lift up the sun gear so it comes into contact with the differential cage. Using a depth gauge, take two measurements 180° apart, between the sun gear and the differential cage. Calculate the average of the two measurements. **This measurement is H2**.



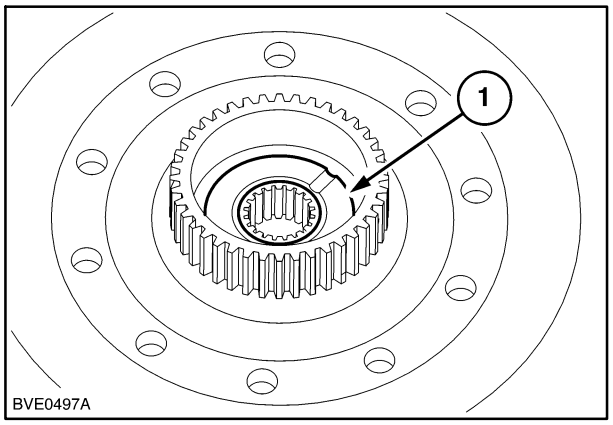
131

19. Remove the multi-wet plated clutch cover (1) from the differential cage.



132

20. Remove the test thrust washer / shim and measure the thickness. **This measurement is S1.**



133

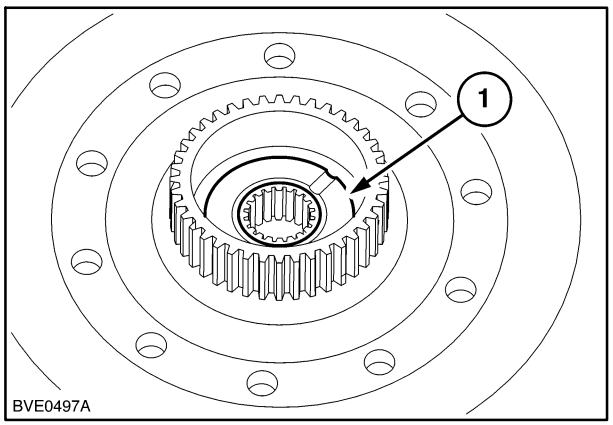
21. Determine the thickness of the thrust washer / shim to be installed as follows:

    Thrust washer/shim = (H1-H2) + S1 - 0.30 mm

    Where:

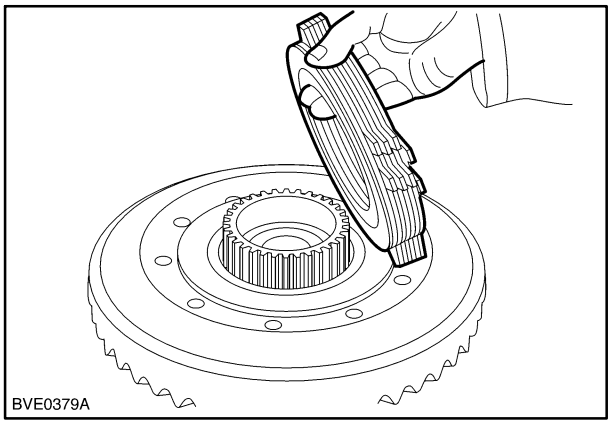
    0.30 mm = the average calculation of 0.20 to 0.45 mm rounded down to the nearest availble shim size.

22. Install the new calculated thrust washer / shim (1).



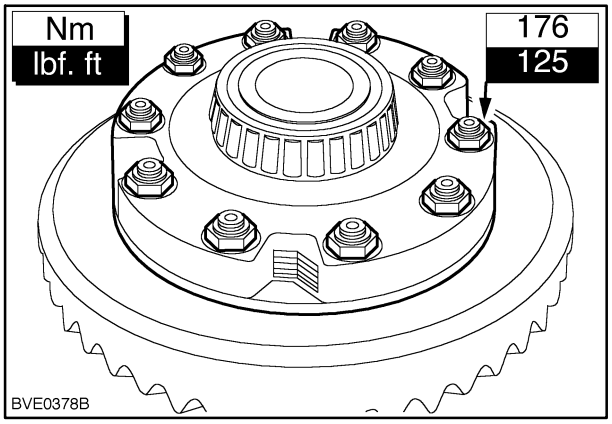
134

23. Install the clutch drive and driven discs from the differential cage.



135

24. Install the multi-wet plated clutch cover (1) to the differential cage. Tighten to the specified torque value.



136

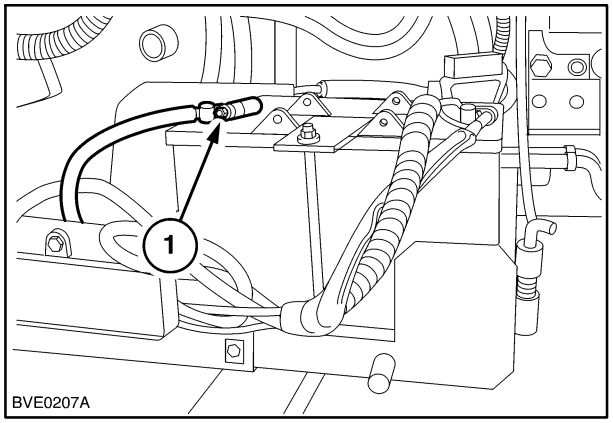
FINAL DRIVE CASE (LEFT OR RIGHT HAND)

Removal (Op. 27 120 10 – 27 120 20)

⚠ WARNING ⚠

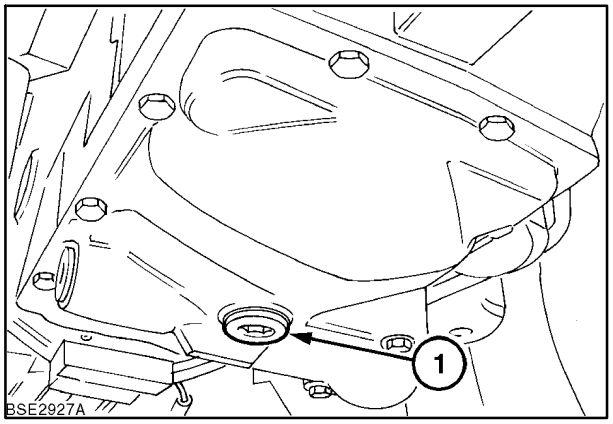
Lift and handle all heavy components using lifting equipment of appropriate capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no–one is in the vicinity of the load to be lifted.

1. Remove the battery cover and disconnect the battery negative cable (1).



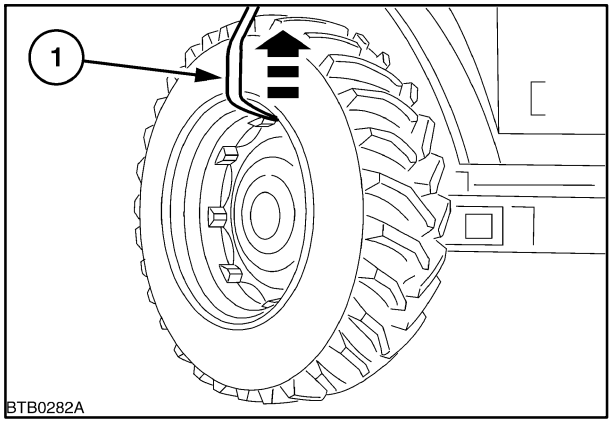
137

2. Remove the drain plug (1) and drain oil into a suitable container.
3. Install the drain plug after the oil has drained (1).



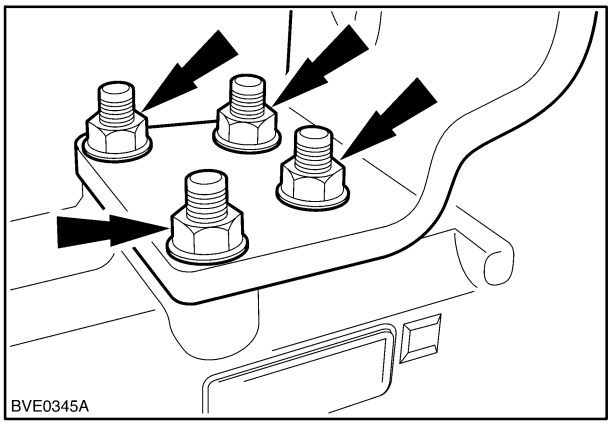
138

4. Jack up the tractor and place a stationary stand under the rear axle housing.
5. Using a suitable sling (1), connect the rear wheel to a hoist and remove the rear wheel.



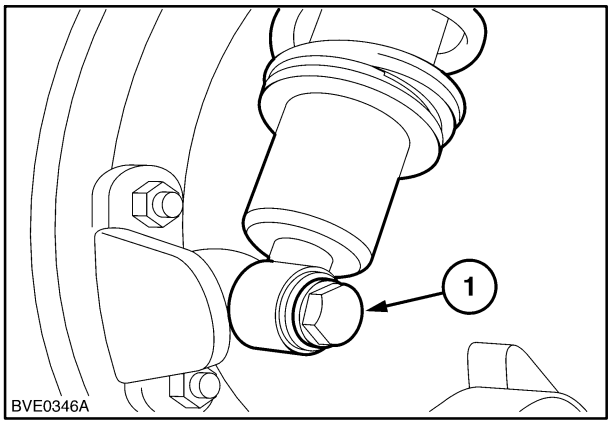
139

6. Remove the cab support from the final drive case.



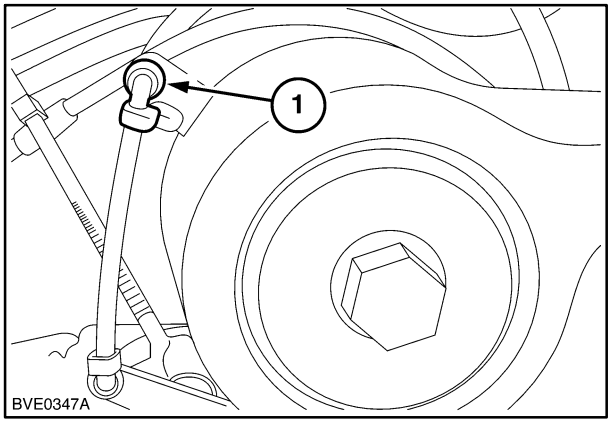
140

7. Remove the damper/spring (1) (if fitted).



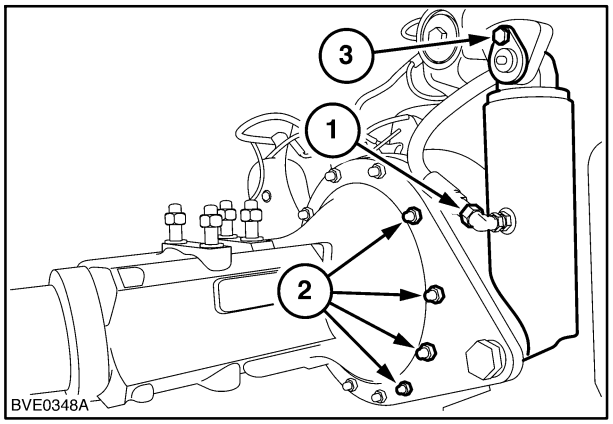
141

8. Disconnect the lift arm potentiometer link.



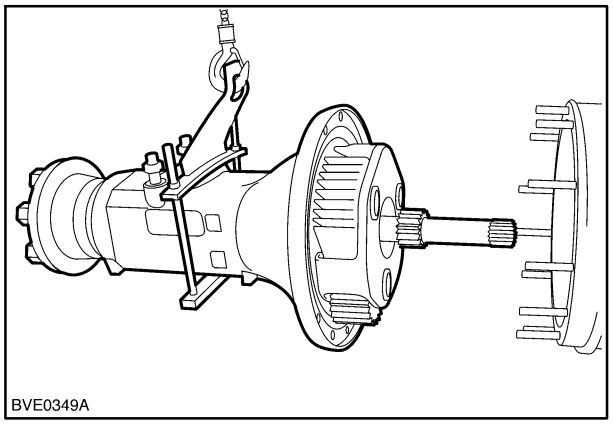
142

9. Disconnect the assistor ram oil supply pipe (1). Remove the circlip (2). Remove the lift assistor ram lower retaining bracket nuts (3) and remove the lift assistor ram.



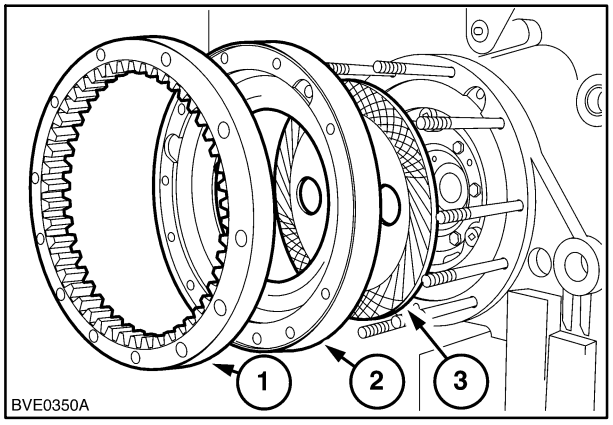
143

10. Install Special tool 380001113 and connect it to a hoist. Remove the final drive case to rear axle housing retaining nuts and remove the final drive assembly together with the half–shaft.



144

11. Remove the outer ring gear (1), steel plate (2) and friction disc (3).



145

Installation (Op. 27 120 10 - 27 120 20)

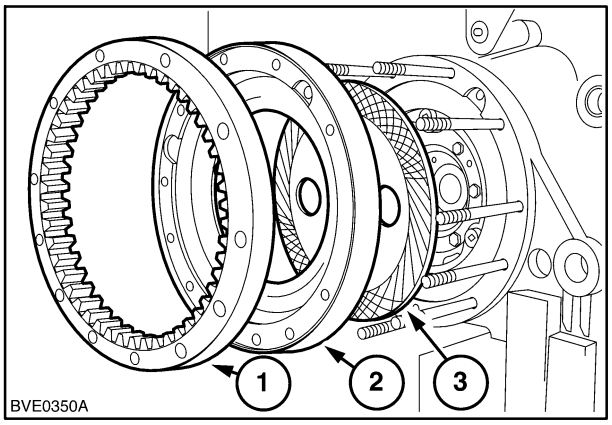
⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity.

Ensure that units or parts are supported by suitable slings or hooks.

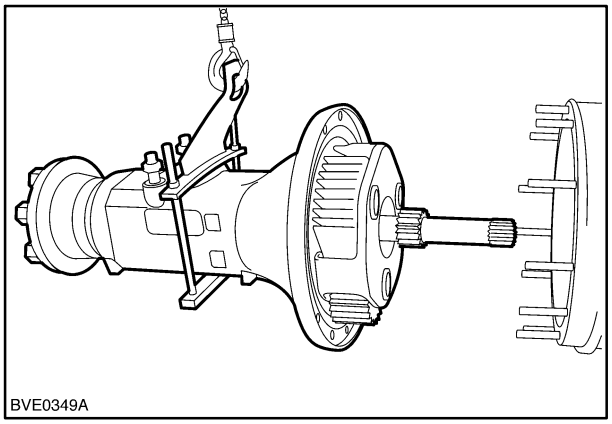
Ensure that no–one is in the vicinity of the load to be lifted.

1. Install the friction disc (3), steel plate (2) and the outer ring gear (1).



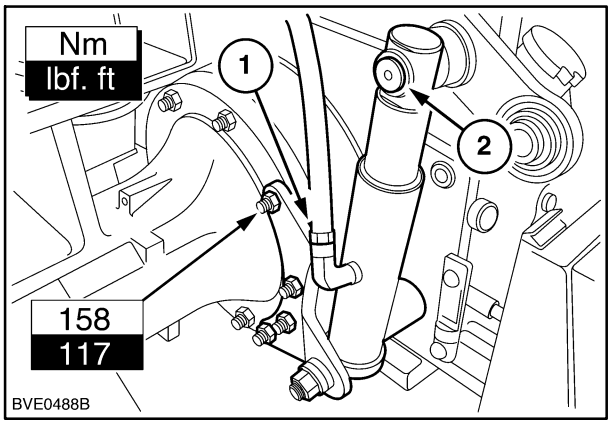
146

2. Install Special tool 380001113 and install the final drive assembly together with the half–shaft.



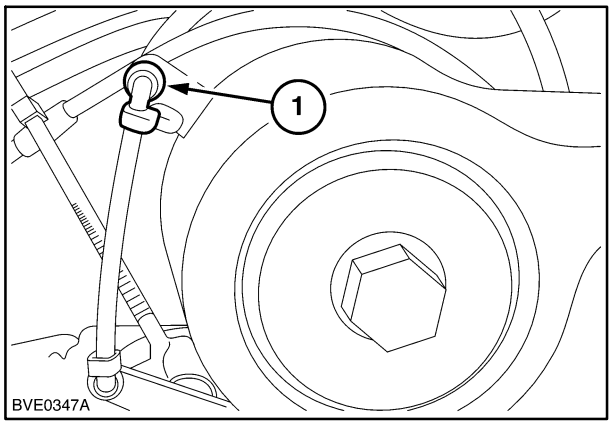
147

3. Install the lift assistor ram, lower retaining bracket and the retaining nuts. Tighten the retaining nuts to the specified torque value. Install the circlip (2) and connect the lift assistor ram oil supply pipe (1).



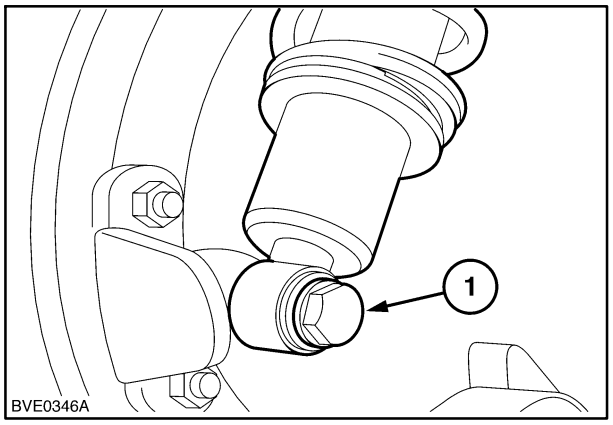
148

4. Connect the lift arm potentiometer link (1).



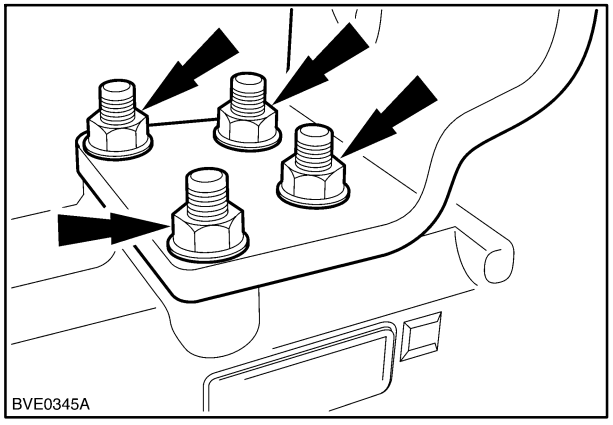
149

5. Install the damper/spring (1) (if fitted).



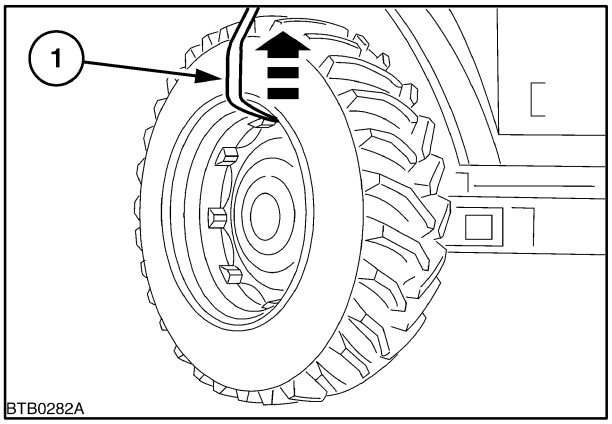
150

6. Install the cab support onto the final drive case.



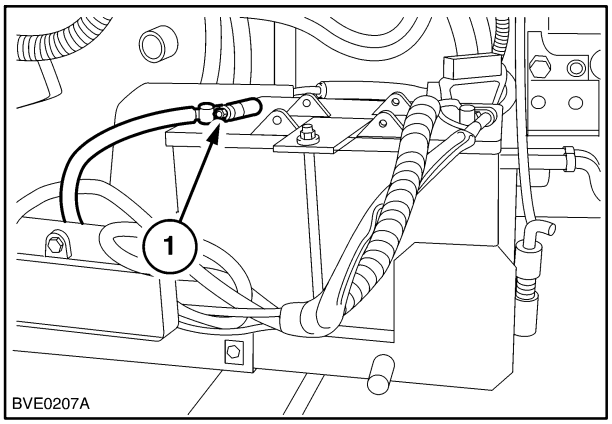
151

7. Using a suitable sling (1), connect the rear wheel to a hoist and install the rear wheel.
8. Jack up the tractor and remove the stationary stand from under the rear axle housing.



152

9. Connect the battery negative cable (1) and install the battery cover.



153

DRIVE WHEEL SHAFT

Removal-Installation (Op. 27 120 34)

⚠ WARNING ⚠

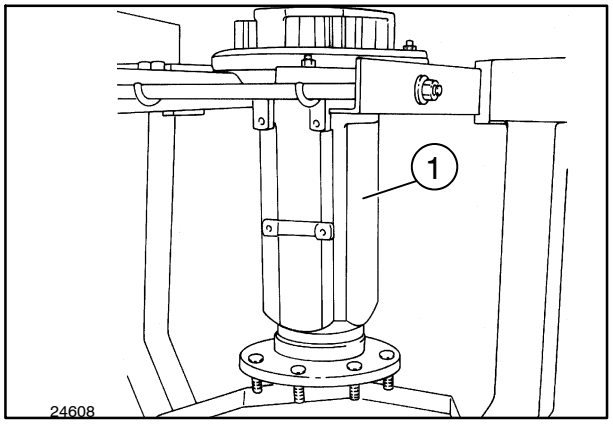
Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear suitable protection clothing, including goggles, gloves and footwear.

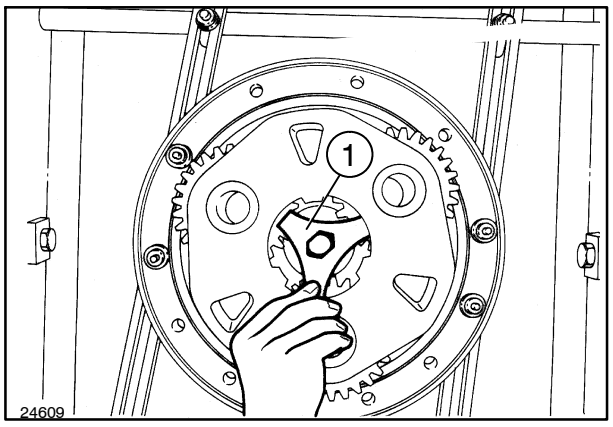
With the final drive case removed from the rear axle housing, proceed as follows:

1. Position the final drive case (1) on a rotary stand.



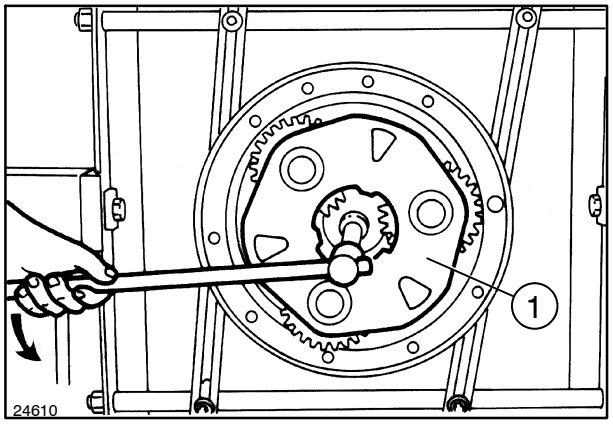
154

2. If necessary, remove the locking plate (1) by slightly turning it



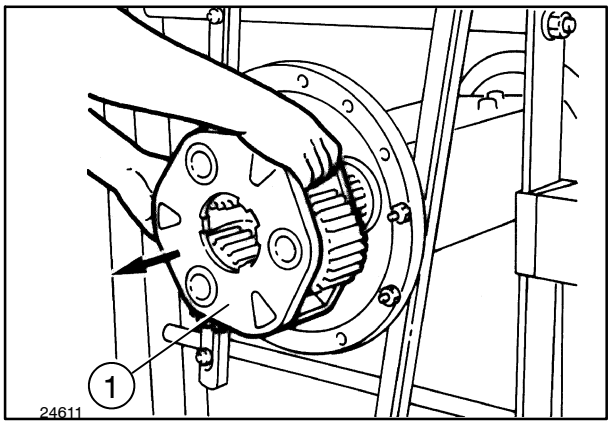
155

3. Loosen the screw attaching the planetary carrier (1) to the drive shaft.



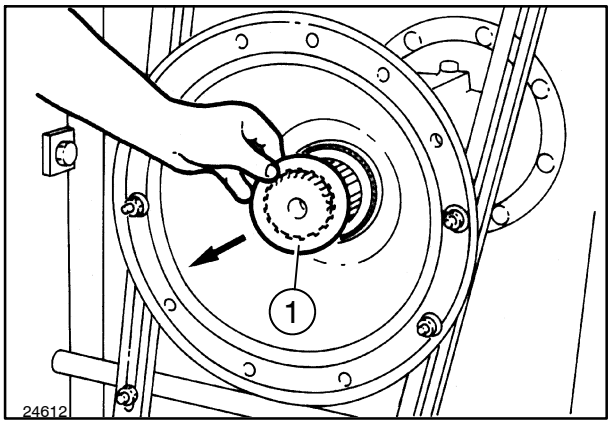
156

4. Slide out the planetary carrier (1).



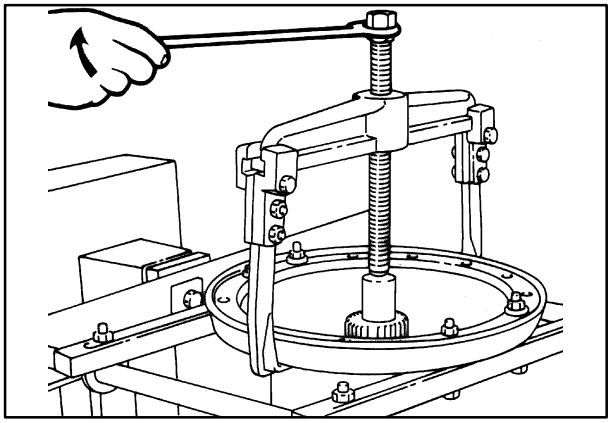
157

5. Recover the thrust washer (1).



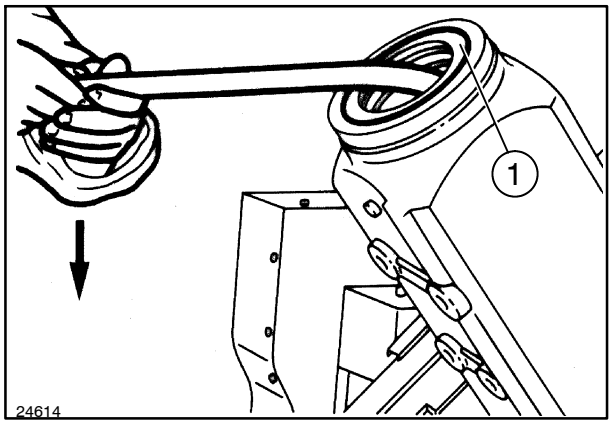
158

6. Using a suitable puller, remove the drive shaft (1).



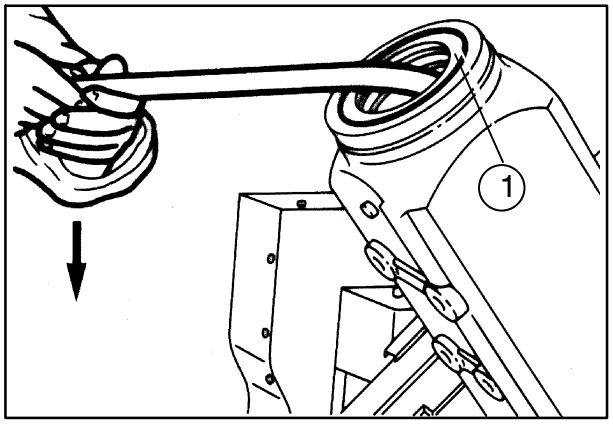
159

7. Remove the seal (1) and recover the bearing inner cup from the wheel side.



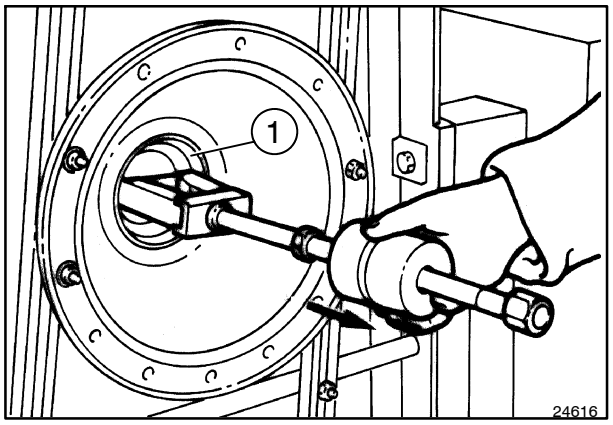
160

8. Using an expansion puller and a slide hammer, remove the bearing outer cup from the wheel side.



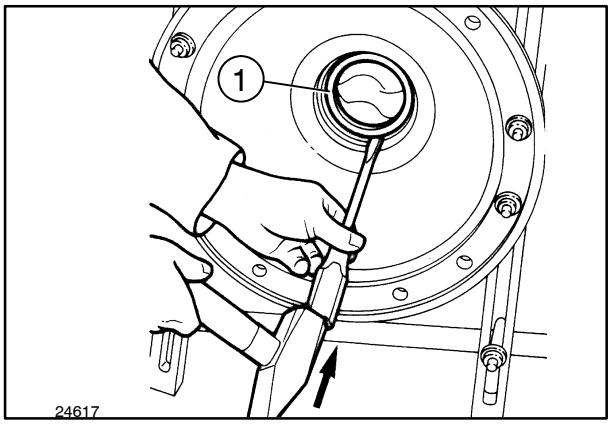
161

9. Using an expansion puller and a slide hammer, remove the bearing outer cup (1) from the final drive side.



162

10. Remove the seal (1).



163

⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.

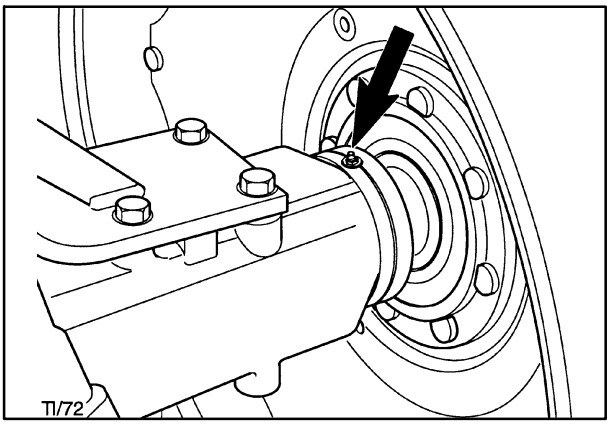
11. Reinstall all the components of the drive wheel shaft assembly observing the following:
    - Reassembly follows the disassembly procedure in reverse, from step 10 back to step 1.
12. Install the outer bearing cups and seals on the housing using suitable drifts.
13. After installing all components on the final drive case, adjust the drive wheel taper bearings.

Drive Wheel Taper Bearing Adjustment

14. Tighten the axle shaft screw to 196 Nm (20 kgm) while turning the shaft to settle the assembly.
15. Loosen the axle shaft screw then tighten it again to 88 Nm (9 kgm) while turning the shaft to settle the bearings properly.
16. Insert the safety plate and lock it screwing in or out the screw until reaching the next notch

NOTE: *Screw in or out to a max. angular variation of 15 °.*

17. Turn the shaft by hand and check if it turns freely, with no end float, nor excess resistance
18. Using the grease nipple, fill the inner recess with grease **AMBRA GR 75 MD** (several grease gun strokes are needed). If a plug is fitted instead of the grease nipple, remove plug and replace with a grease nipple.



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PLANETARY GEAR SET

Removal-Installation (Op. 27 120 32)

⚠ WARNING ⚠

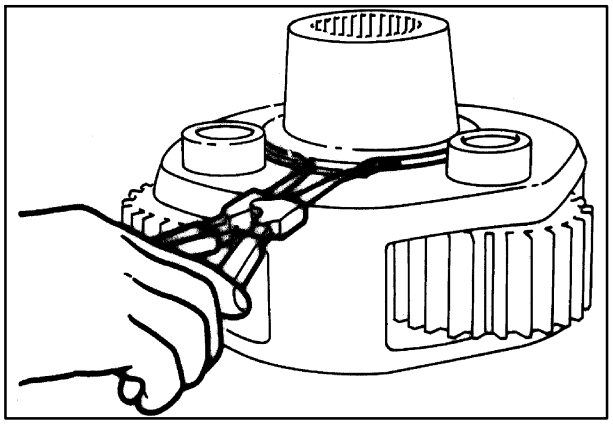
Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

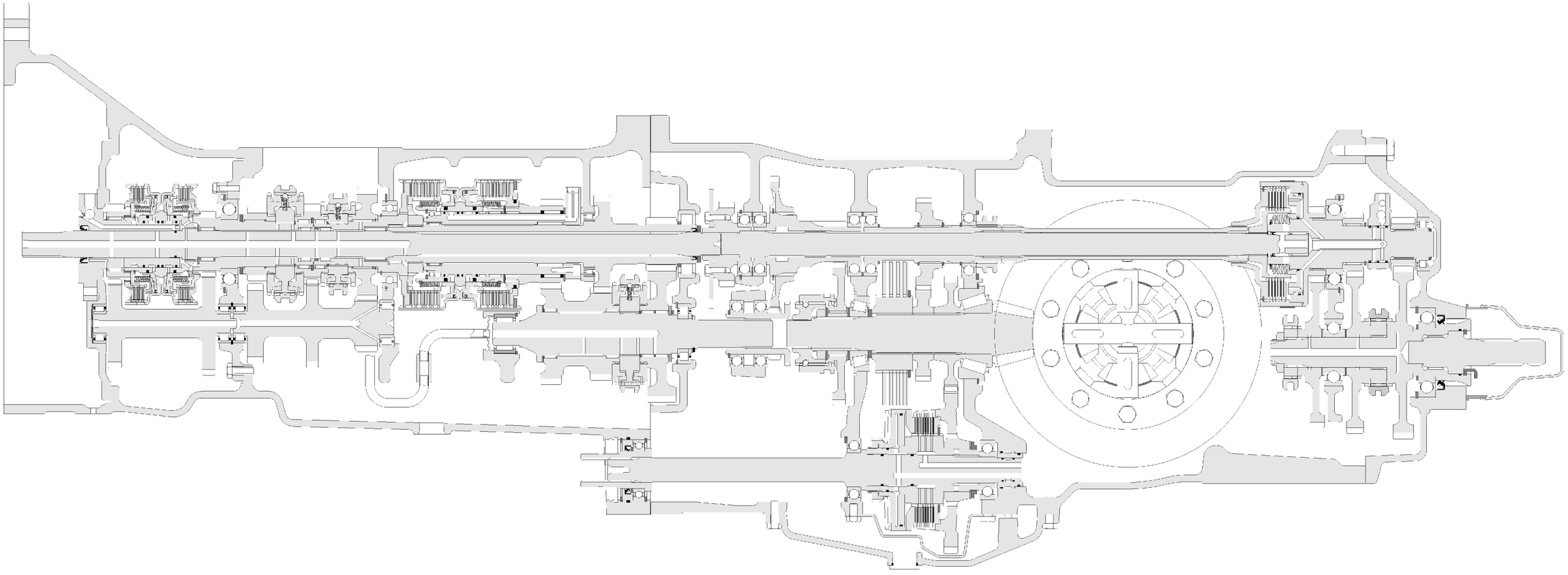
Wear suitable protection clothing, including goggles, gloves and footwear.

With the assembly removed from the case, proceed as follows:

1. Remove retaining ring (1).
2. Slide out the pivot pins and recover the gears complete with the needle bearings. Remove the thrust washer.
3. Reinstall all components of the planetary gear set observing the following:
   - Reassembly follows the disassembly procedure in reverse, from step 2 back to step 1.
   - Insert the thrust washer first on the driven gear holder.



165



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NOTES

SECTION 27 – MECHANICAL REAR WHEEL DRIVE

Chapter 2 – 50 Km/h Drive (17th Gear)

CONTENT

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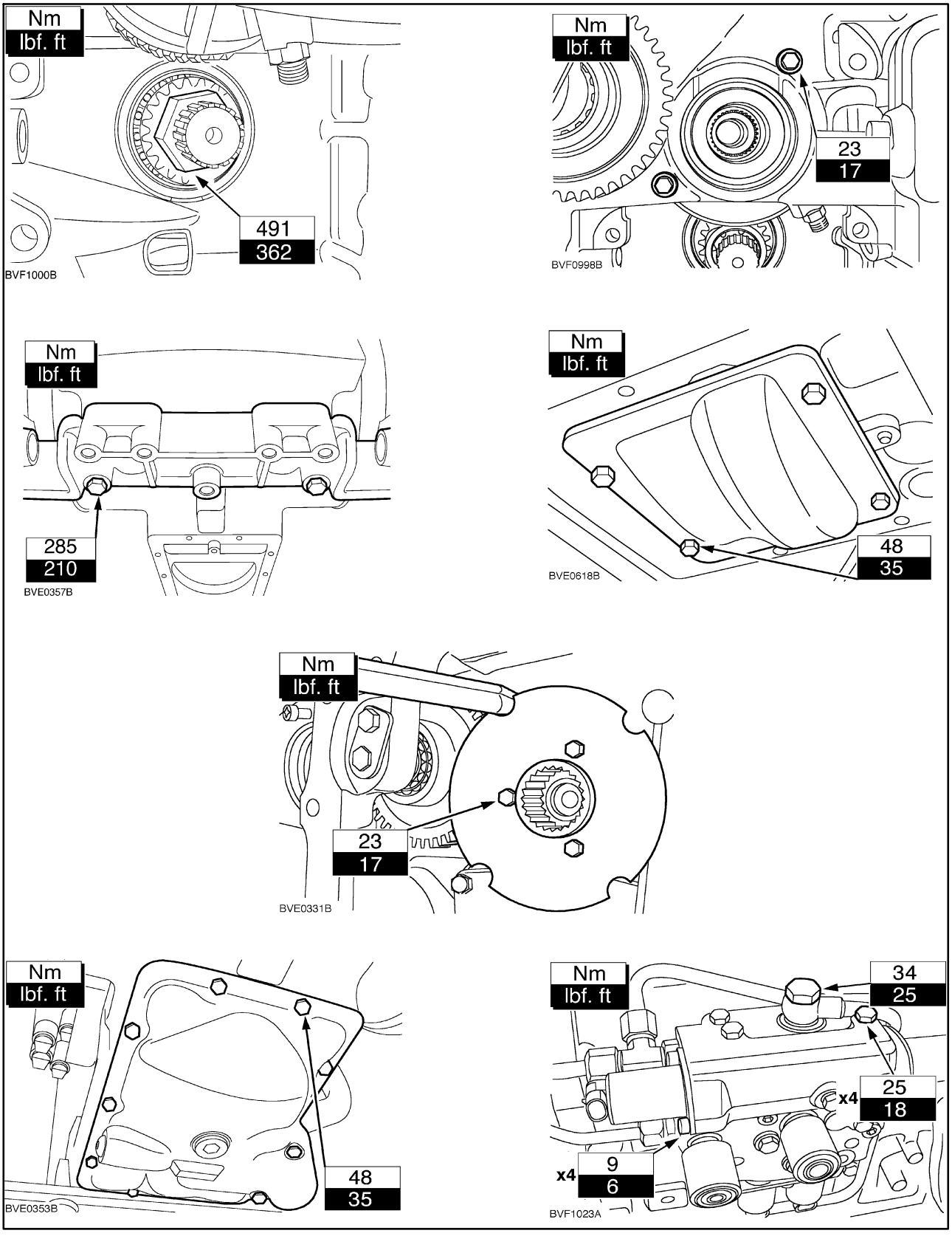
	Tightening Torques	3
	Special Tools	4
	Sectional Views	5
	Description And Operation	7
	Troubleshooting	10
	Overhaul	11
	50 Km/h Clutch (17th Gear)	11
	Removal	11
	Disassembly	18
	Assembly	22
	Installation	26
	50 Km/h Solenoid Valve Block	33
	Removal	33
	Disassembly/Assembly	34
	Installation	35

SPECIFICATIONS

50 Km/h Clutch (17th Gear)	
Type	Mulit-wet plate clutch Electro-hydraulic engaged
Location	Rear axle housing
Drive	Direct drive from the engine flywheel via the PTO input driveshaft
Friction discs	4
Steel plates	4
Belleville washers	6

TIGHTENING TORQUES



SPECIAL TOOLS

CAUTION

Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly on this Manual.

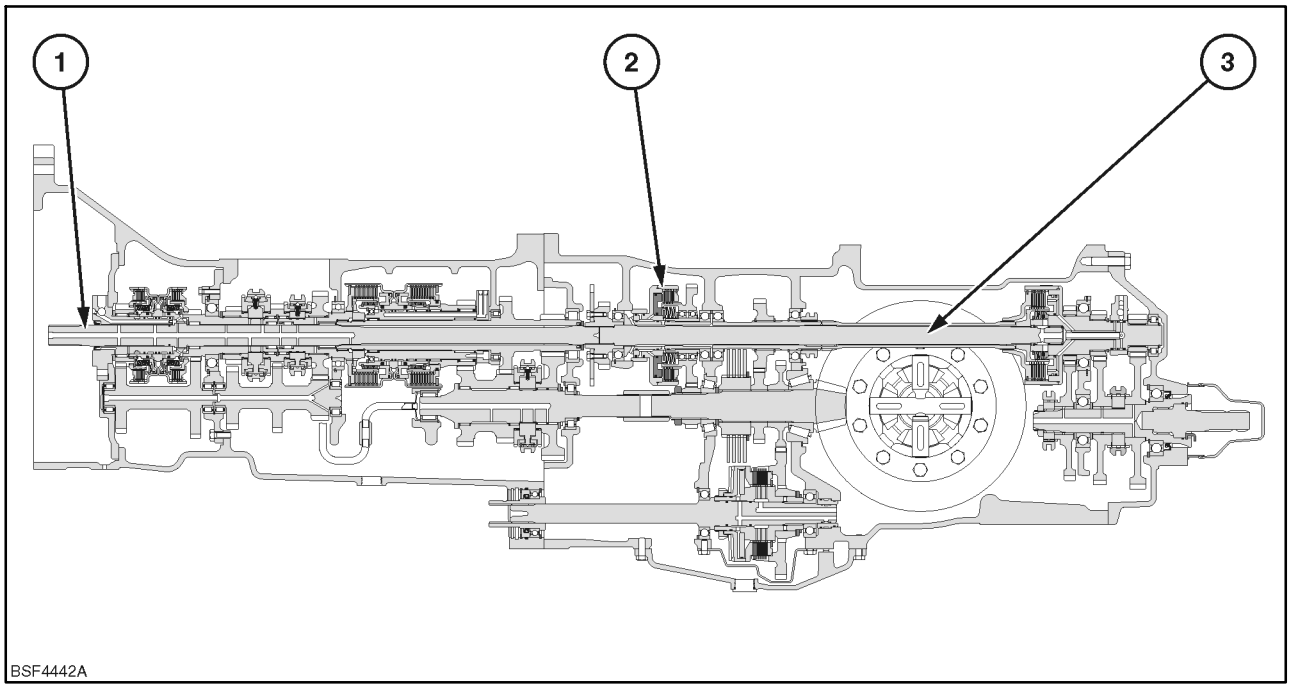
List of special tools necessary to carry out the different operations described in this Section.

297471 Tractor splitting kit

295021 Bellville spring compressor

380000403 Rear axle support

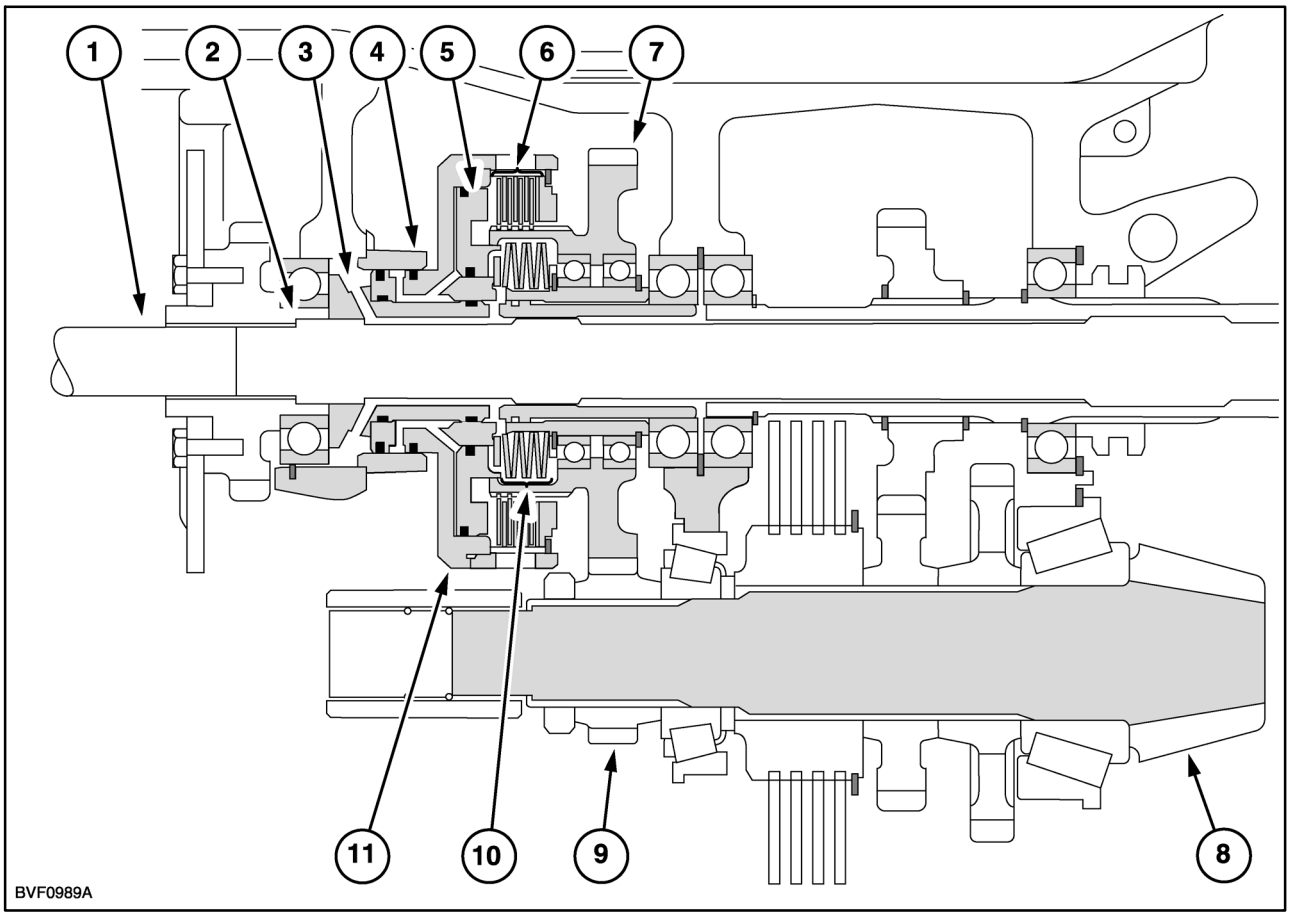
SECTIONAL VIEWS



2

Drive Line Sectional View

1. Main input shaft from the engine flywheel damper
2. 50 Km/h clutch
3. Power take-off (PTO) driveshaft



3

50 Km/h Drive Sectional View

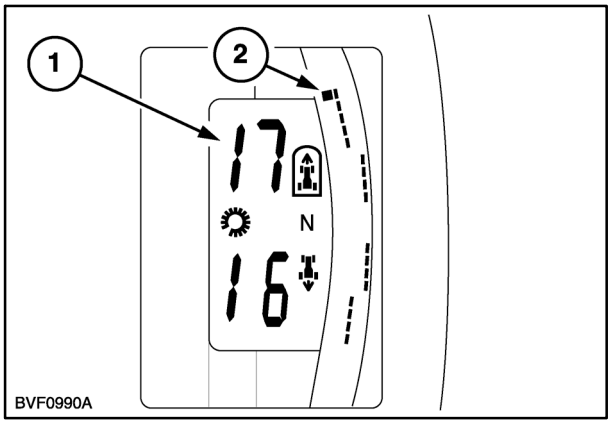
1. PTO driveshaft from the engine flywheel
2. PTO driveshaft to the rear PTO
3. Lubrication oil supply
4. Oil supply manifold
5. Control piston
6. Friction and steel plates
7. Drive gear
8. Pinion shaft
9. Driven gear
10. Belleville washers
11. Clutch housing

DESCRIPTION AND OPERATION

The 50 Km/h transmission has an additional gear and clutch located in the rear axle housing.

When the extra gear (17th) is selected, no other clutches in the transmission are energized and drive is taken directly from the engine flywheel, through the power take-off (PTO) input shaft and to the 50 Km/h clutch.

The advanced display of gears (ADOG) will indicate that 17th gear is selected by displaying the gear number (1) and the gear span indicator (2).



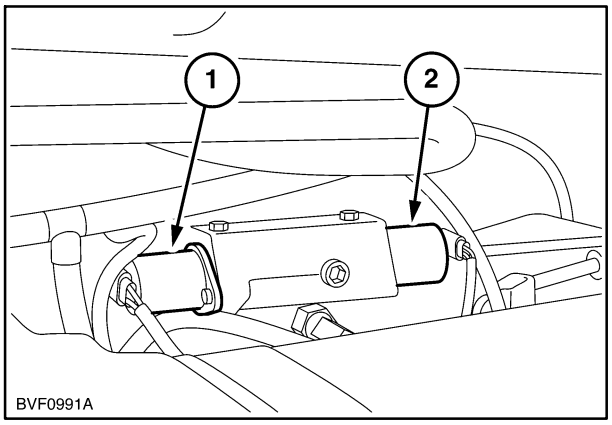
4

To engage the 50 Km/h clutch, low pressure circuit oil is directed from the engagement PWM solenoid valve (1), through the dump solenoid valve (2) and to the 50 km/h clutch.

As a safety feature the 50 km/h clutch cannot be engaged unless both the dump solenoid valve (2) and the engagement PWM solenoid valve (1) are energized.

The dump solenoid valve is energized in 16th gear in preparation to engage 17th gear.

Changing gear from 16th to 17th gear is only possible if the engine speed will be greater than 700 rev/min when 17th gear is engaged.



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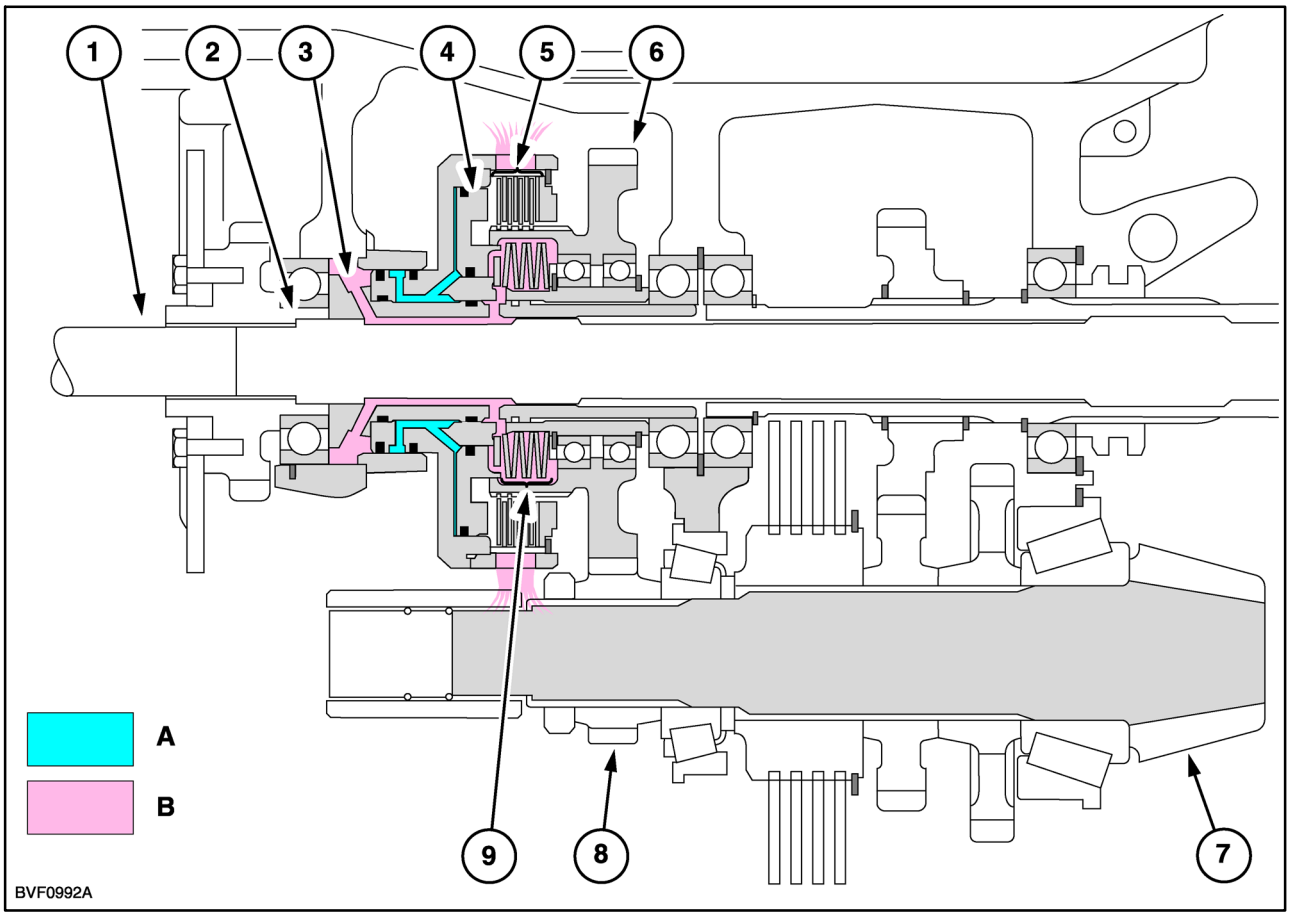


6

50 Km/h Clutch Disengaged

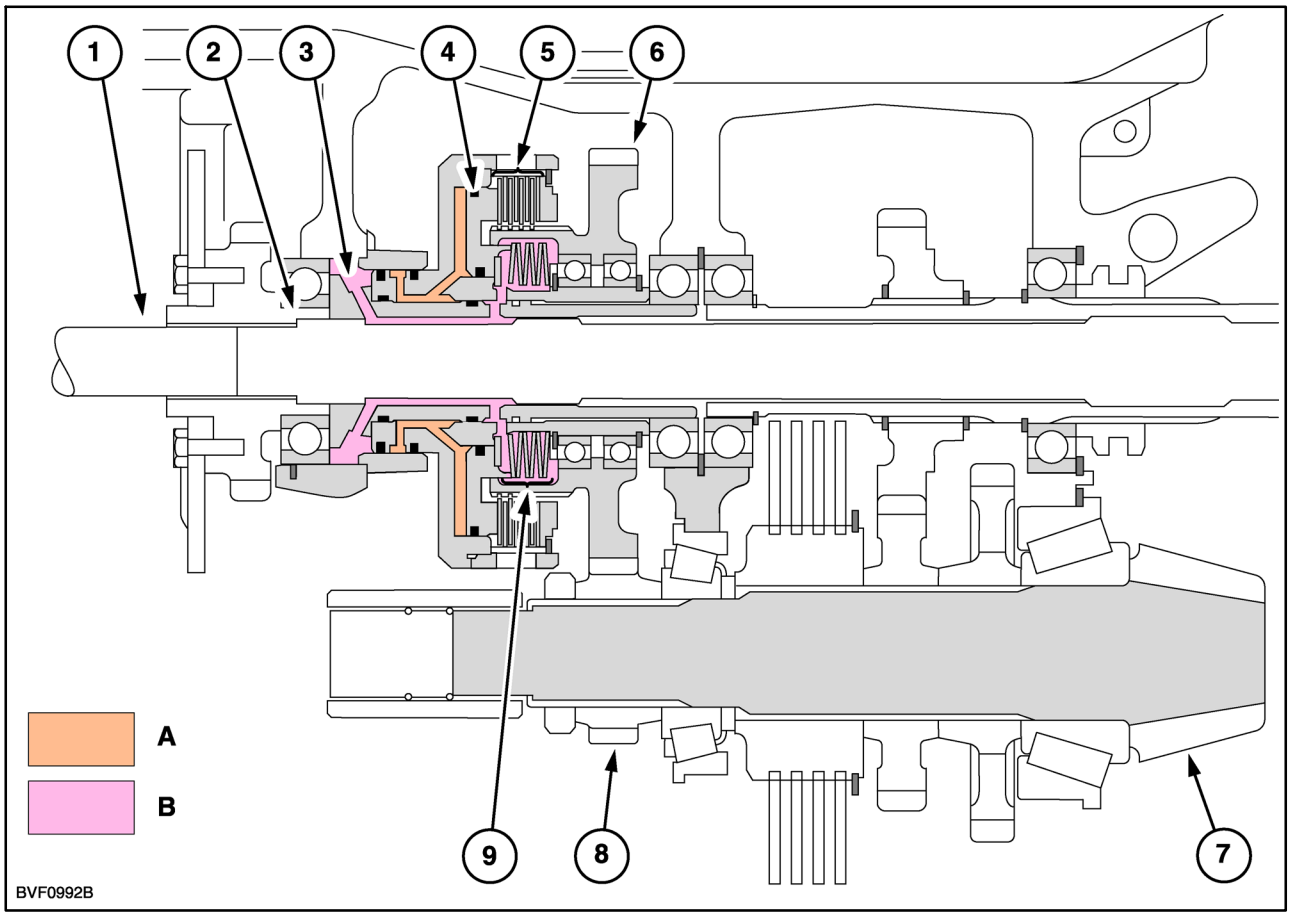
1. Power take-off (PTO) driveshaft from the engine flywheel
2. PTO driveshaft to the rear PTO
3. Lubrication oil supply
4. Control piston
5. Friction and steel plates
6. Drive gear
7. Pinion shaft
8. Driven gear
9. Belleville washers

Figure Colour Key

- **A.** Return to reservoir
- **B.** Lubrication

The engagement PWM solenoid valve and the dump solenoid valve are both de-energized (the dump solenoid valve is energized when in 16th gear in preparation to engage 17th gear). The belleville washers (9) apply a force to the control piston (4), which releases the control piston (4) from the friction and steel plates (5).

The drive gear (6) can now rotate freely on the shaft without transmitting drive to the driven gear (8) mounted on the pinion shaft (7).



7

50 Km/h Clutch Engaged

1. Power take-off (PTO) driveshaft from the engine flywheel
2. PTO driveshaft to the rear PTO
3. Lubrication oil supply
4. Control piston
5. Friction and steel plates
6. Drive gear
7. Pinion shaft
8. Driven gear
9. Belleville washers

Figure Colour Key

A. Low pressure circuit
B. Lubrication

The engagement PWM solenoid valve and the dump solenoid valve are both energized, supplying oil from the low pressure circuit to the face of the control piston (4).

The oil pressure applied to the face of the control piston (4), moves the control piston (4) against the force applied by the belleville washers (9). This compresses the friction and steel plates (5). Drive is then transferred from the PTO driveshaft (2) through the 50 Km/h clutch, drive gear (6) and to the driven gear (8) mounted on the rear axle pinion shaft (7).

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	CORRECTION
50 Km/h (17th gear) does not engage	40 Km/h maximum speed restriction set in machine configurations.	Turn off the speed restriction in machine configurations (refer to the diagnostic H routines chapter in the electrical systems section.
	Engagement PWM solenoid valve faulty.	Replace engagement PWM solenoid valve.
	Dump solenoid valve faulty.	Replace dump solenoid valve.
	No or low oil pressure to the 50 Km/h clutch.	Pressure test 50 Km/h circuit (refer to pressure testing in the hydraulic systems section).
	Wiring harness faulty.	Repair or replace the wiring harness.
Clutch slipping	Low oil pressure to the 50 Km/h clutch.	Pressure test 50 Km/h circuit (refer to pressure testing in the hydraulic systems section).
	Clutch control piston oil seals damaged / worn.	Replace clutch control piston oil seals.
	Worn clutch friction discs.	Replace the clutch friction discs.

OVERHAUL

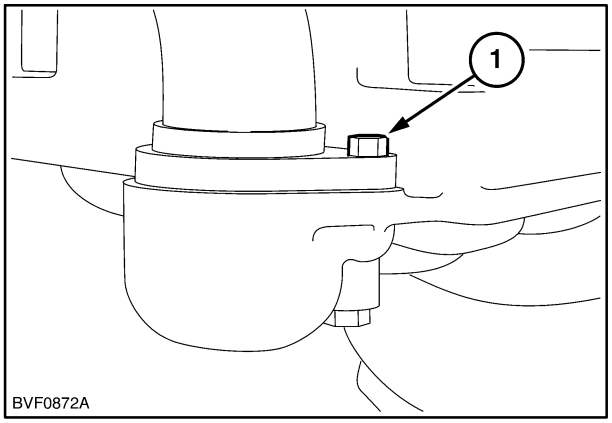
50 KM/H CLUTCH (17TH GEAR)

Removal

⚠ WARNING ⚠

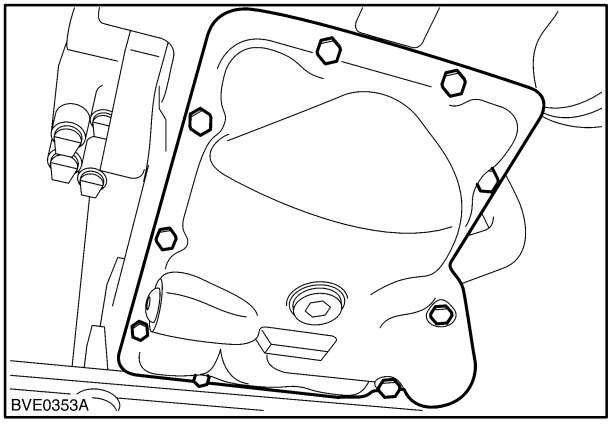
Handle all components with the greatest of care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

1. Separate the transmission, engine and front support from the rear axle. (refer to separating transmission, engine and front support from the rear axle chapter of the separating the tractor section).
2. Remove the PTO housing. (refer to PTO housing removal in the PTO section).
3. Remove both the final drive cases (refer to final drive case removal in this chapter).
4. Remove the oil supply tube retaining bolt (1).



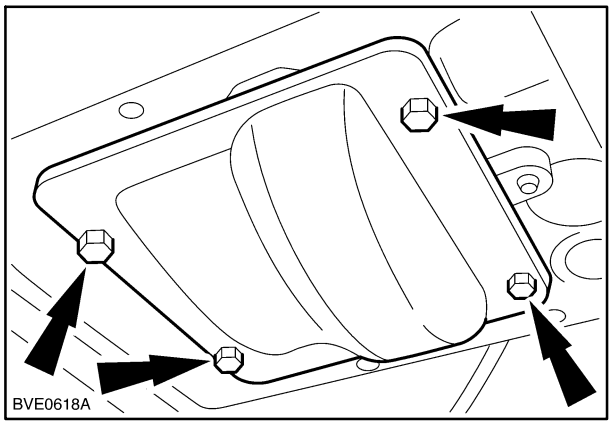
8

5. Remove the rear axle bottom cover.



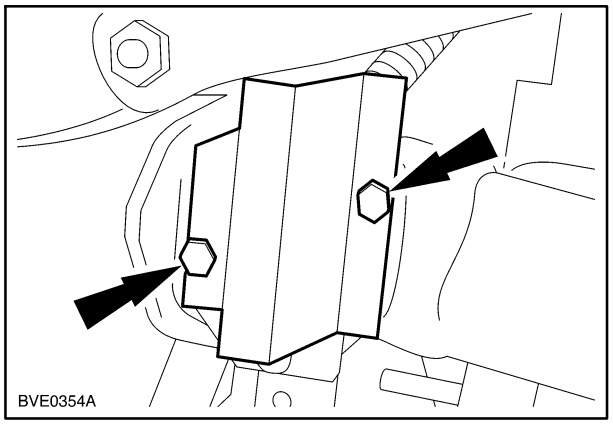
9

6. Remove the four wheel drive clutch inner cover.



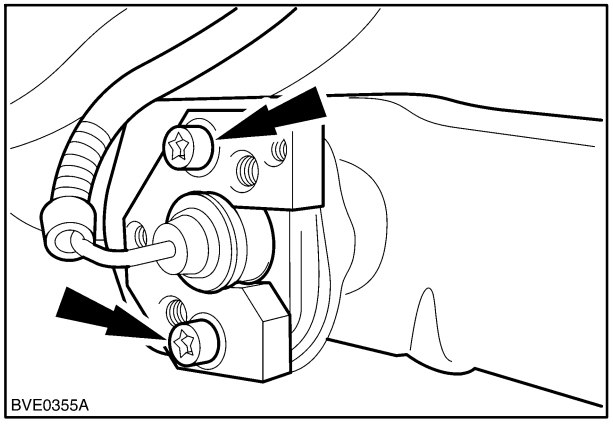
10

7. Remove the draft sensor protection plate.



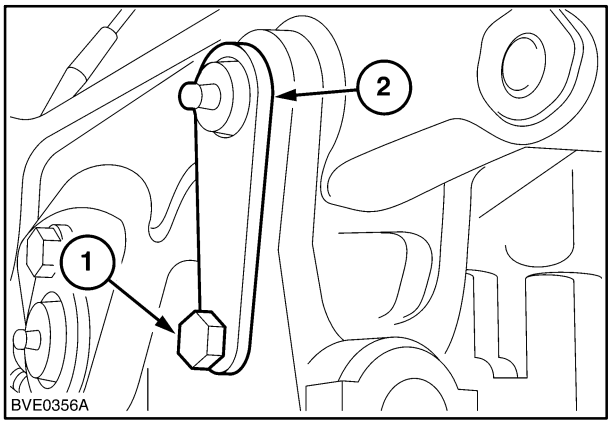
11

8. Remove the retaining bolts, slide out the draft sensor with its mounting plate and remove the lower link.



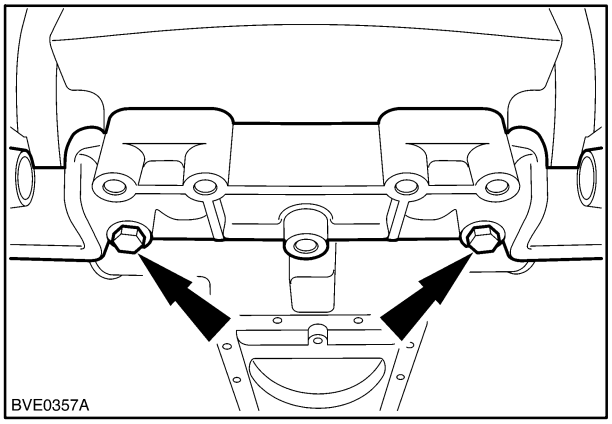
12

9. Remove the vertical tie rod pivot pin retaining bolt (1). Remove the vertical tie rod pivot pin (2) and remove the vertical tie rod.



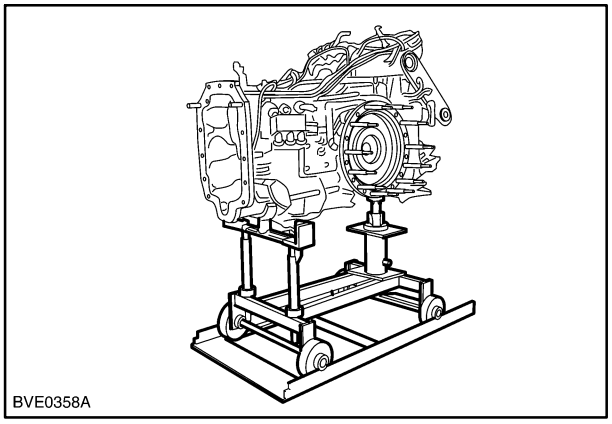
13

10. Remove the lower link support.



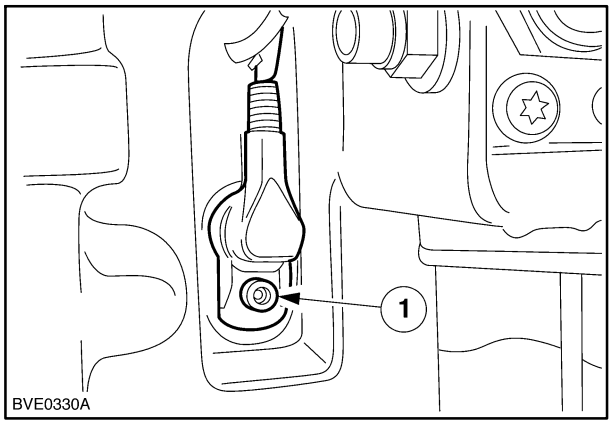
14

11. Support the rear axle on the tractor splitting kit special tool **297471** and position the support special tool **380000403** underneath the rear axle center housing.



15

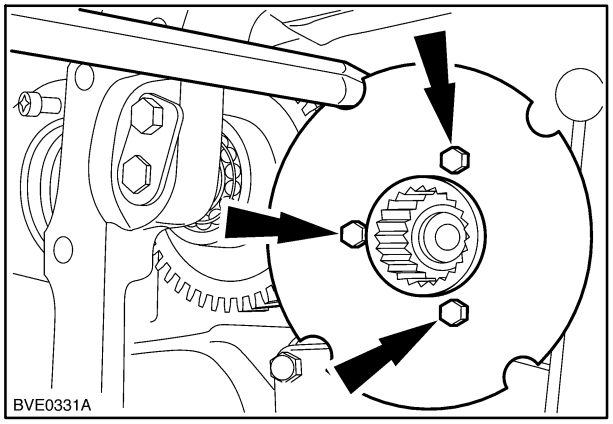
12. Remove the rear differential (refer to the mechanical rear wheel drive chapter in this section).
13. Remove the PTO torque sensor (1).



16

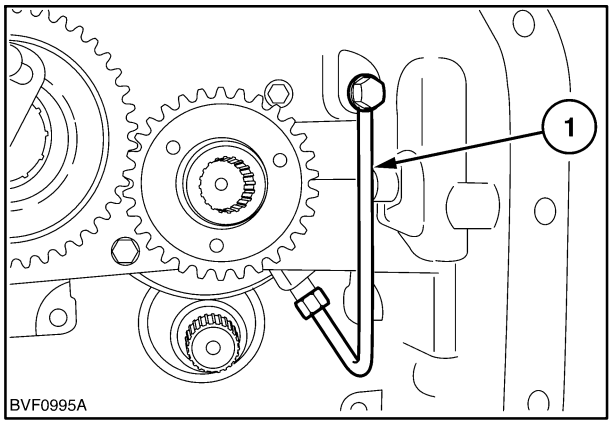
NOTE: *Use a suitable bar to hold the PTO torque sensor pick up disc.*

14. Remove the PTO torque sensor pick up disc.



17

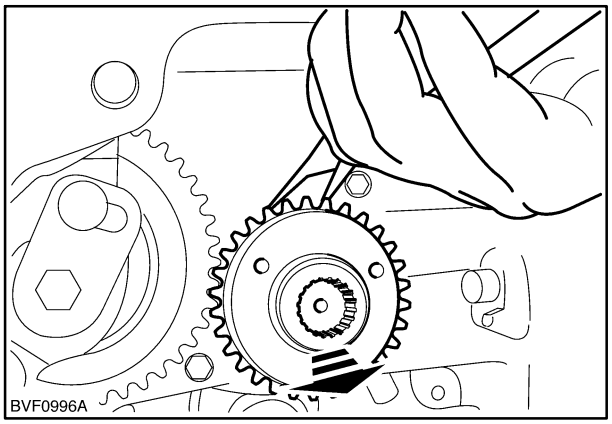
15. Remove the 50 Km/h clutch supply pipe (1).



18

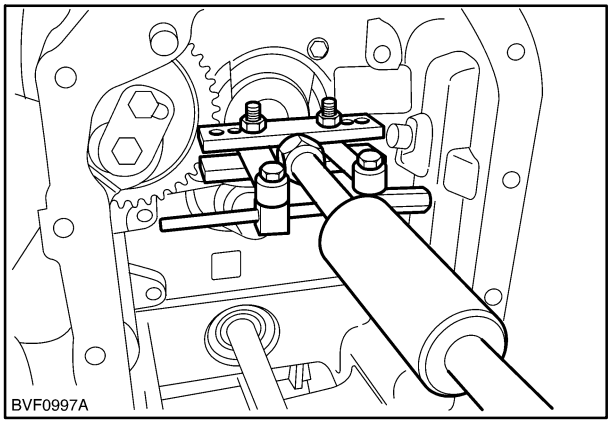
NOTE: *The PTO driveshaft bearing retaining ring must seat fully into the groove of the housing before the PTO driveshaft can be removed.*

16. Expand the retaining ring into the housing and remove the PTO driveshaft.



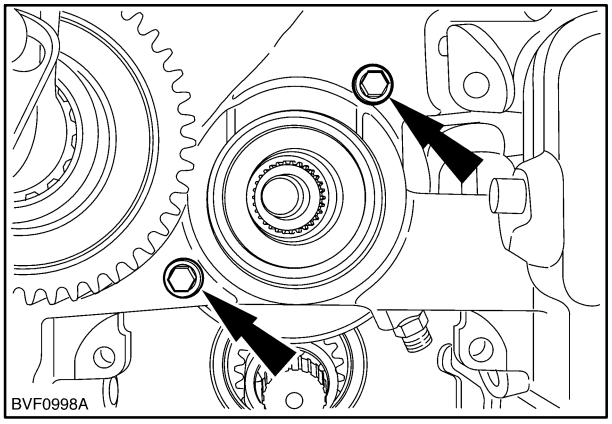
19

17. Using a suitable slide hammer/puller, remove the 50 Km/h clutch support shaft.



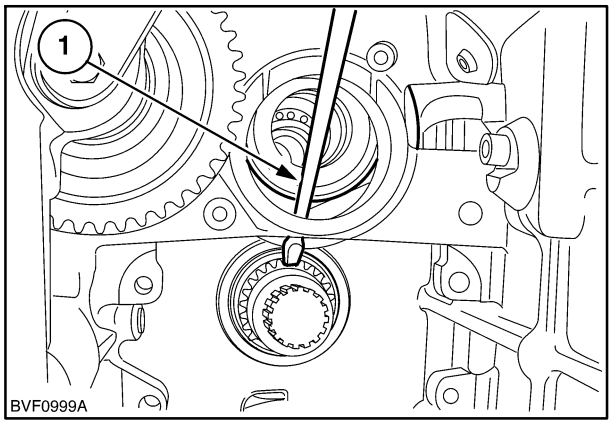
20

18. Remove the 50 Km/h clutch manifold retaining bolts.



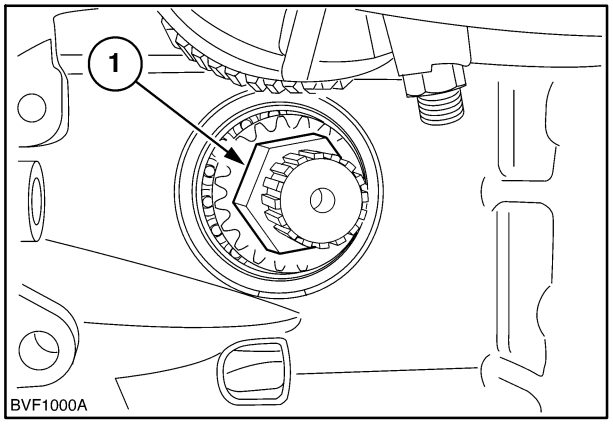
21

19. Using a suitable lever (1), reposition and support the 50 Km/h clutch to allow access to the pinion shaft retaining nut.



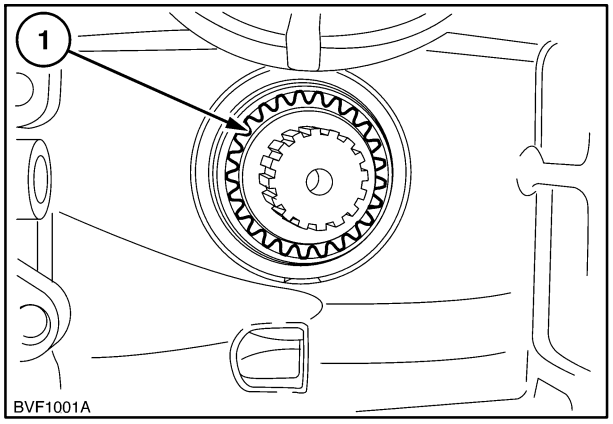
22

20. Apply the parking brake.
21. Remove the pinion shaft retaining nut (1).



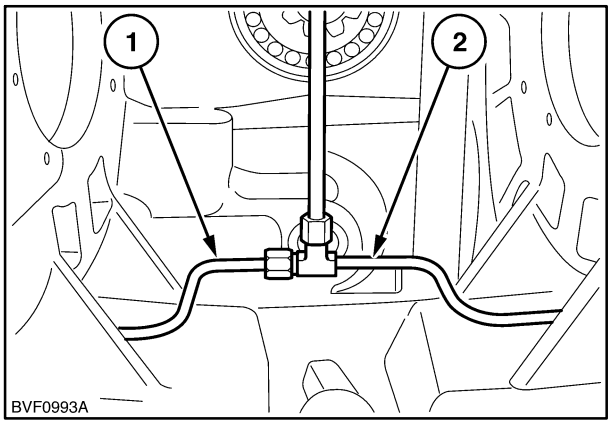
23

22. Remove the 50 Km/h driven gear (1) from the pinion shaft.



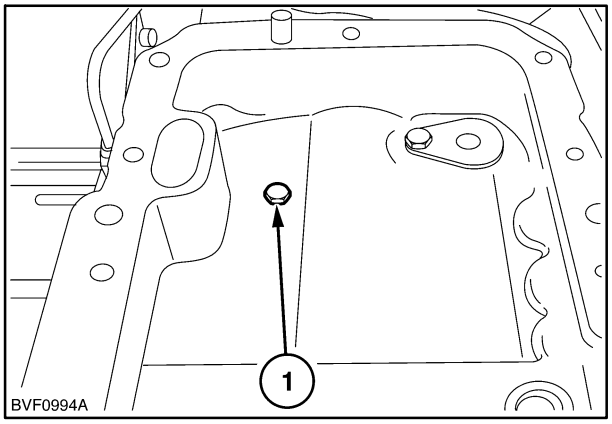
24

23. Remove the left hand side (1) and right hand side (2) lubrication oil supply pipes.



25

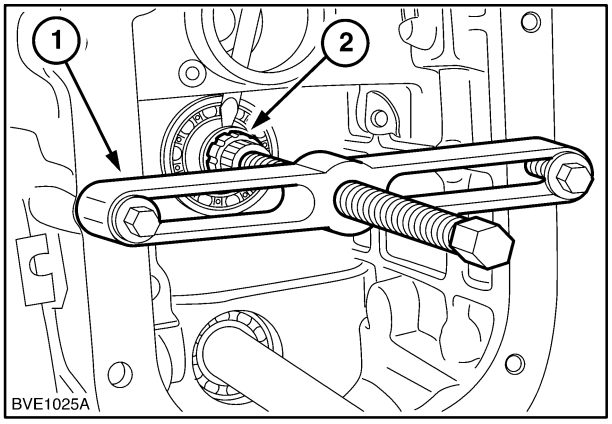
24. Remove the rear hydraulic lift (refer to the hydraulic systems section).
25. Remove the lubrication oil supply pipe retaining bolt (1).



26

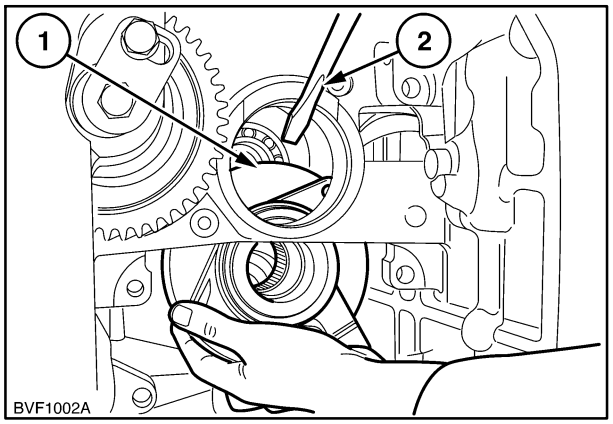
NOTE: *Only move the pinion shaft enough to allow the removal of the 50Km/h clutch.*

26. Using a universal puller (1), partially remove the pinion shaft (2).



27

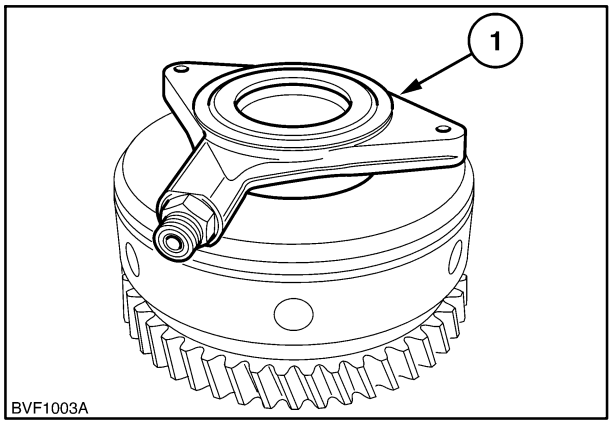
27. Support the 50 Km/h clutch (1) and remove the lever (2).
28. Remove the 50 Km/h clutch from the rear axle housing.



28

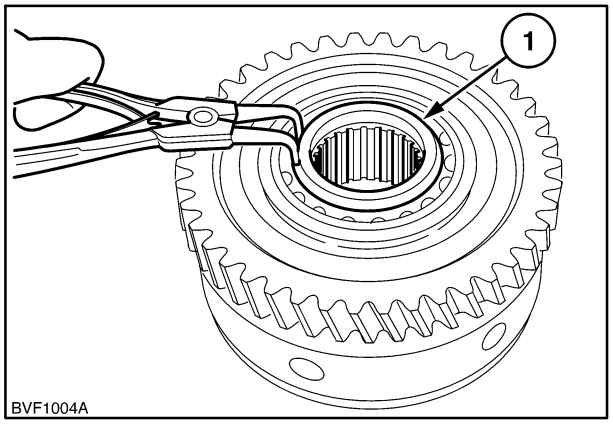
Disassembly

1. Remove the 50 Km/h clutch supply manifold (1).



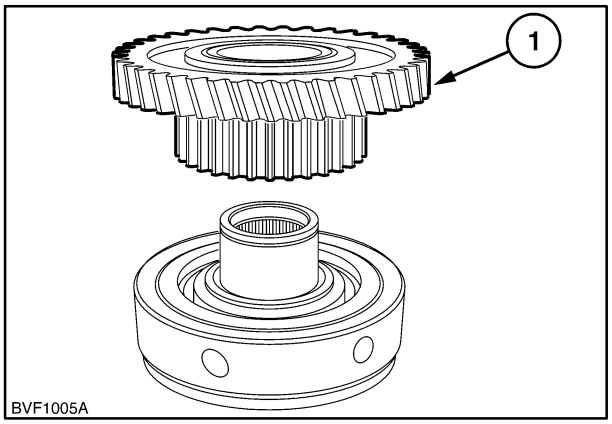
29

2. Using suitable circlip pliers, remove the 50 Km/h drive gear/hub retaining circlip (1).



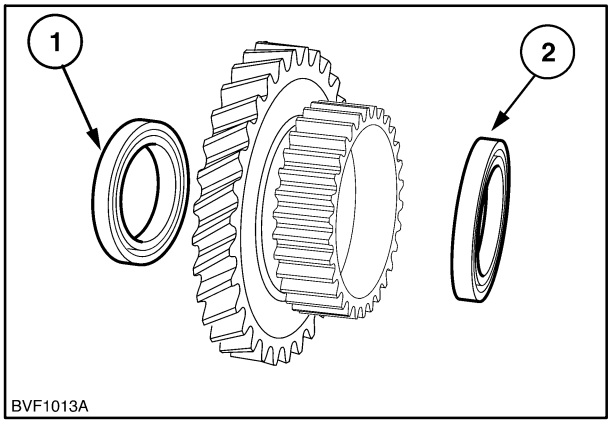
30

3. Remove the 50 Km/h drive gear/hub (1).



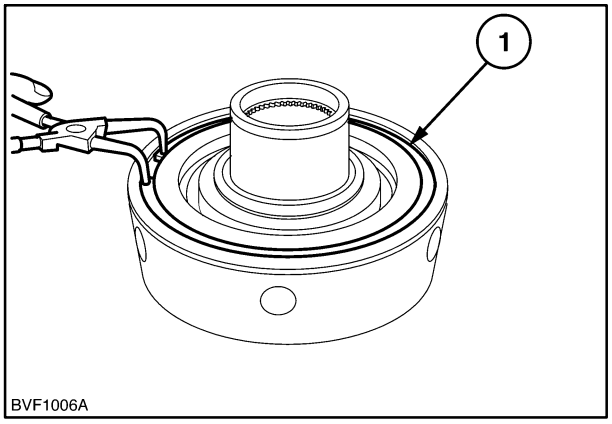
31

4. Remove the 50 Km/h drive gear/hub bearings (1) and (2).



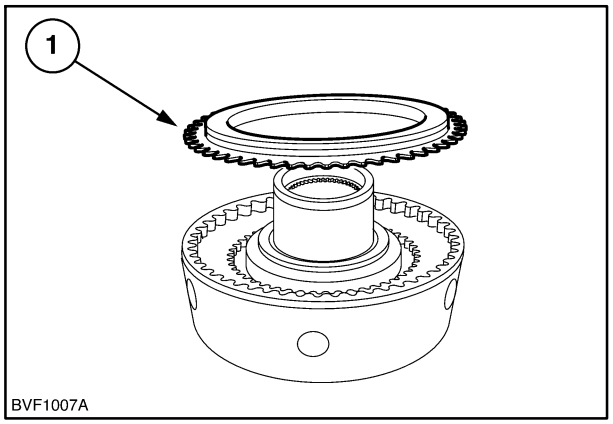
32

5. Remove the 50 Km/h clutch end plate retaining circlip (1).



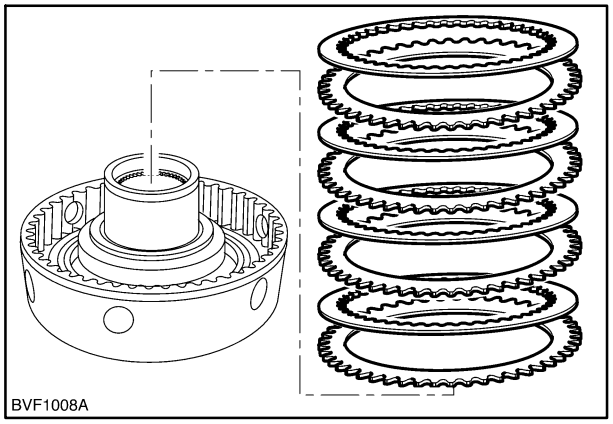
33

6. Remove the 50 Km/h clutch end plate (1).



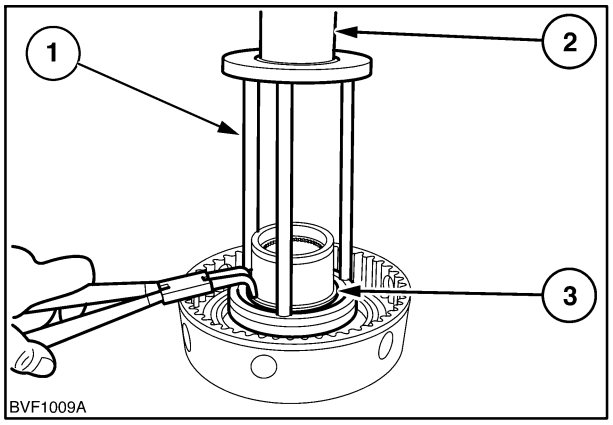
34

7. Remove the four steel plates and the four friction discs.



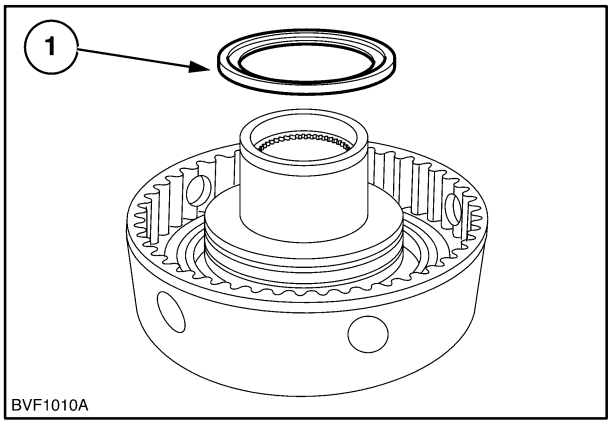
35

8. Using special tool **295021** (1) and a suitable hydraulic press (2), compress the belleville washers and remove the retaining circlip (3).



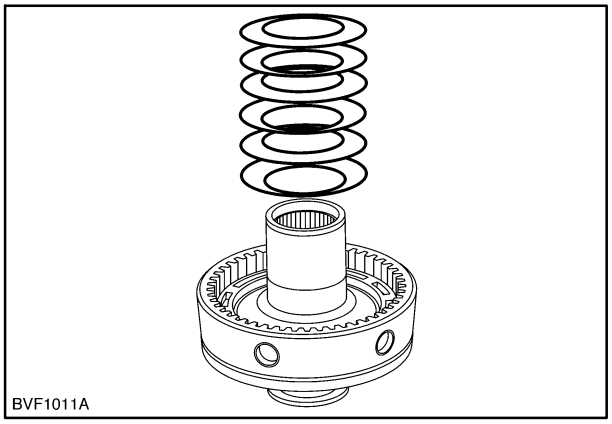
36

9. Remove the circlip retainer (1).



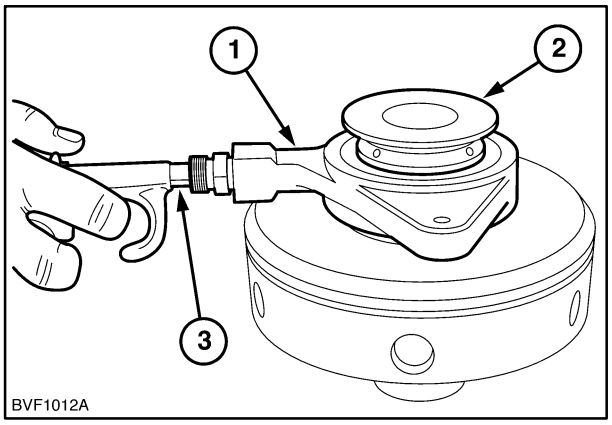
37

10. Remove the six belleville washers.



38

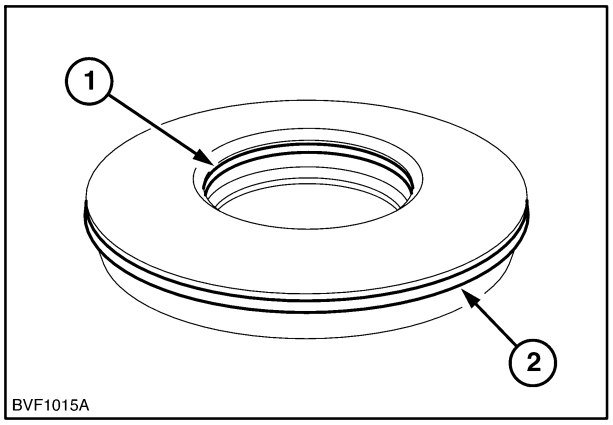
11. Install the 50 Km/h manifold (1) and the support shaft (2).
12. Supply compressed air into the manifold (3) to remove the piston.
13. Inspect all 50 Km/h clutch components for wear and damage and replace as necessary.



39

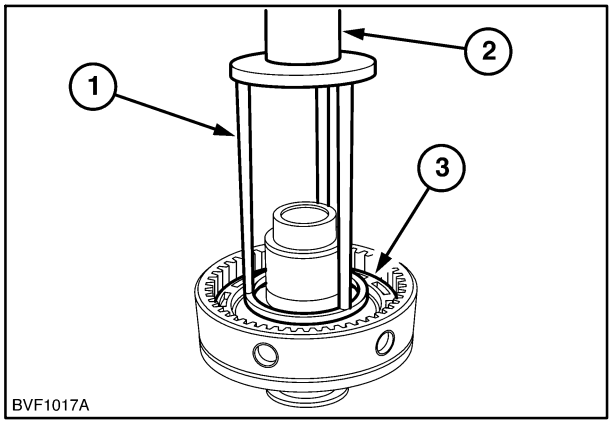
Assembly

1. Install new piston oil seals (1) and (2).



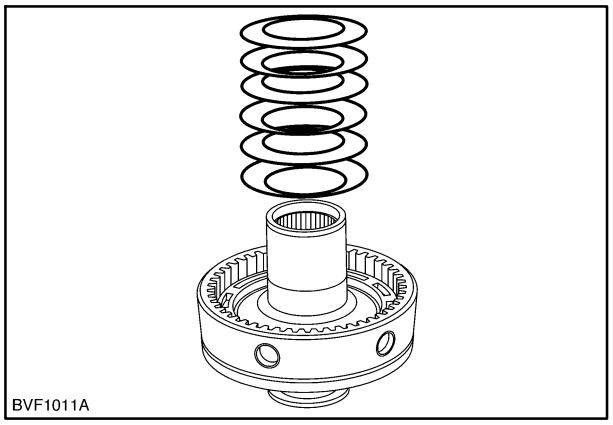
40

2. Using the special tool **295021** (1) and a suitable hydraulic press (2), install the piston (3).



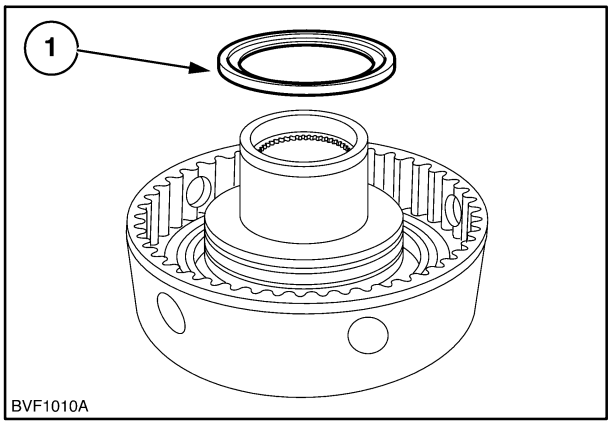
41

3. Install the six belleville washers.



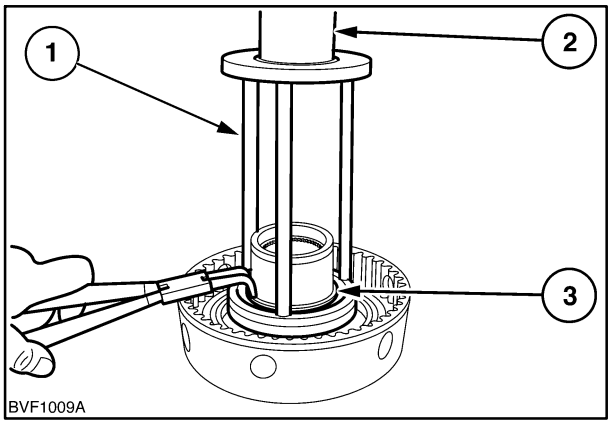
42

4. Install the circlip retainer (1).



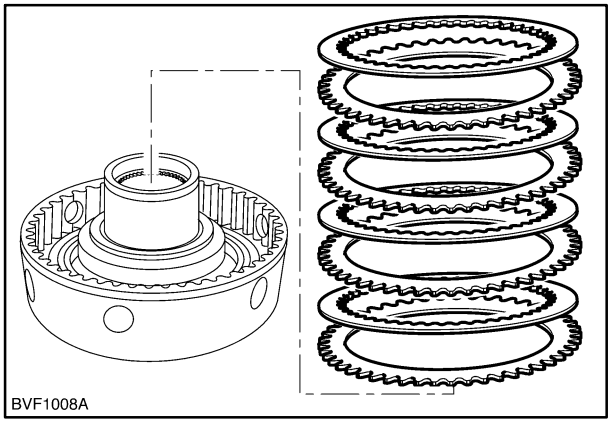
43

5. Using the special tool **295021** (1) and a suitable hydraulic press (2), compress the belleville washers and install the retaining circlip (3).



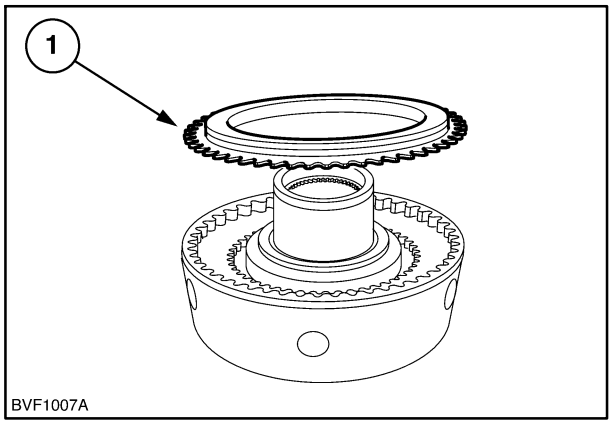
44

6. Install the four steel plates and the four friction discs.



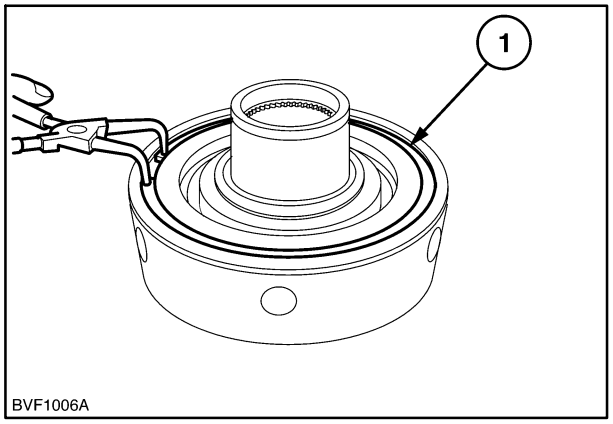
45

7. Install the 50 Km/h clutch end plate (1).



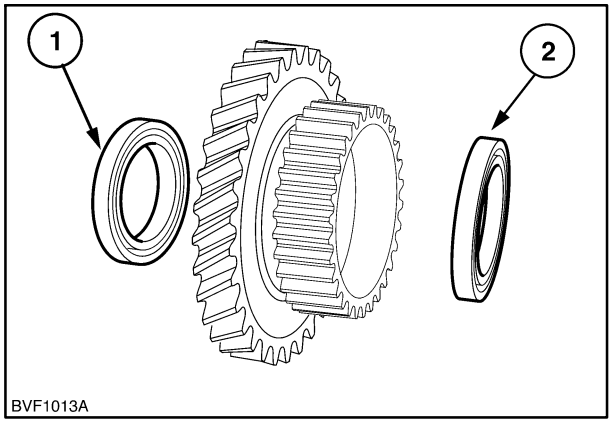
46

8. Using suitable circlip pliers, install the 50 Km/h clutch end plate retaining circlip (1).



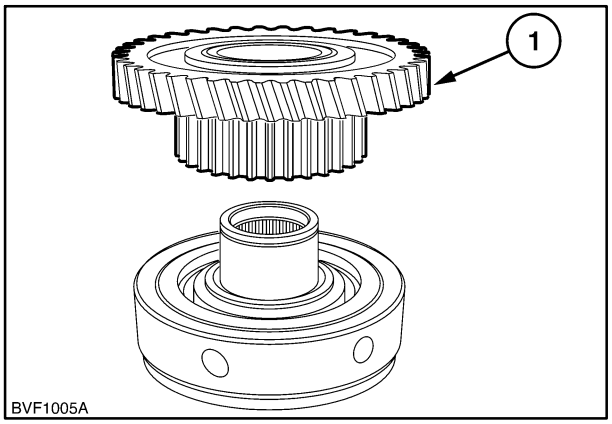
47

9. Install the 50 Km/h drive gear/hub bearings (1) and (2).



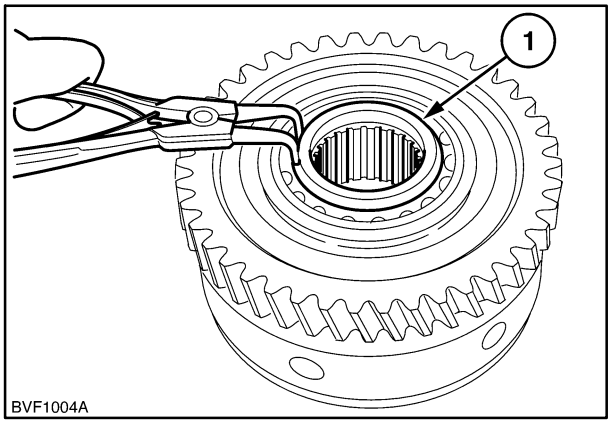
48

10. Install the 50 Km/h drive gear/hub (1).



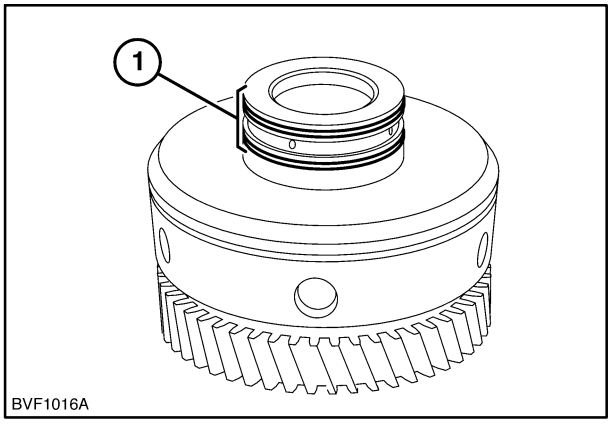
49

11. Using suitable circlip pliers, install the 50 Km/h drive gear/hub retaining circlip (1).



50

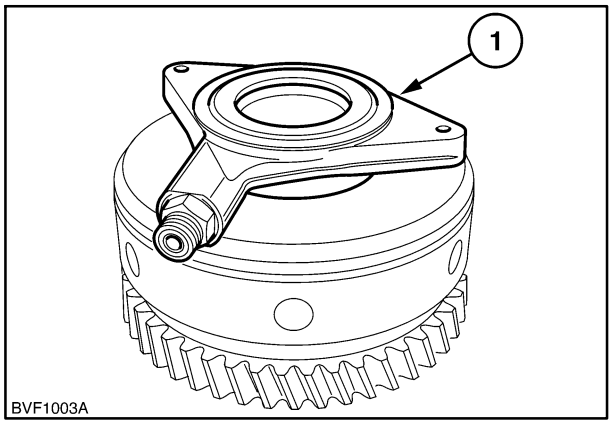
12. Install new annular sealing rings (1)



51

NOTE: *Make sure the machined face of the manifold is facing away from the 50 Km/h clutch.*

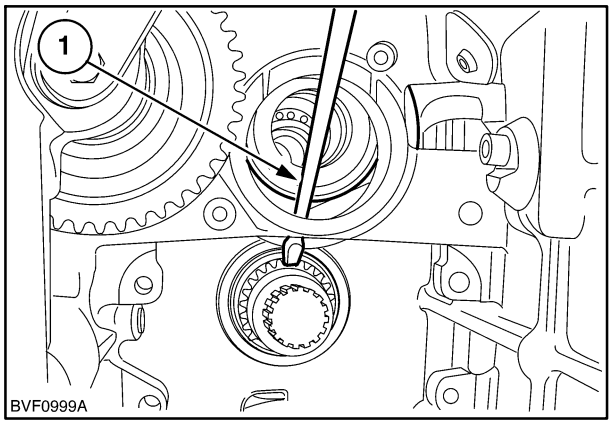
13. Install the 50 Km/h clutch supply manifold (1).



52

Installation

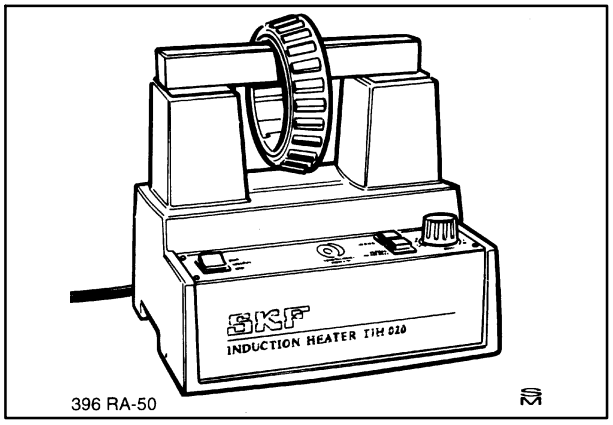
1. Install the 50 Km/h clutch into the rear axle housing and support with a suitable lever (1).



53

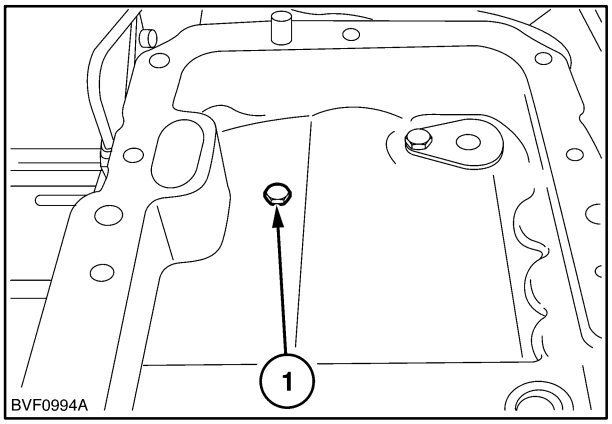
NOTE: *The use of an electronic induction heater will assist in the installation of the bearing.*

2. Install the bearing onto the pinion shaft.



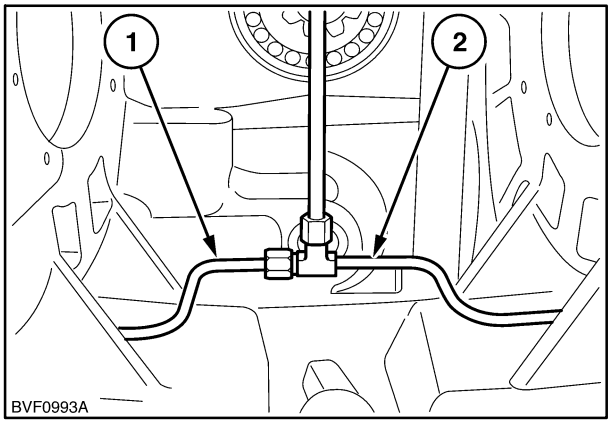
54

3. Install the lubrication oil supply pipe and retaining bolt (1).



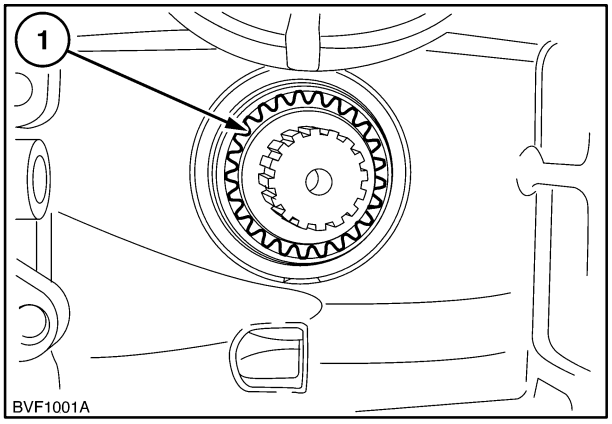
55

4. Install the right hand side (2) and the left hand side (1) lubrication oil supply pipe.
5. Install the rear hydraulic lift (refer to the hydraulic systems section).



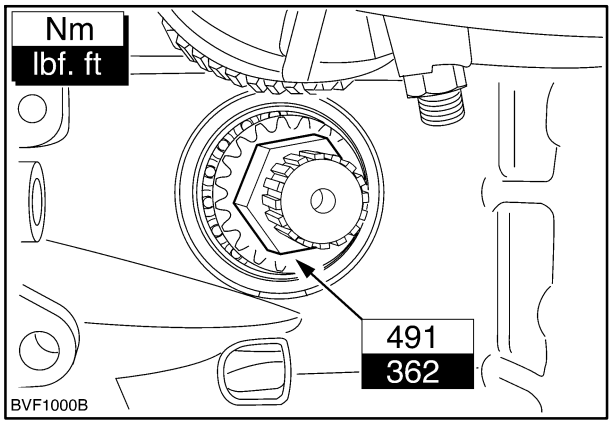
56

6. Install the 50 Km/h driven gear (1) onto the pinion shaft.



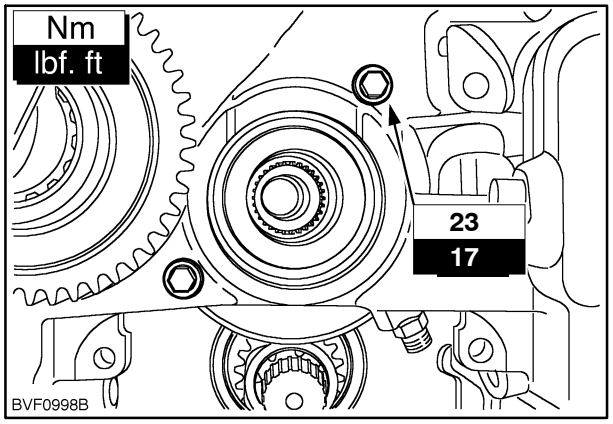
57

7. Apply the parking brake.
8. Install the pinion shaft retaining nut and tighten to the specified torque value.
9. Stake the retaining nut in four places.



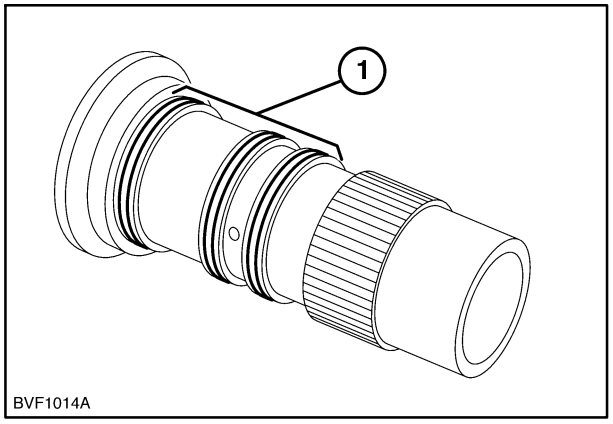
58

10. Remove the lever supporting the 50 Km/h clutch and position the manifold retaining bolt holes in line with the holes in the rear axle housing.
11. Install the 50 Km/h clutch manifold retaining bolts and tighten to the specified torque value.



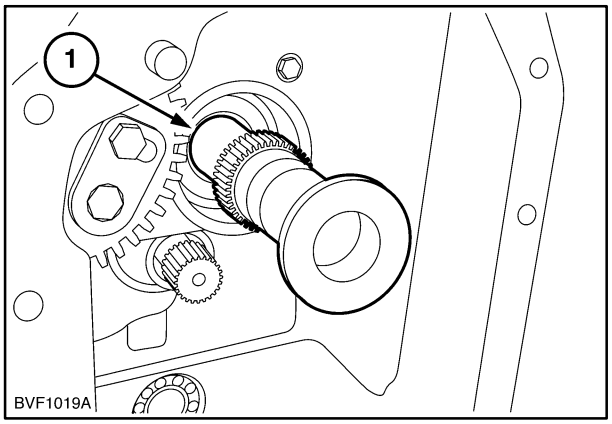
59

12. Install new 50 Km/h support shaft O–rings (1).



60

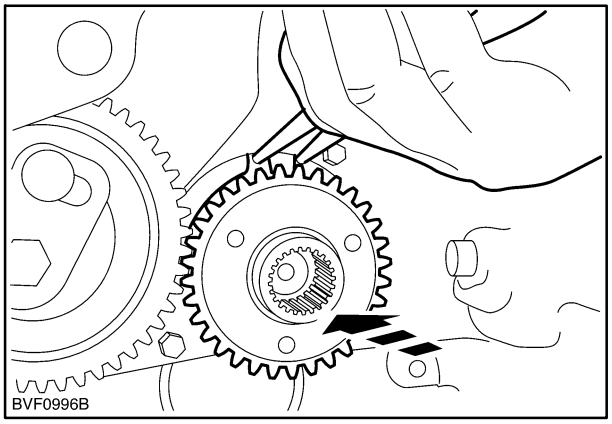
13. Install the 50 Km/h clutch support shaft (1).



61

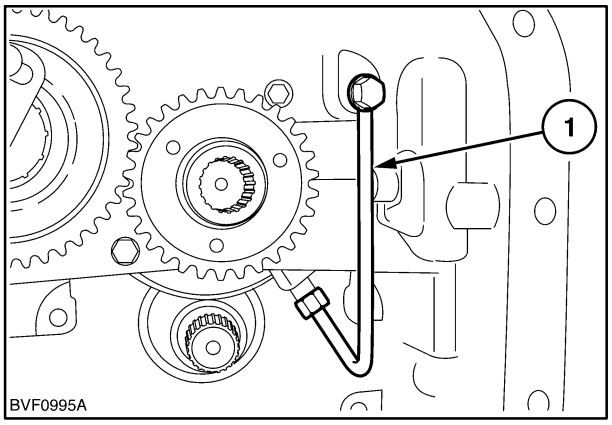
NOTE: *The PTO driveshaft bearing retaining ring must seat fully into the groove of the bearing.*

14. Expand the retaining ring into the housing and install the PTO driveshaft.



62

15. Install the 50 Km/h clutch supply pipe (1).

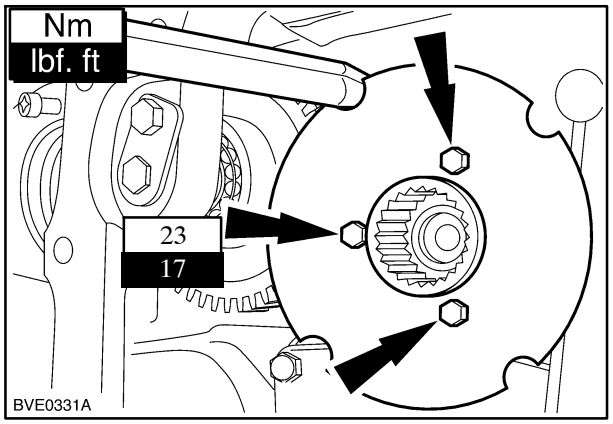


63

NOTE: *Use a suitable bar to hold the PTO torque sensor pick up disc.*

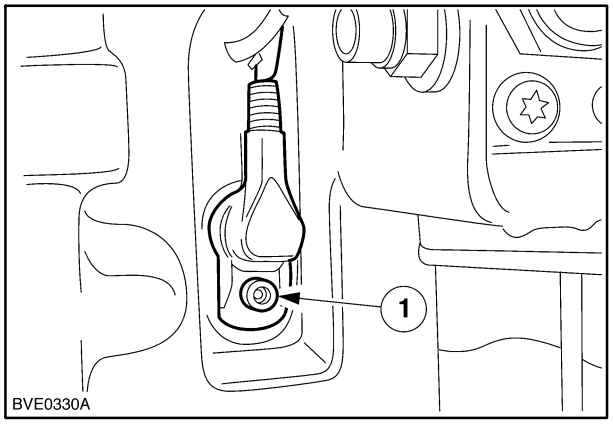
NOTE: *Apply loctite 242 onto the retaining bolt threads.*

16. Install the PTO torque sensor pick up disc.



64

17. Install the PTO torque sensor (1).

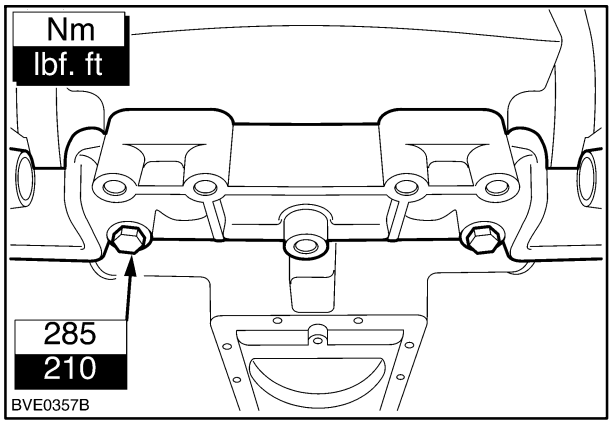


65

18. Install the lower link support to the rear axle housing taking the following into consideration:

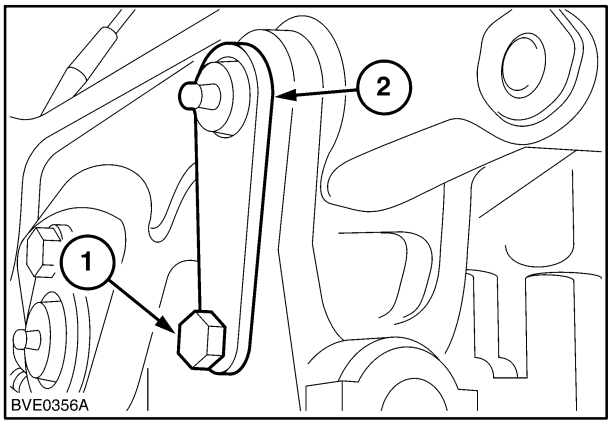
- Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2 mm in diameter to the rear axle housing.

19. Install the lower link support. Tighten the retaining bolts to the specified torque value.



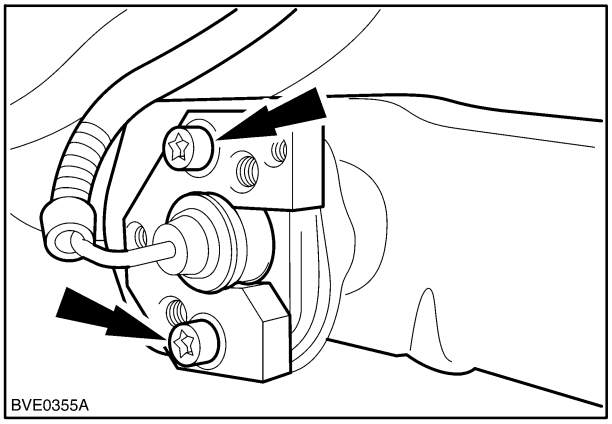
66

20. Position the vertical tie rod. Install the vertical tie rod pivot pin (2). Install the vertical tie rod pivot pin retaining bolt (1).



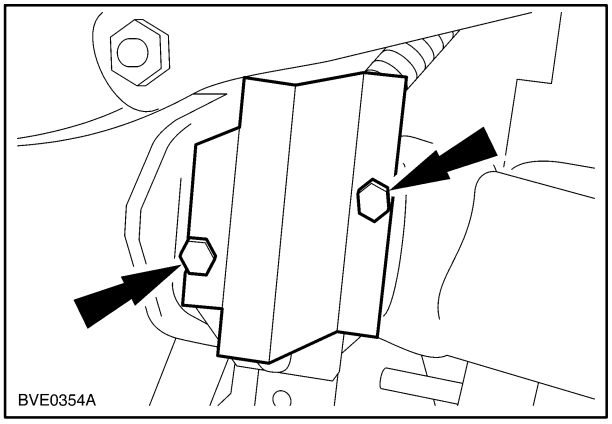
67

21. Position the lower link. Install the draft sensor with its mounting plate and install the retaining bolts.



68

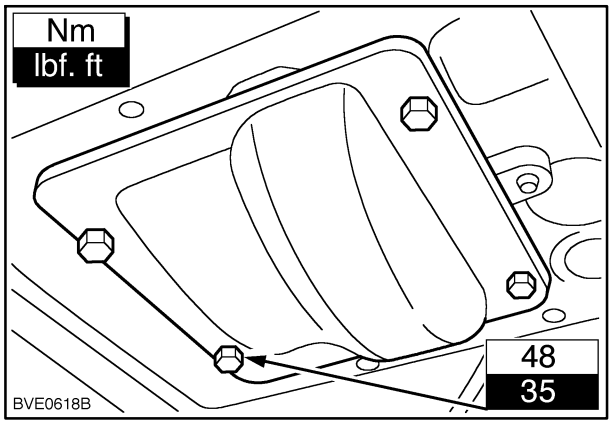
22. Install the draft sensor protection plate (1).



69

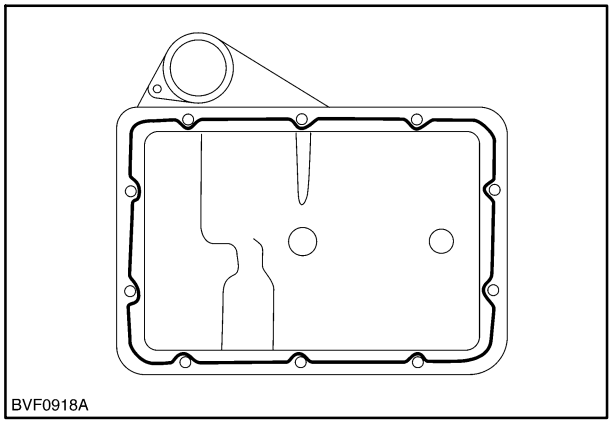
NOTE: *Apply loctite 242 onto the retaining bolt threads.*

23. Install the four wheel drive clutch inner cover. Tighten the retaining bolts to the specified torque value.



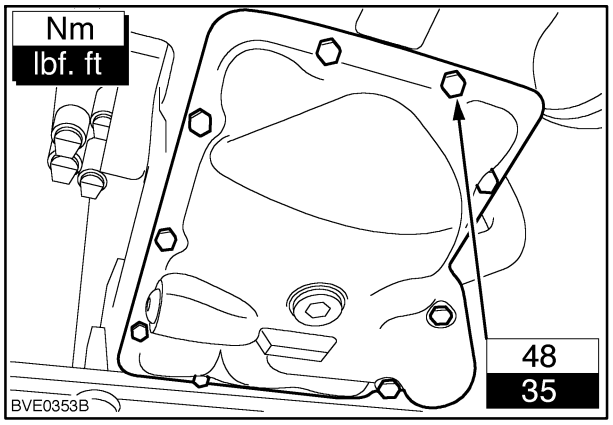
70

24. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



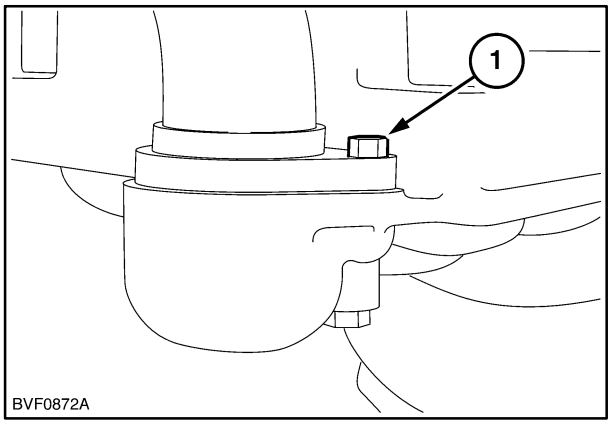
71

25. Install the rear axle bottom cover. Tighten the retaining bolts to the specified torque value.



72

26. Install the oil supply tube retaining bolt (1).
27. Install both final drive cases (refer to final drive case installation in this chapter).
28. Install the PTO housing. (refer to PTO housing installation in the PTO section).
29. Install the transmission, engine and front support to the rear axle. (refer to installing transmission, engine and front support to the rear axle chapter of the separating the tractor section).



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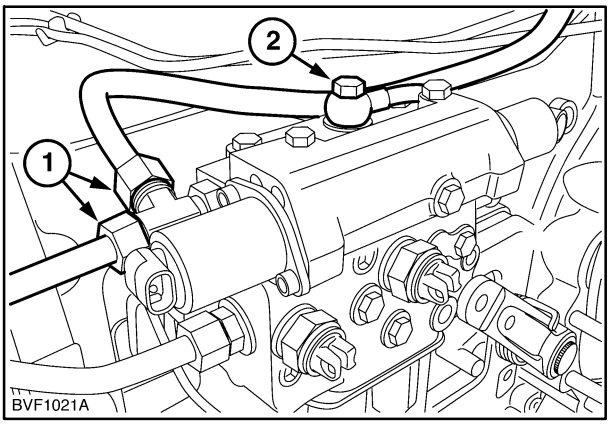
50KM/H SOLENOID VALVE BLOCK

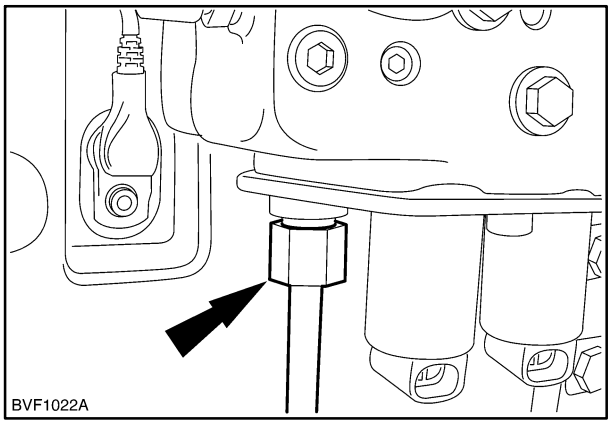
Removal

1. Remove the fuel tank (refer to the fuel tank removal chapter in the engine section).
2. Disconnect the oil supply pipes (1) and remove the oil supply pipe banjo bolt (2).



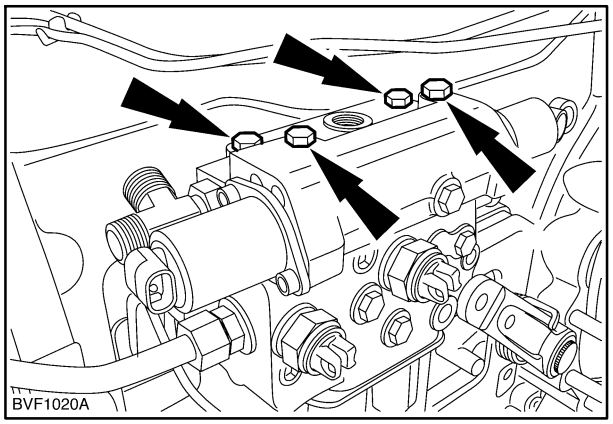
74

3. Remove the oil supply pipe.



75

4. Remove the 50 Km/h solenoid valve block retaining bolts.



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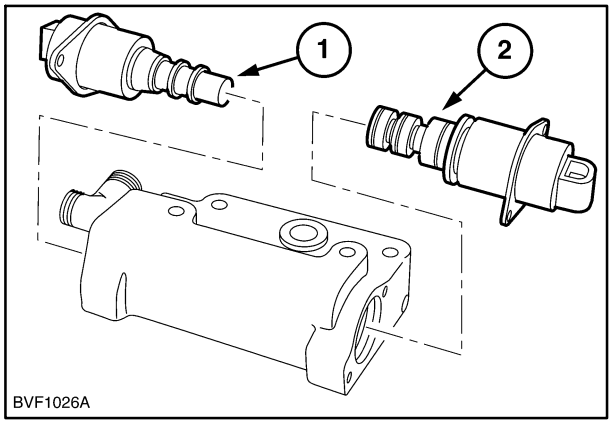
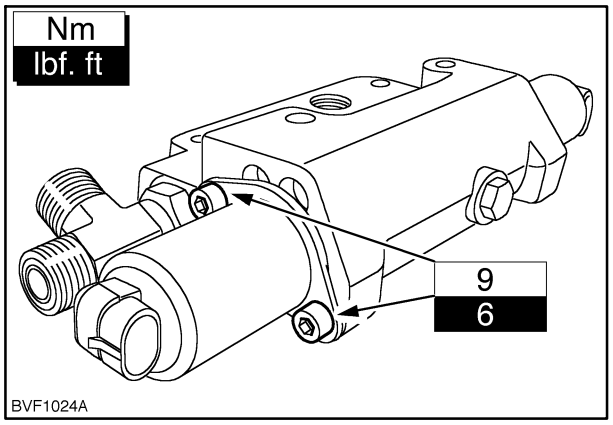
Disassembly/Assembly

1. Remove the 50 Km/h engage/drive PWM solenoid valve.
2. Remove the dump solenoid valve.
3. Inspect all 50 Km/h solenoid valve block components for wear and damage and replace as necessary.



77

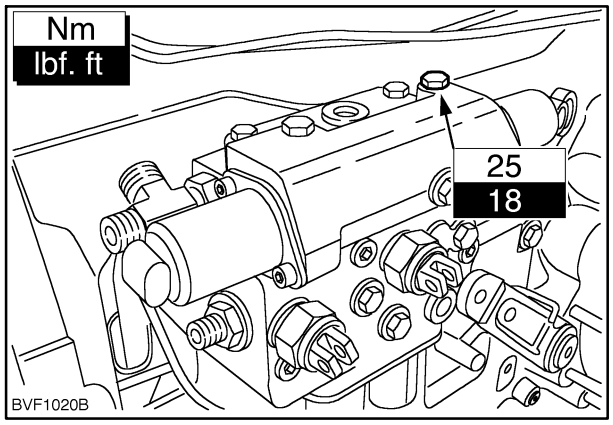
4. Install the solenoid retaining bolts and tighten to the specified torque value.



78

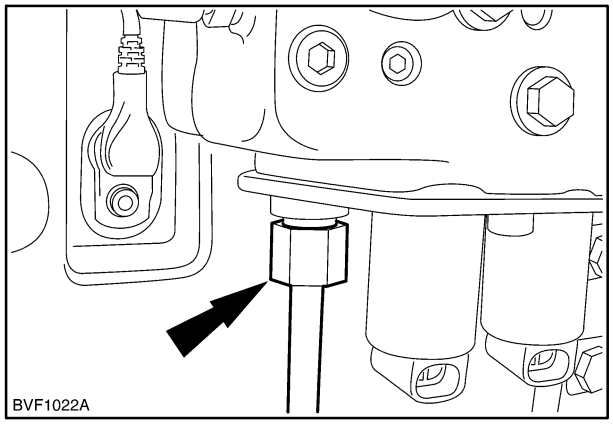
Installation

1. Install the 50 Km/h solenoid valve block retaining bolts and tighten to the specified torque value.



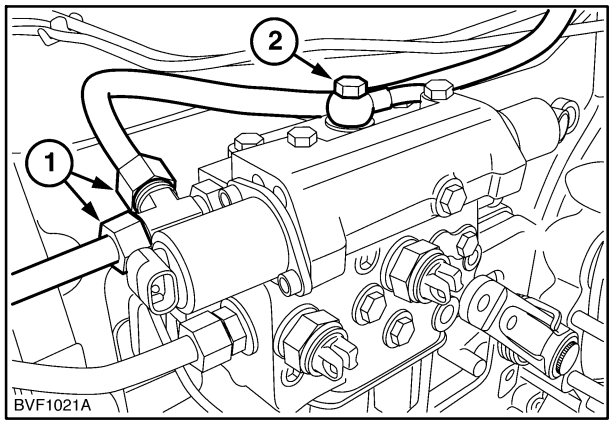
79

2. Install the oil supply pipe.



80

3. Connect the oil supply pipes (1) and install the oil supply pipe banjo bolt (2).



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NOTES

SECTION 31 - POWER TAKE-OFF

Chapter 1 - Power Take-Off

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	Tightening Torques	4
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	Power Take Off (PTO)	21
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	Power Take Off 540/750/1000 Rpm	25
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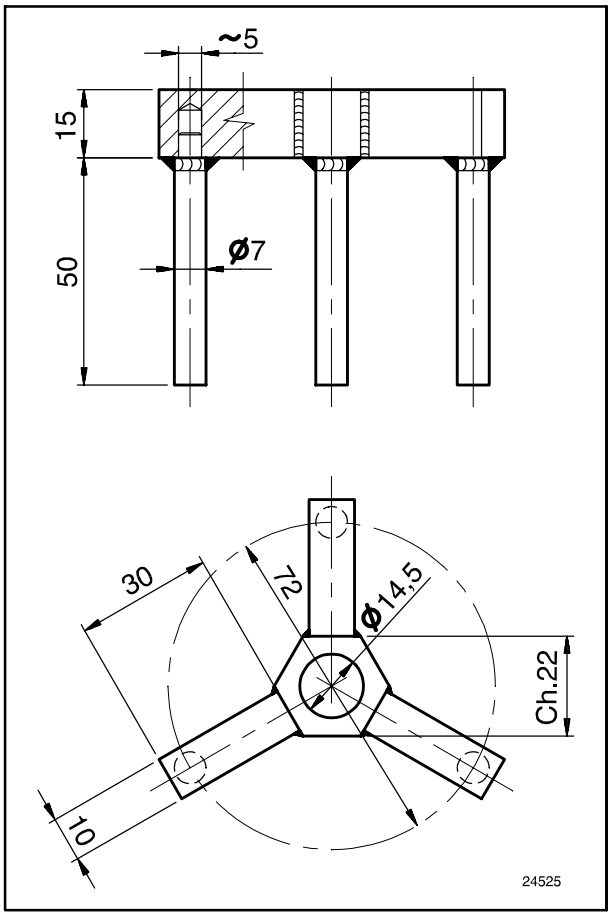
SPECIFICATIONS

Type	Fully independent 540/1000 base ISO 1+1 shaft - Shiftable lever
Type	Fully independant 540/1000 base NASO 1 shaft - Reversible shaft selection
Type	Fully independant 540/540E/1000 Opz. ISO 1+1 shaft - Shiftable lever
Clutch type	Wet multidisc
Number of plates	6
Actuation	Electrohydraulic
Selectable soft start	yes
Fender mounted switch	Optional
Number of splines	for ISO 1-3/8" 6 or 21 spline stub 2 shaft
	for NASO 1-3/8" 6 and 21 spline stub 1 shaft
Number of shafts	1+1 for ISO 1-3/8" 6 spline base - Opz 21 spline
	1 reversible for NASO base 1-3/8" 6 and 21 spline
Engine speed at PTO speed:	
540 rpm	1969 RPM
540 economy rpm	1546 RPM
1000 rpm	2120 RPM
PTO speed at engine rated speed:	
540 rpm	603 RPM
540 economy rpm	768 RPM
1000 rpm	1222 RPM
Driven Gear Bush OD (9, pages 4 and 5) mm	47.910 to 47.966
Driven Gear ID (8) mm	48.050 to 48.089
Gears to Bushes Free Play mm	0.084 to 0.179
Driven Shaft Diameter (11, pages 4 and 5) mm	39.975 to 40.000
Bush ID (9) mm	40.009 to 40.034
Shaft to Bushes Free Play mm	0.009 to 0.059
Number of Clutch Discs: n.	6
Drive Disc Thickness: mm	1.60 to 1.70
Driven Disc Thickness mm	2.15 to 2.25
Number of Clutch Engagement Springs n.	8
Brake	Hydraulically controlled brake band acting on the clutch bell housing

SPECIAL TOOLS

The PTO can be overhauled using proprietary special tools purchased from a good tool retailer.

If required the bellville spring compressor tool 50063 can be maufactured to assist in disassembly but this is not essential.

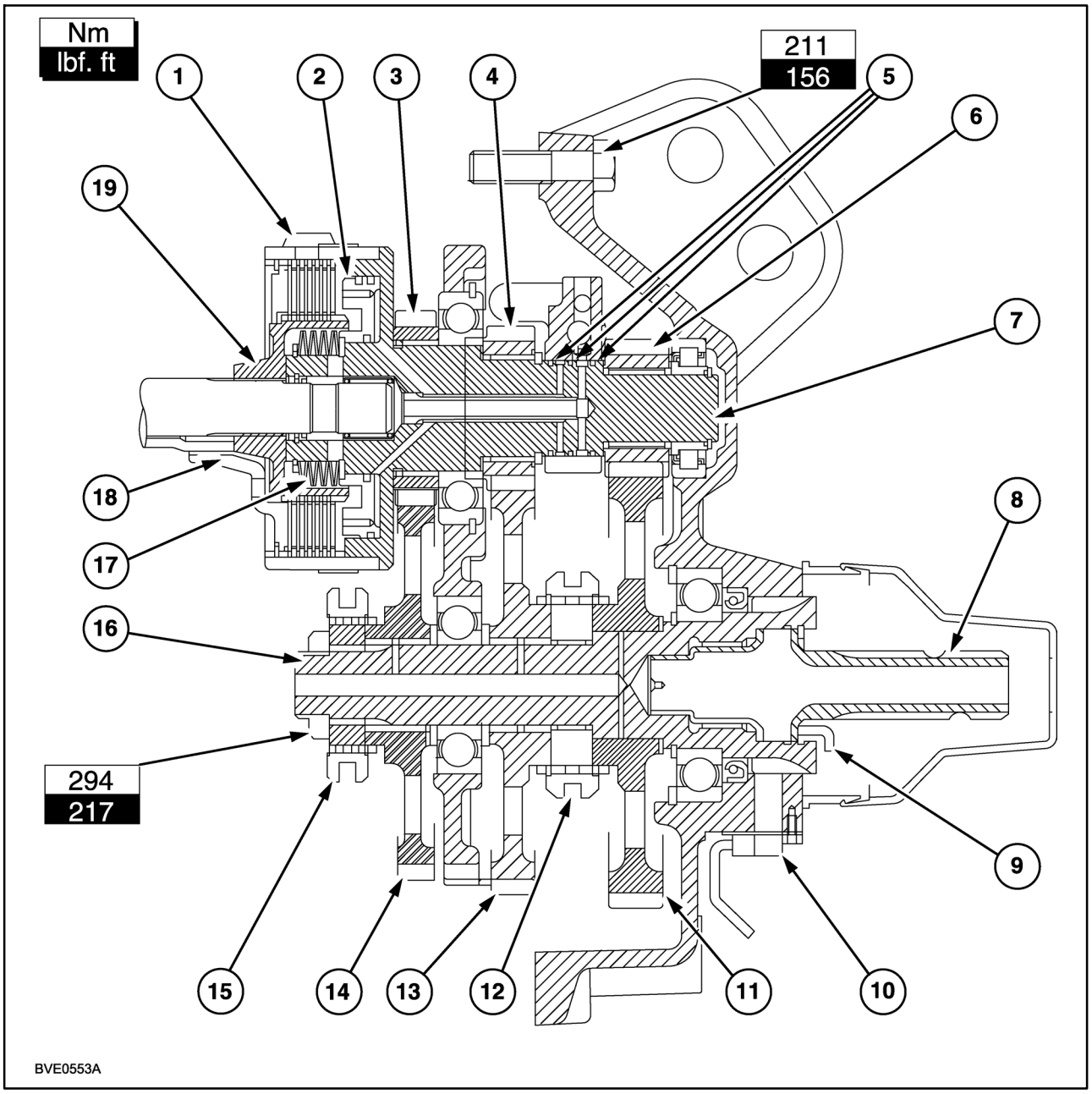


1

PTO hydraulic clutch bellville spring compressor (Mark tool with no. 50063. Dimensions in mm.)

Fabricate tool using Fe42C material.

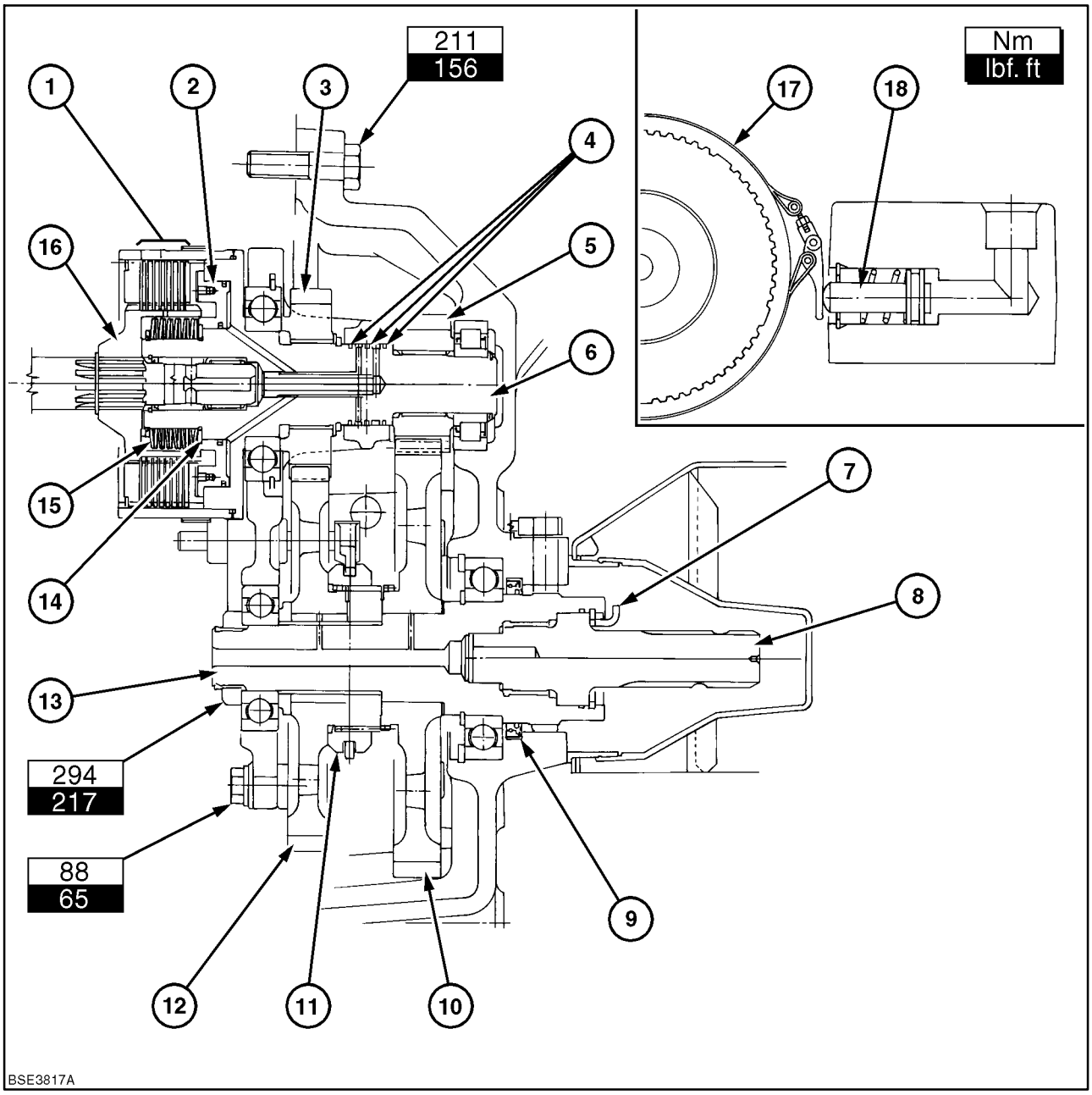
TIGHTENING TORQUES



2

540 / 750 / 1000 RPM PTO Sectional View and Torque Values

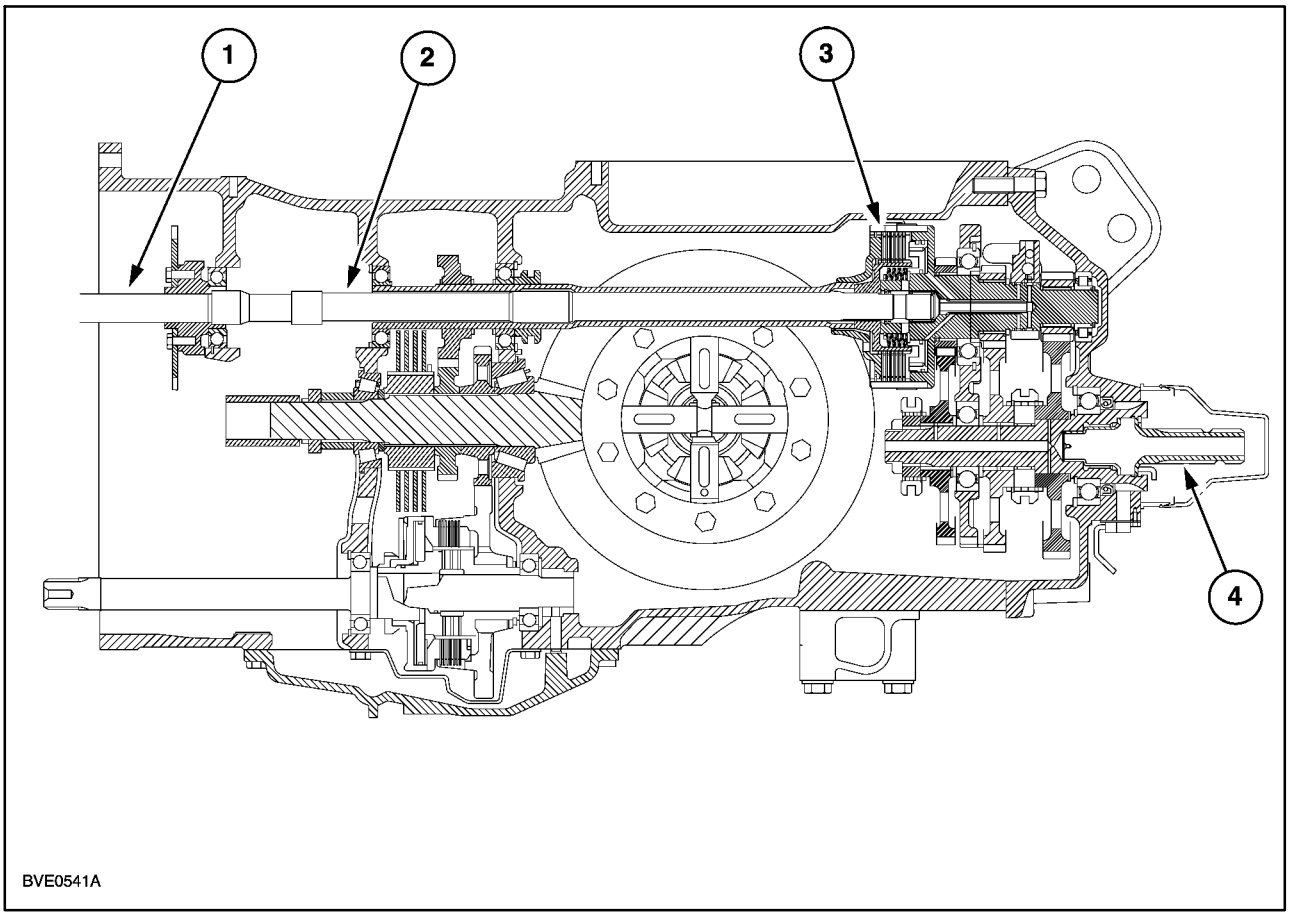
1. Clutch Plates and Separator Discs
2. Piston
3. 1000 RPM Drive Gear
4. 750 RPM Drive Gear
5. Shaft Seals
6. 540 RPM Drive Gear
7. Clutch Housing Shaft
8. PTO Output Shaft
9. Retaining Ring
10. PTO Speed Sensor



3

540 / 1000 RPM PTO Sectional Views and Torque Values

1. Clutch Plates and Separator Discs
2. Piston
3. 1000 RPM Drive Gear
4. Shaft Seals
5. 540 RPM Drive Gear
6. Clutch Housing Shaft
7. Retaining Ring
8. PTO Output Shaft
9. Oil Seal
10. 540 RPM Driven Gear
11. 540 / 1000 RPM Coupler
12. 1000 RPM Driven Gear
13. Driven Shaft
14. Washer
15. Bellville Springs
16. Clutch Hub
17. Brake Band
18. Brake Piston



4

540 / 750 / 1000 RPM PTO Drive

1. Splined shaft from the engine flywheel
2. Splined shaft to the PTO clutch
3. PTO Clutch
4. PTO Output Shaft

DESCRIPTION AND OPERATION

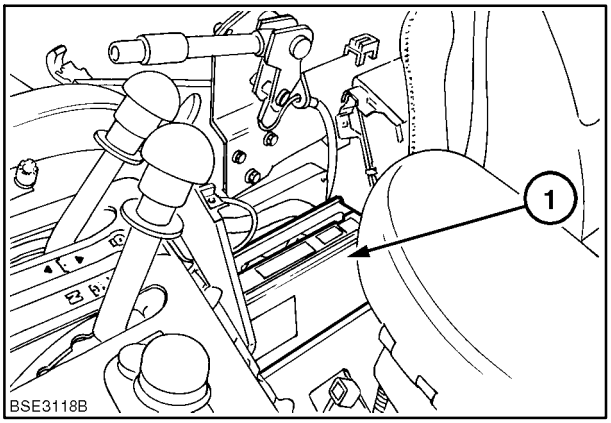
The power take-off (PTO) transfers engine power directly to mounted, semi-mounted or trailed equipment via a splined shaft at the rear of the tractor.

The PTO drive shaft runs through the transmission upper shafts. The PTO drive shaft front end is directly splined to the engine flywheel damper, the rear end is connected to the PTO control clutch.

The rear PTO is controlled by the controller (1) located behind the operators seat.

The controller receives inputs from the PTO ON/OFF switches, (in cab and fender), PTO speed sensor, brake, soft start and the engine controller. These signals are then used to provide the output signals to the PTO clutch engagement solenoid, P.T.O brake solenoid and the PTO ON/OFF overspeed warning lamp.

If the correct conditions are met, ie, speed parameters and switch engagements then the PTO is allowed to start.



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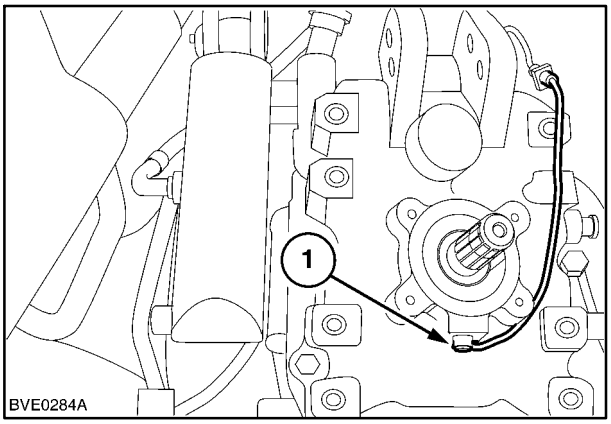
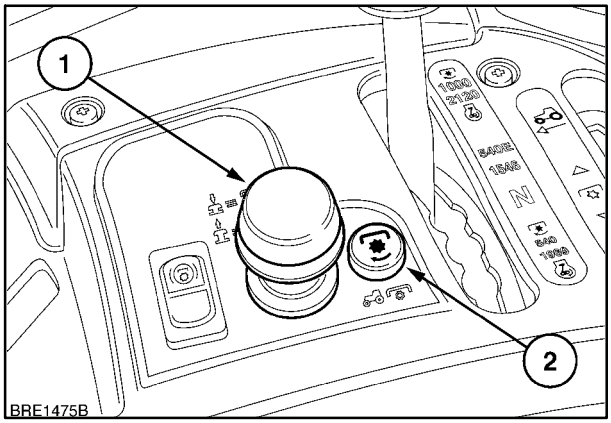
The PTO speed sensor (1) is located below the PTO output shaft.



6

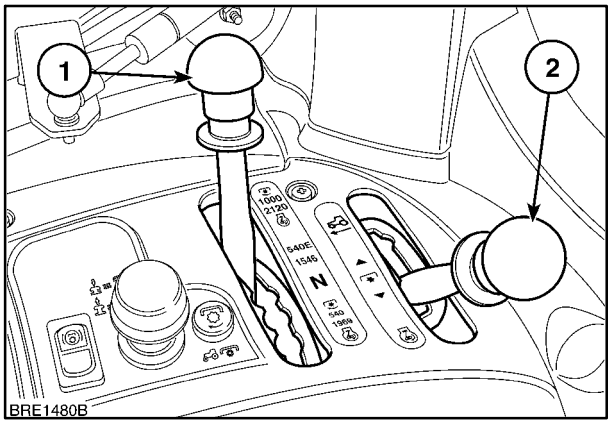
The P.T.O. is engaged and disengaged by means of a knob (1) on the right-hand console. The adjacent warning light (2) will illuminate when the P.T.O. is engaged.



7

With shiftable P.T.O., a range lever is provided. The lever is used to select one of two or three P.T.O. speed ranges to provide power or economy. The range lever (1), is located at the rear of the right-hand console.

Ground drive P.T.O. is available, in conjunction with 3-speed, shiftable P.T.O., on all models. As suggested by the name, ground drive P.T.O. speed is directly related to rotation of the rear wheels rather than engine speed. When ground drive P.T.O. is installed, a second lever (2) is provided.

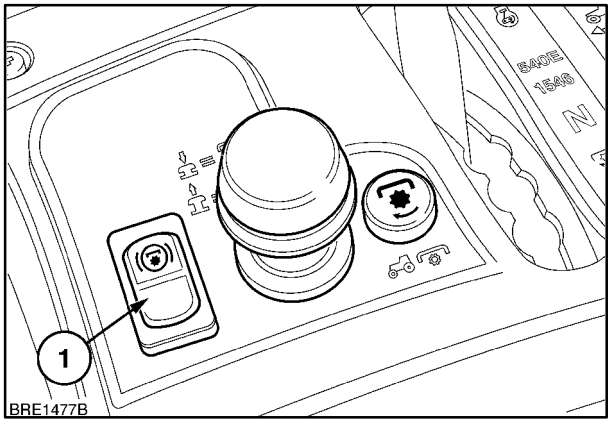


8

IMPORTANT: *An automatic PTO brake is installed to stop shaft rotation quickly when the PTO is disengaged. To avoid overstressing the PTO brake, slow down the implement by reducing engine speed* ***before*** *disengaging the PTO. This is particularly important with implements having a high inertia. Such implements should, ideally, be fitted with an overrun clutch. To avoid damage to the brake when operating high inertia implements, hold down the switch (1), to disengage the brake and allow the implement to come to rest naturally.*

DANGER

To avoid inadvertent movement of the implement, disengage the PTO after each use.



9

EXTERNAL PTO CONTROLS (EXCEPT N. AMERICA)

An optional, fender-mounted PTO switch (1), may be installed on the outer surface of both rear fenders to aid alignment of the P.T.O shaft splines with equipment and facilitate stationary PTO operations.

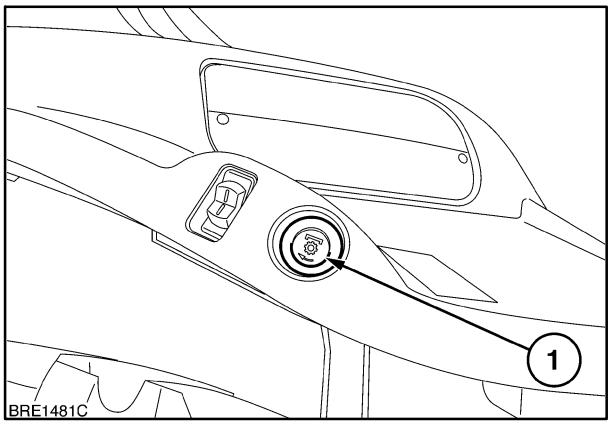
With the engine running, touch the switch momentarily to cause the PTO shaft to index round to align the shaft splines. If the switch is pressed for less than 5 seconds, the shaft will stop turning when the switch is released.

Press and hold in the switch for more than 5 seconds and the PTO will operate continuously. Press the switch again to stop the PTO Alternatively, the PTO may be stopped by means of the in-cab controls, as previously described.

NOTE: *The warning light, on the PTO control panel, will illuminate when the PTO is engaged, momentarily or permanently.*

NOTE: *The PTO may be engaged or disengaged from the fender switch, whether the in-cab control is in the on or off position.*

NOTE: *The soft start function will operate irrespective of whether the P.T.O. is engaged from inside the cab or from a fender switch.*



10

⚠ CAUTION ⚠

Before leaving the tractor to operate the external Power Take Off switches:

- Move the gearshift levers to neutral.
- Disengage the PTO
- Apply the parking brake.

With the engine running, move the hand throttle lever to the low idle position (fully rearwards).

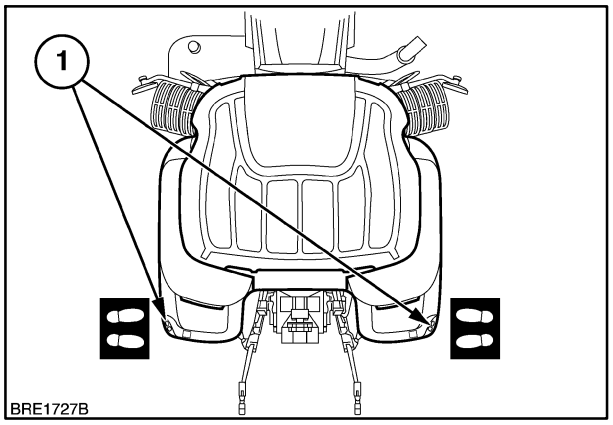
The operator must only activate the external Power Take Off switches (1) while standing to the side of the tractor (outboard of the rear tyres). To aviod damage to implement or tractor, operation of the in cab and external PTO switches should **not** be carried out simultaneously.

⚠ WARNING ⚠

Before using the external Power Take Off switches, ensure that no person or object is in the area of the implement, 3-point linkage or PTO shaft.

Never operate the external switches while standing:

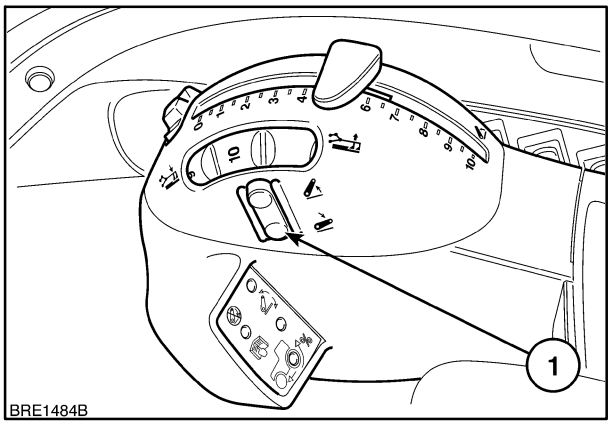
- Directly behind the tractor or tyres.
- Between the lower links.
- On or near the implement.
- Never extend arms, legs, any part of the body or any object into the area near the 3-point linkage, PTO shaft or implement while operating the external switch.
- Never have an assistant working the opposite set of controls.
- When moving to the opposite set of controls, move around the tractor or implement.
- Do not cross between the implement and tractor.



11

AUTO PTO FUNCTION (IF FITTED)

The Auto P.T.O. function provides automatic engagement or disengagement of the rear P.T.O. drive when using the electronic draft control raise/lower switch (1). Operating the electronic draft control switch to raise the implement will automatically disengage P.T.O. drive. Lowering the implement with the electronic draft control switch will re-engage P.T.O. drive.

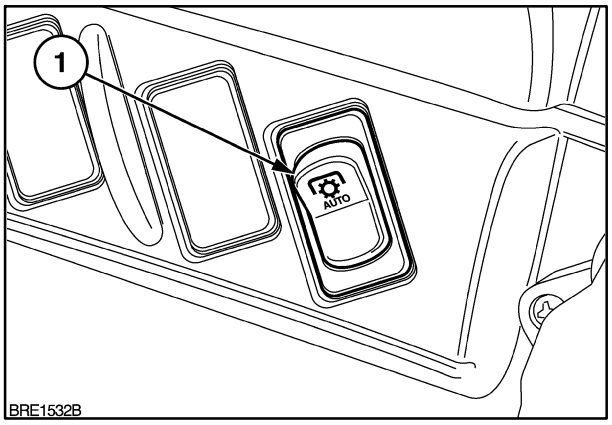


12

To activate the Auto function, engage the P.T.O. and then depress and hold the switch (1) for more than one second. The Auto P.T.O. lamp on the instrument panel will illuminate to confirm engagement.

With the 3 point hitch in the lowered position and the P.T.O. engaged, the Auto lamp will remain on. Raising the implement will cause the Auto lamp to flash until the implement is lowered and P.T.O. drive is re-engaged.

NOTE: *The Auto P.T.O. function will be de-activated every time the key start is switched off.*



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The Auto P.T.O. function will automatically de-activate if one or more of the following situations occurs.

- The tractor speed is above 0.5 Km/h (0.3 MPH) with the 3 point hitch in the raised position for more than 2 minutes.
- With the 3 point hitch raised, the tractor speed falls below 0.5 Km/h (0.3 MPH), or the tractor is stationary for more than 10 seconds.
- If one of the external switches for P.T.O. or 3 point hitch are operated.
- The P.T.O. is switched off using the internal or external switches.
- Operating both internal and external P.T.O. switches simultaneously.
- Ground drive P.T.O. is selected.
- The operator leaves the seat for more than 2 minutes with Auto P.T.O. activated and the 3 point hitch in the raised position.

ENGINE POWER MANAGEMENT

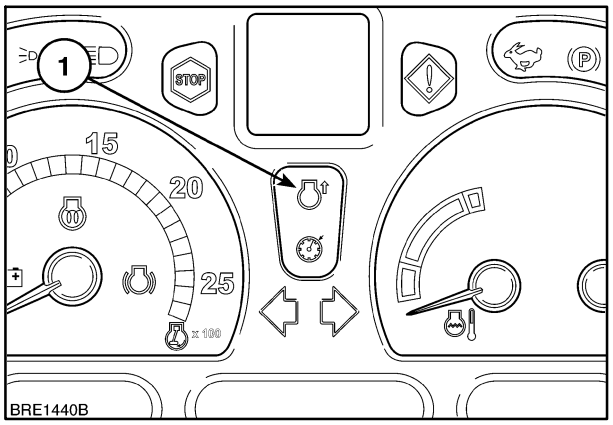
Tractors with common rail fuel injection are equipped with an Engine Power Management (EPM) system that monitors and boosts engine power during Power Take Off operations.

NOTE: *The indicator light (1) on the instrument panel will illuminate when Engine Power Management is activated.*

With the tractor moving and the engine running above 1300 r.p.m., engaging the rear P.T.O. will activate Engine Power Management in the standby mode. When the torque applied through the P.T.O. exceeds a pre-set level, EPM will increase the available engine horsepower. The full level of additional power will be made available providing the combined power requirement for both P.T.O. and driving wheels does not exceed the specified rated power of the tractor.

The 'soft start' facility provides easy start up of heavy, high inertia, PTO driven equipment. Soft start is a fully automatic system controlled by hall effect speed sensors on the engine and within the PTO driveline.

Soft start 'feathers' the PTO clutch engagement to provide a slower, gradual take up of the drive over the first 5 seconds.



14

PTO FUNTIONALITY

Auto Softstart PTO

When engaging softstart a feedback system senses:

- Engine deceleration
- PTO shaft acceleration

Inputs required:

- Crankshaft speed sensor
- PTO speed sensor

PTO Management

Auto PTO will be activated when:

- Vehicle speed > 0.5kph
- PTO is running
- Auto PTO switch is pressed for at least 1 second

Auto PTO will disengage PTO when:

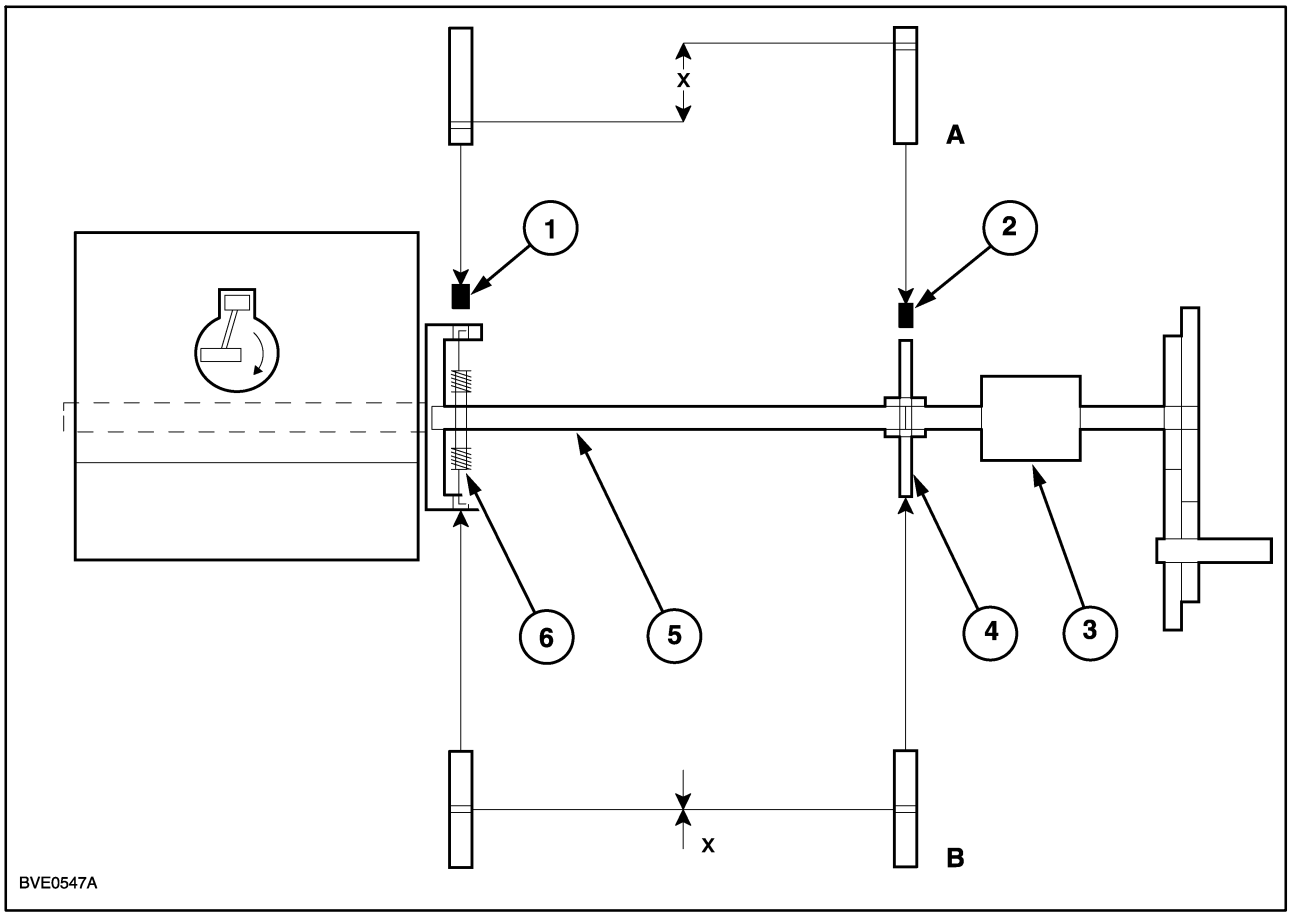
- Hitch is raised using fast raise/lower switch and hitch position reaches preset value (EDC).
- 2 seconds after fast raise/lower switch (MDC) is operated to raise hitch.

Auto PTO is automatically deactivated if:

- Vehicle speed > 0.5kph, rear hitch is raised for > 2 minutes; fast raise/lower switch is nopt activated.
- Rear hitch is in raised position and vehicle speed <= 0.5kph for > 10 seconds.
- Vehicle is stationary and rear hitch is raised for > 10 seconds without fast raise/lower switch being activated.
- The external hitch or PTO switches are operated.
- The PTO switch is turned off.
- Ground drive PTO is selected.
- Driver leaves the seat for > 2 seconds.
- Both PTO cab and PTO fender switches are turned on at the same time.

Inputs required:

- Wheel speed sensor/radar
- Rear hitch height potentiometer.
- PTO speed sensor
- Auto PTO switch
- In cab PTO switch
- Fender switches (PTO and hitch)
- Ground drive PTO switch (if fitted)
- Operator present switch.



15

PTO Torque Sensor (Engine Power Management)

A. PTO under load
B. PTO without load
1. Engine flywheel torque sensor
2. PTO torque sensor
3. PTO clutch
4. PTO torque sensor tone wheel
5. PTO input shaft
6. Engine flywheel damper

The PTO power management system records the amount of torque being transmitted through the PTO shaft (5) using two hall effect sensors (1) and (2). One hall effect sensor is located at the engine flywheel damper (6) and the other is located at the PTO torque sensor tone wheel (4).

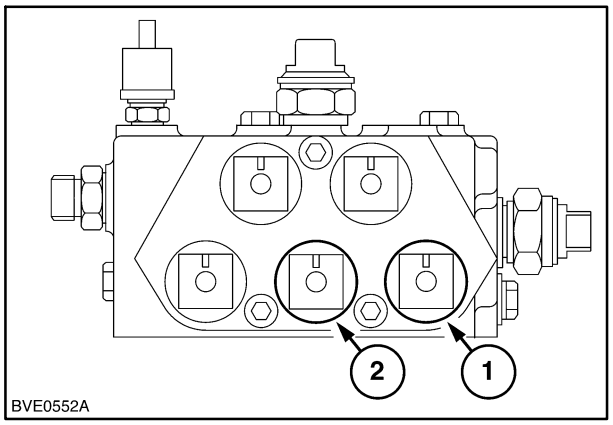
The PTO shaft is engineered from high torsional steel and is designed to twist when a load is applied. Under no load (B) there is no difference (x) between the two sensor positions. Under load (A) the PTO management system detects the amount of twist by comparing the difference (x) between the two sensor positions. The PTO management system knows the torque required to twist the PTO shaft a given amount and uses the difference (x) to calculate the torque produced at the PTO shaft. The PTO management system can then detect an increase in torque and electronically modify the power curves of the engine management system to provide an increase of up to 25 additional horsepower to maintain the PTO performance.

HYDRAULIC OPERATION OF PTO

PTO Disengaged (Reference to Figure 19)

The PTO brake solenoid (1) and the PTO engagement solenoid (2), are housed in the low pressure distribution block on the left hand side of the rear axle.

When the PTO is not in use the PTO brake solenoid is energised and the PTO engagement solenoid is de-energised.



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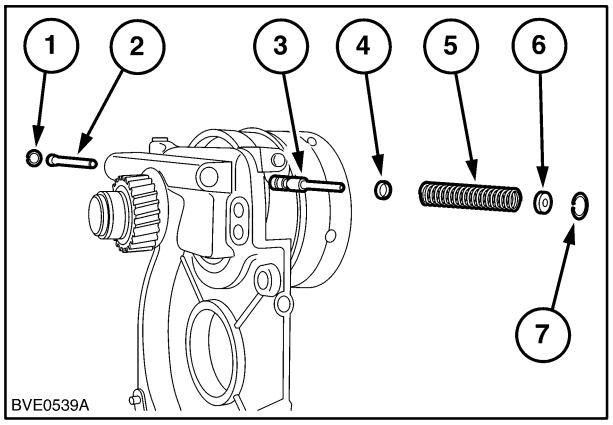
Oil behind the PTO clutch piston is open to reservoir through the lubrication control valve and de-energised PTO engagement solenoid.

The lubrification valve is housed in the PTO housing support plate and comprises of the following components:

1. Circlip
2. Seat
3. Spool
4. Seat
5. Spring
6. Plug
7. Circlip



17

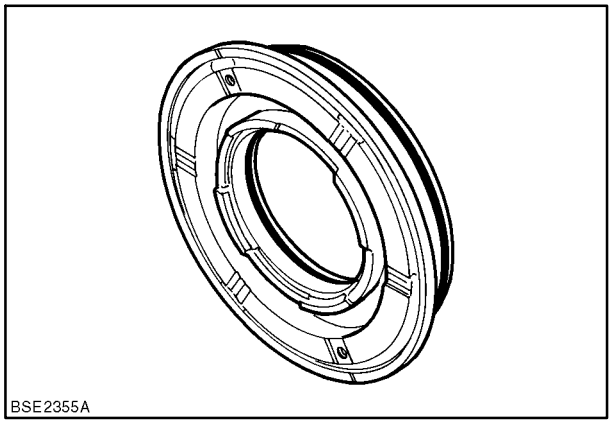
The bellville springs force the piston into the piston housing and disengages drive through the clutch plates to the output shaft .

When the piston is seated in the housing there is a small gap between the rear of the washer and the clutch piston housing.

Lubrication oil flows from the lubrication circuit, through the lubrication valve into the centre of the clutch housing shaft and through drillings in the shaft to the washer.

The small gap behind the washer allows lubricating oil at a restricted rate of 2-3 Litres/min to flow past the rear of washer then through the chanels machined on the front of the piston to lubricate the clutch plates.

It should be noted that when the PTO clutch is disengaged the volume of oil required to lubricate the clutch plates is less than during engagement as described in the next sequence. Consequently this method of restricting lubricating oil to the clutch plates allows additional lubrication to be available for other hydraulic circuits operating on the tractor.



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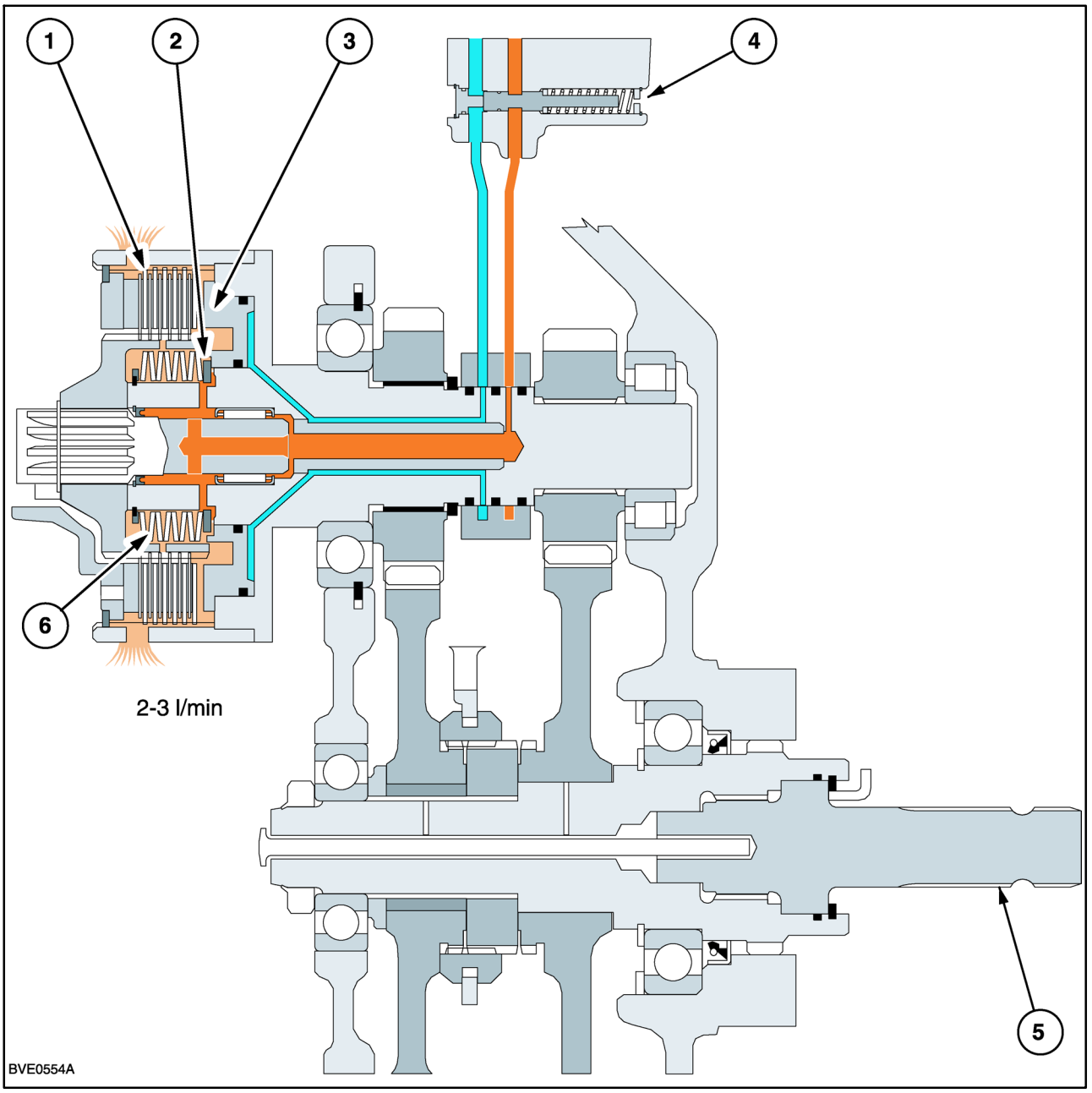


19

PTO CONTROL CLUTCH-DISENGAGED

Lubrication Circuit Oil

Return to Reservoir

Lubrication Oil
@ Reduced Flow

1. Clutch Plates
2. Washer
3. Piston
4. Lubrication Valve
5. PTO Output Shaft
6. Bellville Springs

PTO Engaged (Initial Engagement)

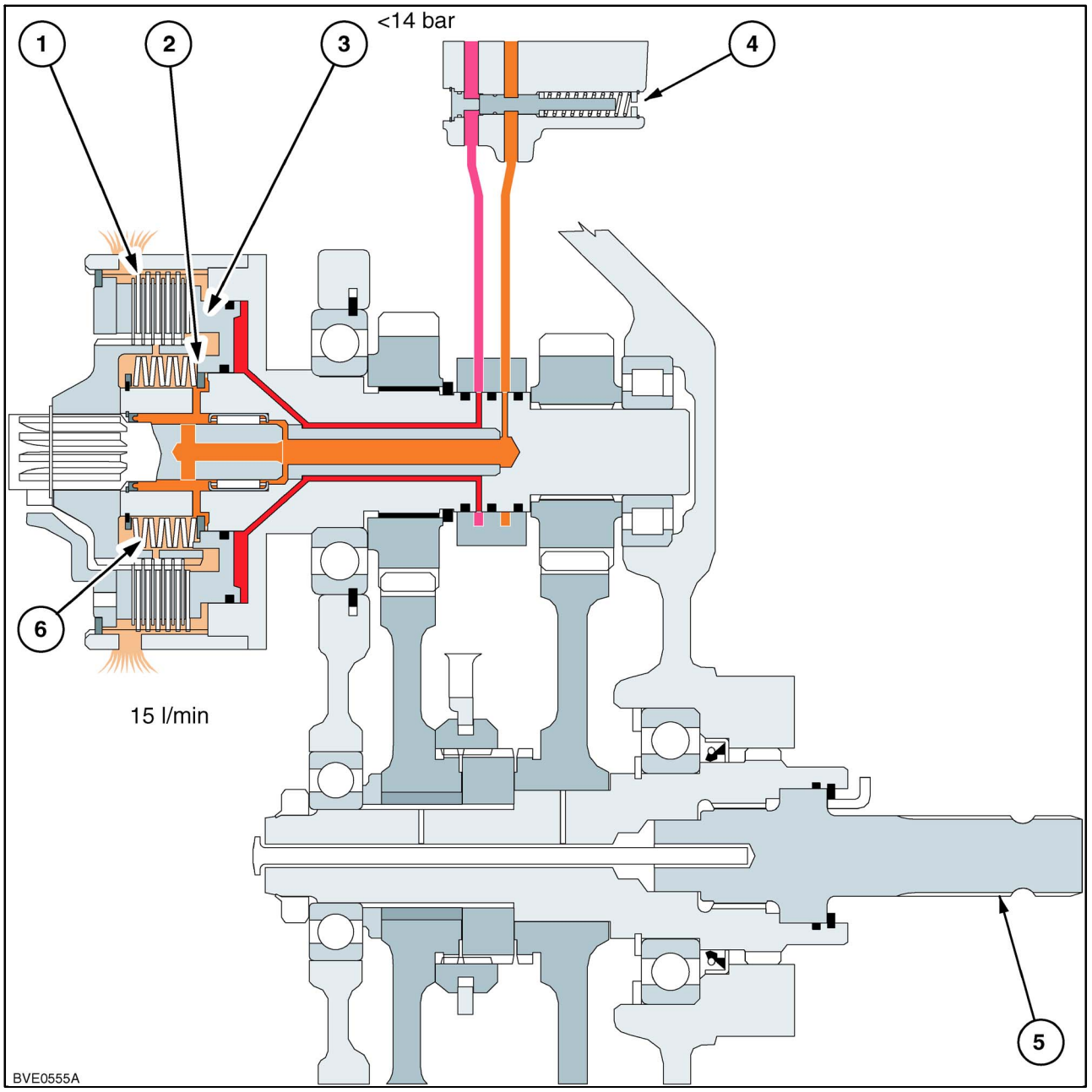
Engagement of the PTO is considered as a two phase operation.

When the PTO is operated the engagement solenoid is energised and the brake solenoid disengaged.

Low pressure hydraulic circuit oil flows from the solenoid and past the end of the lubrication valve to the rear of the clutch piston. As pressure increases the PTO clutch piston moves forward against the washer (2) and bellville springs (6) to compress the clutch plates (1). The action of the piston moving forward increases the gap between the rear of the washer and the clutch piston housing allowing an increased flow of lubricating oil to the clutch plates. This increased flow of up to 15 Litres/min ensures the clutch plates are adequately lubricated during the initial stages of engagement.

PTO Soft Start

The automatic PTO clutch softstart system ensures the load applied to the PTO is controlled in a predictable manner without putting undue stresses on the tractor engine, the PTO shaft and the connecting implement. The soft start feedback system senses engine deceleration and PTO shaft acceleration. Limits for these two parameters are set in the controller and if the system detects that either parameter is going above the set threshold limits, the rise in PTO clutch pressure is held untill they return within the preset limit at which time the clutch pressure again increases to continue engaging the PTO. If the soft start parameters are again exceeded the pressure held process is repeated untill full engagement is achieved. If engagement is not achieved after 5 seconds the clutch pressure is released and the PTO system is turned off.



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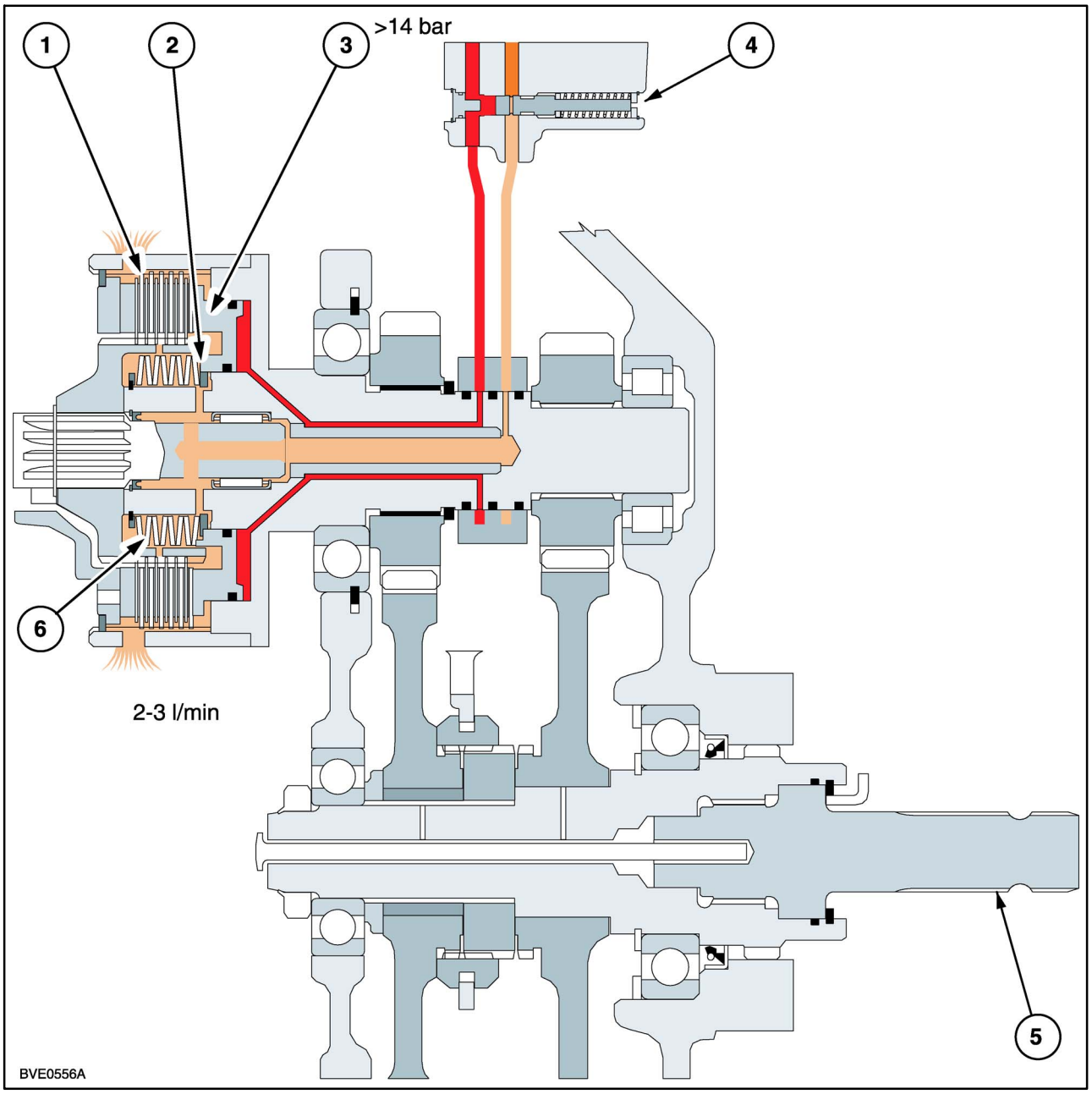
PTO CONTROL CLUTCH-INITIAL ENGAGEMENT

Low Pressure Clutch Engagement Oil <14bar

Lubrication Oil @ High Flow

1. Clutch Plates
2. Washer
3. Piston
4. Lubrication Valve
5. PTO Output Shaft
6. Bellville Springs



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PTO CONTROL CLUTCH-FINAL ENGAGEMENT

Low Pressure Clutch Engagement Oil >14bar

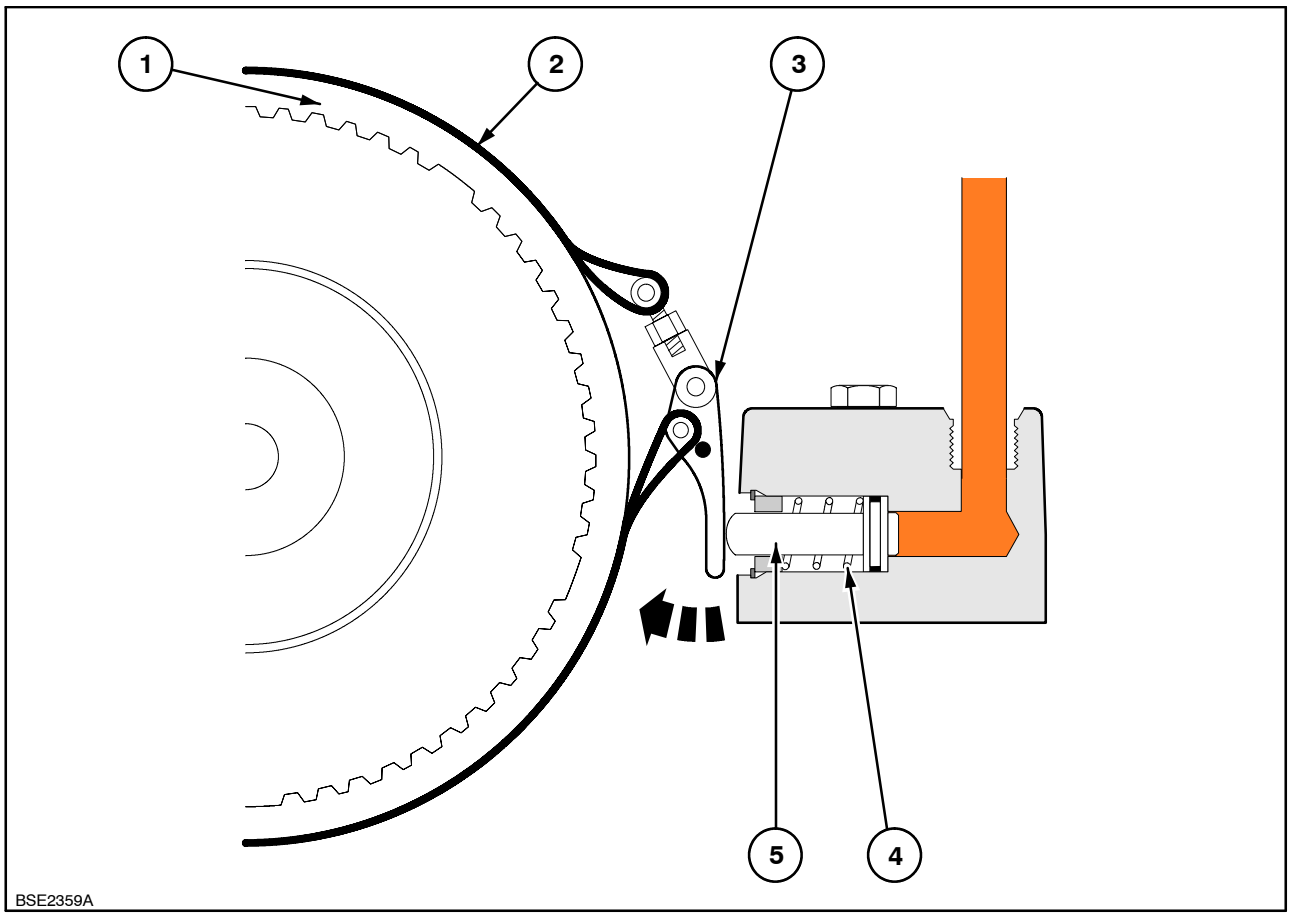
Lubrication Oil at Low Flow

Lubrication Circuit Oil

1. Clutch Plates
2. Washer
3. Piston
4. Lubrication Valve
5. PTO Output Shaft
6. Bellville Springs

PTO Engaged (Final Engagement)
When the pressure applied to the piston approaches 14 bar the pressure applied to the end face of the lubrication valve moves the valve against the spring and reduces the flow of lubricating oil across the valve to the clutch plates to 2-3 Litres/min.

Less lubrication of the clutch plates is necessary after the initial stage of engagement and this process limits the demand of the PTO on the lubrication circuit oil which is also used for other circuits on the tractor. The pressure applied to the rear of the piston will now continue to increases towards 18 bar in order to maintain adequate clutch plate clamping pressure and drive through the clutch to the PTO output shaft.



22

Low Pressure Circuit Oil

1. PTO Clutch Housing
2. PTO brake Band
3. Lever
4. Return Spring
5. Piston

PTO CLUTCH BRAKE

The band type clutch brake operates automatically. It applies when the PTO clutch is being disengaged (braking start) and stops braking when the clutch is completely engaged.

When working with high inertia implements it is possible to keep the brake disengaged by pressing the switch located on the right hand console near the PTO control handle. When the PTO clutch is engaged, the brake control oil is returned to reservoir as the solenoid valve is in the discharge position (de-energized) and consequently there is no operation of the actuation piston (5) onto the band operating lever (2), the piston (5) being returned by the spring (4).

When the PTO control clutch is being disengaged, the solenoid valve is energised and opens, diverting oil from the low pressure circuit onto the piston (5). The piston contacts the lever (3) and band (2) is tightened against the housing (1) to brake the assembly.

TROUBLESHOOTING

The table below details some possible mechanical/hydraulic faults. The controller will also generate error codes related to the PTO system. The error codes are prefixed with the number (5) and displayed on the instrument cluster.

Problem	Possible Causes	Correction
The PTO does not operate	1. Low transmission oil level.	Reset correct level.
	2. Blocked oil filter.	Replace filter.
	3. Faulty hydraulic pump.	Repair or replace pump.
	4. Faulty PTO engagement switch	Replace switch.
	5. Lack of power supply to the solenoid valve: detached or damaged connectors, faulty remote switch.	Reset electrical connections and replace faulty parts.
	6. PTO control solenoid valve stuck open.	Repair or replace solenoid valve.
	7. Oil leakage through the seals with consequent pressure drop: manifold or control plunger seals	Replace damaged seals.
The PTO remains engaged.	1. Faulty PTO engagement switch.	Replace switch.
	2. Lack of power supply to the solenoid valve: detached or damaged connectors or faulty remote switch.	Reset electrical connections and replace faulty parts.
	3. PTO control valve stuck open	Repair or replace solenoid valve.
The PTO control clutch drags.	1. Faulty brake engagement switch	Replace switch.
	2. Lack of power supply to the solenoid valve: detached or damaged connectors or faulty remote switch.	Reset electrical connections and replace faulty parts.
	3. Brake control valve stuck closed.	Repair or replace solenoid valve.
	4. Worn PTO brake	Replace brake.

OVERHAUL

POWER TAKE OFF (PTO)

Removal

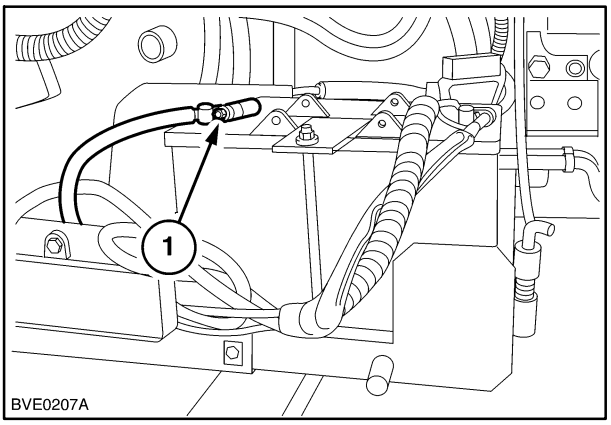
⚠ WARNING ⚠

Handle all components with the greatest care.

Do no insert hands or fingers between the parts.

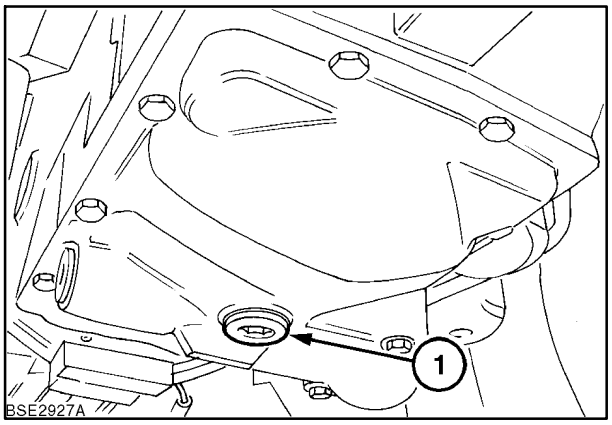
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).



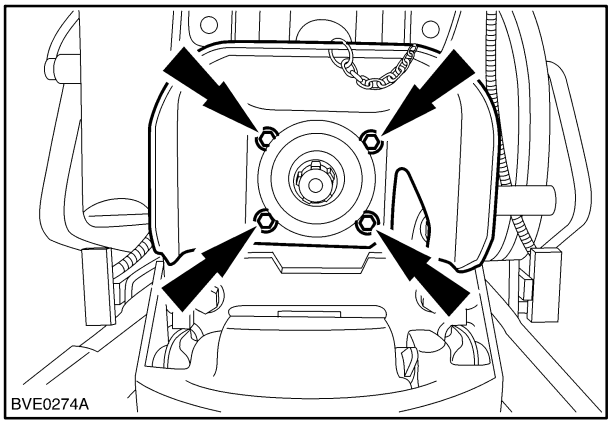
23

2. Remove the drain plug (1) and drain the oil into a suitable container.
3. Install the drain plug after the oil has drained.



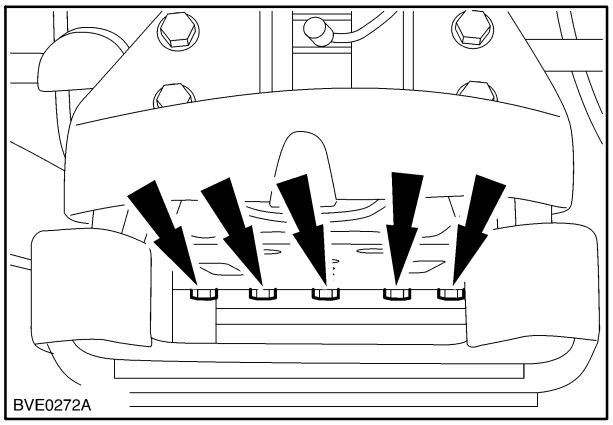
24

4. Remove the PTO guard.



25

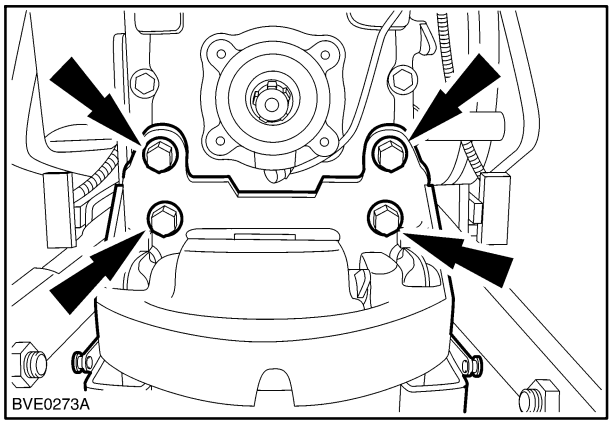
5. Remove the pick up hitch lower retaining bolts (if fitted).



26

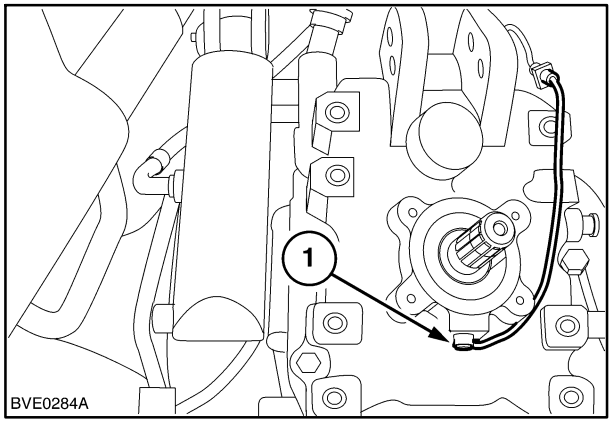
NOTE: *Using a suitable trolley jack support the pick up hitch.*

6. Remove the pick up hitch upper retaining bolts and remove the pick up hitch (if fitted).



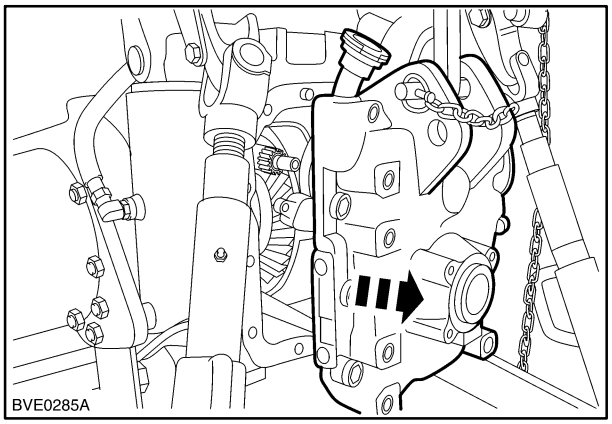
27

7. Remove the PTO speed sensor retaining bolt (1) and detach the PTO speed sensor.



28

8. Using a suitable chain or sling, attach the PTO housing to a hoist. Remove the PTO housing retaining bolts and remove the PTO assembly from the rear axle.



29

Installation

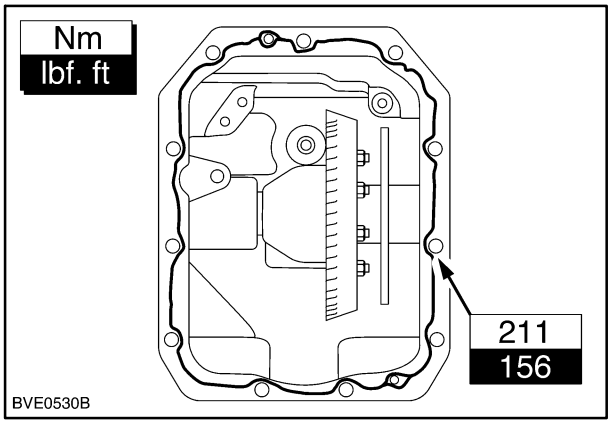
⚠ WARNING ⚠

Handle all components with the greatest care.

Do no insert hands or fingers between the parts.

Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the PTO assembly to the rear axle housing taking the following into consideration:
   - Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2 mm in diameter to the rear axle casing following the pattern shown.



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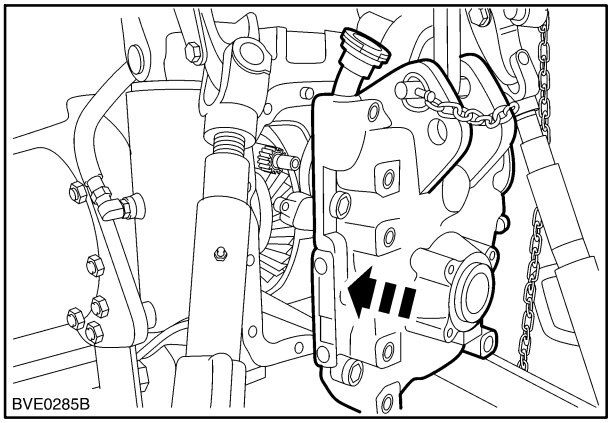
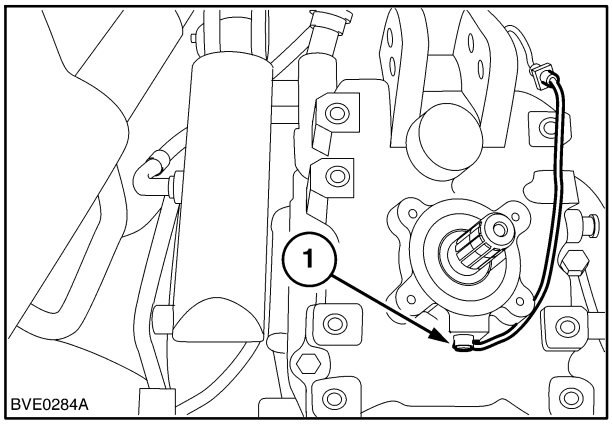
2. Using a suitable chain or sling, attach the PTO housing to a hoist and install the PTO assembly to the rear axle. Install the PTO housing retaining bolts. Tighten to the specified torque value.



31

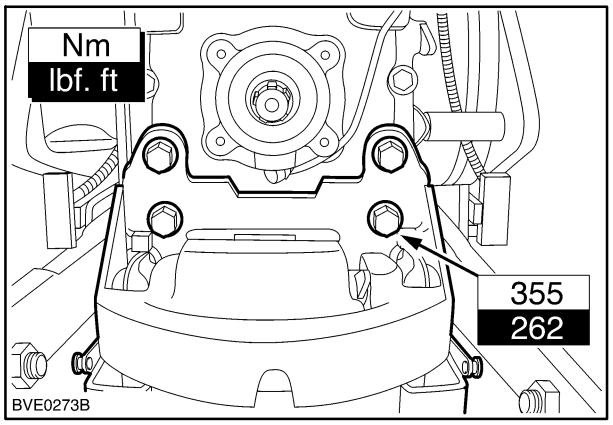
3. Attach the PTO speed sensor and install the PTO speed sensor retaining bolt (1).



32

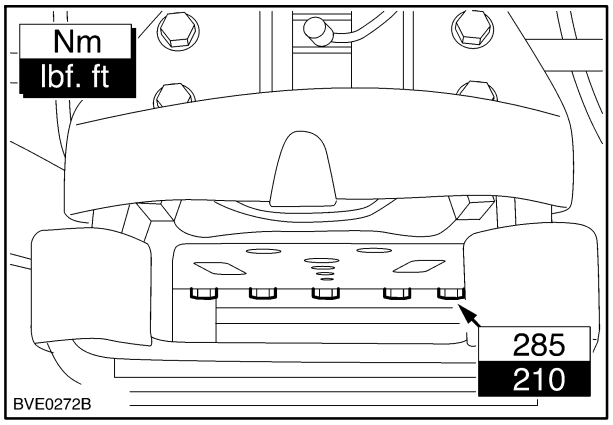
NOTE: *Using a suitable trolley jack support the pick up hitch*

4. Install the pick up hitch and install the pick up hitch upper retaining bolts. Tighten to the specified torque value (if fitted).



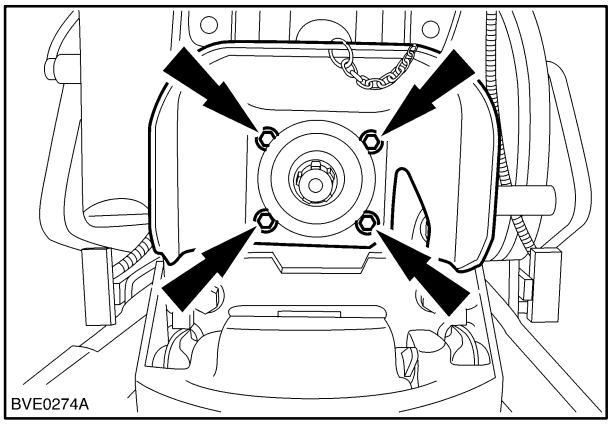
33

5. Install the pick up hitch lower retaining bolts. Tighten to the specified torque value (if fitted).



34

6. Install the PTO guard.



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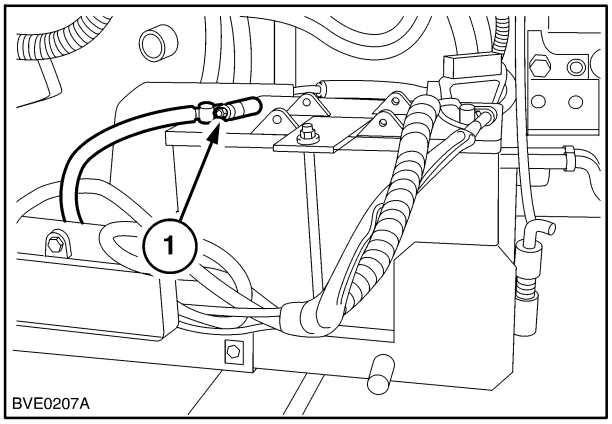
7. Refill the driveline with the correct specification oil.
8. Connect the battery negative cable (1) and install the battery cover.



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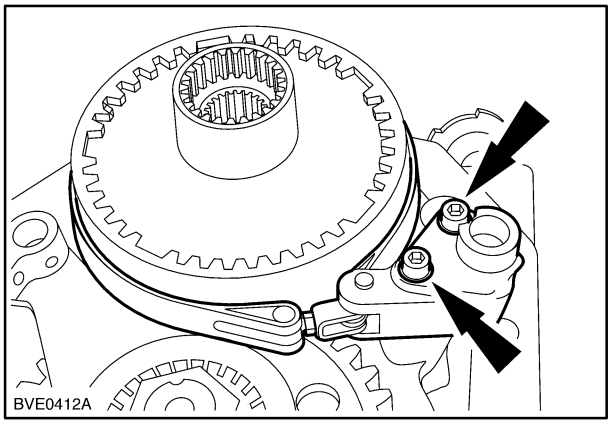
POWER TAKE OFF 540/750/1000 RPM

Disassembly

⚠ WARNING ⚠

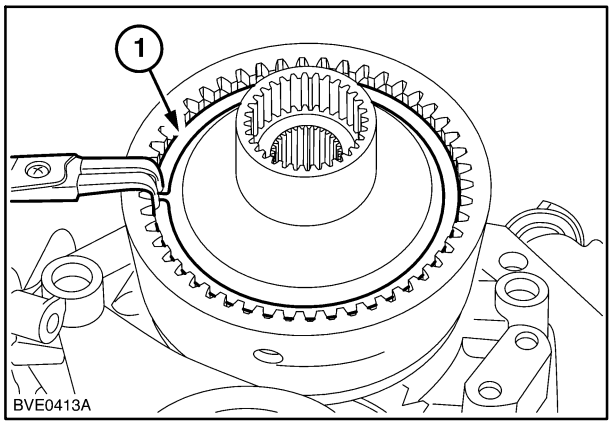
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Place the PTO assembly on a suitable clean working surface or stand if available.
2. Remove the brake band and the brake piston housing.



37

3. Remove the PTO clutch housing PTO end plate circlip (1).



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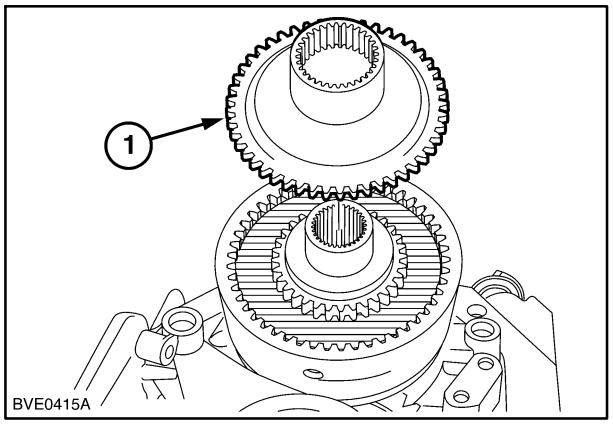
PTO Assemblies with Ground Speed PTO

4. Remove the PTO clutch housing ground speed PTO end plate (1).



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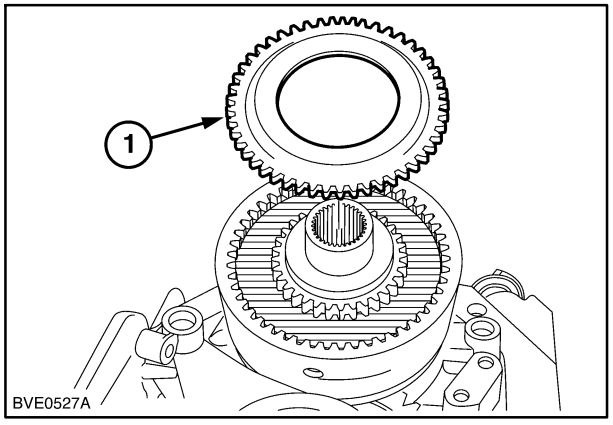
PTO Assemblies Without Ground Speed PTO

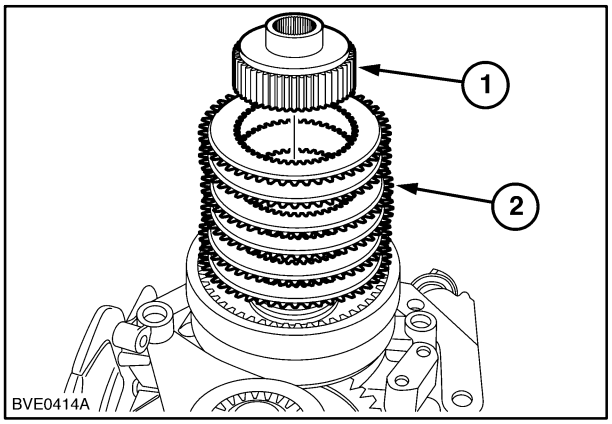
5. Remove the clutch housing PTO end plate (1).



40

All PTO Assemblies

6. Remove the clutch hub (1) and the clutch drive and driven discs (2).



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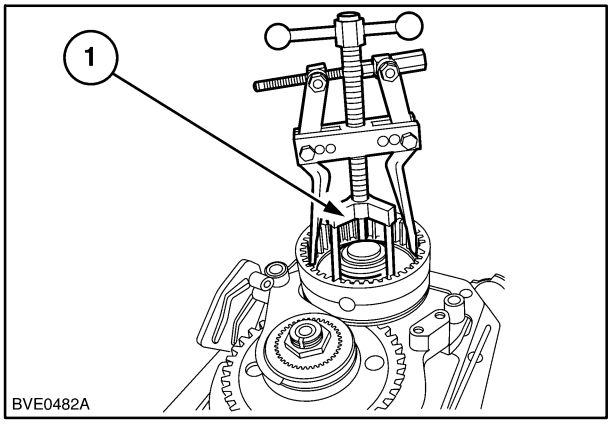
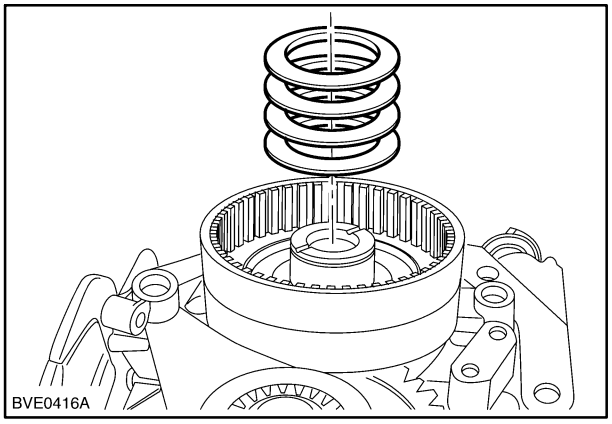
7. If the clutch piston is to be serviced and it is not necessary that further repairs to the clutch hub are required, compress and remove the clutch bellville springs as follows:
8. Install the PTO clutch housing end plate circlip and install a suitable puller and locally fabricated tool **50063** (1). Compress the bellville springs and remove the retaining ring. Slowly and carefully release the pressure.
9. Remove the PTO clutch housing end plate circlip.



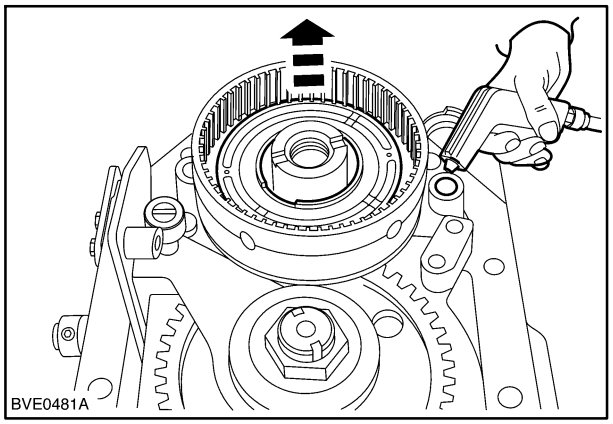
42

10. Remove the bellville springs.



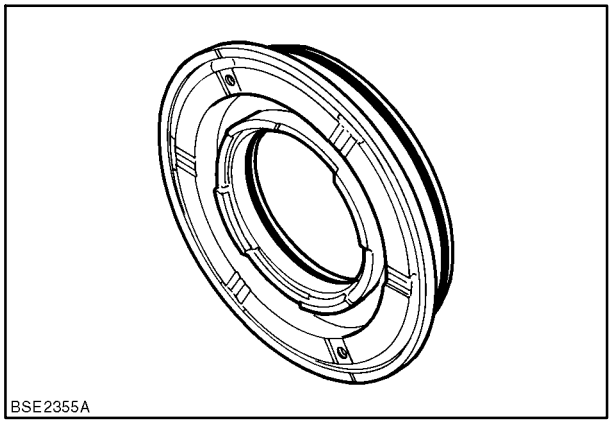
43

11. Use compressed air in the inlet port to remove the piston from the clutch plate housing.



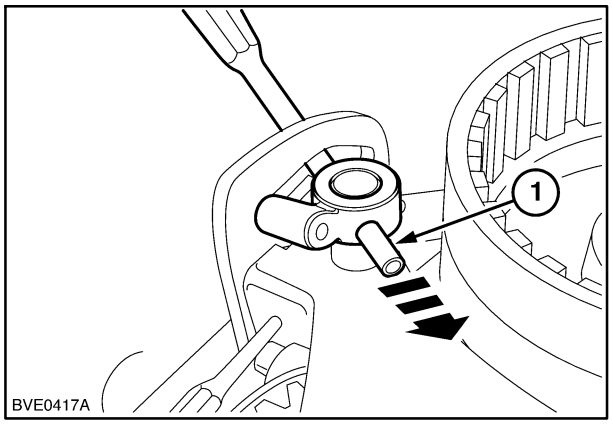
44

12. Examine the pison seals and replace if damaged



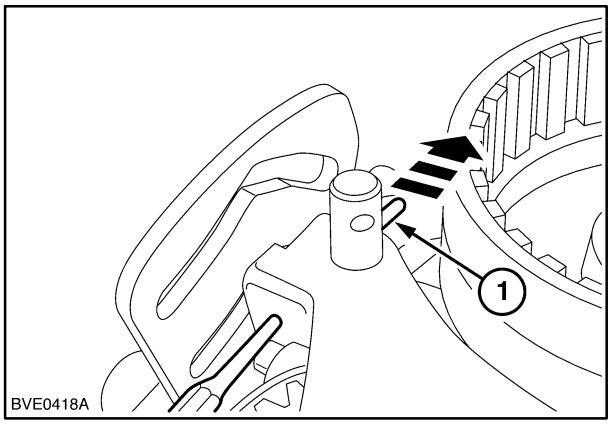
45

13. Remove the roll pin (1) from the selector rod and remove the selector.



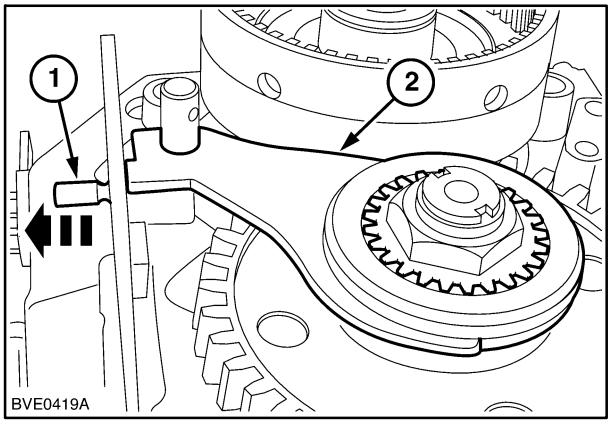
46

14. Remove the PTO selector fork roll pin (1).



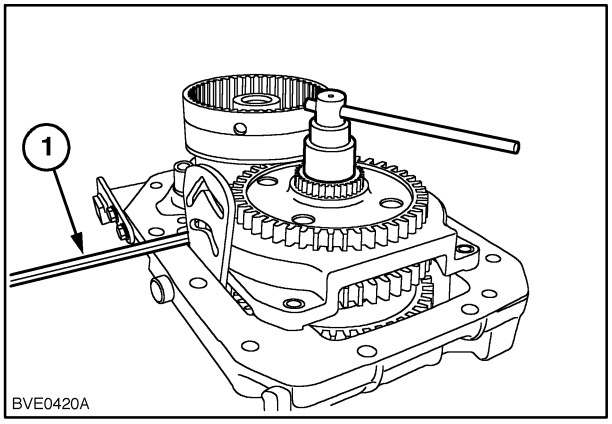
47

15. Remove the PTO selector fork pin (1) and remove the 1000 RPM selector fork assembly (2).



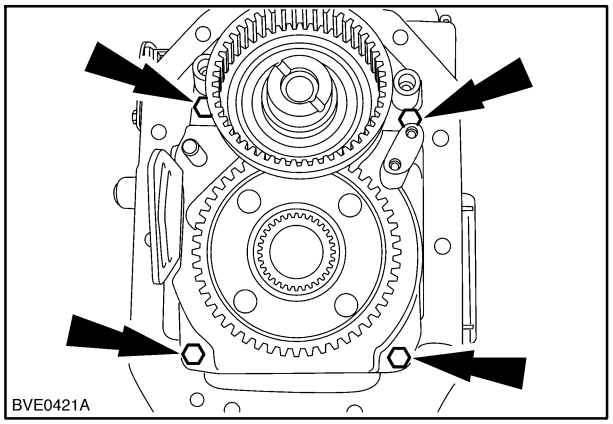
48

16. Using a suitable bar (1) to lock the PTO output shaft. Unstake and remove the PTO output shaft retaining nut.



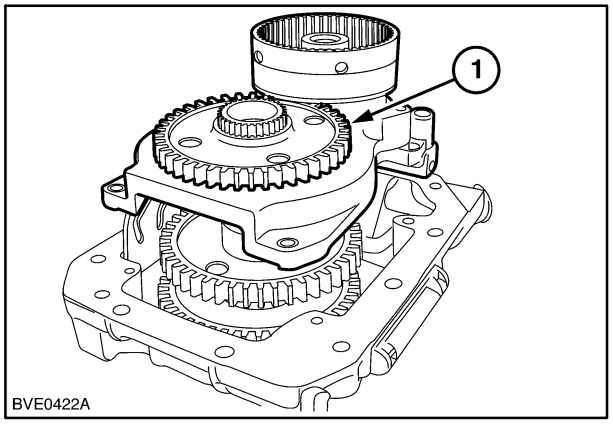
49

17. Remove the support plate retaining bolts.

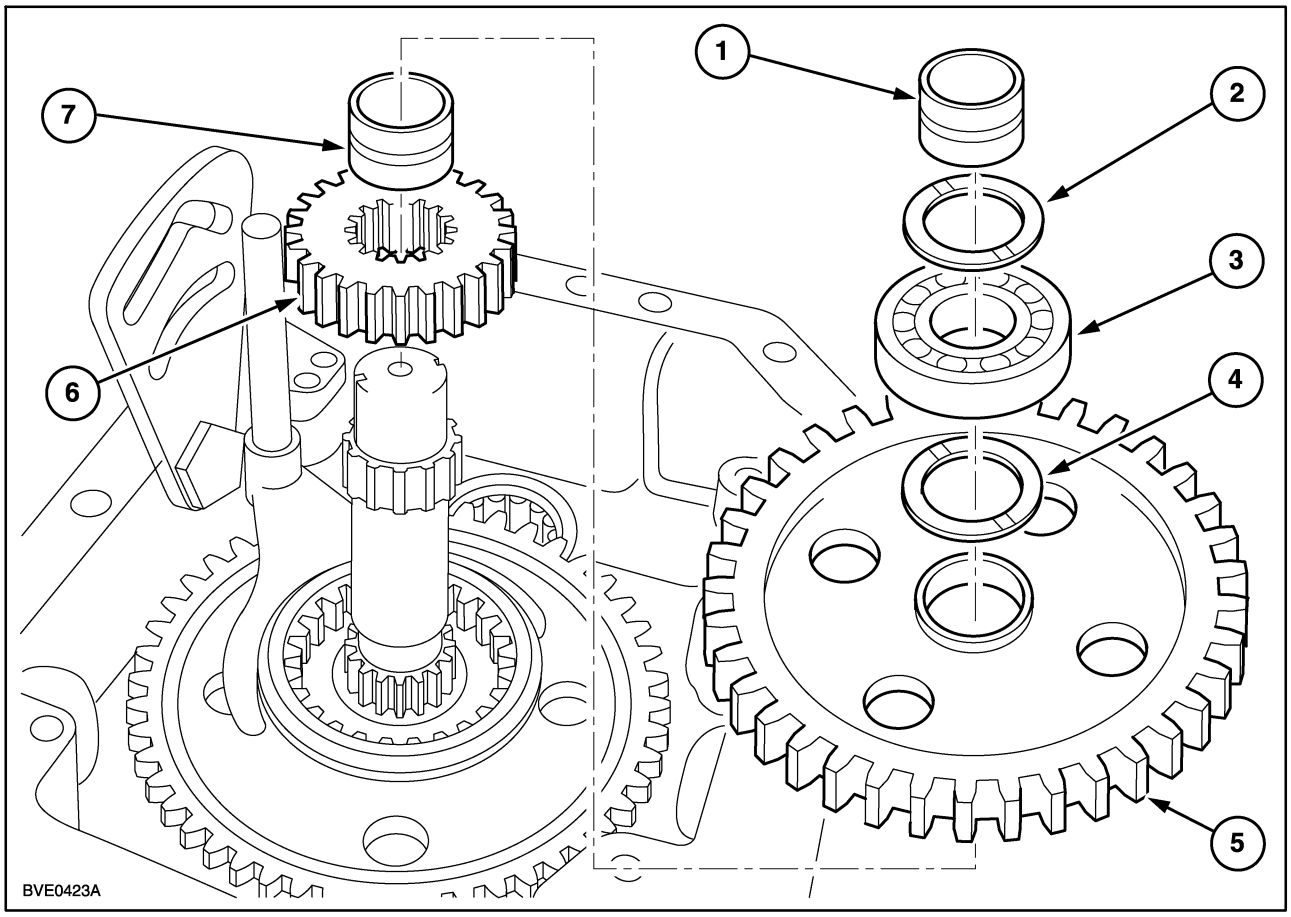


50

18. Remove the support plate and remove the 1000 RPM driven gear (1).



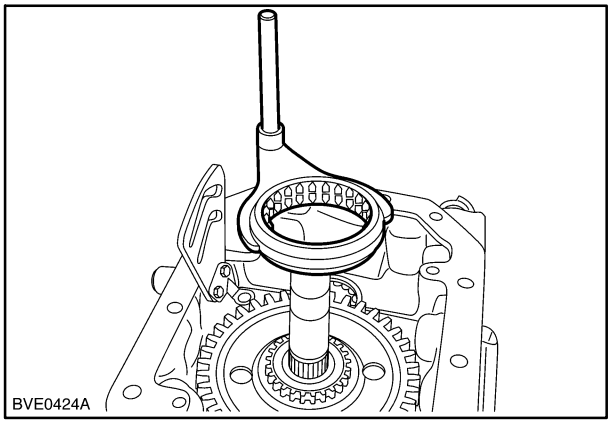
51



52

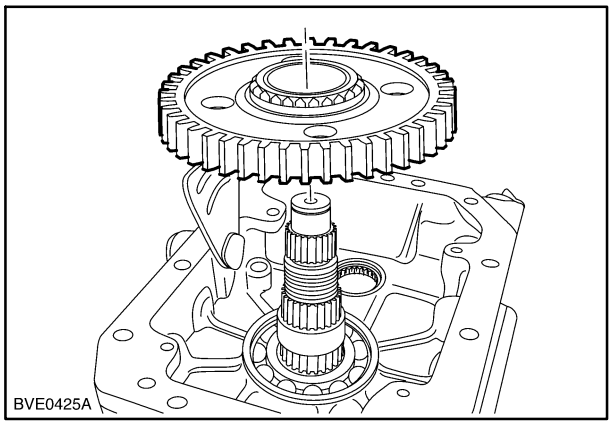
19. Remove the bush (1), thrust washer (2), bearing (3), thrust washer (4), 750 RPM driven gear (5), bush (7), and the 540/750 RPM sliding coupler gear (6).

20. Remove the 540/750 RPM selector fork and the sliding coupler.



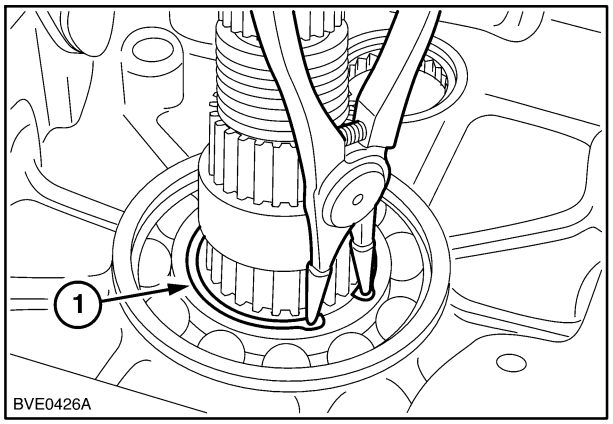
53

21. Remove the 540 RPM driven gear from the output shaft.



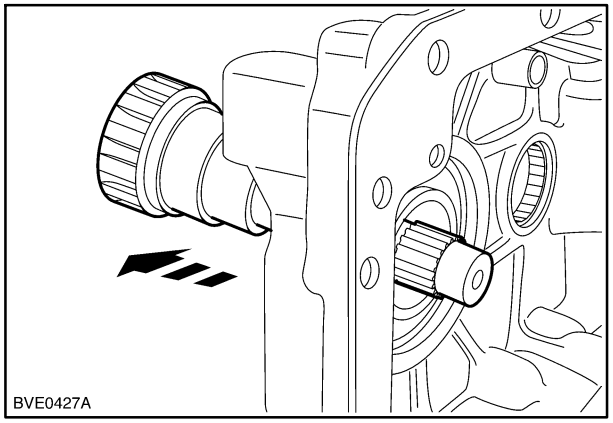
54

22. Remove the PTO output shaft circlip (1)



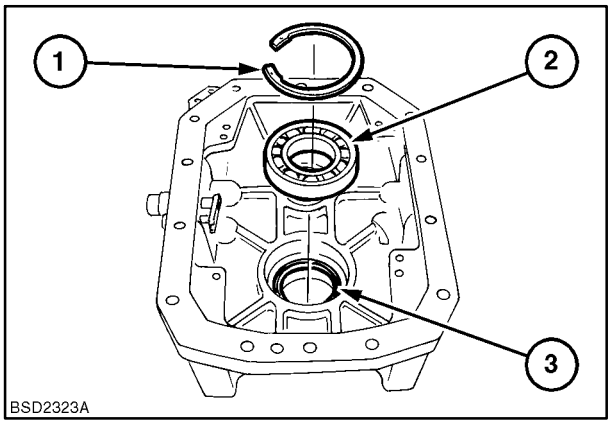
55

23. Remove the PTO output shaft.



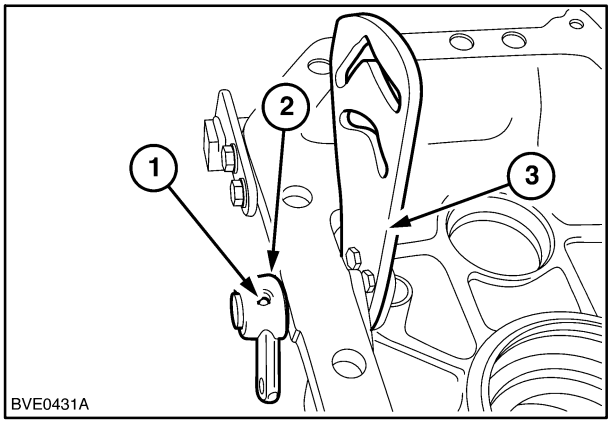
56

24. Remove the circlip (1) bearing (2) and the seal (3).



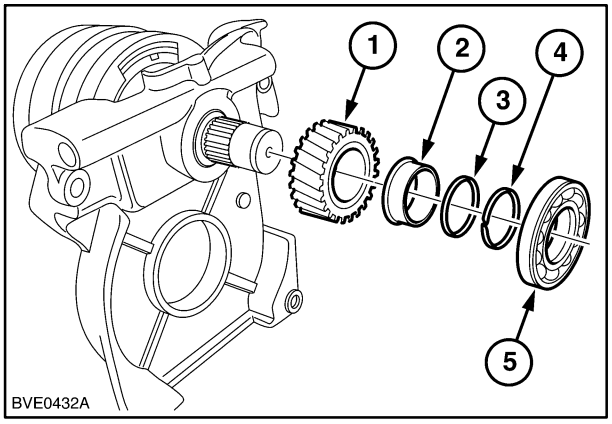
57

25. Remove the roll pin (1), remove selector lever (2) and remove the selector gate (3).



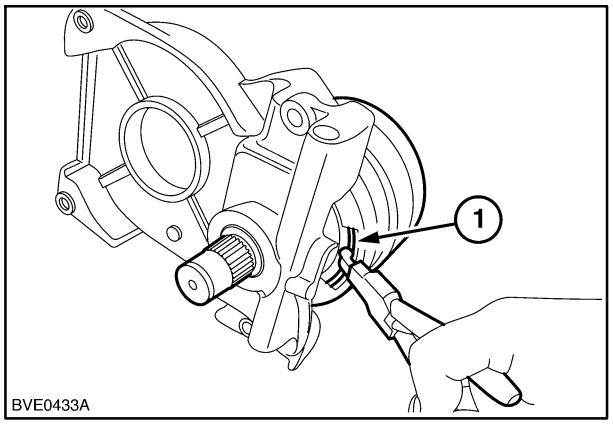
58

26. Remove the bearing (5) circlip (4), washer (3) sleeve (2) and the 750 RPM drive gear (1).



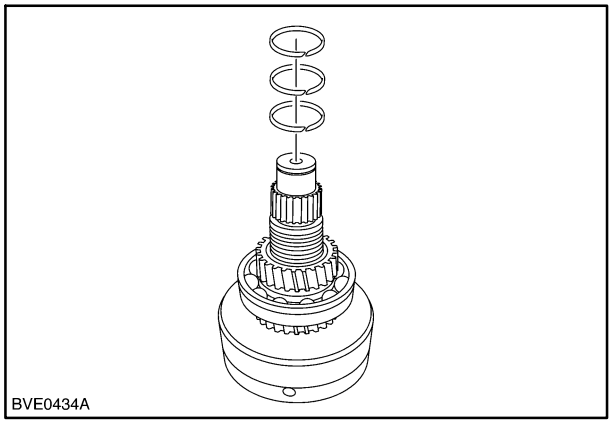
59

27. Expand the circlip (1) into the housing and remove the clutch hub assembly.



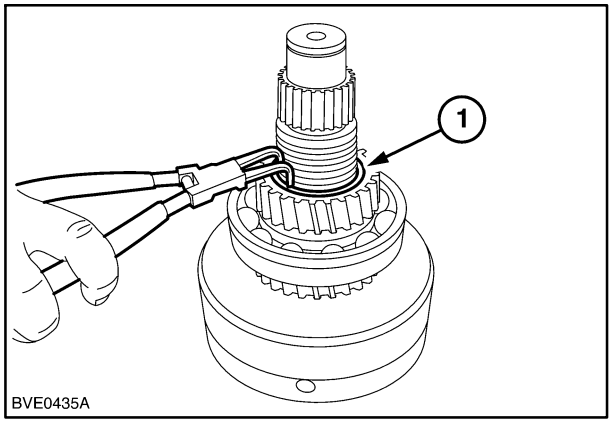
60

28. Remove the sealing rings from the clutch hub shaft.



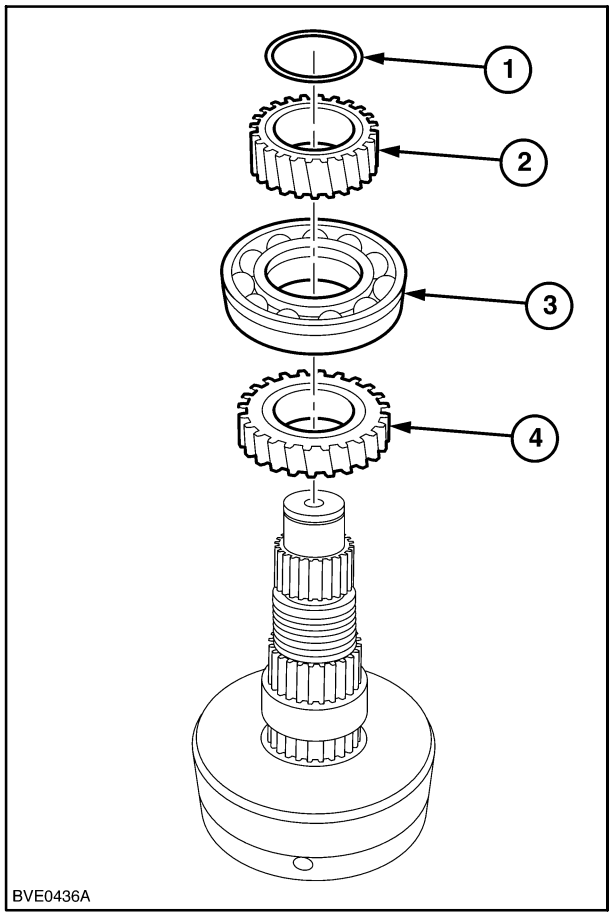
61

29. Remove the circlip (1).



62

30. Remove the washer (1), 750 RPM drive gear (2), bearing (3) and 1000 RPM drive gear (4).



63

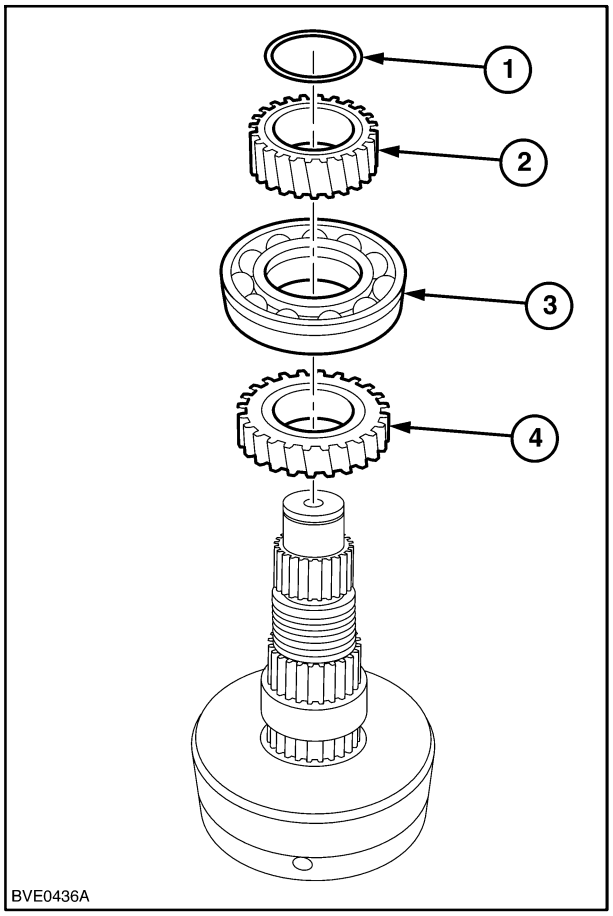
Assembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do no insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

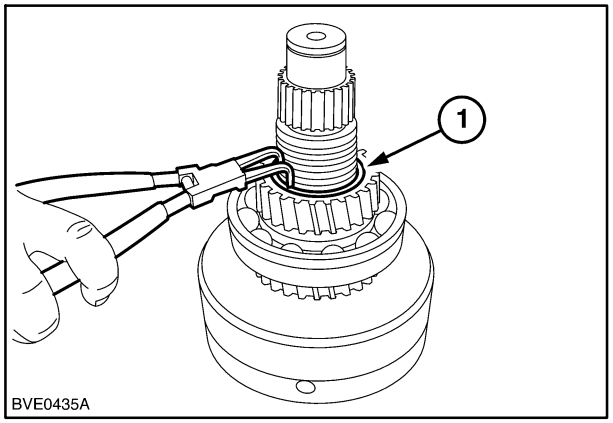
NOTE: *Install new O-ring seals and sealing washers as required.*

1. Install the 1000 RPM drive gear (4), bearing (3), 750 RPM drive gear (2), and the washer (1).



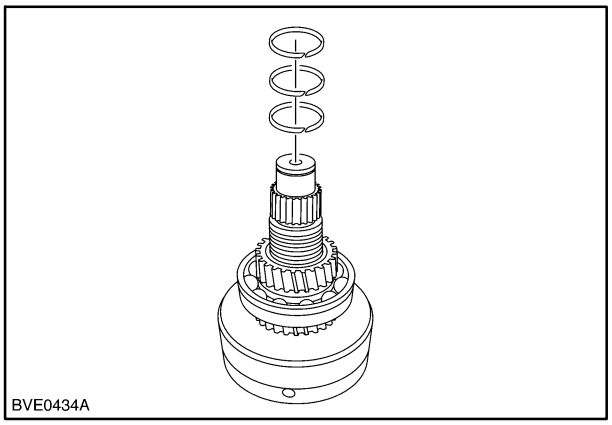
64

2. Install the circlip (1).



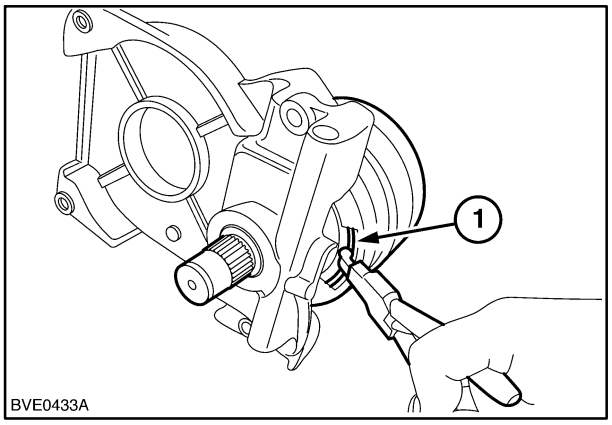
65

3. Install the sealing rings to the clutch hub shaft.



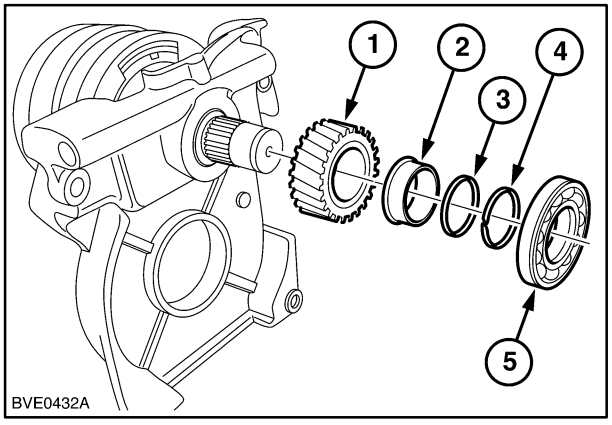
66

4. Expand the circlip (1) into the housing and install the clutch hub assembly.



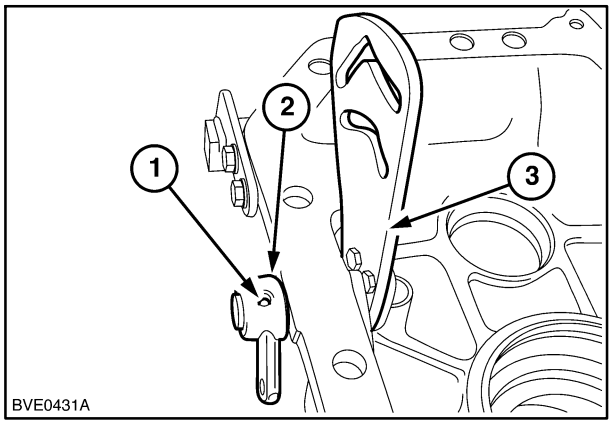
67

5. Install the 750 RPM drive gear (1), sleeve (2), washer (3), circlip (4) and the bearing (5).



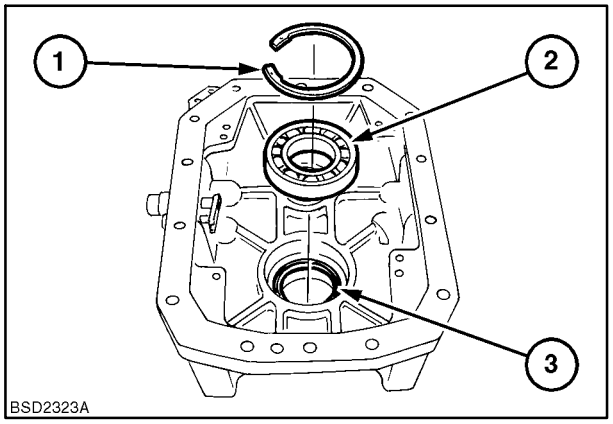
68

6. Install the selector gate (3), selector lever (2) and the roll pin (1).



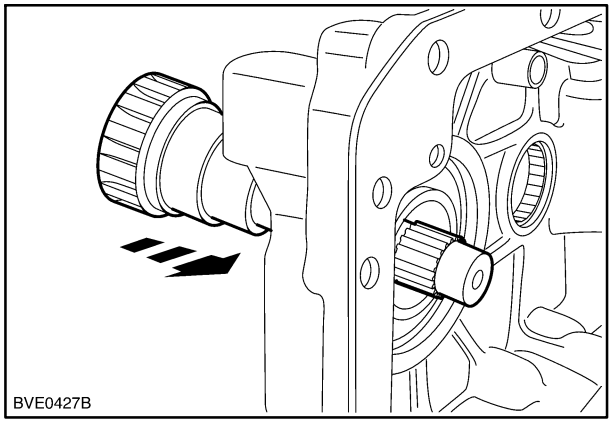
69

7. Install the seal (3), bearing (2) and the circlip (1).



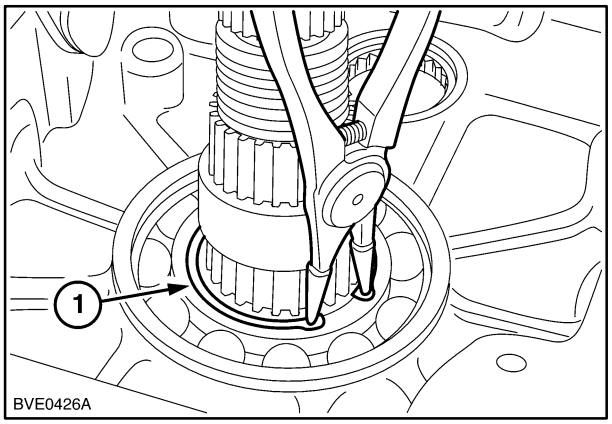
70

8. Install the PTO output shaft.



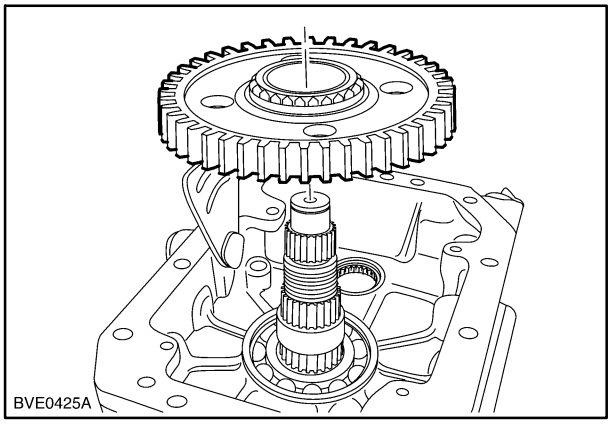
71

9. Install the PTO output shaft circlip (1).



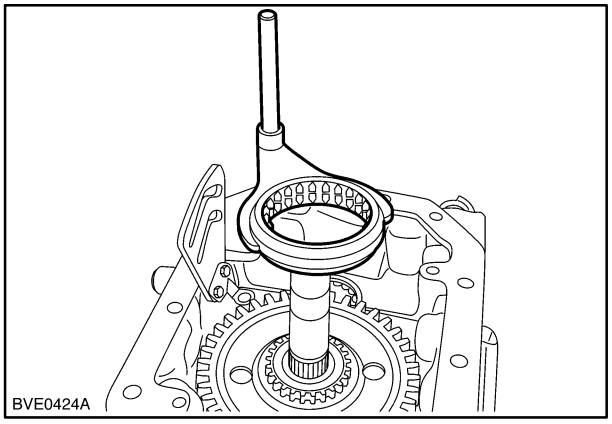
72

10. Install the 540 RPM driven gear to the output shaft.

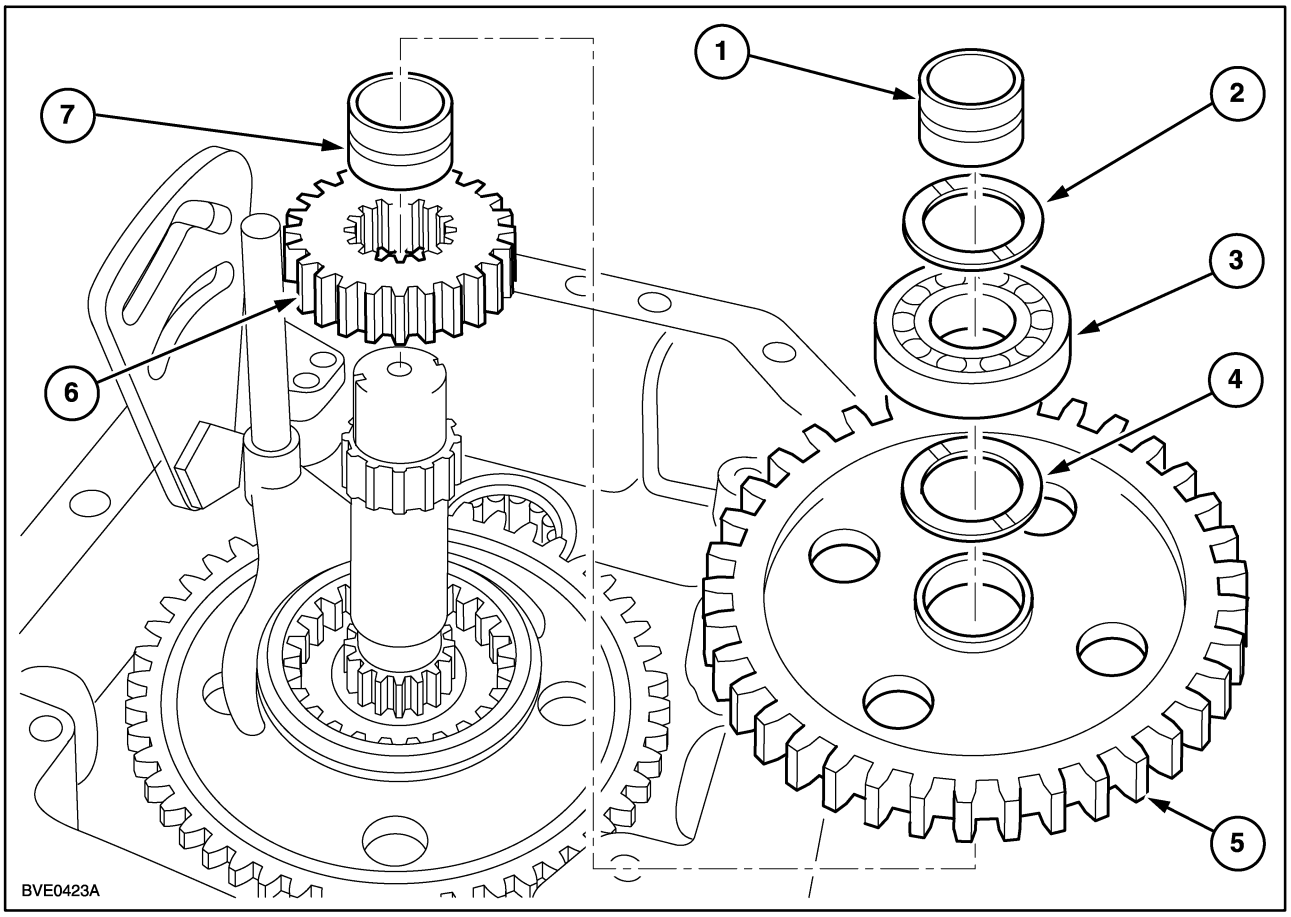


73

11. Install the selector fork and the sliding coupler.



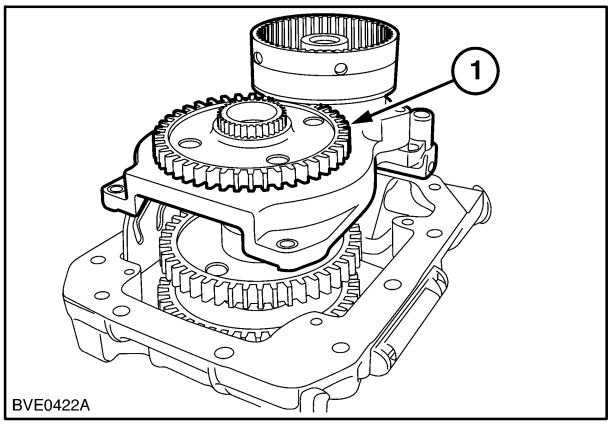
74



75

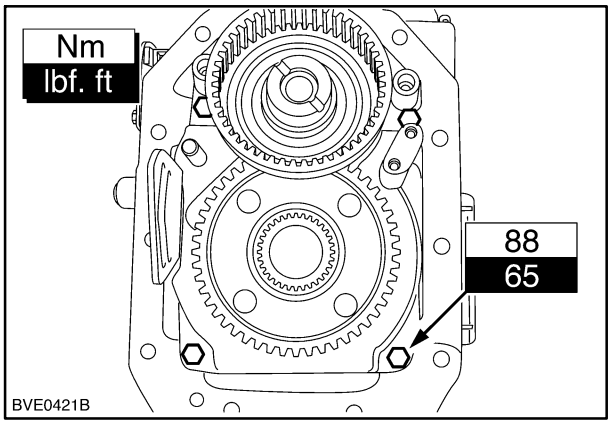
12. Install the 540/750 RPM sliding coupler gear (6), bush (7), 750 RPM driven gear (5), thrust washer (4), bearing (3) thrust washer (2) and the bush (1).

13. Install the 1000 RPM driven gear (1) and the support plate.



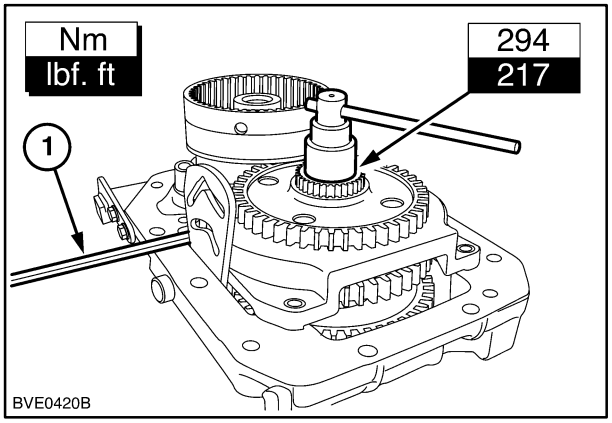
76

14. Install the support plate retaining bolts. Tighten to the specificated torque value.



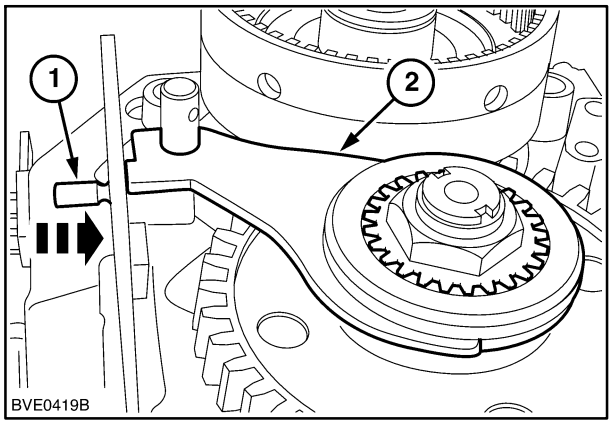
77

15. Using a suitable bar (1) to lock the PTO output shaft. Install a new PTO output shaft gear retaining nut. Tighten to the specified torque value and stake the retaining nut.



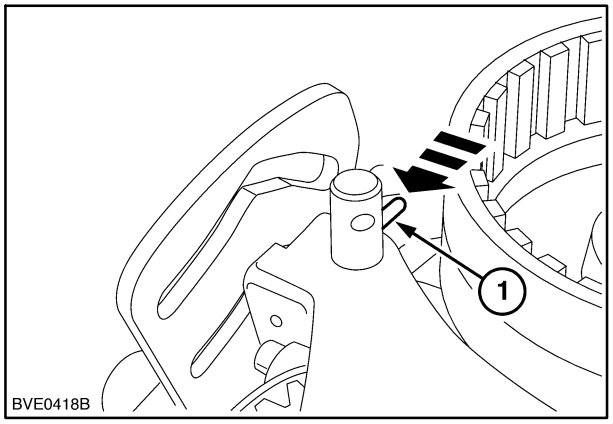
78

16. Install the PTO selector fork and sliding coupler (2) and install the selector fork pin (1).



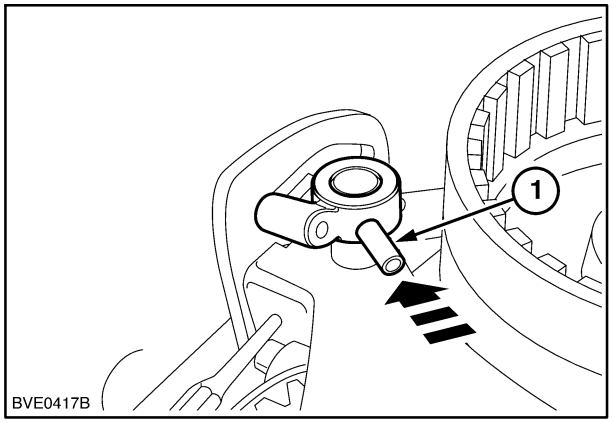
79

17. Install the PTO selector fork roll pin (1).



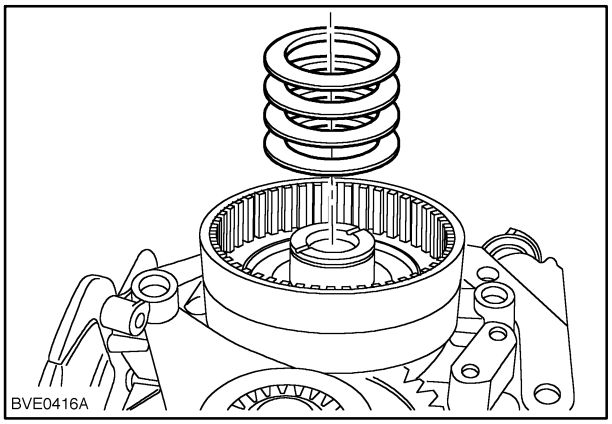
80

18. Install the selector and install the roll pin (1) to the selector rod.



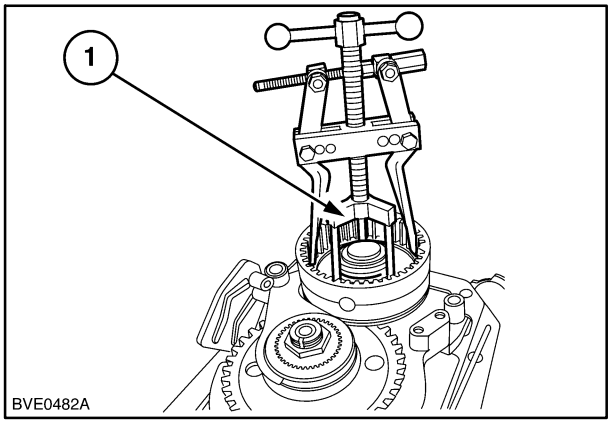
81

19. Install the piston to the clutch housing.
20. Install the bellville springs.



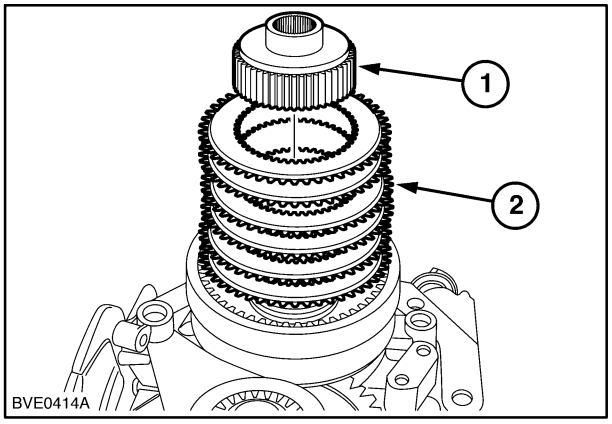
82

21. Install the PTO clutch housing end plate circlip and install a suitable puller and locally fabricated tool **50063** (1). Compress the bellville springs and install the retaining ring. Slowly and carefully release the pressure.
22. Remove the PTO clutch housing end plate circlip.



83

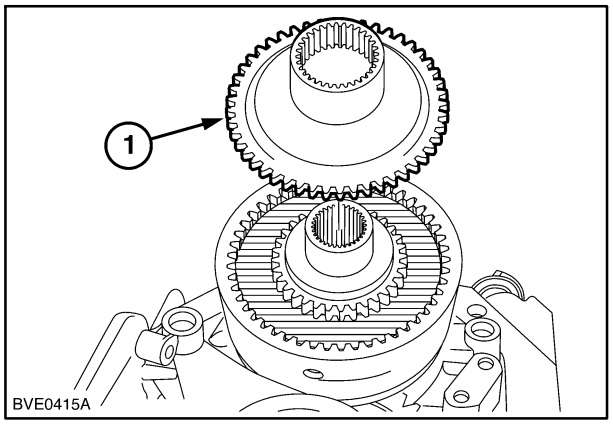
23. Install the clutch drive and driven discs (2) and the clutch hub (1).



84

PTO Assemblies with Ground Speed PTO

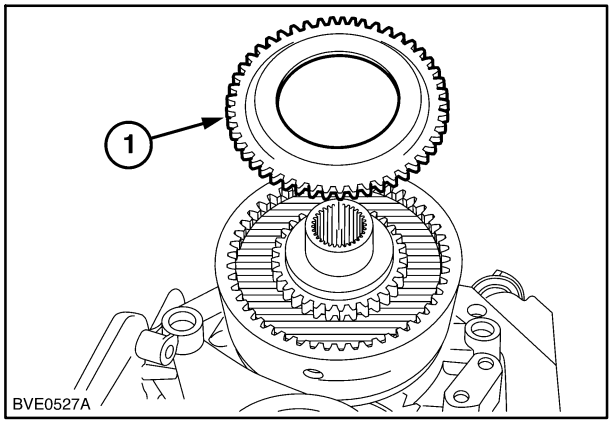
24. Install the ground speed PTO end plate (1).



85

PTO Assemblies Without Ground Speed PTO

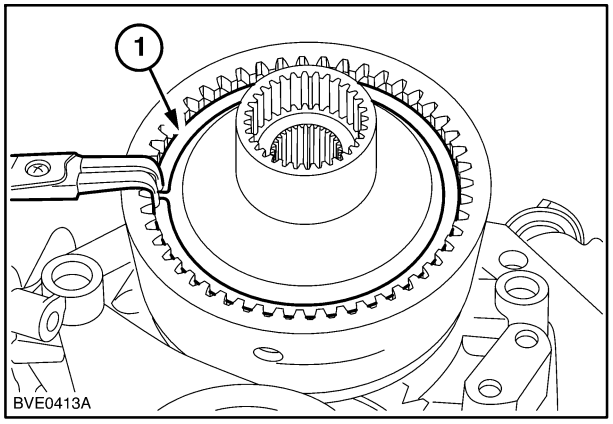
25. Install the clutch housing PTO end plate (1).



86

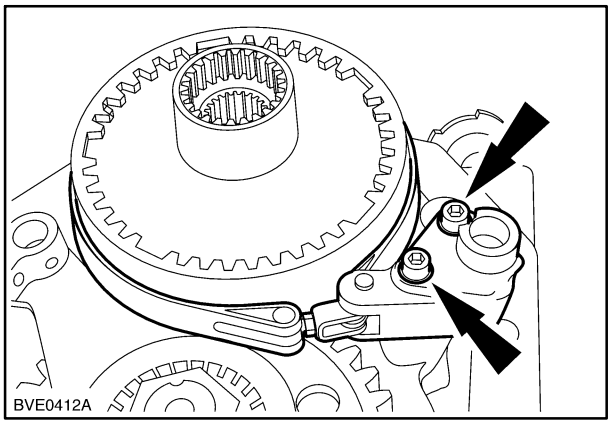
All PTO Assemblies

26. Install the PTO end plate circlip (1).



87

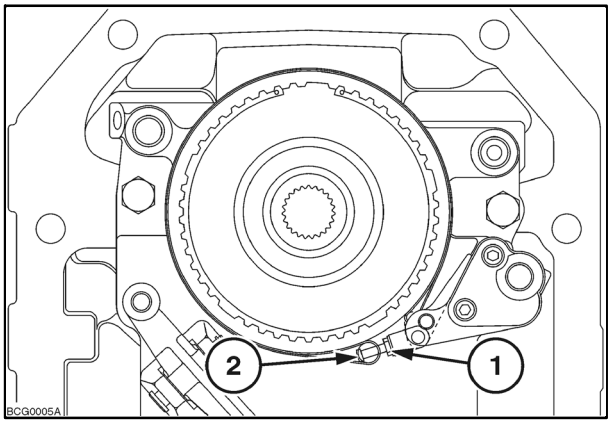
27. Install the brake band and the brake piston housing.



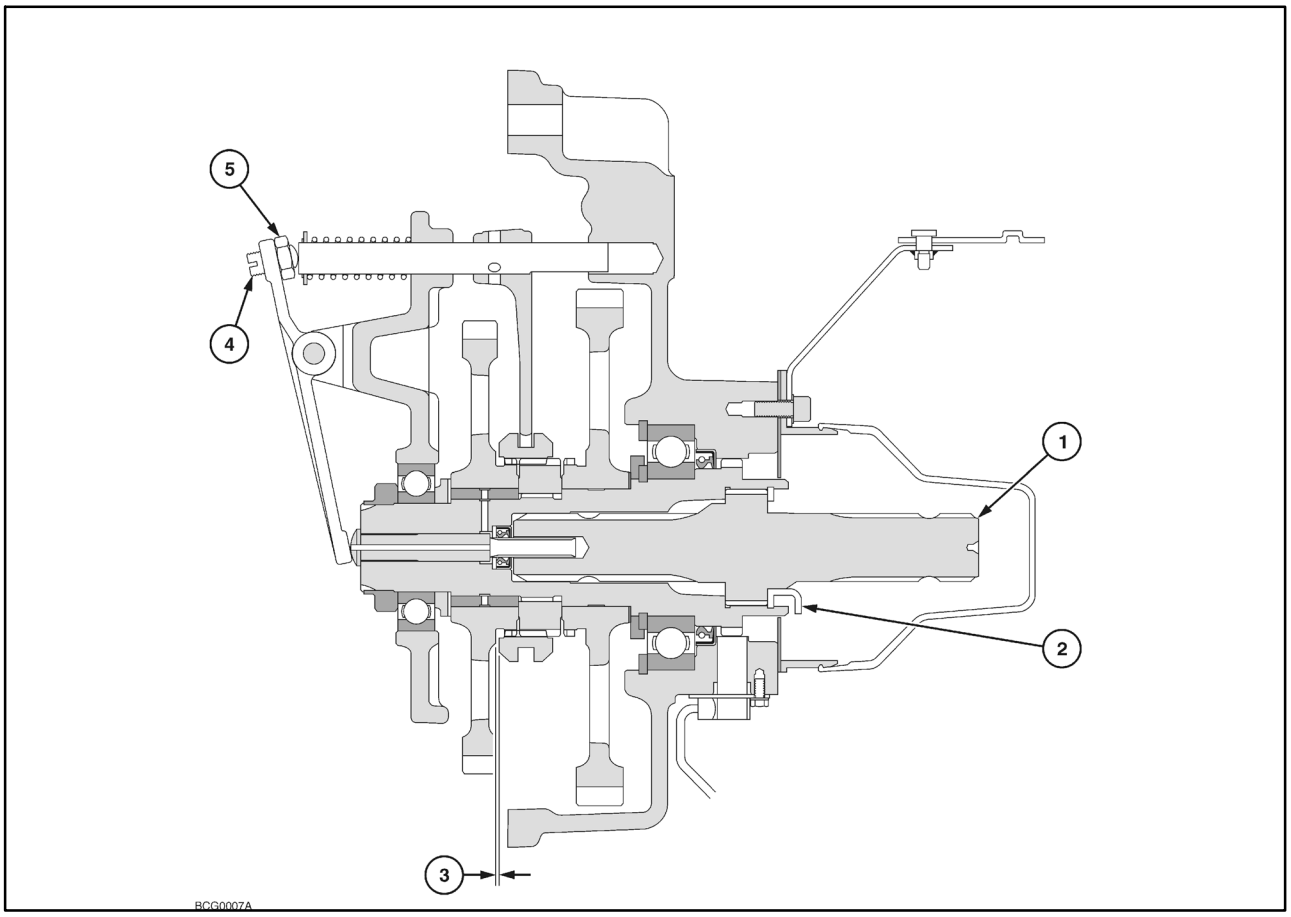
88

PTO Brake Band Adjustment

28. Loosen locknut (1). Torque screw (2) to 1-1,2 Nm, in order to close brake band. Loosen screw two and one half turns and retighten locknut. Check brake band for concentricity. Adjust as required and repeat adjustment procedure.



89



90

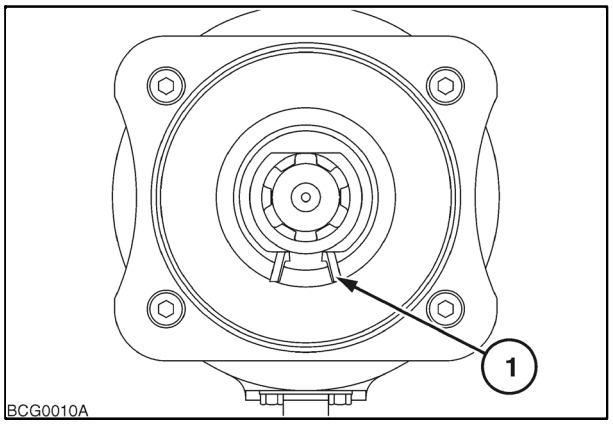
2 SPEED SHAFT CHANGE PTO - INITIAL PTO SHAFT SET UP

NOTE: *The following set up procedure is required to be carried out to 2 Speed PTO units for both 540 and 1000 rpm shafts, after a overhaul or strip down of the PTO assembly and prior to refit into the tractor.*

NOTE: For tractors with Driveline Serial Number up to 009017242 only.

29. Position the PTO shaft (1) into the assembly, with the 21 teeth splines to the outside of the assembly. Secure PTO shaft into place using the PTO output shaft retaining ring (2). Loosen locknut (5) and tighten screw (4) until it touches the rod. Tighten the screw(4) one more turn (360°), tighten locknut (5) to secure. This should now provide a clearance of 0,5 – 1,5mm between the sliding sleeve and 1000 rpm gear (3).

NOTE: *After installing the PTO output shaft retaining ring into the seat, rotate the ring to ensure that it is positioned opposite the flat surface on the PTO output shaft, as per illustration (89).*



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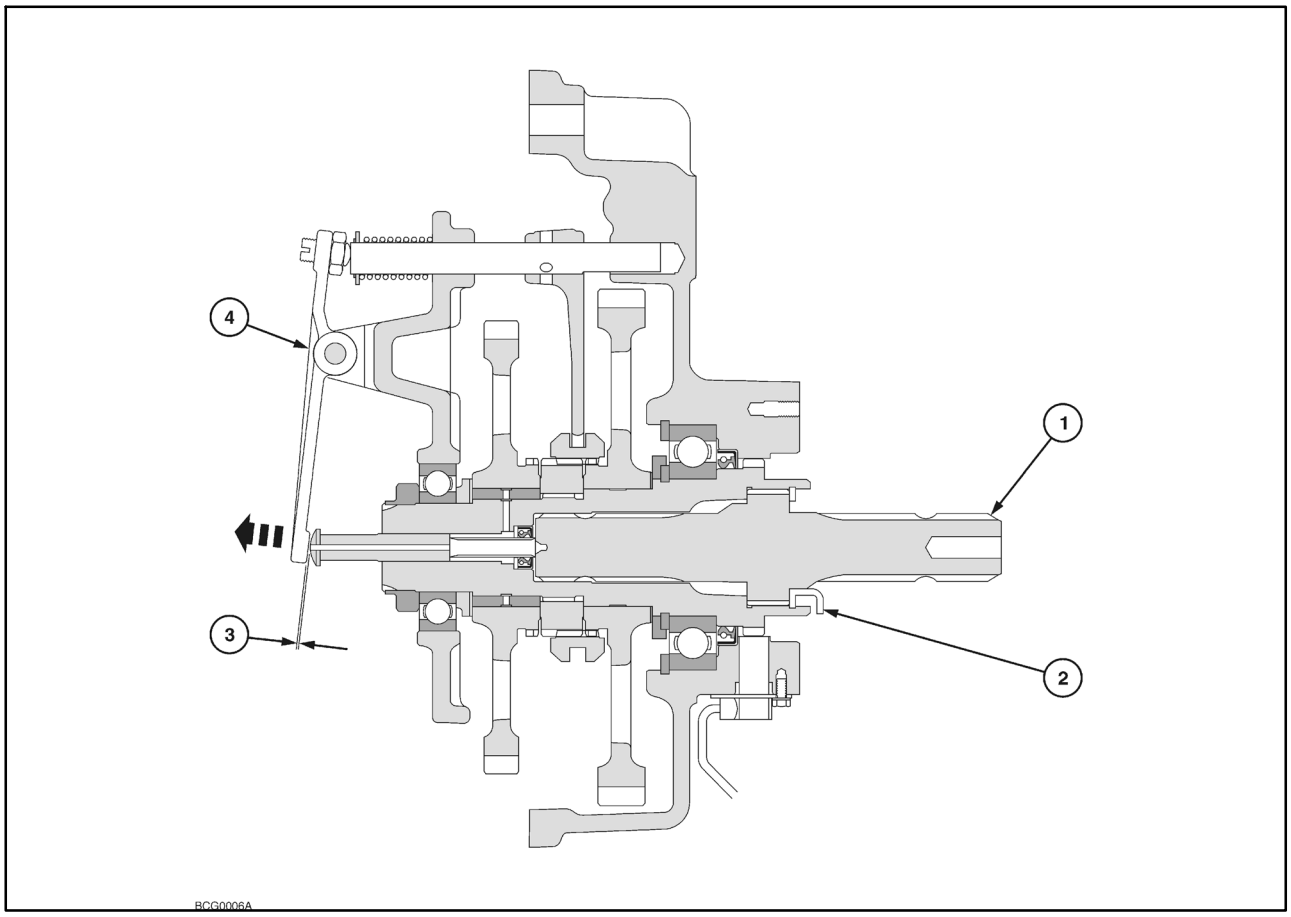

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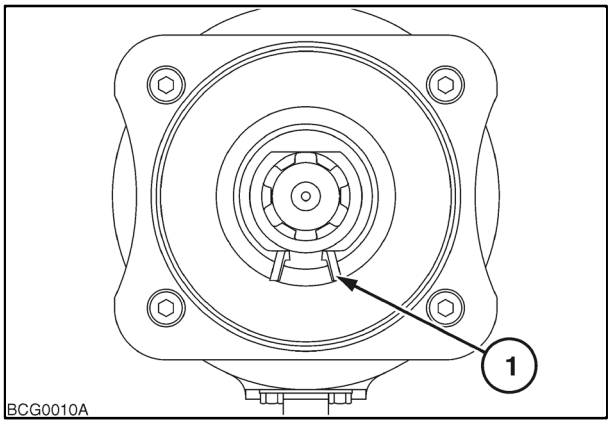
2 SPEED SHAFT CHANGE PTO - INITIAL PTO SHAFT SET UP

NOTE: *The following set up procedure is required to be carried out to 2 Speed PTO units for both 540 and 1000 rpm shafts, after a overhaul or strip down of the PTO assembly and prior to refit into the tractor.*

NOTE: For tractors with Driveline Serial Number up to 009017242 only.

30. Position the PTO shaft (1) into the assembly, with the 6 teeth splines to the outside of the assembly. Secure PTO shaft into place using the PTO output shaft retaining ring (2). Pull lever (4), in the direction of the arrow, and check for the clearance between the lever and actuating pin (3) of 1 - 3mm.

NOTE: *After installing the PTO output shaft retaining ring into the seat, rotate the ring to ensure that it is positioned opposite the flat surface on the PTO output shaft, as per illustration (93).*



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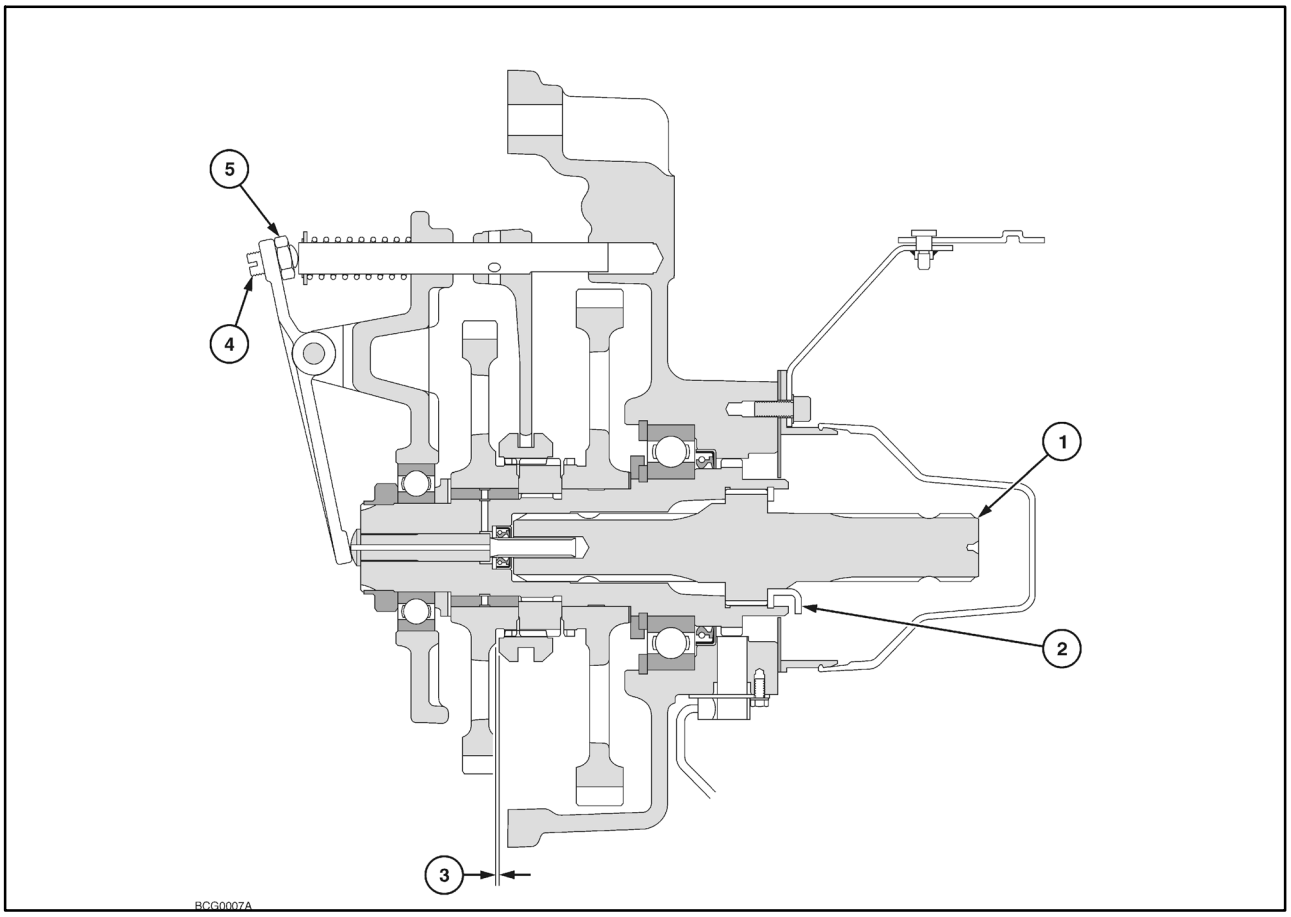

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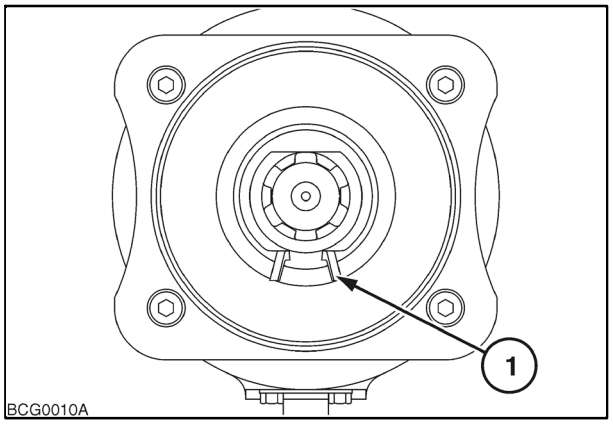
2 SPEED SHAFT CHANGE PTO - INITIAL PTO SHAFT SET UP

NOTE: *The following set up procedure is required to be carried out to 2 Speed PTO units for both 540 and 1000 rpm shafts, after a overhaul or strip down of the PTO assembly and prior to refit into the tractor.*

NOTE: For tractors with Driveline Serial Number from 009017243 only.

31. Position the PTO shaft (1) into the assembly, with the 21 teeth splines to the outside of the assembly. Secure PTO shaft into place using the PTO output shaft retaining ring (2). Loosen locknut (5) and tighten screw (4) until it touches the rod. Tighten the screw(4) half to one more turn (180°/360°), tighten locknut (5) to secure. This should now provide a clearance of 0,2 - 0,6mm between the sliding sleeve and 1000 rpm gear (3).

NOTE: *After installing the PTO output shaft retaining ring into the seat, rotate the ring to ensure that it is positioned opposite the flat surface on the PTO output shaft, as per illustration (89).*



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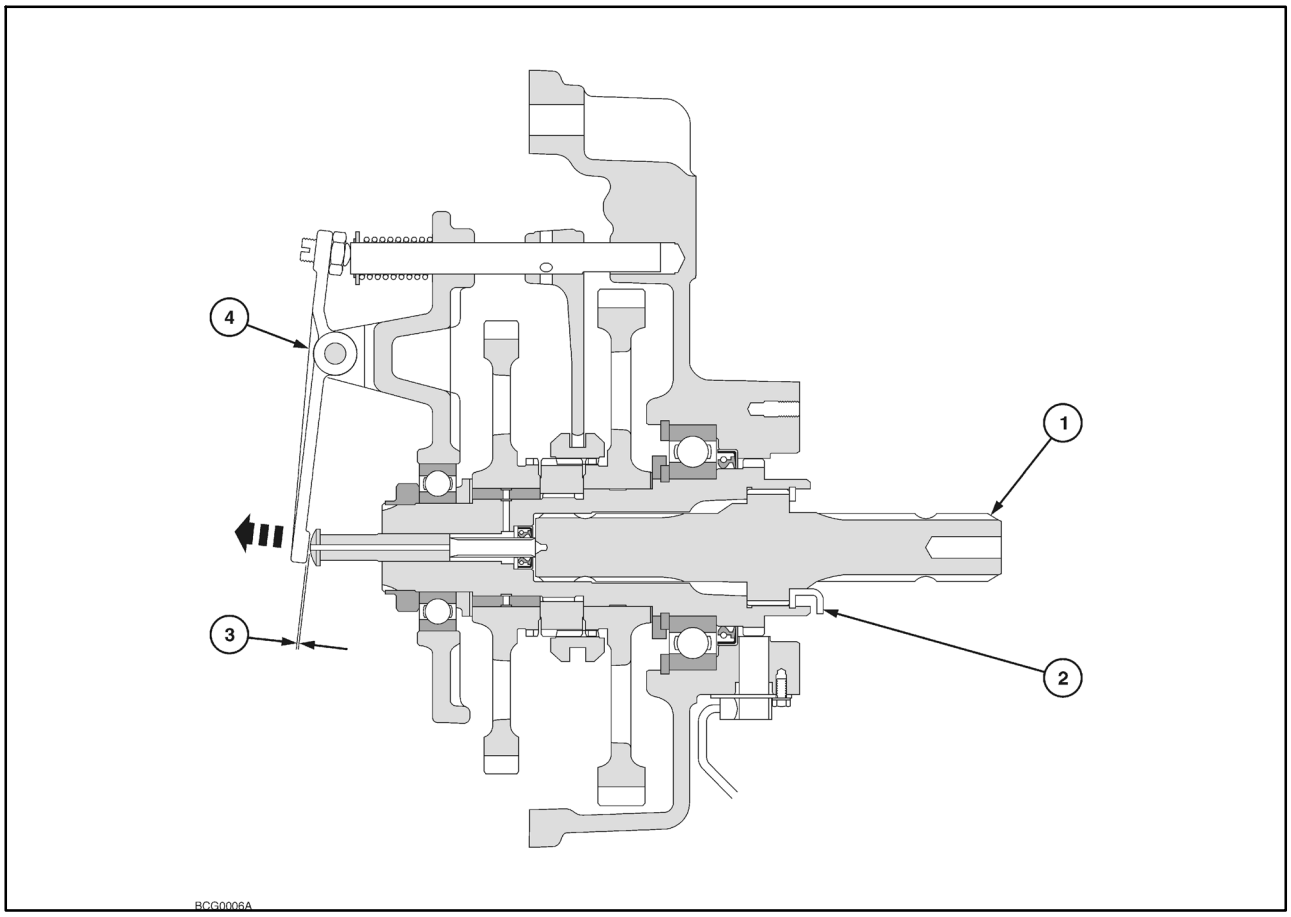

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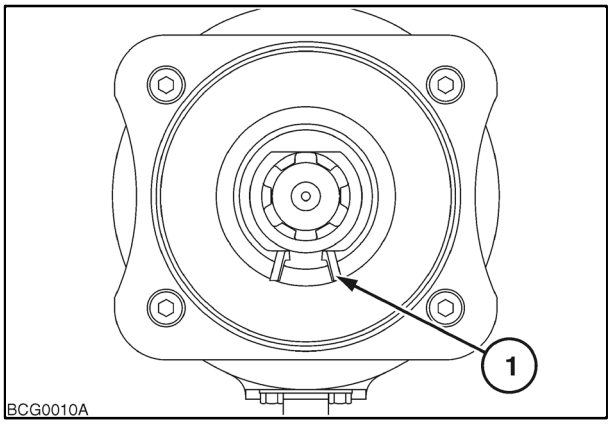
2 SPEED SHAFT CHANGE PTO - INITIAL PTO SHAFT SET UP

NOTE: *The following set up procedure is required to be carried out to 2 Speed PTO units for both 540 and 1000 rpm shafts, after a overhaul or strip down of the PTO assembly and prior to refit into the tractor.*

NOTE: For tractors with Driveline Serial Number from 009017243 only.

32. Position the PTO shaft (1) into the assembly, with the 6 teeth splines to the outside of the assembly. Secure PTO shaft into place using the PTO output shaft retaining ring (2). Pull lever (4), in the direction of the arrow, and check for the clearance between the lever and actuating pin (3) of 0,4 - 1,2mm.

NOTE: *After installing the PTO output shaft retaining ring into the seat, rotate the ring to ensure that it is positioned opposite the flat surface on the PTO output shaft, as per illustration (93).*



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SECTION 31 - POWER TAKE-OFF

Chapter 2 - Ground Speed Power Take-Off (PTO)

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	Description and Operation	3
	Troubleshooting	7
	Adjustments	8
	Ground Speed PTO Selector Cable	8
	Ground Speed PTO Switch	8
	PTO Clutch Oil Supply Cut-Off Valve	8

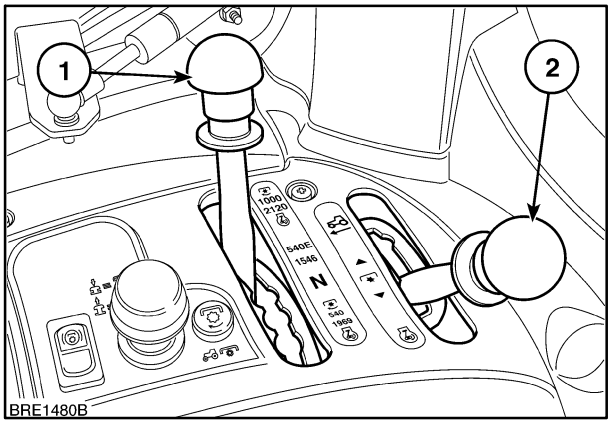
SPECIFICATIONS

Ground Speed PTO	
Type	Mechanical actuation of a sliding coupler selector
Drive	From the pinion shaft
PTO Shaft Revolutions Per Wheel Revolution:	
Heavy Duty Rear Axle (All Models)	
540 range engaged	9.93 : 1
540E range engaged	12.65 : 1
1000 range engaged	17.08 : 1
Light Duty Rear Axle (100 and 110 Models)	
540 range engaged	8.83 : 1
540E range engaged	11.24 : 1
1000 range engaged	15.19 : 1

DESCRIPTION AND OPERATION

Three speed ground speed PTO is available on all models in conjunction with the three speed engine driven, shiftable PTO. Ground speed PTO speed is directly related to the rotation of the rear wheels rather than the engine speed.

Ground speed PTO is selected by the selector lever (2) and the three speed ranges are selected with the PTO range selector lever (1).



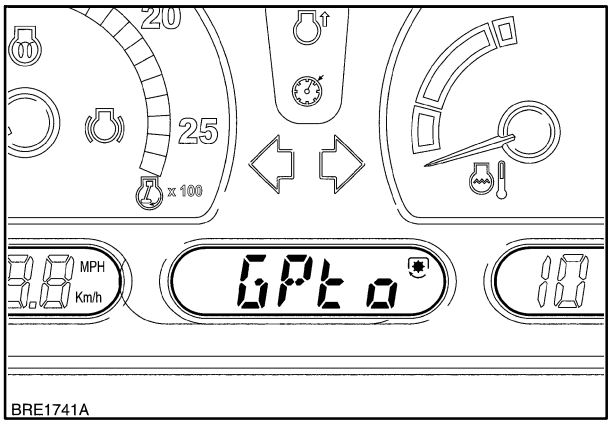
1

NOTE: *To aid smooth engagement of the ground speed PTO, depress and hold both brake pedals while moving the cab selector lever.*

When ground speed PTO is engaged, a Controller Area Network (CAN) message is sent to the instrument cluster and “GPto” is displayed instead of the rear PTO speed.

If ground speed PTO is disengaged then the CAN message is updated and the instrument cluster display will change to display the rear PTO speed.

NOTE: *Selecting ground drive with the engine PTO function engaged will automatically disable engine PTO drive. To re-enable engine PTO drive, move the selector lever to the engine drive position, disengage and then re-engage the main PTO switch.*



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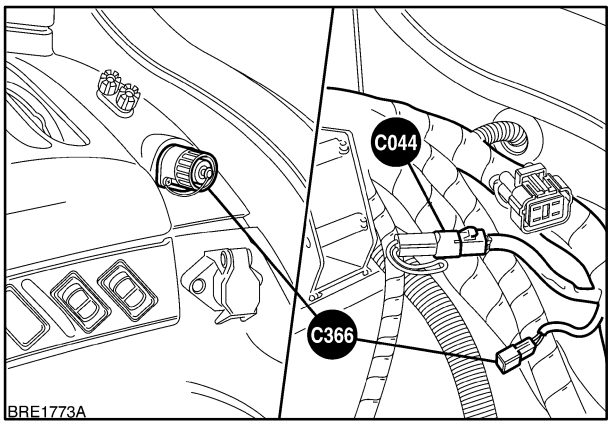
If ground speed PTO is not fitted to the tractor, an electrical connector fitted with a link wire is installed into the electrical connector C044.

If the link wire electrical connector is not installed, the controller will display “GPto” instead of the rear PTO speed.



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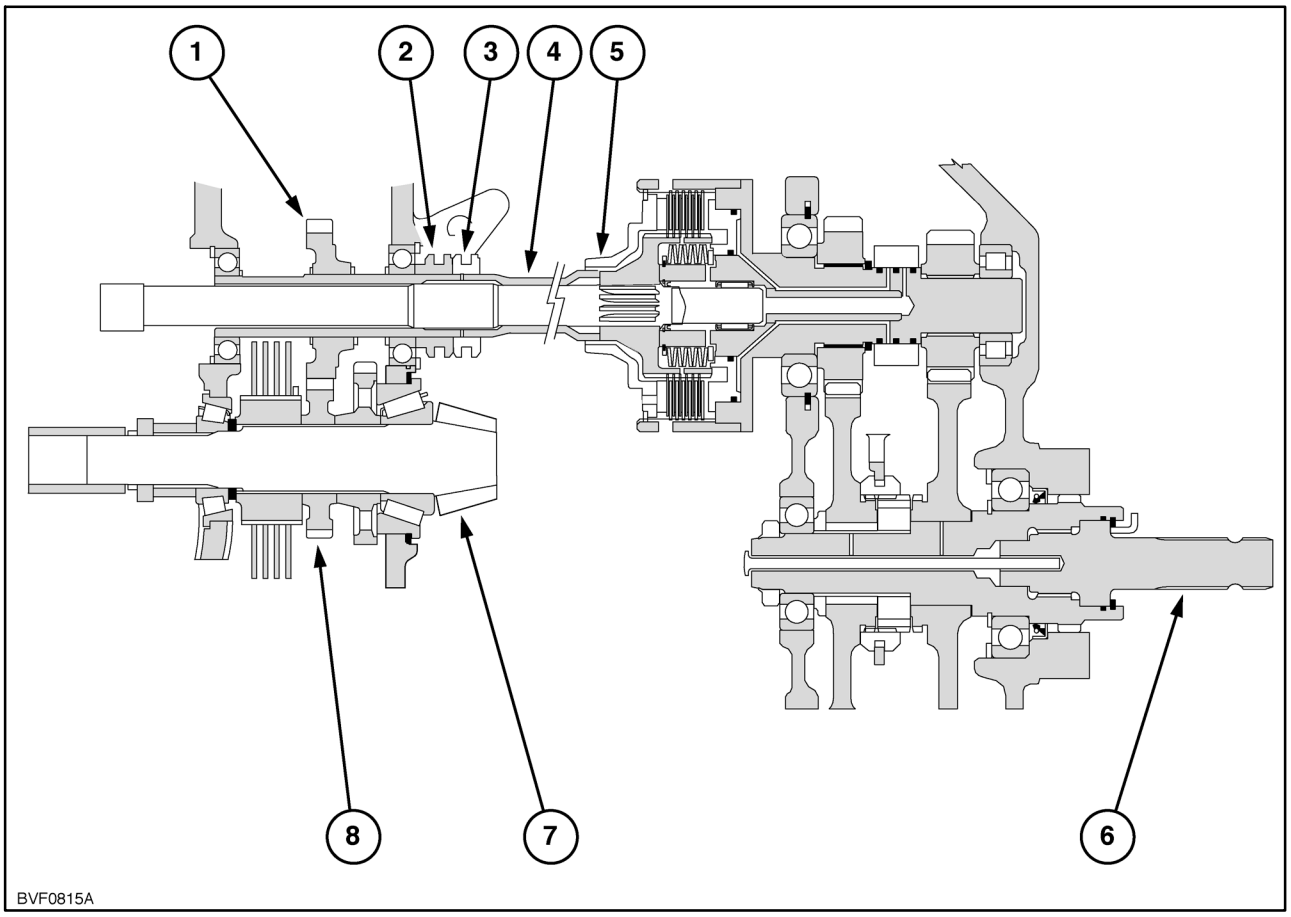
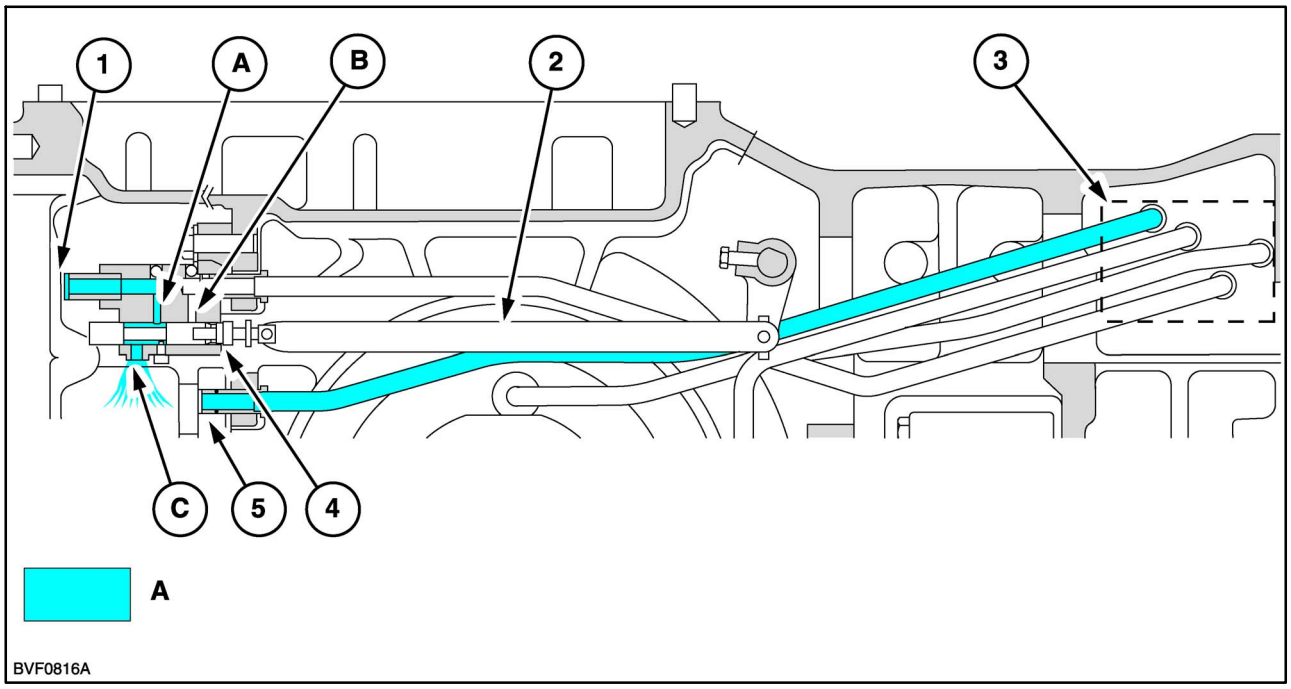


4

Ground Speed PTO Drive Sectional View

1. Ground speed PTO driven gear
2. Sliding engagement coupler (disengaged position)
3. Sliding engagement coupler (engaged position)
4. Ground speed PTO driveshaft
5. Ground speed PTO control clutch end plate
6. PTO output shaft
7. Pinion shaft
8. Ground speed PTO drive gear

When ground speed PTO is selected, the rear axle selector fork will move the sliding engagement coupler (2) to the engaged position (3). This will transfer drive from the drive gear (8) splined to the pinion shaft (7), to the PTO control clutch end plate via the driven gear (1) and the driveshaft (4). The drive by-passes the PTO control clutch and depending on the speed selected by the operator to the output shaft (6).



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PTO Clutch Oil Supply Cut Off Valve Operation - Ground Speed PTO Engaged

1. Oil supply to the PTO control clutch
2. Selector lever
3. Oil supply from the low pressure distribution block
4. PTO oil supply cut-off valve
5. Oil supply to the PTO brake

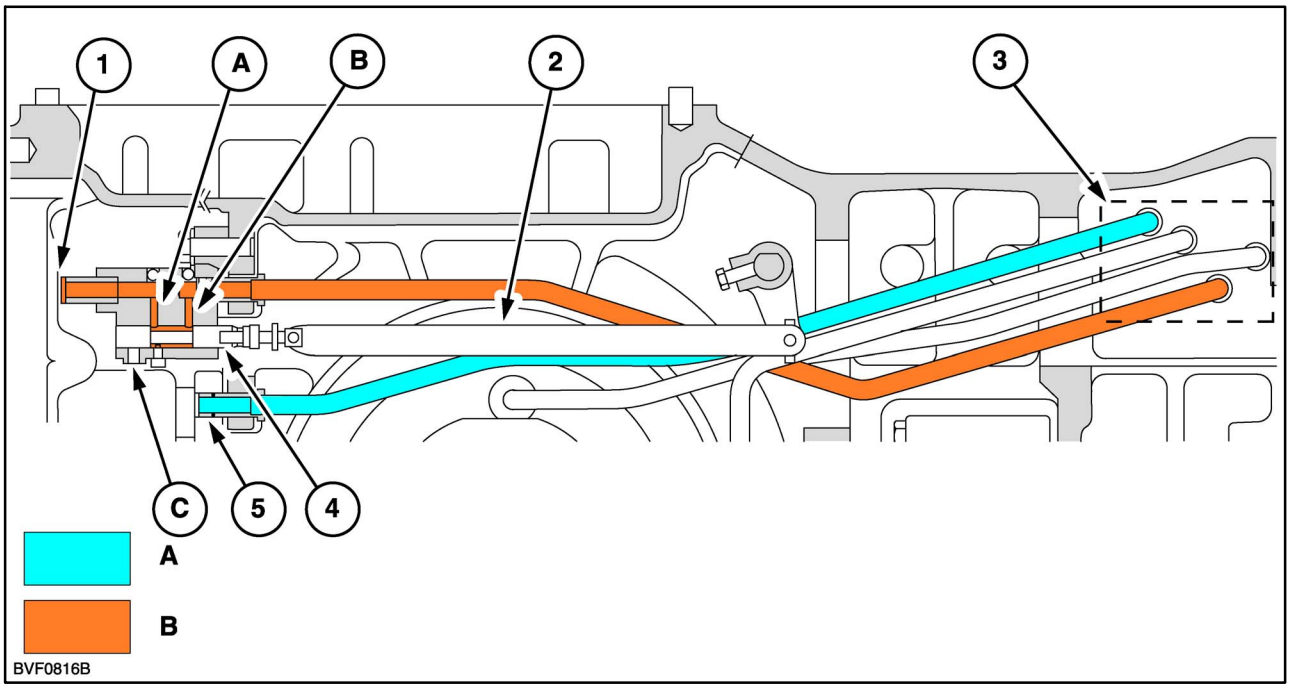
A. Oil supply gallery to PTO control clutch
B. Oil supply gallery from the low pressure distribution block
C. Oil gallery to the oil reservoir (rear axle)

Figure Colour Key

A. Return to reservoir

When ground speed PTO is engaged, the PTO brake solenoid is automatically disengaged by the controller. The PTO clutch oil supply cut-off valve (4) is moved by the selector lever (2) to block the flow of oil from gallery 'A' to gallery 'B'. This will stop the engagement of the PTO clutch as an additional safety feature.

Any residual pressure behind the PTO clutch piston will be open to the oil reservoir through the PTO oil supply cut-off valve (4) and galley 'C'.



6

PTO Clutch Oil Supply Cut Off Valve Operation - Ground Speed PTO Disengaged and PTO Clutch Engaged

1. Oil supply to the PTO control clutch
2. Selector lever
3. Oil supply from the low pressure distribution block
4. PTO oil supply cut-off valve
5. Oil supply to the PTO brake
A. Oil supply gallery to PTO control clutch
B. Oil supply gallery from the low pressure distribution block
C. Oil gallery to the oil reservoir (rear axle)

Figure Colour Key

A. Return to reservoir
B. Low pressure circuit

When ground speed PTO is disengaged, the PTO oil supply cut off valve (4) is moved by the selector lever (2) and the PTO brake solenoid is automatically engaged by the controller.

When the PTO clutch is engaged, the PTO brake is disengaged by the controller and oil can flow from gallery 'B' to gallery 'A' through the PTO oil supply cut-off valve (4).

TROUBLESHOOTING

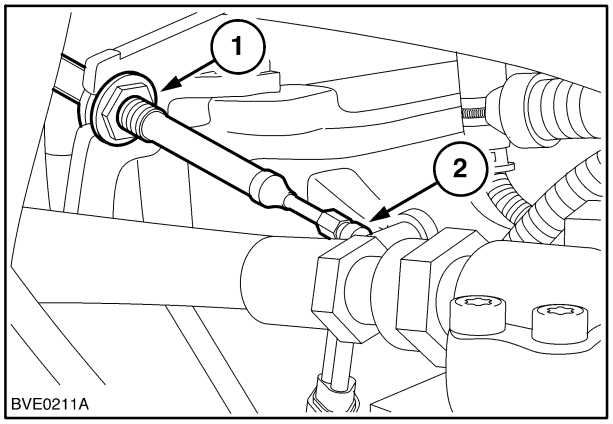
PROBLEM	POSSIBLE CAUSES	CORRECTION
Difficult to engage ground speed PTO	Tractor is not stationary.	Apply parking brake and foot brake pedals before selecting ground speed PTO.
	Incorrect selector cable adjustment.	Adjust the selector cable.
	Damaged selector cable.	Replace the selector cable.
	Selector shaft lever spring broken.	Replace the selector shaft lever spring.
	Worn selector fork.	Replace the selector fork.
	Worn sliding engagement coupler.	Replace the sliding engagement coupler.
	Sliding engagement coupler is a tight fit on the shaft splines.	Clean the splines or replace the shaft and the sliding engagement coupler.
	Engagement teeth worn on the ground speed PTO driveshaft.	Replace the ground speed PTO driveshaft.
	Shift rail seized in the axle housing.	Remove the shift rail and repair or replace as necessary.
	Rear PTO output shaft rotating.	PTO brake not being applied, repair or replace as necessary.
	PTO clutch oil supply cut off valve.	Replace PTO clutch oil supply cut off valve.
Ground speed PTO will not remain in the engaged position	Incorrect selector cable adjustment.	Adjust the selector cable.
	Selector shaft lever spring broken.	Replace the selector shaft lever spring.
	Sliding engagement coupler loose on the shaft splines.	Replace the sliding engagement coupler and/or the shaft.
	Ground speed PTO shaft support bearings worn.	Replace the shaft support bearings.
Ground speed PTO (Gpto) is displayed on the instrument cluster when ground speed PTO is disengeged or not fitted and engine driven rear PTO is engaged	Cab selector lever switch open circuit.	Replace the cab selector lever switch.
	Cab selector lever switch electrical circuit faulty.	Repair or replace the electrical harness.
	Incorrect ground speed PTO switch adjustment.	Adjust the ground speed PTO switch.
	Link wire electrical connector faulty.	Repair or replace the link wire electrical connector.

ADJUSTMENTS

GROUND SPEED PTO SELECTOR CABLE

NOTE: *The adjustment bolt will touch the status switch when disengaged.*

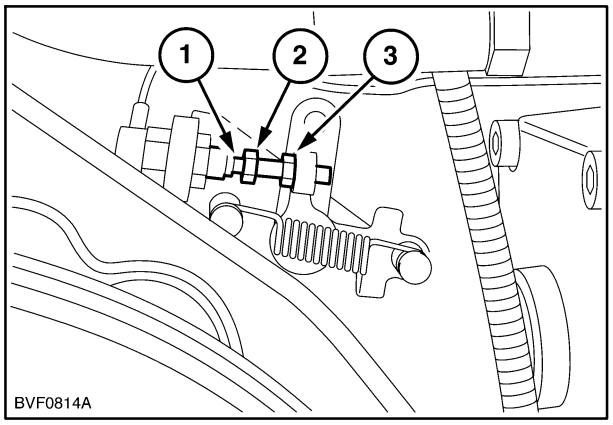
1. Make sure the ground speed PTO is disengaged.
2. Position the selector lever in the cab in the engine driven PTO position.
3. Adjust the selector cable locking nut (1) until the cable end (2) can be installed into the selector lever.
4. Install the retaining clip.



7

GROUND SPEED PTO SWITCH

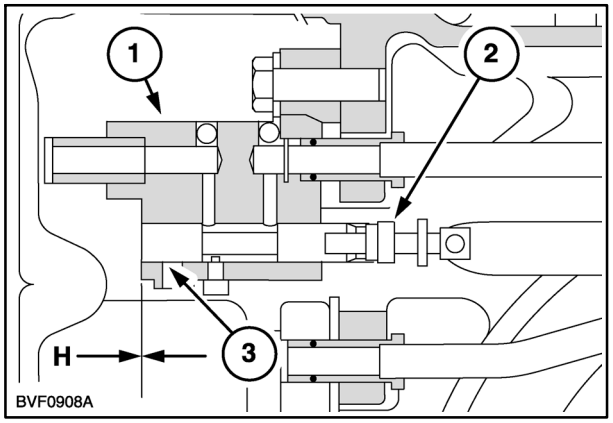
1. Disengage the ground speed PTO.
2. Make sure the switch plunger (1) is depressed between 2.5 mm and 4.5 mm.
3. Adjustment is obtained by loosening the locknut (3) and turning the adjustment bolt (2).



8

PTO CLUTCH OIL SUPPLY CUT-OFF VALVE

1. Disengage the ground speed PTO.
2. Make sure the oil supply cut off valve (3) is level +/- 0.2 mm (H) with the valve body (1).
3. Adjustment is obtained by the adjustment bolt (2).



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SECTION 33 – BRAKING SYSTEM

Chapter 1 – Tractor Brakes

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SPECIFICATIONS

Type	
Service Brakes	Wet disc acting on differential axle half-shafts
Parking Brake	Wet discs acting on pinion gear shaft
Controls	
Service Brakes	Hydraulic, independent pedals (or latched for joint operation) Front brakes power assisted
Parking Brake	Mechanical through a hand lever
Brake Oil Specification	NH 610 A Ambra Brake LHM (mineral oil)
Brake Materials	
Service Brake Friction Disc Material	Resin/graphite
Static Service Brake Disc Material	Steel
Parking Brake Disc Material	Steel
Parking Brake Friction Pad Material	Sintered or organic conglomerate
Rear Service Brake Disc Thickness	
Friction Disc (New) mm	10
Friction Disc (Minimum) mm	8.4
Brake Piston (New) mm	38.5
Final Drive Case Spacer (New) mm	56.5 - 57.5
Parking Brake Disc Thickness	
Friction Pad (New) (Single Friction Side) mm	3.4
Friction Pad (Minimum) (Single Friction Side) mm	3.1
Friction Pad (New) (Double Friction Side) mm	4.5
Friction Pad (Minimum) (Double Friction Side) mm	4.2
Steel Disc mm	4.45 - 4.55
Front Service Brake Disc Thickness	
Friction Disc (New) mm	4.5
Friction Disc (Minimum) mm	3.6
Steel Disc (Internal Plate) mm	4.87 - 5.03
Steel Disc (External Plate) mm	17.8 - 18.2
Front Service Brakes	
Pressure Supply To Front Brake Valve bar	17 - 19
lbf/in^2	247 - 276
Pressure Supply From Front Brake Valve bar	0 - 19
lbf/in^2	0 - 276

SPECIAL TOOLS

⚠ CAUTION ⚠

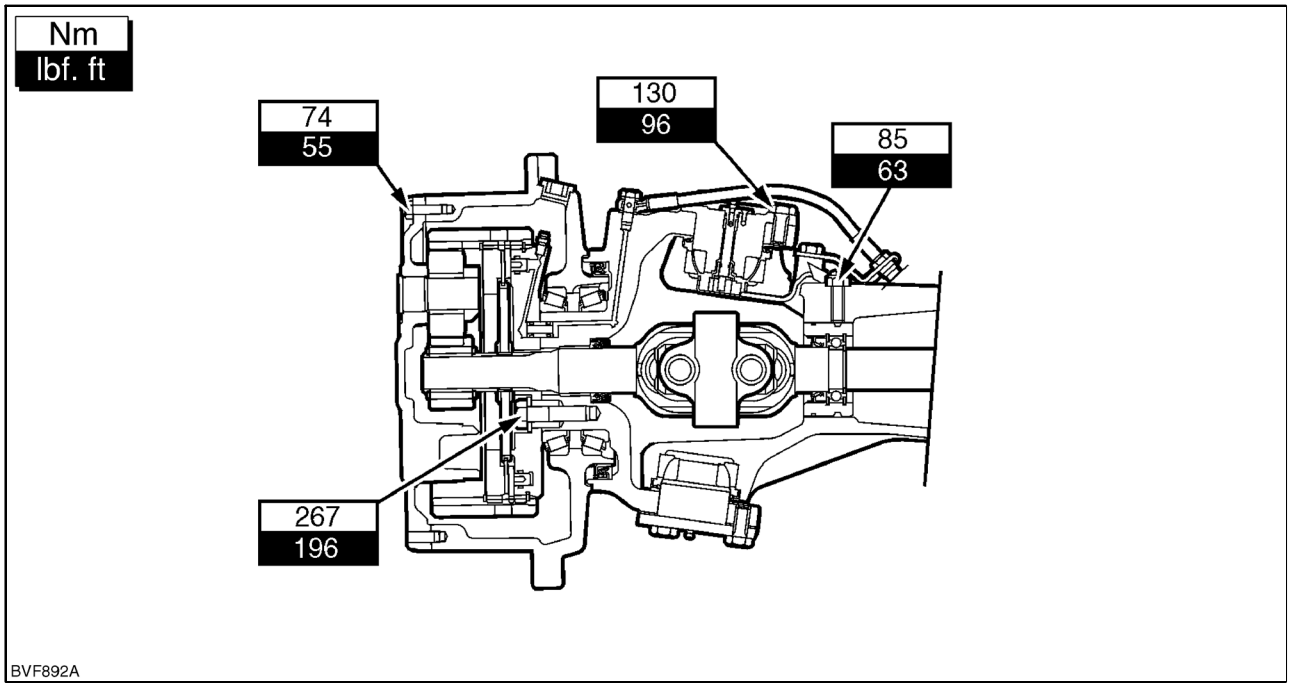
Operations described in this section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly in this Manual.

List of special tools necessary to carry out the different operations described in this section:

380000982 Parking brake alignment tool

292888 Alignment Pins

TIGHTENING TORQUES



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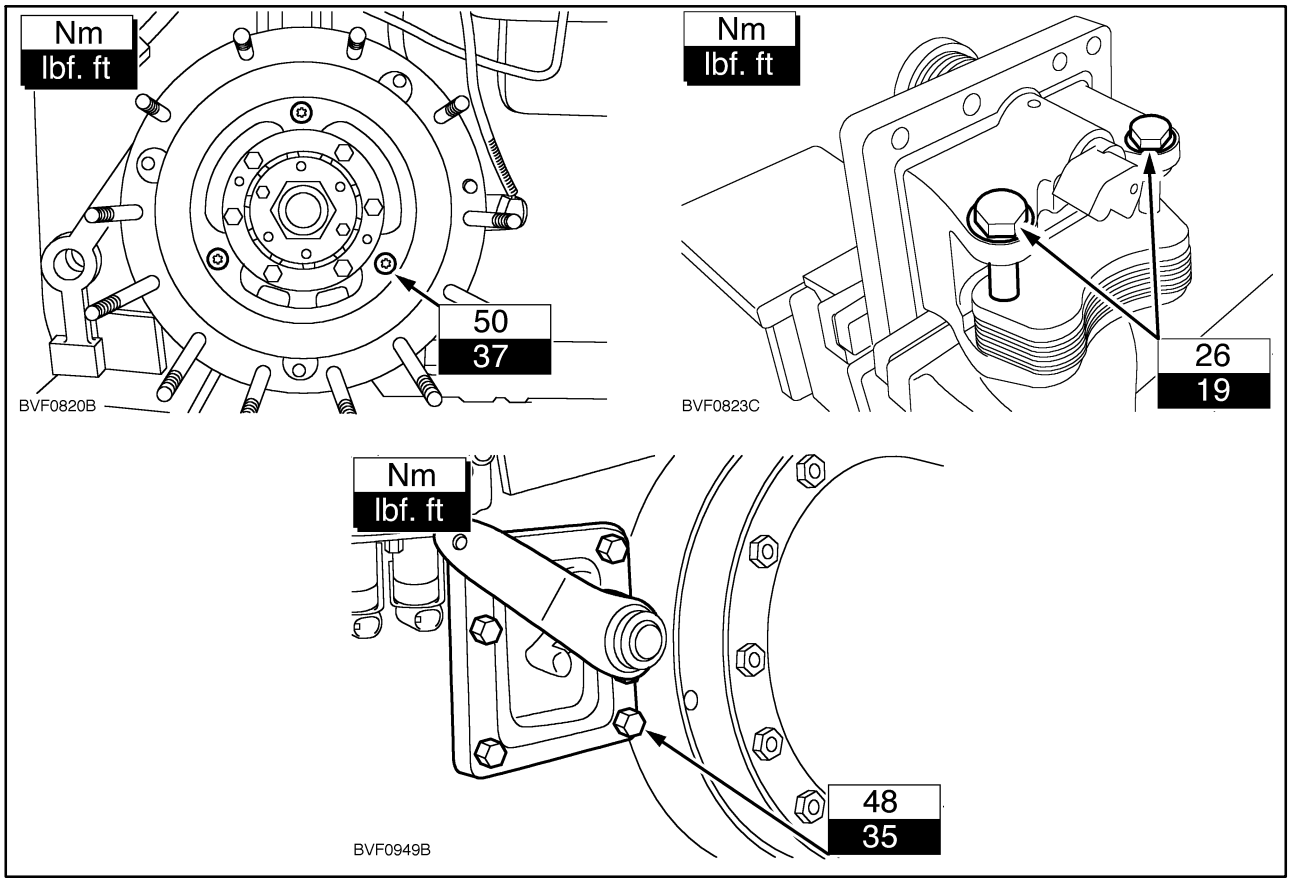

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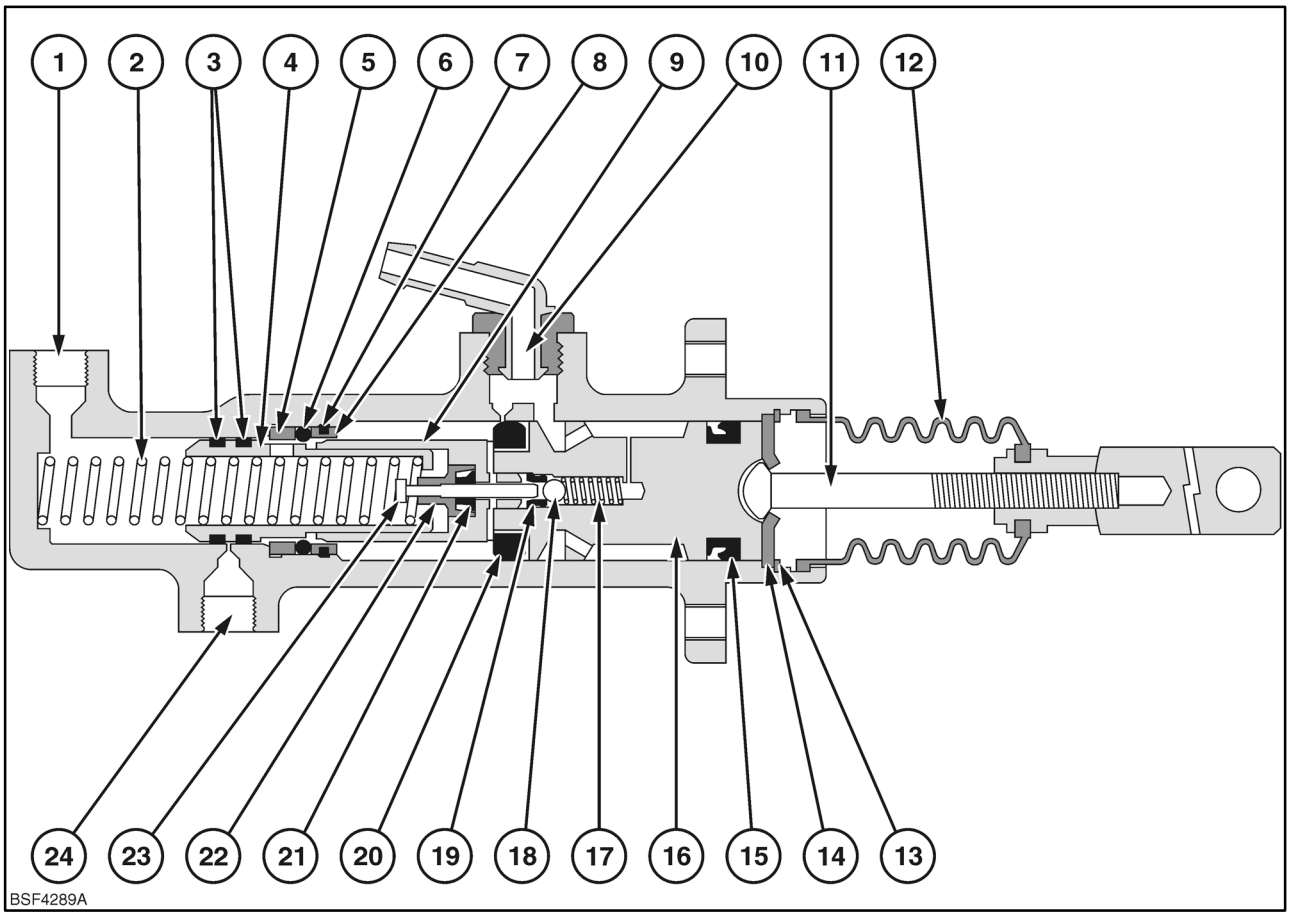
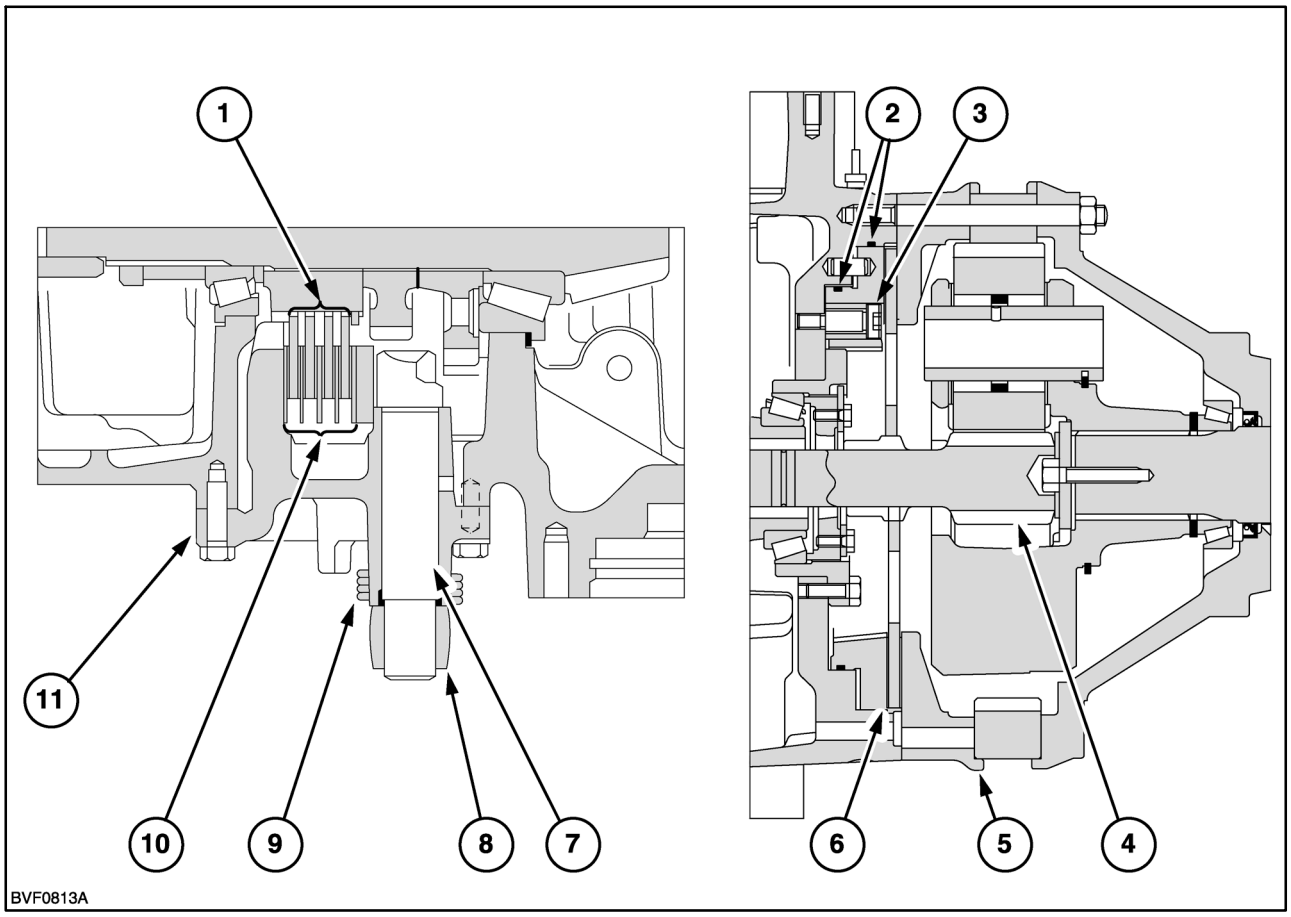
SECTIONAL VIEWS



3

Balanced Brakes Differential Master Cylinder Sectional View

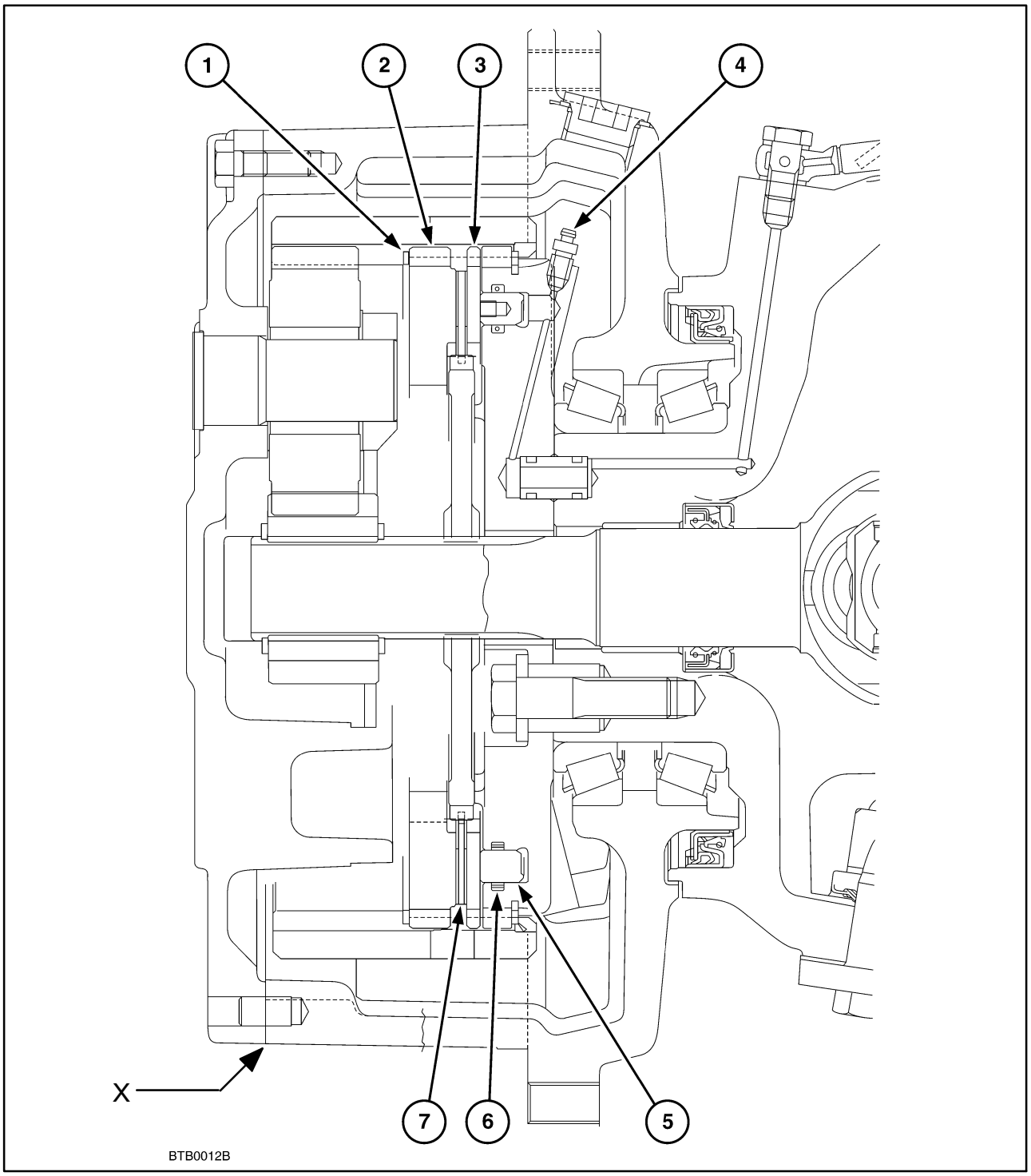
1. Outlet port to brake piston(s)
2. Piston return spring
3. Oil seal
4. Piston
5. Piston sleeve guide ring
6. O–ring
7. Piston sleeve guide ring retaining clip
8. Piston sleeve guide ring
9. Piston sleeve
10. Brake fluid reservoir inlet port
11. Push rod
12. Rubber boot
13. Circlip
14. Piston retaining washer
15. Oil seal
16. Piston
17. Check valve ball return spring
18. Check valve ball
19. Check valve ball seat
20. Oil seal
21. Check valve stem oil seal
22. Check valve stem guide
23. Check valve stem
24. Balance tube port



4

Rear Service and Parking Brake Sectional Views

1. Parking brake steel discs
2. Brake piston oil seals
3. Brake piston retaining bolt
4. Differential output half shaft
5. Final drive case spacer
6. Brake friction disc
7. Parking brake control lever shaft
8. Parking brake control lever
9. Parking brake release spring
10. Parking brake friction pads
11. Parking brake friction pad housing



5

Front Service Brake Sectional View

1. Outer brake plate retaining ring
2. Outer brake plate
3. Inner brake plate
4. Brake bleed screw
5. Brake piston
6. Piston oil seal
7. Friction disc

NOTE: *During installation apply liquid gasket (part number 82995771) on surfaces marked with an X.*

DESCRIPTION AND OPERATION

CONTROL CIRCUIT

The tractor is fitted with two balanced brakes differential master cylinders, linked by a balance tube. When operated individually, each master cylinder will operate each of the rear service brakes independently. If both master cylinders are operated simultaneously they will also operate the trailer brakes, front brakes (if fitted) and the pneumatic trailer brakes (if fitted).

The master cylinders are fed from a single reservoir located under the engine hood and mounted above the engine by means of a bracket.

The balance tube links the two master cylinders. This allows the same braking force to be applied when both both master cylinders are operated simultaneously, even if the force exerted on the pedals by the operator is not equal.

The operation of the balanced brake differential master cylinder is divided into two stages.

The first stage is designed to provide additional fluid transfer within the master cylinder to move the rear service brake piston at an increased rate and reduce pedal travel.

The second stage begins at the point when pedal resistance is just being achieved and the brakes are beginning to bite. When this occurs, the additional fluid transfer available during the first stage is no longer able to assist in the movement of the piston, this reduces the force acting on the piston to allow smooth progressive application of the brakes.

NOTE: *The brake oil used is a mineral type, New Holland Specification NH 610 A, and under no circumstances should a universal oil, ie, DOT 4 type, be used.*

FRONT BRAKE VALVE

Front axle brakes (if fitted), are hydraulically operated from the low pressure hydraulic system via the front brake valve.

The front brake valve is supplied brake fluid from the master cylinders via the trailer brake logic head. This requires a two pedal operation to provide oil flow. The oil supplied to the front brake valve operates a spool, allowing low pressure hydraulic oil to be supplied to the front axle brakes proportional to the brake pedal effort.

FRONT SERVICE BRAKES

The front service brakes are hydraulically operated wet disc type. They are located in the final drive cases of the front axle and are splined to the differential output axle half-shafts.

REAR SERVICE BRAKES

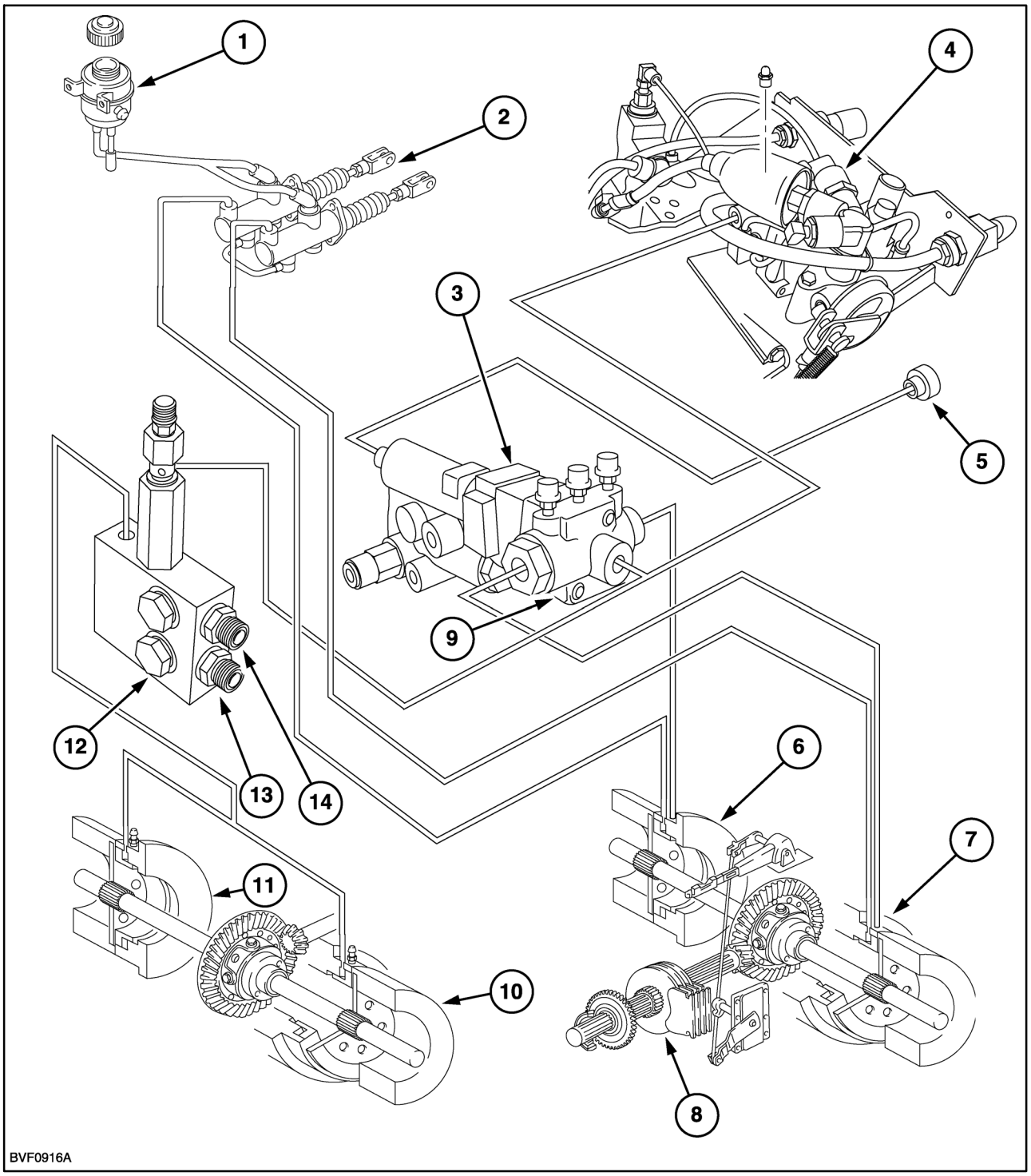
The rear service brakes are hydraulically operated wet disc type. They are located between the rear axle housing and final drive cases and are splined to the differential output axle half-shafts.

NOTE: *The rear service brakes are fitted with a single friction disc each side and self setting free play adjusters.*

PARKING BRAKE

The parking brake is controlled mechanically. It acts on the rear pinion gear shaft and is controlled through a hand lever located to the left of the operators seat.

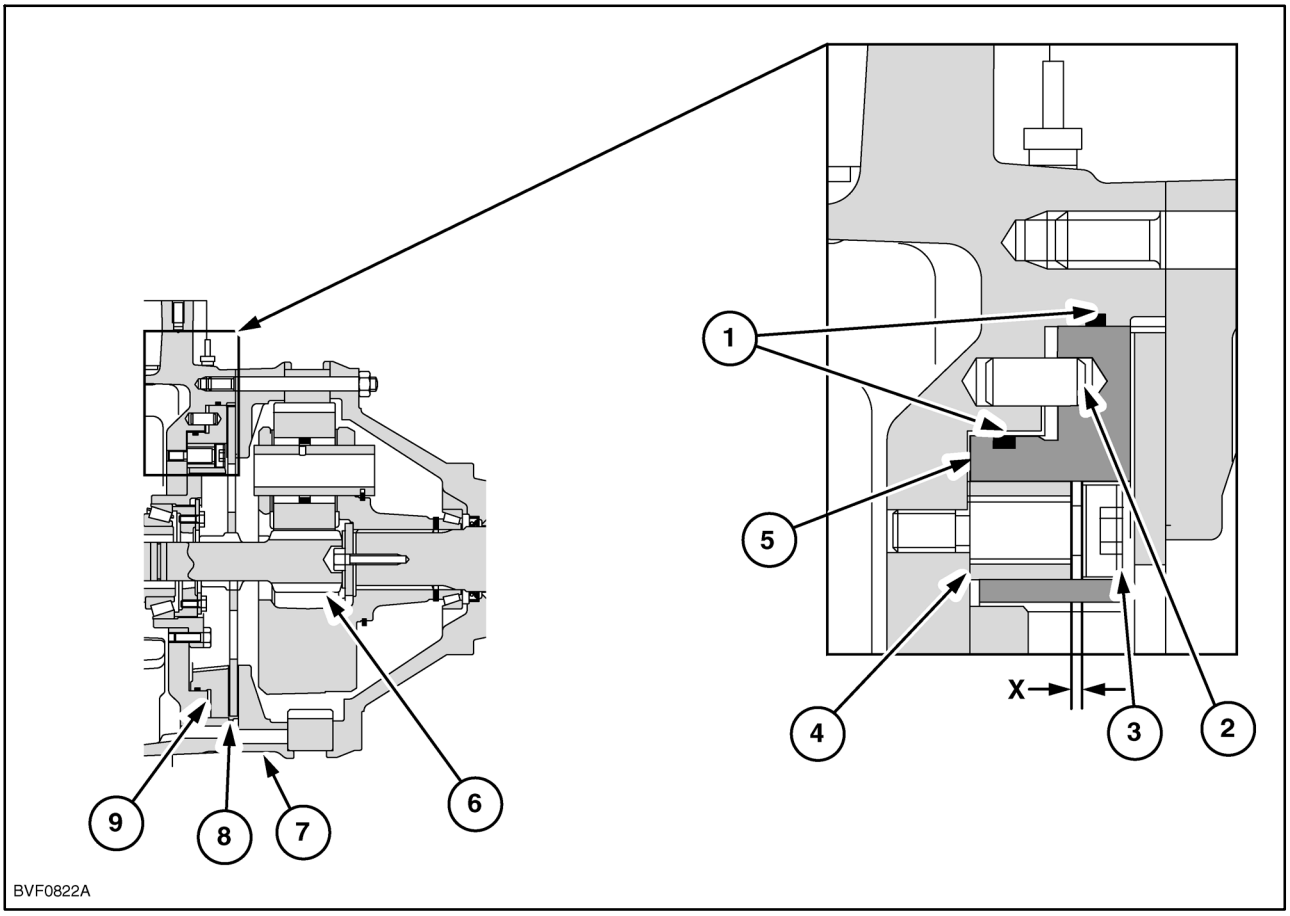
When the parking brake control lever is raised, the cable acts on the actuator forcing the pads against the brake discs which are splined to the tractor rear pinion shaft.



6

Brake System Components

1. Brake fluid reservoir
2. Master cylinders
3. Hydraulic trailer brake valve
4. Pneumatic trailer brake valve
5. Trailer brake valve quick release coupler
6. Rear service brake right hand
7. Rear service brake left hand
8. Parking brake
9. Logic valve
10. Front service brake left hand
11. Front service brake right hand
12. Front brake valve
13. Return to reservoir
14. Low pressure oil supply



7

Rear Service Brake Self Adjuster

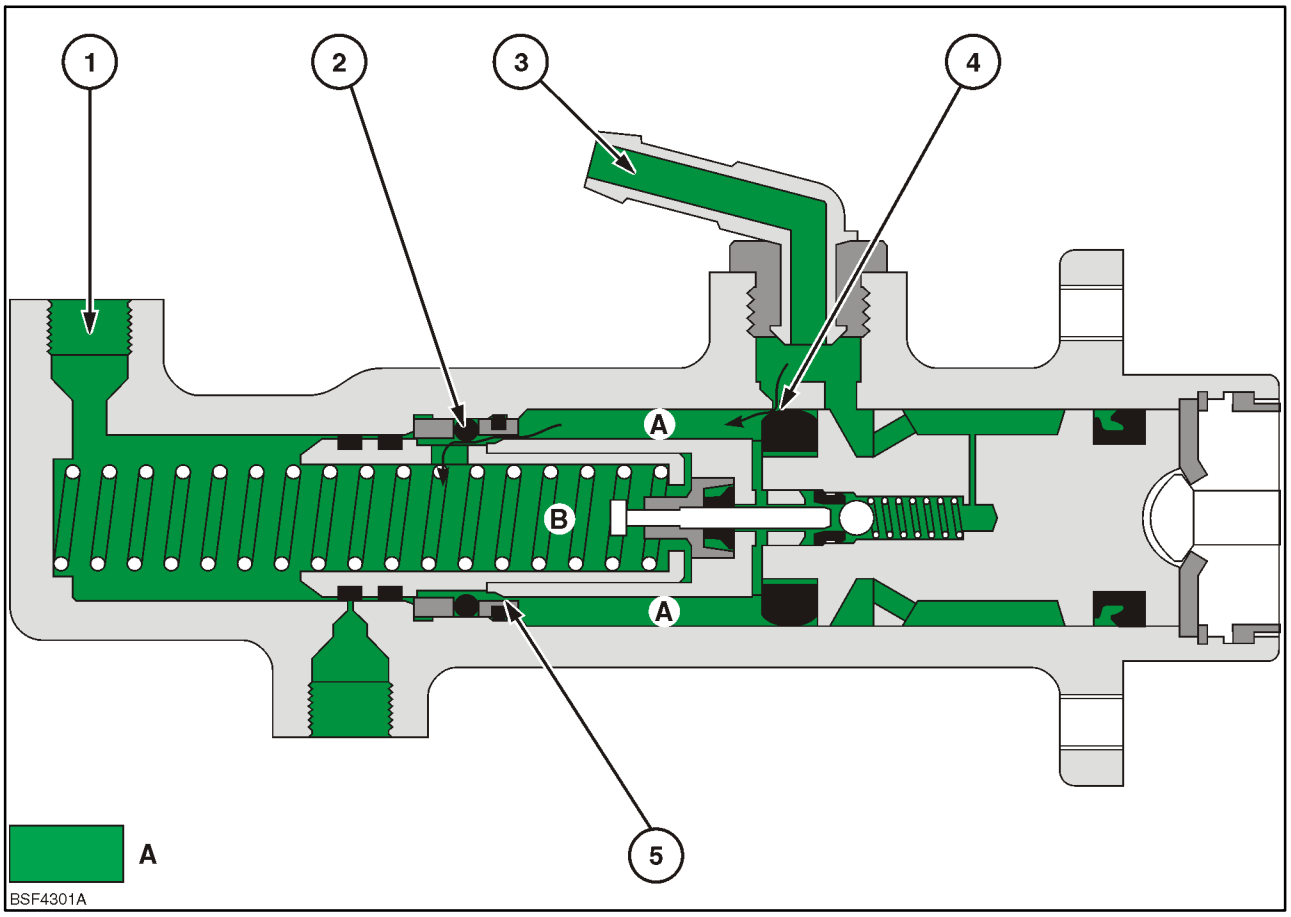
X = Brake friction disc operating clearance

1. Brake piston oil seals
2. Brake piston locating peg
3. Brake piston retaining bolt
4. Brake piston self adjuster
5. Brake piston
6. Differential output half-shaft
7. Final drive case spacer
8. Brake friction disc
9. Brake piston

To compensate for wear of the rear service brake parts, three self adjusters (4) are installed in the brake piston (5). These self adjusters are an interference fit into the brake piston (5).

When the brakes are applied, the brake piston will move and the piston oil seals (1) will distort in their recess until the self adjuster (4) reaches the head of the brake piston retaining bolt (3). To compensate for wear, the brake piston (5) will slide over the interference fitting self adjusters (4) until the brakes are applied.

When the brakes are released the brake piston oil seals (1) will assist in returning the brake piston to the original position due to the oil seals returning to their original shape. This will assist in obtaining the operating clearance (X).



8

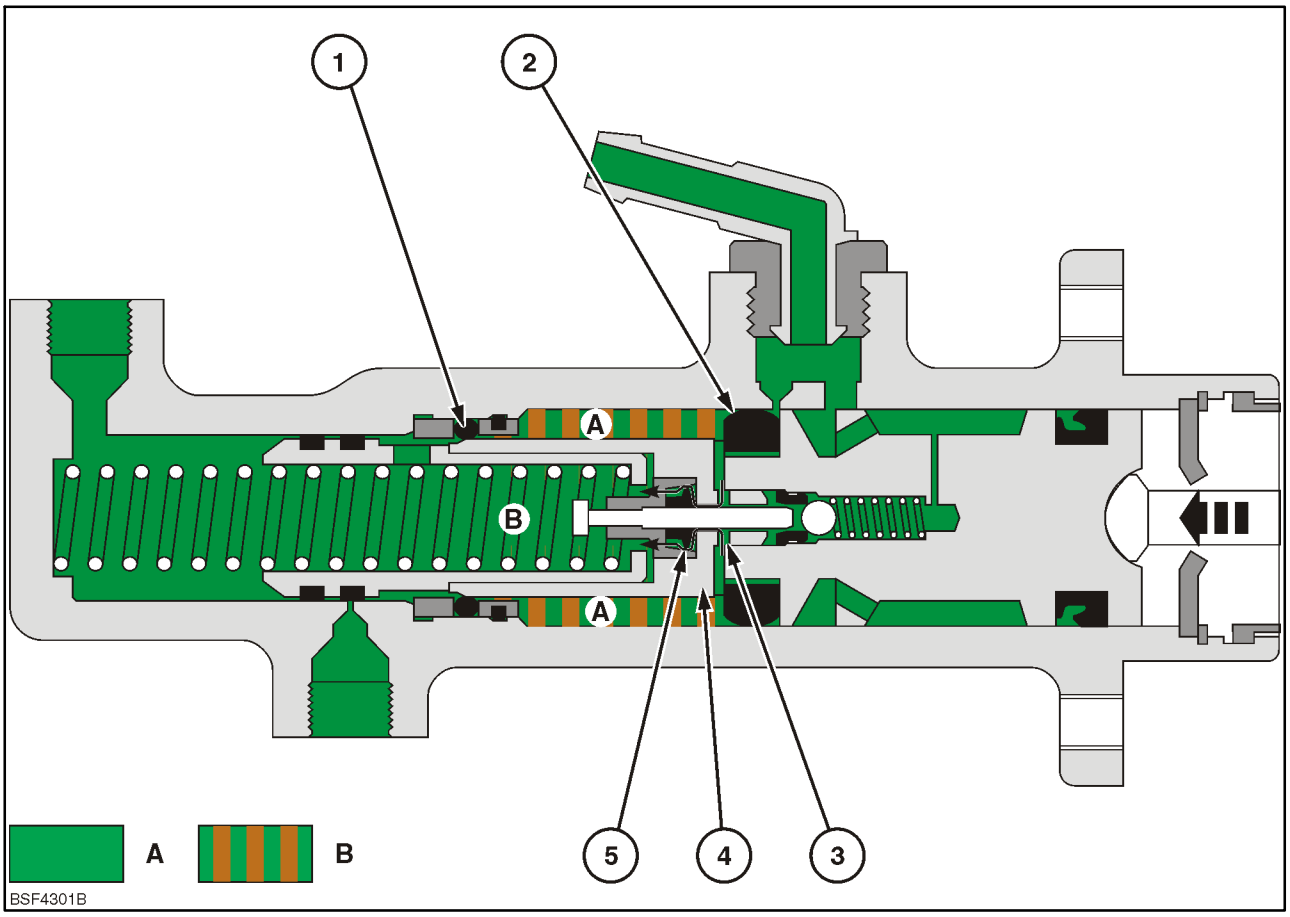
Balanced Brakes Differential Master Cylinder Operation - Brakes Not Applied

1. Outlet port to brake piston(s)
2. O-ring
3. Brake fluid reservoir inlet port
4. Oil seal
5. Piston sleeve groove

Figure Color Key

A. Zero brake pressure

Brake fluid is free to flow from the brake fluid reservoir inlet port (3) and past the oil seal (4) into gallery 'A'. There is a groove located at the end of the piston sleeve (5) which allows brake fluid to flow underneath the O-ring (2) and into gallery 'B'. Brake fluid can then flow through the center of the piston and to the outlet port to the brake piston(s) (1), filling the system.



9

Balanced Brakes Differential Master Cylinder - First Stage

1. O-ring
2. Oil seal
3. Piston sleeve orifice
4. Piston sleeve
5. Check valve stem oil seal

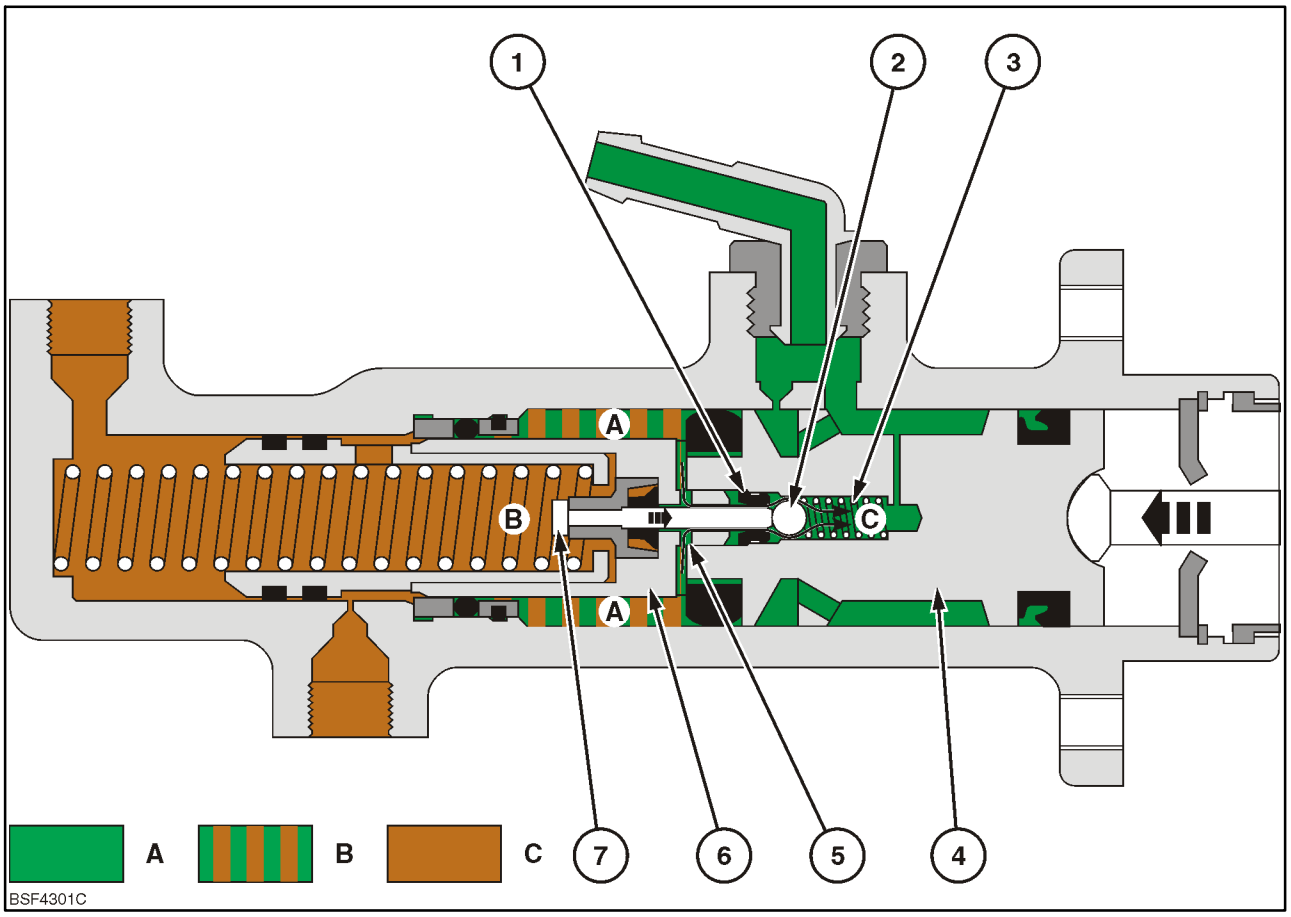
Figure Color Key

A. Zero brake pressure
B. Low brake pressure

When the brake pedal(s) are just beginning to be applied, the piston will act on the back of the piston sleeve (4). This will cause the piston sleeve (4) to move and the groove at the end of the piston sleeve (4) will move past the O-ring (1), allowing the O-ring to seal around the body of the piston sleeve (4) and seal gallery 'A'.

The increased pressure of the brake fluid in gallery 'A' will cause brake fluid to flow into the piston sleeve orifice (3) and act on the lip of the check valve stem oil seal (5). The pressure is enough to raise the lip of the check valve stem seal (5) and allow brake fluid to flow around the check valve stem seal (5) from gallery 'A' to gallery 'B'.

The first stage is designed to provide additional fluid transfer within the master cylinder to move the rear service brake piston at an increased rate and reduce pedal travel.



10

Balanced Brakes Differential Master Cylinder - Second Stage

1. Check valve ball seat
2. Check valve ball
3. Check valve ball return spring
4. Piston
5. Piston sleeve orifice
6. Piston sleeve
7. Check valve stem

Figure Color Key

- **A.** Zero brake pressure
- **B.** Low brake pressure
- **C.** High brake pressure

The second stage begins at the point when pedal resistance is just being achieved and the brakes are beginning to bite. This will cause the pressure to increase in gallery 'B'. The increased pressure in gallery 'B' will act on the back of the check valve stem oil seal, sealing gallery 'B' and stopping brake fluid flowing from gallery 'A'.

As the brakes are further applied the pressure in gallery 'A' will begin to rise and because it can no longer flow into gallery 'B', it must be displaced to allow further travel of piston (4). The increased pressure in gallery 'A' will cause the brake fluid to flow through the piston sleeve orifice (5), around the check valve stem (7) and begin to raise the check valve ball (2) from the check valve ball seat (1). The check valve ball (2) will not begin to move from the check valve ball seat (1) until the pressure acting on the check valve ball (2) is greater than the force of the check valve ball return spring (3).

When the check valve ball (2) begins to move, the pressure in gallery 'B' is also acting on the face of the check valve stem (7) which will move the check valve stem (7) and cause the check valve ball (2) to open fully against the force of the check valve ball return spring (3).

The brake fluid in gallery 'A' can then flow into gallery 'C' and is free to return to the brake fluid reservoir.

The brakes can then remain applied by the force of the piston (4) acting on the back of the piston sleeve (6) and the pressurized brake fluid in gallery 'B' will then act on the service brake piston(s).

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	CORRECTION
Brake pedals are difficult to operate	Seized hydraulic master cylinder.	Replace the master cylinder.
	Blocked or flattened brake control lines.	Clean or replace the brake control lines.
Brakes remain applied when the brake pedals are released	Seized master cylinder pistons.	Replace the master cylinder.
	Seized master cylinder operating linkage.	Clean and lubricate the linkage. Make sure water and dirt ingress is not possible.
Brake noise	Worn brake discs.	Replace brake discs.
Excessive brake pedal travel	Air in the brake system.	Bleed the air form the brake system.
	Worn brake master cylinders.	Replace the brake master cylinders.
	Oil leakage from the brake system.	Repair the leakage.
	Rear service brake self adjusters loose in the brake piston.	Replace the brake self adjusters.
Unbalanced braking	Wrong tyre pressure.	Inflate tyres to correct pressure.
	Worn brake master cylinder.	Replace brake master cylinder.
	Blocked or flattened master cylinder balance tube.	Clean or replace the balance tube.
	Blocked or flattened brake control lines.	Clean or replace the brake control lines.
	Worn or broken master cylinder oil seals.	Replace the master cylinder.
	Worn brake discs on one side.	Replace brake discs.
Poor braking action	Worn brake discs.	Replace brake discs.
	Worn brake master cylinder.	Replace brake master cylinder.
	Air in the brake system.	Bleed the air form the brake system.
	Oil leakage from the brake system.	Repair the leakage.

PROBLEM	POSSIBLE CAUSES	CORRECTION
No/low front brake assistance	Front brake valve faulty.	Repair or replace the front brake valve.
	Logic head faulty.	Repair or replace the logic head.
	Air in the front brake circuit.	Bleed the air form the front brake circuit.
	Faulty low pressure circuit.	Pressure test the low pressure circuit.
Parking brake does not operate correctly	Parking brake cable incorrectly adjusted.	Adjust the parking brake cable.
	Worn brake pads.	Replace brake pads.
Parking brake will not release	Restricted parking brake lever travel.	Repair as necessary.
	Seized brake pads on the brake discs.	Replace damaged parts.

OVERHAUL

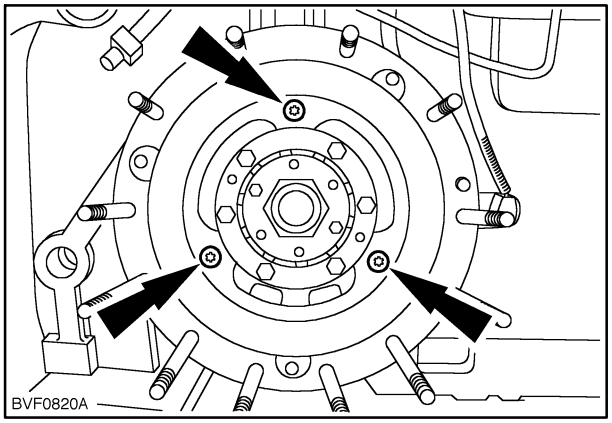
REAR SERVICE BRAKE PISTON

Removal (Op. 33 202)

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

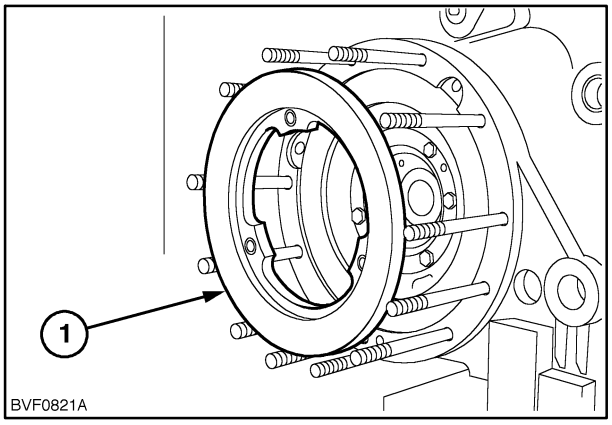
1. Remove the final drive case (refer to final drive case removal in the mechanical rear wheel drive section).
2. Remove the brake piston retaining bolts.



11

NOTE: *Slowly apply the foot brake to aid removal.*

3. Remove the brake piston (1).



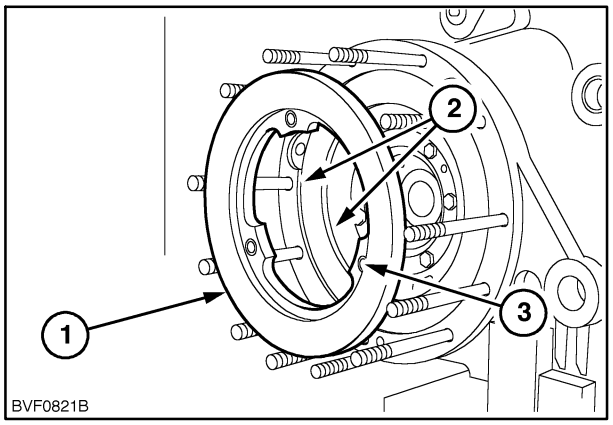
12

Inspection

Inspect the brake piston (1) and the rear axle housing (2), for any signs of corrosion or damage which may cause the piston to seize in the rear axle housing. Repair or replace parts as necessary.

Check if the brake piston self adjusters (3) have become loose in the brake piston. Replace parts as necessary.

Inspect the inner and outer brake discs, if badly scored, worn or cracked replace as necessary.



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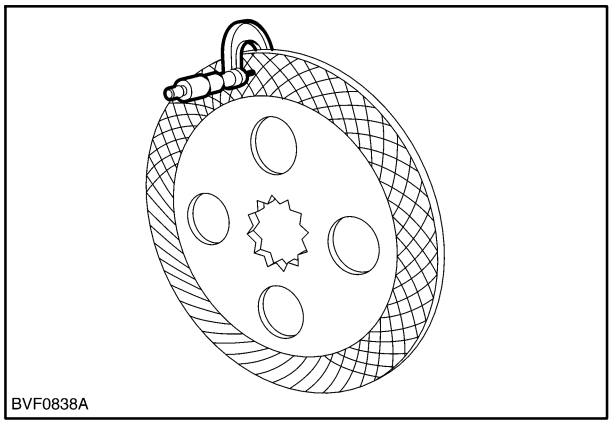
Using a suitable micrometer, measure the thickness of the brake friction disc at three points 180° apart and take an average of the three readings.

Replace the brake friction disc if the thickness is less than 8.4 mm.



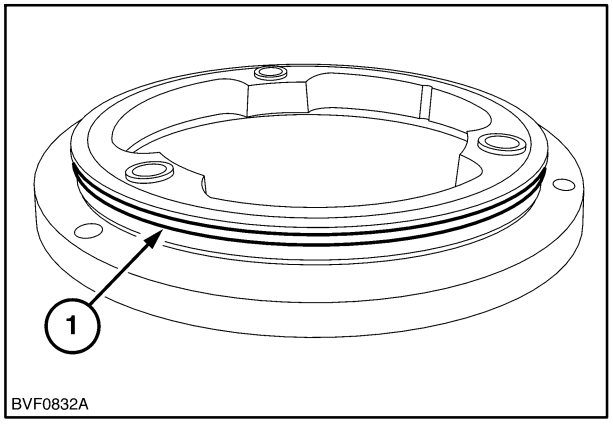
14

Installation (Op. 33 202)

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install a new brake piston oil seal (1) onto the brake piston.



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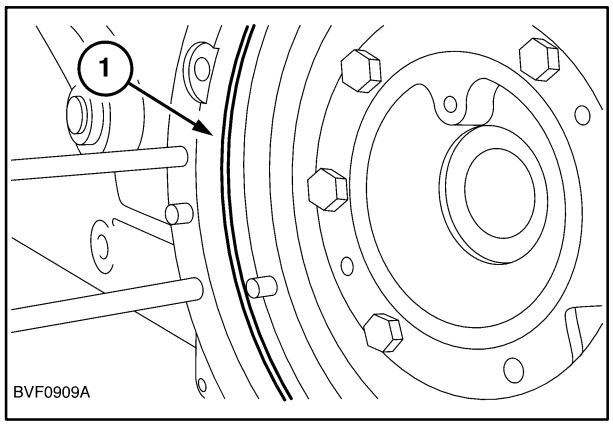
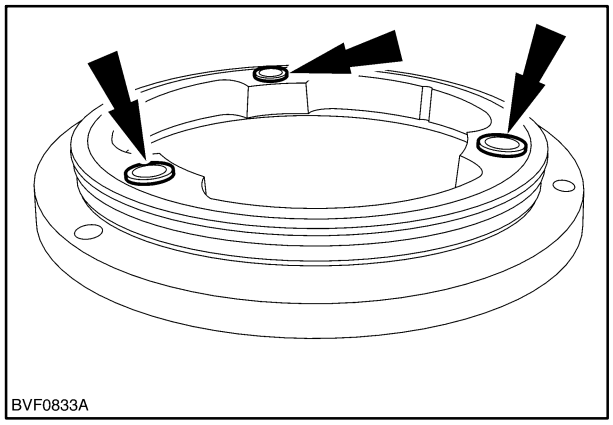
2. Install a new brake piston oil seal (1) into the rear axle housing.



16

NOTE: *Make sure the self adjusters are flush with the brake piston.*

3. Install the brake piston self adjusters back into the brake piston.

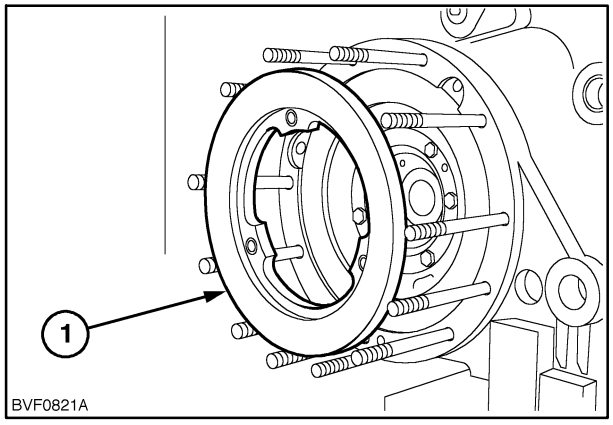


17

4. Apply the specified brake fluid onto the brake piston oil seals.

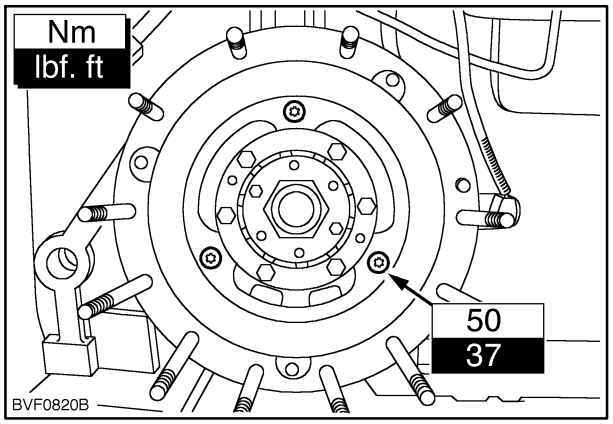
NOTE: *Apply pressure evenly to the brake piston to avoid damage to the oil seals.*

5. Install the brake piston (1).



18

6. Install the brake piston retaining bolts and tighten to the specified torque value.
7. Install the final drive case (refer to final drive case installation in the mechanical rear wheel drive section).
8. Bleed the hydraulic brake system (refer to hydraulic brake system air bleeding in this chapter).



19

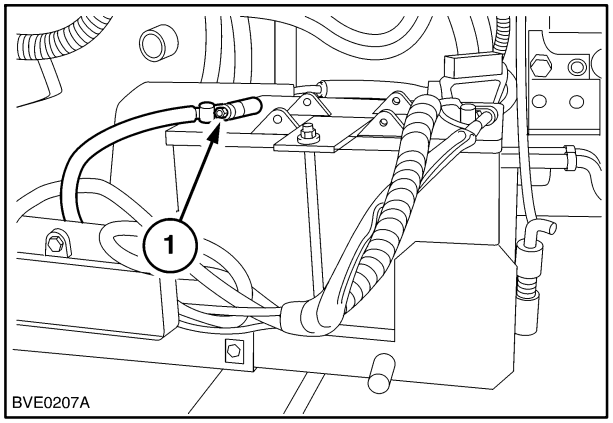
FRONT SERVICE BRAKE VALVE

Removal

⚠ WARNING ⚠

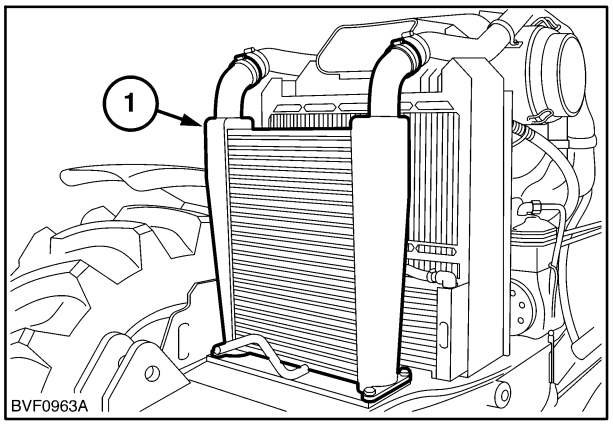
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Open and raise the engine hood.
2. Remove the battery cover and disconnect the battery negative cable (1).



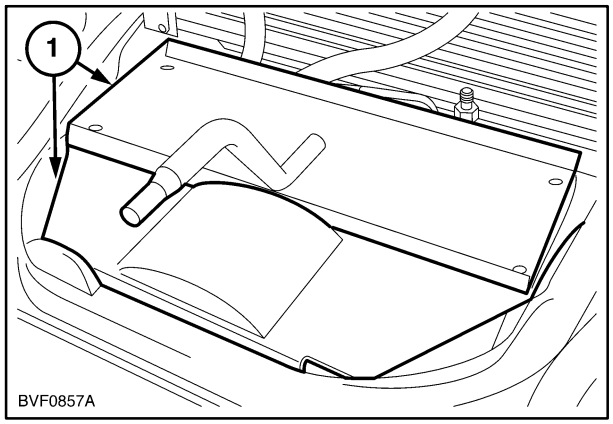
20

3. Remove the intercooler (1).



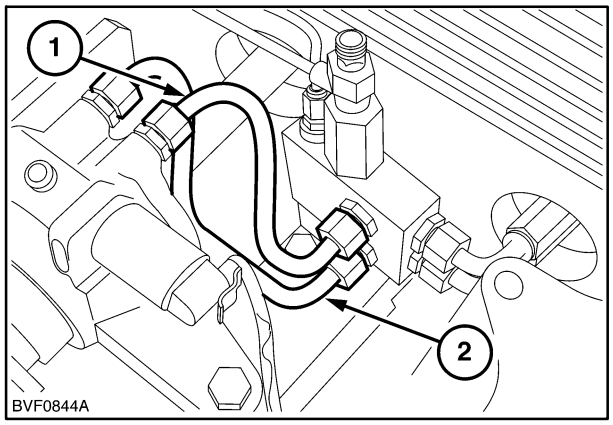
21

4. Remove the front axle support cover plates (1).



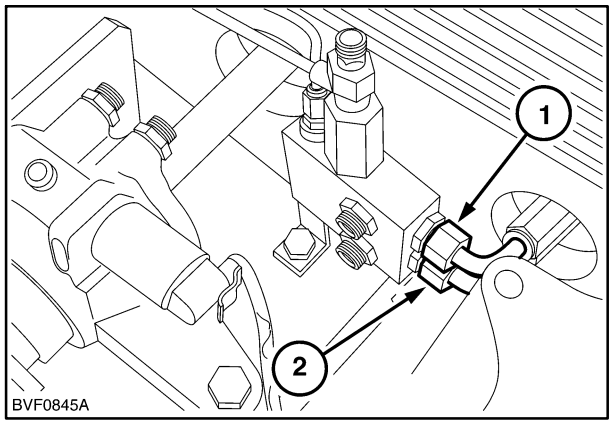
22

5. Remove the front PTO oil return pipe (1) and the oil supply pipe (2) (if fitted).



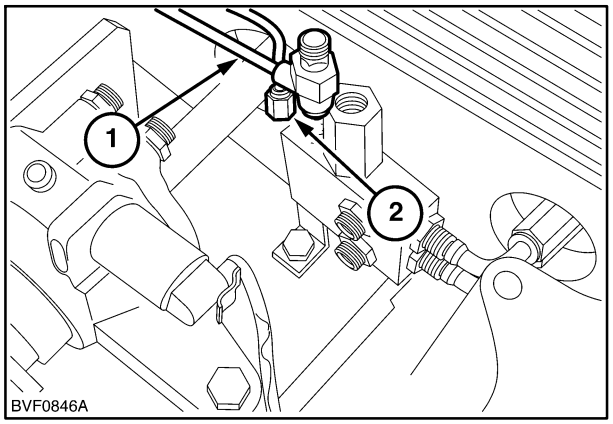
23

6. Disconnect the oil return pipe (1) and the oil supply pipe (2).



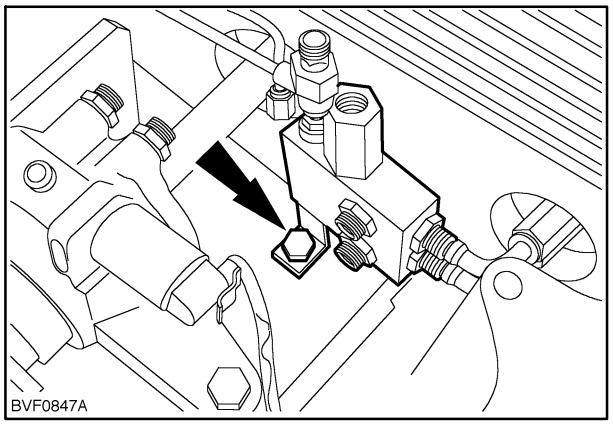
24

7. Disconnect the brake oil supply lines (1) and (2).



25

8. Remove the front service brake valve.



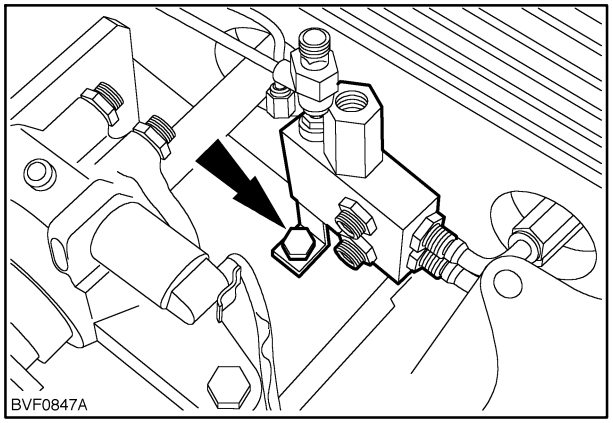
26

Installation

⚠ WARNING ⚠

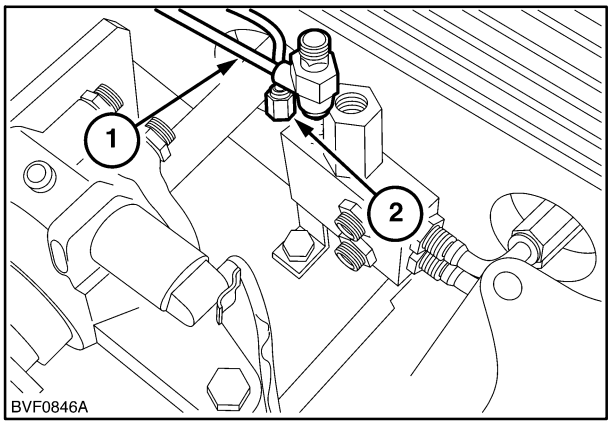
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the front service brake valve.



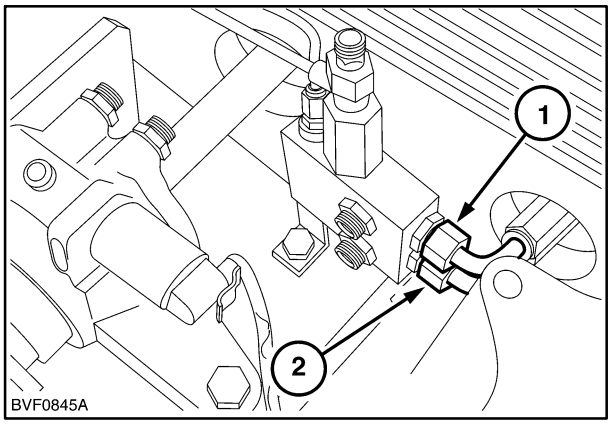
27

2. Connect the brake oil supply lines (1) and (2).



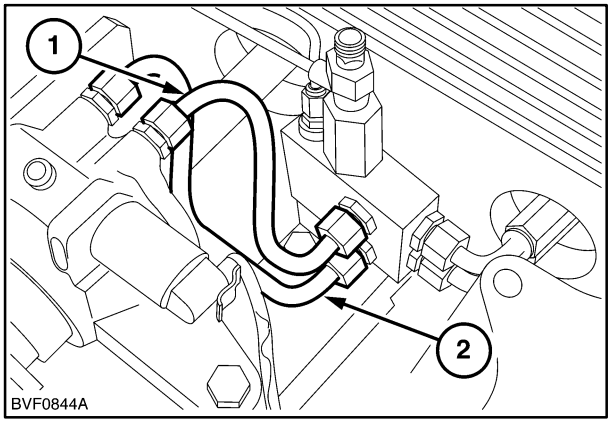
28

3. Connect the oil return pipe (1) and the oil supply pipe (2).



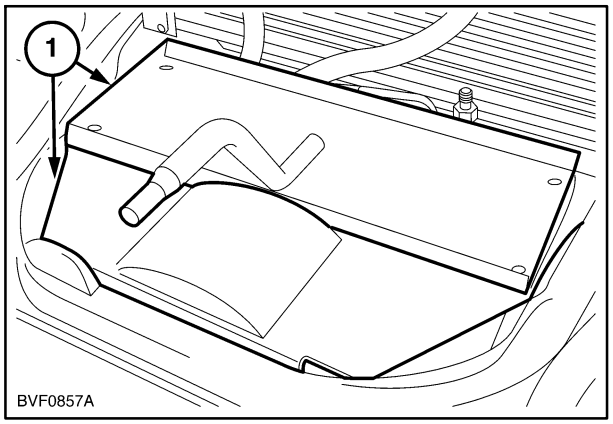
29

4. Install the front PTO oil supply pipe (2) and the oil return pipe (1) (if fitted).



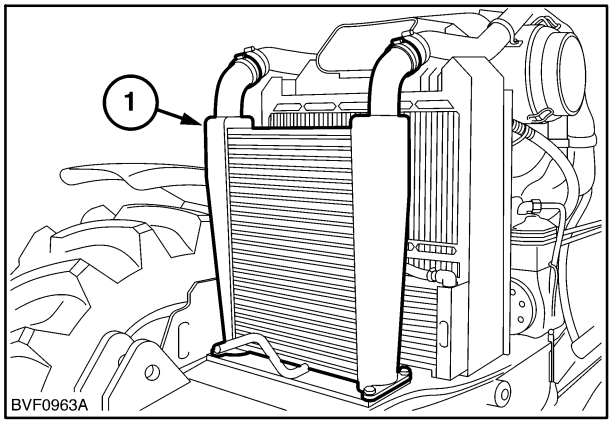
30

5. Install the front axle support cover plates (1).



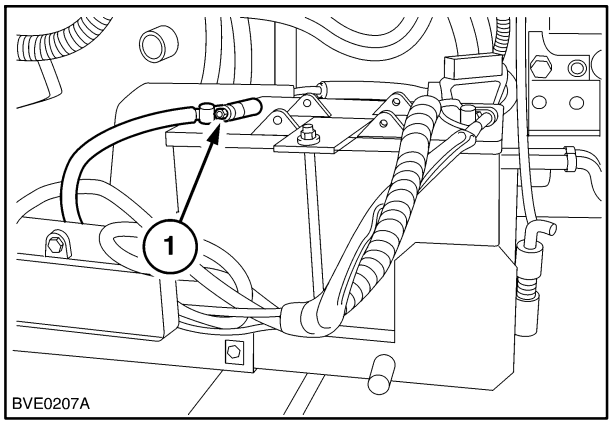
31

6. Install the intercooler (1).



32

7. Connect the battery negative cable (1) and install the battery cover.
8. Bleed the hydraulic brake system (refer to hydraulic brake system air bleeding in this chapter).



33

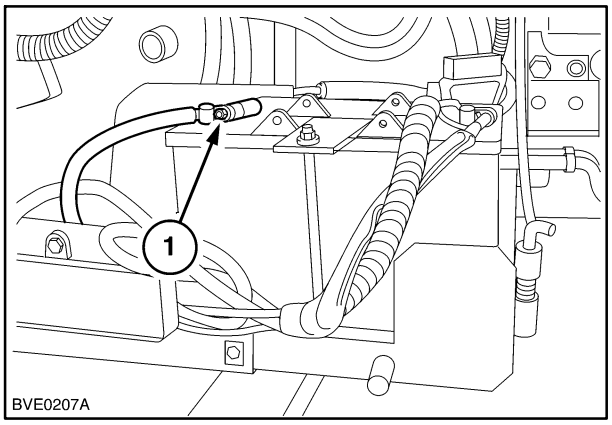
FRONT SERVICE BRAKE (LEFT OR RIGHT HAND)

Disassembly (Op. 33.204)

⚠ WARNING ⚠

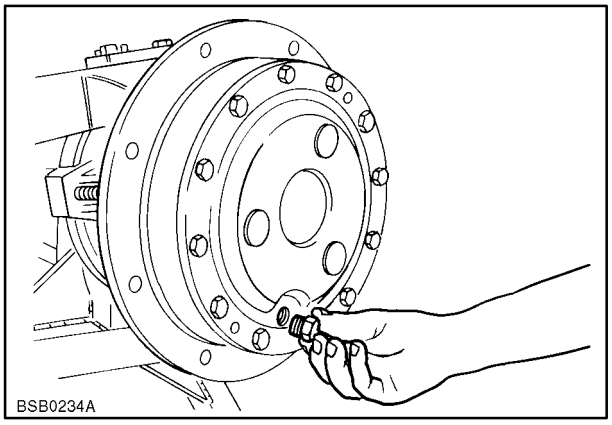
Handle all components with the greatest care.
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Park the tractor on a level surface. Block the wheels to prevent the tractor moving.
2. Open and raise the engine hood.
3. Remove the battery cover and disconnect the battery negative cable (1).



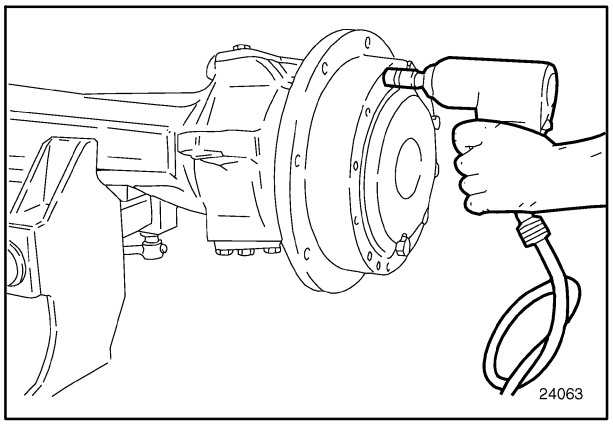
34

4. Raise the front of the tractor, support the front axle and remove the road wheel.
5. Rotate the hub until the drain plug is at the lowest point and drain the oil from the hub.



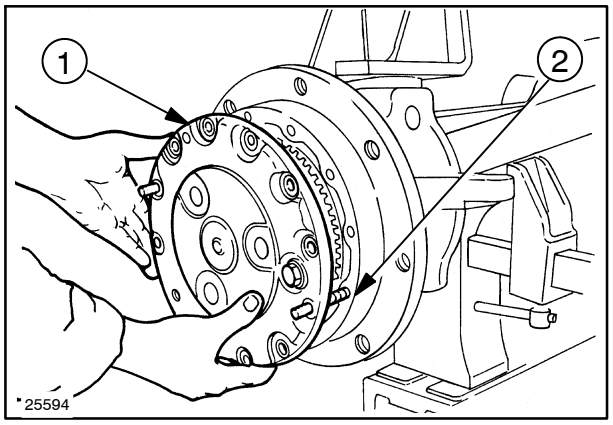
35

6. Remove planetary carrier retaining bolts.



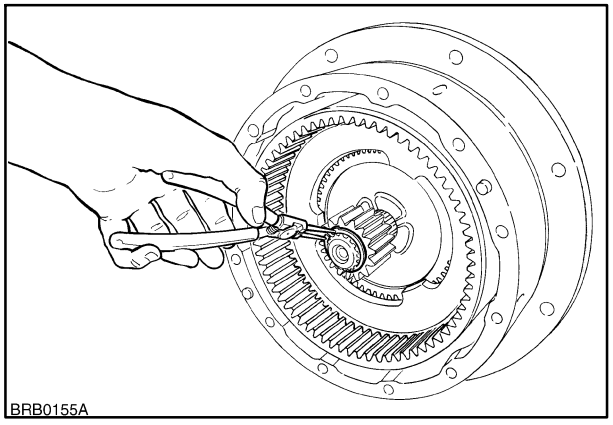
36

7. Install special tool **292888** (2).
8. Using a suitable slide hammer installed into the oil drain plug hole, remove the planetary carrier (1) from the casing.



37

9. Using suitable circlip pliers, remove the sun gear retaining circlip.



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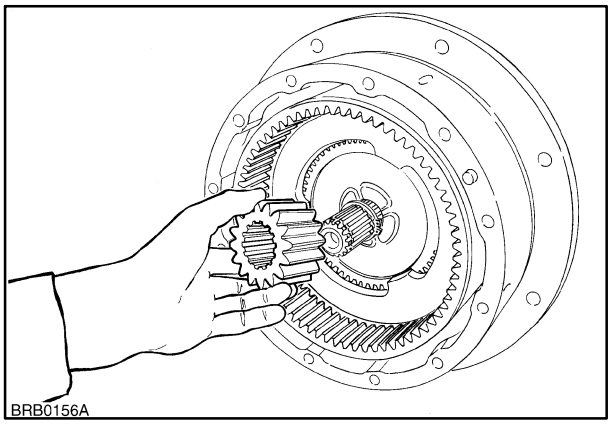
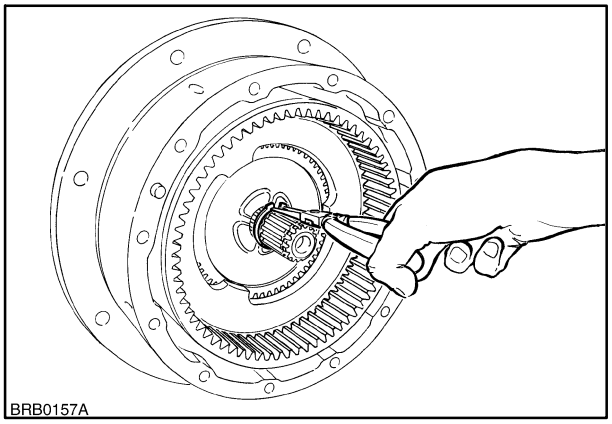
10. Remove the sun gear.



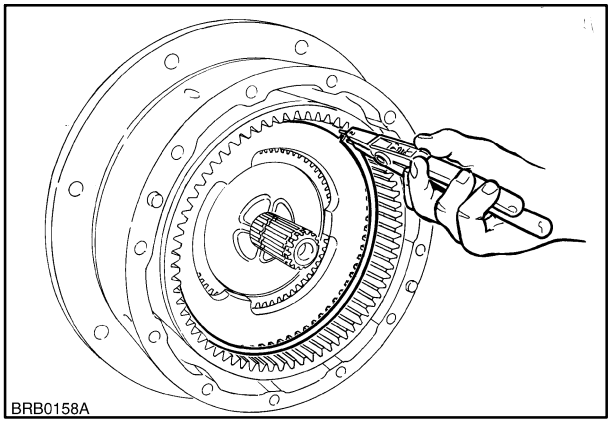
39

11. Using suitable circlip pliers, remove the rear sun gear retaining circlip.



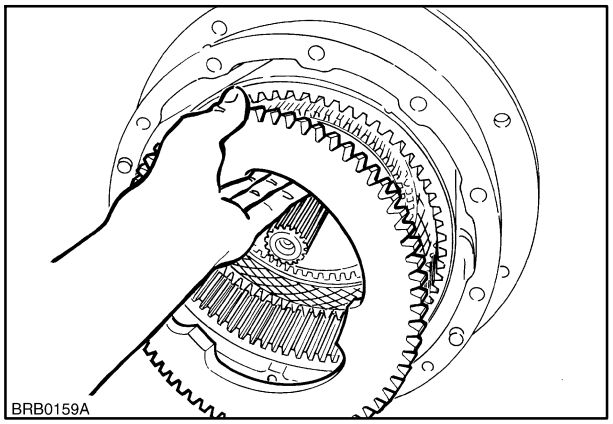
40

12. Using suitable circlip pliers, remove the snap ring retaining the outer brake disc.



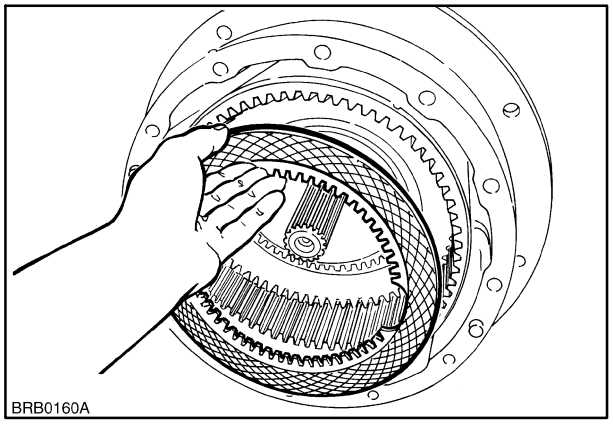
41

13. Remove the outer brake disc from the ring gear.



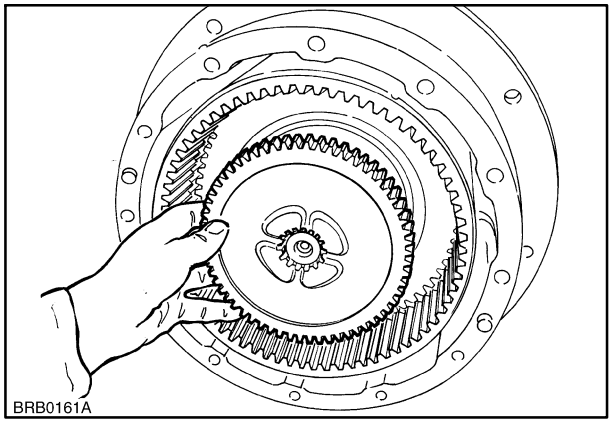
42

14. Remove the friction disc from the friction disc drive plate.



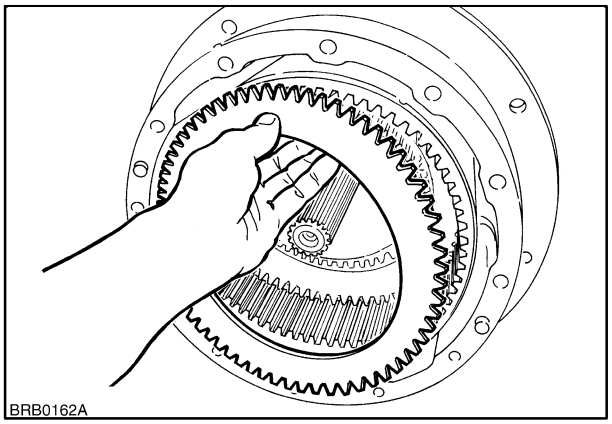
43

15. Remove the friction disc drive plate from the driveshaft.



44

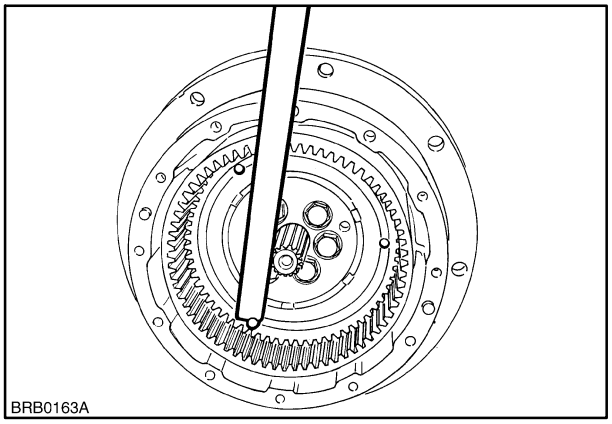
16. Remove the inner brake disc from the ring gear.



45

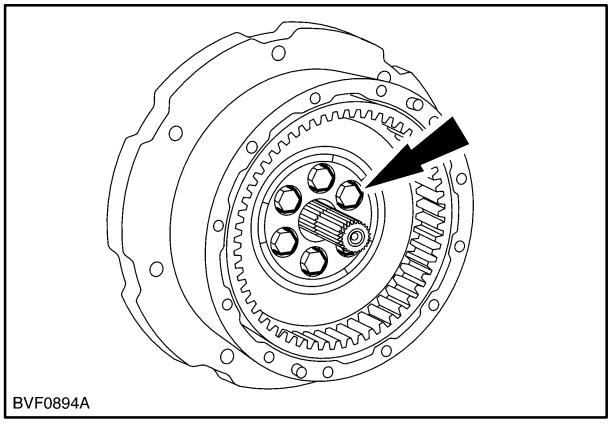
NOTE: *There are three, 6mm threaded bolt holes located in the piston. Bolts may be installed and used as a lever point to aid piston removal.*

17. Remove the piston from the backplate. Apply the foot brakes if necessary to aid removal.



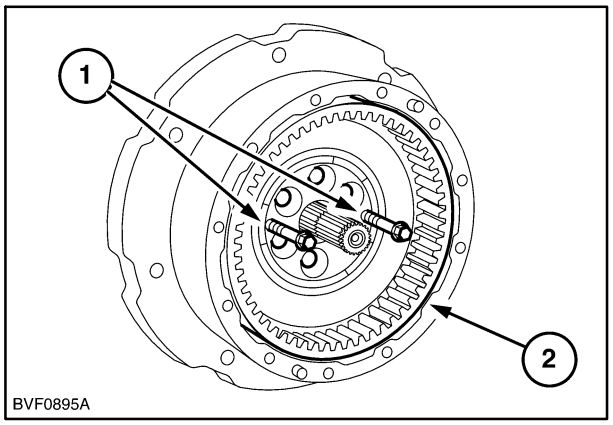
46

18. Remove the ring gear retaining bolts.



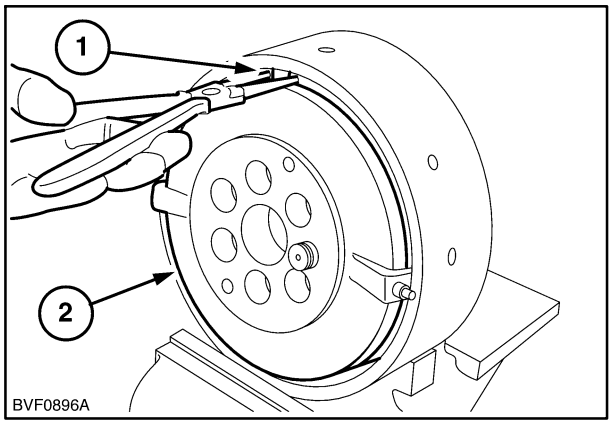
47

19. Install two M12x1.5mm bolts into the separating holes.
20. Tighten the bolts (1) and remove the ring gear (2).



48

21. Using suitable circlip pliers, compress the circlip (1) and remove the piston carrier plate (2) from the ring gear.



49

Inspection (Op. 33.204)

Using a suitable micrometer, measure the thickness of the brake friction disc at three points 180° apart and take an average of the three readings.

Replace the brake friction disc if the thickness is less than 3.6 mm.

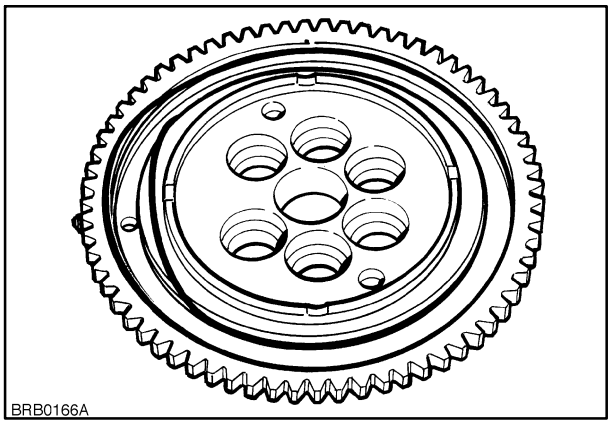
Inspect the inner and outer brake discs, if badly scored, worn or cracked replace as necessary.

Assembly (Op. 33.204)

⚠ WARNING ⚠

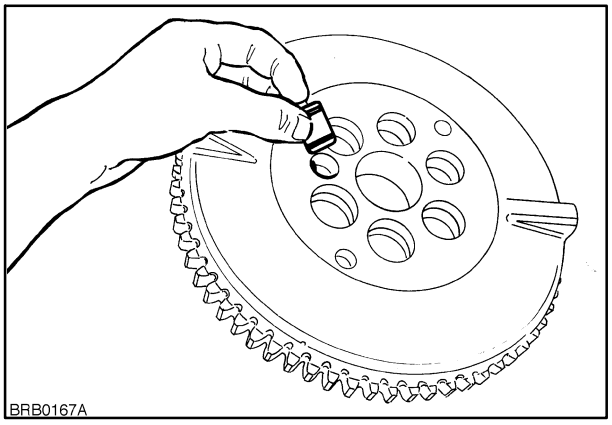
Handle all components with the greatest care.
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the inner and outer piston oil seals from the piston carrier plate. Ensure the carrier is free from any debris and carefully install the new oil seals, allow the oil seals to relax for a few minutes prior to installing the piston.



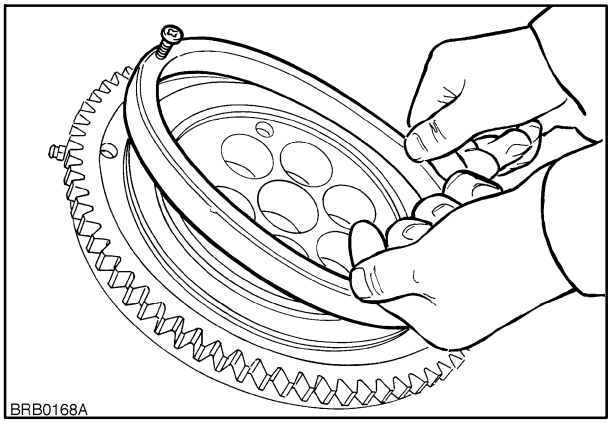
50

2. Remove the oil transfer tube from the rear of the carrier and replace the O-rings.



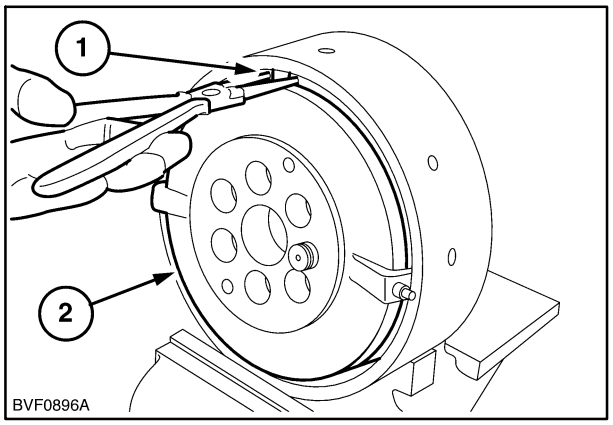
51

3. Lubricate the piston with the specified brake oil and install the piston into the carrier.



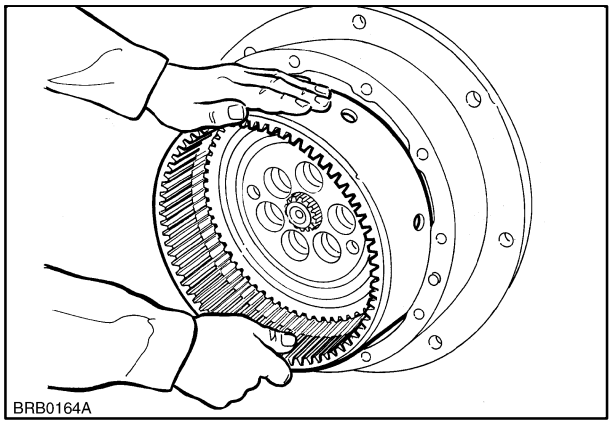
52

4. Using suitable circlip pliers, compress the circlip (1) and install the piston carrier plate (2) into the ring gear.



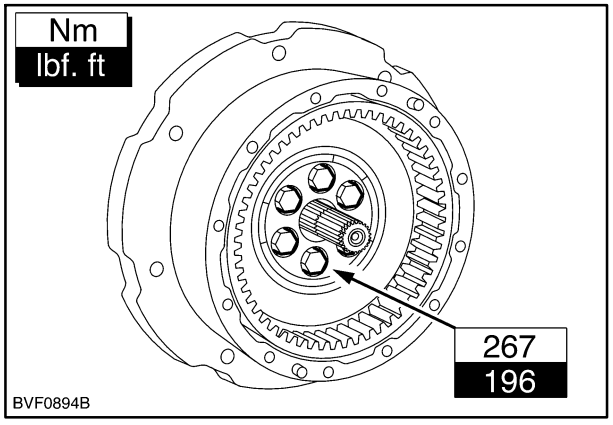
53

5. Install the ring gear.



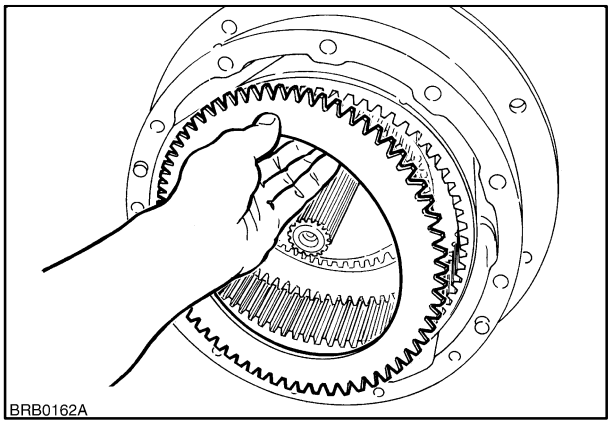
54

6. Install the retaining bolts and tighten to the specified torque value.



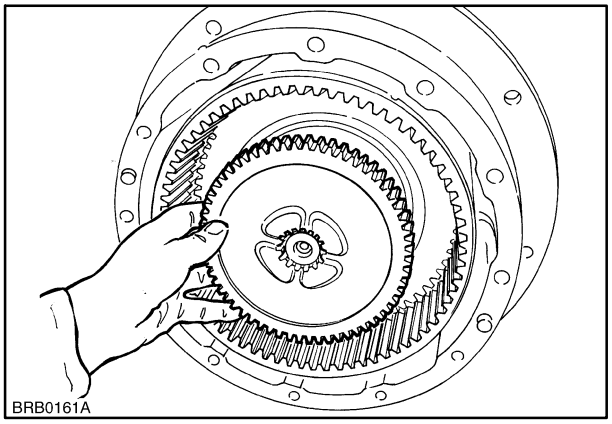
55

7. Install the inner brake disc into the ring gear.



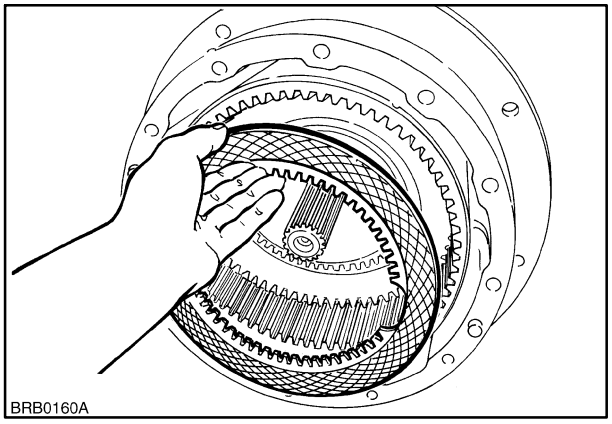
56

8. Install the friction disc drive plate onto the driveshaft.



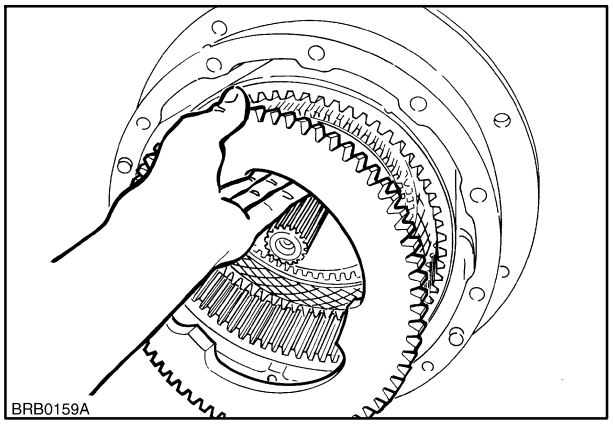
57

9. Install the friction disc.



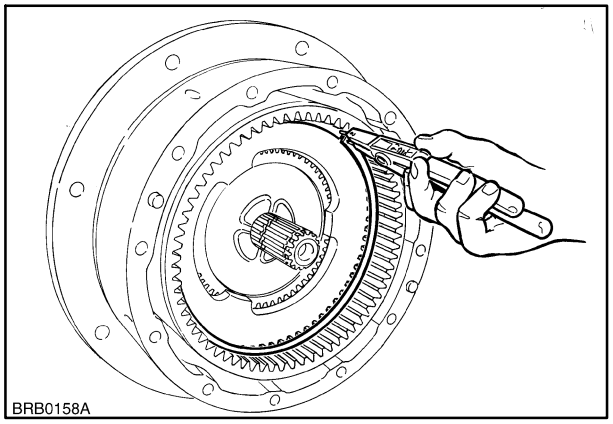
58

10. Install the outer brake disc into the ring gear.



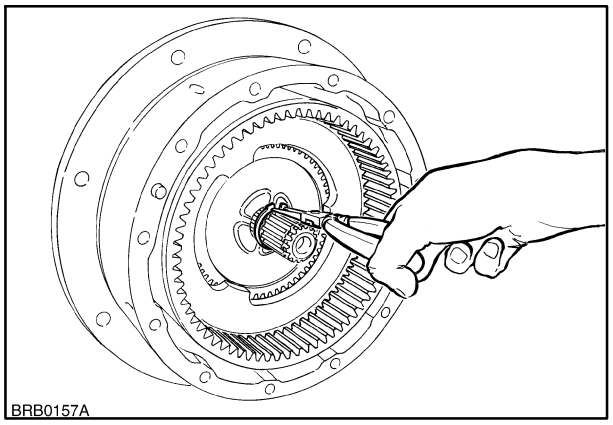
59

11. Using suitable circlip pliers, install the circlip retaining the outer brake disc.



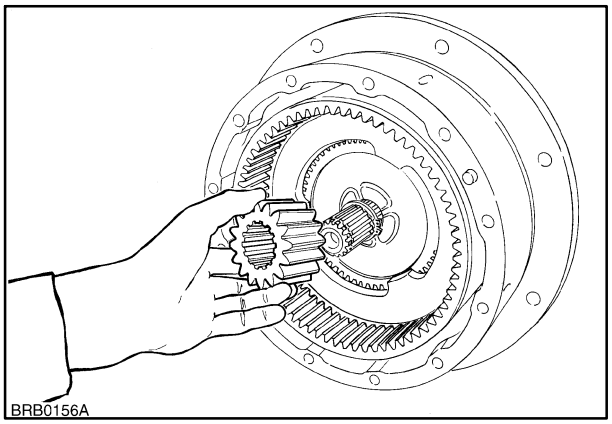
60

12. Using suitable circlip pliers, install the rear sun gear retaining circlip.



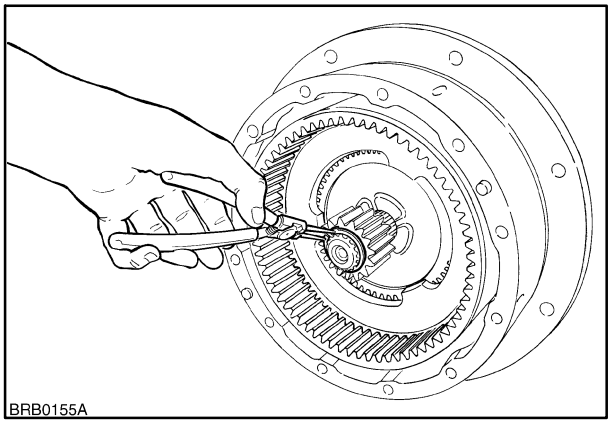
61

13. Install the sun gear.



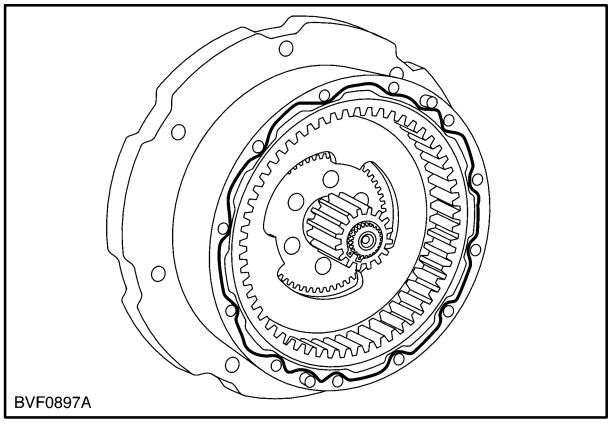
62

14. Using suitable circlip pliers, install the sun gear retaining circlip.



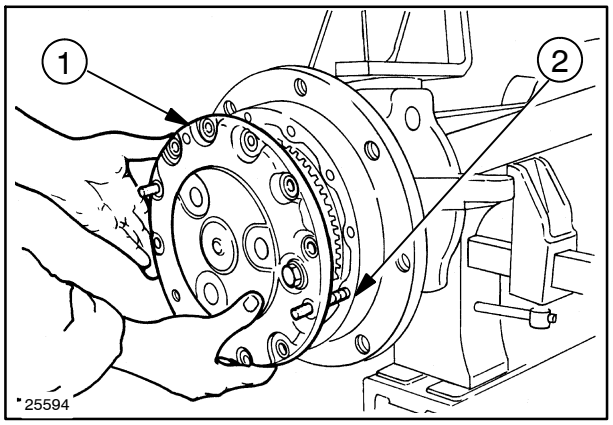
63

15. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



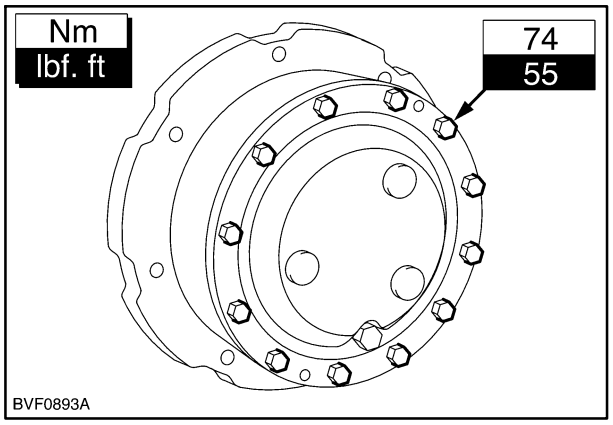
64

16. Install special tool **292888** (2).
17. Install the planetary carrier (1) to the casing.
18. Remove the special tool (2).



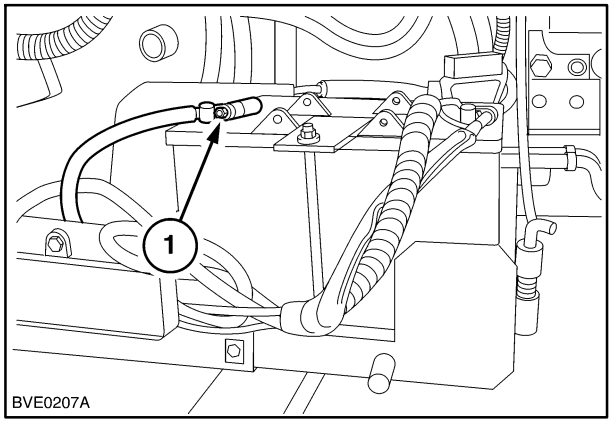
65

19. Install the retaining bolts and tighten to the specified torque value.



66

20. Refill the hub with the correct specified oil.
21. Connect the battery negative cable (1) and install the battery cover.
22. Bleed the hydraulic brake system (refer to hydraulic brake system air bleeding in this chapter).



67

HYDRAULIC BRAKE MASTER CYLINDER (ALL MODELS)

Removal (Op. 33 202 46)

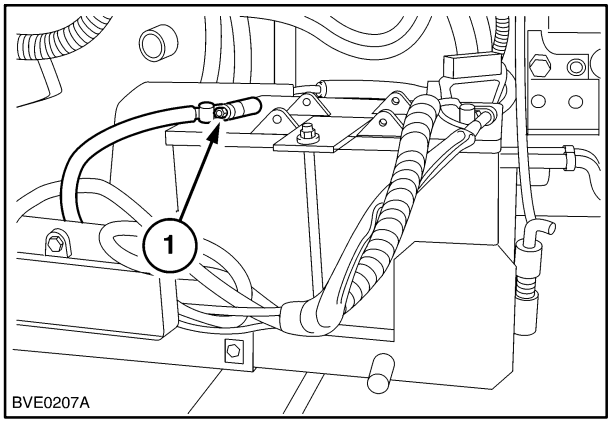
⚠ WARNING ⚠

Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

⚠ WARNING ⚠

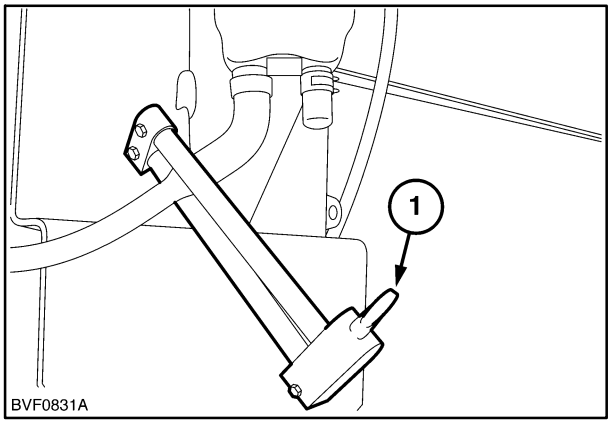
The master cylinder is not a serviceable item. If it is showing signs of leakage, damage or suspected of malfunctioning, the complete unit must be replaced. DO NOT attempt to disassemble and reassemble as seal damage will occur, rendering the unit inoperative with a resultant loss of brake performance.

1. Open and raise the engine hood.
2. Remove the battery cover and disconnect the battery negative cable (1).



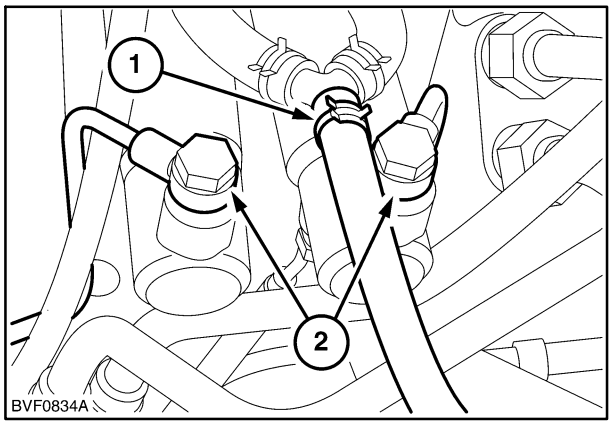
68

3. Using a suitable hose clamp (1), clamp the brake hose from the reservoir to the master cylinders.



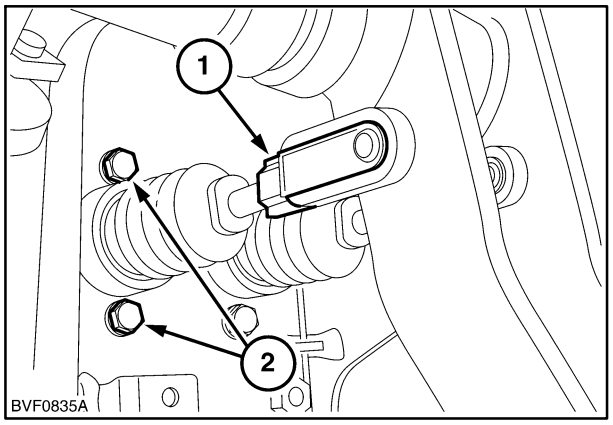
69

4. Disconnect the brake hose (1).
5. Remove the brake line retaining bolts (2) and detach the brake lines.



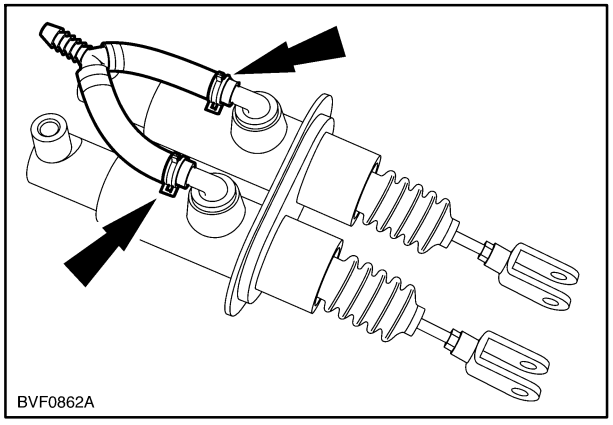
70

6. Remove the retaining pin (1) and the retaining bolts (2). Repeat this step for the right hand side master cylinder.
7. Remove the master cylinders from the engine side of the tractor.



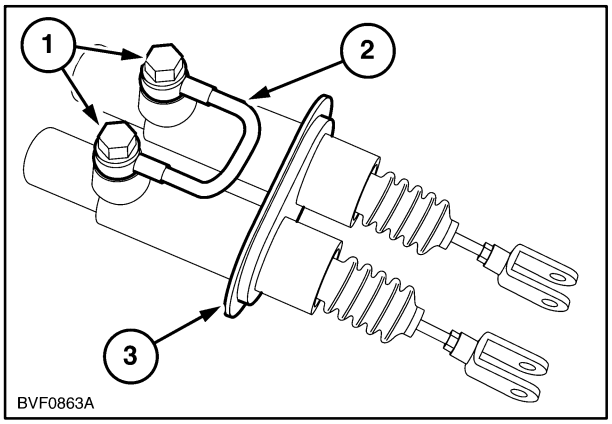
71

8. Disconnect the brake supply hose from the master cylinders.



72

9. Remove the balance tube retaining bolts (1), balance tube (2) and the retaining plate (3).



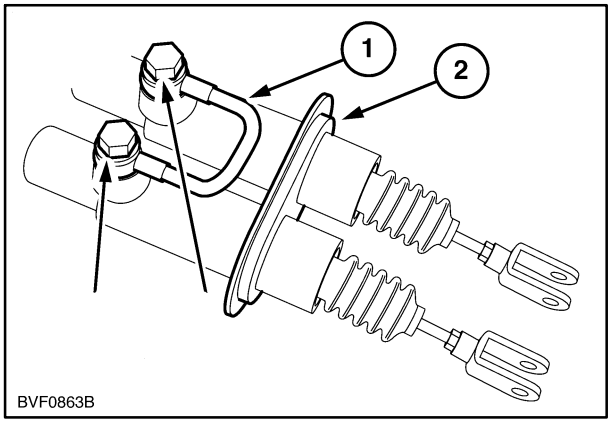
73

Installation (Op. 33 202 46)

⚠ WARNING ⚠

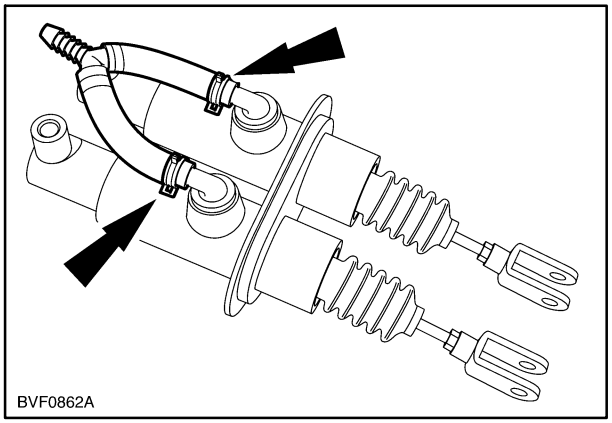
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the retaining plate (2), balance tube (1) and the balance tube retaining bolts. Tighten the retaining bolts to the specified torque value.



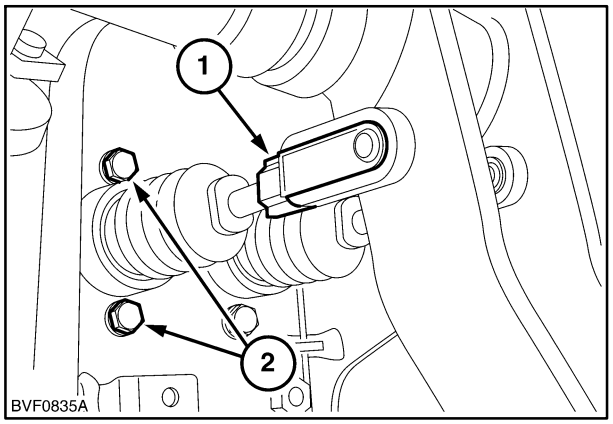
74

2. Connect the brake supply hose to the master cylinders.



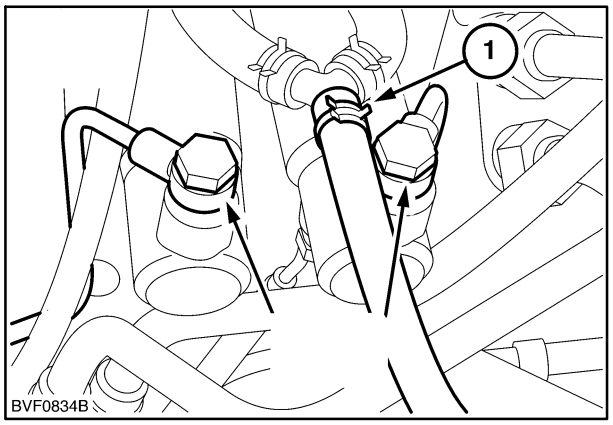
75

3. Install the master cylinders from the engine side of the tractor.
4. Install the retaining bolts (2) and the retaining pin (1). Repeat this step for the right hand side master cylinder.



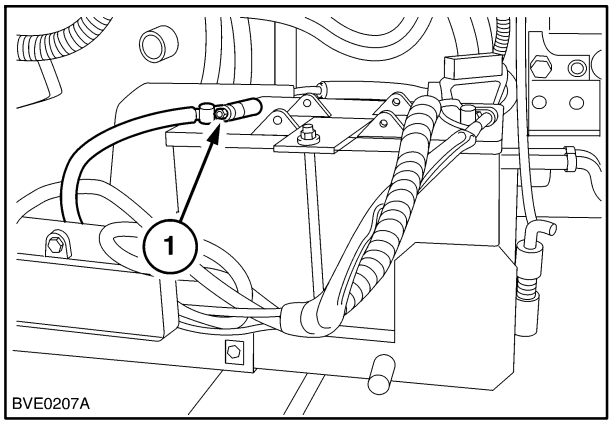
76

5. Connect the brake hose (1).
6. Attach the brake lines and install the retaining bolts. Tighten the retaining bolts to the specified torque value.



77

7. Connect the battery negative cable (1) and install the battery cover.



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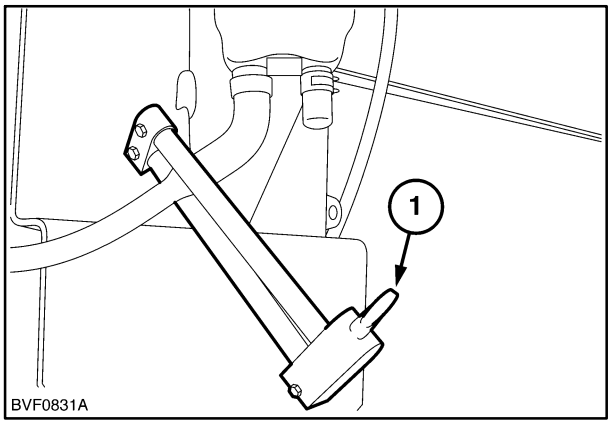
8. Remove the hose clamp (1) from the brake hose.
9. Adjust the brake pedal linkage (refer to brake pedal linkage adjustment in this chapter).
10. Adjust the brake pedal switch(es) (refer to brake pedal switch adjustment in this chapter).
11. Bleed the hydraulic brake system (refer to hydraulic brake system air bleeding in this chapter).



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HYDRAULIC BRAKE SYSTEM AIR BLEEDING

General Brake System Air Bleeding

⚠ WARNING ⚠

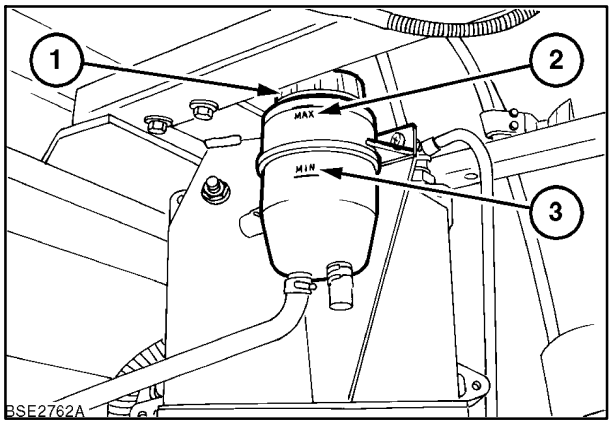
Air bleeding must be carried out any time the brake hydraulic system has been opened.

NOTE: *When bleeding the complete brake system, refer to page 45, figure 86 for the complete brake system air bleeding sequence.*

NOTE: *Make sure the vehicle is on a level surface.*

⚠ CAUTION ⚠

The brake fluid reservoir fluid level must remain above the 'MIN' line (3) at all times during brake system air bleeding.



80

1. Thoroughly clean around all bleed screws and the brake fluid reservoir cap (1).
2. Install one end of a suitable bleed tube to the bleed screw, and the other end into a bleed jar containing a small quantity of brake fluid.
3. Open the bleed screw.
4. Operate the brake pedal(s) fully, and allow the brake pedal to return to the rest position.
5. Continue operating the brake pedal(s) until air-free fluid is seen entering into the bleed jar.
6. Fully depress the brake pedal(s) and tighten the brake bleed screw.
7. Operate the brake pedals fully several times to pressurize the brake system.
8. Refill the brake fluid reservoir to the 'MAX' line (2) (figure 1).

⚠ CAUTION ⚠

Make sure the bleed screw cap(s) are installed after brake system air bleeding. This will prevent corrosion and dirt ingress to the bleed screw. Failure to follow this instruction may cause the bleed screw(s) to become seized.

Rear Service Brake and Trailer Brake Air Bleeding

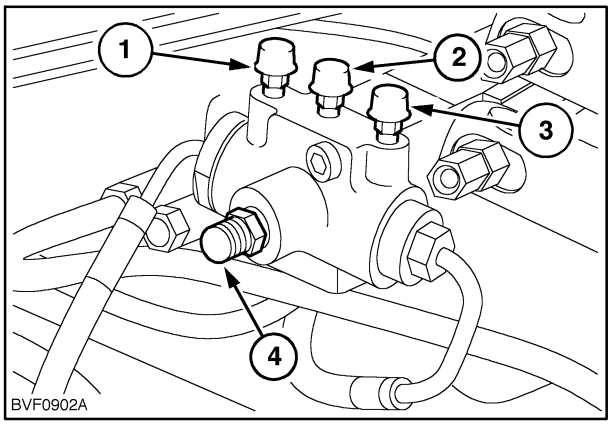
9. Open the corresponding bleed screw by one-half turn in the sequence below on the trailer brake valve logic head. Bleed the air from the brake system at each bleed screw (refer to general brake system air bleeding in this chapter).

   1 - Left brake pedal to bleed air from the system.

   3 - Right brake pedal to bleed air from the system

   4 - Both brake pedals must be latched together to bleed air from the system.

   2 - Both brake pedals must be latched together to bleed air from the system.



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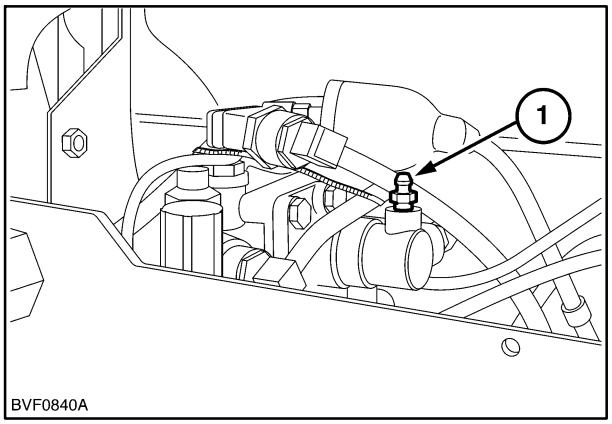
Pneumatic Brakes Air Bleeding (If Fitted)

10. Open the bleed screw (1) by one-half turn on the pneumatic trailer brake valve.

NOTE: *Both brake pedals must be latched together to bleed air from the system.*

11. Bleed the air from the brake system (refer to general brake system air bleeding in this chapter).



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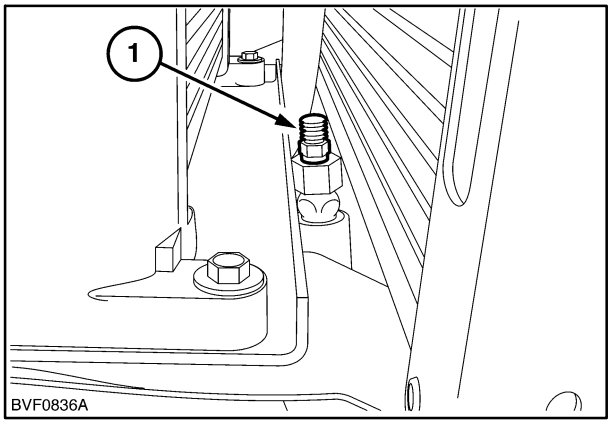
Front Axle Brakes Air Bleeding (If Fitted)

12. Open the bleed screw (1) one-half turn on the front brake valve.

NOTE: *Both brake pedals must be latched together to bleed air from the system.*

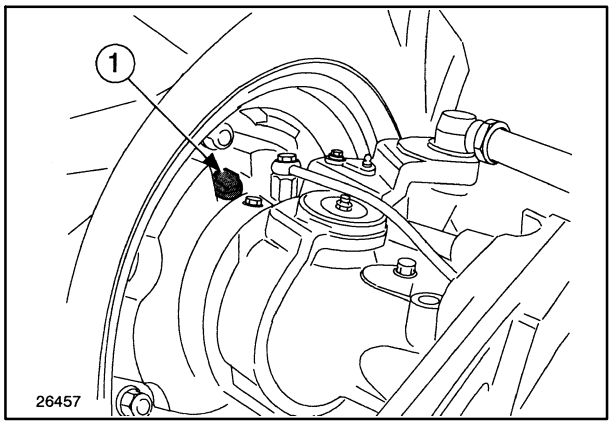
13. Bleed the air from the brake system (refer to general brake system air bleeding in this chapter).



83

NOTE: *Depending on wheel options it may be necessary to bleed the brakes with the wheels removed.*

14. Rotate the hubs to position the plug (1) in the vertical position. Remove the plug and ensure the bleed screw is aligned with the hole.



84

⚠ WARNING ⚠

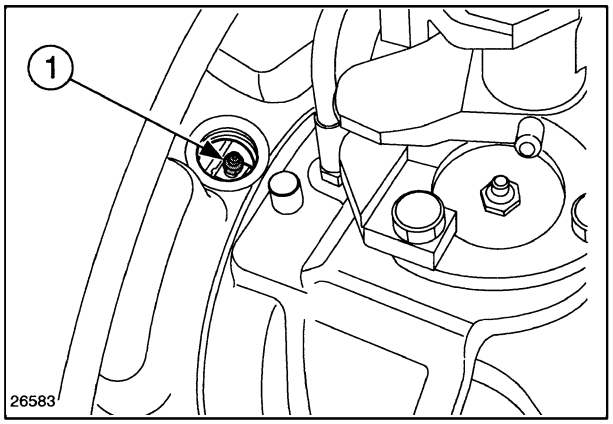
Make sure the parking brake is applied and the transmission range levers are in neutral.

15. Start the tractor and allow to idle.
16. Open the bleed screw (1) by one-half turn.

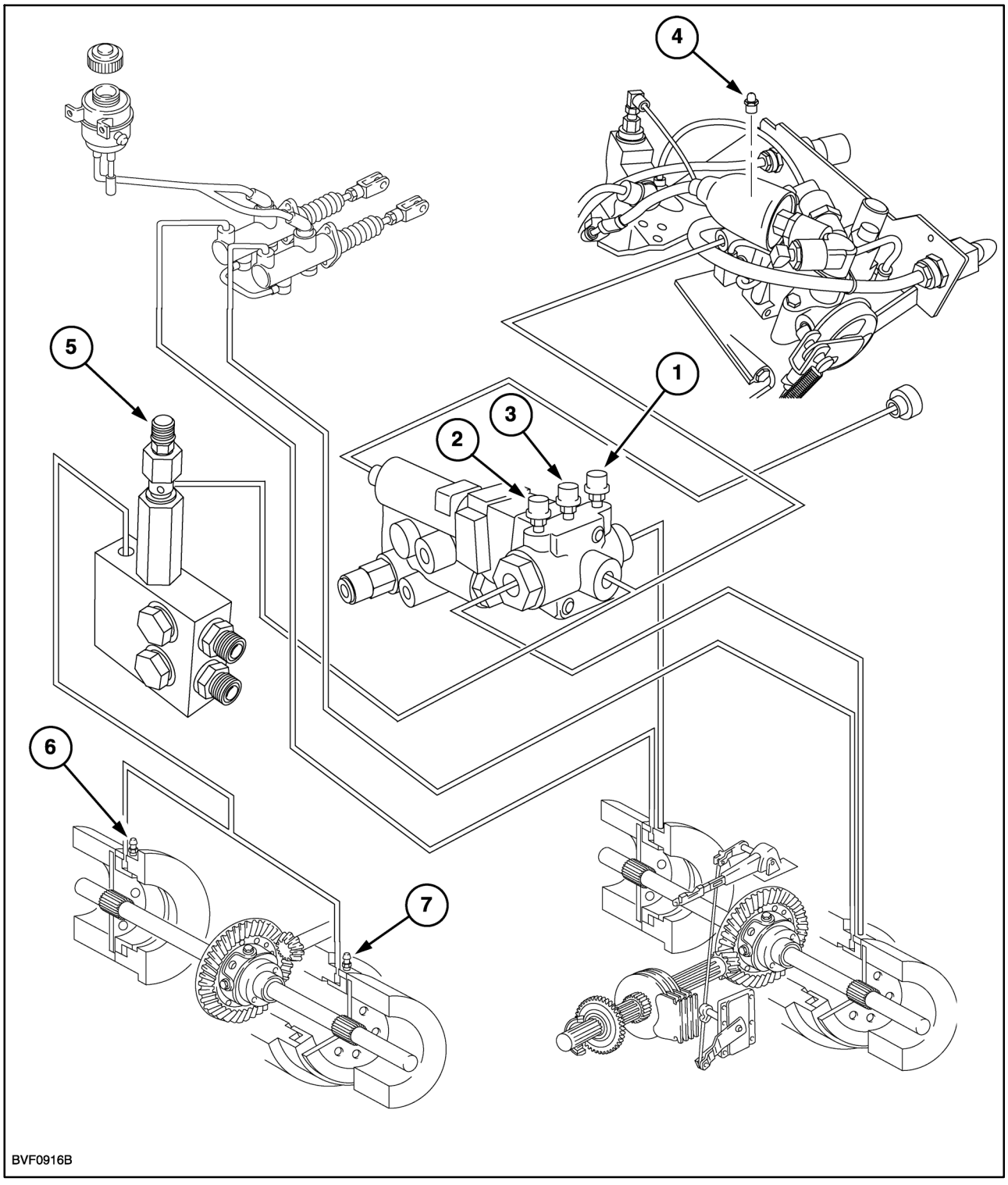
NOTE: *The front axle brakes are supplied from the low pressure hydraulic oil circuit.*

NOTE: *Both brake pedals must be latched together to bleed air from the system.*

17. Bleed the air from the brake system (refer to general brake system air bleeding in this chapter).
18. Install the axle hub plug.



85



86

Complete Brake System Air Bleeding Sequence

NOTE: *Both brake pedals must be depressed when bleeding the brakes in steps (3), (4), and (5).*

NOTE: *Brake fluid is not supplied to steps (6) and (7) from the brake fluid reservoir, these are supplied from the low pressure hydraulic oil circuit*

Follow the numbered step sequence indicated above when bleeding the air from the brake system.

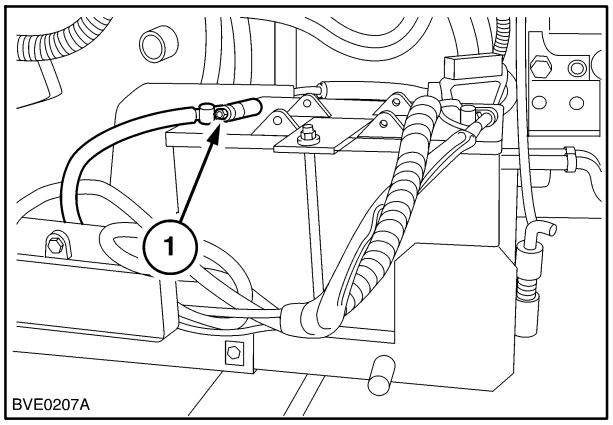
FRONT SERVICE BRAKE VALVE – MODELS WITH INTEGRATED FRONT LIFT

Removal

⚠ WARNING ⚠

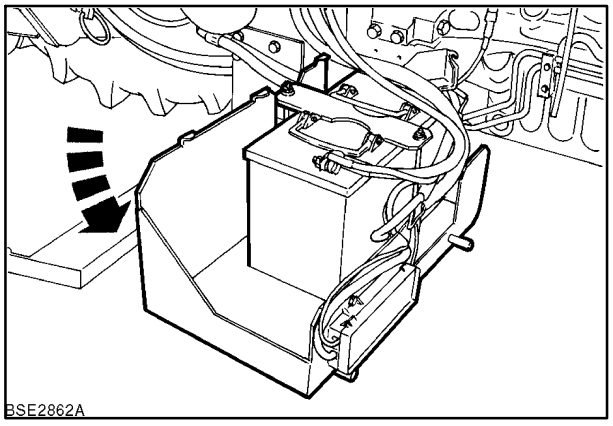
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).



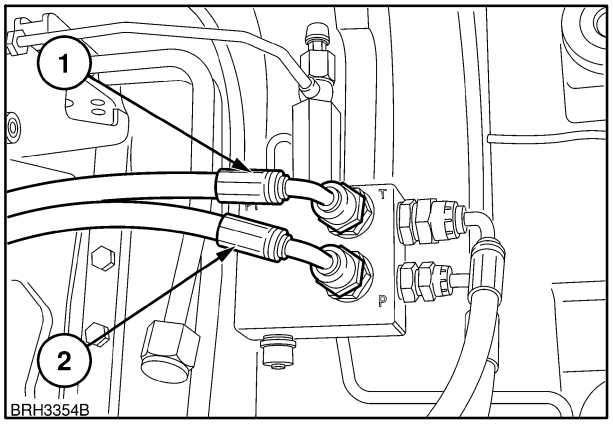
87

2. Swing the battery to the front of the tractor.



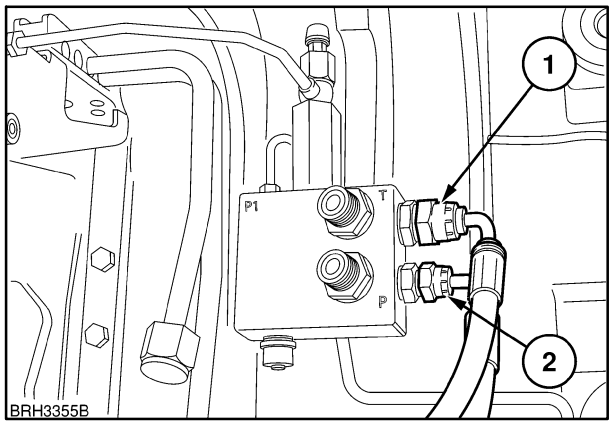
88

3. Disconnect the front PTO oil return pipe (1) and the oil supply pipe (2).



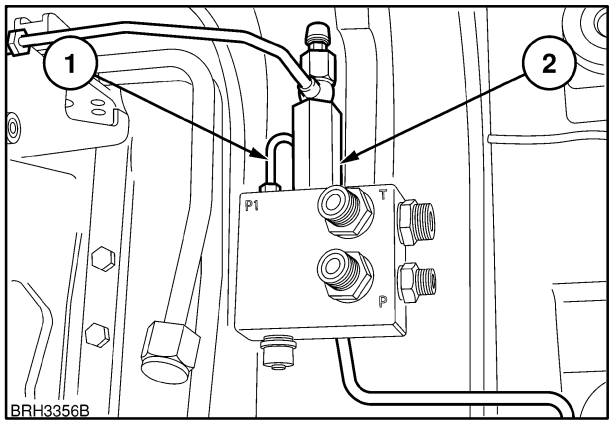
89

4. Disconnect the oil return pipe (1) and the oil supply pipe (2).



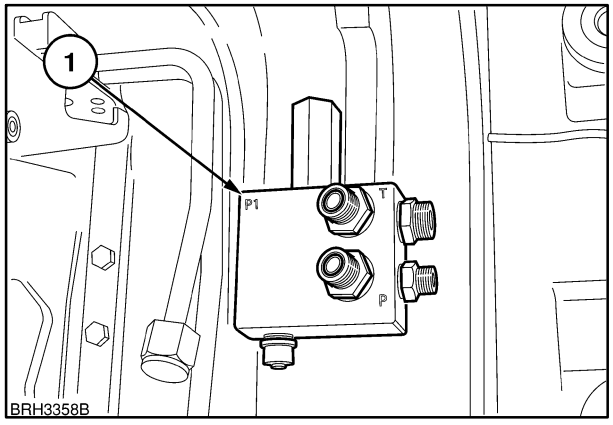
90

5. Disconnect the brake oil supply lines (1) and (2).



91

6. Remove the front service brake valve.



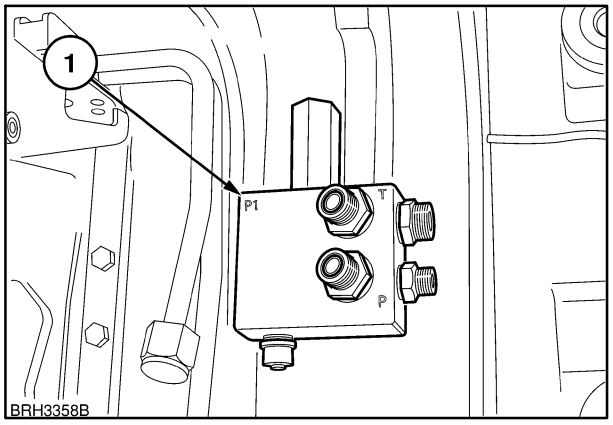
92

Installation

⚠ WARNING ⚠

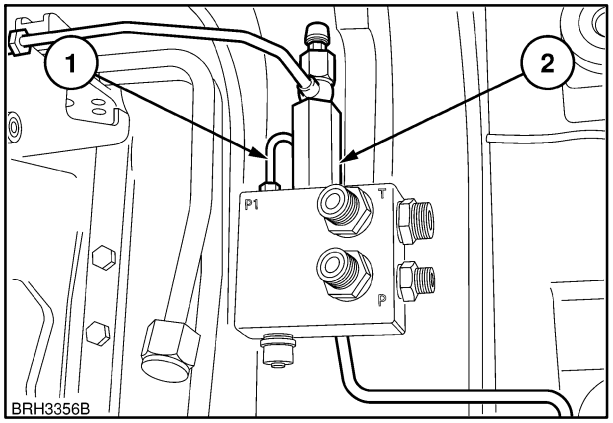
Handle all components with the greatest care.
Do no insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the front service brake valve.



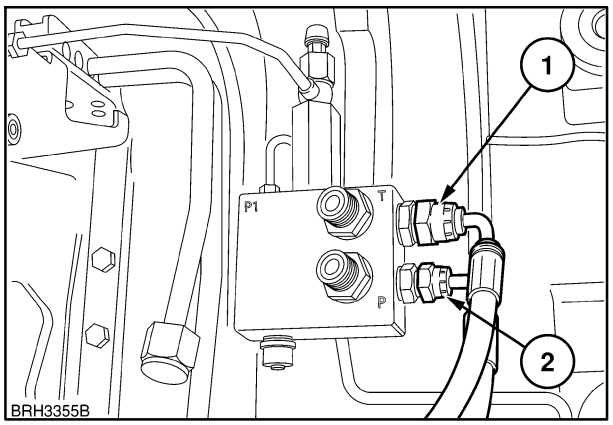
93

2. Connect the brake oil supply lines (1) and (2).



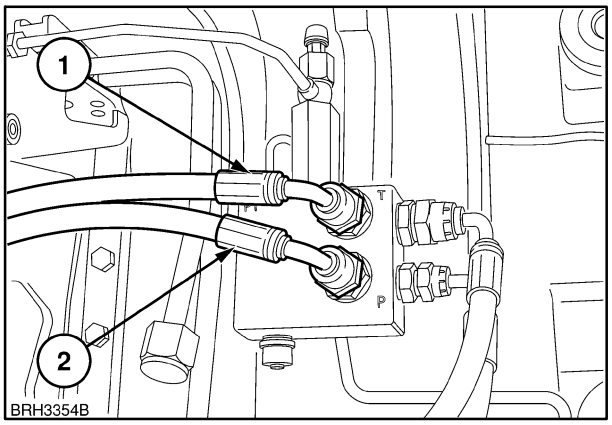
94

3. Connect the oil return pipe (1) and the oil supply pipe (2).



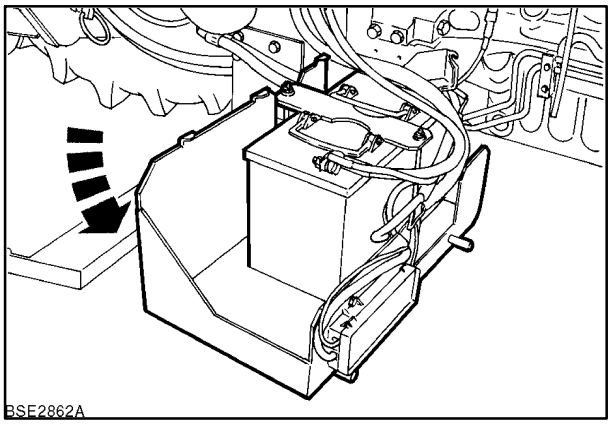
95

4. Connect the front PTO oil return pipe (1) and the oil supply pipe (2).



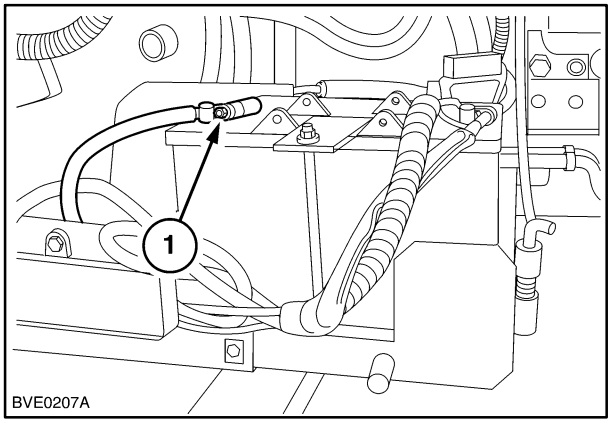
96

5. Return the battery to its operating position and secure.



97

6. Refit the battery cover and connect the battery negative cable (1).
7. Bleed the hydraulic brake system (refer to hydraulic brake system air bleeding in this chapter).

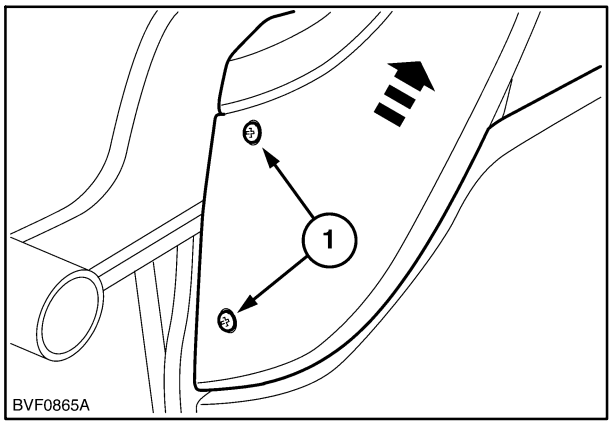


98

BRAKE PEDAL SWITCH

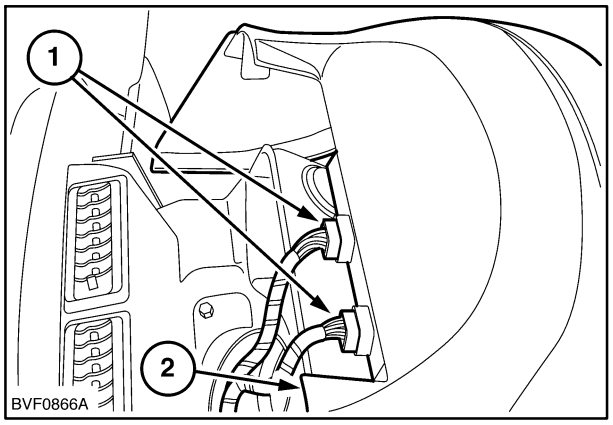
Removal

1. Remove the instrument cluster retaining screws (1). Repeat this step for the right hand side retaining screws.
2. Detach the instrument cluster panel to obtain access to the instrument cluster electrical connectors.



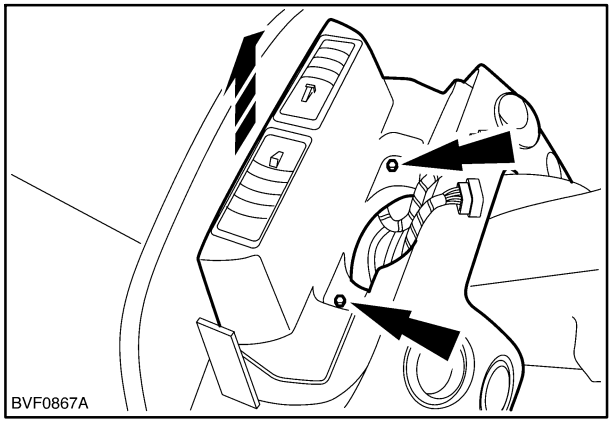
99

3. Disconnect the instrument cluster electrical connectors (1) and remove the instrument panel (2).



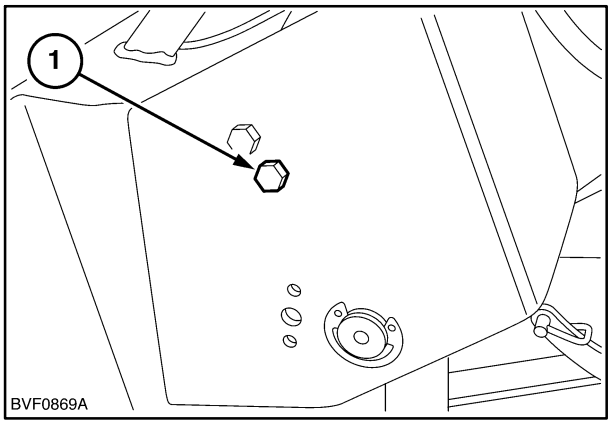
100

4. Remove the air ducting panel.



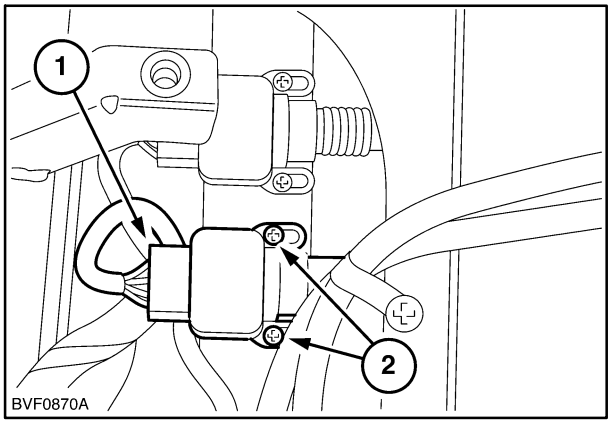
101

5. Remove the brake pedal switch support retaining bolt (1). Repeat this step for the right hand side retaining bolt.



102

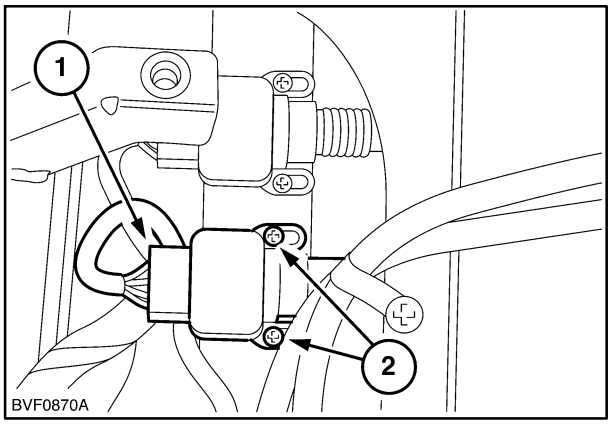
6. Position the brake pedal switch support to gain access to the brake pedal switch retaining screws (2).
7. Disconnect the electrical connector (1) and remove the brake pedal switch retaining screws (2).
8. Remove the brake pedal switch.



103

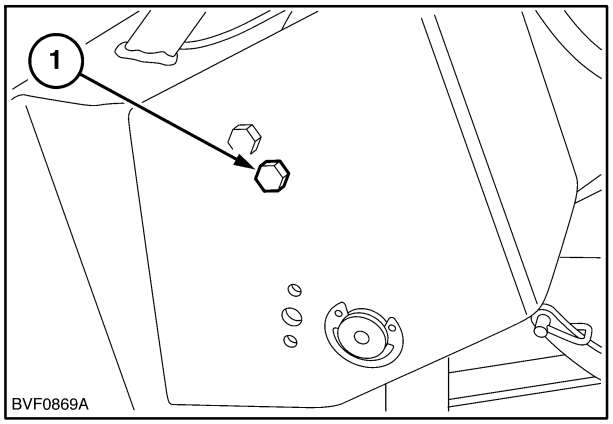
Installation

1. Install the brake pedal switch.
2. Install the brake pedal switch retaining screws (2) and connect the electrical connector (1).



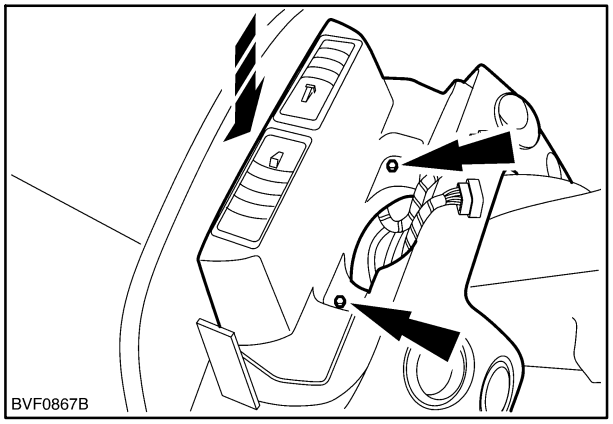
104

3. Position the brake pedal switch support.
4. Install the brake switch support retaining bolt (1). Repeat this step for the right hand side retaining bolt.



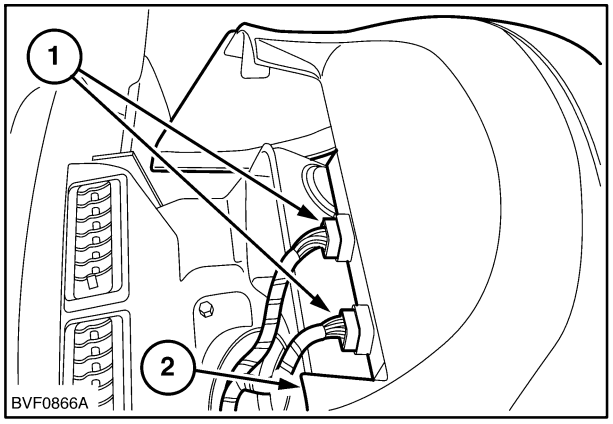
105

5. Install the air ducting panel.



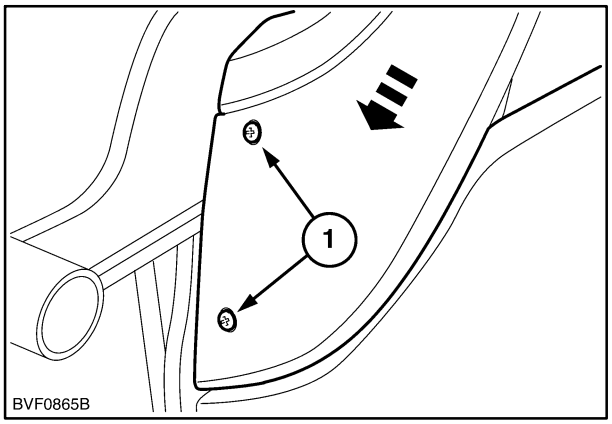
106

6. Install the instrument panel (2) and connect the instrument cluster electrical connectors (1).



107

7. Install the instrument cluster panel.
8. Install the instrument cluster panel retaining screws (1). Repeat this step for the right hand side retaining screws.

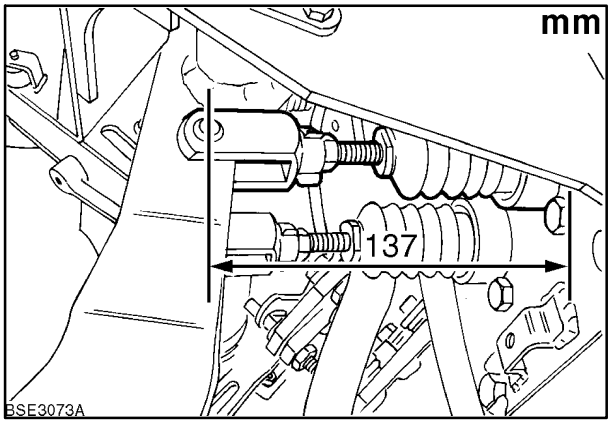


108

BRAKE PEDAL LINKAGE

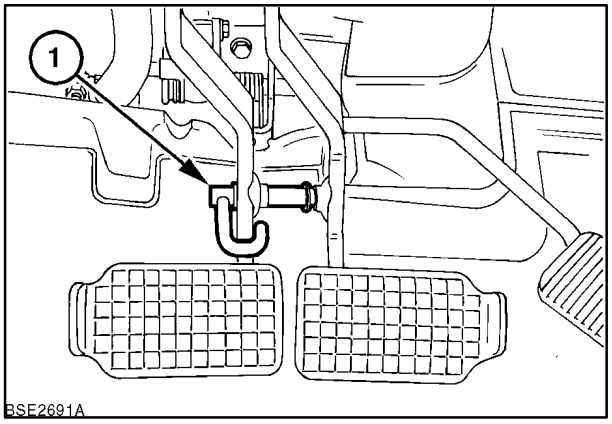
Adjustment

1. Adjust the clevis by loosening the locknut. The distance from the bulkhead to the centre of the clevis hole should be 137mm (5.4 in.). Repeat this step for the left hand side brake pedal linkage.



109

2. Make sure the brake pedal latch (1) engages properly. Adjust the brake pedal linkage as necessary.



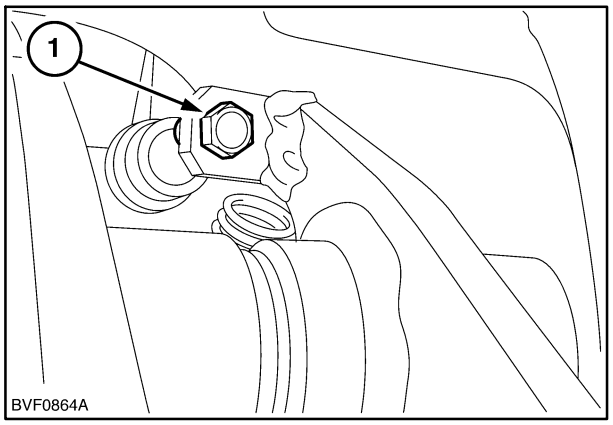
110

BRAKE PEDAL SWITCH

Adjustment

NOTE: *Brake pedal linkage adjustment must be carried out before brake pedal switch adjustment is attempted.*

1. Adjust the brake pedal adjustment bolt (1) to achieve switch operation (an audible click will be heard) when the brake pedal free play is removed and brake pedal resistance is observed.
2. Ensure both the brake pedal switches operate simultaneously.



111

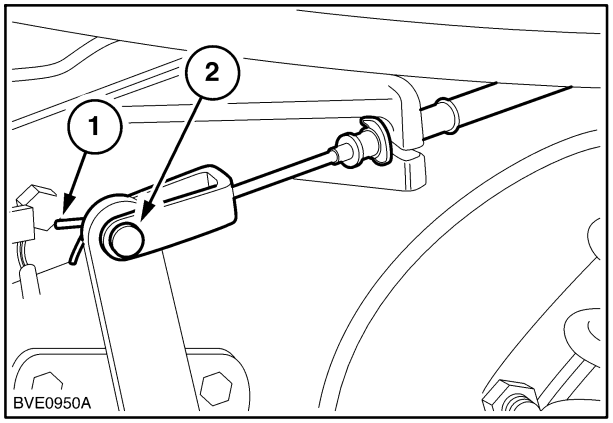
PARKING BRAKE

Removal (Op. 33 110 40)

⚠ WARNING ⚠

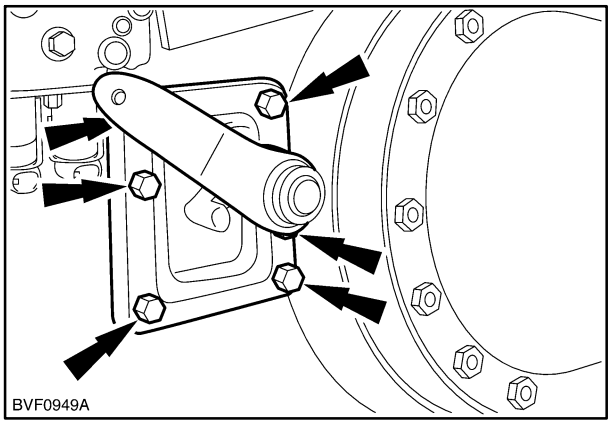
Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the fuel tank (refer to the fuel tank removal in the engine chapter).
2. Remove the split pin (1) and the cotter pin (2) from the parking brake lever.



112

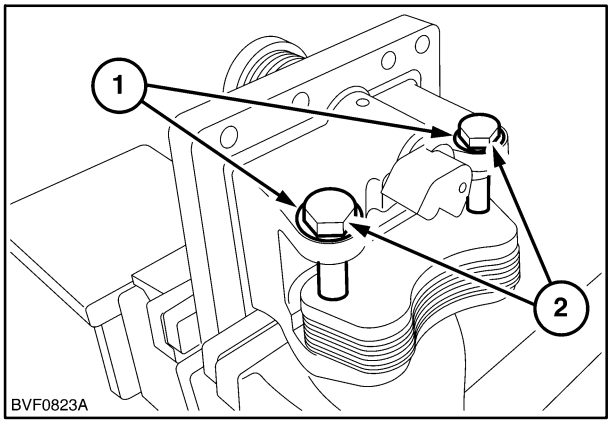
3. Remove the parking brake housing.



113

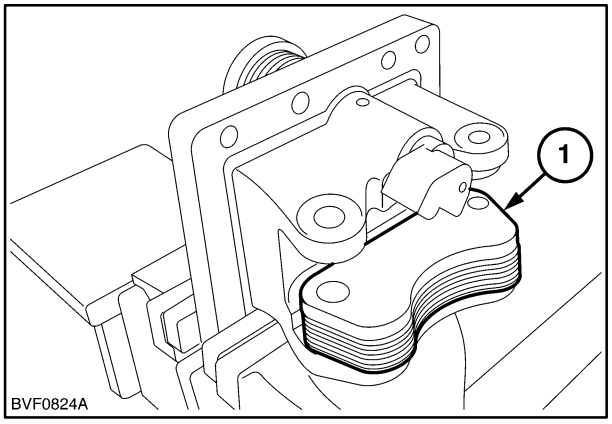
Disassembly (Op. 33 110 40)

1. Install the parking brake housing into a suitable vice.
2. Release the retaining bolt locking tabs (1) and remove the retaining bolts (2).



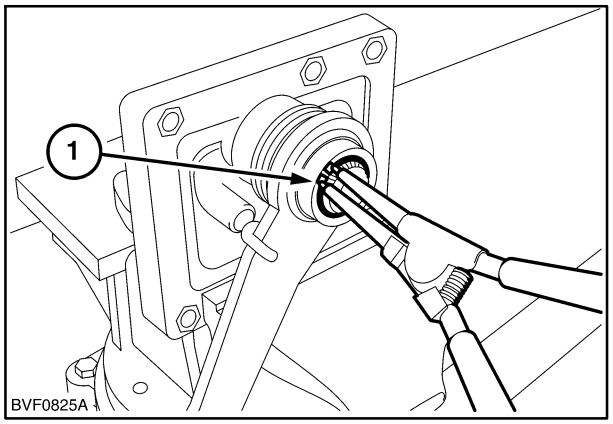
114

3. Remove the friction and steel plates (1).



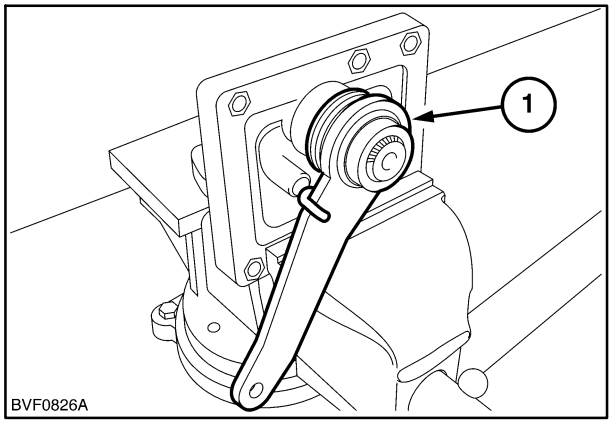
115

4. Rotate the parking brake housing 180°.
5. Using suitable circlip pliers, remove the circlip (1).



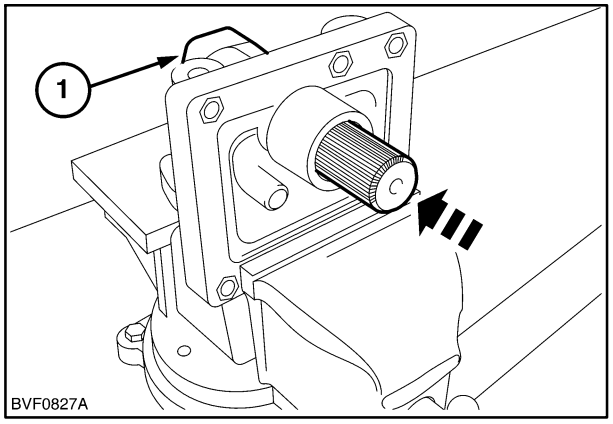
116

6. Remove the parking brake lever and spring (1) .



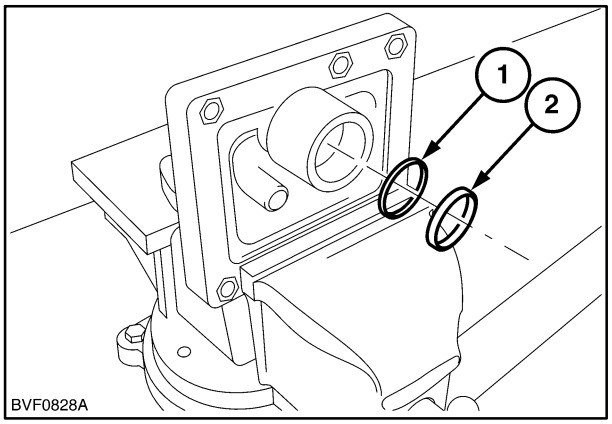
117

7. Remove the parking brake lever shaft (1).



118

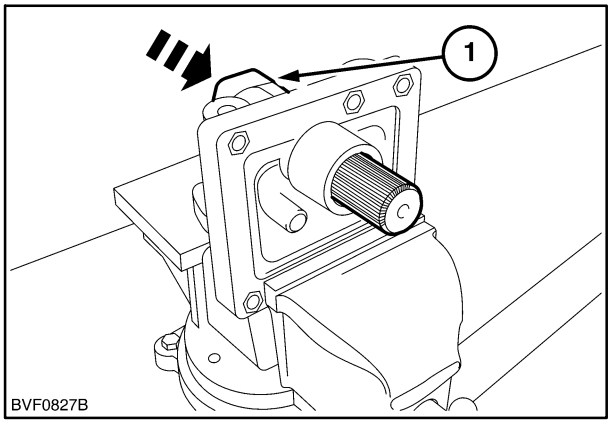
8. Remove the spacer (2) and the O-ring (1).



119

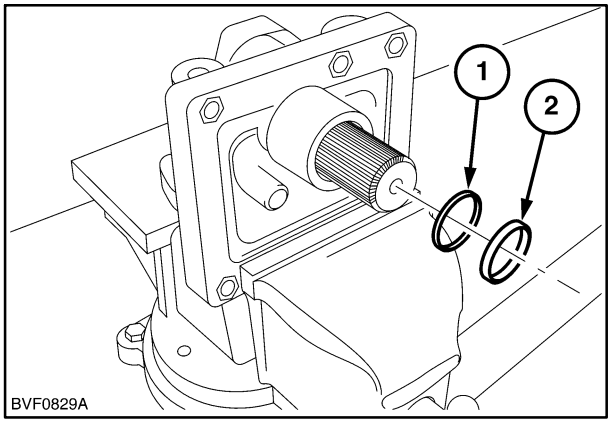
Assembly (Op. 33 110 40)

1. Install the parking brake lever shaft (1).



120

2. Install the O-ring (1) and the spacer (2).

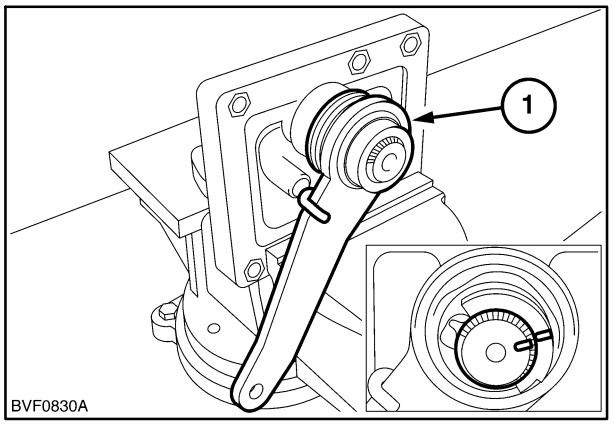


121

NOTE: *The paint must be removed to see the aligning marks.*

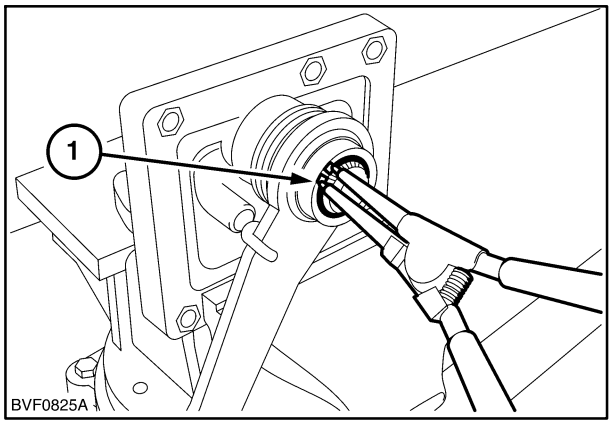
IMPORTANT: *When installing the parking brake lever, the lever must be aligned to the shaft using the aligning marks.*

3. Install the parking brake lever and spring (1).



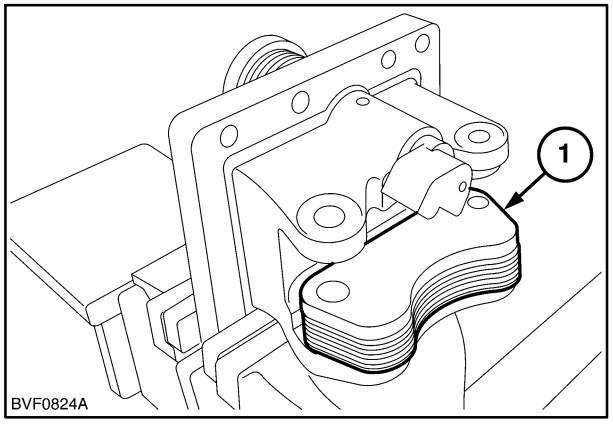
122

4. Using suitable circlip pliers, install the circlip (1).



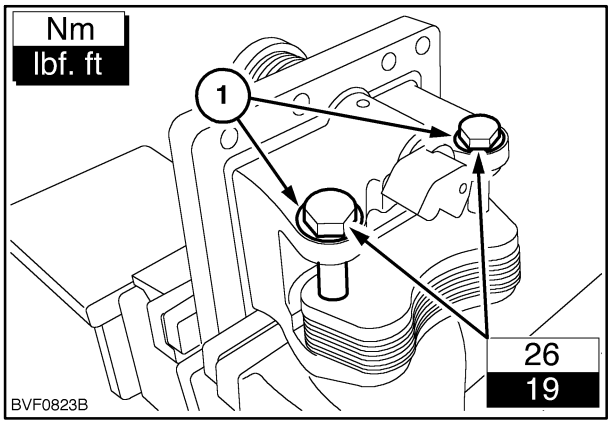
123

5. Rotate the parking brake housing 180°.
6. Install the fiction and steel plates (1).



124

7. Install the locking tabs (1) and the retaining bolts. Tighten the retaining bolts to the specified torque value.
8. Secure the retaining bolts with the locking tabs (1).



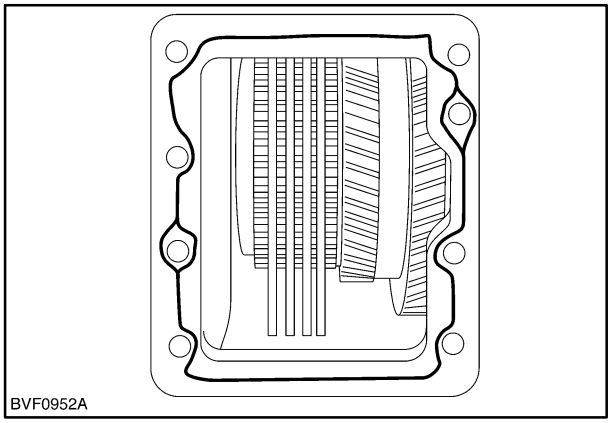
125

Installation (Op. 33 110 40)

⚠ WARNING ⚠

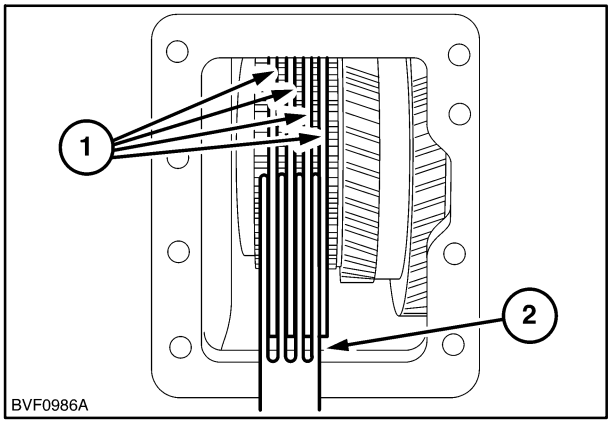
Handle all components with the greatest care.
Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm in diameter to the rear axle housing.



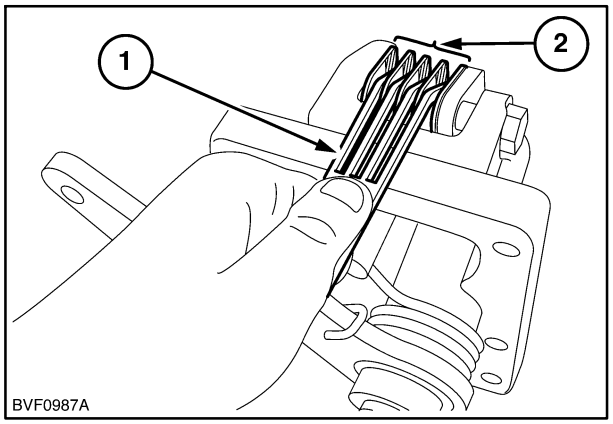
126

2. Using special tool **380000982** (2), align the brake discs (1) on the pinion shaft.



127

3. Install the special tool **380000982** (1) between the brake pads (2).



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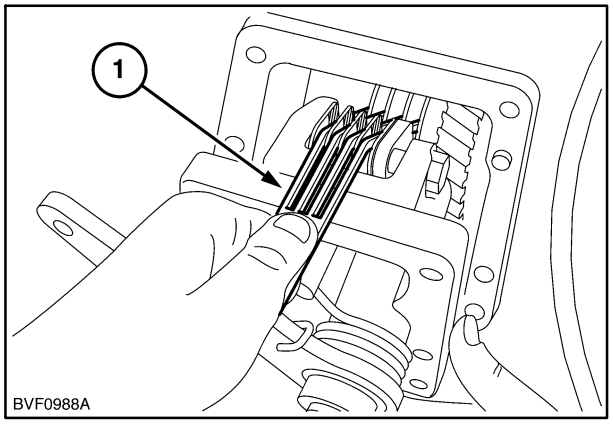
4. Position the parking brake assembly complete with the special tool **380000982** (1) between the brake discs on the pinion shaft. Remove the special tool (1) while installing the parking brake assembly.



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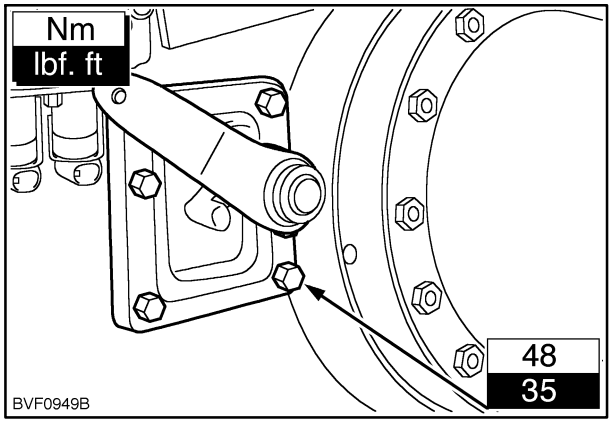
5. Tighten the retaining bolts to the specified torque value.



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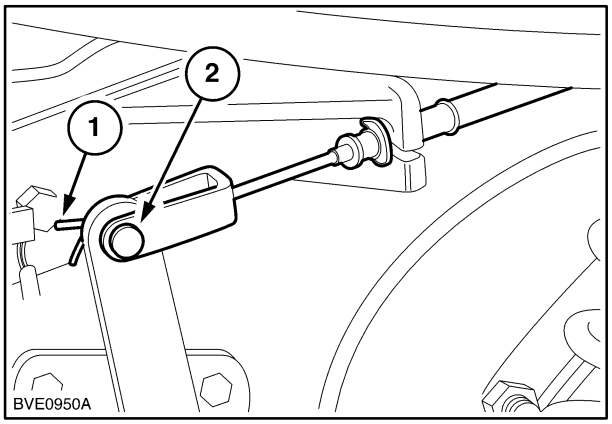
6. Install the cotter pin (2) and the split pin (1) into the parking brake lever.
7. Install the fuel tank (refer to fuel tank installation in the engine chapter).
8. Adjust the parking brake cable (refer to parking brake cable adjustment in this chapter).



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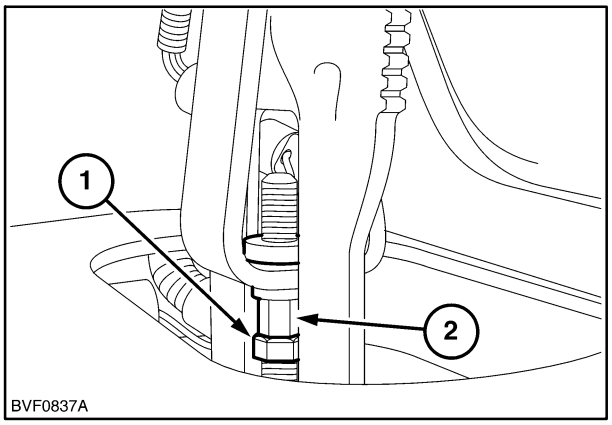
PARKING BRAKE CABLE

Adjustment (Op. 33 110 08)

Adjustment of the parking brake control lever travel should be performed each time the parking brake is serviced or repaired and when the idle travel of the lever is excessive.

Proceed as follows:

1. Block the front wheels using a suitable means.
2. Raise the rear of the tractor using a suitable means until the wheels are slightly off the ground.
3. Raise the parking brake control lever to the third notch on the quadrant.
4. Release the locknut (1) and screw in the adjustment screw (2) until the wheels lock.
5. Lower the parking brake control lever and ensure that the wheels can rotate freely.
6. Apply the parking brake several times to check that the assembly does not get blocked or operate abnormally.
7. Tighten the locknut (1) and lower the tractor.



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ADDITIONAL INFORMATION – BRAKE OVERHAUL

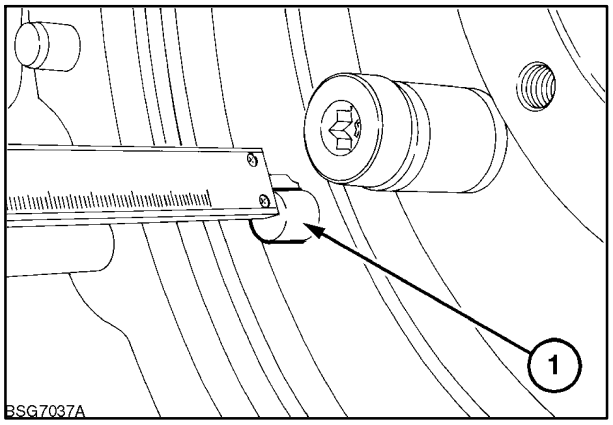
NOTE: *The information provided below is in addition that shown within this chapter.*
The following additional checks and procedures must be made when overhauling or carrying out repairs to the rear axle brakes.

1. Prior to the installation of new brake friction discs, it is required that the new discs are fully immersed in clean/new transmission oil, for a minimum of 12 hours.

Anti Rotational Dowel Protrusion

2. The protrusion of the dowel (1) must be of **11mm**, to prevent the piston disengaging from the dowel. This dimension should be measured using a vernier or depth gauge.
   To carryout any adjustments to obtain the correct dimension, either tap in or pull out all of the anti rotation dowels.

1. Dowels (3 per side)



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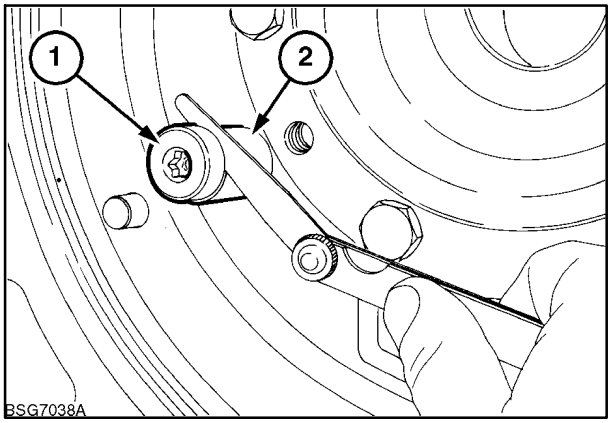
Brake Piston Surface Finish

3. The finish of the brake surface must be perfectly flat and smooth. Minor blemishes can be removed with a fine wet and dry paper, ensuring that the surface finish is kept flat and level.

Collet to Shouldered Screw Head Clearance:
(Reference clearance X, page 10)

4. Shouldered screw (1) length:
   29.21 to 29.26mm

   Collet (2) total length:
   28.95 to 28.98mm
5. Remove the collets (2) from the brake piston.
6. Assemble the shouldered screw (1) with the collet (2) and install on to the transmission housing, tightening the screw to a torque of 50Nm.
7. With the use of feeler gauges, measure the clearance between the screw head and the collet. **This must be between 0.16 and 0.28mm.**
8. Reapeat the procedure on all six shouldered screws and collets (3 per side).
9. Mix and match or replace the screw and collet to achieve the specified clearance.
10. When the specified clearance has been achieved, remove from the transmission housing and retain each screw and collet as matched pairs.



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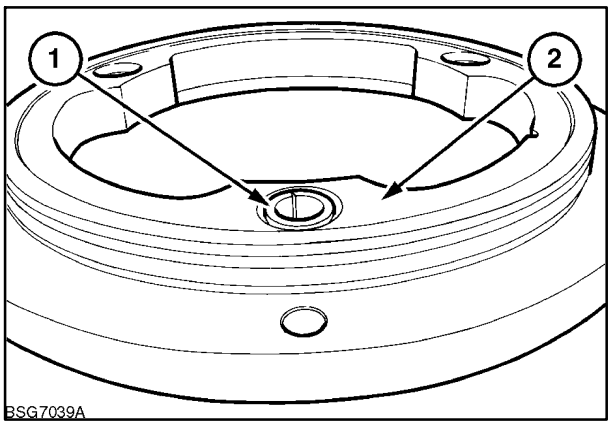
Collet Installation into the Piston

11. The collets (1) must be installed into the brake piston so that the face of the collet is flush with the back face of the piston (2).



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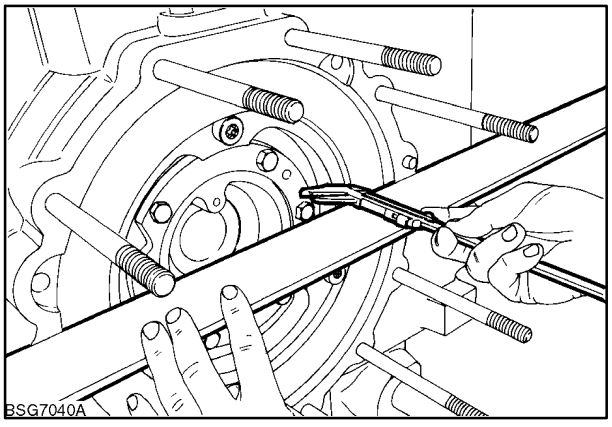
Piston Installation

12. When all of the previous checks have been made, thoroughly lubricate the piston seals with new LHM brake fluid and install the brake piston.

NOTE: *Ensure that the brake bleed screw is undone before installing the brake piston.*

When the piston is installed, ensure that it is located fully back into the rear axle housing.
Check the clearance between the front face of the housing and the face of the brake piston, using the straight edge.
The clearance measured should be a minimum of **11 mm** (fig.6).



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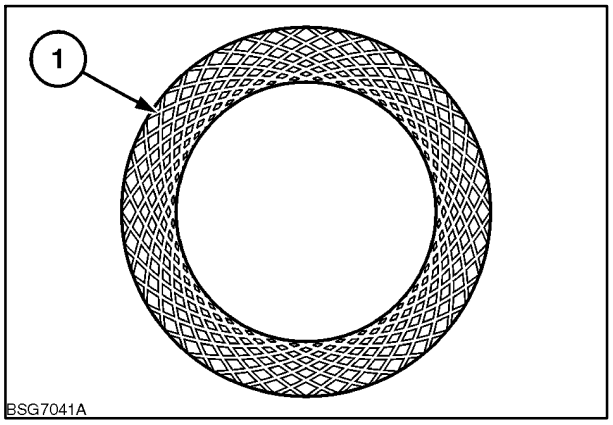
Brake Master Cylinder Return

13. Ensure that the brake pedals fully return.
    If it is suspected that the master cylinder is not fully returning, carry out the following procedure:
14. With the brake system fully assembled, loosen the left hand brake bleed screw at the axle housing, connect an oil can (with hand pump) filled with LHM brake fluid, using a suitable size flexible hose.
15. When pumping the oil can, the brake fluid should flow freely through the master cylinder into the brake fluid reservoir.
16. Close the left hand brake bleed screw and repeat the procedure on the right hand side.
17. When fully reassembled, using suitable equipment, jack up the tractor so that the wheels are off the ground. The rear wheels should be free to rotate using a moderate effort. No binding should be felt.

***NOTE: DO NOT** test newly installed brake discs by performing high speed or high load stops. New brakes should be "bedded in" by avoiding heavy load and severe braking where possible, during the first **50 hours** of use.*

Differences between 30/40Kph and 50Kph Brakes

18. The 30 and 40kph brake disc linings are made from an organic based material. The disc lining can be identified by by the diamond shaped pattern (fig.8).



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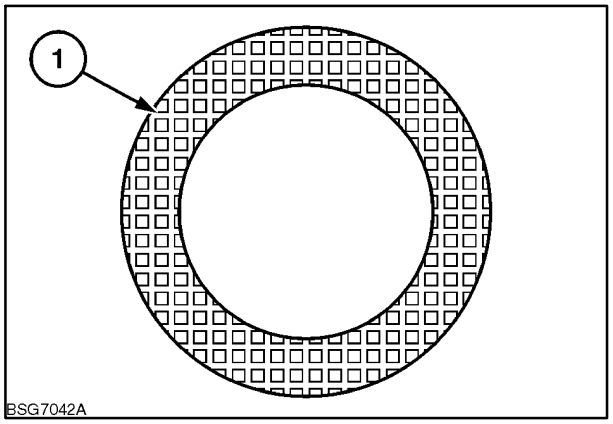
19. The 50kph brake linings are made of Kevlar based material. The disc lining can be identified by the square shaped pattern (fig.9).



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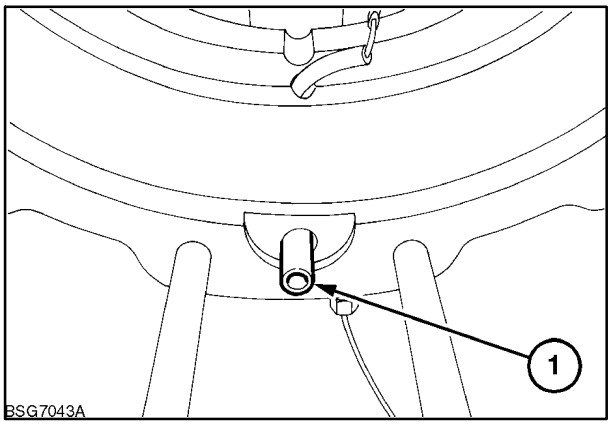
20. Additional oil is pressure fed to the bottom of the brake discs (1) on 50kph brakes, for lubrication and cooling purposes.



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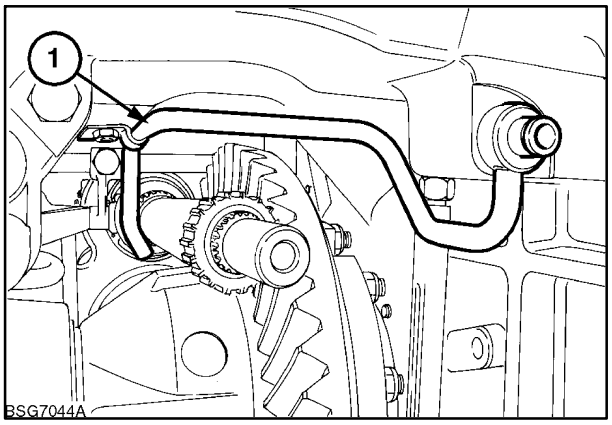
21. The additional pressure fed lubrication can be installed on 30 and 40kph tractors where brake concerns are found, especially on units that operate on road haulage, pulling heavy loaded trailers or tankers.
    To install the pressure fed lubrication circuit, the rear PTO housing must be removed.
    On earlier models, the hydraulic module will also have to be removed to gain access to the lubrication pipe clamp bolt.



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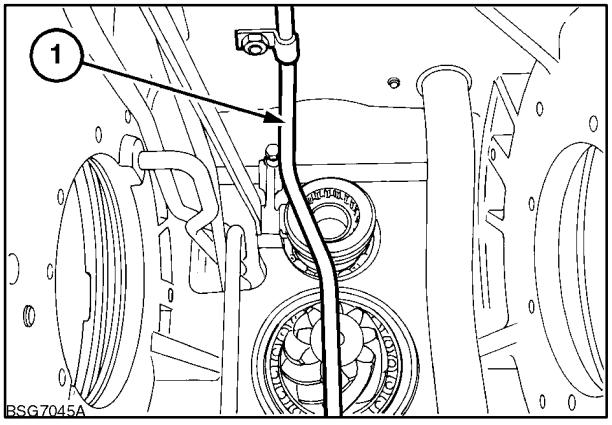
22. Replace the standard pinion lubrication pipe (1, fig. 140), with the 50kph pinion lubrication pipe (1, fig 141)



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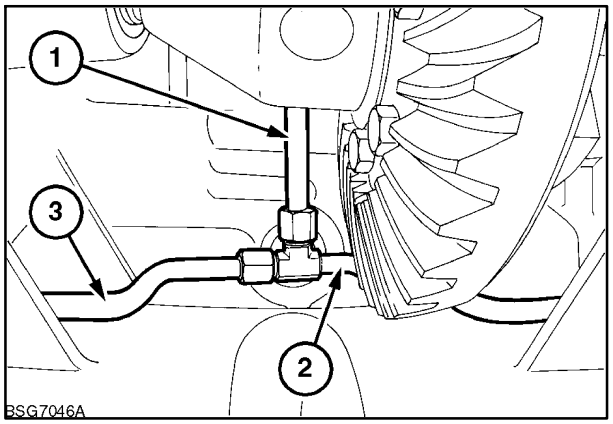
23. Connect the right hand pipe, complete with the restrictor and the left hand pipe, to the pinion lubrication pipe as shown (fig,13).



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SECTION 33 - BRAKING SYSTEM

Chapter 2 - Air Trailer Brakes

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SPECIFICATIONS

Air Compressor:

Location	Left hand side of engine.
Drive	Belt driven via crankshaft
Type	Single cylinder air cooled
Speed	3,000 rev/min. Maximum
Lubrication	Pressure fed from engine
Bore / Stroke	75mm x 36mm
Displacement	159 cm^3
Operating Pressure	18 bar (261 $lbf.in^2$) Maximum

System Operating Pressure: 7.8-8.3 bar (113-120 $lbf.in^2$) "Universal" and "German"
7.0-7.5 bar (101-108 $lbf.in^2$) "Italian"

Unload (relief) Valve Setting: 12 bar (174 $lbf.in^2$) "Universal" and "German"
12 bar (174 $lbf.in^2$) "Italian"

Low Pressure Warning Switch Operates at,: 4.5-5.0 bar (65-73 $lbf.in^2$) "Universal" and "German"
4.5-5.0 bar (65-73 $lbf.in^2$) "Italian"

Pressure Sender

Pressure (bars)	0	2	6	10
Ohms	10	52	124	184

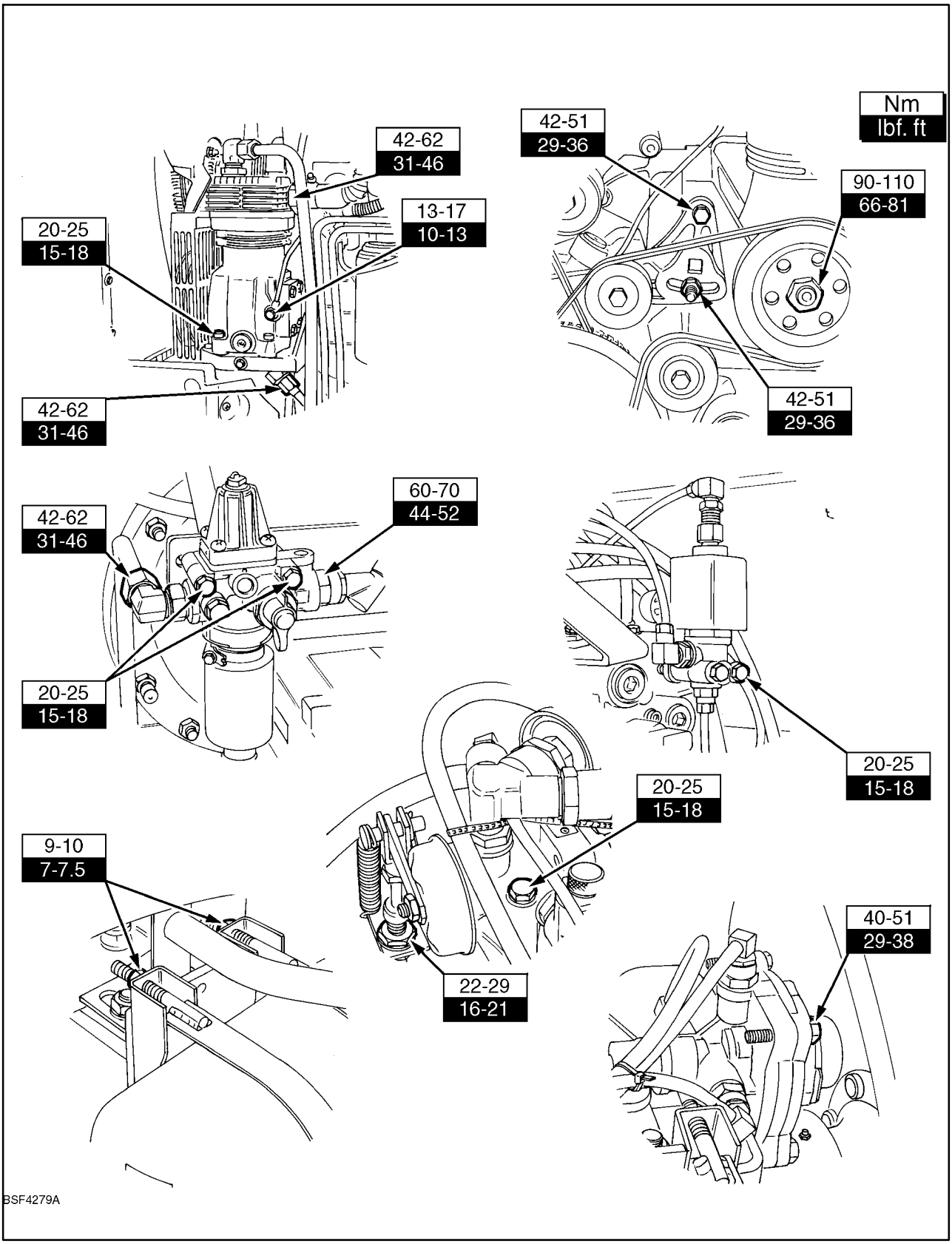
Maintenance

Drain Reservoir Tanks	Daily
Compressor Drive Belt Tension	310 Hz +/- 15Hz, at PDI and every 300 hours

SPECIAL TOOL

380001268 - Belt Tension Meter.

TIGHTENING TORQUES

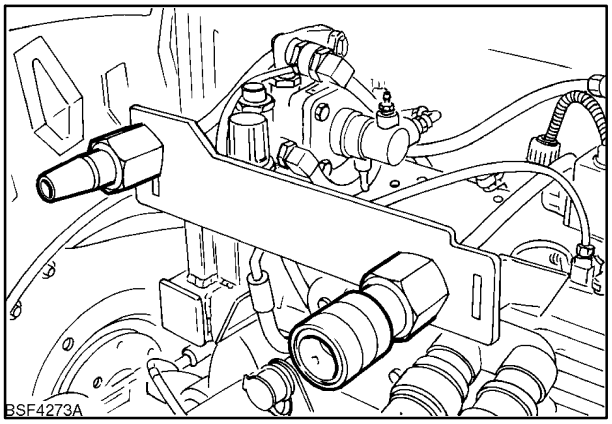


DESCRIPTION AND OPERATION

There are three versions of the air trailer brake available.

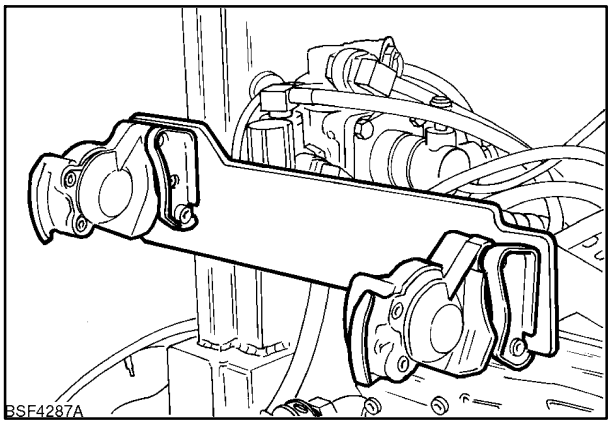
These can be easily identified by the coupler configuration at the rear of the cab.

1. **Universal**
   A generally accepted air brake providing a dual line system. The universal system is available with either the straight inline connectors, Figure 1, or the side mounting type, Figure 2.



1

2. Universal with Side mounting couplers.



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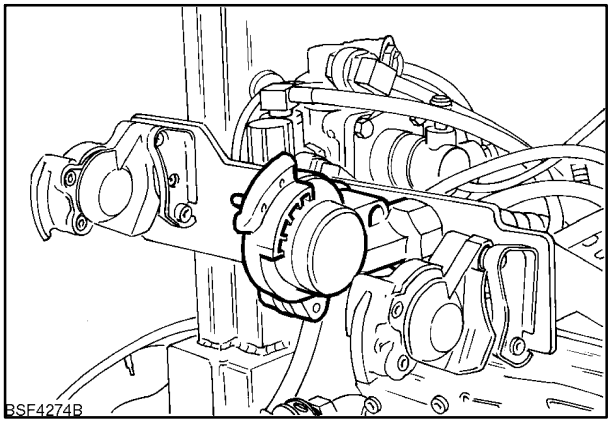
3. **"German"**
   An air brake system designed in accordance with German TUV specifications providing both single and dual line operation.



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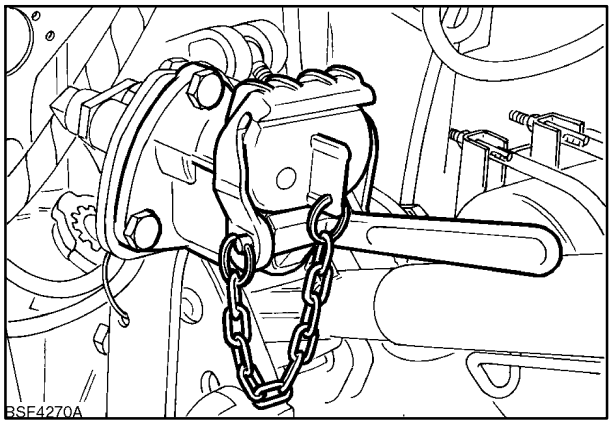
4. **"Italian"**
   An air brake system designed to meet Italian legislation and providing dual line operation.



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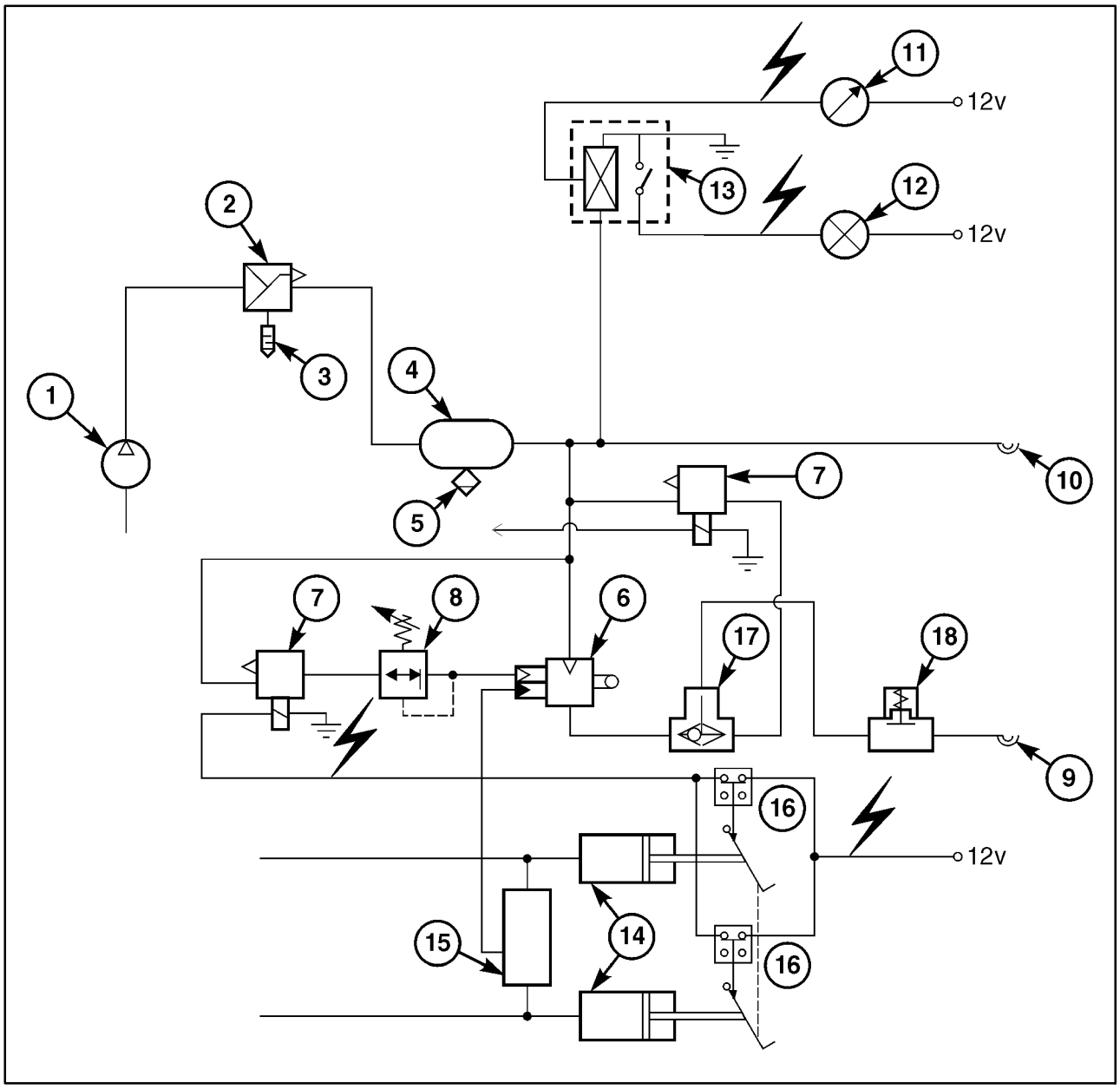

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5

Air Brake Schematic Diagram
"Universal"

1. Compressor
2. Unload Valve (8 bar)
3. Silencer
4. 10 litre Reservoir
5. Drain Valve
6. Dual Line Control Valve
7. Solenoid Valve
8. Pressure Regulator
9. Coupler – Control Line Yellow
10. Coupler – Supply Line Red
11. Pressure Gauge
12. Low Pressure Warning Lamp
13. Pressure Sender
14. Brake Master Cylinder
15. Brake Logic Head
16. Brake Light switches
17. Double Check Valve
18. Quick Release Valve

UNIVERSAL AIR BRAKE OPTION (FIGURE 5)

Brakes Disengaged

Air from the Compressor (1) is supplied to the Unload Valve (2) which regulates system pressure stored in the Reservoir (4).

This pressure is supplied to the trailer via the Red Supply Line (10) Coupler to disengage the brakes.

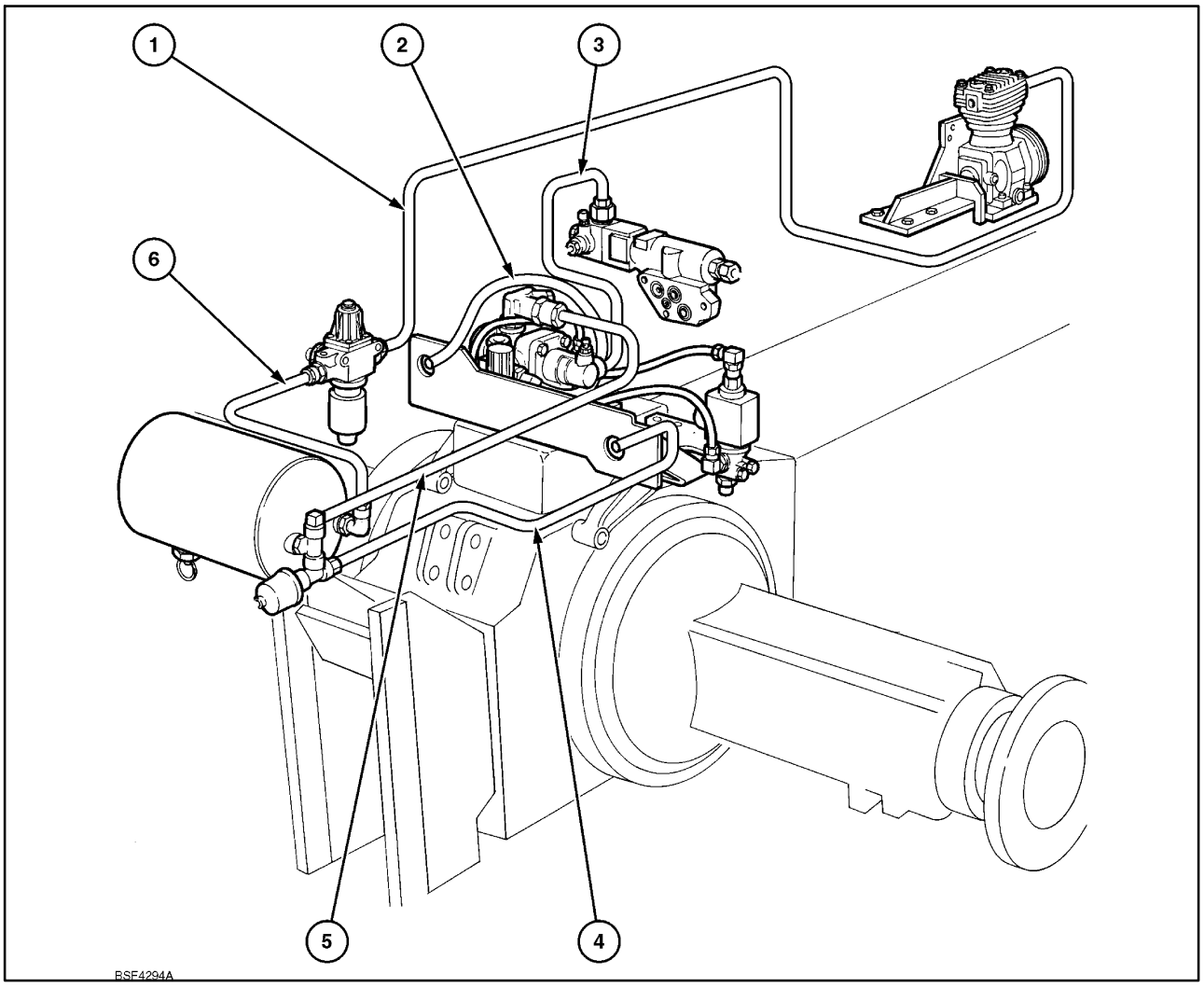
The air in the system also acts on the Pressure Sender Unit (13) which supplies a variable electrical signal to the Pressure Gauge (11) to indicate the pressure in the system.

If the pressure drops below specified limits, the sender incorporates a switch to illuminate the Warning Lamp (12).

Brakes Engaged

Operating the brake pedal closes the Brake Switches (15) which sends a signal to the Solenoid Valve (7). When energised this supplies air via the Pressure Regulator (8) to the Control Valve (6) as pilot pressure to initiate operation of the trailer's brakes via the Yellow Control Line Coupler (9).

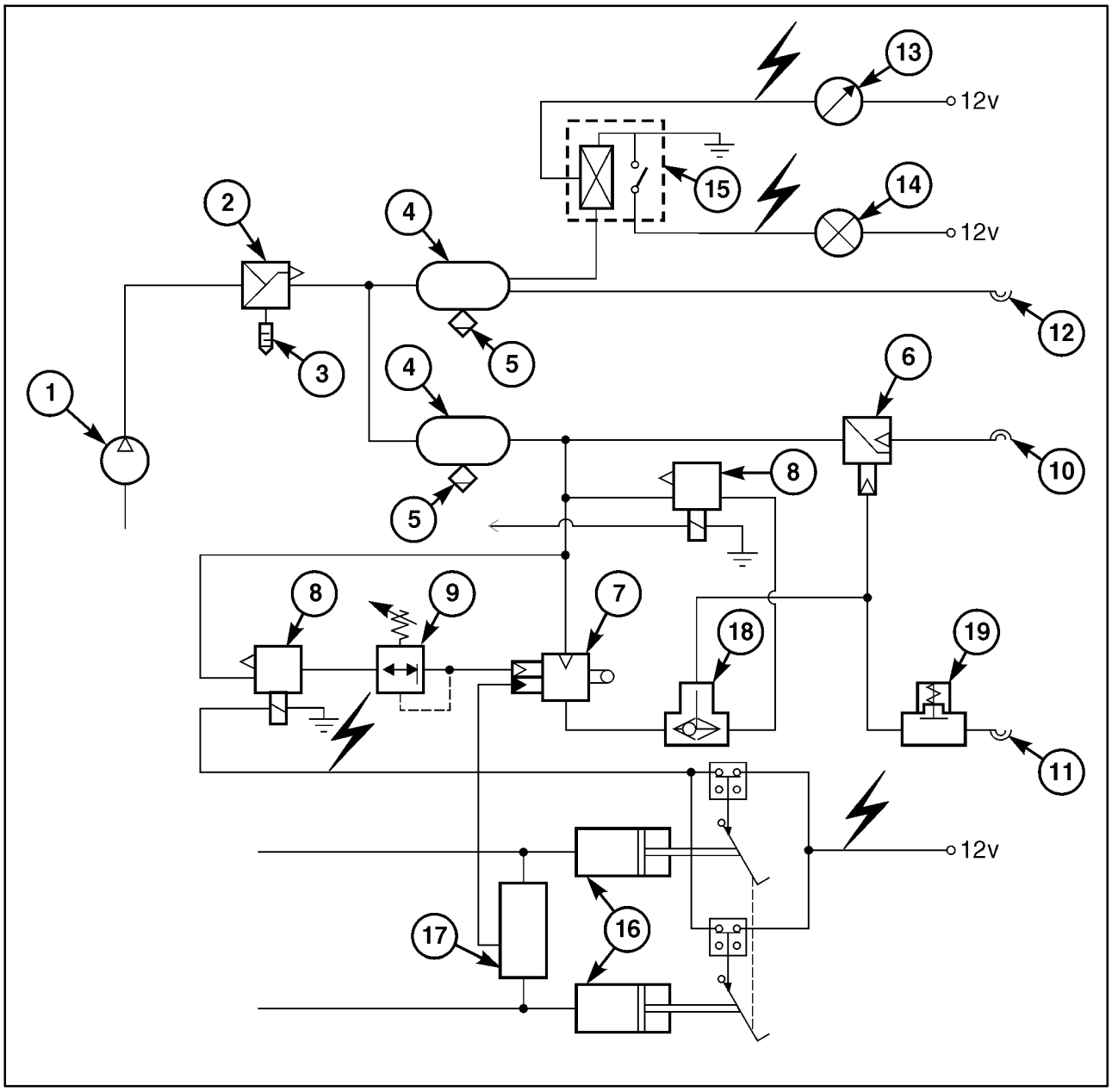
As the tractor's brakes are applied, Hydraulic Pressure from the Master Cylinders (12) is transferred via the Brake Logic Valve (13) to the Control Valve (6) to progressively increase pressure in the Yellow Control Line (9) to the trailer's brake control valve to engage the brakes in line with the tractor brakes.



6

Universal Air Brake - Tube Connections

1. Compressor to unload valve tube
2. Yellow coupler tube
3. Trailer brake valve to control valve tube
4. Red coupler tube
5. Reservoir to Dual line control valve tube
6. Unload valve to left hand reservoir tube



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7

Air Brake Schematic Diagram
"German"

1. Compressor
2. Unload Valve (8 bar)
3. Silencer
4. Reservoir (2 x 10 litres)
5. Drain Valve
6. Single Line Control Valve
7. Dual Line Control Valve
8. Solenoid Valve
9. Pressure Regulator
10. Coupler Single Line Black
11. Coupler Dual Line (Control) Yellow
12. Coupler Dual Line (Supply) Red
13. Pressure Gauge
14. Low Pressure Warning Lamp
15. Pressure Sender Unit
16. Brake Master Cylinder
17. Brake Logic Valve
18. Double Check Valve
19. Quick Release Valve

"GERMAN" AIR BRAKE OPERATION (FIGURE 7)

The German Air Trailer Brake System combines a dual line and single line brake system and has the addition of a second reservoir tank.

Dual Line Braking System

Refer to Universal Braking System.

Single Line Braking System

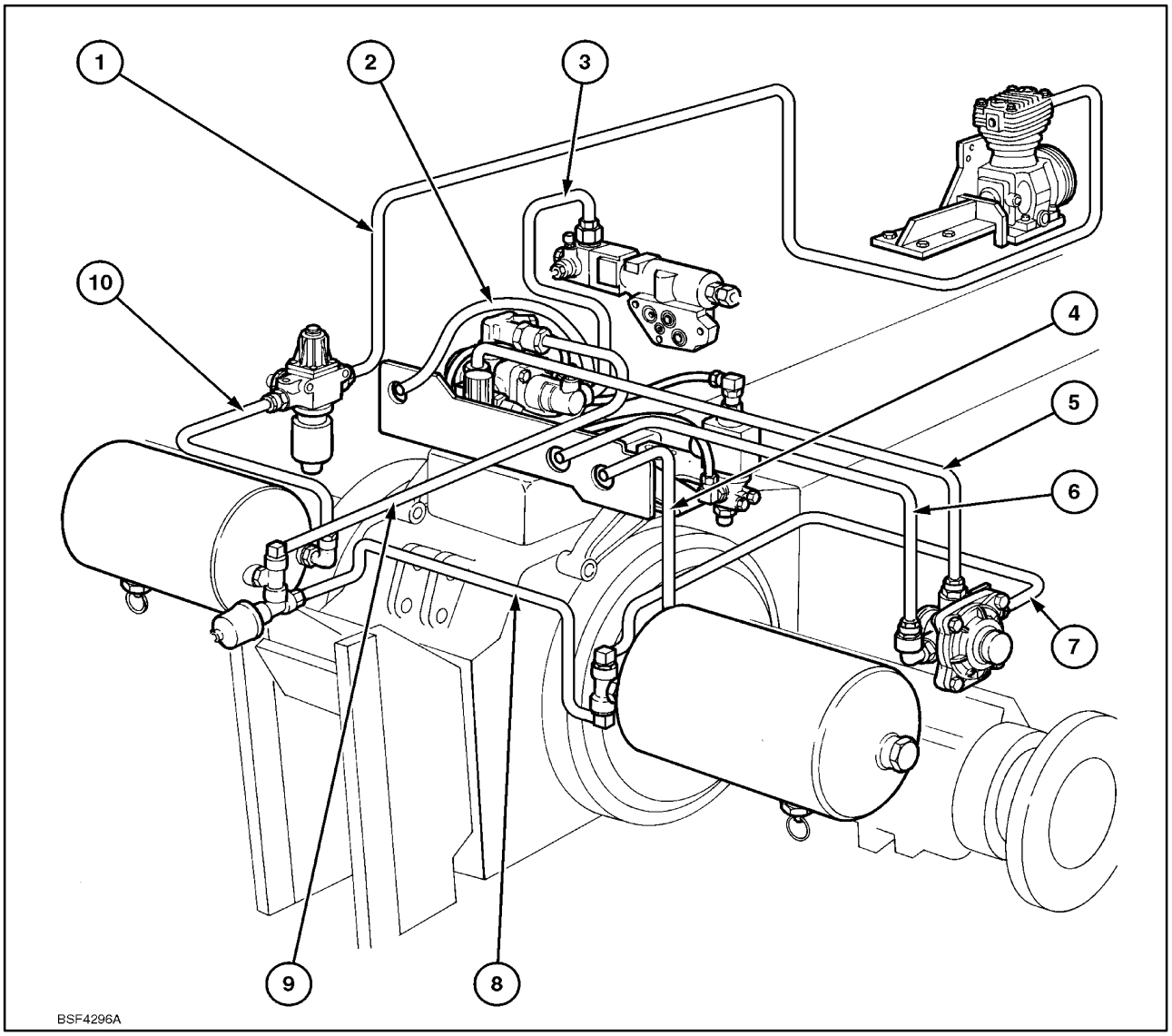
The system functions in a similar fashion to dual line braking except for the following.

Brakes Disengaged

Air from the Reservoir (4) is supplied via the Single Line Control Valve (6) to the Black Line (10) to disengage the trailer's brakes.

Brakes Engaged

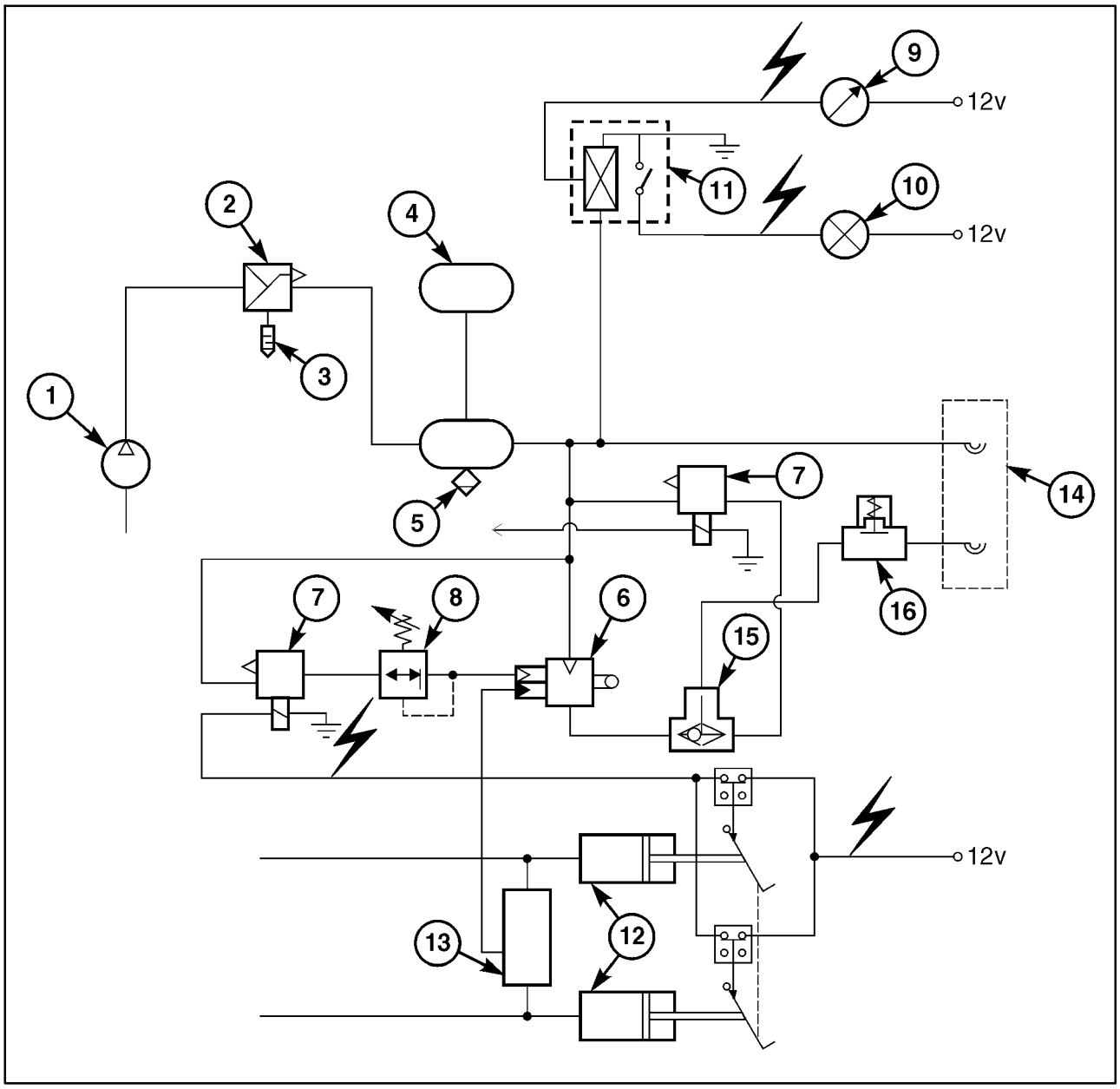
As pressure in the Yellow Line (11) increases, it is sensed at the Single Line Control Valve (6) to progressively vent the air pressure supplied to the trailer via the Black Line (10) to apply the trailer's brakes in line with the tractor's brakes.



8

German Air Brake – Tube Connections

1. Compressor to unload valve tube
2. Yellow coupler tube
3. Trailer brake valve to control valve tube
4. Red coupler tube
5. Single line valve to dual line valve tube
6. Black coupler tube
7. Single line valve to right hand reservoir tube
8. Reservoir to reservoir tube
9. Reservoir to Dual line control valve tube
10. Unload valve to left hand reservoir tube



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9

Air Brake Schematic System
"Italian"

1. Compressor
2. Unload Valve (7 bar)
3. Silencer
4. 2 off Reservoir (10 litres)
5. Drain Valve
6. Dual Line Control Valve
7. Solenoid Valve
8. Pressure Regulator
9. Pressure Gauge
10. Low Pressure Warning Lamp
11. Pressure Sender Unit
12. Brake Master Cylinder
13. Brake Logic Valve
14. Dual Coupler
15. Double Check Valve
16. Quick Release Valve

"ITALIAN" AIR BRAKE OPERATION (FIGURE 9)

Brakes Disengaged

Air from the compressor (1) is supplied to the Unload Valve (2) which regulates system pressure stored in the Reservoir (4).

This pressure is supplied to the trailer via the Dual Coupler (14) supply line to disengage the brakes.

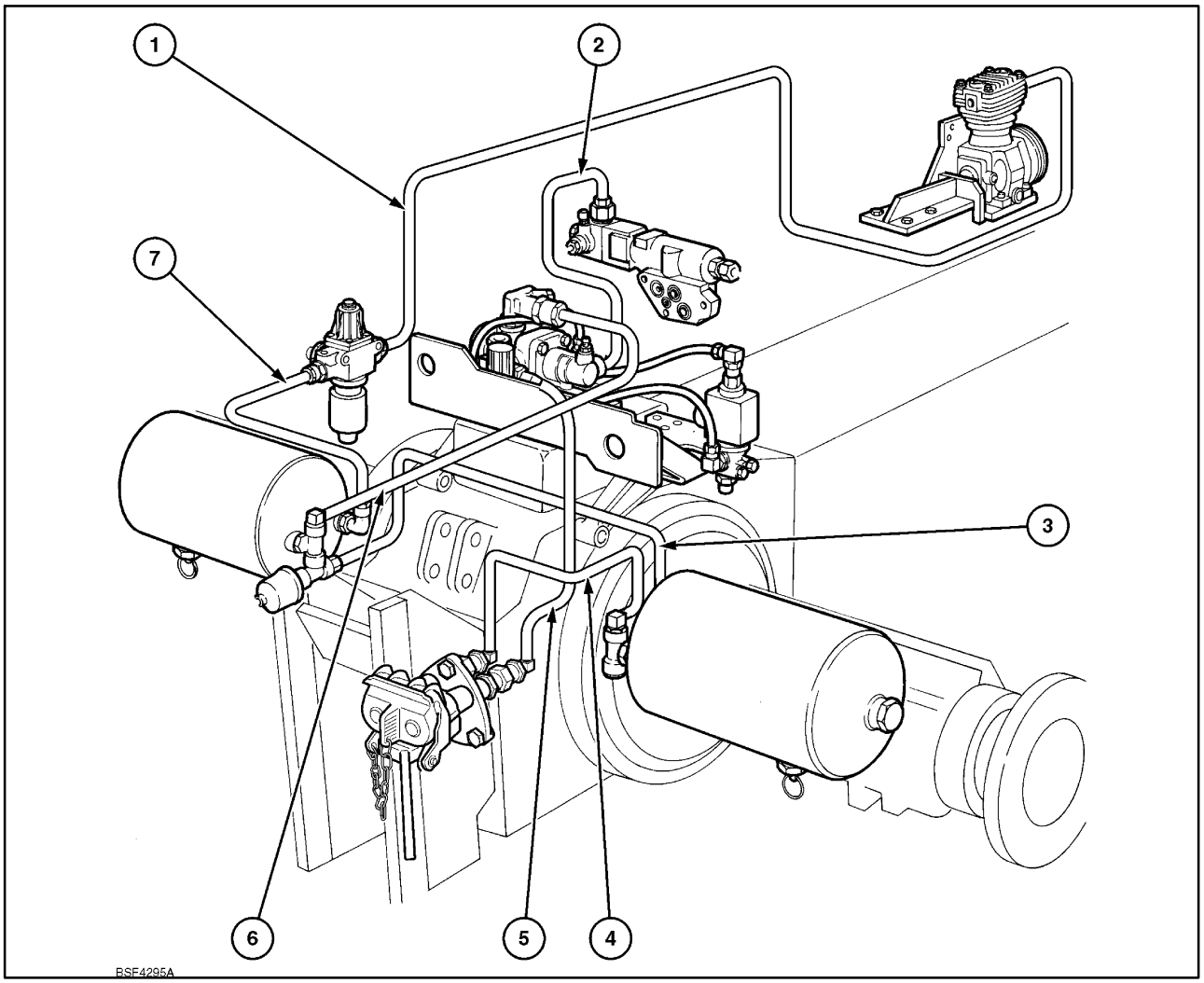
The air in the system also acts on the Pressure Sender Unit (11) which supplies a variable electrical signal to the Pressure Gauge (9) to indicate the pressure in the system.

If the pressure drops below specified limits the sender incorporates a switch to illuminate the Warning Lamp (10).

Brakes Engaged

Operating the brake pedal closes the brake switches which sends a signal to the Solenoid Valve (7). When energised this supplies air via the Pressure Regulator (8) to the Control Valve (6) as pilot pressure to initiate operation of the trailer's brakes via the Dual Coupler (14) control line.

As the tractor's brakes are applied hydraulic pressure from the Master Cylinders (12) is transferred via the Brake Logic Valve (13) to the Control Valve (6) to progressively increase pressure in the Dual Coupler (14) control line to the trailer's brake control valve to engage the brakes in line with the tractor brakes.

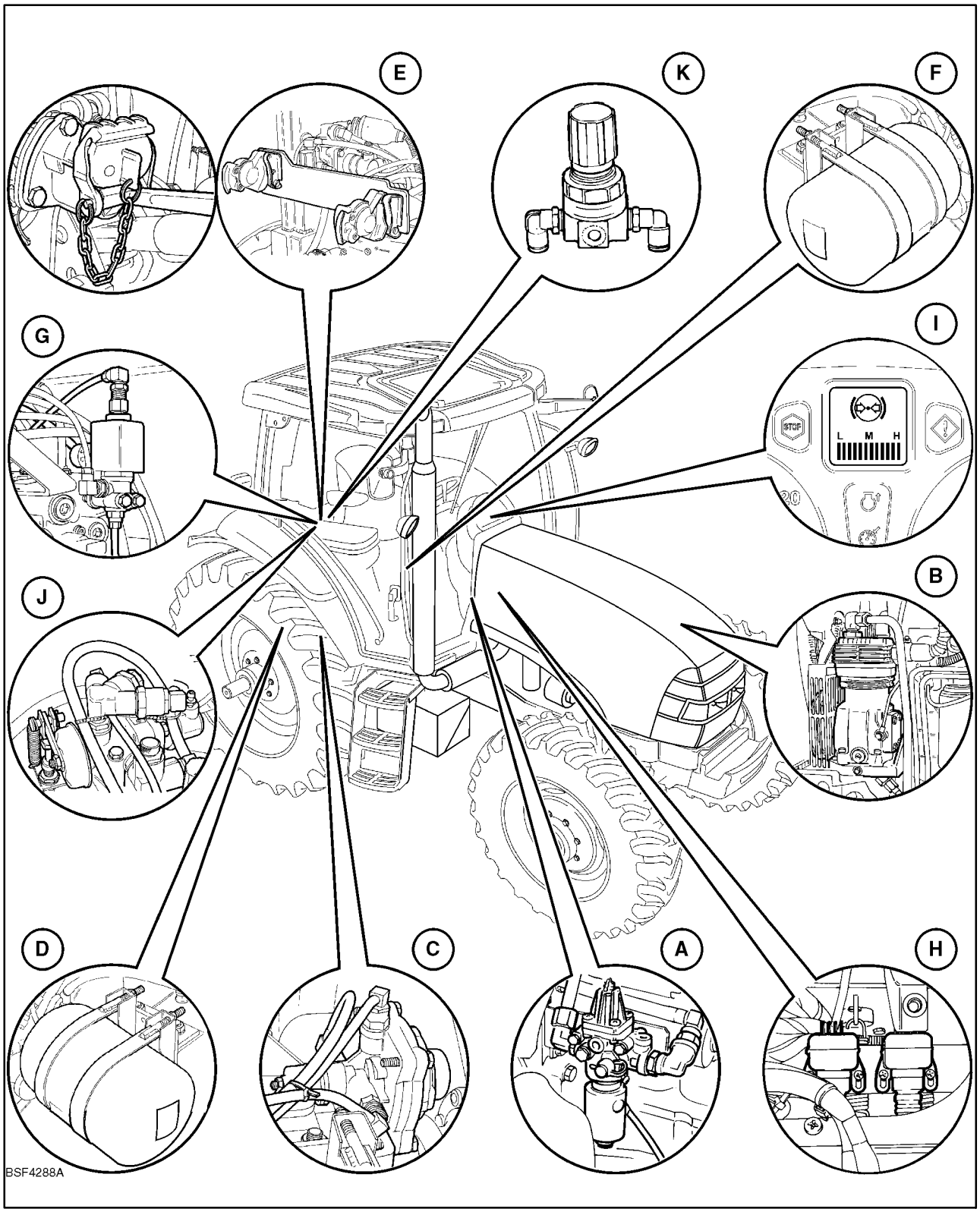


10

Italian Air Brake – Tube Connections

1. Compressor to unload valve tube
2. Trailer brake valve to control valve tube
3. Reservoir to reservoir tube
4. Yellow coupler tube
5. Red coupler tube
6. Reservoir to Dual line control valve tube
7. Unload valve to left hand reservoir tube

COMPONENT FUNCTION

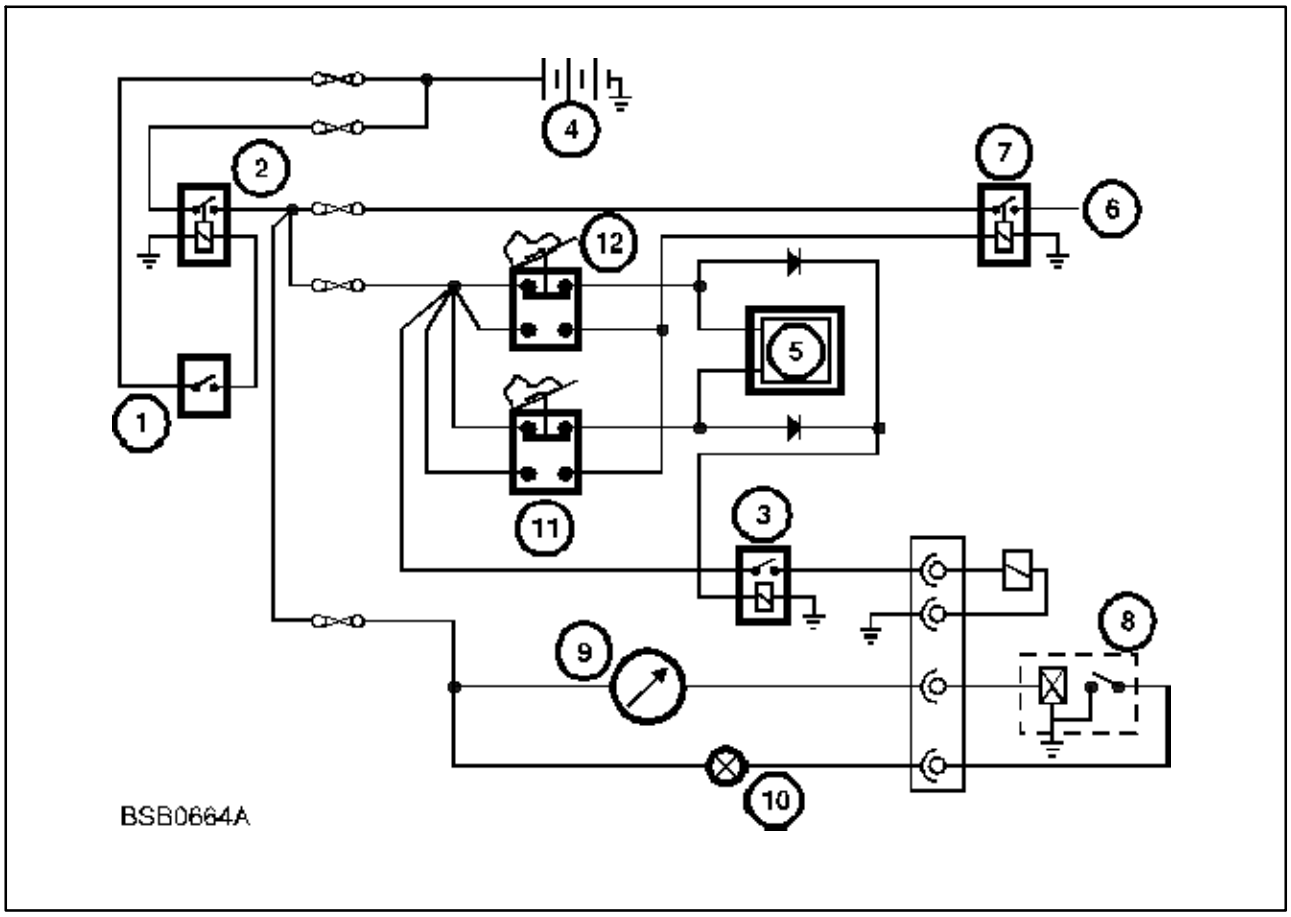


Description	Diagram Ref.	Function
Compressor	B	Belt driven via the crankshaft. Takes filtered air and compresses it to supply the reservoir tank(s) with pressurised air. The compressor is lubricated from the engine lube system.
Unload (relief) Valve	A	Controls the operating pressure within the system to prevent system damage from excess pressure. Also removes any contamination from the system during unloading.
Reservoir Tanks	D & F	Provides storage for the compressed air generated by the compressor.
Brake Pedal Switch	H	When both brake pedal switches are operated, (both brake pedals depressed), relay 'A' becomes de–energised, this cuts the voltage to the dual line control valve solenoid.
Dual Line Control Valve Solenoid	G	Operated via the brake pedal switch, supplies air pressure to the dual line control valve to establish the trailer brake pressure before the tractor brakes become effective, thereby preventing any delay in operation.
Dual Line Control Valve	J	Provides control of the two line braking system in conjunction with the hydraulic pressure supplied from the brake master cylinder. A mechanical connection to the handbrake provides full trailer braking when the handbrake is applied.
Single Line Control Valve	C	Controls the single line trailer brake system in conjunction with the dual line control valve and brake master cylinder pressure.

Description	Diagram Ref.	Function
Pressure Switch/sender Assembly	D&F	Connected directly in line with the reservoir, provides an electrical signal to the cab pressure gauge. When the pressure drops to 4.5-5.0 bar (65-73 lbf.in^2) or lower the switch closes and completes the circuit to illuminate the warning lamp on the instrument cluster.
Pressure Gauge	I	Electrically operated gauge by a signal received from the pressure switch/sender assembly.
Couplers	E	Red and yellow couplers for dual line systems. Red is the supply coupler with full pressure available all the time. The yellow coupler is the control line. Air pressure at the coupler is increased as the brake pedal is depressed. The black coupler is for single line systems. Pressure is available at the coupler with the brake pedal released, pressure decreases as the pedal is depressed. The “Italian” trailer brake uses a dual coupler which has both the supply and control lines in one coupler.
Brake Logic Valve	TBA	Ensures that trailer braking only occurs when both brake pedals are depressed simultaneously. Hydraulic pressure from both brake master cylinders act on a ball and plunger arrangement which then allows pressure oil out to act on the control valve.
Regulating Valve	K	Provides a means for the operator to “Fine Tune” the pressure supplied from the solenoid to the control valve dependant upon the characteristics of the trailers brakes.

TROUBLESHOOTING

Description	Causes	Remedy
Instrument cluster light illuminates when system is running.	1. System pressure below 4.5/3.5 bar.	1. Compressor drive belt broken 2. Check system for leaks 3. Unload valve failed, stuck open 4. Compressor fault 5. Reservoir drain tap faulty
	2. Faulty switch or switch wiring	1. Disconnect wiring to switch. If light extinguishes replace switch. If light remains illuminated check wiring for short to earth.
Trailer brakes not functioning (system air pressure okay)	1. Air in braking system	1. Bleed brakes
	2. Faulty pilot valve	1. Disconnect supply line to control valve from pilot valve assembly. Operate the brakes, if oil is expelled, pilot valve is okay. If no oil expelled remove and inspect pilot valve.
	3. Control valve faulty	1. Repair/replace as required
Delay in trailer brake operation	1. Dual line solenoid failed closed or permanently energised.	1. Disconnect wiring to solenoid. If brakes operate normally inspect wiring for short to +12v. If still a delay in operation after wire disconnection replace solenoid assembly. 2. Faulty brake switch
System pressure too high (exceeds 12±2 bar)	1. Faulty unload valve	1. Remove valve clean/replace.



11

Air Brake Electrical System

1. Ignition Switch
2. Ignition Relay (Normally Open)
3. Relay 'A' (Normally Closed)
4. Battery
5. Electronic Management Unit
6. Feed to Stoplamps
7. Relay G
8. Pressure/Sender Switch
9. Pressure Gauge
10. Instrument Lamp Warning Lamp
11. Right Hand Brake Pedal Switch
12. Left Hand Brake Pedal Switch

OVERHAUL

COMPONENT REMOVAL AND INSTALLATION

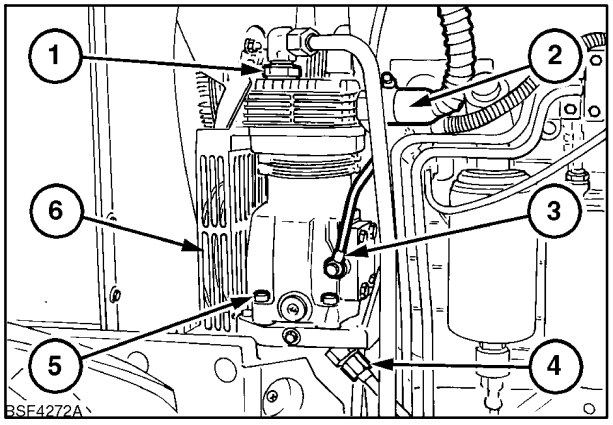
Group 33.000

⚠ WARNING ⚠

Before removing any air system component ensure that there is no air pressure in the system. This can be achieved by depressing and releasing the brake pedal several times with the engine off and draining the air reservoirs. Also ensure that the wheels of the tractor/trailer are chocked.

Compressor - Figure 12

1. Remove the compressor drive belt guard and drive belt(6).
2. Disconnect air inlet hose (2).
3. Disconnect air outlet tube (1).
4. Remove the oil drain tube (4).
5. Remove the oil inlet tube (3).
6. Remove the four compressor mounting bolts and lift compressor away from tractor (5).
7. Reassembly is the reversal of removal, noting the following point:



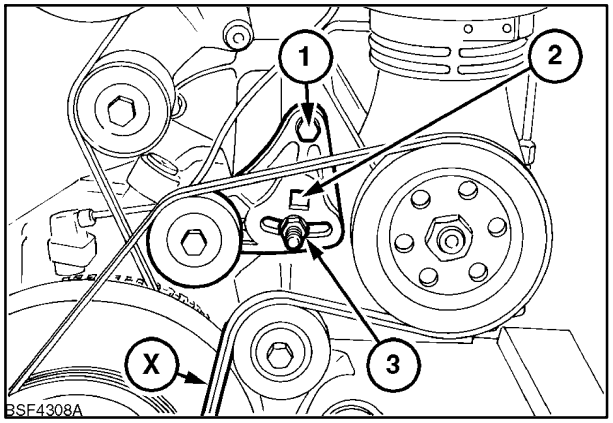
12

a. The drive belt is tensioned by loosening bolt (1) and nut (3) on adjustable idler. Place 1/2" sq.drive into position (2) and apply pressure to tension drive belt. Tighten bolt (1) and nut (3) and remove 1/2" sq.drive.

b. With the use of a special tool **380001268** measure the tension of the belt at point **'X'**, by "pinging" the belt. The required measurement at **'X'** should be 310Hz , +/-15Hz.

c. If further adjustments are required, repeat steps a & b.

d. Tighten bolt (1) to 90-110Nm and nut (3) to 7.5Nm.

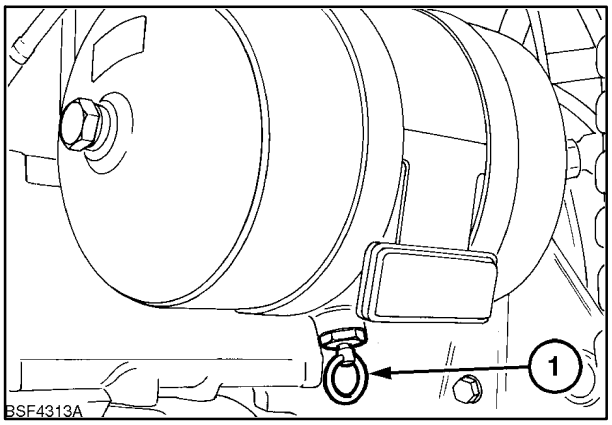


13

Drain the Air Reservoirs

Prior to performing any of the following operations drain the air reservoirs to release pressure from the system.

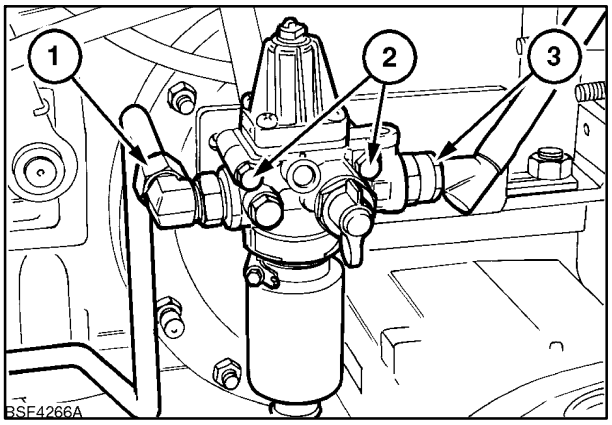
There is a plunger on the base of each reservoir. To drain a reservoir, move the plunger (1) laterally, in any direction, and allow air pressure and any accumulated water to escape. The reservoirs will recharge with air when the engine is restarted.



14

Unload Valve - Figure 15

1. Disconnect pressure feed tube from compressor (1).
2. Disconnect outlet hose to the reservoir (3).
3. Remove the two retaining bolts (2) and withdraw valve from tractor.
4. Reassembly is the reversal of removal.

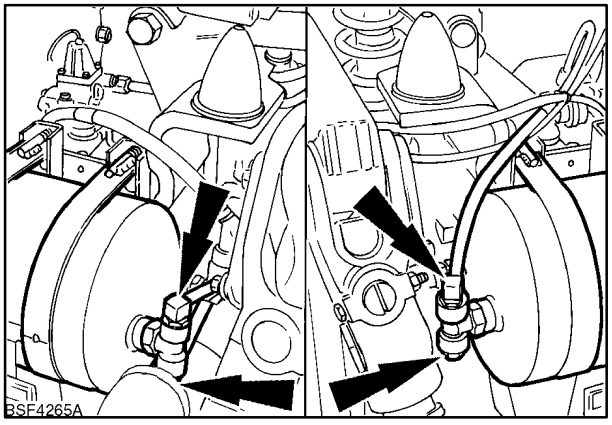


15

Reservoir Tanks - Figure 16

NOTE: *Removal of the wheel will aid removal of the reservoir tank(s), but is not essential.*

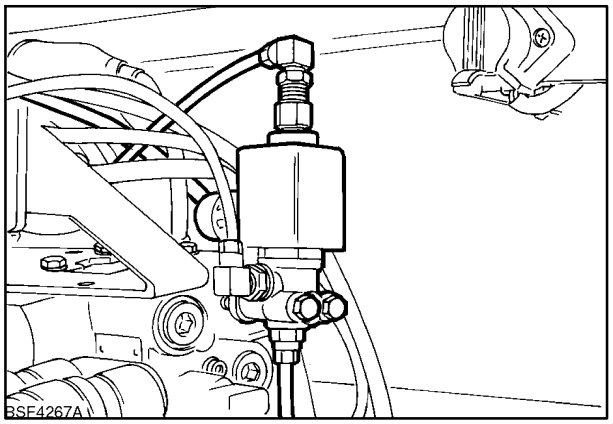
1. Remove all the tubes and hoses connected to the tank, noting their location.
2. Loosen the strap retaining nuts and lift out the tank.
3. Reassembly is the reversal of removal.



16

Dual Line Solenoid – Figure 17.

1. Disconnect the electrical connector.
2. Disconnect the two air lines.
3. Remove the two retaining bolts and lift away from the tractor.
4. Reassembly is the reversal of removal.



17

Dual Line Control Valve – Figure 18.

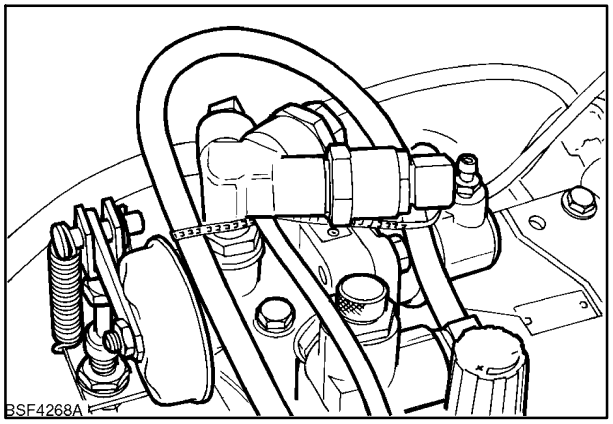
1. Disconnect the handbrake cable connection.
2. Disconnect hydraulic brake connection from Pilot valve assembly, cap the end of the tube to prevent contamination and excessive loss of brake oil.
3. Disconnect large diameter air lines, noting locations for reassembly.

Disconnect dual line control valve solenoid.

Remove the two retaining bolts and lift the control valve assembly complete with bracket and solenoid valve from the tractor.

4. Reassembly is the reversal of removal, noting the following points:–
   a. When the tube is reconnected it will be necessary to bleed the braking system. Bleed each side of the pilot head assembly, first, then at the bleed screw located in the control valve.
   b. Ensure the handbrake cable is adjusted correctly after assembly:

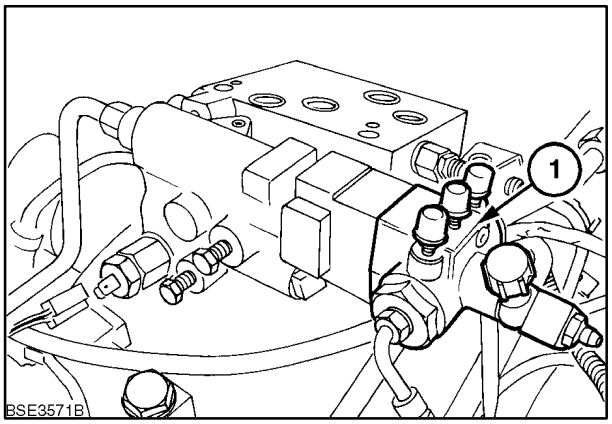
      Refer to pressure testing at the end of this chapter for correct handbrake set up.



18

Logic Head Valve Assembly - Figure 19

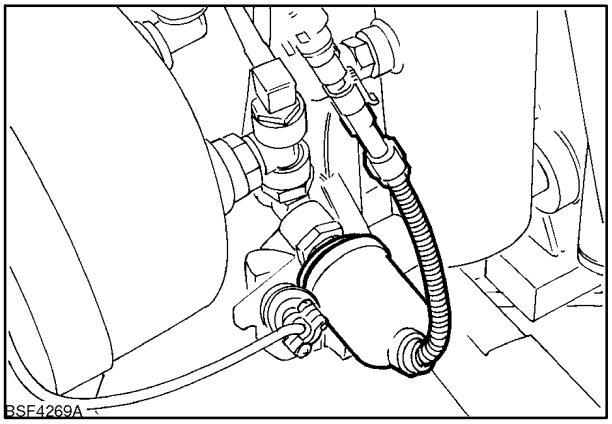
1. Disconnect the two tubes from the braking system and if fitted the tube to the front brakes. Cap the ends of the tubes to prevent dirt ingress.
2. Remove the two(2) allen headed retaining bolts (1), Figure 19 and lift away from the tractor.
3. Reassembly is the reversal of removal, noting the following point:
   a. Bleed the braking system of air as described previously.



19

Pressure Switch/Sender Assembly - Figure 20.

1. Disconnect wiring to switch.
2. Remove the switch/sender assembly from the tee connector.
3. Reassembly is the reversal of removal.



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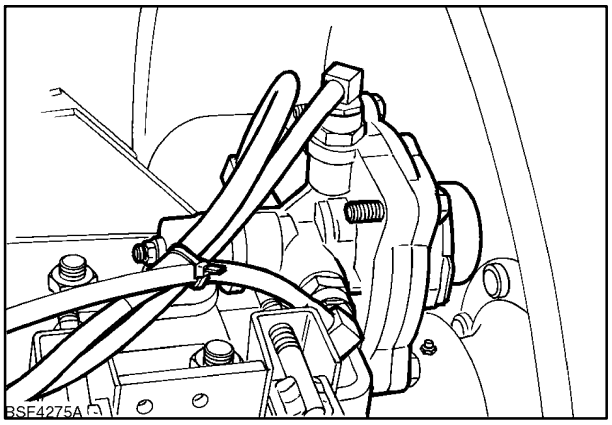
Single Line Control Valve - Figure 21

1. Disconnect the three air lines to the single line control valve assembly.
2. Remove the valve to support bracket retaining bolts and lift away from tractor.
3. Reassembly is the reversal of removal.



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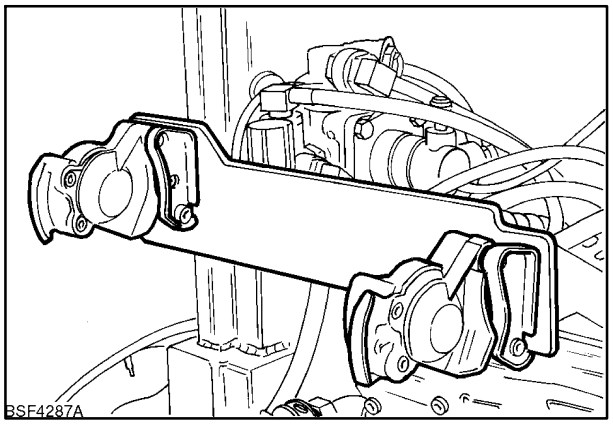
Coupler – Figure 22

1. Remove the tube from the rear of the coupler
2. Unscrew the coupler assembly from the bracket.
3. Reassembly is the reversal of removal.



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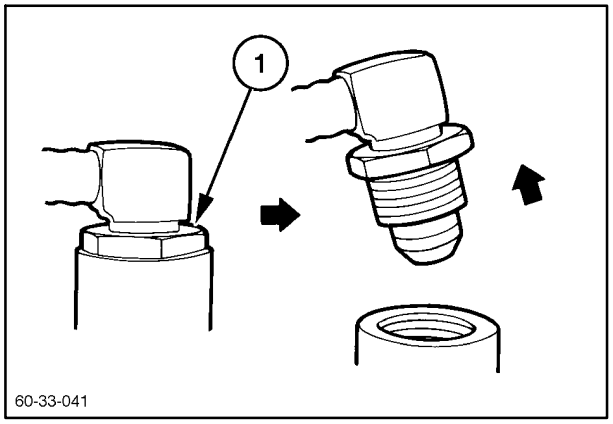
Air Line – Figure 23

1. To remove an air pipe it is necessary to undo and remove the complete fitting (1) from the component. When removed the retaining clip can then be removed to allow the pipe to be disassembled from the fitting.



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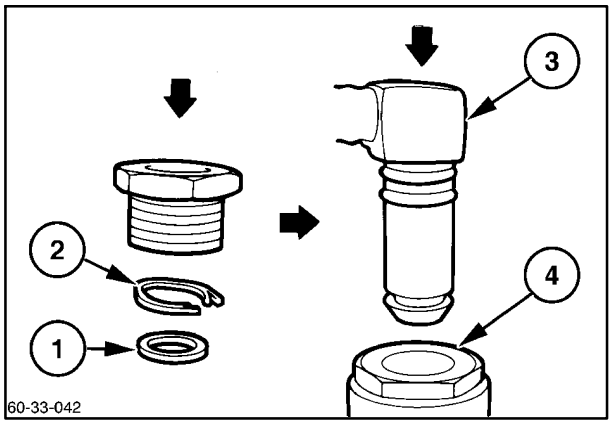
2. To install the push-in type air lines the following should be observed:
   - Ensure the seal (1) is correctly seated in the bottom of the connector fitting.
   - Ensure the plastic retaining clip (2) is also correctly installed in the component connector fitting.
   - Install and tighten the connector fitting (4).
3. Firmly push the pipe connector (3) into the component connector fitting (4).



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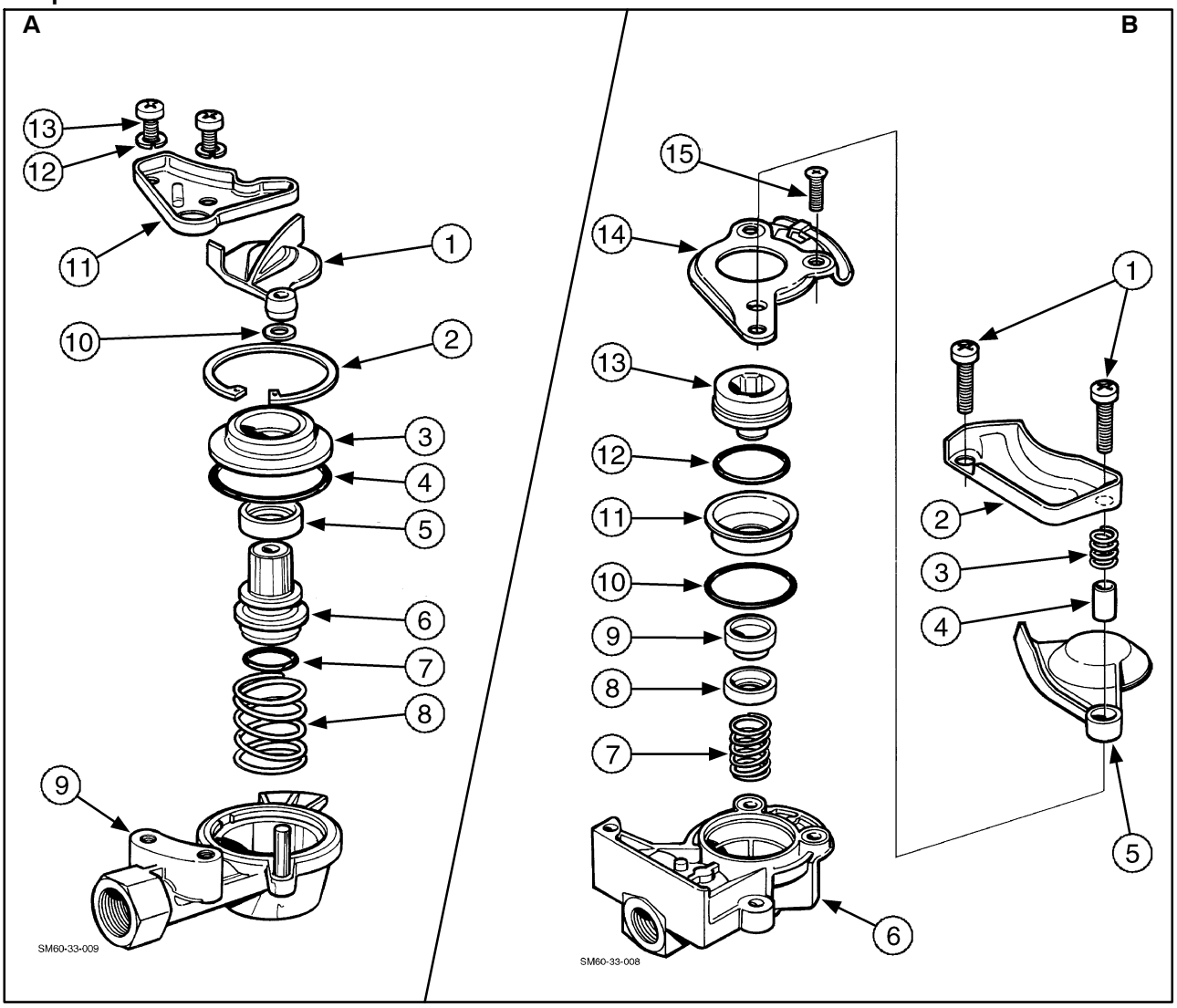
⚠ WARNING ⚠

An air pipe should never be installed as a single item with the component fitting. The retaining clip may not seat properly and this will lead to pipe disconnection and air leakage. Always install the fitting, seal and retaining ring to the component and then install the pipe into the fitting.

COMPONENT DISASSEMBLY/ASSEMBLY

Couplers



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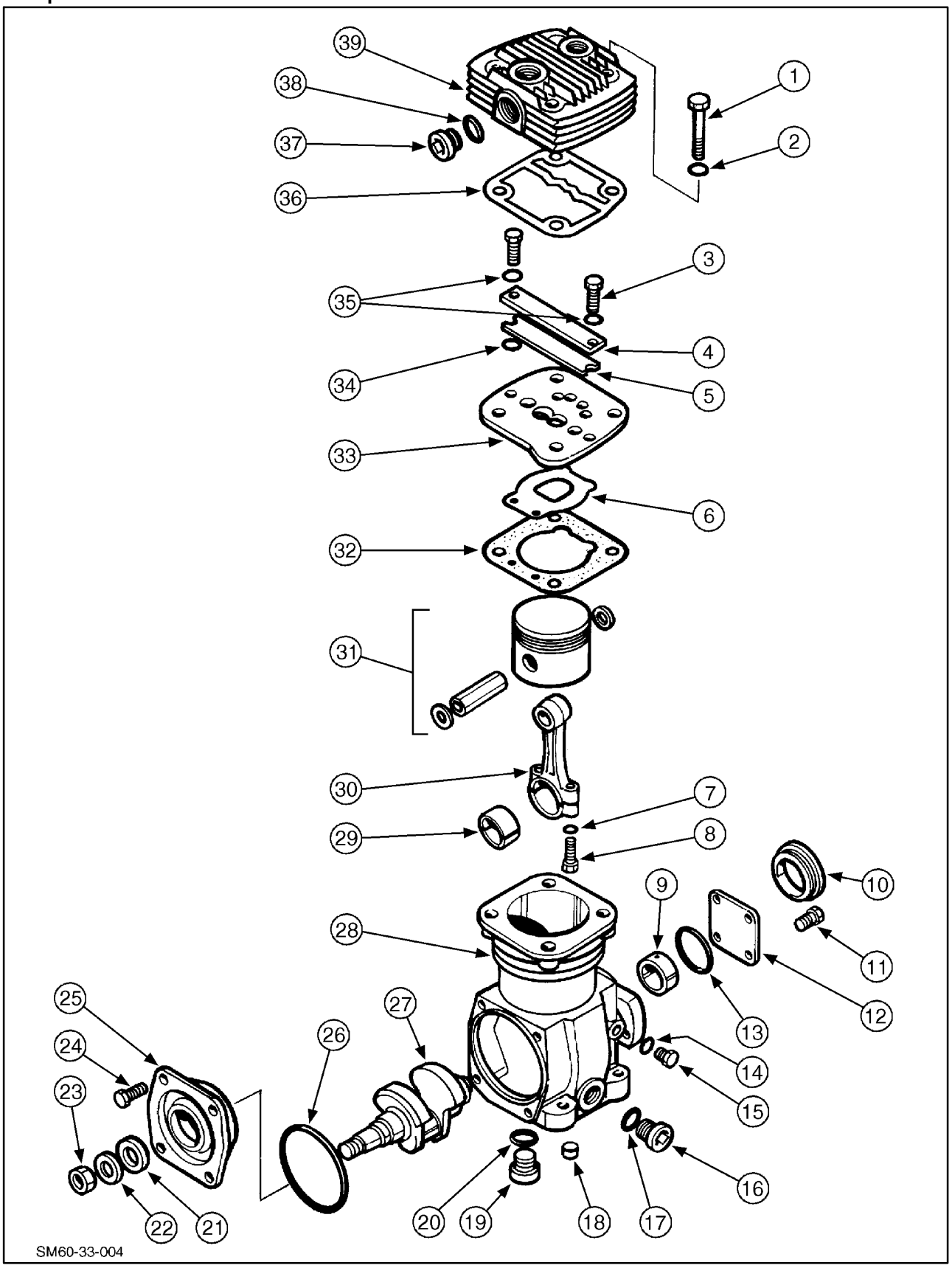
COUPLERS
Key to Components - Figure 25

A. Single Line Coupler
1. Cover
2. Circlip
3. Bush
4. 'O' Ring
5. Valve Ring
6. Valve Body
7. 'O' Ring
8. Spring
9. Housing
10. Washer
11. Guide Piece
12. Washer
13. Screw

B. Supply and Control Line Couplers
1. Screw
2. Guide Piece
3. Spring
4. Tube
5. Cover
6. Housing
7. Spring
8. Cap
9. Valve
10. 'O' Ring
11. Cap
12. 'O' Ring
13. Thrust Piece
14. Guide
15. Screw

Compressor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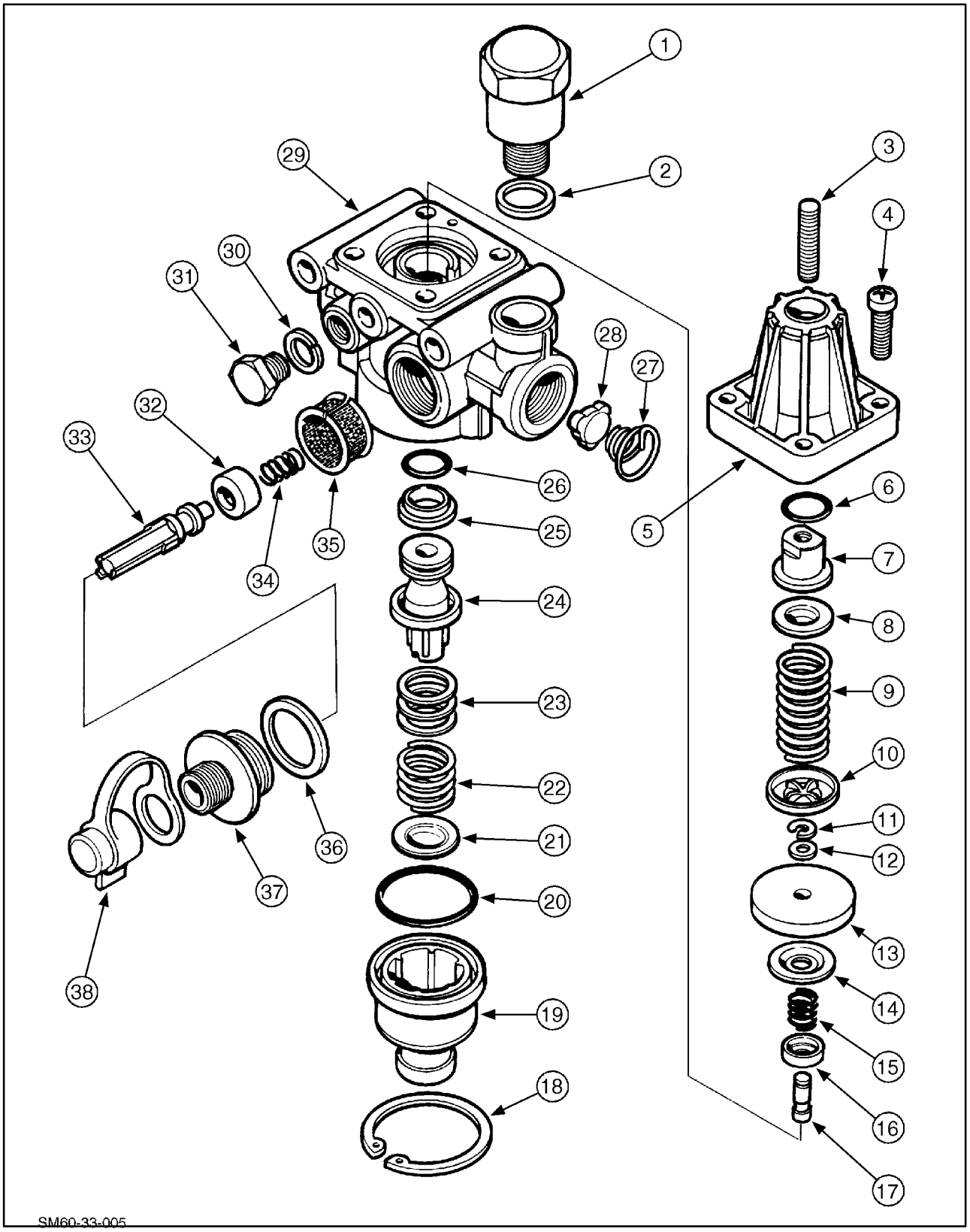
SM60-33-004

COMPRESSOR

Key to Components - Figure 26

1. Bolt
2. Sealing Ring
3. Bolt
4. Pressure Valve Support
5. Pressure Valve Plate
6. Suction Valve Plate
7. Washer
8. Bolt
9. Bush
10. Alternate End Housing
11. Screw
12. Cover
13. 'O' Ring
14. Sealing Washer
15. Locking Screw
16. Plug
17. Sealing Ring
18. Cap
19. Bolt
20. Washer
21. Seal
22. Washer
23. Nut
24. Screw
25. Bearing and Cover Assembly
26. 'O' Ring
27. Crankshaft
28. Crankcase
29. Connecting Rod Bearing
30. Connecting Rod
31. Piston Assembly
32. Gasket
33. Valve Assembly (complete)
34. Washer
35. Bush
36. Gasket
37. Plug
38. Washer
39. Cylinder Head

Unloader Valve



27

NOTE: *The filter, item 35, should be cleaned at regular intervals, depending on the operating conditions and replaced if necessary when cleaning is no longer effective.*

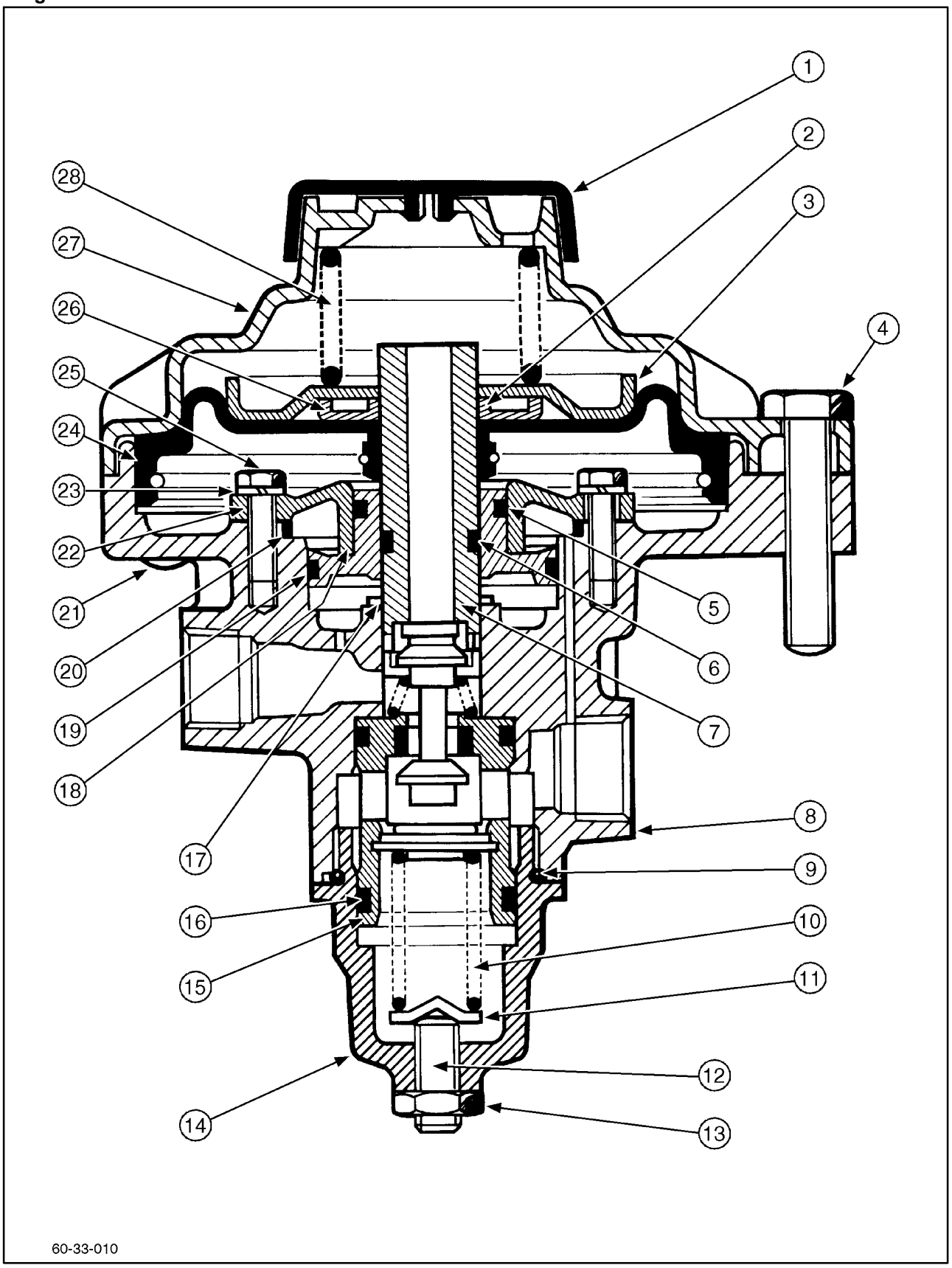
UNLOADER VALVE

Key to Components - Figure 27

1. Relief Valve
2. Sealing Ring
3. Adjuster Screw
4. Screw
5. Housing
6. 'O' Ring
7. Adjuster Block
8. Seat
9. Spring
10. Seat
11. 'C' Clip
12. Washer
13. Plate
14. Spring Seat
15. Spring
16. Washer
17. Bolt
18. Circlip
19. Cover
20. Seal
21. Spring Seat
22. Spring
23. Shims
24. Valve
25. Seal
26. 'O' Ring
27. Tapered Spring
28. Valve
29. Housing
30. Sealing Ring
31. Bolt
32. Bush
33. Valve
34. Spring
35. Filter
36. Seal
37. Adaptor
38. Protective Cap

NOTE: *After reassembly of the unloader valve it will be necessary to adjust the pressure at which the valve unloads. Start at a low setting , i.e, the adjuster screw (3), unscrewed several turns. Observe the pressure gauge within the cab and gradually increase the pressure, by rotating the adjuster clockwise, until 7.0-7.5 bar (Italian) or 7.8-8.3 bar (universal/German) is indicated.*

Single Line Control Valve

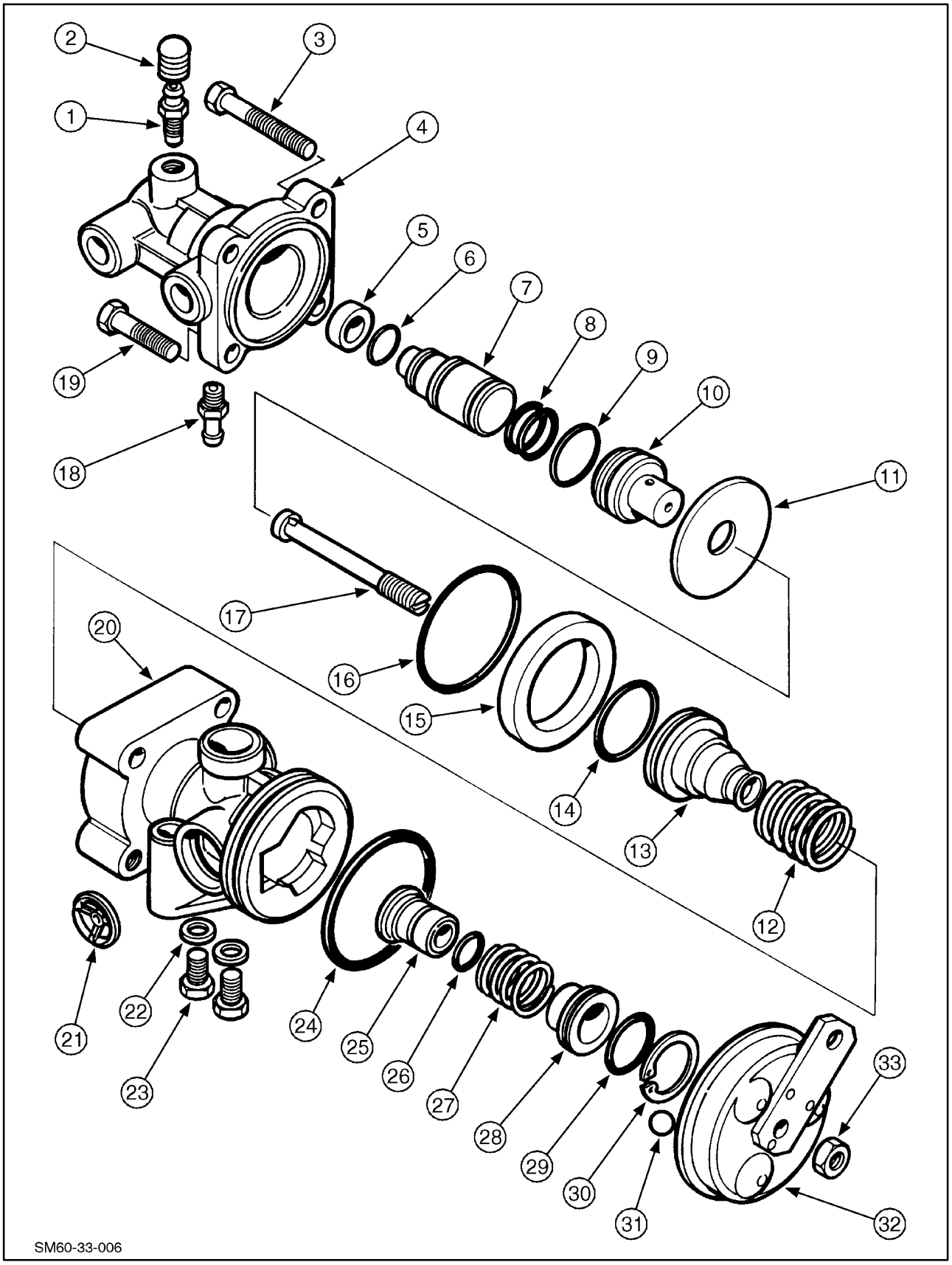


SINGLE LINE CONTROL VALVE

Key to Components - Figure 28

1. Cap
2. Lockring
3. Diaphragm Disk
4. Bolt
5. 'O' Ring
6. 'O' Ring
7. Valve Tappet
8. Housing
9. 'O' Ring
10. Compression Spring
11. Spring Plate
12. Adjuster Screw
13. Locknut
14. End Cap
15. Valve
16. 'O' Ring
17. Lockring
18. Piston
19. 'O' Ring
20. Bolt
21. 'O' Ring
22. Support
23. Spring Washer
24. Diaphragm
25. Bolt
26. Cup Seal
27. Cover
28. Spring

Dual Line Control Valve

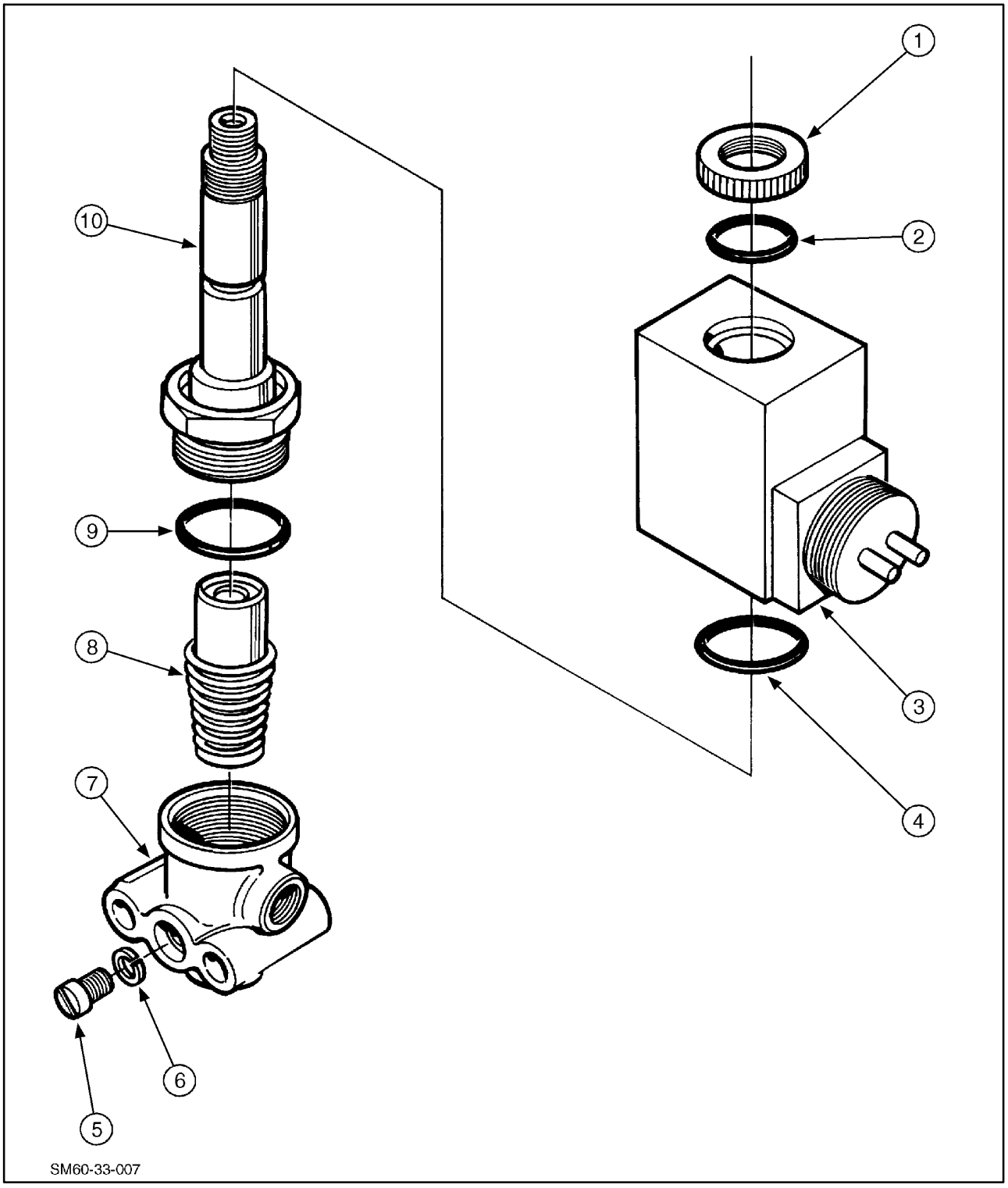


DUAL LINE CONTROL VALVE

Key to Components - Figure 29

1. Vent Screw
2. Protective Cap
3. Bolt
4. Housing
5. Lip Seal
6. 'O' Ring
7. Tappet
8. 'O' Ring
9. 'O' Ring
10. Tappet
11. Washer
12. Spring
13. Piston
14. 'O' Ring
15. Guide Ring
16. 'O' Ring
17. Rod
18. Vent Screw
19. Bolt
20. Housing
21. Valve with Lockring
22. Sealing Ring
23. Bolt
24. 'O' Ring
25. Valve
26. 'O' Ring
27. Spring
28. Guide
29. 'O' Ring
30. Circlip
31. Ball
32. Cap
33. Bolt

Solenoid Valve



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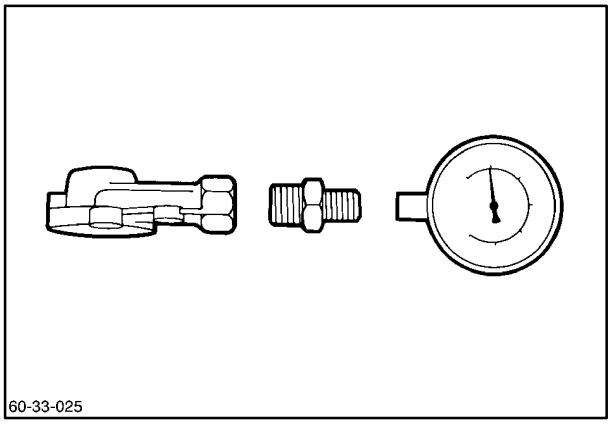
SOLENOID VALVE
Key to Components – Figure 30

1. Knurled Nut
2. 'O' Ring
3. Housing
4. 'O' Ring
5. Cylinder Screw
6. Lock Washer
7. Flange
8. Spool
9. 'O' Ring
10. Armature

PRESSURE TESTING

TRACTOR PREPARATION

1. Position the tractor on a flat, level surface and in a suitable location to allow the engine to run during the testing.
2. Chock the wheels and ensure the parking brake is in the OFF position.
3. To perform the test it will be necessary to obtain the correct trailer side couplers for the system, to couple up to the tractor connectors.



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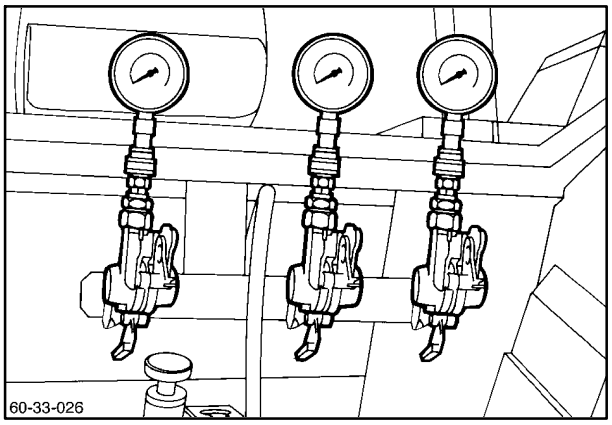
Use suitable fittings to connect to each trailer side coupler a 0–10 bar, undamped (100mm), pressure gauge. Connect the appropriately coloured couplers to the corresponding tractor coupler.

- "Italian" trailer brake
- "German" trailer brake
- "Universal" trailer brake



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PRE-TEST PROCEDURE

NOTE: *For all pressure testing illustrations the gauges represent the following coupler colours:*

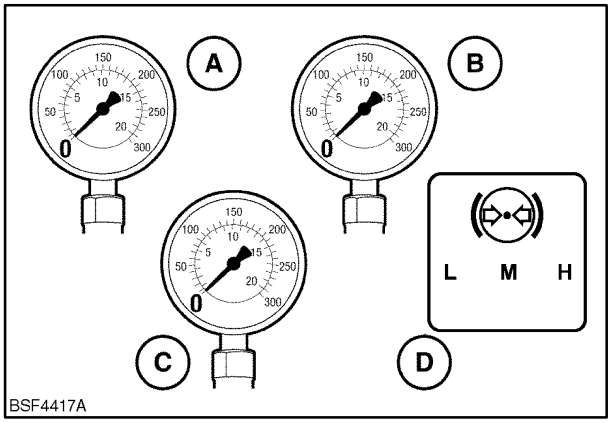
A = Dual line control (Yellow)
B = Single line supply (Black
C = Dual line supply (Red)
D = Cab Gauge

1. Switch tractor ignition on.
2. All test gauges, including vehicle gauge located on the left hand 'B' pillar, must read zero pressure (drain tanks if required).

NOTE: *Tractor 'B' pillar gauge reads line pressure which is the same as that shown on the red line coupler gauge.*

3. Low pressure warning indicator for the air brake system must be illuminated on the instrument cluster. Warning light located in top right hand corner of the instrument cluster.

NOTE: *All figures in ( ) refer to the Italian trailer brake pressures, where they differ.*



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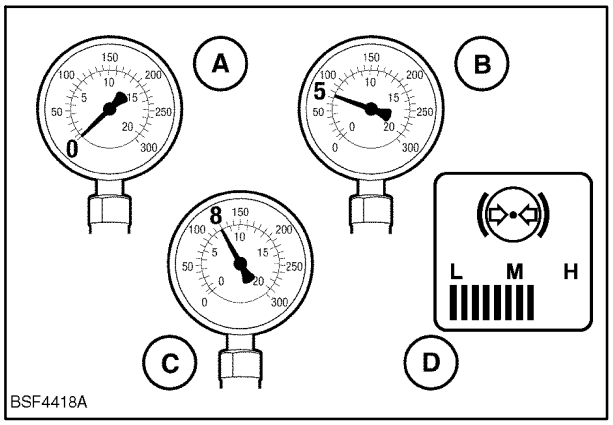
1. Start the tractor
2. System should be fully pressurised within 40 to 60 seconds depending on engine rev setting (a maximum period of 3 minutes is permitted for the system to reach operating pressure). When the system is fully pressurised the gauges must read as follows:

Gauges			Pressure (Bar)
Dual Line Control	(Yellow)	(A)	0
Single Line Supply	(Black)	(B)	5.0 – 6.0
Dual Line Supply	(Red)	(C)	7.5 – 8.5 (6.5 – 7.5)
Cab		(D)	8.0 (7.0)

NOTE: *Cab gauge reads 8.0 (7.0) bar in the green segment.*



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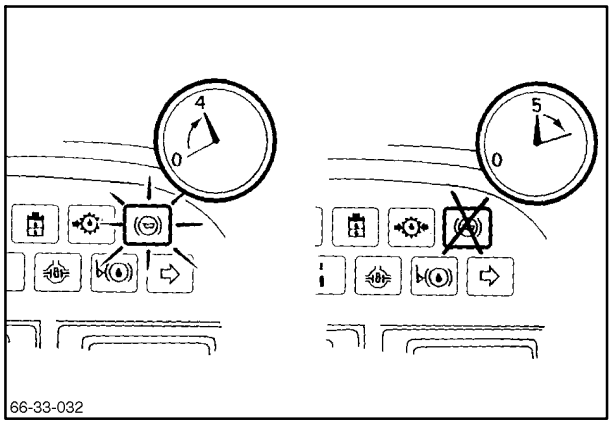
3. As the system is being pressurised, the air brake low pressure warning light on the instrument cluster should extinguish between 4.5 and 5.5 bar.

NOTE: *Indication of malfunctioning must be investigated and the defect rectified before continuing with the test.*



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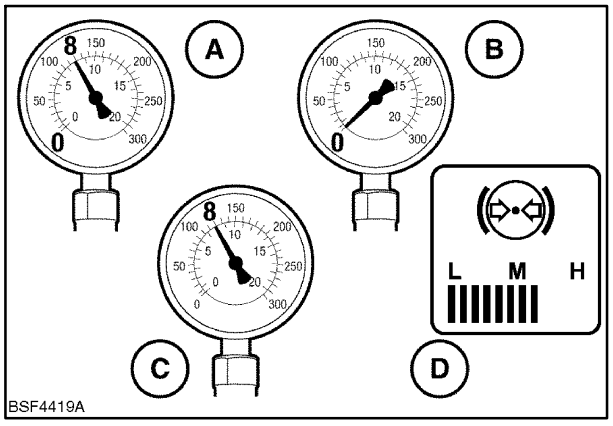
4. Apply tractor parking brake

   The gauges must now read the following values:

Gauges			Pressure (Bar)
Dual Line Control	(Yellow)	(A)	7.5 – 8.5 (6.5 – 7.5)
Single Line Supply	(Black)	(B)	0
Dual Line Supply	(Red)	(C)	7.5 – 8.5 (6.5 – 7.5)
Cab		(D)	8.0 (7.0)

In cases where the gauges do not exhibit the above values, adjust the handbrake cable to the dual line control valve as described on the following page.



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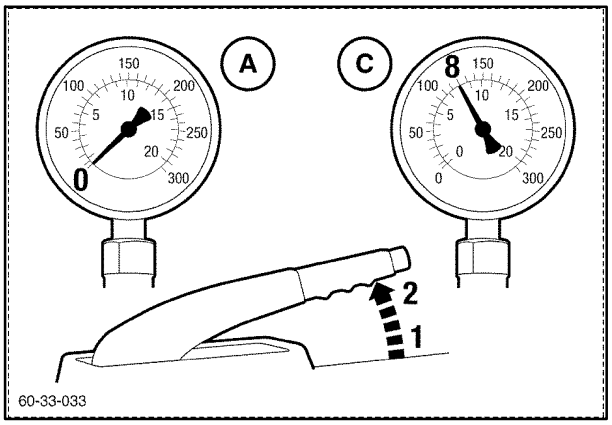
HANDBRAKE CONTROL CABLE ADJUSTMENT

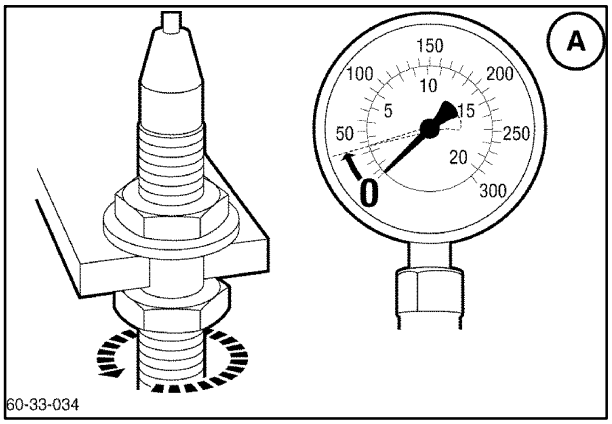
1. Handbrake off, system (red), (C), at full pressure 8 (7) bar (ignition on - engine off). Check yellow gauge (A) is on zero.
2. Handbrake up four clicks - slacken dual valve operating cable top nut.



37

3. Adjust cable (by tightening the bottom nut first on the cable assembly) until needle on yellow gauge (A) just starts to move, lock up top nut.
4. Check operation of handbrake.

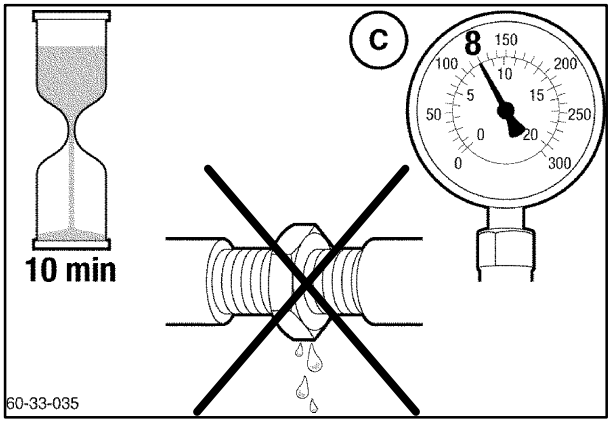
   Handbrake On = 8 (7) bar yellow
   Handbrake Off = 0 bar yellow



38

LEAK TEST

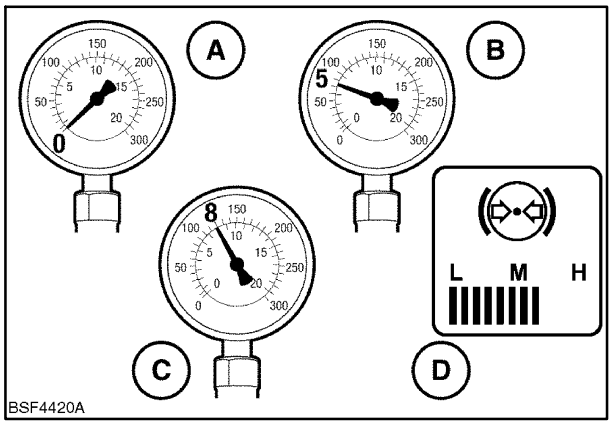
1. Engine off - tractor parking brake applied.
2. No deterioration of the red line pressure (8 (7) bar) must occur over a 10 minute period. Indication of any leakage must be investigated, the defect rectified and the test repeated.



39

BRAKE PEDAL TEST PROCEDURE

1. Start the tractor. Engine revs not to exceed 1000 rev/min.
2. Do NOT apply tractor parking brake.



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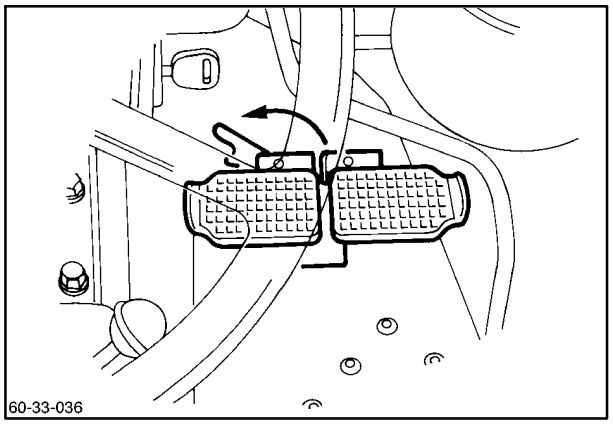
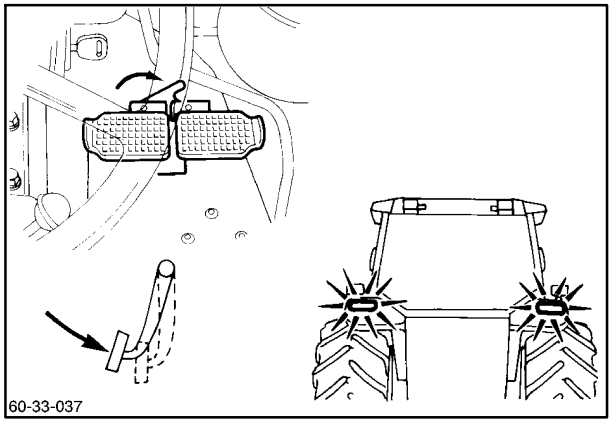
3. Release brake pedal link pin so that pedals will work individually.
4. Apply left hand and right hand brake pedals individually. No change in pressure readings on test gauges must occur.



41

5. Reconnect brake pedal link pin, apply brake pedals fully several operations until red system pressure below 7 (6) bar – vehicle compressor will come back on load – allow system to reach full pressure 8 (7) bar (loud 'pop' will be heard as unload valve opens). Gently apply pressure to linked pedals until both brake light switches have just clicked on, brake lights on and 4WD indicator on dash is illuminated. The gauges will now record the following values:



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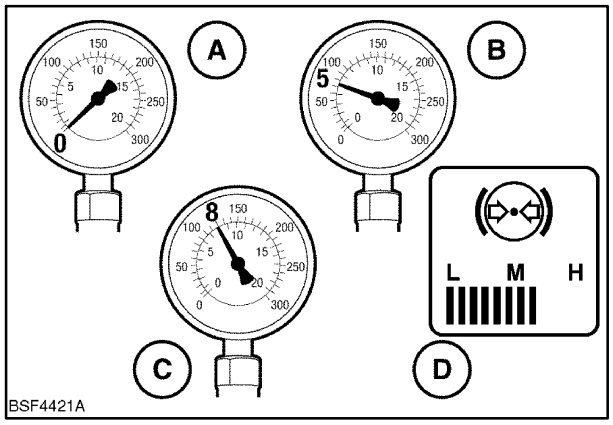
DUAL LINE SYSTEMS

Gauges			Pressure (Bar)
Dual Line Control	(Yellow)	(A)	0.5 - 1.0
Single Line Supply	(Black)	(B)	4.5 - 5.0*
Dual Line Supply	(Red)	(C)	7.5 - 8.5 (6.5 - 7.5)
Cab		(D)	8.0 (7.0)

* slight drop in pressure must occur



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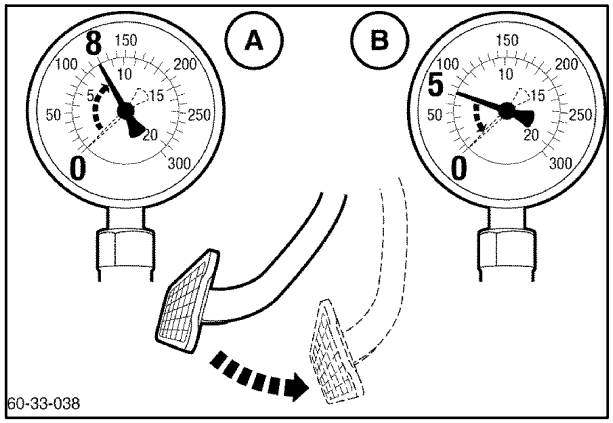
NOTE: *If the brake lights operate late into the braking process, i.e. pedals are depressed more than 20mm before the brake switches are switched on, no advance braking on the air brake system will occur. The brake switches must be reset and the brake test performed again.*

SINGLE LINE SYSTEM

6. Fully apply brake pedal effort with graduated effort. Yellow line (A), pressure must increase evenly to a maximum of 7-8 bar. Black line (B), pressure must decrease evenly to zero bar.



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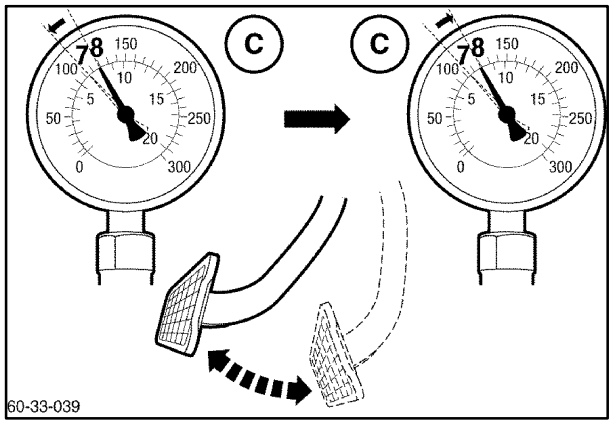
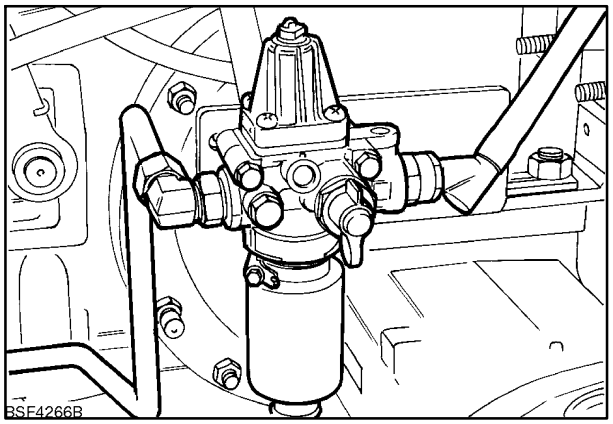
PRESSURE REGULATOR ON/OFF TEST PROCEDURE

1. Set engine at idle revs.
2. Do NOT apply tractor parking brake.
3. With the system fully pressurised 8 (7) bar, depress the brake pedals several times until the pressure drops below 7 (6) bar on Red system gauge (C) and gauge in cab.



45

4. The unload valve, located on the RHS of the engine must recharge the system to 8 (7) bar.
5. In cases where an unload valve is found to be faulty, a new unload valve must be fitted and the test repeated.



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SECTION 35 - HYDRAULIC SYSTEMS

Chapter 1 - Hydraulic Circuits

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DESCRIPTION AND OPERATION

CIRCUIT IDENTIFICATION

The hydraulic systems can be separated into the following circuits:-

High Pressure Circuit

Hydraulic Lift Assembly
Remote Control Valves
Trailer Brake (Where Fitted)
Suspended Front Axle
Front Lift (Where fitted)

Steering Circuit

Steering Motor and Cylinders

Low Pressure Circuit

Independent Power Take Off (PTO)
Differential Lock
Front Wheel Drive engagement
Transmission clutch and synchroniser engagement
Creeper engagement (Where fitted)
Front PTO (Where fitted)
50 kph engagement (Where fitted)

Lubrication Circuit

PTO Clutch Plates
Transmission Clutch Plates
Transmission Shaft Pressure Lube
Pump Drive Gear Bearing
Hydraulic Lift Cross Shaft

The high pressure circuit is of the 'Closed Centre Load Sensing' design on all tractor model options fed by either a Variable Displacement Pump or a Fixed Displacement Pump.

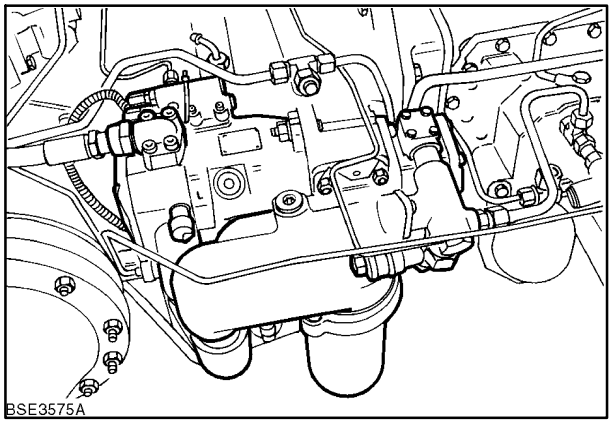
The steering, low pressure and lubrication circuits are fed by a separate fixed displacement pump via a solenoid activated lubrication block. On models with Supersteer axles, the steering circuit has dynamic load sensing.

Hydraulic Pump/ HPL/ Remote Valve Options

	Less Hydraulic Trailer Brakes								With Hydraulic Trailer Brakes								Hydraulic Trailer Brake Italy							
	Fixed Disp.				Variable Disp.				Fixed Disp.				Variable Disp.				Fixed Disp.				Variable Disp.			
	MDC		EDC		MDC		EDC		MDC		EDC		MDC		EDC		MDC		EDC		MDC		EDC	
Remotes	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
12x12	Y	Y							Y	Y							Y	Y						
24x24	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y			Y	Y
16x16					Y	Y	Y	Y					Y	Y	Y	Y					Y	Y	Y	Y

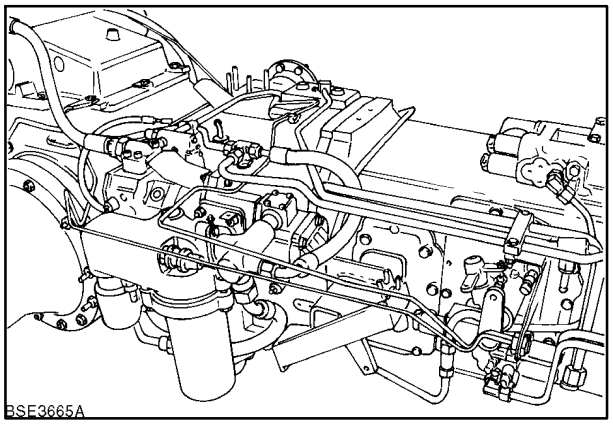
Before commencing work on a tractor it is important to identify if the tractor has a variable displacement pump or fixed displacement pumps and the type of transmission.

Figure 1 shows the variable displacement pump with a 16 x 16 Transmission.



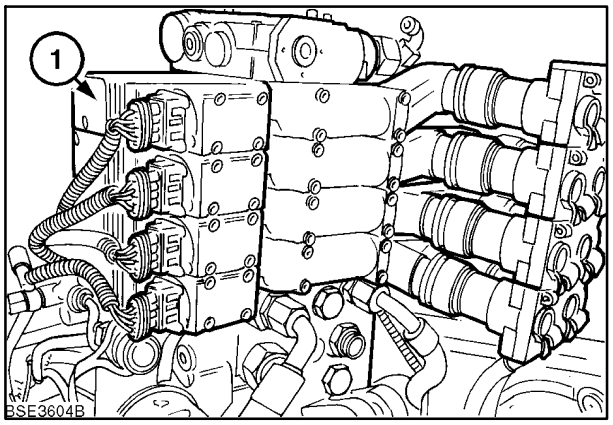
1

Figure 2 shows the fixed displacement pump with a 24 x 24 Transmission.



2

Closed center remote valves (1) and Electronic draft control .



3

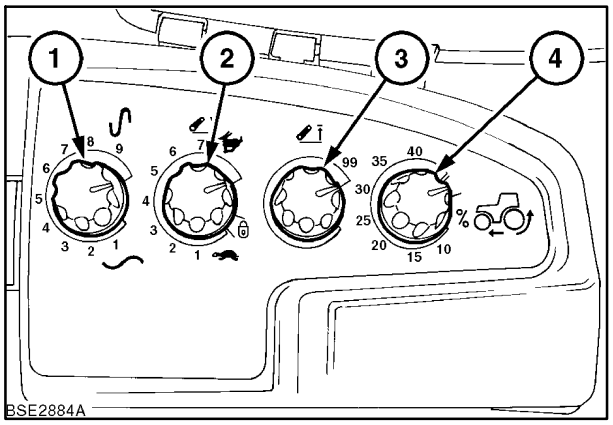
Tractors installed with the electronic draft control hydraulic lift assembly use a unique operator control panel.

(1). Draft sensitivity control knob

(2). Drop rate control knob

(3). Height limit control knob

(4). Slip limit control knob



4

The lift arm position control is unique to tractors with electronic draft control.

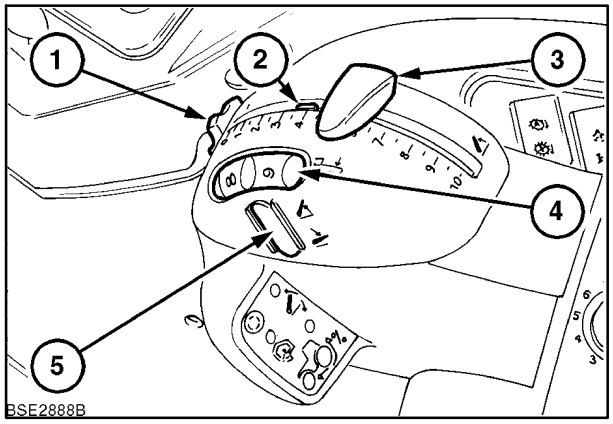
(1). Stop adjuster thumbwheel

(2). Stop

(3). Position control lever

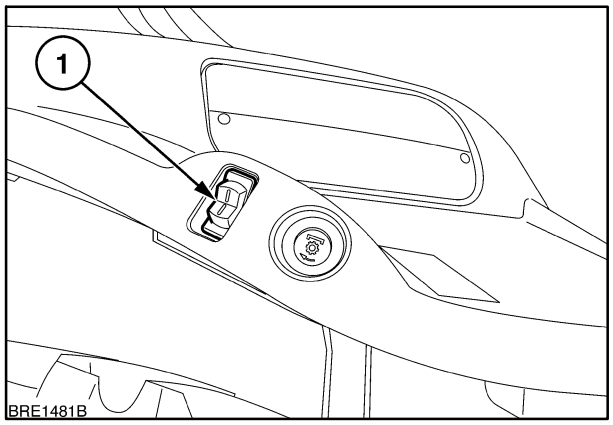
(4). Draft loading wheel

(5). Raise/lower switch



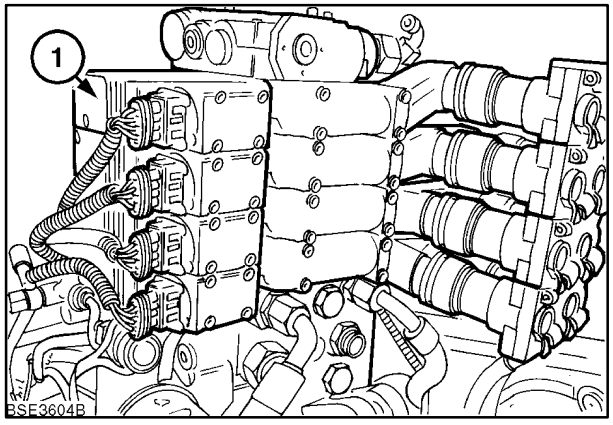
5

The raise and lowering functions of the electronic draft control lift system can also be operated from the rear fender switch(1).



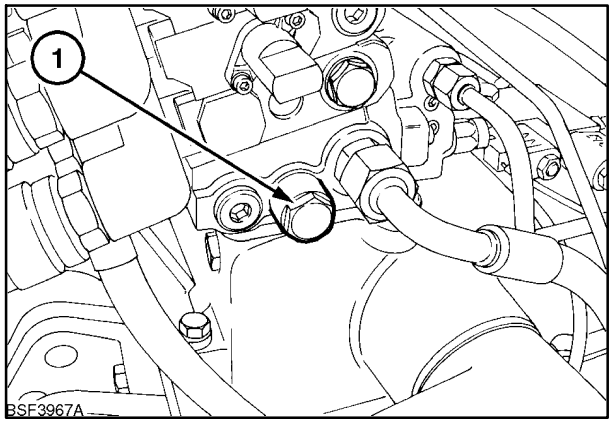
6

The closed center model tractors can also have electro-hydraulic remote valves (1).



7

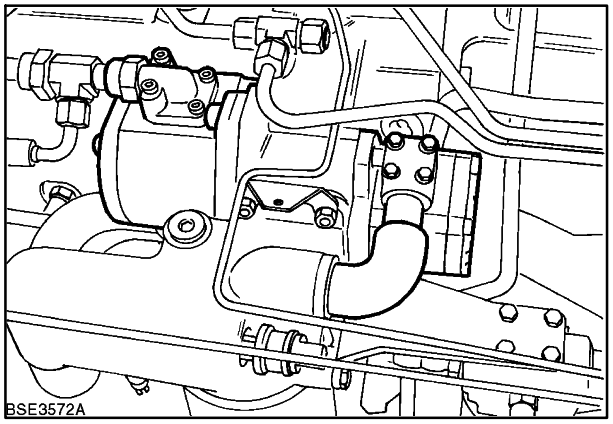
Located below the Electronic Draft Control valve (Where fitted), is the Hydraulic Power Tapping port (Power Beyond) block. This includes a priority valve(1) and also a low pressure regulating valve. This block also has a flange plate which allows the addition of a trailer brake valve.



8

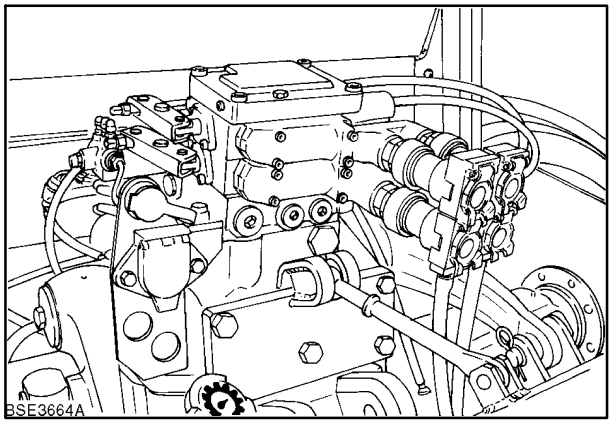
Fixed Displacement high pressure hydraulic systems can be identified from the following:-

Fixed displacement pump.



9

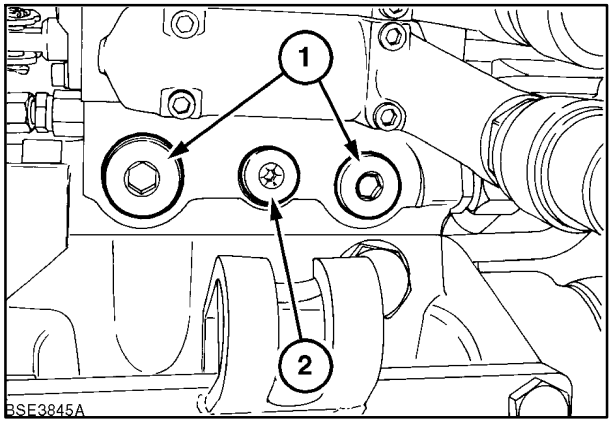
Mechanical remote control valves



10

Located below the Electronic Draft Control valve (Where fitted), is the Hydraulic Power Tapping port (Power Beyond) block. This includes a priority valve and also a low pressure regulating valve. This block also has a flange plate which allows the addition of a trailer brake valve.

1. Power Beyond Ports
2. Pressure Relief Valve



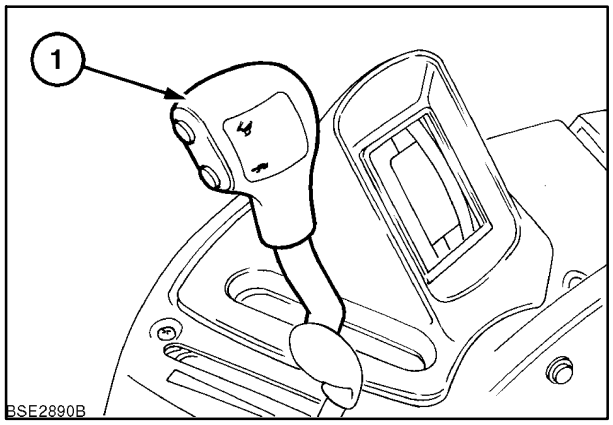
11

The type of transmission installed can be identified by inspecting the transmission control lever.

Tractors with 16 x 16 transmission have a single control lever (1) with two shift buttons.

Closed center hydraulic system only.

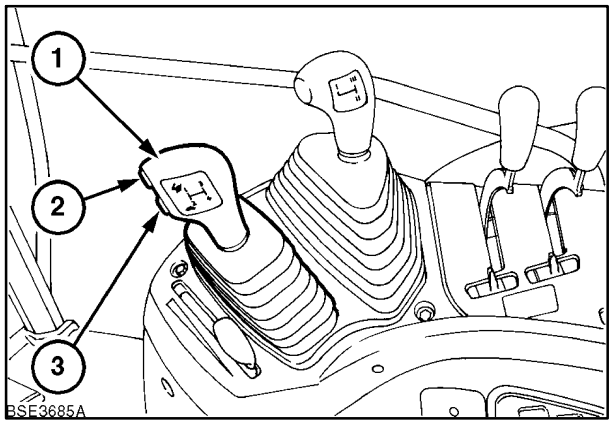
Figure 12 shows Semi-Powershift control lever.



12

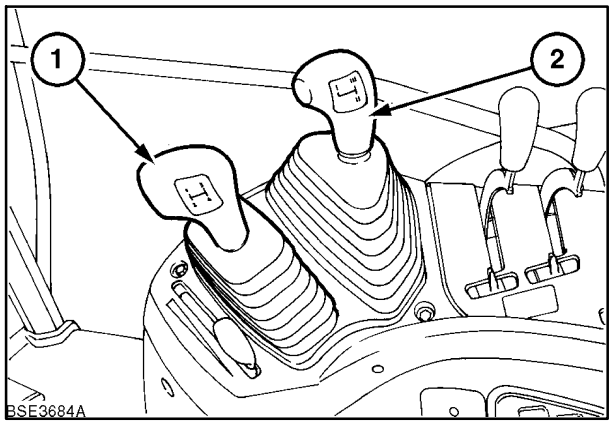
Tractors installed with 24 x 24 transmission uses two control levers. The main transmission lever (1) is provided with push buttons (2) and (3) to actuate the Dual Command function.

These tractors can use either variable displacement pump or a fixed displacement pump.



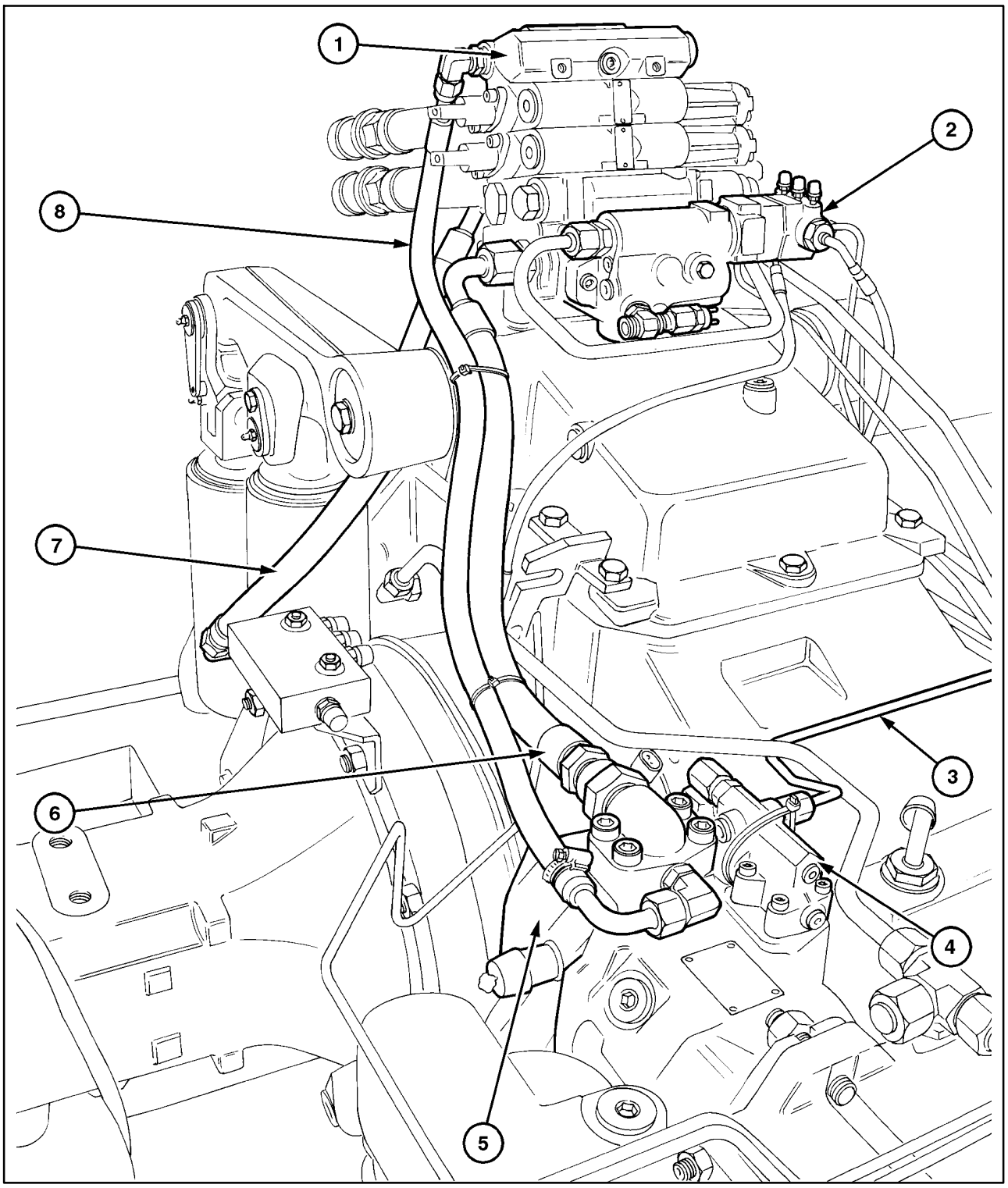
13

Tractors installed with 12 x 12 Command transmission uses two control levers. These are the main shift lever (1) and the range lever (2)



14

CLOSED CENTER LOAD SENSING HIGH PRESSURE HYDRAULIC CIRCUIT



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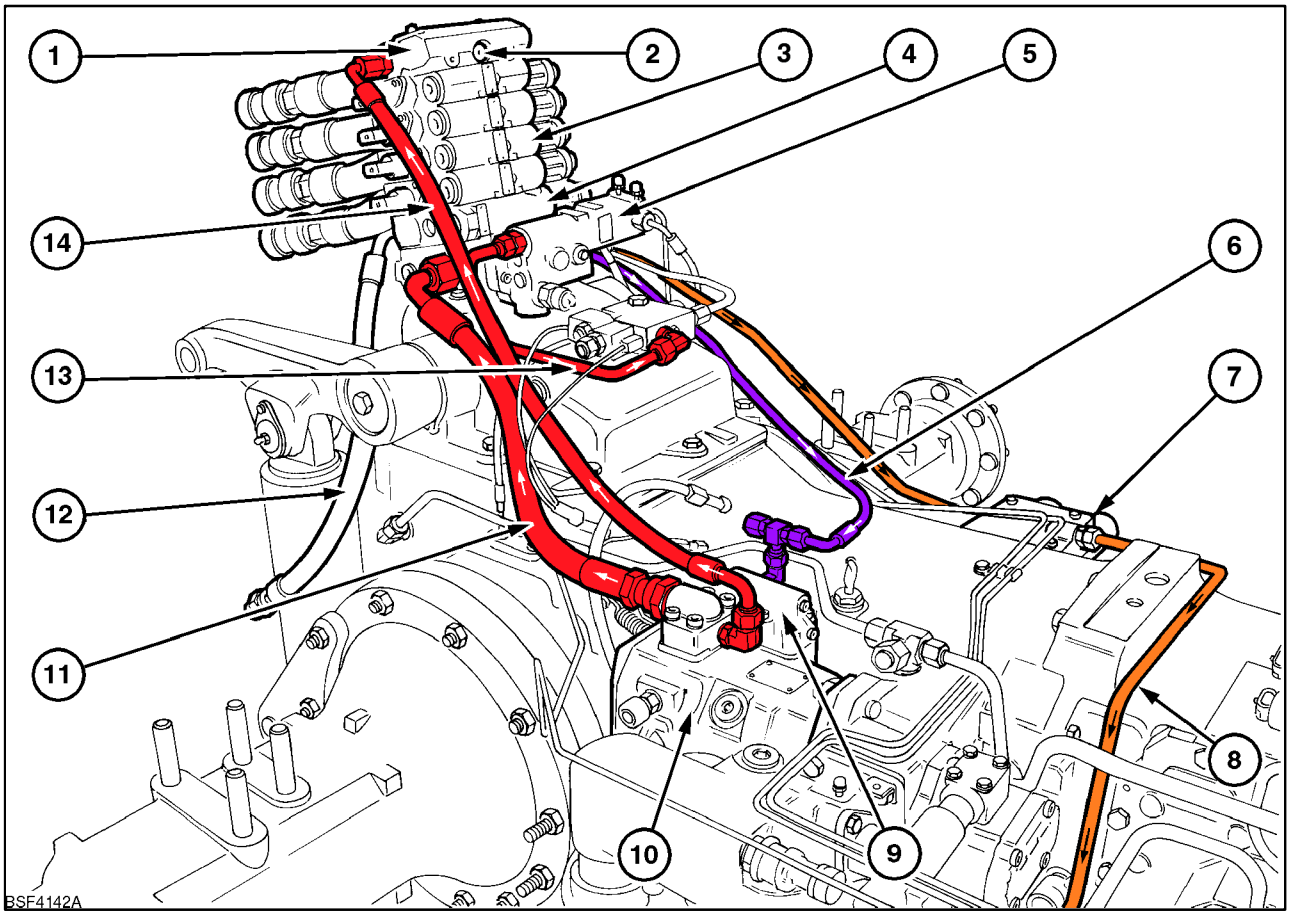
High Pressure Circuit Components and Pipework
Tractors with Variable Flow Piston Pump

1. Remote and EDC Control Valves
2. Trailer Brake Valve
3. Load Sense Lines
4. Flow and Pressure Compensator Valve
5. Variable Flow Hydraulic Pump
6. Feed to Remote Valves
7. To Hydraulic Lift Ram
8. Feed to Electro-Hydraulic Valve Pilot Line

The principal of operation of the closed center load sensing high pressure hydraulic circuit with variable flow piston pump is to supply oil flow on demand. It also enables simultaneous operation of the trailer brakes, hydraulic lift, remote control valve assemblies and front axle suspension where fitted. The load sensing variable flow piston pump offers significant benefits in reducing the engine power loss that occurs in open center systems where a high volume of oil, often far in excess of demand, is continuously pumped round the hydraulic circuit even when they are not being operated.

A fixed displacement pump (Charge Pump) serves as an initial displacement pump for the variable displacement pump . The variable displacement pump first of all supplies oil to the trailer brake valve (where fitted),the remote valves and electronic draft control valve and a pilot oil supply with lower priority. The highest load pressure is indicated to the flow and compensating valve on the pump via the load sensing line. The flow and compensator valve controls the pump pressure in such a way that it always exceeds the highest load pressure by a pre-set difference. A priority valve for low pressure circuit demand is located in the bottom subplate of the remote valve stack. Tractors fitted with Electro-hydraulic remotes valves also have high pressure oil supplied from the variable displacement pump to the top plate of the remote valve stack. The oil passes through the top plate via a small filter and a pressure limiting valve (20-22)Bar. The oil is then directed to the pilot oil supply of the electro-hydraulic control valve.



16

High Pressure Circuit Components and Pipework
Tractors with Variable Flow Piston Pump

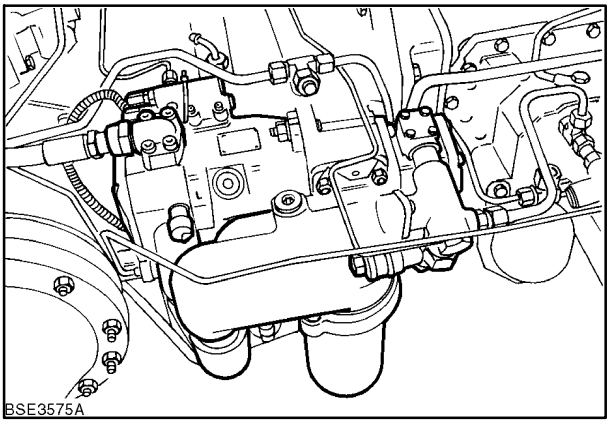
1. End Plate
2. Load Sensing port for Mid Mount Valve
3. Electro-Hydraulic Remote Valves
4. Electronic Draft Control Valve
5. Trailer Brake Valve (Where Fitted)
6. Load Sensing Line
7. Low Pressure Circuit Distribution Manifold
8. Low Pressure Feed
9. Flow and Pressure Compensator Valve
10. Variable Displacement Pump
11. High Pressure Feed to Electro-Hydraulic Remote Valves
12. Feed To Hydraulic Lift Cylinder
13. Feed to Italian type trailer brake solenoids
14. High Pressure Feed to Electro-Hydraulic Valve Pilot Line

The high pressure circuit is illustrated in Figure 38 identifies The following components.

Hydraulic Pump

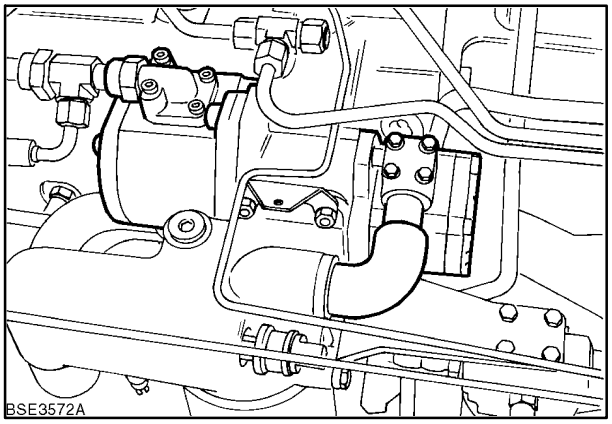
Figure 17 shows the variable displacement pump assembly.

Integral with the high pressure variable displacement pump is the load sensing valve, containing the pressure and flow compensating valves, the steering pump , the charge pressure and main system filters and various electrical switches.



17

Figure 18 shows the fixed displacement pump assembly.

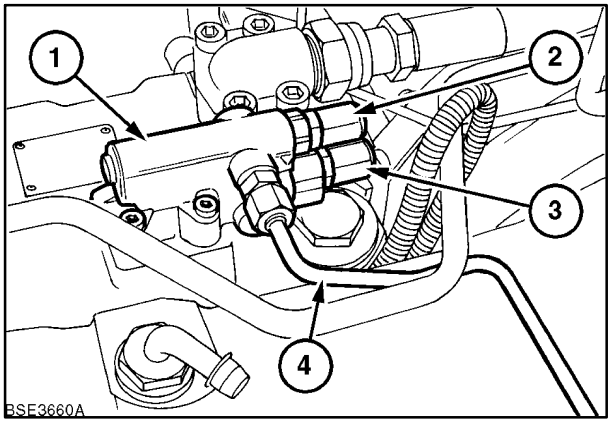


18

Load Sensing Valve

Load sensing valve assembly (1), consists of a flow compensating valve(2) and a high pressure control valve(3). The load sensing valve receives hydraulic signals from operated components through the load sense line(4) and relays this to the pump which will adjust to satisfy the system demands.

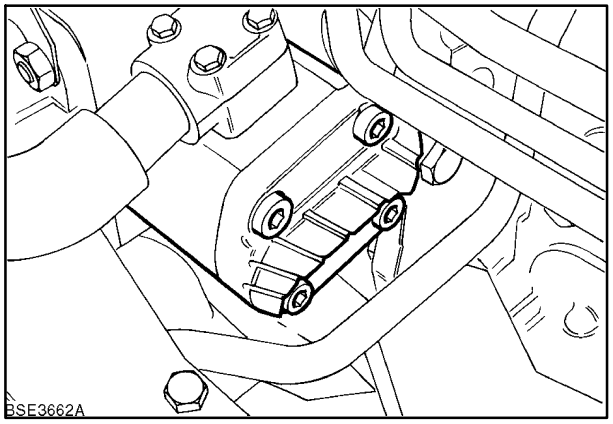
Figure 19 shows the load sense valve assembly.



19

Steering Pump

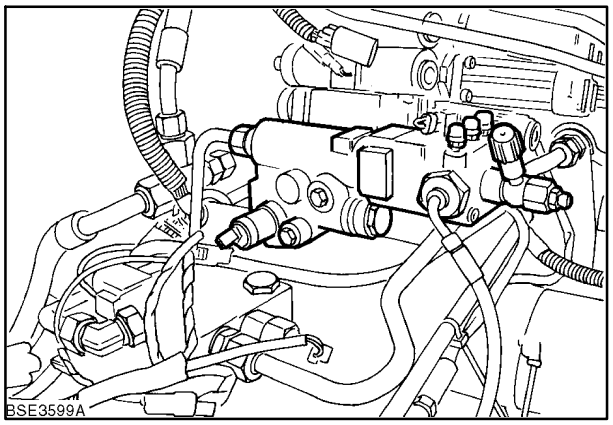
The steering pump is a separate unit but still driven from the same drive gear as the main pump.



20

Trailer Brake Valve

Trailer brake valve which is located beneath the cab just in front of the hydraulic lift assembly. The valve diverts oil pressure to the trailer brakes whenever both tractor brake pedals are depressed.



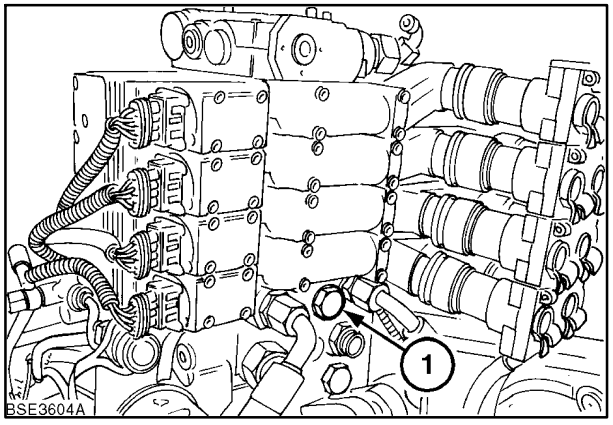
21

Hydraulic Lift Electronic Draft Control Valve

The hydraulic lift Electronic Draft Control Valve is a stack type design mounted together with the Remote Control Valves (1) at the rear below the cab, and incorporates the safety valve for the lift cylinders.

The lift cylinder safety valve protects the lift cylinder from shock loadings and limits the pressure in the cylinder to 205–215 bar (2973–3118 psi).

The hydraulic lift control valve is a proportional solenoid operated valve, controlled by a microprocessor, to raise and lower the hydraulic lift.

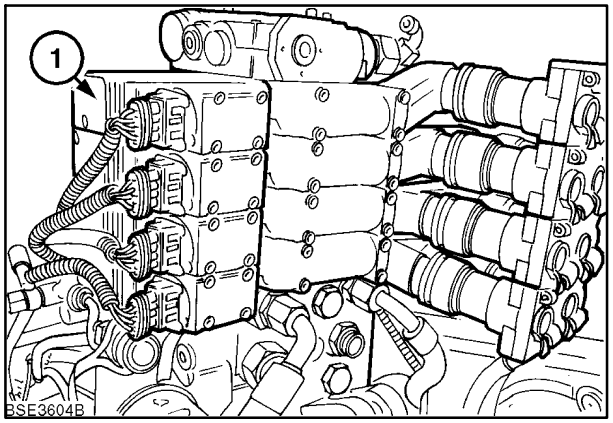


22

Closed Center Load Sensing Remote Control Valves

There are two types of remote valves available for the closed center system. Standard fitment are the mechanical remote valves operated via a cable from within the cab and optional on all 16 x 16 models are electro hydraulically operated valves, (1), Figure 23, which are operated by electrical switches and have their own in-built processor to control oil flow via a solenoid valve.

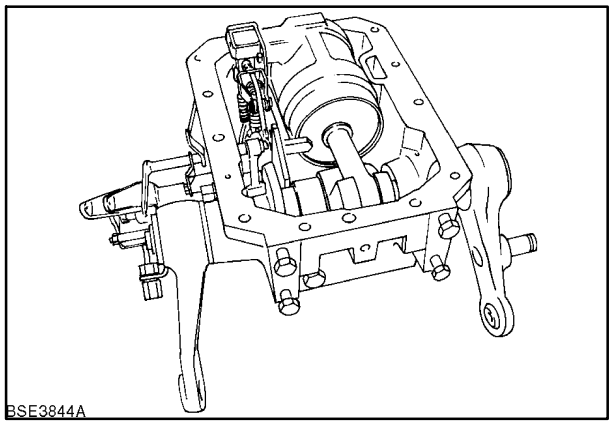
Up to four mechanical type valves can be installed.



23

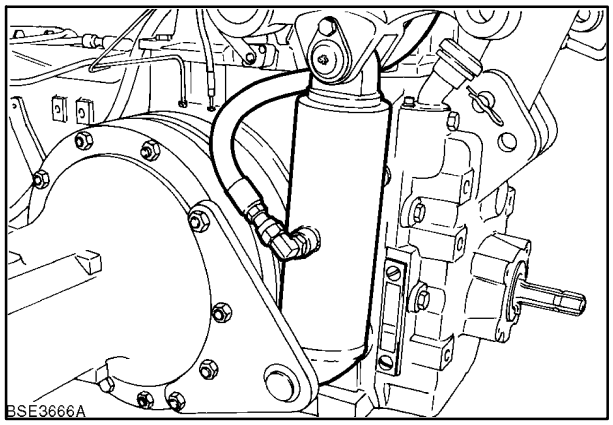
Hydraulic Lift Cylinders

Models with mechanical draft control utilize a main lift cylinder which is located internally within the rear axle top cover and also one or two 50mm external cylinders depending on specification , Figure 24.



24

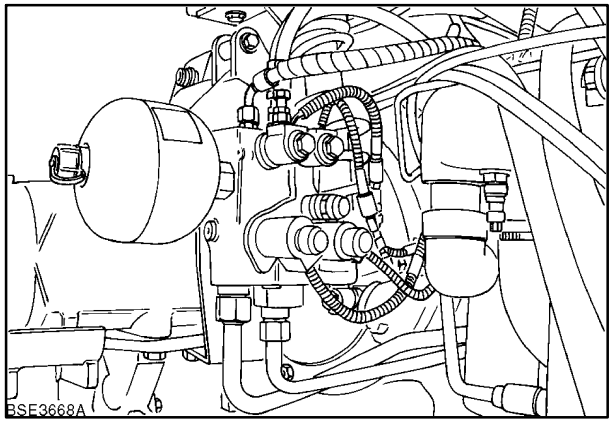
Models with electronic draft control utilize two external cylinders, one per lift arm, anchored to the rear axle with a bracket, Figure 25.



25

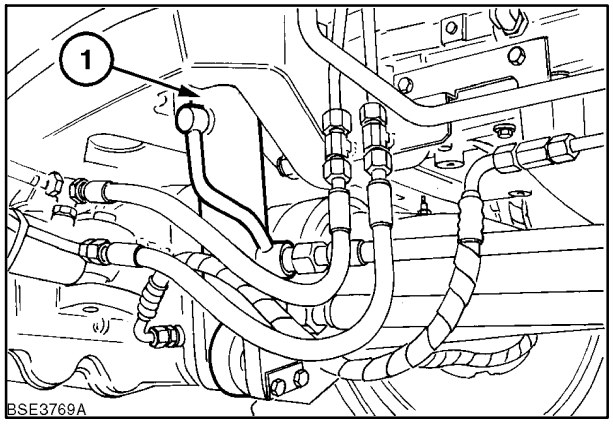
Suspended Front Axle Control Valve

Located on the right hand side of the tractor and attached to the rear axle center housing. Receives high pressure oil, via the trailer brake valve, if fitted, and with the use of processor controlled PWM valves controls oil to a cylinder, attached between the front axle and front support, to provide a hydraulically controlled suspended front axle.



26

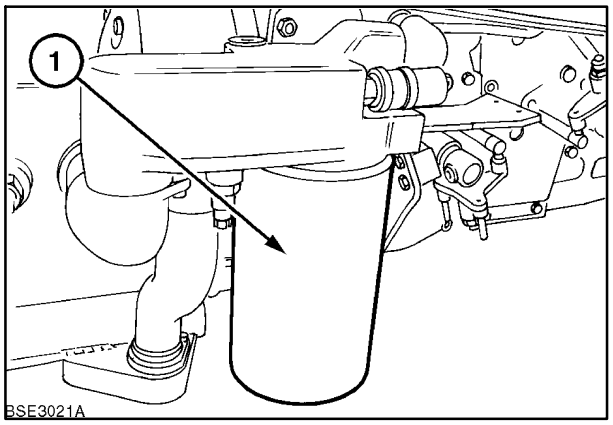
Front axle to front support hydraulic control cylinder(1).



27

Hydraulic System Filters

Figure 28 shows the main hydraulic filter (1) for tractors fitted with 12 x 12 Transmission with mechanical draft control.

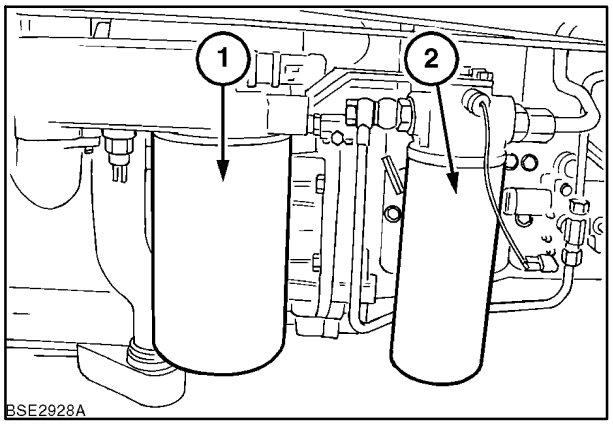


28

Figure 29 shows the main hydraulic filters for tractors with fixed displacement hydraulic pump. this type of pump is only fitted to tractors with 24 x 24 with mechanical draft control.

1. Intake Filter

2. Transmission Feed Pressure Filter



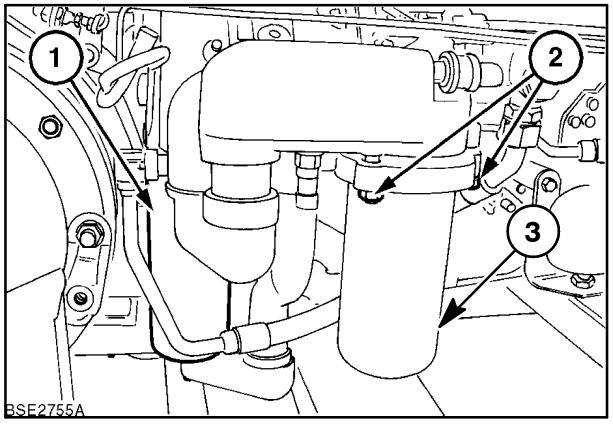
29

The main filter (3) and the charge filter (1) Figure 30 are only installed on tractors with variable displacement pump (CCLS system).

1. Charge Filter

2. Main Filter Retaining Nuts

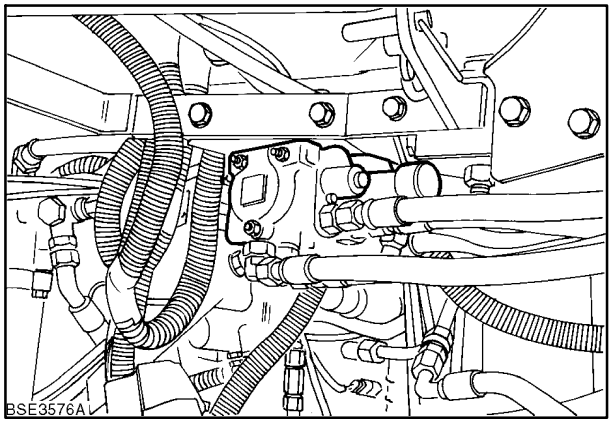
3. Main Intake Filter



30

Mid-Mount Remote Valves

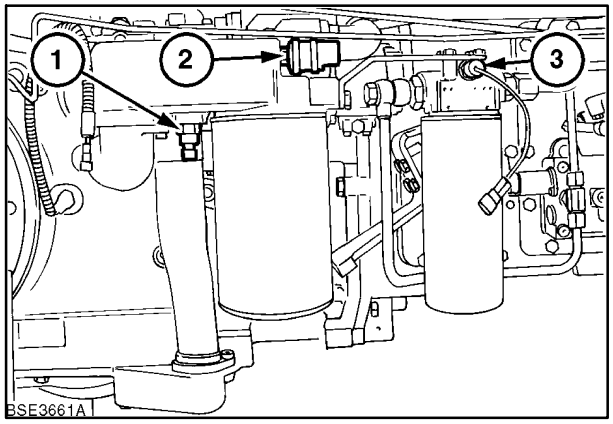
Optional additional remote valves are mounted under the cab. Connected into the high pressure oil line supplied from the hydraulic pump after the trailer brake valve and operated via a joystick control in the cab.



31

High Pressure Hydraulic System, Fixed Displacement Pump – Electrical Switches

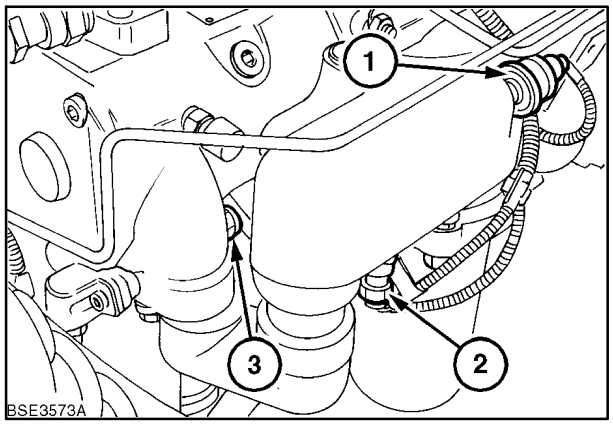
1. Oil Temperature Switch
2. Intake Filter restriction (vacuum) Switch
3. Steering Pressure Switch



32

High Pressure Hydraulic System, Variable Displacement Pump (CCLS) – Electrical Switches

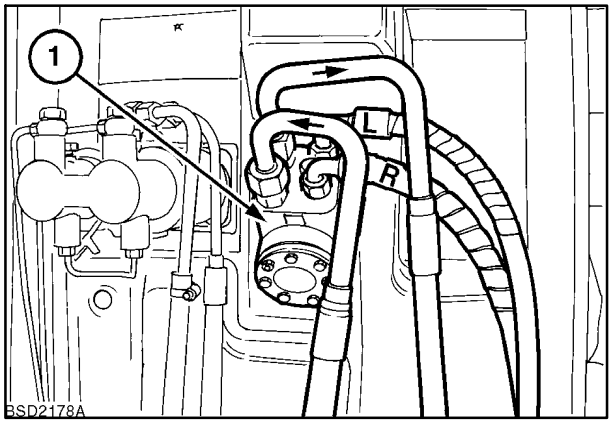
1. Intake Filter restriction (vacuum) Switch
2. Low OIl Temperature Switch
3. Low Charge Pressure Warning Switch



33

Steering Motor

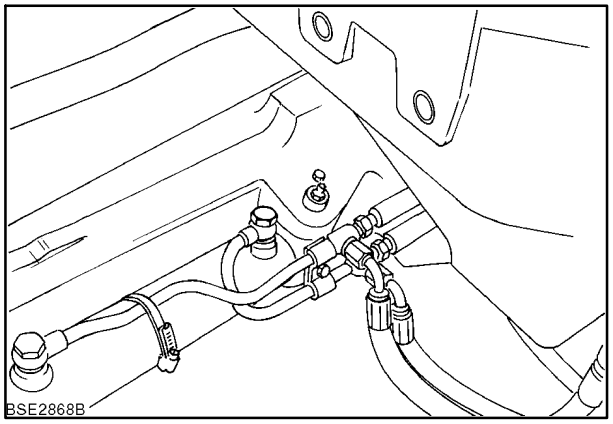
There are two types of steering motors fitted depending on whether the tractor is with or less supersteer. The less Supersteer models use a fixed displacement motor. The with Supersteer models are of a Dynamic load sensing type with a variable displacement, depending on the speed the steering wheel is rotated.



34

Steering Cylinders

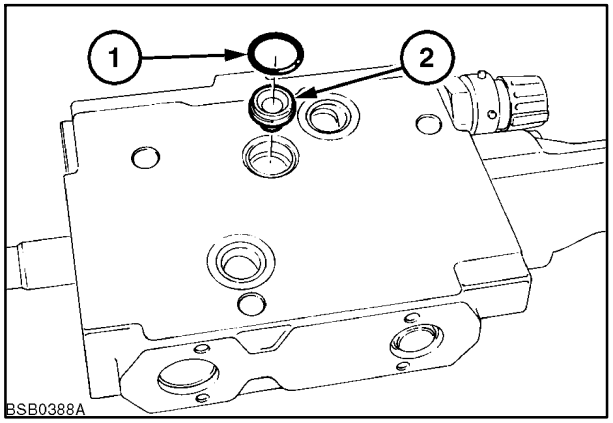
Receives high pressure oil directly from the steering motor.



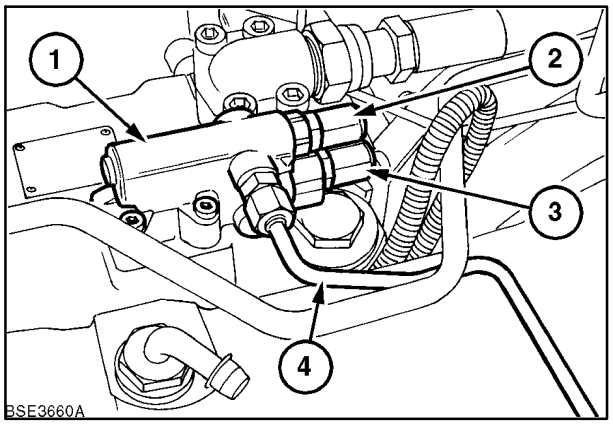
35

Load Sensing Shuttle Valve

Located in each remote valve slice, the Electronic Draft Control valve and between the trailer brake valve, front suspension valve and mid-mounted valves, where fitted, is the load sensing shuttle valve (2). This allows the function with the highest pressure demand to send sensing pressure to the load sensing valve, Figure 37, on the variable displacement pump.



36



37

1. Valve Body
2. Flow Compensating Valve
3. Pressure Compensator Valve
4. Load Sensing Line

With Reference to Figure 38.

Operation of the closed center high pressure hydraulic circuit is as follows:-

The components in the high pressure hydraulic circuit are connected by their load sensing lines to the hydraulic load sensing valve which controls the output of the hydraulic pump.

When the trailer brakes, remote control valves, hydraulic lift or front axle suspension (where fitted) are operating, the load sensing valve on variable flow piston pump, compares the pressure in the component load sense line with the output pressure of the hydraulic pump.

If pump output pressure is less than the combined pressure of the load sense line and spring force of the flow control valve, then pump output continues to increase. When circuit demand is satisfied pump pressure overcomes the combined pressure of the load sense line and flow compensating valve spring. This moves the spool in the flow compensating valve to the right, allowing control pressure oil to be directed to the variable flow swash plate servo piston, which de-strokes the pump to adjust output to circuit demand.

For a detailed explanation on the load sensing operating principle of the variable flow piston pump refer to Chapter 2 in this section of the Repair Manual.

High Pressure oil is fed to a subplate at the bottom of the remote valve stack where it is directed to the Trailer Brake valve which has priority for safety reasons. The oil is then redirected to the Electronic Draft Control Valve and the Electro-Hydraulic Remote Valves. Within the subplate is a pressure compensating valve which diverts the oil to the low pressure system at a pressure of 17-18 bar.

High Pressure oil is also fed to the top of the Remote Valve stack through an end plate which incorporates a pressure limiting valve and this supplies oil at 20-22 bar to the pilot line galleries in the Electro-Hydraulic Remote Valves.

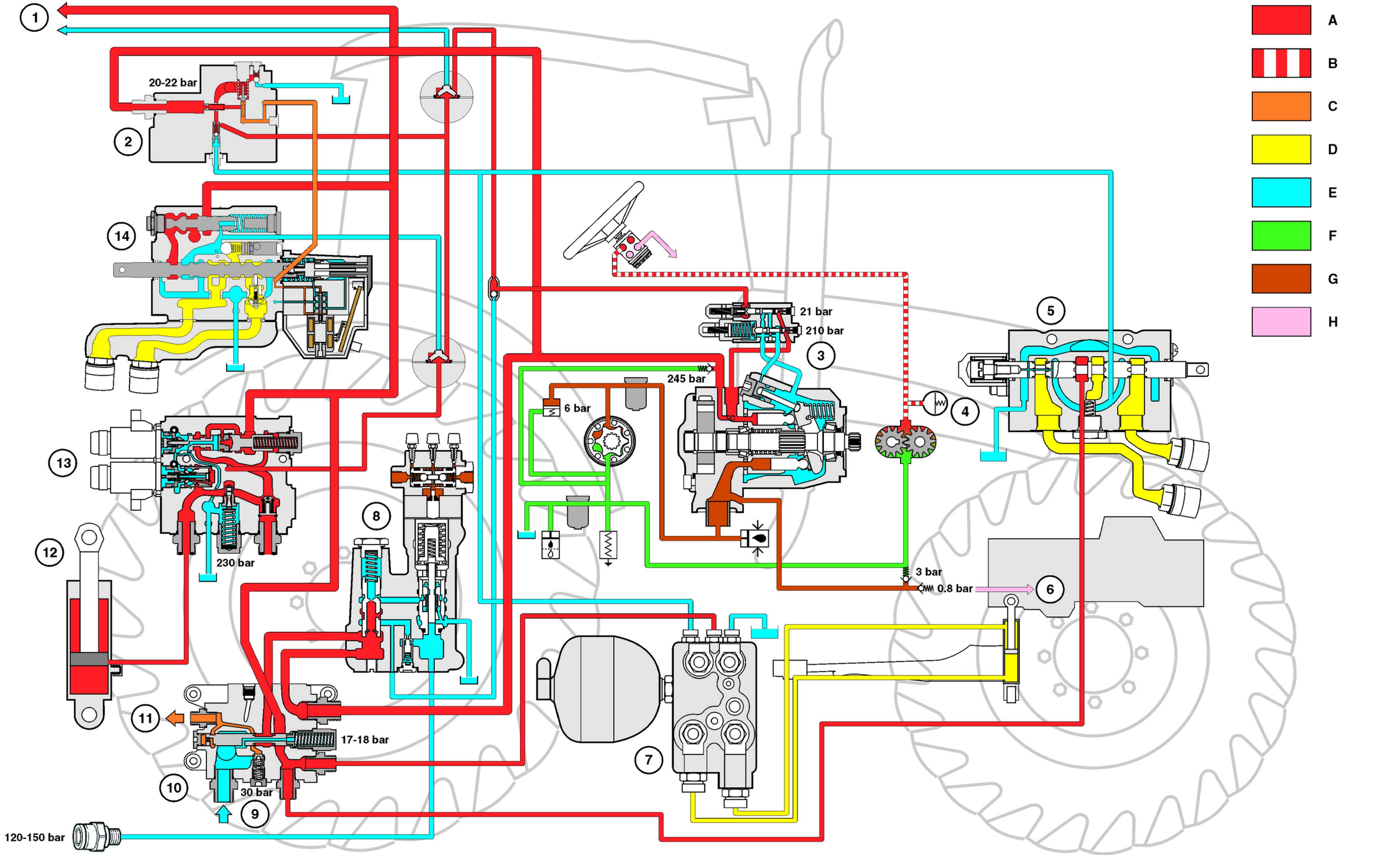
Surplus oil from the charge pump to the variable displacement pump is fed past the 0.8 bar valve and boosts the pressure in the lubrication circuit.

Figure 38

Variable Displacement High Pressure Hydraulic Circuit With Electronic Draft Control 16 x 16 Models

1. To Additional Remote Control Valves
2. End Plate With Pilot Line Pressure Reducing Valve and Load Sensing Shuttle Valve
3. Variable Displacement Hydraulic Pump
4. Low Pressure Switch
5. Mid Mounted Remote Control Valve
6. Boosted Lubrication Oil
7. Front Suspension Control Valve
8. Trailer Brake Valve
9. Power Beyond Ports
10. Subplate with Low Pressure Compensator Valve
11. Feed to Low Pressure circuit
12. Lift Cylinder
13. Electronic Draft Control Valve
14. Electro-Hydraulic Remote Control Valve

A. High Pressure Circuit Oil
B. Steering Circuit
C. Low Pressure Circuit Oil
D. Trapped Oil
E. Return To Reservoir Oil
F. Suction Oil
G. Charge Pump Oil
H. Lubrication Oil



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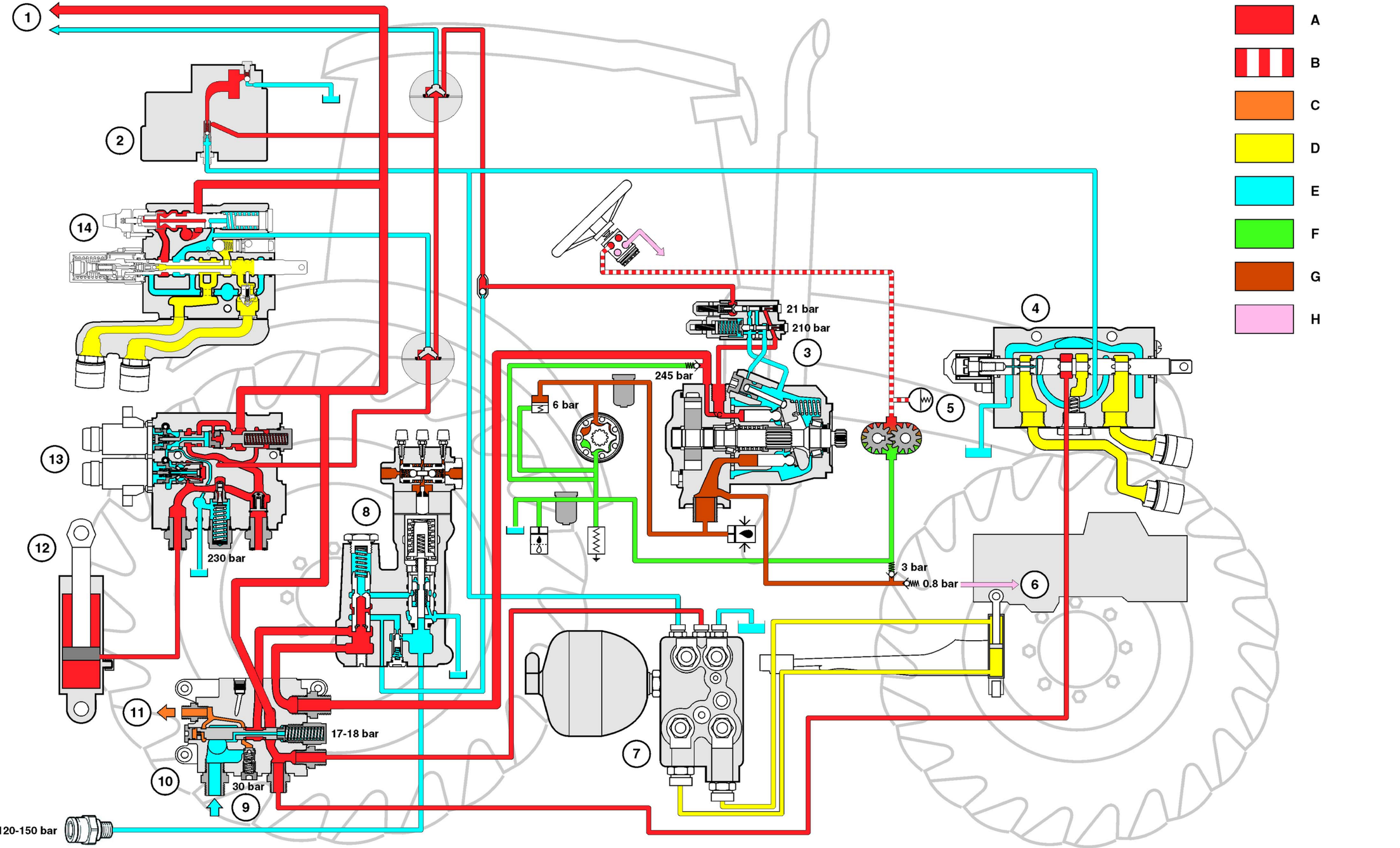
Variable Displacement Pump High Pressure Hydraulic Circuit 16 x 16 Models

Figure 39
Variable Displacement Pump Closed Centre Load Sensing Hydraulic Circuit 24 x24 Models

1. To Additional Remote Control Valves
2. End Plate With Load Sensing Shuttle Valve
3. Variable Displacement Hydraulic Pump
4. Mid Mounted Remote Control Valve
5. Low Pressure Switch
6. Boosted Lubrication Oil
7. Front Suspension Control Valve
8. Trailer Brake Valve
9. Power Beyond Ports
10. Subplate with Low Pressure Compensator Valve
11. Feed to Low Pressure circuit
12. Lift Cylinder
13. Electronic Draft Control Valve
14. Remote Control Valve

A. High Pressure Circuit Oil
B. Steering Circuit
C. Low Pressure Circuit Oil
D. Trapped Oil
E. Return To Reservoir Oil
F. Suction Oil
G. Charge Pump Oil
H. Lubrication Oil



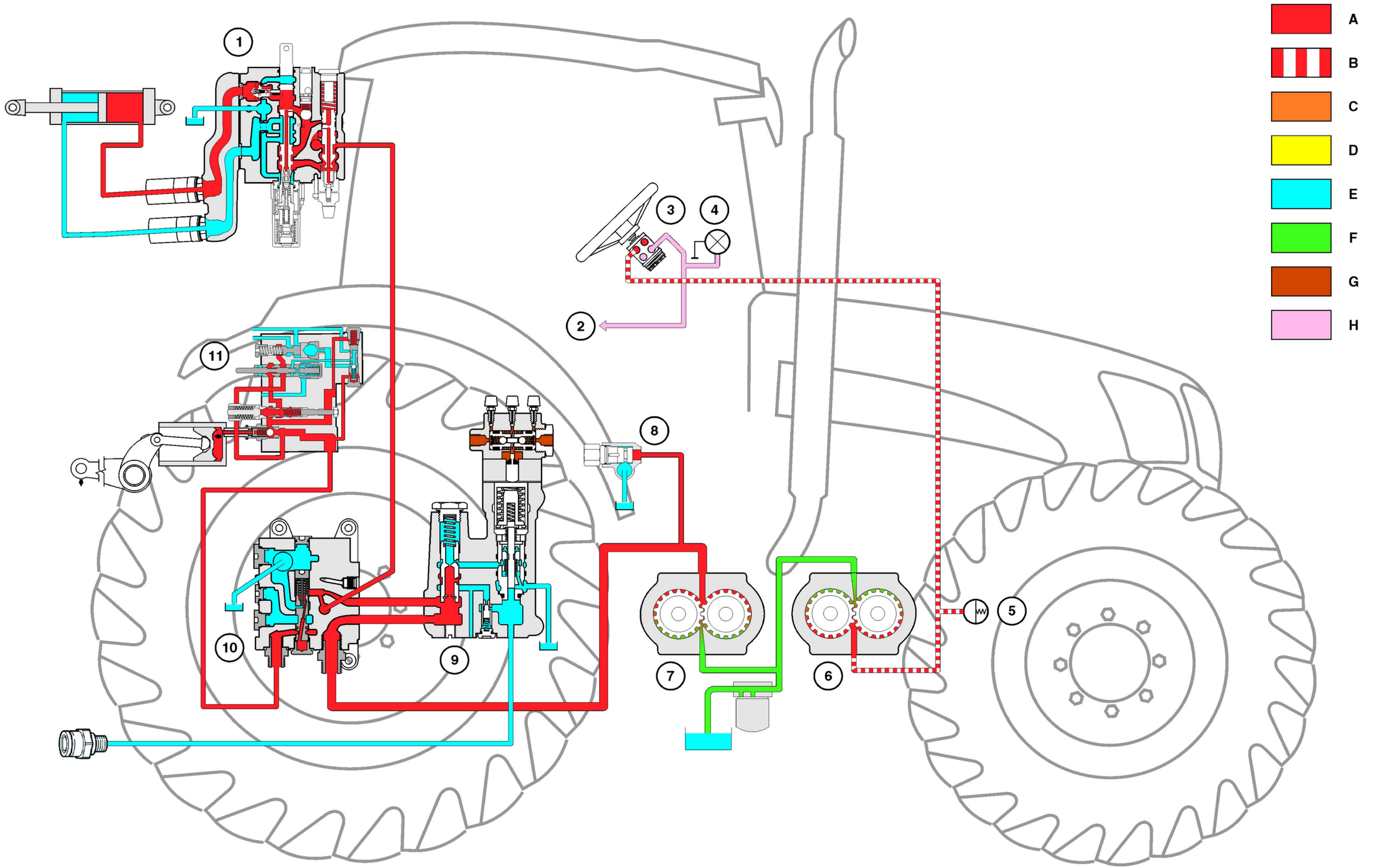
Variable Displacement Pump High Pressure Hydraulic Circuit 24 x 24 Models

Figure 40

Fixed Displacement Pump Hydraulic Circuit 12 x 12 and 24 x 24 Models

1. Remote Control Valves
2. Low Pressure Services Manifold
3. Steering Motor
4. Low Pressure Warning Lamp
5. Low Pressure Switch
6. Steering Pump
7. Fixed Displacement Pump
8. Pressure Relief Valve (195-205 bar)
9. Trailer Brake Valve
10. Subplate with Low Pressure Compensator Valve
11. Mechanical Draft Control Valve

A. High Pressure Ciircuit Oil
B. Steering Circuit
C. Low Pressure Circuit Oil
D. Trapped Oil
E. Return To Reservoir Oil
F. Suction Oil
G. Charge Pump Oil
H. Lubrication Oil



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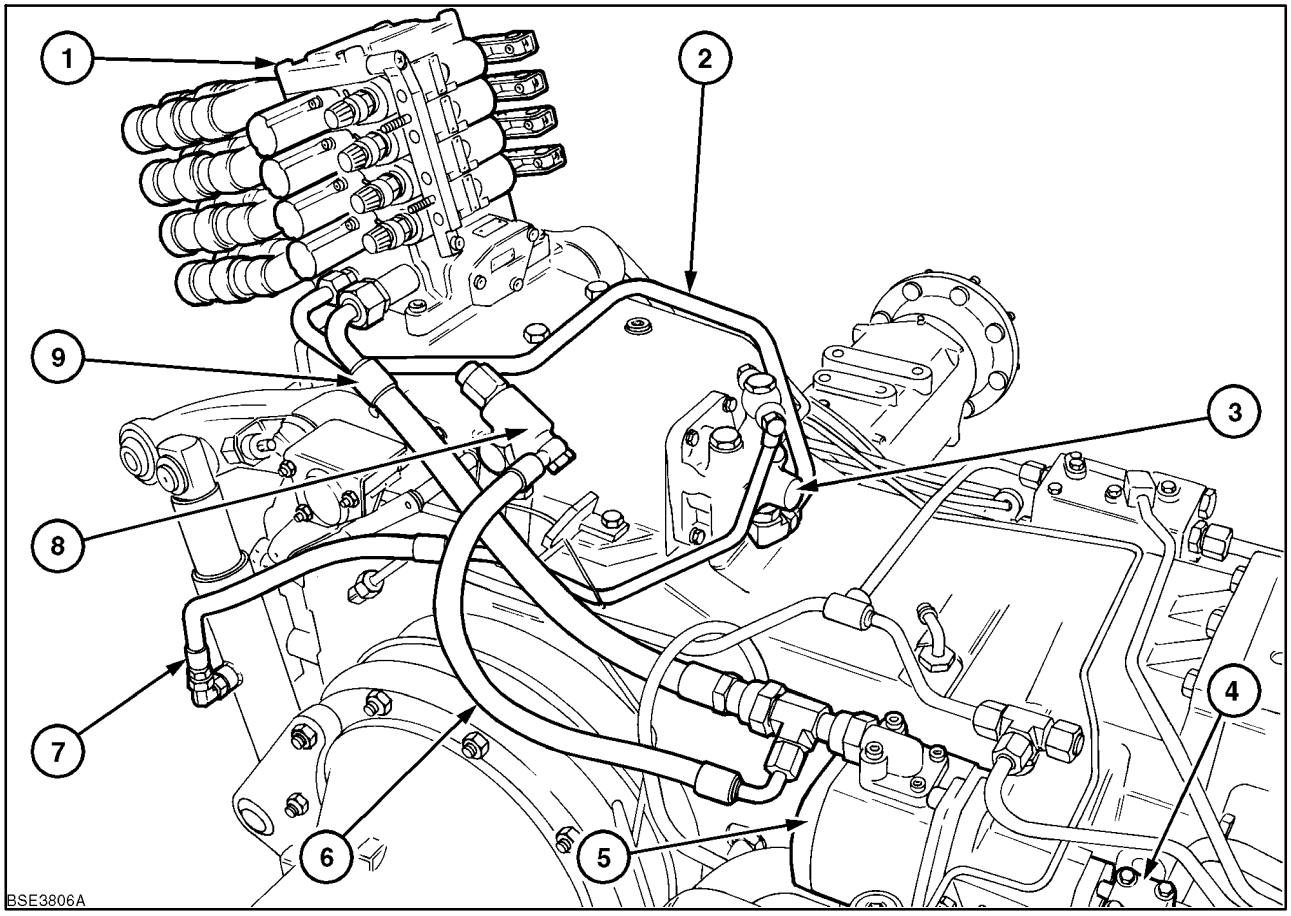
Fixed Displacement Pump Hydraulic Cicuit 12 x 12 and 24 X 24 Models

FIXED DISPLACEMENT HIGH PRESSURE HYDRAULIC CIRCUIT



41

High Pressure Circuit Components and Pipework

Tractors with Mechanical Hydraulic Lift and Fixed Displacement Hydraulic Pump

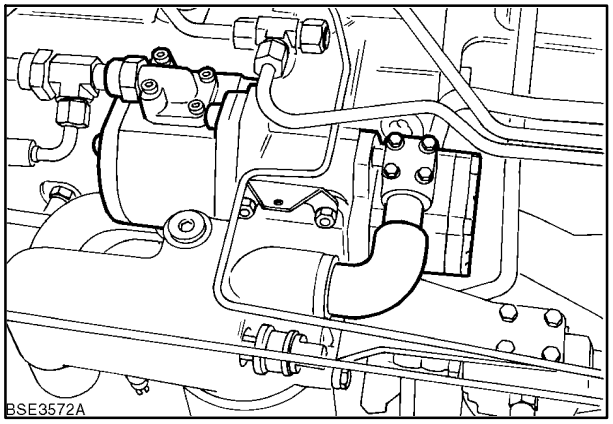
1. Remote Control Valves
2. Feed To Mechanical Draft Control Valve
3. Mechanical Draft Control Valve
4. Steering Pump (Steering Circuit)
5. High Pressure Circuit Gear Pump
6. Hose To Pressure Relief Valve
7. Feed To Lift Cylinder
8. Pressure Relief Valve (195 bar)
9. High Pressure Feed To Remote Valve Stack

On high pressure hydraulic systems with fixed displacement pump, all components are connected in series and pump flow is continually circulating through the hydraulic system even when the circuits are not being operated.

The priority of operation is given to the order of components in the circuits, that is trailer brakes, remote valves and hydraulic lift.

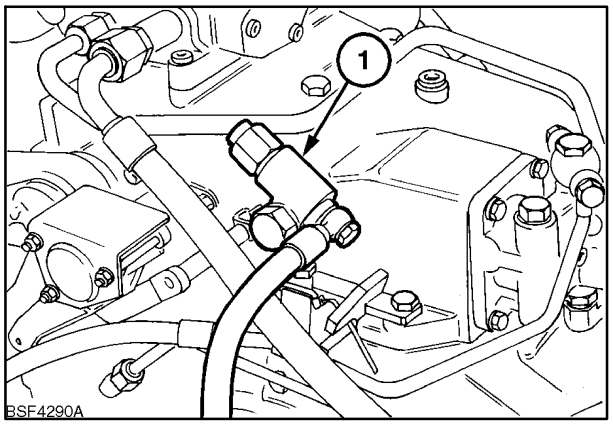
The high pressure hydraulic circuits for tractors installed with mechanically controlled hydraulic lift are shown in Figures 48 and include the components shown on the following pages.

Fixed displacement hydraulic pump assembly comprising of the high pressure gear pump and steering/low pressure gear pump .



42

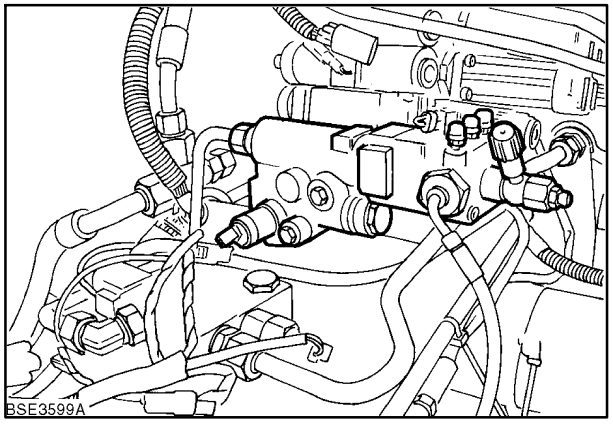
High pressure circuit relief valve (1) located on the right hand side of the top cover diverts pump flow to sump if the system pressure reaches 190 bar (2755 PSI).



43

The trailer brake valve is located beneath the cab on top of the hydraulic lift cover. The valve diverts oil pressure to the trailer brakes whenever the right hand tractor brake pedals is depressed. This is unlike the valve installed on the closed centre system where both pedals have to be depressed in order for the valve to operate.

The trailer brake has absolute priority over other services in the circuit.



44

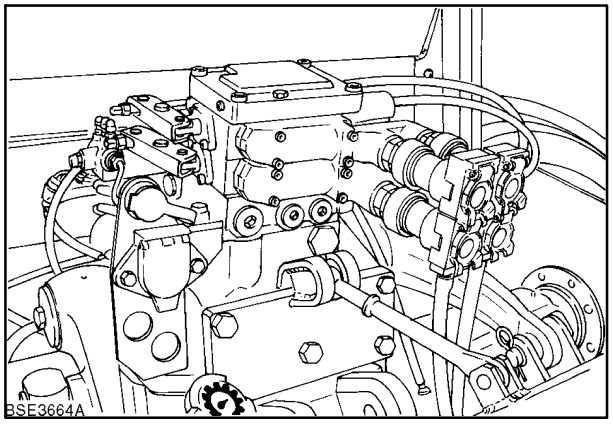
The remote valves are available as two, three or four valves per tractor.

The valves can be double-acting with float and kick out.

Double acting convertible to single-acting with float.

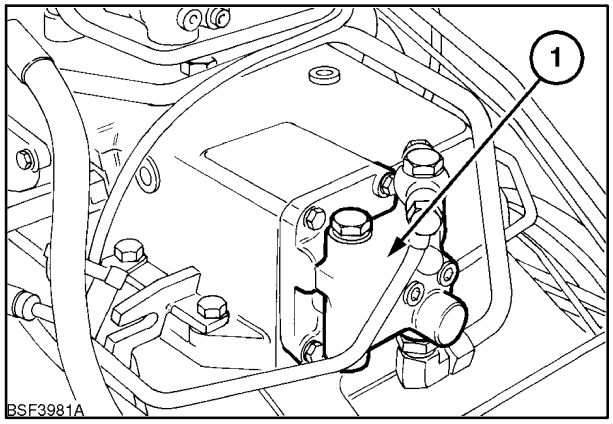
Double acting convertible to single-acting.

When four remote valves are installed the optional flow divider valve (1) is available enabling simultaneous operation of remote valve No 1 with another remote valve or hydraulic lift.



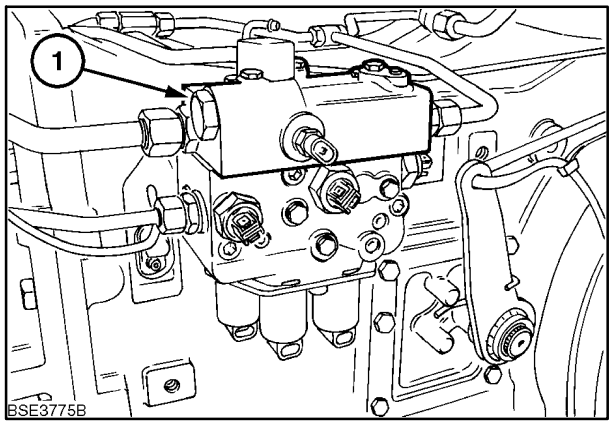
45

On tractors which are fitted with mechanical hydraulic lift, the lift cylinder control valve (1) assembly is located at the front of the hydraulic lift assembly. The lift cylinder safety valve is mounted on the rear face of the control valve which must be removed to obtain access. This safety valve will operate at between 210 to 215 bar.



46

The **low pressure regulating valve** is located in the top manifold situated on the lubrication services distribution block on the left hand side of the rear axle centre housing.This valve regulates the pressure in the low pressure circuit to 17-18 bar (246-261 lbf/in^2).



47

Also located in this manifold are the **oil cooler by-pass valve** and the **lubrification relief valve** (7.3 - 8.3 bar).

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2) the **cooler by-pass valve (1)** located on the right hand side of the transmission will operate to ensure that adequate flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.

The steering pump / steering return oil is directed through the oil cooler at the front of the tractor and is limited to a maximum pressure of 7 bar (101 lbf/in^2) by the **lubrication relief valve l**ocated in the lubrication services distribution block on the left hand side of the rear axle centre housing.

High Pressure Circuit for Tractors with Fixed Displacement Pump and Mechanical Hydraulic Lift

With Reference to Figure 48.

Both the high and low pressure pumps are driven by a 'live' drive gear train directly connected to the PTO clutch input drive shaft and driven by the engine flywheel.

Oil is drawn through the common intake port and filter to both the high and steering/low pressure pump assemblies.

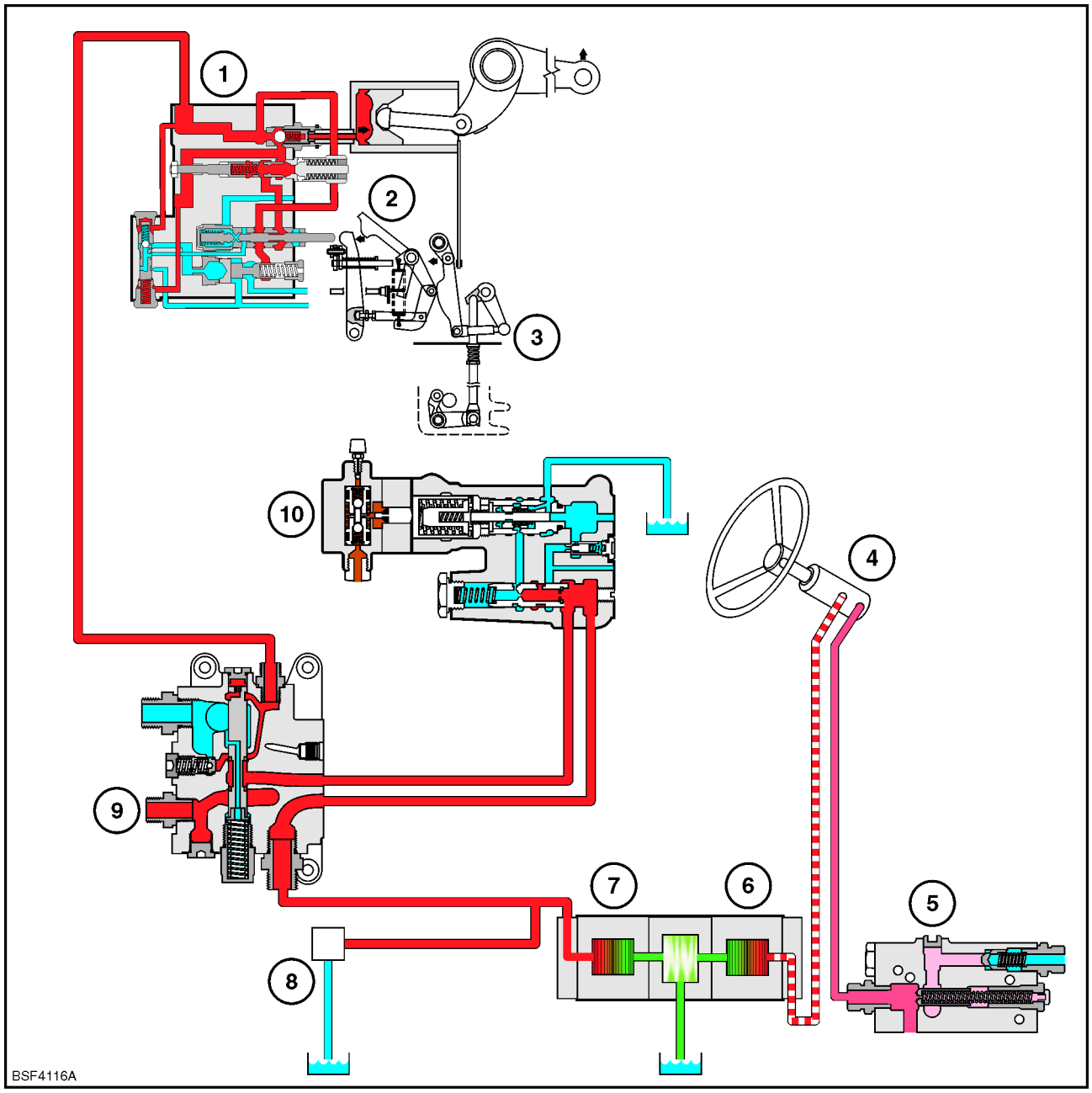
The high pressure pump supplies constant oil flow according to engine speed, through the trailer brake and remote valves via a subplate at the bottom of the remote valve stack. The subplate incorporates a flow control valve which limits the maximum operating pressure.

Oil, after passing through the remote valves, enters the hydraulic lift control valve located at the front of the lift assembly, which controls the raising and lowering of the lift.

All excess oil flow produced by the hydraulic pump is returned direct to the rear axle through the control valve spool located in the hydraulic lift control valve assembly.

Also located within the assembly is the lift cylinder safety valve, which protects the lift cylinder and seals from excessive peaks of pressure during operation.

For further details on operation of the mechanical hydraulic lift assembly, trailer brake valve and mechanical remotes refer to the appropriate Chapters in this Section of the Repair Manual.



Fixed Displacement Pump High Pressure Hydraulic Circuit Operation 48
Tractors With Mechanical Hydraulic Lift
Hydraulic Lift Operating

Steering System Oil

System Pressure Oil

Trapped Oil

Low Pressure Circuit Oil
17-18 bar (246-261 lbf/in^2)

Return to Reservoir Oil

Lubrication Oil

Suction Oil

1. Lift Control Valve
2. Lift Cylinder Safety Valve
3. Mechanical Hydraulic Lift Assembly
4. Steering Motor
5. Low Pressure Circuit Pressure Regulating Valve
6. Steering and Low Pressure Circuit Gear Pump
7. Fixed Displacement Pump
8. Pressure Relief Valve (195 bar)
9. Subplate with Pressure Compensator
10. Trailer Brake Valve

LOW PRESSURE HYDRAULIC CIRCUITS

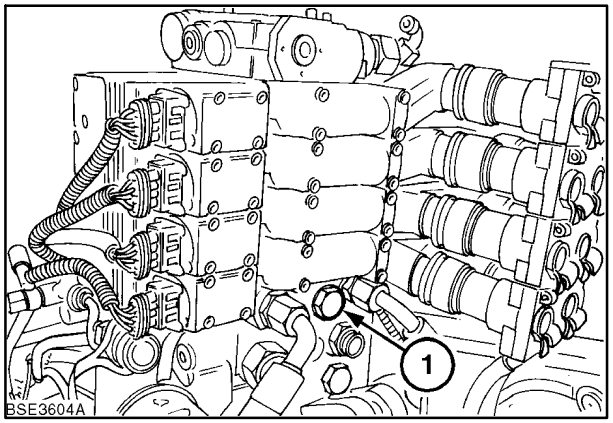
16 x 16 Transmission

The low pressure hydraulic circuit for tractors with 16 x 16 transmissions is shown on Figure 62

The function of the principal components in the circuit are described as follows:

High pressure oil from the variable displacement pump, via the trailer brake valve if fitted, is supplied to a flow dividing and low pressure regulating valve, located in the lower slice of the remote valves and EDC assembly.

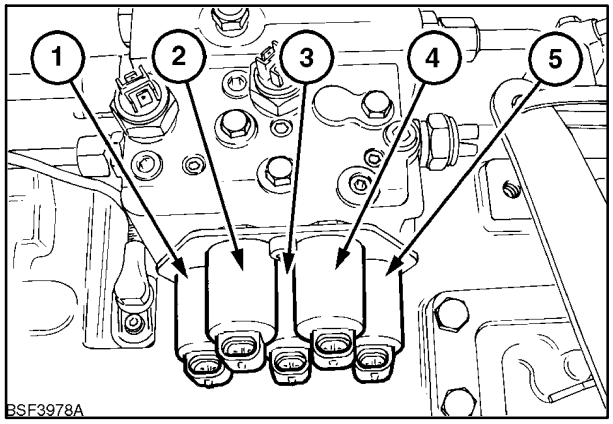
The oil is divided in the valve, depending on system demands and the oil destined for the low pressure system is regulated to 17–18 bar. High pressure oil is also fed to the end plate on top of the remote valves.This oil is the pilot line supply for the Electro–Hydraulic remotes, excess oil is returned to sump.



49

The **low pressure distributor valve block** is located under the cab on the left of the rear axle centre housing. The block is fed oil directly from the power steering return line. Located in the valve block are the solenoid valves for the 4WD,creeper, differential lock, P.T.O and P.T.O. brake.

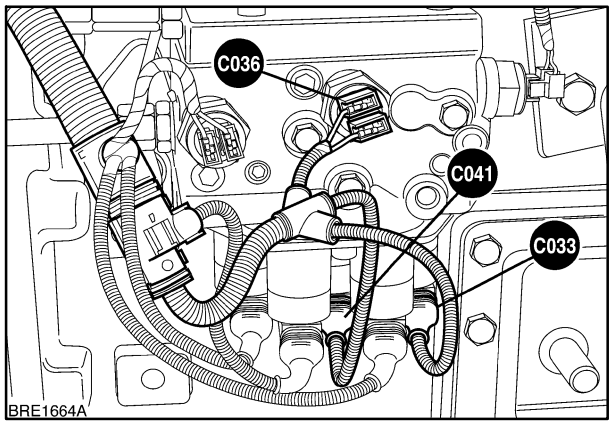
1. Creeper Solenoid
2. Differential Lock Solenoid
3. PTO Clutch (PWM)
4. Four Wheel Drive Solenoid
5. PTO Brake Solenoid



50

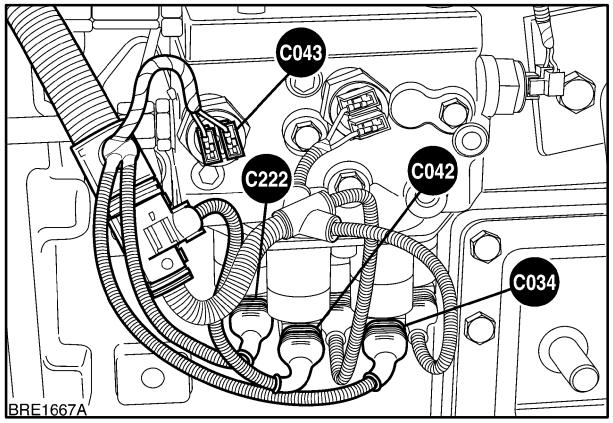
NOTE: *The four wheel drive is spring applied and the solenoid is energised whenever disengagement of the drive is required.*

C033 PTO Brake
C041 PTO PWM



51

C222 Creeper
C042 Differential Lock
C034 Four Wheel Drive



52

The transmission top cover contains the transmission control solenoids for one to four and five to eight range engagement and forward and reverse engagement. The low pressure oil is again supplied direct from the regulating valve outlet and is distributed by galleries within the top cover.

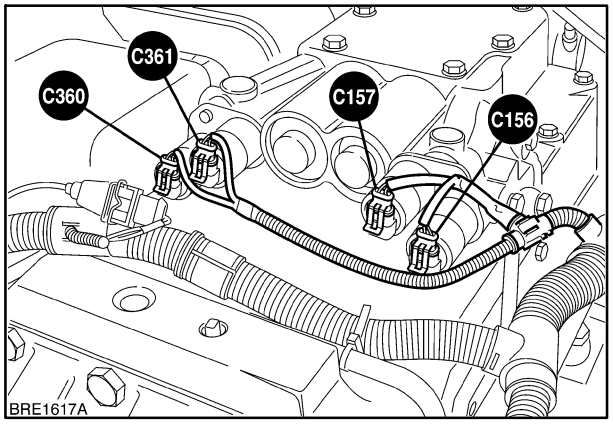
Solenoid Function

C360 5 – 8 Range Synchro Solenoid

C361 1 – 4 Range Synchro Solenoid

C156 Reverse Solenoid Clutch

C157 Forward Solenoid Clutch



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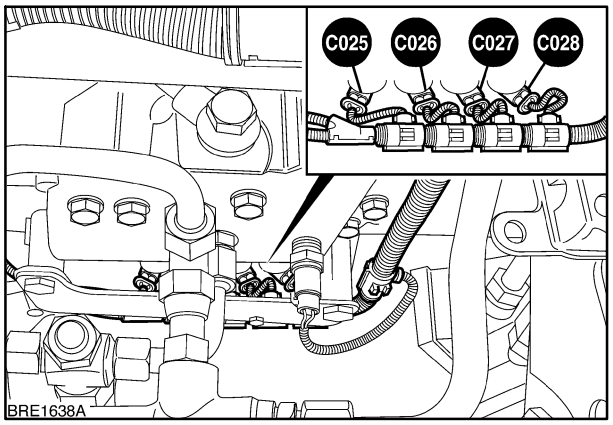
C025 C4 Valve

C026 C3 Valve

C027 C2 Valve

C028 C1 Valve

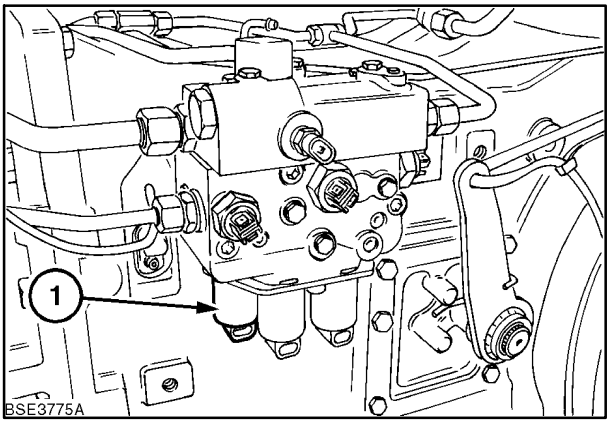
NOTE: *The 'C' number prefix before each solenoid description is the electrical connector reference.*



54

Transmission Creeper

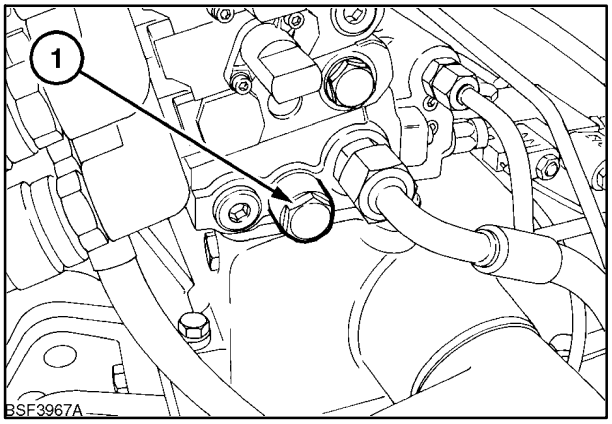
The creeper actuating solenoid valve (1) is located in the low pressure distribution block on the left hand side of the the rear axle centre housing.



55

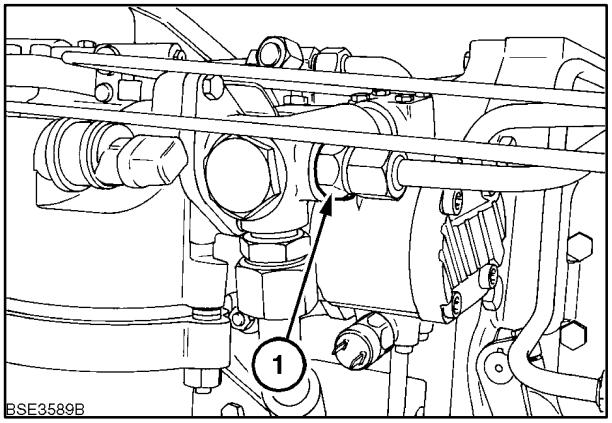
Lubrication Oil

Lubrication oil can be supplied from two sources. The steering priority valve is located in the bottom plate of the Remote Valve stack and this supplies oil to the lube circuit when the unit does not require oil for steering purposes. Lubrication oil is also supplied from the return side of the steering motor and from the charge pressure circuit via a supplementary lube valve.



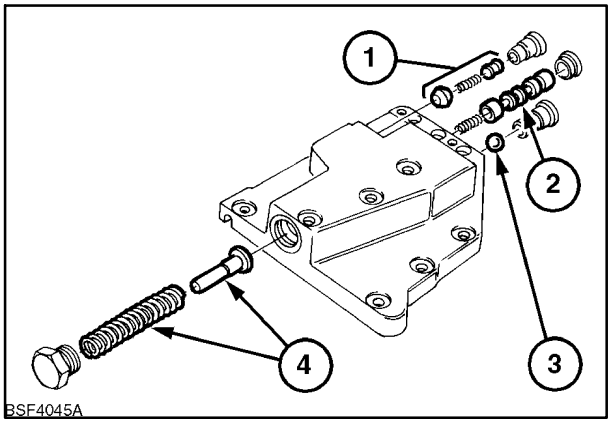
56

The supplementary lube valve (1) is located in a three way elbow in the inlet tube to the steering pump. The valve is rated at 0.8bar. When the pressure differential between the charge pump and the variable displacement pump is more than 0.8 Bar , the surplus oil is directed pass the valve and into the lubrication circuit.



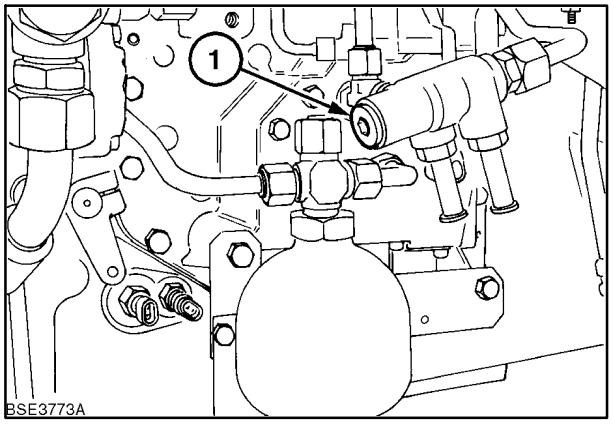
57

The steering pump / steering return oil is directed through the oil cooler at the front of the tractor and is limited to a maximum pressure of 7 bar (101 lbf/in^2) by the **lubrication relief valve (2)** located in the transmission side cover. Components lubricated by this oil are the transmission shafts and clutches.

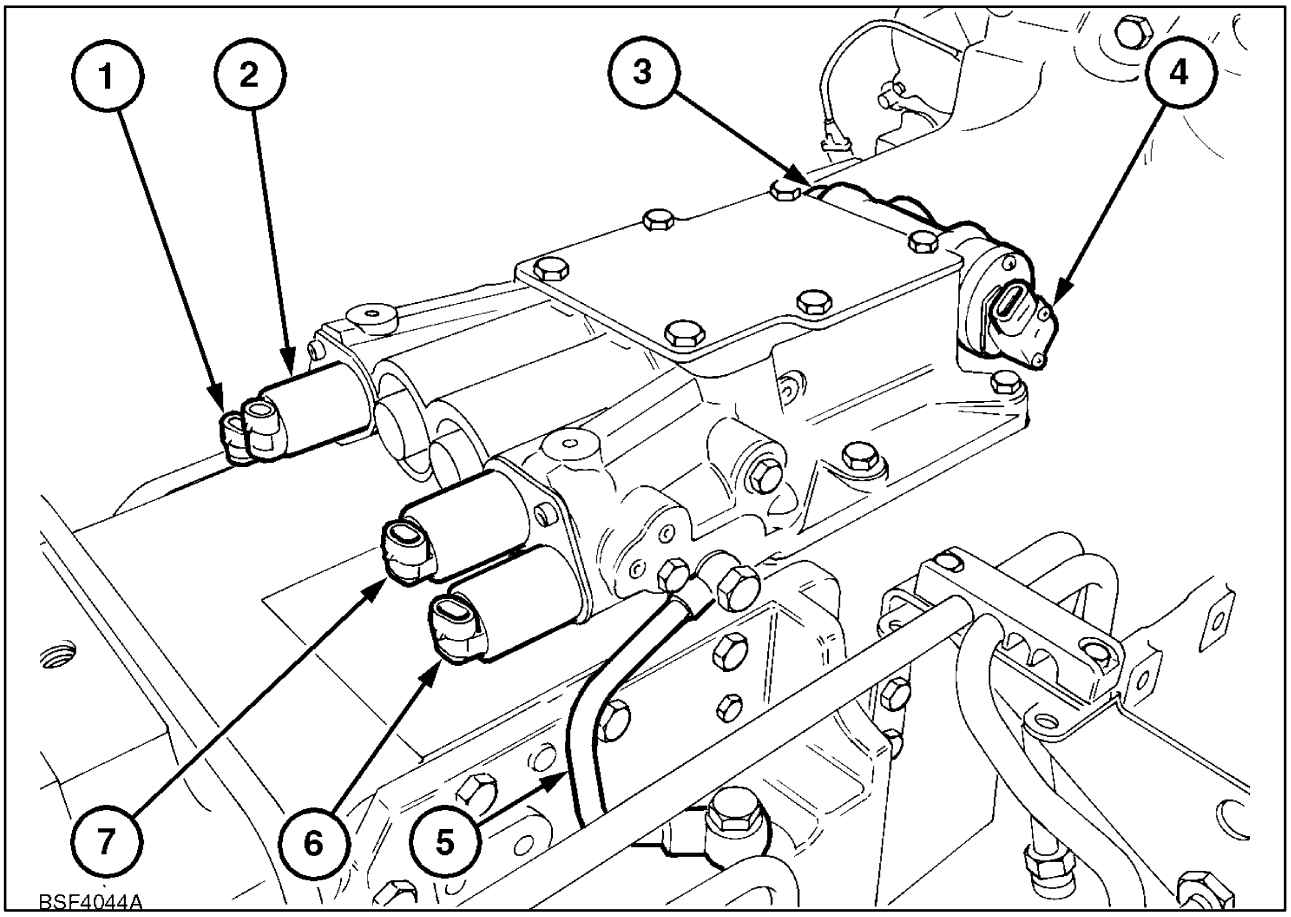


58

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2) the **cooler by-pass valve (1)** located on the right hand side of the transmission will operate to ensure that adequate flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.



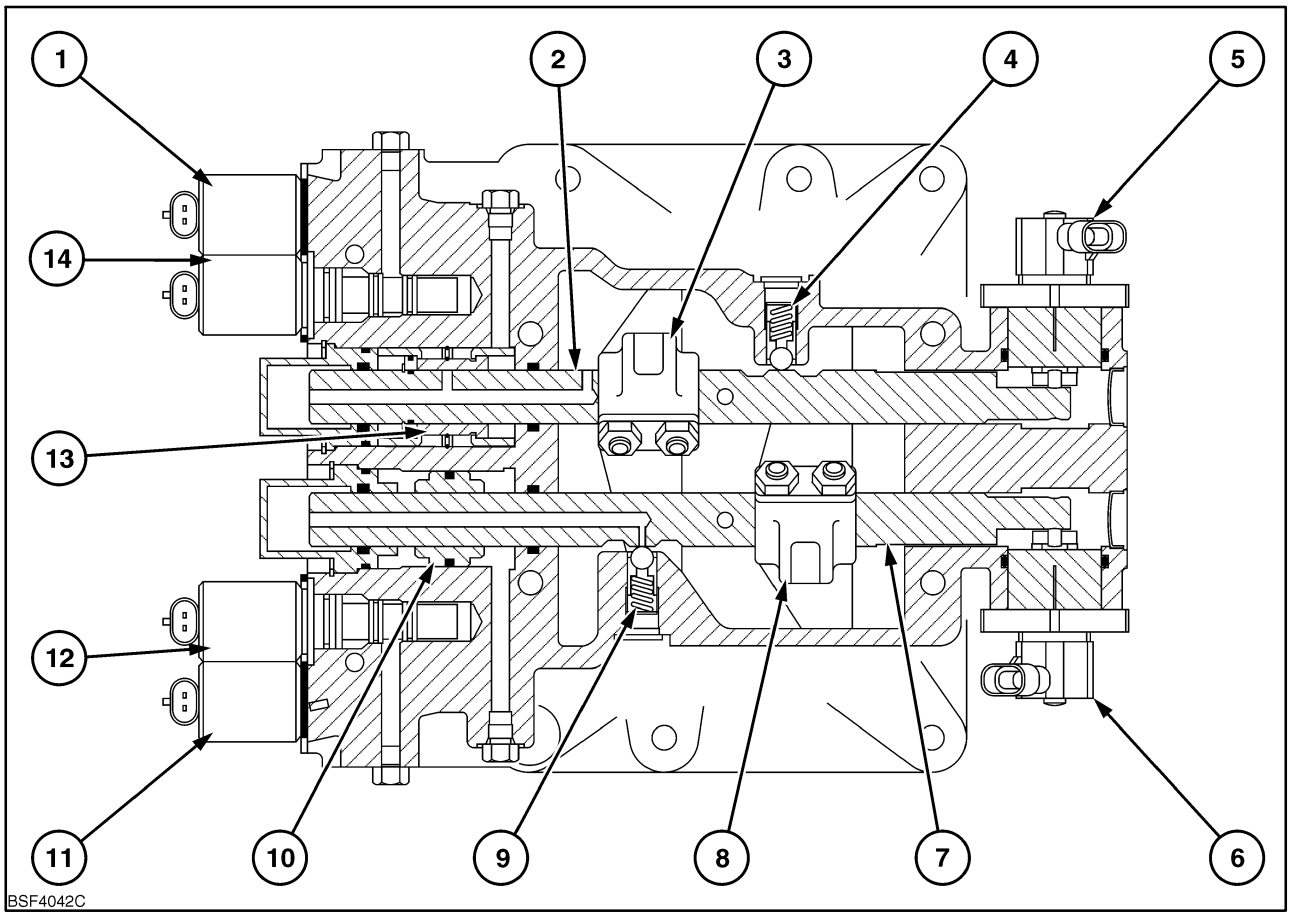
59



60

16 x 16 Transmission Top Cover

1. 5-8 Solenoid
2. 1-4 Solenoid
3. 1-4/5-8 Synchroniser Position Potentiometer
4. Forward/Reverse Synchroniser Position Potentiometer
5. Low Pressure Feed
6. Reverse Solenoid
7. Forward Solenoid



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16 x 16 Transmission Top Cover

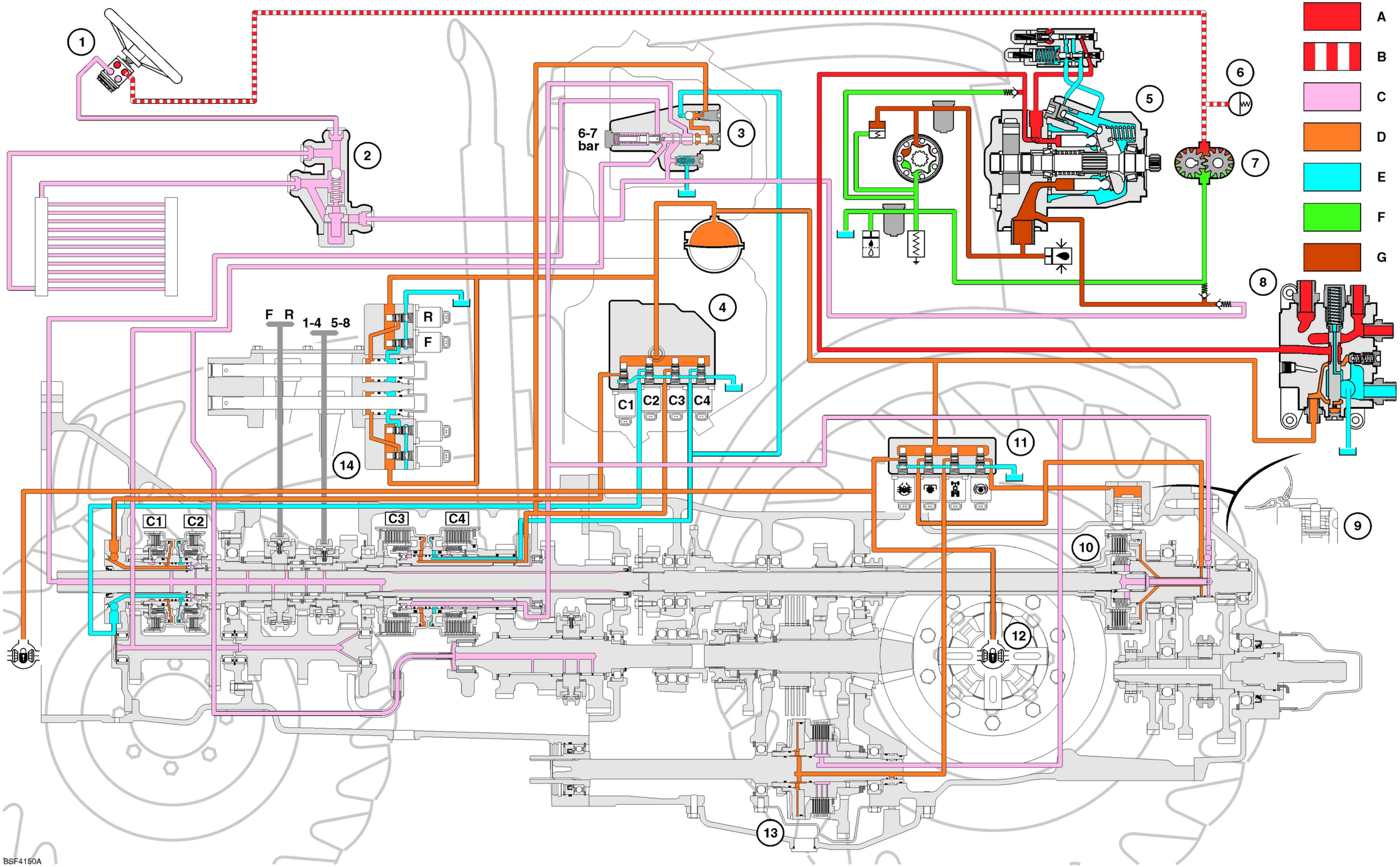
1. Reverse Solenoid
2. Forward/Reverse Rail
3. Forward/Reverse Shift Fork
4. Forward/Reverse Detent Assembly
5. Forward/Reverse Synchroniser Position Potentiometer
6. 1-4/5-8 Synchroniser Position Potentiometer
7. 1-4/5-8 Shift Rail
8. 1-4/5-8 Shift Fork
9. 1-4/5-8 Detent Assembly
10. Piston
11. 5-8 Solenoid
12. 1-4 Solenoid
13. Piston
14. Forward Solenoid

Figure 62

Low Pressure Hydraulic Circuit - 16 x 16 Transmission

1. Steering Motor
2. Oil Cooler By-Pass Valve
3. Lubrication Control Valve Assembly
4. Transmission Control Solenoid Assembly
5. Variable Displacement Pump
6. Low Pressure Switch
7. Steering Pump
8. Subplate with Low Pressure Compensator Valve
9. PTO Brake
10. PTO Clutch
11. Low Pressure oil distribution Manifold
12. Rear Differential Lock
13. Four Wheel Drive Clutch
14. Transmission Top Cover Solenoids

A. High Pressure Circuit oil
B. Steering Circuit
C. Lubrication Oil
D. Low pressure Circuit Oil



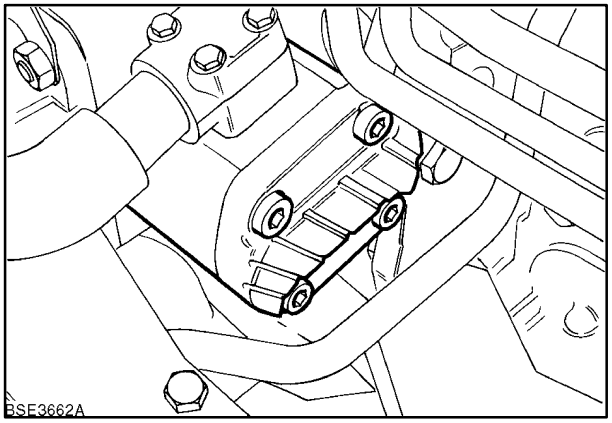
Low Pressure Hydraulic Circuit - 16 x 16 Models

12x12 Transmission

The low pressure hydraulic circuit for tractors with 12 x 12 Command transmissions is shown on Figure 65.

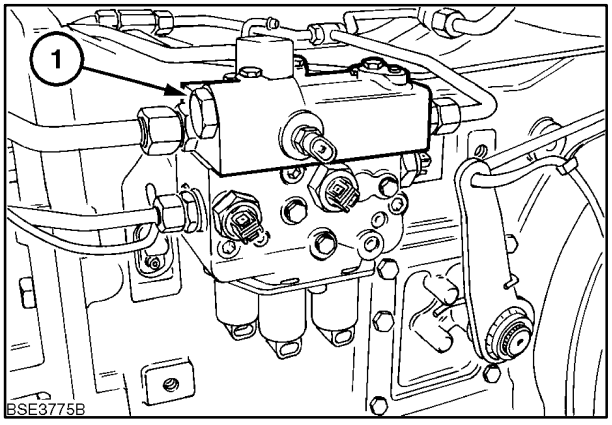
The function of the principal components in the circuit are described as follows:

Oil is drawn through the steering and low pressure circuit pump to the steering motor. The flow of low pressure oil is diverted in one direction through the low pressure regulating valve and oil by pass cooler valve and on to the services distribution block which diverts oil when needed to the Diff lock, PTO, and PTO brake. The flow is also diverted through the services distribution block and returns to reservoir.



63

The **low pressure regulating valve** in the top manifold (1) of the lubrication distribution block limits the pressure in this circuit to 17-18 bar (246-261 lbf/in^2) and the excess flow passes into the lubrication circuit.



64

Low pressure circuit oil is directed through the oil cooler at the front of the tractor and is limited to a maximum pressure of 7 bar (100 lbf/in^2) by the **lubrication valve** which is also located in the manifold on top of the lubrication distribution valve. Components lubricated by this oil are transmission shafts , hydraulic pump drive gear, hydraulic lift cross shaft and PTO clutch lubrication.

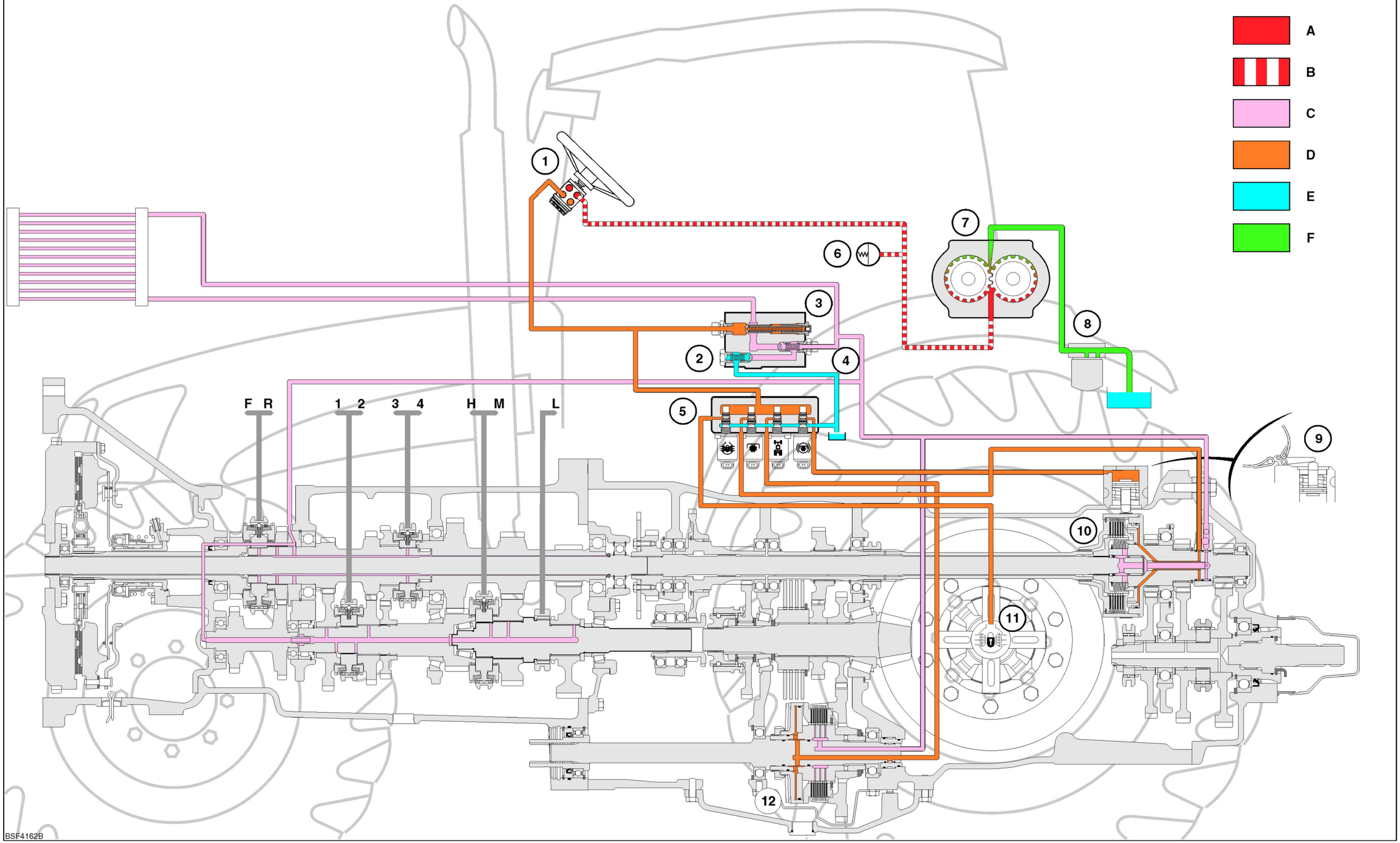
When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2) the **cooler by-pass valve** also located in the manifold on top of the lubrication distribution valve will operate to ensure that adequate flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.

Figure 65

Low Pressure Hydraulic Circuit - Tractors with 12 x 12 Transmission

1. Steering Motor
2. Lubrication Relief Valve
3. Low Pressure Regulating Valve
4. Oil Cooler Bypass Valve
5. Low Pressure Services Manifold
6. Low Pressure Switch
7. Steering Pump
8. Filter
9. PTO Brake
10. PTO Clutch
11. Differential Lock
12. 4WD Clutch

A. High Pressure Circuit Oil
B. Steering Circuit
C. Lubrication Oil
D. Low Pressure Oil
E. Return To Reservoir
F. Suction Oil



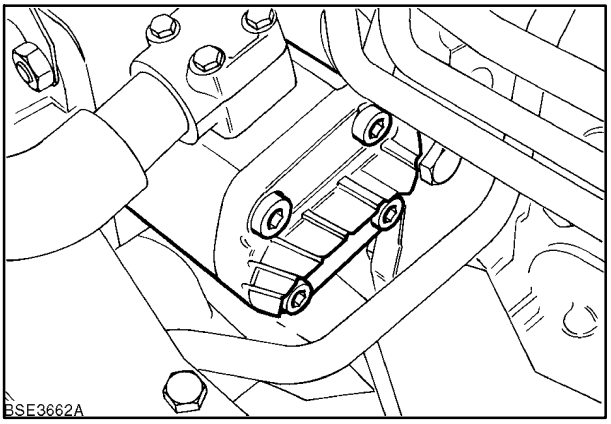
Low Pressure Hydraulic Circuit - 12 x 12 Models

Low Pressure Circuit Operation
Tractors with 24x24 Transmission

With Reference to Figure 73.

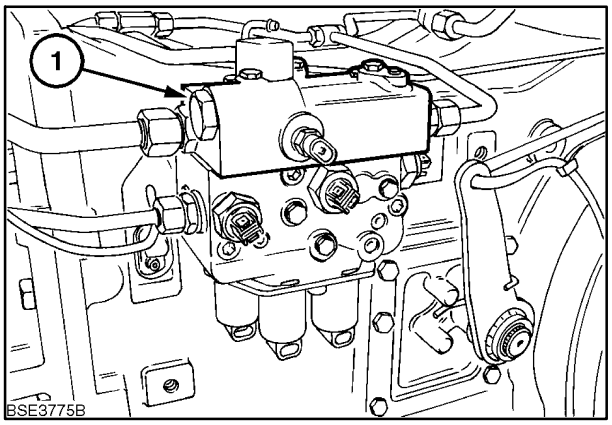
Oil is drawn through the steering and low pressure circuit pump to the steering motor which feeds oil to the low pressure services manifold . The top section of the manifold houses the Oil Cooler by-pass valve, low pressure regulating valve, and the lubrication relief valve.

Refer to Steering Section 41 for further details.



66

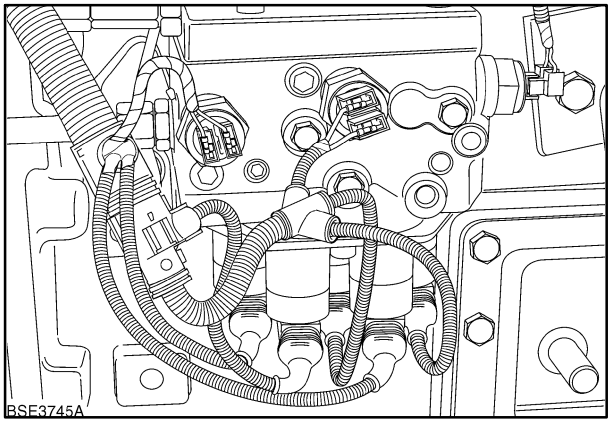
The low pressure regulating valve mounted above the low pressure services block limits the pressure in this circuit to 17-18 bar (246-261 lbf/in^2) and the excess flow passes into the lubrication circuit.



67

The solenoids in the in the low pressure services block, are energised to divert flow and engage the creeper (where fitted), differential lock, PTO clutch and brake and disengage four wheel drive.

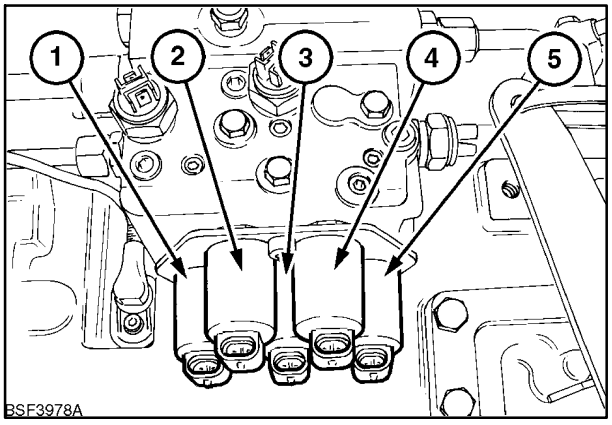
NOTE: *The four wheel drive is spring applied and the solenoid is energised whenever disengagement of the drive is required.*



68

Solenoid Function

1. Creeper (Where fitted)
2. Diff lock
3. PTO
4. Four Wheel Drive
5. PTO Brake

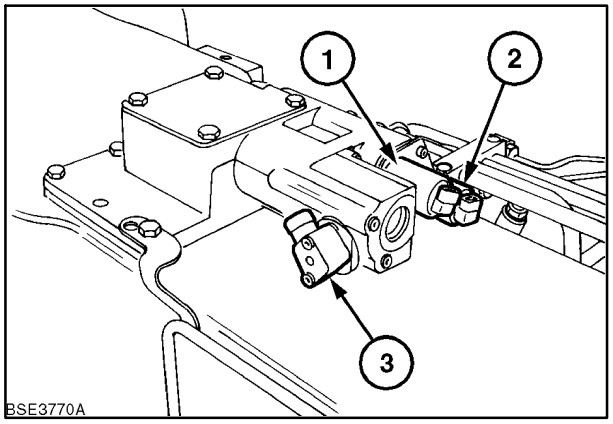


69

The pulse width modulated solenoids in the transmission top cover are used to progressively engage/disengage the transmission forward/reverse synchroniser.

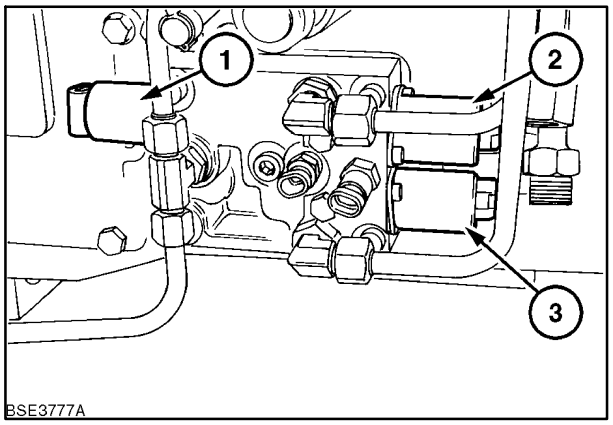
Solenoid Function

1. Reverse Synchroniser
2. Forward Synchroniser
3. Forward/Reverse Potentiometer



70

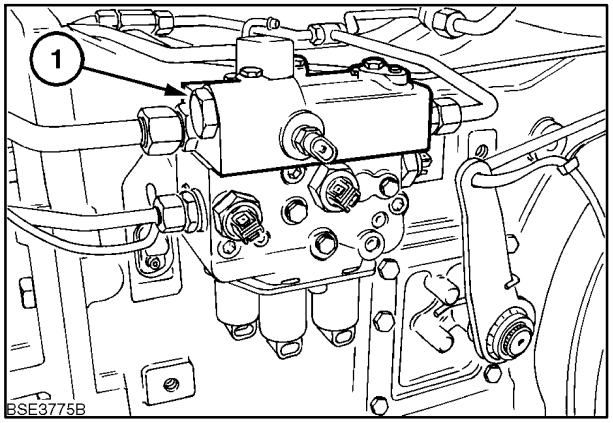
The **dump solenoid** (1) in the transmission side cover is a safety solenoid controlled by the pressure switches in the A and B clutch circuits. In the unlikely event that both these clutches are pressurised at the same time the dump solenoid is energised allowing pressure in the circuit to be diverted to sump preventing 'lock up' of the transmission.



71

Low pressure circuit oil is directed through the oil cooler at the front of the tractor and limited to a maximum pressure of 7 bar (100 lbf/in^2) by the **lubrication valve** (1) located in the manifold on top of the lubication distribution block on the left hand side of the rear axle centre housing. Components lubricated by this oil are transmission clutches and shafts, hydraulic pump drive gear, hydraulic lift cross shaft and PTO clutch lubrication.

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2), the **cooler by-pass valve (1)** which is also located in the manifold on top of the lubication distribution block on the left hand side of the rear axle centre housing will operate to ensure that an adequate oil flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.



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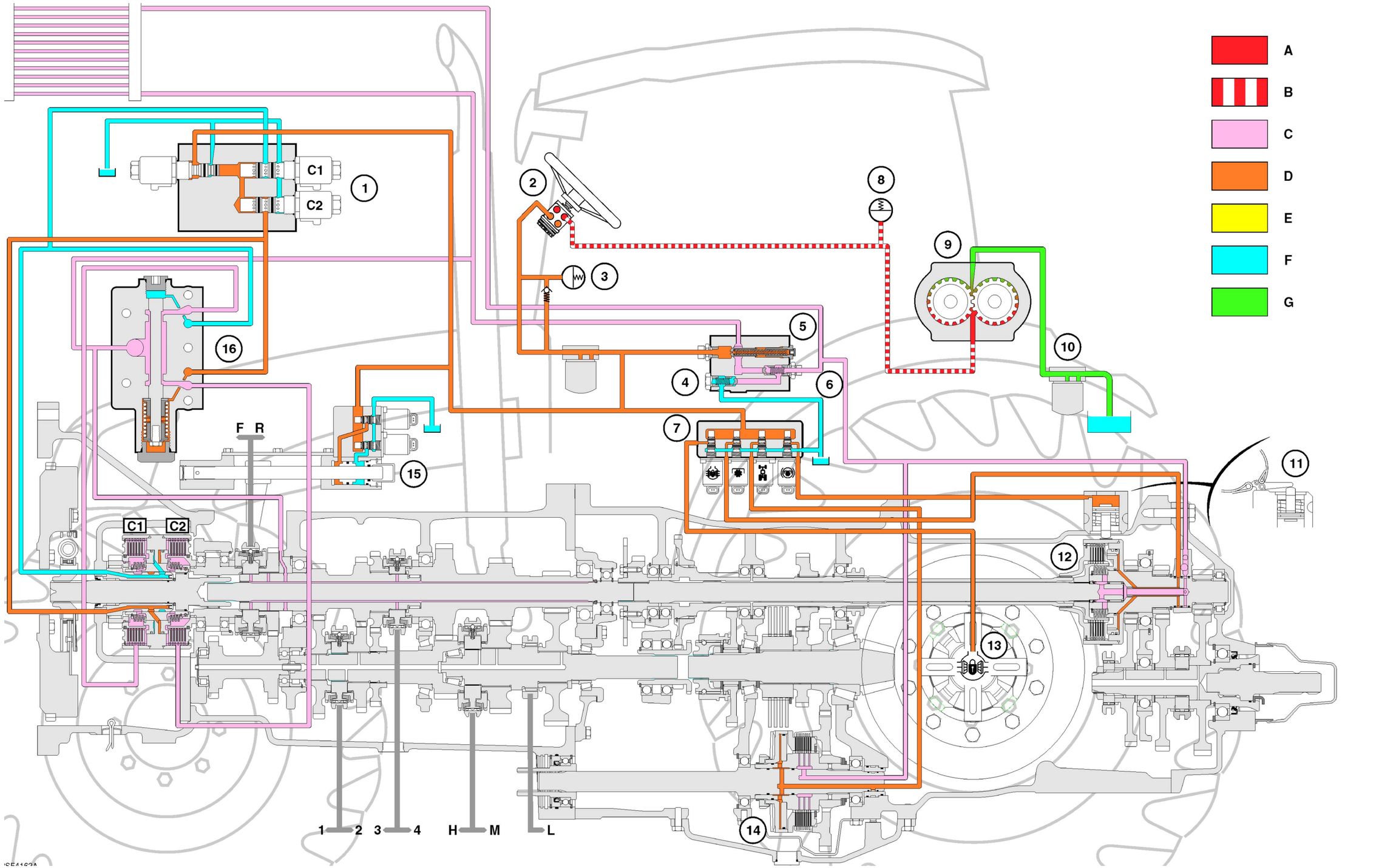
NOTES

Low Pressure Circuit 24 x 24 Models

1. Transmission Control Valve Assembly
2. Steering Motor
3. Pressure Switch
4. Lubrication Relief Valve
5. Low Pressure Regulating Valve
6. Oil Cooler By-pass Valve
7. Low Pressure Services Manifold
8. Low Pressure Switch
9. Steering Pump
10. Filter
11. PTO Brake
12. PTO Clutch
13. Diff Lock
14. Four Wheel Drive Clutch
15. Forward and Reverse Solenoids
16. Lubrication Valve

A. High Pressure Circuit Oil
B. Steering Circuit Oil
C. Lubrication Circuit Oil
D. Low Pressure Circuit Oil
E. Trapped Oil
F. Return To Reservoir
G. Suction Oil


A
B
C
D
E
F
G
C1
C2
1
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3
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F R
1 2 3 4 H M L

TROUBLESHOOTING

Before commencing fault finding refer to the initial check fault finding chart which may identify an obvious cause for the concern and prevent unnecessary component disassembly.

IMPORTANT: *If the steering is inoperative, there will be no lubrication to the transmission or PTO clutch and the tractor must not be run for more than 5 minutes at a maximum engine speed of 1000 rev/min.*

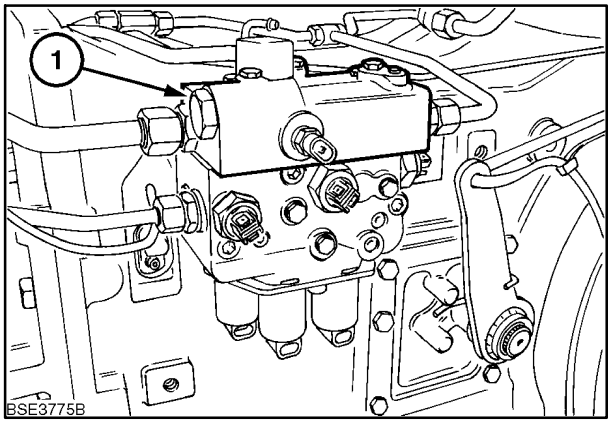
Fault finding charts listed in this Chapter are:–

- Initial Fault Finding Check
- Transmission Low Pressure Warning Light 'On'
- Charge Pressure Light Flashing
- Intake Filter Restriction Warning Light 'On'
- Power Steering not Working or Working Incorrectly
- Trailer Brakes not Working
- Hydraulic Lift not Working Correctly
- Remote Control Valves not Working

INITIAL FAULT FINDING CHECKS TO BE PERFORMED BEFORE PROCEEDING TO GENERAL DIAGNOSTIC PROCEDURE

Problem	Possible Cause	Remedy
Error code identified by micro –processor	Component malfunction	Refer to Error code fault finding charts
Rear Axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
Oil contaminated with dirt, water, or antifreeze	Filters not replaced at correct service interval	Replace all filters on pump
Warning light displayed on instrument cluster	Component not functioning correctly	Identify function not operating correcly and refer to the appropriate fault finding chart

TRANSMISSION LOW PRESSURE WARNING LIGHT 'ON'



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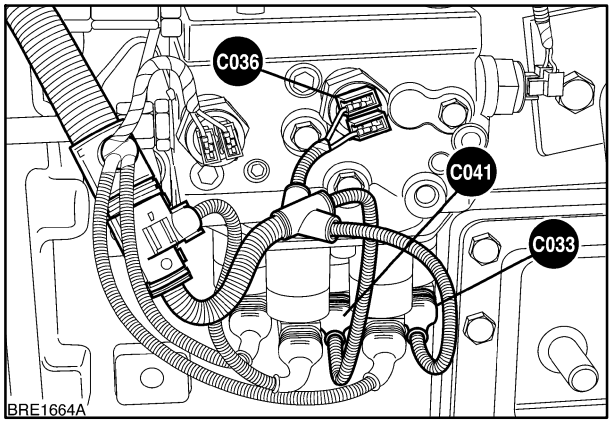
Low Pressure Regulating Valve



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Transmission Low Oil Pressure Switch

Problem	Possible Cause	Remedy
High pressure system components do not operate, ie, hydraulic lift, remote valves and trailer brakes	High pressure pump malfunction	Perform tests for high pressure pumpRefer to relevant chapter
Low pressure systems components do not operate,ie, transmission, PTO, FWD and Diff Locks	Low pressure regulating valve sticking, broken components or relief vavle may be stuck open	Pressure test the low pressure circuit. If the pressure is not 17 bar,inspect the low pressure regulating valve or relief valve. If this does not clear the fault check for a large leak in one of the low pressure system component circuits.
	If the pressure is 17 bar there may be an electrical foual	Check for an electrical fault which may affect the operation of all low pressure components, ie, disconnected harness to low pressure block
Low pressure systems components do operate,	Oil pressure switch not functioning correctly or faulty wiring	If the warning lamp does not remain on inspect the switch. It should be open , replace if faulty. If the lamp remains on repair wiring fault between C036 and C081 Pin 12 of the insrument cluster

CHARGE PRESSURE LIGHT FLASHING

Problem	Possible Cause	Remedy
Rear axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
If charge pressure is correct (1.6–3.4 bar) disconnect wiring to low charge pressure switch. If the light is not extinguished	Short circuit to chassis in R/N/B colour wire from instrument console connector C177 Pin 7 and charge pressure switch	Locate and repair short circuit
As above, but light is extinguished	Blocked/contaminated filters	Replace charge pump and inlet filters
If filters have been replaced and pressure is correct	Faulty low charge pressure switch	Replace low charge pressure switch
Filters changed but still pressure is incorrect	Charge pressure filter dump valve and charge pressure valves sticking open	Replace valves
	Worn charge pump	Replace pump

INTAKE FILTER RESTRICTION WARNING LIGHT ON

Problem	Possible Cause	Remedy
Rear axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
Inlet and charge pressure filters not functioning	Filters contaminated	Replace filters
If wiring to filter restriction switch is disconnected and light is not extinguished	Short circuit to chassis in B/N colour wire from instrument console connector C175 Pin 16 and intake filter restriction switch	Locate and repair short circuit
If wiring to filter restriction switch is disconnected and light is extinguished	Intake filter restriction switch faulty	Replace intake filter restriction switch

POWER STEERING NOT WORKING OR WORKING INCORRECTLY

Problem	Possible Cause	Remedy
Steering pressure warning light is illuminated	Incorrect pressure in the steering system	Pressure test the steering system as describedin the 'Pressure Testing' Chapter
	Steering pump faulty	Remove steering pump and examine the drive to the pump, if O.K. repair or replace the steering pump assembly
Pressure is correct up to the steering cylinders	Mechanical fault in the steering components	If pump output is good but pressure to the cylinders is low or zero, suspect a faulty steering motor. See section 41 for steering motor removal and overhaul.

TRAILER BRAKES NOT WORKING

Problem	Possible Cause	Remedy
Trailer brakes not working correctly	Air in system	Bleed the trailer brakes
	Pressure incorrect in system	Pressure test the Trailer brakes
Pressure test confirms fault	Hydraulic lift not working satisfactorily	Test maximum system pressure at remote valve coupler. Pressure 2900–3000 lbf/in^2 (200–207 bar)
	If pressure not correct	Adjust flow/pressure compensating valve. If this does not clear the fault examine flow/compensating valve for sticking component
		Check the variable flow pump swash plate to ensure it is not sticking
If pressure test confirms correct pressure	Trailer brake valve faulty	Operate and hold remote valve to generate maximum system pressure and at the same time operate the trailer brakes. If the trailer brake valve does not function correctly overhaul trailer brake valve

HYDRAULIC LIFT NOT WORKING CORRECTLY

Problem	Possible Cause	Remedy
In cab fast raise /work switch not in correct position		Move switch to work position
Is hitch enabled symbol illuminated		Capture hitch
		Check position of controls on control panel
Charge pressure light flashing	Charge pump system problem	Refer to charge pressure light flashing fault finding chart
Electronic draft control error code identified		Refer to Electronic draft control fault codes in section 55
Trailer brakes(if fitted) not working correctly. (Install a pressure gauge in the trailer brake coupler)	Fault in the variable displacement pump	Pressure test the pump to determine the fault
Remote valves not operating correctly. (Install a pressure gauge in the remote valve coupler)	Contaminated components in low pressure regulating valve assembly	Inspect the low pressure regulating valve assembly for sticking spool. dirt contamination or broken components. Rectify as required
Hydraulic lift working erratically	Circuit leak	Perform pump leak test to determine if fault relates to either internal leak or hydraulic circuit leak
Lift arms locked in either fully raised or lowered position	Sticking plunger in EDC valve raise or lower solenoid	Check EDC valve raise or lower solenoid for sticking plungers and rectify accordingly
Perform standby pressure test . If pressure is not 300-350 lbf/in^2 (21-24 bar)	Flow compensating valve requires examination or adjustment	Adjust/examine flow compensating valve
	Variable displacement pump swash plate sticking	Disassemble variable displacement and check swash plate piston for sticking
Standby pressure is correct and whilst operating remotes at high pressure standby hydraulic lift operates correctly	Fault in load sensing line from EDC valve	Investigate and rectify fault in load sensing line
If the hydraulic lift does not operate correctly	Sticking spools in EDC valve or leaking lift cylinder safety valve	Examine EDC valve for sticking spool and rectify or if lift cylinder safety valve ? is leaking replace?
	Lift arms leak down under pressure if heavy weight is placed on them	Overhaul lift cylinder

REMOTE CONTROL VALVES NOT WORKING – MECHANICALLY OPERATED TYPE

Problem	Possible Cause	Remedy
If hydraulic lift is not working	Various	Refer to fault finding chart for hydraulic lift not working
If hydraulic lift is working	Remote control valve fault	Test maximum system pressure at each remote valve coupler. If they reach correct pressure 200–207 bar (2900–3000 PSI) examine flow/pressure compensating valve for sticking
One of the remote valves does not reach the correct pressure		Operate all remote valve levers simultaneously. If the defective remote valve does not reach correct pressure, overhaul as required
Defective remote valve does reach the required pressure	Faulty Load sensing valve	Examine load sensing valve between remote valve sections

Remote Control Valves Not Working - Electro-Hydraulic (EHR) Type

Problem	Possible Cause	Remedy
When the key start is switched on the EHR control lever solenoids cannot be heard to activate	Faulty fuses (39 or 41)	Replace fuses if faulty
The EHR control lever solenoids can be heard to activate	Hydraulic stop button not in the operating position	Activate switch to the operating position
Hydraulic stop button is in operating position	Hydraulic lift not working	Refer to 'Hydraulic lift not working'
	EHR enable relay faulty	Replace the relay
	EHR fault codes may be stored in the controller memory	Refer to the fault code chapter in the electrical section
	Components in low pressure system may not be operating correctly	Low pressure supply to remotes not available. Fault find the low-pressure system as described in 'Transmission warning light ON '
Hydraulic lift and remote valve are operated simultaneusly and pressure is registered from the remote coupler	Fault in the load sense circuit or the compensating valve in the variable displacement pump	Identify and remedy fault
Hydraulic lift and remote valve are operated simultaneously and pressure is NOT registered from the remote coupler	Fault in the electrical system	Perform the EHR valve renumbering prodedure . If the valves are still inoperative check the CAN-BUS wiring between the remotes and the central controller. If the fault still persists re-load the software into the central controller and if still inoperative replace the processor

NOTES

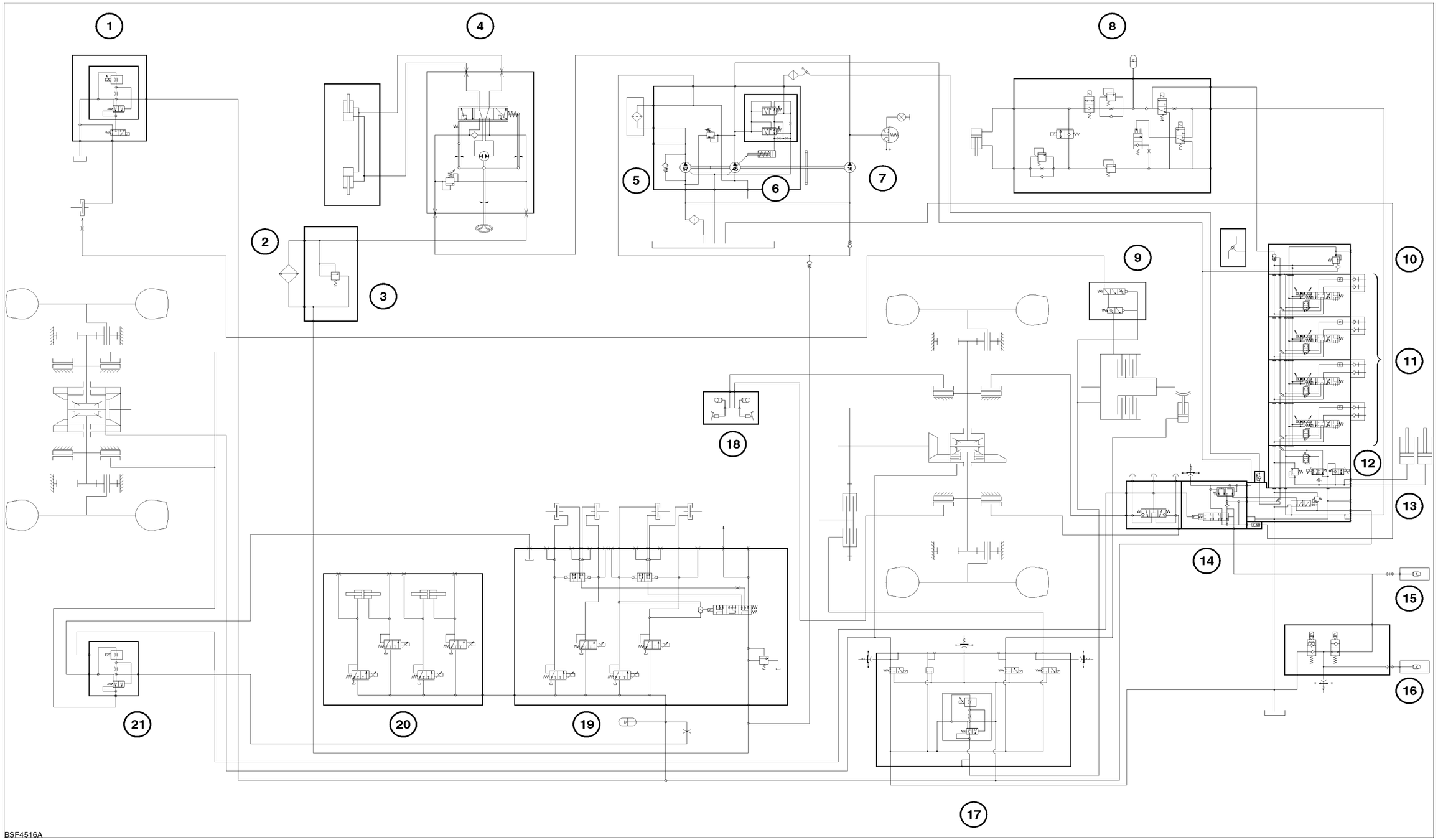
Fold out for Hydraulic System Schematic Diagrams

HYDRAULIC SYSTEM DIAGRAMS

MODEL 16 X 16
MODEL 24 X 24
MODEL 12 X 12

16 x 16 CCLS with Electronic Draft Control

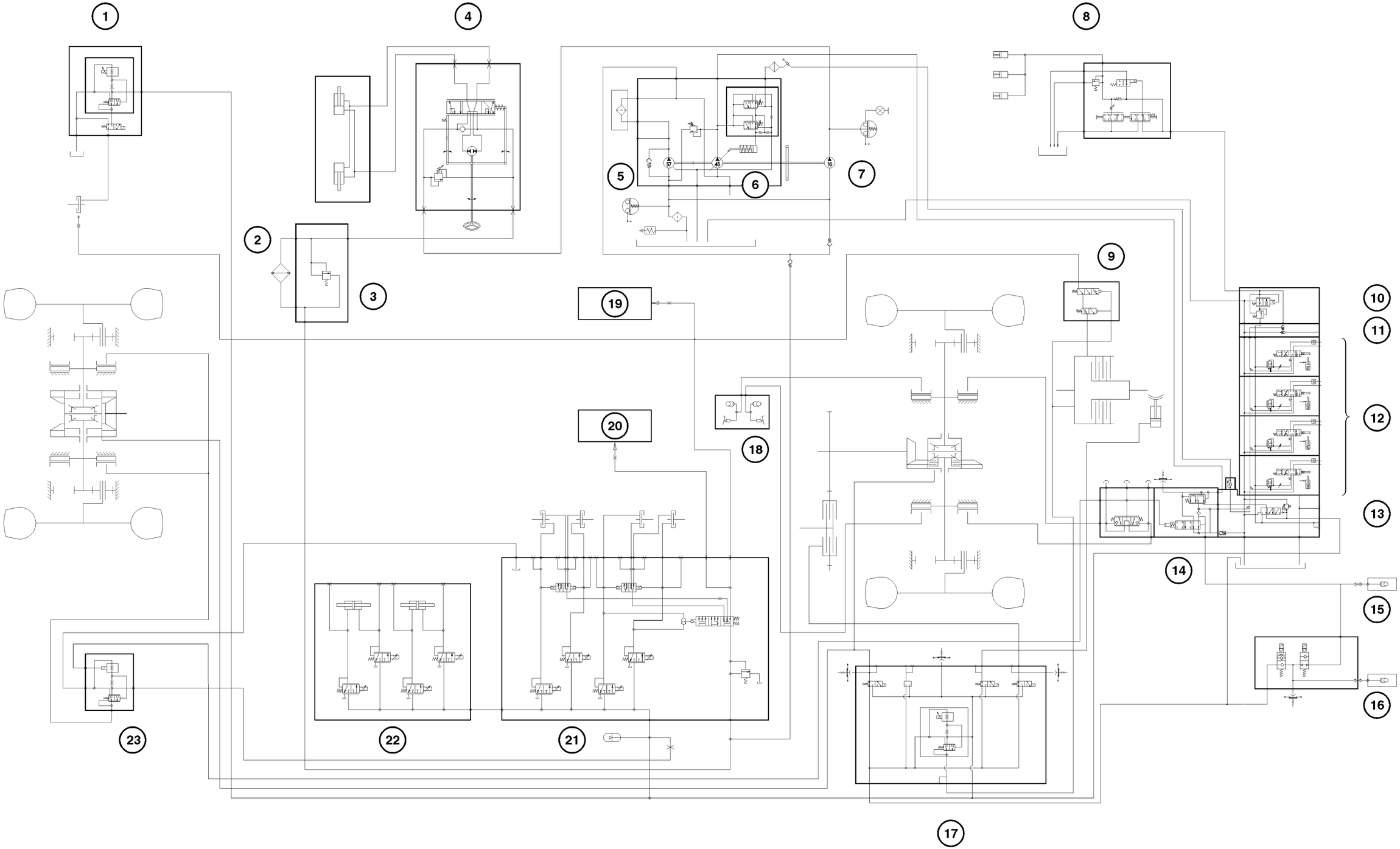
1. 50 KPH Engage and Dump Solenoids
2. Oil Cooler
3. Oil Cooler By Pass Valve
4. Steering Motor
5. Charge Pump
6. Variable Flow Pump
7. Steering Pump
8. Suspension Valve
9. PTO Lubrication Control Valve
10. End Plate
11. Electronic Remote Valves
12. EDC Valve
13. Sub Plate
14. Trailer Brake Valve
15. Trailer Brake Coupler
16. Italian Version Trailer Brake Coupler
17. Low Pressure Distribution Manifold
18. Brake Pedal Master Cylinders
19. Transmission Side Cover
20. Transmission Lubrication Valve
21. Front Brake Valve



16x16 CCLS EDC

16 x 16 CCLS with Mechanical Draft Control

1. 50 KPH Engage and Dump Solenoids
2. Oil Cooler
3. Oil Cooler By Pass Valve
4. Steering Motor
5. Charge Pump
6. Variable Flow Hydraulic Pump
7. Steering Pump
8. Mechanical Draft Control Valve
9. PTO Lubrication Control Valve
10. Flow Control Block
11. End Plate
12. Remote Control Valves
13. Sub Plate with Priority Valve and Power Beyond Ports
14. Trailer Brake Valve
15. Trailer Brake Coupler
16. Italian Trailer Brake Solenoid Block and Coupler
17. Low Pressure Distribution Manifold
18. Brake Pedals and Master Cylinders
19. Pumps Drive Lubrication
20. Transmission Lubrication
21. Transmission Side Cover - C1, C2, C3, and C4 Solenoids
22. Top Cover PWM Valves- 1-4, 5-8, Forward and Reverse
23. Front Brake Valve



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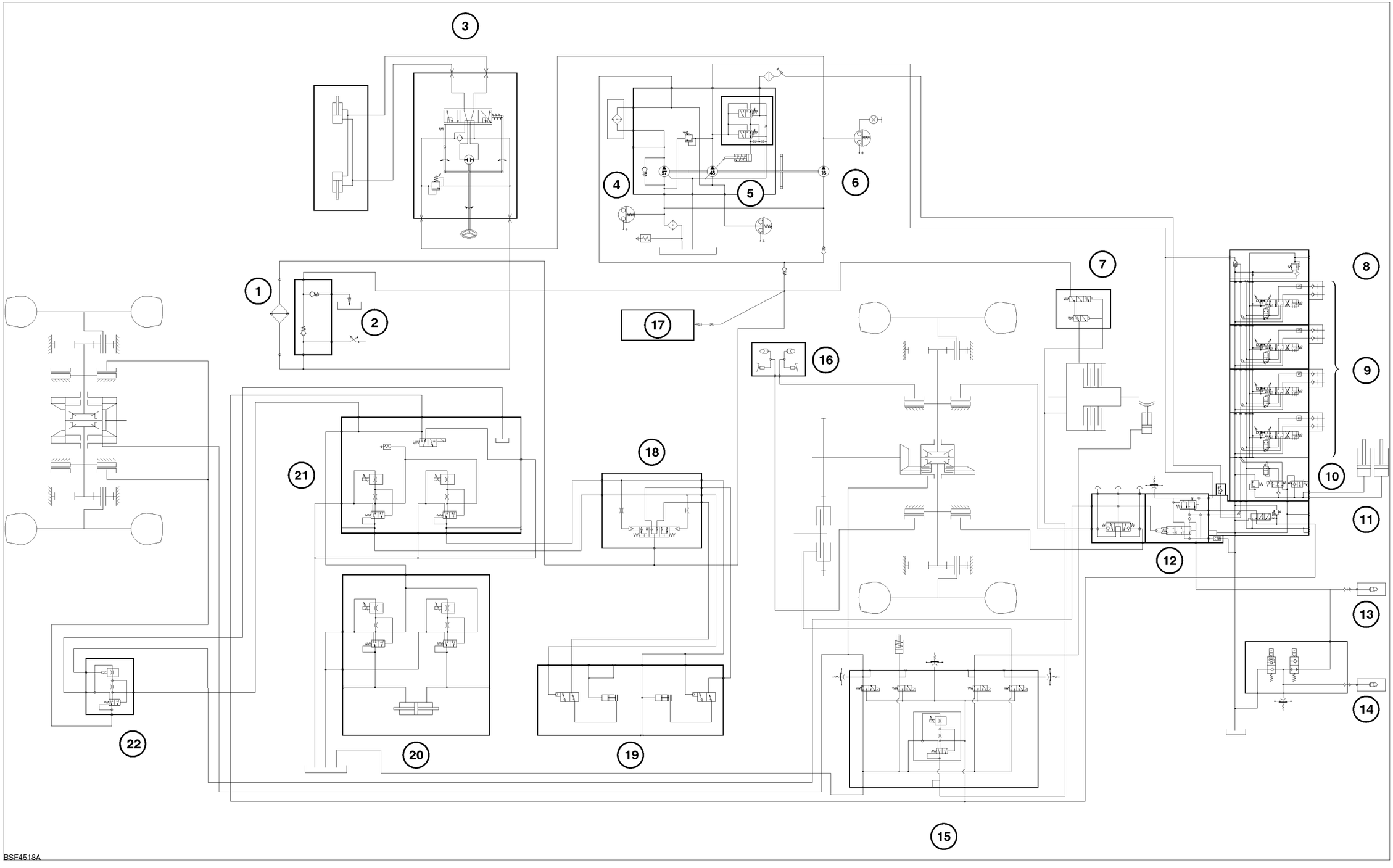
24 x 24 CCLS with Electronic Draft Control

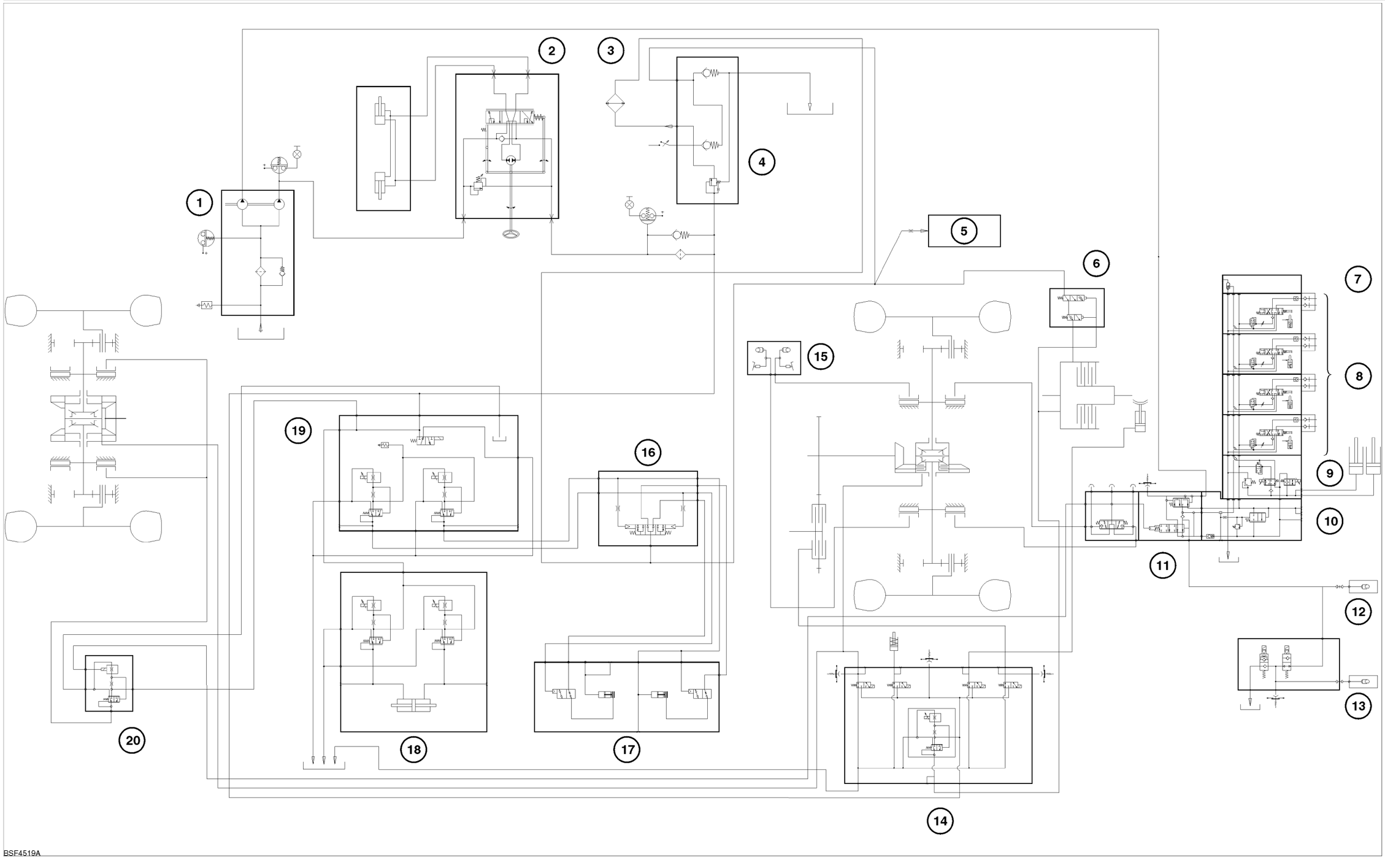
1. Oil Cooler
2. Lube Relief Valve and Oil Cooler By Pass Valve
3. Steering Motor
4. Charge Pump
5. Variable Flow Pump
6. Steering Pump
7. PTO Lubrication Control Valve
8. End Plate
9. Electronic Remote Valves
10. Electronic Draft Control Valve
11. Sub Plate with Low Pressure Priority Valve
12. Trailer Brake Valve
13. Trailer Brake Coupler
14. Italian Version Trailer Brake Coupler and Solenoid Assembly
15. Low Pressure Distribution Manifold
16. Brake Pedals and Master Cylinders
17. Pump Drive Lubrication
18. Hi Lo Lube Valve
19. C1, C2 Clutch Solenoids
20. Forward and Reverse Solenoid Valves
21. Hi Lo Valve
22. Front Brake Valve



24x24 CCLS EDC

24 x 24 Fixed Displacement with Electronic Draft Control

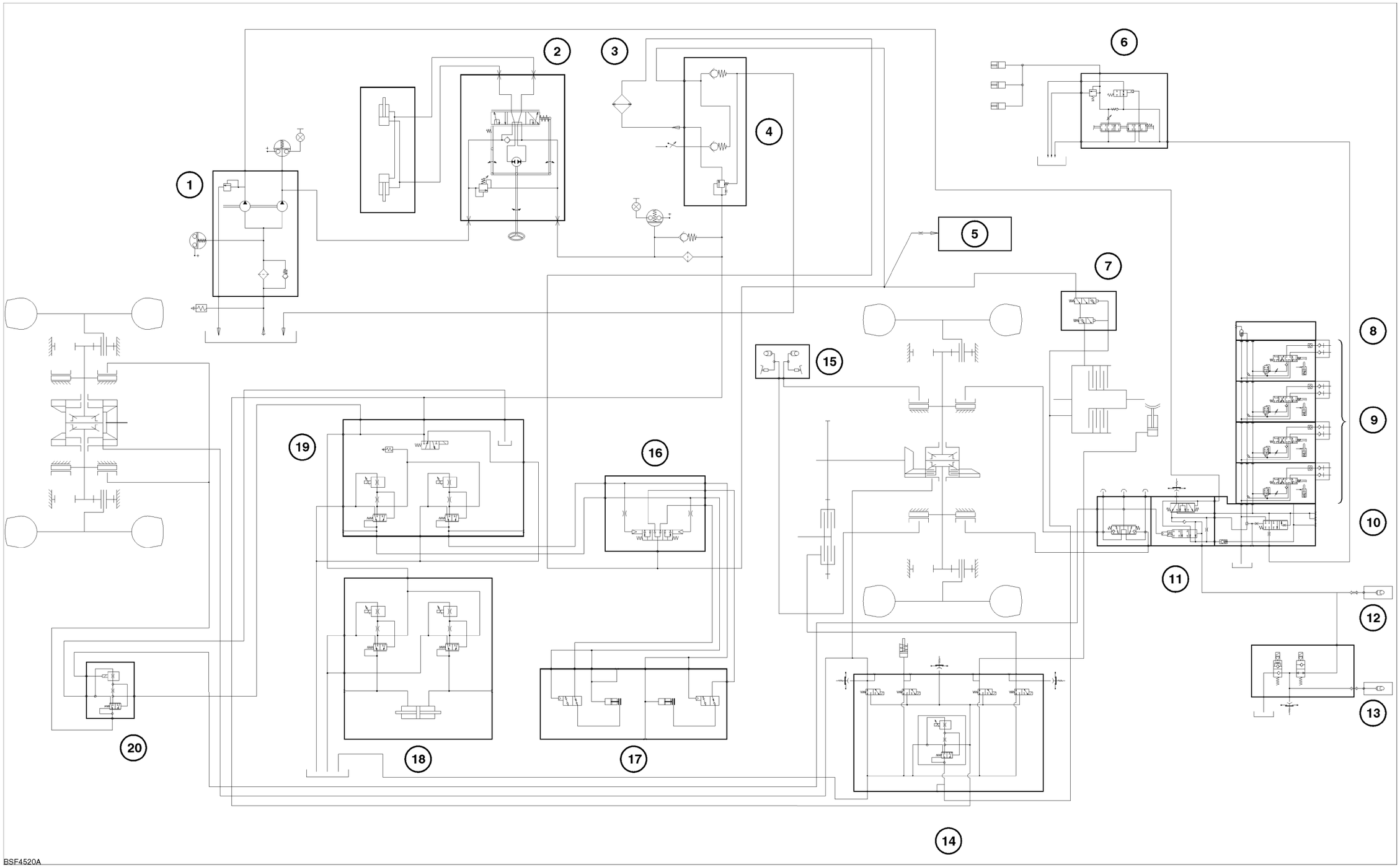
1. Fixed Displacement Pump
2. Steering Motor
3. Oil Cooler
4. Oil Cooler By Pass Valve, Lube Relief Valve, Regulating pressure Valve
5. Pumps Drive Lubrication
6. PTO Lubrication Control Valve
7. End Plate
8. Remote Control Valves
9. Electronic Draft Control Valve
10. Sub Plate with Unload Valve
11. Trailer Brake Valve
12. Trailer Brake Coupling
13. Italian Version Trailer Brake Coupling and Solenoid Assembly
14. Low Pressure Distribution Manifold
15. Brake Pedals and Master Cylinders
16. Hi Lo Lube Valve
17. Transmission Solenoids , C1and C2
18. Forward and Reverse Valve
19. Hi Lo Valve Assembly
20. Front Brake Valve



24x24 OC EDC

24 x 24 Fixed Displacement with Mechanical Draft Control

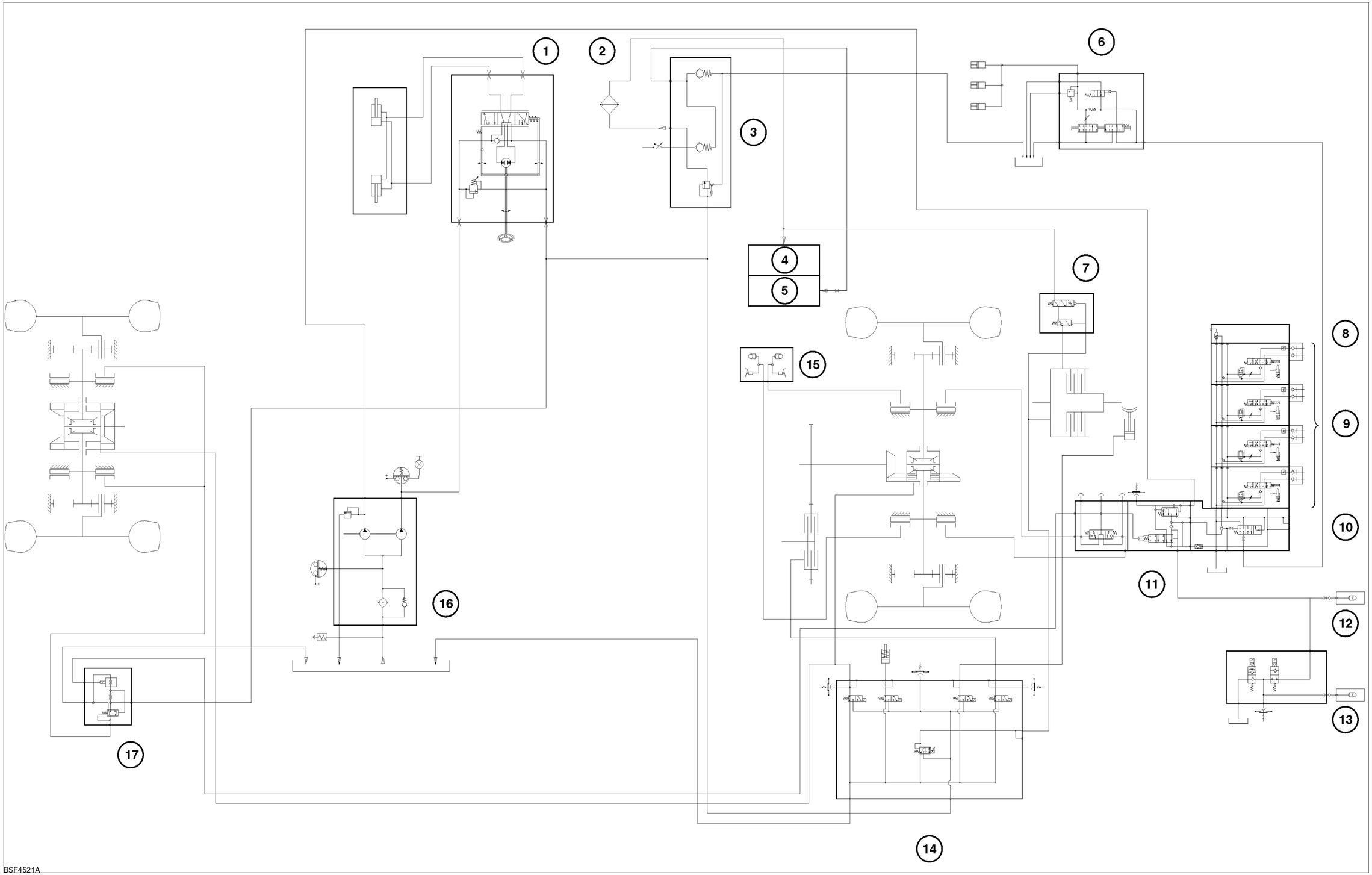
1. Fixed Displacement and Steering Pump
2. Steering Motor
3. Oil Cooler
4. Oil Cooler By Pass Valve , Lube Relief Valve, Regulating pressure Valve
5. Pumps Drive Lubrication
6. Mechanical Draft Control Valve
7. PTO Lubrication Control Valve
8. End Plate
9. Remote Control Valves
10. Sub Plate With Unload Valve
11. Trailer Brake Valve
12. Trailer Brake Coupling
13. Italian Version Trailer Brake Coupling and Solenoid Assembly
14. Low Pressure Distribution Manifold
15. Brake Pedals and Master Cylinders
16. Hi Lo Lube Valve
17. Transmission Solenoids , C1and C2
18. Forward and Reverse Valve
19. Hi Lo Valve Assembly
20. Front Brake Valve



24x24 OC MDC

12 x 12 Fixed Displacement With Mechanical Draft Control

1. Steering Motor
2. Oil Cooler
3. Oil Cooler By Pass Valve , Lube Relief Valve, Regulating pressure Valve
4. Transmission Lubrication
5. Pumps Drive Lubrication
6. Mechanical Draft Control Valv
7. PTO Lubrication Control Valve
8. End Plate
9. Remote Control Valves
10. Sub Plate With Unload Valve
11. Trailer Brake Valve
12. Trailer Brake Coupling
13. Italian Version Trailer Brake Coupling and Solenoid Assembly
14. Low Pressure Distribution Manifold
15. Brake Pedals and Master Cylinders
16. Fixed Displacement and Steering Pump
17. Front Brake Valve



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SECTION 35 - HYDRAULIC SYSTEMS

Chapter 2 - Variable Flow Hydraulic Pump Assembly

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SPECIFICATIONS

CHARGE PUMP (106 LTR/MIN)

Type	Gear Type Pump
Charge Pressure Filter Dump Valve	Crack open @ 6.9 bar (100 lbf/in^2) Fully Open @ 12.4 bar (180 lbf/in^2)
Charge Pressure	Minimum 1.6-3.4 bar (23-50 lbf/in^2) @ 2100 rev/min and variable flow piston pump 'On Load'
Charge Pressure Switch	Close @ 0.55-0.82 bar (8-12 lbf/in^2) Making charge pressure warning light flash

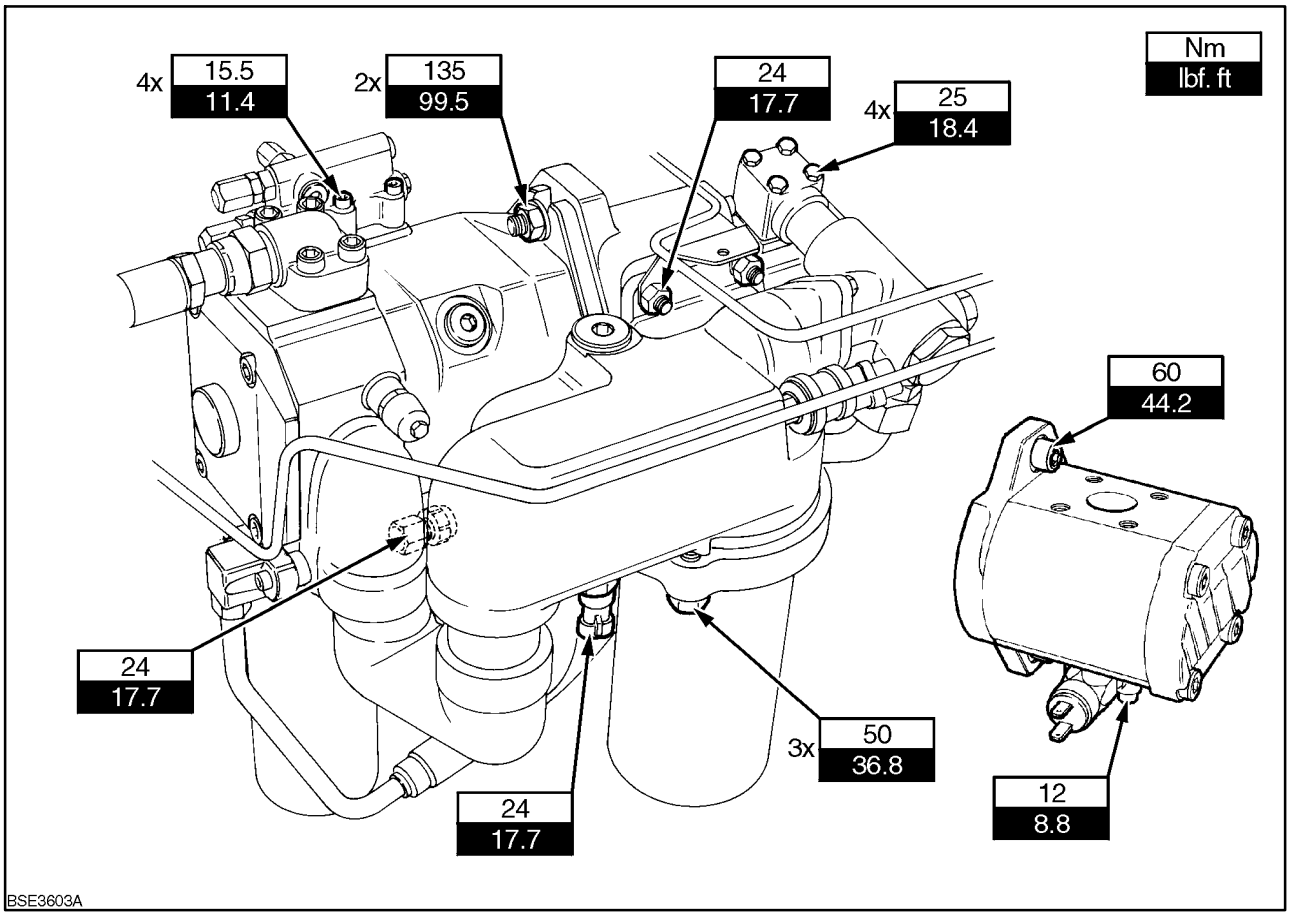
LOAD SENSED VARIABLE DISPLACEMENT PISTON PUMP

Type	Variable Flow Piston Pump (Swash Plate Controlled)
Rotation	Clockwise
Pump Speed@2200erpm	2662rpm
Minimum Output @ 2200 erpm	95-105 Ltr/min@ One Remote valve 25.1 - 27.7 US Galls/min
Minimum Output @ 2200 erpm	110-113 Ltr/min 29 -29.8 US Galls/min
Standby Pressure (Low Pressure Standby)	22 - 24 bar (319-348 lbf/in^2)
Maximum System Pressure (High Pressure Standby)	205-215 bar (2972-3118 lbf/in^2)
Charge Pressure Filter Relief Valve	6 bar
Charge System Pressure	3 bar
Nominal Case Drain	
max allowable @190bar main pump working pressure	5.7 - 6.7 ipm

STEERING/LOW PRESSURE CIRCUIT PUMP

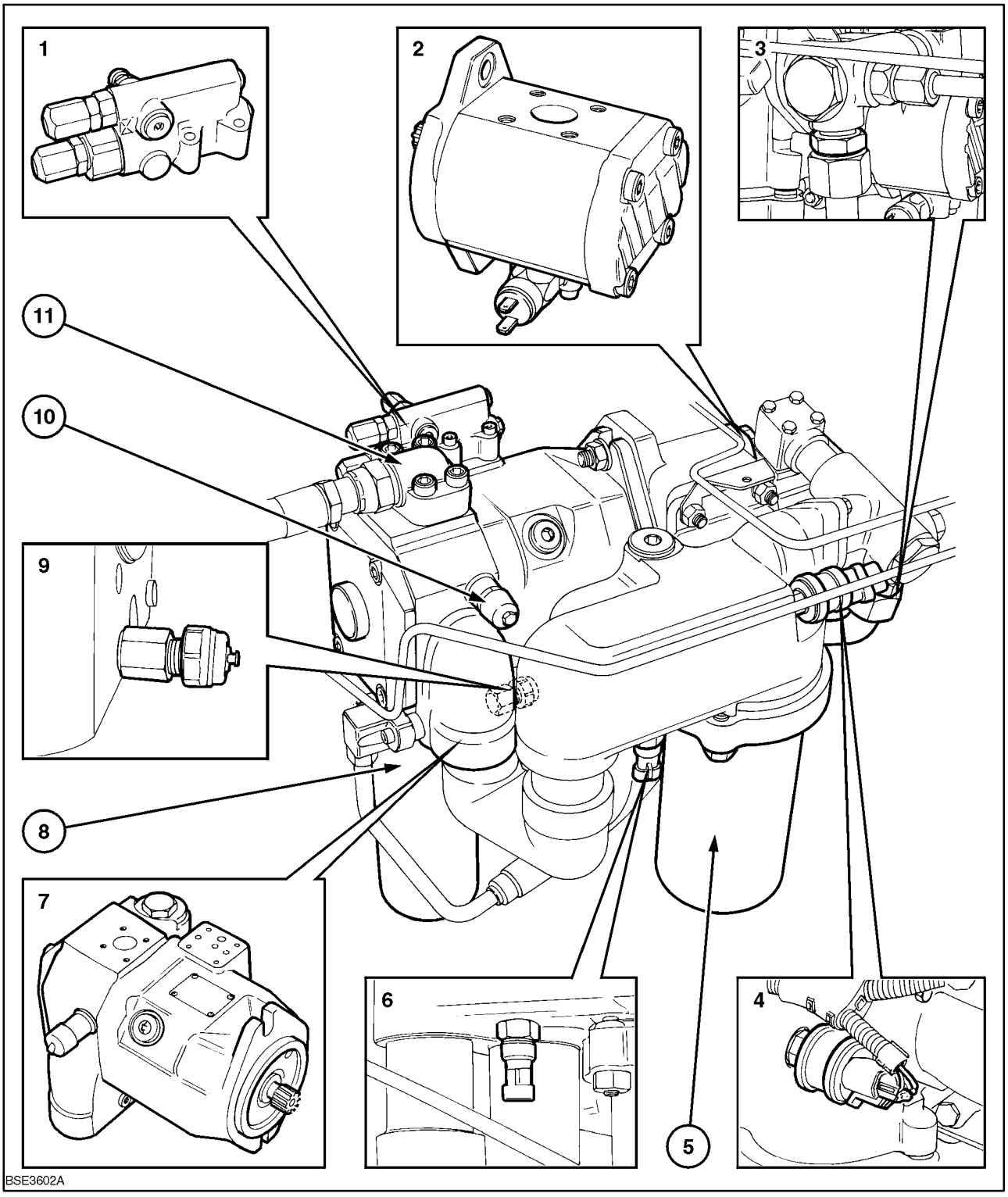
Type	Fixed Displacement Gear Type Pump
Minimum Output @ 2200 erpm	38.5 Ltr/min 10.2 US Galls/min
Flow to Steering Motor	22-28ltr/min 4.8-6.2 Imp Galls/min 5.8-7.4 US Galls/min
Steering Pressure	186bar (2700 lbf/in^2) max
Regulated Low Pressure	17 - 19 bar (247 - 276 lbf/in^2)

TIGHTENING TORQUES



1

35 000 DESCRIPTION AND OPERATION



2

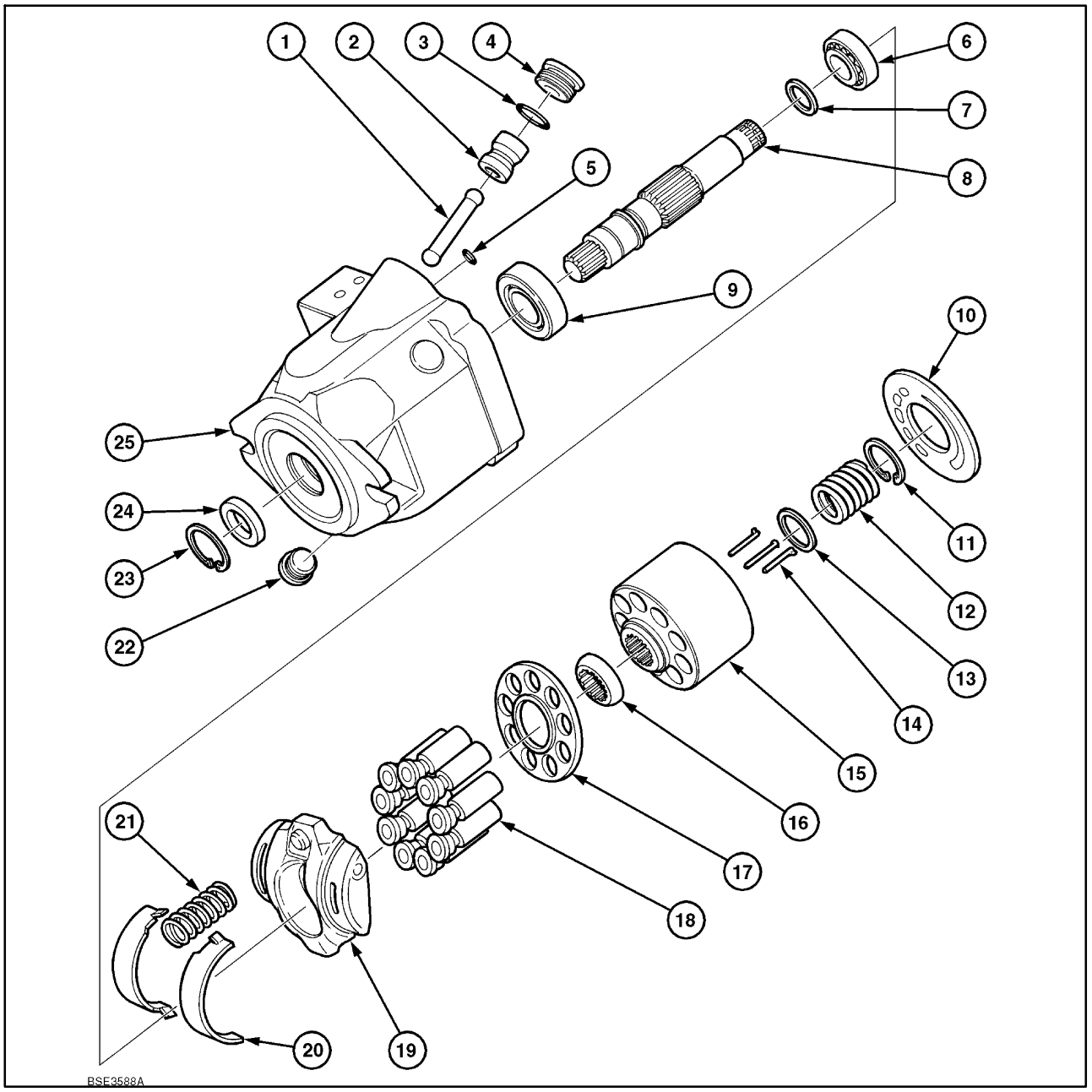
Hydraulic Pump Assembly With Variable Displacement Closed Center Load Sensing

1. Load Sensing Valve assembly
2. Steering Pump
3. Supplementary Lube valve and By-pass Valve
4. Main Intake Filter restriction (vacuum) Switch
5. Main Filter
6. Low OIl Temperature Switch
7. Variable Displacement Pump and Charge Pump
8. Charge Pump Filter
9. Low Charge Pressure Warning Switch
10. Main System Relief Valve (245 bar)
11. Pressure Feed to Remote Valve Block

HYDRAULIC PUMP

The variable flow closed center load sensing hydraulic pump assembly is mounted on the right hand side of the rear axle center housing and contains within its body two hydraulic pumps.

- A charge pump of the gear type to supply oil at a charge pressure of 3 bar (44 lbf/in^2) to a variable flow closed center load sensing hydraulic piston pump.
- A variable flow closed center load sensing piston type hydraulic pump supplying oil to the high pressure circuits for operation of:-
  - Trailer Brake
  - Hydraulic Lift Assembly
  - Remote Control Valves
  - Front Axle Suspension
  - Front Lift
  - Mid Mount remote valves



3

Variable Flow Piston Pump Pump Components

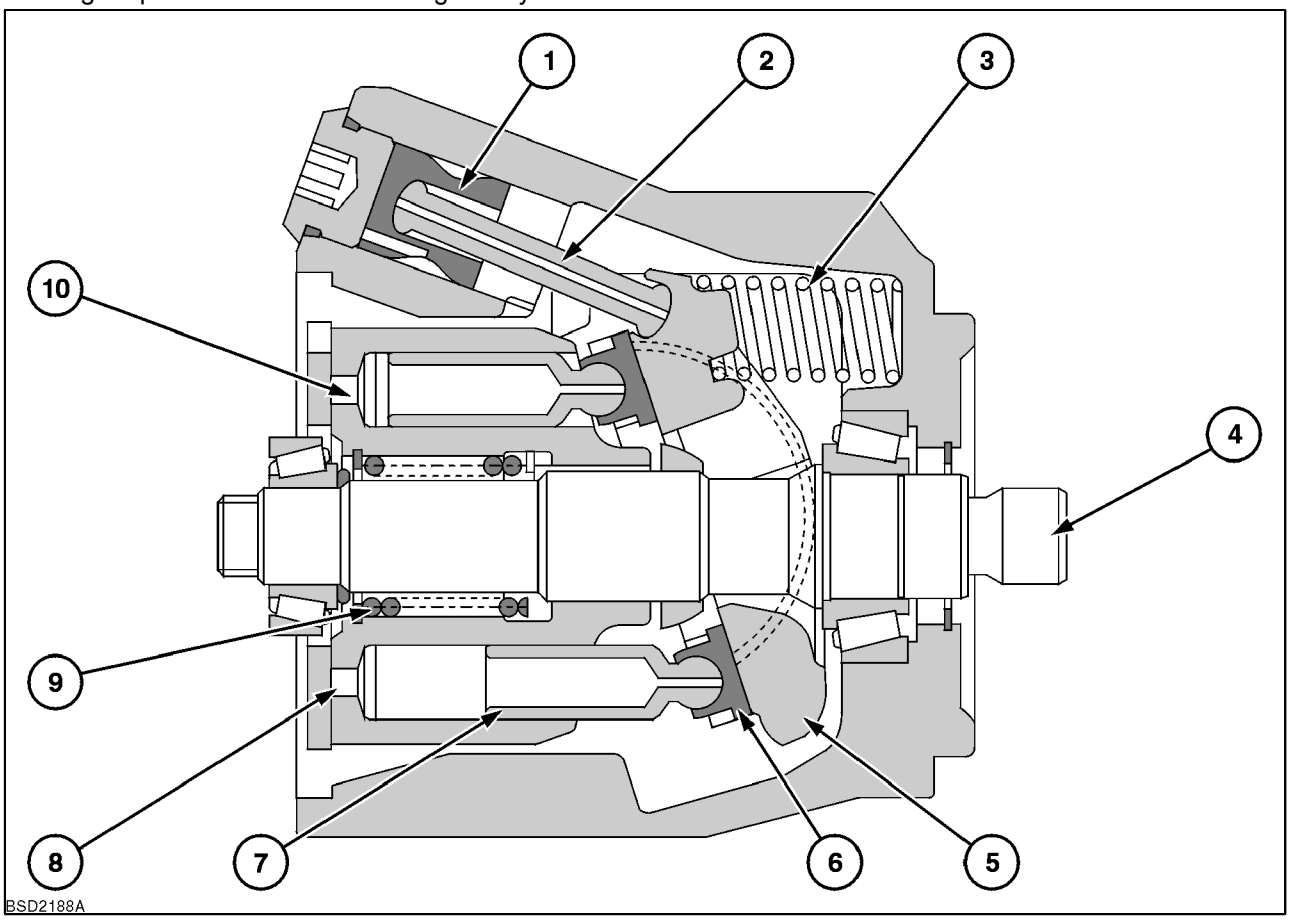
1. Rod
2. Piston
3. 'O' Ring
4. Plug
5. Seal
6. Bearing
7. Shim
8. Shaft
9. Bearing
10. Valve Plate
11. Snap Ring
12. Spring
13. Seal
14. Pins
15. Rotor Cylinder
16. Cone
17. Plate
18. Pistons
19. Swash Plate
20. Thrust Bearing
21. Spring

Both pumping elements are driven by a 'live' drive gear train directly connected to the PTO clutch input drive shaft and driven by the engine flywheel.

The operating principal of the fixed displacement gear pump is to provide a constant oil flow directly related to the rotation speed of the pump.

The operating principal of a variable flow piston pump is to provide oil flow on demand and minimises the engine power absorbed in driving the hydraulic pump when the hydraulic circuits do not require maximum pump flow.

The variable flow piston pump in hydraulic systems therefore has distinct power loss advantages over fixed displacement gear type pumps, which continually provide oil flow and absorb engine power even when the hydraulic circuits do not require the total pump output.



4

Variable Displacement Piston Pump-Sectional Drawing

1. Stroke control piston
2. Rod
3. Swash plate return spring
4. Driveshaft
5. Swash plate
6. Slipper (9 off)
7. Piston and barrel (9 off)
8. Inlet port
9. Shaft pre-load spring
10. Oulet port

VARIABLE DISPLACEMENT PISTON PUMP

The major components of the variable flow piston pump with closed center load sensing are:

- A nine element pumping head.
- A plate mechanism (swash plate) to adjust piston stroke and corresponding pump output.
- A load sensing valve which monitors the requirements of the hydraulic circuits and signals the pump to increase or decrease hydraulic oil flow accordingly.

The nine element pumping head is cylindrical in shape and has nine barrels, into each of which, is installed a piston. On the end of each piston is pressed a slipper which always remains in contact with the face of the swash plate located at the front of the pumping head.

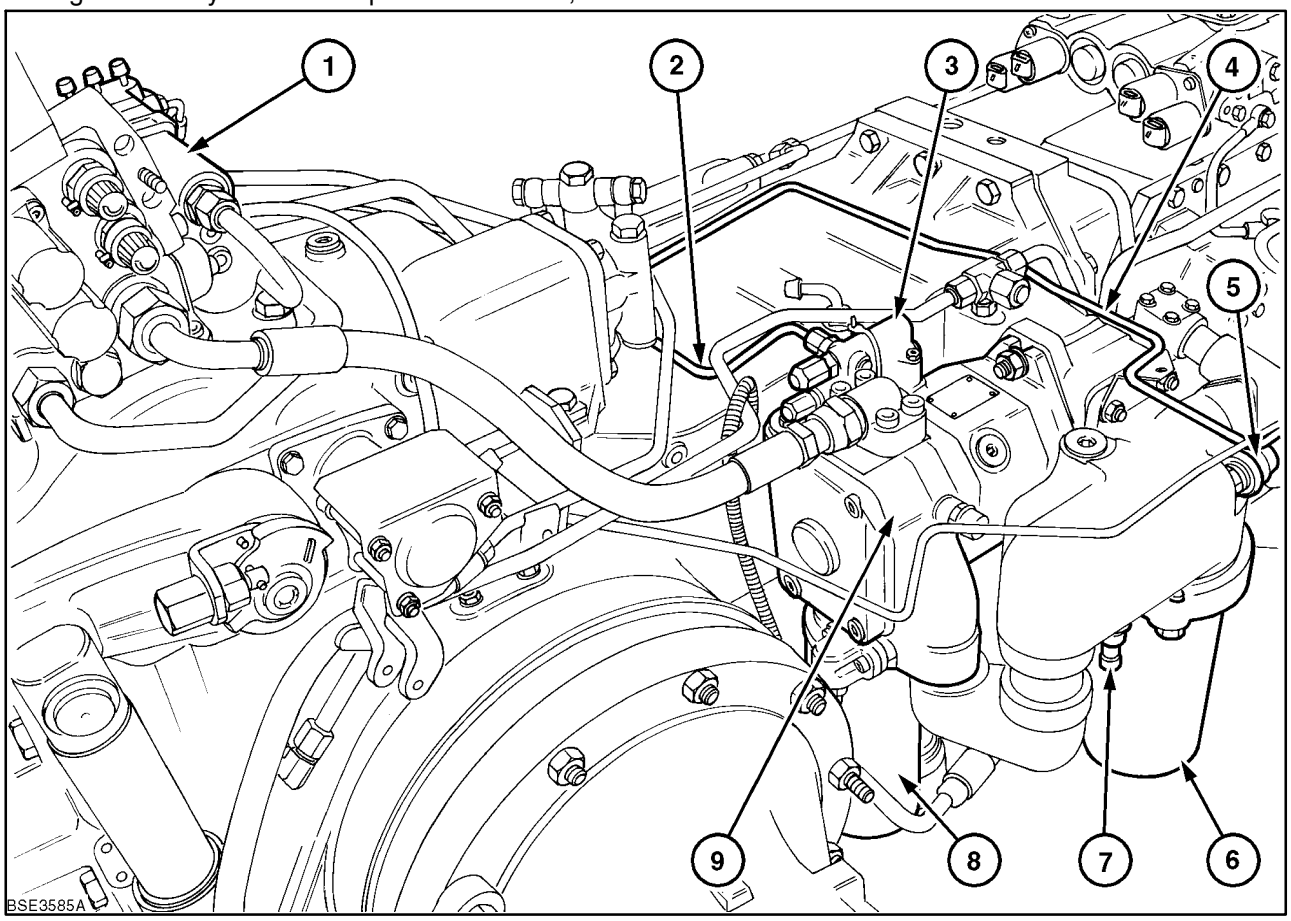
The drive shaft, which is driven by the pump drive gear, rotates the pumping head. As the pumping head rotates, the pistons move in and out of their barrels, following the contour of the swash plate. For

every revolution of the drive shaft each piston completes one pumping cycle.

The swash plate, which does not rotate but pivots about the front of the pumping head, is the control mechanism that limits the stroke of each piston and works in conjunction with the pressure and flow compensating valves in the load sensing line.

As the pumping head rotates each barrel passes over the inlet and then the outlet ports of the pump. During the inlet cycle for each piston and barrel, oil is pumped into the barrel pushing the piston forward so that it always remains in contact with the swash plate. The stroke of each piston and volume of oil charged into its barrel is therefore dependent on the angle of the swash plate.

After a piston and barrel has completed the inlet stroke, further rotation of the head aligns the barrel with the outlet port. Oil within the barrel is then forcibly ejected by the piston through the exhaust port to the hydraulic circuits.



5

Variable Displacement Hydraulic Pump Installation

1. Trailer Brake Valve Assembly
2. Load Sensing Line
3. Flow and Compensator Valve
4. Steering Pump
5. Filter Restriction Vacuum Switch
6. Main Intake Filter
7. Low Oil Temperature Switch
8. Charge Pressure Filter
9. Variable Displacement Pump

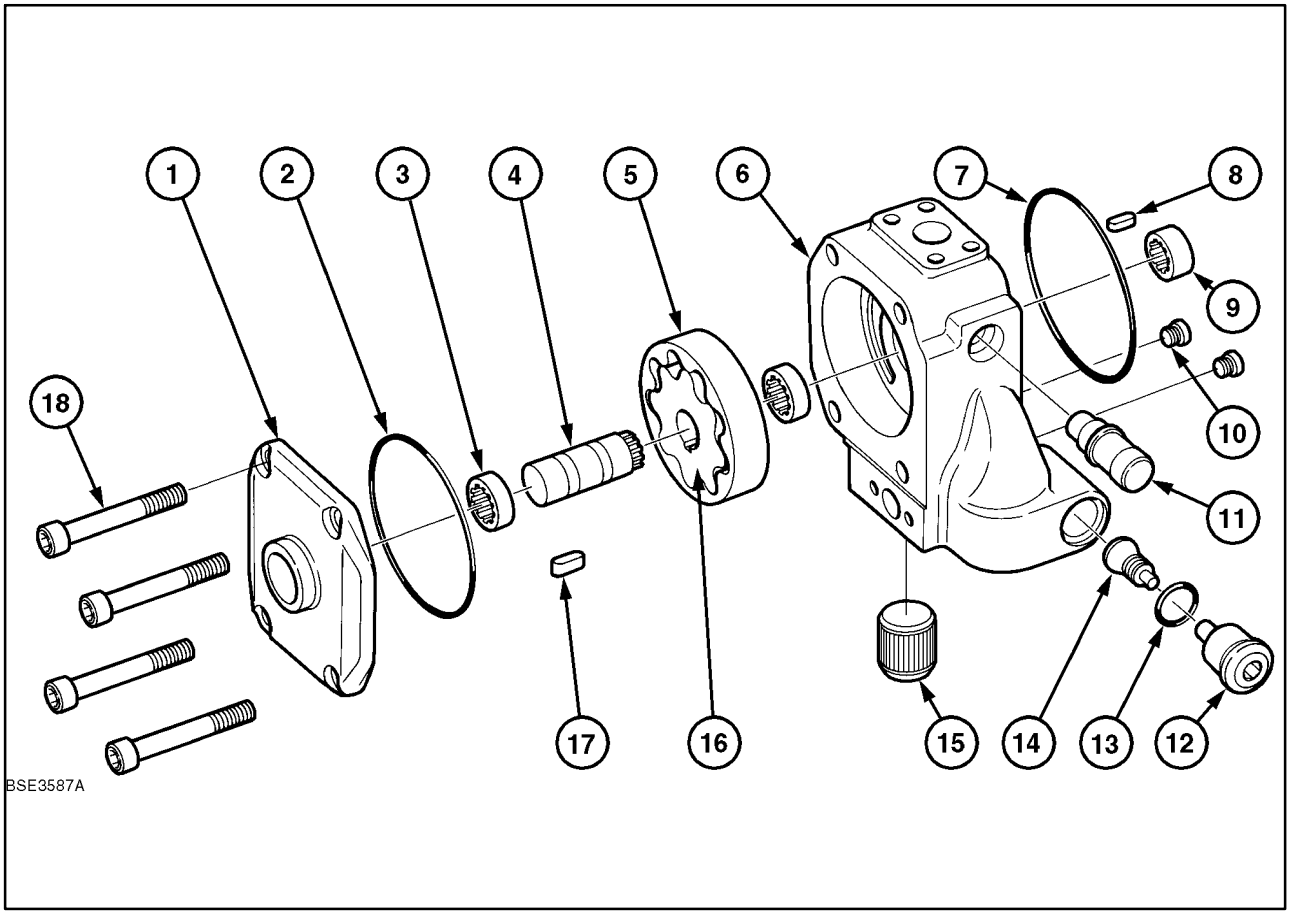
The location of the principal components in the hydraulic pump assembly are identified above. These items are shown on the hydraulic circuit diagrams which describe the operating modes of the pump. The principal function of the valves and switches is as follows:

INTAKE FILTER AND RESTRICTION SWITCH

Oil for both the charge and steering pump is drawn from the rear axle center housing via the intake filter. The filter incorporates a by-pass valve, which is an integral part of the replaceable filter and it is therefore essential that the correct filter is installed at every filter change.

When the filter is blocked the oil filter restriction vacuum switch is activated and illuminates the oil filter restriction warning light on the instrument panel.

Because oil is more viscous (thicker) when cold and can falsely indicate that the filter requires servicing a low temperature oil switch is also used in the filter restriction circuit. This switch ensures that the warning light will not operate if the oil temperature is less than 40°C.



6

Charge Pump Components

1. EndPlate
2. Seal
3. Coupling
4. Shaft
5. Rotor Housing
6. Charge Pump Housing
7. Seal
8. Pin
9. Hub
10. Screw Plug
11. System Relief Valve (245 Bar)
12. Check Valve Plug
13. Seal
14. Charge Pressure Filter Dump Valve Spool
15. Main Charge Filter
16. Pump Rotor
17. Key
18. Screws

LOW CHARGE PRESSURE SWITCH

The low charge pressure switch will cause a light to 'Flash' on the instrument cluster whenever the charge pressure is less than 0.75 bar (11 lbf/in^2)

CHARGE PRESSURE FILTER DUMP VALVE

The charge pressure filter dump valve is a safety relief valve for relieving excess pressure on the charge pump should the filter be restricted. This valve will start to operate if the charge pressure exceeds 6 bar (87 lbf/in^2).

CHARGE PRESSURE VALVE

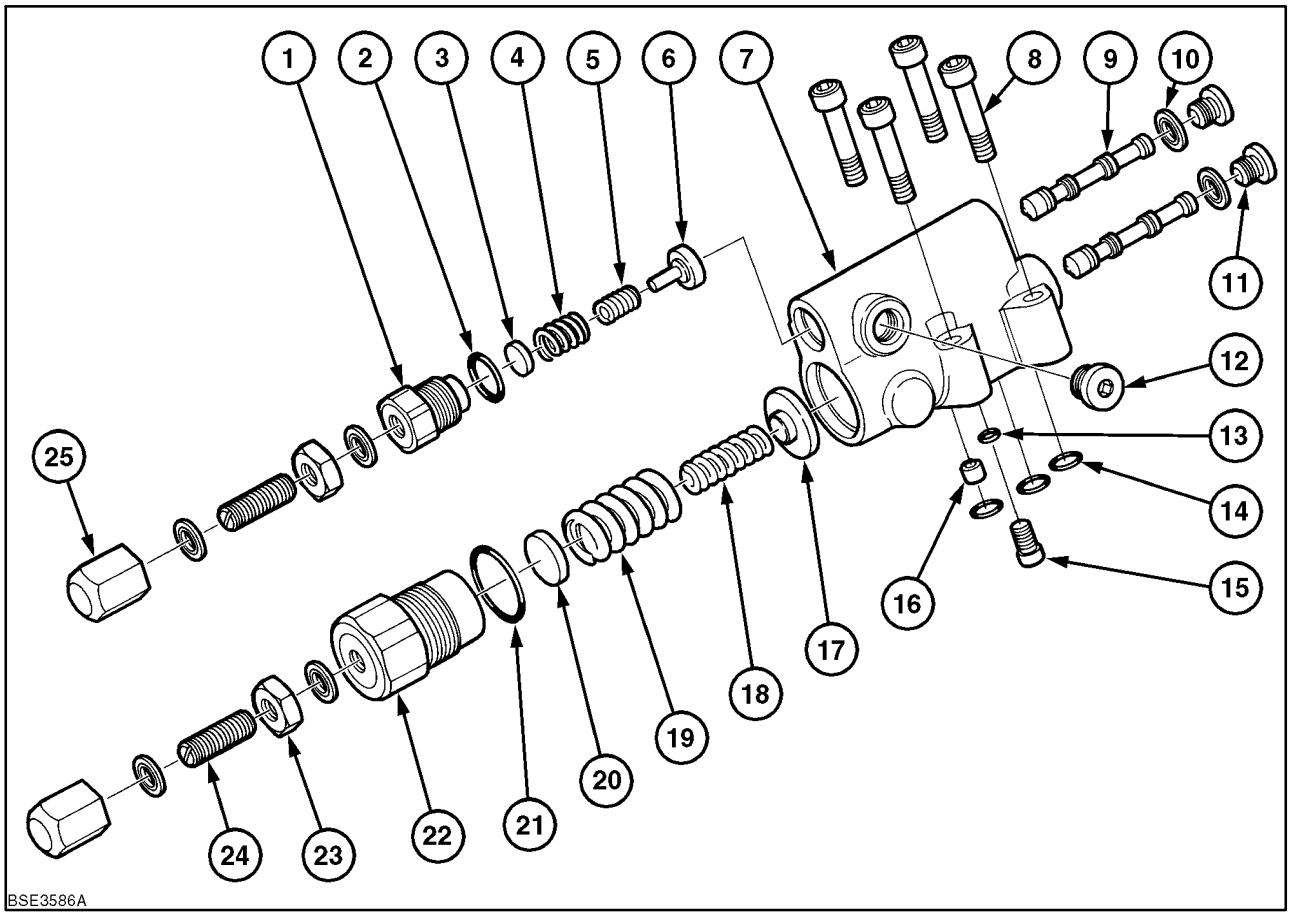
The charge pressure valve diverts excess oil supplied by the charge pump and not required by the variable flow piston pump to the inlet port of the steering and lubrication circuit pump.

This valve starts to operate at a pressure of 1 bar (14.5 lbf/in^2) and when fully open limits the charge pressure circuit oil to 3 bar (44 lbf/in^2) .

FLOW AND PRESSURE COMPENSATING VALVES

Output from the variable flow piston pump is determined by adjusting the angle of the swash plate in the pump. The flow compensating valve senses the circuit operating pressure and adjusts the swash plate angle to control pump output.

If pump output and circuit pressure rises to 205 bar (2973 PSI) the pressure compensating valve overrides the flow compensating valve and adjusts the swash plate angle to limit maximum system pressure.



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Flow and Pressure Compensating Valves

1. Plug
2. Seal
3. Disc
4. Spring
5. Spring
6. Seat
7. Housing
8. Screw
9. Spool
10. Snap-ring
11. Plug
12. Plug
13. Seal
14. Seal
15. Damper Screw
16. Nozzle
17. Seat
18. Spring
19. Spring
20. Disc
21. Seal
22. Plug
23. Nut
24. Screw
25. Locknut

HYDRAULIC CIRCUIT OPERATION

With Reference to Figure 8

The charge pressure pump draws oil through the charge pump inlet filter.

Oil drawn by the charge pump flows through the charge pressure filter to the variable flow piston pump and also through the charge pressure valve to the inlet port of the steering pump.

Because output from the charge pump can exceed the combined demand of the steering and variable displacement pumps an open gallery between the inlet side of the charge and steering pumps allows excess flow to the inlet side of the steering pump to be returned to the inlet side port of the charge pump.

The variable flow closed center load sensing hydraulic pump operates progressively in 5 modes:-

Generating Low Pressure Standby pressure

Low Pressure Standby

High Pressure Circuit Maximum Demand

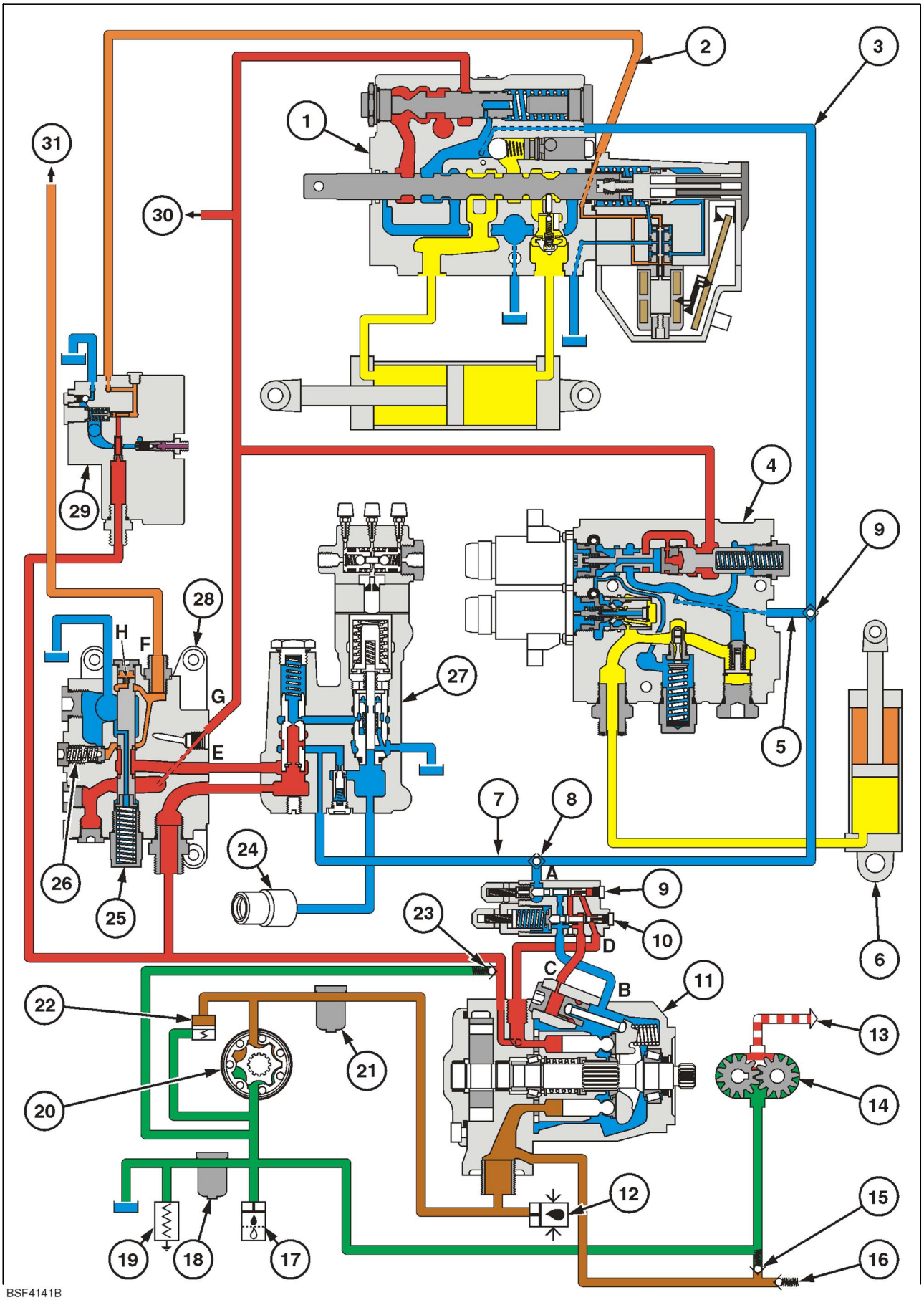
High Pressure Circuit Low Demand

Maximum System Pressure
(High Pressure Standby)

1. Electro Hydraulic Remote (EHR) Valve
2. Low Pressure Pilot Line for EHR Control Spool
3. Load Sensing LIne from EHR Valve
4. Electronic Draft Control (EDC) Valve
5. Load Sensing Line from EDC Valve
6. Lift Ram
7. Load Sensing Line from Trailer Brake Valve
8. Load Sensing Shuttle Valves
9. Flow Compensating Valve (22 bar)
10. Pressure Compensating Valve (205 bar)
11. Variable Displacement Pump Assembly
12. Low Charge Pressure Warning Switch
13. Steering System Supply oil
14. Steering Pump
15. Charge Pressure Bypass Valve (3 bar)
16. Supplementary lube valve (0.8 bar)
17. Main Intake Filter Vacuum Switch
18. Main Intake Filter
19. Low Temperature Switch (40°C switch prevents main filter blocked light illuminating until oil reaches at least 40°C)
20. Charge Pump
21. Charge Pressure Filter
22. Charge Pressure Filter Dump Valve (6 bar)
23. Main System Relief Valve (245 bar)
24. Trailer Brake Valve Outlet
25. Low Pressure Regulating Valve
26. Low Pressure Relief Valve (30 bar)
27. Trailer Brake Valve
28. Low Pressure Regulating Valve Assembly
29. End Plate with Pressure Regulator Valve for Supply to EHR Pilot Line (20-22 bar).
30. High Pressure Supply to Front Suspension or Mid Mount Remotes, where fitted.
31. Low pressure Supply to Transmission clutches, Four Wheel Drive, Differential Locks ,PTO clutch and PTO Brake.

A. Load Sensing Line from High pressure circuit components.
B. Return to Reservoir from flow and pressure compensating valves.
C. Gallery to Swash Plate servo piston from flow and compensating valves
D. System Pressure sensing gallery to flow and pressure compensating valves
E. System pressure supply to low pressure regulating valve
F. Regulated Low pressure oil supply
G. System pressure outlet from low pressure regulaing valve
H. Low pressure regulating valve spool sensing gallery

System Pressure @ 205 bar
Standby Pressure @ 22 bar
Control Pressure
Charge Pressure @ 3 bar
Suction
Return to Reservoir
Steering Circuit
Low Pressure @ 17 bar
Trapped Oil
Lubrication oil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GENERATING LOW PRESSURE STANDBY

With Reference to Figure 9

Low pressure standby is the system pressure, 21 bar (304 lbf/in$^{2)}$, maintained by the hydraulic pump when high pressure hydraulic circuits are not being operated.

Control of the swash plate, which regulates the output of the variable displacement piston pump, is achieved by the flow and pressure compensating valves located on the top of the pump.

When the engine is first started, the swash plate return spring positions the swash plate for maximum output of the pump. During engine start up, Low Standby Pressure has not yet been generated by the pump and the flow compensating valve spool is held to the right by spring pressure. The position of the spool prevents oil pressure generated by the pump, being applied through gallery D to the swash plate servo piston through gallery "C". The swash plate consequently remains in the maximum flow position until the piston pump has developed standby pressure.

1. Electro Hydraulic Remote (EHR) Valve
2. Low Pressure Pilot Line for EHR Control Spool
3. Load Sensing LIne from EHR Valve
4. Electronic Draft Control (EDC) Valve
5. Load Sensing Line from EDC Valve
6. Lift Ram
7. Load Sensing Line from Trailer Brake Valve
8. Load Sensing Shuttle Valves
9. Flow Compensating Valve (22 bar)
10. Pressure Compensating Valve (205 bar)
11. Variable Displacement Pump Assembly
12. Low Charge Pressure Warning Switch
13. Steering System Supply oil
14. Steering Pump
15. Charge Pressure Bypass Valve (3 bar)
16. Supplementary lube oil (0.8 bar)
17. Main Intake Filter Vacuum Switch
18. Main Intake Filter
19. Low Temperature Switch (40°C switch prevents main filter blocked light illuminating until oil reaches at least 40°C)
20. Charge Pump
21. Charge Pressure Filter
22. Charge Pressure Filter Dump Valve (6 bar)
23. Main System Relief Valve (245 bar)
24. Trailer Brake Valve Outlet
25. Low Pressure Regulating Valve
26. Low Pressure Relief Valve (30 bar)
27. Trailer Brake Valve
28. Low Pressure Regulating Valve Assembly
29. End Plate with Pressure Regulator Valve for Supply to EHR Pilot Line (20-22 bar).
30. High Pressure Supply to Front Suspension or Mid Mount Remotes (Where Fitted).
31. Low Pressure Circuit Supply to Four wheel Drive , Differential locks, PTO Clutch and PTO Brake.

System Pressure @ 205 bar

Standby Pressure @ 22 bar

Control Pressure

Charge Pressure @ 3 bar

Suction

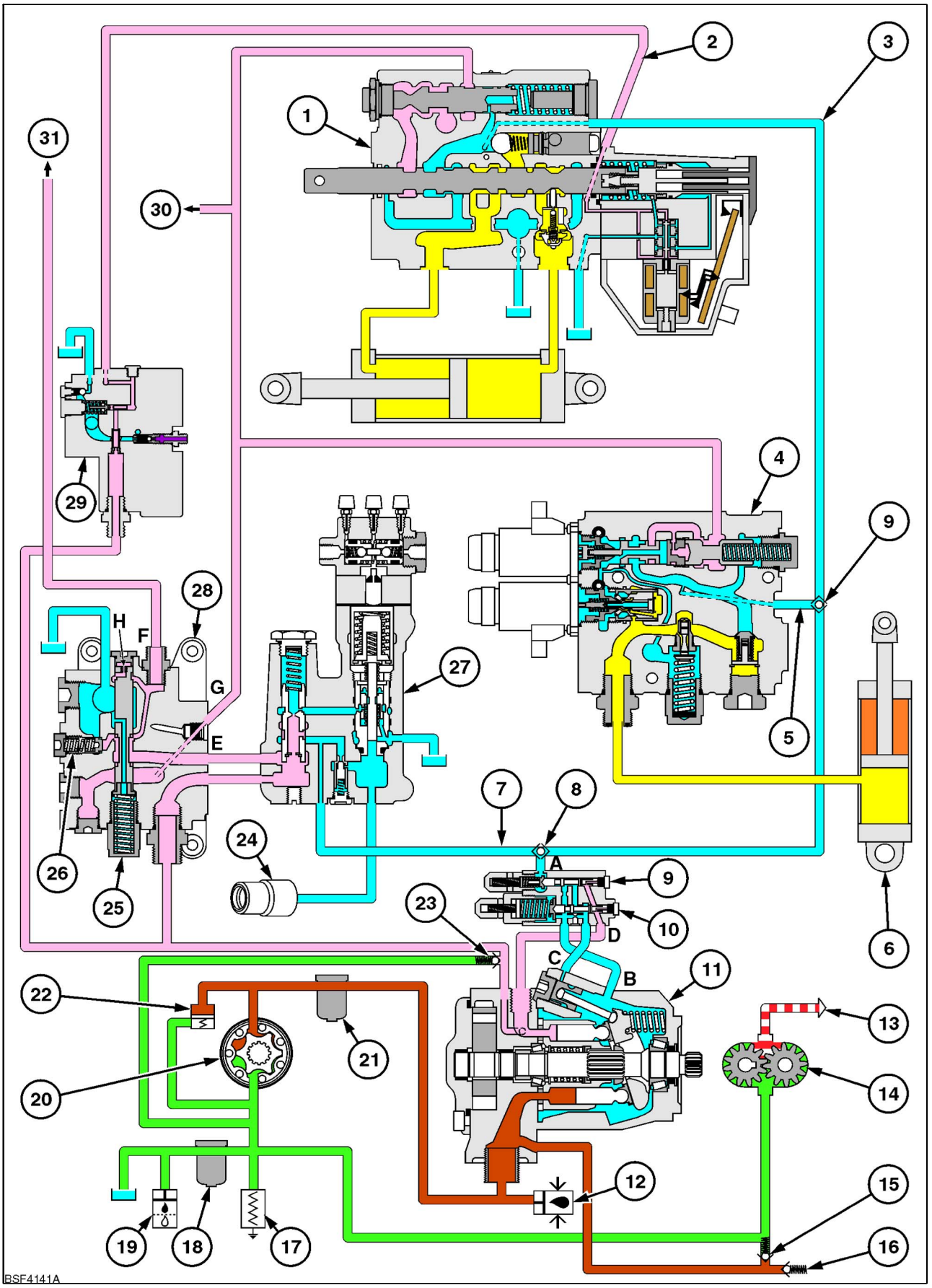
Return to Reservoir

Steering Circuit

Low Pressure @ 17 bar

Trapped Oil

Lubrication oil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REGULATING LOW PRESSURE STANDBY

With Reference to Figure 10

When the pressure in the system is below 17 bar the Low-Pressure Priority valve is held by the spring to give flow priority to the low-pressure systems.

As the pressure in the system increases to 17 bar the Low-Pressure Priority valve is moved against the spring, by the pressure sensed through the orifice, to allow increased flow to the high pressure systems and regulates the pressure in the low pressure system.

As system pressure continues increases to 22 bar, known as Low Standby Pressure, the increase in pressure is sensed in gallery D and applied to the end of the flow compensator spool. The spool gradually moves against the spring allowing oil flow from gallery D to gallery C, Figure 10.

The controlled pressure rise in gallery C operates the swash plate servo piston, changing the angle of the swash plate in relation to the pumping head. The change in angle reduces the operating stroke of the pistons and output of the pump.

As pump output decreases and the pressure in gallery D reduces to less than 22 bar, the spring in the flow compensating valve gradually moves the spool to the left opening gallery C to sump through gallery B, via the spring cavity of the pressure compensating valve. This reduces the pressure applied to the servo piston, allowing the servo piston to retract at a controlled rate under pressure from the swash plate return spring, which re-adjusts the angle of the swash plate to increase pump output.

This process where the flow compensating valve spool moves back and forth to control the pressure applied to the servo piston, continues until there is a demand by the hydraulic system to increase output to operate the hydraulic lift, remote control valves, front axle suspension (where fitted) or trailer brakes (where fitted).

1. Electro Hydraulic Remote (EHR) Valve
2. Low Pressure Pilot Line for EHR Control Spool
3. Load Sensing LIne from EHR Valve
4. Electronic Draft Control (EDC) Valve
5. Load Sensing Line from EDC Valve
6. Lift Ram
7. Load Sensing Line from Trailer Brake Valve
8. Load Sensing Shuttle Valves
9. Flow Compensating Valve (22 bar)
10. Pressure Compensating Valve (205 bar)
11. Variable Displacement Pump Assembly
12. Low Charge Pressure Warning Switch
13. Steering System Supply oil
14. Steering Pump
15. Charge Pressure Bypass Valve (3 bar)
16. Supplementary lube oil (0.8 bar)
17. Main Intake Filter Vacuum Switch
18. Main Intake Filter
19. Low Temperature Switch (40°C switch prevents main filter blocked light illuminating until oil reaches at least 40°C)
20. Charge Pump
21. Charge Pressure Filter
22. Charge Pressure Filter Dump Valve (6 bar)
23. Main System Relief Valve (245 bar)
24. Trailer Brake Valve Outlet
25. Low Pressure Regulating Valve
26. Low Pressure Relief Valve (30 bar)
27. Trailer Brake Valve
28. Low Pressure Regulating Valve Assembly
29. End Plate with Pressure Regulator Valve for Supply to EHR Pilot Line (20-22 bar).
30. High Pressure Supply to Front Suspension or Mid Mount Remotes (Where Fitted).
31. Low Pressure Circuit Supply to Four wheel Drive , Differential locks, PTO Clutch and PTO Brake.

System Pressure @ 205 bar

Standby Pressure @ 22 bar

Control Pressure

Charge Pressure @ 3 bar

Suction

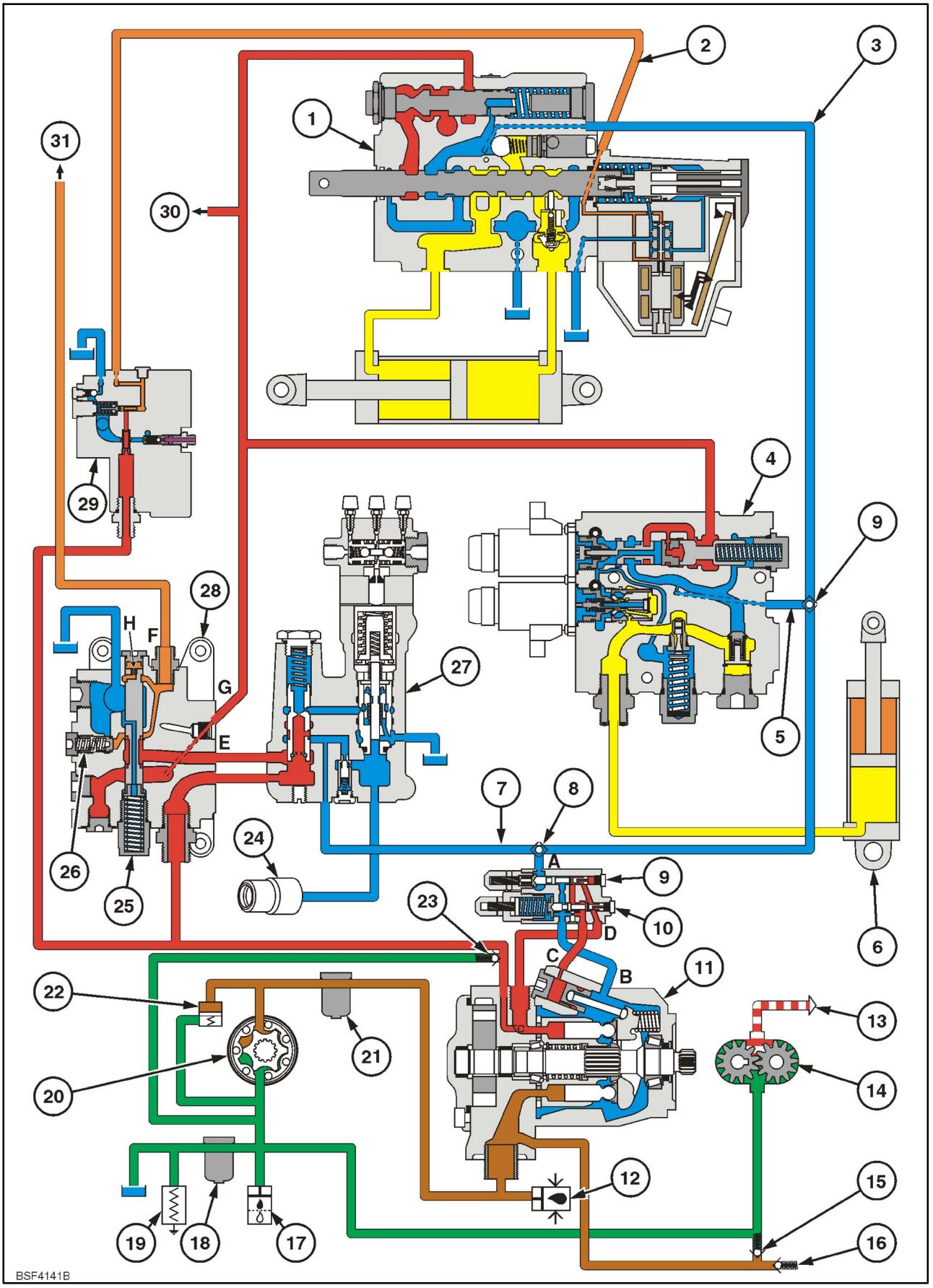
Return to Reservoir

Steering Circuit

Low Pressure @ 17 bar

Trapped Oil

Lubrication oil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HIGH PRESSURE CIRCUIT HIGH DEMAND

With Reference to Figure 11

After the pump has reached standby pressure and one of the high pressure services is operated, the pressure rise in the hydraulic circuit being operated is sensed by the load sensing line A.

The pressure in the sensing line is now applied to the spring loaded end of the flow compensator valve.

The combined pressure from the pilot line and flow compensating valve return spring causes the flow compensating spool to move against the standby pressure in gallery D, preventing the flow of oil to the swash plate servo piston through gallery C.

The movement of the spool opens gallery C to the return to sump gallery B, allowing the servo piston to retract under pressure from the swash plate return spring, which re-adjusts the angle of the swash plate to increase pump output.

As the pressure in the system increases the Low Pressure Priority Valve works against the spring to regulate the low pressure system to 17 Bar.

1. Electro Hydraulic Remote (EHR) Valve
2. Low Pressure Pilot Line for EHR Control Spool
3. Load Sensing LIne from EHR Valve
4. Electronic Draft Control (EDC) Valve
5. Load Sensing Line from EDC Valve
6. Lift Ram
7. Load Sensing Line from Trailer Brake Valve
8. Load Sensing Shuttle Valves
9. Flow Compensating Valve (22 bar)
10. Pressure Compensating Valve (205 bar)
11. Variable Displacement Pump Assembly
12. Low Charge Pressure Warning Switch
13. Steering System Supply oil
14. Steering Pump
15. Charge Pressure Bypass Valve (3 bar)
16. Supplementary lube oil (0.8 bar)
17. Main Intake Filter Vacuum Switch
18. Main Intake Filter
19. Low Temperature Switch (40°C switch prevents main filter blocked light illuminating until oil reaches at least 40°C)
20. Charge Pump
21. Charge Pressure Filter
22. Charge Pressure Filter Dump Valve (6 bar)
23. Main System Relief Valve (245 bar)
24. Trailer Brake Valve Outlet
25. Low Pressure Regulating Valve
26. Low Pressure Relief Valve (30 bar)
27. Trailer Brake Valve
28. Low Pressure Regulating Valve Assembly
29. End Plate with Pressure Regulator Valve for Supply to EHR Pilot Line (20-22 bar).
30. High Pressure Supply to Front Suspension or Mid Mount Remotes (Where Fitted).
31. Low Pressure Circuit Supply to Four wheel Drive , Differential locks, PTO Clutch and PTO Brake.

System Pressure @ 205 bar

Standby Pressure @ 22 bar

Control Pressure

Charge Pressure @ 3 bar

Suction

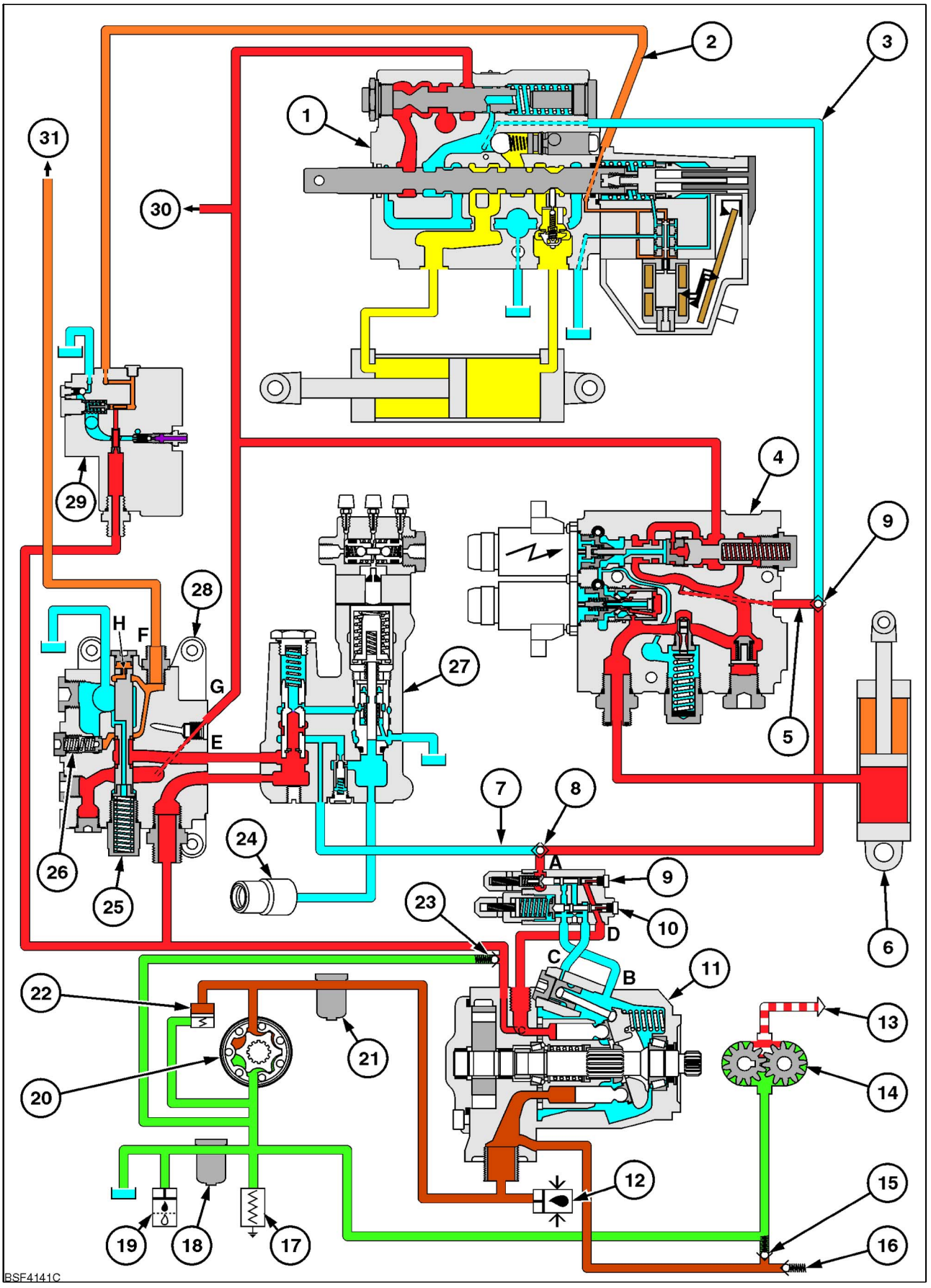
Return to Reservoir

Steering Circuit

Low Pressure @ 17 bar

Trapped Oil

Lubrication oil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HIGH PRESSURE CIRCUIT LOW DEMAND

With Reference to Figure 12

As pump output increases so does the system pressure generated and applied to the end of the flow compensating spool through gallery D.

When the hydraulic operating cycle nears completion, eg. the hydraulic lift is raised out of the ground and the main spool in the electronic draft control valve gradually returns to the neutral position, the pressure in the load sensing line similarly begins to decrease. When the pressure generated in gallery D is 22 bar greater than that in the load sensing gallery A the flow compensator spool moves back against the spring to open gallery D to gallery C. The controlled pressure rise in gallery C now operates the swash plate servo piston and changes the swash plate angle to reduce pump output and the speed of lift.

It can now be seen that the basic principle of pump control, when operating the hydraulic high pressure circuits, is similar to that for operation of the pump at standby pressure when there is no high pressure hydraulic demand. The only difference is that because the pressure in the hydraulic system circuit being operated is sensed through the load sensing line A, the pressure required to operate the flow compensating valve is higher than that for standby pressure operation.

The Low-Pressure Priority Valve will continue to sense the changes in system pressure to regulate the low-pressure system to 17 Bar.

1. Electro Hydraulic Remote (EHR) Valve
2. Low Pressure Pilot Line for EHR Control Spool
3. Load Sensing LIne from EHR Valve
4. Electronic Draft Control (EDC) Valve
5. To Lube Circuit
6. Lift Ram
7. Load Sensing Line from Trailer Brake Valve
8. Load Sensing Shuttle Valves
9. Flow Compensating Valve (22 bar)
10. Pressure Compensating Valve (205 bar)
11. Variable Displacement Pump Assembly
12. Low Charge Pressure Warning Switch
13. Steering System Supply oil
14. Steering Pump
15. Charge Pressure Bypass Valve (3 bar)
16. Supplementary lube oil (0.8 bar)
17. Main Intake Filter Vacuum Switch
18. Main Intake Filter
19. Low Temperature Switch (40°C switch prevents main filter blocked light illuminating until oil reaches at least 40°C)
20. Charge Pump
21. Charge Pressure Filter
22. Charge Pressure Filter Dump Valve (6 bar)
23. Main System Relief Valve (245 bar)
24. Trailer Brake Valve Outlet
25. Low Pressure Regulating Valve
26. Low Pressure Relief Valve (30 bar)
27. Trailer Brake Valve
28. Low Pressure Regulating Valve Assembly
29. End Plate with Pressure Regulator Valve for Supply to EHR Pilot Line (20-22 bar).
30. High Pressure Supply to Front Suspension or Mid Mount Remotes (Where Fitted).
31. Low Pressure Circuit Supply to Four wheel Drive , Differential locks, PTO Clutch and PTO Brake.

System Pressure @ 205 bar

Standby Pressure @ 22 bar

Control Pressure

Charge Pressure @ 3 bar

Suction

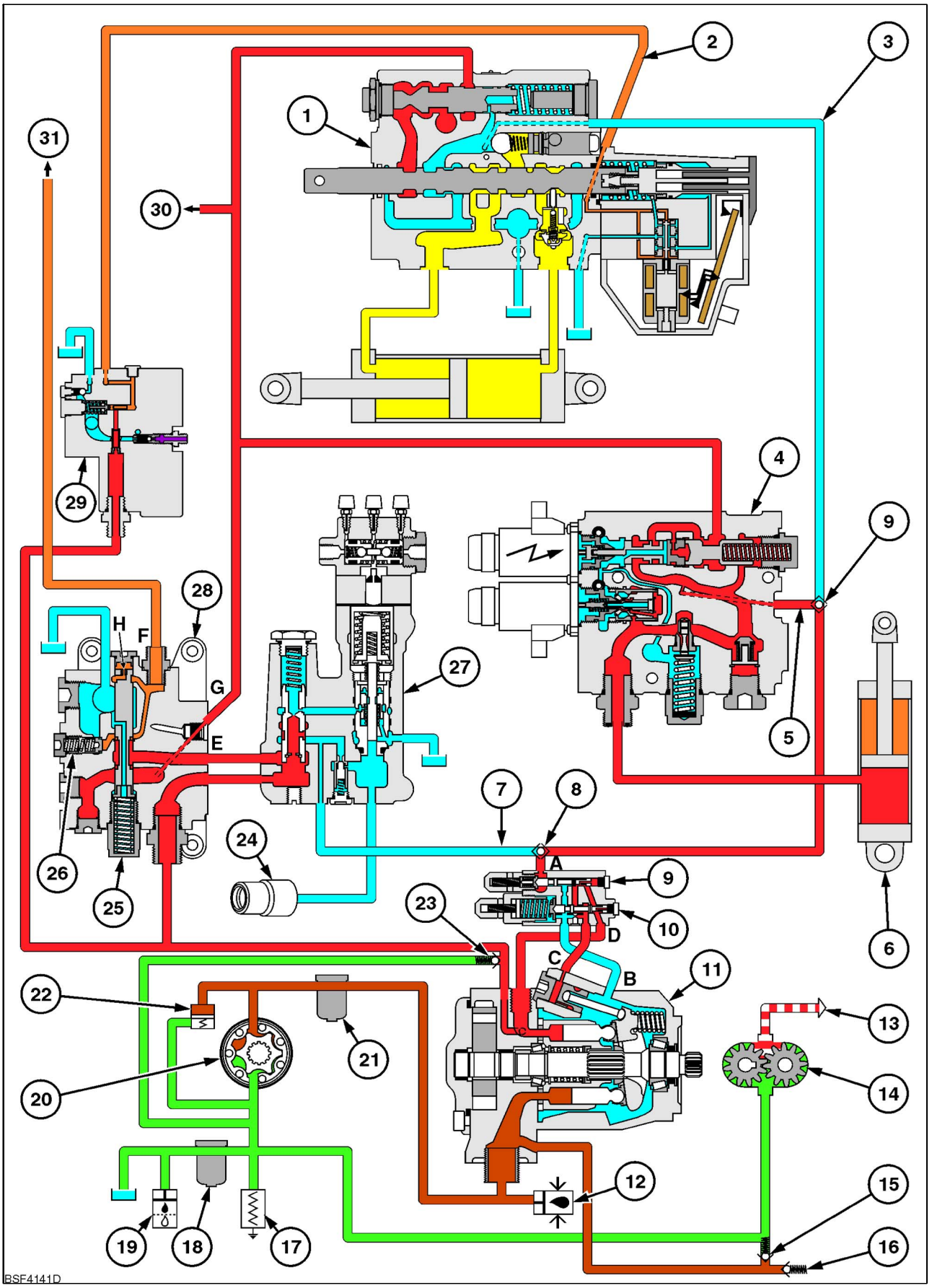
Return to Reservoir

Steering Circuit

Low Pressure @ 17 bar

Trapped Oil

Lubrication oil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LIMITING MAXIMUM SYSTEM PRESSURE

With Reference to Figure 13

To limit the maximum output pressure of the piston pump under normal operating conditions, a pressure compensating valve, located adjacent to the flow compensator valve, is incorporated in the swash plate control circuit. This valve limits the pressure to 190 bar and operates as follows:-

As the pressure in gallery D increases to 210 bar the pressure compensator valve spool moves against the valve return spring and opens gallery D to gallery C. The pressure in gallery D is now applied to the servo piston which changes the swash plate angle to reduce pump output to minimum flow. This operating mode is referred to as high pressure standby.

If the pressure in gallery D for some reason exceeds the setting of the pressure compensating valve there is a system safety valve set to 245 bar to prevent consequential damage that may occur due to excessive pressures,

The Low-Pressure Priority Valve will continue to sense the changes in system pressure to regulate the low-pressure system to 17 Bar.

1. Electro Hydraulic Remote (EHR) Valve
2. Low Pressure Pilot Line for EHR Control Spool
3. Load Sensing LIne from EHR Valve
4. Electronic Draft Control (EDC) Valve
5. Load Sensing Line from EDC Valve
6. Lift Ram
7. Load Sensing Line from Trailer Brake Valve
8. Load Sensing Shuttle Valves
9. Flow Compensating Valve (22 bar)
10. Pressure Compensating Valve (205 bar)
11. Variable Displacement Pump Assembly
12. Low Charge Pressure Warning Switch
13. Steering System Supply oil
14. Steering Pump
15. Charge Pressure Bypass Valve (3 bar)
16. Supplementary lube oil (0.8 bar)
17. Main Intake Filter Vacuum Switch
18. Main Intake Filter
19. Low Temperature Switch (40°C switch prevents main filter blocked light illuminating until oil reaches at least 40°C)
20. Charge Pump
21. Charge Pressure Filter
22. Charge Pressure Filter Dump Valve (6 bar)
23. Main System Relief Valve (245 bar)
24. Trailer Brake Valve Outlet
25. Low Pressure Regulating Valve
26. Low Pressure Relief Valve (30 bar)
27. Trailer Brake Valve
28. Low Pressure Regulating Valve Assembly
29. End Plate with Pressure Regulator Valve for Supply to EHR Pilot Line (20-22 bar).
30. High Pressure Supply to Front Suspension or Mid Mount Remotes (Where Fitted).
31. Low Pressure Circuit Supply to Four wheel Drive , Differential locks, PTO Clutch and PTO Brake.

System Pressure @ 205 bar

Standby Pressure @ 22 bar

Control Pressure

Charge Pressure @ 3 bar

Suction

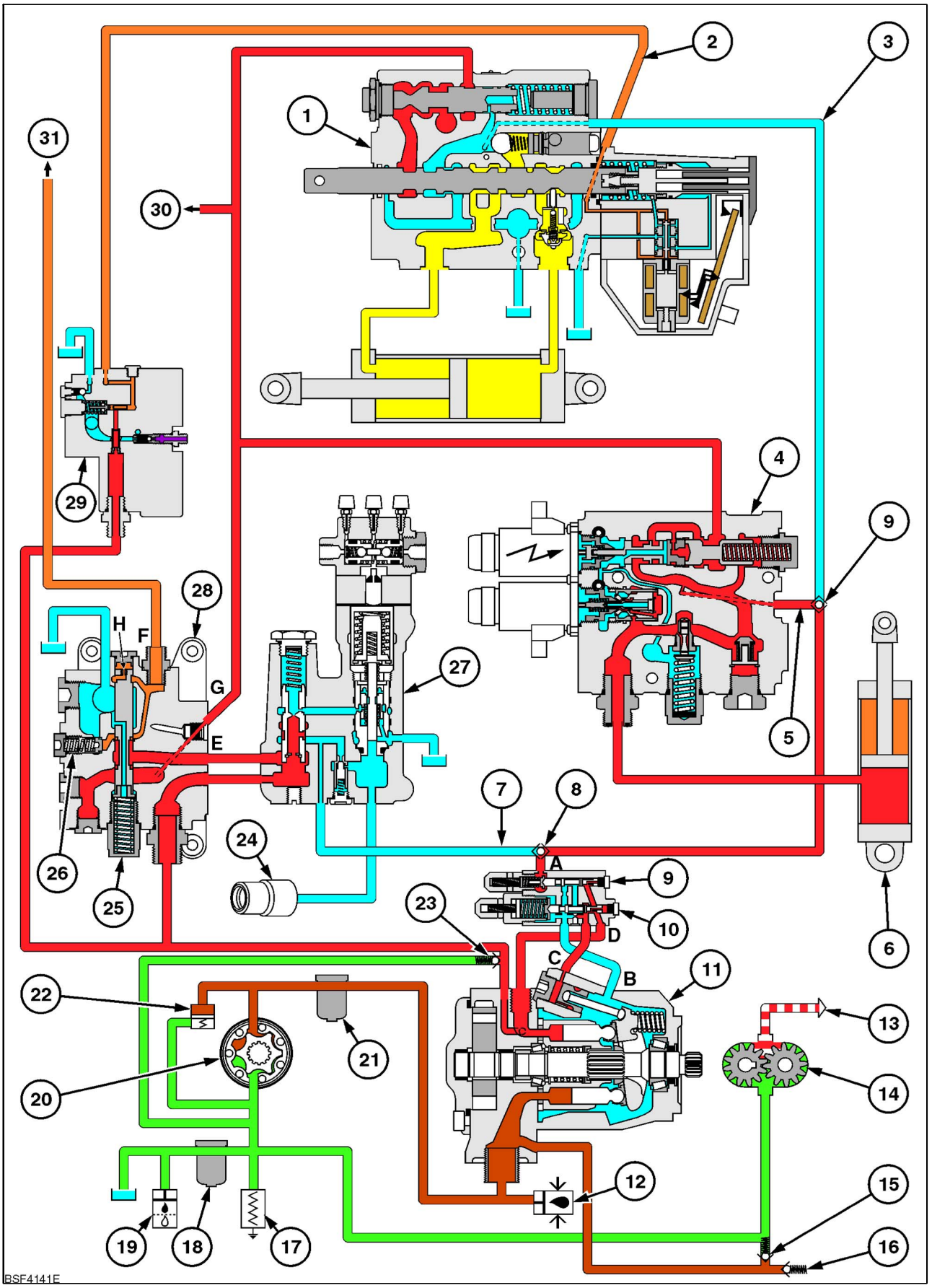
Return to Reservoir

Steering Circuit

Low Pressure @ 17 bar

Trapped Oil

Lubrication oil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OPERATION OF LOW PRESSURE REGULATING VALVE

The regulated flow of oil discharged from the variable displacement piston pump is directed to the low and high pressure hydraulic circuits via the trailer brake valve (where fitted) and the pressure regulating valve.

Because pump output is initially directed through the trailer brake valve, where fitted, the system ensures that the trailer brakes have priority over other hydraulic circuits.

The pressure regulating valve, located in the bottom section of the remote valve and EDC block, controls the maximum pressure of oil in the low pressure hydraulic circuit while at the same time directing high pressure system oil to the hydraulic power lift and remote control valves.

The low pressure hydraulic circuit, which is at a pressure of 17 bar (246 lbf/in2) operates the electronic remote valve spools (where fitted), P.T.O., differential lock, four wheel drive engagement system and transmission control circuits.

With reference to Figures 14, 15 and 16, operation of the pressure regulating valve is as follows:-

When the pressure in the system is below 17 bar the Low-Pressure regulating valve is held to the left by the spring allowing system pressure oil from the variable displacement piston pump to flow from gallery E to the low pressure hydraulic circuits through gallery F to give flow priority to the low-pressure systems, Figure 14.

The resulting pressure in gallery F is sensed in the pressure sensing gallery H drilled through the center of the spool. As the pressure in gallery F increases, the spool moves against the spring restricting the flow of oil into gallery F to maintain the pressure of oil in the low pressure hydraulic circuit at 17 bar (246 lbf/in2), while at the same time allowing system pressure oil to flow into gallery G.

When the high pressure hydraulic circuits are not in operation the variable displacement piston pump is on minimal delivery and the pressure regulating valve spool directs most of the flow from gallery E to gallery F, in order to maintain the low pressure hydraulic circuit pressure of 17 bar (246 lbf/in2), Figure 15.

When the high pressure hydraulic circuits are in operation and the variable displacement piston pump has increased delivery to satisfy demand, the spool moves almost totally against the spring in order to regulate the pressure of oil in the low pressure hydraulic circuit, Figure 16.

It can now be seen that the spool moves back and forth to maintain the low pressure circuit oil at 17 bar (246 lbf/in2), while at the same time allowing system pressure oil to be directed to the high pressure hydraulic circuit for operation of the hydraulic lift and remote control valves.

To prevent any damage occurring due to excessive pressures in the low pressure hydraulic circuit, the low pressure circuit safety valve will operate whenever the pressure increases to 30 bar. Should this occur the safety valve poppet will lift off its seat and vent the circuit to reservoir.

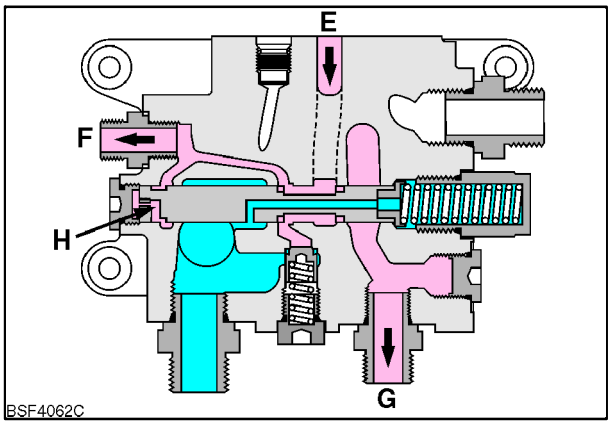
A. Load Sensing Line from High pressure circuit components.
B. Return to Reservoir from flow and pressure compensating valves.
C. Gallery to Swash Plate servo piston from flow and compensating valves
D. System Pressure sensing gallery to flow and pressure compensating valves
E. System pressure supply to low pressure regulating valve
F. Regulated Low pressure oil supply
G. System pressure outlet from low pressure regulating valve
H. Low pressure regulating valve spool sensing gallery

Pressure Regulating Valve

System Pressure @ 205 bar
Return to Reservoir
Standby Pressure @ 22 bar
Low Pressure System
Control Pressure

LOW PRESSURE REGULATING VALVE

System pressure less than low standby pressure



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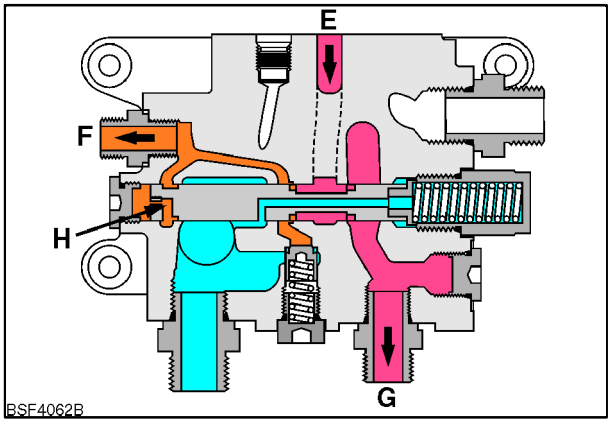
LOW PRESSURE REGULATING VALVE

System pressure at low standby, no high pressure demand



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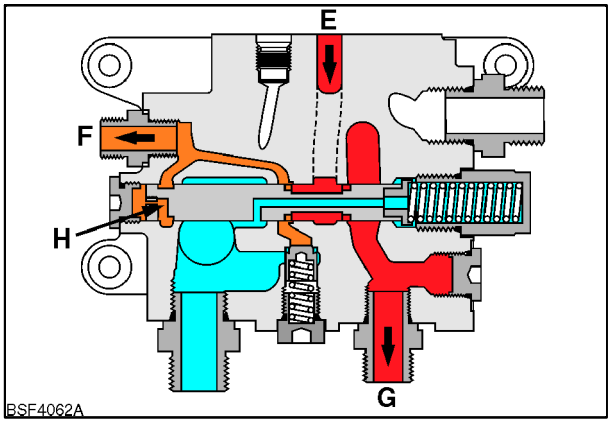
LOW PRESSURE REGULATING VALVE

System pressure at high standby, high pressure demand



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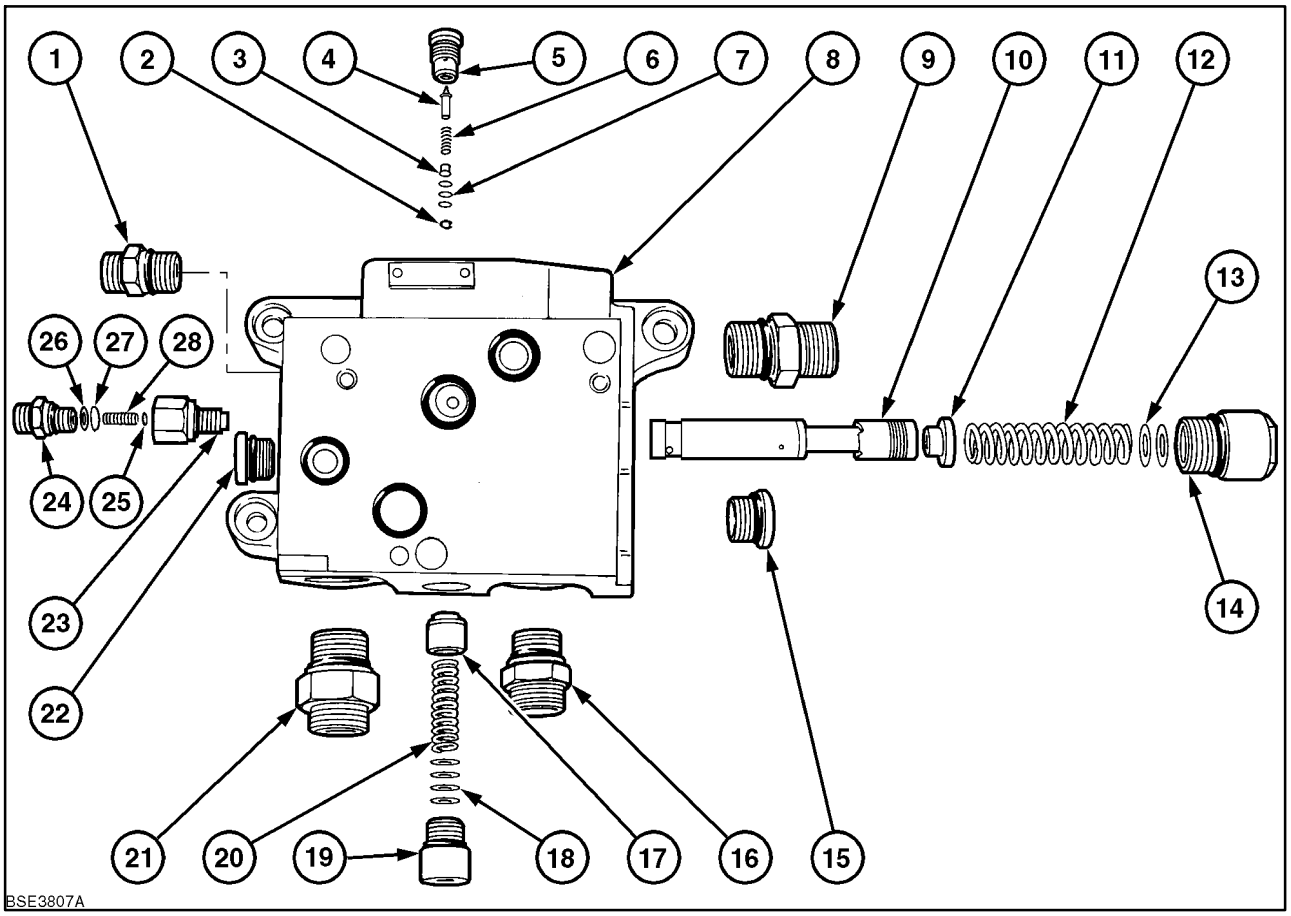

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Power Beyond and Pressure Regulating Valve Manifold

1. Low Pressure Feed Connector
2. Seal
3. Seat
4. Valve
5. Seat
6. Spring
7. Shims
8. Manifold Body
9. High Pressure Inlet Feed Connector
10. Pressure Regulating Valve Spool
11. Seat
12. Spring
13. Shims
14. End Cap
15. Plug
16. Power Beyond Connector
17. Poppet Valve
18. Shims
19. Plug
20. Spring
21. Power Beyond Connector
22. Plug
23. Seat
24. Load Sensing Line Connector
25. Seat
26. Washer
27. Washer
28. Spring

35 000 TROUBLESHOOTING

Before commencing fault finding refer to the initial check fault finding chart which may identify an obvious cause for the concern and prevent unnecessary component disassembly.

IMPORTANT: *If the steering is inoperative, there will be no lubrication to the transmission or PTO clutch and the tractor must not be run for more than 5 minutes at a maximum engine speed of 1000 rev/min.*

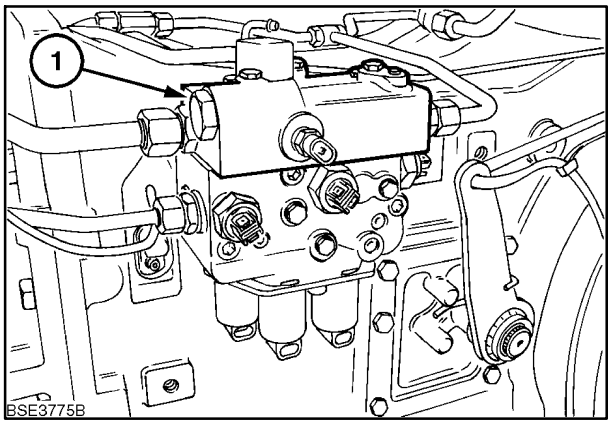
Fault finding charts listed in this Chapter are:-

- Initial Fault Finding Check
- Transmission Low Pressure Warning Light 'On'
- Charge Pressure Light Flashing
- Intake Filter Restriction Warning Light 'On'
- Power Steering not Working or Working Incorrectly
- Trailer Brakes not Working
- Hydraulic Lift not Working Correctly
- Remote Control Valves not Working

INITIAL FAULT FINDING CHECKS TO BE PERFORMED BEFORE PROCEEDING TO GENERAL DIAGNOSTIC PROCEDURE

Problem	Possible Cause	Remedy
Error code identified by micro -processor	Component malfunction	Refer to Error code fault finding charts
Rear Axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
Oil contaminated with dirt, water, or antifreeze	Filters not replaced at correct service interval	Replace all filters on pump
Warning light displayed on instrument cluster	Component not functioning correctly	Identify function not operating correcly and refer to the appropriate fault finding chart

TRANSMISSION LOW PRESSURE WARNING LIGHT 'ON'



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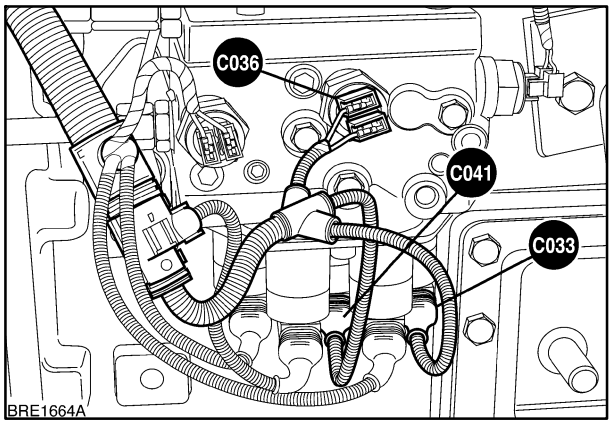
Low Pressure Regulating Valve



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Transmission Low Oil Pressure Switch

Problem	Possible Cause	Remedy
High pressure system components i.e. hydraulic lift, remote valves, and trailer brakes, and low pressure system components are still operating	Wiring fault	Remove connector C036 from the oil pressure switch. If the warning light remains on repair the wiring fault between C036 and C081 of the instrument cluster
High pressure system components i.e. hydraulic lift, remote valves, and trailer brakes, do not operate	Pressure incorrect	Perform tests for variable displacement pump. Refer to pressure testing described later in this chapter
Low pressure system components i.e. transmission, PTO, FWD and Diff locks do not operate	Sticking, broken components of low pressure regulating valve or stuck open relief valve.	Remove and examine the low pressure regulating valve for sticking, broken components or stuck open relief valve.
	Low pressure circuit pressure is incorrect	Pressure test circuit. Should be 17 bar
		Check for electrical fault which may affect the operation of all low pressure components i.e. disconnected harness to low pressure block
	Oil pressure switch faulty	Inspect the switch. The switch should be normally open, replace if faulty.
	Large leak in one of the low pressure system component circuits	Check for leaks and rectify

CHARGE PRESSURE LIGHT FLASHING

Problem	Possible Cause	Remedy
Rear axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
If charge pressure is correct (1.6-3.4 bar) disconnect wiring to low charge pressure switch. If the light is not extinguished	Short circuit to chassis in R/N/B colour wire from instrument console connector C177 Pin 7 and charge pressure switch	Locate and repair short circuit
As above, but light is extinguished	Blocked/contaminated filters	Replace charge pump and inlet filters
If filters have been replaced and pressure is correct	Faulty low charge pressure switch	Replace low charge pressure switch
Filters changed but still pressure is incorrect	Charge pressure filter dump valve and charge pressure valves sticking open	Replace valves
	Worn charge pump	Replace pump

INTAKE FILTER RESTRICTION WARNING LIGHT ON

Problem	Possible Cause	Remedy
Rear axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
Inlet and charge pressure filters not functioning	Filters contaminated	Replace filters
If wiring to filter restriction switch is disconnected and light is not extinguished	Short circuit to chassis in B/N colour wire from instrument console connector C175 Pin 16 and intake filter restriction switch	Locate and repair short circuit
If wiring to filter restriction switch is disconnected and light is extinguished	Intake filter restriction switch faulty	Replace intake filter restriction switch

POWER STEERING NOT WORKING OR WORKING INCORRECTLY

Problem	Possible Cause	Remedy
Steering pressure warning light is illuminated	Incorrect pressure in the steering system	Pressure test the steering system as describedin the 'Pressure Testing' Chapter
	Steering pump faulty	Remove steering pump and examine the drive to the pump, if O.K. repair or replace the steering pump assembly
Pressure is correct up to the steering cylinders	Mechanical fault in the steering components	If pump output is good but pressure to the cylinders is low or zero, suspect a faulty steering motor. See section 41 for steering motor removal and overhaul.

TRAILER BRAKES NOT WORKING

Problem	Possible Cause	Remedy
Trailer brakes not working correctly	Air in system	Bleed the trailer brakes
	Pressure incorrect in system	Pressure test the Trailer brakes
Pressure test confirms fault	Hydraulic lift not working satisfactorily	Test maximum system pressure at remote valve coupler. Pressure 2900-3000 lbf/in^2 (200-207 bar)
	If pressure not correct	Adjust flow/pressure compensating valve. If this does not clear the fault examine flow/compensating valve for sticking component
		Check the variable flow pump swash plate to ensure it is not sticking
If pressure test confirms correct pressure	Trailer brake valve faulty	Operate and hold remote valve to generate maximum system pressure and at the same time operate the trailer brakes. If the trailer brake valve does not function correctly overhaul trailer brake valve

HYDRAULIC LIFT NOT WORKING CORRECTLY

Problem	Possible Cause	Remedy
In cab fast raise /work switch not in correct position		Move switch to work position
Is hitch enabled symbol illuminated		Capture hitch
		Check position of controls on control panel
Charge pressure light flashing	Charge pump system problem	Refer to charge pressure light flashing fault finding chart
Electronic draft control error code identified		Refer to Electronic draft control fault codes in section 55
Trailer brakes(if fitted) not working correctly. (Install a pressure gauge in the trailer brake coupler)	Fault in the variable displacement pump	Pressure test the pump to determine the fault
Remote valves not operating correctly. (Install a pressure gauge in the remote valve coupler)	Contaminated components in low pressure regulating valve assembly	Inspect the low pressure regulating valve assembly for sticking spool. dirt contamination or broken components. Rectify as required
Hydraulic lift working erratically	Circuit leak	Perform pump leak test to determine if fault relates to either internal leak or hydraulic circuit leak
Lift arms locked in either fully raised or lowered position	Sticking plunger in EDC valve raise or lower solenoid	Check EDC valve raise or lower solenoid for sticking plungers and rectify accordingly
Perform standby pressure test . If pressure is not 300-350 lbf/in^2 (21-24 bar)	Flow compensating valve requires examination or adjustment	Adjust/examine flow compensating valve
	Variable displacement pump swash plate sticking	Disassemble variable displacement and check swash plate piston for sticking
Standby pressure is correct and whilst operating remotes at high pressure standby hydraulic lift operates correctly	Fault in load sensing line from EDC valve	Investigate and rectify fault in load sensing line
If the hydraulic lift does not operate correctly	Sticking spools in EDC valve or leaking lift cylinder safety valve	Examine EDC valve for sticking spool and rectify or if lift cylinder safety valve ? is leaking replace?
	Lift arms leak down under pressure if heavy weight is placed on them	Overhaul lift cylinder

REMOTE CONTROL VALVES NOT WORKING - MECHANICALLY OPERATED TYPE

Problem	Possible Cause	Remedy
If hydraulic lift is not working	Various	Refer to fault finding chart for hydraulic lift not working
If hydraulic lift is working	Remote control valve fault	Test maximum system pressure at each remote valve coupler. If they reach correct pressure 200–207 bar (2900–3000 PSI) examine flow/pressure compensating valve for sticking
One of the remote valves does not reach the correct pressure		Operate all remote valve levers simultaneously. If the defective remote valve does not reach correct pressure, overhaul as required
Defective remote valve does reach the required pressure	Faulty Load sensing valve	Examine load sensing valve between remote valve sections

REMOTE CONTROL VALVES NOT WORKING - ELECTRO-HYDRAULIC (EHR) TYPE

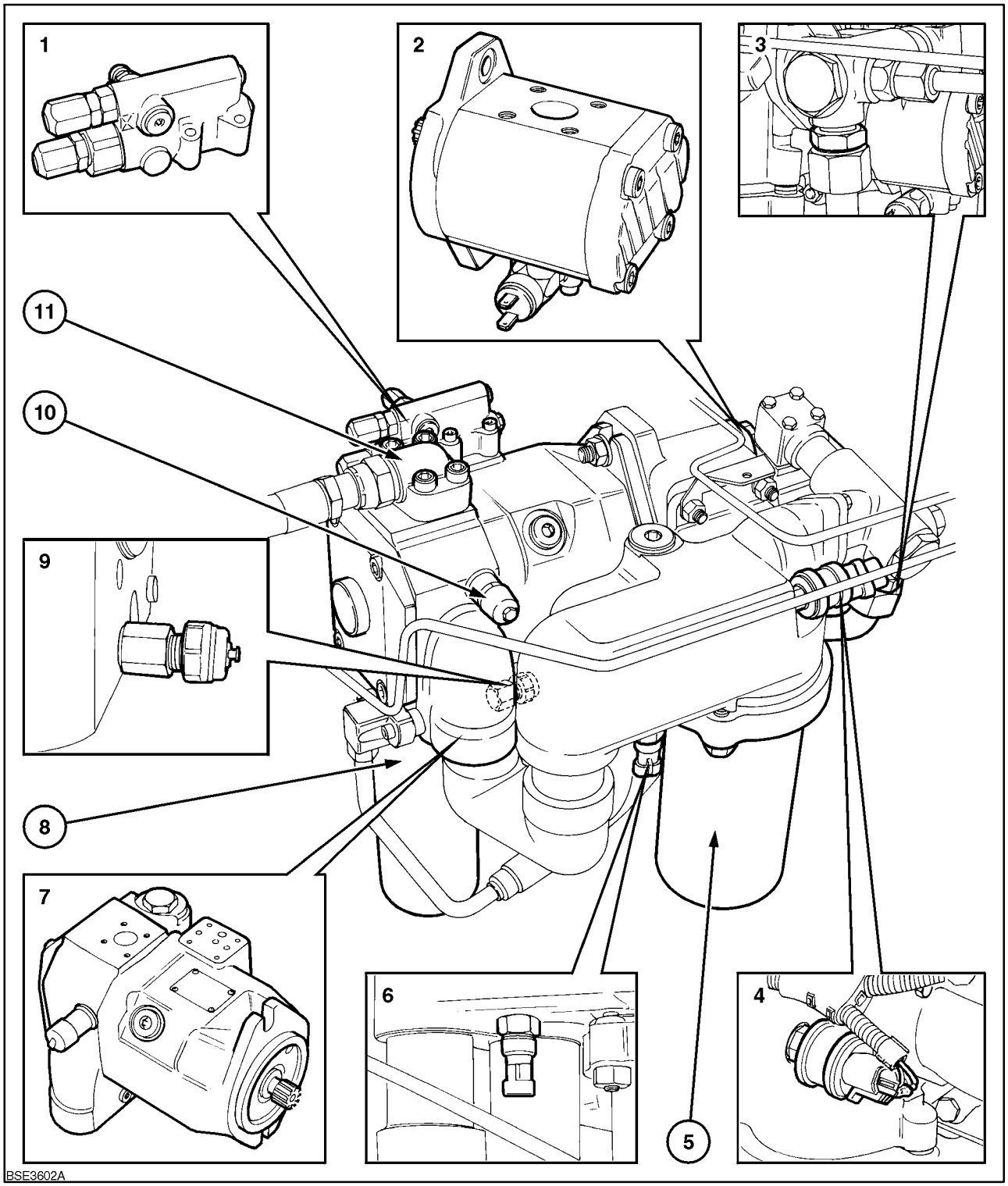
Problem	Possible Cause	Remedy
When the key start is switched on the EHR control lever solenoids cannot be heard to activate	Faulty fuse	Replace fuse if faulty
The EHR control lever solenoids can be heard to activate	Hydraulic stop button not in the operating position	Activate switch to the operating position
Hydraulic stop button is in operating position	Hydraulic lift not working	Refer to 'Hydraulic lift not working'
	EHR enable relay faulty	Replace the relay
	EHR fault codes may be stored in the controller memory	Refer to the fault code chapter in the electrical section
	Components in low pressure system may not be operating correctly	Low pressure supply to remotes not available. Fault find the low-pressure system as described in 'Transmission warning light ON '
Hydraulic lift and remote valve are operated simultaneusly and pressure is registered from the remote coupler	Fault in the load sense circuit or the compensating valve in the variable displacement pump	Identify and remedy fault
Hydraulic lift and remote valve are operated simultaneusly and pressure is NOT registered from the remote coupler	Fault in the electrical system	Perform the EHR valve renumbering prodedure . If the valves are still inoperative check the CAN-BUS wiring between the remotes and the central controller. If the fault still persists re-load the software into the central controller and if still inoperative replace the processor

PUMP PRESSURE AND FLOW TESTING

IMPORTANT: *Before performing any pressure or flow testing operate the tractor until the oil in the rear axle is at normal operating temperature. 75 °C(170 °F).*

Please refer to the Pressure Testing Chapter situated elsewhere within this section.

OVERHAUL



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Load Sensed Variable Displacement Pump Installation

1. Load Sensing Valve (Flow and Pressure Compensating Valve)
2. Steering Pump
3. Supplementary Lube Valve
4. Vacuum Switch
5. Intake Filter
6. Oil Low Temperature Switch
7. Charge and Variable Flow Piston Pump Assembly
8. Charge Pump Filter
9. Low Charge Pressure Switch
10. System Relief Valve
11. Pressure feed to Remote Valve Block

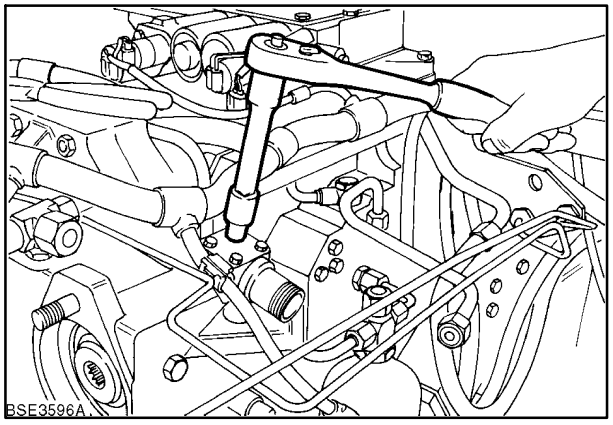
This procedure describes the overhaul of the Load Sensed Variable Displacement pump assembly when removed from the tractor. The following items however can be serviced with the pump installed on the tractor.

- Blocked Filter Dump Valve
- Pressure and Flow Compensating Valves
- Steering Pump Assembly
- Steering Flow Control Valve (Priority Valve)

STEERING PUMP

Removal

1. Disconnect steering pipe from inlet manifold.
2. Remove inlet manifold.
3. Remove the 4 allen headed screws from under the pump and remove the pressure tube which also holds the P.A.S. switch.



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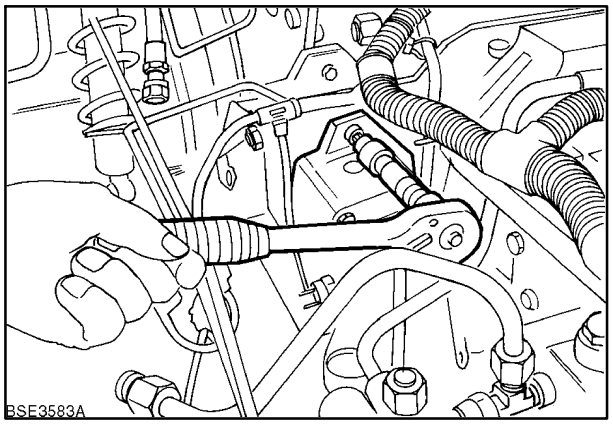
4. Remove the allen headed bolts and remove the steering pump.



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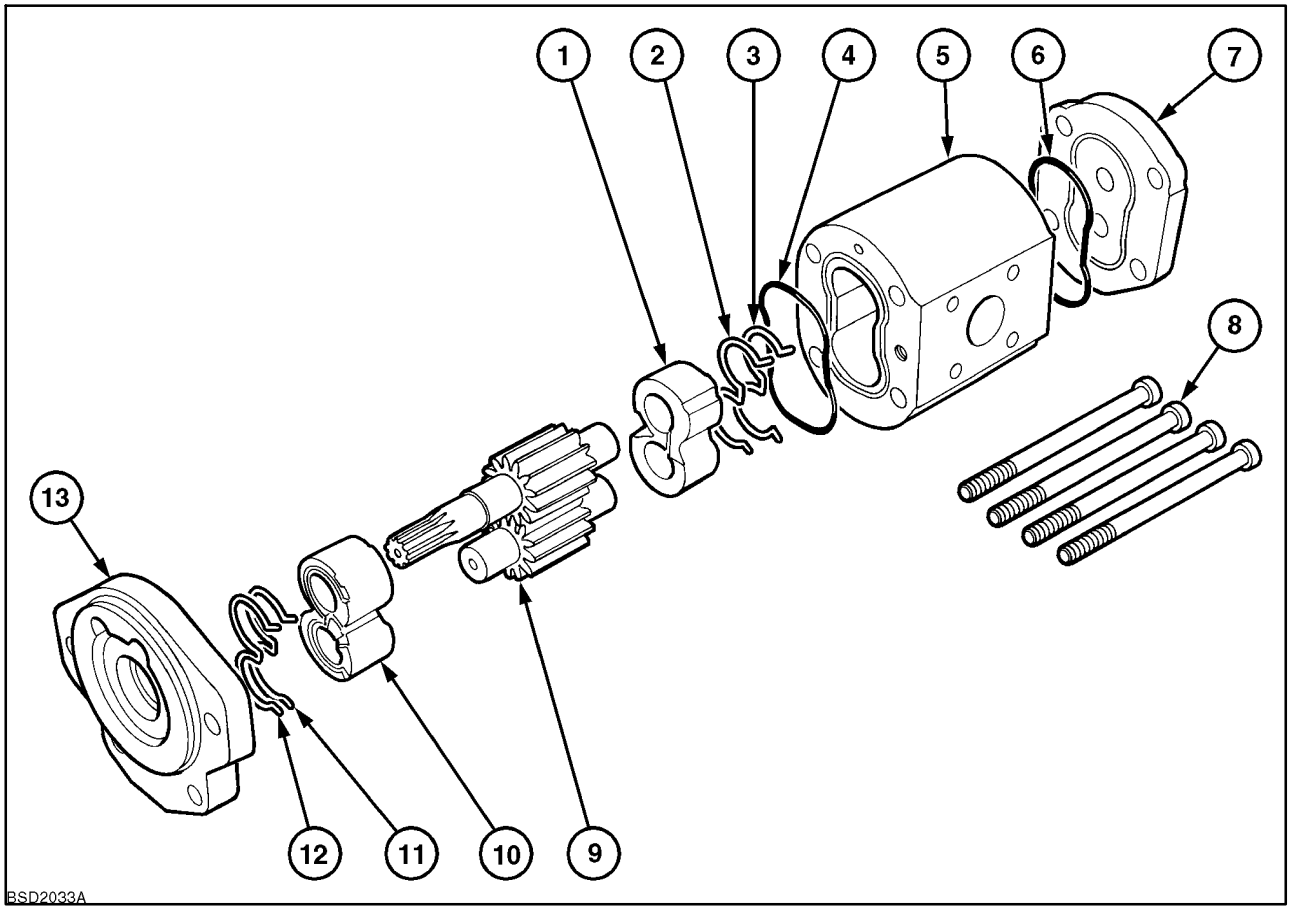


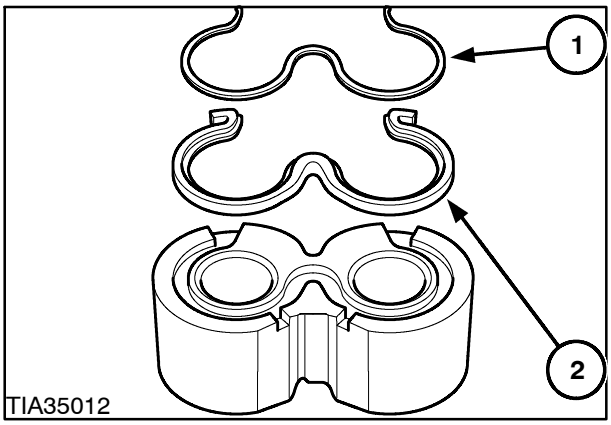
STEERING PUMP ASSEMBLY EXPLODED VIEW

1. Bearing Block
2. Seal
3. Plastic Back-up Seal
4. Seal
5. Pump Housing
6. Seal
7. End Plate
8. Retaining Bolts
9. Drive Gears
10. Bearing Block
11. Seal
12. Plastic Back-up Seal
13. End Plate

IMPORTANT: *When servicing the pump gears, particular attention must be paid to the following points:*

- *The width of each gear set must be within 0.0002 in. (0.005 mm) of each other to ensure satisfactory pump efficiency.*
- *Journals must be within 0.0005 in. (0.013 mm) of each other.*
- *Gear faces must be flat. This feature may be checked by blueing a bearing face and rotating against the gear. This check will also reveal any sharp edges on the teeth.*

5. Install new seals and 'O' rings. When installing seals in the bearing block ensure that the plastic back-up seal (1) is correctly positioned in the rubber seal (2).



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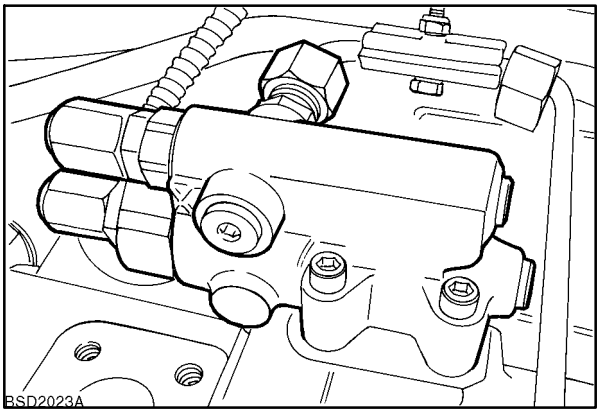
PRESSURE AND FLOW COMPENSATOR VALVE

Disassembly

1. Disconnect load sense line connection and remove pressure and flow compensating valve assembly.
2. Remove the tamper proof caps, carefully unscrew each adjuster and remove the component parts.
3. To ensure correct re-assembly keep the component parts for each valve separate.

IMPORTANT: *Due to extreme spring pressure within valves DO NOT remove rear plugs until the adjusters have been removed.*



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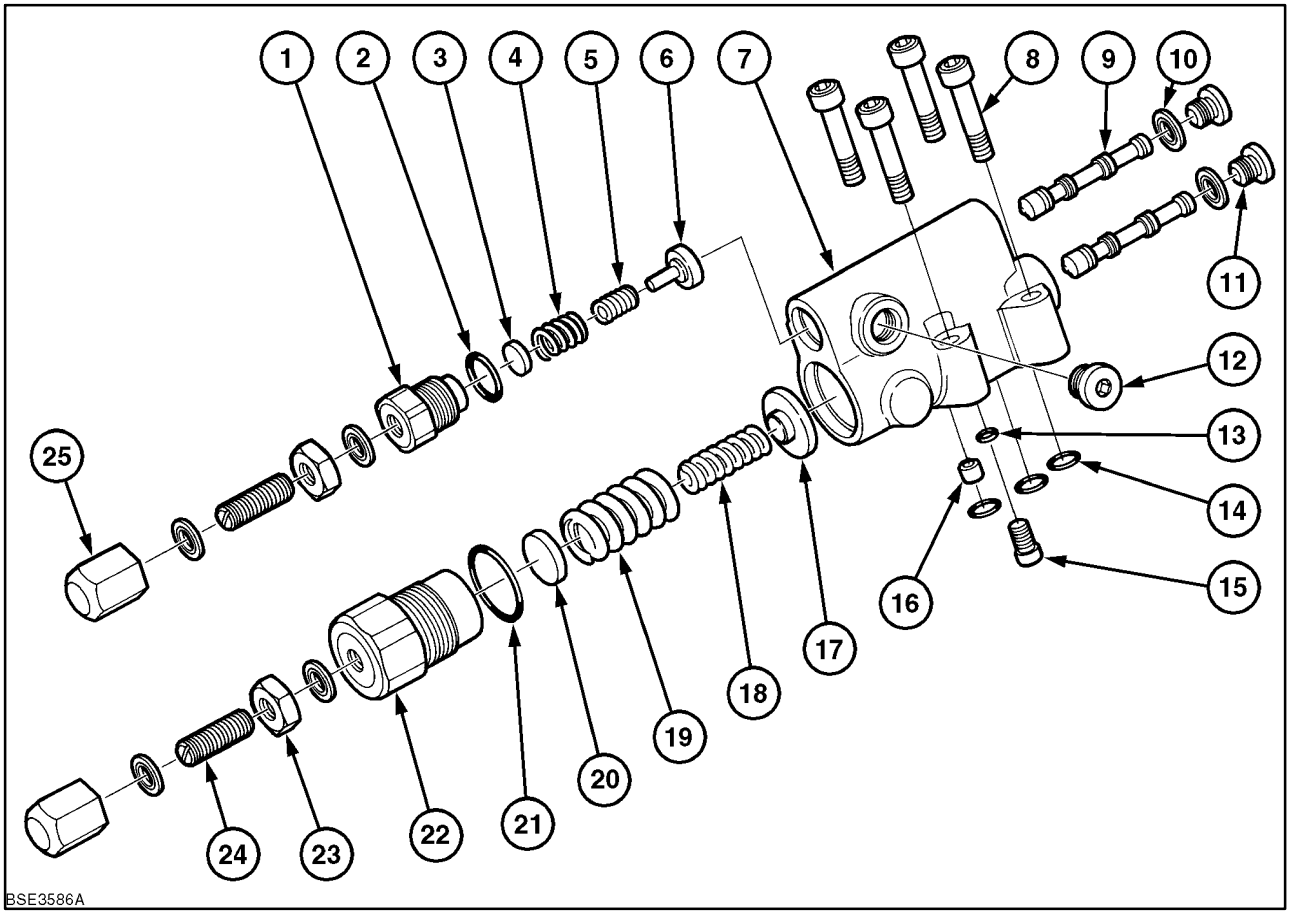


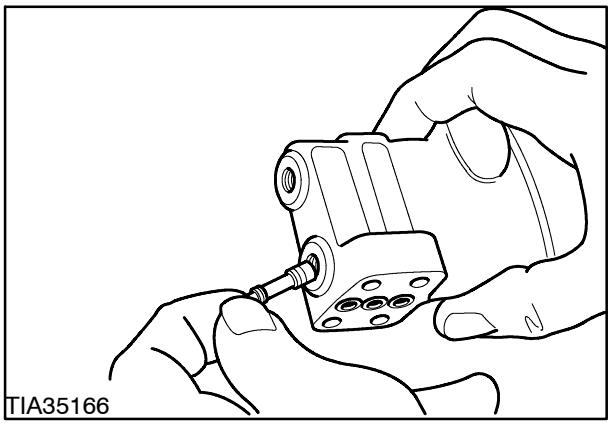
Flow and Pressure Compensating Valves

1. Plug
2. Seal
3. Disc
4. Spring
5. Spring
6. Seat
7. Housing
8. Screw
9. Spool
10. Snap-ring
11. Plug
12. Plug
13. Seal
14. Seal
15. Damper Screw
16. Nozzle
17. Seat
18. Spring
19. Spring
20. Disc
21. Seal
22. Plug
23. Nut
24. Screw
25. Locknut

Assembly

Re-assembly of the valves follows the removal procedure in reverse. On re-assembly observe the following:-

- Wash all components in a suitable solvent.
- Examine all components for wear or damage. If the spools are damaged it is necessary to replace the complete valve assembly.
- Lubricate all parts with clean hydraulic oil.
- To aid re-assembly of pressure and flow compensating valves, the spools should be inserted into the rear of the housing.
- Tighten all plugs and locknuts to the correct torque as detailed in Specifications.
- When installing valve on pump ensure all 'O' ring seals are correctly installed.
- Pressure test the pump and adjust the pressure and flow compensating valves to the correct specification as detailed in Pressure Testing Section of this Chapter.



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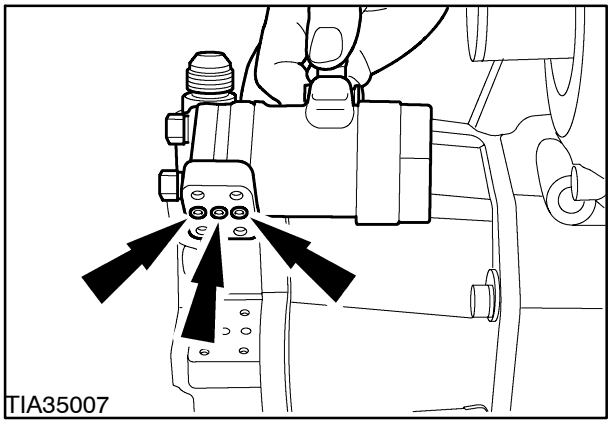

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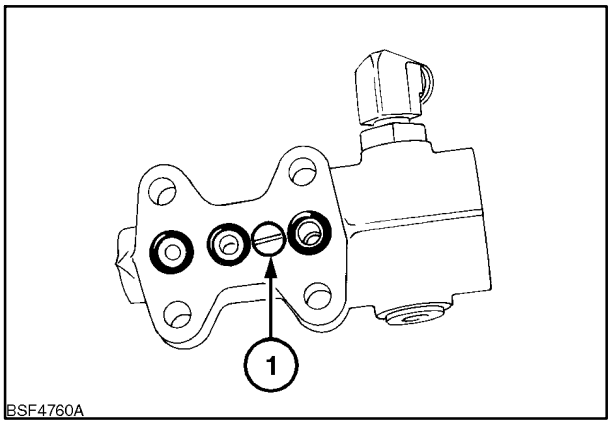
NOTE: *If the damper screw (1) is removed for any reason it should be re-installed in alignment with the trhee ports and should be loctited into position. Failure to adjust this screw correctly could reduce the efficiency of the system.*



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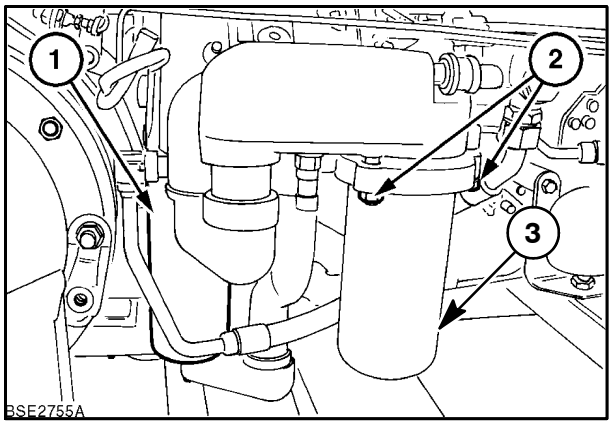
LOAD SENSOR VARIABLE DISPLACEMENT PUMP

Removal

1. Securely support the tractor on suitable axle stands and remove the right hand rear wheel.

NOTE: *To prevent excessive loss of oil loosen intake filter by approximately one turn and leave for one minute to allow oil in filter to drain into sump.*

2. Drain oil into a suitable container
3. Remove charge filter (1) by unscrewing anti-clockwise.
4. Remove the intake filter (3) by removing the retaining bolts (2).
5. Disconnect all electrical and hydraulic connections to pump.
6. Ensure lubrication pipe banjo connector (1) and brake line retaining bracket (2) are disconnected from pump body.
7. Remove filter housing and related tubes and elbows including the supplementary lube valve.
8. Undo pump retaining nuts and remove pump.



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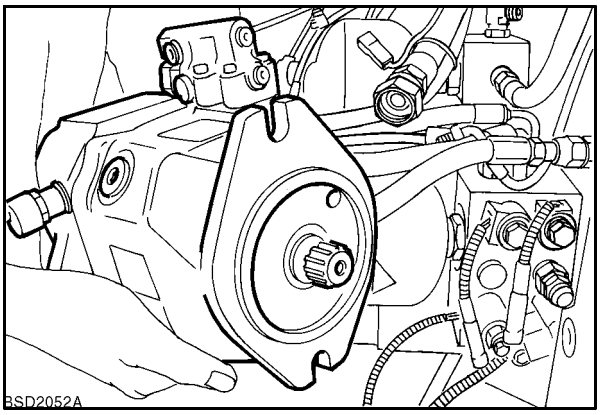

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⚠ WARNING ⚠

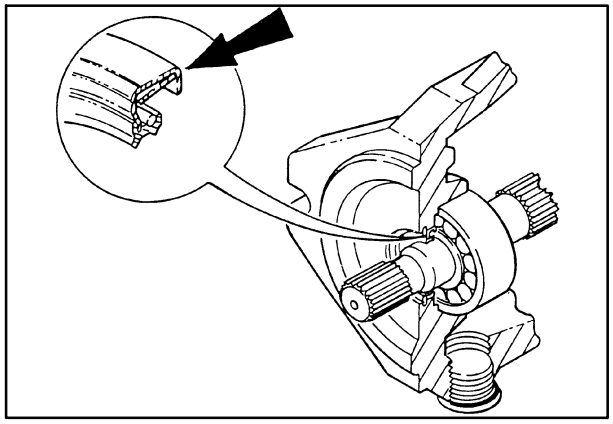
The hydraulic pump is a heavy component and weighs 40 kgs. It is important that it is securely supported when being removed from the tractor.

NOTE: *If oil is not drained from transmission, do not remove tube from sump at sump end otherwise oil spillage will occur.*

INPUT SHAFT SEAL

Replacement

1. When replacing the input shaft seal, make sure the pump housings mounting flange is clean. Use circlip pliers to remove the input shaft seal retaining ring.



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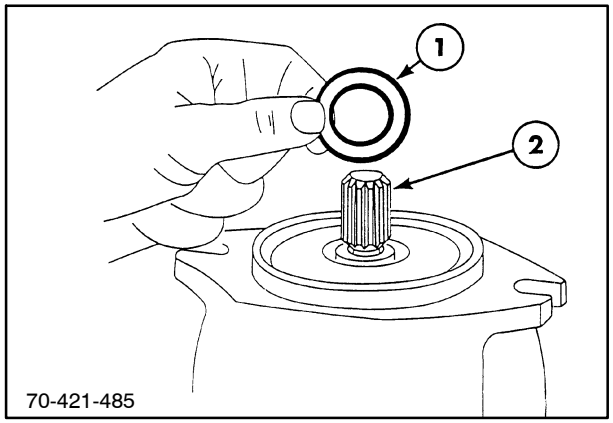
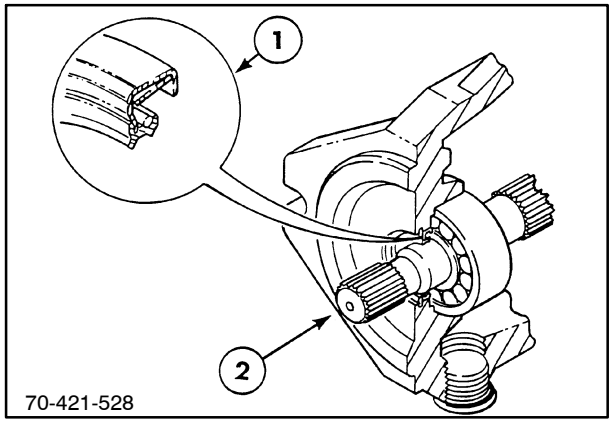
2. With the retaining ring removed, use a punch or similar tool, and carefully pierce the top of the lip seal. Using the punch, pry the seal from its bore.



31

3. Protect the inner lip of the new shaft seal, 1, lubricate and install the seal over the input shaft, 2, and into the pump housing.



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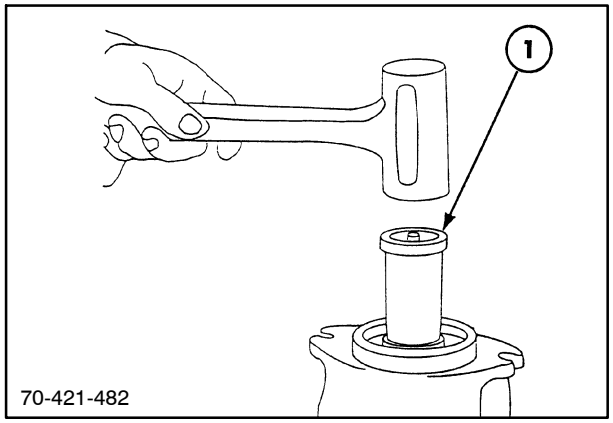
4. Tap the shaft seal into the pump housing until it is just slightly below flush of the counterbore face. DO NOT SEAT THE SEAL AT THIS TIME.



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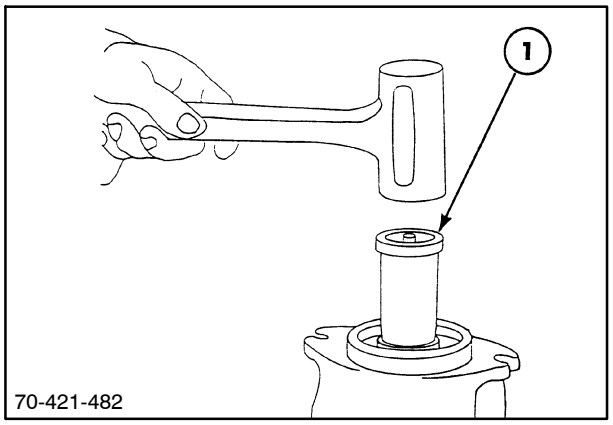
5. Use a seal driver, 1, such as a 1-1/4″ ID 1-1/2″ OD x 2-1/2″ long pipe as shown here, to press both the retaining ring and shaft seal into the pump housing.

NOTE: *Press the retaining ring in just far enough that it snaps into the retaining ring groove machined into the pump housing.*



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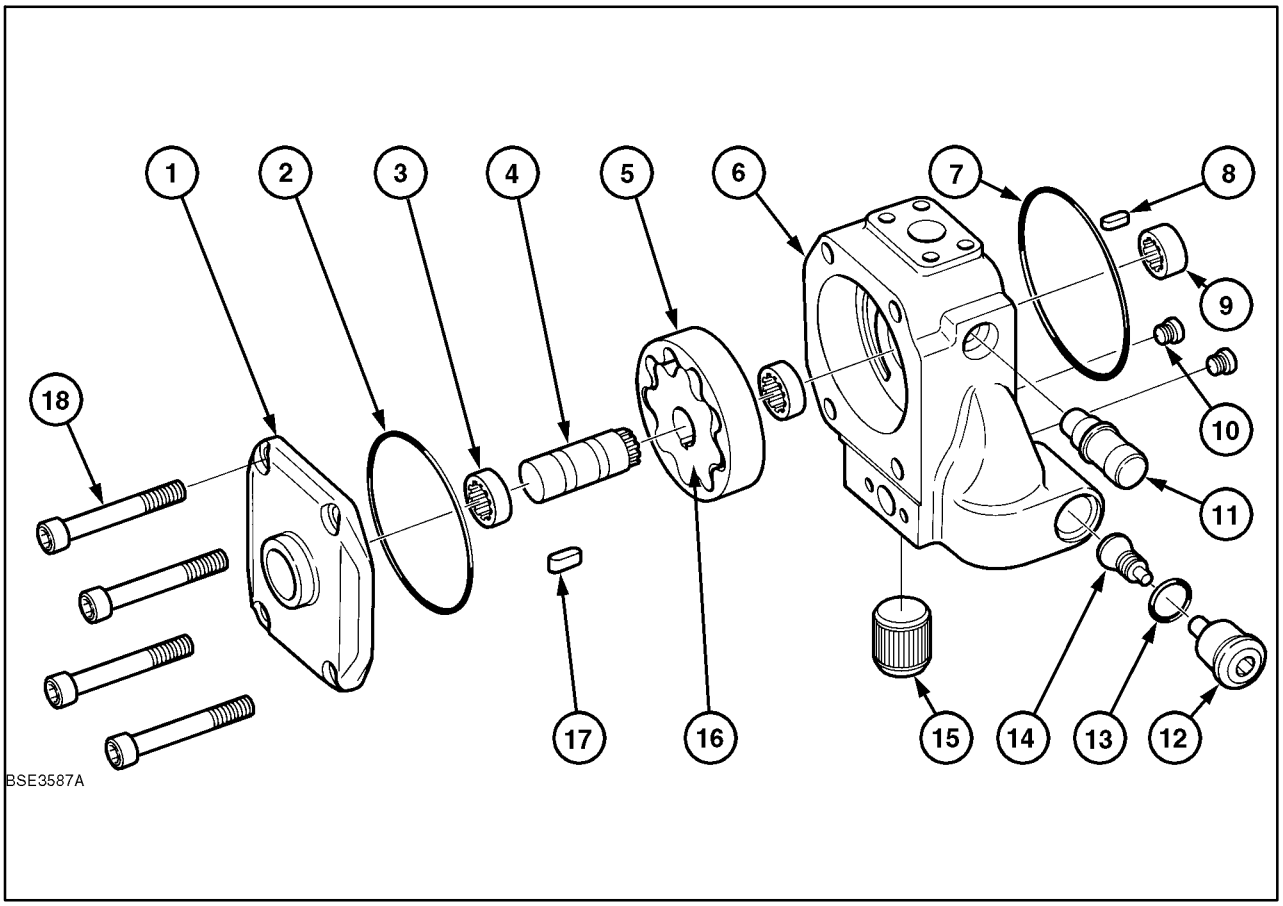

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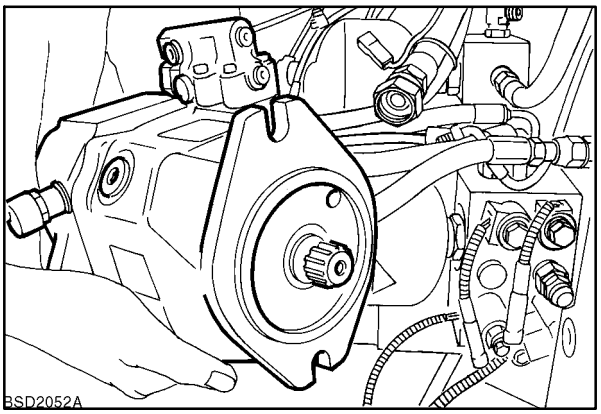
Charge Pump Components

1. EndPlate
2. Seal
3. Coupling
4. Shaft
5. Rotor Housing
6. Charge Pump Housing
7. Seal
8. Pin
9. Hub
10. Screw Plug
11. System Relief Valve (245 Bar)
12. Check Valve Plug
13. Seal
14. Check Valve Spool
15. Main Charge Filter
16. Pump Rotor
17. Key
18. Screws

CHARGE PUMP

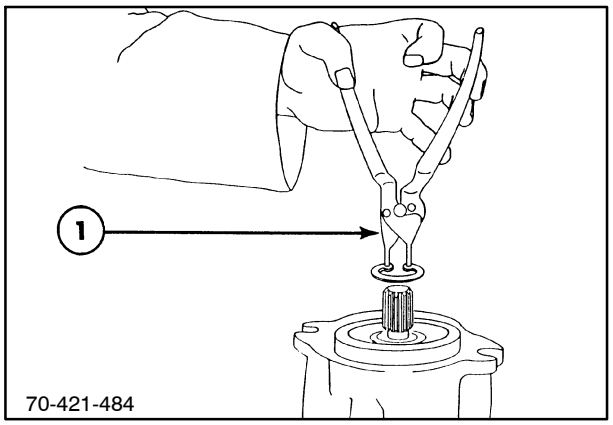
Disassembly/Assembly

1. Remove hydraulic pump assembly from tractor as described previously.
2. Remove 4 bolts securing charge pump housing.



36

3. Carefully separate charge pump housing from main pump body.Use circlip pliers to remove the input shaft seal retaining ring(1).



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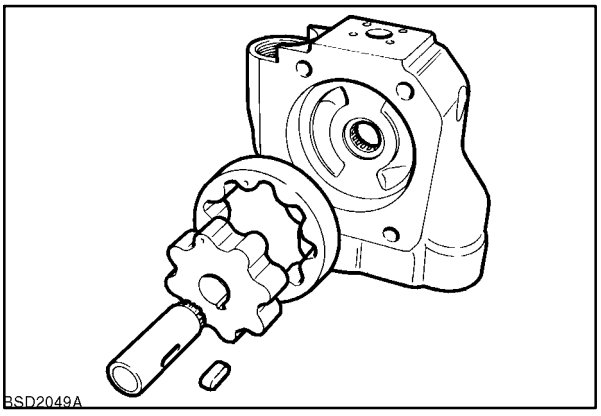
4. Remove pump rotor, housing and rotor shaft. Inspect for wear or damage.

NOTE: *Ensure when reassembling the pump that the punched dot markings on the rotor and rotor housing face to the outside of the pump housing, as illustrated.*



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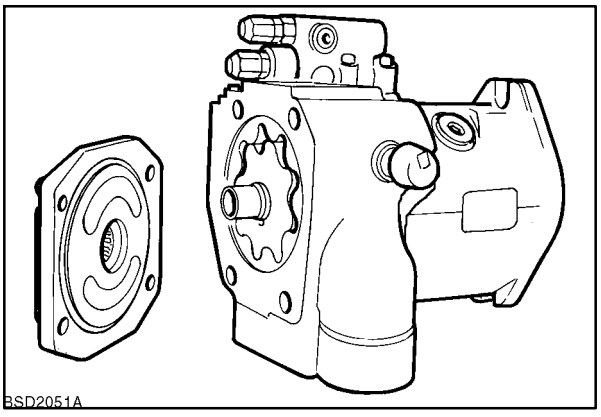
5. Inspect seal in end cover and replace if required.
6. Tighten housing retaining bolts to a torque of 50-62Nm.
7. Tighten housing retaining bolts to a torque of 50-62Nm.



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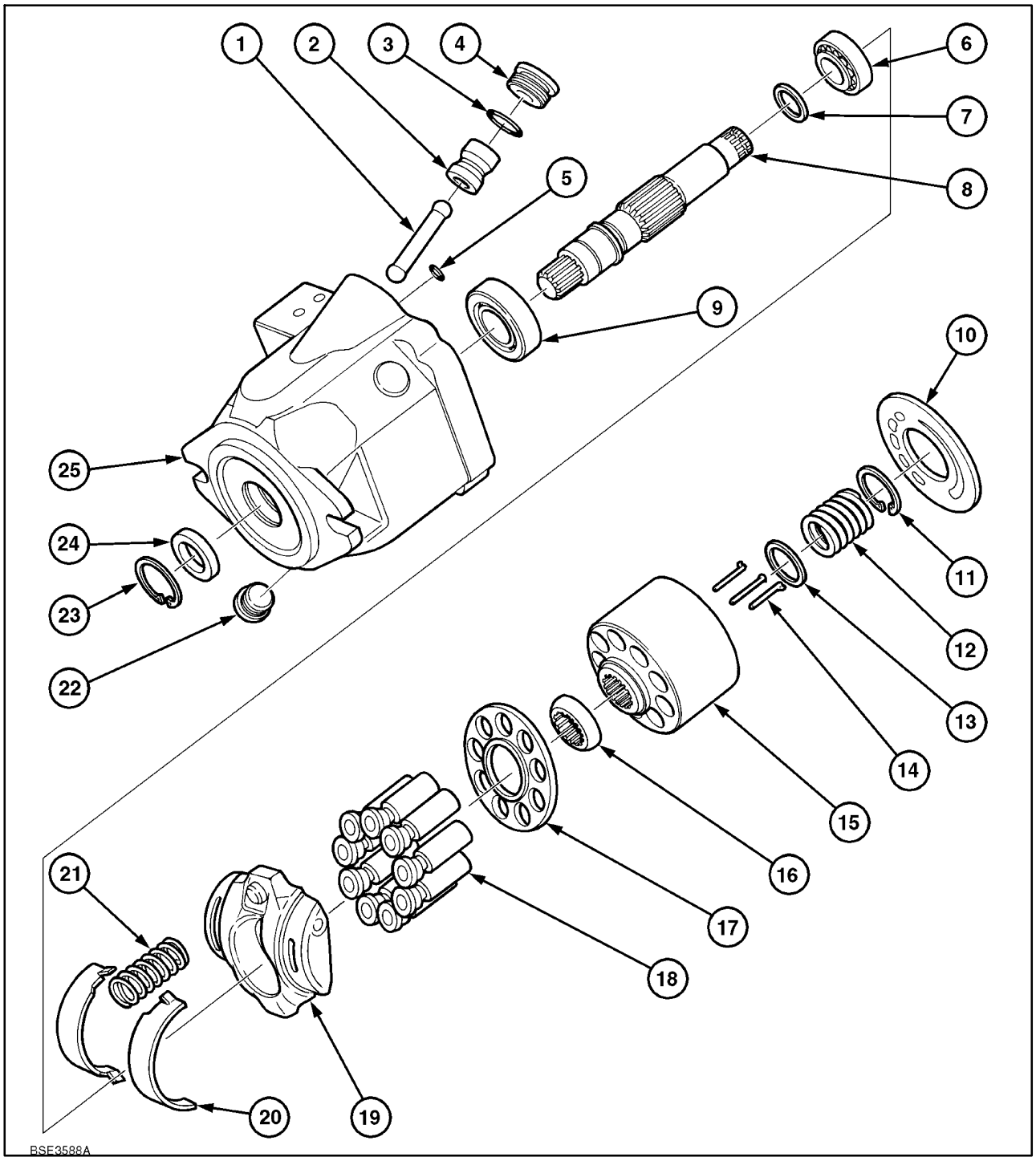

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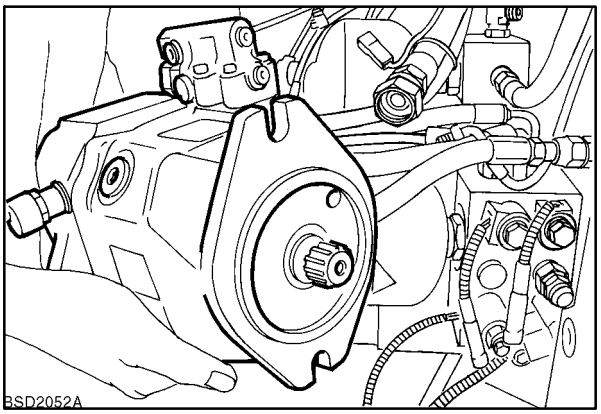
Load Sensed Variable Displacement Pump

1. Rod
2. Piston
3. Seal
4. Plug
5. Seal
6. Bearing
7. Ring
8. Shaft
9. Bearing
10. Plate
11. Ring
12. Spring
13. Seal
14. Pins
15. Rotor Cylinder
16. Cone
17. Plate
18. Rotor Pistons
19. Swash Plate
20. Bearings
21. Spring
22. Plug
23. Snapring
24. Gasket
25. Pump Housing

LOAD SENSED VARIABLE DISPLACEMENT PUMP

Disassembly

1. Remove hydraulic pump assembly from tractor as described previously.



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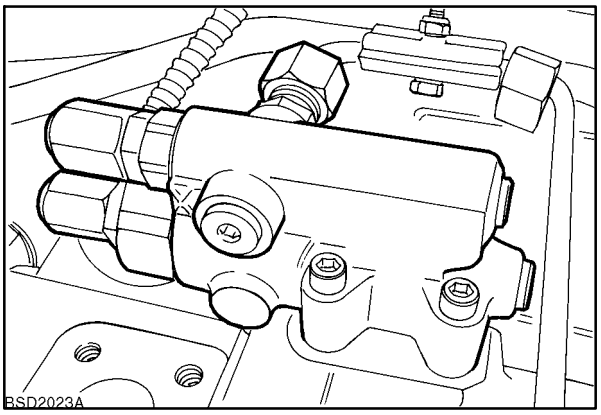
2. Remove pressure and flow compensating valves assembly.



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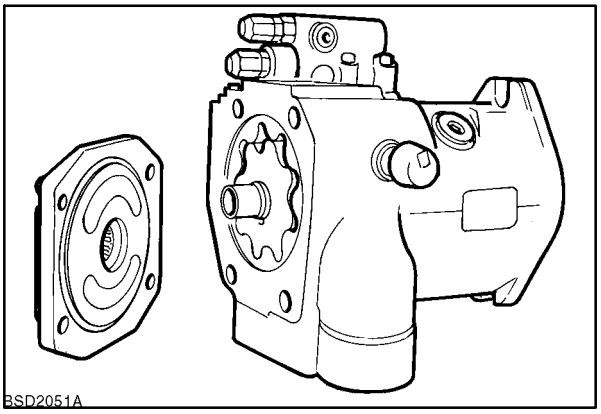
3. Undo the 4 retaining bolts and remove circlip from opposite end of pump.Gently remove charge Pump from main pump assembly.



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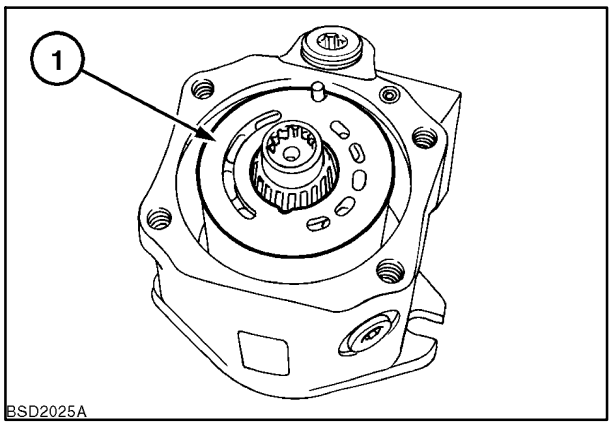
4. Examine valve plate(1). Check to see if it is scored, nicked, warped or damaged by cavitation. Look for score marks or damage around the bearing surface area. Check the inlet and discharge port area for signs of contamination. This contamination may show as grooves starting in the feathering notch,



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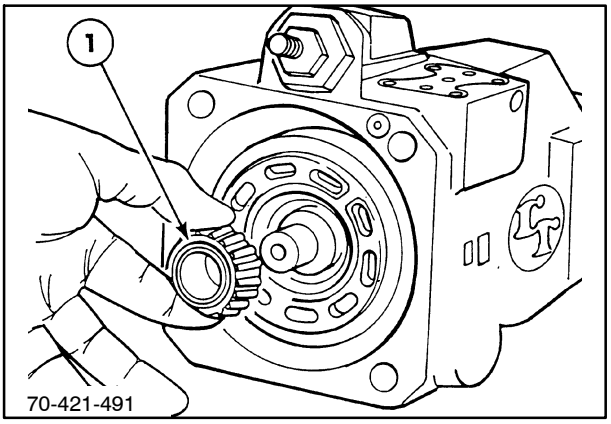
5. Remove bearing cone(1) and splined connector.



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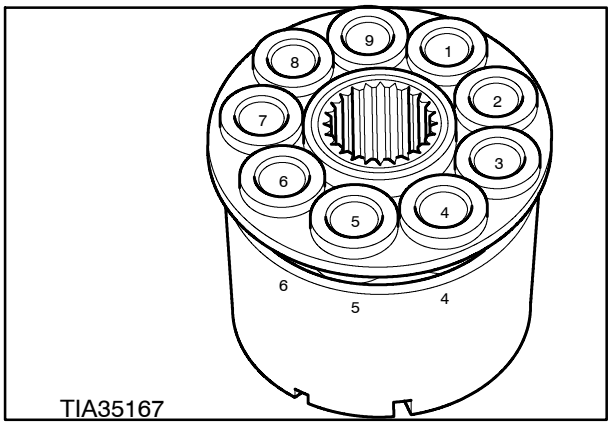
6. Remove preload spacer from driveshaft.Remove pumping head and piston from housing. Using a suitable marker identify each piston and slipper to their corresponding barrel in the pumping head.



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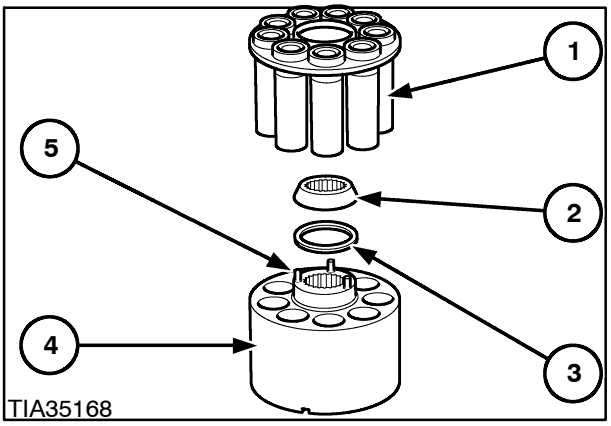
7. Separate pumping head and slipper assembly and inspect for damage. Where damage is identified the pumping element must be replaced.

Pumping Head and Slipper Assembly

1. Pistons and Slippers
2. Cone
3. Washer
4. Pumping Head
5. Pins (3 off)



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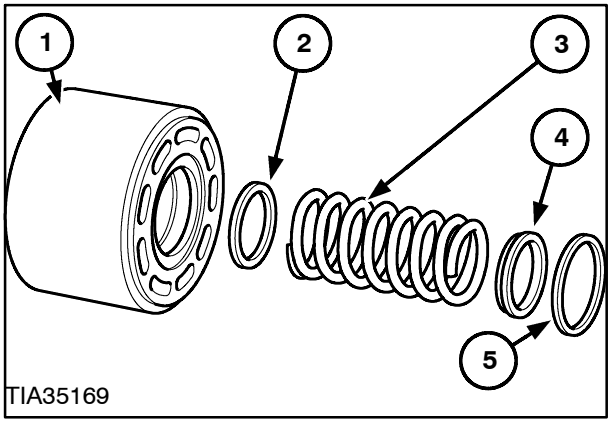
8. If necessary disassemble pumping head spring assembly by compressing the collar against the spring.

IMPORTANT: *Due to high spring pressure take care when removing retaining ring.*

Pumping Head Spring Assembly

1. Pumping Head
2. Washer
3. Spring
4. Collar
5. Retaining Ring



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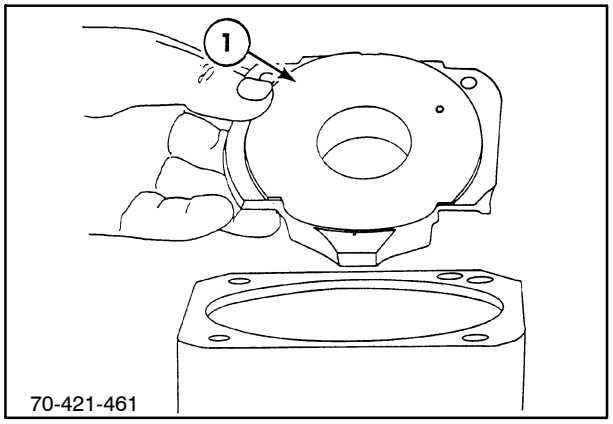
9. Remove swash plate (1) assembly.
10. Inspect components for wear and replace if damaged.



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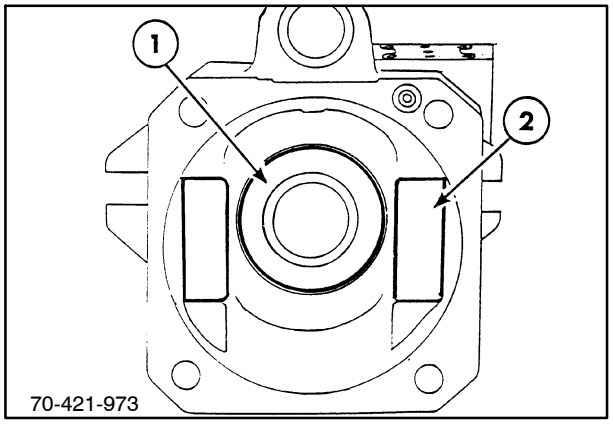
Assembly

Before reassembling the load sensed variable displacement pump, replace all worn and damaged parts and assemblies and all seals and O rings. Lubricate the seals and O rings with petroleum jelly to retain them during reassembly and provide lubrication to the dust and shaft seals. Also lubricate all part surfaces freely with clean hydraulic fluid.

1. Install a new input shaft bearing cup, (1) , and swash plate bearings (2).



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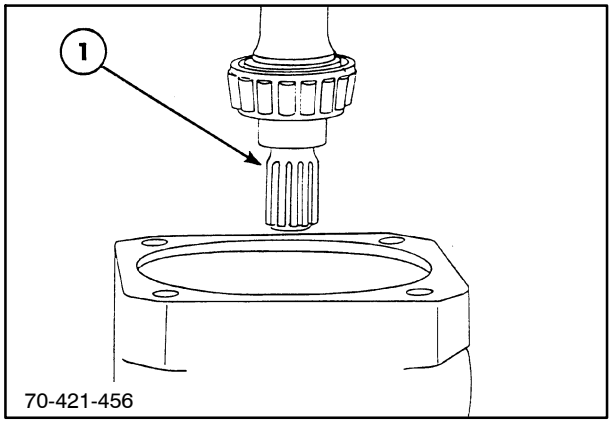
2. Install input shaft into housing.



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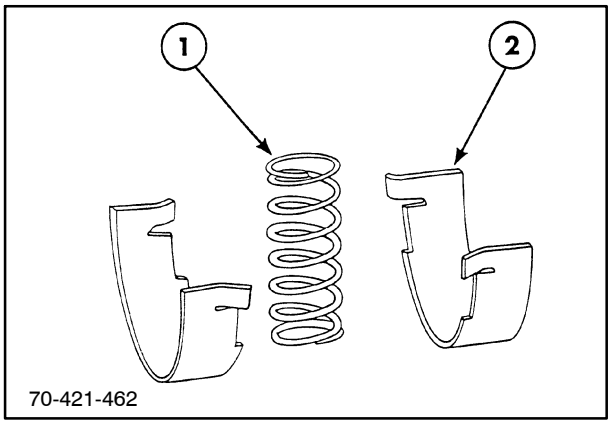
3. Install swash plate control spring and swash plare bearings.



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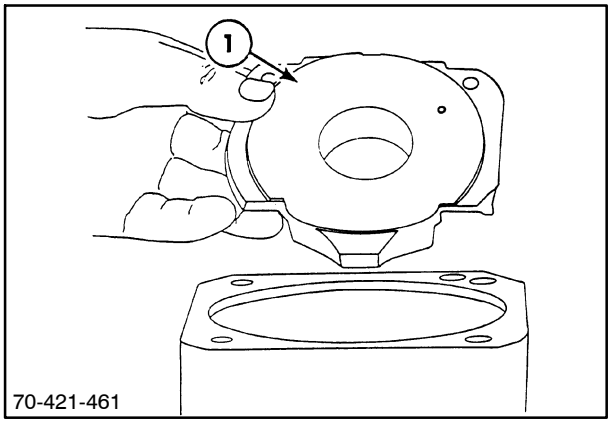
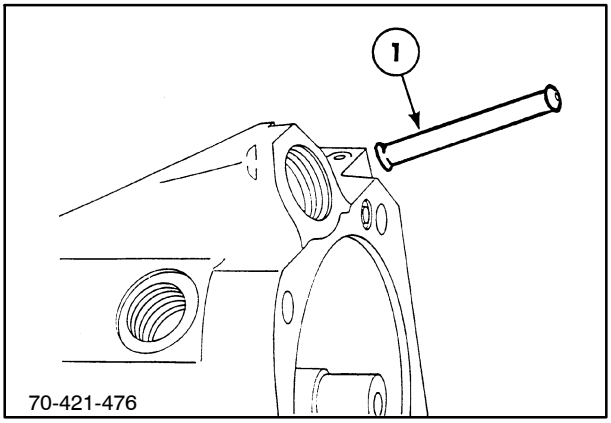
4. Reassemble the swash plate, 1, into the housing by tilting the swash plate with the push rod socket up slightly and installing.

NOTE: *Caution must be used when installing the complete swash plate so as not to dislodge the swash plate spring or the saddle bearings.*



5. Insert the push rod, 1, through the stroke piston bore and reengage the end of the tube into the swash plate socket.



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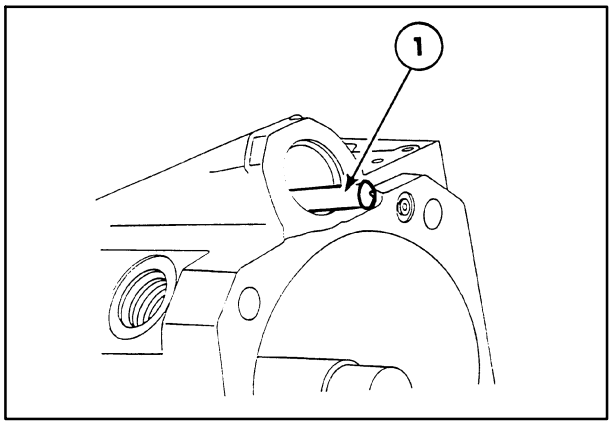
6. Tilt the swash plate up and insert the push rod, 1, down and into the socket. Make sure the push rod is engaged in the socket correctly.



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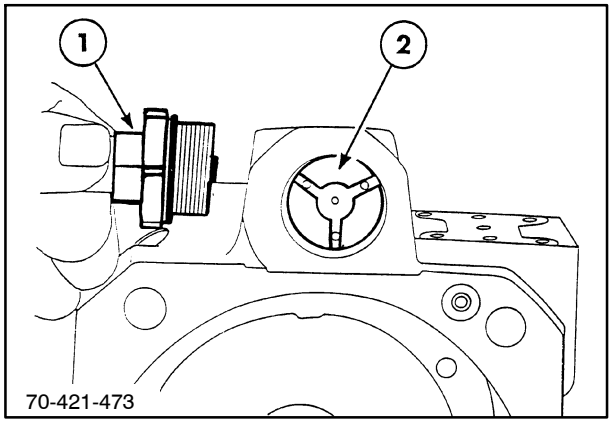
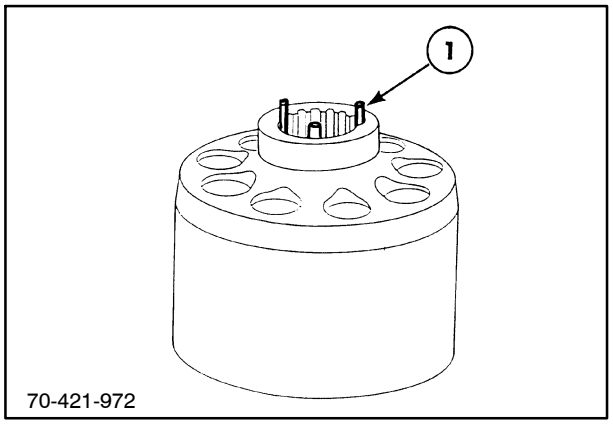
7. Install the stroke control piston, 2, in the bore. Screw the plug, 1, back on.



55

Pumping Head and Piston Assembly

1. Install the guide pins, (1), in the block splines.



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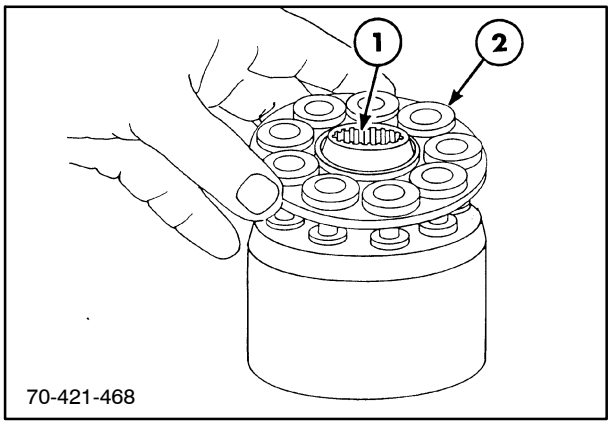
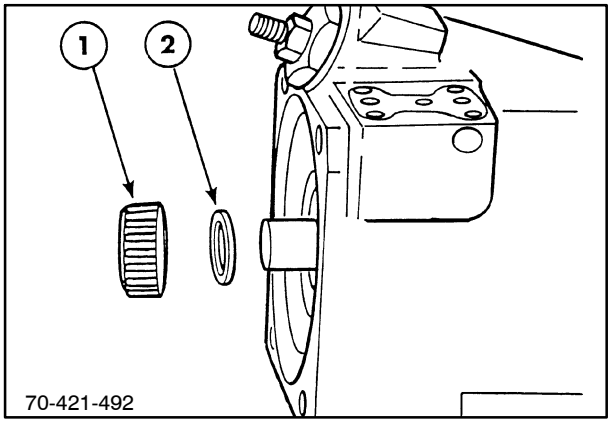
2. Lubricate and install the bearing, (1), spider and piston assemblies, (2), on the pivot and into the block assembly.



57

3. Check bearing preload before installing the rotating group. Install bearing, 1, and spacer, 2, on the shaft.



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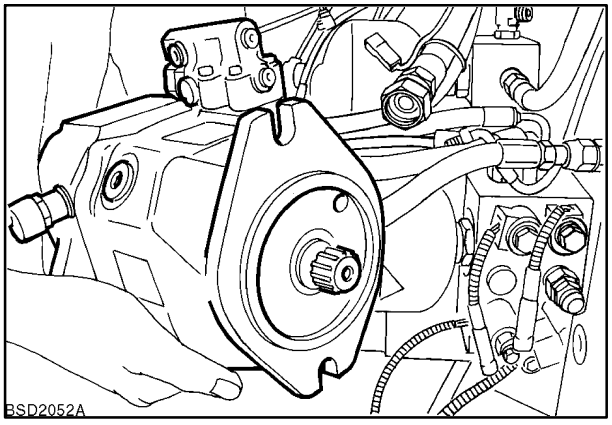
⚠ WARNING ⚠

The hydraulic pump is a heavy component and weighs 30 kgs. It is important that it is securely supported when being re-installed to the tractor.



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Installation

1. Locate the pump into the housing and secure with the two nuts.
2. Re-install the filter housing.
3. Re-install lube valve manifold
4. Reconnect all electrical connectors and hydraulic pipes.

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 3 - Electronic Draft Control

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CAUTION: *Observe the following precautions when arc welding on tractors installed with electronic draft control*

- Where possible, disconnect the part or implement to be arc welded from the tractor.
- Disconnect both battery cables from the battery. Isolate the cable ends to avoid contact with each other and the tractor.
- Position the welder earth (ground) clamp as close to the welding area as possible.
- If welding is to be carried out in close proximity of the tractor microprocessors then they should be removed from the tractor.
- Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.

SPECIFICATIONS

MAXIMUM LIFT CAPACITY - ALL MODELS

Test results to OECD criteria–links horizontal, maximum hydraulic pressure:

With 1 Assist Ram (50mm)	
610 mm (24 in.) to rear of ball ends	4831 kg 10650 lb
With 2 Assist Rams (50mm)	
610 mm (24 in.) to rear of ball ends	5851 kg 12899 lb
With 2 Assist Ram (80mm)	
610 mm (24 in.) to rear of ball ends	5638 kg 124091lb
With 2 Assist Ram (90mm)	
610 mm (24 in.) to rear of ball ends	7117 kg 15691 lb

VALVE SETTINGS

Lift Cylinder Relief Valve (located in EDC Valve)	3335 PSI (230 bar) Variable Displacement Pump 3045 PSI (210–215 bar) Fixed Displacement Pump

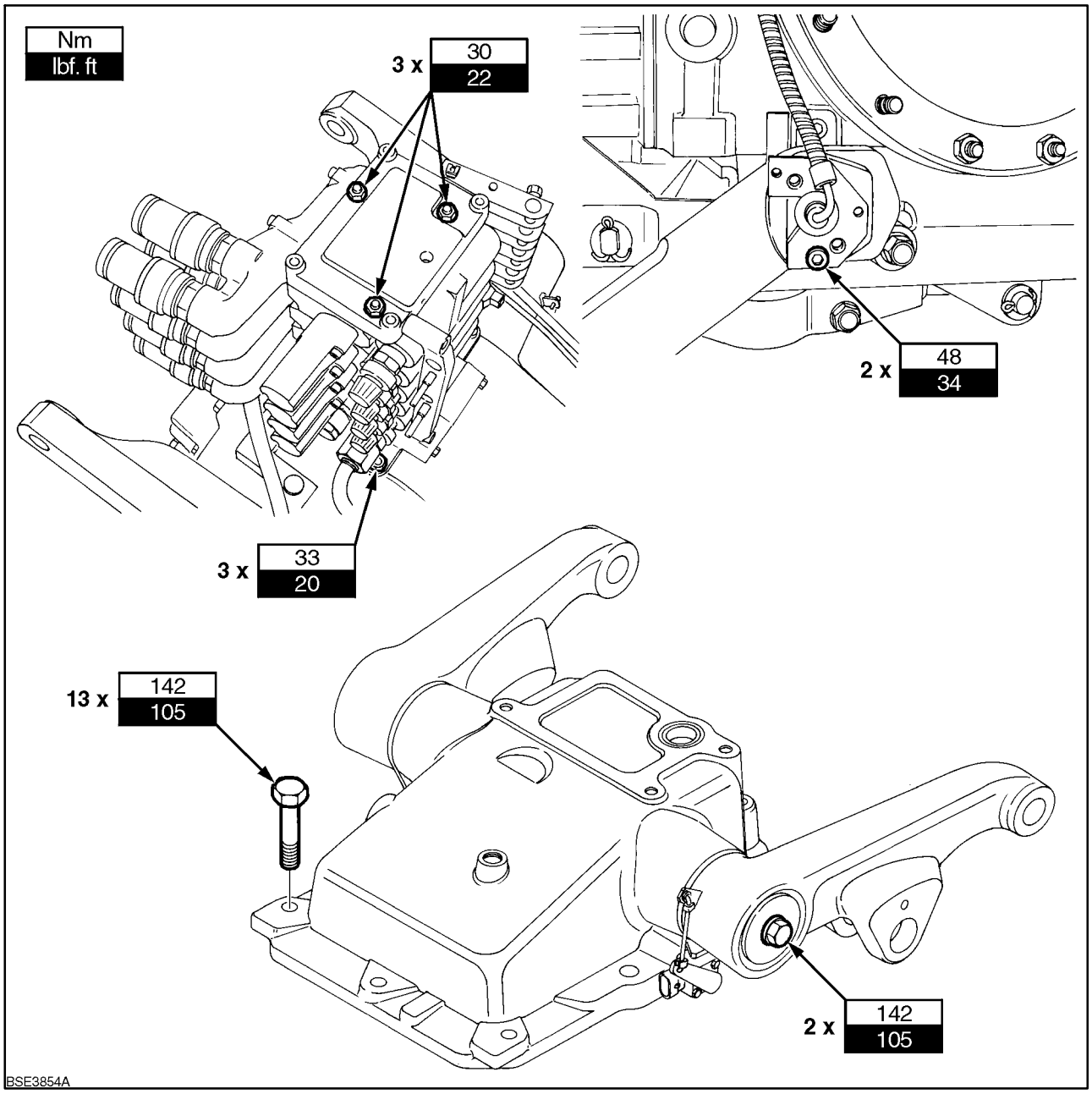
GASKET SEALER

Flexible Gasket Sealant	Part No 82995771

SPECIAL TOOLS

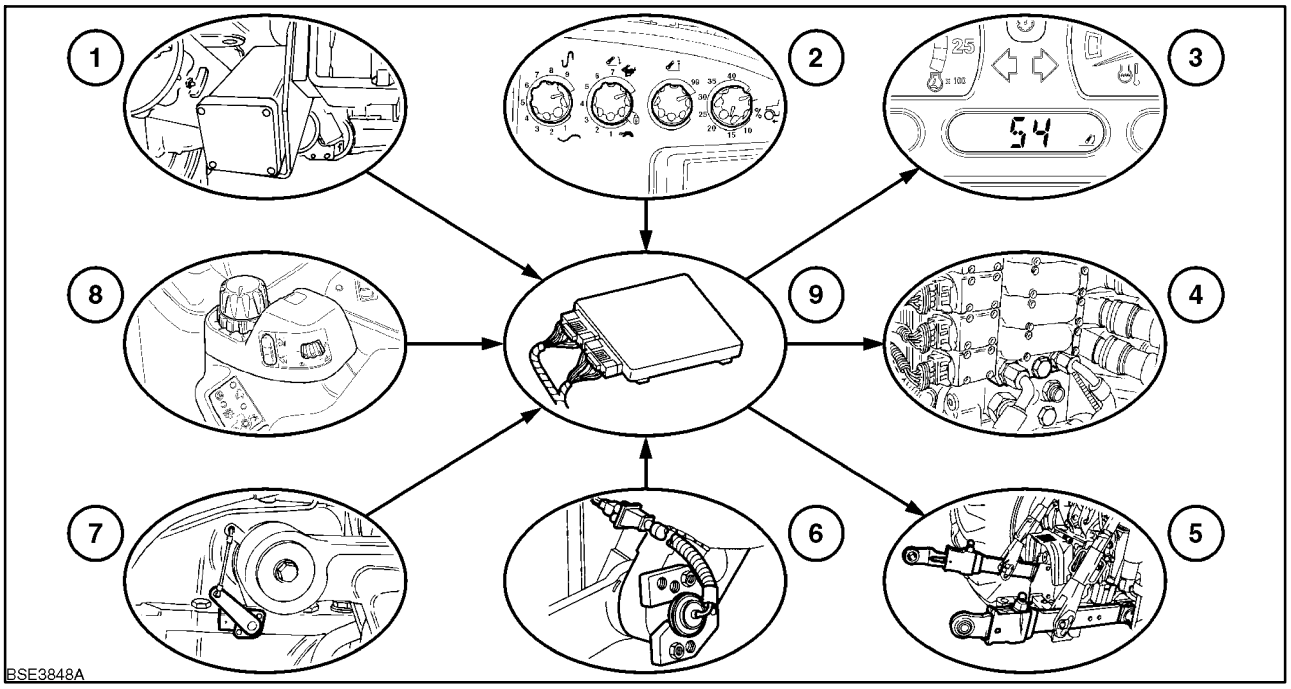
		Tool Part No.
Hydraulic Lift Bracket		293983
Hydraulic Lift Lifting Hook		291359/2
Lift Piston Installation Ring (optional)		293813
Lift Cross Shaft Seal Installer		293985
Flowmeter	Suitable for measuring 0–120 ltrs/min	-
Flowmeter Hoses	Procure locally to suit Flowmeter used	-

TIGHTENING TORQUES



1

DESCRIPTION AND OPERATION



2

Position/Draft Control Schematic

1. Performance Monitor Radar
2. Control Panel
3. Instrument Panel
4. Electronic Draft Control Valve
5. Hydraulic Lift
6. Load Sensing Pins
7. Lift Arm Position Sensing Potentiometer
8. Implement Depth/Draft Controls
9. Microprocessor

PRINCIPAL OF DRAFT CONTROL

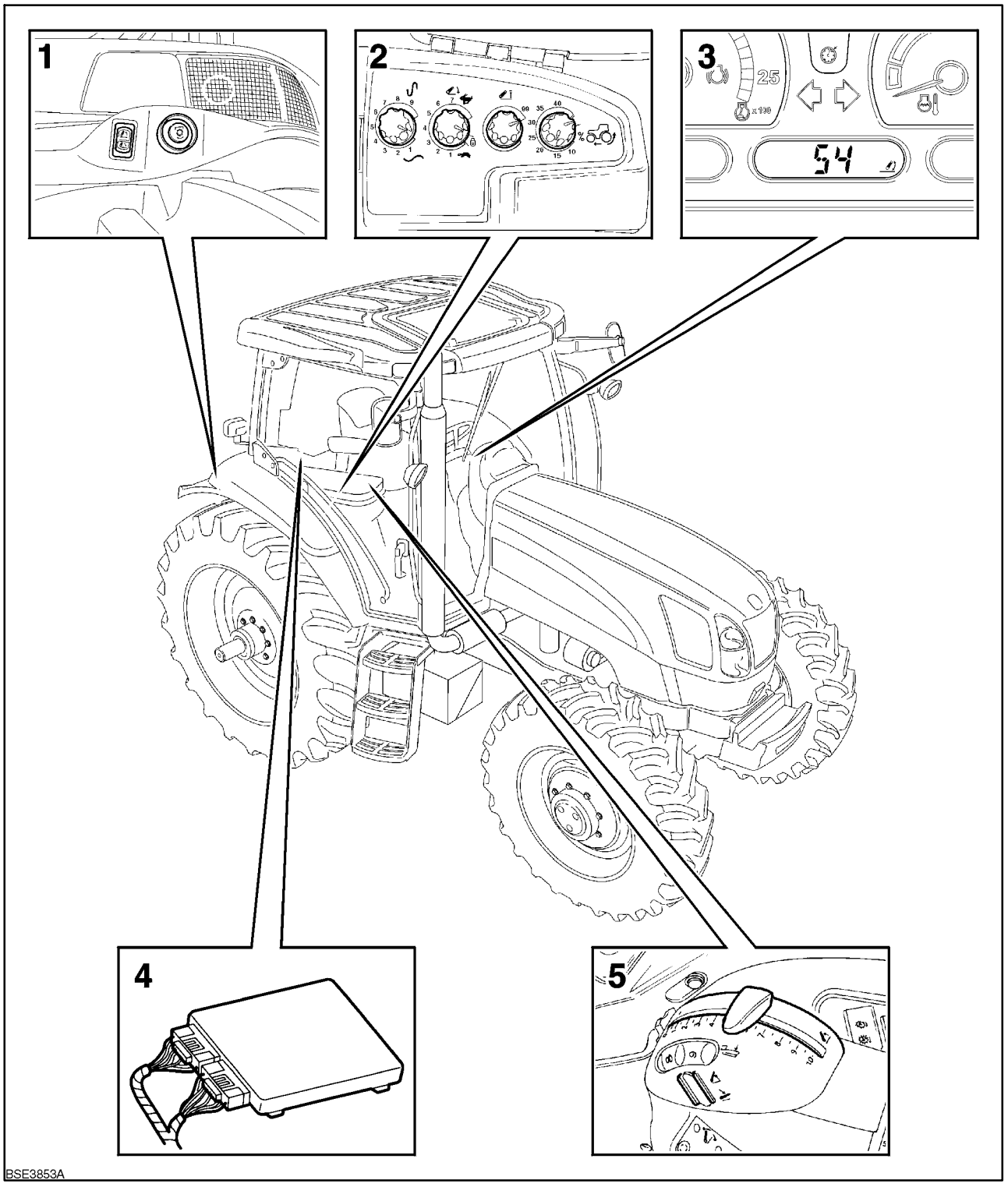
One method of providing a more constant depth control is to take advantage of the fact that draft loading increases with implement depth. If a fixed implement draft is maintained a fixed implement depth will result, providing the tractor speed and type of soil being worked remain constant.

The hydraulic lift electronic draft control system provides a means of accurately controlling implement draft and soil penetration depth on fully or semi mounted implements.

The principle of electronic draft control, is to sense draft variations through two load sensing pins in the lower links and using a microprocessor translate these variations into electrical signals for controlling the draft loading and working depth of an implement.

The smoothness and accuracy provided during operation gives this system a clear advantage over conventional mechanical systems.

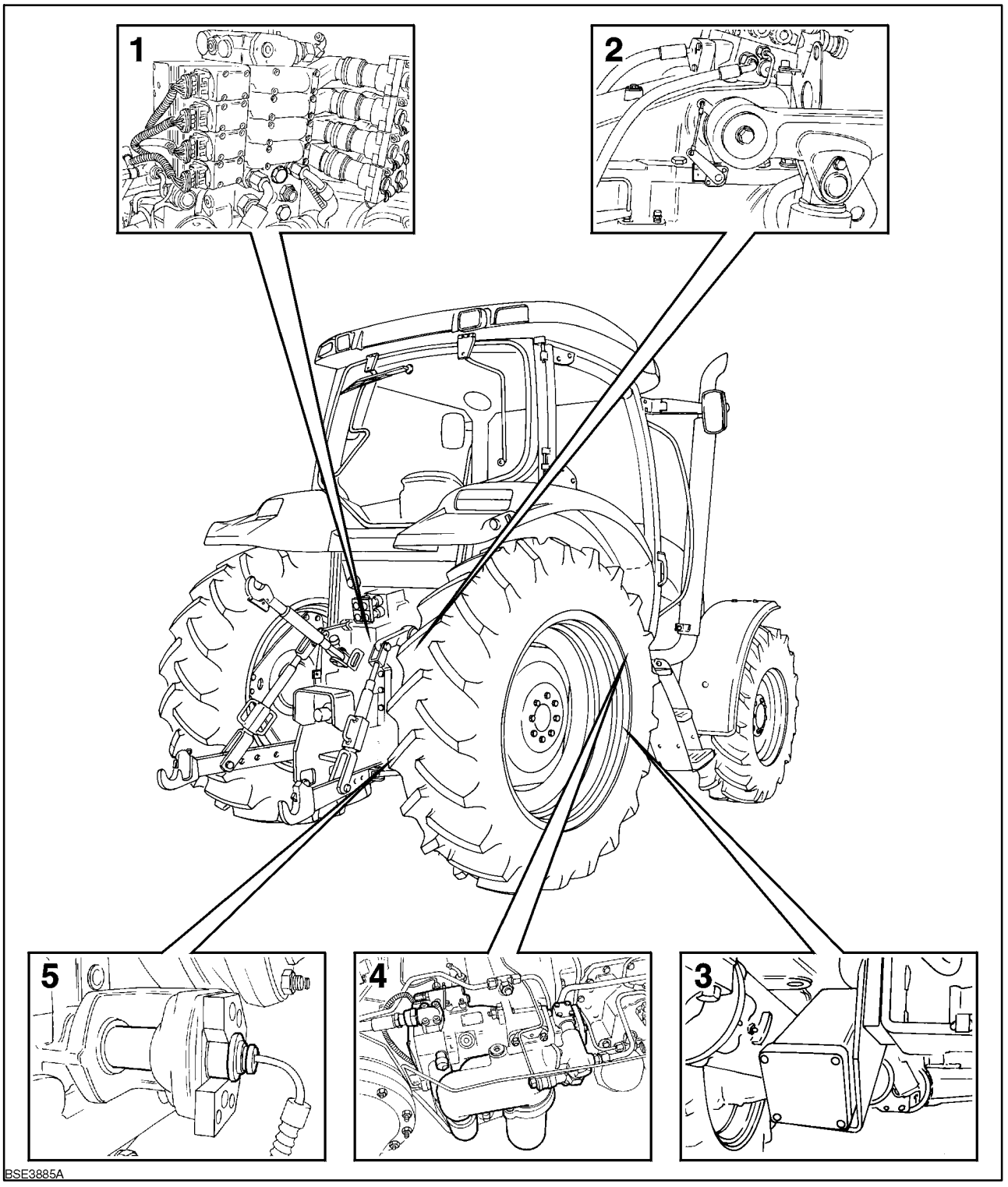
In addition to providing draft control, it is also necessary to provide a system where the hydraulic links can be maintained at a position relative to the tractor regardless of draft forces on the implement. This method of maintaining the implement position is called position control.



3

Electronic Draft Control Component Layout

1. Rear Fender External Lift/Lower Switch
2. Draft Sensitivity and Drop Rate Controls
3. Instrument Cluster
4. EDC Microprocessor
5. Implement Depth/Draft Controls



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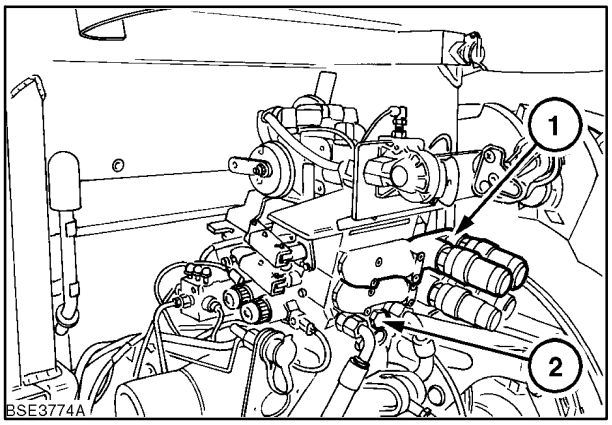
Electronic Draft Control Component Layout - Continued

1. Electronic Draft Control Valve
2. Lift Arm Position Sensing Potentiometer
3. Performance Monitor Radar
4. Variable Displacement Hydraulic Pump
5. Load Sensing Pin

HYDRAULIC LIFT ASSEMBLY AND CONTROL VALVE

The hydraulic lift Electronic Draft Control valve (EDC valve) is a stack type proportional solenoid operated valve (2) mounted with the remote control valves (1) at the rear of the tractor.

The valve responds to pulse width modulated signals from the microprocessor to direct pump pressure oil to and from the hydraulic lift cylinders in direct proportion to the degree of lift required.



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HYDRAULIC PUMP

Oil flow to the electronic draft control system is provided by the Fixed Displacement pump or Load Sensing Variable Displacement piston pump which adjusts output according to hydraulic circuit demand.

Figure 6, 16 X16 Models.

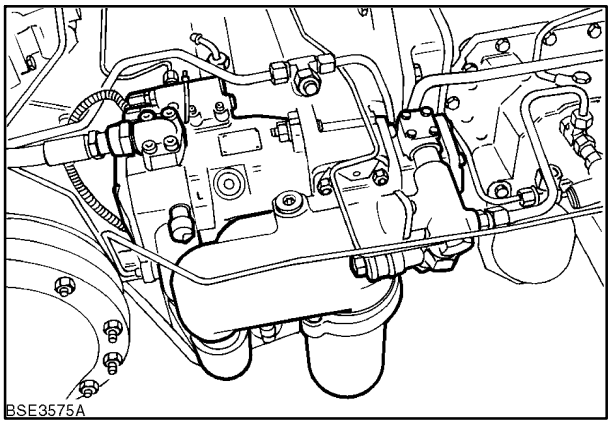

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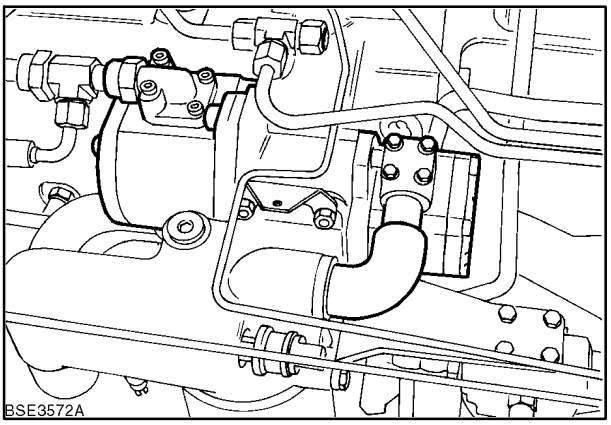
Figure 7, 24 X 24 Models.

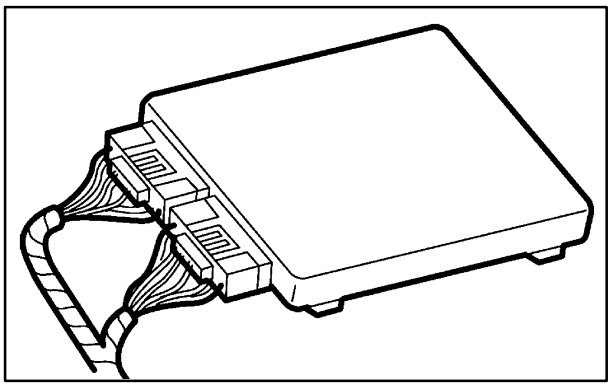


7

ELECTRONIC DRAFT CONTROL (EDC) PROCESSOR

The processor is the management system for the electronic draft control hydraulic lift assembly.

The processor is housed in a protective casing and connected to the electrical harness via multi-pin connectors. The processor contains no serviceable parts and requires direct replacement when faulty.



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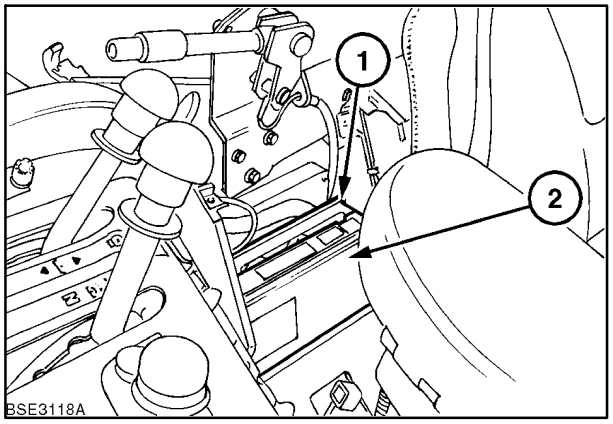
The processor (1) is located behind the panel to the rear of the operators seat

The processor converts electronic signals from the operator controls, lift arm position sensing potentiometer and lower link load sensing pins to operate the pulse width modulating valve and raise/lower the hydraulic lift.

The processor also has a self diagnostic capability which detects when the system is not functioning correctly. When this occurs an error code is generated and held in the processor memory so they may be retrieved when diagnosing faults on the tractor.



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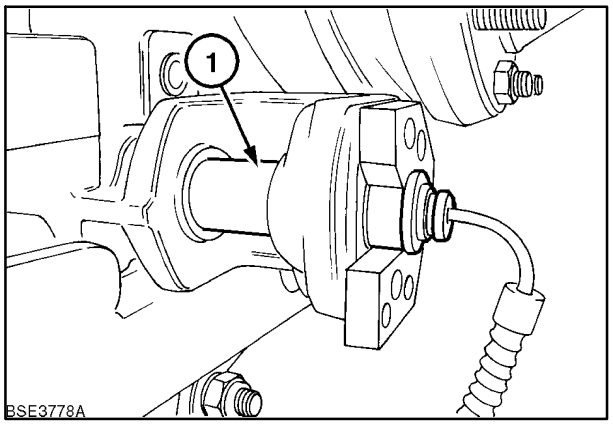
LOAD SENSING PINS

The load sensing pins (1) sense draft variations applied by an implement on the lower links.

The pins react to draft shear forces in the horizontal plane but not forces due to the weight of the implement.



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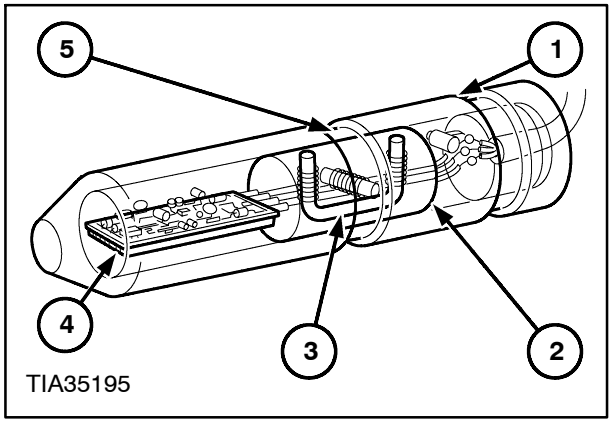
Each load sensing pin consists of a hollow metal tube (1) containing a circuit board (4) and load sensing core (2). Within the core material are three wire coils (3) supported by metal rods. The coils are energised by the 8.5 volt supply and create a stable pattern of magnetic flux within the core.

The outer casing of the pin is made from a metal with unique electromagnetic properties. When the metal is subjected to a shear force, which is centred on the wasted section (5) of the pin, the natural magnetism of the pin casing changes, which distorts the magnetic flux pattern of the core and is transformed into an electrical output signal. This signal which is proportional to the draft load acting on the implement is then received by the processor.



11

OPERATOR CONTROLS

The lift arm position control lever (1) is used to raise and lower the hydraulic lift arms. The lever is used to set the lower limit working depth of an implement.

The draft loading control (2) has a scale of zero to 10 and is used to select the implement draft forces which directly effects the working depth of the implement when lowered into the ground using the lift arm position lever.

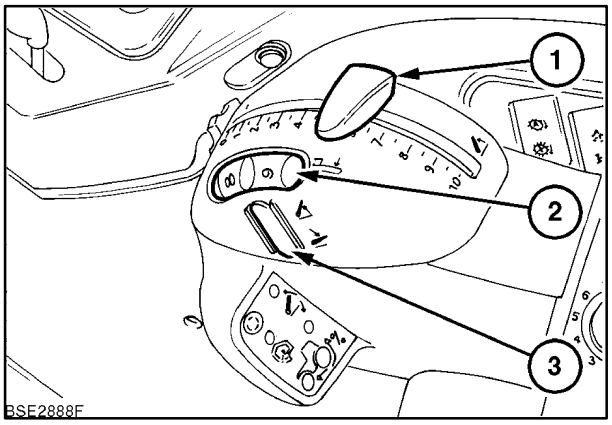
Draft control is in operation when the scale of 0 to 9 is selected. Zero is the minimum draft setting and 9 the maximum.

When Position 10 is selected the hydraulic lift is in 'Position Control' and draft forces applied to the implement have no effect on the working depth. in this condition the implement depth and position of the lift arms is controlled only by the lift arm position control lever.

The raise lower switch (3) is a three position switch that enables the implement to be raised and lowered without moving the lift control lever.

Pressing and releasing the bottom of the switch causes the implement to lower to the preset working depth. The switch will spring into the mid position when released.

Pressing and holding the bottom of the switch causes the implement to fully lower and overrides the lowering limit set by the lift arm position control lever. The lift arms will raise back to the preset depth when the button is released.



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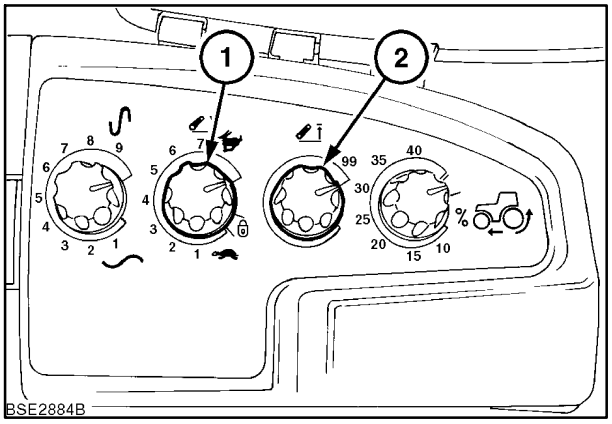
The drop rate control (1), adjusts the speed at which the lift arms drop during a lowering cycle.

The height limit control (2) restricts the maximum height the lift arms can be raised and is used to prevent large implements from striking the rear of the cab or platform. This control restricts the lift height when either the lift control lever or external lift/lower switches are used.

When transporting equipment on the 3 point linkage turning the drop rate control fully anti-clockwise to the transport lock (padlock symbol) will prevent the implement from accidentally lowering and damaging the road surface.



13

When transporting equipment implement bounce can lead to lack of steering control at speeds. By turning the drop rate control fully anti-clockwise and using the raise lower switch to raise the implement, 'Dynamic Ride Control is selected and functions whenever the tractor is operating at speeds above 8 kph (5 MPH).

Dynamic Ride Control is an automatic system to counter implement bounce.

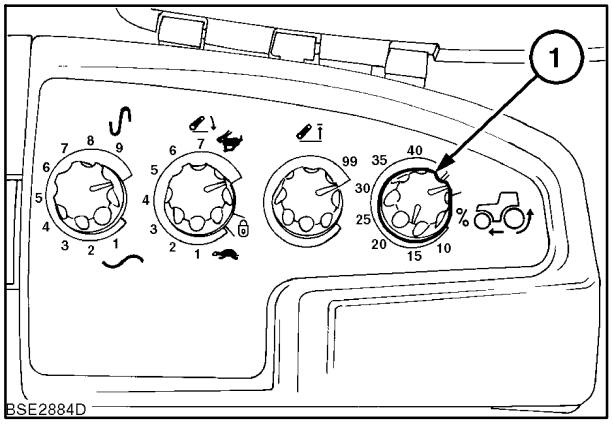
Whenever the front wheels hit a bump causing the front of the tractor to rise, the hydraulic system will immediately react to counter the movement and minimise implement bounce to provide a smoother ride.

The slip limit control (1), available only with the optional radar sensor unit, enables the operator to select a wheel slip threshold. When the wheel start to slip beyond the set limit the working depth of the implement is automatically reduced until wheel slip returns to the set level.

The slip limit 'on' indicator (2), will illuminate when slip control is activated and the implement is raised to restore the selected slip rate.

The warning light (5) has two functions:-

A 'Flashing Light' warns that there is a malfunction in the Electronic Draft control system. Figure 15



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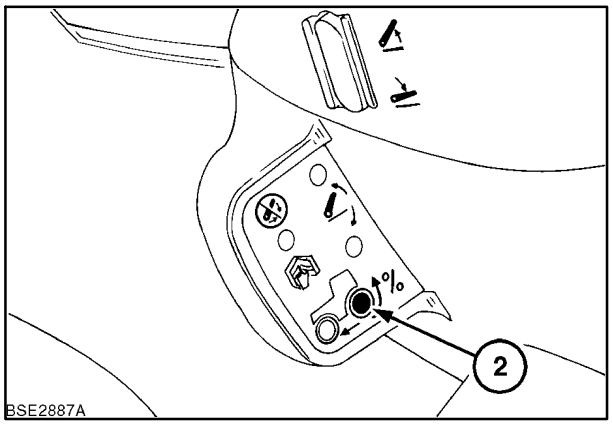

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A 'Steady Light' is a hitch disabled warning and indicates that the hydraulic lift is disabled and cannot be operated using the in cab controls. The 'hitch disabled warning will display if:

- The position control lever has been moved while the engine is stopped.
- One of the external power lift switches has been operated to raise or lower the lift arms.

To put the controls back into phase with the linkage move the raise/lower switch to the central position, start the engine and move the lift arm control lever slowly forward or rearward until the warning light goes out.

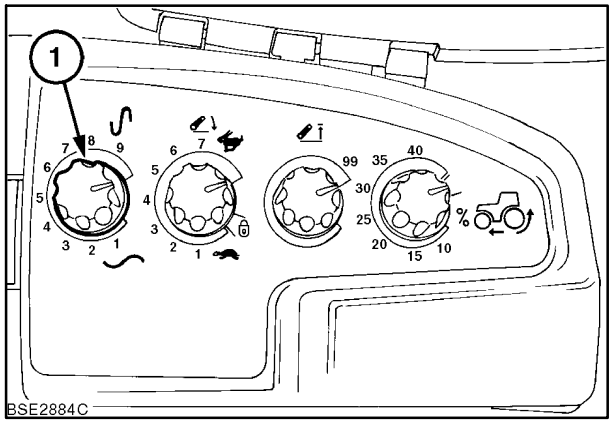
Because soil conditions in a field can vary it is necessary to select the sensitivity rate (draft loading operating band) at which the system responds to changes in draft loading.

This is achieved using the draft sensitivity control (1) which has a scale of 0 to 10.

Position 10 on the control is the most sensitive where minor variations in soil density will cause the hydraulic system to respond with repeated movements of the linkage in ordure to maintain the draft loading within required operating band.

Turning the control towards position 1 (fully clockwise) will progressively decrease the rate of sensitivity. This allows the draft loading on the pins to vary within a larger operating band before the system responds and makes automatic corrections to implement depth.

The movement indicator lights (2) and (3) will illuminate every time the system reacts to adjust the draft loading.



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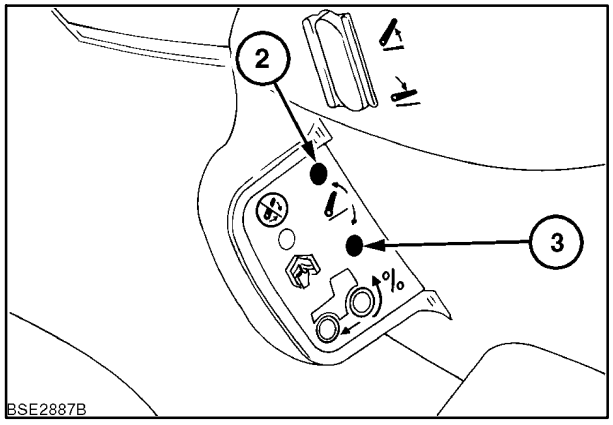
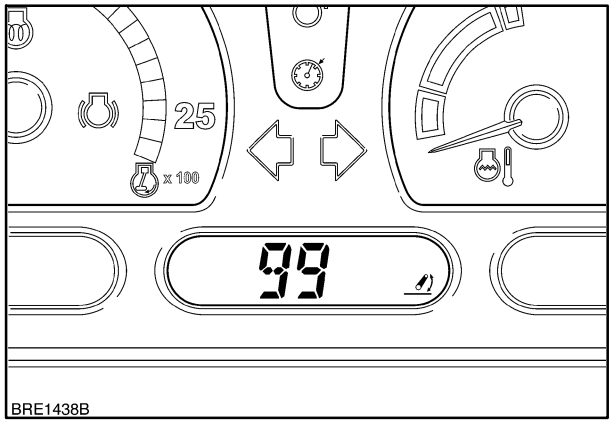


17

When operating in 'Position Control' the digital display on the instrument panel will indicate the position of the lift arms over a scale of '0' to'99' (1). A display of '0' indicates that the links are fully lowered and '99' that they are fully raised.



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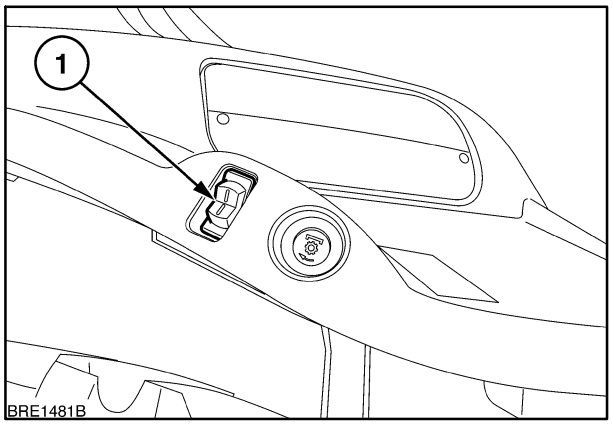
REAR FENDER LIFT LOWER SWITCHES

These externally operated switches (1) allow the hydraulic linkage to be raised and lowered by the operator while standing beside the tractor, so aiding attachment and detachment of implements.



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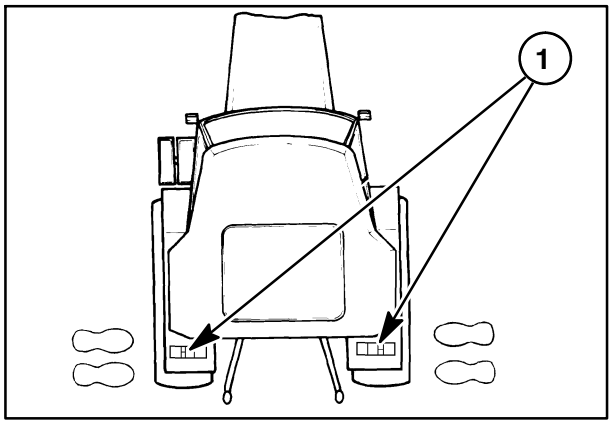
⚠ CAUTION ⚠

Before leaving the tractor to operate the external switches:

- *Move the gearshift levers to neutral.*
- *Disengage the P.T.O.*
- *Apply the parking brake.*

With the engine running, move the hand throttle lever to the low idle position (fully rearwards).

The operator must only activate the external switches (1) while standing to the side of the tractor (outboard of the rear tyres). To avoid damage to implement or tractor, operation of the in cab and external hydraulic controls should **not** be carried out simultaneously.



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⚠ WARNING ⚠

Before using the external hydraulic power lift switches, ensure that no person or object is in the area of the implement or 3-point linkage.

Never operate the external switches while standing:

- *Directly behind the tractor or tyres.*
- *Between the lower links.*
- *On or near the implement.*
- *Never extend arms, legs, any part of the body or any object into the area near the 3-point linkage or implement while operating the external switch.*
- *Never have an assistant working the opposite set of controls.*
- *When moving to the opposite set of controls, move around the tractor or implement.*
- *Do not cross between the implement and tractor.*

DRAFT CONTROL

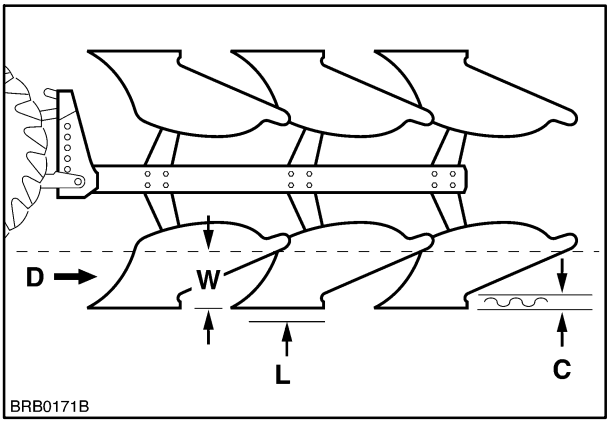
In draft control the working position of the lift arms is affected by the lift arm position control lever, draft loading control, draft sensitivity and slip limit control. All these controls interact with each other to achieve the desired operation of the hydraulic lift.

D Draft Load on Implement

W Working Depth
(Set by Draft Loading Control)

L Lower Limit
(Set By Lift Arm Position Control Lever)

C Correction Band
(Set by Sensitivity Control)



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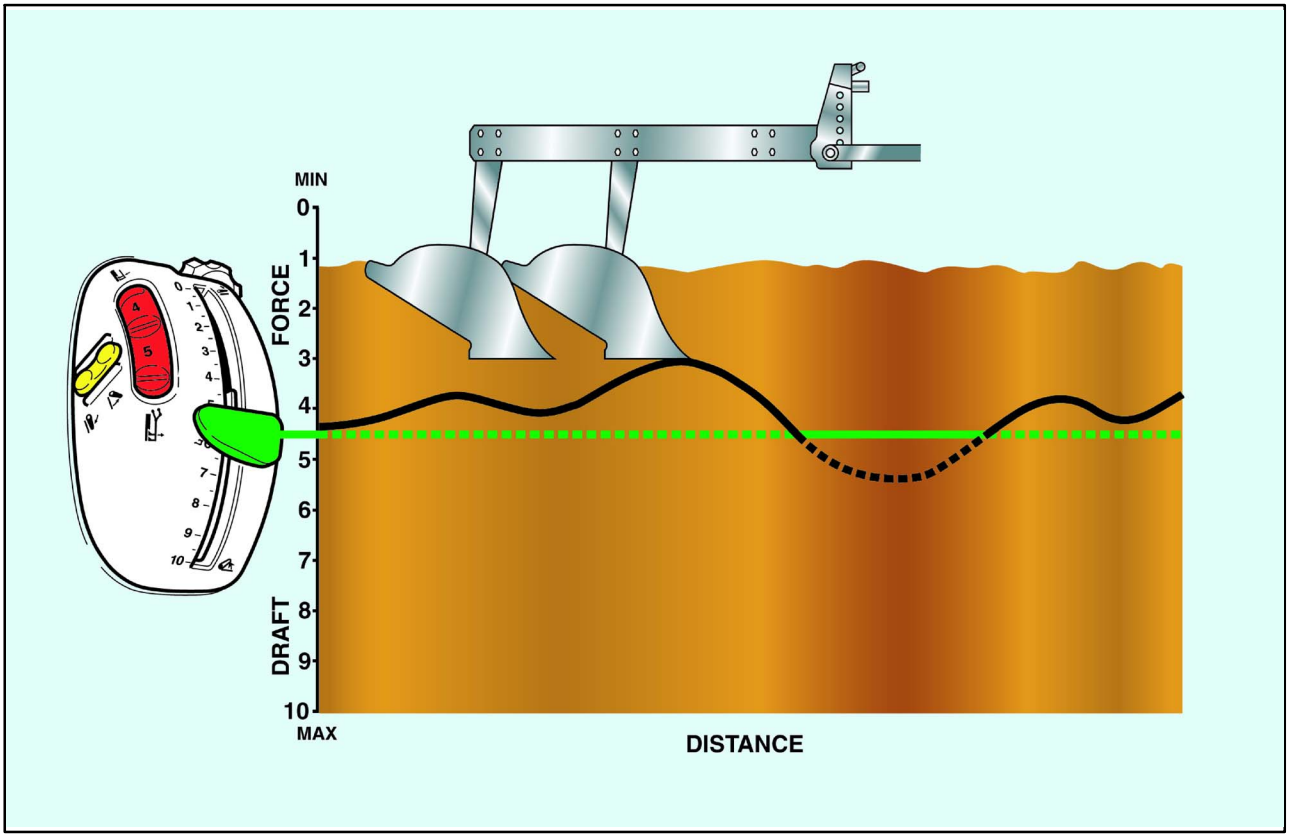
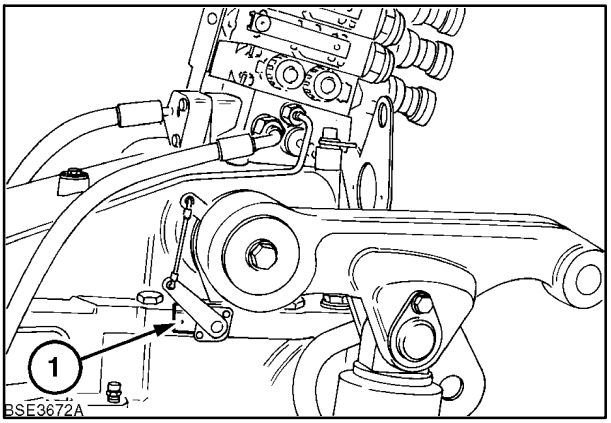


22

The lower limit working depth of an implement in the soil is controlled by the lift arm position control lever.

Irrespective of any draft loading applied to the implement the maximum depth of the implement will never exceed this setting.

The depth of the implement is sensed using the lift arm position control potentiometer (1) which sends a signal to the microprocessor to turn off power to the lower solenoid of the hydraulic control valve when maximum depth has been reached.



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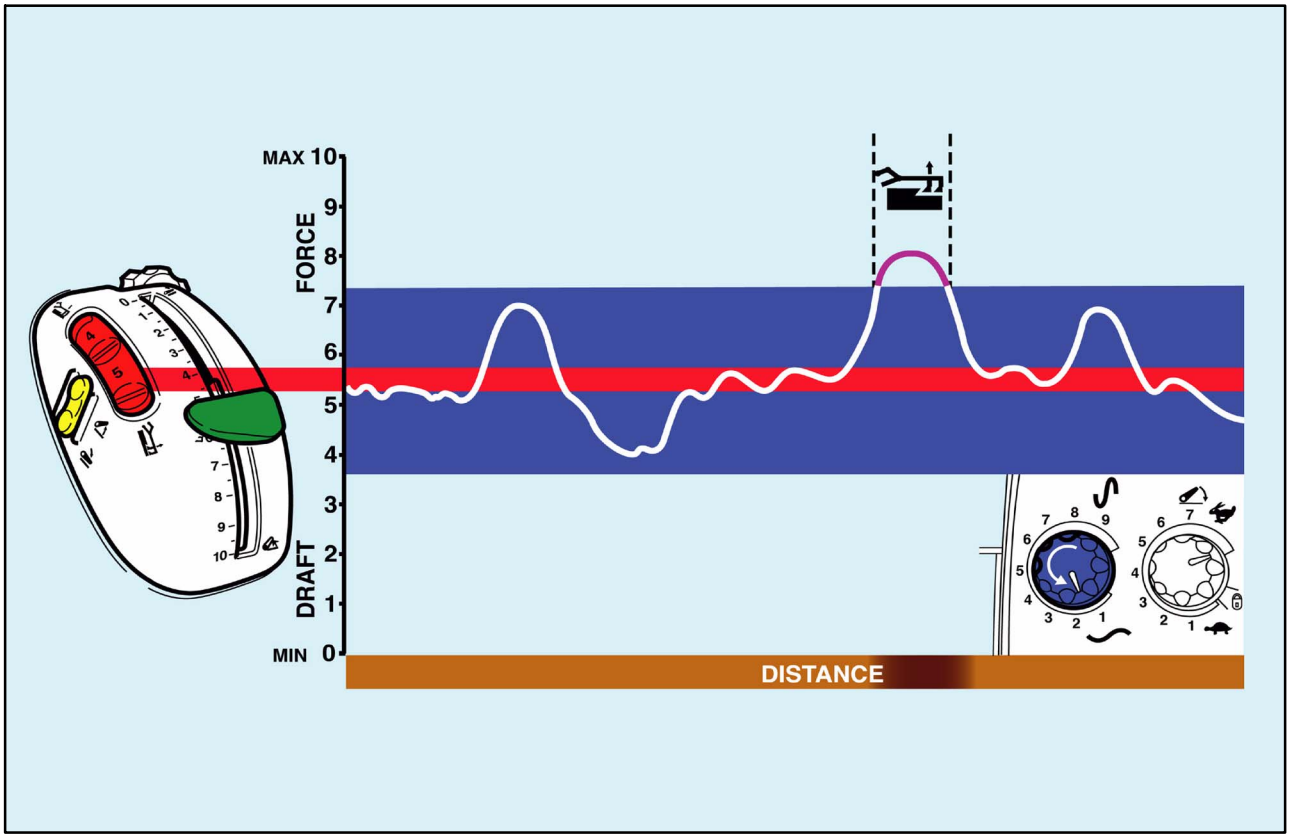

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Low Sensitivity Setting

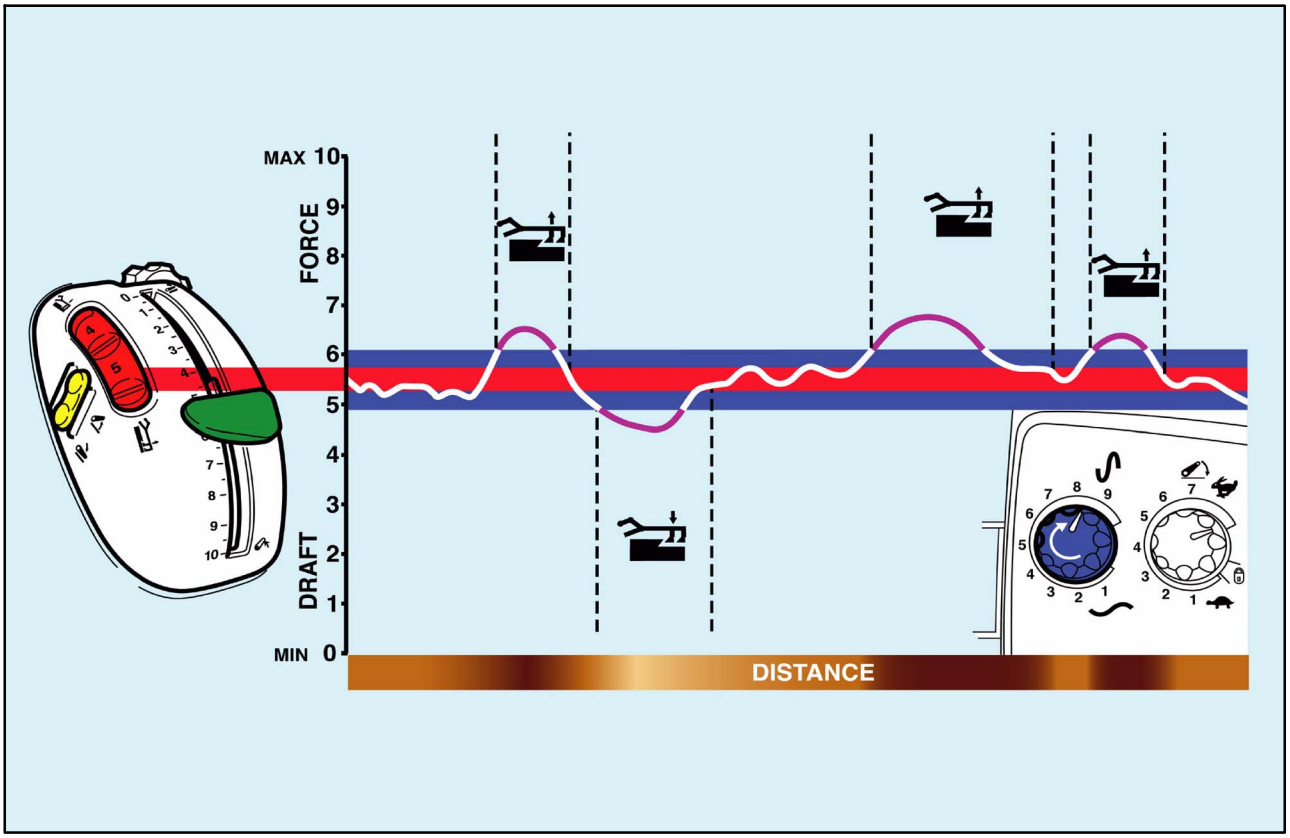
When draft control has been selected the working depth of the implement is controlled by the draft loading (red band) and draft sensitivity (blue band) applied to the load sensing pins.

If draft loading fluctuates within the sensitivity band the lift control valve will remain in the neutral condition and implement depth will remain constant.

When a low draft sensitivity (sensitivity knob turned counter clockwise) is selected large variations in draft control are allowed before changes are made to implement depth. This provides a more constant implement working depth.

If the draft loading applied to the implement exceeds the sensitivity setting the control valve raising solenoid is energised and the implement is raised sufficiently until draft loading are restored to the nominal value set by the draft loading control.

When draft loading decreases due to lighter soil being encountered the lowering solenoid would be energised to lower the implement further into the ground and restore the draft force. The working depth of the implement will however never be lower than that set by the lift arm position control lever.



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High Sensitivity Setting

When high sensitivity is selected (sensitivity knob turned clockwise) the draft forces will often reach the minimum and maximum draft control settings. In this situation the hydraulic control valve will make more corrections to implement depth in order to achieve the required draft loading.

This more sensitive selection of implement draft control is used when working on undulating ground and weight Transfer for adequate traction is essential.

The wide band less sensitive draft control setting, Figure 24, is used where a more constant implement depth is required and acceptable traction can be achieved.

NOTE: *If Position control has been selected the draft forces applied to the load sensing pins will have no effect and implement depth is controlled only by the lift arm control lever.*

HYDRAULIC OPERATION OF LIFT CONTROL VALVE

The components within the Electronic draft control are as shown and function as follows:-

Flow Control Spool

The flow control spool regulates flow from the parallel gallery, running through the centre of the remote valve and electronic draft control valve sections to the hydraulic lift. The valve compares the pressure in the parallel gallery with the operating pressure of the hydraulic lift and regulates flow to the hydraulic lift circuit according to lift circuit demand.

Raise Spool

The raise spool directs flow to the lift circuit and is directly controlled by the pulse width modulating raise solenoid.

Raise Solenoid

The raise solenoid is a pulse width modulated solenoid controlled by the electronic draft control processor. Activation of the solenoid is controlled by the electronic draft control processor and is proportional to the speed of lift required.

Load Check Valve

The load check valve prevents oil trapped in the lift cylinder escaping to reservoir. The valve will only open when the pressure flowing across the raise spool is greater than the pressure of the trapped oil in the lift cylinder.

Lift Cylinder Relief Valve

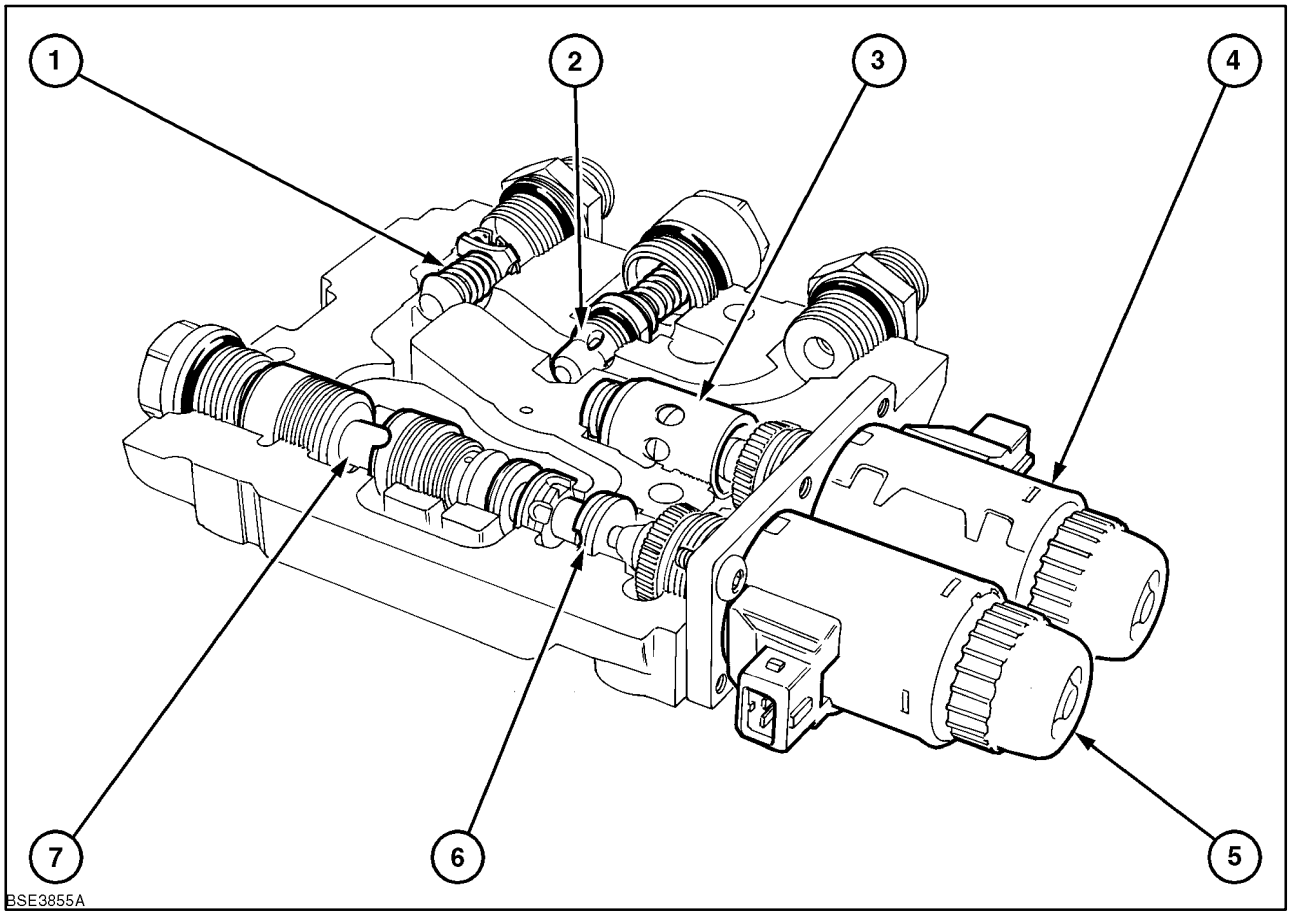
The lift cylinder relief valve protects the lift cylinder from excessive shock loads and operates at 230bar.

Lower Solenoid

The lower solenoid is identical in design to the pulse width modulated raise solenoid. The solenoid is activated by the processor and controls operation of the lowering metering valve in order to maintain the desired rate of implement drop.

Lowering Metering Valve

The lowering metering valve controls the rate of flow from the lift cylinder to reservoir when lowering the hydraulic lift. The valve is operated by the pulse width modulated lowering solenoid.



26

Electronic Draft Control Valve Components

1. Load Check Valve
2. Lift Cylinder Relief Valve (230 Bar)
3. Lowering Metering Valve
4. Lowering Solenoid
5. Raise Solenoid
6. Raise Spool
7. Flow Compensating Valve

SECTIONAL VIEWS

ELECTRONIC DRAFT CONTROL

Neutral

NOTE: *The hydraulic lift cylinder is a single acting cylinder requiring only a single port for raising and lowering the lift arms.*

When the hydraulic lift is in 'Neutral' the control valve solenoids are not energised.

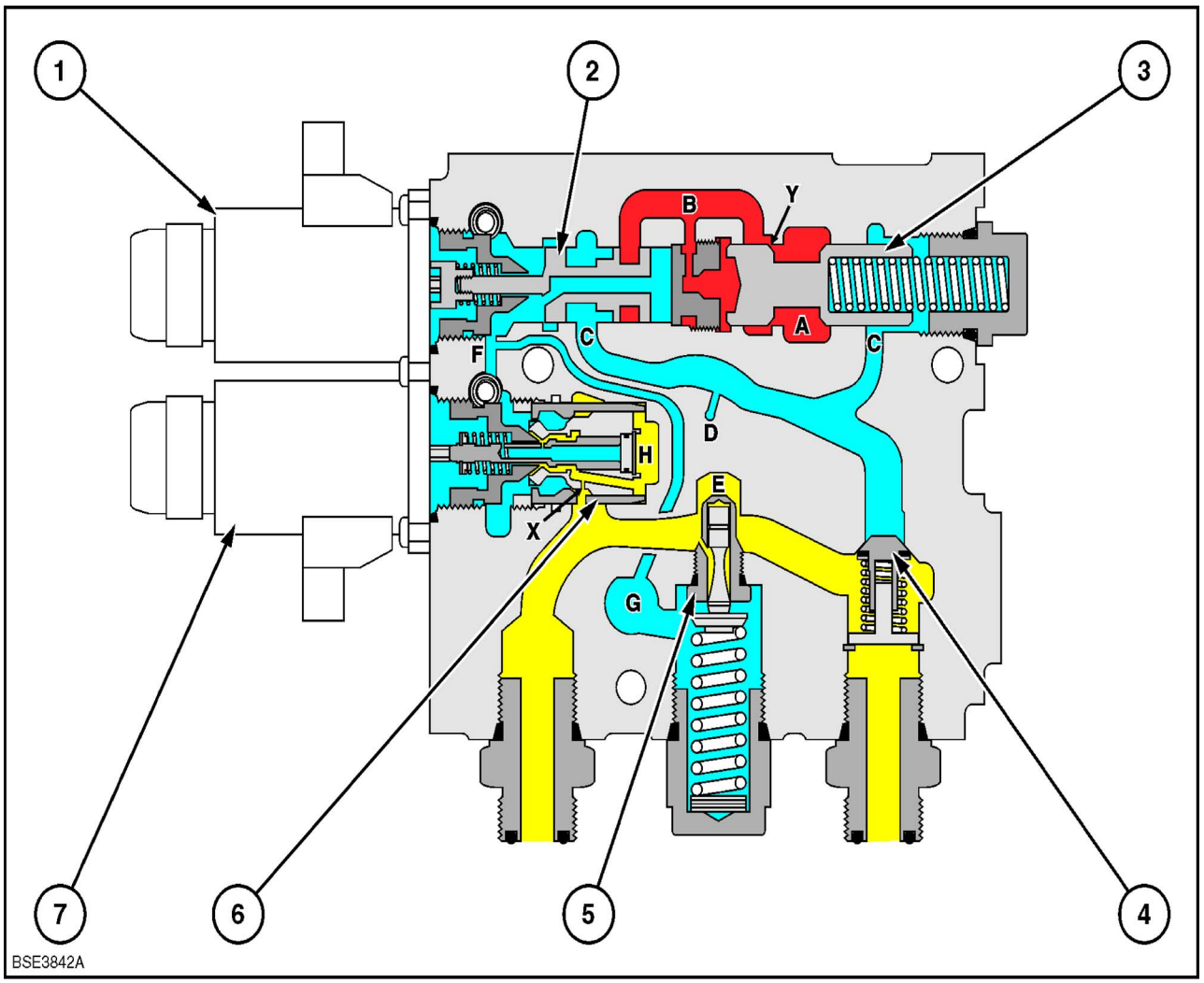
Oil flow from the parallel gallery 'A' flows past the flow compensator spool into gallery 'B' where it is blocked by the lands of the raising spool.

Oil under pressure in the hydraulic lift circuit is prevented from entering gallery 'E' by the load check valve (5).

The trapped pressurised oil in the lift circuit is applied to the right hand end of the metering valve through the small drilling 'X'. The applied pressure holds the metering valve in the closed position preventing oil flow from gallery 'E' to the return to reservoir gallery (F).

When the valve is in neutral, gallery 'C' and load sensing galleries'D' are open to reservoir, through the centre of the raising spool and gallery 'F'.

Gallery 'G' is a common return to reservoir gallery running through the centre of the valve stack.



Electronic Draft Control - Neutral

Pump Pressure

Return To Reservoir

Trapped Oil

27

1. Raising Solenoid
2. Raising Spool
3. Flow Compensator Spool
4. Load Check Valve
5. Lift Cylinder Safety Valve (230 Bar)
6. Lowering Metering Valve
7. Lowering Solenoid

Raising

When the hydraulic lift is raised using the operator controls or the electronic draft control system makes adjustments to reduce implement depth the pulse width modulated raise solenoid is energised by the microprocessor.

Controlled energising of the solenoid by the microprocessor enables the solenoid to move the spool to the right in proportion to the rate of lift required by the system.

When system pressure is sufficient to lift the check valve (5) off it's seat, oil from gallery 'C' flows into gallery 'E' and operates the lift cylinder

Pressure oil in the lift circuit is applied through the small drilling 'X' to the right hand end of the metering valve 'H' and holds the valve in a closed position preventing oil in gallery 'E' returning to reservoir through gallery (F).

The operating pressure of the hydraulic lift cylinder is sensed in gallery 'C' and load sensing gallery 'D' which controls hydraulic pump output. Refer to Chapter 6 Closed Centre Remote Valves for further details on operation of the load sensing circuit.

The pressure in gallery 'C' is applied to the right hand spring loaded end of the flow control spool while at the same time system pressure in gallery 'B' is applied to the left hand end of the flow control spool.

The differential pressures applied to each end of the flow control spool causes the spool to move to a state of equilibrium and automatically adjusts the flow from the parallel gallery 'A' across the metering lands 'Y' and through galleries 'C' and 'E' to the lift cylinder.

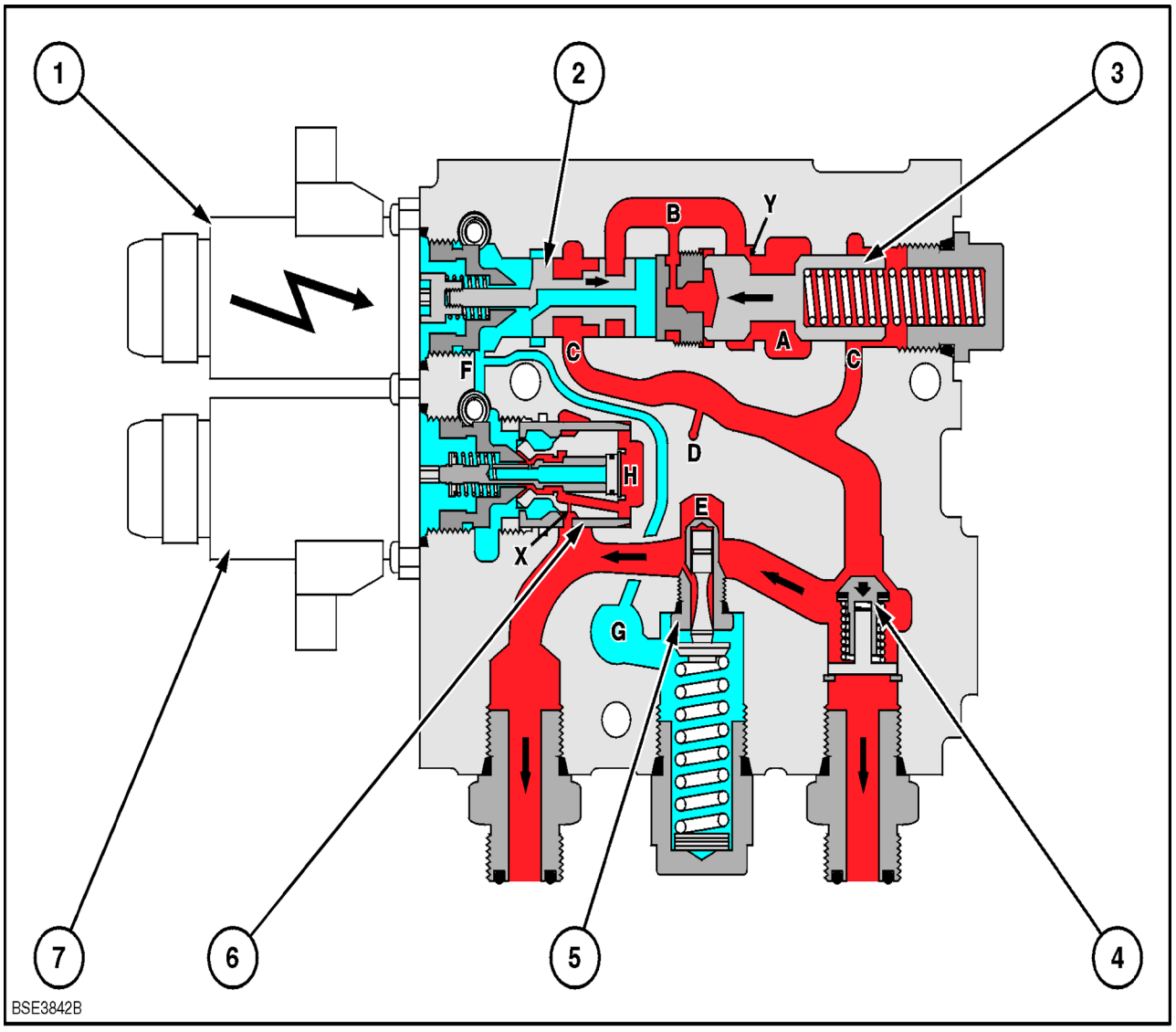
The flow control spool is essential to ensure that flow from the parallel gallery 'A' to the hydraulic lift is accurately controlled irrespective of the operating pressure of any remote control valve circuits which are operating simultaneously with the hydraulic lift.

When the lift arms reach the required height the microprocessor switches off the signal to the solenoid and the raise spool is moved to the left by the spring to re-establish the neutral condition.

If the lift arms are subjected to shock loading and pressure in the hydraulic lift circuit exceeds 230 bar the pressure is vented to reservoir through the lift cylinder safety valve.

Figure 28 illustrates flow through the flow control spool when the hydraulic lift is the highest pressure operating circuit in the system.

Figure 29 illustrates operation of the flow control spool when the hydraulic lift is operating at a lower pressure but simultaneously with a remote control valve which is operating at a higher pressure. In this situation the system pressure in parallel gallery 'A' is higher than the operating pressure of the hydraulic lift.



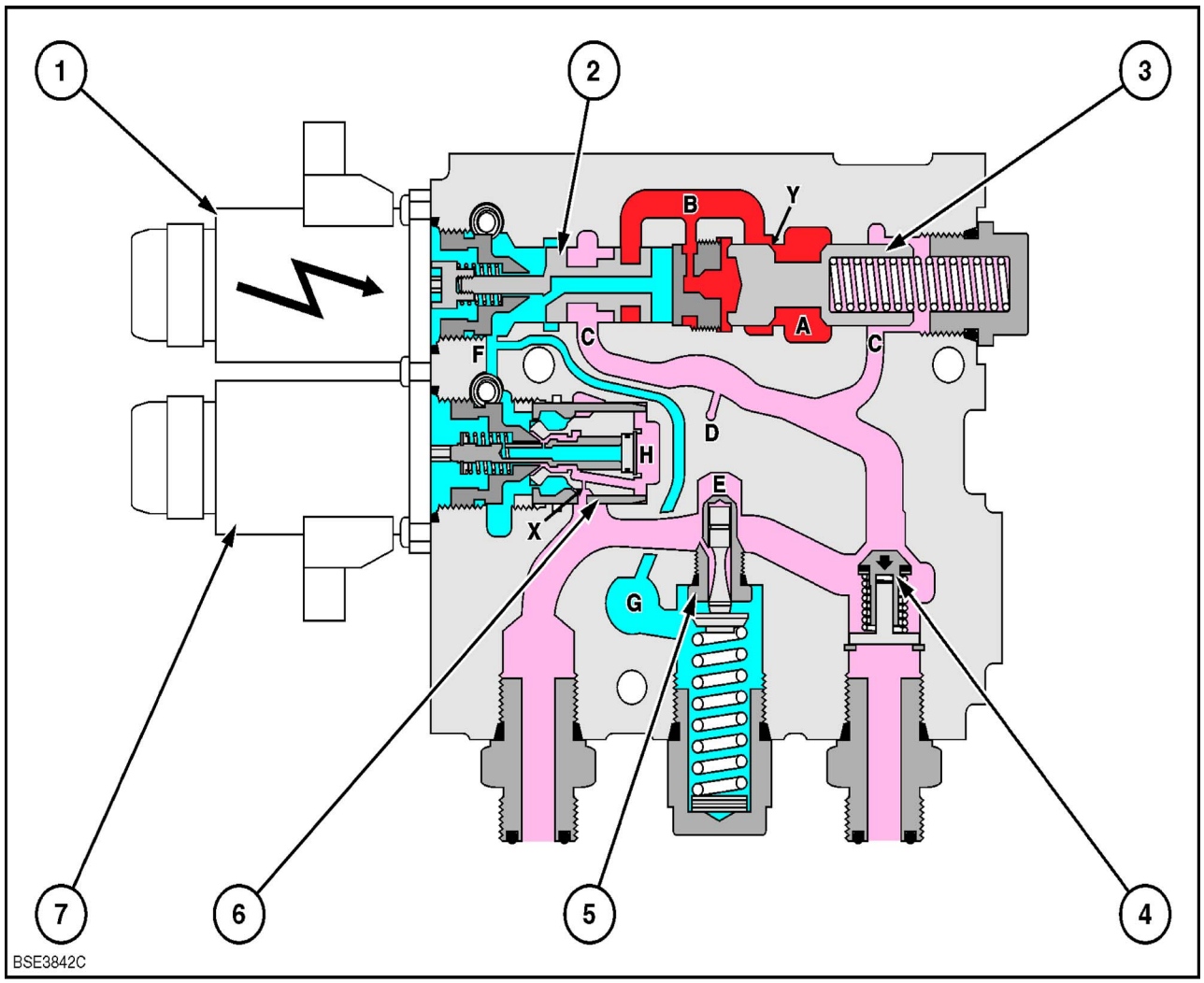
Electronic Draft Control - Raising (High Pressure Lift)

Pump Pressure Oil

Return To Reservoir

28

1. Raising Solenoid
2. Raising Spool
3. Flow Compensator Spool
4. Load Check Valve
5. Lift Cylinder Safety Valve (230 Bar)
6. Lowering Metering Valve
7. Lowering Solenoid



Electronic Draft Control - Raising
Low Pressure Lift while Remote Valves Operating at High Pressure

Pump Pressure Oil

Return To Reservoir

Hydraulic Lift Pressure
(lower than pump pressure)

29

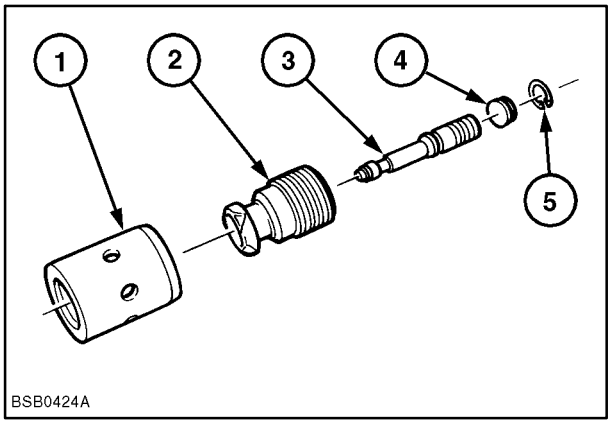
1. Raising Solenoid
2. Raising Spool
3. Flow Compensator Spool
4. Load Check Valve
5. Lift Cylinder Safety Valve (230 Bar)
6. Metering Valve
7. Lowering Solenoid

Lowering

Lowering of the hydraulic lift arms is achieved by venting the oil trapped in the hydraulic lift cylinder back to reservoir through the lowering metering valve in a controlled manner.

Lowering Metering Valve

1. Sleeve
2. Metering Spool
3. Pilot Spool
4. Plug
5. Circlip

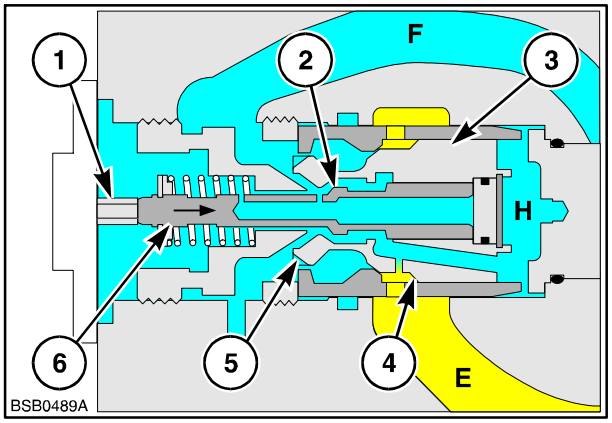


30

The lowering cycle should be considered as a 2 stage operation.

Stage 1: The pulse width modulating solenoid is energised and the plunger (1) moves the pilot spool (6) to the right. The oil trapped on the right hand end of the lowering valve 'H' is now control vented over the lands of the pilot spool (2) to reservoir through gallery 'F'.

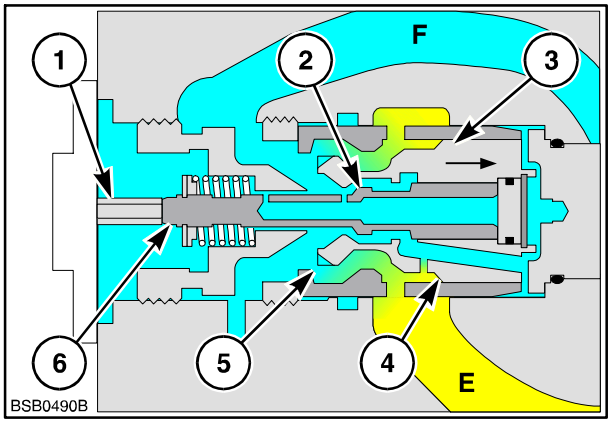
The pressure of oil trapped oil in the lift cylinder Gallery 'E' is applied to the chamfer face (4) of the metering spool (3), causing the spool to move to the right.



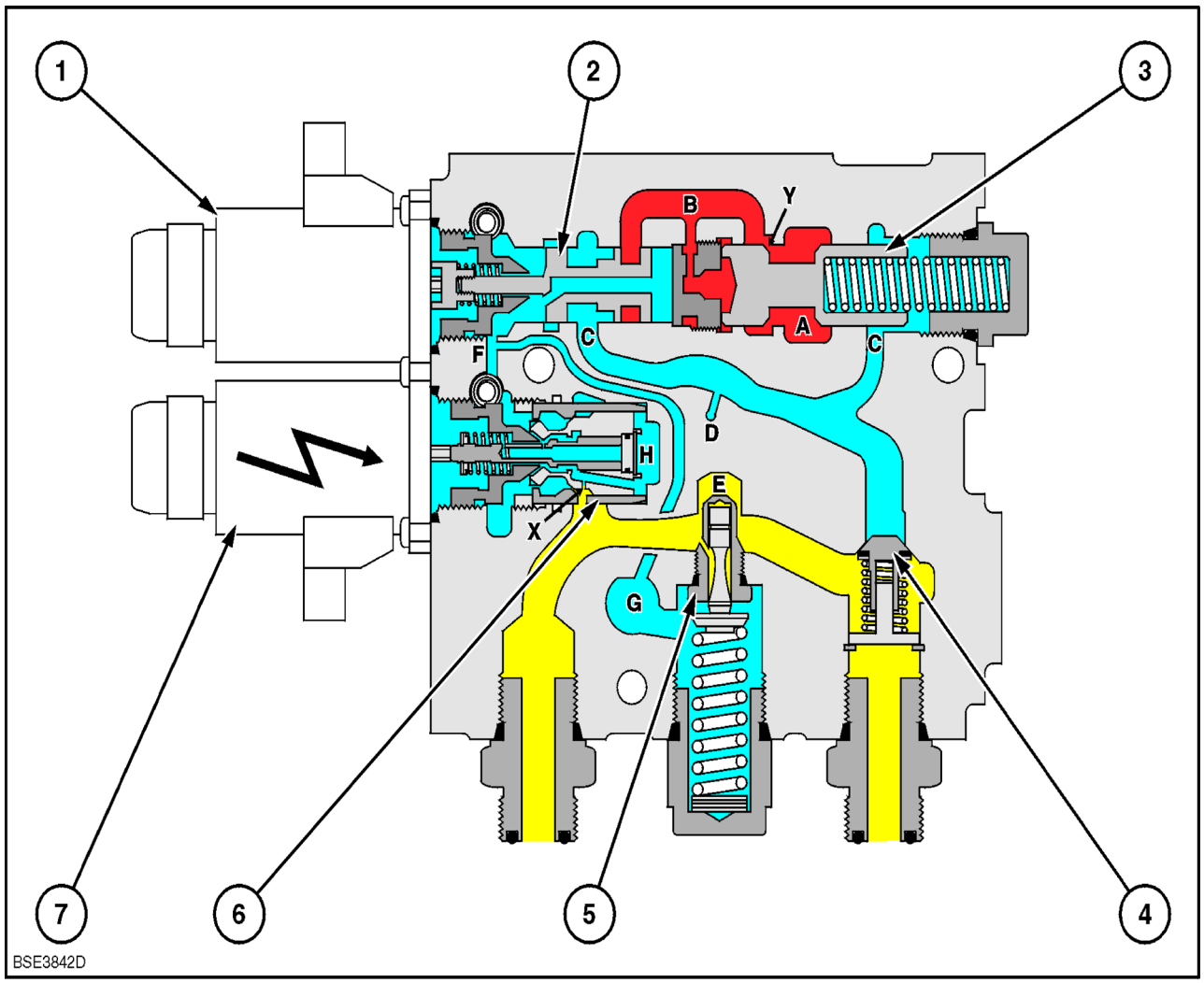
31

Oil from the lift cylinder flows across the valve metering lands (5) and returns to reservoir allowing the lift arms to lower under the weight of the implement.

The rate of lowering is electronically controlled by the processor and pulse width modulated lowering solenoid which adjusts the clearance over the metering lands (5).



32



Electronic Draft Control - Lowering (1)

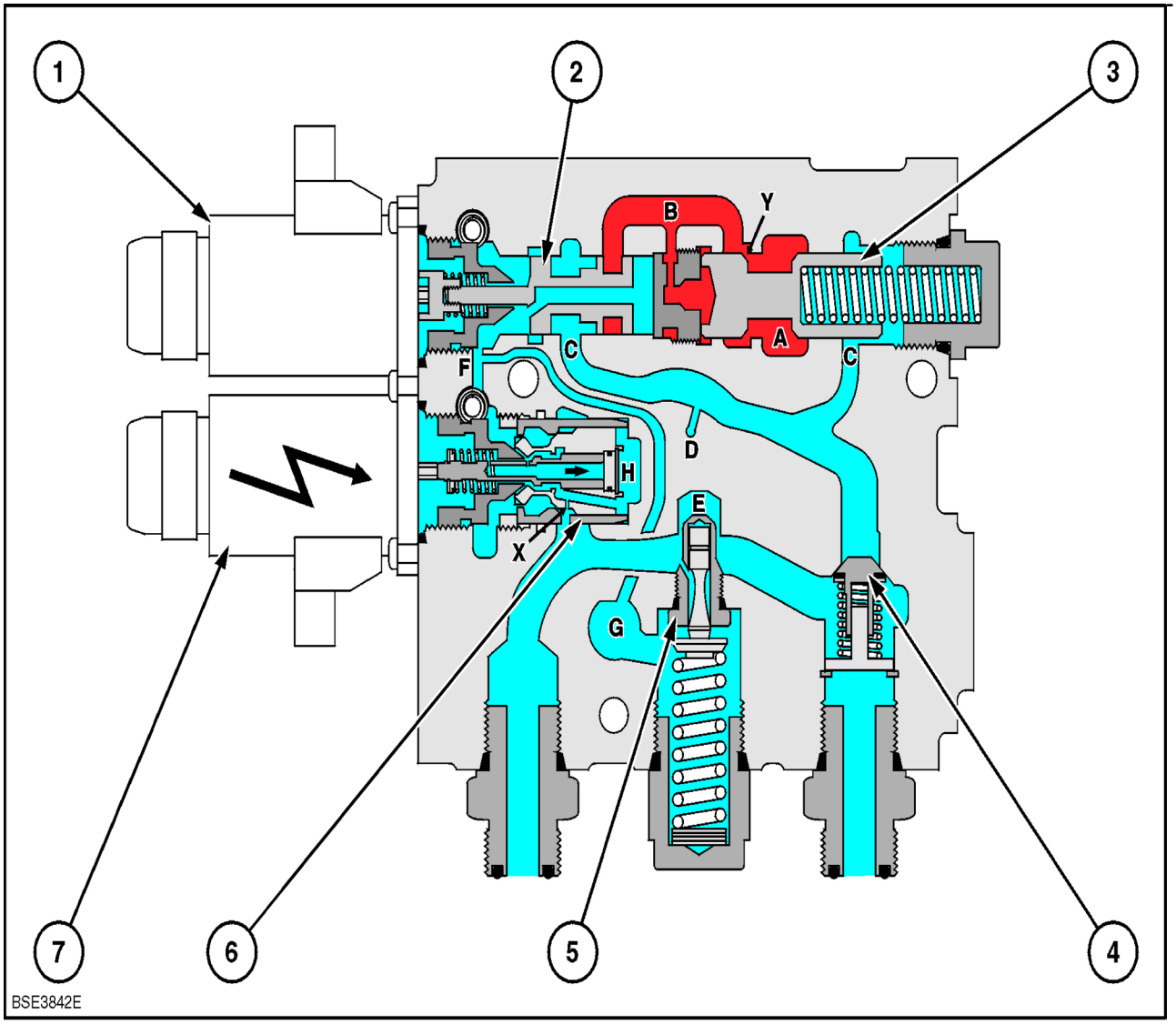
Pump Pressure Oil

Return To Reservoir

Trapped Oil

33

1. Raising Solenoid
2. Raising Spool
3. Flow Compensator Spool
4. Load Check Valve
5. Lift Cylinder Safety Valve
6. Lowering Metering Valve
7. Lowering Solenoid



Electronic Draft Control - lowering (2)

Pump Pressure Oil

Return To Reservoir

34

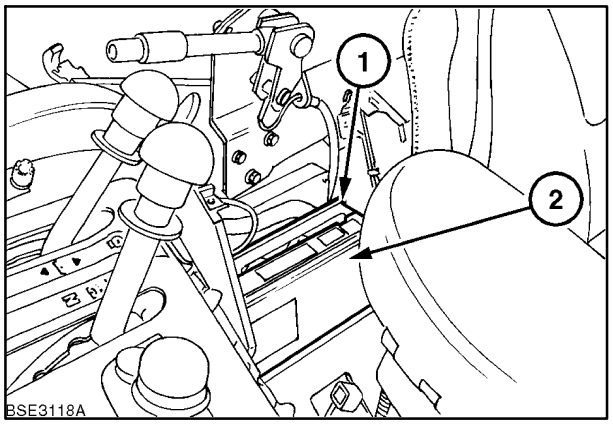
1. Raising Solenoid
2. Raising Spool
3. Flow Compensator Spool
4. Load Check Valve
5. Lift Cylinder Safety Valve
6. Lowering Metering Valve
7. Lowering Solenoid

CALIBRATIONS

ELECTRONIC DRAFT CONTROL

The EDC electronic management system has an inbuilt self diagnostic facility which is able to store error codes and the time since the last occurrence. This facility utilises the digital display of the AEIC instrument panel to indicate, in coded format, any malfunction in the electrical and electronic circuitry or the processor.

The error codes are listed in the following pages but reference must be made to the Fault finding and Calibration chapter of the electrical section.



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ERROR CODES

The following listing details the Electronic Draft Control error codes that can be displayed on the instrument panel whenever a fault is detected in the system.

Should an error occur, reference should be made to the appropriate page of the fault finding chapter within the electrical section.

When using the fault finding charts ensure the correct chart for the tractor configuration, ie, transmission type, is used.

Each connector and pin is identified using alpha numeric codes.

For example the wiring from the microprocessor to the slip control potentiometer is identified as C239-4 to C0121-1 colour TQ/R. This indicates the wiring runs from the microprocessor connector C239 pin number 4 to the slip control potentiometer connector C121 pin number 1 and is a turquoise wire with a red tracer.

Code	ERROR CODE DESCRIPTION
1002	Radar disconnected
1003	Speed sensor error
1004	Speed sensor signal too low
1005	Speed sensor signal too High
1006	Slip control pot signal too low
1007	Slip control pot signal too High
1008	Raise / work switch failure
1009	Both external switches operated at same time
1010	Height limit potentiometer signal too low
1011	Height limit potentiometer signal too high
1012	Drop rate potentiometer signal too low
1013	Drop rate potentiometer signal too high
1014	Right Hand load sensing pin signal too low
1015	Right Hand load sensing pin signal too high
1016	Left Hand load sensing pin signal too low
1017	Left Hand load sensing pin signal too high
1018	Both load sensing pins disconnected
1019	Load sensing pin voltage too low
1020	Load sensing pin voltage too high
1021	Position / draft control potentiometer too low
1022	Position / draft control potentiometer too high
1023	Control panel disconnected
1024	Perform Hydraulic Lift Autocalibration
1025	Mouse lift lever potentiometer signal too low
1026	Mouse lift lever potentiometer signal too high
1027	Max. Lift arm position potentiometer too low
1028	Max. Lift arm position potentiometer too high
1029	Hydraulic Control valve disconnected
1030	Ground signal open curcuit
1031	Chassis Harness Disconnected

Continued

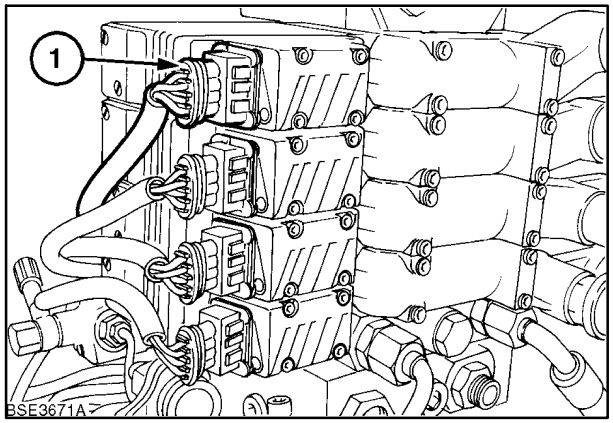
1032	Draft Load potentiometer shorted to +12v
1033	Draft Load potentiometer open curcuit
1049	Wheel speed sensor open curcuit
1053	5 volt ref. Short to +12v
1054	5 volt ref. Short to ground.
1057	Module Failure
1059	5 volt ref. Open curcuit
1063	lower solenoid open curcuit
1064	Raise solenoid open curcuit
1065	lower solenoid short curcuit
1066	Raise solenoid short curcuit
1067	EDC Hyd. Valve supply too low
1068	Height limit Calibration Error

OVERHAUL

ELECTRONIC DRAFT CONTROL VALVE

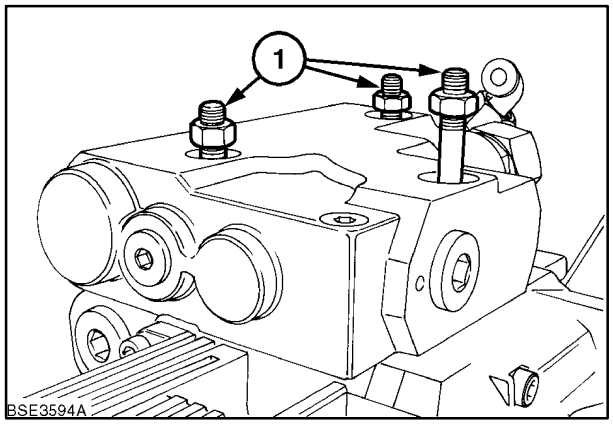
Removal

1. Lower hydraulic links and thoroughly clean remote valve stack.
2. Remove all pipes and electrical connections from the remote valves (1) and electronic draft control valve.



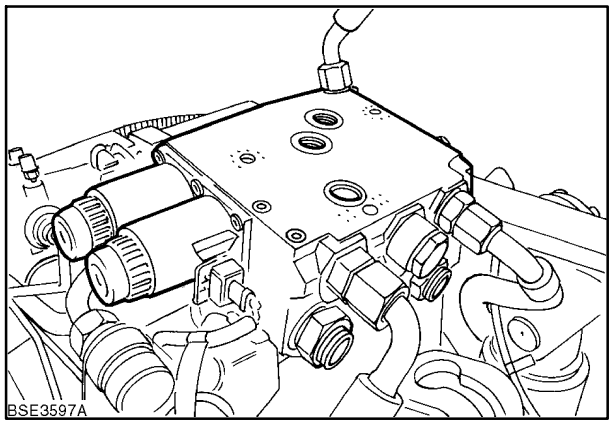
36

3. Make a diagonal mark across the remote valves to facilitate correct positioning when re-assembling. Unscrew the three retaining studs and carefully remove the top plate and remote valve slices .



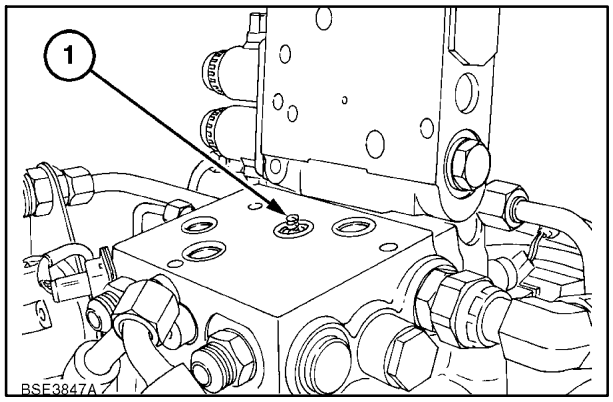
37

NOTE: *The valve stack is very heavy take care when dismantling.*



38

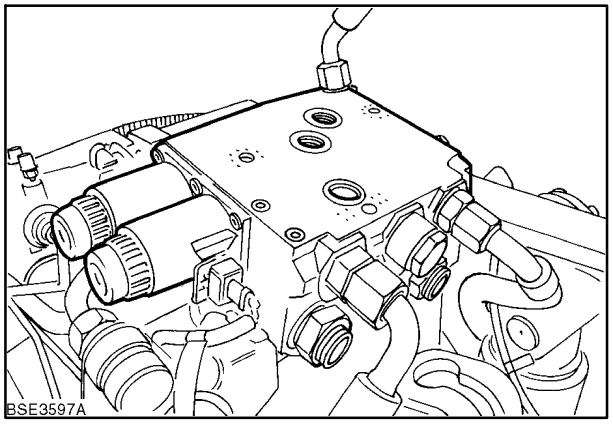
4. Remove the EDC slice being careful not to dislodge the spring located on the load sensing valve.



39

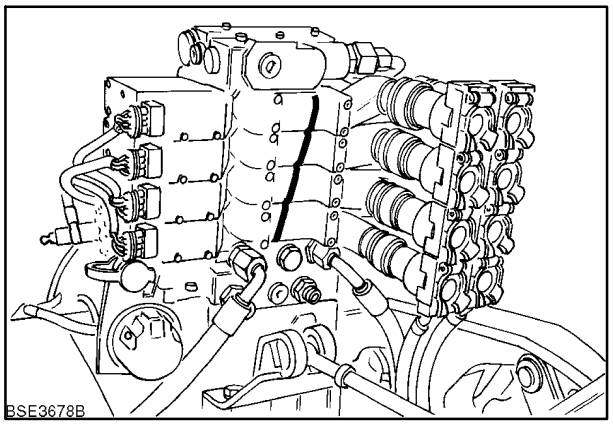
Installation

1. Ensure spring is correctly located in the load sensing valve of the bottom (Power Beyond) slice.
2. Locate the EDC valve on top of the bottom slice.



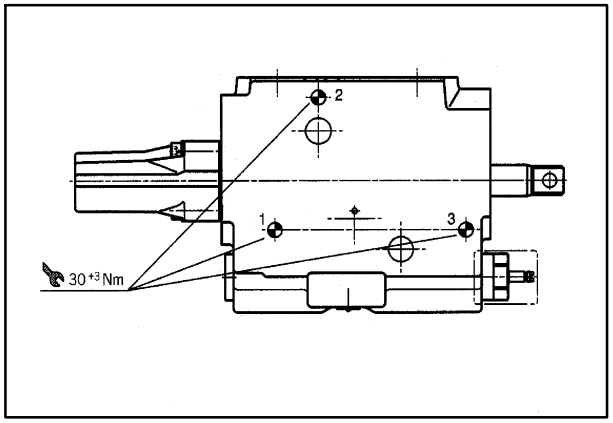
40

3. Replace the remote valve slices in the correct order.
4. Install the top plate and make sure all slices are correctly aligned. Replace the clamping bolts into the stack.

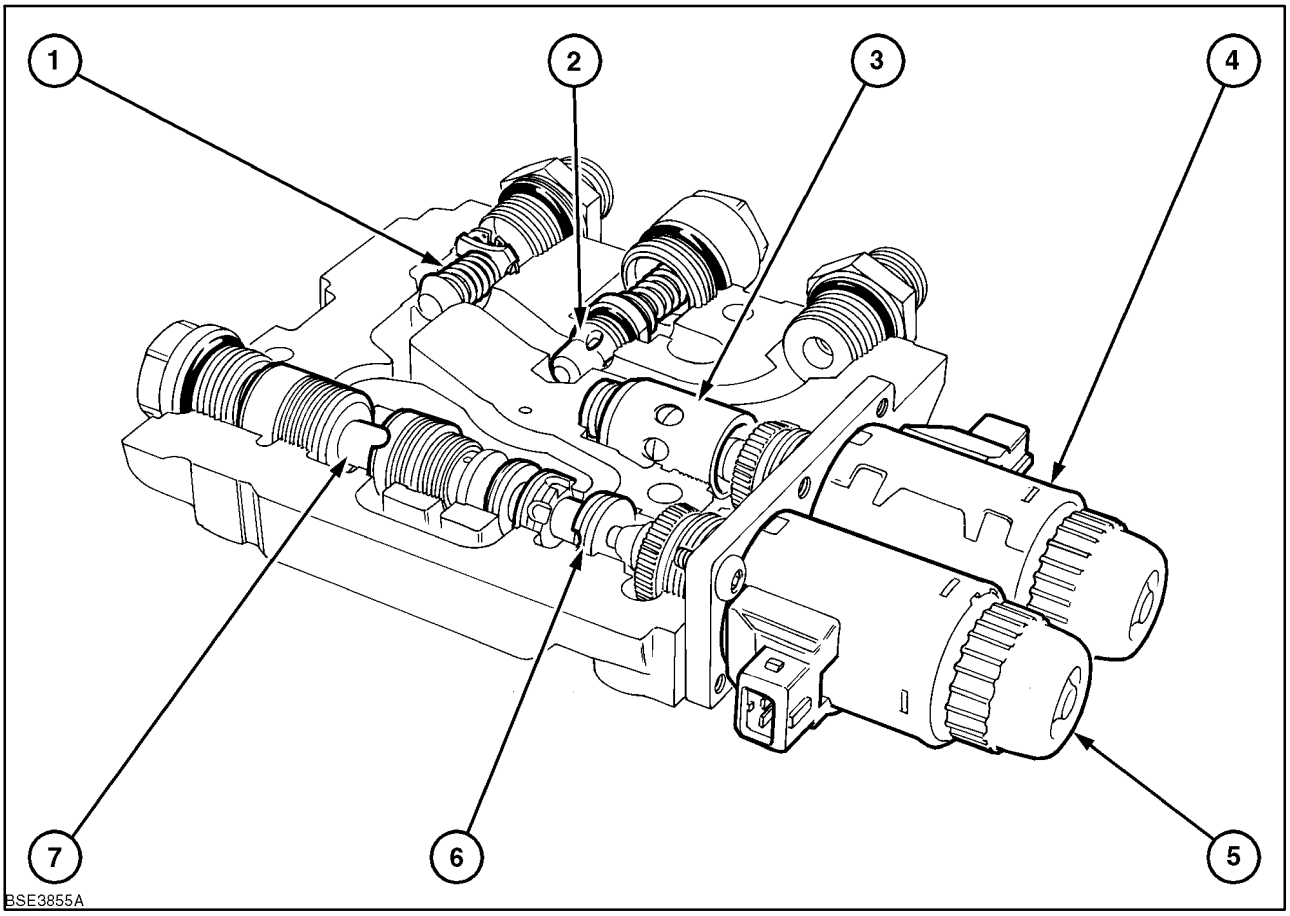


41

5. Tighten clamp bolts to torque of 30 Nm in sequence 1,2,3.



42



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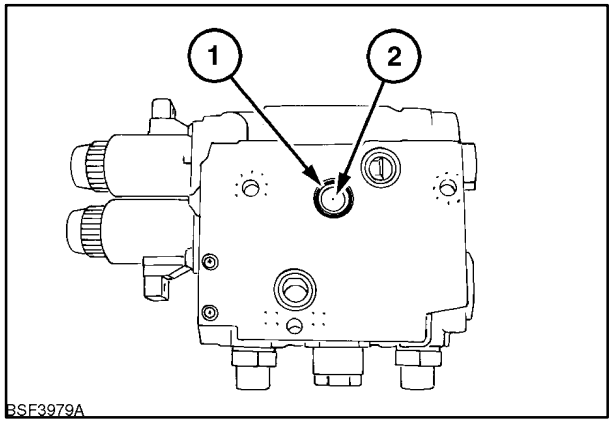
Electronic Draft Control Valve Components

1. Load Check Valve
2. Lift Cylinder Relief Valve (230 Bar)
3. Lowering Metering Element
4. Lowering Solenoid
5. Raise Solenoid
6. Raise Spool
7. Flow Compensating Valve

Disassembly

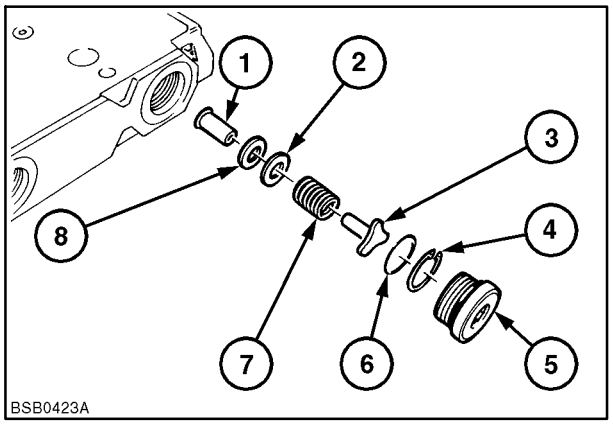
1. Remove 'O' ring (1) and load sense check valve (2).



44

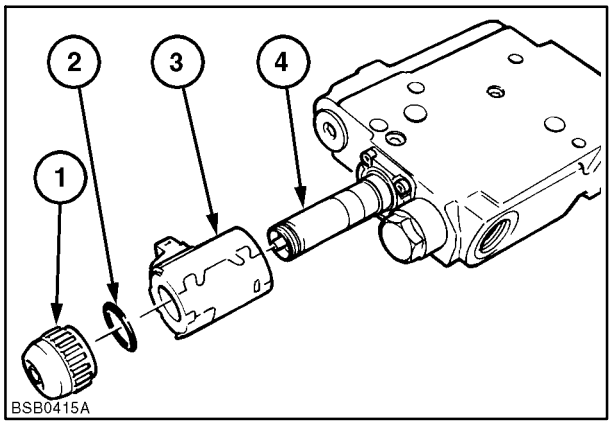
2. Remove load check valve

1. Valve
2. Washer
3. Guide
4. Circlip
5. Plug
6. Washer
7. Spring
8. Rubber Seal



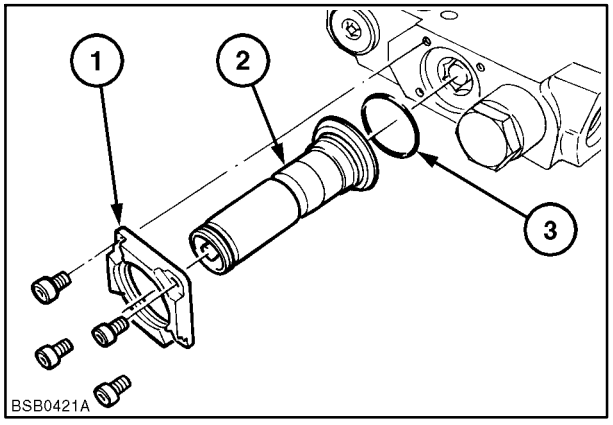
45

3. Unscrew knob (1) and remove 'O' ring (2) and coil (3) from each solenoid (4).



46

4. Unscrew and remove the six allen headed screws and remove retainer plate (1). Remove solenoid cores(2) and 'O' rings (3).



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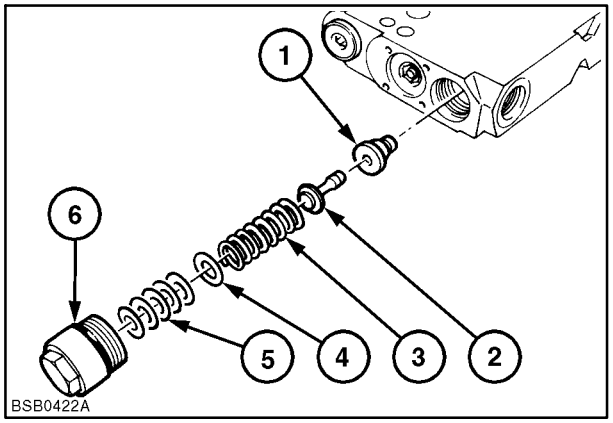
5. Remove Lift Cylinder Safety Valve.

⚠ WARNING ⚠

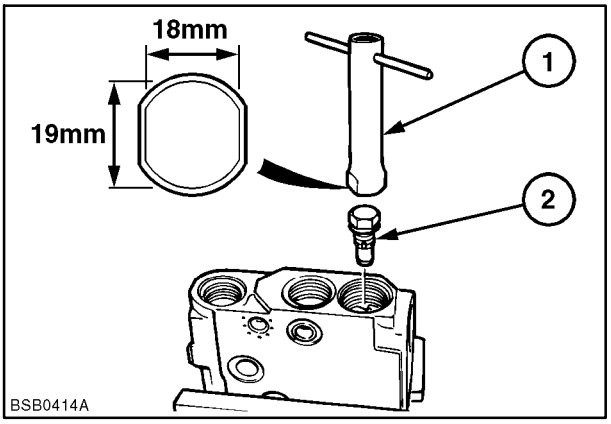
A large spring is positioned beneath the plug (4), take extreme care when removing plugs.

1. Seat
2. Valve
3. Spring
4. Copper Washer
5. Shims
6. End Cap



48

6. Manufacture box spanner (1) from 18mm internal diameter steel tube and remove lift cylinder safety valve seat (2).



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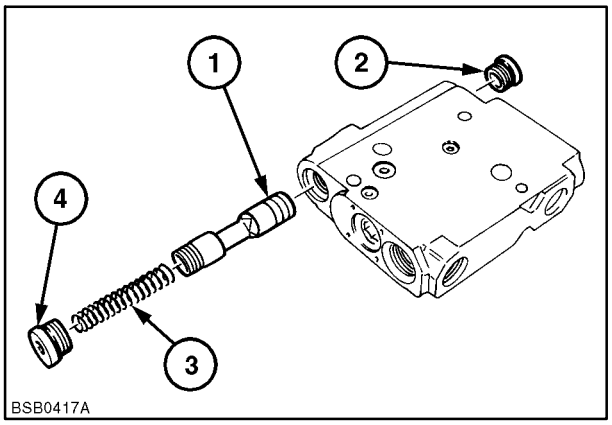
7. Remove flow compensating spool (1).

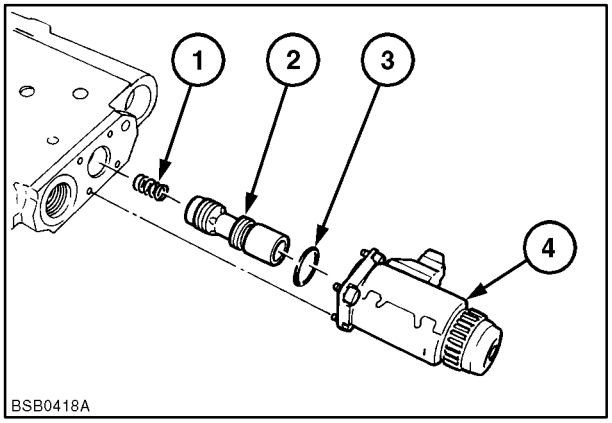
⚠ WARNING ⚠

A large spring (3) is positioned beneath the plug (4), take extreme care when removing plugs.



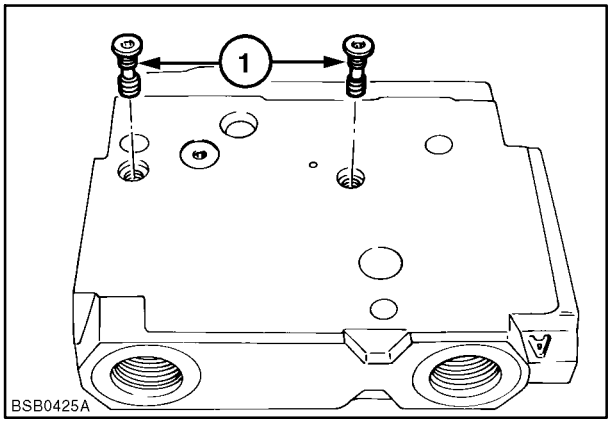
50

8. Remove solenoid assembly (4), 'O' ring (3), raise spool (2) and spring (1).



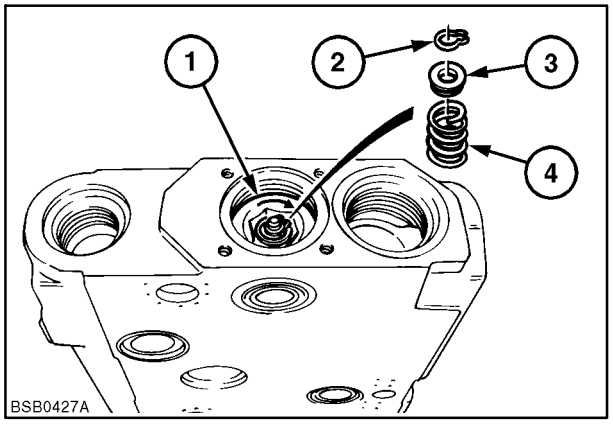
51

9. To remove the lowering metering valve it is necessary to disassemble the valve in stages as follows:-
10. Using a 4mm allen key unscrew and remove the plug located on the underside of the EDC valve slice .



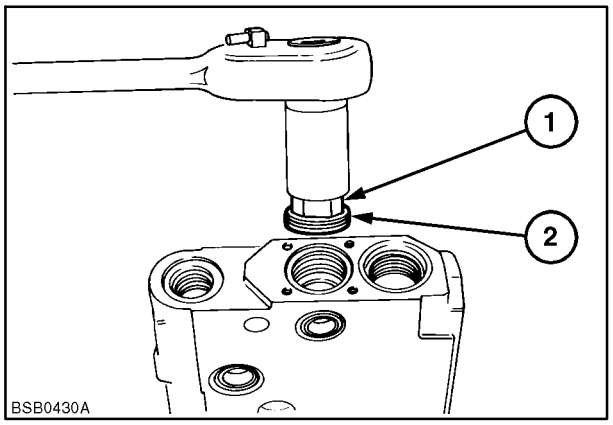
52

11. Use piece of 14mm hexagonal bar with an 11mm hole drilled through centre to screw the nozzle (1) further into valve housing. This will reduce the pressure of the metering valve spring on circlip (2).
12. Remove circlip (2), seat (3) and spring (4).
13. Remove Nozzle.



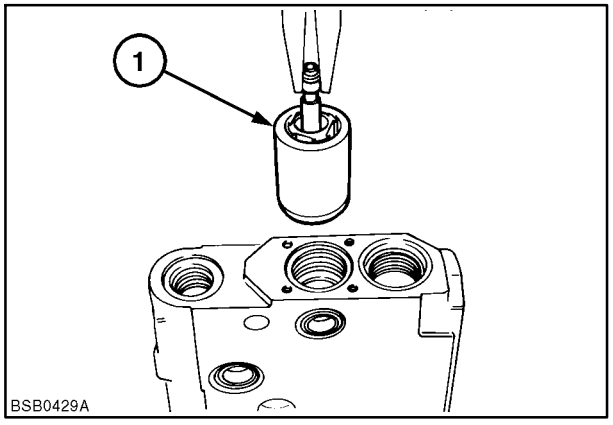
53

14. Remove locking ring (1) use a 17mm piece of hexagonal bar (1) with 11mm hole drilled down centre.



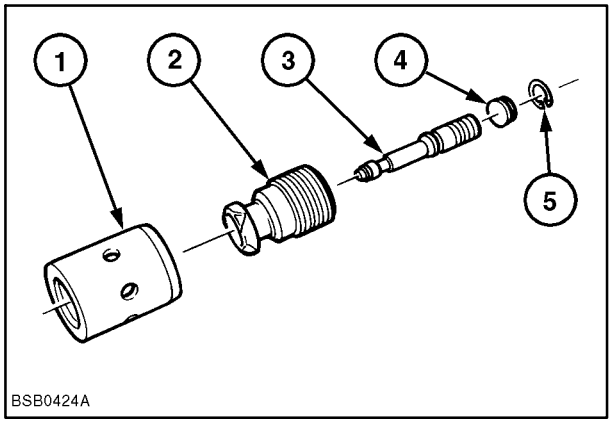
54

15. Pull metering element (1) from housing.



55

16. Disassemble metering element components.
    1. Sleeve
    2. Metering Element
    3. Pilot Spool
    4. Plug
    5. Circlip



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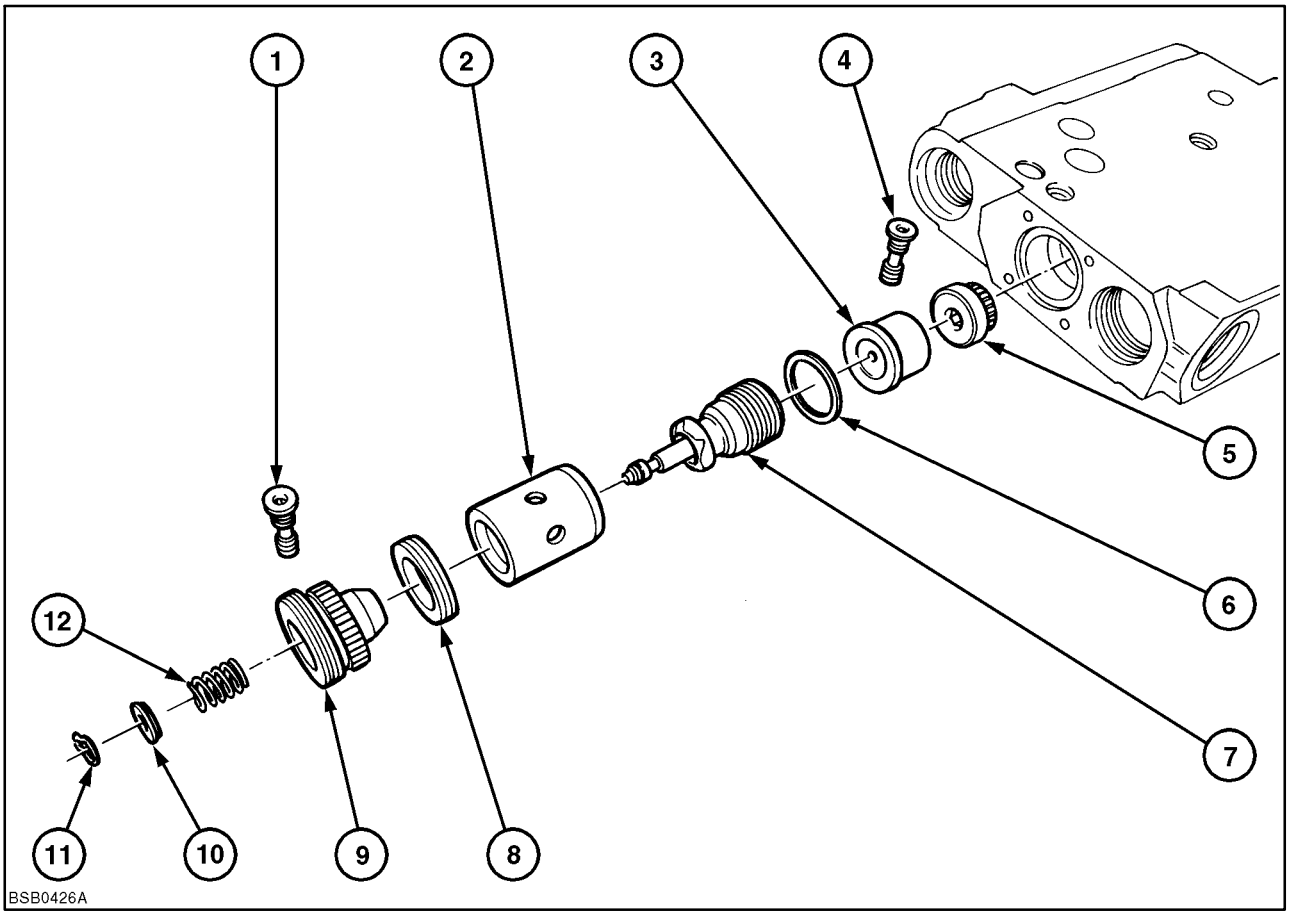

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Metering Valve Components

1. Locking Screw
2. Sleeve
3. Plug
4. Locking Screw
5. Orifice
6. Shim
7. Metering Valve
8. Locking Ring
9. Nozzle
10. Seat
11. Circlip

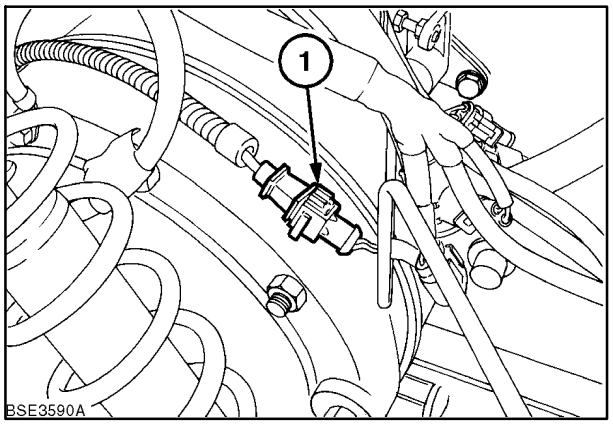
Assembly

1. Re-assembly follows disassembly procedure in reverse.
2. When installing nozzle (5) and locking ring (6) ensure serrated edge of orifice and nozzle align with locking screws (1) and (4).

LOAD SENSING PIN

Removal

1. Lower hydraulic lift arms.
2. Disconnect load sensing pin connectors(1). The connectors are located on top of the rear axle housing.



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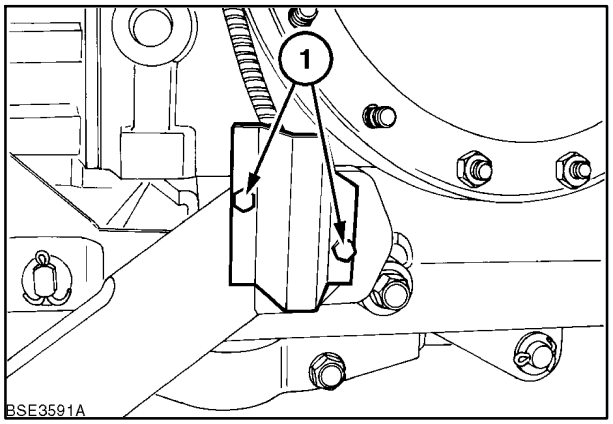
3. Remove guard by removing the two retaining bolts (1).



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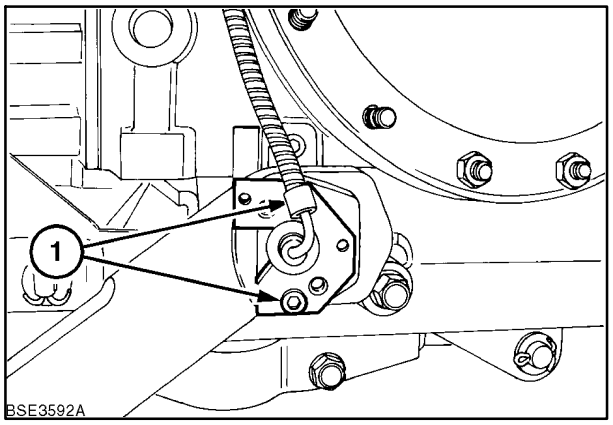
4. Remove the two bolts from the retaining bracket and withdraw Pin.



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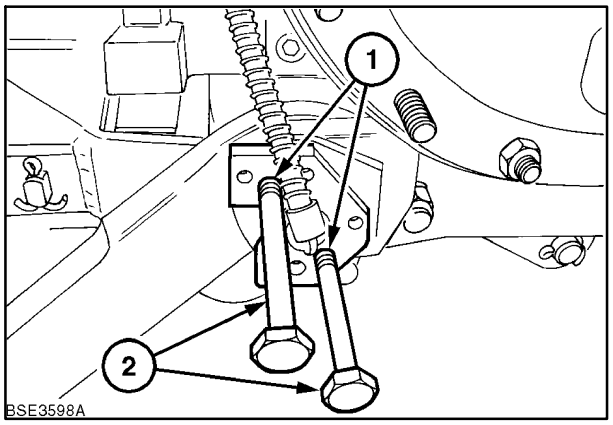
5. If required use extra 10mm bolt holes (1) and bolts (2) to jack pin from locating hole.



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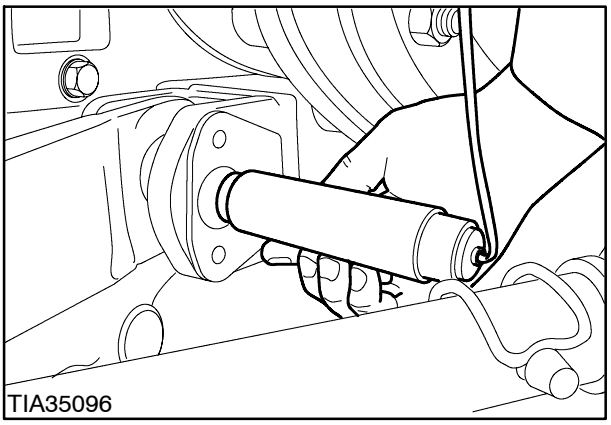
Installation

1. Install pin making sure that it is located with the three flat sides facing towards the front of the tractor.



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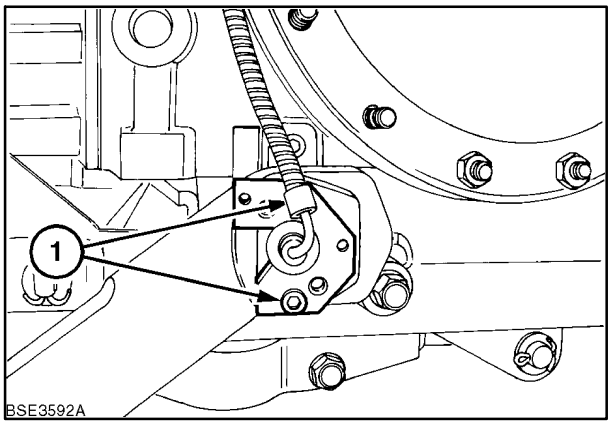
2. Install the retaining bracket with the open end facing the rear of the tractor.
3. Torque clamp bolts to the specified torque (48Nm).



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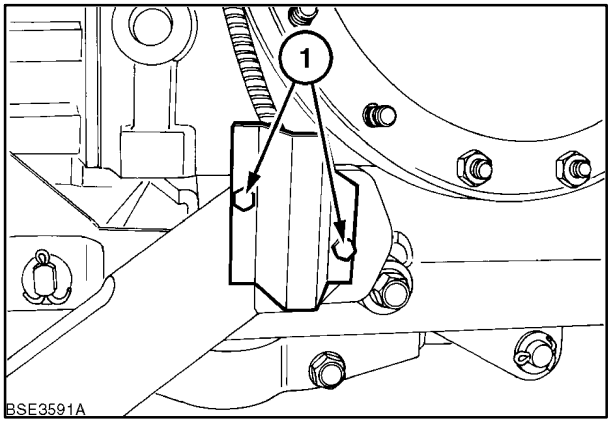
4. Re install guard and tighten bolts to 23Nm.



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SECTION 35 - HYDRAULIC SYSTEMS

Chapter 4 - Mechanical Rear Hydraulic Lift

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SPECIFICATIONS

Type		with controlled position/draft and mixed control
Operating system		by means of two independent levers
Setting speed of lift reaction		automatic, by means of hydraulic device integral to control valve
LIFT-O-MATIC		allows fast lifting/lowering operations using push buttons, without using the draft control position levers
Single-acting cylinder:		
- rated diameter and stroke:		
All models	mm (in.)	110 x 128 (4.3307x5.0393)
- capacity:		
All models	cm^3 in^3	1216 (74.20)
Pressure relief valve setting	bar PSI	210-215 (3045-3118)
Cylinder safety valve setting	bar PSI	245 (3553)
Lift piston diameter:		
- All models	mm (in.)	109.980 to 110.000 (4.3299 to 4.3307)
Internal diameter of cylinder liner:		
- All models	mm (in.)	110.036 to 110.071 (4.3321 to 4.3335)
Clearance between piston and liner	mm (in.)	0.036 to 0.091 (0.0014 to 0.005)
Diameter of lift arms shaft (11, fig. 14, page 16) in correspondence with bushes:		
- right-hand side	mm (in.)	54.970 to 55.000 (2.2035 to 2.1653)
- left-hand side	mm (in.)	62.670 to 62.700 (2.4673 to 2.4685)
Internal diameter of bushings fitted on lift body:		
- right-hand side (8)	mm (in.)	55.100 to 55.184 ([1]) (2.1692 to 2.1726)
- left-hand side (12)	mm (in.)	62.800 to 62.884 ([1]) (2.4724 to 2.4757)
Clearance between lifting arm shaft and relative bushings	mm (in.)	0.100 to 0.214 (0.0039 to 0.0084)
Interference between bushings and relative seats	mm (in.)	0.065 to 0.185 (0.0025 to 0.0072)
Axial clearance of shaft complete with lifting arms	mm (in.)	0.2 to 1.4 (0.0078 to 0.05511)

([1]) Value to be obtained after obtaining interference fit without grinding operations.

(continued)

(continued)

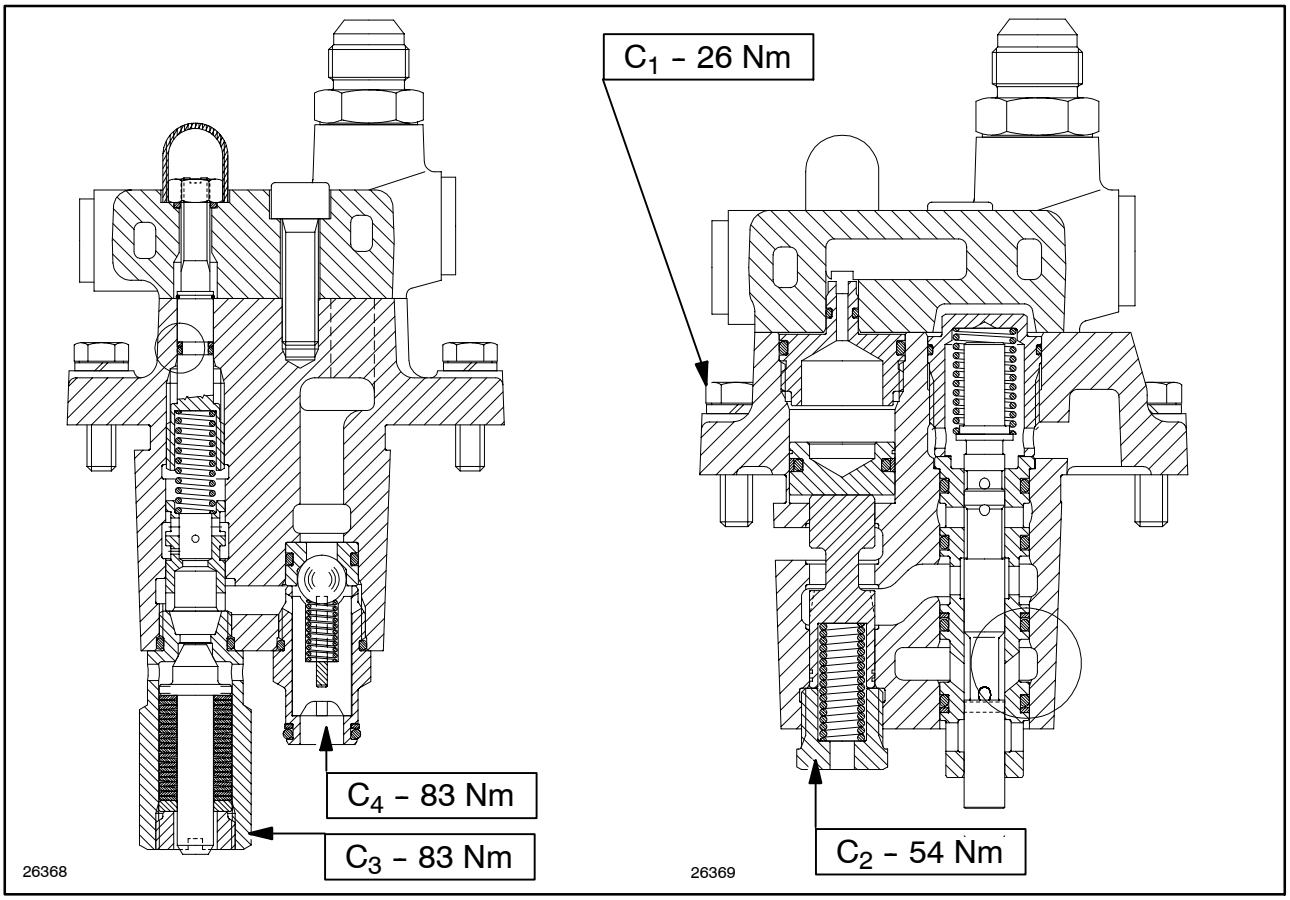
External diameter of draft control transmission shaft	mm (in.)	21.967 to 22.000 (0.8648 to 0.8661)
Internal diameter of seats in support	mm (in.)	22.020 to 22.072 (0.8669 to 0.8689)
Clearance between transmission shaft and relative seat	mm (in.)	0.020 to 0.105 (0.0007 to 0.0041)
Diameter of position control transmission shaft	mm (in.)	13.973 to 14.000 (0.5501 to 0.5511)
Internal diameter of position control transmission shaft	mm (in.)	14.016 to 14.059 (0.5518 to 0.5535)
Clearance between draft control transmission shaft and position control transmission shaft	mm (in.)	0.016 to 0.086 (0.0006 to 0.0033)
Clearance between control valve block pin (8, fig. 14 page 16) and the relative seat on the control valve block body	mm (in.)	0.008 to 0.012 ([2]) (0.0003 to 0.0004)
Clearance between lift control valve (10) and the relative seat on the control valve block body	mm (in.)	0.008 to 0.014 ([2]) (0.0003 to 0.0005)
Check valve return spring (12):		
- spring free length	mm (in.)	25.5 (1.0039)
- spring length under load of 52 to 56 N (5.28 to 5.72 kg) .	mm (in.)	17.5 (0.6889)
Control valve block pin return spring (5):		
- spring free length	mm (in.)	50.5 (1.9881)
- spring length under load of 31.7 to 35 N (3.23 to 3.57 kg)	mm (in.)	34 (1.3385)
Control valve return spring (9)		
- spring free length	mm (in.)	44 (1.7322)
- spring length under load of 103 to 114.7 N (10.5 to 11.7 kg)	mm (in.)	29 (1.1417)
Arm descent speed control valve spring (14)		
- spring free length	mm (in.)	34 (1.3385)
- spring length under load of 67 to 73 N (6.86 to 7.46 kg)	mm (in.)	27 (1.0629)
Intervention speed control valve spring (1) :		
- spring free length	mm (in.)	48 (1.8897)
- spring length under load of 65 to 71 N (6.6 to 7.2 kg)	mm (in.)	32 (1.2598)
Intervention speed control valve spring (4):		
- spring free length	mm (in.)	21 (0.8267)
- spring length under load of 0.9 to 1 N (0.09 to 0.11 kg)	mm (in.)	13 (0.5118)

([2]) During assembly the control valve block pins and control valves are carefully selected so as to obtain the required clearance.

Implement Hitching Device

Type		three-point linkage
Category: - All models		2
Draft control		by means of lower arms with flex bar
Flex bar diameter: - All models	mm (in.)	29.967 to 30.000 (1.1798 to 1.1811)
Axial clearance of flex bar	mm (in.)	2.0 to 6.0 (0.0748 to 0.1771)

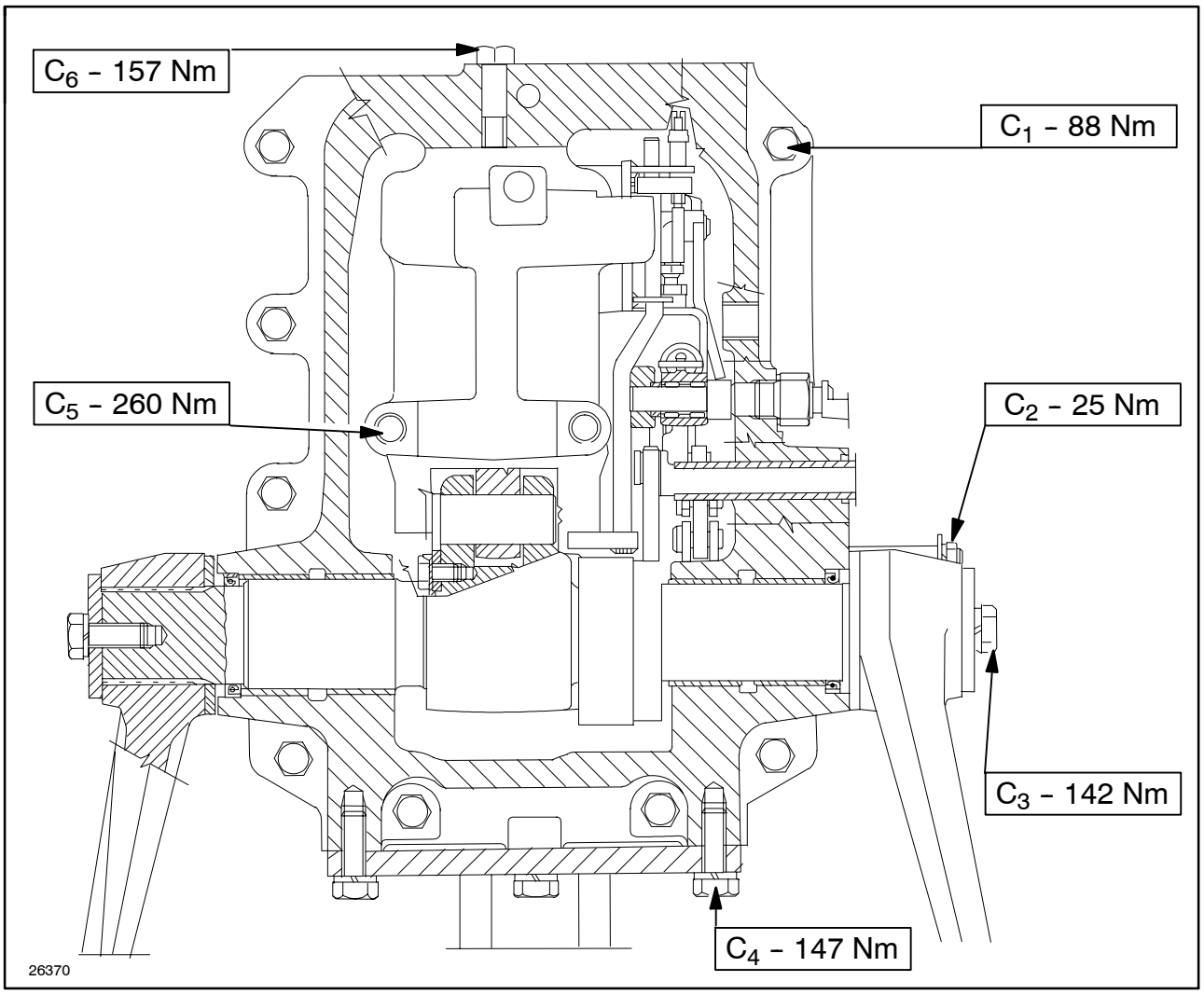
TIGHTENING TORQUES



1

Tightening Torques	Thread	Tightening torque	
		Nm	lbf.ft
Lift			
Bolts securing control valve block to lift (C_1, fig. 1)	M 8 x 1.25	26	19
Control valve cap (C_2)	M 20 x 1.5	54	40
Cylinder safety valve (C_3)	M 20 x 1.5	83	61
Check valve union (C_4)	M 24 x 1.5	83	61
Lift internal arm retaining bolts	M 10 x 1.25	61	45
Position shaft nut	M 10 x 1.25	15	11

(continued)



2

(continued)

Tightening Torques	Thread	Tightening torque	
		Nm	lbf.ft
Bolts securing lift to rear transmission casing (C_1, fig. 2)	M 12 x 1.25	98	72
Nuts for lever quadrant bracket stud bolts (C_2)	M 8 x 1.25	25	18
Lifting arm plate retaining bolts (C_3)	M 14 x 1.5	142	105
Third point support retaining bolts (C_4)	M 14 x 1.5	147	108
Lift cylinder retaining bolts:			
- upper (C_5)	M 16 x 1.5	260	191
- front (C_6)	M 14 x 1.5	157	116

SPECIAL TOOLS

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

380000224 Hydraulic lift lifting hook

X 380000225 Ring for fitting lift piston seals

X 380000262 Punch for fitting lift arm shaft seal

X 380000261 Punch for fitting needle bearings on control valve block control lever bushing

X 380000260 Punch for fitting needle bearings on draft control lower lever and link rod

X 380000230 Wrench for cylinder safety valve setting ring nut

X 380000231 Wrench for lift pressure relief setting ring nut

X 380000266 Guard for fitting seal on arm descent speed control pin

380000240 Universal pressure control kit

380000215 Hand pump for valve calibration

X 380000218 Union for cylinder safety valve calibration

X 380000217 Union for lift pressure relief valve calibration

X 380000274 Union for checking distributor valve seal

X 380000267 Wrench for arms height adjustment

X 380000275 Guard for pilot valve seal

X 380000263 Controlled draft setting tool

X 380000264 Position and draft control setting tool

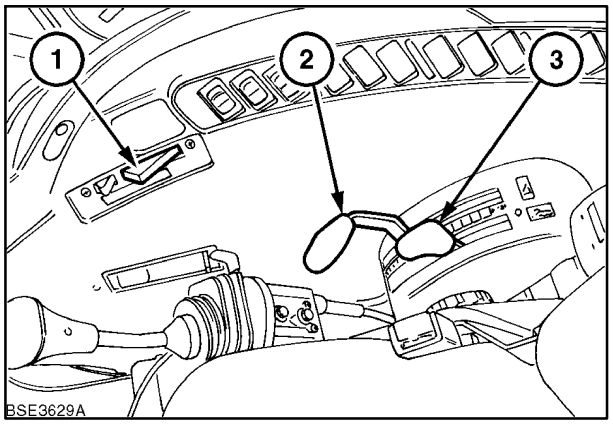
380000238 Adapter (use with **380000224**)

DESCRIPTION AND OPERATION

The tractor is equipped with a hydraulic system providing accurate and sensitive control over a wide range of operating conditions.

This is a mechanically controlled system that offers Position Control and Draft Control sensed through the lower links of the 3-point linkage.

The system is controlled by the Draft Control lever (3) the Position Control lever (2) and the fast raise button (1). The fast raise button will fully raise the 3-point linkage (and attached implement) independently of the Position or Draft Control levers.



3

POSITION CONTROL

Provides accurate and sensitive control of implements, such as sprayers, rakes, mowers, etc., that operate above the ground. Once set, the position of the lower links will remain at a constant height unless adjusted using the lift control lever.

DRAFT CONTROL

Is most suitable for mounted implements operating in the ground. Changes in the working depth or changes in soil resistance cause the draft loading on the implement to increase or decrease.

PRE-OPERATION CHECKS

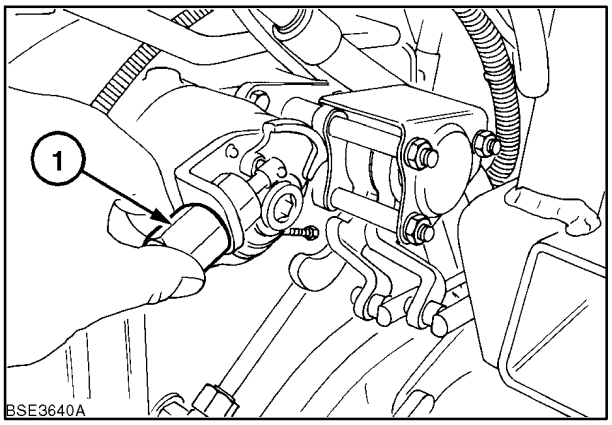
⚠ CAUTION ⚠

Before starting the engine, always ensure that the fast raise button (1) is pushed in, as shown, to prevent inadvertent raising of the 3-point linkage.

IMPORTANT: *Some mounted or semi-mounted equipment may interfere with, and damage the cab. To avoid the possibility of cab damage, check for adequate clearance by slowly raising the equipment using the* ***Position Control*** *lever (2). If any part of the equipment comes closer than 100 mm (4 in.) to the cab, stop raising. Stop the engine, lower equipment to the ground and adjust the height limiter cam.*

HEIGHT LIMITER CAM

The height limiter cam is on the right-hand end of the hydraulic rocker shaft. Turn the cam adjuster (1) clockwise to decrease implement height, turn anti-clockwise to increase implement height. The cam adjuster is self locking and will remain in position once set.



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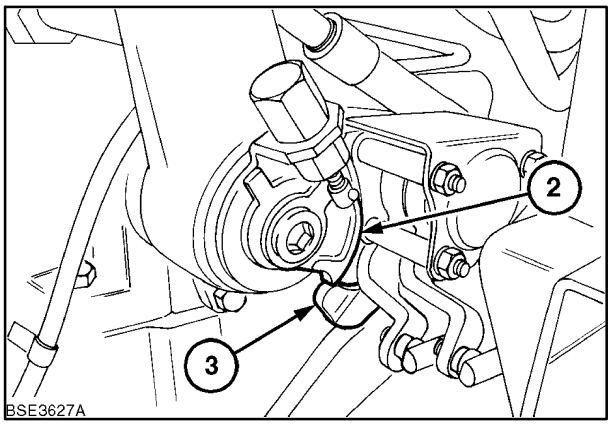
The cam (2) is shown in contact with the lever (3) at the maximum height position. To achieve full lift height, turn the cam adjuster fully anti-clockwise until the cam is clear of the lever when the lower links are in the fully raised position.

NOTE: *The height limiter cam only affects operation of the fast raise button. When the cam comes into contact with the lever, it cancels the signal from the fast raise button and stops the 3-point linkage from raising further.*

Repeat the previous step to check for implement to cab clearance. If clearance is inadequate, move the cam further in a clockwise direction. When clearance is satisfactory, proceed to operate.



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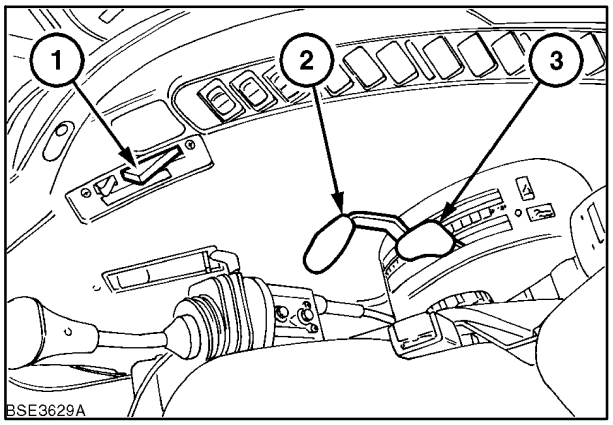
POSITION CONTROL OPERATION

***IMPORTANT*:** *Always set the system to Position Control at any time when not actually operating in Draft Control, such as when attaching or transporting equipment or when no equipment is attached.*

Move the Draft Control lever (3), fully forward in the quadrant. Set the required implement height/depth using the Position Control lever (2). Pull the lever back to raise the implement, push forward to lower. Implement height/depth is relative to the position of the lever in the quadrant.



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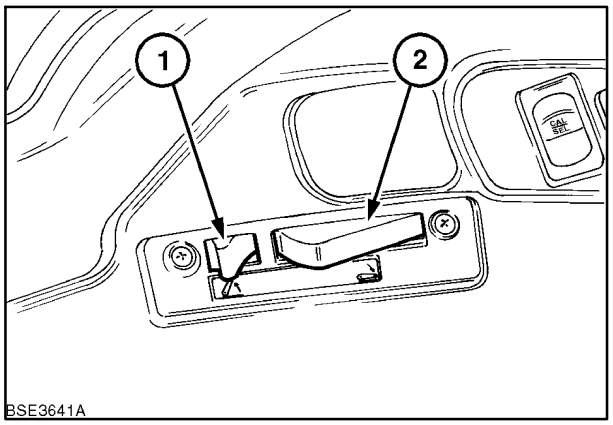
To raise the implement at the end of each pass, or whenever required, move the latch (1) rearward to release the fast raise button. The button (2) will pop out, as shown and the 3-point linkage (and implement) will raise to full lift height (as determined by the height limiter cam setting) without the need to move the Position Control lever.

To lower the implement, simply press the fast raise button (2) fully in, as shown, and the implement will lower to the height/depth set by the Position Control lever.



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⚠ CAUTION ⚠

When transporting equipment on the 3-point linkage, raise the implement using the Position Control lever. The hydraulic system will maintain the equipment at the height set by the Position Control lever and prevent the equipment lowering and becoming damaged, damaging the road surface or causing personal injury.

DRAFT CONTROL OPERATION

When starting work, move the Position Control lever (2) fully forward and lower the implement into work using the Draft Control lever (3). Push the lever forward to increase the draft loading. Pull rearwards to reduce the draft loading. In most circumstances forward movement of the lift control lever will increase implement depth and rearward movement will reduce the depth.

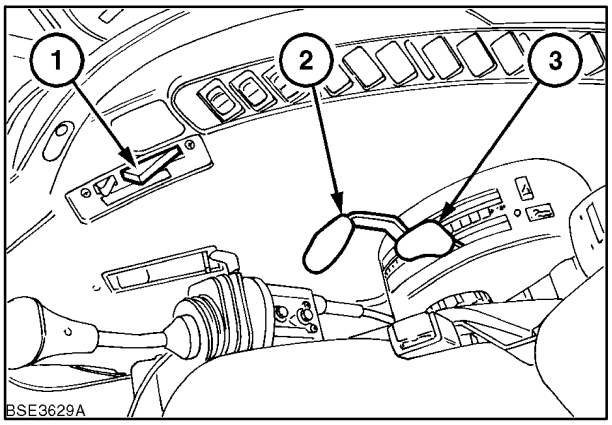
Once set, the tractor hydraulic system will automatically adjust the implement depth to maintain an even pull on the tractor and so reduce wheel slip to a minimum.

Observe the implement as it pulls through the soil. If the hydraulic system reaction (vertical movement of the implement) is too great or too frequent then system sensitivity may be reduced by adjustment of the sensor bar spacers (2).

To move a spacer, remove the nut and bolt (4), end stop (3), spacer (2) and lower link (1). Re-install the spacer first, followed by the lower link and end stop. Secure the end stop with the nut and bolt. Tighten the nut securely. This is the most sensitive position, recommended for light implements or light draft loads.

To reduce system sensitivity, move the spacers at each end of the sensor bar to the outside of the lower links as shown in Figure 9. This is the least sensitive position, recommended for heavier implements or heavy draft conditions.

As with Position Control operation, use the fast raise button to raise and lower the 3-point linkage (and implement) at the end of each pass. Do not move the Draft Control lever as this will affect the previously determined setting.



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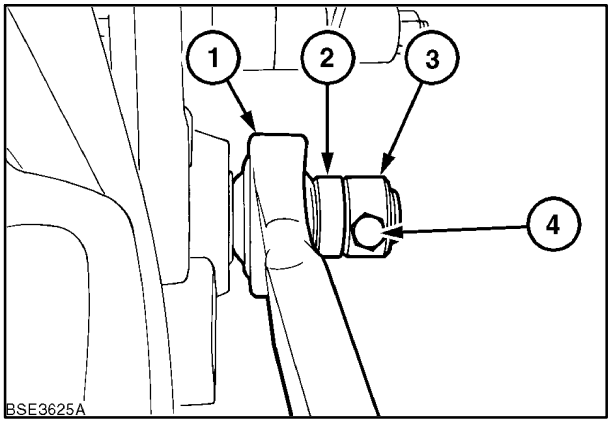
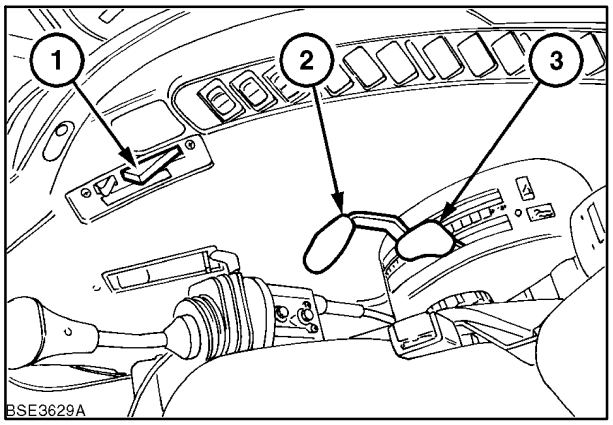


9

COMBINED POSITION AND DRAFT CONTROL OPERATION

When starting work, lower the implement to the required depth by means of the Draft Control lever (3), as previously described. Observe the implement as it pulls through the soil.

When the implement stabilises at the required depth, ease the Position Control lever (2) back until the lift arms tend to rise. The lift linkage is now operating in Draft Control but the implement is prevented, by the Position Control function, from sinking too far when the draft load reduces.



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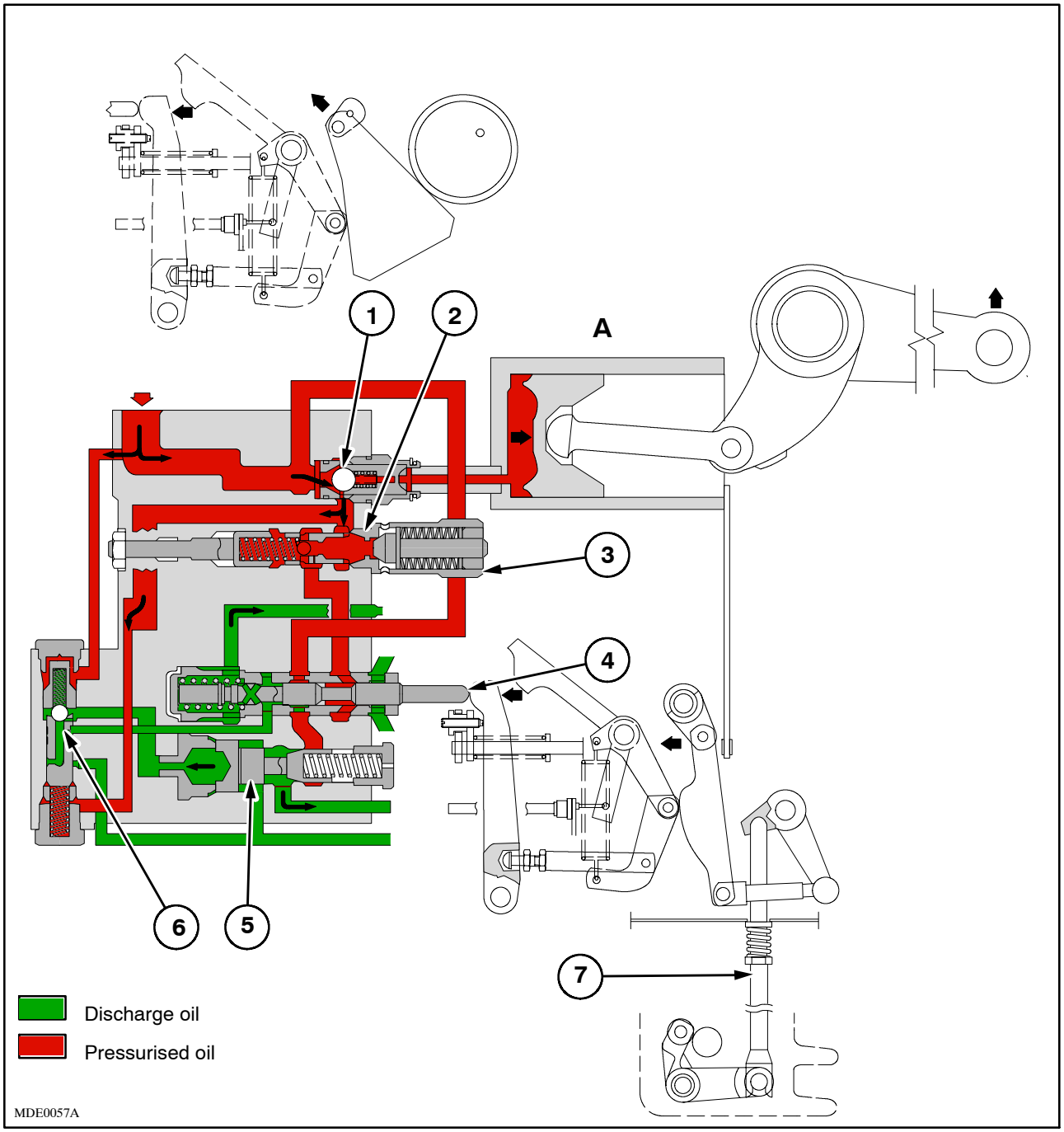
FLOAT OPERATION

To operate with the lift in float mode move the Draft and Position Control levers fully forward. This will enable the lift arms to move up and down freely allowing the implement to follow the ground contours.

ARM LIFT PHASE



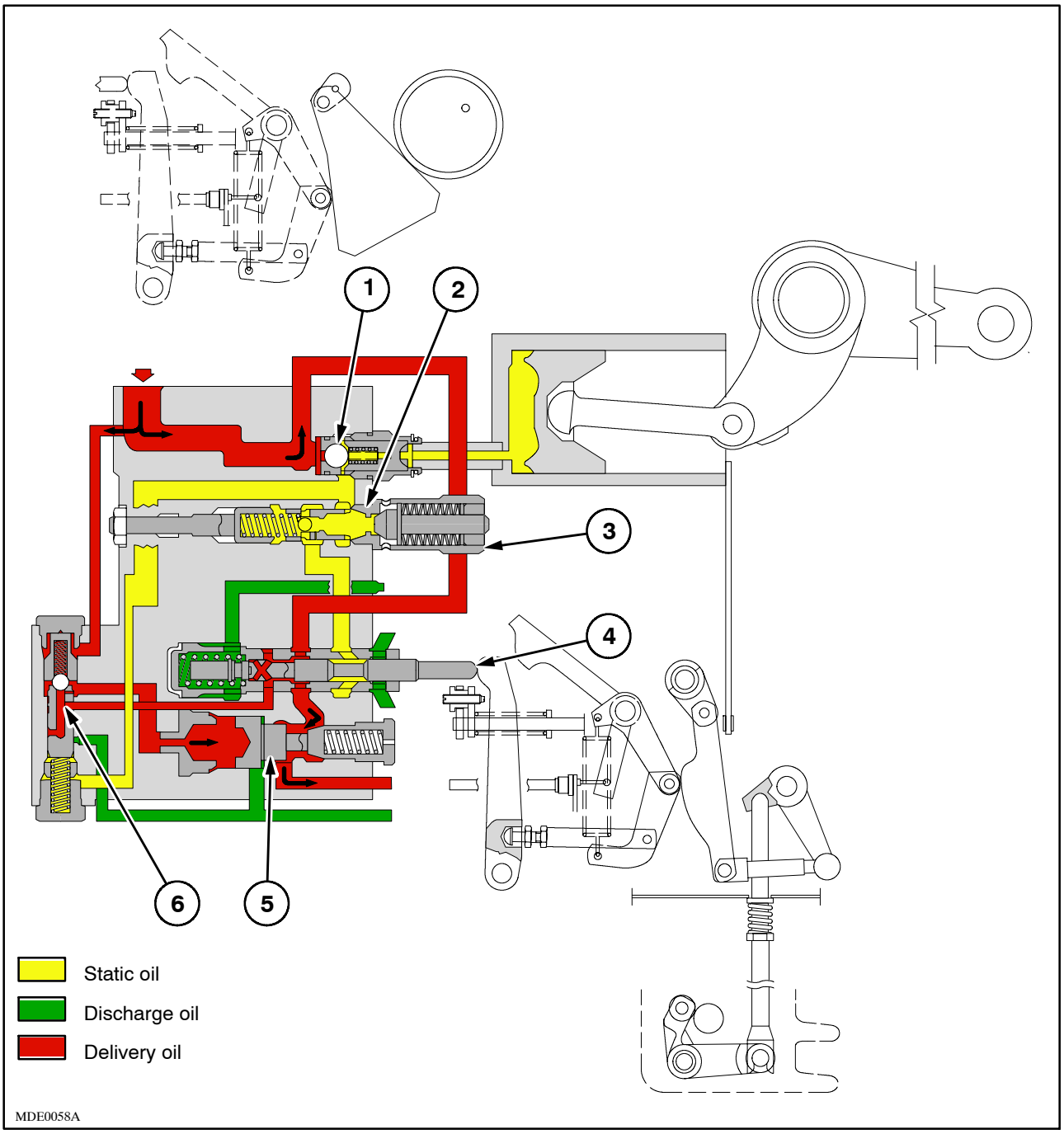
11

Arm Lift Phase

A. Detail of operation with draft control
1. Check valve
2. Arm descent speed control valve
3. Cylinder safety valve
4. Control valve block pin
5. Control valve
6. Intervention speed adjustment valve
7. Draft transmission rod

When the operator uses the position control lever (located on the right-hand side) to raise the arms; the movement shown by the arrows (control valve pin) is transmitted by the internal lever mechanisms to the control valve block pin (4). This pin interrupts the oil flow to the control valve (5). The valve (5) is moved by the relative spring, and the intervention speed valve (6), allowing the pressurised oil to open the check valve (1) and act on the arm raise piston.
With controlled draft operation (detail **A**) the lift command is sent to the flex bar, which in turn transmits the movement (shown by the arrows) to the control valve block pin (4) via the transmission rod (7).

NEUTRAL PHASE



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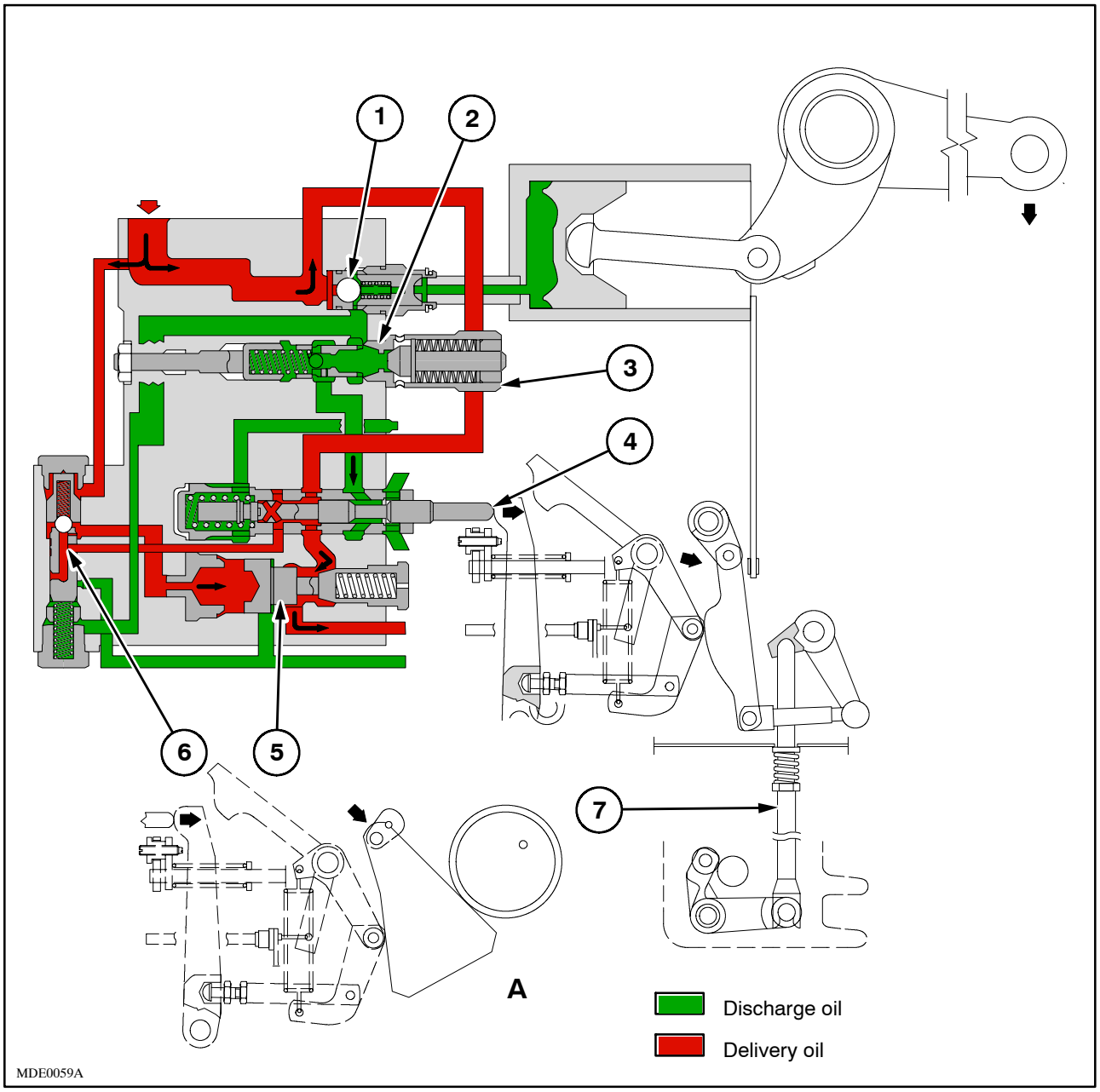
Neutral Phase

1. Check valve
2. Arm descent speed control valve
3. Cylinder safety valve
4. Control valve block pin
5. Control valve
6. Intervention speed adjustment valve

When the lift arms have reached the predetermined height, the internal lever mechanisms stop. The position of the control valve block pin (4), allows the oil to be directed to the control valve piston (5) through the intervention speed adjustment valve (6). The pressurised piston moves the valve, opening a drainage line, allowing the oil to flow to the transmission casing instead of the lift cylinder.

ARM LOWER PHASE



13

Arm Lower Phase

A. Detail of operation with controlled draft
1. Check valve
2. Arm descent speed control valve
3. Cylinder safety valve
4. Control valve block pin
5. Control valve
6. Intervention speed adjustment valve
7. Draft transmission rod

When the operator lowers the position control lever on the right-hand side, the arms are lowered. The internal lever mechanisms transmit movement (shown by the arrows) to the control valve block pin (4). The control valve block pin (4), is pulled downward by the spring, allowing the cylinder oil, under the thrust of the piston, to discharge through the arm descent speed control valve (2). The delivery oil passes through the valve (2) and pushes on the control valve piston (5). This overcomes the resistance of the spring and moves the valve, thereby creating an outlet and allowing the oil to flow to the transmission casing instead of the lift cylinder.

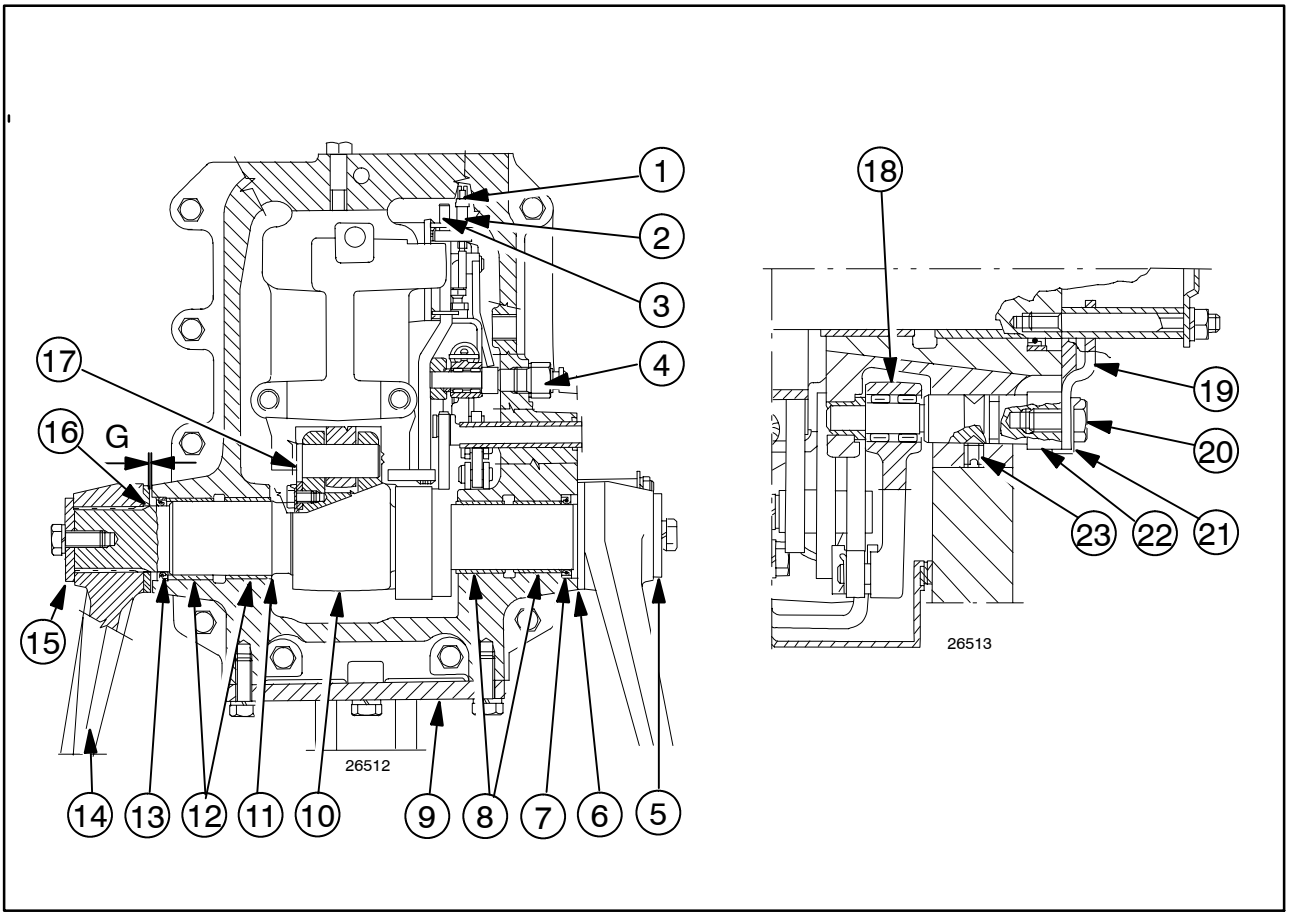
With controlled draft operation (detail A), the lowering command is sent to the flex bar, which in turn transmits the movement (shown by the arrows) to the control valve block pin (4) via the transmission rod (7).

NOTE: *The lowering speed of the implement connected to the lift arms is controlled by the position of the arm descent speed control valve (2).*

Loosening *the valve (2) control screw reduces the size of the outlet between the valve and the control valve block body.*

Fully tightening *the screw increases the size of the discharge opening and the implement lowers faster.*

LIFT CROSS-SECTIONAL VIEW

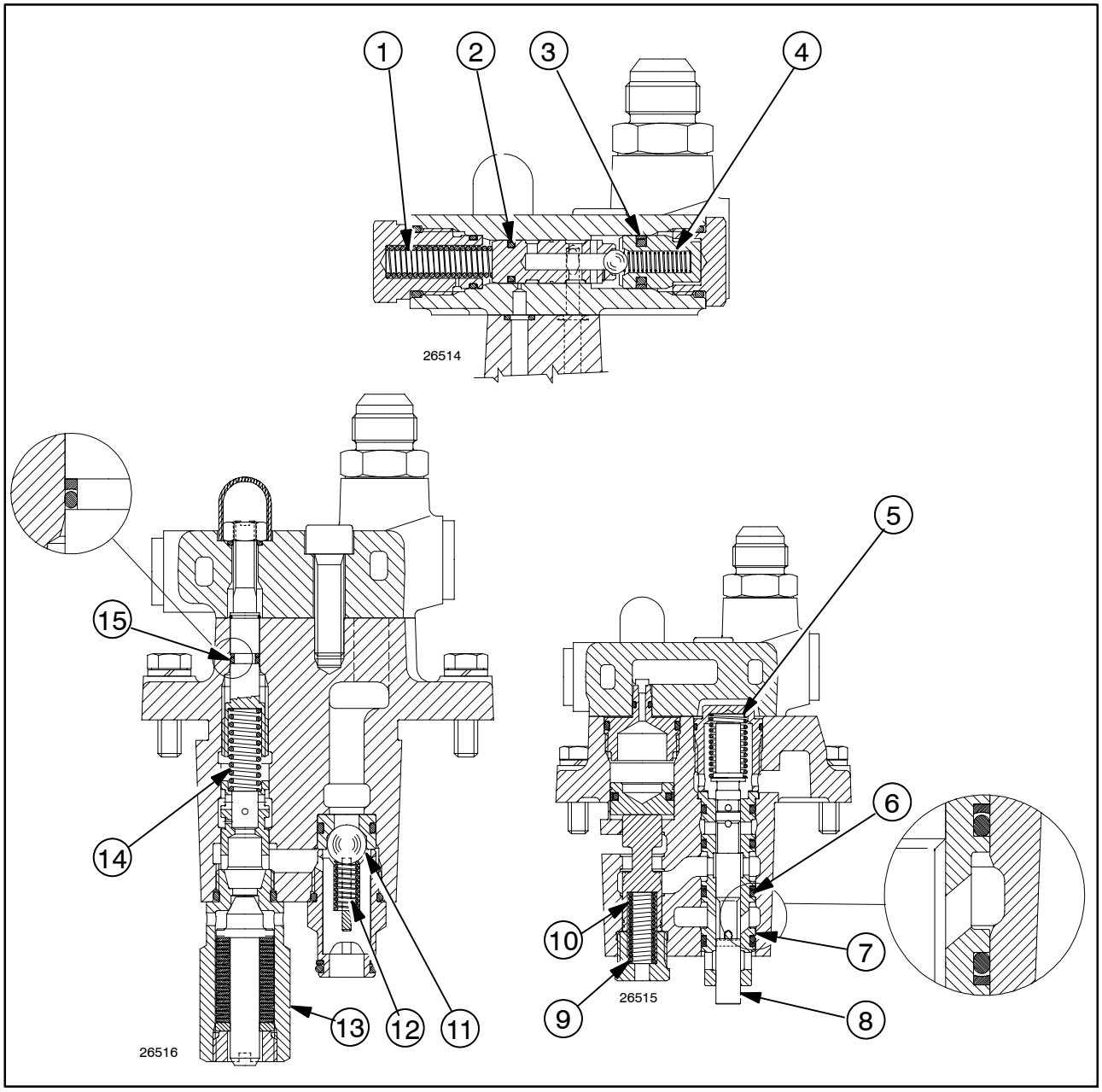


14

Lift Cross-Sectional Views

G. 0.2 to 1.4 mm (0.0078 to 0.0551 in.). Shaft axial clearance
1. Travel limit adjuster screw
2. sunken locknut for travel limit adjuster screw
3. Travel limit shift rail
4. Lift-O-Matic control valve tie-rod arm pin-lever
5. Arms thrust plate
6. Thrust washer
7. Right-hand seal
8. Right-hand bushing
9. Top link support
10. Internal arm
11. Arm control shaft
12. Left-hand bushings
13. Left-hand seal
14. Lift arms
15. Arms thrust plate
16. Thrust washer
17. Top link piston pin
18. Draft control internal lever
19. Bracket
20. Retaining bolt
21. Lock Washer
22. Lever pivot eccentric pin (18)
23. Threaded grub screw

HYDRAULIC LIFT CONTROL VALVE BLOCK CROSS-SECTIONAL VIEW



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Hydraulic Lift Control Valve Block Cross-Sectional View

1. Intervention speed adjustment valve spring
2. Seal and ring
3. Seal and ring
4. Intervention speed adjustment valve spring
5. Control valve block pin return spring
6. Seal and ring
7. Control valve block pin seat
8. Control valve block pin
9. Control valve return spring
10. Control valve
11. Check valve ball
12. Check valve return spring
13. Cylinder safety valve
14. Arm descent speed control valve spring
15. Seal and ring

NOTE: *When fitting seals 2, 3, 6 and 15, heat the corresponding support disks in oil at a temperature of approximately 122 °F (50 °C). When fitting seal (15) and its support disk, use guard* ***380000266****. When fitting seal (6) and its support disk, use guard* ***380000275****.*
Seals (2 and 3) and the relative support disks can be fitted without guards, as long as care is taken not to damage them.

TROUBLESHOOTING

Problems	Possible Causes	Solutions
The lift does not raise.	1. Oil filter clogged.	Replace filter.
	2. Control valve jammed in discharge position.	Release control valve.
	3. Hydraulic pump faulty.	Overhaul or replace pump.
The lift moves in jerks.	1. Oil filter clogged.	Replace filter.
	2. Air in the pump suction line.	Check that the unions are airtight and the seals are efficient.
The lift raises too slowly.	1. Oil filter clogged.	Replace filter.
	2. Oil leaking past the seals resulting in pressure loss: piston seals or delivery union seals.	Replace all defective seals.
	3. Hydraulic pump faulty.	Overhaul or replace pump.
The lift lowers too slowly.	1. Arm descent speed set incorrectly.	Set correctly.
The lift lowers too quickly.	1. Arm descent speed set incorrectly.	Set correctly.
The lift operates in jerks.	1. Foreign bodies between the ball and relative seat on the delivery control valve.	Disassemble the valve, eliminate foreign bodies and check the oil filter.
	2. Faulty on the delivery control valve ball.	Replace the delivery control valve.
	3. Delivery control valve piston jammed.	Disassemble the valve and remove the cause of the piston jam.

(continued)

(continued)

Problems	Possible Causes	Solutions
The lift operates extremely slowly.	1. Blocked discharge holes on delivery control valve.	Disassemble the valve, eliminate the cause of the obstruction and check the oil filter.
	2. Delivery control valve piston jammed.	Disassemble the valve and remove the cause of the piston jam.
The lift is unable to keep the load raised (with the engine running, the load moves up and down rhythmically; with the engine turned off, the load lowers).	1. Faulty seal on check valve.	Dismantle, check and replace the parts concerned, if necessary.
	2. Oil leaking past the seals on the control valve block pin seat.	Replace the seals.
	3. Control valve block pin seal faulty.	Dismantle and clean the seal; replace the control valve block pin and seat if defective.
	4. Oil leaking past the lift piston seal or the seals on the cylinder oil discharge fitting.	Replace the seals.
	5. Defective seal or cylinder safety valve seal set to very low value.	Replace the valve.
The pressure relief valve cuts in when the lift arms reach the completely raised position.	1. Lift arm travel set incorrectly.	Set correctly.
Lift has poor lifting capacity.	1. The pressure relief valve is set incorrectly.	Replace the valve.
	2. Cylinder safety set incorrectly.	Replace the valve.
	3. Poor pump efficiency (generally combined with a considerable increase in lift time).	Overhaul or replace pump.

OVERHAUL

MECHANICAL REAR HYDRAULIC LIFT

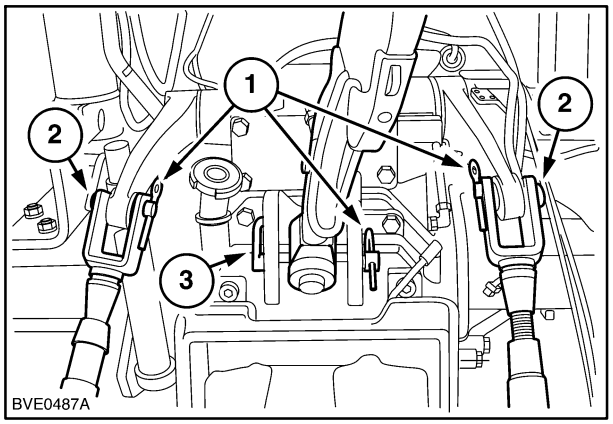
Removal

(Op. 35 110 30)

DANGER

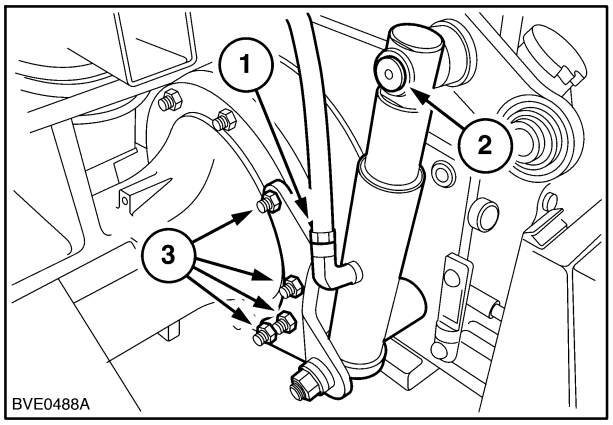
Lift and handle all heavy components using lifting equipment of appropriate capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

1. Remove the trailer brake valves (refer to trailer brake valve removal in the trailer brake valve chapter of the hydraulic systems section).
2. Remove the remote control valves (refer to remote control valve removal in the remote control valve chapter of the hydraulic systems section).
3. Remove the split pins (1), vertical tie-rod pins (2) and detach the vertical tie rods.
4. Remove the top link pin (3) and remove the top link.



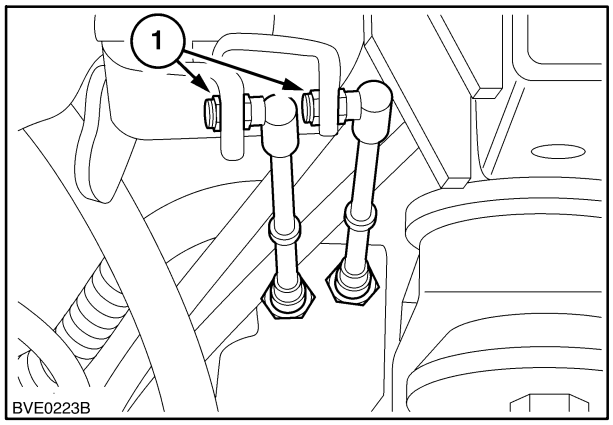
16

5. Disconnect the lift assistor ram oil supply pipe (1). Remove the circlip (2). Remove the lift assistor ram lower retaining bracket retaining nuts (3) and remove the lift assistor ram.



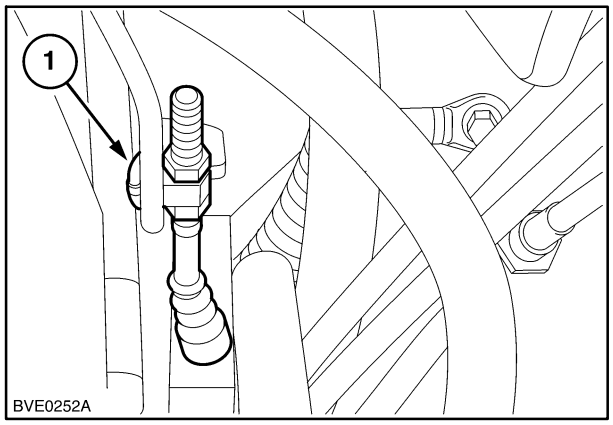
17

6. Remove the draft cable and the position cable retaining nuts (1) and detach the draft cable and the position cable.



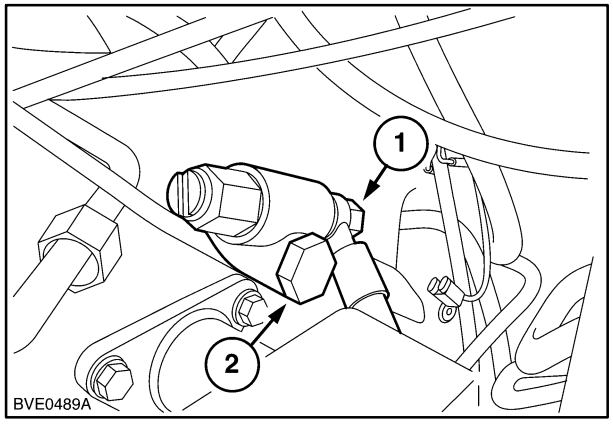
18

7. Remove the retaining clip (1) and detach the Lift-O-Matic cable.



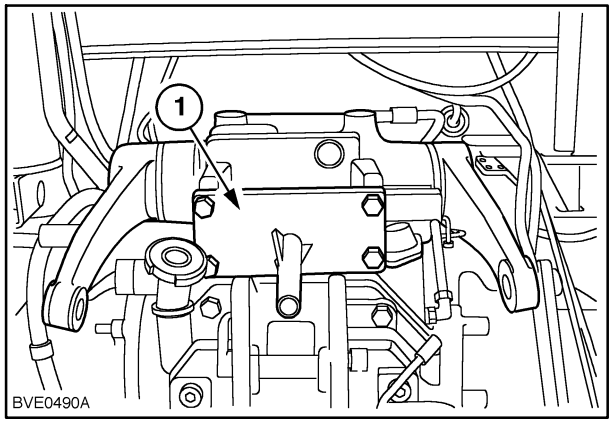
19

8. Disconnect the oil pressure relief valve hose (1). Remove the banjo bolt (2) and remove the relief valve assembly.



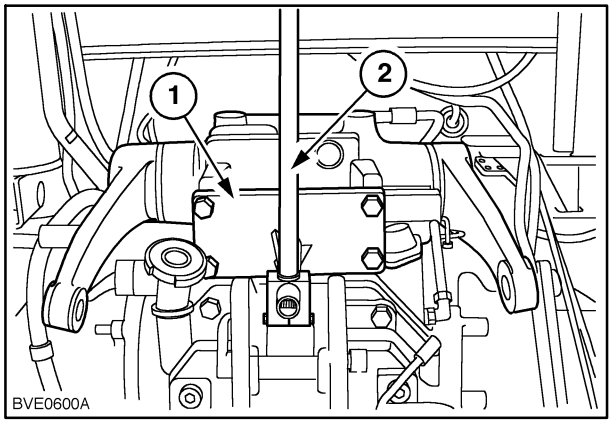
20

9. Remove the mechanical rear hydraulic lift retaining bolts.
10. Install the special tool 380000238 (1) to the mechanical rear hydraulic lift.



21

11. Install the special tool 380000224 (2) to the special tool 380000238 (1). Attach the special tool 380000224 to a suitable hoist. Remove the mechanical rear hydraulic lift.



22

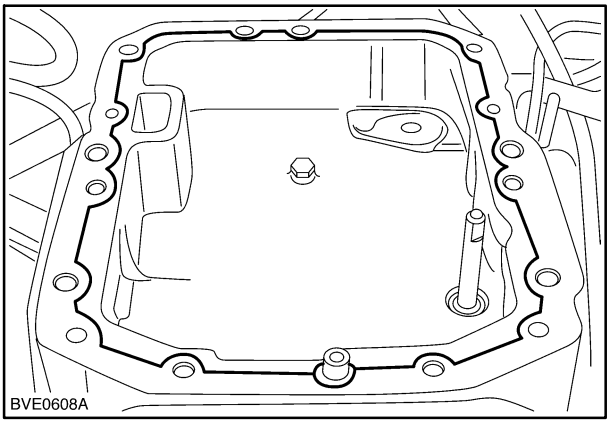
Installation

(Op. 35 110 30)

DANGER

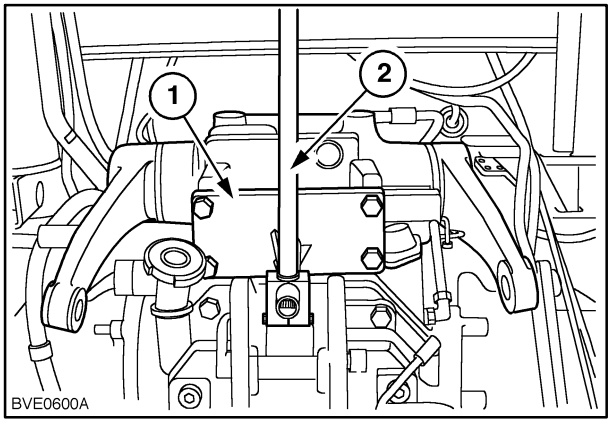
Lift and handle all heavy components using lifting equipment of appropriate capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

1. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



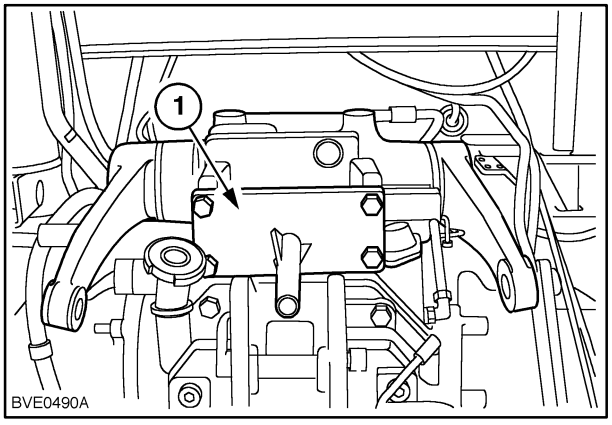
23

2. Install the mechanical rear hydraulic lift and remove the special tool 380000224 (2) from the special tool 380000238 (1).



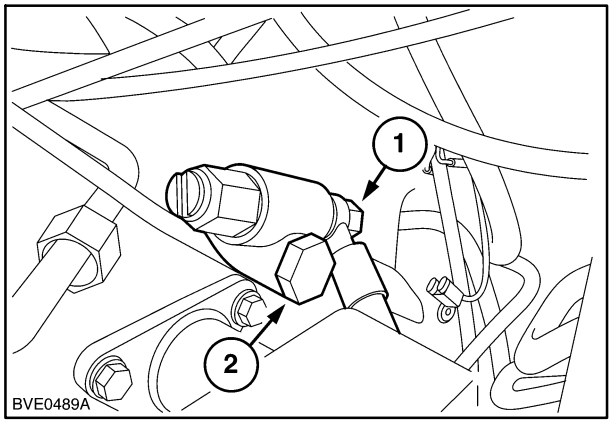
24

3. Remove the special tool 380000238 (1) from the mechanical rear hydraulic lift.
4. Install the mechanical rear hydraulic lift retaining bolts.



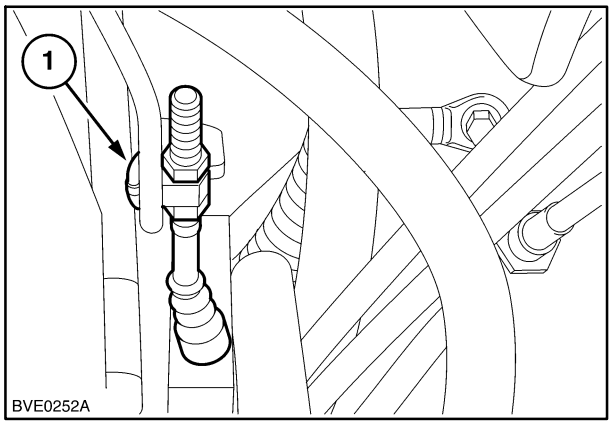
25

5. Install the oil pressure relief valve assembly. Install the banjo bolt (2) and connect the relief valve hose (1).



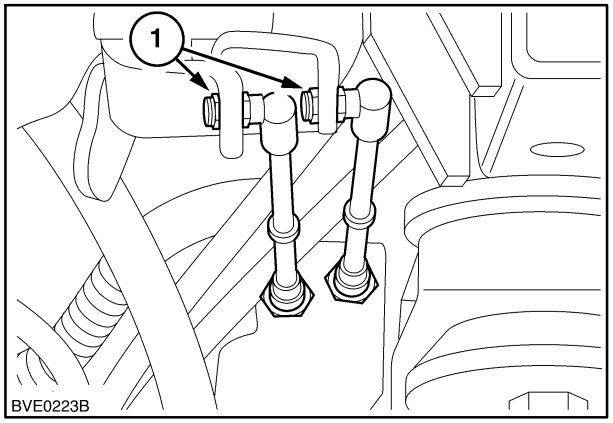
26

6. Attach the Lift-O-Matic cable and install the retaining clip (1).



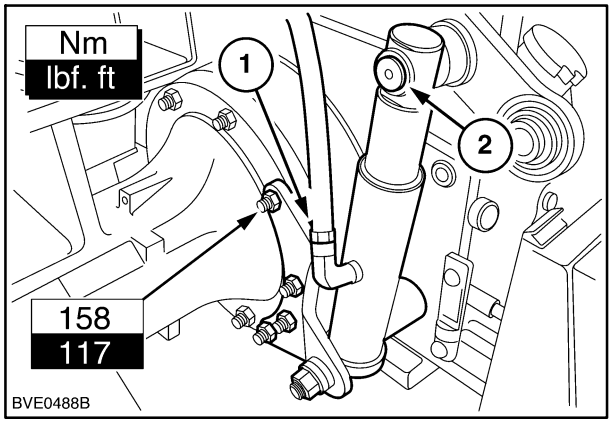
27

7. Attach the draft cable and the position cable. Install the draft cable and the position cable retaining nuts (1).



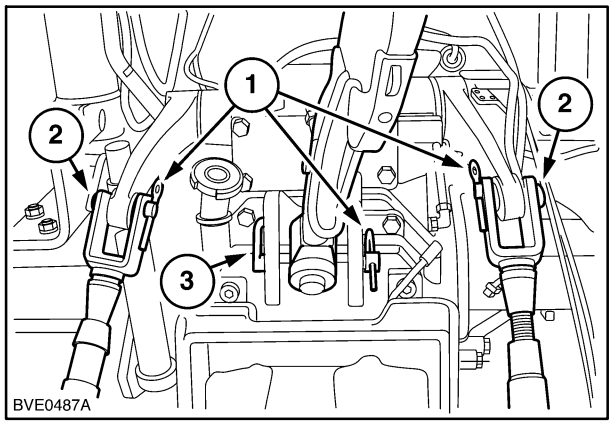
28

8. Install the lift assistor ram, lower retaining bracket, and the retaining nuts. Tighten the retaining nuts to the specified torque value. Install the circlip (2) and connect the lift assistor ram oil supply pipe (1).



29

9. Install the top link and install the top link pin (3).
10. Attach the vertical tie-rods. Install the vertical tie-rod pins (2) and the split pins (1).
11. Refill the driveline with the correct specification oil.



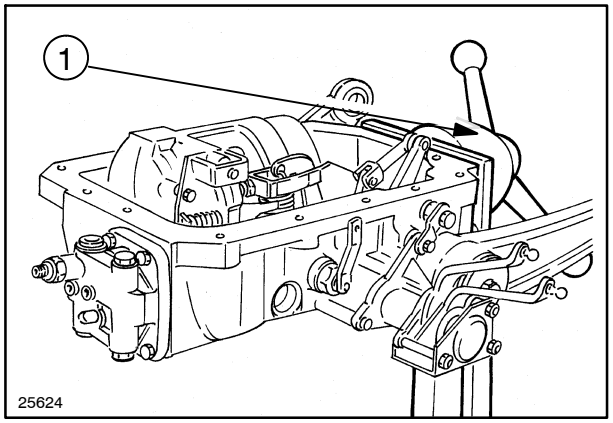
30

Disassembly

⚠ WARNING ⚠

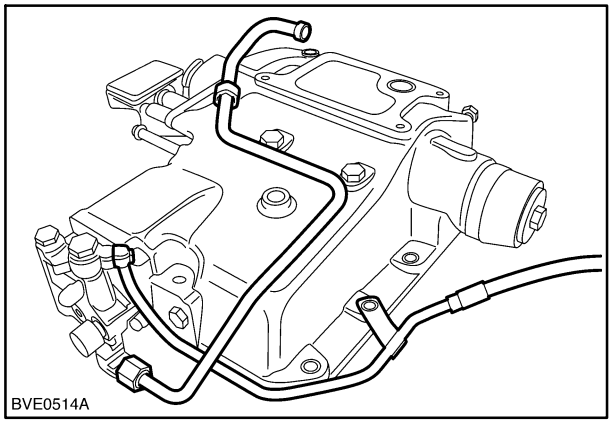
Handle all components with the greatest care. Do not insert hands or fingers between the parts.Wear suitable protection clothing, including goggles, gloves and footwear.

1. Using suitable slings or chains, connect the hydraulic lift to a hoist and install the hydraulic lift on a rotating stand (1).



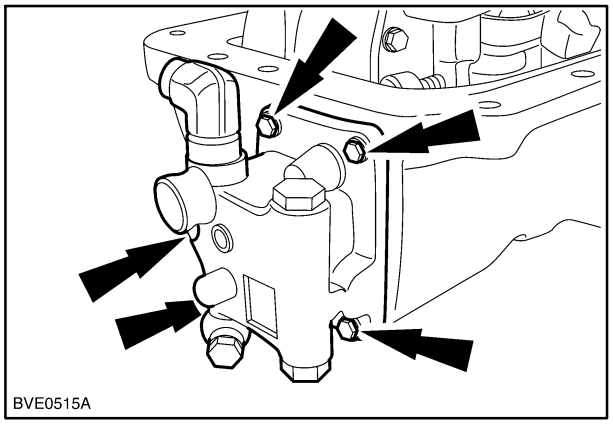
31

2. Remove the oil supply pipes from the mechanical rear hydraulic lift.



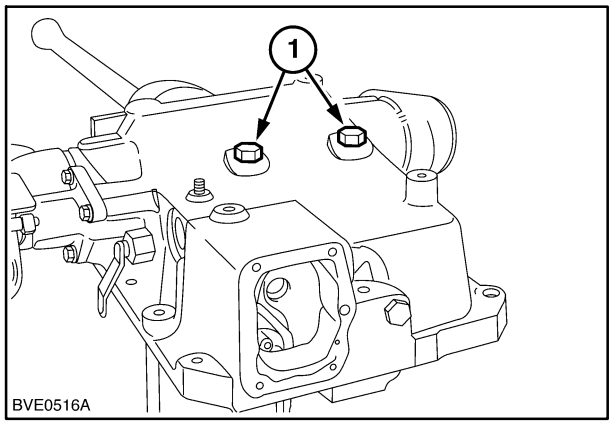
32

3. Remove the control valve.



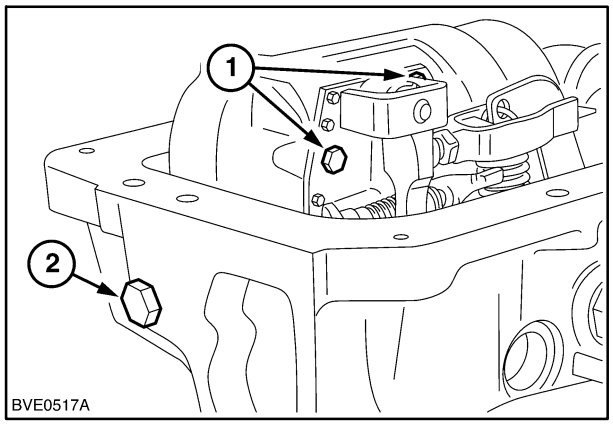
33

4. Remove the hydraulic lift cylinder retaining bolts (1).



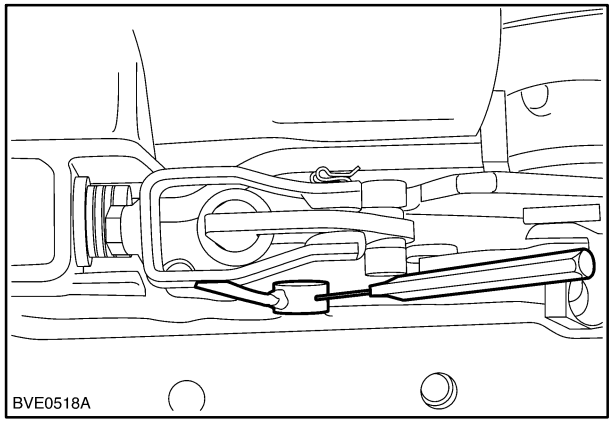
34

5. Remove the retaining bolts (1) securing the internal levers to the hydraulic lift cylinder.
6. Remove the hydraulic lift cylinder retaining bolt (2).



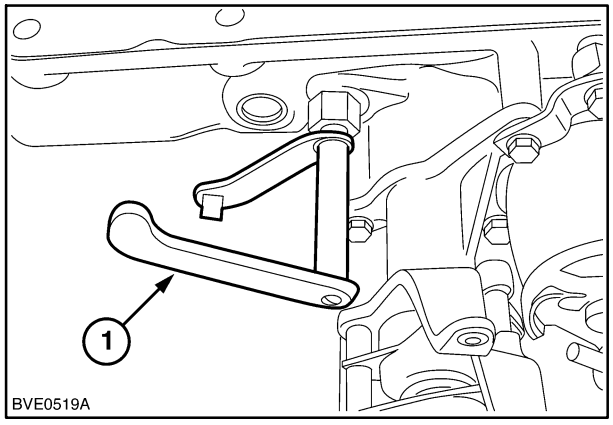
35

7. Remove the roll pin from the Lift-O-Matic control internal lever.



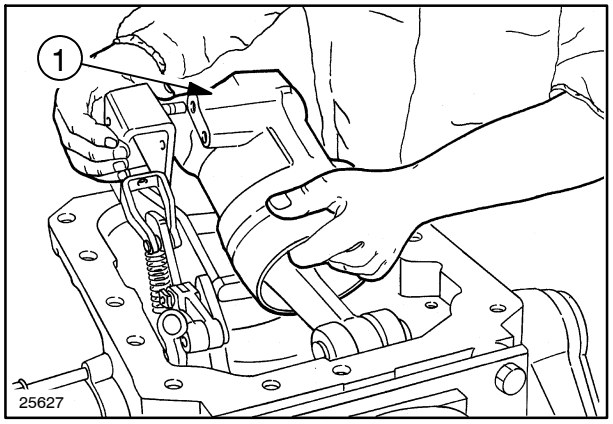
36

8. Remove the Lift-O-Matic control linkage (1).



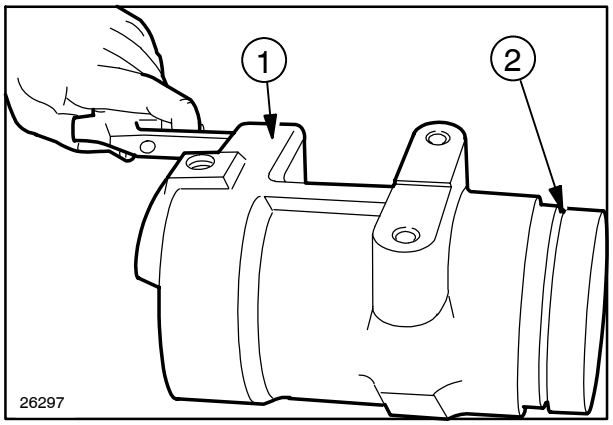
37

9. Remove the hydraulic lift cylinder and piston (1).



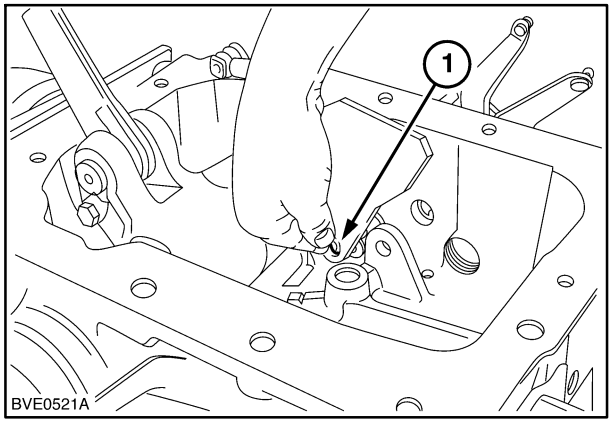
38

10. Use compressed air in the inlet port to remove the piston (2) from the hydraulic lift cylinder (1).



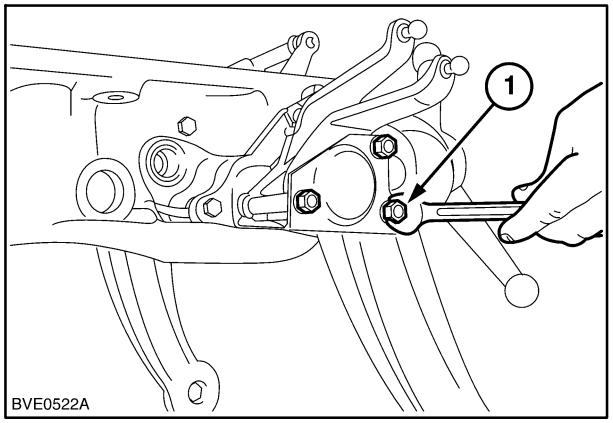
39

11. Remove the circlip and remove the position control internal lever (1).



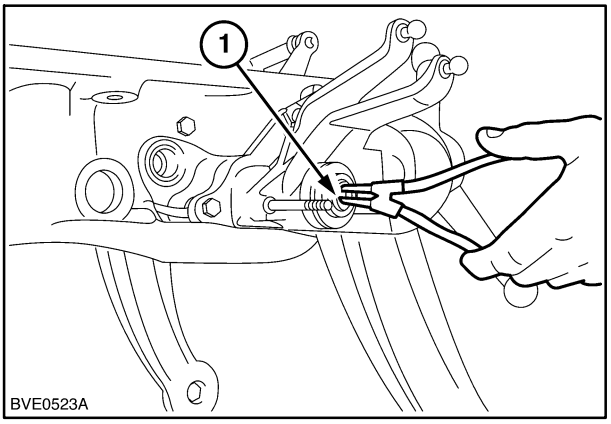
40

12. Remove the lift control lever friction disc cover bolts (1).



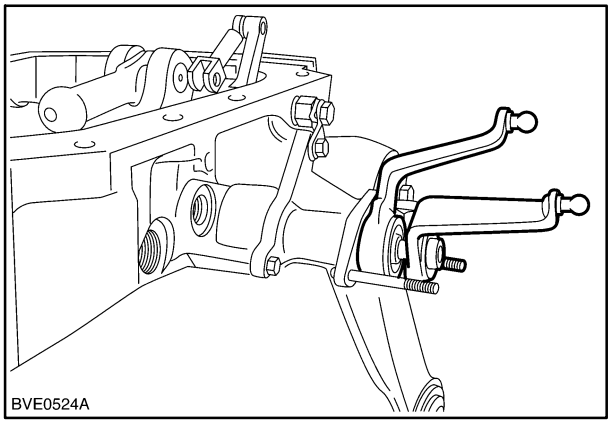
41

13. Remove the lift control lever friction disc circlip (1).



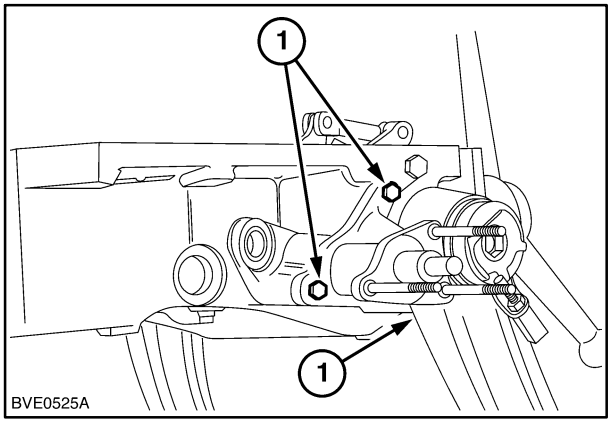
42

14. Remove the lift control levers and the friction discs.



43

15. Remove the lift control linkage bracket retaining bolts (1).



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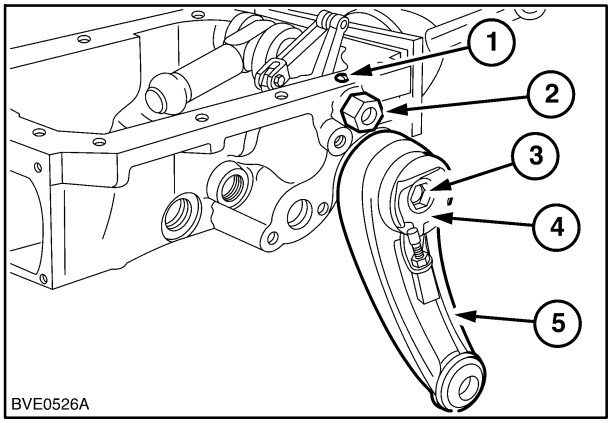
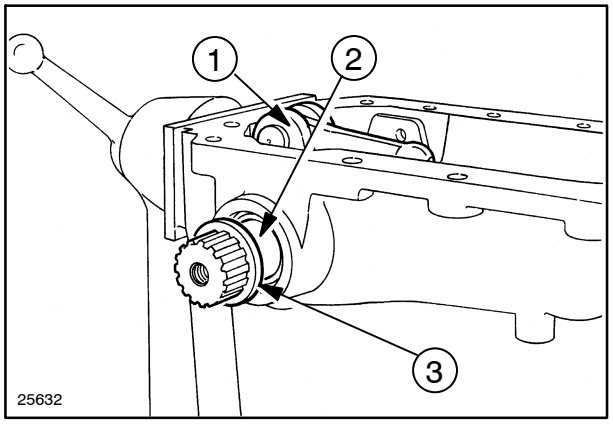
16. Remove the eccentric shaft retaining screw (1).
17. Remove the eccentric shaft (2) and the internal lift control linkage.
18. Remove the right hand side lift arm retaining bolt (3), the Lift-O-Matic height limiter (4) and remove the right hand side lift arm (5).
19. Remove the the right hand side thrust washer.
20. Remove the left hand side retaining bolt. Remove the left hand side lift arm and the thrust washer.



45

21. Release the retaining bolt safety tab on the internal arm (1) and remove the retaining bolt. Remove the shaft (2). Remove and discard the and the oil seals (3).



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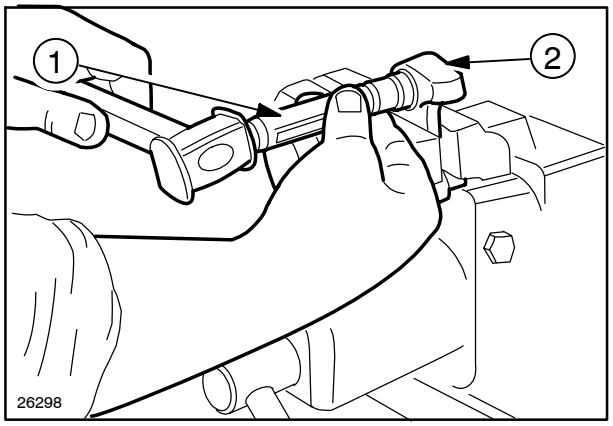
Assembly

WARNING

Handle all components with the greatest care.Do not insert hands or fingers between the parts.Wear suitable protection clothing, including goggles, gloves and footwear.

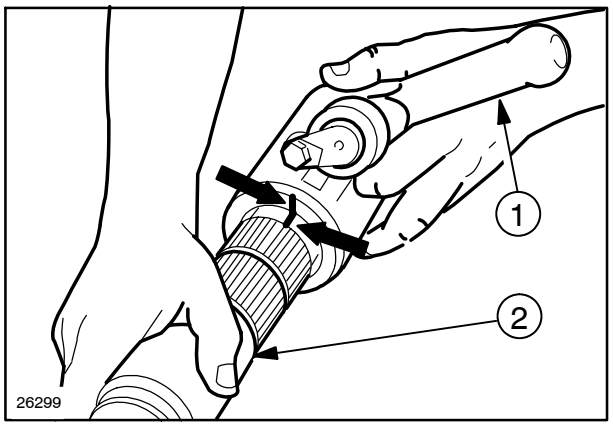
NOTE: *Install new O-ring seals and sealing washers as required.*

1. Using the special tool **380000260** (1), install the draft control internal lever (2) bearings.
2. Using the special tool **380000261**, install the control valve lever bearings.



47

3. Install the lift arms shaft (2) and the internal arm (1) into the lift casing, matching up the reference marks. Tighten the internal arm retaining bolt.



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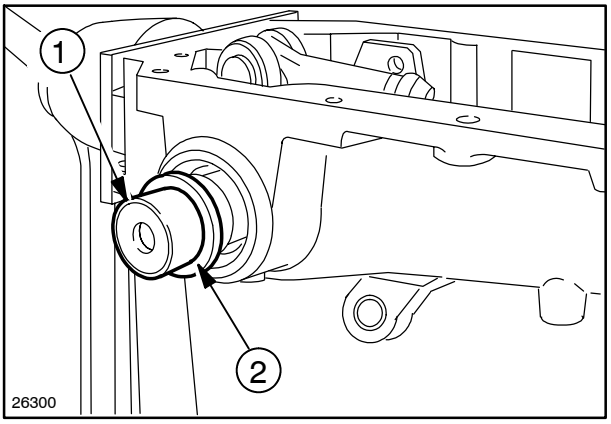
4. Using a suitable plastic sheet cover the splines on the shaft (1) to prevent damage to the new oil seal
5. Install the oil seal (2) onto the shaft and push the oil seal manually into its seat. Remove the plastic sheet (2).



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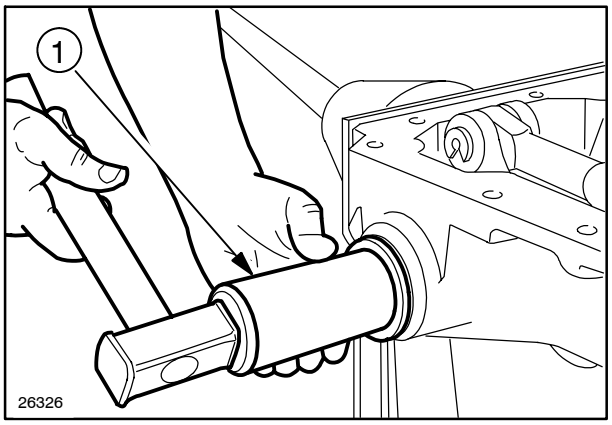
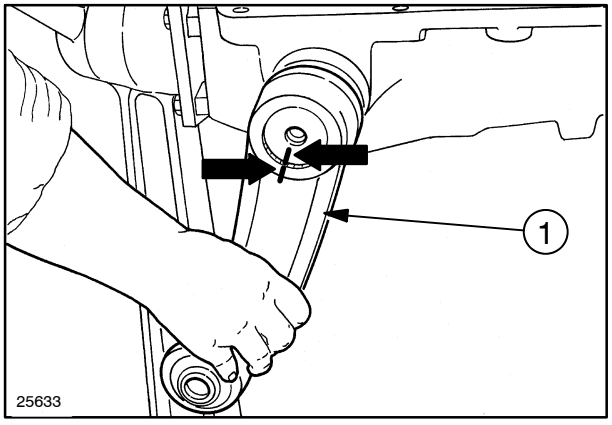
6. Using the special tool **380000262** (1), install the oil seal into the correct position.



50

7. Install the thrust washers and install the lift arms (1) on to the shaft, matching up the reference marks.



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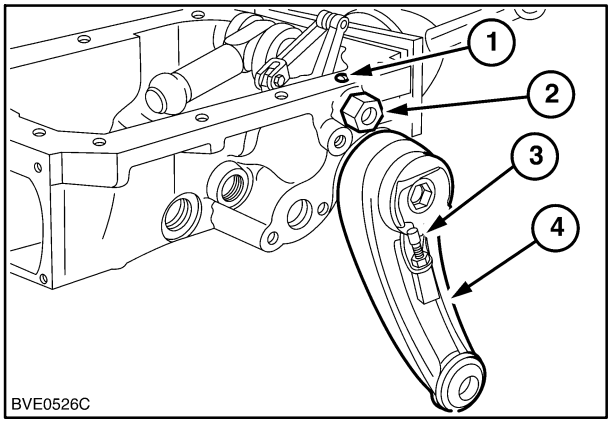
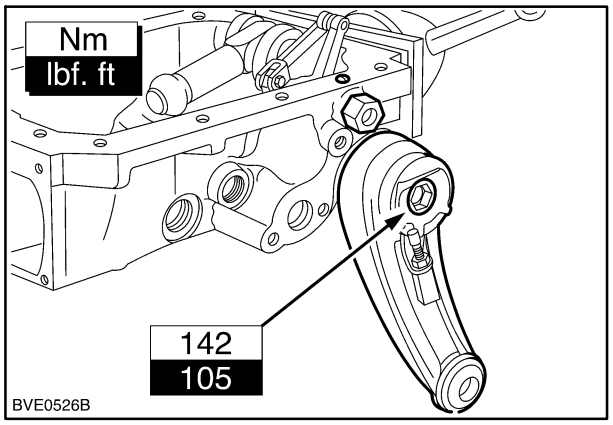
8. Install the Lift-O-Matic height limiter (3) onto the right hand side lift arm (4).
9. Install the eccentric shaft (2) and the internal lift control linkage.
10. Install the eccentric shaft retaining screw (1).



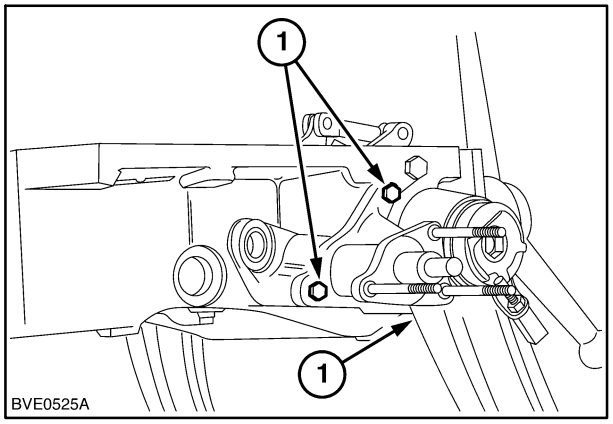
52

11. Install the right hand side lift arm retaining bolt. Tighten to the specified torque valve. Repeat this step for the left hand side lift arm.



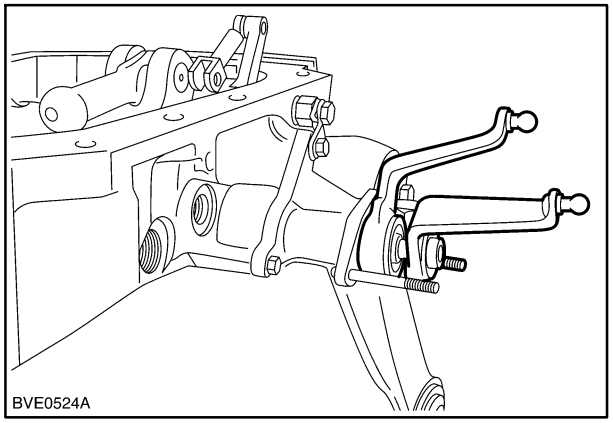
53

12. Install the lift control linkage bracket retaining bolts (1).



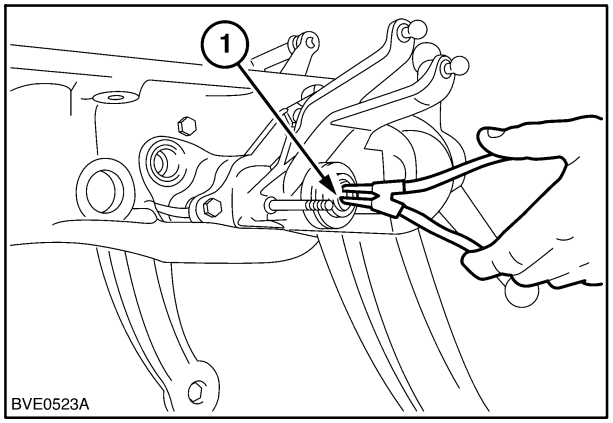
54

13. Install the lift control levers and the friction discs.



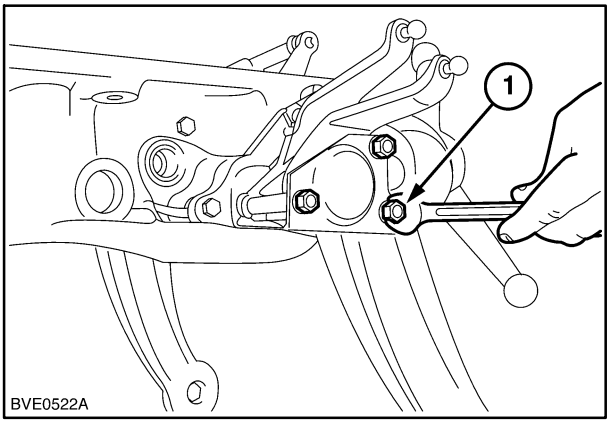
55

14. Install the lift control lever friction disc circlip (1).



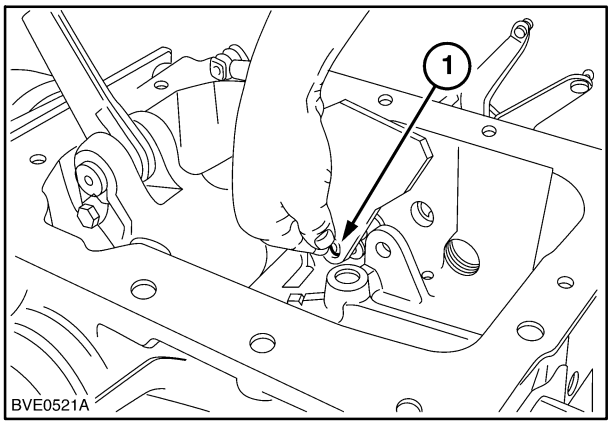
56

15. Install the lift control lever friction disc cover bolts (1).



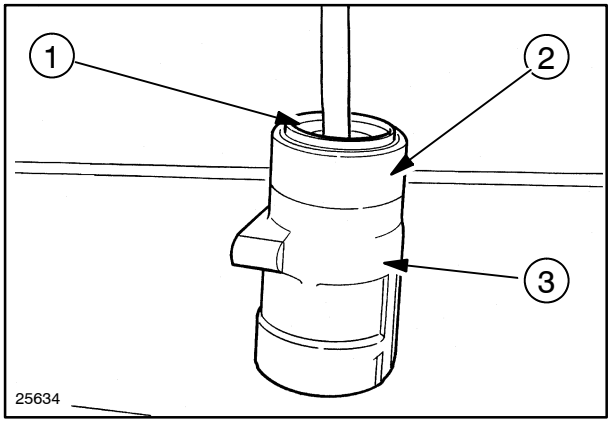
57

16. Install the position control internal lever (1) and install the circlip.



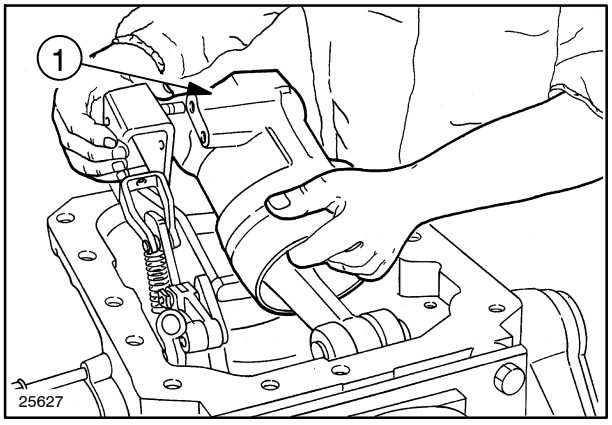
58

17. Using the special tool **380000225** (2), install the piston (1) into the hydraulic lift cylinder (3).



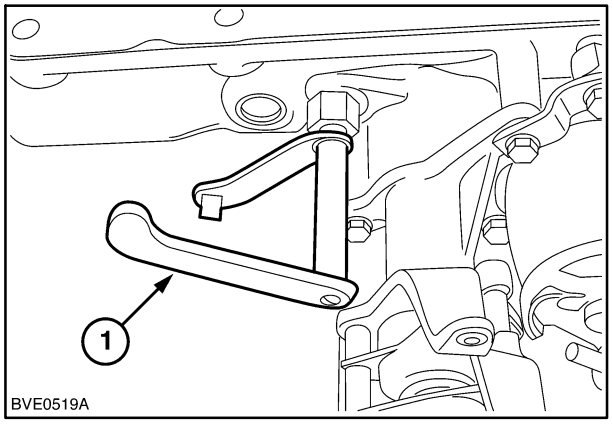
59

18. Install the hydraulic lift cylinder and piston (1).



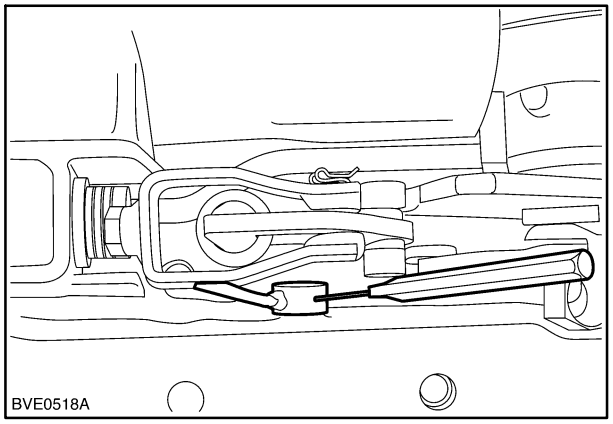
60

19. Install the Lift-O-Matic control linkage (1).



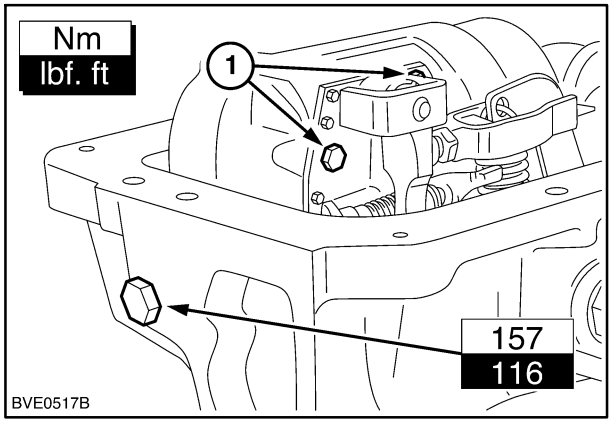
61

20. Install the roll pin to the Lift-O-Matic control internal lever.



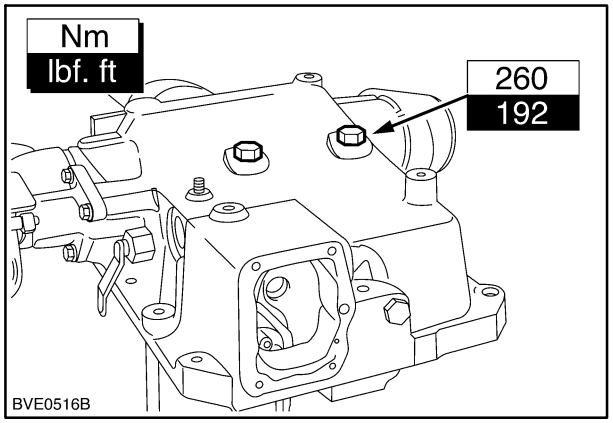
62

21. Install the hydraulic lift cylinder retaining bolt. Tighten to the specified torque value.
22. Install the retaining bolts (1) securing the internal levers to the hydraulic lift cylinder.



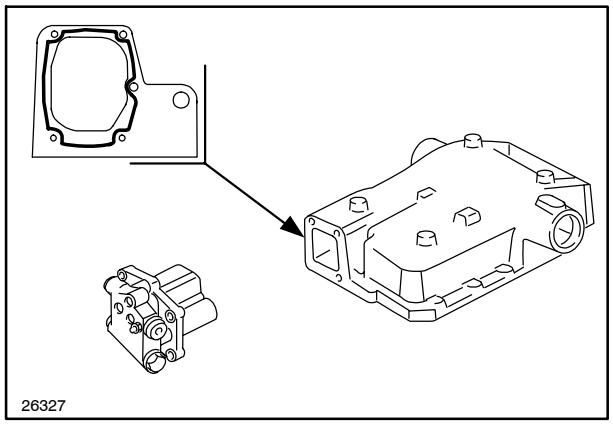
63

23. Install the hydraulic lift cylinder retaining bolts. Tighten to the specified torque value.



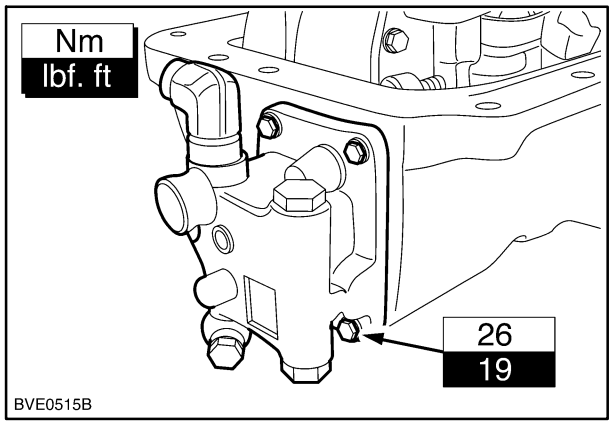
64

24. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



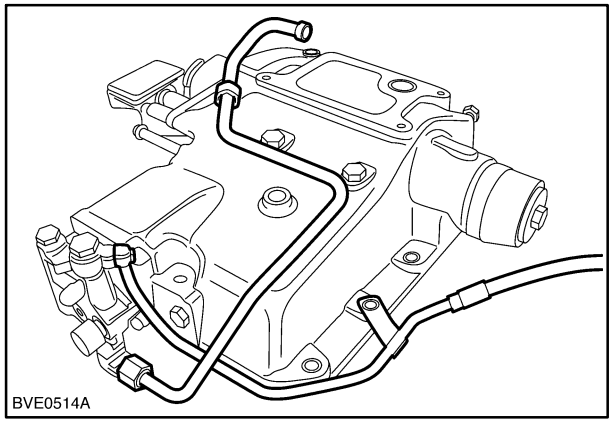
65

25. Install the control valve. Tighten to the specified torque value.



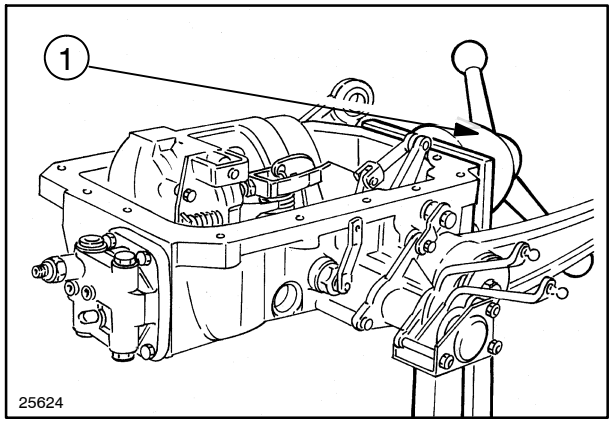
66

26. Install the oil supply pipes to the mechanical rear hydraulic lift.



67

27. Using suitable slings or chains, connect the hydraulic lift to a hoist and remove the hydraulic lift from the rotating stand (1).



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Adjustments

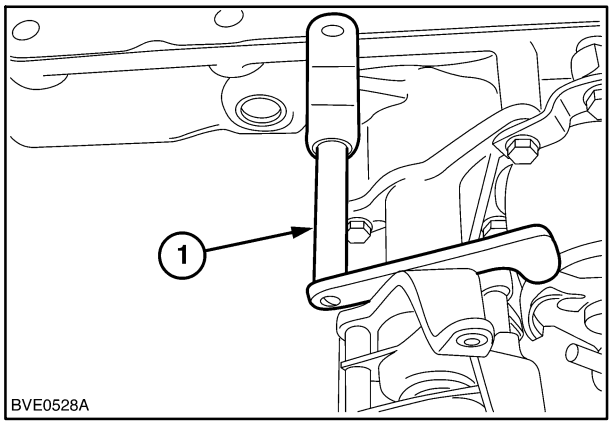
⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

NOTE: *The adjustments should be carried out with the mechanical rear hydraulic lift on a rotating stand.*

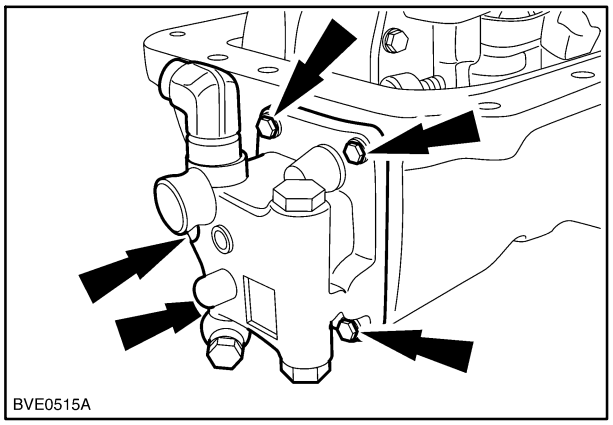
Position Control Adjustment

1. Make sure the Lift-O-Matic control linkage (1) remains in the OFF position (external lever locked in the vertical position) unless otherwise indicated.



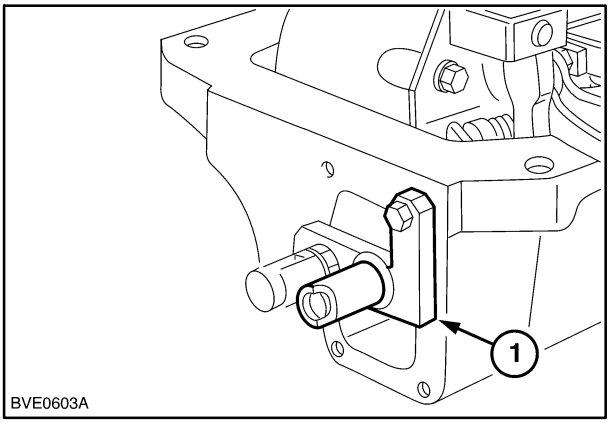
69

2. Remove the control valve.



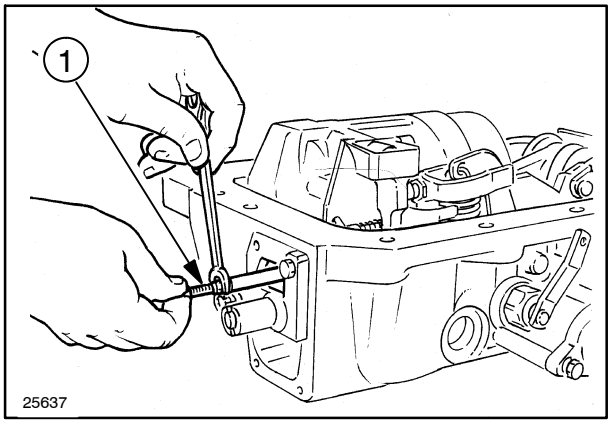
70

3. Install the special tool 380000264 (1) to the mechanical rear hydraulic lift.



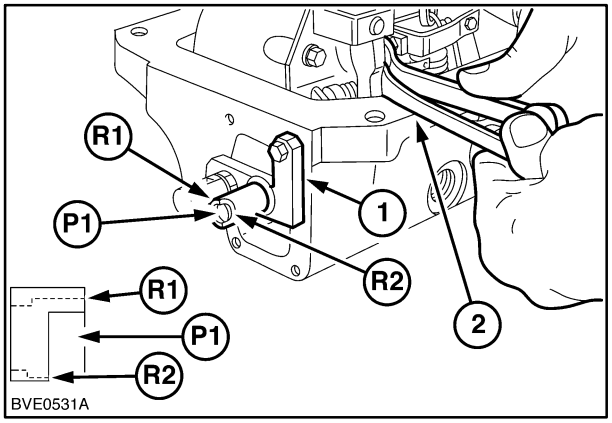
71

4. Position the lift arms in the raised position.
5. Place the position control lever in the fully raised position.
6. Using the special tool 380000267 (1) loosen the lock nut and loosen the maximum height limit adjustment screw until it no longer makes contact with the control valve lever.



72

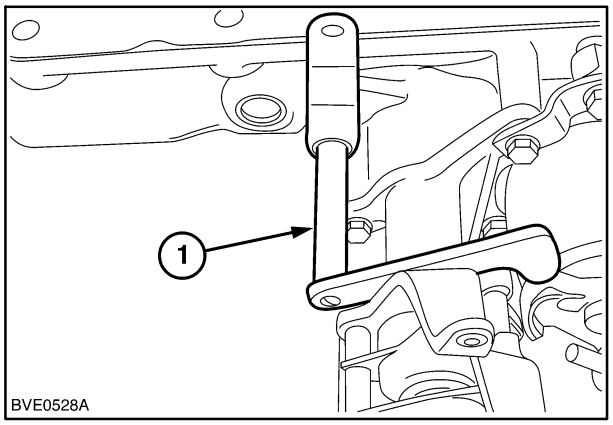
7. Adjust the link (2) until the plunger (P1) is aligned with the exteral reference (R1) on the special tool 380000264 (1).
8. Tighten the locknut.



73

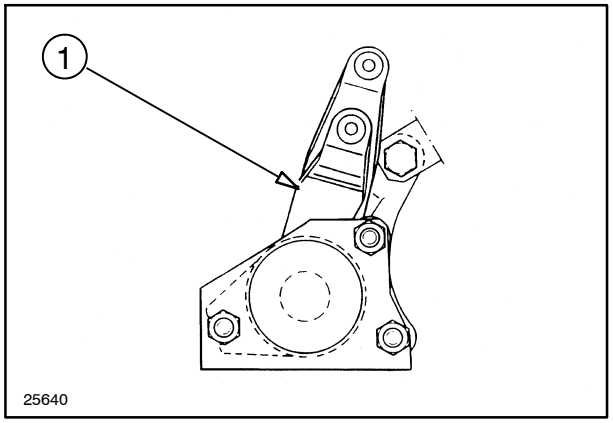
Draft Control Adjustment

1. Make sure the Lift-O-Matic control linkage (1) remains in the OFF position (external lever locked in the vertical position) unless otherwise indicated.



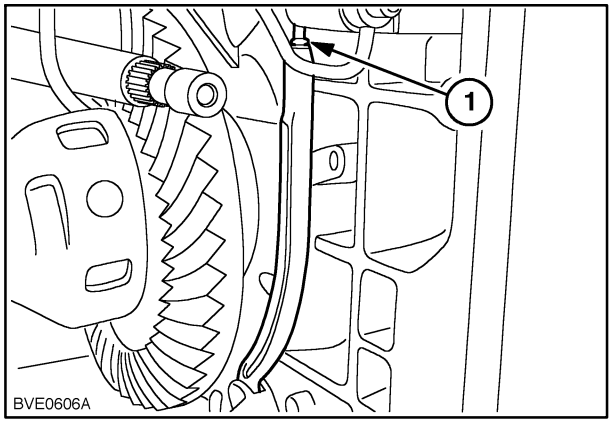
74

2. Position the lift arms in the raised position.
3. Place the position and draft control levers (1) in the fully lowered position.



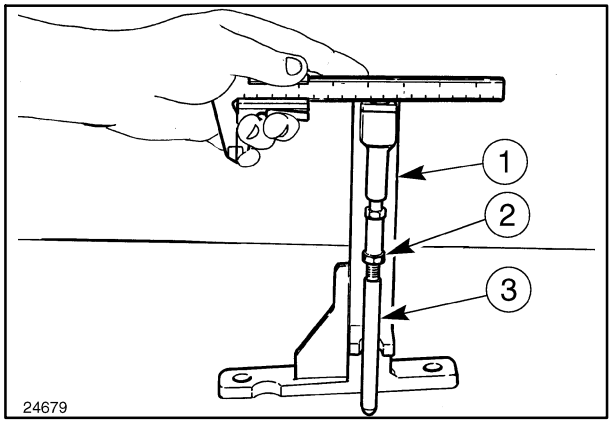
75

4. Remove the PTO housing (refer to removing the PTO housing in the PTO section).
5. Remove the top section of the draft sensing control rod (1).

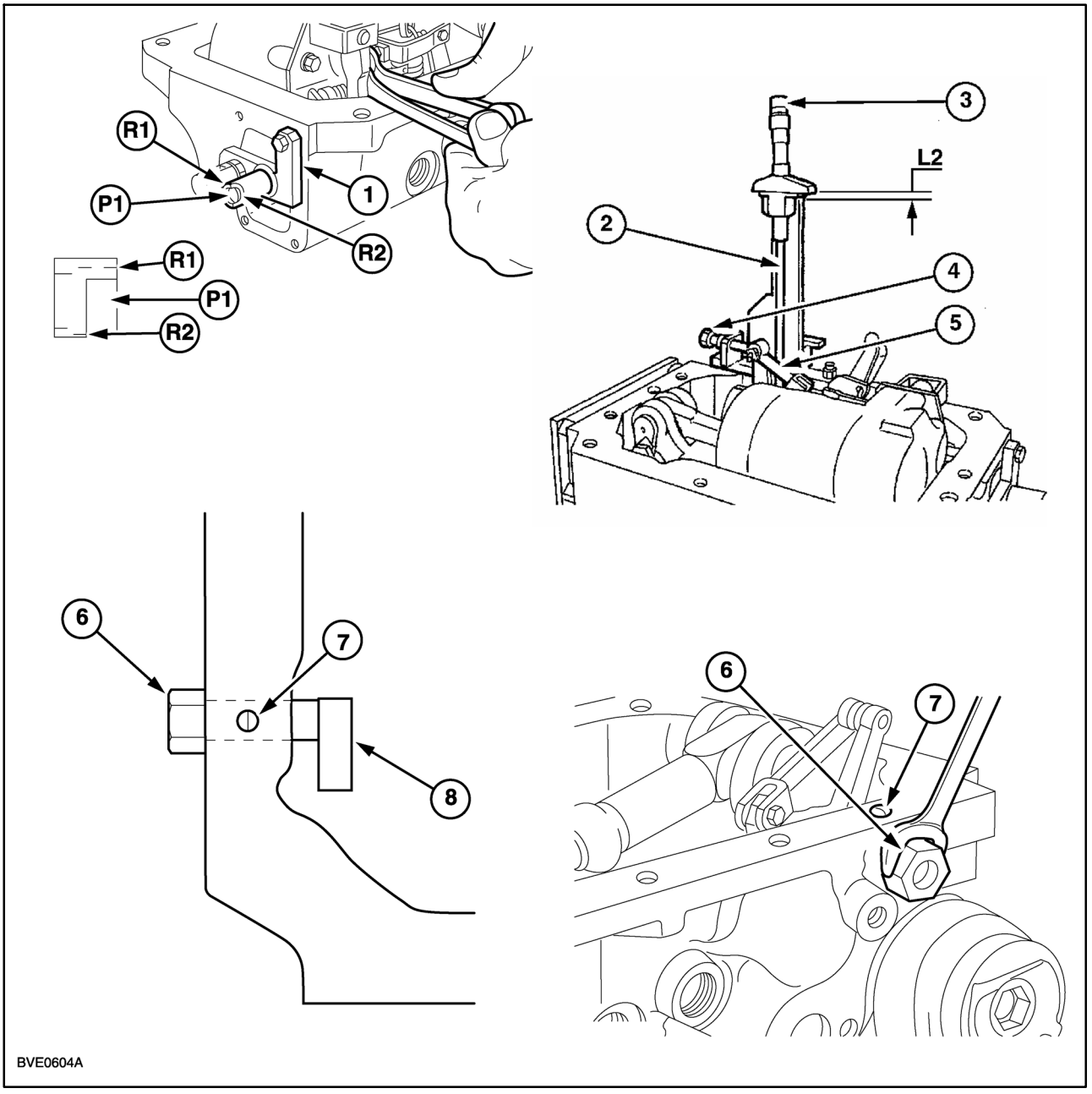


76

6. Attach the top section of the draft sensing control rod (3) to the extension adaptor of the special tool 380000263 (1).
7. Place the special tool 380000263 (1) onto a surface plate and adjust the end of the rod (3) until the upper end of the rod is level with the special tool 380000263 (1).
8. Tighten the locknut (2).



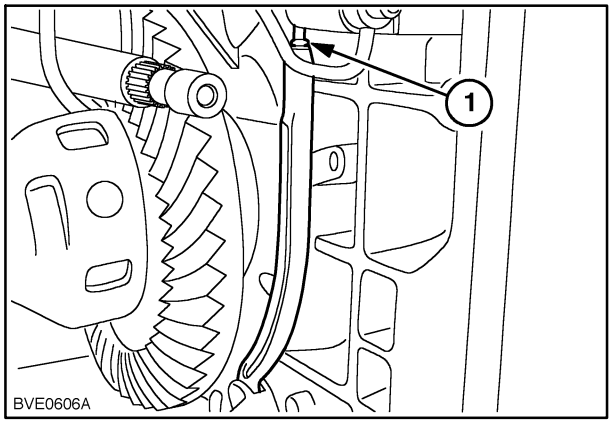
77



78

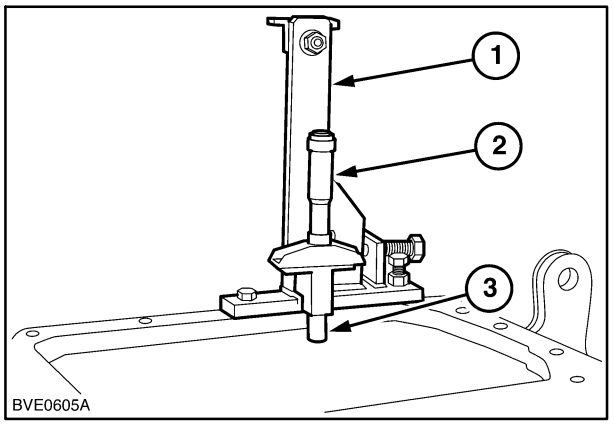
9. Install the special tool 380000263 (2) and the extension adaptor/rod onto the hydraulic rear lift cover.
10. Loosen the eccentric shaft grub screw (7).
11. Rotate the eccentric shaft (6) until the cam lobe (8) is pointing towards the rear of the hydraulic lift cover.
12. Using the adjustment screw (4) on the special tool (2), align the plunger (P1) with the inner register (R2) of the special tool 380000264 (1).
13. Rotate the eccentric shaft (6) until the plunger (P1) is fully retracted.
14. Using the adjustment screw (4), align the plunger (P1) with the inner register (R2) of the special tool (1).
15. Rotate the eccentric shaft (6) until the plunger (P1) is level with the outer register (R1) of the special tool (1).
16. Using a suitable depth guage (3), measure the distance from the top of the extension adaptor/rod to the top surface of the special tool (2).
17. If the measurement (L2) is not between 23.9-24.1 mm (0.9409-0.9488 in) slacken the adjustment screw (4) and adjust the link (5) accordingly.
18. Rotate the adjustment screw (4) until the plunger (P1) is level with the outer register (R1).
19. Check the measurement (L2) is between 23.9-24.1 mm (0.9409-0.9488 in).

20. Install the top section of the draft sensing control rod (1).



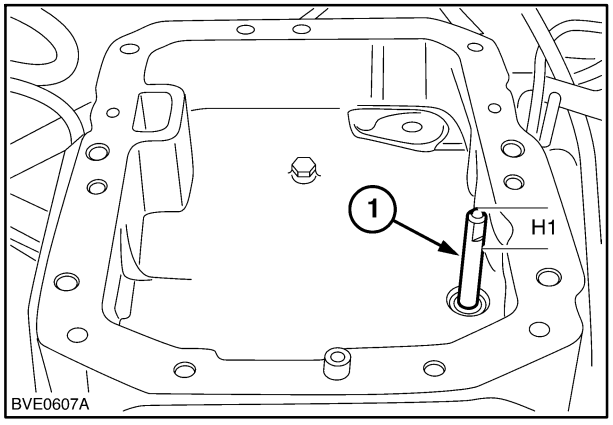
79

21. Install the special tool 380000263 (1) onto the rear axle drive housing. Install a suitable depth gauge (2) to check check the height of the draft sensing control rod (3).



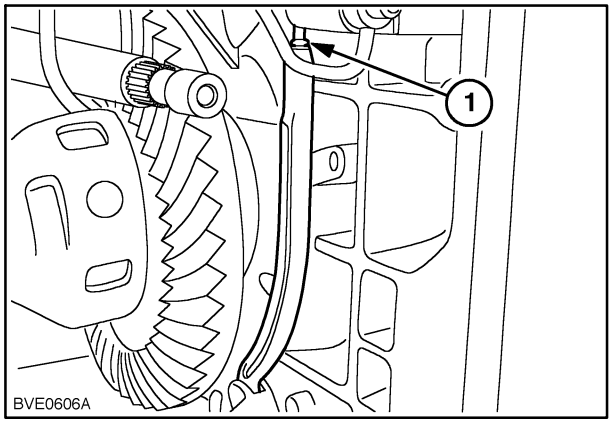
80

22. Using the depth gauge, check that the height (H1) of the draft sensing control rod is between 18.7-18.9 mm (0.7362-0.7440 in) above the rear axle drive housing.



81

23. If the measurement (H1) is not between 18.7-18.9 mm (0.7362-0.7440 in) slacken the adjustment nut (1) and adjust the draft sensing control rod as required.



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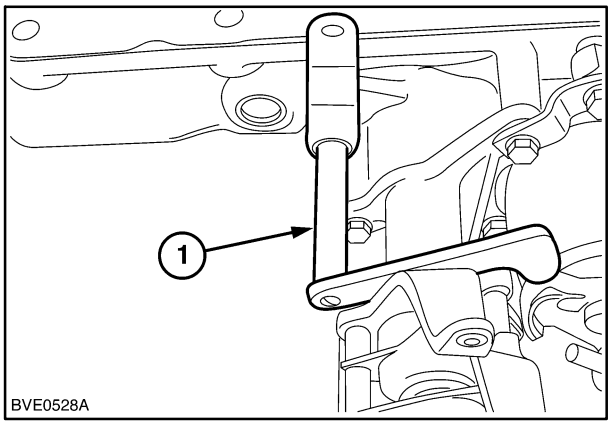
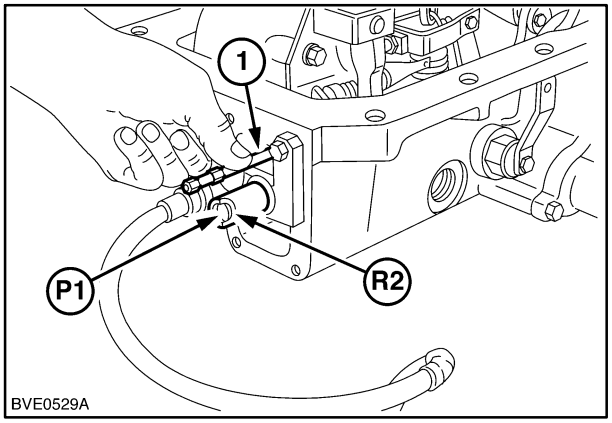
Upper Height Limit Adjustment

1. Make sure the Lift-O-Matic control linkage (1) remains in the OFF position (external lever locked in the vertical position) unless otherwise indicated.



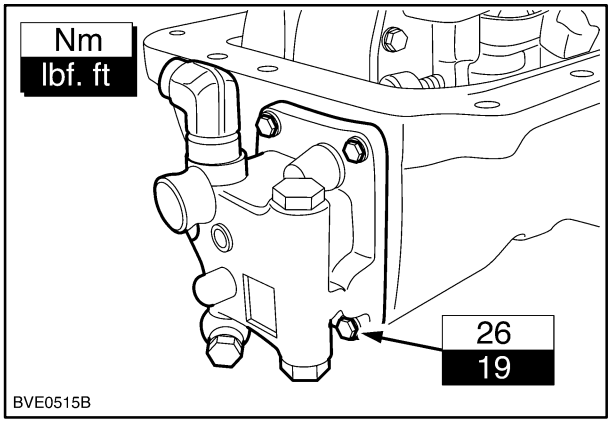
83

2. Position the lift arms in the raised position.
3. Place the position control lever in the fully raised position.
4. Connect a compressed air line to the special tool 380000264 and fill the lift cylinder with air.
5. Using the special tool 380000267 (1), adjust the maximum height limit screw so that the plunger (P1) retracts 1.3-1.7 mm (0.0511-0.0669 in) below the internal register (R2).
6. Tighten the locknut.



84

7. Disconnect the compressed air line.
8. Remove the special tool 380000264.
9. Install the control valve. Tighten the retaining bolts to the specified torque value.
10. Install the PTO housing (refer to installing the PTO housing in the PTO section).



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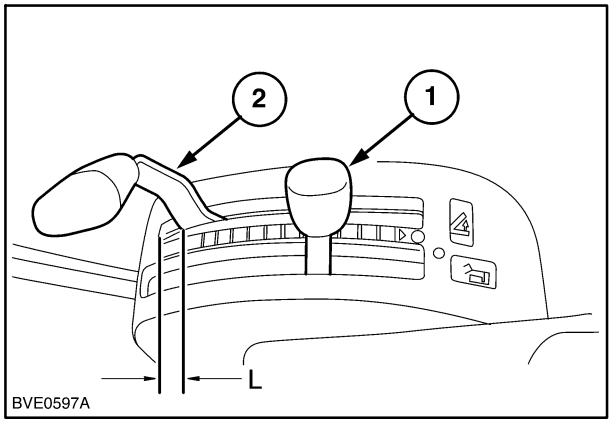
⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

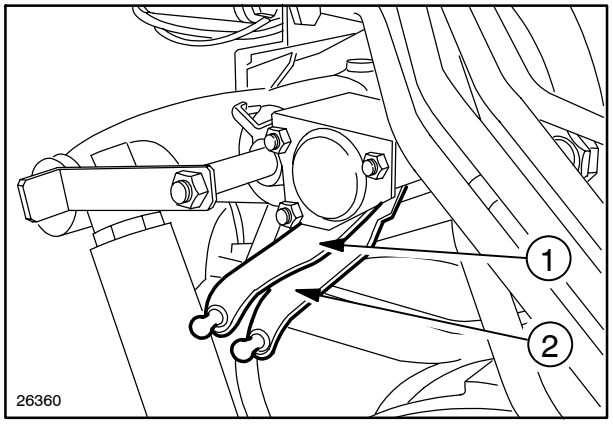
Position Control Cable Adjustments

1. Move the position control lever (2) fully forward on the quadrant to a distance (L) of 15 to 20 mm (0.5905–0.7874 in) from the start of the slot.



86

2. Move the external position control lever (1) completely back against the spacer.
3. Connect the control cable and the adjust the length as required.
4. Secure the cable in position using the locknuts.



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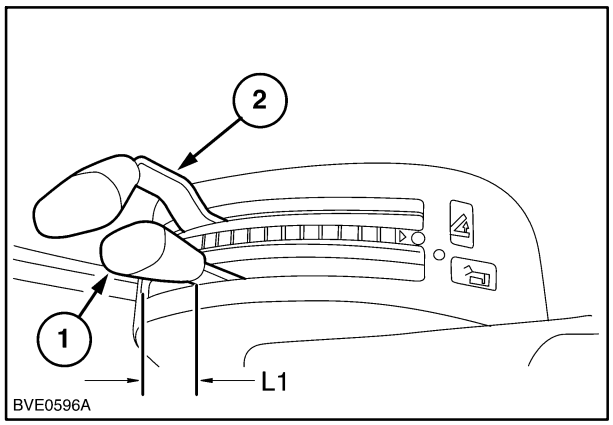
Draft Control Cable Adjustments

Test Conditions:

- engine running at medium speed;
- allow the oil in the system to reach a temperature of 30 to 40 oC (86 to 104 F) .

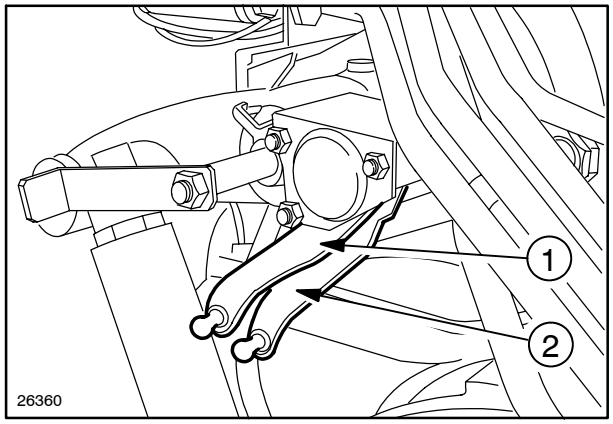
Then proceed as follows:

1. Move the position control lever (2) fully forward on the quadrant and the draft control lever (1) to a distance (L1) of 15 to 20 mm (0.5905 to 0.7874 in) from the start of the slot.



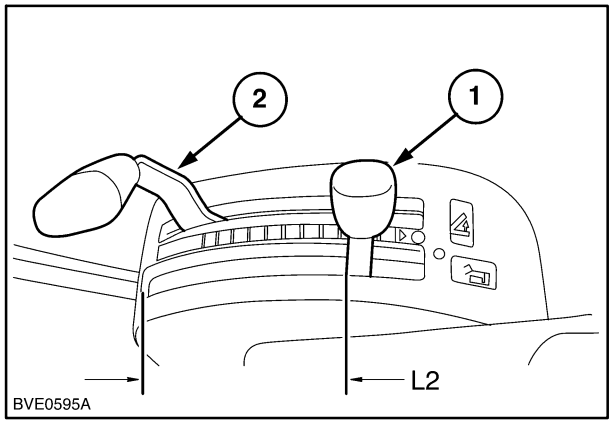
88

2. Move the external draft control lever (2) completely back against the spacer.
3. Connect the control cable and adjust the length as required.



89

4. Move the draft control lever (1) to a distance (L2) of 185 to 195 mm (7.2834 to 7.6771 in) from the start of the slot and check that the arms start to raise.



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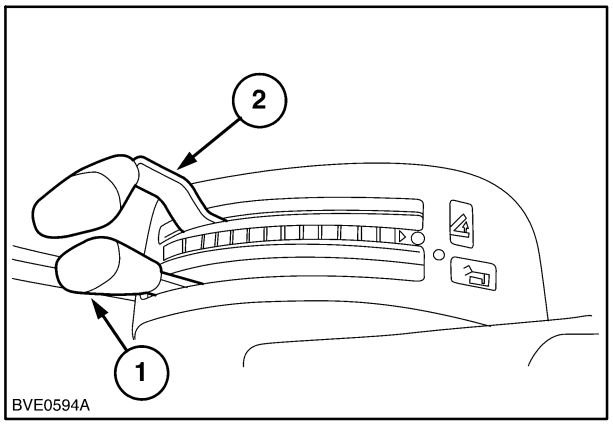
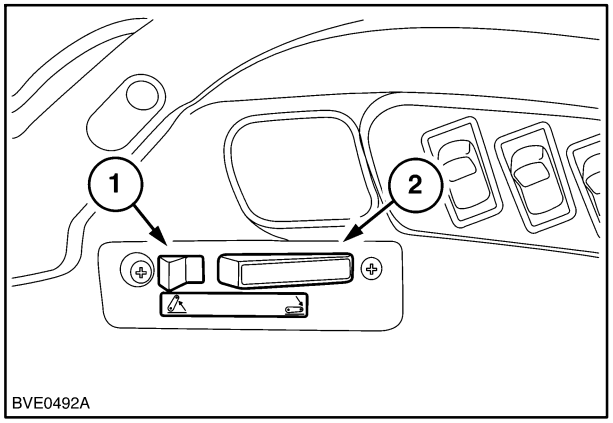
Lift-O-Matic Cable Adjustments

1. Move the position control lever (2) and the draft control lever (1) completely forward on the quadrant.



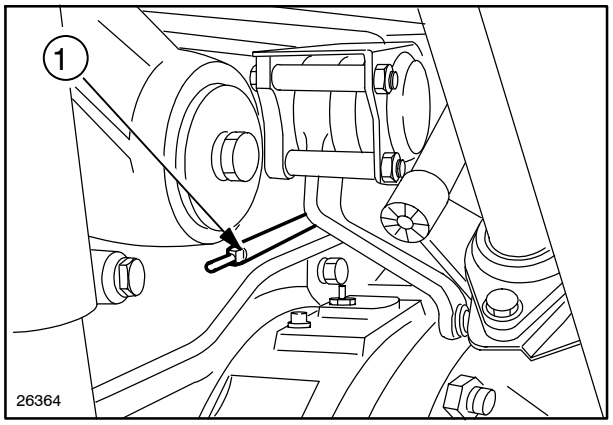
91

2. Depress the latch (1) to release the fast raise button (2) and raise the arms.



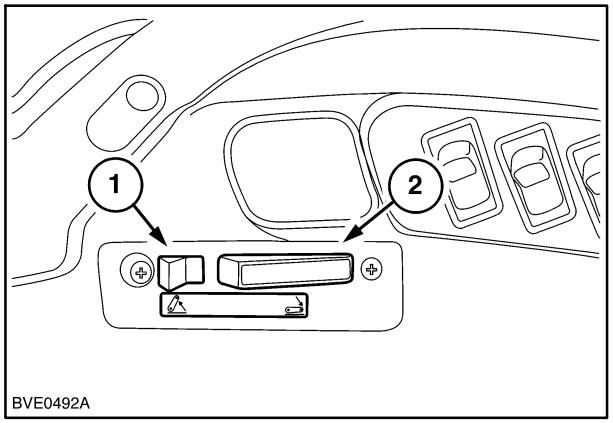
92

3. Adjust the nut (1) until the arms begin to lower and unscrew the nut (1) by another 1.5 turns.



93

4. Using the fast raise button (2) and the latch (1), raise and lower the arms a few times.



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LIFT-O-MATIC UPPER STROKE HEIGHT LIMIT

Adjustment

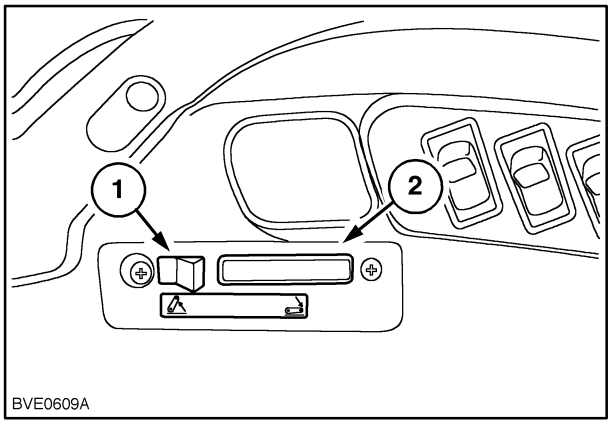
⚠ WARNING ⚠

Handle all components with the greatest care.Do not insert hands or fingers between the parts.Wear suitable protection clothing, including goggles, gloves and footwear.

⚠ WARNING ⚠

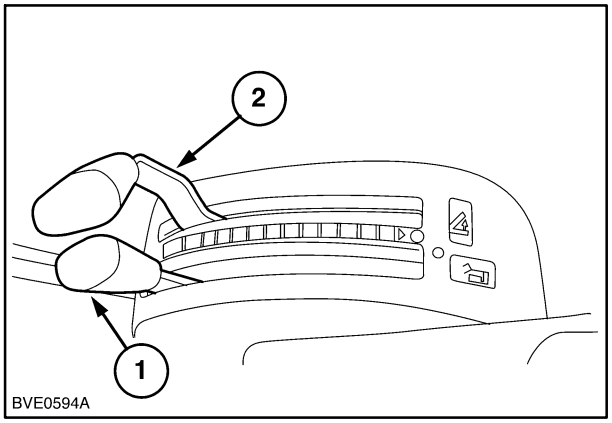
Always use appropriate tools to align fixing holes. NEVER USE YOUR FINGERS OR HANDS.

1. Apply a load to the link ends of the lower implement attachment arms.
2. Start the engine and keep it running at medium speed.
3. Depress the fast raise button (2) to lower the arms.



95

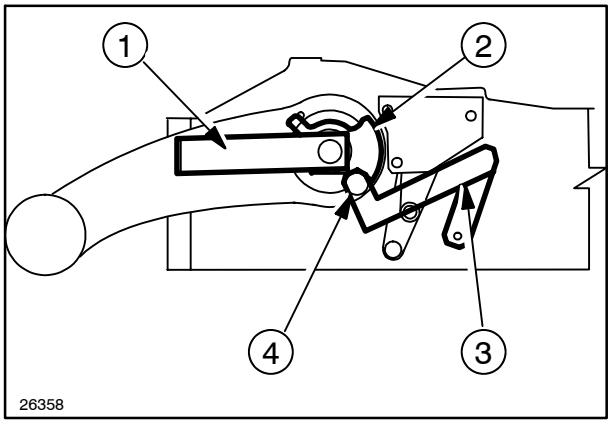
4. Move the position control lever (2) and the draft control lever (1) completely forward on the quadrant.
5. Using the position control lever (2) raise the arms to the desired height.



96

NOTE: *The arm upper stroke height limit adjustment only applies to the Lift-O-Matic device and does not affect the other functions of the lift. This means that the arms can be raised completely using the draft and position control levers.*

6. Loosen the cam adjuster (1) and turn the Lift-O-Matic cam (2) clockwise until it contacts the needle (4) on the Lift-O-Matic control lever (3).
7. Use the Lift-O-Matic control switches to raise and lower the arms a few times to ensure the correct operation.



97

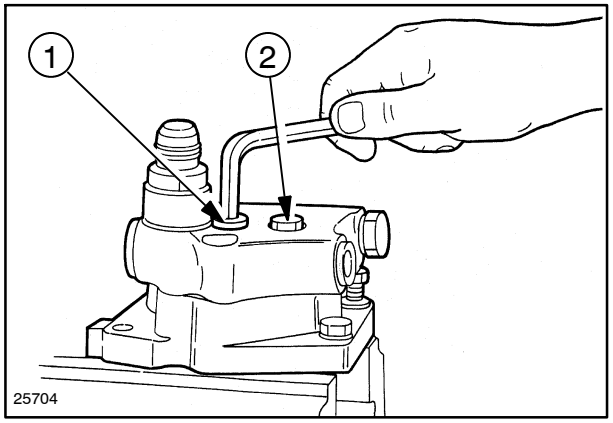
MECHANICAL REAR HYDRAULIC LIFT CONTROL VALVE

Disassembly (With Control Valve Removed)

⚠ WARNING ⚠

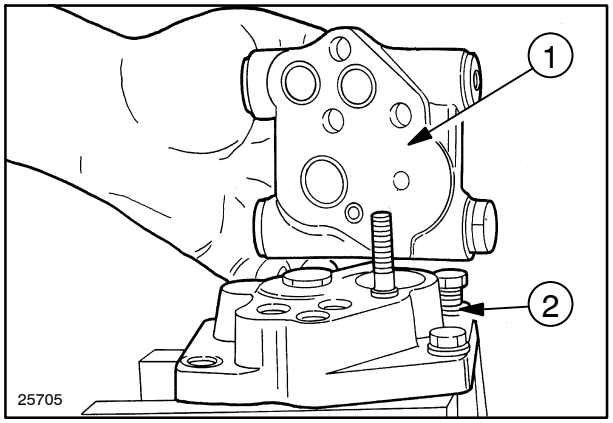
Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing – safety goggles, gloves and shoes.

1. Before disassembly, thoroughly clean the surfaces of the control valve, clamp the control valve in a vice and unscrew bolts (1) and (2).



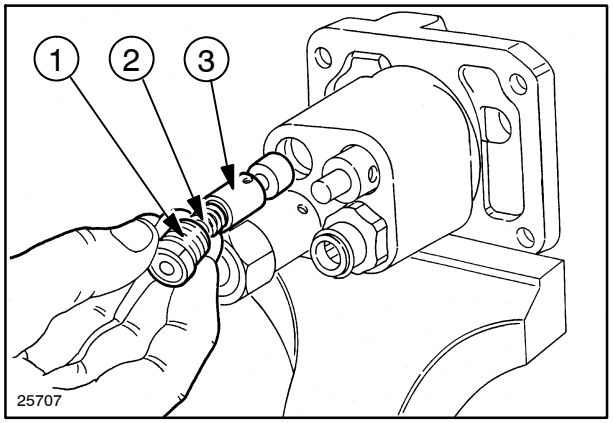
98

2. Remove the cover (1) on the lift body (2).



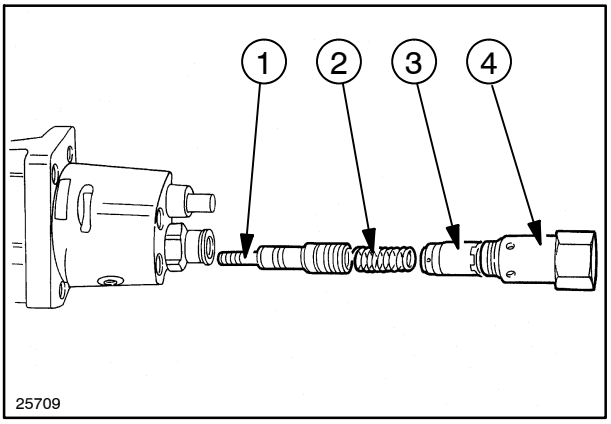
99

3. Unscrew the cap (1) and remove the spring (2) and the valve (3).



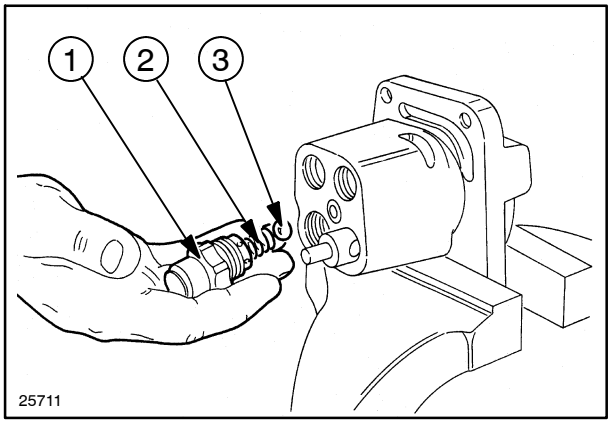
100

4. Remove the cylinder safety valve (4) and recover the arm lowering speed adjustment valve (3), the spring (2) and the pin (1).



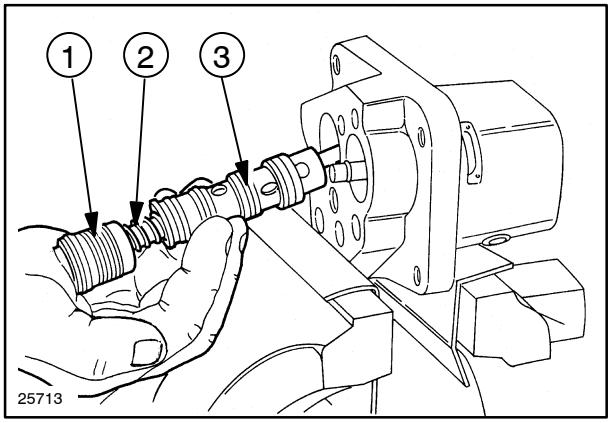
101

5. Disassemble the non-return valve: union (1), spring (2) and ball (3).



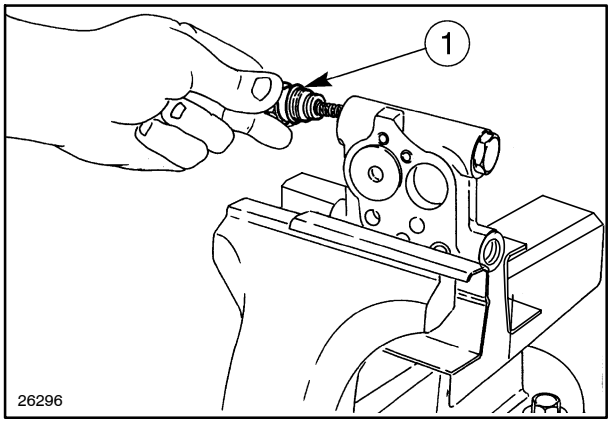
102

6. Extract the control valve pin (1) and remove the relative seat (3) and spring (2).



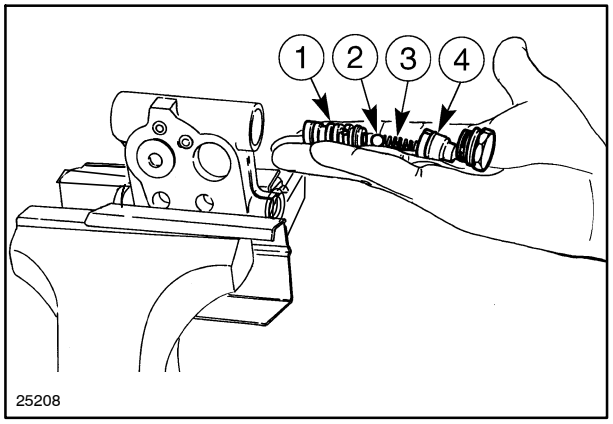
103

7. Remove the cap (1) and spring and the delivery control valve shutter.



104

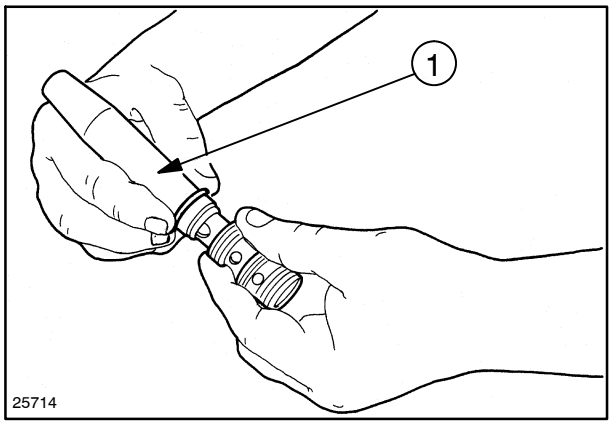
8. Disassemble the piston (1), spring (3), ball (2) and shutter (4) on the delivery control valve.



105

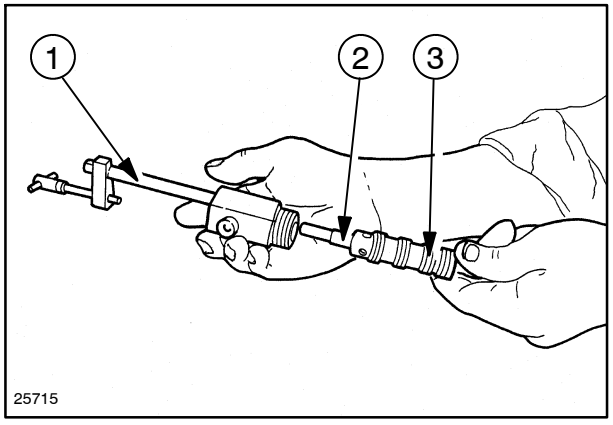
9. Check the wear of the seals on the control valve block-pin seat. If damaged, replace the seals using protection device **380000275** (1), and following the instructions on page 49.

10. Check the efficiency of the control valve block pin as follows.



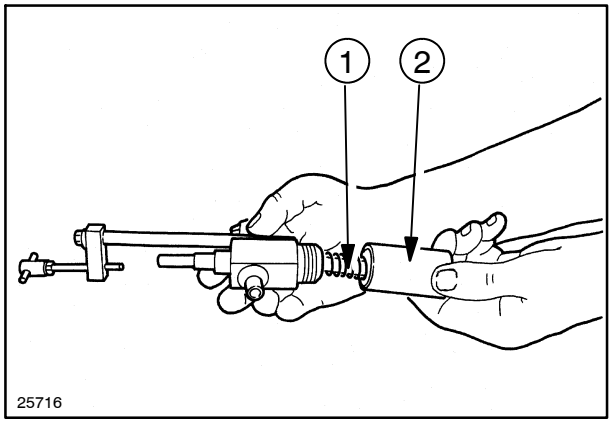
106

11. Fit the control valve block pin (2) complete with seat (3) on the tool **380000274** (1).



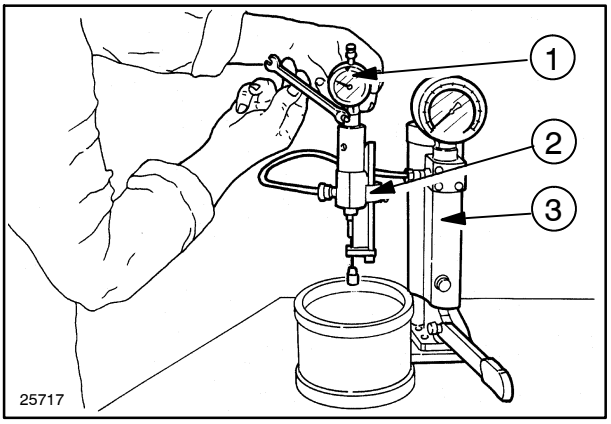
107

12. Fit the control valve block pin spring (1) and the cap (2) of tool **380000274**. Tighten the cap as far as it will go and check that the control valve block-pin slides in its seat.



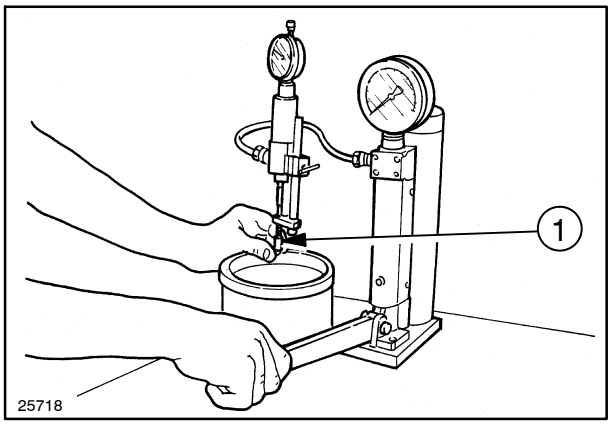
108

13. Assemble tool **380000274** (2) on the hand pump **380000275** (3), supplied with **ISO VG68, DIN 51524/51525** oil for outside temperatures of 0 to 50° C. Connect a dial gauge (1), securing in position with the screw.



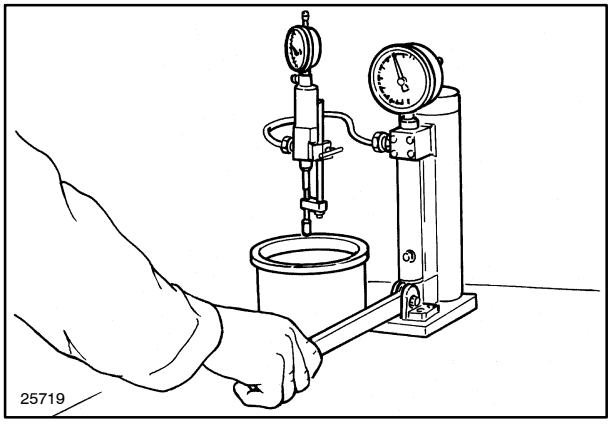
109

14. Operate the hand pump, whilst tightening the tool screw (1), until the oil stops flowing out through the control valve block pin seat outlet.
15. Zero-set the dial gauge.
16. Tighten the screw (1) on the tool further to move the control valve block pin by 1.8 to 2 mm (0.0708 to 0.0787 in.), using the dial gauge to read this distance.



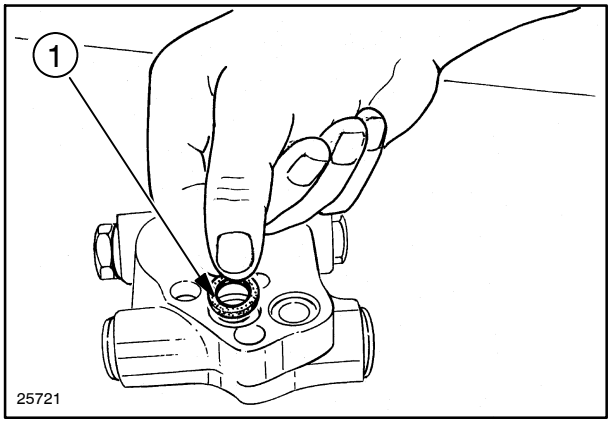
110

17. Operate the hand pump until the oil in the system is at an initial pressure of 245 bar (3553.42 lbf/in2). Using the pressure gauge, check that it takes more than six seconds for the pressure to fall 196 bar (2842.74 lbf/in2) to 98 bar (1421.37 lbf/in2). If it takes less than this time, replace the control valve block pin. Bear in mind that this part is supplied together with the relevant seat.



111

18. Check the control valve cover seals (1) and replace if necessary.

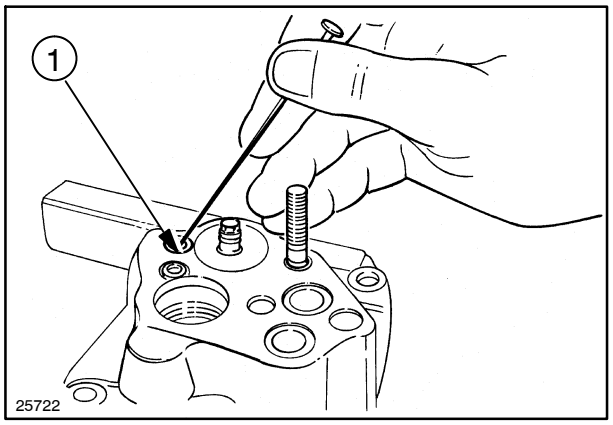


112

19. Check the control valve seals (1) and replace if necessary.

20. Check the arm descent speed control pin seal and replace if necessary, following the instructions in the note on page 17.

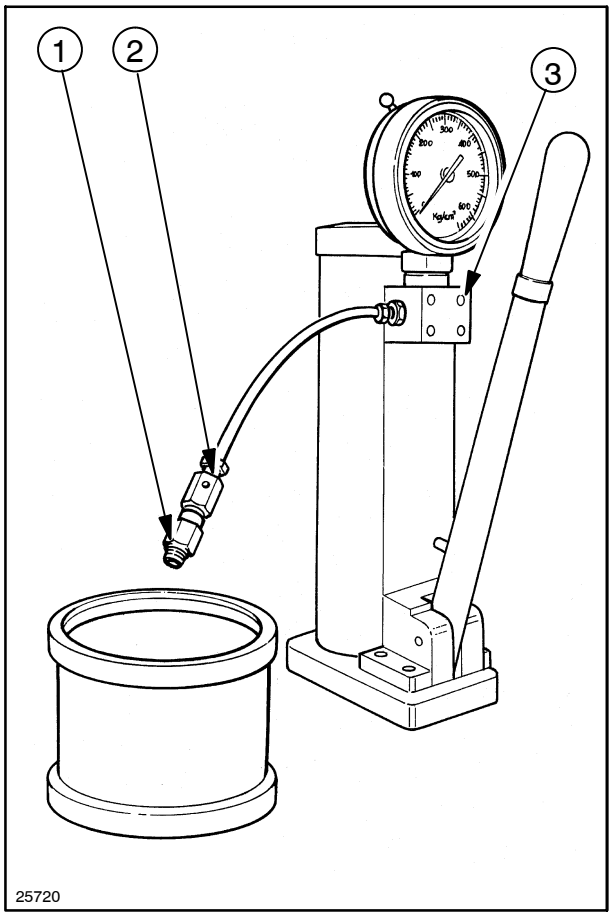
21. Check the cylinder pressure relief valve calibration as follows.



113

22. Fit the cylinder safety valve (1) on the valve union **380000218** (2) and connect to the hand pump **380000277** (3).

23. Operate the hand pump (3) and check that the cylinder safety valve opens at a pressure of 215 bar (3118.31 lbf/in2). If the valve setting does not correspond with the specified value, it is advised to change the valve immediately. If necessary it can be adjusted by turning the threaded cap, using wrench **380000230**. Tighten to increase the valve setting value or loosen to reduce the value.



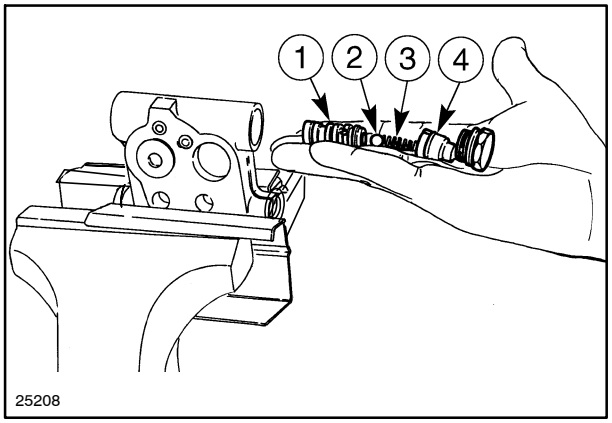
114

Assembly
(With Control Valve Removed)

⚠ WARNING ⚠

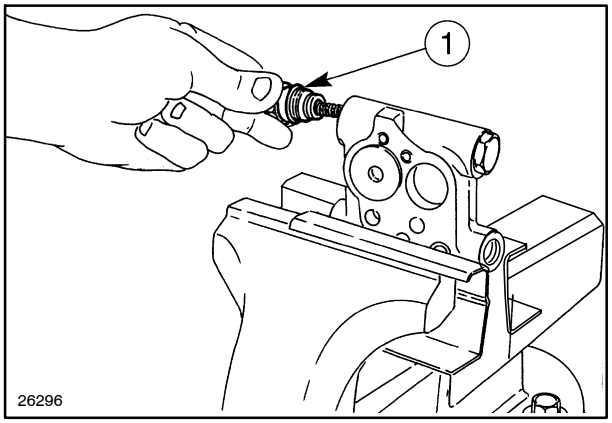
Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

1. Assemble the piston (1), ball (2), spring (3) and shutter (4) on the delivery control valve.



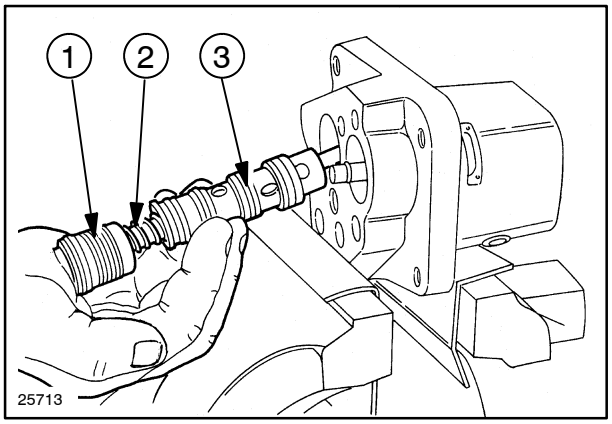
115

2. Install the spring and delivery control valve shutter and the cap (1).



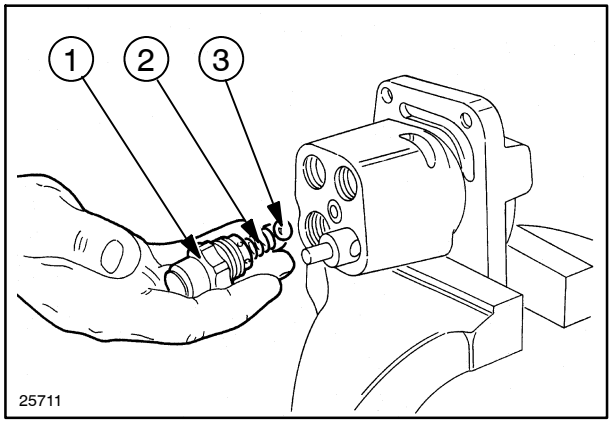
116

3. Install the seat (3), spring (2) and the control valve pin (1).



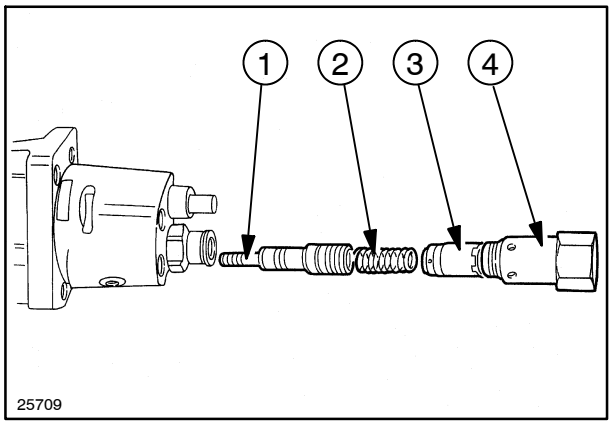
117

4. Assemble the non-return valve: union (1), spring (2) and ball (3). Tighten to the specified torque value of 83 Nm (61 lbf.ft).



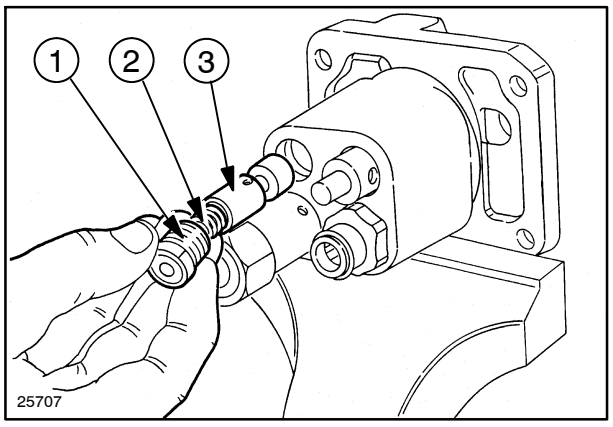
118

5. Install the pin (1) the spring (2) the arm lowering speed adjustment valve (3) and the cylinder safety valve (4). Tighten to the specified torque value of 83 Nm (61 lbf.ft).



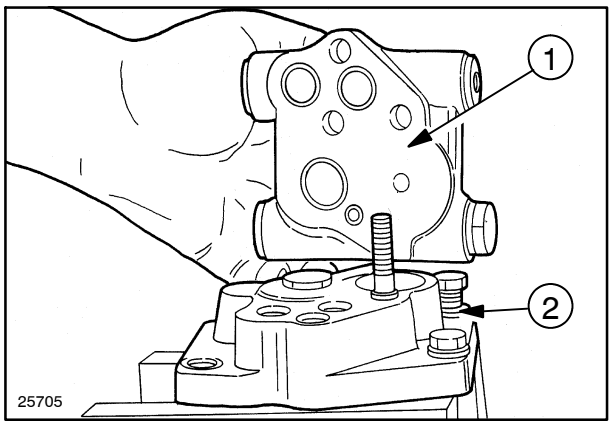
119

6. Install the spring (2) and the valve (3) and the cap (1). Tighten to the specified torque value of 54 Nm (40 lbf.ft).



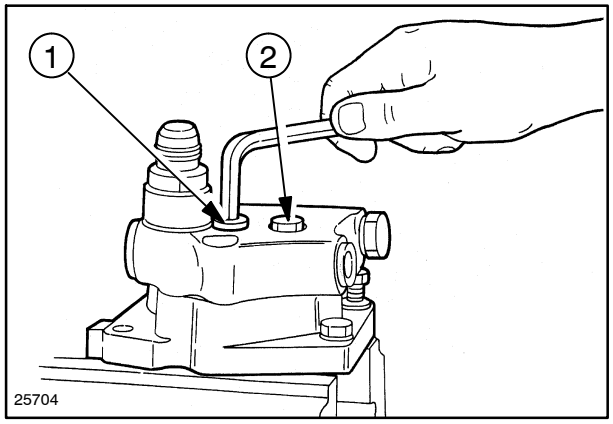
120

7. Before assembly, thoroughly clean the surfaces of the control valve.
8. Install the cover (1) on the lift body (2).



121

9. Clamp the control valve in a vice and tighten the retaining bolts (1) and (2).



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NOTES

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 5 - Fixed Displacement Gear Pump

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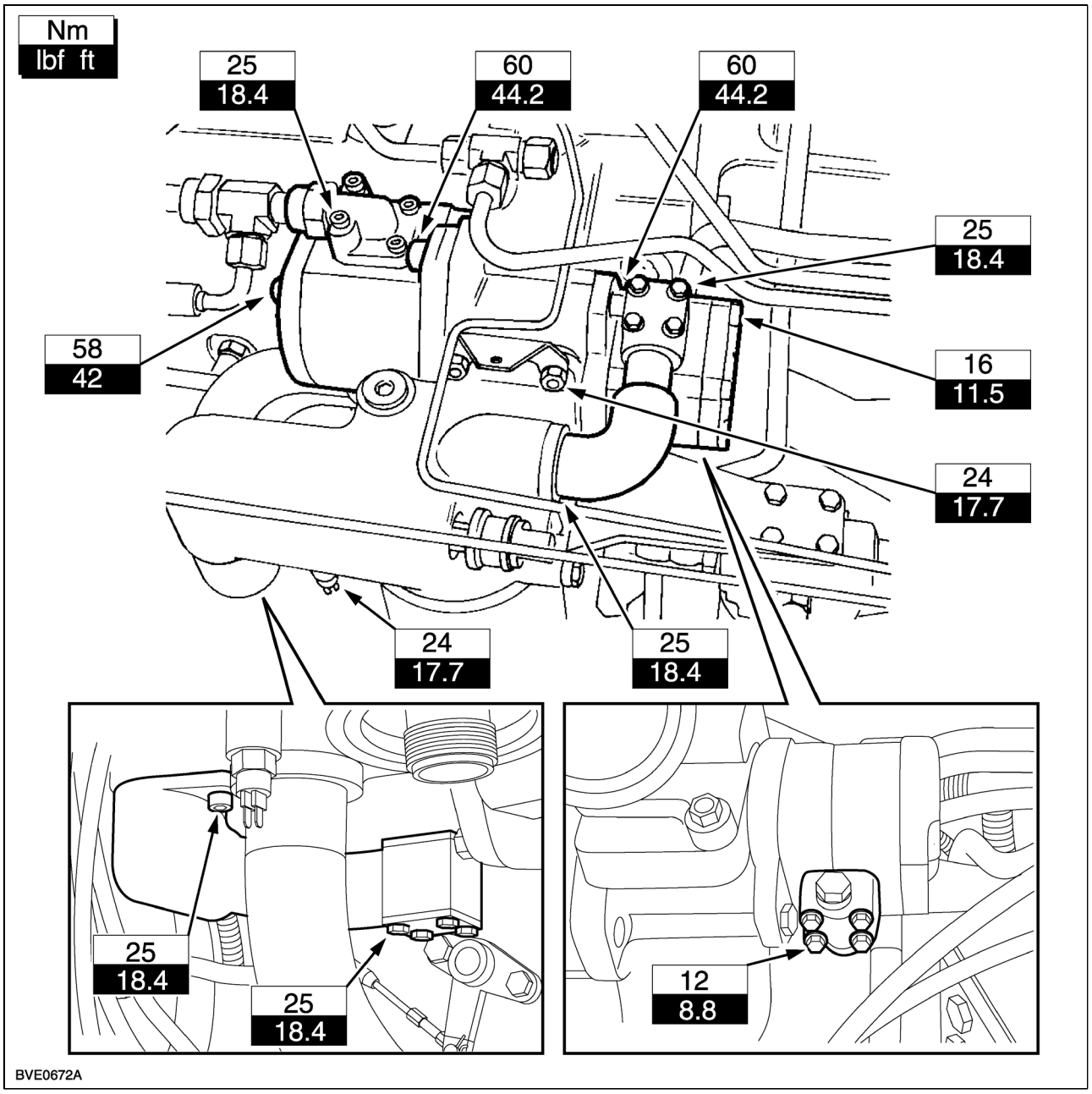
	Disassembly - Assembly	18
	Hydraulic Oil Pump	20
	Inspection	20

SPECIFICATIONS

Filter		
Type		Full-flow, screw-on cartridge
Location		Pump intake, on the R.H. side of the rear axle housing
PUMP		
Type		Gear type, with oil suction from transmission casing
Location		On the R.H. side of the rear axle housing
Manufacturer		BOSCH
Drive		Driven by PTO input shaft
TSA Plus/Deluxe		
Corresponding rated output	l/min	80
	(US gallon/min)	21.1
TSA Standard		
Corresponding rated output	l/min	63
	(US gallon/min)	16.64

TIGHTENING TORQUES



1

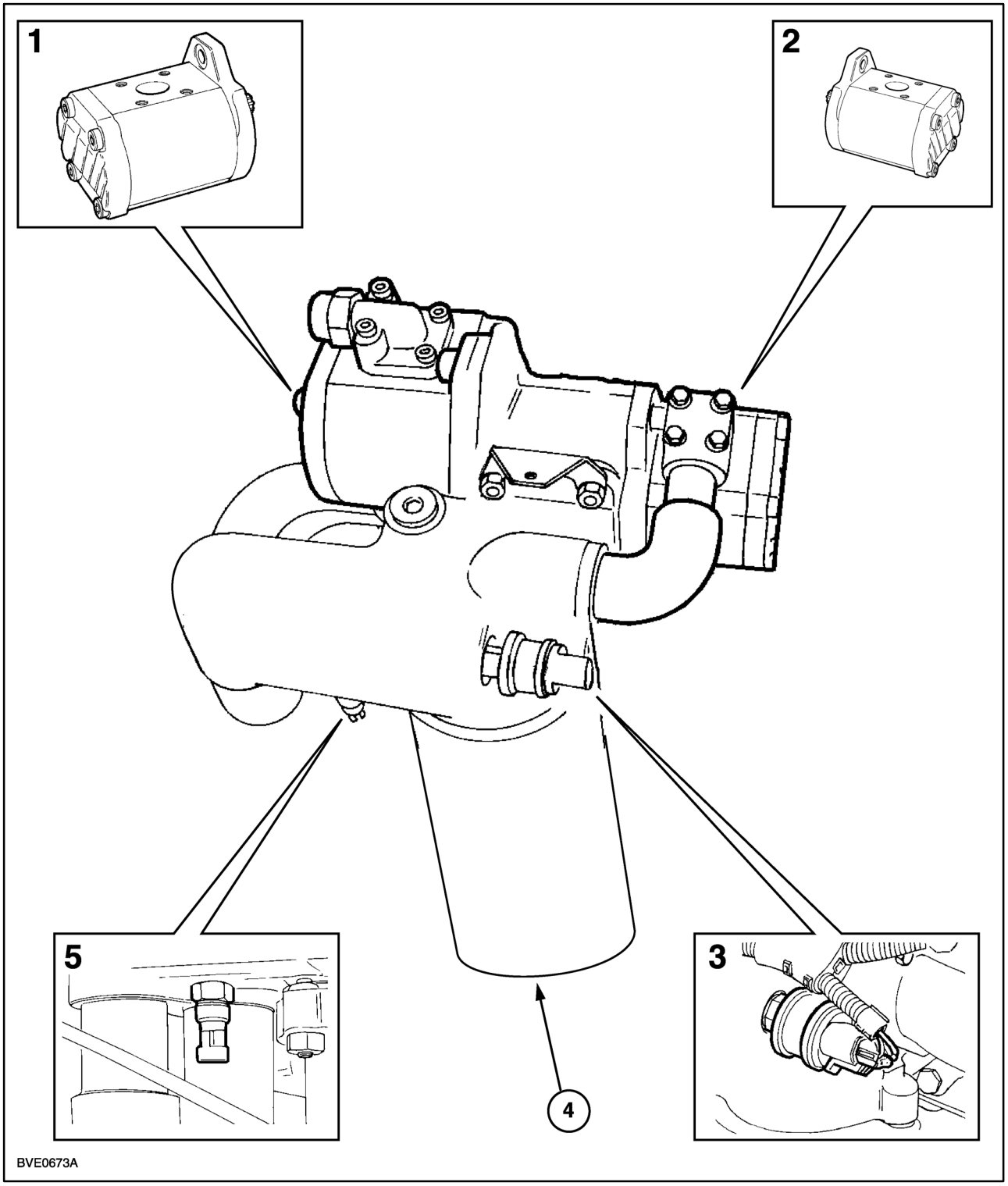
DESCRIPTION AND OPERATION

The hydraulic pumps are a gear type and fixed displacement according to ERPM.

The hydraulic pumps are mounted on the right hand side of the rear axle housing and are driven from gears splined directly to the PTO drive shaft. Oil is supplied to the hydraulic pumps from the rear axle housing, via a common intake filter.

The front hydraulic pump controls hydrostatic steering, front and rear differential locks, PTO and PTO brake, and four wheel drive engagement.

The rear hydraulic pump supplies oil for the hydraulic lift, trailer brake valve, and remote control valves.



2

Hydraulic Pump Assembly With Fixed Displacement Closed Centre System

1. Hydraulic lift system oil pump
2. Steering / low pressure oil pump
3. Main intake filter restriction (vacuum) switch
4. Main intake filter
5. Low oil temperature switch

OVERHAUL

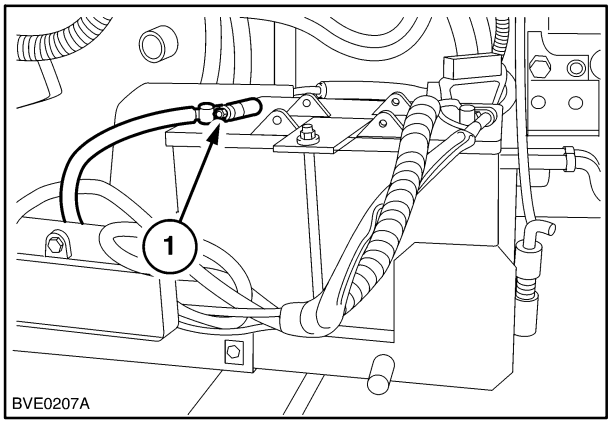
HYDRAULIC LIFT SYSTEM OIL PUMP

Removal

⚠ WARNING ⚠

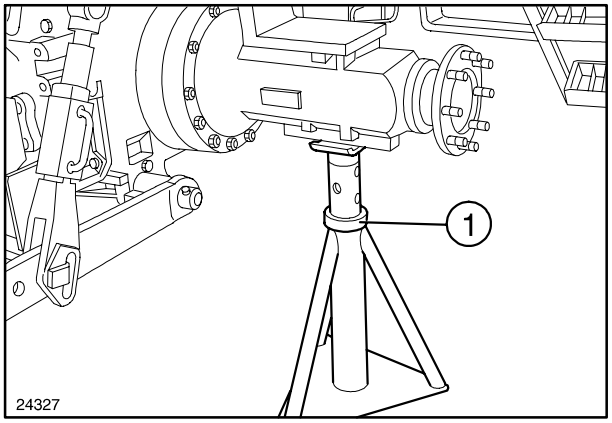
Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).



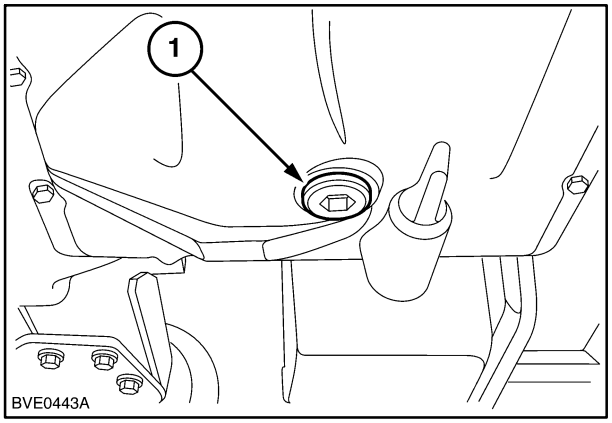
3

2. Raise the rear of the tractor, place an axle stand (1) under the right hand side final drive case and remove the right hand side rear wheel.



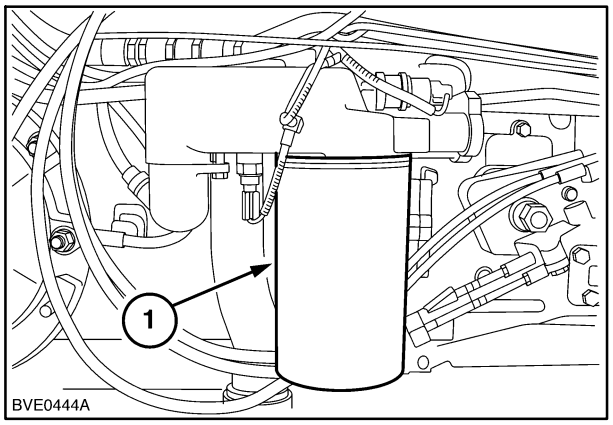
4

3. Remove the drain plug (1) and drain oil into a suitable container.
4. Install the drain plug after the oil has drained.



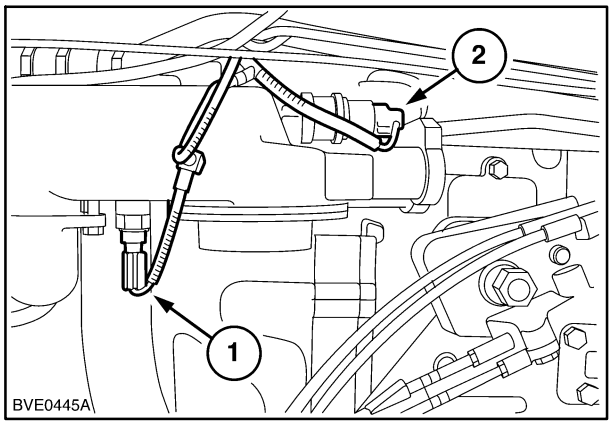
5

5. Using a suitable filter strap, remove the oil filter (1).



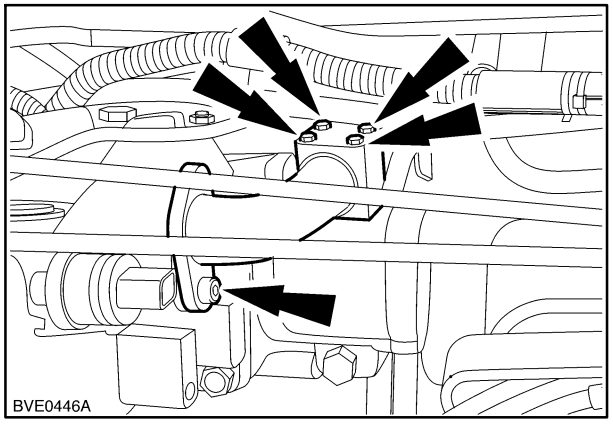
6

6. Disconect the low oil temperature switch electrical connector (1) and the main intake filter restriction switch electrical connector (2).
7. Cut the cable tie and reposition the wiring harness.



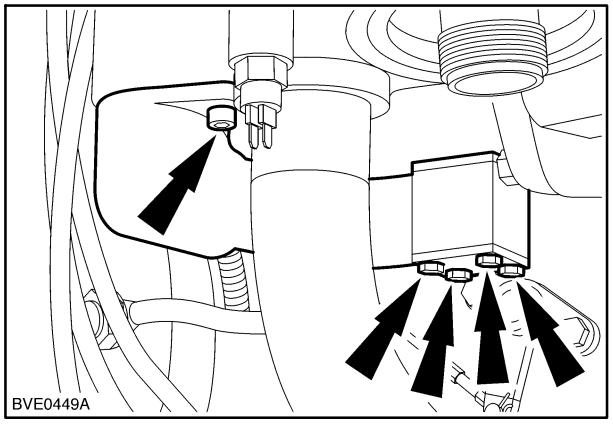
7

8. Remove the steering / low pressure oil pump oil supply pipe.



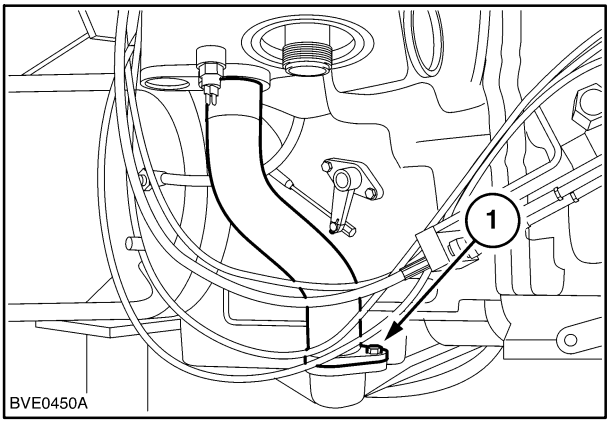
8

9. Remove the hydraulic lift system oil pump oil supply pipe.



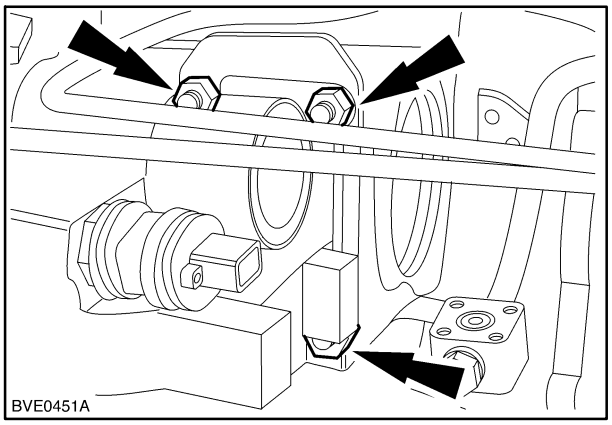
9

10. Remove the main oil supply pipe lower retaining bolt (1).



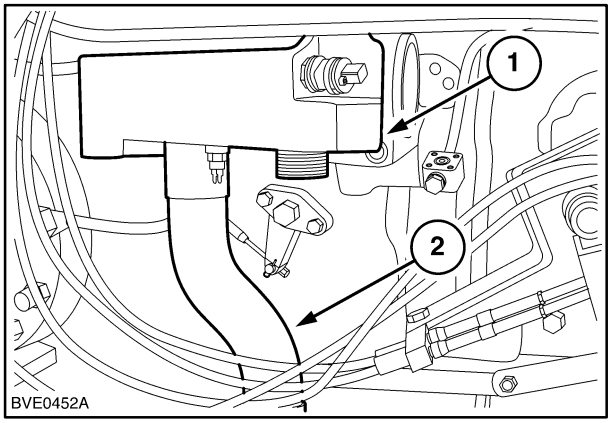
10

11. Remove the oil supply manifold retaining nuts.



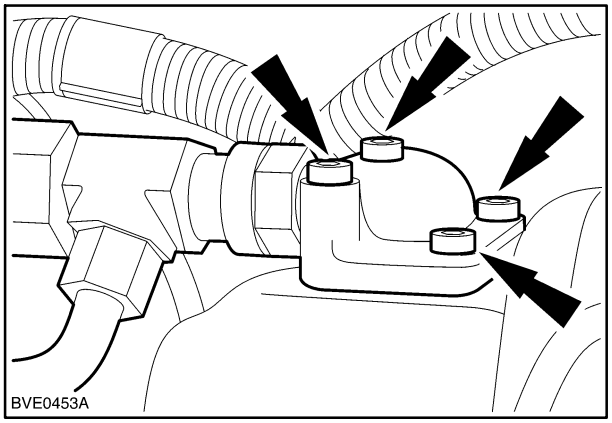
11

12. Remove the oil supply manifold (1) and the main oil supply pipe (2) as an assembly.



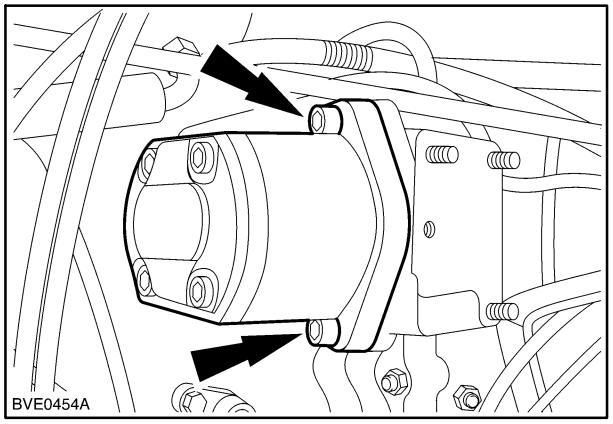
12

13. Detach the hydralic lift system oil pump supply pipe.



13

14. Remove the hydraulic lift system oil pump.



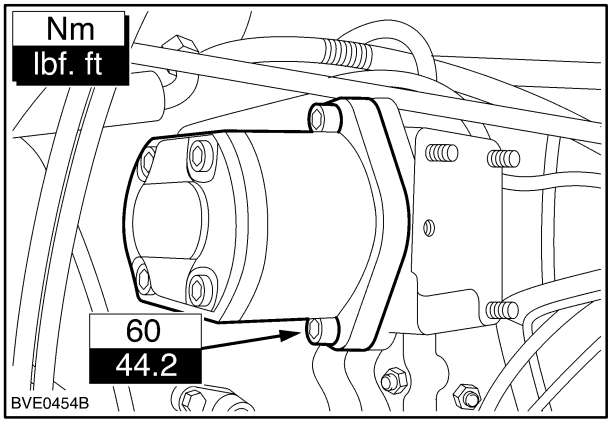
14

Installation

⚠ WARNING ⚠

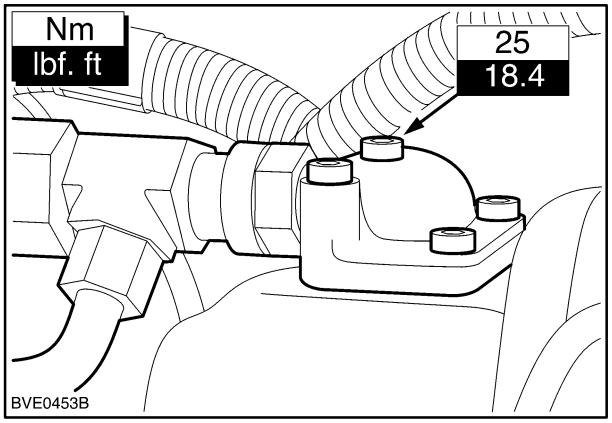
Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the hydraulic lift system oil pump. Tighten the retaining bolts to the specified torque value.



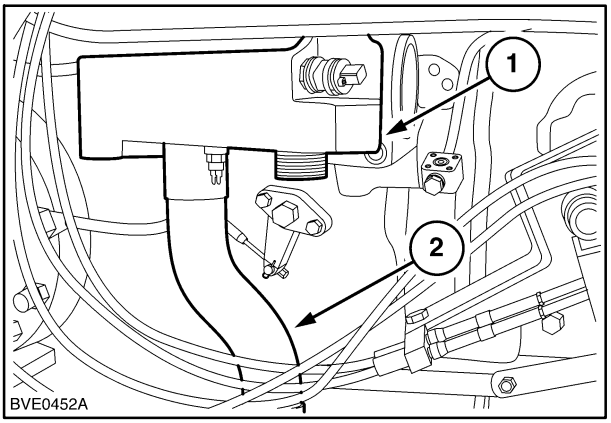
15

2. Attach the hydraulic lift system oil pump oil supply pipe. Tighten the retaining bolts to the specified torque value.



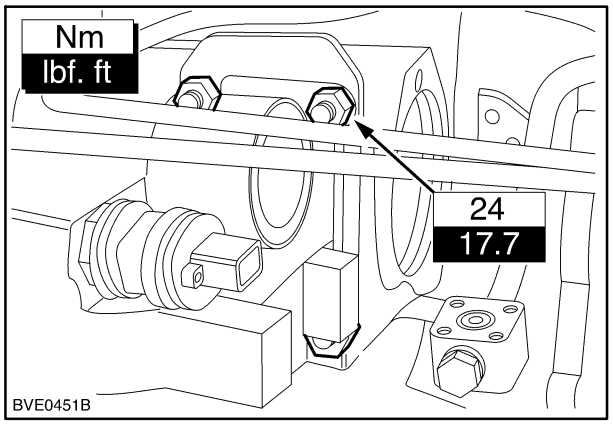
16

3. Install the oil supply manifold (1) and the main oil supply pipe (2) as an assembly.



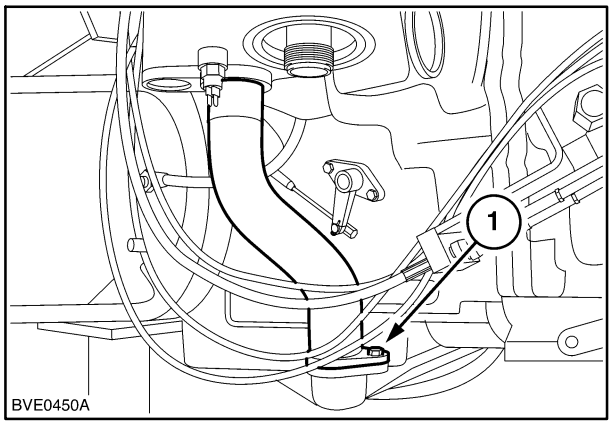
17

4. Install the oil supply manifold retaining nuts and torque to the specified torque value.



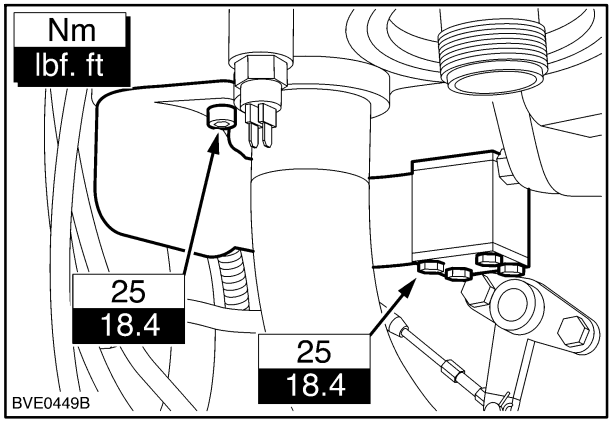
18

5. Install the main oil supply pipe lower retaining bolt (1).



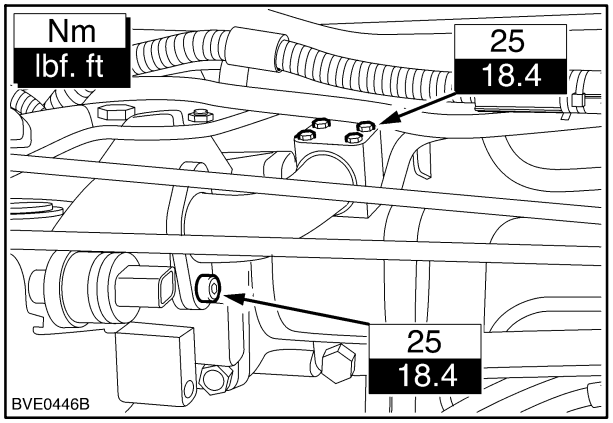
19

6. Install the hydraulic lift system oil pump oil supply pipe. Tighten the retaining bolts to the specified torque value.



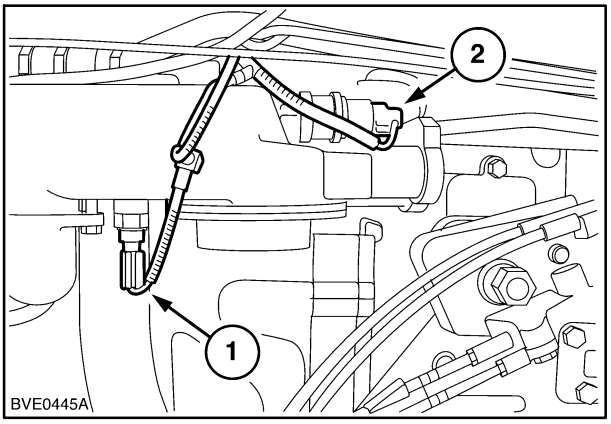
20

7. Install the steering / low pressure oil pump oil supply pipe. Tighten the retaining bolts to the specified torque value.



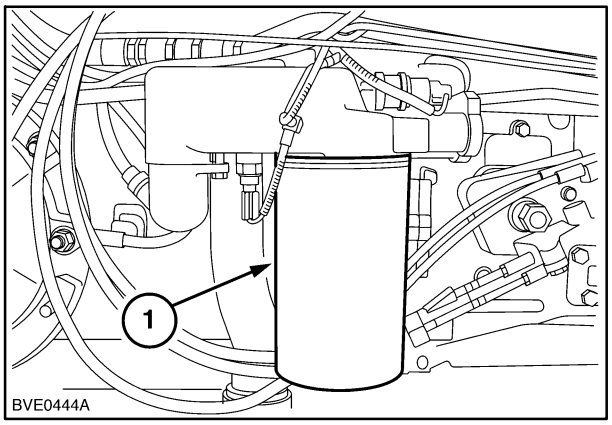
21

8. Connect the low oil temperature switch electrical connector (1) and the main intake filter restriction switch electrical connector (2).



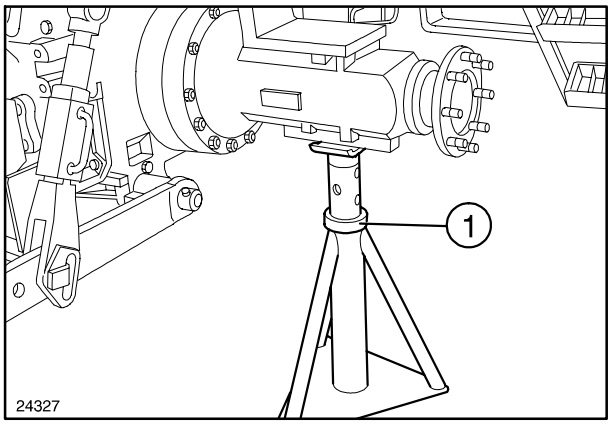
22

9. Install a new oil filter (1).



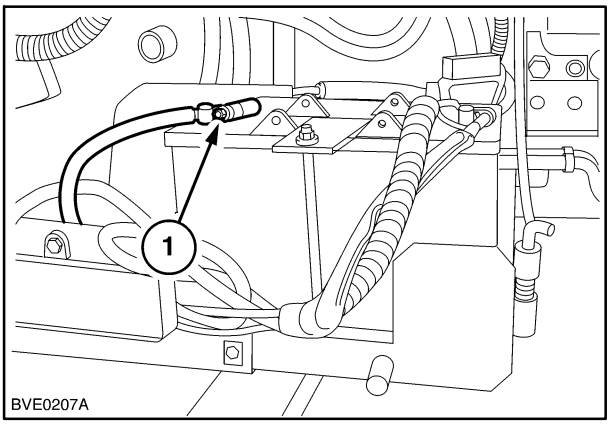
23

10. Refill the driveline with oil to the correct specification.
11. Raise the rear of the tractor. Install the right hand side rear wheel and remove the axle stand (1) from under the right hand side final drive case.



24

12. Connect the battery negative cable (1) and install the battery cover.



25

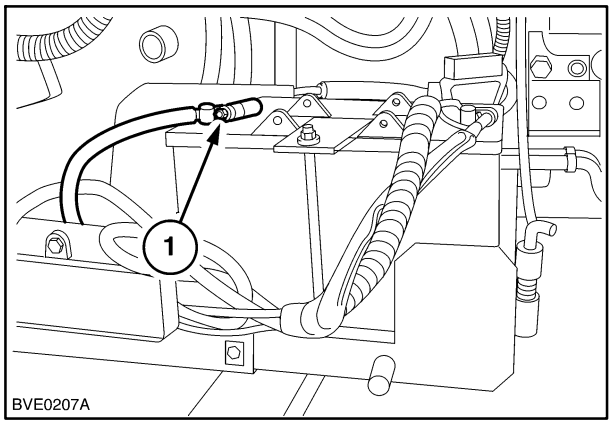
HYDRAULIC STEERING / LOW PRESSURE OIL PUMP

Removal

⚠ WARNING ⚠

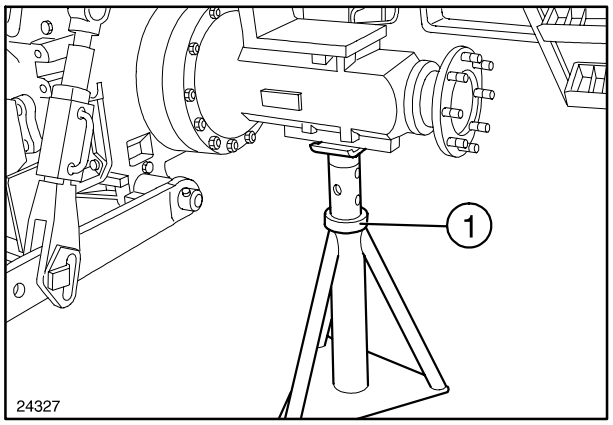
Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Remove the battery cover and disconnect the battery negative cable (1).



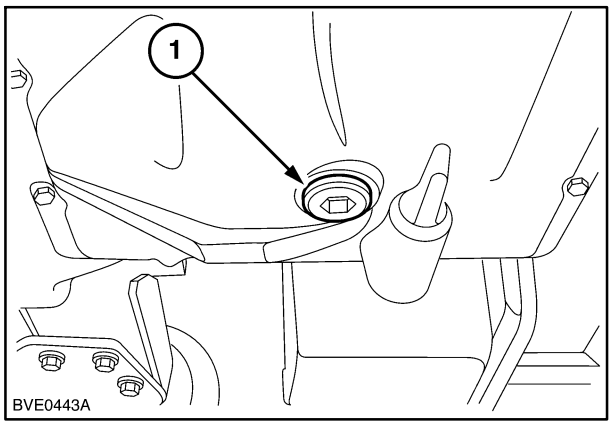
26

2. Raise the rear of the tractor, place an axle stand (1) under the right hand side final drive case and remove the right hand side rear wheel.



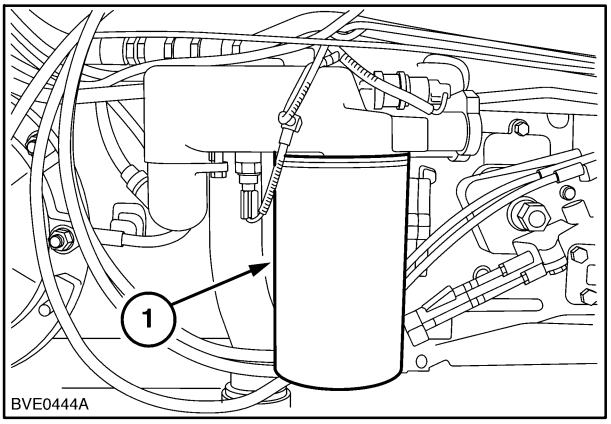
27

3. Remove the drain plug (1) and drain oil into a suitable container.
4. Install the drain plug after the oil has drained.



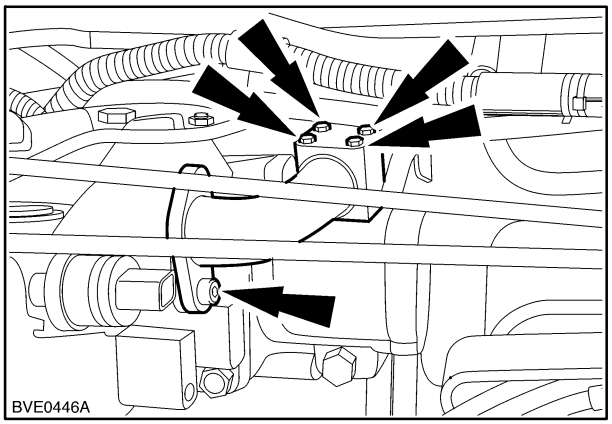
28

5. Using a suitable filter strap, remove the oil filter (1).



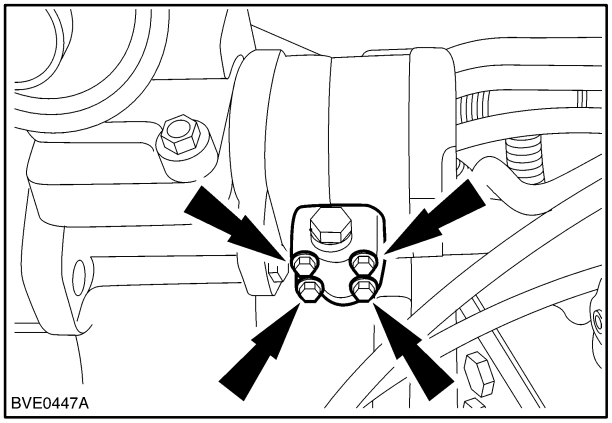
29

6. Remove the steering / low pressure oil pump oil supply pipe.



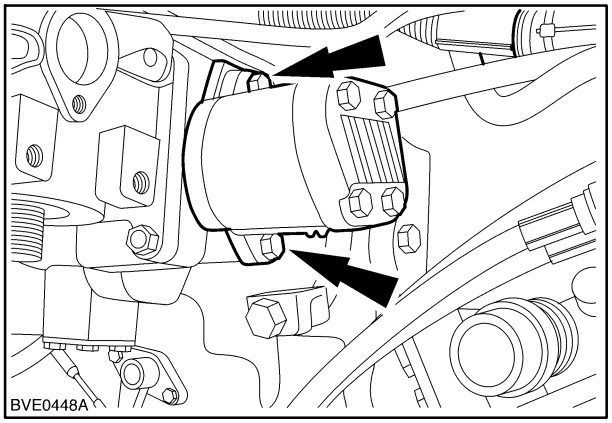
30

7. Disconnect the oil supply pipe from the steering / low pressure oil pump.



31

8. Remove the steering / low pressure oil pump.



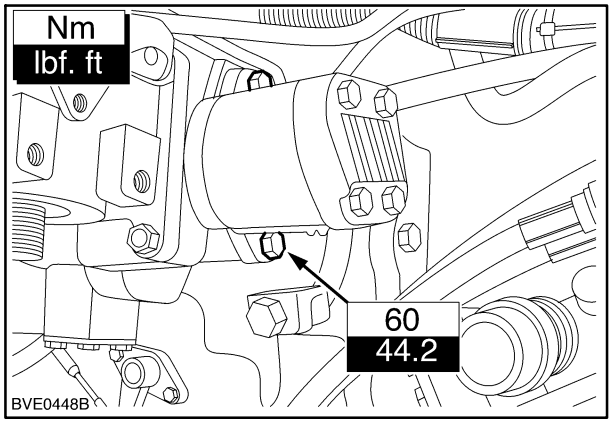
32

Installation

⚠ WARNING ⚠

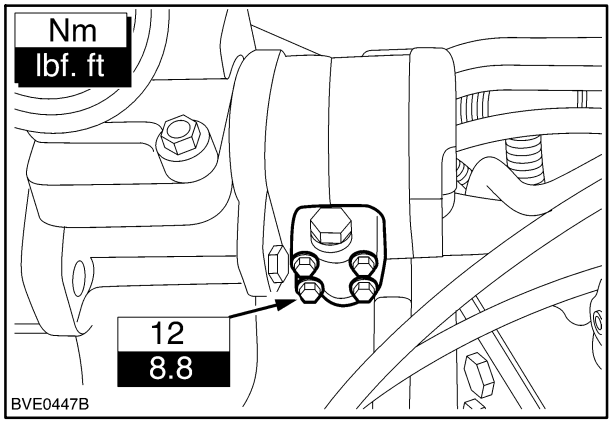
Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

1. Install the steering / low pressure oil pump. Tighten the retaining bolts to the specified torque value.



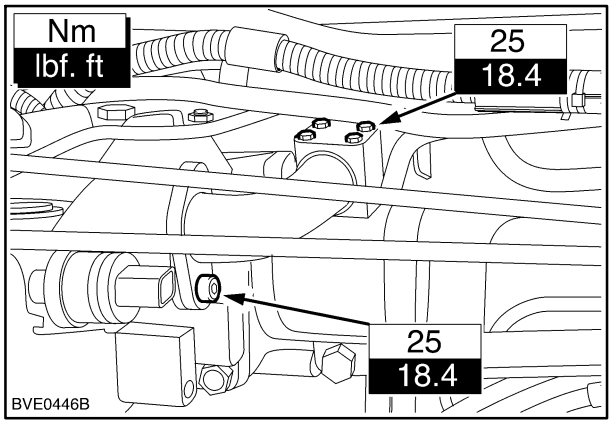
33

2. Connect the oil supply pipe to the steering / low presssure oil pump. Tighten the retaining bolts to the specified torque value.



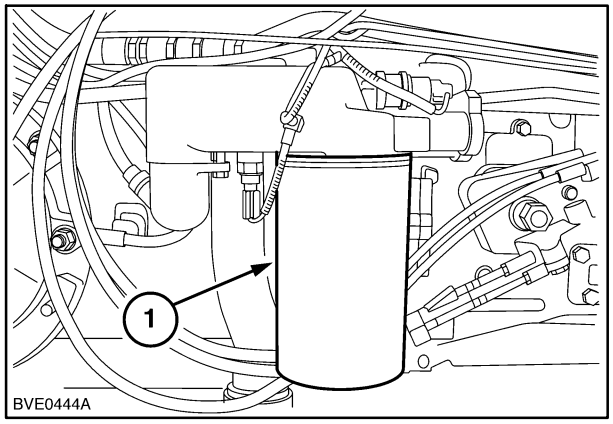
34

3. Install the steering / low pressure oil pump oil supply pipe. Tighten the retaining bolts to the specified torque value.



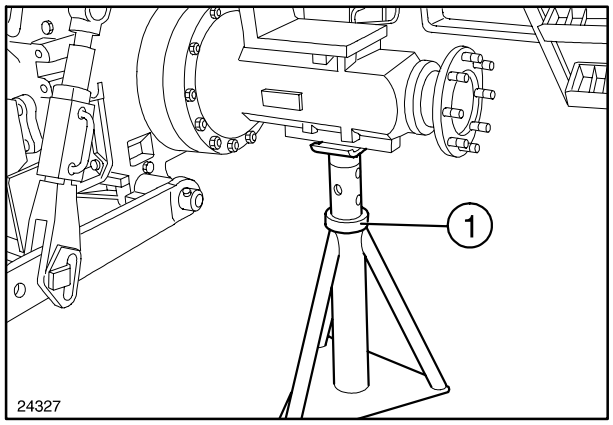
35

4. Install a new oil filter (1).



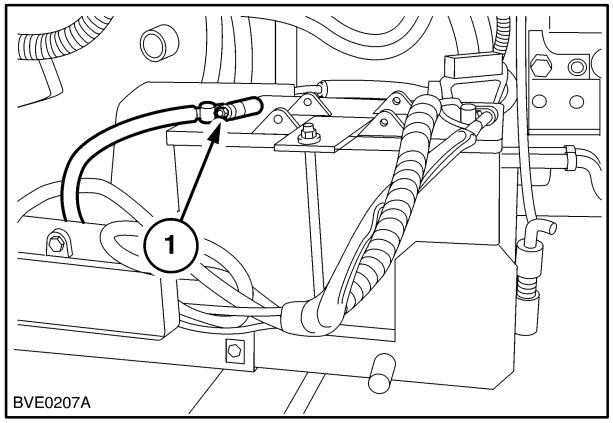
36

5. Refill the driveline with oil to the correct specification.
6. Install the right-hand rear wheel and remove the axle stand (1) from under the right-hand final drive case.



37

7. Connect the battery negative cable (1) and install the battery cover.



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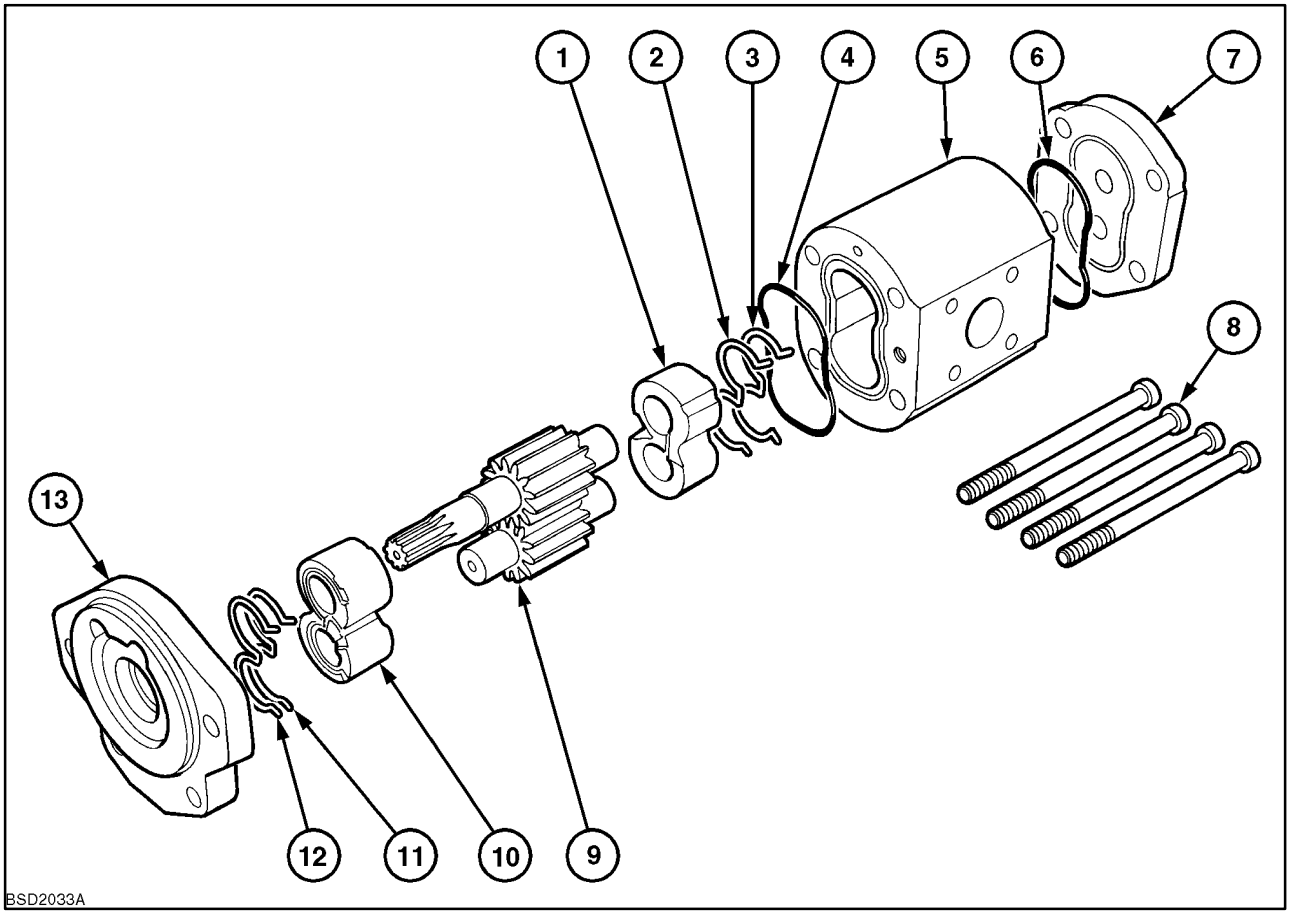
HYDRAULIC LIFT SYSTEM OIL PUMP

Disassembly - Assembly

⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.



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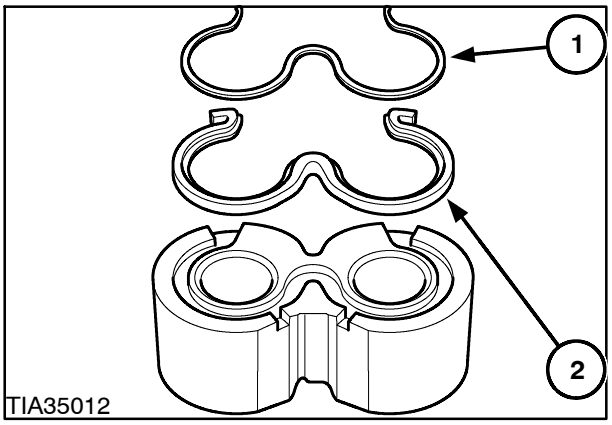
Hydraulic Lift System Oil Pump Exploded View

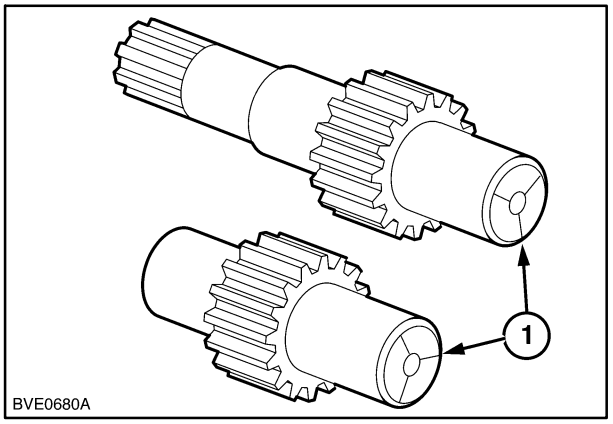
1. Bearing Block
2. Oil Seal
3. Plastic Back-up Seal
4. O-ring Seal
5. Pump Housing
6. O-ring Seal
7. End Plate
8. Retaining Bolts
9. Drive Gears
10. Bearing Block
11. Oil Seal
12. Plastic Back-up Seal
13. End Plate

1. Install new oil seals and O-rings. When installing oil seals in the bearing block ensure that the plastic back-up seal (1) is correctly positioned in the rubber seal (2).



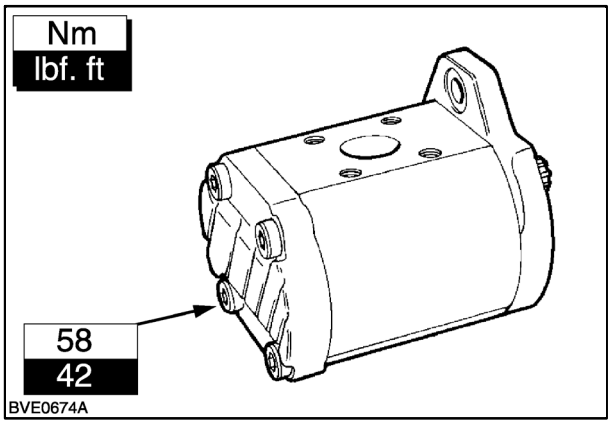
40

2. Install the driveshaft and driven gears into the hydraulic pump body, ensuring that the identification marks (1) face in the same direction.



41

3. Tighten the retaining bolts to the specified torque value.



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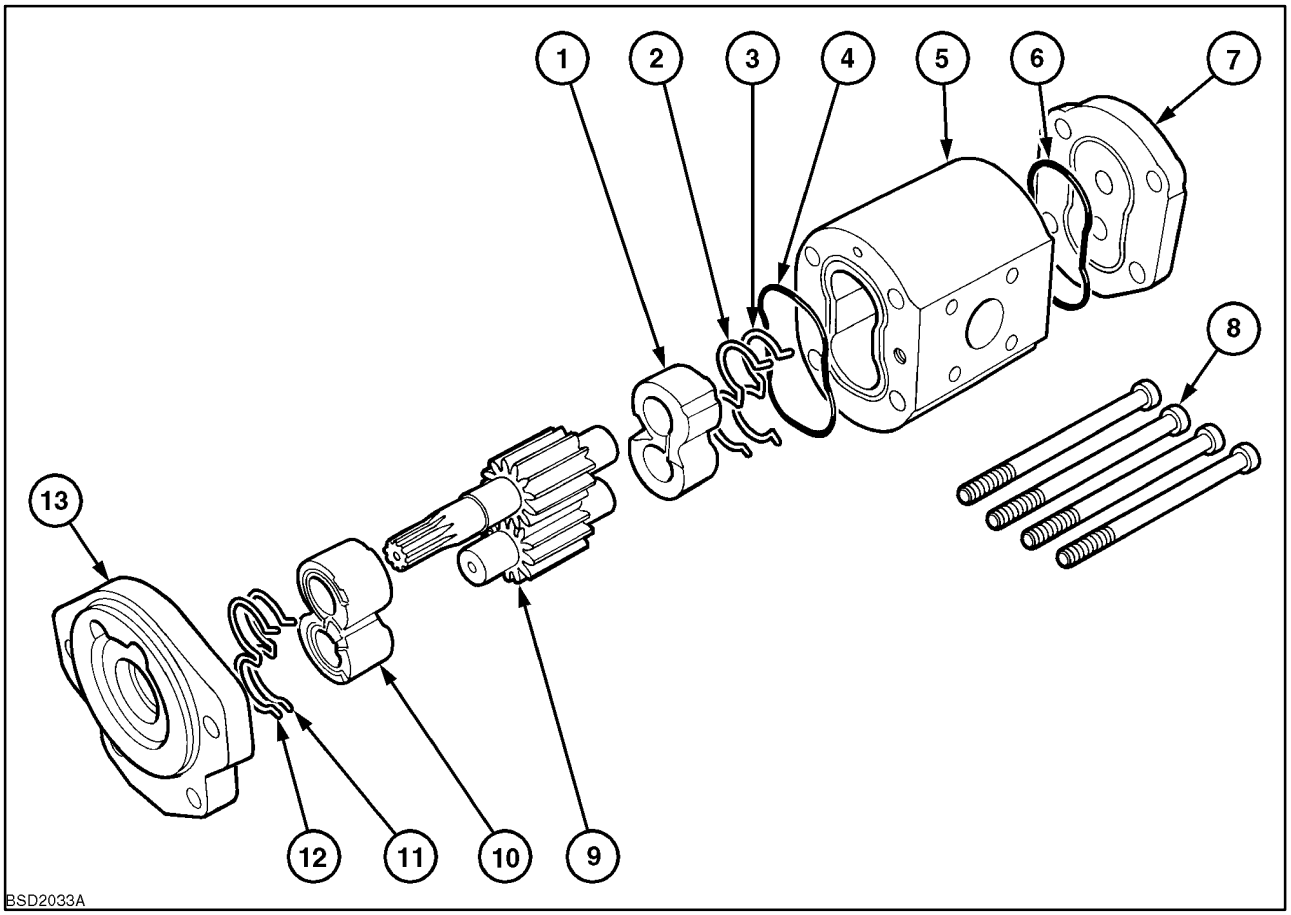
HYDRAULIC STEERING/LOW PRESSURE OIL PUMP

Disassembly - Assembly

⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protective clothing, including goggles, gloves and footwear.

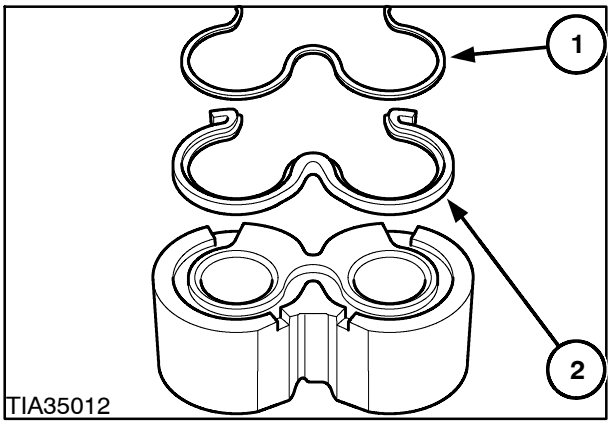


43

Steering / Low Pressure Oil Pump Exploded View

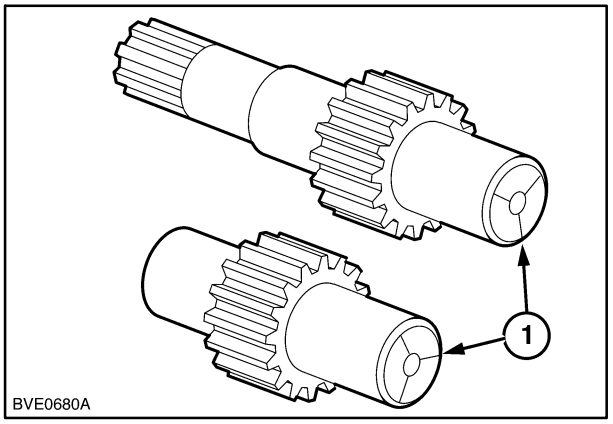
1. Bearing Block
2. Oil Seal
3. Plastic Back-up Seal
4. O-ring Seal
5. Pump Housing
6. O-ring Seal
7. End Plate
8. Retaining Bolts
9. Drive Gears
10. Bearing Block
11. Oil Seal
12. Plastic Back-up Seal
13. End Plate

4. Install new oil seals and O-rings. When installing oil seals in the bearing block ensure that the plastic back-up seal (1) is correctly positioned in the rubber seal (2).



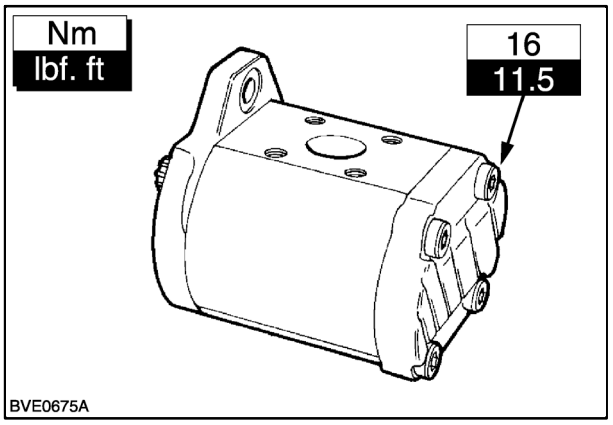
44

5. Install the driveshaft and driven gears into the hydraulic pump body, ensuring that the identification marks (1) face in the same direction.



45

6. Tighten the retaining bolts to the specified torque value.



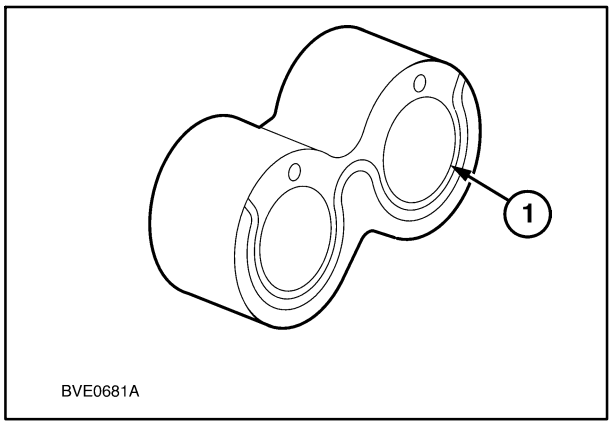
46

HYDRAULIC OIL PUMP

Inspection

1. Wash all components using a suitable degreaser.
2. Inspect the O-ring seal groove and the shaft oil seal recess in the mounting flange, these should be undamaged and free from burrs.
3. Examine the gears, shafts, and bearing blocks for wear. The pump must be renewed if:

- The PTFE coated bearings (1) in the bearing blocks are worn through revealing the bronze backing.
- The gear side faces are scored. This concern is often caused by contaminated oil.
- There is a distinctive wear step on the side faces of the gears and bearing blocks.



47

IMPORTANT: *When servicing the pump gears, particular attention must be paid to the following points:*

- The width of each gear set must be within 0.005 mm (0.0002 in.) of each other to ensure satisfactory pump efficiency.
- Journals must be within 0.013 mm (0.0005 in.) of each other.
- Gear faces must be flat. This feature may be checked using engineers blue on the bearing face and rotating against the gear. This check will also reveal any sharp edges on the teeth.

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 6 - Trailer Brake Auxiliary Valves

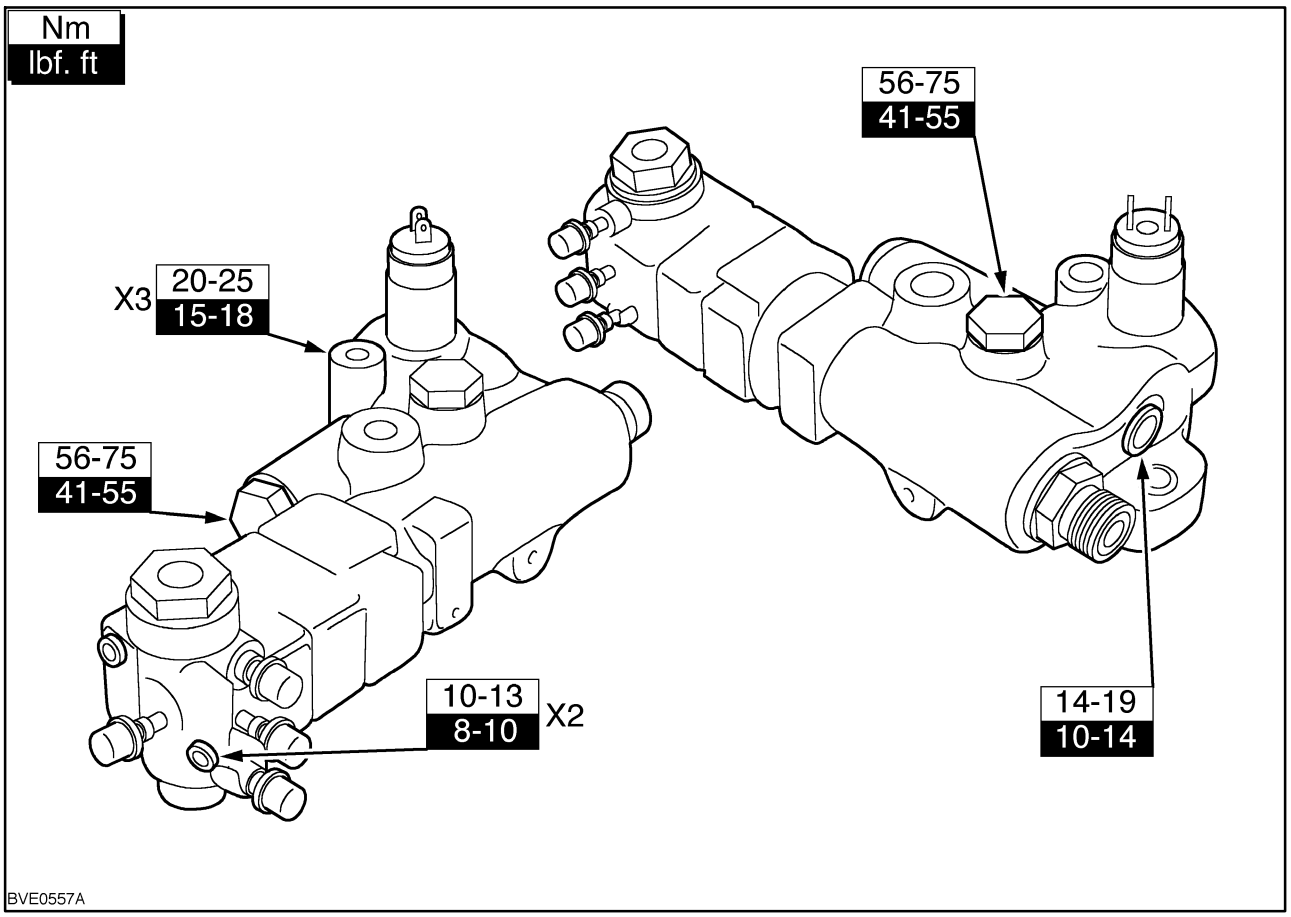
CONTENT

Section	Description	Page
	Specifications	2
	Tightening Torques	2
	Description and Operation	3
	Trailer Brake Circuit	4
	Trailer Brake Layout	5
	Valve Operation	6
	Tractor Brakes Not Applied	6
	Tractor Brakes Being Applied–Initial Application	7
	Tractor Brakes Being Applied– Brakes Held	8
	Brakes Applied With Maximum Brake Pedal Pressure	9
	Italian Trailer Brakes	10
	Engine Running Brakes Not Applied	12
	Engine Running Brakes Applied	14
	Engine Stopped or Running But With Low Hydraulic Pump Flow.	16
	Engine Running and Parking Brake Applied	18
	Troubleshooting	20
	Trailer Brake Valve	20
	Italian Trailer Brake Fault Finding	20
	Overhaul	21
	Trailer Brake Valve	21
	Removal	21
	Installation	22
	Italian Trailer Brake Solenoid Valve Block	23
	Removal	23
	Installation	23

SPECIFICATIONS

Maximum Trailer Brake Pressure . . . . . bar	150
Italian Trailer Brakes Trailer Brake Disengagement Pressure . . . . . bar	10–12
Brake Reservoir Oil	Ambra Brake LHM

TIGHTENING TORQUES

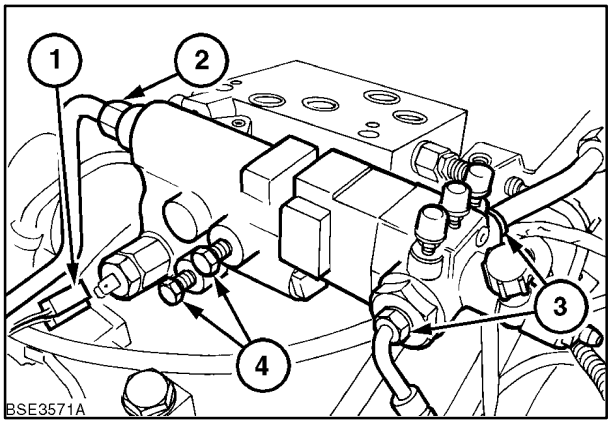


1

DESCRIPTION AND OPERATION

Tractors may be fitted with a hydraulically operated trailer brake valve which operates the trailer brakes whenever the brake system is activated by depressing the footbrake.

Installation of the trailer brake valves varies according to model however the principal of operation remains the same.

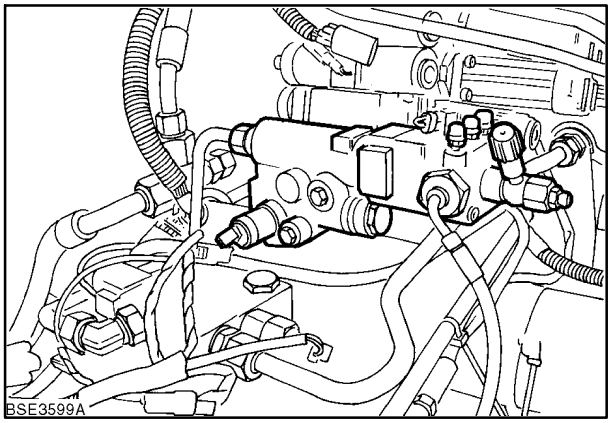


2

Trailer brake installation

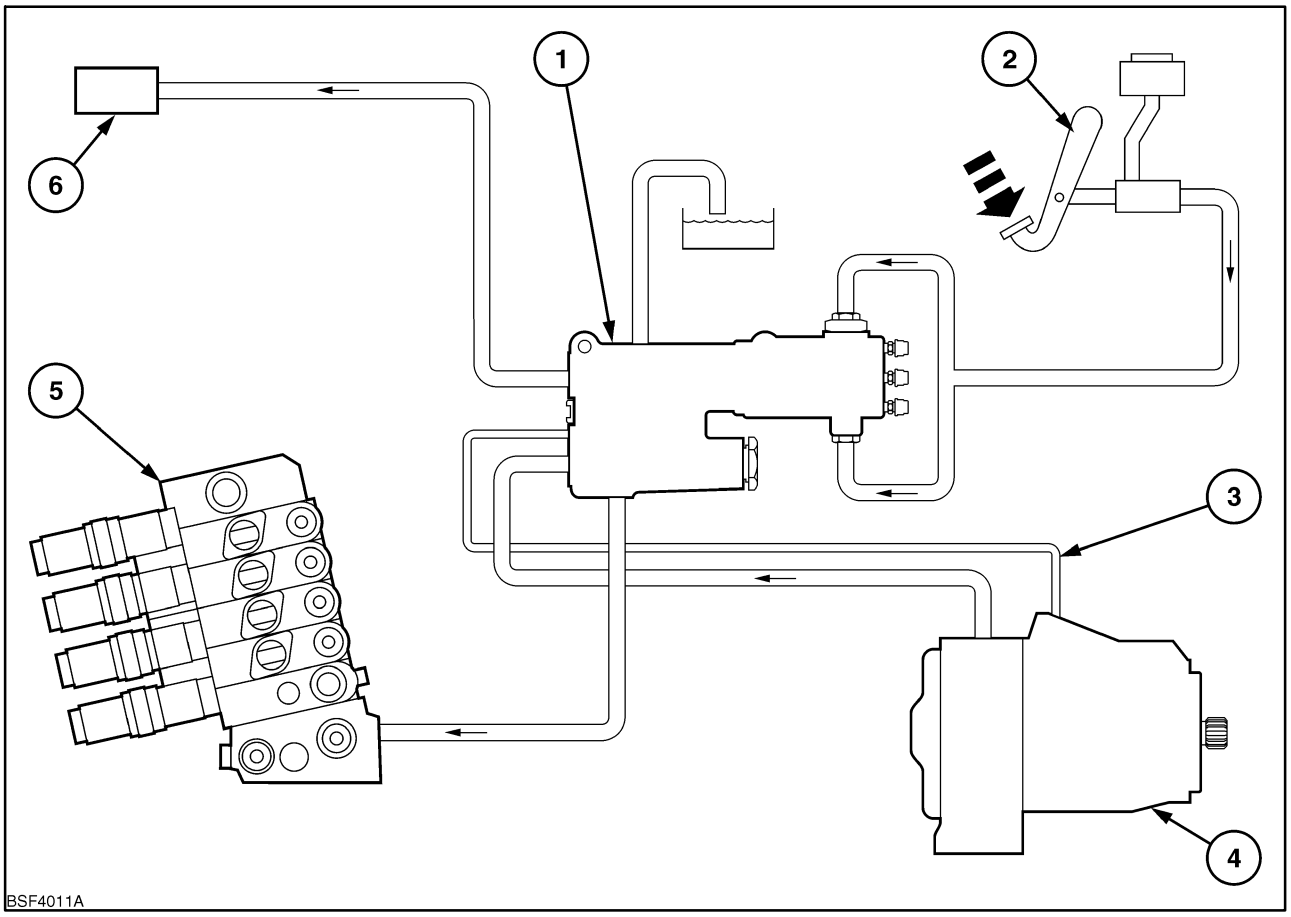
1. Low Pressure Switch connection
2. Feed To Trailer Brake Coupling
3. Pressure Line toTractor Brakes
4. Retaining Screws

For tractors marketed in Italy a modified trailer brake valve is fitted which ensures the trailer brakes are also applied when:-
The engine is stopped
The parking brake is applied
Output from the hydraulic pump is very low.



3

TRAILER BRAKE CIRCUIT



4

Trailer Brake Circuit

1. Trailer Brake Valve
2. Braking Pressure
3. Load Sense Line
4. Variable Displacement Hydraulic Pump
5. Remote Valves
6. Trailer Brakes

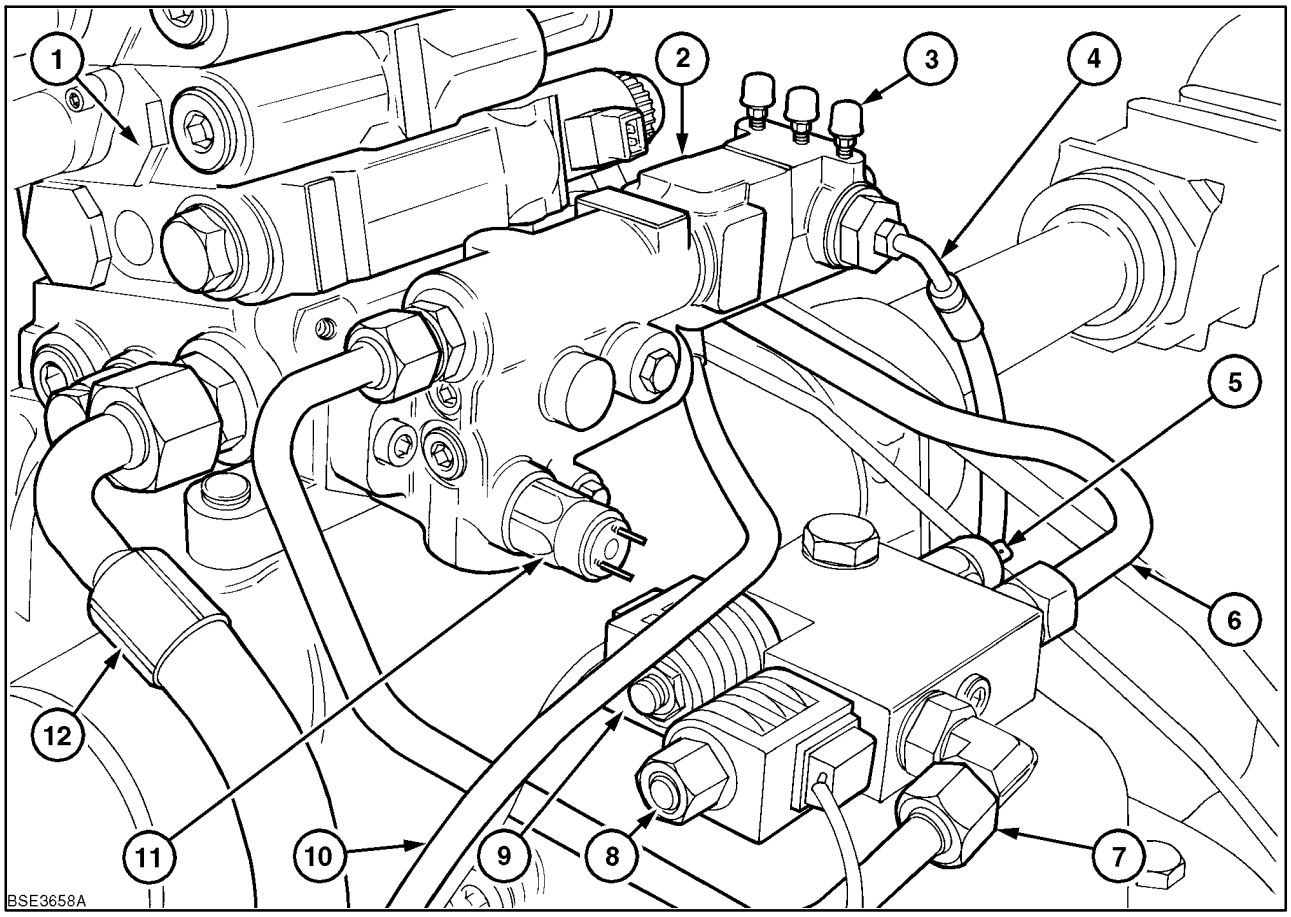
Oil flows from the hydraulic pump (4) and into the trailer brake valve (1) via the power beyond slice before flowing onto the remote valves and other high pressure hydraulic circuits.

The position of the trailer brake valve in the circuit ensures that the trailer brake circuit has priority flow over the remote valves (5) and other hydraulic high pressure circuits.

Trailer braking is proportional to the effort on the tractor brake pedal. Feedback is provided by the trailer brake valve to give a sense of feel to the operator which aids precise braking.

The description and operation described on the following pages is for the standard trailer brake system. The additional operating features of the valve when fitted with the Italian features is described from page 10.

TRAILER BRAKE LAYOUT

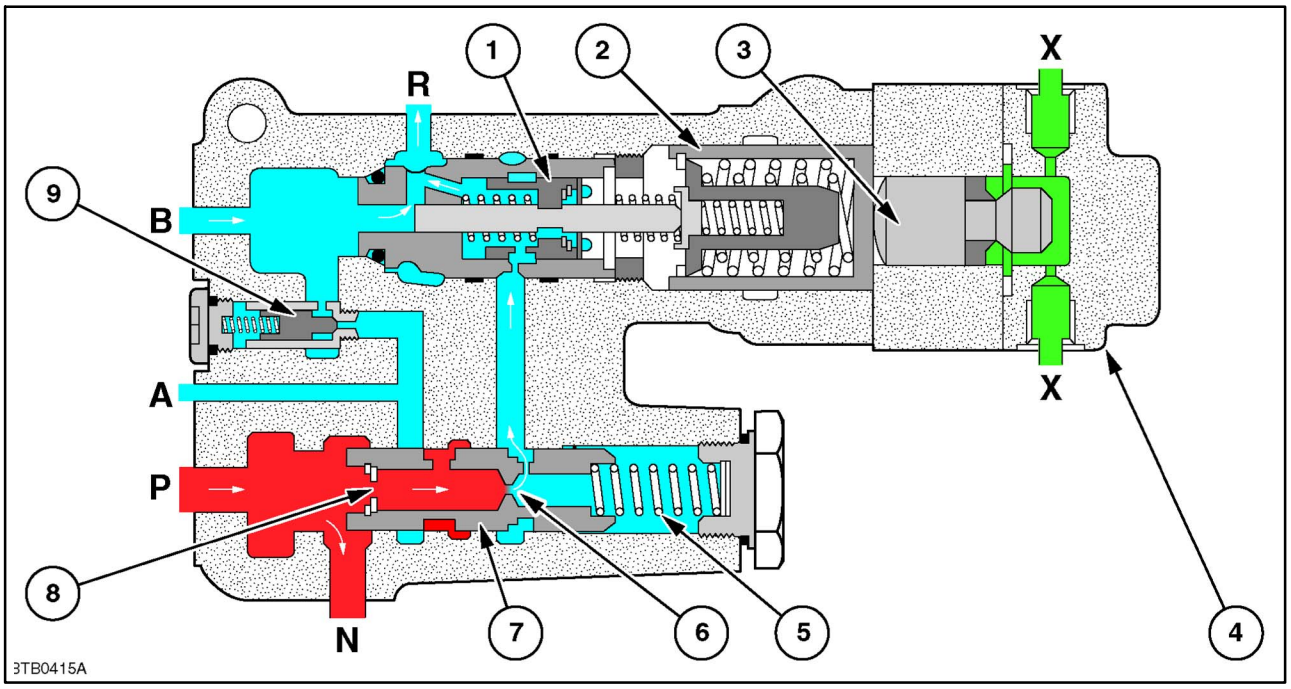


5

Trailer Brake Layout Tractors

1. Remote Valves
2. Trailer Brake Valve
3. Bleed Nipple
4. Pressure Line toTractor Left Hand Brakes
5. Trailer Brake engaged warning lamp switch(Italian Trailer Brake)
6. Feed toTrailer Brake Coupling
7. Feed to solenoid block
8. Delivery Solenoid (Italian Trailer Brake)
9. Discharge Solenoid (Italian Trailer Brake)
10. Pressure Line to Right Hand Brakes
11. Low Pressure Switch (10 bar)
12. Supply Feed From Pump

VALVE OPERATION



6

Trailer Brake Valve Operation - Tractor Brakes Not Applied

Pump Pressure

Return to Reservoir

Zero Brake Pedal Pressure

1. Control Valve and Spool
2. Pressure Relief Element
3. Piston
4. Pilot Head
5. Spring
6. Throttling Orifice
7. Flow Regulating Valve
8. Restrictor
9. Check Valve

A. Load Sensing Gallery To Implement Pump
B To Trailer Brakes
N Outlet Port to Implement Valves

P Inlet Port from Hydraulic Pump
R Return to Reservoir
X Pressure from Tractor Brake Pedal Application

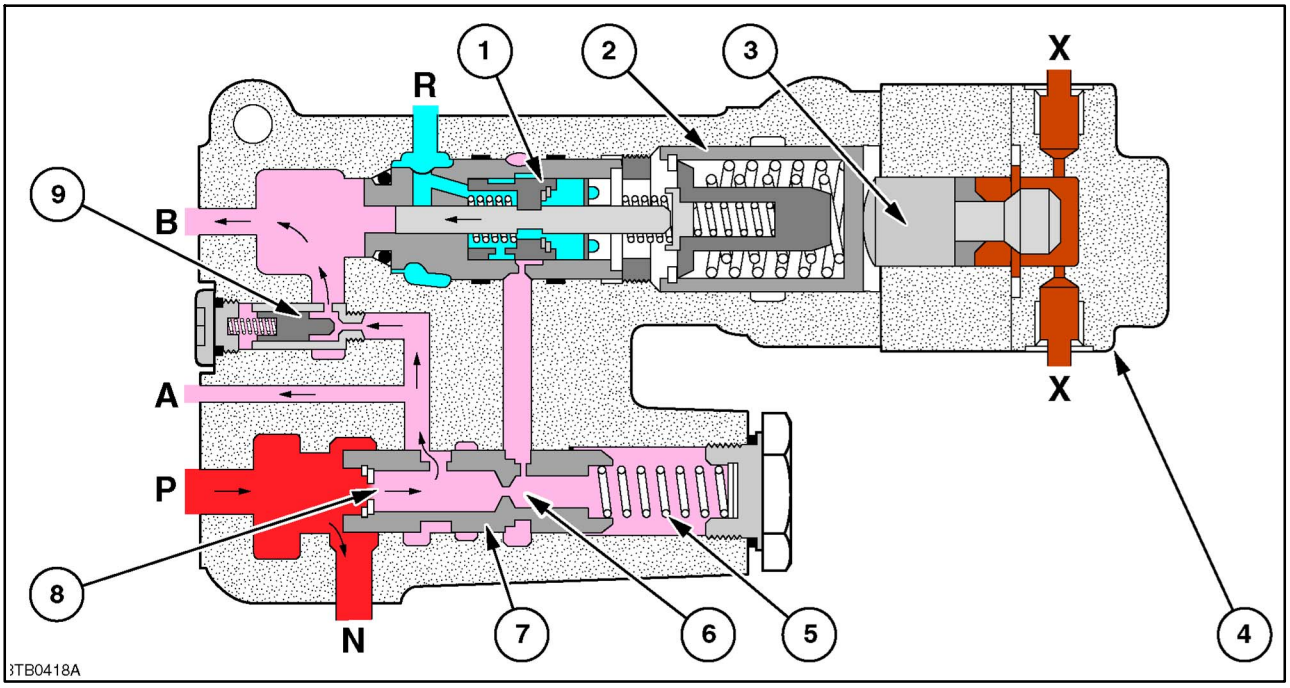
Tractor Brakes Not Applied

When the tractor brakes are not applied there is no hydraulic pressure in the circuit from the tractor brake pedal master cylinder to ports 'X' of the pilot head (4).

The piston (3) is not under pressure and the control valve (1) assumes the neutral position.

The trailer brake line 'B' is relieved to reservoir through the control valve and port 'R'.

Their is a small controlled flow of oil from the implement pump through port 'P' of approximately 0.6 Litres/min which passes to the reservoir through restrictor (8), throttling orifice (6) control valve (1) and port 'R'. The pressure drop at the throttling orifice (6) holds the flow regulating valve (7) in the open flow position allowing all remaining flow to pass from port 'P' through port 'N' to the implement valves and other hydraulic circuits.



7

Trailer Brake Valve Operation - Brakes Being Applied

Pump Pressure

Brake Pedal Pressure

Reduced Flow

Return to Reservoir

1. Control Valve and Spool
2. Pressure Relief Element
3. Piston
4. Pilot Head
5. Spring
6. Throttling Orifice
7. Flow Regulating Valve
8. Restrictor
9. Check Valve

A. Load Sensing Gallery To Implement Pump
B To Trailer Brakes
N Outlet Port to Hydraulic Circuit
P Inlet Port from Hydraulic Pump
R Return to Reservoir
X Pressure from Tractor Brake Pedal Application

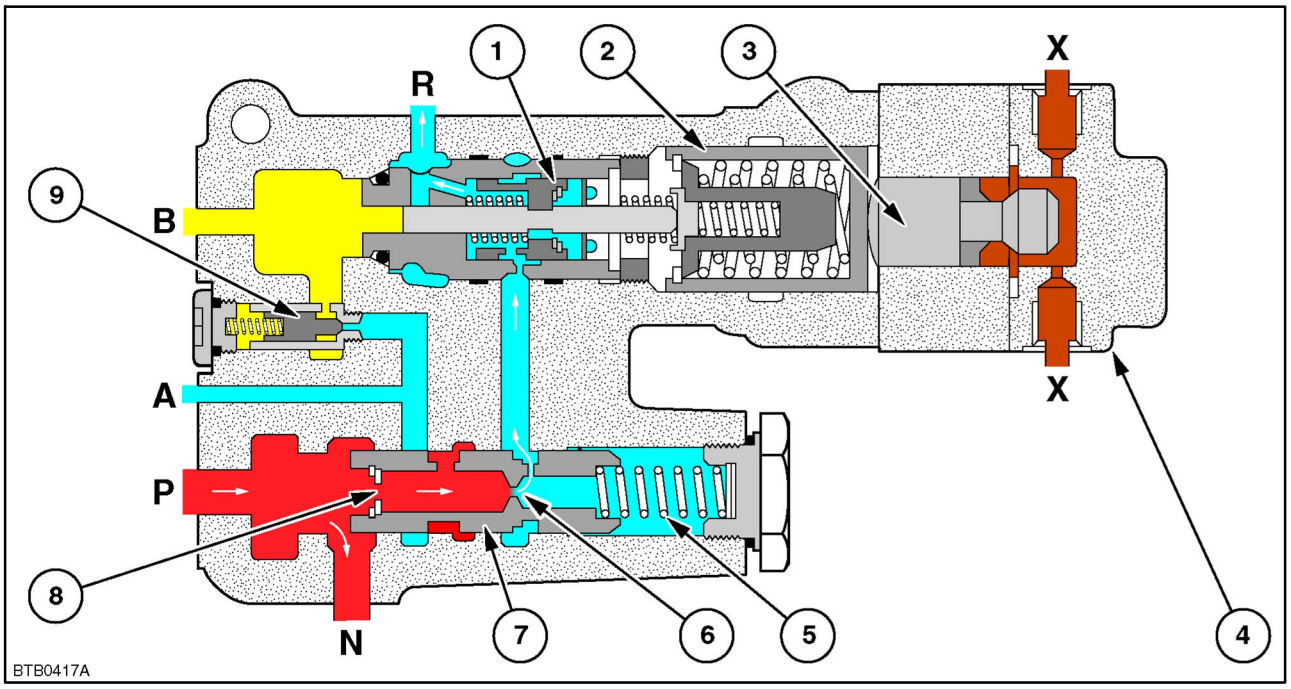
Tractor Brakes Being Applied-Initial Application

When the tractor brake pedal is being depressed the pilot piston (3) is pressurised through ports 'X' and moves forward pushing against the pressure relief element (2). As the pressure relief element moves to the left the control valve spool (1) similarly moves to the left.

As the control spool moves to the left the flow of oil to reservoir through port 'R' is prevented in two stages. First the connection between the trailer brake line 'B' and return to reservoir port 'R' is closed. Secondly oil passing through the centre of the flow regulating valve is prevented from returning to reservoir through the control valve and port 'R'. As oil from the hydraulic implement pump continues to pass through the flow regulating valve, the combination of rising oil pressure on the spring side of the valve and the spring pressure moves the regulating valve to the left.

A constant flow of oil from the implement pump passes from port 'P' to the trailer brake through restrictor (8), and check valve (9). The residual flow by-passes the flow regulating valve (7) and passes to the tractor implement valves and other hydraulic circuits through port 'N'.

The pressure in the trailer brake line 'B' builds up and acts on the end of the control valve spool in opposition to the pressure on the piston (3).



8

Trailer Brake Valve Operation - Brakes Held

Pump Pressure

Brake Pedal Pressure

Trapped Oil (Pressurised)

Return to Reservoir

1. Control Valve and Spool
2. Pressure Relief Element
3. Piston
4. Pilot Head
5. Spring
6. Throttling Orifice
7. Flow Regulating Valve
8. Restrictor
9. Check Valve

A. Load Sensing Gallery To Implement Pump
B To Trailer Brakes
N Outlet Port to Hydraulic Circuit
P Inlet Port from Hydraulic Pump
R Return to Reservoir
X Pressure from Tractor Brake Pedal Application

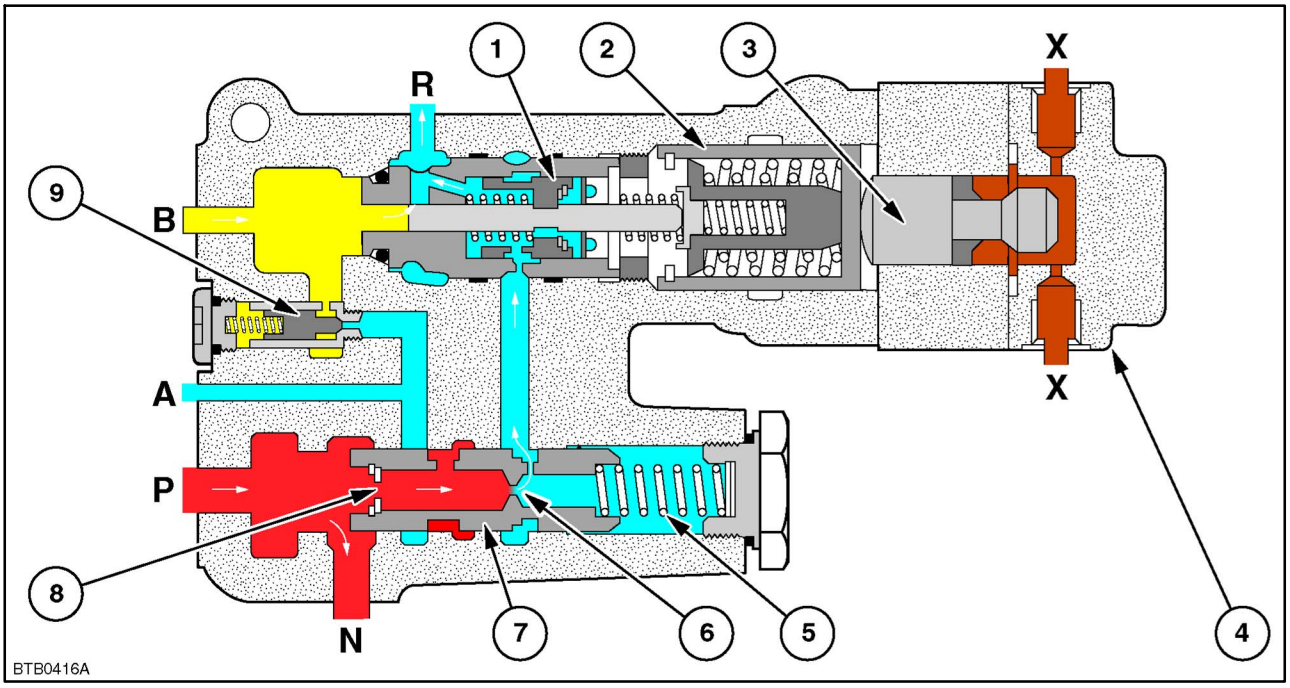
Tractor Brakes Being Applied- Brakes Held

If the tractor brake pedal is kept depressed the brake line 'B' remains blocked from the return to reservoir port 'R'. The pressure in the trailer brake line 'B' increases until it matches the tractor braking pressure and acts on the end surface of the control valve spool (1) moving the spool to the right against the pressure being applied by the brake pedals.

The oil trapped at the spring end of the flow regulating valve (7) is now open to reservoir through port 'R' and the valve moves to the right preventing any further pump pressure oil flowing past the check valve (9) and into the trailer brake circuit 'B'. All pump flow with the exception of a small controlled flow returning to reservoir through the throttling orifice (6) is now directed to port 'N' and the tractor implement valves and other hydraulic circuits.

The oil in the trailer brakes is now trapped and maintained at a constant pressure until the pressure applied to the brake pedal is changed.

When the brake pedal pressure is decreased the control spool moves to the right allowing the trapped oil in the trailer brake circuit to return to reservoir through port 'R' as shown in Figure 6. Oil in circuit 'B' is allowed to escape to reservoir until the pressure in the trailer brake circuit once again matches the pressure applied to the tractor brake pedal.



9

Trailer Brake Valve Operation - Brakes Applied With Maximum Brake Pedal Pressure

Pump Pressure

Brake Pedal Pressure

Trapped Oil (Pressurised)

Return to Reservoir

1. Control Valve and Spool
2. Pressure Relief Element
3. Piston
4. Pilot Head
5. Spring
6. Throttling Orifice
7. Flow Regulating Valve
8. Restrictor
9. Check Valve

A. Load Sensing Gallery To Implement Pump
B To Trailer Brakes
N Outlet Port to Hydraulic Circuit
P Inlet Port from Hydraulic Pump
R Return to Reservoir
X Pressure from Tractor Brake Pedal Application

Brakes Applied With Maximum Brake Pedal Pressure

If at any time the maximum permissible trailer braking pressure of 150 bar (2180lbf/in^2) is reached, for example by pressing excessively on the tractor brake pedal or due to any other external forces an increase in braking pressure is prevented by the pressure relief element (2).

As pressure in the trailer braking circuit increases to the maximum permissible limit, the trailer brake circuit pressure forces the control spool (1) against the springs in the pressure relief element (2). The springs which are preset to the maximum permissible braking pressure are compressed and the control spool (1) moves to the right allowing the oil trapped behind the flow regulating valve to return to reservoir through port 'R'. The flow regulating valve now moves to the right and prevents any further pump system pressure being directed over the check valve to the trailer brake circuit.

If the excess pressure is as a result of external factors in the trailer brake system the pressure in gallery 'B' is similarly applied to the end face of the control valve which momentarily moves further to the right opening gallery 'B' to reservoir through port (R). This allows the excess pressure in the trailer brake circuit to be vented to reservoir avoiding further increase of the braking pressure.

Although the trailer brake circuit has priority over the implement valve hydraulic circuits the tractor hydraulics can be used and pressurised as desired through all operating situations of the trailer brakes without any adverse effect.

ITALIAN TRAILER BRAKES

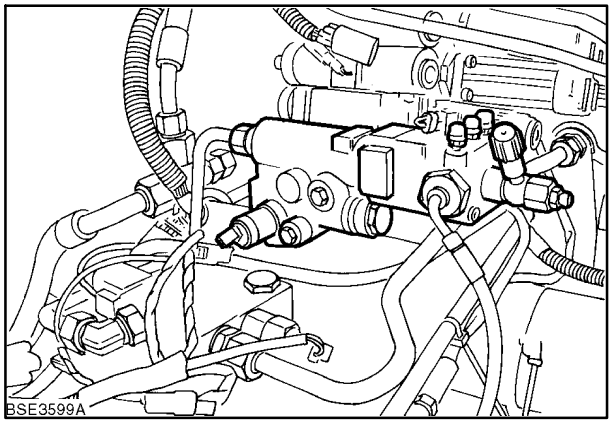
The unique braking mechanism on Italian trailers automatically applies the trailer brakes whenever the tractor engine is stopped, output from the hydraulic pump is very low or the tractor is disconnected from the trailer.

NOTE: *The Italian trailer braking system will only function on trailers specifically designed to the Italian trailer braking specification. Do NOT attach trailers which are not to the Italian specification to tractors installed with the* ***Italian*** *trailer brake option. Failure to observe this requirement may result in continual partial engagement of the brakes on the trailer and consequential overheating.*

The internal components of the Italian trailer brake valve are the same as the standard trailer braking system, however an additional manifold (3) is attached to the 'P' and 'B' ports. This manifold contains two solenoids (1) and (2) and internal galleries which direct oil to and from the trailer brake circuit in accordance with the trailer braking requirements of this system.

An oil discharge valve located in the the return port 'R' of the valve creates a back pressure of 10 to 12 bar in the system whenever the engine is running but the foot brakes are not applied.

The full description and operation of the system is described as follows.



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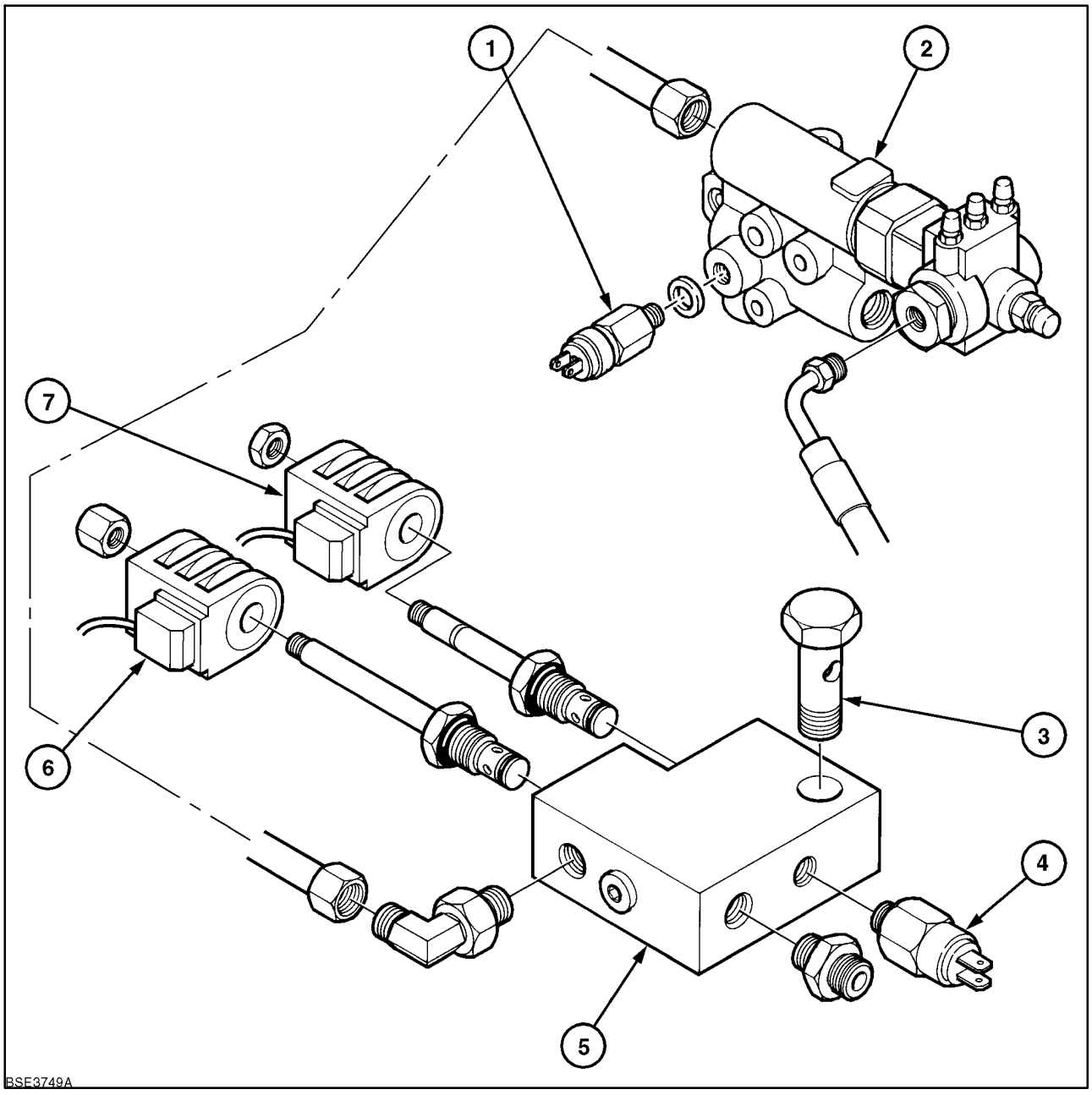


11

Italian Trailer Brake Components

1. Low Pressure Switch
2. Trailer Brake Valve
3. Manifold Bolt
4. 10-12bar Pressure Regulating Valve
5. Manifold
6. Solenoid
7. Solenoid

Engine Running Brakes Not Applied

To release the trailer braking mechanism a pressure of 11 to 12 bar (160-174lbf/in^2) is required at the trailer brake coupling whenever the handbrake is released while the engine is running and the footbrake is not being applied.

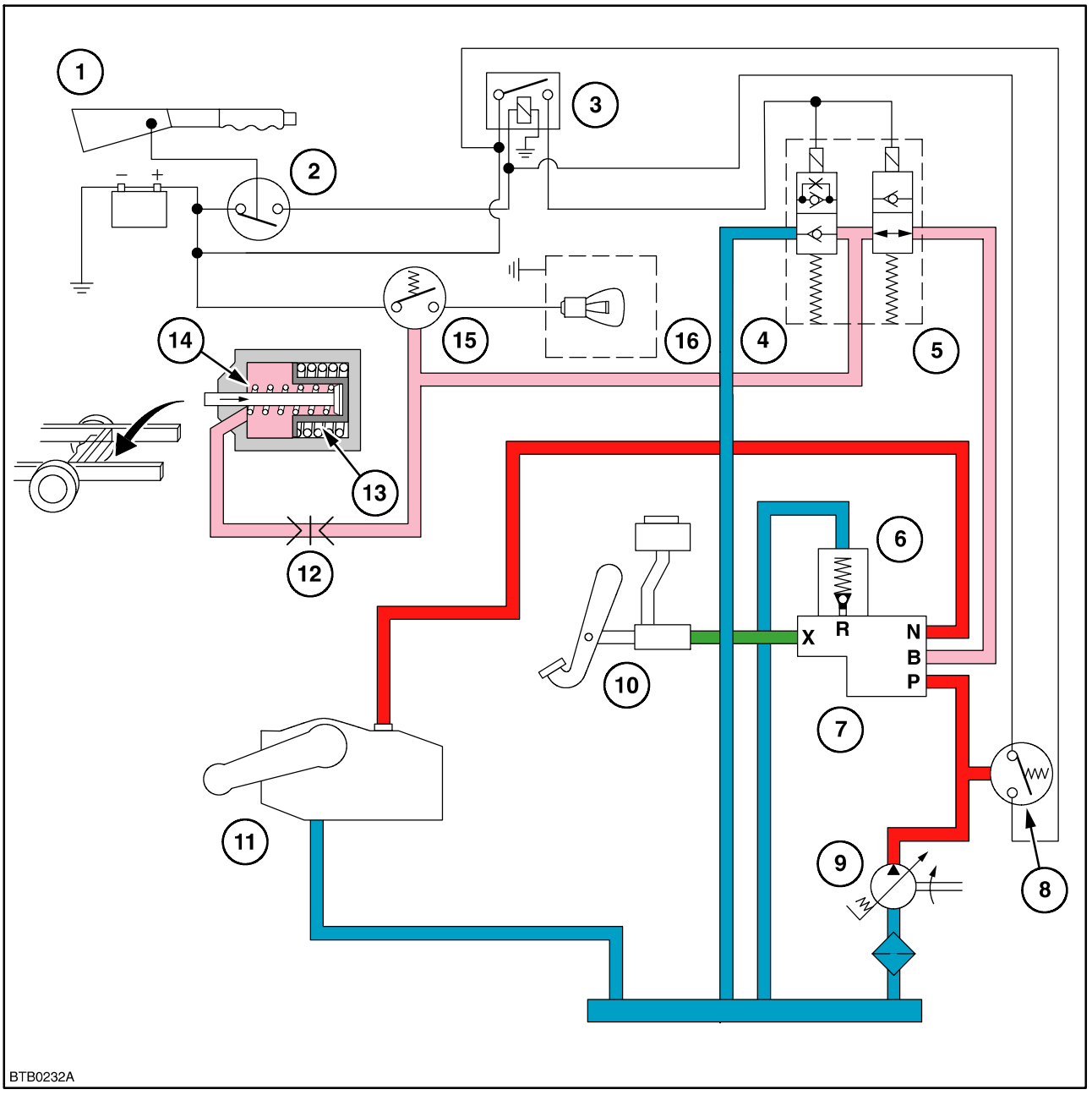
This pressure is controlled by the oil discharge valve (6) which is attached to the trailer brake return to reservoir port (R).

Oil from the implement pump flows to the trailer brake valve (7) port 'P'. When the brakes are not applied a small flow of oil returns to reservoir through port (R) with the remaining flow passing from port (P) to the implement valves and hydraulic lift through port N.

The 11-12 bar pressure created by the oil discharge valve flows from the trailer brake line (B), through the solenoid valves (4 and 5) to the trailer brake coupler (12).

This pressure is sufficient to overcome spring (13) of the Italian brake actuating mechanism. As the spring is compressed, spring (14) retracts the actuating pin to disengage the braking mechanism on the trailer.

NOTE: *At engine start-up the trailer brake indicator light (6) will remain illuminated until the 11 bar pressure necessary to disengage the braking mechanism has been created. To reduce the time necessary to reach trailer brake release pressure depress the brake pedal with the parking brake lever in the off position.*



12

Italian Trailer Brake Valve Schematic- Engine Running Brakes Not Applied

Pump Pressure

Brake Pedal Pressure

Trailer Brake Release Pressure (11bar)

Return To Reservoir

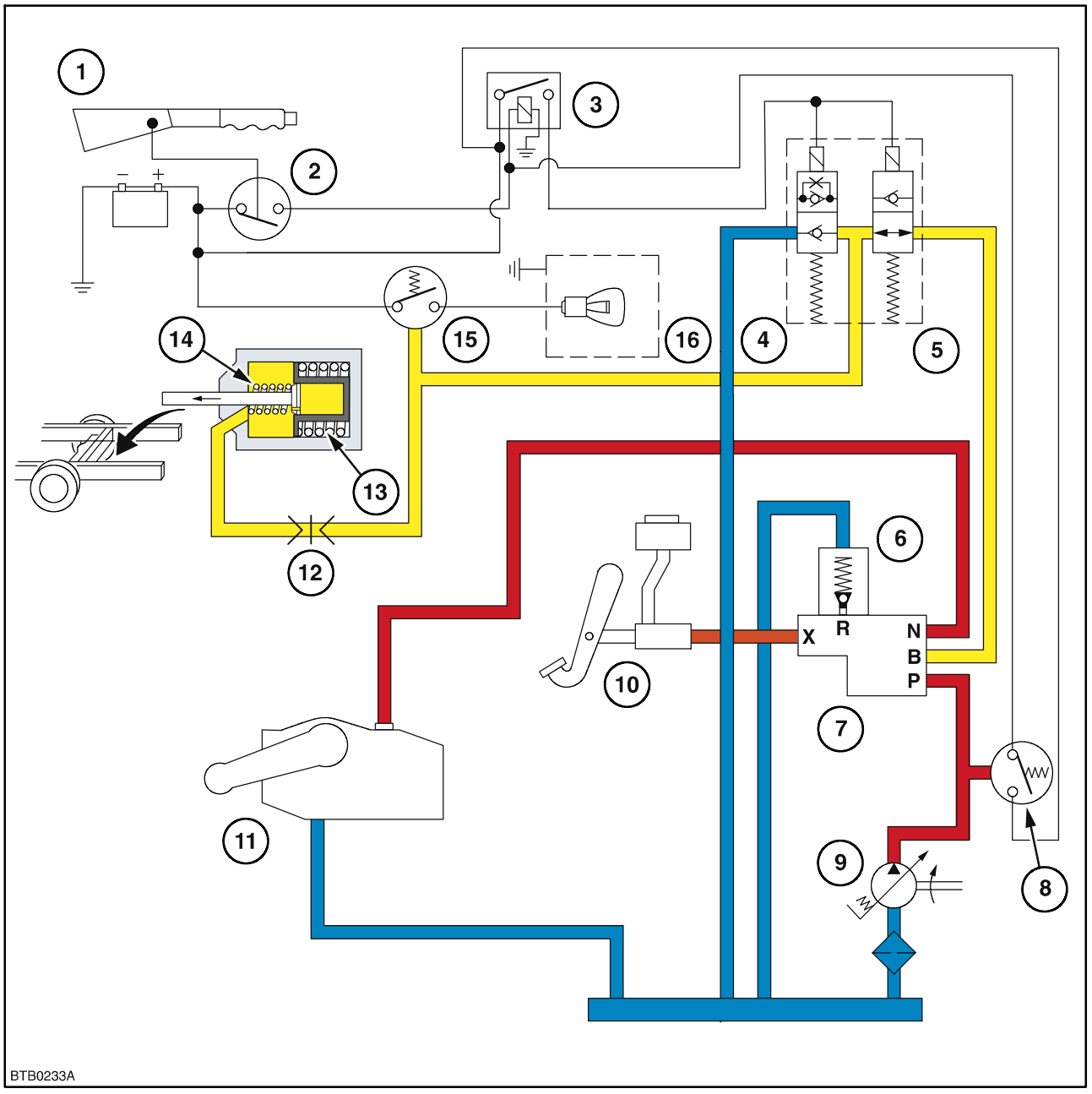
1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. 11 bar Pressure Regulating Valve
7. Trailer Brake Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Implement Valves and Hydraulic Lift
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

Engine Running Brakes Applied

When the tractor brake pedal is depressed the control of oil flow through the trailer brake valve (7) is the same as described for tractors with the standard trailer brake system, refer to Page 8 and the outlet pressure through port 'B' will be 12-150bar (174-2180lbf/in^2) depending on the pressure applied to the brake pedal.

The delivery solenoid (5) is open and the discharge solenoid (4) is closed. Oil exiting port 'B' flows through the 'Open' delivery solenoid valve (5) to the trailer brake coupler (12).

When a trailer is connected to the coupler the pressure passing through the coupling to the trailer braking mechanism overcomes the spring force (13 and 14) and moves the actuating pin forward to apply the brakes on the trailer.



13

Italian Trailer Brake Valve Schematic- Engine Running Brakes Applied

Pump Pressure

Brake Pedal Pressure

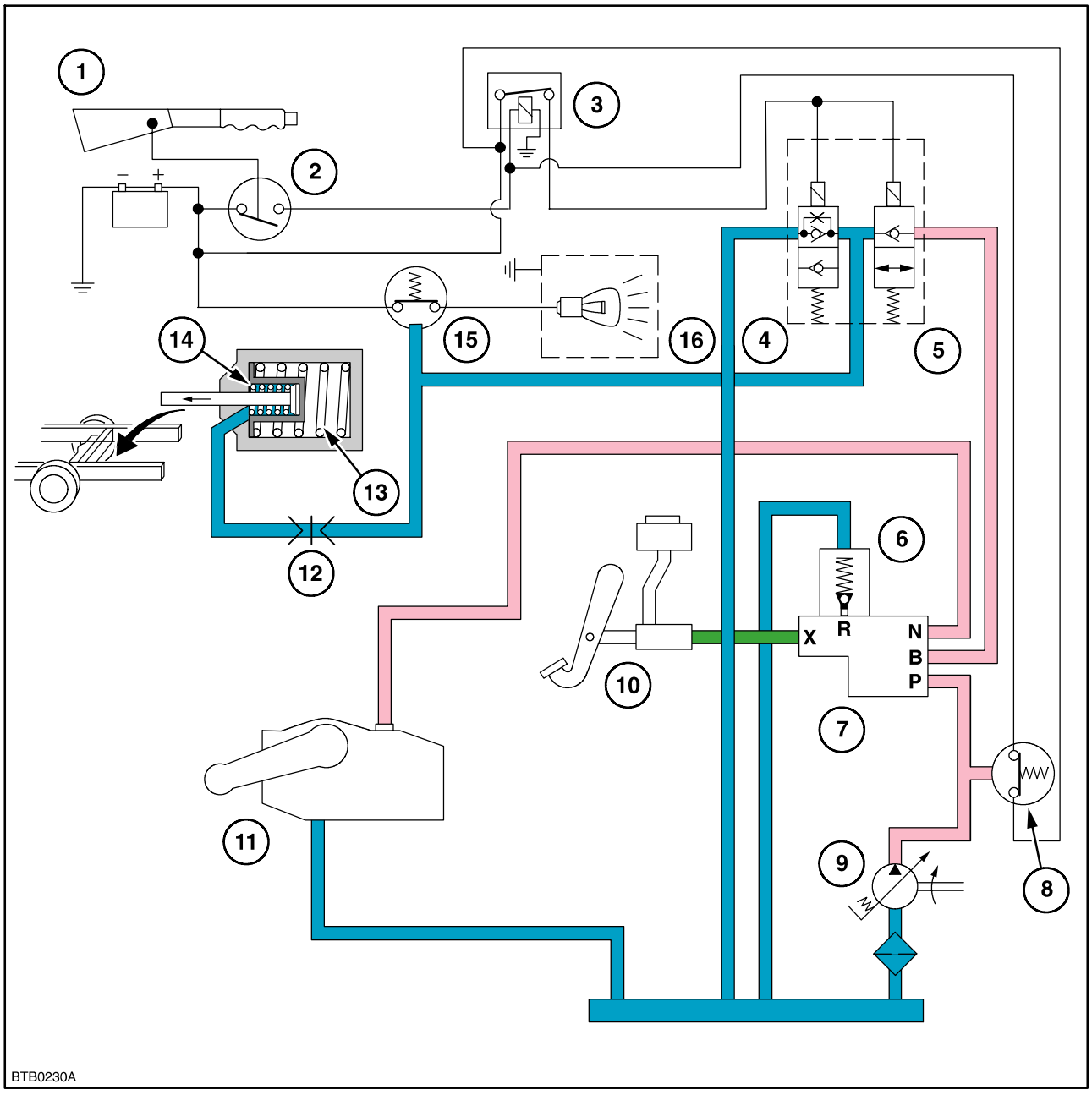
Trailer Braking Pressure

Return To Reservoir

1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. 11 bar Pressure Regulating Valve
7. Trailer Brake Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Implement Valves and Hydraulic Lift
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

Engine Stopped or Running but with Low Hydraulic Pump Flow.

When the engine has stopped or the output from the hydraulic implement pump is very low the pressure switch (8) closes. With the switch closed the current energises the relay (3). The relay closes and current reaches and energises the solenoid valves (4) and (5). The delivery solenoid (5) is now closed and discharge solenoid (4) is open. In this condition the oil in the trailer brake line discharges to reservoir through solenoid (4). Their is now insufficient pressure to overcome the spring (13) and therefore the actuating pin moves forward to apply the brakes. Low pressure in the trailer brake line causes the switch (15) to close and illuminate the warning lamp (16).



14

Italian Trailer Brake Valve Schematic- Engine Stopped or Running With Low Hydraulic Pump Flow

Pump Pressure (Less than 10 bar)

Return To Reservoir

Brake Pedal Pressure

1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. 11 bar Pressure Regulating Valve
7. Trailer Brake Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Implement Valves and Hydraulic Lift
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

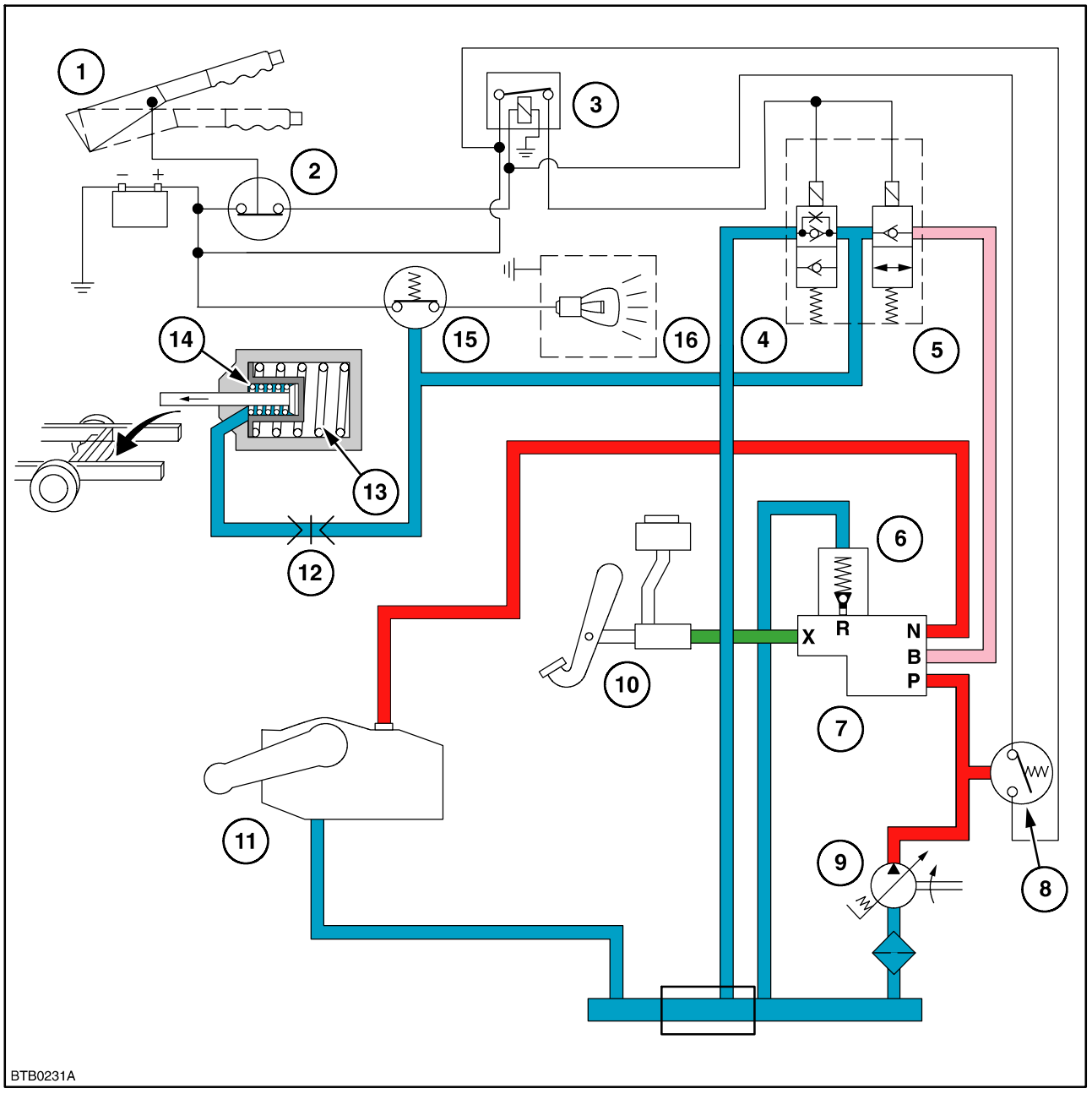
Engine Running and Parking Brake Applied

When the parking brake is applied the switch (2) is closed. With the switch closed the current energises the relay (3). The relay closes and current reaches and energises the solenoid valves (4) and (5).

The delivery solenoid valve (5) is now closed and discharge solenoid valve (4) is open. The 11 bar pressure oil at port 'B' is blocked by delivery solenoid valve (5) and the pressure in the trailer brake coupler line is discharged to reservoir through discharge solenoid valve (4).

Because there is insufficient pressure to overcome spring (13) the actuating pin is pushed forward to apply the brakes. The low pressure in the trailer brake coupler line causes the trailer brake warning lamp switch (15) to close and the in cab warning lamp will illuminate.

NOTE: *After applying the parking brake, wait approximately 10 seconds before stopping the engine. This will allow complete discharge of the oil pressure in the trailer brake line to obtain full application of the trailer brakes.*



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Italian Trailer Brake Valve Schematic- Engine Running and Parking Brake Applied

Pump Pressure

Release Pressure (11bar)

Zero Brake Pedal Pressure

Return To Reservoir

1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. 11 bar Pressure Regulating Valve
7. Trailer Brake Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Implement Valves and Hydraulic Lift
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

TROUBLESHOOTING

TRAILER BRAKE VALVE

Problem	Possible cause	Correction
Pressure higher or lower than specified.	1. Faulty trailer brake pressure regulating valve.	Replace trailer brake valve.
	2. Faulty hydraulic pump (9).	Test Pump and identify concern.
Excess pressure peaks are observed when applying the brake pedals for 10 seconds.	1. Oil leaks from hydraulic system	Locate leaks and repair.
	2. Trailer brake auxiliary valve (7) leaks.	Replace trailer brake auxiliary valve.

ITALIAN TRAILER BRAKE FAULT FINDING

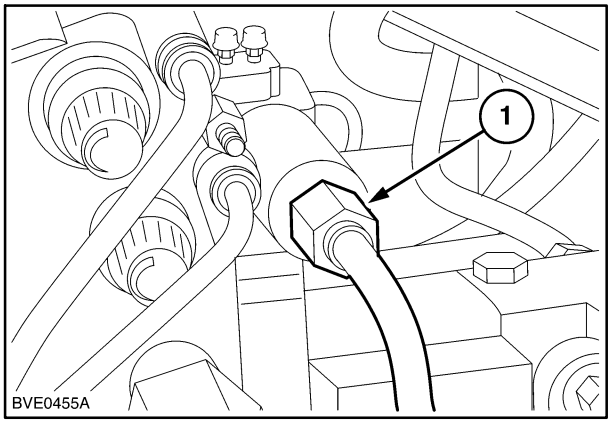
Problem	Possible cause	Correction
Trailer brake disengagement pressure is less than 10 bar.	3. Parking brake engaged.	Disengage parking brake.
	4. Trailer brake disengagement pressure regulating valve incorrectly adjusted.	Replace valve.
	5. Faulty trailer brake engaged warning lamp switch.	Replace switch.
	6. Faulty hydraulic pump.	Test hydraulic pump.
	7. Delivery solenoid valve stuck closed.	Repair or replace solenoid valve.
	8. Discharge solenoid valve stuck open.	Repair or replace solenoid valve. Discharge and delivery solenoid valves reversed.
Trailer brake disengagement pressure = 0 to 10 bar	1. Trailer brake disengagement pressure valve incorrectly adjusted.	Replace valve.
Correct trailer brake disengagement pressure but warning lamp is on.	1. Faulty trailer brake engaged warning lamp switch.	Replace switch.
Trailer brake disengagement pressure not correct but warning light is off.	1. Faulty warning lamp.	Replace lamp.
	2. Faulty trailer brake engaged warning lamp switch.	Replace switch.
Trailer brake disengagement pressure does not zero when parking brake is applied.	1. Faulty parking brake switch.	Replace switch.
	2. Faulty circuit relay.	Replace relay.
	3. Discharge solenoid valve faulty or stuck closed.	Repair or replace solenoid valve.
Trailer brake disengagement pressure is permanently zeroed when operating the remote control valve lever(s).	1. Trailer brake low pressure switch exceeding rated value (3 ± 0.5 bar).	Replace switch.
	2. Low pressure and trailer brake engaged warning lamp switches reversed	Move switches to correct positions.

OVERHAUL

TRAILER BRAKE VALVE

Removal

1. Disconnect the trailer brake valve electrical connectors and reposition the wiring harness.
2. Disconnect the trailer brake valve oil supply pipe (1).



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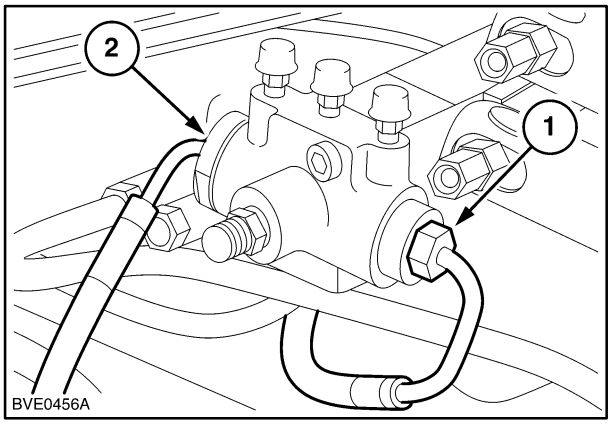
3. Disconnect the brake pipes (1) and (2) from the trailer brake valve.



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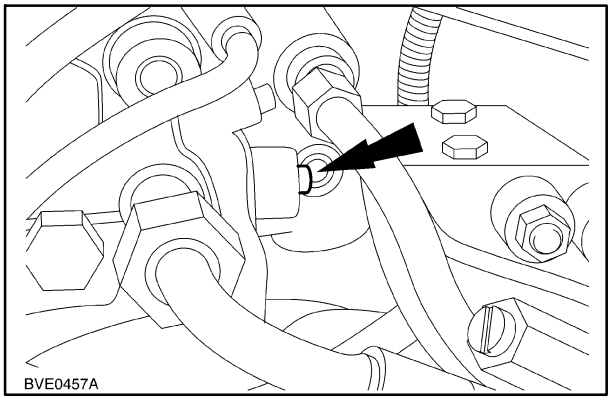
4. Remove the trailer brake valve retaining bolt.



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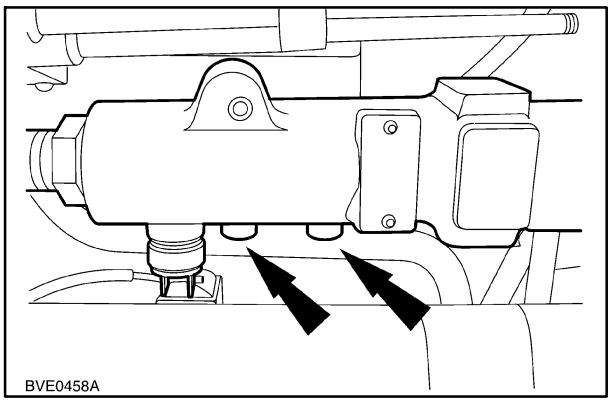
5. Remove the remaining trailer brake valve retaining bolts and remove the trailer brake valve.



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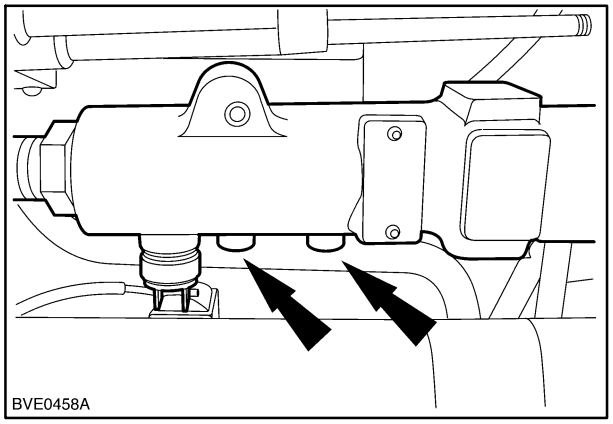
Installation

NOTE: *Install new O-ring seals as required.*

1. Install the trailer brake valve and the trailer brake valve retaining bolts.



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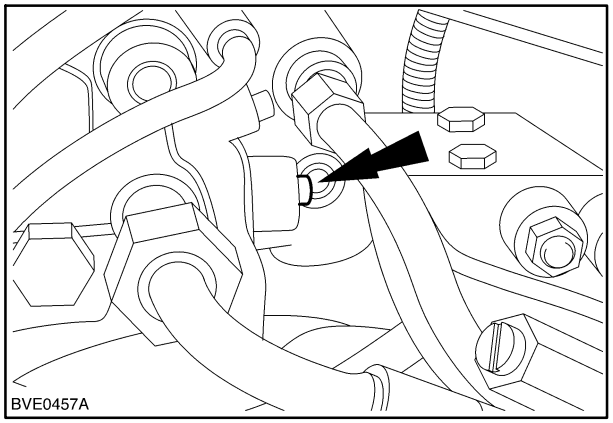
2. Install the remaining trailer brake valve retaining bolt.



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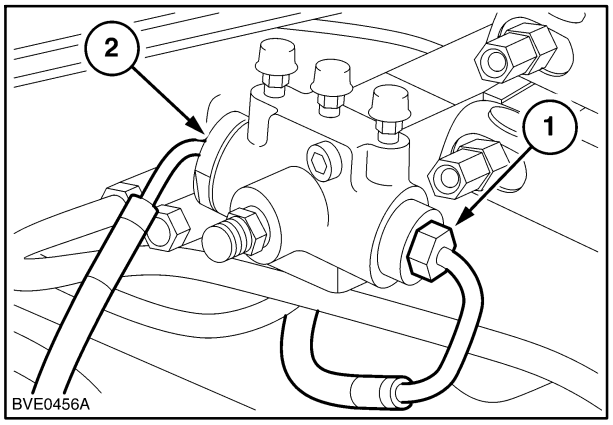
3. Connect the brake pipes (1) and (2) to the trailer brake valve.



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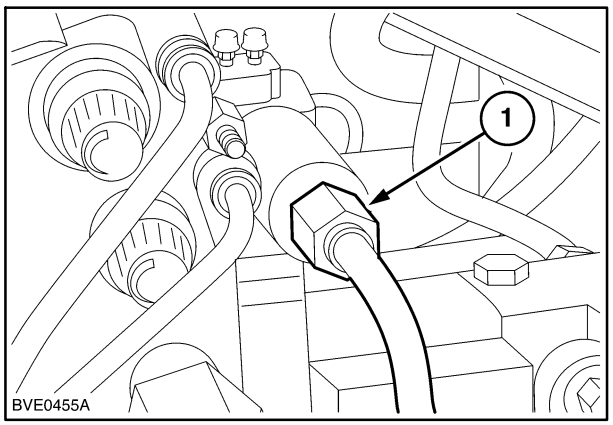
4. Connect the trailer brake valve oil supply pipe (1).
5. Connect the trailer brake valve electrical connectors.
6. Bleed the brake system (refer to bleeding the brakes in the brakes and controls section).
7. Refill the driveline with correct the specification oil.



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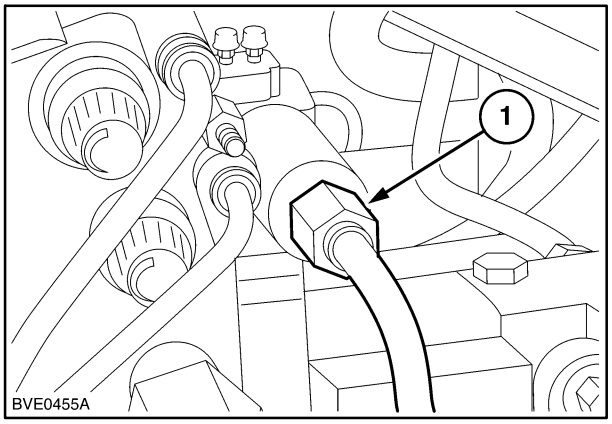
ITALIAN TRAILER BRAKE SOLENOID VALVE BLOCK

Removal

1. Disconnect the trailer brake solenoid valve block electrical connectors.
2. Disconnect the trailer brake valve oil supply pipe (1).



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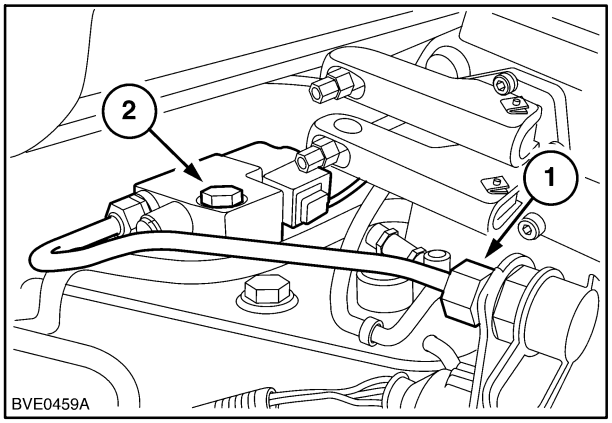
3. Disconnect the oil supply pipe (1) from the quick release coupling and remove the banjo retaining bolt (2) from the Italian trailer brake solenoid valve block.
4. Remove the Italian trailer brake solenoid valve block with the oil supply pipes attached.
5. Remove the oil supply pipes from the Italian trailer brake solenoid valve block.



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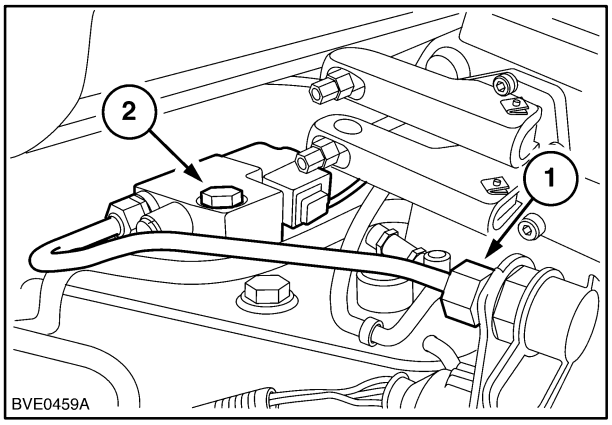
Installation

NOTE: *Install new sealing washers as required.*

1. Install the oil supply pipes to the Italian trailer brake solenoid valve block.
2. Install the Italian trailer brake solenoid valve block with the oil supply pipes attached.
3. Install the banjo retaining bolt (2) to the Italian trailer brake soleoid valve block and connect the oil supply pipe (1) to the quick release coupling.



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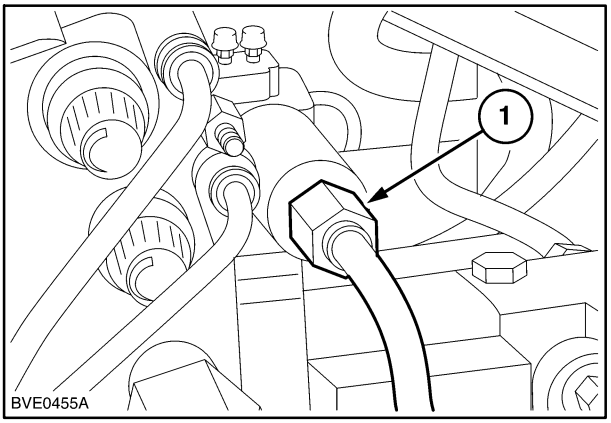
4. Connect the trailer brake valve oil supply pipe (1).
5. Connect the Italian trailer brake solenoid valve electrical connectors.
6. Refill the driveline with the correct specification oil.



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SECTION 35 - HYDRAULIC SYSTEMS

Chapter 7 - Mechanical Remote Control Valves

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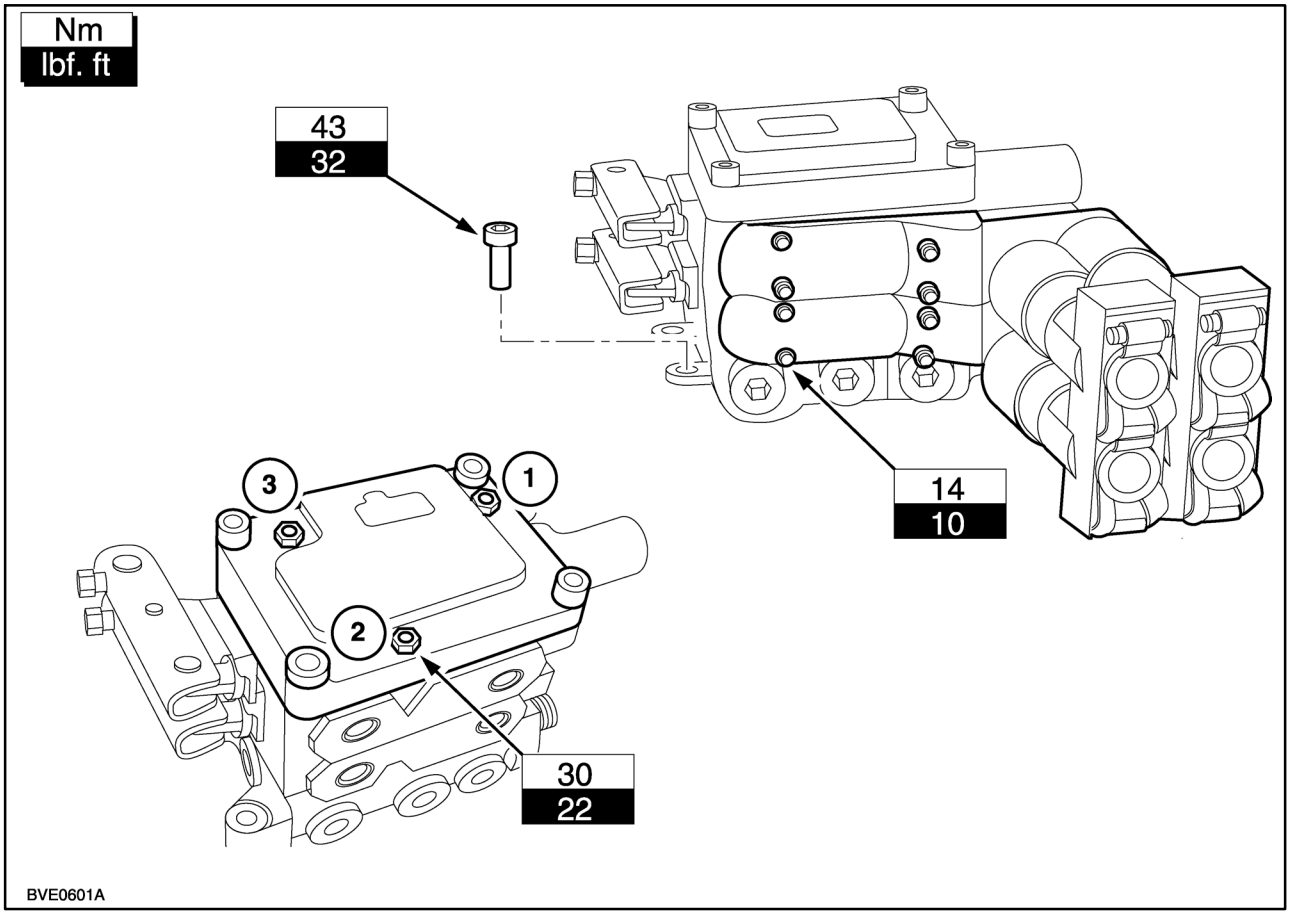
	Removal	23
	Installation	26
	Cable Adjustment	29
	Disassembly	30
	Assembly	36

SPECIFICATIONS

Remote Control Valve Output	90 ltrs/min. @ 100bar @ 2200erpm
Detent Regulating Valve Pressure	Pre set non adjustable

TIGHTENING TORQUES



1

SPECIAL TOOLS

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**. To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

297612 Lifting bracket

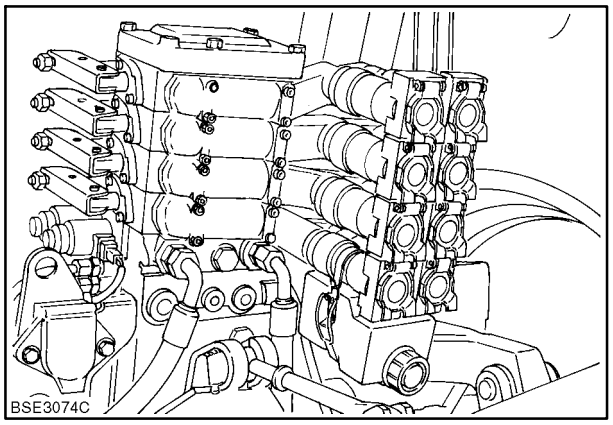
TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	CORRECTION
One remote control valve does not operate	Cable broken	Replace the cable
	Main control spool stuck	Loosen and retighten the remote control valve stack tie-rod retaining nuts to the specified torque value and sequence
	Spool centring and detent mechanism faulty	Examine the spool centring and detent mechanism
	Lock valve faulty	Examine the lock valve
	Load sensing check valve stuck	Examine the load sensing check valve
	Remote control valve faulty	Repair or replace the remote control valve
All remote control valves do not operate	Pressure relief valve / pressure compensating valve pressure set too low	Adjust the pressure relief valve / pressure compensating valve to 205 bar
	Pressure relief valve / pressure compensating valve faulty	Repair or replace the pressure relief valve / pressure compensating valve
	Flow compensating valve pressure set too low (low pressure standby)	Adjust flow compensating valve to 23 bar
	Flow compensating valve faulty	Repair or replace the flow compensating valve
Actuator being operated drops before raising	Load hold check valve faulty	Examine the load hold check valve

DESCRIPTION AND OPERATION

MECHANICAL REMOTE CONTROL VALVES

Hydraulic remote control valves are available to operate external hydraulic cylinders, motors etc. All models have two valves as standard, installed at the rear of the tractor adjacent to the top link.



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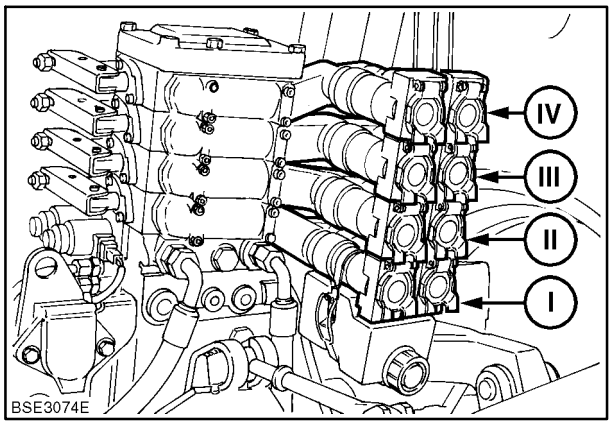
The levers and their respective valves are colour coded for identification.

I	Green
II	Blue
III	Brown
IV	Black



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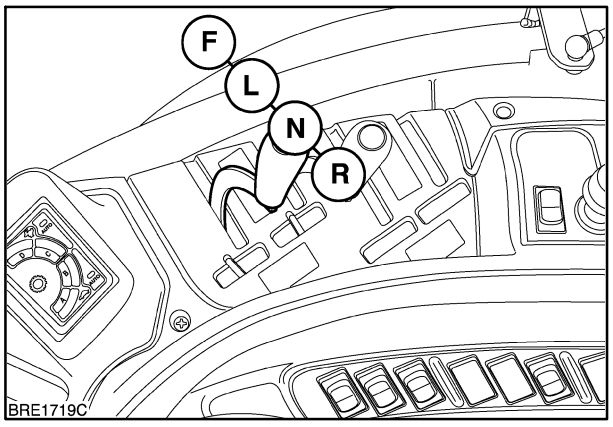
Each valve is controlled by a separate lever providing four operating positions.

Raise (R) – Pull a lever toward you to extend the cylinder to which it is connected.

Neutral (N) – Push the lever forward to select neutral and de-activate the connected cylinder.

Lower (L) – Push the lever forward, past neutral, to retract the cylinder.

Float (F) – Push the lever fully forward, beyond the 'lower' position, to select 'float'. This will permit the cylinder to extend or retract freely, allowing equipment such as scraper blades to 'float' or follow the ground contour.



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Each control lever has a 'rolling gate' which is used to select or lock-out individual remote valve functions. Detents on the lever (1) will lock the 'gate' in one of five positions.

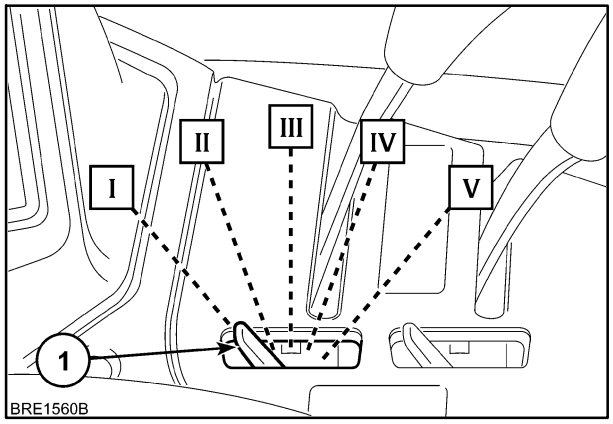
I. - Neutral and Raise locked out: Lower and Float functional. Move the lever into float before selecting this position.

II. - Raise locked out: Neutral, Lower and Float functional.

III.- All valve functions are operative.

IV. - Float locked out: Raise, Neutral and Lower functional.

V. - Lever locked in neutral: No valve functions are available.



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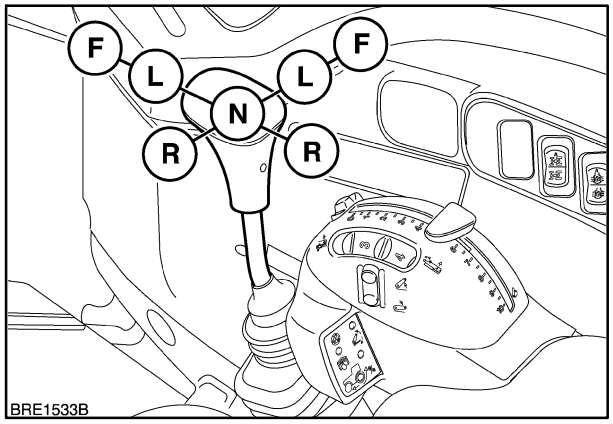
On tractors with four valves, the first and second valves may be controlled by levers or by a 4-way joystick control mounted to the right of the operator's seat.

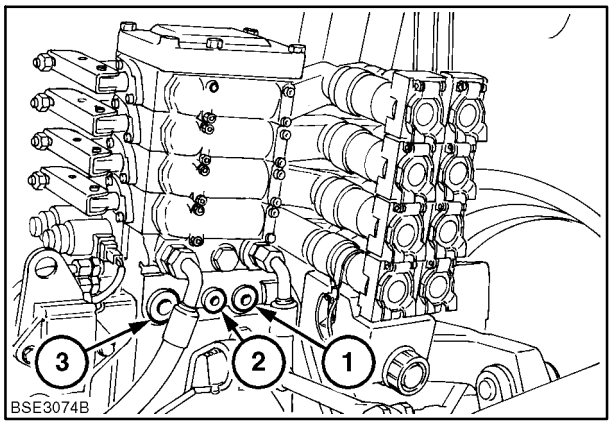


6

ADDITIONAL OIL SUPPLY FOR REMOTE HYDRAULIC SERVICES

For implements or attachments requiring continuous or high oil flows from the tractor hydraulic system, provision is made to connect directly into the main hydraulic circuit at the rear of the tractor.

1. Pressure Line (P) - M22 x 1.5/15.5 (ISO 6149)
2. Low Pressure Relief Valve (30 Bar)
3. Return Oil Line (R) - M27 x 2/19 (ISO 6149)



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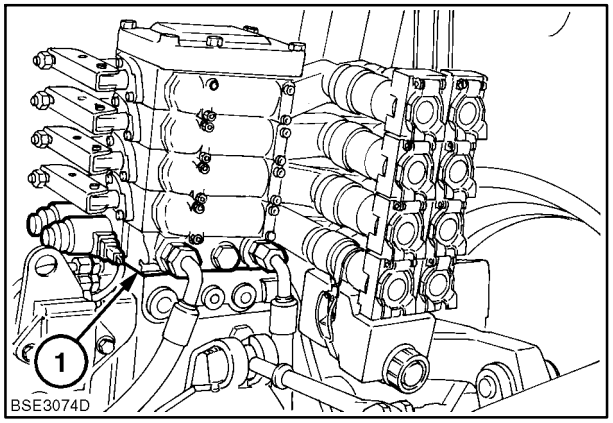
The remote valves are are a stack type design clamped together with the hydraulic lift Electronic Draft Control valve (1) on the Closed Centre Load Sensing hydraulic systems.



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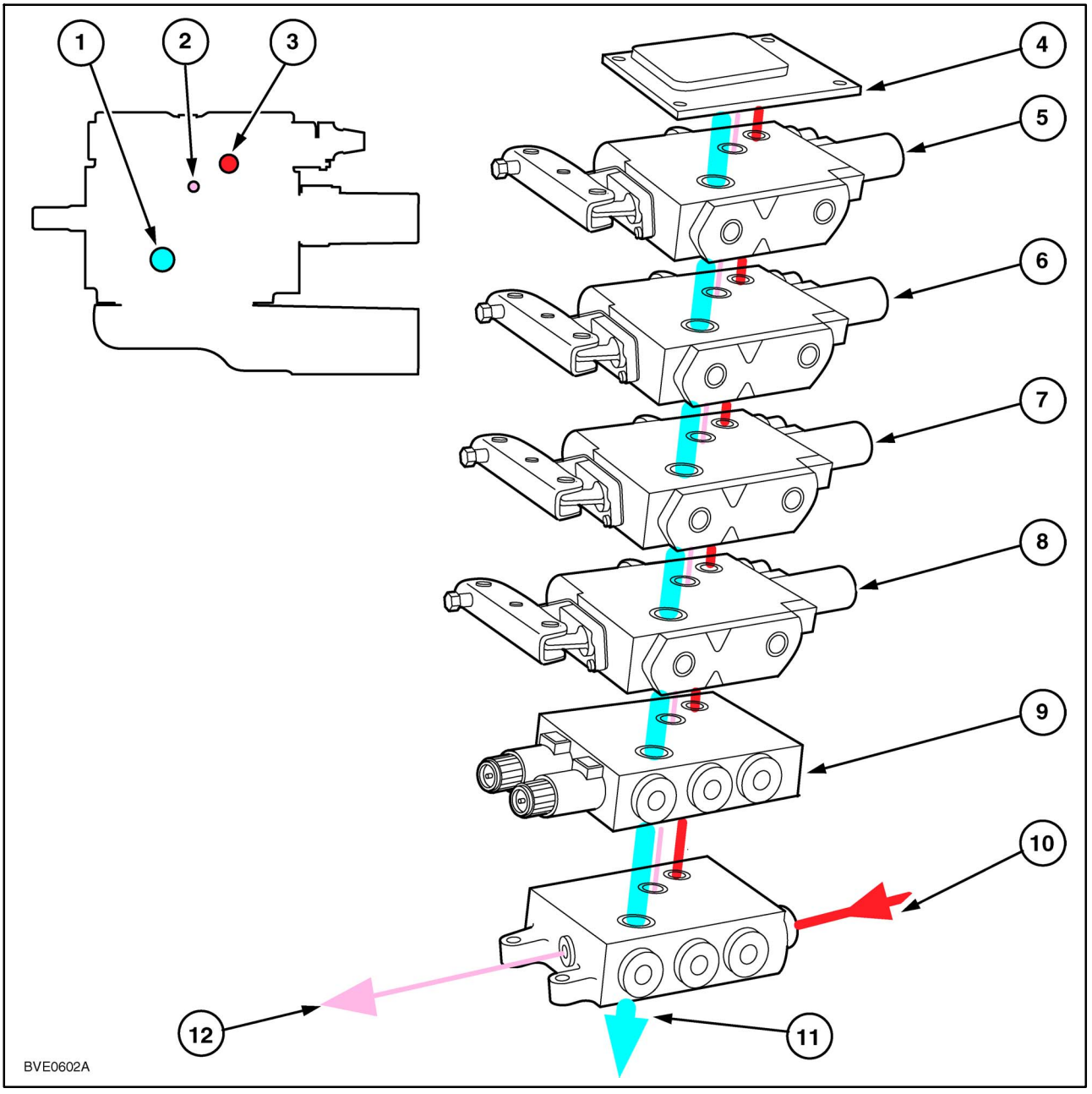


9

Remote Control Valve and Electronic Draft Control Valve Interconnecting Galleries

Pump Pressure

Return To Reservoir

Load Sensing

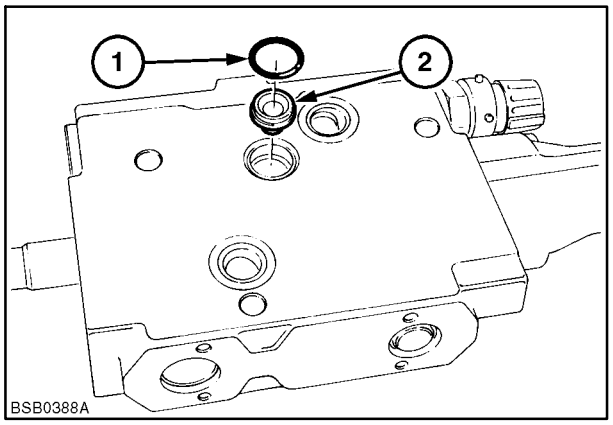
1. Return to Reservoir
2. Load sensing Gallery
3. Parallel Supply Gallery
4. End Cover
5. Remote Control Valve IV
6. Remote Control Valve III
7. Remote Control Valve II
8. Remote Control Valve I
9. Electronic Draft Control Valve
10. From Hydraulic Oil Pump
11. Return to Reservoir
12. Load Sense Line

All valve sections have a common parallel inlet and return to reservoir gallery.

The load sensing gallery passes through the centre of the valve stack and signals the pump to increase or decrease output according to the demand.

The parallel gallery and load sensing system enables two or more valves to be operated simultaneously without loss of efficiency.

'O' ring seals (1) and load sense check valves (2) between each valve section ensure the highest circuit load sense pressure is transmitted to control the output of the hydraulic oil pump.



10

The principal hydraulic components within each remote control valve section are:-

FLOW CONTROL ADJUSTER

The flow control adjuster is manually operated and adjusts oil flow through the remote valve. Turning the adjuster changes the size of the restriction in the path of oil flowing through the flow control spool.

FLOW CONTROL SPOOL

The flow control spool senses pressure differential across the restriction set by the flow control adjuster and regulates flow through the remote valve. Because each flow control spool individually senses the pressure differential in the remote valve being operated, two or more circuits working at different pressures can be controlled simultaneously.

LOAD HOLD CHECK VALVE

The load hold check valve prevents a backflow of pressure from the remote valve circuit when the main control spool is operated and the hydraulic oil pump system pressure is less than the backpressure in the circuit.

This is explained by the following example:-

When a cylinder is holding a heavy load and the main control spool is moved from the neutral to the raise position, the hydraulic system pressure may be less than the back pressure in the remote control valve circuit. When this occurs the back pressure would cause oil in the circuit to flow backwards and the load to momentarily drop before hydraulic system pressure has risen to hold and then raise the load further. The load hold check valve prevents this situation from occurring.

MAIN CONTROL SPOOL

The main control spool is spring centered to a neutral position and when moved directs oil flow to the raise or lower ports of the remote control valve.

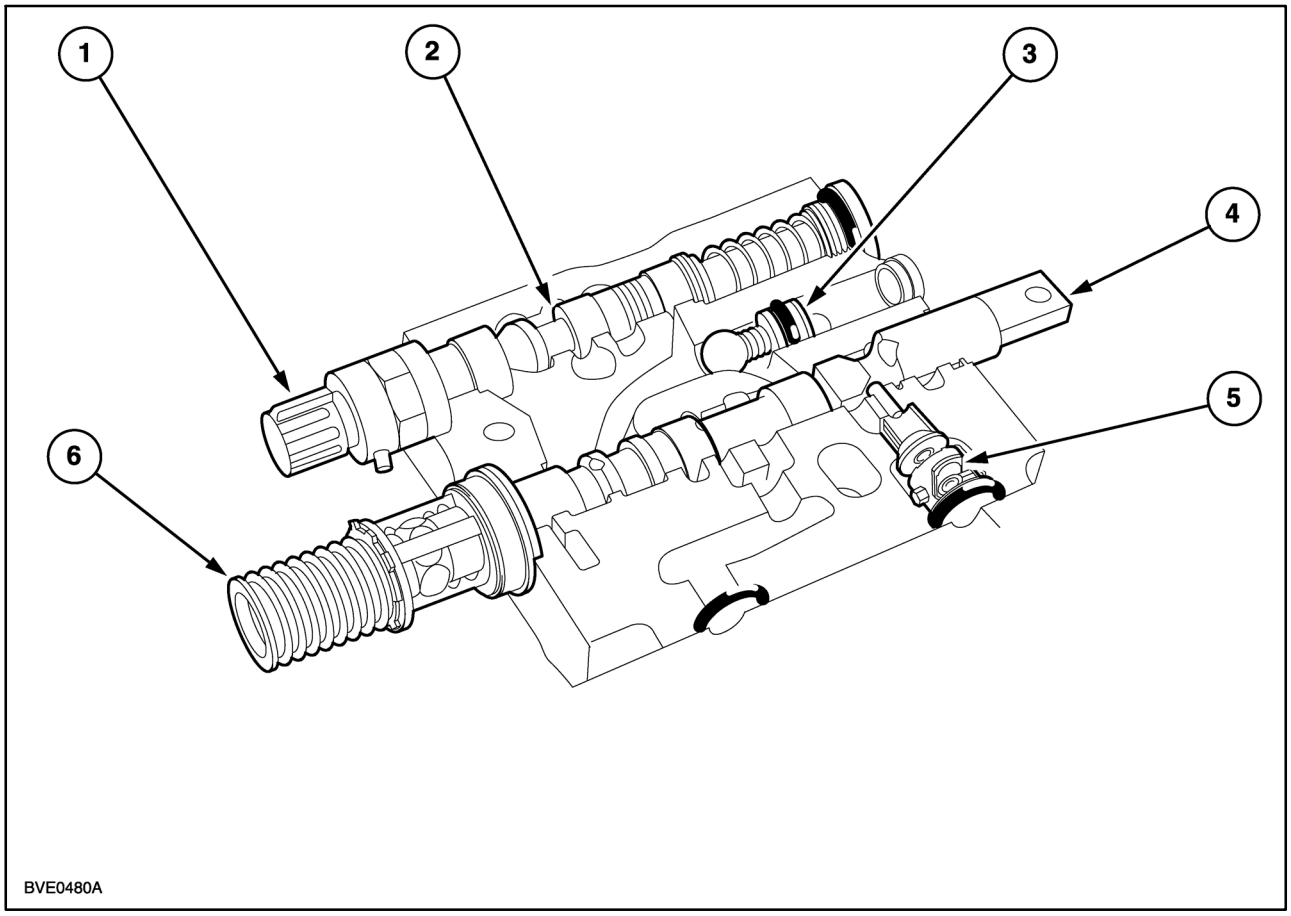
LOCK VALVE

The lock valve is located in the raise port of the remote control valve and is closed whenever the main control spool is in neutral. The lock valve prevents leakdown of an implement should there be any leakage across the lands of the main control spool when in the neutral position. The lock valve is automatically opened whenever the main control spool is moved from the neutral position.

SPOOL CENTRING AND DETENT MECHANISM

The spool centring and detent mechanism spring loads the main control spool to the neutral position. When the main control spool is moved to the Raise, Lower or Float positions the spool centring and detent mechanism holds the main control spool in position using ball bearings which engage in grooves within a detent cage.

A factory set detent regulating valve in the spool centring and detent mechanism automatically releases the balls and returns the main control spool to neutral whenever the operating pressure exceeds the preset value.



11

Remote Control Valve Components

1. Flow Control Adjuster
2. Flow Control Spool
3. Load Hold Check Valve
4. Main Control Spool
5. Lock Valve
6. Spool Centring and Detent Mechanism

OIL FLOW IN NEUTRAL

When the remote control valves are in neutral, the main control spool is held in the central position by the centring spring.

Oil flow from the parallel gallery (A) to the raise and lower ports is blocked by the lands of the main control spool.

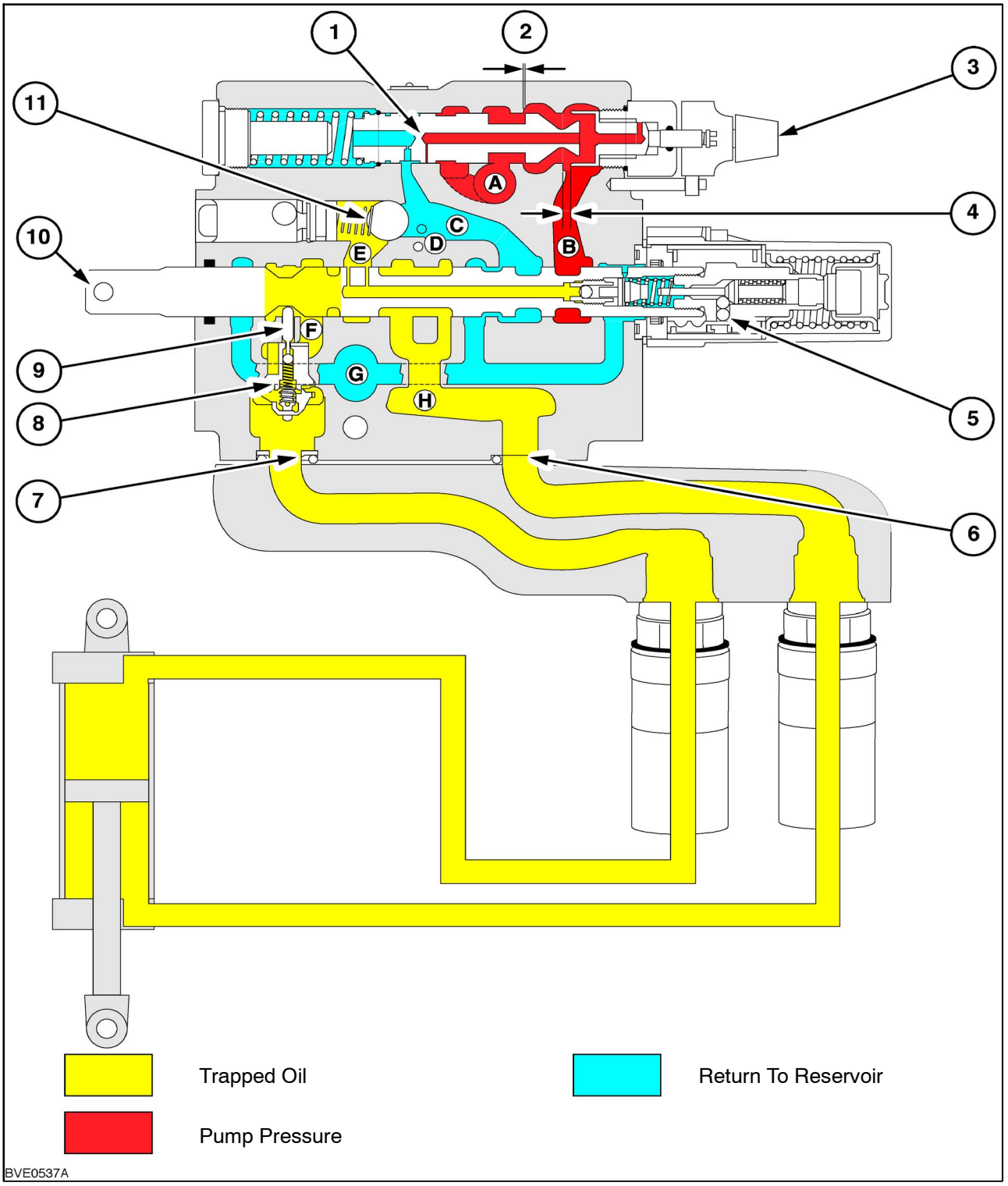
Gallery 'C' and load sensing gallery 'D' are vented to the reservoir through galley 'G'.

The galleries to the raise and lower ports are blocked by the lands on the main control spool.

The pin (9) on the lock valve (8) is positioned in the waisted section of the main control spool (10) allowing the lock valve (8) to be spring loaded into the closed position preventing an extended cylinder retracting under load, should there be a slight leakage in the main control spool.

Figure 12
Single Remote Control Valve Operation – Neutral

1. Flow Control Spool
2. Metering Land
3. Flow Control Adjuster
4. Manually Adjusted Flow Control Restriction
5. Spool Centring and Detent Mechanism
6. Lower (Cylinder Retract) Port
7. Raise (Cylinder Extend) Port
8. Lock Valve
9. Pin
10. Main Control Spool
11. Load Hold Check Valve Ball



12

Single Remote Control Valve Operation - Neutral

OIL FLOW IN RAISING (CYLINDER EXTEND)

When the remote control valve lever is moved to the raise position, the main control spool (10) moves to the right and the spring loaded detent balls (5) engage with the left hand groove in the detent mechanism.

Moving the main control spool (10) to the raise position causes the pin (9) on the lock valve (8) to ride up the ramp of the main control spool and hold the lock valve in the open position.

Gallery 'B' is now open to gallery 'C' and gallery 'E' is open to gallery 'F'.

The flow from gallery 'C' is blocked by the load hold check valve ball (11) until the pressure in the gallery is sufficient to lift load hold check valve ball (11) of its seat against the back pressure in the lift port gallery 'E'.

Oil can flow from:-

Gallery 'C' past the load hold check valve ball (11) into Gallery 'E'.

Across the flat on the main control spool (10) to Gallery 'F'.

Through the lock valve (8).

Out through the raise port (7) of the remote control valve.

Exhaust oil from the extending cylinder returns through the lowering port (6) and gallery (H), around the land on the main control spool (10) and back to the reservoir via the common gallery 'G'.

If the load hold check valve ball (11) was not installed the situation could occur where pump pressure is insufficient to support the load in the raise port (7) when the remote control valve is moved from neutral to the raise position. Under this situation the load would momentarily drop until pump pressure was sufficient to support the load.

The rate of flow through the remote control valve is adjusted by the manual flow control adjuster (3), which manually changes the size of restriction (4).

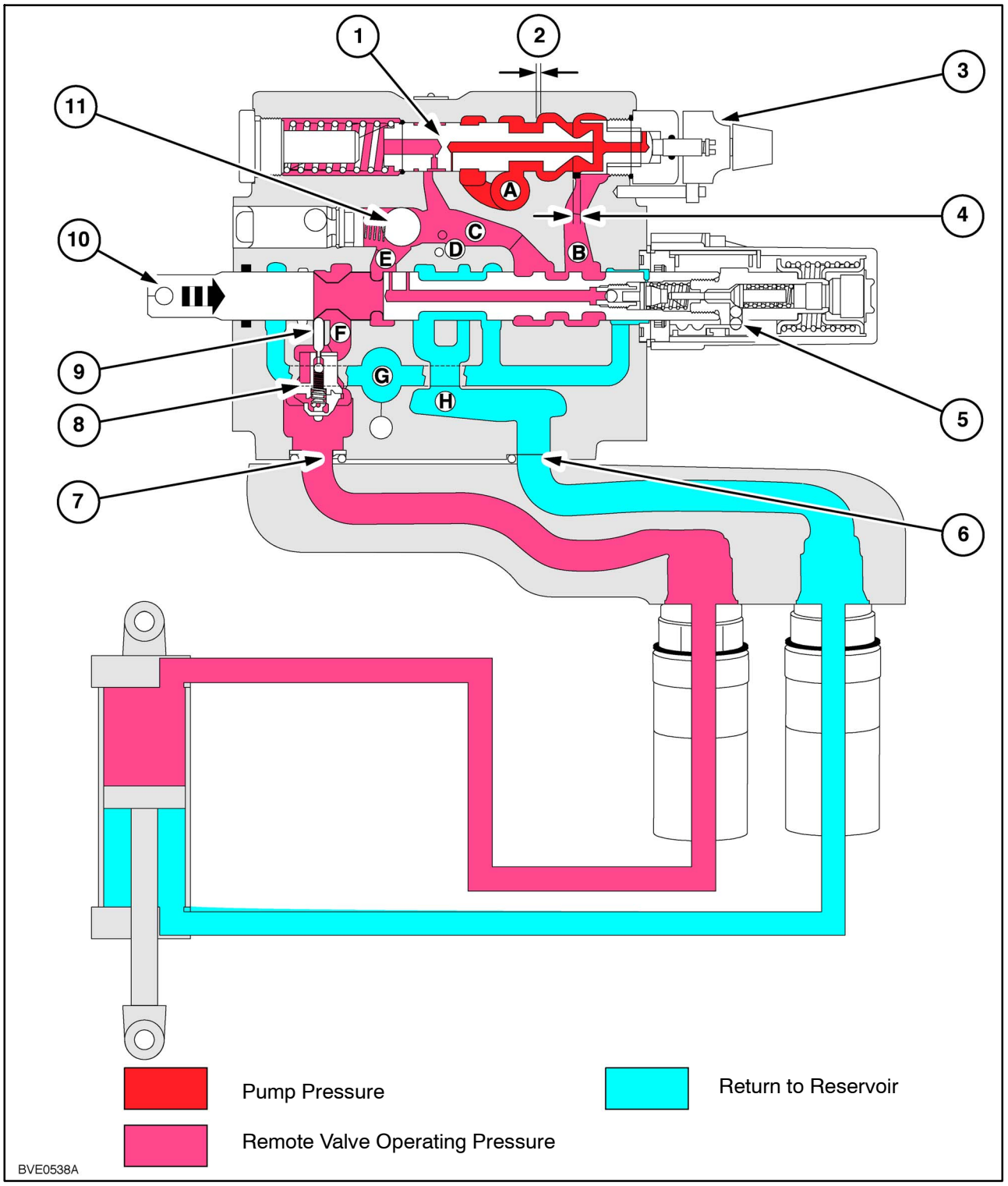
To maintain set flow through the remotes under all conditions with varying pump inlet pressure in parallel gallery 'A' the flow control spool senses the differential pressure across the manually adjusted flow control restriction (4) between galleries 'A' and 'B'.

The differential pressure sensed on each end of the spool causes the spool to move to a new state of equilibrium and continually regulates the flow across the spool metering lands (2) to maintain a constant flow through the manually adjusted flow control restriction (4) irrespective of the pressure in other hydraulic circuits.

The pressure in gallery 'C' is also transmitted down the load sensing gallery 'D' to the flow compensating valve of the variable flow piston pump where pump output is regulated according to the circuit demand.

Figure 13
Single Remote Control Valve Operation-Raising (Cylinder Extend)

1. Flow Control Spool
2. Metering Land
3. Flow Control Adjuster
4. Manually Adjusted Flow Control Restriction
5. Detent Balls
6. Lower (Cylinder Retract) Port
7. Raise (Cylinder Extend) Port
8. Lock Valve
9. Pin
10. Main Control Spool
11. Load Hold Check Valve Ball



13

Single Remote Control Valve Operation - Raising (Cylinder Extend)

OIL FLOW IN LOWERING (CYLINDER RETRACT)

When the remote control valve lever is moved to the lower position the main control spool (10) moves to the left and the spring loaded detent balls (5) engage with the middle groove in the detent mechanism.

In a similar manner as for the raise cycle of the remote control valve the position of the spool causes the pin (9) on the lock valve (8) to hold the lock valve in the open position.

Gallery 'B' is now open to gallery 'C' and gallery 'E' is open to gallery 'H'.

Oil from the parallel gallery 'A' flows past the flow control spool (1) and the restrictor (2) into gallery 'C' and the load sensing gallery 'D'.

The load hold check valve ball (11) remains closed until pump system pressure is sufficient to overcome the back pressure in gallery 'E'. When the load hold check valve ball (11) lifts of the seat oil flows into gallery 'H', round the main control spool (10) to gallery 'G' and out through the lowering port (6) of the remote control valve coupling.

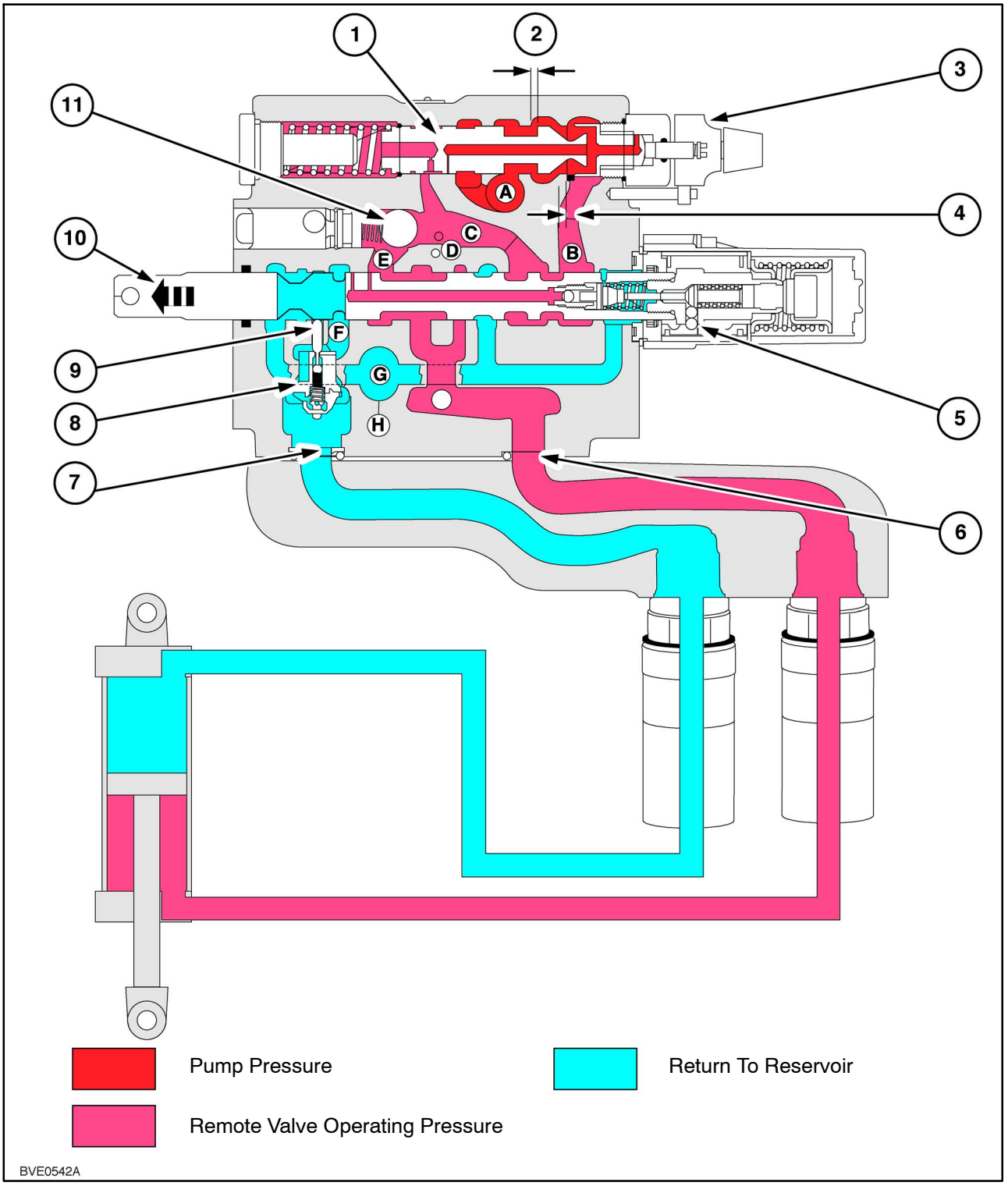
Exhaust oil from the retracting cylinder returns to the reservoir gallery 'G' though the raise port (7) and the lock valve (8).

Pump output and system pressure will continually react to the maximum demand of the tractor high pressure hydraulic circuits as sensed through the load sensing lines.

Flow through the remote control valve is controlled in exactly the same manner as described in the 'Oil Flow In Raising' section by sensing differential pressure across the manually adjusted flow control restriction (4).

Figure 14
Single Remote Control Valve Operation – Lowering (Cylinder Retract)

1. Flow Control Spool
2. Metering Land
3. Flow Control Adjuster
4. Manually Adjusted Flow Control Restriction
5. Detent Balls
6. Lower (Cylinder Retract) Port
7. Raise (Cylinder Extend) Port
8. Lock Valve
9. Pin
10. Main Control Spool
11. Load Hold Check Valve Ball



14

Single Remote Control Valve Operation - Lowering (Cylinder Retract)

OIL FLOW IN FLOAT

The float position allows the free flow of oil from both the raise and lower ports of the remote control valve permitting the cylinder to extend or retract freely. This feature is particularly useful to allow equipment such as scraper blades to 'float' or follow the ground contour.

When the remote control valve lever is pushed fully forward to the float position the main control spool (10) is moved fully to the left and the spring loaded detent balls engage with the right hand groove in the detent mechanism (5).

Oil flow from the gallery (B) to the raise and lower ports is blocked by the lands of the spool.

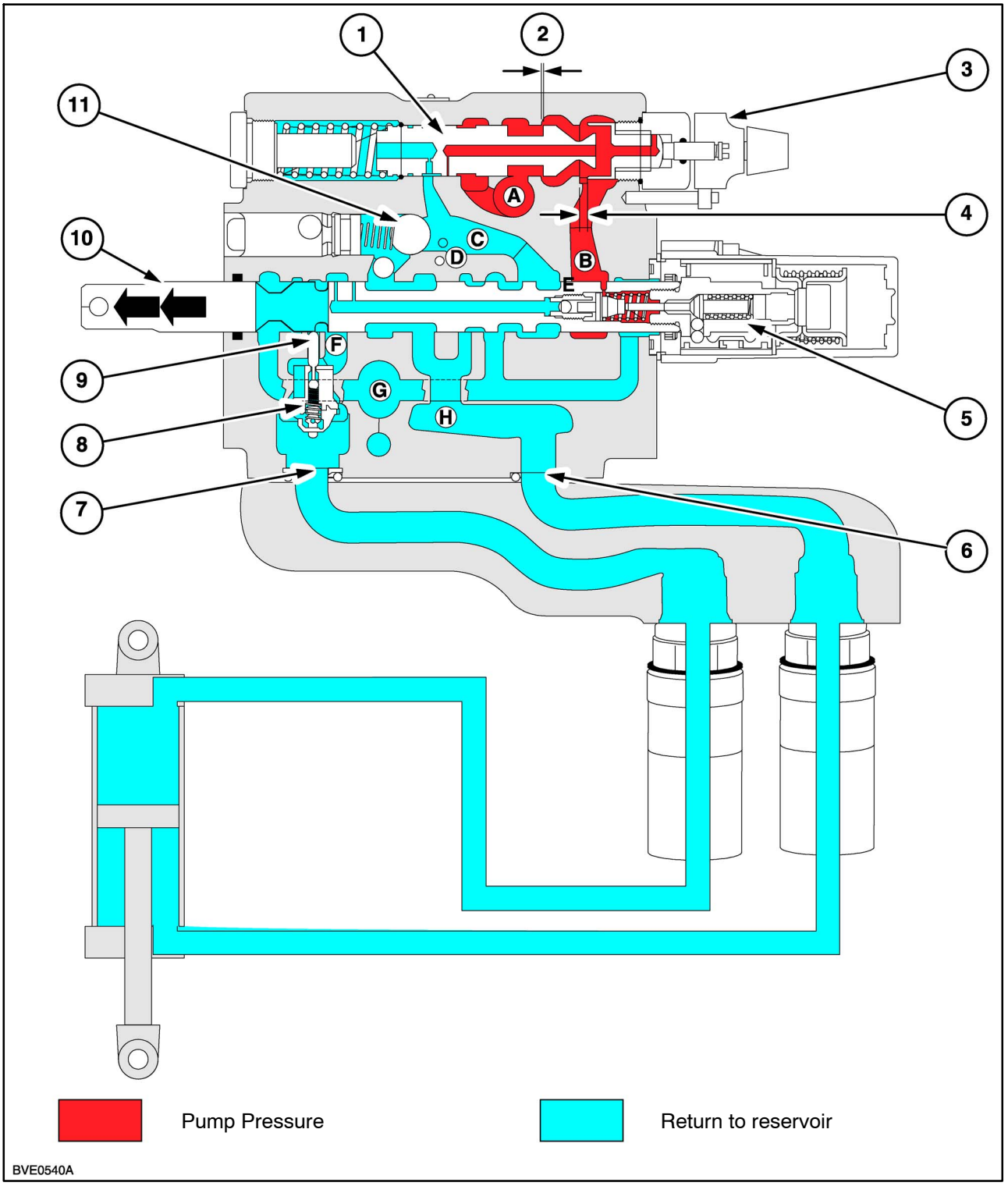
The position of the main control spool (10) causes the pin (9) on the lock valve (8) to hold the lock valve in the open position.

The raise and lower ports of the remote control valve are open to the reservoir gallery 'G' allowing a free flow of oil from one port of the cylinder to the other.

Should a void occur in the circuit oil will be drawn by suction from one side of the cylinder to the other.

Figure 15
Single Remote Control Valve Operation – Float

1. Flow Control Spool
2. Metering Land
3. Flow Control Adjuster
4. Manually Adjusted Flow Control Restriction
5. Spool Centring and Detent Mechanism
6. Lower (Cylinder Retract) Port
7. Raise (Cylinder Extend) Port
8. Lock Valve
9. Pin
10. Main Control Spool
11. Load Hold Check Valve



15

Single Remote Control Valve Operation - Float

OPERATION OF DETENT PRESSURE REGULATING VALVE

Under normal operating conditions excessive pressures in the remote control valve circuits are protected by the detent pressure regulating valve which returns the main control spool (1) to neutral when the operating pressure of the cylinder exceeds the factory preset value.

If the remote control valve lever is physically held by the operator to prevent the main control spool (1) returning to neutral the maximum operating pressure is restricted to a maximum of 205 bar by the pressure compensating valve in the closed centre load sensing (CCLS) hydraulic pump.

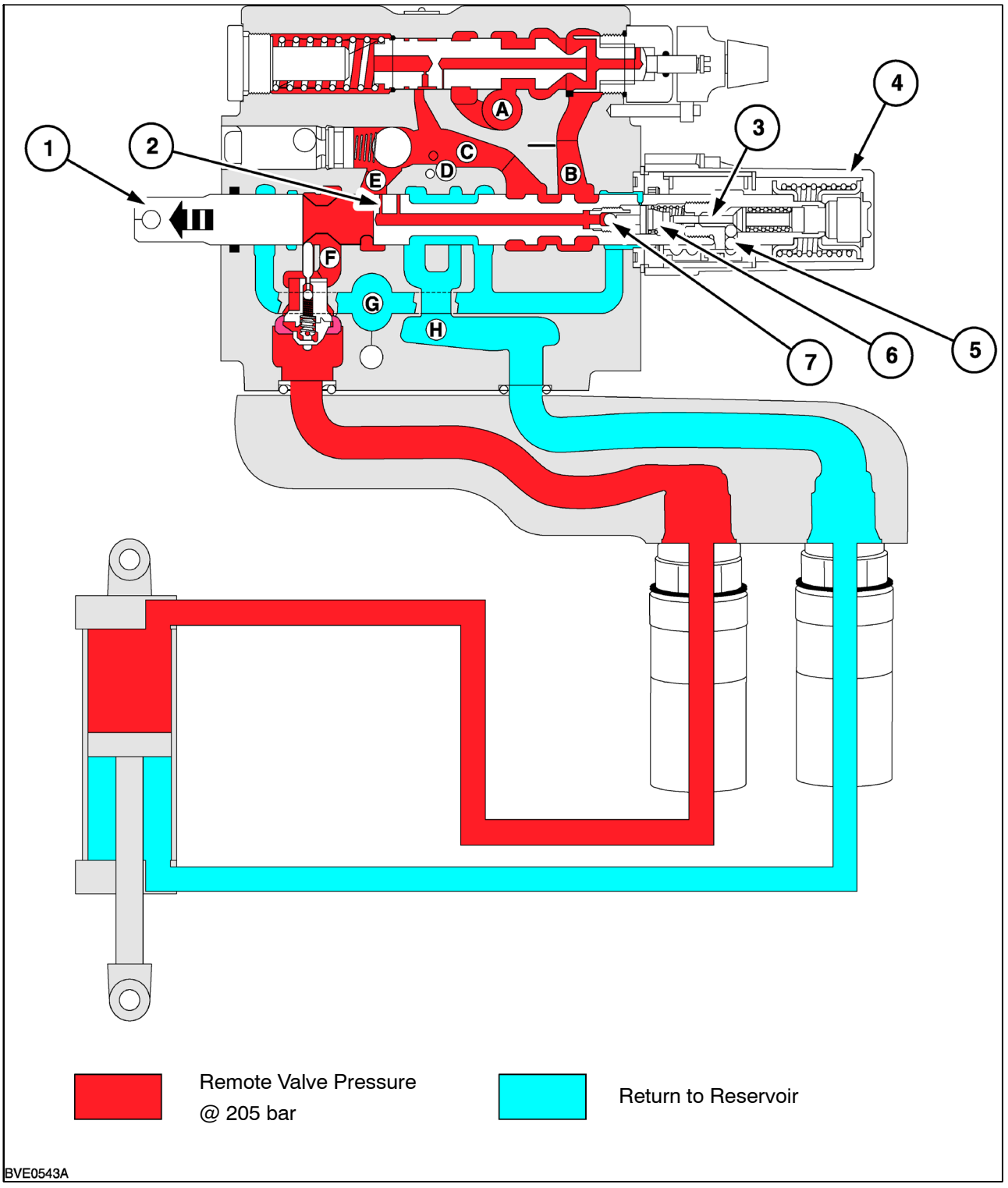
Operation of the detent regulating valve is as follows:-

When the main control spool (1) is moved to the raise or lower position the detent balls (5) of the spool centering and detent mechanism (4) are held in detents by the tapered face of the spring loaded plunger (3).

In the raise or lower condition the operating pressure of the remote control valve circuit is also sensed in the centre drilling of the main control spool through the small radial drillings (2). As pressure increases a force is applied to the small ball (7) in the end of the main control spool (1) which pushes the detent regulating valve piston (6) and spring loaded plunger (3) to the left. The detent balls in the centring mechanism are no longer held in the detent by the tapered face of the spring loaded plunger (3) and the centring spring moves the main control spool to neutral.

Figure 16
Operation of Detent Pressure Regulating Valve

1. Main Control Spool
2. Radial Drillings
3. Spring Loaded Plunger
4. Spool Centring and Detent Mechanism
5. Detent Balls
6. Detent Regulating Valve Piston
7. Ball



16

Operation of Detent Pressure Regulating Valve

NOTES

OPERATION OF TWO OR MORE CONTROL VALVES SIMULTANEOUSLY

Because the stack type remote valves have a common parallel input gallery and individual flow control valves it is possible to operate two or more remotes simultaneously without loss of efficiency.

This is achieved by the flow control spools which regulate flow through each remote valve irrespective of pump system pressure.

If these valves were not fitted and two remotes were operating simultaneously at different pressures all oil would attempt to flow to the light load circuit.

The following details the process of operating a single remote valve and then operating an additional remote valve at the same time.

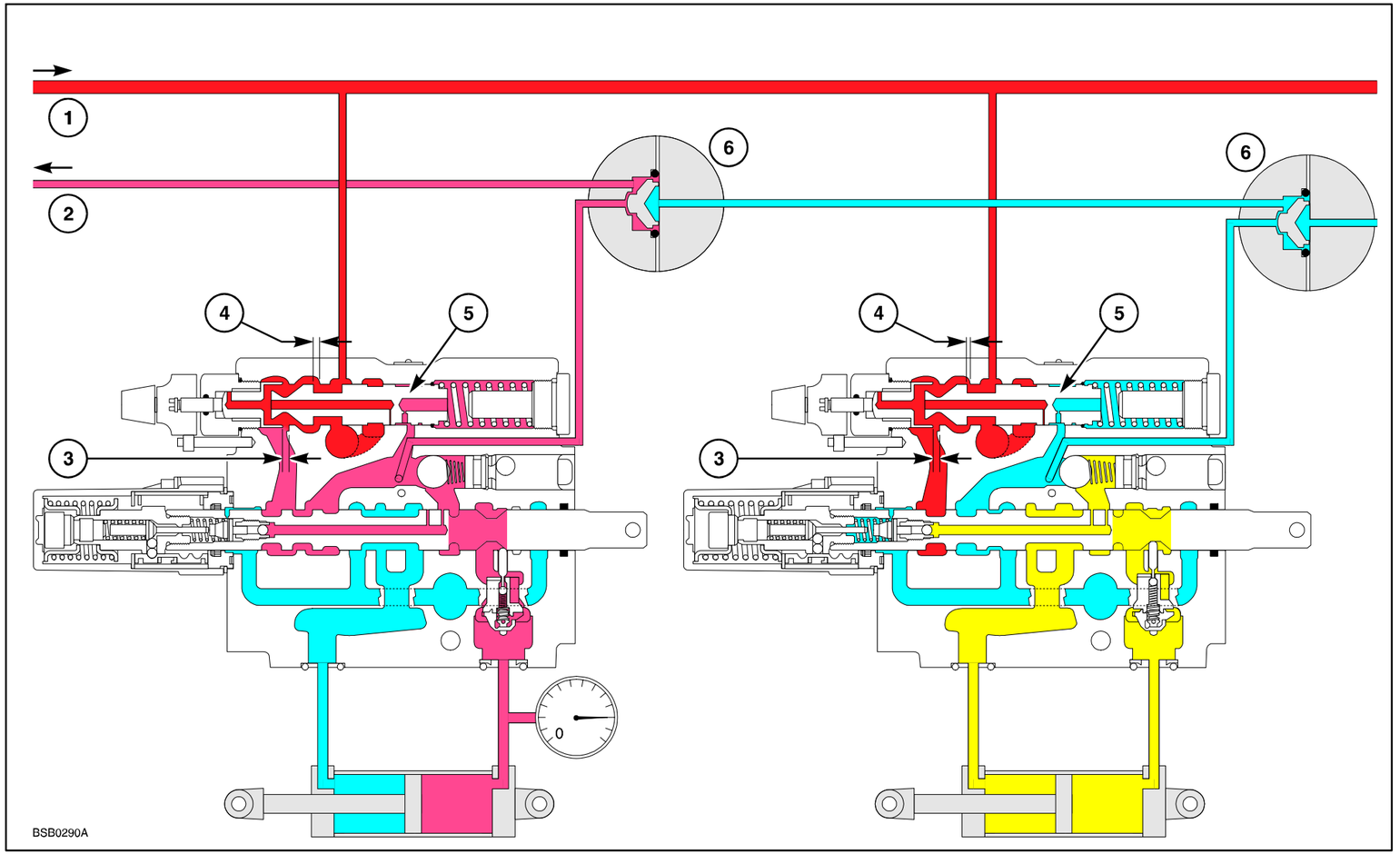
When a single service is operated the pressure in the parallel gallery is at pump pressure.

The pressure in the load sense line to the hydraulic pump is equal to the operating pressure of the working remote valve.

Required flow through the remote valve is set by turning the manual flow control knob. This action adjusts the size of restriction (3).

The pressure differential across the restriction (3) is sensed on each end of the flow control valve spool and causes the spool to move to a position of equilibrium which adjusts the flow across the spool metering lands (4).

The adjustment of flow across the metering land (4) produces a constant flow across the manually adjusted flow control restriction (3) and through the remote valve.



Single Remote Valve Operating

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Pump Pressure

Return to Reservoir

Remote Valve Operating Pressure

Trapped Oil

A. Remote Valve in Operation

1. Parallel Gallery
(Interconnecting Remote Valves Sections)

2. Load Sense Line
(Interconnecting Remote Valves Sections)

B. Remote Valves in Neutral

3. Manually Adjusted Flow Control Restriction

4. Spool Metering Lands

5. Flow Control Spool

6. Load Sense Line Check Valve

It is essential that the flow of oil through two or more remote valves operating simultaneously at different pressure is individually controlled otherwise oil will always flow to the circuit operating at the lowest pressure.

When operating two or more hydraulic services the operating pressure in the parallel gallery is at the highest operating pressure of the hydraulic system as sensed through the load sense line.

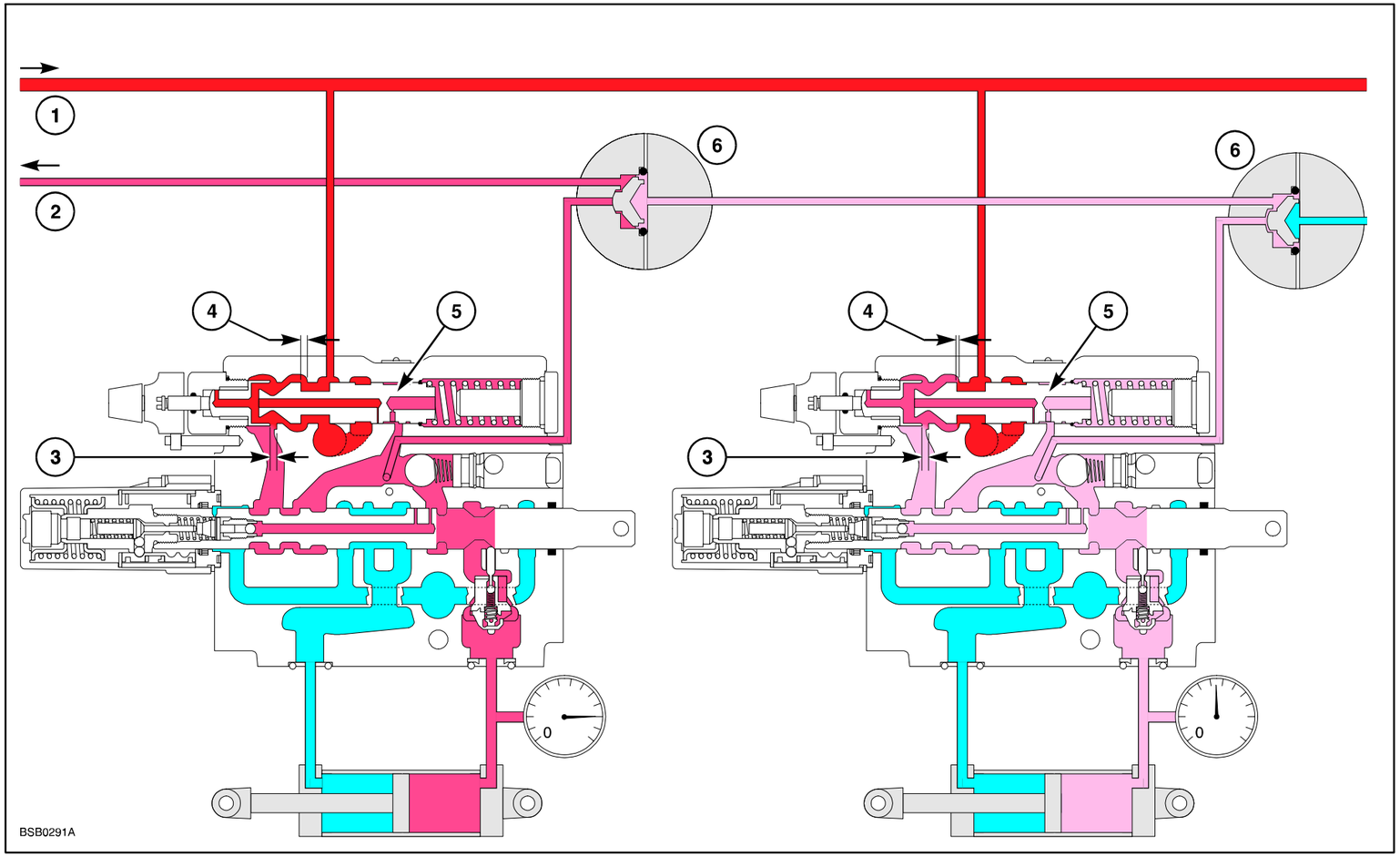
Check valves in the load sense line between each valve section ensure only the highest pressure is directed to the pump flow pressure compensating valve.

In the same manner as for single remote valve operation the differential pressure across the manually adjusted flow control restriction (3) is sensed by the flow compensating spool.

Because each remote valve is operating at a different pressures the flow control valve spools will move to different positions to achieve a state of equilibrium.

The flow across the metering land (4) of the lower pressure operating remote valve will be different to the flow across the metering land of the higher operating pressure remote valve.

The metering land on each flow control spool now maintains the required constant flow through the manually adjusted flow control restriction in each remote valve irrespective of the higher pump system pressure required to operate other hydraulic circuits.



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Two Remote Valves Operating

Pump Pressure

Lower Pressure Remote Valve Operation

High Pressure Remote Valve Operation

Return To Reservoir

A. Remote Valve Operating At High Pressure

1. Parallel Gallery
(Interconnecting Remote Valves Sections)

2. Load Sense Line
(Interconnecting Remote Valves Sections)

B. Remote Valve Operating At Lower Pressure

3. Manually Adjusted Flow Control Restriction

4. Spool Metering Lands

5. Flow Control Spool

6. Load Sense Line Check Valve

OVERHAUL

MECHANICAL REMOTE CONTROL VALVE

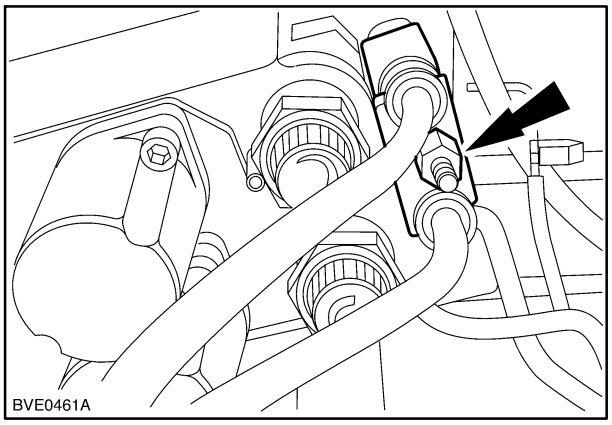
Removal

NOTE: *Individual remote control valve assemblies can be removed from the tractor without the need to remove the complete valve stack*

1. Lower the hydraulic link arms and thoroughly clean the remote control valve stack.

NOTE: *Ensure the remote control valve lever is in the neutral position to aid the removal.*

2. Remove the remote control valve cable retaining clamp.



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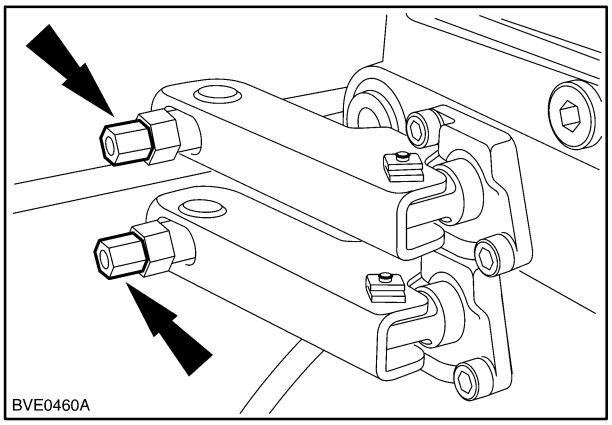
3. Remove the remote control valve cable lock nuts.



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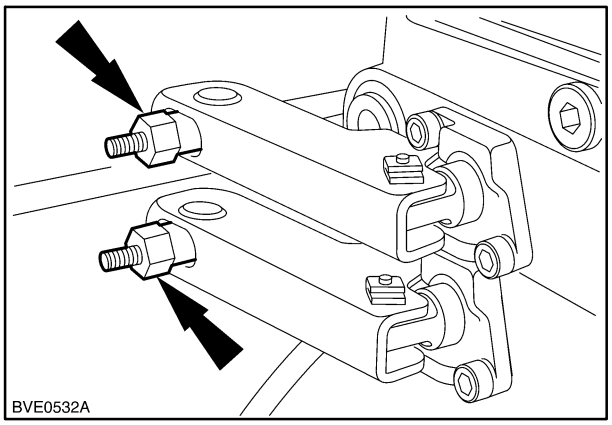
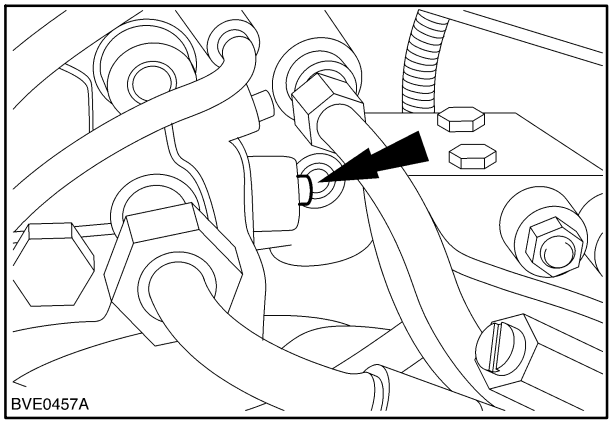
4. Release the remote control valve cable from the adjusting nut.



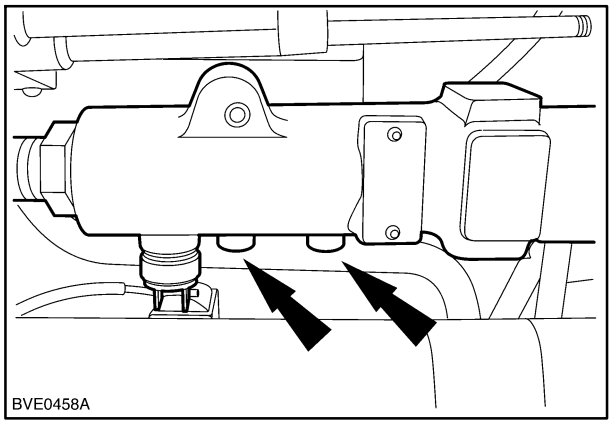
21

5. Remove the trailer brake valve retaining bolt.



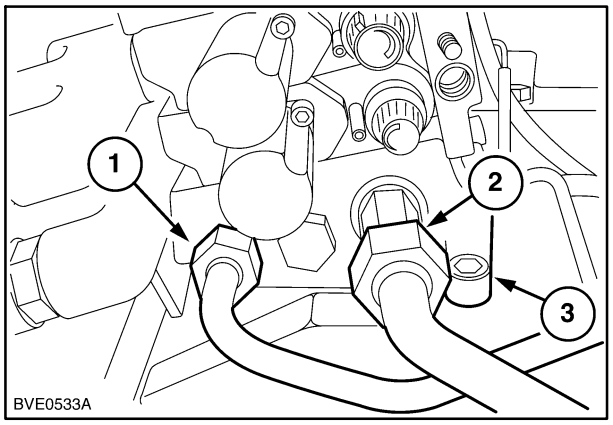
22

6. Remove the remaining trailer brake valve. retaining bolts.



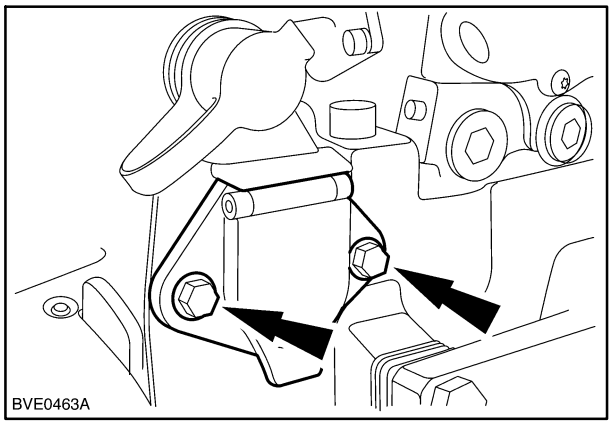
23

7. Disconnect the remote control valve block oil supply pipes (1) and (2).
8. Remove the remote control valve block retaining bolt (3).



24

9. Disconnect the auxiliary electrical socket electrical connector.
10. Remove the auxiliary electrical connector socket.



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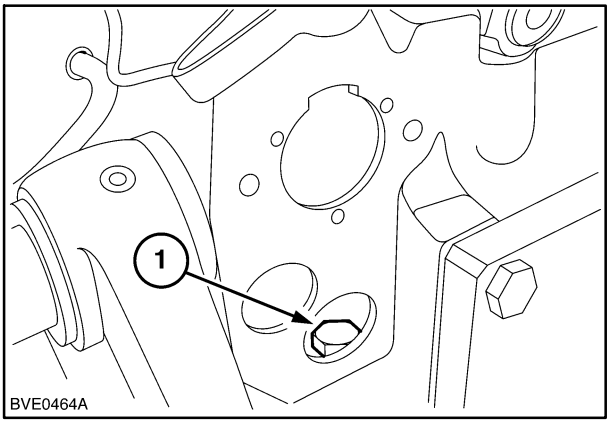
11. Remove the auxiliary electrical socket bracket lower retaining bolt (1).



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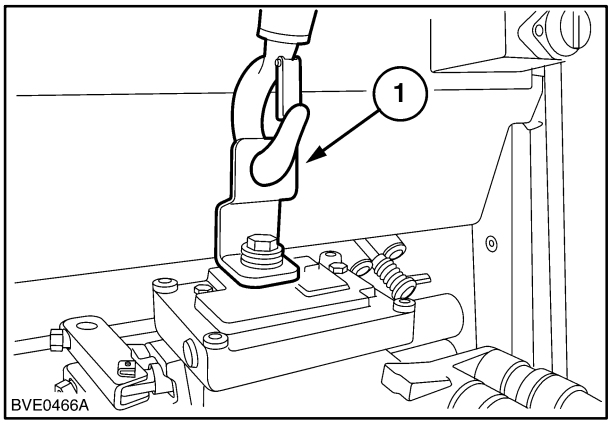
⚠ WARNING ⚠

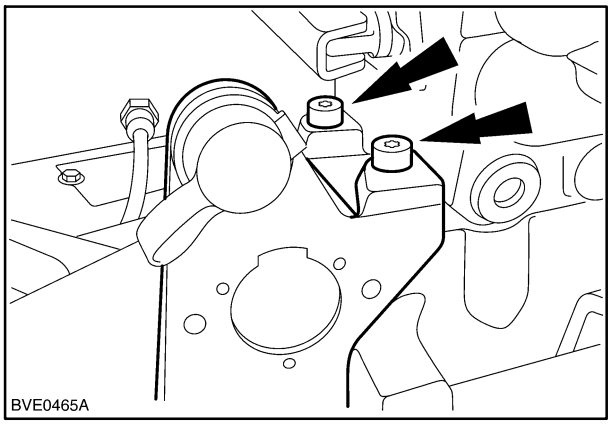
The valve stack is very heavy DO NOT attempt to remove without the use of lifting equipment.

12. Install the lifting bracket 297612 (1) and attach a suitable hoist.



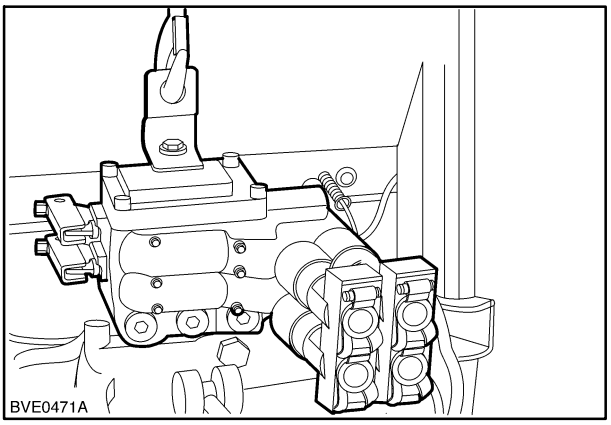
27

13. Remove the two remainig remote control valve block retaining bolts and remove the auxiliary electrical socket bracket.



28

14. Remove the remote control valves.



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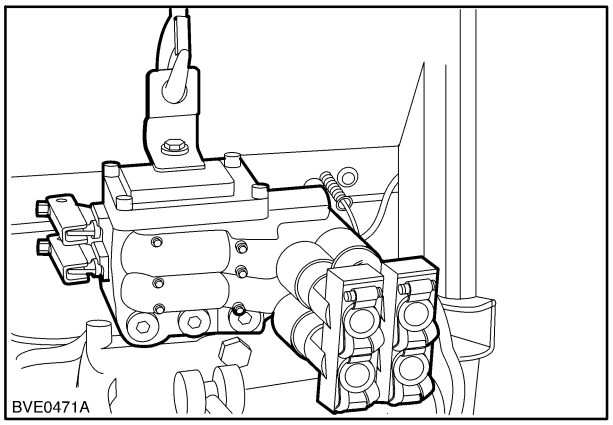
Installation

WARNING

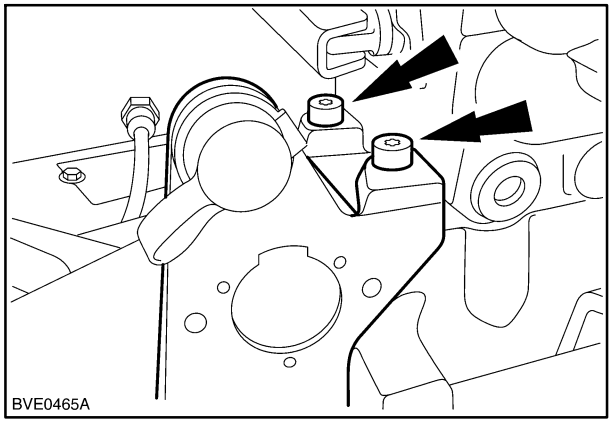
The valve stack is very heavy DO NOT attempt to install without the use of lifting equipment.

1. Install the remote control valves.



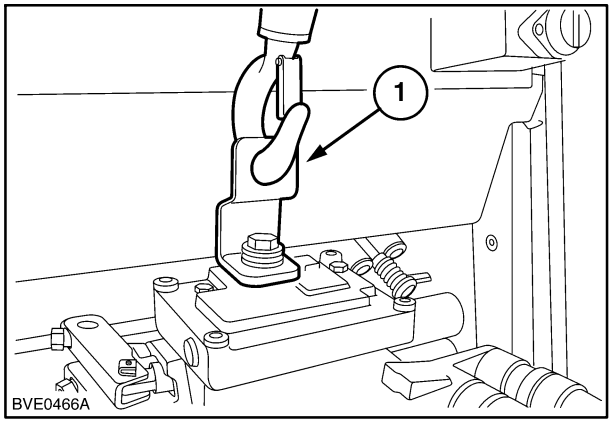
30

2. Install the auxiliary electrical socket bracket and the two remote control valve block retaining bolts.



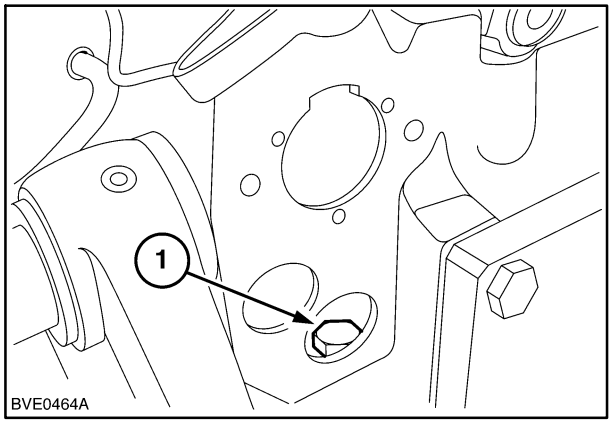
31

3. Detach the hoist and the lifting bracket 297612 (1).



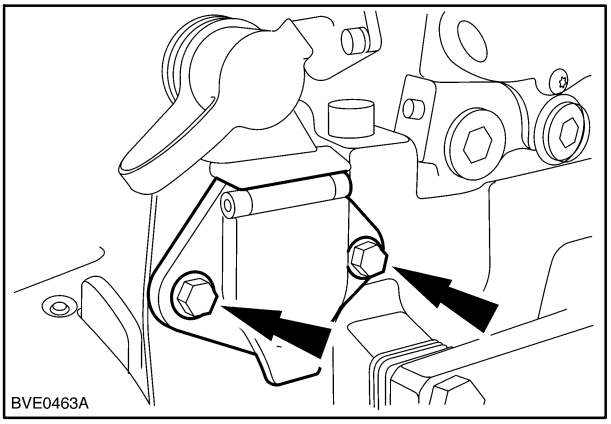
32

4. Install the auxiliary electrical socket bracket lower retaining bolt (1).



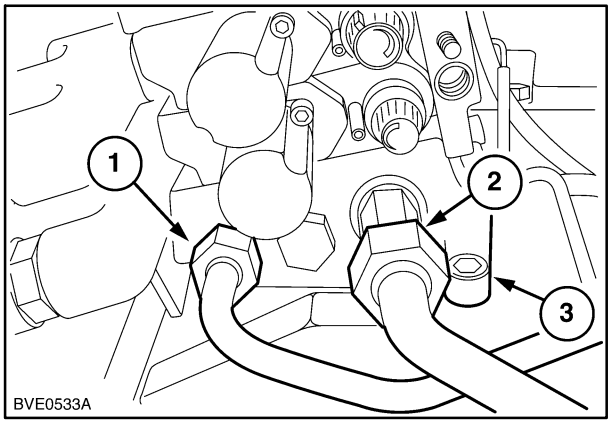
33

5. Install the auxiliary electrical socket.
6. Connect the auxiliary electrical socket electrical connector.



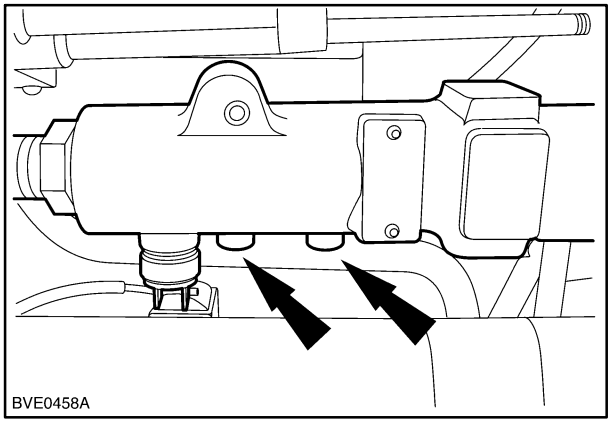
34

7. Install the remote control valve block retaining bolt (3).
8. Connect the remote control valve block oil supply pipes (1) and (2).



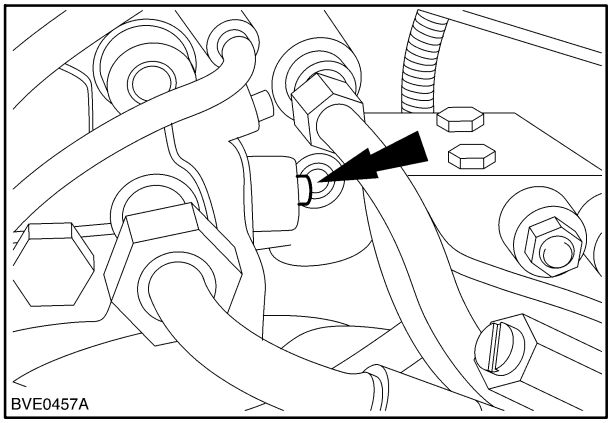
35

9. Install the trailer brake valve retaining bolts.



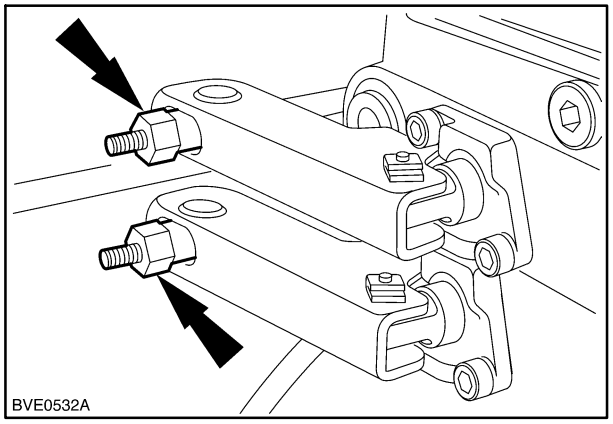
36

10. Install the remaining trailer brake valve retaining bolt.



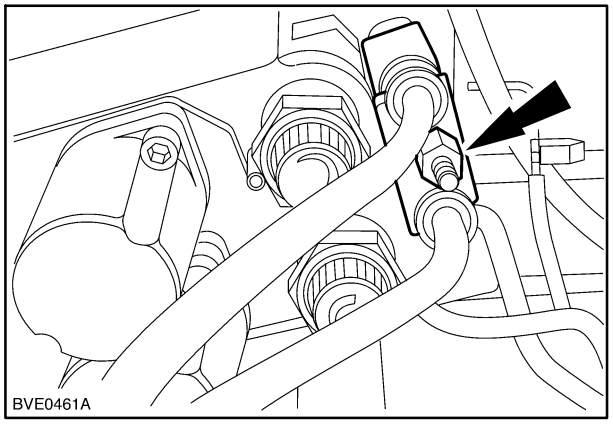
37

11. Install the remote control valve cable into the adjustment nut. Repeat this step for the remaining remote control valve cable(s). (refer to remote control valve cable adjustment in this chapter).



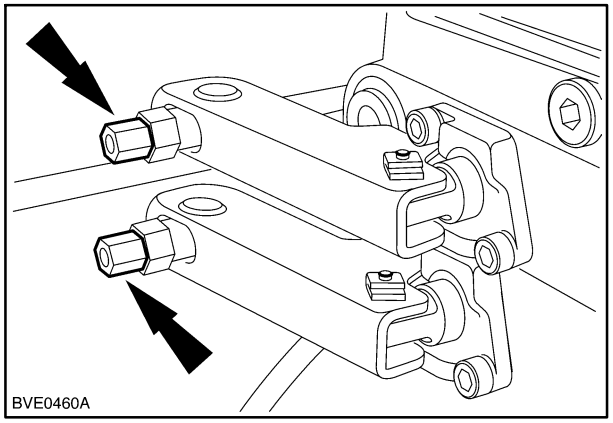
38

12. Install the remote control valve cable retaining clamp.



39

13. Install the remote control valve cable lock nuts.



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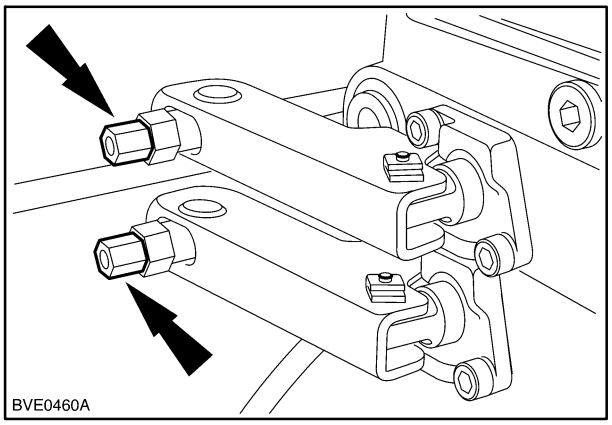
Cable Adjustment

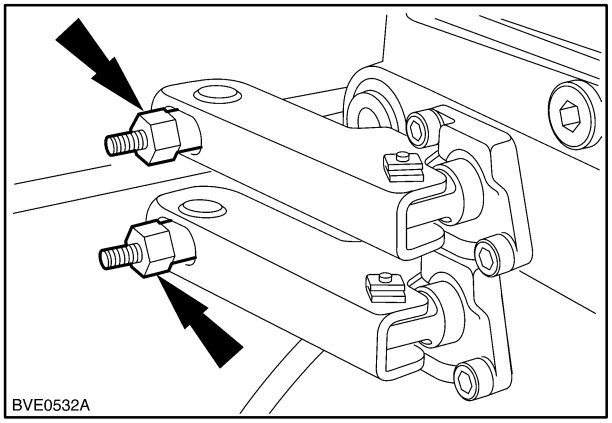
NOTE: *Ensure the remote control valve is in neutral before proceding.*

1. Remove the remote control valve cable lock nut.



41

2. Adjust the remote control valve cable adjustment nut.
3. Adjustment is correct when all the positions are avaliable (eg. extend, neutral, retract, and float).
4. Repeat steps 1-3 for the remaining remote control valve cable(s).



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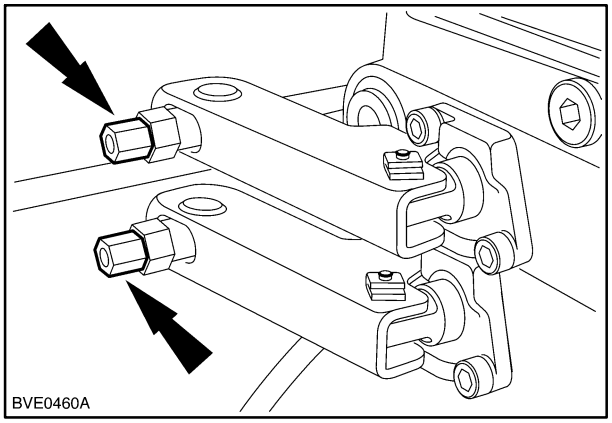
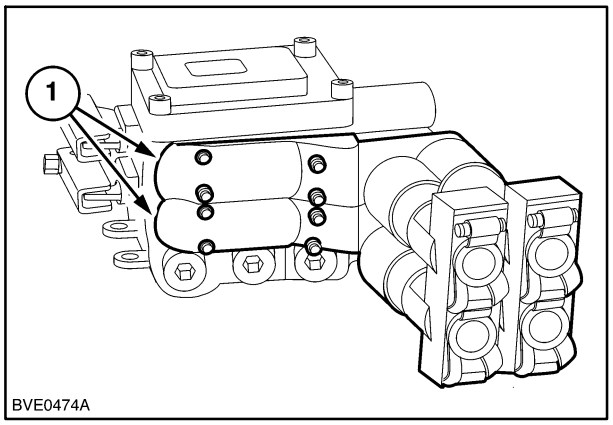
5. Install the remote control valve cable lock nuts.



43

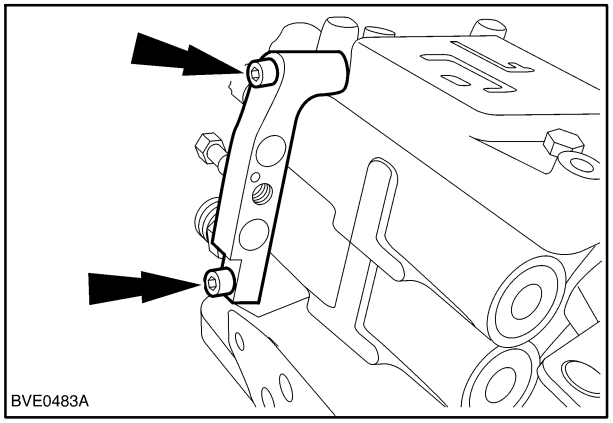
Disassembly

1. Remove the remote control valve quick release coupling manifold(s).
2. The couplers are serviced as an assembly and should not be disassembled.



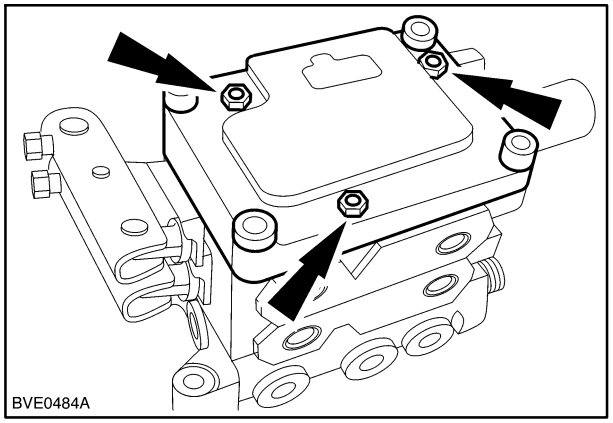
44

3. Remove the remote control valve control cable retaining bracket.



45

4. Remove the remote control valve end cover retaining nuts.
5. Remove the remote control valve end cover.



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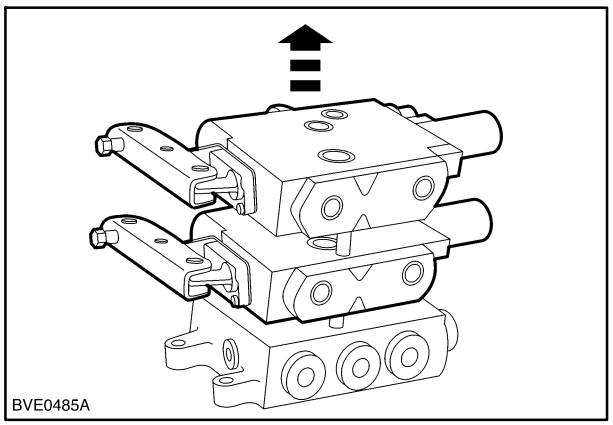
6. Remove the remote control valve slices from the remote control valve base manifold.



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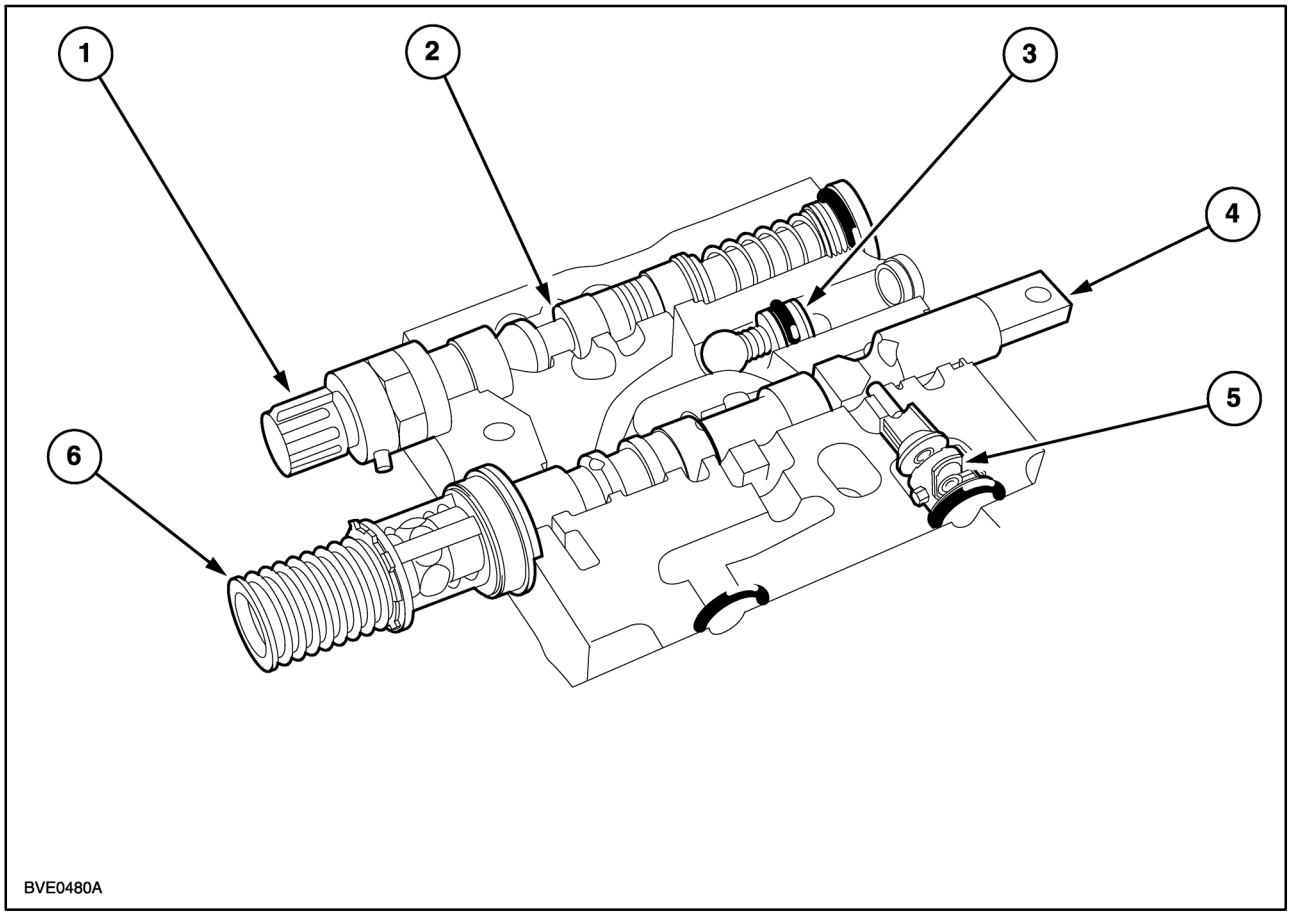

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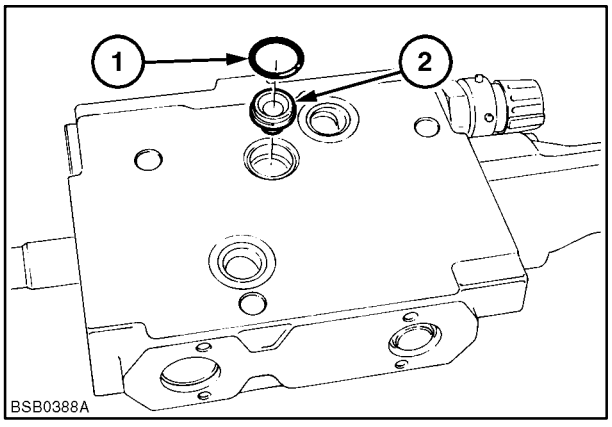
Mechanical Remote Control Valve Components

1. Flow Control Adjuster
2. Flow Control Spool
3. Load Holding Check Valve
4. Main Control Spool
5. Lock Valve
6. Spool Centring and Detent Mechanism

7. Disassemble the remote control valve slice using the following instructions and illustrations.
8. Remove the O-ring (1) and the check valve (2).
9. Remove the flow control adjuster knob (1) and unscrew the flow control adjuster from the remote control valve body.



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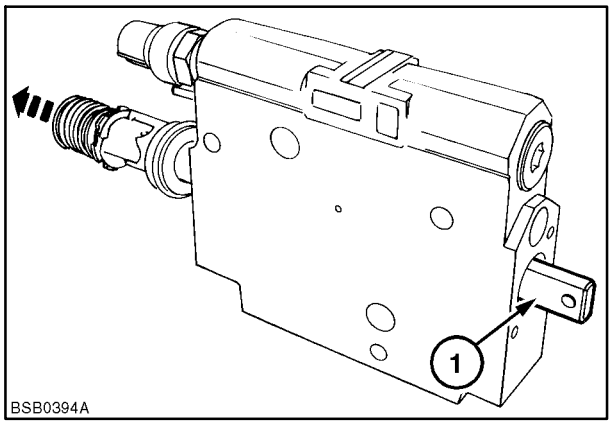
10. Prior to removing the control valve spool ensure the flats (1) on the end of the spool are in the vertical position as shown.

⚠ CAUTION ⚠

Do not rotate the main control spool or use force once inserted into the bore, otherwise damage to the spool and the lock valve pin will occur.

11. Remove the remote control valve main control spool.



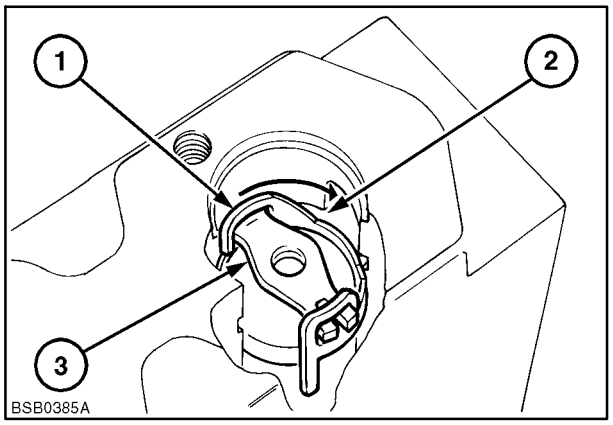
50

12. Remove the lock valve from the raise port as follows:-

    Using a small scewdriver, open the two slots (1) on the keeper (2) and turn the keeper through 90 degrees.

    Remove the spring seat (3) from the remote control valve housing.

    Remove the lock valve.



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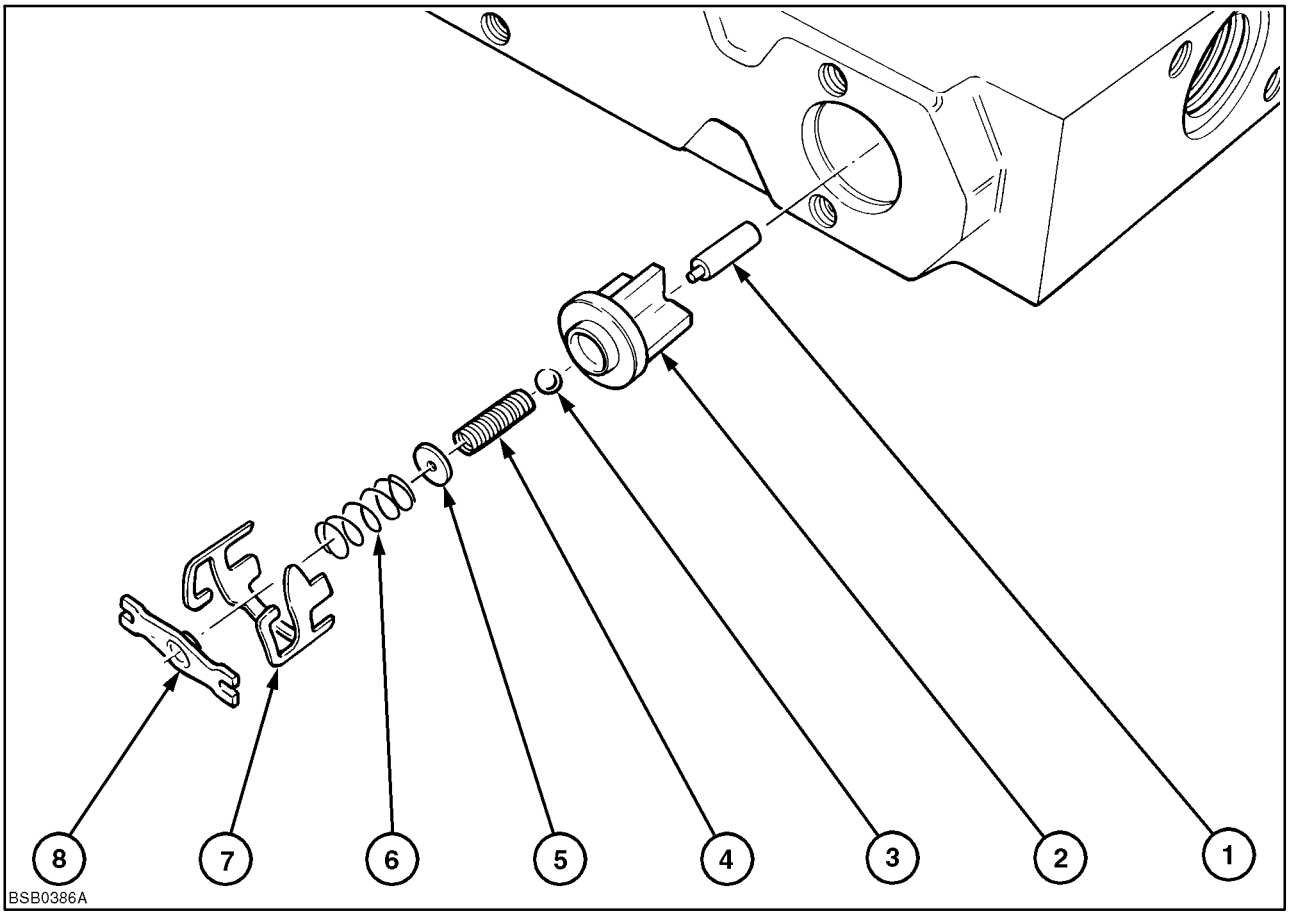

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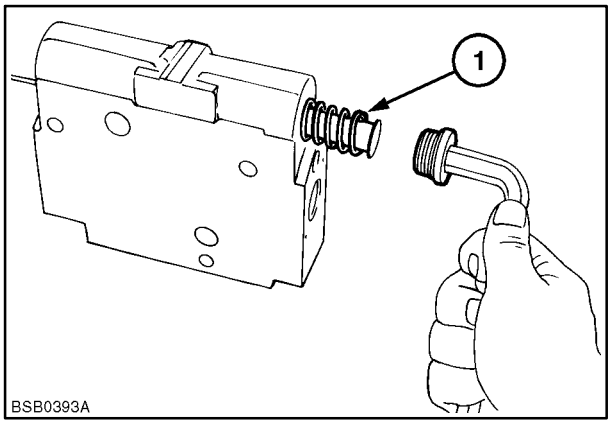
Lock Valve

1. Plunger
2. Lock Valve
3. Ball
4. Spring
5. Washer
6. Spring
7. Spring Seat
8. Keeper

⚠ WARNING ⚠

A large spring (1) is positioned beneath the plug, take extreme care when removing the plug.

13. Carefully remove the flow control spool plug.



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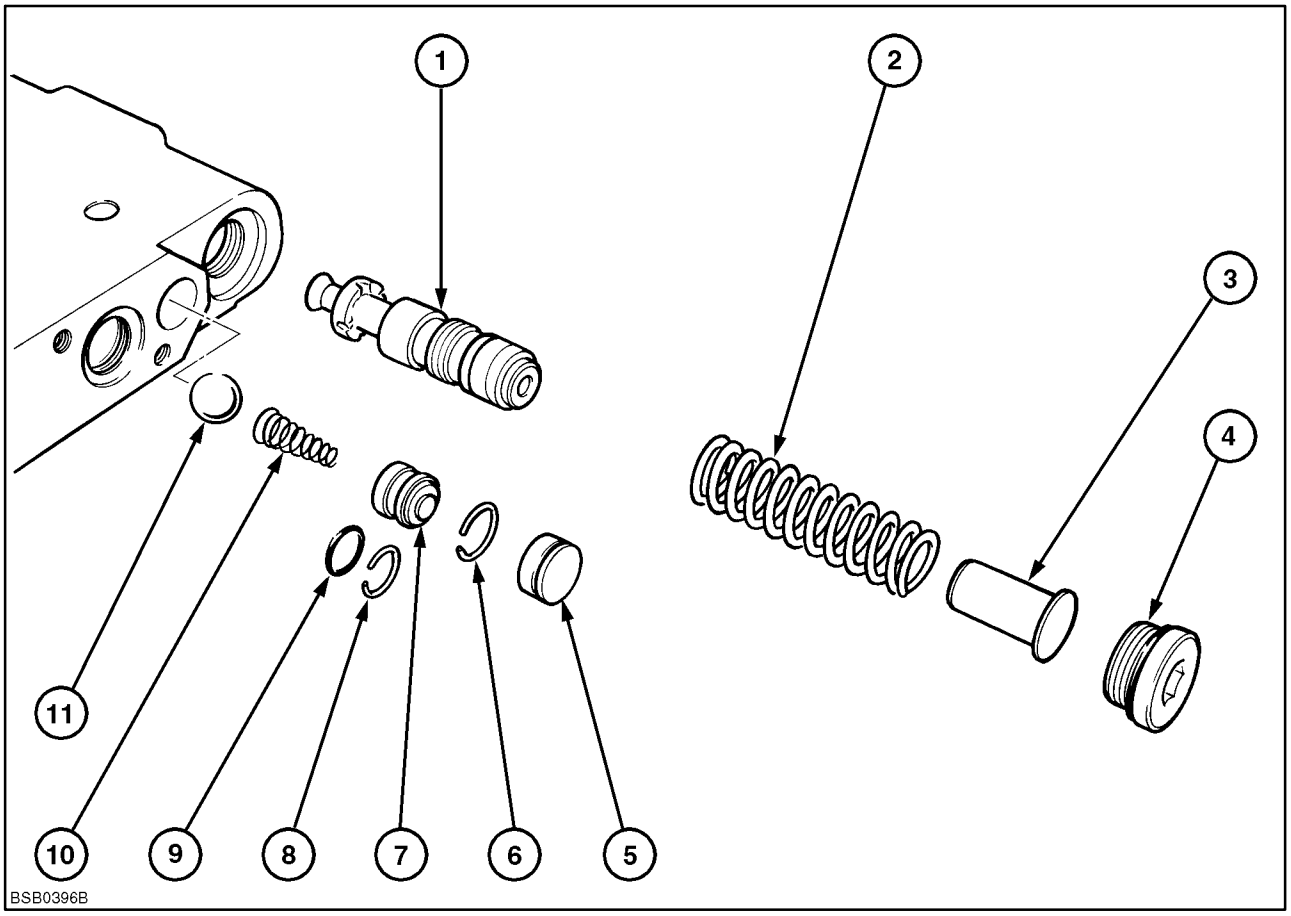

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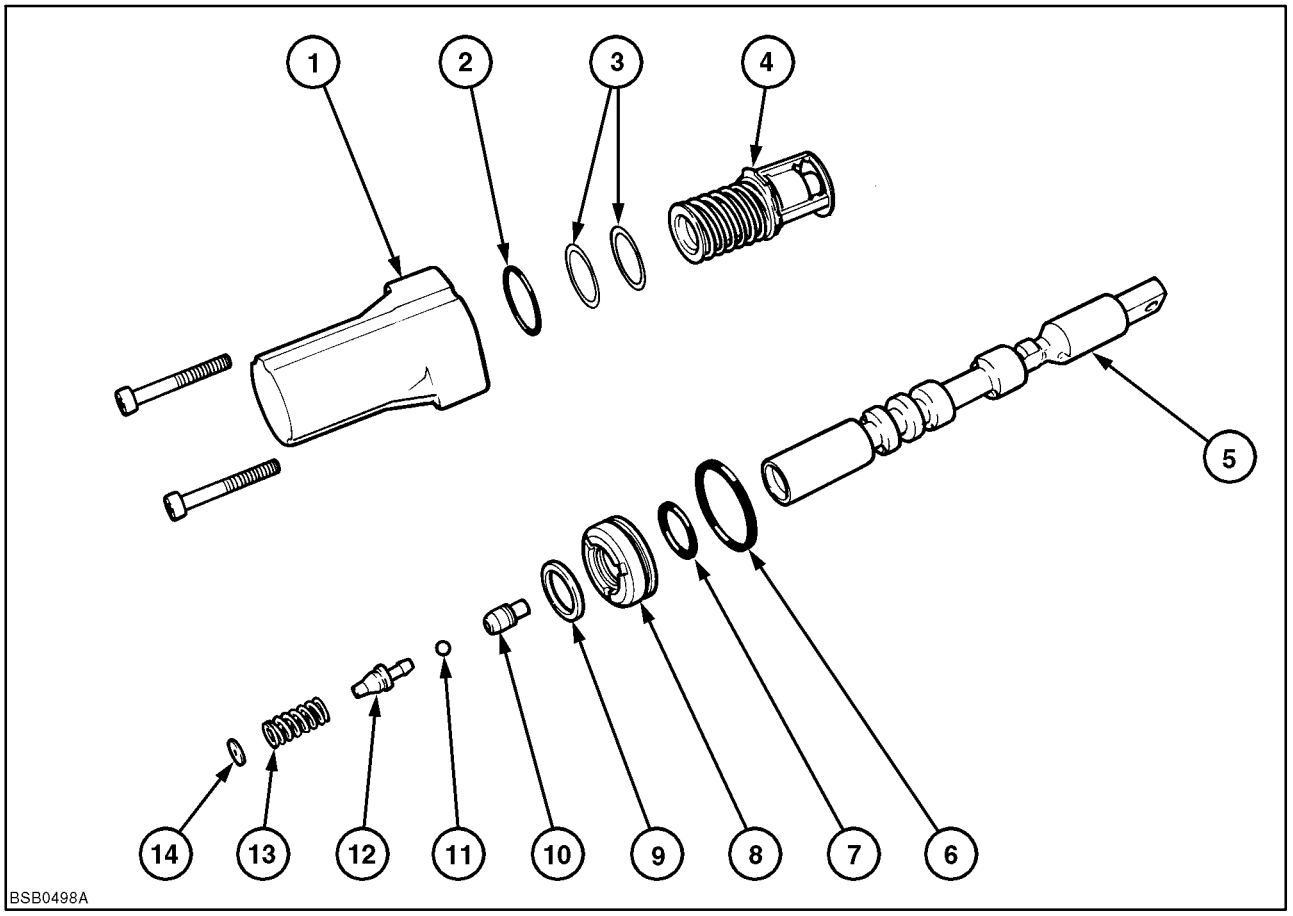
Flow Control Spool and Load Hold Check Valve

1. Flow Control Spool
2. Spring
3. Spring Guide
4. Plug and 'O' Ring
5. Plastic Cap
6. Retainer
7. Plug
8. Back-up Ring
9. 'O' Ring
10. Spring
11. Load Hold Check Valve Ball



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Main Control Spool

1. End Cap
2. 'O' Ring
3. Shims
4. Spool Centring Mechanism
5. Main Control Spool
6. 'O' Ring
7. 'O' Ring
8. Spacer
9. Back-Up Ring
10. Detent Release Orifice
11. Ball
12. Plunger
13. Spring
14. Spring Seat

14. Remove the main control spool (5) by removing the spool centring mechanism (4).

NOTE: *It is not recommended that the spool centring mechanism (4) is disassembled.*

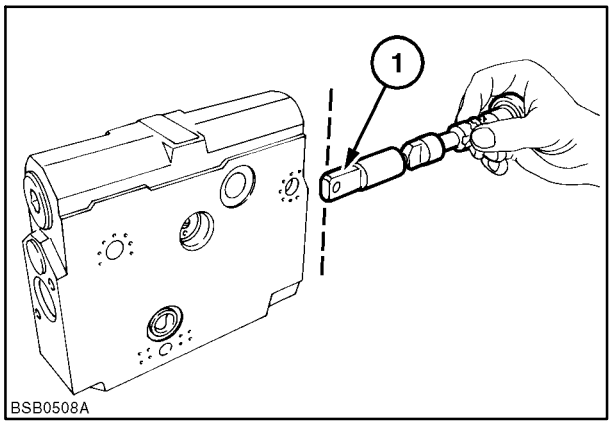
15. Housed within the centre of the remote control valve main control spool (5) is the detent release orifice (10). This is factory preset and servicing should be restricted to washing in an approved degreasing agent without removing the orifice from within the spool.

Assembly

1. Assembly follows the disassembly procedure in reverse. Install the lock valve prior to installing the main control spool.
2. Prior to inserting the main control spool in the remote control valve housing ensure the flats (1) on the end of the spool are in the vertical position as shown.

⚠ CAUTION ⚠

Do not rotate the main control spool or use force once inserted into the bore, otherwise damage to the main control spool and the lock valve pin will occur.



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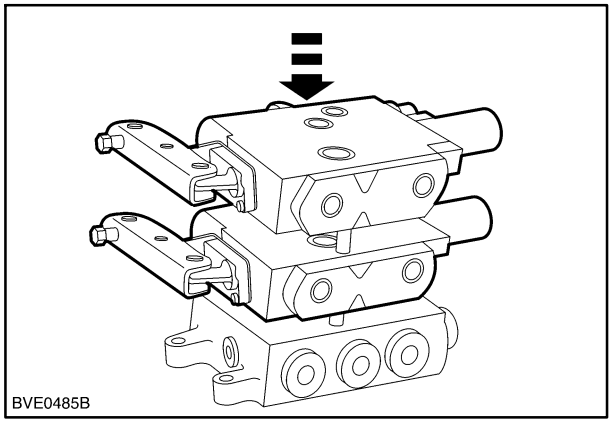
3. Install the remote control valve slices on the remote control valve base manifold.



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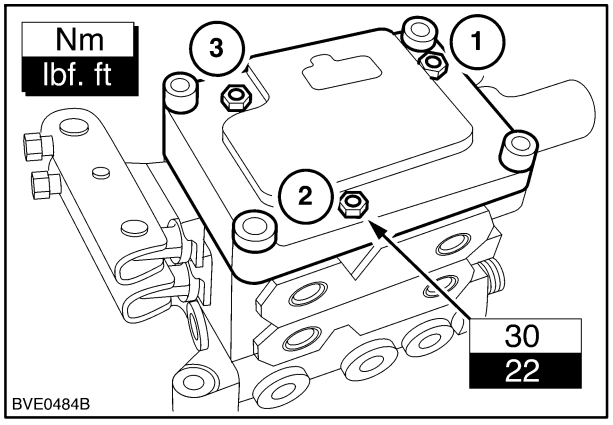
4. Install the remote control valve end cover.
5. Install the remote control valve end cover retaining nuts. Tighten the retaining nuts to the specified torque value and in the correct sequence.



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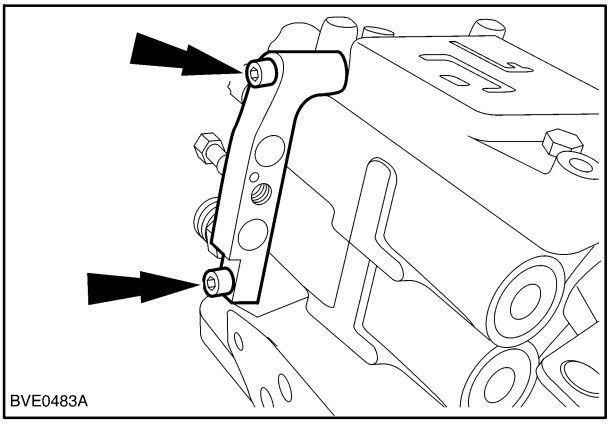
6. Install the remote control valve control cable retaining bracket.



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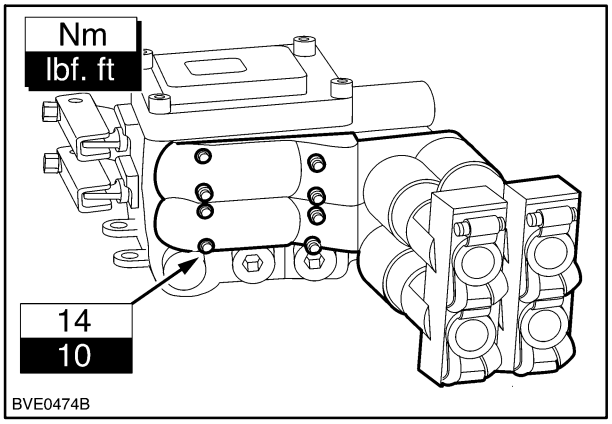
7. Install the remote control valve quick release coupling manifold(s). Tighten the retaining bolts to the specified torque value.



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NOTES

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 8 - Closed Center Electro-Hydraulic Remote Control Valves

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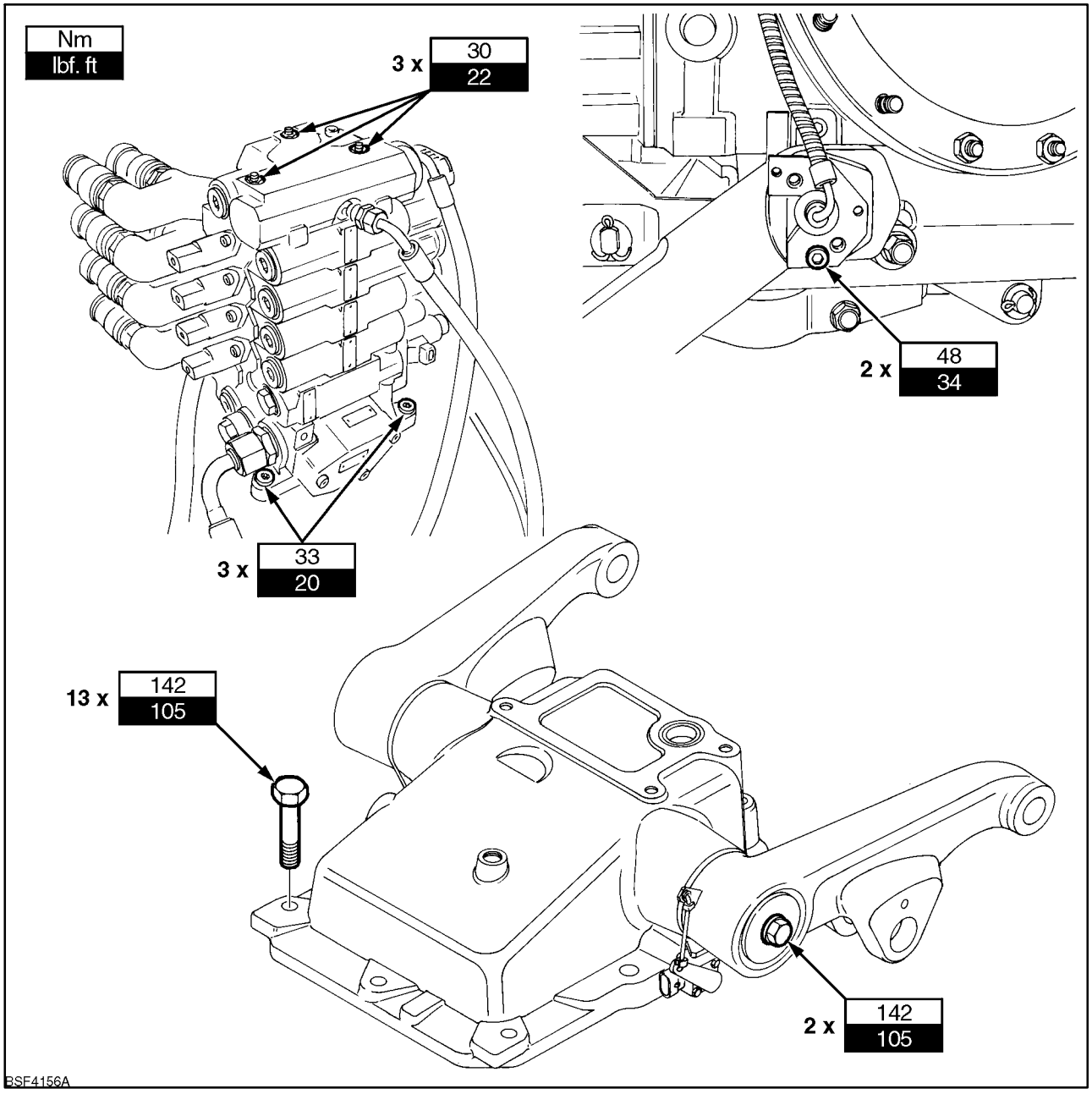
SPECIFICATIONS

Remote Valve Output	95-105 ltrs/min. @ 100bar@2200erpm
Detent Regulating Valve Pressure	Pre set non adjustable

TIGHTENING TORQUES



1

SPECIAL TOOLS

Lifting Bracket	**297612**
Flowmeter 0-200 ltrs/min	Procure Locally

TROUBLESHOOTING
REMOTE CONTROL VALVES NOT WORKING - ELECTRO-HYDRAULIC REMOTE VALVES

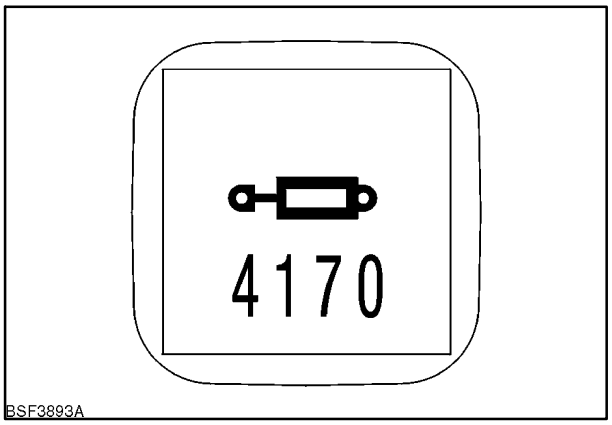
PROBLEM	POSSIBLE CAUSES	CORRECTION
All of the EHR valves are inoperative	Isolator switch not activated	Press the switch to activate
	Faulty switch	Check operation of the switch using a suitable multi-meter and if faulty replace the switch
	EHR relay not operating	Replace the relay
	EHR CAN BUS wiring faulty	Disconnect one of the EHR's and using a suitable multi-meter check the resistance of the CAN wiring between terminals 2 and 3 (green and yellow). If the resistance is NOT approximately 120Ω Trace the fault in the wiring and repair
		If the resistance is approximately 120Ω reload the software into the XCM processor - DD Module
		If the EHR's are still inoperative replace the processor with one of known performance
One or more EHR valves do not operate	Error code 4*** displayed on instrument cluster	Refer to error code charts in Section 55
	If hydraulic lift is not working this may indicate a high pressure system fault	Refer to fault finding chart for for hydraulic lift not working
	If hydraulic lift is working flow compensating valve could be faulty	Operate and hold control lever to test maximum system pressure at each remote valve coupler. If pressure at each valve coupler is below 205-215 bar (2973-3118 PSI for variable displacement pump; 190-205 bar, 2755-2973 PSI for fixed displace-memt pump) examine flow/pressure compensating valve for sticking Repair or replace the flow compensat-ing valve
	Load Sensing valve between valve sections requires check	Operate all remote valve levers simultaneously and check if the pressure at the defective remote valve is 205-215 bar (2973-3118 PSI for variable displacement pump; 190-205 bar, 2755-2973 PSI for fixed displacememt pump)
	Faulty remote valve	Operate all remote valve levers simultaneously and check if the pressure at the defective remote valve is NOT 205-215 bar (2973-3118 PSI for variable displace-ment pump; 190-205 bar, 2755-2973 PSI for fixed displacememt pump) overhaul remote valve which failed the pressure test

FAULT CODE LISTING

Error Code	Error description
4100	Remote No.1 no control message received
4101	Remote No.1 control message not plausible
4102	Remote No.1 EEPROM Error
4103	Remote No.1 switched to failsafe
4104	Remote No.1 under voltage
4105	Remote No.1 over voltage
4106	Remote No.1 spool movement too low
4107	Remote No.1 spool movement too high
4108	Remote No.1 Float position not reached
4109	Remote No.1 manually operated
4110	Remote No.1 driver faulty
4111	Remote No.1 POT faulty
4112	Remote No.1 unable to reach neutral
4113	Remote No.1 spool not in neutral at key on
4114	Remote No.2 no control message received
4115	Remote No.2 control message not plausible
4116	Remote No.2 EEPROM error
4117	Remote No.2 switched to failsafe
4118	Remote No.2 under voltage
4119	Remote No.2 over voltage
4120	Remote No.2 spool movement too low
4121	Remote No.2 spool movement too high
4122	Remote No.2 float position not reached
4123	Remote No.2 manually operated
4124	Remote No.2 driver faulty
4125	Remote No.2 POT faulty
4126	Remote No.2 unable to reach neutral
4127	Remote No.2 spool not in neutral at key on
4128	Remote No.3 no control message received
4129	Remote No.3 control message not plausible
4130	Remote No.3 EEPROM error
4131	Remote No.3 switched to failsafe
4132	Remote No.3 under voltage
4133	Remote No.3 over voltage
4134	Remote No.3 spool movement too low
4135	Remote No.3 spool movement too high
4136	Remote No.3 float position not reached
4137	Remote No.3 manually operated

Error Code	Error description
4138	Remote No.3 driver faulty
4139	Remote No.3 POT faulty
4140	Remote No.3 unable to reach neutral
4141	Remote No.3 spool not in neutral at key on
4142	Remote No.4 no control message received
4143	Remote No.4 control message not plausible
4144	Remote No.4 EEPROM error
4145	Remote No.4 switched to failsafe
4146	Remote No.4 under voltage
4147	Remote No.4 over voltage
4148	Remote No.4 spool movement too low
4149	Remote No.4 spool movement too high
4150	Remote No.4 float position not reached
4151	Remote No.4 manually operated
4152	Remote No.4 driver faulty
4153	Remote No.4 POT faulty
4154	Remote No.4 unable to reach neutral
4155	Remote No.4 spool not on neutral at key on
4170	EHR control No.1 not calibrated
4171	EHR control No.1 open circuit
4172	EHR control No.1 short circuit
4173	EHR control No.2 not calibrated
4174	EHR control No.2 open circuit
4175	EHR control No.2 short circuit
4176	Timer switch No.1 /No.2 not connected
4177	EHR Control No.3 not calibrated
4178	EHR control No.3 open circuit
4179	EHR control No.3 short circuit
4180	EHR control No.4 not calibrated
4181	EHR control No.4 open circuit
4182	EHR control No.4 short circuit
4183	Timer switch No.3/No.4 not connected
4184	EHR joystick POT X open circuit
4185	EHR joystick POT X short circuit
4186	EHR joystick POT Y open circuit
4187	EHR joystick POT Y short circuit

Electro-Hydraulic Fault code display in Digital instrument cluster.



2

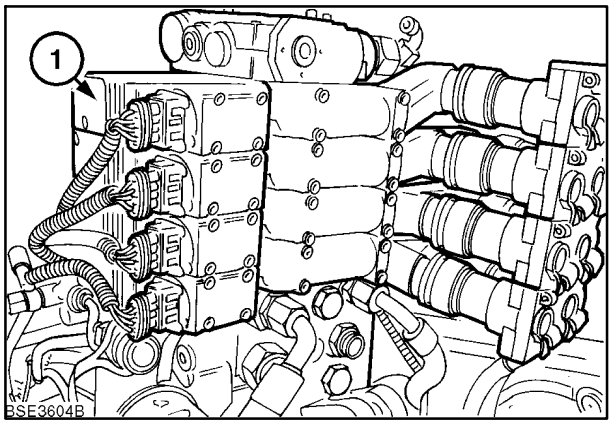
DESCRIPTION AND OPERATION

Electro-Hydraulic type remote valves are optional on all models of tractors with electroshift transmission.

Each remote valve has its own built in micro-processor which controls the oil flow through a solenoid activated valve, based on inputs received from the operator controlled switches.

Each remote valve is connected into the electrical CAN BUS system to the DD control module, located behind the drivers seat. Each remote valve can also detect system faults and send a message to the DD module which in turn sends a signal to allow a fault code to be displayed on the instrument cluster.

A list of fault codes can be found at the beginning of this Chapter. The fault finding flow charts can be found in Section 55, Electrical Systems.

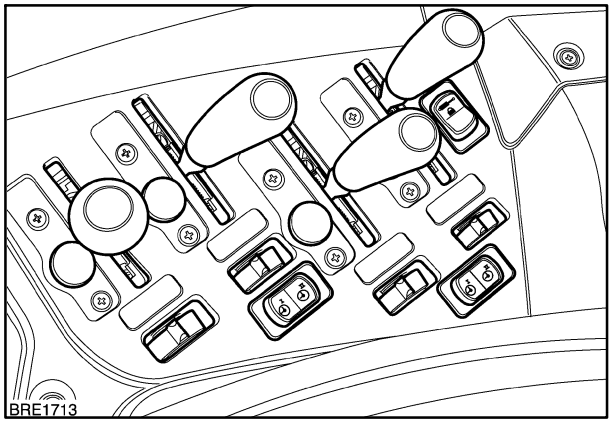


3

CONTROL LEVERS

The electro-hydraulic remote valves are operated by control levers in the right-hand console. Each control lever is coloured to correspond to the colour on the remote valve. A maximum of four electro-hydraulic remote valves may be fitted.

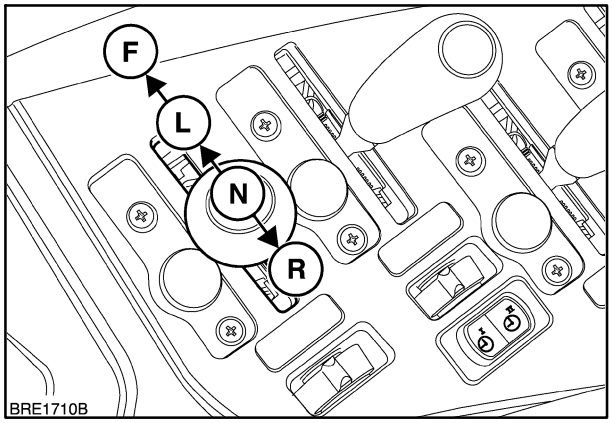
1.	Control lever I	Green
2.	Control lever II	Blue
3.	Control lever III	Brown
4.	Control lever IV	Black



4

The remote valve control levers have four positions: neutral, extend, retract, and float.

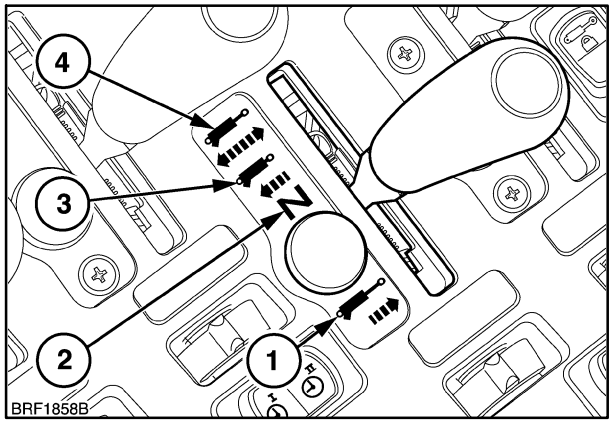
Pull the lever back from the neutral position, to the “extend” (raise) position. From neutral, push forward to the “retract” (lower) position. Push the lever fully forward to the float position. Float will permit the cylinder to extend or retract allowing equipment such as scraper blades to “float” or follow the ground contour.



5

The “float” position is also used for retracting a single-acting cylinder and for the OFF position for hydraulic motors.

The extend, (1), neutral, (2), retract, (3), and float, (4), positions are identified by symbols on the decal adjacent to each control lever.

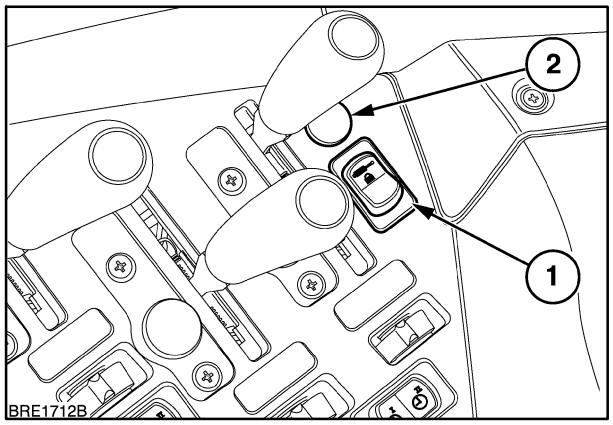


6

ISOLATOR SWITCH

The remote valves will not operate unless the system is energised using the isolator switch (1). Press and release the lower part of the switch to activate the system, press the upper part to de-activate. When activated the amber warning light (2) will light. Once energised, the remote valves will operate whenever the tractor engine is running.

***IMPORTANT**: The isolator switch may be used to immediately stop operation of the rear remote hydraulics by quickly depressing the top of the switch. The isolator switch only controls the remote valves and has no effect on three point linkage operation.*

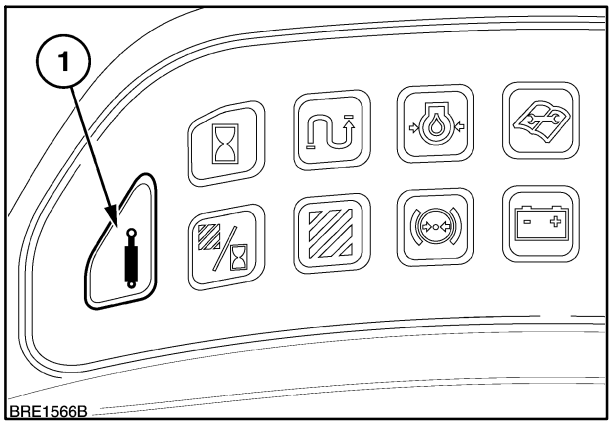


7

MANUAL AND PROGRAMMABLE LEVER OPERATION

The Enhanced keypad is used to select and program the timed functions for each of the electro-hydraulic remote valves. As each remote valve is selected using the remote valve key (1), a visual display of the valve functions will appear in the Dot Matrix screen.

Depress the key once to activate the remote valve display in the DMD. Repeated operation of the key will cycle through each valve display individually.



8

MANUAL OPERATION

When used in manual mode, without the timer function, the electronic remote valves will operate in a similar way to the mechanical valves previously described.

IMPORTANT: *Care must be taken when operating in the manual mode that the remote valve lever is not left in the detented extend or retract positions when using remote cylinders. When the cylinder has reached the end of its stroke the control lever* ***must*** *be returned to the neutral position manually. Failure to observe this procedure will overheat the oil and may lead to failure of hydraulic or driveline components.*

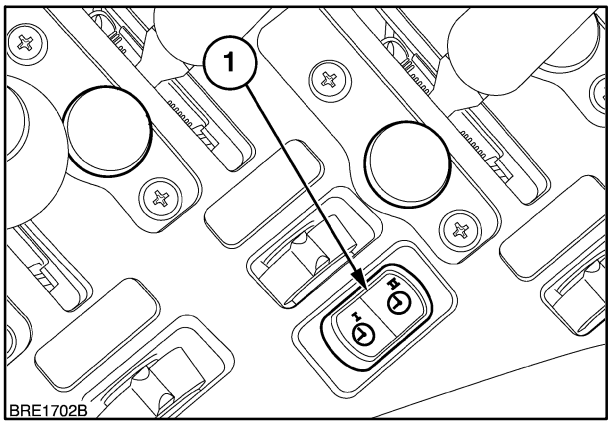
IMPORTANT: *Never use the neutral position from the extend or retract position to stop a hydraulic motor. Sudden hydraulic lock up of the system may cause extensive damage to the motor.*

In manual mode, oil flow through each valve is adjusted using the flow rate setting as previously described.

TIMED PROGRAM OPERATION

Timed program operation is provided primarily for operation of hydraulic cylinders. This feature allows the operator to program a time delay between when the control levers are activated and when the oil flow to the implement is stopped.

To operate the electronic remote valves in programd mode, depress the appropriate side of timer control switch (1) as shown. When the switch is depressed, the green light adjacent to the switch will start to flash. The system is now in standby mode ready to accept a program sequence. The light will continue to flash for twenty seconds allowing the operator sufficient time to begin the programming sequence. If a program is not started within this period, the system will automatically de-activate, depress the timer control switch again to re-start the sequence.



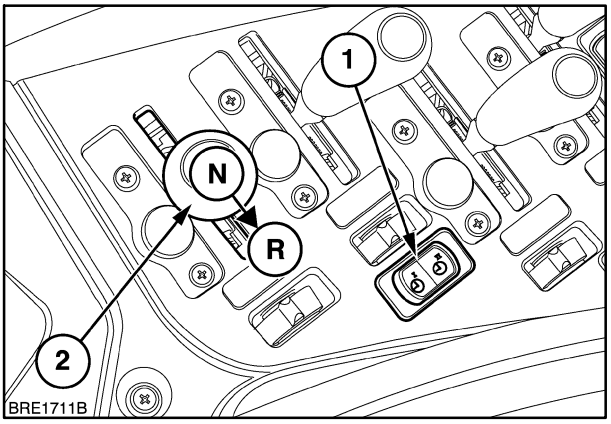
9

PROGRAMING A DOUBLE ACTING SERVICE

To program the remote valves, first ensure the cylinder hydraulic hoses are properly connected to the appropriate rear remote valve. Start the tractor engine and set at the normal operating speed in which the cylinder is to be operated. This is important as the programming of the control levers is based on a time interval corresponding to the time it takes the cylinder rod to extend and retract. Any change in engine rpm will have an effect on hydraulic flow and therefore the time taken for the cylinder to extend and retract.

The timed period for control lever operation remains the same regardless of oil flow, therefore consistent operation is required for the system to function correctly. Using the corresponding timer switch (1) depress the switch so the light begins to flash. While the light is flashing move control lever (2) to extend the cylinder. At this point the light ceases to flash and will remain on.

Hold the lever until the cylinder is extended to the desired position and then return the lever to the neutral position. When the lever is returned to the neutral position the programming light will begin to flash again indicating the retract phase of the cycle should now be programd.

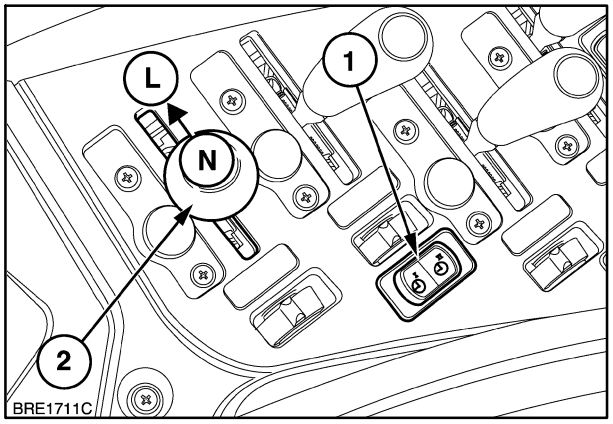


10

Operate the control lever (2) to retract the cylinder(L) and the programming light will cease to flash and remain on. Hold the lever until the cylinder has completed the retract cycle and then return to the neutral position. After the second phase has been programd the light will remain on.

Timed program operation of the remote valve is now completed for both extend and retract movements of the cylinder.

Repeat the above sequence to program the remaining control levers.



11

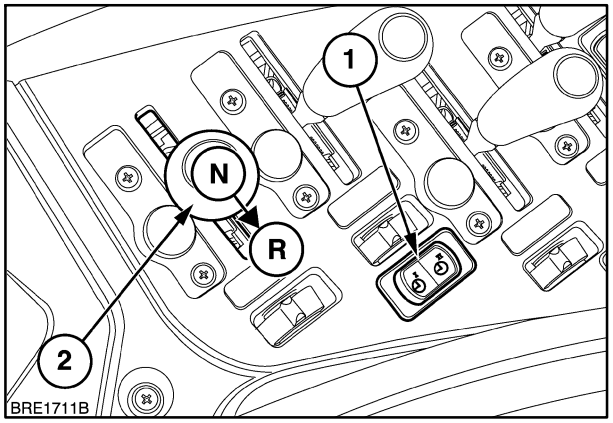
Programming of the control lever can be performed in either sequence, extend/retract, retract/extend or for one movement only, extend or retract. The maximum allowable time span for any timed operation is 30 seconds.

NOTE: *Turning the key-start switch OFF will erase the program.*

PROGRAMMING A SINGLE ACTING SERVICE

To program a single acting service carry out the same set-up procedure as previously described for a double acting service.

With the program light flashing, move the remote valve lever from neutral to the extend position(R). When the cylinder has extended to the desired position, manually return the lever to the neutral position. The program light will continue to flash but this should be ignored and the lever left in the neutral position. After 10 seconds the light will cease to flash and will remain on, thus indicating the single acting program has been memorised.



12

The single acting service can be programd in both the extend and retract modes.

NOTE: *When using a timed sequence for a single acting service i.e. programd in extend mode only, the retract mode will not function until the program sequence has been deleted.*

If the control lever is moved to the float position no timed program is possible and the control lever must be returned to neutral manually.

REPLAYING A TIMED PROGRAM

The timed sequence begins as soon as the lever is placed in the extend or retract detent position. On reaching the end of the timed period, oil flowing through the remote valve will be halted, the remote valve lever should now be returned to the neutral position ready for the next operation. Throughout the replay sequence, the green warning light will remain illuminated.

DELETING PROGRAMS

To delete a program, depress the program switch to de-activate timer operation. The light will extinguish and the memorised sequence will be cleared from the program in the memory.

RELIEVING SYSTEM PRESSURE

To ease removal and installation of the couplers, relieve the pressure in the system. Securely support the implement. Make sure no one will be injured by moving equipment when relieving pressure in the system. Move the control lever to the float position with the engine running. This will relieve the pressure. Turn the engine off with the control lever still in float. After the engine is shut down return the control lever to the neutral position. The couplers can now be connected or disconnected with minimal pressure and effort.

⚠ WARNING ⚠

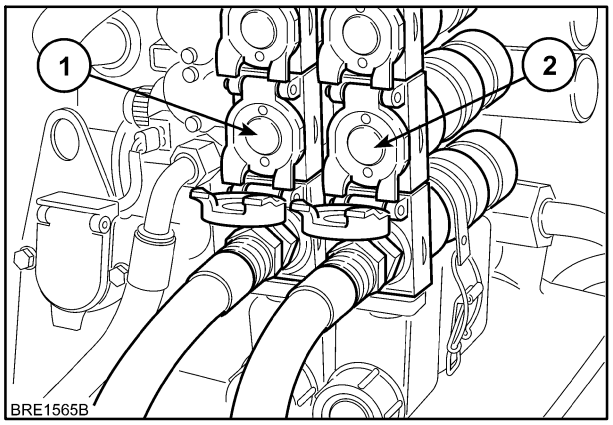
Before connecting or disconnecting hydraulic hoses at the remote cylinders, relieve the pressure in the circuit by first starting the engine and then move the control levers fully forward to the “float” position. Then stop the engine. Make sure no one will be injured by moving equipment when relieving pressure in the system. Before disconnecting cylinders or equipment, make sure the equipment or implement is supported securely.

Never work under equipment supported by a hydraulic device because it may drop if the control is actuated (even with the engine stopped) or in the event of hose failure, etc. always use a secure support for equipment which must be serviced while in the raised position. Make sure that oil contained within the remote cylinders is clean and is of the correct grade.

QUICK COUPLERS

Each remote control valve has a pair of $^1/_2$ in. quick-disconnect, female couplers (1) and (2). The couplers are of a self-sealing/locking design but will allow remote cylinder hoses to pull free if the implement should become disconnected from the tractor.The raise (lift) coupler (1), is on the left-hand side, the lower (drop) coupler (2), on the right-hand side. The couplers referred to in this picture are for remote control valve No. I.

The flip-up covers are colour coded black, brown, blue and green to corresponding to the control levers in the cab..



13

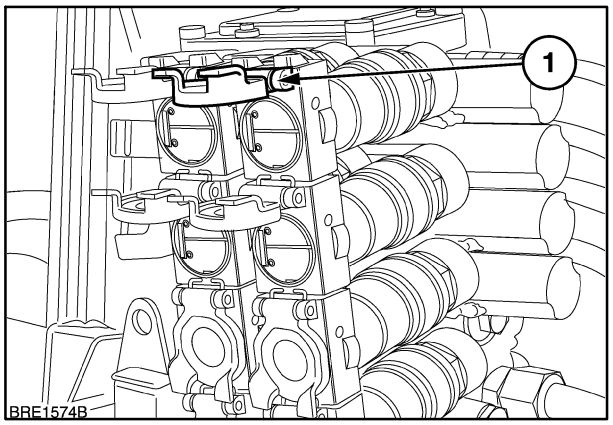
Hinged, spring-loaded dust caps are provided on each coupler. To connect a remote cylinder, lift the dust cap (1) and insert the feed and/or return hose into the coupler, ensuring that it is correctly seated. Ensure that there is sufficient slack in the hose(s) to allow the tractor/implement to turn in either direction.

Actuate the remote valve to supply hydraulic pressure which will complete the hydraulic coupling of the tractor and implement.

To disconnect, grip the hose a short distance from the coupler, push the hose forward, into the coupler, then quickly pull on the hose to 'pop' the coupler free

The couplers will accept standard $^1/_2$" SAE or ISO connectors. The couplers can be connected or disconnected under pressure. Disconnect pressure is proportional to system pressure. Increased system pressure will require increased force to disconnect the couplers.

NOTE: *The oil flow through remote valve number one will always take priority over the other valves. For equipment using more than one valve, the hydraulic service requiring the highest flow should be connected to valve number one.*



14

CONNECTING SINGLE-ACTING CYLINDERS

Connect the hose from a single-acting cylinder to the leftower coupler on the remote control valve, as previously described.

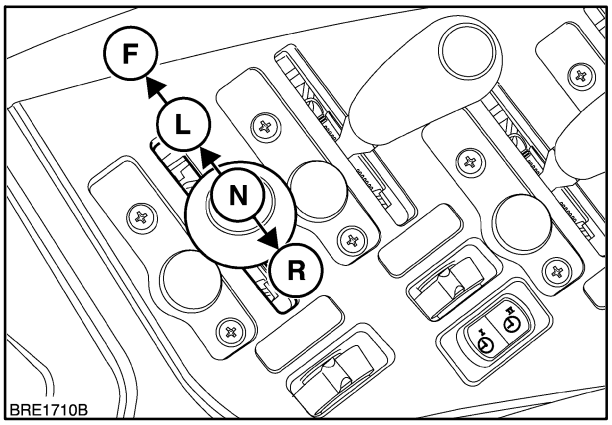
To extend a single-acting cylinder, pull the control lever back to the “extend” position (2).

Manually return the lever to the neutral position to stop the cylinder before it is fully extended or allow the valve to return to neutral automatically when the cylinder reaches the end of its stroke and timed operation.

To retract a single-acting cylinder, move the lever fully forward to the “float” position (F).

NOTE: *In single acting timer mode the remote lever will lock in the extend position and will* ***not*** *automatically return to the neutral position.*

IMPORTANT: *Always use the “float” position to lower a single-acting cylinder. The “retract” position is for double-acting cylinders only.*



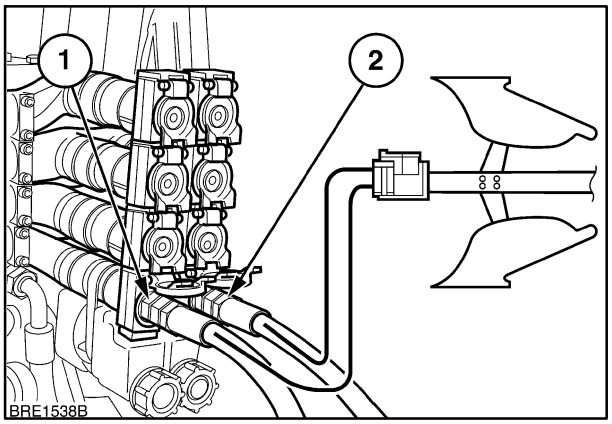
15

CONNECTING DOUBLE-ACTING CYLINDERS

Connect the feed hose from a double-acting cylinder to the left hand coupler(1) on the remote control valve and the return hose to the right hand coupler(2), as previously described. To extend a double-acting cylinder, pull the control lever back to the “extend” position .

To retract a double-acting cylinder, push the control lever forward past neutral to the “retract” position . Further forward movement of the lever will select “float” which will allow the cylinder to extend or retract freely. This feature is very helpful when carrying out work with equipment such as scraper blades and loaders.

NOTE: *To prevent cylinders creeing under load, always connectthe hose from the load supporting side of the cylinder to the left hand coupler.*



16

OPERATING CONTINUOUS FLOW HYDRAULIC EQUIPMENT

Continuous flow hydraulic equipment (e.g., hydraulic motors) should be connected to the 1st remote control valve couplers with the pressure hose connected to the right retract coupler and the return hose connected to the low pressure return circuit.

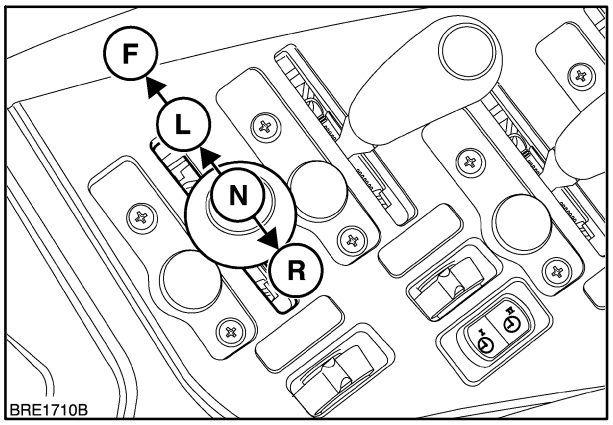
The flow control should be adjusted to regulate the motor speed. If the flow control is open too far, the 3-point hitch and other remote valves will slow down or stop. Using the flow control this way will ensure that the hydraulic system will only supply the oil required by the motor.

With the remote control valve lever fully forward in the "float" (4) position, the motor will be stationary. The hydraulic motor will operate if the lever is pulled back to the "retract" (3) position. To stop the motor, move the lever from the retract position to the float position. In the float position the motor will be able to stop slowly, which will not damage the motor.

IMPORTANT: *When operating continuous flow equipment, the remote control valve lever must not be moved rearward to the neutral or raise positions as damage to the equipment may result.*

Observe the following to further protect the tractor and equipment.

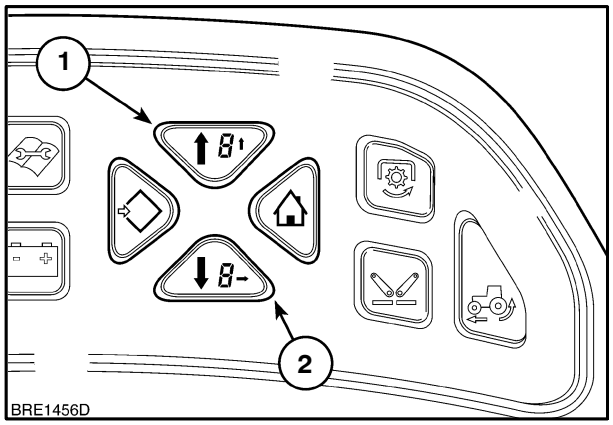
- Do not open any bypass valve in the equipment or motor. Use the flow control to regulate the rate of flow or speed of the motor.
- Do not hold the remote control valve lever to operate the equipment.
- To ensure optimum hydraulic oil cooling, operate continuous flow equipment at the highest flow setting (by use of the flow control) and lowest engine speed that will give the required machine performance and speed.



17

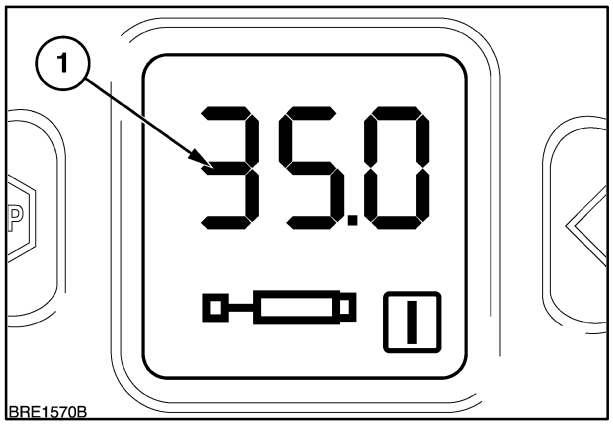
OPERATING SEVERAL REMOTE VALVES SIMULTANEOUSLY OR REMOTE VALVES AND HYDRAULIC LIFT SIMULTANEOUSLY

If operating two or more remote control valves simultaneously or remote valves and the hydraulic lift, all the flow control valves (1), should be adjustedusing the enhanced keypad to provide a partial flow, as previously described. If not so adjusted, all the available flow may be directed to the full flow circuit when the pressure in that circuit is less than that of the other circuits in use.



18

NOTE: *The oil flow through remote valve number one will always take priority over the other valves. For equipment using of more than one remote valve, the hydraulic service with the highest flow requirement should be connected to valve number one.*



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BLEEDING REMOTE CYLINDERS

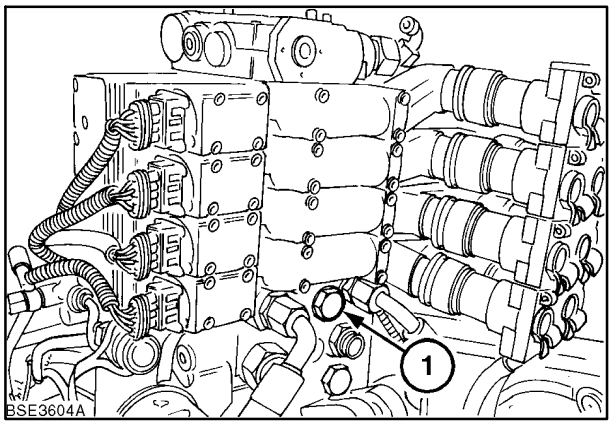
When connecting a cylinder with trapped air, i.e., a new cylinder, one that has been out of service or one that has had the hoses disconnected, it will be necessary to bleed the cylinder to remove the air.

With the hoses connected to the remote control valve couplers at the rear of the tractor, position the cylinder with the hose end uppermost and extend and retract the cylinder seven or eight times using the remote control valve operating lever.

Check the rear axle oil level before and after operating a remote cylinder.

VALVE DESCRIPTION

The remote valves are a stack type design clamped together with the hydraulic lift electronic draft control valve (1). The stack assembly also incorporates the low pressure regulating and priority valve .



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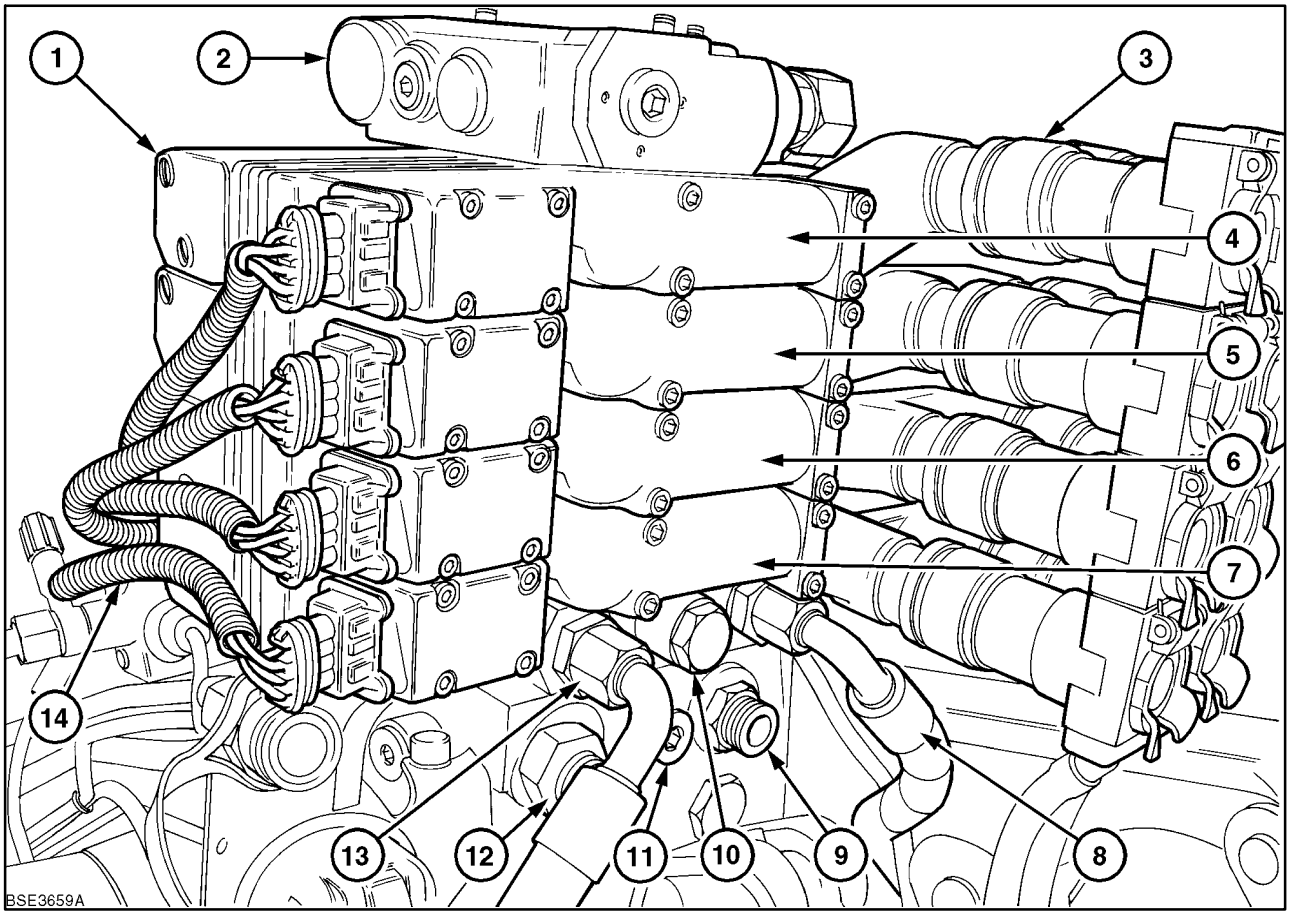
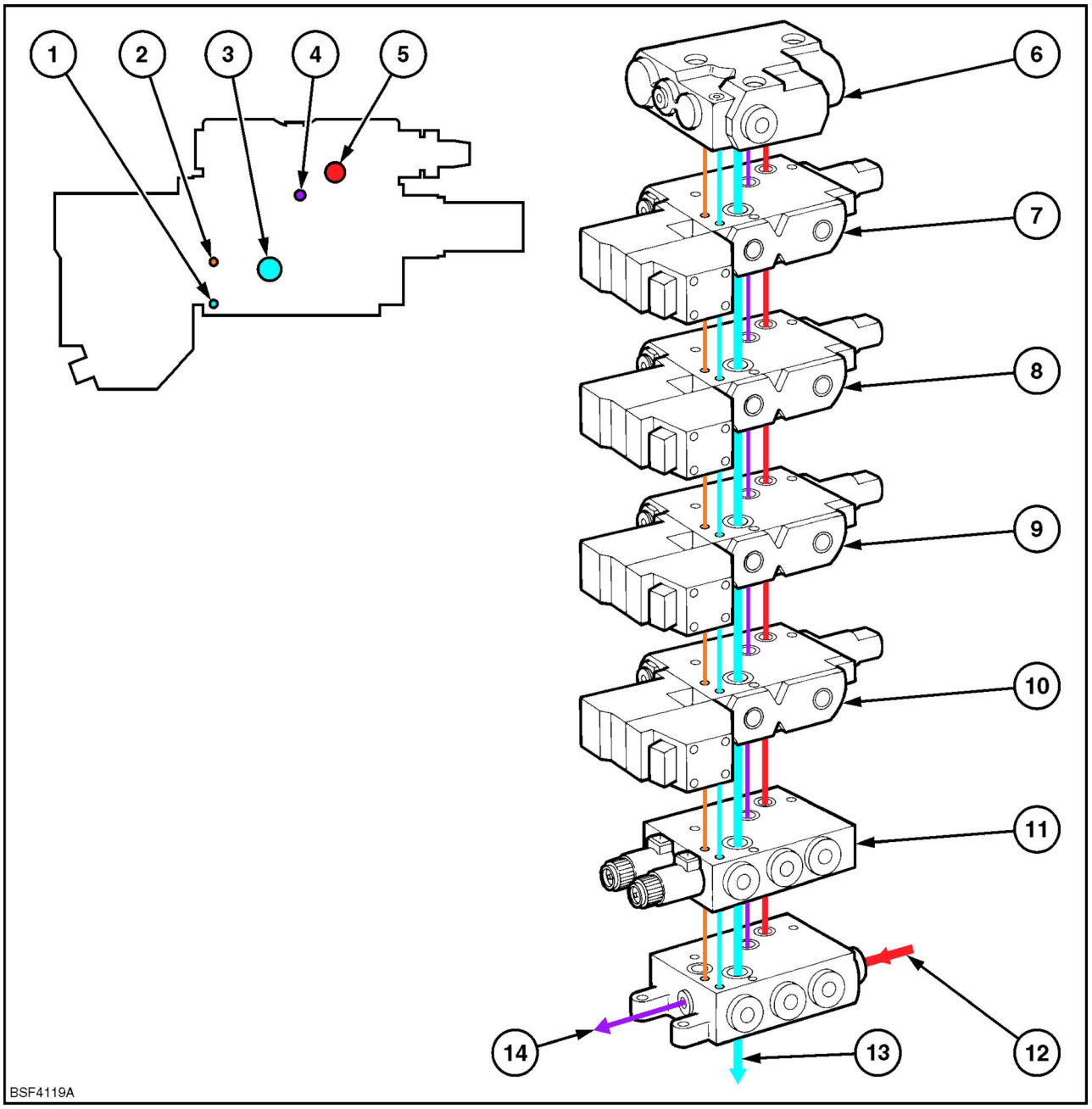


21

Electronic Draft Control and Closed Centre Remote Control Valve Stack

1. Solenoid
2. End Plate With Pressure Limiting Valve (20-22bar)
3. Coupler
4. Remote Control Valve No IV
5. Remote Control Valve No III
6. Remote Control Valve No II
7. Remote Control Valve No I
8. Feed To Right Hand Lift Cylinder
9. Power Beyond Feed
10. Lift Cylinder Relief Valve (230 Bar)
11. Low Pressure Relief Valve (28-33 Bar)
12. Power Beyond Return
13. Feed To Left Hand Cylinder
14. Wire Harness for Remote Valve Solenoids



Pump Pressure

Return To Reservoir

Load Sensing

Control Valve Pilot Oil

22

Remote Control Valve and EDC Control Valve Interconnecting Galleries

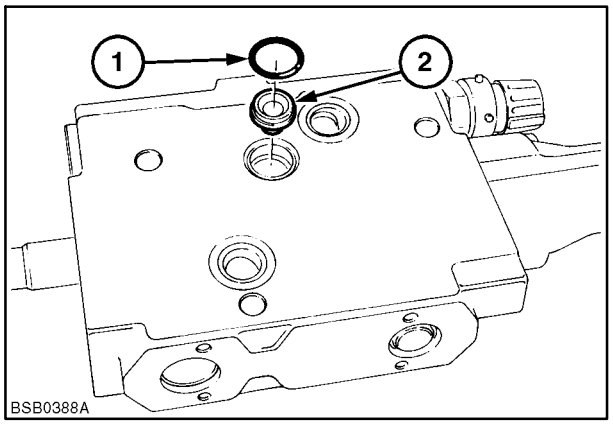
1. Control valve pilot line return oil
2. Control valve pilot line oil
3. Return to Reservoir Gallery
4. Load sensing Gallery
5. Pump Pressure Galleryl
6. EndPlate with Pressure Regulating Valve
7. Remote Valve IV
8. Remote Valve III
9. Remote Valve II
10. Renmote Valve I
11. Electronic Draft Control Valve
12. Feed From Hydraulic Oil Pump
13. Return to Reservoir
14. Load Sensing Line

All valve sections have a common parallel inlet and return to reservoir gallery. The electro-hydraulic remote valve sections also have common galleries for the control valve pilot pressure and return oil.

The load sensing gallery passes through the centre of the valve stack and signals the pump to increase or decrease output according to demand.

The parallel gallery and load sensing system enables two or more valves to be operated simultaneously without loss of efficiency.

'O' ring seals (1) and load sense check valves (2) between each valve section ensure the highest circuit load sense pressure is transmitted to control output of the hydraulic pump.



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The principal hydraulic components within each Electro-Hydraulic remote control valve section are:

SOLENOID CONTROL UNIT - PCC VALVE

A signal to operate a solenoid activated valve is received from the operator control switches into the micro-processor of the control unit. The spool within the solenoid valve moves according to the forces of the solenoid which allows pilot oil pressure, regulated to 20-22 bar, to act on the control valve spool. The control unit is also able to accurately sense the position of the spool and can detect errors in the system, which, via the CAN BUS electrics, can be displayed as fault codes which have a '4***' number.

FLOW CONTROL SPOOL

Ensures that if more than one remote valve is operated that the available oil flow is proportionally distributed amongst the valves being operated depending on demand. The flow control valve spool senses the differential pressure within the valve and regulates the flow accordingly. Because each flow control spool individually senses the pressure in the remote valve being operated, two or more circuits working at different pressures can be controlled simultaneously.

LOAD HOLD CHECK VALVE

The check valve prevents a backflow of pressure from the remote valve circuit when the control spool is operated and pump system pressure is less than the backpressure in the circuit.

This is explained by the following example:

When a cylinder is holding a heavy load and the control valve spool is moved from the neutral to raise position, the pump system pressure may be less than the back pressure in the remote valve circuit. When this occurs the back pressure would cause oil in the circuit to flow backwards and the load to momentarily drop before pump system pressure has risen to hold and then raise the load further. The load hold check valve prevents this situation from occurring.

LOCK VALVE

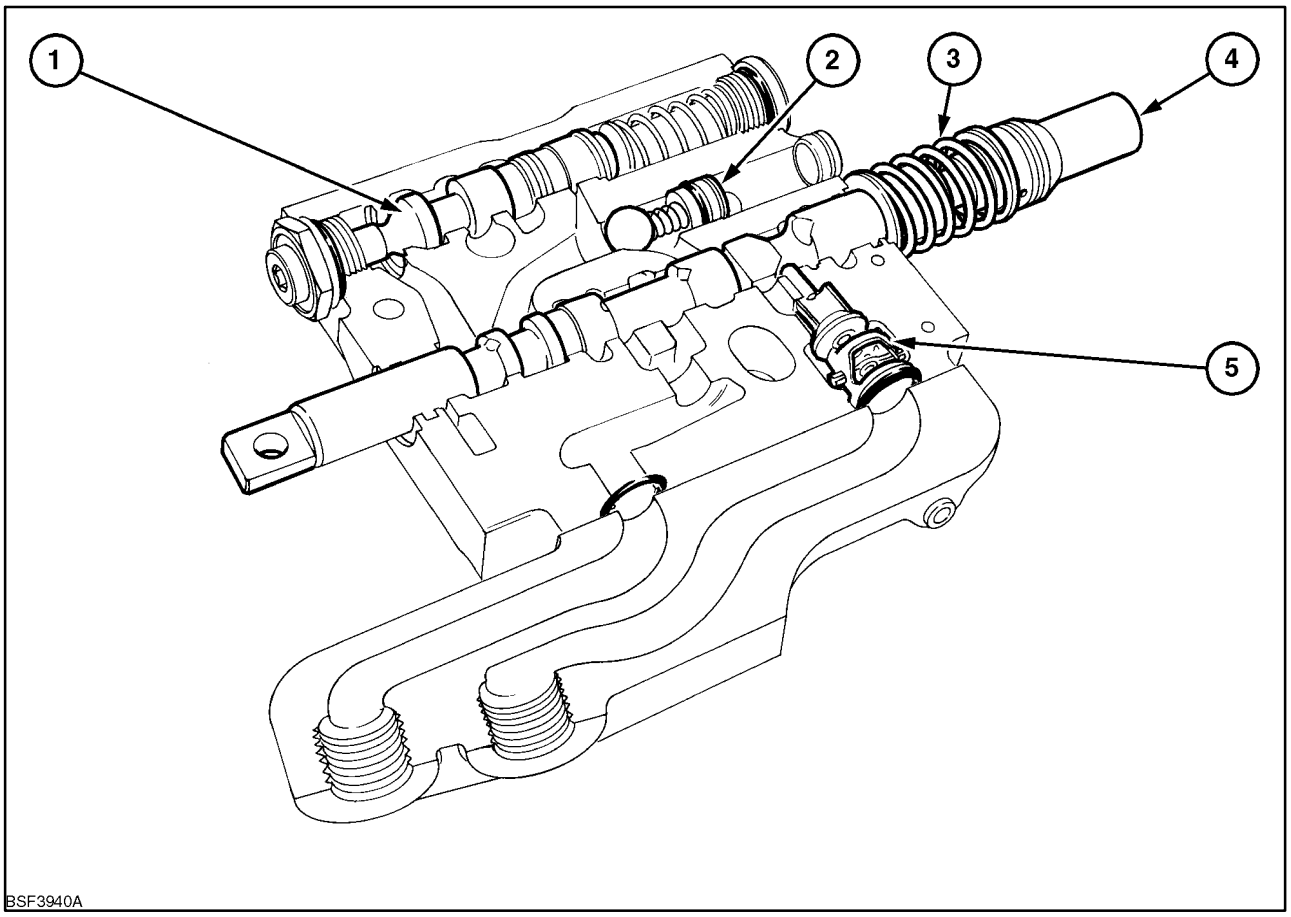
The lock valve is located in the raise port of the remote valve and is closed whenever the remote valve is in neutral. The lock valve prevents leakdown of an implement should there be any leakage across the lands of the spool when in the neutral position. The lock valve is automatically opened whenever the control spool is moved from the neutral position.

CONTROL VALVE SPOOL

The control valve spool is spring centred to a neutral position and when moved by the regulated pilot pressure, via the solenoid control unit, directs oil flow to the raise or lower ports of the control valve.

SPOOL CENTERING SPRING

The spool centering mechanism spring loads the control valve spool to the neutral position.



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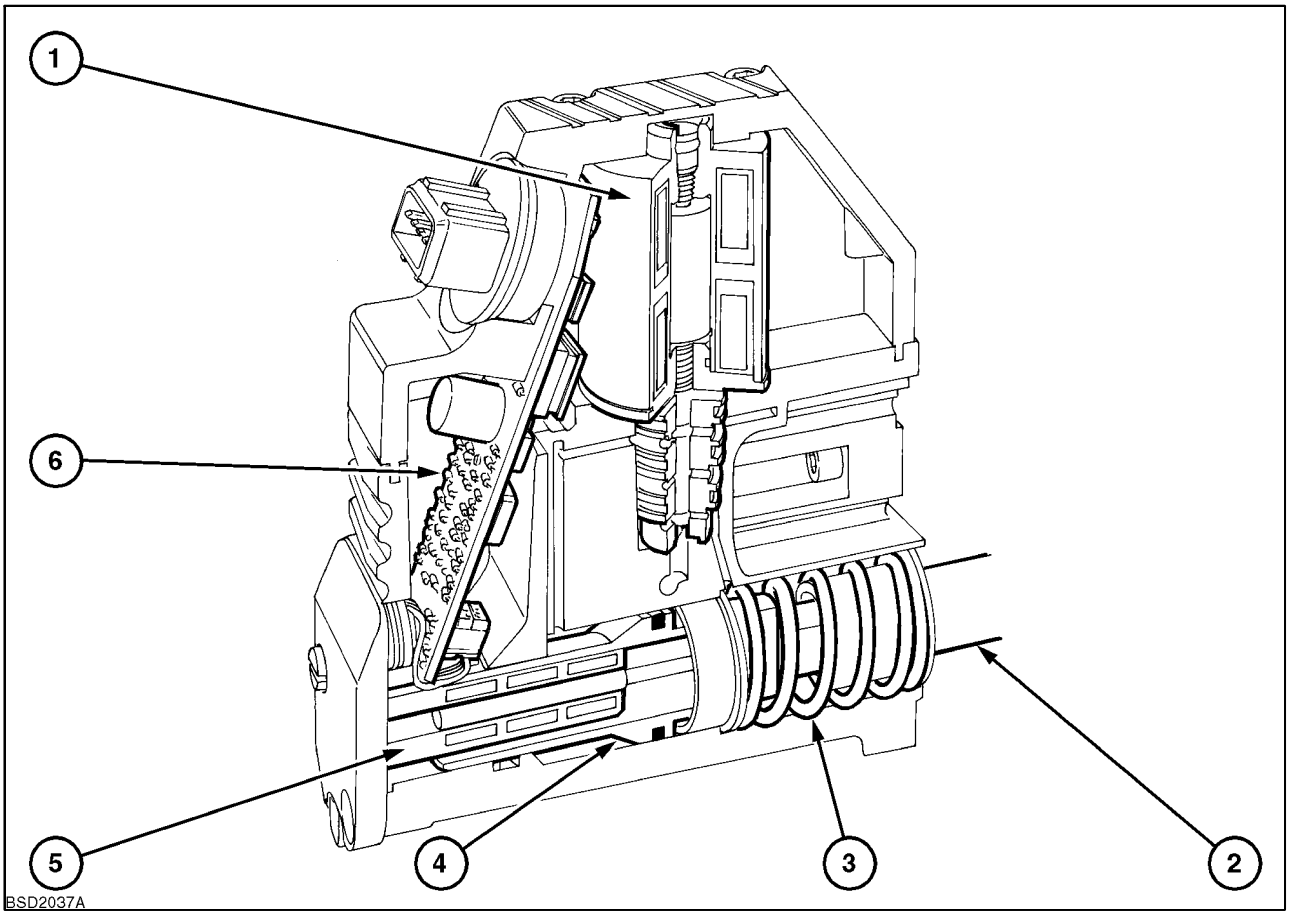
Closed Centre Remote Control Valve Components

1. Flow Control Spool
2. Check Valve
3. Spring
4. Control Valve Spool
5. Load Holding Check Valve



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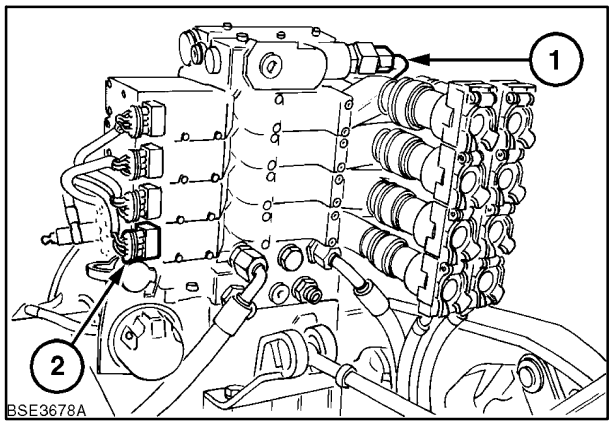
Control Unit Assembly

1. Solenoid Valve
2. Control Valve Spool
3. Centering Spring
4. Control Piston and Seal
5. Position Sensor
6. Control Micro Processor

High pressure oil is supplied direct from the pump to the electro-hydraulic control via the end plate on top of the valve stack(1). This oil is directed to the pilot oil supply in the control valve and is regulated to 20-22 bar by a pressure reducing valve located in the end plate.



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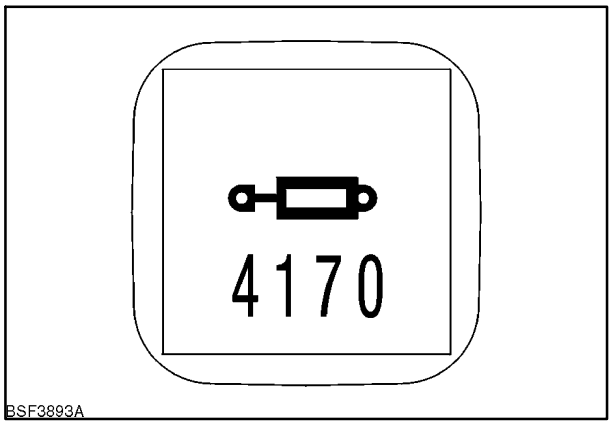
RE-CALIBRATING ELECTRONIC REMOTE VALVE LEVERS

Should one of the control levers lose synchronisation with the remote valve itself, an error code will appear in lower central area of the instrument panel display. The code displayed will show 4170(or 4173, 4177 or 4180) identifying the valve requiring re-calibration. To re-synchronise lever and valve, carry out the following procedure.



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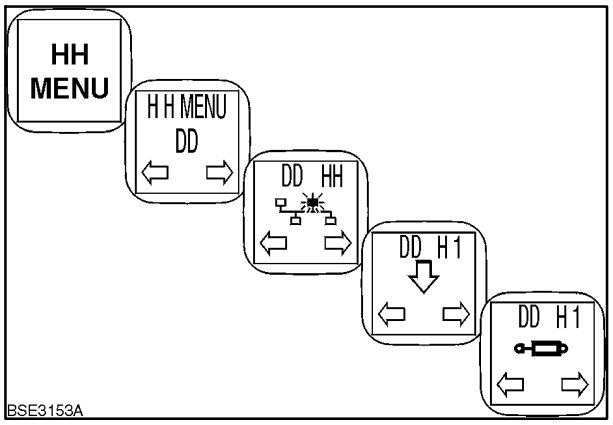
1. Install the diagnostic connector, tool no. 380000843 and start the engine.
2. Using the hour minute and light dimming buttons on the instrument cluster, navigate through to H1 and the htydraulic ram symbol on the DD processor.



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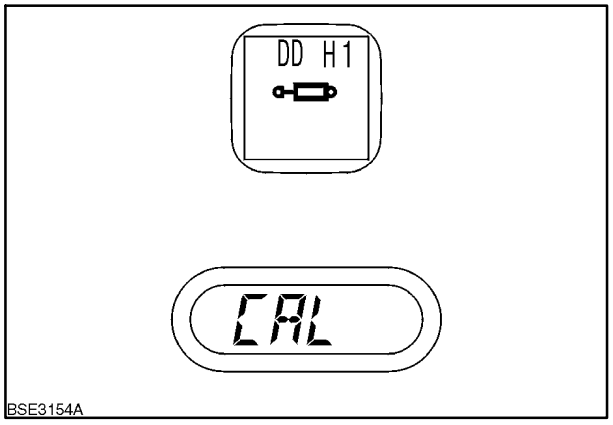
3. 'CAL' will be displayed.



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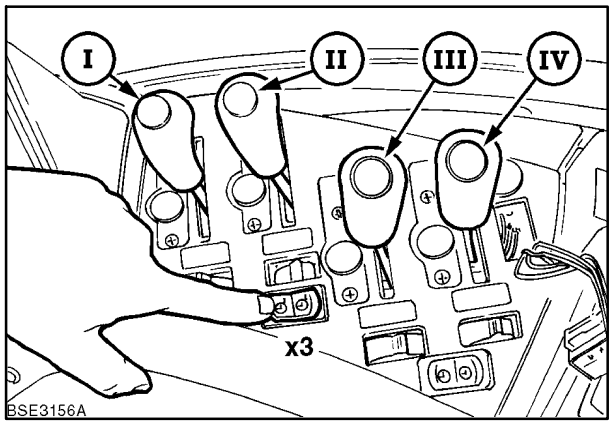
4. Press the program switch of the lever to be calibrated 3 times within 4 seconds.



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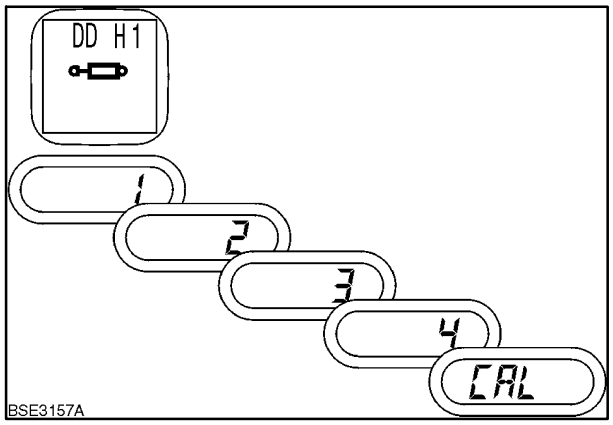
5. The calibration will proceed and the display will change to 1, the program lamp will illuminate. When the neutral position is established the display will change to 2, the program light will switch off.
6. While 2 is displayed move the lever to the raise position, the program light will illuminate. when the raise position is established the display will change to 3, the program light will switch off.
7. While 3 is displayed move the lever to the lower position, the program light will illuminate . When the lower positionis established the display will change to 4, the program light will switch off.
8. While 4 is displayed move the lever to the float position, the program light will illuminate. When the float position is established the display will change to CAL and the program light will switch off.
9. When CAL is displayed this signals the end of calibration for that particular lever, repeat the procedure for the remaining levers as required.
10. Key off to store the new calibration values.



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OIL FLOW IN NEUTRAL

When the remote valves are in neutral the control valve spool is held in the central position by the centering spring.

Oil flow from the parallel gallery (A) to the raise and lower ports is blocked by the lands of the main control spool.

Gallery 'C' and load sensing gallery 'D' are vented to reservoir through galley 'G'.

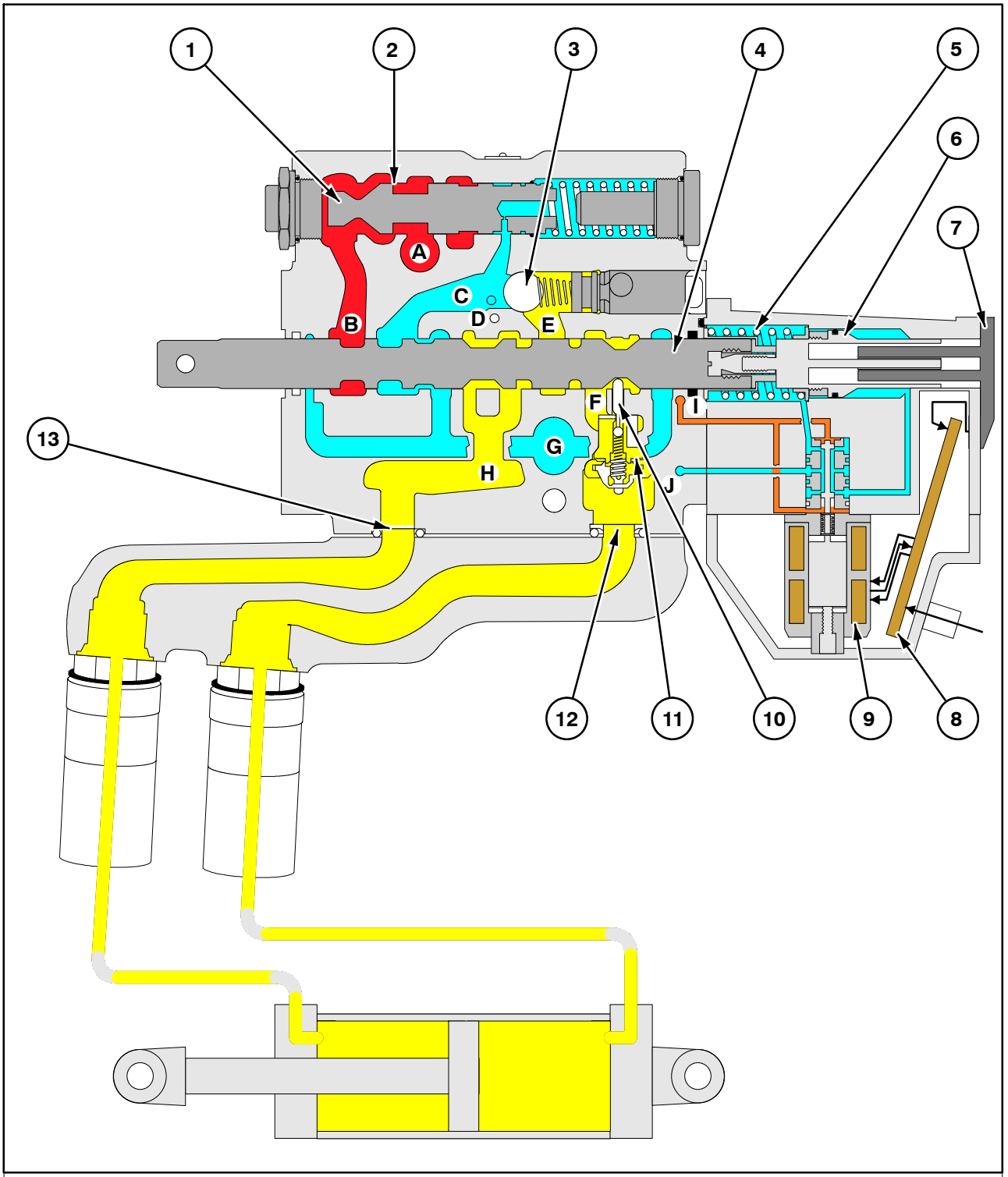
The galleries to the raise and lower ports are blocked by the lands on the main control spool.

The pin on the lock valve is positioned in the waisted section of the spool allowing the valve to be spring loaded into the closed position preventing an extended cylinder retracting under load should there be a slight leakage in the main spool.

Figure 32

Single Remote Control Valve Operation-Neutral

1. Flow Control Spool
2. Metering Land
3. Load Hold Check Valve
4. Main Control Spool
5. Spool Centering Spring
6. Control Spool Operating Piston
7. Position Sensor
8. Micro Processor
9. Solenoid Valve
10. Pin
11. Lock Valve
12. Raise (Cylinder Extend) Port
13. Lower (Cylinder Retract) Port



BSE3801A

Single Remote Control Valve Operation-Neutral 32

Pump Pressure

Return to Reservoir

Trapped Oil

Pilot Line Pressure

OIL FLOW IN RAISING (CYLINDER EXTEND)

When the remote valve operator control switch is moved to the raise position the control spool is moved to the left via pilot line oil from the solenoid control unit, supplied from Gallery 'I'.

Moving the spool to the raise position causes the pin (6) on the lock valve to ride up the ramp of the spool and hold the valve in the open position.

Gallery 'B' is now open to gallery 'C' and gallery 'E' is open to gallery 'F'.

The flow from gallery 'C' is blocked by the load hold check valve ball (4) until pressure in the gallery is sufficient to lift the ball off its seat against the back pressure in the lift port gallery 'E'.

Oil can flow from:

Gallery 'C' past the load hold check valve into Gallery 'E'.

Across the flat on the main control spool to Gallery 'F'.

Through the lock valve (7).

Out through the raise port (8) of the remote valve.

Exhaust oil from the extending cylinder returns through the lowering port and gallery (H), around the land on the main control spool and back to reservoir via the common gallery 'G'.

If the load hold check valve (4) was not installed the situation could occur where pump pressure is insufficient to support the load in the raise port when the remote valve is moved from neutral to raise condition. Under this situation the load would momentarily drop until pump pressure was sufficient to support the load.

The rate of flow through the remote control valve is controlled electronically by the control unit solenoid, again based on the setting of the flow potentiometer within the cab.

To maintain set flow through the remotes under all conditions with varying pump inlet pressure in parallel gallery 'A' the flow control spool senses the pressure and the spool adjusts to provide the required flow at each operating remote.

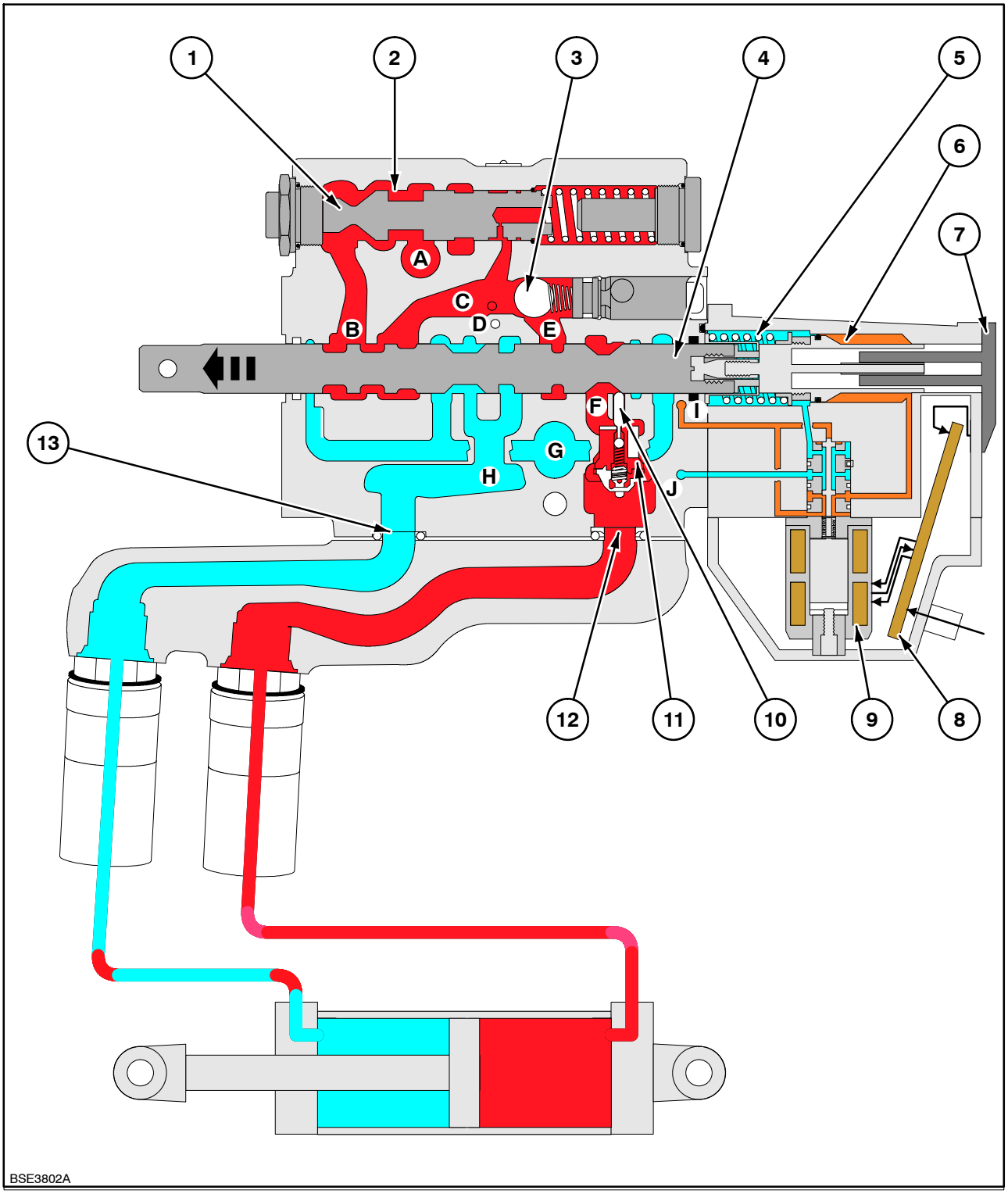
The differential pressure sensed on each end of the spool causes the spool to move to a new state of equilibrium and continually regulates the flow across the spool metering lands (2) to maintain a constant flow through the flow control restrictio,n irrespective of pressure in other hydraulic circuits.

The pressure in gallery 'C' is also transmitted down the load sensing gallery 'D' to the flow compensating valve of the variable flow piston pump where pump output is regulated according to circuit demand.

Figure 33

Single Remote Control Valve Operation-Raising (Cylinder Extend)

1. Flow Control Spool
2. Metering Land
3. Load Hold Check Valve
4. Main Control Spool
5. Spool Centering Spring
6. Control Spool Operating Piston
7. Position Sensor
8. Micro Processor
9. Solenoid Valve
10. Pin
11. Lock Valve
12. Raise (Cylinder Extend) Port
13. Lower (Cylinder Retract) Port



33

Single Remote Control Valve Operation-Raising (Cylinder Extend)

Pump Pressure

Remote Valve Operating Pressure

Return to Reservoir

Pilot Line Pressure

OIL FLOW IN LOWERING (CYLINDER RETRACT)

When the remote valve operator control switch is moved to the lower position the control spool is moved to the right via pilot line oil from the solenoid control unit, supplied from gallery 'I'.

In a similar manner as for the raise cycle of the remote valve the position of the spool causes the pin on the lock valve to hold the valve in the open position.

Gallery 'B' is now open to gallery 'C' and gallery 'E' is open to gallery 'H'.

Oil from the parallel gallery 'A' flows past the flow control valve spool and restrictor (2) into gallery 'C' and the load sensing gallery 'D'.

The load hold check valve ball (4) remains closed until pump system pressure is sufficient to overcome the back pressure in gallery 'E'. When the load hold check valve ball lifts of the seat oil flows into gallery 'H', round the control valve spool to gallery 'G' and out through the lowering port of the remote valve coupling.

Exhaust oil from the Retracting cylinder returns to reservoir gallery 'G' though the raising port and lock valve (7).

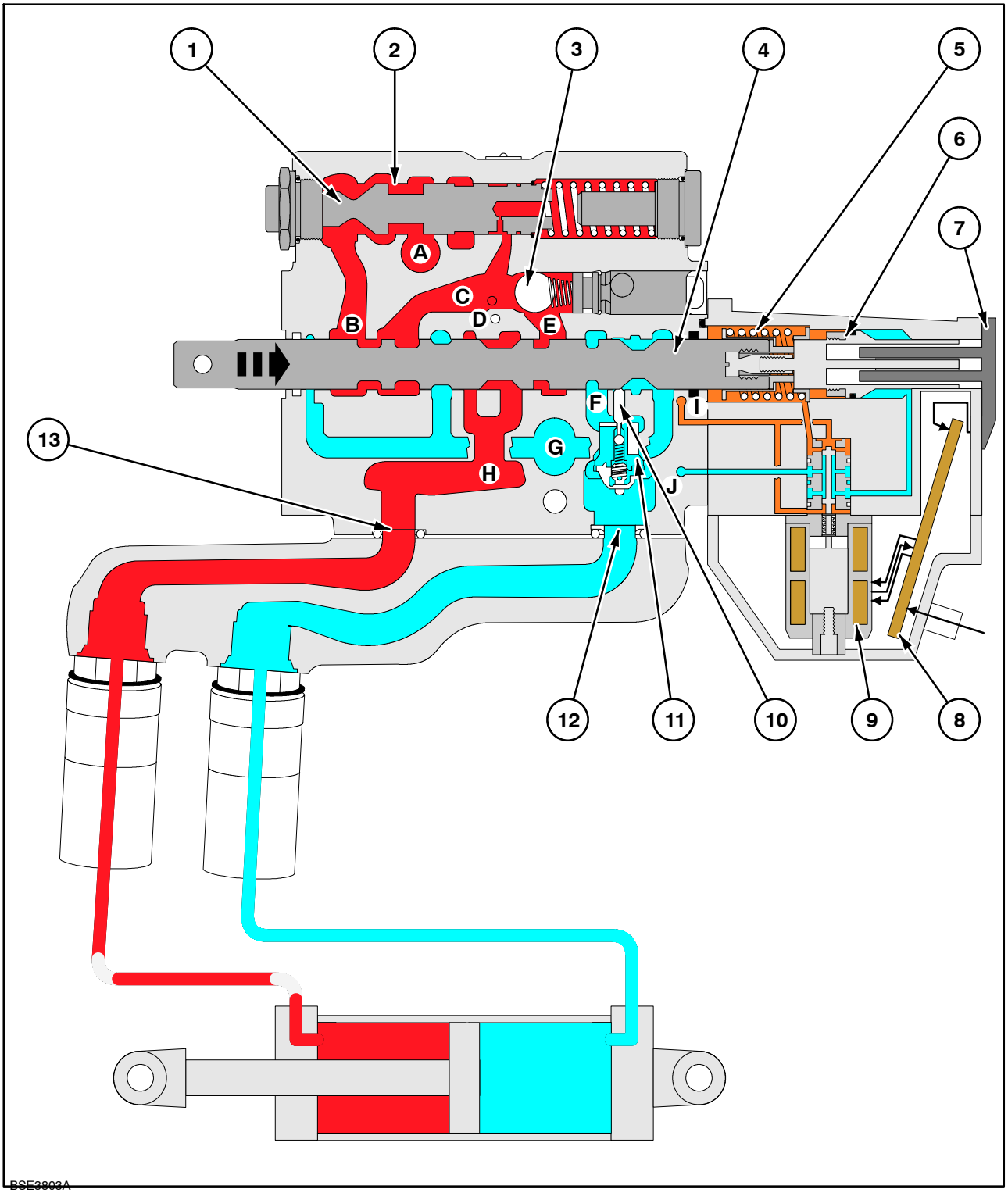
Pump output and system pressure will continually react to the maximum demand of the tractor high pressure hydraulic circuits as sensed through the load sensing lines.

Flow through the remotes is controlled in exactly the same manner as described in the 'Oil Flow In Raising' section by sensing differential pressure across the flow control spool.

Figure 34

Single Remote Control Valve Operation-Lowering (Cylinder Retract)

1. Flow Control Spool
2. Metering Land
3. Load Hold Check Valve
4. Main Control Spool
5. Spool Centering Spring
6. Control Spool Operating Piston
7. Position Sensor
8. Micro Processor
9. Solenoid Valve
10. Pin
11. Lock Valve
12. Raise (Cylinder Extend) Port
13. Lower (Cylinder Retract) Port



Single Remote Control Valve Operation-Lowering (Cylinder Retract) 34

Pump Pressure

Return to Reservoir

Remote Valve Operating Pressure

Pilot Line Pressure

OIL FLOW IN FLOAT

The float position allows the free flow of oil from both the raise and lower ports of the remote valve permitting the cylinder to extend or retract freely. This feature is particularly useful to allow equipment such as scraper blades to 'float' or follow the ground contour.

When the remote valve operator control switch is moved to the float position the control spool is moved fully to the right via pilot line oil from the solenoid control unit, supplied from gallery 'I'.

Oil flow from the gallery (B) to the raise and lower ports is blocked by the land of the spool end.

The position of the spool causes the pin (7) on the lock valve to hold the valve in the open position.

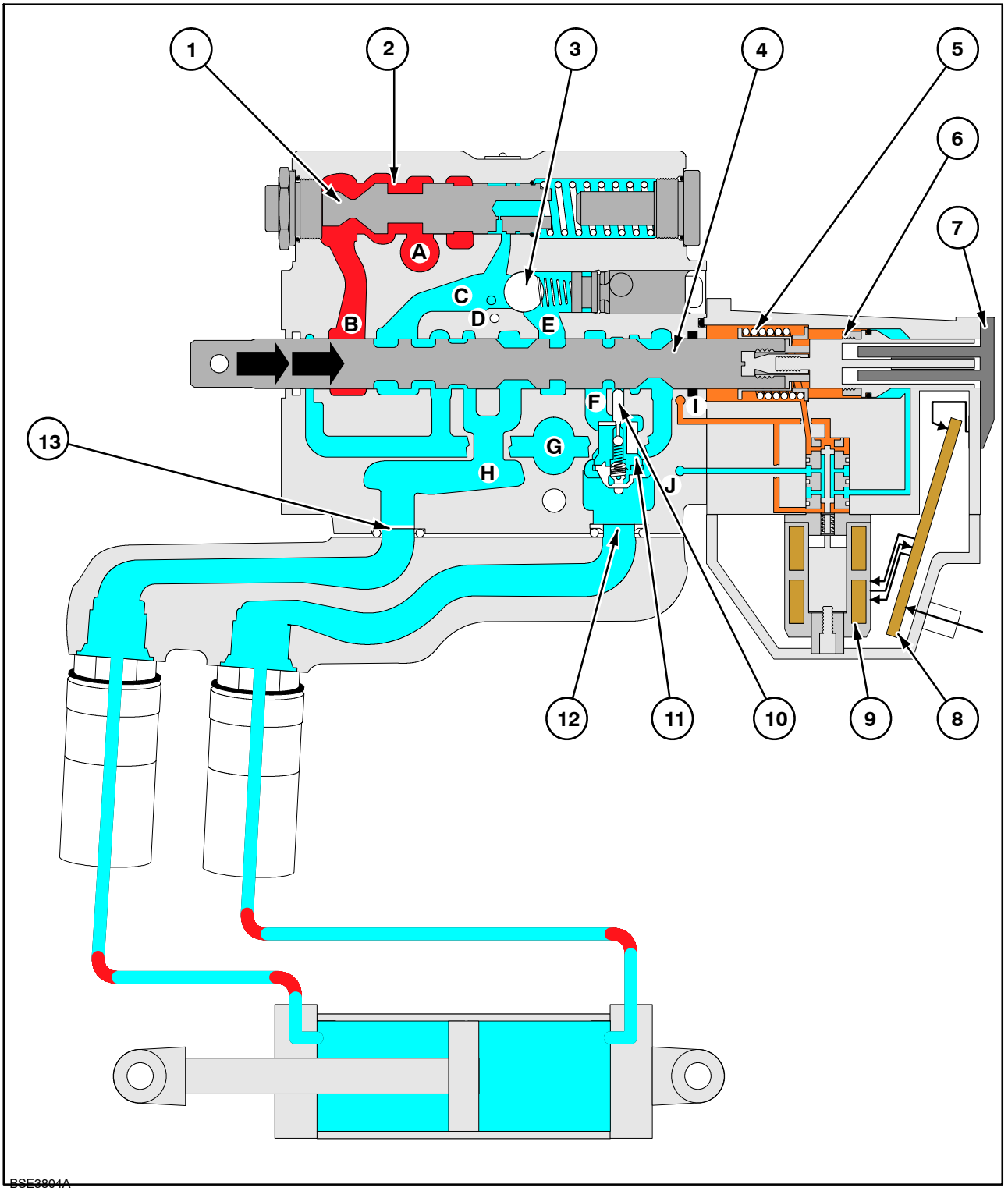
The raise and lower ports of the remote valve are open to reservoir gallery 'G' allowing a free flow of oil from one port of the cylinder to the other.

Should a void occur in the circuit oil will be drawn by suction from one side of the cylinder to the other.

Figure 35

Single Remote Control Valve Operation-Float

1. Flow Control Spool
2. Metering Land
3. Load Hold Check Valve
4. Main Control Spool
5. Spool Centering Spring
6. Control Spool Operating Piston
7. Position Sensor
8. Micro Processor
9. Solenoid Valve
10. Pin
11. Lock Valve
12. Raise (Cylinder Extend) Port
13. Lower (Cylinder Retract) Port



Single Remote Control Valve Operation-Float 35

Pump Pressure

Return to Reservoir

Pilot Line Pressure

NOTES

OPERATION OF TWO OR MORE CONTROL VALVES SIMULTANEOUSLY

Because the stack type remote valves have a common parallel input gallery and individual flow control valves it is possible to operate two or more remotes simultaneously without loss of efficiency.

This is achieved by the flow control spools which regulate flow through each remote valve irrespective of pump system pressure.

If these valves were not fitted and two remotes were operating simultaneously at different pressures all oil would attempt to flow to the light load circuit.

The following details the process of operating a single remote valve and then operating an additional remote valve at the same time.

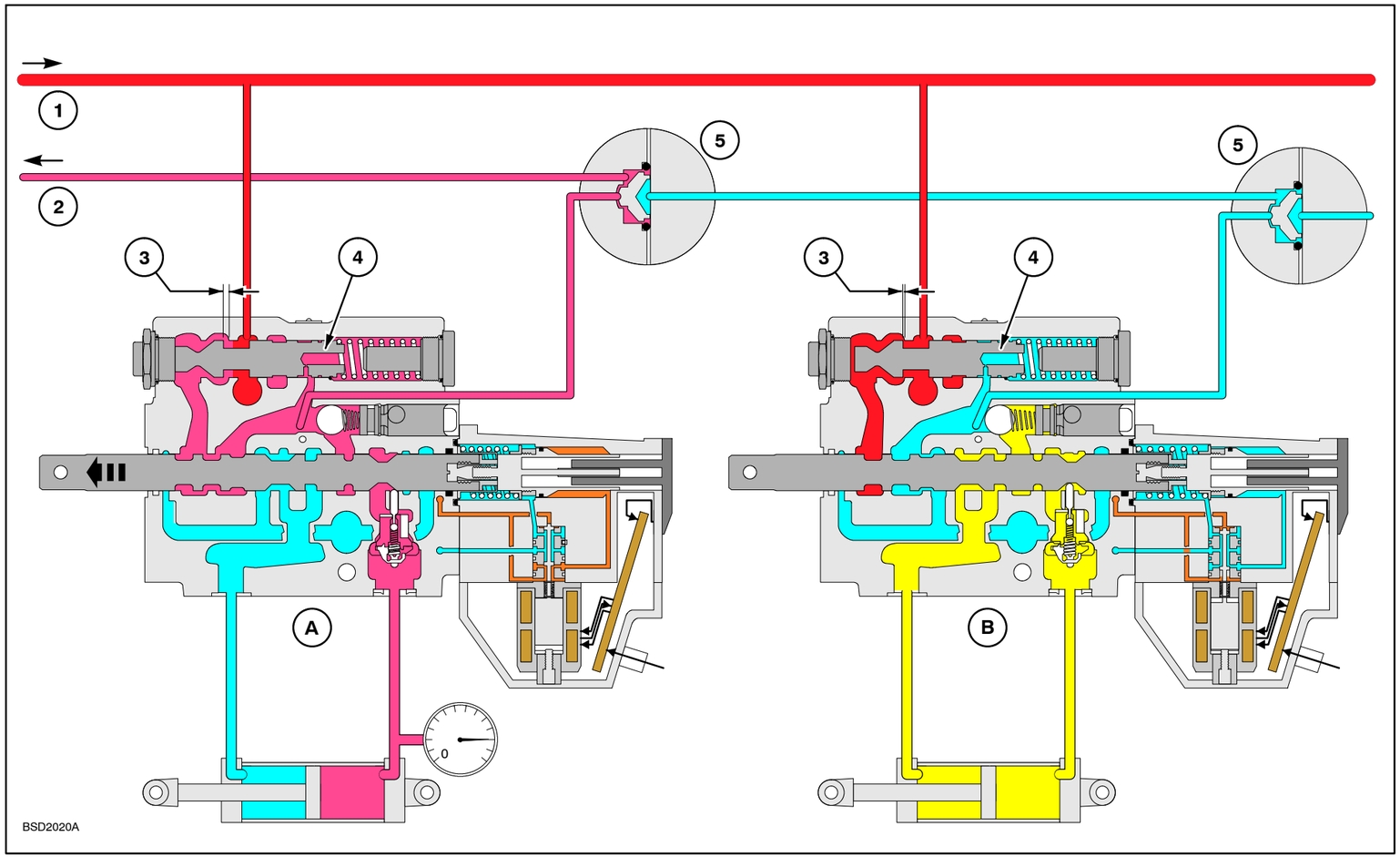
When a single service is operated the pressure in the parallel gallery is at pump pressure.

The pressure in the load sense line to the hydraulic pump is equal to the operating pressure of the working remote valve.

Required flow through the electro-hydraulic remote valve is set by turning the operator controlled potentiometer in the cab. The flow is then determined by the control valve spool which is electrically controlled by the control unit solenoid.

The pressure differential in combination with the spring acting on the ends of the flow control spool causes the spool to move to a position of equilibrium which adjusts the flow across the spool metering lands (3).

The adjustment of flow across the metering land (3) produces a constant flow through the remote valve.



Single Remote Valve Operating

Pump Pressure

Return to Reservoir

Remote Valve Operating Pressure

Trapped Oil

A. Remote Valve in Operation

1. Parallel Gallery
(Interconnecting Remote Valves Sections)

2. Load Sense Line
(Interconnecting Remote Valves Sections)

B. Remote Valves in Neutral

3. Spool Metering Lands

4. Flow Control Spool

5. Load Sense Line Check Valve

It is essential that the flow of oil through two or more remote valves operating simultaneously at different pressures is individually controlled otherwise oil will always flow to the circuit operating at the lowest pressure.

When operating two or more hydraulic services the operating pressure in the parallel gallery is at the highest operating pressure of the hydraulic system as sensed through the load sense line.

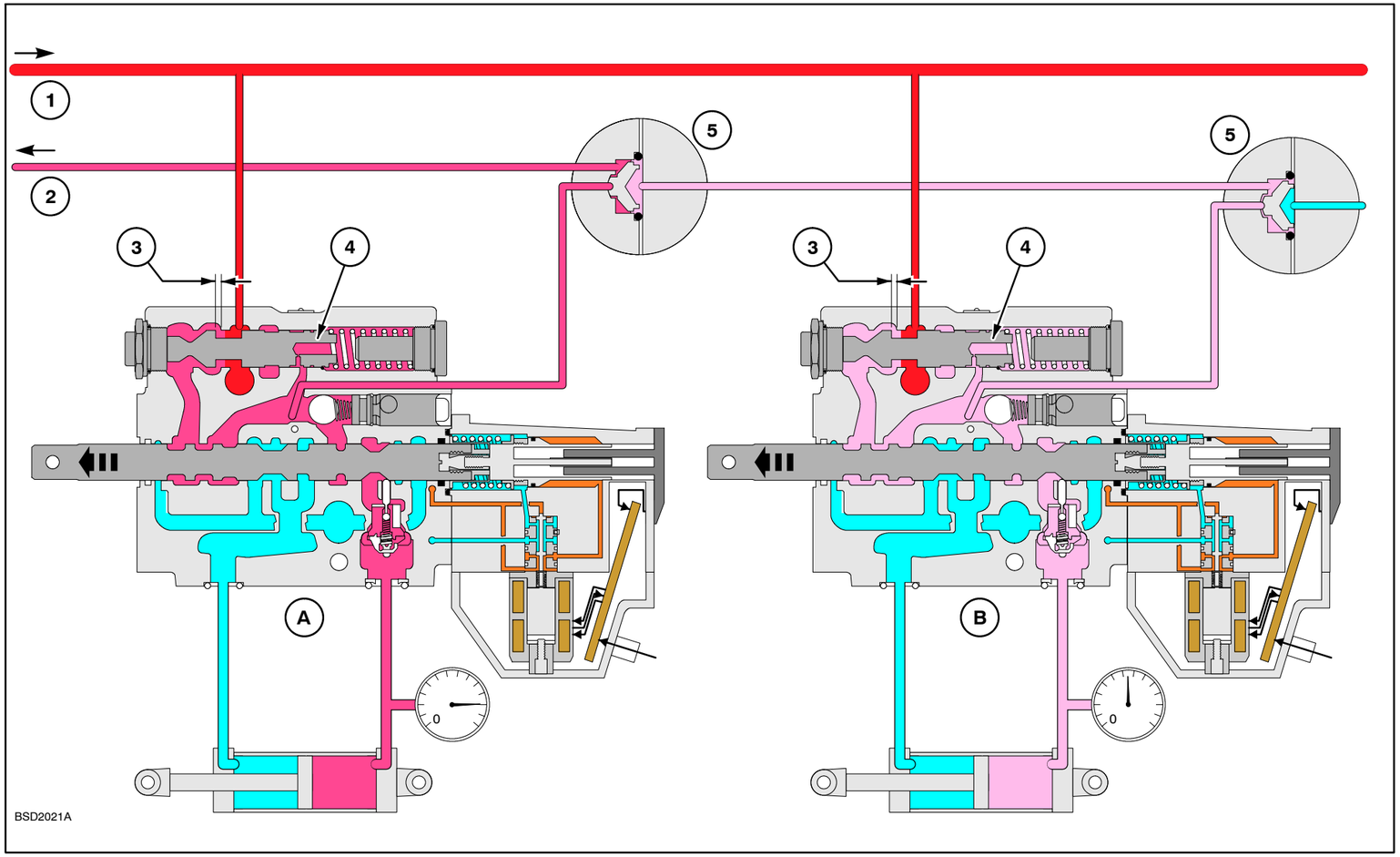
Check valves in the load sense line between each valve section ensure only the highest pressure is directed to the pump flow pressure compensating valve.

In the same manner as for single remote valve operation the differential pressure across the flow control spool is sensed and flow adjusted accordingly.

Because each remote valve is operating at a different pressure the flow control valve spools will move to different positions to achieve a state of equilibrium.

The flow across the metering land (3) of the lower pressure operating remote valve will be different to the flow across the metering land of the higher operating pressure remote valve.

The metering land on each flow control spool now maintains the required constant flow through the flow control restriction in each remote valve irrespective of the higher pump system pressure required to operate other hydraulic circuits.



Two Remote Valves Operating

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Pump Pressure

Lower Pressure Remote Valve Operation

High Pressure Remote Valve Operation

Return To Reservoir

A. Remote Valve Operating At High Pressure

1. Parallel Gallery (Interconnecting Remote Valves Sections)

2. Load Sense Line (Interconnecting Remote Valves Sections)

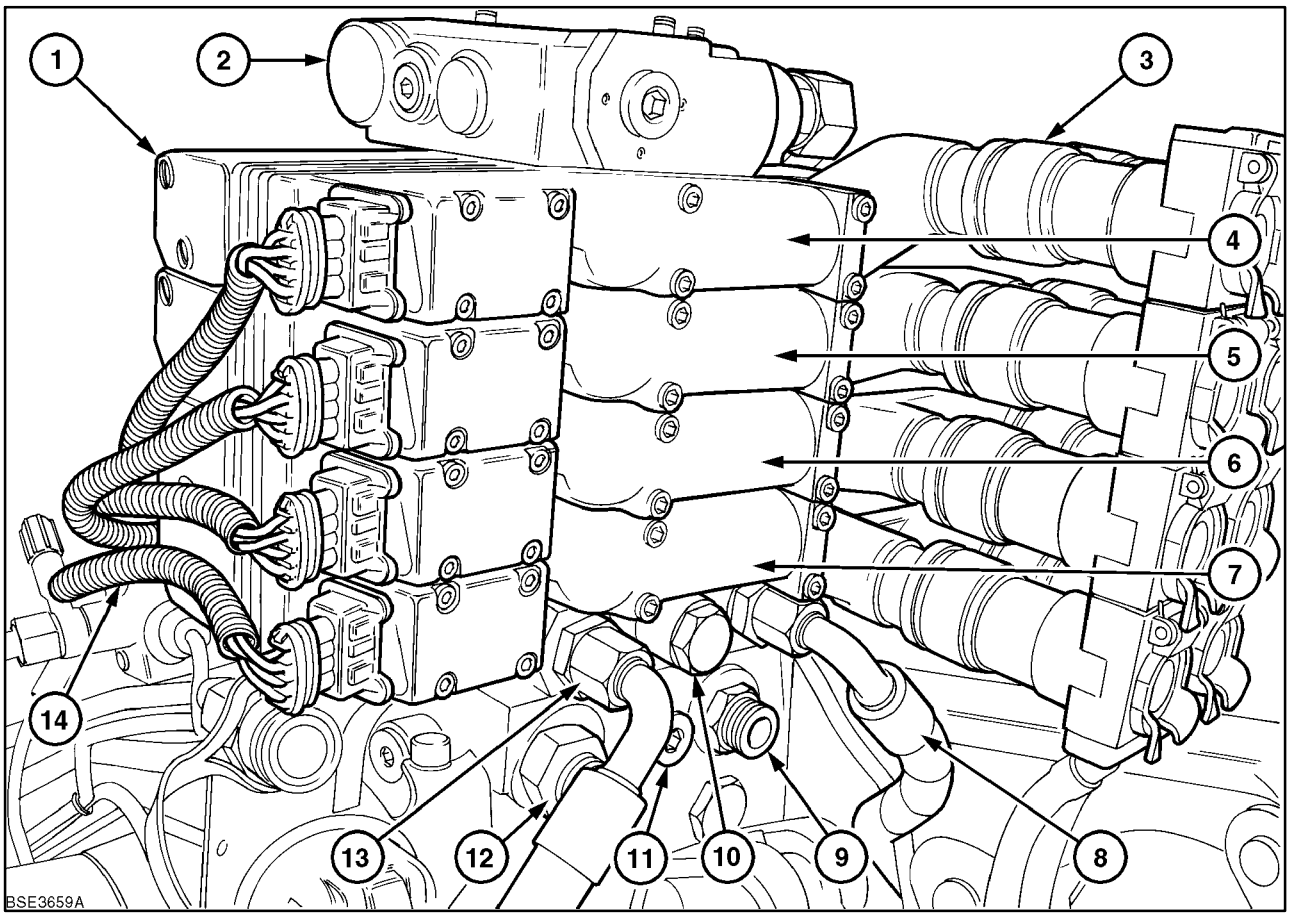
B. Remote Valve Operating At Lower Pressure

3. Spool Metering Lands

4. Flow Control Spool

5. Load Sense Line Check Valve

ELECTRO HYDRAULIC REMOTE VALVE COMPONENTS



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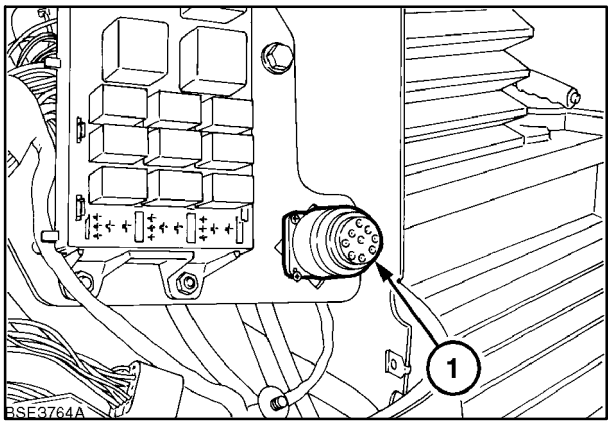
Electronically Controlled Remote Valve

1. Solenoid
2. End Plate
3. Coupler
4. Remote Valve No IV
5. Remote Valve No III
6. Remote Valve No II
7. Remote Valve No I
8. Feed To Right Hand Cylinder
9. Power Beyond Feed Port
10. Lift Cylinder Relief Valve (230 Bar)
11. Low Pressure Relief Valve (28-33 Bar)
12. Power Beyond Return Port
13. Feed To Left Hand Cylinder
14. Solenoid Harness

EHR VALVE NUMBER PROGRAMING

Each electro hydraulic remote valve has its own built in processor. The processor stores in its memory the valves number within the remote stack, ie, whether it is valve No.1,2 ,3 ,4 or 5. If it becomes necessary to replace a valve assembly then it becomes necessary to reprogram the number of each valve within the complete valve assembly. Valve assemblies are supplied from parts with no number assigned. To reprogram the valve number sequence use the following procedure:



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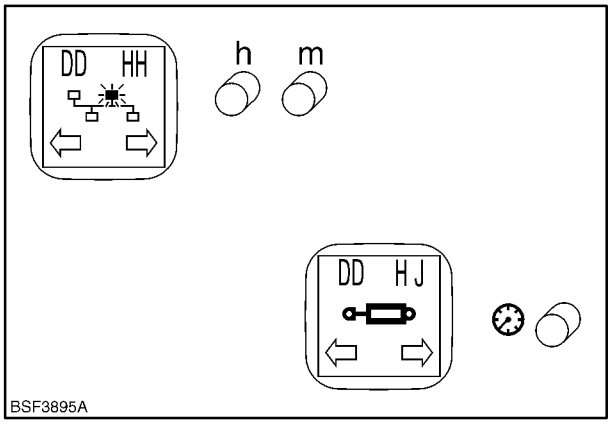
1. With all the remote valves connected to the harness, install diagnostic connector, tool No. 380000843. Turn the Key Start switch ON and select H-menu Mode HJ on the DD processor.



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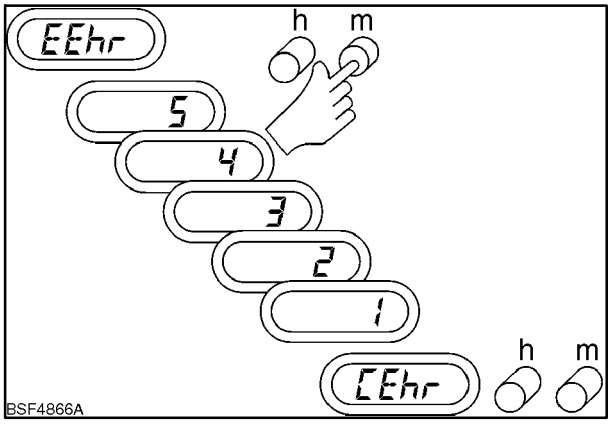
2. The display will change to show 'EEhr'
3. Depress and hold the minute button. The display will change to 5 and countdown to 1, then change to 'CEhr', this means that the valve numbers have been cleared.

NOTE: *If the procedure is aborted or the minute button released the display will return to 'EEhr'*

4. Turn the Key start switch OFF.



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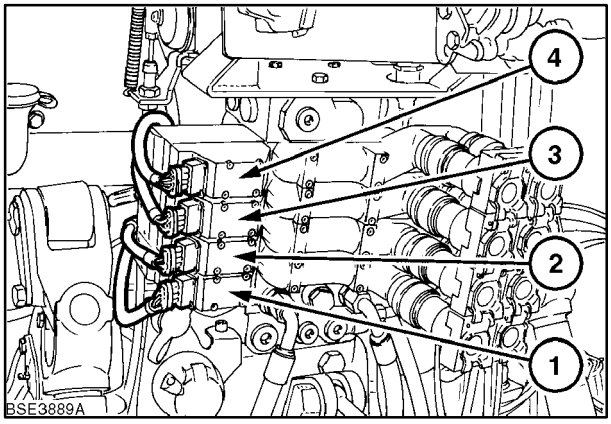
5. Disconnect the connectors from each remote valve.



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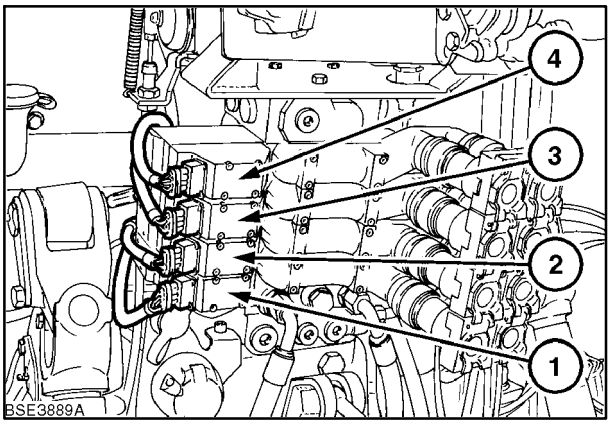
6. Turn the Key Start switch ON and select H Menu mode HJ.
7. The instrument cluster display will flash '**EHr_**'.
8. ***Reconnect each valve in the correct order, ie, No.1 being the lowest valve.*** As each valve is connected an audible beep will signify that the valve is recognised.



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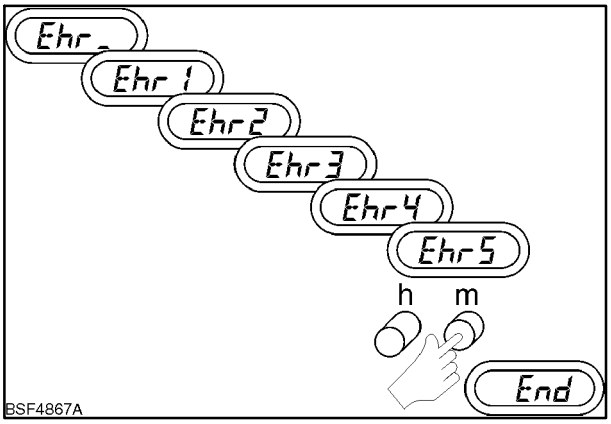
9. The display will change to '**EHr1**' then flash '**EHr2**' to signify that the controller is ready for the next valve to be connected. As each valve is connected the display will change to show the next valve number to be connected until '**Ehr5**' is displayed.
10. When all the valves are connected, depress and hold the minute button, the display will change to '**End**' to signify that the programming is complete.



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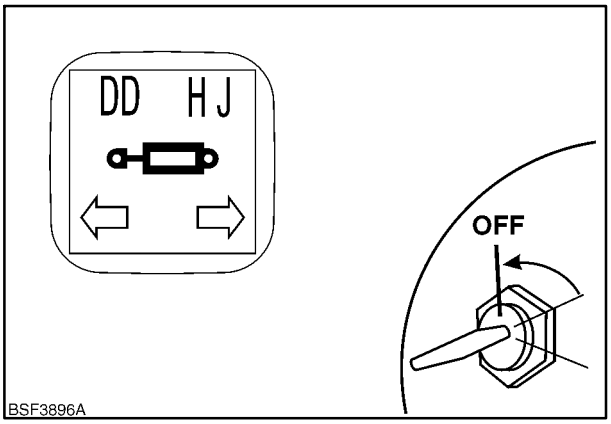
11. Turn the key start switch OFF to store the programming.



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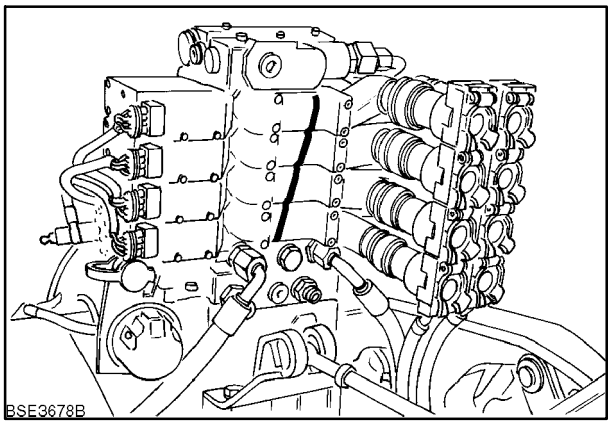
OVERHAUL

REMOTE VALVE

Removal

NOTE: *Individual remote valve assemblies can be removed from the tractor without the need to remove the complete valve stack.*

1. Lower hydraulic links and thoroughly clean remote valve stack.
2. To aid re-assembly draw a diagonal line across the valve stack.



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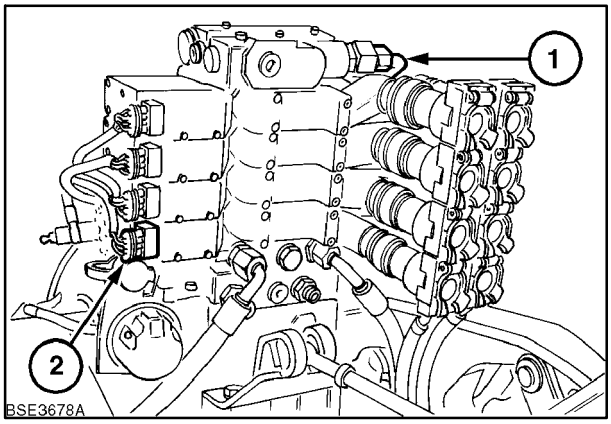
3. Identify and disconnect the connectors to each remote valve solenoid.
4. Disconnect hydraulic pipework (1).



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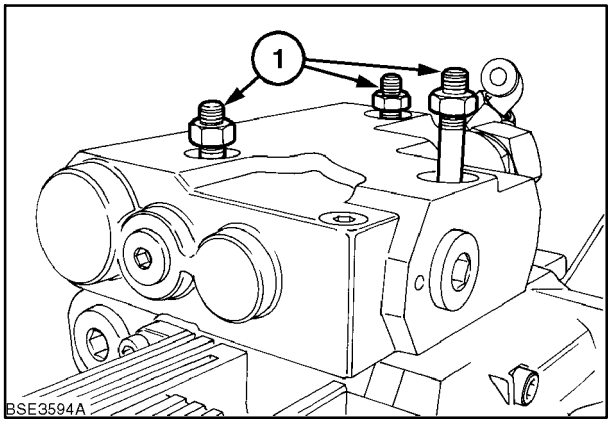
5. Remove the top plate
6. Remove the valve bolts (1).
7. Remove slices making sure to place them in their correct order on the workbench.



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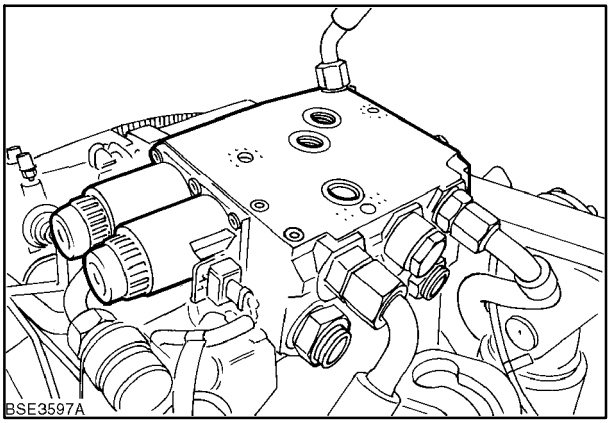
8. Remove EDC slice and Power beyond slice.



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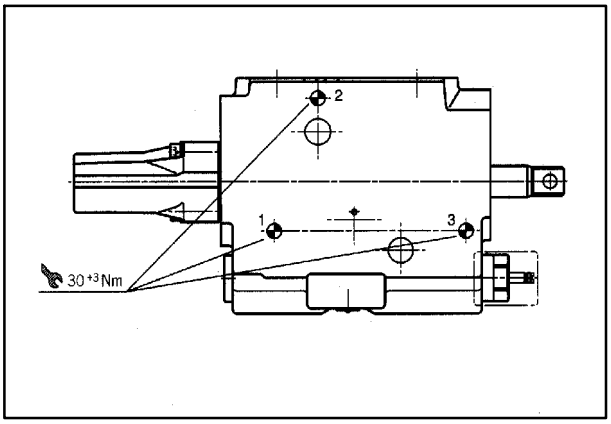
Installation

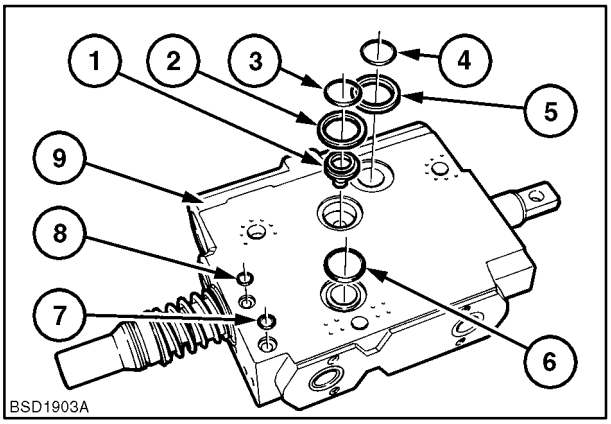
1. Replace the slices onto the top of the centre housing ensuring they are aligned with the mark scratched onto the slices when they were removed.
2. Relocate the valve bolts and tighten in sequence to a torque 30 Nm.



50

Disassembly

1. Disassemble with reference to following.
   - **1.** Load Sense Check Valve
   - **2.** Back up Ring
   - **3.** 'O' Ring
   - **4.** 'O' Ring
   - **5.** Back up Ring
   - **6.** 'O' Ring
   - **7.** 'O' Ring
   - **8.** 'O' Ring
   - **9.** Remote Valve Housing



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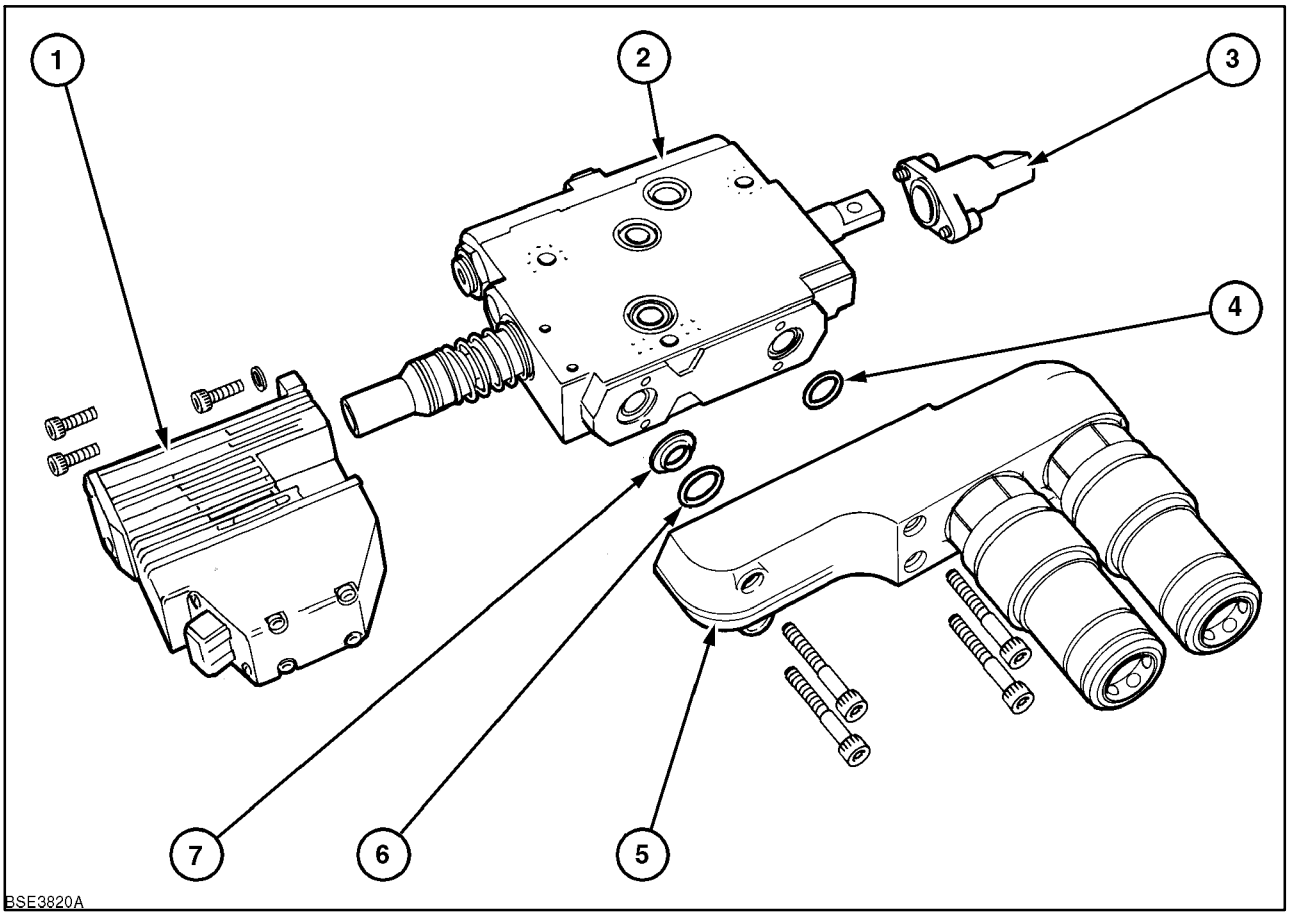

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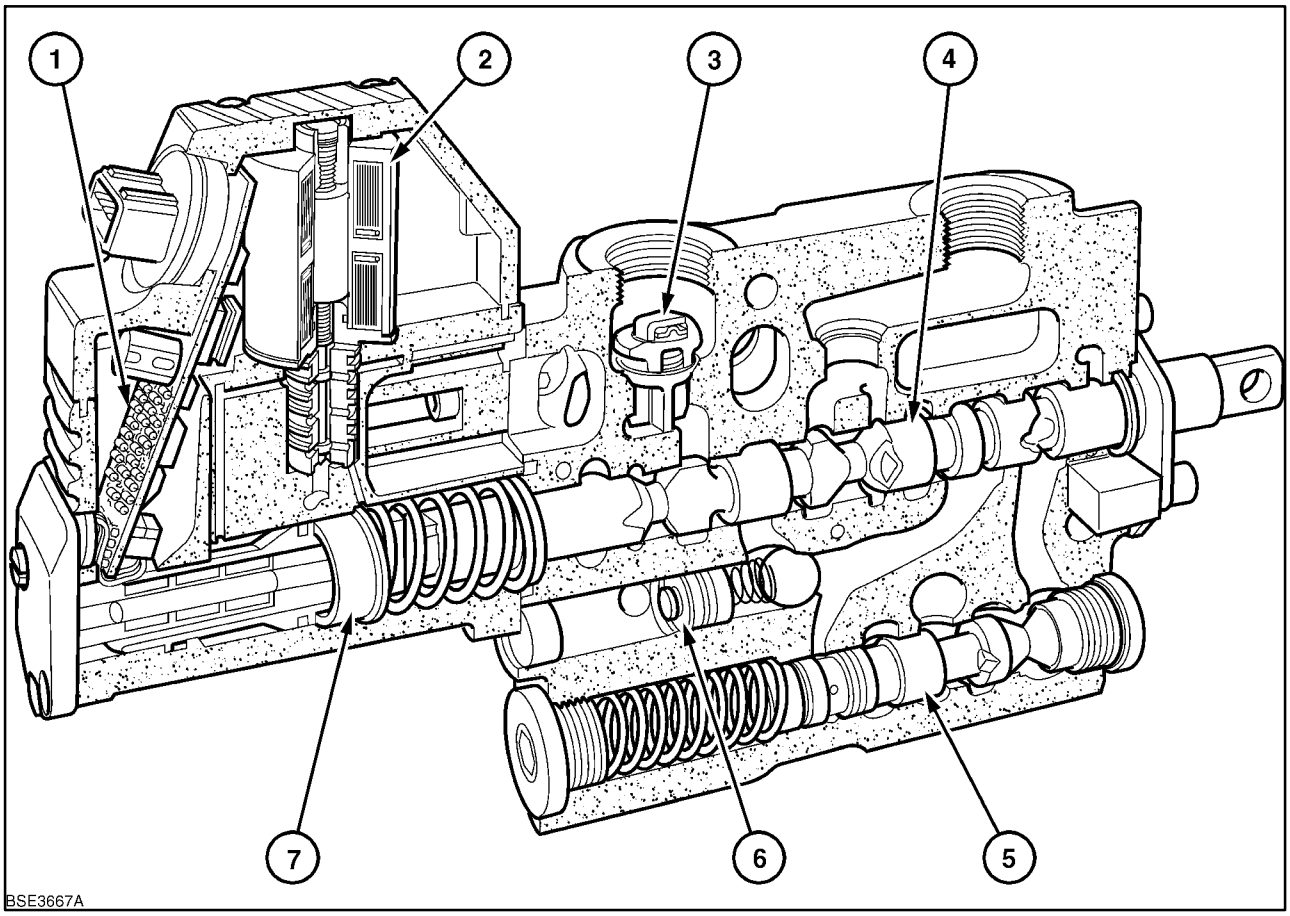
Remote Valve and Coupler Housing

1. Spool Control Unit
2. Remote Valve Body
3. Cap
4. 'O' Ring
5. Coupler Housing
6. 'O' Ring
7. Seat

2. The couplers are serviced as an assembly and should not be disassembled.

NOTE: *DO NOT attempt to remove the spool until the load holding valve (5) Figure 53 has been removed, otherwise damage to the spool will occur.*



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Electro-Hydraulic Controlled Closed Centre Remote Control Valve Components

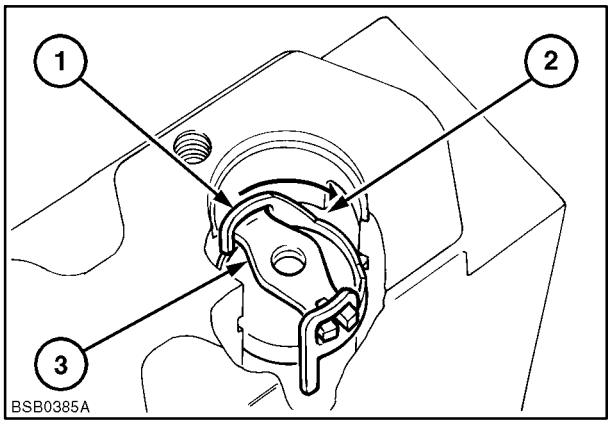
1. Spool Control Unit
2. Pilot Valve
3. Load Holding Valve
4. Control Valve Spool
5. Flow Control Spool
6. Check Valve
7. Control Piston

3. Remove load holding valve from raise port as follows:-

   Using small screwdriver, open the two slots (1) on keeper (2).

   Turn spring seat (3) through 90° and remove from housing.

   Remove load check valve components.



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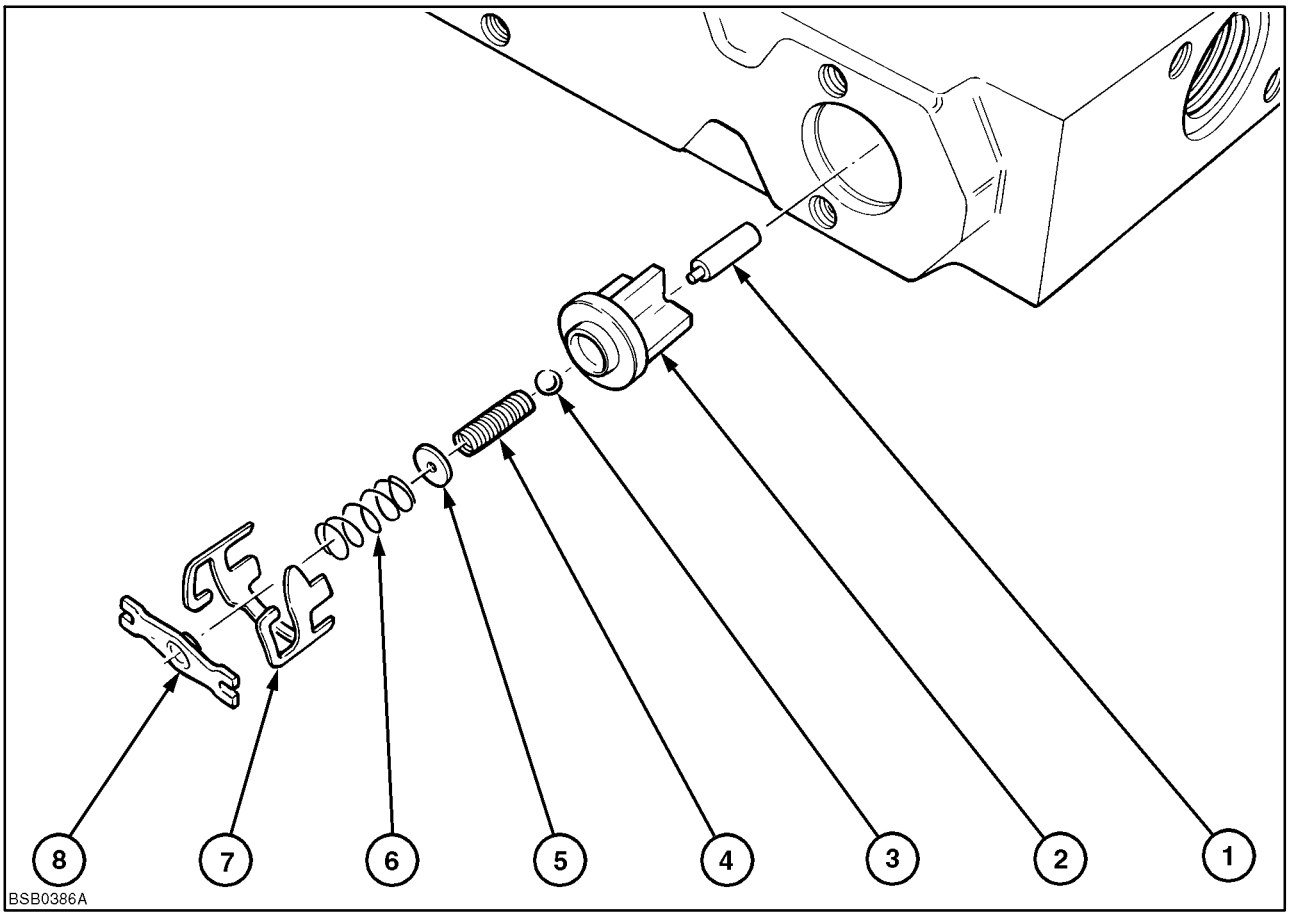

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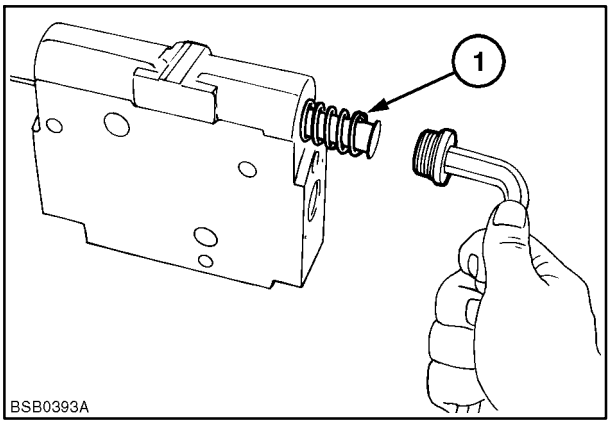
Load Check Valve

1. Plunger
2. Load Holding Valve
3. Ball
4. Spring
5. Washer
6. Spring
7. Spring Seat
8. Keeper

4. Carefully remove flow control valve plug.

⚠ WARNING ⚠

A large spring (1) is positioned beneath the plug, take extreme care when removing plug.



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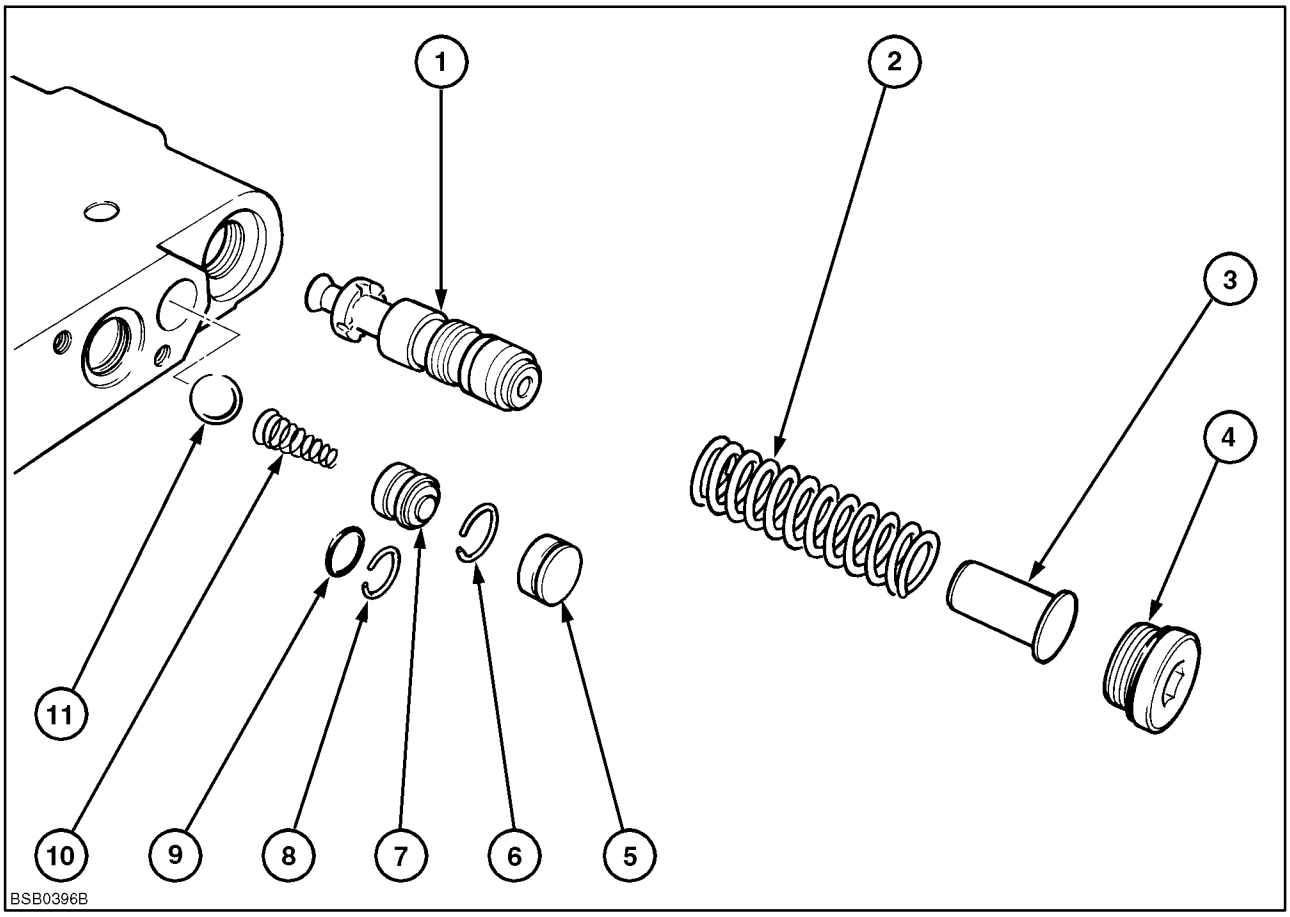

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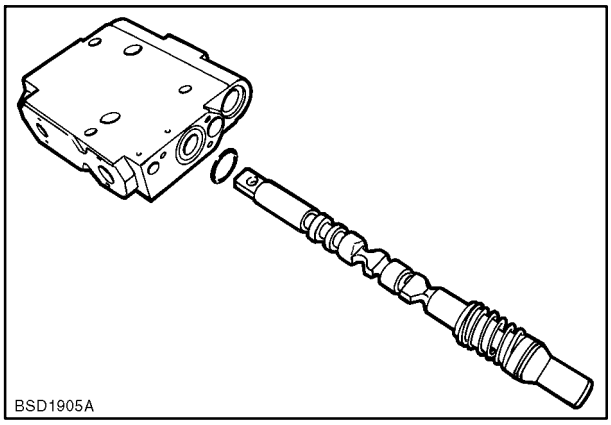
Flow Control Spool and Check Valve

1. Flow Control Spool
2. Spring
3. Spring Guide
4. Plug and 'O' Ring
5. Plastic Cap
6. Retainer
7. Plug
8. Back-up Ring
9. 'O' Ring
10. Spring
11. Check Valve Ball

5. Withdraw control valve spool from housing.
6. The spring centring mechanism is factory set. DO NOT disassemble the spool.



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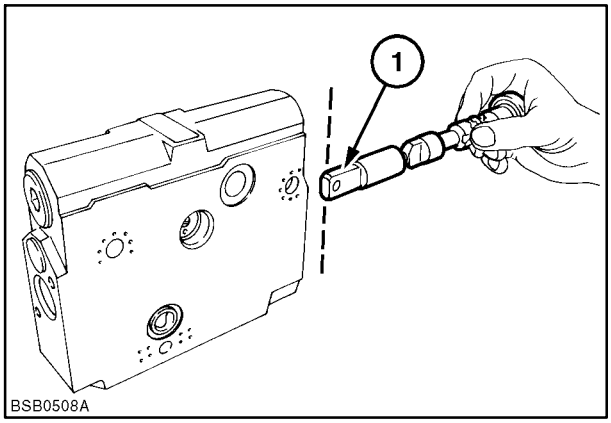
Assembly

1. Re-assembly follows the disassembly procedure in reverse.
2. Prior to inserting control valve spool in housing ensure flats (1) on end of spool are in vertical position as shown, then install the load holding valve, Figure 55. **Do Not** rotate spool after installing load holding valve otherwise damage to spool and load holding valve plunger will occur.



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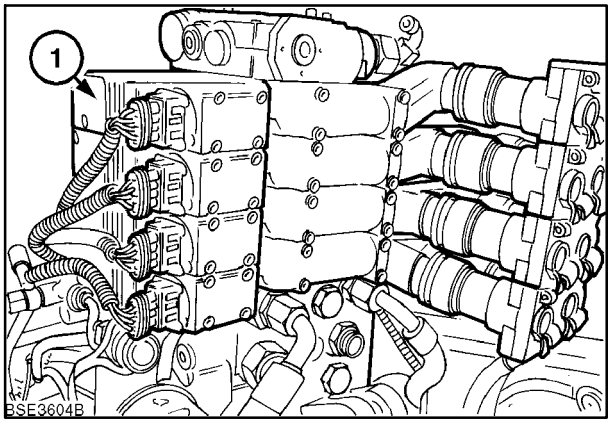
COMPLETE VALVE STACK

Removal

1. Steam clean remote control valve assembly prior to removal.
2. Lower hydraulic links.
3. Remove covers on remote valve couplers.
4. Remove support for pneumatic trailer brake couplers (where fitted).



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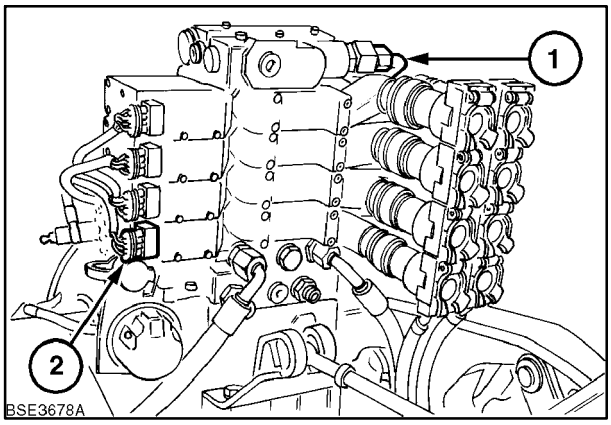
5. Disconnect harness from electronic draft control solenoids ,remote valve solenoids (2), and pressure feed hose (1).

NOTE: *Identify the remote valve connectors to facilitate correct re-installation.*



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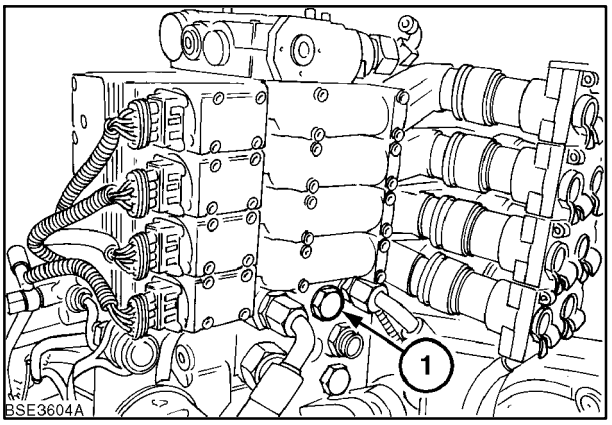
6. Disconnect the lift cylinder hydraulic hoses from the EDC slice (1) .



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7. Using suitable lifting equipment support remote valve assembly, remove the three base securing bolts and lift valve stack from tractor.

Installation

1. Using suitable lifting equipment support remote valve assembly and relocate onto the centre housing. Replace the three base securing bolts and tighten retaining bolts to torque of 43Nm.
2. Re-connect all electrical and hydraulic connectors.

NOTES

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 8A - Hydraulic Remote Control Valves With Configurable Detent

CONTENTS

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	Configurable Detent Control	2
	Overhaul	3
	Removal	3
	Installation	3

DESCRIPTION AND OPERATION

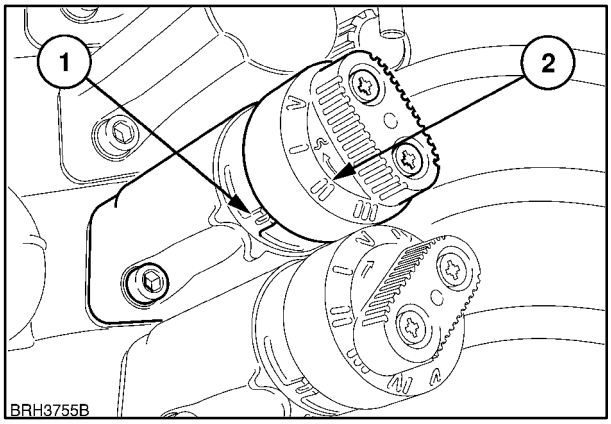
CONFIGURABLE DETENT CONTROL

All models fitted with cabs, CCLS pump and EDC can be fitted with a Remote valves with configurable detent.

To select a setting, rotate the control until the number (2), on the end cap, aligns with the mark (1), on the valve body.

NOTE: *If the number on the rotary control is not aligned correctly with the reference mark on the valve body, the performance of the valve may be affected.*

Before turning the selector, ensure any residual pressure in the hydraulic system is exhausted. To do this, stop the tractor engine, cycle the remote valve lever through all positions and then place the lever in neutral.



1

Each position offers the following functions:

I. Raise (R), Neutral (N), Lower (L) and Float (F) positions available.
Detent position in Float only.
No lever auto return to neutral (kick out).

II. Raise, Neutral and Lower positions only.
No Float facility.
No detent positions available.
No lever auto return to neutral (kick out).

III. Raise, Neutral, Lower and Float positions available.
Detents in Raise, Lower and Float.
Lever auto return to neutral (kick out) in Raise and Lower positions.

IV. Raise, Neutral, Lower and Float positions available.
Detents in Raise, Lower and Float.
No lever auto return to neutral (kick out).

V. *Raise and Float positions available.
Detents in Raise and Float.
No lever auto return to neutral (kick out).

*To select position 5, place the remote valve lever in neutral, select position I **or** IV then move the lever to the Float position. With the lever in Float select position V.

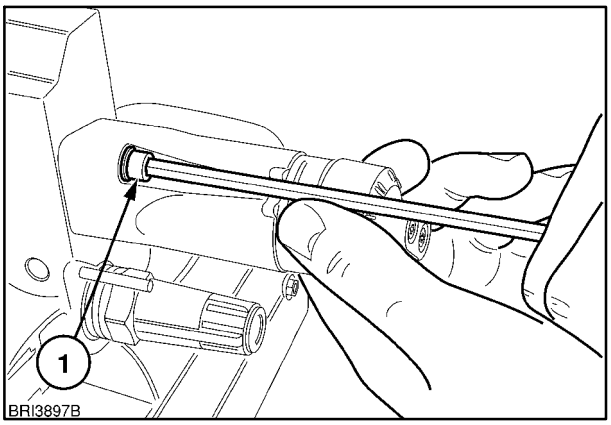
To de-select position V, put the remote valve lever into float, turn the selector control to position I **or** IV and then move the remote valve lever to neutral. It is now possible to select positions I to IV.

IMPORTANT: *To prevent inadvertent movement of attached equipment when starting the tractor engine, ensure the remote valve levers are in the correct position before operating the key-start switch:*
With the selector in positions I to IV - **Neutral**
With the selector in position V - **Float**

OVERHAUL

REMOVAL

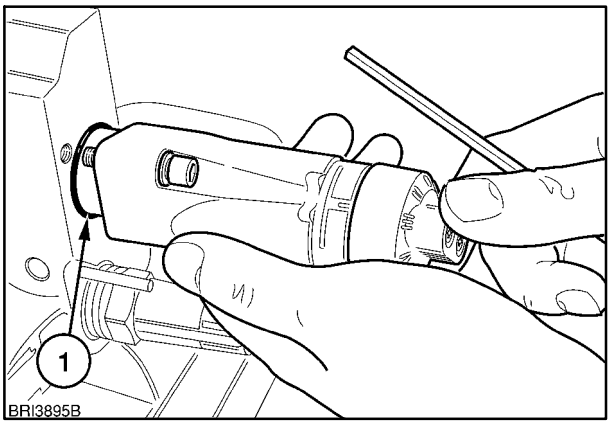
1. Before removing the detent housing ensure the remote spool is in the neutral position and the detent configuration knob is in position III.
2. Unscrew the two allen headed screws (1) which retain the cap to the valve slice.



2

3. Carefully remove the cap. Do not push or pull the spool whilst removing the cap. Ensure that the 'O' ring (1) is not damaged during the removal process.

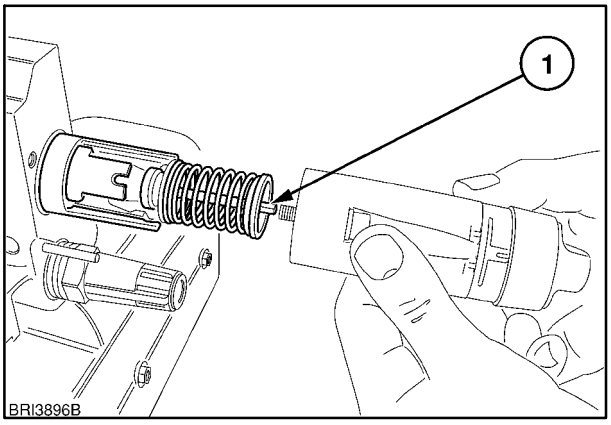
NOTE: *Inside the cap there are shims between the spring seat and the cap. These shims are unique to the detent unit and should be removed from the cap and kept safe for installation.*



3

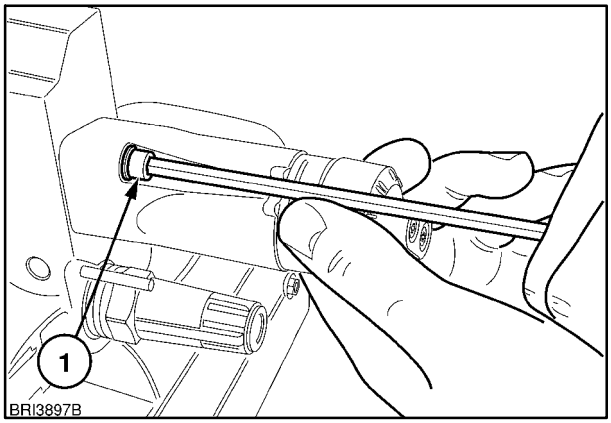
INSTALLATION

1. Ensure the detent configuration knob is in position III on the cap. Place the shims inside the cap making sure they are correctly positioned.
2. Fit the cap over the detent section making sure rotary shaft (1) of the adjustable detent fits onto the configuration knob.



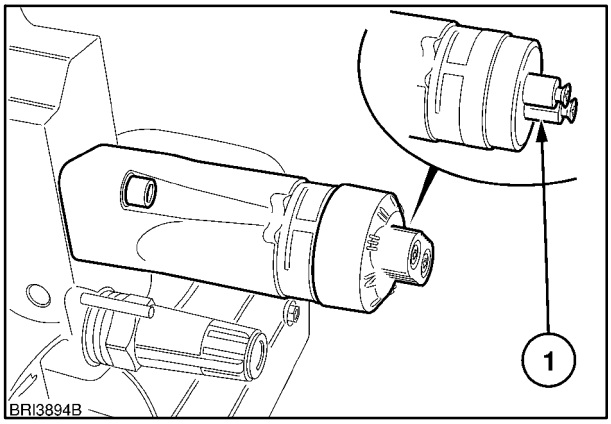
4

3. Place the allen headed screws into cap and tighten both screws evenly to a torque of 5.5 Nm (49 in-lb).
4. Move the spool from neutral to lower, raise, and back to neutral to ensure smooth operation.



5

5. To replace the plastic knob to the alloy knob (1) use the screws that are supplied with the new knob. These screws are coated with a micro encapsulated adhesive and can only be used once. Torque to 1.5 Nm (13 in-lb).



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SECTION 35 - HYDRAULIC SYSTEMS

Chapter 9 - Hydraulic Pressure Testing

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INTRODUCTION

Pressure test kit 297611 has been developed for pressure testing all 100 through to 135 model tractors and contains adaptors specifically designed for access to the tractors test ports.

This chapter describes the procedure for performing the following pressure tests using the pressure test kit and other standard fittings already available.

- High Pressure System
- High Pressure Standby
- Sensing Line Pressure
- Low Pressure Standby
- Pump Charge Pressure
- Steering
- Lift Ram Pressure
- Low Pressure System
- Lubrication
- Trailer Brake Valve

Before commencing hydraulic pressure testing perform the fault finding check followed by the fault finding procedure for the type of concern identified. Following these checks may identify an obvious cause for the concern and prevent unnecessary component disassembly.

The hydraulic pump is the centre of the hydraulic system and this chapter describes in detail the tests necessary to confirm that the hydraulic pump output is within specification. After the hydraulic pump output has been tested, each individual component can be tested in the hydraulic system to locate the fault.

SPECIFICATIONS

VARIABLE DISPLACEMENT PISTON PUMP

Main Hydraulic Pump

Type	Variable Displacement Closed Centre Load Sensing Piston Pump
Minimum Output @ 2200 ERPM (new pump)	95 – 105 Ltr/min @ One Remote Valve 25.1 – 27.7 US gal/min
Minimum Output @ 2200 ERPM (new pump)	110 – 113 Ltr/min 29 – 29.8 US gal/min
Charge Pressure (piston pump in standby)	6 – 8 bar (87 – 116 PSI)
Low Standby Pressure	22 – 24 bar (319 – 348 PSI)
High Standby (maximum system) Pressure	205 – 215 bar (2973 – 3118 PSI)
Regulated Low Pressure	17 – 19 bar (247 – 276 PSI)

Steering/Lubrication Pump

Type	Fixed Displacement Gear Type
Minimum Output @ 2200 ERPM (new pump)	38.5 Ltr/min 10.2 US gal/min
Steering Pressure	186 bar (2700 PSI)

FIXED DISPLACEMENT GEAR PUMP SYSTEM

Main Hydraulic Pump

Type	Fixed Displacement Gear Type
Minimum Output @ 2200 ERPM (new pump)	77 Ltr/min 20.3 US gal/min
Maximum System Pressure	190 – 205 bar (2827 – 2972 PSI)

Steering/Low Pressure Pump

Type	Fixed Displacement Gear Type
Minimum Output @ 2200 ERPM (new pump)	38.5 Ltr/min 10.2 US gal/min
Steering Pressure	186 bar (2700 PSI)
Regulated Low Pressure	17 – 19 bar (247 – 276 PSI)

SPECIAL TOOLS

DESCRIPTION	TOOL NUMBER
T-adaptor $^{11}/_{16}$ ORFS female x $^{11}/_{16}$ ORFS male x $^{7}/_{16}$ UNF female	297600*
Adaptor M10 banjo x $^{7}/_{16}$ UNF female	297602*
Adaptor $^{7}/_{16}$ UNF female x M12 x 1.5 male	297607*
T-adaptor $^{7}/_{16}$ UNF female x 1/4 BSP hose tail x $^{1}/_{2}$ hose	297610*
$^{7}/_{16}$ UNF male Quick release adaptor	297240*
Adaptor M10 x 1.0p x $^{7}/_{16}$ UNF female	297404*
Adaptor M10 banjo x $^{7}/_{16}$ UNF female	297609*
Adaptor $^{7}/_{16}$ UNF male	292928#
90° quick release fitting with adaptor M8 x 1.0 male	297241
Blanking Cap $^{11}/_{16}$ ORFS	297671
Pressure Gauge 0-10 bar (0-150 PSI)	293241#
Pressure Gauge 0-27 bar (0-300 PSI)	297167
Pressure Gauge 0-40 bar (0-600 PSI)	293242#
Pressure Gauge 0-250 bar (0-3600 PSI)	293244#
Remote valve coupling 5101741 or	293449
Quick release adaptor	291924
Pressure gauge hose	292246#
$^{1}/_{8}$ NPT fitting to attach hose 292246 to gauge	291927#
T-adaptor $^{13}/_{16}$ ORFS female x $^{13}/_{16}$ ORFS male x $^{7}/_{16}$ UNF female	380000842
Adaptor M10 x 1.0p x $^{7}/_{16}$ JIC male (enables use of gauges with $^{7}/_{16}$ JIC hoses if used)	297417
Bypass connector	297407
Trailer brake fitting	293190#
Open Centre Lift Pressure Regulating Valve Adjusting Tool	291863
Adaptor $^{7}/_{16}$ JIC male x $^{7}/_{16}$ UNF male (purchase locally)	
Flow Meter 120 ltr/min (27 gpm) minimum (purchase locally)	

* Part of hydraulic adaptor kit 297611

Part of hydraulic pressure test kit 292870

TROUBLESHOOTING

Possible failure modes:

1. Driveline oil level low
2. Driveline oil contaminated
3. Hydraulic pump oil filters contaminated or blocked

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Check the driveline oil level.
   A. If the oil level is low, add the correct specification oil as required.
   B. If the oil level is okay, continue to step 2.
2. Check for oil contamination.
   A. If the oil is contaminated with dirt, water or antifreeze, repair the cause of the contamination and replace the driveline oil to the correct specification.
   B. If the oil is okay, continue to step 3.
3. Check if the hydraulic pump oil filters have been replaced at the correct service intervals.
   A. If the hydraulic pump oil filters have not been replaced, replace all the oil filters on the hydraulic pump.
   B. If the oil filters are okay, continue to step 4.
4. Check if the transmission/steering low pressure warning symbol/light is displayed.
   A. If the warning symbol/light is displayed, set the engine speed to 1000 rev/min and check if the steering operates. **If the steering does not operate turn the keystart OFF immediately** to avoid damage due to lack of oil flow to the low pressure and lubrication circuits. To continue fault finding refer to transmission/steering low pressure warning symbol/light – displayed fault finding procedure.
   B. If the warning symbol/light is not displayed, test the system for normal operation.

TRANSMISSION/STEERING LOW PRESSURE WARNING SYMBOL/LIGHT – DISPLAYED (VARIABLE DISPLACEMENT PUMP SYSTEMS)

Possible failure modes:

1. Faulty low pressure warning switch
2. Faulty electrical harness
3. Faulty low pressure regulating valve
4. Faulty low pressure relief valve
5. Large pressure leak in one of the low pressure system component circuits

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Check the operation of the high pressure system.

   A. Operate all of the high pressure components, i.e. hydraulic lift, remote control valves and trailer brakes. If all of the high pressure components are not functioning, continue to variable displacement hydraulic pump pressure testing in this chapter.

   B. If the high pressure system is okay, continue to step 2.

2. Check the operation of the low pressure system.

   A. Operate all of the low pressure components, i.e. transmission, PTO, four wheel drive and differential lock. If the low pressure components are not functioning correctly, continue to step 6.

   B. If the low pressure system is okay, continue to step 3.

3. Check the low pressure warning switch.

   A. Start the engine. Check for an open circuit between terminal 1 and terminal 2 of the low pressure warning switch. If an open circuit is not indicated. Turn the keystart OFF and replace the low pressure warning switch.

   B. If an open circuit is indicated, continue to step 4.

4. Check the PAS pressure warning switch.

   A. Start the engine. Check for an open circuit between terminal 1 and terminal 2 of the PAS pressure warning switch. If an open circuit is not indicated. Turn the keystart OFF and replace the PAS pressure warning switch.

   B. If an open circuit is indicated, continue to step 5.

5. Check for a short to ground.

   A. Disconnect the low pressure warning switch electrical connector **C036** and the PAS pressure warning switch electrical connector **C174**. Check between connector **C174** pin **1 (W/B/S)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, test the system for normal operation.

6. Pressure test the low pressure system.

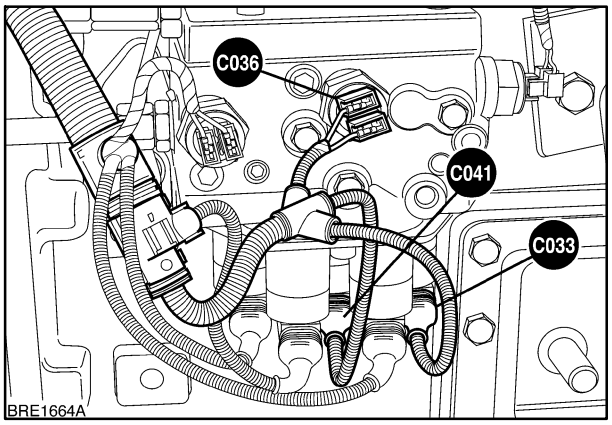
   A. Continue to the low pressure system test in this chapter. If the low pressure system is not 17 – 19 bar (247 – 276 PSI), continue to step 7.

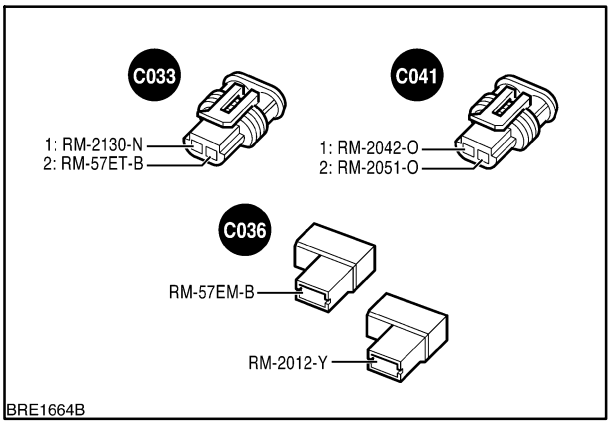
   B. If the pressure is okay, check for an electrical fault which may affect the operation of all the low pressure components, i.e. disconnected electrical harness to the low pressure distribution block.

7. Check the low pressure regulating valve and the low pressure relief valve.

   A. If the low pressure regulating valve and the low pressure relief valves are okay, check for a large leak in one of the low pressure system components. Continue to low pressure component leak test in this chapter.

   B. Remove and inspect the low pressure regulating valve and the low pressure relief valve, If they are sticking or damaged, repair or replace as required.


C036
C041
C033
BRE1664A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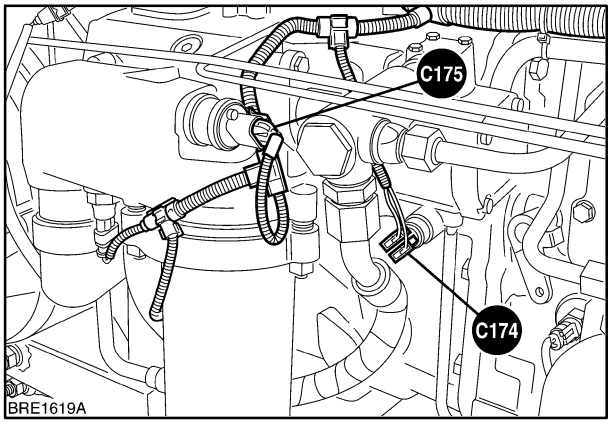
C041
1: RM-2042-O
2: RM-2051-O
C036
RM-57EM-B
RM-2012-Y
BRE1664B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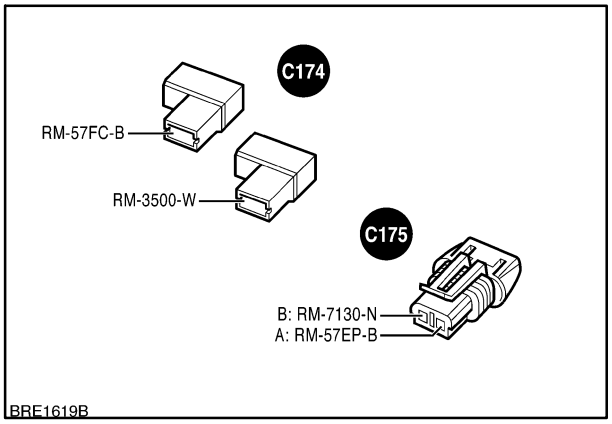
C174
BRE1619A


C174
RM-57FC-B
RM-3500-W
C175
B: RM-7130-N
A: RM-57EP-B
BRE1619B

TRANSMISSION LOW PRESSURE WARNING SYMBOL/LIGHT - DISPLAYED (FIXED DISPLACEMENT PUMP SYSTEMS)

Possible failure modes:

1. Faulty low pressure warning switch
2. Faulty electrical harness
3. Faulty low pressure regulating valve
4. Faulty low pressure relief valve
5. Large pressure leak in one of the low pressure system component circuits

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Check the operation of the steering system.

   A. Continue to steering tests in this chapter.

   B. If the steering system is okay, continue to step 2.
2. Check the operation of the low pressure system.

   A. Operate all of the low pressure components, i.e. transmission, PTO, four wheel drive and differential lock. If the low pressure components are not functioning correctly, continue to step 5.

   B. If the low pressure system is okay, continue to step 3.
3. Check the transmission low pressure warning symbol/light operation.

   A. Disconnect the low pressure warning switch electrical connector **C036**. Start the engine. If the warning symbol/light is displayed. Turn the keystart OFF and repair the short to ground between **C036** pin **1 (Y/O)** and the instrument cluser connector **C081** pin **12 (Y/O)**.

   B. If the warning symbol/light is not displayed, continue to step 4.
4. Check the low pressure warning switch.

   A. Start the engine. Check for an open circuit between terminal 1 and terminal 2 of the low pressure warning switch. If an open circuit is not indicated. Turn the keystart OFF and replace the low pressure warning switch.

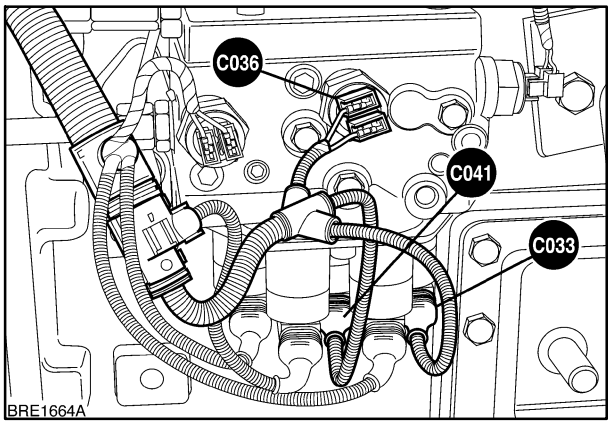
   B. If an open circuit is indicated, test the system for normal operation.
5. Pressure test the low pressure system.

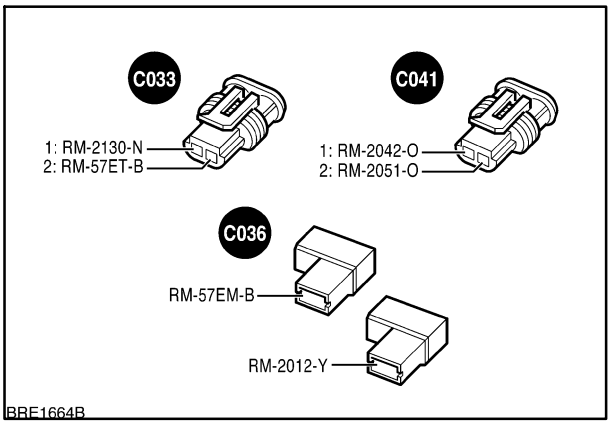
   A. Continue to low pressure system test in this chapter. If the low pressure system is not 17 - 19 bar (247 - 276 PSI), continue to step 6.

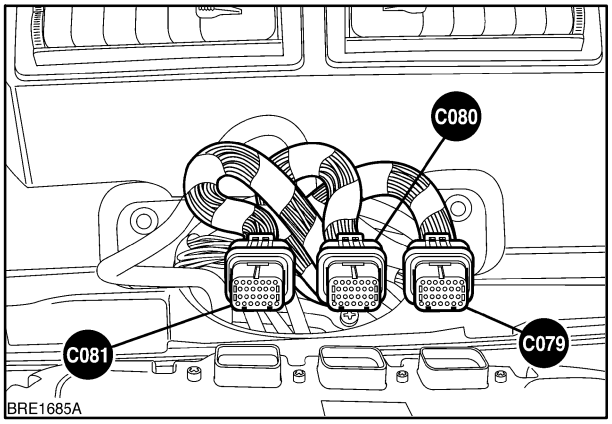
   B. If the pressure is okay, check for an electrical fault which may affect the operation of all the low pressure components, i.e. disconnected electrical harness to the low pressure distribution block.
6. Check the low pressure regulating valve and the low pressure relief valve.

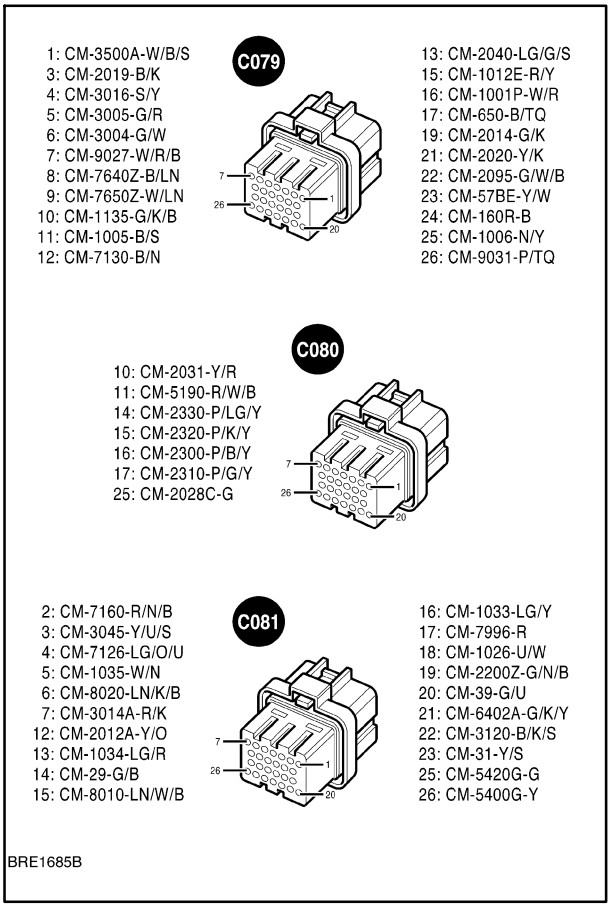
   A. If the low pressure regulating valve and the low pressure relief valves are okay, check for a large leak in one of the low pressure system components. Continue to low pressure component leak test in this chapter.

   B. Remove and examine the low pressure regulating valve and the low pressure relief valve, If they are sticking or damaged, repair or replace as required.


C036
C041
C033
BRE1664A


C033
1: RM-2130-N
2: RM-57ET-B
C041
1: RM-2042-O
2: RM-2051-O
C036
RM-57EM-B
RM-2012-Y
BRE1664B


C080
C081
C079
BRE1685A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3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
C079
7
26
1
20
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

CHARGE PRESSURE WARNING SYMBOL/LIGHT - DISPLAYED (VARIABLE DISPLACEMENT PUMP SYSTEMS)

Possible failure modes:

1. Inlet and charge pressure oil filters contaminated or blocked
2. Faulty charge pressure warning switch
3. Faulty electrical harness
4. Faulty charge pressure filter dump valve
5. Faulty charge pressure valve
6. Faulty charge pressure oil pump

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Pressure test the charge pressure system.

   A. Continue to charge pressure test in this chapter. If the charge pressure is less than 1.6 bar (23 PSI), continue to step 3.

   B. If the pressure is okay, continue to step 2.

2. Check the warning symbol/light operation.

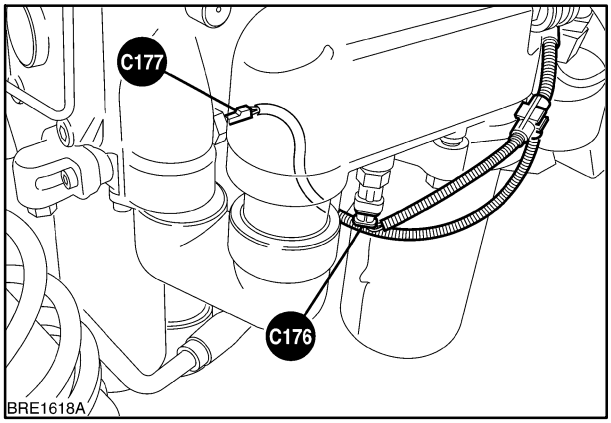
   A. Disconnect the charge pressure warning switch electrical connector **C177**. Turn the keystart ON. If the warning symbol/light is displayed, repair the short to ground between **C177** pin **1 (R/N/B)** and the instrument cluser electrical connector **C081** pin **2 (R/N/B)**.

   B. If the charge pressure warning symbol/light is not displayed, Turn the keystart OFF and replace the inlet and charge pressure oil filters and continue to step 1.

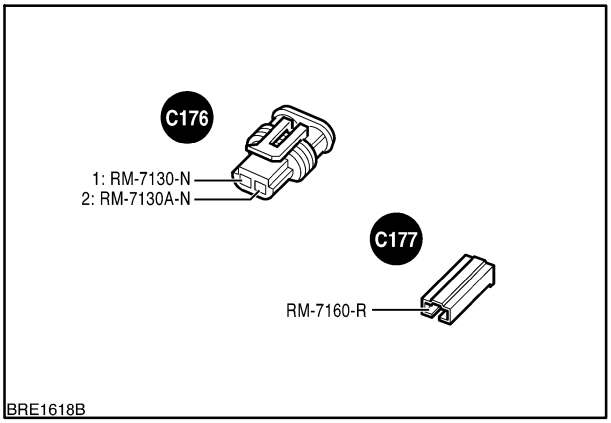
3. Check the charge pressure filter dump valve and the charge pressure valve.

   A. Remove and examine the charge pressure filter dump valve and the charge pressure valve, If they are sticking open or damaged, replace the valve(s) as required, DO NOT re-adjust these valves.

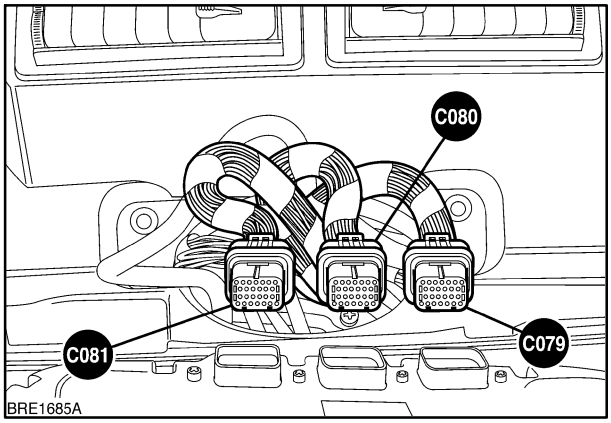
   B. If the charge pressure filter dump valve and the charge pressure valve are okay, repair or replace the charge pressure oil pump.



BRE1618A



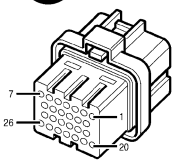
BRE1618B



BRE1685A

C079

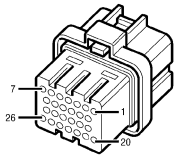
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N



13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ

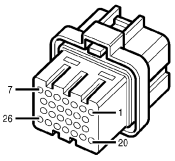
C080

10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G



C081

2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B



16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y

BRE1685B

INTAKE OIL FILTER RESTRICTION WARNING SYMBOL/LIGHT – DISPLAYED (ALL SYSTEMS)

Possible failure modes:

1. Inlet and charge pressure oil filters contaminated or blocked
2. Faulty intake oil filter restriction warning switch
3. Faulty electrical harness

NOTE: *The oil filter restriction switch and the temperature switch are wired in series (**C176**).*

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Change inlet and charge pressure oil filters.

   A. Test the sytem for normal operation. If the warning symbol/light is displayed, continue to step 2.

2. Check the intake oil filter restriction warning symbol/light operation.

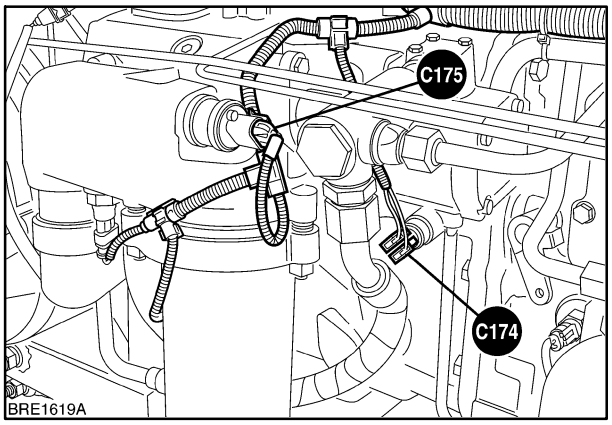
   A. Disconnect the intake oil filter restriction warning switch electrical connector **C175,** bridge temperature switch **C176**. Turn the keystart ON. If the warning symbol/light is displayed, repair the short to ground between **C175** pin **A (B)** and the instrument cluser connector **C079** pin **12 (B/N)**.

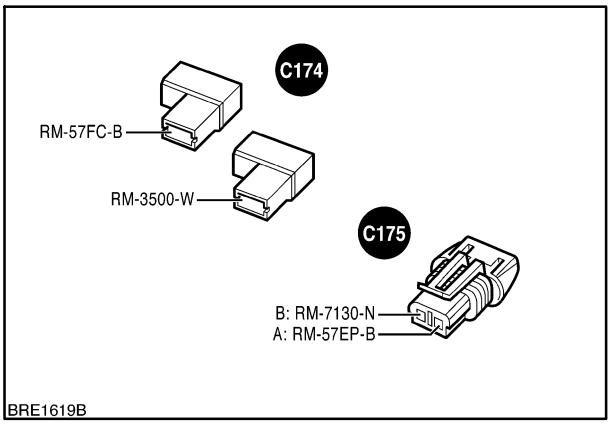
   B. If the warning symbol/light is not displayed, continue to step 3.

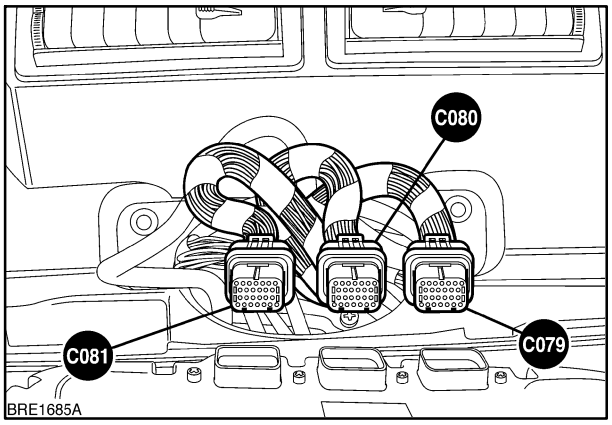
3. Check the intake oil filter restriction warning switch.

   A. Start the engine. Check for an open circuit between terminal 1 and terminal 2 of the intake oil filter restriction warning switch. If an open circuit is not indicated. Turn the keysart OFF and replace the intake oil filter restriction warning switch.

   B. If an open circuit is indicated, test the system for normal operation.







C079

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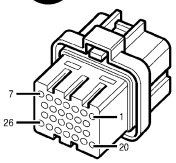
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ



C080

10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
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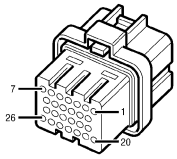
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G



C081

2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
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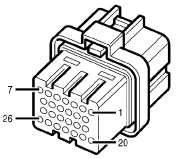
26: CM-5400G-Y



BRE1685B

POWER STEERING NOT WORKING OR WORKING INCORRECTLY (ALL SYSTEMS)

Possible failure modes:

1. Mechanical fault with steering components
2. Steering oil pump drive broken
3. Faulty steering oil pump
4. Faulty steering motor

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Check the transmission/steering low pressure warning symbol/lamp being displayed.

   A. If the warning symbol/lamp is displayed, continue to transmission/steering low pressure warning symbol/light – displayed fault finding procedure.

   B. If the warning symbol/lamp is not displayed, continue to step 2.

2. Pressure test the steering system.

   A. Continue to steering circuit pressure test in this chapter. If the steering circuit pressure is not 186 bar (2700 PSI), remove the steering oil pump and check the drive to the oil pump, if the oil pump drive is okay, replace the steering oil pump.

   B. If the pressure is okay up to the steering cylinders, suspect a mechanical fault with the steering components. If steering pump output is okay but the pressure to the steering cylinders is low or zero, repair or replace the steering motor as required.

TRAILER BRAKES NOT WORKING

Possible failure modes:

1. Air ingress in the trailer braking circuit
2. Low pressure standby pressure incorrect
3. Faulty flow compensating valve
4. High pressure standby pressure incorrect
5. Faulty pressure compensating valve
6. Faulty load sensing circuit
7. Faulty trailer brake valve

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Bleed the tractor brakes system including logic head and front brake valve.
2. Pressure test the trailer brakes.

   A. Continue to trailer brake test in this chapter. If the trailer brake pressure is not 120 – 150 bar (1740 – 2176 PSI), continue to step 3.

   B. If the pressure is okay, test the system for normal operation.

3. Check if the trailer brake operates correctly while operating the remote control valves.

   A. If the trailer brake operates correctly, check the load sensing circuit from the trailer brake valve.

   B. If the trailer brake does not operate correctly, check the trailer brake valve, repair or replace as required.

4. Pressure test low pressure standby.

   A. Continue to low pressure standby test in this chapter. If the pressure is not 22 – 24 bar (319 – 348 PSI), adjust the flow compensating valve or check the flow compensating valve for sticking or damage. If the flow compennsating valve is okay, disassemble the hydraulic pump and check the swash plate piston for sticking or damage.

   B. If the pressure is okay, continue to step 4.

5. Pressure test high pressure standby.

   A. Continue to high pressure standby test in this chapter. If the pressure is not 190 – 205 bar (2755 – 2972 PSI) fixed displacement, 205–215 bar (2973–3118 PSI) variable displacement, adjust the pressure compensating valve or check the pressure compensating valve for sticking or damage.

ELECTRONIC DRAFT CONTROL NOT WORKING CORRECTLY

Possible failure modes:

1. Position control and lower links out of phase
2. Drop rate control is in the transport lock position
3. Faulty charge pressure
4. Electronic draft control error
5. Faulty low pressure regulating valve
6. Air ingress into the hydraulic system
7. Faulty raise or lower solenoid valves
8. Low pressure standby pressure incorrect
9. Faulty flow compensating valve
10. High pressure standby pressure incorrect
11. Faulty pressure compensating valve
12. Faulty load sensing circuit
13. Faulty lift cylinders
14. Faulty electronic draft control valve
15. Faulty variable displacement hydraulic pump

Solution:

NOTE: *When the cause of the fault has been rectified, test the system for normal operation.*

1. Check if the hitch disabled symbol is illuminated.

   A. If the symbol is illuminated, start the engine and rotate the position control to place the position control and lower links back into phase.

   B. If the symbol is not illuminated, continue to step 2.

2. Check if the drop rate control is in the transport lock position on the control panel.

   A. If the drop rate control is in the transport lock position, turn the drop rate control to an operating position.

   B. If the drop rate control is not in the transport lock position, continue to step 3.

3. Check the operation of the remote control valves to ensure that they come “on load”.

   A. Check that lift works correctly with remote valves “on load”, if yes then this is load sensing or compensator problem. If the hydraulic lift does not operate correctly, check the electronic draft control valve for sticking valves and leaking cylinder safety relief valve.

   B. Install a pressure gauge in the remote control valve coupler and operate the remote control valve, if the the pressure is not 205 – 215 bar (2973 – 3118 PSI), check the low pressure regulating valve for sticking or damage, repair or replace as required.

   C. If the pressure is okay, continue to step 4.

4. Check if the charge pressure warning symbol/light is displayed.

   A. If the warning symbol/light is displayed, continue to charge pressure warning symbol/light - displayed fault finding procedure.

   B. If the warnig symbol/light is not displayed, continue to step 5.

5. Check if an electronic draft control error is displayed or stored.

   A. If an electronic draft control error is displayed or stored, continue to the fault codes chapter of the electrical systems section.

   B. If an electronic draft control error is not displayed or stored, continue to step 6.

6. If fitted, pressure test the trailer brakes.

   A. Continue to trailer brake test in this chapter. If the trailer brake pressure is not 135 - 145 bar (1958 - 2103 PSI), suspect a fault in the variable displacement pump assembly, continue to variable displacement hydraulic pump pressure testing in this chapter.

   B. If the pressure is okay, continue to step 7.

7. Check if the hydraulic lift is working erratically.

   A. If the hydraulic lift is working erratically, continue to hydraulic oil pump air ingress test in this chapter.

   B. If the hydraulic lift is okay, continue to step 8.

8. Check if the lift arms are locked in the fully raised or lowered position.

   A. If the lift arms are locked, check the electronic draft control raise or lower solenoid valves for sticking.

   B. If the lift arms are not locked, continue to step 9.

9. Pressure test low pressure standby.

   A. Continue to low pressure standby test in this chapter. If the pressure is not 22 - 24 bar (319 - 348 PSI), adjust the flow compensating valve or check the flow compensating valve for sticking or damage. If the flow compennsating valve is okay, disassemble the hydraulic pump and check the swash plate piston for sticking or damage.

   B. If the pressure is okay, continue to step 10.

10. Pressure test high pressure standby.

    A. Continue to high pressure standby test in this chapter. If the pressure is not 205 - 215 bar (2973 - 3118 PSI) variable displacement, 190-205 bar (2755-2973 PSI) fixed displacement, adjust the pressure compensating valve or check the pressure compensating valve for sticking or damage.

    B. If the pressure is okay, continue to step 11.

11. Check if the lift arms leak down when a load is applied..

    A. If the arms leak down, check the lift cylinder(s), isolating each cylinder in turn, repair or replace as required.

    B. EDC valve, check valve/ lower valve.

TESTING

HYDRAULIC OIL PUMP PRESSURE AND FLOW TESTING

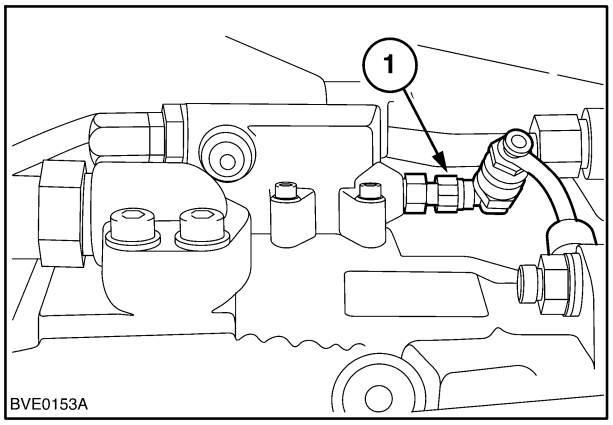
IMPORTANT: *Before performing any pressure or flow testing operate the tractor until the oil in the rear axle is at normal operating temperature. 75°C (170°F).*

The following tests check operation of the hydraulic pump and associated high pressure circuits.

Low Pressure Standby

1. Remove the pressure compensating valve plug and install the 90° quick release fitting adaptor **297241** (1).
   - Test port thread M8 x 1.0
2. Attach a 0 – 40 bar (0 – 600 PSI) pressure gauge **293242**, using the quick release coupler **291924** (1) and the hose **292246**.
3. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
4. The pressure reading should be 22 – 24 bar (319 – 348 PSI) and is the 'Low Pressure Standby'.

   IMPORTANT: Do Not *operate the tractor brakes or any remote control valve lever, otherwise the system pressure will increase to maximum pressure of 205 – 215 bar (2973 – 3118* PSI*) this will result in damage to the pressure gauge.*
5. If the pressure reading is not to the specification, adjust the flow compensating valve (1).
6. If the pressure reading is high, examine the flow compensating valve (1) spool for sticking.



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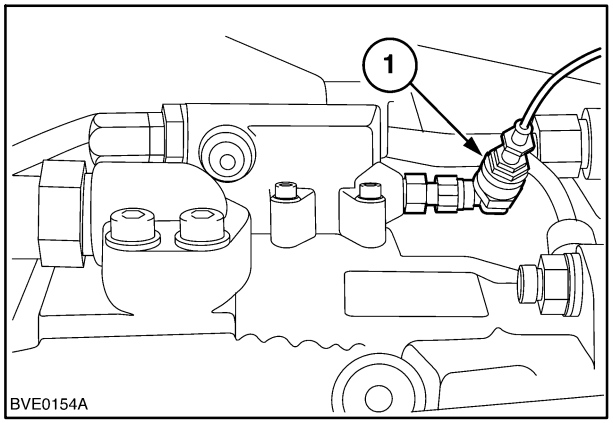

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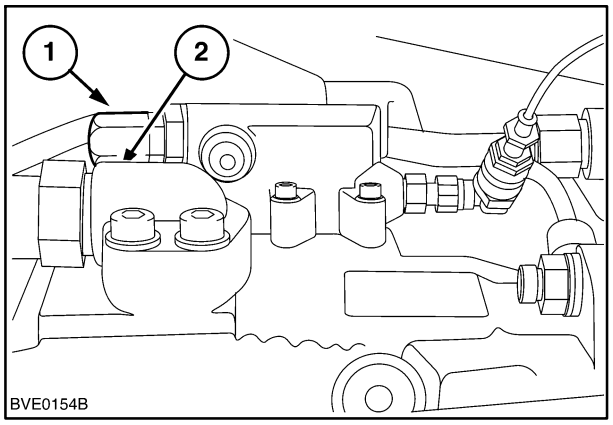

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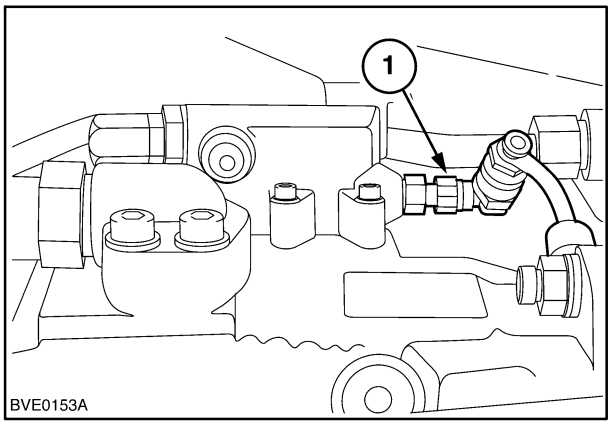
High Pressure Standby

1. Remove the pressure compensating valve plug and install the 90° quick release fitting adaptor **297241** (1).
   - Test port thread M8 x 1.0



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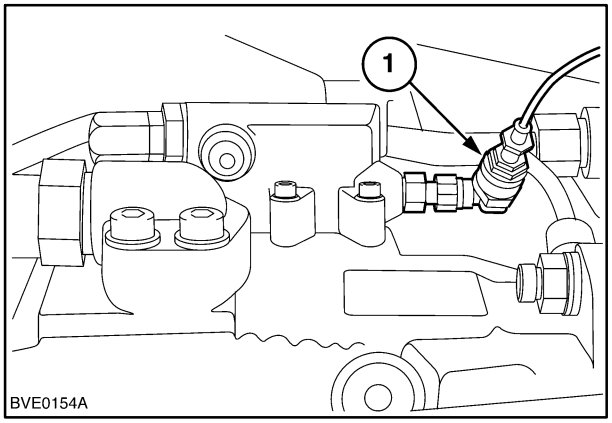
2. Attach a 0 - 250 bar (0 - 3600 PSI) pressure gauge **293244**, using the quick release coupler **291924** (1) and the hose **292246**.



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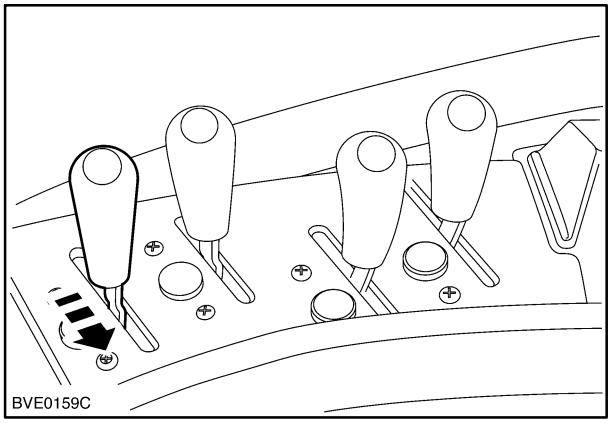
3. Set the remote control valve number 1 in the 'Extend' position.
4. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
5. The pressure reading should be 205 - 215 bar (2973 - 3118 PSI, variable displacement, 190-205 bar (2755-2973 PSI) fixed displacement) and is the 'High Pressure Standby'.



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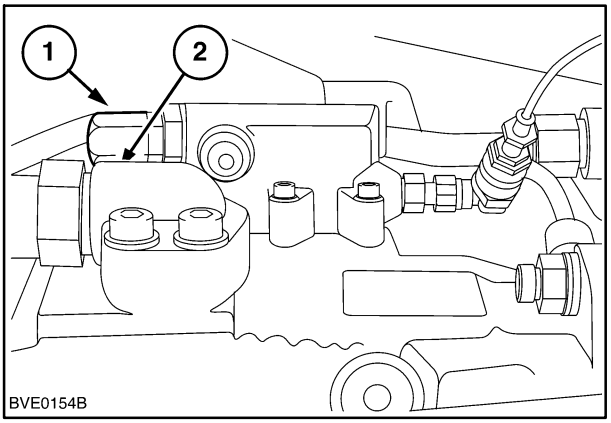
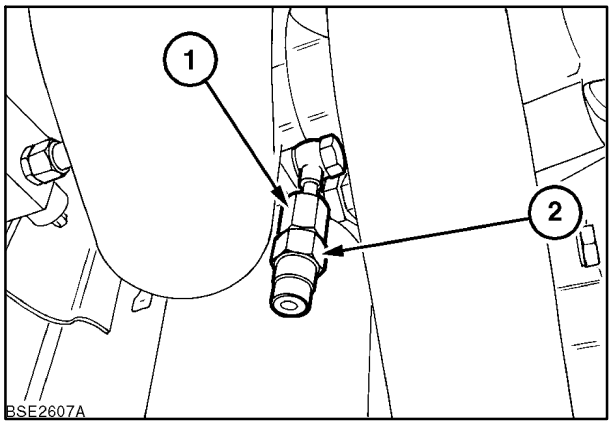
6. If the pressure reading is not to specification adjust the pressure compensating valve (2).



7

Charge Pressure Test

1. Remove the charge pressure switch and install the adaptor **297602** (1) and the quick release fitting **297240** (2).
   - Test port thread M10 x 1.0
2. Attach a 0 – 10 bar (0 – 145 PSI) pressure gauge **293241**, using the quick release coupler **291924** and the hose **292246**.



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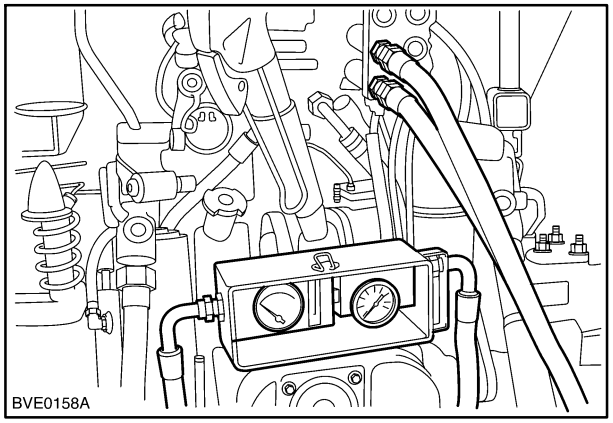
3. Install a 180 ltr/min (47.5 gpm) flow meter between the remote control valves number 1 and number 2. Ensure the inlet hose of the flow meter is installed into the extend port of valve number 1.
4. Fully open the load valve on the flow meter.
5. Set the hydraulic oil flow to maximum.



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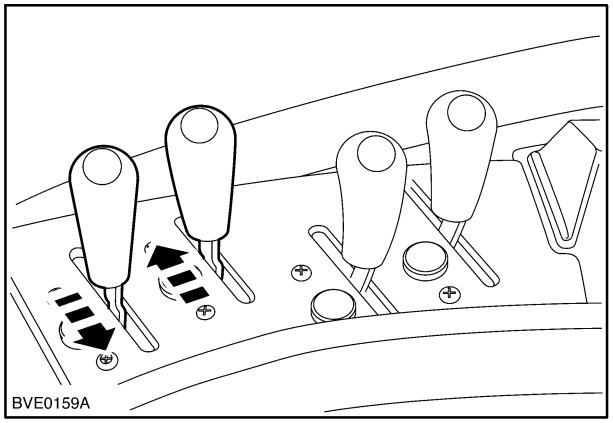
6. Set the remote control valve number 2 in the 'Float' position.
7. Set the remote control valve number 1 in the 'Extend' position.
8. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.



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9. Move the remote control valve lever for the remote control valve number 1 between the extend and neutral position.
10. The following pressures should be observed:
    6 – 8 bar (87 – 116 PSI) – Neutral
    2 bar (29 PSI) – Extend

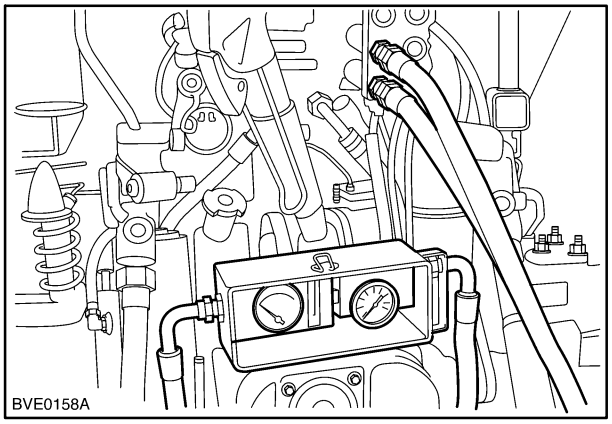
If the pressure reading is below 1.6 bar (23 PSI), replace the hydraulic oil filters and re-test.

If after re-test the charge pressure is still below the specification, check the supplementary lube valve, examine both the charge pressure filter dump valve and the charge pressure valve before disassembling the hydraulic oil pump to inspect for wear.

Variable Displacement Piston Pump Flow Test

To flow test the variable flow piston pump it is recommended that the output is checked at the remote control valves.

1. Install the flow meter between the inlet ports of the remote control valves number 1 and number 2.
2. Set the hydraulic oil flow to maximum.



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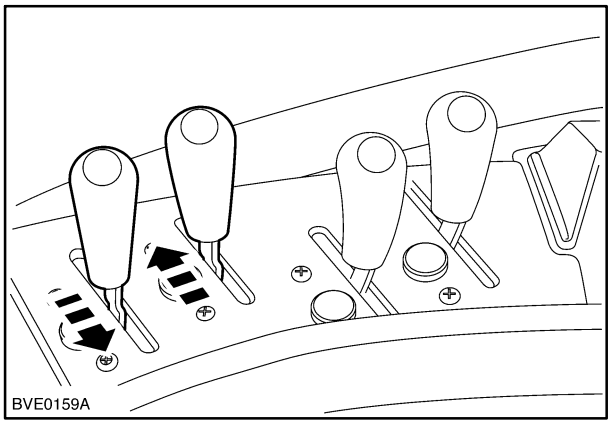
3. Ensure the load valve on the flow meter is fully 'Open'.
4. Set the engine speed to 1100 rev/min.
5. Set the remote control valve number 2 in the 'Float' position and the remote control valve number 1 in the 'Extend' position.
6. Adjust the load on the flow meter to a pressure of 100 bar (1450 PSI).
7. If a flow of 47 ltr/min (12.4 gpm) is recorded the hydraulic pump oil flow is within specification.

NOTE: *This test is performed at half maximum rated speed and assumes that pump flow at rated speed is twice that measured in the test.*



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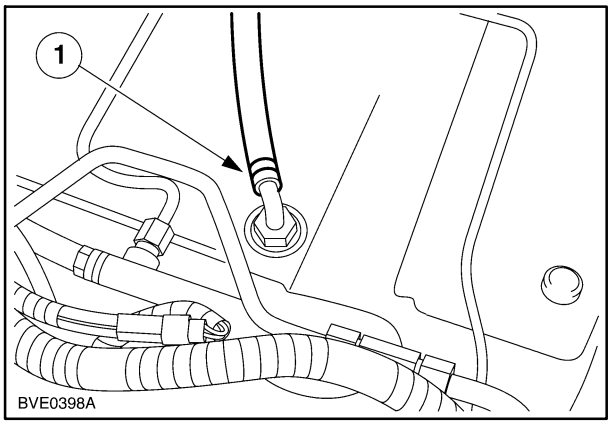
Hydraulic Oil Pump Air Ingress Test

The hydraulic oil pump aeration test should be performed whenever the operation of the hydraulic system is erratic or the hydraulic pump is extremely noisy.

The purpose of the test is to find out if the malfunction of the system is due to internal or external air ingress.

1. Disconnect the driveline breather tube (1) from the top of the rear axle.



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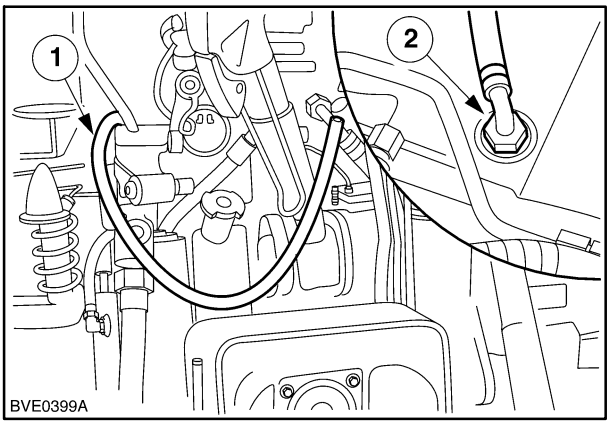
2. Attach approximately 2 metres of 10 mm ($^3/_8$ inch) clear plastic tube (1) to the driveline breather connection (2) on top of the rear axle and position the tubing so that it forms a 'U' (Similar to a manometer).
3. Fill the tube with sufficient oil to prevent the ingress of air through the tube.
4. Set the engine speed to 1000 rev/min and pull and hold the remote control valve lever.



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If internal air ingress is identified, oil or bubbles will be drawn into the driveline through the clear plastic tube.

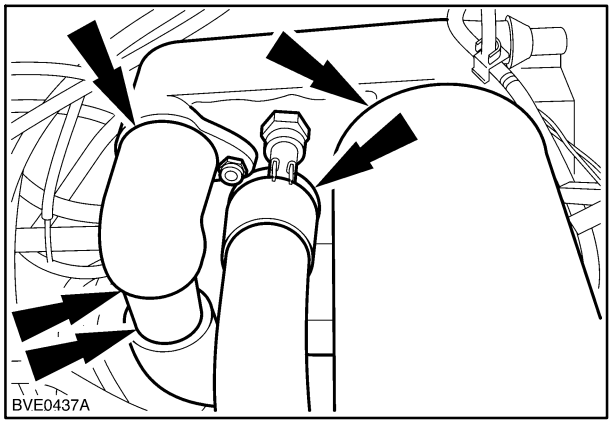
If external air ingress is identified, oil in the clear plastic tube will be pushed towards the open end by the air being drawn into the driveline through the inlet system of the hydraulic oil pump .

⚠ WARNING ⚠

If the leak is excessively large it is possible for the oil to be projected out of the tube. Take care to position the tube so not to cause injury or project oil into the work area.

If external air ingress is identified, possible air ingress through the hydraulic oil pump filter(s), intake tube joints, remote control valve tube joints.

If internal air ingress is identified, possible hydraulic oil pump shaft seal damaged or worn.



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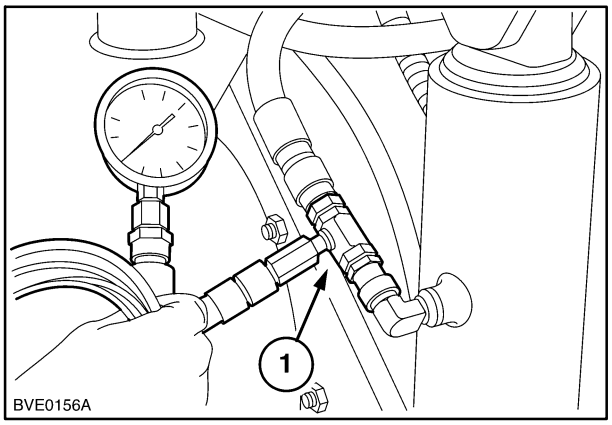
Lift Ram Pressure Test

IMPORTANT: *Before performing any pressure or flow testing, operate the tractor until the oil in the rear axle is at normal operating temperature. 75°C (170°F).*

The following tests checks the operation of the Electronic Draft Control valve/lift cover control valve and lift rams.

1. Install the T-adaptor **380000842** (1), (tractors with Electronic Draft Control) between the lift cylinder elbow and the flexible hose.
2. Attach a 0 - 250 bar (0 - 3600 PSI) pressure gauge **293244**, using the quick release coupler **291924** and the hose **292246**.
3. Turn the keystart ON, disconnect the lift arm potentiometer. Error code 1027 will be displayed or stored in the memory.
4. Turn the keysatart OFF and reconnect the potentiometer.
5. Start the engine, Error code 1024 (Electronic Draft Control requires calibration) will be displayed or stored in the memory.
6. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.



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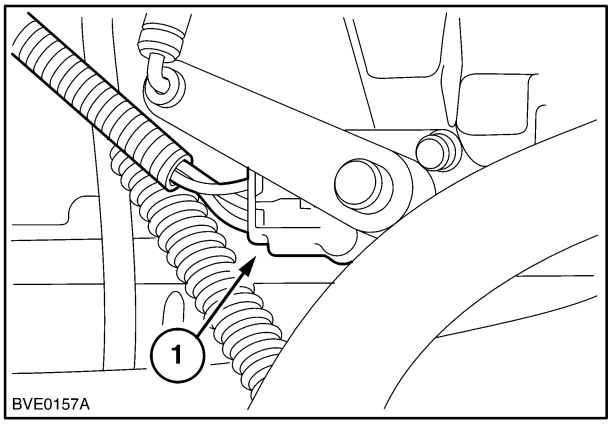

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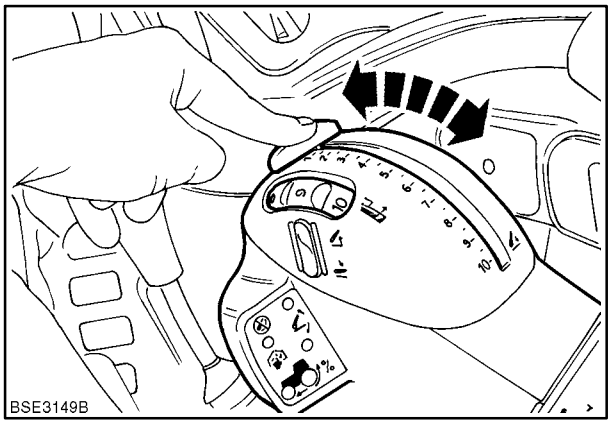
7. Lower and then fully raise the lift arms. Maximum system pressure will be applied for approximately 2 seconds as the pressure relief valve operates.
8. The pressure reading should be 205 - 215 bar (2973 - 3118 PSI) variable displacement, 190-205 bar (2755-2973 PSI) fixed displacement.
9. If the pressure is low this may indicate either a faulty electronic draft control valve/lift cover control valve or a fault in one of the lift rams. A large leak on the low pressure circuit would also give low remote valve and hydraulic lift pressure, but not to the trailer brake circuit.



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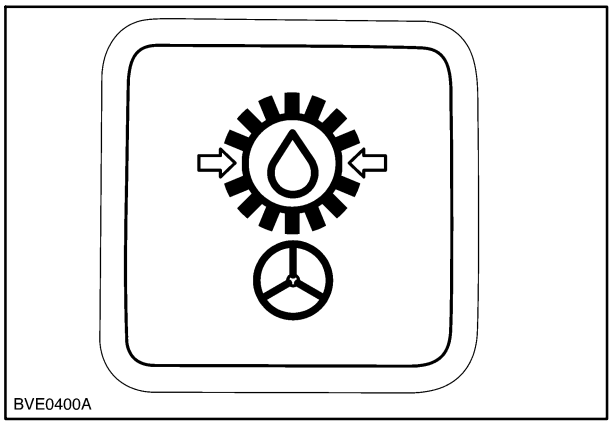
Steering/Low Pressure Hydraulic Pump Test

There is no pressure relief valve in the steering hydraulic pump. The following practical test will determine if the steering hydraulic pump output is sufficient to allow satisfactory operation of the steering system.



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Steering Test

1. Set the engine speed to 1100 rev/min.
2. Quickly turn the steering from lock to lock.

   If the steering is operating correctly the reaction should be immediate with no time delay between turning the steering wheel and the movement of the wheels.
3. At full lock the relief valve in the steering motor should be heard to blow and the engine speed drop to approximately 970 rev/min.

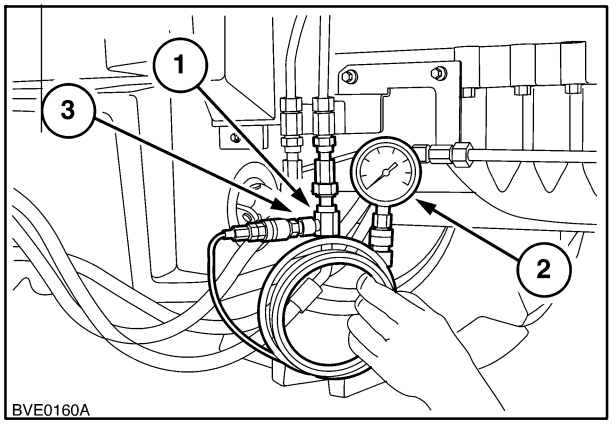
   If on the 12 x 12/24 x 24 with fixed displacement pump the transmission/steering low pressure warning symbol is displayed when the steering is held on full lock, this is an indication that the hydraulic pump has developed an internal leak. Check the torque of the hydraulic pump mounting bolts and if tight, examine the hydraulic pump for leaking seals or wear.

Steering Circuit Pressure Test

1. Install the T-adaptor **297600** (1) and the quick release fitting **297240** (3), into the hydraulic hose to the steering cylinder.
2. Attach a 0 - 250 bar (0 - 3600 PSI) pressure gauge **293244** (2), using the quick release coupler **291924** and the hose **292246**.
3. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
4. Turn the steering wheel to full lock and hold in this position.

NOTE: *The use of a force greater than 5* PSI *at the rim of the steering wheel may lead to slightly inaccurate readings due to the pumping action of the hydrostatic steering motor.*

5. The pressure reading should be 186 bar (2700 PSI).



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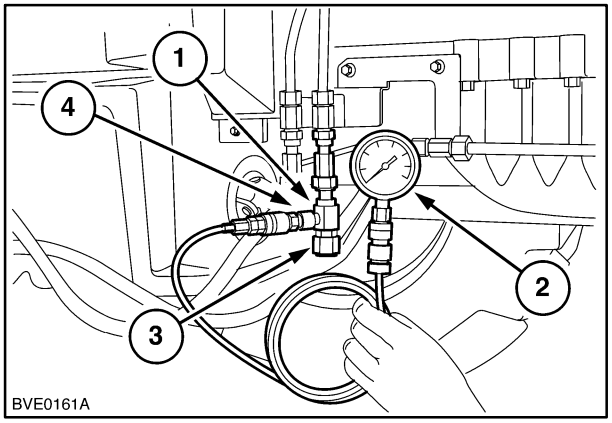
Steering Relief Valve Pressure Test

IMPORTANT: *There is no pressure relief valve in the steering/low pressure hydraulic pump and the following pressure test must only be performed as specified below. Failure to observe this precaution may result in severe damage to the hydraulic pump.*

1. Turn the steering onto full right hand lock.
2. Turn the keystart OFF.
3. Disconnect the right hand turn feed hose.
4. Install the T-adaptor **297600** (1) and the quick release fitting **297240** (4), into the solid tube. Cap the bottom of the Tee-piece with the blanking cap, **297671** or a standard No 6 cap $^{(11}/_{16}$ inch ORFS female thread cap purchased locally (3).
5. Attach a 0 - 250 bar (0 - 3600 PSI) pressure gauge **293244** (2), using the quick release coupler **291924** and the hose **292246**.
6. Restart the engine and set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure. Turn the steering wheel to the left with a pull of approximately 22 N (5 PSI) and observe the pressure reading.



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NOTE: *The use of a force greater than 5* PSI *at the rim of the steering wheel may lead to slightly inaccurate readings due to the pumping action of the hydrostatic steering motor.*

The pressure reading should be:-

186 bar (2700 PSI) for all models.

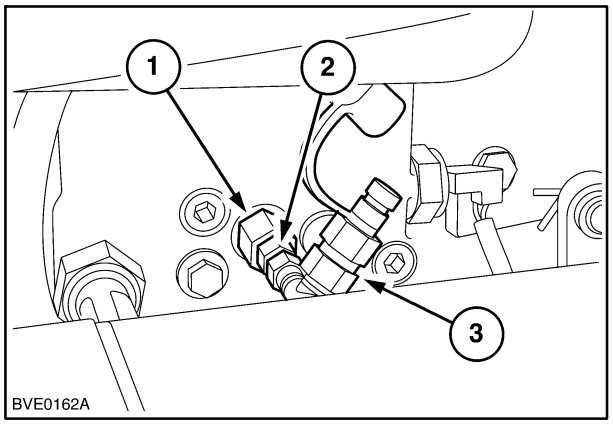
If the steering test was satisfactory but the pressure readings are out of specification the pressure relief valve in the steering motor must be adjusted.

7. If the system pressure is not to specification proceed to Relief Valve Adjustment.

Low Pressure System Test

The low pressure circuit can be checked on all models by removing the low pressure warning switch, located in the low pressure distribution block on the left hand side of the rear axle.

1. Apply the parking brake.
2. Remove the four wheel driveshaft.
3. Raise the left hand rear wheel and place a suitable support under the axle casing. Remove the left hand rear wheel.
4. Install the adaptor **297607** (1), $^{7}/_{16}$ – 20 JIC male x $^{7}/_{16}$ – 20 UNF male (2) and the 90° quick release fitting **297241** (3).
   - Test port thread M12 x 1.5
5. Attach a 0 – 40 bar (0 – 600 PSI) pressure gauge **293242**, using the quick release coupler **291924** and the hose **292246**.
6. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
7. The pressure reading should be 17 – 19 bar (247 – 276 PSI).



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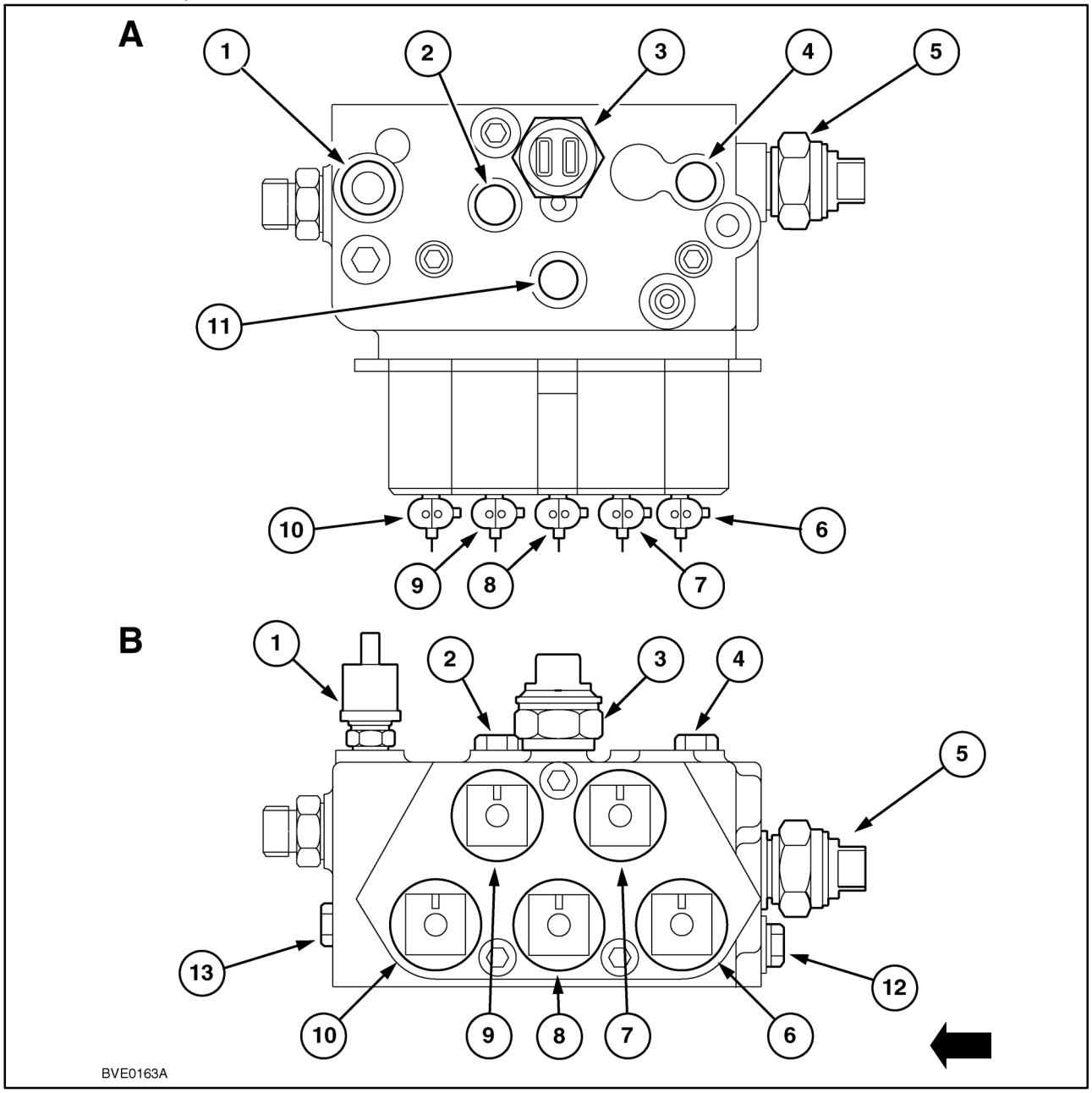
Low Pressure Component Tests

The components of the low pressure system, ie, the PTO, PTO brake, Four Wheel Drive, Differential lock and the Creeper can be tested from the test ports located in the low pressure distribution block.



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Pressure Test Ports, Pressure Switches and Solenoid Valve Identification

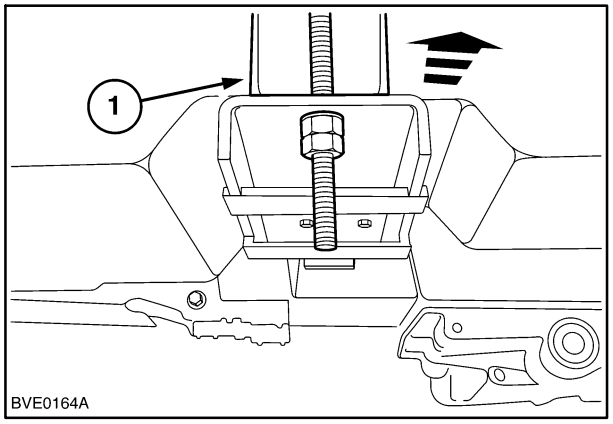
A. Side on view of manifold body

1. Differential lock pressure switch
2. Differential lock test port
3. Low pressure warning switch
4. Four Wheel Drive test port
5. Four Wheel Drive pressure switch
6. PTO brake solenoid valve
7. Four Wheel Drive solenoid valve

B. Below view of manifold body

8. PTO PWM solenoid valve
9. Differential lock solenoid valve
10. Creeper solenoid valve
11. PTO test port
12. PTO brake test port
13. Creeper test port

1. Remove the fuel tank rear securing strap (1) from the fuel tank support and pull the fuel tank out. This will improve the access to the low pressure distribution block.
2. Remove the four wheel driveshaft.



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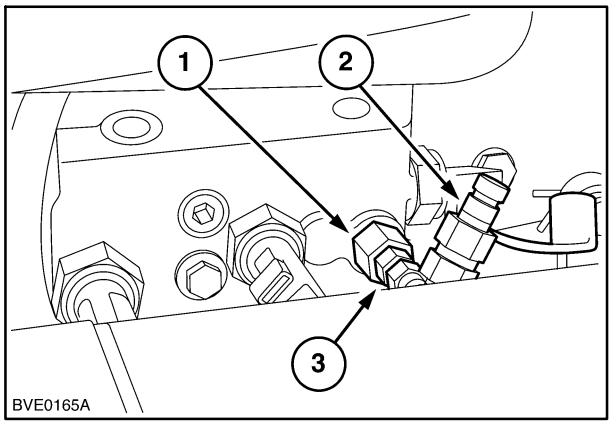
3. Remove the test port plug and install the adaptor 297404 (1), $^{7}/_{16}$ - 20 JIC male x $^{7}/_{16}$ - 20 UNF male (3) and the 90° quick release fitting 297241 (2).
4. Install the adaptor **297602** and the quick release fitting **297240** for the PTO brake pressure test.
   - Test port thread M10 x 1.0

NOTE: *Adaptor is shown in the Four Wheel Drive test port.*



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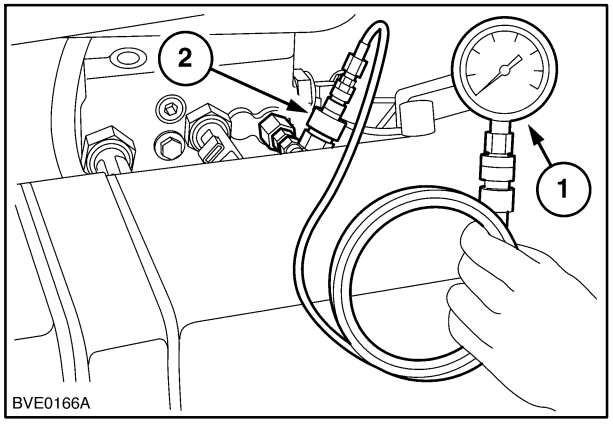
5. Attach a 0 - 40 bar (0 - 600 PSI) pressure gauge **293242** (1), using the quick release coupler **291924** (2) and the hose **292246**.
6. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
7. Operate the component to be tested, the pressure reading should be 17 - 19 bar (247 - 276 PSI).

NOTE: *Pressure is only present at the four wheel drive pressure test port when four wheel drive is disengaged. Pressure is not present when four wheel drive is engaged or the parking brake is applied.*



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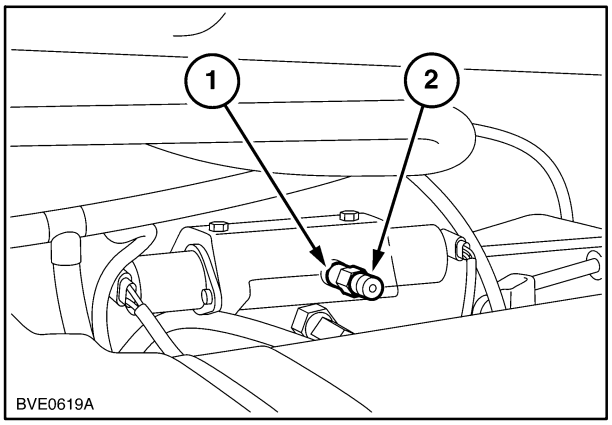
8. If there is no change in pressure when the component is operated, but the low pressure system test pressures are within specification. The fault could be either with the solenoid or the wiring. Check for voltage at the respective connector. If +12v is available suspect the solenoid, if no voltage is seen suspect the wiring.

50 Kph Clutch Pressure Test

1. Remove the test port plug and install the adaptor **297404** (1) and the quick release adaptor **297240** (2).
   - Test port thread M10 x 1.0



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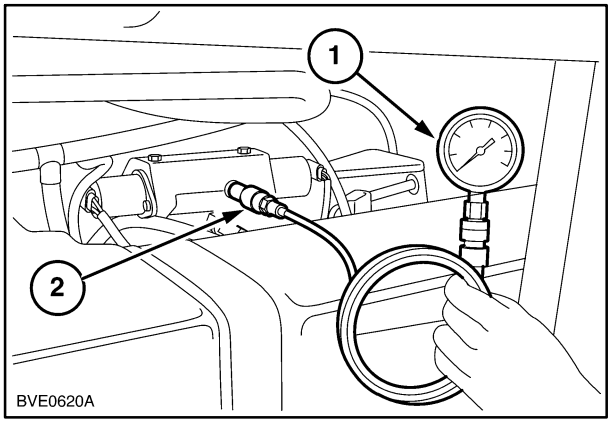
2. Attach a 0 – 40 bar (0 – 600 PSI) pressure gauge **293242** (1), using the quick release coupler **291924** (2) and the hose **292246**.

⚠ CAUTION ⚠

Ensure the pressure hose does not touch any moving part.



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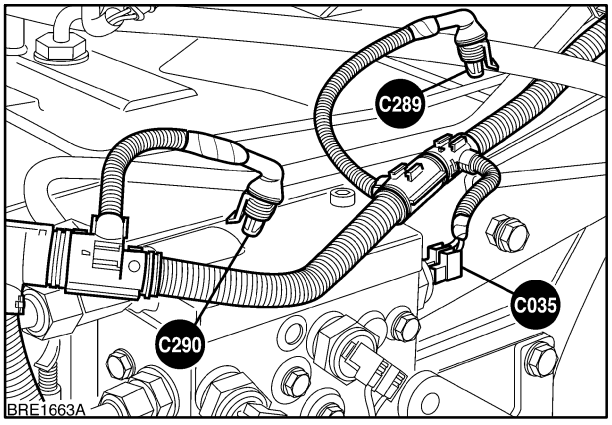
3. Drive the tractor and change from gear 16 to gear 17. The pressure reading should be 17 – 19 bar (247 – 276 PSI) when gear 17 is engaged.

4. Figures 29 and 30 indicate the connectors and wire colours for the specified connectors, to ensure that the correct connections are made to the PWM/Dump valves.



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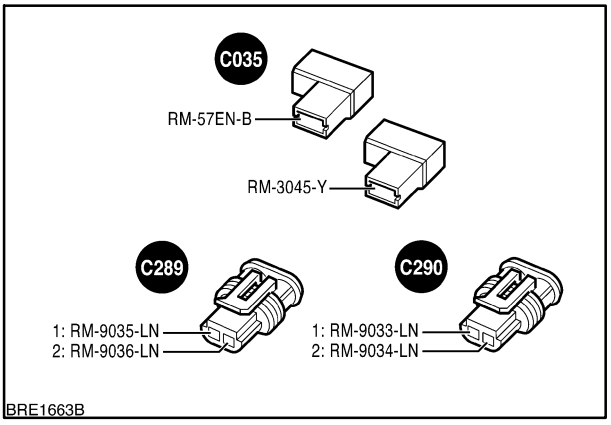
NOTE: *Connector* ***C289*** *is for the* ***50kph Dump Solenoid*** *with wire colours light brown/white/black and light brown/purple/yellow.*

NOTE: *Connector* ***C290*** *is for the* ***50kph Solenoid*** *with wire colours light brown/red/black and light brown/black.*

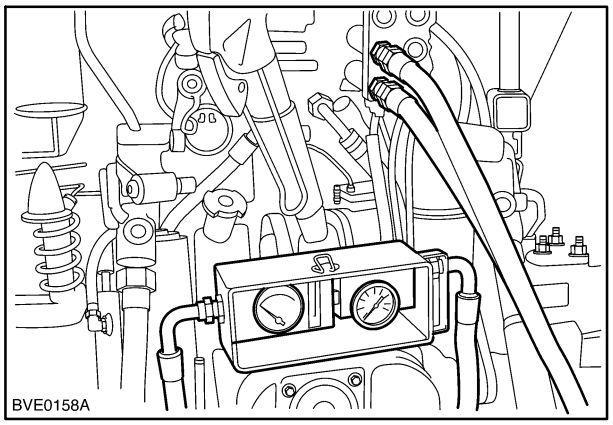


30

Low Pressure Component Leak Test (Variable Displacement Pump Systems)

This test is performed to confirm that the suspected low pressure component has a pressure leak.

1. Install the flow meter between the inlet ports of the remote control valves number 1 and number 2.
2. Set the hydraulic oil flow to maximum.



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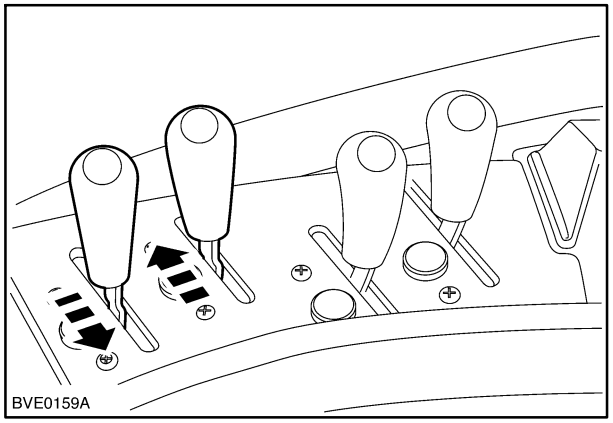
3. Ensure the load valve on the flow meter is fully 'Open'.
4. Set the engine speed to 1000 rev/min.
5. Set the remote control valve number 2 in the 'Float' position and the remote control valve number 1 in the 'Extend' position.
6. Adjust the load on the flow meter to a pressure of 100 bar (1450 PSI).
7. Operate the suspected low pressure component, i.e. four wheel drive, transmission clutches, differential lock.
8. Observe the flow on the flow meter. The flow will decrease to supply the component being operated and should rise back to the original flow. If the flow remains decreased, this indicates a pressure leak in the low pressure components circuit being tested.



32

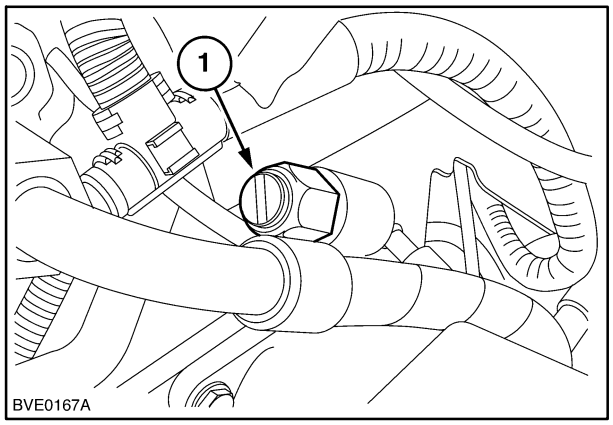
FIXED DISPLACEMENT PUMP - LIFT PRESSURE REGULATING VALVE

Removal-Installation

(Op. 35 114 30)

The lift pressure regulating valve (high pressure circuit relief valve) (1) is linked from the oil supply line.

If faulty, remove and replace the valve.



33

Setting

(Op. 35 114 32)

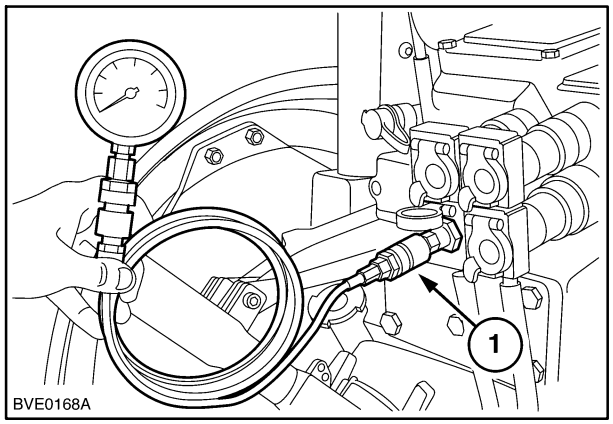
Proceed as follows:

1. Run the engine until oil reaches a temperature of approximately 50°C (122°F).
2. Insert fitting tool no. **293449** or **5101741**(1) into a remote valve coupler and connect to a 0 to 250 bar (3600 PSI) pressure gauge **293244** from test kit no. **292870**.
3. Move and hold the remote control valve lever until the pressure regulating valve operates.
4. With the engine running at 1500 rpm, the pressure gauge should read approx. 205 bar (2973 PSI). If the valve setting is not to specification, the best thing to do is to replace the valve. In case of need, however, it is possible to adjust valve setting through the threaded plug using the spanner tool no. 291863. Tighten the threaded plug to increase valve setting, loosen to decrease.

NOTE: *The pressure regulating valve setting can also be checked as a bench test, as follows:*

5. Mount the pressure regulating valve (1) on the test fitting tool no. **290824** (2) and connect fitting to the hand pump tool no. **290284** (3).
6. Prime the hand pump (3) and check that the pressure regulating valve opens at a pressure of approximately 205 bar (2973 PSI).

NOTE: *The pressure regulating valve is set with oil flow in production. Consequently, the test performed using the hand pump tool no. 290284 should be considered as indicative only. Therefore, we advise to test the pressure regulating valve setting with the valve installed in the tractor, as previously described.*



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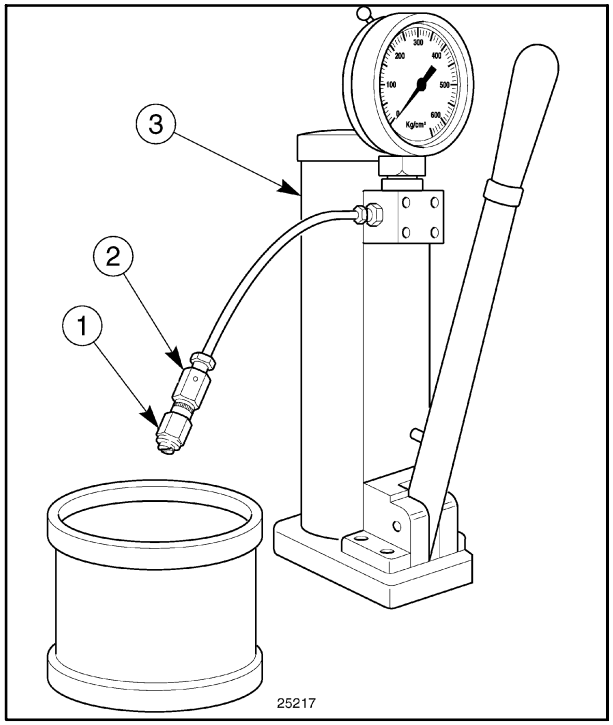

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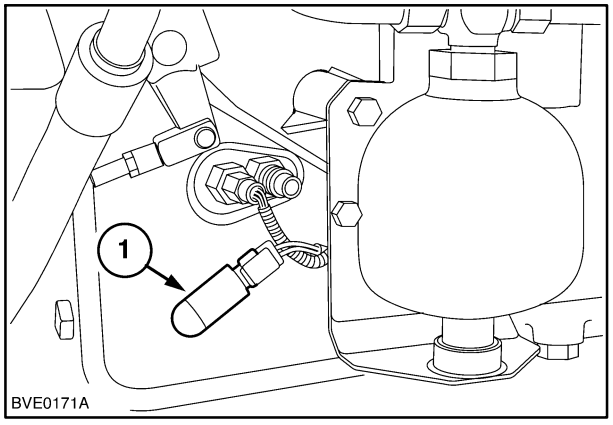
16 X 16 TRANSMISSION PRESSURE TESTING

Pressure test ports are provided on the transmission control valve cover, detailed in Figure 38, to enable the transmission clutches, and lubrication pressures to be tested to determine the correct function of a number of system components. Components such as solenoids, clutch pedal operation and micro-processor can be seen to be operating correctly by the results of pressure testing.

NOTE: *Prior to pressure testing, make certain that all the points detailed under the tractor preparation are carried out to ensure maximum safety.*

Tractor Preparation

1. Start and drive the tractor to warm the transmission oil to a minimum operating temperature of 50°C (122°F).
2. Apply the parking brake.
3. Remove the four wheel driveshaft.
4. Raise the right hand rear wheel and place a suitable support under the axle casing. Remove the right hand rear wheel.
5. Disconnect the grey electrical connector from the high range switch and install the 'Switch By-Pass Connector', **297407** (1), into the tractor harness end. By installing the switch By-Pass connector, the processor receives a signal indicating that the high range is selected, although the **RANGE LEVER remains in NEUTRAL** throughout the testing.



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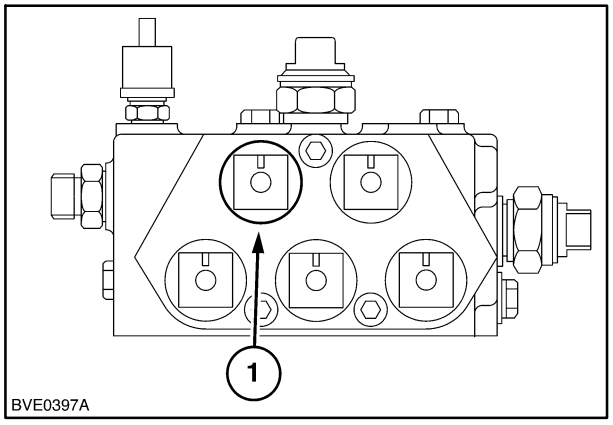
6. Disconnect the differential lock solenoid electrical connector (1).



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C1/C2 and C3/C4 Clutch Engagement and Disengagement Pressure Test

7. Remove the test port plugs, refer to figure 38 and install the adaptors:
   - C1/C2 quick release fitting **297240**.
   - C3/C4 $^{7}/_{16}$ JIC male x $^{7}/_{16}$ UNF male and 90° quick release fitting **297241**.
   - Test port thread $^{7}/_{16}$ -20 UNF

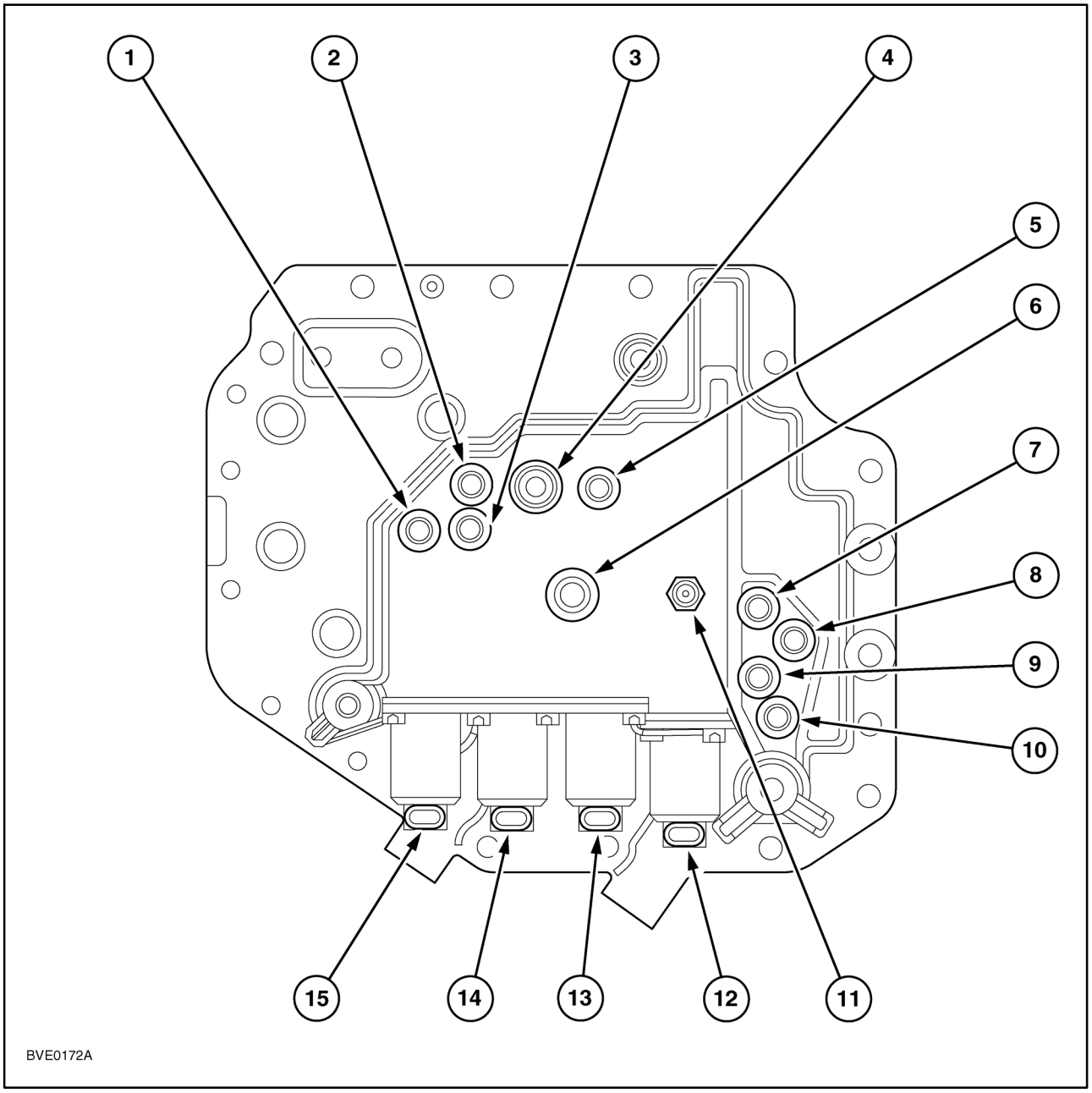
NOTE: *Table 2 shows C3 clutch feathering test, C4 clutch feathering test pressures should be the same as C3.*

8. Attach four 0 - 40 bar (0 - 600 PSI) pressure gauges **293242**, using the quick release coupler **291924** (2). The testing may be carried out with two gauges using the following procedure:
   - Connect to C1 and C2 test ports and carry out tests from gears nine through to twelve.
   - Connect to C3 and C4 test ports and carry out tests from gears nine through to twelve.
   - Connect to C2 and C3 test ports with gear 10 selected and carry out C3 clutch feathering test.
   - Connect to C2 and C4 test ports with gear 9 selected and carry out C4 clutch feathering test.
9. Position the shuttle lever in **Forward** and leave the High/Low range lever in **Neutral.**
10. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
11. Observe the reading on the gauges and compare with those in Table 1 as the gears are shifted, Table 2 for the feathering tests and Table 3 for Forward/Neutral/Reverse shuttle test.

Lube Supply Pressure Test

1. Prepare the tractor as described in tractor preparation.
2. Remove the test port plug, refer to figure 38 and Install the quick release fitting **297240**.
   - Test port thread $^{7}/_{16}$ - 20 UNF
3. Attach a 0 - 10 bar (0 - 145 PSI) pressure gauge **293241**, using the quick release coupler **291924** and the hose **292246**.
4. The following pressures should be observed.

   3 bar (44 PSI) - Neutral
   2 bar (29 PSI) - Forward/Reverse



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Pressure Test Ports and Solenoid Valve Identification

1. C4 Pressure test port
2. C3 Pressure test port
3. C3/C4 Lube pressure test port
4. Lube inlet connector
5. Lube supply pressure test port
6. Regulated pressure inlet
7. C2 Pressure test port
8. C1/C2 Lube pressure test port
9. C1 pressure test port
10. Transmission bearing/synchroniser lube pressure
11. Oil temperature sender
12. C1 PWM solenoid valve
13. C2 PWM solenoid valve
14. C3 PWM solenoid valve
15. C4 PWM solenoid valve

Pressure Testing Tables

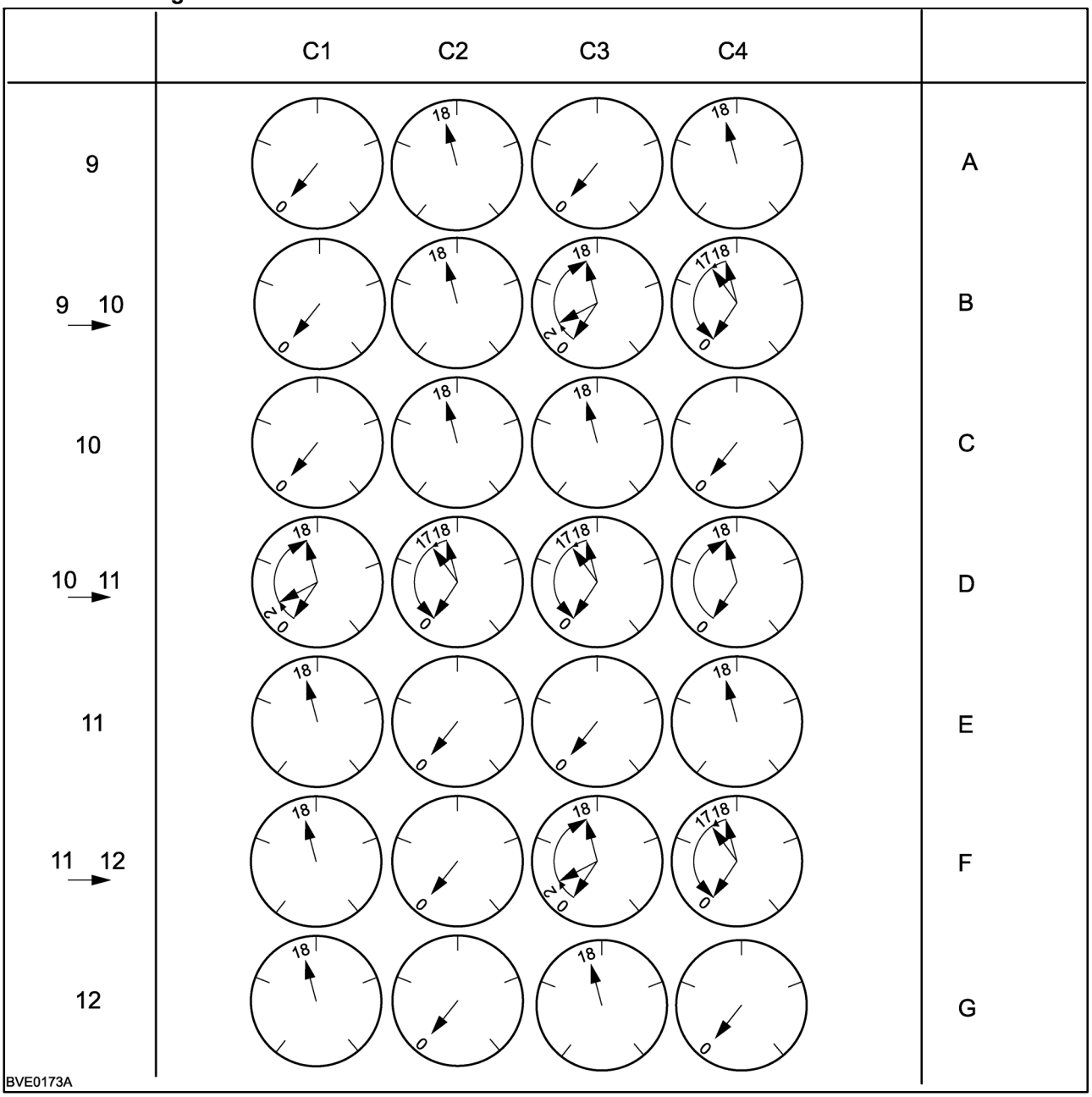

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Table 1 - Pressure Testing - Clutch PWM Solenoid Valve Operation

A.	C2 and C4	Full Pressure
B.	C2	Full Pressure
	C3	0 to 2 bar : 2 to 18 bar (0 to 29 PSI : 29 to 261 PSI)
	C4	18 to 17 bar : 17 to 0 bar (261 to 246 PSI : 246 to 0 PSI)
C.	C2 and C3	Full Pressure
D.	C1	0 to 2 bar : 2 to 18 bar (0 to 29 PSI : 29 to 261 PSI)
	C2 and C3	18 to 17 bar : 17 to 0 bar (261 to 246 PSI : 246 to 0 PSI)
	C4	0 to 18 bar (0 to 261 PSI)
E.	C1 and C4	Full Pressure
F.	C1	Full Pressure
	C3	0 to 2 bar : 2 to 18 bar (0 to 29 PSI : 29 to 261 PSI)
	C4	18 to 17 bar : 17 to 0 bar (261 to 246 PSI : 246 to 0 PSI)
G.	C1 and C3	Full Pressure

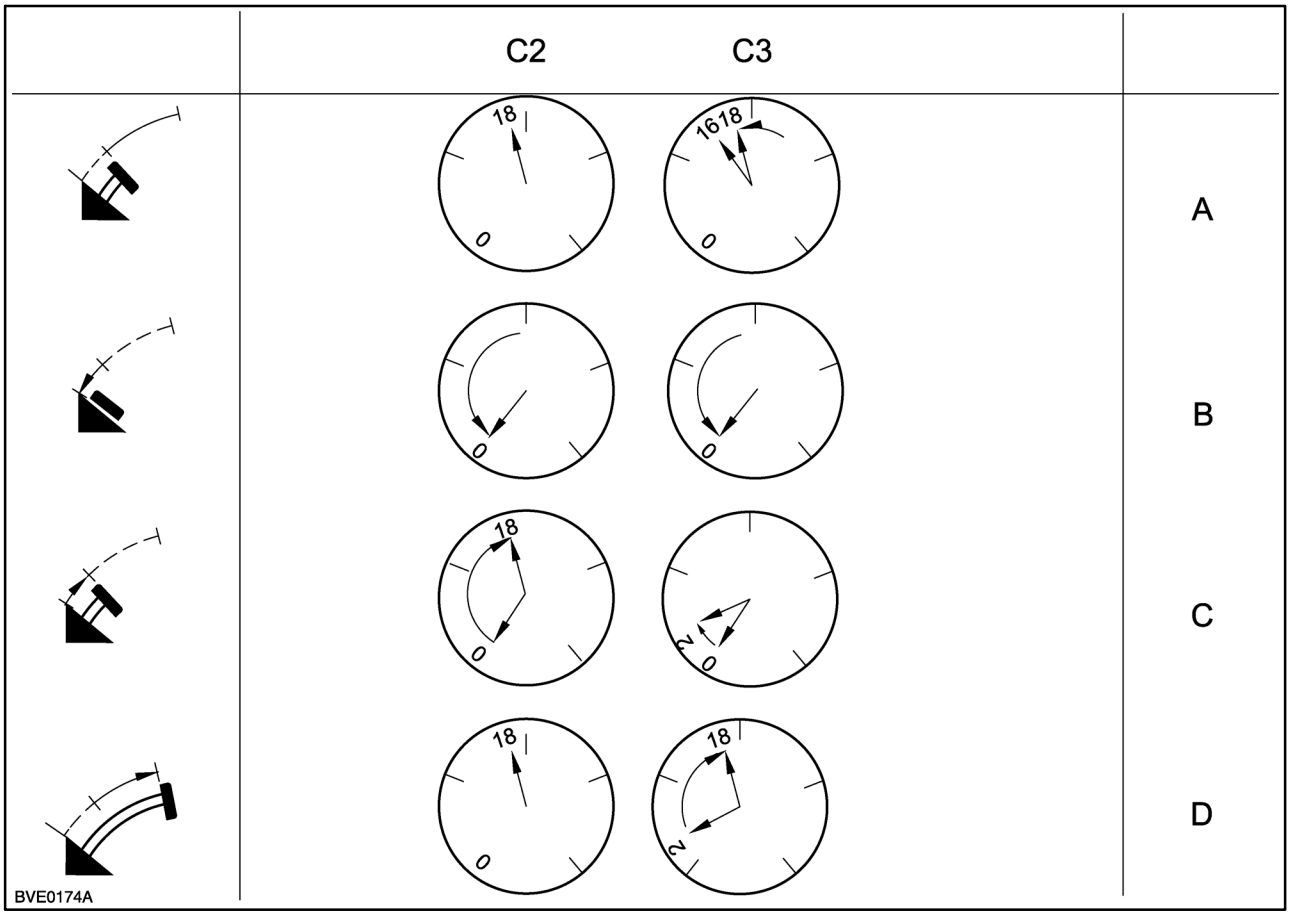

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Table 2 - Clutch Feathering Tests for C3 Clutch - Gear 10 Selected

A. When the clutch pedal is initially depressed the pressure in C3 will reduce from the fully engaged pressure by approximately 2 bar.

B. When the clutch pedal is fully depressed C2 and C3 pressures should be zero.

C. Releasing the clutch pedal from the fully depressed position should restore C2 to full pressure and C3 to feathering pressure.

D. Pressure in C3 should progressively increase as the clutch pedal is released indicating the PWM solenoid valve and clutch potentiometer are functioning correctly.

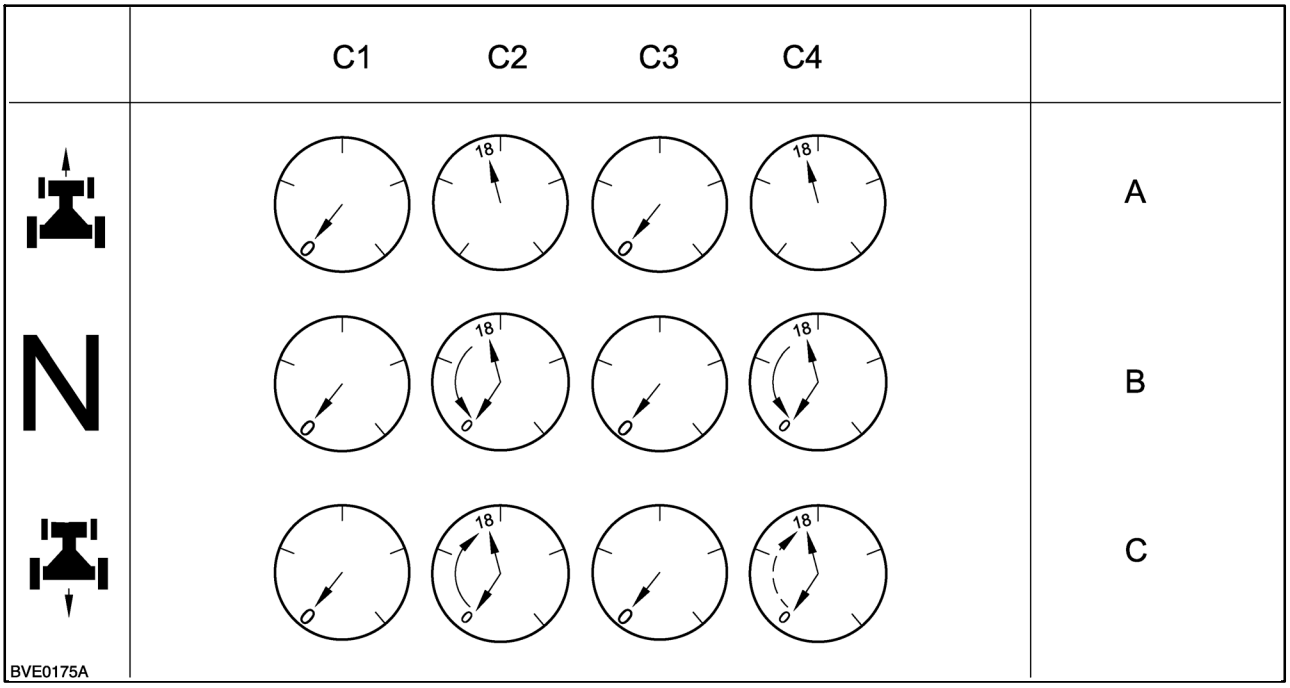

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Table 3 - Forward/Neutral/Reverse Shuttle Test - Gear 9 Selected

A.	C2 and C4	Full Pressure
B.	C2 and C4	18 to 0 bar (261 to 0 PSI)
C.	C2	Immediate full pressure restored
	C4	Controlled engagement to full pressure

NOTE: *Release the parking brake to perform the shuttle test and make sure the* ***RANGE LEVER remains in NEUTRAL****.*

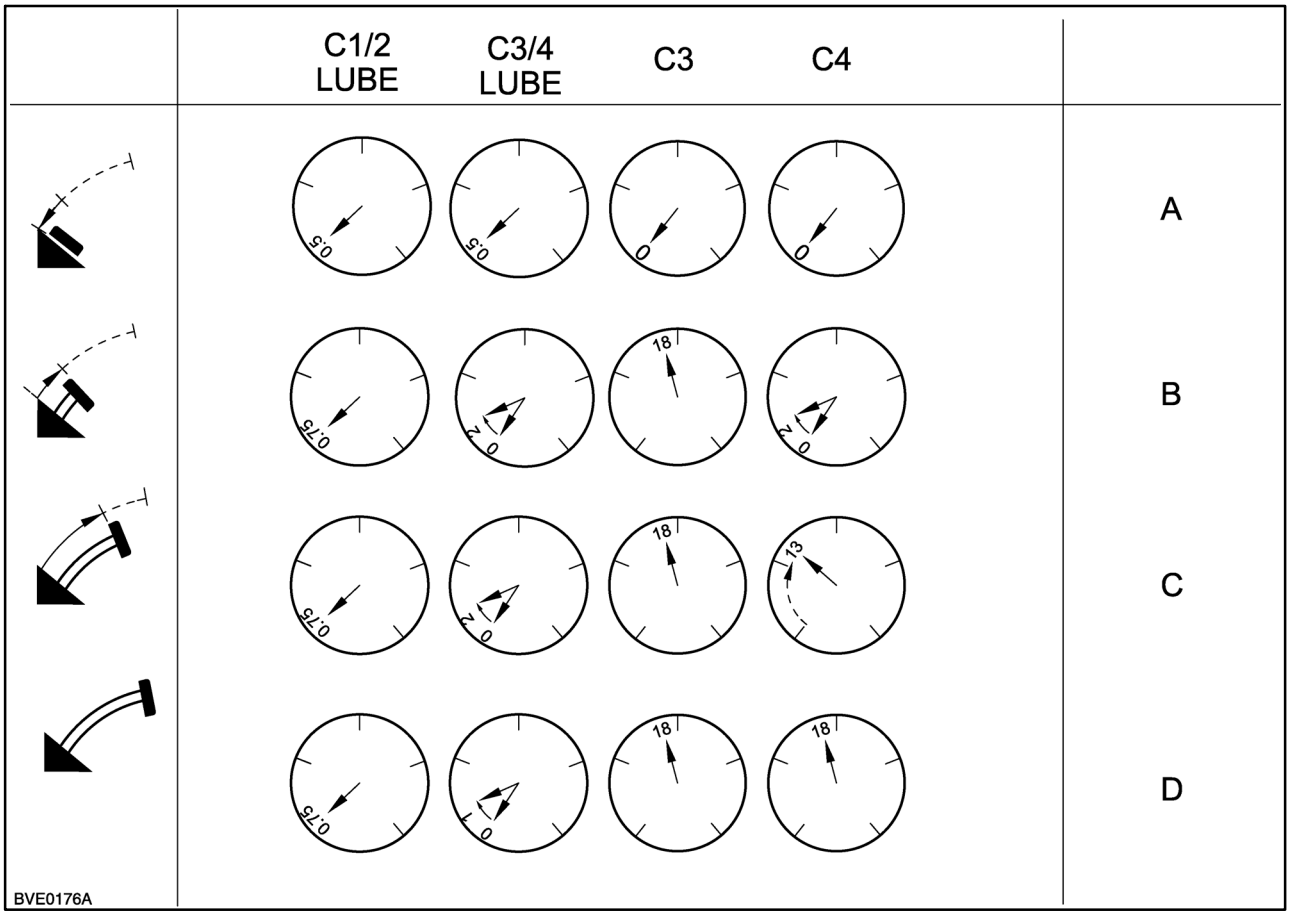

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Table 4 - Clutch Lube Pressure Tests - Gear 9 Selected

A.

C2 and C4	Zero pressure
C1/C2 Lube	Approx. 0.5 bar (7.2 PSI)
C3/C4 Lube	Approx. 0.5 bar (7.2 PSI)

B.

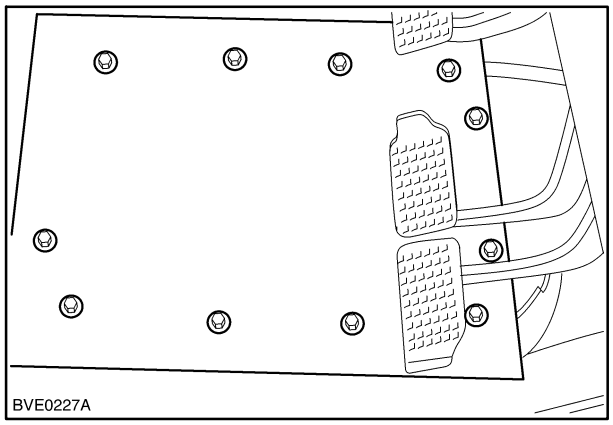
C2	Full pressure
C4	0 to 2 bar (0 to 29 PSI)
C1/C2 Lube	Approx. 0.75 bar (10.8 PSI)
C3/C4 Lube	Approx. 2 bar (29 PSI)

C.

C2	Full pressure
C4	Full pressure
C1/C2 Lube	Approx. 0.75 bar (10.8 PSI)
C3/C4 Lube	Reduced to 1 bar (14.5 PSI)

Forward/Reverse and 1-4/5-8 Range Synchroniser Pressure Test

1. Slide the operator seat fully rearward.
2. Remove the rubber mat from the cab.
3. Remove the cab floor panel from the cab.



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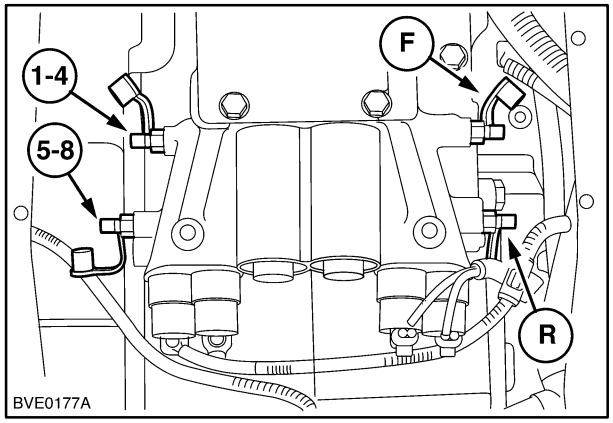
4. Remove the test port plugs and install the quick release fitting **297240** in the forward (F), reverse (R), 1-4 and 5-8 range test ports.
   - Test port thread $^{7}/_{16}$ - 20 UNF
5. Attach four 0 - 40 bar (0 - 600 PSI) pressure gauges **293242**, using the quick release coupler **291924**.

NOTE: *Due to the operating characteristics of the synchroniser it is not possible to accurately pressure test the synchroniser operating piston during normal tractor operation. The synchroniser will only take the required pressure to move and then the pressure will be cut. This would be seen only as a momentary blip on a pressure gauge. Therefore the following procedure, using the calibration mode, should be used to determine if full pressure is being achieved.*



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6. Enter the transmission calibration procedure.
7. The table below shows the synchroniser calibration stages and at what stage the pressure can be expected to be seen.

Stage	Synchroniser Pressures bar (PSI)			
	Forward (F)	Reverse (R)	1-4 Range	5-8 Range
SOC	**18** (261**)**	0	0	**18** (261**)**
1	0	**0-5*** (0-72.5*)**	0	0
2	0	**18** (261**)**	0	0
3	0	0	**0-5*** (0-72.5*)**	0
4	0	0	**18** (261**)**	0
5	**0-5*** (0-72.5*)**	0	0	0
6	**18** (261**)**	0	0	0
7	0	0	0	**0-5*** (0-72.5*)**
8	0	0	0	**18** (261**)**
END	0	0	0	0

***** This pressure slowly increases to overcome the synchroniser detent position and may not be noticed on the pressure gauge.

****** This pressure increases at a faster rate to shift the synchroniser into position.

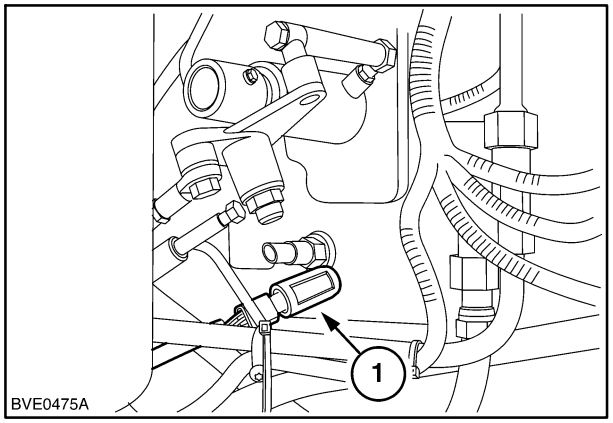
24 X 24 TRANSMISSION PRESSURE TESTING

Pressure test ports are provided on the transmission control valve cover to enable the transmission clutches to be tested to determine the correct function of a number of system components. Components such as solenoids, clutch pedal operation and micro-processor can be seen to be operating correctly by the results of pressure testing.

NOTE: *Prior to pressure testing, make certain that all the points detailed under the tractor preparation are carried out to ensure maximum safety.*

Tractor Preparation

1. Start and drive the tractor to warm the transmission oil to a minimum operating temperature of 50°C (122°F).
2. Apply the parking brake.
3. Remove the four wheel driveshaft.
4. Disconnect the electrical connector from the high/low/medium range switch and install the 'Switch By-Pass Connector', **297407** (1), into the tractor harness end. By installing the switch By-Pass connector, the processor receives a signal indicating that either high range or medium range is selected, although the **HIGH/LOW/MEDIUM RANGE LEVER remains in NEUTRAL** throughout the testing.



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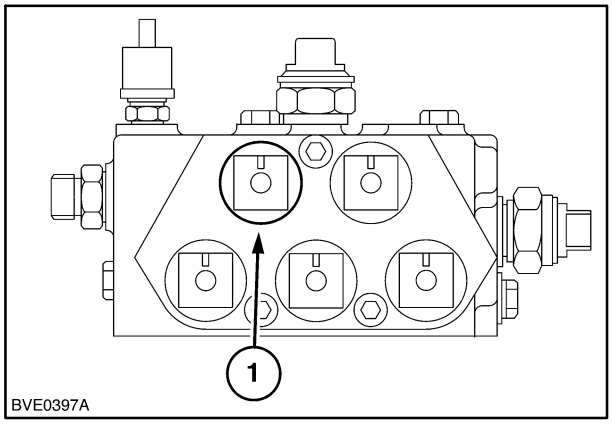
5. Disconnect the differential lock solenoid electrical connector (1).



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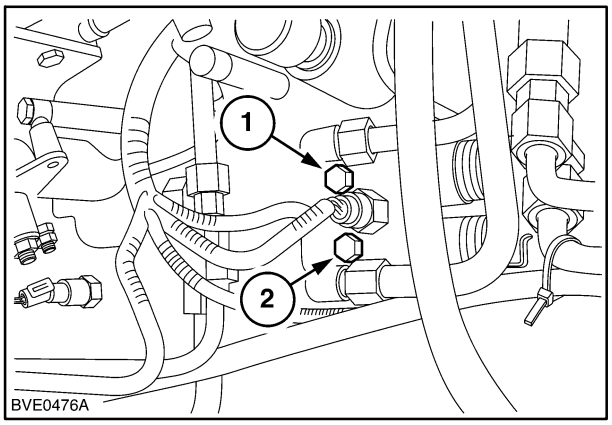
C1/C2 Clutch Engagement and Disengagement

6. Remove the C1 (1) and the C2 (2) test port plugs.



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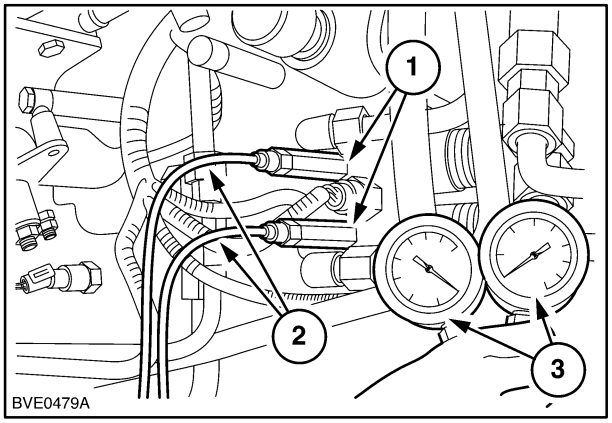
7. Install the quick release fitting **292928** (1) in the C1 and C2 test ports.
   - Test port thread $^{7}/_{16}$ – 20 UNF
8. Attach two 0 – 40 bar (0 – 600 PSI) pressure gauges (3) **293242**, using the hose **292246** (2).
9. Position the shuttle lever in **Forward** and leave the High/Low/Medium range lever in **Neutral.**
10. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
11. Observe the readings on the gauges and compare with those in Table 1.



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Pressure Test Tables

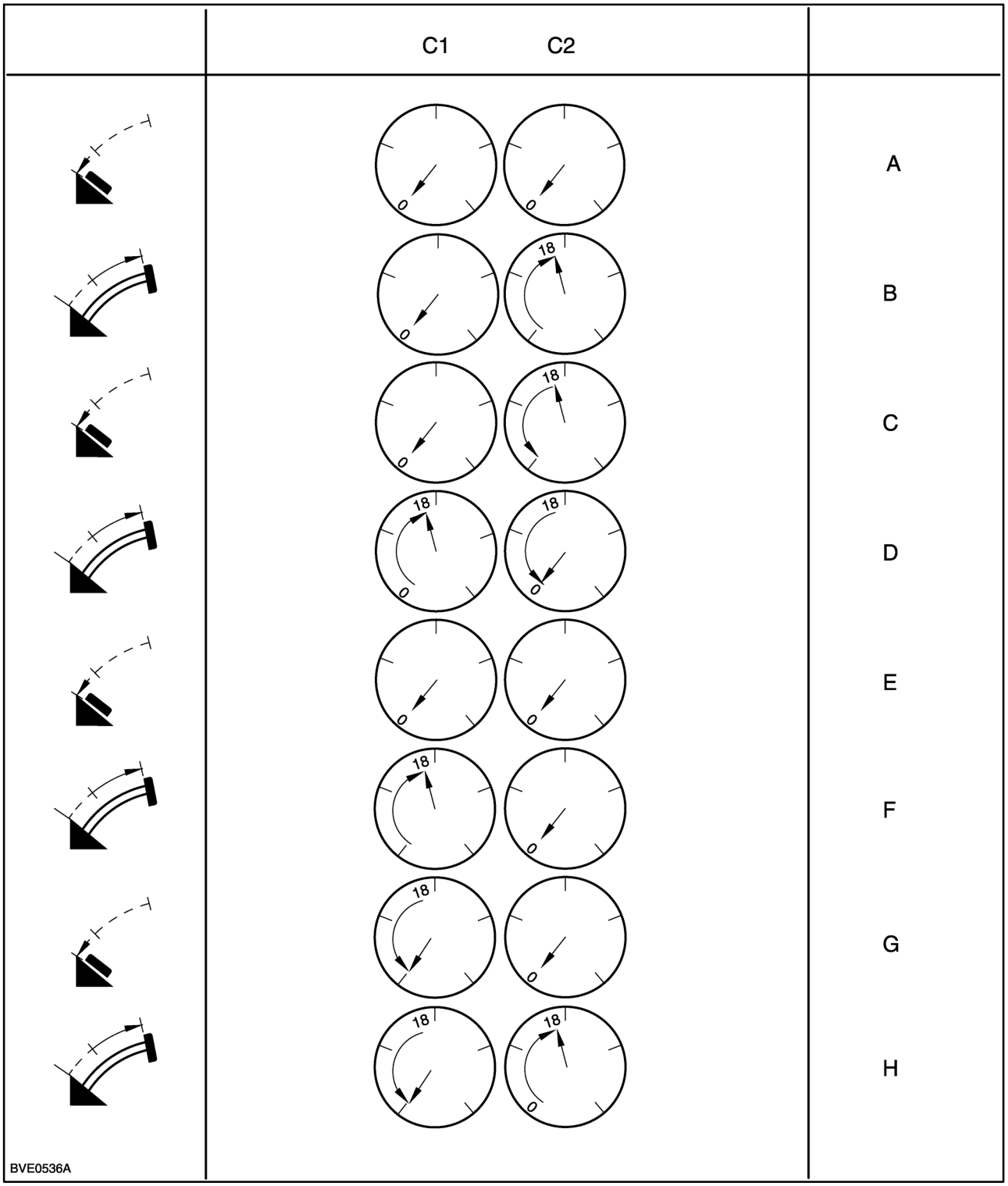

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Table 1 - Pressure Tests for C1 and C2

A. High Selected (Direct Drive)
Pressure on C1 and C2 should be zero. Indicates the dump valve solenoid is operational.

B. Releasing the clutch pedal from the fully depressed position should smoothly and gradually restore C2 to full pressure. C1 should remain at zero. Indicates the correct C2 PWM solenoid valve and the clutch pedal operation.

C. Depressing the clutch pedal should progressively reduce the pressure in C2 and with the pedal fully depressed zero pressure should be indicated. Indicates the correct C2 PWM solenoid valve, clutch potentiometer and the dump valve operation.

D. Switch From High (Direct Drive) to Low (Underdrive)
C2 pressure should reduce to zero, C1 pressure should rise to full pressure. This should appear to be an instantaneous operation with just a slight overlap of pressure between the clutches. This indicates the correct operation of C1 and C2 PWM solenoid valves.

E. Low Selected (Underdrive)
Pressure on C1 and C2 should be zero. This indicates the correct dump valve operation.

F. Releasing the clutch pedal from the fully depressed position should smoothly and gradually restore C1 to full pressure. C2 should remain at zero. This indicates the correct C1 PWM solenoid valve and the clutch pedal operation.

G. Depressing the clutch pedal should progressively reduce the pressure in C1 and with the pedal fully depressed zero pressure should be indicated. This indicates the correct C1 PWM solenoid valve, clutch potentiometer and the dump valve operation.

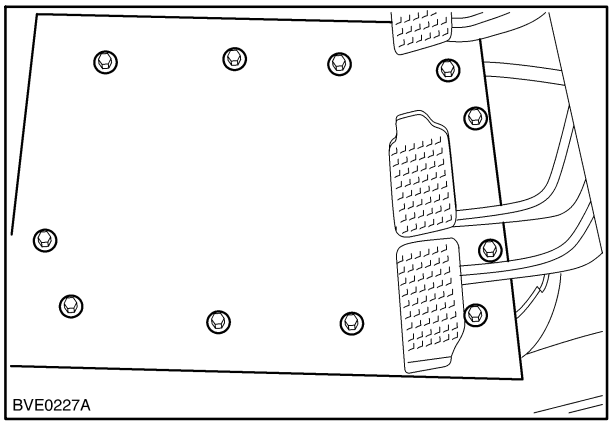
H. Switch From Low (Underdrive) to High (Direct Drive)
C1 pressure should reduce to zero, C2 pressure should rise to full pressure. This should appear to be an instantaneous operation with just a slight overlap of pressure between the clutches. This indicates the correct operation of C1 and C2 PWM solenoid valves.

Pressure Testing Notes:

1. Maximum pressure should be between 15 – 18 bar (220 – 260 PSI). If maximum pressure is obtained in only one of the clutches, suspect a fault in that clutch circuit, e.g. leaking clutch seals, faulty PWM solenoid valve. The pressure at 1500 rev/min. should be between 13.8 – 16.5 bar (200 – 240 PSI).
2. If the pressure is low on both clutches this may indicate a faulty dump solenoid valve or a fault in the hydraulic supply circuit.
3. Sudden, irregular rises or drops in pressure as the clutch pedal is operated may indicate a faulty clutch potentiometer if it occurs in both Low (underdrive) and High (direct drive), or if only one of the drives drops pressure this may indicate a faulty PWM valve.
4. If the pressure comes on suddenly as the clutch pedal is raised, this may indicate that the clutch pedal switch is incorrectly adjusted.
5. If the pressure is not at absolute zero with the clutch pedal fully depressed, this may also indicate a incorrectly adjusted clutch switch or a possible fault with the dump solenoid valve.

Forward/Reverse Synchroniser Pressure Test

1. Slide the operator seat fully rearward.
2. Remove the rubber mat from the cab.
3. Remove the cab floor panel from the cab.



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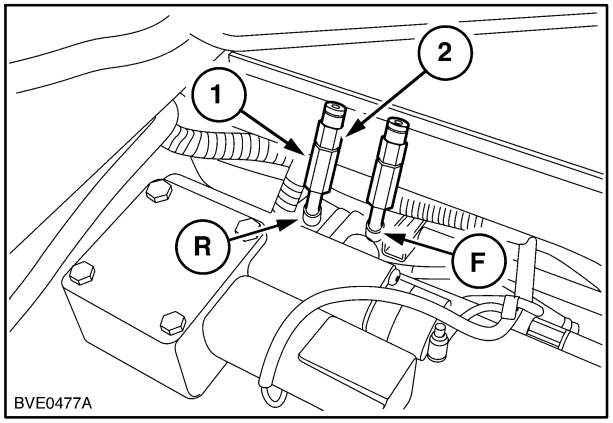
4. Remove the test port plugs and install the adaptors **297609** (1) and the quick release fitting **297240** (2). in the forward (F) and the reverse (R) test ports.
   - Test port thread 7/16 – 20
5. Attach two 0 – 40 bar (0 – 600 PSI) pressure gauges **293242**, using the quick release coupler **291924**.

NOTE: *Due to the operating characteristics of the synchroniser it is not possible to accurately pressure test the synchroniser operating piston during normal tractor operation. The synchroniser will only take the required pressure to move and then the pressure will be cut. This would be seen only as a momentary blip on a pressure gauge. Therefore the following procedure, using the calibration mode, should be used to determine if full pressure is being achieved.*

6. Enter the transmission calibration procedure.
7. The table below shows the synchroniser calibration stages and at what stage the pressure can be expected to be seen.



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Stage	Synchroniser Pressures bar (PSI)	
	Forward (F)	Reverse (R)
SOC	**18** (261 **)**	0
1	0	**0–5* (0–72.5 *)**
2	0	**18** (261**)**
3	**0–5* (0–72.5*)**	0
4	**18** (261 **)**	0
END	0	0

***** This pressure slowly increases to overcome the synchroniser detent position and may not be noticed on the pressure gauge.

****** This pressure increases at a faster rate to shift the synchroniser into position.

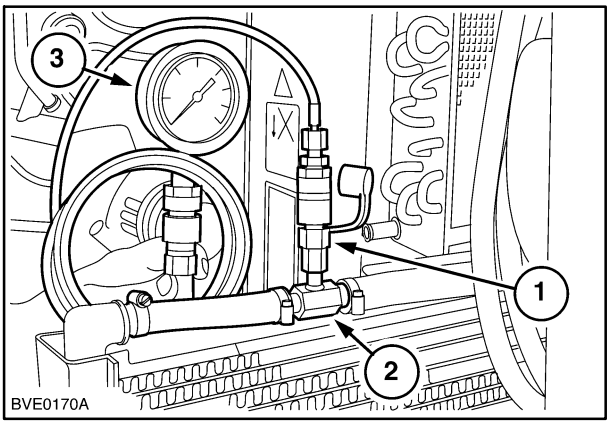
Cooler By-pass Valve - Lubrication Pressure

IMPORTANT: *Before performing any pressure or flow testing operate the tractor until the oil in the rear axle is at normal operating temperature. 75°C (170°F).*

The following test checks the operation of the cooler by-pass valve and lubrication valve and should be performed if insufficient lubrication pressure is suspected.

1. Install the T-adaptor **297610** (2) and the quick release fitting **297240** (1) into the oil cooler line.
2. Attach a 0 - 27 bar (0 - 300 PSI) pressure gauge **297167** (3), using the quick release coupler **291924** and the hose **292246**.
3. The following pressures should be observed at the different engine rev/min.

   5 bar (73 PSI) @ 1000 ERPM
   6 bar (87 PSI) @ 1500 ERPM
   9 bar (131 PSI) @ 2000 ERPM



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TRAILER BRAKE PRESSURE TESTING

Test Conditions

Oil temperature 40° to 50° C (104° to 122° F).

Engine speed 1000 rpm.

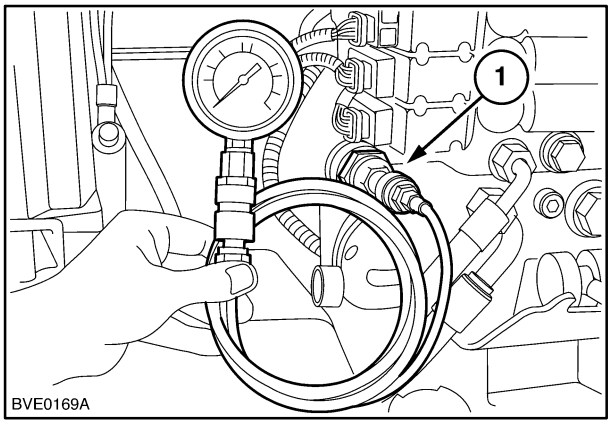
Electrical system powered.

Parking brake disengaged.

Pressure Test (All Models)

Proceed as follows:

1. Insert fitting no. **293190** (1) in trailer brake coupler and connect it to a 0 to 250 bar (3600 PSI) pressure gauge **293244**.
2. Couple both brake pedals together and with engine and oil in the conditions described at the beginning of this chapter, apply the foot brake. The pressure gauge reading should increase depending on pedal effort up to 135 to 145 bar (1958 - 2103 PSI).
3. Engage parking brake, disconnect pressure gauge and fitting no. **293190** (1).



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Troubleshooting

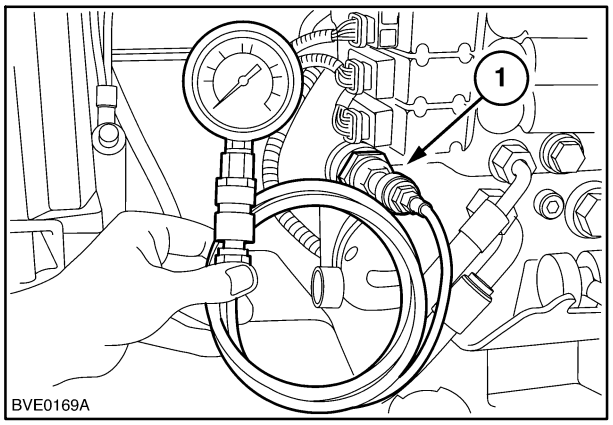
Problem	Possible Causes	Correction
Pressure higher or lower than specified.	4. Faulty trailer braking auxiliary valve pressure regulating valve.	Replace trailer braking auxiliary valve.
	4. Faulty hydraulic pump.	Replace pump.

TRAILER BRAKE SYSTEM LEAK TEST (ALL MODELS)

Leak Test

Proceed as follows:

1. Insert fitting no. **293190** (1) in trailer brake coupler and connect it to a 0 to 250 bar pressure gauge **293244**.
2. Couple both brake pedals together and with engine and oil in the conditions described at the beginning of this chapter apply the foot brakes for a minimum of 10 seconds. The pressure gauge reading should increase up to 135 to 145 bar (1958 - 2103 PSI) and remain constant.
3. Engage parking brake, disconnect pressure gauge and fitting no. **293190** (1).

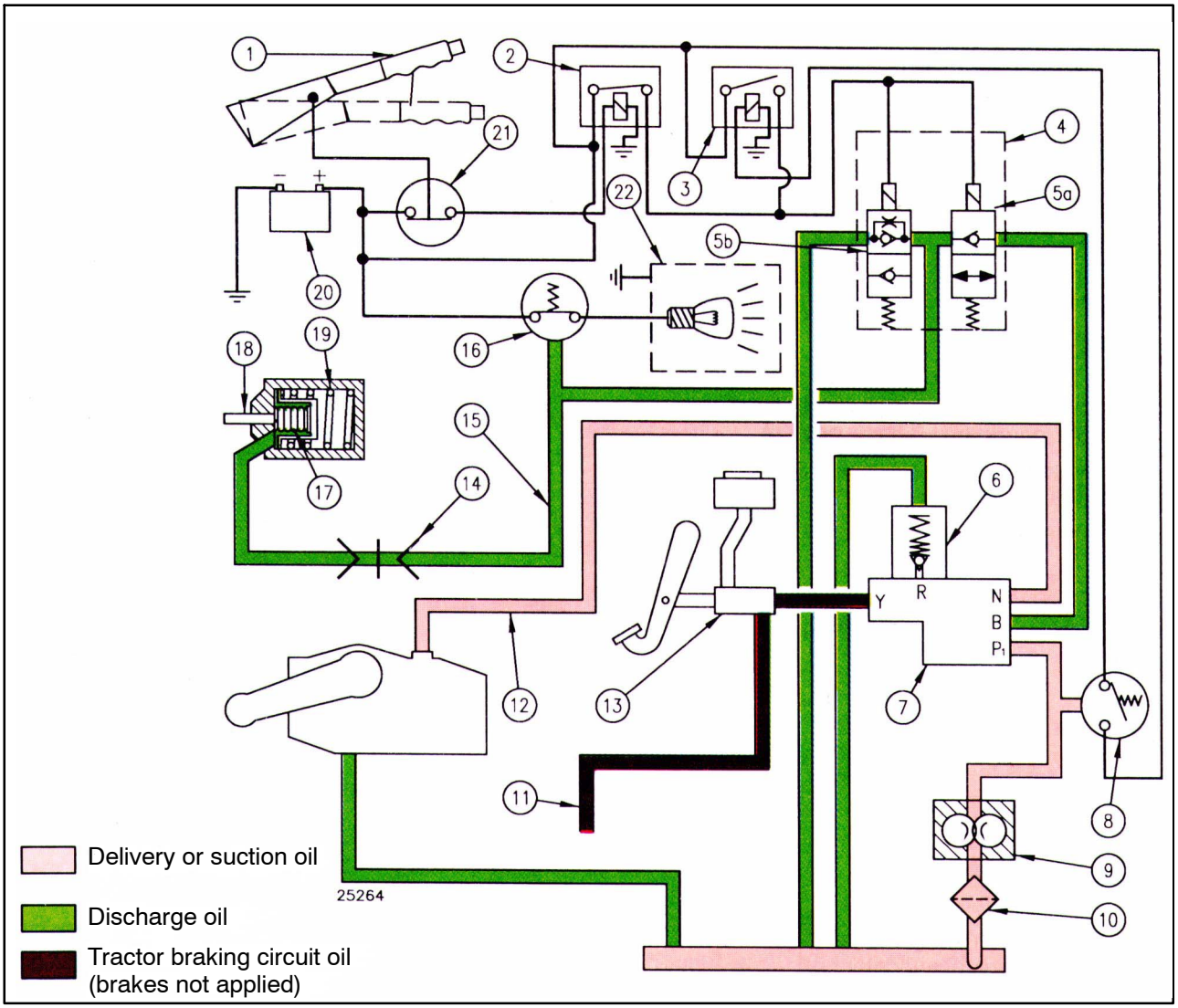


54

Troubleshooting

Problem	Possible Causes	Correction
Excess pressure peaks are observed when applying the brake pedals for 10 seconds.	4. Oil leaks from hydraulic system.	Locate leaks and repair.
	4. Solenoid valve leak.	Replace solenoid valve.
	4. Trailer brake auxiliary valve leaks.	Replace trailer brake auxiliary valve.

TRAILER BRAKE OPERATION



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TRAILER BRAKE VALVE ELECTRO-HYDRAULIC OPERATION DIAGRAM (ITALY ONLY)

Engine running, parking brake engagement

1. Parking brake control lever - 2. Parking brake indicator circuit relay - 3. Trailer brake circuit relay - 4. Trailer braking control solenoid valves - 5a. Delivery solenoid valve (normally open) - 5b. Discharge solenoid valve (normally closed) - 6. Trailer brake disengagement pressure regulating valve - 7. Trailer braking valve - 8. Trailer brake circuit safety switch - 9. Hydraulic pump - 10. Filter - 11. Brake control line - 12. Hydraulic lift and auxiliary valve supply line - 13. Brake pump - 14. Trailer-tractor coupler - 15. Trailer brake control line - 16. Trailer brake engaged indicator switch 17- 19. Springs - 18. Trailer brake control pin - 20. Battery - 21. Parking brake engaged switch - 22. Trailer brake engaged light indicator.

Parking brake (1) engagement makes the switch (21) close. Therefore current is allowed to reach and excite the relay (2),and through the closed relay contact (2) it excites the solenoid valves (5a and 5b) closing the former and opening the latter. In this condition line and trailer brake oil (15), subject to the spring (19) force can reach the discharge through the solenoid valve (5b). Braking action is performed mechanically following the spring (19) pressure on the pin (18). Oil discharge creates a pressure drop which closes the switch (16), and current, passing through the switch (16), reaches the instrument panel light indicator (22), which lights up.**Notice -** After parking brake engagement, wait approx. 10 seconds before stopping the engine to permit complete oil discharge from trailer brake cylinder and obtain optimal braking action.

HYDRAULIC TRAILER BRAKE CHECK

Italian Option

	Foot Brake	**Hand Brake**	**Warning Light (Trailer Brake)**	**Gauge Pressure at Coupler bar (PSI)**
Key 'ON'	OFF	OFF	ON	0
Engine Running (800-1000rpm)*	OFF	OFF	OFF*	10 (145)
Engine Running (800-1000rpm)*	OFF	ON	ON	0
Engine Running (800-1000rpm)*	OFF	OFF	OFF	10 (145)
Engine Running (800-1000rpm)*	Apply foot brake progressively	OFF	OFF	10-120/150 (145-1740/2175)
Engine Running (800-1000rpm)*	ON	ON	ON	0
Engine Running (800-1000rpm)*	ON	OFF	OFF	120/150 (1740/2175)
Engine Running (800-1000rpm)*	Release foot brake progressively	OFF	OFF	120/150-10 (1740/2175-145)
Engine Running (800-1000rpm)*	OFF	ON	ON	0
Engine Running (800-1000rpm)*	OFF	OFF	OFF	10 (145)
Key 'OFF'	OFF	OFF	OFF	0

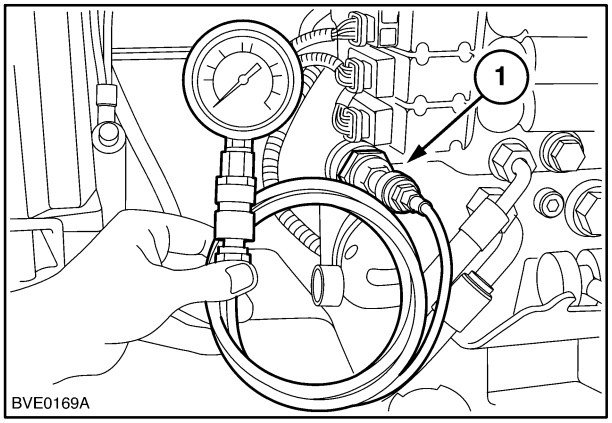
***NOTE:** * If air brakes are fitted, the warning light will stay on until air reservoirs are full at correct pressure(Air and hydraulic brakes share the same light).*

TRAILER BRAKE DISENGAGEMENT PRESSURE TEST (ITALIAN TRAILER BRAKES ONLY)

Pressure Test

Proceed as follows:

1. Insert fitting no. **293190** (1) into the trailer brake coupler and connect it to a 0 - 40 bar (0-600 PSI) pressure gauge **293242**.
2. With engine and oil as detailed above, pressure should be 11 - 12 bar (160 - 174 PSI).
3. Make sure that light indicator (22, Figure 55) is off.
4. Engage parking brake, disconnect pressure gauge and fitting no. **293190** (1).



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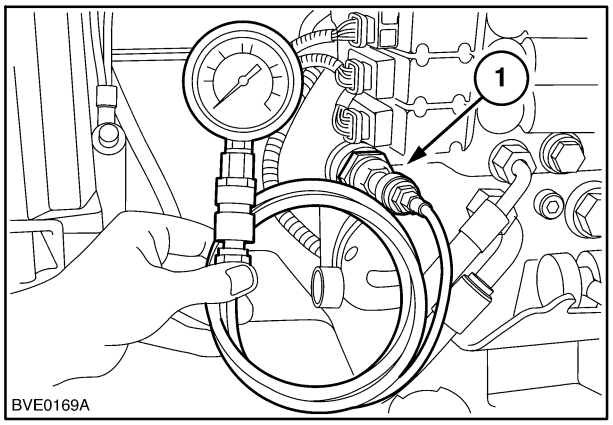
Troubleshooting

Problem	Possible Causes	Correction
Trailer brake disengagement pressure = 0 bar (light indicator on 22, Figure 55).	1. Parking brake (1, Figure 55) engaged.	Disengage parking brake.
	2. Trailer brake disengagement pressure valve misadjusted (6)	Replace valve.
	3. Faulty trailer brake circuit safety switch (8).	Replace switch.
	4. Faulty hydraulic pump (9).	Overhaul or replace pump.
	5. Delivery solenoid valve (5a) stuck closed.	Repair or replace solenoid valve.
	6. Discharge solenoid valve (5b) stuck open.	Repair or replace solenoid valve.
Trailer brake disengagement pressure = 0 - 11 bar (0 - 160 PSI)	1. Trailer brake disengagement pressure valve incorrectly adjusted (6).	Replace valve.
Correct trailer brake disengagement pressure but light indicator (22) is on.	1. Faulty trailer brake engaged indicator switch (16).	Replace switch.
Trailer brake disengagement pressure not correct but light indicator (22) is off.	1. Faulty indicator lamp (22).	Replace lamp.
	2. Faulty trailer brake engaged indicator switch (16).	Replace switch.

PARKING BRAKE ENGAGEMENT TEST (ITALIAN TRAILER BRAKES ONLY)



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Engagement Test

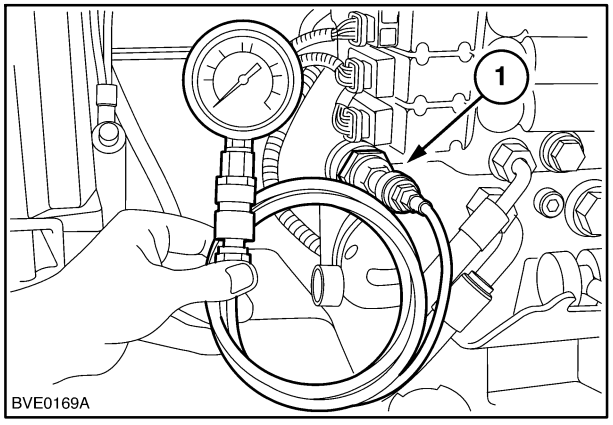
Proceed as follows:

1. Insert fitting no. **293190** (1) in trailer brake coupler and connect it to a 0 - 40 bar (0 - 600 PSI) pressure gauge **293242**.
2. With engine and oil in the conditions described at the beginning of this chapter, fully raise parking brake control lever (1, Figure 55).
3. Check if pressure is 0 bar and light indicator (22, Figure 55) is on.
4. With the parking brake engaged disconnect pressure gauge and fitting no. **293190** (1).

Troubleshooting

Problem	Possible Causes	Correction
Trailer brake disengagement pressure does not zero when parking brake is applied.	4. Faulty parking brake engaged switch (21, Figure 55).	Replace switch.
	4. Faulty parking brake indicator circuit relay (2).	Replace relay.
	4. Discharge solenoid valve (5b) faulty or stuck closed.	Repair or replace solenoid valve.

TRAILER BRAKE CIRCUIT SAFETY SWITCH TEST (ITALIAN TRAILER BRAKES ONLY)



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Circuit Safety Switch Test

Proceed as follows:

1. Insert fitting no. **293190** in trailer brake coupler and connect it to a 0 - 40 bar (0 - 600 PSI) pressure gauge **293242**.
2. With the parking brake OFF and tractor brakes not applied, operate and hold the remote control valve lever and allow the system pressure relief valve to operate. Keep this position for a few seconds and quickly release the control lever.
3. Check if parking brake disengagement pressure remains at the specified value: 11 - 12 bar (160 - 174 PSI).
4. Engage parking brake, disconnect pressure gauge and fitting no. **293190** (1).

Troubleshooting

Problem	Possible Causes	Correction
Trailer brake disengagement pressure is permanently zeroed when operating the levers described above.	1. Trailer brake circuit safety switch (8, Figure 55) adjustment exceeding rated value 2.5 - 3.5 bar (36 - 51 PSI).	Replace switch.
	2. Switches (8 and 16) reversed in the specified positions or with exchanged power supply cables.	Move switches to correct positions or reverse power supply cables.

SECTION 35 – HYDRAULIC SYSTEMS

Chapter 10 – External Lift Rams

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Section	Description	Page
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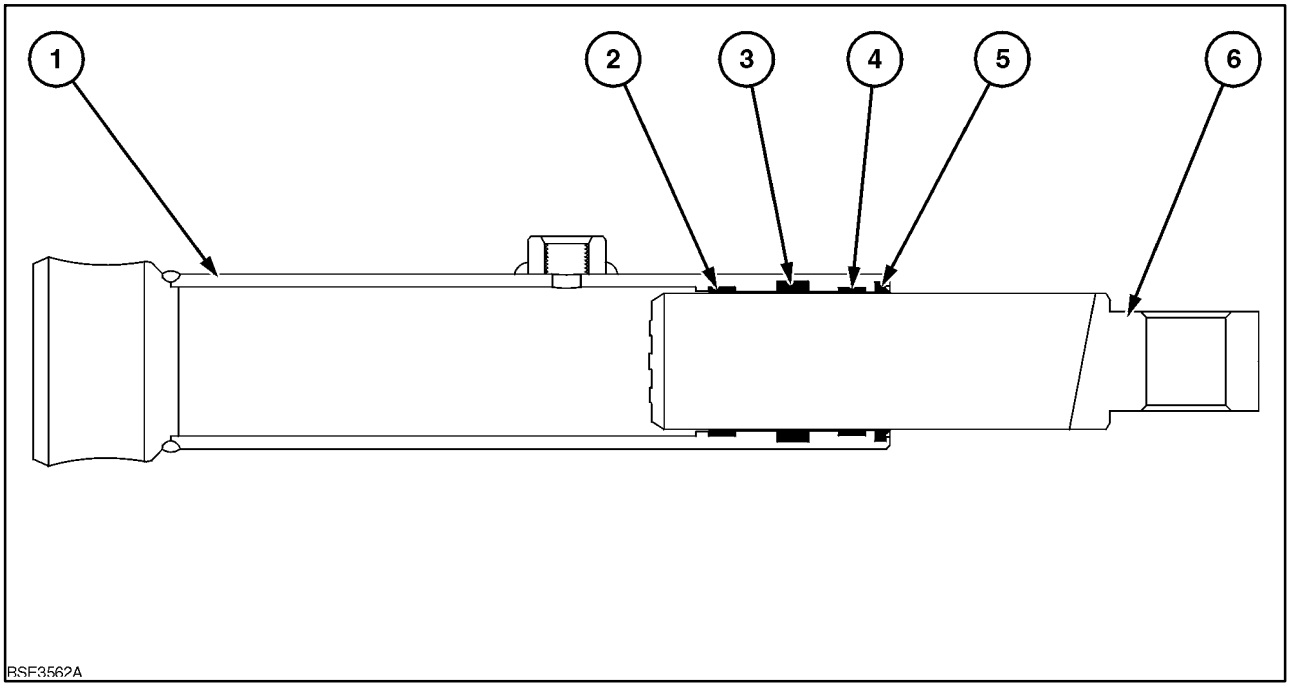
	Lift Ram Options	2
	Description and Operation	4
	Overhaul	4
	Assist Ram	4
	Removal	4
	Disassembly	5
	Assembly	6
	Installation	6

SPECIFICATIONS

LIFT RAM OPTIONS

No. of Ext. Cyl	Diameter	Internal Cyl.	MDC/EDC	Axle Type	Model
2	50	Yes	MDC	Light Duty	All except TS135A
1	50	Yes	MDC	Light Duty	All except TS135A
1	50	Yes	MDC	Heavy Duty	TS100A,TS110A
2	80	No	EDC	Light Duty	TS100A,TS110A
2	80	No	EDC	Heavy Duty	All except TS135A
2	90	No	EDC	Heavy Duty	All except TS100A

Type	Single-acting
Quantity	1 or 2
Pin diameter mm	28
Stroke mm	170

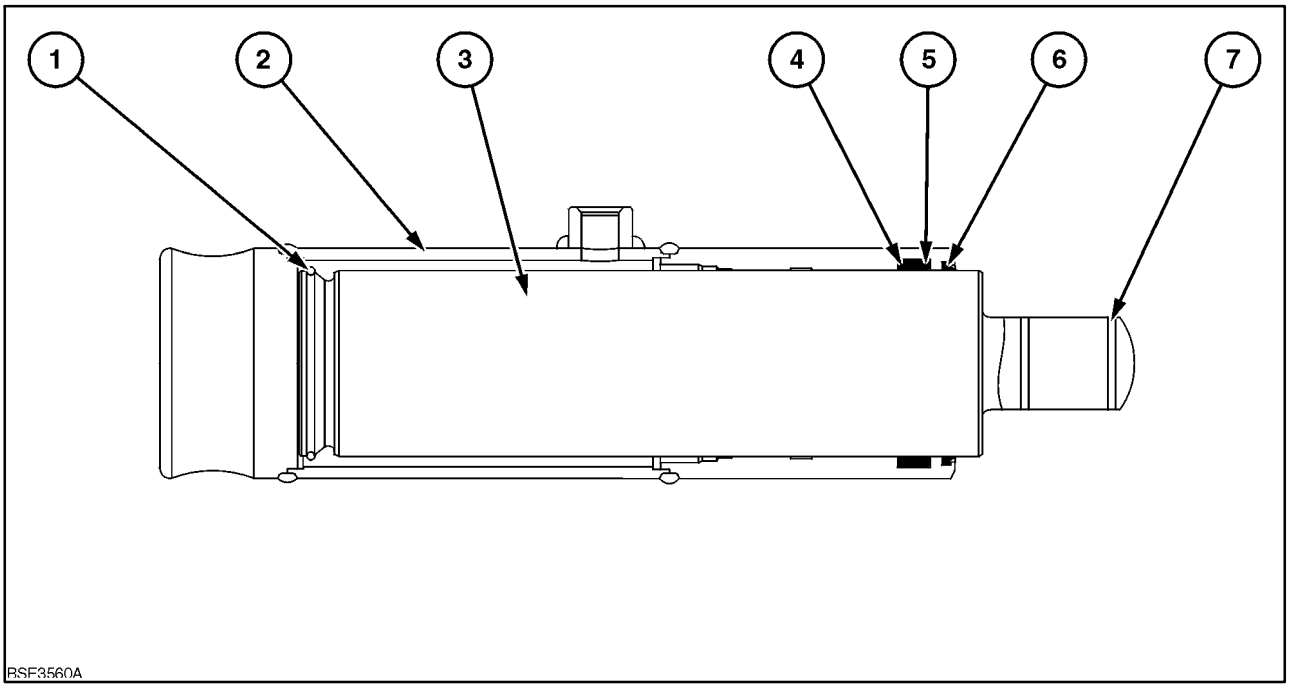


1

Assist Ram Sectional View(50 mm Diameter)

1. Assist ram cylinder
2. Guide Ring
3. Rod seal
4. Guide Ring
5. Rod Wiper
6. Rod

Type	Single-acting
Quantity	1 or 2
Pin diameter . . . . . mm	35/39
Stroke . . . . . mm	177



2

Assist Ram Sectional View(80 mm and 90 mmDiameter)

1. Seeger Ring
2. Assist Ram Cylinder
3. Rod
4. Seal
5. Back-up Washer
6. Rod Wiper
7. Bushing

DESCRIPTION AND OPERATION

An assist ram can be installed to increase hydraulic lift power on certain models.

The assist rams are connected to the lift arms and anchored on the rear axle using a bracket.

The assist ram is single-acting type and controlled by the oil flow from the lift control valve, which operates the hydraulic lift.

OVERHAUL

ASSIST RAM

Removal

(Op. 35 116 30)

⚠ WARNING ⚠

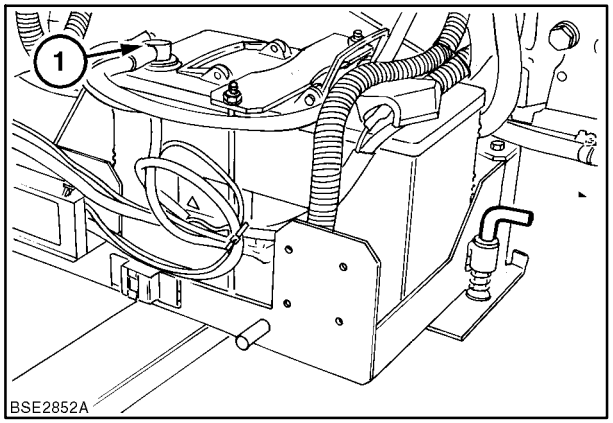
Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear suitable protective clothing, including goggles, gloves and footwear.

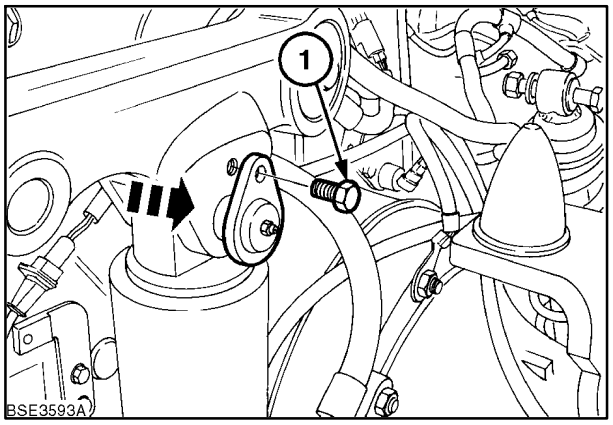
Remove the assist ram as follows:

1. Remove battery cover and swing out battery tray to gain access to the battery cables.
2. Detach negative cable (1) from battery and insulate.
3. Fully lower lift arms and support on blocks.



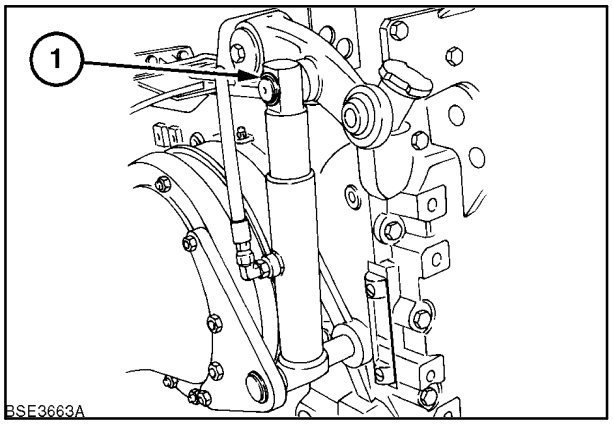
3

4. Disconnect the oil supply line taking care to drain the oil into a suitable container.
5. Remove screw(1) holding top pin.



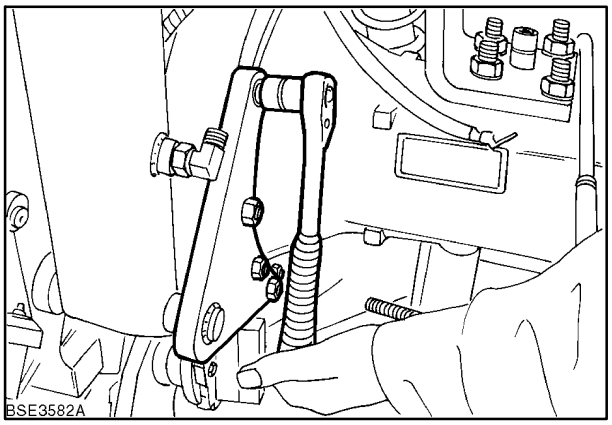
4

Or on machines fitted with 50 mm cylinders remove the circlip(1) with circlip pliers.



5

6. Loosen the 4 nuts on cylinder bracket.
7. Remove the top pin and lower the cylinder.
8. Support the cylinder and completely remove the cylinder and bracket.



6

Disassembly

(Op. 35 116 33)

80 and 90 mm Cylinders

Disassemble the assist ram as follows:

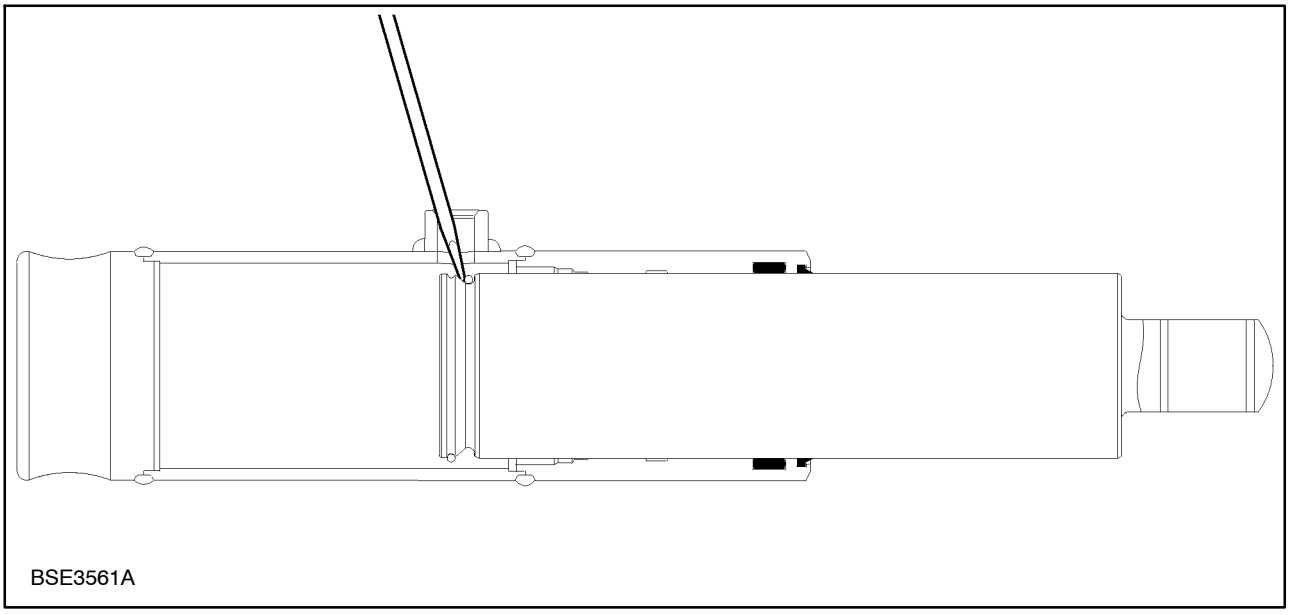
1. Remove the elbow fitting
2. Position the cylinder so that the end of the rod is aligned with the hole in the cylinder body.
3. Using a screwdriver move the retaining ring onto the recess on the rod , figure 7.
4. Holding the cylinder securely pull the rod from the cylinder.
5. Lubricate components with specified oil and installthe piston (2).

⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

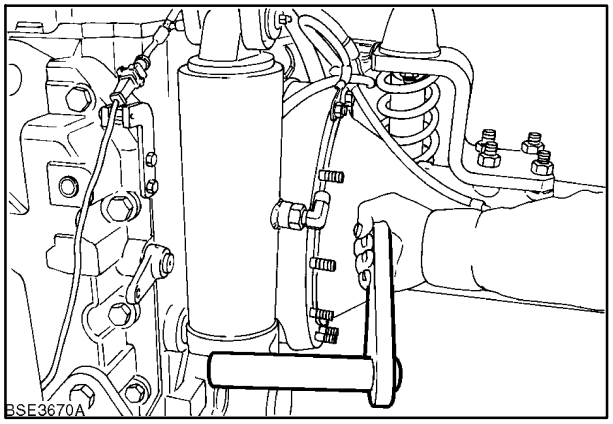
Wear suitable protective clothing, including goggles, gloves and footwear.



7

Assembly

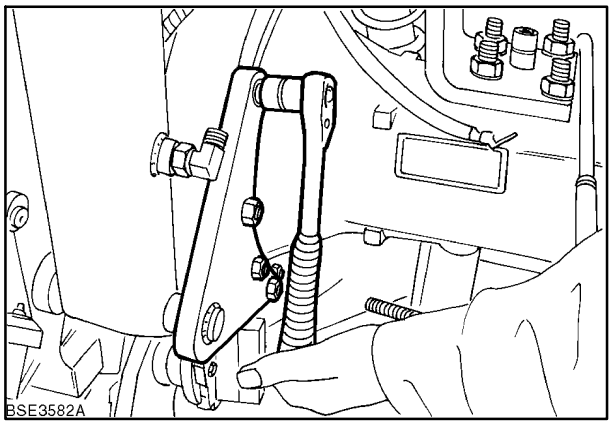
1. Replace all seals.
2. Lubricate components with specified oil and install the piston (2).
3. Align the rod end with the hole in the cylinder.
4. Using a screwdriver move the retaining ring onto the recess at the end of the rod , figure 7.
5. Refit the elbow fitting.



8

Installation

1. Place cylinder in line with the top pin hole and locate pin into position.
2. Locate bottom bracket and pin assembly through the cylinder and into the centre housing.
3. Locate and tighten the four nuts on the bracket to a torque of 160Nm.
4. Place screw into the pin and tighten to 50Nm.



9

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 11 - Front Loader

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SPECIFICATIONS

LIFTARM SIZES AND TYPES

Type	Tractor
100FL	Tractors from 52-70 kW (70-95 HP)
120FL	Tractors from 60-89 kW (80-120 HP)
130FL	Tractors from 66-96 kW (90-120 HP)

LOADER DESCRIPTION

The FL range of loaders are available in three basic configurations.

FLNS Hydraulically operated loader with Easylock mounting system, double acting cylinders for lift and bucket operation. Protective guard for radiator grille.

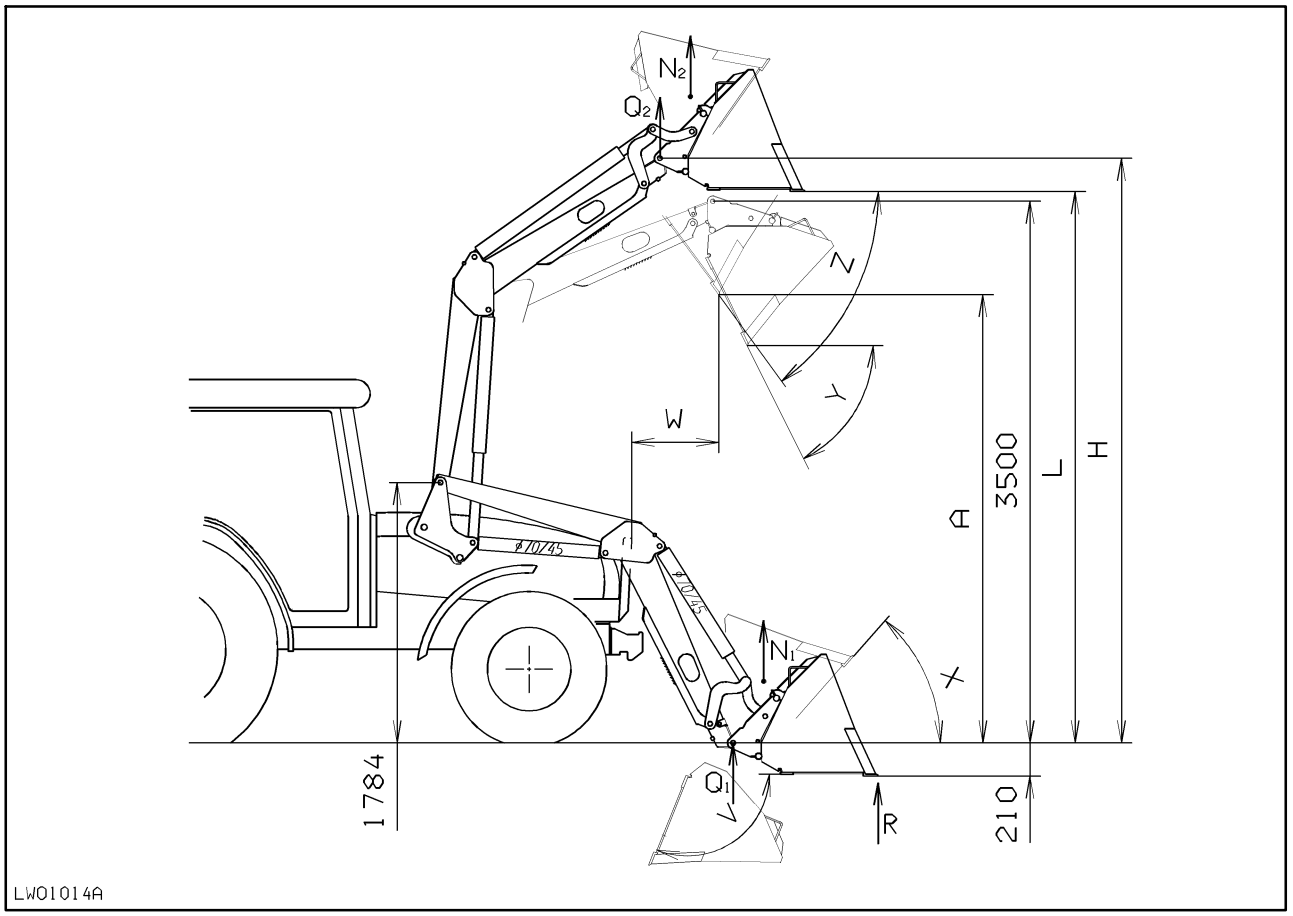
FLMS Hydraulically operated loader with Easylock mounting system, double acting cylinders for lift and bucket operation. Mechanical self levelling bucket control. Protective guard for radiator grille.

FLHS Hydraulically operated loader with Easylock mounting system, double acting cylinders for lift and bucket operation. Hydraulic self levelling bucket control. Protective guard for radiator grille.

WARNING

The mentioned technical data are theoretical values which apply only for liftarm pivot of the liftarm shown on the picture. In practice the actual values can differ from the mentioned values due to tractor geometry and tire equipment.

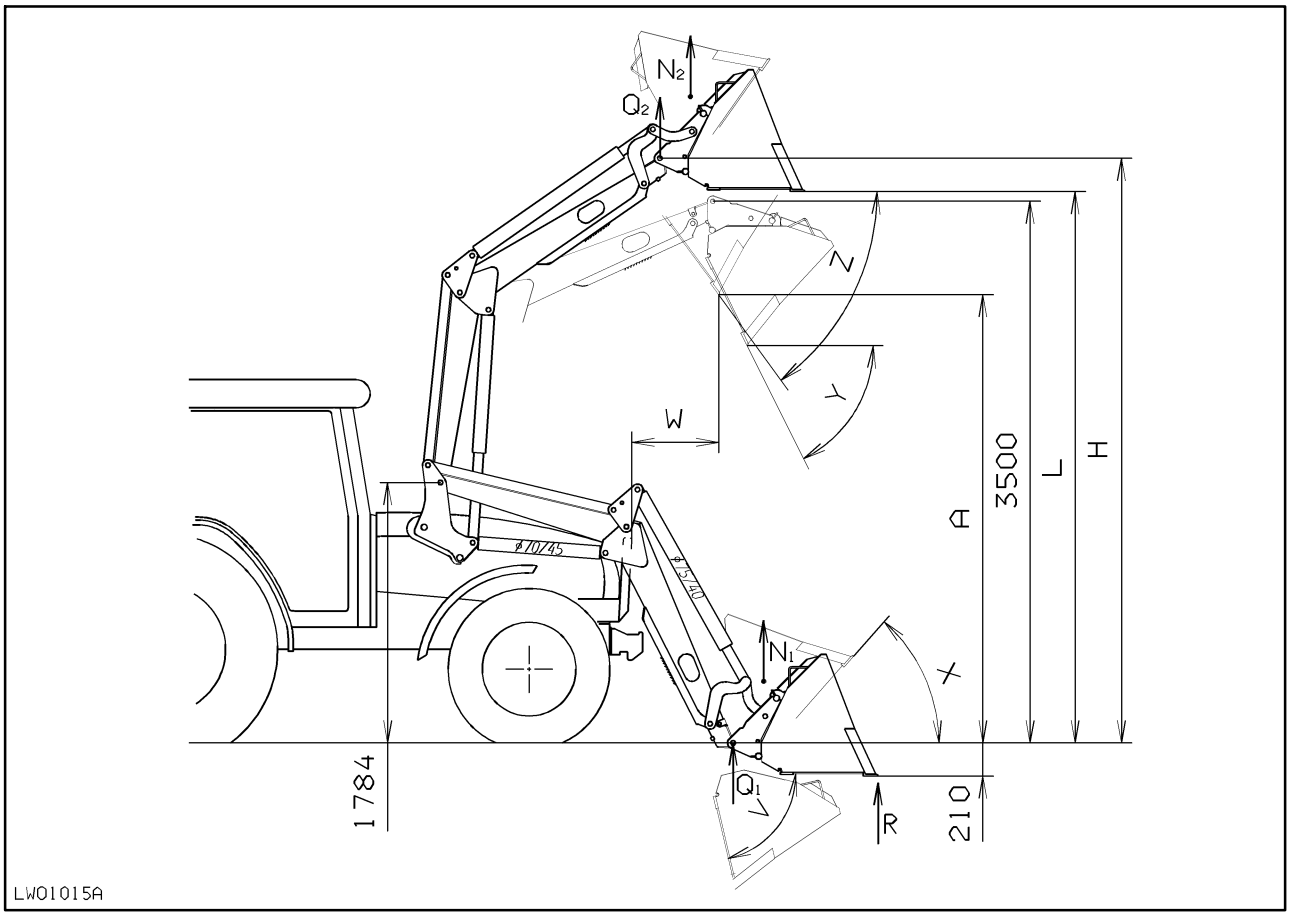
100FLNS, 100FLHS.



1

HYDRAULIC PUMP: 185 bar (18.5 MPA) EFFICIENCY: 0.85				NS/HS
Q_1	Breakout force	kgs	At pivot pin, at ground level	2532
Q_2	Lift capacity	kgs	At pivot pin, max lift height	1821 / 1761
N_1	Load	kgs	Centre of gravity of bucket at X = Max	1962 / 1902
N_2	Load	kgs	Less bucket weight - 200 kg	1324 / 1264
N_1	Load	kgs	900 mm forward of pivot pin	1552 / 1492
N_2	Load	kgs	Less Pallet Fork weight - 120 kg	1029 / 969
R	Tearout force	kgs	At ground level	2070
H	Max lift height	mm	At attachment pivot pin	3755
L	Lift-over height	mm	Bucket level	3545
V	Tip angle	°	With lift arm fully lowered	155
Z	Dump angle	°	At max lift height	58
Y	Dump angle	°	At 3.5 m lift height	67
X	Roll-back angle	°	At ground level	47
A	Dump height	mm	At "Z"	2860
W	Dump height	mm	At "Z"	628

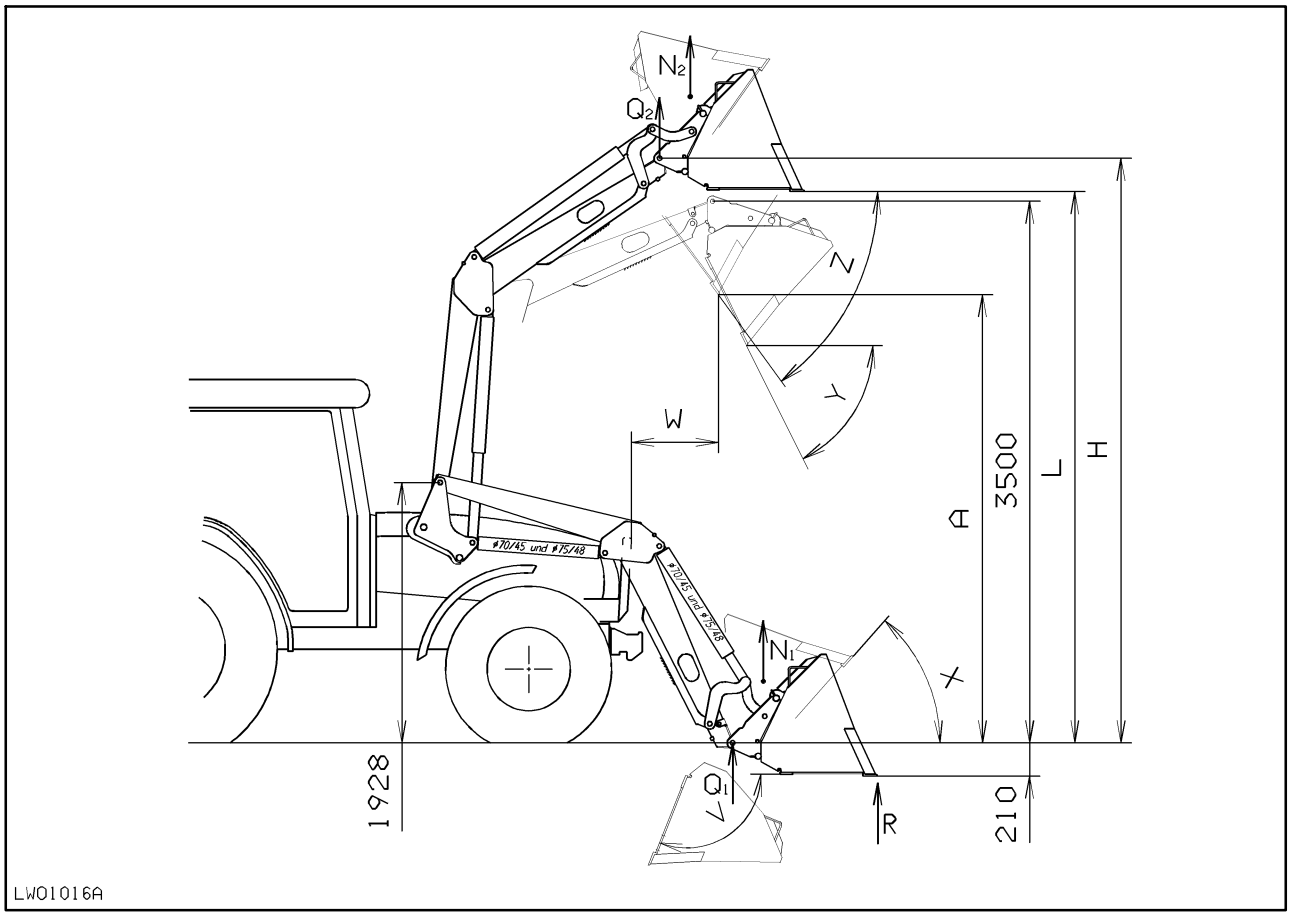
100FLMS



2

HYDRAULIC PUMP: 185 bar (18.5 MPA) EFFICIENCY: 0.85				MS
Q_1	Breakout force	kgs	At pivot pin, at ground level	2532
Q_2	Lift capacity	kgs	At pivot pin, max lift height	1821
N_1	Load	kgs	Centre of gravity of bucket at X = Max	2332
N_2	Load	kgs	Less bucket weight - 200 kg	1621
N_1	Load	kgs	900 mm forward of pivot pin	2412
N_2	Load	kgs	Less Pallet Fork weight - 120 kg	1701
R	Tearout force	kgs	At ground level	2780
H	Max lift height	mm	At attachment pivot pin	3755
L	Lift-over height	mm	Bucket level	3545
V	Tip angle	°	With lift arm fully lowered	81
Z	Dump angle	°	At max lift height	58
Y	Dump angle	°	At 3.5 m lift height	67
X	Roll-back angle	°	At ground level	47
A	Dump height	mm	At "Z"	2860
W	Dump height	mm	At "Z"	628

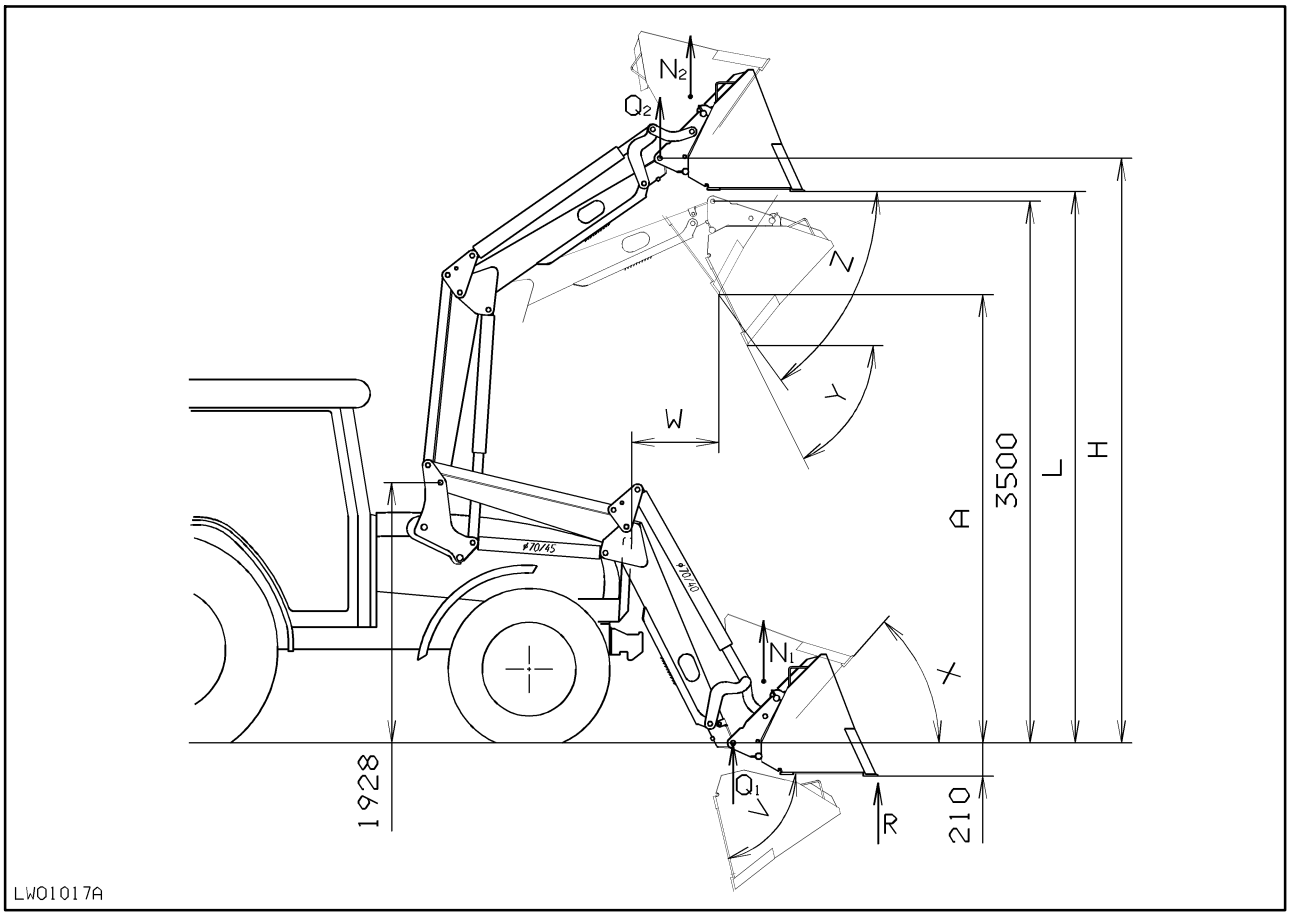
120FLNS, 120FLHS



3

HYDRAULIC PUMP: 185 bar (18.5 MPA) EFFICIENCY: 0.85				NS/HS
Q_1	Breakout force	kgs	At pivot pin, at ground level	2310 / 2592
Q_2	Lift capacity	kgs	At pivot pin, max lift height	1688 / 1878
N_1	Load	kgs	Centre of gravity of bucket at X = Max	1798 / 2034
N_2	Load	kgs	Less bucket weight - 200 kg	1229 / 1381
N_1	Load	kgs	900 mm forward of pivot pin	1453 / 1625
N_2	Load	kgs	Less Pallet Fork weight - 120 kg	974 / 1076
R	Tearout force	kgs	At ground level	2036 / 2351
H	Max lift height	mm	At attachment pivot pin	4084
L	Lift-over height	mm	Bucket level	3874
V	Tip angle	°	With lift arm fully lowered	155
Z	Dump angle	°	At max lift height	58
Y	Dump angle	°	At 3.5 m lift height	76
X	Roll-back angle	°	At ground level	47
A	Dump height	mm	At "Z"	3192
W	Dump height	mm	At "Z"	785

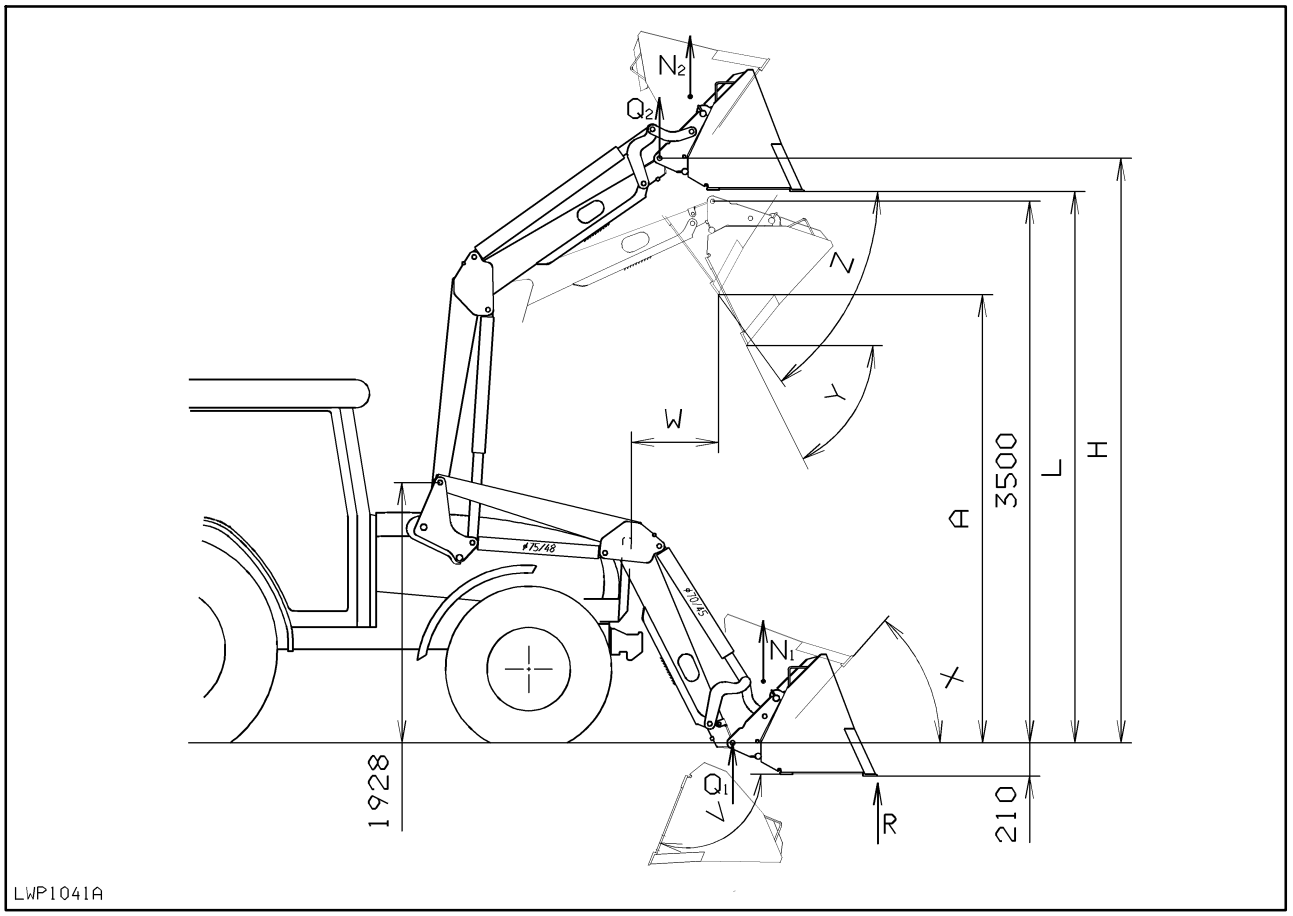
120FLMS



4

HYDRAULIC PUMP: 185 bar (18.5 MPA) EFFICIENCY: 0.85				MS
Q_1	Breakout force	kgs	At pivot pin, at ground level	2310
Q_2	Lift capacity	kgs	At pivot pin, max lift height	1688
N_1	Load	kgs	Centre of gravity of bucket at X = Max	2110
N_2	Load	kgs	Less bucket weight - 200 kg	1488
N_1	Load	kgs	900 mm forward of pivot pin	2190
N_2	Load	kgs	Less Pallet Fork weight - 120 kg	1568
R	Tearout force	kgs	At ground level	2281
H	Max lift height	mm	At attachment pivot pin	4084
L	Lift-over height	mm	Bucket level	3874
V	Tip angle	°	With lift arm fully lowered	86
Z	Dump angle	°	At max lift height	58
Y	Dump angle	°	At 3.5 m lift height	76
X	Roll-back angle	°	At ground level	47
A	Dump height	mm	At "Z"	3192
W	Dump height	mm	At "Z"	785

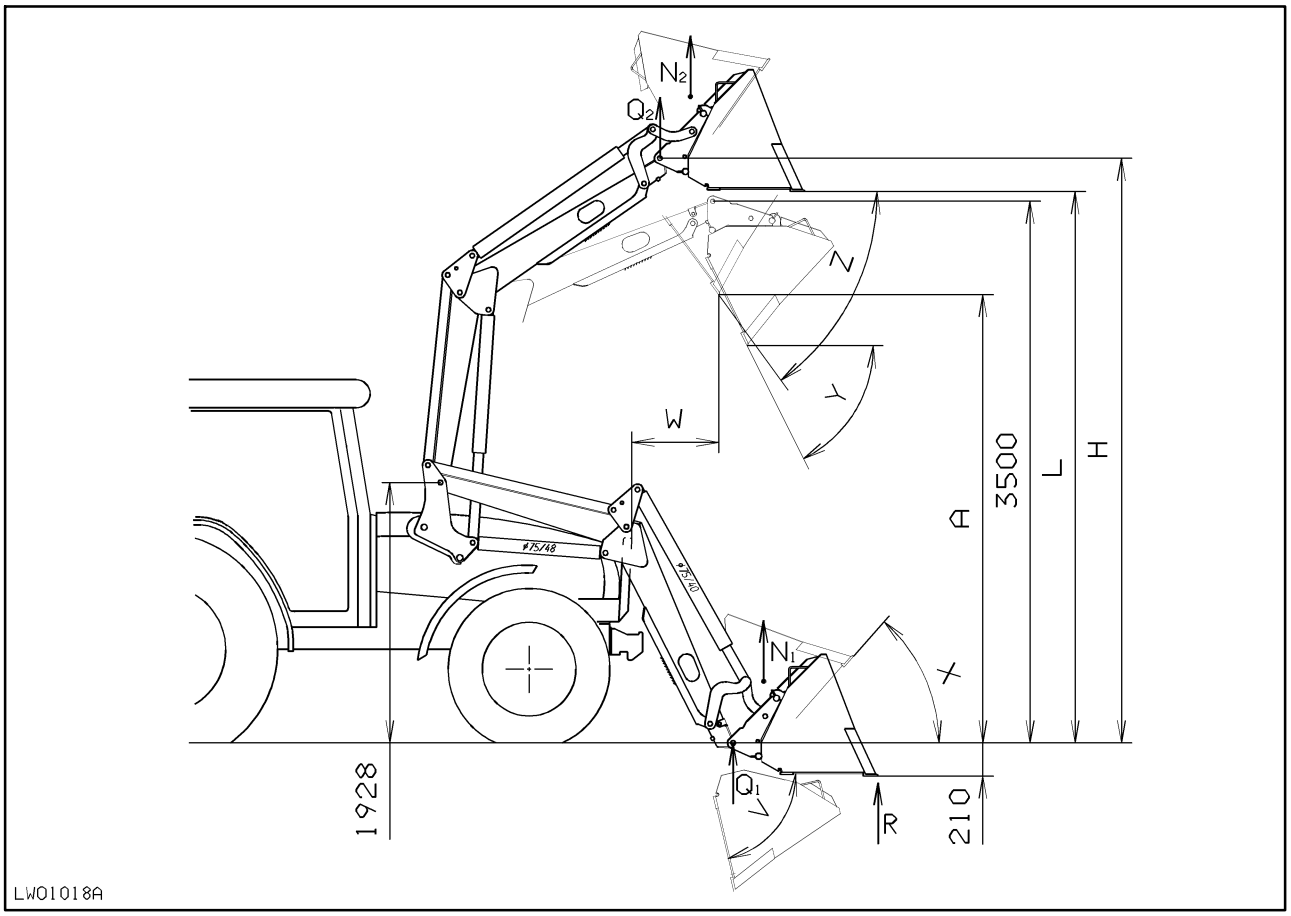
130FLNS, 130FLHS



5

HYDRAULIC PUMP: 185 bar (18.5 MPA) EFFICIENCY: 0.85				NS / HS
Q_1	Breakout force	kgs	At pivot pin, at ground level	2652 / 2954
Q_2	Lift capacity	kgs	At pivot pin, max lift height	1938 / 2141
N_1	Load	kgs	Centre of gravity of bucket at X = Max	2094 / 2319
N_2	Load	kgs	Less bucket weight - 200 kg	1441 / 1574
N_1	Load	kgs	900 mm forward of pivot pin	1685 / 1852
N_2	Load	kgs	Less Pallet Fork weight - 120 kg	1136 / 1227
R	Tearout force	kgs	At ground level	2036 / 2351
H	Max lift height	mm	At attachment pivot pin	4084
L	Lift-over height	mm	Bucket level	3874
V	Tip angle	°	With lift arm fully lowered	155
Z	Dump angle	°	At max lift height	58
Y	Dump angle	°	At 3.5 m lift height	76
X	Roll-back angle	°	At ground level	47
A	Dump height	mm	At "Z"	3192
W	Dump height	mm	At "Z"	785

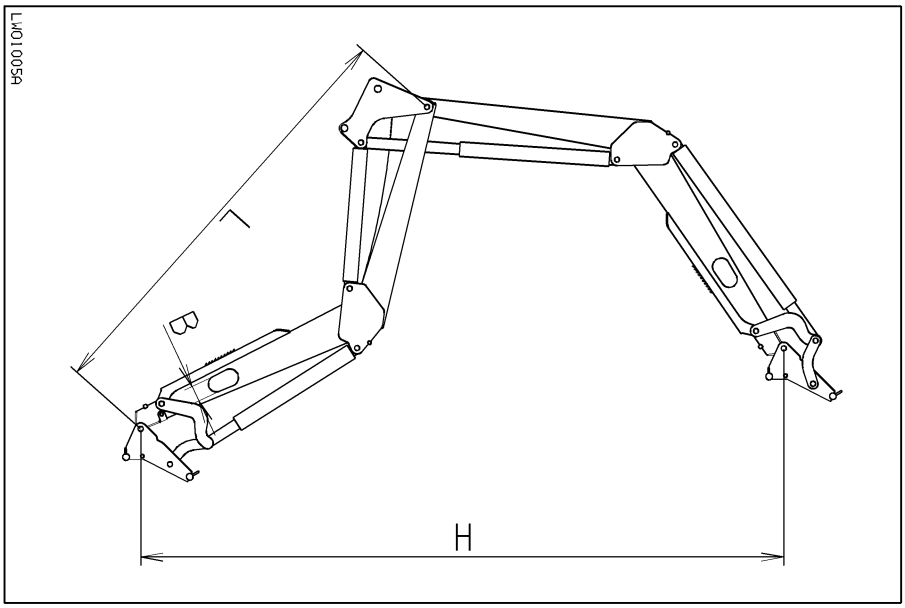
130FLMS



6

HYDRAULIC PUMP: 185 bar (18.5 MPA) EFFICIENCY: 0.85				MS
Q_1	Breakout force	kgs	At pivot pin, at ground level	2652
Q_2	Lift capacity	kgs	At pivot pin, max lift height	1938
N_1	Load	kgs	Centre of gravity of bucket at X = Max	2452
N_2	Load	kgs	Less bucket weight - 200 kg	1738
N_1	Load	kgs	900 mm forward of pivot pin	2532
N_2	Load	kgs	Less Pallet Fork weight - 120 kg	1818
R	Tearout force	kgs	At ground level	2782
H	Max lift height	mm	At attachment pivot pin	4084
L	Lift-over height	mm	Bucket level	3874
V	Tip angle	°	With lift arm fully lowered	86
Z	Dump angle	°	At max lift height	58
Y	Dump angle	°	At 3.5 m lift height	76
X	Roll-back angle	°	At ground level	47
A	Dump height	mm	At "Z"	3192
W	Dump height	mm	At "Z"	785

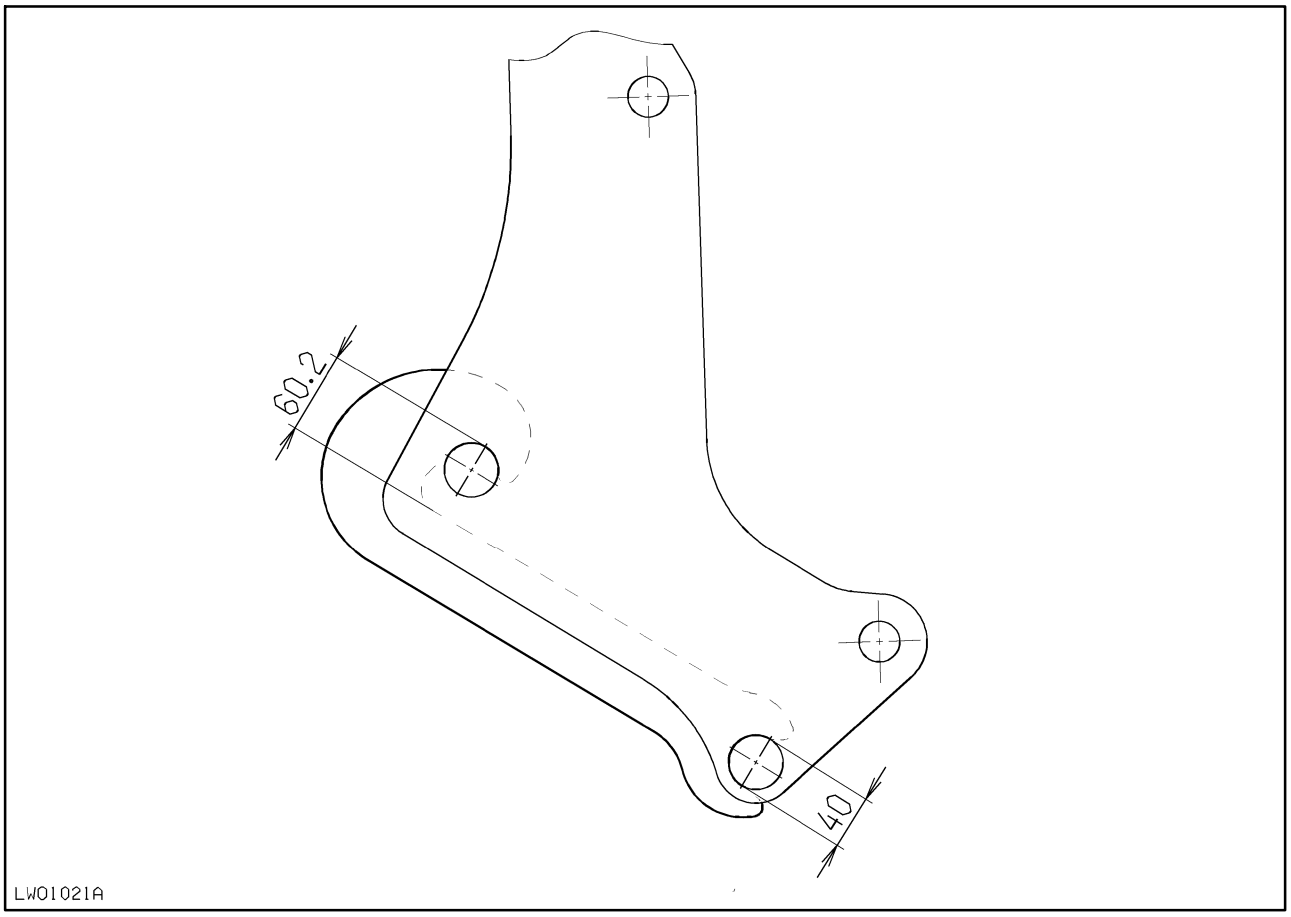
LIFTARM MAIN DIMENSIONS



7

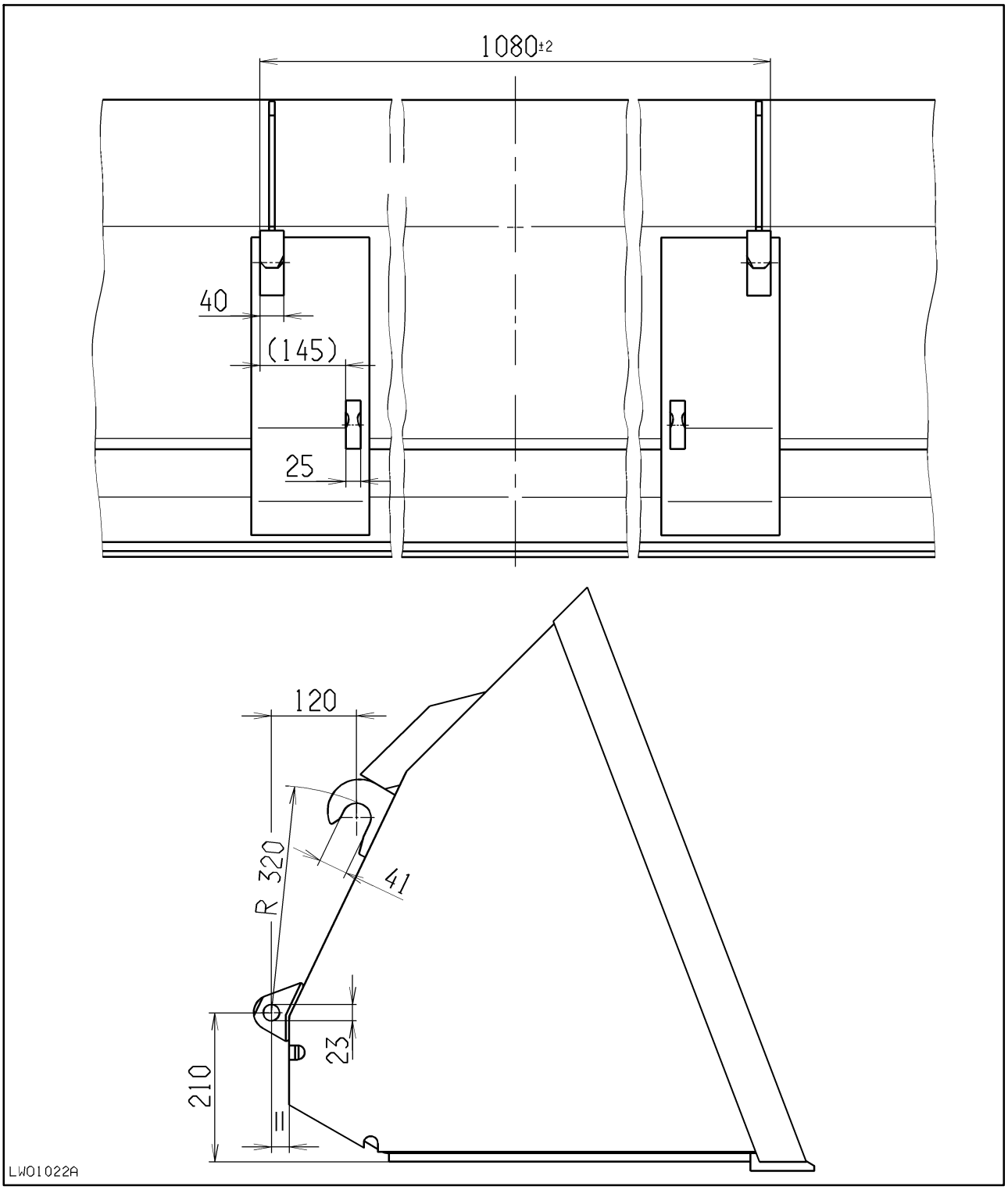
Type	L	B	H	Ø Cylinder
	mm	mm	mm	mm
100FL	2500	95	3750	70 / 45
120FL	2720	115	4080	70 / 45
130FL				75 / 48

REFERENCE DIMENSION FOR DRIVE-IN SUPPORT BRACKET



8

REFERENCE DIMENSIONS FOR HOOK ATTACHMENTS

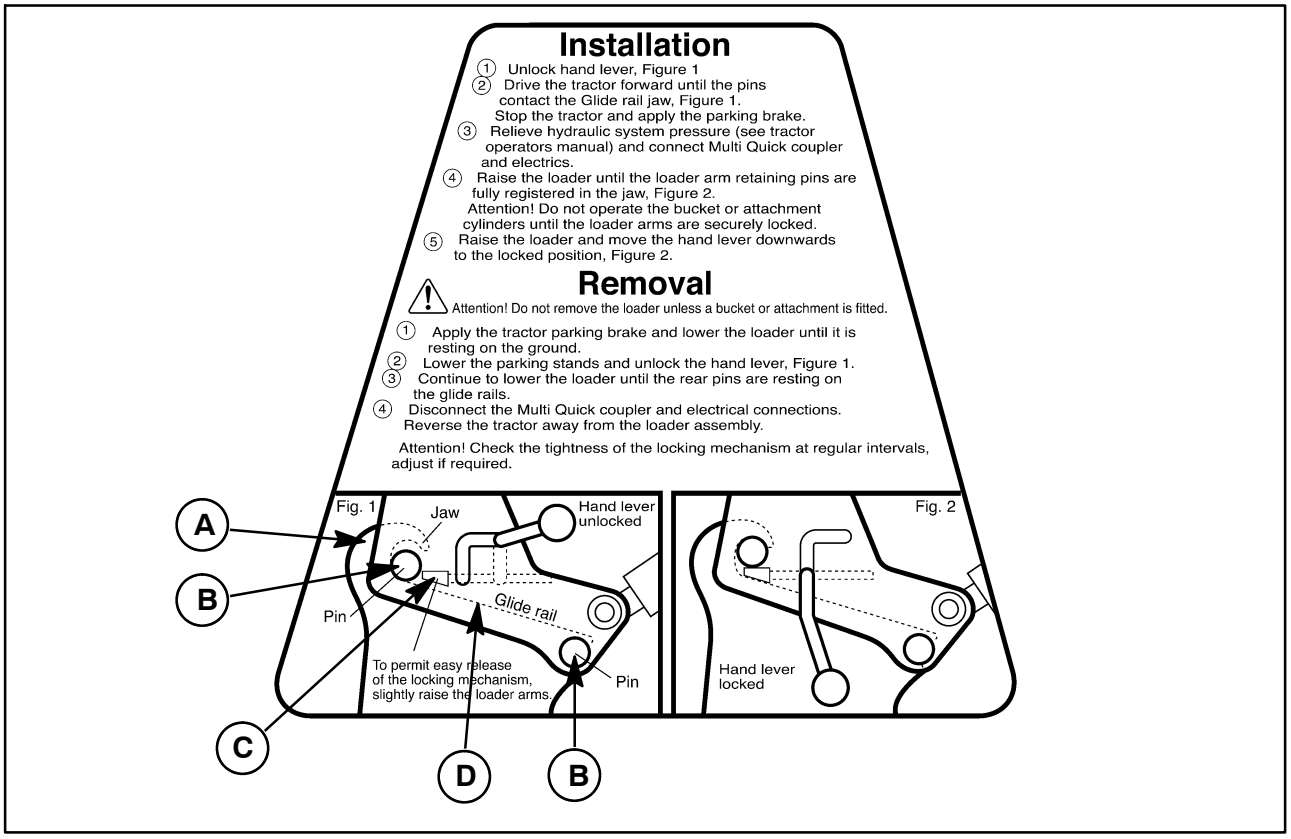


9

DESCRIPTION AND OPERATION

LOADER INSTALLATION/REMOVAL DECAL

NOTE: *To ensure complete safety when removing or installing the loader boom, follow the instructions of the decal placed on the loader pillar.*



10

Installation

1. Unlock hand lever, Figure 1.
2. Drive tractor forward until the pins contact the glide rail jaw, Figure 1. Stop the tractor and apply the parking brake.
3. Relieve hydraulic system pressure (see tractor operators manual) and connect Multi Quick coupler and electrics.
4. Raise the loader until the loader arm retaining pins are fully registered in the jaw, Figure 2.

Attention! Do not operate the bucket or attachment cylinders until the loader arms are securely locked.

5. Raise the loader and move the hand lever downwards to the locked position, Figure 2.

Removal

Attention! Do not remove the loader unless a bucket or attachment is fitted.

1. Apply the tractor parking brake and lower the loader until it is resting on the ground.
2. Lower the parking stands and unlock the hand lever, Figure 1.
3. Continue to lower the loader until the rear pins are resting on the glide rails.
4. Disconnect the Multi Quick coupler and electrical connections. Reverse the tractor away from the loader assembly.

Attention! Check the tightness of the locking mechanism at regular intervals, adjust if required.

Figure 1, Hand Lever Unlocked.

A. Jaw.

B. Loader arm pins.

C. Locking wedge. To permit easy release of the locking mechanism, slightly raise the loader arms.

D. Glide rail.

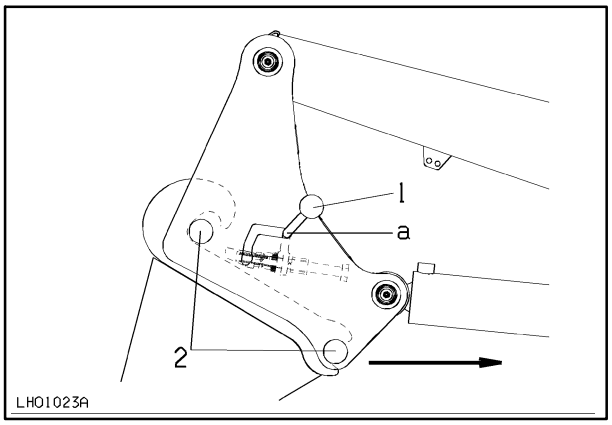
Figure 2, Hand Lever Locked.

INSTALLATION OF LOADER UNIT

Unlatch gripping lever (1) and drive the tractor forward into the parked loader liftarm, until the pins (2) of the pillars contact the stop in the arresting hook. Brake the tractor in this position by applying the handbrake.

Connect the hydraulic line by means of the couplings (Fig. 12) resp. Multi Quick Coupler

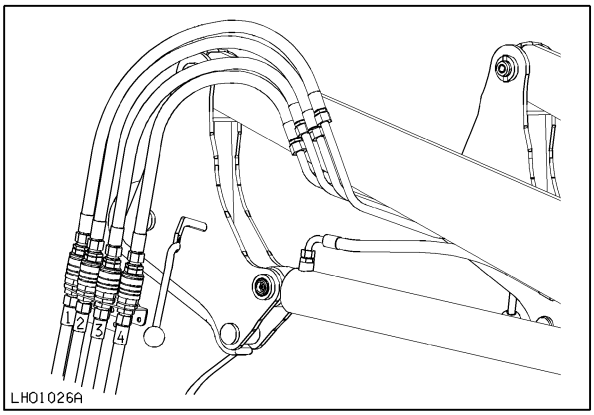
Move control valve lever to position “Raise”, until the pins (2) contact the arresting hooks completely at both sides. Lift the loader liftarm, until the bucket clears the ground completely.



11

Use gripping lever to lock. Fold the support stands swiftly against the loader arm and allow the locking cam to catch into the slot of the support stand.

NOTE: *When handling the support stand there is a danger of injury by pinching. Keep hands clear of the area between support stand and loader arm.*



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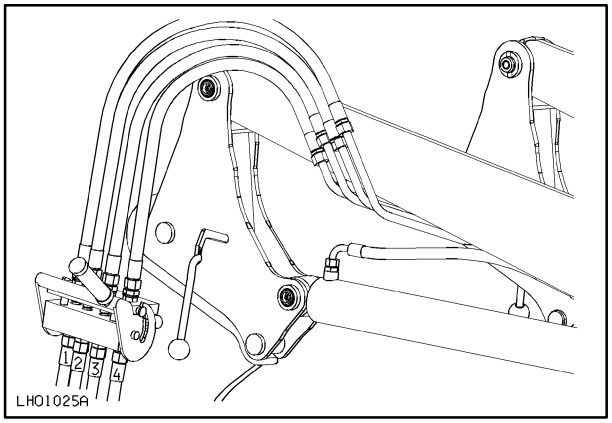
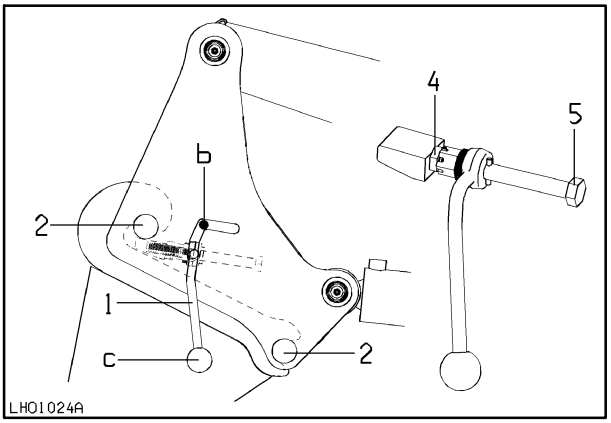


13

After initial installation adjust Easylock system (see fig. 14) as follows: Loosen nut (4), adjust bolt (5) to ensure the tensioning process commences in position (b) of the gripping lever, which should be noticeable preloaded in position (c). Tighten locknut (4).

Bleed the hydraulic rams by lifting and lowering the loader liftarm several times.

The locking mechanism has to be checked at each attachment and removal as well as occasionally if the frontloader remains mounted on the tractor for a longer period. Correct the setting if necessary.



14

REMOVAL OF THE FRONT LOADER

⚠ WARNING ⚠

Do not park loader liftarm without attached bucket or other attachment, otherwise danger of tipping over!

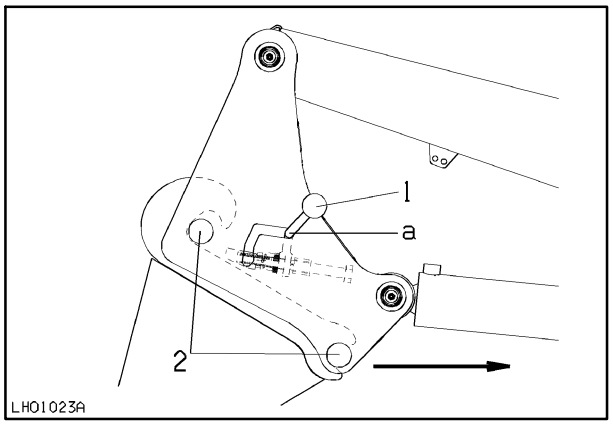
Lower balance beam without pressure up to the ground.

Unlock gripping handle (1) and fold Varipark system down onto the ground.

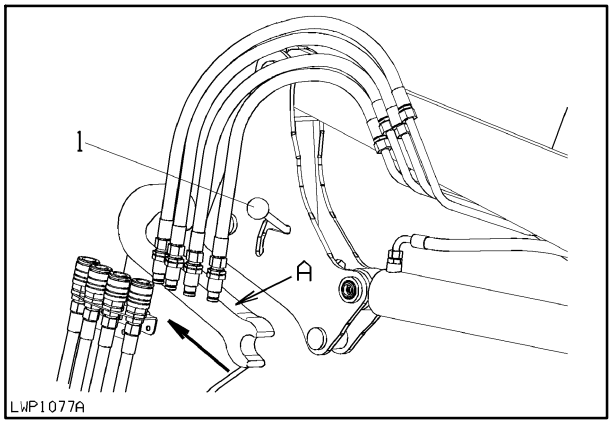
Drive forward slightly, allow control unit thereby to remain in position “Lower” until the pins (2) glide out from the arresting hooks and lie on the glide path (A). (Driving forward is omitted in the case of double-acting hydraulic rams, because the pins (2) will slip out of the arresting hook through the retraction of the hydraulic cylinders).

Drive backwards until the Varipark system engage and the pillar take off from the glide path (A).

Disconnect the hydraulic lines at the couplings (see fig. 13 resp. 12) and at the electric cable. Fit dust cap and blanking plug. Drive tractor out.

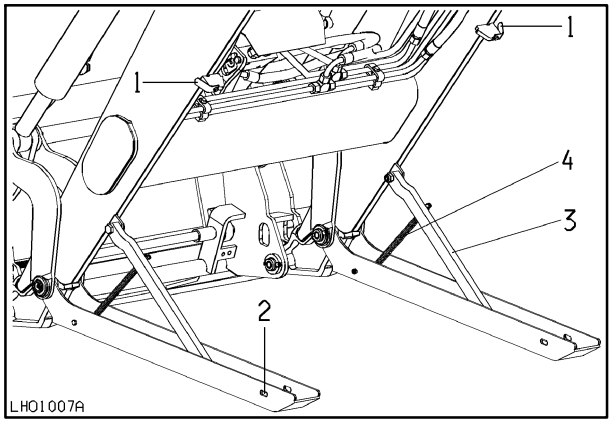


15



16

Loading and lightly raising the front loader attachment as well as thorough lubrication of the glide path A (see fig. 16) will facilitate loosening the tensioning wedge (see fig. 14).

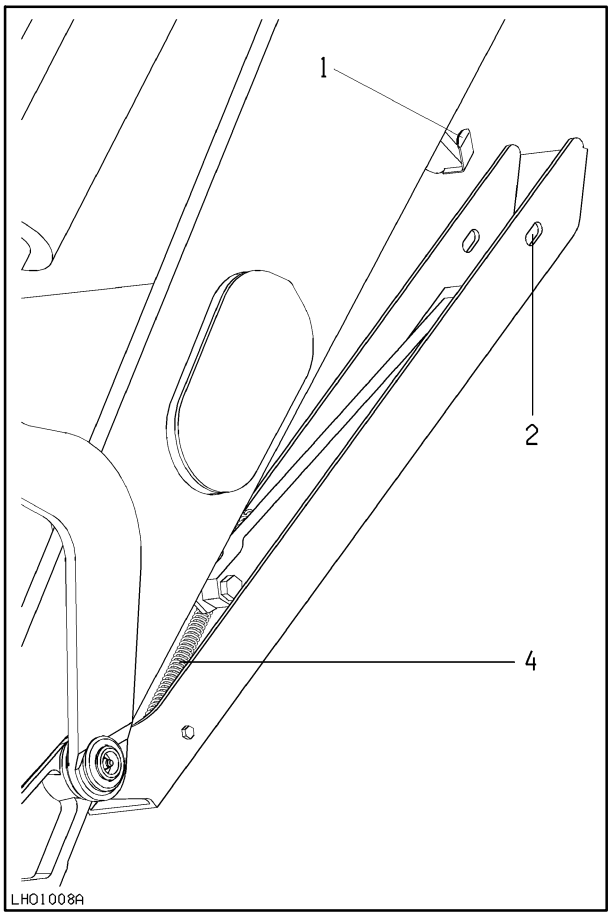


17

UNFOLDING VARIPARK SYSTEM STANDS

To fold out the Varipark stands, move their feet sideways towards the tractor and at the same time press them downward until the locking cams come loose from the slots. Then unfold the Varipark stands down to the ground.

Varipark system stands are automatically locked in this position by the spring-loaded support struts. Be sure that the ground is solid enough.



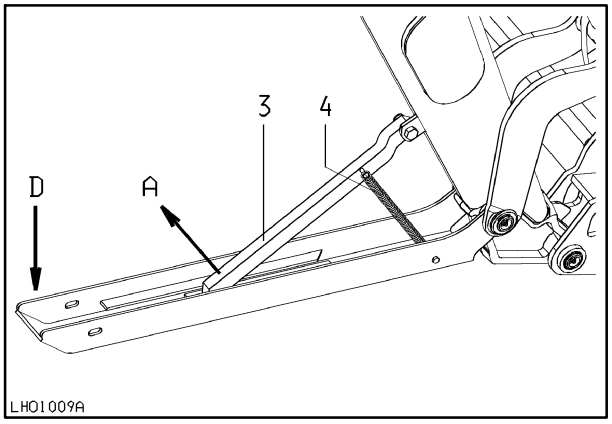
18

FOLDING UP VARIPARK SYSTEM STANDS

To fold up the Varipark stands, use one hand to pull up the support strut against the resistance of the torsion spring in the direction of arrow A and at the same time push the Varipark stand in the direction of arrow D to prevent the Varipark strut from locking into engagement. Pull the Varipark stand out of the locking area and then move it swiftly against the loader arm.

⚠ WARNING ⚠

When handling the Varipark stand there is a danger of injury by pinching. Keep hands clear of the area between Varipark stand and loader arm.



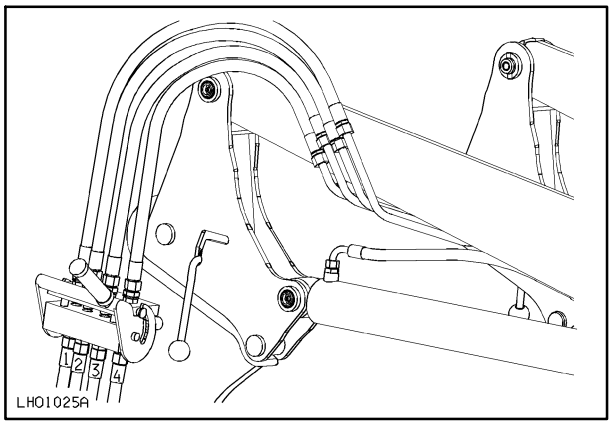
19

The Varipark stand will be locked when the locking cam catches into the slot. The cam and the slot should be greased occasionally. When installing and removing the loader arm follow the instructions of the decal placed on the loader arm pillar.

MULTI QUICK COUPLER

Connection Liftarm - Tractor

All for hydraulic hoses can be connected and disconnected in no time. This is a very good solution that pays as connection times significantly reduce. It is possible to unbolt with maximum hydraulic pressure. This is an environmentally friendly solution as significant leakages will not occur.



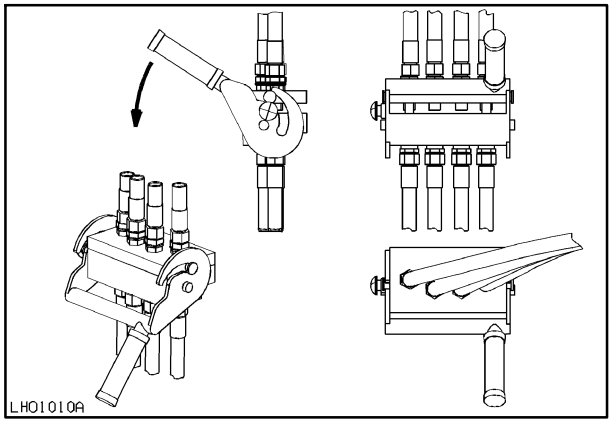
20

Connection Liftarm - Attachment / Implements

The connections for the 3rd and 4th hydraulic services are screw-coupler in series standard. We recommend the Multi Quick Coupler version for frequent replacement of attachments. An upgrade is possible.

⚠ WARNING ⚠

It is essential that the male and female connectors of the Multi Quick Coupler are clean when the hoses are coupled. Relieve all pressure from the hydraulic system before coupling the hoses. Damage to the seals could result if the hoses are coupled under pressure.



21

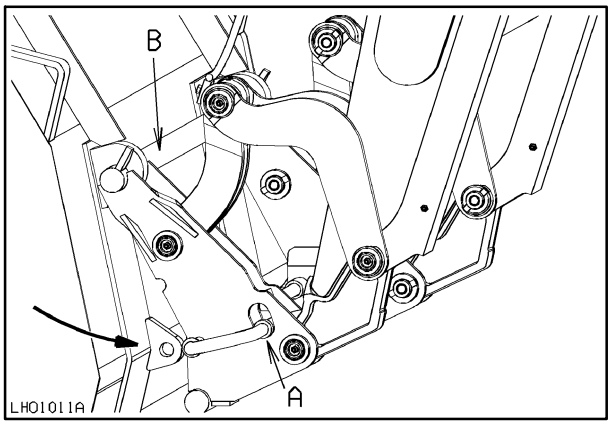
INSTALLATION AND REMOVAL OF ATTACHMENTS USING QUICK ATTACH

⚠ WARNING ⚠

The loader arm/loader unit may only be installed and removed by the operator.

Pick-up of Attachments

1. Pull out the handle for the sliding pin on the left hand side of the quick change frame. Turn handle to the right until the bushing bottoms against the lower end of the slotted hole. This will prevent the handle sliding back out of its unlocked position. (Fig. 22)
2. Tilt the Quick Attach frame approximately 15 degrees forwards by means of the hydraulic attachment control. (Fig. 22)
3. Drive tractor and loader liftarm with shaft under the attachment hooks and raise in direction F, until the shaft fully contacts the hooks. The attachment will swivel with the lugs into the Quick Attach frame. (Fig. 22)
4. Tilt the quick-change frame backwards until the sliding pins engage in the lugs (Fig. 23). The attachment is now rigidly connected to Quick Attach frame and loader liftarm.



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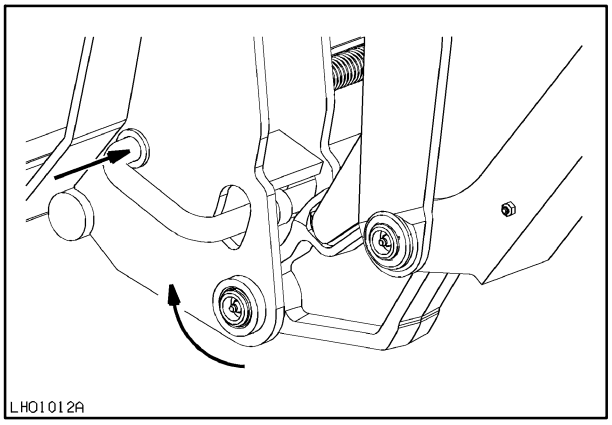
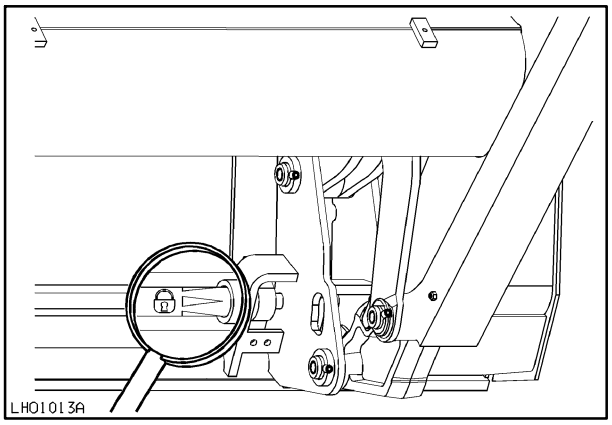


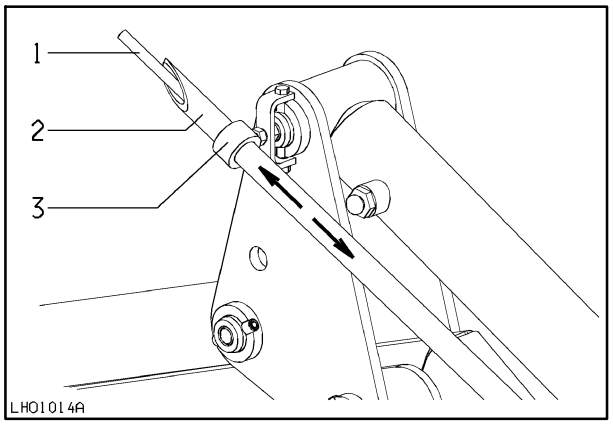
23

5. Before any use of the front loader, make a visual check to be sure that the pins of the locking bar are in position and the attachment is correctly and safely secured to the loader arm (fig. 24 Hydro Quick Attach, illustrated). To ensure a secure connection tilt the bucket 15deg and force the cutting edge against the ground.



24

6. After taking up the attachment, adjust the visual indicator in such a way that the top ends of guide tube (2) and connecting rod (1) stay flush if the attachment is horizontal. The guide tube (2) can be adjusted by moving the clip (3) on the cylinder barrel.
7. Removing the attachments is a reversal of the mounting procedure.



25

LIFTARM TYPES AND FUNCTIONS

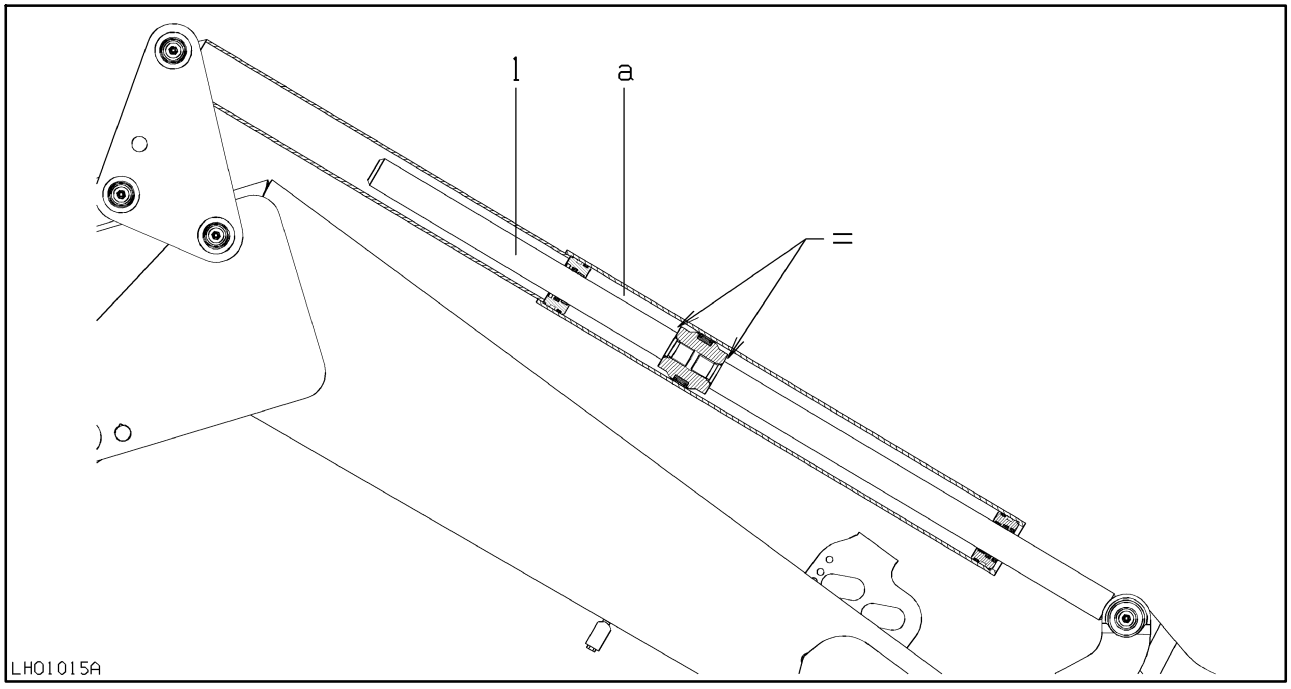
Parallel Guidance Functional Variants

FL frontloaders are offered with the multi functional Hydraulic self levelling motion type HS or with Mechanical self levelling motion type MS.

Mechanical Self Levelling

Loaders with mechanical self levelling motion lift the attachments horizontally via fitted steering bars.

The proportional operation cylinders make loading and unloading at the same speed possible (fig. 26).

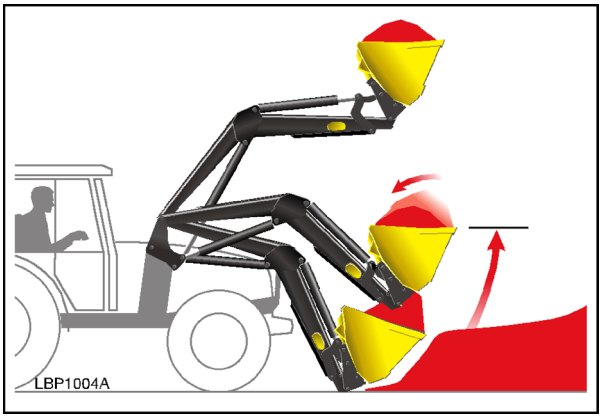


26

ADVANTAGES OF HYDRAULIC SELF LEVELLING

Hydraulic Self Levelling Can Be Switched Off by the Push on a Button

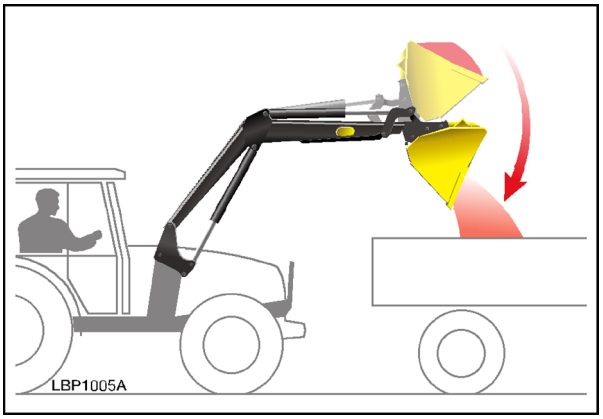
When a loader is lifted with the Hydraulic self levelling switched off, the load falls down into the bucket - because the angle of the attachment increased while rising the liftarm. There are no losses because of pouring. Mechanically controlled frontloaders do not posses this “scooping effect”.



27

Rapid Discharge Fast Tip

Besides descharge with normal speed you can, on your HS-loader, press a button to activate the integrated rapid discharge valve in order to get a rapid discharge. This optional function not only saves time and increases the loading performance, but it also improves the discharge properties when handling sticky goods because of the jolting action of the bucket - even the corners of the bucket are cleared.

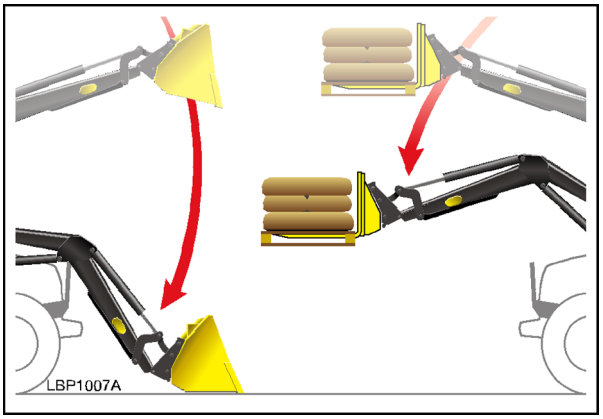


28

Lowering Speed Adjustable

There are loading jobs where a sensitive control operation is required, such as the loading of pallets. One turn on the adjustment valve, and the HS-loader can be operated sensitively. When loading ground or manure, time is often restricted. No problem with the HS-loader - one turn of the valve and you are on rapid operation.

NOTE: *When rapid-discharging operate control unit and push-button always combined!*



29

OPERATION OF HYDRAULIC SELF LEVELLING

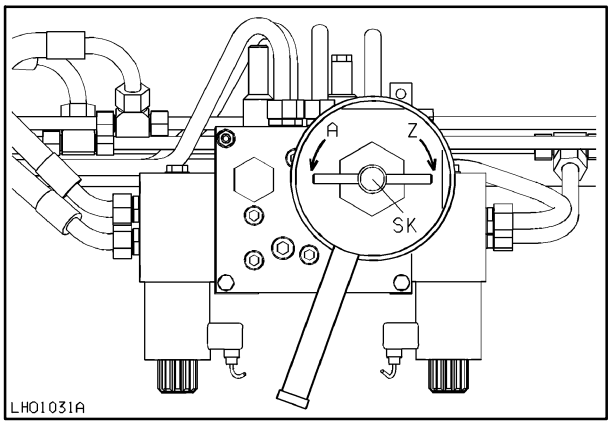
The adjusting toggle SK of the control unit must be turned and locked in the direction

"Float position off" (Z), whenever it is intended to work with Hydraulic self levelling.

Depressing the closing button (S2) at the liftarm actuation control lever will result in the short term de-activation of the Hydraulic self levelling. The loader liftarm is locked hydraulically while it is being raised or lowered with a tipped bucket. Depressing the closing button (S2) deactivates the locking effect. If Hydraulic self levelling is disengaged the Lift capacity of the loader liftarm will increase.

Turn adjusting toggle SK of the control unit to "floating position" (A) if:

- More lowering speed of the loader arm is required (without accurate parallel motion).
- The loader arm has to be lowered when the tractor engine is stopped.
- The frontloader has to be removed. In this case pressure is released from the hydraulic rams and operation of the screw couplings will be easier.
- At working with the frontloader the loader arm must be set to floating position, e.g. when leveling, clearing snow etc. In this case set the control unit to floating position and operate the closing button S (Hydraulic self levelling "off").



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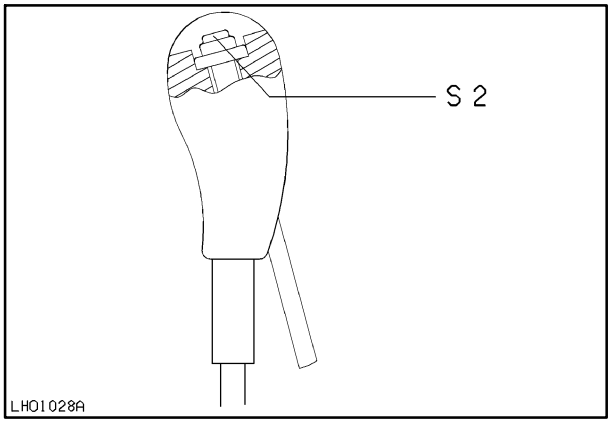

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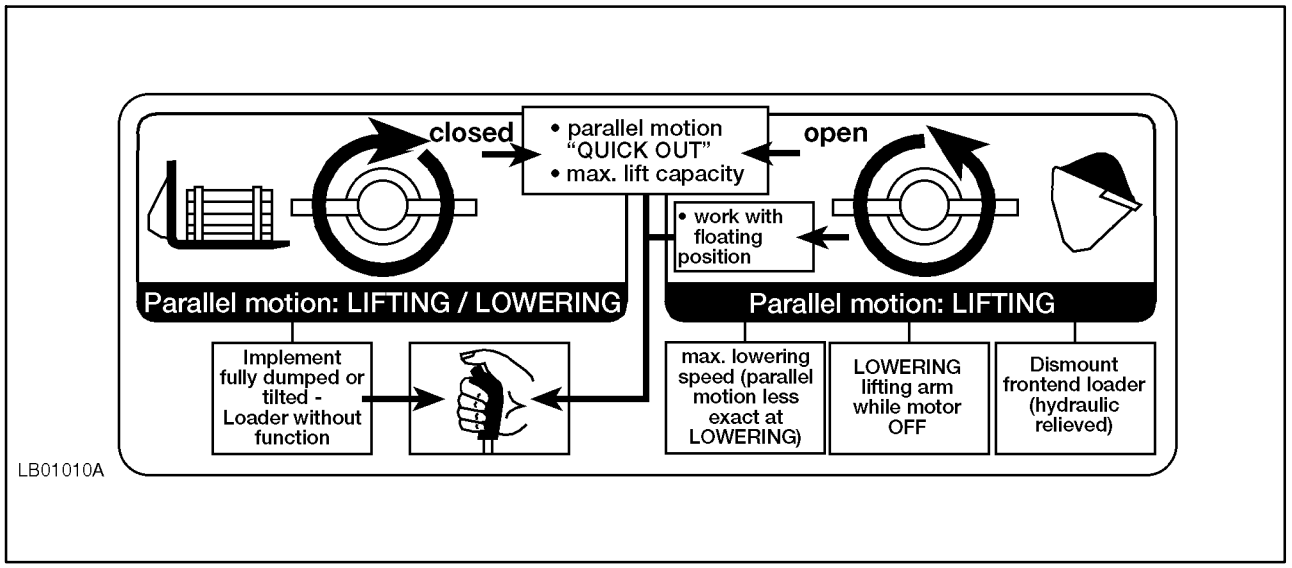


32

Attention!

When lowering the loader arm with Hydraulic self levelling switched on, avoid too high an engine speed otherwise the pressure relief valve of the tractor hydraulics would respond causing the hydraulic pump to steadily feed oil against high pressure.

FUNCTION OF HYDRAULIC SELF LEVELLING

The oil will be diverted during raising of the loader liftarm from the piston rod area of the liftarm rams into the piston chamber of the attachment rams. The oil from the piston rod chamber of the attachment rams flows via a load retaining valve back into the oil reservoir of the tractor.

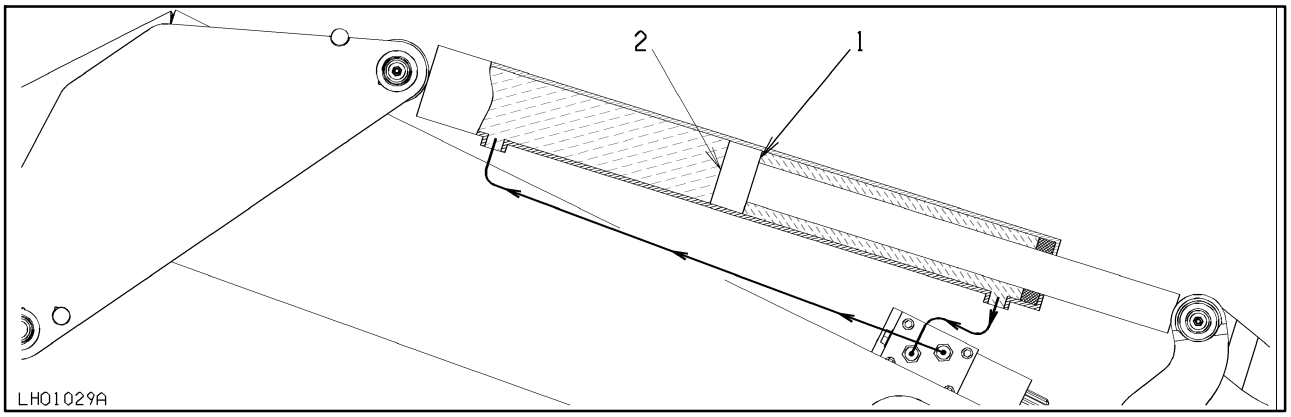
This process will result in a following control function which ensures (in conjunction with the preceding control lever system) that the bucket, with is horizontally adjusted base, assumes in every attitude of the liftarm an attachment angle parallel to the starting position.

The oil supplied by the tractor pump flows during lowering of the loader liftarm into the piston rod chamber of the attachment rams, at the same time there is a transfer of oil from the piston chamber of attachment rams into the piston ring chambers of the liftarm rams which are thereby retracted.

The oil from the piston chamber of the liftarm rams returns via a load retaining valve to the oil reservoir to the tractor.

The oil supplied by the hydraulic pump of the tractor flows during tilting (charging) of the bucket into the piston rod chambers of the attachment rams and the oil from the piston chamber of the attachment rams then flows pressure-free back into the oil reservoir of the tractor.

The oil supplied by the hydraulic pump of the tractor flows during tipping (discharging) of the bucket into the piston chambers of the attachment rams and the oil returning from the piston rod chambers of the attachment rams is at the same time conducted via a load retaining valve into the oil reservoir of the tractor. This process prevents also rapid dropping of the bucket.



33

Automatic self-leveling function (not described here)

This function is actually not available and will be implemented on electro-hydraulic controlled proportional valve liftarms.

Self-leveling is defined as automatic repositioning of liftarm / attachment.

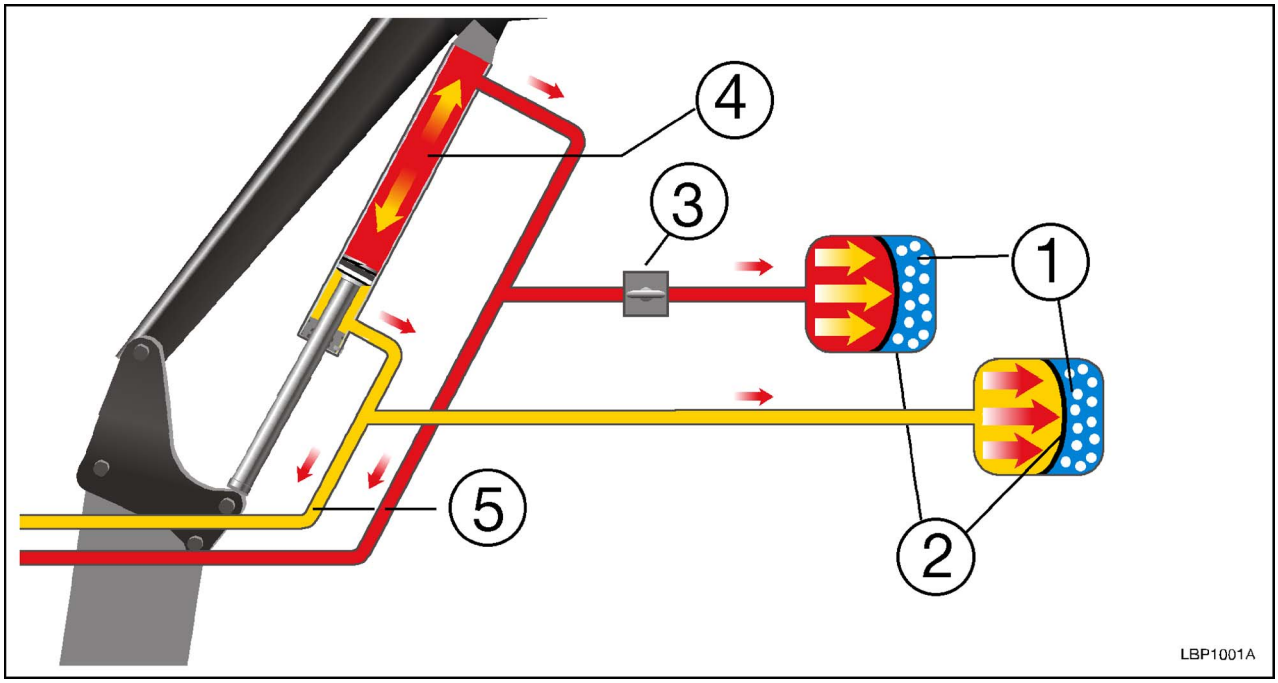
SMOOTH RIDE CONTROL

Operation

Longer transport travels at high speed on bumpy lanes can heavily stress the tractor and the driver especially if a frontloader is installed.

This situation is largely improved by the SMOOTH RIDE CONTROL system available as an option for the frontloader (retrofit is also possible). The mode of operation is simple but highly effective: opening of a shut-off tap will lead the oil inside the service for the loader arm cylinders to be deviated towards two diaphragm-type pressure accumulators. The oil can expand against the pressure of the rubber diaphragms. Violent shocks transmitted from the road to the frontloader are effectively damped and eliminated by the pressure accumulators.

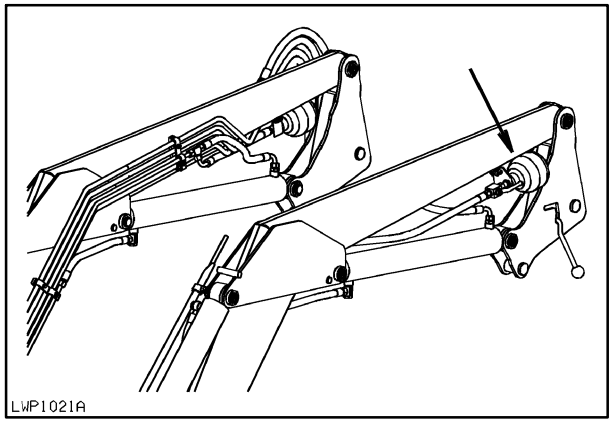
To suppress the SMOOTH RIDE CONTROL effect for the loading operation, it suffices to close the shut-off tap again.



34

1. Gas pressure cylinder
2. Diaphram
3. Stop valve, open
4. Pressure variations
5. Line leading to tractor control valve

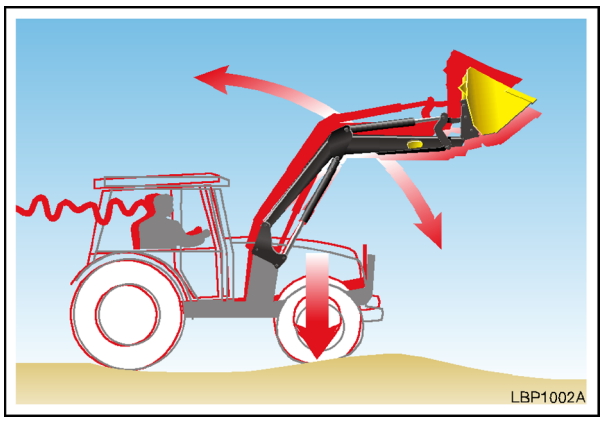
Both gas pressure accumulators are mounted in a clean and protected position - in the triangle between arm-support-ram.



35

SMOOTH RIDE CONTROL protects your tractor and increases the driving comfort.

Without SMOOTH RIDE CONTROL



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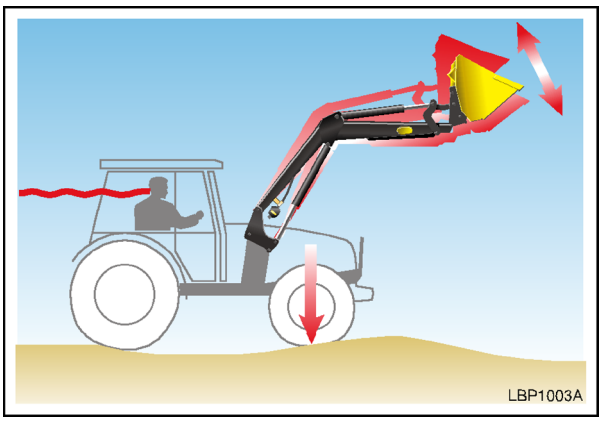
When a tractor fitted with a conventional frontloader, i.e. without the SMOOTH RIDE CONTROL system, travels at high speed on a bumpy lane, the resulting hunting effect will still be increased by the frontloader. This effect can only be reduced by the flexing action of the tires if the tractor is fitted with rigid axles. Both tractor and driver are heavily stressed as a result of the poor travelling characteristics.

With SMOOTH RIDE CONTROL



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If fitted with the SMOOTH RIDE CONTROL system, the frontloader effectively cushions the movement of the tractor under the same conditions. Sitting relaxed in his cab, the driver securely steers the tractor along the road. Shocks acting on the frontloader are smoothly compensated by the two pneumatic pressure accumulators – the connection between tractor and frontloader is no longer rigid but flexible.

General instruction

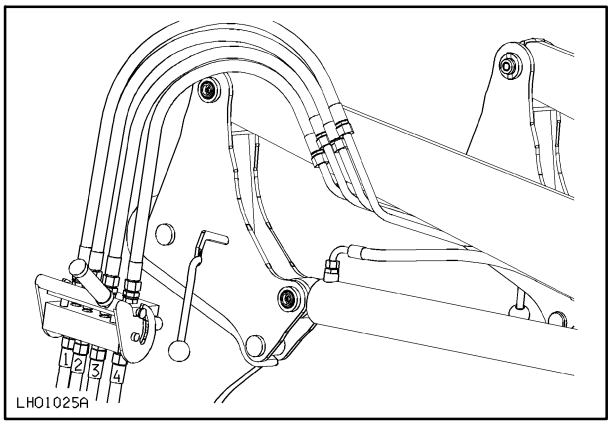
When the loader unit is fitted with SMOOTH RIDE CONTROL please notice the following instructions:

- It is preferable to use SMOOTH RIDE CONTROL when operating in long term road driving and bad road conditions (cock valve open). As shown in principal on the picture right the impact load of the liftarm will be damped through the accumulator.
- When loading with short distances to drive, i.e. earthwork the cock valve of SMOOTH RIDE CONTROL should be closed between the lift side of the liftarm ram and the accumulator. At maximum load of frontloader the permanently changing use are disadvantages for the membrane of the accumulator. Further wise, a certain “swinging effect” can occur through the accumulator. The cock valve should be also closed when working with palette forks to refuse any “swinging effects” when lifting or lowering of palette.

MULTI QUICK COUPLER

Connection Liftarm - Tractor

All for hydraulic hoses can be connected and disconnected in no time. This is a very good solution that pays as connection times significantly reduce. It is possible to unbolt with maximum hydraulic pressure. This is an environmentally friendly solution as significant leakages will not occur.



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Connection Liftarm - Attachment

The connections for the 3rd and 4th hydraulic services are screw-coupler (fig.39(1)) in series standard. We recommend the Multi Quick Coupler version (fig.39(2)) for frequent change of attachments. An upgrade is possible.

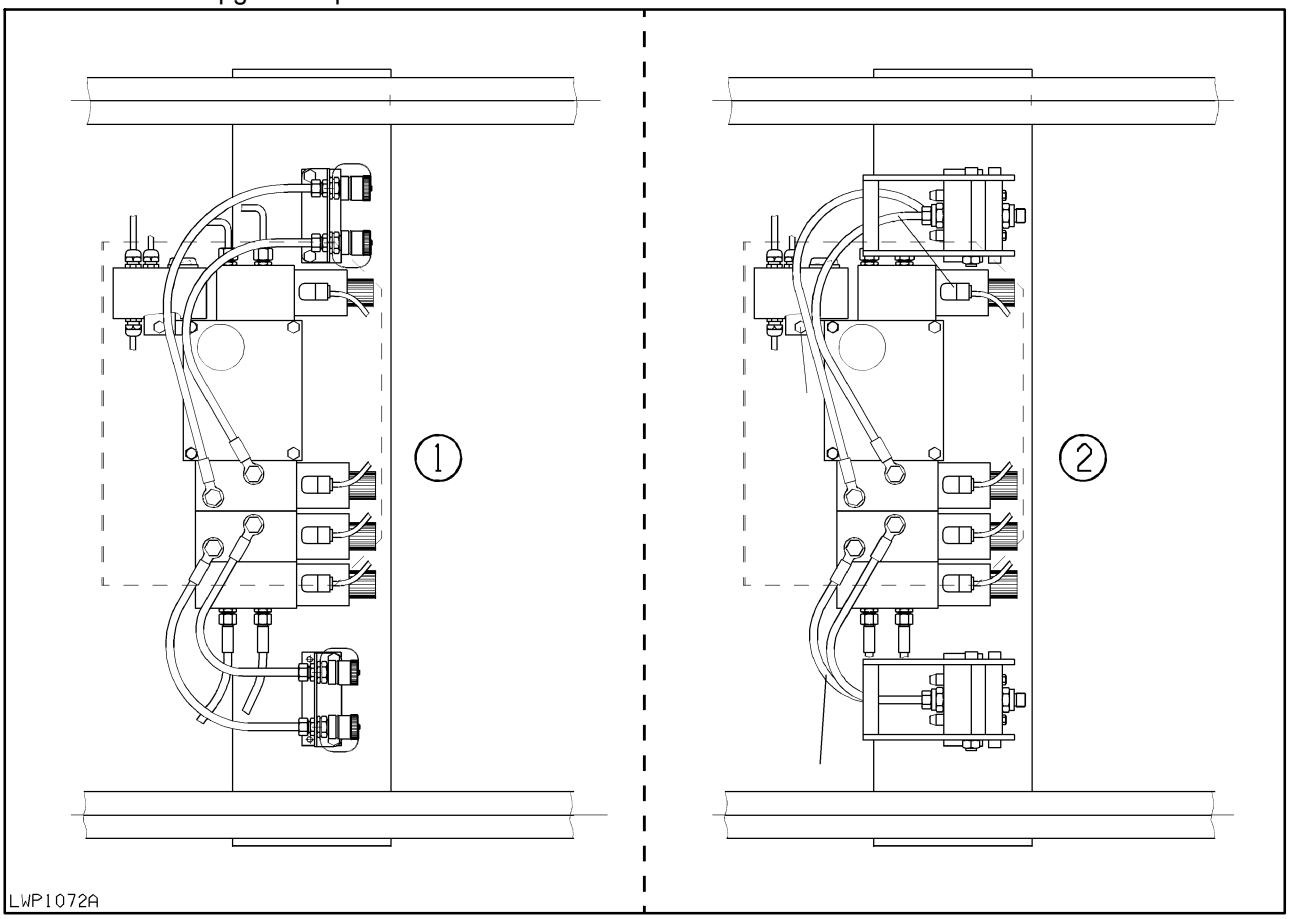

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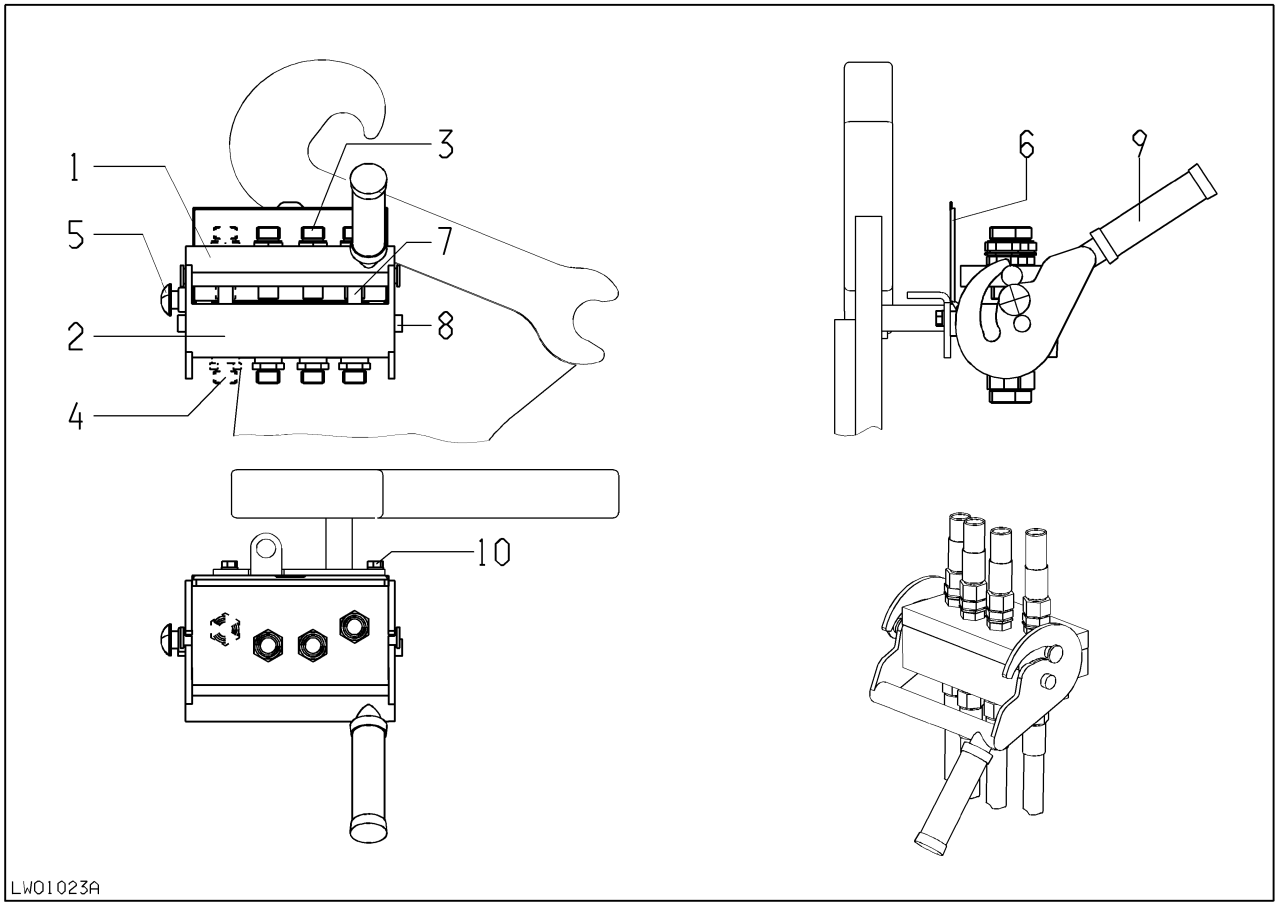
Illustration / spare parts

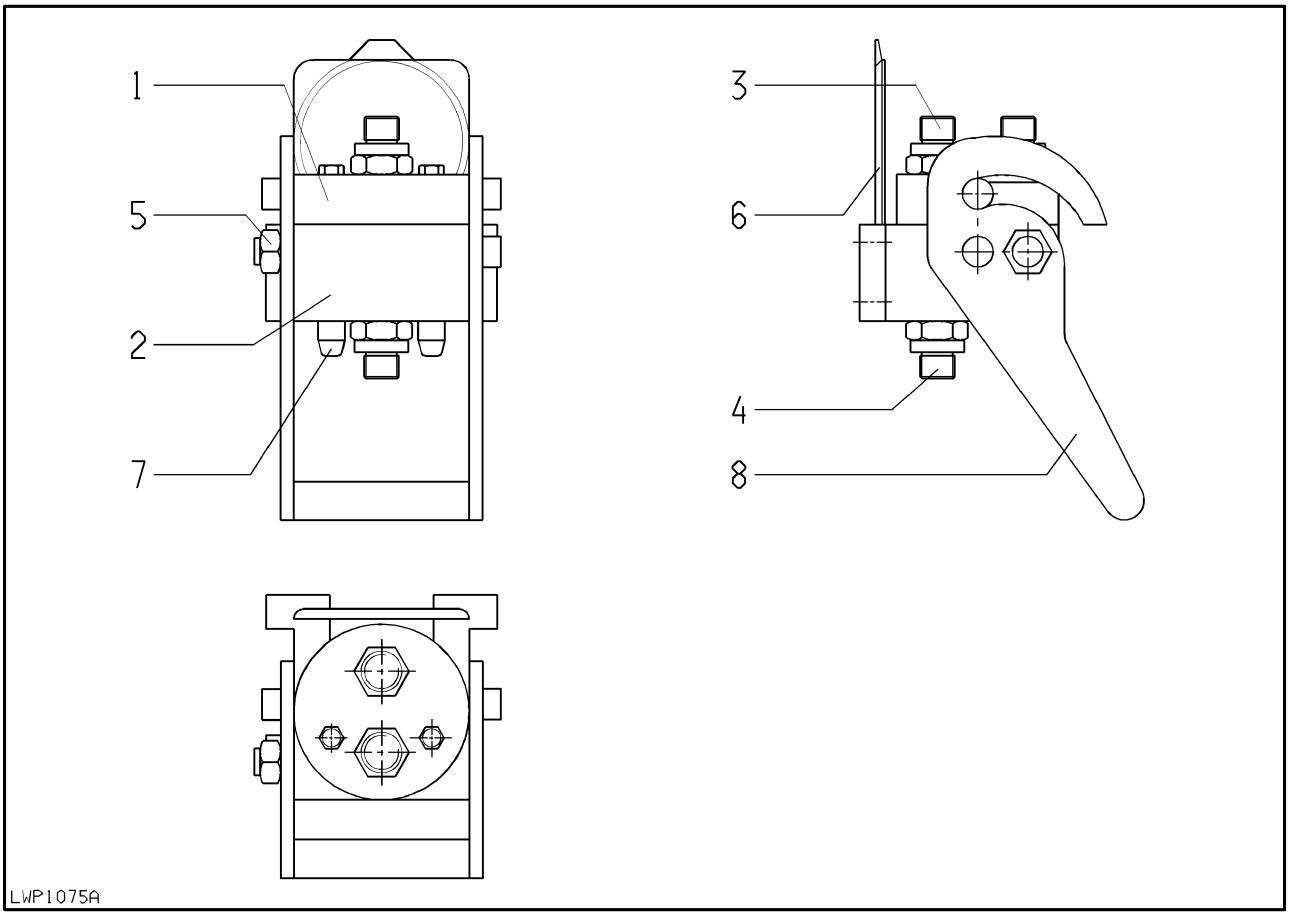
Tractor - Liftarm



40

POS.	DESCRIPTION	QUANTITIES
1	Multi Quick Coupler upper part	1
2	Multi Quick Coupler lower part	1
3	Plug and seal	4
4	Socket and seal	4
5	Accessories	1
6	Cover	1
7	Bolt with nut	2
8	Screw	2
9	Lever	1
10	Screw and washer	2

Liftarm - Attachment



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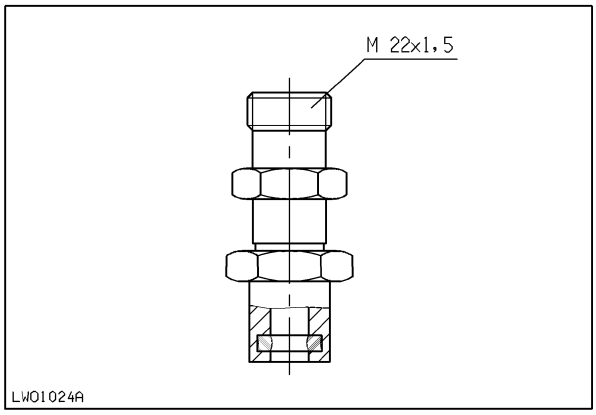
POS.	DESCRIPTION	QUANTITIES
1	Plug plate	1
2	Socket plate	1
3	Plug	1
3	Sealing	2
4	Socket	2
4	Sealing	2
5	Accessories	2
6	Cover	1
7	Bolt with nut	1
8	Lever	2

SEAL KITS FOR MULTI QUICK COUPLER

Tractor - liftarm

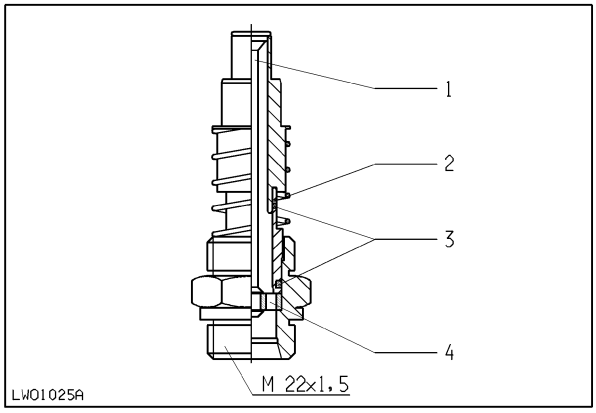
Plug:



42

Socket:

1. Tappet
2. Back-up ring
3. O-Ring
4. Ring, snap



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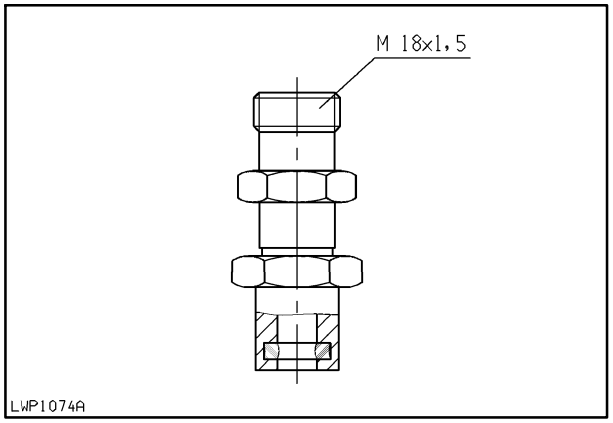
Liftarm - Attachment

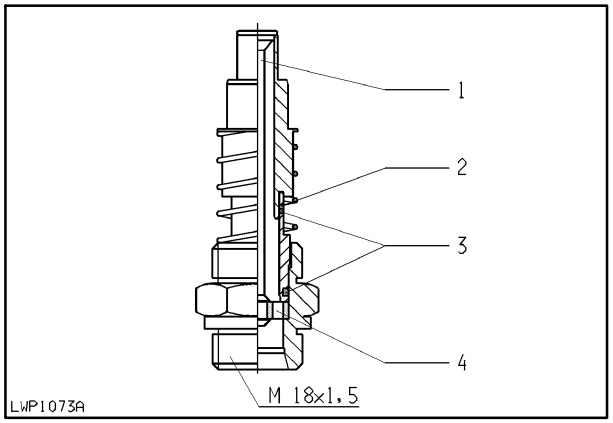
Order No:



44

Socket:

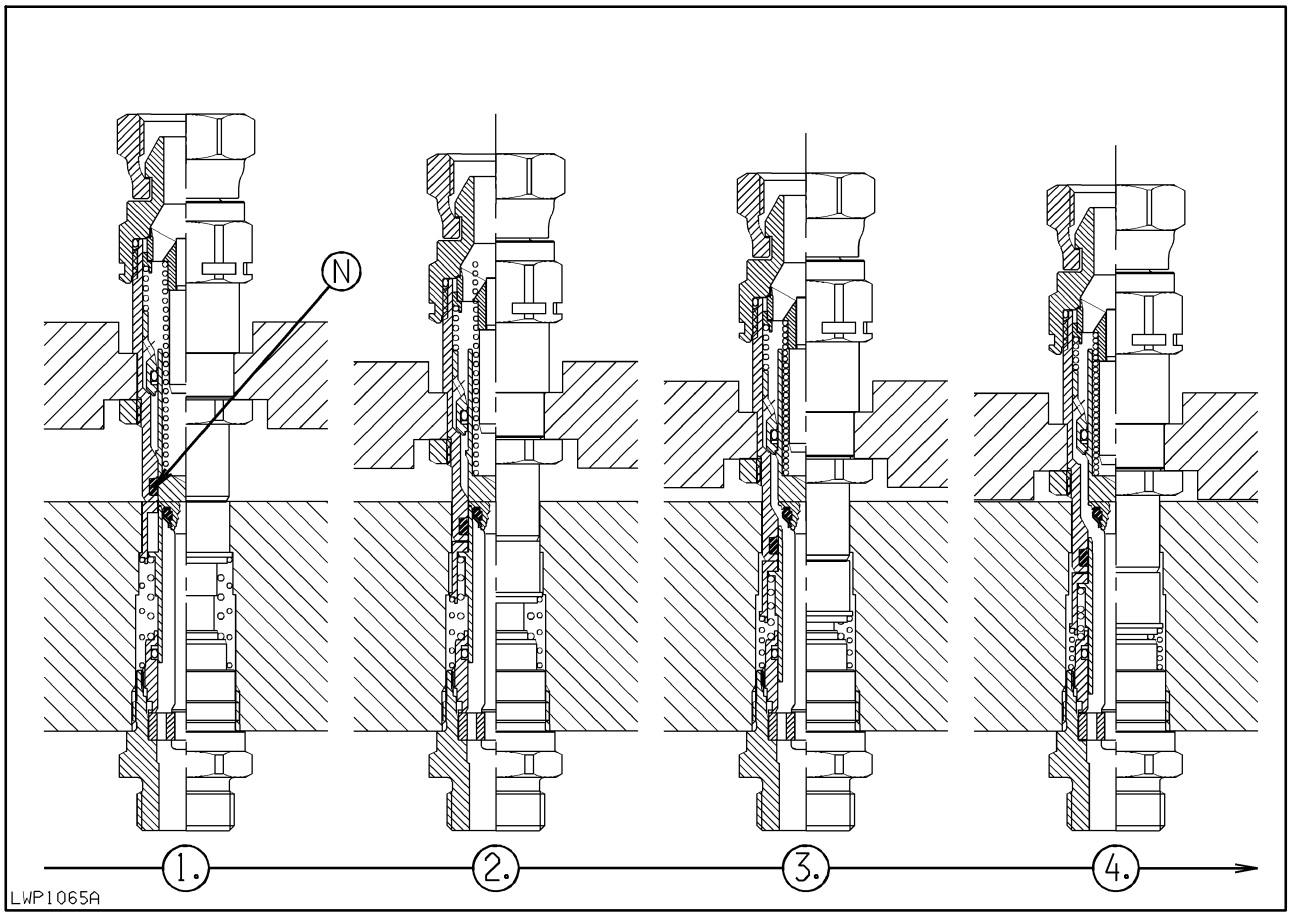
1. Tappet
2. Back-up ring
3. O-Ring
4. Ring, snap



45

Refer to your parts catalogue for the part numbers to suit the above repair kits.

FUNCTIONAL DIAGRAM



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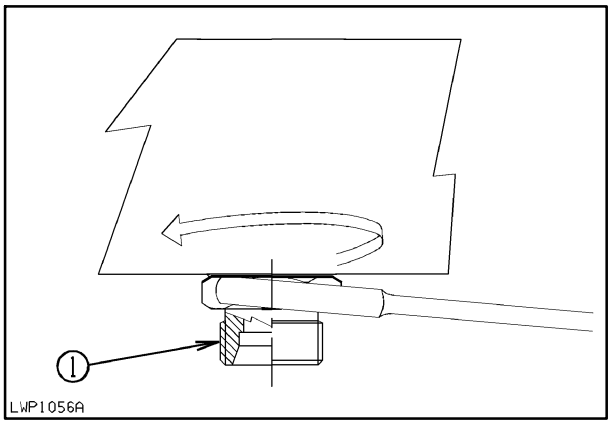
TROUBLESHOOTING

Description of malfunction	Troubleshooting
Leakage with Multi Quick Coupler connected.	Locate the leaking line by means of draining holes on the sides of fixed part. Change the damaged seal (N) of the leaking male part.(Refer to fig.46, page 29) If the leakage continues replace the female coupling too. If the leakage goes on again verify if the levers are deformed. Deformed levers provoke a misalignment and cause the seals breakage.
Leakage resulting from a connection under pressure.	Locate the leaking line by means of draining holes on the sides of fixed part. Change the damaged seal (N) of the leaking male part.(Refer to fig.46, page 29) If the leakage continues replace the female coupling and the male coupling of the specific line. If the leakage goes on again verify if the levers are deformed. Deformed levers provoke a misalignment and cause the seals breakage.
Leakage from the male part in disconnected position.	Locate the leaking line. Change the damaged seal (N) of the leaking male part.(Refer to fig.46, page 29) If the leakage continues replace the male coupling of the specific line. If after using, the leakage continues replace the female coupling and the seal (N) of the male coupling.(Refer to fig.46, page 29) If the leakage goes on again verify if the levers are deformed. Deformed levers provoke a misalignment and cause the seals breakage.
Leakage from the female part in disconnected position.	Locate the leaking line.Replace the female coupling of the specific line.
Multi Quick Coupler does not connect.	Verify if the lines are under pressure. With lines under pressure it is necessary an higher force on the lever. If you are not able to get a manual connection do not use extensions or other attachments, you could damage the levers and the internal components of couplings. Decrease the pressure by unscrewing the fittings. If the lines are not under pressure verify that the levers or the reference pins are not damaged. If they are, replace them.
Multi Quick Coupler does not disconnect.	Verify if the levers are not damaged. If they are, replace them.

OVERHAUL

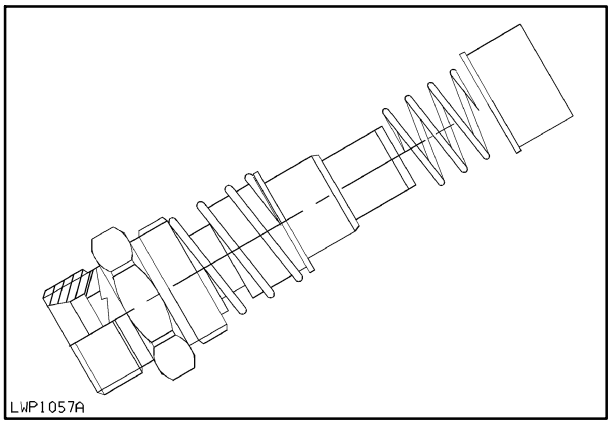
REPLACEMENT OF FEMALE PART COUPLING

1. Unscrew the damaged internal body (1).



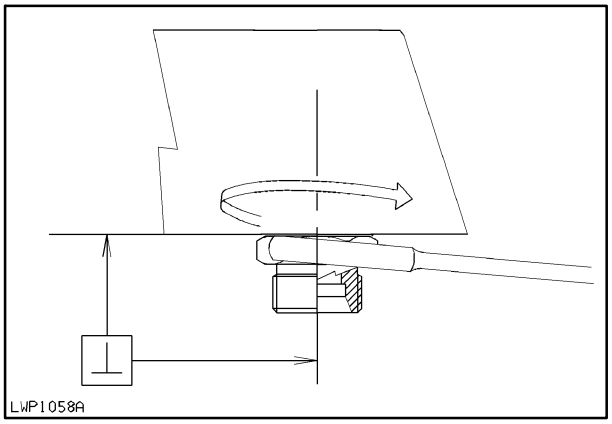
47

2. Reassemble the new internal body as shown in the drawing.



48

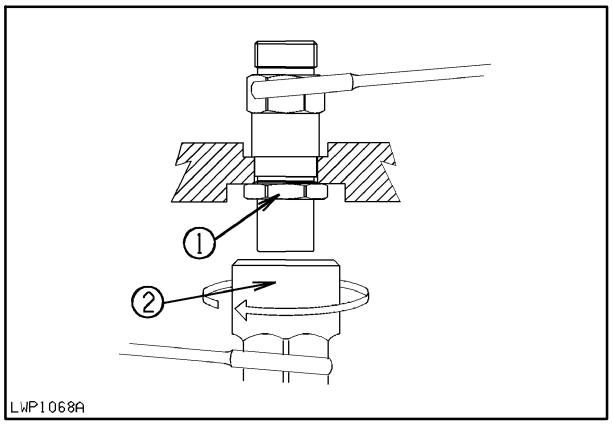
3. Re-position the coupling and tighten to 70 Nm.



49

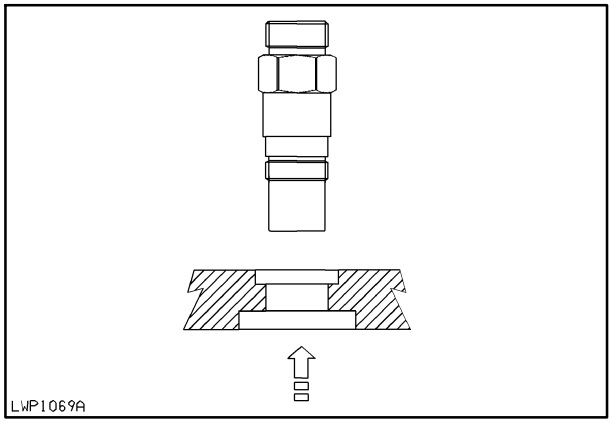
REPLACEMENT OF MALE PART COUPLING

1. Unscrew the lock nut (1) by using the tubular spanner (2).



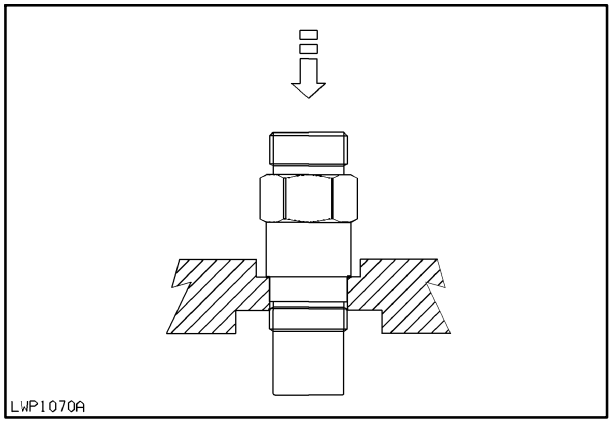
50

2. Remove the damaged male part.



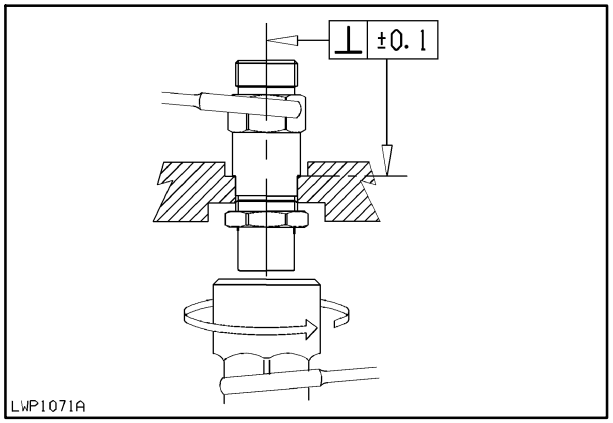
51

3. Insert the new mal part up to shoulder.



52

4. Re-position the coupling and tighten the lock nut to 50 Nm.



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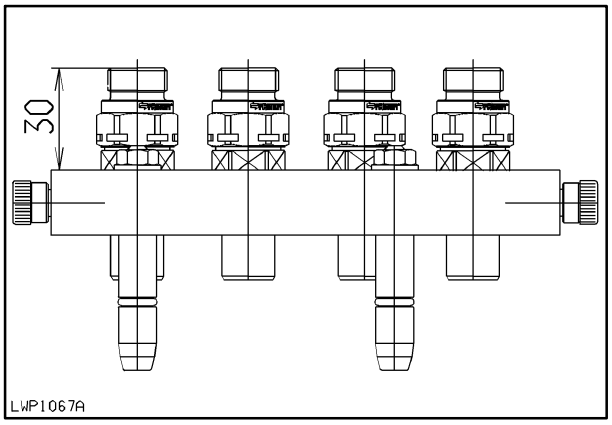
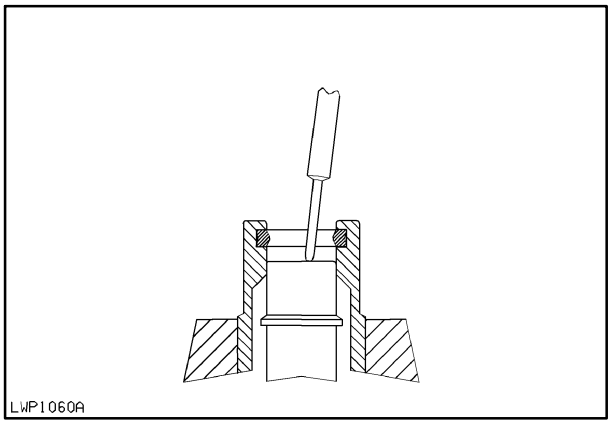
REPLACEMENT OF SEALS TO MALE SECTION OF MULTI QUICK COUPLER

1. Position the manifold block (Fig. 54) in a vice.



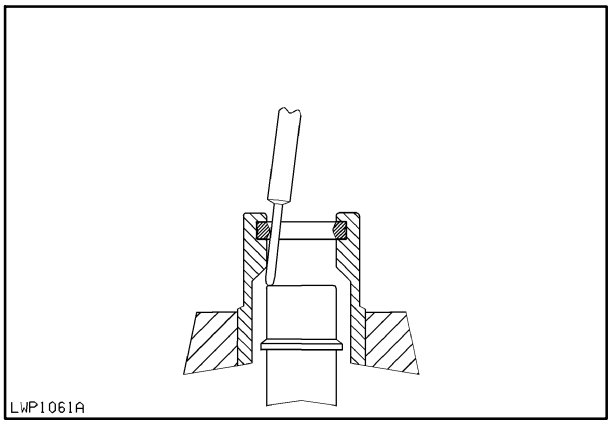
54

2. Pull back the valve with a screw driver.



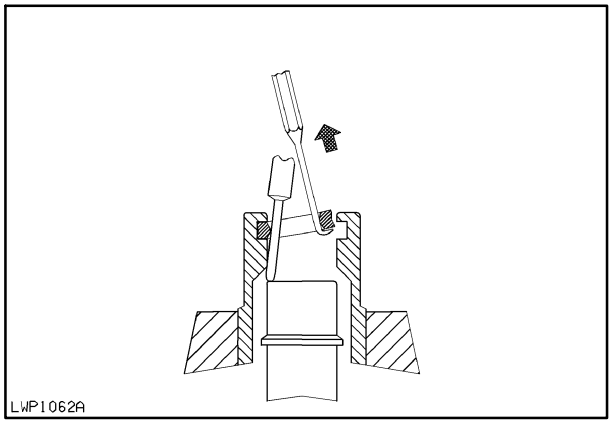
55

3. Keep the valve open by utilising a suitable tool.



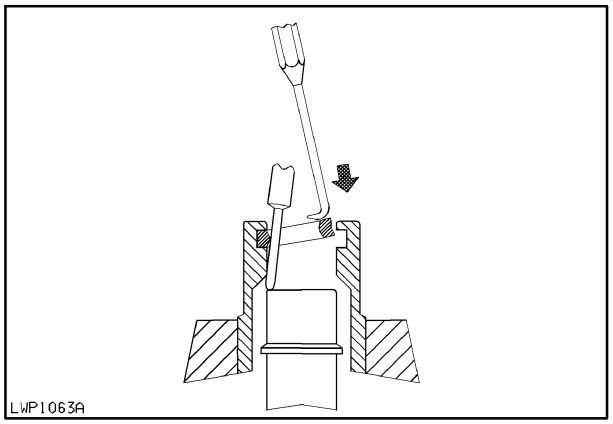
56

4. Remove the damaged seal.



57

5. Clean the seal seat carefully.
6. Lubricate the seal before inserting in the groove.
7. Insert the seal in the position as shown in the figure.



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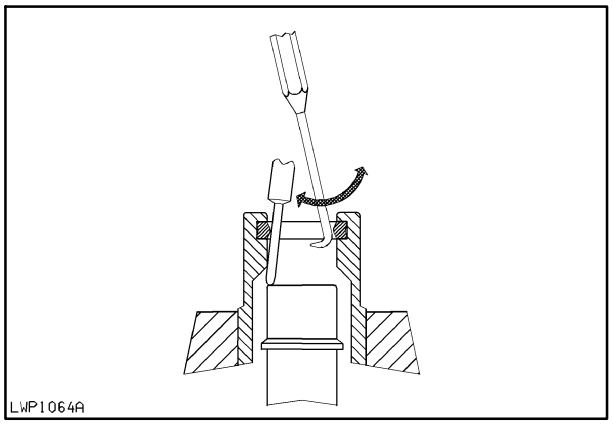
8. Ensure that the seal is well arranged in its groove.
9. Release the valve carefully.



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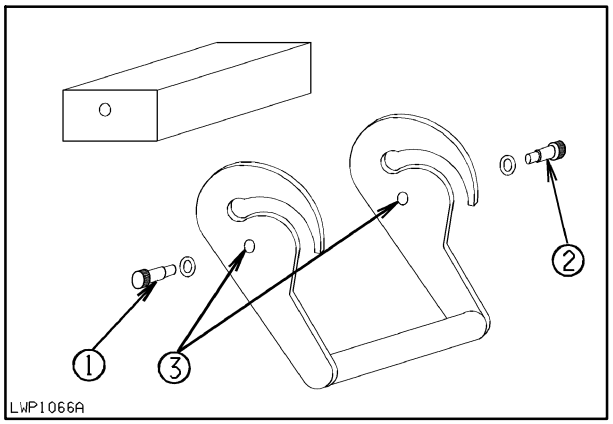
LEVER REPLACEMENT

1. Remove the screws (1+2)
2. Remove the damaged lever
3. Insert the new lever
4. Grease the holes (3)
5. Spin down the screws (1+2)
6. Tighten screws to 40 Nm.



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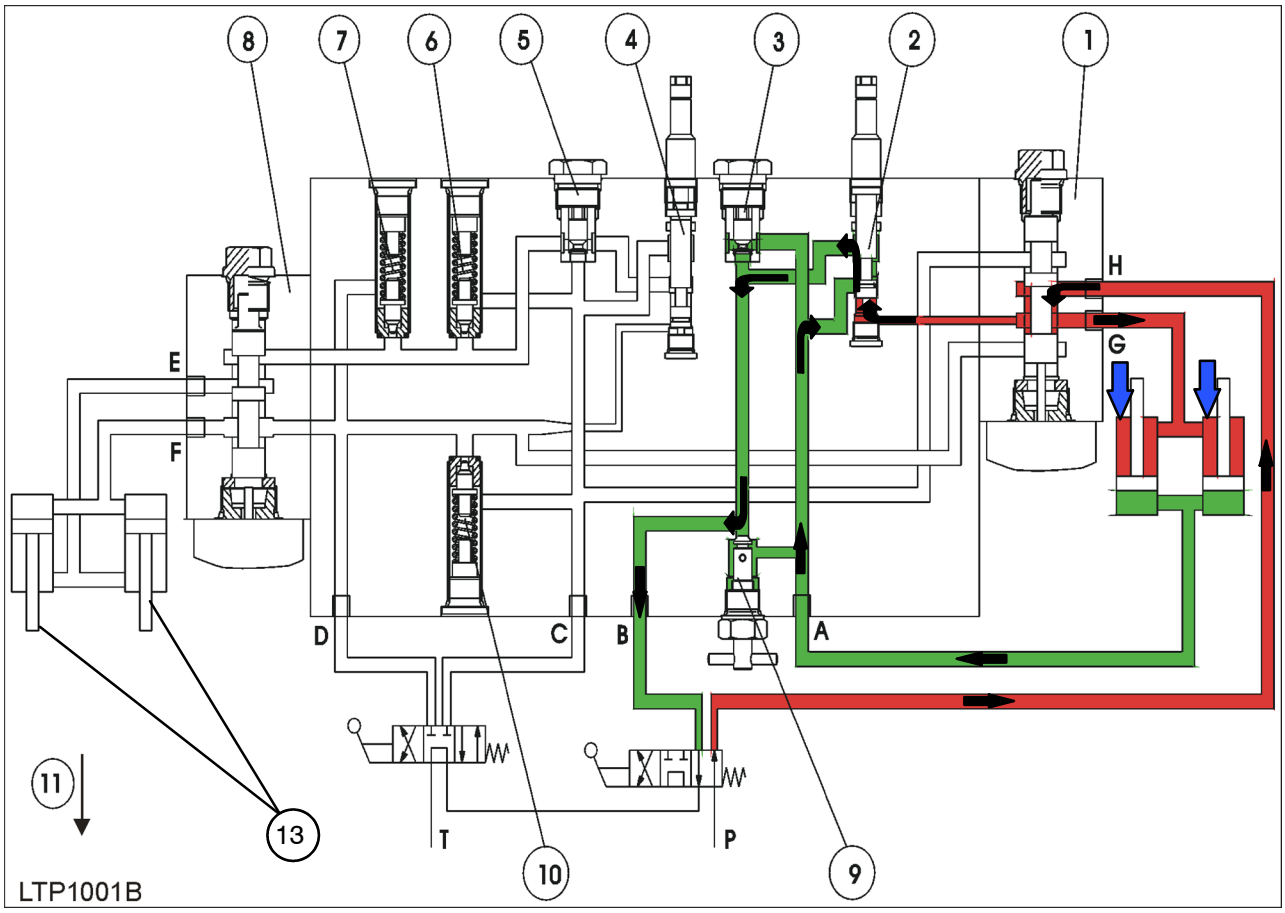
HYDRAULIC FUNCTIONS AND OIL FLOW FOR HS LIFTARM

LIFTARM LOWERING WITHOUT HYDRAULIC SELF LEVELLING



61

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

Operation:

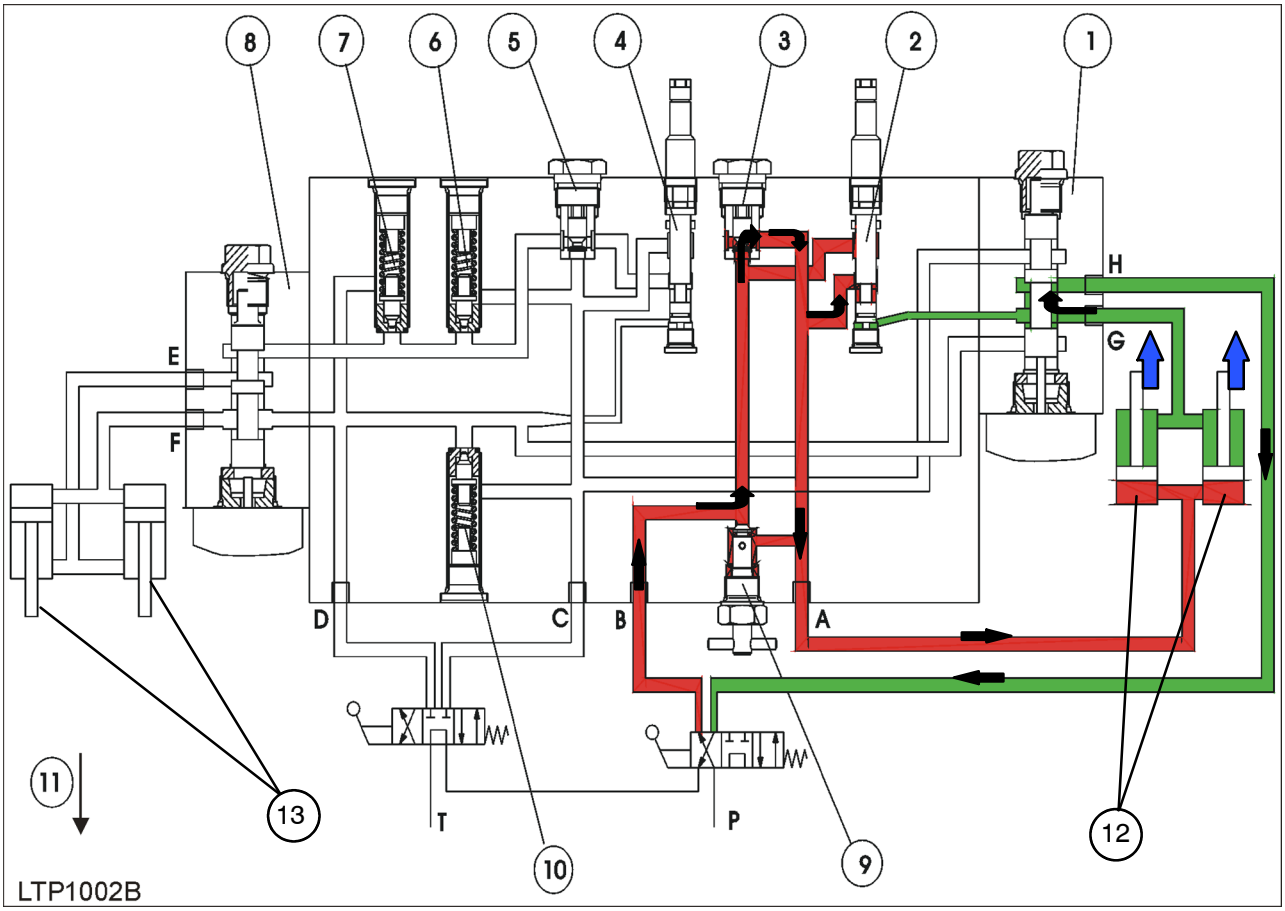
- Press button S_2
- Move Joystick to lower position

Valve function:

Pressure oil (Red):
- Hydraulic self levelling valve (1) switched “on”
- Lowering brake valve (2) active

Return flow (Green):
- Load check valve (3) neutral position
- Adjusting toggle (9) in closed position

LIFTARM RAISING WITHOUT HYDRAULIC SELF LEVELLING



62

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

Operation:

- Press button S_2
- Move Joystick to lift position

Valve function:

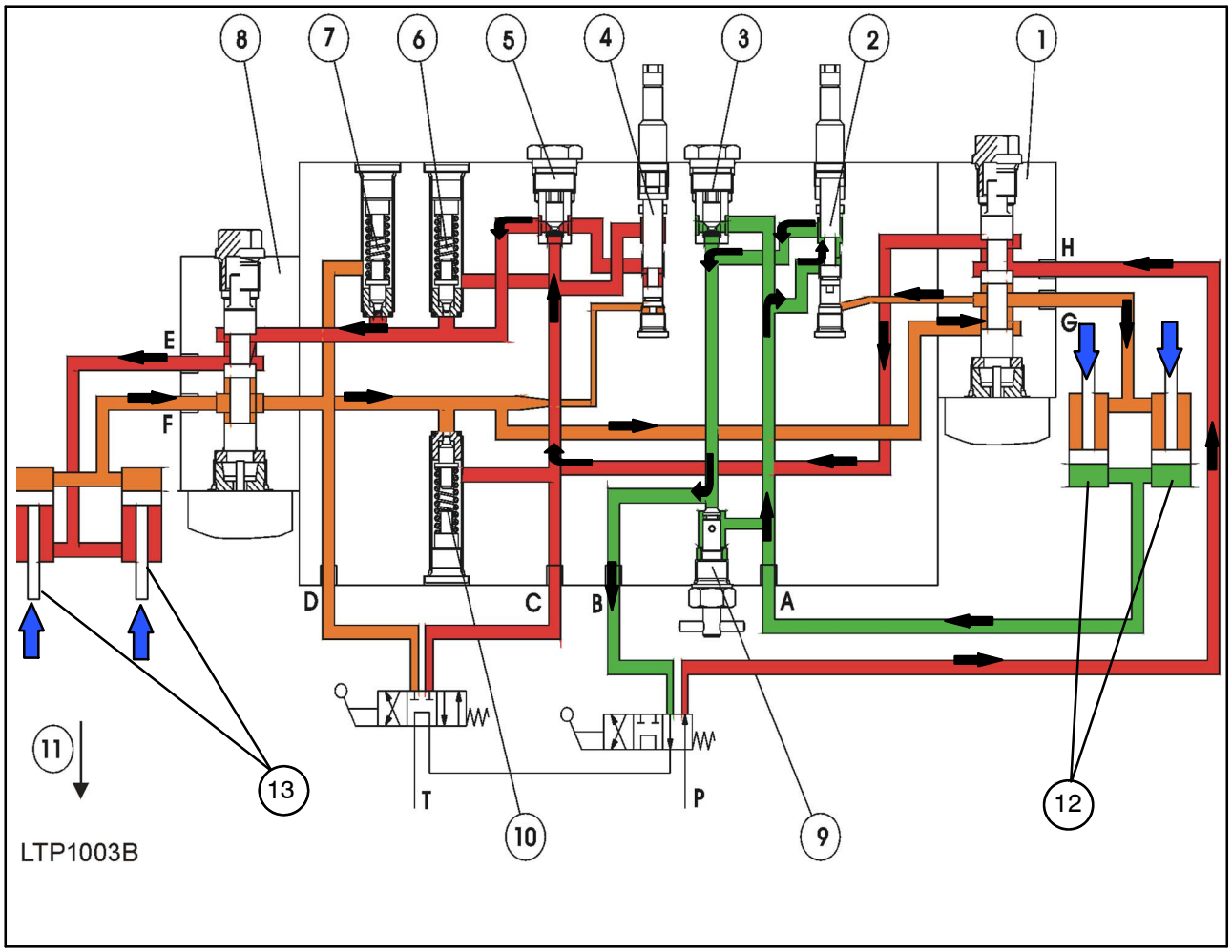
Pressure oil (Red):

- Load check valve (3) open position
- Lowering brake valve (2) neutral position
- Adjusting toggle (9) in closed position

Return flow (Green):

- Hydraulic self levelling valve (1) switched “on”

LIFTARM LOWERING WITH HYDRAULIC SELF LEVELLING



63

1. Hydraulic self levelling
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

Operation: - Move Joystick to lower position

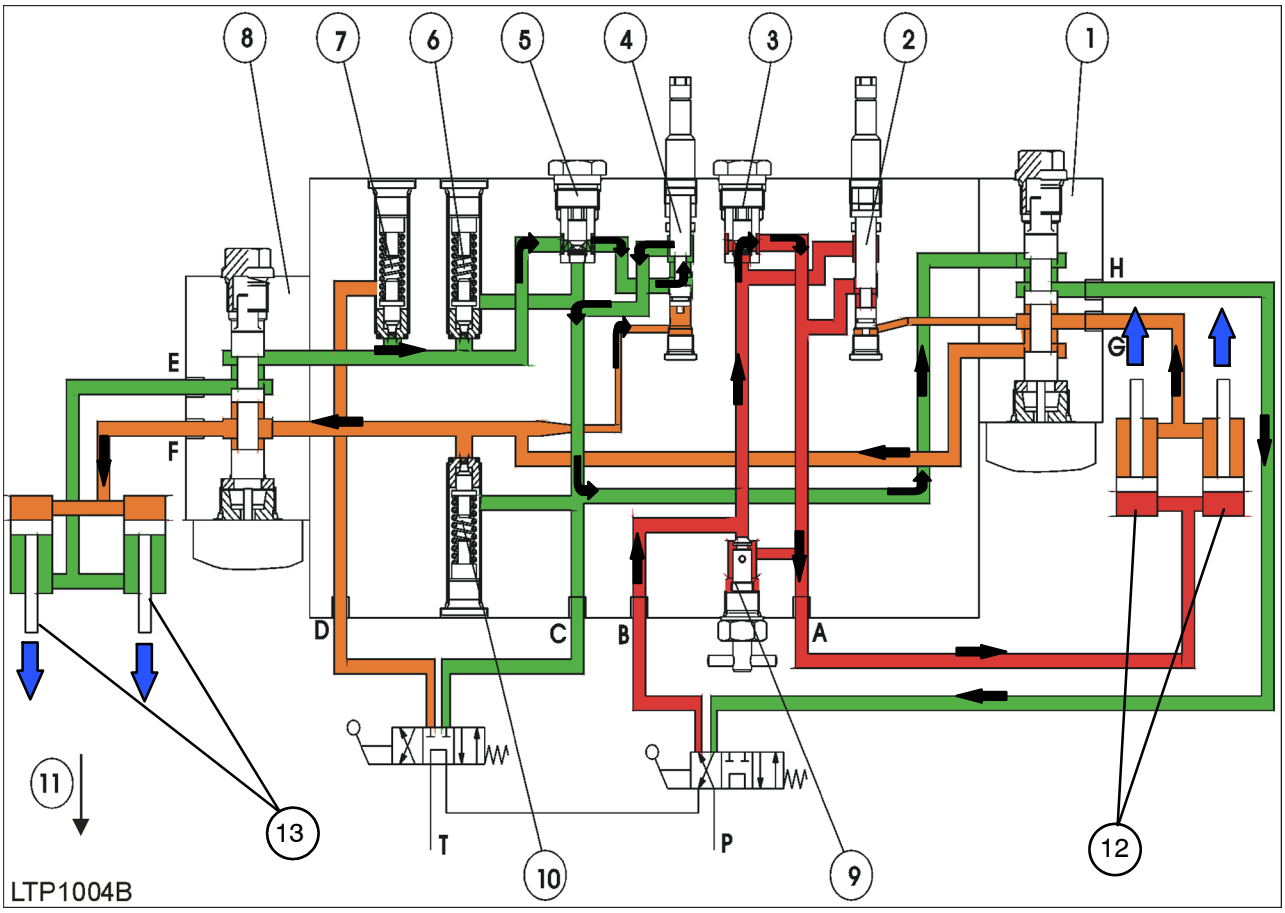
Valve function:

Pressure oil (Red):
- Hydraulic self levelling (1) neutral position
- Load check valve (5) open position
- Lowering brake valve (4) neutral position
- Pressure relief valve A/B/C (6/7/10) neutral position
- Fast Tip valve (8) neutral position

Controlling oil (Orange):
- Attachment cylinder (13) retract position
- Hydraulic oil on piston surface of attachment cylinders (13), is displaced onto piston area of liftarm cylinders (12)
- Lift arm cylinder (12) retract position

Return flow (Green):
- Load check valve (3) neutral position
- Lowering brake valve (2) active position
- Adjusting toggle (9) closed position

LIFTARM RAISING WITH HYDRAULIC SELF LEVELLING



64

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

Operation: - Move Joystick to lift position

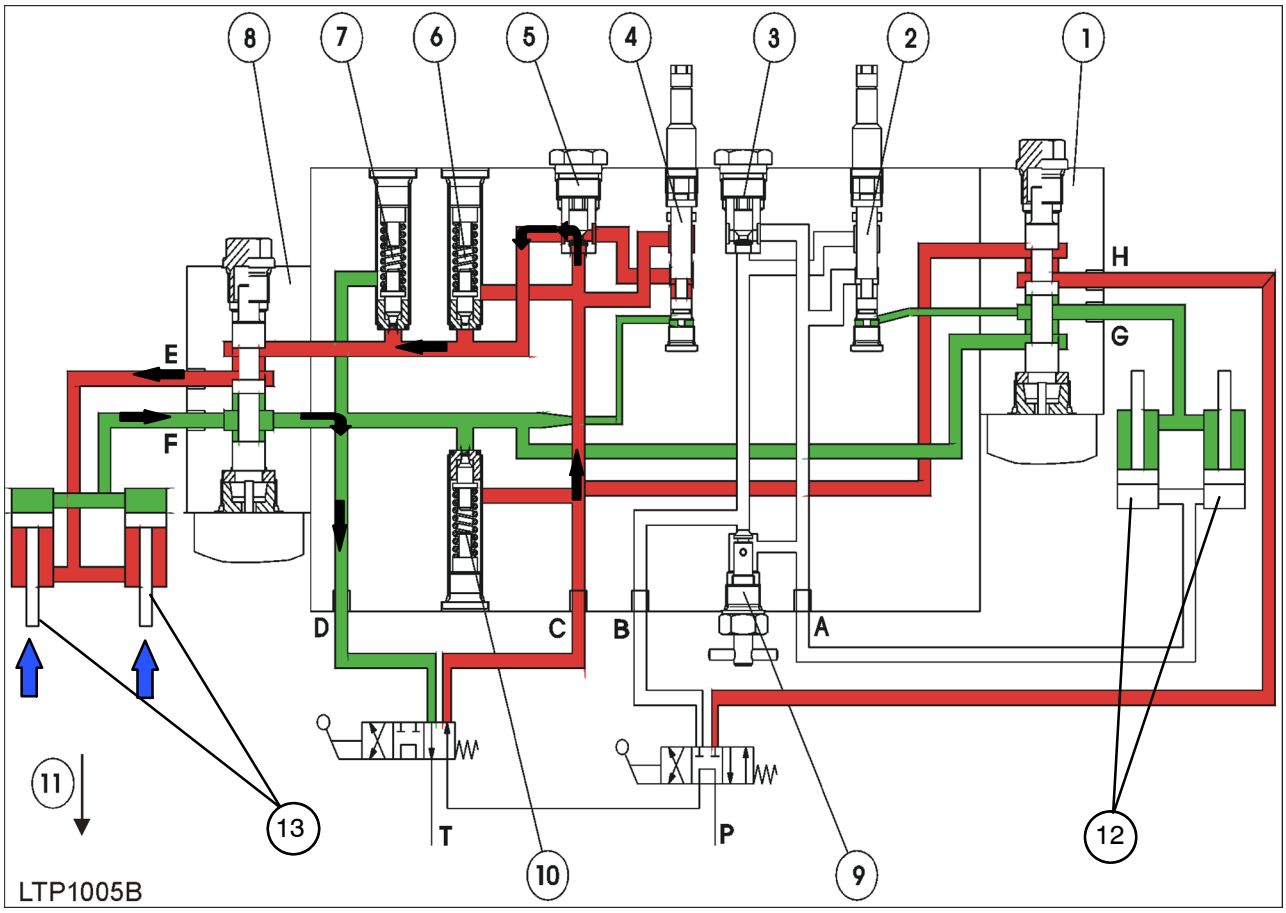
Valve function:

Pressure oil (Red):
- Hydraulic self levelling valve (1) neutral position
- Load check valve (3) open position
- Lowering brake valve (2) open position
- Adjusting toggle (9) closed position

Controlling oil (Orange):
- Hydraulic oil on piston area of liftarm cyliders (12), is displaced onto the piston surface of the attachment cylinders (13)
- Attachment cylinder (13) extend position

Return flow (Green):
- Fast Tip valve (8) neutral position
- Pressure relief valve A/B/C (6/7/10) neutral position
- Load check valve (5) neutral position
- Attachment lowering brake valve (4) active position

ATTACHMENT BUCKET CROWDING



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1. Hydraulic self levelling
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

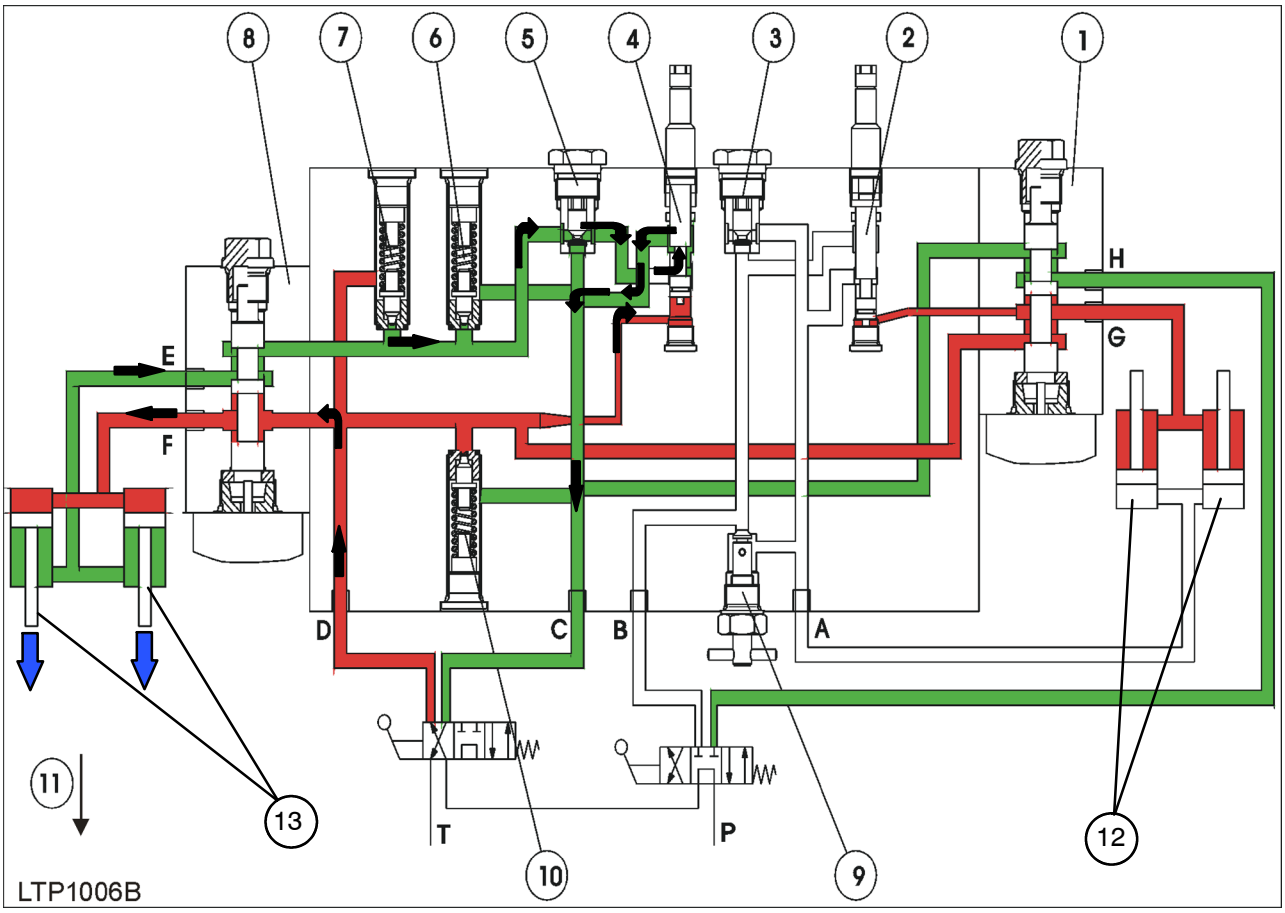
Operation: - Move Joystick to crowd position

Valve function:

Pressure oil (Red):
- Load check valve (5) open position
- Attachment lowering brake valve (4) neutral position
- Pressure relief valve A/B/C (6/7/10) neutral position
- Attachment cylinder (13) retract position

Return flow (Green): - Fast Tip valve (8) neutral position

ATTACHMENT BUCKET TIPPING



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1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

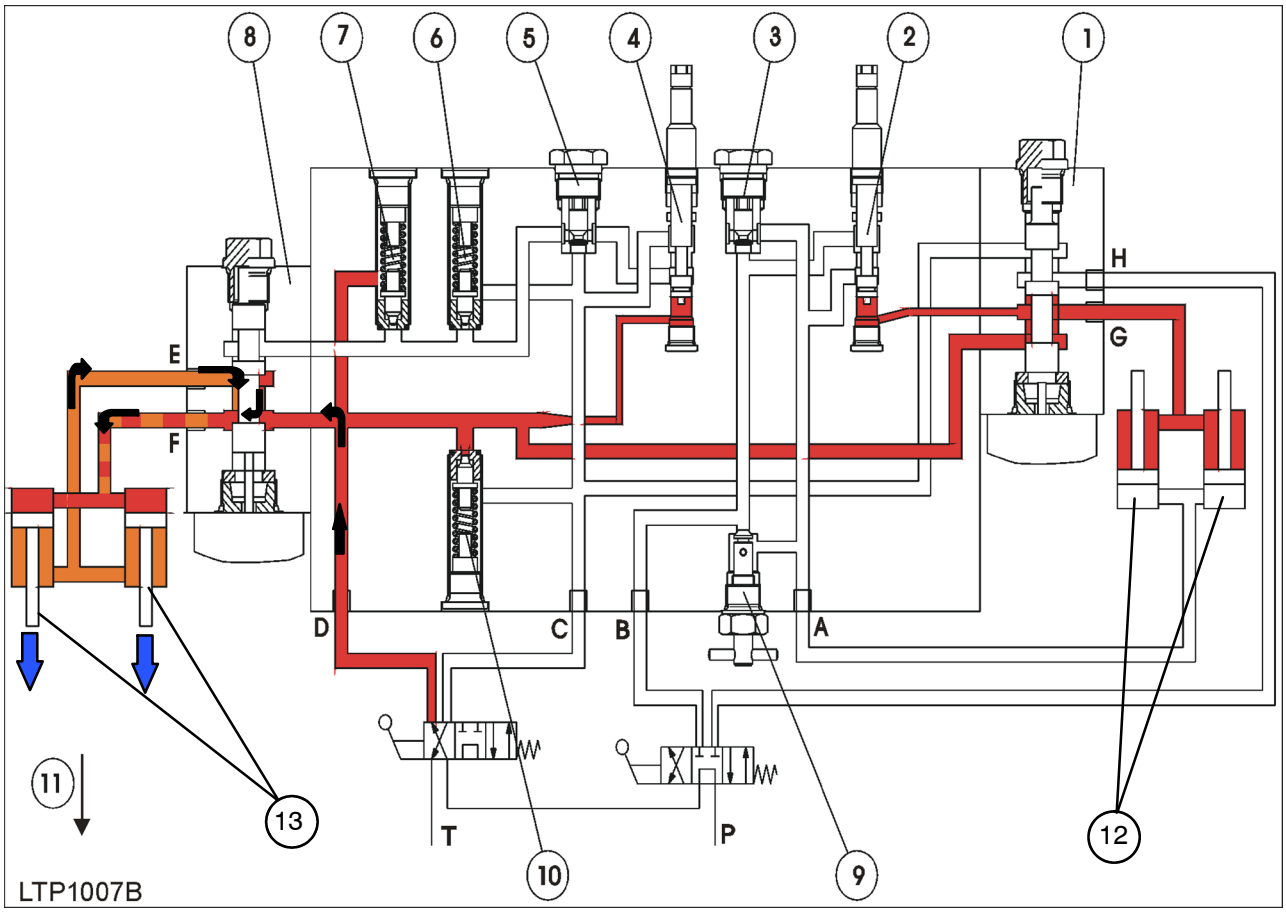
Operation: Move Joystick to tip

Valve function:

Pressure oil (Red):
- Pressure relief valve A/B/C (6/7/10) neutral position
- Fast Tip valve (8) neutral position
- Attachment cylinder (13) extend position

Return flow (Green):
- Load check valve (5) neutral position
- Attachment lowering brake valve (4) neutral position

ATTACHMENT BUCKET TIPPING WITH FAST TIP



67

1. Hydraulic self levelling
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Driving direction
12. Liftarm cylinder
13. Attachment cylinder

Operation:

- Move Joystick to tip
- Press button S_1

Valve function:

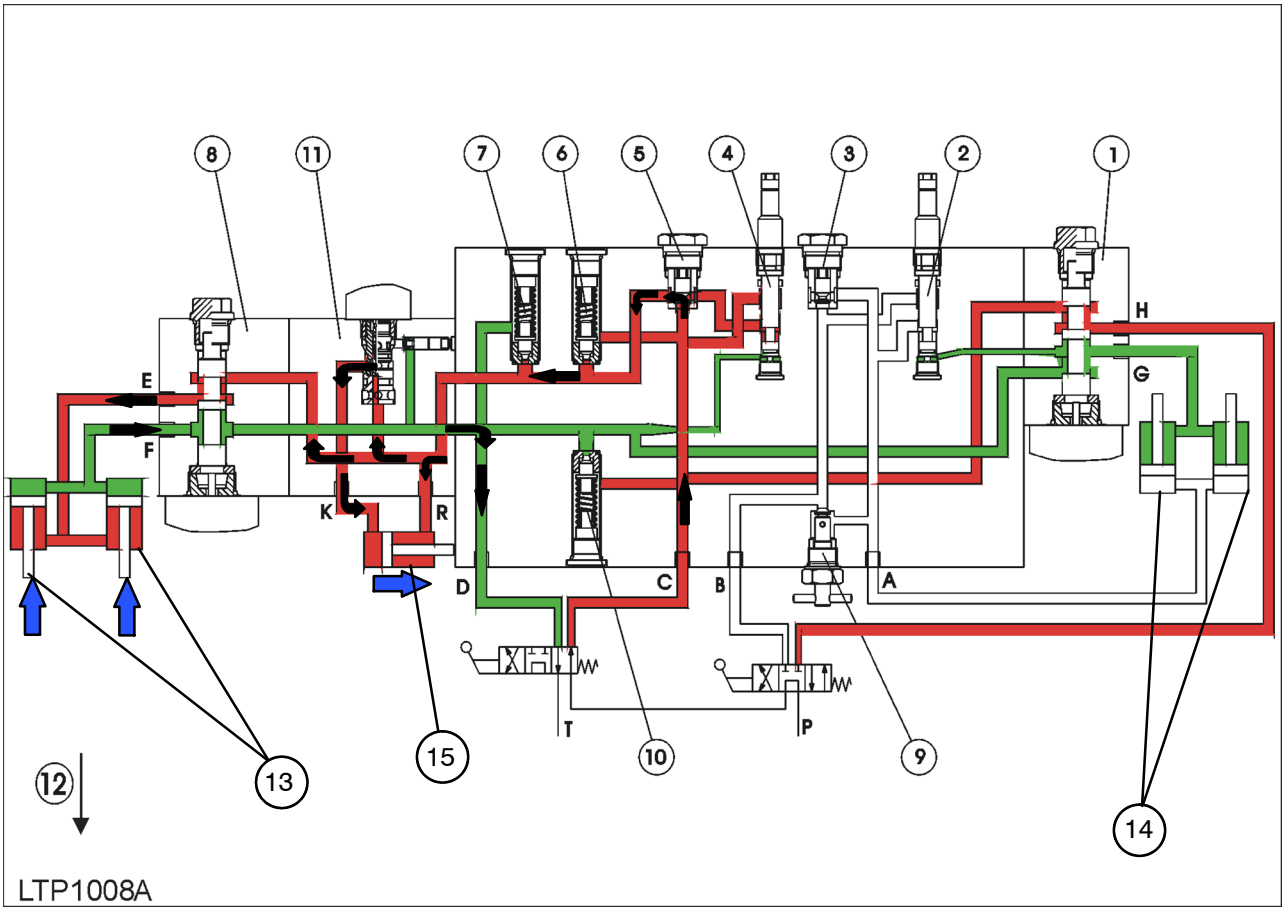
Pressure oil (Red):

- Pressure relief valve A/B/C (6/7/10) neutral position
- Fast Tip valve (8) switched “on”

⇒ Attachment cylinder (13) extend postion

⇒ Hydraulic oil in the piston area of attachment cylinders (13), is displaced onto the piston surface of the attachment cylinders (13)

HYDRAULIC QUICK ATTACH: LOCKED POSITION



68

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Hydraulic attachment lock valve
12. Driving direction
13. Attachment cylinder
14. Liftarm cylinder
15. Hydraulic Quick Attach cylinder

Operation:

- Button S_W off position
- Move Joystick to crowd position

Valve function:

Pressure oil (Red):

- Load check valve (5) open position
- Attachment lowering brake valve (4) neutral position
- Pressure relief valve A/B/C (6/7/10) neutral position
- Hydraulic attachment lock valve (11) neutral position
- Fast Tip valve (8) neutral position

⇒ Attachment cylinder (13) retract position

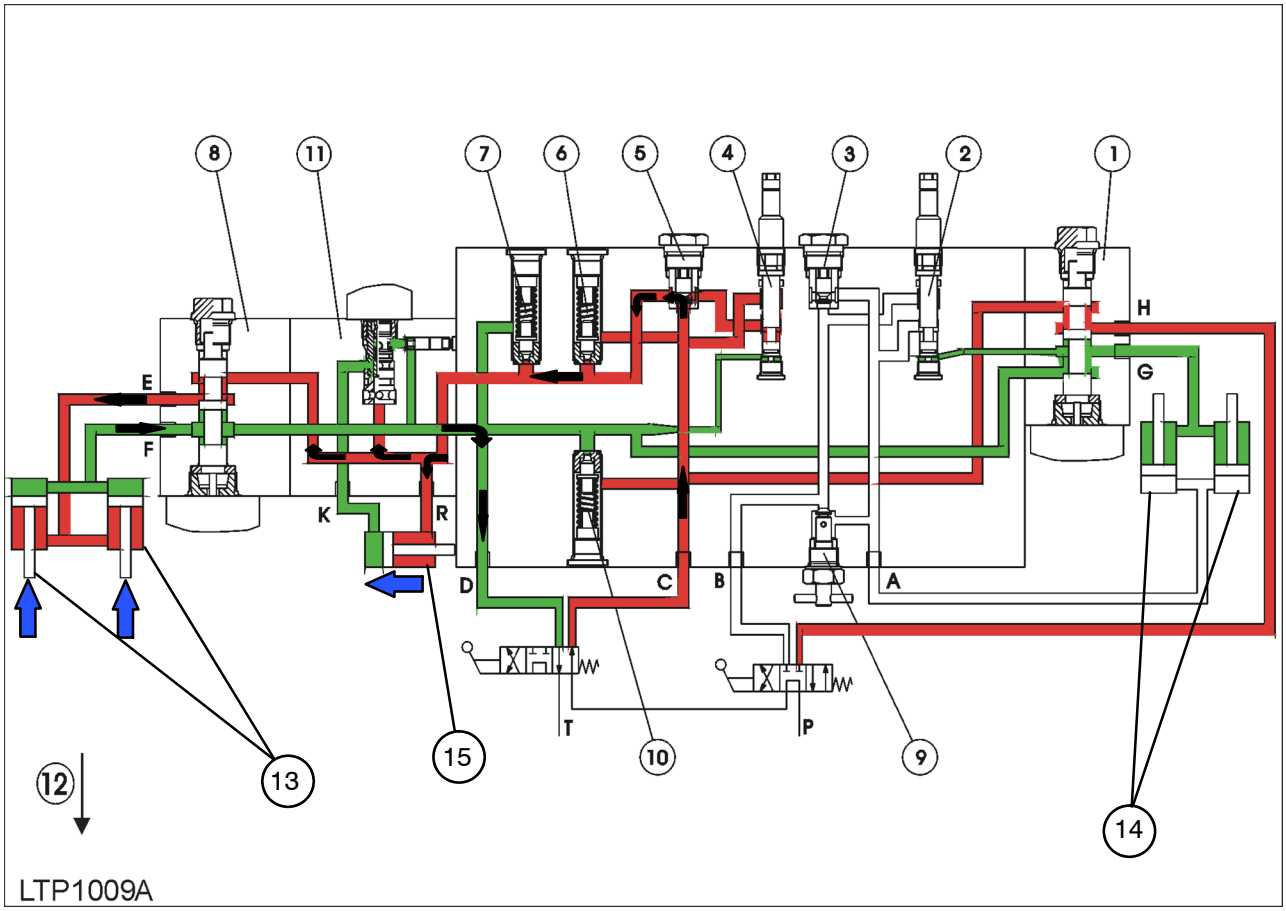
⇒ Hydraulic Quick Attach cylinder (15) extend position

($F_{Piston\ surface} > F_{Piston\ area}$)

Return flow (Green):

- Fast Tip valve (8) neutral position

HYDRAULIC QUICK ATTACH: NOT LOCKED POSITION



69

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. Hydraulic attachment lock valve
12. Driving direction
13. Attachment cylinder
14. Liftarm cylinder
15. Hydraulic Quick Attach cylinder

Operation:

Button S_W on position
- Move Joystick to crowd position

Valve function:

Pressure oil (Red):

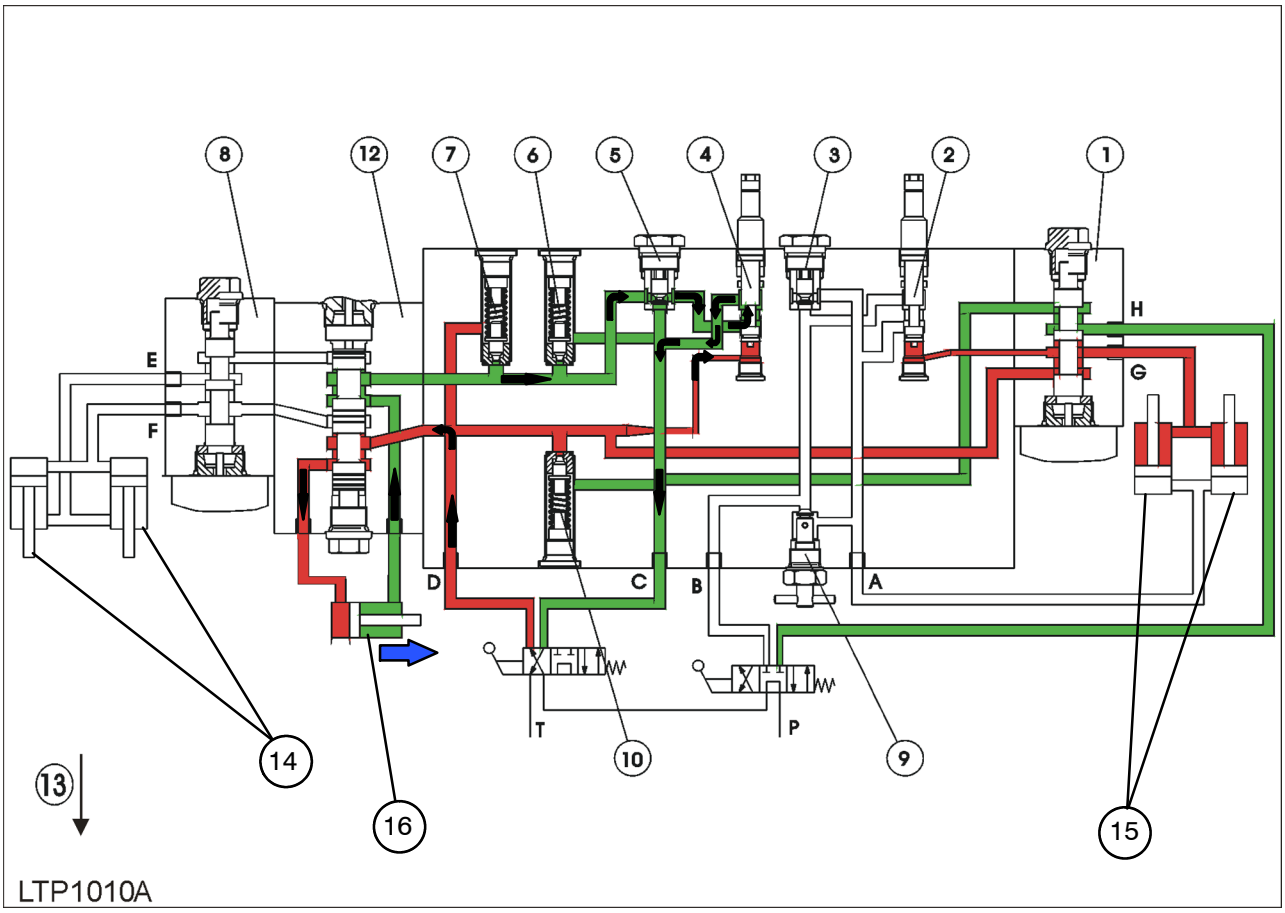
- Load check valve (5) open position
- Attachment lowering brake valve (4) neutral position
- Pressure relief valve A/B/C (6/7/10) neutral position
- Hydraulic attachment lock valve (11) “on” position

⇒ Attachment cylinder (13) retract position
⇒ Hydraulic Quick Attach cylinder (15) retract position
⇒ Attachment unlocked

Return flow (Green):

- Fast Tip valve (8) neutral position

3RD CONTROL SERVICE: CYLINDER EXTEND



70

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. No reference
12. 3rd Control service valve
13. Driving direction
14. Attachment cylinder
15. Liftarm cylinder
16. 3rd control service cylinder

Operation:

- Press button S_3
- Move Joystick to tip position

Valve function:

Pressure oil (Red):

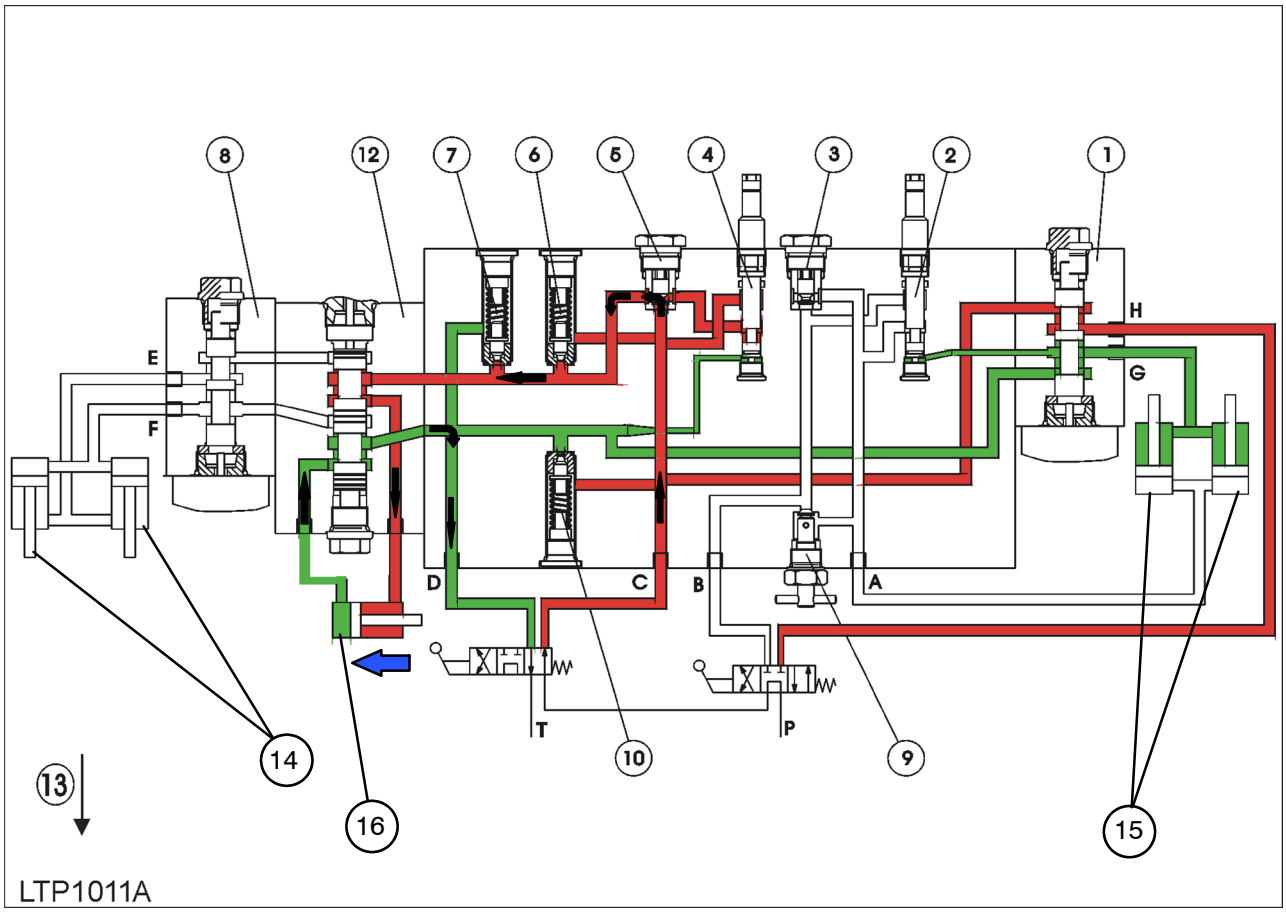
- 3rd Control service valve (12) “on” position
- Pressure relief valve A/B/C (6/7/10) neutral position

⇒ 3rd Control service cylinder (16) extend position

Return flow (Green):

- Load check valve (5) closed position
- Attachment lowering brake valve (4) active position

3RD CONTROL SERVICE: CYLINDER RETRACT



71

1. Hydraulic self levelling valve
2. Lowering brake valve
3. Load check valve
4. Lowering brake valve - attachment
5. Load check valve
6. Pressure relief valve A
7. Pressure relief valve B
8. Fast Tip valve
9. Adjusting toggle
10. Pressure relief valve C
11. No reference
12. 3rd Control service valve
13. Driving direction
14. Attachment cylinder
15. Liftarm cylinder
16. 3rd control service cylinder

Operation:

- Press button S_3
- Move Joystick to crowd position

Valve function:

Pressure oil (Red):

- 3rd Control service valve (12) “on” position
- Load check valve (5) open position
- Attachment lowering brake valve (4) neutral position
- Pressure relief valve A/B/C (6/7/10) neutral position

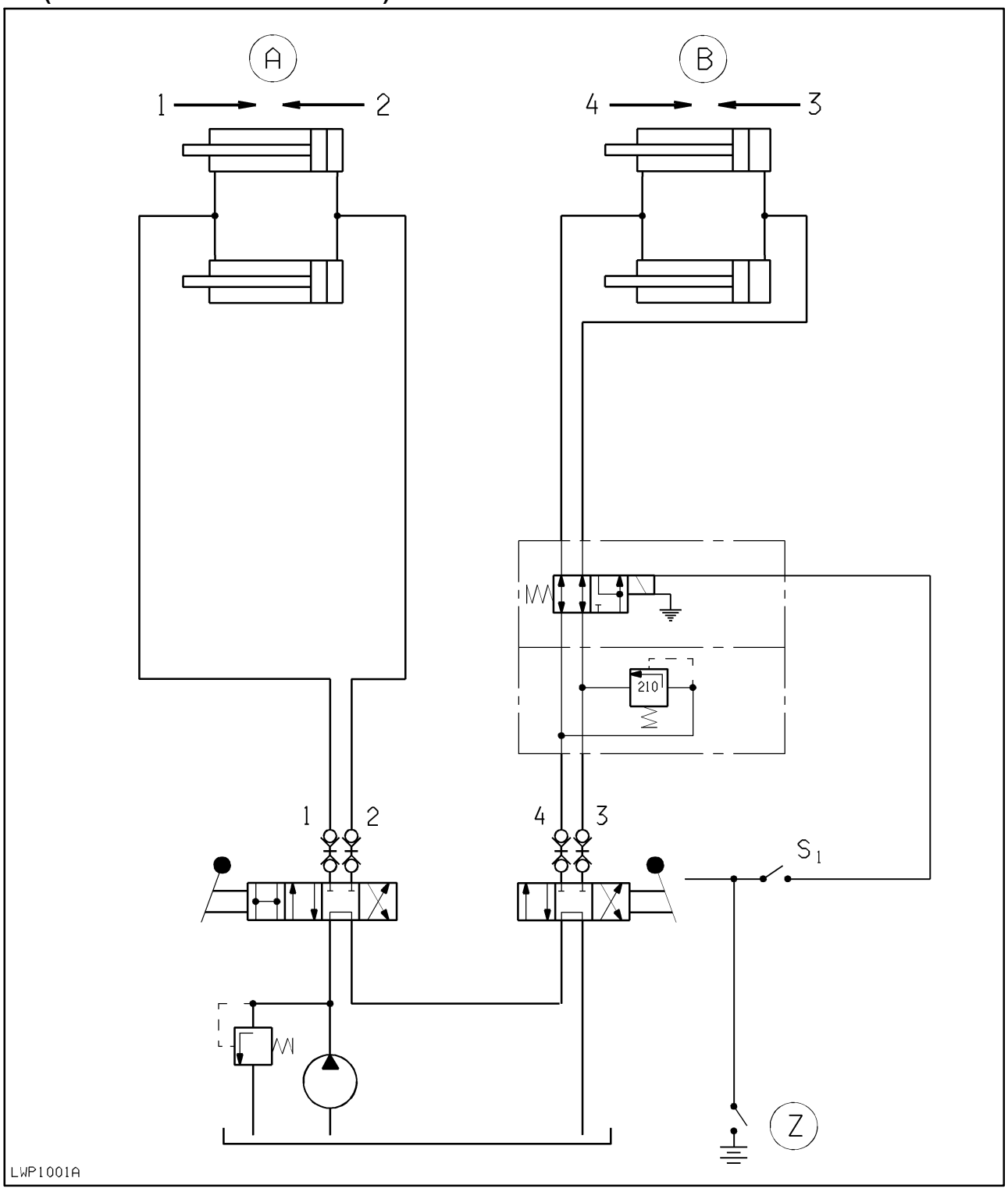
⇒ 3rd Control service cylinder (16) retract position

HYDRAULIC DIAGRAM

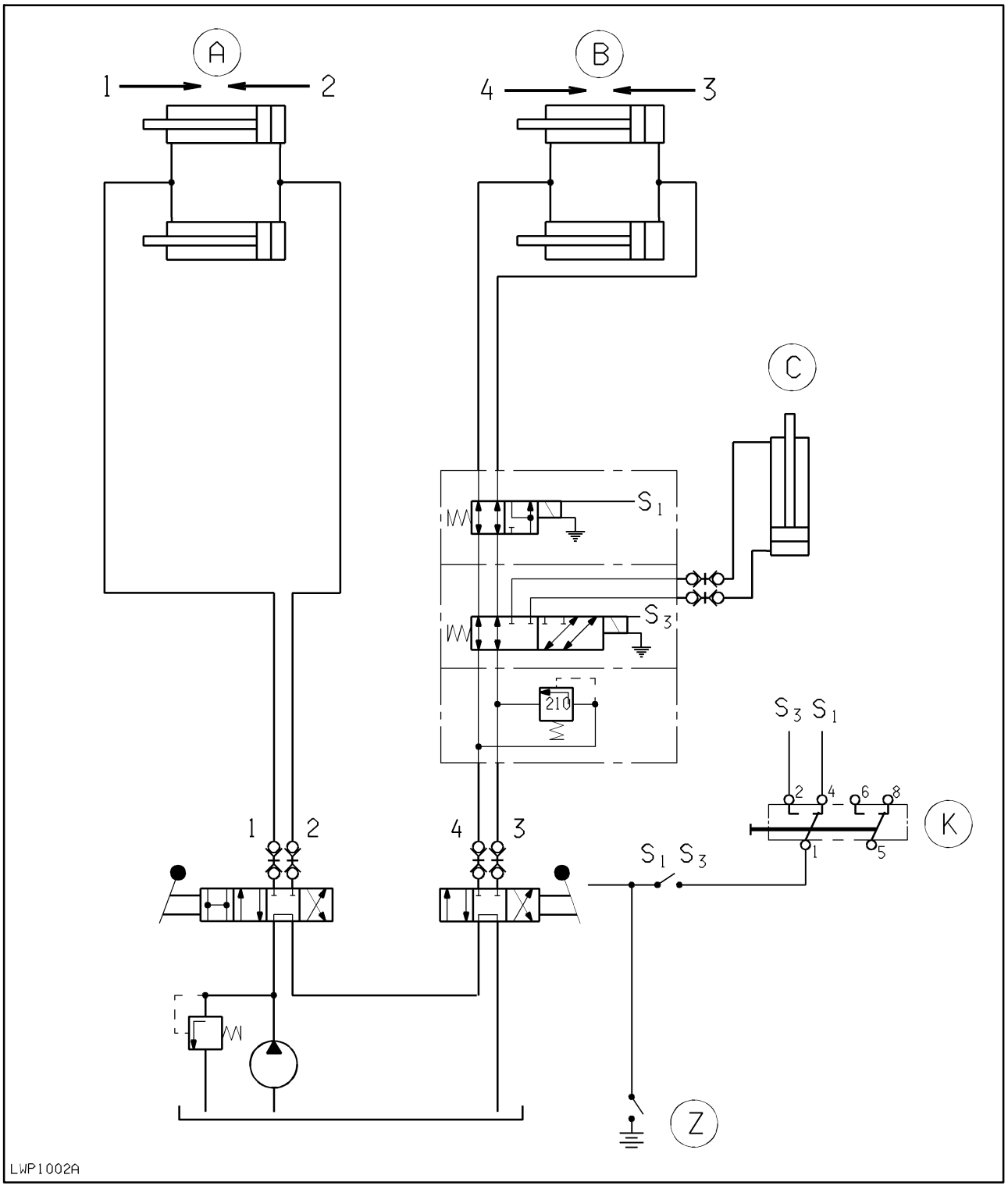
Used abbreviations for hydraulic diagram

A	Liftarm
B	Attachment
C	3rd Control service
D	4th Control service
K	Toggle switch
W	Hydraulic Quick Attach lock
Z	Ignition
S1	Fast Tip on
S2	Hydraulic self levelling off
S3	3rd Control service on
S4	4th Control service on
SW	Hydraulic Quick Attach lock off
1	Lowering
2	Raising
3	Tipping
4	Crowding

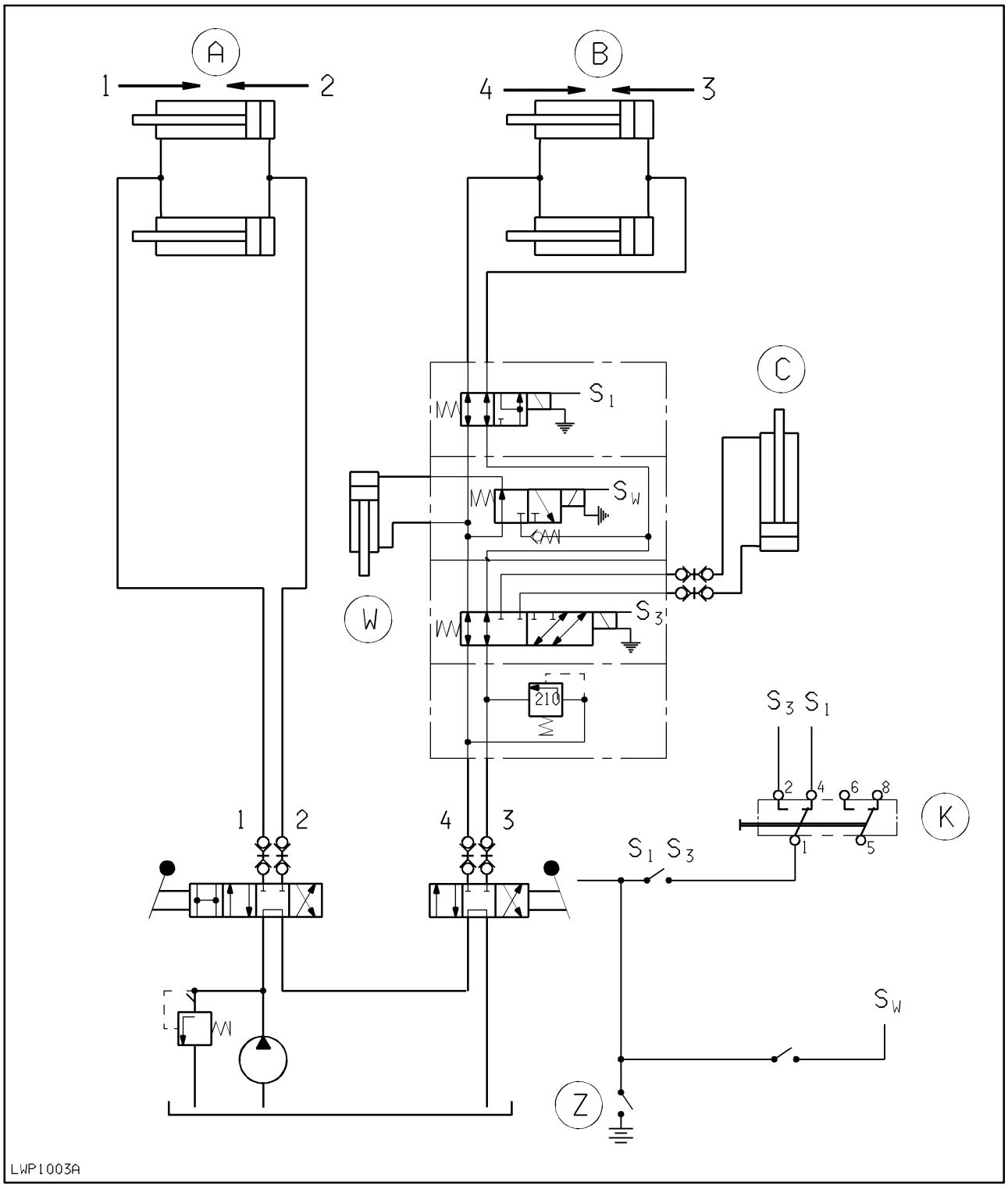
NS (STANDARD - BASIC VERSION)



NS WITH 3RD CONTROL SERVICE



NS WITH 3RD CONTROL SERVICE AND HYDRAULIC QUICK ATTACH



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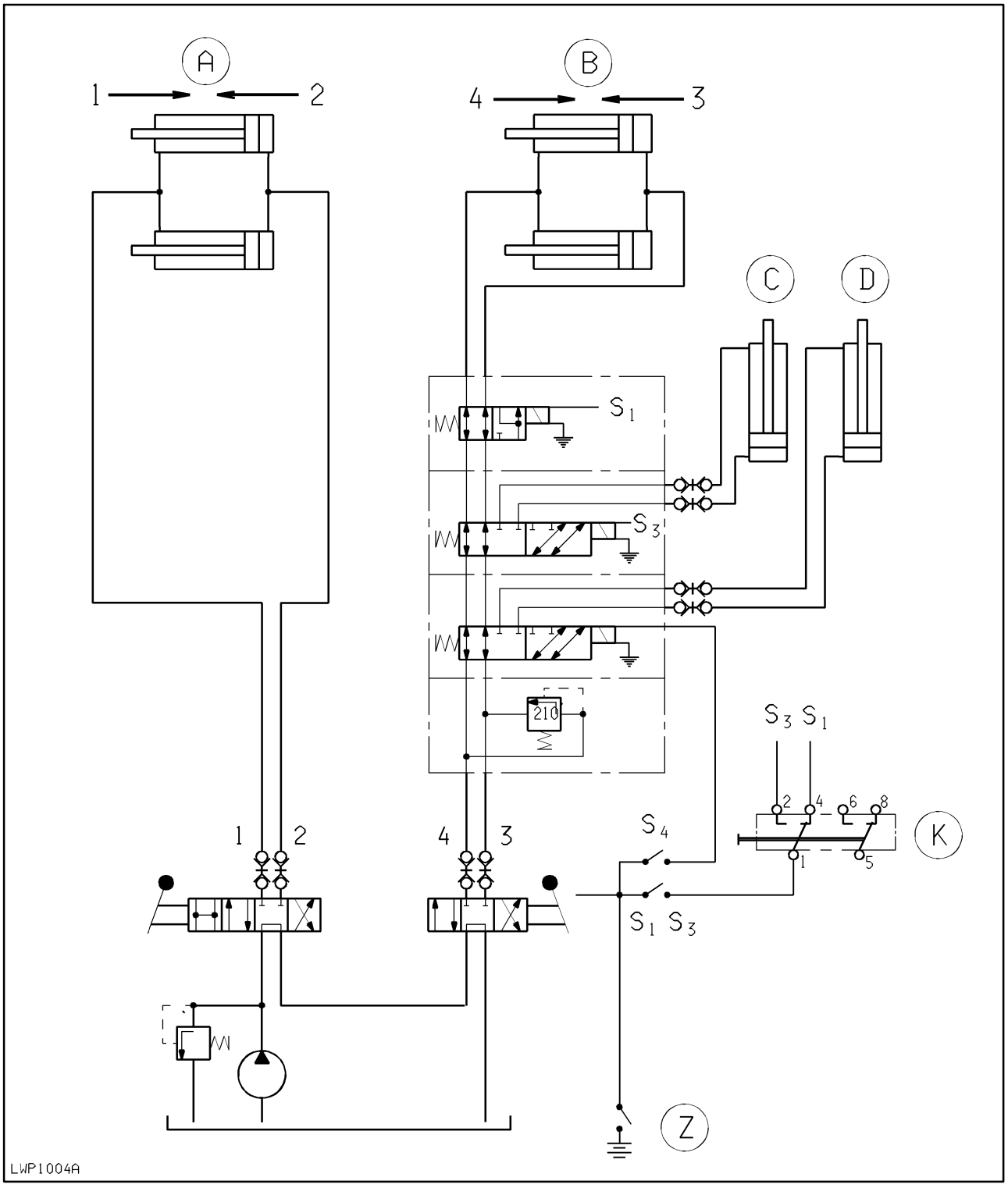
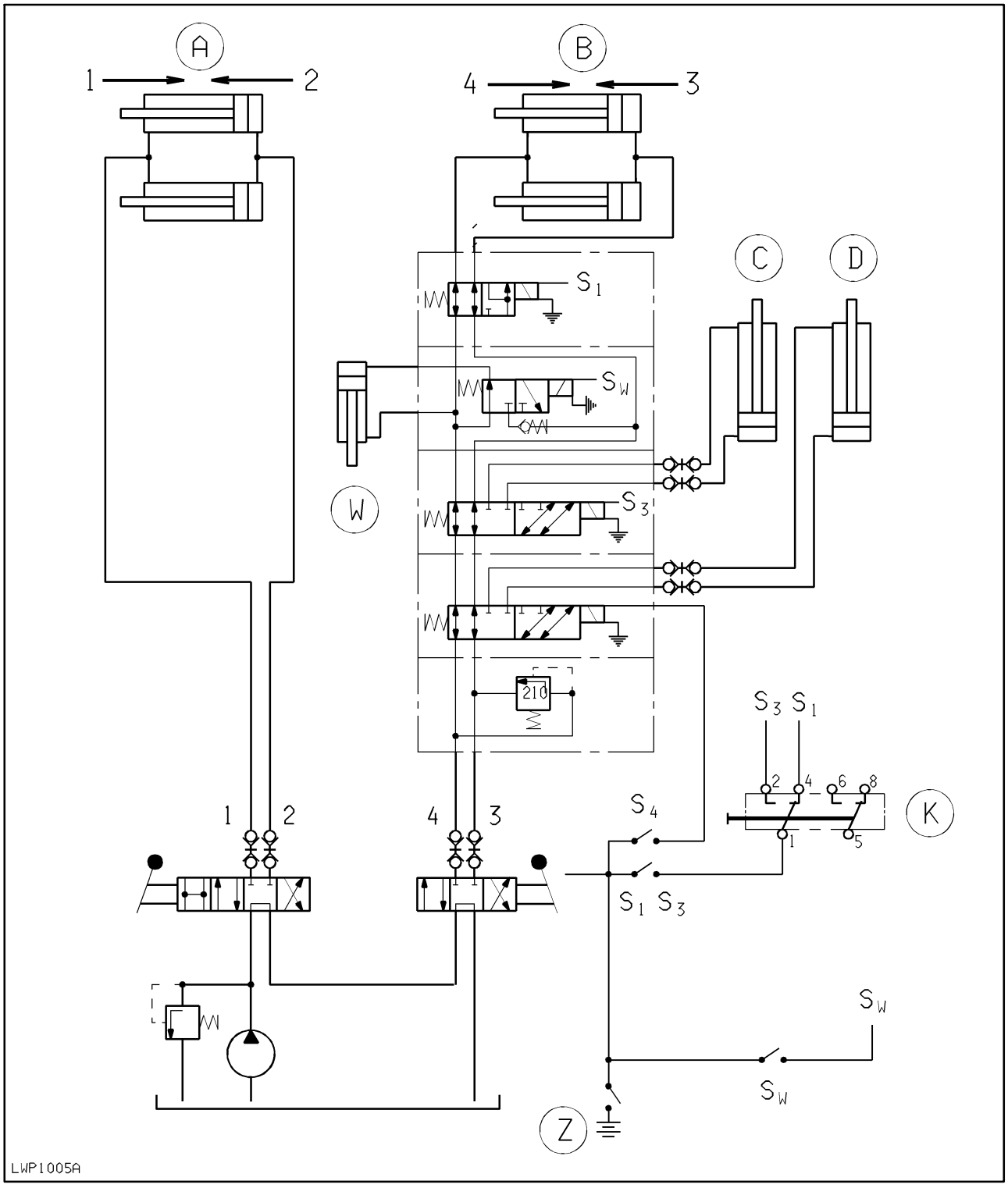


NS WITH 3RD AND 4TH CONTROL SERVICE AND HYDRAULIC QUICK ATTACH



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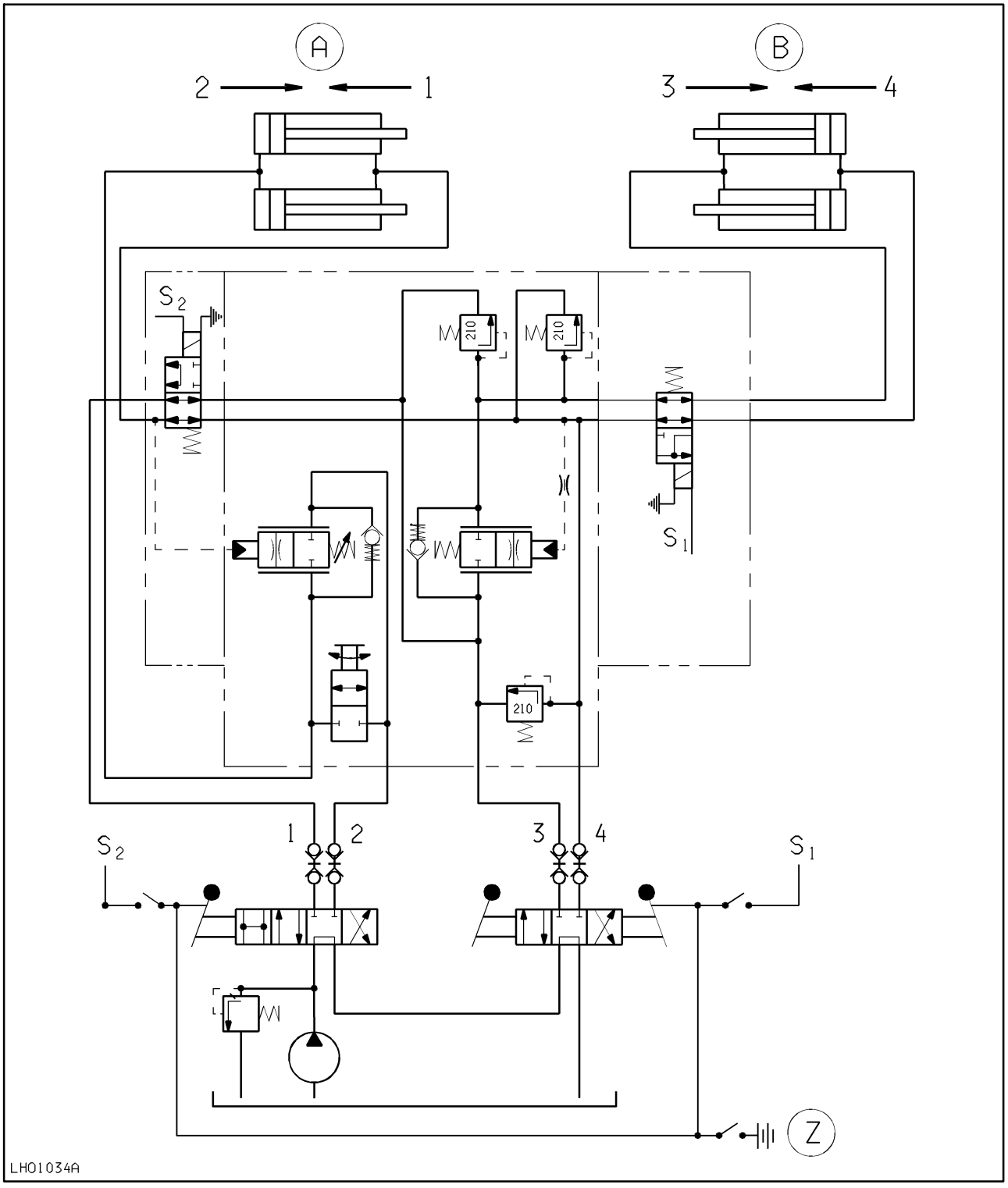
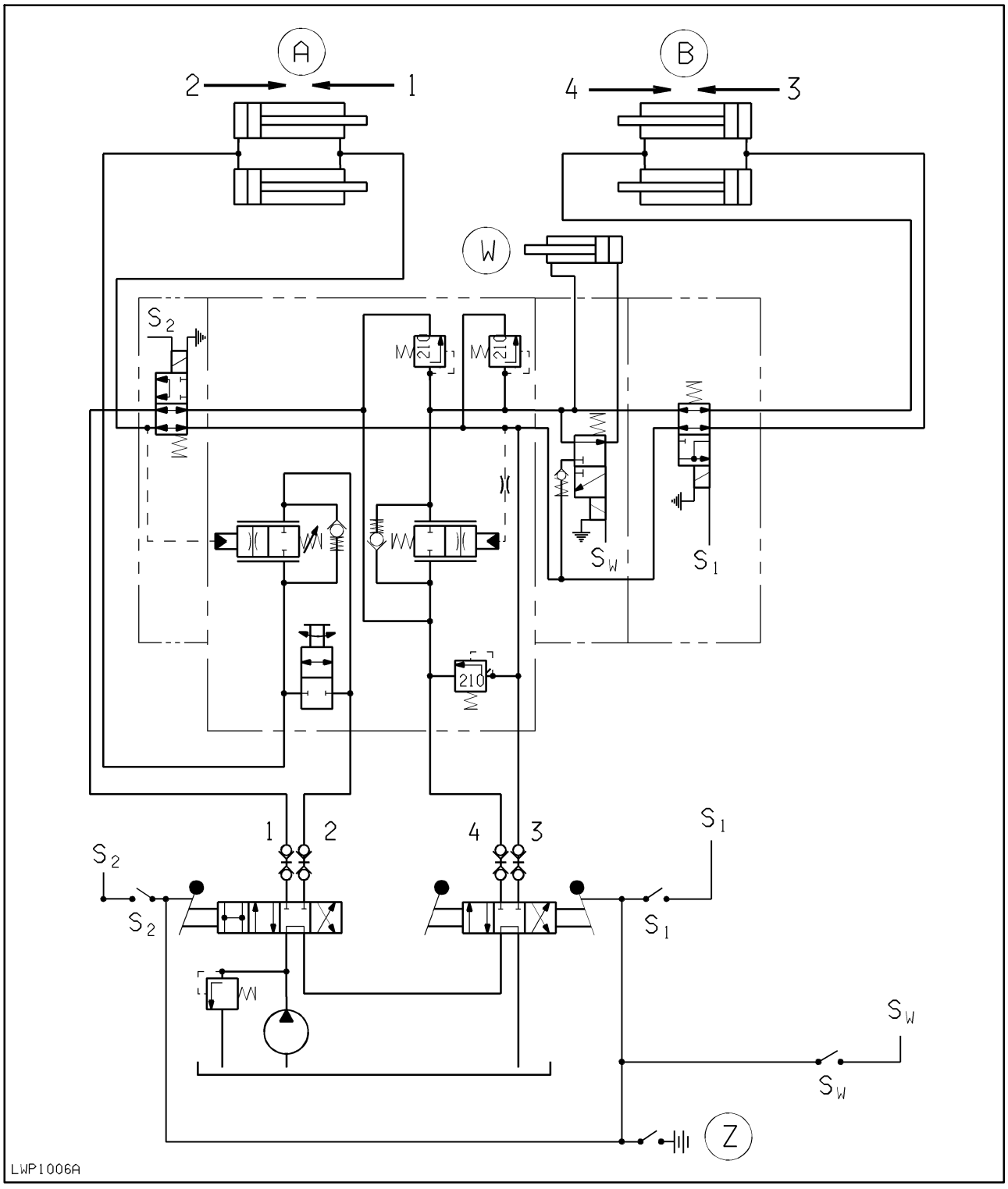


HS WITH HYDRAULIC QUICK ATTACH



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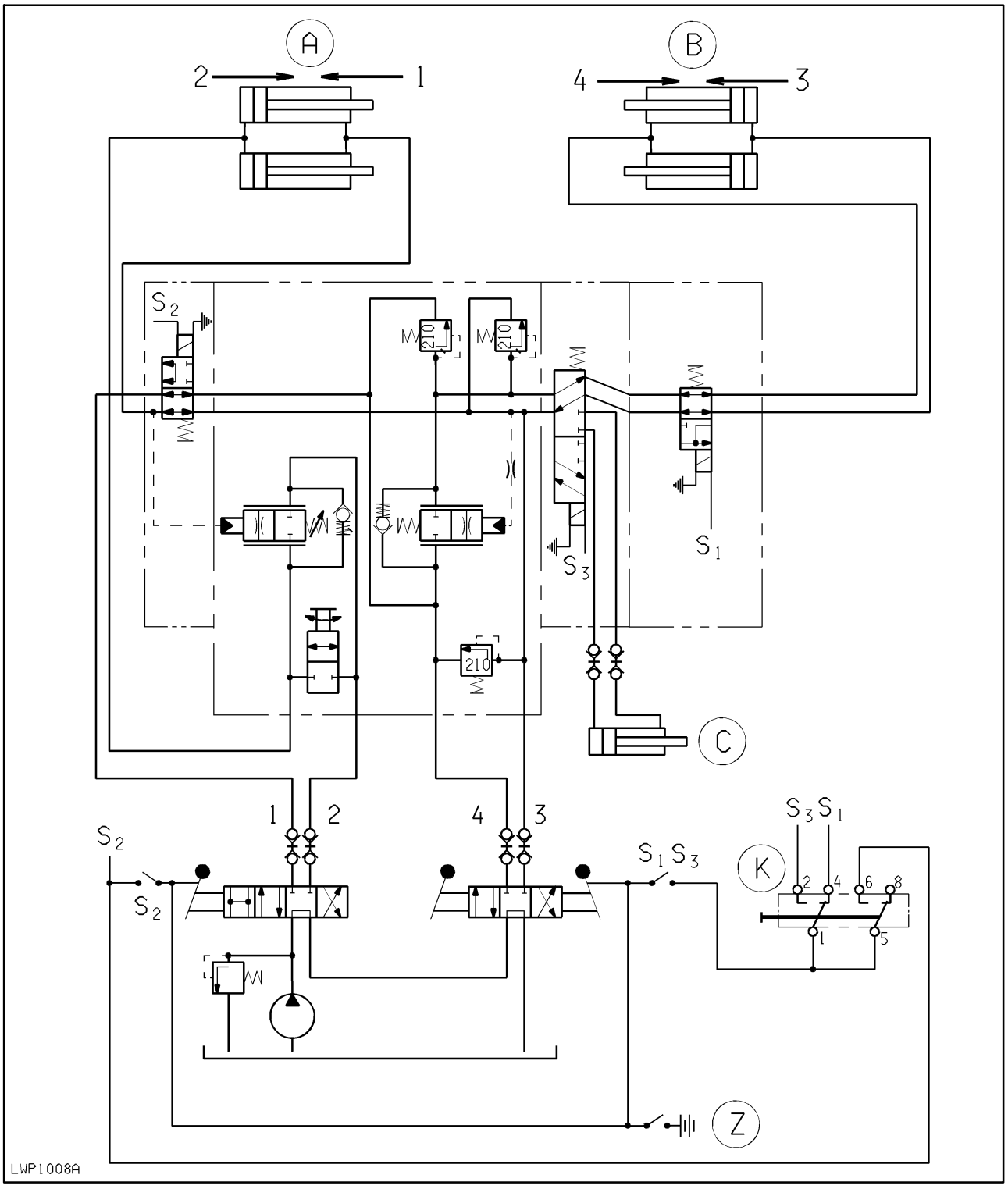
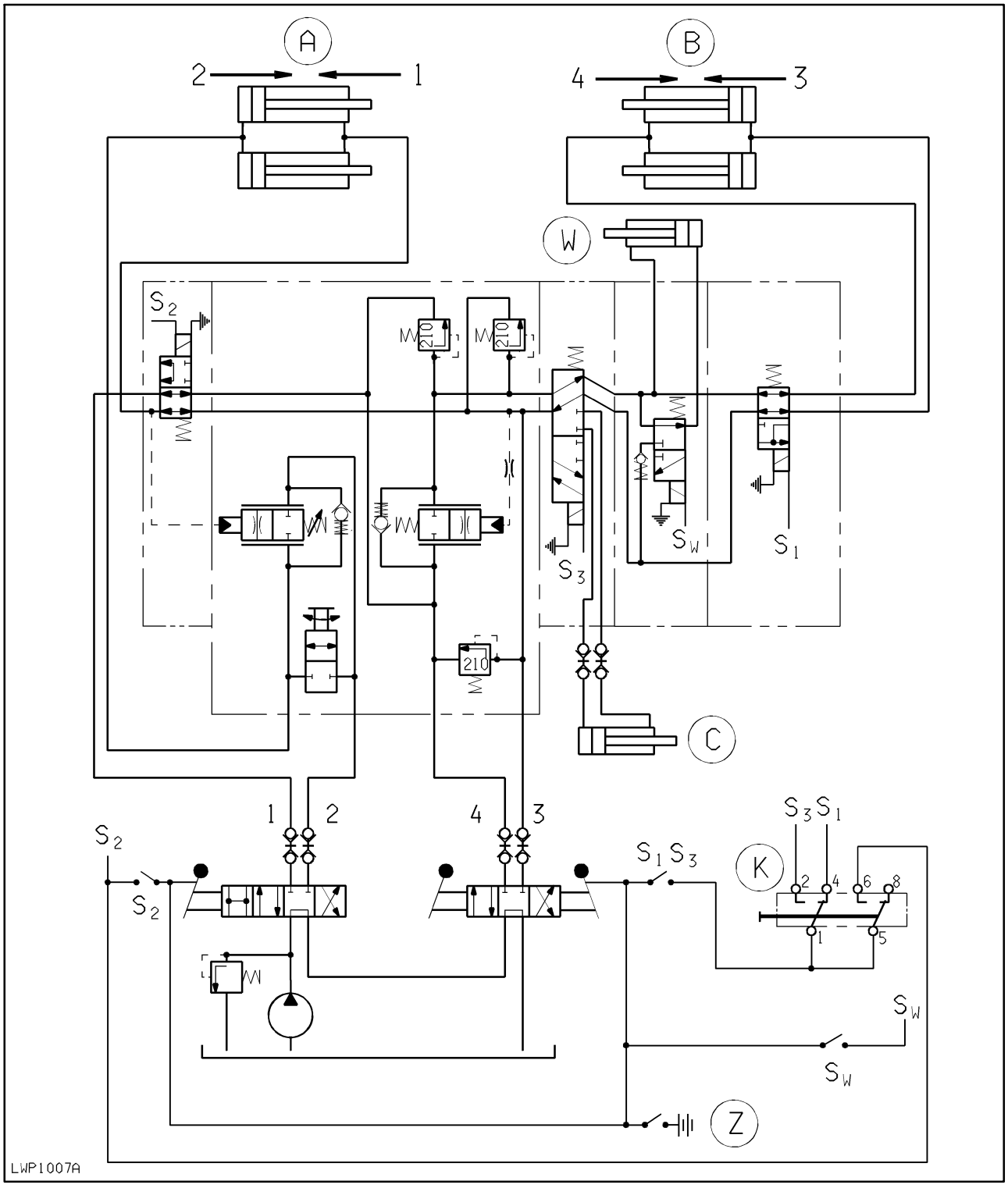


HS WITH 3RD CONTROL SERVICE AND HYDRAULIC QUICK ATTACH



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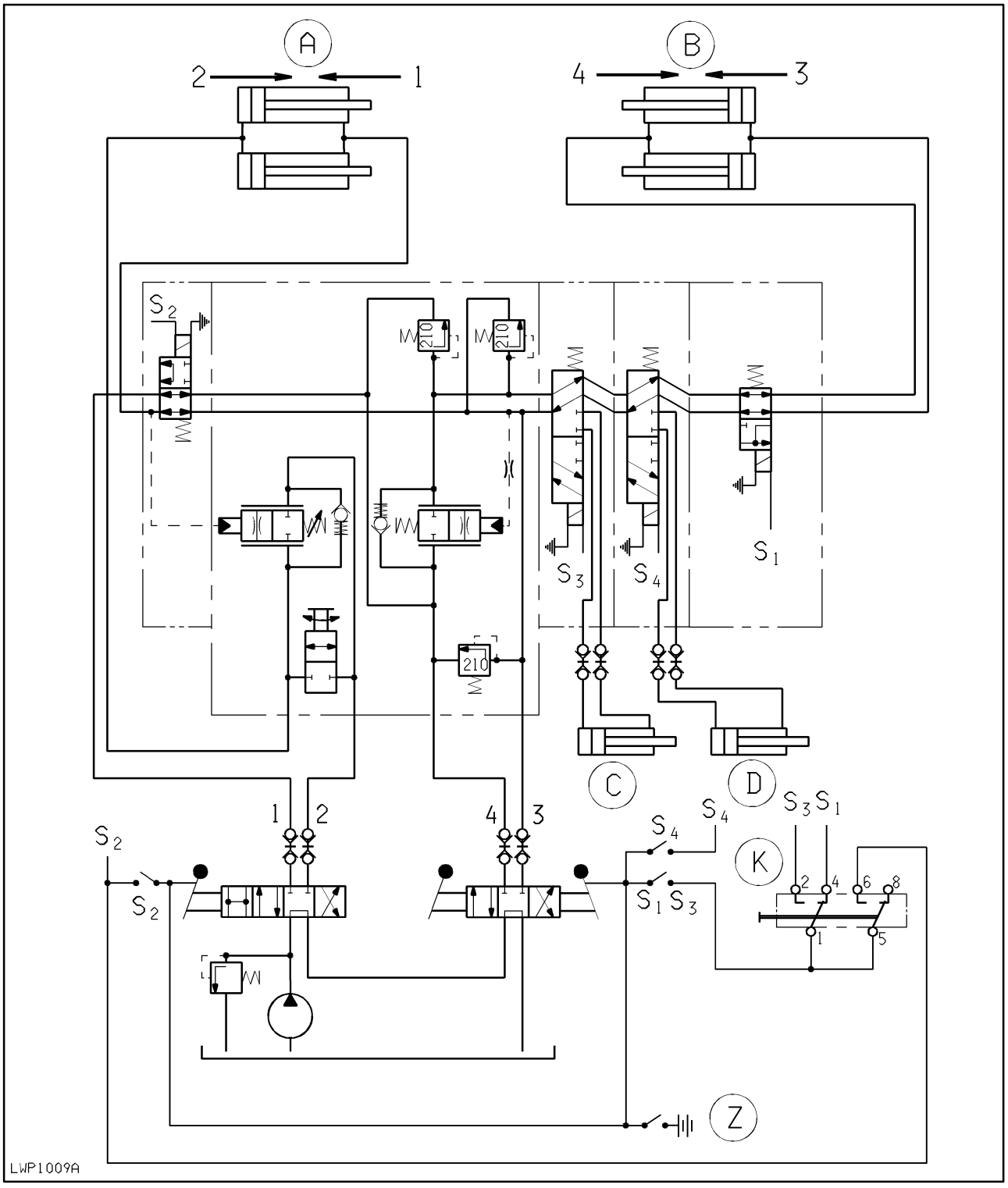
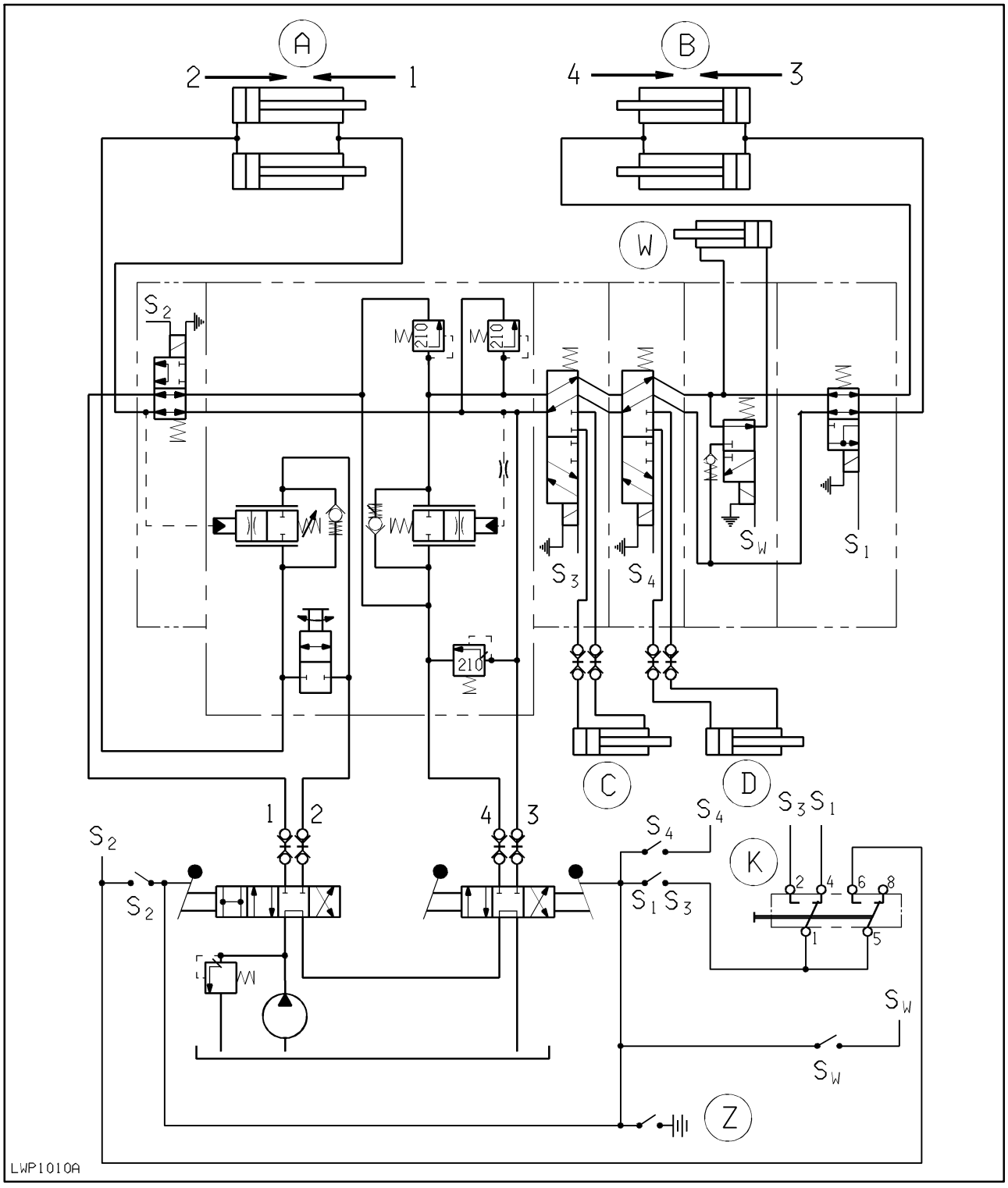


HS WITH 3RD AND 4TH CONTROL SERVICE AND HYDRAULIC QUICK ATTACH



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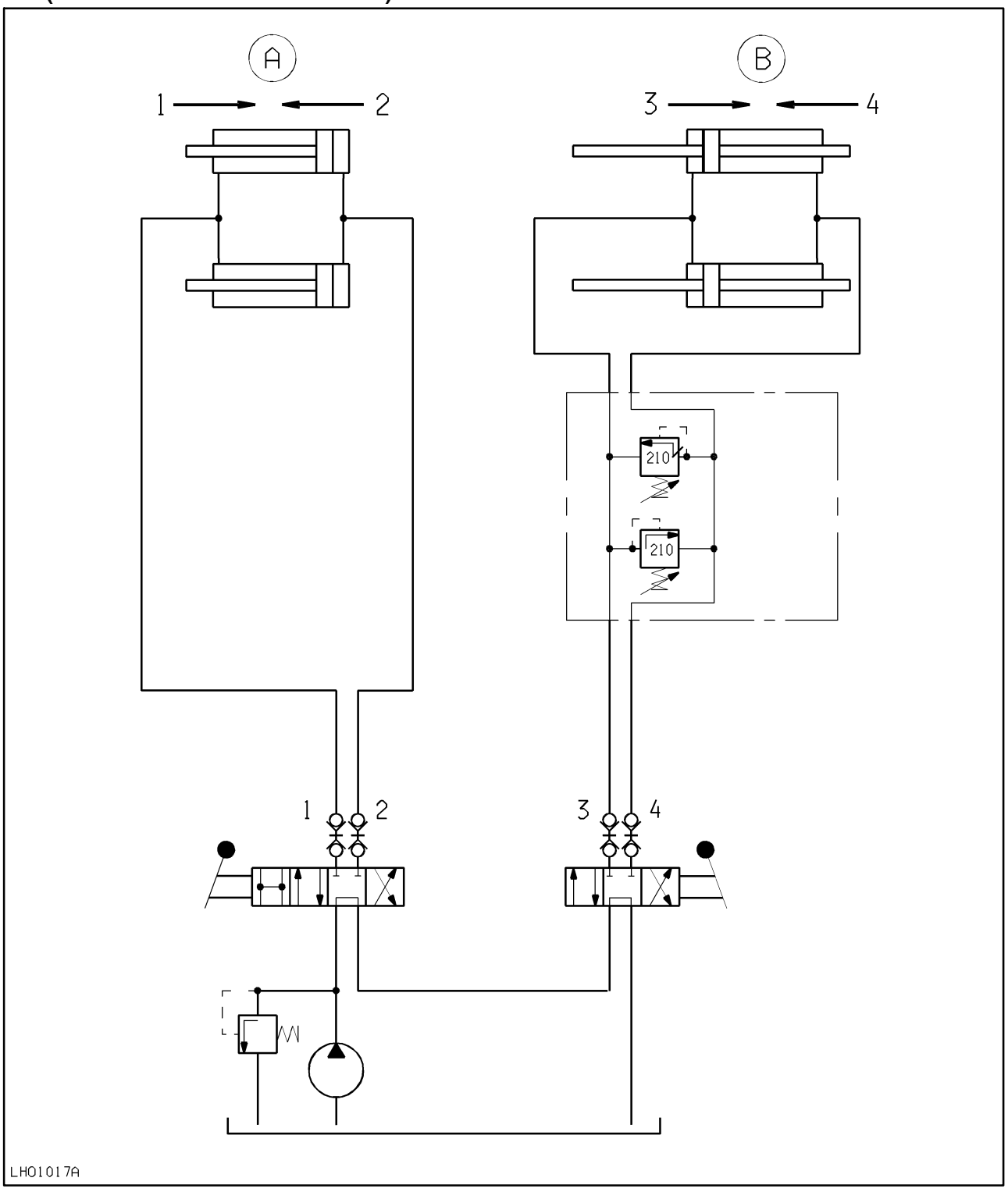

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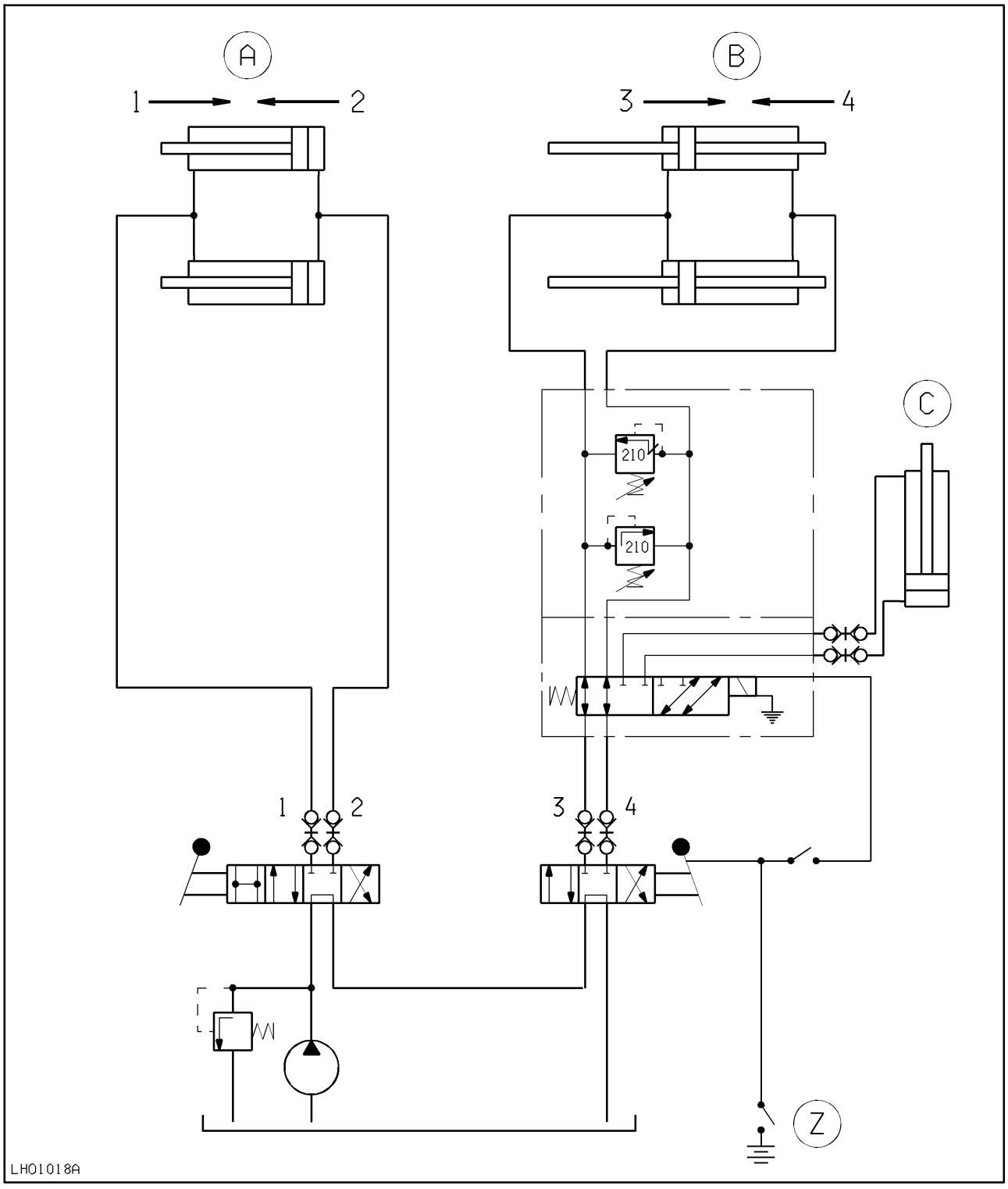
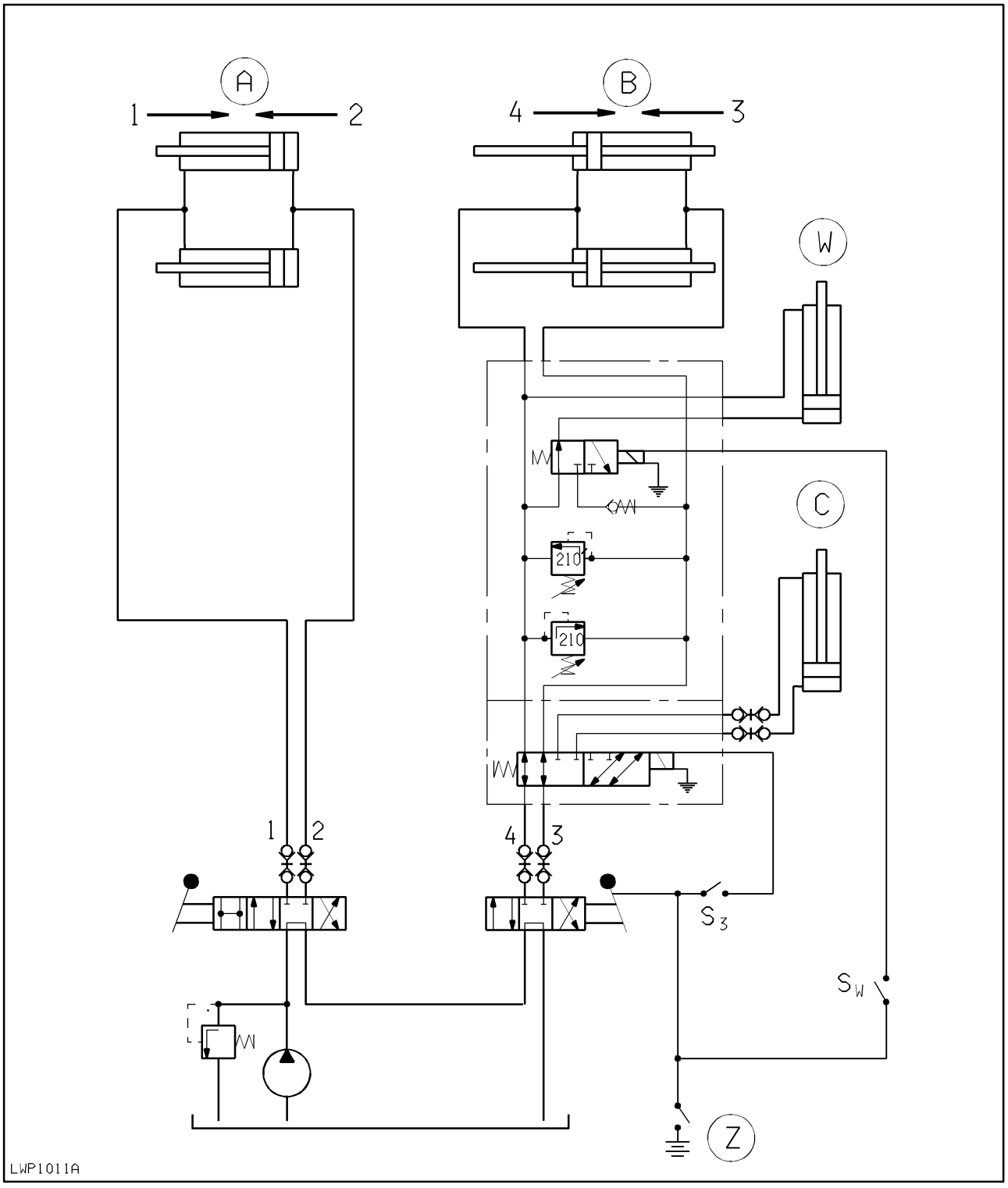


84

MS WITH 3RD CONTROL SERVICE AND HYDRAULIC QUICK ATTACH



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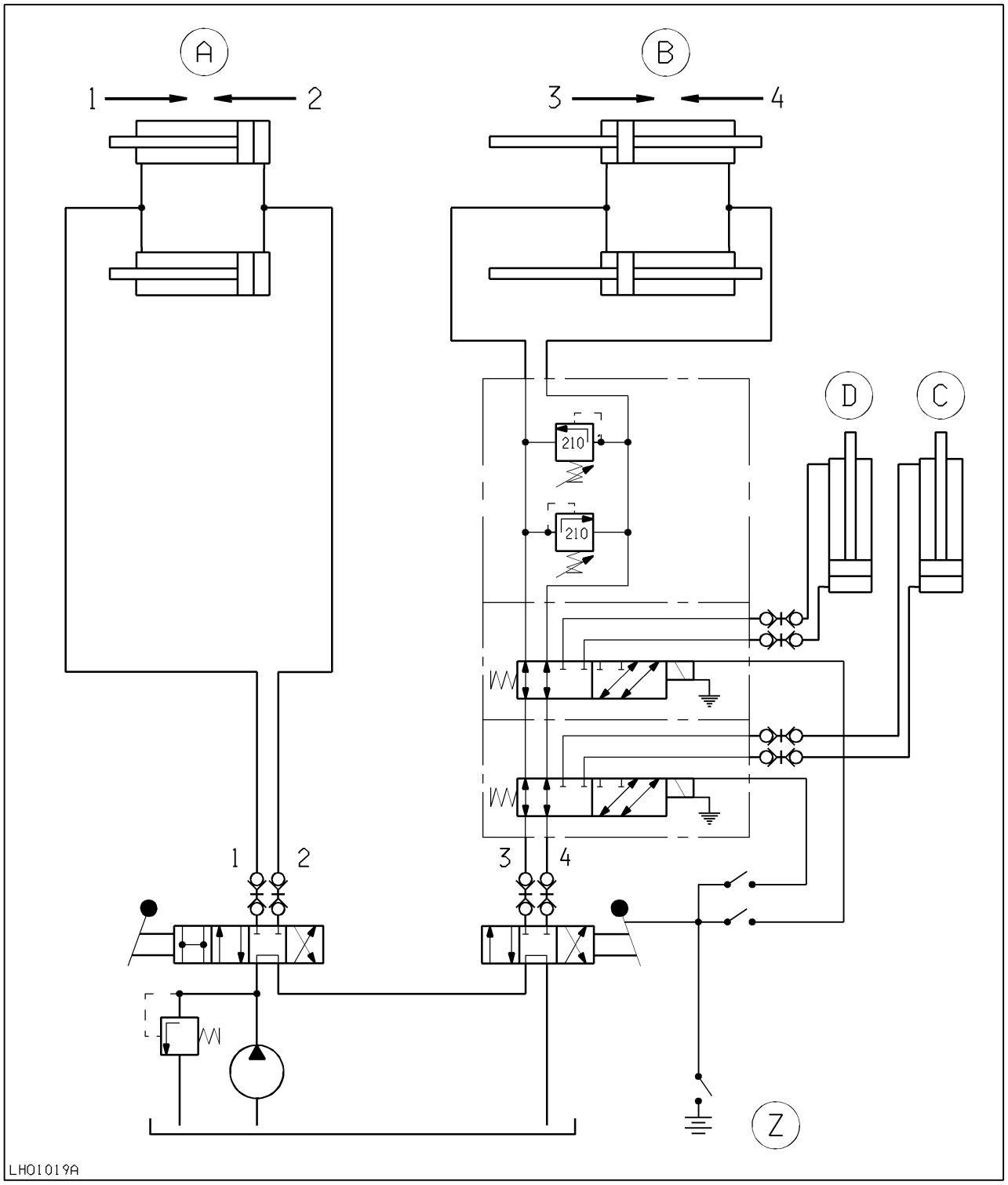

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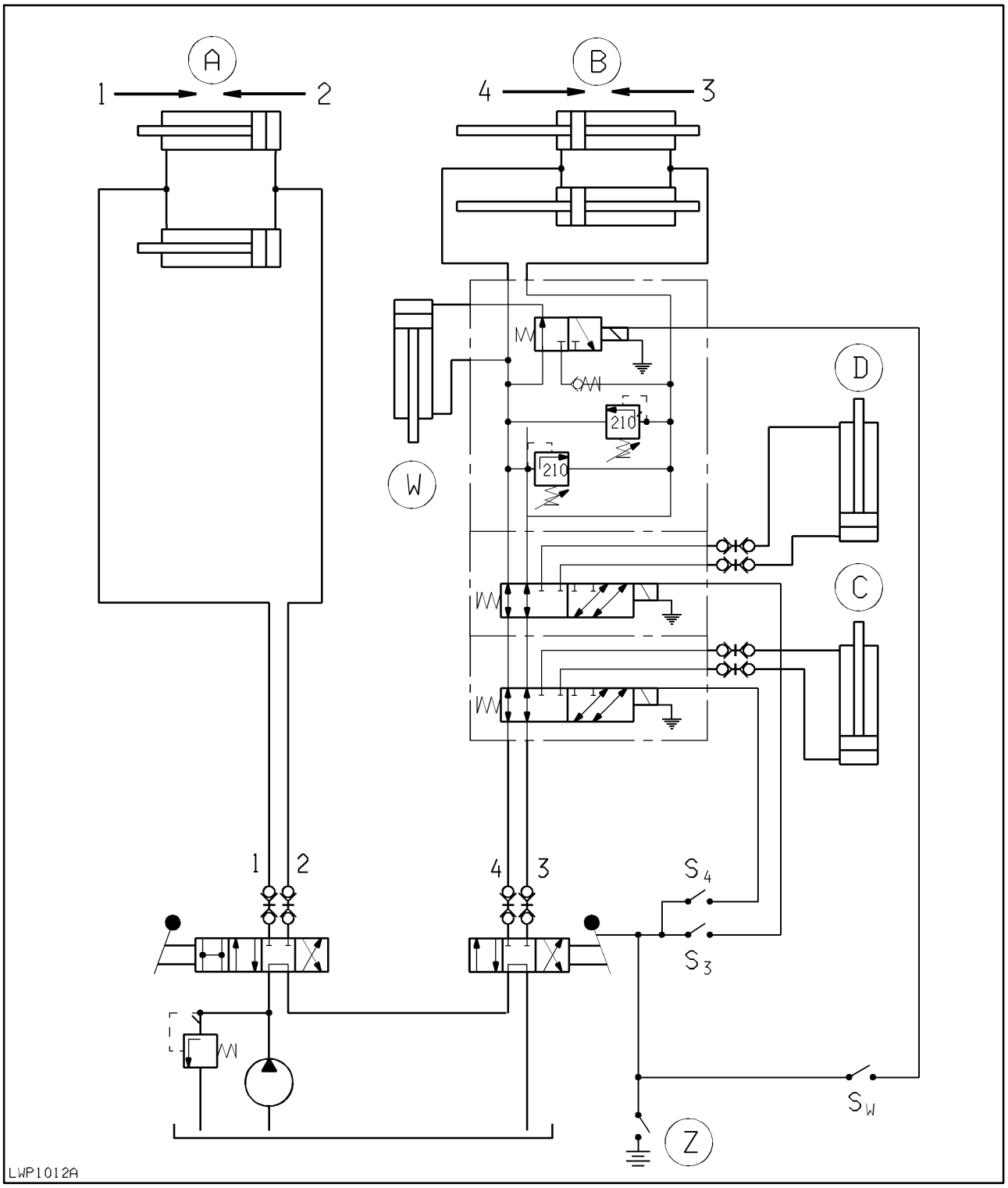

ELECTRICAL WIRING DIAGRAM

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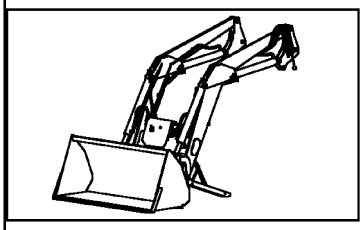

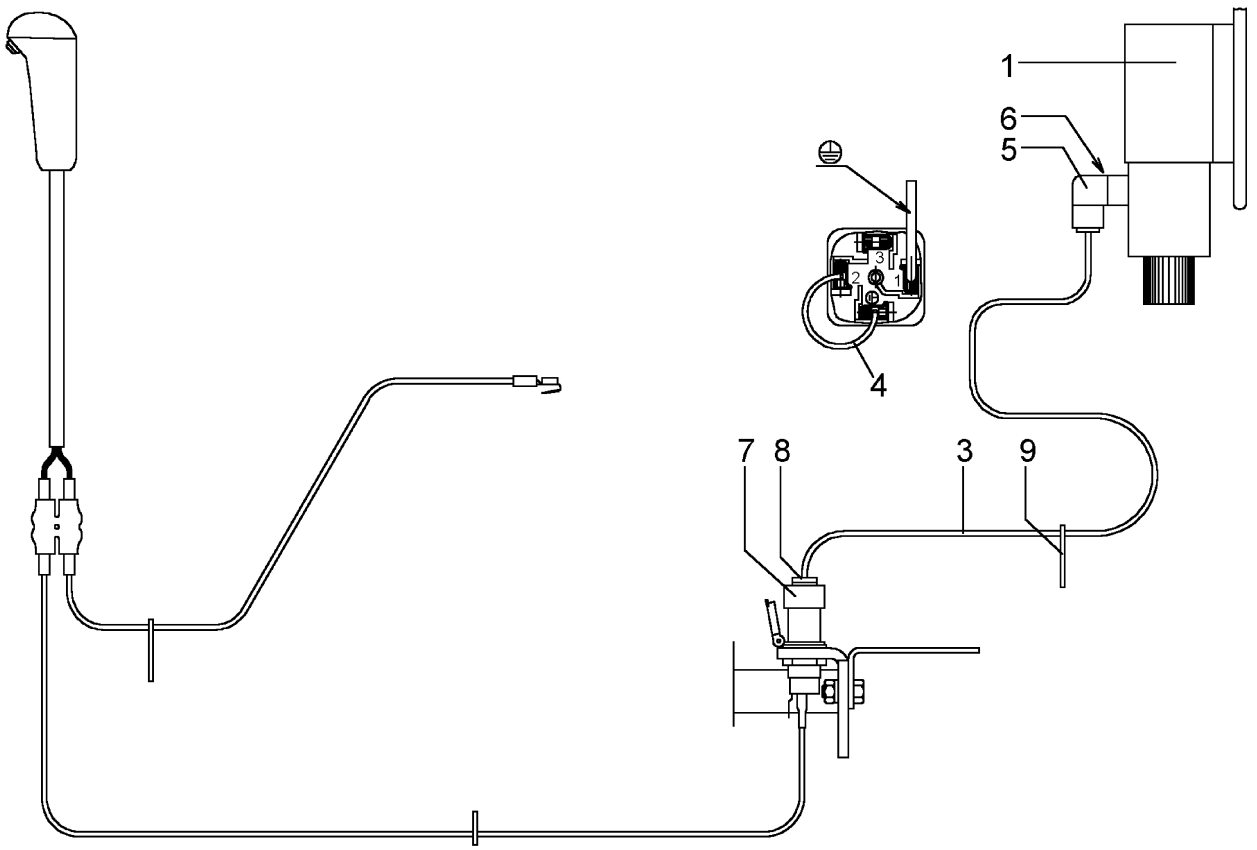

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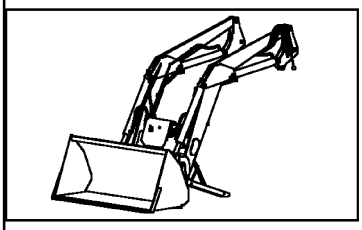

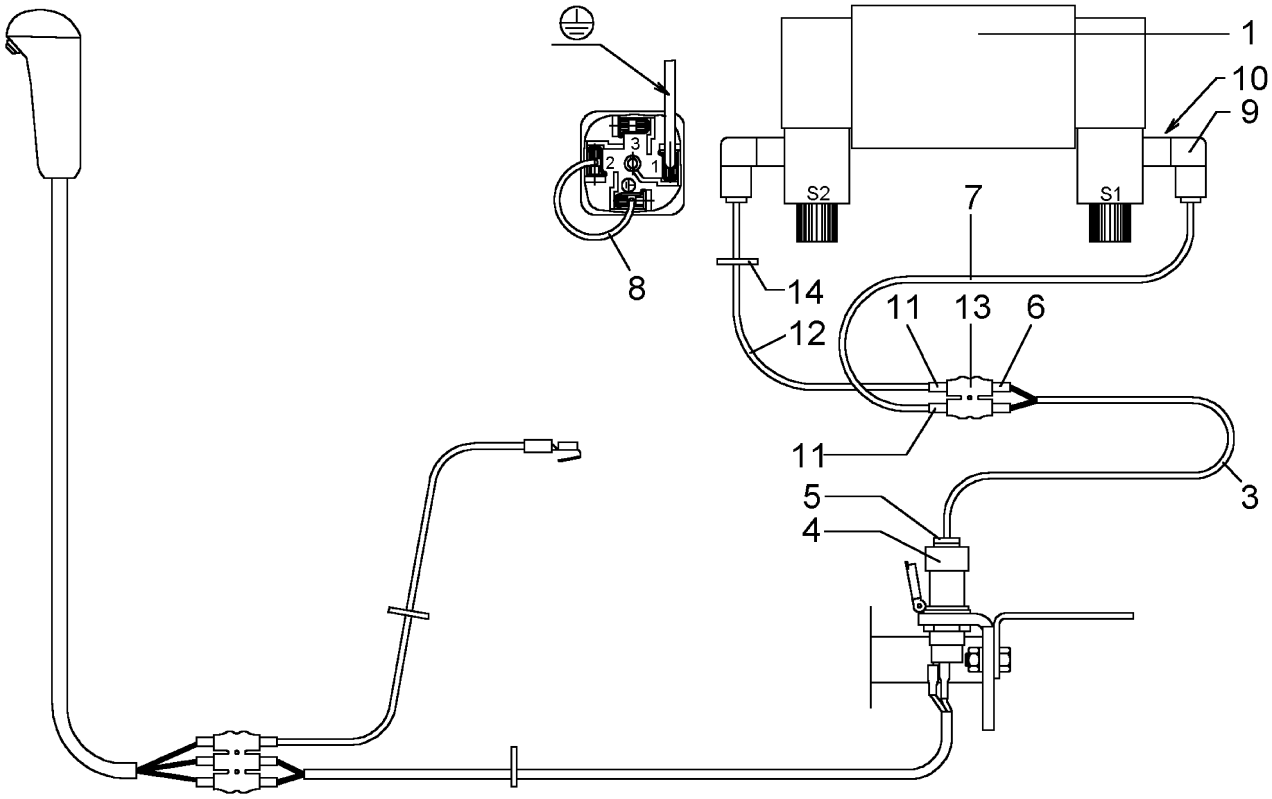

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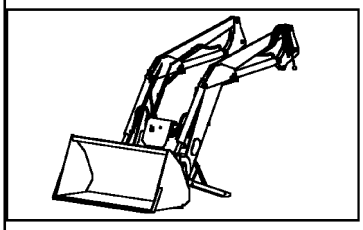

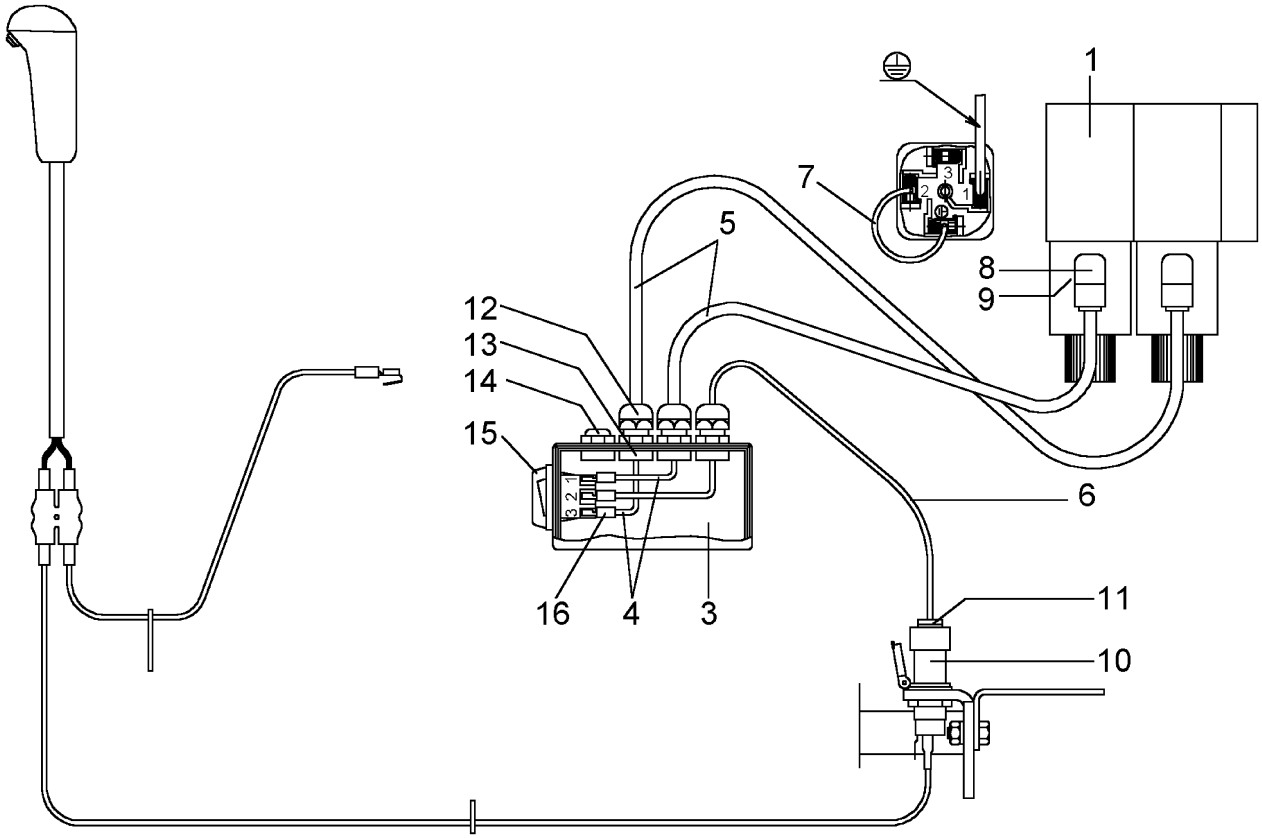

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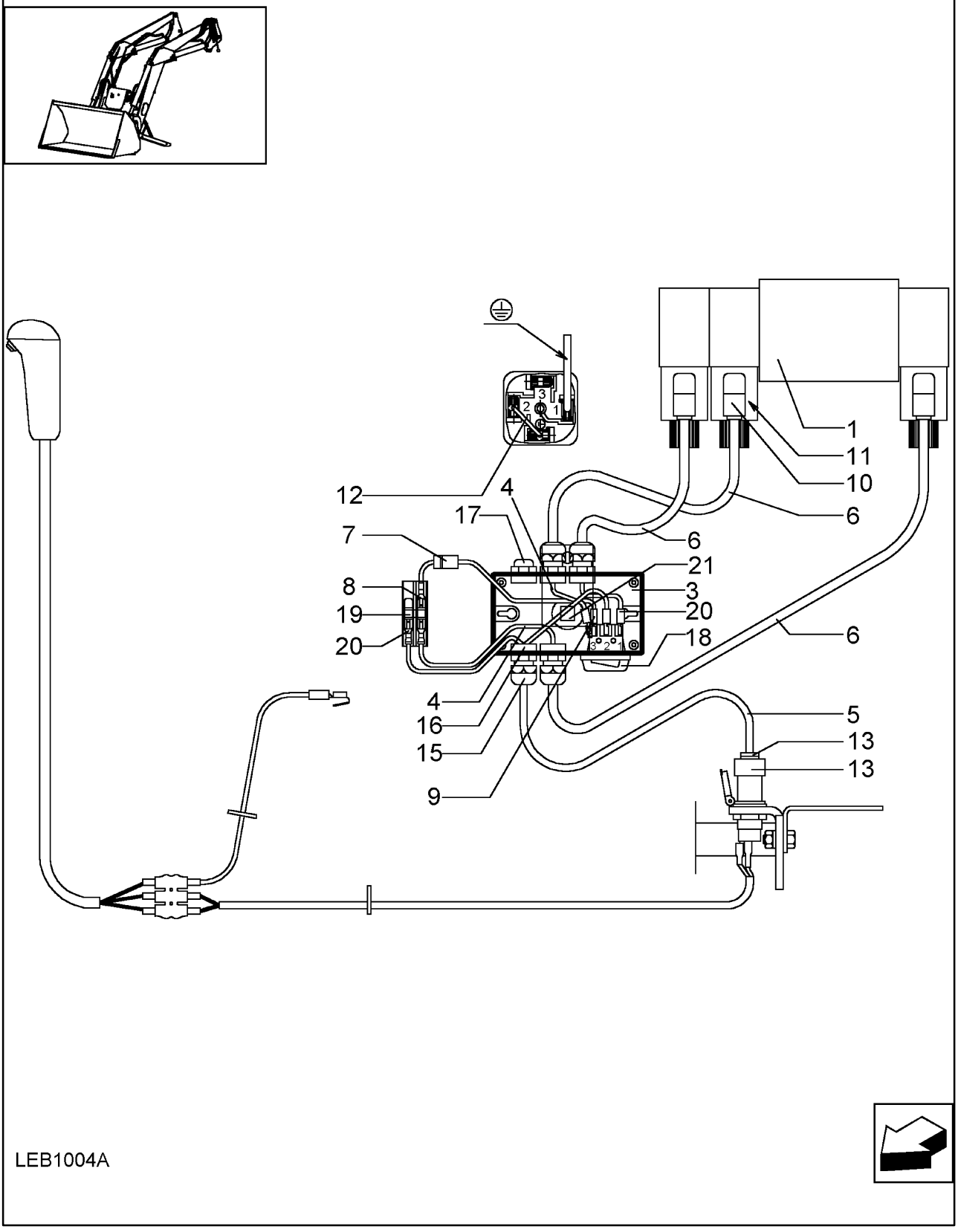

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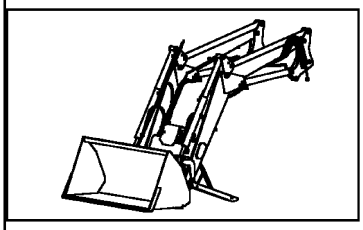

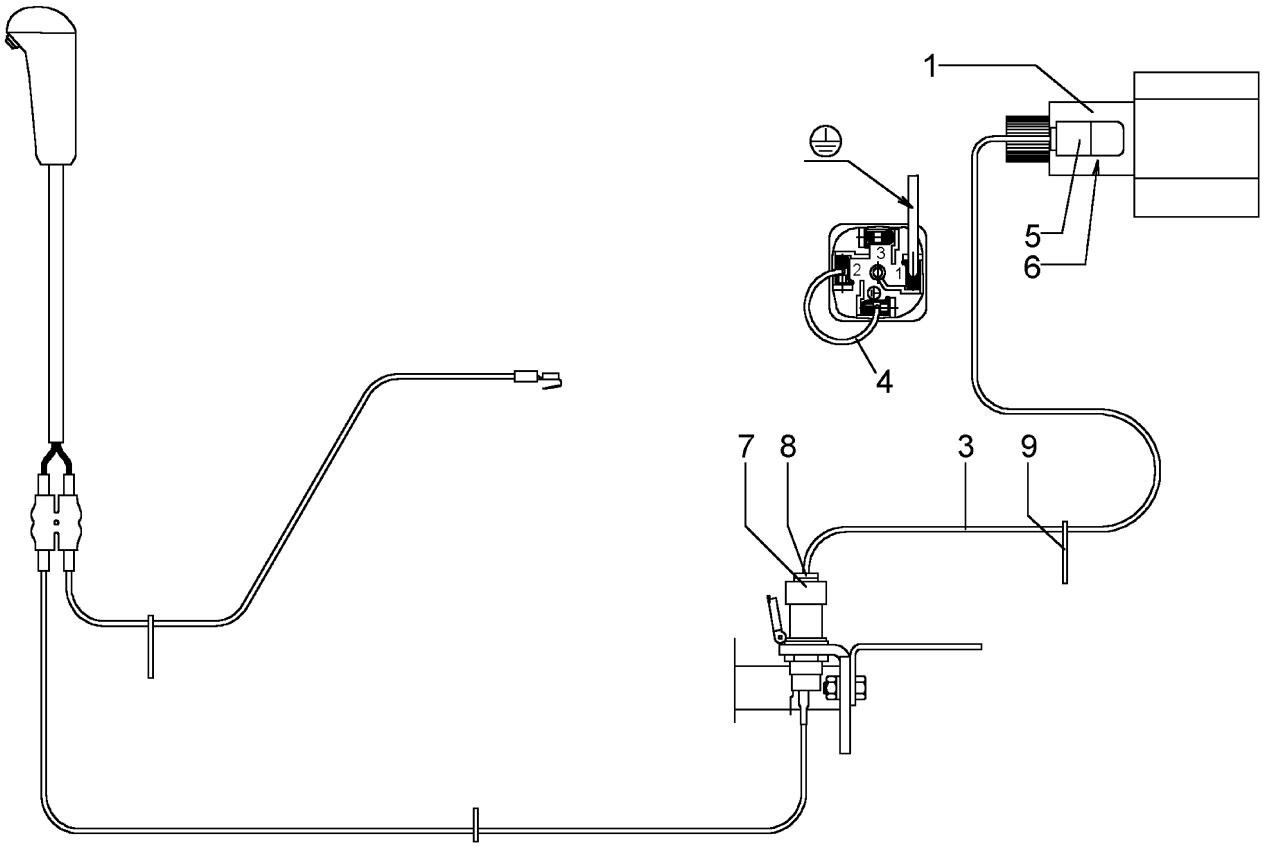

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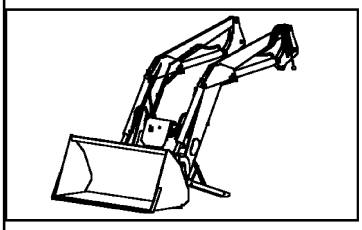

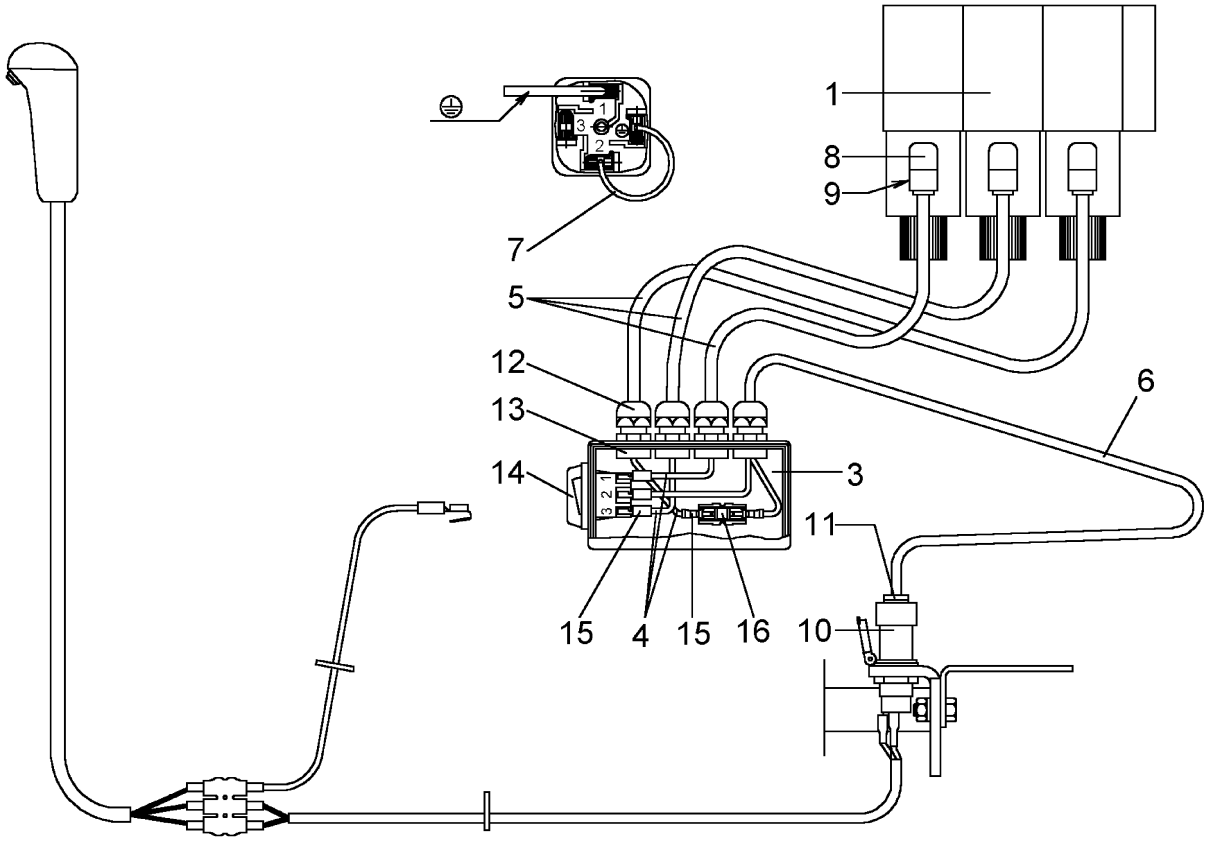

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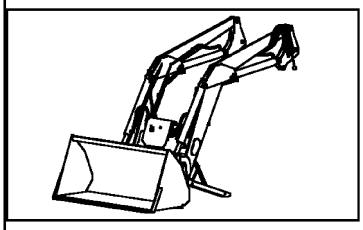

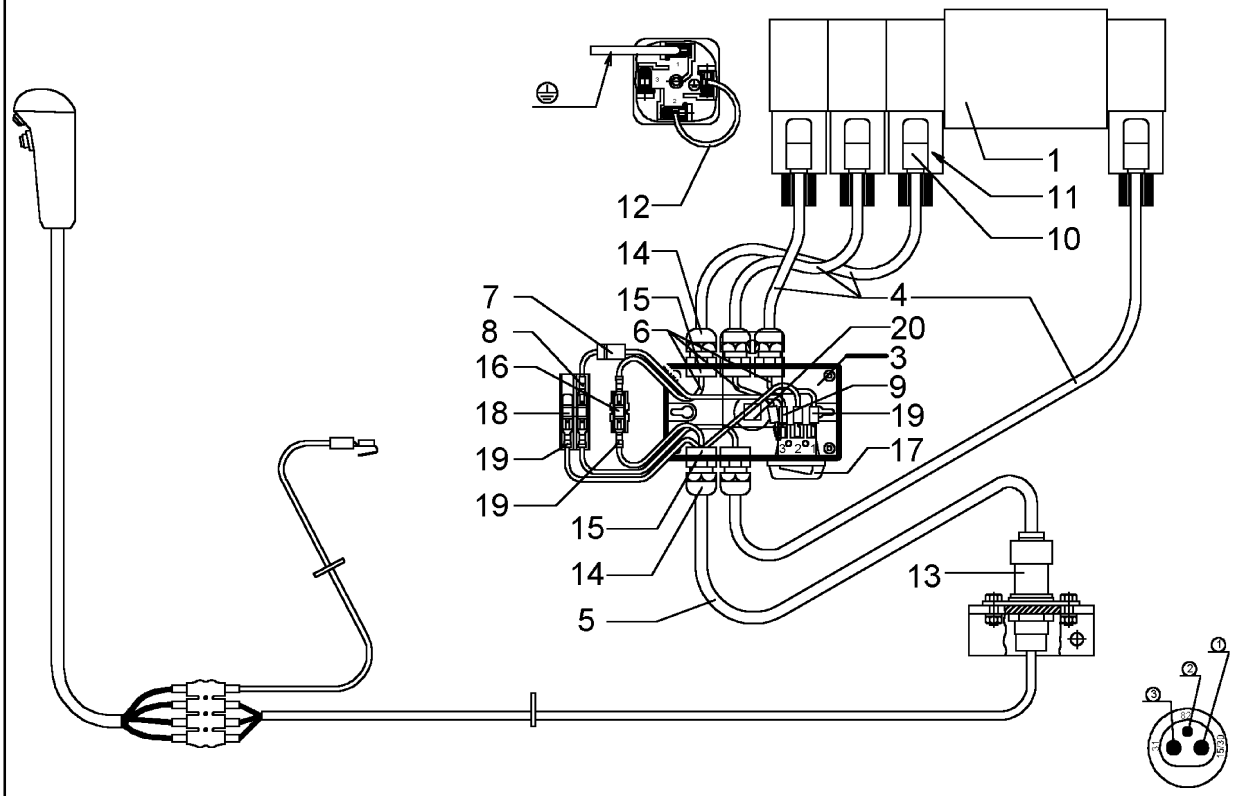

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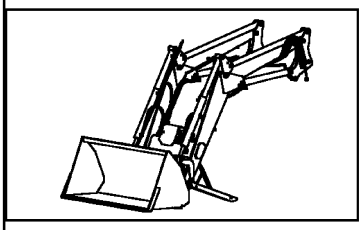
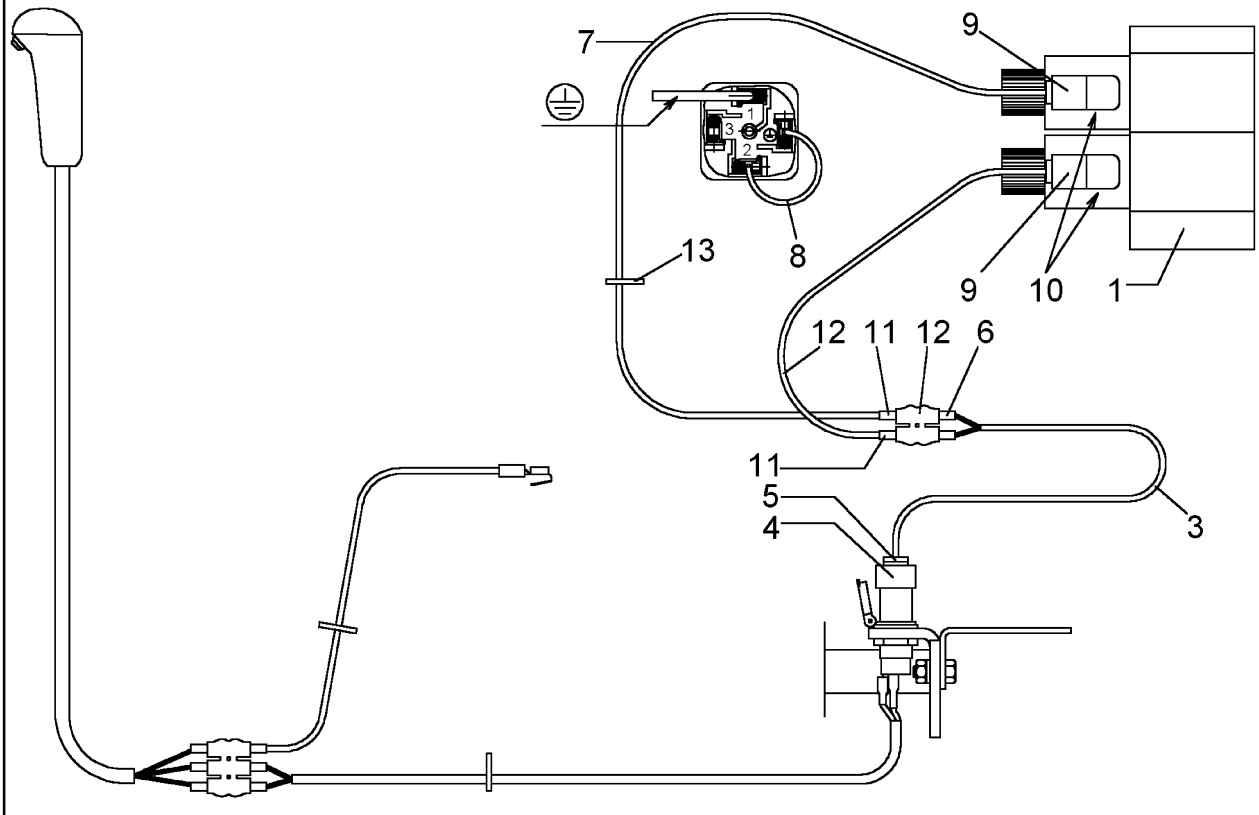
MS WITH 3RD AND 4TH CONTROL WIRING



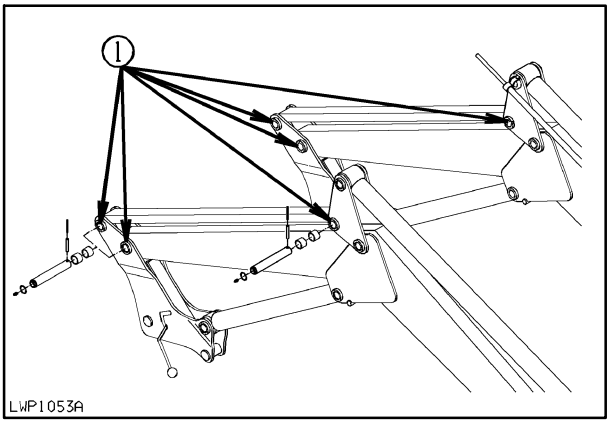


LEB1008A

REPAIR INSTRUCTIONS

MECHANICAL COMPONENTS

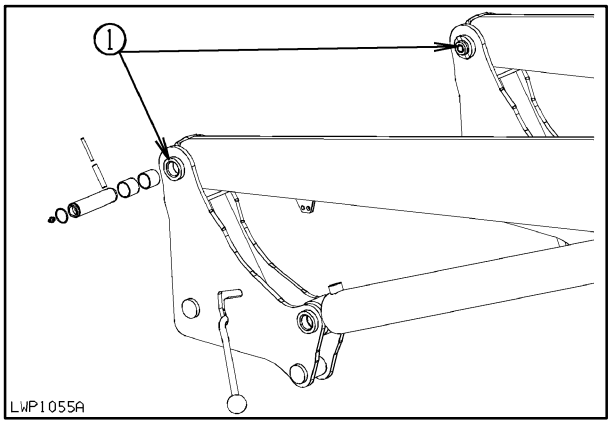
ATTENTION: Assembly instruction bolts!



90

At (high stress) pivot points on the loaders, special high-grade pivot bolts are used.

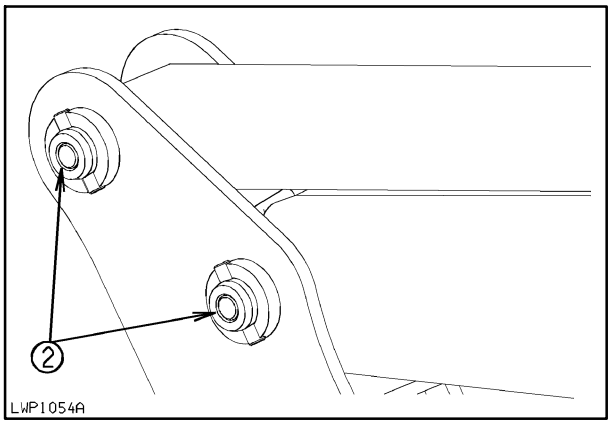
- MS (fig. 90) 6 places
- NS/HS (fig. 91) 2 places



91

So take care on repairs that these bolts are inserted again to the points marked with (1), figs. 91 & 92.

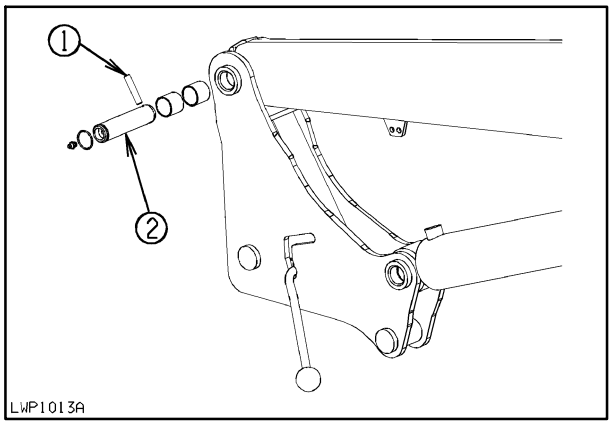
The high-graded bolts can be recognized by the ring groove mark (2) on the inside end face (see fig. 92).



92

Replacement of Bolt

1. Knock out hollow tension pin (1).
2. Knock out bolt (2) with a suitable mandrel.
3. Carry out assembly in reverse order.



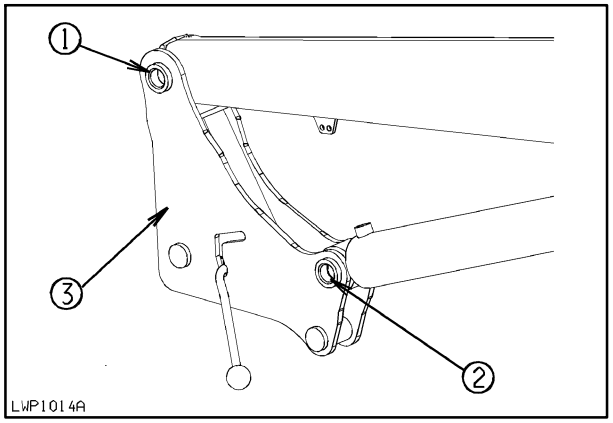
93

Replacement of Drive-in Triangles of NS and HS Liftarms

⚠ WARNING ⚠

For this operation the liftarm has to be disassembled from tractor!

1. Remove bolts (1+2) as to the instruction on page 71 (fig.94).
2. Take off drive-in triangle (3).
3. Carry out assembly in reverse order.



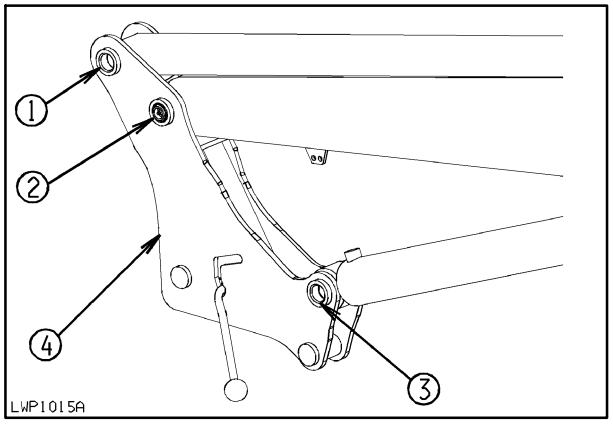
94

Replacement of Drive-in Triangles of MS

⚠ WARNING ⚠

For this operation the liftarm has to be disassembled from tractor!

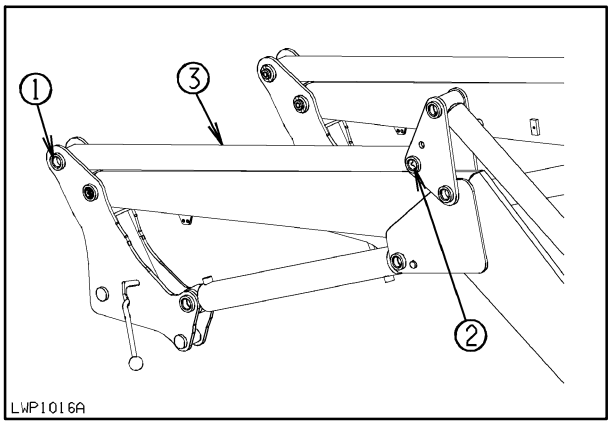
1. Remove bolts (1,2+3) as to the instruction on page 71 (fig.94).
2. Take off drive-in triangle (4).
3. Carry out assembly in reverse order.



95

Replacement of Control Rods (MS Liftarms Only)

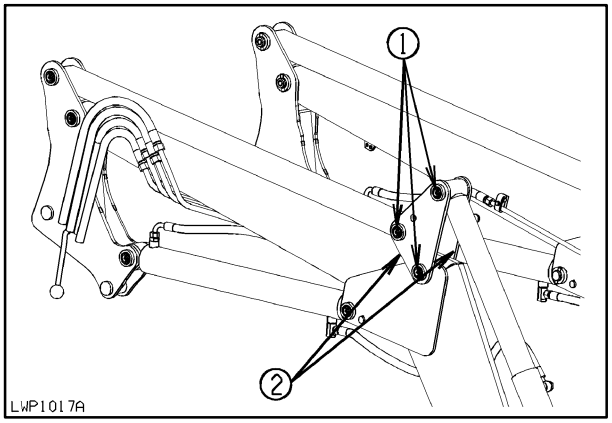
1. Remove bolts (1+2) as to the instruction on page 71(fig.94).
2. Take off control bar (3).
3. Carry out assembly in reverse order.



96

Replacement of Linkage Plates (MS Liftarms Only)

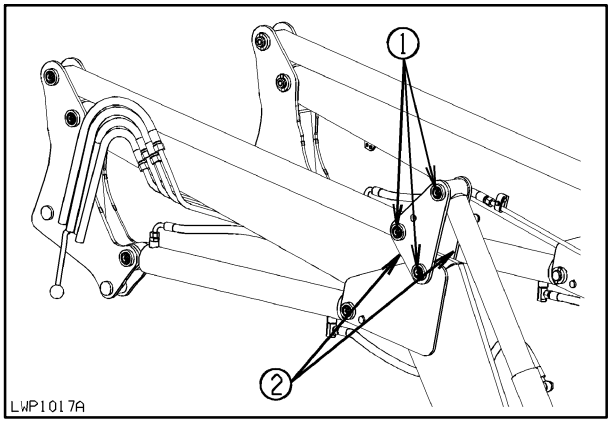
1. Remove the three bolts (1) as to the instruction on page 71(fig.94).
2. Take off the two deflection plates.
3. Carry out assembly in reverse order.



97

Replacement of Relay Arm

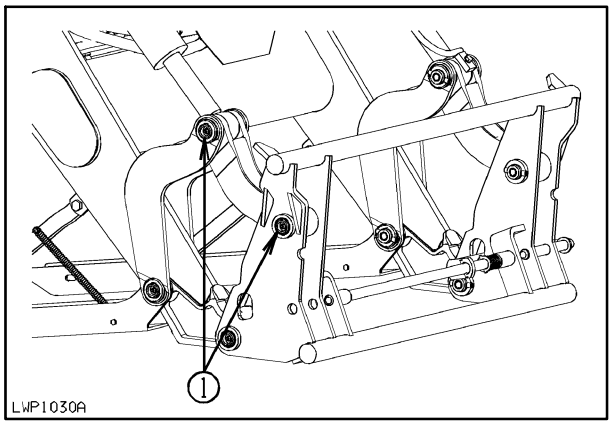
1. Remove the bolt (1) as to the instruction on page 71(fig.94).
2. Take off relay arm.
3. Carry out assembly in reverse order.



98

Replacement of Double Lever Handle

1. Remove bolt (1) as to the instruction on page 71(fig.94).
2. Take off double lever handle.
3. Carry out assembly in reverse order.



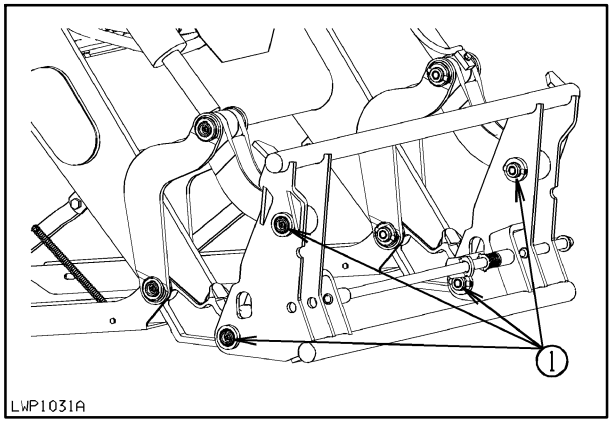
99

Replacement of Quick Attach Frame

WARNING

For this operation the liftarm has to be disassembled from tractor!

1. Remove bolt (1) as to the instruction on page 71(fig.94).
2. Take off frame.
3. Carry out assembly in reverse order.



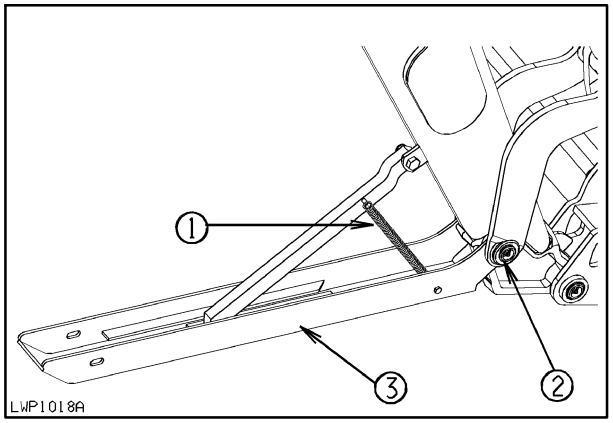
100

Replacement of Varipark Stands

WARNING

For this operation the liftarm has to be disassembled from tractor!

1. Detach tension spring (1).
2. Remove bolt (2) as to the instruction on page 71(fig.94).
3. Take off support stand (3).
4. Carry out assembly in reverse order.



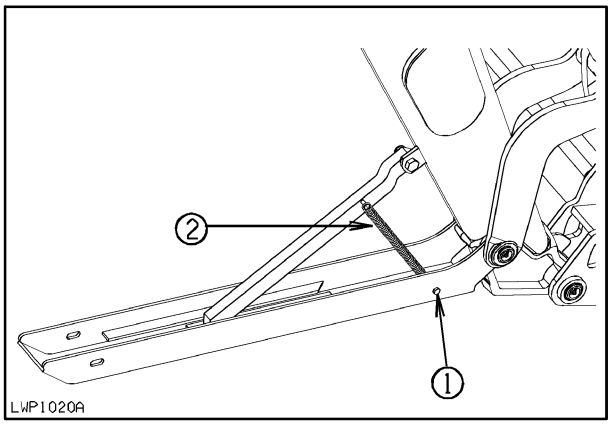
101

Replacement of Spring for Varipark Lock

⚠ WARNING ⚠

For this operation the liftarm has to be disassembled from tractor!

1. Remove screw (1).
2. Take out spring (2).
3. Carry out assembly in reverse order.



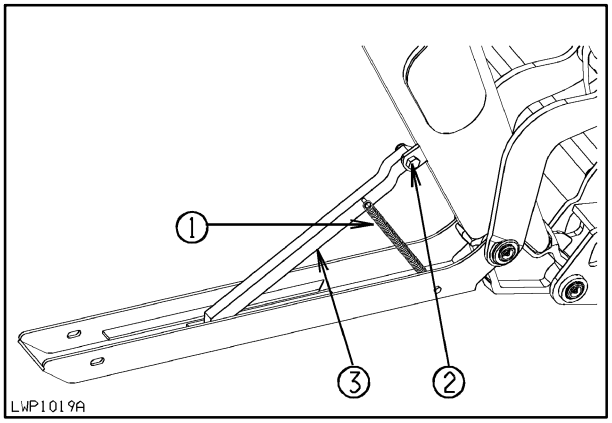
102

Replacement of Lock for Varipark

⚠ WARNING ⚠

For this operation the liftarm has to be disassembled from tractor!

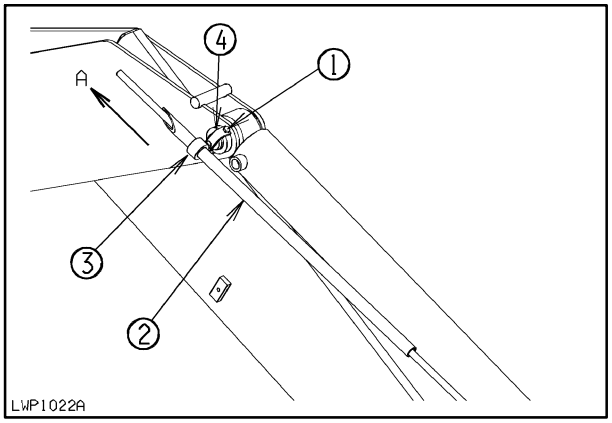
1. Detach tension spring (1).
2. Remove screw (2).
3. Take off locking (3).
4. Carry out assembly in reverse order.



103

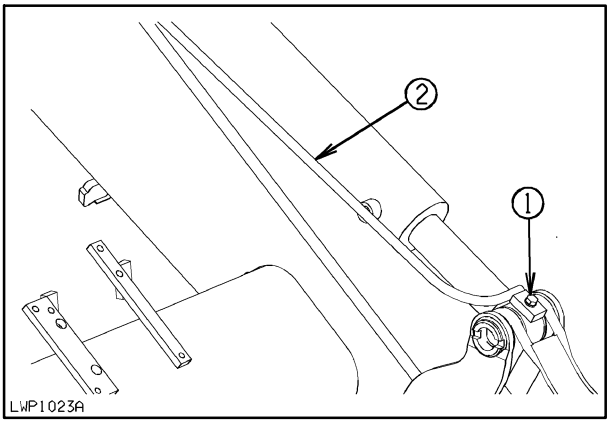
Replacement of Visual Metering Unit

1. Remove screw (1).
2. Pull off tube (2) with sleeve (3) and yoke (4) from visual display in direction A.



104

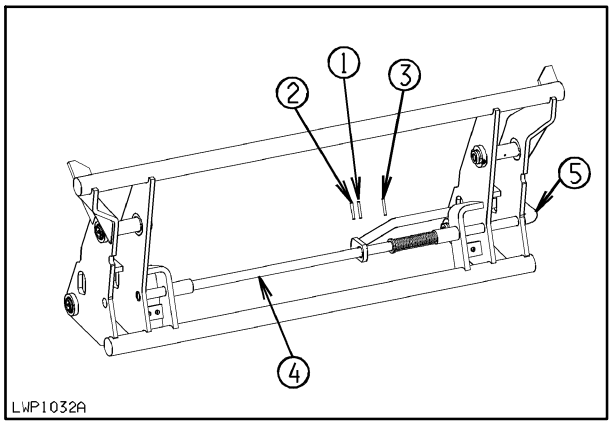
3. Remove screw (1).
4. Take off visual display (2).
5. Carry out assembly in reverse order.



105

Replacement of Quick Attach

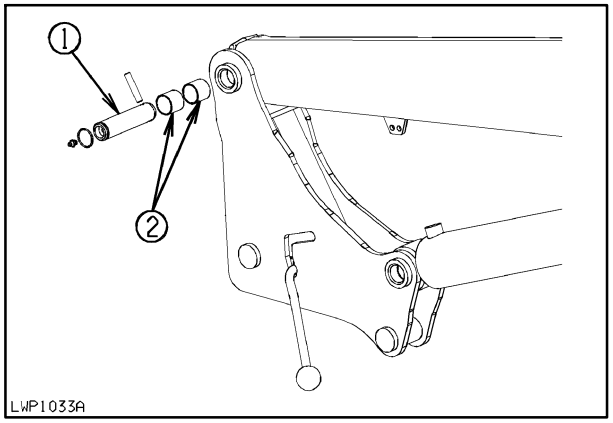
1. Knock out medium hollow tension pin (1) - Attention, due to the spring tension the bar (4) bounces to the left.
2. Take off spring.
3. Knock out left hollow tension pin (2).
4. Knock out right hollow tension pin (3).
5. Take off bar (4) to the left from the change frame.
6. Take off plug (5) from the change frame.
7. Carry out assembly in reverse order.



106

Replacement of Bushes

1. Remove bolt (1) as to the instruction on page 71(fig.94).
2. Knock out worn bushes.
3. Carry out assembly in reserve order. Please note that the bushes are to be of a flush fit.



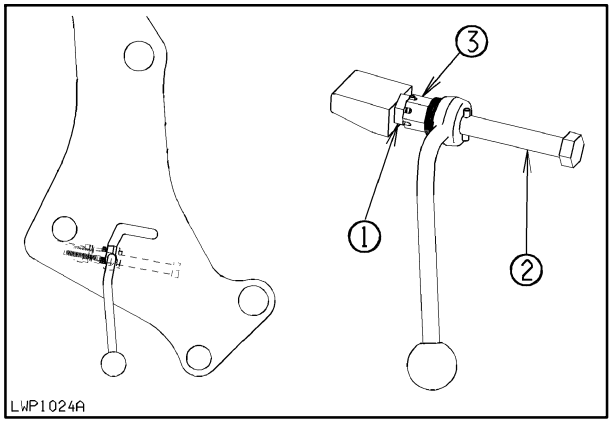
107

Replacement of Locking of Drive-in Triangles

⚠ WARNING ⚠

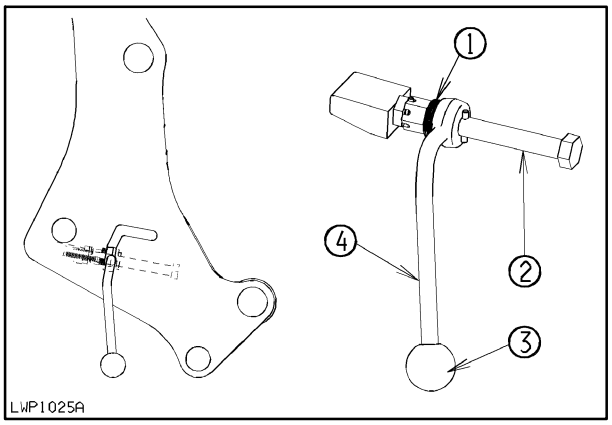
For this operation the liftarm has to be disassembled from tractor!

1. Remove drive-in triangle.
2. Release locknut (1).**Fig. 109**
3. Knock out the two split pins.
4. Unscrew stud bolt (2) from the key.
5. Screw down locknut from stud bolt.
6. Screw down castle nut from stud bolt.



108

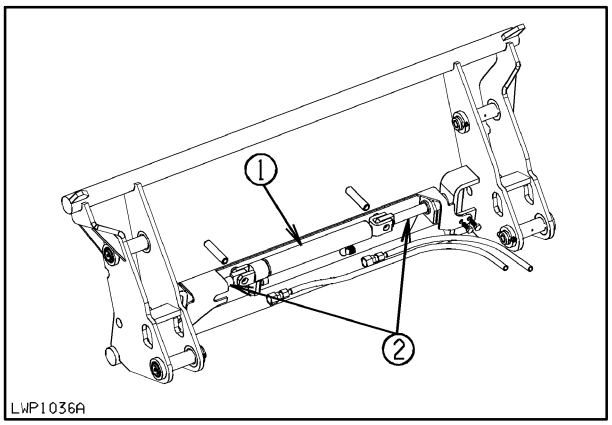
7. Remove cup spring packages (1) from stud bolt (2).**Fig. 110**
8. Screw down ball handle (3) from the grip bolt (4).
9. Pull out stud bolt from the drive-in triangle.
10. Take off grip bolt from the drive-in triangle.
11. When assembling - in reverse order - tighten the castle nut lightly against the cup spring packages and lock with a split pin. The position of the key has to be considered as well (see figure).



109

Replacement Plug for Hydraulic Quick Attach

1. Disassemble cylinder (1) as to the instruction on page 77 (fig.115), headed, **"Replacement hydraulic cylinder for Hydraulic Quick Attach".**
2. Take off plug (2).
3. Carry out assembly in reserve order.

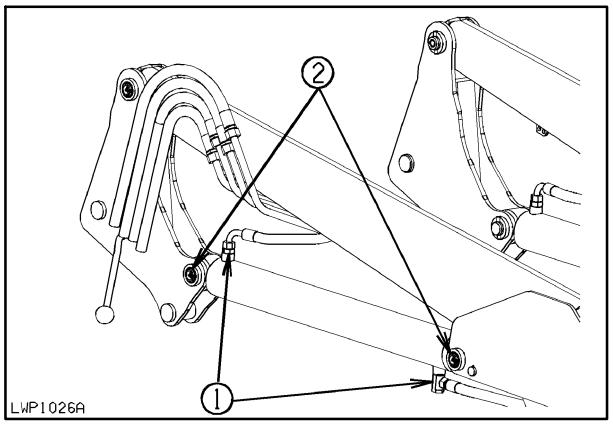


110

HYDRAULIC COMPONENTS

Replacement Cylinder of Function "Lifting - Lowering"

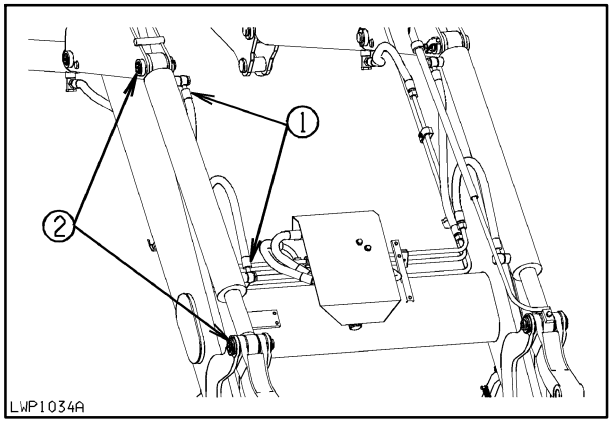
1. Disassemble tube lines (1).
2. Remove bolts (2) as to the instruction on page 71(fig.94).
3. Remove cylinder.
4. Carry out assembly in reverse order.



111

Replacement Cylinder of Function "Tipping - Crowding"

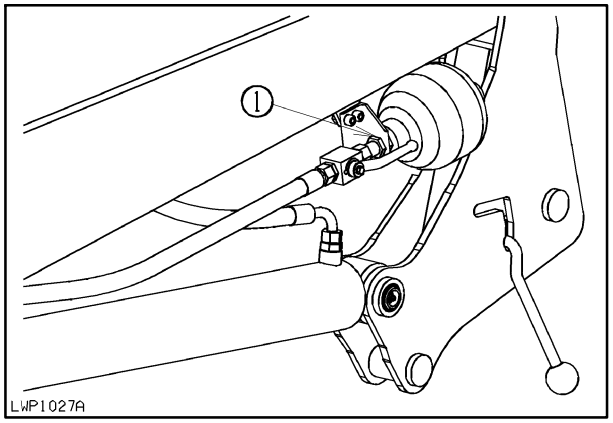
1. Disassemble tube lines (1) (with MS liftarm additionally the bleed valve).
2. The visual display unit of the left cylinder in driving direction has to be assembled according to operation step on page 74(fig.105), headed, "**Replacement of visual metering unit**" to remove the cylinder.
3. Remove bolts (2) as to the instruction on page 71(fig.94).
4. Remove cylinder.
5. Carry out assembly in reverse order.



112

Replacement Membrane Storage for Smooth Ride Control

1. Disassemble tube line of corresponding membrane storage.
2. Disassemble locknut (1) at the bulkhead connection.
3. Take off membrane storage.
4. Carry out assembly in reverse order.



113

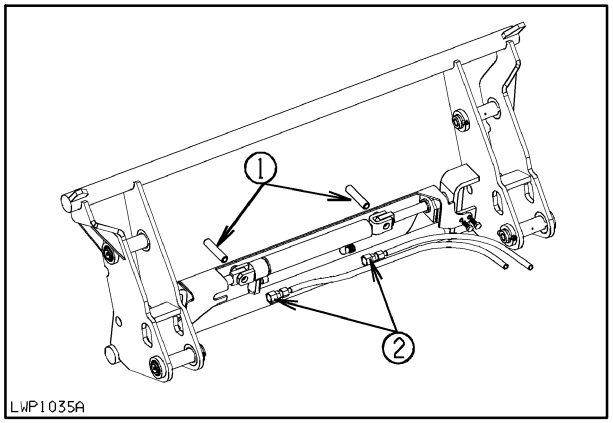
Replacement Hydraulic Cylinder for Hydraulic Quick Attach

1. Set attachment lock on "Unlock".
2. Knock out tension pins (1) through fitting opening.
3. Remove hydraulic cylinder.
4. Take off tube lines (2)

⚠ WARNING ⚠

A residual pressure will remain in the lines.

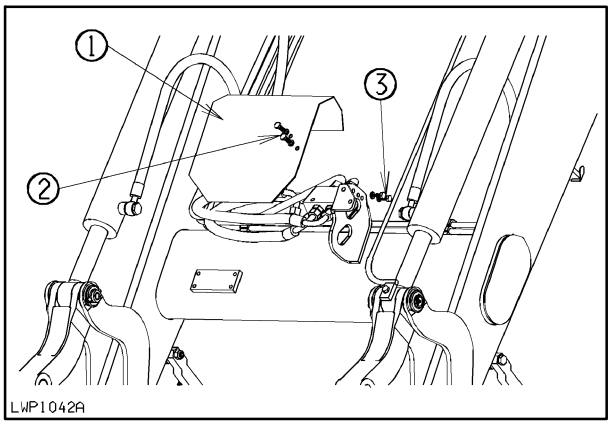
5. Carry out assembly in reverse order.



114

Replacement Pressure Relief Valve for MS Liftarms

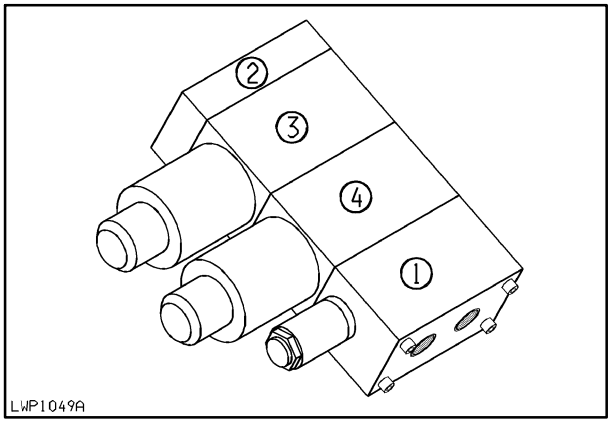
1. Disassemble base plate (1) by removing of screws (2).
2. Disassemble hydraulic lines.
3. Remove fixing bolts (3) of valve.
4. Take off relief valve.
5. Carry out assembly in reverse order whereby the position of the valve has to be considered.



115

Replacement Valve for Hydraulic Quick Attach and 3rd or 4th Control Service of MS Liftarms

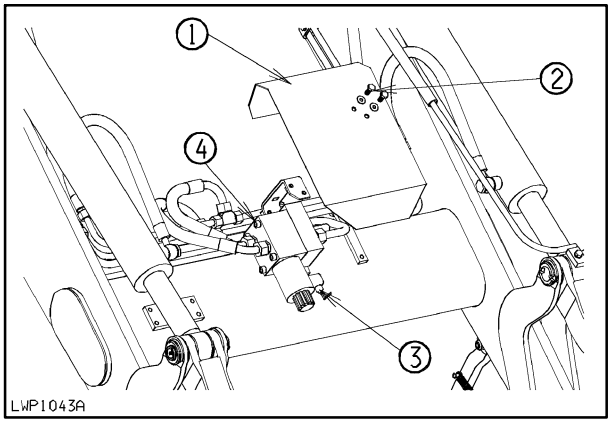
Replacement of valves for Hydraulic Quick Attach(1), 3rd control service (3) and 4th control service (4) is carried out in the same way as the replacement of pressure control valve, above.



116

Replacement Fast Tip Valve for NS Liftarms

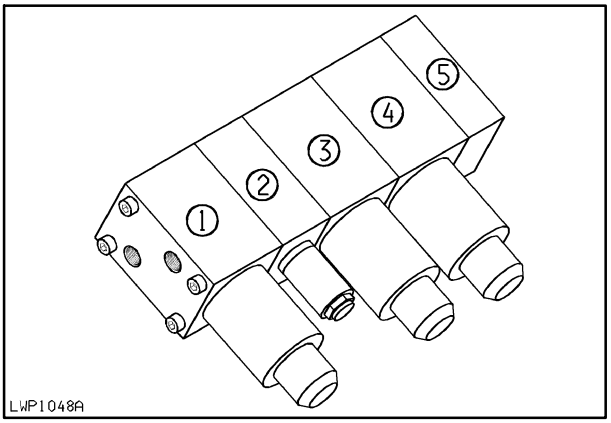
1. Disassemble base plate (1) by removing the screws (2).
2. Take off plug (3) at the magnet coil.
3. Disassemble hydraulic tubes.
4. Remove the four fixing bolts (4) of valve.
5. Take off valve.
6. Carry out assembly in reverse order whereby the position of the valve has to be considered.



117

Replacement Valve for Hydraulic Quick Attach and 3rd or 4th Control Service of NS Liftarms

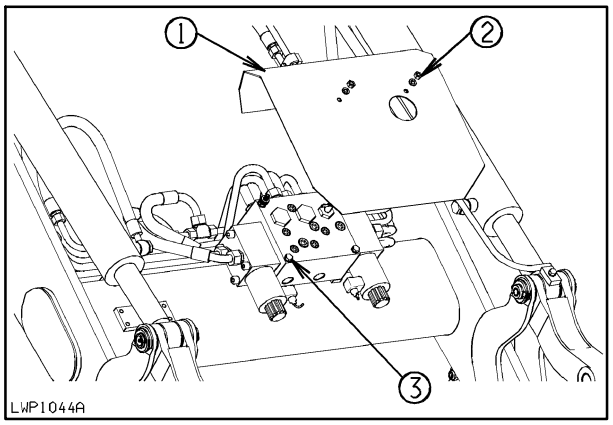
The valves for Hydraulic Quick Attach(2), 3rd control service (3) and 4th control service (4) are flanged between Fast Tip valve (1) and base plate with the pressure control valve (5). Therefore the replacement of these valves is carried out in the same way as the replacement of the Fast Tip valve in the instruction above for NS liftarms.



118

Replacement of Hydraulic Self Levelling Control Block for HS Liftarms

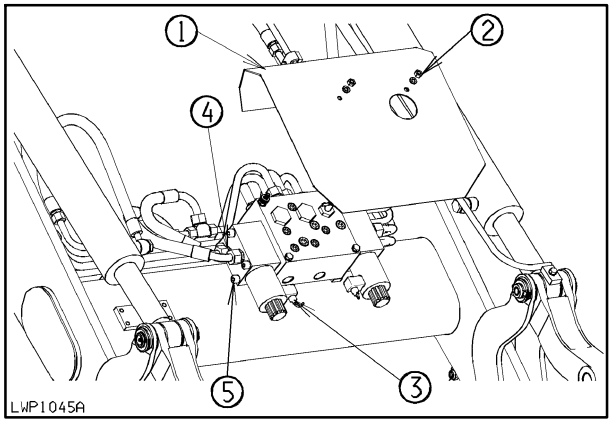
1. Disassemble base plate (1) by removing the two screws (2).
2. Take off plug of the magnet coil.
3. Disassemble hydraulic lines.
4. Remove the four fixing screws (3) of valve.
5. Take off valve.
6. Carry out assembly in reverse order.



119

Replacement Fast Tip Valve for HS Liftarms

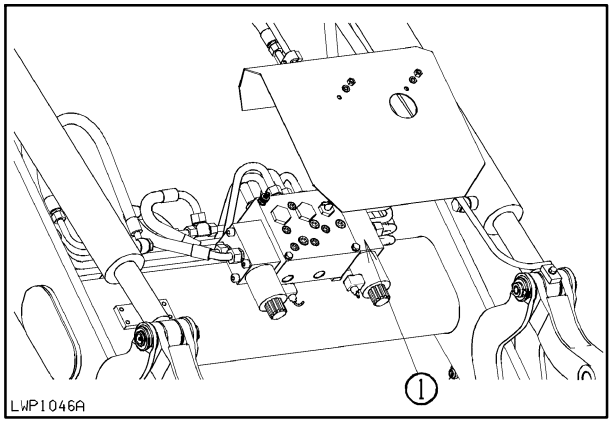
1. Disassemble base plate (1) by removing the two screws (2).
2. Take off plug (3) of the magnet coil.
3. Disassemble hydraulic lines (4).
4. Take off fixing screws (5) of valve.
5. Take off valve.
6. Carry out assembly in reverse order whereby the position of o-rings has to be considered.



120

Replacement Valve "Hydraulic Self Levelling Off" for HS liftarms

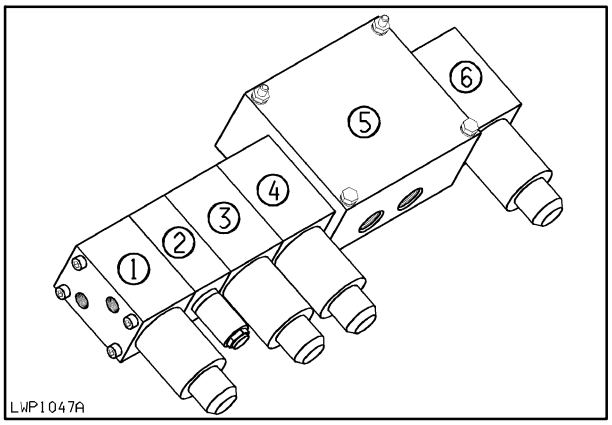
The replacement of the valve "Hydraulic self levelling off" (1) is carried out the same way as the replacement of the Fast Tip valve, above.



121

Replacement Valve for Hydraulic Quick Attach and 3rd or 4th Control Service of HS Liftarms

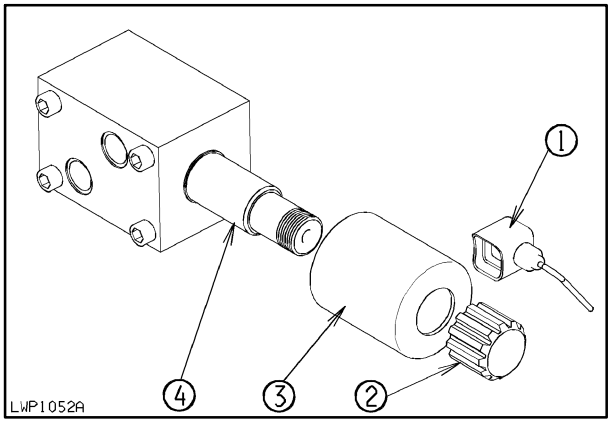
The valves for Hydraulic Quick Attach(2), 3rd control service (3) and 4th control service (4) are flanged between Fast Tip valve (1) and the parallel control block (5). The replacement of these valves is carried out in the same way as the replacement of the Fast Tip valve (6) for the HS Liftarms, above.



122

Replacement of the Magnet Spool for the Fast Tip Valve

1. Disassemble base plate as to the instruction on page 79, "**Replacement Fast Tip valve of HS Liftarms" (fig.121).**
2. Take off plug (1) at the magnet coil.
3. Take off milled nut (2).
4. Pull off magnet coil (3) from valve.
5. Unscrew valve (4) from block.
6. Carry out assembly in reverse order.

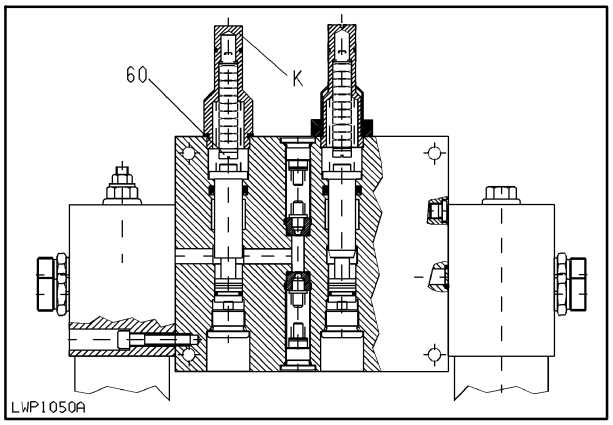


123

CONTROL VALVE HS (VS 140)

Replacement of Compression Spring and Cup Spring Packages for Fast Tip Valve

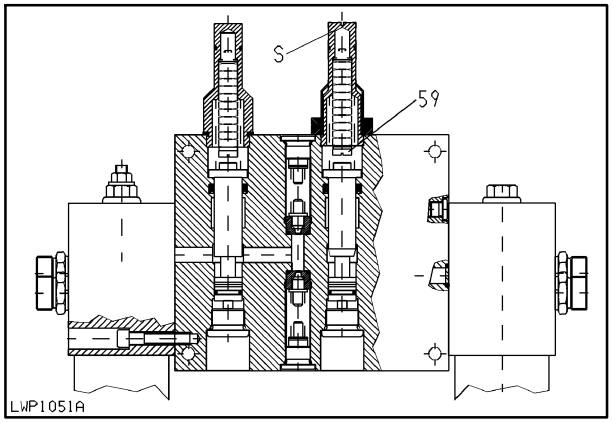
1. Disassemble base plate as described on page 79 **"Replacement Fast Tip valve of HS Liftarms" (fig.121)**.
2. Unscrew the cap (K) from the block.
3. Take off cup spring package (60) with the compression spring.
4. Carry out assembly in reverse order, whereby it has to be considered that the piston end is lubricated.



124

Replacement of Compression Spring and Cup Spring Packages for Hydraulic Self Levelling Valve

1. Disassemble base plate as described on page 79 **"Replacement Fast Tip valve of HS Liftarms" (fig.121)**.
2. Unscrew the three fixing screws and take off adjusting screw(S).
3. Take off cup spring package (59) with the compression spring.
4. Carry out assembly in reverse order, whereby it has to be considered that the piston end is lubricated.

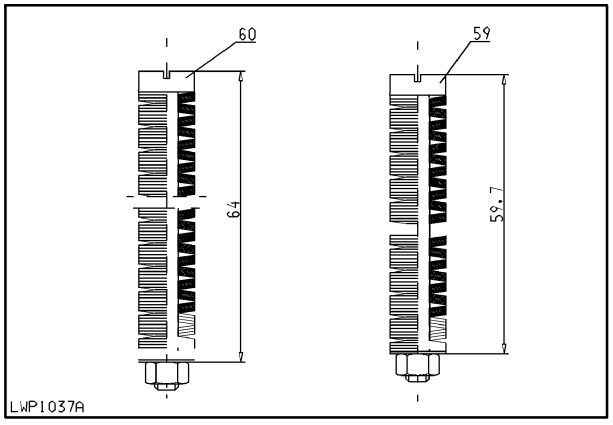


125

Measures of Cup Spring Package

59: 30 layers with 3 units,
first cup spring adjacent outside

60: 31 layers with 3 units,
first cup spring adjacent outside.



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TROUBLESHOOTING

GENERAL ANALYSIS

Description of malfunction	Cause	Troubleshooting
Small lift and tearout force.	Insufficient oil pressure.	Check the tractor hydraulics.
Joystick difficult to operate.	Bowden cables hardly to operate.	Check routing and movability of the bowden cables. If necessary oil or replace bowden cables.
Loader and attachment move slowly or not at all.	1. Insufficient oil in the hydraulic system.	Check Oil level and refill oil if necessary.
	2. Hydro-couplers connection incorrect.	Check and correct couplers.
	3. Defect Multi Quick Coupler.	Check coupler and replace if necessary.
	4. Insufficient oil flow.	Check the tractor hydraulic.
	5. Pressure relief valve of the loader sticks in position open.	Check system pressure.
Loader and/or attachment operate in wrong direction relative to Joystick.	1. Couplers connected incorrectly.	Check and correct couplers.
	2. Bowden cables connected incorrectly	Check and correct bowden cables connection.
Slow speed or sticking lift function of the loader.	1. Insufficient oil in hydraulic system.	Check Oil level and refill oil if necessary.
	2. Engine R.P.M. to slow.	Increase engine speed.
	3. Cold hydraulic fluid.	Allow hydraulic system to warm up to operating temperature.
	4. Load to high.	Reduce load.
	5. Defect hydro-coupler.	Check coupler and replace if necessary.
	6. Internal leakage of hydraulic cylinder.	Check cylinder, replace defect cylinder if necessary.
	7. Pressure relief valve incorrect adjusted.	Check setting of the pressure relief valve.
	8. Internal leakage of control valve.	Check control valve, replace if necessary.
Insufficient lift power.	1. Internal leakage in hydraulic cylinder.	Check cylinder, replace defect cylinder if necessary.
	2. Load to high.	Reduce load.
	3. Pressure relief valve setting incorrect.	Check setting of the pressure relief valve.
	4. Internal leakage of control valve.	Check control valve, replace if necessary.
Air in the hydraulic system. (Indicated by foamy fluid.)	1. Hydraulic pump sucks air.	Check lines between hydraulic pump and tank for loose or defect connections.
	2. Hydraulic filters are dirty	Check hydraulic filters and replace if necessary.

Description of malfunction	Cause	Troubleshooting
Leaking couplers of the loader or 3rd or 4th control circuit.	Leakage by penetrated dirt.	Clean the coupler and replace as required. When not using the loader and/or the 3rd and 4th control circuit lock the couplers with protective caps and keep the cover of the Multi Quick Coupler closed.
Loader arm or attachment is locking after a certain lifting movement.	1. The coupling is not completely closed.	Check the Multi Quick Coupler.
	2. The coupling is defect.	The defect coupling half must be replaced.
Attachment is tilting to the rear. Only MS loaders.	1. Relief valves misadjusted or defect.	Examine relief valves, if necessary exchange.
	2. Handling error: Engine speed too small.	Increase engine speed.

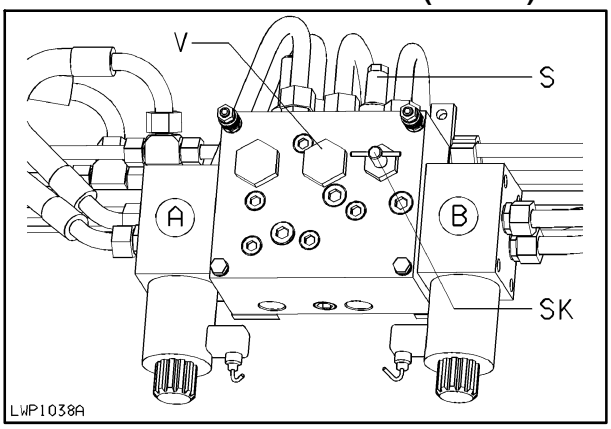
HYDRAULIC LIFTARM VARIANTS NS/HS

Description of malfunction	Cause	Troubleshooting
The liftarm is locking at lowering when the “Hydraulic self levelling” is switched off by means of the push button.	Connections of the plug couplings have been confused.	Pipes 1 and 2 for the loader arm have to be connected to the same control unit.
Liftarm or attachment is locking after a certain lifting movement.	1. The coupling is not completely jointed.	Check the coupling.
	2. The coupling is defective.	The defective coupling half must be changed.
The valve for “switched off Hydraulic self levelling” or “switched on Fast Tip” cannot be actuated.		Check current supply to the bush buttons of the control lever and check the further flow of the circuit when one of the push buttons is actuated.
		If switching should not be possible although current is fed to the magnet, check the earth lead. The magnets are connected to earth via the valve and the loader arm. For this reason the surface between magnet and valve must be free from paintwork.
The liftarm begins to swing when lowering loads.		Reduce lowering speed. In case of loading operations which do not require an accurate parallel motion at lowering the adjusting toggle should be unlocked about 2 turns.

Description of malfunction	Cause	Troubleshooting
Attachments of NS loader arms are tilting to the rear.		Fast Tip must only be switched on if the control is set to “tipping” and the engine speed is high enough so as to allow oil circulate from the tractor pump to the ram. Otherwise a vacuum would result which would be compressed at the next phase thus allowing the scoop to swing back.
The attachment actuating rams extend, but do not retract.	1. The piston seal of the attachment actuating ram is leaking.	Check all rams separately for internal/external leakage, replace defect cylinder if necessary.
The attachment actuating rams extend, but do not retract.	2. The seat valve does not return to its initial position when rapid motion is actuated.	Remove the seat valve and check same for contamination, if need be renew it.
Leakages in the control unit for “Hydraulic self levelling”.		Retighten screw connections.
		In case of leakage between magnet and valve: undo the knurled nut, remove the magnet and retighten the magnet care by means of the spanner with milled key bow.
		In case of leakage between base and flange valves: retighten screws or renew O–ring seals.
Attachment opens and liftarm lowers.	This fault is caused by the control unit for “Hydraulic self levelling”: the “Fast Tip” valve produces an oil exchange in the attachment actuating ram between ring and piston surface, causing the attachment to tilt. The result is a vacuum at the piston surface which is compensated by the liftarm ram connected to the attachment actuating ram.	At liftarm lifted, extend the tool actuating ram up to the limit stop by actuating the hydraulic system (without rapid motion). Now the oil can no longer circulate from the loader arm ram to the attachment actuating ram.
		At liftarm lifted, fully retract the attachment actuating ram so that the centre of gravity of the attachment is situated behind the pivot point.
Attachments of NS loader arms are tilting to the rear.		Fast Tip must only be switched on if the control is set to “Tipping” and the engine speed is high enough so as to allow oil circulate from the tractor pump to the ram. Otherwise a vacuum would result which would be compressed at the next phase thus allowing the scoop to swing back.
The attachment actuating rams extend, but do not retract.	1. The pistons seal of the attachment actuating ram is defective so that the surface of the pistons and that of the seal are joined to each other.	Check all rams separately for tightness, replace defect cylinder if necessary
	2. The seat valve does not return to its initial position when rapid motion is actuated.	Remove the seat valve and check same for contamination, if need be renew it.

Description of malfunction	Cause	Troubleshooting
Leakages in the control unit for “Hydraulic self levelling”.		Retighten screw connections.
		In case of leakage between magnet and valve: undo the knurled nut, remove the magnet and retighten the magnet care by means of the spanner with milled key bow.
		In case of leakage between base and flange valves: retighten screws or renew O-ring seals.
Attachment opens and loader arm lowers.	This fault is caused by the control unit for “Hydraulic self levelling”: the “Fast Tip” valve produces an oil ex-replacement in the attachment actuating ram between ring and piston surface, causing the attachment to tilt. The result is a vacuum at the piston surface which is compensated by the loader arm ram connected to the attachment actuating ram.	At loader arm lifted, extend the attachment actuating ram up to the limit stop by actuating the hydraulic system (without Fast Tip). Now the oil can no longer circulate from the loader arm ram to the attachment actuating ram.
		At loader arm lifted, fully retract the attachment actuating ram so that the centre of gravity of the attachment is situated behind the pivot point.

VALVE CONTROL BLOCK HS (VS 140)



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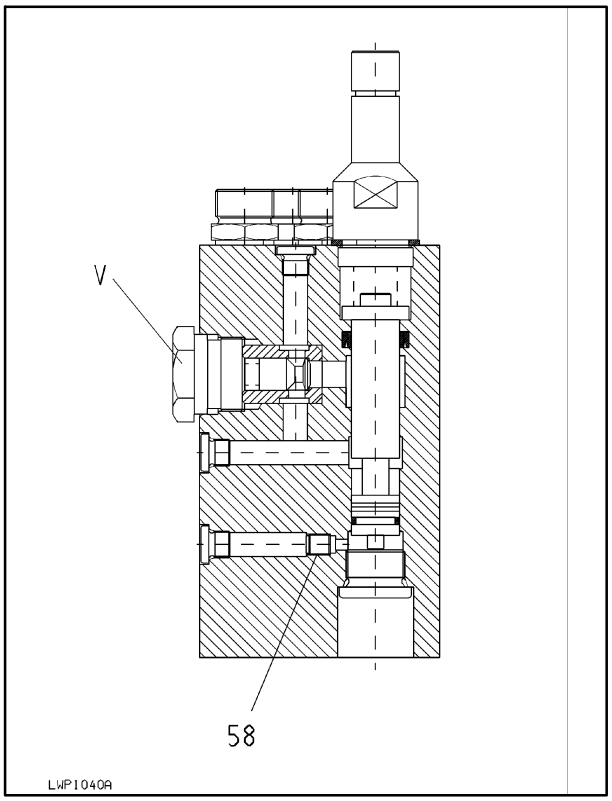
A: Control valve Fast Tip
B: Control valve Hydraulic self levelling
S: Adjusting screw
SK: Adjusting toggle
V: Sealing screw
3: Piston
43: Sealing
58: Panel
59: Cup spring package (Hydraulic self levelling)
60: Cup spring package (Fast Tip)



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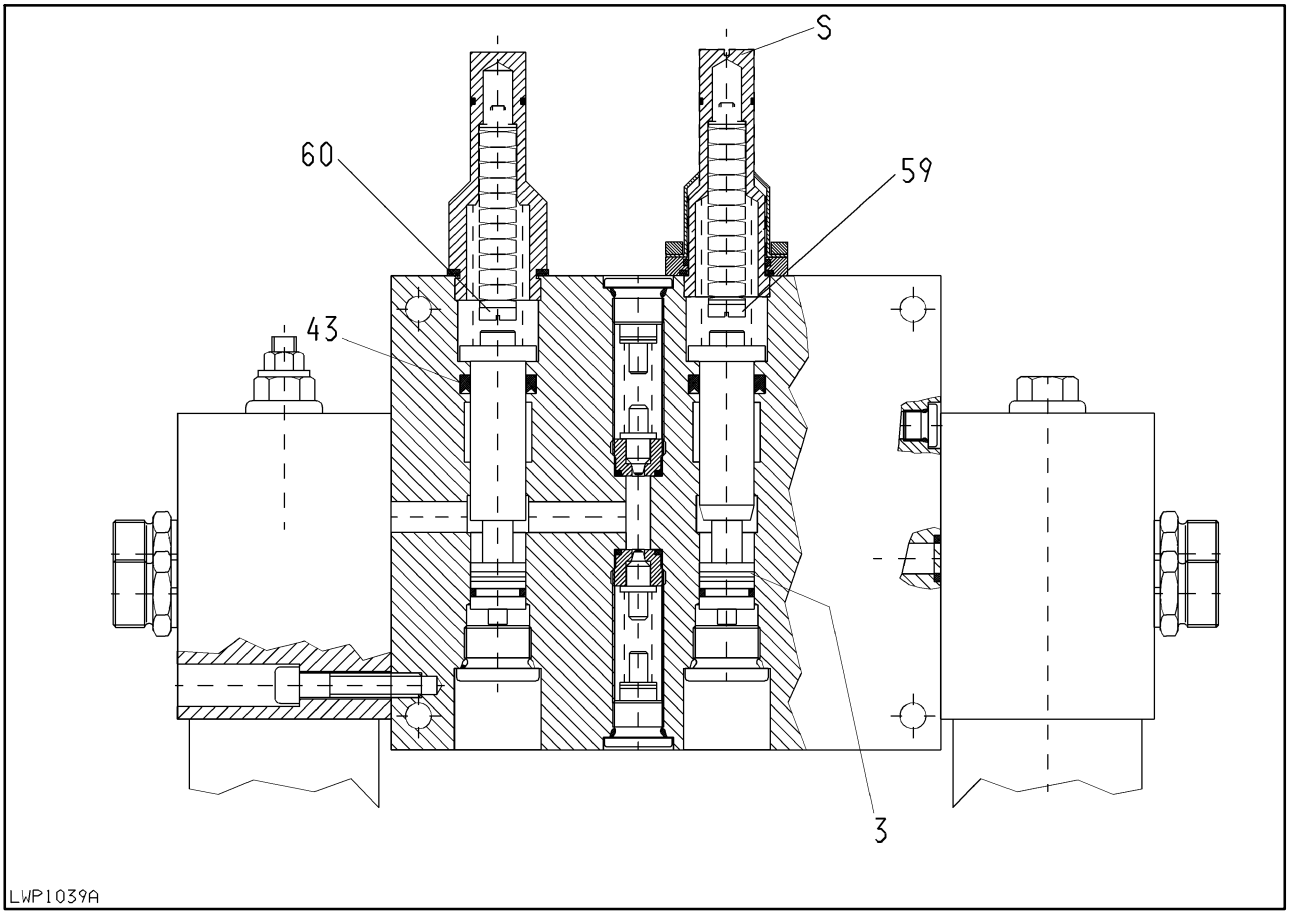

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Description of malfunction	Cause	Troubleshooting
Liftarm crowds up at lowering	1. Adjusting screw (S) unscrewed too far.	Reduce lowering speed by in screwing of the adjusting screw.
	2. Lowering speed too high.	
	3. Cup spring package (Pos. 59) broken due to too high loading of liftarm.	Replace cup spring package, remove rests, lubricate piston end well.
Liftarm lowers self-acting.	1. Adjusting toggle (SK) open.	Shut adjusting toggle (SK).
	2. Adjusting toggle (SK) leaky due to dirt.	Clean adjusting toggle (SK).
	3. Check valve leaky due to wearing / dirt	Replacement
	4. Piston clamps (Pos. 3) due to corrosion or foreign matter	Replacement
	5. Piston (Pos. 3) clamps sealing screw (V) screwed too tightly.	Tightening torque 20-22 Nm.
	6. Leakage at piston - wearing.	Replacement
Attachment itself does not tip. Hydraulic self levelling / Liftarm does not lift.	1. Panel (Pos. 58) blocked	Cleaning
	2. Piston clamps due to foreign matter or oxidation.	Replacement
No operating function (electric operation)	1. Cable defect / loose contact	Gauge electrically.
	2. Magnet plug - cable slacked inside	Replace magnet plug.
	3. Ground screw of spool plug loose / lost	Tighten / replace
Hydraulic self levelling does not shut down or Fast Tip without function	1. Piston clamps due to dirt or foreign matter	Clean piston and control drilling
	2. Torque of fixing screws too high	Re-torque screws (20-22 Nm), if unsuccessful, replacement.
Attachment crowd self-acting.	Air in the system by tipping via pressing Fast Tip.	De-aerate system.
Liftarms lowers too slowly	Adjusting screw (S) is screwed in too far.	Basic adjustment: Unscrew adjustment screw up to stop, then screw in for 1,5 turns.
Oil leakage at the cap or adjusting screw (S).	Sealing (Pos. 43) defect due to wearing, foreign matter, oxidized piston	Replacement.

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 12 - Mid Mount Remote Valves

CONTENT

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	Description and Operation	4
	Mid Mount Valve Hydraulic Circuit	8
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	Third Valve Slice (Where Fitted)	16
	Removal	18
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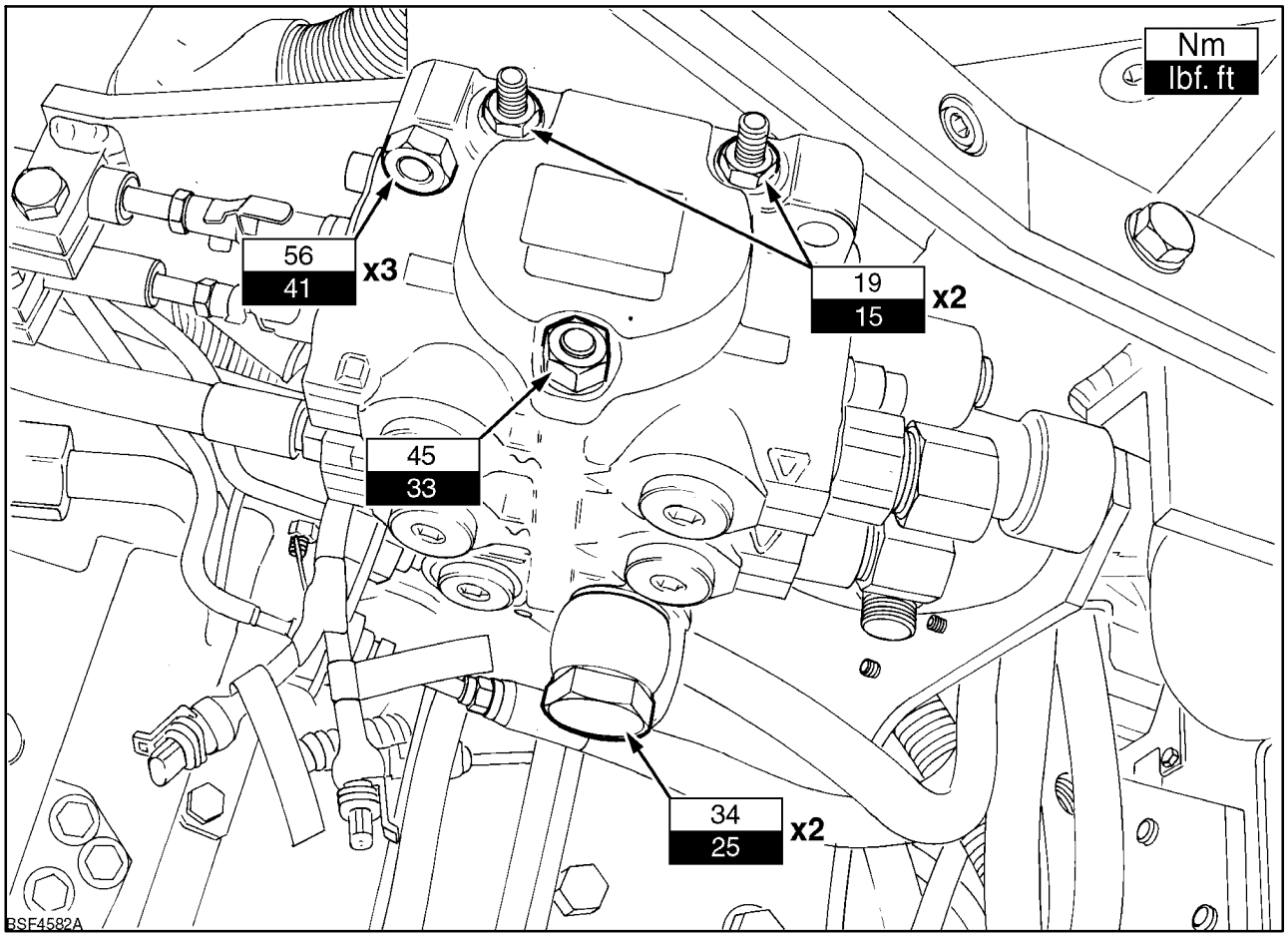
	Assembly	19

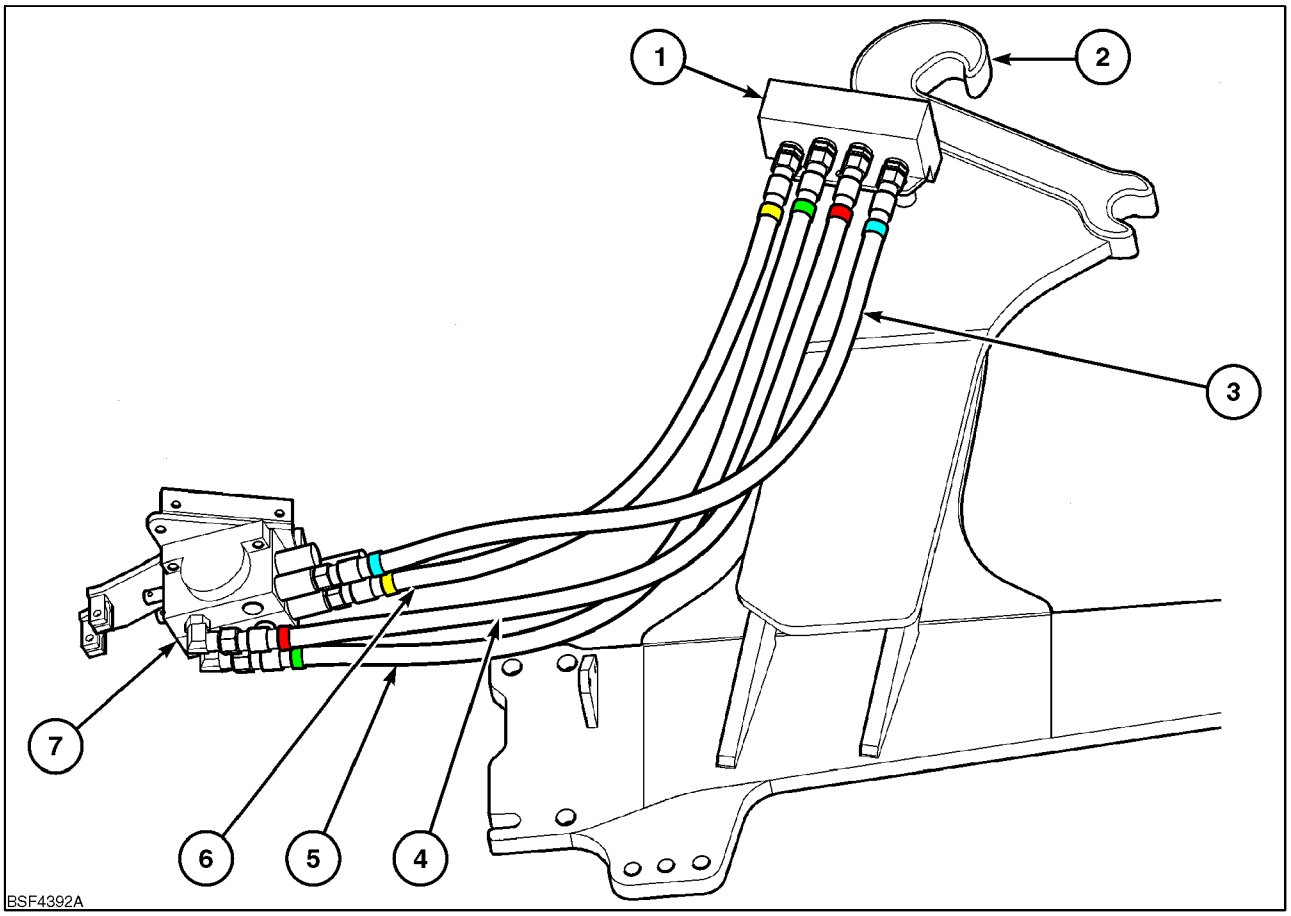
SPECIFICATIONS

Type	Parallel–Closed Centre Circuit
Maximum Flow through one valve at rated engine speed:	
– Fixed Displacement Pump	80 Litres/Min (21.1 U.S. Gals/Min)
– Variable Flow Displacement Pump	95 Litres/Min (25.0U.S. Gals/Min)
Maximum Flow through Third Mid mount Valve:	37.7 Litres/Min (10 U.S. Gals/Min)
Valve to Coupler Hoses	1/2” Bore with 13/16” ORFS fittings both ends
Load Sense Relief Valve Setting	165.47 $^{+}/_{-}$ 1.7 Bar (2400 $^{+}/_{-}$ 25 lbf in^{2})
Load Sense Differential	19.65 – 20.33 Bar (285 – 295 lbf in^{2})

TIGHTENING TORQUES



DESCRIPTION AND OPERATION



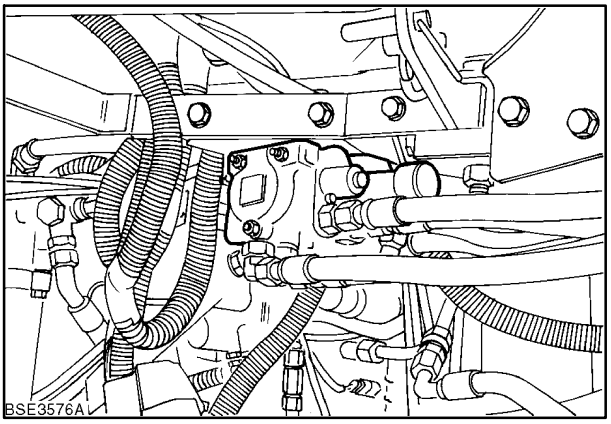
1

Mid Mount Valve Loader Components

1. Multi-Quick Coupler
2. Loader Support
3. Tip Hose - Blue
4. Crowd Hose - Red
5. Raise Hose - Green
6. Lower Hose - Yellow
7. Mid Mount Valve Assembly

Tractors equipped with the Mid Mount Valve option are fitted with a seat mounted joystick, a mid mount valve assembly, plumbing and loader mounting brackets ready for attaching the loader arms.

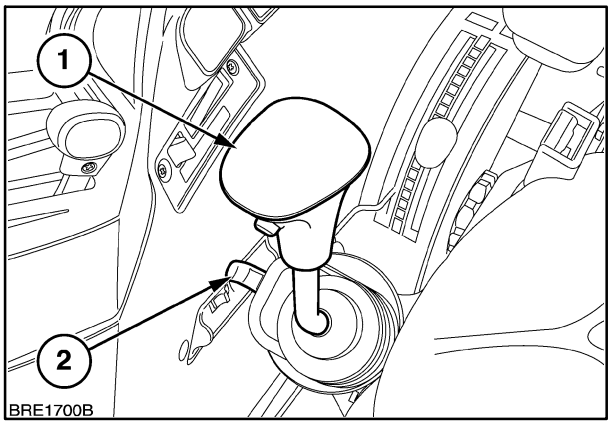
The Mid Mount Valve is located underneath the cab on the right hand side. The base version has a two spool valve for raising and lowering the boom and tipping and curling the bucket when used with a loader.



1

The valves are operated by means of a joystick control (1) mounted on the right hand side of the seat.

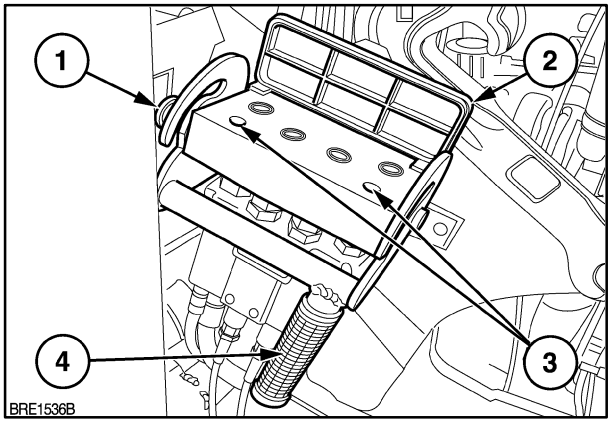
The three position push/pull lever (2) is used to fully lock the joystick in neutral to avoid accidental operation. In the middle position side travel of the joystick is locked.



2

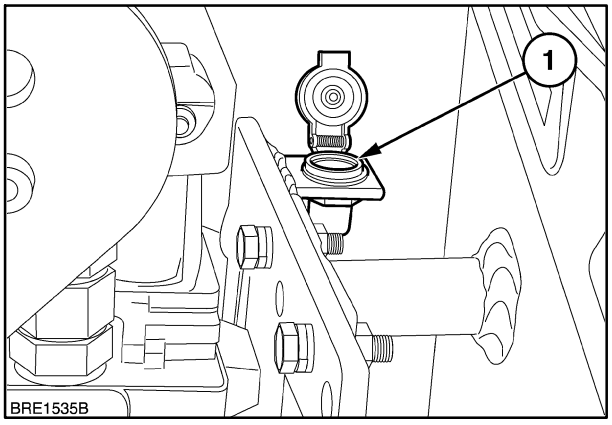
European loader ready options come complete with a “Multi-Quick” coupler. This allows the couplers to be connected and disconnected at once with the minimum of leakage.

1. Lock Button
2. Protective Cover
3. Alignment Holes
4. Clamp Handle



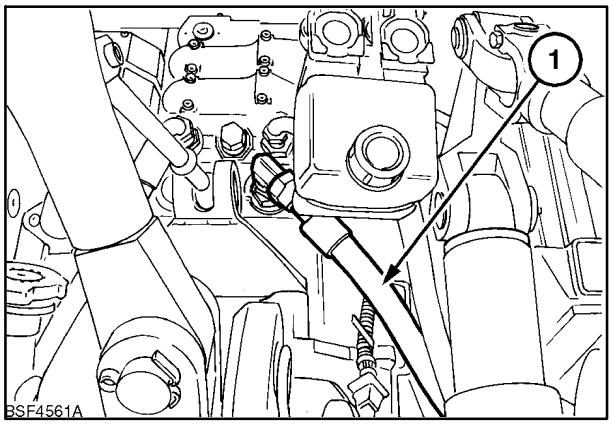
3

A third hydraulic service (where fitted) is electrically controlled via a cable that connects to a socket (1) on the loader subframe. This is operated by depressing a switch located on the joystick handle.



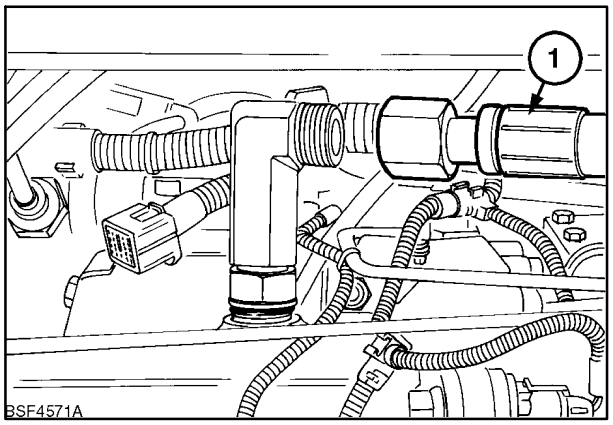
4

The mid mount valves are fed high pressure oil via a hose (1) from the power beyond port of the sub plate located at the bottom of the remote valve stack.



5

Oil from the mid mount valves is returned from the outlet port via a hose (1) and an elbow to the hydraulic pump filter housing manifold.



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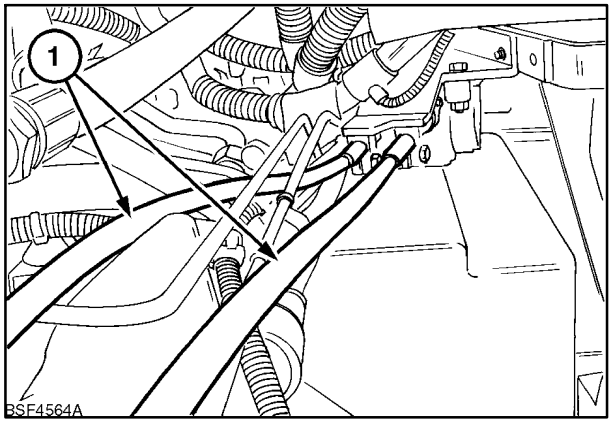
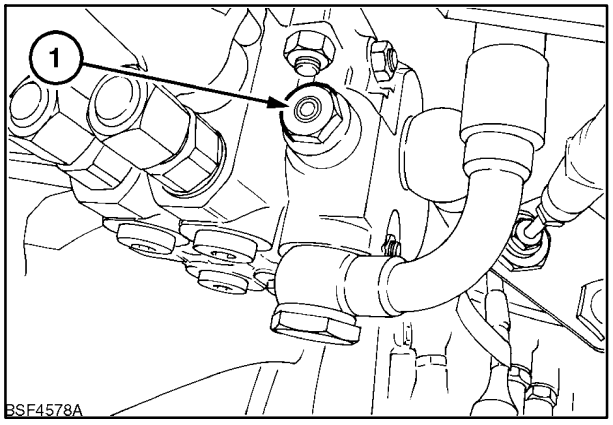
The spools are cable (1) operated by the joystick situated in the cab.



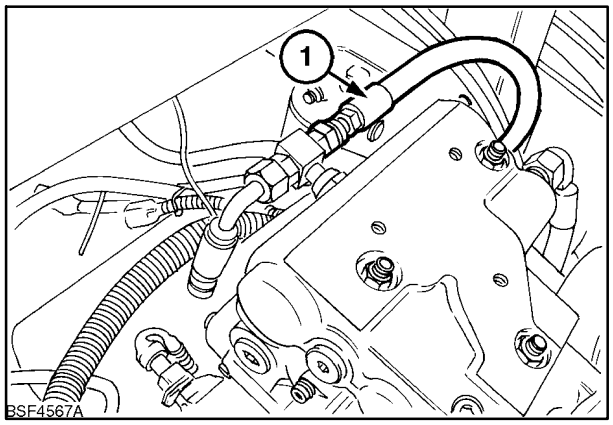
7

A load sense relief valve is located on the inlet slice of the valve assembly.



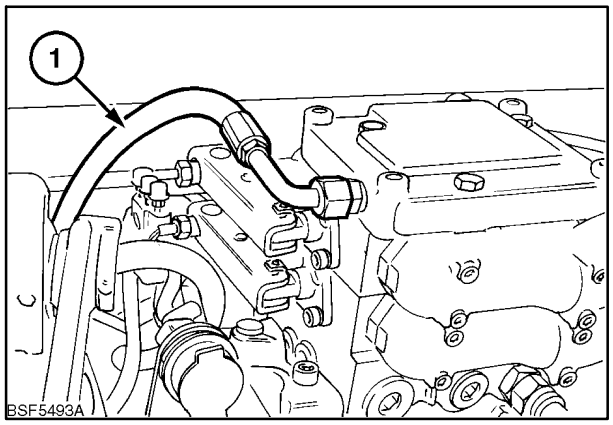
8

The Load sensing line (1) is connected to the front of the end plate on machines with Electronic remote valves.



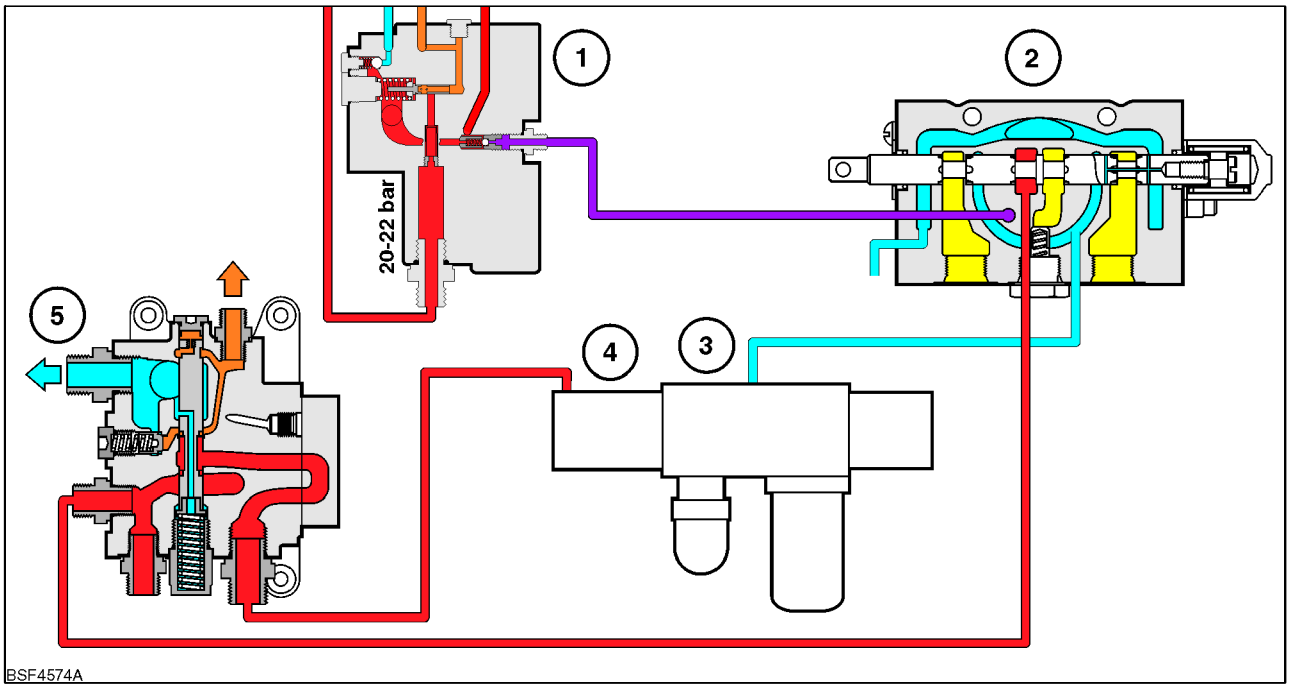
9

On machines with mechanical remote valves the load sensing line (1) is connected to the left hand side of the end plate on top of the remote valve stack.



10

MID MOUNT VALVE HYDRAULIC CIRCUIT



11

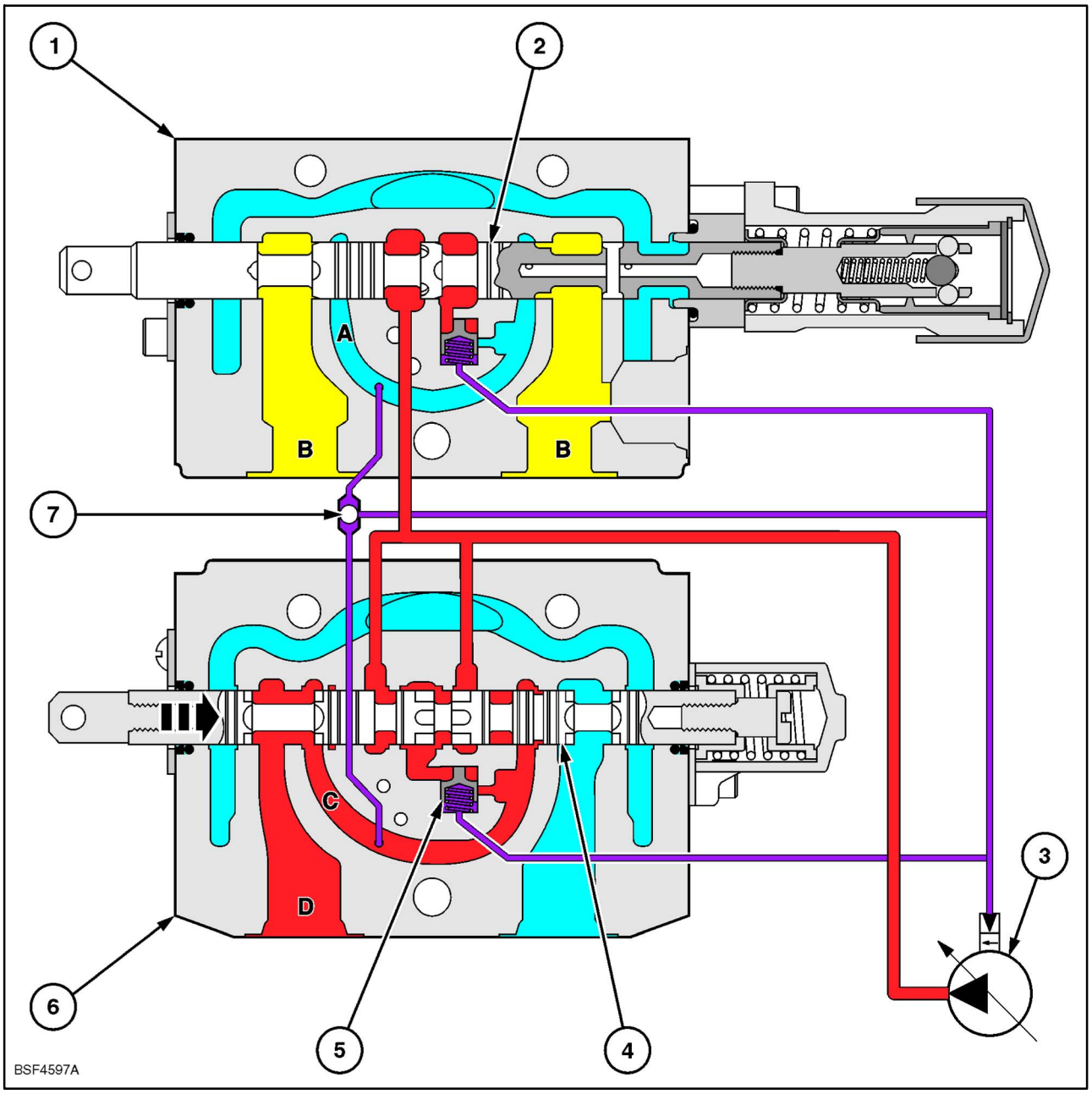
1. End Plate on Remote Valve Stack
2. Mid Mount Valve Slice
3. Return to Hydraulic pump Filter manifold
4. Main Hydraulic Pump
5. Sub Plate on bottom of Remote Valve Stack

The main hydraulic pump (4) sends high pressure oil to the subplate (5) located at the base of the remote valve stack. The high pressure oil is then taken from the power beyond port of the sub plate to the inlet port of the mid mount valve inlet slice (2) . The return oil is directed through the exhaust gallery of the valves, out of the outlet slice, and is returned to reservoir via an elbow connected to the suction manifold of the main pump filter housing (3). The load sensing line is connected within the valve assembly to the end plate of the remote valve stack (1).

MID MOUNT VALVE OPERATION

With Reference to Figure 12.

When the control valve with detent (boom) (1) is in neutral, output from the pump (3) can flow uninterrupted through the staggered centre gallery (A) and the lands on the spool (2) prevent flow to the cylinder ports (B). The lands on the spool trap the oil between the outlet port of the valve and the cylinders. When the spool is activated (as shown in the lower non detented (bucket) valve (6) high pressure oil is directed to the staggered centre gallery (C). The load sense shuttle (7) in turn transmits the highest pressure to the load sense valve on the hydraulic pump (3) and all the compensators (5) within the valve assembly. The Pump responds to the load sense signal with load sense pressure plus pump margin or differential. It is this pressure margin or differential that overcomes the compensators and permits flow to the staggered centre gallery and the cylinder port (D).



12

High Pressure Circuit Oil

Return To Reservoir Oil

Load Sensing Pressure Oil

Trapped Oil

1. Control Valve with Detent (Boom)
2. Boom Spool
3. Pump
4. Bucket Spool
5. Compensator
6. Control Valve less detent (Bucket) Valve
7. Load Sense Shuttle Valve

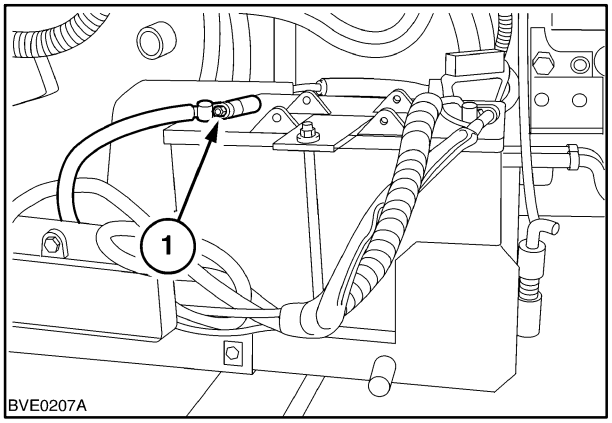
OVERHAUL

MID MOUNT VALVE

Removal

1. Raise the steps and lock in an upright position using the pin. Swing out the battery tray. Remove the cover. Disconnect the battery negative cable
2. Disconnect the supply and return pipes from the valve assembly.

NOTE: *Drain oil from pipes into a suitable receptacle.*



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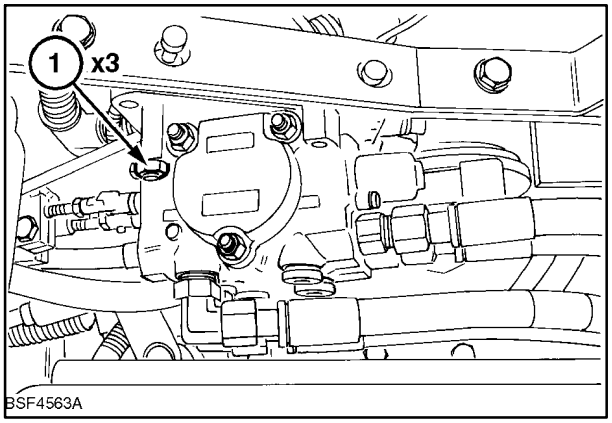
3. Disconnect the load sensing line and the loader hoses if fitted.
4. Unclip the retaining pins from the joystick control shafts. Loosen the screws which clamp the joystick cables in place.
5. Loosen and remove the three retaining bolts and carefully remove the mid mount valve.

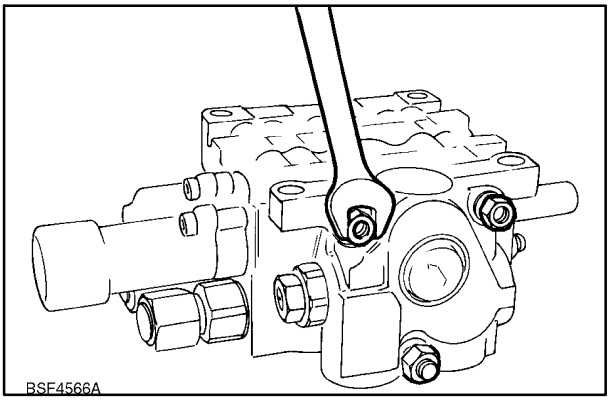


14

Disassembly

NOTE: *Prior to disassembly the valve should be thoroughly cleaned using an approved de-greasing agent.*

1. Remove the three retaining nuts from one end leaving the tie rods in position to aid slice removal and assembly.



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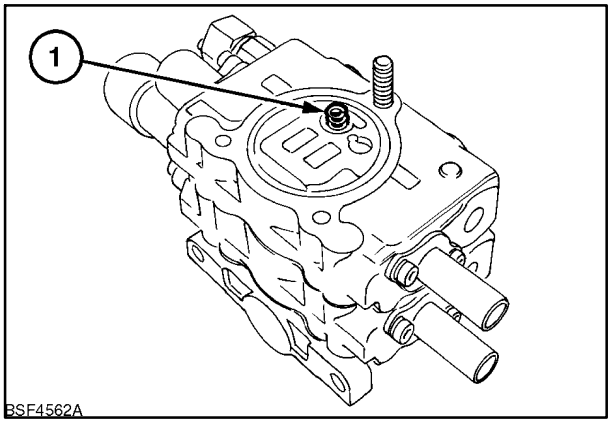
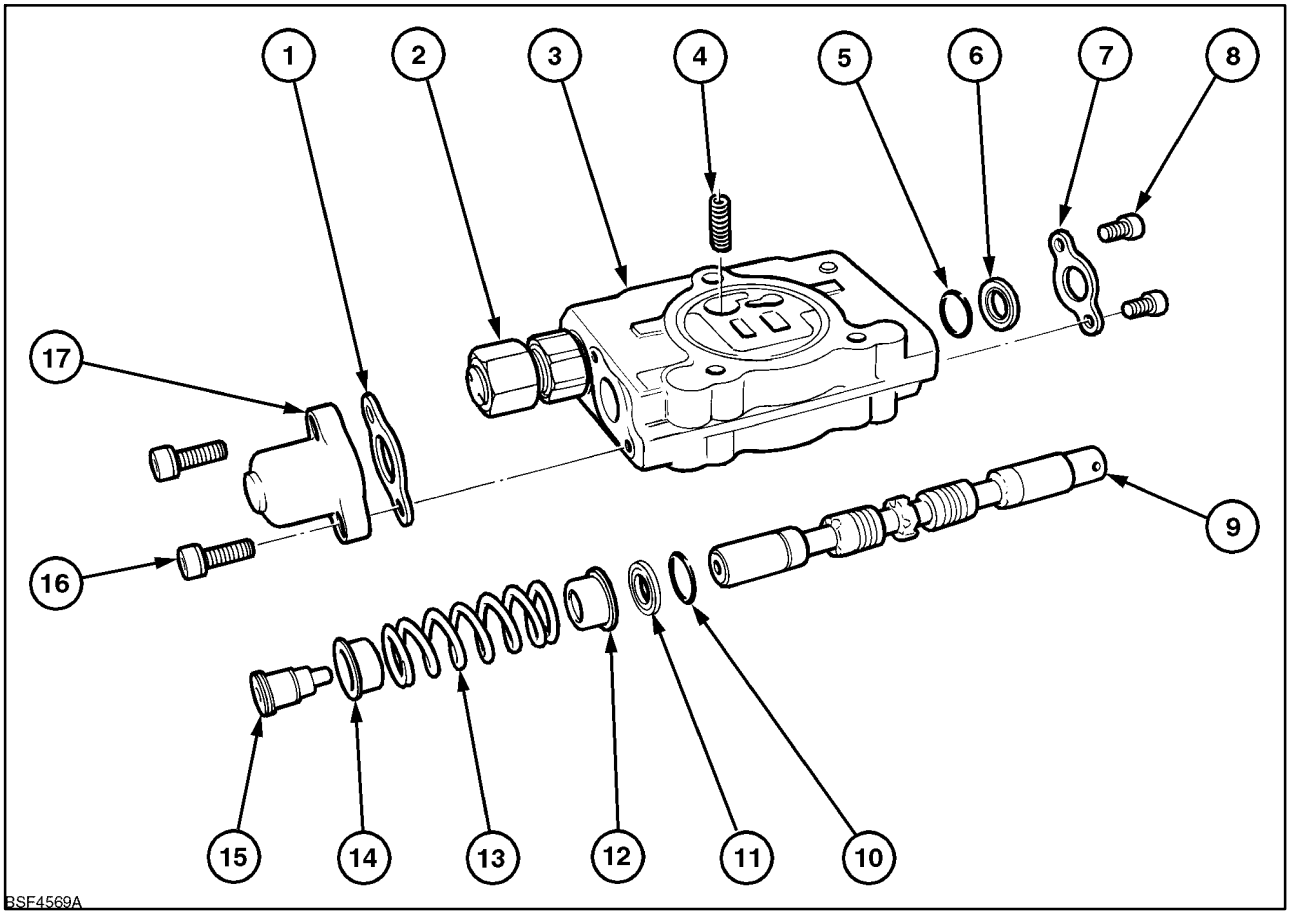
2. Remove the outlet slice being careful not to dislodge the spring (1) located in the valve slice.
3. Carefully separate the remaining slices.



16

1. Clean the machine thoroughly paying particular attention to the hydraulic valve area.
2. Operate lever to relieve hydraulic pressure in the circuits.
3. Remove the operating linkage from the valve spools to be resealed.
4. Remove the two screws and the seal plate from the spool. (Items 8 and 7 Figure 17).
5. Remove the centring spring housing from the lower end of the valve spool by removing the two screws. (Items 16 and 17 Figure 17).
6. Remove the screw retaining the centring spring to the spool (Item 15 Figure 17). The spool can be prevented from turning by inserting a steel rod in the linkage hole on the upper end.
7. Remove the seal plate from the spool (Item 1 Figure 17) .
8. Remove the lip seal and wiper ring from either end of the spool (Items 5, 6, 10 and 11 Figure 17). It may be helpful to slide the spool to push the seals out. Care should be taken not to damage the spool or valve block during this operation. Be aware that the spool will be unsupported at this point and may slide out of the valve block. Support the spool as necessary.



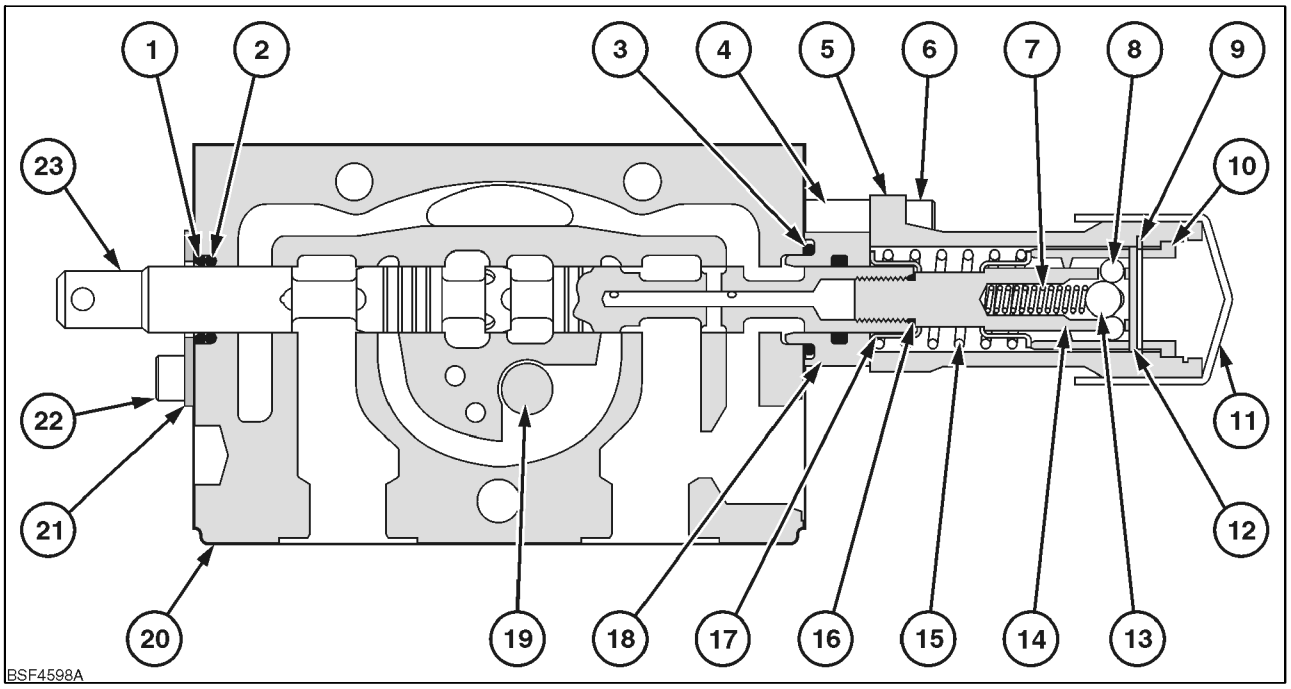
17

Control Valve less Detent (Bucket) Components

1. Seal Plate
2. Fitting
3. Valve Body
4. Spring
5. Lip Seal
6. Wiper Ring
7. Seal Plate
8. Retaining Screw
9. Spool
10. Lip Seal
11. Wiper Ring
12. Centering Spring Seat
13. Centreing Spring
14. Centering Spring Seat
15. Screw
16. Retaining Screw
17. Centreing Spring Cover

Assembly

1. Carefully place the seal over the end of the spool and press the seal into position between the spool and the valve block recess. It may be helpful to lubricate the spool slightly with hydraulic oil to facilitate this operation. The trapped air behind the seal can be released by slightly pushing the spool into the valve block. This will allow the seal to locate correctly in its housing. Do not allow the spool feathering lands or balancing grooves to pass through the seal as damage will occur.
2. Fit a new wiper ring with the lip facing outwards away from the seal.
3. Fit the seal plate onto the valve block using the two screws. Tighten the screws to 10 Nm.
4. Repeat this operation – steps 9 to 12 – for the spring end of the spool.
5. Fit the centring spring with retaining bolt (Item 15 Figure 17) into the end of the spool. Use Loctite 242 on the bolt threads before tightening to 10 Nm.
6. Fit the spring cap and screws through the seal plate and tighten to 10 Nm.
7. Reconnect the linkage to the spool end.
8. Both valve spools are sealed in the same way .



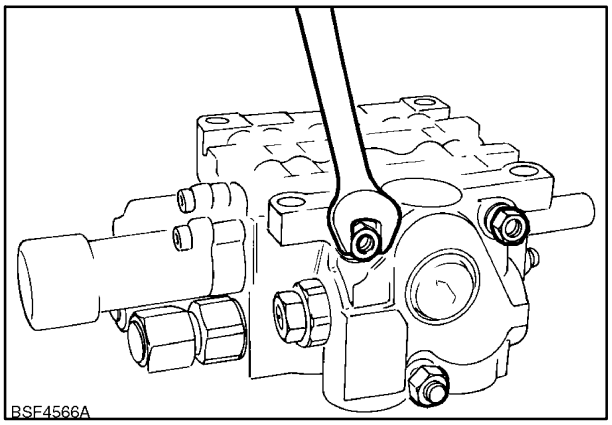
18

Control Valve with Detent (Boom) Components

1. Wiper Seal
2. O-Ring
3. O-Ring
4. Spacer
5. Spool Cap
6. Screw
7. Spring
8. Ball (4 Off)
9. Retaining Ring
10. Detent Sleeve
11. Boot
12. Spacer
13. Ball
14. Spool End Detent Pin
15. Spring
16. O-Ring
17. Centering Spring Seat
18. Spool Spacer Cap
19. Compensator Piston
20. Housing
21. Seal Plate
22. Screw
23. Spool

Installation

1. Assemble the valve slices onto the tie rods.
2. When re-assembling the valve slices progressively tighten the smaller tie bar retaining nuts to a torque of 19Nm (14 lbf.ft)



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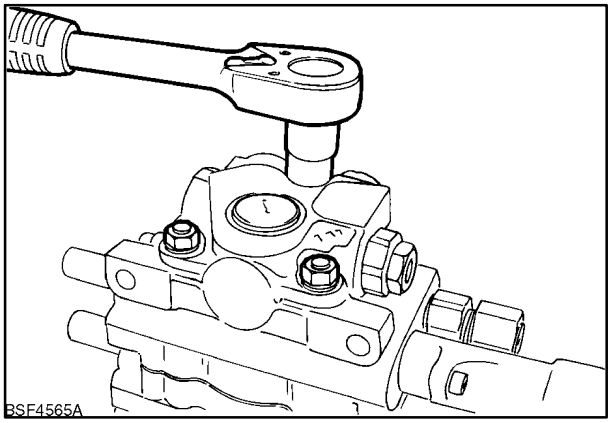
3. Tighten the larger tie bar nut to a torque of 45 Nm (33 lbf.ft).



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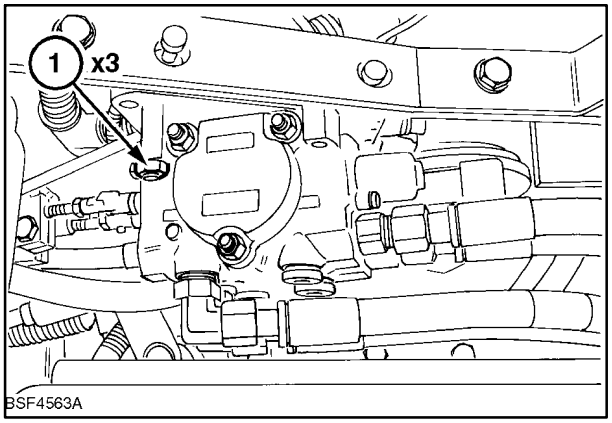
4. Install the valve assembly on to the bracket and torque nuts to 56 Nm (41 lbf.ft).
5. Reconnect inlet, outlet, and load sensing hoses.
6. Reconnect loader hoses (where fitted).



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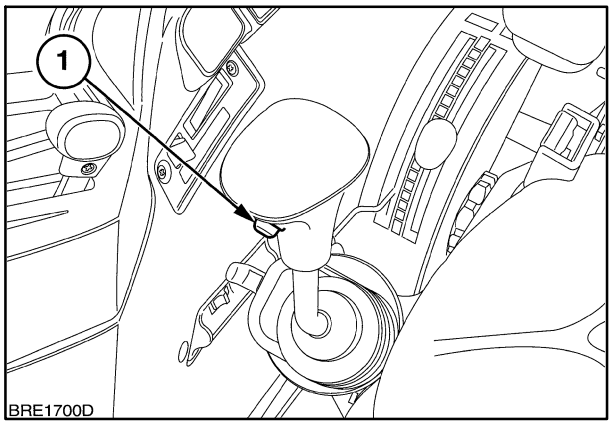
THIRD VALVE SLICE (WHERE FITTED)

The third hydraulic service is activated using a button located on the loader joystick. With the button depressed, oil is diverted from the bucket circuit to a pair of couplers mounted on the loader arm. These can be used to operate a bucket grab or similar piece of equipment.



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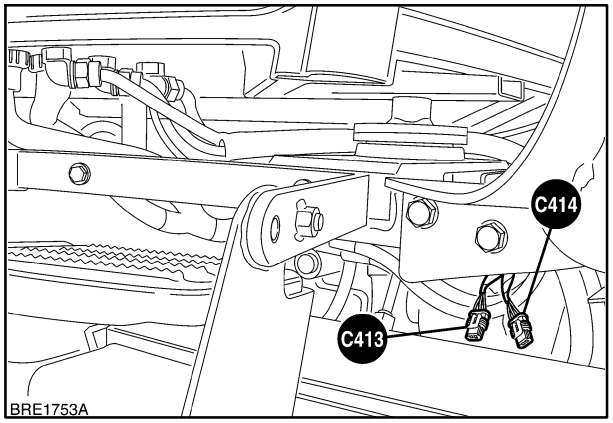
The two solenoids are connected to the main harness via connectors C413 and C414 which are located on the right hand side underneath the step.



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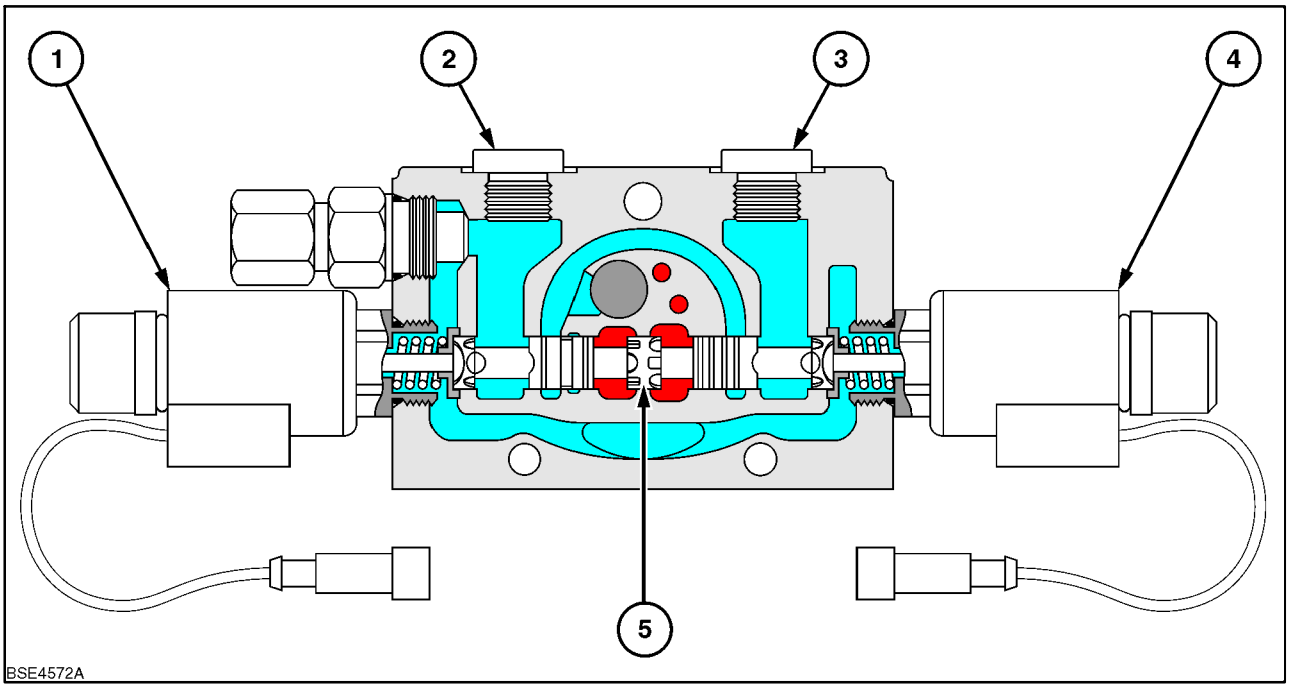

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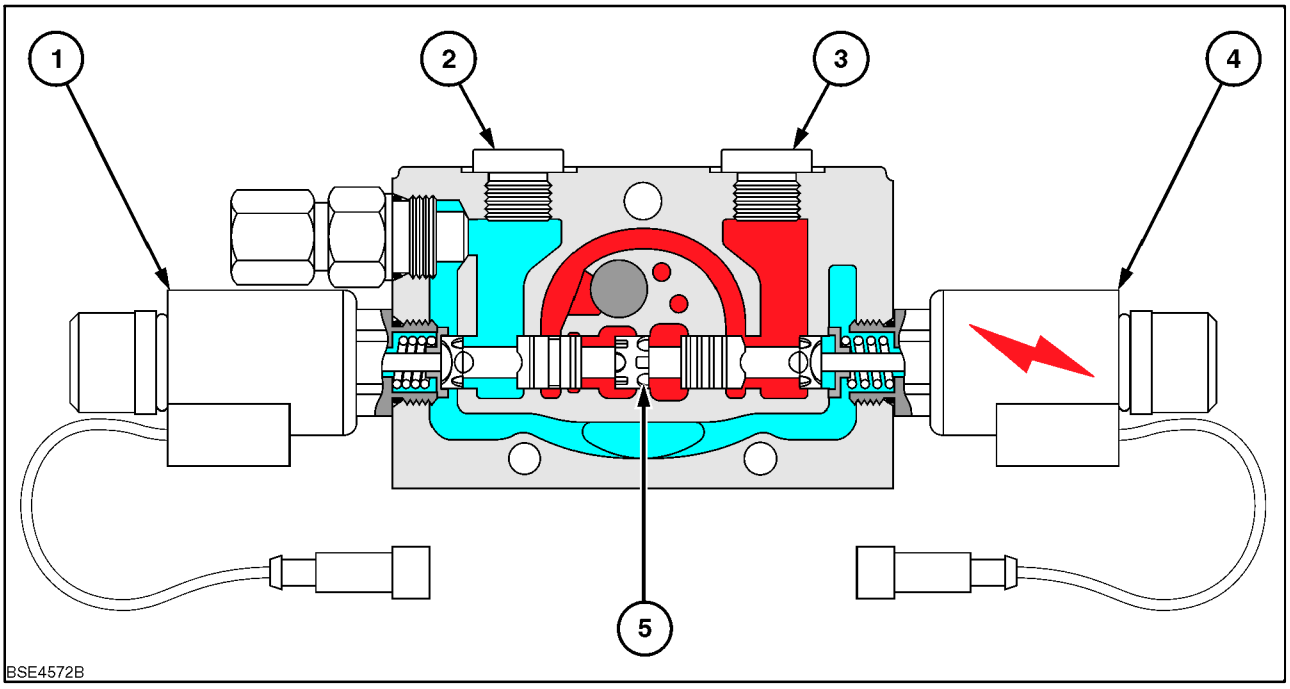

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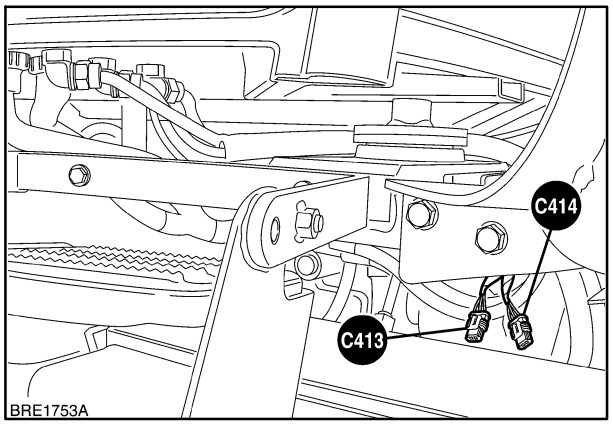
Third Valve Section

1. Solenoid
2. Port “A”
3. Port “B”
4. Solenoid
5. Spool

When both solenoids are not energised the valve is in neutral (See Figure 24). Oil from the high pressure circuit can flow uninterrupted through the staggered open centre gallery and the lands on the spool prevent flow to the cylinder ports “A” and “B”. When a solenoid is energised (See Figure 25) the spool is moved to the left. High pressure oil flows past the lands of the spool and is fed to Port “B”. Return Oil allowed back to reservoir across the spool from Port “A”.

Removal

1. Disconnect the solenoid wires from the harness
2. Disconnect the load sensing line
3. Disconnect the loader control hoses (where fitted)
4. Disconnect the inlet and outlet hoses.
5. Undo the retaining pins from the joystick control shafts. Loosen the screws which clamp the joystick cables in place.



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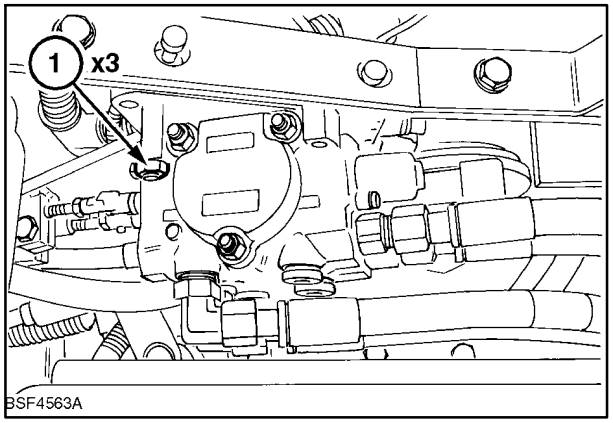
6. Undo the valve assembly retaining nuts and remove the valve assembly
7. Undo the tie rod nuts and remove the third valve slice.



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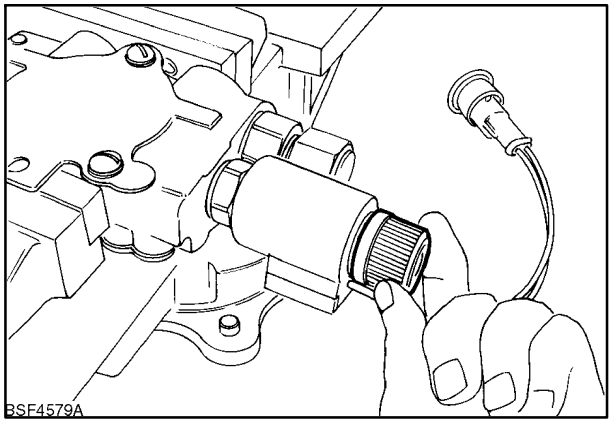
Disassembly

1. Loosen the knurled knob on the end of the solenoid.



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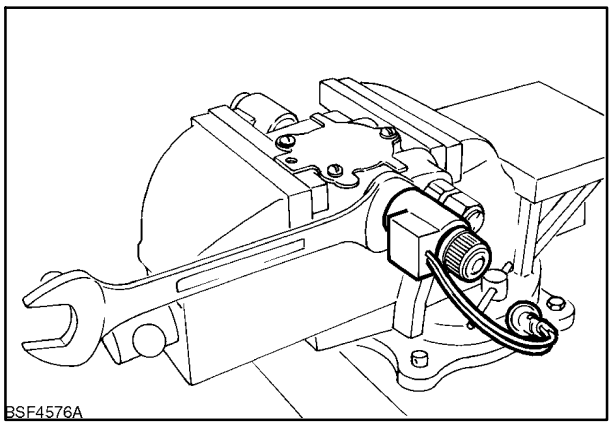
2. Undo the solenoid nut.



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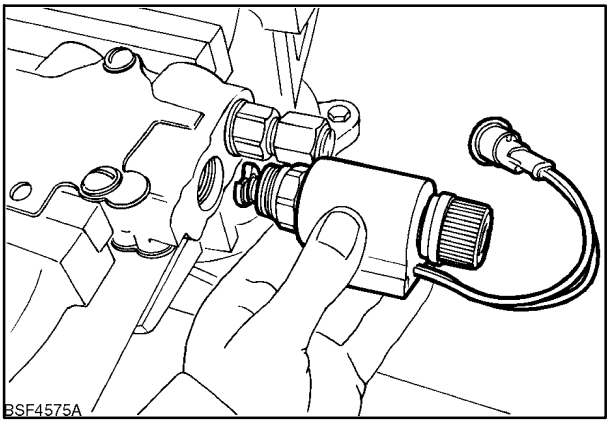
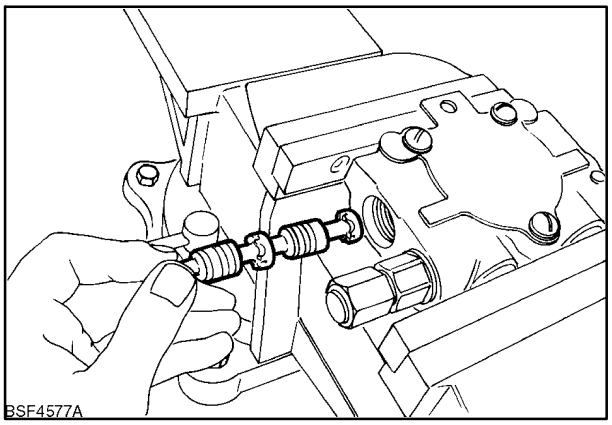
3. Withdraw the solenoid assembly. Repeat for the opposite solenoid.



30

4. Carefully remove spool from the valve slice.
5. Inspect the spool and bore for scoring and damage. If the spool is badly scored or worn the valve assembly must be replaced.



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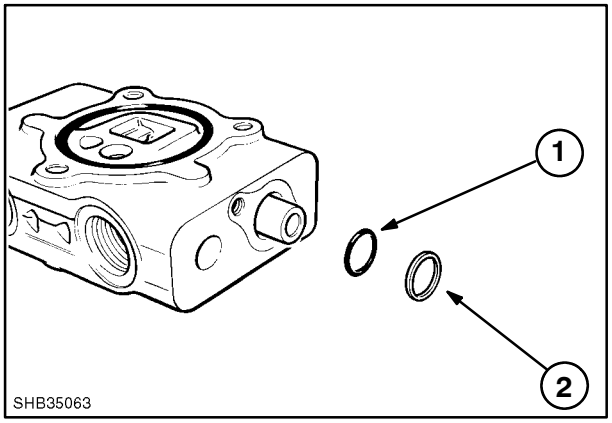
Assembly

1. Lubricate spool before re-assembly.
2. To avoid damage to “O” ring seals on either end of spools, insert spool into valve housing before installing “O” ring (1) and Wiper (2).



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NOTES

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 13 - Hydraulic Front Lift and Power Take-Off (PTO)

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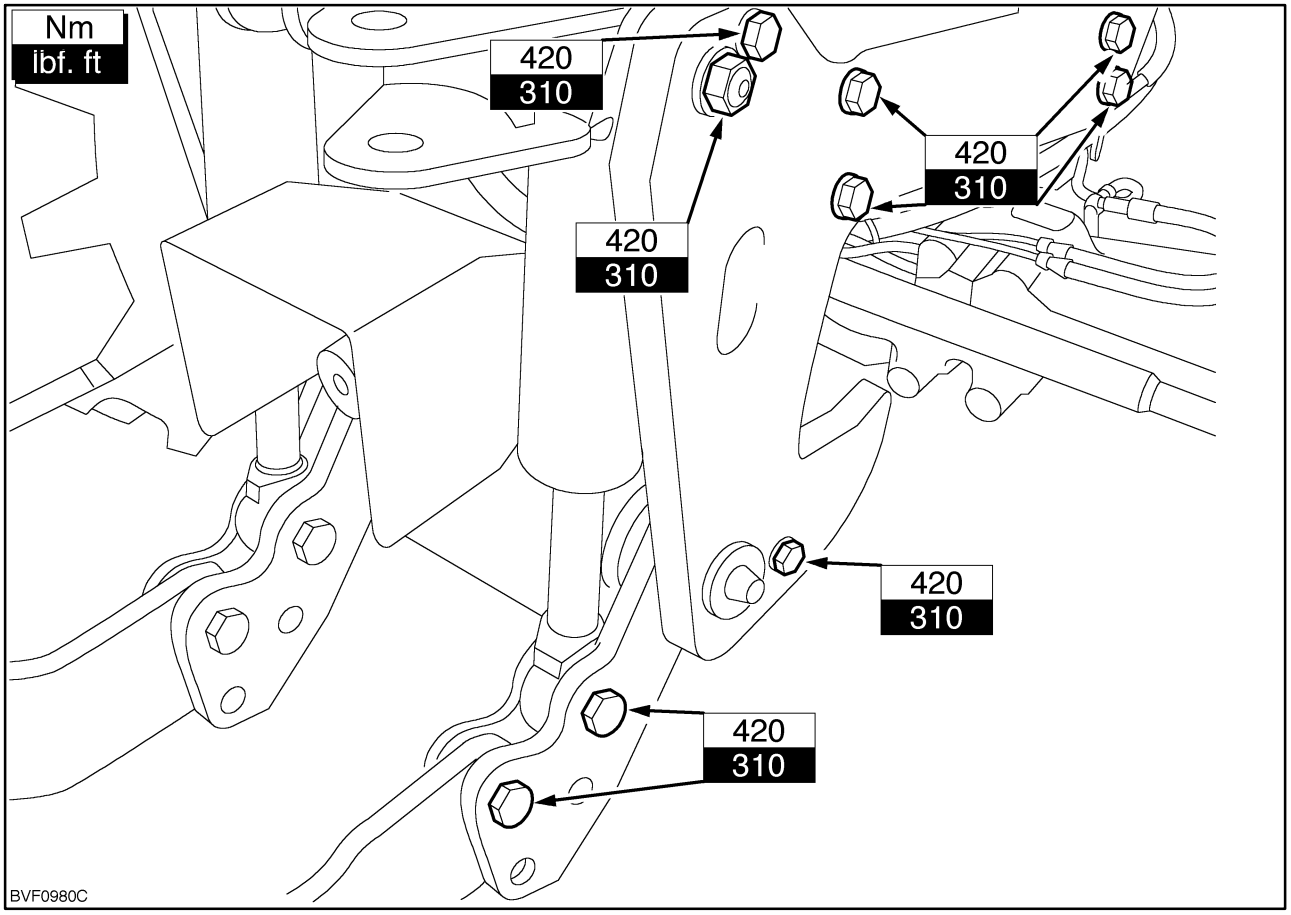
SPECIFICATIONS

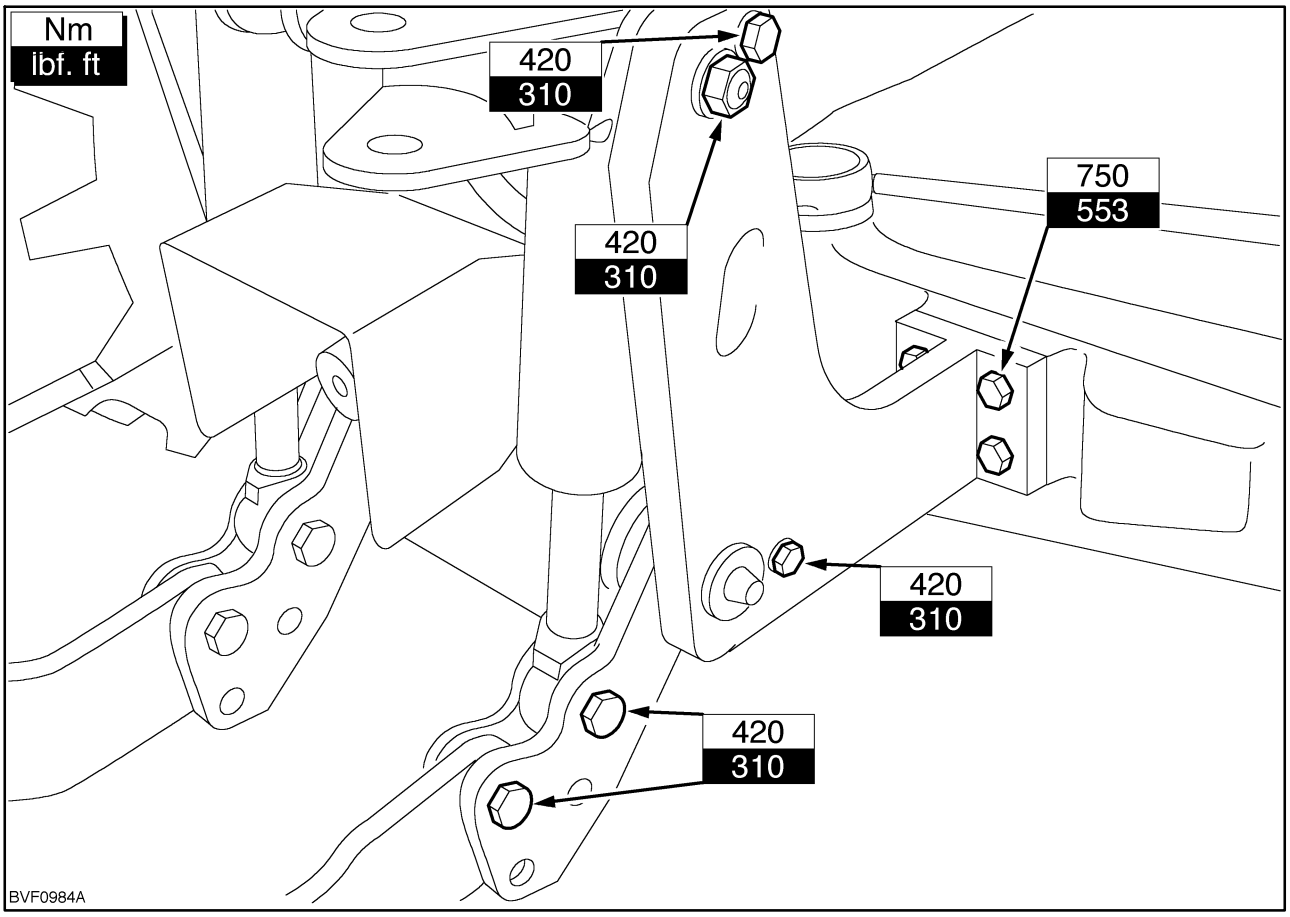
Front PTO	
Type	Fully independent 1000 rev/min. Electro-hydraulic engagement. Spring disengagement
Clutch type	Multi-dry plate
Drive	From the engine front crankshaft pulley
Multi-dry plate clutch discs	
Friction discs	3
Steel discs	3
Engine speed at 1000 rev/min PTO speed	2120 rev/min
Maximum PTO capacity . . . . . Hp	110
Reduction gearbox oil specification	NH 410 B Ambra Multi G

TIGHTENING TORQUES

TRACTORS WITHOUT SUPERSTEER FRONT AXLE



TRACTORS WITH SUPERSTEER FRONT AXLE



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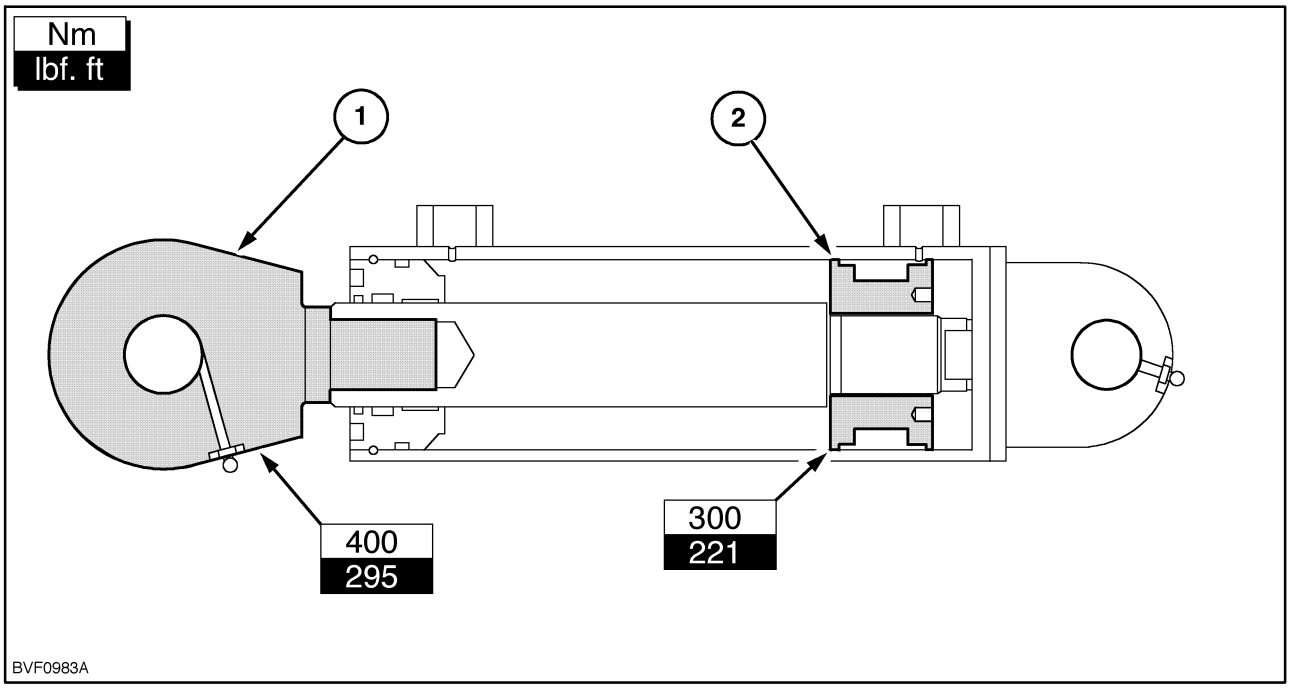
ALL MODELS

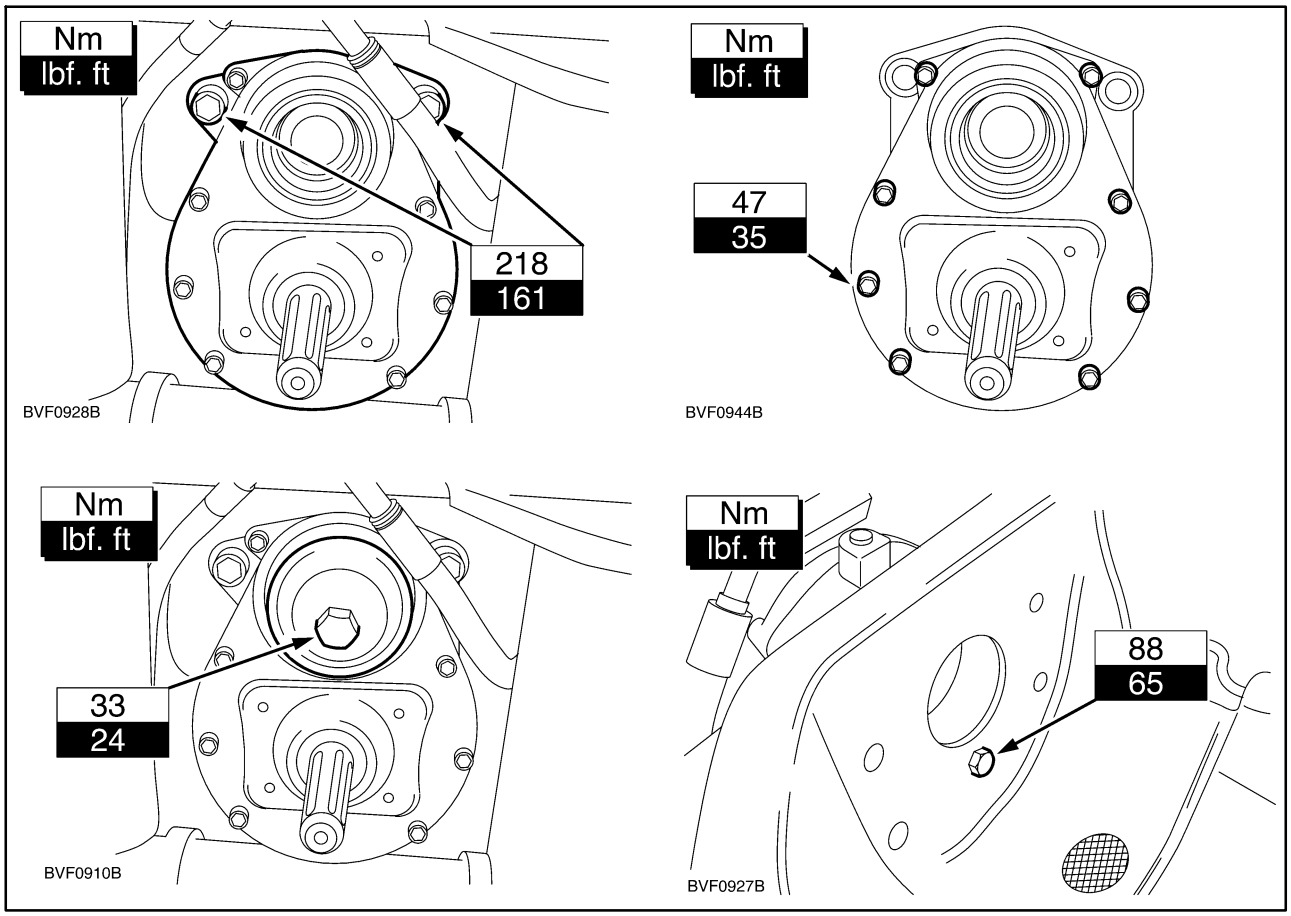


3

1. Apply Loctite 243 to the thread

2. Apply Loctite 638 to the thread

FRONT POWER TAKE-OFF



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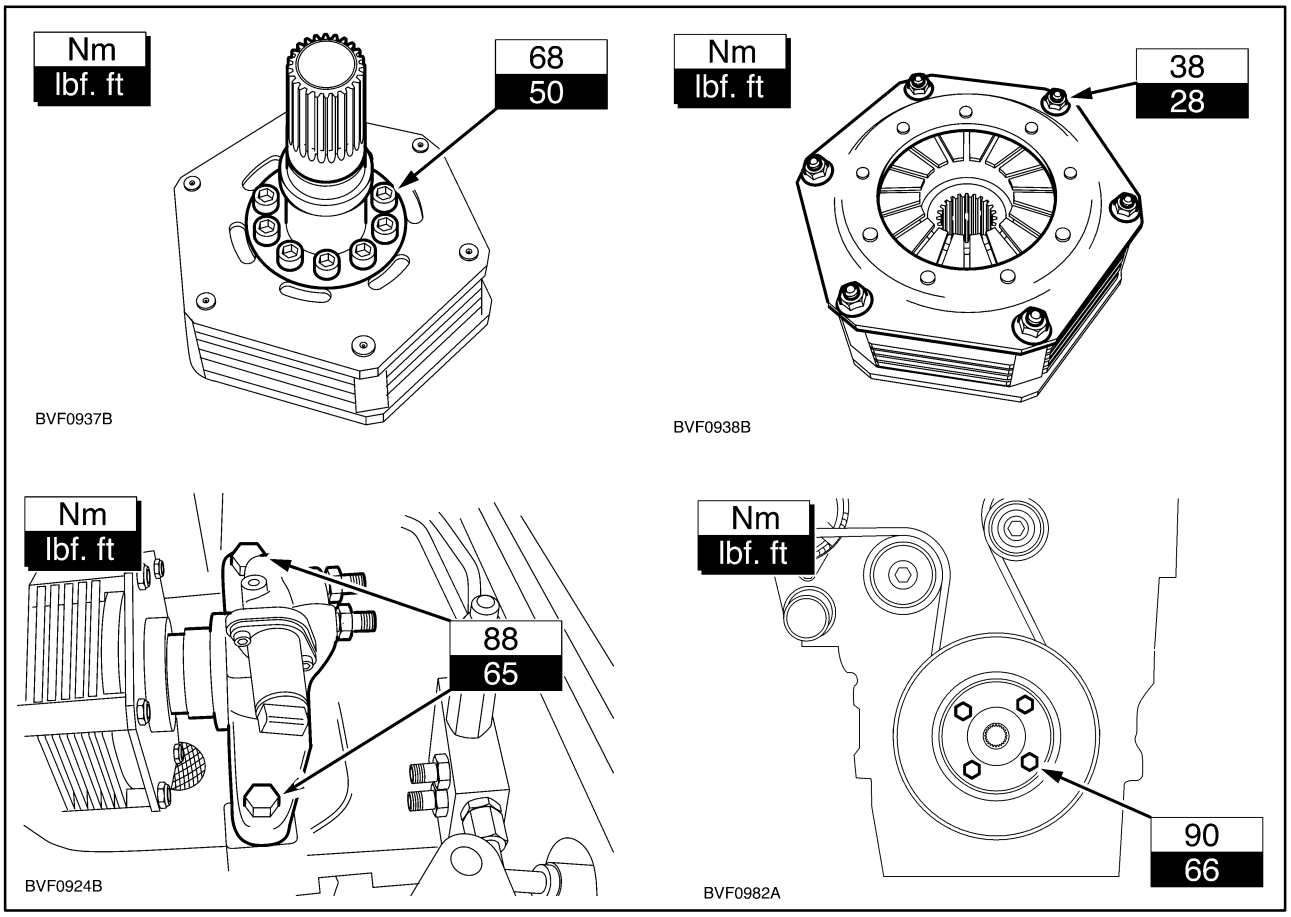

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SPECIAL TOOLS

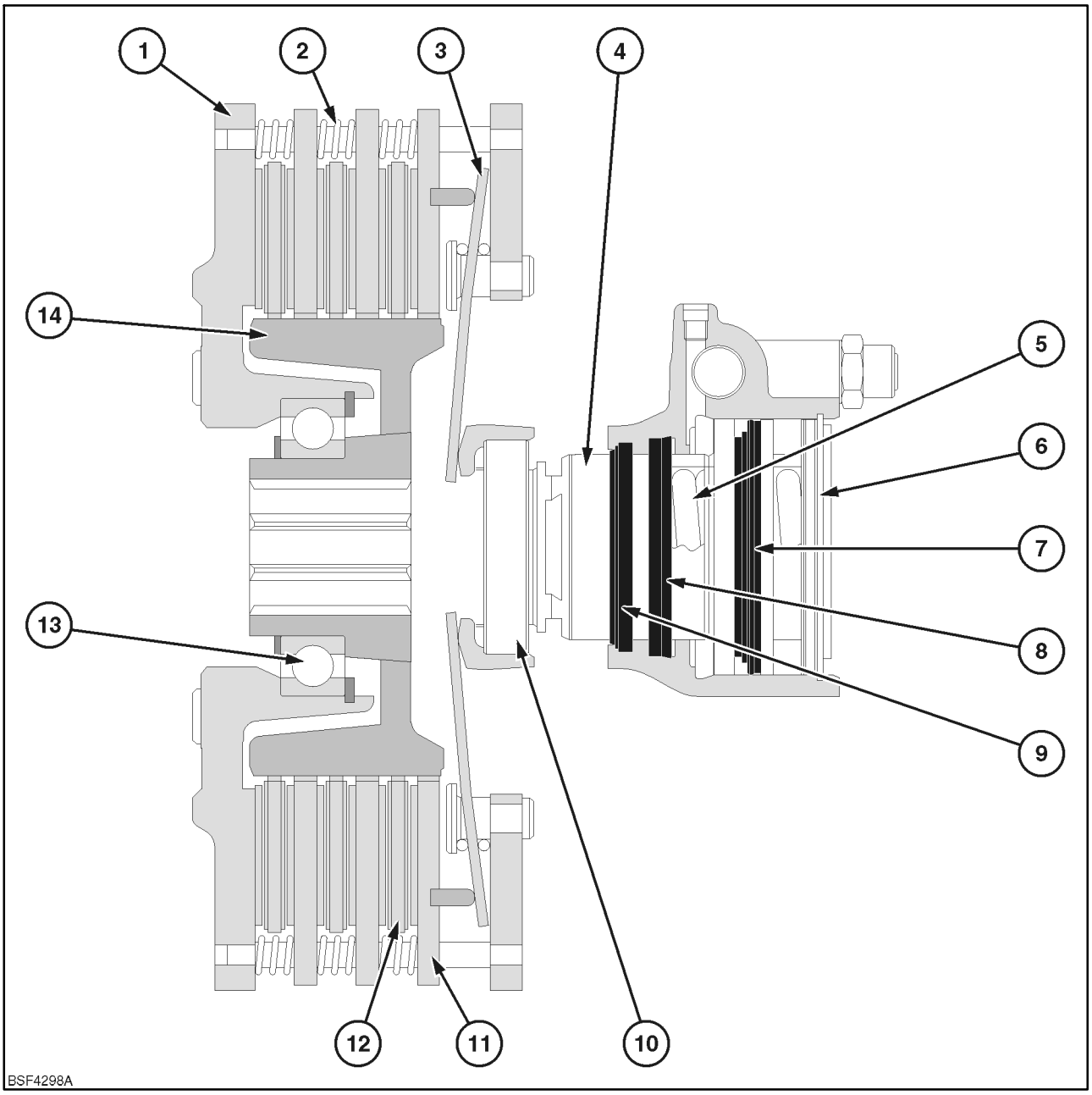
⚠ CAUTION ⚠

Operations described in this section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly in this Manual.

List of special tools necessary to carry out the different operations described in this section:

380001158 Control piston spanner

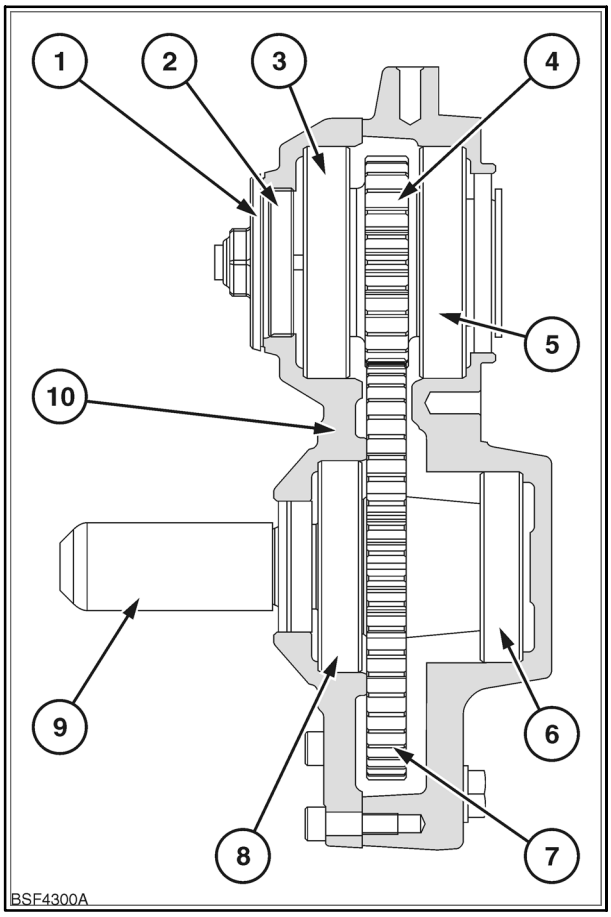
SECTIONAL VIEWS



6

Front PTO Clutch Sectional View

1. PTO clutch housing
2. Spring
3. Diaphragm spring
4. Piston
5. Piston spring
6. Circlip
7. Piston oil seal
8. Control housing oil seal
9. Control housing dust seal
10. Clutch release bearing
11. Steel plate
12. Friction disc
13. Bearing
14. Clutch housing



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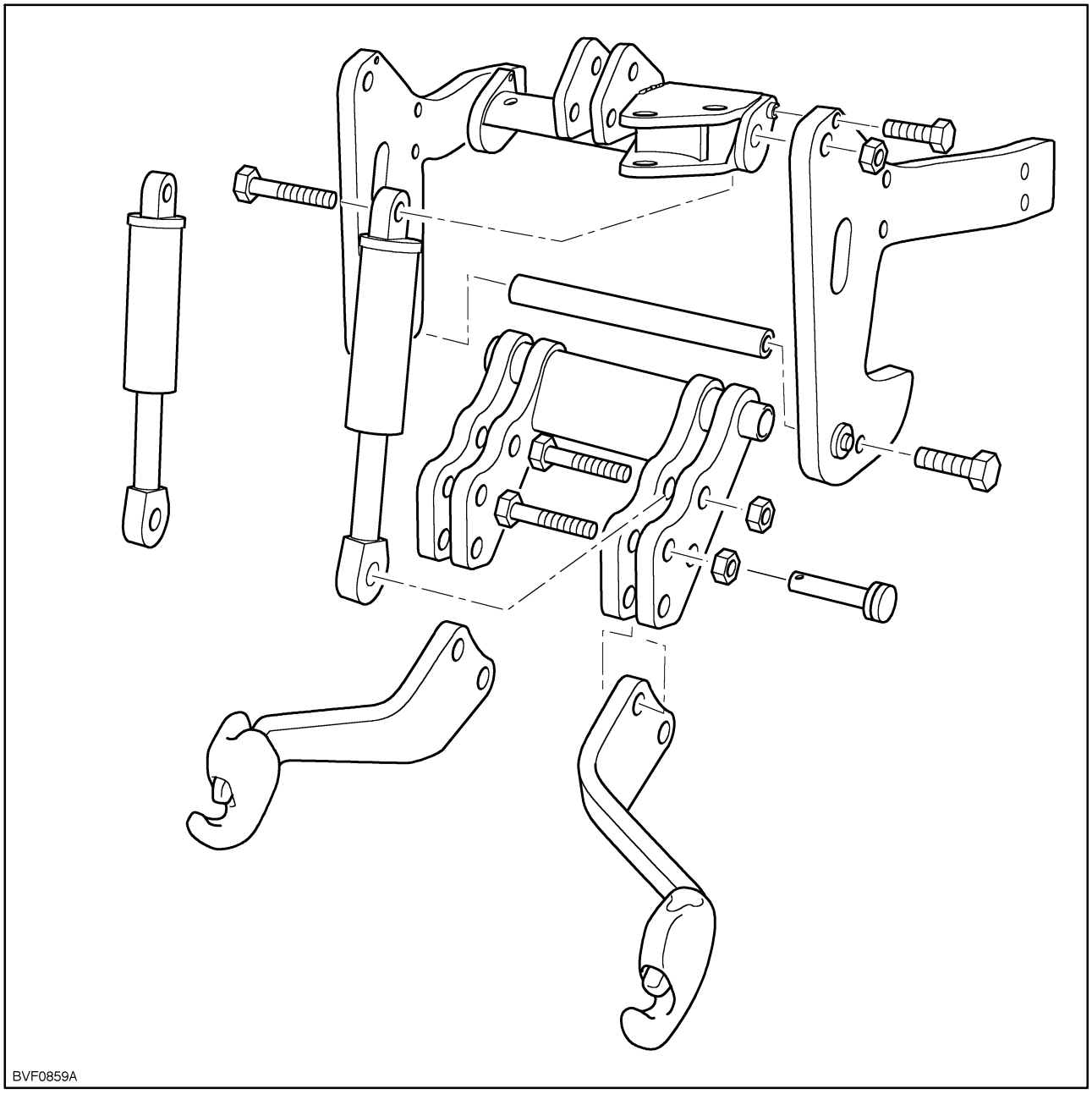
Front PTO Reduction Gearbox Sectional View

1. Input shaft cover
2. Input shaft plug
3. Bearing
4. Drive gear
5. Bearing
6. Bearing
7. Driven gear
8. Bearing
9. PTO output shaft
10. PTO reduction gearbox casing

DESCRIPTION AND OPERATION

FRONT HYDRAULIC LIFT



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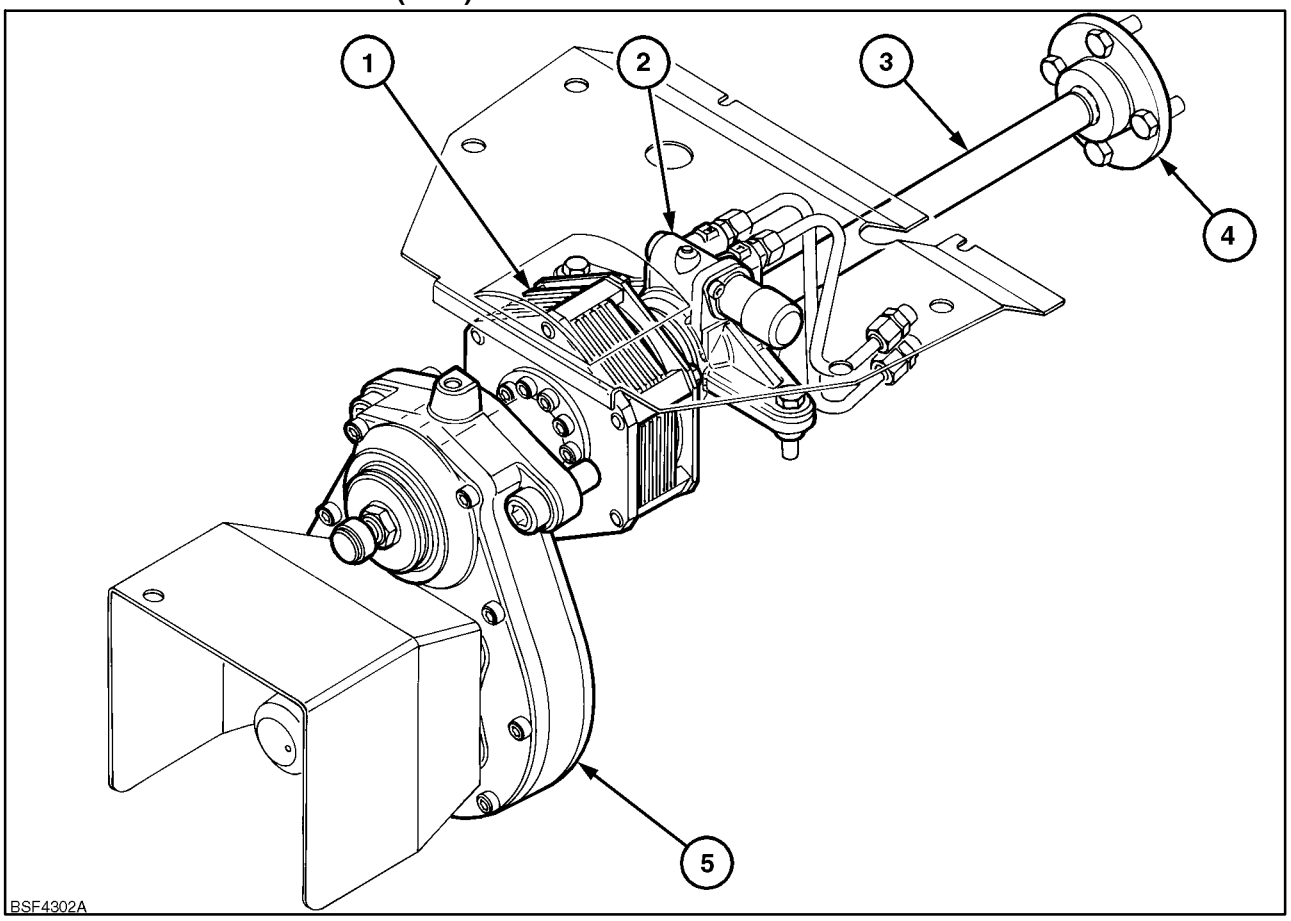
Front Hydraulic Lift

The front hydraulic lift consists of an adjustable top link and a pair of folding lower links. The top and lower links have open claws that permit rapid coupling and uncoupling of implements. The claws are equipped with self locking latches to ensure positive retention of the tractor linkage to the implement.

Two single acting hydraulic cylinders are used to raise and lower the hydraulic lift.

FRONT POWER TAKE-OFF (PTO)



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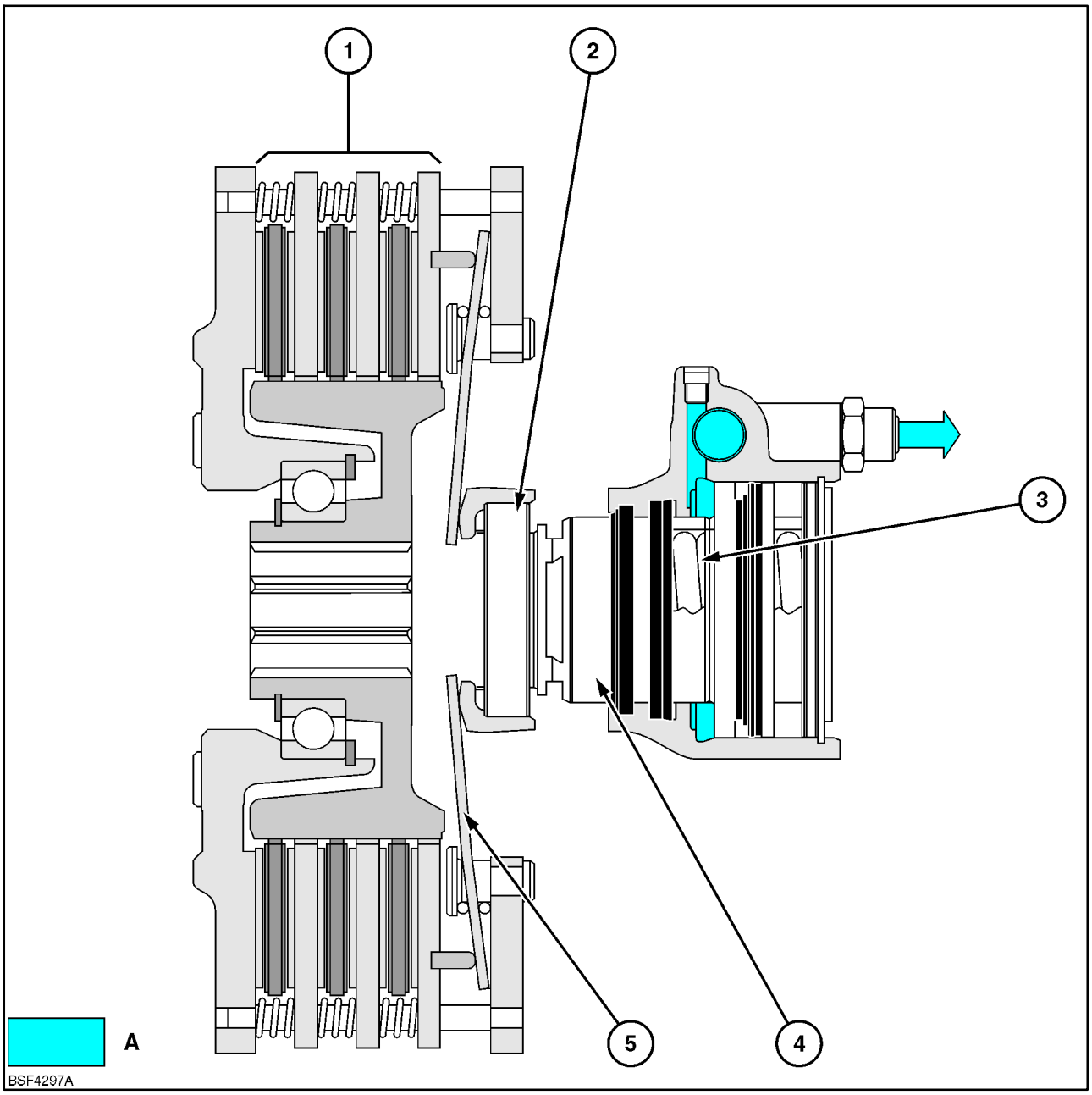
Front PTO

1. PTO multi-dry plate clutch
2. PTO control housing
3. PTO input shaft
4. Engine crankshaft pulley coupler
5. PTO reduction gearbox

The front PTO is engaged/disengaged by the piston control housing (2). The PTO is driven directly from the engine crankshaft. The engine crankshaft pulley coupler (4) transfers drive through the PTO input shaft (3) and into the multi-dry plate clutch (1). When the PTO is engaged the drive is transferred through the multi-dry plate clutch (1) into the PTO reduction gearbox (5) to the PTO reduction gearbox output shaft.



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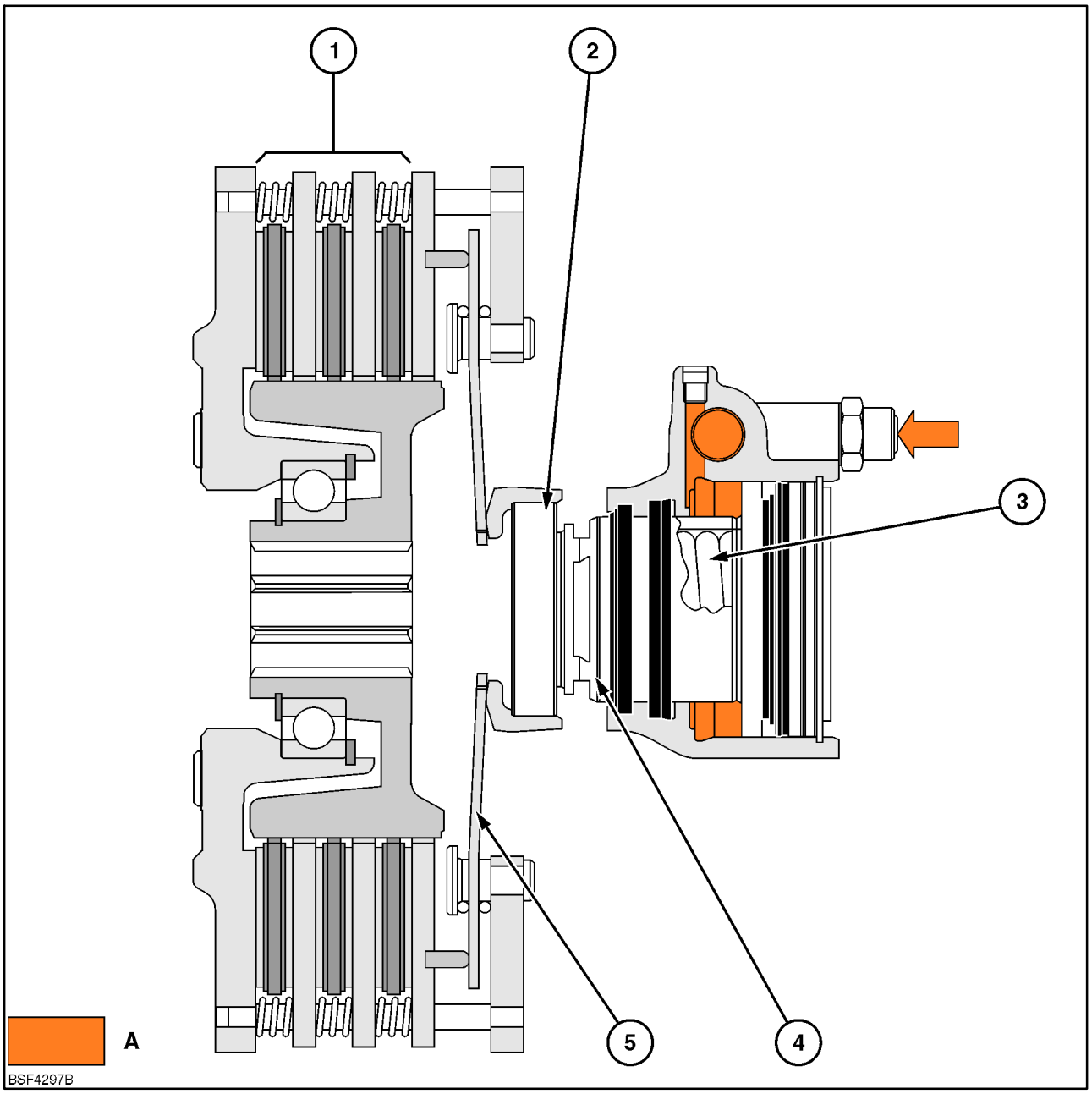
Front PTO Operation - Front PTO Disengaged

1. Friction discs and steel plates
2. Clutch release bearing
3. Piston spring
4. Piston
5. Diaphragm spring

Figure Colour Key

A. Return to reservoir

When the front PTO is disengaged, power to the solenoid valve is switched off allowing the oil to return to the reservoir. With no oil pressure acting against the piston (4), the spring (3) pushes the piston (4) out of the housing and pushes the clutch release bearing (2) into contact with the PTO clutch diaphragm spring (5). When pressure is applied to the diaphragm spring (5) it releases the force acting on the clutch pressure plate. This allows the springs in between the friction discs and steel plates (1) to expand, allowing the clutch hub to rotate freely within the clutch housing.



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Front PTO Operation - Front PTO Engaged

1. Friction discs and steel plates
2. Clutch release bearing
3. Spring
4. Piston
5. Diaphragm spring

Figure Colour Key

A. Low pressure circuit

When the front PTO is engaged, the solenoid valve is energized, allowing oil pressure to be applied to the piston (4). The oil pressure acting against the piston (4), overcomes the piston spring (3), which allows the piston (4) to retract into the housing, releasing the clutch release bearing (2) from the force of the diaphragm spring (5). When pressure is released from the diaphragm spring (5), it increases the force acting on the clutch pressure plate. This compresses the springs in between the friction discs and steel plates (1), clamping the friction discs and steel plates (1) together, locking the clutch hub and the clutch housing together.

TROUBLESHOOTING

FRONT PTO

PROBLEM	POSSIBLE CAUSES	CORRECTION
Front PTO not engaging	Front PTO is not turned on in machine configurations.	Turn the front PTO on in machine configurations (refer to the diagnostic H routines chapter in the electrical systems section).
	Front PTO solenoid valve not energizing.	Check the electrical circuit.
	Solenoid valve sticking.	Replace the solenoid valve.
Front PTO permanently engaged	Piston spring broken.	Replace the piston spring.
	Solenoid valve sticking.	Replace the solenoid valve.
Low power from the front PTO output shaft	Fault in the low pressure circuit.	Pressure test the low pressure circuit.
	Front PTO piston oil seals leaking.	Overhaul the front PTO control housing.
	Front PTO multi-dry plate clutch plates worn.	Overhaul the front PTO multi-dry plate clutch.
Front PTO output shaft oil seal leak	Worn oil seal.	Replace the oil seal and check the level of oil in the reduction gearbox.
	Excessive oil level in the front PTO reduction gearbox.	Check the oil level.
Front PTO bearings overheated/worn	Lack of oil in front PTO reduction gearbox.	Check the oil level. If low examine the front PTO reduction gearbox for leaks.
	Incorrect specification oil or old oil in the front PTO reduction gearbox.	Replace with the correct specification of oil.

FRONT HYDRAULIC LIFT

PROBLEM	POSSIBLE CAUSES	CORRECTION
Front hydraulic lift not raising	Diverter valve not open.	Open the diverter valve.
	Height limit control incorrectly set.	Adjust the height limit control to the required setting.
	Front hydraulic lift arm position sensing potentiometer damaged.	Replace the potentiometer.
Front hydraulic lift will not raise heavy loads	Front hydraulic lift cylinder oil seals leaking.	Overhaul the front hydraulic lift cylinders.

OVERHAUL

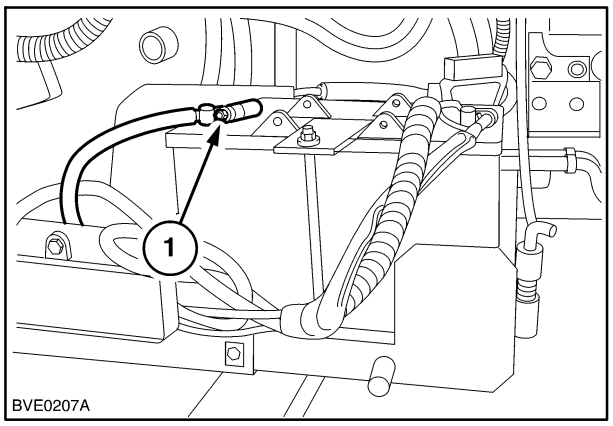
HYDRAULIC FRONT LIFT

Removal

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

1. Lower the front hydraulic lift arms.
2. Remove the battery cover and disconnect the battery negative cable (1).



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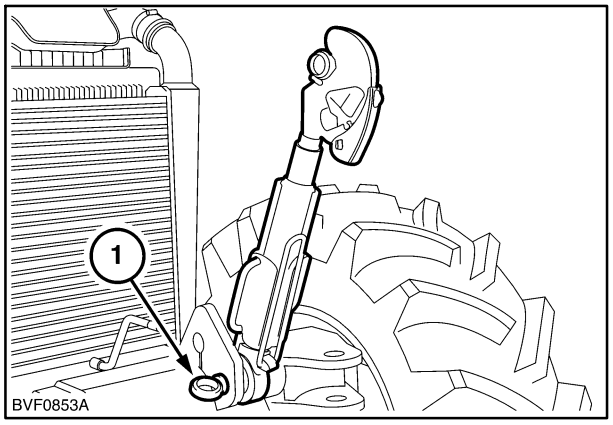
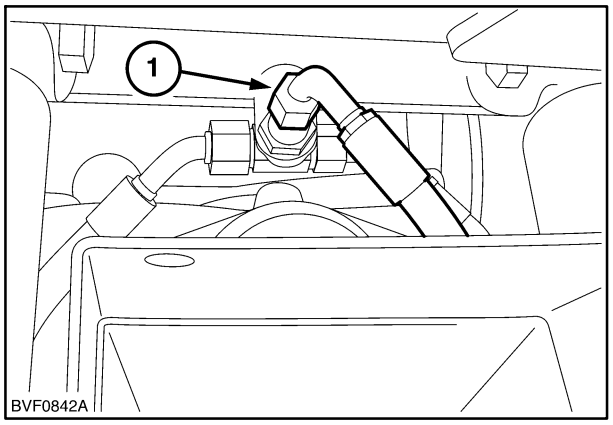
3. Remove the retaining pin (1) and remove the front top link.



13

4. Disconnect the hydraulic supply pipe (1) from the T-piece.



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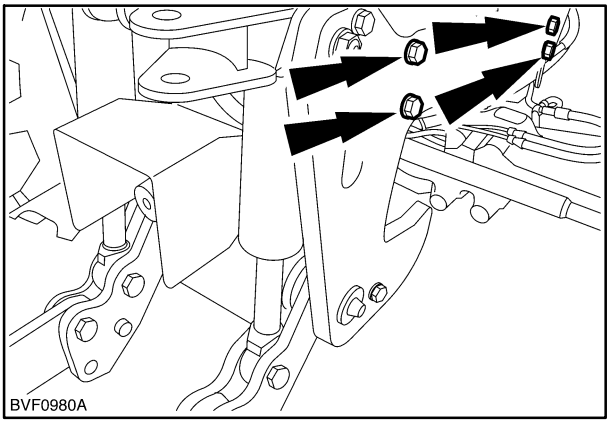
5. Using a suitable strap, attach the hydraulic front lift to a suitable hoist.
6. Remove the left hand side hydraulic front lift retaining bolts. Repeat this step for the right hand side.



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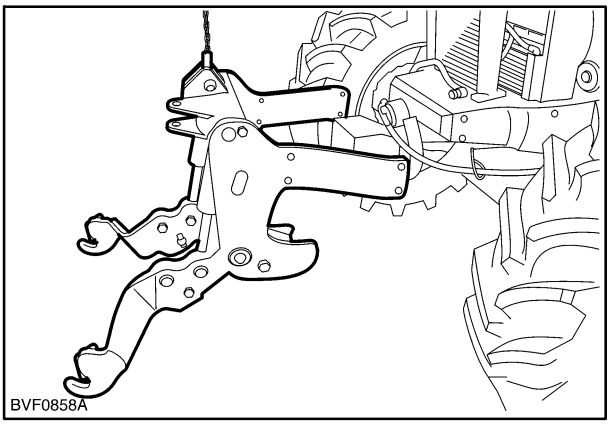
7. Remove the hydraulic front lift.



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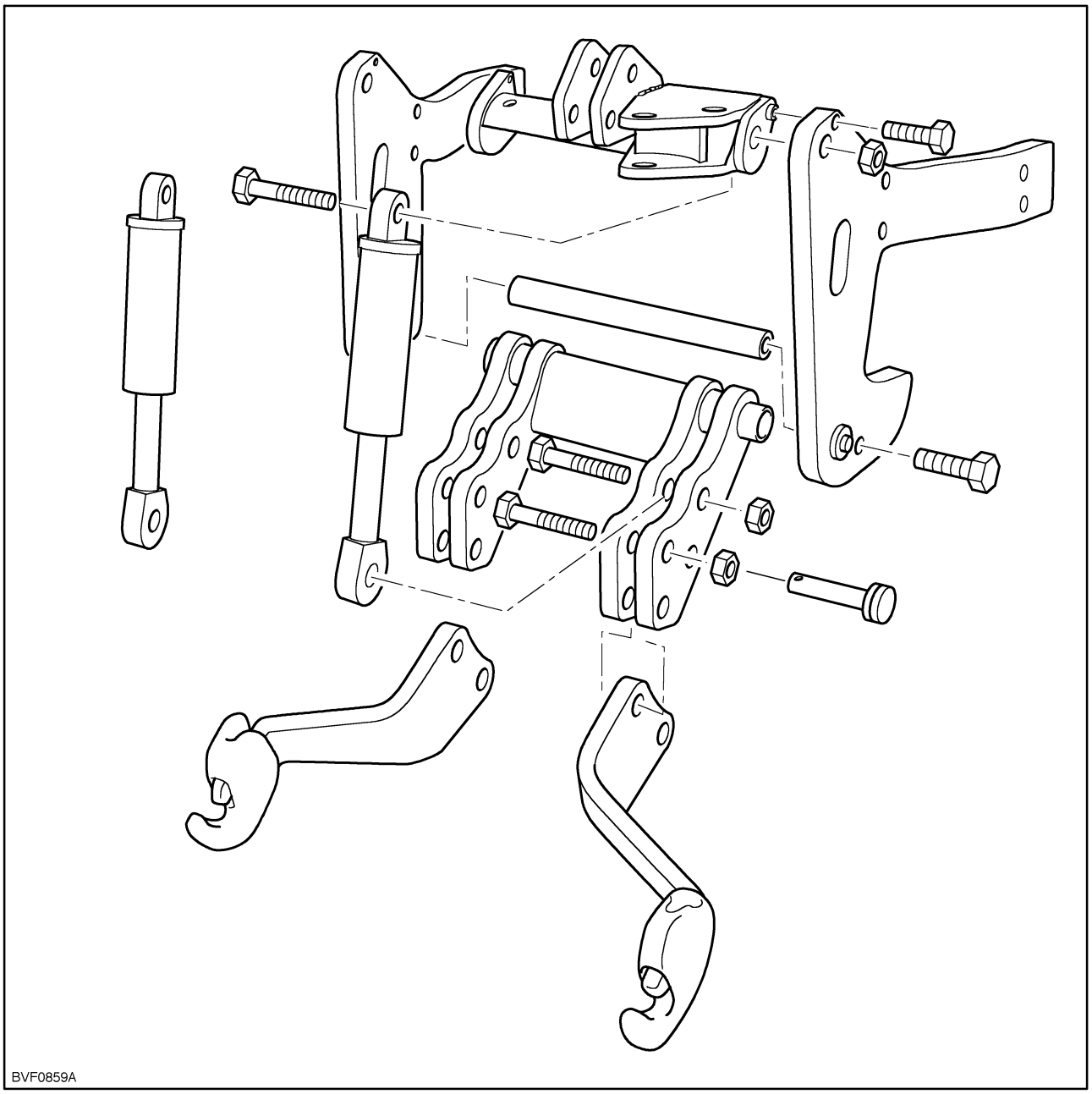
Disassembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.



Assembly

⚠ WARNING ⚠

Handle all components with the greatest care.
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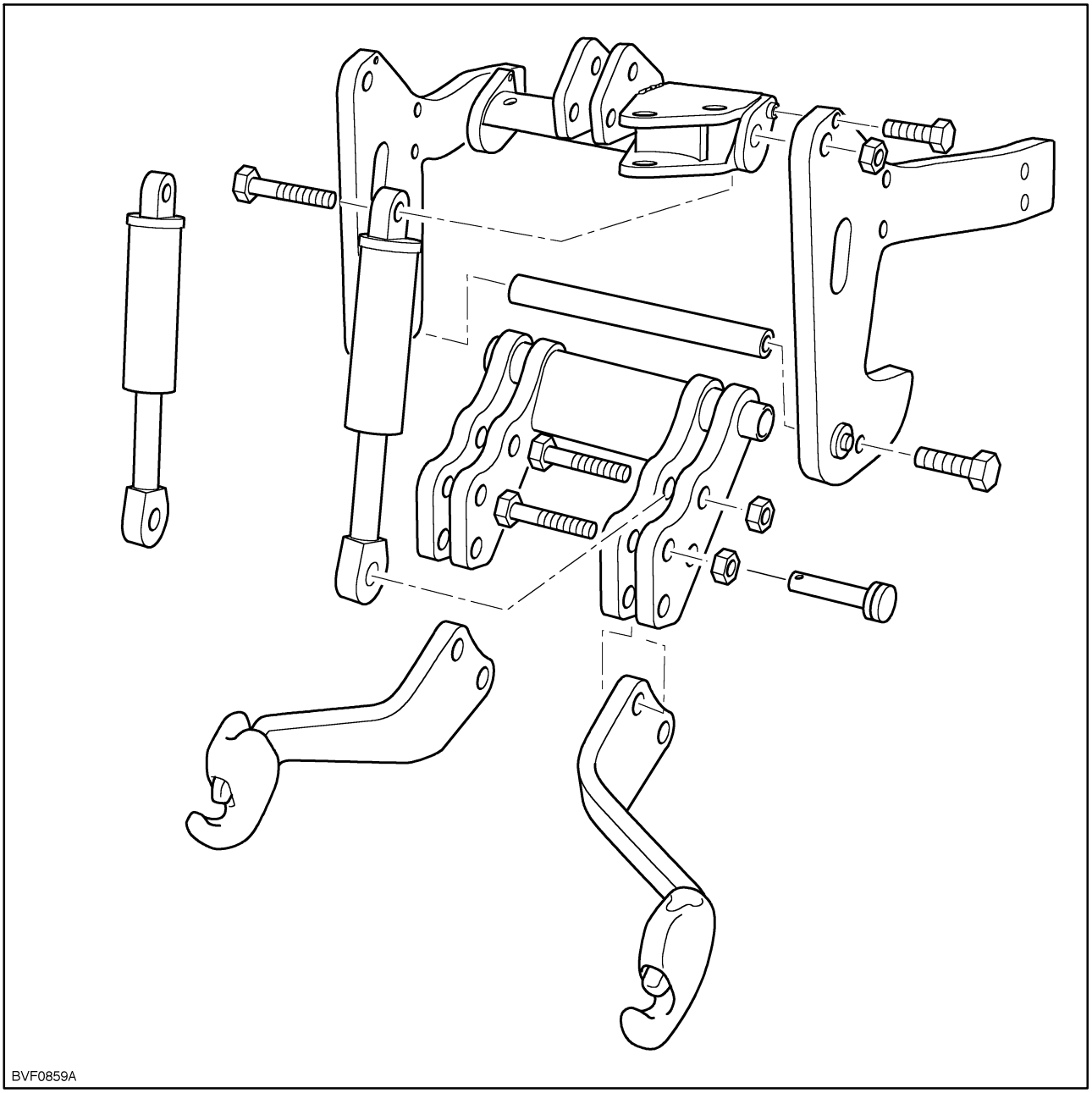
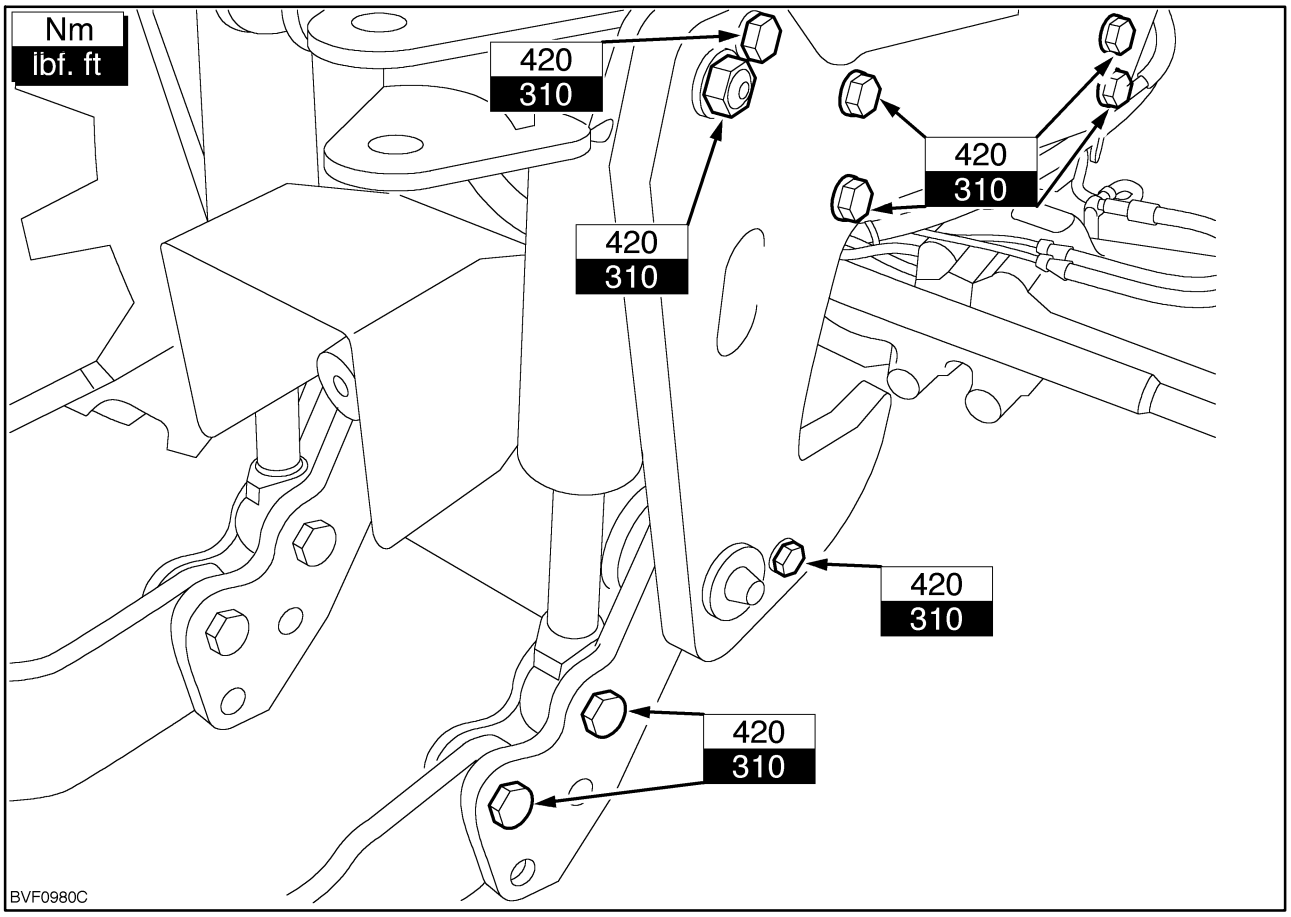
Wear goggles, gloves and footwear.





19

Installation

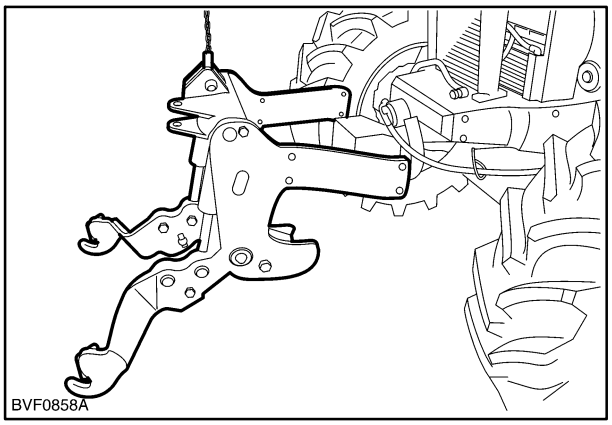
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

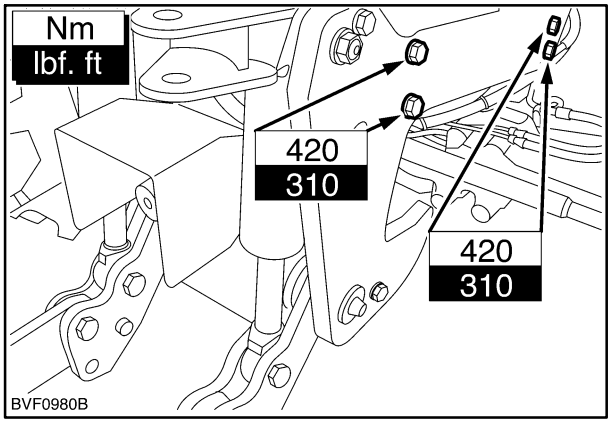
Wear goggles, gloves and footwear.

1. Using a suitable hoist, install the hydraulic front lift.



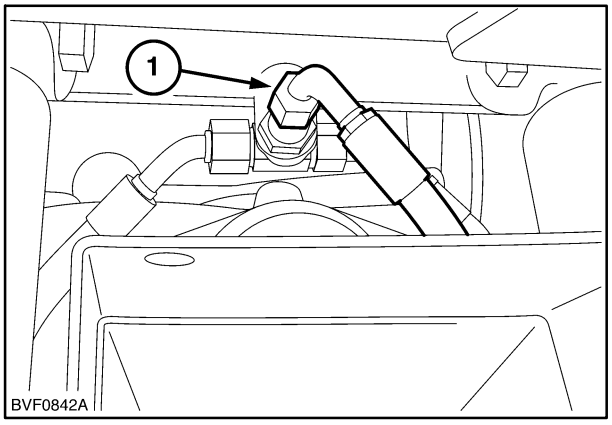
20

2. Install the left hand side and right hand side hydraulic front lift retaining bolts. Tighten the retaining bolts to the specified torque value.



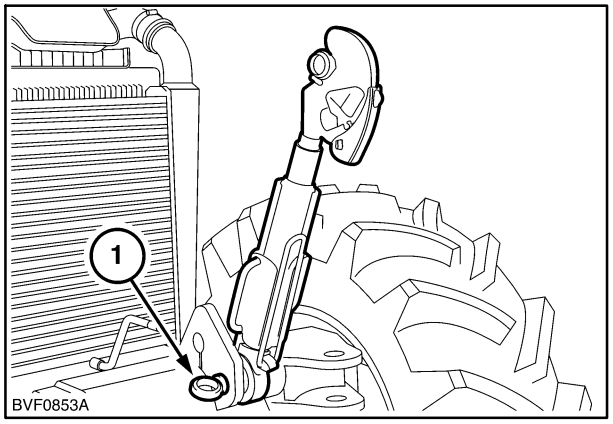
21

3. Connect the hydraulic supply pipe (1) to the T-piece.



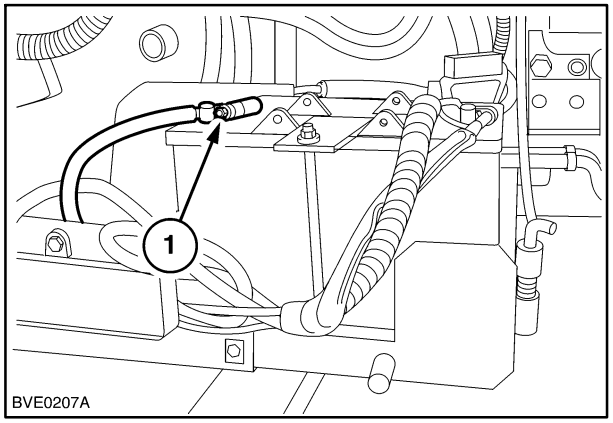
22

4. Install the front top link and install the retaining pin (1).



23

5. Connect the battery negative cable (1) and install the battery cover.



24

HYDRAULIC FRONT LIFT RAM

Removal

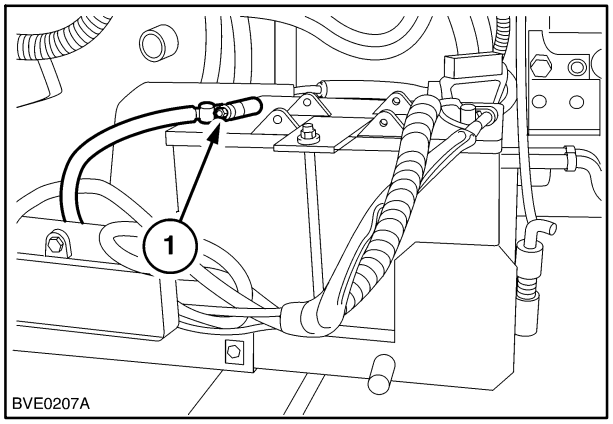
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

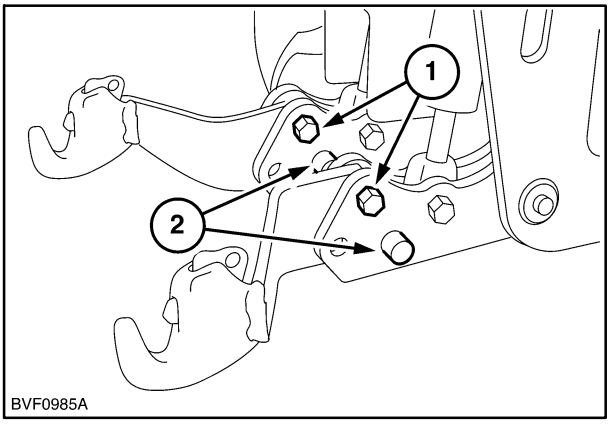
Wear goggles, gloves and footwear.

1. Lower the front hydraulic lift arms.
2. Remove the battery cover and disconnect the battery negative cable (1).



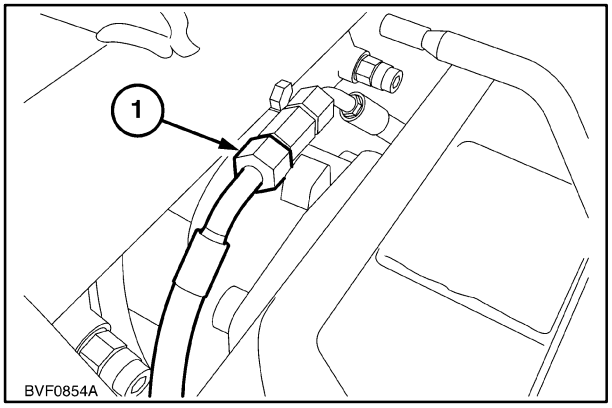
25

3. Remove the retaining bolts (1), retaining pins (2) and remove the front hydraulic lift arms.



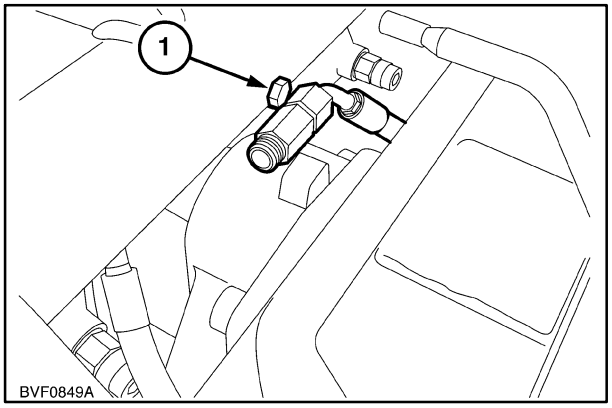
26

4. Disconnect the hydraulic ram supply pipe (1) from the T-piece.



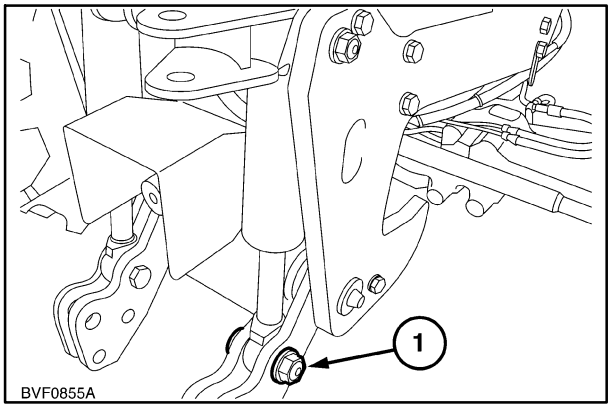
27

5. Remove the T-piece retaining bolt (1) and detach the T-piece from the hydraulic front lift.



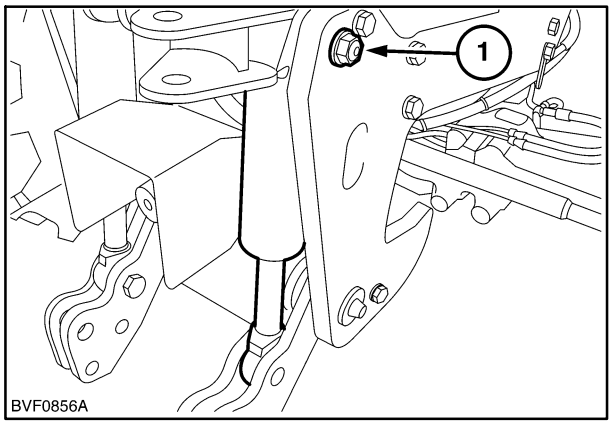
28

6. Remove the hydraulic front lift ram lower retaining nut and bolt (1).



29

7. Remove the retaining nut (1), slide out the pin and remove the hydraulic front lift ram.



30

Installation

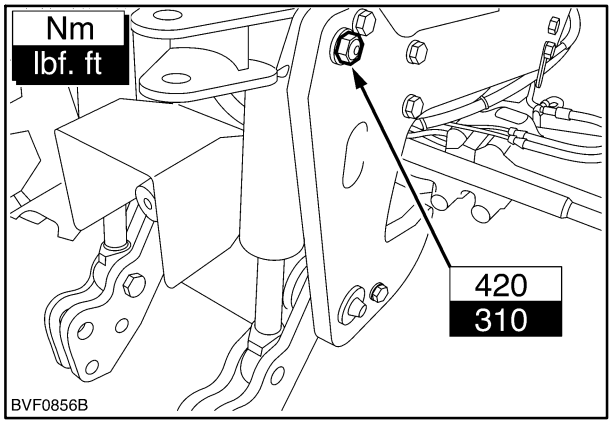
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

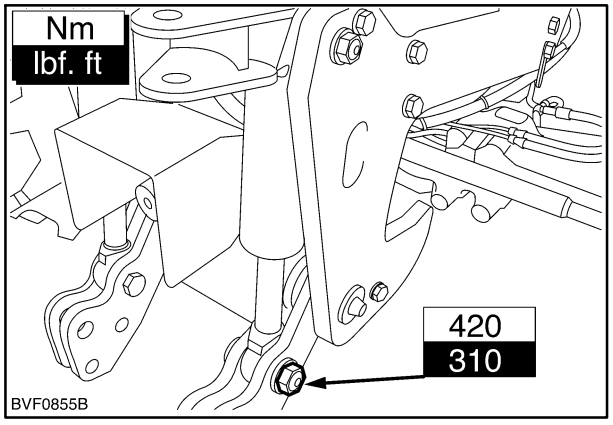
Wear goggles, gloves and footwear.

1. Install the hydraulic front lift ram and slide in the pin. Install the retaining nut and tighten to the specified torque value.



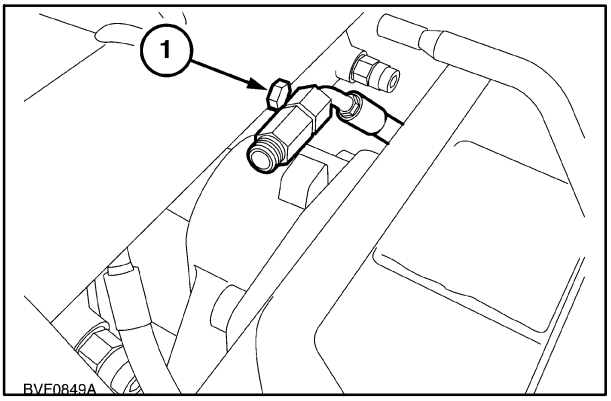
31

2. Install the hydraulic front lift ram lower retaining nut and bolt. Tighten to the specified torque value.



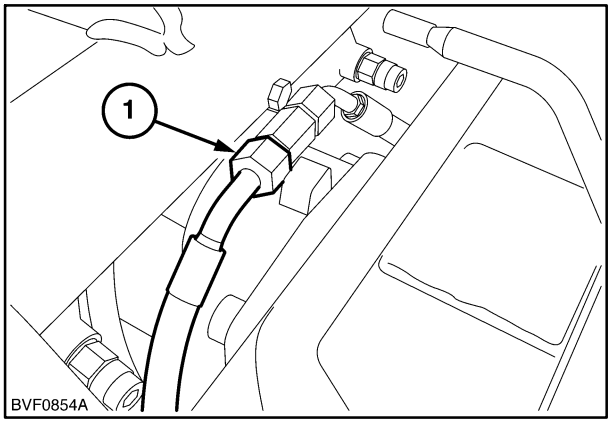
32

3. Attach the T-piece to the hydraulic front lift and install the hydraulic front lift retaining bolt (1).



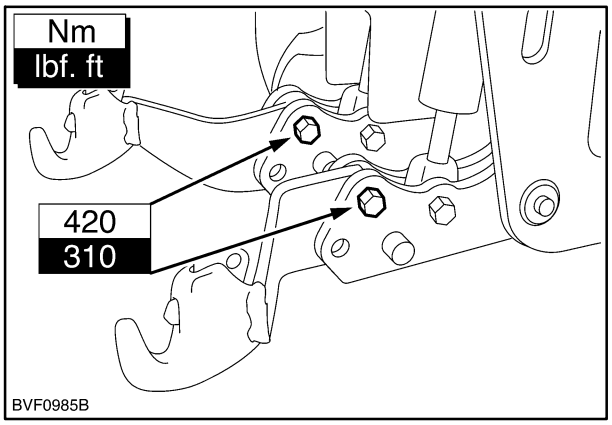
33

4. Connect the hydraulic ram supply pipe (1) to the T-piece.



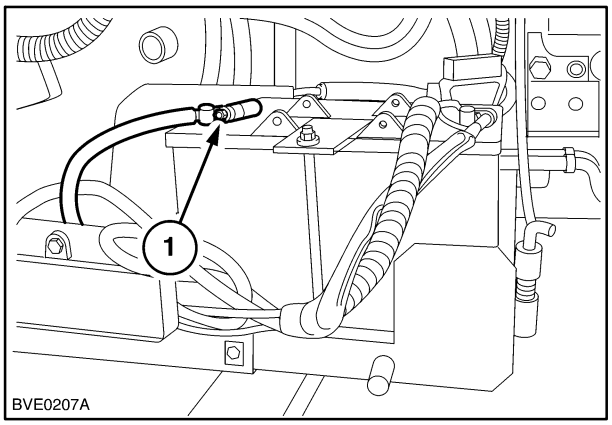
34

5. Install the front hydraulic lift arms, retaining pins and the retaining bolts. Tighten the retaining bolts to the specified torque value.



35

6. Connect the battery negative cable (1) and install the battery cover.



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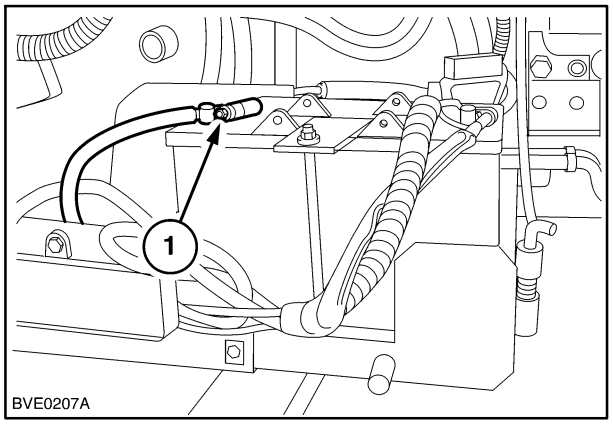
FRONT PTO CONTROL HOUSING

Removal

⚠ WARNING ⚠

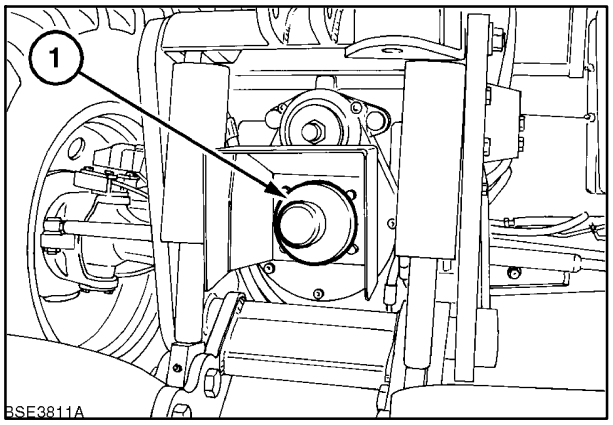
Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

1. Lower the front hydraulic lift arms.
2. Remove the battery cover and disconnect the battery negative cable (1).



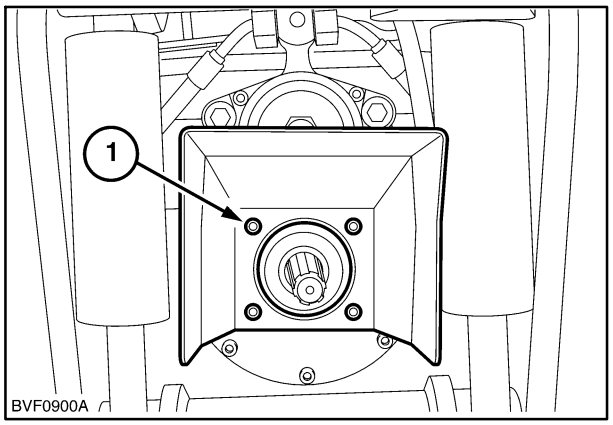
37

3. Remove the PTO output shaft cover (1).



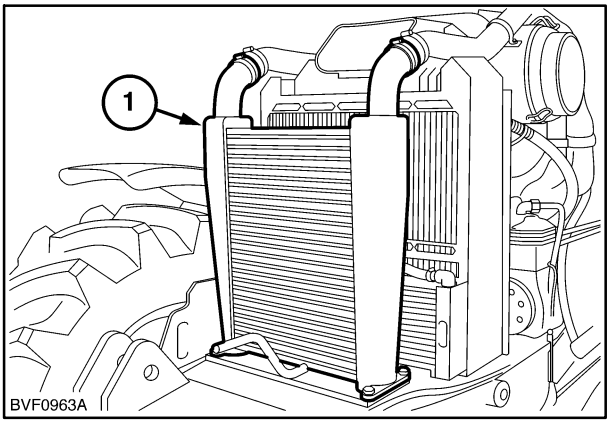
38

4. Remove the retaining bolts (1) and remove the PTO guard.



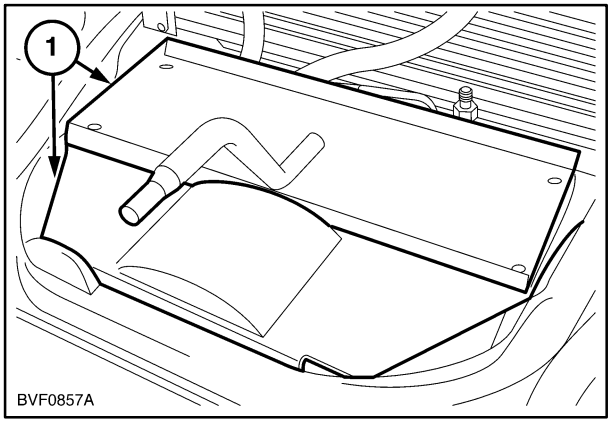
39

5. Remove the intercooler (1).



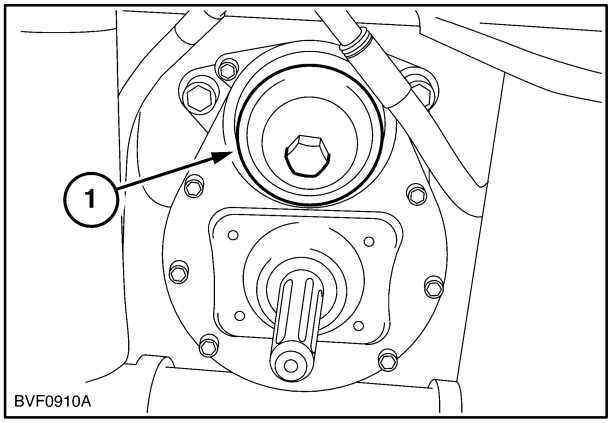
40

6. Remove the front axle support cover plates (1).



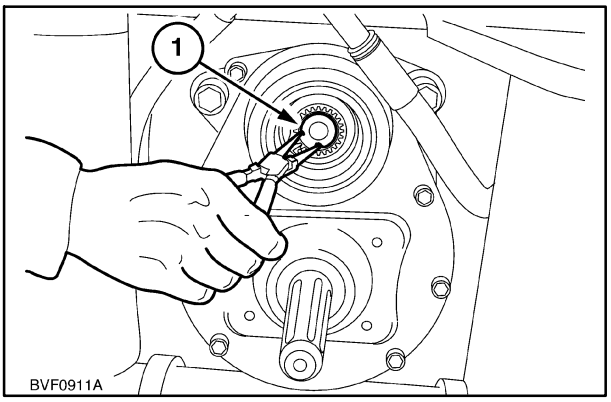
41

7. Remove the PTO input shaft cover (1).



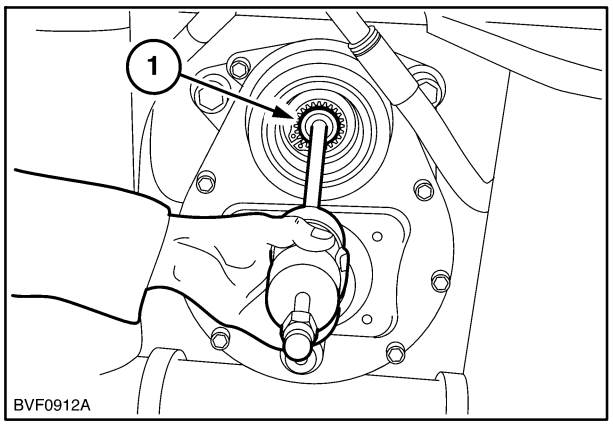
42

8. Using suitable circlip pliers, remove the PTO input shaft plug circlip (1).



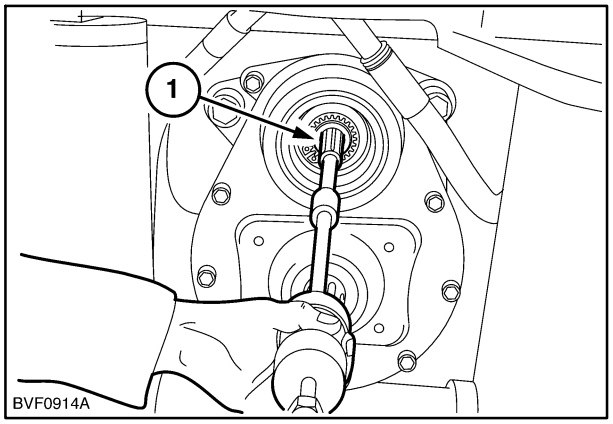
43

9. Using a suitable slide hammer and a M12 x 1.75 mm adaptor, remove the PTO input shaft plug (1).



44

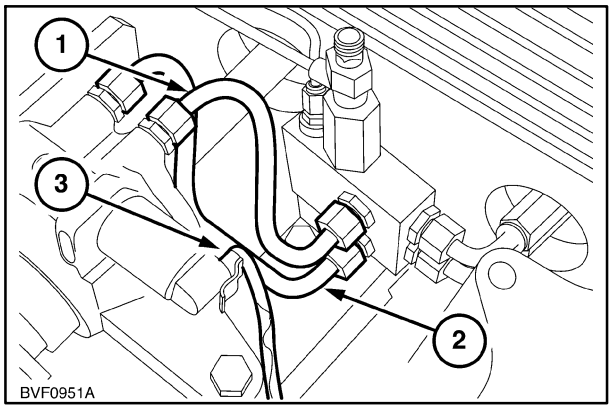
10. Using a suitable slide hammer and a M12 x 1.50 mm adaptor, remove the PTO input shaft (1).



45

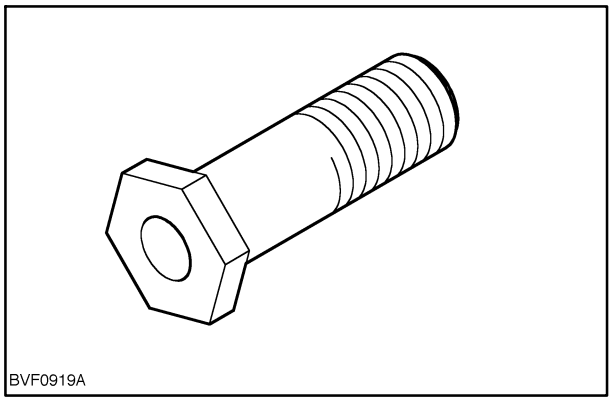
If the PTO cannot be engaged

11. Remove the front PTO return pipe (1) and the front PTO feed pipe (2).
12. Disconnect the control housing solenoid valve electrical connector (3).



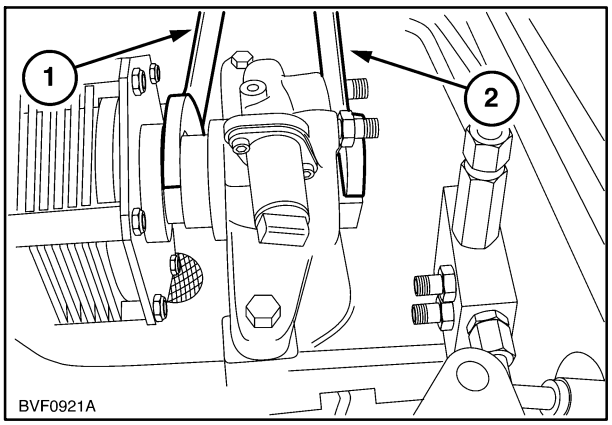
46

13. Remove the piston spring compression bolt (M36 x 4 x 140 mm), supplied with the tractor and located in the front support cover plates.



47

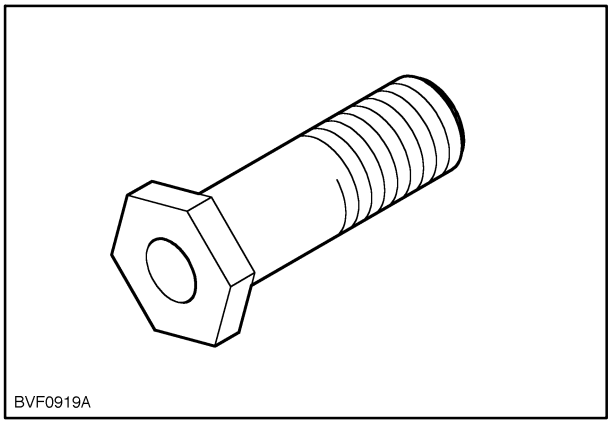
14. Install the piston spring compression bolt into the PTO control housing. Using special tool **380001158** (1), stop the piston from turning. Using a 50 mm spanner (2). Tighten the piston spring compression bolt to withdraw the piston.



48

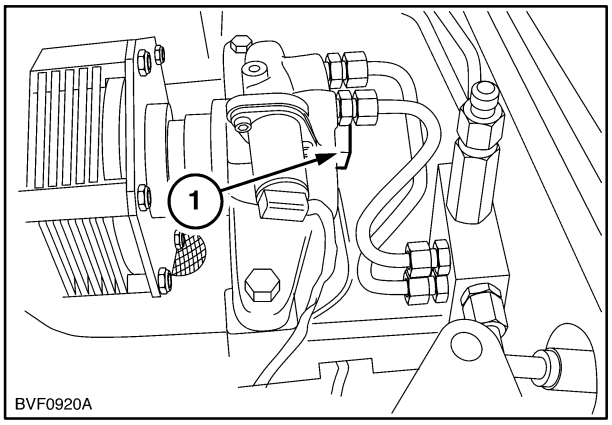
If the front PTO can be engaged

15. Remove the piston spring compression bolt (M36 x 4 x 140 mm), supplied with the tractor and located in the front support cover plates.



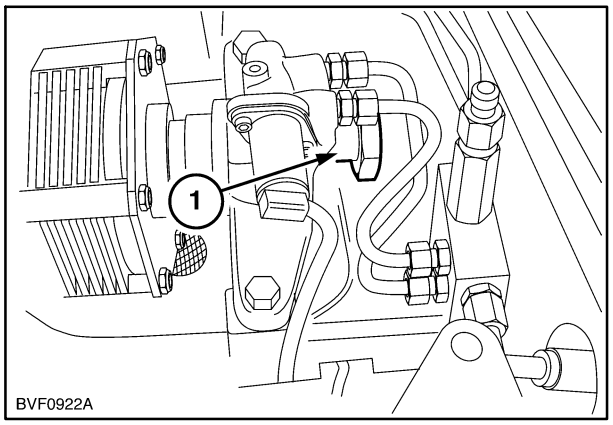
49

16. Install the piston spring compression bolt (1) into the PTO control housing and tighten finger tight.



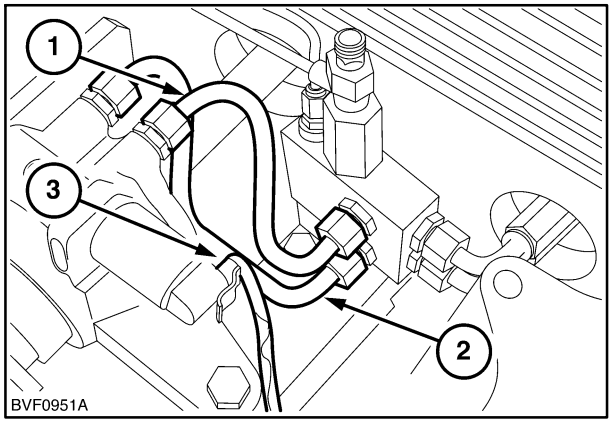
50

17. Start the engine and engage the front PTO.
18. Tighten the piston spring compression bolt (1) into the PTO control housing.



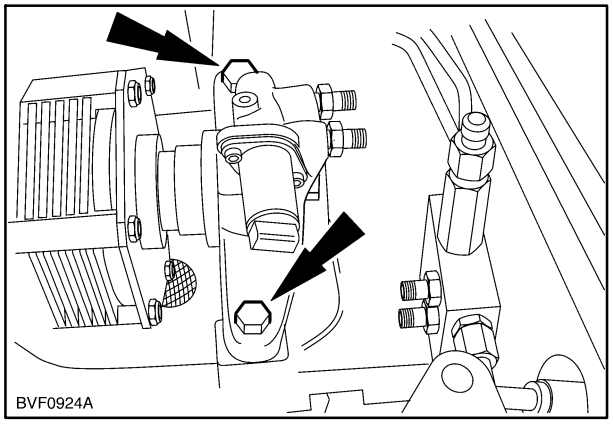
51

19. Disengage the PTO and turn off the engine.
20. Remove the front PTO return pipe (1) and the front PTO supply pipe (2).
21. Disconnect the control housing solenoid valve electrical connector (3).



52

22. Remove the PTO control housing.

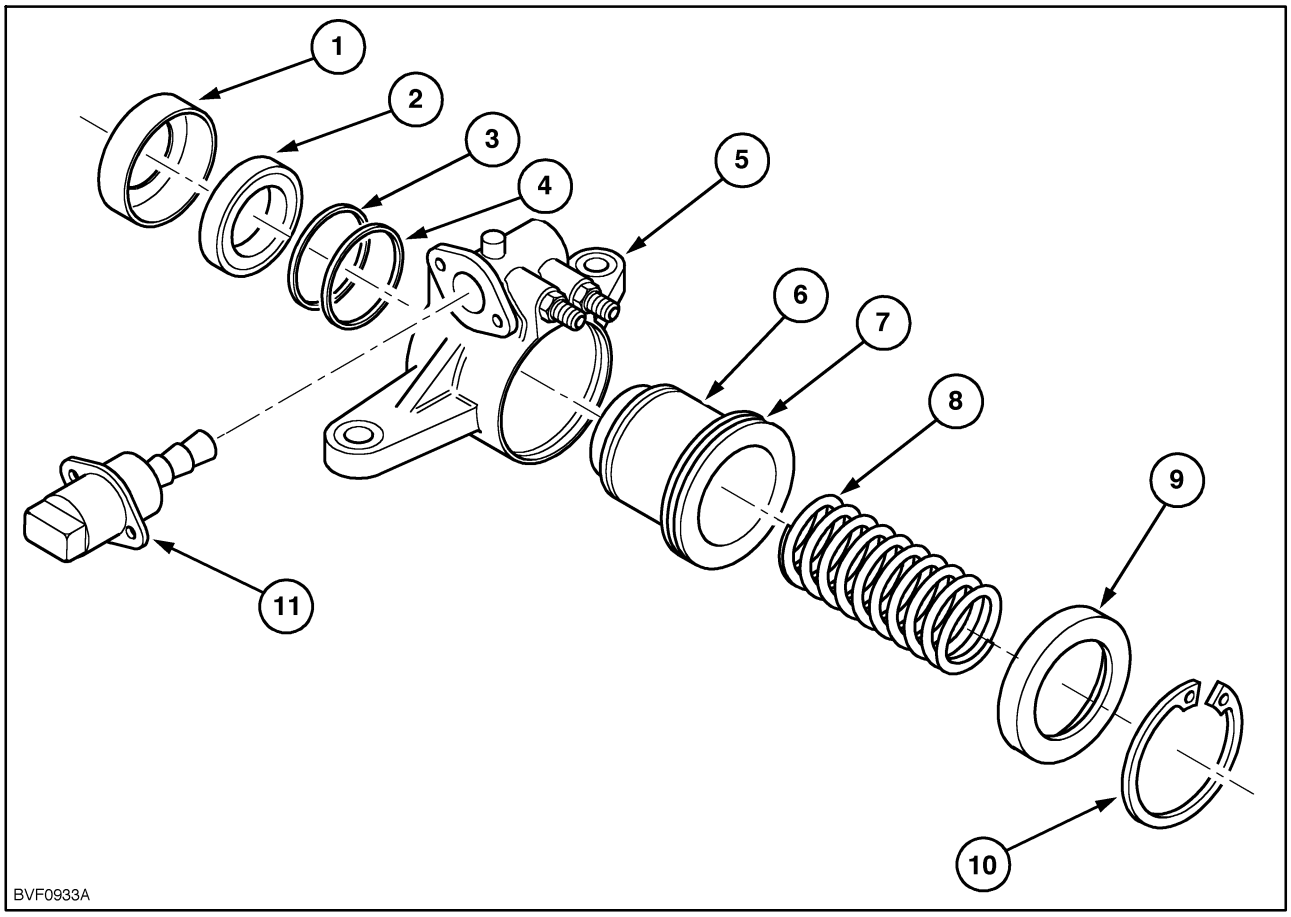


53

Disassembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.



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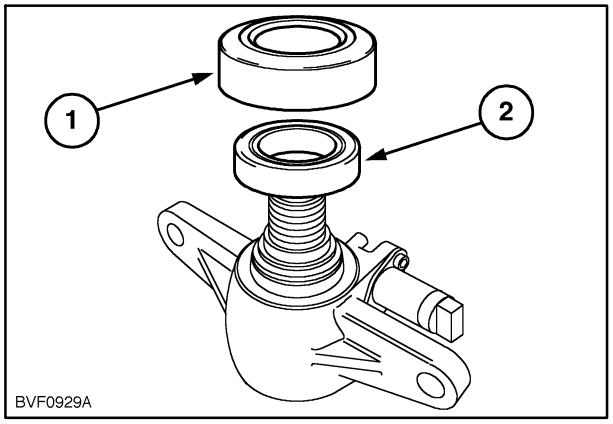
PTO Control Housing Exploded View

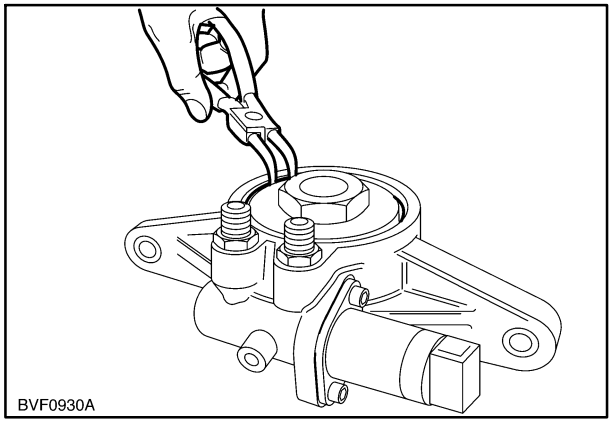
1. Bearing cover
2. Bearing
3. Dust ring
4. Piston oil seal
5. PTO control housing
6. Piston
7. Piston seal
8. Spring
9. Spring cover
10. Circlip
11. Solenoid valve

1. Remove the clutch release bearing cover (1) and the clutch release bearing (2).



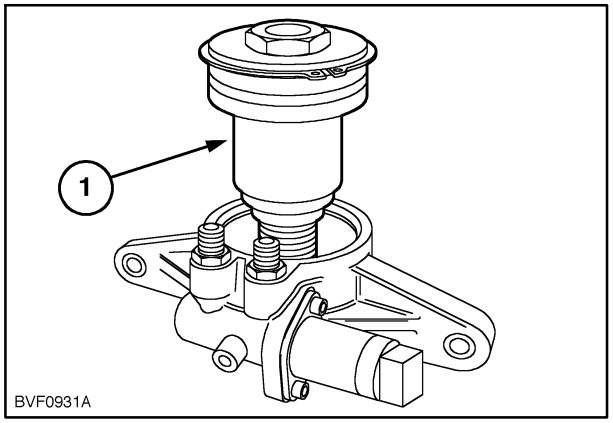
55

2. Rotate the PTO control housing 180°.
3. Using suitable circlip pliers, compress the circlip.



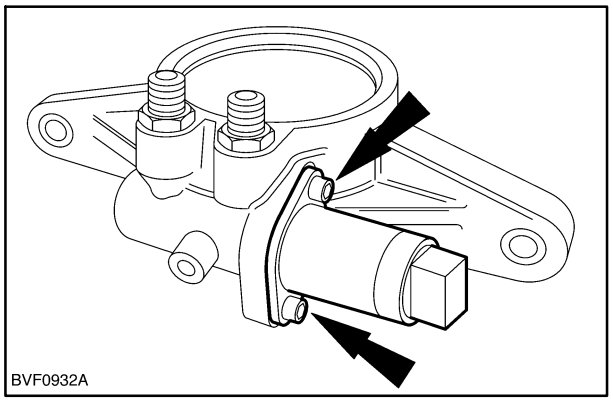
56

4. Remove the piston and spring assembly (1) from the PTO control housing.



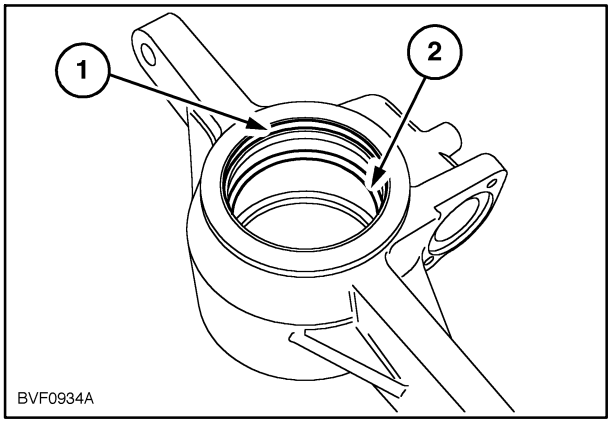
57

5. Remove the solenoid from the PTO control housing.



58

6. Remove and discard the PTO control housing dust ring (1) and piston oil seal (2).



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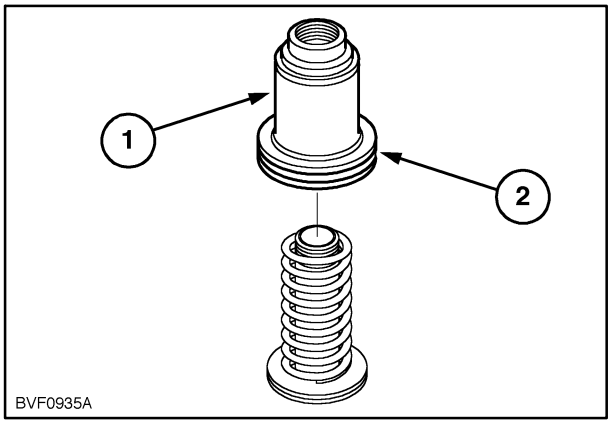
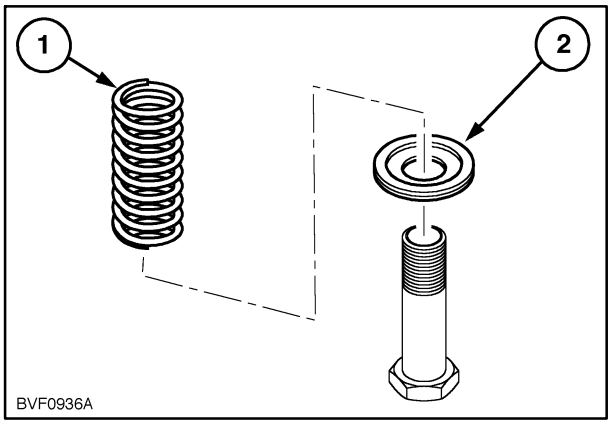
7. Using a suitable vice, clamp the head of the piston spring compression bolt (M36 x 4 x 140 mm). Using the special tool **380001158** release the spring tension and remove the piston (1).
8. Remove and discard the piston oil seal (2).



60

9. Remove the spring (1) and cover (2)

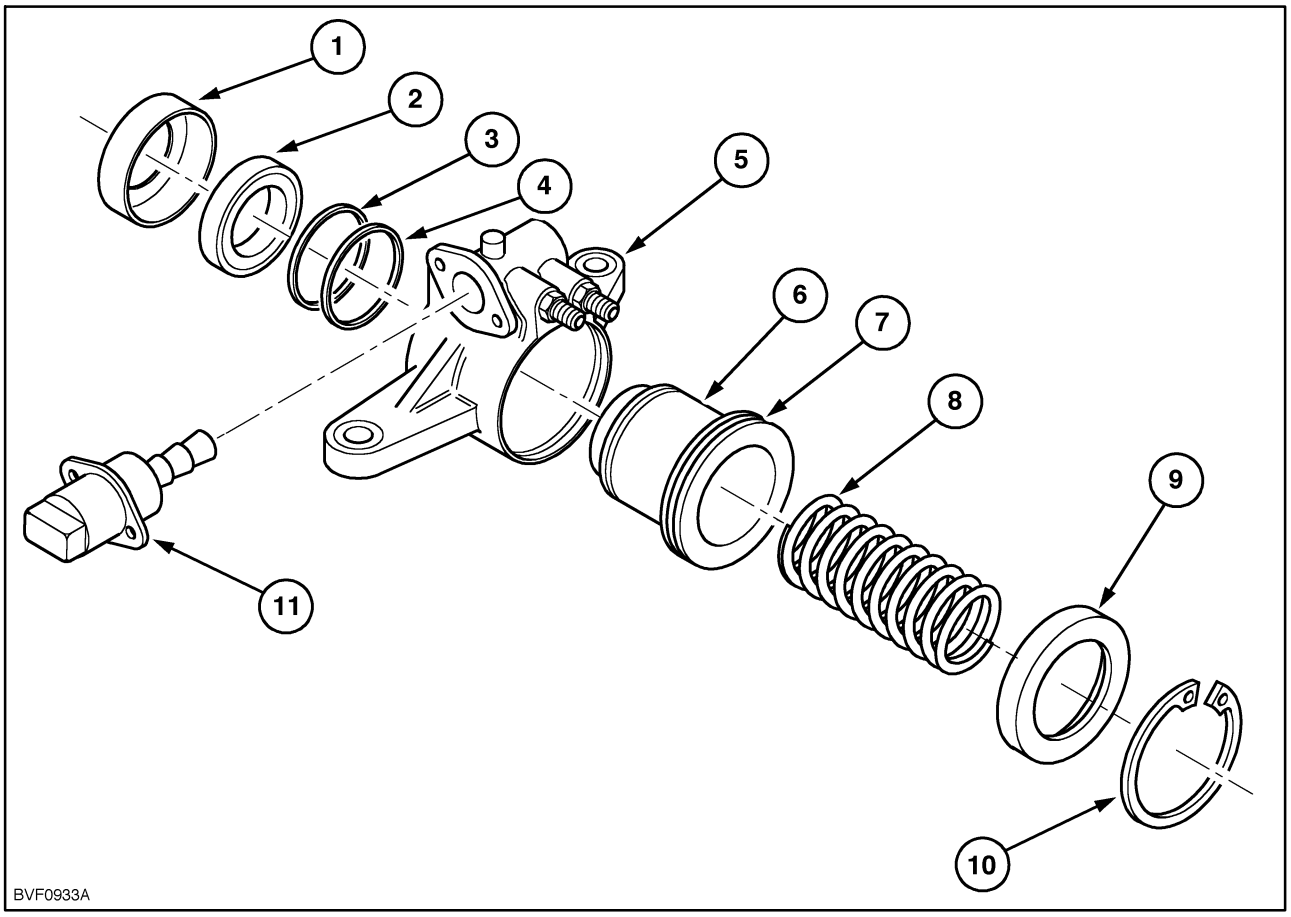


61

Assembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.



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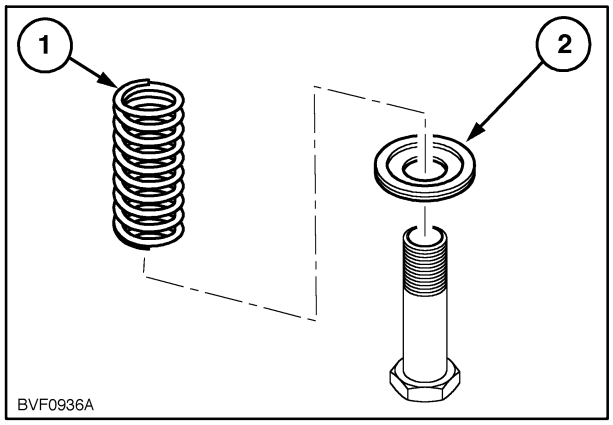
PTO Control Housing Exploded View

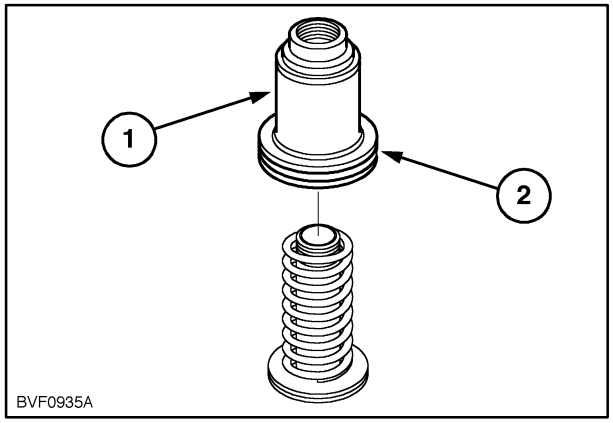
1. Bearing cover
2. Bearing
3. Dust ring
4. Piston oil seal
5. PTO control housing
6. Piston
7. Piston seal
8. Spring
9. Spring cover
10. Circlip
11. Solenoid valve

1. Install the spring (1) and cover (2)



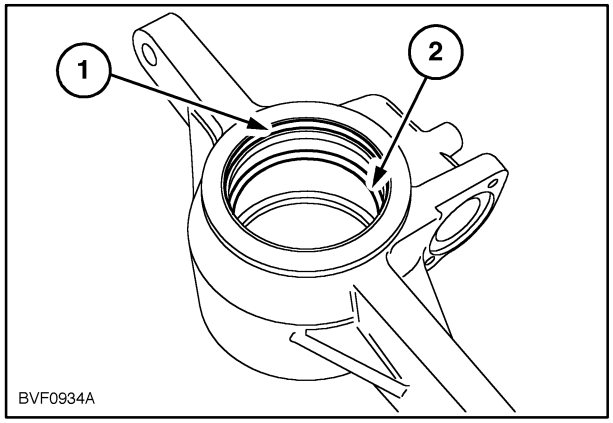
63

2. Install a new piston oil seal (2).
3. Install the piston (1).
4. Using special tool **380001158**, tighten the piston to fully compress the spring.



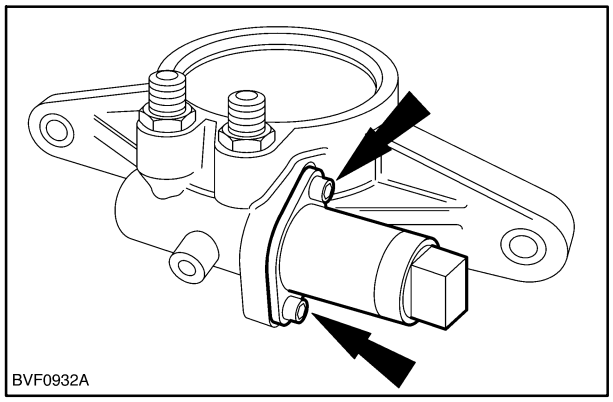
64

5. Install a new dust ring (1) and a new piston oil seal (2) into the PTO control housing.



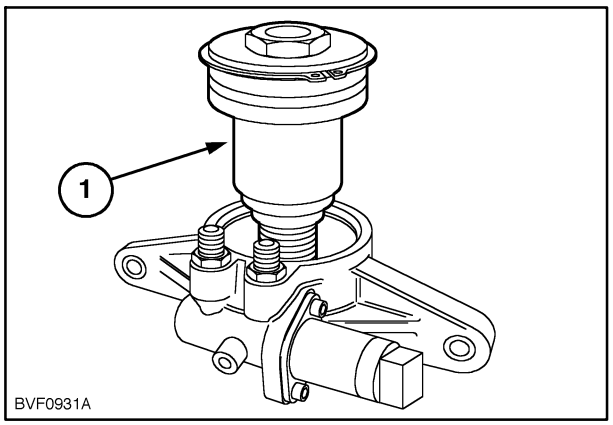
65

6. Install the solenoid valve into the PTO control housing.



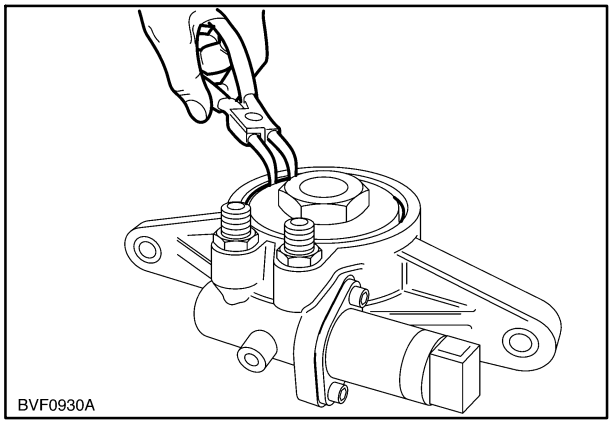
66

7. Partially install the piston and spring assembly(1) into the PTO control housing.



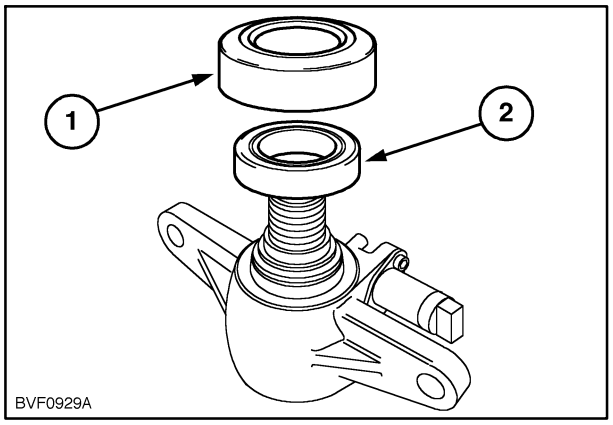
67

8. Using suitable circlip pliers, compress the circlip and fully install the piston into the PTO control housing.



68

9. Install the clutch release bearing (2) and the clutch release bearing cover (1).



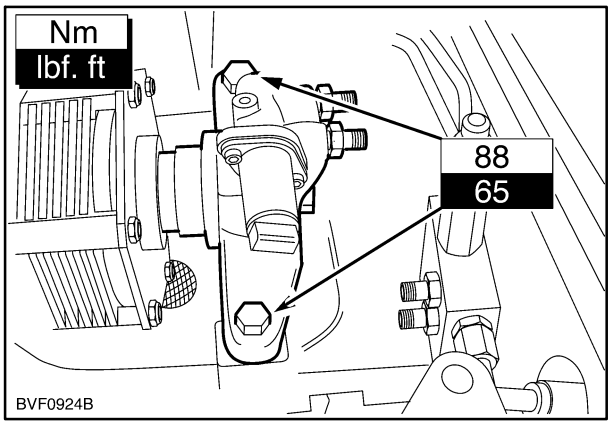
69

Installation

⚠ WARNING ⚠

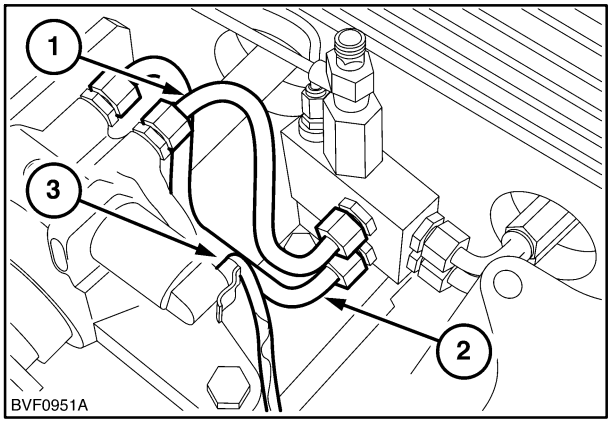
Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

1. Install the PTO control housing. Tighten the retaining bolts to the specified torque value.



70

2. Install the front PTO return pipe (1) and the front PTO supply pipe (2).
3. Connect the control housing solenoid valve electrical connector (3).

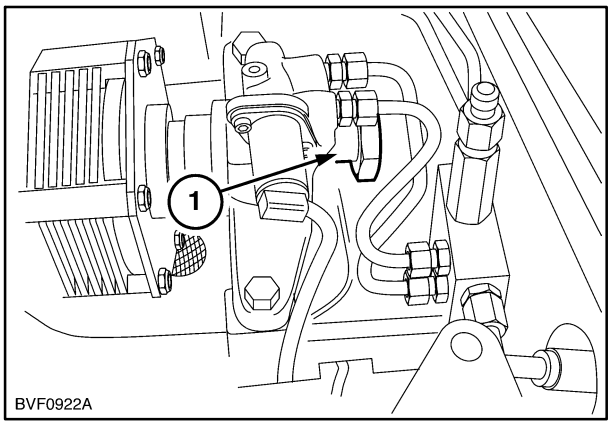


71

4. Start the engine and engage the front PTO.

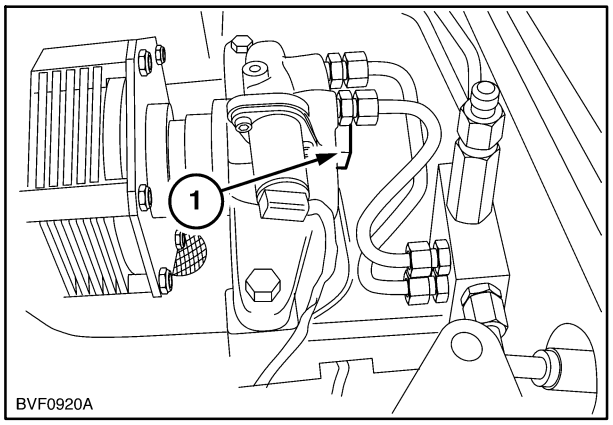
NOTE: *The bolt cannot be removed at this stage.*

5. Loosen the piston spring compression bolt (M36 x 4 x 140 mm) (1) from the PTO control housing until the piston spring compression bolt comes into contact with the pipe.
6. Disengage the front PTO and turn off the engine.



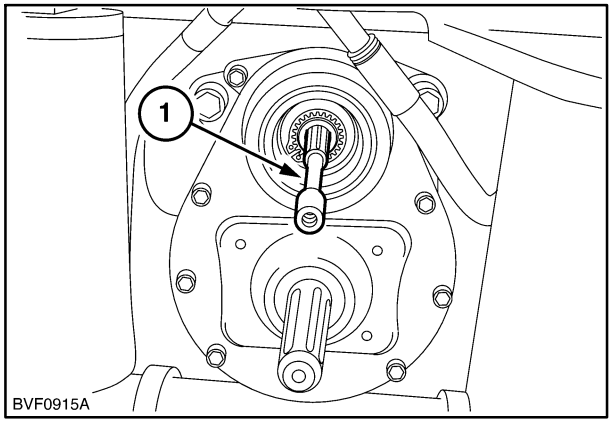
72

7. Remove the piston spring compression bolt (M36 x 4 x 140 mm) (1) from the PTO control housing.



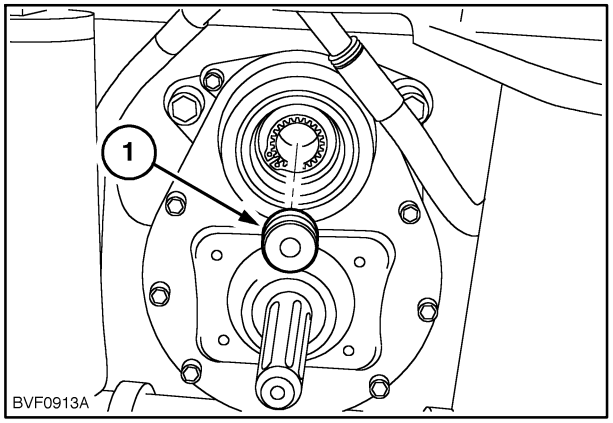
73

8. Install the PTO input shaft (1).



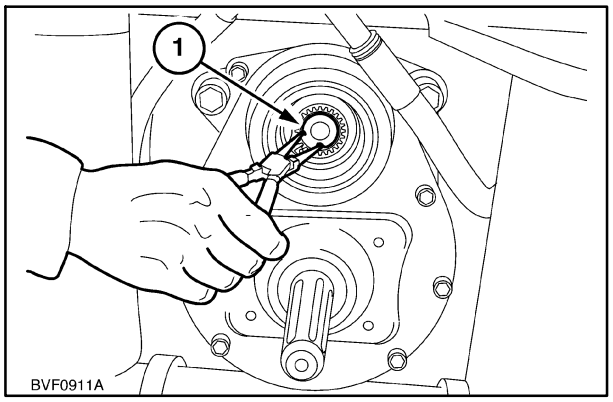
74

9. Install the PTO input shaft plug (1).



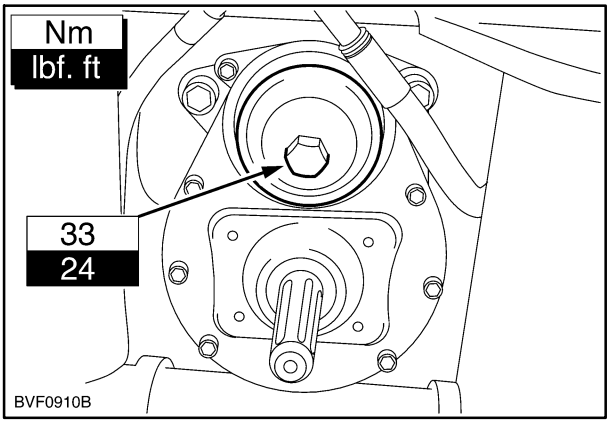
75

10. Using suitable circlip pliers, install the PTO input shaft plug circlip (1).



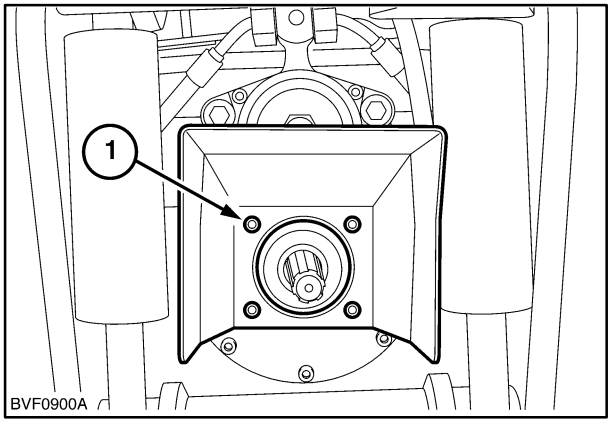
76

11. Install the PTO input shaft cover. Tighten to the specified torque value.



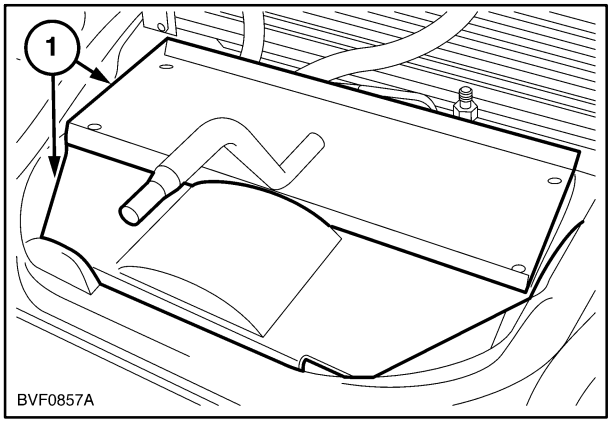
77

12. Install the PTO guard (1).



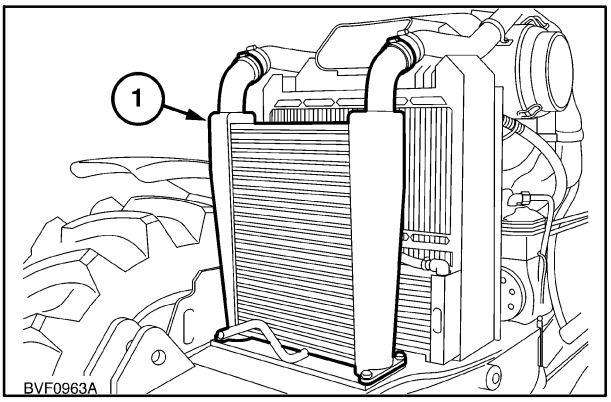
78

13. Install the front axle support cover plates (1).



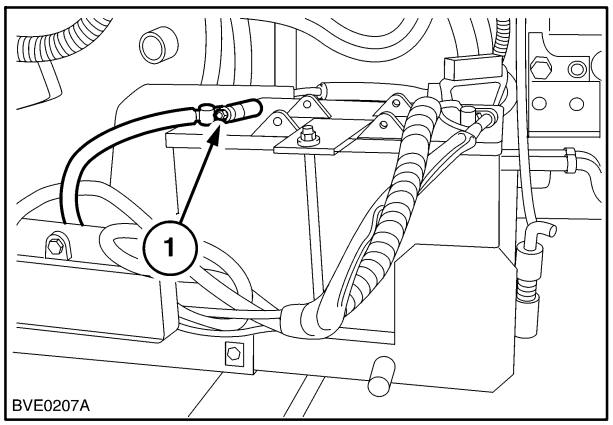
79

14. install the Intercooler (1).



80

15. Connect the battery negative cable (1) and install the battery cover.



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FRONT PTO CLUTCH

Removal

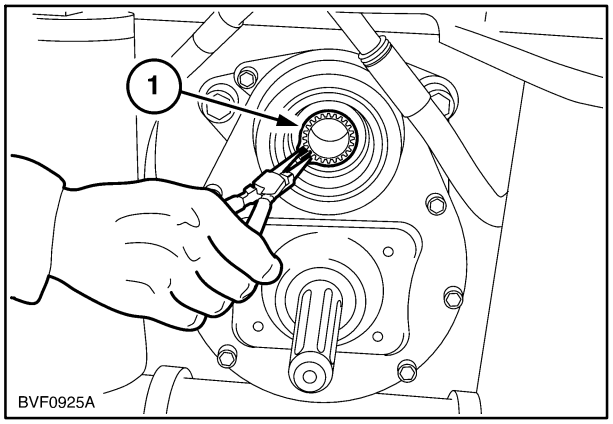
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

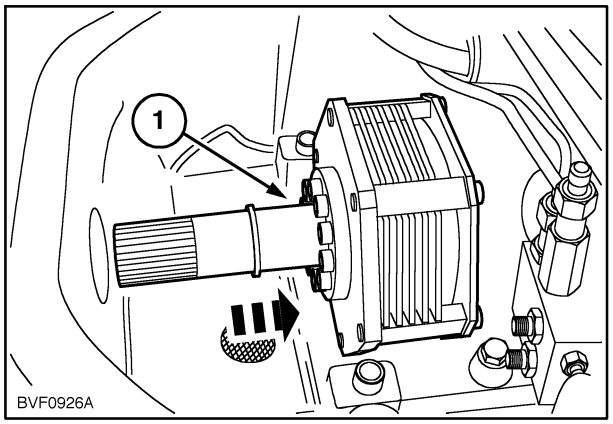
Wear goggles, gloves and footwear.

1. Remove the PTO control housing (refer to PTO control housing removal in this chapter).
2. Using suitable circlip pliers, remove the PTO clutch shaft circlip (1).



82

3. Remove the PTO clutch (1).



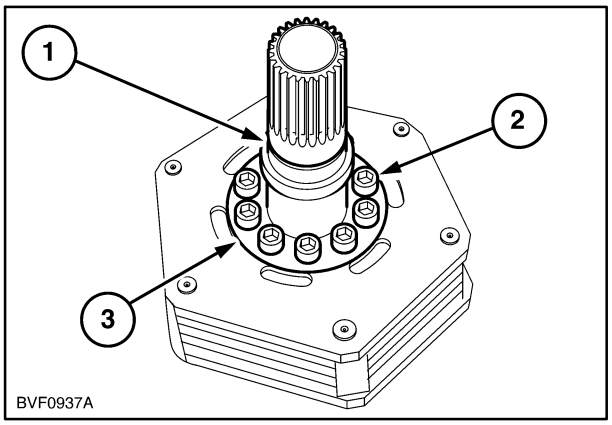
83

Disassembly

WARNING

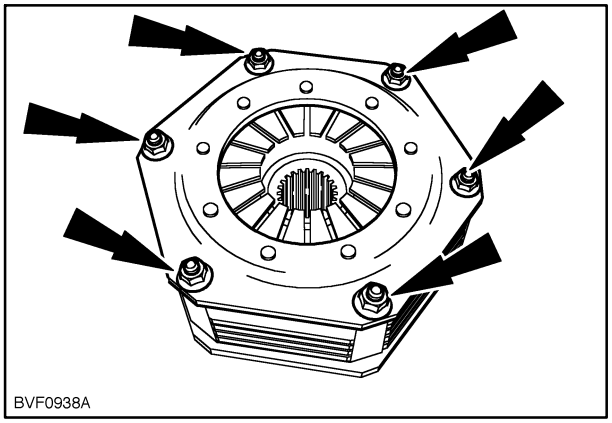
Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

1. Remove and discard the front PTO clutch shaft O-ring seal (1).
2. Remove the retaining bolts (2) and remove the front PTO clutch shaft (3).



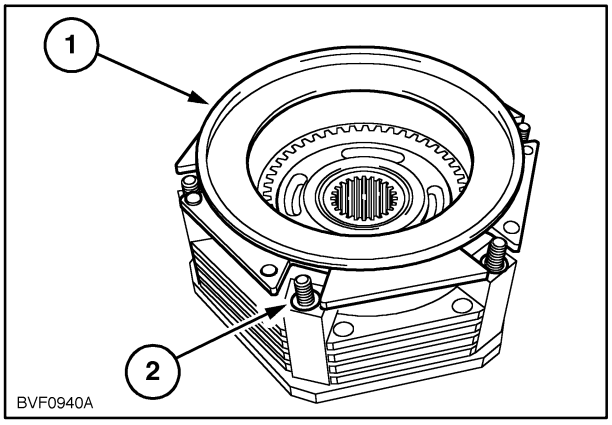
84

3. Remove the PTO clutch pressure plate.



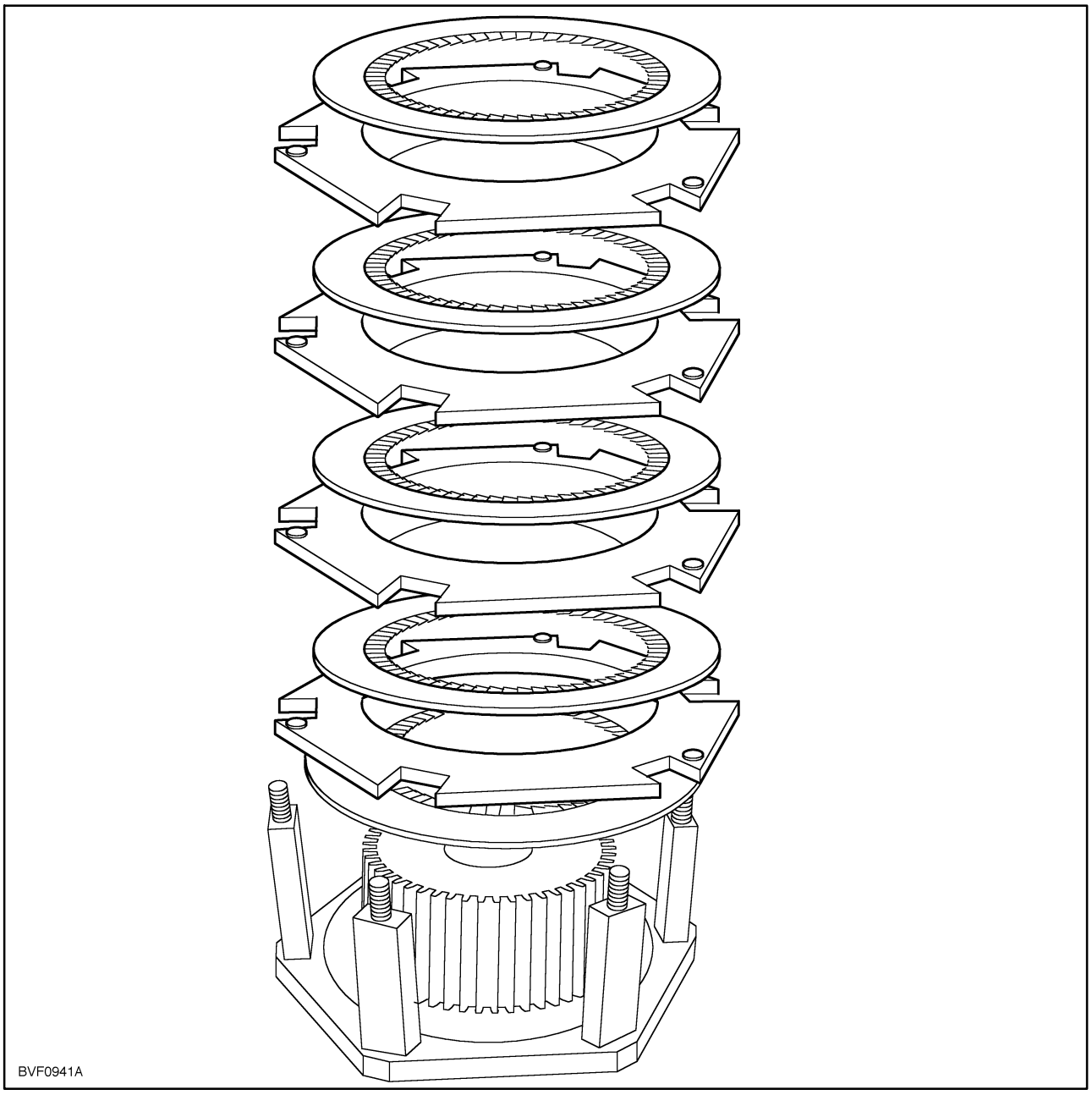
85

4. Remove the PTO clutch top plate (1).
5. Remove the washers (2).



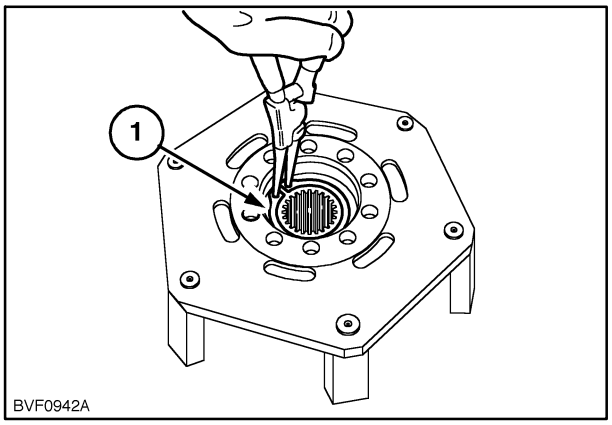
86

6. Remove the friction discs and steel plates from the PTO clutch.

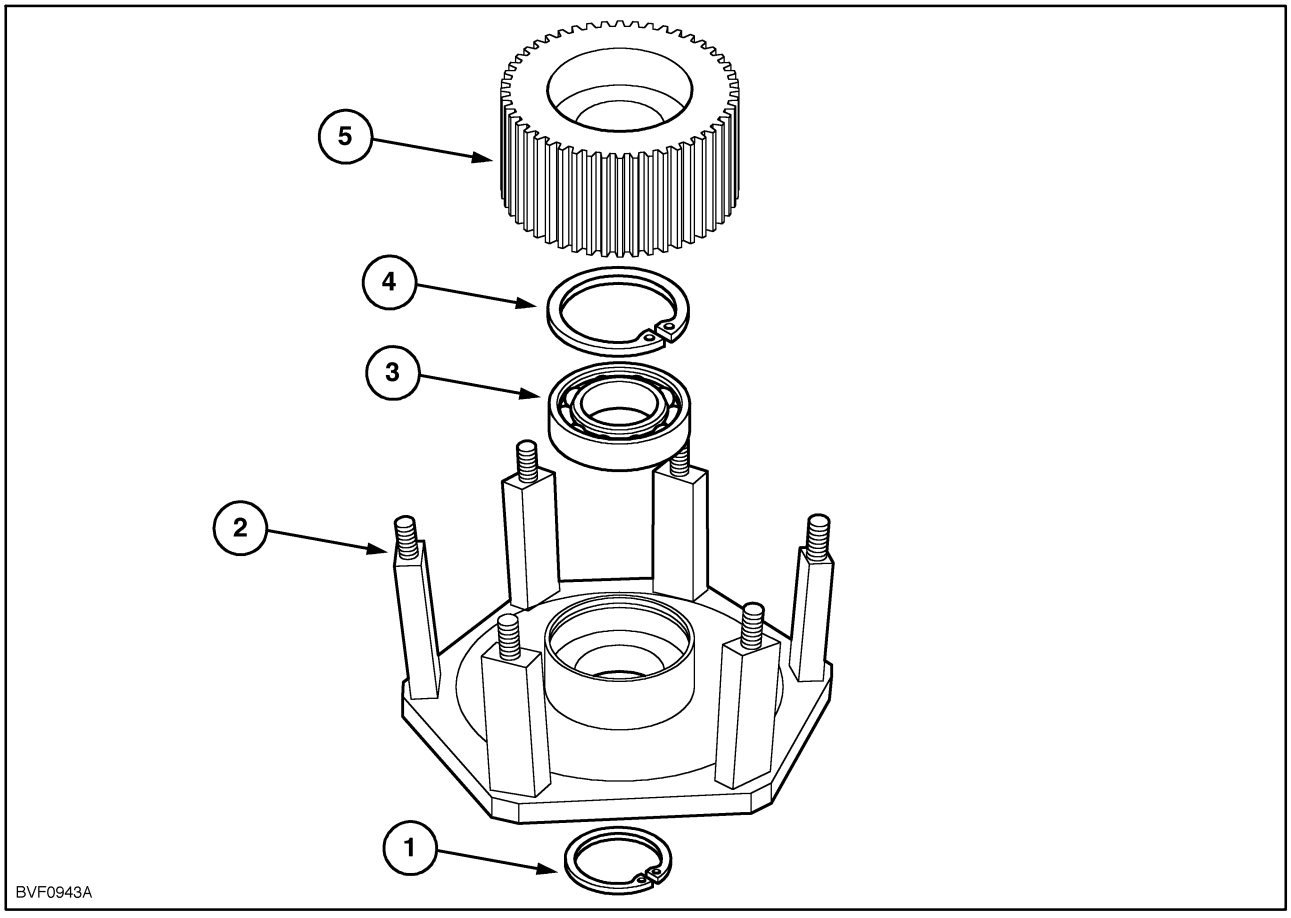


87

7. Using suitable circlip pliers, remove the clutch hub circlip (1).



88



89

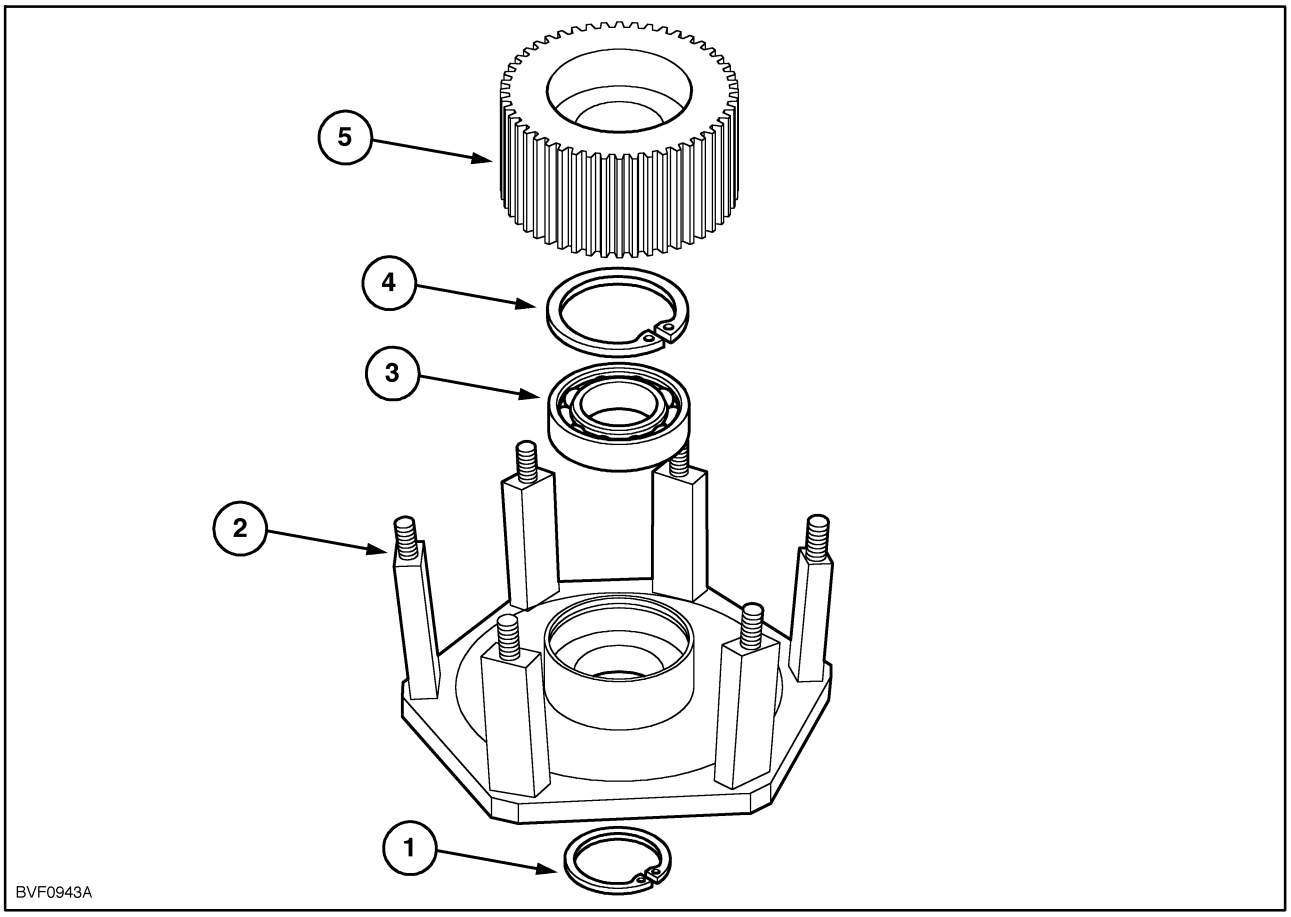
PTO Clutch Assembly Exploded View

1. Circlip
2. PTO clutch plate housing
3. Bearing
4. Circlip
5. Clutch hub

Assembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.



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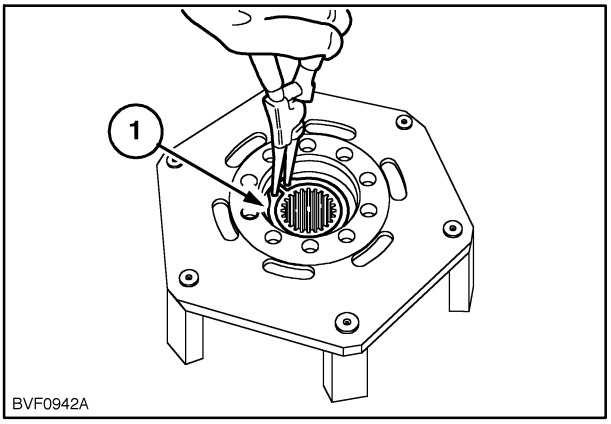
PTO Clutch Assembly Exploded View

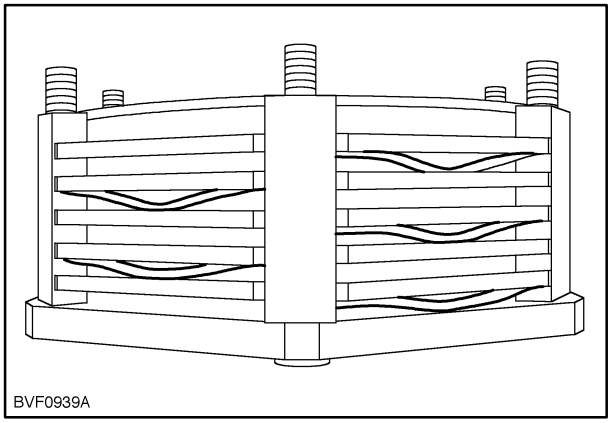
1. Circlip
2. PTO clutch plate housing
3. Bearing
4. Circlip
5. Clutch hub

1. Using suitable circlip pliers, install the clutch hub circlip (1).



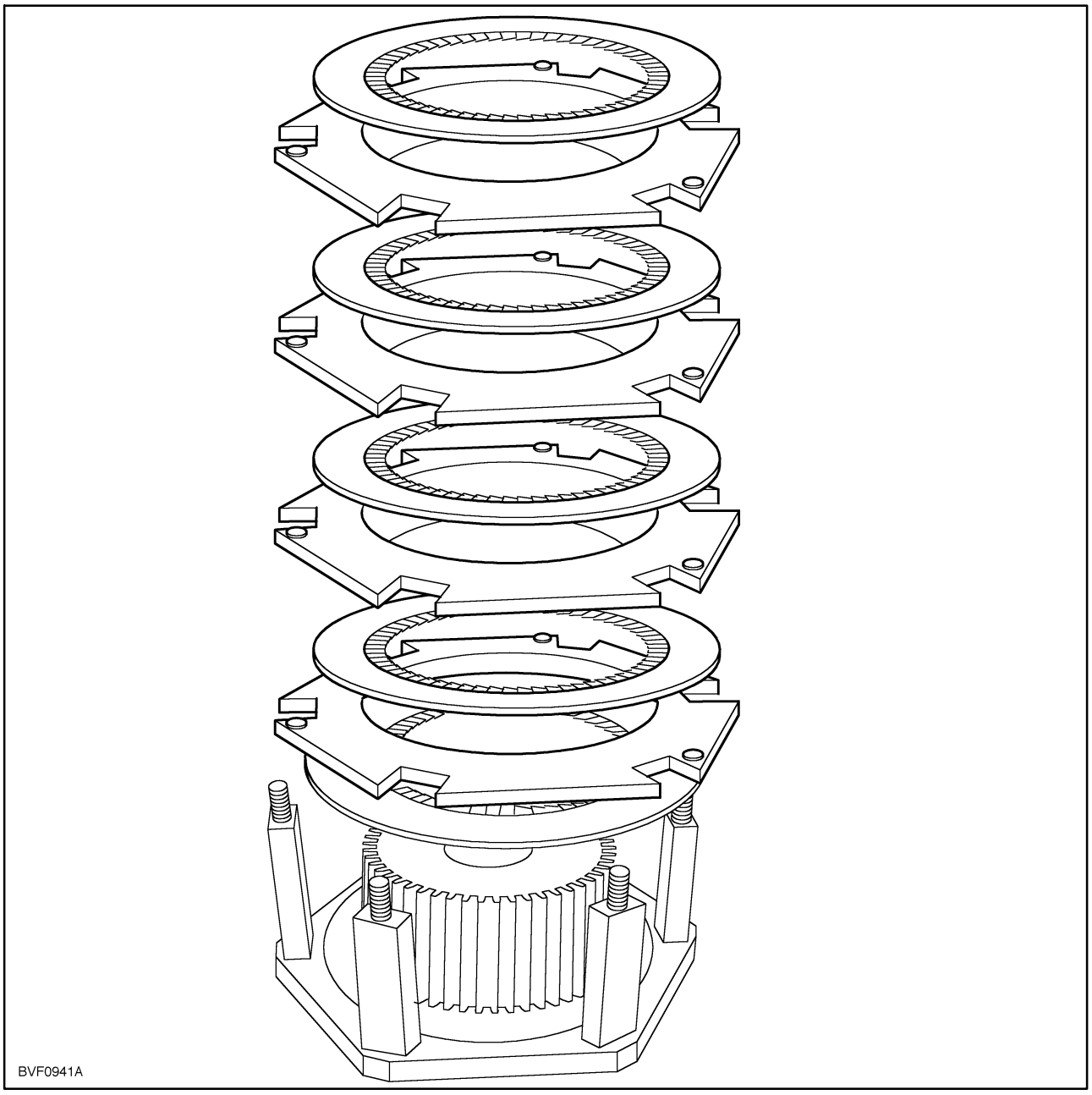
91

NOTE: *Make sure that the steel plates are installed alternately as indicated.*



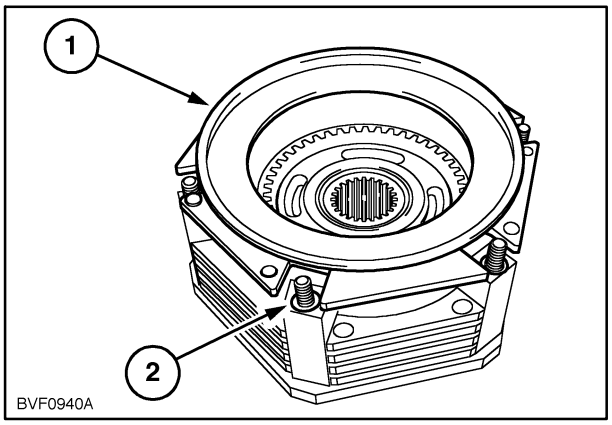
92

2. Install the friction discs and steel plates into the PTO clutch.



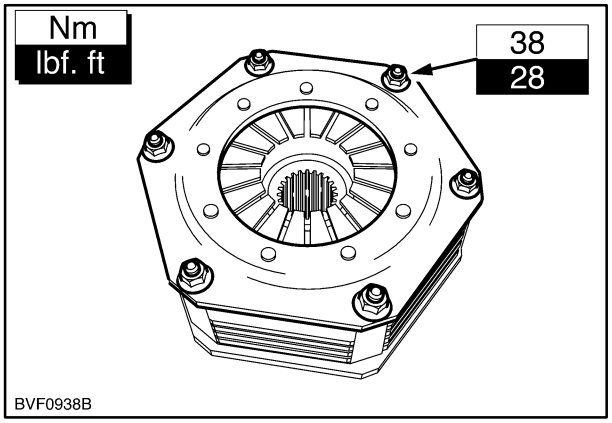
93

3. Install the washers (2).
4. Install the PTO clutch top plate (1).



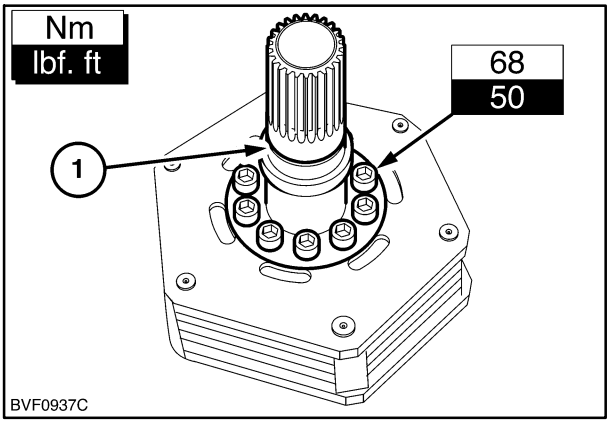
94

5. Install the PTO clutch pressure plate. Tighten the retaining nuts to the specified torque value.



95

6. Install the PTO clutch shaft. Tighten the retaining bolts to the specified torque value.
7. Install a new front PTO clutch shaft O-ring seal (1).



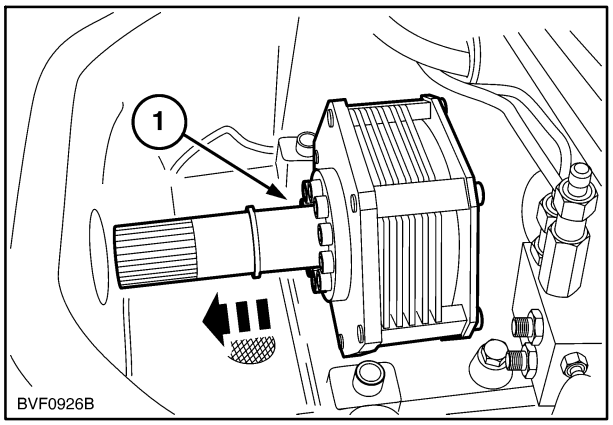
96

Installation

⚠ WARNING ⚠

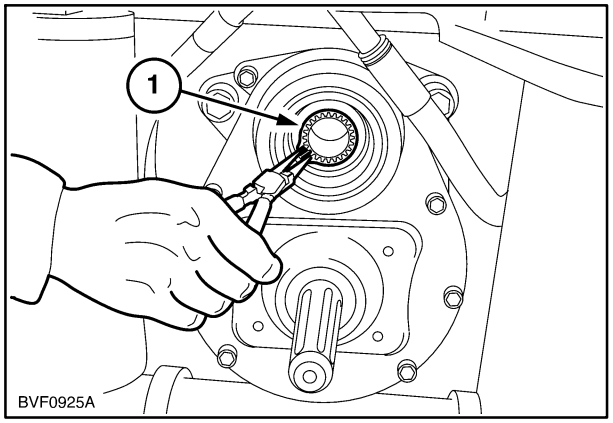
Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

1. Install the PTO clutch (1).



97

2. Using suitable circlip pliers, install the PTO clutch shaft circlip (1).
3. Install the PTO control housing (refer to PTO control housing installation in this chapter).



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FRONT PTO REDUCTION GEARBOX

Removal

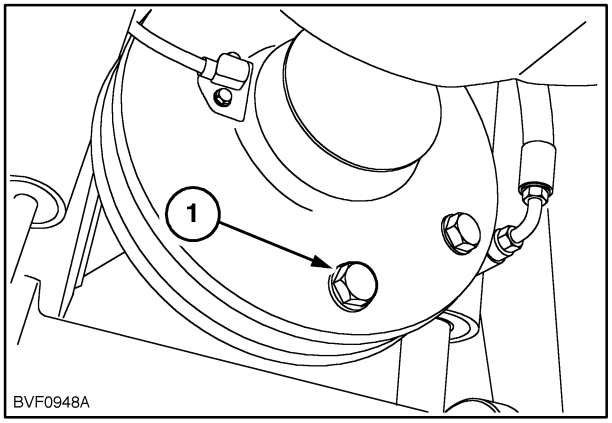
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

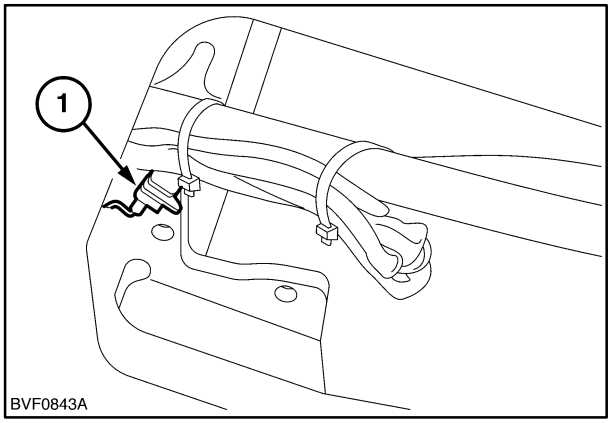
Wear goggles, gloves and footwear.

1. Remove the PTO clutch (refer to PTO clutch removal in this chapter).
2. Remove the drain plug (1) and drain the oil into a suitable container.
3. Install the drain plug (1) after the oil has drained.



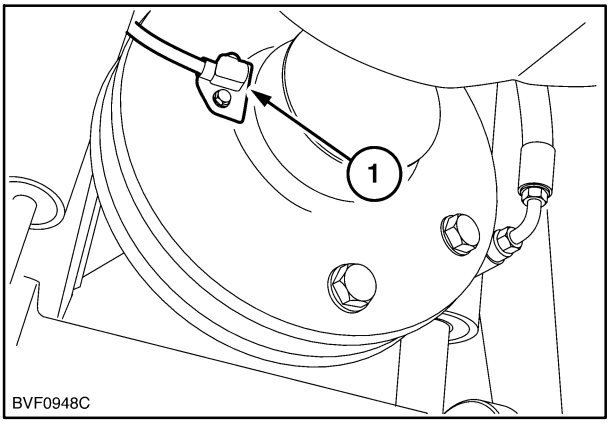
99

4. Disconnect the PTO speed sensor electrical connector.



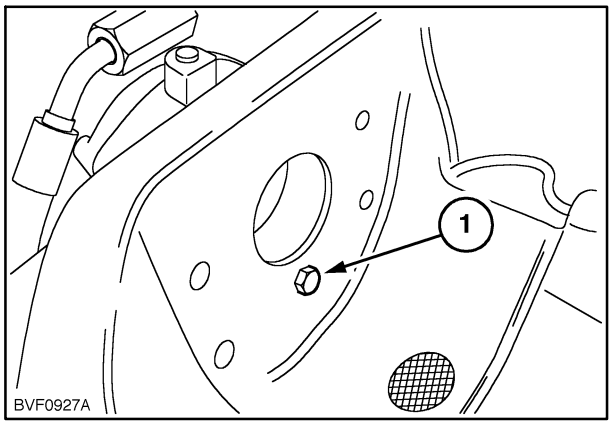
100

5. Remove the PTO speed sensor (1).



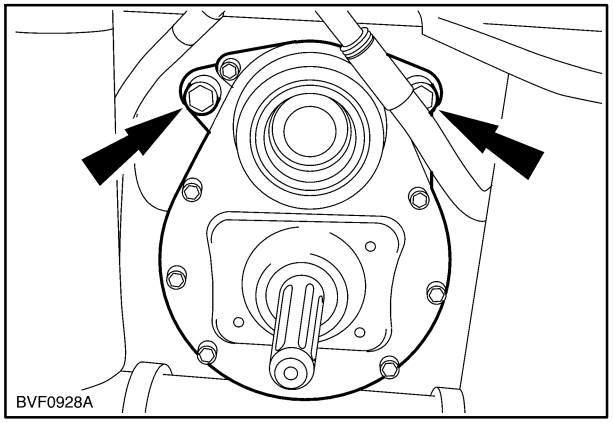
101

6. Remove the front PTO reduction gearbox rear retaining bolt (1).



102

7. Remove the front PTO reduction gearbox.



103

Disassembly

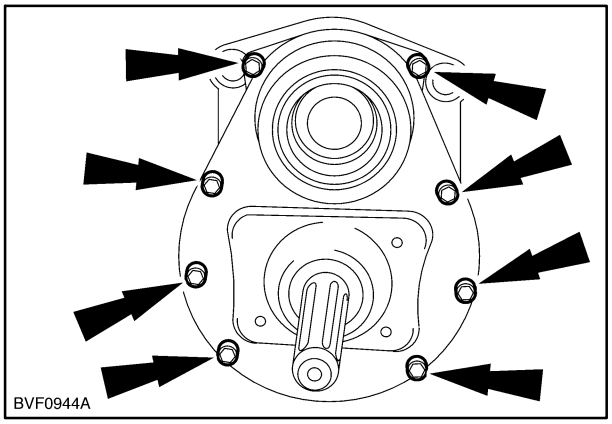
WARNING

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

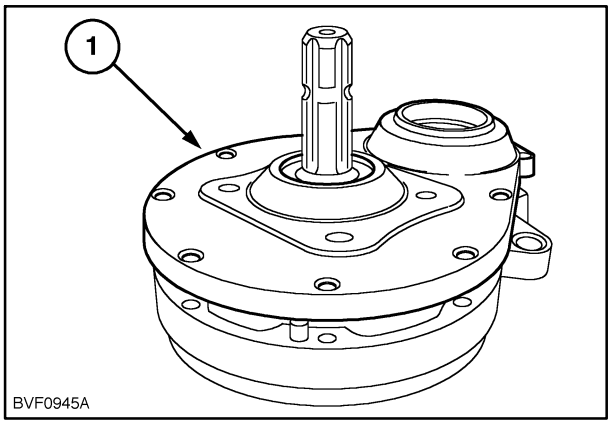
Wear goggles, gloves and footwear.

1. Remove the front PTO reduction gearbox (refer to front PTO reduction gearbox removal in this chapter).
2. Remove the PTO reduction gearbox front cover retaining bolts.

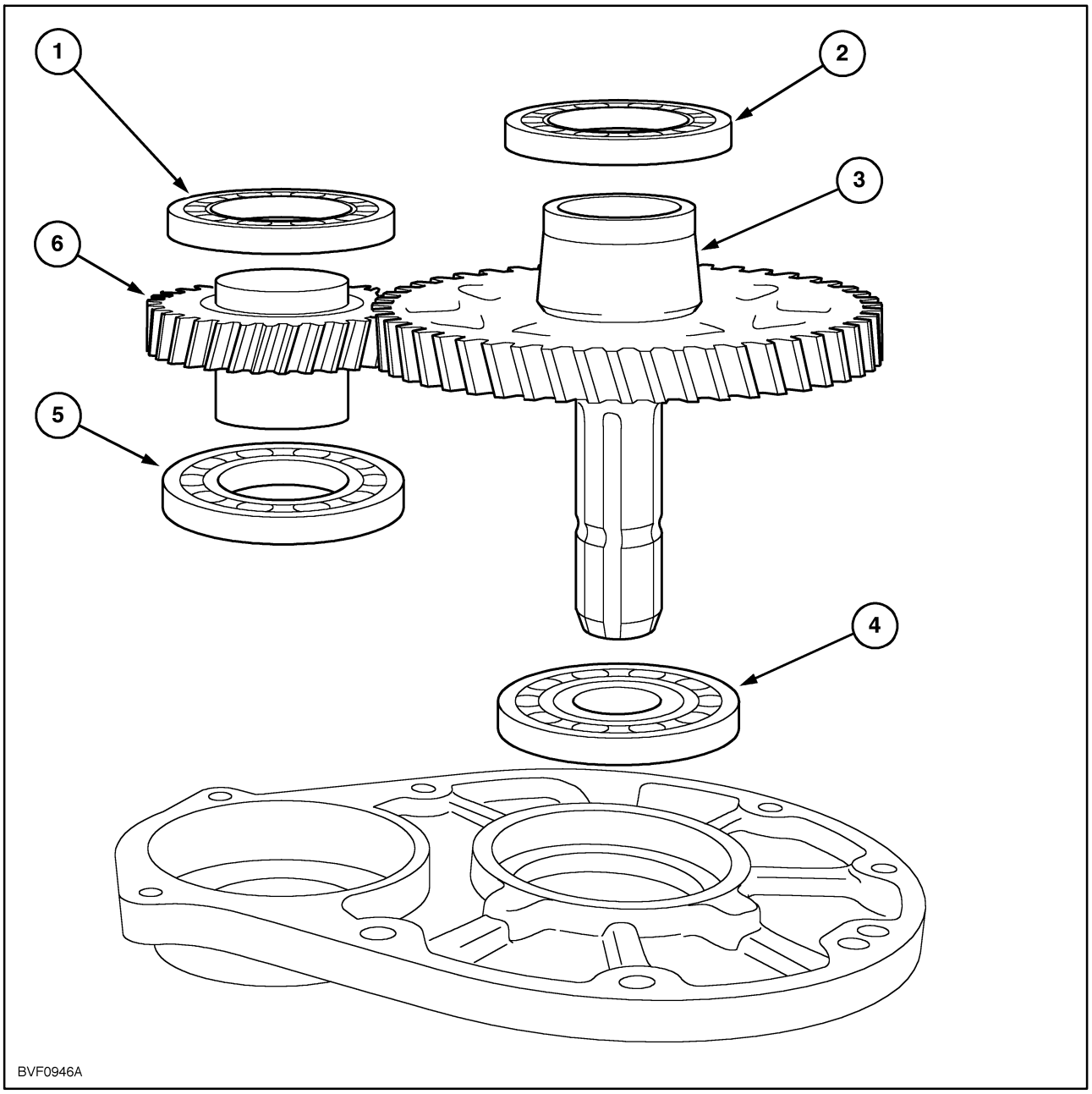


104

3. Remove the PTO reduction gearbox front cover (1).



105



106

Front PTO Reduction Gearbox Exploded View

1. Bearing
2. Bearing
3. PTO driven gear assembly
4. Bearing
5. Bearing
6. PTO drive gear

Assembly

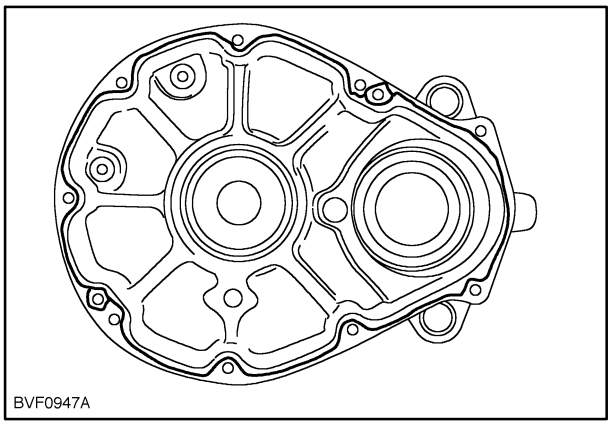
⚠ WARNING ⚠

Handle all components with the greatest care.

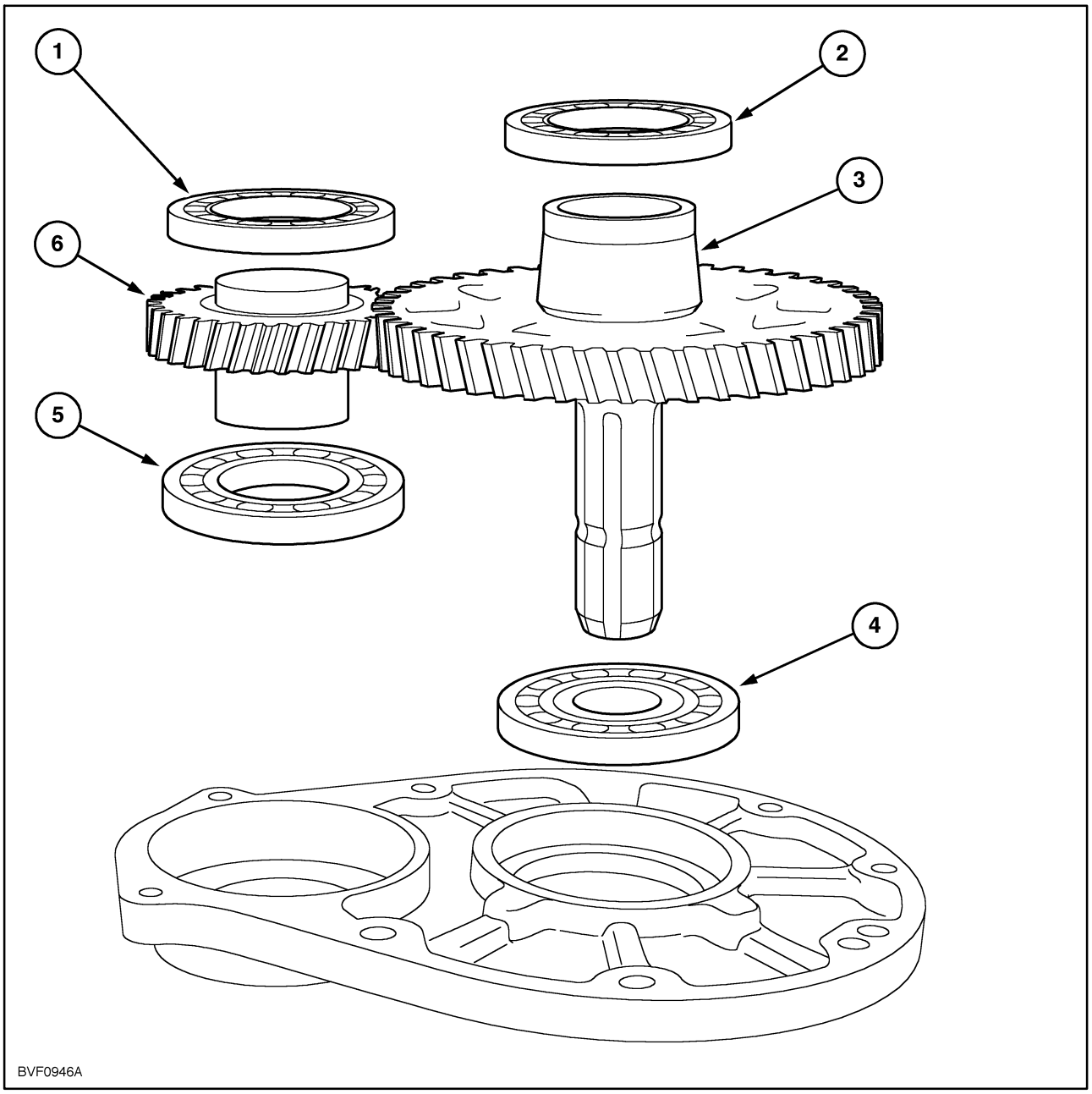
Do not insert hands or fingers between the parts.

Wear goggles, gloves and footwear.

1. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



107



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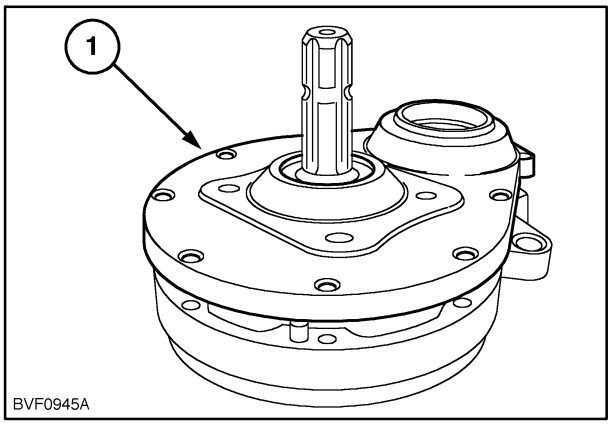
Front PTO Reduction Gearbox Exploded View

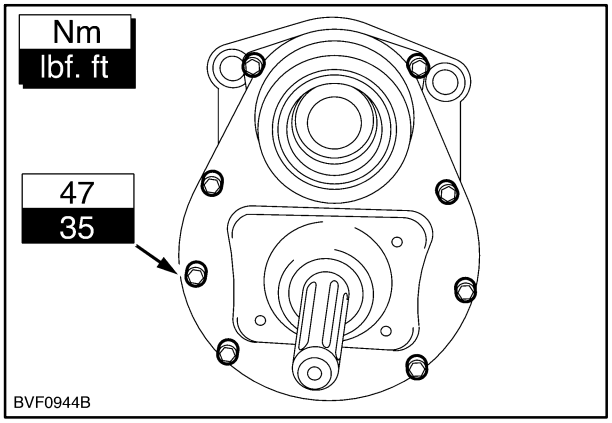
1. Bearing
2. Bearing
3. PTO driven gear assembly
4. Bearing
5. Bearing
6. PTO drive gear

2. Install the PTO reduction gearbox front cover.



109

3. Install the PTO reduction gearbox front cover retaining bolts. Tighten to the specified torque value.



110

Installation

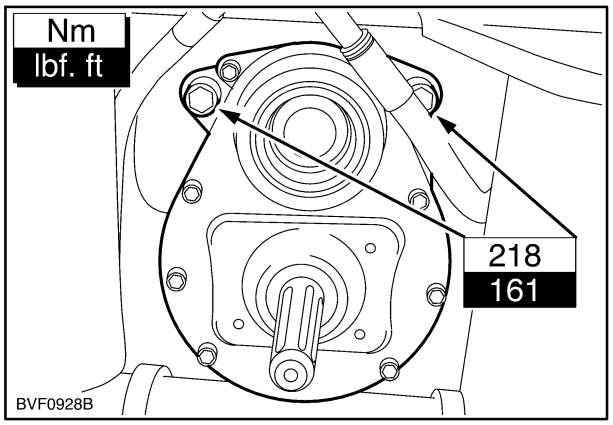
WARNING

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

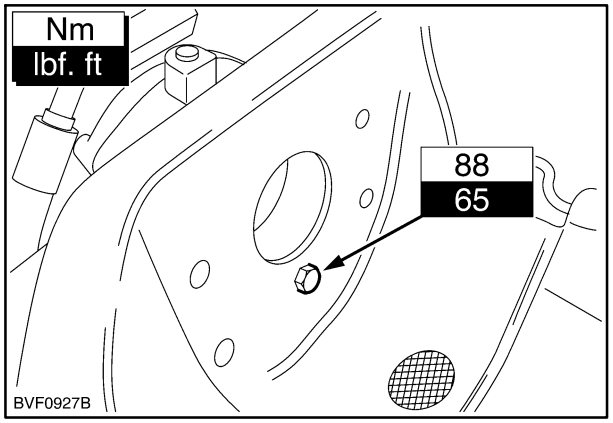
Wear goggles, gloves and footwear.

1. Install the PTO reduction gearbox and the retaining bolts. Tighten the retaining bolts to the specified torque value.



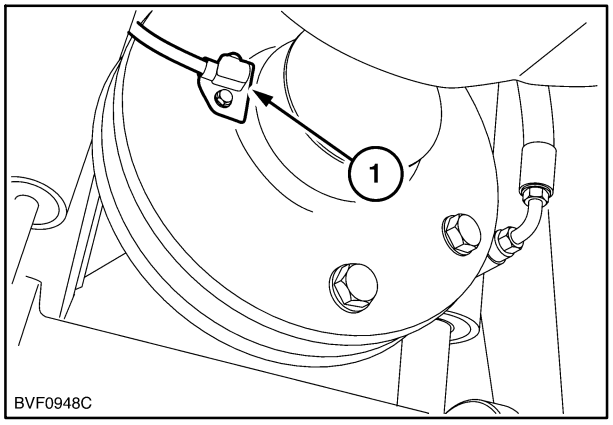
111

2. Install the PTO rear retaining bolt. Tighten to the specified torque value.



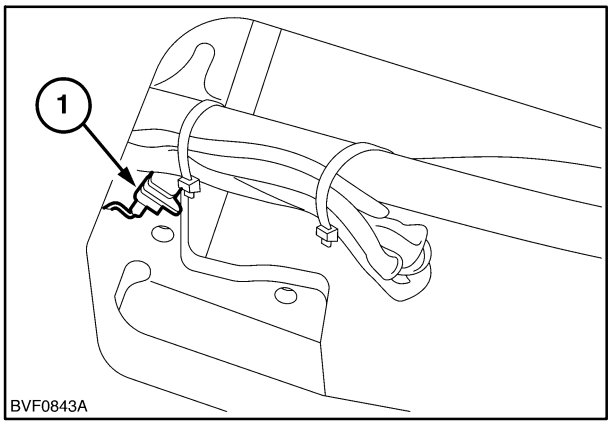
112

3. Install the PTO speed sensor (1).



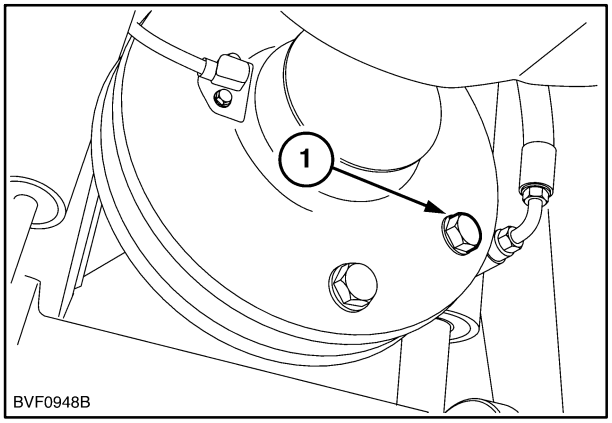
113

4. Connect the PTO speed sensor electrical connector (1).



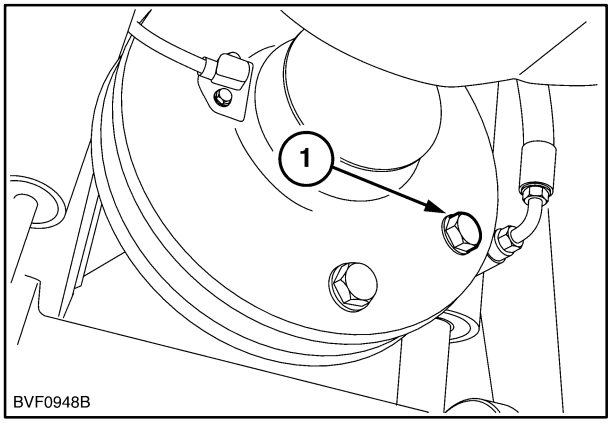
114

5. Remove the refill/level plug (1).



115

6. Fill the PTO reduction gearbox with the correct specification oil, until the oil can be seen level with the refill/level plug hole.
7. Install the refill/level plug (1).
8. Install the front PTO clutch (refer to PTO clutch installation in this chapter).



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SECTION 35 – HYDRAULIC SYSTEMS

Chapter 14 – TS–A Standard Hydraulic Circuits

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DESCRIPTION, OPERATION AND CIRCUIT IDENTIFICATION

The hydraulic systems can be separated into the following circuits:

HIGH PRESSURE CIRCUIT

- Hydraulic Lift Assembly
- Open Centre Remote Control Valves
- Trailer Brake (Where Fitted)
- Front Lift (Where fitted)
- Mid Mount Valves (Where Fitted)

STEERING CIRCUIT

- Steering Motor and Cylinders

LOW PRESSURE CIRCUIT

- Independent Power Take Off (PTO)
- Differential Lock
- Front Wheel Drive engagement
- Transmission clutch and synchroniser engagement
- Creeper engagement (Where fitted)
- Front PTO (Where fitted)

LUBRICATION CIRCUIT

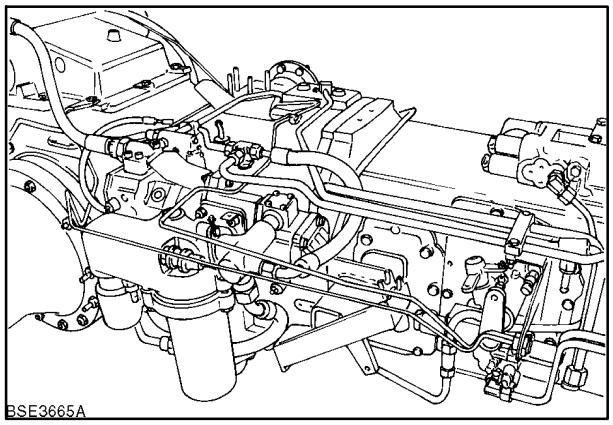
- PTO Clutch Plates
- Transmission Clutch Plates
- Transmission Shaft Pressure Lube
- Pump Drive Gear Bearing
- Hydraulic Lift Cross Shaft

All TS-A Standard models have a 63 ltr/min Fixed Displacement Pump, two mechanically operated open centre remote valves (3rd valve optional).Mid Mount remote valves (two mechanically operated, one electronically operated). Hydraulic Trailer Brakes are optional .

The high pressure circuit is of the 'Open Centre ' design on all TS-A Standard models fed by a Fixed Displacement Pump.

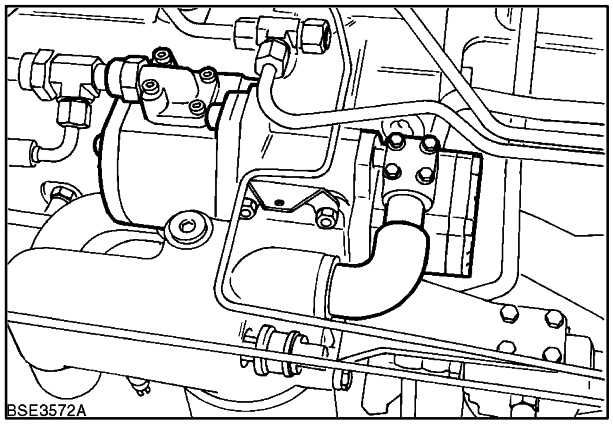
The steering, low pressure and lubrication circuits are fed by a separate fixed displacement pump via a solenoid activated lubrication block.

Figure 1 shows the fixed displacement pump with a 24 x 24 Transmission.



1

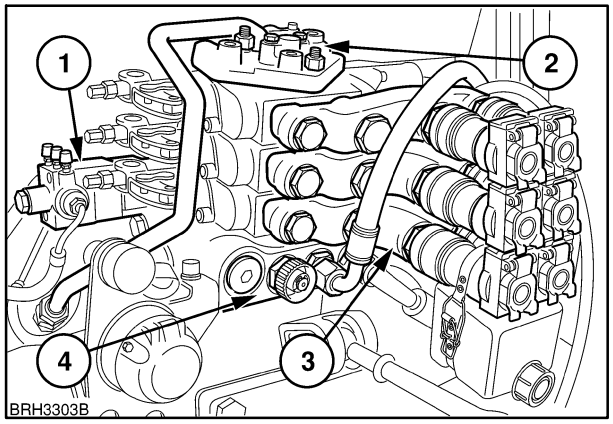
Fixed displacement pump with a flow rate of 63 ltrs/Min.



2

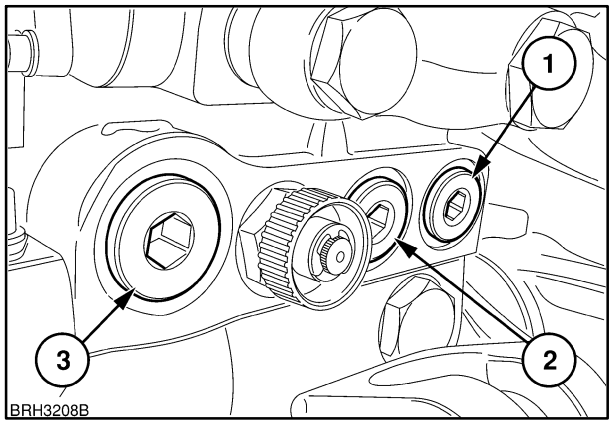
TS-A Standard model tractors with open centre remote valves less electronic draft control.

1. Trailer Brake Valve
2. End Plate with outlet to hydraulic lift valve
3. Remote Valve assembly
4. Hydraulic Power Tapping port (Power Beyond) block



3

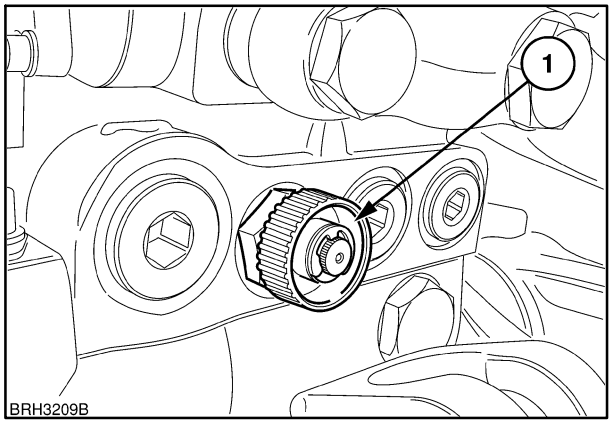
Located below the Remote Valve stack is the Hydraulic Power Tapping port (Power Beyond) block. This block has a flange plate which allows the addition of a trailer brake valve.
For implements or attachments requiring a continuous oil flow from the tractor hydraulic system, provision is made to connect directly into the main hydraulic circuit at the rear of the tractor. Pressure is fed to the implement through port (1) and is returned to port (2). Both ports are M22 x 1.5 (ISO 6149). Where an implement control valve has a third port i.e. for exhaust oil when using a float facility, then the hose from the third port should be connected to the M27 x 2.0 (ISO 6149) port (3).



4

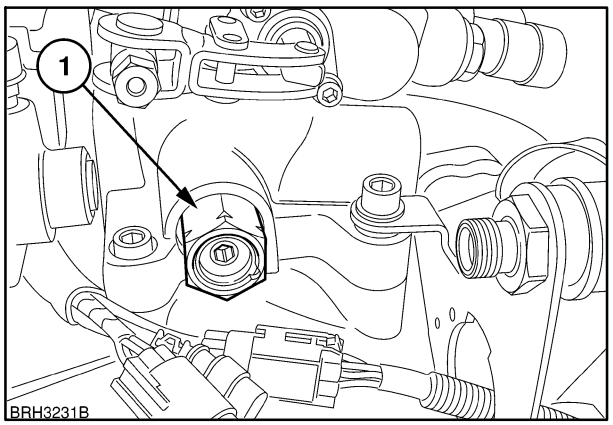
To provide an oil flow from the Power Beyond port to the implement or mid mount valves, screw the selector control (1) fully in (clockwise).

When the Power Beyond ports are plugged the selector control must be screwed fully out (anti-clockwise).



5

Located within the Hydraulic Power Tapping port (Power Beyond) block is the hydraulic relief valve (1). This has an operating pressure of 190-195 bar at 25L/Min.

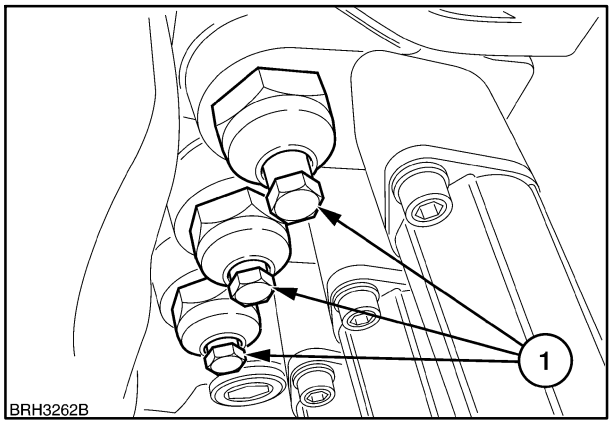


6

CONVERTING REMOTE VALVES TO SINGLE OR DOUBLE ACTING OPERATION

Each remote valve is equipped with a screw (1) which converts the valve from double to single acting operation.

- **Single Acting:** Unscrew the adjusting screw fully outwards (anti-clockwise) until it stops. Do not overtighten.
- **Double Acting:** Screw the adjusting screw fully inwards (clockwise). Do not overtighten.



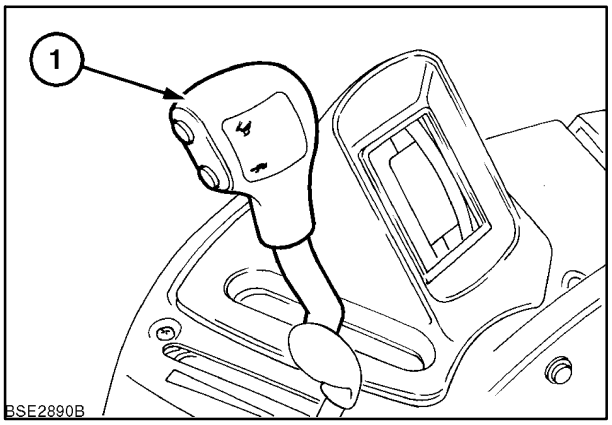
7

The type of transmission installed can be identified by inspecting the transmission control lever.

Tractors with 16 x 16 transmission have a single control lever (1) with two shift buttons.

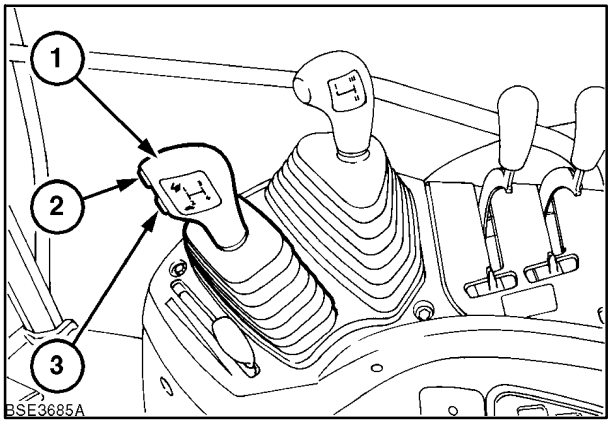
Closed centre hydraulic system only.

Figure 8 shows Semi-Powershift control lever.



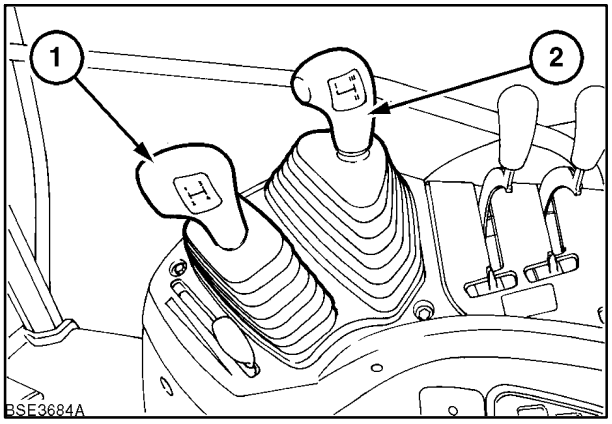
8

Tractors installed with 24 x 24 transmission uses two control levers. The main transmission lever (1) is provided with push buttons (2) and (3) to actuate the Dual Command function.



9

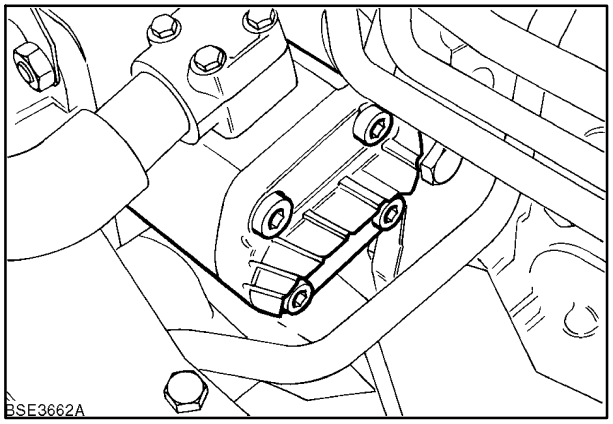
Tractors installed with 12 x 12 Command transmission uses two control levers. These are the main shift lever (1) and the range lever (2)



10

STEERING PUMP

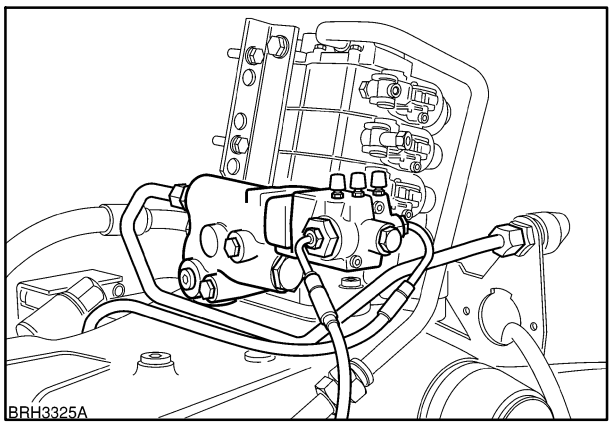
The steering pump is a separate unit but still driven from the same drive gear as the main pump.



11

TRAILER BRAKE VALVE

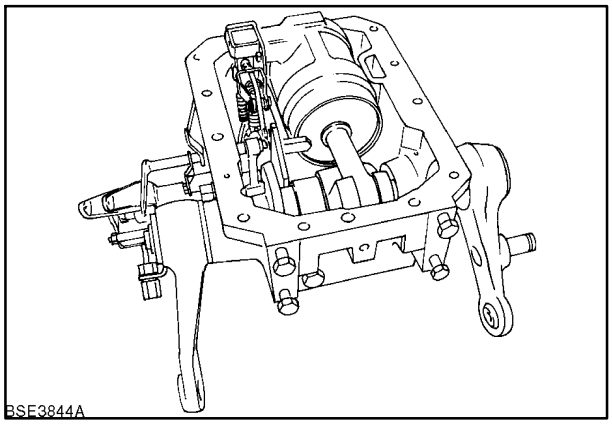
Is located beneath the cab just in front of the hydraulic lift assembly. The valve diverts oil pressure to the trailer brakes whenever both tractor brake pedals are depressed.



12

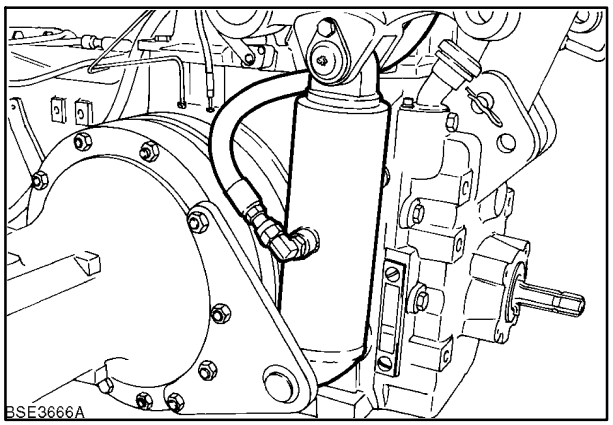
HYDRAULIC LIFT CYLINDERS

Models with mechanical draft control utilize a main lift cylinder which is located internally within the rear axle top cover, Figure 13.



13

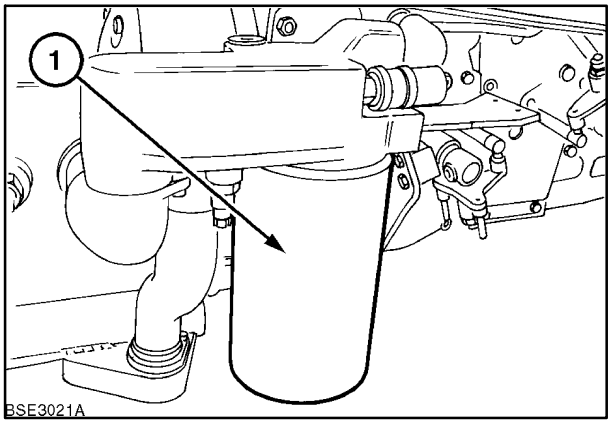
TS-A Standard models can utilize one or two 50 mm external cylinders, one per lift arm, anchored to the rear axle with a bracket, Figure 14.



14

HYDRAULIC SYSTEM FILTERS

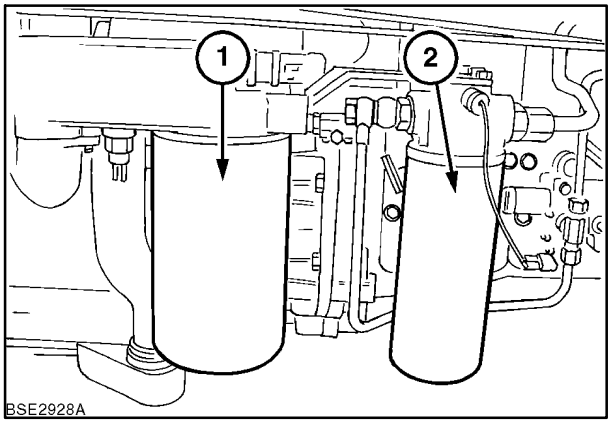
Figure 15 shows the main hydraulic filter (1) for tractors fitted with 12 x 12 Transmission with mechanical draft control.



15

Figure 16 shows the main hydraulic filters for tractors with fixed displacement hydraulic pump. this type of pump is only fitted to tractors with 24 x 24 with mechanical draft control.

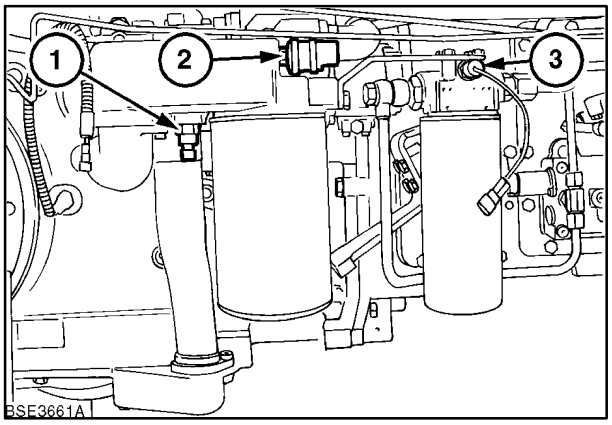
1. Intake Filter
2. Transmission Feed Pressure Filter



16

HIGH PRESSURE HYDRAULIC SYSTEM, FIXED DISPLACEMENT PUMP - ELECTRICAL SWITCHES

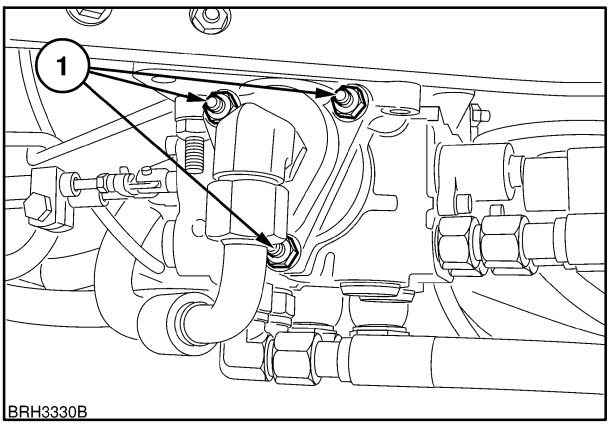
1. Oil Temperature Switch
2. Intake Filter restriction (vacuum) Switch
3. Steering Pressure Switch



17

MID-MOUNT REMOTE VALVES

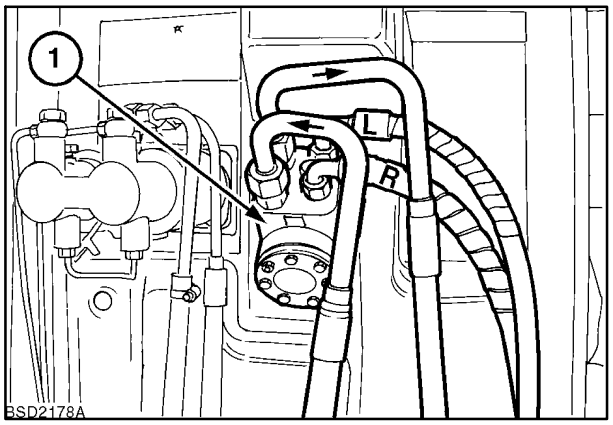
Optional additional remote valves are mounted under the cab. Connected into the high pressure oil line via the power beyond ports located at the bottom of the remote valve stack. The valves are operated via a joystick control in the cab.



18

STEERING MOTOR

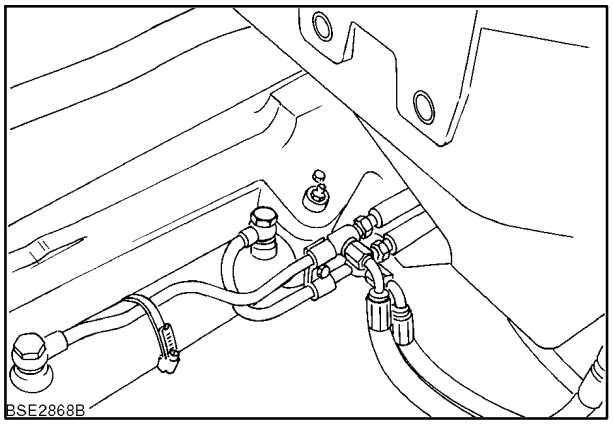
TS-A Standard models use a fixed displacement motor.



19

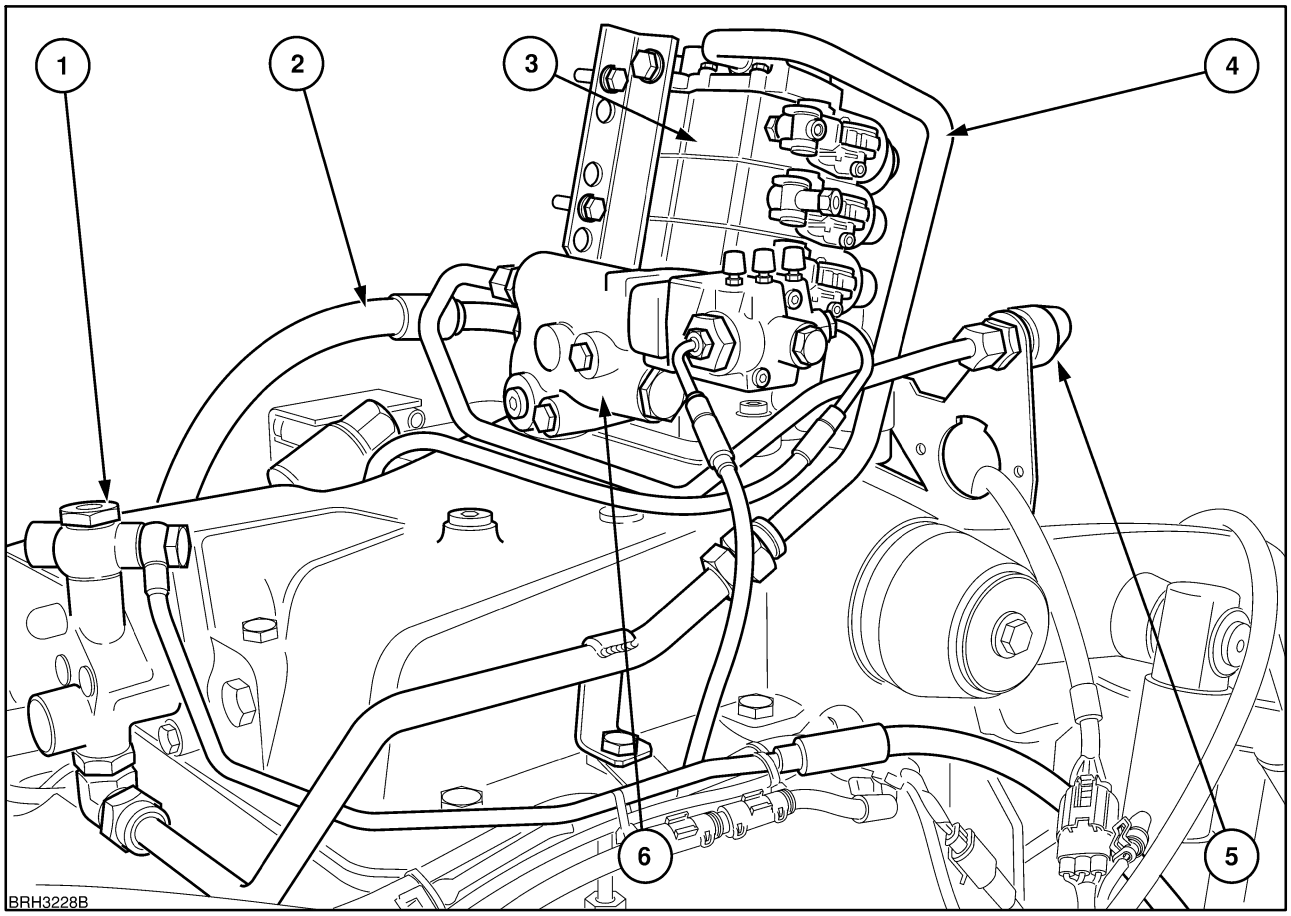
STEERING CYLINDERS

Receives high pressure oil directly from the steering motor .



20

FIXED DISPLACEMENT HIGH PRESSURE HYDRAULIC CIRCUIT

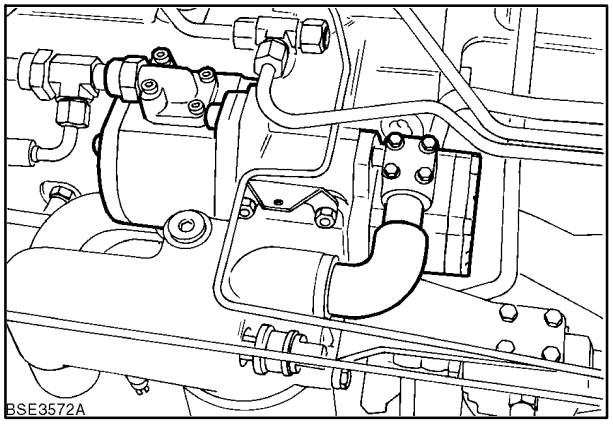


21

High Pressure Circuit Components and Pipework
Tractors with Fixed Displacement Pump

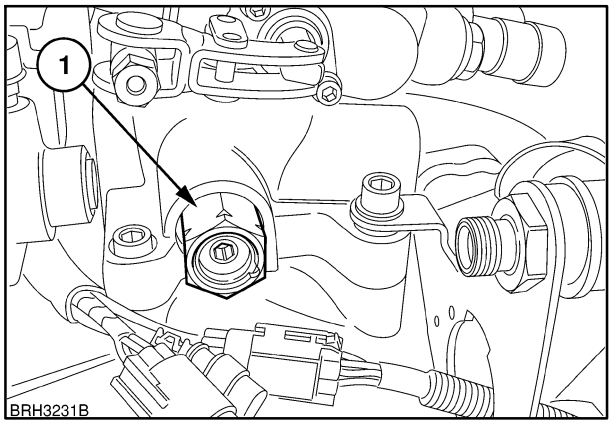
1. Mechanical Draft Control Valve
2. High Pressure Feed to Remote Valves
3. Remote Valves
4. Feed Mechanical Draft Control Valve
5. Trailer Brake Valve Connector pipe
6. Trailer Brake Valve (Where Fitted)

Fixed displacement hydraulic pump assembly comprising of the high pressure gear pump and steering/low pressure gear pump .



22

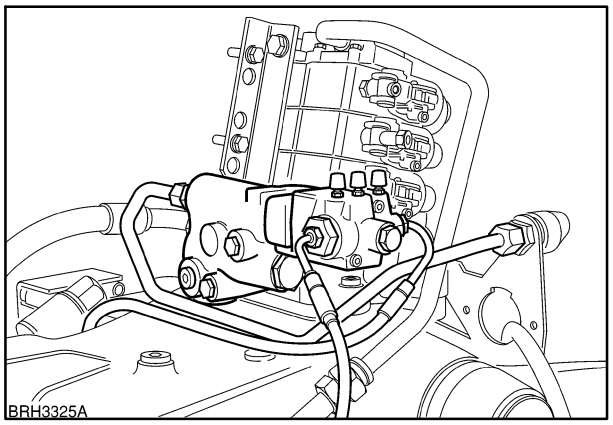
High pressure circuit relief valve (1) is located in the remote valve stack sub plate and diverts pump flow to sump if the system pressure reaches 190 bar (2755 lbf/in^2).



23

The trailer brake valve is located beneath the cab on top of the hydraulic lift cover. The valve diverts oil pressure to the trailer brakes whenever the right hand tractor brake pedals is depressed. This is unlike the valve installed on the closed centre system where both pedals have to be depressed in order for the valve to operate.

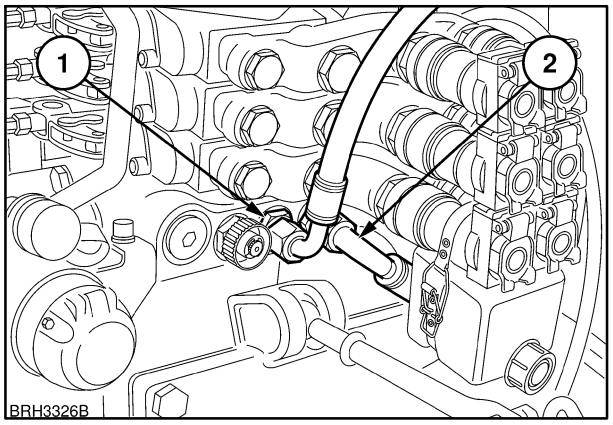
The trailer brake has absolute priority over other services in the circuit.



24

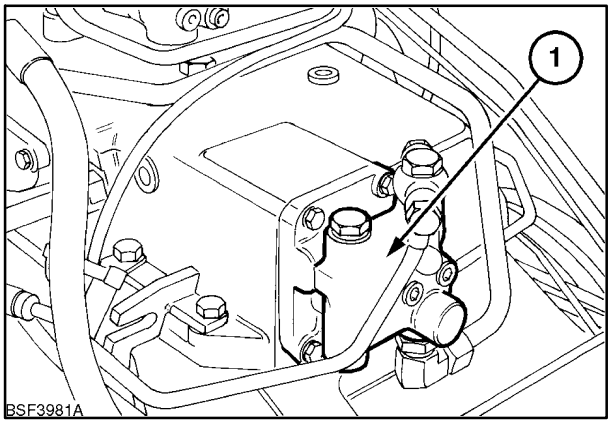
The remote valves are available as two or three valves per tractor.

The valves can be double-acting with float and kick out.



25

On tractors which are fitted with mechanical hydraulic lift, the lift cylinder control valve (1) assembly is located at the front of the hydraulic lift assembly. The lift cylinder safety valve is mounted on the rear face of the control valve which must be removed to obtain access. This safety valve will operate at between 210 and 215 Bar.



26

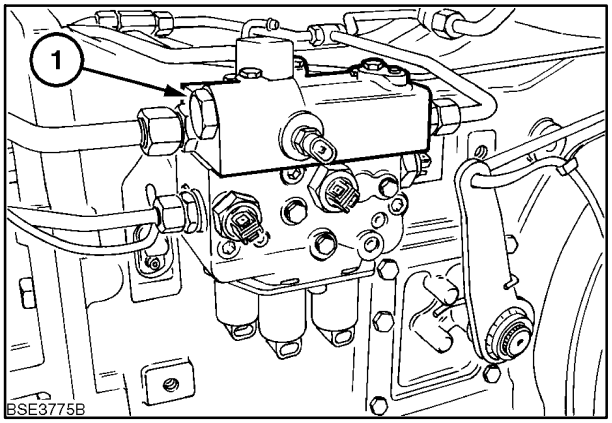
LOW PRESSURE REGULATING VALVE

Is located in the top manifold situated on the lubrication services distribution block on the left hand side of the rear axle centre housing.This valve regulates the pressure in the low pressure circuit to 17-18 bar (246-261 lbf/in^2).

Also located in this manifold are the **oil cooler by-pass valve** and the **lubrification relief valve** (7.3 - 8.3 bar).

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2) the **cooler by-pass valve (1)** located on the right hand side of the transmission will operate to ensure that adequate flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.

The steering pump / steering return oil is directed through the oil cooler at the front of the tractor and is limited to a maximum pressure of 7 bar (101 lbf/in^2) by the **lubrication relief valve l**ocated in the lubrication services distribution block on the left hand side of the rear axle centre housing.



27

HIGH PRESSURE CIRCUIT FOR TRACTORS WITH FIXED DISPLACEMENT PUMP AND MECHANICAL HYDRAULIC LIFT

With Reference to Figure 28.

Both the high and low pressure pumps are driven by a 'live' drive gear train directly connected to the PTO clutch input drive shaft and driven by the engine flywheel.

Oil is drawn through the common intake port and filter to both the high and steering/low pressure pump assemblies.

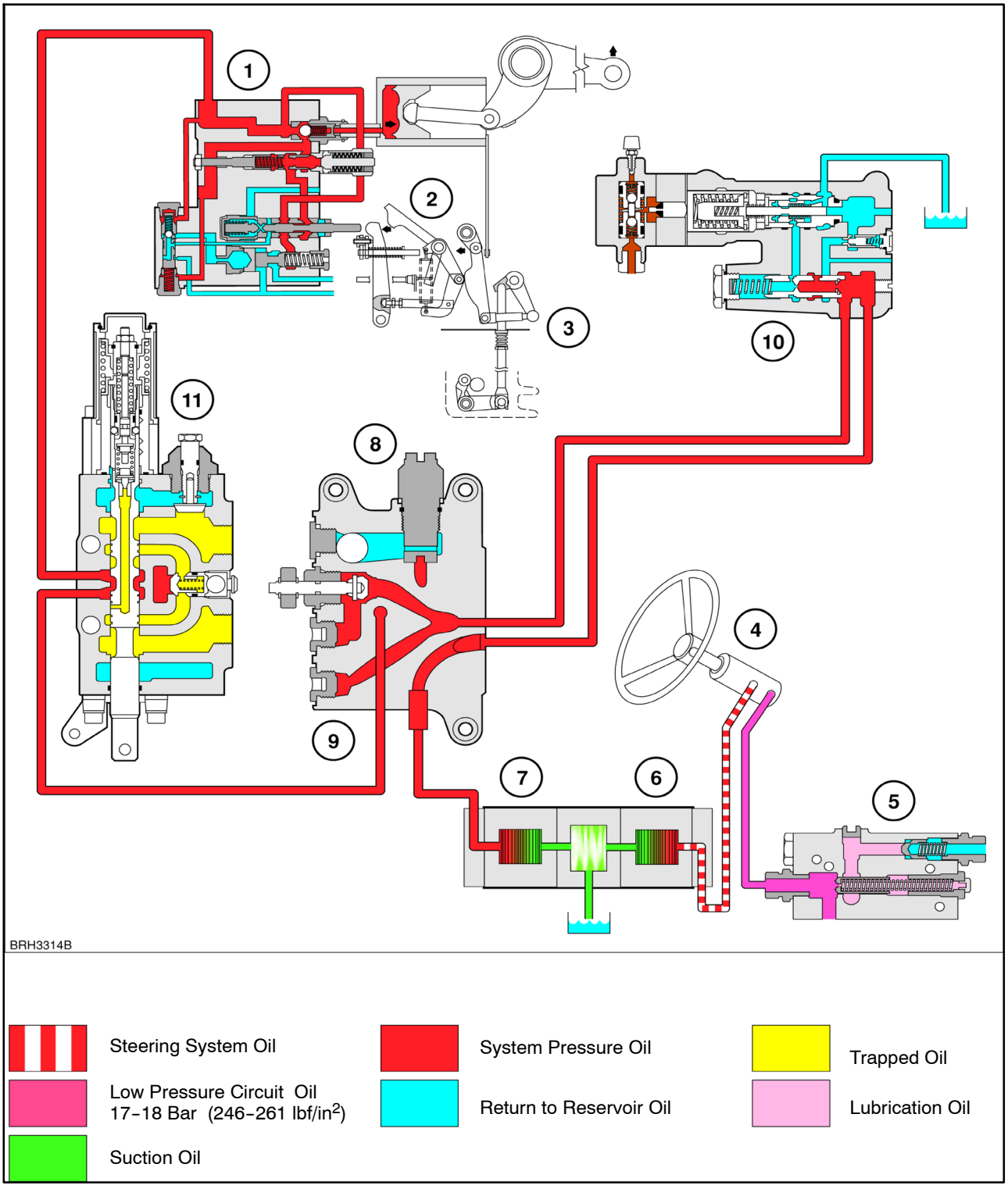
The high pressure pump supplies constant oil flow according to engine speed, through the trailer brake and remote valves via a subplate at the bottom of the remote valve stack. The subplate incorporates a Relief valve which operates at between 190-195 bar at 25 ltrs/min .

Oil, after passing through the remote valves, enters the hydraulic lift control valve located at the front of the lift assembly, which controls the raising and lowering of the lift.

All excess oil flow produced by the hydraulic pump is returned direct to the rear axle through the control valve spool located in the hydraulic lift control valve assembly.

Also located within the assembly is the lift cylinder safety valve, which protects the lift cylinder and seals from excessive peaks of pressure during operation.

For further details on operation of the mechanical hydraulic lift assembly, trailer brake valve and mechanical remotes refer to the appropriate Chapters in this Section of the Repair Manual.



28

1. Lift Control Valve
2. Lift Cylinder Safety Valve
3. Mechanical Hydraulic Lift Assembly
4. Steering Motor
5. Low Pressure Regulating Valve
6. Steering and Low Pressure Circuit Gear Pump
7. Fixed Displacement Pump
8. Pressure Relief Valve (190-195 Bar/2755- 2828 psi)
9. Subplate with Power Byond Tap
10. Trailer Brake Valve
11. Single/double Acting Remote Valve

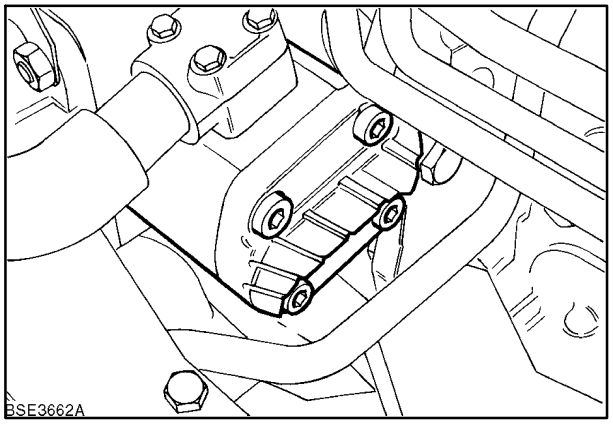
LOW PRESSURE HYDRAULIC CIRCUITS

Tractors with 12x12 Transmission

The complete hydraulic circuit for tractors with 12 x 12 transmissions is shown on Figure 31.

The function of the principal components in the circuit are described as follows:

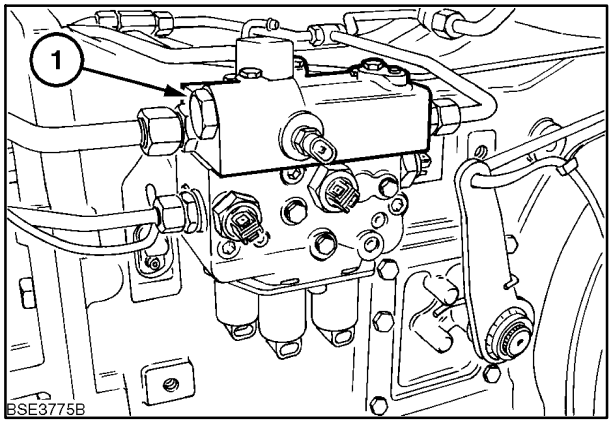
Oil is drawn through the steering and low pressure circuit pump to the steering motor. The flow of low pressure oil is diverted in one direction through the low pressure regulating valve and oil by pass cooler valve and on to the services distribution block which diverts oil when needed to the Diff lock, PTO, and PTO brake. The flow is also diverted through the services distribution block and returns to reservoir.



29

The **low pressure regulating valve** in the top manifold (1) of the lubrication distribution block limits the pressure in this circuit to 17-18 bar (246-261 lbf/in^2) and the excess flow passes into the lubrication circuit.

Low pressure circuit oil is directed through the oil cooler at the front of the tractor and is limited to a maximum pressure of 7 bar (100 lbf/in^2) by the **lubrication valve** which is also located in the manifold on top of the lubrication distribution valve. Components lubricated by this oil are transmission shafts , hydraulic pump drive gear, hydraulic lift cross shaft and PTO clutch lubrication.



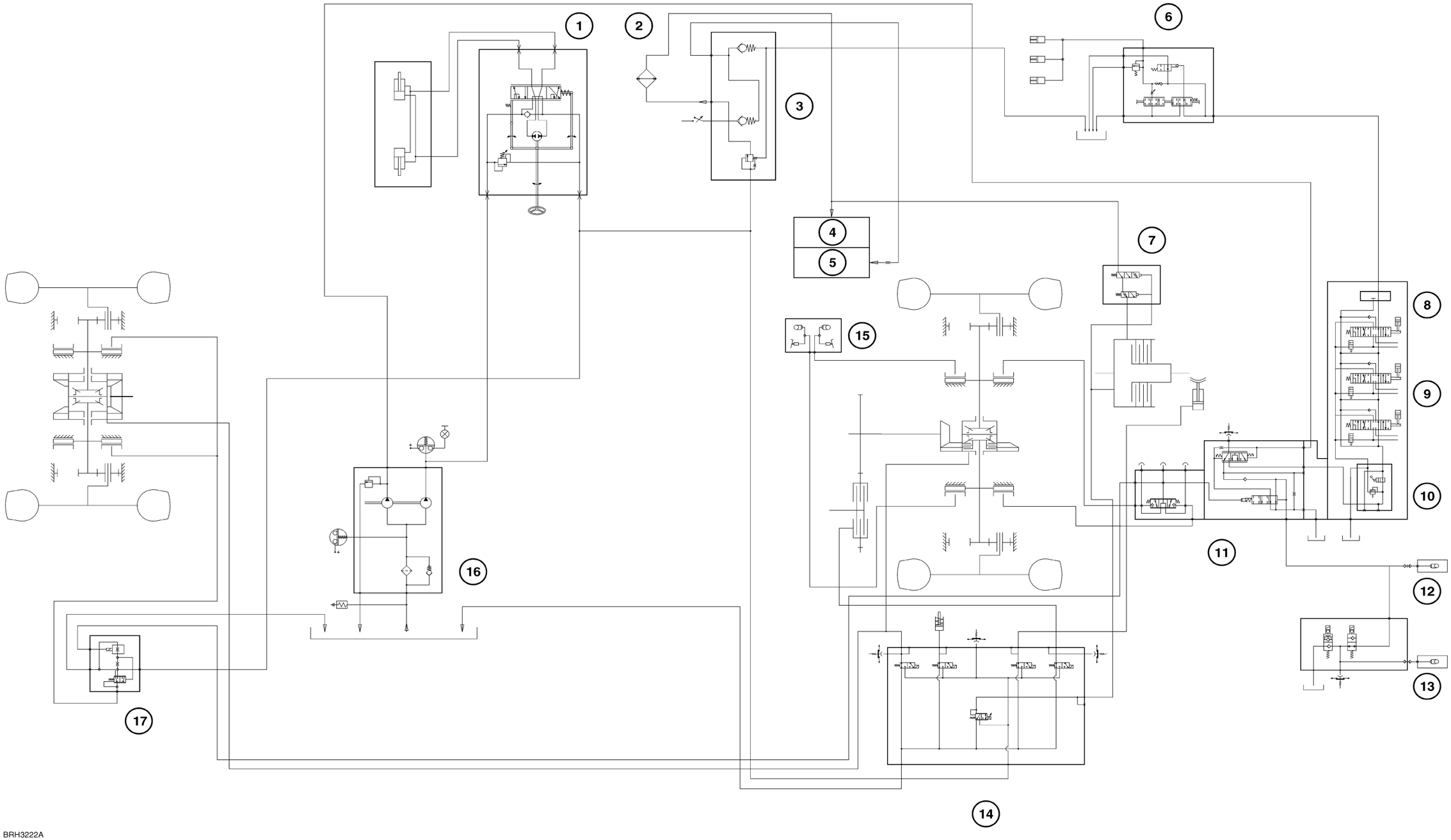
30

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2) the **cooler by-pass valve** also located in the manifold on top of the lubrication distribution valve will operate to ensure that adequate flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.

NOTES

Figure 31
Hydraulic Circuit - Tractors with 12 x 12 Transmission

1. Steering Motor
2. Oil Cooler
3. Oil Cooler Bypass Valve,Low Pressure Regulating Valve, lube relief valve
4. Transmission Lubrication
5. Pumps Drive Lubrication
6. Mechanical Draft Control Valve
7. PTO lubrication Control Valve
8. End Plate
9. Mechanical Remote Valves
10. Sub Plate with Relief Valve and Power Beyond Tap and ports
11. Trailer Brake Valve
12. Trailer Brake Coupling
13. Italian Version Trailer Brake coupling and Solenoid Assembly
14. Low Pressure Distribution Manifold
15. Brake Pedals and Master Cylinder
16. Fixed Displacement Pump and Steering Pump
17. Brake Valve



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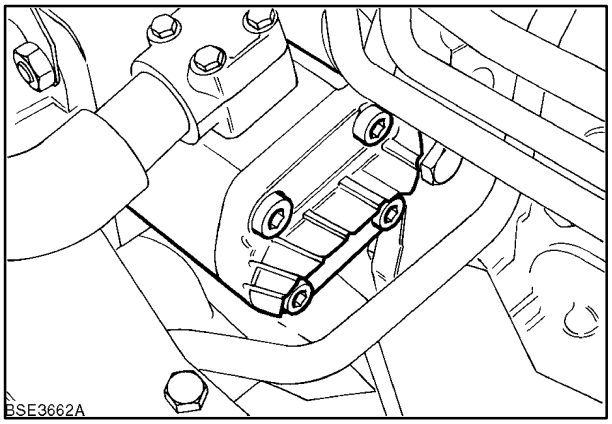
12x12 OC W/MDC

Tractors with 16 x 16 Transmission

The complete hydraulic circuit for tractors with 16 x 16 transmissions is shown on Figure 44.

The function of the principal components in the circuit are described as follows:

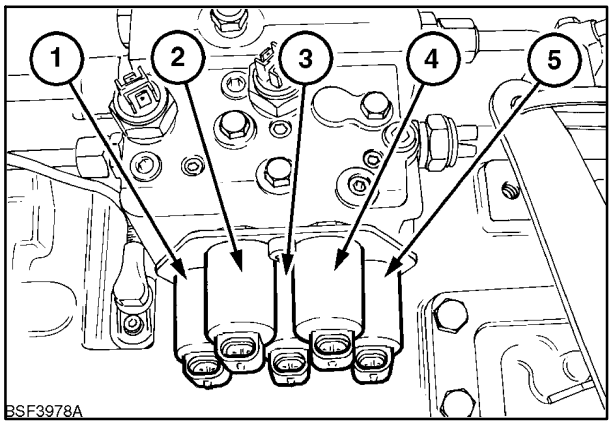
Oil is drawn through the steering and low pressure circuit pump to the steering motor. The flow of low pressure oil is diverted in one direction through the low pressure regulating valve and oil by pass cooler valve and on to the services distribution block which diverts oil when needed to the Diff lock, PTO, and PTO brake. The flow is also diverted through the services distribution block and returns to reservoir.



32

The **low pressure distributor valve block** is located under the cab on the left of the rear axle centre housing. The block is fed oil directly from the power steering return line. Located in the valve block are the solenoid valves for the 4WD,creeper, differential lock, P.T.O and P.T.O. brake.

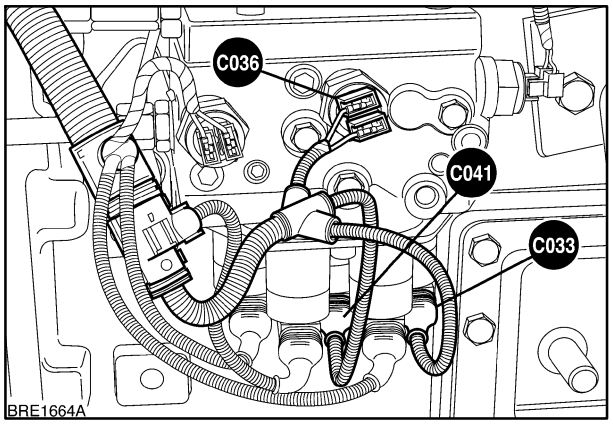
1. Creeper Solenoid
2. Differential Lock Solenoid
3. PTO Clutch (PWM)
4. Four Wheel Drive Solenoid
5. PTO Brake Solenoid



33

NOTE: *The four wheel drive is spring applied and the solenoid is energised whenever disengagement of the drive is required.*

C033 PTO Brake
C041 PTO PWM



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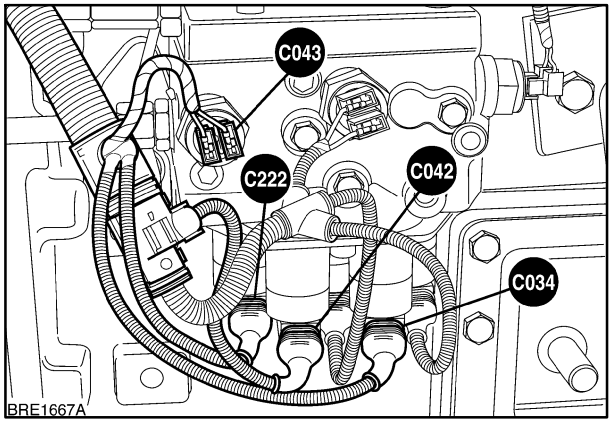
C222 Creeper
C042 Differential Lock
C034 Four Wheel Drive



35

The transmission top cover contains the transmission control solenoids for one to four and five to eight range engagement and forward and reverse engagement. The low pressure oil is again supplied direct from the regulating valve outlet and is distributed by galleries within the top cover.

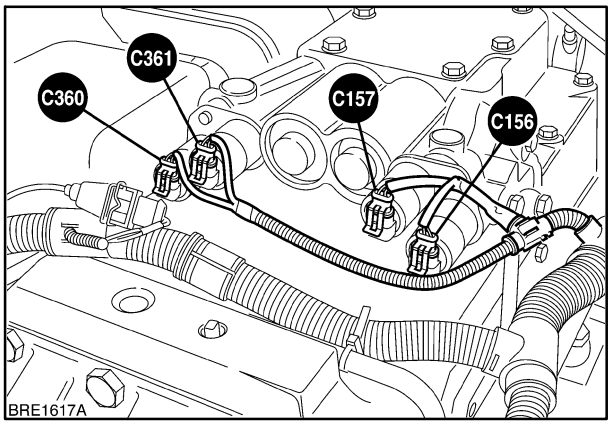
Solenoid Function

C360 5 – 8 Range Synchro Solenoid

C361 1 – 4 Range Synchro Solenoid

C156 Reverse Solenoid Clutch

C157 Forward Solenoid Clutch



36

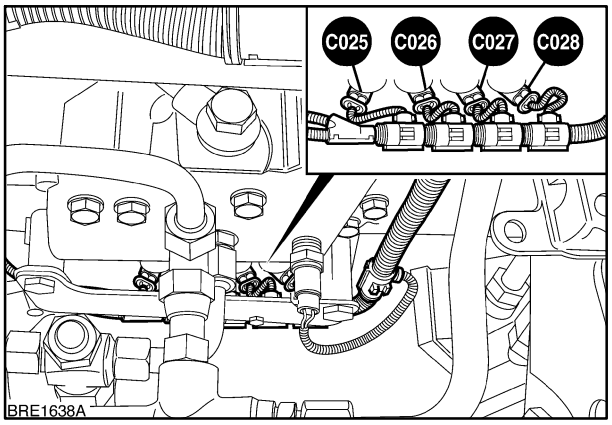
C025 C4 Valve

C026 C3 Valve

C027 C2 Valve

C028 C1 Valve

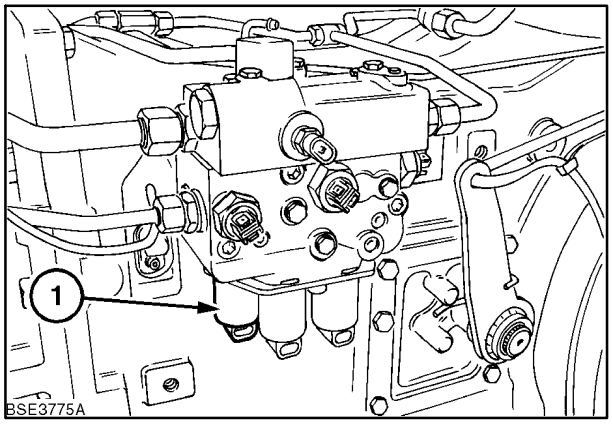
NOTE: *The 'C' number prefix before each solenoid description is the electrical connector reference.*



37

Transmission Creeper

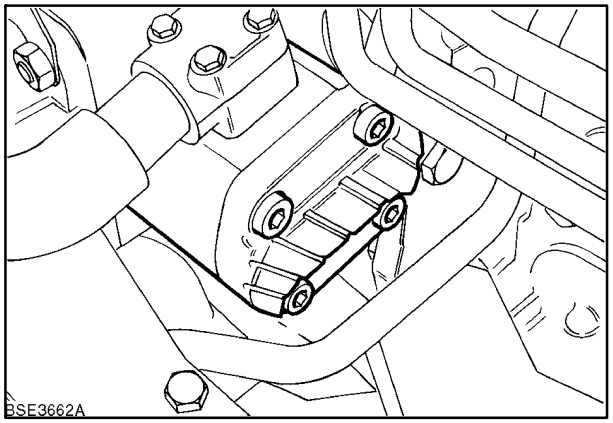
The creeper actuating solenoid valve (1) is located in the low pressure distribution block on the left hand side of the the rear axle centre housing.



38

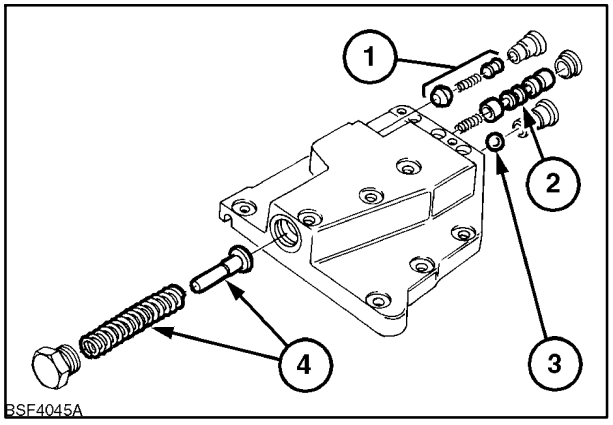
Lubrication Oil

Lubrication oil is supplied from the steering motor.



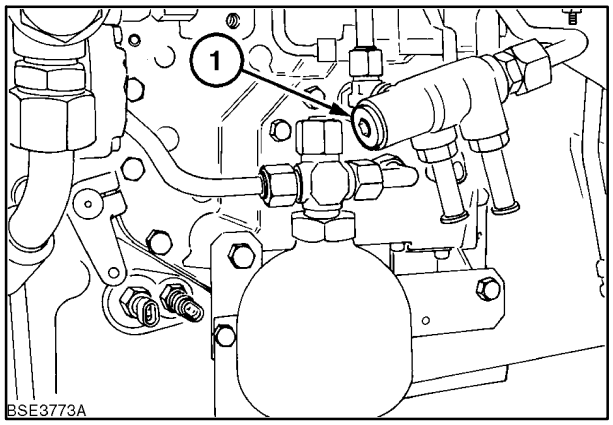
39

The steering pump / steering return oil is directed through the oil cooler at the front of the tractor and is limited to a maximum pressure of 7 bar (101 lbf/in^2) by the **lubrication relief valve (2)** located in the transmission side cover. Components lubricated by this oil are the transmission shafts and clutches.

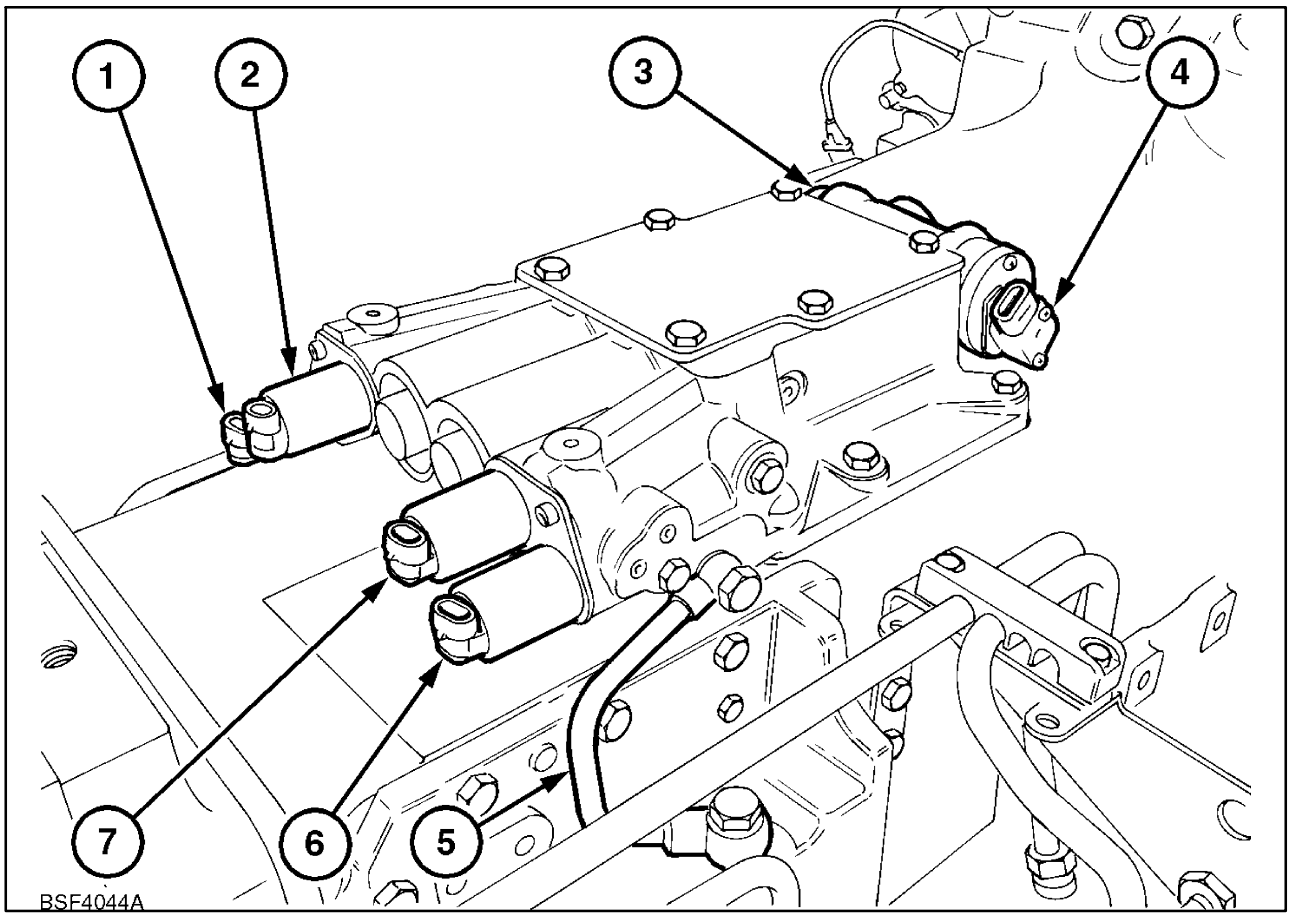


40

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2) the **cooler by-pass valve (1)** located on the right hand side of the transmission will operate to ensure that adequate flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.



41



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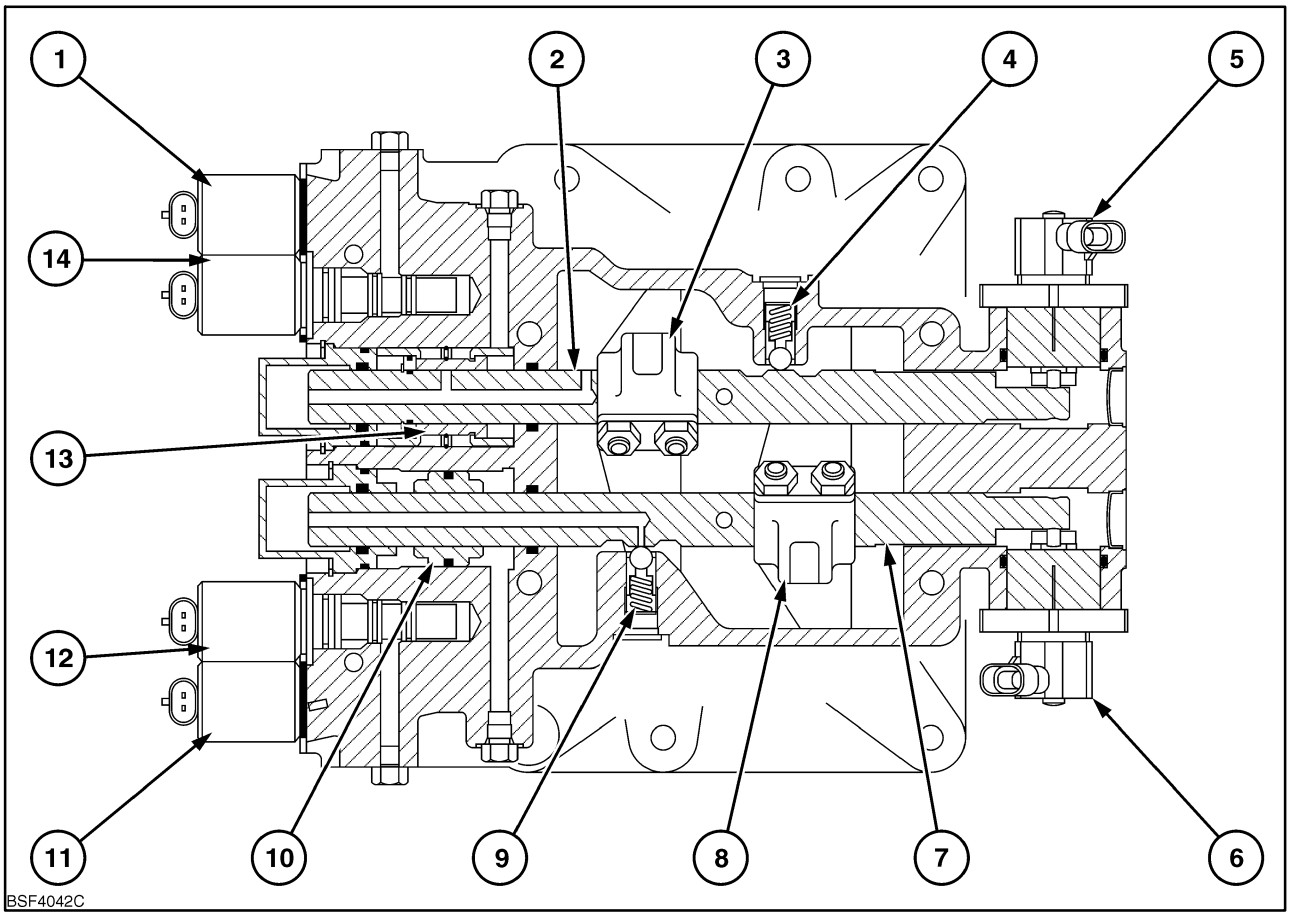
16 x 16 Transmission Top Cover

1. 5-8 Solenoid
2. 1-4 Solenoid
3. 1-4/5-8 Synchroniser Position Potentiometer
4. Forward/Reverse Synchroniser Position Potentiometer
5. Low Pressure Feed
6. Reverse Solenoid
7. Forward Solenoid



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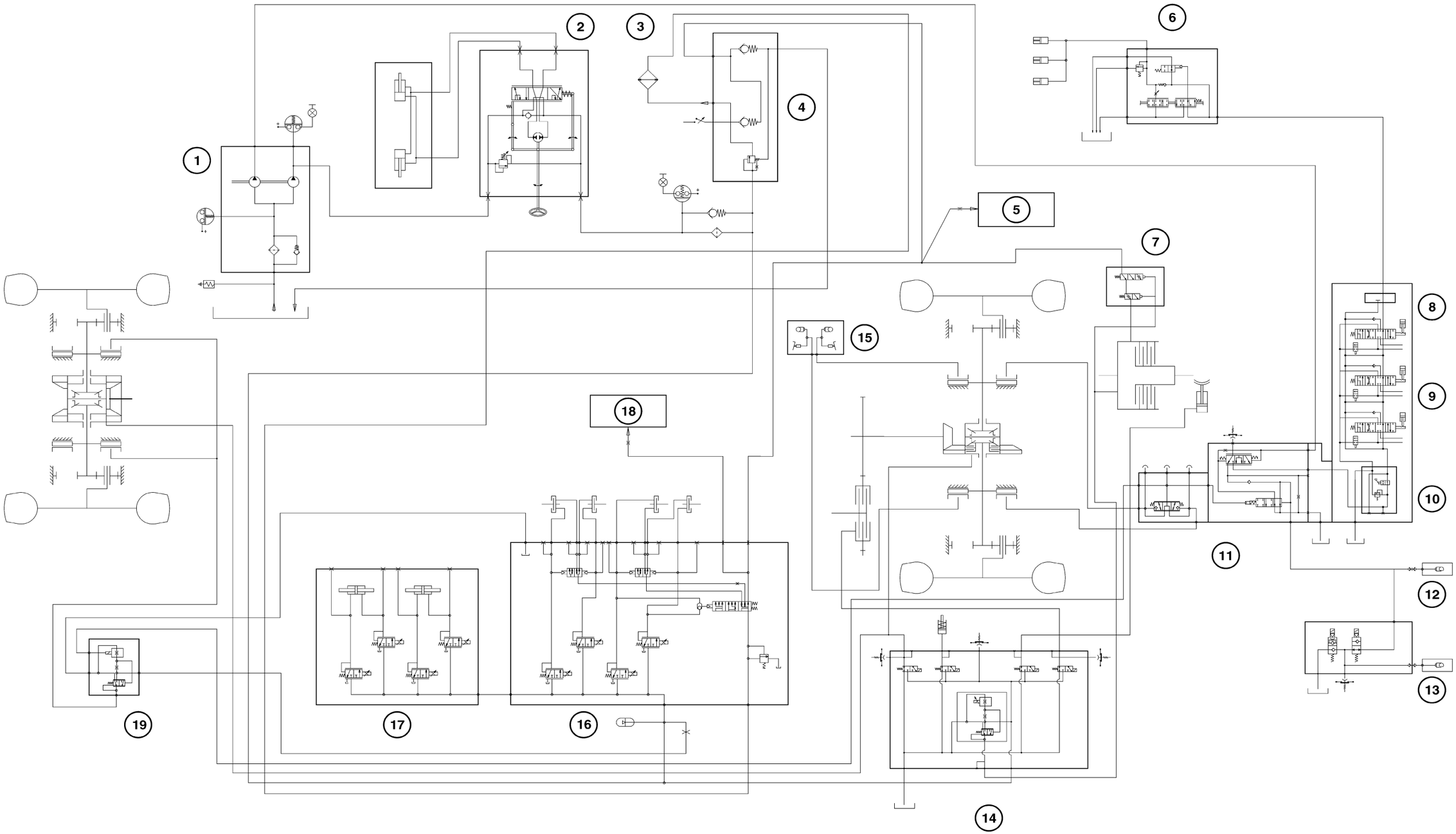
16 x 16 Transmission Top Cover

1. Reverse Solenoid
2. Forward/Reverse Rail
3. Forward/Reverse Shift Fork
4. Forward/Reverse Detent Assembly
5. Forward/Reverse Synchroniser Position Potentiometer
6. 1-4/5-8 Synchroniser Position Potentiometer
7. 1-4/5-8 Shift Rail
8. 1-4/5-8 Shift Fork
9. 1-4/5-8 Detent Assembly
10. Piston
11. 5-8 Solenoid
12. 1-4 Solenoid
13. Piston
14. Forward Solenoid

NOTES

Figure 44

1. Fixed Displacement Pump
2. Steering Motor
3. Oil Cooler
4. Oil Cooler Bypass Valve, Low Pressure Regulating Valve, Lube Relief Valve
5. Pumps Drive Lubrication
6. Mechanical Draft Control Valve
7. PTO Lubrication Control Valve
8. End Plate
9. Mechanical Remote Control Valves
10. Sub Plate with Relief Valve and Power Beyond Tap and ports
11. Trailer Brake Valve
12. Trailer Brake Coupling
13. Italian Version Trailer Brake Coupling and Solenoid Assembly
14. Low Pressure Distribution Manifold
15. Brake Pedals and Master Cylinder
16. Transmission Side Covers -C1,C2,C3, and C4 solenoids
17. Top Cover PWM Valves - 1-4, 5-8, Forward and Reverse
18. Transmission Lubrication
19. Front Brake Valve



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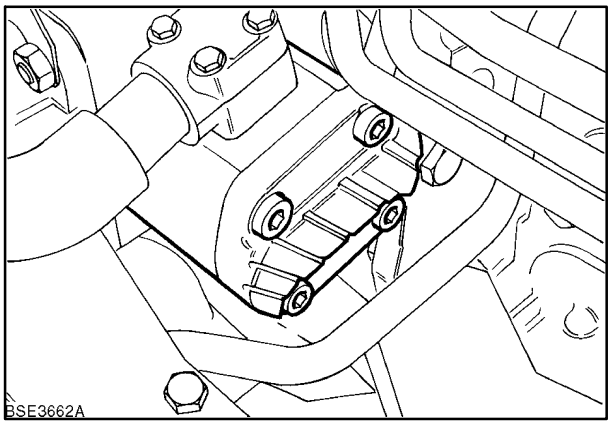
16x16 W/OC MDC

Tractors 24x24 Transmission

With Reference to Figure 52.

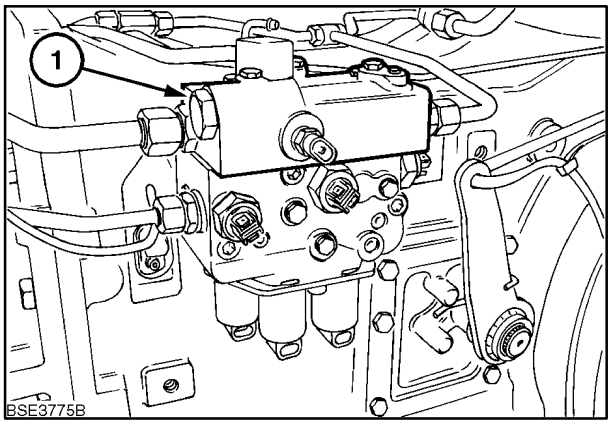
Oil is drawn through the steering and low pressure circuit pump to the steering motor which feeds oil to the low pressure services manifold . The top section of the manifold houses the Oil Cooler by-pass valve, low pressure regulating valve, and the lubrication relief valve.

Refer to Steering Section 41 for further details.



45

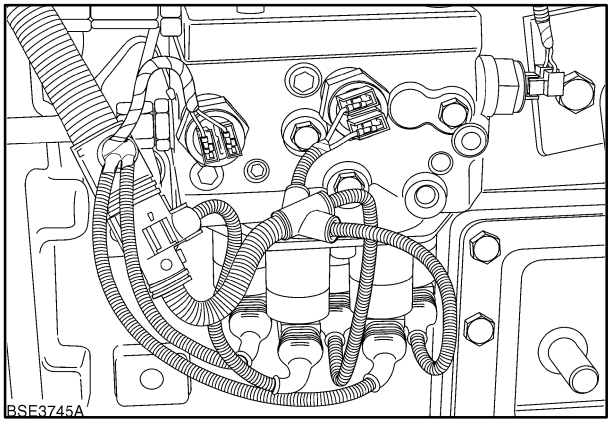
The low pressure regulating valve mounted above the low pressure services block limits the pressure in this circuit to 17-18 bar (246-261 lbf/in^2) and the excess flow passes into the lubrication circuit.



46

The solenoids in the in the low pressure services block, are energised to divert flow and engage the creeper (where fitted), differential lock, PTO clutch and brake and disengage four wheel drive.

NOTE: *The four wheel drive is spring applied and the solenoid is energised whenever disengagement of the drive is required.*



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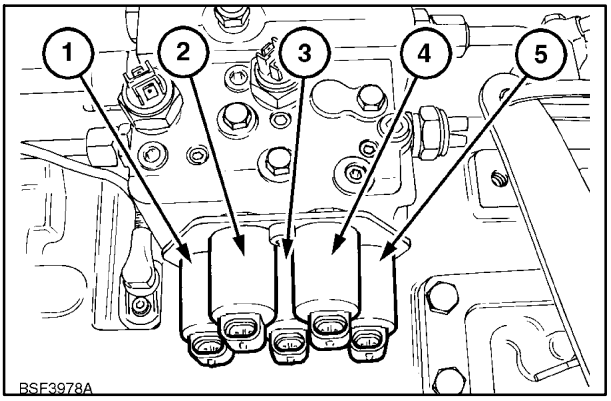
Solenoid Function

1. Creeper (Where fitted)
2. Diff lock
3. PTO
4. Four Wheel Drive
5. PTO Brake



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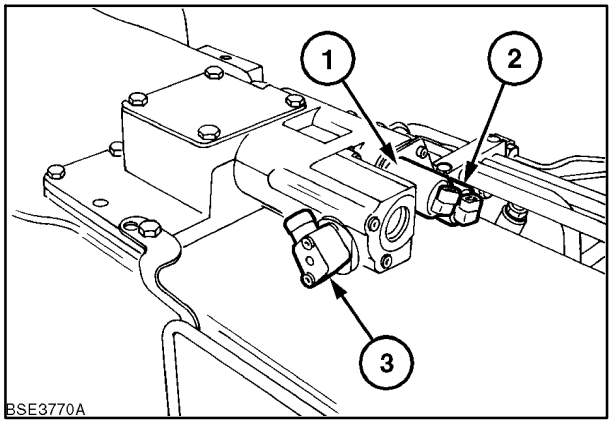
The pulse width modulated solenoids in the transmission top cover are used to progressively engage/disengage the transmission forward/ reverse synchroniser.

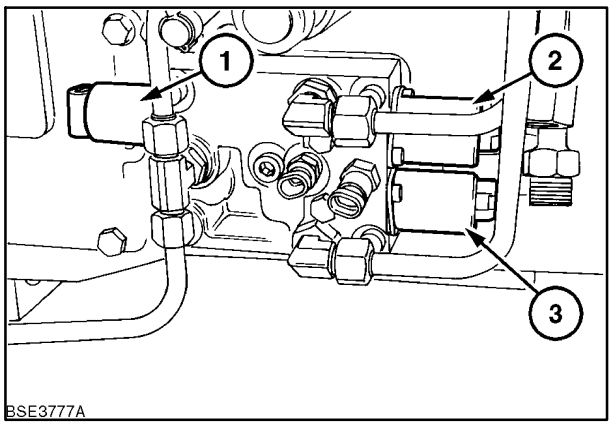
Solenoid Function

1. Reverse Synchroniser
2. Forward Synchroniser
3. Forward/Reverse Potentiometer



49

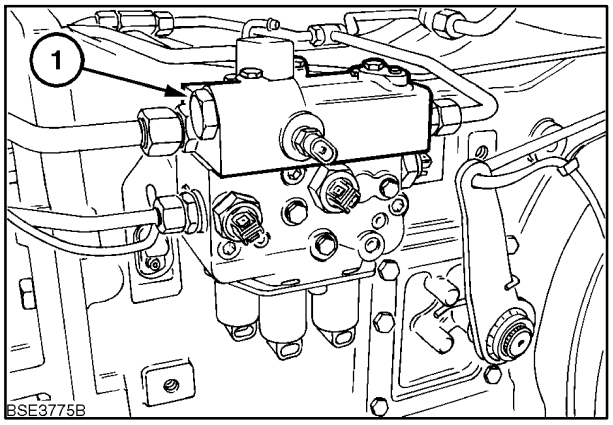
The **dump solenoid** (1) in the transmission side cover is a safety solenoid controlled by the pressure switches in the A and B clutch circuits. In the unlikely event that both these clutches are pressurised at the same time the dump solenoid is energised allowing pressure in the circuit to be diverted to sump preventing 'lock up' of the transmission.



50

Low pressure circuit oil is directed through the oil cooler at the front of the tractor and limited to a maximum pressure of 7 bar (100 lbf/in^2) by the **lubrication valve** (1) located in the manifold on top of the lubrication distribution block on the left hand side of the rear axle centre housing. Components lubricated by this oil are transmission clutches and shafts, hydraulic pump drive gear, hydraulic lift cross shaft and PTO clutch lubrication.

When the oil is cold and pressure differential across the oil cooler is higher than 6 bar (87 lbf/in^2), the **cooler by-pass valve (1)** which is also located in the manifold on top of the lubrication distribution block on the left hand side of the rear axle centre housing will operate to ensure that an adequate oil flow to the lubrication circuit is maintained. This feature of diverting oil from the cooler assists in aiding a rapid warm up of oil in cold weather conditions.



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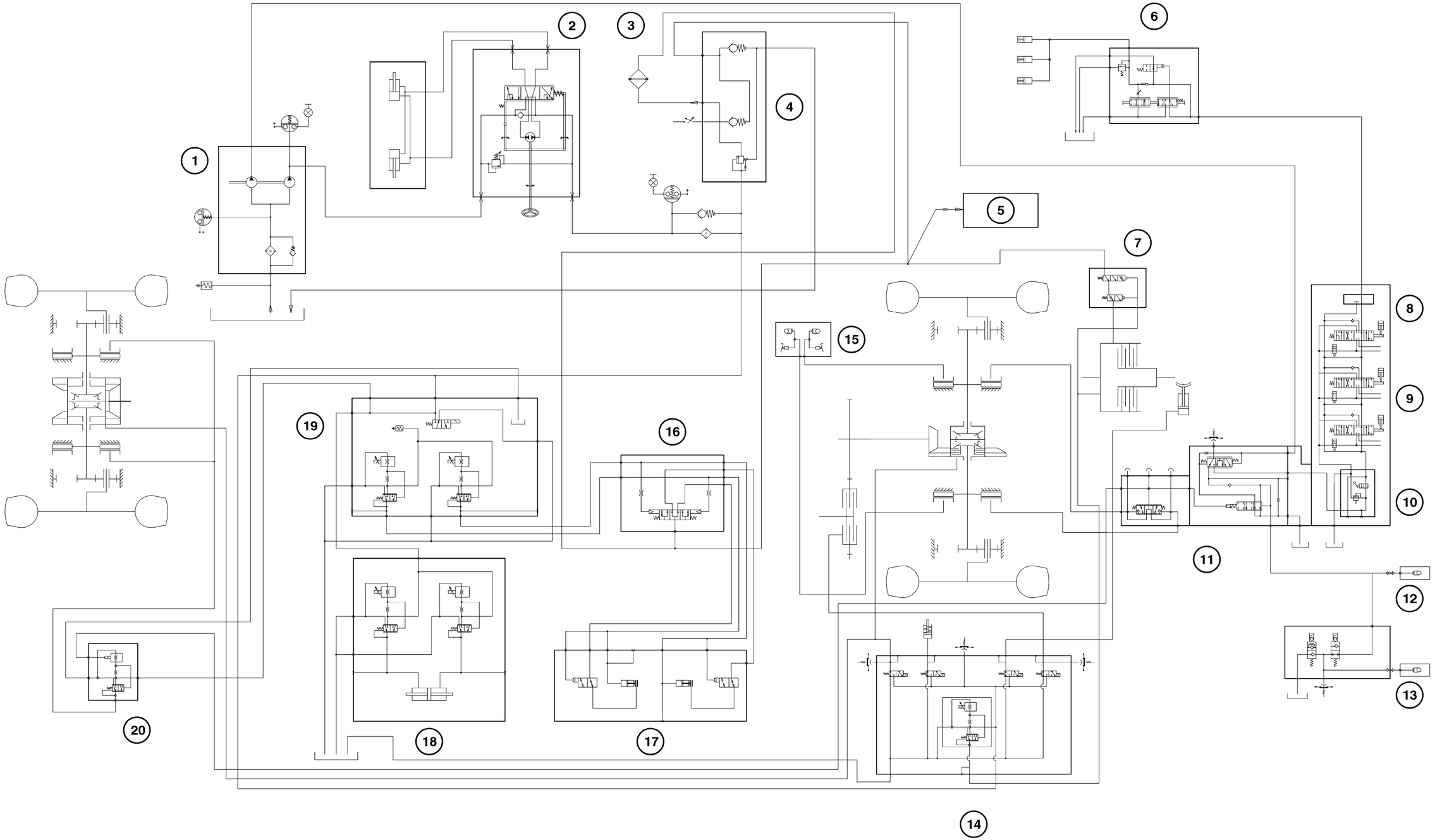
NOTES

Hydraulic Circuit 24 x 24 Models

1. Fixed Displacement Pump and Steering Pump
2. Steering Motor
3. Oil Cooler
4. Oil Cooler By-pass Valve,Lubrication Relief Valve,Low Pressure Regulating Valve
5. Pumps drive lubrication
6. Mechanical Draft Control Valve
7. PTO lubrication control valve
8. End Plate
9. Remot control Valves
10. Sub plate with relief valve and power beyond tap and ports
11. Trailer Brake valve
12. Trailer Brake Coupling
13. Italian Trailer Brake Coupling and Solenoid assembly
14. Low Pressure Distribution Manifold
15. Brake Pedals and Mastyer Cylinders
16. Hi Lo Lube Valve
17. Transmission Solenoids
18. Forward and Reverse Valve
19. Hi Lo Valve Assembly
20. Front Brake Valve



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TROUBLESHOOTING

Before commencing fault finding refer to the initial check fault finding chart which may identify an obvious cause for the concern and prevent unnecessary component disassembly.

IMPORTANT: *If the steering is inoperative, there will be no lubrication to the transmission or PTO clutch and the tractor must not be run for more than 5 minutes at a maximum engine speed of 1000 rev/min.*

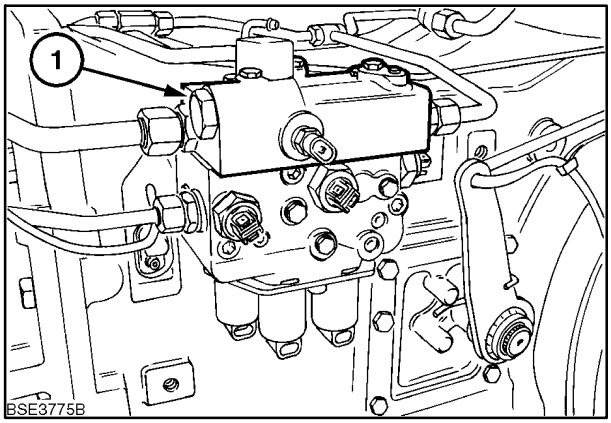
Fault finding charts listed in this Chapter are:-

- Initial Fault Finding Check
- Transmission Low Pressure Warning Light 'On'
- Intake Filter Restriction Warning Light 'On'
- Power Steering not Working or Working Incorrectly
- Trailer Brakes not Working
- Hydraulic Lift not Working Correctly
- Remote Control Valves not Working

INITIAL FAULT FINDING CHECKS TO BE PERFORMED BEFORE PROCEEDING TO GENERAL DIAGNOSTIC PROCEDURE

Problem	Possible Cause	Remedy
Error code identified by micro -processor	Component malfunction	Refer to Error code fault finding charts
Rear Axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
Oil contaminated with dirt, water, or antifreeze	Filters not replaced at correct service interval	Replace all filters on pump
Warning light displayed on instrument cluster	Component not functioning correctly	Identify function not operating correctly and refer to the appropriate fault finding chart

TRANSMISSION LOW PRESSURE WARNING LIGHT 'ON'



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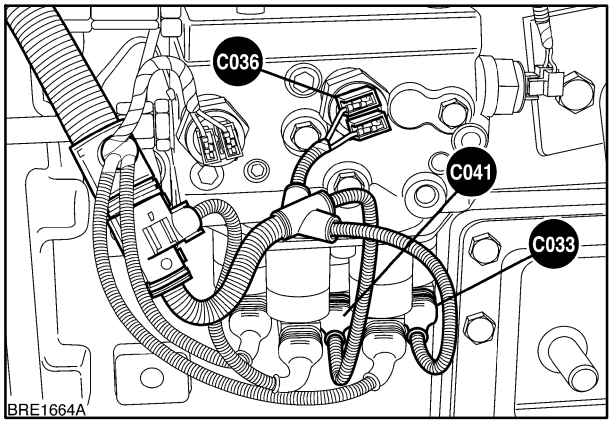
Low Pressure Regulating Valve



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Transmission Low Oil Pressure Switch

Problem	Possible Cause	Remedy
High pressure system components do not operate, ie, hydraulic lift, remote valves and trailer brakes	High pressure pump malfunction	Perform tests for high pressure pump Refer to relevant chapter
Low pressure systems components do not operate,ie, transmission, PTO, FWD and Diff Locks	Low pressure regulating valve sticking, broken components or relief vavle may be stuck open	Pressure test the low pressure circuit. If the pressure is not 17 bar,inspect the low pressure regulating valve or relief valve. If this does not clear the fault check for a large leak in one of the low pressure system component circuits.
	If the pressure is 17 bar there may be an electrical fault	Check for an electrical fault which may affect the operation of all low pressure components, ie, disconnected harness to low pressure block
Low pressure systems components do not operate,	Oil pressure switch not functioning correctly or faulty wiring	If the warning lamp does not remain on inspect the switch. It should be open , replace if faulty. If the lamp remains on repair wiring fault between C036 and C081 Pin 12 of the insrument cluster

INTAKE FILTER RESTRICTION WARNING LIGHT ON

Problem	Possible Cause	Remedy
Rear axle oil level incorrect	Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
Inlet filter not functioning	Filter contaminated	Replace filter
If wiring to filter restriction switch is disconnected and light is not extinguished	Short circuit to chassis in B/N colour wire from instrument console connector C175 Pin 16 and intake filter restriction switch	Locate and repair short circuit
If wiring to filter restriction switch is disconnected and light is extinguished	Intake filter restriction switch faulty	Replace intake filter restriction switch

POWER STEERING NOT WORKING OR WORKING INCORRECTLY

Problem	Possible Cause	Remedy
Steering pressure warning light is illuminated	Incorrect pressure in the steering system	Pressure test the steering system as describedin the 'Pressure Testing' Chapter
	Steering pump faulty	Remove steering pump and examine the drive to the pump, if O.K. repair or replace the steering pump assembly
Pressure is correct up to the steering cylinders	Mechanical fault in the steering components	If pump output is good but pressure to the cylinders is low or zero, suspect a faulty steering motor. See section 41 for steering motor removal and overhaul.

TRAILER BRAKES NOT WORKING

Problem	Possible Cause	Remedy
Trailer brakes not working correctly	Air in system	Bleed the trailer brakes
	Pressure incorrect in system	Pressure test the Trailer brakes
Pressure test confirms fault	Hydraulic lift not working satisfactorily	Test maximum system pressure at remote valve coupler. Pressure 2900-3000 lbf/in^2 (200-207 bar)
If pressure test confirms correct pressure	Trailer brake valve faulty	Operate and hold remote valve to generate maximum system pressure and at the same time operate the trailer brakes. If the trailer brake valve does not function correctly overhaul trailer brake valve

HYDRAULIC LIFT NOT WORKING CORRECTLY

Problem	Possible Cause	Remedy
Is hitch enabled symbol illuminated		Capture hitch
		Check position of controls on control panel
Trailer brakes(if fitted) not working correctly. (Install a pressure gauge in the trailer brake coupler)	Fault in the fixed displacement pump	Pressure test the pump to determine the fault
Remote valves not operating correctly. (Install a pressure gauge in the remote valve coupler)	Contaminated components in low pressure regulating valve assembly	Inspect the low pressure regulating valve assembly for sticking spool. dirt contamination or broken components. Rectify as required
Hydraulic lift working erratically	Circuit leak	Perform pump leak test to determine if fault relates to either internal leak or hydraulic circuit leak
If the hydraulic lift does not operate correctly	Lift arms leak down under pressure if heavy weight is placed on them	Overhaul lift cylinder

REMOTE CONTROL VALVES NOT WORKING – MECHANICALLY OPERATED TYPE

Problem	Possible Cause	Remedy
If hydraulic lift is not working	Various	Refer to fault finding chart for hydraulic lift not working
If hydraulic lift is working	Remote control valve fault	Test maximum system pressure at each remote valve coupler. If they reach correct pressure (2465.64 to 2538.16 psi – 170–175 bar)
One of the remote valves does not reach the correct pressure		Operate all remote valve levers simultaneously. If the defective remote valve does not reach correct pressure, overhaul as required

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 15 - TS-A Standard - Open Center System Remote Control Valves

CONTENT

Section	Description	Page
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	Converting Remote Valves to Single or Double Acting Operation	5
	Operating Stages of Auxiliary Control Valve for the Operation of a Double-acting Cylinder (Figs. 7 and 8) and a Single-acting Cylinder (Figs. 9 and 10)	8
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	Float Operation	11
	Overhaul	12
	Mechanical Remote Control Valve	12
	Removal	12
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	Cable Adjustment	18
	Auxiliary Control Valves	19
	Disassembly	19
	Control Valve Leakage Test	21
	Adjustment of the Automatic Detent Release Pressure	21

SPECIFICATIONS

Filter	full-flow, with replaceable paper cartridge, (common to the hydraulic lift circuit)
Pump	Fixed displacement pump
AUXILIARY CONTROL VALVES	
Location	valve stack up to a maximum of 3 control valves, fixed to the Rear axle housing with a sub plate
Operating	by hand levers
Pressure release valve calibration psi (bar)	2755.86 to 2828.38 psi (190 to 195)
Type	convertible for operation of single or double-acting actuators with float control and automatic detent release,

SPECIAL TOOLS

⚠ CAUTION ⚠

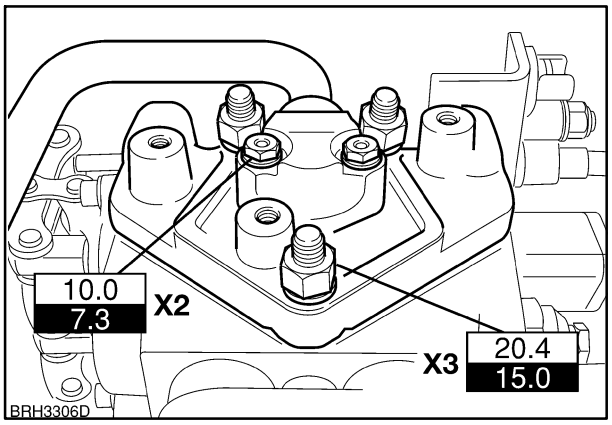
The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an (**X**) .To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this Section.

380000240 Universal pressure testing kit.

380000241 Seal guard for Kontak control valve single-acting valve.

TIGHTENING TORQUES

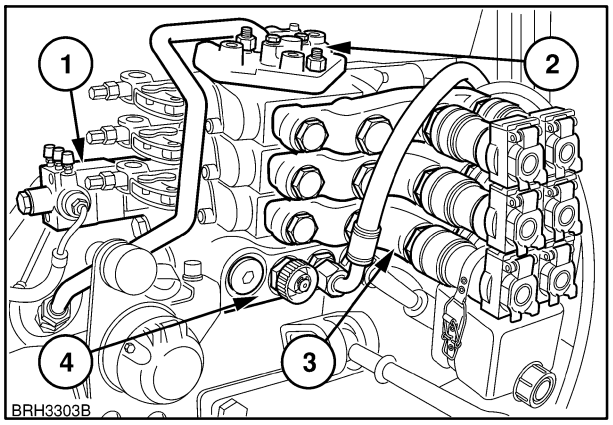


1

Parts to tighten	Thread	Tightening Torques	
End Plate retaining bolts (2)	3/8" – 24 UNF	20.4 Nm	15 lb.ft
Mechanical hydraulic lift valve feed pipe bolts (2)	1/4" – 20 UNC	10 Nm	7.3 lb.ft
Remote control valve block inlet plate (3)	M 10 x 1.25	43 Nm	32 lb.ft

DESCRIPTION AND OPERATION

TS-A Standard model tractors with open centre remote valves less electronic draft control.



2

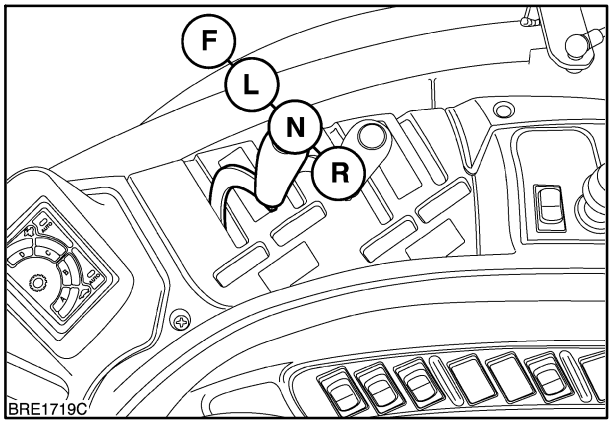
1. Trailer Brake Valve
2. End Plate with outlet to hydraulic lift valve
3. Remote Valve
4. Hydraulic Power Tapping port (Power Beyond) block

The auxiliary control valves serve for control of hydraulic loads external to the tractor.

Up to a maximum of 3 auxiliary control valves can be fitted.

The rear auxiliary control valves are operated by the hand levers located on the right-hand side of the driving position.

The levers and respective control valves are identified by colour, as follows:



3

Lever colour	Control valve position	no.
Green	Lower valve	I
Blue	Centre valve	II
Brown	Upper valve	III

Each control lever has three or four positions, depending on the type of control valve it operates.

1. **Lifting** - Pull the lever backwards to extend the connected cylinder and lift the implement.
2. **Neutral** - Push the lever forwards leaving the lifting position to select neutral and stop the flow of oil to the connected cylinder.
3. **Lowering** - Push the lever further forwards, beyond the neutral position, to return the cylinder and lower the implement.

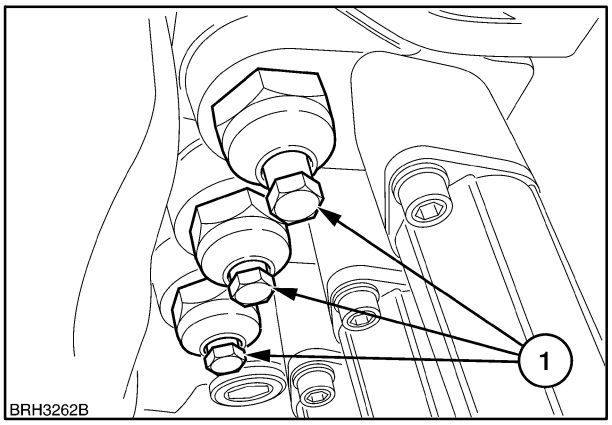
4. **Float** - Push the lever beyond the "lowering" position to select the "float" function. This will allow the cylinder to extend or return freely, permitting implements (such as blades) to follow the profile of the terrain.

CONVERTING REMOTE VALVES TO SINGLE OR DOUBLE ACTING OPERATION

Each remote valve is equipped with a screw (1) which converts the valve from double to single acting operation.

- **Single Acting:** Unscrew the adjusting screw fully outwards (anti-clockwise) until it stops. Do not overtighten.

- **Double Acting:** Screw the adjusting screw fully inwards (clockwise). Do not overtighten.



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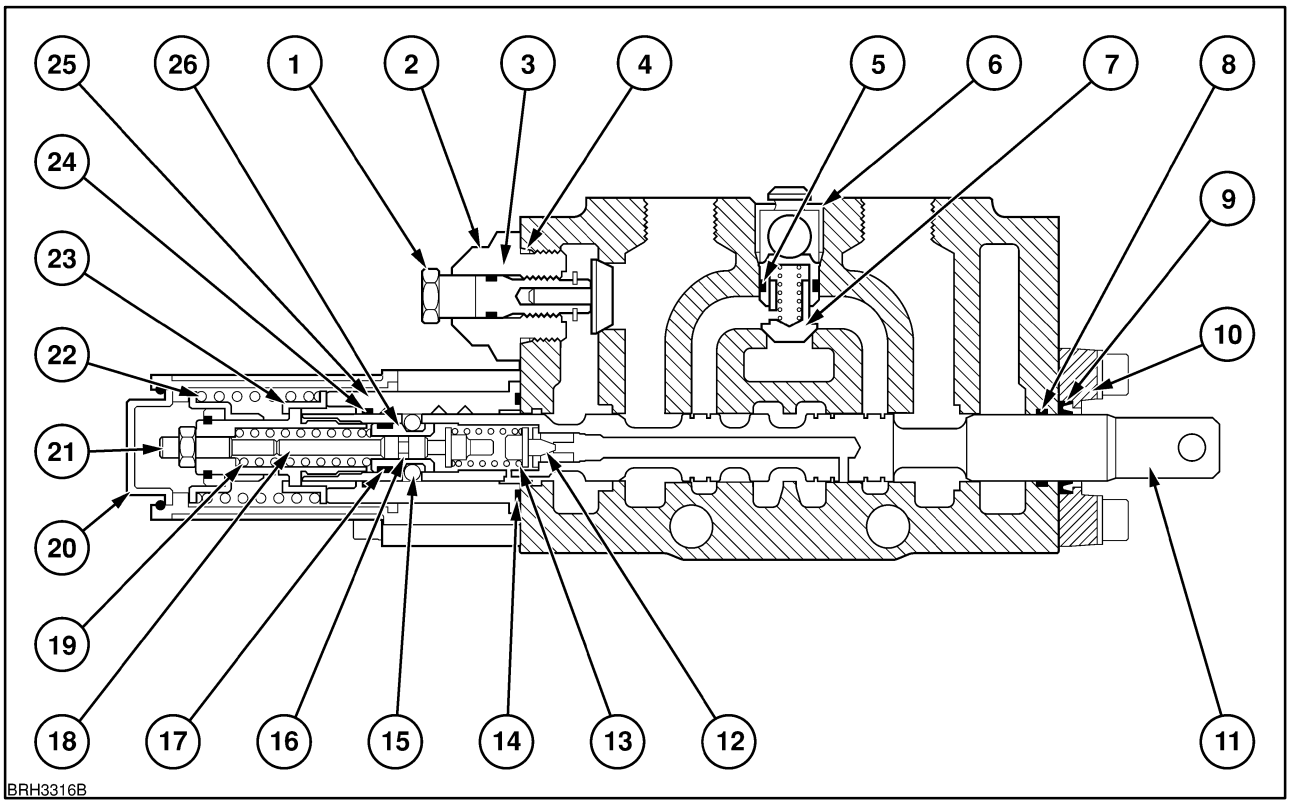
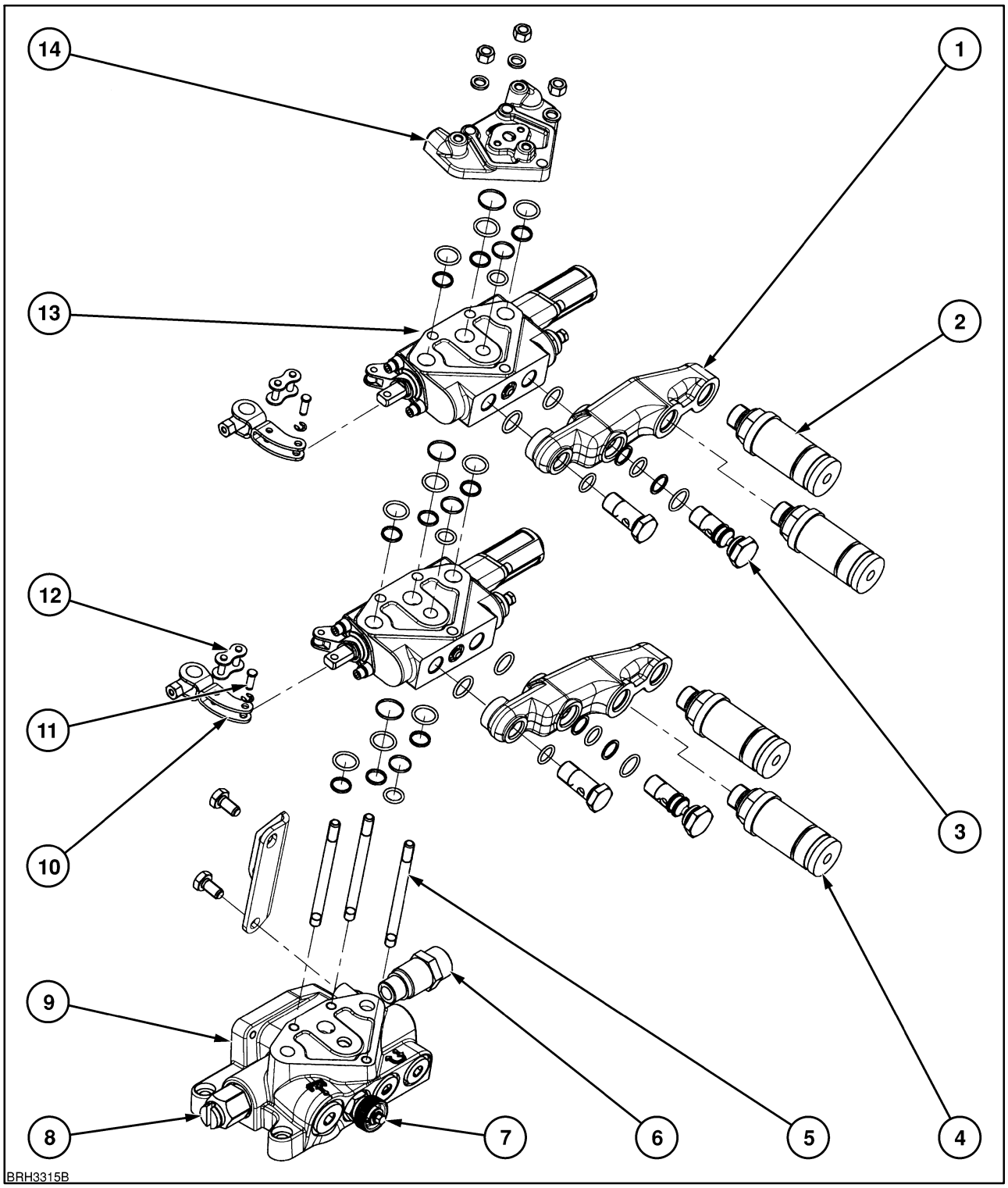


5

Single/double-acting auxiliary control valve with automatic detent release - cross-sectional view

1. Single/double-acting switching valve.
2. Valve retaining plug
3. Seal.
4. Seal.
5. Seal.
6. Check valve seat.
7. Non-return valve.
8. Seal.
9. Seal.
10. Control support.
11. Control valve stem.
12. Tapered needle
13. Spring.
14. Seal.
15. Detent balls.
16. Seal.
17. Seal.
18. Internal plunger.
19. Spring.
20. Cover.
21. Detent release pressure adjuster screw.
22. Control valve stem return spring.
23. Cup.
24. Seal.
25. Detent notch body.
26. Detent ball support.



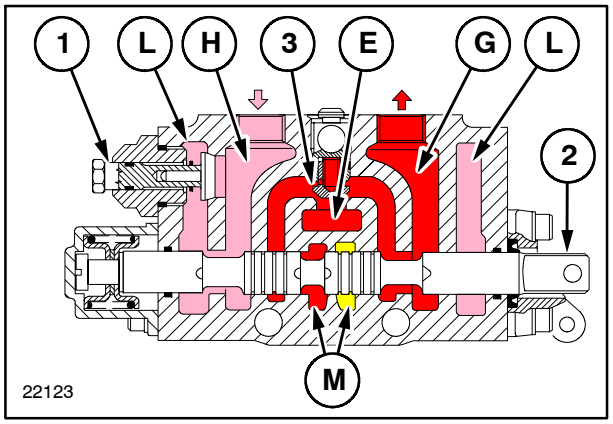
6

Mechanical Remote Valve Assembly Components

1. Remote Valve Coupler Manifold
2. Remote Valve Coupler (Feed)
3. Banjo bolt
4. Remote Valve Coupler (Return)
5. Tie-Rod (3)
6. Main pressure feed connector
7. Power Beyond Tap
8. Relief Valve (190-195 Bar)
9. Inlet Plate
10. Lever Assembly
11. Pin
12. Link
13. Valve Slice
14. End Plate

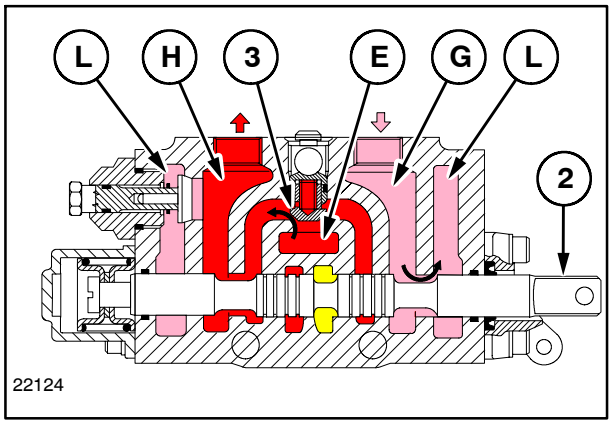
OPERATING STAGES OF AUXILIARY CONTROL VALVE FOR THE OPERATION OF A DOUBLE-ACTING CYLINDER (Figs. 7 and 8) AND A SINGLE-ACTING CYLINDER (Figs. 9 and 10)

1. LIFTING - On pulling back the control lever (located in the cab) the control valve stem (2, fig. 7) shifts to connect the cylinder bottom chamber with the delivery line (E) by way of the check valve (3) and line (G) and also the cylinder top chamber with the exhaust line (L) by way of line (H), intercepting the supply of oil to the lift control valve. Keep the lever pulled back, to extend the cylinder to its full stroke; on releasing the lever it will automatically return to the neutral position under the action of the return spring, and the entire flow from the pump will be conveyed to the lift control valve by way of lines (M).



7

2. LOWERING - To lower the implement, push the control lever (located in the cab). The control valve stem (2) will shift to the position indicated in fig. 8 thus allowing the oil in the lower cylinder chamber to flow to the exhaust (L) through the line (G), while the upper chamber is connected to the delivery line (E) through line (H) and check valve (3).



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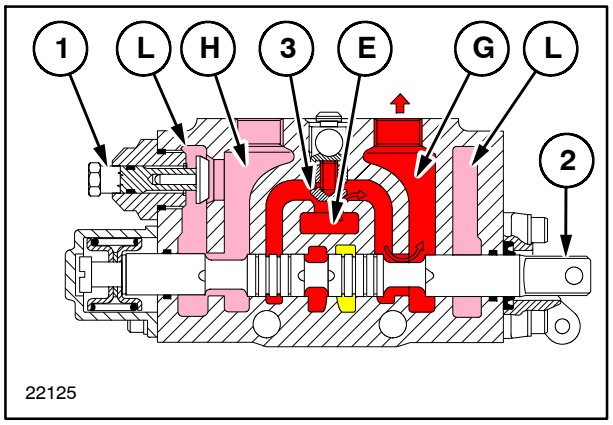
3. LIFTING - On pulling back the control lever (located in the cab) the control valve stem (2, fig. 9) shifts to connect the cylinder with the delivery line (E) by way of the check valve (3) and line (G). Line (H), for the control of double-acting cylinders, is not used at this stage as it is permanently connected to the exhaust (L) by the open position of the switching valve (1).

Pressurised oil

Oil in suction, delivery or exhaust

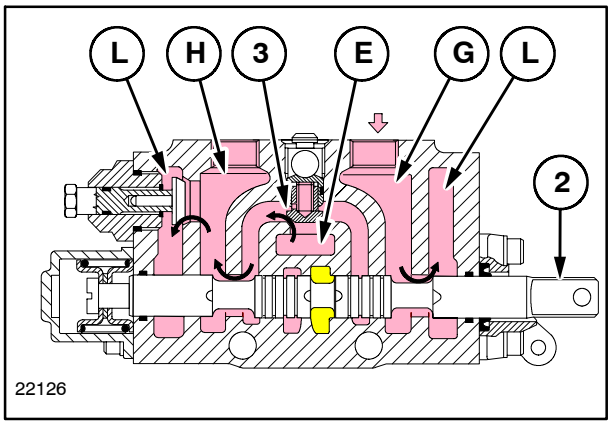
Static oil



9

4. LOWERING -On pushing back the control lever (located in the cab) the stem (2) will shift to the position indicated in fig. 10. The oil contained in the cylinder, pressurised by the weight of the lifted implement, will flow to the exhaust (L) by way of line (G), while the entire flow from the pump is also conveyed to the exhaust (L) through the check valve (3) and line (H).

NOTE: *To govern a double-acting cylinder you need to fully screw in the screw (1); to govern a single-acting cylinder you need to unscrew it.*



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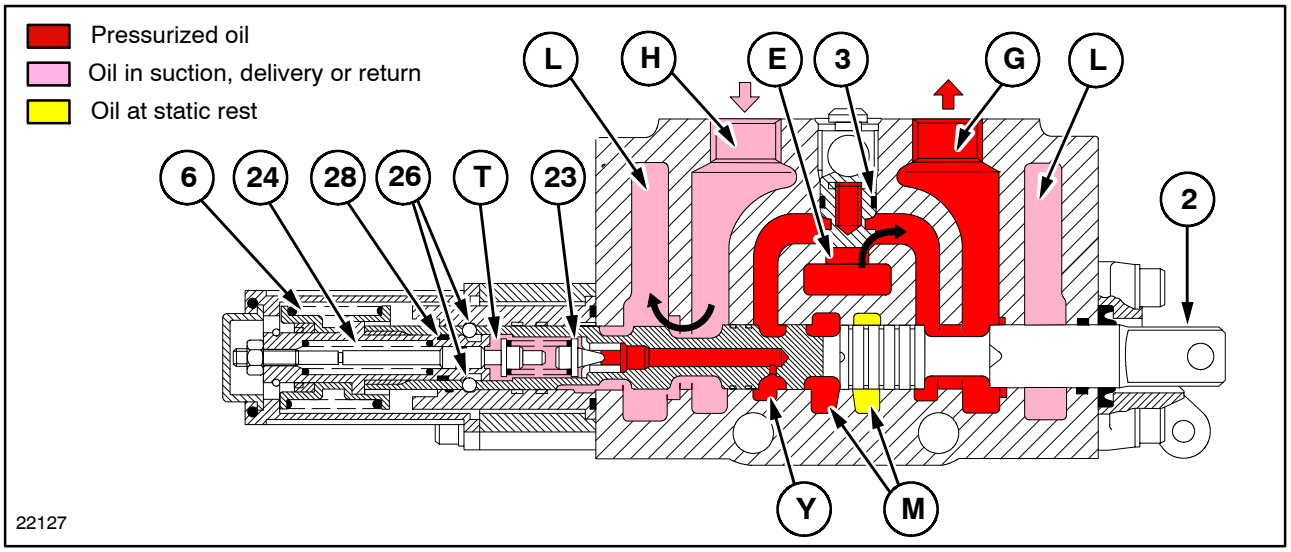
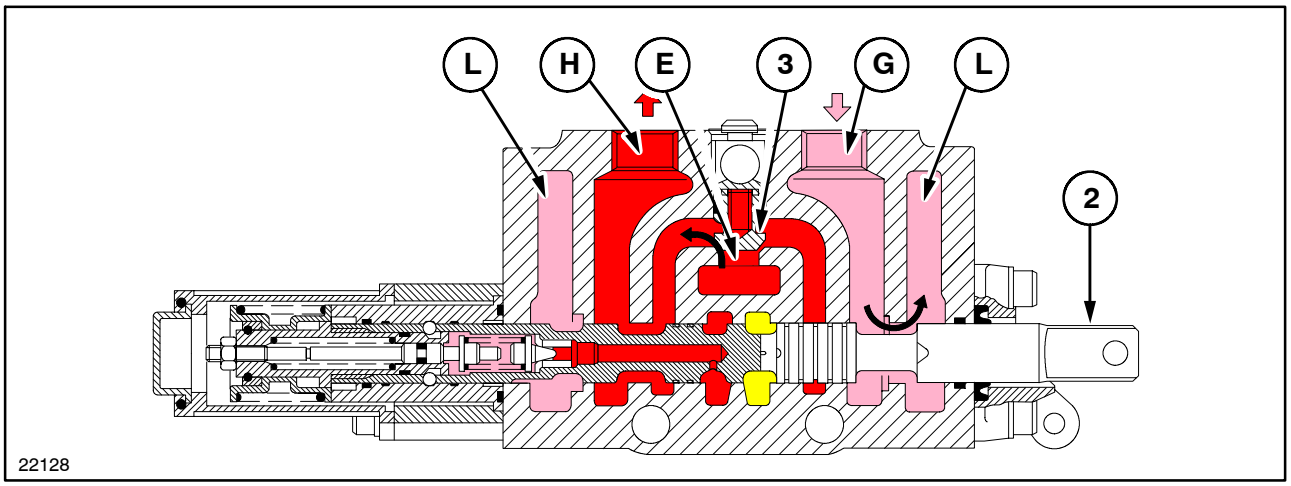
OPERATING STAGES OF AUXILIARY CONTROL VALVE FOR THE OPERATION OF A SINGLE/ DOUBLE-ACTING CYLINDER WITH AUTOMATIC DETENT RELEASE AND FLOAT POSITION



11

Lifting

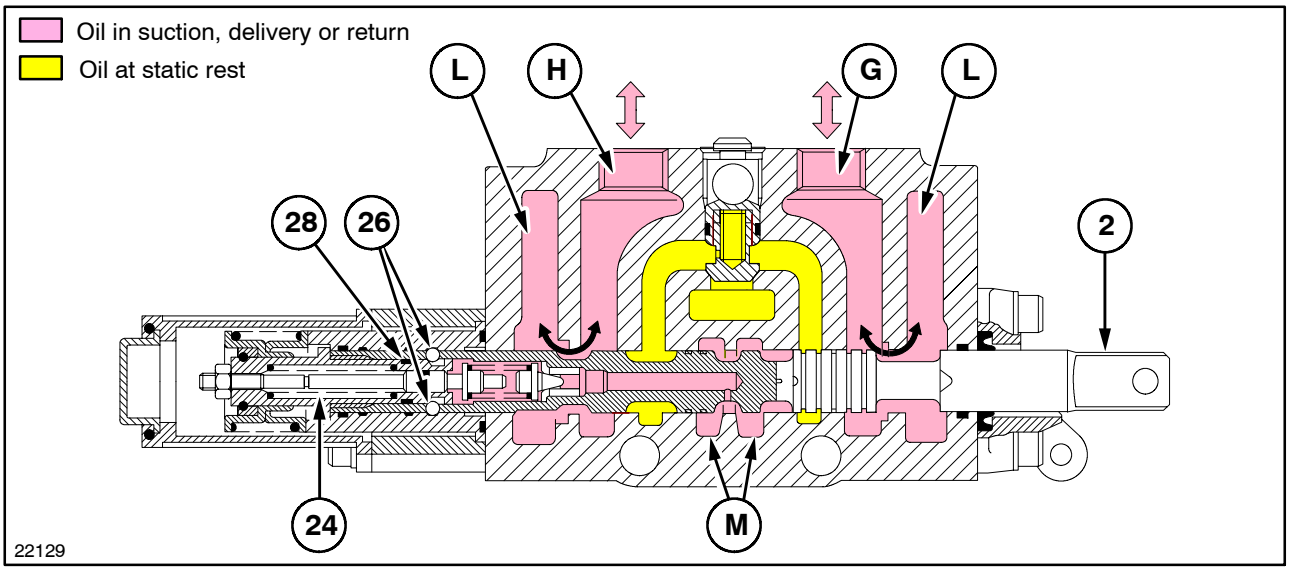
On pulling back the control lever (located in the cab), the control valve stem (2) shifts and the detent balls (26) engage the left hand groove, where they are held in place by the support (28) and spring (24). The movement of the stem (2) connects: delivery line (E) with the lower chamber of the cylinder, by way of the check valve (3) and the line (G), and also the upper cylinder chamber with the exhaust line (L) by way of line (H), intercepting the supply of oil to the hydraulic lift control valve. On completion of the lifting movement, the oil pressure increases to 2465.77 to 2538.29 psi (170 to 175 bar), acting through the port (Y), it overcomes the resistance of the spring of the tapered cap (23). Inside chamber (T) the oil pressure increases and, acting on the support (28), it overcomes the resistance of the spring, thus moving the support (28). In this condition the two detent balls (26) drop onto the support (28), releasing the stem (2) which, under the action of the spring (6), returns to the neutral position, and consequently the entire flow from the pump is conveyed to the lift control valve through lines (M).



12

Lowering

To lower the implement, push forward the control lever (in the cab). The control valve stem (2) shifts and the detent balls (26) engage in the central groove where they are held in position by the support (28) and the spring (24). In this condition the oil contained in the lower chamber of the cylinder can flow to the exhaust (L) by way of line (G), while the upper chamber is connected with the delivery (E) by way of line (H) and check valve (3). On completion of the lowering operation, the detent will be automatically released in the manner described previously.



13

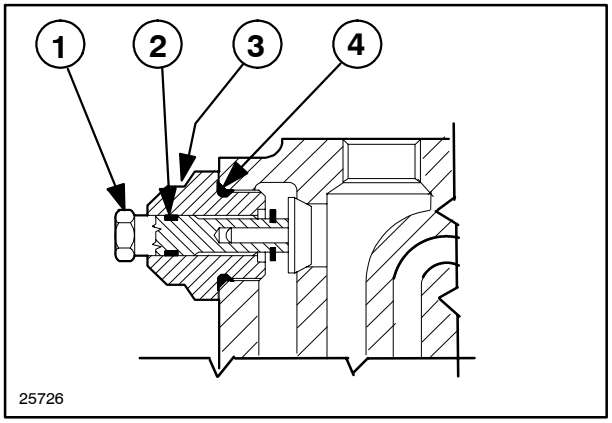
Float Operation

For float operation push forward the control lever (in the cab). The control valve stem (2) shifts and the balls (26) enter the right-hand groove, held in place by the support and spring (24). In this position the stem (2) connects: the two lines (M) providing the lift control valve with the entire pump flow and the two exhaust lines (L), by way of lines (H, G) respectively with the upper and lower chambers of the cylinder. In this condition the only force exerted on the implement will be that created by its own weight, thus allowing the implement to follow the profile of the terrain and permitting the hydraulic lift to be used. With float operation the automatic detent release function is excluded, as there will be insufficient pressure in the auxiliary control valve.

Single/double-acting switching valve (of control valve fig. 10 - 11 - 12)

1. Single/double-acting switching valve.
2. Seal.
3. Valve retaining plug.
4. Seal.

NOTE: *To govern a double-acting cylinder you need to fully screw in the screw (1); to govern a single-acting cylinder you need to unscrew it.*



14

OVERHAUL

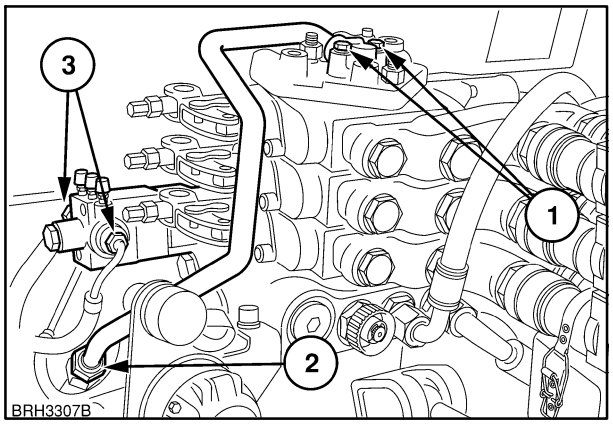
MECHANICAL REMOTE CONTROL VALVE

Removal

NOTE: *Individual remote control valve assemblies can be removed from the tractor without the need to remove the complete valve stack*

NOTE: *Prior to disassembly the valve should be thoroughly cleaned using an approved de-greasing agent.*

1. Lower the hydraulic link arms and thoroughly clean the remote control valve stack.
2. Remove the mechanical lift valve feed pipe by loosening pipe nut (2) and removing the two retaining bolts on top of the manifold (1).
3. Remove trailer brake valve brake connections (3)



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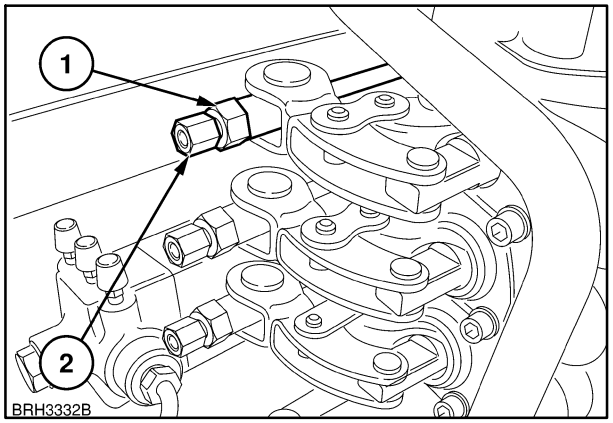
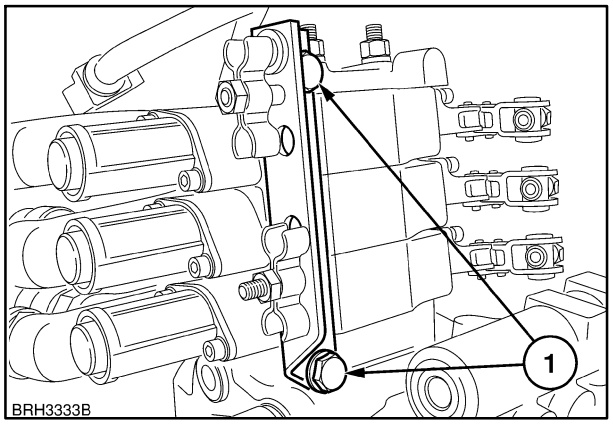
NOTE: *Ensure the remote control valve lever is in the neutral position to aid the removal.*

4. Remove the remote control valve cable lock nuts (2).
5. Release the remote control valve cable from the adjusting nut (1).



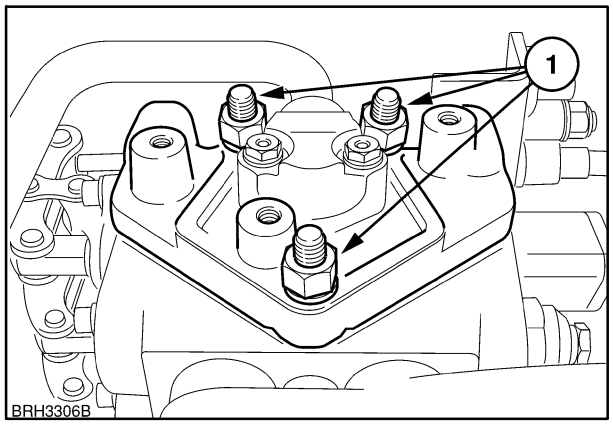
16

6. Remove the 2 cable stop bracket bolts (1) and remove the bracket.



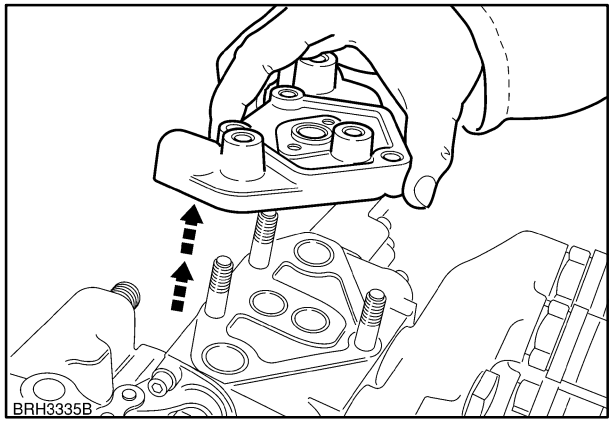
17

7. Remove the 3 retaining bolts (1) from the top of the valve stack



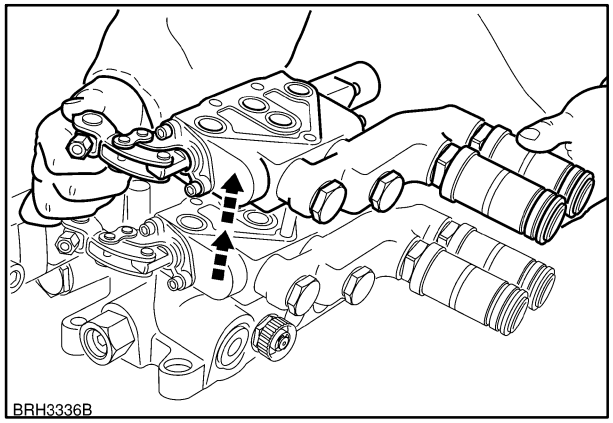
18

8. Remove the end plate from the valve slices



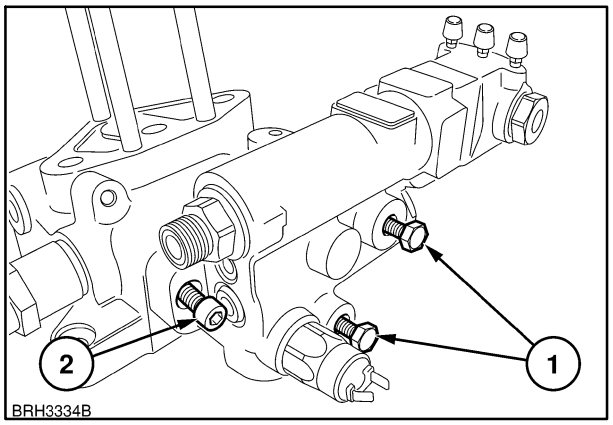
19

9. Remove the remote control valve slices from the inlet manifold.



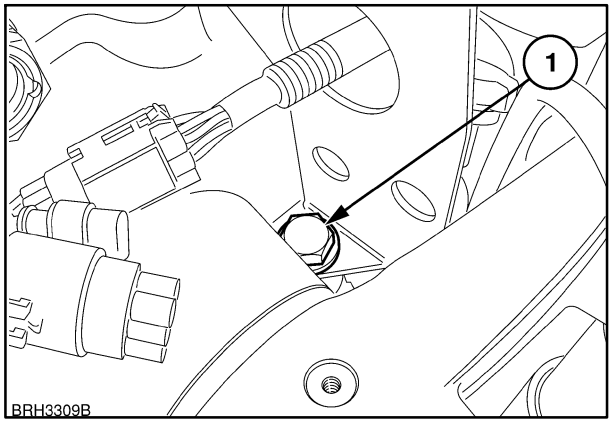
20

10. Remove the trailer brake valve retaining bolts (1) and the allen headed retaining screw (2).



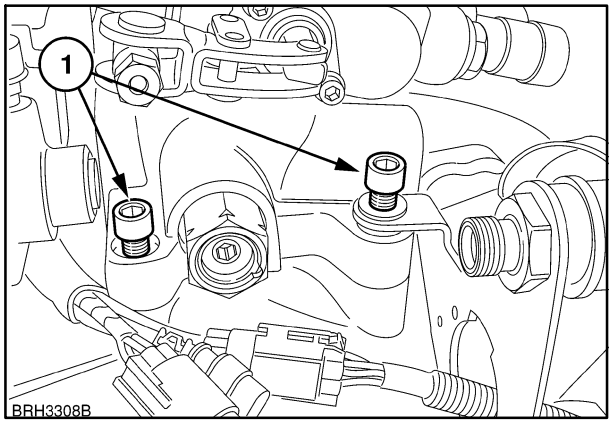
21

11. To remove the remote control valve block inlet plate assembly remove the oil supply pipe
12. Undo the lower bolt (1) which retains the hydraulic trailer brake pipe bracket.



22

13. Remove the remote control valve block retaining bolts x 3



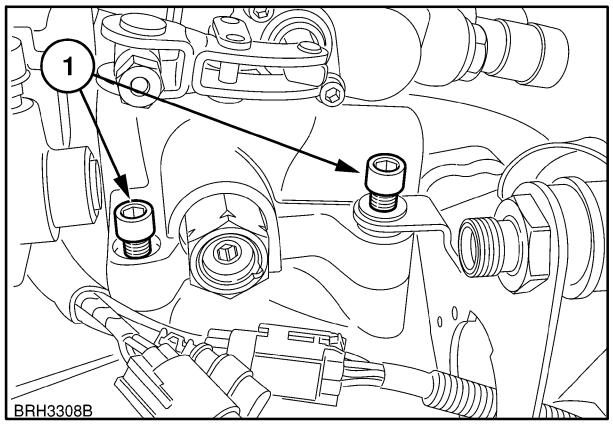
23

Installation

⚠ WARNING ⚠

The valve stack is very heavy DO NOT attempt to install without the use of lifting equipment.

1. Install remote control valve block inlet plate. Locate trailer brake coupling bracket and install the three retaining bolts(1) and tighten to 43 Nm (32 lb.ft)



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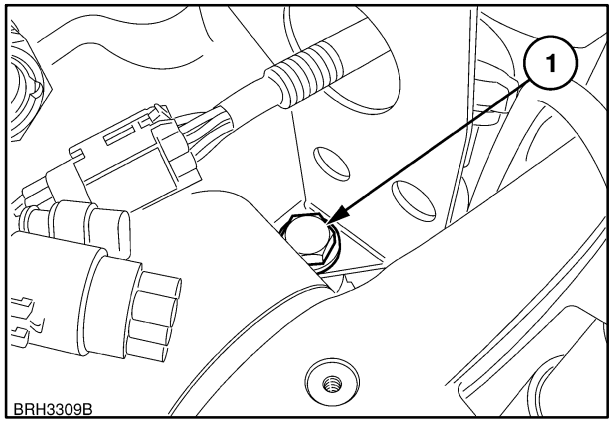
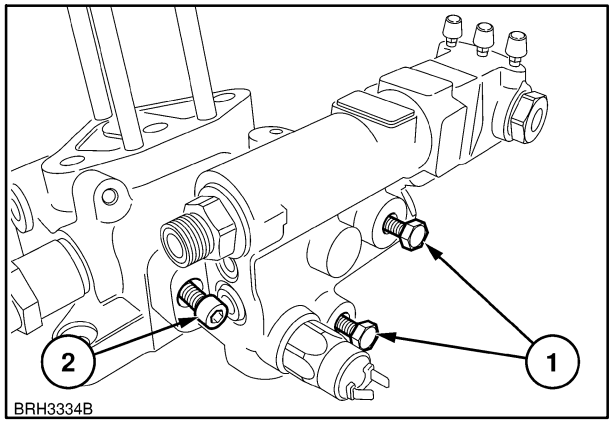
2. Install the lower trailer brake bracket bolt and tighten to 43 Nm (32 lb.ft)



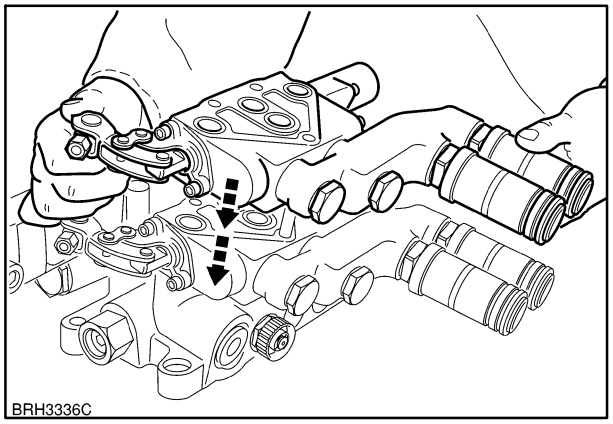
2

3. Install the trailer brake valve and the trailer brake valve retaining bolts. Tighten to 25 Nm (18 lbf.ft).



3

4. Install valve slices onto the tie rods.



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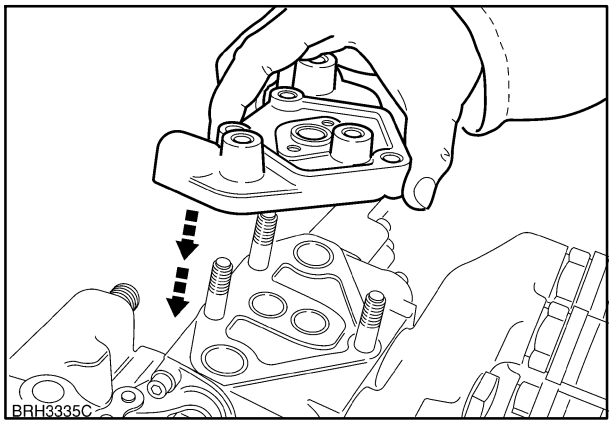
5. Install the end plate over the tie rods.



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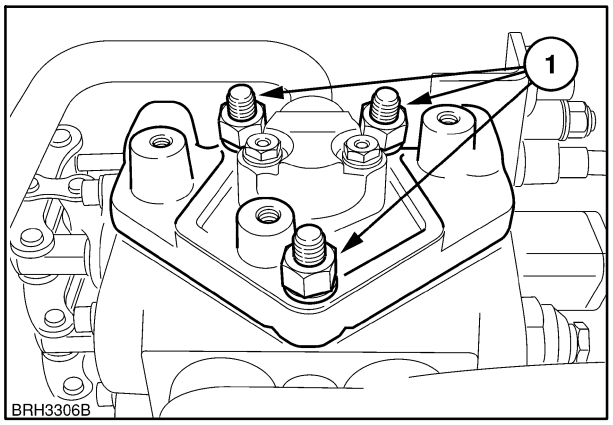
6. Install the remote valve stack retaining nuts.
7. Tighten nuts to 20.4 Nm



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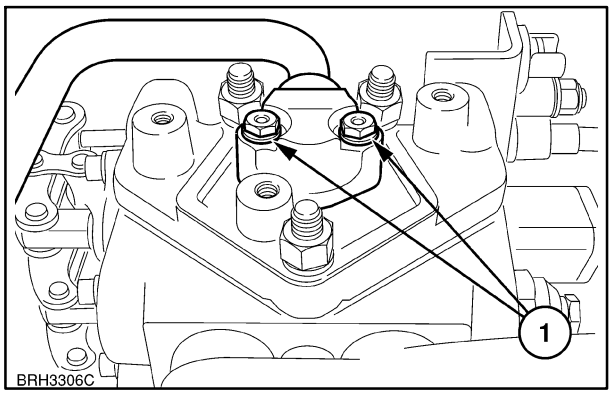
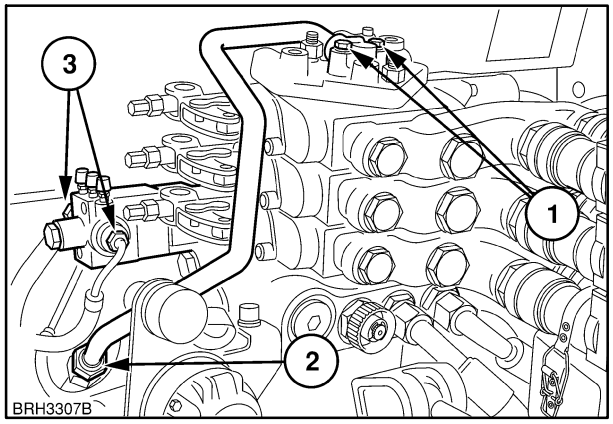
8. Install mechanical hydraulic lift valve feed pipe.
9. Tighten bolts (1) to 10 Nm (7.3 lb.ft)



7

10. Install mechanical hydraulic lift valve feed pipe to connector (2).
11. Refit trailer brake valve pipes (3).



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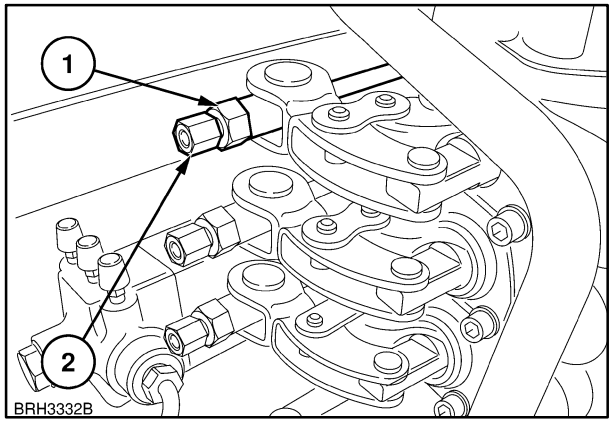
12. Install the remote control valve cable into the adjustment nut (1). Repeat this step for the remaining remote control valve cable(s). (refer to remote control valve cable adjustment in this chapter).



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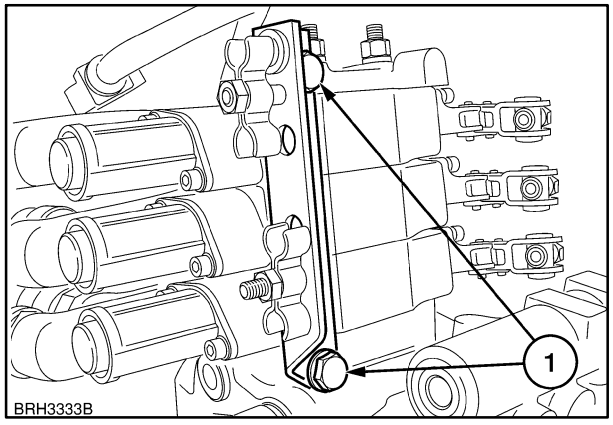
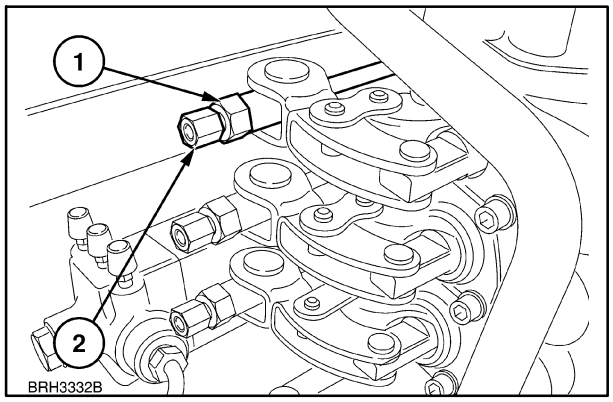
13. Install the remote control valve cable retaining clamp.



10

14. Install the remote control valve cable lock nuts (2).

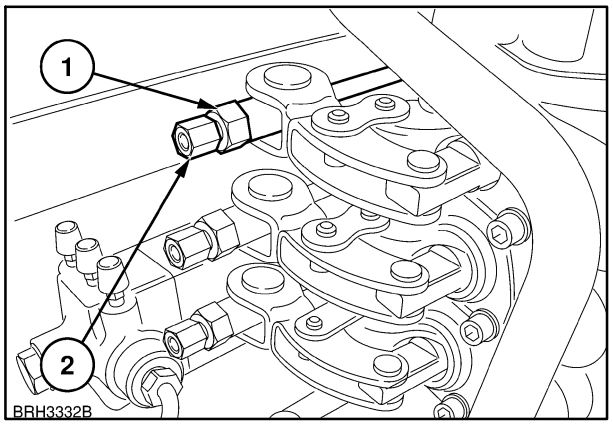


11

Cable Adjustment

NOTE: *Ensure the remote control valve is in neutral before proceeding.*

1. Remove the remote control valve cable lock nut (2).
2. Adjust the remote control valve cable adjustment nut (1).
3. Adjustment is correct when all the positions are available (eg. extend, neutral, retract, and float).
4. Repeat steps 1–3 for the remaining remote control valve cable(s).
5. Install the remote control valve cable lock nuts (2).



1

Op. 35 204 46

AUXILIARY CONTROL VALVES

Disassembly

⚠ WARNING ⚠

Handle all parts carefully.

Do not put your hands or fingers between parts.

Wear suitable safety clothing - safety goggles, gloves and shoes.

⚠ WARNING ⚠

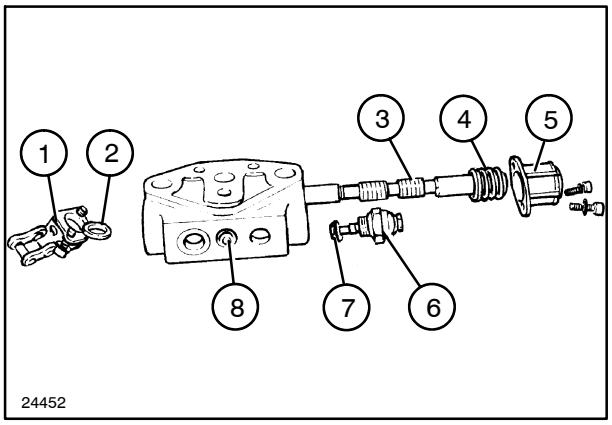
Always use appropriate tools to align fixing holes.

NEVER USE FINGERS OR HANDS.

Convertible single/double acting auxiliary control valve.

Disassemble the auxiliary control valve into its component parts, referring to fig. 2 and the following instructions:

1. Remove the cover (5), recover the spring (4) and the relative cup.
2. Extract the control valve stem (3).
3. Remove the control lever support (1) and recover the seal (2).
4. Remove the plug (6) and recover the single/double action switching valve (7).
5. Remove the valve housing (8) and recover the check valve and relative spring.
6. Check the condition of the seals before assembly.

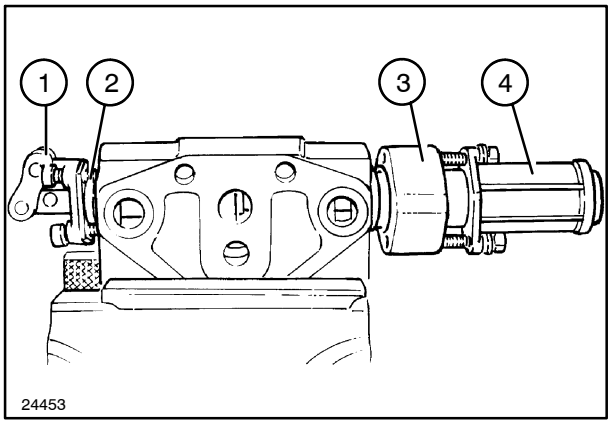


2

Single/double-acting auxiliary control valve with float control and automatic detent release.

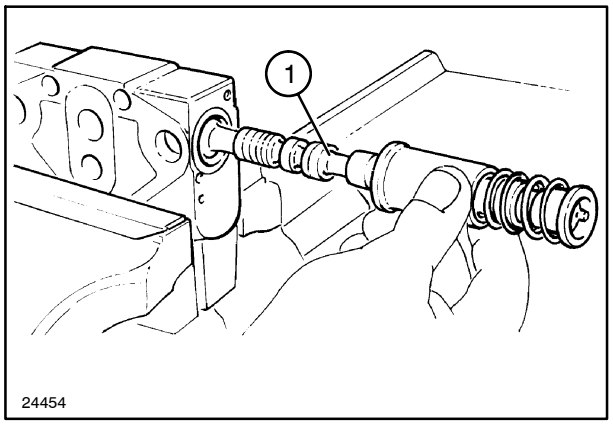
Disassemble the auxiliary control valve into its component parts, referring to fig. 3 and the following instructions:

1. Take out the retaining bolts, remove the cover (4) and the spacer (3).
2. Take out the retaining bolts and remove the control lever support (1) and its seal (2).



3

3. Extract the control valve stem (1).
4. Remove the valve housing and recover the check valve and spring.
5. Check the condition of the seals before assembly.

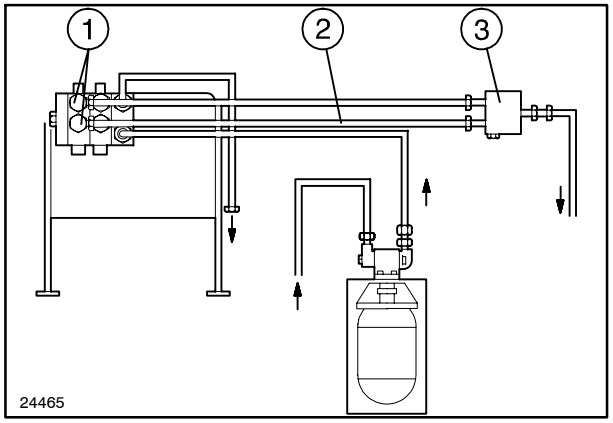


4

Diagram showing the installation of the tools and equipment required for the stem sticking test for control valves configured for double-acting operation (fig. 5) and control valves configured for single-acting operation (fig. 6).

Control valve stem sticking test (figs. 5 and 6).

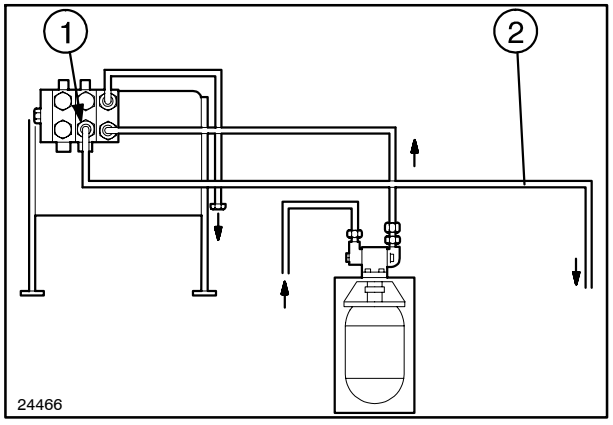
NOTE: *With a test appliance filled with oil type ISO VG 68, DIN 51524/51525, the following tests must be performed at a temperature of approximately 140 °F (60 °C) and a flow rate of 12.5 litres/min., which can be obtained by having the motor turn at the highest speed (1450 rpm).*



5

Install the auxiliary control valve assembly and the test equipment as indicated in the diagrams (figs. 5 and 6) and consider that:

- on control valves configured for double-acting operation (fig. 5), the two cylinder delivery ports must be connected to the ball connector (3) by way of the pipes (2) and unions (1);
- on control valves configured for single-acting operation (fig. 6), the return line (2) must be connected, by way of the union (1), to the delivery port on the control valve (port located opposite to the switching valve).

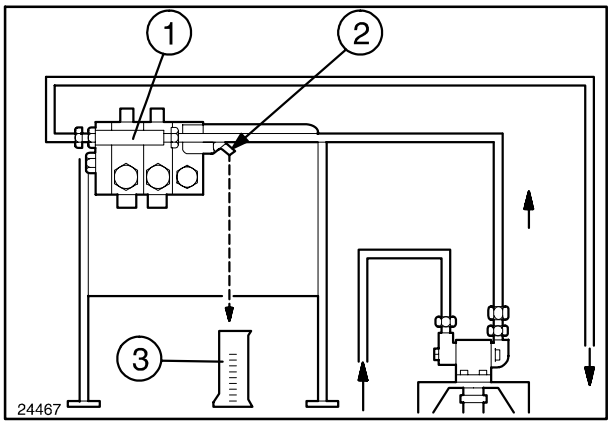


6

After having made the connections as indicated in the diagram, carry out the test as follows:

- start the hydraulic pump and operate the hand lever to move the control valve stem (in both directions for double-acting control valves);
- gradually increase the pressure by turning the handwheel on the test equipment, checking on the pressure gauge that the pressure reaches 2494.78 psi (172 bar). In this condition the control valve stem should slide normally and return to the neutral position the moment the hand lever is released;
- repeat the test on the other control valves after making the appropriate connections.

Diagram showing the installation of the tools and equipment required for the control valve stem leakage test



7

Control Valve Leakage Test

Install the auxiliary control valve stack and the test equipment as indicated in the diagram (fig. 7) bearing in mind that the 3-way union (1) must be connected to single and double acting control valves using suitable adapters.

After having made the connections indicated in the diagram, carry out the test as follows:

- start the hydraulic pump and gradually increase the pressure by turning the handwheel on the test equipment until a pressure of 2132.16 psi (147 bar) is shown on the pressure gauge;

- collect the leaked oil flowing from the union (2), in the burette provided (3) for a period of exactly one minute. Check that the quantity of oil collected does not exceed 25 cm^3/minute in the case of a new control valve, or 60 cm^3/minute for a used control valve.

Repeat the test on each control valve, checking alternately the two delivery lines to the user cylinder.

ADJUSTMENT OF THE AUTOMATIC DETENT RELEASE PRESSURE

Connect the control valve to the test equipment.

Start the hydraulic pump and tighten the release pressure adjuster screw (21, fig. 5) until a pressure of 2465.77 to 2538.29 psi (170 to 175 bar) is obtained in front of the tapered cap (17).

Lock the screw (21) in position by tightening the locknut.

NOTES

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 16 - TS-A Standard Mid Mount Remote Valves

CONTENT

Section	Description	Page
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	Third Valve Slice (Where Fitted)	17
	Removal	19
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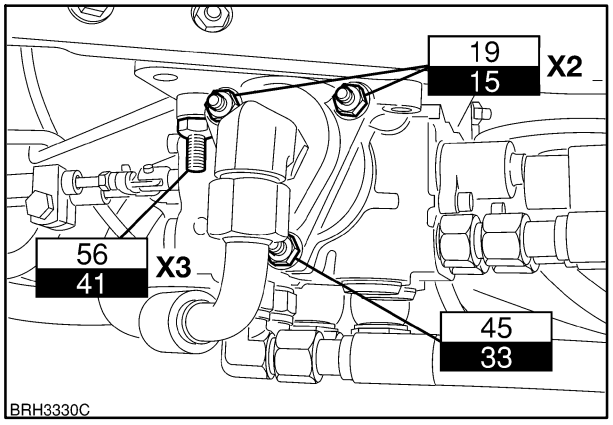
	Assembly	20
	Installation	20

SPECIFICATIONS

Type	Parallel–Open Centre Circuit
Maximum Flow through one valve at rated engine speed: – Fixed Displacement Pump	63 Litres/Min (16.64 U.S. Gals/Min)
Maximum Flow through Third Mid mount Valve:	37.7 Litres/Min (10 U.S. Gals/Min)
Valve to Coupler Hoses	1/2” Bore with 13/16” ORFS fittings both ends

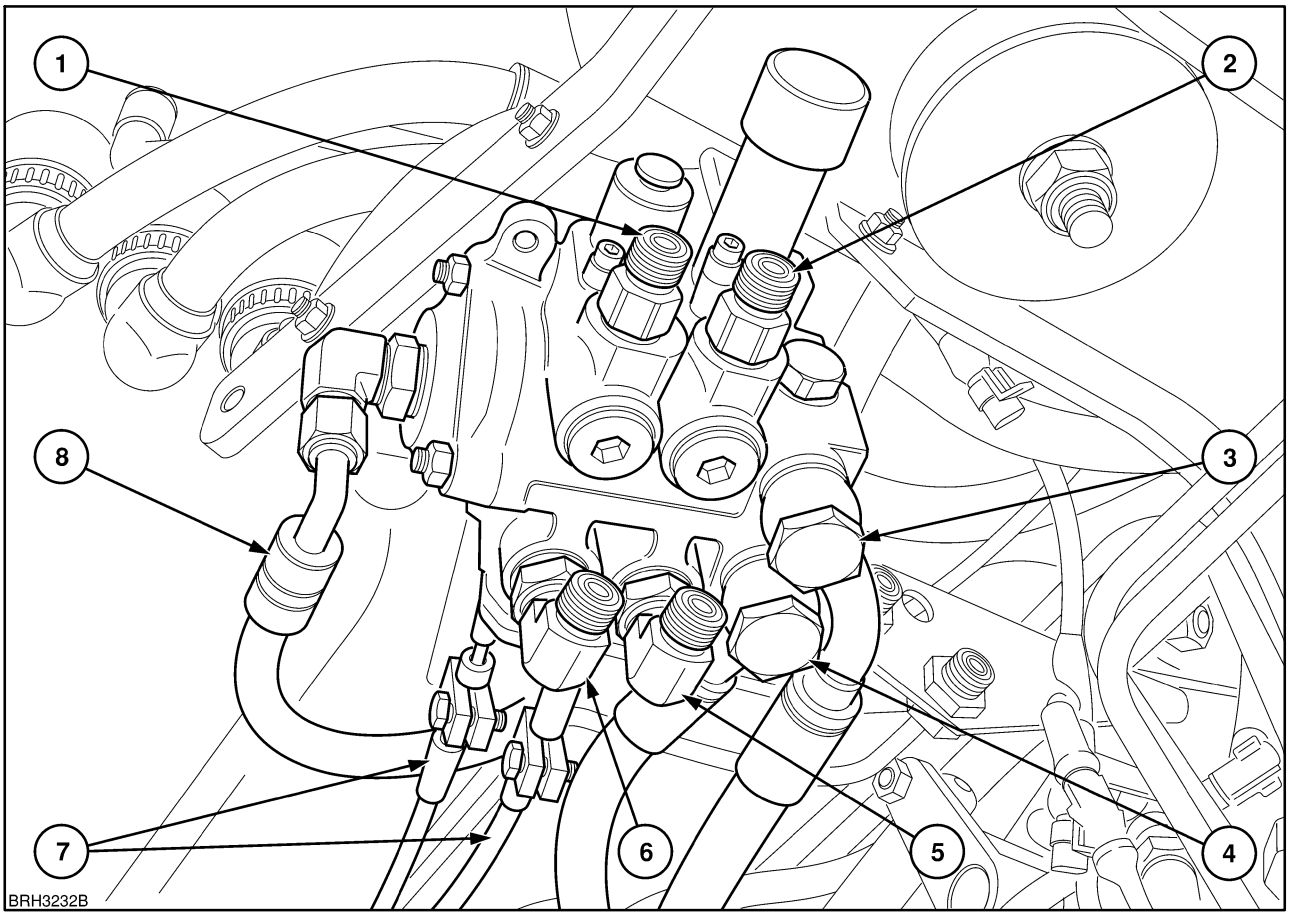
TIGHTENING TORQUES

NOTE: *Ensure correct alignment of end sections relative to spool sections. Apply pressure to the end sections and tighten all nuts to 13 Nm (10 lb.ft). Final torque the two 1/2” nuts to 19Nm (15 lb.ft) and the single 9/16” nut to 33 Nm (45 ib.ft).*



1

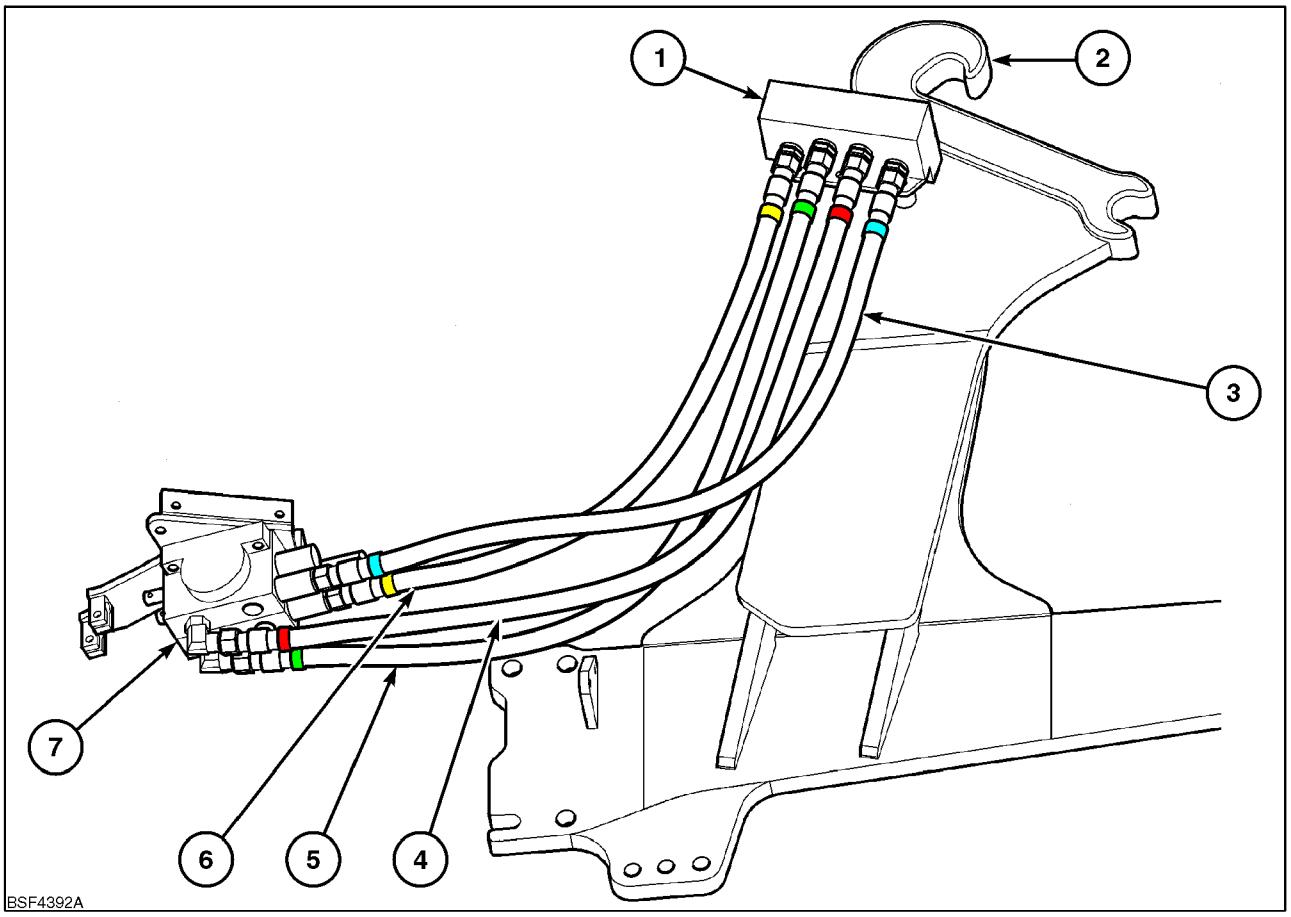
DESCRIPTION AND OPERATION



2

Mid Mount Valve Pipe Layout

1. Tip hose connector
2. Lower Hose Connector
3. Return to Filter housing
4. inlet from power beyond port
5. Raise hose connector
6. Crowd Hose connector
7. Valve operating cables
8. Return to power beyond port



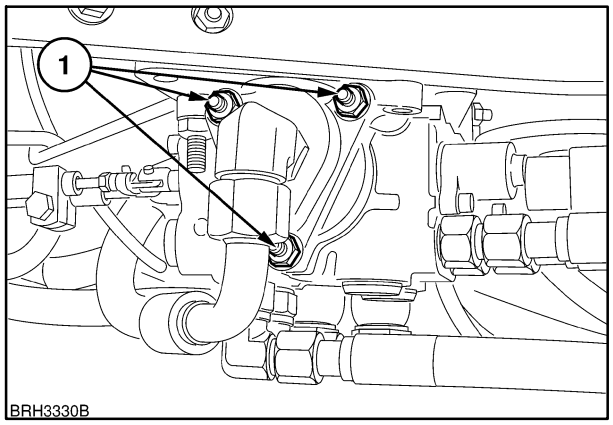
3

Mid Mount Valve Loader Components

1. Multi-Quick Coupler
2. Loader Support
3. Tip Hose - Blue
4. Crowd Hose - Red
5. Raise Hose - Green
6. Lower Hose - Yellow
7. Mid Mount Valve Assembly

Tractors equipped with the Mid Mount Valve option are fitted with a seat mounted joystick, a mid mount valve assembly, plumbing and loader mounting brackets ready for attaching the loader arms.

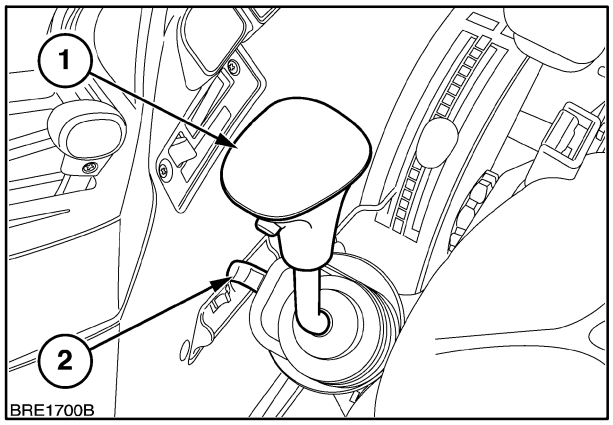
The Mid Mount Valve is located underneath the cab on the right hand side. The base version has a two spool valve for raising and lowering the boom and tipping and curling the bucket when used with a loader.



1

The valves are operated by means of a joystick control (1) mounted on the right hand side of the seat.

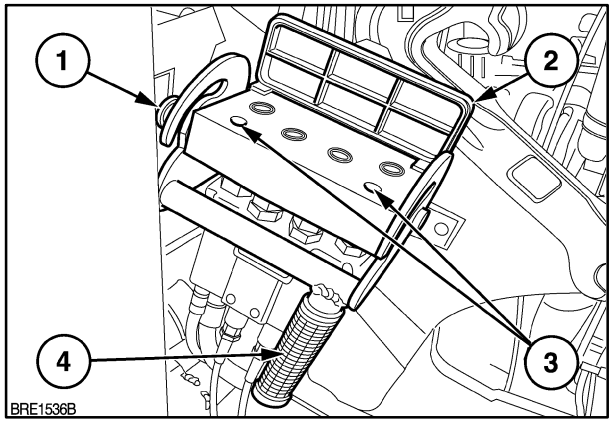
The three position push/pull lever (2) is used to fully lock the joystick in neutral to avoid accidental operation. In the middle position side travel of the joystick is locked.



2

European loader ready options come complete with a “Multi-Quick” coupler. This allows the couplers to be connected and disconnected at once with the minimum of leakage.

1. Lock Button
2. Protective Cover
3. Alignment Holes
4. Clamp Handle



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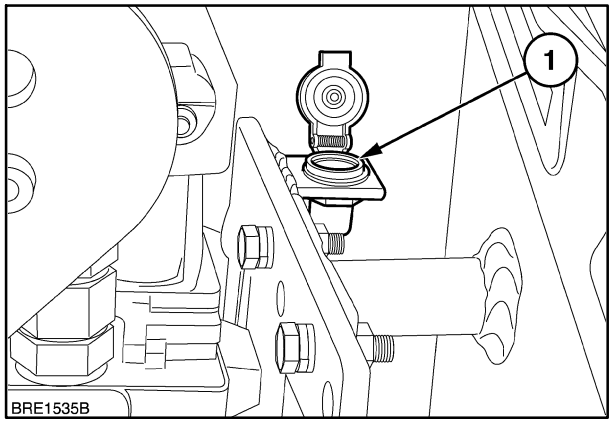
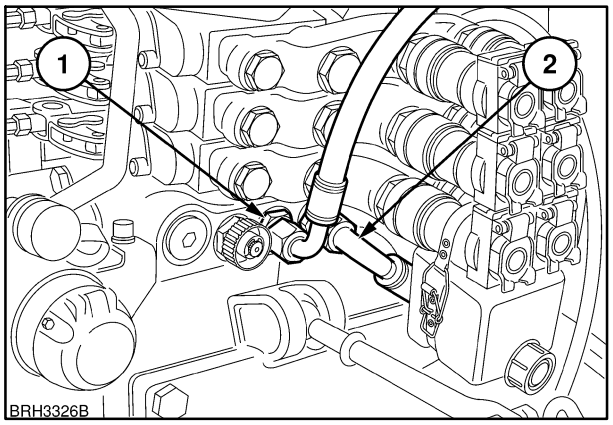
A third hydraulic service (where fitted) is electrically controlled via a cable that connects to a socket (1) on the loader subframe. This is operated by depressing a switch located on the joystick handle.



4

The mid mount valves are fed high pressure oil via a hose (2) from the power beyond port of the sub plate located at the bottom of the remote valve stack. The return supply is fed back into the sub plate via a hose into another power beyond port (1) . Both ports are M22 x 1.5 (ISO 6149).



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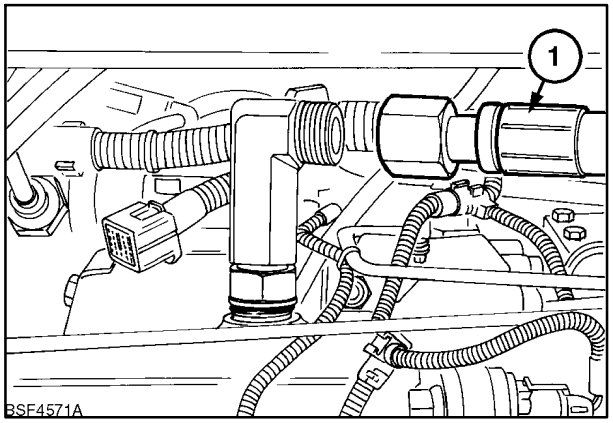
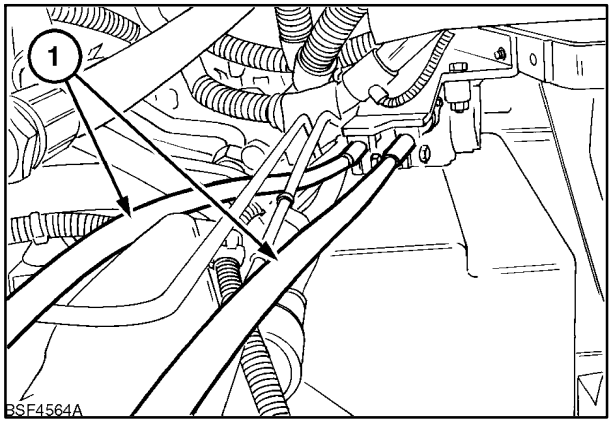
Oil from the mid mount valves is returned from the outlet port via a hose (1) and an elbow to the hydraulic pump filter housing manifold.



6

The spools are cable (1) operated by the joystick situated in the cab.



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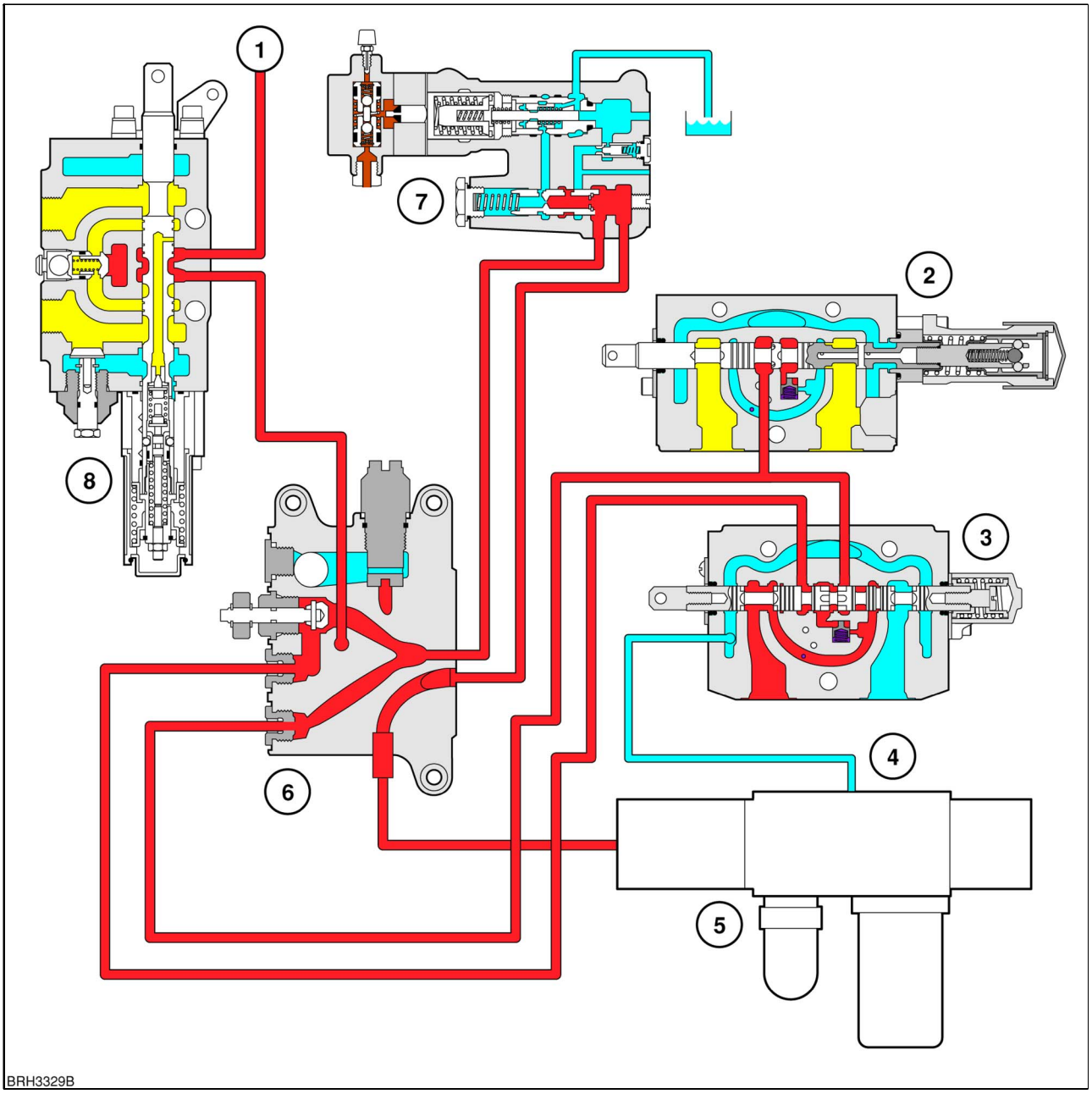


8

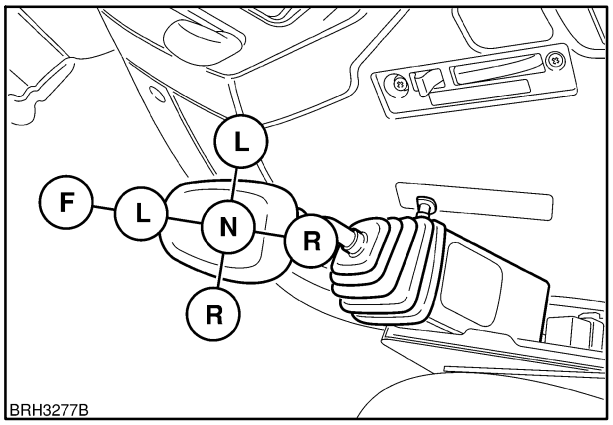
MID MOUNT VALVE HYDRAULIC CIRCUIT

1. High Pressure flow to Mechanical Hydraulic Lift Valve
2. Mid Mount Remote Valve (Boom slice)
3. Mid Mount Remote Valve (Bucket slice)
4. Return to Tank connector
5. Fixed displacement Pump
6. Inlet Plate with relief valve and power beyond tap
7. Trailer Brake Valve
8. Rear remote valve

The main hydraulic pump (5) sends high pressure oil to the subplate (6) located at the base of the remote valve stack. The high pressure oil is then taken from the power beyond port of the sub plate to the inlet port of the mid mount valve inlet slice and through the central work port or bridge of the boom slice (2) or bucket slice (3) . The return oil is directed through the exhaust gallery of the valves, out of the outlet slice, and is returned to the hydraulic system through the return line via an elbow connected to the suction manifold of the main pump filter housing (4).

CONTROL VALVE IN NEUTRAL (FIG. 10)

When the control valve is in neutral, output from the power beyond block can flow uninterrupted through the staggered open centre gallery(6), and the lands on the spool (7) prevent flow to the ports (1) and (3).



9

CONTROL VALVE OPERATING (FIG. 11)

When the control lever is operated the spool (7) is moved to either the extend or retract position.

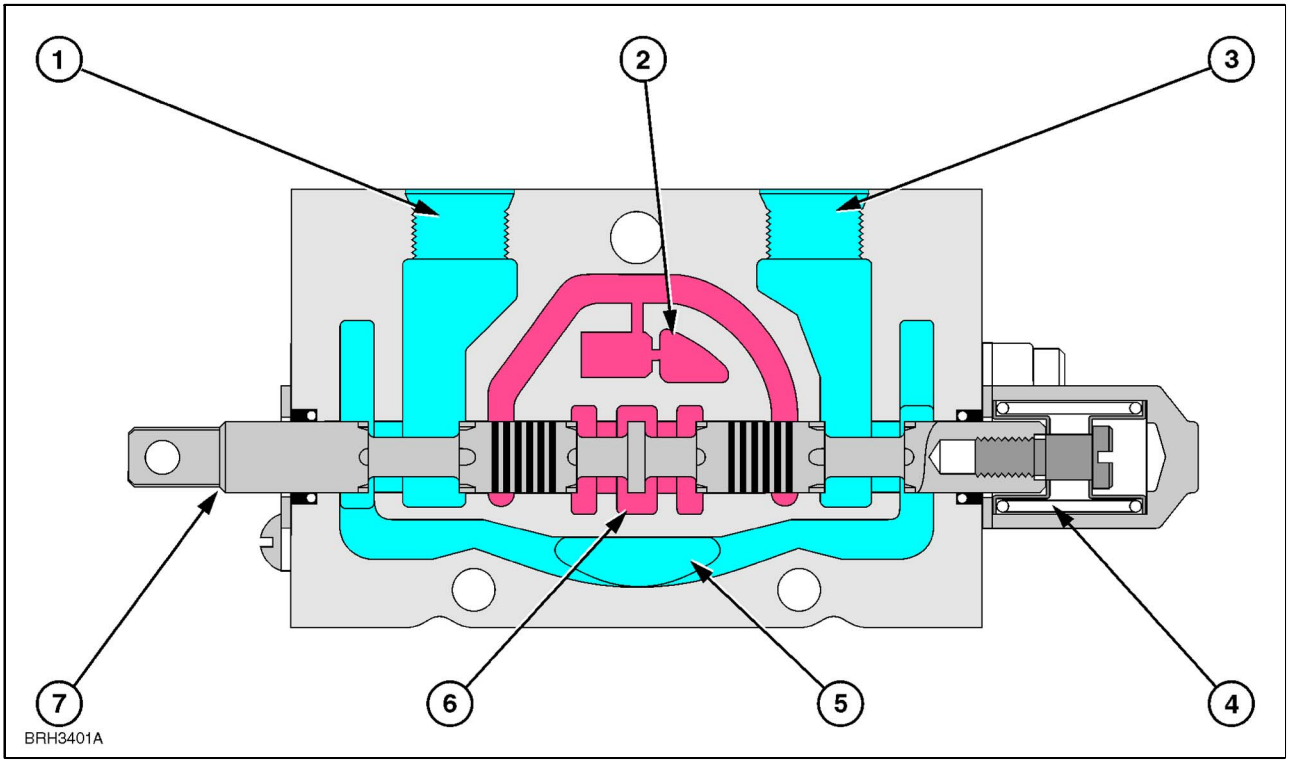
Oil flow through the staggered open centre gallery (6) is blocked and system pressure rises in the parallel gallery (2).

Pressure oil flows past the spool through the cylinder port (3) .

Return oil from the opposite end of the cylinder also flows back to reservoir across the spool and through the exhaust gallery (5).

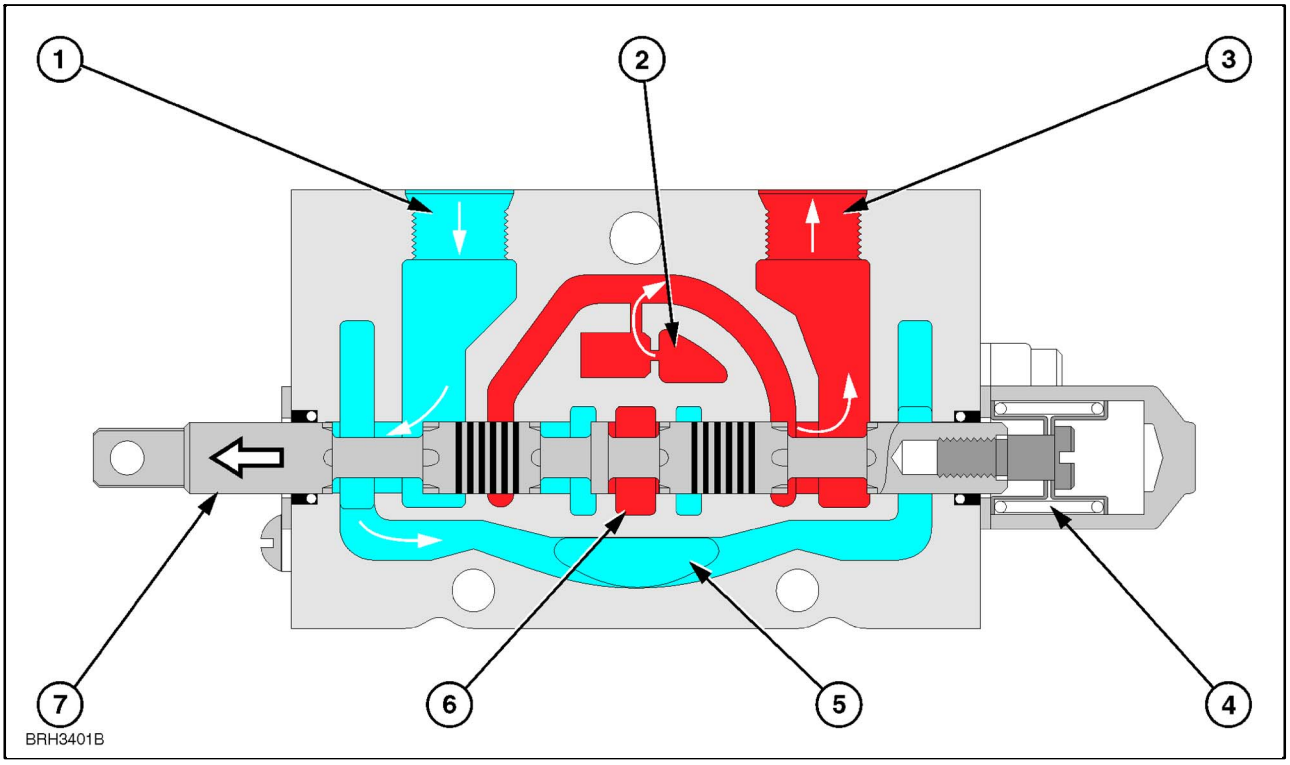
Bucket Control Valve Section

1. Work Port
2. Parallel Gallery
3. Work Port
4. Centering Spring
5. Exhaust Gallery
6. Staggered Open Centre Gallery
7. Spool



10

Bucket Control Valve Section - Neutral Position



11

Bucket Control Valve Section - Operating Position

Pump Pressure Oil

Return to Reservoir Oil

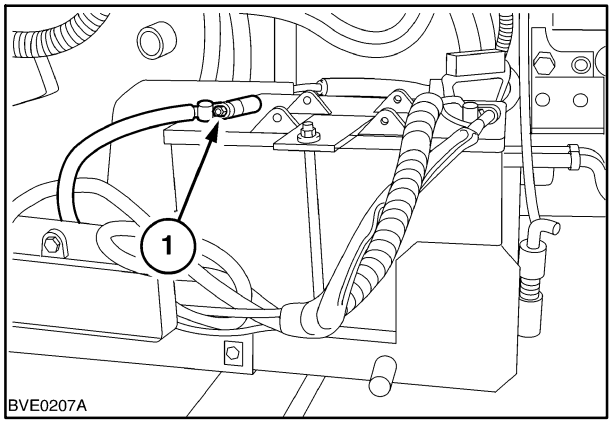
OVERHAUL

MID MOUNT VALVE

Removal

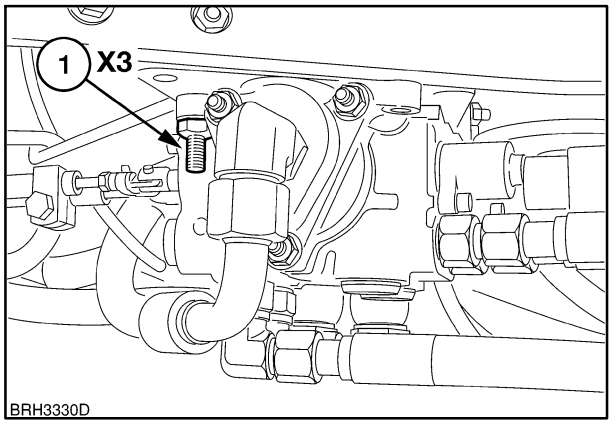
1. Raise the steps and lock in an upright position using the pin. Swing out the battery tray. Remove the cover. Disconnect the battery negative cable
2. Disconnect the supply and return pipes from the valve assembly.

NOTE: *Drain oil from pipes into a suitable rece;ptacle.*



12

3. Disconnect the loader hoses if fitted.
4. Unclip the retaining pins from the joystick control shafts. Loosen the screws which clamp the joystick cables in place.
5. Loosen and remove the three retaining bolts (1) and carefully remove the mid mount valve.

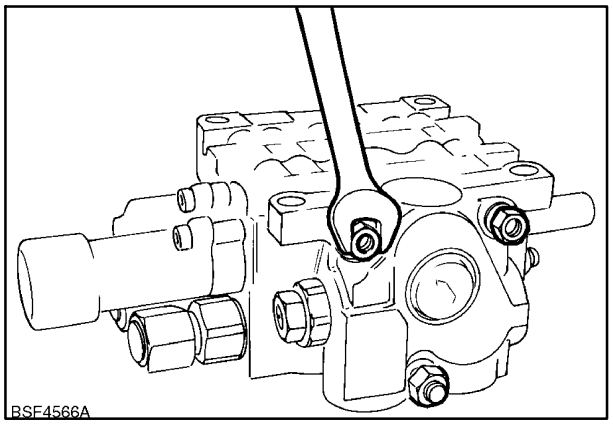


13

Disassembly

NOTE: *Prior to disassembly the valve should be thoroughly cleaned using an approved de-greasing agent.*

1. Remove the three retaining nuts from one end leaving the tie rods in position to aid slice removal and assembly.



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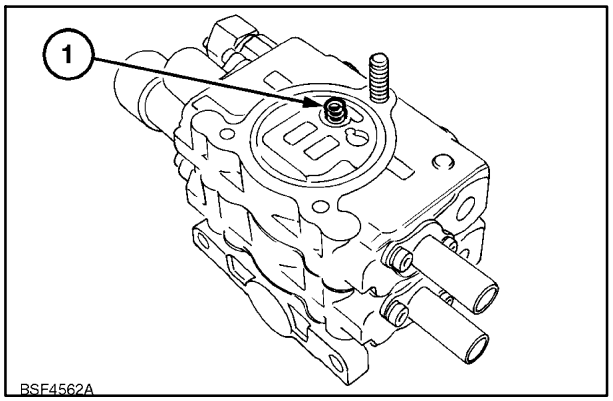
2. Remove the outlet slice being careful not to dislodge the spring (1) located in the valve slice.
3. Carefully separate the remaining slices.



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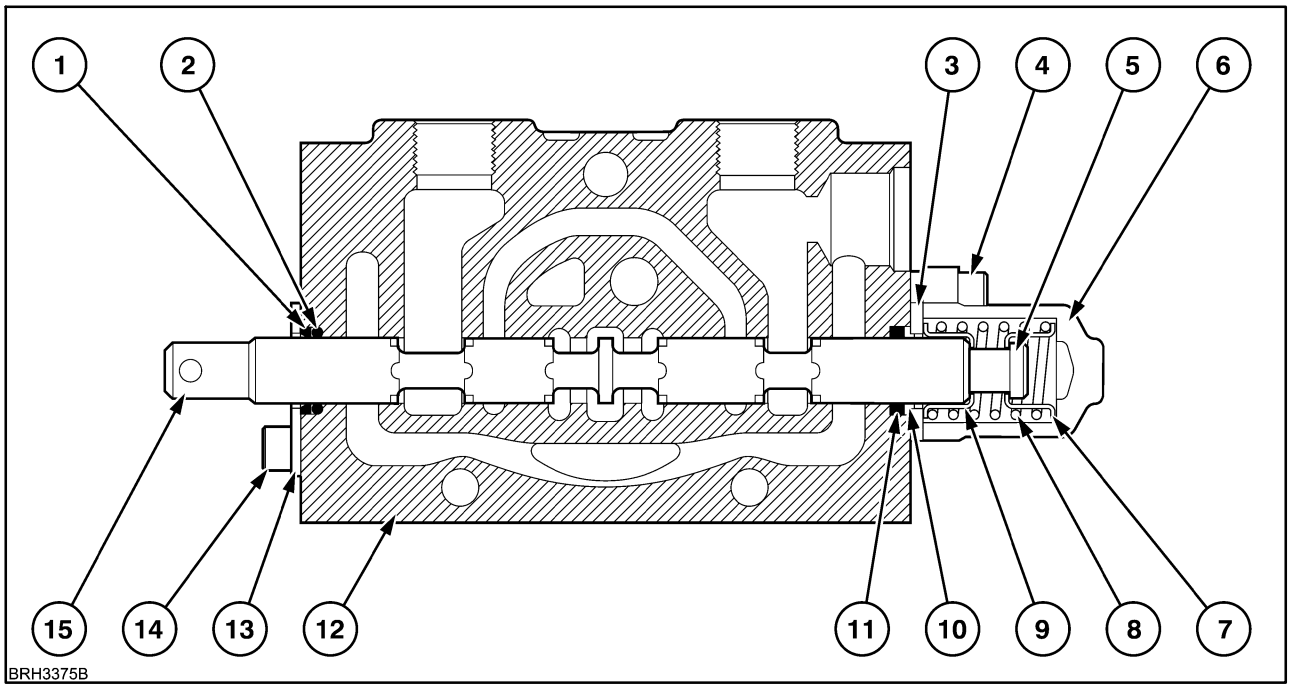
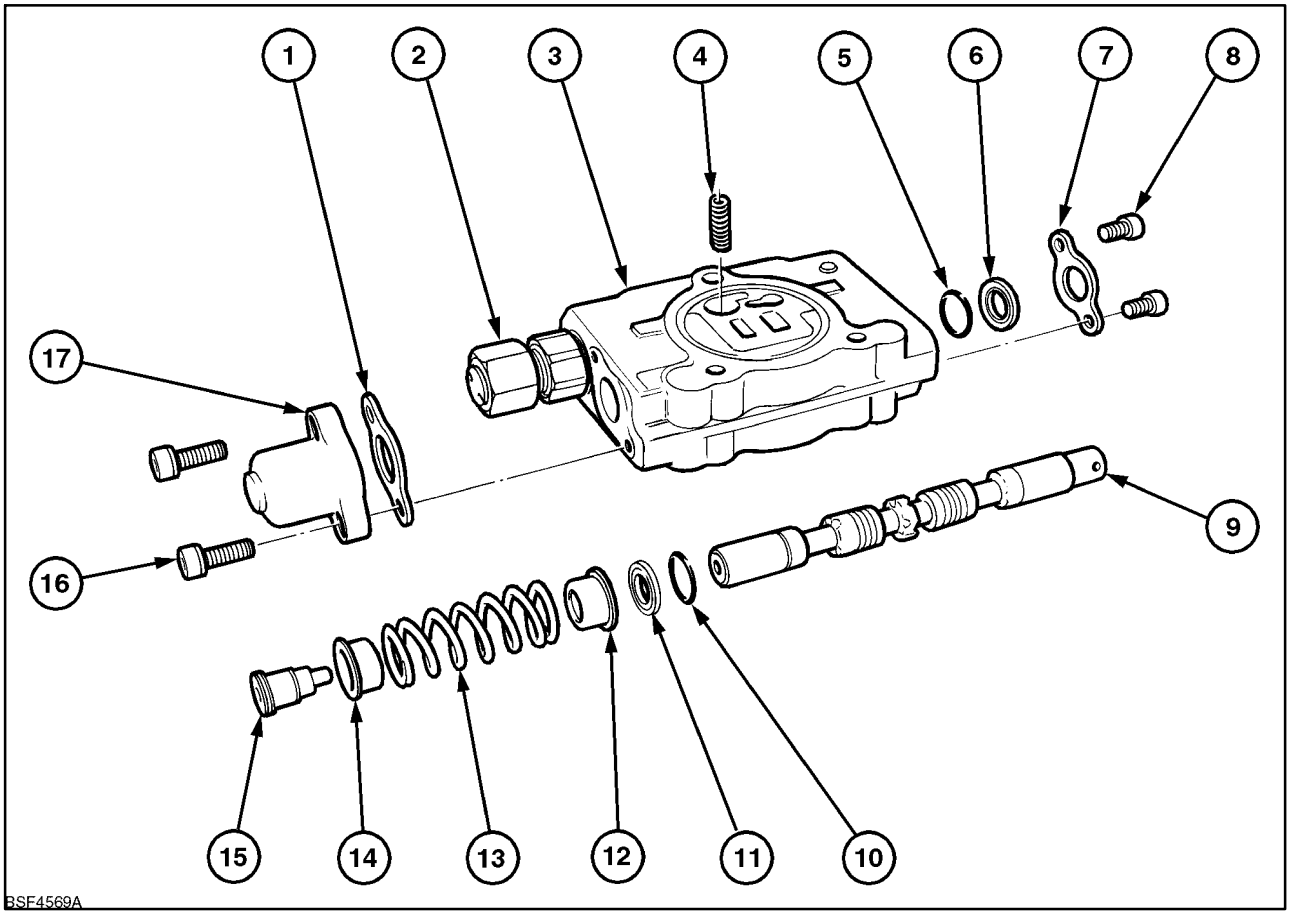


16

Control Valve less Detent (Bucket) Components

1. Wiper Ring
2. 'O' Ring
3. Seal Plate
4. Retaining Screw
5. Spool End
6. Spool Cap
7. Spring Seat
8. Spring
9. Spring Seat
10. Wiper Ring
11. 'O' Ring
12. Spool Housing
13. Seal Plate
14. Retaining Screw
15. Spool

1. Clean the machine thoroughly paying particular attention to the hydraulic valve area.
2. Operate lever to relieve hydraulic pressure in the circuits.
3. Remove the operating linkage from the valve spools to be resealed.
4. Remove the two screws and the seal plate from the spool. (Items 8 and 7 Figure 17).
5. Remove the centring spring housing from the lower end of the valve spool by removing the two screws. (Items 16 and 17 Figure 17).
6. Remove the screw retaining the centring spring to the spool (Item 15 Figure 17). The spool can be prevented from turning by inserting a steel rod in the linkage hole on the upper end.
7. Remove the seal plate from the spool (Item 1 Figure 17) .
8. Remove the lip seal and wiper ring from either end of the spool (Items 5, 6, 10 and 11 Figure 17). It may be helpful to slide the spool to push the seals out. Care should be taken not to damage the spool or valve block during this operation. Be aware that the spool will be unsupported at this point and may slide out of the valve block. Support the spool as necessary.



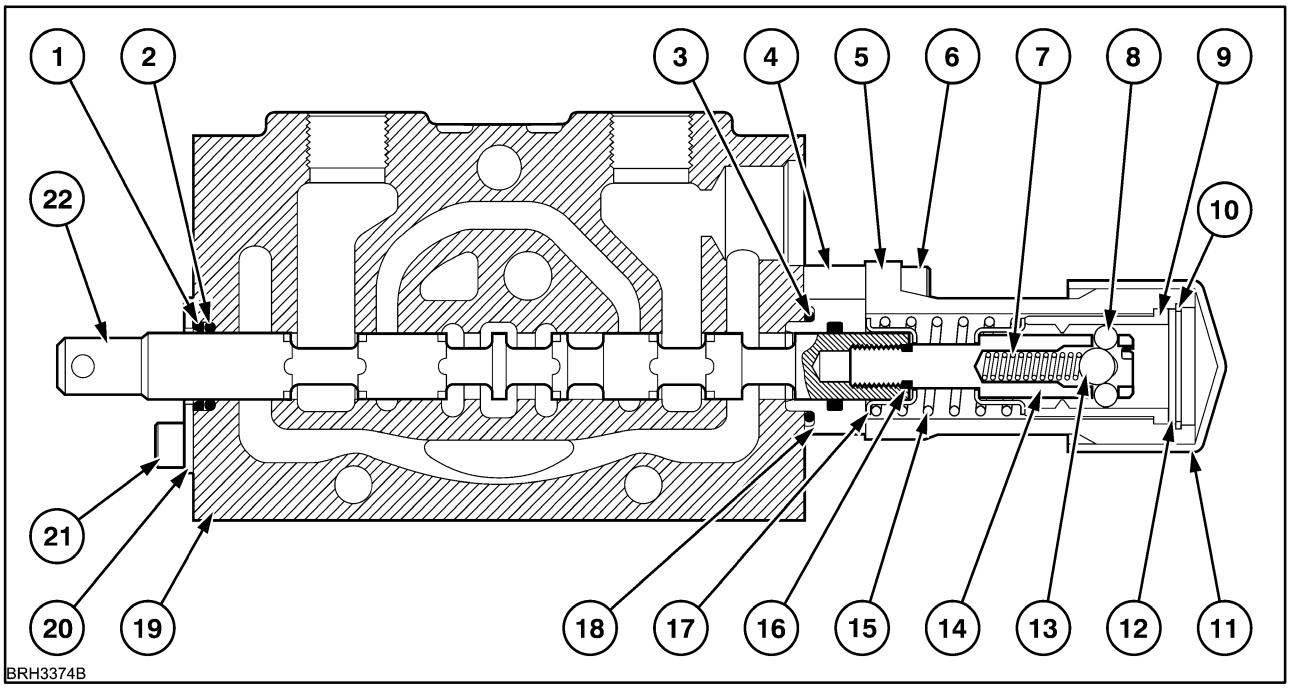
17

Control Valve less Detent (Bucket) Components

1. Seal Plate
2. Fitting
3. Valve Body
4. Spring
5. Lip Seal
6. Wiper Ring
7. Seal Plate
8. Retaining Screw
9. Spool
10. Lip Seal
11. Wiper Ring
12. Centering Spring Seat
13. Centreing Spring
14. Centering Spring Seat
15. Screw
16. Retaining Screw
17. Centreing Spring Cover

Assembly

1. Carefully place the seal over the end of the spool and press the seal into position between the spool and the valve block recess. It may be helpful to lubricate the spool slightly with hydraulic oil to facilitate this operation. The trapped air behind the seal can be released by slightly pushing the spool into the valve block. This will allow the seal to locate correctly in its housing. Do not allow the spool feathering lands or balancing grooves to pass through the seal as damage will occur.
2. Fit a new wiper ring with the lip facing outwards away from the seal.
3. Fit the seal plate onto the valve block using the two screws. Tighten the screws to 10 Nm.
4. Repeat this operation – steps 9 to 12 – for the spring end of the spool.
5. Fit the centring spring with retaining bolt (Item 15 Figure 17) into the end of the spool. Use Loctite 242 on the bolt threads before tightening to 10 Nm.
6. Fit the spring cap and screws through the seal plate and tighten to 10 Nm.
7. Reconnect the linkage to the spool end.
8. Both valve spools are sealed in the same way.



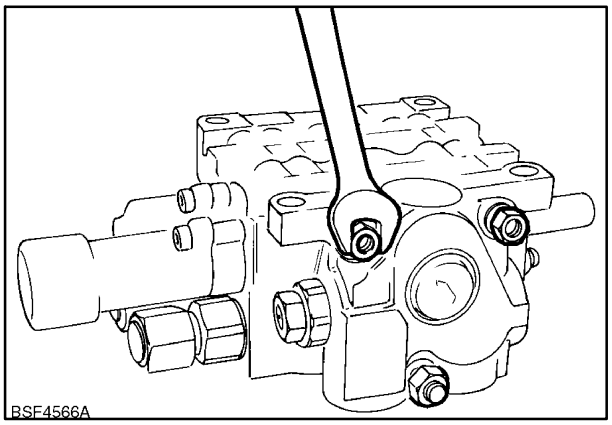
18

Control Valve with Detent (Boom) Components

1. Wiper Seal
2. O-Ring
3. O-Ring
4. Spacer
5. Cap - Spool
6. Spacer Cap Spool
7. Spring
8. Ball (4 Off)
9. Detent Sleeve
10. Retaining Ring
11. Boot
12. Spacer
13. Ball
14. Spool End Detent Pin
15. Spring
16. Spool End
17. Spring Seat
18. Spool Cap Spacer
19. Spool Housing
20. Seal Plate
21. Screw
22. Spool

Installation

1. Assemble tie rod nuts to one end of each tie rod with one or two threads showing.
2. Insert tie rods through the holes of the inlet slice with the larger tie rod at the top. Ensure large 'O' Ring is correctly seated in the inlet slice.
3. Place the first spool section 'O' ring side up on the inlet section. Seat the 'O' ring and insert the check valve nose down into the load check cavity.
4. Repeat procedure for each spool section.
5. When re-assembling the valve slices apply pressure to the end sections and tighten all nuts progressively to 13 Nm (10 lb.ft) .
6. Final torque the two 1/2" retaining nuts to a torque of 19Nm (14 lbf.ft)
7. Tighten the larger tie bar nut to a torque of 45 Nm (33 lbf.ft).
8. Install the valve assembly on to the bracket and torque nuts to 56 Nm (41 lbf.ft).
9. Reconnect inlet, outlet, and return hoses.
10. Reconnect loader hoses (where fitted).



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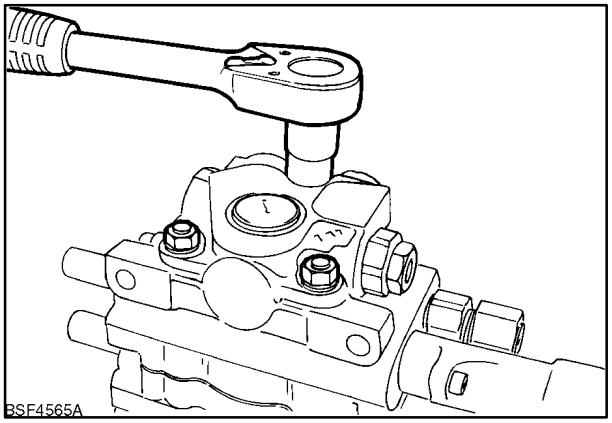

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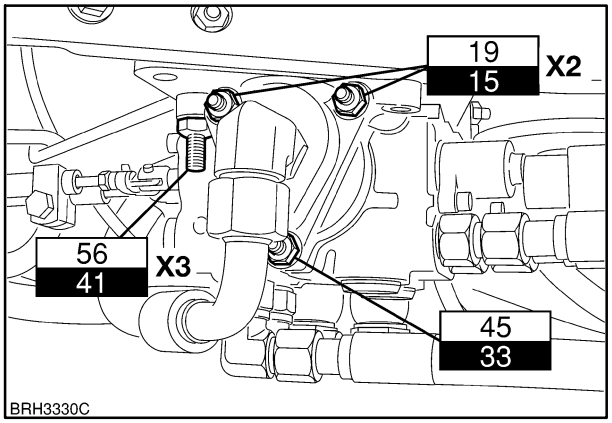

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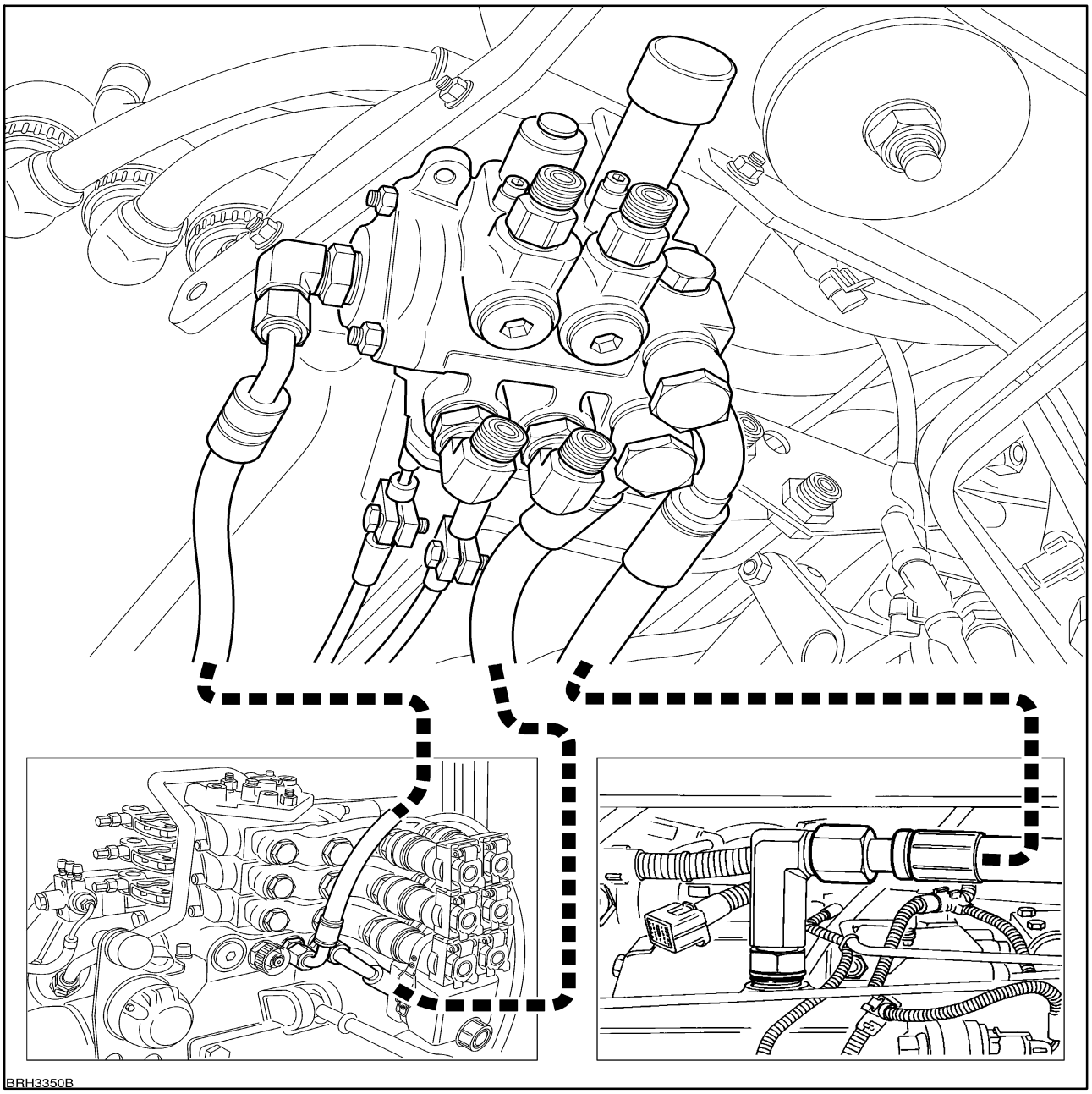
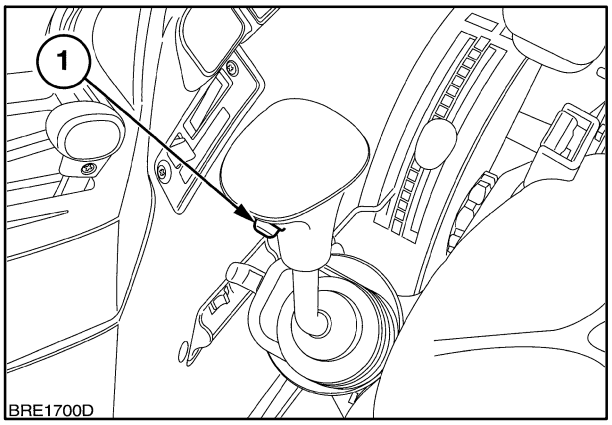


22

Mid Mount Valve Tube Routing

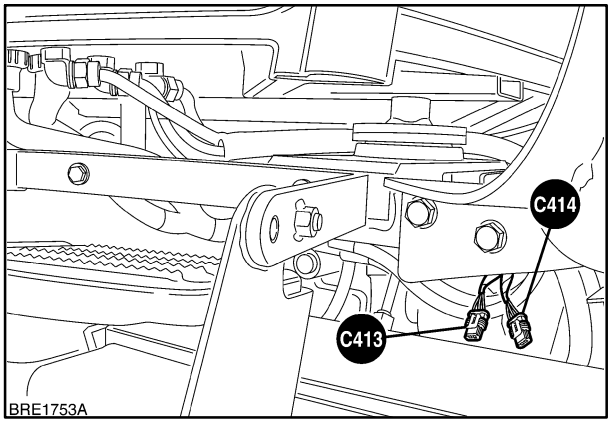
THIRD VALVE SLICE (WHERE FITTED)

The third hydraulic service is activated using a button located on the loader joystick. With the button depressed, oil is diverted from the bucket circuit to a pair of couplers mounted on the loader arm. These can be used to operate a bucket grab or similar piece of equipment.



23

The two solenoids are connected to the main harness via connectors C413 and C414 which are located on the right hand side underneath the step.



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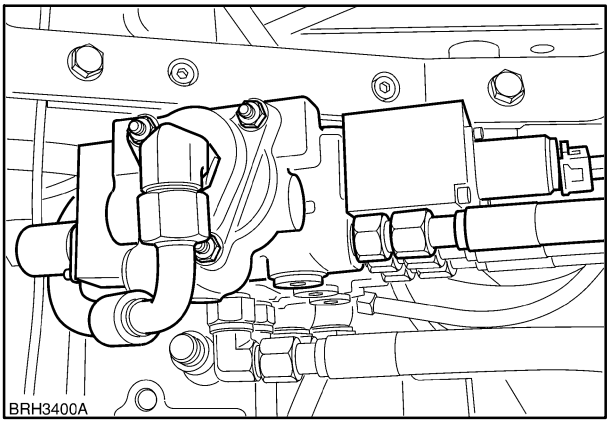
The third valve slice is located under the steps and is connected to the existing mid mount valves with longer tie rods.



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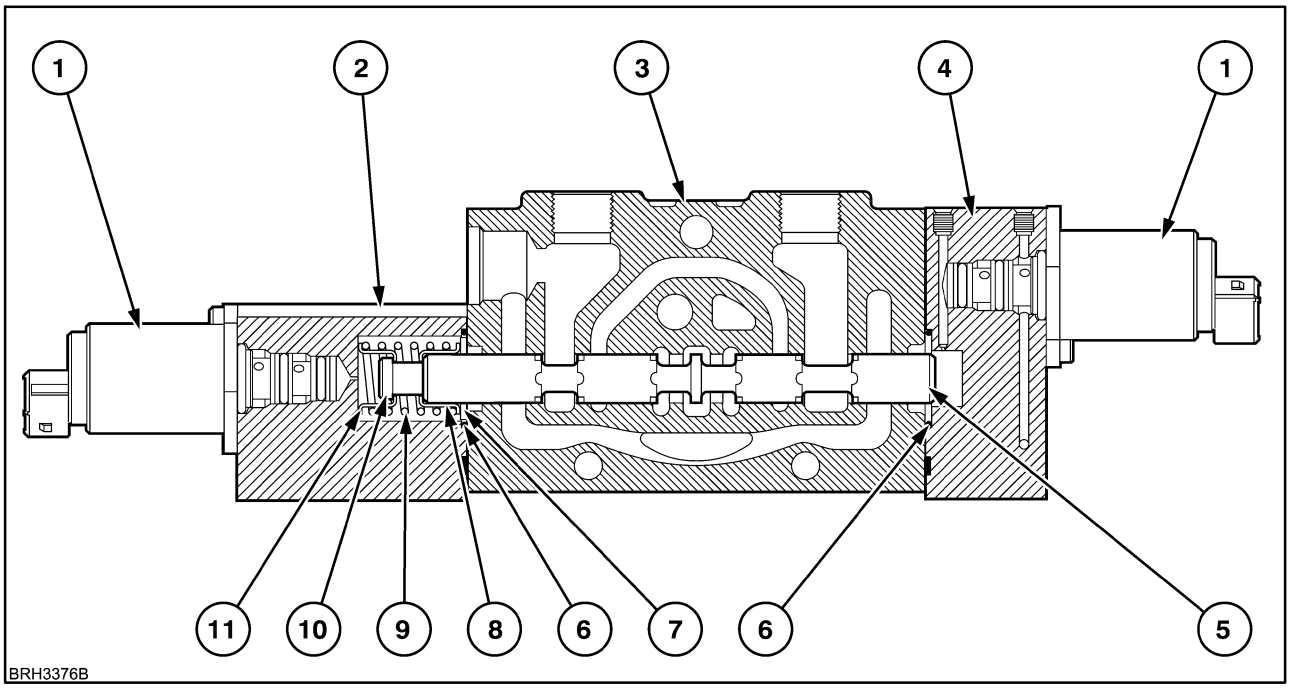

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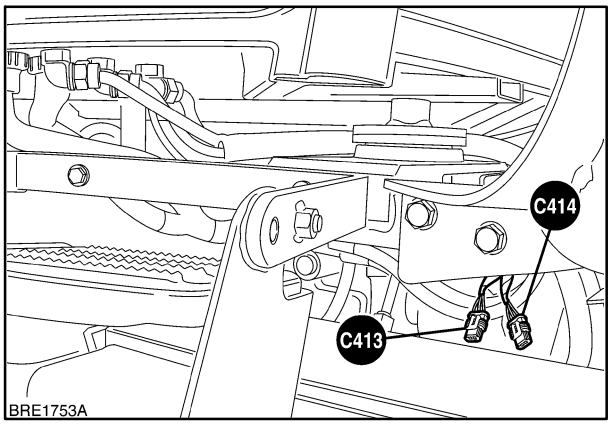
Third Mid Mount Control Valve Slice Components

1. Solenoid
2. Solenoid End Cap
3. Spool Housing
4. Solenoid End Cap
5. Spool
6. 'O' Ring
7. Flat Washer
8. Spring Seat
9. Spring
10. Spool End
11. Spring Seat

When both solenoids are not energised the valve is in neutral . Oil from the high pressure circuit can flow uninterrupted through the staggered open centre gallery and the lands on the spool prevent flow to the cylinder work ports . When a solenoid is energised the spool is moved to the left or right depending on which action is required. High pressure oil flows past the lands of the spool and is fed to the relevant work port. Return Oil is allowed back to reservoir across the spool from the opposite port .

Removal

1. Disconnect the solenoid wires from the harness
2. Disconnect the loader control hoses (where fitted)
3. Disconnect the inlet and outlet and return hoses.



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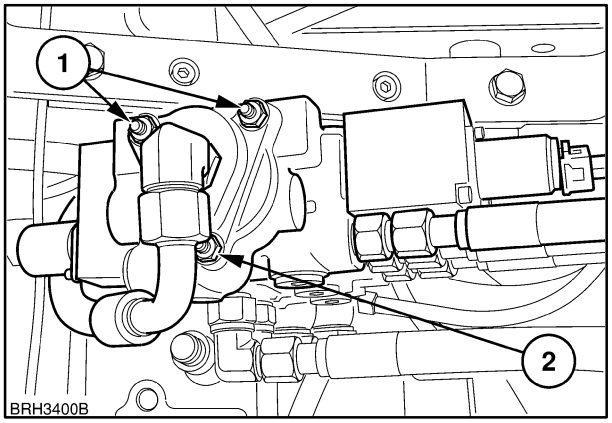
4. Undo the tie rod nuts and remove the third valve slice.



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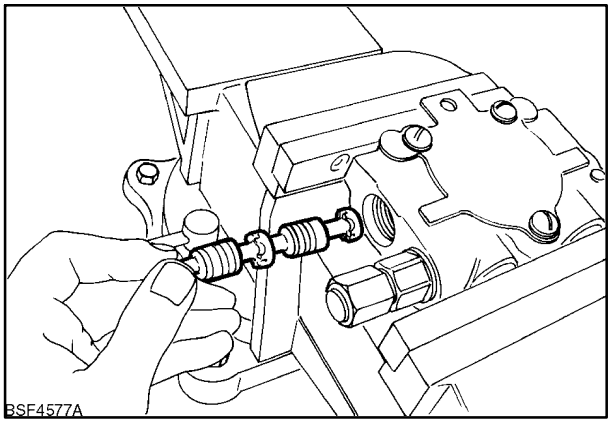
Disassembly

1. Remove the solenoid retaining screws and pull out the solenoid from the housing.
2. Undo the solenoid housing retaining screws and remove the housing from the valve.
3. Withdraw the solenoid assembly. Repeat for the opposite solenoid.
4. Carefully remove spool from the valve slice.
5. Inspect the spool and bore for scoring and damage. If the spool is badly scored or worn the valve assembly must be replaced.



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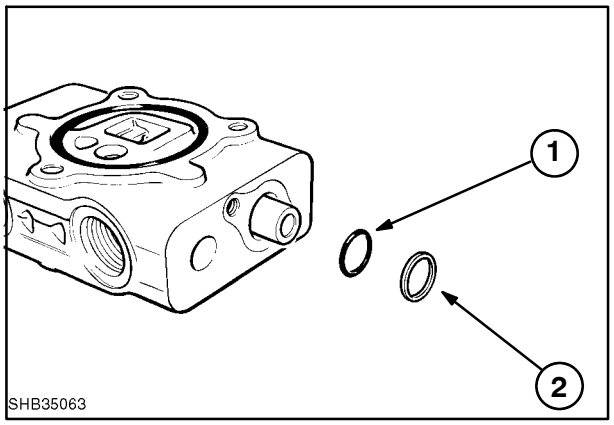
Assembly

1. Lubricate spool before re-assembly.
2. To avoid damage to “O” ring seals on either end of spools, insert spool into valve housing before installing “O” ring (1) and Wiper (2).
3. Re-install centreing spring ,solenoid housing and solenoids.



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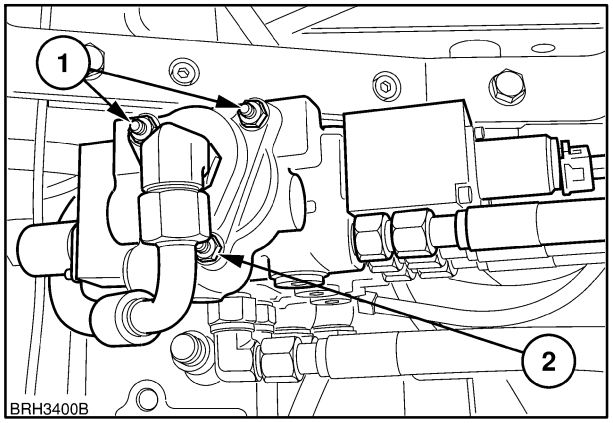
Installation

1. Place the third valve slice onto the tie rods. Replace the
2. Progressively tighten the smaller tie bar retaining nuts (1) to a torque of 19Nm (14 lbf.ft)
3. Tighten the larger tie bar nut to a torque of 45 Nm (33 lbf.ft).



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SECTION 35 - HYDRAULIC SYSTEMS

Chapter 17 - Integrated Hydraulic Front Lift and Power Take-Off (PTO) (All Models from 06-2005)

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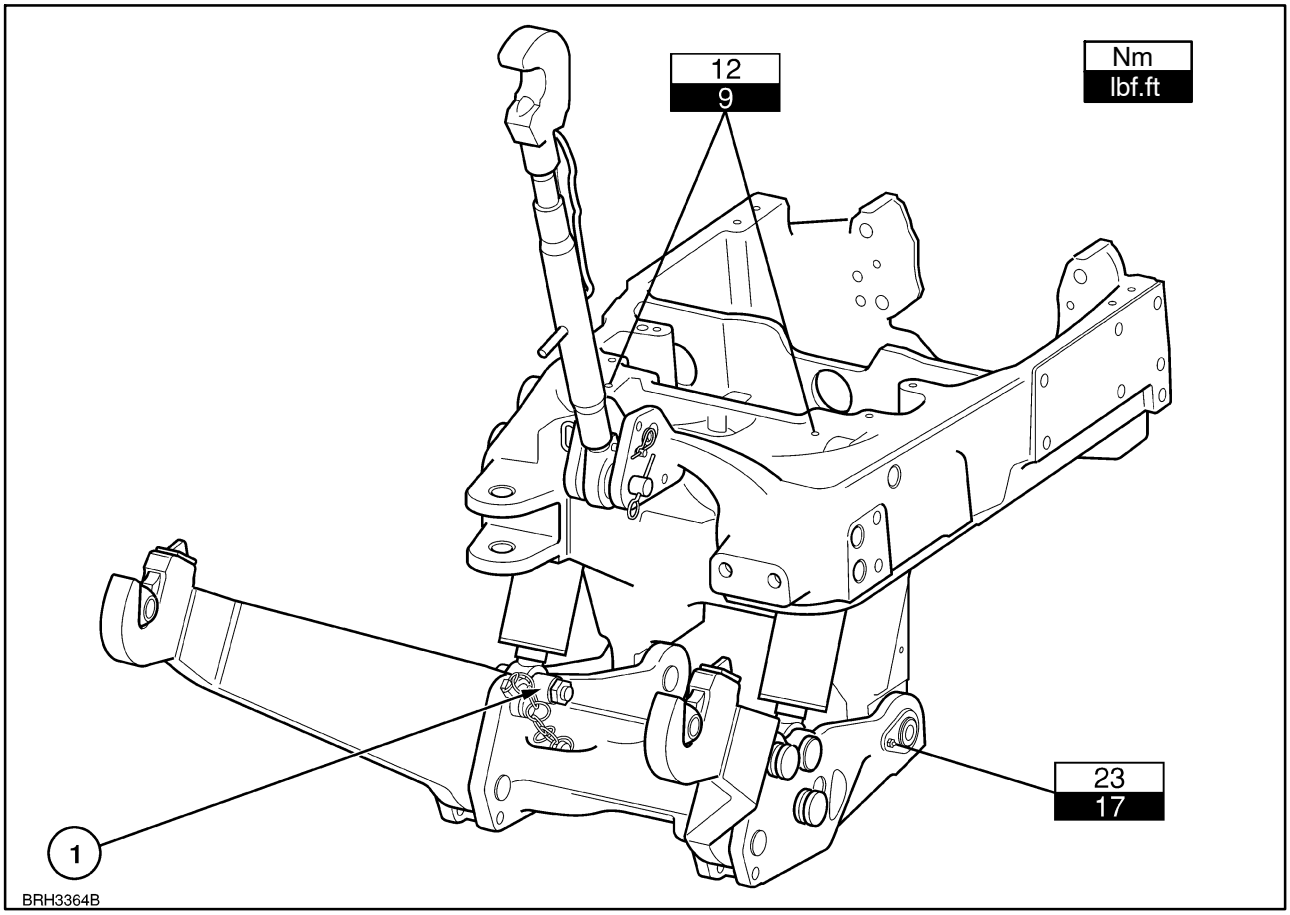
SPECIFICATIONS

Front PTO	
Type	Fully independent 1000 rev/min. Electro-hydraulic engagement. Spring disengagement
Clutch type	Multi-dry plate
Drive	From the engine front crankshaft pulley
Multi-dry plate clutch discs	
Friction discs	3
Steel discs	3
Engine speed at 1000 rev/min PTO speed	2120 rev/min
Maximum PTO capacity ..... Hp	110
Reduction gearbox oil specification	NH 410 B Ambra Multi G

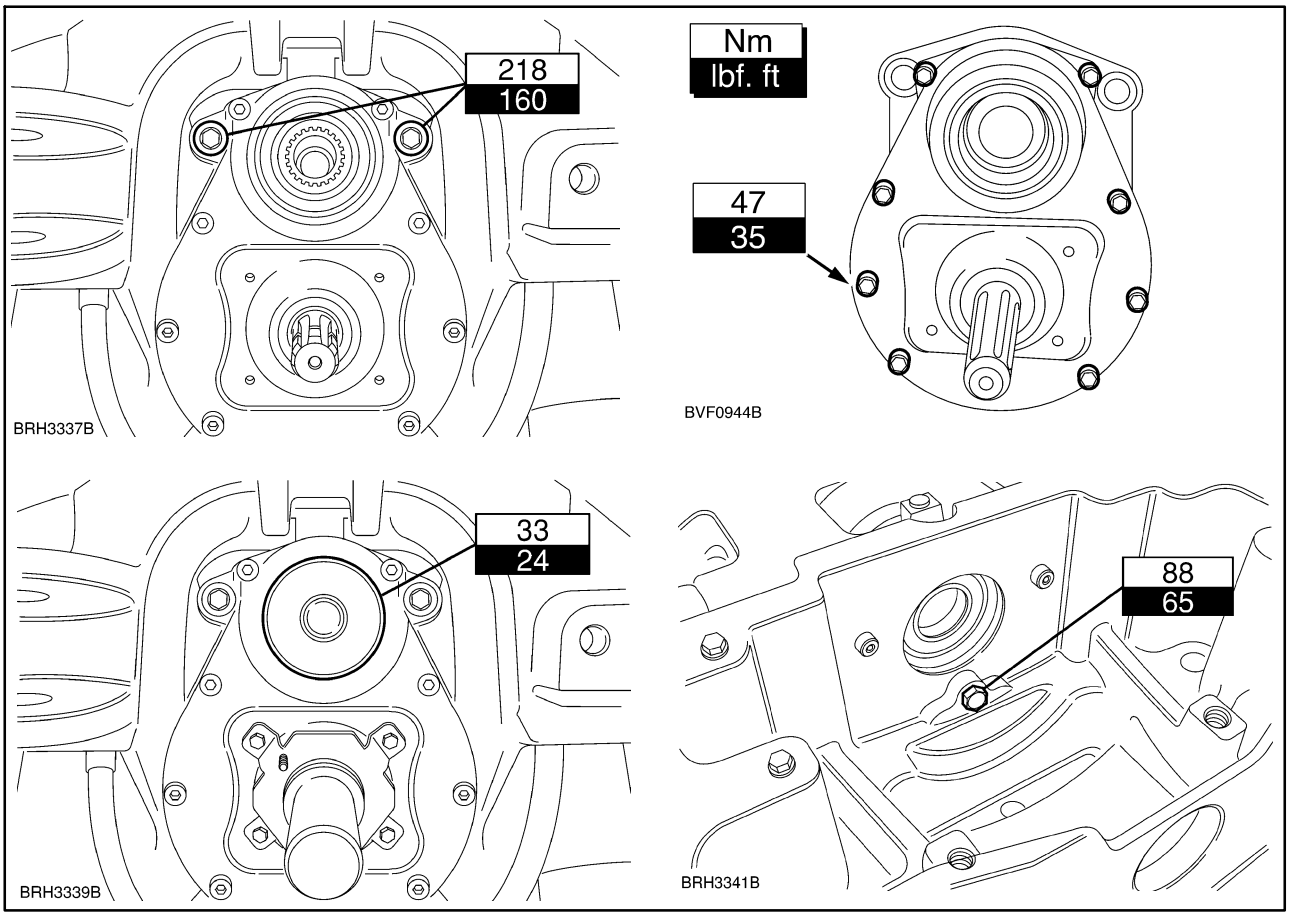
TIGHTENING TORQUES

HYDRAULIC FRONT LIFT



1

FRONT POWER TAKE-OFF



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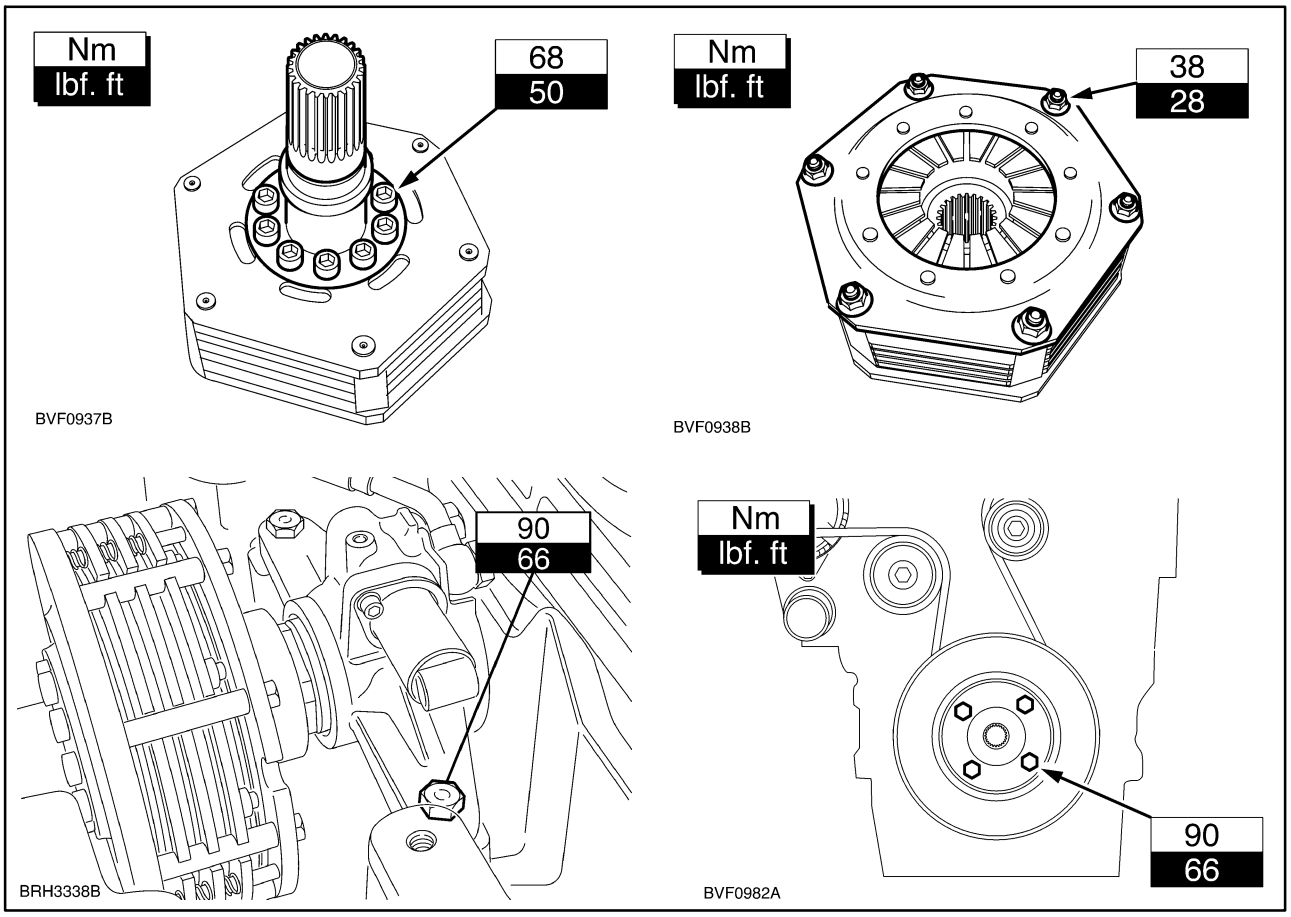


3

SPECIAL TOOLS

⚠ CAUTION ⚠

Operations described in this section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.
To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the self-made ones for which you will find the necessary construction drawings and specifications directly in this Manual.

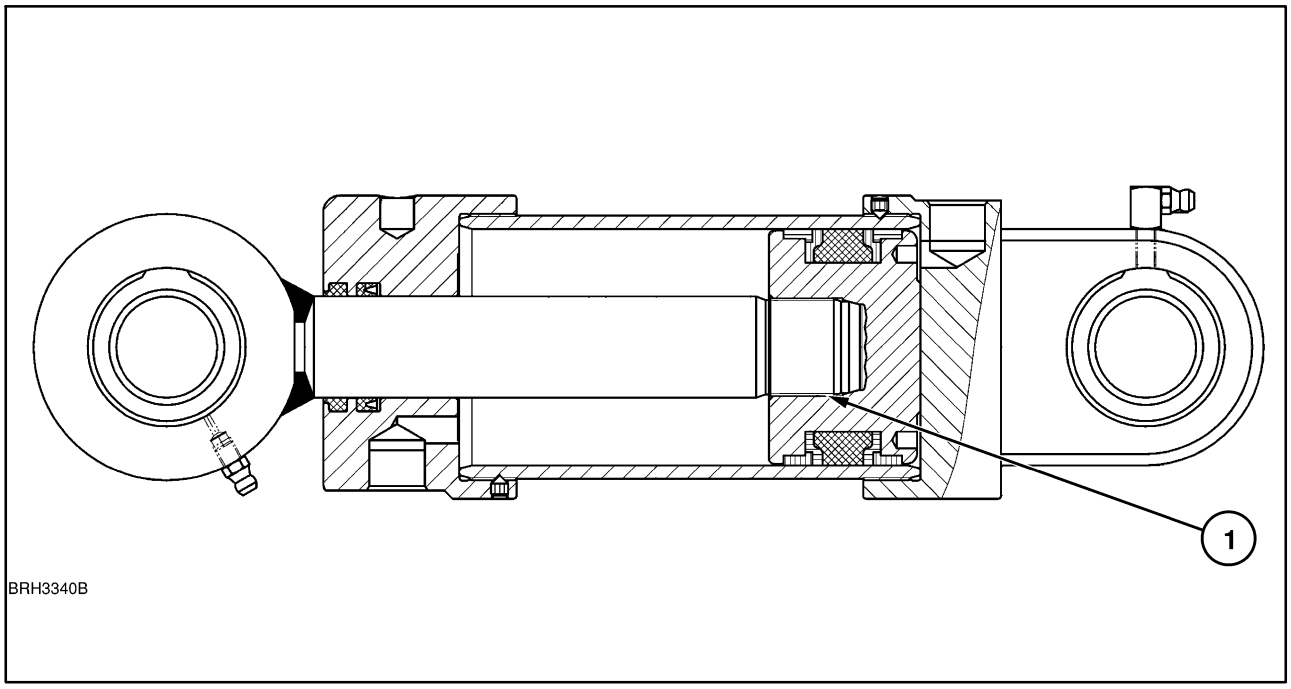
List of special tools necessary to carry out the different operations described in this section:

380001158 Control piston spanner

47057766 PTO Piston control spring compression bolt

SECTIONAL VIEWS

HYDRAULIC FRONT LIFT - LIFT CYLINDER



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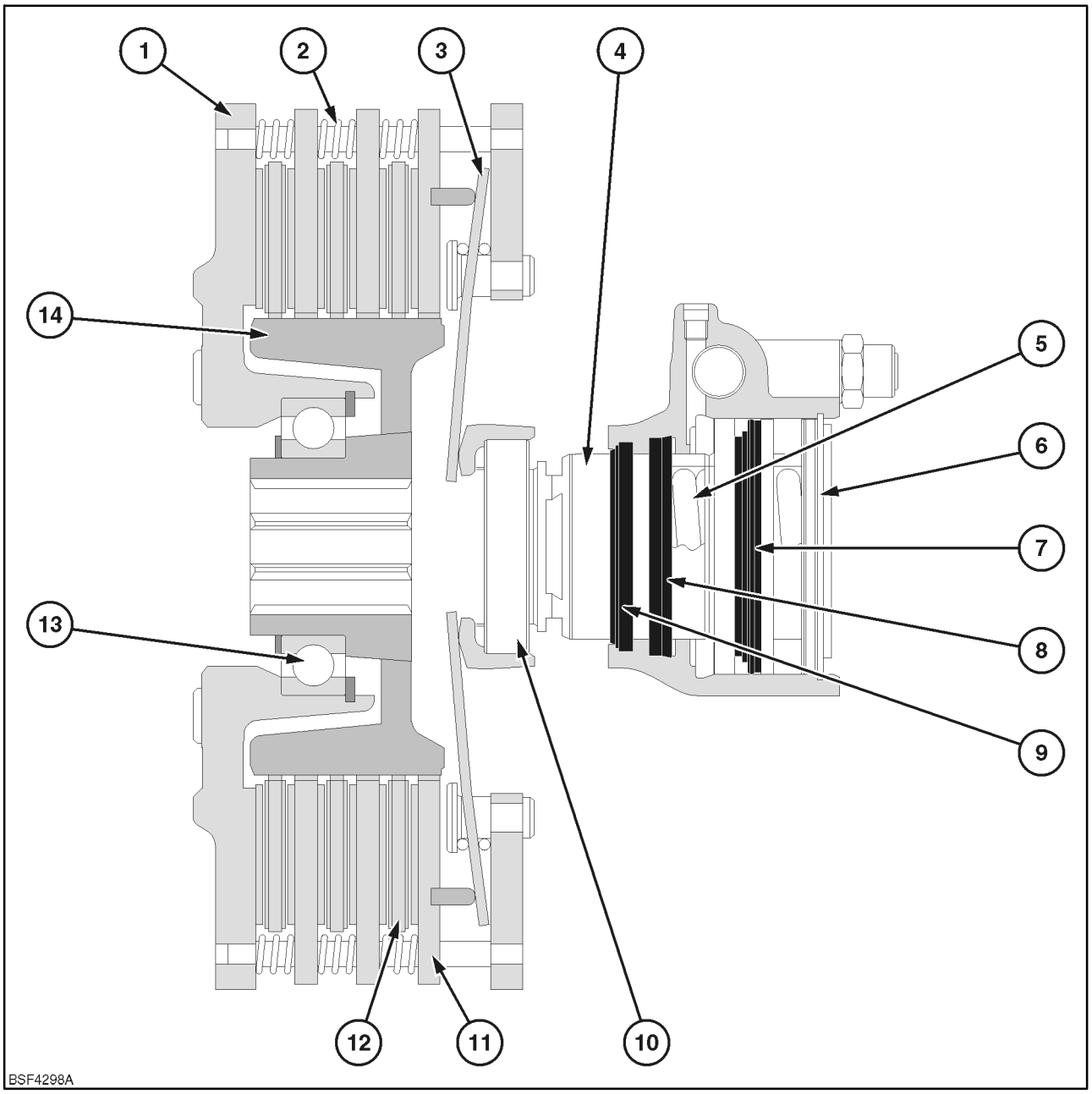
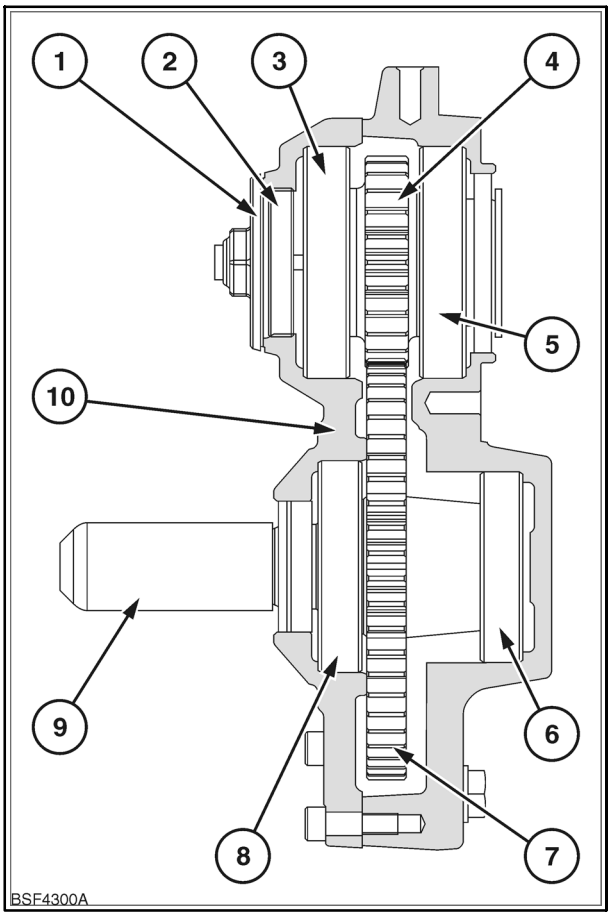
1. Apply Loctite 638 to the thread



5

Front PTO Clutch Sectional View

1. PTO clutch housing
2. Spring
3. Diaphragm spring
4. Piston
5. Piston spring
6. Circlip
7. Piston oil seal
8. Control housing oil seal
9. Control housing dust seal
10. Clutch release bearing
11. Steel plate
12. Friction disc
13. Bearing
14. Clutch housing



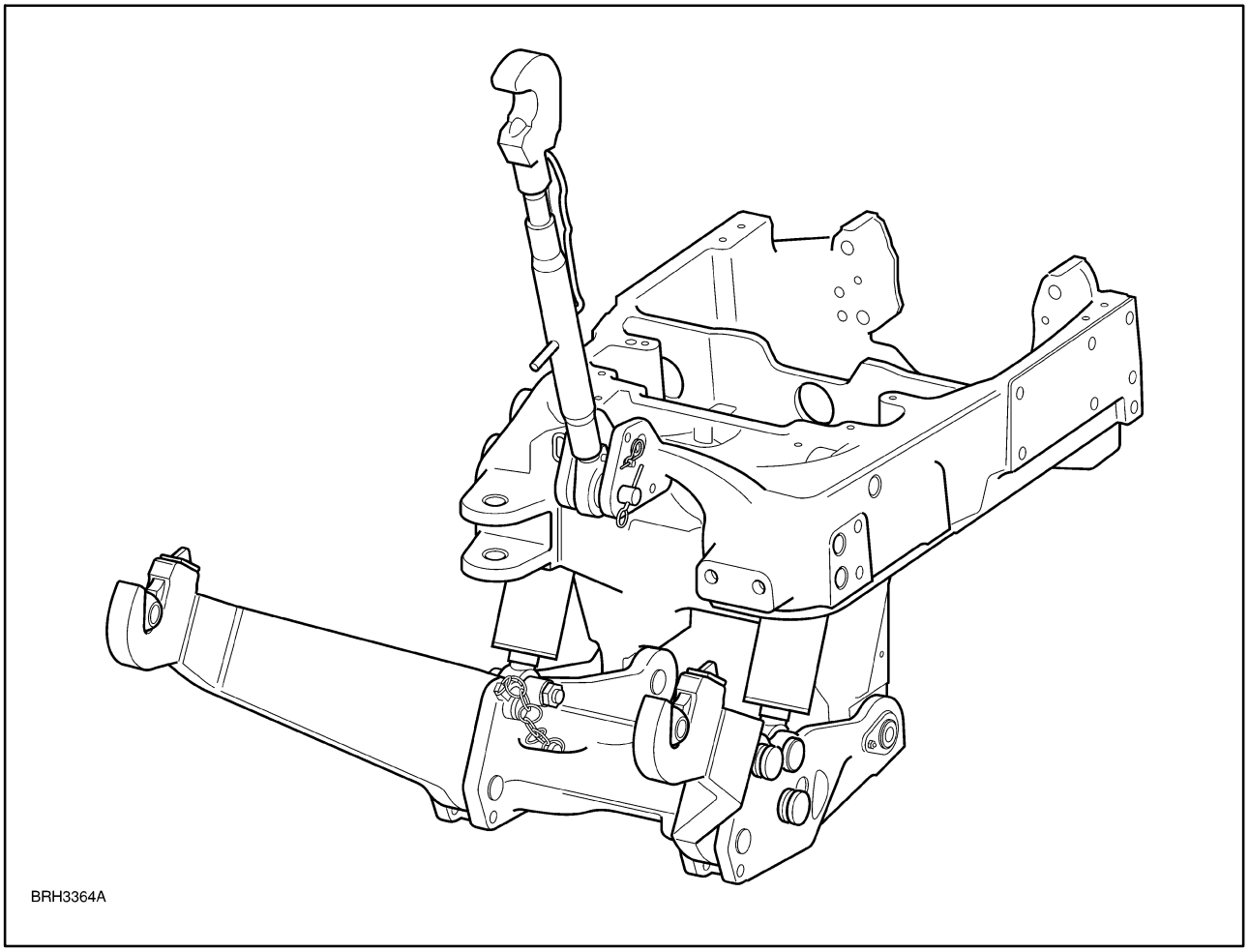
6

Front PTO Reduction Gearbox Sectional View

1. Input shaft cover
2. Input shaft plug
3. Bearing
4. Drive gear
5. Bearing
6. Bearing
7. Driven gear
8. Bearing
9. PTO output shaft
10. PTO reduction gearbox casing

DESCRIPTION AND OPERATION

FRONT HYDRAULIC LIFT

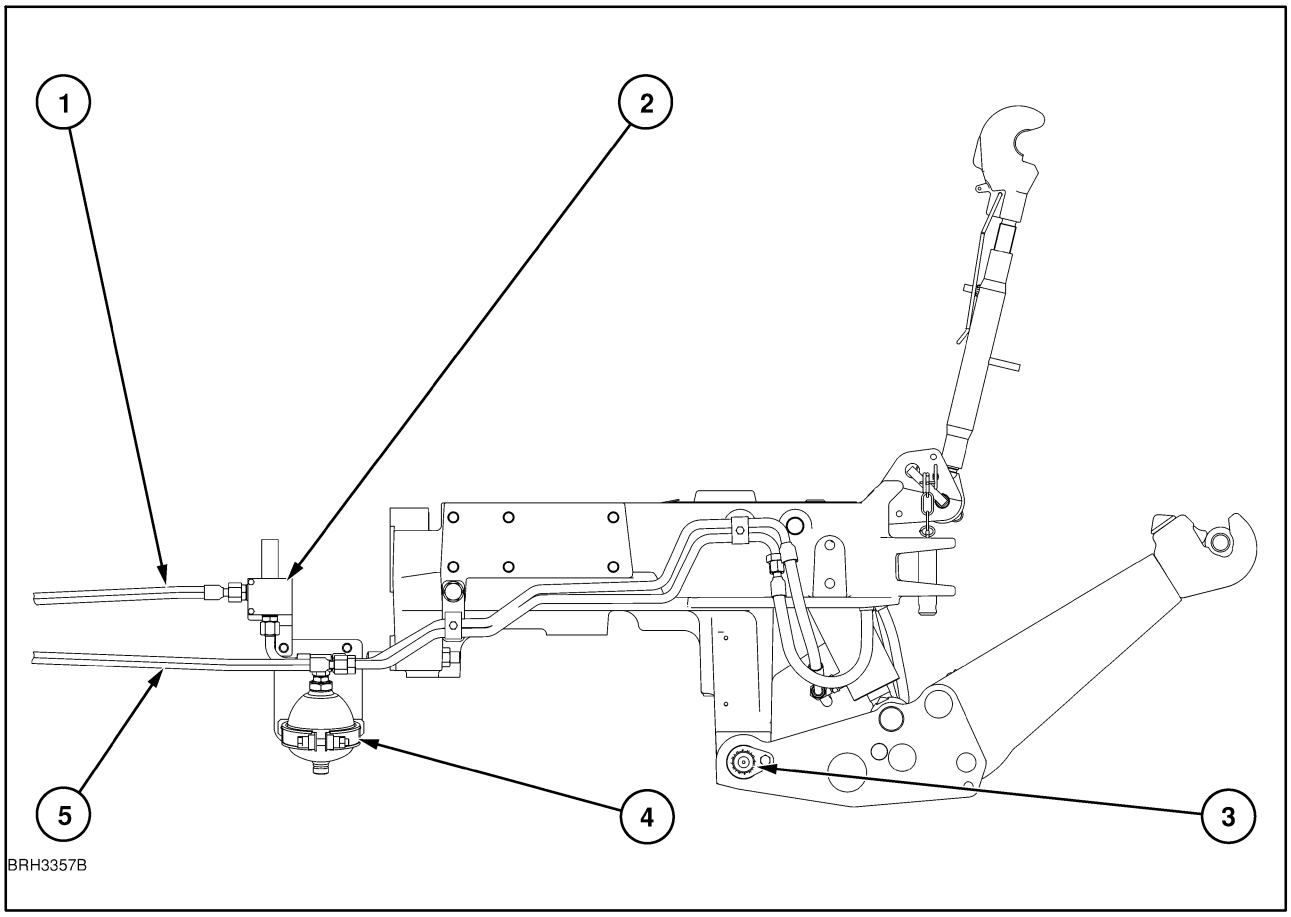


7

Front Hydraulic Lift

The front hydraulic lift consists of an adjustable top link and a pair of folding lower links. The top and lower links have open claws that permit rapid coupling and uncoupling of implements. The claws are equipped with self locking latches to ensure positive retention of the tractor linkage to the implement.

Two single acting hydraulic cylinders are used to raise and lower the hydraulic lift.



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Vibration Absorbtion and Travel Limit

1. Hydraulic line - Lift
2. Solenoid valve (with mechanical remotes only)
3. Angle sensor
4. Accumulator
5. Hydraulic line - Lowering

Vibration Absorbtion

The vibration absorption is done by an accumulator (4) which is assembled into the hydraulic lift line (1). The vibration absorption is permanently active. (passive vibration absorption) The accumulator takes the pressure peaks which occur when driving on a bumpy road. The build up of the tractor is substantially reduced and load peaks to the tractor are eliminated. In case of very heavy front mounted implements (e.g. snow cutter) the accumulator may respond already during normal operation. (lift-lower-neutral) (soft characteristic of the front hydraulic lift).

Technical Data - Accumulator

capacity 0,75
lgas-fill-overpressure . . . . . 130 $^{+2/-1}$ bar
max. operating pressure . . . . . 210 bar
max. operating temperature . . -30 / 80°C

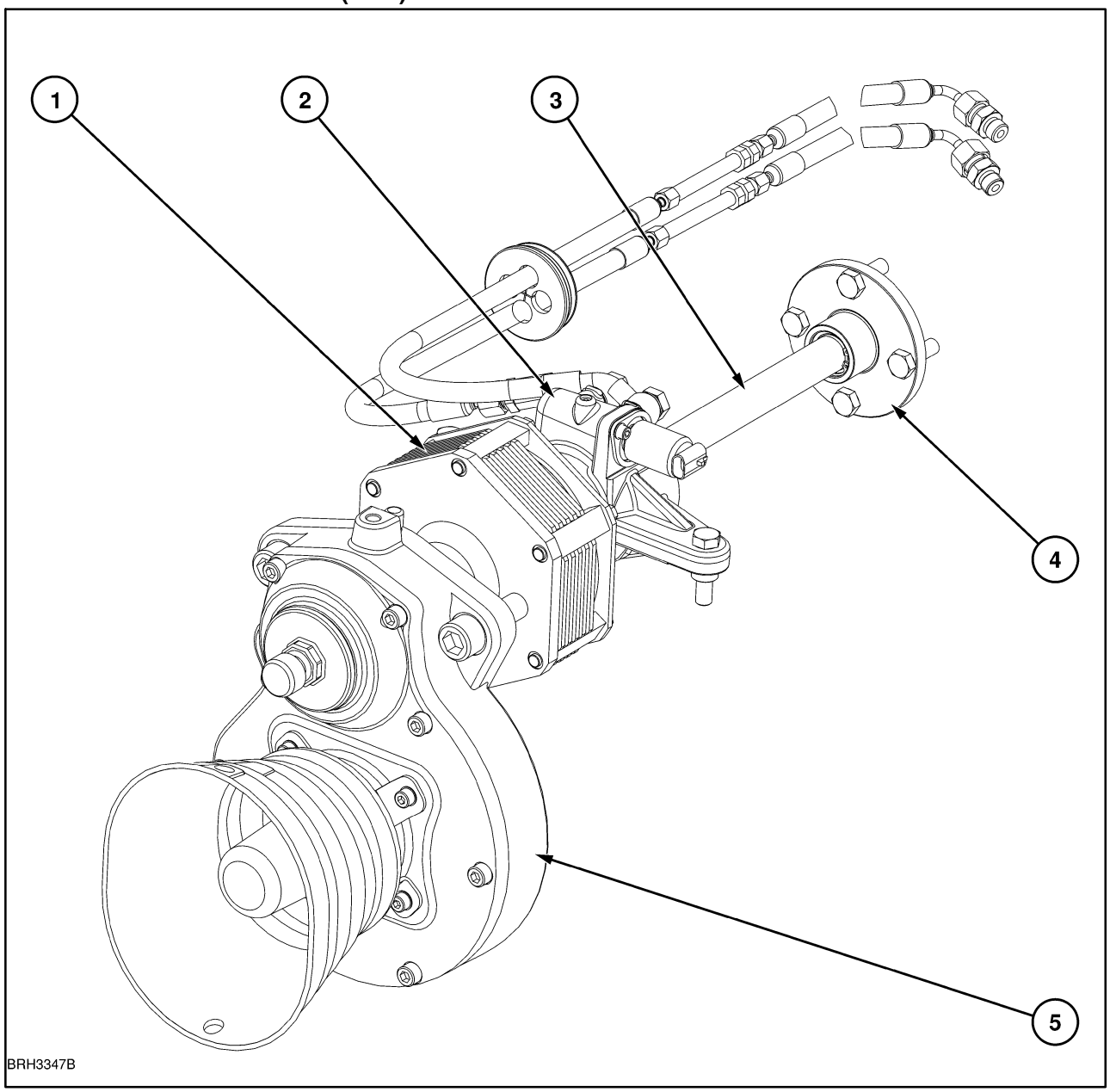
TRAVEL LIMIT OF FRONT HYDRAULIC LIFT, WITH ELECTRONIC-HYDRAULIC REMOTE VALVES FITTED

The top end-position (nominal value) of the front hydraulic lift can be adjusted via potentiometer-control in the cab. (e.g. to protect the propeller shaft). An angle sensor (3) assembled to the lift fork provides the signal of the actual position (actual value) to the control unit. As soon as the actual value reaches the nominal value, the remote valve moves into neutral position.

TRAVEL LIMIT OF FRONT HYDRAULIC LIFT, WITH MECHANICAL REMOTE VALVES FITTED

A solenoid valve (2) is necessary for the travel limit if the tractor is fitted with mechanical remote valves. The solenoid valve is assembled into the “lifting” hydraulic line, before the accumulator. As soon as the actual value reaches the nominal value the solenoid is activated via the control unit and goes into a closed position. The sudden rise in operating pressure causes the main control slide in the remote valve to go into the neutral position (kick-out-function).

FRONT POWER TAKE-OFF (PTO)



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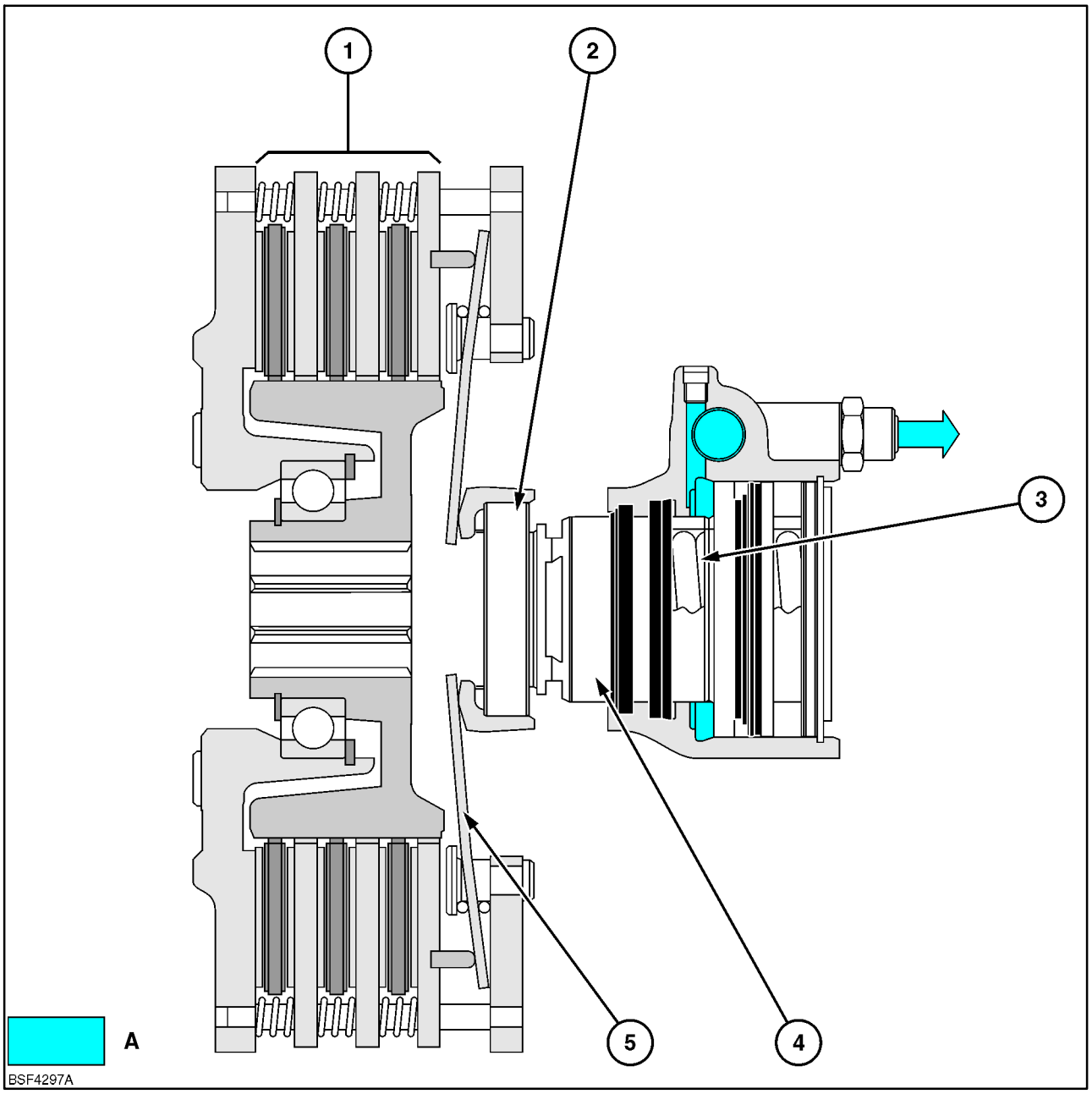
Front PTO

1. PTO multi-dry plate clutch
2. PTO control housing
3. PTO input shaft
4. Engine crankshaft pulley coupler
5. PTO reduction gearbox

The front PTO is engaged/disengaged by the piston control housing (2). The PTO is driven directly from the engine crankshaft. The engine crankshaft pulley coupler (4) transfers drive through the PTO input shaft (3) and into the multi-dry plate clutch (1). When the PTO is engaged the drive is transferred through the multi-dry plate clutch (1) into the PTO reduction gearbox (5) to the PTO reduction gearbox output shaft.



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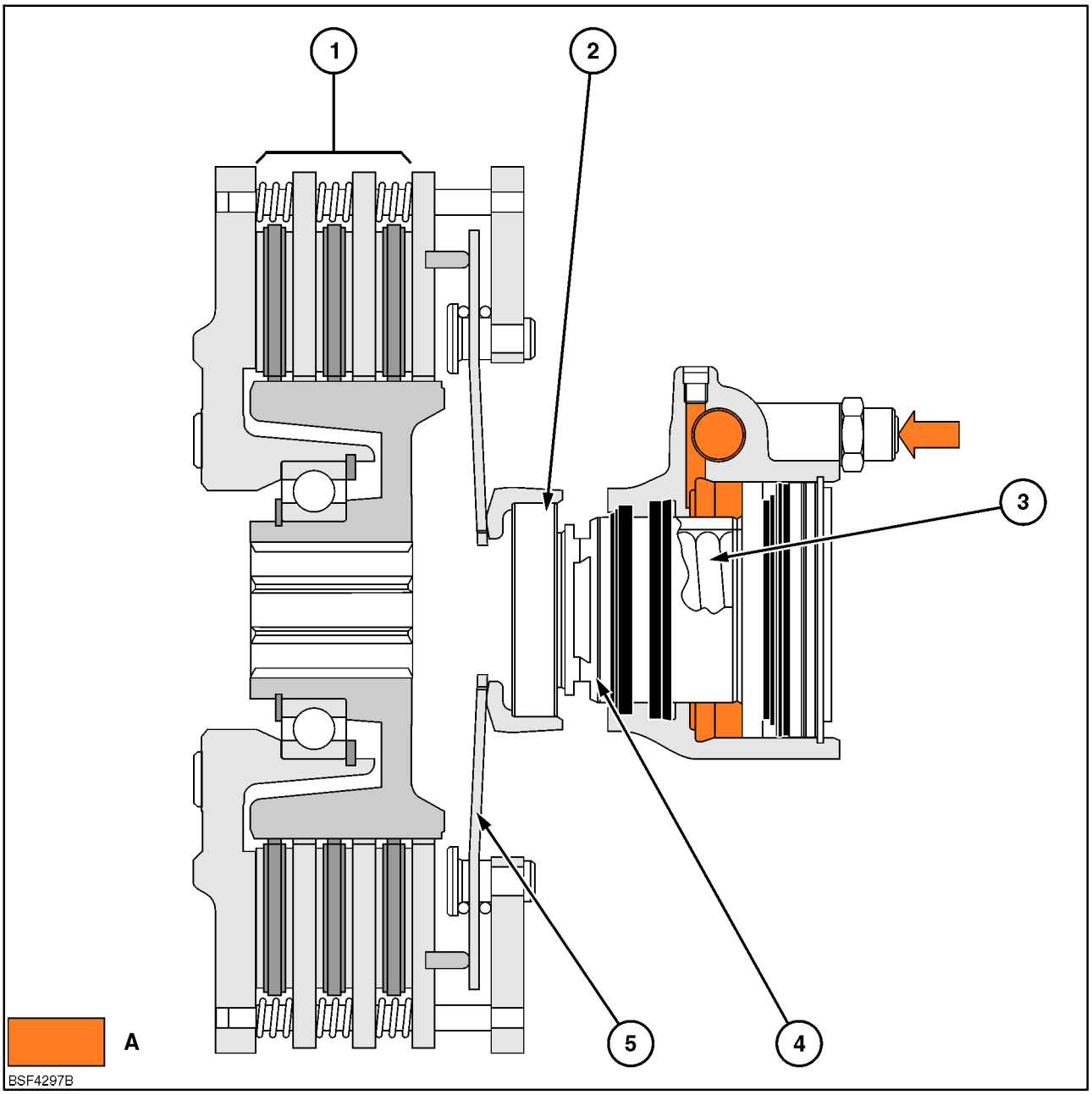
Front PTO Operation - Front PTO Disengaged

1. Friction discs and steel plates
2. Clutch release bearing
3. Piston spring
4. Piston
5. Diaphragm spring

Figure Colour Key

A. Return to reservoir

When the front PTO is disengaged, power to the solenoid valve is switched off allowing the oil to return to the reservoir. With no oil pressure acting against the piston (4), the spring (3) pushes the piston (4) out of the housing and pushes the clutch release bearing (2) into contact with the PTO clutch diaphragm spring (5). When pressure is applied to the diaphragm spring (5) it releases the force acting on the clutch pressure plate. This allows the springs in between the friction discs and steel plates (1) to expand, allowing the clutch hub to rotate freely within the clutch housing.



11

Front PTO Operation - Front PTO Engaged

1. Friction discs and steel plates
2. Clutch release bearing
3. Spring
4. Piston
5. Diaphragm spring

Figure Colour Key

A. Low pressure circuit

When the front PTO is engaged, the solenoid valve is energized, allowing oil pressure to be applied to the piston (4). The oil pressure acting against the piston (4), overcomes the piston spring (3), which allows the piston (4) to retract into the housing, releasing the clutch release bearing (2) from the force of the diaphragm spring (5). When pressure is released from the diaphragm spring (5), it increases the force acting on the clutch pressure plate. This compresses the springs in between the friction discs and steel plates (1), clamping the friction discs and steel plates (1) together, locking the clutch hub and the clutch housing together.

TROUBLESHOOTING

FRONT PTO

PROBLEM	POSSIBLE CAUSES	CORRECTION
Front PTO not engaging	Front PTO is not turned on in machine configurations.	Turn the front PTO on in machine configurations (refer to the diagnostic H routines chapter in the electrical systems section).
	Front PTO solenoid valve not energizing.	Check the electrical circuit.
	Solenoid valve sticking.	Replace the solenoid valve.
Front PTO permanently engaged	Piston spring broken.	Replace the piston spring.
	Solenoid valve sticking.	Replace the solenoid valve.
Low power from the front PTO output shaft	Fault in the low pressure circuit.	Pressure test the low pressure circuit.
	Front PTO piston oil seals leaking.	Overhaul the front PTO control housing.
	Front PTO multi-dry plate clutch plates worn.	Overhaul the front PTO multi-dry plate clutch.
Front PTO output shaft oil seal leak	Worn oil seal.	Replace the oil seal and check the level of oil in the reduction gearbox.
	Excessive oil level in the front PTO reduction gearbox.	Check the oil level.
Front PTO bearings overheated/worn	Lack of oil in front PTO reduction gearbox.	Check the oil level. If low examine the front PTO reduction gearbox for leaks.
	Incorrect specification oil or old oil in the front PTO reduction gearbox.	Replace with the correct specification of oil.

FRONT HYDRAULIC LIFT

PROBLEM	POSSIBLE CAUSES	CORRECTION
Front hydraulic lift not raising	Diverter valve not open.	Open the diverter valve.
	Height limit control incorrectly set.	Adjust the height limit control to the required setting.
	Front hydraulic lift arm position sensing potentiometer damaged.	Replace the potentiometer.
Front hydraulic lift will not raise heavy loads	Front hydraulic lift cylinder oil seals leaking.	Overhaul the front hydraulic lift cylinders.

OVERHAUL

HYDRAULIC FRONT LIFT

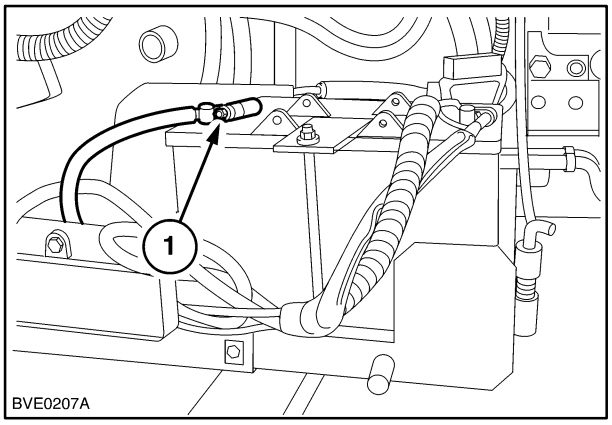
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear goggles, gloves and footwear.

1. Lower the front hydraulic lift arms.
2. Remove the battery cover and disconnect the battery negative cable (1).
3. Disconnect the hydraulic lines.
4. Use the following exploded view to aid disassembly and assembly.



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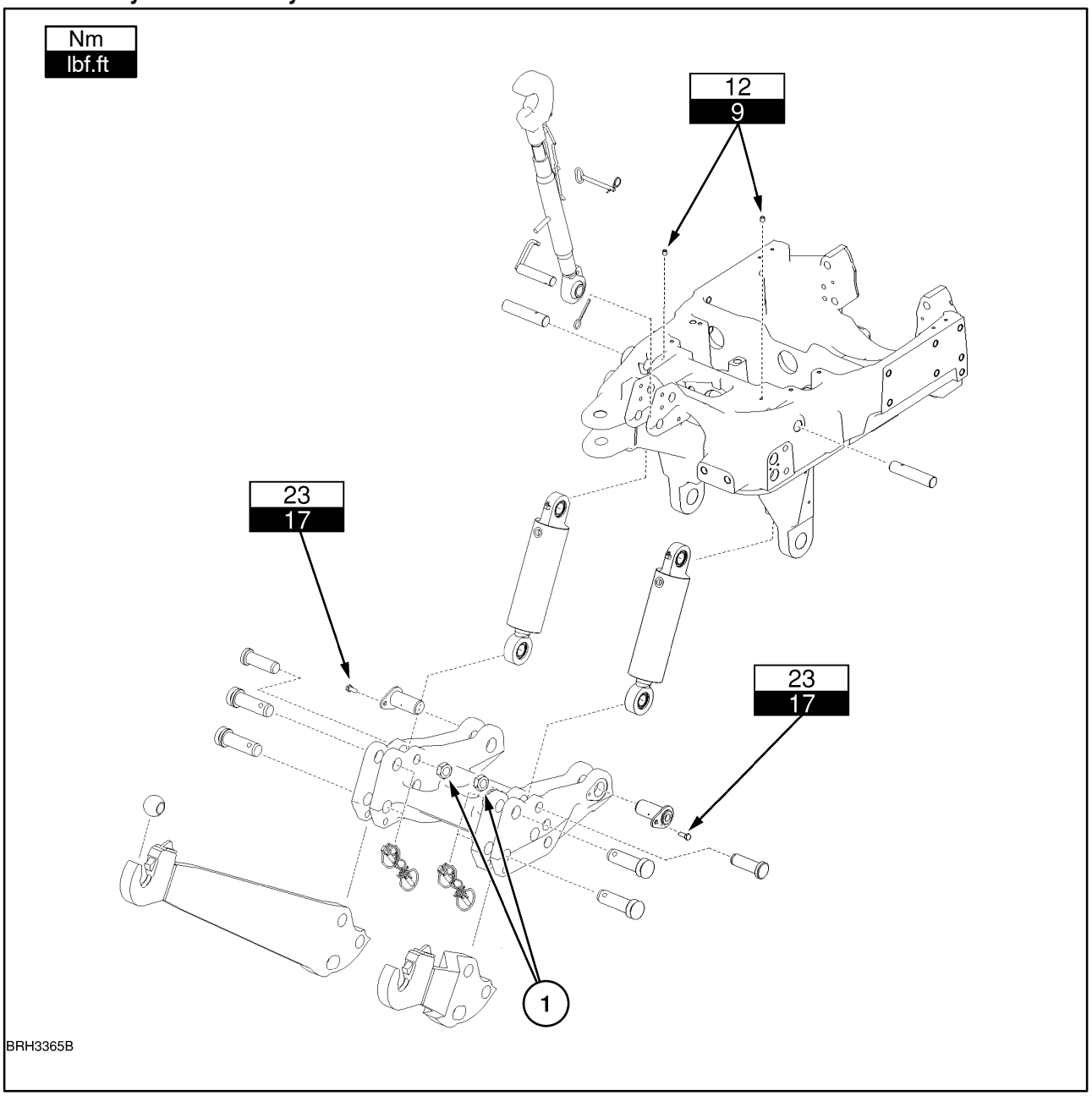
Disassembly and Assembly



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Integrated Hydraulic Front Lift - Component Disassembly

1. Assemble lock nut only to contact surface. Do not tighten.

FRONT PTO CONTROL HOUSING

Removal

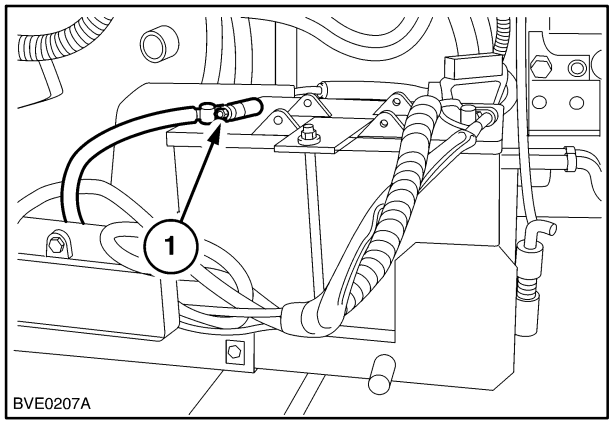
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

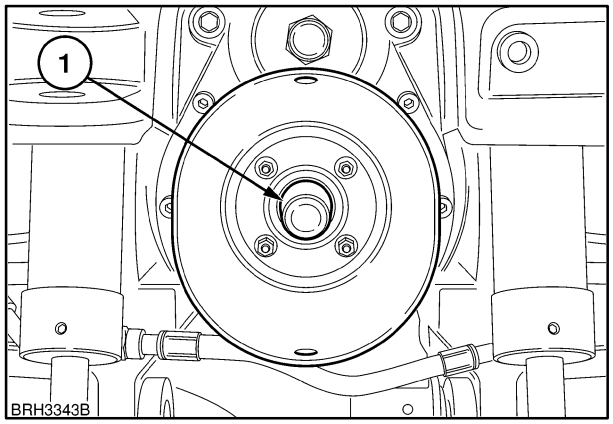
Wear goggles, gloves and footwear.

1. Lower the front hydraulic lift arms.
2. Remove the battery cover and disconnect the battery negative cable (1).



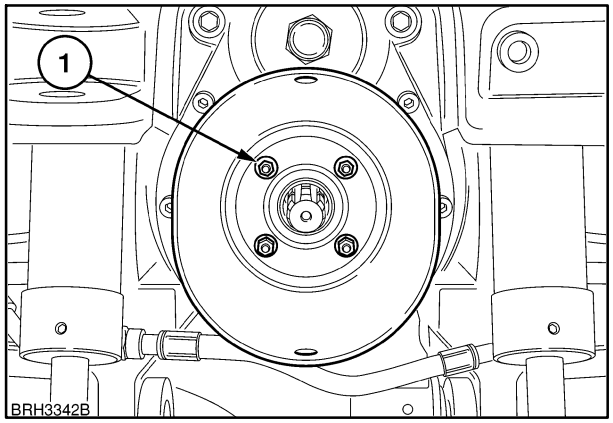
14

3. Remove the PTO output shaft cover (1).



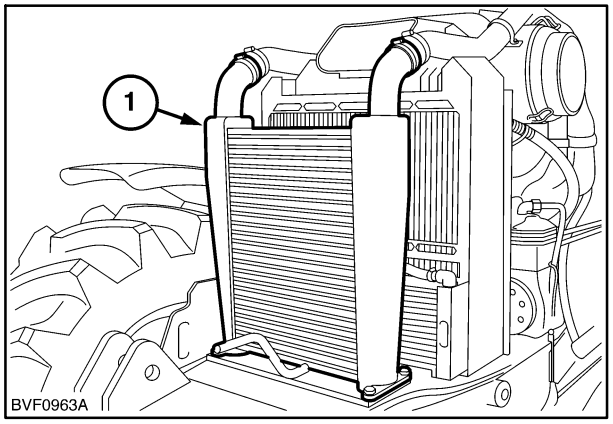
15

4. Remove the retaining bolts, x4, (1) and remove the PTO guard.



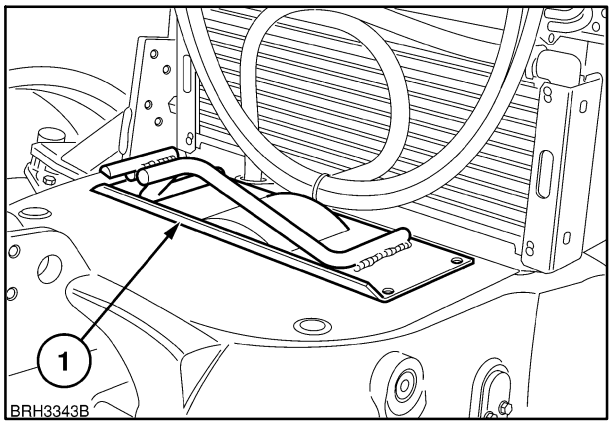
16

5. Remove the intercooler (1).



17

6. Remove the front axle support cover plates (1).



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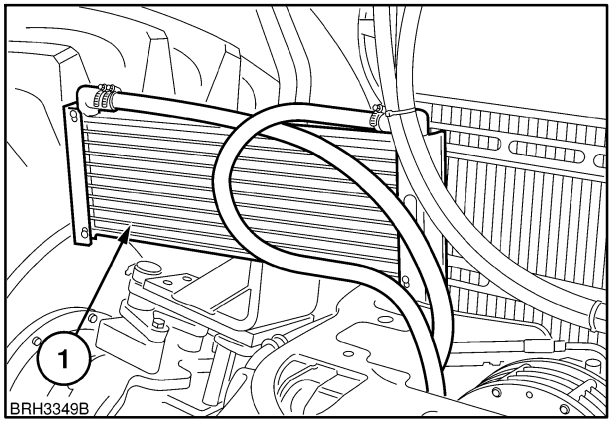
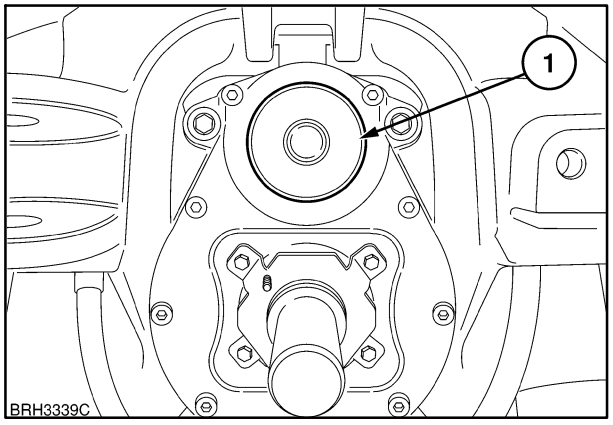
7. Slide the transmission oil cooler (1) to the side.



19

8. Remove the PTO input shaft cover (1).



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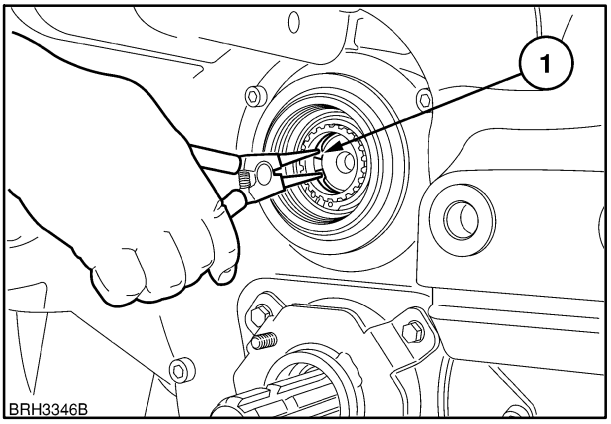
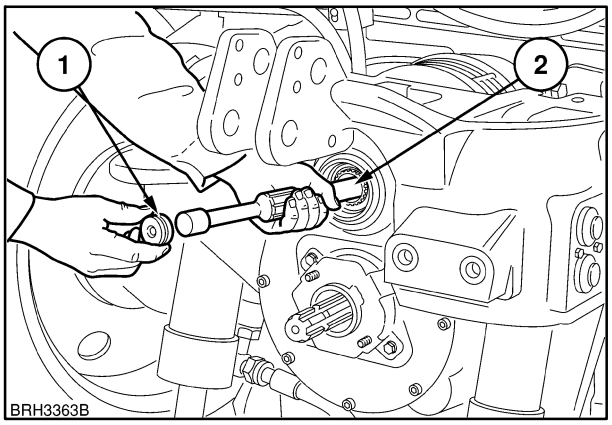
9. Using suitable circlip pliers, remove the PTO input shaft plug circlip (1).



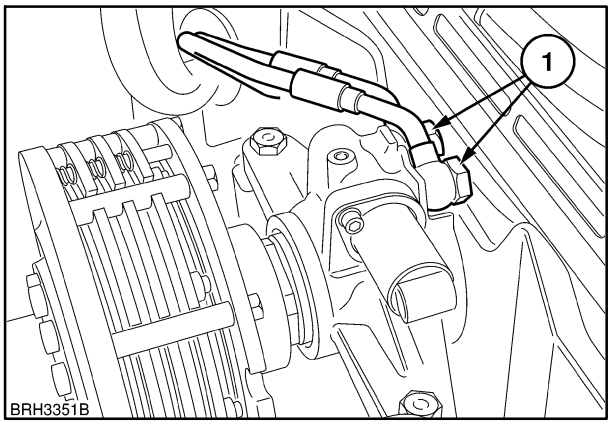
21

10. Remove the input shaft plug (1) and input shaft (2).



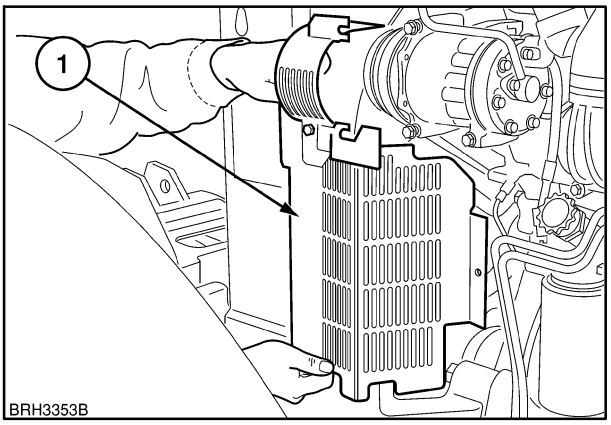
22

11. Disconnect the hydraulic lines (1) from the control housing.



23

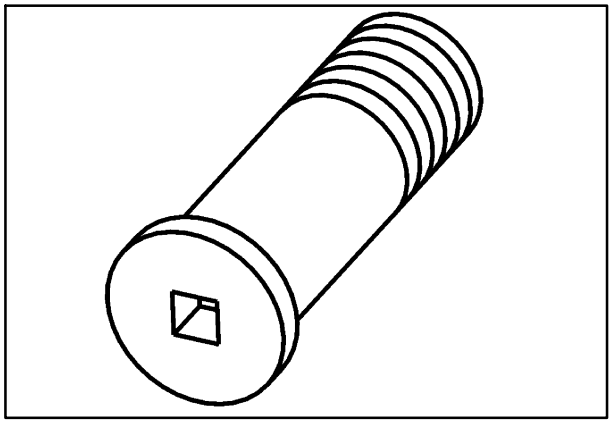
12. Remove the drive belt guard (1) from the left hand side of the engine.



24

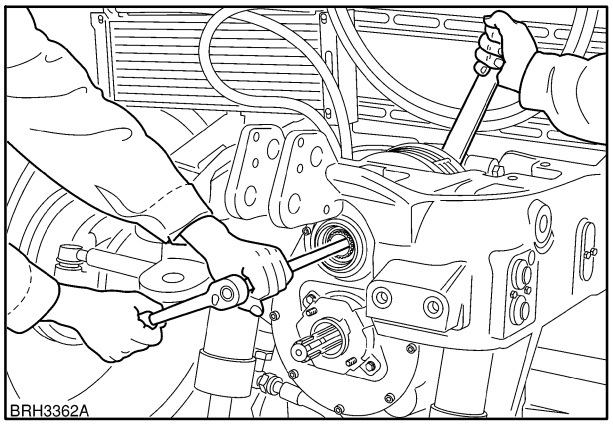
13. Insert the piston spring compressing bolt, part number, **47057766**, underneath the radiator, into the control housing.

NOTE: *Loosen the retaining bolts of the radiator. Lifting the radiator a little provides improved access to insert the piston spring compression bolt.*



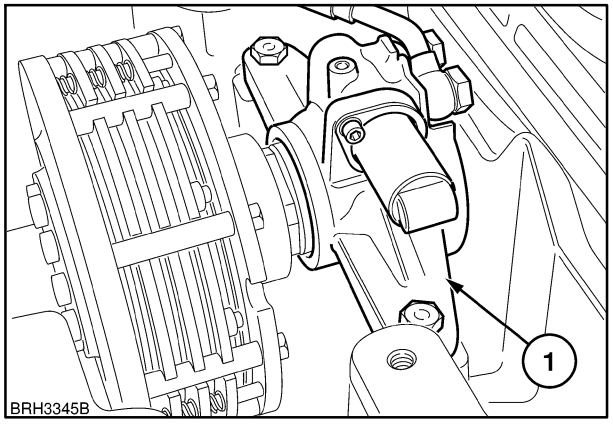
25

14. Screw in the piston spring compression bolt until the piston is pushed back and the thrust bearing of the control housing is released.
    Hold the piston with special tool **380001158**, while turning the piston spring compression bolt.



26

15. Remove the control valve housing (1).

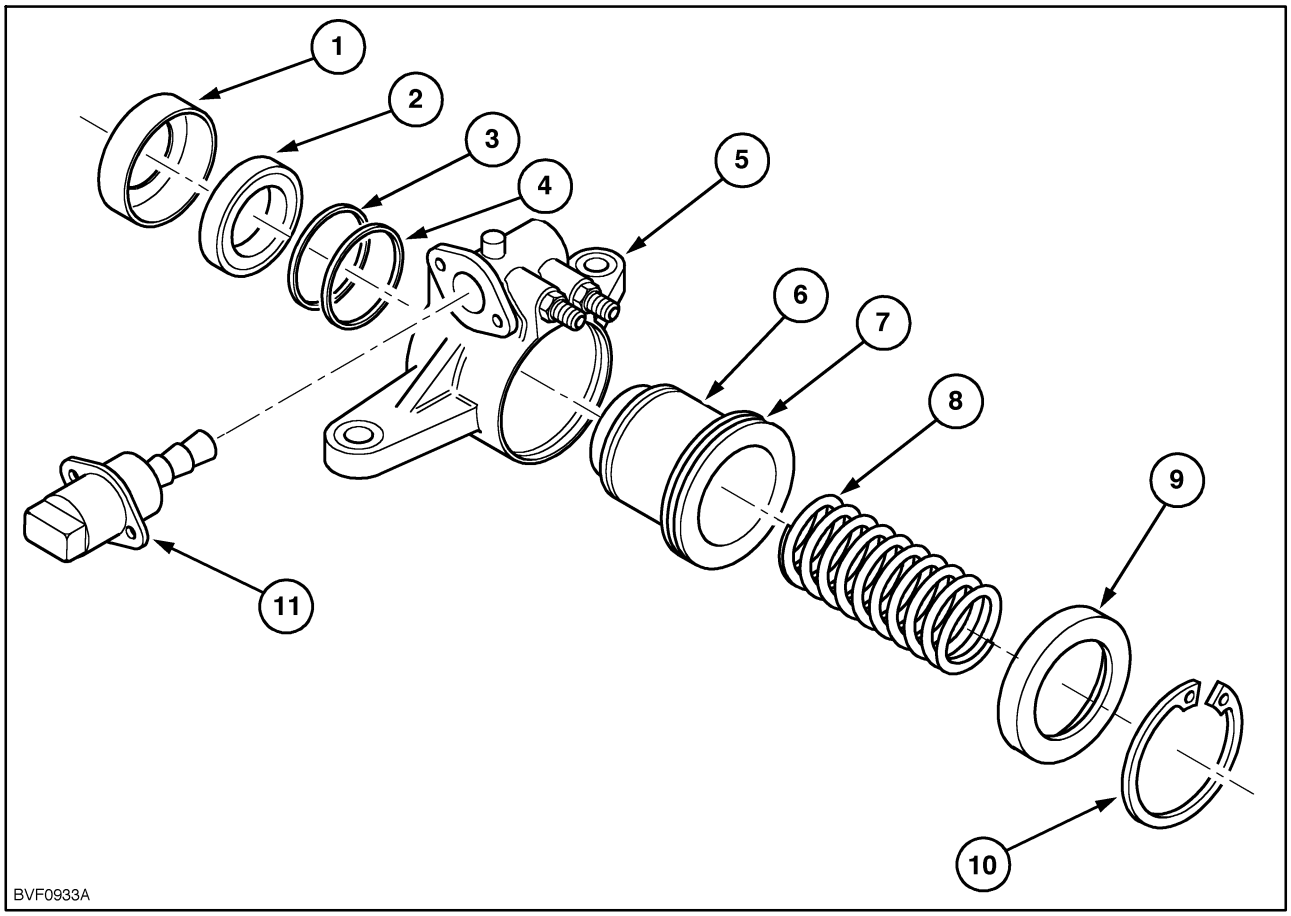


27

Disassembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

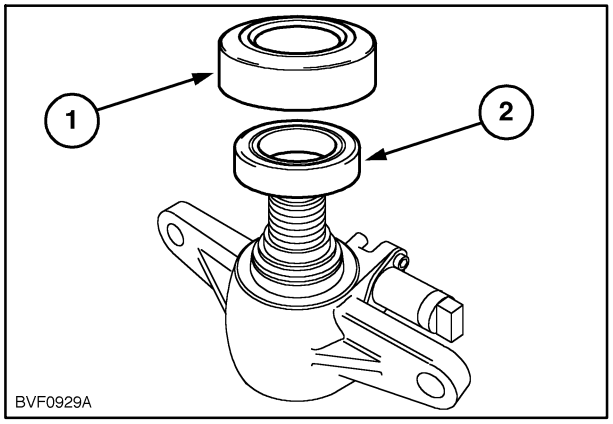


28

PTO Control Housing Exploded View

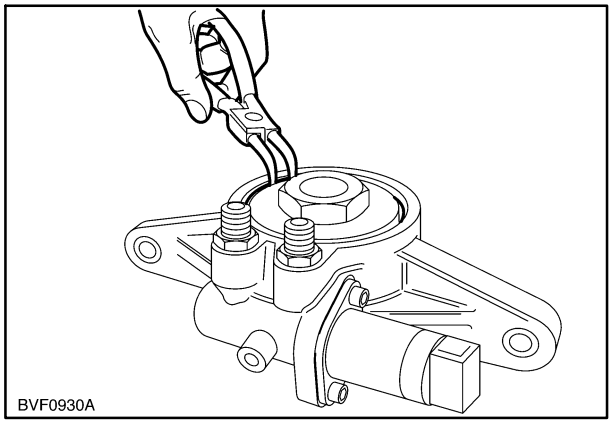
1. Bearing cover
2. Bearing
3. Dust ring
4. Piston oil seal
5. PTO control housing
6. Piston
7. Piston seal
8. Spring
9. Spring cover
10. Circlip
11. Solenoid valve

1. Remove the clutch release bearing cover (1) and the clutch release bearing (2).



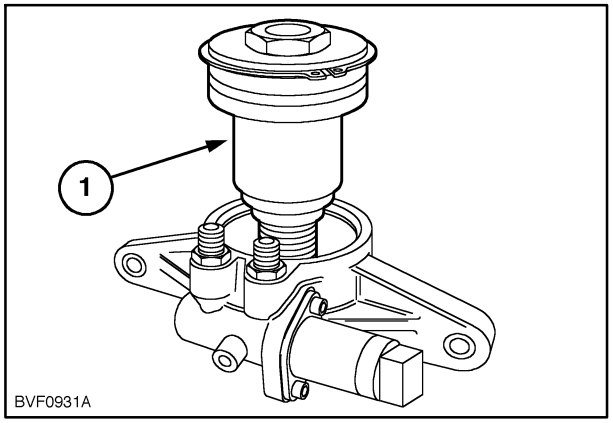
29

2. Rotate the PTO control housing 180°.
3. Using suitable circlip pliers, compress the circlip.



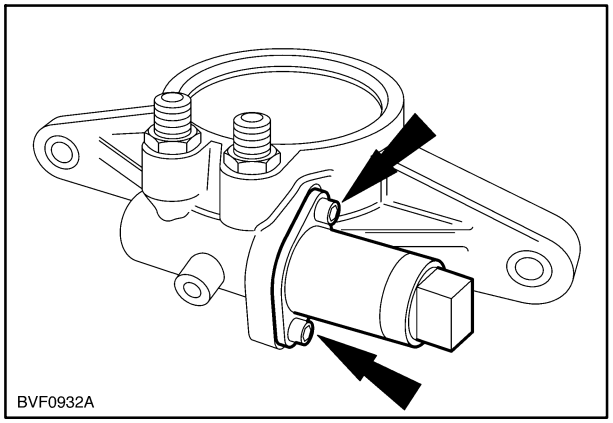
30

4. Remove the piston and spring assembly (1) from the PTO control housing.



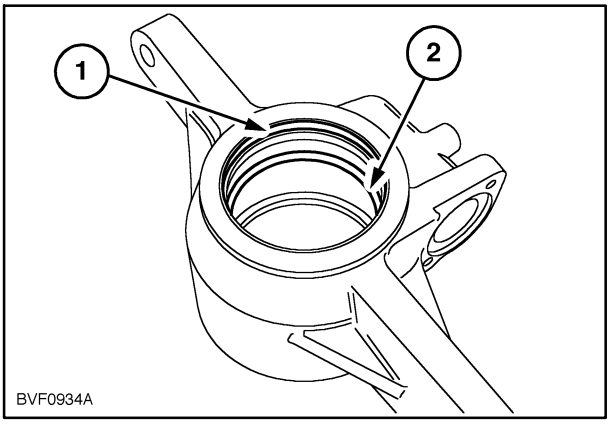
31

5. Remove the solenoid from the PTO control housing.



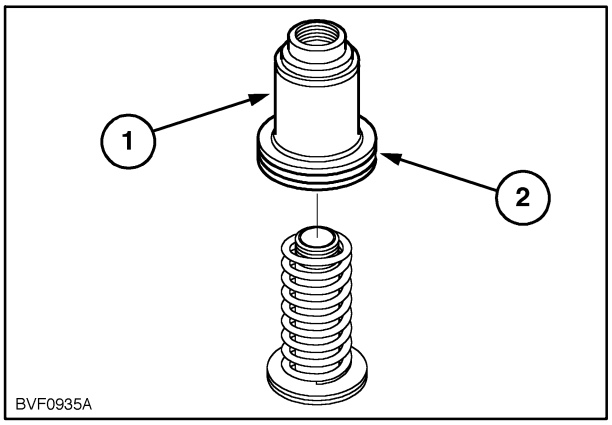
32

6. Remove and discard the PTO control housing dust ring (1) and piston oil seal (2).



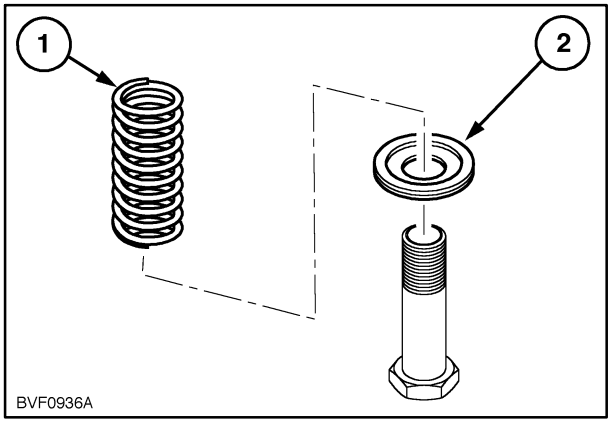
33

7. Using a suitable vice, clamp the head of the piston spring compression bolt (M36 x 4 x 140 mm). Using the special tool **380001158** release the spring tension and remove the piston (1).
8. Remove and discard the piston oil seal (2).



34

9. Remove the spring (1) and cover (2)

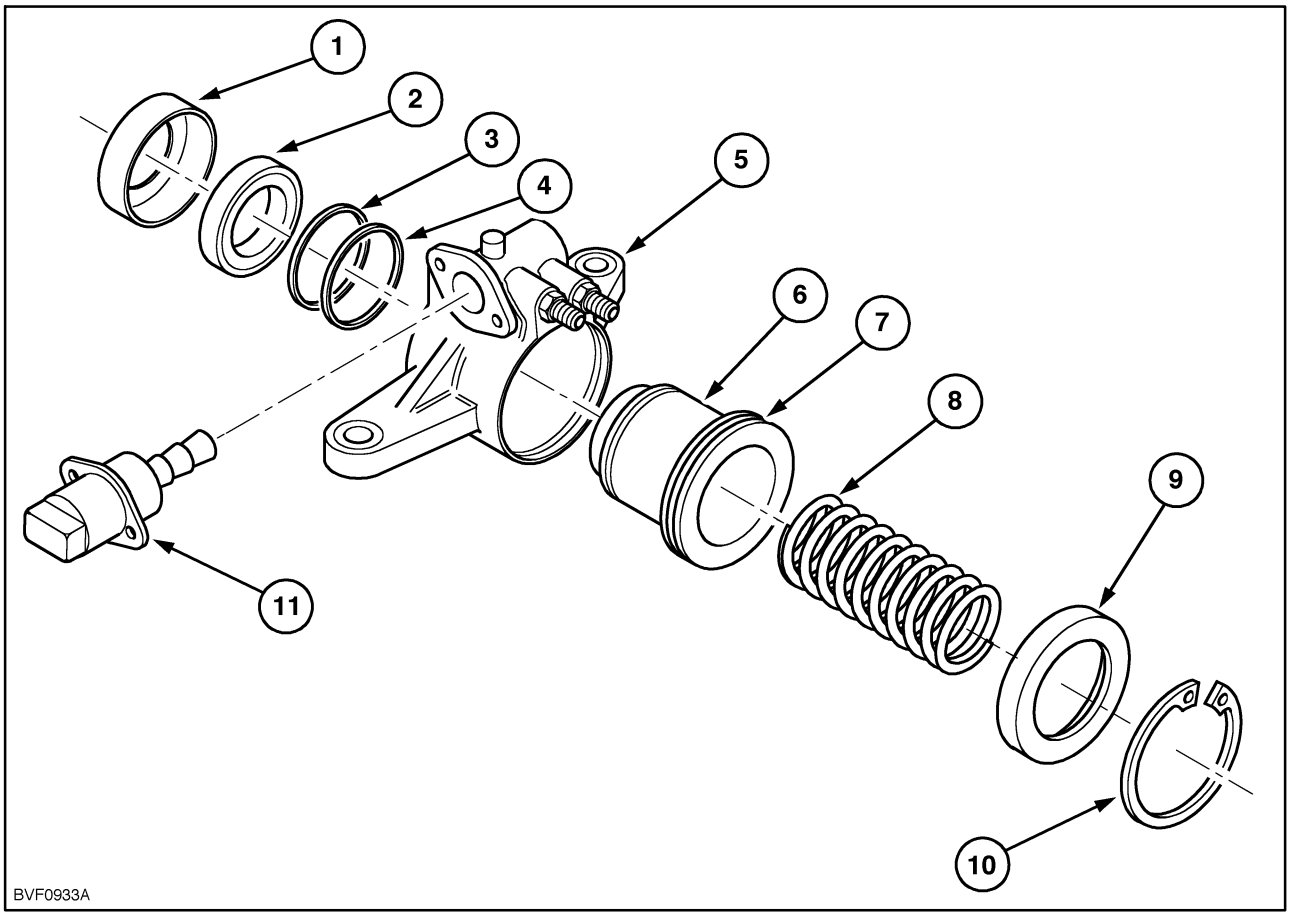


35

Assembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

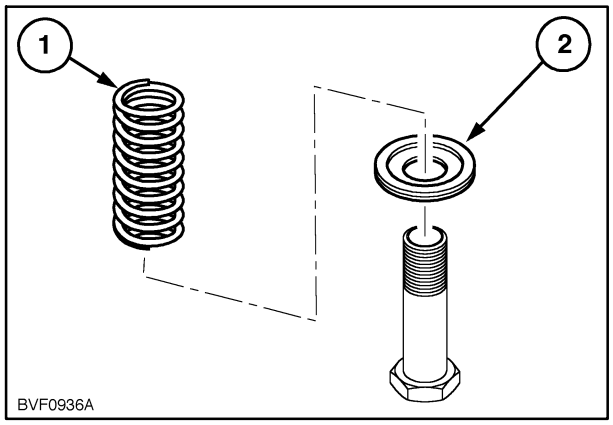


36

PTO Control Housing Exploded View

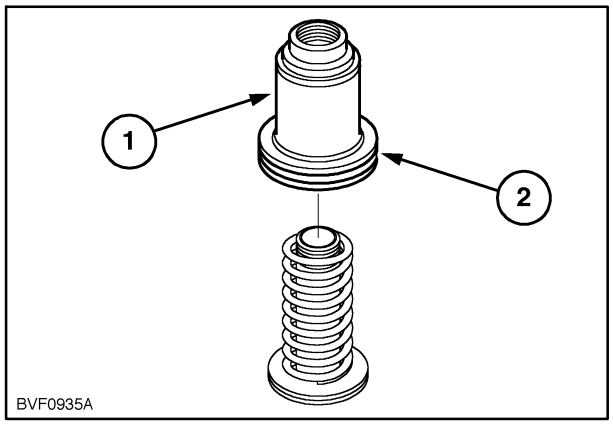
1. Bearing cover
2. Bearing
3. Dust ring
4. Piston oil seal
5. PTO control housing
6. Piston
7. Piston seal
8. Spring
9. Spring cover
10. Circlip
11. Solenoid valve

1. Install the spring (1) and cover (2)



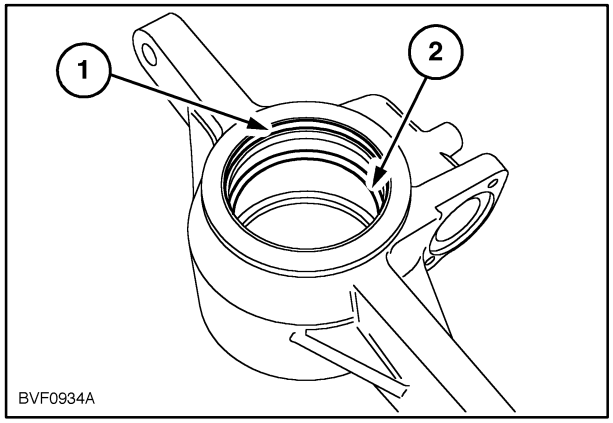
37

2. Install a new piston oil seal (2).
3. Install the piston (1).
4. Using special tool **380001158**, tighten the piston to fully compress the spring.



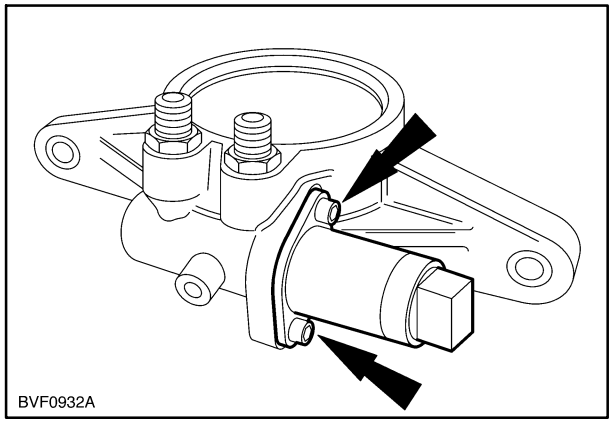
38

5. Install a new dust ring (1) and a new piston oil seal (2) into the PTO control housing.



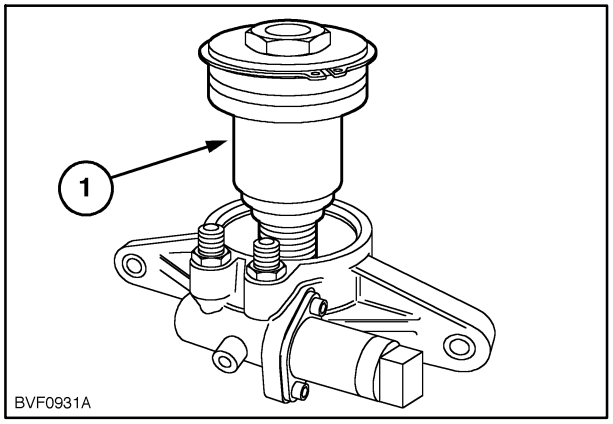
39

6. Install the solenoid valve into the PTO control housing.



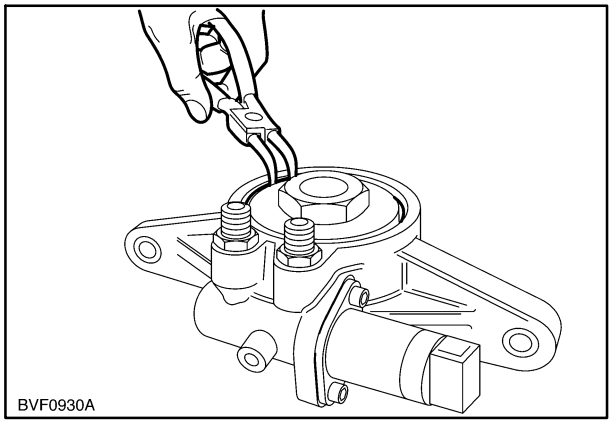
40

7. Partially install the piston and spring assembly(1) into the PTO control housing.



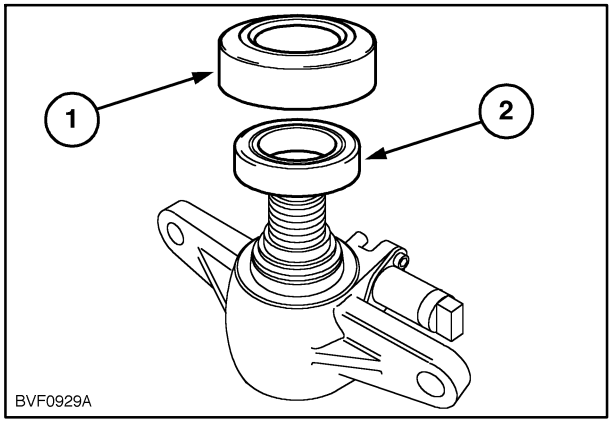
41

8. Using suitable circlip pliers, compress the circlip and fully install the piston into the PTO control housing.



42

9. Install the clutch release bearing (2) and the clutch release bearing cover (1).



43

Installation

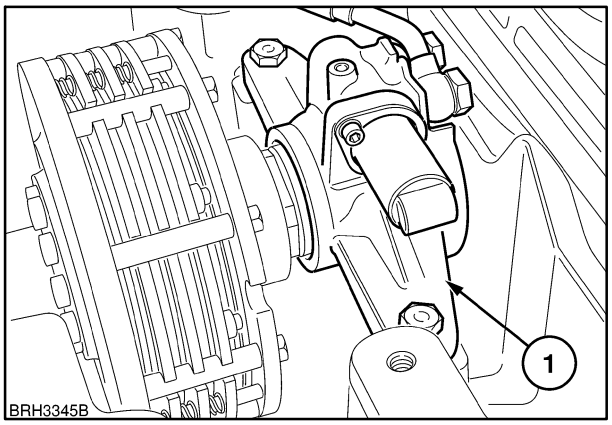
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear goggles, gloves and footwear.

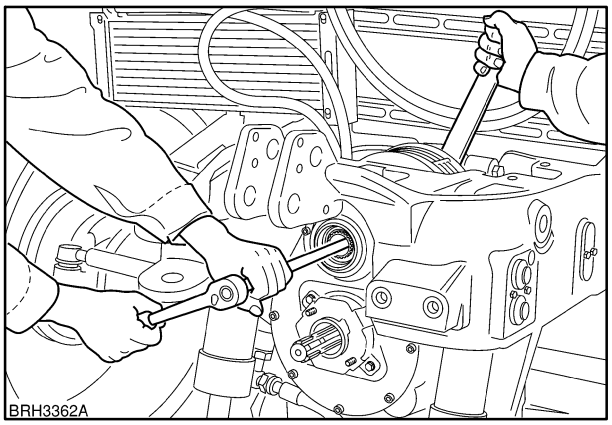
1. Install the PTO control housing. Tighten the retaining bolts to the specified torque value.



44

2. Hold the piston with special tool **380001158**, while releasing the piston spring compression bolt.

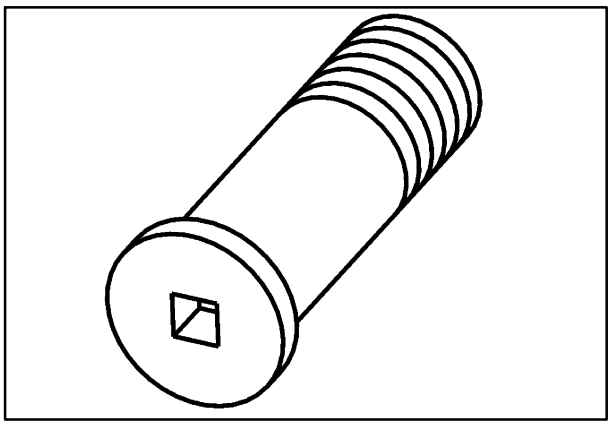
   Screw out the piston spring compression bolt until the piston is released and in contact with the thrust bearing of the control housing.



45

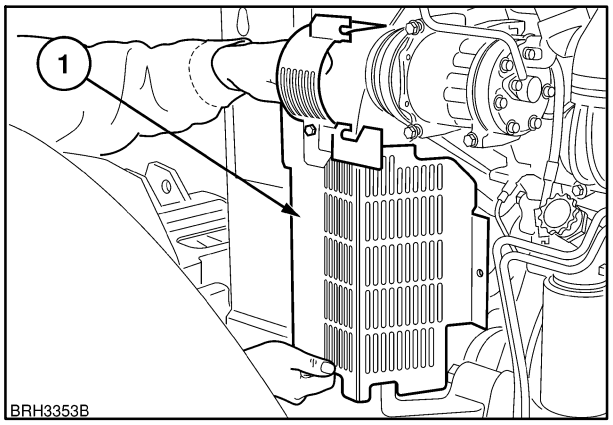
3. Remove the piston spring compressing bolt, part number, **47057766**, from the control housing, underneath the radiator.

NOTE: *Tighten the radiator bolts if loosened during disassembly.*



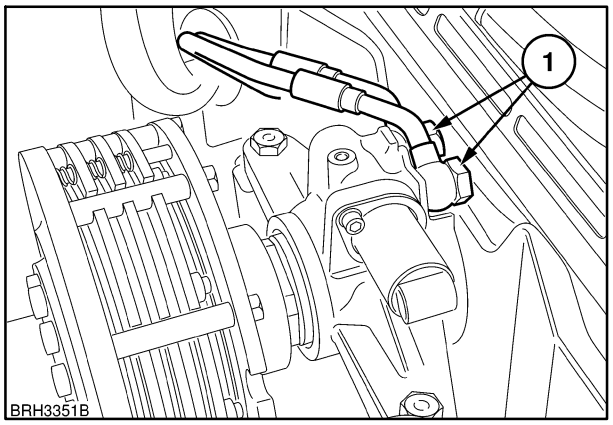
46

4. Install the drive belt guard (1) to the left hand side of the engine.



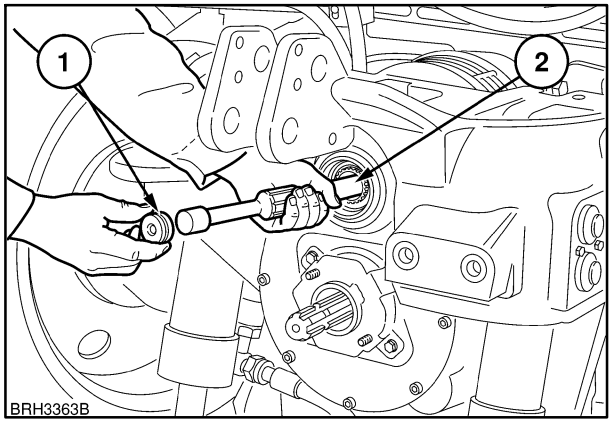
47

5. Connect the hydraulic lines (1) to the control housing.



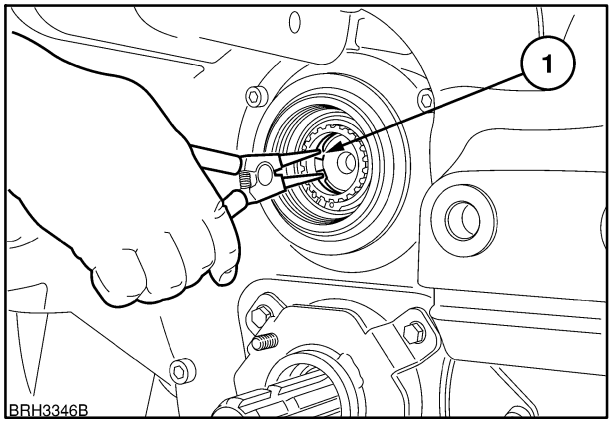
48

6. Install the PTO input shaft (2) and plug (1).



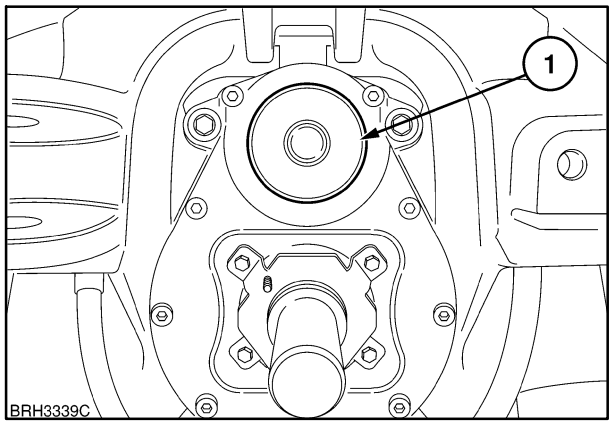
49

7. Using suitable circlip pliers, install the PTO input shaft plug circlip (1).



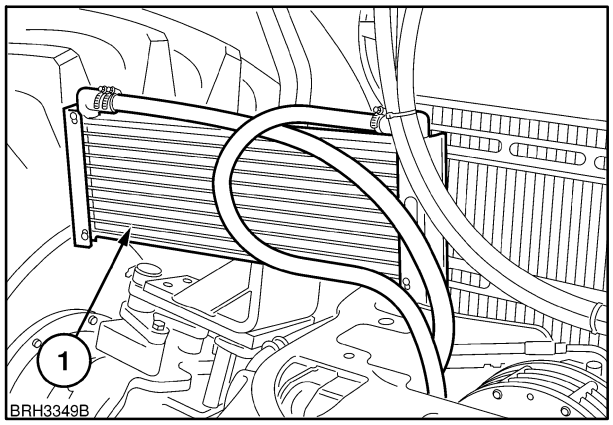
50

8. Install the PTO input shaft cover (1). Tighten to the specified torque value.



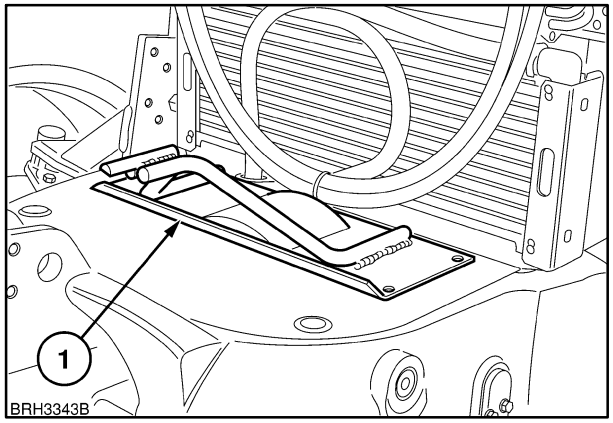
51

9. Slide the transmission oil cooler (1) across the radiator and secure.



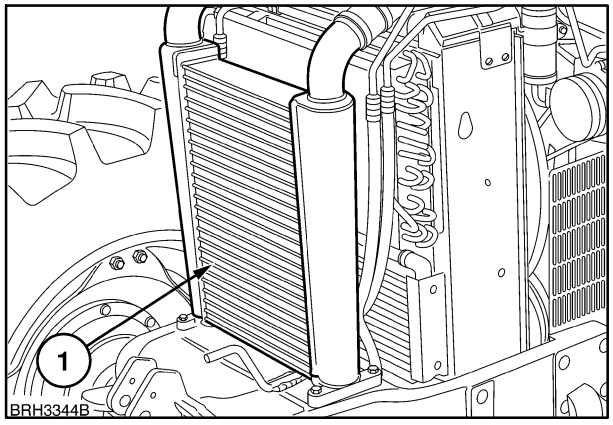
52

10. Install the front axle support cover plates (1).



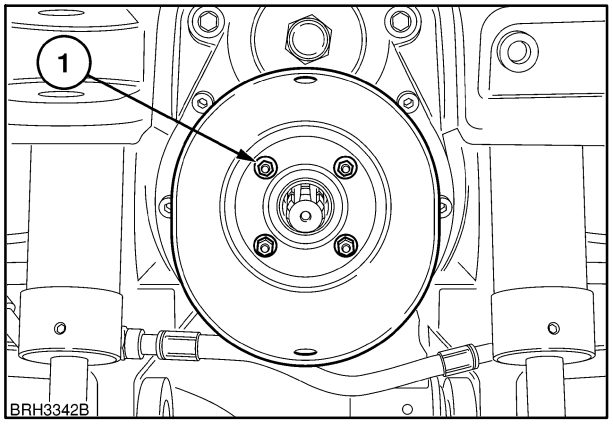
53

11. Install the Intercooler (1).



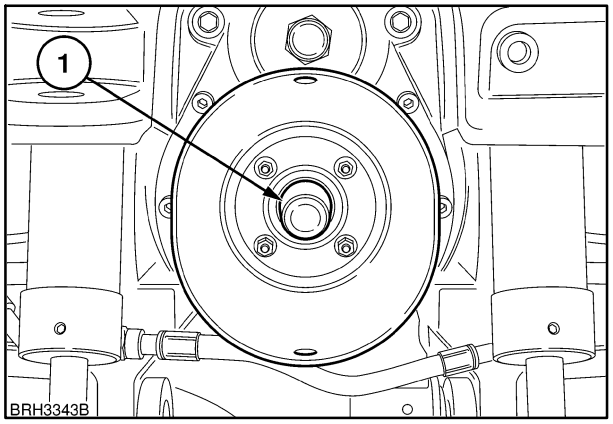
54

12. Install the PTO guard and tighten the bolts x4 (1) to the correct torque.



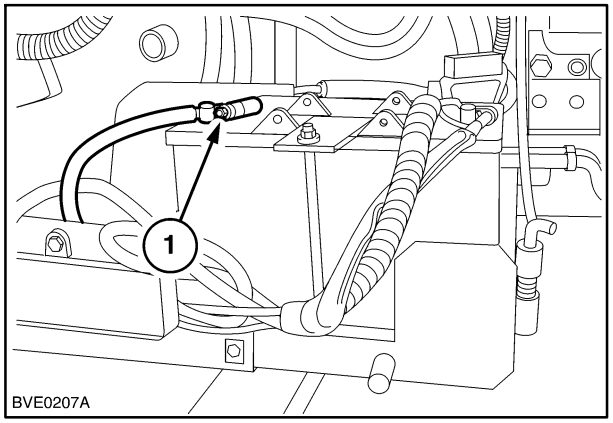
55

13. Install the PTO output shaft cover (1).



56

14. Connect the battery negative cable (1) and install the battery cover.



57

FRONT PTO CLUTCH

Removal

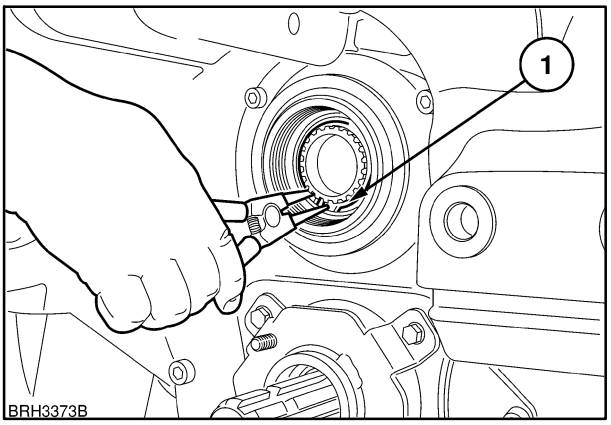
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

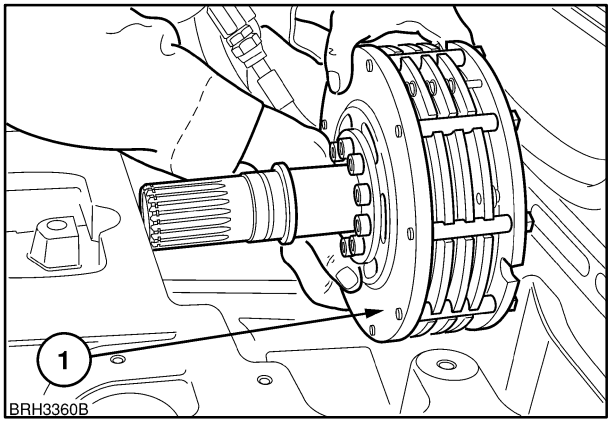
Wear goggles, gloves and footwear.

1. Remove the PTO control housing (refer to PTO control housing removal in this chapter).
2. Using suitable circlip pliers, remove the PTO clutch shaft circlip (1).



58

3. Remove the PTO clutch (1).



59

Disassembly

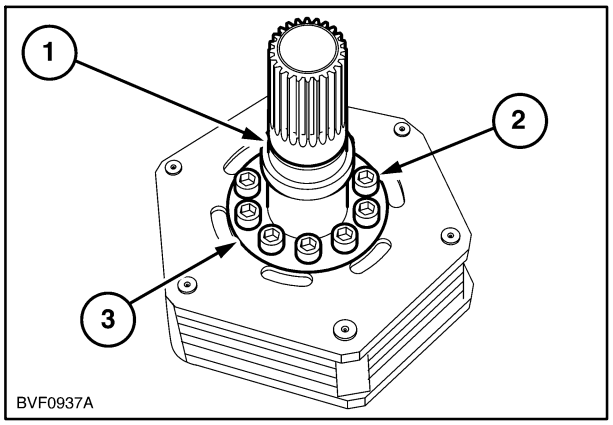
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

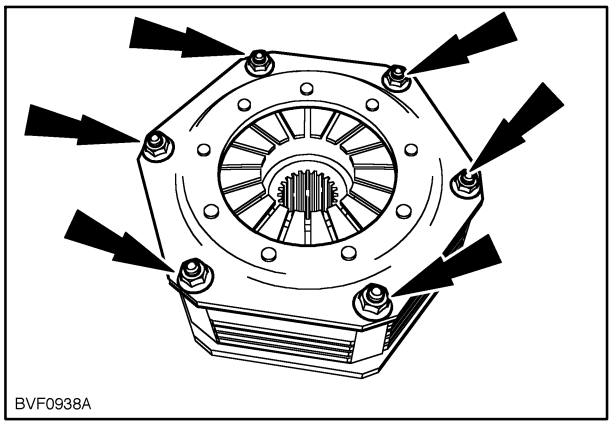
Wear goggles, gloves and footwear.

1. Remove and discard the front PTO clutch shaft O-ring seal (1).
2. Remove the retaining bolts (2) and remove the front PTO clutch shaft (3).



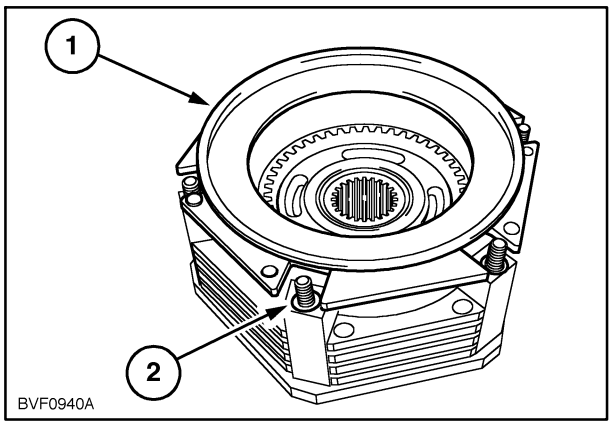
60

3. Remove the PTO clutch pressure plate.



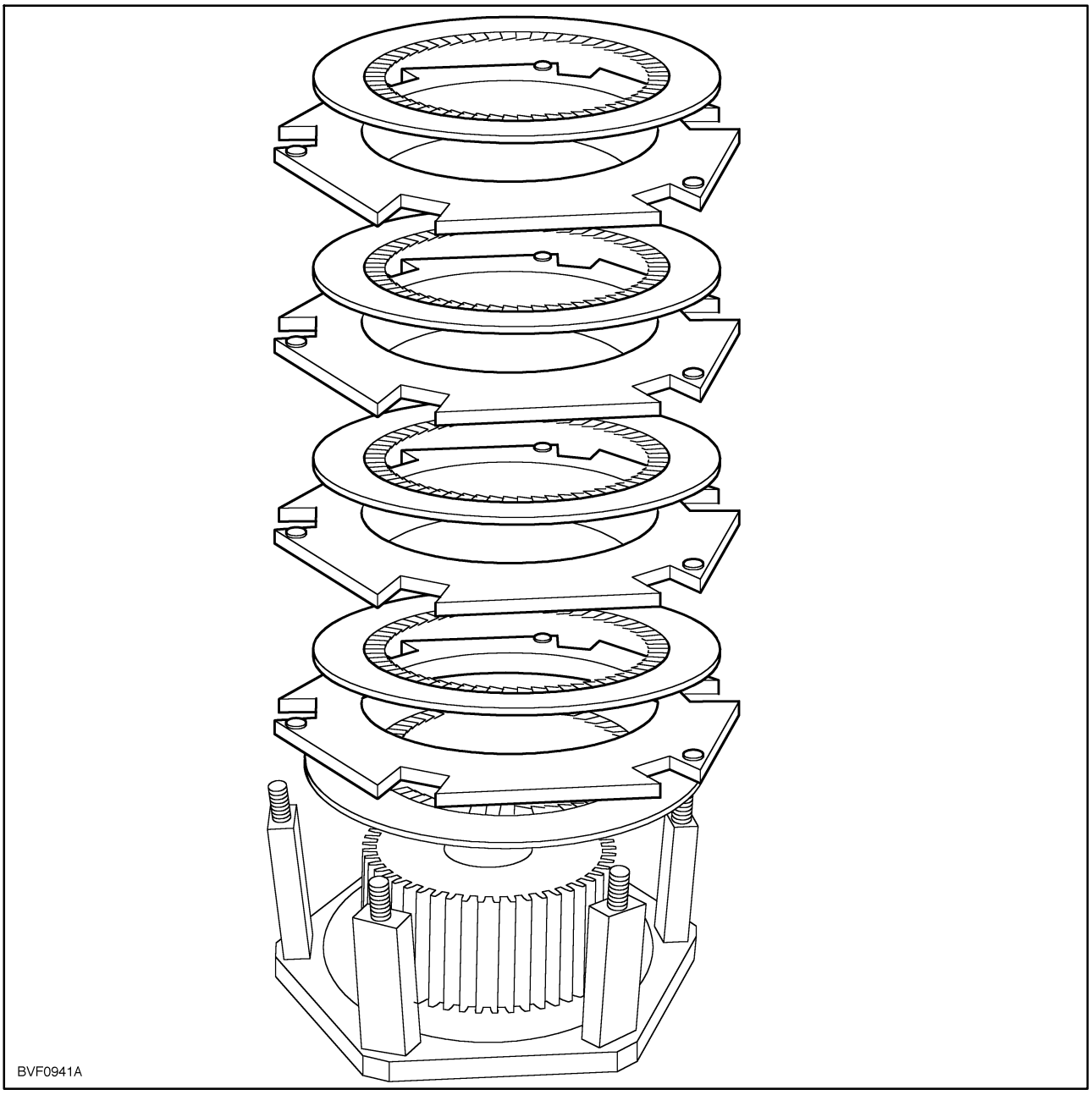
61

4. Remove the PTO clutch top plate (1).
5. Remove the washers (2).



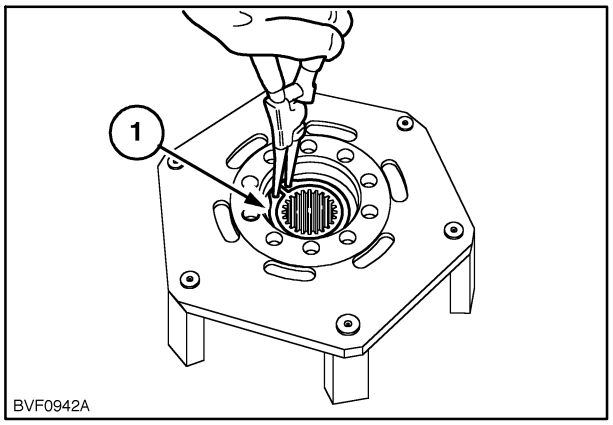
62

6. Remove the friction discs and steel plates from the PTO clutch.

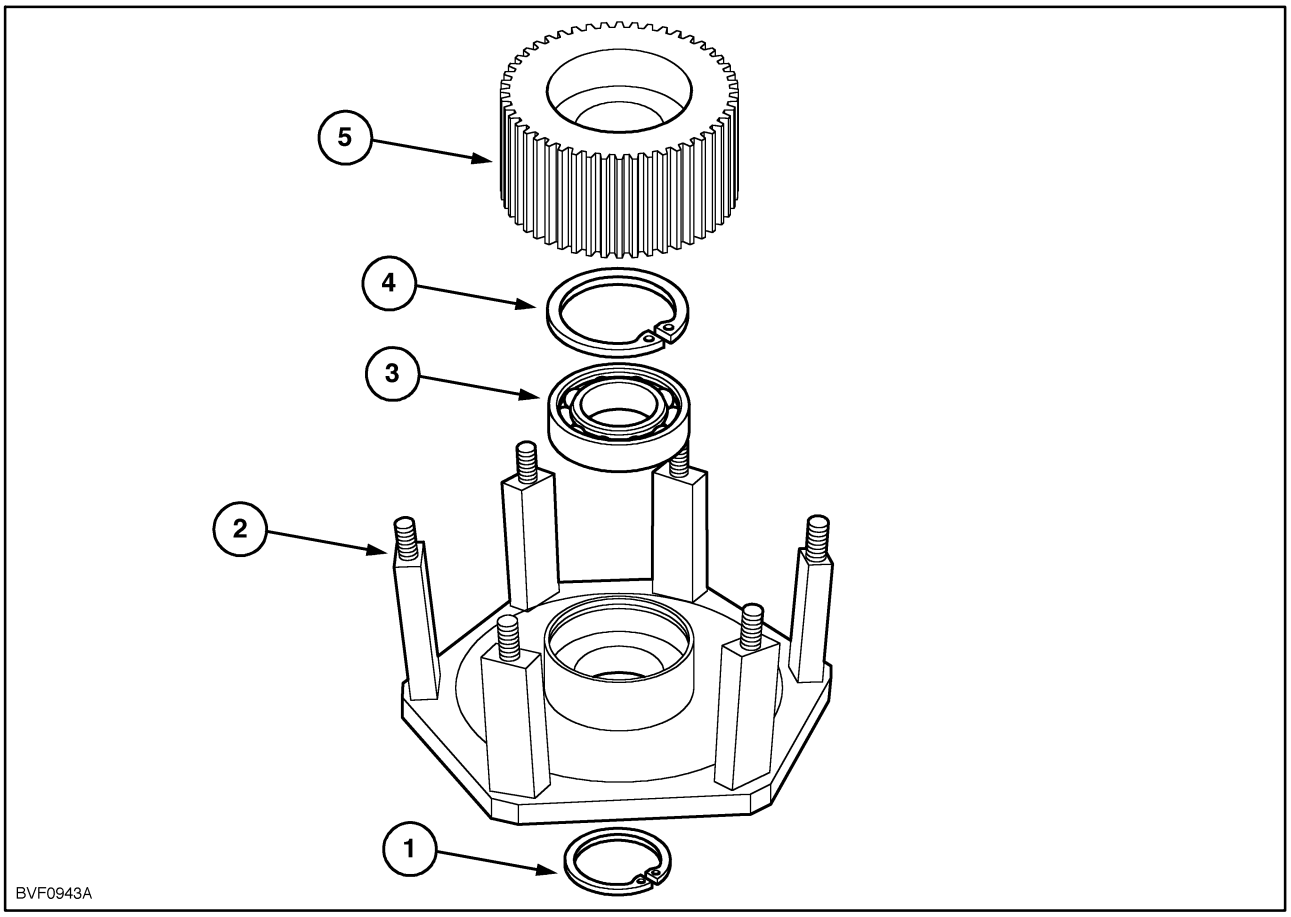


63

7. Using suitable circlip pliers, remove the clutch hub circlip (1).



64



65

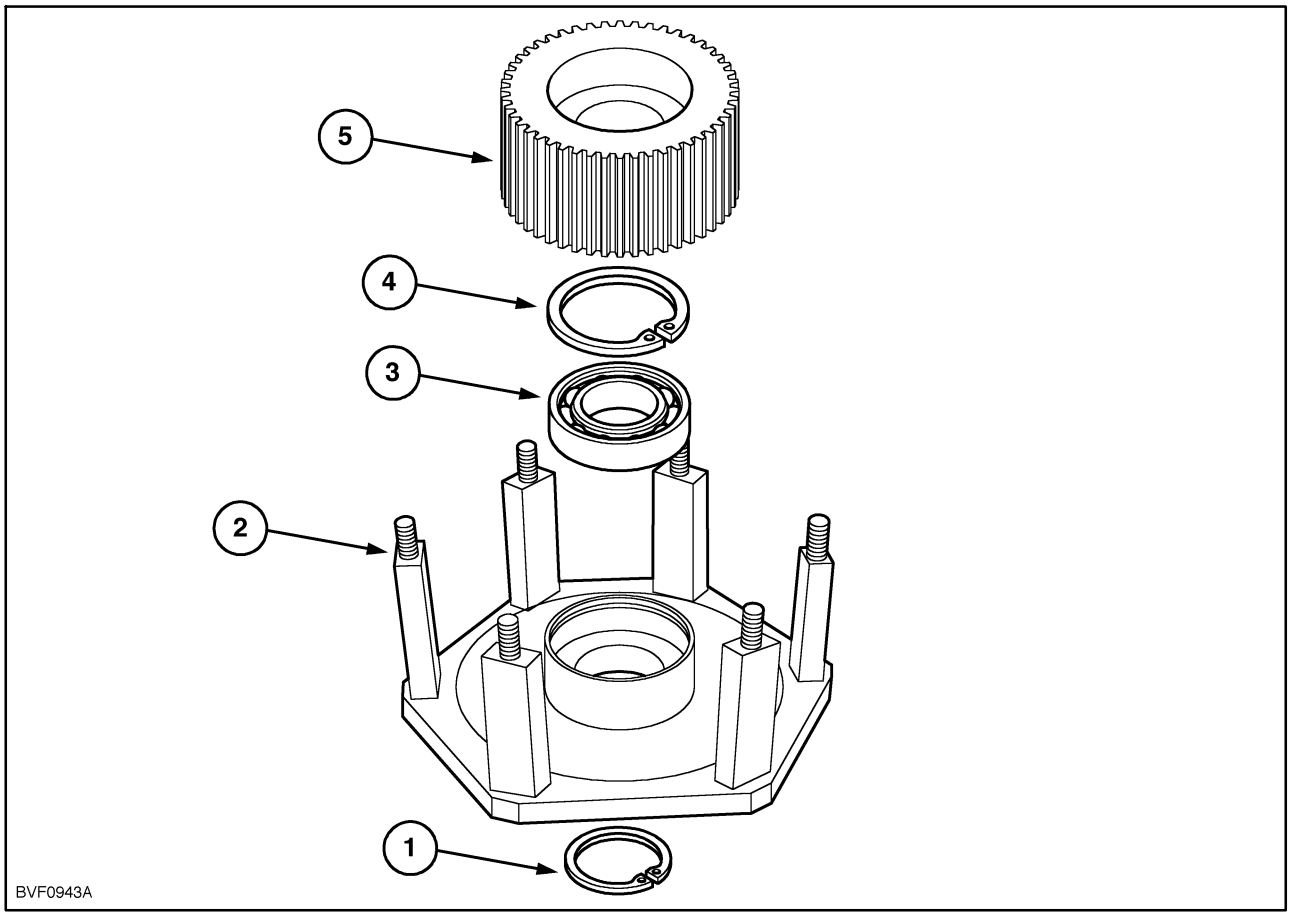
PTO Clutch Assembly Exploded View

1. Circlip
2. PTO clutch plate housing
3. Bearing
4. Circlip
5. Clutch hub

Assembly

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.



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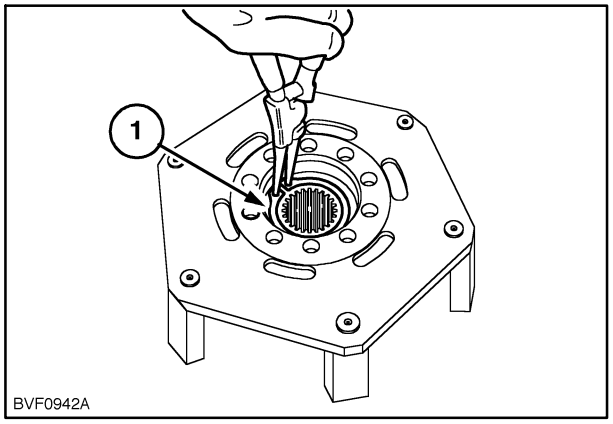
PTO Clutch Assembly Exploded View

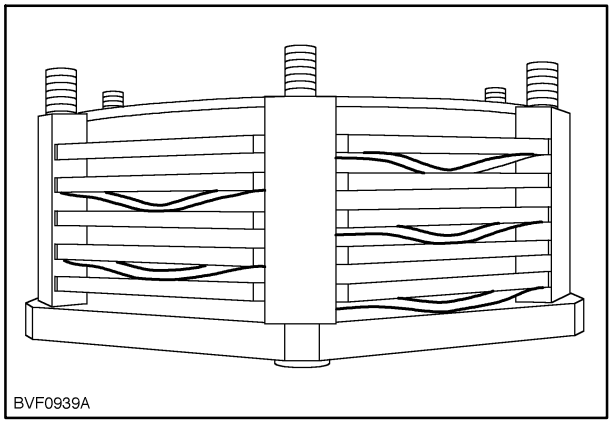
1. Circlip
2. PTO clutch plate housing
3. Bearing
4. Circlip
5. Clutch hub

1. Using suitable circlip pliers, install the clutch hub circlip (1).



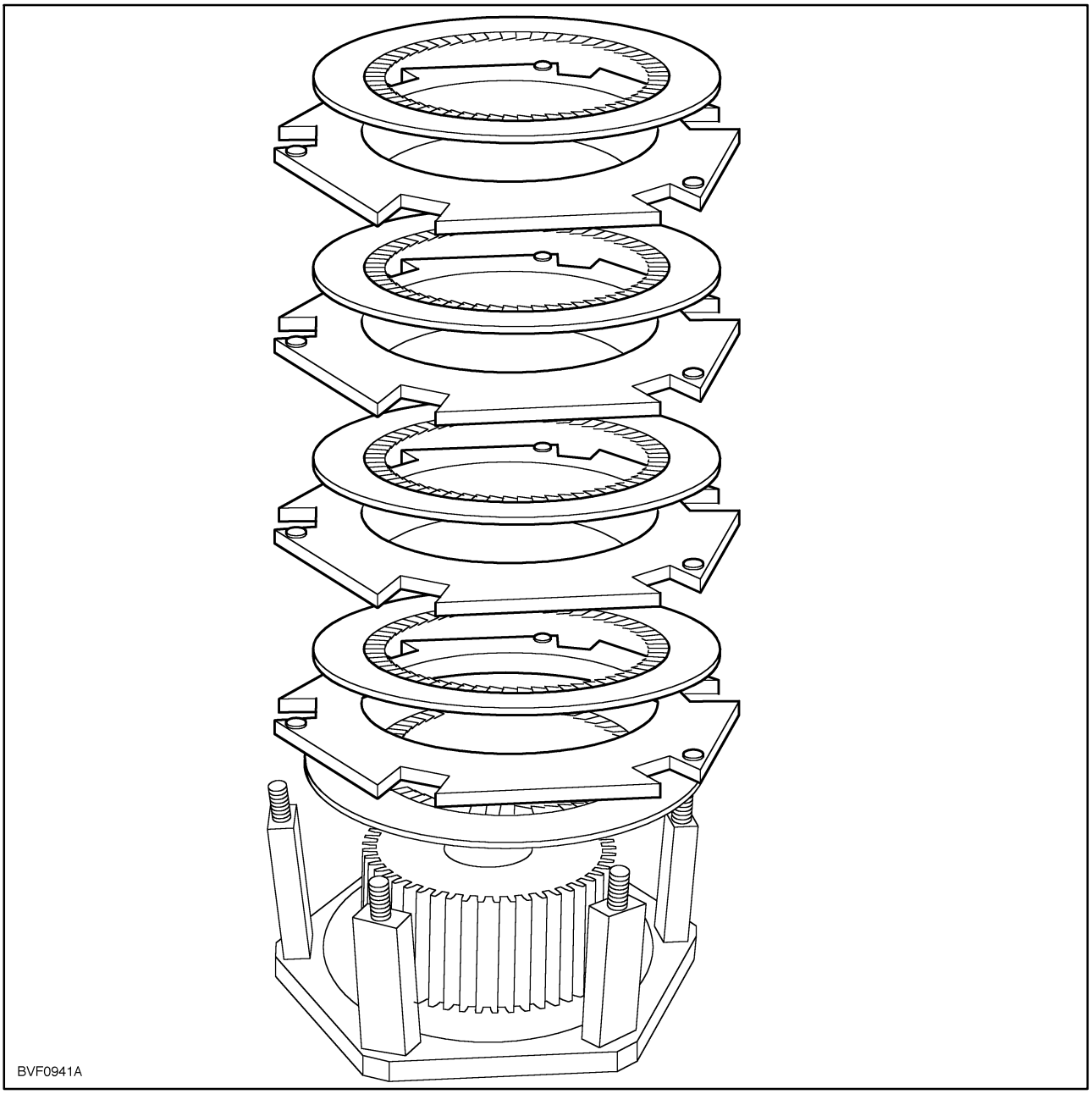
67

NOTE: *Make sure that the steel plates are installed alternately as indicated.*



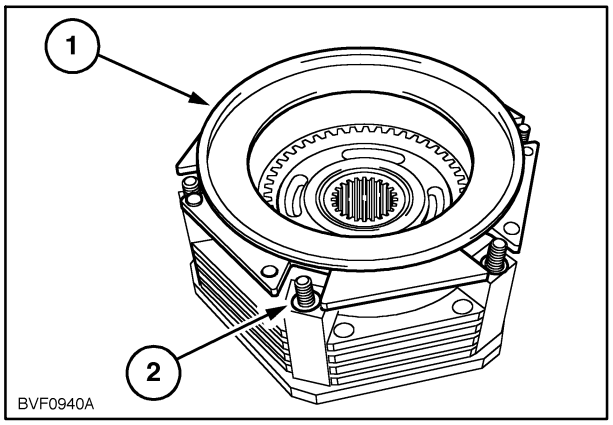
68

2. Install the friction discs and steel plates into the PTO clutch.



69

3. Install the washers (2).
4. Install the PTO clutch top plate (1).



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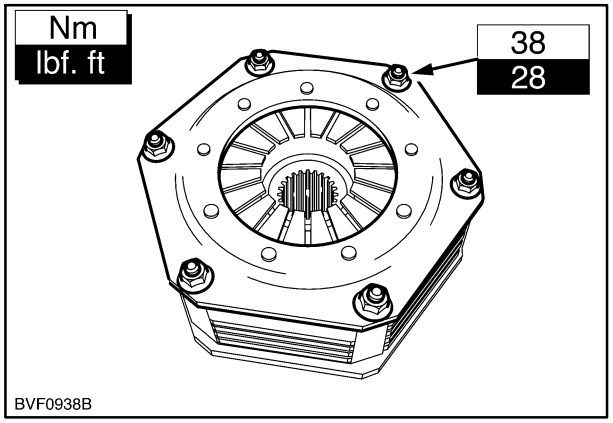
5. Install the PTO clutch pressure plate. Tighten the retaining nuts to the specified torque value.



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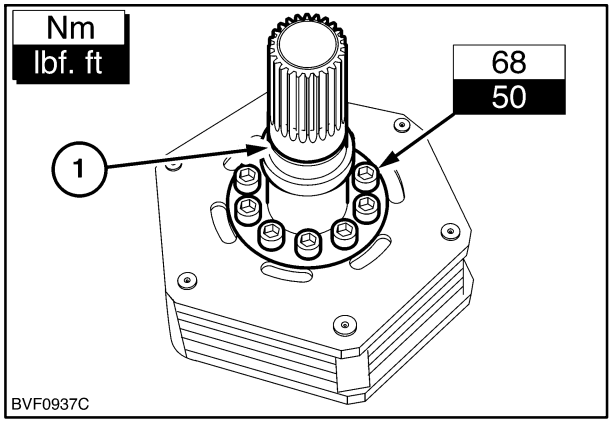
6. Install the PTO clutch shaft. Tighten the retaining bolts to the specified torque value.
7. Install a new front PTO clutch shaft O-ring seal (1).



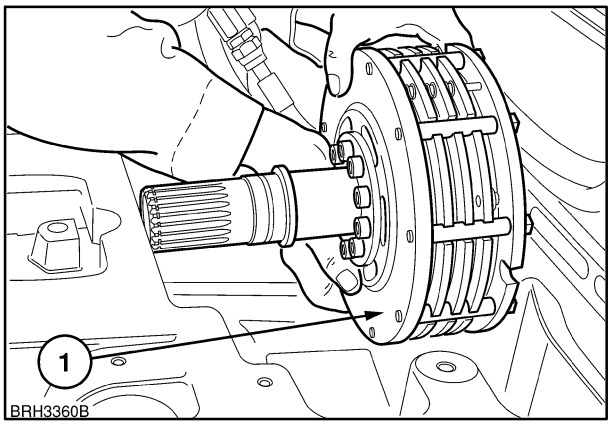
72

Installation

⚠ WARNING ⚠

Handle all components with the greatest care.
Do not insert hands or fingers between the parts.
Wear goggles, gloves and footwear.

1. Install the PTO clutch (1).



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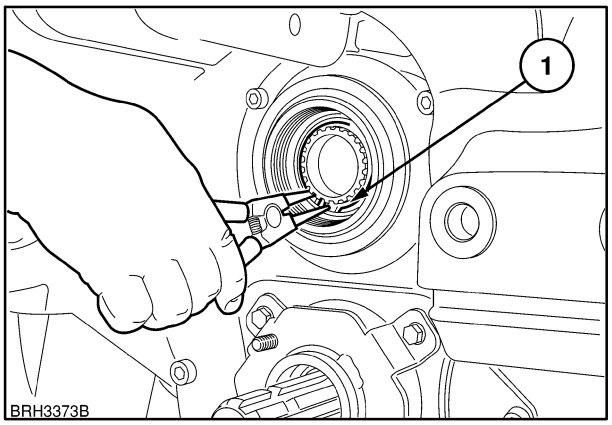
2. Using suitable circlip pliers, install the PTO clutch shaft circlip (1).
3. Install the PTO control housing (refer to PTO control housing installation in this chapter).



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FRONT PTO REDUCTION GEARBOX

Removal

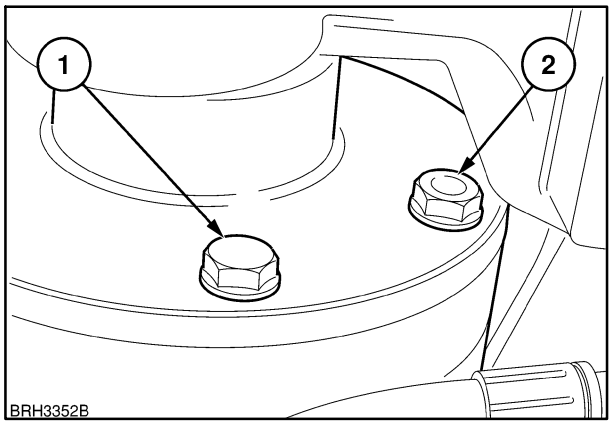
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

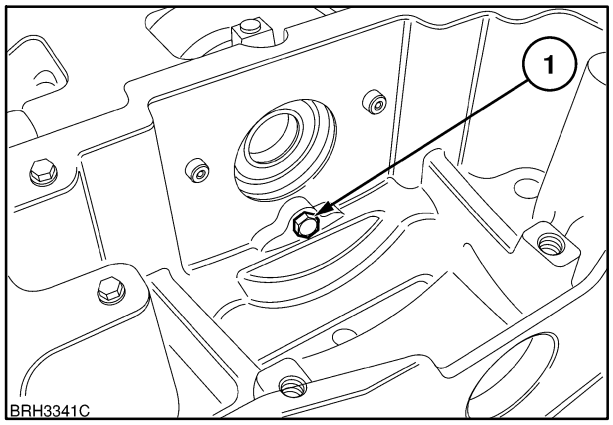
Wear goggles, gloves and footwear.

1. Remove the PTO clutch (refer to PTO clutch removal in this chapter).
2. Remove the drain plug (1) and drain the oil into a suitable container.
3. Install the drain plug (1) after the oil has drained.



75

4. Remove the front PTO reduction gearbox rear retaining bolt (1).



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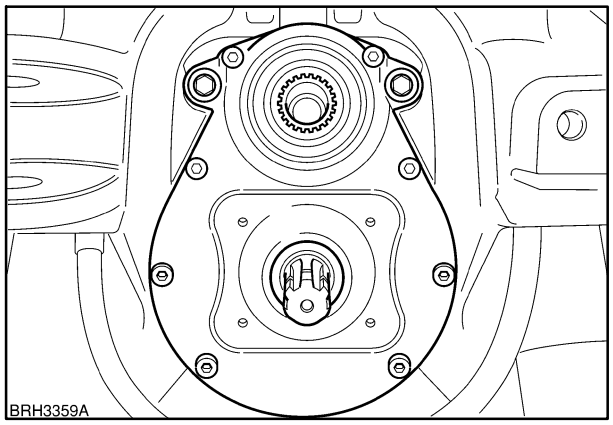
5. Remove the front PTO reduction gearbox.



77

Disassembly

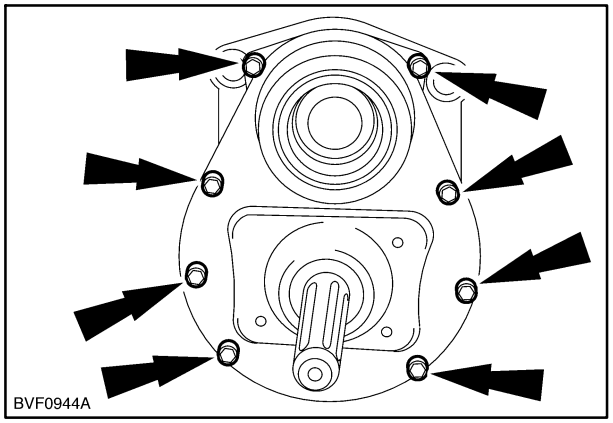
WARNING

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear goggles, gloves and footwear.

1. Remove the front PTO reduction gearbox (refer to front PTO reduction gearbox removal in this chapter).
2. Remove the PTO reduction gearbox front cover retaining bolts.



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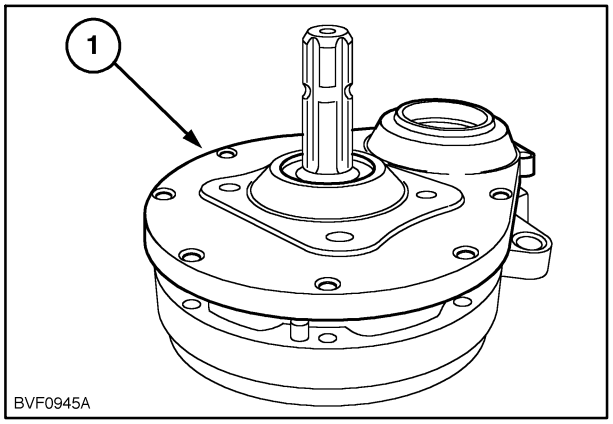
3. Remove the PTO reduction gearbox front cover (1).



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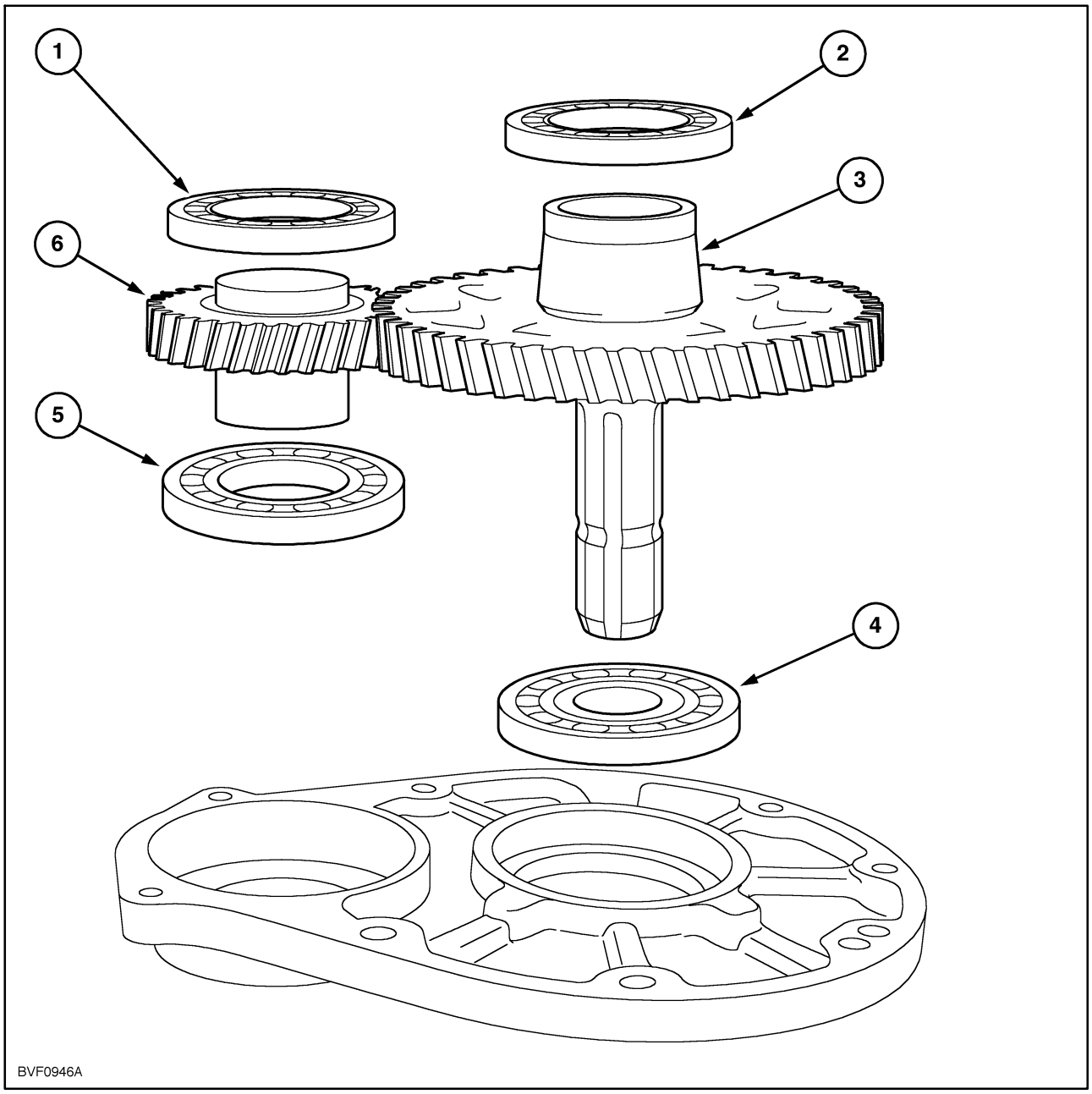

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Front PTO Reduction Gearbox Exploded View

1. Bearing
2. Bearing
3. PTO driven gear assembly
4. Bearing
5. Bearing
6. PTO drive gear

Assembly

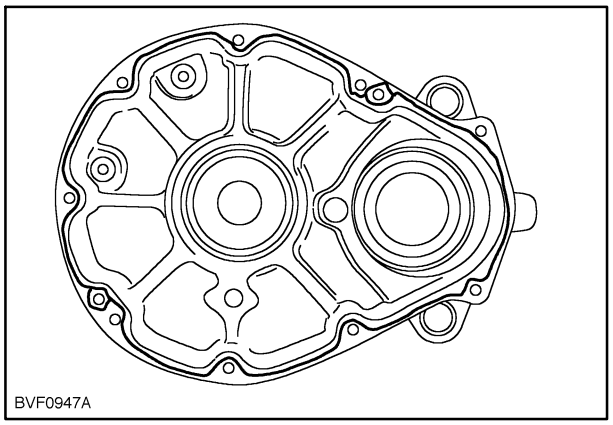
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear goggles, gloves and footwear.

1. Thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately 2mm diameter following the pattern shown.



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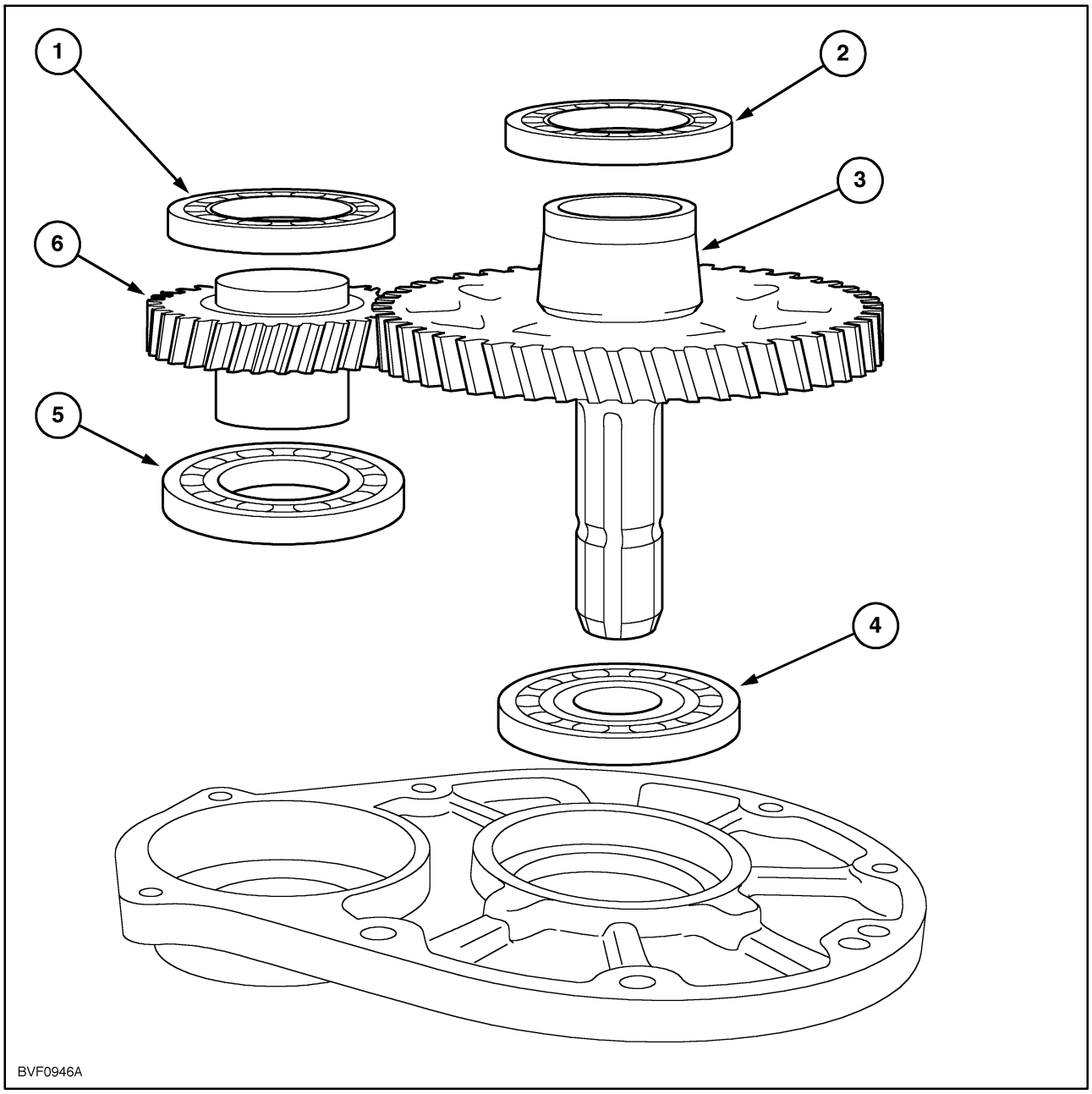

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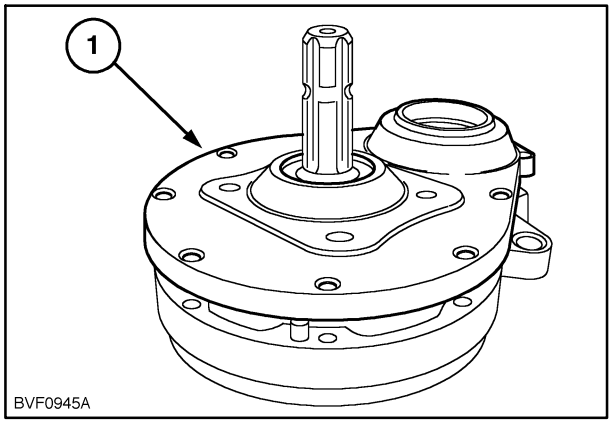
Front PTO Reduction Gearbox Exploded View

1. Bearing
2. Bearing
3. PTO driven gear assembly
4. Bearing
5. Bearing
6. PTO drive gear

2. Install the PTO reduction gearbox front cover.



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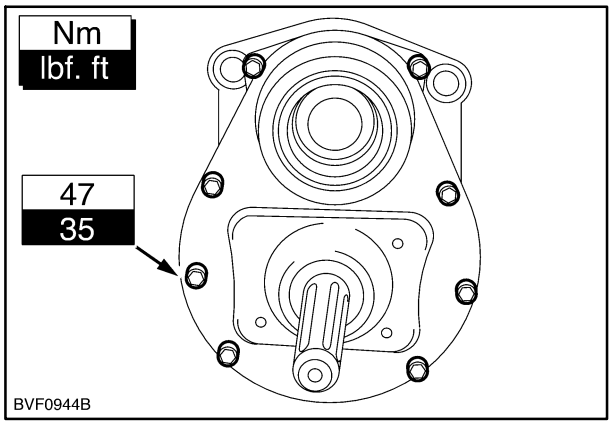
3. Install the PTO reduction gearbox front cover retaining bolts. Tighten to the specified torque value.



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Installation

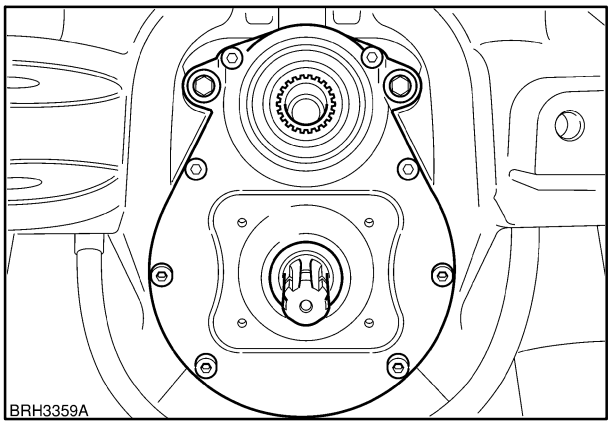
⚠ WARNING ⚠

Handle all components with the greatest care.

Do not insert hands or fingers between the parts.

Wear goggles, gloves and footwear.

1. Install the PTO reduction gearbox and the retaining bolts. Tighten the retaining bolts to the specified torque value.



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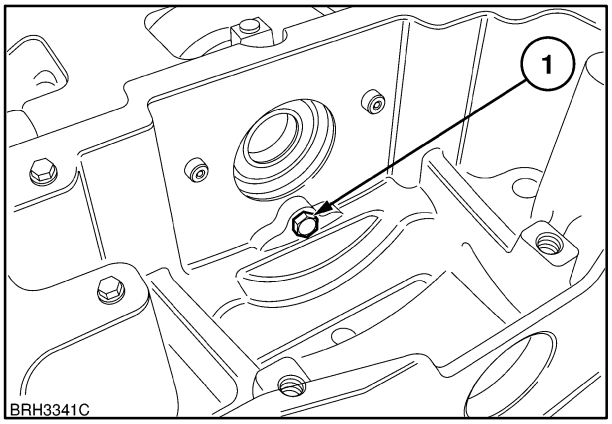
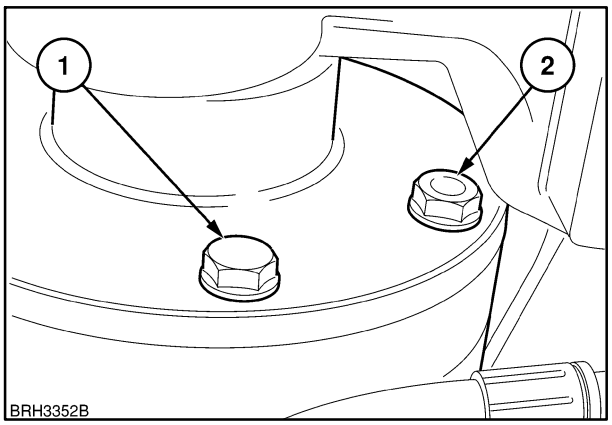
2. Install the PTO rear retaining bolt. Tighten to the specified torque value.



86

3. Remove the refill/level plug (2).
4. Fill the PTO reduction gearbox with the correct specification oil, until the oil can be seen level with the refill/level plug hole.
5. Install the refill/level plug (1).
6. Install the front PTO clutch (refer to PTO clutch installation in this chapter).



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NOTES

SECTION 41 – STEERING

Chapter 1 – Hydrostatic Steering System

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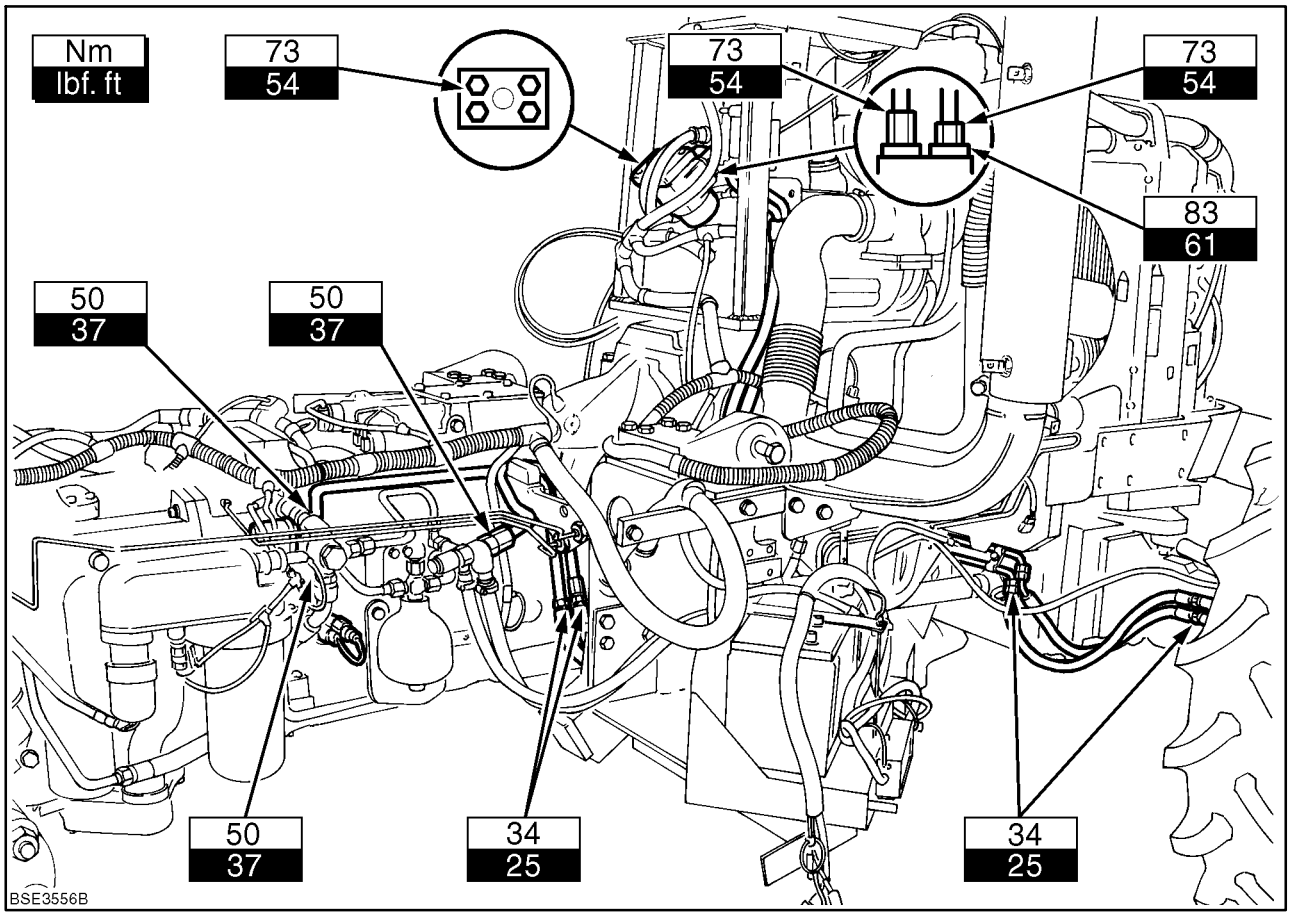
Op. 41 000

SPECIFICATIONS

HYDROSTATIC SYSTEM		
Pump specifications	**2WD**	**4WD**
Minimum Pump Output		
Litres/min.	40	40
Imp.Galls/min.	8.8	8.8
U.S. Galls/min.	10.6	10.6
Steering Motor Displacement	100cc/rev Std Axle 125cc/rev HD Axle	160cc/rev
Relief Valve Maximum Differential Pressure Setting	145 Bar Std Axle (2100 lbf.in^2) 170 Bar HD Axle (2465 lbf.in^2)	170 Bar (2465 lbf.in^2)
Absolute Gauge Pressure	161 Bar Std Axle (2335 lbf.in^2) 186 Bar HD Axle (2700 lbf.in^2)	186 Bar (2700 lbf.in^2)
TWO WHEEL DRIVE AXLE		
Standard Tyre (Front)	7.5 x 16	
Maximum Steering angle	55°	
Steering Wheel Turns (Lock to Lock)	3.3	
Cylinder	1 off Double Acting	
Turning Radius with Brakes	3.277 m	
Turning Radius less Brakes	3.66 m	
Toe-out	0-13 mm	
FOUR WHEEL DRIVE AXLE		
Standard Tyre (Front)	14.9 R24	
Maximum Steering angle	55° or 65° with SuperSteer	
Steering Wheel Turns (Lock to Lock)	3.9	
Cylinder	2 off double acting	
	4 cyl	**6 cyl**
Turning Radius with Brakes (4WD disengaged)	3.510 m	3.745 m
Turning Radius less Brakes (4WD disengaged)	4.040 m	4.355 m
Turning Radius with Brakes (with SuperSteer)	3.495 m	3.860 m
Turning Radius less Brakes (With SuperSteer)	3.755 m	4.145 m
Toe-In	0-6mm	

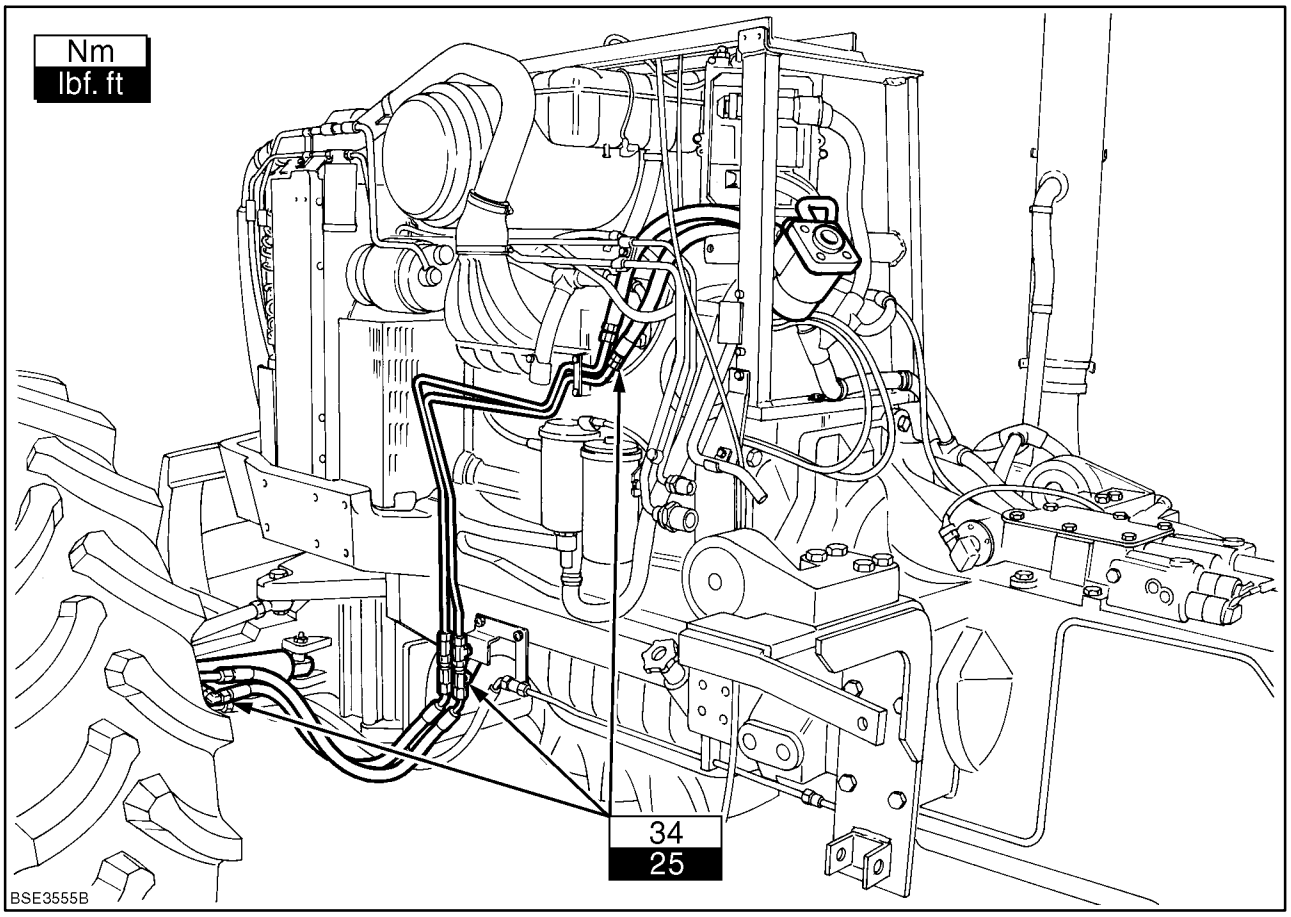
TIGHTENING TORQUES



1

Steering General

	Nm	lbf.ft
Steering Wheel Retaining Nut	23.0	17.0
Front Wheel Nut 2WD	314.0	230.0
Front Wheel Nut 4WD	211.0	156.0
Motor End Cover	23.0	17.0
Cylinder, Rod End Nut (2WD)	270.0	200.0
Cylinder, Tube End Nut (2WD)	360.0	265.0
Cylinder, Tube End Pin Retaining Bolt (4WD)	23.0	17.0
Column to Frame Bolt	23.0	17.0



2

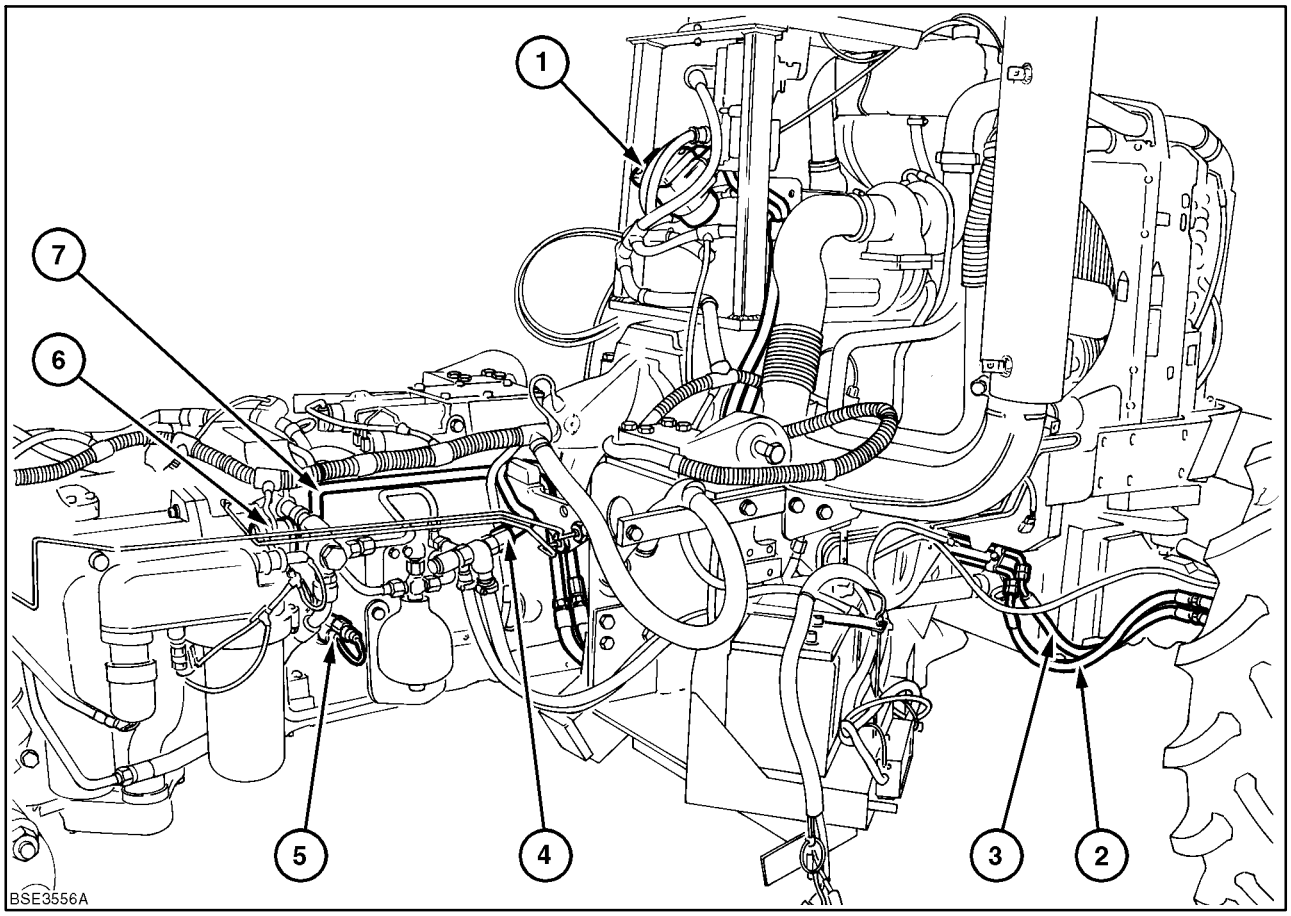
SPECIAL TOOLS

DESCRIPTION	TOOL NUMBER
Roto-glyd Seal Installer	294056
T-adaptor $^{11}/_{16}$ ORFS female x $^{11}/_{16}$ ORFS male x $^{7}/_{16}$ UNF female	297600*
$^{7}/_{16}$ UNF male Quick release adaptor	297240*
Blanking Cap $^{11}/_{16}$ ORFS	297671
Pressure Gauge 0-250 bar	293244#
Quick release adaptor	291924
Pressure gauge hose	292246#

* Part of hydraulic adaptor kit 297611

Part of hydraulic pressure test kit 292870

DESCRIPTION AND OPERATION



3

Hydrostatic Steering System Component Layout (Right Hand Side)

1. Steering Motor
2. Right Hand Turn Hose
3. Left Hand Turn Hose
4. Steering Return Line
5. Switch
6. Steering Pump
7. Pump Output Line

STEERING SYSTEM

All models have fitted as standard, hydrostatic steering systems that are powered when the engine is running, by a fixed displacement hydraulic pump mounted on the rear axle.

Both open and closed centre hydraulic systems share the main intake filter of that system.

The pump, driven by a gear straight from the P.T.O. shaft, pressurises the steering column operated steering motor. The pressurised oil from the steering motor drives the axle mounted double acting steering cylinder (2WD), or twin cylinders (4WD).

A low pressure warning switch is fitted to the pump outlet port and should the pressure in the steering pump system drop below 0.7 bar (10 $lbf.in^2$) a light will illuminate on the instrument cluster.

The steering motor is similar across the vehicle range and is bolted to a bracket within the steering console and connected to the steering column by a splined shaft.

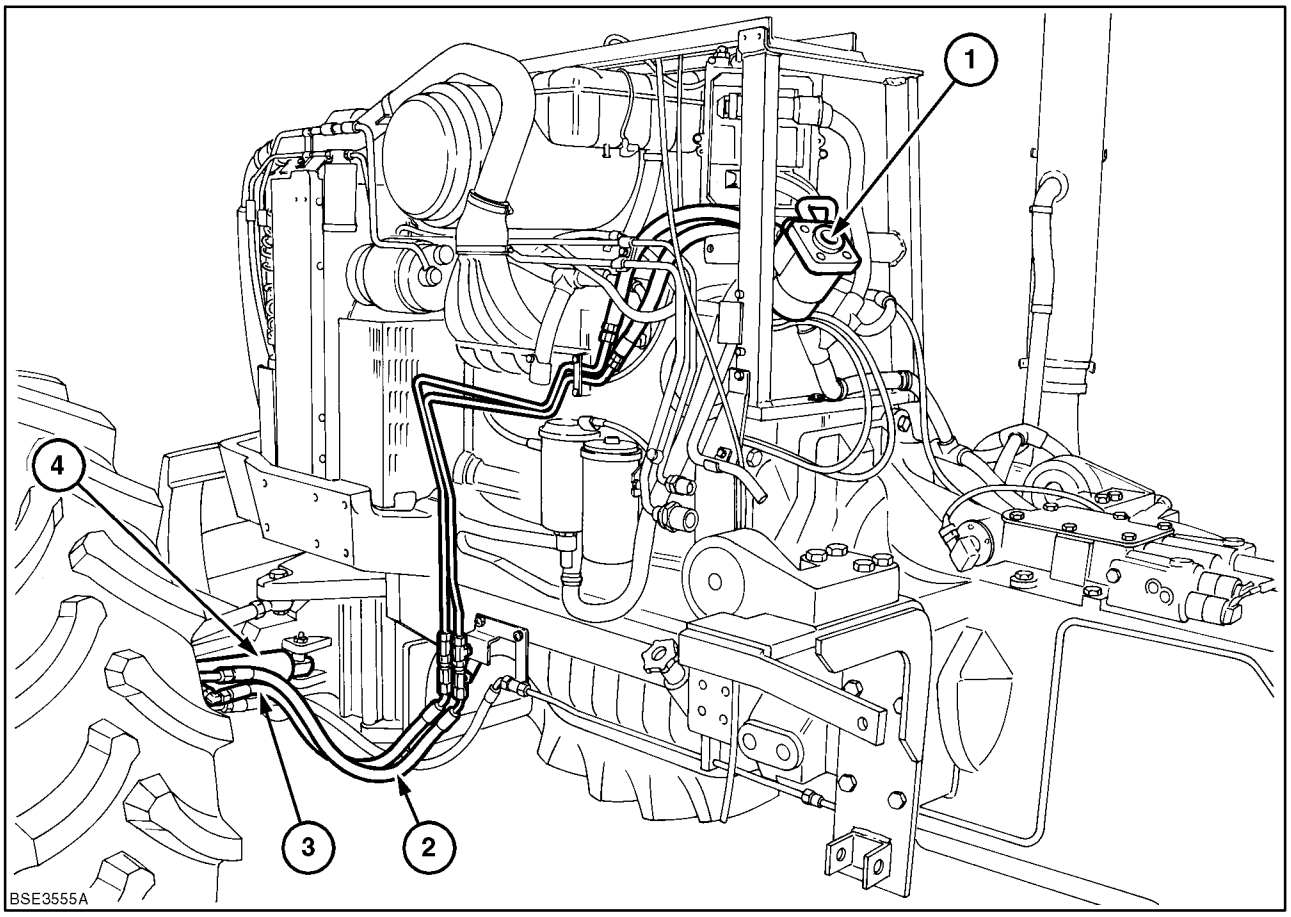
All models, except those with Supersteer, use a reactive type steering motor, models with Supersteer front axle use a non-reactive type motor.

The steering column is adjustable for varying angles of tilt on all models.

On two wheel drive units the steering cylinder is fixed at one end to the front axle beam and at the other to an eye on the spindle steering arm.

On four wheel drive units two steering cylinders are used, one for each wheel. The cylinders are fixed at one end to the axle casing and the piston end to steering arms from the swivel housings.

The pressure relief valve for the system is contained within the steering motor itself.



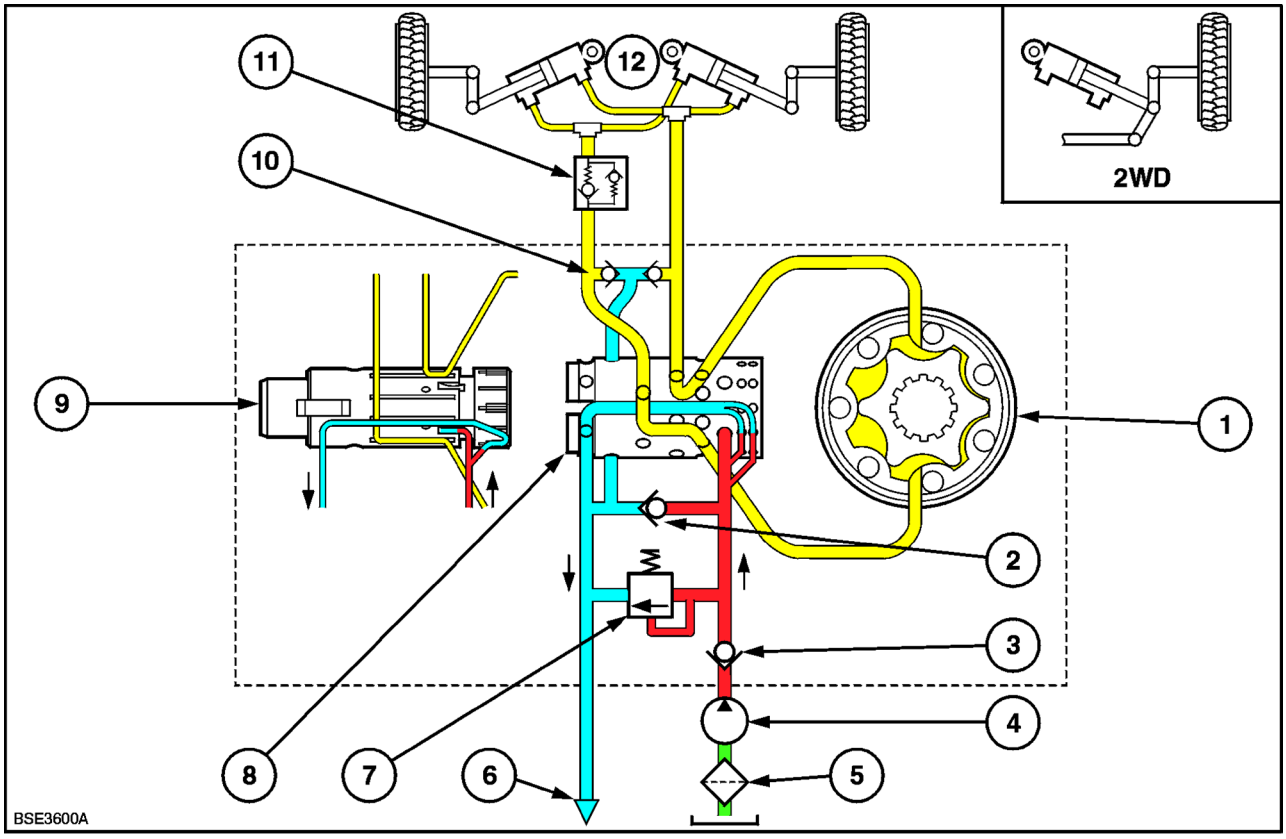
4

Hydrostatic Steering System Component Layout (Left HAnd Side)

1. Steering Motor
2. Right Hand Turn Hose
3. Left Hand Turn Hose
4. Steering Cylinder

Oil is drawn from the rear axle and into the pump through a filter, pressurised by the rotation of the gears, and expelled through the pump outlet port to the steering motor.

The pressurised oil, when received at the steering motor, is directed to the steering actuating cylinder when the steering wheel is turned.



Steering Operation Schematic - Neutral Position

Pump Oil

Trapped Oil

Return Oil
(Restricted by Cooling and Lubrication

Suction Oil

5

1. Metering Unit
2. Check Valve
3. Non Return Valve
4. Pump and Flow Control Valve
5. Filter
6. Return via Cooling and Lubrication
7. Pressure Relief Valve
8. Control Valve Sleeve
9. Control Valve Spool
10. Suction Valves (2WD Only)
11. Bias Valve (2WD Only)
12. Steering Cylinder/s

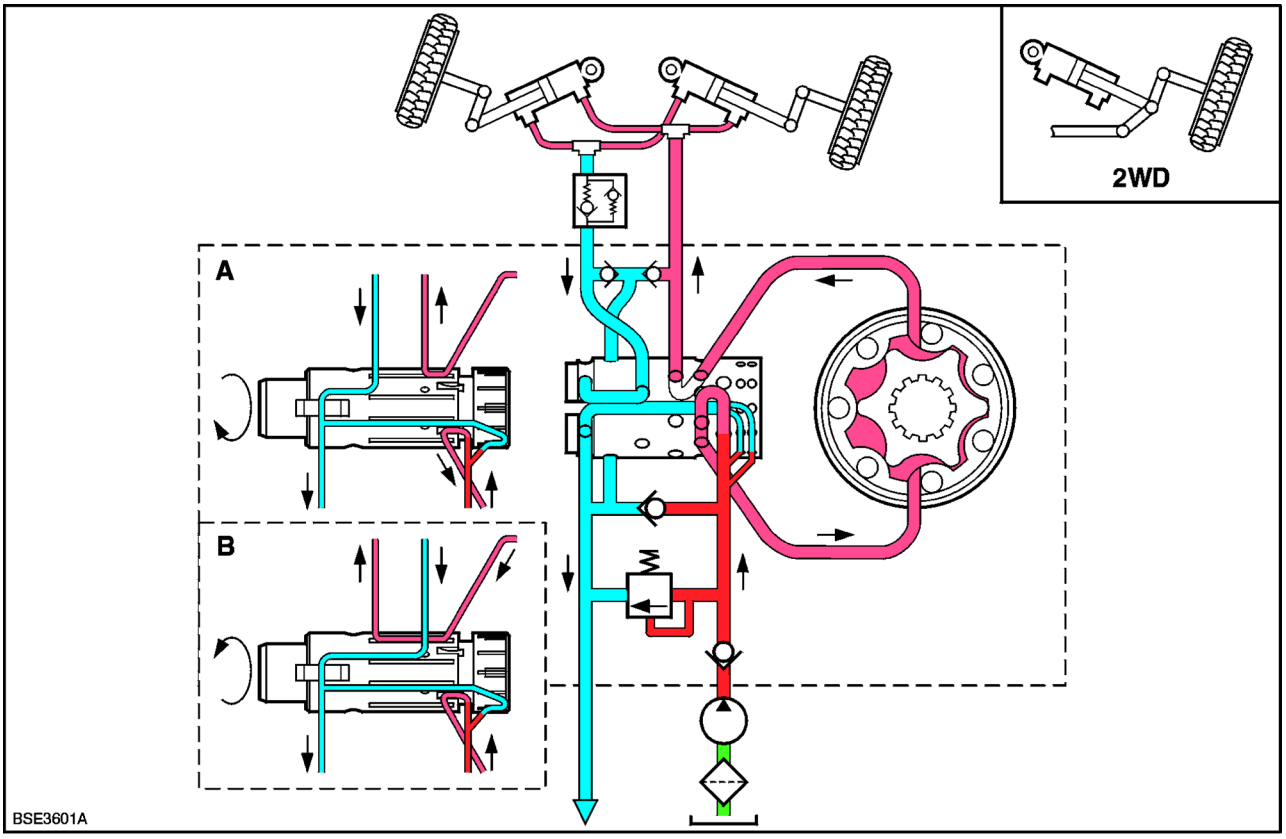
The steering motor incorporates a metering unit which regulates the volume of oil supplied to the cylinder so that it is proportional to the angular movement of the steering wheel. The metering unit in combination with the check valve also allows the steering to be operated **MANUALLY** without pressurised oil being supplied from the pump.

Suction valves, item 10 Figure 5, only used on two wheel drive models, prevent cavitation in the steering cylinder as oil is transferred from a small area to a large area when the steering motor is in the neutral position.

The system is fully hydrostatic and as such there is no mechanical connection between the steering column and the steering wheels.

Neutral Position

With the steering wheel held still, the leaf springs in the steering motor return and hold the spool and sleeve in the neutral position. This ensures no more oil is supplied to the steering cylinder, Figure 5. The trapped oil is, however, allowed to transfer between the left and right turn sides of the cylinder/s, on less supersteer models, with reactive steering motors, allowing the wheels to react to the ground conditions to provide feedback for the driver. On supersteer models there is no feedback to the driver when in the neutral position, the non-reactive type steering motor has shock valves installed to relieve excessive pressure in the case of a large object being hit which may otherwise cause damage to the system.



Oil Flow Schematic
A- Right Hand Turn B- Left Hand Turn

Pressure Supply

Metered Oil to Steering Cylinder

Return Oil
(Restricted by Cooling and Lubrication

Suction Oil

6

Right Hand Turn

When the steering wheel is turned the movement of the control valve spool in its sleeve forms a series of passages. During right turns the oil flows through the sleeve along a groove in the valve spool and into a passage in the steering motor housing which leads to the metering unit, Figure 6.

The metering unit is turned by the drive shaft and directs oil along another set of passages in the spool and sleeve and into the steering cylinder. Return oil from the other side of the cylinder is directed through the valve spool and sleeve to a return passage in the housing.

Left Hand Turn

When turning the wheel to the left oil flows along the sleeve and operates in a similar manner as described in right hand turn, Figure 6.

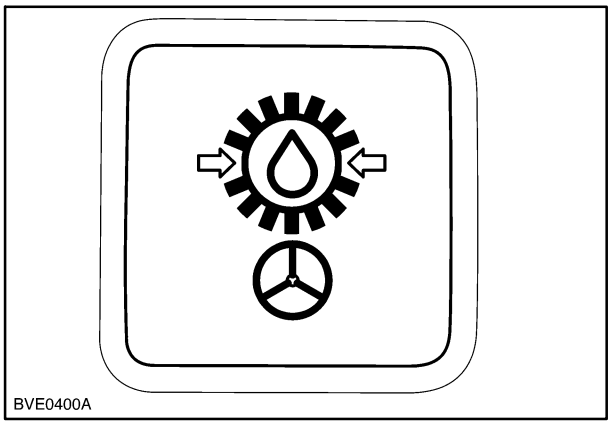
Manual Turning (no Power Assistance)

In the event of a power steering pump failure or loss of oil pressure, the power steering system can be operated manually. Turning the steering wheel rotates the metering unit rotor and forces oil into the power steering cylinder (2WD) or cylinders (4WD).

On the suction side of the metering unit, return oil flows from the cylinder and is drawn through the check valve to feed the metering unit.

Steering / Low Pressure Hydraulic Pump Test

There is no pressure relief valve in the steering hydraulic pump. The following practical test will determine if the steering hydraulic pump output is sufficient to allow satisfactory operation of the steering system.



7

Steering Test

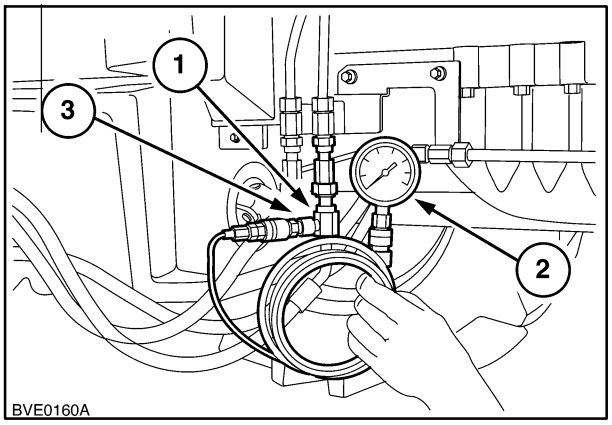
1. Set the engine speed to 1100 rev/min.
2. Quickly turn the steering from lock to lock.

   If the steering is operating correctly the reaction should be immediate with no time delay between turning the steering wheel and the movement of the wheels.
3. At full lock the relief valve in the steering motor should be heard to blow and the engine speed drop to approximately 970 rev/min.

   If the transmission / steering low pressure warning symbol is displayed when the steering is held on full lock, this is an indication that the hydraulic pump has developed an internal leak. Check the torque of the hydraulic pump mounting bolts and if tight, examine the hydraulic pump for leaking seals or wear.

Steering Circuit Pressure Test

1. Install the T-adaptor 297600 (1) and the quick release fitting 297240 (3), into the hydraulic hose to the steering cylinder.
2. Attach a 0 - 250 bar (0 - 3600 lbf/in^2) pressure gauge 293244 (2), using the quick release coupler 291924 and the hose 292246.
3. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure.
4. Turn the steering wheel to full lock and hold in this position.
5. The pressure reading should be 186 bar (2700 lbf/in^2).



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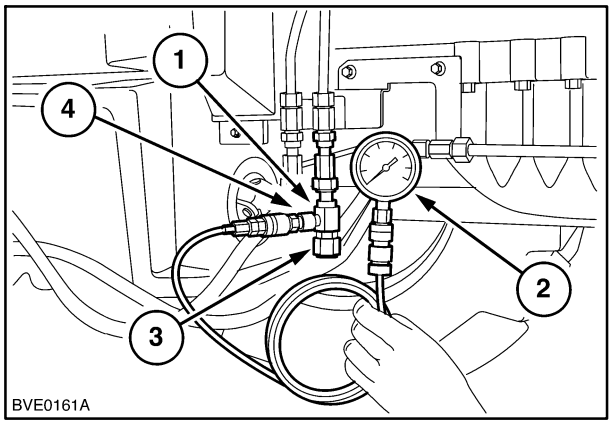
Steering Relief Valve Pressure Test

IMPORTANT: *There is no pressure relief valve in the steering / low pressure hydraulic pump and the following pressure test must only be performed as specified below. Failure to observe this precaution may result in severe damage to the hydraulic pump.*

1. Turn the steering onto full right hand lock.
2. Turn the keystart OFF.
3. Disconnect the right hand turn feed hose.
4. Install the T-adaptor 297600 (1) and the quick release fitting 297240 (4), into the solid tube. Cap the bottom of the Tee-piece with the blanking cap, 297671 or a standard No 6 cap ($^{11}/_{16}$ inch ORFS female thread cap purchased locally (3).
5. Attach a 0 - 250 bar (0 - 3600 lbf/in^2) pressure gauge 293244 (2), using the quick release coupler 291924 and the hose 292246.
6. Set the engine speed to 1500 rev/min to observe the system operation pressure or 2200 rev/min for the maximum system pressure. Turn the steering wheel to the left with a pull of approximately 22 N (2.25 kgf, 5 lbf) and observe the pressure reading.



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NOTE: *The use of a force greater than 5 lbf. at the rim of the steering wheel may lead to slightly inaccurate readings due to the pumping action of the hydrostatic steering motor.*

The pressure reading should be:-

186 bar (2700 lbf/in^2) for all models.

If the steering test was satisfactory but the pressure readings are out of specification the pressure relief valve in the steering motor must be adjusted.

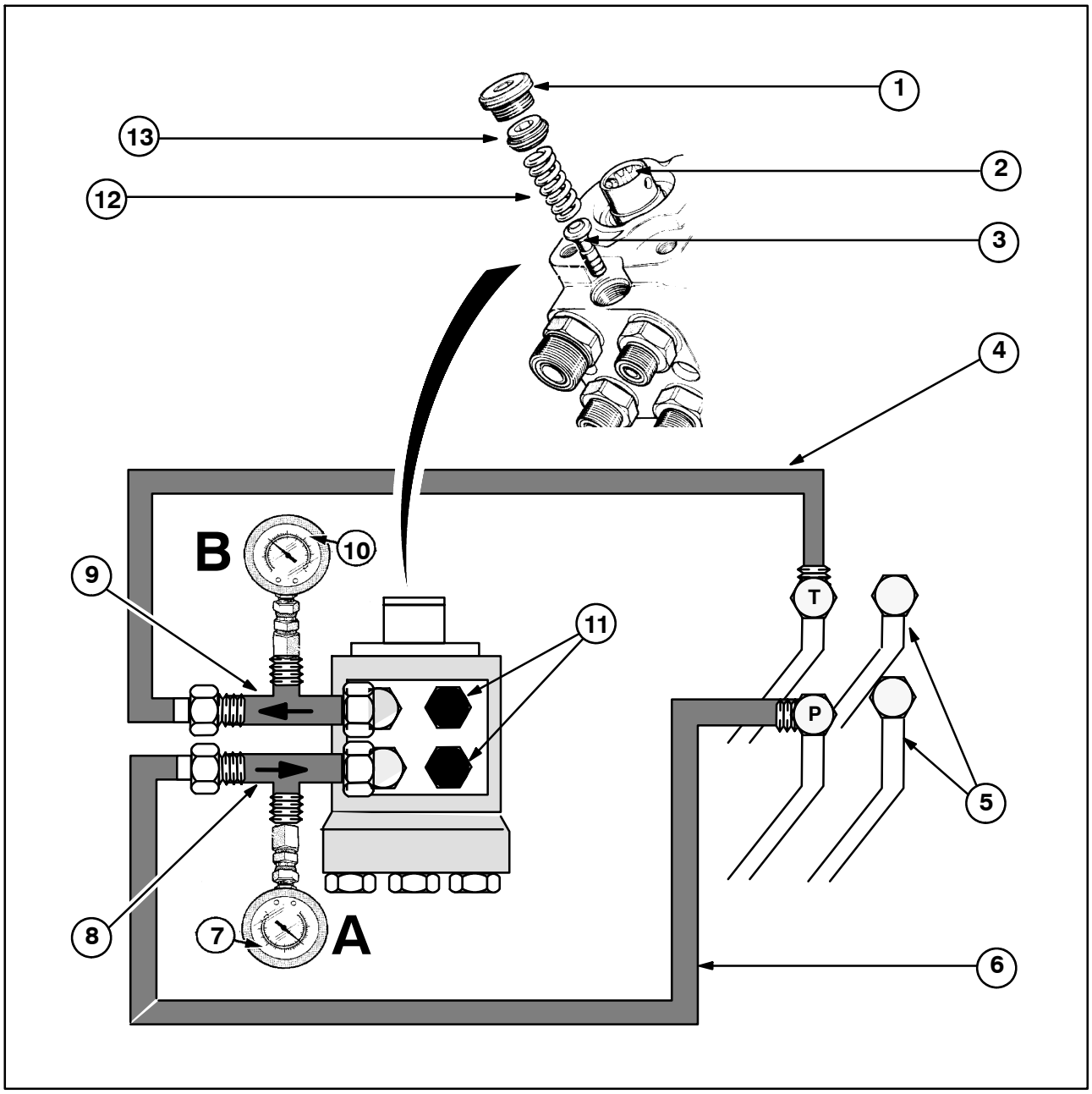
7. If the system pressure is not to specification proceed to Relief Valve Adjustment.

Differential Pressure

Differential pressure is the difference in pressure between the supply and sump ports on the steering motor. Measured (gauge) pressure is equal to the relief valve setting plus system back pressure.

System back pressure should be approximately16 bar (232 lbf/in^2) for all models.

The flow of oil on leaving the steering motor returns to the pump body for distribution to the low pressure and/or lubrication circuits. The pressure of oil returning from the steering motor is regulated at a pressure of 16.0 bar (232.0 lbf/in^2), by the low pressure regulating valve, at 2100 revs/min. As the pressure is regulated, excess oil in the low pressure circuit flows through the regulating valve, into an adjacent lubrication circuit relief valve which limits the pressure of oil in the lubrication circuit to 7 bar (100 lbf.in^2).



10

Steering Motor Relief Valve Adjustment

1. Plug
2. Steering Shaft
3. Relief Valve
4. Fabricated Steering Motor Output Hose
5. Tractor Tubes to Steering Cylinder
6. Fabricated Hose for Pump Supply to Steering Motor
7. Pressure Gauge 0-5000lbf.in^2
8. Size 8 ORS Swivel Running Tee
9. Size 10 ORS Swivel Running Tee
10. Pressure Gauge 0-500lbf.in^2
11. Size 6 ORS Blanking Cap
12. Spring
13. Adjuster

Relief Valve Adjustment - All Models

With reference to Figure 10.

NOTE: *To adjust the steering system relief valve it is necessary to remove the steering motor from the steering bracket, to gain access to the hexagon headed adjusting screw.*

1. Disconnect the steering motor from the steering bracket, as detailed previously in this Chapter, and remove from the tractor.
2. Fabricate suitable test hoses to connect from the tractor pressure and return tubes. Connect the hoses into locally procured tee pieces and install pressure gauges. Start the engine and idle between 1450 and 1500 rev/min. Run the tractor until the transmission oil reaches normal working temperature of approximately 68°C (155°F).
3. With the engine running, turn the steering motor shaft to obtain full lock. The pressure gauge reading at point 'A' should read 186 bar (2700 lbf.in^2). The gauge pressure at point 'B' should be in the region of 16 bar (235 lbf.in^2).
4. To establish actual (differential) pressure subtract gauge 'B' reading from the gauge 'A' reading. The differential pressure should be to the specification of:
   Gauge 'A' 186 bar (2700 lbf.in^2) minus Gauge 'B 235 lbf.in^2 (16 bar) =
   2465 lbf.in^2 (170 bar) on all models
5. If the pressure readings are not correct, reset the adjuster (item 13), 10, using an 8mm hexagon key. Half a turn on the adjuster equates to approximately 200 lbf.in^2 (13.8 bar).

TROUBLESHOOTING

IMPORTANT: *When effecting a repair the cause must be corrected to avoid a repeat failure.*

PROBLEM	POSSIBLE CAUSE	REMEDY
Low steering pressure warning light illuminates	1. Faulty pump	1. Pressure test system, repair/replace pump as required.
	2. Fault in return to tank (back pressure) side	2. Check low pressure system (fixed displacement main hydraulic pump) or check lubrication system (variable displacement main hydraulic pump systems).
	3. Leak in system	3. Inspect feed and return lines to the pump. Replace damaged hoses as required.
No steering or excessive effort to steer	1. Air in system	1. Check for loose connections or damaged tubing. Purge system of air.
	2. Steering system relief valve sticking/faulty	2. Check system pressure.
	3. Worn pump	3. Inspect and repair.
	4. Leaking steering cylinder	4. Inspect and repair.
	5. Broken or damaged steering column coupling	5. Inspect and replace as required.
	6. Damaged or worn metering unit	6. Inspect and replace as required.
Steering wanders	1. Excessive play in steering linkage joints	1. Inspect and replace as required.
	2. Leaking steering cylinder	2. Inspect and repair.
	3. Damaged or worn metering unit	3. Inspect and replace as required.
Drift to Left, Two Wheel Drive only	1. Bias valve faulty	1. Replace or repair
Front wheels surge when steering	1. Leaking steering cylinder	1. Inspect and repair.
	2. Damaged or worn metering unit	2. Inspect and replace as required

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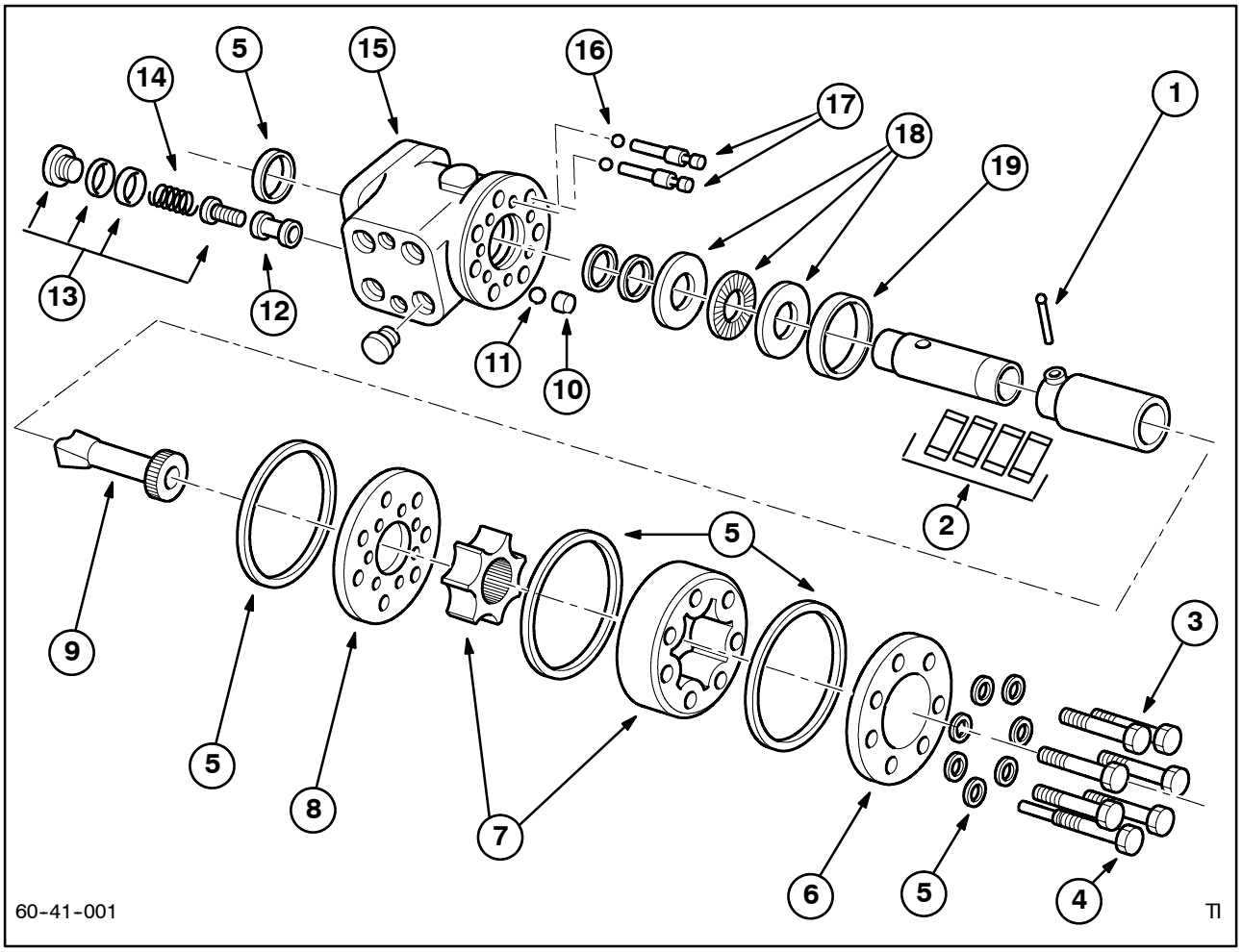
OVERHAUL

STEERING MOTOR



11

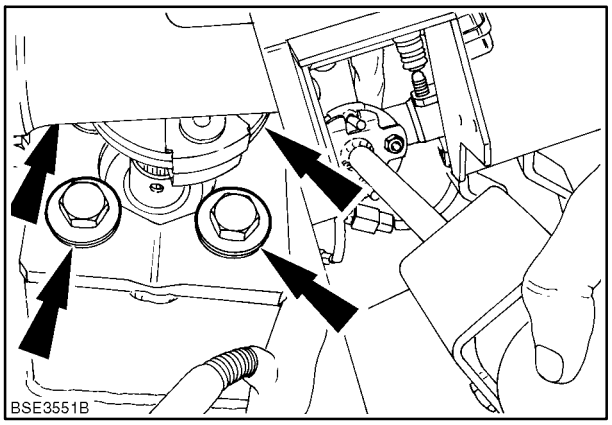
Steering Motor (2WD + 4WD Less Supersteer)

1. Pin
2. Centering Springs
3. Retaining Bolts
4. Dowel Pin Bolt
5. 'O' Ring Seal (Kit)
6. End Plate
7. Rotor and Stator Assembly
8. Manifold Plate
9. Drive Shaft
10. Retainer
11. Ball
12. Relief Valve Seat
13. Relief Valve (Kit items)
14. Spring
15. Complete Assembly
16. Ball (2WD only)
17. Pin (2WD only)
18. Thrust Bearing and Washers
19. Spacer

Removal

1. Position the tractor on a hard level surface and apply the parking brake.
2. To gain access to the steering motor :-

   Raise the engine hood
   Remove the steering column console
   Remove left hand engine side cover
3. Disconnect the four supply/return tubes and 'O' ring seals from the steering motor and cap the ends of the tubes.
4. Remove the four bolts at the base of the steering column and slide the steering motor from the upper section of the steering column, Figure 12.
5. Remove the steering motor from the front of the cab through the engine compartment.



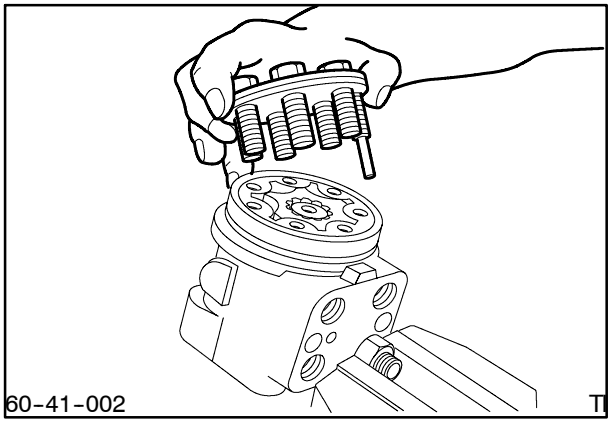
12

Disassembly

1. With the steering motor connectors removed note position of the non return valve.
2. Hold the steering motor securely in a vice using a tube connector as shown in, Figure 13.

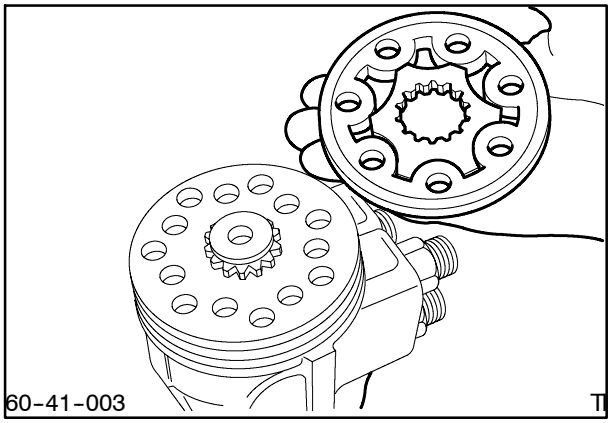
NOTE: *The position of the pin bolt must remain the same on re-assembly.*

3. Remove the end plate bolts, end plate and 'O' ring, Figure 13.



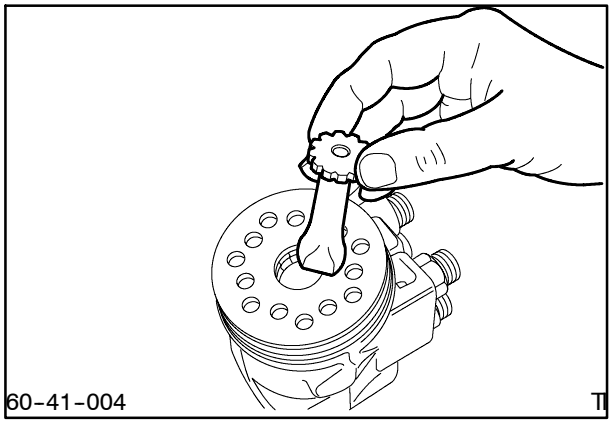
13

4. Remove metering unit, valve plate and 'O' ring seals, note mating surfaces for correct re-assembly, Figure 14.



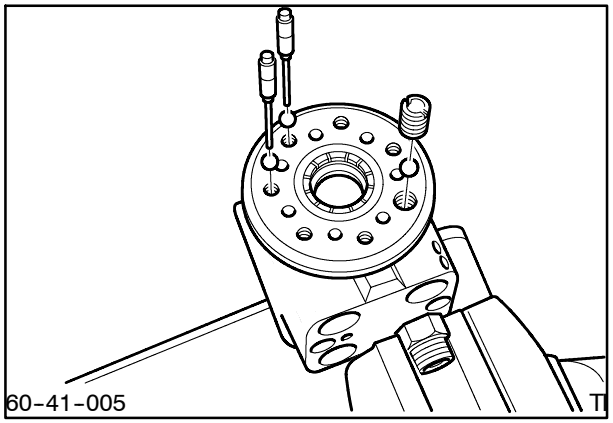
14

5. Lift out rotor drive-shaft, Figure 15.



15

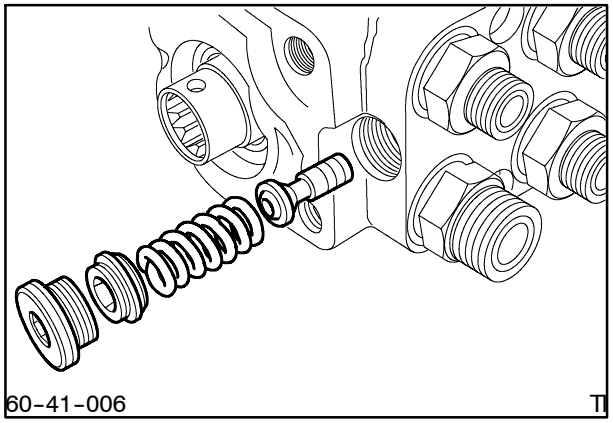
6. Unscrew the check valve retainer, Figure 16 and shake out the check and suction valves (2WD only).



16

7. Remove the relief valve assembly, Figure 17.

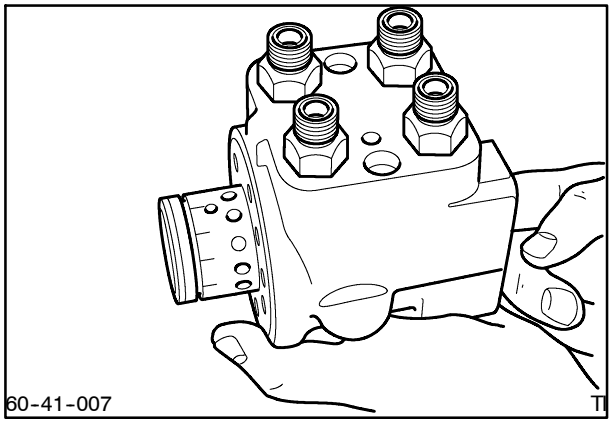
IMPORTANT: *The relief valve must be set to the correct pressure setting on re-assembly. Follow the correct procedure as detailed under the heading 'Pressure relief valve setting', of this Chapter.*



17

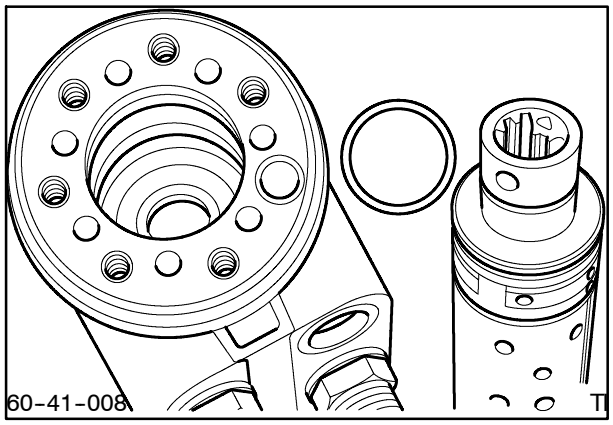
8. Remove the inner and outer valve sleeves, bearings and thrust washer, Figure 18.

NOTE: *When removing spool and sleeve ensure drive pin is in a horizontal position so that it cannot fall into an internal gallery and make removal difficult.*



18

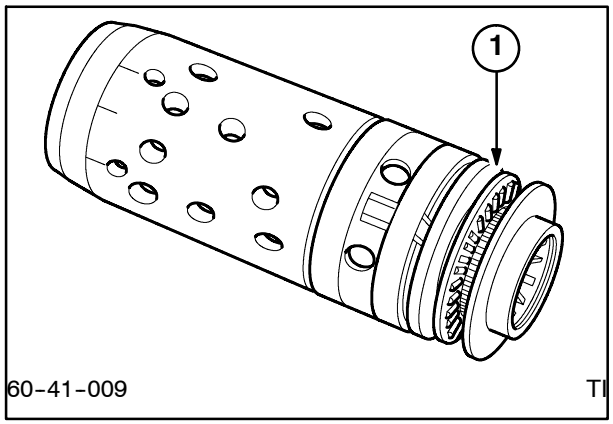
9. Once spool is disassembled from the body ensure oil seal is removed, Figure 19.



19

IMPORTANT: *Upon re-assembly ensure washer, item 1, Figure 20 is installed with chamfer towards the valve sleeve.*

10. Remove the control valve spool and sleeve, Figure 20.

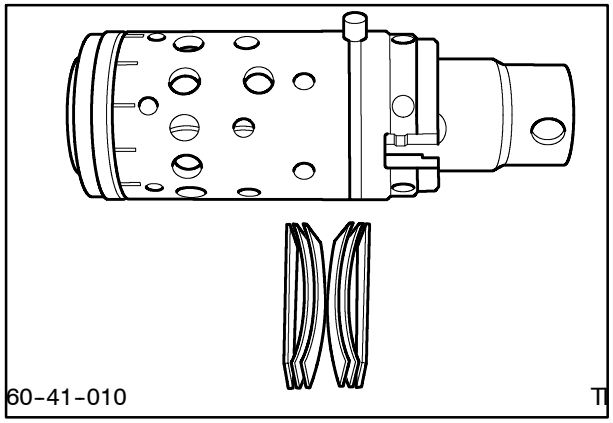


20

11. Remove centering springs, Figure 21.

NOTE: *Arrangement of the leaves must remain the same upon re-assembly.*

12. Remove drive pin, Figure 21.
13. Push inner sleeve from outer sleeve.
14. Remove 'O' ring and back-up ring.



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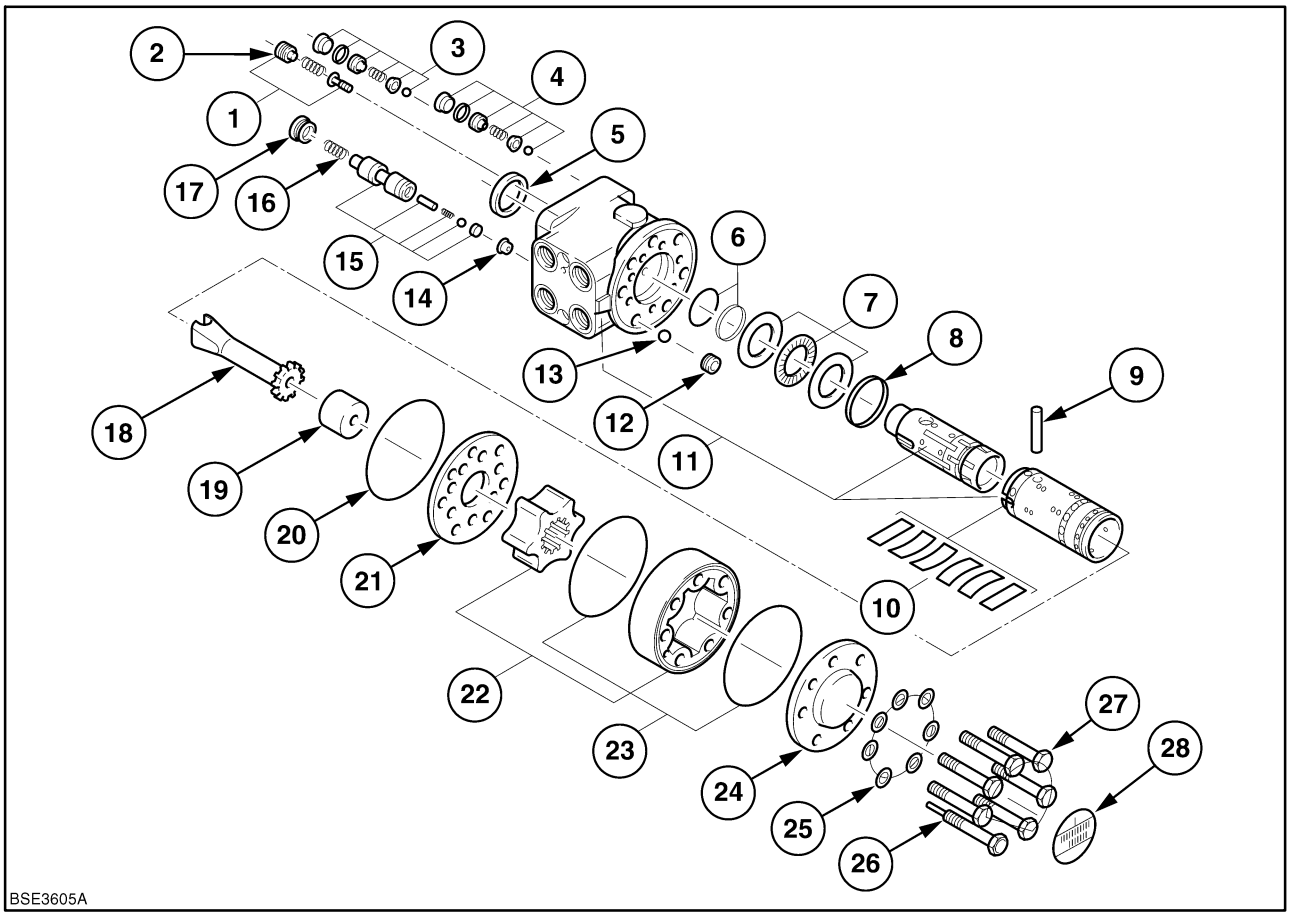


22

Steering Motor - Models with Supersteer

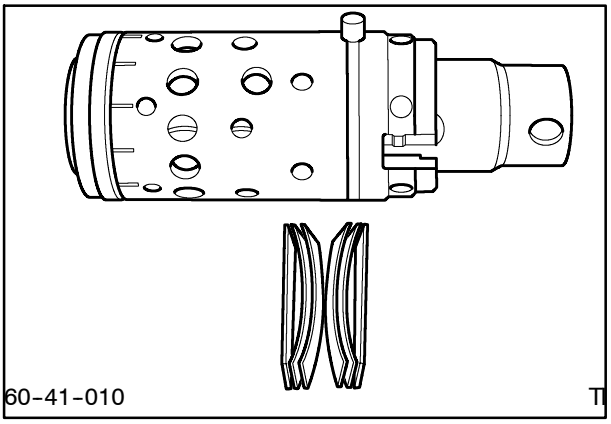
1. Relief Valve
2. Spring for Relief Valve
3. Shock Valve
4. Shock Valve
5. Dust Seal Ring
6. Shaft Seal
7. Bearing
8. Ring
9. Cross Pin
10. Set of Springs
11. Housing, Spool and Sleeve
12. Thread Bushing
13. Ball ø 8.5 mm
14. Amplification Orifice
15. Amplification Spool
16. Spring
17. Plug
18. Drive Link
19. Spacer
20. O-ring
21. Distributor Plate
22. Gear Wheel Set
23. O-ring
24. End Cover
25. Washer
26. Special Screw
27. Special Screw
28. Name Plate

Inspection

1. Wash all parts in a suitable solvent to remove any foreign particles and dry with a clean lint free cloth or compressed air.
2. Inspect valve sleeves for, damage or wear. Minor burrs or scratches can be removed with a fine abrasive. Ensure all parts are thoroughly cleaned prior to re-assembly.
3. Check leaf springs for damage. Replace if necessary.
4. Discard all 'O' ring seals and replace with new seals on re-assembly.

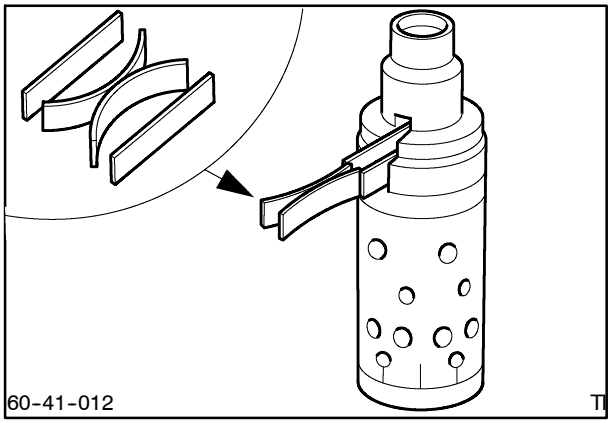
Assembly

1. Assemble inner and outer sleeves so that the leaf spring slots align.
2. Install the drive pin, Figure 23.



23

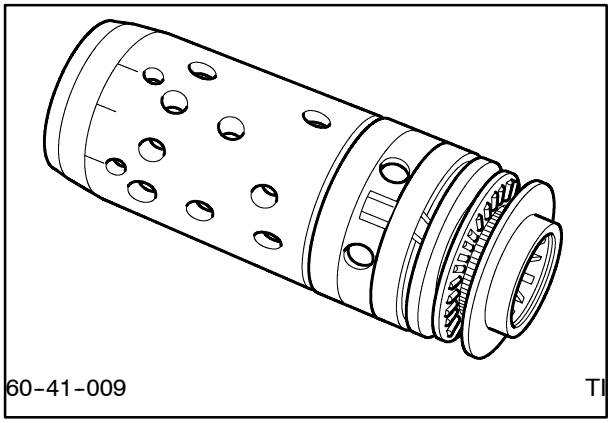
3. Install the leaf springs and push fully into position, Figure 24.



24

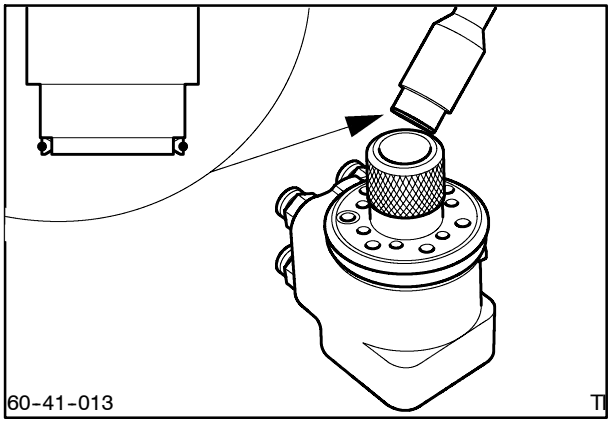
4. Install leaf spring retainer, and bearing, Figure 25.

NOTE: *The inner bearing race must be positioned with the chamfer side facing the spool, 20.*



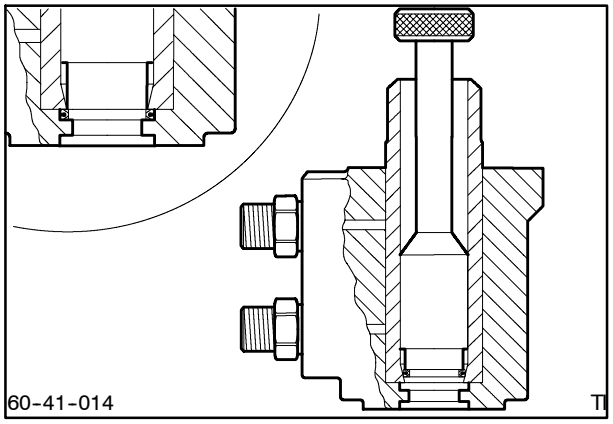
25

5. Apply a light coating of hydraulic oil onto the sleeve item 2 and insert into the steering motor body, item 3, Figure 26.
6. Coat the 'O' ring and back-up ring, item 4, Figure 26, with hydraulic fluid and position them onto the seal installer guide.
   - Use special tool No. 294056 to install oil seal type roto-glyd.



26

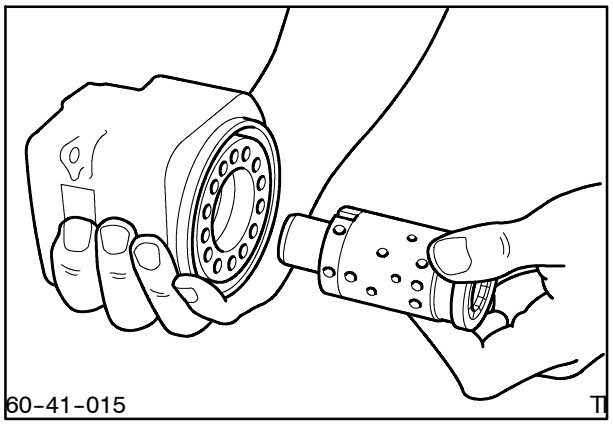
7. Position the seal guide tool into the sleeve and push down with a twisting action, Figure 27.
8. Remove tools once the seal has seated.



27

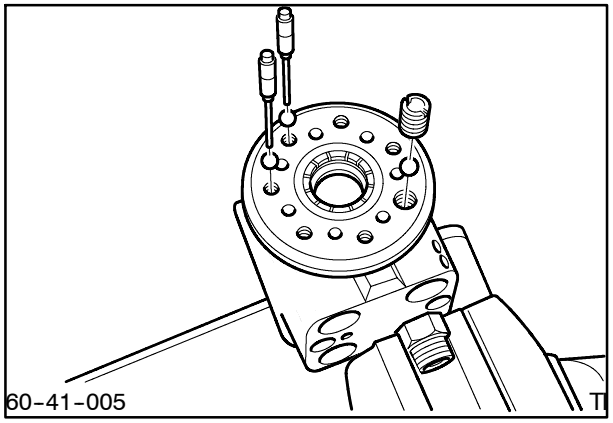
9. With the seal installed in the motor body refit control valve, Figure 28.

NOTE: *Ensure that the Drive is in a horizontal position to aid re-assembly.*



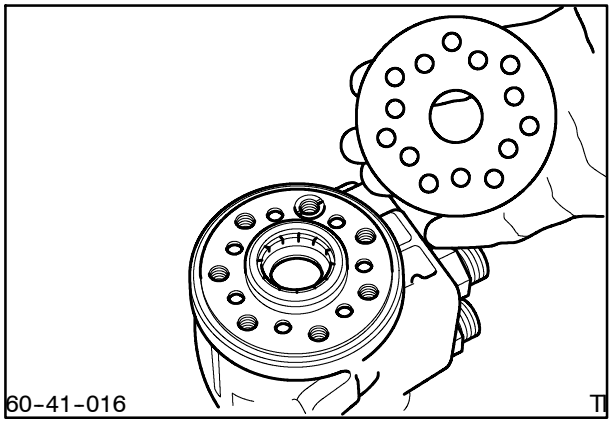
28

10. Once the control valve is seated correctly refit the check and suction valves (2WD only), Figure 29.
11. Screw the check valve down to just below the surface of the housing.



29

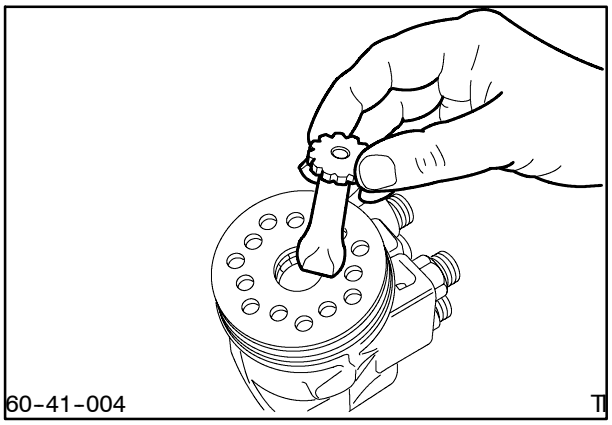
12. Refit the 'O' Ring and place the end plate in position.



30

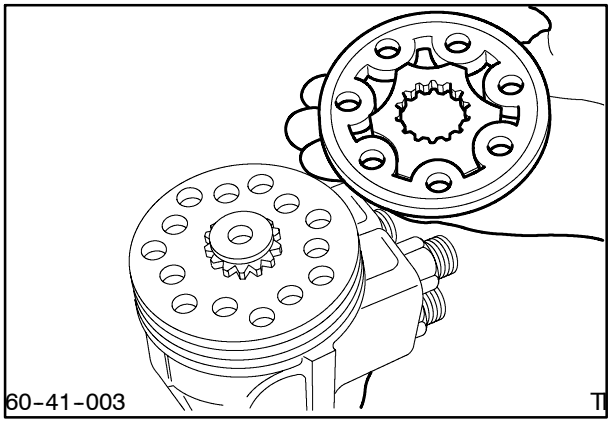
Metering Unit Assembly

1. To aid reassembly install the control valve into the housing so that the drive pin is perpendicular to the front face of the housing.
2. Install drive link into the steering motor body, Figure 31, ensuring that the link engages correctly over the drive pin.



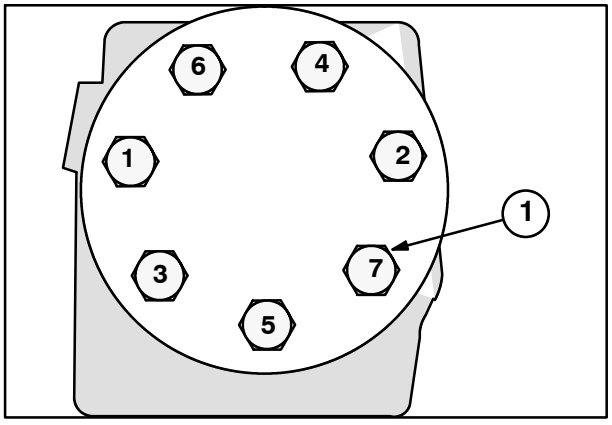
31

3. Assemble the metering unit rotor and stator and install new lightly greased 'O' rings to either side of the stator, Figure 32.
4. Assemble the rotor and stator onto the drive link.



32

5. Install the end plate and bolts, ensure the pin bolt(1) is fitted in position '7'. Tighten the bolts in two steps, first to 8 lbf.ft (10.8 Nm) and then to 21 lbf.ft (28.4 Nm) in sequence as shown, Figure 33.

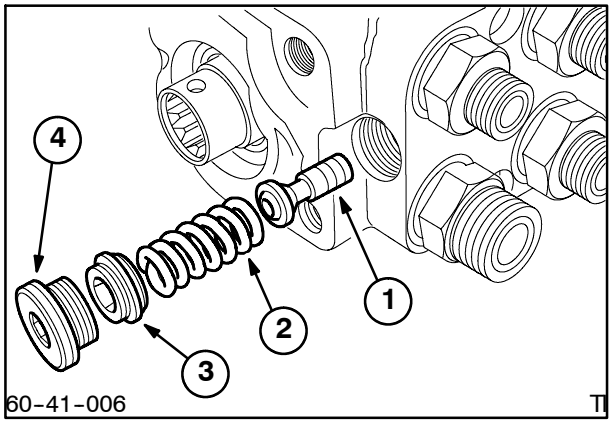


33

6. Install the relief valve assembly, items 1, 2 and 3 Figure 34., leaving the plug, item 4 out until after the relief valve has been adjusted.
7. Check to ensure the motor turns freely without binding.

IMPORTANT: *The relief valve must be set to the correct pressure setting after the motor has been re-assembled. Follow the correct procedure as detailed under 'Pressure relief valve setting', of this Chapter.*

8. After the relief valve has been correctly set re-install the steering motor onto the mounting bracket and tighten the securing bolts to a torque value of 10-15 lbf ft(13-20Nm).
9. Reconnect the steering hoses, tighten to a torque value of 10-15 lbf ft (13-20Nm).
10. Purge the air from the system by operating the steering system from lock to lock until the system functions correctly.



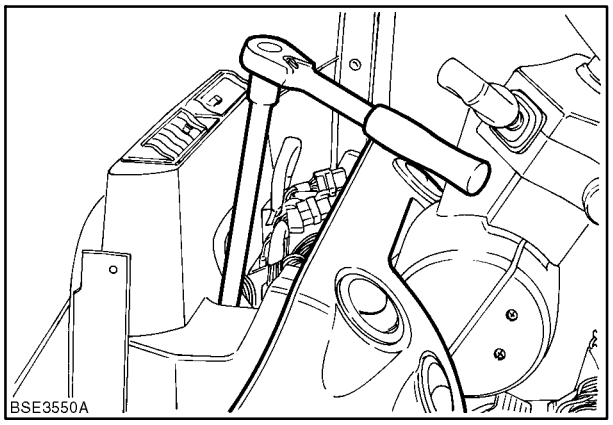
34

STEERING COLUMN

NOTE: *The component parts of the steering column as listed are serviced separately.*

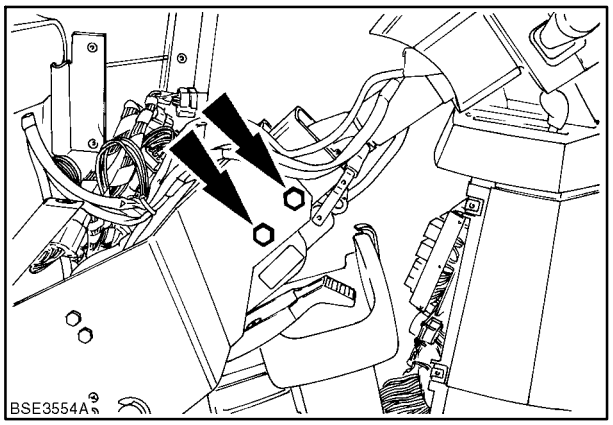
Removal

1. Remove the steering wheel, if required.
2. Remove the instrument panel. Undo the two mounting screws and remove the lower steering column cover.



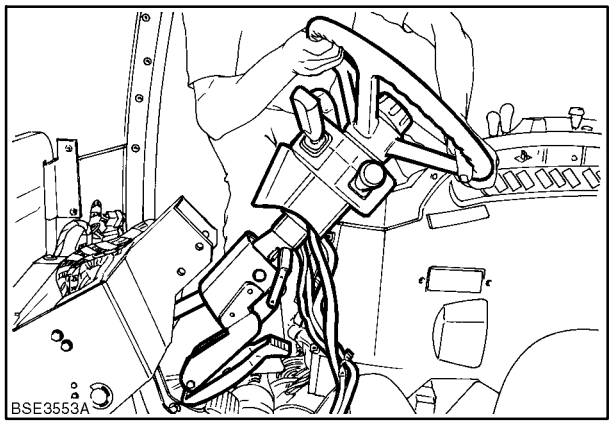
35

3. Disconnect the multi-function switch wiring and shuttle lever switch wiring connectors.
4. Remove the four securing bolts securing the column to the frame, Figure 36.



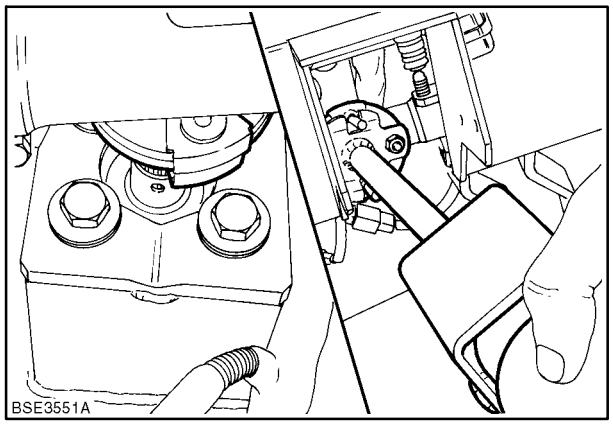
36

5. Lift the column clear of the steering shaft and clear of the instrument console, Figure 37.



37

6. Ease the coupling from the steering motor shaft and remove the steering shaft, Figure 38.



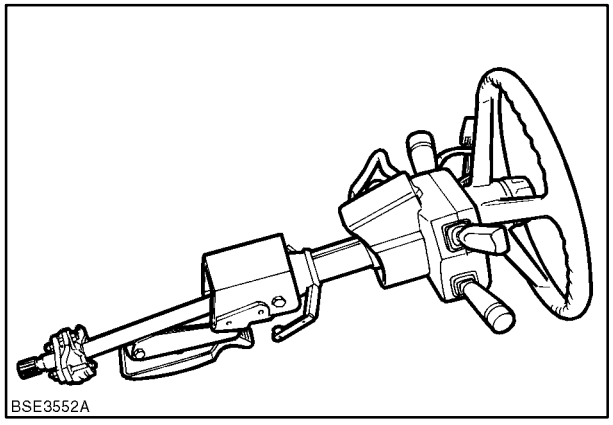
38

Inspection

1. Inspect the steering shaft universal joint and lower rubber coupling. Replace if any free play is evident.
2. Inspect the column assembly, if damaged or the bushes are worn a new assembly will be required.

Installation

1. Place spacer and steering shaft onto the steering motor and install pin.
2. Carefully place the steering column through the instrument console and over the steering shaft, ensuring flat sides are aligned.
3. Replace the securing bolts at the top of the column. Tighten to 23 Nm (17 lbf.ft).
4. Refit the upper and lower column covers and shuttle switch if fitted.
5. Refit the instrument console panels.
6. Refit the steering wheel.



39

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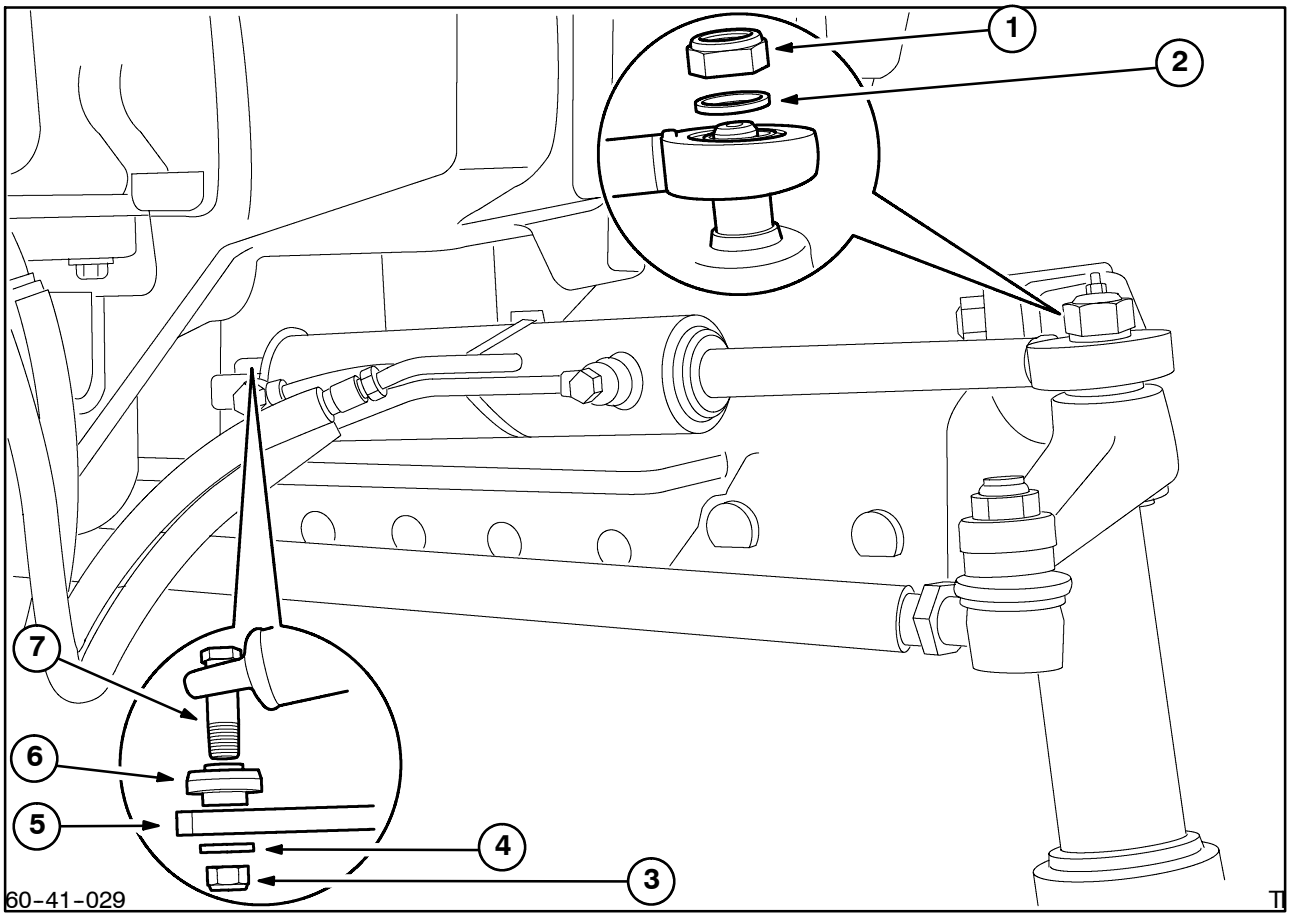
TWO WHEEL DRIVE STEERING CYLINDER



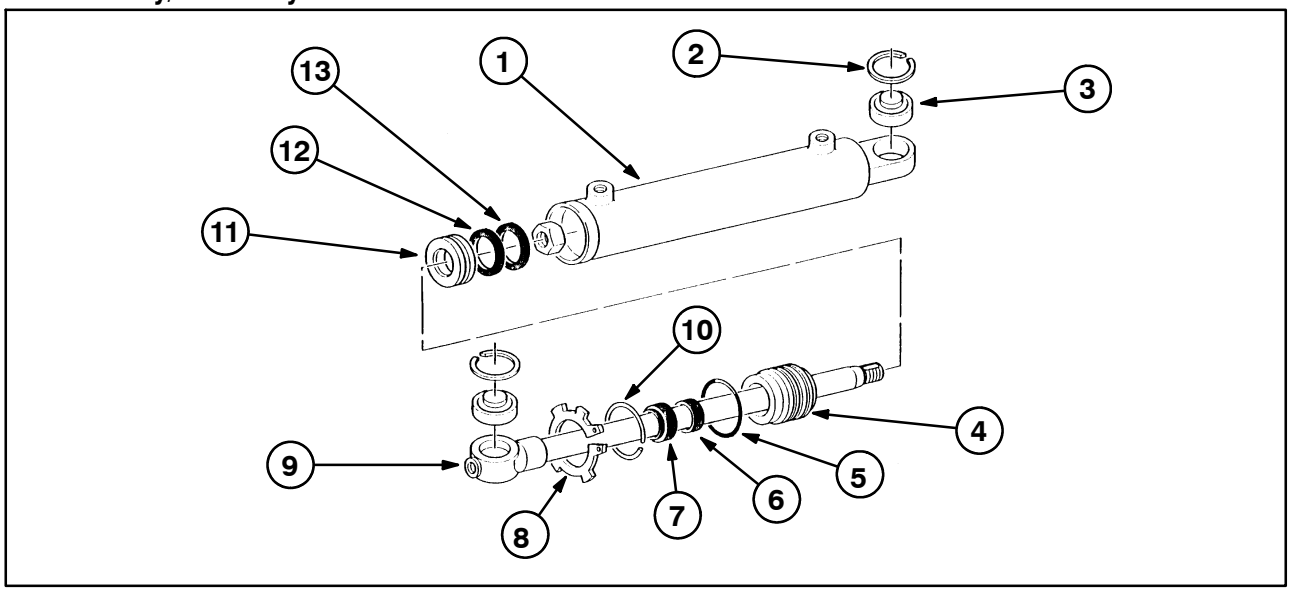
Steering Cylinder Installation - Two Wheel Drive (Standard Duty)

1. Nut
2. Washer
3. Nut
4. Washer
5. Cylinder Mounting Bracket
6. Spacer
7. Bolt

Removal

1. Stand the unit on a hard level surface and position the front wheel in the straight ahead position.
2. Disconnect flexible pipes, cap the open pipe ends and remove hose clamps.
3. Position of flexible pipes and orientation of connectors must be the same upon re-assembly.
4. Remove the nut securing the cylinder rod ball joint to the steering arm and separate the joint, Figure 40.
5. Remove the steering cylinder to axle pivot pin and remove the steering cylinder from the vehicle.
6. Installation is the reversal of the removal procedure.

Disassembly/Assembly

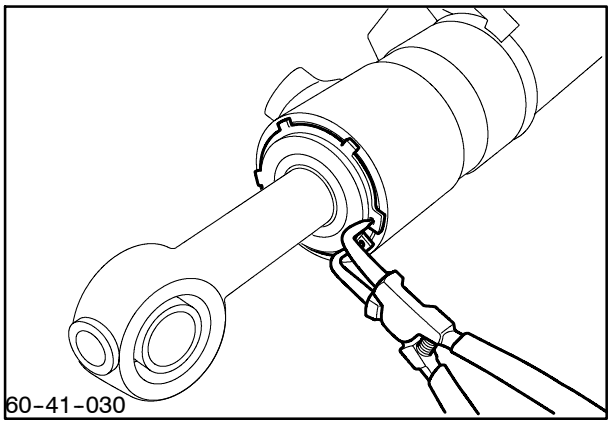


41

Steering Cylinder Assembly - Two Wheel Drive

1. Cylinder
2. Lockring
3. Bearing
4. Gland
5. 'O' Ring
6. Seal
7. Wiper Seal
8. Gland Lockring
9. Cylinder Rod
10. Retaining Ring
11. Piston
12. Seal
13. Seal

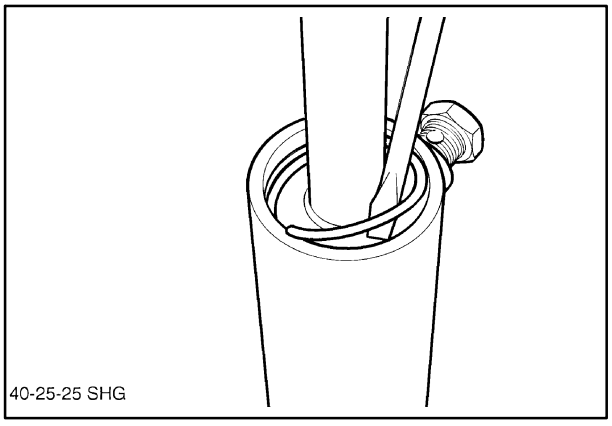
1. Using appropriate circlip pliers, remove the gland lockring.
2. Using a punch, push the steering cylinder gland into the cylinder and remove the wire locking ring.
3. Pull the rod and gland assembly from the cylinder.
4. Remove the nut from the cylinder rod and disassemble to replace seals.



42

5. Inspect the bore of the cylinder and replace if scored.
6. Reassemble the cylinder in the reverse to disassembly, lubricating all components as assembled. Replace all seals supplied in the service seal kit.

NOTE: *The seal located in the centre of the gland is replaceable.*



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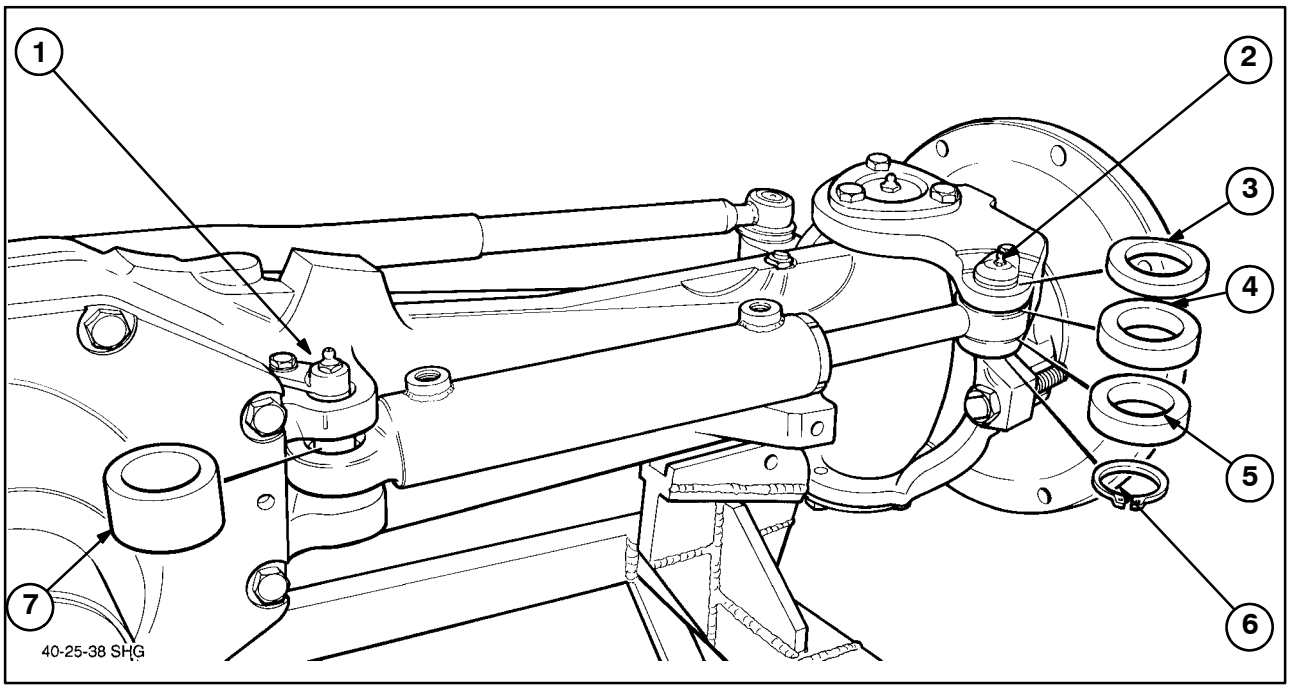
FOUR WHEEL DRIVE STEERING CYLINDER

Removal and Installation



44

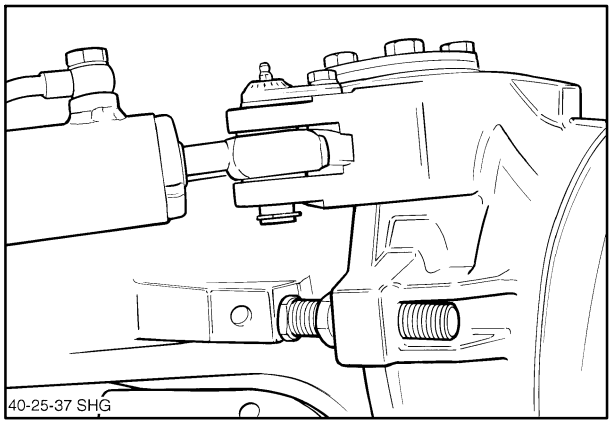
Steering Cylinder Installation - Four Wheel Drive

1. Pivot Pin
2. Pivot Pin
3. D Shaped Washer
4. Spacer
5. Spacer
6. Circlip
7. Spacer

1. Stand the unit on a hard level surface and position the front wheel in the straight ahead position.
2. Disconnect flexible pipes, cap the open pipe ends and remove hose clamps.

NOTE: *Position of flexible pipes and orientation of connectors must be the same upon re-assembly.*

3. Remove the snap ring retaining the steering arm to the cylinder piston pivot pin, item 6, Figure 44 and remove the pivot pin.
4. Remove the steering cylinder fixed end pivot pin retaining bolt and withdraw the pivot pin, item 1, Figure 44 . Remove the cylinder from the vehicle.
5. Installation is the reversal of the removal procedure.

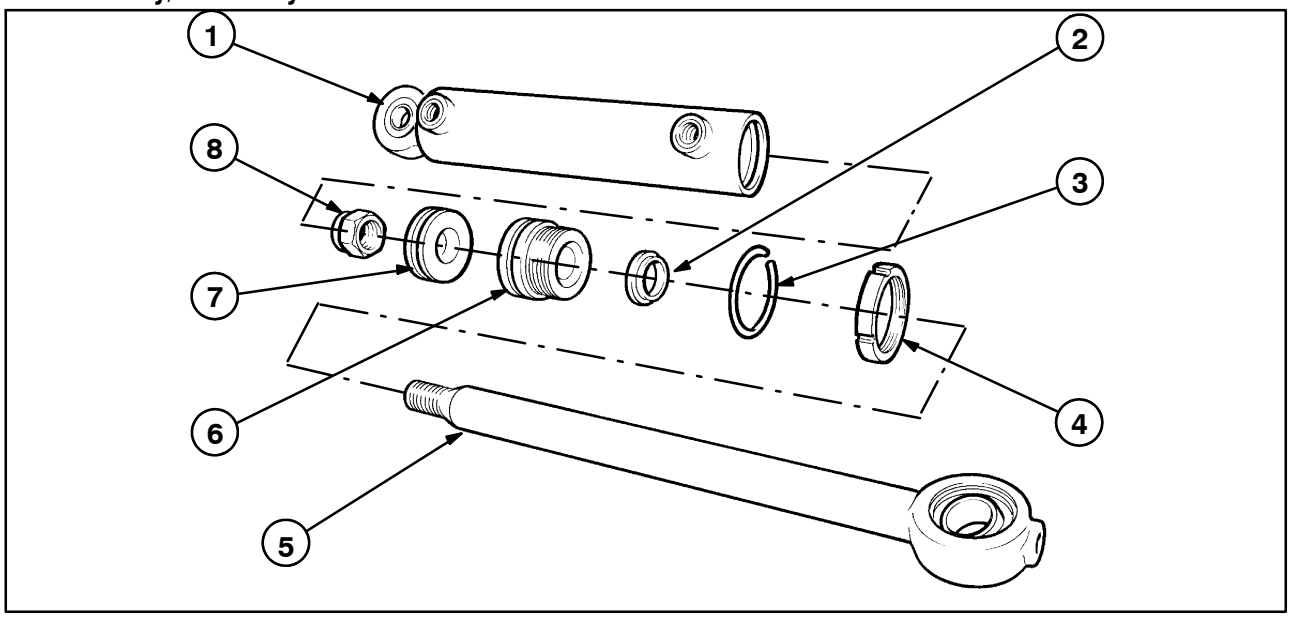


45

Steering Stop Adjustment

1. Turn the wheels to full lock and adjust steering stop to ensure tyres or mudguards do not touch the side of the tractor and that the steering cylinders have not reached the end of their travel.

Disassembly/Assembly

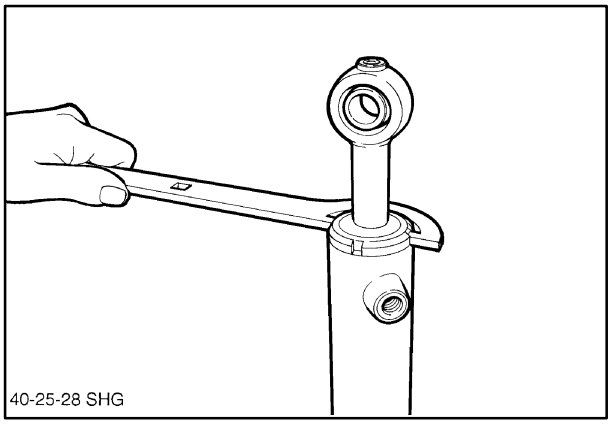


46

Steering Cylinder Assembly - Four Wheel Drive

1. Cylinder
2. Wiper Seal
3. Retaining Ring
4. Gland Nut
5. Cylinder Rod
6. Gland and Seal Assembly
7. Piston
8. Nut

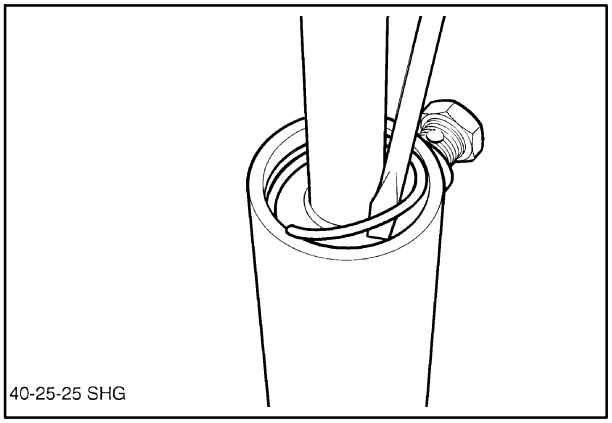
1. Using appropriate 'C' spanner, unscrew and remove the gland nut.
2. Using a punch, push the steering cylinder gland into the cylinder and remove the wire locking ring.
3. Pull the rod and gland assembly from the cylinder.
4. Remove the nut from the cylinder rod and disassemble to replace seals.



47

5. Inspect the bore of the cylinder and replace if scored.
6. Reassemble the cylinder in the reverse to disassembly, lubricating all components as assembled. Replace all seals supplied in the service seal kit.

NOTE: *The seal located in the centre of the gland is replaceable.*



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NOTES

SECTION 41 - STEERING

Chapter 2 - Fast Steer System

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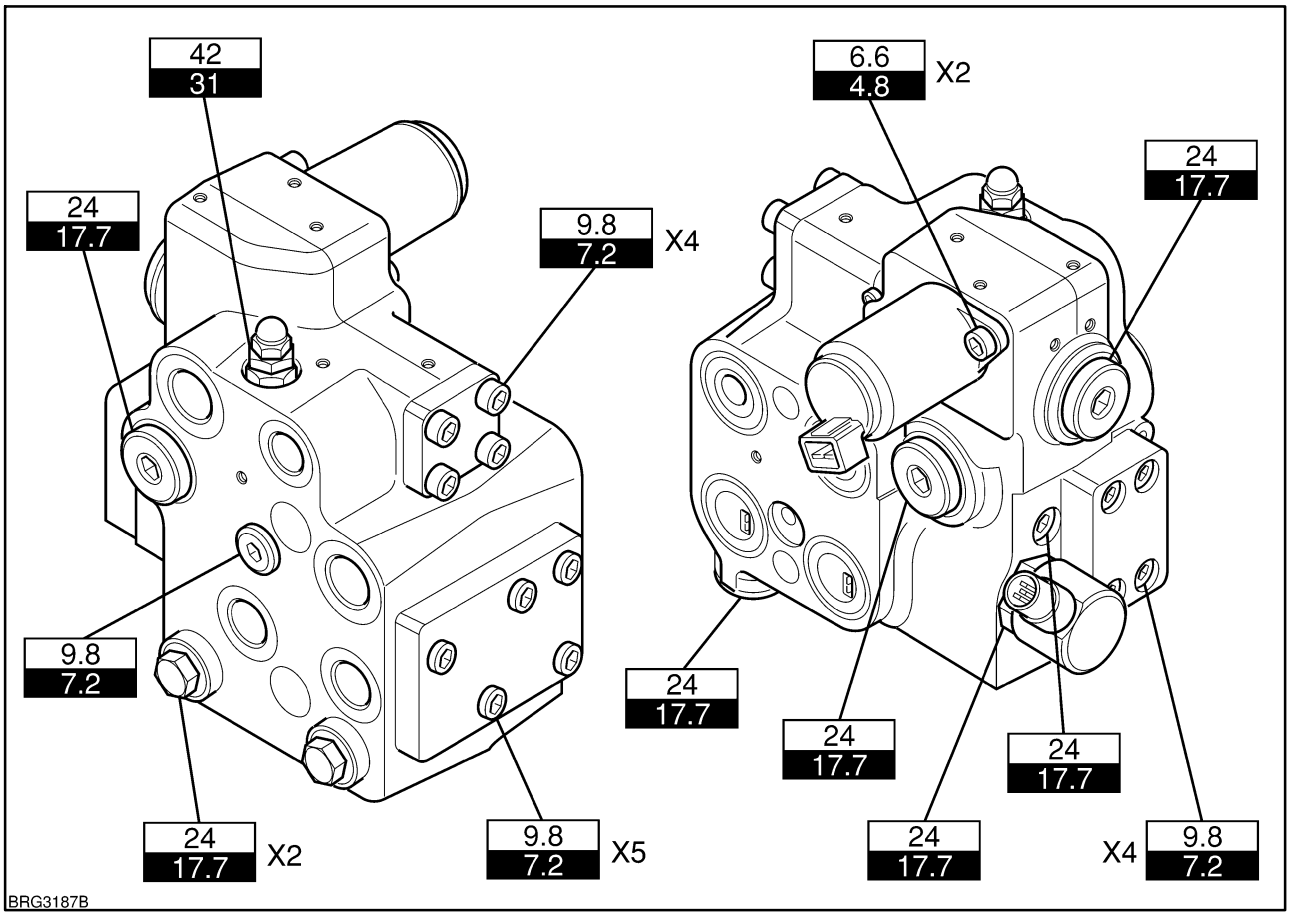
SPECIFICATIONS

FAST STEER VALVE	
Pump specifications	**4WD**
Minimum Pump Output	
Litres/min.	40
Imp.Galls/min.	8.8
U.S. Galls/min.	10.6
Steering Motor Displacement	160cc/rev
Relief Valve Maximum Differential Pressure Setting	170 Bar (2465 lbf.in^2) 225 - 245 Bar (3263 - 3553 lbf.in^2)
Absolute Gauge Pressure	186 Bar (2700 lbf.in^2)

FOUR WHEEL DRIVE AXLE		
Standard Tyre (Front)	14.9 R24	
Maximum Steering angle	55° or 65° with SuperSteer	
Steering Wheel Turns (Lock to Lock)	3.9	
Cylinder	2 off double acting	
	4 cyl	**6 cyl**
Turning Radius with Brakes (4WD disengaged)	3.510 m	3.745 m
Turning Radius less Brakes (4WD disengaged)	4.040 m	4.355 m
Turning Radius with Brakes (with SuperSteer)	3.495 m	3.860 m
Turning Radius less Brakes (With SuperSteer)	3.755 m	4.145 m

TIGHTENING TORQUES



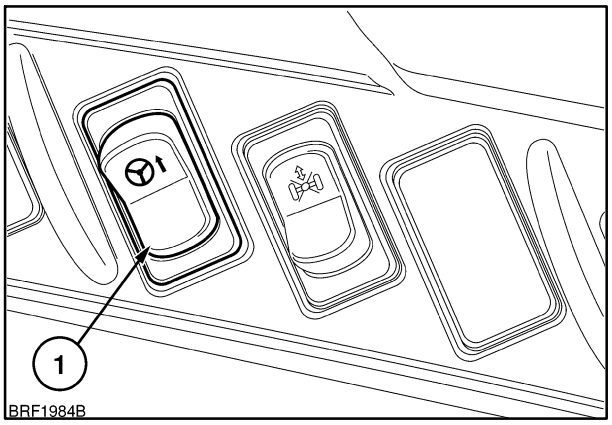
1

DESCRIPTION AND OPERATION

The optional Fast Steer system is designed to provide fast steering response when required i.e. when operating with a front loader.

From the straight ahead position, Fast Steer will provide full right or left hand steering lock with plus or minus a 8° movement of the steering wheel.

To activate Fast Steer, depress the isolator switch (1).



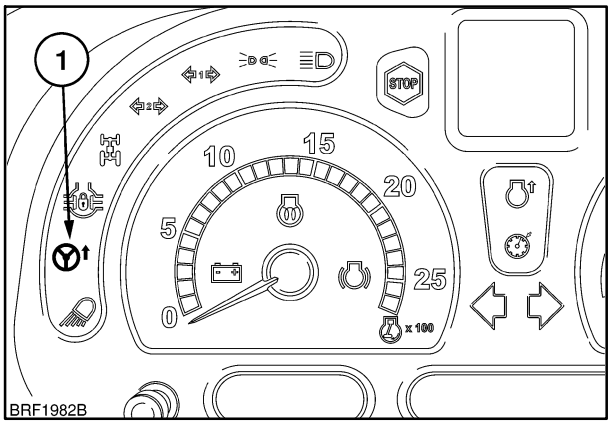
2

NOTE: *For Fast Steer to function the tractor speed must not exceed 10 K/mh (6.2 MPH).*

To operate Fast Steer, depress and hold the centre ring (3) Figure 4 on the steering wheel, to disengage, release the ring. With the Fast Steer centre ring depressed, the warning light (2), Figure 3 will illuminate on the instrument panel. It will extinguish when the centre ring is released.

Fast Steer will only function if all the following conditions are met.

1. The isolator switch is in the ON position.
2. The speed of the tractor does not exceed 10 K/mh (6.2 MPH)
3. The Centre ring (3) is held down.
4. The warning light on the instrument panel is illuminated

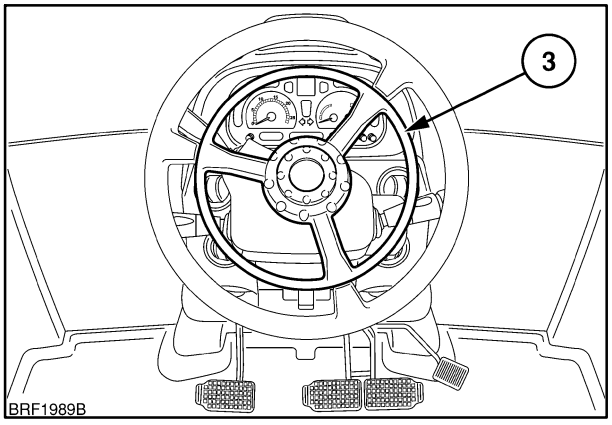


3

Fast Steer will automatically disengage if a fault occurs or one of the above conditions are not applied. Should Fast Steer automatically disengage, an audible warning will sound and an error code will be appear in the Dot Matrix Display.

To re-activate the Fast Steer function, turn off the isolator switch (1) Figure 2 , ensure the tractor speed is below 10 K/mh (6.2 MPH), and turn the switch on again.

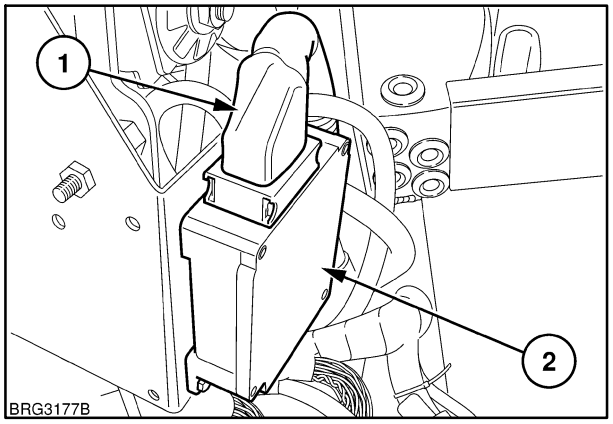
IMPORTANT: *To promote safe operation of Fast Steer, it is advised that the operator become familiar with the system before operating in the field.*



4

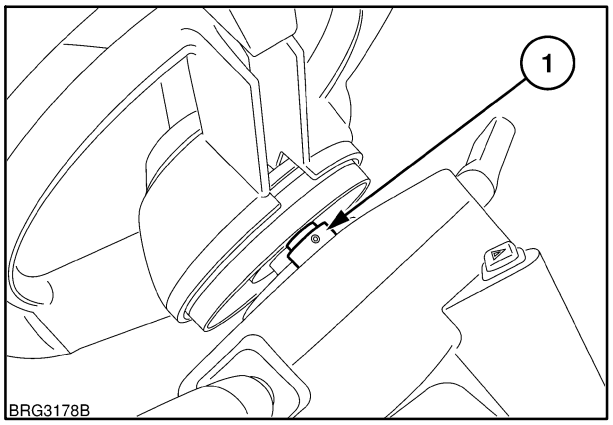
NOTE: *In cold oil temperature conditions it is advisable to turn steering from lock to lock before engaging the Fast Steer System.*

The Fast steer controller is located on the right hand side underneath the instrument console. The module (2) is connected to the fast steer valve via a harness (1).



5

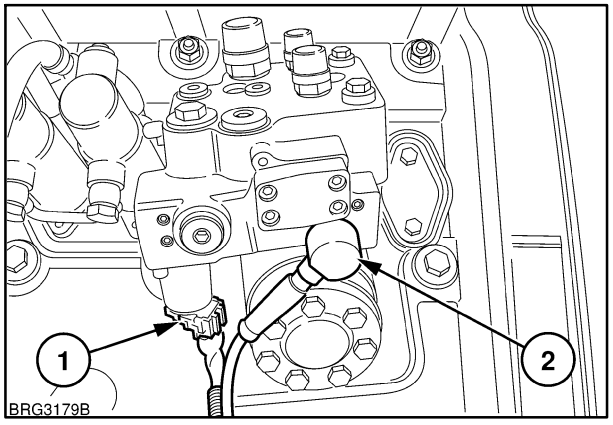
A proximity sensor (1) is located on the steering column. This senses the magnetic field strength change as the metal in the plate of the inner steering wheel ring moves away or closer to the sensor.



6

The fast steer valve is connected electronically to the controller by a harness . When the the system is enabled the controller powers a pilot valve solenoid (1) . The position of the split valve spool is checked by the sensor (LVDT) (2) to verify that the spool is not stuck in such a manner that would allow the Fast steer to be active or operate in an unsafe condition.

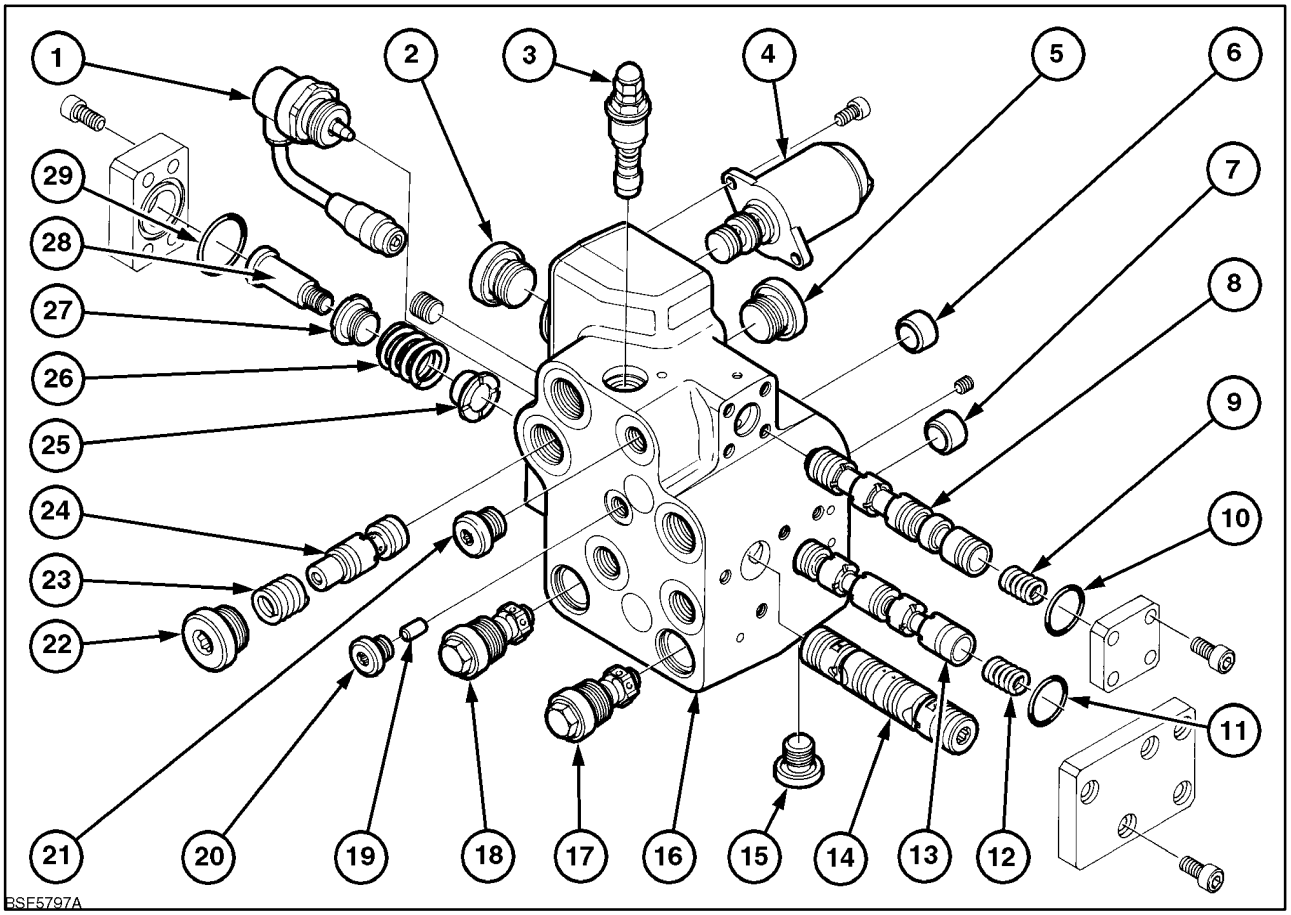
The construction of the LVDT consists of three coils which make up the static transformer and a movable inner iron core. One of the coils is the primary coil and the other two are secondary coils. When the iron core slides through the transformer, a certain number of coils are affected by the proximity of the sliding core and thus generate a unique output to the controller.



7

After the operator has enabled Fast Steer operation and the diagnostic program has not encountered any faults , the fast steer controller powers a pilot valve solenoid attached to a change valve on the Fast Steer valve. this directs the oil flow from the steering motor directly to the distributor spool and split valve. When the steering wheel is is turned the trapped oil in the steering motor now acts as pilot pressure to move the distributor valve, connecting the pump directly to the steering cylinders.The increased flow of oil to the steering cylinders provides an accelerated steering action. When the steering ring is released the fast steer controller disengages the solenoid and the oil flow reverts to the conventional steering motor operation.

FAST STEER VALVE



8

Fast Steer Valve - Components

1. LVDT Valve (Linear variable differential transformer) (Linear Position Transducer)
2. Plug M18 X 1.5
3. LSD Valve (40-180 Bar)
4. Solenoid
5. Plug
6. Bushing
7. Bushing
8. Change Valve Spool
9. Change Valve Spring
10. O-Ring
11. O-Ring
12. Split Valve Spring
13. Split Valve Spool
14. Distributor Spool
15. Plug M12 X1.5
16. Valve Body
17. SDS Valve
18. SDS Valve
19. Screw
20. Plug
21. Plug M12 X 1.5
22. Plug M18 X 1.5
23. Compensator Spring
24. Compensator Spool
25. Bushing
26. Spring
27. Bushing
28. Distributor Pin
29. O-Ring

FAST STEER HYDRAULIC OPERATION

Hydraulic oil is fed from the steering pump (10) to the change or pilot valve (12). When the system is enabled by activating the Fast Steer switch, the solenoid (11) moves against the spring pressure to allow oil to activate the change or pilot valve (12). The change valve spool overcomes the spring pressure and allows the oil to reach the distributor spool (7) this directs the oil flow from the steering motor directly to the distributor spool and split valve.

If the steering wheel is rotated left for example, the pilot pressure is exerted on the distributor spool thus enabling oil to flow to the Split valve(4) which in turn allows the increased oil flow to activate the steering cylinder(3).

OPERATING AND MONITORING SYSTEM

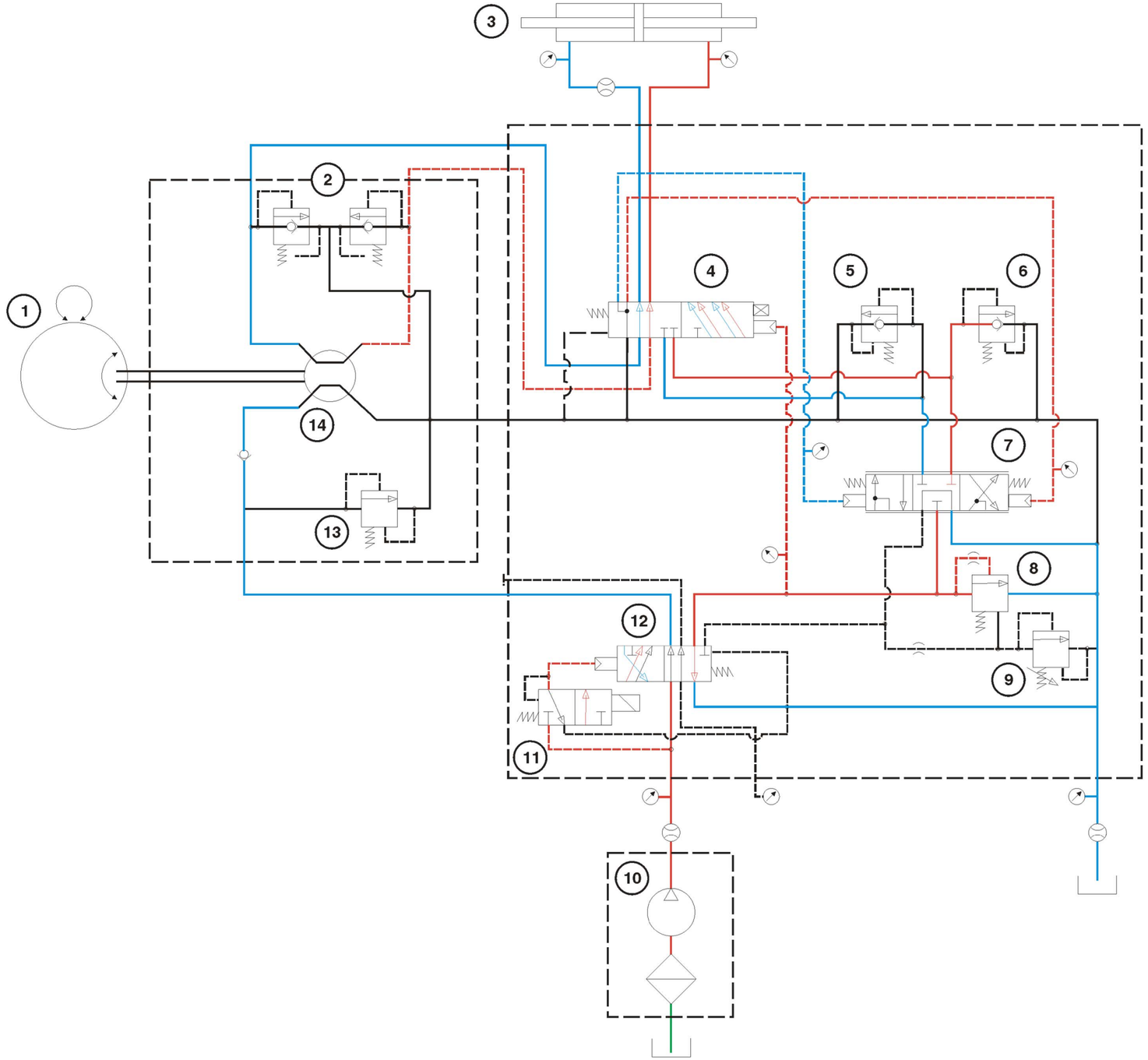
The electrical and hydraulic systems allow safe operation and monitoring of system in the following manner:

When the system is enabled by using the Fast Steer switch, the electronics perform a functional and status check. The split valve spool is checked to ensure that it is not stuck in such a manner that would allow the fast steer system to be active or operate in a dangerous way which may cause loss of control of the tractor. Should such a state exist the system activates the critical stop audible and visual alarms to the operator. If there is an invalid state that does not endanger the operator, only the visual alarm is activated. If the split valve is stuck at the midpoint of travel, then the system is in between these two modes and will be unable to determine exactly which mode the tractor is in and the critical stop alarms are activated. If the distributor spool becomes stuck it will be forced back into place by hydraulic pressure and the system will revert to normal steering mode.

When the system has determined that the hydraulic components are functioning correctly the system then checks the operator inputs and verifies that the operator controls are working correctly. The solenoids,sensors, and switches are checked for correct operational voltage and current levels and any failure will cause the system to go into a failsafe mode. If there is any problems with any of these components the system deactivates itself and prevents any electrical engagement of the system. If there are no problems with the components then the system goes into standby mode awaiting operator inputs. The system constantly monitors itself checking for failures and illegal logic combinations during fast steer operation and notifies the operator via the visual and audible alarms in the event of a system error or component failure.

Fast Steer Hydraulic Circuit

1. Steering Wheel
2. Steering Motor Shock Valves
3. Steering Cylinders
4. Split Valve/LVDT Valve (Linear Variable Differential Transformer)
5. Shock Valve (SDS) (225-245 bar)
6. Shock Valve (SDS) (225-245 bar)
7. Distributor Spool
8. Compensator Valve
9. LSD Valve (40-180 Bar)
10. Main Hydraulic Pump
11. Solenoid
12. Change Valve (Pilot Valve)
13. Steering Motor Relief Valve (170 bar)
14. Orbital Motor



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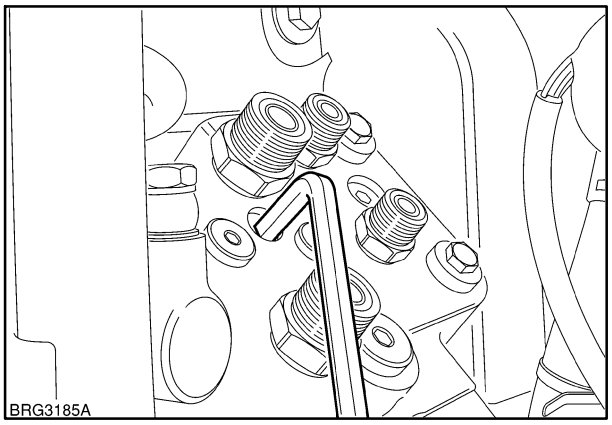
Fast Steer System Hydraulic Circuit

OVERHAUL

FAST STEER VALVE



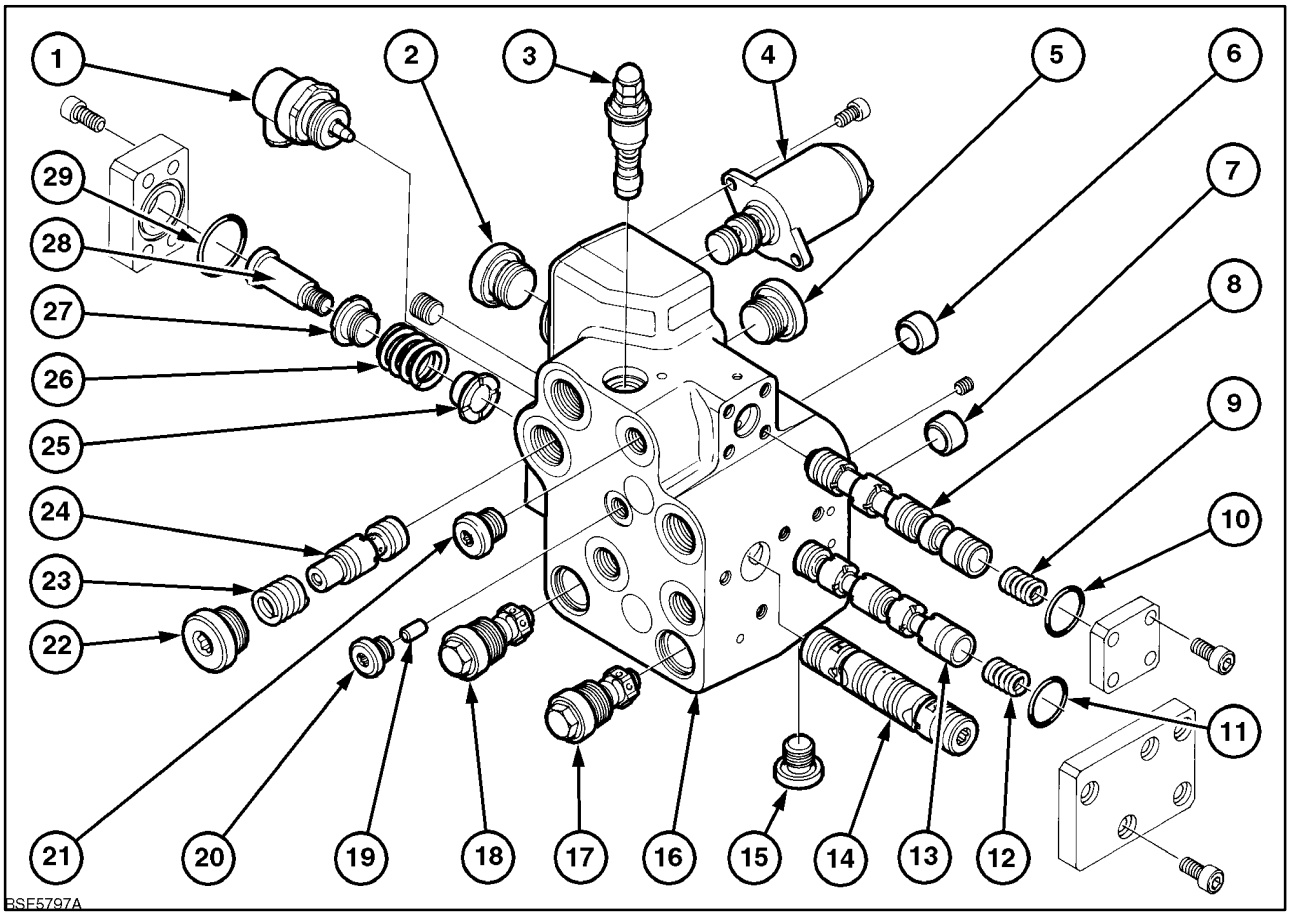
10

Removal

1. Position the tractor on a hard level surface and apply the parking brake.
2. To gain access to the fast steer valve :-
   Raise the engine hood
   Remove the steering column console
   Remove left hand engine side cover
3. Move the processor harness out of the way.
4. Undo the brake reservoir and move to one side. (Do not disconnect hose)
5. Disconnect the four supply/return tubes and 'O' ring seals from the Fast Steer valve and cap the ends of the tubes.
6. Disconnect the wiring to the solenoid and the LVDT sensor.
7. Remove the two allen headed bolts on the fast steer valve with an 8mm Allen key.
8. Remove the Fast Steer valve assembly from the front of the cab through the engine compartment.

Disassembly

1. Remove the screws holding the solenoid in place and remove the solenoid.
2. Carefully remove the four allen headed screws which hold the change valve flange in place. Remove the flange ,'O' ring, spring and spool (8,Fig.11.).
3. Remove the five allen headed screws and remove the flange which gives access to the split valve spool and the distributor spool. Remove the spools (13 & 14, Fig. 11.) , spring and 'O' rings.
4. On the opposite side of the valve remove the screws and flange which hold the distributor pin in position. Remove the pin (28, Fig.11.) , bush, spring and 'O' rings.
5. Remove the plug, spring and compensator spool (24, Fig.11).
6. Remove the two SDS valves (17 &18, Fig.11).
7. Remove the LVDT sensor (1,Fig.11).
8. Remove the LSD valve (3.Fig11.)



11

Fast Steer Valve - Components

1. LVDT Valve (Linear variable differential transformer) (Linear Position Transducer)
2. Plug M18 X 1.5
3. LSD Valve (40-180 Bar)
4. Solenoid
5. Plug
6. Bushing
7. Bushing
8. Change Valve Spool
9. Change Valve Spring
10. O-Ring
11. O-Ring
12. Split Valve Spring
13. Split Valve Spool
14. Distributor Spool
15. Plug M12 X1.5
16. Valve Body
17. SDS Valve
18. SDS Valve
19. Screw
20. Plug
21. Plug M12 X 1.5
22. Plug M18 X 1.5
23. Compensator Spring
24. Compensator Spool
25. Bushing
26. Spring
27. Bushing
28. Distributor Pin
29. O-Ring

Inspection

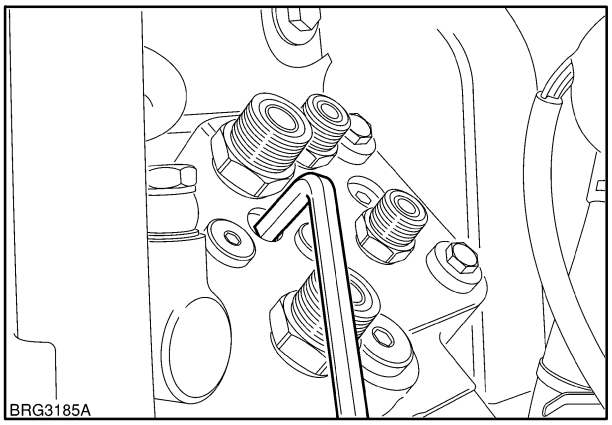
1. Wash all parts in a suitable solvent to remove any foreign particles and dry with a clean lint free cloth or compressed air.
2. Inspect valve sleeves for, damage or wear. Ensure all parts are thoroughly cleaned prior to re-assembly.
3. Discard all 'O' ring seals and replace with new seals on re-assembly.
4. If any of the spools (items 8,13, 14) , and SDS valves (items 17 & 18) are damaged a complete valve assembly will be required.

Assembly

1. Re- install all removed items as per Fig. 11.
2. Ensure all screws and plugs are tightened to the correct torque settings.

Installation

1. Make sure surfaces of steering motor and Fast Steer valve are clean.
2. Ensure 'O' rings are seated correctly on the valve.
3. Position Fast Steer valve on the steering motor and fix with the two allen headed screws.
4. Tighten the screws to 45Nm (33.19 Ft lbs)



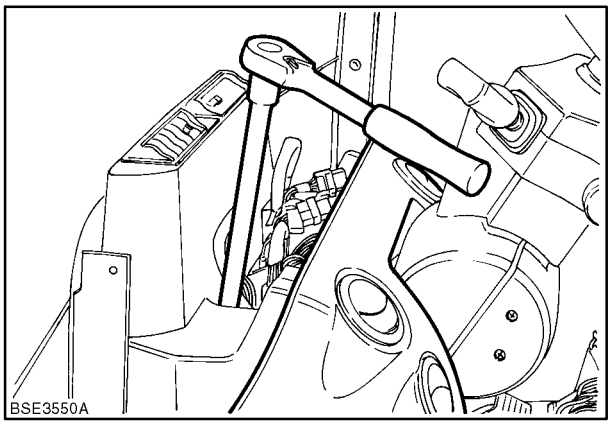
12

STEERING COLUMN

NOTE: *The component parts of the steering column as listed are serviced separately.*

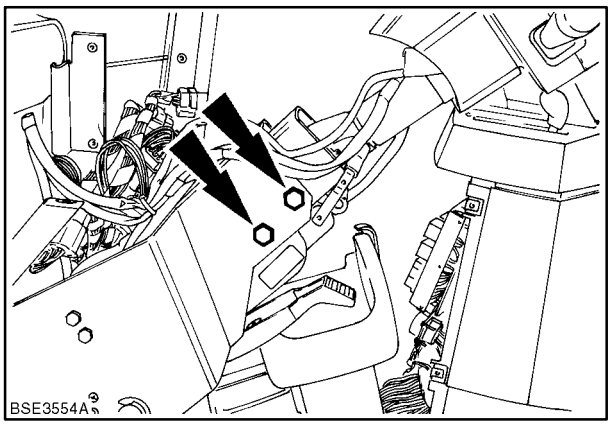
Removal

1. Remove the steering wheel, if required.
2. Remove the instrument panel. Undo the two mounting screws and remove the lower steering column cover.



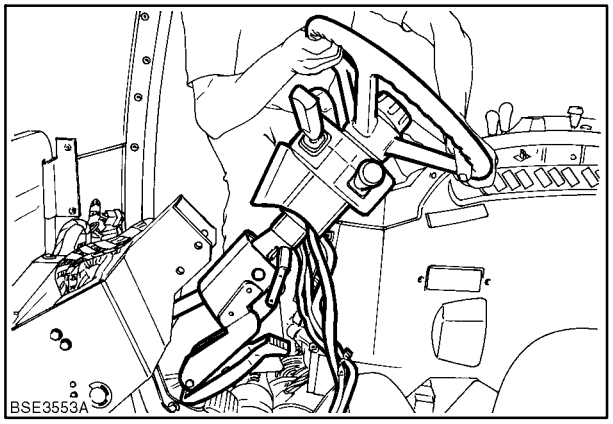
13

3. Disconnect the multi-function switch wiring and shuttle lever switch wiring connectors.
4. Disconnect the Fast Steer sensor switch connector.
5. Remove the four securing bolts securing the column to the frame, Figure 14.



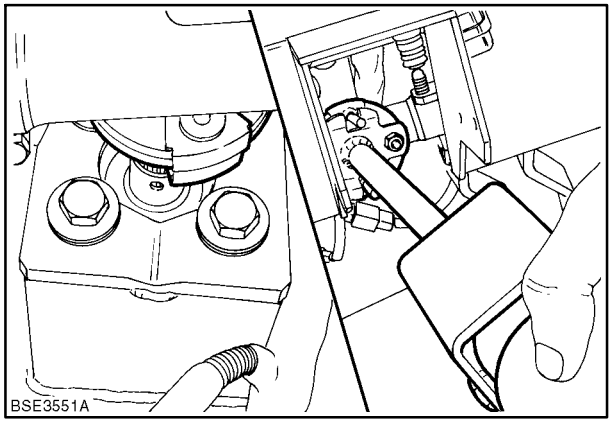
14

6. Lift the column clear of the steering shaft and clear of the instrument console, Figure 15.



15

7. Ease the coupling from the steering motor shaft and remove the steering shaft, Figure 16.



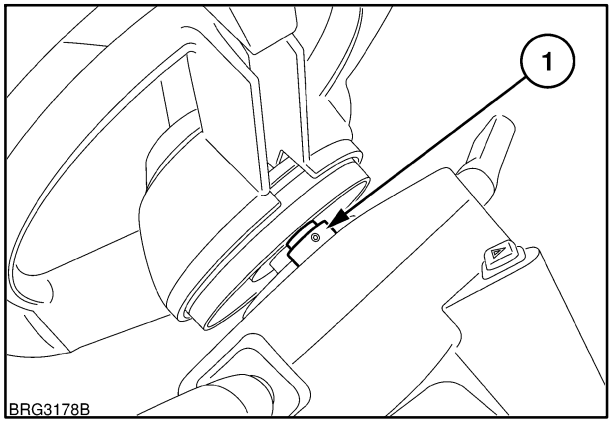
16

Inspection

1. Inspect the steering shaft universal joint and lower rubber coupling. Replace if any free play is evident.
2. Inspect the column assembly, if damaged or the bushes are worn a new assembly will be required.

Installation

1. Place spacer and steering shaft onto the steering motor and install pin.
2. Carefully place the steering column through the instrument console and over the steering shaft, ensuring flat sides are aligned.
3. Replace the securing bolts at the top of the column. Tighten to 23 Nm (17 lbf.ft).
4. Use the two adjusting nuts on the fast steer sensor (1) to ensure that the operating distance is 1-3mm between the sensor and the inner steering ring plate.



17

ERROR CODES

15001	Not Used
15002	Steering wheel control proximity sensor open circuit and short circuit to +12 and Ground
15003	Steering wheel control proximity sensor short circuit
15006	Split valve LVDT sensor open circuit
15007	Split valve LVDT sensor short circuit
15008	Change valve solenoid open circuit or short to ground
15009	Change valve solenoid short circuit across itself
15010	Safety Switch fail
15011	Maximum engagement time elapsed (5 minutes)
15012	Split valve spool stuck open
15013	Change valve or Split valve spools stuck closed
15014	Split valve spool stuck in transition zone , system can't identify which steering mode the tractor is in.
No Code	Oil temperature less than 5° Centigrade (LED will flash on instrument cluster)
15024	System not calibrated

Refer to Section 55 Chapter 9a for full error code description

CALIBRATIONS

HH - FAST STEER H ROUTINES

HH	Service Menu
H1	Calibration Menu
H2	View calibration values
H3	View/Change options (Not used)
H4	View software version
H5	Switches and threshfold monitor
H6	Vehicle information
H7	Tests Mode (not used)
H8	Clear EPROM
H9	View voltmeter channels
HA	Demonstration Menu (Not used)
HB	View Fault Stack
HC	Clear Fault Stack
HD	Set error code state (Not used)
HE	View frequency inputs
HF	View module hardware information
HJ	(Not used)

H1 - CALIBRATION PROCEDURES

Park on a flat surface and set engine speed to 1300 R.P.M. (U21 will indicate low RPM.)

Ensure Transmission oil 5° C (U19 will indicate low transmission oil temperature).

Depress the Fast Steer enable switch (The LED on the instrument panel will be lit.) (U71 will indicate Fast Steer enable switch off).

Enter the H1 menu via the ADIC Fast Steer System (KA Module) sub menu.

The display will automatically display PROX for the proximity sensor or LVDT for the LVDT sensor or DEF to adopt the default values for both the proximity and LVDT sensors. Use the H and M buttons to switch between these three settings.

Proximity Switch Calibration

Use the dimming button to enter the PROX calibration routine.

The display should show O__, this is for the steering wheel in the disengage position.

Press and hold the dimming button until the signal has been stable for two seconds this is confirmed by a beep, then a display O123, where 123 is the digital representation of the voltage.

The display should then go to C___, this is for the steering wheel in the engage position. Holding the steering wheel in the engage position, depress the dimming button until the signal has been stable for two seconds, this confirmed by a beep, then a display of C123 , where 123 is the digital representation of the voltage. The display then reverts to the H1 menu.

LVDT Calibration

Select the H1 menu and select LVDT using the dimming button. The system should automatically pilot the solenoid and measure the LVDT values in both positions and overwrite the default values.

Resetting the Default Values

Enter the H1 menu and select DEF using the dimming button. Confirms with a beep and reverts to the H1 Menu.

H2 - VIEW CALIBRATION VALUES

Channel	Description	Default	Value Range
Ch 1	Proximity Open	350	350 - 999
Ch 2	Proximity Closed	250	0 - 250
Ch 3	LVDT Secondary 1 Conventional	400	400 - 750
Ch 4	LVDT Secondary 2 Conventional	500	400 - 750
Ch 5	LVDT Secondary 1 Fast Steer	500	400 - 750
Ch 6	LVDT Secondary 2 Fast Steer	400	400 - 750

H4 - VIEW SOFTWARE REVISION LEVEL

This menu displays the software release of the unit.

Use standard H4 procedure as on ADIC.

H5 - SWITCH DIAGNOSTICS

Switch Identification Numbers	Description
117	Enable Switch
118	Safety Switch
119	Proximity Switch
120	LVDT

The H5 menu is used to check the operation of the switch inputs (analogue and digital) to an electronic control module . When a switch transition is detected (either low-high or high-low) the display will show “d” followed by a number indicating which circuit the transition occurred.

If the same circuit has two transitions in a row the display changes to “d0” when the second transition occurs.

Navigate to H5. Once the display shows “d-- , the switch operation can be tested (See table above).

H6 - VEHICLE INFORMATION

Not Used

H7 - VEHICLE TEST MODE

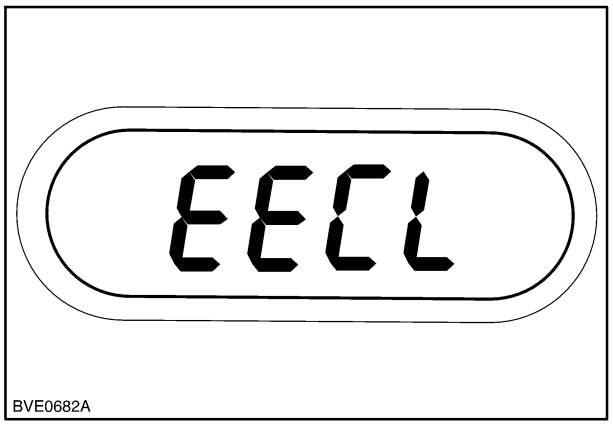
Not Used

H8 - CLEAR ELECTRICAL ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default.

Select the H8 menu by depressing the “dimming” key.

The lower central display will display “EECL” .



18

⚠ CAUTION ⚠

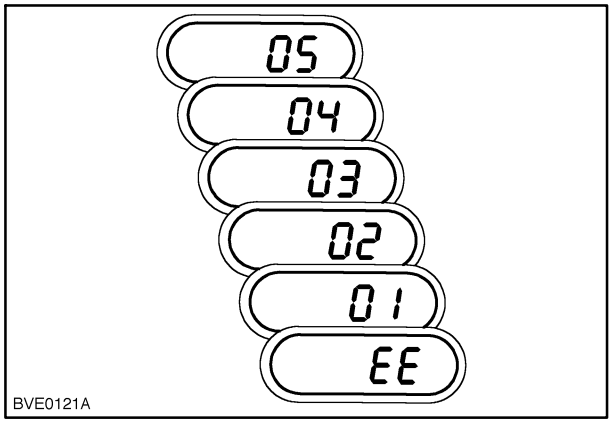
H8 will clear all calibrations values and stored error codes.

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the resetting of the EEPROM.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the EEPROM has been cleared.

Turn the keystart OFF.



19

H9 - VOLTMETER

If an intermittent fault is detected within a circuit, a “wiggle“ test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

Channel	Description	Value
1	LVDT Secondary winding 1	450–750
2	LVDT Secondary winding 2	450–750
3	Proximity Sensor	50–800
4	Current Electrovalve mA	350–500

HA - DEMO MODES

Not Used

HB - STORED ERROR CODES

Use standard HB procedure

HC - STORED ERROR CODES

Use standard HC procedure

HD - SET ERROR CODE STATE

Not Used

HE - FREQUENCY

Channel	Description	Typical
1	Engine Speed (CAN)	0–2700 rpm
2	Wheel Speed (CAN)	0–40 kph

HF - VIEW CONTROLLER HARDWARE INFORMATION

Use standard HF procedure

"U" CODES

Code	
U19	Transmission oil temperature too low (below 5° C)

Possible failures:

1. Oil temperature too low. Increase oil temperature and repeat calibration
2. Check transmission temperature sensor.

Code	
U21	ERPM is below 1300 RPM, increase engine speed

Possible failures:

1. Operator has not set engine speed correctly.
2. Open circuit for the engine speed sensor going to cluster. (Mechanical Engines Only)
3. Instrument cluster is not receiving power.
4. Broken CAN

NOTE: *Use the H9 in the transmission module to see if the engine speed is being detected.*

Code	
U71	Fast Steer enable switch off

Possible failures:

1. Turn on the enable switch and repeat calibration
2. Check for faulty enable switch.

Check enable sensor connection.

Code	
U72	Proximity sensor open out of range

Possible failures:

1. Incorrect position of the steering wheel.
2. Faulty proximity sensor.

Check proximity sensor connection.

Code	
U73	Proximity sensor closed out of range

Possible failures:

1. Incorrect position of the steering wheel.
2. Faulty proximity sensor.

Check proximity sensor connection.

Code	
U74	LVDT calibration unsuccessful (out of range at the fifth attempt)

Possible failures:

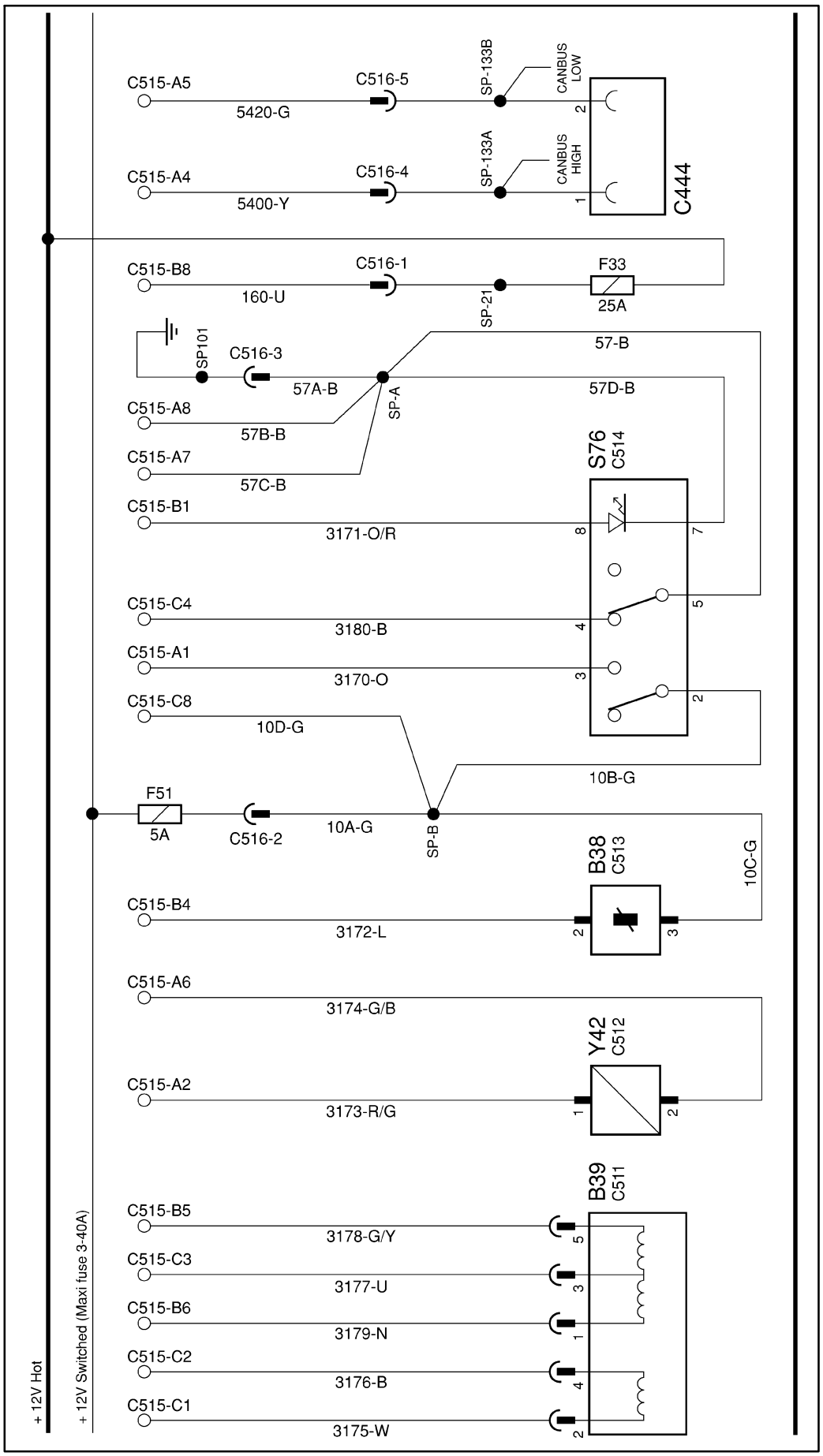
1. Faulty LVDT sensor.
2. Faulty Fast steer hydraulic valve
3. Incorrect assembly of hydraulic valve.

Check LVDT sensor.

NOTES

WIRING DIAGRAMS

FAST STEER SYSTEM



Key to Wiring Diagram

Connector C511 (component B39) - LVDT

Connector C512 (component Y42) - Split Valve Solenoid Valve

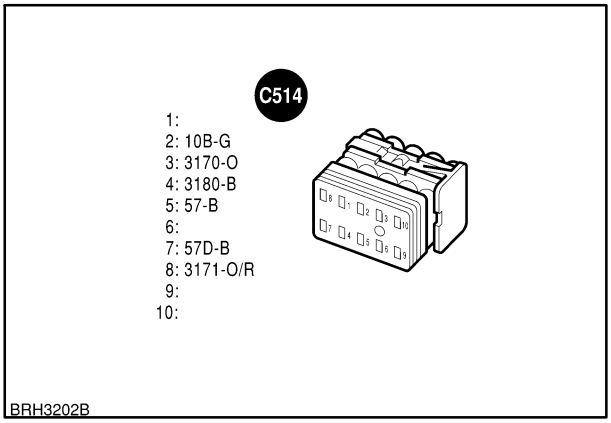
Connector C513 (component B38) - Proximity sensor

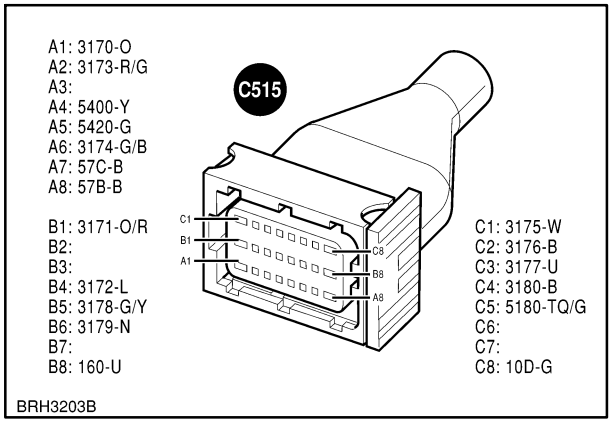
Connector C514 (component S76) - Safety/enable switch

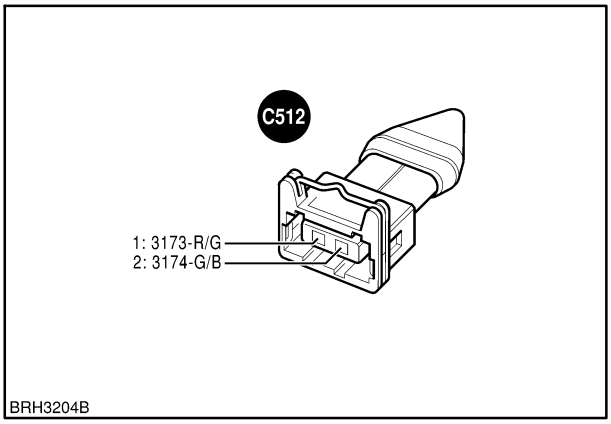
Connector C515 - KA (fast steer) processor

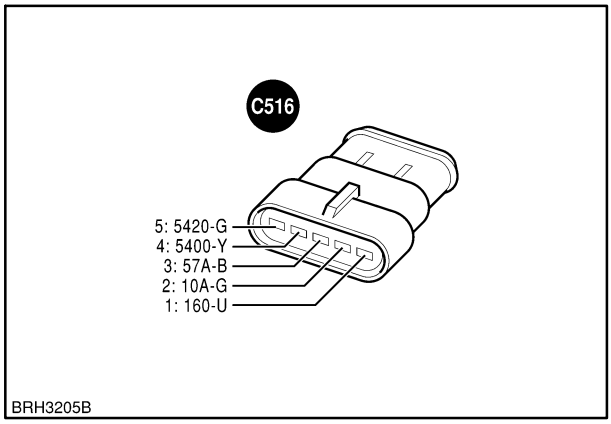
Connector C516 - Fast Steer to Main cab harness connector

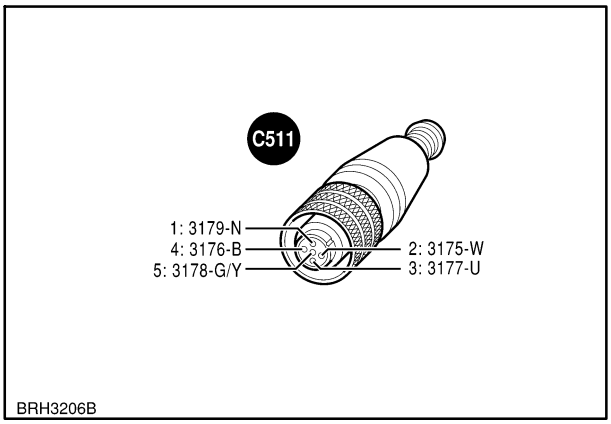
Connector C444 - Trans CAN select connector

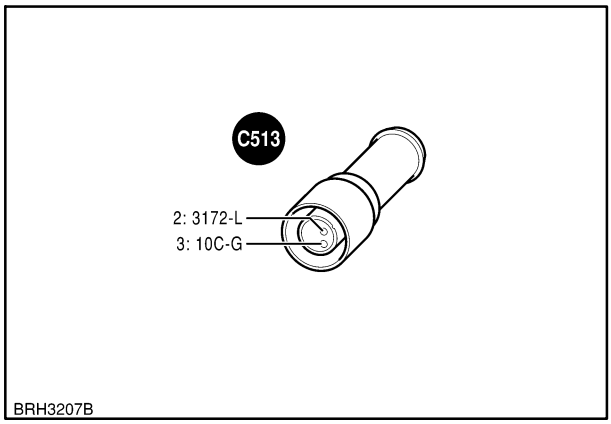












NOTES

SECTION 44 - FRONT AXLE AND WHEELS

Chapter 1 - Front Axle and Wheels

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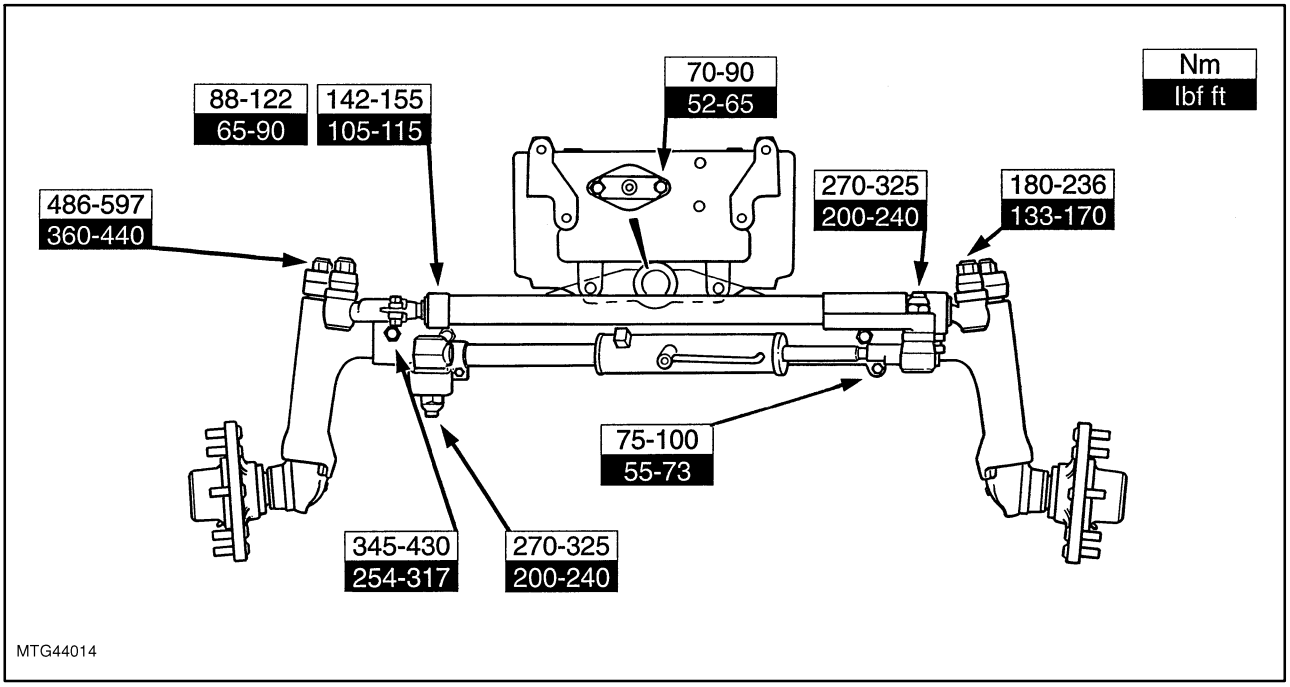
SPECIFICATIONS

Type	Centrally pivoted hollow centre beam with telescopic axle extensions and spindle assemblies at each end,
Track settings (7 off) mm	1422-1524-1626-1727-1829-1930-2032-2134
Track settings (7 off) (Tobacco Axle) mm	1727-1829-1930-2032-2134-2235-2337-2438
Wheel camber	3°
Wheel toe-in mm	0 to 13
Swivel Pin Assembly	
Swivel pin (3, Fig. 3) diameter at Upper bush mm	43.69 to 43.76
Press-fit bush (Upper) inner diameter mm	43.84 to 44.02
Swivel pin (3, Fig. 3) diameter at Lower bush mm	49.10 to 49.15
Press-fit bush (Lower) inner diameter mm	49.02 to 49.30
Axle Pivot Pin Assembly	
Pivot pin (9, Fig. 3) diameter mm	47.6
Press-fit bush (8) inner diameter mm	47.663 to 47.816 ([1])

([1]) final dimension without reaming

TIGHTENING TORQUES



1

SPECIAL TOOLS

⚠ CAUTION ⚠

Operations described in this Section of the Manual must be performed using the following **ESSENTIAL** tools marked with the identification code **(X)**.

To work safely and achieve the best technical results with additional savings of time and effort, these mandatory tools should be used in conjunction with the suggested special tools listed below and integrated with the Dealer made ones for which you will find the necessary construction drawings and specifications in this Manual.

List of special tools necessary to carry out the different operations described in this Section.

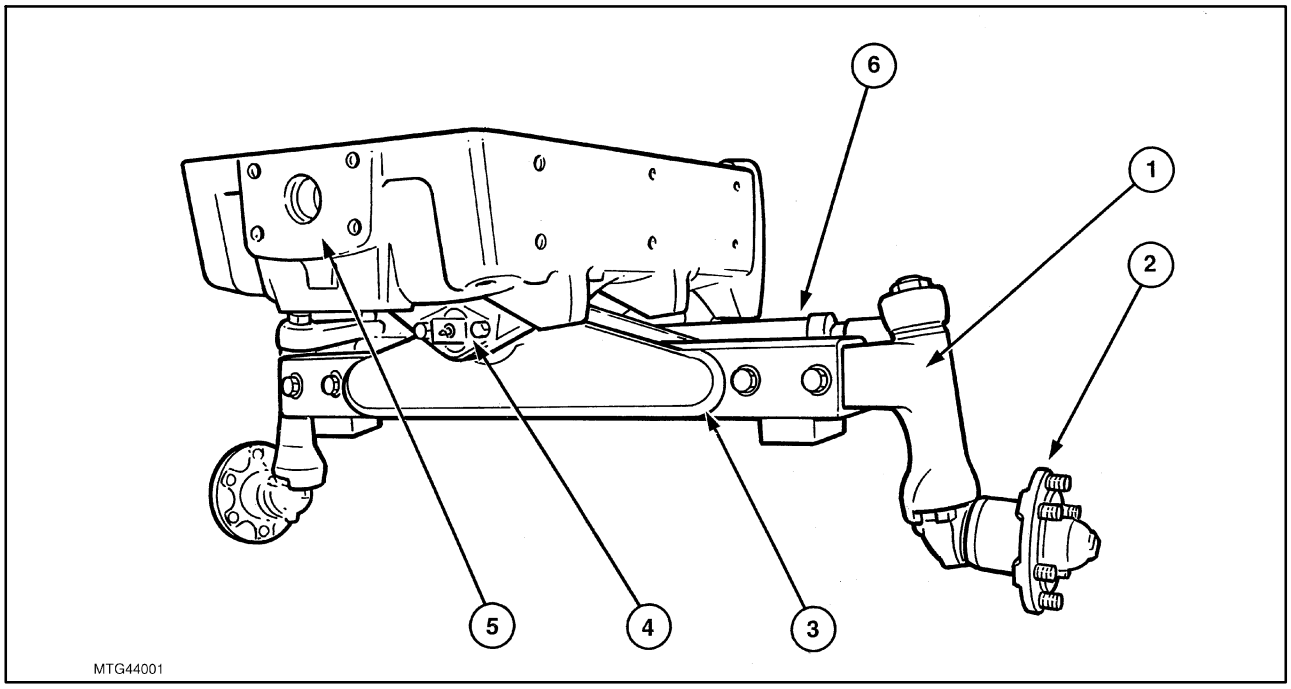
292927 Slide hammer**.**

292400 Wheel lifting hook.

TROUBLESHOOTING

Problem	Possible Cause	Correction
Premature tyre wear	1. Wrong inflation pressure.	Inflate tyres to correct pressure, refer to values suggested in the Operator's Manual. Always comply with values specified by the tyre manufacturer.
	2. Wrong front wheel toe-in.	Adjust toe-in (see page 14).
Poor tractor stability	1. Wrong inflation pressure.	Inflate tyres to correct pressure

DESCRIPTION AND OPERATION



2

Two Wheel Drive Axle Assembly

1. Telescopic Axle Extension
2. Wheel Hub and Spindle
3. Centre Beam
4. Support Pin
5. Front Support
6. Track Control Rod Assembly

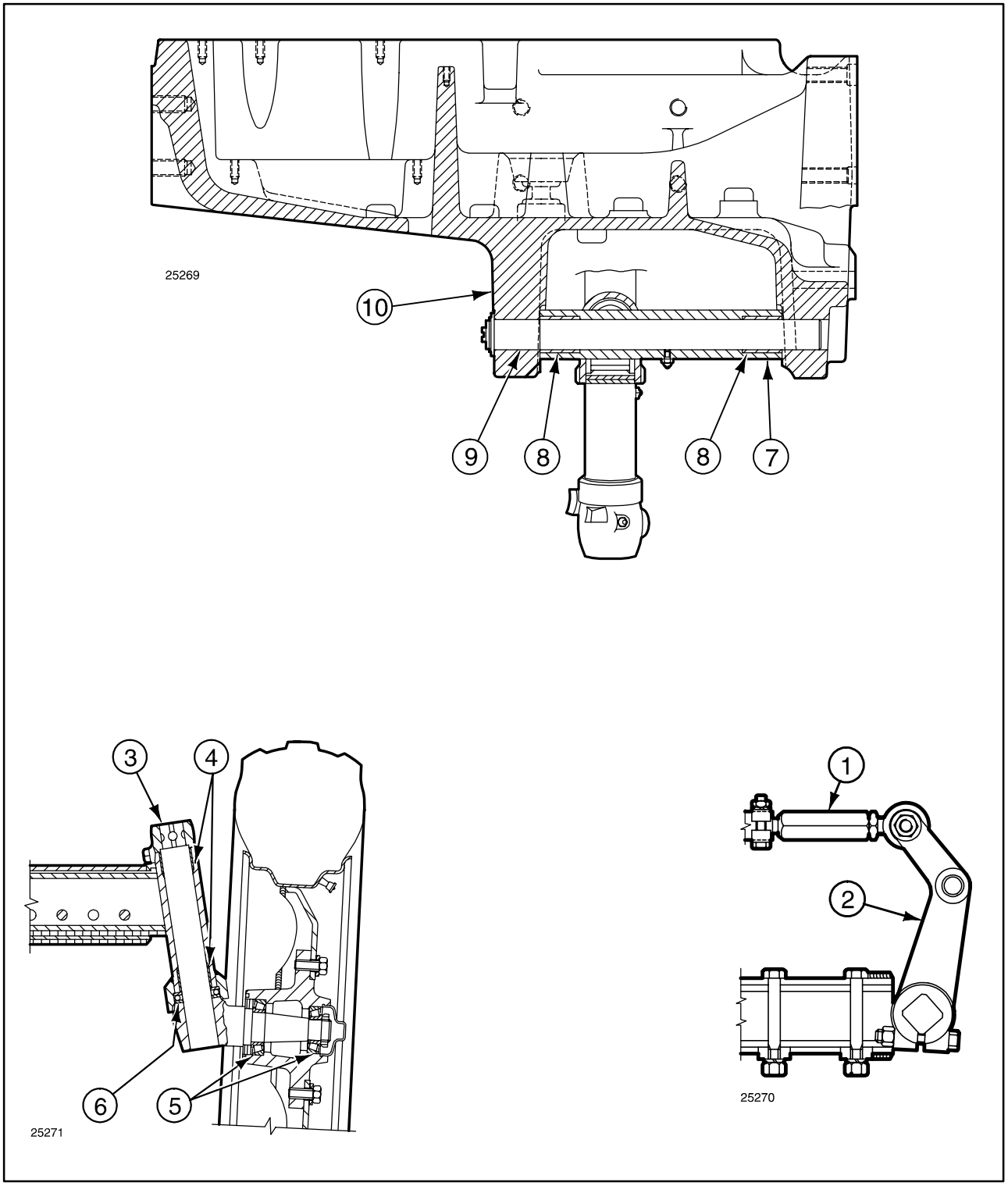
The standard two wheel drive front axle consists of a square tube centre beam with telescopic axle extensions and spindle assemblies at each end.

The centre beam is attached to the front axle carrier by means of a single pivot which allows oscillation on both sides.

The front axle is controlled by the power steering system through a cylinder attached to the axle housing and the swivel pin control lever. The two swivel pins are connected by an adjustable track control rod for toe-in adjustment, if required.

Axle centre beam and telescopic outer sections are drilled to obtain 7 possible track settings.

The heavy duty axle is also composed of a square tube centre beam with telescopic outer sections and attached by use of a single pivot. The centre beam and telescopic outer sections are drilled to obtain 7 possible track settings. The heavy duty axle has an an eight stud heavy duty spindle and hub assembly.



3

Standard Front Axle and Carrier - Sectional View

1. Adjustable track control rod
2. Swivel pin control lever
3. Swivel pin
4. Swivel pin bushings
5. Wheel hub tapered roller bearing.
6. Swivel pin thrust bearing
7. Axle centre beam
8. Axle pivot pin bushings
9. Axle pivot pin
10. Front axle carrier.
11. Socket Assembly
12. Grease Fitting
13. Cylinder
14. Bolt
15. Washer
16. Trunnion

OVERHAUL

FRONT AXLE

Op. 44 101 30

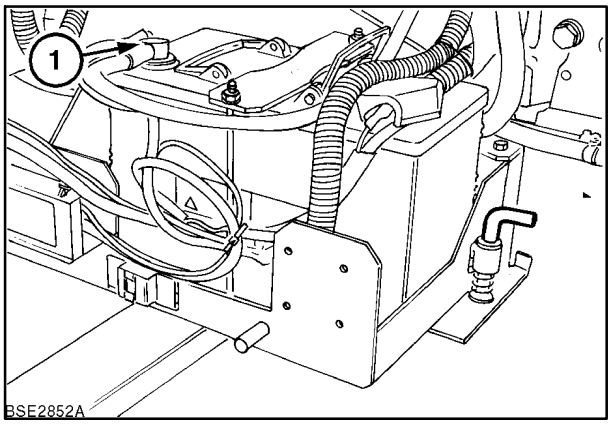
Removal

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate capacity. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no-one is in the vicinity of the load to be lifted.

Remove the front axle assembly from the tractor as follows:

1. Open and raise engine hood.
2. Disconnect the negative cable (1) from the battery and insulate.
3. Safely block rear wheels.
4. Remove front weights and weight support, where fitted.



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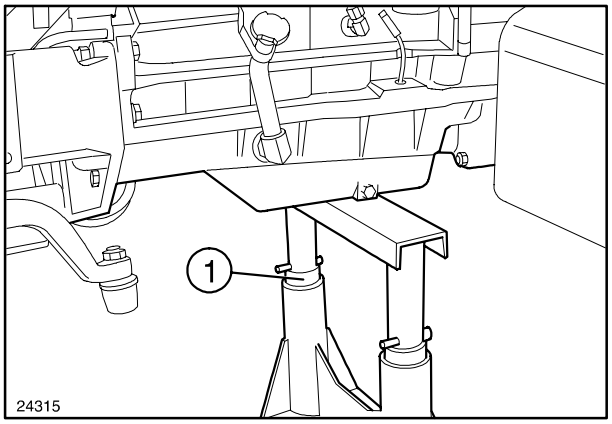
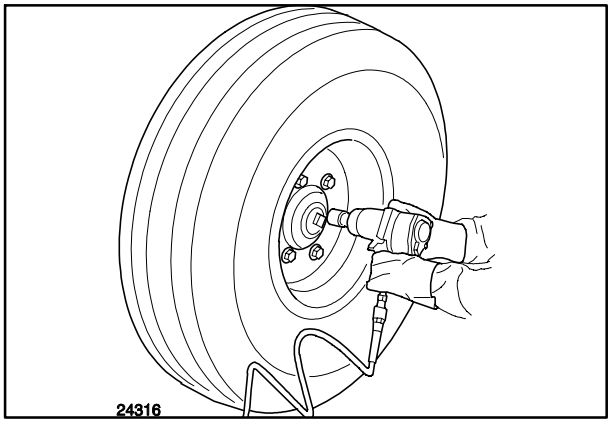
5. Jack up front of tractor and place a stationary stand (1) under the sump.



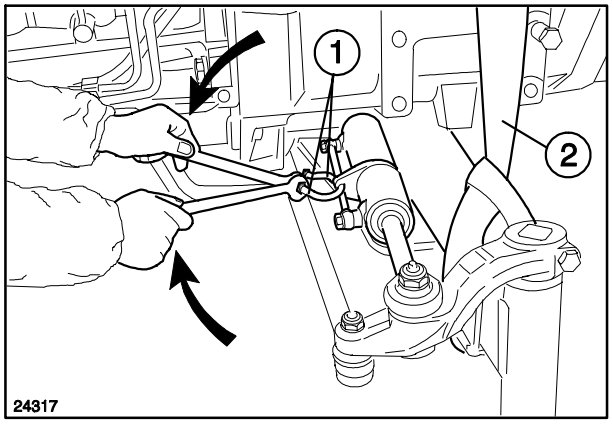
5

6. Loosen retaining bolts and remove front wheels.



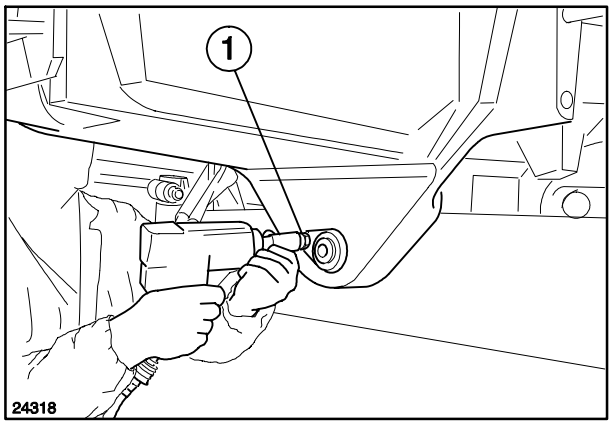
6

7. Connect axle to a hoist using two nylon cables (2) (one on each side). Disconnect steering cylinder control pipes (1).



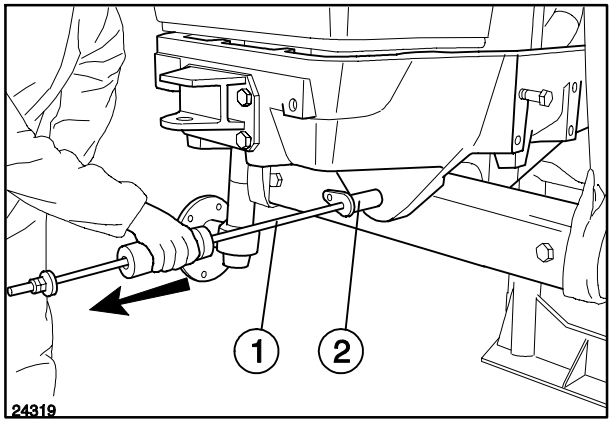
7

8. Loosen the axle pivot pin locking bolts (1).



8

9. Using a slide puller (1) on the pivot pin (2) withdraw the pivot pin.

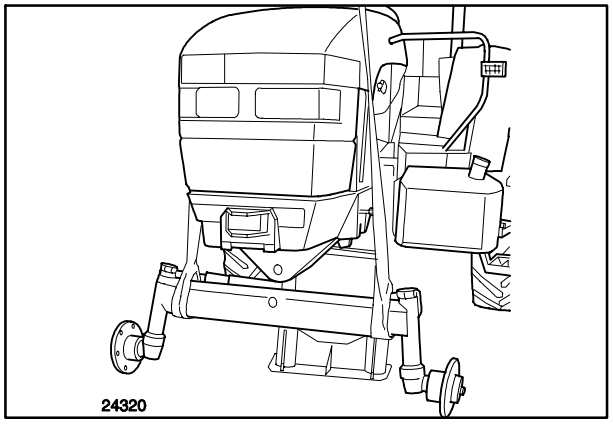


9

10. Remove front axle using a hoist.

⚠ WARNING ⚠

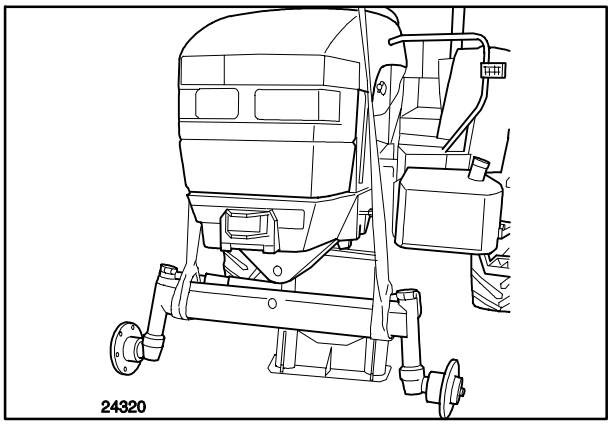
Always use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.



10

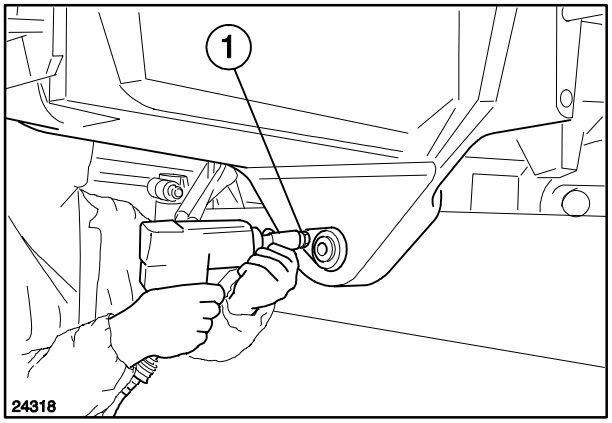
Installation

1. Locate the front axle into the front support using a hoist.



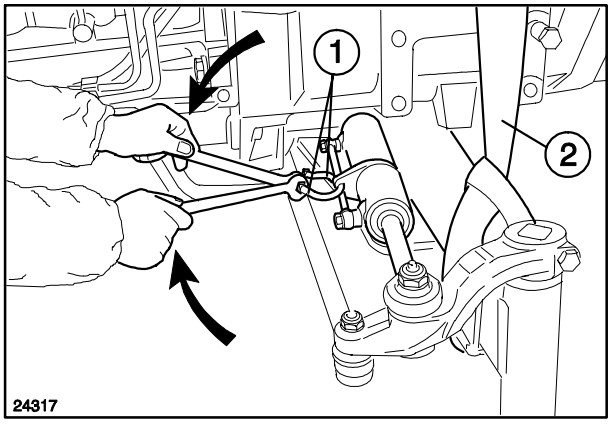
11

2. Install the axle pivot pin and tighten securing bolts (1) to a torque of 70–90 Nm (52–65 lbf ft).



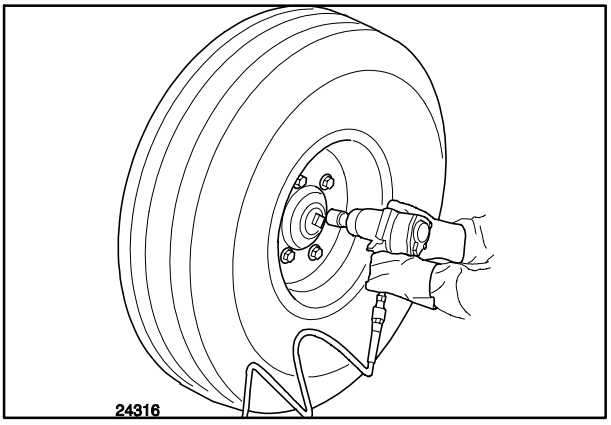
12

3. Reconnect the steering cylinder control pipes.



13

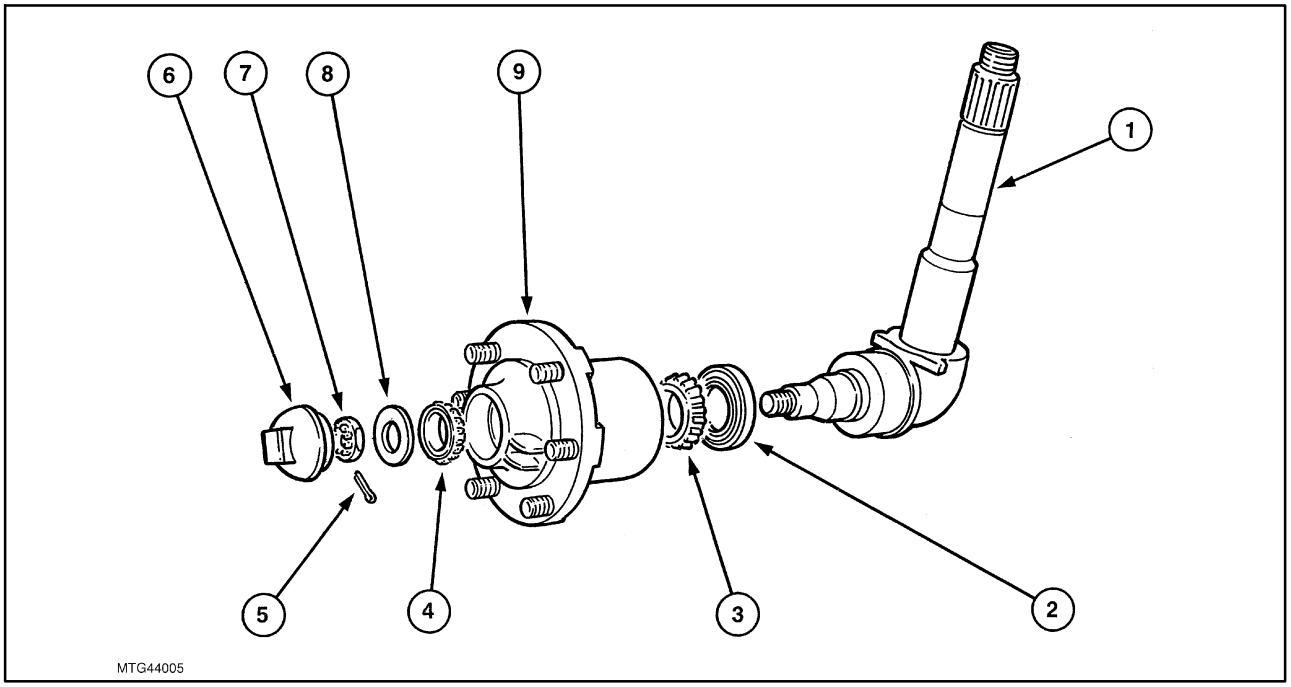
4. Place the wheels onto the hubs and tighten to 133 Nm (98 lbf ft).



14

HUB AND SPINDLE

Disassembly and Assembly



15

Hub and Spindle Assembly

1. Spindle
2. Grease Retainer
3. Inner Bearing
4. Outer Bearing
5. Split Pin
6. Grease Retaining Cap
7. Castellated Nut
8. Washer
9. Hub

The wheel hubs spindles and extensions can be serviced without removing the axle from the tractor. It is only necessary to remove the axle in order to replace the bushes in the centre beam.

For overhaul of the steering cylinder refer to Section 41 Steering Systems.

FRONT WHEEL HUB

Removal

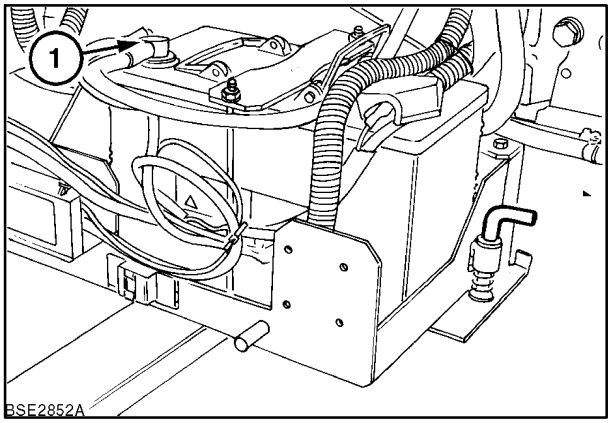
Op. 44 101 22

⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

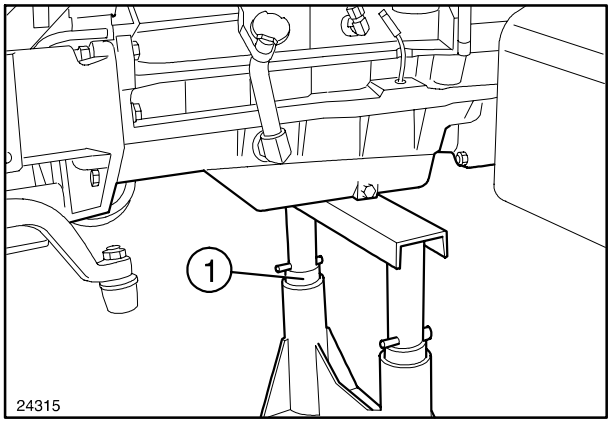
Wheel hubs can be removed with the front axle on the tractor. Proceed as follows for each hub:

1. Open and raise engine hood.
2. Disconnect the negative cable (1) from the battery and insulate.
3. Safely block rear wheels.
4. Remove front weights and weight support, where fitted.



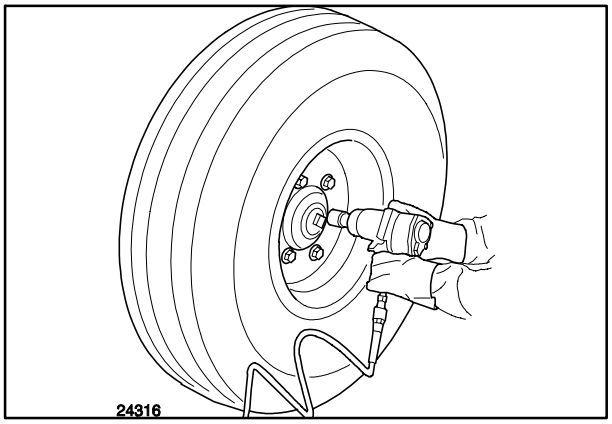
16

5. Jack up front tractor and place a stationary stand (1) under the sump.



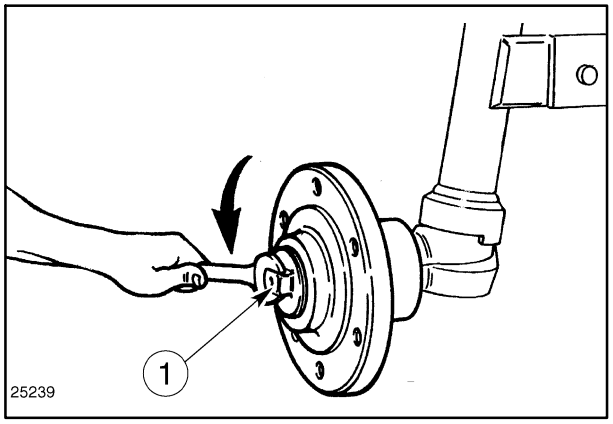
17

6. Loosen retaining bolts and remove front wheels.



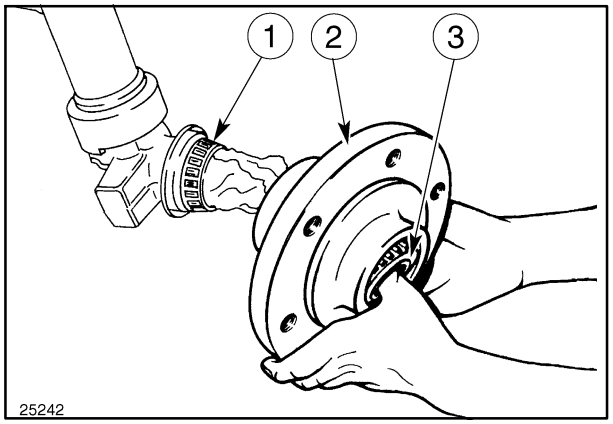
18

7. Remove the wheel hub bearing grease cup (1)



19

8. Remove the wheel hub (2) and recover bearings (1 and 3).



20

Inspection

1. Clean all components using a suitable cleaning agent such as parraffin (Kerosene).
2. Inspect hub inner and outer bearings and cups. If damaged they should be replaced as an assembly, ensuring that the new cups seat correctly against the shoulders of the wheel hub.

Installation

1. Position grease retainer and inner bearing on spindle
2. Fill the wheel hub and bearing with **AMBRA GR 75 MD** grease.
3. Install Hub, outer bearing, washer and castellated nut.
4. Tighten the castellated nut to 42 Nm (31 lbf. ft).
5. Rotate hub clockwise three to four revolutions.
6. Tighten castellated nut to 75 Nm (55 lbf ft).
7. Loosen nut two slots, tighten to nearest locking position and install cotter pin.
8. Pressure charge specified grease through outer bearing until it exudes from the annulus of the hub seal.
9. Install the grease retaining cap.

SPINDLE ASSEMBLY

Removal

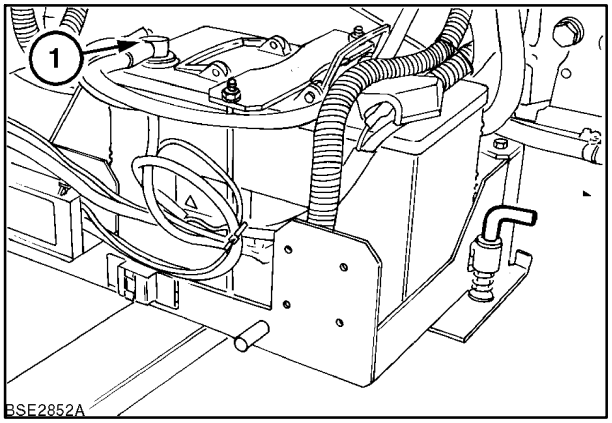
Op. 44 101 46

⚠ WARNING ⚠

Handle all components with the greatest care. Do not insert hands or fingers between the parts. Wear suitable protection clothing, including goggles, gloves and footwear.

Swivel pins can be overhauled with the front axle on the tractor. Proceed as follows for each wheel:

1. Open and raise engine hood.
2. Detach the negative cable (1) from the battery and insulate.
3. Safely block rear wheels.
4. Remove front ballast and ballast support, if present.



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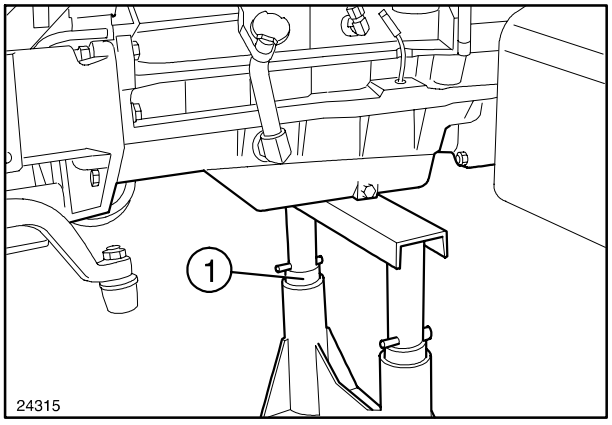
5. Jack up front of tractor and place a stationary stand (1) under the sump.



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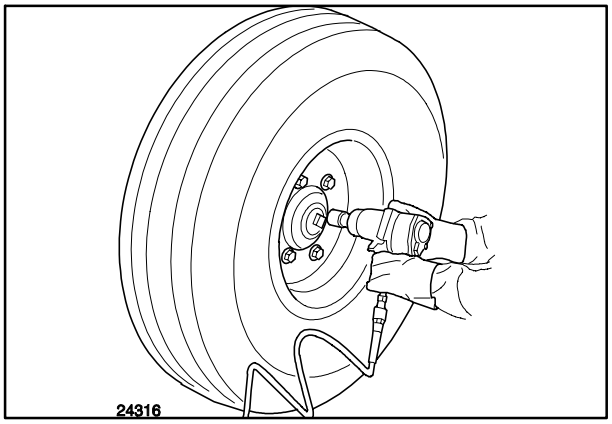
6. Loosen retaining bolts and remove front wheels.



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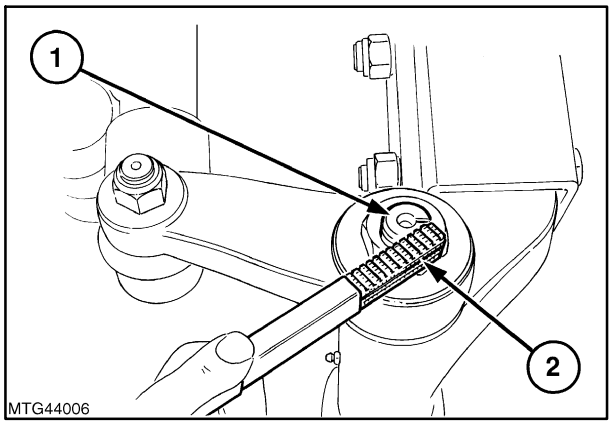
7. Place an hydraulic jack under the spindle assembly. Using a file (2) clean the threads (1) at the top of the spindle.



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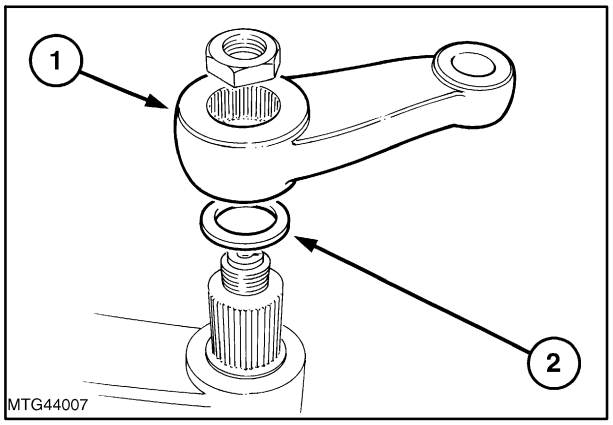
8. Disconnect track control rod assembly from the spindle arm (1) .
9. Using a suitable puller remove spindle arm and felt washer (2).



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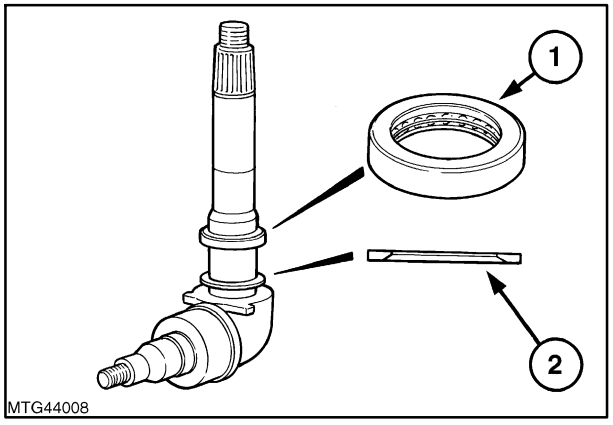
10. Remove spindle ,thrust bearing (1) and spacer (2).



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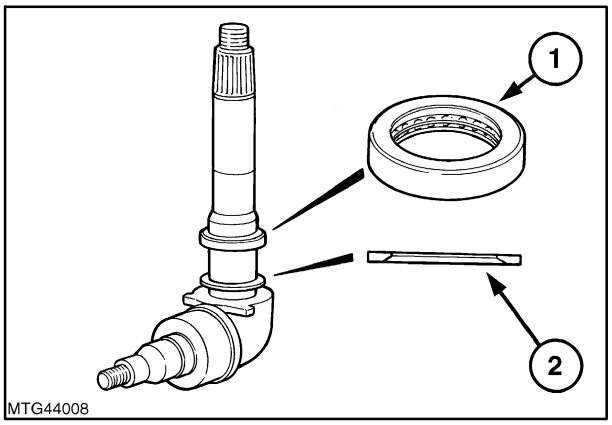
Inspection

1. Clean all components using a suitable cleaning agent such as paraffin (Kerosene).
2. Inspect the spindle bearing surfaces, thrust bearing and washer for wear or damage.
3. Inspect the spindle bushes in the top and bottom of the axle telescopic extensions. If worn remove extension from tractor and replace bushes.
4. Inspect track control rod ball joints.

Installation

1. Position spacer on wheel spindle. Ensure chamfered edge of spacer faces down.
2. Position bearing on spindle with manufacturers name facing upwards.
3. Pack spindle thrust bearing with grease to specification NH710A (Ambra GR9) and install on spindle.
4. Install spindle into axle extension. Ensure spindle rotates freely in the bushes.
5. Install a new felt dust seal.



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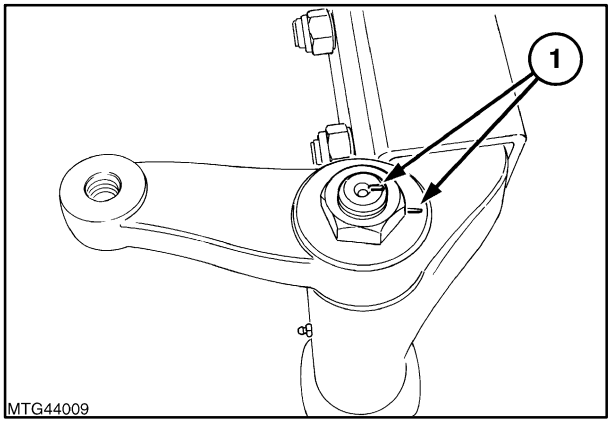
6. Position arm onto the spindle ensuring the marks on both the arm and spindle are aligned (1).
7. Tighten the spindle nut to a torque of 360-440 lbf ft (488-597 Nm). To prevent the nut from loosening during normal operation deform the protruding thread adjacent to the nut.



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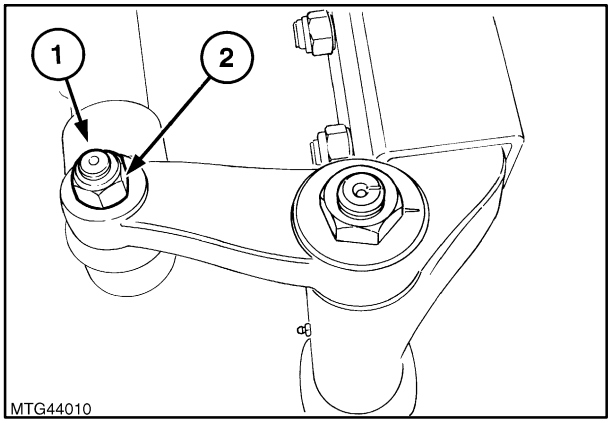
8. Reconnect track control rod and tighten ball joint (1), Figure 29, to the correct torque of:- 180-236 Nm (133-170 lbf.ft).
9. After re-assembly check front wheel track adjustment.



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FRONT WHEEL SETTINGS

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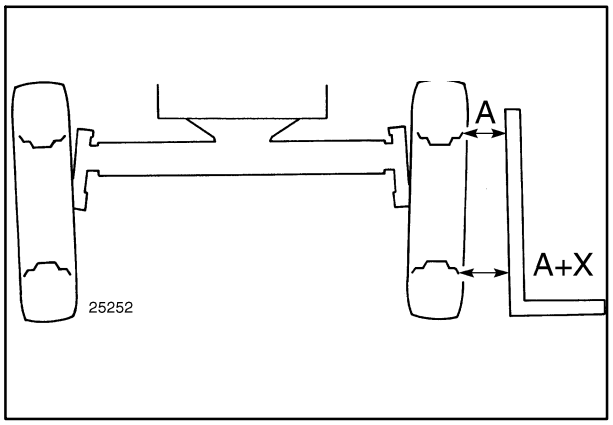
Wheel Camber Test

Check the front wheel camber considering that, when the tractor moves along a straight line, wheels should be tilted by 3° relative to the ground, corresponding to a difference (X) of approximately 16 mm between the rim edges (with 16" rims). If camber is not correct repair or replace faulty parts.



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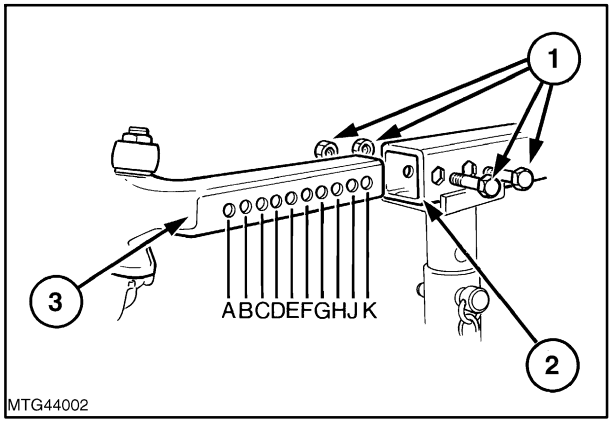
TRACK WIDTH ADJUSTMENT

1. Apply the hand brake and place blocks at the front and rear wheels.
2. Jack up the front axle (2) and place on axle stands.
3. Remove axle extension (3) securing bolts (1).
4. Remove the locating bolts from both ends of the track rod.



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5. Set the left and right hand axle extensions to the required track as indicated.

Standard Axle

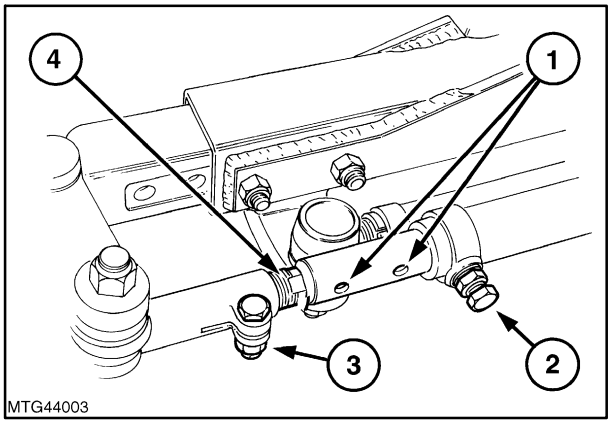
Track Setting		Securing Bolt Locations Refer to Figure 31	
in.	mm		
56	1422	A	C
60	1524	B	D
64	1626	C	E
68	1727	D	F
72	1829	E	G
76	1930	F	H
80	2032	G	J
84	2134	H	K

NOTE: *The track settings shown are approximate. The front wheel discs are off-set relative to the centre line of the rim. The track settings in the table are with the dished side of the wheel nearest the axle hub. If the front wheels are reversed on the hubs the track settings shown in the tables will be increased by approximately 4 in. (100 mm).*

Tobacco Axle (North America Only)

Track Setting		Securing Bolt Locations Refer to Figure 31	
in.	mm		
68	1727	A	C
72	1829	B	D
76	1930	C	E
80	2032	D	F
84	2134	E	G
88	2235	F	H
92	2337	G	J
96	2438	H	K

6. Install the axle extension securing bolts and tighten to a torque of 407 Nm (300 lbf ft)
7. Position both wheels straight ahead and install the track control rod locating bolts, Figure 32. Tighten the bolts to a torque of 150Nm (110 lbf ft) and their locknuts to 75 Nm (55 lbf ft). Re-check all torque settings after 50 hours of operation.



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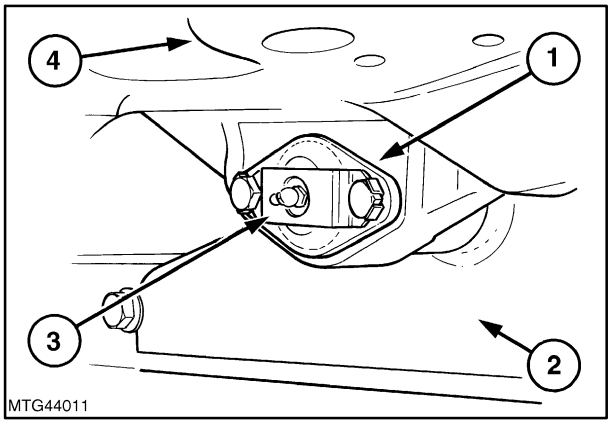
Track Control Rod - Left Hand End

1. Drillngs
2. Locating Bolt and Locknut
3. Clamp Bolt
4. Threaded Section

AXLE CENTRE BEAM AND FRONT SUPPORT

Removal

1. Postition the front wheels straight ahead.
2. Disconnect and remove steering cylinder.
3. Raise the front of the tractor and position safety stands under the engine and remove front wheels.
4. Support axle centre beam assembly to remove weight from support pin.
5. Remove locking plate (3),.
6. Drive the pin (1) from the support and carefully lower axle (2) from front support.



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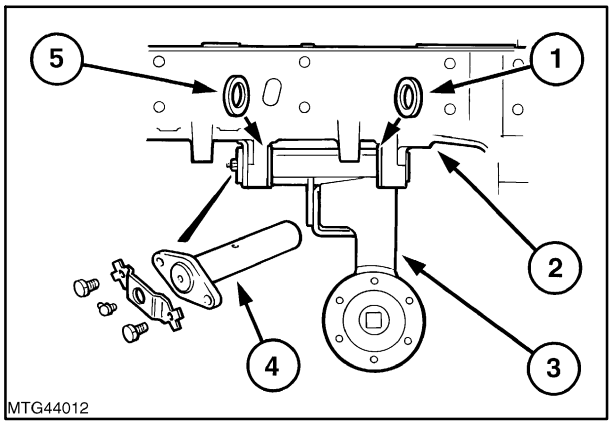
Inspection

1. Inspect bushes and pin, replacing if worn or damaged.
2. Replace thrust washers.
3. Replace support pin locking plate.
4. Inspect front support for signs of cracks.

Installation

1. Install axle (3) onto front support (2) ensuring thrust washers (1 & 5) are positioned at both ends of axle pivot pin bore.
2. Tighten support pin (4) retaining bolts to a torque of 70-90 Nm (52-66 lbf ft) and bend locking plate tabs against bolt heads.



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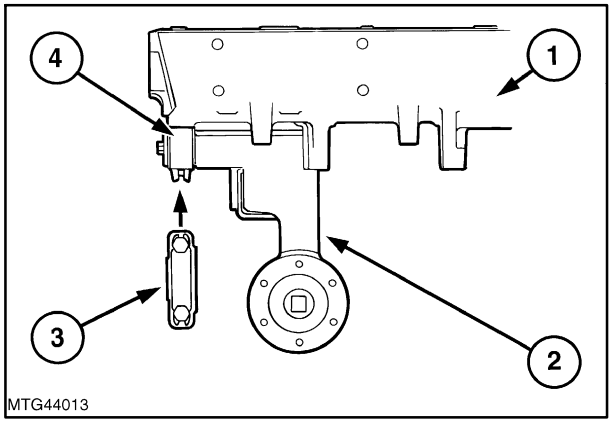
NOTE: *On tractors fitted with the long wheel base option (2), ensure the axle pivot pin trunnion (4) to front support (1) retaining bolts are tightened to a torque of 345-430 Nm (254-317 lbf ft) and locked in position with a locking plate (3).*

3. Reconnect steering cylinder and bleed steering system of air as described in Section 41, Steering Systems.



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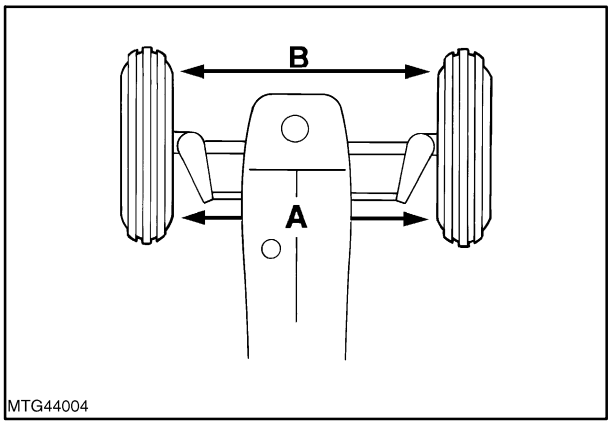
Front Wheel Toe-in Alignment (Standard Axle)

When the tractor moves along a straight line, wheels should be parallel to the tractor centre line or slightly toe-in until a max. of 5 mm, measured between the rim edges.

Check correct toe-in as follows:

1. Inflate front tyres to a pressure of 2.5 bar (kg/cm^2).
2. Place the steering wheel at mid-travel, with one spoke along the tractor centre line.
3. Check if wheels are parallel to the tractor centre line.



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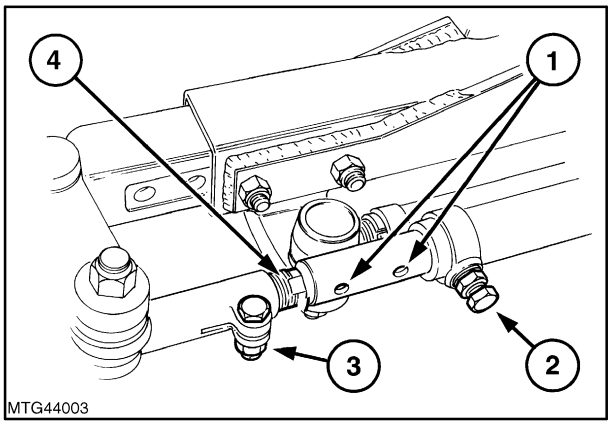
4. Measure the distance between the wheel inner rims at hub height at the **front** of the wheels. The measurement taken should be the same as (A) or less by up to 13 mm (0.5in) max.
5. Rotate both front wheels 180° and check the measurements again, this time at the **rear** of the wheels This will eliminate wheel rim run out errors. The correct toe-in setting is 0-13mm (0.5 in).

Should it be necessary to adjust the front wheel toe-in, proceed as follows:

6. Remove the locating bolt (2) from the left hand end of the track rod and slacken the clamp bolt (3).
7. Turn the threaded section of the track rod (4) in or out until the toe-in is correct when the locating bolt is re-inserted.
8. Tighten the clamp bolt to 100Nm (75 lbf. ft), the locating bolts to 150 Nm (110 lbf. ft) and their locknuts to 75Nm (55 lbf. ft).
9. Move the tractor forward to rotate both front wheels 180° and check the measurements again, this time at the **rear** of the wheels . This will eliminate wheel rim run-out errors.



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NOTES

SECTION 50 - AUXILIARY UNITS

Chapter 1 - Air Conditioning

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SPECIFICATIONS

Refrigerant Specification	New Holland Specification 82000810 (R134a)
Refrigerant Charge	1.1 kg (2.4 lbs)
Compressor Oil Specifications	New Holland Specification 82008750 (PAG Type) (ISO 46 Viscosity) Sanden SP10
Refrigerant Oil Capacity (Compressor and system)	186 cc-228 cc
Cooling capacity @ 22° C - 49° C (75° F - 120°F) ambient. 4.5 kW Typical (Actual capacity dependent on system control operator settings)	
Combined High/Low/Fan Pressure Switch (Mounted Adjacent to Compressor)	
Low Pressure Switch	
On	2.06 bar (29.9 lbf/in^2)
Off	1.96 bar (28.4 lbf/in^2)
High pressure Switch	
On	22 bar (319 lbf/in^2)
Off	28 bar (406 lbf/in^2)
Low Pressure Cut Out Switch (Mounted in Evaporator Housing)	
On	2.3 bar (34 lbf/in^2)
Off	0.7 bar (10 lbf/in^2)

COMPRESSOR

Manufacturer and Type	Sanden SD7H15
Compressor Clutch and Pulley Air Gap	0.4-0.8 mm (0.016 and 0.031″)
Drive Belt Tension	Automatic Belt Tensioner

TIGHTENING TORQUES

Compressor Cylinder Head Bolts		24.5-26.5 Nm (18-19.5 lbf.ft)
Compressor Clutch Front Plate retaining Bolt		11.0-14.0 Nm (8-10 lbf.ft)
Self-sealing Couplings	small	40-54 Nm (29-40 lbf ft)
	large	54-68 Nm (40-50 lbf ft)
Compressor Mounting Bolts		20.5-25.5 Nm (15-19 lbf.ft)

SPECIAL TOOLS

Certified Refrigerant Recover,Recycling and Recharge Equipment suitable for the type of refrigerant gas used on tractor are required when servicing air conditioning systems.

This special equipment is available through recognised suppliers of air conditioning equipment. Refer to the Tool supplier for details on the latest equipment available for servicing the air conditioning system.

Vacuum/charge Portable system	New Holland Tool No.294030
Recovey/recharge Portable system	New Holland Tool No.294161
Evaporator and condenser cleaner	New Holland Tool No.293831
Electronic Gas Leak Detector	New Holland Tool No.294036
Manifold Gauge Set (Where required)	New Holland Tool No.292744
COMPRESSOR TOOLS:	
Sanden SDH715 KIt	OTC/V.L Churchill Ltd Part No.297422 (NH.50-100)

DESCRIPTION AND OPERATION

SAFETY PRECAUTIONS

⚠ WARNING ⚠

*Before overhauling an air conditioning system read and observe the following Safety PrecautionsIf a repair or replacement becomes necessary, ensure that only certified Air Conditioning technicians are employed, using approved equipment to effect repairs. Do **not** attempt to disassemble the air conditioning system, It is possible to be **severely frostbitten or injured** by escaping refrigerant.*

***IMPORTANT:** Do **not** allow refrigerant to escape into the atmosphere.*

Refrigerant must be handled with care in order to AVOID HAZARDS.

Undue direct contact with liquid refrigerant can produce freezing of skin and eyes.

Keep the refrigerant container and air conditioning system away from flame or heat sources, the resulting pressure increase can cause the container or system to explode.

If in direct contact with open flames or heated metal surfaces, the refrigerant will decompose and produce products that are toxic and acidic.

Make sure to comply with the following indications and simple precautions to avoid any risk of injury:

- Never discharge refrigerant into the atmosphere. When servicing air conditioning units a certified refrigerant recovery unit operated by a certified technician must be used.
- When discharging the refrigerant in the system make sure you are operating in well-ventilated premises with good air circulation and far away from open flames.
- When charging and discharging the system always wear goggles and take suitable precautions to protect the face in general and the eyes in particular, from accidental spillage of the refrigerant fluid.
- The oil and refrigerant mixture inside the air conditioning system is pressurized.
  Consequently, never loosen fittings or tamper with lines unless the system has been properly discharged.
- Before loosening any connection, cover the fitting in question with a cloth and wear gloves and goggles in order to prevent refrigerant from reaching the skin or eyes.
- In the event of an accident, proceed as follows:-

  If the refrigerant has reached the eyes, wash them immediately with copious amounts of sterilised water or mains pressure tap water and transfer to hospital for immediate medical help.

  If the refrigerant has touched the skin, wash with cold water and transfer to hospital for immediate medical help.

PRINCIPALS OF AIR CONDITIONING

The function of the air conditioning system is to improve the operator's comfort by cooling the air temperature inside the cab and reducing the humidity level.

This temperature control is achieved by absorbing the heat within the cab into a refrigerant and then allowing the heat absorbed by the refrigerant to be transferred to the outside air

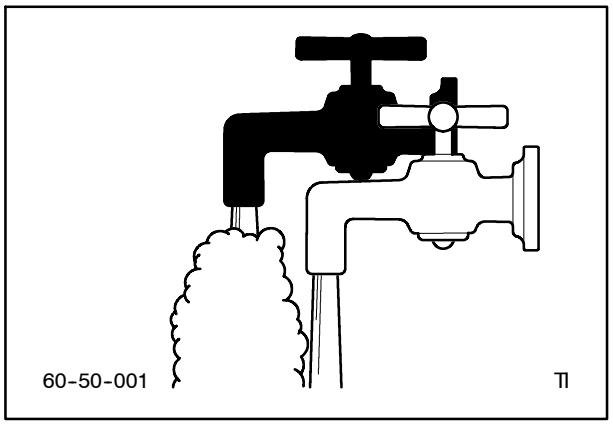
In order to achieve this heat transfer the following principals of heat generation and transfer are applied within the air conditioning system.

1. When two bodies of different temperature come together heat is transferred from one to another. On air conditioning systems an evaporator is used to hold the low temperature refrigerant which absorbs the heat from the air within the cab.
2. When a gas is pressurised the temperature of the gas will rise. In air conditioning systems the increase in pressure is achieved using a compressor.
3. When a gas is cooled it will condense into a liquid. In the air conditioning system a condenser is used to cool the gas and the resulting liquid is stored in a receiver dryer.
4. When a liquid is atomized through an orifice, the temperature of the resultant vapour will drop. The low temperature of the atomized liquid will then absorb heat from its surroundings. On air conditioning systems the refrigerant is atomized using an expansion valve.

It can now be seen that the principal components of an air conditioning system are:-

- Refrigerant
- Evaporator
- Compressor
- Condenser
- Receiver Dryer
- Expansion Valve

Figure 5, uses the examples above to illustrate the air conditioning cycle.



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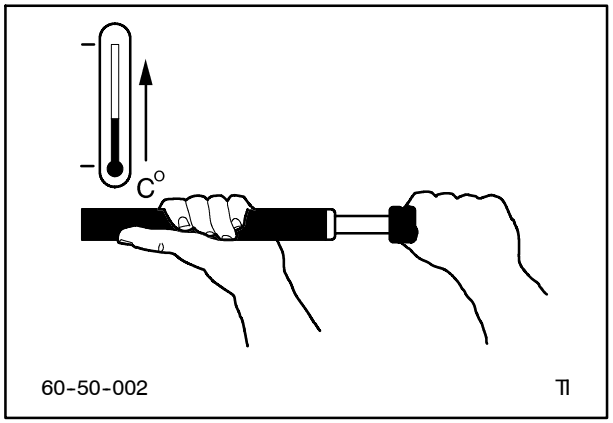

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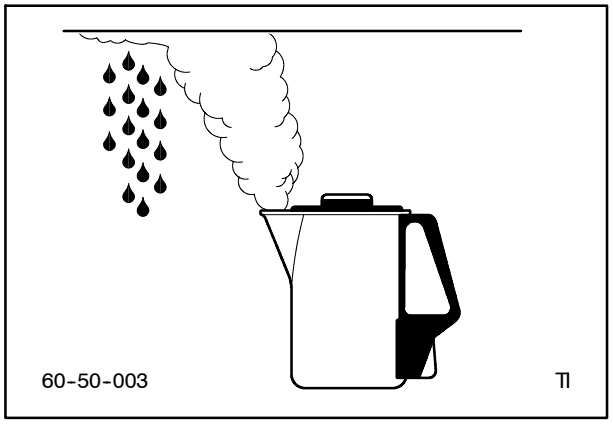

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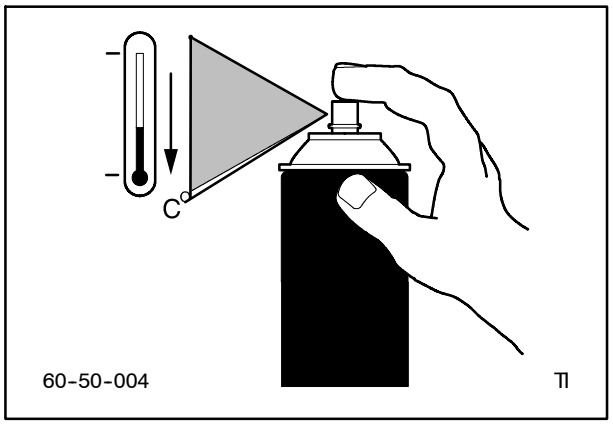

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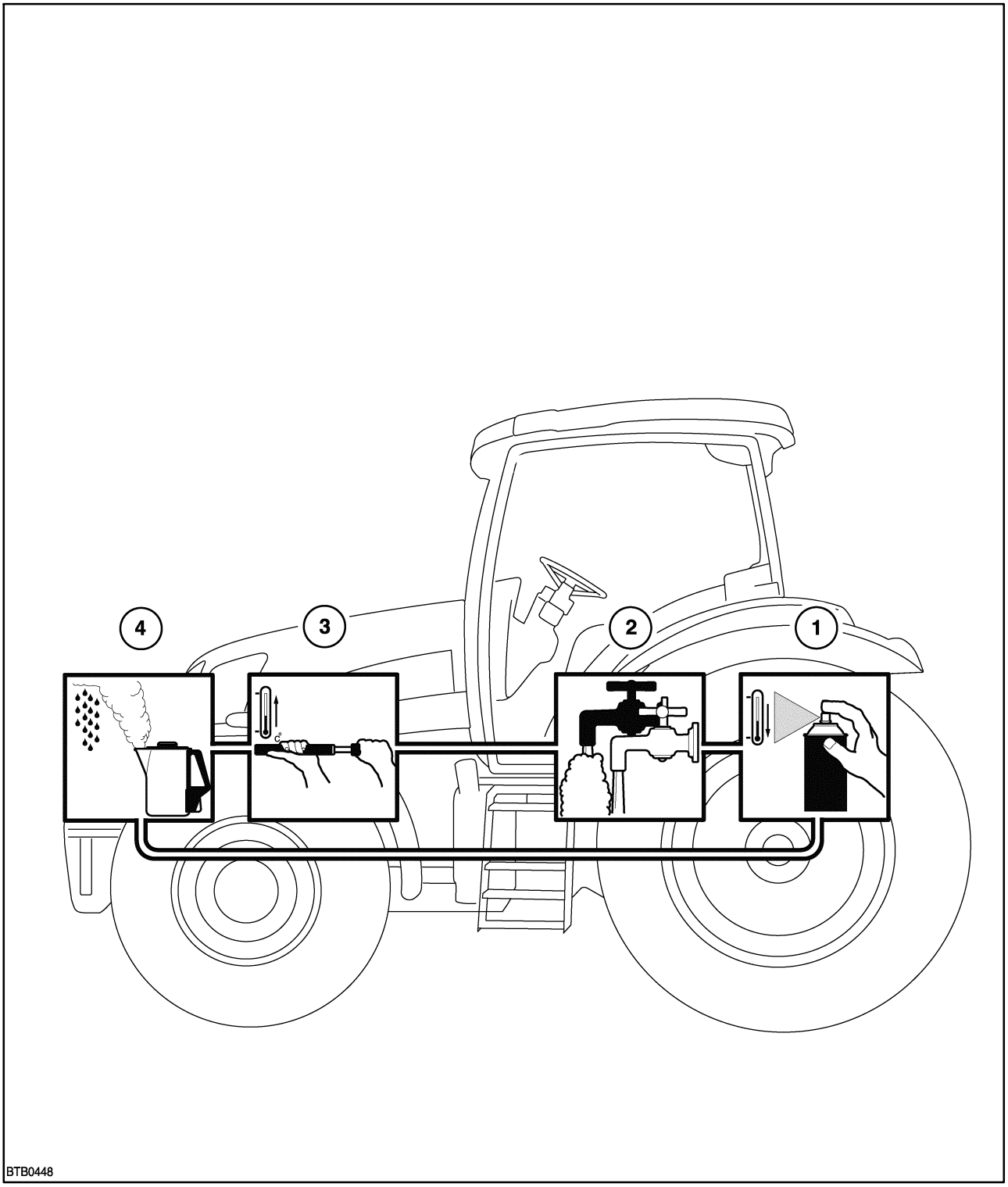
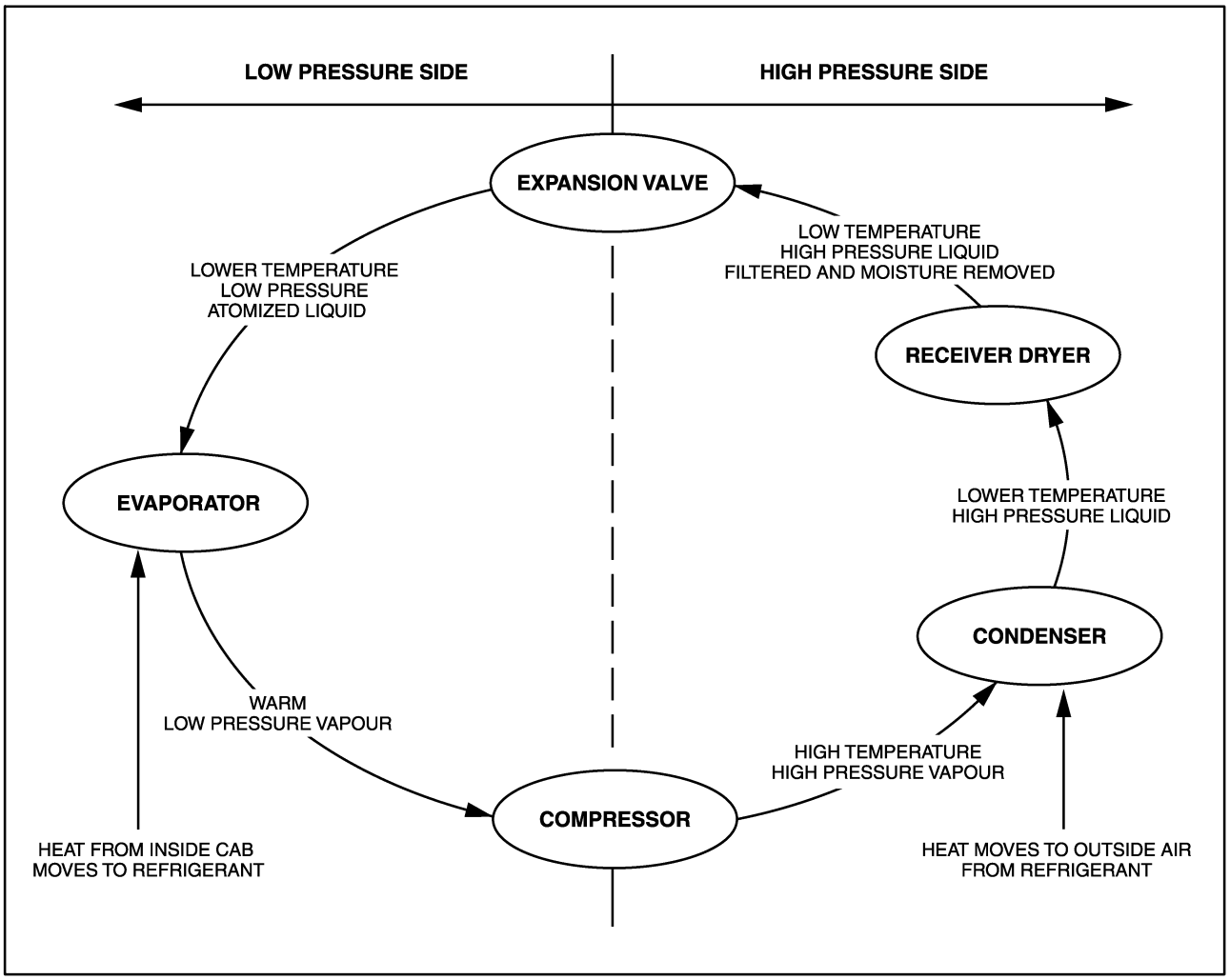


5

Air Conditioning Principal of Operation

1. Expansion Valve - Atomizes Liquid Refrigerant Before Passing to Evaporator
2. Evaporator- Absorbs Heat From Air In Cab
3. Compressor - Compresses and Raises Temperature Of Refrigerant Gas
4. Condenser, Evaporator and Dryer - Converts Refrigerant from Gas to a Liquid



6

AIR CONDITIONING FLOW DIAGRAM

Figure 6, shows in schematic form the flow of refrigerant through the five major components of an air conditioning system. Refer to, Figure 6, for the location of these components on the tractor.

Refrigerant is drawn into the compressor as a cool, low pressure vapor which is compressed and then pumped out as a hot, high pressure vapor to the condenser.

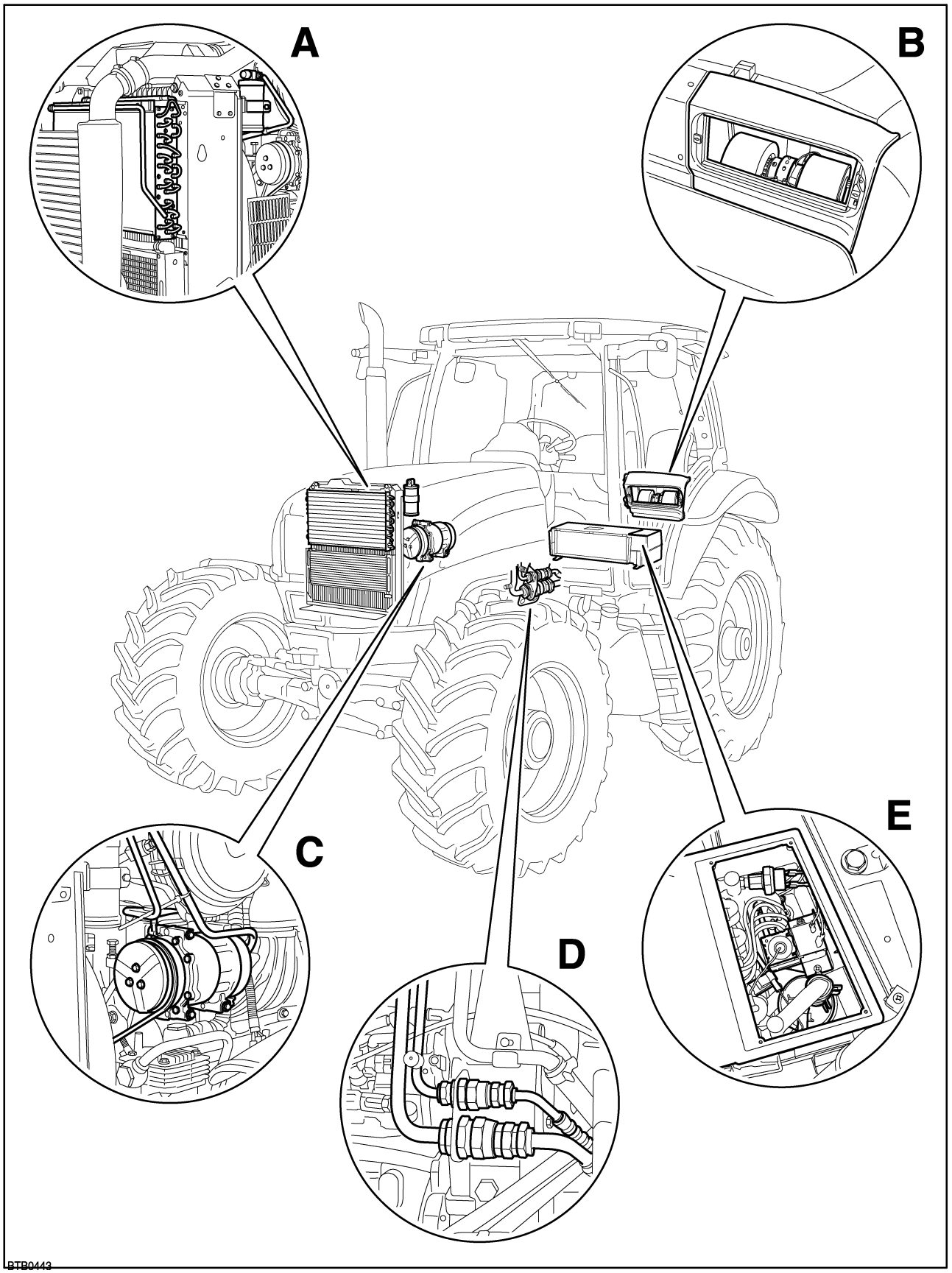
As the hot, high pressure vapor passes through the condenser core it gives off heat to the cooler outside air, being drawn past the fins by the engine cooling fan.

By giving off heat to the outside air, the vapor is condensed to a liquid which moves under high pressure to the receiver dryer where it is stored until released to the evaporator by the temperature sensing expansion valve.

As liquid refrigerant passes through the metered orifice in the expansion valve the refrigerant changes from a high pressure liquid to a low pressure atomized liquid with a lower temperature.

This low pressure, low temperature, atomized liquid enters the evaporator coils and absorbs heat from the cab warm air blown across the coils and fins by the cab blower motor. The refrigerant now changes from a cold low pressure atomized liquid to a warm low pressure vapor and leaves the evaporator outlet, moving to the suction (low pressure) side of the compressor to repeat the cycle.

As this heat loss is taking place, moisture (humidity) in the cab air will condense on the outside of the evaporator and drain off as water through the drain hoses attached to the evaporator drain pan, thereby reducing the humidity level of the cab.



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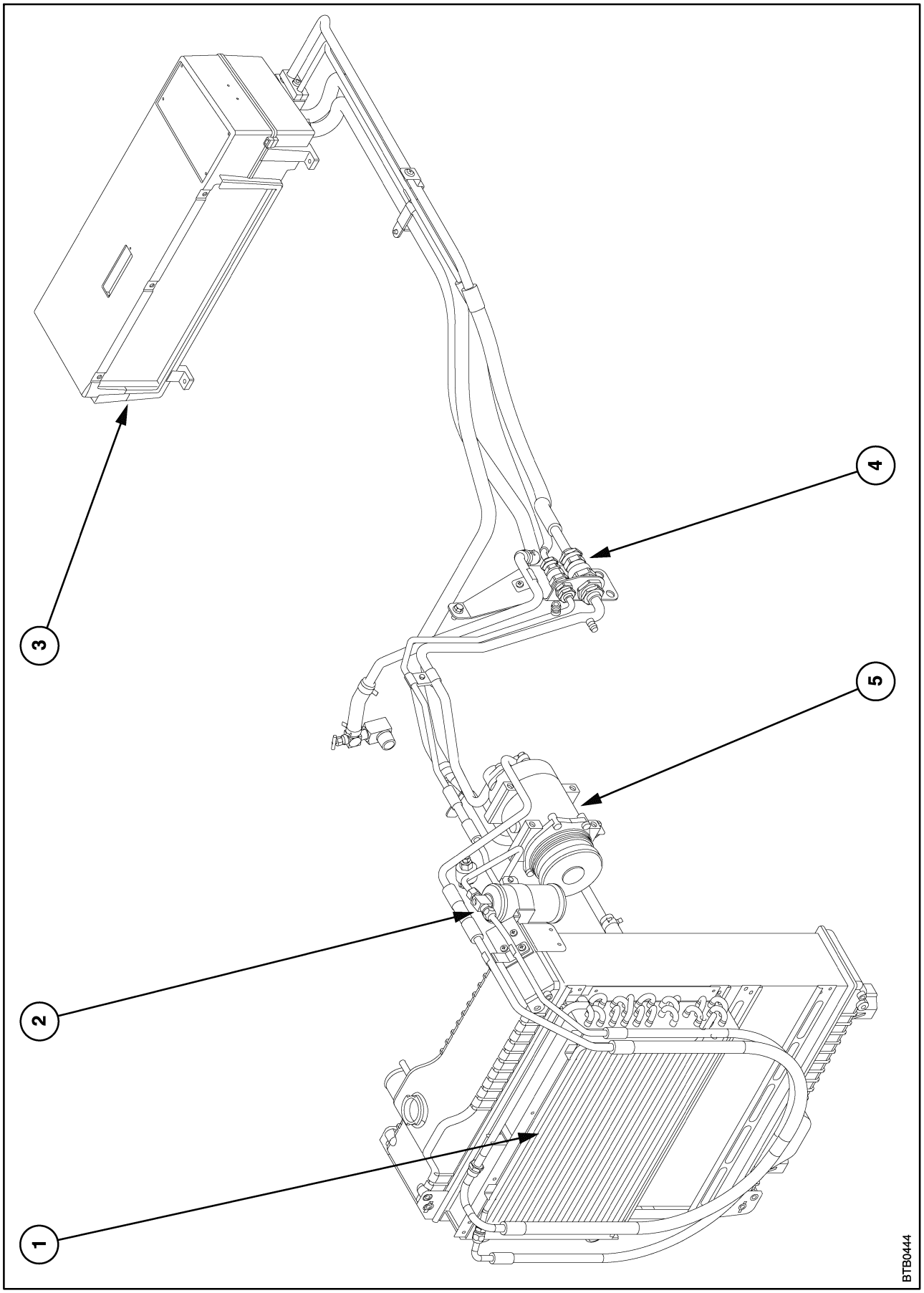
Air Conditioning Component Layout

A. Condenser and Receiver Dryer
B. Blower Motor and Fan Assembly
C. Compressor
D. Quick Release Self Sealing Couplings
E. Evaporator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SYSTEM LAYOUT

1. Receiver Dryer
2. Condenser
3. Evaporator
4. Quick Release Self Sealing Couplings
5. Compressor

Refrigerant

To achieve the absorption and the release of heat which is, in essence, the function of an air conditioning system, requires the use of a suitable "refrigerant" - a liquid that has a relatively low temperature boiling point, plus certain desirable safety and stability features.

The refrigerant used in the air conditioning system is refrigerant R-134a.

NOTE: *To help protect the environment legislation has been introduced in most territories banning the release into the atmosphere of refrigerants,including R134a. All service procedures contained in this manual can be carried out without the need to release refrigerant into the atmosphere.*

In order to prevent the incorrect type of refrigerant being charged to the system the service valves fitted to the tractor and necessary to connect up refrigerant recovery, evacuation and recycling/recharging equipment will be of two different sizes as recognised and specified by the air conditioning industry.

⚠ WARNING ⚠

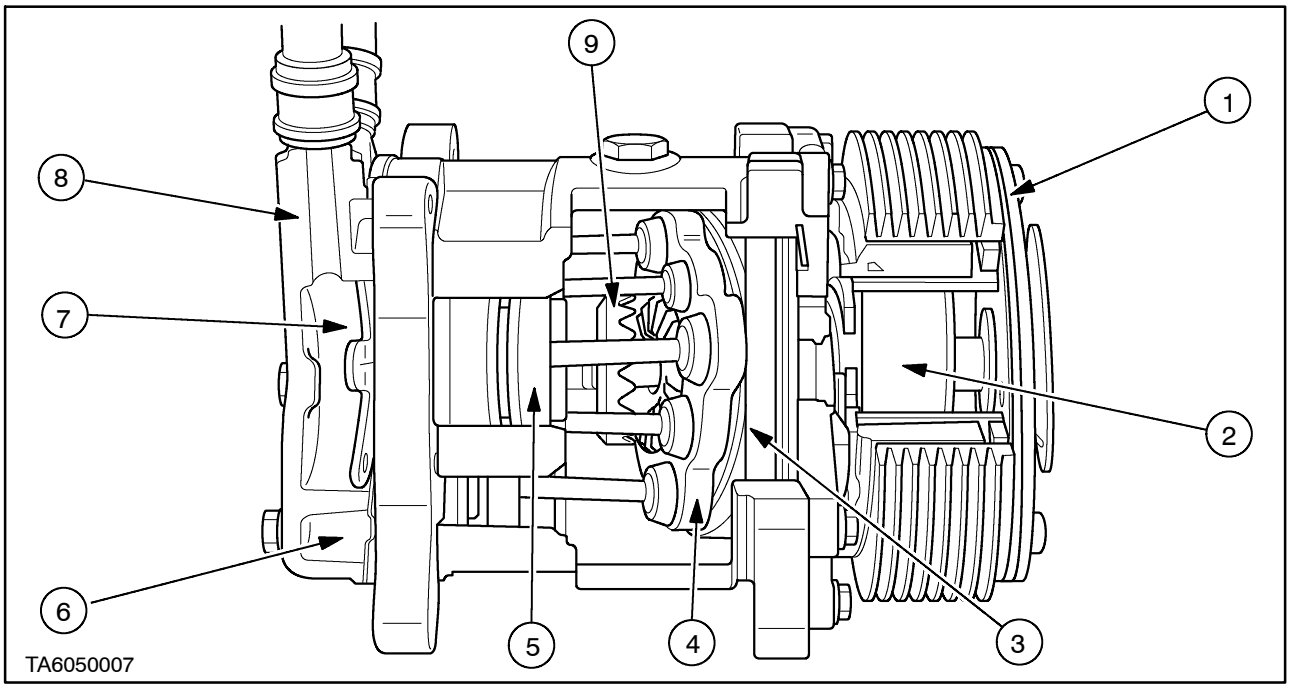
R-134a refrigerant is ***not compatible*** *with R-12 refrigerant.* ***Do not*** *attempt to replace R134a refrigerant with R-12 refrigerant or test the system using gauges or equipment previously used with R12 as damage to the system will result.*

R-134a refrigerant is stable at all operating temperatures and able to absorb great quantities of heat.

The boiling point of R-134a is -22° C (-15° F) at atmospheric pressure.

If the pressure is increased, R-134a will readily vaporize to absorb heat at temperatures between -11.7° C (11° F) at 1.9 bar (27.5 lbf/in^2) and 0°C (32° F) at 42 lbf/in^2 (2.9 bar) in the evaporator.

At higher pressures, R-134a will condense and give off heat at temperatures between 48° C (118° F) at 12.4 bar (180 lbf/in^2) and 58° C (136° F) at 15.85 bar (230 lbf/in^2) in the condenser.



9

Air Conditioning Refrigerant Compressor

1. Electro-magnetic Clutch
2. Clutch Bearing
3. Cam Rotor
4. Wobble Plate
5. Piston
6. Suction Chamber
7. Discharge Chamber
8. Cylinder Head
9. Static Gear

Compressor Pump

The tractor air conditioning unit compressor pump is mounted on the left hand side of the engine and is belt driven by the crankshaft pulley, Figure 7.

The compressor separates the low and high pressure sides of the system and is basically a pump which has two functions:

(1) To raise the refrigerant temperature by compression to a higher degree of temperature than the ambient (outside air) temperature.

(2) To circulate the required volume of refrigerant through the system.

The refrigerant compressor is a seven cylinder wobble plate unit housed in a die cast aluminium housing.

Drive to the wobble plate is from the pulley, through the electro magnetic clutch to the main driveshaft. Attached to the driveshaft is a cam rotor which oscillates the wobble plate. The wobble plate is prevented from rotating by a static gear engaging with teeth formed in the face of the plate. The seven pistons are connected to the wobble plate by rods located in ball sockets.

Refrigerant is drawn in on the downward stroke of a piston through the reed valves located either end of the cylinder assembly. Refrigerant enters the cylinder assembly through a gallery in the outer circumference of the cylinder assembly.

The upwards stroke of the piston compresses the refrigerant and expels it through another reed valve into an inner gallery in the cylinder assembly and out into the refrigerant circuit.

The compressor is lubricated with a Polyalklene Glycol (PAG) oil. This oil is totally miscible with the refrigerant and is carried around the refrigerant circuit.

The compressor is activated by an electro-magnetic clutch which functions to engage or disengage the compressor as required in the operation of the air conditioning system.

The clutch is primarily activated by the:-

- Temperature cycling control switch
- Combined high/low pressure cut-out switch
- Low pressure cut-out switch

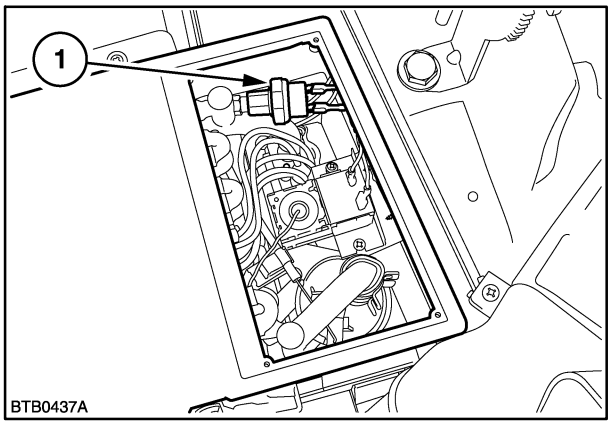
Low Pressure Cut-out Switch

The low pressure switch (1) Figure 10, is in the evaporator outlet line and is located under a lid in the evaporator housing under the rear floor.

The purpose of the switch is to shut off the compressor pump in the event of low pressure in the refrigerant system.

Low refrigerant pressure may occur due to a faulty expansion valve, icing up of the expansion valve orifice or refrigerant loss. Low refrigerant pressure may result in damage to the compressor pump.

The low pressure switch is factory set and cannot be adjusted.



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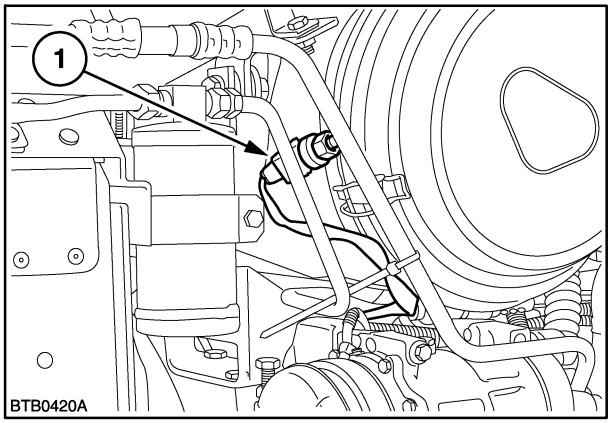
Combined High/Low Pressure Cut-out Switch

The combined high/low pressure switch, (1) Figure 11, is located in the condenser inlet line from the compressor. The switch shuts off the compressor pump in the event of a restriction in the high pressure line or excessively low pressure due to lack of refrigerant in the system.

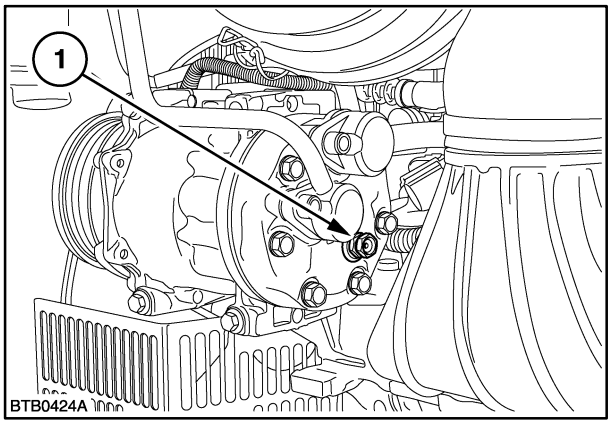
Loss of refrigerant in the system will result in insufficient cooling and lubrication and continuous operation will cause damage to the compressor pump.



11

System Pressure Relief Valve

A relief valve is located at the discharge port on the compressor, (1) Figure 12. This allows the system refrigerant to be discharged into the engine bay (atmosphere) instead of in the cab, if the system pressure became such that a hose might fail in the cab and cause injury to the operator. This secondary safety feature will only operate in extreme conditions, for example, if the high pressure cut out switch were to fail, or in the event of an engine fire.

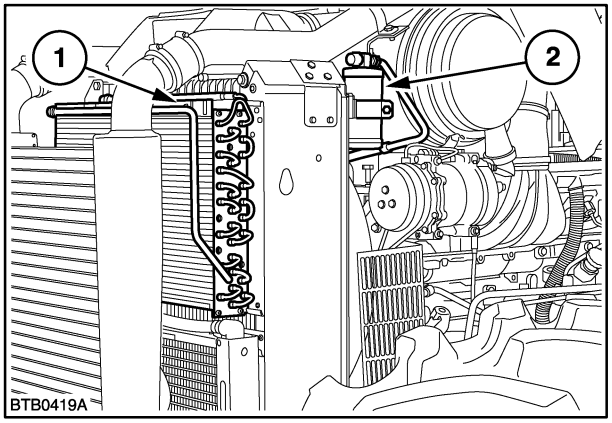


12

Condenser And Receiver Dryer

The condenser, (1) located at the front of the tractor, Figure 13, consists of a number of turns of continuous coil mounted in a series of thin cooling fins to provide a maximum of heat transfer in a minimum amount of space.

The condenser receives the hot, high pressure refrigerant vapour from the compressor. The hot vapour passes through the condenser coils and outside air is pulled through the condenser by the engine cooline fan.



13

Heat moves from the hot refrigerant vapour into the cooler outside air flowing across the condenser coils and fins.

When the refrigerant vapour reaches the pressure and temperature that will induce a change of state, a large quantity of heat is transferred to the outside air and the refrigerant changes to a high pressure warm liquid.

The warm liquid refrigerant continues onto the receiver/drier where it is filtered and desiccated, to remove any moisture, before passing through an outlet line to the thermostatic expansion valve.

The receiver/dryer (2), Figure 13 stores the liquid refrigerant to be sure a steady flow to the thermostatic expansion valve is maintained under widely different operating conditions.

The drier section contains a desiccant (Molecular sieve) to absorb any moisture within the system and a filter prevents the entry of foreign particles.

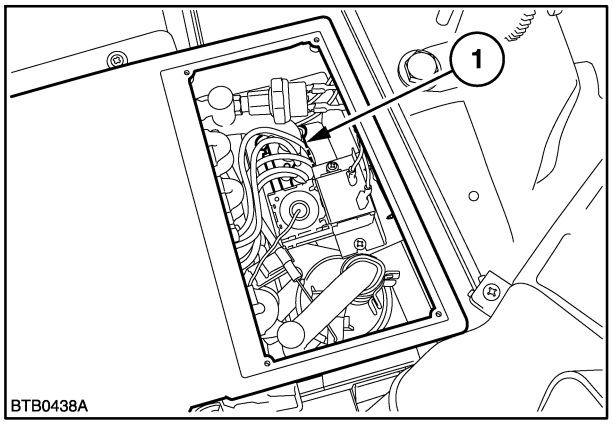
NOTE: *Any moisture in the air conditioning system is extremely harmful. Moisture not absorbed by the dehydrator will circulate with the refrigerant and droplets may collect and freeze in the thermostatic expansion valve orifice. This action will block the refrigerant flow and stop the cooling action. Moisture will also react with refrigerant R-134a and the lubricant to form a corrosive acid.*

The desiccant can only absorb a limited amount of moisture before reaching saturation point. Because of this, after any system component replacement or repairs requiring entry into the system, the receiver/dryer should be replaced.

Expansion Valve

The expansion valve (1) Figure 14, is located next to the evaporator, in the pressure line leading from the receiver/dryer and performs the following functions:

1. METERING ACTION -
   A metered orifice changes the liquid refrigerant from a high pressure low temperature liquid to a low pressure, lower temperature atomized liquid.
2. MODULATING ACTION -
   A thermostatically controlled valve within the expansion valve body controls the volume of liquid refrigerant passing through the orifice and makes sure the refrigerant is fully vaporized within the evaporator. Liquid refrigerant would damage the compressor reed valves or freeze the pistons.
3. CONTROLLING ACTION -
   The valve responds to changes in the cooling requirements. When increased cooling is required, the valve opens to increase the refrigerant flow and when less cooling is required the valve closes and decreases the refrigerant flow.



14

Expansion Valve - Operation

All of the needed temperature sensing and pressure sensing functions are consolidated into this basic unit and no external tubes are required for these purposes.

The refrigerant from the condenser and receiver dryer enters the thermostatic expansion valve as a high pressure warm liquid. Upon passing through the ball and spring controlled metering orifice, the pressure and temperature of the refrigerant is reduced and the refrigerant leaves the thermostatic expansion valve as a low pressure, lower temperature atomized liquid.

The atomized liquid now passes through the evaporator where it absorbs heat before returning via the expansion valve to the compressor as a warm Low pressure vapour.

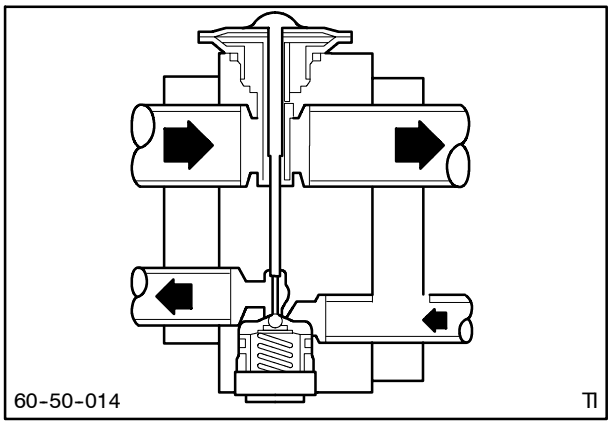
There are two refrigerant passages in the valve. One passage is in the refrigerant line from the condenser to the evaporator and contains the ball and spring type orifice valve. The other passage is in the refrigerant line from the evaporator to the compressor and contains the valve's temperature sensing element.

Liquid refrigerant flow from the condenser and receiver dryer is controlled by a push-rod forcing the orifice valve ball off its seat and the spring exerting pressure on the ball to keep it on its seat.

During stabilized (vehicle shutdown) conditions, the pressure on the bottom of the expansion valve diaphragm rises above the pressure on the top of the diaphragm allowing the valve spring to close the orifice.

When the system is started, the pressure on the bottom of the diaphragm drops rapidly, allowing the orifice to open and meter atomized liquid refrigerant to the evaporator where it begins to vaporize.

Suction from the compressor draws the vaporized refrigerant out of the evaporator and back through a gallery in the top of the valve which passes the temperature sensor.



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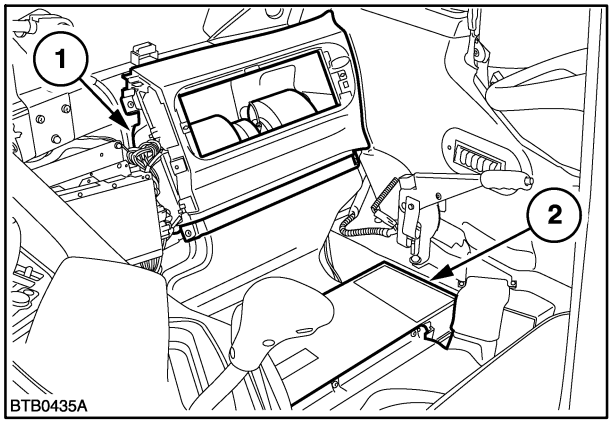
The temperature sensor reacts to variations in refrigerant gas pressure returning from the evaporator. When heat from the passenger compartment is absorbed by the refrigerant the pressure of the gas increases causing a differential pressure above and below the temperature sensor diaphragm. The diaphragm reacts to this pressure differential and a push rod forces the ball in the expansion valve orifice further off its seat. This reaction allows an increase in the atomized refrigerant to flow through the valve, to the evaporator, so that more heat can be absorbed by the air conditioning system.

Similarly when the temperature of the gas returning from the evaporator decreases the pressure of the gas decreases. This causes the diaphragm to react accordingly and allow the ball in the orifice to move closer towards its seat thus reducing the flow of refrigerant through the valve to the evaporator.

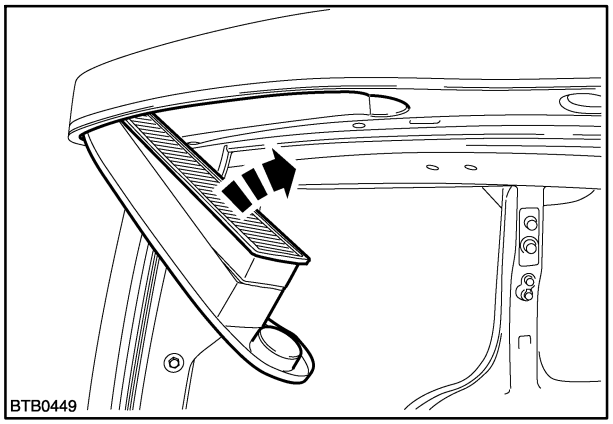


16

Evaporator

The evaporator, (2) Figure 16, is located under the rear seat floor and consists of a number of turns of continuous coils mounted in a series of thin cooling fins to provide a maximum of heat transfer in a minimum amount of space.

Low temperature refrigerant in the evaporator absorbs heat from the hotter air in the operator's compartment, thereby cooling the air.



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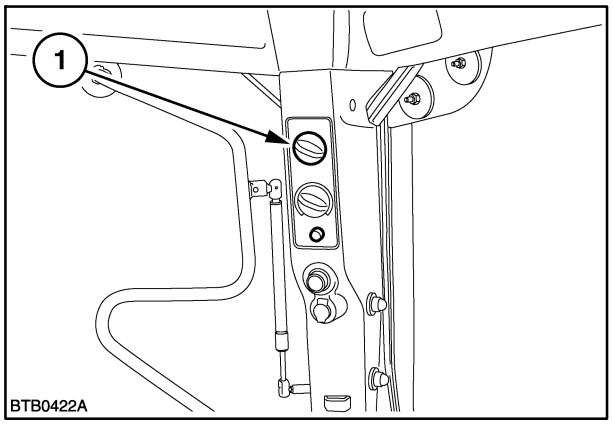
Blower Fan

The blower fan, (1) Figure 16, draws warm air from outside the cab through the intake filters, Figure 17 and forces it across the evaporator before entering the cab through louvered vents.

The blower motor is controlled by a four-speed switch (1), Figure 18. The switch uses a variable resistor to change the fan speed.

The coldest air will be obtained at the slowest fan speed but the greatest cooling capacity is obtained at the highest fan speed.



18

FAULT FINDING AND TESTING

AIR CONDITIONING SYSTEM

General

Overhaul of the air conditioning system should only be undertaken by a certified specialist refrigeration engineer using a comprehensive air conditioning test kit, including a gas leak detector, suitable for R134a refrigerant gas.

⚠ WARNING ⚠

Before dismantling an air conditioning system for repair the gas within the system must be discharged and recovered using a ***certified recovery unit*** *designed for the type of refrigerant gas used in the system.*

NEVER release refrigerant gas into the atmosphere.

ALWAYS wear safety goggles and gloves when servicing any part of the air conditioning system.

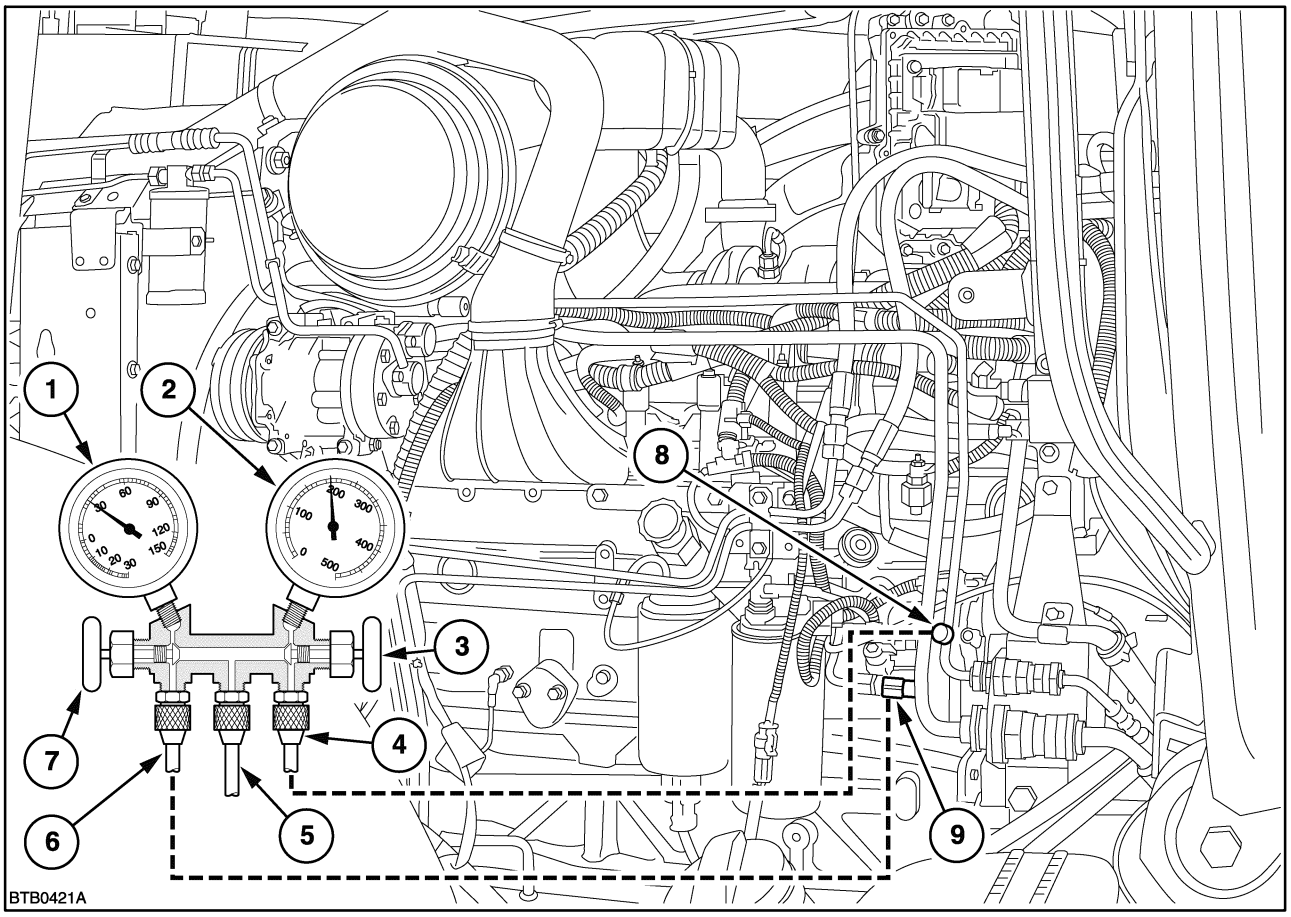
To prevent the entry of any foreign material, observe the following points:

- Ensure all tools, gauges, hoses and replacement parts are kept clean and dry and are suitable for the type of refrigerant gas used in the system.
- Clean all hoses and fittings before disconnecting. Cap or plug all openings when disconnected.
- When adding lubricating oil to the system always uncap and re-cap the oil container immediately before and after use. Always ensure the oil remains free of moisture.

Preliminary Fault Finding

Always conduct the preliminary fault finding checks before performance testing the system.

1. Run the engine at 1000-1200 rev/min for 10 minutes with the air conditioner set at maximum cooling and the blower on high speed.
2. Check that the heater temperature control is switched OFF.
3. Close the heater shut-off valve on the rear of the inlet manifold.
4. Check that the blower fan is operating at all speeds.
5. Check that the compressor clutch engages when the air conditioning switch is pressed in. A clicking sound indicates the clutch is engaging. If the clutch fails to operate it may indicate an electrical problem in the high or low pressure cut out switches or malfunction of the electric drive clutch on the compressor.
6. Check the engine cooling fan is drawing cool air through the condenser
7. Check the compressor drive belt tension.
8. Check the condenser core and grid is clean and free of obstruction.
9. Check the cab air filters are clean and free of obstruction.
10. Check the evaporator fins are not plugged or excessively dirty.



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Attaching Manifold Gauge Set to the Tractor

1. Low Side Gauge
2. High Side Gauge
3. Shut-off Valve
4. Test Hose to High Side Service Connector
5. Center Hose (Not Used)
6. Test Hose to Low Side Service Connector
7. Shut-off Valve
8. High Pressure Side Service Valve
9. Low Pressure Side Service Valve

Performance Testing The Air Conditioning System

The manifold gauge set is the most important tool used in testing and servicing the air conditioning system.

It should be noted however that for those dealers who posses the latest design level of refrigerant recovery, recycling and recharging station these gauges are an integral part of the machine.

The following instructions for performance testing the air conditioning system is based on the use of the gauge set shown in Figure 19. The principal of operation is however similar when testing the system using a recovery and recharging station with integral gauges.

When using this type of equipment **always** consult the manufacturers operating instructions.

Operating Precautions

IMPORTANT: *Always ensure the shut-off valves are* ***closed*** *(turn clockwise until seated) during all test operations.*

In the closed position, refrigerant circulates around the valve stems to the gauges. Therefore, when the manifold gauge set is connected into a system, pressure is registered on both gauges.

- **NEVER** open the HIGH SIDE shut off valve when the system is operating.
- **ALWAYS** open the LOW SIDE shutoff valve when adding refrigerant.

Attaching The Gauge Set To The Tractor

⚠ WARNING ⚠

To avoid personal injury, stop the tractor engine during connection of the manifold gauge set.

1. Check that the gauge set shut off valves are closed (turned fully clockwise).
2. Connect the high side gauge hose (normally red) to the high pressure side service valve and the low side gauge hose (normally blue) to the low pressure side service valve on the tractor, Figure 19. Ensure the hose connections are fully tightened.

IMPORTANT: *Prior to connection of the manifold gauge set, identify the suction (low pressure) and discharge (high pressure) service gauge ports. The high pressure service valve is always in the line from the compressor to the condenser.*

The high and low pressure service valves on the tractor are spring loaded valve and will be automatically opened when the test hose is connected.

NOTE: *The test hose must incorporate a valve depressor to actuate this type of valve.*

The service valves have a protective cap. This cap must be removed for test gauge connections and replaced when service operations are completed.

Test Procedure

After the manifold gauge set has been connected and before pressure tests can be made, the system must be stabilized as follows:

1. Re-check that both the high and low side shut off valves on the manifold gauge set are fully **closed.**
2. Apply the parking brake, check the gear shift levers are in neutral and close the cab windows and doors.
3. Run the engine at 1000-1200 rev/min.
4. Turn the heater temperature control 'off'
5. Operate the system at maximum cooling, with the blower fan at high speed for 10 minutes to stabilize all components.
6. Check the manifold low pressure gauge reading is within the specified range of approximately 4-36 lbf/in^2 (0.28-2.48 bar) (0.28-2.53 kgf/cm^2).
7. Check the manifold high pressure gauge reading and compare the reading to the pressure indicated on the pressure temperature chart below.
8. Measure and compare the temperature of conditioned air entering the cab through the louvered air vents with the ambient air at the air intake filters on the outside of the cab.

   If the system is operating correctly the conditioned air entering the cab should be 6-9° C (10-15° F) cooler than the ambient temperature of the outside air.
9. If it is confirmed that the system is not operating correctly refer to the fault diagnostic charts and performance test gauge reading examples on the following pages for possible corrective action.

⚠ WARNING ⚠

A significant amount of refrigerant vapour may have condensed to a liquid at the service fitting at the high side of the compressor. Use a cloth or other protective material when disconnecting the manifold hose from this fitting to prevent personal injury to hands and face.

APPROXIMATE HIGH PRESSURE GAUGE READINGS

Ambient Air Temperature		High Pressure Gauge Reading		
Degrees F	**Degrees C**	**bar**	**kgf/cm^2**	**lbf/in^2**
59	15	9.6	9.7	140
68	20	13	13.3	191
77	25	15	15.3	221
86	30	18	18.4	265
95	35	20	20.5	294
104	40	22	22.5	323
113	45	23	23.5	338

TROUBLESHOOTING

PERFORMANCE TEST DIAGNOSIS

Gauge Readings: Low Pressure - Low
High Pressure - Low

PROBLEM	POSSIBLE CAUSES	CORRECTION
Evaporator air not cold (Refer to Example 1)	Low refrigerant charge.	Perform leak tests and repair Evacuate system Charge system, re-test system
Evaporator air warm	Extremely low refrigerant charge.	Perform leak tests and repair Evacuate system Charge system, re-test system
Evaporator air cool but not sufficiently cold. Low pressure switch cutting out Expansion valve to evaporator tube shows considerable condensation or frost. Too cold to touch	Expansion valve not permitting sufficient flow. Stuck valve	Check expansion valve as follows: Set a max. cooling Low pressure gauge should drop slowly If expansion valve is defective: Discharge system Replace expansion valve Evacuate system Charge system Re-test

Gauge Readings: Low Pressure - High
High Pressure - High

PROBLEM	POSSIBLE CAUSES	CORRECTION
Evaporator air warm	Improper operation of condenser	Inspect for dirty condenser restricting air flow and cooling
Liquid line hot (condenser outlet to expansion valve tube)	Overcharged with refrigerant	Check operation of condenser cooling fans. Repair or replace as needed.
High pressure switch cutting out	Air in system	Check for overcharge as follows: Stop the engine. Recover and recycle the charge using correct recovery equipment. Recharge the the system with the correct quantity of refrigerant, replacing any lost lubricant. Recheck performance of air conditioning system.
Evaporator air not cold	Expansion valve allowing too much refrigerant to flow through the evaporator	Check expansion valve as follows: Set for Maximum cooling. Low pressure gauge should drop slowly If expansion valve is defective: Discharge System Replace Expansion Valve Evacuate System Charge System Re–test

Gauge Readings: Low Pressure - Low
High Pressure - High

PROBLEM	POSSIBLE CAUSES	CORRECTION
Insufficient cooling	Restriction in liquid line	Discharge the system Replace the receiver/drier Inspect all lines and tubing from compressor outlet to expansion valve. Replace if needed. Evacuate the system Charge the system Re–test

Gauge Readings: Low Pressure - High
High Pressure - Low

PROBLEM	POSSIBLE CAUSES	CORRECTION
Evaporator air not cold	Internal leak in compressor. (reed valves, gasket, worn or scored piston rings or cylinder)	Discharge the system Replace the compressor Evacuate the system Charge the system Re–test

Gauge Readings: Low Pressure - Normal
High Pressure - Normal

PROBLEM	POSSIBLE CAUSES	CORRECTION
Insufficient cooling Low pressure reading does not fluctuate with changes in temperature control switch (pressure should drop until compressor cycles) Evaporator air not cold.	System low on charge Air or moisture present in system	Perform leak test Discharge system Repair leaks Replace receiver/drier Check oil level Evacuate system Charge the system Re–test

Gauge Readings: Low Pressure - High
High Pressure - Normal

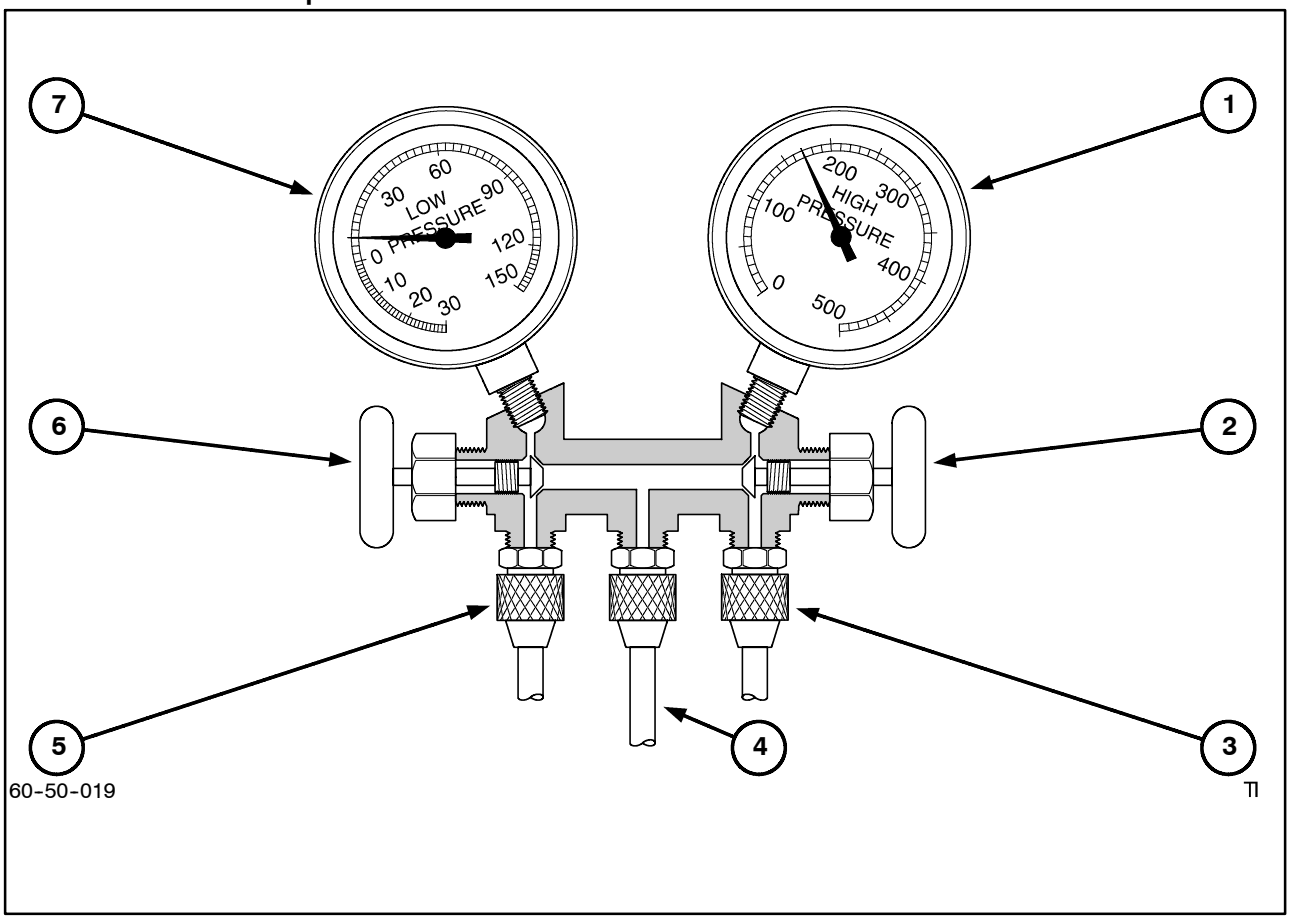
PROBLEM	POSSIBLE CAUSES	CORRECTION
Compressor cycles “on” and “off” too frequently	Defective temperature control (thermostatic) switch	Stop engine and shut off A/C Replace temperature control switch Re–test system and check compressor cycling

EXAMPLES OF MANIFOLD GAUGE READINGS AND INTERPRETATIONS

The following examples show typical low and high pressure gauge readings obtained when performance testing the air conditioning system with an ambient temperature of 35° C (95° F).

The recommended corrective action is based on a similar fault as identified in the performance test diagnosis charts.

Performance Test Example 1



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Performance Test Example 1

1. High Side Low
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Low

Problem:

Little or no cooling.

Cause:

Refrigerant slightly low.

Conditions*

Low side pressure too low.
Gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure too low.
Gauge should read 19-21 bar
(275-305 lbf/in^2).

Evaporator air not cold.

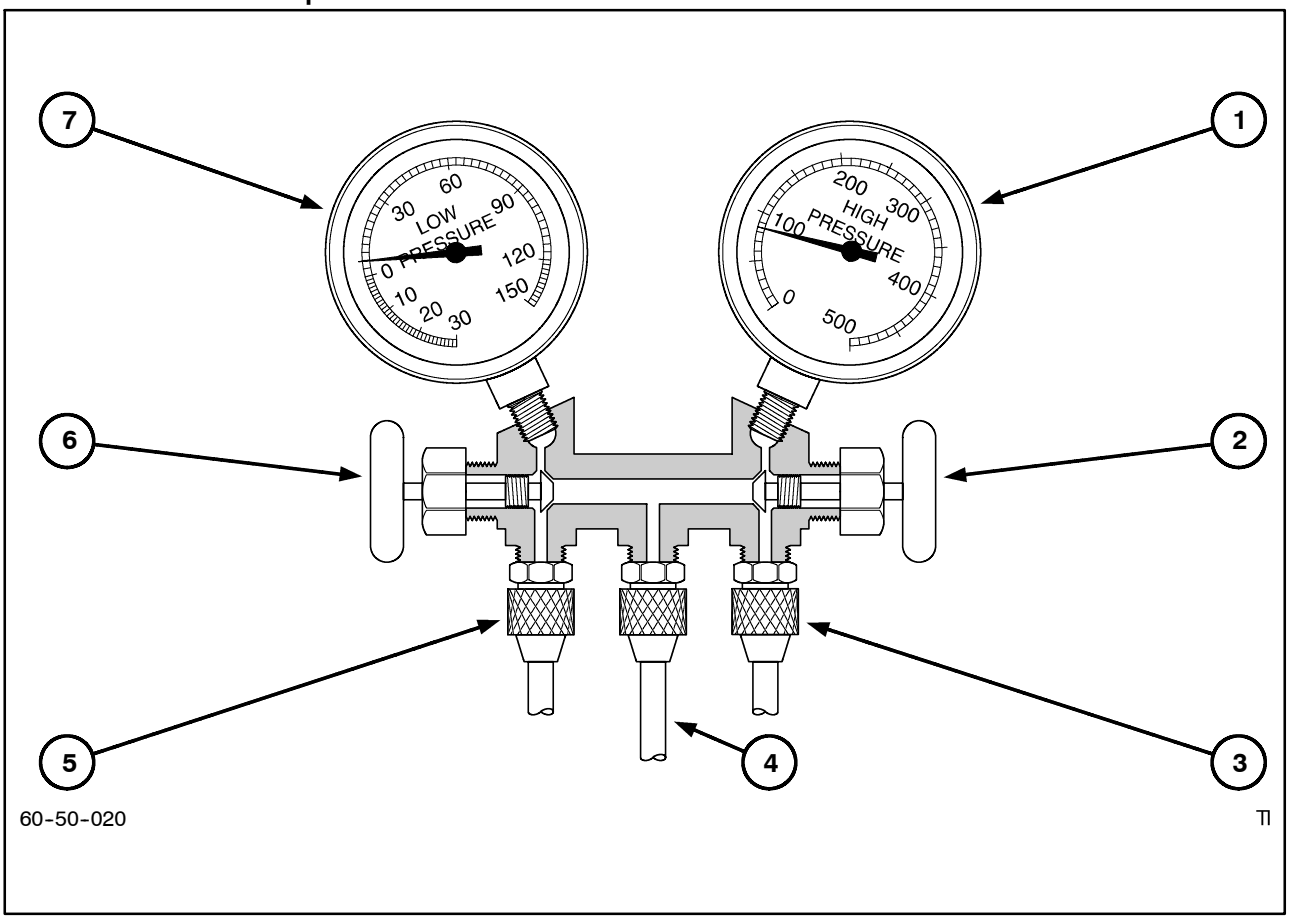
Corrective Procedures

1. Leak test the system.
2. Repair leaks. (Discharge and recover the refrigerant from the system; replace lines or components).
3. Check compressor oil to ensure no loss.
4. Evacuate the system.
5. Charge the system.
6. Performance test the system.

DIAGNOSIS: *System refrigerant is low. May be caused by a small leak.*

NOTE: *Test procedure based upon ambient temperature of 35°C (95° F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 2



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Performance Test Example 2

1. High Side Low
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Low

Problem:

Insufficient cooling.

Cause:

Refrigerant excessively low.

Conditions*

Low side pressure very low.
Gauge should read 1-2 bar (15-30 lbf/in^2)

High side pressure too low.
Gauge should read 19-21 bar (275-305 lbf/in^2).

Evaporator air warm.

Low pressure switch cutting out

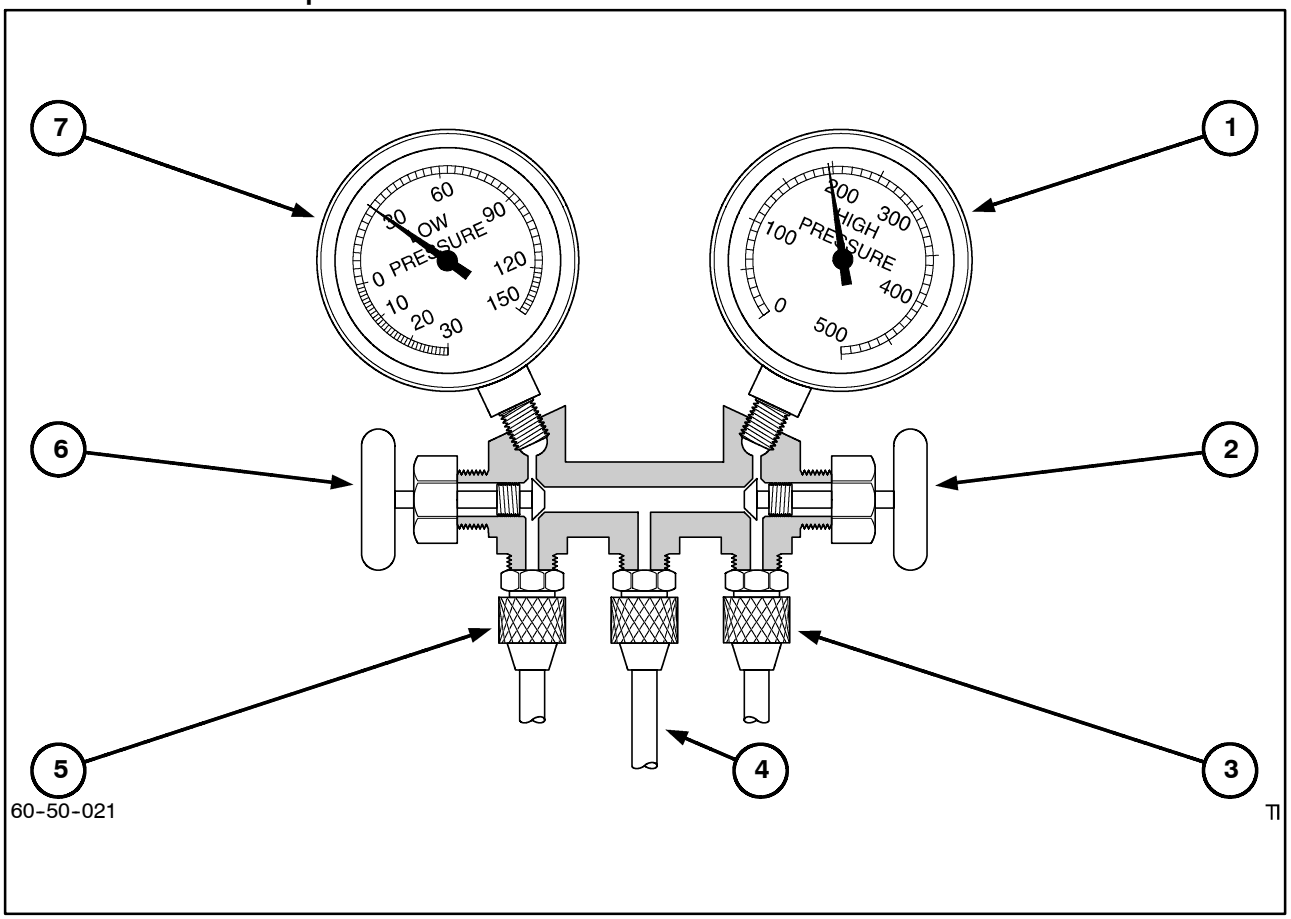
Corrective Procedures

1. Leak test the system.
2. Discharge and recover the refrigerant from the system.
3. Repair leaks.
4. Check compressor oil to ensure no loss.
5. Evacuate the system.
6. Charge the system.
7. Performance test the system.

DIAGNOSIS: *System refrigerant is extremely low. A serious leak is indicated.*

NOTE: *Test procedure based upon ambient temperature of 95 °F. For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 3



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Performance Test Example 3

1. High Side Normal
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Low

Problem:

Insufficient cooling.

Cause:

Air in system.

Conditions*

Low side pressure reading does not change when compressor cycles “on” and “off”.

High side pressure slightly high or slightly low. Gauge should read 19-21 bar (275-305 lbf/in^2).

Evaporator air not cold.

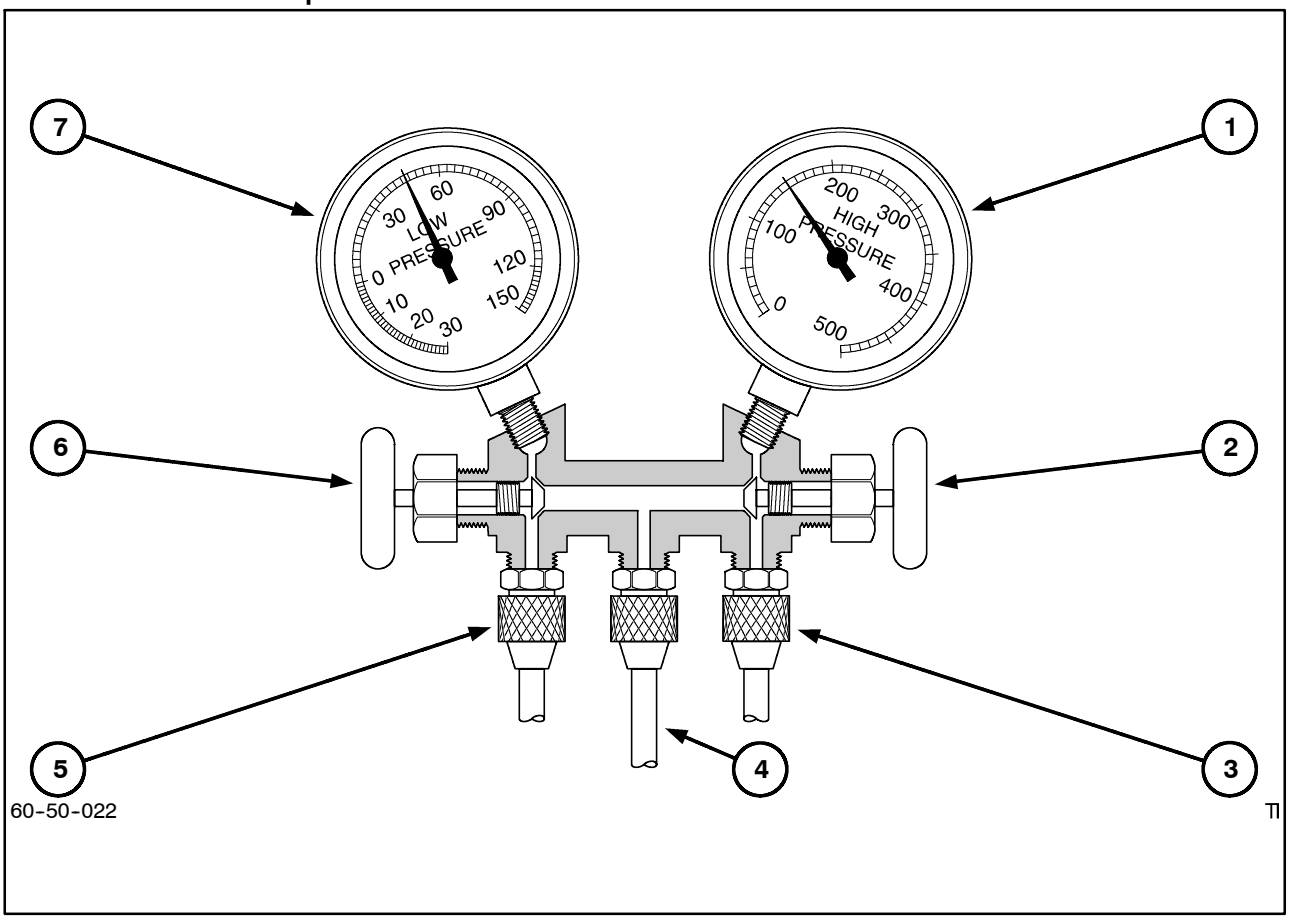
Corrective Procedures

1. Leak test the system. Give special attention to the compressor seal area.
2. Discharge and recover the refrigerant from the system.
3. Repair leaks.
4. Replace the receiver/dryer.
5. Check compressor oil to ensure no loss.
6. Evacuate the system.
7. Charge the system.
8. Performance test the system.

DIAGNOSIS: *Air or moisture in system. System not fully charged.*

NOTE: *Test procedure based upon ambient temperature of 35°C (95°F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 4



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Performance Test Example 4

1. High Side Low
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side High

Problem:

Insufficient cooling.

Cause:

Compressor malfunction.

Conditions*

Low side pressure too high. Gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure too low. Gauge should read 19-21 bar (275-305 lbf/in^2).

Evaporator air not cold.

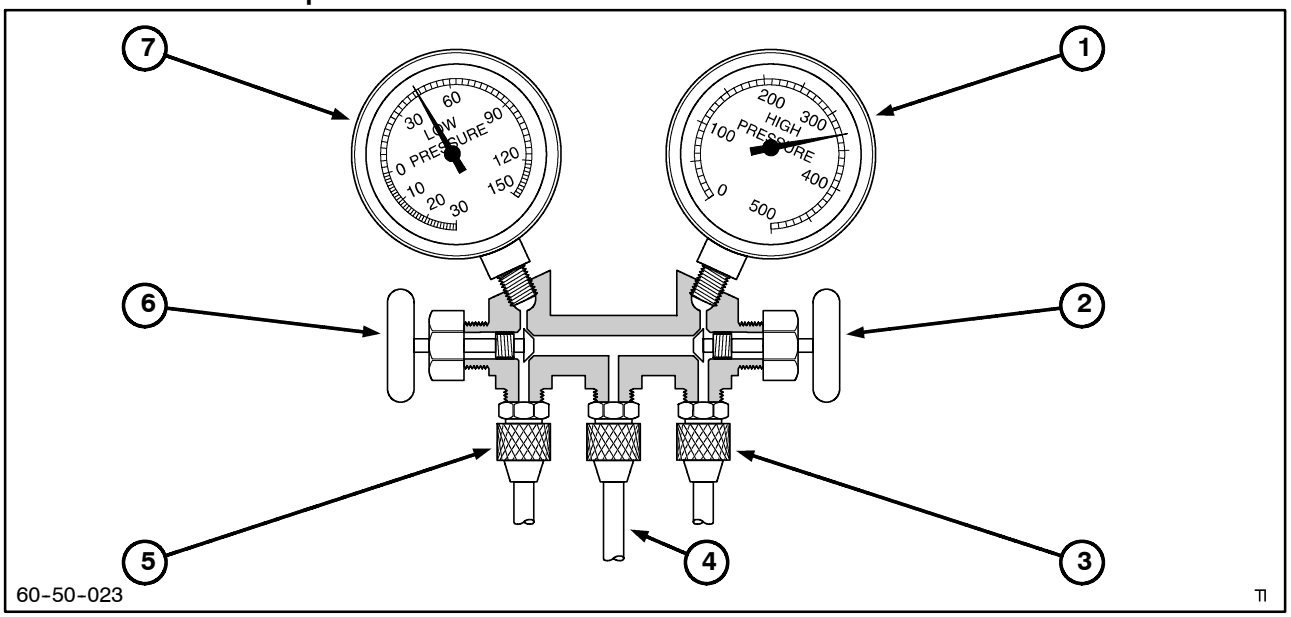
Corrective Procedures

1. Replace the compressor.

DIAGNOSIS: *Internal leak in compressor caused by worn or scored pistons, rings, or cylinders.*

NOTE: *Test procedure based upon ambient temperature of 35°C (95° F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 5



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Performance Test Example 5

1. High Side High
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side High

Problem:

Insufficient or no cooling. Engine overheats in some cases.

Cause:

Condenser not functioning properly.

Conditions*

Low side pressure too high. Gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure too high. Gauge should read 19-21 bar (275-305 lbf/in^2).

Liquid line hot.

Evaporator air warm.

High pressure switch cutting out.

Corrective Procedures

1. Check belt. Loose or worn drive belts could cause excessive pressures in the compressor head.
2. Look for clogged passages between the condenser fins and coil, or other obstructions that could reduce condenser airflow.
3. If engine is overheating replace engine thermostat and radiator pressure cap.

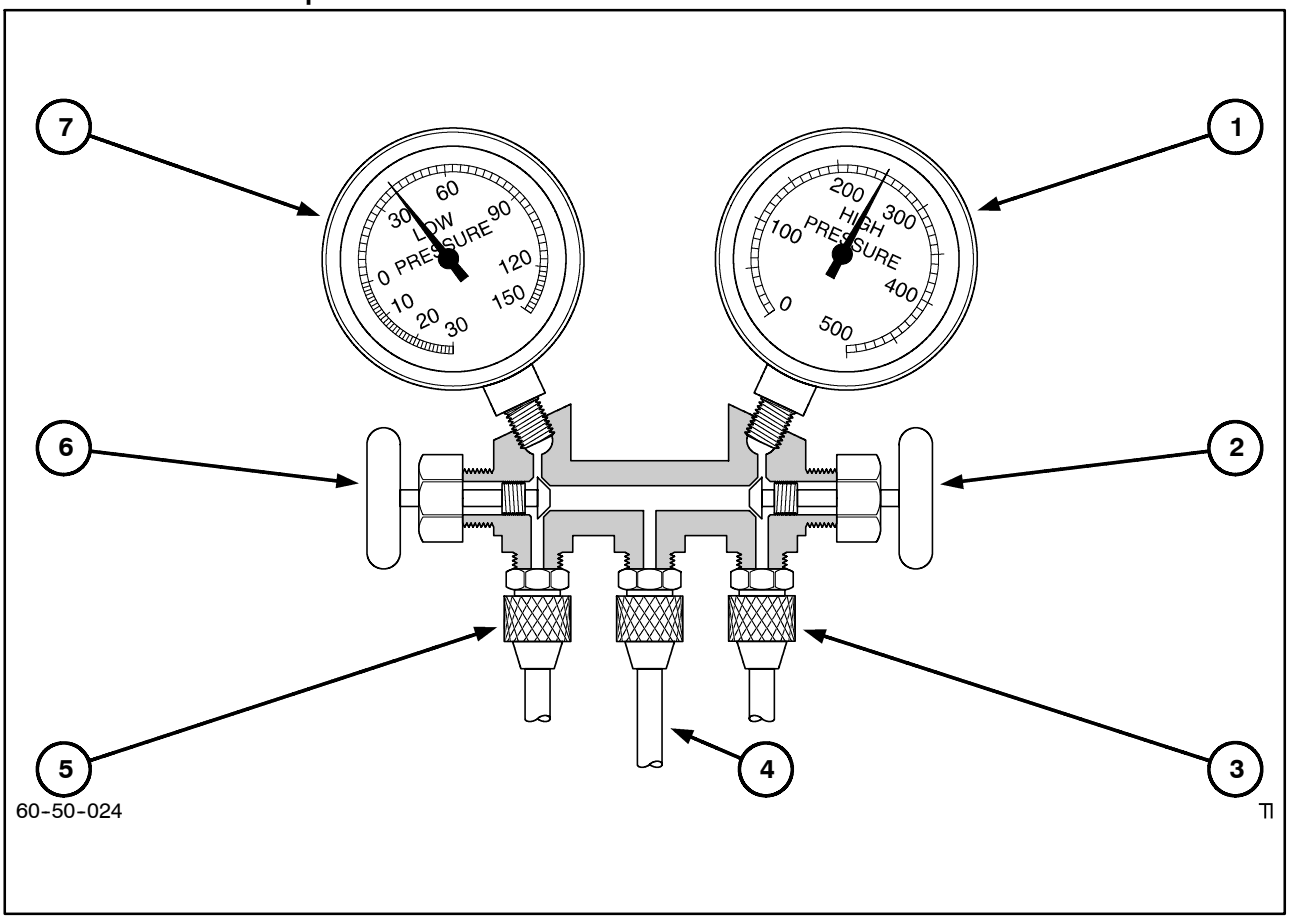
At this point, operate the system and check its performance. If still unsatisfactory, proceed as follows:-

1. Discharge and recover the refrigerant from the system.
2. Remove the condenser and clean and flush it to ensure a free flow of refrigerant. Or, if the condenser appears to be unduly dirty or plugged, replace it.
3. Replace the receiver/dryer.
4. Evacuate the system, and recharge it with the correct quantity of refrigerant.
5. Performance test the system.

DIAGNOSIS: *Lack of cooling caused by pressure that is too high on the high side, resulting from improper operation of condenser. (Refrigerant charge may be normal or excessive).*

NOTE: *Test procedure based upon ambient temperature of 35°C (95° F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 6



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Performance Test Example 6

1. High Side Normal
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Normal

Problem:

Insufficient or no cooling.

Cause:

Large amount of air in system.

Conditions*

Low side pressure too high. Gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure too high. Gauge should read 19-21 bar (275-305 lbf/in^2).

Evaporator air not cool.

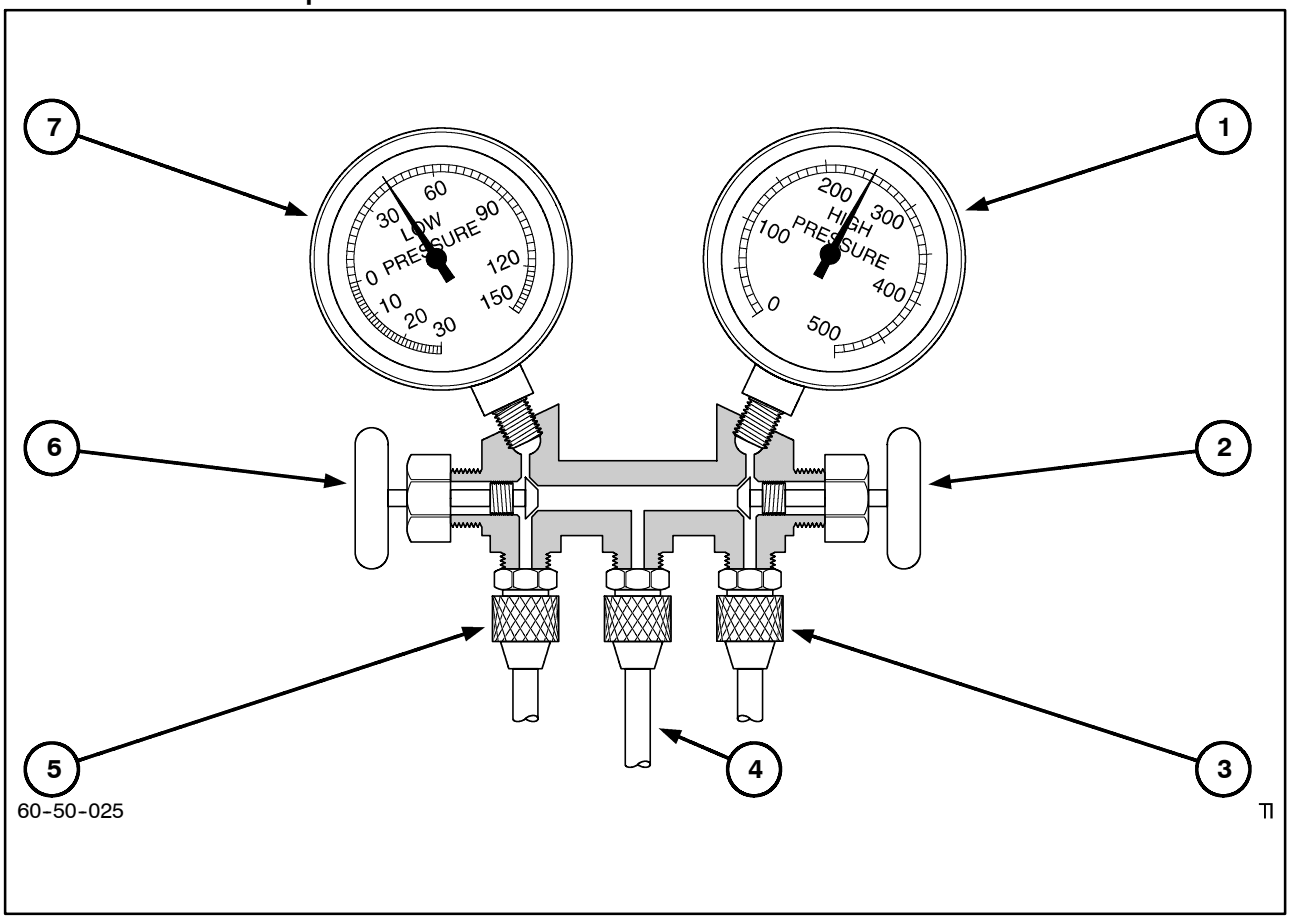
Corrective Procedures

1. Discharge and recover the refrigerant from the system.
2. Replace the receiver/dryer.
3. Evacuate the system.
4. Charge the system.
5. Performance test the system.

DIAGNOSIS: *Air in system. This, and the moisture in the air, is contaminating the refrigerant, causing the system to operate improperly.*

NOTE: *Test procedure based upon ambient temperature of 35°C (95° F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 7



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Performance Test Example 7

1. High Side High
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Hide

Problem:

Insufficient or no cooling.

Cause:

Improper operation of thermostatic expansion valve (stuck open)

Conditions*

Low side pressure too high. gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure too high. Gauge should read 19-21 bar (275-305 lbf/in^2).

Evaporator air warm.

Evaporator and suction hose (to compressor) surfaces show considerable moisture.

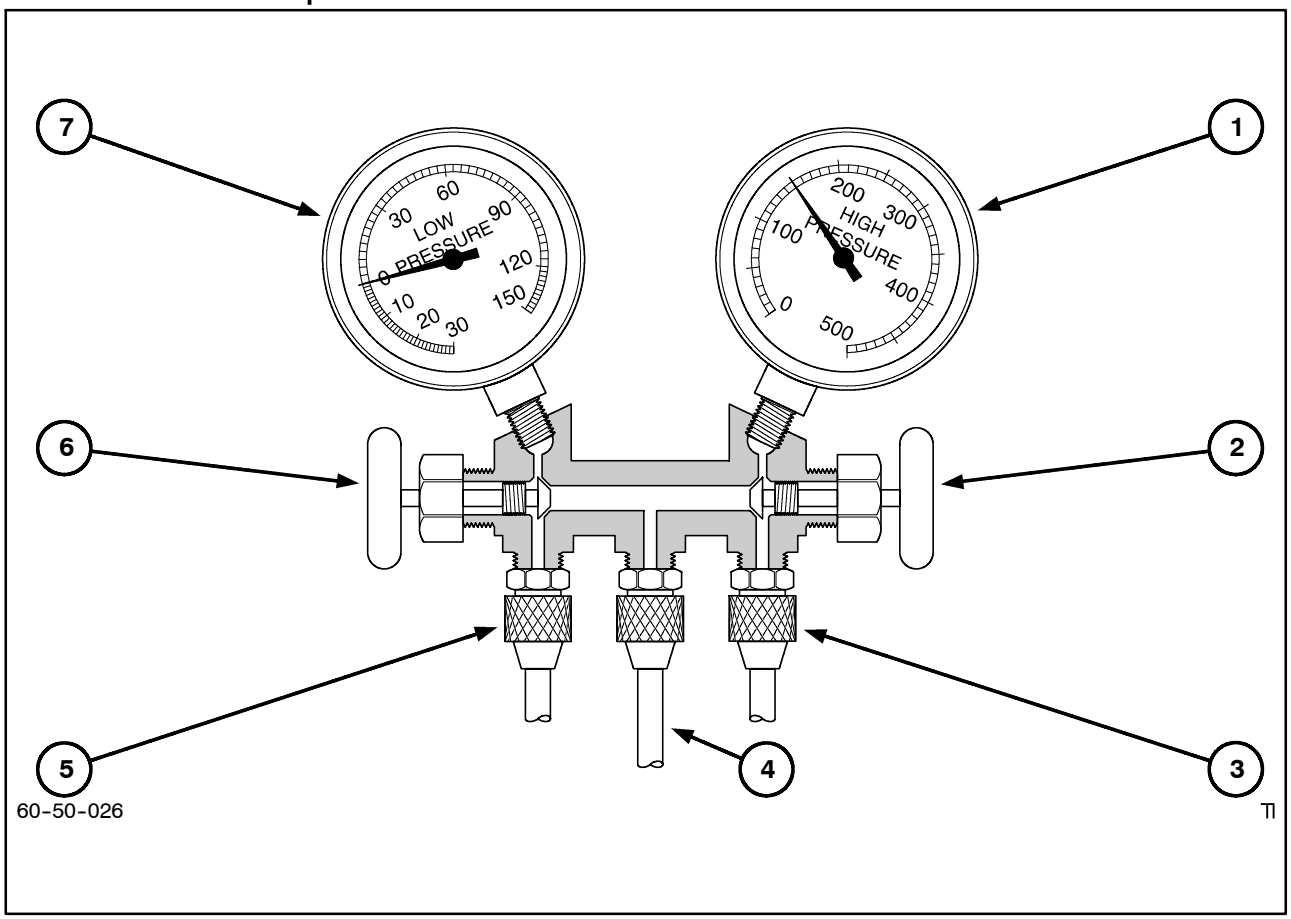
Corrective Procedures

1. Check for sticking expansion valve as follows:-
   Operate the system at maximum cooling.
   Check the low side gauge. The pressure should drop slowly.
2. If the test indicates that the expansion valve is defective, proceed as follows:
   Discharge and recover the refrigerant from the system.
   Replace the expansion valve.
   Evacuate the system.
   Charge the system.
   Performance test the system.

DIAGNOSIS: *Thermostatic expansion valve is allowing too much refrigerant to flow through the evaporator coils. Valve may be stuck open.*

NOTE: *Test procedure based upon ambient temperature of 35°C (95°F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 8



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Performance Test Example 8

1. High Side Low
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Low

Problem:

Insufficient cooling.

Cause:

Improper operation of thermostatic expansion valve (stuck closed).

Conditions*

Low side pressure too low (zero or vacuum). Gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure low. Gauge should read 19-21 bar (275-305 lbf/in^2).

Evaporator air cool, but not sufficiently cold.

Evaporator inlet pipe surface shows considerable moisture or frost.

Low pressure switch cutting out.

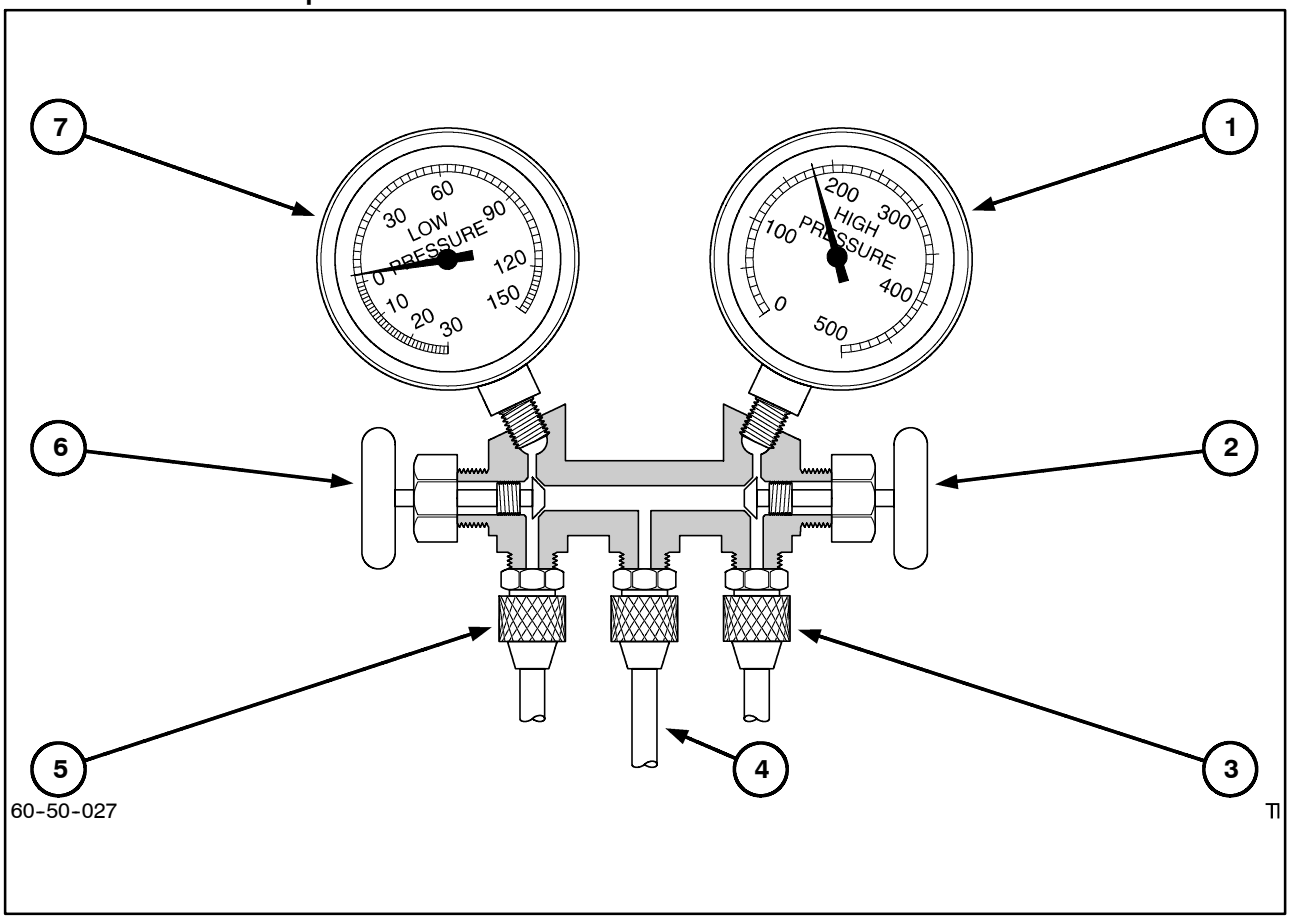
Corrective Procedures

1. Place finger on expansion valve to evaporator tube. If too cold to touch, proceed as follows:
   Operate the system at maximum cooling.
   Check the low side gauge. The pressure should drop slowly.
2. If the procedure outlined in Step 1 shows that the expansion valve is defective, proceed as follows:
   Discharge system
   Replace expansion valve
   Evacuate the system.
   Charge the system.
   Performance test the system.

DIAGNOSIS: *Expansion valve is not permitting a sufficient flow of refrigerant. May be caused by valve stuck in restricted or closed position.*

NOTE: *Test procedure based upon ambient temperature of 35°C (95° F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 9



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Performance Test Example 9

1. High Side Low
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Low

Problem:

Insufficient cooling.

Cause:

Restriction in high side of system.

Conditions*

Low side pressure too low. Gauge should read 1-2 bar (15-30 lbf/in^2).

High side pressure too low. Gauge should read 19-21 bar (275-305 lbf/in^2).

NOTE: *A normal or high reading of the high side pressure gauge under these conditions indicates the system is overcharged or the condenser or receiver/dryer is too small.*

Evaporator only slightly cool.

Liquid line and receiver/dryer are cool to touch and show frost or considerable moisture.

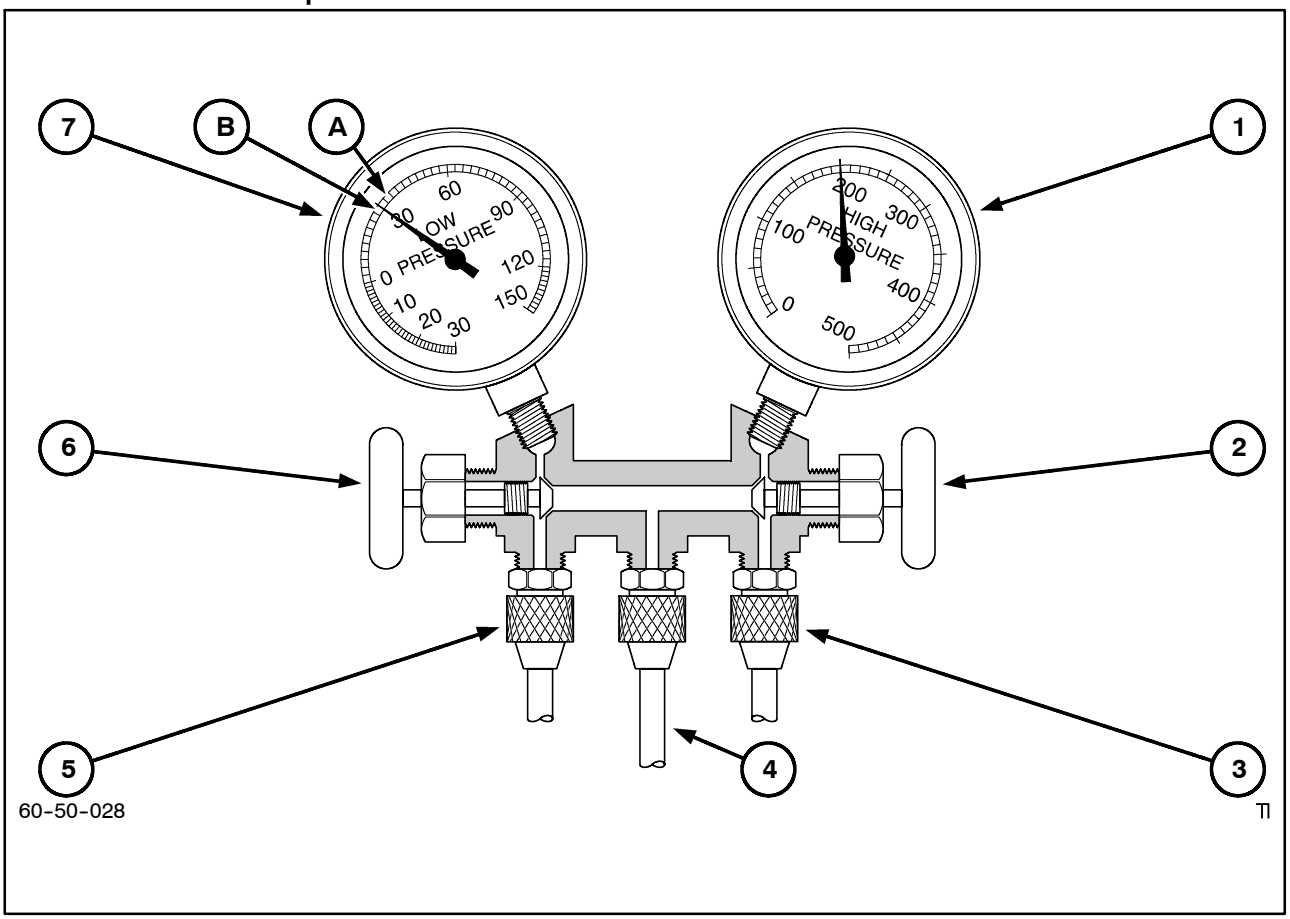
Corrective Procedures

1. Discharge and recover the refrigerant from the system.
2. Replace the liquid lines, receiver/dryer, or other obstructed components.
3. Evacuate the system.
4. Charge the system.
5. Performance test the system.

DIAGNOSIS: *Restriction in the liquid line and/or receiver/dryer resulting in a "starved" evaporator (compressor moving refrigerant from the evaporator faster than it can enter).*

NOTE: *Test procedure based upon ambient temperature of 95 °F. For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

Performance Test Example 10



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Performance Test Example 10

1. High Side Normal
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Gauge
   Compressor Cycles on at 34 lbf/in^2 (2.3 bar)
   Compressor Cycles off at 28 lbf/in^2 (1.9 bar)

Problem:

Compressor cycles (cuts in and out) too rapidly.

Cause:

Thermostatic switch defective.

Conditions*

Low side pressure readings too high during both "on" and "off" compressor cycles and between cycles. Readings should be:

0.8–1.0 bar (12-15 lbf/in^2) - cycle "off"

2.5–2.7 bar (36-39 lbf/in^2) - cycle "on"

1.7–1.9 bar (24-27 lbf/in^2) - between cycles

High side pressure normal. Gauge should read 16–18 bar (230–260 lbf/in^2).

Corrective Procedures

1. Stop the engine and shut off A/C system.
2. Replace thermostatic switch with switch of same type.
3. Make sure the switch's temperature sensor is installed in the same position and depth (in evaporator core) as previous.
4. Performance test the system.

DIAGNOSIS: *Defective thermostatic switch.*

NOTE: *Test procedure based upon ambient temperature of 35 °C (95 °F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.*

LEAK TESTING, DISCHARGING AND CHARGING THE AIR CONDITIONING SYSTEM

Leak Test

To perform a leak test if refrigerant leakage is suspected, use an electronic leak detector, Figure 30 following manufacturer's instructions.

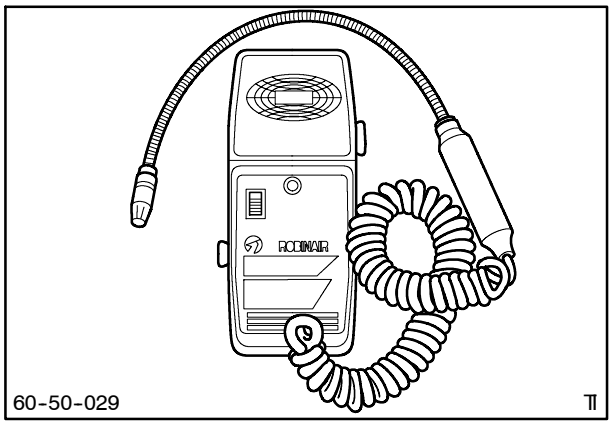
Electronic leak detectors use flashing lights or sound to alert the operator to a leak. If the leak detector's sensitivity is adjustable, be sure you calibrate the detector according to the manufacturer's instructions before use.

When using a leak detector, keep in mind that a very slight amount of leakage in the compressor pulley area is normal and does not necessarily indicate a repair is required.

When a leak is located, follow these steps.

- Discharge the system using a certified freon recovery system.
- Repair the leak.
- Evacuate the system.
- Partially charge system with 400 grammes (14 ozs) of refrigerant.
- Check system for leaks.
- Fully charge the system.

Always check the system for leaks as a final test after evacuating and before recharging. Refer to Evacuating the system.



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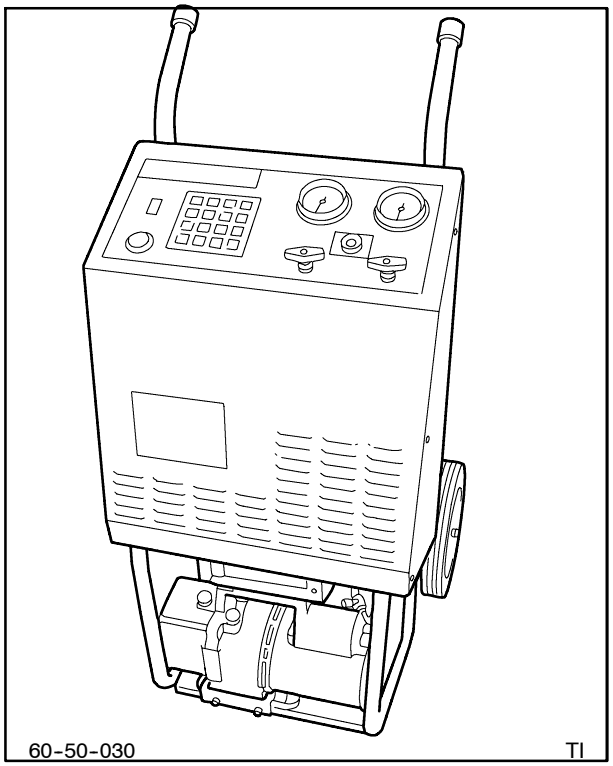
Discharging The System

Legislation has been introduced banning the release of refrigerant into the atmosphere.

Whenever overhauling the air conditioning system or performing other tasks which require the air conditioning system to be dismantled it is necessary to discharge the refrigerant gas before commencing repair.

Before you can dismantle an air conditioning system for repairs, you must discharge and recover the refrigerant using a **certified** recovery unit in accordance with the manufacturers instructions.

Figure 31 shows a combined refrigerant recovery, evacuation and recycling/charging station. This equipment removes R-134a refrigerant from the air conditioning system, recycles and recharges all in one hook up. The unit is designed to be used with the manifold gauge set built into the control panel.



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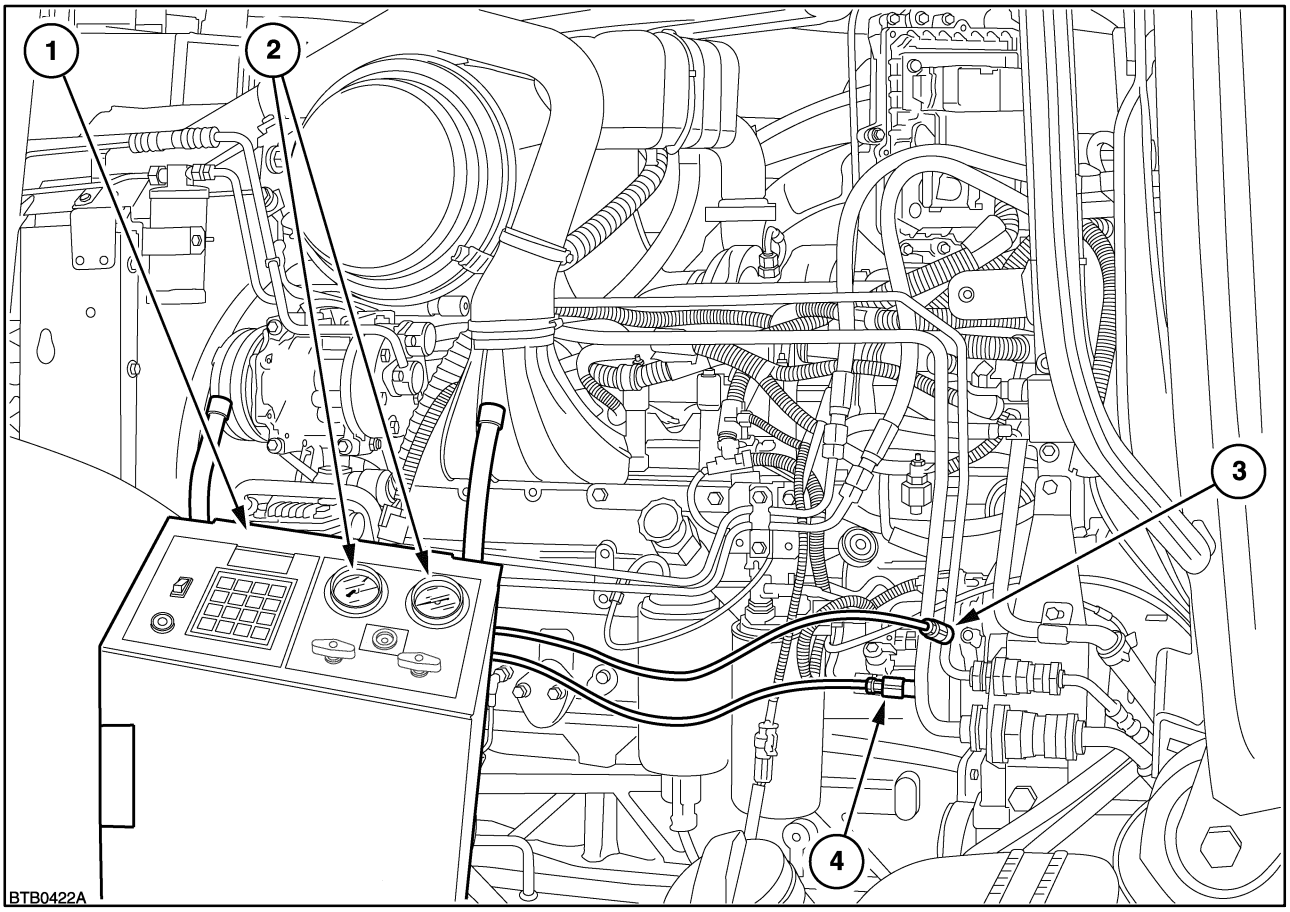

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Connecting Recovery Evacuation and recycling/Charging Station to the Tractor

1. Recovery/Recharging Unit
2. Built In Manifold Gauge Set
3. High Side Service Valve (Red Hose)
4. Low Side Service Valve (Blue Hose)

Other recovery systems are available where the manifold gauges are not an integral part of the machine. When this type of equipment is used a separate manifold gauge set must be used.

The following is a summary of the steps for discharging the system using a recovery/recycling unit

⚠ WARNING ⚠

Never *discharge refrigerant gas into the atmosphere. Always where safety goggles and gloves when working with refrigerant. Only use authorised refrigerant tanks.*

IMPORTANT: *Always follow the manufactures instructions when operating recovery equipment.*

1. Run the vehicle's air conditioning system for a few minutes.
2. Set up the recovery unit following manufacturer's instructions. Ensure that the units red (high side) hose is connected to the high side fitting and the blue (low side) hose to the low side fitting, Figure 32.

NOTE: *If a unit requiring the manifold gauge set is being used, the low and high sides of the manifold set are connected to the low and high sides of the tractor air conditioning system. The hose from the recovery unit is then connected to the manifold centre port. Refer to Figure 33.*

3. To recover refrigerant, open both high and low side valves on the control panel or the valves on the manifold gauge set if being used, Figure 33.
4. Open the valves labeled "gas" and "liquid" on the recovery unit refrigerant tank, Figure 34.
5. Plug in the units power cord
6. Operate the recovery system in accordance with the manufacturers instructions.

The compressor will shut off automatically when the recovery is complete.

Flushing The System

Air conditioning systems may occasionally become contaminated with solid particles. This contamination may be the result of allowing dirt to enter the system while it was open, from aluminum corrosion or sludge, or from disintegrated compressor reed plates. Contamination of this nature can result in plugged evaporators, condensers and expansion valves.

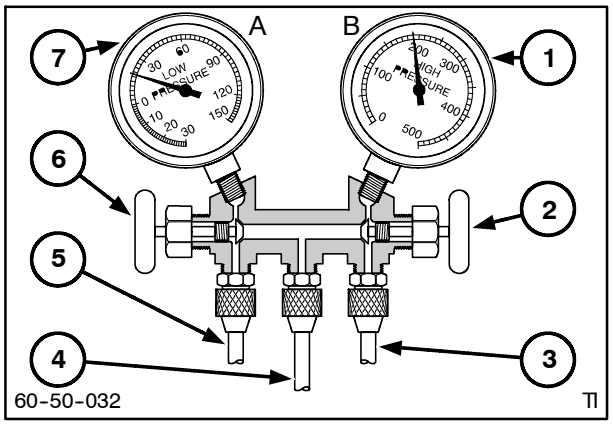
Contaminated systems must be flushed with a special flushing solvent to remove the unwanted material. Prior to flushing, the system must be discharged as described in “Discharging the System”.

Each individual component must be flushed after disconnecting every hose fitting.

The compressor and expansion valve can not be flushed, therefore, the compressor should be disassembled and cleaned or replaced and the expansion valve should be replaced. When flushing the system always replace the receiver/drier.

NOTE: *Never use any solvent for flushing an air conditioning system other than a special flush solvent made specifically for air conditioning systems. Always follow the manufacturer’s recommendations and directions for using the flushing equipment and solvent.*

Re-assemble and evacuate the system to remove air and moisture as described in “Evacuating the System”.



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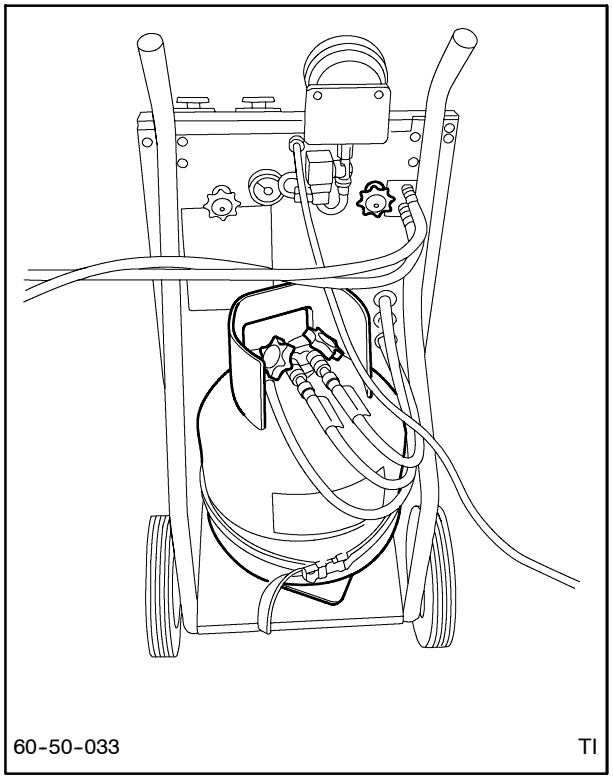
Manifold Gauge Set

1. High Side Gauge
2. High Side Shut-off Valve
3. High Side Hose
4. Centre Service Hose
5. Low Side Hose
6. Low Side Shut-off Valve
7. Low Side Gauge



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Evacuating The System

IMPORTANT: *A system in which the refrigerant has been recovered to facilitate repairs, must be evacuated before new refrigerant is installed.*

Air and moisture are removed by evacuating the system using a vacuum pump.

The automatic recycling, recharge and evacuation stations or evacuating and charging stations available throughout the air conditioning industry incorporate a vacuum pump within the assembly. If this type of equipment is not available a separate vacuum pump and manifold gauge set must be used.

As the system is evacuated the boiling point of any moisture within the system is similarly lowered. As the vacuum increases the boiling reduces to below that of the ambient temperate and the moisture is subsequently boiled away.

The relationship of system vacuum to the boiling temperature at which the water vapor is removed from the system is as follows:

System Vacuum		Temperature	
In Mercury	Cm. of Mercury	° F	° C
28.0	71.0	100	37
28.9	73.4	80	27
29.4	74.6	60	16
29.7	75.4	40	5
29.8	75.7	20	-7
29.9	75.9	0	-18

NOTE: *For every 1000 feet (305 m) above sea level, the vacuum gauge reading must be corrected by adding 1″ (2.54 cm) of mercury to compensate for the change in atmospheric pressure.*

IMPORTANT: *Be sure the system is completely discharged as refrigerant will damage the vacuum pump.*

1. If the manifold gauge set is being used connect the low and high sides of the manifold to the low and high sides of the tractor air conditioning system as described for discharging the system.

   Connect the manifold centre hose to the vacuum pump suction port as per the manufacturers instructions.

   Fully open both the low and high side gauge shutoff valves.
2. If a combined recovery/evacuation unit is to be used attach the unit to the air conditioning system in accordance with the manufacturers instructions. Be sure to read all installation and operating instructions carefully before starting the unit.
3. After starting the evacuation cycle, note the low side gauge to be sure the system pulls down into a vacuum.
4. Time the evacuation for a minimum of 20 minutes from the point when lowest vacuum is attained.
5. When the low side gauge attains the lowest steady vacuum, stop the evacuation process.

NOTE: *The vacuum pump achieves ultimate vacuum with the vented exhaust valve closed.*

6. Check the system by closing the gauge shut-off valves, turning the vacuum pump off and noting the low side gauge reading. A loss of more than 2″ (5 cm) of vacuum in 5 minutes indicates either a leak or moisture in the system.
7. If the gauge needle remains stationary and the vacuum is maintained for 3-5 minutes, close both the high and low side manifold hand valves, turn off and disconnect the center hose from the pump. The system is now ready for charging.
8. If a leak is detected, charge the system with approximately 14 ozs (400 g) of refrigerant, see charging the system and identify leak using a leak detector.
9. Once the leak is located discharge and recover the refrigerant in the system, repair the leak, then repeat the evacuation procedure.

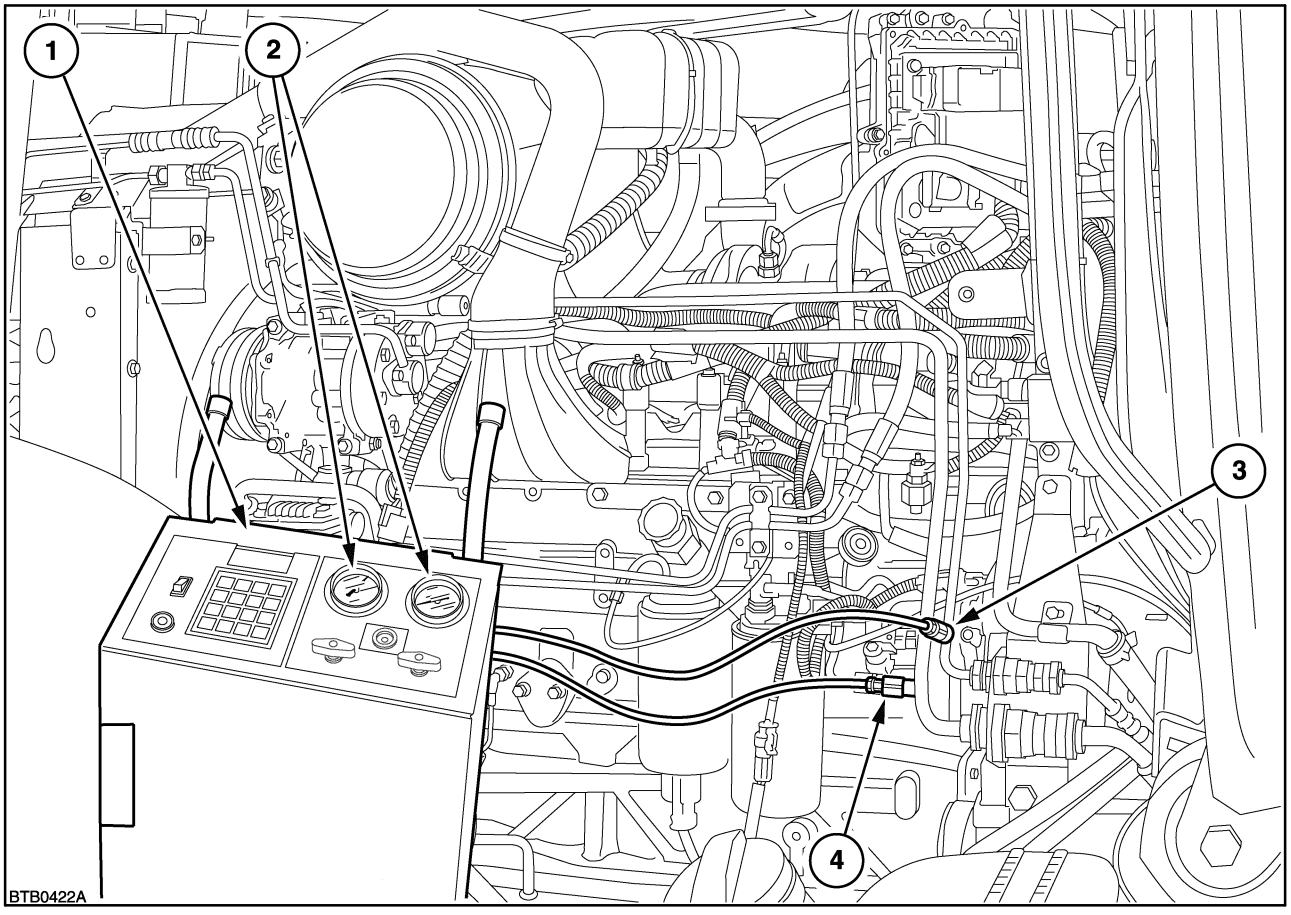
Charging The System

IMPORTANT: *Be sure there are no leaks in the system and the system has been fully evacuated. Observe all safety recommendations when handling refrigerant R-134a, see "Precautions when Handling Refrigerant R-134a" in this Section.*

1. Ensure the charging unit is correctly connected to the tractor air conditioning system in accordance with the manufacturers instructions.
2. If a charging unit, in conjunction with the manifold gauge set is used, open the high and low side hand valves on the manifold.
3. Charge the system with 1.1kg (2.4lbs) of refrigerant as per the manufacturers instructions.
4. If the charging rate becomes very slow close the high side valve, start the tractor and set engine speed to idle. Turn 'ON' the air conditioning so that the compressor can pull the remainder of the refrigerant into the system.
5. If the refrigerant charge will not completely transfer to the air conditioning system, recover and recharge the system.
6. Close the high and low side valves on the units control panel, or manifold gauge set if being used and test the air conditioning as detailed in Performance Testing The Air Conditioning System on Page 15.

NOTE: *After charging a system use the following start up procedure to ensure the lubricating oil is properly dispersed around the system:*

- Ensure air conditioning is switched OFF.
- Start the engine and bring speed down to idle.
- Turn the air conditioning ON and allow system to operate for at least one minute before increasing engine speed.



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Connecting Recovery Evacuation and Recycling/Charging Station to the Tractor

1. Recovery/Recharging Unit
2. Built In Manifold Gauge Set
3. High Side Service Valve (Red Hose)
4. Low Side Service Valve (Blue Hose)

OVERHAUL

General

⚠ WARNING ⚠

Before disconnecting components in the air conditioning system the refrigerant gas must be discharged and recovered using a certified recovery system. Refer to Discharging the system on Page 34. ***Do Not*** *discharge the gas into the atmosphere.*

If an air conditioning component is to be replaced during a system overhaul it is necessary to drain any refrigerant oil that has collected in the component being replaced into a clean calibrated container.

A volume of clean refrigerant oil equivalent to that removed from the replaced component must then be added to the new item before being installed onto the tractor.

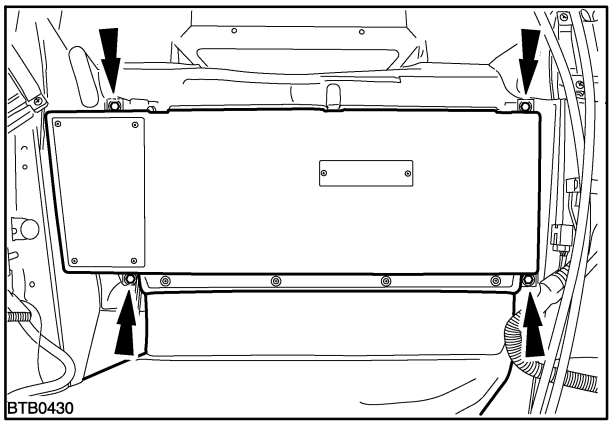
Upon completion of the repair evacuate, recharge, leak test and performance test the system to ensure correct operation.

EXPANSION VALVE

Replacement

The expansion valve is not a serviceable item and must be replaced if defective.

1. Fully discharge the air conditioning system.
2. Remove main seat, remove front and rear floor mats and remove rear floor to gain access to the HVAC unit.
3. Undo 4 securing bolts and remove HVAC unit complete with rear ducting, Figure 36.
4. The ducts on the rear of the HVAC unit can then be removed and the unit serviced out of the vehicle.
5. Access to the evaporator is obtained by removing the 4 spring clips on the housing and lifting out the evaporator/heater assembly, to access the expansion valve, Figure 37.
6. The unit needs to be removed from the vehicle to access the expansion valve.



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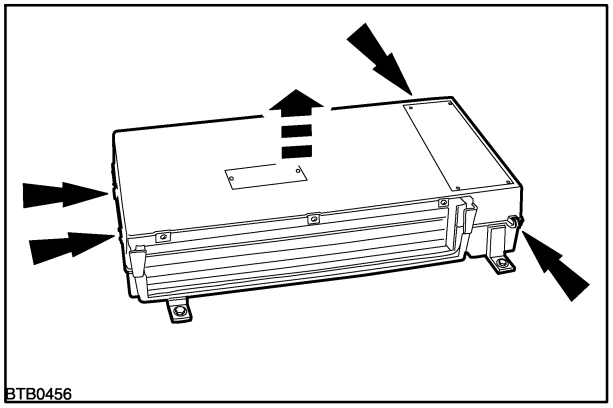

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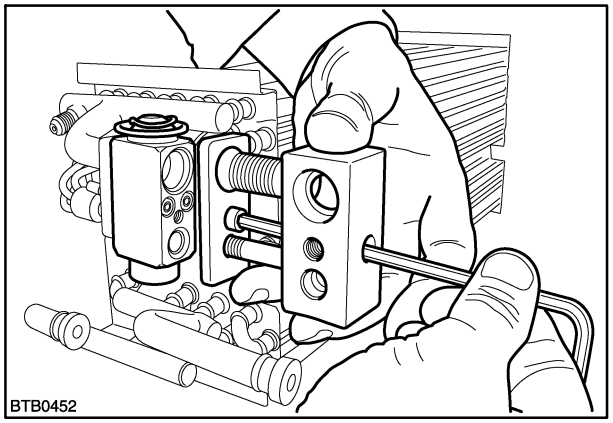
7. Remove Allen screw securing the inlet and outlet connection to the valve, and remove inlet/outlet assembly, Figure 38.



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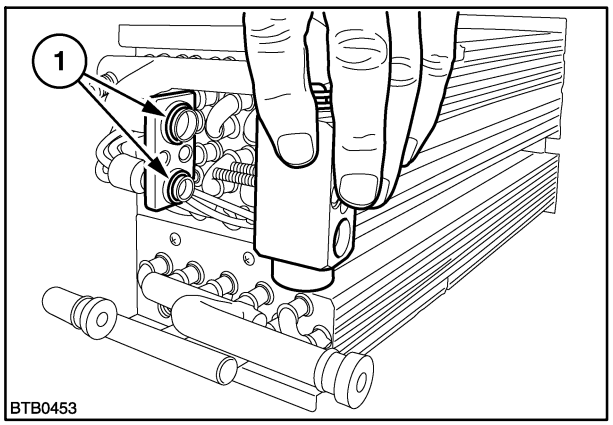
8. Remove expansion valve and replace the 'O' ring seals, (1) Figure 39 and lubricate with refrigerant oil prior to installing the valve using disassembly procedure in reverse.
9. Evacuate, leak test and recharge the system.



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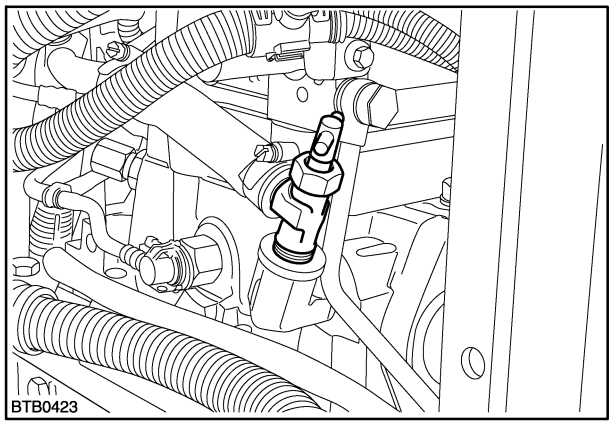
EVAPORATOR

Removal

1. Close the heater shut-off valve on the rear of the inlet manifold, Figure 40.
2. Turn the cab heater temperature control to maximum heat.



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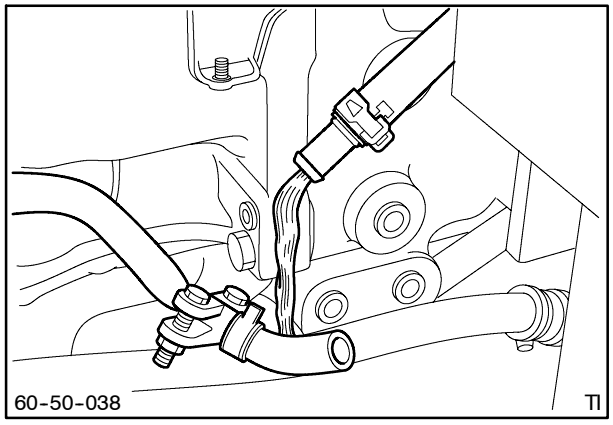
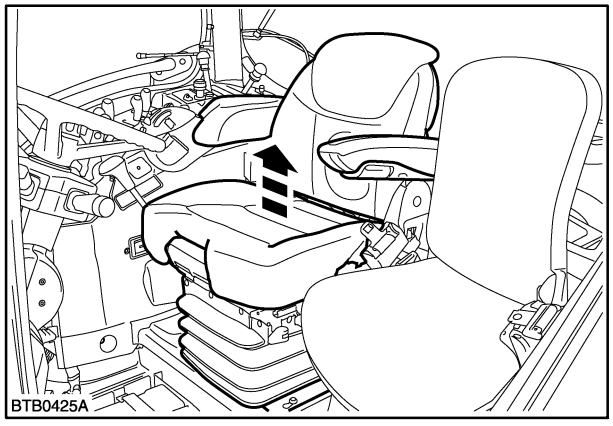
3. Apply a clamp to the heater return hose at the left side of the engine. Disconnect the hose and drain the heater system of coolant, Figure 41.
4. Discharge and reclaim refrigerant gas using certified recovery systems.
5. Remove aircon and water hoses under cab (removal of rear wheel first helps).



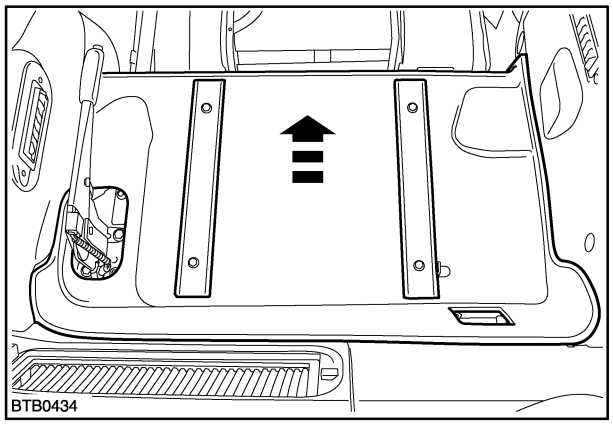
41

6. Remove main seat to the gain access to the front and rear floor mats. Figure 42.



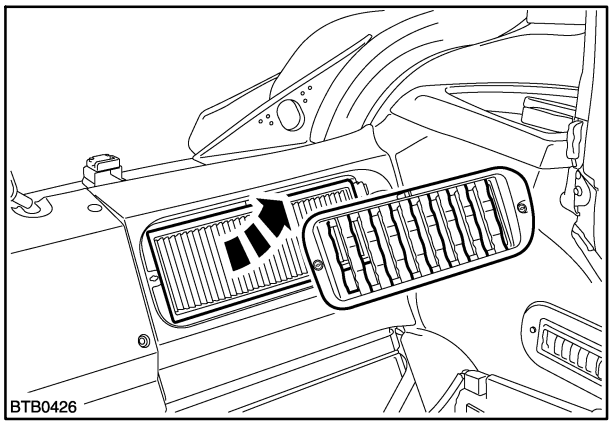
42

7. Remove front and rear floor mats to gain access to front and rear floor plates, Figure 43.



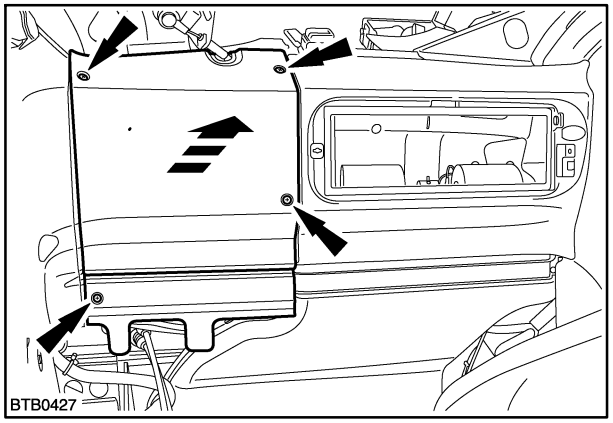
43

8. Remove the recirculation grill and filter to gain access to the screws at the top of the blower assembly, Figure 44.



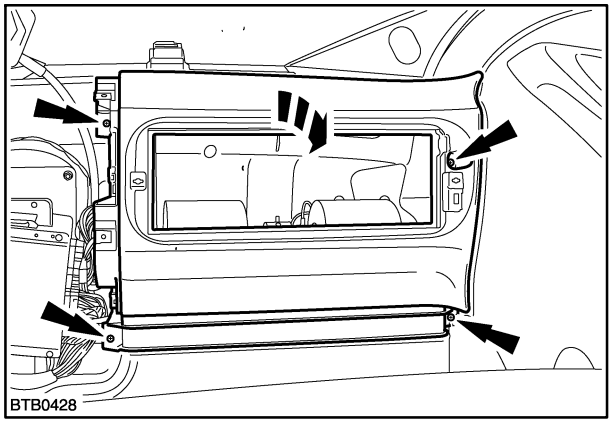
44

9. Undo securing screws and remove rear module cover beside blower housing, Figure 45.



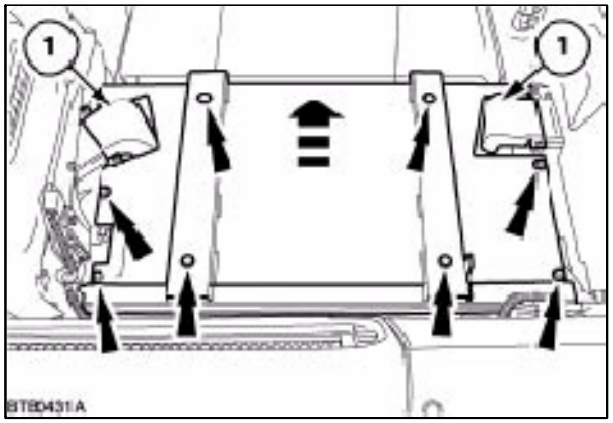
45

10. Undo securing screws on blower housing and tilt forward for access. Disconnect wiring multiplug at the bottom of housing and remove, Figure 46.



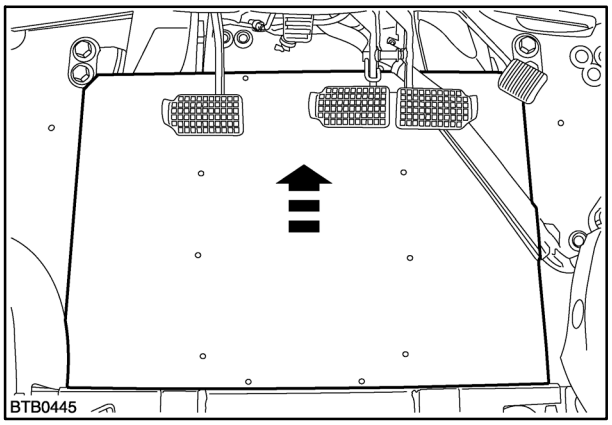
46

11. Unscrew and remove lower side ducts (1) and remove rear floor plate, Figure 47.



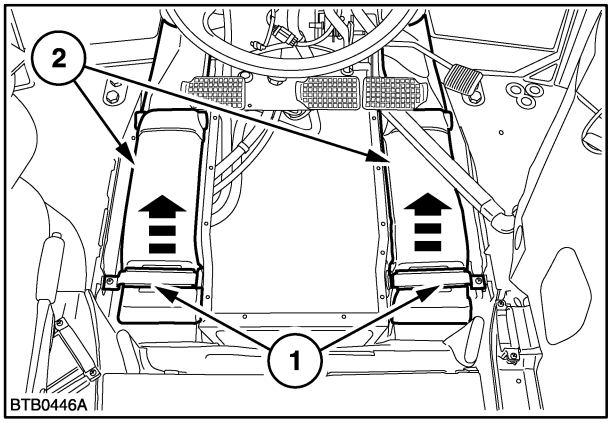
47

12. Undo securing bolts and remove front floor plate, Figure 48.



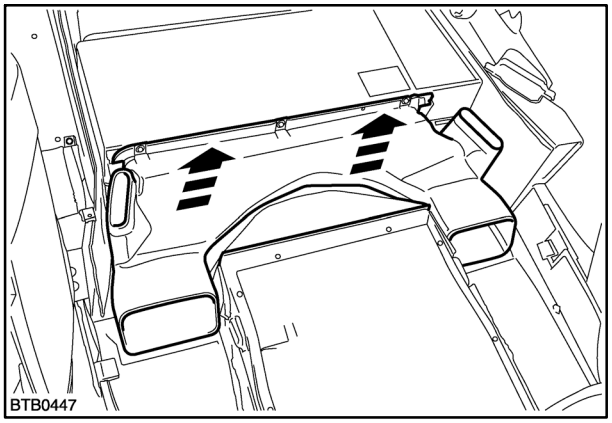
48

13. Unscrew securing brackets (1) and remove front ducts (2), Figure 49.



49

14. Undo securing screws and remove outlet duct on front of the HVAC unit, Figure 50.
15. Undo the 4 securing bolts on the HVAC unit and remove complete with the rear ducting, Figure 51.
16. The ducting on the rear of the HVAC unit can then be removed and the unit serviced out of the vehicle.
17. Check the evaporator assembly fins for damage. Straighten fins if necessary.
18. Clean the evaporator core of all foreign material to be sure it is free of obstructions.
19. Check the evaporator assembly for indications of refrigerant leakage. If damage or leaks are evident, replace the evaporator core.
20. If a new evaporator is to be installed drain the refrigerant oil in the evaporator into a clean calibrated container. Measure the quantity of oil obtained and add the same quantity of new refrigerant oil directly into the replacement evaporator core.
21. Install evaporator using disassembly procedure in reverse.
22. Evacuate, leak test and recharge the system.



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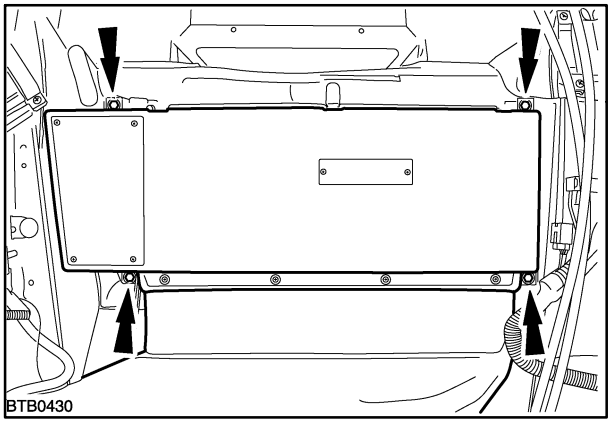
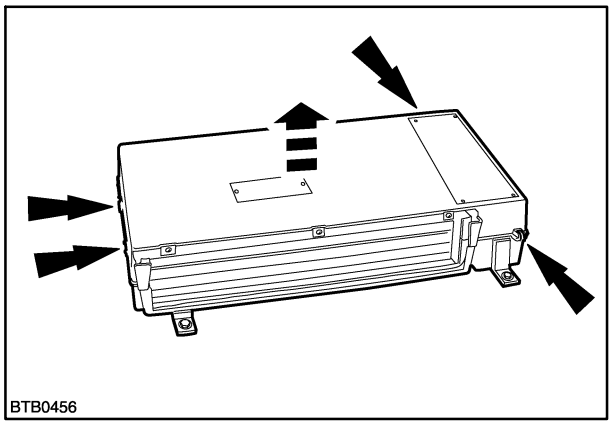


51

23. Access to the evaporator/heater is obtained by removing the 4 spring clips on the housing and lifting out the evaporator/heater assembly, Figure 52.

Installation

1. Install evaporator using disassembly procedure in reverse.



52

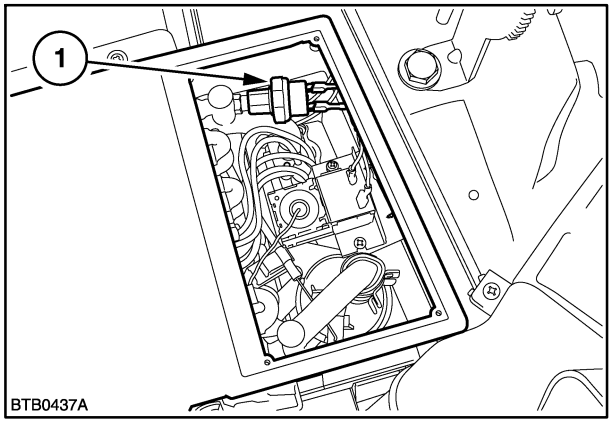
LOW PRESSURE CUT-OUT SWITCH

Replacement

1. With the engine 'Off' check continuity across the switch contacts, (1) Figure 53. If the switch shows 'Open Circuit' replace as detailed below.

NOTE: *The switch can be replaced without discharging the system.*

2. Remove switch, (1), by unscrewing from self sealing schrader valve.



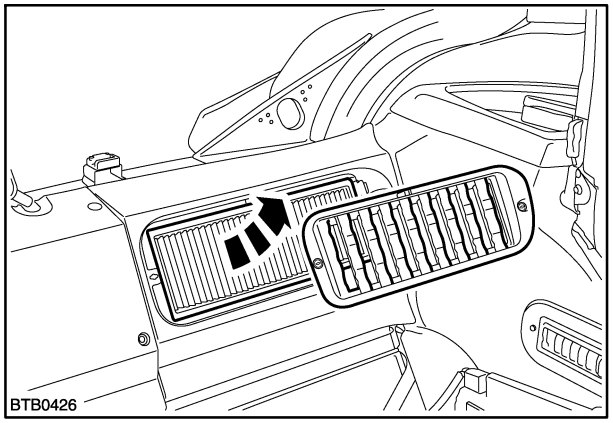
53

BLOWER MOTOR AND FAN ASSEMBLY

Removal

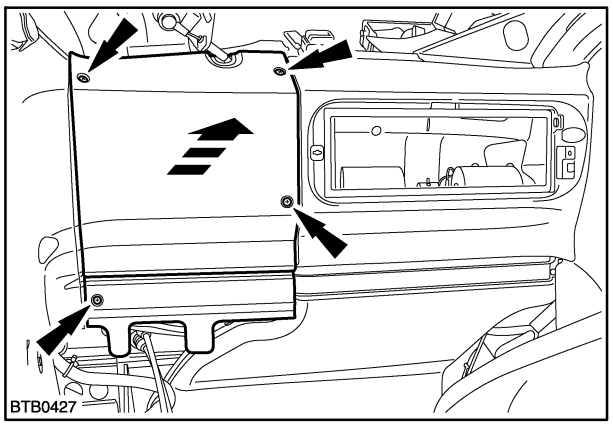
1. Remove the recirculation grill and filter to gain access to the screws at the top of the blower assembly.

The blower motor can if required be removed without discharging the system as follows:-



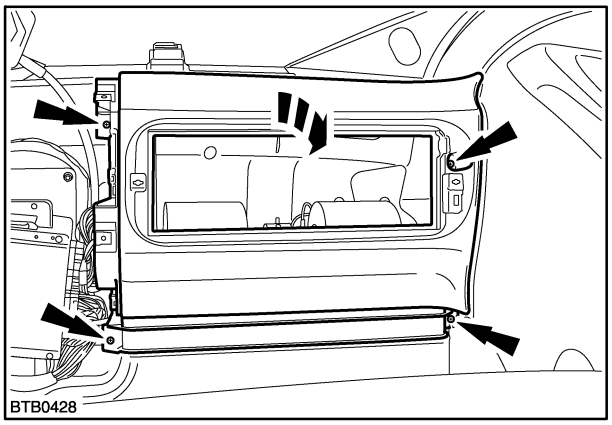
54

2. Undo securing screws and remove rear module cover beside blower housing, Figure 55.



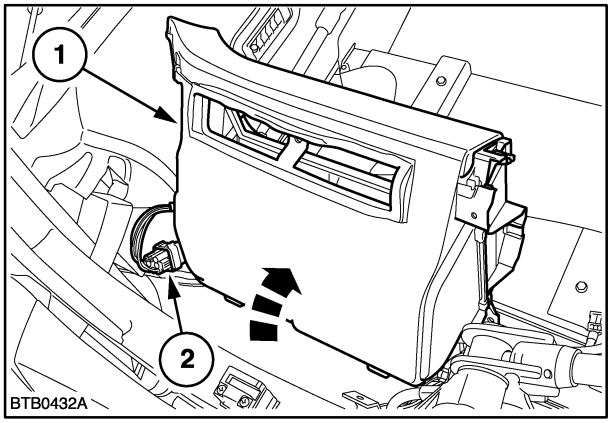
55

3. Undo securing screws on blower motor housing and tilt forward for access, Figure 56.



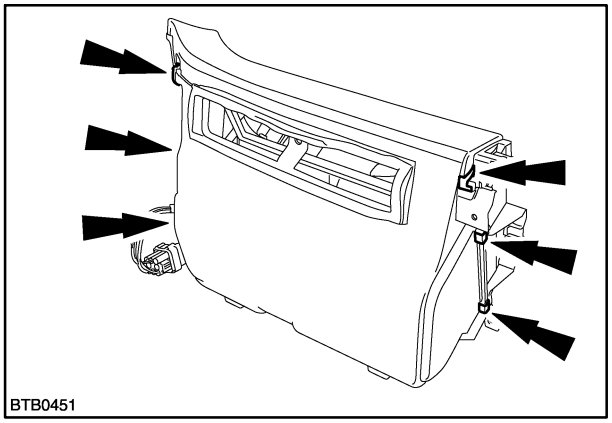
56

4. Disconnect wiring multiplug (2) Figure 57. at the bottom of the housing (1) and remove blower motor assembly.



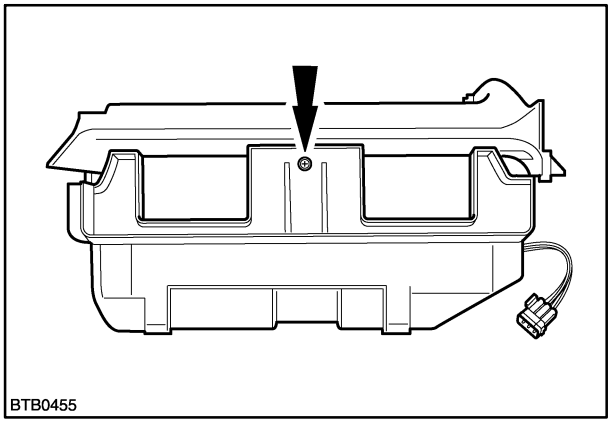
57

5. To Gain access to the blower motor , remove the 6 spring clips that hold the 2 halves of the blower housing together Figure 58.



58

6. Undo the single screw on the underside of the lower half of the blower housing that secures the blower in place, the blower will then slide out. Figure 59.



59

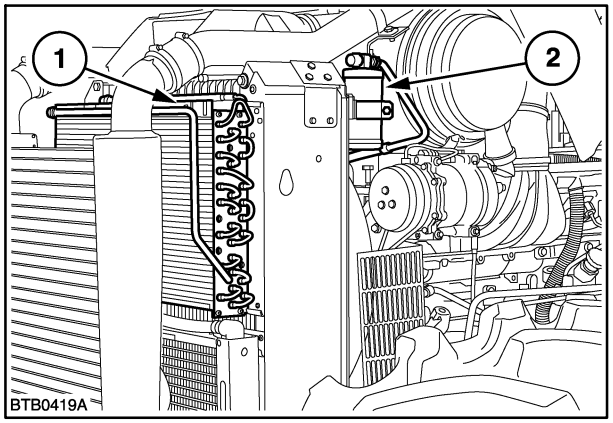
RECEIVER DRYER AND CONDENSER

Replacement

The receiver/dryer, (2) Figure 60, cannot be overhauled and must be replaced as an assembly. The receiver/dryer assembly should be replaced if it is suspected that moisture is in the system.

The receiver dryer must also be replaced if the system has been discharged and the air conditioning joints disconnected.

1. Discharge and reclaim refrigerant gas using certified recovery systems.
2. Disconnect the hose fittings from the dryer and then release the clamp around the body of the drier and remove the drier from the tractor.
3. Slide condenser, (1) Figure 60, to side of tractor.
4. Disconnect the connections to the condenser.
5. Cap and plug all fittings to prevent any dirt entering the system.
6. Remove condenser from tractor.
7. Inspect the condenser assembly fins for damage and be sure they are not plugged.
8. Check the condenser for signs of leakage. If the condenser is damaged or leaking, install a new condenser assembly.
9. Drain the refrigerant oil from the receiver dryer into a clean calibrated container. Measure the quantity of oil obtained and add the same quantity of new refrigerant oil directly into the new item.
10. If the condenser is to be replaced, drain the refrigerant oil from the condenser into a clean calibrated container. Measure the quantity of oil obtained and add the same quantity of new refrigerant oil directly into the new condenser.
11. Soak new tubing connector 'O' rings in clean refrigerant lubrication oil and install onto tubing
12. Install condenser and a new receiver dryer.
13. Evacuate, leak test and recharge the system.



60

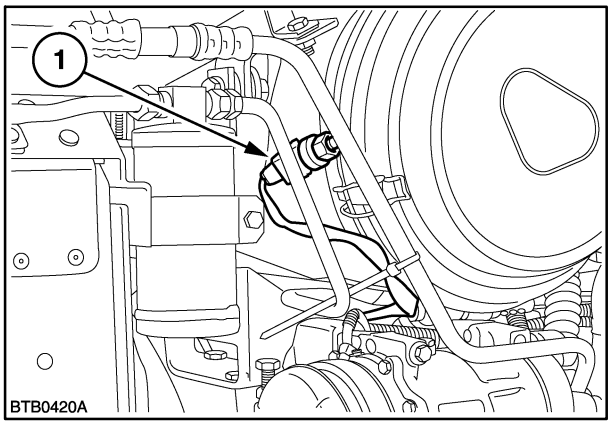
COMPRESSOR HIGH LOW CUT-OUT SWITCH

Replacement

1. With the engine 'Off' check continuity across the switch contacts, (1), Figure 61. If the switch shows 'Open Circuit' replace as detailed below.

NOTE: *The switch can be replaced without discharging the system.*

2. Remove switch by unscrewing from self sealing schrader valve.
3. Replace with new switch and connect the harness.



61

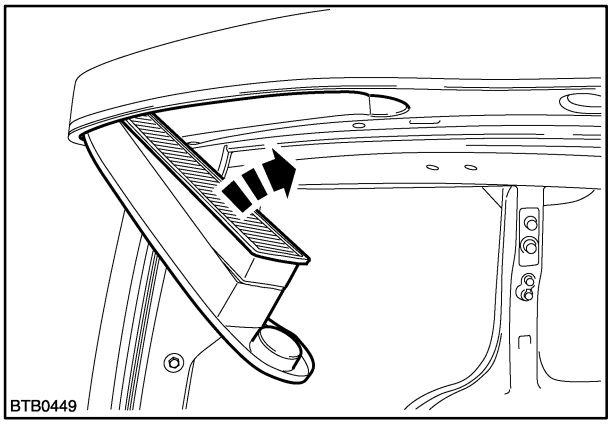
CAB AIR FILTERS

Replacement

1. Before servicing the filters, switch off the blower and close the roof hatch, all windows and one door. Slam the final door closed and the resulting back pressure will dislodge most of the loose dirt from the underside of the filters.
2. Remove filter elements. The fresh air filters, Figure 62, have a prefilter element fitted that is designed to catch most of the dust/chaff. This prefilter is part of the filter and should be pulled out from the underside and cleaned first, then pushed back in.
3. The recirculation filter, Figure 62 is fitted with a pull tab. This should be used to remove the filter. The filter pleats should never be used to remove the filter as damage will result.

   Blow the dust from the upper surface through the element to the underside. Clean by blowing with compressed air not exceeding 2 bar 30 ($lbf/in^{2)}$. Hold the nozzle at least 12 in (300 mm) from the element to prevent damage to the pleats.

   Care should be taken when using compressed air as this may damage to the filter.
4. Clean all filter chambers with a damp, lint free cloth.
5. Replace the filter elements with the rubber seal uppermost and re-install the covers.



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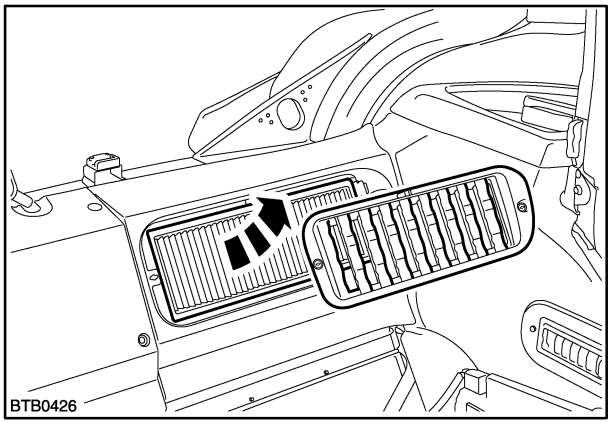
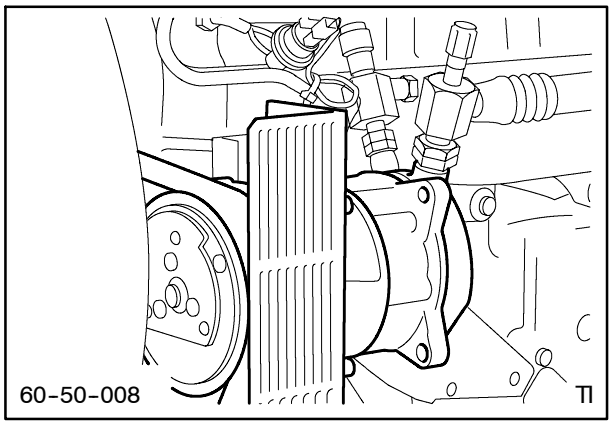


63

COMPRESSOR

Removal

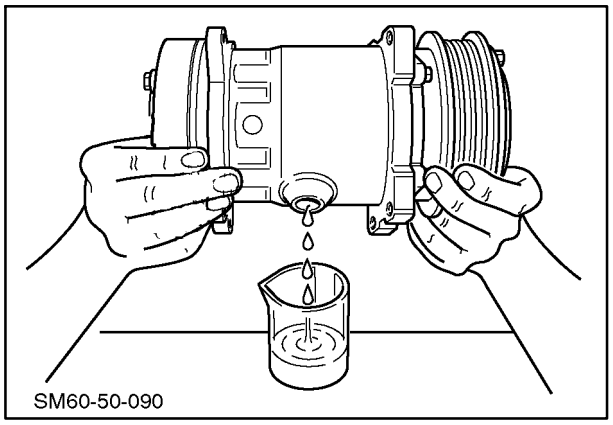
1. Discharge and reclaim refrigerant gas using certified recovery systems. Record the amount of oil discharged as (**X**).
2. Disconnect tubing to compressor.
3. Disconnect wiring connector to compressor clutch.
4. Disconnect drive belt, remove the four mounting bolts and remove compressor from tractor.



64

5. Drain the refrigerant oil from the old compressor into a clean calibrated container. Measure and record the quantity of oil as (**Y**). This information is required during installation of the new or overhauled unit.

NOTE: *It is necessary to rotate the compressor drive shaft several times to completely expel all the oil.*



65

Installation

1. Installation is the reversal of the removal but the following points should be noted:-

- Torque the mounting bolts to 40-51Nm (29-38lbf.ft).

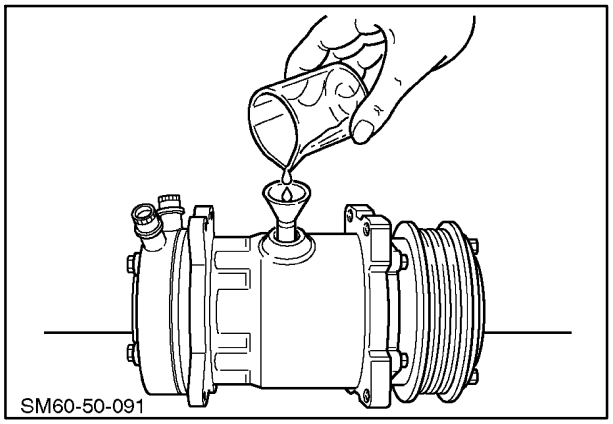
NOTE: *It is recommended that a new receiver / drier assembly is installed after any system component replacement or any repair that requires entry into the system.*

- Drain the oil from the new compressor to be fitted into a clean container, or if the old compressor is to be refitted, obtain a new can of refrigerant oil.
- Calculate the amount of oil to be installed as, **(x)+(y)**. Add this quantity of the new oil into the fill port on top of the compressor.

NOTE: *Refer to the following page regarding* ***Oil Level Measurement*** *to determine if the system oil quantity is correct.*

After charging a system use the following start up procedure to ensure the lubricating oil is properly dispersed around the system:

- Ensure air conditioning is switched OFF.
- Start the engine and bring speed down to idle.
- Turn the air conditioning ON and allow system to operate for at least five minutes before increasing engine speed.



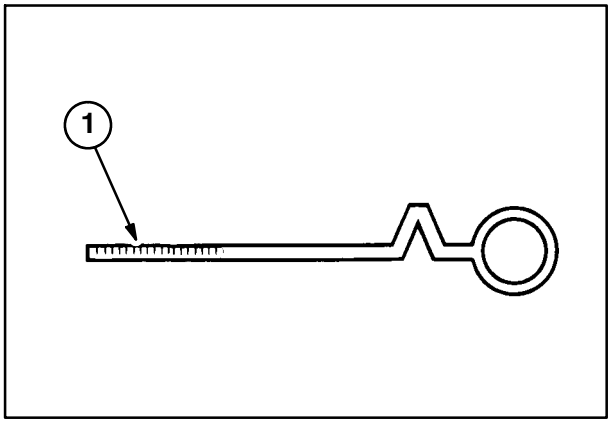
66

Oil Level Measurement (on vehicle)

Oil level in the compressor should be checked when a system component is removed or replaced or when an oil leak is suspected.

Use the following procedure to determine if the oil quantity is correct.

1. Start the engine and allow to idle. Switch on air conditioning and run the compressor for 10 minutes.
2. Recover the refrigerant from the system, very slowly so as not to lose any oil.
3. Carefully remove the oil filler plug. Turn the armature retaining nut to allow full insertion of the oil dipstick (1) Figure 67, supplied with kit NH.50-100.
4. Remove the dipstick and count the notches covered by the oil. An acceptable level of oil is when 5-7 notches are covered.
5. Add or subtract oil through the filler plug to obtain the correct level.
6. Ensure the filler hole seat and filler plug seal are clean and not damaged and Install the oil plug. Tighten to 15-25Nm (11-18lbf.ft).



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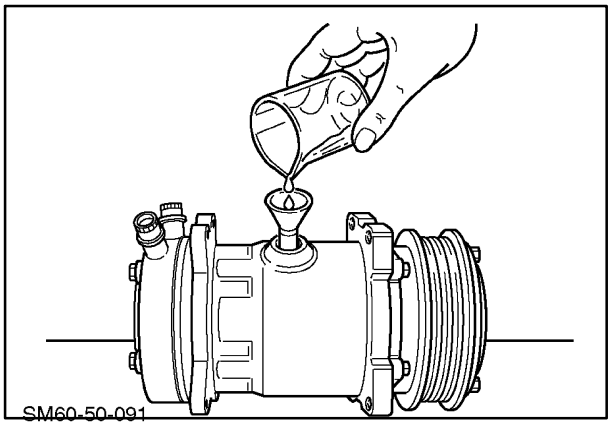
Oil Retained in System Components

After replacement of individual system components it will be necessary to add some oil to the system to make up the amount lost in the removed component. The table, on the right, shows some typical volumes for the components. It is, however, still recommended that the on vehicle oil level measurement procedure, described above, is carried out after a new component has been installed to establish correct oil quantity.



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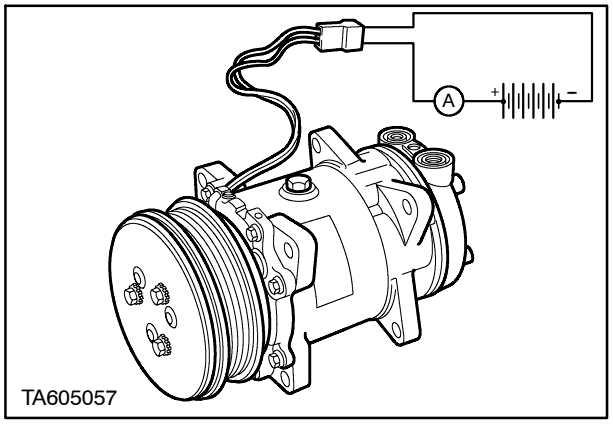
Component	Typical oil amount	
	fl.oz.	cc
Evaporator	2.0	60
Condenser	1.0	30
Receiver / drier	0.5	15
Hoses	0.3	10

Inspection

1. Rotate the compressor shaft. Use a suitable socket on the hub centre bolt or by hand using the rubber dampers.

   If severe roughness is felt while rotating the hub, the compressor should be disassembled.

2. Using a 12 volt battery check current drawn by the field coil which should be between 3.6– 4.2 Amps.



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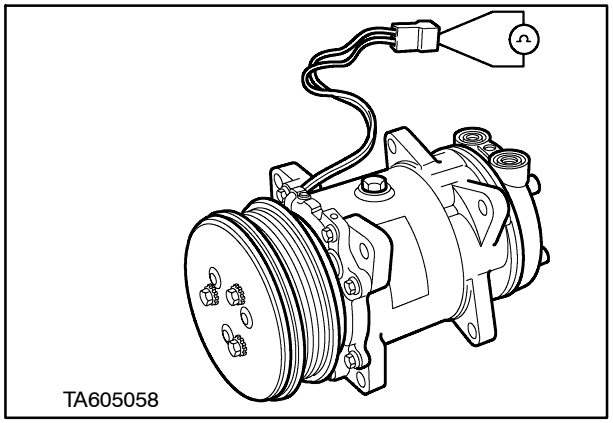
   Very high current readings indicate a short circuit in the field coil and no current reading indicate an open circuit. Replace coil with either fault. Resistance of the coil using an ohmmeter should be approximately 3.0Ω at 20°C.

   A poor earth (ground) connection of the field coil will result in a low voltage.

3. Ensure clutch is disengaged and rotate pulley by hand. If roughness in the bearing is felt, it will be necessary to replace the pulley and bearing as an assembly.



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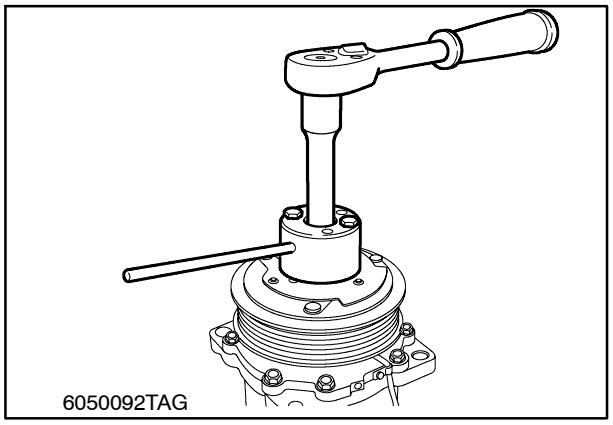
CLUTCH

Removal

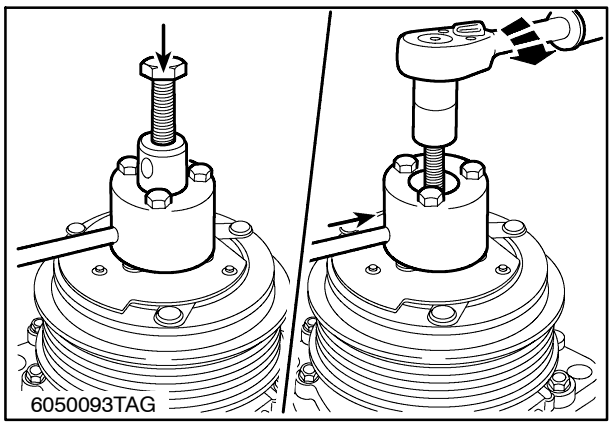
All clutch servicing should be done with the compressor removed from the vehicle:

1. Support the compressor. If using a vice, do not hold on to the housing.
2. Remove the cover on the front of the clutch plate.
3. Using the front plate tool hold the clutch plate stationary and remove the retaining nut from the end of the shaft. Figure 71.



71

4. Place a thread protector over the end of the driveshaft and using a puller remove the clutch front plate, Figure 72.



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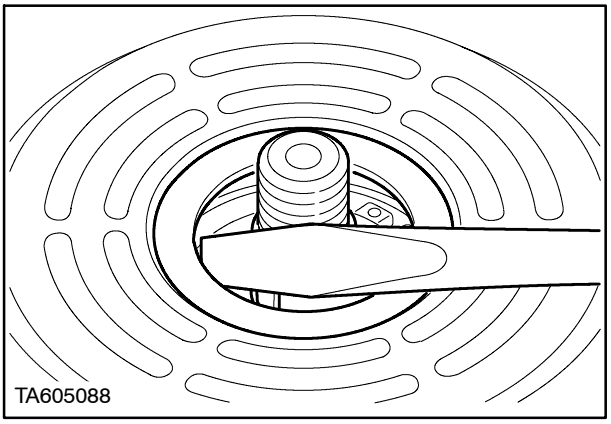
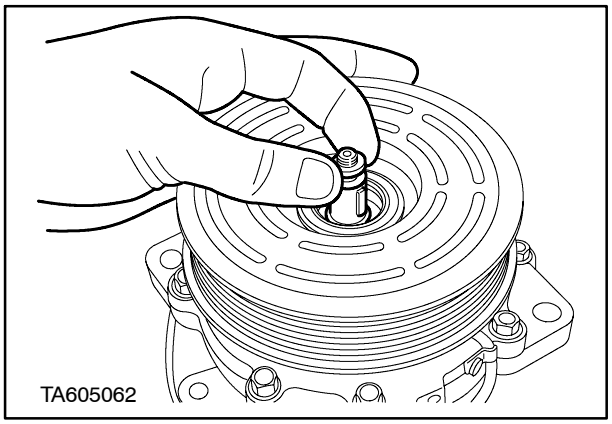
Disassembly

1. Carefully remove the bearing dust cover, if fitted.



73

2. Remove the clutch shims



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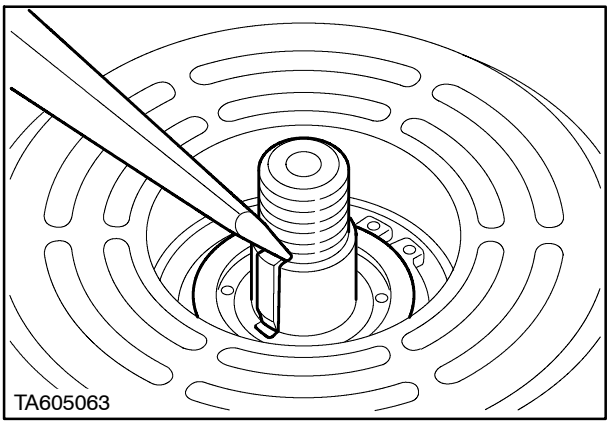
3. Remove the shaft key



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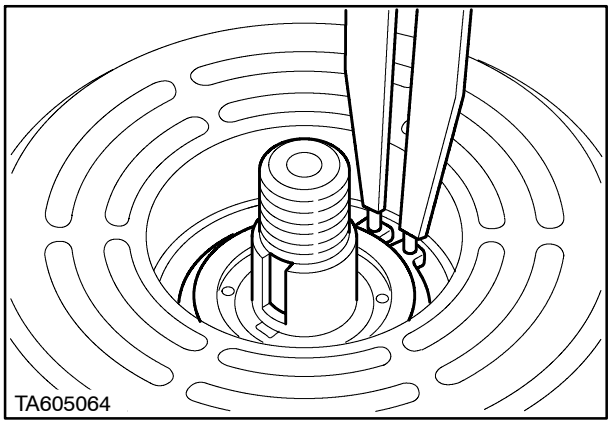
4. Remove the pulley bearing external snap ring



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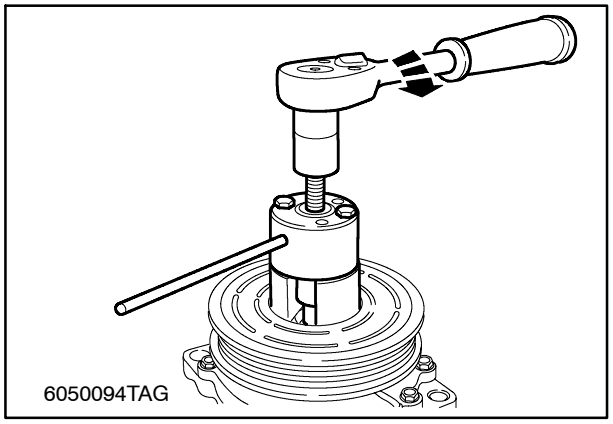
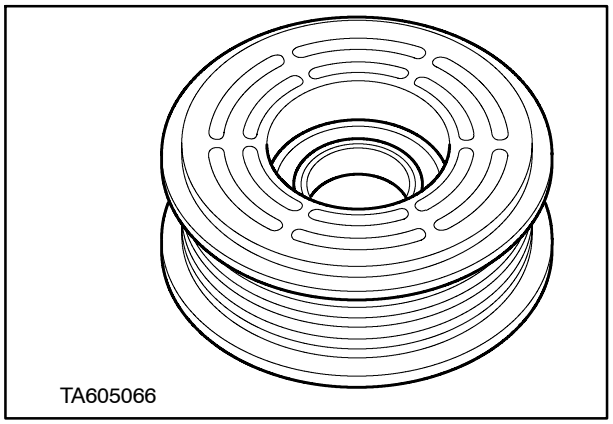
5. With a shaft protector over the exposed shaft, use a suitable puller to remove the clutch pulley.



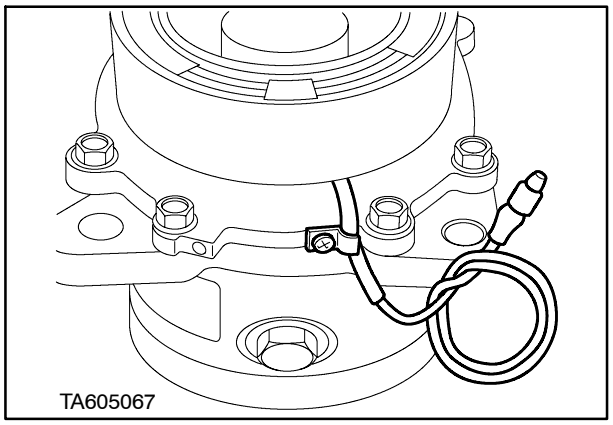
77

6. Inspect the pulley bearing for wear and replace where necessary.



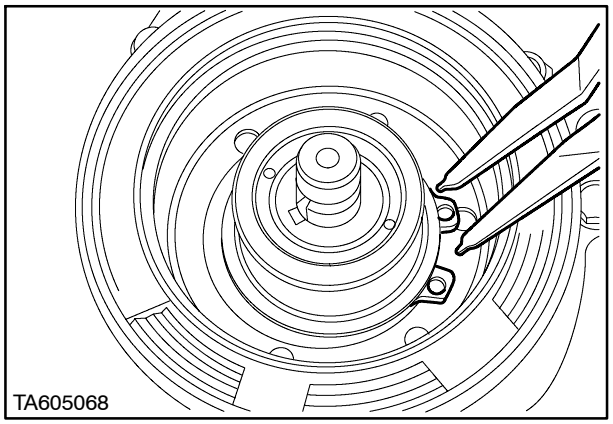
78

7. Remove the field coil wire retaining clip.



79

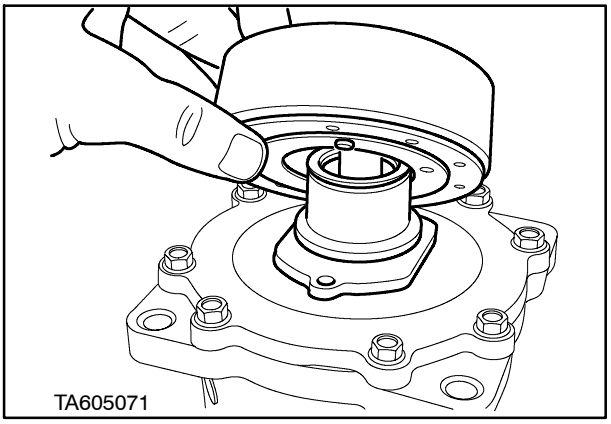
8. Remove the field coil retaining snap ring and lift the coil from the housing.



80

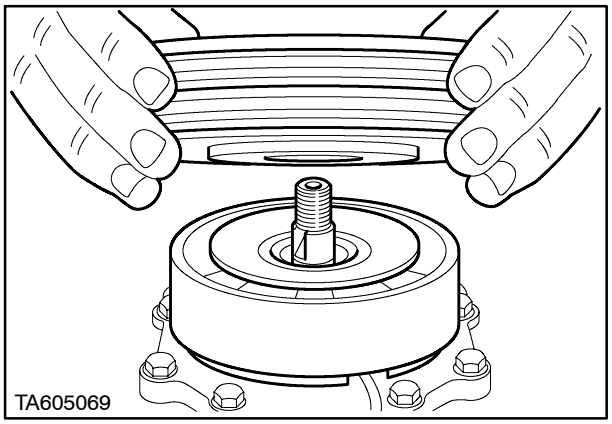
Assembly

1. Install the field coil, ensuring that the lug on the compressor housing locates in the cut out on the back of the coil housing, secure with the snap ring.



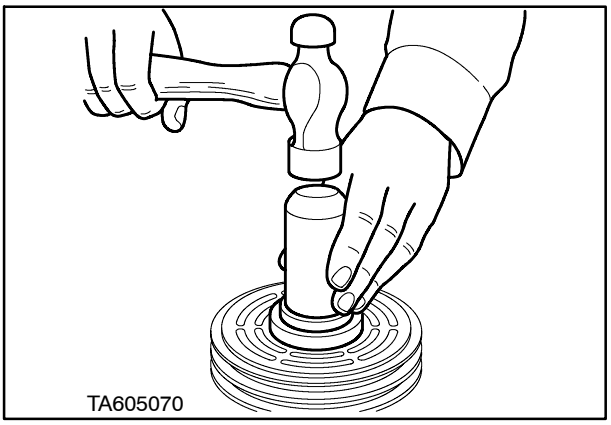
81

2. Position the pulley on the housing hub.



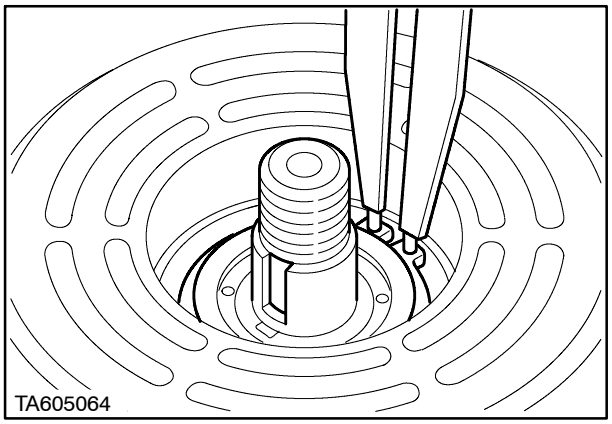
82

3. Using a suitable adaptor that rests firmly on the inner race of the pulley bearing, tap the pulley onto the front hub of the compressor.



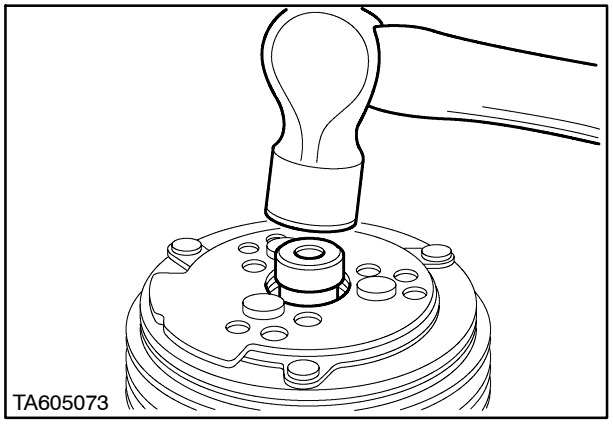
83

4. Install the bearing snap ring.
5. Replace the original shims, key and a new bearing dust cover.



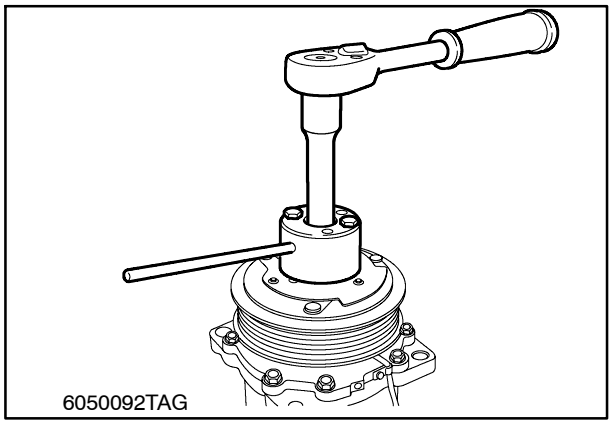
84

6. Install the clutch front plate and using a suitable adaptor, tap into position.



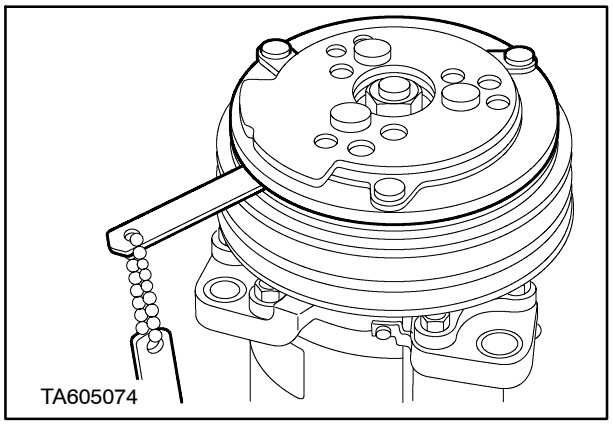
85

7. Replace the retaining nut and tighten to a torque of 18Nm (13lbf.ft).



86

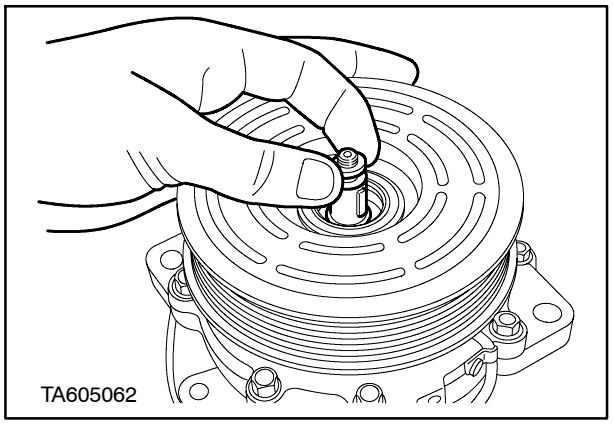
8. Check the clearance between the clutch front plate and pulley. This should be consistent around the circumference and be between 0.4–0.8mm (0.016–0.031in.)
9. If the air gap is not consistent, lightly pry up on the counter weighted front plate at the low spots or lightly tap down at the high spots.



87

10. If the clearance is not within specification the shims under the front plate, Figure 88, should be added to or subtracted from until the correct clearance is obtained.

NOTE: *New shims are available in sizes 1.00, 0.50 and 0.13 mm, (0.040, 0.020 and 0.005 in.).*



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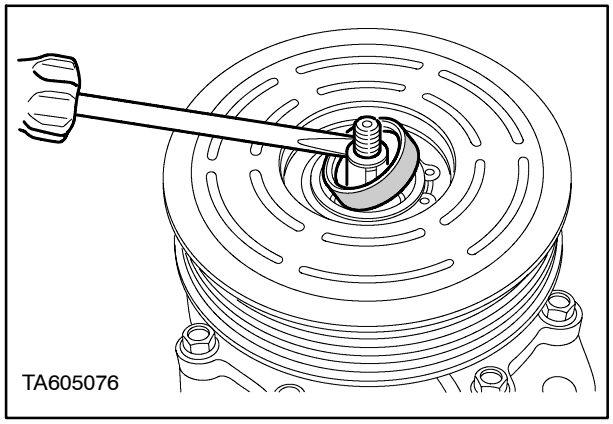
Shaft Seal Replacement

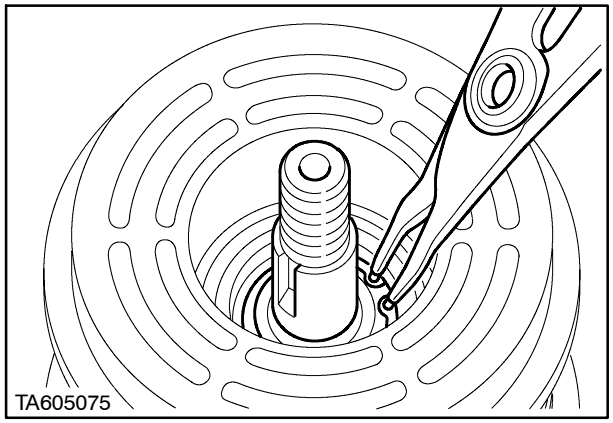
The refrigerant must be discharged from the system and the compressor removed from the vehicle prior to replacing the shaft seal.

1. Remove the clutch front plate, as detailed in steps 1 to 7 of clutch disassembly.
2. Using a suitable lever or pair of snap ring pliers, remove the felt ring.



89

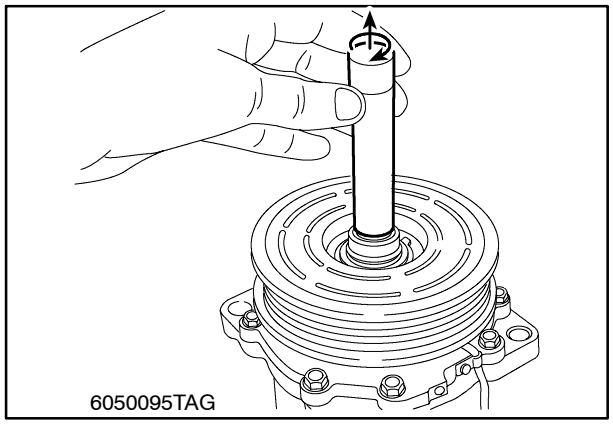
3. Remove the shaft seal retaining snap ring.



90

4. Insert the seal remover/installer tool. Twist the tool to engage the slots in the seal. Pull up to remove. Discard the seal.

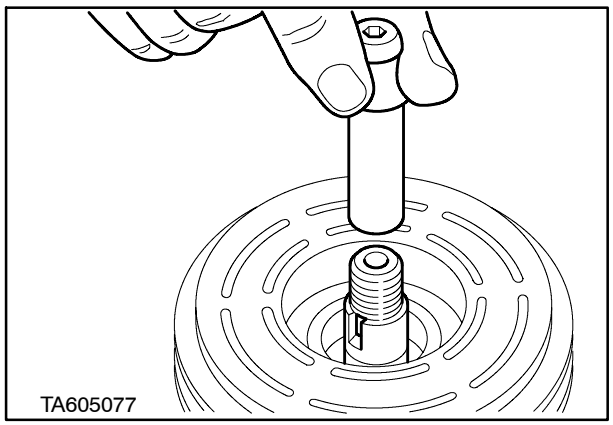
NOTE: *If seal remover tool is not available, insert a suitable piece of hooked wire into the seal slot and pull out seal.*



91

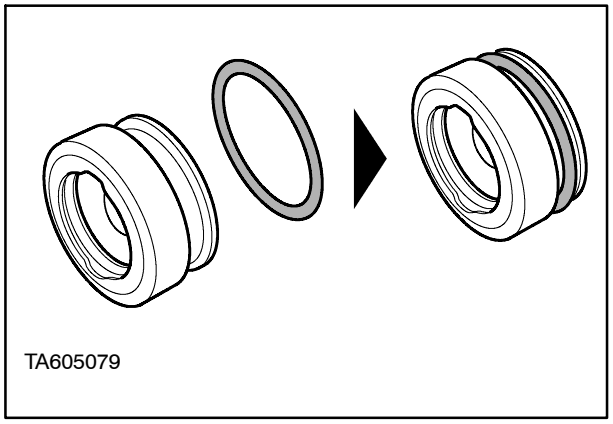
Installation

1. Thoroughly clean the seal cavity in the hub. Use 'lint free' cloth only.
2. Position the seal protector over the driveshaft.



92

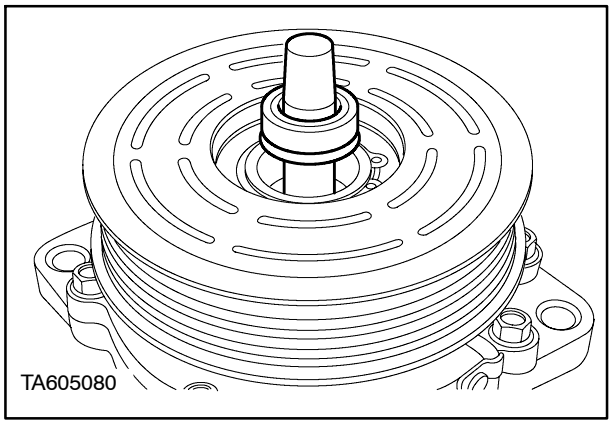
3. Ensure the shaft seal 'O' ring is installed onto the seal assembly.



93

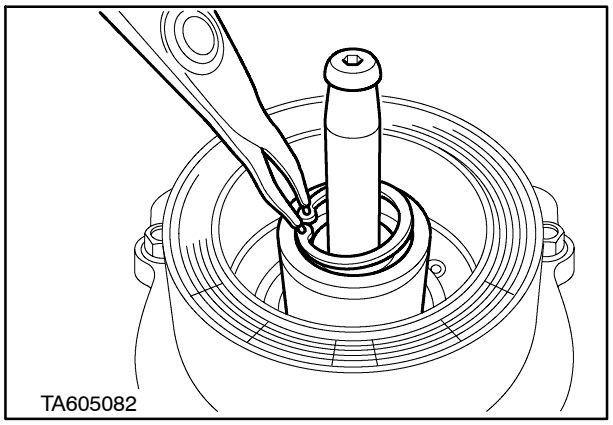
4. Dip the new seal assembly in clean refrigerant oil and attach to the seal remover/installer tool.
5. Insert the new seal fully into the hub.

NOTE: *If remover/installer tool is not available, position the seal squarely in the hub and tap gently until fully seated.*



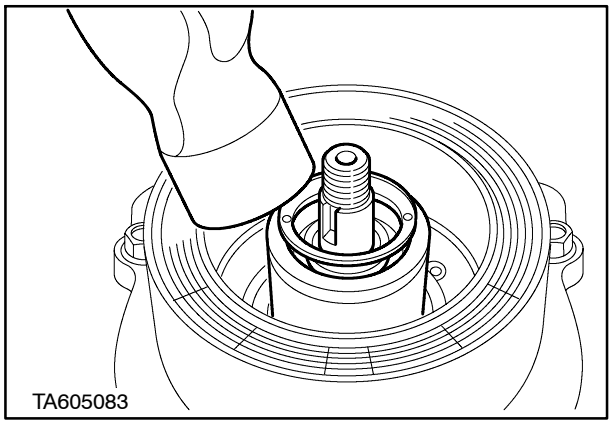
94

6. Install the seal snap ring. If the snap ring has a beveled edge this should face outwards.



95

7. Install a new felt seal and gently tap into position.
8. Remove the shaft protector and position the shims over the shaft.
9. Reinstall the clutch front plate as described in clutch reassembly.



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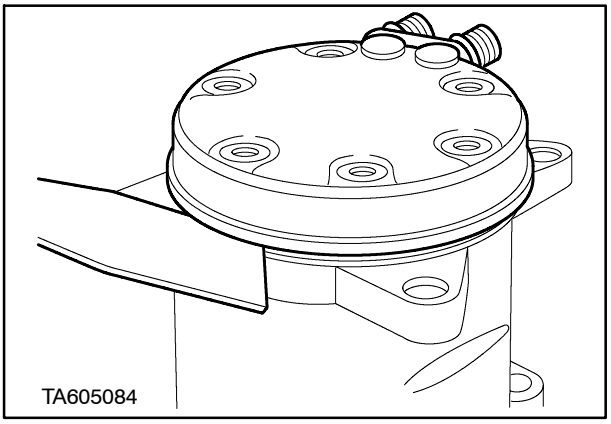
CYLINDER HEAD

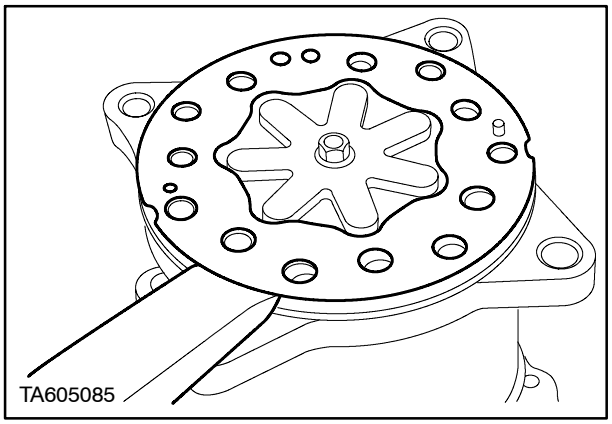
Disassembly

1. Drain the refrigerant oil from the compressor into a clean calibrated container. Measure and record the quantity of oil obtained. This information is required during installation of the new or overhauled unit.



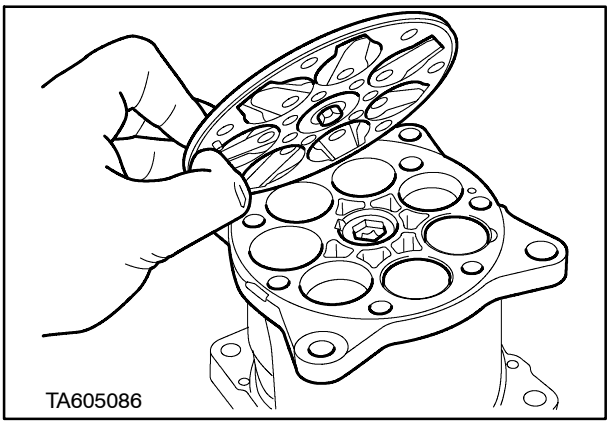
97

2. Remove the six cylinder head bolts and using a hide mallet, gently tap the cylinder head free. The use of a gasket scraper may also be required to free cylinder the cylinder head from the compressor body.
3. If the valve plate and/or cylinder head are to be reused, carefully remove the gasket using a suitable scraper.



98

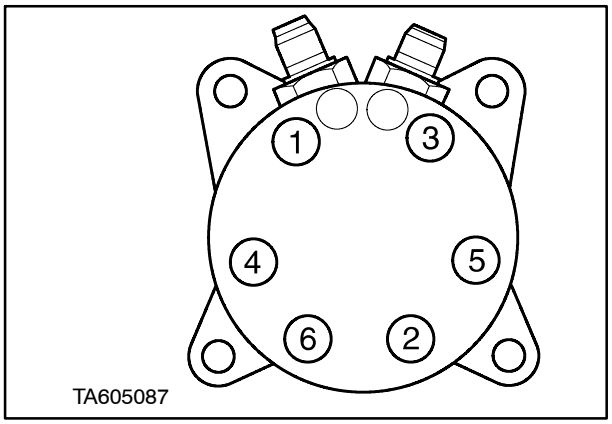
4. Gently pry the valve plate free from the cylinder block and remove the gasket.
5. Inspect the valve plate for damage.



99

Assembly

1. Coat the top of the valve plate with clean refrigerant oil and reassemble the cylinder head using the reverse of the disassembly procedure.
2. When installing the gaskets and valve plate ensure they are correctly positioned over the locating pins in the cylinder block.
3. Install the cylinder head bolts and tighten using the sequence shown in Figure 100. Torque initially to 20Nm (14lbf.ft) then finally to 32Nm (24 lbf.ft).
4. When the overhaul is complete add to the compressor a volume of oil equivalent to that drained prior to disassembly.



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NOTES

SECTION 55 – ELECTRICAL SYSTEM

Chapter 1 – Electrical Introduction

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SPECIFICATIONS

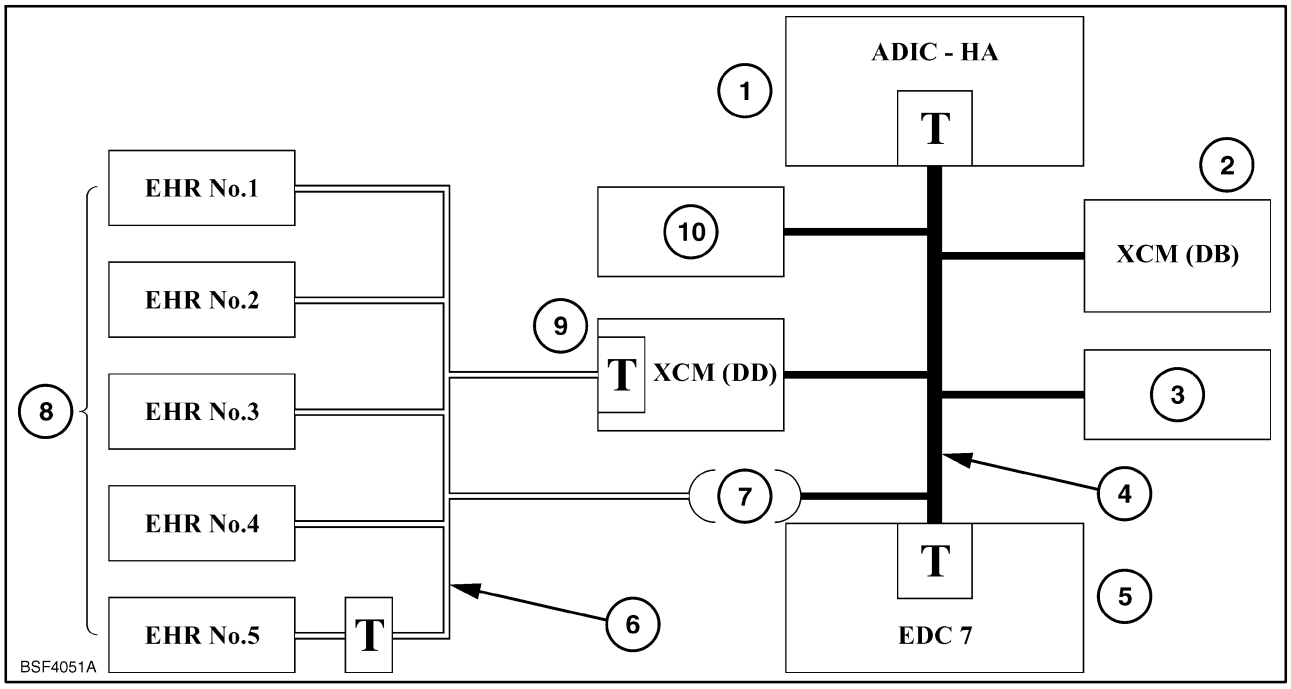
Alternator	
– with cab	12 volt, 120 amp
– less cab	12 volt 70 amp
Battery	
– standard	Minimum maintenance 12 volt 800 cca
– heavy duty (Up to Tractor Serial Number ACP 261702)	Minimum maintenance 12 volt 1300 cca
– heavy duty (From Tractor Serial Number ACP 261703)	Minimum maintenance 12 volt 960 cca
Starting motor	Positive engagement, solenoid operated 3.0Kw – geared reduction (Up to Tractor Serial Number ACP 242468) 4.2Kw – geared reduction (From Tractor Serial Number ACP 242469)
Cold starting aid	Inlet manifold grid heater
Bulb rating and type	
– headlights	60/55W – H4
– parking lights (front)	5W – R5W
– parking lights (rear)	5W – P21/5W
– work lights (hi–mount)	55W – H3
– work lights (auxiliary)	50W – GE866
– turn indicators (front)	21W – PY21W
– turn indicators (rear)	21W – R21W
– stop lights	21W – P21/5W
– licence plate lights	5W – R5W

DESCRIPTION AND OPERATION

ELECTRICAL SYSTEM AND FUSES

All models utilise a CAN (Controlled Area Network) in addition to the standard wiring harnesses. The CAN is a 2-wire system which uses a series of numeric values sent at very high speed to transmit data between processors and components. A CAN system has the advantage of being able to use one component for many applications without the need for hard wiring to each application, as in a conventional system.

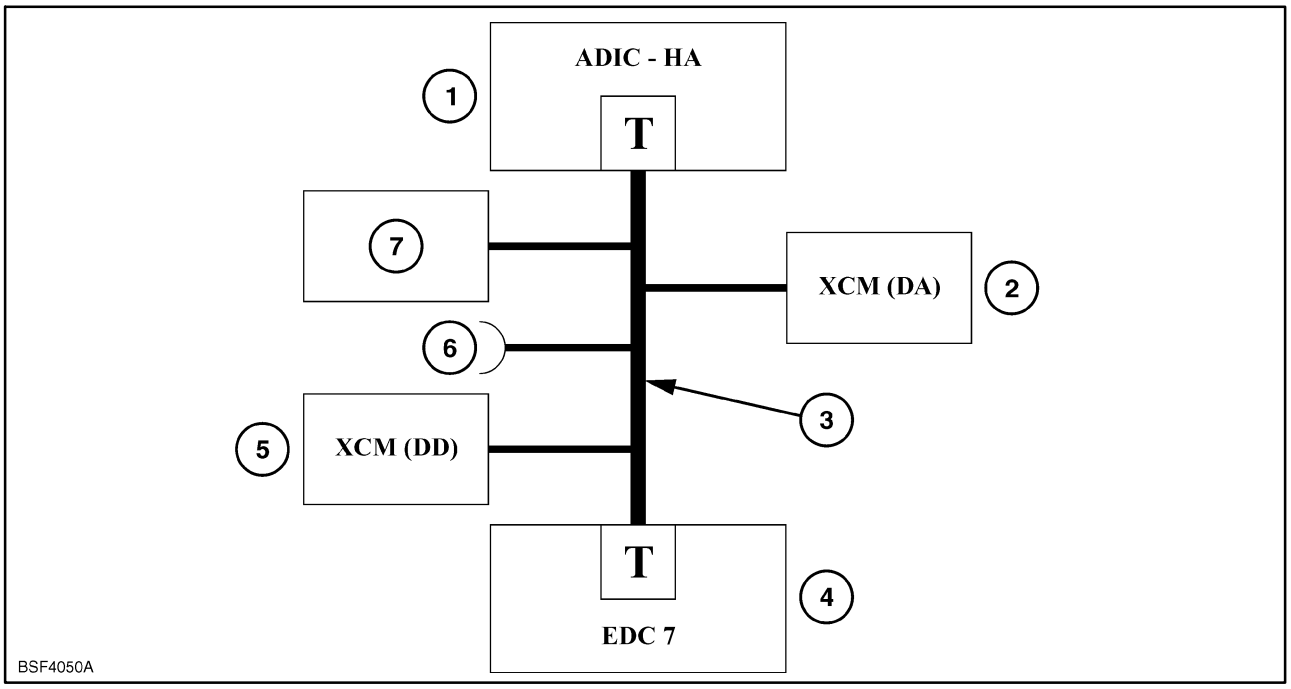
Depending on the model specification, processors are used to control transmissions, hydraulic lift, PTO systems, four wheel drive, differential lock, creeper engagement, fuel injection control, front suspension, and Electro-Hydraulic remotes.



1

CAN Architecture - 16 x 16 Models

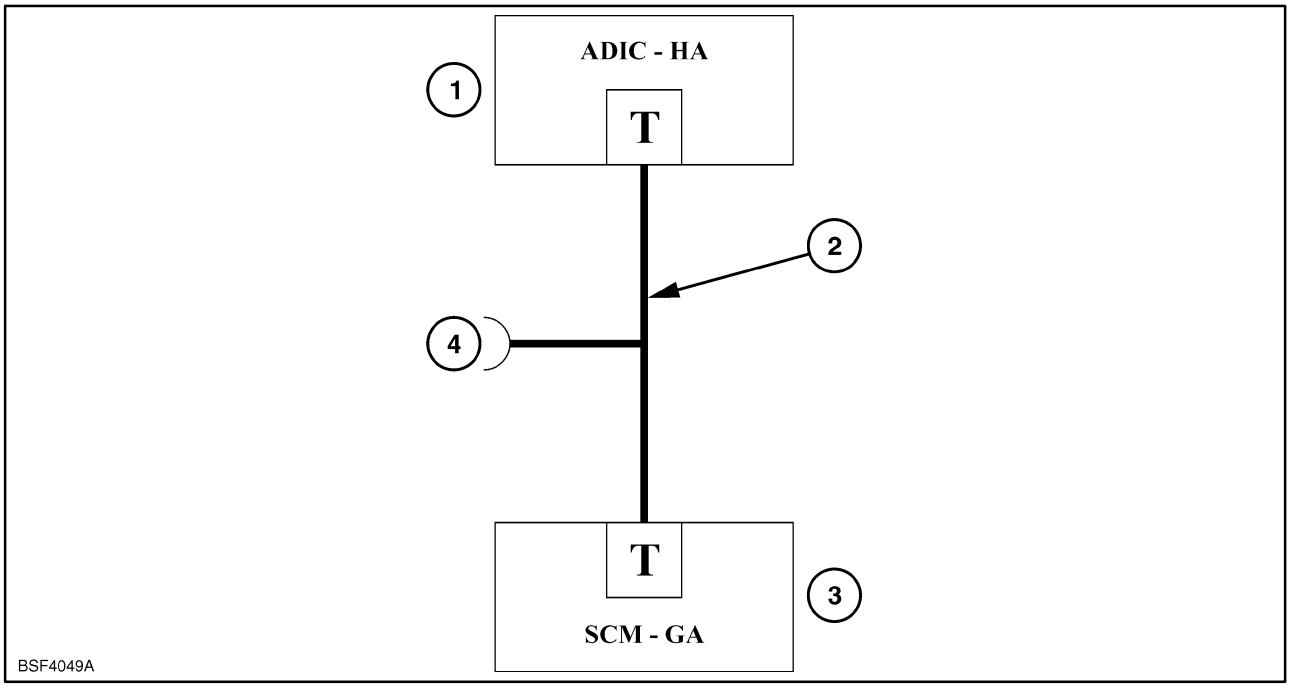
1. Instrument Cluster (HA Module)
2. XCM (DB Module),
3. CAN Gear Display (optional)
4. CAN 1
5. EDC7 (Engine module)
6. CAN 2
7. Diagnostic Connector
8. Electro Hydraulic Remotes
9. XCM (DD Module)
10. Instrument Cluster Enhanced Keypad



2

CAN Architecture – 24 x 24 Models

1. Instrument Cluster (HA Module)
2. XCM (DA Module),
3. CAN wiring (yellow and green wires)
4. EDC7 (Engine module)
5. XCM (DD Module)
6. Diagnostic Connector
7. Instrument Cluster Enhanced Keypad



3

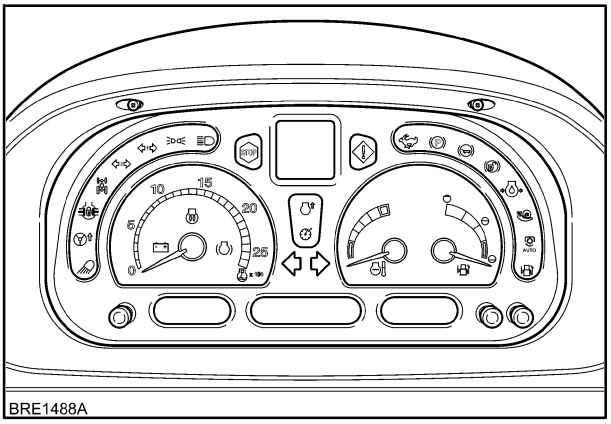
CAN Architecture – 12 x 12 Models

1. Instrument Cluster (HA Module)
2. CAN wiring (yellow and green wires)
3. SCM (GA Module)
4. Diagnostic Connector

INSTRUMENT CLUSTER

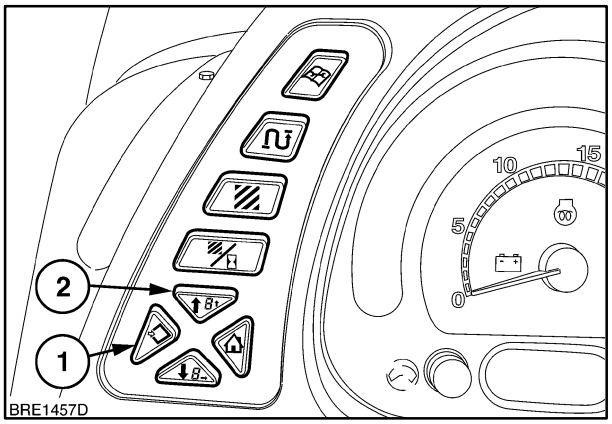
There is one basic instrument cluster available, the Analogue Digital instrument cluster (ADIC), which can be supplied with an optional 'enhanced Keypad' to provide additional functionality.

Analogue Digital Instrument Cluster



4

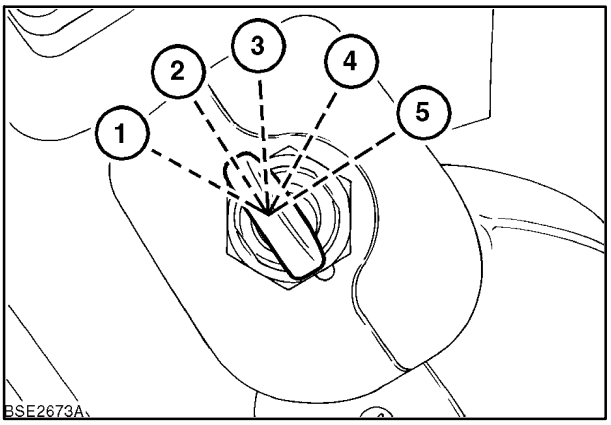
Instrument cluster with enhanced Key pad option.



5

The Key start switch has five positions:

1. Not Used
2. Off
3. Accessory 'on'
4. Grid heater, warning lamps and instruments 'on'
5. Grid heater 'on', starter motor engaged



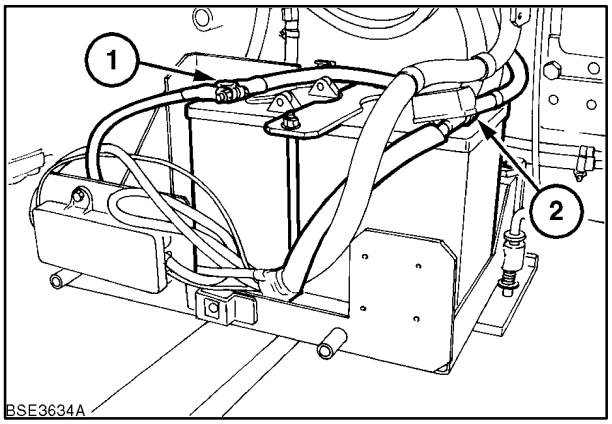
6

The standard battery for all models is a single 800cca low maintenance battery of six cell construction with negative ground.

Optional for all models is a single heavy duty 1300cca battery.

The battery is located on the right hand side behind the cab steps.

Battery negative post (1), battery positive post (2).



7

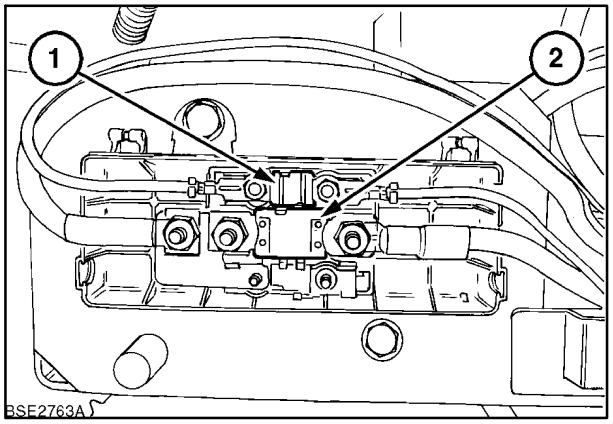
FUSES AND RELAYS

The electrical system is protected by three types of fusing.

Directly from the battery is located a 250Amp 'mega-fuse' (2) and up to 2 x 40 Amp 'midi-fuses' (1).

The 250 Amp fuse protects the main electrical system and the 40 Amp midi fuses protect the front lift and provide a clean supply to the electronic system.

The mega and midi fuses are located in front of the battery on the right hand side of the tractor behind the cab steps.

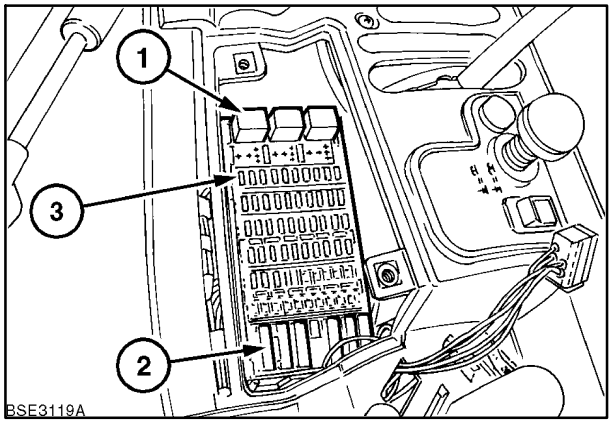


8

From the mega-fuse the power is then distributed to up to 6 'Maxi-fuses' (2) and then onto the conventional mini-fuses (3) and relays (1).

The maxi and mini fuses are located to the rear of the right hand console.

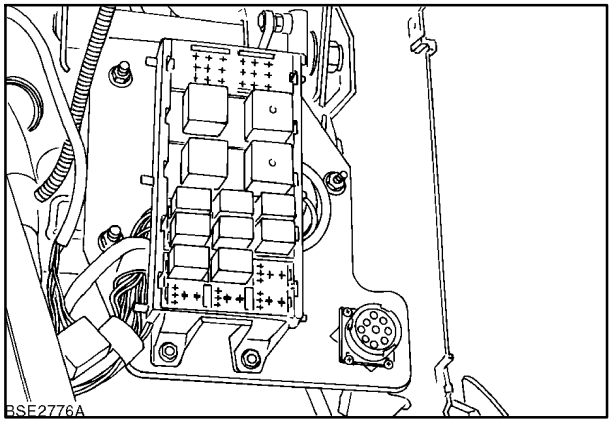
Refer to following tables for fuse descriptions.



9

The Main relay holder is located at the front of the right hand console under the transmission control levers.

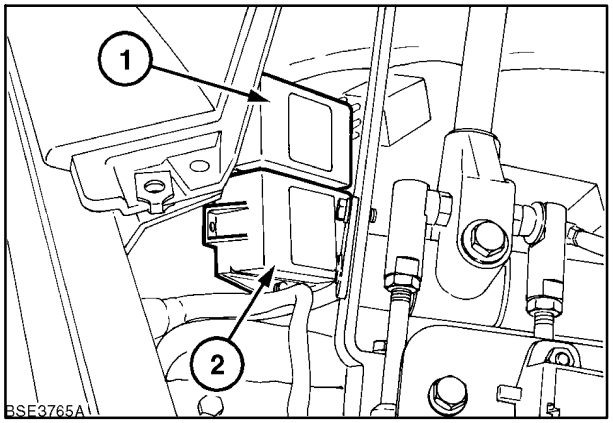
Refer to following tables for relay functions



10

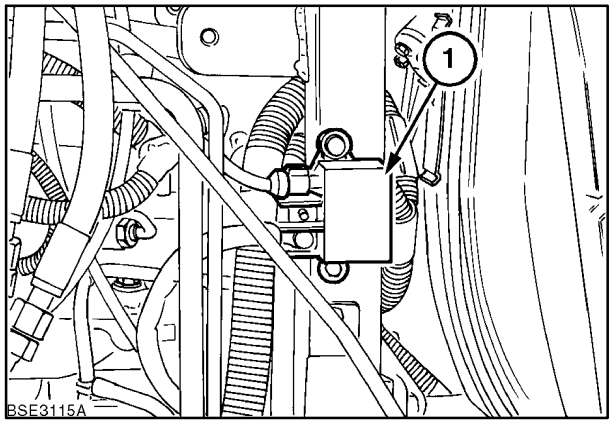
Grid heater control module (1), 12x12 only.

Flasher relay unit (2), all models, located behind the right hand trim under the transmission control levers.



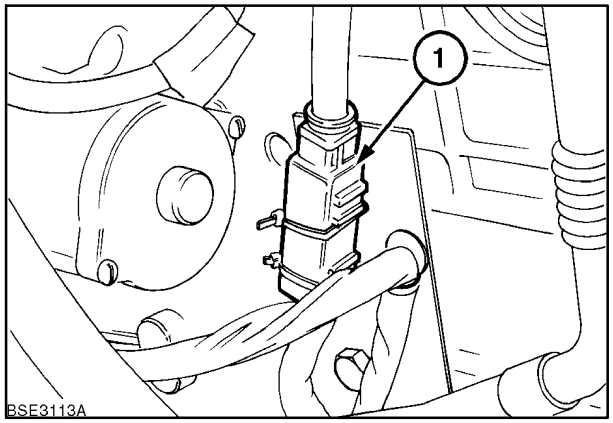
11

Grid Heater relay, (1), located to the rear of the left hand side of the engine.



12

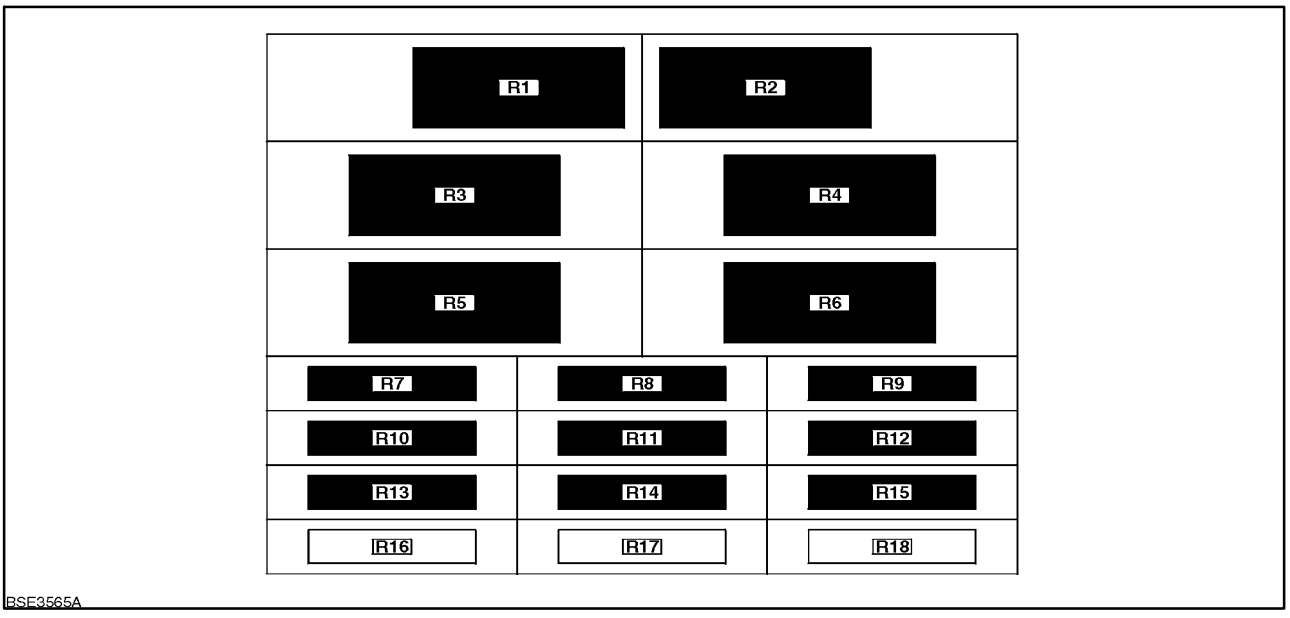
Grid Heater Fuse (250Amp), (1), located on the right hand side of the engine near the starter motor.



13

12 x 12 With and Less Cab

Relay	*Function*
1	Blank(Less Cab) Windshield Wiper - Front (With Cab)
2	Blank (Less Cab) Windshield Wiper - Rear (With Cab)
3	Ignition Relay
4	Lights
5	Starter
6	Blower Motor
7	Dip Beam Headlamps
8	Stoplamps
9	Main Beam Headlamps
10	Trailer Brake Pressure Hydraulic
11	Trailer Brake Supply Hydraulic
12	Stoplamps Switch Feed (Less Cab) +Trailer Brake Pneumatic (With Cab)
13	Blank (Less Cab) Engine Run and Cold Start-Mechanical Engines Only (With Cab)
14	Reverse Alarm
15	A/C Clutch Relay Feed
16	Blank
17	Blank
18	Blank
19	Worklamps - Front Lower
20	Worklamps - Rear Lower
21	Electronics Supply
22	Blank
23	Blank
24	Blank



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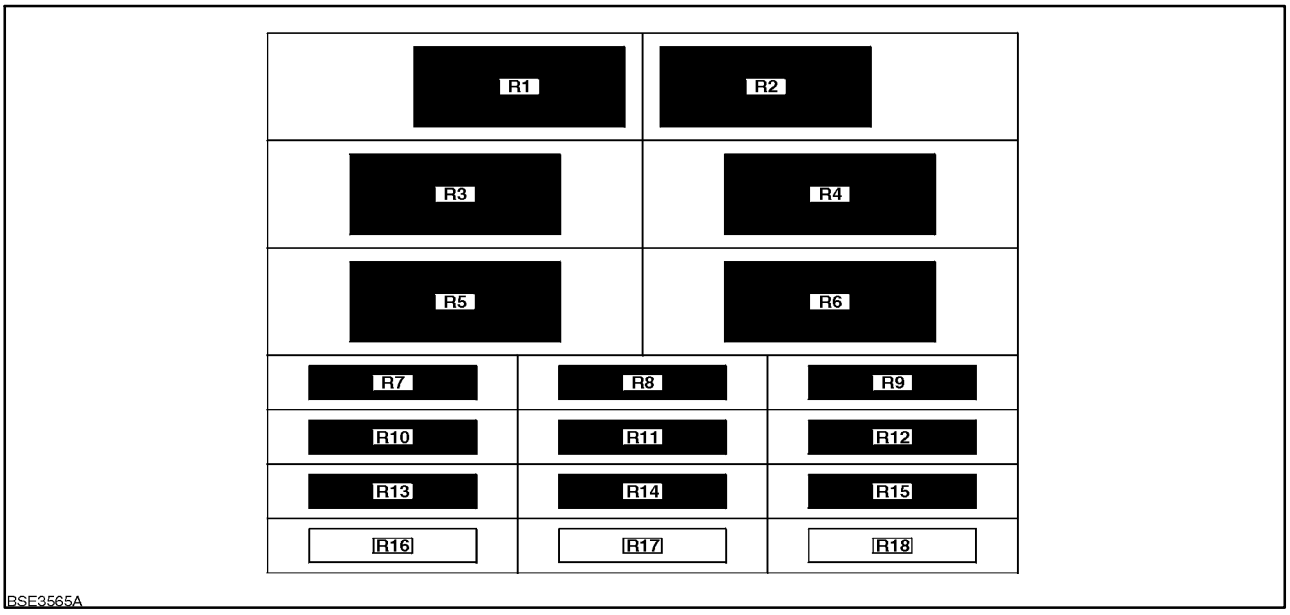
14

16 x 16/24 x 24 Less Cab

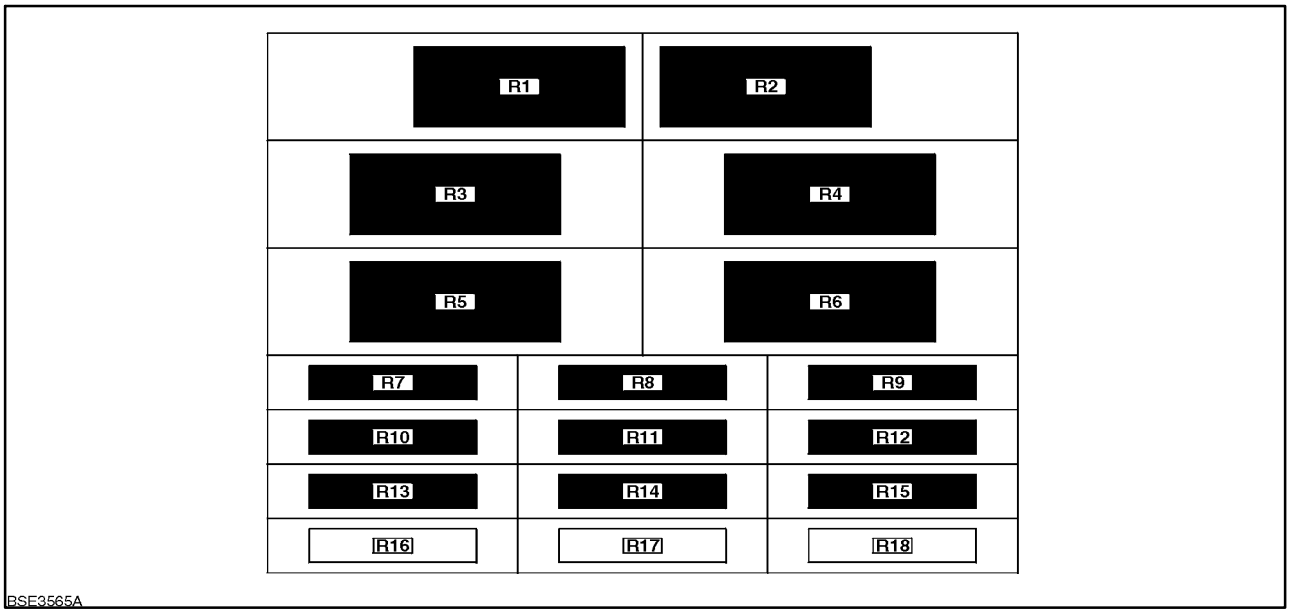
Relay	*Function*
1	Blank
2	Blank
3	Ignition Relay
4	Lights
5	Starter
6	Blank
7	Dip Beam Headlamps
8	Stoplamps
9	Main Beam Headlamps
10	Trailer Brake Pressure Pneumatic
11	Trailer Brake Supply Hydraulic
12	Stoplamps Switch Feed
13	Engine Cold Start Advance + Engine Shutdown (Mechanical Engine Only)
14	Reverse Alarm
15	Blank
16	Blank
17	Blank
18	Blank
19	Worklamps – Front Lower
20	Worklamps – Rear Lower
21	Electronics
22	Blank
23	Blank
24	Blank



15

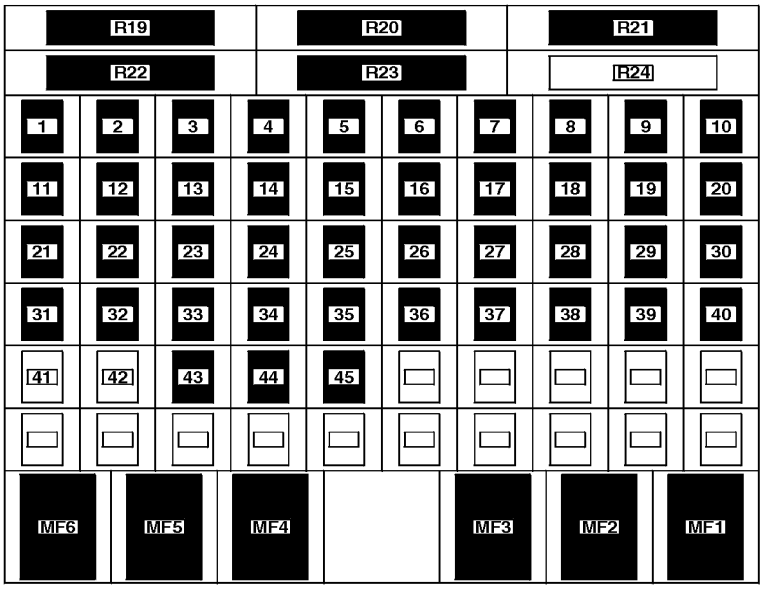
16 x 16/24 x 24 With Cab

Relay	*Function*
1	Front Windshield Wiper Module
2	Rear Windshield Wiper Module
3	Ignition Relay
4	Side/Tail Lights and Illumination
5	Starter
6	Blower Motor
7	Dip Beam Headlamps
8	Stoplamps
9	Main Beam Headlamps
10	Trailer Brake Supply Pneumatic
11	Trailer Brake Supply Hydraulic
12	Stoplamps Switch Feed and Air Brakes
13	Engine Cold Start Advance (Mechanical Engines Only)
14	Reverse Alarm
15	A/C Clutch Relay Feed
16	EHR Power (16 x16 Only)
17	Blank
18	Blank
19	Worklamps Front Lower (Front Hood)
20	Worklamps Rear Lower
21	Electronics Supply
22	Blank
23	Blank
24	Blank



Mini Fuses (12x12 Less Cab)

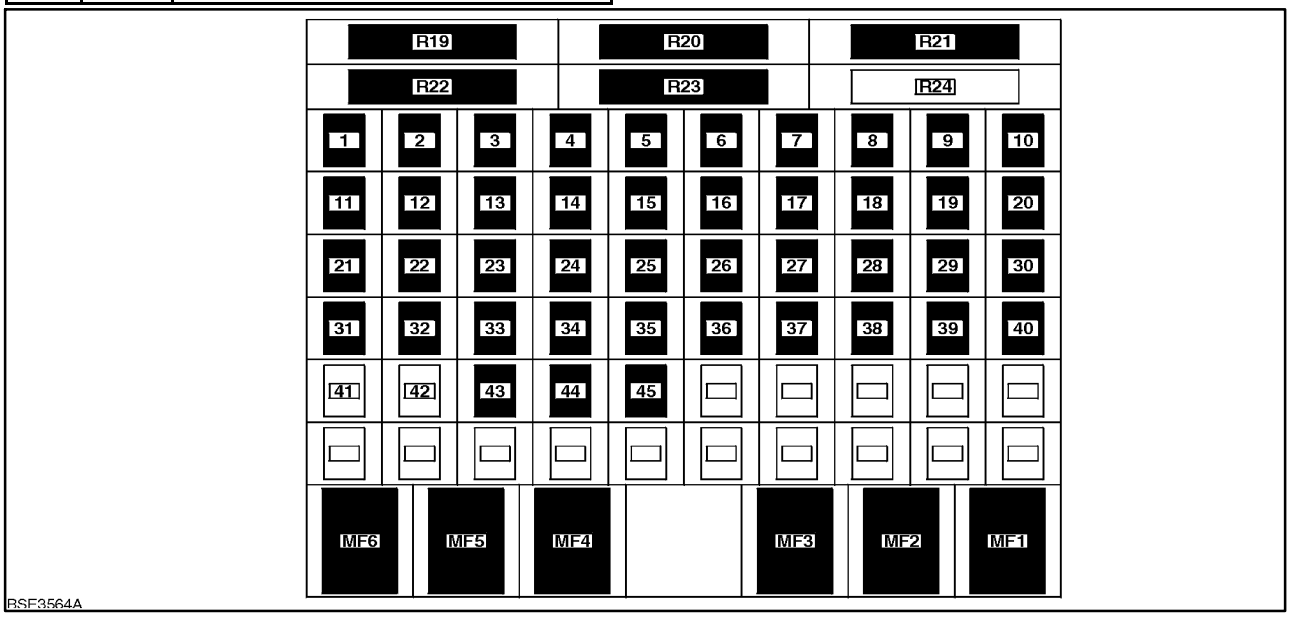
No.	*Amps*	*Circuit*
1	10	Handbrake Lamp
2	-	Blank
3	-	Blank
4	-	Blank
5	-	Blank
6	-	Blank
7	20	Main Lights
8	20	Starter Switch
9	-	Blank
10	-	Blank
11	-	Blank
12	-	Blank
13	15	Stoplamps
14	15	Main Light Switch + Flasher Unit
15	20	Stoplamp Switch+Trailer Brake Hydraulic +Pedal Latch
16	-	Blank
17	-	Blank
18	15	Seat
19	-	Blank
20	10	Back up Alarm+Transmission Diagnostic
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Headlamps
28	-	Blank
29	-	Blank
30	15	Rear/Lower Worklamps
31	-	Blank
32	30	Flasher Unit
33	25	Diagnostic Connector
34	10	Instrument Cluster
35	10	SCM (Small Control Module)
36	10	Instrument Cluster
37	15	Front Switch Group+Transmission Ignition
38	10	SCM +Switch Panel +Ground Speed+Rear PTO Warning Lamp+PTO Brake
39	10	Seat
40	-	Blank
41	-	Blank
42	-	Blank
43	10	Starter Switch (Run Position)
44	-	Blank
45	25	Front Ignition



BSF3564A

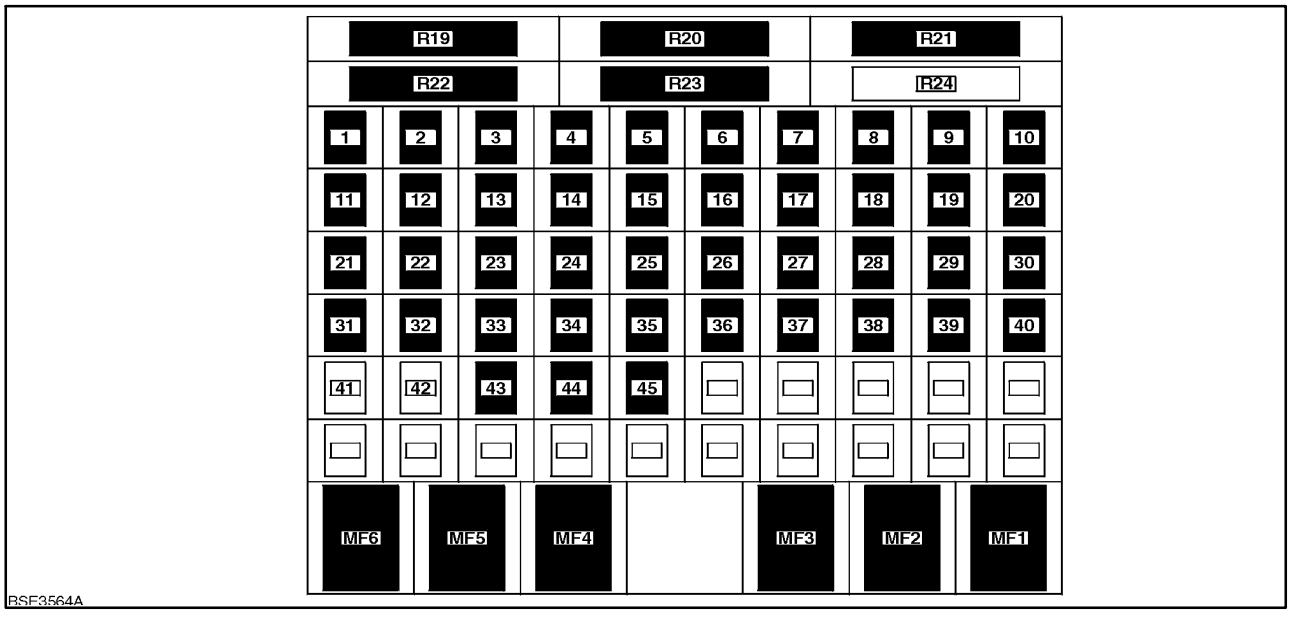
Mini Fuses (12x12 With Cab)

No.	*Amps*	*Circuit*
1	10	Interior/Puddle Lights
2	25	Cigar Lighter+Power studs
3	10	A/C Clutch
4	10	Accessory Sockets
5	30	Blower Motor
6	8.6	Radio KAM+Worklamp ECU
7	20	Main Lights+Hazard Switch
8	20	Starter Switch
9	25	Loader
10	–	Blank
11	10	Front and Rear Windshield Wiper
12	10	Wiper Switch and Rear Wiper Park
13	15	Stoplamps
14	15	Main Light Switch+Turn Signal
15	20	Stoplamps Switch+Trailer Brake Hydraulic+Pedal Latch
16	15	Trailer Brake Pneumatic
17	25	Accessory Sockets
18	15	Blower Motor+seat
19	–	Blank
20	10	Radar Socket+Transmission Diagnostic Socket+ADICKeypad+Radar Gun+Backup Alarm
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Worklamps (Front Hood)
28	15	ECU Worklamp
29	30	ECU Worklamp
30	15	Rear/Lower Worklamps
31	15	ECU Worklamp
32	30	Flasher Unit
33	25	Diagnostic Connector+Engine ECU
34	10	Instrument Cluster
35	10	SCM (Small Control Module)
36	10	Instrument Cluster Ignition
37	15	Transmission Ignition
38	10	SCM +Switch Panel+Ground Speed PTO Switch+Rear PTO Warning Lamp+PTO Brake
39	10	Seat
40	10	Radio
41	–	Blank
42	–	Blank
43	10	Starter Switch (Run Position)
44	25	Front B
45	25	Front Ignition+8 Amp Socket



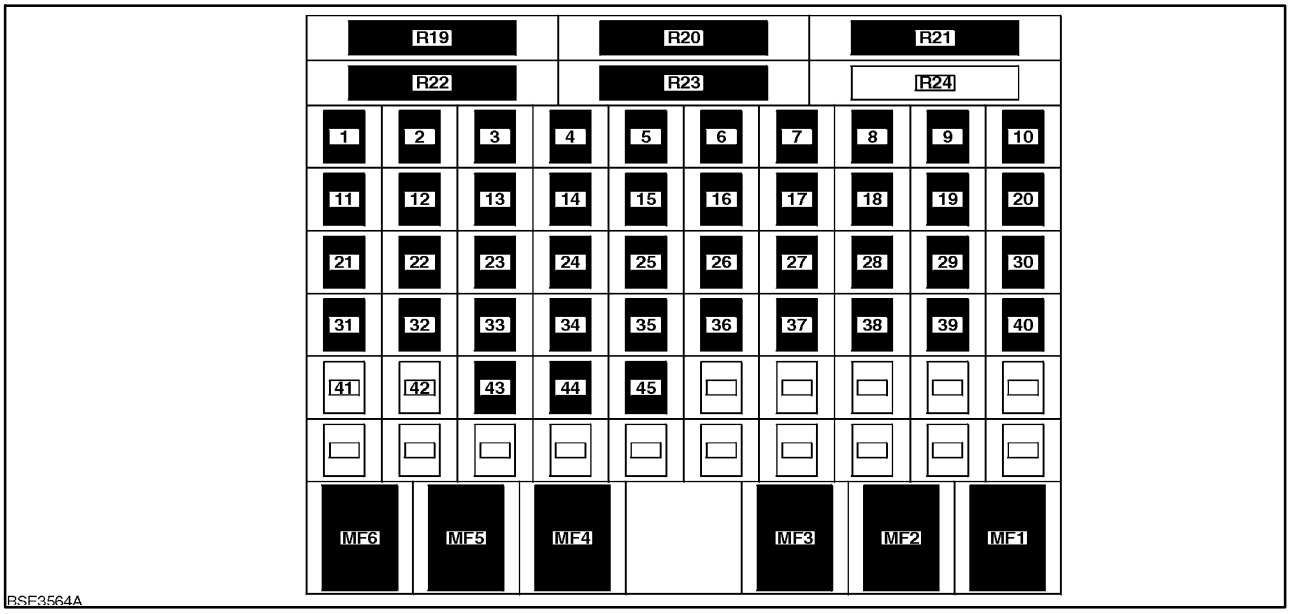
Mini Fuses 16x16/24x24 Less Cab

No.	*Amps*	*Circuit*
1	10	Handbrake Lamp
2	–	Blank
3	–	Blank
4	–	Blank
5	–	Blank
6	–	Blank
7	20	Main Lights+Hazard Switch
8	20	Starter Switch
9	25	Loader
10	–	Blank
11	–	Blank
12	–	Blank
13	15	Stoplamps
14	15	Main Light Switch+Flasher Unit
15	20	Stoplamp Switch+Trailer Brake Hydraulic+Pedal Latch
16	–	Blank
17	–	Blank
18	15	Seat
19	10	Blank
20	10	Standard Control Module Diagnostic+Auxiliary Control Module Diagnostic+Keypad+Reverse Alarm+Radar Gun
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Worklamps
28	–	Blank
29	–	Blank
30	15	Rear/Lower Worklamps
31	–	Blank
32	30	Flasher Unit
33	25	Diagnostic Connector+Engine ECU
34	10	Instrument Cluster
35	10	DC Mem+Standard Control Module+Auxiliary Control Module
36	10	Instrument Cluster Ignition
37	15	Transmission Ignition
38	10	HPL+Switch Panel+Ground Speed PTO+SCM+Rear PTO Warning-Lamp+PTO Brake+Display Of Gears Connector
39	10	HPL+Seat+Hand Throttle+Armrest
40	–	Blank
41	10	Front Suspension/PTO
42	10	Front Suspension
43	10	Starter Switch (Run Position)
44	25	Front B
45	–	Blank



Mini Fuses 16x16/24x24 With Cab

No.	*Amps*	*Circuit*
1	10	Interior/Puddle Light/Handbrake Lamp
2	25	Cigar Lighter+Power Studs
3	10	A/C Clutch
4	10	Accessory Sockets
5	30	Blower Motor
6	10	Radio KAM+Worklamp ECU
7	20	Main Lights+Hazard Switch
8	20	Starter Switch
9	25	Loader
10	–	Blank
11	15	Front and Rear Windshield Wiper
12	10	Wiper Switch and Rear Wiper Park
13	10	Stoplamps
14	15	Main Light Switch+Flasher Unit
15	20	Stoplamp Switch+Pedal Latch
16	15	Trailer Brake
17	25	Accessory Sockets
18	15	Blower Motor+Seat
19	–	Blank
20	10	Radar Socket+Transmission Diagnostic Socket+Auxiliary Diagnostic Socket+ADIC KeyPad+Radar Gun+BackUp Alarm
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Worklamps (Front Hood)
28	15	ECU Worklamp
29	30	ECU Worklamp
30	15	Rear/Lower Worklamps
31	15	ECU Worklamp
32	30	Flasher Unit
33	25	Diagnostic Connector+Engine ECU
34	10	Instrument Cluster B+
35	10	DC Mem+SCM+ACM
36	10	Instrument Cluster Ignition
37	15	Transmission Ignition
38	10	Rear PTO Switch+Rear PTO Lamp+HPL+SCM+Ground Speed PTO+Display Of Gears Connector
39	10	HPL+Seat+Armrest+EDC(+EHR Levers 16 x 16 Only)
40	10	Radio
41	15	Front Suspension/PTO(+EHR Levers 16 x !6 Only)
42	10	Front Suspension
43	10	Starter Switch (Run position)
44	25	Front B
45	25	Front Ignition+8 Amp Socket



Maxi Fuses 12 x 12 Less Cab

No.	*Amps*	***Protected Components***
MF1	80	Engine
MF2	30	Lighting
MF3	40	B+KAM ADIC
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab

Maxi Fuses 12 x 12 With Cab

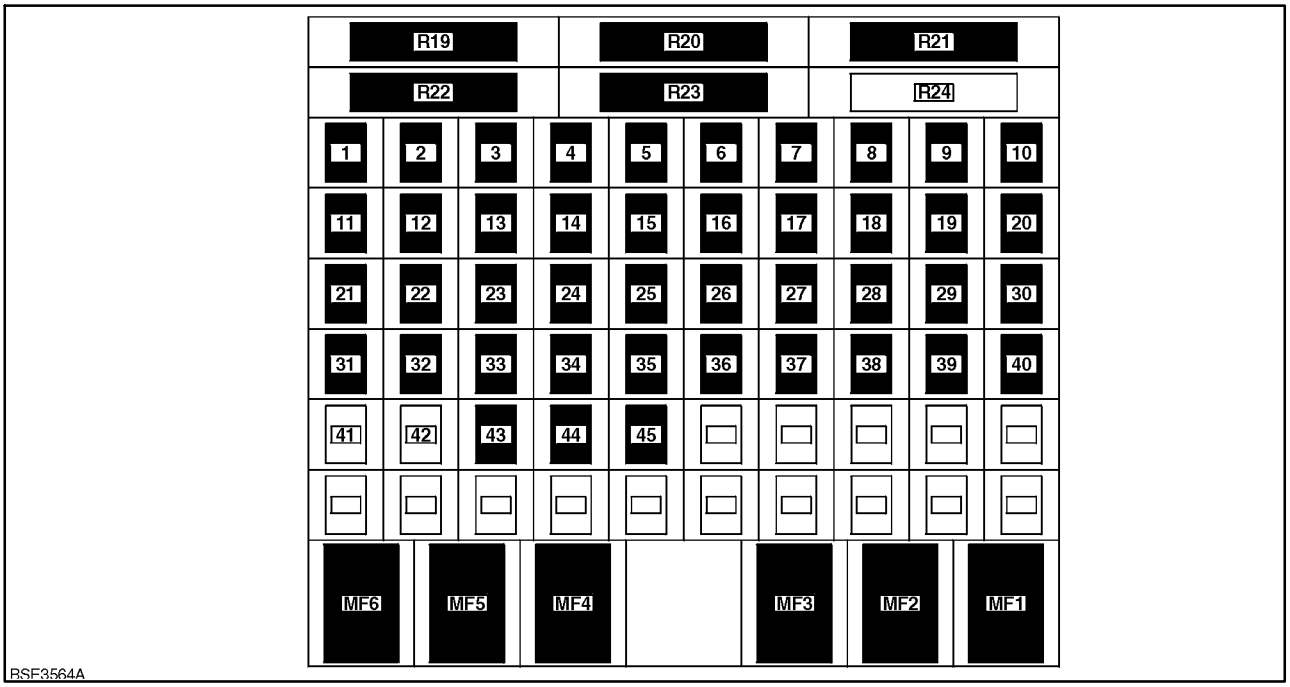
No.	*Amps*	***Protected Components***
MF1	80	Engine,Ignition Relay
MF2	30	Lighting,Ignition Switch,Radio,Worklamp ECU
MF3	40	B+ KAM ADIC, SCM
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab

Maxi Fuses 16 x 16/24 x 24 Less Cab

No.	*Amps*	***Protected Components***
MF1	80	Engine
MF2	30	Lighting
MF3	40	B+ KAM ADIC
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab

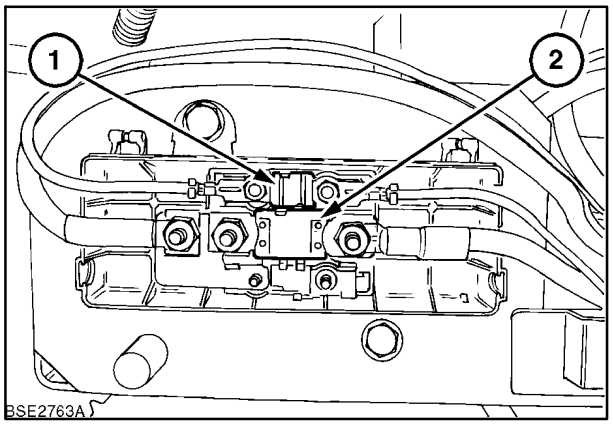
Maxi Fuses 16 x 16/24 x 24 With Cab

No.	*Amps*	***Protected Components***
MF1	80	Engine,Ignition Relay
MF2	30	Lighting ,Ignition Switch, Main Lighting Switch,Radio,Worklamp ECU
MF3	40	B+ KAM ADIC,Engine ECU, Transmission ECU
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab



Power Fuses – All Models

Fuse No.	*Amps*	*Protected Supply*
PF1	30	Power E Electronic Supply
PF2	250	Power B+ Main Supply
PF3	30	Power B+Implement Socket Front



22

CONTROLLERS

	Electronic Module				
Model/type / Function	24x24	16x16	24x24 16x16	12x12	24x24 16x16
	DA	DB	DD	GA	EDC7
Rear PTO	✓	✓		✓	
Differential Lock	✓	✓		✓	
Four Wheel Drive	✓	✓		✓	
Engine Control (vehicle side)	✓	✓			
Auto Headland Turn Sequence (HTS)	✓	✓			
Electronic Draft Control	✓	✓			
Front Suspen-sion			✓		
Front PTO			✓		
Front Lift			✓		
Electro–Hydraulic Remotes			✓		
Transmission 24x24	✓				
Transmission 16x16		✓			
Engine Control (engine side)					✓

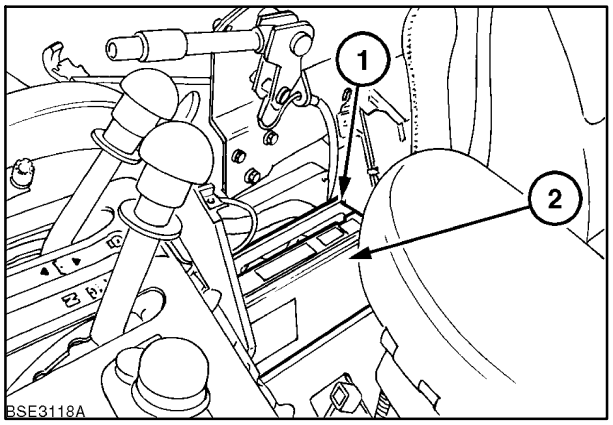
The controller type is identified by a code which is attached to each module. The code, for example, 'DB' identifies it as the module used on a tractor with a 16x16 transmission controlling those functions highlighted in the table above.

All the modules on the tractor are linked by the CAN harness and this also links in the instrument cluster, gear display (16x16 only) and diagnostic connector.

Refer to the system diagrams at the end of this chapter for full processor details and inter connectivity.

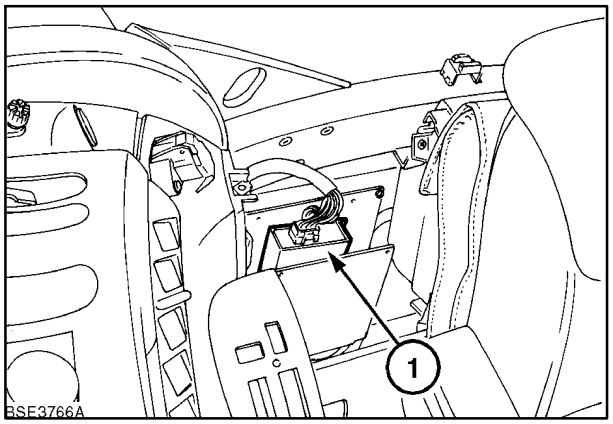
Controller Locations

DA/DB, (2), DD, (1), controllers



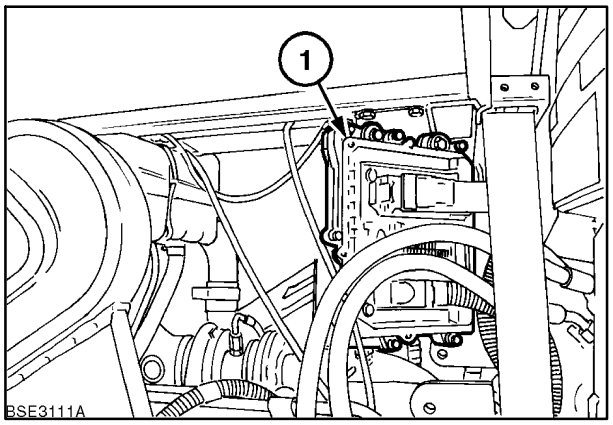
23

GA controller (12x12 models only)



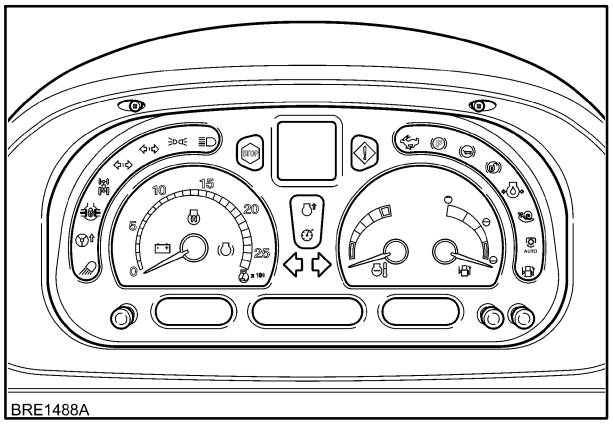
24

EDC7 (engine) controller



25

Analogue Digital Instrument Cluster, (ADIC/HA/HB module).



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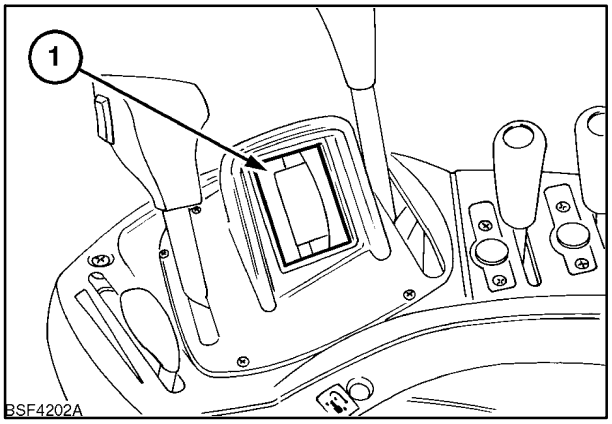
Display of Gears

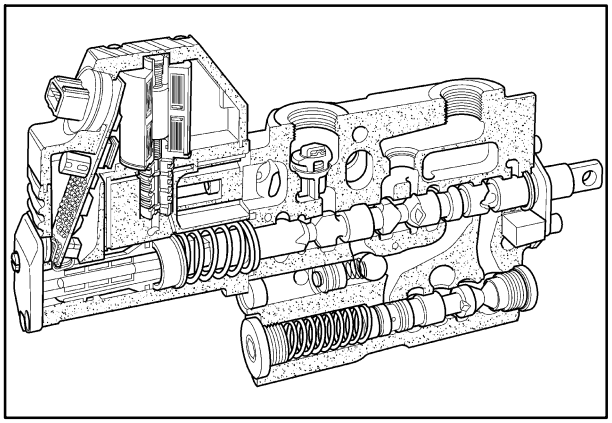
The display of gears module on tractors with the 16x16 transmission is connected into the electrical system via the main CAN BUS network.



27

Electro-Hydraulic Remote Valve

Optional electro-hydraulic valves. Each electro-hydraulic valve contains its own built in processor which connects to the central controller via a separate, second CAN BUS network (CAN 2).



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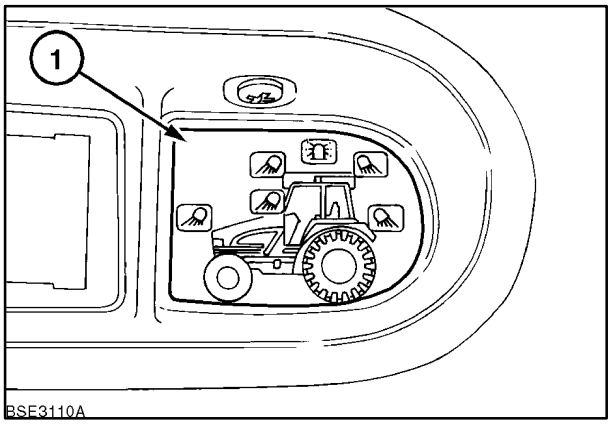
Worklamp Control Module

Located in the cab roof to the right hand side of the operator.



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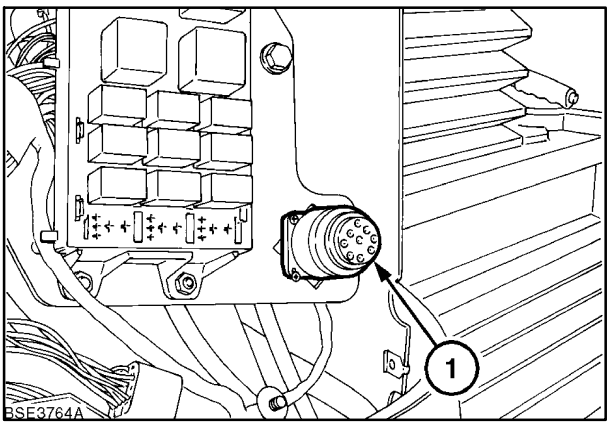
DIAGNOSTIC CONNECTOR

A single diagnostic port, located behind the trim under the transmission control levers, to interrogate all of the controllers is incorporated into the wiring harness. With the aid of special service tool **380000843**, the port can be used to gain access to the on-board H-menu diagnostics, see later in this Section for full details, to download software or to connect in more specialised diagnostic equipment such as the E.S.T. (Electronic Service Tool).



30

PROTECTING THE ELECTRONIC AND ELECTRICAL SYSTEMS DURING BATTERY CHARGING OR WELDING

To avoid damage to the electronic/electrical systems, always observe the following:

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.

2. Never short any of the charging components to earth.

3. Do not use a slave battery of higher than 12 volts nominal voltage.

4. Always observe correct polarity when installing the batteries or using a slave battery to jump start the engine. Follow the instructions in the operator's manual when jump starting the tractor. Connect positive to positive and negative to negative.

5. Always disconnect the earth cable from the batteries before carrying out arc welding on the tractor or on any implement attached to the tractor.

6. Position the welder earth cable clamp as close to the welding area as possible.

7. If welding is to be carried out in close proximity to a computer module, then the module should be removed from the tractor. It is recommended that this procedure be carried out by an authorised dealer.

8. Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.

9. Always disconnect the negative cable from the batteries when charging the batteries in the tractor with a battery charger.

⚠ WARNING ⚠

Batteries contain sulphuric acid. In case of contact with skin, flush the affected area with water for five minutes. Seek medical attention immediately. Avoid contact with the skin, eyes or clothing. Wear eye protection when working near batteries.

IMPORTANT: *Failure to disconnect the two earth cable connections at the battery prior to charging the batteries or welding on the tractor or attached implement will result in damage to the electronic and electrical systems.*

Temporary Wiring Harness Repair

⚠ WARNING ⚠

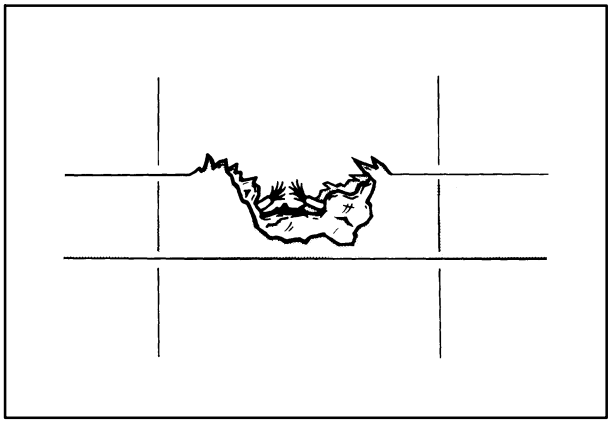
It is acceptable to use the following repair procedure on the CAN BUS wiring. It is important though to ensure that the wire lengths are not altered from the original as this will affect the performance of the CAN BUS system.

The following method to repair wiring is a temporary expedient only. Wiring should be replaced as soon as possible. Replacement of temporary repaired cables with new is particularly important if the tractor is to be used for spraying as chemicals can enter the repaired area, travel up the cable and damage electrical components. Do not attempt to repair the wire on any system sensors as these are sealed and should only be replaced with a new component.

NOTE: *When conducting a cable repair it is important that only RESIN CORED SOLDER is used. Use of other types of solder may result in further cable damage.*

To carry out a temporary repair, proceed as follows:-

1. Locate damaged portion of cable then cut away outer protective cover on both sides of the damaged area, Figure 31.



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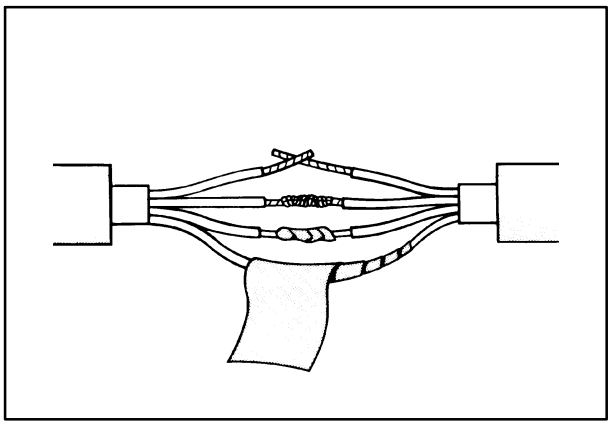
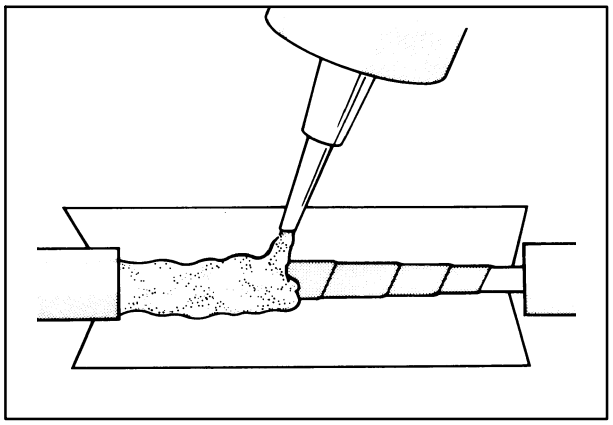
2. Peel back the cable from both ends of the damaged area and carefully cut away the inner cable cover at the damaged area and strip about 13 mm ($^1/_2$ inch) of insulation from the wires. Do not cut away any wire strands.
3. Using a suitable solvent, clean about 2 inches (50 mm) from each cover end. Clean the grey cable cover and the individual leads.
4. Twist two bare leads together for each damaged lead, being careful to match wire colours, then solder the leads using resin cored solder. Tape each repaired lead with vinyl insulation tape, Figure 32.



32

5. Wind a layer of vinyl insulation tape up to the grey cable cover at each end of the repair section. Make a paper trough, Figure 33, then apply silicon rubber compound (non hardening sealant) over the repaired section up to the cover ends. Sufficient sealant must be used to fill the ends of the cut away area.

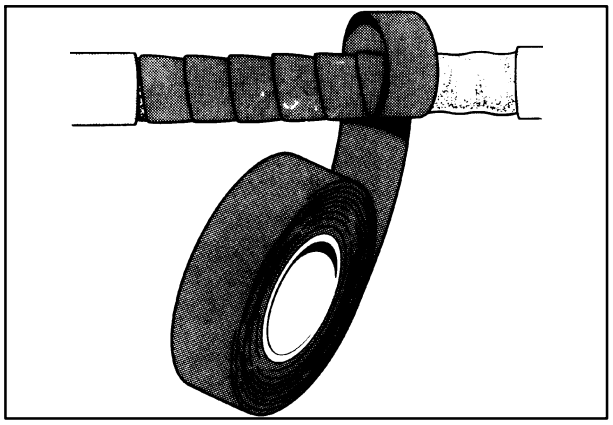


33

6. Allow the compound to cure then cover the area with insulating tape taking the tape well over each end of the repair. An overlap of at least 2 inches (50 mm) of tape at each end is necessary, Figure 34.

7. Check to ensure the repair is satisfactory and secure the repaired cable so that repeat damage is avoided.

NOTE: *This is a temporary repair only. Ensure the damaged cable is replaced as soon as possible to prevent ingress of water or chemicals.*



34

Fold out for Electrical System Diagrams.

ELECTRICAL SYSTEM DIAGRAMS

16 x 16 MODELS
24 x 24 MODELS
12 x 12 MODELS

16X16 AND 24X24 MODELS – INSTRUMENT CLUSTER SYSTEM DIAGRAM

1. BATTERY
2. MAXI FUSES
3. IGNITION SWITCH
4. IGNITION RELAY
5. CRANK DETECT VIA SHUTTLE NEUTRAL SWITCH
6. ENGINE SHUTDOWN RELAY
7. ENGINE SHUTDOWN SOLENOID
8. INDICATOR FLASHER UNIT
9. HANDBRAKE SWITCH
10. ENHANCED KEYPAD (OPTION 1)
11. ENHANCED KEYPAD (OPTION 2)
12. ALTERNATOR
13. INSTRUMENT CLUSTER UNIT
14. RELAY V – STOPLAMP RELAY
15. RELAY A – TRAILER BRAKE RELAY
16. BRAKE PEDAL SWITCHES
17. SENSOR SIGNAL GROUND
18. CHASSIS GROUND
19. POWER GROUND
20. DIAGNOSTICS CONNECTOR

INSTRUMENT CLUSTER - TERMINALS

CONNECTOR C079 – CN1

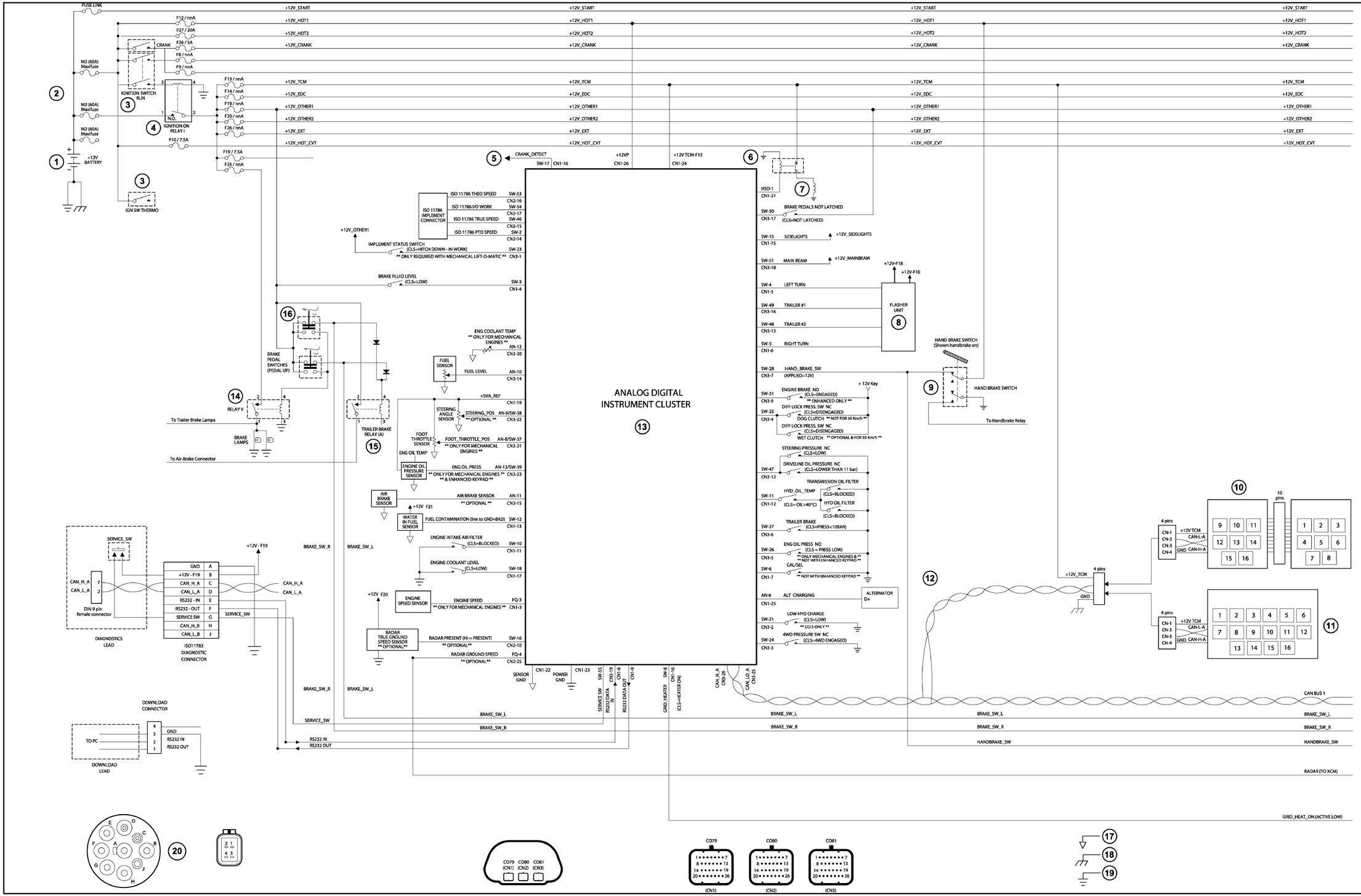
3. ENGINE SPEED SENSOR
4. BRAKE FLUID LEVEL
5. INDICATOR LEFT TURN
6. INDICATOR RIGHT TURN
7. CAL/SEL SWITCH
8. RS232 DATA IN
9. RS232 DATA OUT
10. GRID HEATER
11. AIR FILTER BLOCKED SWITCH
12. HYDRAULIC OIL TEMP
13. FUEL CONTAMINATION SWITCH
15. SIDELIGHTS
16. CRANK DETECT
17. ENGINE COOLANT LEVEL
19. +5V REFERENCE SUPPLY
21. ENGINE SHUTDOWN
22. SENSOR GROUND
23. POWER GROUND
24. +12V FUSE 13
25. ALTERNATOR CHARGING
26. +12V (HOT) FUSE 12

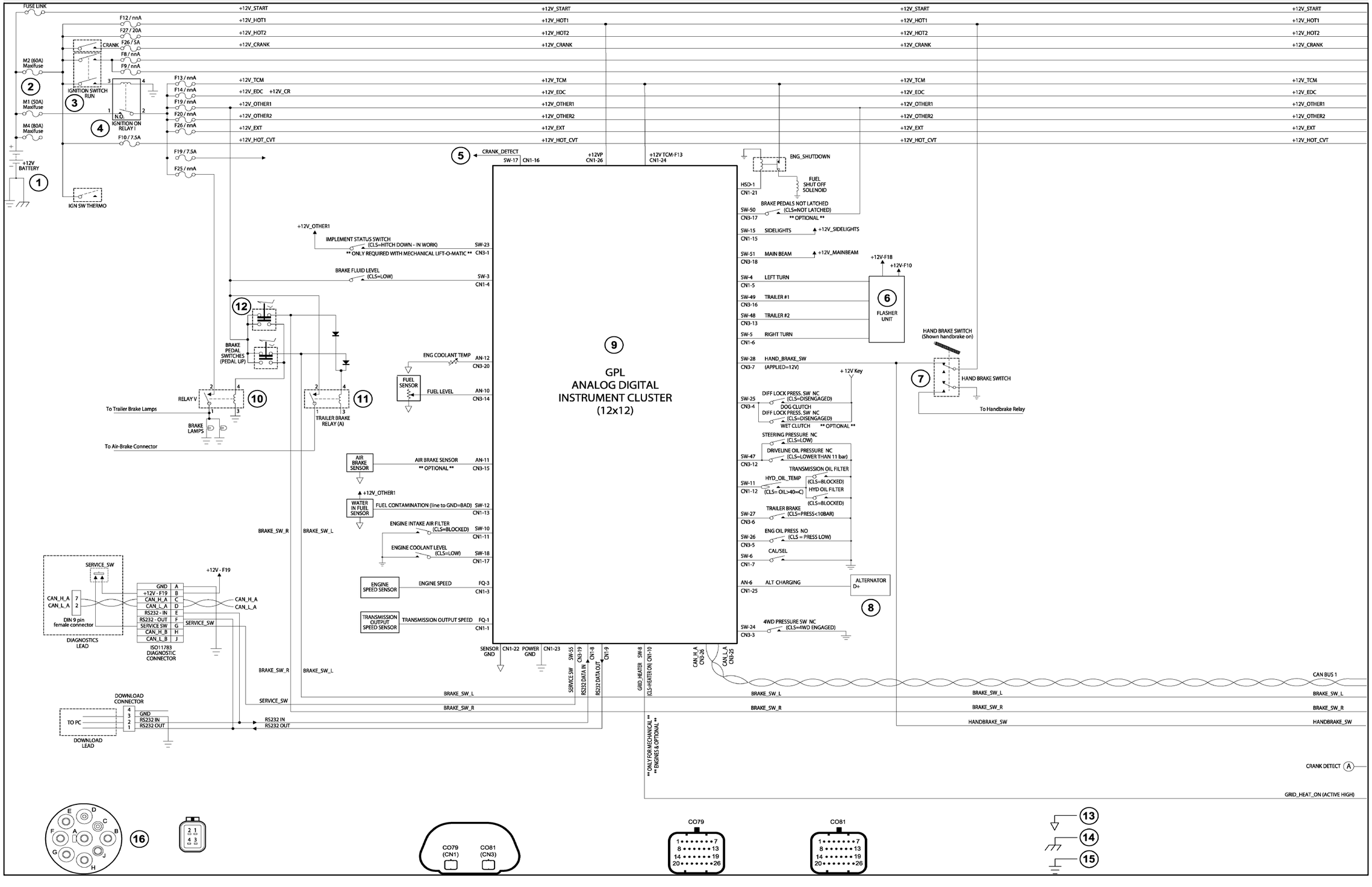
CONNECTOR C080 – CN2

10. RADAR PRESENT
14. PTO SPEED
15. TRUE SPEED
16. THEORETICAL SPEED
17. INPUT/OUTPUT WORK
25. RADAR GROUND SPEED

CONNECTOR C081 – CN3

1. IMPLEMENT STATUS SWITCH
2. LOW HYDRAULIC CHARGE
3. 4WD PRESSURE SWITCH
4. DIFF LOCK PRESSURE SWITCH
5. ENGINE OIL PRESSURE
6. TRAILER BRAKE
7. HANDBRAKE SWITCH
9. ENGINE BRAKE
12. DRIVELINE OIL PRESSURE
13. TRAILER 2
14. FUEL LEVEL
15. AIR BRAKE SENSOR
16. TRAILER 1
17. BRAKE PEDALS NOT LATCHED SWITCH
18. MAIN BEAM
19. SERVICE SWITCH
20. ENGINE COOLANT TEMPERATURE
21. FOOT THROTTLE POSITION
22. STEERING ANGLE SENSOR
23. ENGINE OIL PRESSURE SENSOR
25. CAN 1 – LOW
26. CAN 1 – HIGH


FUSE LINK
F12 / nnA
F27 / 20A
F26 / 5A
CRANK
F8 / nnA
F9 / nnA
M2 (60A) Maxifuse
M2 (60A) Maxifuse
M2 (60A) Maxifuse
F10 / 7.5A
F19 / 7.5A
F25 / nnA
+12V BATTERY
IGN SW THERMO
IGNITION SWITCH RUN
IGNITION ON RELAY
F13 / nnA
F14 / nnA
F19 / nnA
F20 / nnA
F26 / nnA
+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
+12V_HOT_CVT
CRANK_DETECT
SW-17 CN1-16
+12VP CN1-26
+12V TCM-F13 CN1-24
ANALOG DIGITAL INSTRUMENT CLUSTER
ISO 11786 IMPLEMENT CONNECTOR
ISO 11786 THEO SPEED SW-53 CN2-16
ISO 11786 I/O WORK SW-54 CN2-17
ISO 11786 TRUE SPEED SW-46 CN2-15
ISO 11786 PTO SPEED SW-2 CN2-14
IMPLEMENT STATUS SWITCH (CLS=HITCH DOWN - IN WORK) SW-23 CN3-1
** ONLY REQUIRED WITH MECHANICAL LIFT-O-MATIC **
BRAKE FLUID LEVEL (CLS=LOW) SW-3 CN1-4
BRAKE PEDAL SWITCHES (PEDAL UP)
RELAY V
TRAILER BRAKE RELAY (A)
To Trailer Brake Lamps
BRAKE LAMPS
To Air-Brake Connector
ENG COOLANT TEMP ** ONLY FOR MECHANICAL ENGINES ** AN-12 CN3-20
FUEL SENSOR
FUEL LEVEL AN-10 CN3-14
+5VA_REF CN1-19
STEERING ANGLE SENSOR
STEERING_POS AN-9/SW-38 ** OPTIONAL ** CN3-22
FOOT THROTTLE SENSOR
FOOT_THROTTLE_POS AN-8/SW-37 ** ONLY FOR MECHANICAL ENGINES ** CN3-21
ENG OIL TEMP
ENGINE OIL PRESSURE SENSOR
ENG OIL PRESS AN-13/SW-39 ** ONLY FOR MECHANICAL ENGINES ** ** & ENHANCED KEYPAD ** CN3-23
AIR BRAKE SENSOR
AIR BRAKE SENSOR AN-11 ** OPTIONAL ** CN3-15
+12V F21
WATER IN FUEL SENSOR
FUEL CONTAMINATION (line to GND=BAD) SW-12 CN1-13
ENGINE INTAKE AIR FILTER (CLS=BLOCKED) SW-10 CN1-11
ENGINE COOLANT LEVEL (CLS=LOW) SW-18 CN1-17
+12V F20
ENGINE SPEED SENSOR
ENGINE SPEED FQ-3 ** ONLY FOR MECHANICAL ENGINES ** CN3-3
RADAR TRUE GROUND SPEED SENSOR ** OPTIONAL **
RADAR PRESENT (Hi = PRESENT) SW-16 ** OPTIONAL ** CN2-10
RADAR GROUND SPEED FQ-4 ** OPTIONAL ** CN2-25
SENSOR GND CN1-22
POWER GND CN1-23
SERVICE SW SW-55 CN1-19
RS232 DATA IN CN1-8
RS232 DATA OUT CN1-9
GRID_HEATER SW-8 CN1-10 (CLS=HEATER ON)
CAN_H_A CN3-26
CAN_L_O_A CN3-25
HSD-1 CN1-21
SW-50 CN3-17 BRAKE PEDALS NOT LATCHED (CLS=NOT LATCHED)
SW-15 CN1-15 SIDELIGHTS +12V_SIDELIGHTS
SW-51 CN3-18 MAIN BEAM +12V_MAINBEAM
SW-4 CN1-5 LEFT TURN
SW-49 CN3-16 TRAILER #1
SW-48 CN3-13 TRAILER #2
SW-5 CN1-6 RIGHT TURN
+12V-F18
+12V-F10
FLASHER UNIT
HAND BRAKE SWITCH (Shown handbrake on)
HAND BRAKE SWITCH
To Handbrake Relay
SW-28 CN3-7 HAND_BRAKE_SW (APPLIED=12V)
+12V Key
SW-31 CN3-9 ENGINE BRAKE NO (CLS=ENGAGED) ** ENHANCED ONLY **
SW-25 CN3-4 DIFF LOCK PRESS. SW NC (CLS=DISENGAGED) DOG CLUTCH ** NOT FOR 50 Km/h **
DIFF LOCK PRESS. SW NC (CLS=DISENGAGED) WET CLUTCH ** OPTIONAL & FOR 50 Km/h **
STEERING PRESSURE NC (CLS=LOW)
SW-47 CN3-12 DRIVELINE OIL PRESSURE NC (CLS=LOWER THAN 11 bar)
TRANSMISSION OIL FILTER (CLS=BLOCKED)
SW-11 CN1-12 HYD_OIL_TEMP (CLS= OIL>40°C)
HYD OIL FILTER (CLS=BLOCKED)
SW-27 CN3-6 TRAILER BRAKE (CLS=PRESS<10BAR)
SW-26 CN3-5 ENG OIL PRESS NO (CLS = PRESS LOW) ** ONLY MECHANICAL ENGINES & ** ** NOT WITH ENHANCED KEYPAD **
SW-6 CN1-7 CAL/SEL ** NOT WITH ENHANCED KEYPAD **
AN-6 CN1-25 ALT CHARGING
ALTERNATOR D+
SW-21 CN3-2 LOW HYD CHARGE (CLS=LOW) ** CCLS ONLY **
SW-24 CN3-3 4WD PRESSURE SW NC (CLS=4WD ENGAGED)
SERVICE_SW
DIN 9 pin female connector
CAN_H_A
CAN_L_A
DIAGNOSTICS LEAD
GND A
+12V - F19 B
CAN_H_A C
CAN_L_A D
RS232 - IN E
RS232 - OUT F
SERVICE SW G
CAN_H_B H
CAN_L_B J
ISO11783 DIAGNOSTIC CONNECTOR
+12V - F19
BRAKE_SW_R
BRAKE_SW_L
SERVICE_SW
DOWNLOAD CONNECTOR
TO PC
GND
RS232 IN
RS232 OUT
DOWNLOAD LEAD
RS232 IN
RS232 OUT
4 pins
+12V TCM
CAN-L-A
GND CAN-H-A
10 pins
+12V_TCM
GND
CAN BUS 1
BRAKE_SW_L
BRAKE_SW_R
HANDBRAKE_SW
RADAR (TO XCM)
GRID_HEAT_ON (ACTIVE LOW)
CO79 (CN1)
CO80 (CN2)
CO81 (CN3)


FUSE LINK
F12 / nnA
F27 / 20A
F26 / 5A
F8 / nnA
F9 / nnA
CRANK
M2 (60A) Maxifuse
M1 (50A) Maxifuse
M4 (80A) Maxifuse
F10 / 7.5A
F19 / 7.5A
F25 / nnA
+12V BATTERY
IGNITION SWITCH RUN
N.O.
IGNITION ON RELAY I
IGN SW THERMO
F13 / nnA
F14 / nnA
F19 / nnA
F20 / nnA
F26 / nnA
+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC +12V_CR
+12V_OTHER1
+12V_OTHER2
+12V_EXT
+12V_HOT_CVT
CRANK_DETECT
SW-17 CN1-16
+12VP CN1-26
+12V TCM-F13 CN1-24
GPL
ANALOG DIGITAL
INSTRUMENT CLUSTER
(12x12)
ENG_SHUTDOWN
HSD-1 CN1-21
FUEL SHUT OFF SOLENOID
BRAKE PEDALS NOT LATCHED (CLS=NOT LATCHED)
SW-50 CN3-17
** OPTIONAL **
SW-15 SIDELIGHTS +12V_SIDELIGHTS
CN1-15
SW-51 MAIN BEAM +12V_MAINBEAM
CN3-18
+12V-F18
+12V-F10
SW-4 LEFT TURN CN1-5
SW-49 TRAILER #1 CN3-16
SW-48 TRAILER #2 CN3-13
SW-5 RIGHT TURN CN1-6
FLASHER UNIT
HAND BRAKE SWITCH (Shown handbrake on)
HAND BRAKE SWITCH
To Handbrake Relay
SW-28 HAND_BRAKE_SW
CN3-7 (APPLIED=12V)
+ 12V Key
SW-25 CN3-4
DIFF LOCK PRESS. SW NC (CLS=DISENGAGED)
DOG CLUTCH
DIFF LOCK PRESS. SW NC (CLS=DISENGAGED)
WET CLUTCH ** OPTIONAL **
STEERING PRESSURE NC (CLS=LOW)
SW-47 CN3-12
DRIVELINE OIL PRESSURE NC (CLS=LOWER THAN 11 bar)
TRANSMISSION OIL FILTER
SW-11 CN1-12
HYD_OIL_TEMP (CLS= OIL>40ºC)
HYD OIL FILTER (CLS=BLOCKED)
SW-27 CN3-6
TRAILER BRAKE (CLS=PRESS<10BAR)
SW-26 CN3-5
ENG OIL PRESS NO (CLS = PRESS LOW)
SW-6 CN1-7
CAL/SEL
AN-6 CN1-25
ALT CHARGING
ALTERNATOR D+
SW-24 CN3-3
4WD PRESSURE SW NC (CLS=4WD ENGAGED)
+12V_OTHER1
IMPLEMENT STATUS SWITCH (CLS=HITCH DOWN - IN WORK)
** ONLY REQUIRED WITH MECHANICAL LIFT-O-MATIC **
SW-23 CN3-1
BRAKE FLUID LEVEL (CLS=LOW)
SW-3 CN1-4
BRAKE PEDAL SWITCHES (PEDAL UP)
RELAY V
To Trailer Brake Lamps
BRAKE LAMPS
To Air-Brake Connector
TRAILER BRAKE RELAY (A)
ENG COOLANT TEMP AN-12 CN3-20
FUEL SENSOR
FUEL LEVEL AN-10 CN3-14
AIR BRAKE SENSOR
AIR BRAKE SENSOR AN-11 ** OPTIONAL ** CN3-15
▲ +12V_OTHER1
WATER IN FUEL SENSOR
FUEL CONTAMINATION (line to GND=BAD) SW-12 CN1-13
ENGINE INTAKE AIR FILTER (CLS=BLOCKED) SW-10 CN1-11
ENGINE COOLANT LEVEL (CLS=LOW) SW-18 CN1-17
ENGINE SPEED SENSOR
ENGINE SPEED FQ-3 CN1-3
TRANSMISSION OUTPUT SPEED SENSOR
TRANSMISSION OUTPUT SPEED FQ-1 CN1-1
BRAKE_SW_R
BRAKE_SW_L
SERVICE_SW
SERVICE_SW
CAN_H_A
CAN_L_A
DIN 9 pin female connector
DIAGNOSTICS LEAD
GND A
+12V - F19 B
CAN_H_A C
CAN_L_A D
RS232 - IN E
RS232 - OUT F
SERVICE SW G
CAN_H_B H
CAN_L_B J
ISO11783 DIAGNOSTIC CONNECTOR
DOWNLOAD CONNECTOR
TO PC
GND
RS232 IN
RS232 OUT
DOWNLOAD LEAD
RS232 IN
RS232 OUT
SENSOR GND CN1-22
POWER GND CN1-23
SERVICE SW SW-55 CN3-19
RS232 DATA IN CN1-8
RS232 DATA OUT CN1-9
GRID_HEATER SW-8 (CLS=HEATER ON) CN1-10
CAN_H_A CN3-26
CAN_L_A CN3-25
** ONLY FOR MECHANICAL **
** ENGINES & OPTIONAL **
CAN BUS 1
BRAKE_SW_L
BRAKE_SW_R
HANDBRAKE_SW
CRANK DETECT (A)
GRID_HEAT_ON (ACTIVE HIGH)
CO79 (CN1)
CO81 (CN3)
CO79
CO81
1 7
8 13
14 19
20 26
1 7
8 13
14 19
20 26
E D C B A F G J H
2 1
4 3
13
14
15

12X12 MODELS - INSTRUMENT CLUSTER SYSTEM DIAGRAM

1. BATTERY
2. MAXI FUSES
3. IGNITION SWITCH
4. IGNITION RELAY
5. CRANK DETECT VIA SHUTTLE NEUTRAL SWITCH
6. INDICATOR FLASHER UNIT
7. HANDBRAKE SWITCH
8. ALTERNATOR
9. INSTRUMENT CLUSTER UNIT
10. RELAY V - STOPLAMP RELAY
11. RELAY A - TRAILER BRAKE RELAY
12. BRAKE PEDAL SWITCHES
13. SENSOR SIGNAL GROUND
14. CHASSIS GROUND
15. POWER GROUND
16. DIAGNOSTIC SOCKET

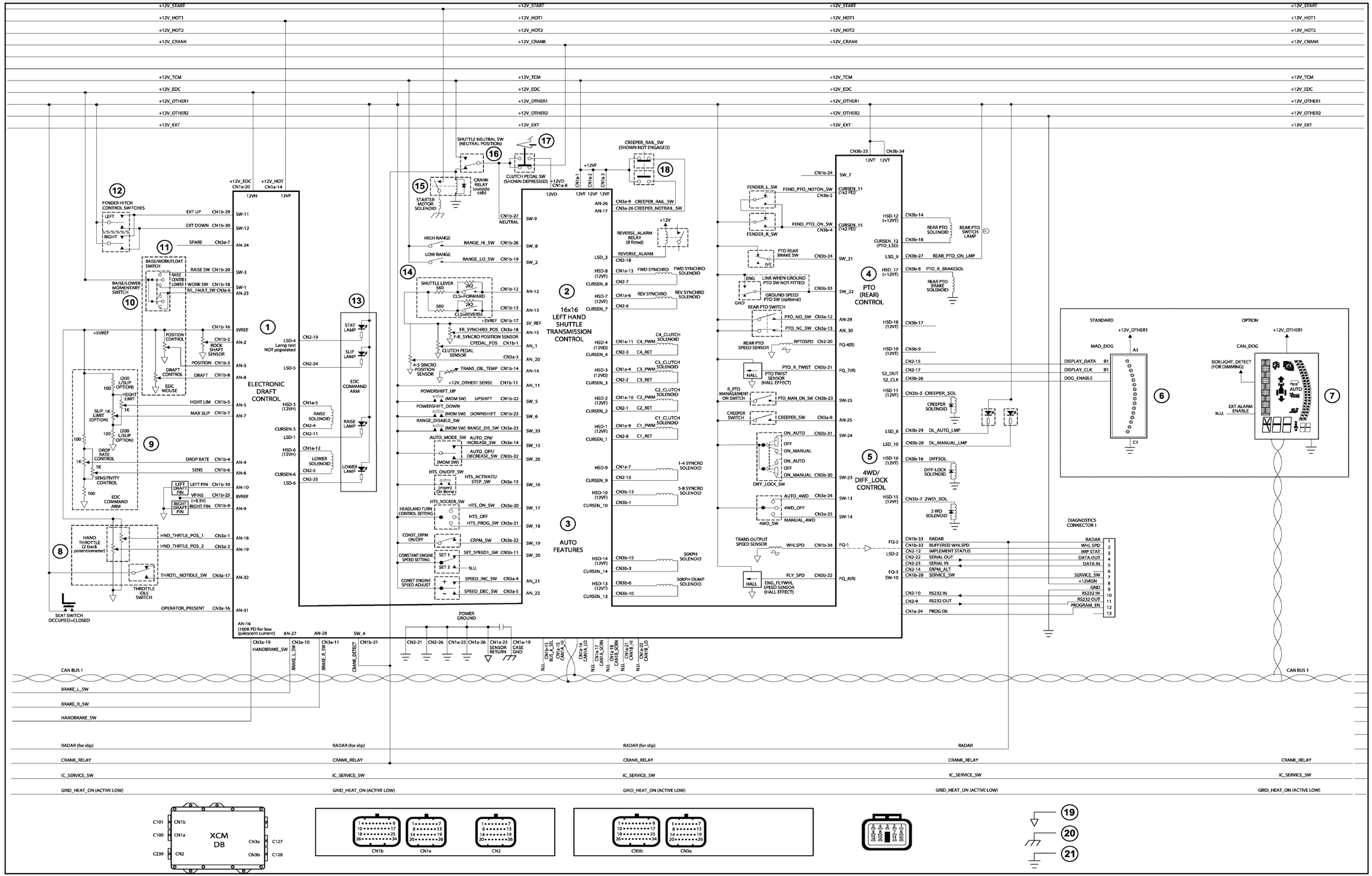
INSTRUMENT CLUSTER - TERMINALS

CONNECTOR C079 - CN1

1. TRANSMISSION OUTPUT SPEED SENSOR
3. ENGINE SPEED SENSOR
4. BRAKE FLUID LEVEL
5. INDICATOR LEFT TURN
6. INDICATOR RIGHT TURN
7. CAL/SEL SWITCH
8. RS232 DATA IN
9. RS232 DATA OUT
10. GRID HEATER
11. AIR FILTER BLOCKED SWITCH
12. HYDRAULIC OIL FILTER BLOCKED
13. FUEL CONTAMINATION SWITCH
15. SIDELIGHTS
16. CRANK DETECT
17. ENGINE COOLANT LEVEL
21. ENGINE SHUTDOWN
22. SENSOR GROUND
23. POWER GROUND
24. +12V FUSE 13
25. ALTERNATOR
26. +12V (HOT) FUSE 12

CONNECTOR C081 - CN3

1. IMPLEMENT STATUS SWITCH
3. 4WD PRESSURE SWITCH
4. DIFF LOCK PRESSURE SWITCH
5. ENGINE OIL PRESSURE
6. TRAILER BRAKE
7. HANDBRAKE SWITCH
12. DRIVELINE OIL PRESSURE
13. TRAILER 2
14. FUEL LEVEL
15. AIR BRAKE SENSOR
16. TRAILER 1
17. BRAKE PEDALS LATCHED SWITCH
18. MAIN BEAM
19. SERVICE SWITCH
20. ENGINE COOLANT TEMPERATURE
25. CAN 1 - LOW
26. CAN 1 - HIGH


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
1 ELECTRONIC DRAFT CONTROL
2 16x16 LEFT HAND SHUTTLE TRANSMISSION CONTROL
3 AUTO FEATURES
4 PTO (REAR) CONTROL
5 4WD/ DIFF_LOCK CONTROL
6
7
8 HAND THROTTLE (2 track potentiometer)
9 EDC COMMAND ARM
10 RAISE/LOWER MOMENTARY SWITCH
11 RAISE/WORK/FLOAT SWITCH
12 FENDER HITCH CONTROL SWITCHES
13 STAT LAMP, SLIP LAMP, EDC COMMAND ARM, RAISE LAMP, LOWER LAMP
14 SHUTTLE LEVER
15 STARTER MOTOR SOLENOID, CRANK RELAY (outside cab)
16 SHUTTLE NEUTRAL SW (NEUTRAL POSITION)
17 CLUTCH PEDAL SW (SHOWN DEPRESSED)
18 CREEPER_RAIL_SW (SHOWN NOT ENGAGED)
REVERSE_ALARM RELAY (If fitted)
REVERSE_ALARM
FWD SYNCHRO SOLENOID
REV SYNCHRO SOLENOID
C4_CLUTCH SOLENOID
C3_CLUTCH SOLENOID
C2_CLUTCH SOLENOID
C1_CLUTCH SOLENOID
1-4 SYNCRO SOLENOID
5-8 SYNCRO SOLENOID
50KPH SOLENOID
50KPH DUMP SOLENOID
REAR PTO SOLENOID
REAR PTO SWITCH LAMP
REAR PTO BRAKE SOLENOID
CREEPER SOLENOID
DIFF-LOCK SOLENOID
2WD SOLENOID
DIAGNOSTICS CONNECTOR 1
STANDARD
OPTION
MAD_DOG
CAN_DOG
SIDELIGHT_DETECT (FOR DIMMING)
EXT ALARM ENABLE
CAN BUS 1
BRAKE_L_SW
BRAKE_R_SW
HANDBRAKE_SW
RADAR (for slip)
CRANK_RELAY
IC_SERVICE_SW
GRID_HEAT_ON (ACTIVE LOW)
POWER GROUND
XCM DB
CN1b
CN1a
CN2
CN3b
CN3a

12X12 MODELS - INSTRUMENT CLUSTER SYSTEM DIAGRAM

1. BATTERY
2. MAXI FUSES
3. IGNITION SWITCH
4. IGNITION RELAY
5. CRANK DETECT VIA SHUTTLE NEUTRAL SWITCH
6. INDICATOR FLASHER UNIT
7. HANDBRAKE SWITCH
8. ALTERNATOR
9. INSTRUMENT CLUSTER UNIT
10. RELAY V - STOPLAMP RELAY
11. RELAY A - TRAILER BRAKE RELAY
12. BRAKE PEDAL SWITCHES
13. SENSOR SIGNAL GROUND
14. CHASSIS GROUND
15. POWER GROUND
16. DIAGNOSTIC SOCKET

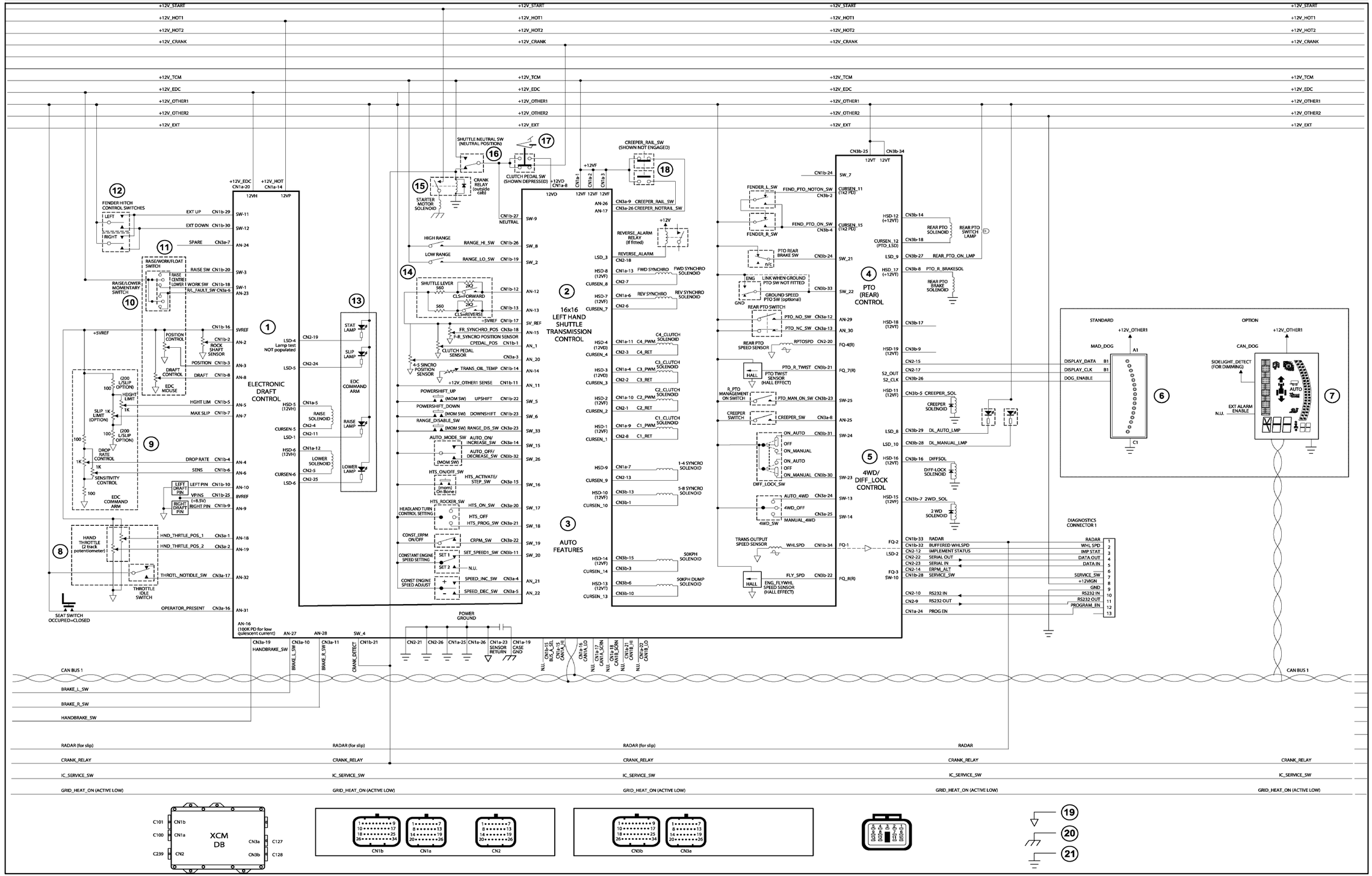
INSTRUMENT CLUSTER - TERMINALS

CONNECTOR C079 - CN1

1. TRANSMISSION OUTPUT SPEED SENSOR
3. ENGINE SPEED SENSOR
4. BRAKE FLUID LEVEL
5. INDICATOR LEFT TURN
6. INDICATOR RIGHT TURN
7. CAL/SEL SWITCH
8. RS232 DATA IN
9. RS232 DATA OUT
10. GRID HEATER
11. AIR FILTER BLOCKED SWITCH
12. HYDRAULIC OIL FILTER BLOCKED
13. FUEL CONTAMINATION SWITCH
15. SIDELIGHTS
16. CRANK DETECT
17. ENGINE COOLANT LEVEL
21. ENGINE SHUTDOWN
22. SENSOR GROUND
23. POWER GROUND
24. +12V FUSE 13
25. ALTERNATOR
26. +12V (HOT) FUSE 12

CONNECTOR C081 - CN3

1. IMPLEMENT STATUS SWITCH
3. 4WD PRESSURE SWITCH
4. DIFF LOCK PRESSURE SWITCH
5. ENGINE OIL PRESSURE
6. TRAILER BRAKE
7. HANDBRAKE SWITCH
12. DRIVELINE OIL PRESSURE
13. TRAILER 2
14. FUEL LEVEL
15. AIR BRAKE SENSOR
16. TRAILER 1
17. BRAKE PEDALS LATCHED SWITCH
18. MAIN BEAM
19. SERVICE SWITCH
20. ENGINE COOLANT TEMPERATURE
25. CAN 1 - LOW
26. CAN 1 - HIGH


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
1 ELECTRONIC DRAFT CONTROL
2 16x16 LEFT HAND SHUTTLE TRANSMISSION CONTROL
3 AUTO FEATURES
4 PTO (REAR) CONTROL
5 4WD/ DIFF_LOCK CONTROL
6
7
8 HAND THROTTLE (2 track potentiometer)
9 EDC COMMAND ARM
10 RAISE/LOWER MOMENTARY SWITCH
11 RAISE/WORK/FLOAT SWITCH
12 FENDER HITCH CONTROL SWITCHES
13 STAT LAMP, SLIP LAMP, EDC COMMAND ARM, RAISE LAMP, LOWER LAMP
14 SHUTTLE LEVER
15 STARTER MOTOR SOLENOID, CRANK RELAY (outside cab)
16 SHUTTLE NEUTRAL SW (NEUTRAL POSITION)
17 CLUTCH PEDAL SW (SHOWN DEPRESSED)
18 CREEPER_RAIL_SW (SHOWN NOT ENGAGED)
REVERSE_ALARM RELAY (If fitted)
REVERSE_ALARM
FWD SYNCHRO SOLENOID
REV SYNCHRO SOLENOID
C4_CLUTCH SOLENOID
C3_CLUTCH SOLENOID
C2_CLUTCH SOLENOID
C1_CLUTCH SOLENOID
1-4 SYNCRO SOLENOID
5-8 SYNCRO SOLENOID
50KPH SOLENOID
50KPH DUMP SOLENOID
REAR PTO SOLENOID
REAR PTO SWITCH LAMP
REAR PTO BRAKE SOLENOID
CREEPER SOLENOID
DIFF-LOCK SOLENOID
2WD SOLENOID
DIAGNOSTICS CONNECTOR 1
STANDARD
OPTION
MAD_DOG
CAN_DOG
SIDELIGHT_DETECT (FOR DIMMING)
EXT ALARM ENABLE
CAN BUS 1
BRAKE_L_SW
BRAKE_R_SW
HANDBRAKE_SW
RADAR (for slip)
CRANK_RELAY
IC_SERVICE_SW
GRID_HEAT_ON (ACTIVE LOW)
POWER GROUND
XCM DB
CN1b
CN1a
CN2
CN3b
CN3a

16X16 CENTRAL CONTROL UNIT - DB (EDC, TRANSMISSION, REAR PTO, 4WD AND DIFF LOCK)

1. EDC CONTROL
2. TRANSMISSION CONTROL
3. AUTO FEATURES CONTROL
4. REAR PTO CONTROL
5. 4WD DIFF LOCK CONTROL
6. GEAR DISPLAY- STANDARD
7. GEAR DISPLAY - OPTIONAL
8. HAND THROTTLE POTENTIOMETER
9. EDC CONTROL PANEL
10. EDC MOUSE UNIT
11. RAISE / WORK SWITCH
12. RAISE / LOWER FENDER SWITCHES
13. EDC INFORMATION LAMPS
14. TRANSMISSION SHUTTLE LEVER
15. STARTER MOTOR SOLENOID
16. SHUTTLE LEVER NEUTRAL SWITCH
17. CLUTCH PEDAL SWITCH
18. CREEPER SWITCH
19. SENSOR GROUND
20. CHASSIS GROUND
21. POWER GROUND

CONNECTOR C100 (CN1a)

1. +12V VF SUPPLY (FUSE 13)
2. +12V VF SUPPLY (FUSE 13)
3. +12V VF SUPPLY (FUSE 13)
4. C3 PWM SOLENOID DRIVER
5. RAISE SOLENOID DRIVER
6. REVERSE SYNCHRO SOLENOID DRIVER
7. 1-4 SYNCHRO SOLENOID DRIVER
8. +12V VD SUPPLY (FUSE 13)
9. C1 PWM SOLENOID DRIVER
10. C2 PWM SOLENOID DRIVER
11. C4 PWM SOLENOID DRIVER
12. LOWER SOLENOID DRIVER
13. FORWARD SYNCHRO SOLENOID DRIVER
14. +12V (HOT) FUSE 12
15. CAN 1 - HI
16. CAN 1 - LO
19. CASE GROUND
20. +12V (EDC) FUSE 14
23. SENSOR RETURN
24. PROGRAMME ENABLE
25. POWER GROUND
26. POWER GROUND

CONNECTOR C101 (CN1b)

1. CLUTCH PEDAL POTENTIOMETER
2. ROCK SHAFT SENSOR
3. EDC POSITION CONTROL
4. DROP RATE CONTROL
5. HEIGHT LIMIT CONTROL
6. SENSITIVITY CONTROL
7. MAXIMUM SLIP CONTROL
8. EDC DRAFT CONTROL
9. EDC DRAFT PIN - RIGHT
10. EDC DRAFT PIN - LEFT
11. +12V SENSE
12. SHUTTLE LEVER FORWARD SWITCH
13. SHUTTLE LEVER REVERSE SWITCH
14. TRANSMISSION OIL TEMPERATURE
16. EDC +5V REFERENCE LINE
17. TRANSMISSION +5V REFERENCE LINE
18. WORK SWITCH
19. HIGH/MEDIUM NEUTRAL POSITION
20. RAISE SWITCH
21. CRANK DETECT
22. UPSHIFT SWITCH
23. DOWNSHIFT SWITCH
25. +8.5V DRAFT PIN SUPPLY
26. 1-2 & 3-4 TRANS NEUTRAL POSITION
27. SHUTTLE LEVER NEUTRAL SWITCH
28. SERVICE SWITCH
29. FENDER HITCH SWITCH - UP
30. FENDER HITCH SWITCH - DOWN
32. BUFFERED WHEEL SPEED
33. RADAR
34. WHEEL SPEED

CONNECTOR C239 (CN2)

1. C2 PWM SOLENOID RETURN
2. C3 PWM SOLENOID RETURN
3. C4 PWM SOLENOID RETURN
4. EDC RAISE SOLENOID RETURN
5. EDC LOWER SOLENOID RETURN
6. REVERSE SYNCHRO SOLENOID RETURN
7. FORWARD SYNCHRO SOLENOID RETURN
8. C1 PWM SOLENOID RETURN
9. RS232 OUT
10. RS232 IN
11. EDC RAISING LAMP
12. IMPLEMENT STATUS
13. 1-4 SYNCHRO SOLENOID RETURN
15. DISPLAY DATA
17. DISPLAY
18. REVERSE ALARM
19. EDC STATUS LAMP
20. REAR PTO SPEED SENSOR
21. POWER GROUND
22. SERIAL OUT
23. SERIAL IN
24. SLIP LAMP
25. EDC LOWERING LAMP
26. POWER GROUND

CONNECTOR C127 (CN3a)

1. HAND THROTTLE POSITION POT 1
2. HAND THROTTLE POSITION POT 2
3. 4-5 SYNCHRO POSITION POT
4. CRPM - SPEED INCREASE SWITCH
5. CRPM - SPEED DECREASE SWITCH
6. WORK SWITCH (2)
7. RAISE SWITCH (2)
8. CREEPER SWITCH
9. CREEPER RAIL SWITCH
10. BRAKE SWITCH - LEFT HAND
11. BRAKE SWITCH - RIGHT HAND
12. PTO (NORMALLY OPEN) SWITCH
13. PTO (NORMALLY CLOSED) SWITCH
14. AUTO ON / INCREASE SWITCH
15. HTS STEP SWITCH
16. SEAT SWITCH
17. THROTTLE IDLE SWITCH
18. FOR/REV SYNCHRO POT
19. HANDBRAKE SWITCH
20. HTS ON SWITCH
21. HTS PROGRAMME SWITCH
22. CRPM SWITCH
23. RANGE DISABLE SWITCH
24. AUTO 4WD
25. MANUAL 4WD
26. CREEPER NOT ENGAGED SWITCH

CONNECTOR C128 (CN3b)

1. 5-8 SYNCHRO SOLENOID RETURN
2. REAR PTO FENDER SWITCH - OFF
3. 50 KPH SOLENOID RETURN
4. REAR PTO FENDER SWITCH - ON
5. CREEPER SOLENOID
6. 50 KPH DUMP SOLENOID DRIVER
7. 2WD/4WD SOLENOID
8. REAR PTO BRAKE SOLENOID
10. 50 KPH DUMP SOLENOID RETURN
11. SET ENGINE SPEED SWITCH
13. 5-8 SYNCHRO SOLENOID DRIVER
14. REAR PTO SOLENOID DRIVER
15. 50 KPH SOLENOID DRIVER
16. DIFF LOCK SOLENOID
18. REAR PTO SOLENOID RETURN
21. PTO SHAFT TWIST SENSOR
22. ENGINE FLYWHEEL SPEED SENSOR
23. REAR PTO MANUAL ON SWITCH
24. REAR PTO BRAKE SWITCH
25. +12V SWITCHED FEED FROM FUSE 19
26. DOG ENABLE
27. REAR PTO ON LAMP
28. DIFF LOCK MANUAL LAMP
29. DIFF LOCK AUTO LAMP
30. DIFF LOCK MANUAL ON SWITCH
31. DIFF LOCK AUTO ON SWITCH
32. AUTO OFF / DECREASE SWITCH
33. GROUND SPEED PTO SWITCH
34. +12V SWITCHED FEED FROM FUSE 19

24x24 CENTRAL CONTROL UNIT - DA (EDC, TRANSMISSION, REAR PTO, 4WD AND DIFF LOCK)

1. EDC CONTROL
2. TRANSMISSION CONTROL
3. AUTO FEATURES CONTROL
4. REAR PTO CONTROL
5. 4WD DIFF LOCK CONTROL
6. HAND THROTTLE POTENTIOMETER
7. EDC CONTROL PANEL
8. EDC MOUSE UNIT
9. RAISE / WORK SWITCH
10. RAISE / LOWER FENDER SWITCHES
11. EDC INFORMATION LAMPS
12. TRANSMISSION SHUTTLE LEVER
13. STARTER MOTOR SOLENOID
14. SHUTTLE LEVER NEUTRAL SWITCH
15. CLUTCH PEDAL SWITCH
16. CREEPER SWITCH
17. SENSOR GROUND
18. CHASSIS GROUND
19. POWER GROUND

CONNECTOR C100 (CN1a)

1. +12V VF SUPPLY (FUSE 13)
2. +12V VF SUPPLY (FUSE 13)
3. +12V VF SUPPLY (FUSE 13)
4. C3 PWM SOLENOID DRIVER
5. RAISE SOLENOID DRIVER
6. REVERSE SYNCHRO SOLENOID DRIVER
8. +12V VD SUPPLY (FUSE 13)
10. PROVIDE PRESSURE PWM SOLENOID DRIVER
11. C4 PWM SOLENOID DRIVER
12. LOWER SOLENOID DRIVER
13. FORWARD SYNCHRO SOLENOID DRIVER
14. +12V (HOT) FUSE 12
15. CAN 1 - HI
16. CAN 1 - LO
19. CASE GROUND
20. +12V (EDC) FUSE 14
23. SENSOR RETURN
24. PROGRAMME ENABLE
25. POWER GROUND
26. POWER GROUND

CONNECTOR C101 (CN1b)

1. CLUTCH PEDAL POTENTIOMETER
2. ROCK SHAFT SENSOR
3. EDC POSITION CONTROL
4. DROP RATE CONTROL
5. HEIGHT LIMIT CONTROL
6. SENSITIVITY CONTROL
7. MAXIMUM SLIP CONTROL
8. EDC DRAFT CONTROL
9. EDC DRAFT PIN - RIGHT
10. EDC DRAFT PIN - LEFT
11. +12V SENSE
12. SHUTTLE LEVER FORWARD SWITCH
13. SHUTTLE LEVER REVERSE SWITCH
14. TRANSMISSION OIL TEMPERATURE
16. EDC +5V REFERENCE LINE
17. TRANSMISSION +5V REFERENCE LINE
18. WORK SWITCH
19. HIGH/MEDIUM NEUTRAL POSITION
20. RAISE SWITCH
21. CRANK DETECT
22. UPSHIFT SWITCH
23. DOWNSHIFT SWITCH
25. +8.5V DRAFT PIN SUPPLY
26. 1-2 & 3-4 TRANS NEUTRAL POSITION
27. SHUTTLE LEVER NEUTRAL SWITCH
28. SERVICE SWITCH
29. FENDER HITCH SWITCH - UP
30. FENDER HITCH SWITCH - DOWN
32. BUFFERED WHEEL SPEED
33. RADAR
34. WHEEL SPEED

CONNECTOR C239 (CN2)

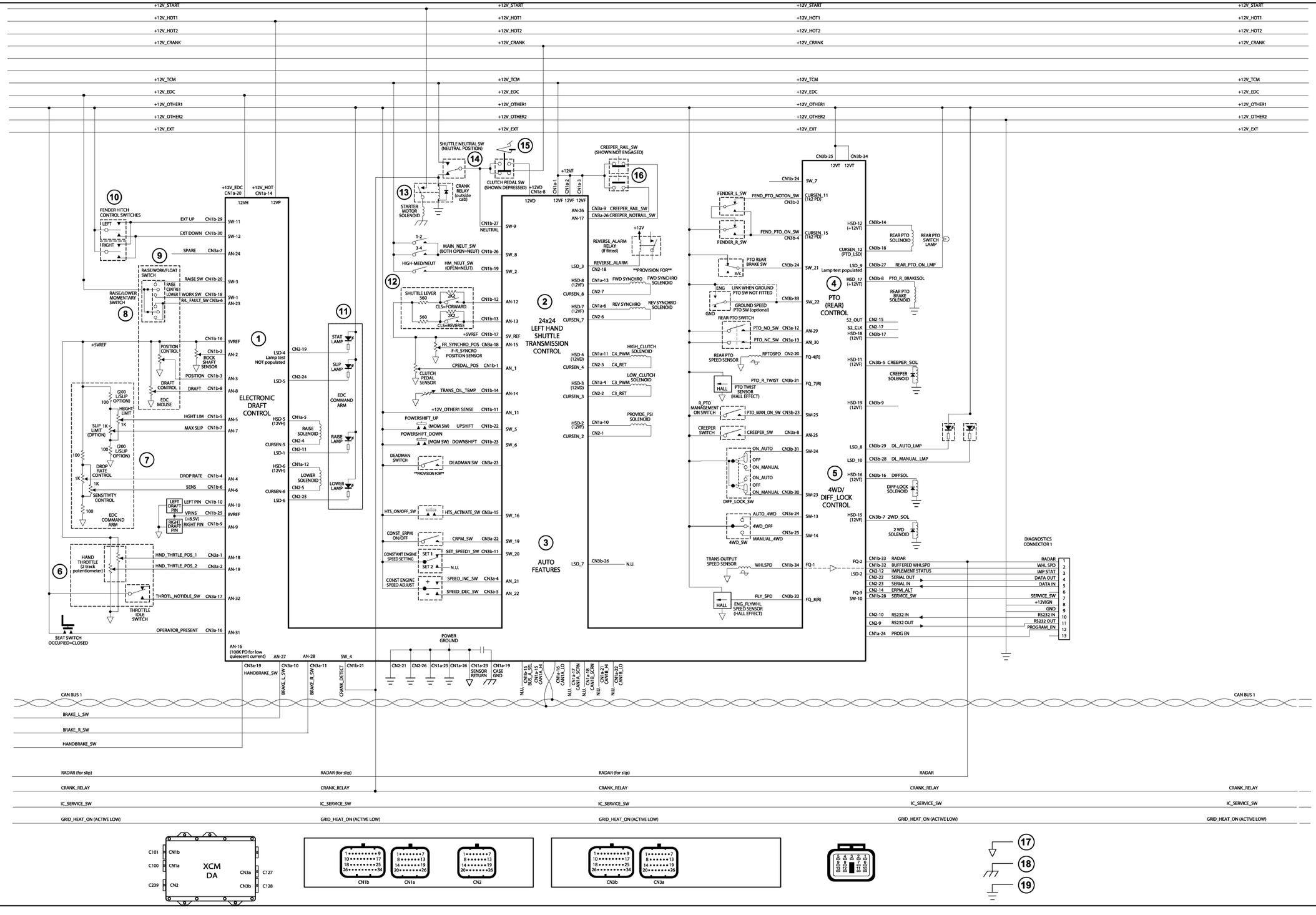
1. PROVIDE PRESSURE SOLENOID RETURN
2. C3 PWM SOLENOID RETURN
3. C4 PWM SOLENOID RETURN
4. EDC RAISE SOLENOID RETURN
5. EDC LOWER SOLENOID RETURN
6. REVERSE SYNCHRO SOLENOID RETURN
7. FORWARD SYNCHRO SOLENOID RETURN
9. RS232 OUT
10. RS232 IN
11. EDC RAISING LAMP
12. IMPLEMENT STATUS
18. REVERSE ALARM
19. EDC STATUS LAMP
20. REAR PTO SPEED SENSOR
21. POWER GROUND
22. SERIAL OUT
23. SERIAL IN
24. SLIP LAMP
25. EDC LOWERING LAMP
26. POWER GROUND

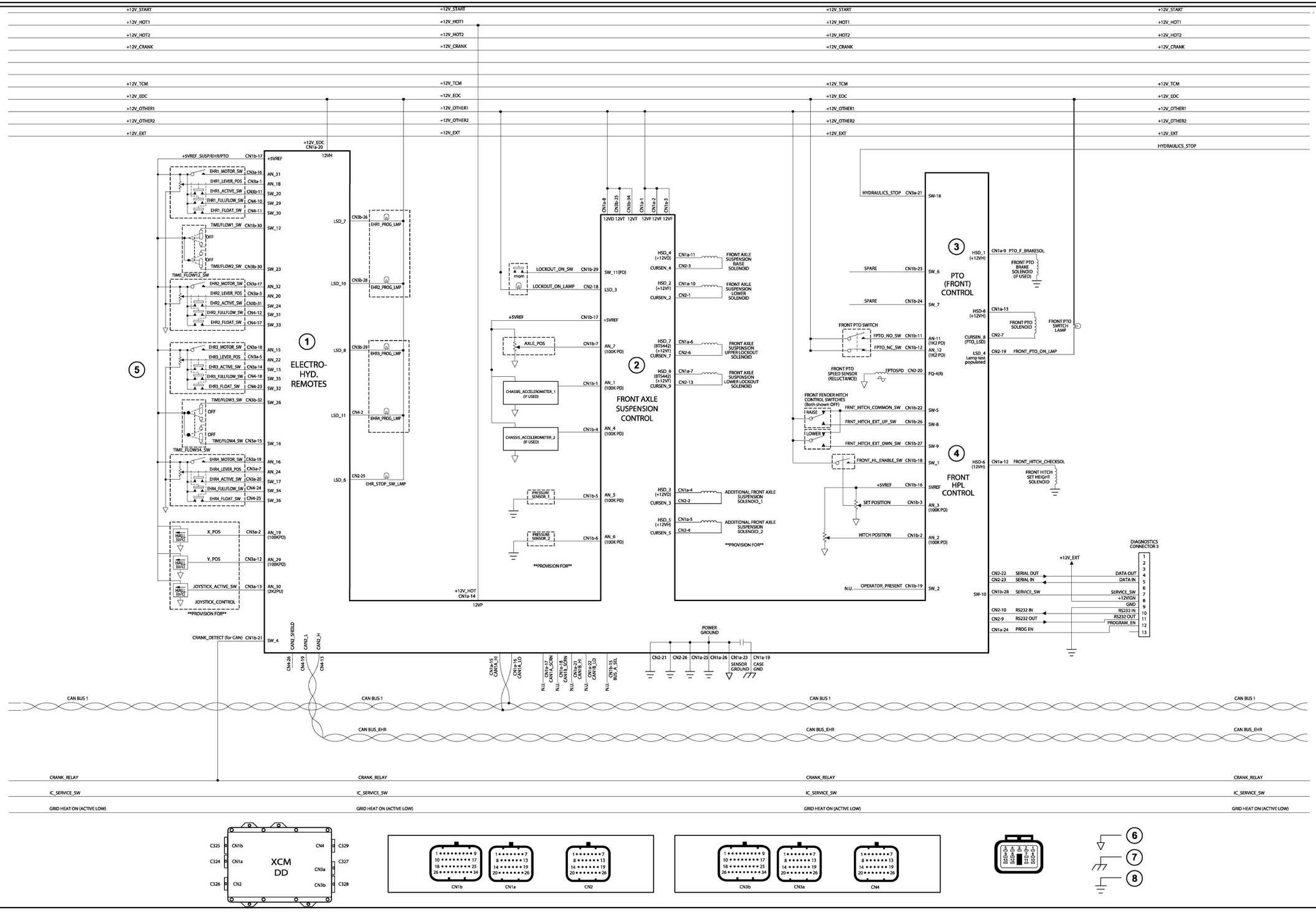
CONNECTOR C127 (CN3a)

1. HAND THROTTLE POSITION POT 1
2. HAND THROTTLE POSITION POT 2
4. CRPM - SPEED INCREASE SWITCH
5. CRPM - SPEED DECREASE SWITCH
6. WORK SWITCH (2)
7. RAISE SWITCH (2)
8. CREEPER SWITCH
9. CREEPER RAIL SWITCH
10. BRAKE SWITCH - LEFT HAND
11. BRAKE SWITCH - RIGHT HAND
12. PTO (NORMALLY OPEN) SWITCH
13. PTO (NORMALLY CLOSED) SWITCH
15. HTS STEP SWITCH
16. SEAT SWITCH
17. THROTTLE IDLE SWITCH
18. FOR/REV SYNCHRO POT
19. HANDBRAKE SWITCH
22. CRPM SWITCH
23. DEADMAN SWITCH
24. AUTO 4WD
25. MANUAL 4WD
26. CREEPER NOT ENGAGED SWITCH

CONNECTOR C128 (CN3b)

2. REAR PTO FENDER SWITCH - LEFT HAND
4. REAR PTO FENDER SWITCH - RIGHT HAND
5. CREEPER SOLENOID
7. 2WD/4WD SOLENOID
8. REAR PTO BRAKE SOLENOID
11. SET ENGINE SPEED SWITCH
14. REAR PTO SOLENOID DRIVER
16. DIFF LOCK SOLENOID
18. REAR PTO SOLENOID RETURN
21. PTO SHAFT TWIST SENSOR
22. ENGINE FLYWHEEL SPEED SENSOR
23. REAR PTO MANUAL ON SWITCH
24. REAR PTO BRAKE SWITCH
25. +12V SWITCHED FEED FROM FUSE 19
27. REAR PTO ON LAMP
28. DIFF LOCK MANUAL LAMP
29. DIFF LOCK AUTO LAMP
30. DIFF LOCK MANUAL ON SWITCH
31. DIFF LOCK AUTO ON SWITCH
33. GROUND SPEED PTO SWITCH
34. +12V SWITCHED FEED FROM FUSE 19


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
ELECTRONIC DRAFT CONTROL
24x24 LEFT HAND SHUTTLE TRANSMISSION CONTROL
AUTO FEATURES
4WD/ DIFF_LOCK CONTROL
PTO (REAR) CONTROL
FENDER HITCH CONTROL SWITCHES
RAISE/WORK/FLOAT SWITCH
RAISE/LOWER MOMENTARY SWITCH
DRAFT CONTROL
EDC MOUSE
HEIGHT LIMIT
SLIP LIMIT (OPTION)
DROP RATE CONTROL
SENSITIVITY CONTROL
EDC COMMAND ARM
HAND THROTTLE (2 track potentiometer)
THROTTLE IDLE SWITCH
SEAT SWITCH OCCUPIED=CLOSED
SHUTTLE NEUTRAL SW (NEUTRAL POSITION)
CLUTCH PEDAL SW (SHOWN DEPRESSED)
CREEPER_RAIL_SW (SHOWN NOT ENGAGED)
CRANK RELAY (outside cab)
STARTER MOTOR SOLENOID
MAIN_NEUT_SW (BOTH OPEN=NEUT)
HM_NEUT_SW (OPEN=NEUT)
SHUTTLE LEVER
CLS=FORWARD
CLS=REVERSE
CLUTCH PEDAL SENSOR
FR_SYNCHRO_POS
F-R_SYNCRO POSITION SENSOR
CPEDAL_POS
TRANS_OIL_TEMP
POWERSHIFT_UP
POWERSHIFT_DOWN
DEADMAN SWITCH
HTS_ON/OFF_SW
CONST_ERPM ON/OFF
CONSTANT ENGINE SPEED SETTING
CONST ENGINE SPEED ADJUST
REVERSE_ALARM RELAY (If fitted)
FWD SYNCHRO SOLENOID
REV SYNCHRO SOLENOID
HIGH_CLUTCH SOLENOID
LOW_CLUTCH SOLENOID
PROVIDE_PSI SOLENOID
FENDER_L_SW
FENDER_R_SW
PTO REAR BRAKE SW
REAR PTO SPEED SENSOR
PTO TWIST SENSOR (HALL EFFECT)
R_PTO MANAGEMENT ON SWITCH
CREEPER SWITCH
DIFF_LOCK_SW
4WD_SW
TRANS OUTPUT SPEED SENSOR
ENG_FLYWHL SPEED SENSOR (HALL EFFECT)
REAR PTO SOLENOID
REAR PTO SWITCH LAMP
REAR PTO BRAKE SOLENOID
CREEPER SOLENOID
DIFF-LOCK SOLENOID
2 WD SOLENOID
DIAGNOSTICS CONNECTOR 1
XCM DA
CAN BUS 1
BRAKE_L_SW
BRAKE_R_SW
HANDBRAKE_SW
RADAR (for slip)
CRANK_RELAY
IC_SERVICE_SW
GRID_HEAT_ON (ACTIVE LOW)
POWER GROUND


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
HYDRAULICS_STOP
+12V_EDC CN1a-20
12VH
+5VREF_SUSP/EHR/PTO CN1b-17
EHR1_MOTOR_SW CN3a-16
EHR1_LEVER_POS CN3a-1
EHR1_ACTIVE_SW CN3b-11
EHR1_FULLFLOW_SW CN4-10
EHR1_FLOAT_SW CN4-11
TIME/FLOW1_SW CN1b-30
OFF
TIME/FLOW2_SW CN3b-30
TIME_FLOW12_SW
EHR2_MOTOR_SW CN3a-17
EHR2_LEVER_POS CN3a-3
EHR2_ACTIVE_SW CN3b-31
EHR2_FULLFLOW_SW CN4-12
EHR2_FLOAT_SW CN4-17
EHR3_MOTOR_SW CN3a-18
EHR3_LEVER_POS CN3a-5
EHR3_ACTIVE_SW CN3a-14
EHR3_FULLFLOW_SW CN4-18
EHR3_FLOAT_SW CN4-23
TIME/FLOW3_SW CN3b-32
TIME/FLOW4_SW CN3a-15
TIME_FLOW34_SW
EHR4_MOTOR_SW CN3a-19
EHR4_LEVER_POS CN3a-7
EHR4_ACTIVE_SW CN3a-20
EHR4_FULLFLOW_SW CN4-24
EHR4_FLOAT_SW CN4-25
X_POS CN3a-2
Y_POS CN3a-12
JOYSTICK_ACTIVE_SW CN3a-13
JOYSTICK_CONTROL
PROVISION FOR
CRANK_DETECT (for CAN) CN1b-21
1 ELECTRO-HYD. REMOTES
5
AN_31
AN_18
SW_20
SW_29
SW_30
SW_12
SW_23
AN_32
AN_20
SW_24
SW_31
SW_33
AN_15
AN_22
SW_15
SW_35
SW_32
SW_26
SW_16
AN_16
AN_24
SW_17
SW_34
SW_36
AN_19 (100KPD)
AN_29 (100KPD)
AN_30 (2K2PU)
SW_4
LSD_7
LSD_10
LSD_8
LSD_11
LSD_6
CN3b-26
CN3b-28
CN3b-29
CN4-2
CN2-25
EHR1_PROG_LMP
EHR2_PROG_LMP
EHR3_PROG_LMP
EHR4_PROG_LMP
EHR_STOP_SW_LMP
CN4-26 CAN2_SHIELD
CN4-19 CAN2_L
CN4-13 CAN2_H
CN1a-8 12VD
CN3b-25 12VT
CN3b-34 12VT
CN1a-1 12VF
CN1a-2 12VF
CN1a-3 12VF
LOCKOUT_ON_SW CN1b-29
LOCKOUT_ON_LAMP CN2-18
momn
SW_11(PD)
LSD_3
+5VREF CN1b-17
AXLE_POS CN1b-7
AN_7 (100K PD)
CHASSIS_ACCELEROMETER_1 (IF USED) CN1b-1
AN_1 (100K PD)
CHASSIS_ACCELEROMETER_2 (IF USED) CN1b-4
AN_4 (100K PD)
PRESSURE SENSOR_1 CN1b-5
AN_5 (100K PD)
PRESSURE SENSOR_2 CN1b-6
AN_6 (100K PD)
PROVISION FOR
+12V_HOT CN1a-14
12VP
2 FRONT AXLE SUSPENSION CONTROL
HSD_4 (+12VD) CURSEN_4
HSD_2 (+12VF) CURSEN_2
HSD_7 (BTS442) (+12VF) CURSEN_7
HSD_9 (BTS442) (+12VF) CURSEN_9
CN1a-11 CN2-3 FRONT AXLE SUSPENSION RAISE SOLENOID
CN1a-10 CN2-1 FRONT AXLE SUSPENSION LOWER SOLENOID
CN1a-6 CN2-6 FRONT AXLE SUSPENSION UPPER LOCKOUT SOLENOID
CN1a-7 CN2-13 FRONT AXLE SUSPENSION LOWER LOCKOUT SOLENOID
HSD_3 (+12VD) CURSEN_3
HSD_5 (+12VH) CURSEN_5
CN1a-4 CN2-2 ADDITIONAL FRONT AXLE SUSPENSION SOLENOID_1
CN1a-5 CN2-4 ADDITIONAL FRONT AXLE SUSPENSION SOLENOID_2
PROVISION FOR
HYDRAULICS_STOP CN3a-21
SW-18
3 PTO (FRONT) CONTROL
SPARE CN1b-23
SW_6
SPARE CN1b-24
SW_7
FRONT PTO SWITCH
FPTO_NO_SW CN1b-11
FPTO_NC_SW CN1b-12
AN-11 (1K2 PD)
AN_12 (1K2 PD)
FRONT PTO SPEED SENSOR (RELUCTANCE)
FPTOSPD CN2-20
FQ-4(R)
FRONT FENDER HITCH CONTROL SWITCHES (Both shown OFF)
RAISE
LOWER
FRNT_HITCH_COMMON_SW CN1b-22
FRNT_HITCH_EXT_UP_SW CN1b-26
FRNT_HITCH_EXT_DWN_SW CN1b-27
FRONT_HL_ENABLE_SW CN1b-18
SW-5
SW-8
SW-9
SW_1
4 FRONT HPL CONTROL
+5VREF CN1b-16
5VREF
SET POSITION CN1b-3
AN_3 (100K PD)
HITCH POSITION CN1b-2
AN_2 (100K PD)
N.U. OPERATOR_PRESENT CN1b-19
SW_2
HSD_1 (+12VH)
CN1a-9 PTO_F_BRAKESOL
FRONT PTO BRAKE SOLENOID (IF USED)
HSD-8 (+12VH)
CN1a-13
FRONT PTO SOLENOID
FRONT PTO SWITCH LAMP
CURSEN_8 (PTO_LSD)
CN2-7
LSD_4 Lamp test populated
CN2-19 FRONT_PTO_ON_LMP
HSD-6 (12VH)
CN1a-12 FRONT_HITCH_CHECKSOL
FRONT HITCH SET HEIGHT SOLENOID
DIAGNOSTICS CONNECTOR 3
+12V_EXT
SW-10
CN2-22 SERIAL OUT
CN2-23 SERIAL IN
CN1b-28 SERVICE_SW
CN2-10 RS232 IN
CN2-9 RS232 OUT
CN1a-24 PROG EN
DATA OUT
DATA IN
SERVICE_SW
+12VDGN
GND
RS232 IN
RS232 OUT
PROGRAM_EN
POWER GROUND
CN2-21
CN2-26
CN1a-25
CN1a-26
CN1a-23 SENSOR GROUND
CN1a-19 CASE GND
CN1a-16 CANTA_LO
CN1a-17 CANTA_CORN
CN1a-18 CANTA_SHIELD
CN1a-21 CANTB_HI
CN1a-22 CANTB_LO
CN1b-15 BUS_A_SEL
N.U.
CAN BUS 1
CAN BUS_EHR
CRANK_RELAY
IC_SERVICE_SW
GRID HEAT ON (ACTIVE LOW)
XCM DD
C325 CN1b C329
C324 CN1a C327
C326 CN2 C328
CN4 C3a C3b
CN1b
CN1a
CN2
CN3b
CN3a
CN4
6
7
8

16X16 & 24X24 MODELS - AUXILIARY CONTROL UNIT - DD FRONT SUSPENSION, EHR's, FRONT LIFT AND PTO CONTROL

1. ELECTRO HYDRAULIC REMOTE (EHR) CONTROL
2. FRONT AXLE SUSPENSION CONTROL
3. FRONT PTO CONTROL
4. FRONT LIFT CONTROL
5. EHR LEVERS
6. SENSOR GROUND
7. CASE GROUND
8. CHASSIS GROUND

CONNECTOR C324 (CN1a)

1. +12V (VF) FROM FUSE 19
2. +12V (VF) FROM FUSE 19
3. +12V (VF) FROM FUSE 19
4. ADDITIONAL FRONT AXLE SUSPENSION SOL.1
5. ADDITIONAL FRONT AXLE SUSPENSION SOL. 2
6. SUSPENSION UPPER LOCKOUT SOLENOID
7. SUSPENSION LOWER LOCKOUT SOLENOID
8. +12V (VD) FROM FUSE19
9. FRONT PTO BRAKE SOLENOID (IF USED)
10. SUSPENSION LOWER SOLENOID
11. SUSPENSION RAISE SOLENOID
12. FRONT HITCH HEIGHT SOLENOID
13. FRONT PTO SOLENOID SUPPLY
14. +12V (VP) PERMANENT - FUSE 12
15. CAN 1 HIGH
16. CAN 1 LOW
19. CASE GROUND
20. +12V (VH) FROM FUSE 14
23. SENSOR GROUND
24. PROGRAM EN.
25. CHASSIS GROUND
26. CHASSIS GROUND

CONNECTOR C325 (CN1b)

1. CHASSIS ACCELEROMETER 1
2. FRONT LIFT HITCH POSITION POT.
3. FRONT LIFT SET POSITION POT.
4. CHASSIS ACCELEROMETER 2
5. PRESSURE SENSOR 1
6. PRESSURE SENSOR 2
7. FRONT AXLE POSITION POT
11. FRONT PTO SWITCH
12. FRONT PTO SWITCH
16. +5V REFERENCE
17. +5V REFERENCE
18. FRONT HITCH ENABLE SWITCH
21. CRANK DETECT
22. FRONT HITCH FENDER SWITCH - COMMON
23. SPARE
24. SPARE
26. FRONT HITCH FENDER SWITCH - RAISE
27. FRONT HITCH FENDER SWITCH - LOWER
28. SERVICE SWITCH
29. SUSPENSION LOCKOUT SWITCH
30. TIME / FLOW 1 SWITCH

CONNECTOR C326 (CN2)

1. SUSPENSION LOWER SOLENOID RETURN
3. SUSPENSION RAISE SOLENOID RETURN
6. SUSPENSION UPPER LOCKOUT SOLENOID RETURN
7. FRONT PTO SOLENOID RETURN
9. RS232 OUT
10. RS232 IN
13. SUSPENSION LOWER LOCKOUT SOLENOID RETURN
18. SUSPENSION LOCKOUT LAMP
19. FRONT PTO ON LAMP
20. FRONT PTO SPEED SENSOR
21. CHASSIS GROUND
22. SERIAL OUT
23. SERIAL IN
25. EHR STOP SWITCH LAMP
26. CHASSIS GROUND

CONNECTOR C327 (CN3a)

1. EHR 1 LEVER POSITION
2. "X" POS JOYSTICK CONTROL
3. EHR 2 LEVER POSITION
5. EHR 3 LEVER POSITION
7. EHR 4 LEVER POSITION
12. "Y" POS JOYSTICK CONTROL
13. JOYSTICK ACTIVE SWITCH
14. EHR 3 ACTIVE SWITCH
15. TIME / FLOW 4 SWITCH
16. EHR 1 MOTOR SWITCH
17. EHR 2 MOTOR SWITCH
18. EHR 3 MOTOR SWITCH
19. EHR 4 MOTOR SWITCH
20. EHR 4 ACTIVE SWITCH
21. EHR HYDRAULIC STOP

CONNECTOR C328 (CN3b)

11. EHR 1 ACTIVE SWITCH
25. +12V (VT) FROM FUSE 19
26. EHR 1 PROGRAM LAMP
28. EHR 2 PROGRAM LAMP
29. EHR 3 PROGRAM LAMP
30. TIME / FLOW 2 SWITCH
31. EHR 2 ACTIVE SWITCH
32. TIME / FLOW 3 SWITCH
34. +12V (VT) FROM FUSE 19

CONNECTOR C329 (CN4)

2. EHR 4 PROGRAM LAMP
10. EHR 1 FULL FLOW SWITCH
11. EHR 1 FLOAT SWITCH
12. EHR 2 FULL FLOW SWITCH
13. CAN 2 HIGH
17. EHR 2 FLOAT SWITCH
18. EHR 3 FULL FLOW SWITCH
19. CAN 2 LOW
23. EHR 3 FLOAT SWITCH
24. EHR 4 FULL FLOW SWITCH
25. EHR 4 FLOAT SWITCH

ELECTRONIC ENGINE CONTROL

EDC7 MODULE

1. EDC7 MODULE
2. ENGINE, COMPONENT SIDE, CONNECTOR
3. VEHICLE, HARNESS SIDE, CONNECTOR
4. FUEL METERING UNIT
5. INJECTOR CYLINDER 1
6. INJECTOR CYLINDER 2
7. INJECTOR CYLINDER 3
8. INJECTOR CYLINDER 4
9. INJECTOR CYLINDER 5
10. INJECTOR CYLINDER 6
11. DIAGNOSTIC CONNECTOR
12. FOOT THROTTLE CONTROL
14. FUEL FILTER HEATER
15. GRID HEATER RELAY #2
16. GRID HEATER RELAY #1
17. BOOST PRESSURE AND TEMPERATURE SENSOR
18. OIL PRESSURE AND OIL TEMPERATURE SENSOR
19. RAIL PRESSURE SENSOR
20. COOLANT TEMPERATURE
21. FUEL TEMPERATURE
22. CRANKSHAFT SPEED SENSOR (FRONT PULLEY)
23. CAMSHAFT SPEED SENSOR
24. SENSOR GROUND
25. CHASSIS GROUND
26. POWER GROUND

CONNECTOR C242 (1.XX)

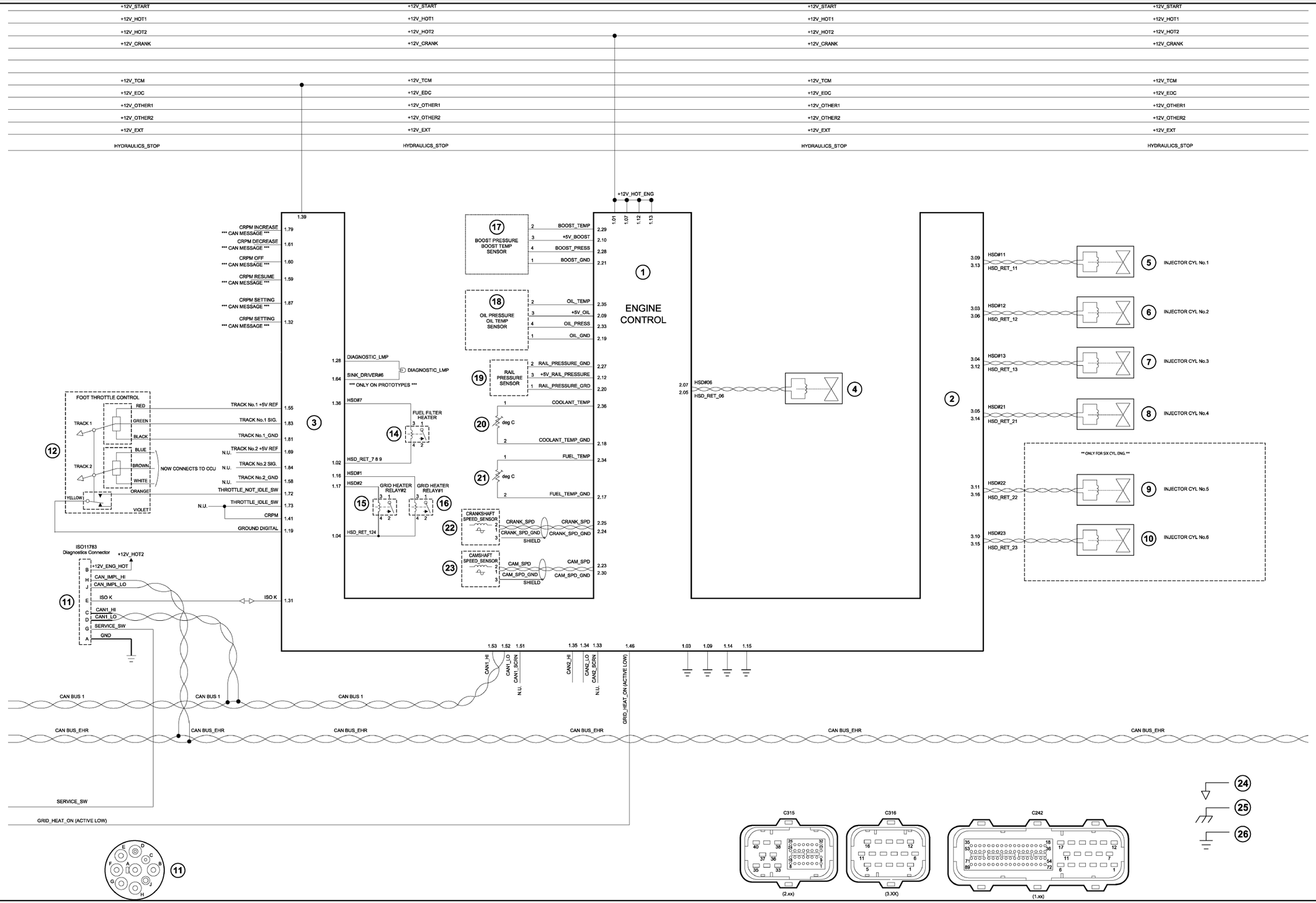
1. +12V PERMANENT FROM FUSE 27
2. FUEL FILTER HEATER RETURN
3. POWER GROUND
4. GRID HEATER RELAY RETURN
7. +12V PERMANENT FROM FUSE 27
9. POWER GROUND
11. ENGINE BRAKE SOLENOID SUPPLY
12. +12V PERMANENT FROM FUSE 27
13. +12V PERMANENT FROM FUSE 27
14. POWER GROUND
15. POWER GROUND
16. GRID HEATER RELAY #1 SUPPLY
17. GRID HEATER RELAY #2 SUPPLY
19. GROUND DIGITAL
21. ENGINE EXHAUST BRAKE SWITCH
31. DIAGNOSTIC K-LINE
34. CAN 2 LOW
35. CAN 2 HIGH
36. FUEL FILTER HEATER SUPPLY
39. +12V FROM FUSE 13
46. GRID HEATER ON (TO INSTRUMENT CLUSTER)
52. CAN 1 LOW
53. CAN 1 HIGH
55. +5V REFERENCE
72. FOOT THROTTLE IDLE SWITCH
81. FOOT THROTTLE TRACK 1 GROUND
83. FOOT THROTTLE TRACK 1 SIGNAL

CONNECTOR C315 (2.XX)

5. FUEL METERING UNIT RETURN
7. FUEL METERING UNIT SUPPLY
9. +5V OIL SENSOR SUPPLY
10. +5V BOOST SENSOR SUPPLY
12. +5V RAIL PRESSURE SENSOR SUPPLY
17. FUEL TEMPERATURE SENSOR GROUND
18. COOLANT TEMPERATURE GROUND
19. OIL SENSOR GROUND
20. RAIL PRESSURE SENSOR GROUND
21. BOOST SENSOR GROUND
23. CAMSHAFT SPEED SENSOR SUPPLY
24. CRANKSHAFT SPEED SENSOR GROUND
25. CRANKSHAFT SPEED SENSOR SUPPLY
27. RAIL PRESSURE GROUND
28. BOOST PRESSURE
29. BOOST TEMPERATURE
30. CAMSHAFT SPEED SENSOR GROUND
33. OIL PRESSURE
34. FUEL TEMPERATURE SENSOR
35. OIL TEMPERATURE
36. COOLANT TEMPERATURE

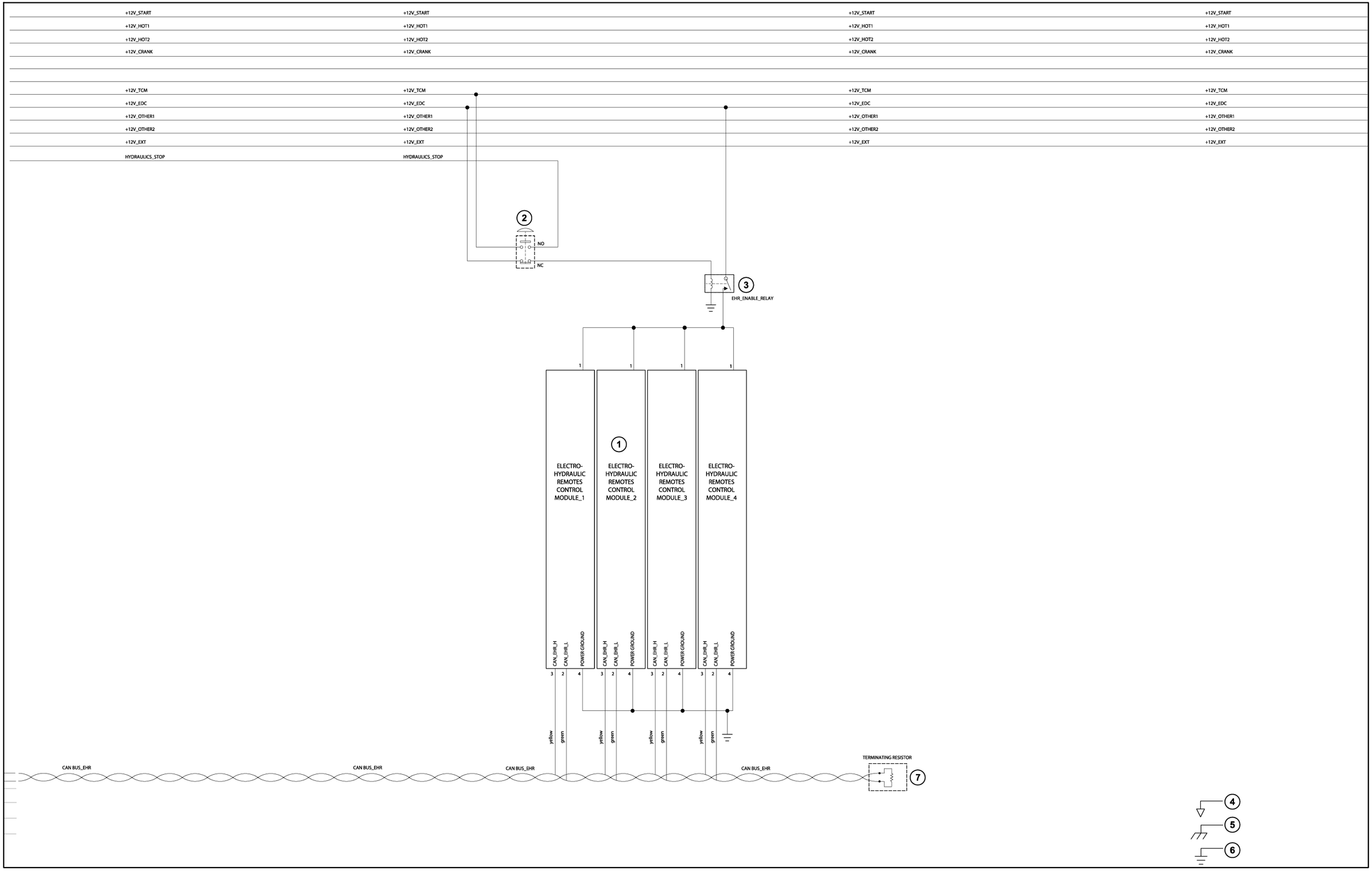
CONNECTOR C316 (3.XX)

3. INJECTOR CYLINDER NUMBER 2 SUPPLY
4. INJECTOR CYLINDER NUMBER 3 SUPPLY
5. INJECTOR CYLINDER NUMBER 4 SUPPLY
6. INJECTOR CYLINDER NUMBER 2 RETURN
9. INJECTOR CYLINDER NUMBER 1 SUPPLY
10. INJECTOR CYLINDER NUMBER 6 SUPPLY
11. INJECTOR CYLINDER NUMBER 5 SUPPLY
12. INJECTOR CYLINDER NUMBER 3 RETURN
13. INJECTOR CYLINDER NUMBER 1 RETURN
14. INJECTOR CYLINDER NUMBER 4 RETURN
15. INJECTOR CYLINDER NUMBER 6 RETURN
16. INJECTOR CYLINDER NUMBER 5 RETURN


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
HYDRAULICS_STOP
+12V_HOT_ENG
ENGINE CONTROL
1.01
1.07
1.12
1.13
1.39
CRPM INCREASE *** CAN MESSAGE ***
CRPM DECREASE *** CAN MESSAGE ***
CRPM OFF *** CAN MESSAGE ***
CRPM RESUME *** CAN MESSAGE ***
CRPM SETTING *** CAN MESSAGE ***
CRPM SETTING *** CAN MESSAGE ***
1.79
1.61
1.60
1.59
1.87
1.32
DIAGNOSTIC_LMP
SINK_DRIVER#6
*** ONLY ON PROTOTYPES ***
1.28
1.64
HSD#7
1.36
HSD_RET_7 8 9
1.02
HSD#1
1.16
HSD#2
1.17
HSD_RET_124
1.04
FUEL FILTER HEATER
GRID HEATER RELAY#2
GRID HEATER RELAY#1
FOOT THROTTLE CONTROL
TRACK 1
TRACK 2
RED
GREEN
BLACK
BLUE
BROWN
WHITE
ORANGE
YELLOW
VIOLET
NOW CONNECTS TO CCU
TRACK No.1 +5V REF
TRACK No.1 SIG.
TRACK No.1_GND
TRACK No.2 +5V REF
TRACK No.2 SIG.
TRACK No.2_GND
THROTTLE_NOT_IDLE_SW
THROTTLE_IDLE_SW
CRPM
GROUND DIGITAL
1.55
1.83
1.81
1.69
1.84
1.58
1.72
1.73
1.41
1.19
N.U.
BOOST_TEMP
+5V_BOOST
BOOST_PRESS
BOOST_GND
2.29
2.10
2.28
2.21
OIL_TEMP
+5V_OIL
OIL_PRESS
OIL_GND
2.35
2.09
2.33
2.19
RAIL_PRESSURE_GND
+5V_RAIL_PRESSURE
RAIL_PRESSURE_GRD
2.27
2.12
2.20
COOLANT_TEMP
COOLANT_TEMP_GND
2.36
2.18
FUEL_TEMP
FUEL_TEMP_GND
2.34
2.17
CRANKSHAFT SPEED_SENSOR
CRANK_SPD
CRANK_SPD_GND
SHIELD
2.25
2.24
CAMSHAFT SPEED_SENSOR
CAM_SPD
CAM_SPD_GND
SHIELD
2.23
2.30
HSD#06
HSD_RET_06
2.07
2.05
HSD#11
HSD_RET_11
3.09
3.13
HSD#12
HSD_RET_12
3.03
3.06
HSD#13
HSD_RET_13
3.04
3.12
HSD#21
HSD_RET_21
3.05
3.14
** ONLY FOR SIX CYL. ENG. **
HSD#22
HSD_RET_22
3.11
3.16
HSD#23
HSD_RET_23
3.10
3.15
INJECTOR CYL No.1
INJECTOR CYL No.2
INJECTOR CYL No.3
INJECTOR CYL No.4
INJECTOR CYL No.5
INJECTOR CYL No.6
ISO11783 Diagnostics Connector
+12V_HOT2
+12V_ENG_HOT
CAN_IMPL_HI
CAN_IMPL_LO
ISO K
CAN1_HI
CAN1_LO
SERVICE_SW
GND
ISO K
1.31
1.53
1.52
1.51
CAN1_HI
CAN1_LO
CAN1_SCRN
N.U.
1.35
1.34
1.33
CAN2_HI
CAN2_LO
CAN2_SCRN
N.U.
1.46
GRID_HEAT_ON (ACTIVE LOW)
1.03
1.09
1.14
1.15
CAN BUS 1
CAN BUS_EHR
SERVICE_SW
GRID_HEAT_ON (ACTIVE LOW)
C315
C316
C242
(2.xx)
(3.XX)
(1.xx)

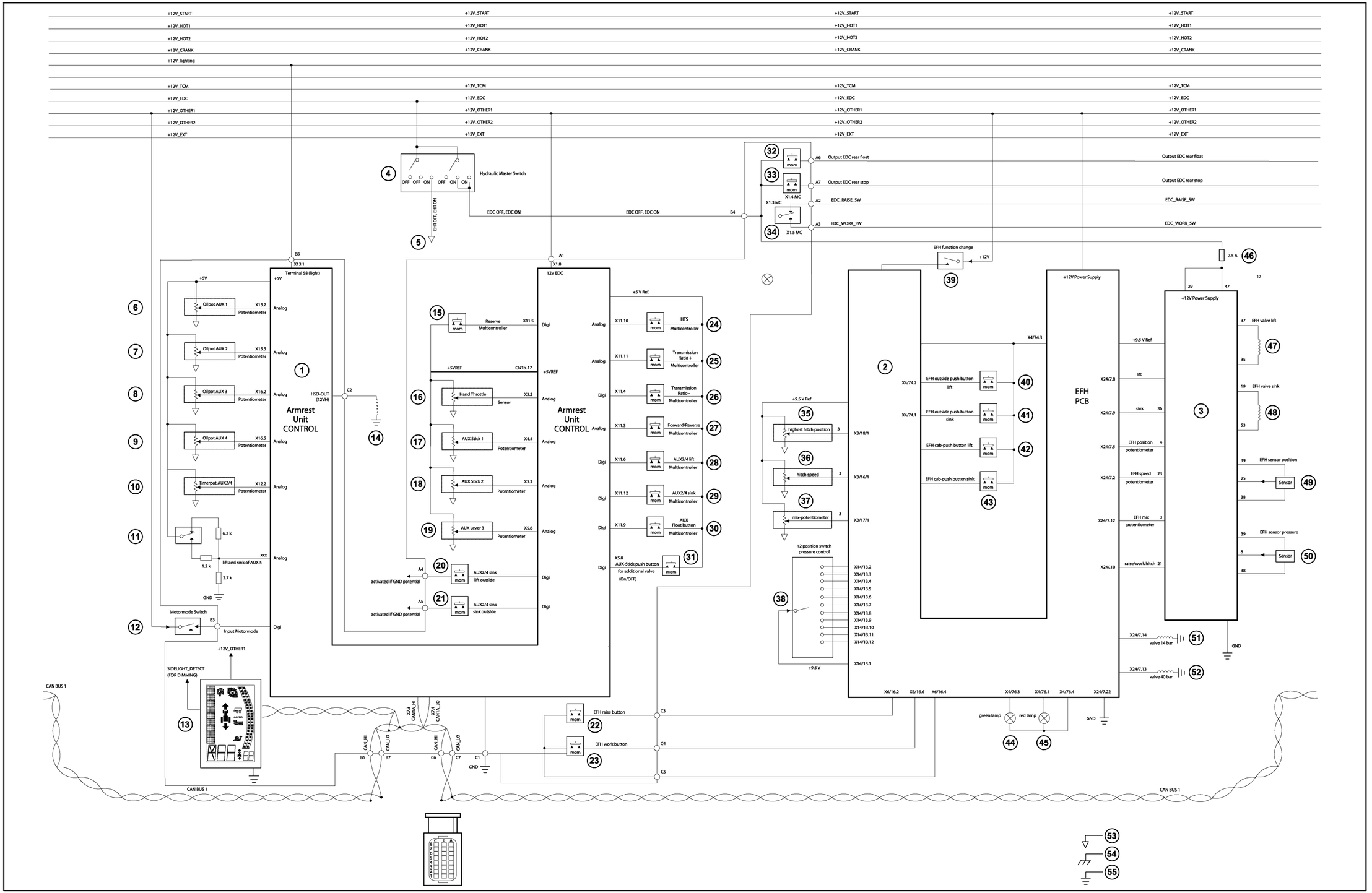
ELECTRO - HYDRAULIC REMOTE (EHR) CONTROL SYSTEM DIAGRAM

1. ELECTRO-HYDRAULIC REMOTE VALVES
2. EHR VALVES EMERGENCY STOP BUTTON
3. EHR ENABLE RELAY
4. SENSOR GROUND
5. CHASSIS GROUND
6. POWER GROUND
7. TERMINATING RESISTOR


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
HYDRAULICS_STOP
2
NO
NC
3
EHR_ENABLE_RELAY
1
1
1
1
1
ELECTRO-HYDRAULIC REMOTES CONTROL MODULE_1
ELECTRO-HYDRAULIC REMOTES CONTROL MODULE_2
ELECTRO-HYDRAULIC REMOTES CONTROL MODULE_3
ELECTRO-HYDRAULIC REMOTES CONTROL MODULE_4
CAN_EHR_H
CAN_EHR_L
POWER GROUND
3
2
4
yellow
green
CAN BUS_EHR
TERMINATING RESISTOR
7
4
5
6

ARM REST UNIT AND ELECTRONIC FRONT HITCH (EFH) SYSTEM DIAGRAM

1. ARM REST UNIT MODULE
2. ELECTRONIC FRONT HITCH MODULE
3. ELECTRONIC FRONT HITCH (BOSCH MODULE)
4. HYDRAULIC MASTER SWITCH
5. (TO ELECTRO HYDRAULIC REMOTE SCHEMATIC)
6. POTENTIOMETER AUX 1
7. POTENTIOMETER AUX 2
8. POTENTIOMETER AUX 3
9. POTENTIOMETER AUX 4
10. POTENTIOMETER - TIMER AUX 2/4
11. SWITCH - LIFT AND LOWER OF AUX 5
12. MOTORMODE SWITCH
13. GEAR DISPLAY MODULE
14. VALVE
15. MULICONTROLLER SWITCH (RESERVE)
16. HAND THROTTLE
17. AUX STICK 1 POTENTIOMETER
18. AUX STICK 2 POTENTIOMETER
19. AUX LEVER 3 POTENTIOMETER
20. AUX 2/4 EXTERNAL LIFT
21. AUX 2/4 EXTERNAL LOWER
22. EFH LIFT BUTTON
23. EFH WORK BUTTON
24. HTS SWITCH
25. TRANSMISSION RATIO - UPSHIFT
26. TRANSMISSION RATIO - DOWNSHIFT
27. FORWARD / REVERSE
28. AUX 2/4 LIFT
29. AUX 2/4 LOWER
30. AUX FLOAT BUTTON
31. ADDITIONAL VALVE ON/OFF
32. EDC REAR FLOAT
33. EDC REAR STOP
34. EDC RAISE / WORK SWITC
35. HITCH POSITION SET POTENTIOMETER
36. HITCH SPEED SET POTENTIOMETER
37. HITCH MIX POTENTIOMETER
38. PRESSURE CONTROL SWITCH
39. EFH FUNCTION SWITCH
40. EFH EXTERNAL LIFT SWITCH
41. EFH EXTERNAL LOWER SWITCH
42. EFH CAB LIFT SWITCH
43. EFH CAB LOWER SWITCH
44. GREEN LAMP
45. RED LAMP
46. FUSE
47. EFH LIFT VALVE
48. EFH LOWER VALVE
49. EFH POSITION SENSOR
50. EFH PRESSURE SENSOR
51. VALVE - 14 BAR
52. VALVE - 40 BAR
53. SENSOR SIGNAL GROUND
54. CHASSIS GROUND
55. POWER GROUND


+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK
+12V_lighting
+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT
Hydraulic Master Switch
OFF OFF ON OFF ON ON
EHR OFF, EHR ON
EDC OFF, EDC ON
B4
Output EDC rear float
Output EDC rear stop
EDC_RAISE_SW
EDC_WORK_SW
X1.4 MC
X1.3 MC
X1.5 MC
EFH function change
+12V
7.5 A
+12V Power Supply
B8
X13.1
Terminal 58 (light)
A1
X1.8
12V EDC
Armrest Unit CONTROL
HSD-OUT (12V/4)
Oilpot AUX 1
Oilpot AUX 2
Oilpot AUX 3
Oilpot AUX 4
Timerpot AUX2/4
Potentiometer
Analog
Digi
6.2 k
1.2 k
2.7 k
lift and sink of AUX 5
GND
Motormode Switch
Input Motormode
+12V_OTHER1
SIDELIGHT_DETECT (FOR DIMMING)
CAN BUS 1
CAN_HI
CAN_LO
+5 V Ref.
Reserve
HTS
Transmission Ratio +
Transmission Ratio -
Forward/Reverse
AUX2/4 lift
AUX2/4 sink
AUX Float button
Multicontroller
+5VREF
CN1b-17
Hand Throttle
Sensor
AUX Stick 1
AUX Stick 2
AUX Lever 3
AUX2/4 sink lift outside
AUX2/4 sink sink outside
activated if GND potential
AUX Stick push button for additional valve (On/OFF)
+9.5 V Ref
highest hitch position
hitch speed
mix-potentiometer
12 position switch pressure control
+9.5 V
EFH outside push button lift
EFH outside push button sink
EFH cab-push button lift
EFH cab-push button sink
EFH raise button
EFH work button
EFH PCB
+9.5 V Ref
lift
sink
EFH position potentiometer
EFH speed potentiometer
EFH mix potentiometer
raise/work hitch
valve 14 bar
valve 40 bar
EFH valve lift
EFH valve sink
EFH sensor position
EFH sensor pressure
Sensor
green lamp
red lamp
GND

12 x 12 MODELS ONLY – PTO / DIFF LOCK / 4WD CONTROL (SCM – SMALL CONRTOL MODULE)

1. PTO /DIFF LOCK / 4WD CONTROL
2. DIFF LOCK LAMPS
3. DIFF LOCK
4. PTO
5. BRAKE
6. SENSOR SIGNAL GROUND
7. CHASSIS GROUND
8. POWER GROUND

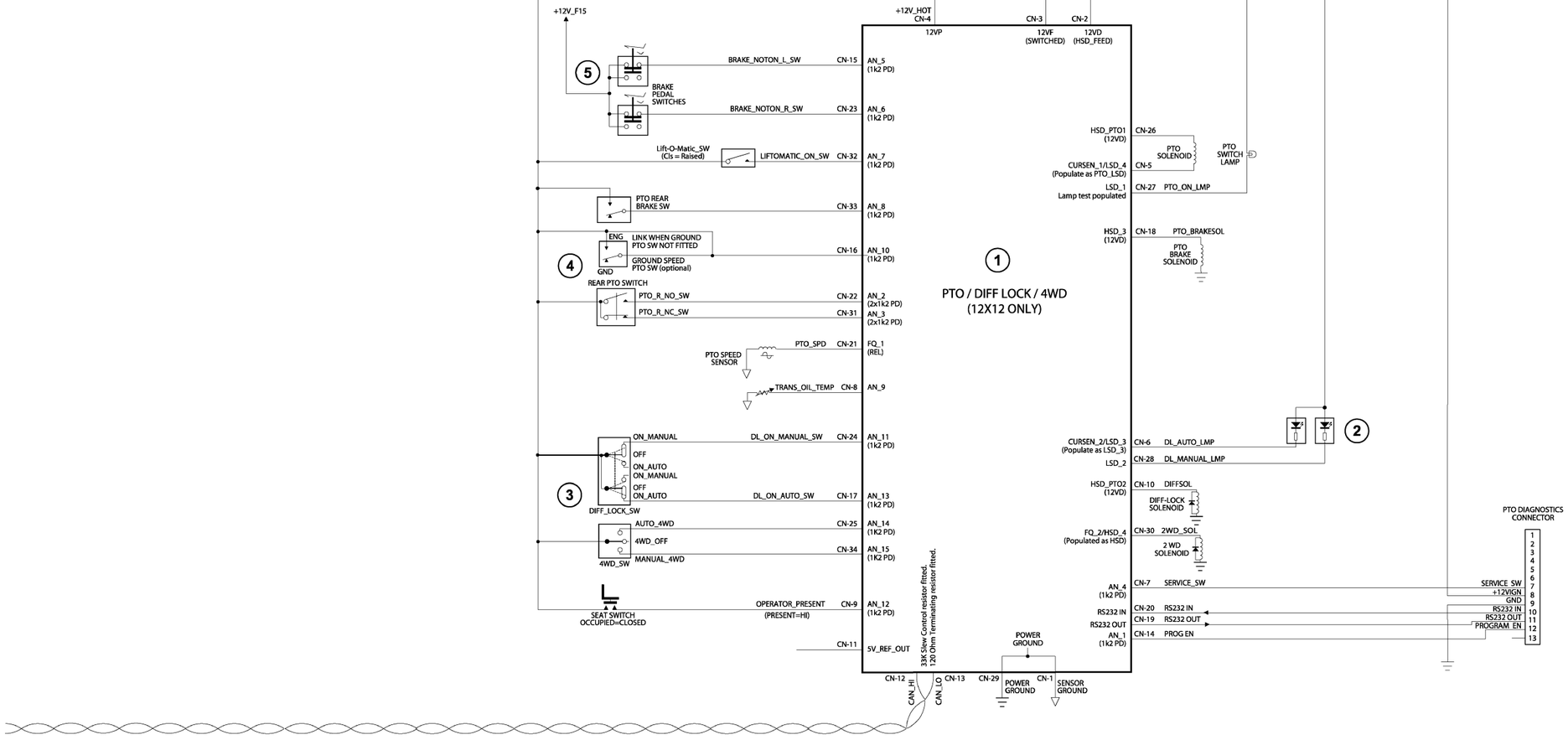
SCM - TERMINALS

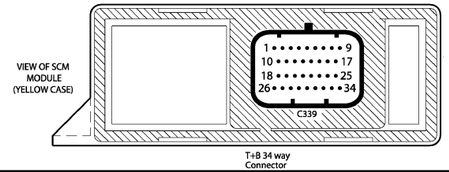
CONNECTOR C339 - CN

1. SENSOR GROUND
2. +12VD HSD FEED
3. +12VF SWITCHED
4. +12V HOT FEED
5. PTO SOLENOID RETURN
6. DIFF LOCK AUTO LAMP
7. SERVICE SWITCH
8. TRANSMISSION OIL TEMPERATURE
9. SEAT SWITCH
10. DIFF LOCK SOLENOID
12. CAN 1 - HI
13. CAN 1 - LO
14. PROGRAM EN
15. BRAKE NOT ON - LEFT SWITCH
16. GROUND SPEED PTO
17. DIFF LOCK ON - AUTO SWITCH
18. PTO BRAKE SOLENOID
19. RS232 OUT
20. RS232 IN
21. PTO SPEED SENSOR
22. REAR PTO SWITCH (N/O)
23. BRAKE NOT ON - RIGHT SWITCH
24. DIFF LOCK ON - MANUAL SWITCH
25. 4WD AUTO SWITCH
26. PTO SOLENOID FEED
27. PTO ON LAMP
28. DIFF LOCK MANUAL LAMP
29. POWER GROUND
30. 2WD SOLENOID
31. REAR PTO SWITCH (N/C)
32. LIFTOMATIC ON SWITCH
33. REAR PTO BRAKE SWITCH
34. 4WD MANUAL SWITCH

+12V_START
+12V_HOT1
+12V_HOT2
+12V_CRANK

+12V_TCM
+12V_EDC
+12V_OTHER1
+12V_OTHER2
+12V_EXT

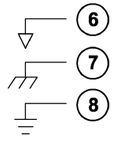




VIEW OF SCM
MODULE
(YELLOW CASE)

T+B 34 way
Connector

Diagnostic
connector
(harness)



NOTES PAGE

SECTION 55 - ELECTRICAL SYSTEM

Chapter 2 - Analogue/Digital Instrument Cluster

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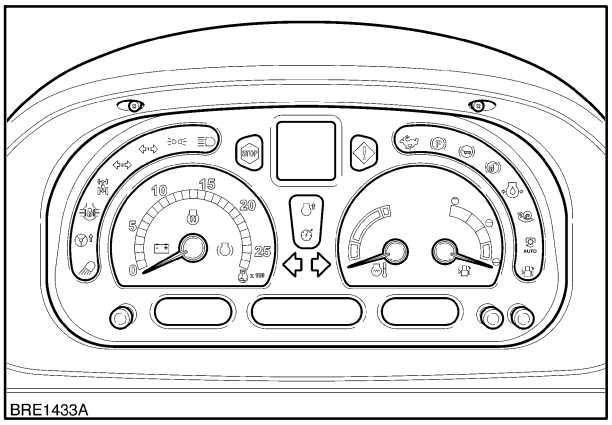
DESCRIPTION AND OPERATION

ANALOGUE/DIGITAL INSTRUMENTATION

The instrument panel consists of three analogue gauges, three liquid crystal displays (LCD's) and a dot matrix display (DMD).

In addition to the gauges and LCD displays there are 25 coloured lights providing other operating information or warning of system malfunction.

The lower left button on the instrument panel controls the intensity of back lighting for the LCD's and dot matrix displays, the two right-hand buttons adjust the digital clock.

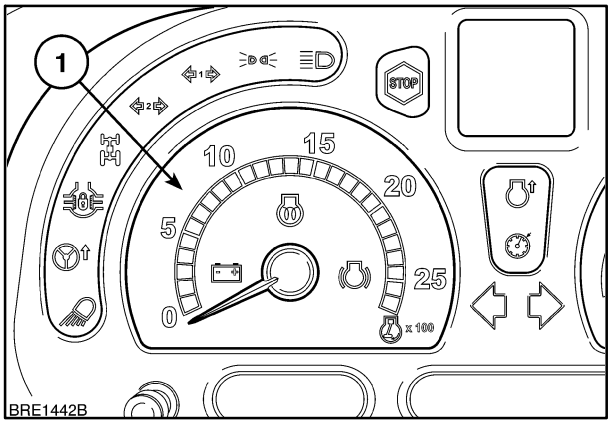


1

GAUGES

Engine Tachometer

The tachometer (1) indicates engine revolutions per minute. Each division on the scale represents 100 rev/min., therefore with the needle indicating '20' the engine is running at 2000 rev/min.



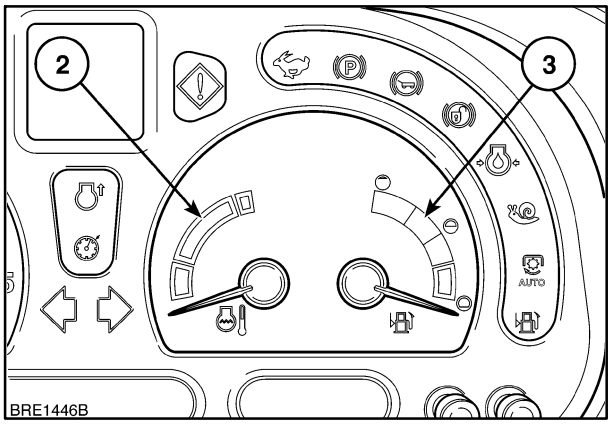
2

Engine Coolant Temperature Gauge

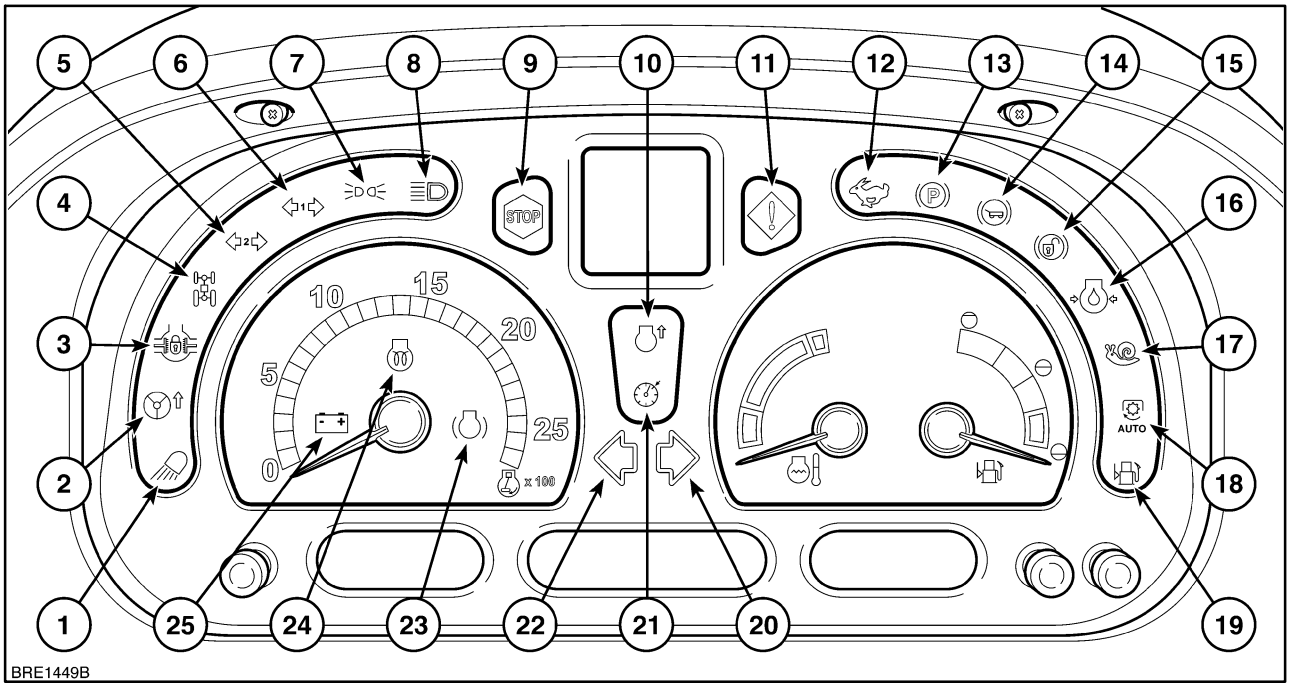
The temperature gauge (2) indicates the temperature of the engine coolant. If the needle enters the upper (red) section of the gauge while the engine is running, stop the engine and investigate the cause.

Fuel Level Gauge

The gauge (3) indicates the level of fuel in the tank and is only operative with the key-start switch turned on.



3



4

INDICATOR AND WARNING LIGHTS

The 25 coloured lights provide operating information or give warning of system malfunction. Illumination of a warning light may be accompanied by an audible alarm. Depending on the severity of the malfunction, an alarm will sound as follows.

Critical Alarm

Alarm will sound contiuously accompanied by the **red** warning light. The tractor **must** be stopped immeadiately. The alarm will sound until the fault is corrected or the engine switched off.

Non Critical Alarm

A 5 second continuous alarm will be accompanied by the **amber** warning light. A failure or error has occured but the operator may continue work. The fault should be rectified as soon as possible.

Action Required

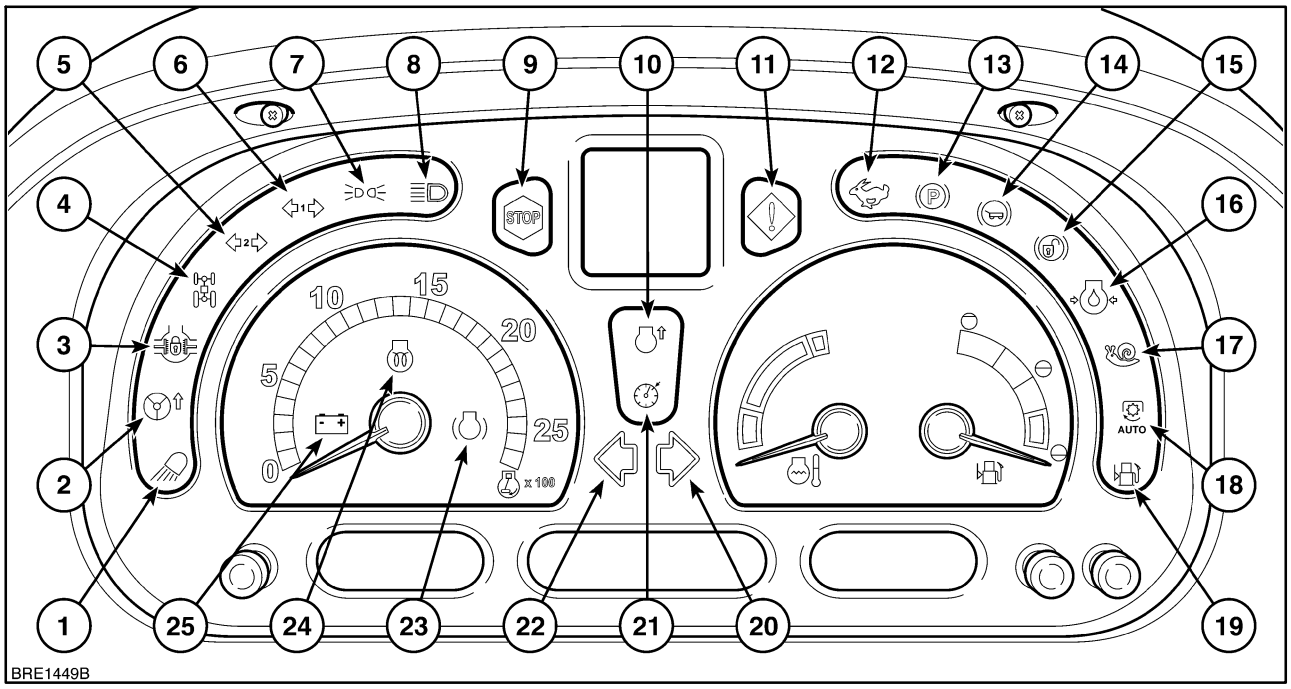
A two pulse alarm will sound for 1 second to advise the operator that a certain action is required. The alarm will contiinue to sound until the operator carries out the appropriate action or the tractor engine is switched off.

General Alarm

A general alarm will sound if the operator attempts to carry out an inappropriate action i.e. driving the tractor with the handbrake applied.

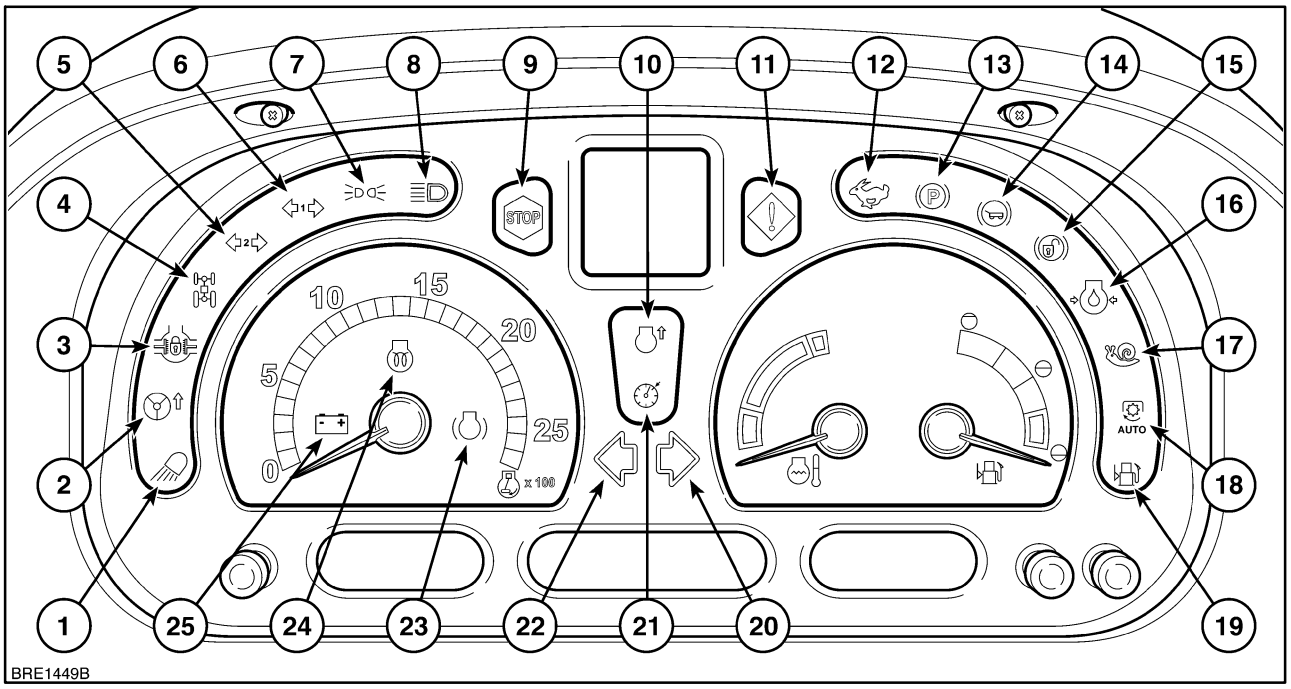
Indicator and Warning Lights

1. Work lamp - Light will illuminate when work lamps are switched on.
2. Fast Steer - Light will illuminate when fast steer function is activated.
3. Differential lock - Light will illuminate when the differential lock is engaged.
4. Four wheel drive - Light will illuminate when the drive to the front wheels is engaged.
5. Trailer turn signal - Light will flash with tractor/trailer turn signals when a second trailer is attached.
6. Trailer turn signal - Light will flash with tractor/trailer turn signals when a trailer is attached
7. Parking lights - Light will illuminate when the tractor lights are switched on.



5

8. Headlight high beam - Light will illuminate when the tractor lights are switched to high beam.
9. Red Stop light - If Stop light comes on stop the tractor immediately and investigate the cause. A warning symbol will appear in the Dot Matrix Display to confirm the location of the fault.
10. Engine power boost activated - Illumination of this light will be accompanied by the power boost symbol appearing in the Dot Matrix Display.
11. Amber Warning light - Illumination of this light will be accompanied by a warning symbol in the Dot Matrix Display. Stop the tractor and investigate the cause.
12. Direct drive indicator - Light will illuminate to indicate transmission is in direct drive.
13. Parking brake - Light will flash with key-start switch on and parking brake applied. If the key-start switch is turned off and the parking brake not applied, or the operator leaves the seat without applying the handbrake, a warning buzzer will sound for approximately 10 seconds or until the handbrake is applied.
14. Trailer brake pressure (Italy only) - Light will flash accompanied by a warning buzzer to indicate that hydraulic oil pressure to the trailer brake circuit is low. The Red Stop light will also illuminate. Stop the tractor and investigate the cause.
15. Brake pedals not latched - Light will illuminate to show when pedal latch is unlocked (Japan only).
16. Engine oil pressure - Steady light accompanied by the Red Stop light will indicate low engine oil pressure. Stop the engine and investigate the cause.
17. Creeper gears - Light will illuminate when creeper gears are engaged.
18. Auto P.T.O. function - The light will illuminate when the Auto P.T.O. function is enabled. Each time the implement is raised with Auto P.T.O. activated, the light will flash. When the implement is lowered into work the light will cease to flash and become steady.
19. Fuel level low - Light will be illuminated when the tractor requires re-fuelling.



6

20. Right turn indicator – Light will flash with tractor right-hand turn signal. Intermittent alarm will sound if indicator is not cancelled after 20 seconds.
21. Constant engine speed activated – Illumination of this light will be accompanied by the constant speed symbol appearing in the Dot Matrix Display.
22. Left turn indicator – Light will flash with tractor left-hand turn signal. Intermittent alarm will sound if indicator is not cancelled after 20 seconds (5 minutes with tractor stationary).
23. Engine exhaust brake – Light will illuminate when exhaust brake system is activated.
24. Cold start device – Light will illuminate when the grid heater is activated using the key–start switch.
25. Alternator – Light continuously illuminated indicates that the alternator is not charging. The Red Stop light will flash and the non critical alarm will sound.

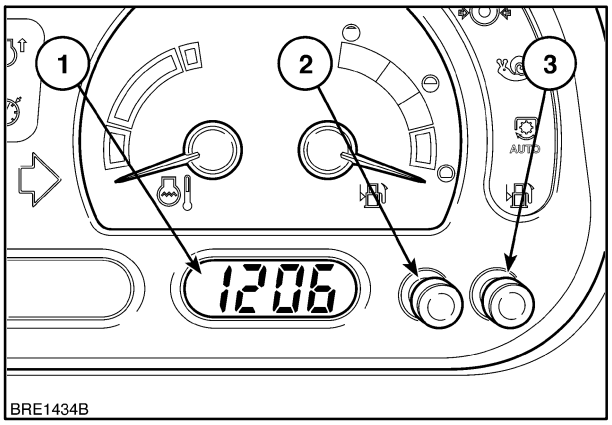
LIQUID CRYSTAL DISPLAYS

Clock

A digital clock (1) is installed on the right-hand side of the instrument panel.

To adjust the time display turn the key-start on, depress and hold the Hour or Minute button until the read out starts to Flash. To advance the hour, depress the 'H' button (2). Each time the button is depressed the time will advance by 1 hour. Alternatively, hold in the button and the display will advance automatically. Release the button when the time setting is correct.

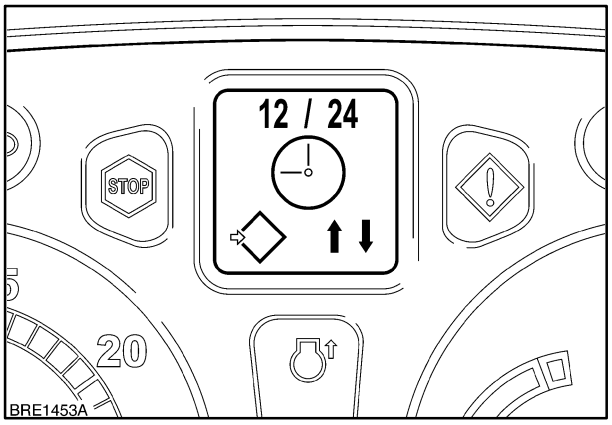
Repeat the procedure using the 'M' button (3) for the minute display. To memorise the setting do not touch either button for 10 seconds.



7

Changing the Display with 'H' and 'M' buttons

The clock is set at the factory to display a 12 hour reading. To change to a 24 hour reading, depress and hold both 'H' and 'M' buttons with the key-start off. Turn the key-start on and continue to hold both buttons for three seconds, the clock will change to show a 24 hour display. Repeat the procedure to change back to a 12 hour reading. Turn the key-start off to store the setting.

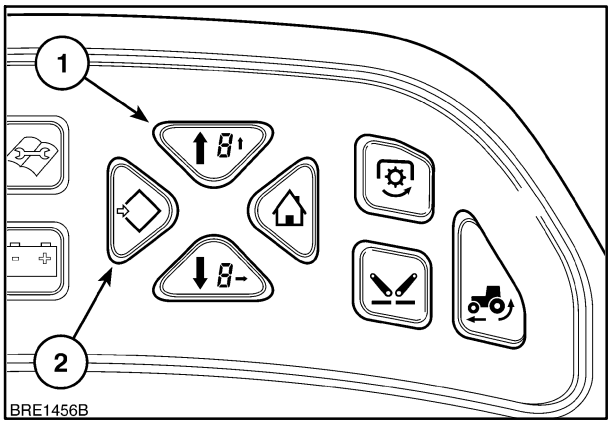


8

Changing the Display with Enhanced Keypad (where fitted)

With the key-start in the ON position, depress and hold the Menu/Enter key (2) for 3 seconds. The DMD will read **SETUP MENU**, this will change to **CAL** after 2 seconds. Using the Menu Up key (1), scroll through the menu until the clock symbol appears in the display accompanied by **12** / **24,** Figure 8.

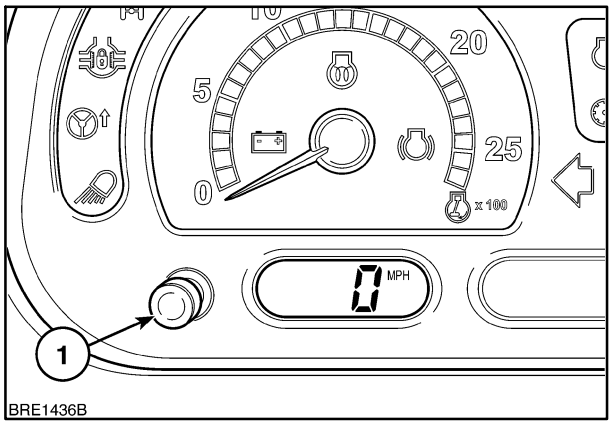
Depress the Menu/Enter key again and the display will change to show an arrow pointing to 12 or 24. Using the Menu Up/Down keys move the arrow up or down to the setting required and then depress the Menu/Enter key to save and return to the main menu.



9

Dimming Control

The brightness of the liquid crystal (LCD) and dot matrix displays (DMD) may be varied by using the dimming control button (1). Momentarily depressing the button will alter the backlighting in steps. Depress and hold the button to cycle through the full range of backlighting from low to high intensity. Release the button when the required setting is obtained.



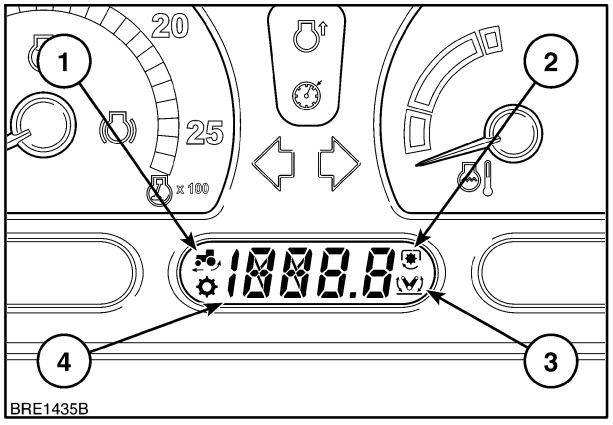
10

Center LCD

The information displayed in the center LCD (4), will vary depending on tractor specification. Use the CAL/SEL switch or Enhanced Keypad (where fitted) to toggle between the displays.

The following information may be displayed in the center LCD.

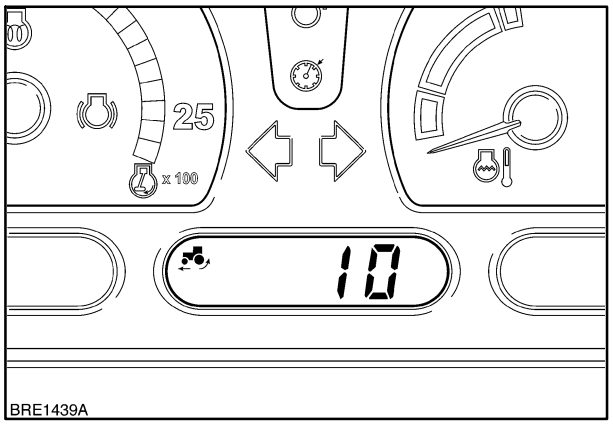
1. Rear wheel slip (with radar option only)
2. Power Take Off speed (front or rear)
3. 3–point hitch position (front or rear)



11

Rear Wheel Slip

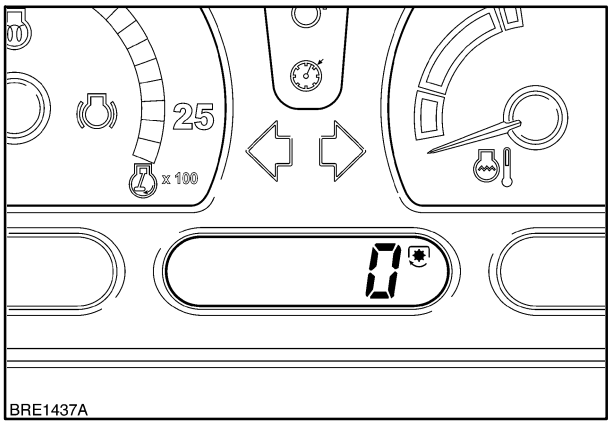
If your tractor is equipped with optional ground speed radar, the percentage (%) of rear wheel slip may be displayed. The slip figure is calculated from information provided by the transmission speed sensor (theoretical ground speed) and the radar (true ground speed).



12

Power Take Off Speed

When operating the rear Power Take Off the display may be used to monitor the output shaft speed. Use the CAL/SEL button or Enhanced Keypad (where fitted), to select either rear P.T.O. speed or front P.T.O. speed (where fitted).

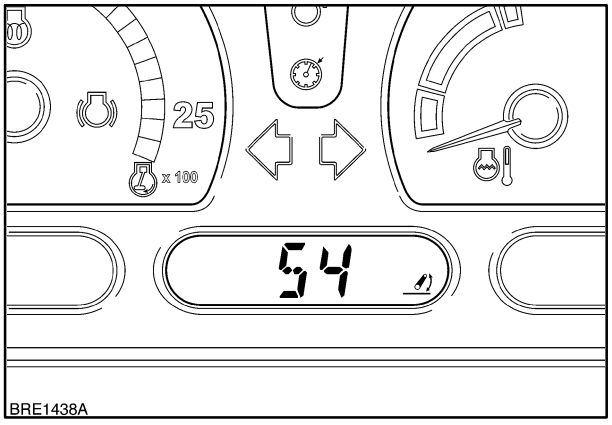


13

3-Point Hitch Position

If your tractor is equipped with Electronic Draft Control (EDC) the display may be used to show the position of the 3-point hitch (and implement) by means of numbers ranging from **'0'** (fully lowered position) to **'100'** (maximum lift height).

When a front hitch is installed, the display may be used to show the height of the front lift arms. **'0'** will represent the fully lowered position, **'100'** the maximum lift height.



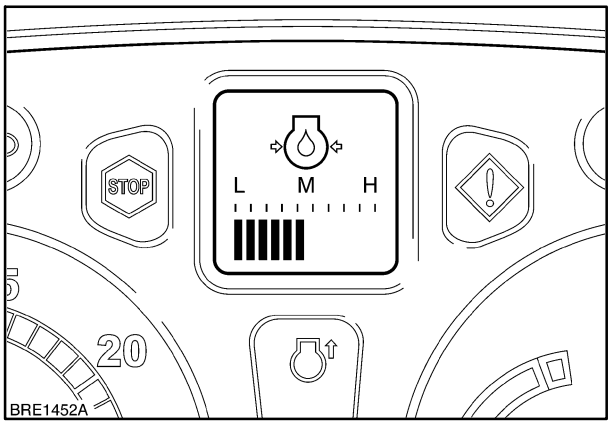
14

DOT MATRIX DISPLAY

A number of tractor operating and set-up functions may be shown in the Dot Matrix Display (DMD). To select a function use the CAL/SEL button or the Enhanced Keypad (where fitted). A symbol will appear to confirm the function selected.

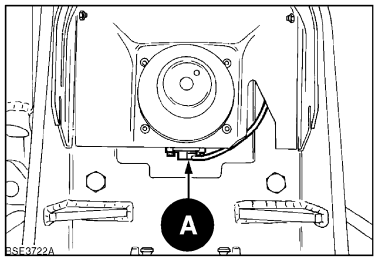
NOTE: *See page 20 for an explanation of warning and advisory symbols.*

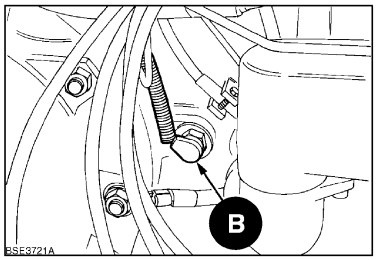
If an error occurs in the instrument panel or tractor systems circuits, a malfunction warning symbol will appear in this display accompanied by an error code. Consult your authorised dealer.

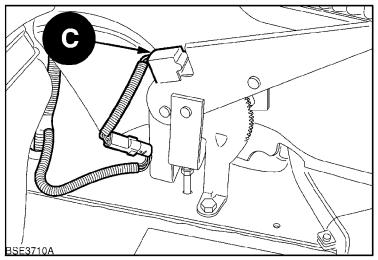


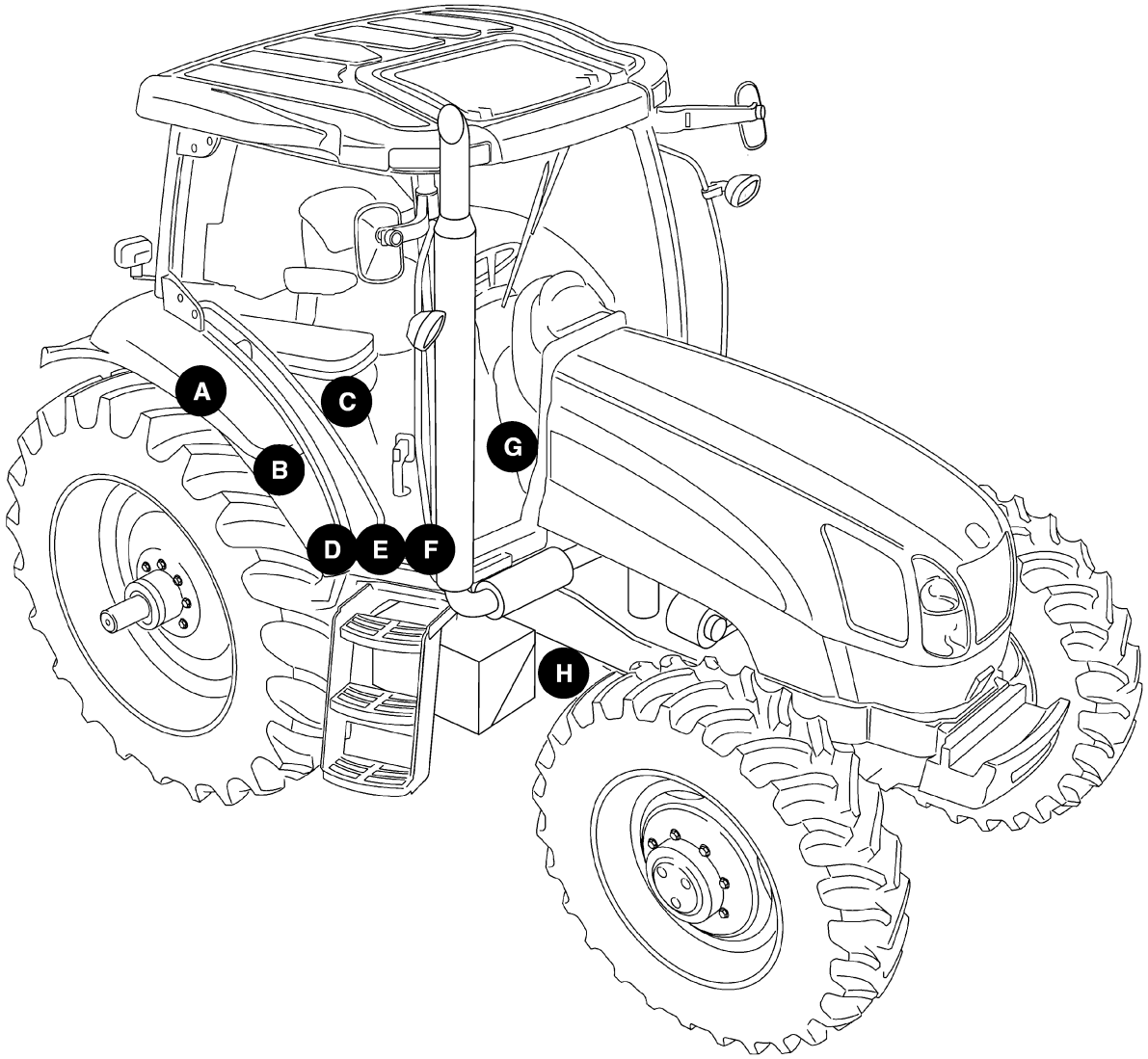
15

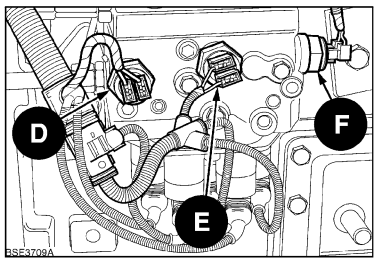
SENDERS, SENSORS AND SWITCHES

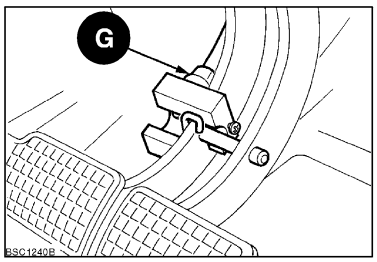


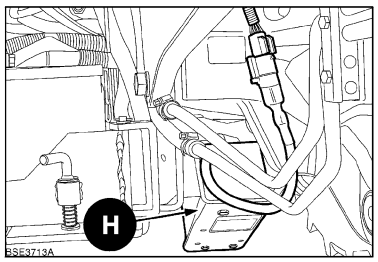












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SENDERS, SENSORS & SWITCHES

A Rear PTO Speed Sensor
Sensor output modulates as signal voltage to the instrument cluster to display PTO speed.

B Transmission Output Speed Sensor
Senses transmission output (wheel) speed and generates a signal for cluster ground speed display, distance display, and to cumpute area accumulations.
When a radar is fitted, the transmission speed sensor is used only to compute % slip display.

C Parking Brake Switch
Switch is closed with parking brake applied, providing a warning lamp and audible alarm with key switch on.
Sounds an alarm when wheel movement is detected above 0.8 km/H (0.5 mph).
Sounds an alarm for 2 minutes with key switch off and park brake released.

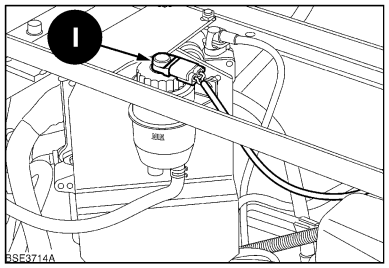
D Differential Lock Pressure Switch
Operates when transmission oil pressure 11 bar (142 – 170 psi) is present in differential lock supply lines to illuminate warning lamp. Switch is normally open.

E Transmsssion Oil Pressure Switch
Operates as transmission oil pressure drops below 11 bar (142 – 170 psi) to operate warning lamp. Switch is normally closed.

F 4WD Pressure Switch
Operates when transmission pressue 11 bar (142 – 170 psi) is absent in 4WD line (4WD engaged) to illuminate warning lamp. Switch is normally closed.

G Brake Pedals Not Latched Switch (if fitted)
Operates when brake pedals are not latched to display warning lamp.

H Radar Sensor (Optional)
Senses true ground speed and generates a signal for cluster ground speed, % slip, distance displays and to compute area accumulations.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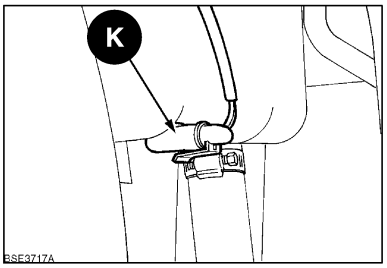
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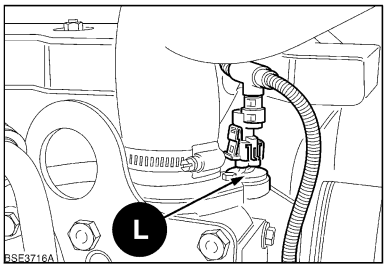
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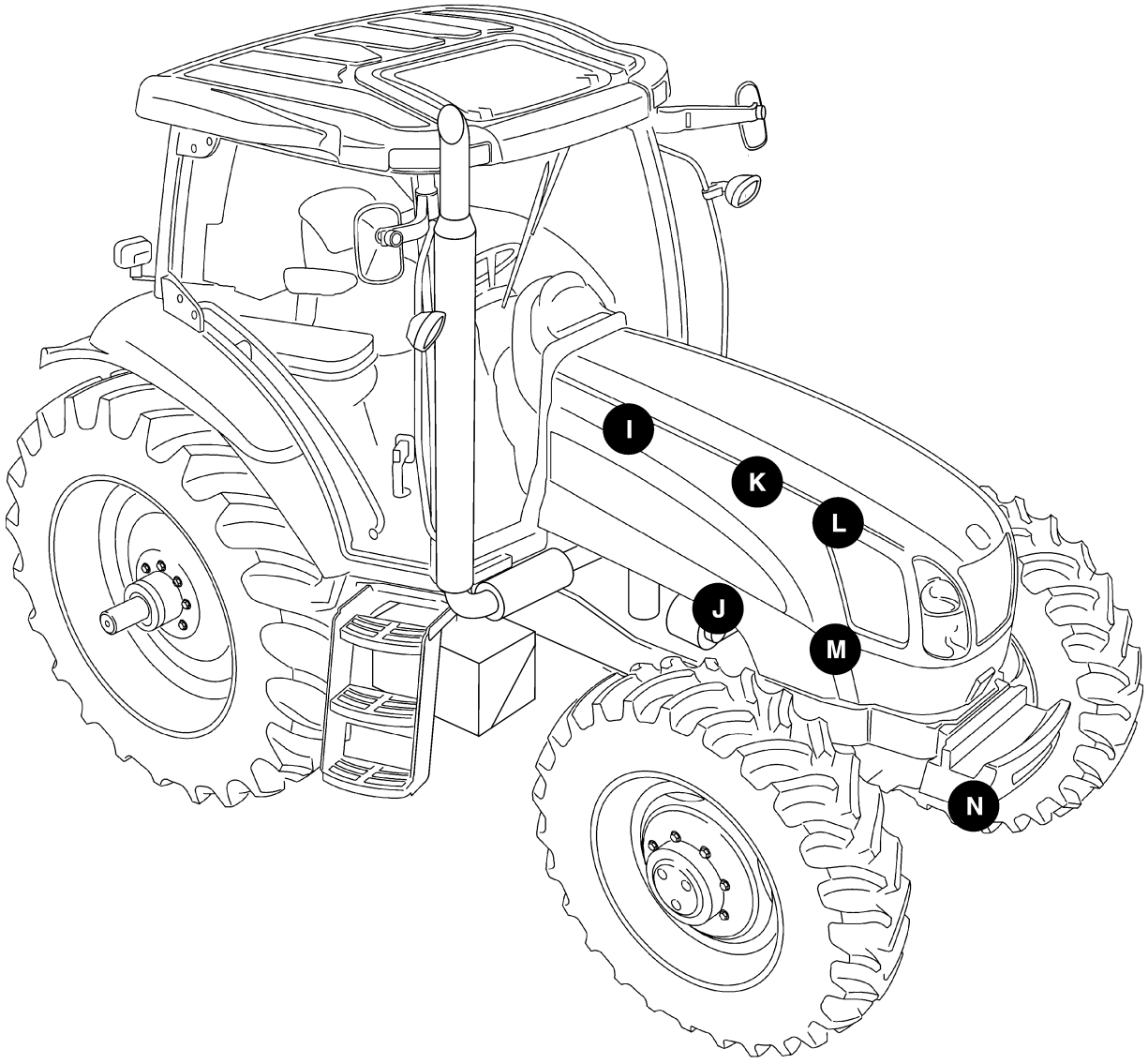
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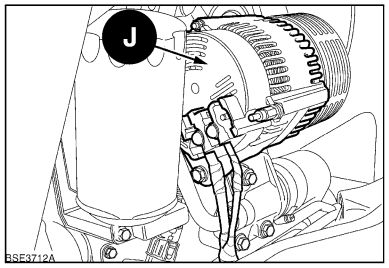
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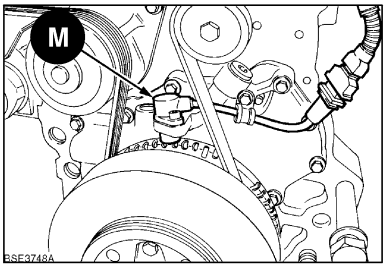
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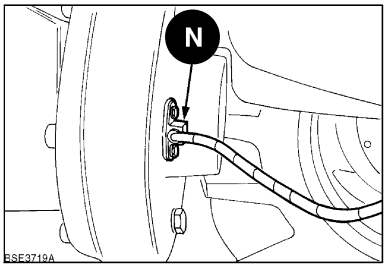
N
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SENDERS, SENSORS & SWITCHES

I Brake fluid Level Switch
Operates as fluid level drops below minimum to display warning lamp. Switch is normally closed.

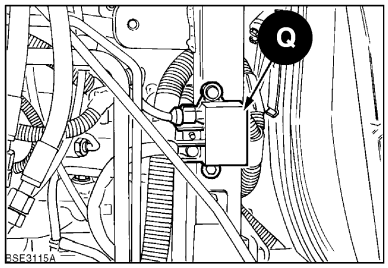
J Alternator
Provides a signal for instrument cluster charge warning lamp.

K Engine Coolant Level Switch
Operates as engine coolant level drops to illuminate warning lamp. Switch is normall closed.

L Engine Coolant Temperature Sender
The temperature sender resistance changes proportionally with Coolant temperaure causing a modulated signal voltage to be sent back to the instrument cluster to operate the gauge.

M Engine Speed Sensor
Sensor output modulates as signal voltage to the instrument cluster to display ERPM.

N Front PTO Speed Sensor (if fitted)
Sensor output modulates as signal voltage to the instrument cluster to display PTO speed.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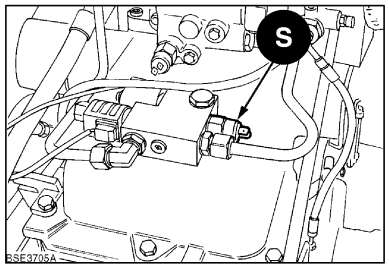
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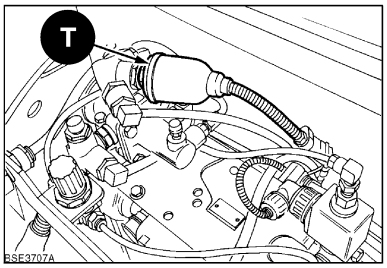
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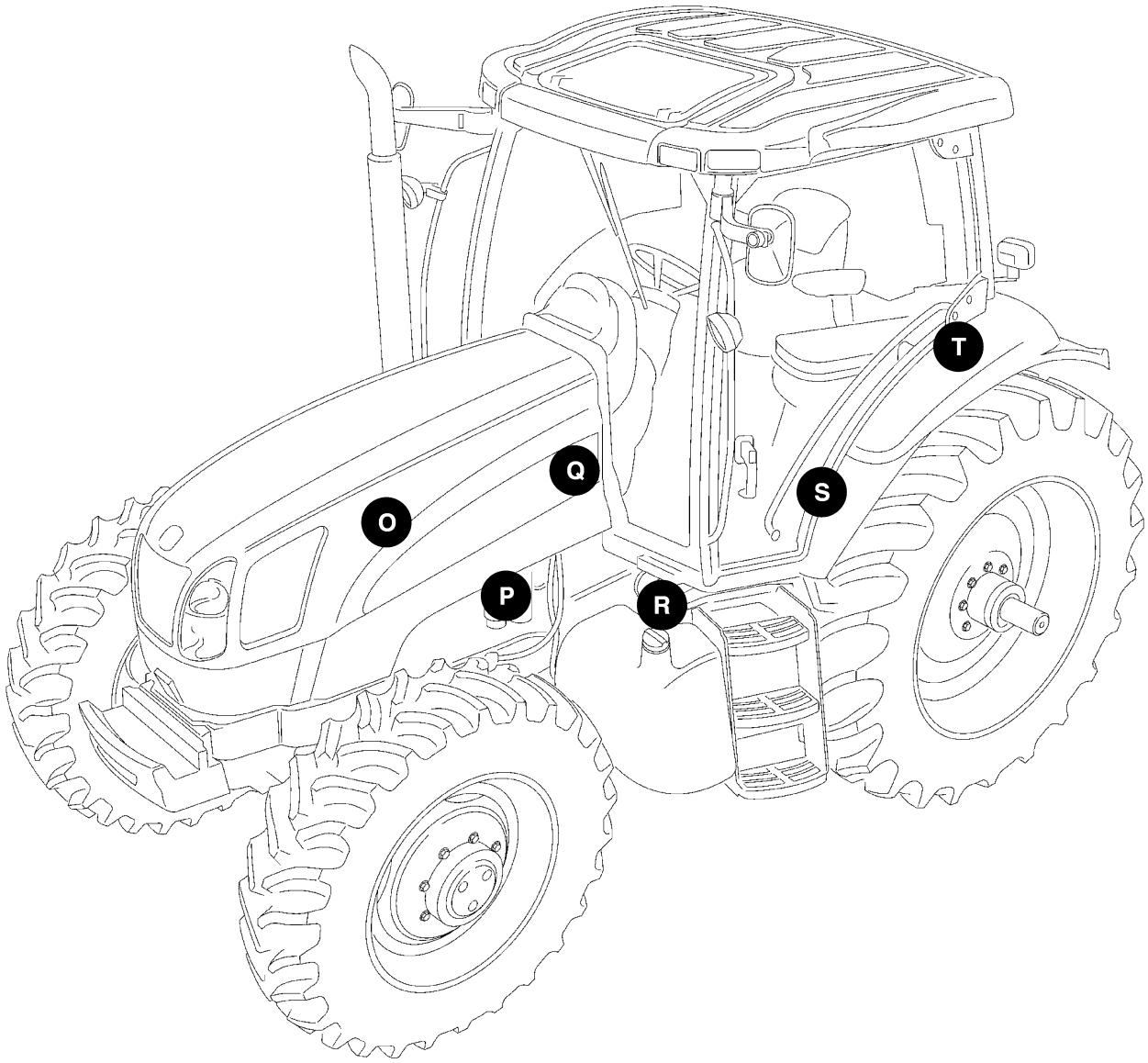
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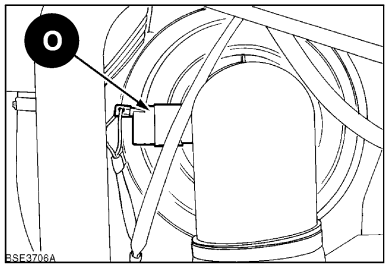
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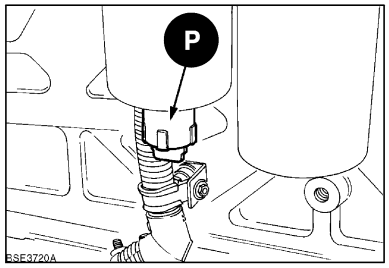
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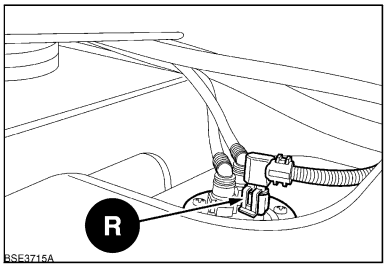
R
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BSE3741A

SENDERS, SENSORS & SWITCHES

O Engine Intake Air Filter Restriction Switch
Operates when the vacuum in the air intake system rises above 46.7mm Hg to illuminate warning lamp. Switch is normally open.

P Water in Fuel Switch
Operates when water is detected in the fuel to illuminate warning lamp.

Q Engine Grid Heater Relay
Operates when engine grid heater is enabled and displays warnig lamp.

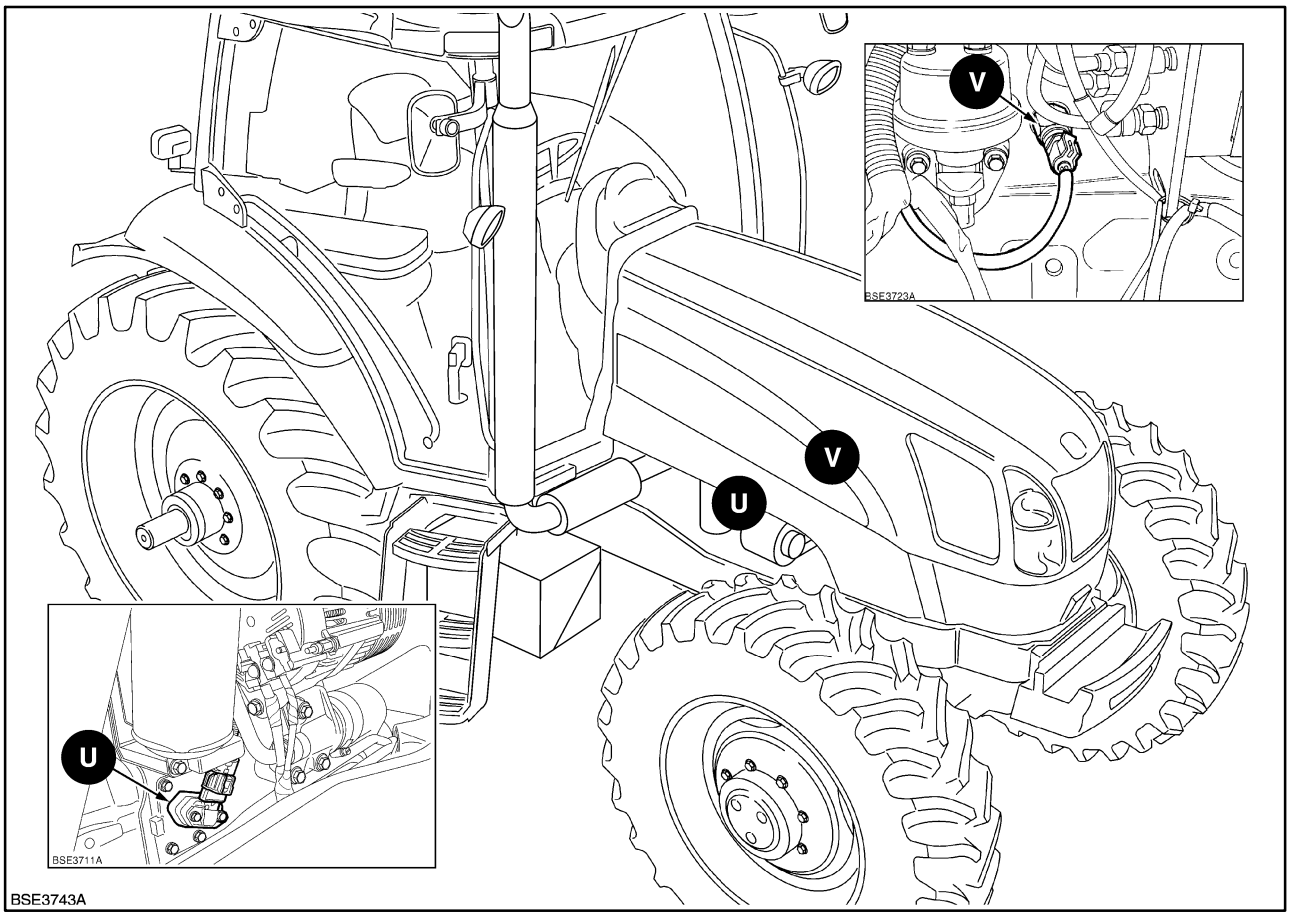
R Fuel Level Sender
Signal from sender potentiometer determines fuel level displayed on the gauge.

SENDER RESISTANCE	GAUGE INDICATION	FAULT
< 13. 6 ohms		Short Circuit
31.3 ohms	FULL	
250 ohms	EMPTY	
> 900 ohms		Open Circuit

S Trailer Brake Switch
Operates when trailer brakes are applied to illuminate warning lamp.

T Airbrake Pressure Sensor
Resistance varies with air pressure, when pressure is below 4.5 bar the warning lamp is activated.

Pressure (bar)	0	1	2	3	4	5	6	7	8	9	10
Resistance (ohms)	10	31	52	71	88	106	124	140	. 155	. 170	. 184

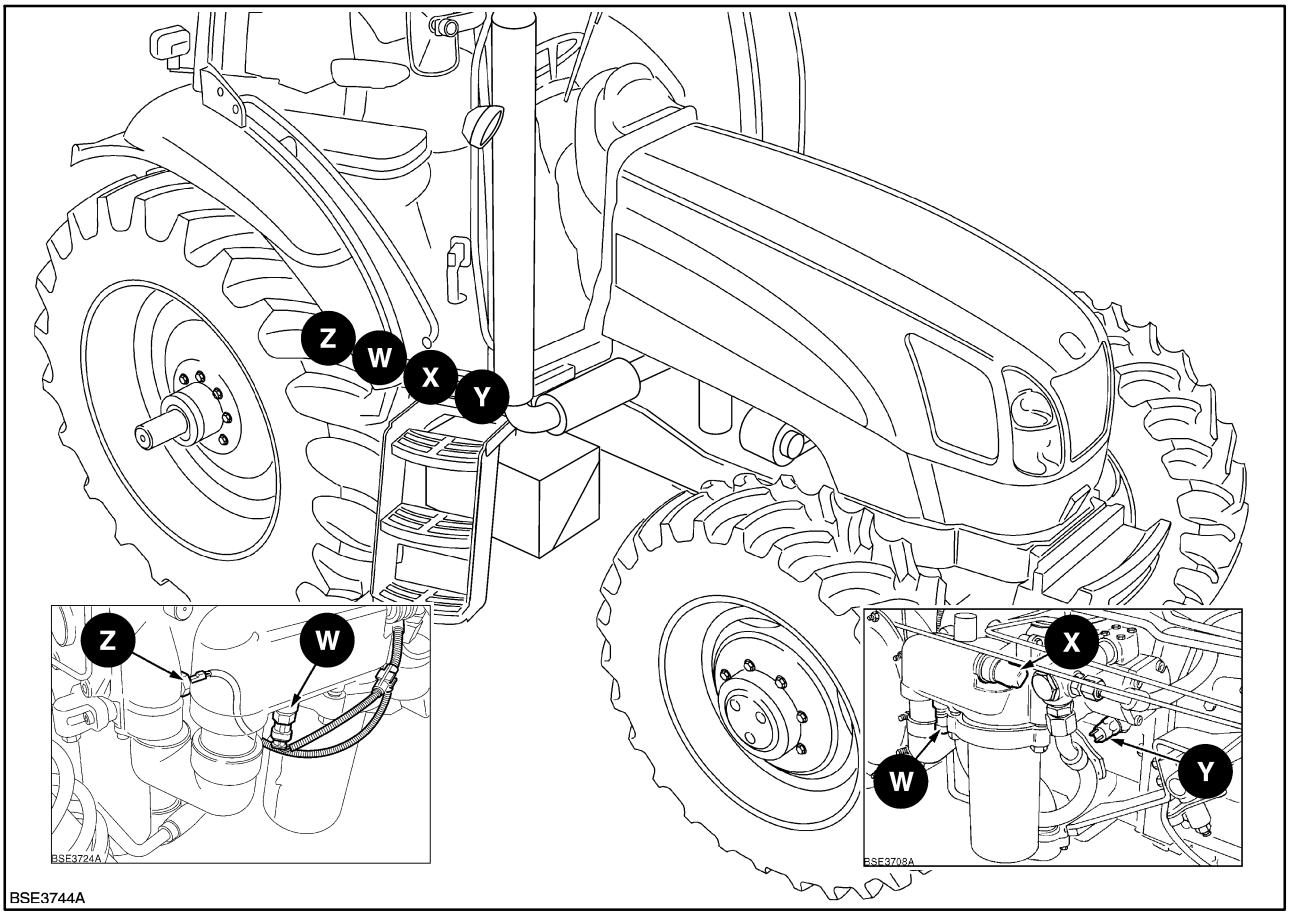


19

U **Engine Oil Pressure Sensor (Electronic Engines)**
Activates oil pressure warning according to the table below

V **Engine Oil Pressure Sensor (Mechanical Engines)**
Activates oil pressure warning according to the table below

RPM	Pressure (kPa)	Alarm
< 500	----	OFF
500 - 1500	< 55	ON
1500 - 2000	55 - 110	ON
2000 - 3000	115 - 165	ON



20

W **Intake Filter Oil Temperautre Switch**
Operates as the transmission oil temperature rises above 40°C (104°F) to allow the intake filter restriction switch to function. Switch is normally open.

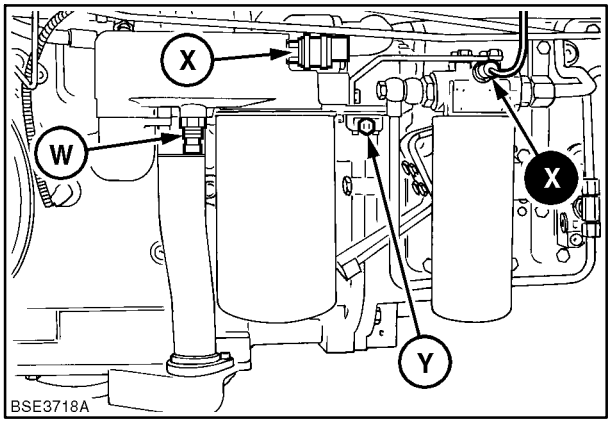
X **Intake Filter Restriction Switch**
Operates as the transmission intake vacuum rises above 406mm Hg (228.8 in H_2O) to operate warning lamp. Switch is normally open.

Y **Steering Pressure Switch**
Operates when pressure drops below 0.8 bar, illuminating warning lamp in instrument cluster.

Z **Charge Pressure Switch**
Operates as charge pressure drops below 0.8 bar to illuminate warning lamp. Switch is normally closed.

24 x 24 Transmissions

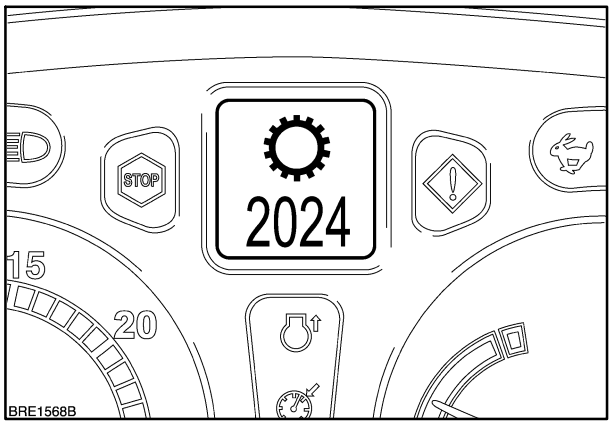
An additional filter restriction switch **X** is fitted to the right hand filter on these transmissions.



21

ERROR CODES

The advanced electronics on your tractor are able to detect a malfunction or error occuring in key areas such as engine, transmission, electrical and hydraulic systems. Should a malfunction or error occur, a symbol will appear in the DMD with a four digit error code. This may be accompanied by the illumination of a warning light and an audible alarm depending on the severity of the fault. Consult your authorised dealer.



22

ACTIVE AND NON ACTIVE WARNINGS

In addition to the error codes previously described, there are a number warning symbols that may appear in the Dot Matrix Display. These symbols will be accompanied by either a Red (critical) or Amber (non-critical) warning light.

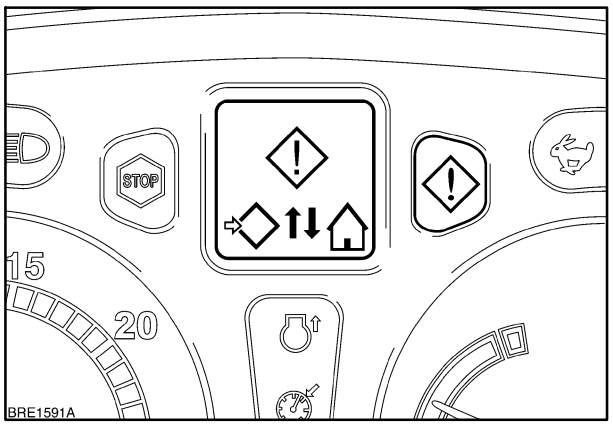
Active (critical) symbols appearing with a Red warning light will remain permanently displayed until the tractor is stopped and the fault rectified.

Non active (non-critical) symbols accompanied by the Amber light will be displayed for five seconds before the DMD defaults to the symbol previously shown. The amber warning light will continue to illuminate.

By using the CAL/SEL button, or the Enhanced Keypad where fitted, non active warnings that are not permanently displayed may be recalled.

Using the CAL/SEL button

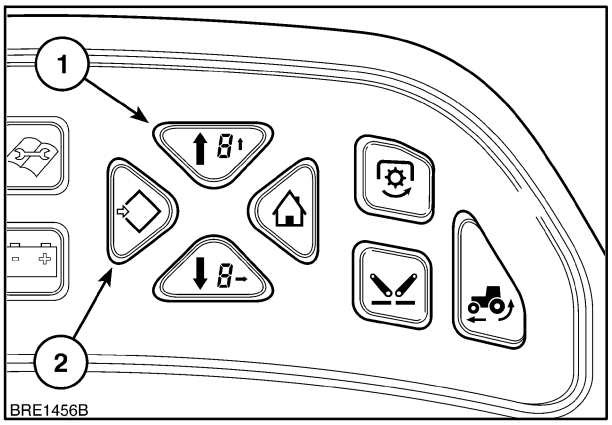
- Depress and hold the CAL/SEL button for three seconds to enter **SETUP MENU**, after two seconds the display will change to **CAL.** Using the clock set buttons H and M to toggle the display, select the the non active warning symbol, Figure 23.
- Depress the CAL/SEL button and the non active symbol will be replaced with a symbol corresponding to the fault detected. After three seconds the display will default back to the non active warning symbol.
- If more than one warning symbol has been stored, the display will cycle through all symbols at three second intervals.
- Momentarily depress the dimming button to exit the display.



23

Using the Enhanced Keypad

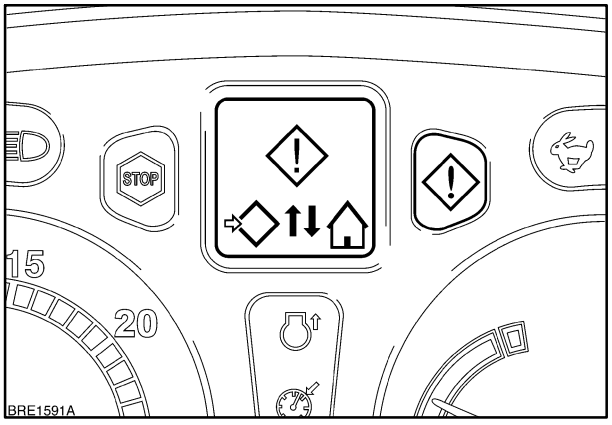
- With the key-start in the ON position, depress and hold the Menu/Enter key (2) for 3 seconds. The DMD will read **SETUP MENU**, this will change to **CAL** after 2 seconds. Using the Menu Up key (1), scroll through the menu until the non-active warning symbol Figure 25, is displayed.
- By momentarily depressing the Menu/Enter key again, the non active symbol will be replaced with a symbol corresponding to the fault detected. After three seconds the display will default back to the non active warning symbol.



24

- If more than one non-active symbol has been stored, the display will cycle through all symbols at three second intervals.

Touch the Menu/Enter key again to exit the display and return to the main menu.



25

EXPLANATION OF SYMBOLS

There are a number of warning/advisory symbols that may appear in the Dot Matrix Display. The symbols can be categorised into four main groups.

1. **Warning.** These symbols advise of a fault that is critical to the operation of the tractor. Stop the tractor as soon as possible, investigate the cause and rectify the fault.
2. **Advisory.** The advisory symbols are not detremental to the operation of the tractor but should not be ignored. Take appropriate action where necessary.
3. **Maintenance.** These symbols tell the operator there is a concern relating to the basic functions of the tractor, ie. low fuel, low coolant level etc.
4. **System Fault.** The system fault symbols relate to an operational fault in one or more of the tractors main components, either electrical or mechanical. Consult your authorised dealer.

Dot Matrix Symbols – Warning
(Stop the tractor and investigate the cause)

1. Intercooler charge air temperature too high

2. Engine coolant temperature too high – accompanied by Red warning light and critical alarm

3. Engine oil pressure low – accompanied by Red warning light and critical alarm

4. Transmission/steering oil pressure low – accompanied by Red warning light and critical alarm

5. Transmission oil temperature too high – accompanied by Red warning light

6. Alternator not charging – accompanied by Red warning light and non critical alarm

7. Air brake pressure low – accompanied by air pressure bargraph and Red warning light

Dot Matrix Symbols – Advisory
(Carry out appropriate action where necessary)

1. Cycle clutch pedal – accompanied by action required alarm

2. Place shuttle lever in neutral – accompanied by action required alarm

3. LCD / DMD backlighting level

4. Air brake system pressure – see item 7, Dot Matrix Symbols – Warning

5. Engine oil pressure – see item 3, Dot Matrix Symbols – Warning

Dot Matrix Symbols - Maintenance
(Refer to Section 4)

1. Engine air filter blocked - accompanied by Amber warning light
2. Brake fluid level low - accompanied by Red warning light
3. Engine coolant level low - accompanied by Amber warning light
4. Water contamination in fuel - accompanied by Amber warning light, mechanical engines only.
4. Water contamination in fuel - accompanied by Red warning light and critcal alarm, electronic engines only.
5. Fuel level low
6. Hydraulic oil filter blocked - accompanied by Amber warning light
7. Transmission oil filter blocked - see 'Hydraulic oil filter blocked'
8. Hydraulic system charge pressure low - illuminated by a Red warning light

Dot Matrix Symbols - System Fault
(Consult your authorised dealer)

1. Engine
2. Transmission
3. Differential lock
4. CAN malfunction
5. Electronic draft control
6. Front hitch
7. P.T.O. system
8. Electronic remote valves
9. Front suspension
10. Four wheel drive
11. Instrument panel electrical fault
12. Fast steer system

INSTRUMENT CLUSTER ERROR CODES

Error Code	Function	Symbol	Warning Lamp	Lamp Condition	Alarm
14001	Rear PTO solenoid O/C or short to +12V	ADIC	Amber	F/C	
14002	Rear PTO solenoid short to ground	ADIC	Amber	F/C	
14011	Engine speed sensor O/C or short to +12V	ADIC	Amber	F/C	
14012	Engine speed sensor short to ground	ADIC	Amber	F/C	
14021	Radar O/C or short to +12V	ADIC	Amber	F/C	
14022	Radar short to ground	ADIC	Amber	F/C	
14031	Front PTO solenoid O/C or short to +12V	ADIC	Amber	F/C	
14032	Front PTO solenoid short to ground	ADIC	Amber	F/C	
14041	Engine coolant temp sensor O/C or short to +12V	ADIC	Amber	F/C	Non Critical
14042	Engine coolant temp sensor short to ground	ADIC	Amber	F/C	Non Critical
14051	Fuel level sensor O/C or short to +12V	ADIC	Amber	F/C	
14052	Fuel level sensor short to ground	ADIC	Amber	F/C	
14061	Airbrake pressure sensor O/C or short to +12V	ADIC	Amber	F/C	Non Critical
14071	Front hitch position sensor short to +12V	ADIC	Amber	F/C	
14072	Front hitch position sensor O/C or short to ground	ADIC	Amber	F/C	
14081	Engine oil pressure sensor short to +12V	ADIC	Amber	F/C	Non Critical
14082	Engine oil pressure sensor O/C or short to ground	ADIC	Amber	F/C	Non Critical
14091	Transmission output speed sensor O/C or short to +12V	ADIC	Amber	F/C	
14092	Transmission output speed sensor short to ground	ADIC	Amber	F/C	
14100	Airbrake pressure not configured	ADIC	Amber	F/C	Non Critical
14101	Fuel contaminated (water in fuel) sensor not connected				
14200	Error with EPROM				
14900	XCM DA, DB, DE or DF not connected	CAN			
14901	Engine module (ECM) missing	CAN			
14902	XCM DD or DH not connected	CAN			
14903	SCM GA not connected	CAN			
14904	Armrest control unit LA not connected	CAN			
14905	Keypad not connected	CAN			
14906	Fast steering module not connected	CAN			
14907	CAN DOG missing	CAN			

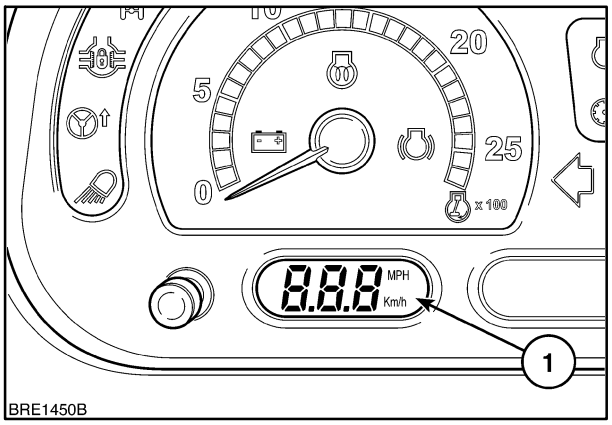
Lamp condition F/C indicates lamp flashes for 5 seconds then remains steady ON.

TRACTOR GROUND SPEED DISPLAY

The lower left-hand LCD provides a permanent display of ground speed (1) in km/h or MPH dependent upon the country in which the tractor is to be used. If required, the display may be changed to read an alternate ground speed unit from that set at the factory.

NOTE: *If the tractor rear tire size is changed, the ground speed display may require re-calibrating to suit the radius of the new tire.*

NOTE: *Illustration shows all displays activated.*



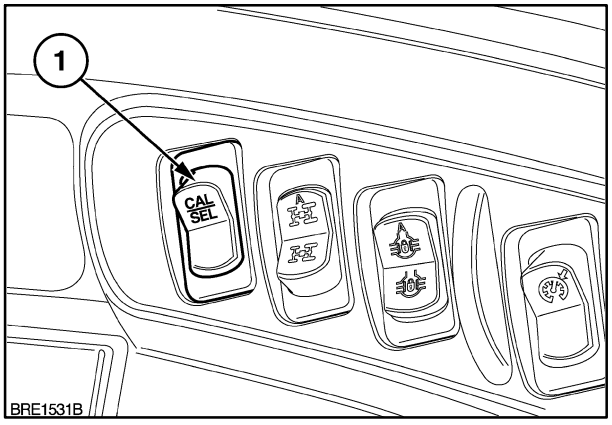
26

Changing the Ground Speed Units

Using the CAL/SEL Button

- With the key-start switch in the OFF position, depress and hold in the CAL/SEL button (1) and turn the key-start switch ON. The **Km/h MPH** symbols will appear flashing in the display. Release the button.

- Press the CAL/SEL button again to toggle between **Km/h** and **MPH**. When the required ground speed unit is displayed turn off the key-start to store the selected speed unit in the memory.

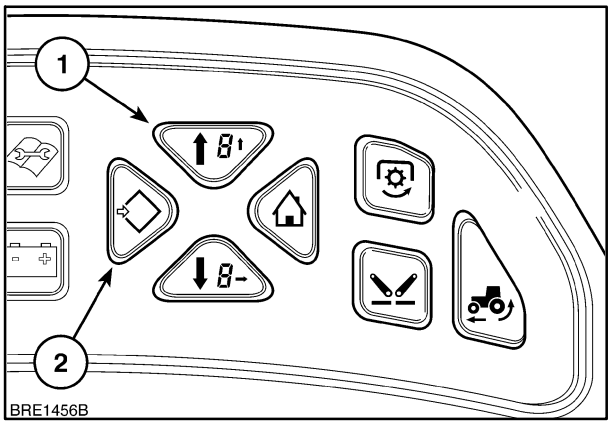


27

Using the Enhanced Keypad (where fitted)

- With the key-start in the ON position, depress and hold the Menu/Enter key (2) for 3 seconds. The DMD will read **SETUP MENU**, this will change to **CAL** after 2 seconds. Using the Menu Up key (1), scroll through the menu until the **Km/h MPH** screen appears.

- Momentarily depress the Menu/Enter key (2) and, using the Menu Up/Down keys, select the required speed reading. To store the setting and return to the main menu depress the Menu/Enter key again. Depress the Exit/Cancel key to return to the original display.



28

Calibrating the Ground Speed Display

Should you wish to install alternative rear tire equipment that would provide a radius difference of more than 13 mm (0.5 in), then the electronic control module should be re-calibrated to display an accurate ground speed figure. To re-calibrate use one of the following methods:

IMPORTANT: *If your tractor is equipped with the optional slip control feature, then the ground speed displayed is a true speed as sensed by a radar unit, calibration is therefore* ***not*** *required.*

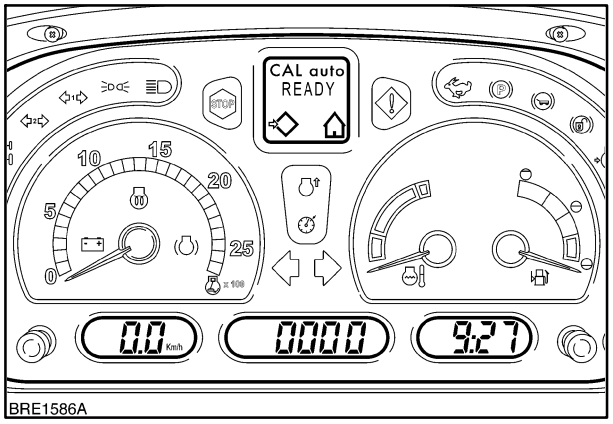
- Ensure that the tire pressures are correct for the load being carried. (See Tire Load/Inflation tables in Section 3 of Operators manual).
- Select a stretch of dry, firm, level ground (preferably concrete) and carefully measure out a distance of exactly 100.0 m (328 feet). Mark the start and finish of this measured distance with a bold chalk line.

Auto Calibration with CAL/SEL Button

- Park the tractor a short distance from the start line and, with the engine running, depress and hold the CAL/SEL button for 3 seconds to enter the calibration mode. **SETUP_MENU** will appear in the Dot Matrix Display. After approximately two seconds the display will change to **CAL**. Using the clock Min/Hour buttons select **CAL auto.** Depress the CAL/SEL button to confirm selection of **CAL auto**, the central LCD display will read **0000.**

NOTE: *The set up procedure may be cancelled at any time by depressing the LCD dimmer control button or by turning the key-start off.*

- Select a suitable transmission ratio to provide a speed above 3 km/h (1.8 MPH) and drive up to the start line. Depress the CAL/SEL button to select **CAL auto ready.** As the center of the front tires passes over the start line, press and release the CAL/SEL button. The speed display will flash **CAL auto ON** and the central LCD will show a four digit figure that will increase as the tractor moves forward.
- As the center of the front tires passes over the finish line, press and release the CAL/SEL button again, **CAL auto OK** will appear in the Dot Matrix Display. Depress the CAL/SEL button again to exit setup and return to the main menu.



BRE1586A

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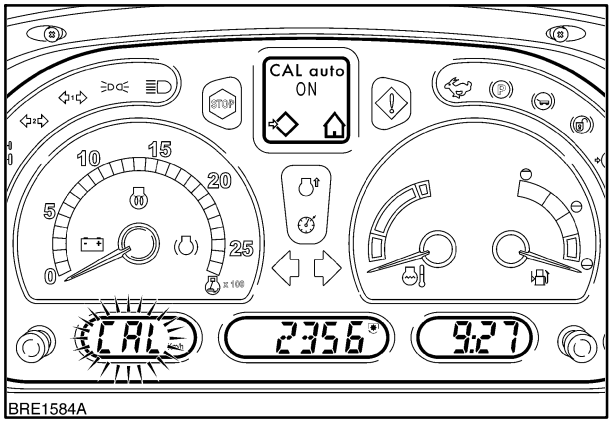

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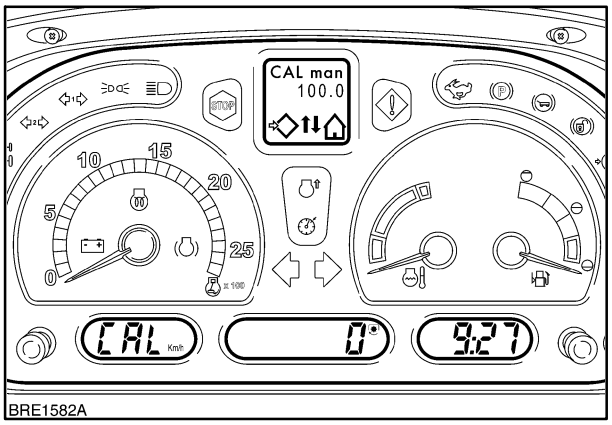
Manual Calibration with CAL/SEL Button

The manual calibration allows the operator to set the rolling circumference of the rear tire (if known) without the need to drive over a measured distance.

- With the tractor stationary and the key-start on, depress and hold the CAL/SEL button for 3 seconds to enter the calibration mode. **CAL man** will appear in the Dot Matrix Display. After approximately two seconds the display will change to **CAL**. Depress the CAL/SEL button again to select **CAL man_100.0**.



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NOTE: *The set up procedure may be cancelled at any time by depressing the LCD dimmer control button or by turning the key-start off.*
IMPORTANT: *When entering new tire rolling circumference figures, use metric values (centimetres) with* ***Km/h*** *speedometer reading and Imperial values (inches) with* ***MPH*** *reading, see table on page NO TAG.*

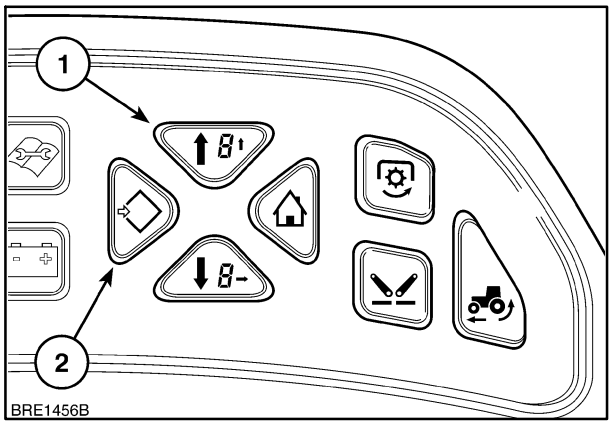
- By depressing the 'h' and 'm' clock buttons, the rolling circumference of the rear tire may be entered into the numerical display (**100.0**).

- Depress the 'h' button to select the first digit to be changed, repeated operation of the 'h' button will cycle the cursor through all the digits in turn. To alter the value of the digit selected, momentarily depress the 'm' button until the correct figure is shown.

- With the new rolling circumference figure entered into the display, depress the CAL/SEL button again to save the setting and return to the main menu.

Auto Calibration with Enhanced Keypad (where fitted)

- With the the tractor stationary and the engine running, depress and hold the Menu/Enter key (2) for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Depress the Enter key and **CAL man** will be appear. Using the Menu Up key (1), scroll through the menu until **CAL auto** is displayed.
- Depress the Menu/Enter key again and **CAL auto ready** will appear in the DMD. Select a suitable transmission ratio to provide a forward speed above 3 km/h (1.8 MPH). As the center of the front tires passes over the start line, press and release the Menu/Enter key. The speed display will start to flash **CAL** and the central LCD will show a four digit figure that will increase as the tractor moves forward. The display will change to read **CAL auto ON**.
- As the center of the front tires passes over the finish line, press and release the Menu/Enter key. **CAL auto OK** will appear in the Dot Matrix Display. Depress the Menu/Enter key to store the setting.



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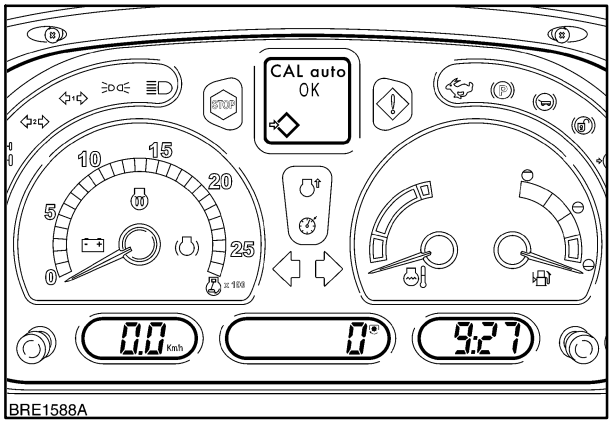


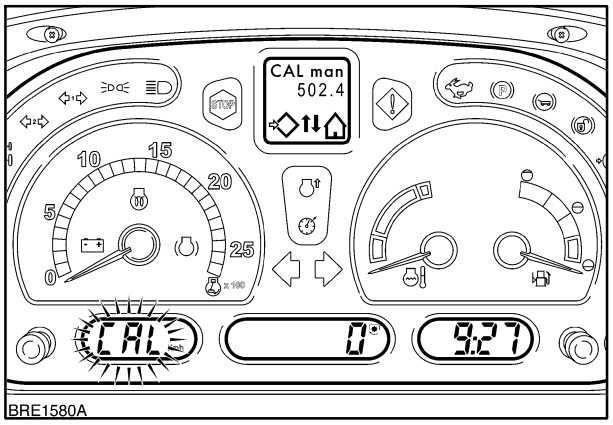
33

Manual Calibration with Enhanced Keypad (where fitted)

- With the key-start in the ON position, depress and hold the Menu/Enter button (2) for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Depress the Enter key and **CAL man** will appear. (It may be necessary to use the Menu Up/Down buttons to scroll through the menu until **CAL man** is displayed).
- Depress the Menu/Enter key again to change the DMD display to **CAL_Man_100.0.** Using the Digit Select key choose the first digit to be set, the digit will commence to flash. Enter the first number using the Digit Value key, repeat the procedure to set the remaining calibration figures that correspond to the size of rear tire fitted to your tractor.

IMPORTANT: *When entering new tire rolling circumference figures, use metric values (centimetres) with* ***Km/h*** *speedometer reading and Imperial values (inches) with* ***MPH*** *reading, see table on page 27.*

- Depress the Menu/Enter key to memorise the setting and return to the main menu screen, depress Exit/Cancel to exit set up and return to the original display.



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Ground Speed Calibration Numbers

The rolling circumference for any given tire size will vary depending on tire manufacturer. The figures shown in the table are an average based on rolling circumference data supplied by several manufacturers. To obtain an accurate figure for your rear tires, consult your authorised dealer or tire supplier.

If the size of tire on your tractor is not listed, then the road speed calibration may be carried out using one of the following procedures.

Carry out the Auto calibration as previously described or measure the rear tire rolling circumference.

1. To measure the rolling circumference of the rear tire, park the tractor on a level surface and make a vertical chalk mark on the sidewall where the tire tread contacts the ground. Make a second chalk mark on the ground aligning with the mark on the tire.

2. Slowly drive the tractor forward until the rear wheel has made one revolution and the chalk mark on the sidewall is again in contact with the ground. Mark the ground again and measure the distance between the two chalk marks.

IMPORTANT: *If your tractor is equipped with the optional slip control feature, then the ground speed displayed is a true speed as sensed by a radar unit, calibration is therefore* ***not*** *required.*

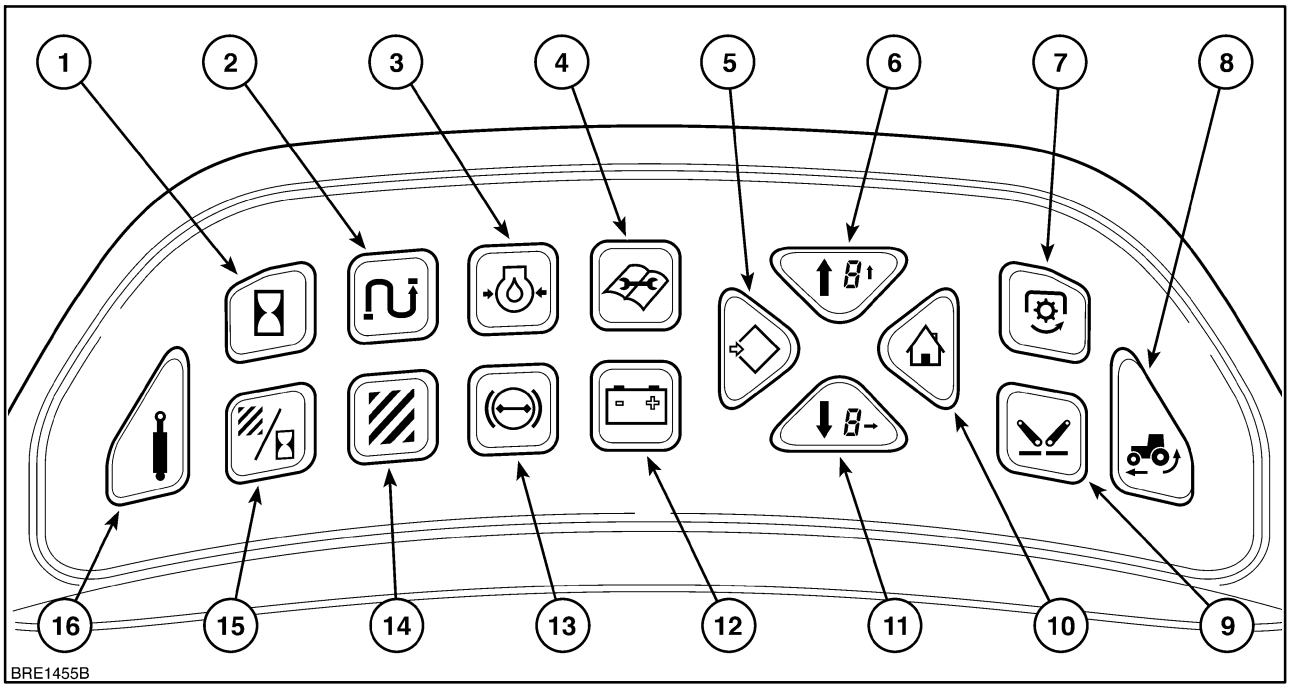
⚠ WARNING ⚠

The radar ground speed sensor emits a low intensity microwave signal which will not cause any ill effects in normal use. Although the signal intensity is low, do not look directly into the face of the sensor while in operation so as to avoid eye damage.

Rear Tire Rolling Circumferences

Tire Size	Tire Rolling Circumference	
	Centimetres	Inches
16.9 – 24	400.0	157.4
18.4 – 28	442.8	174.3
18.4 – 30	458.4	180.4
18.4R – 30	461.5	181.6
16.9 – 34	463.8	182.5
16.9R – 34	473.0	186.2
480/70R – 34	474.5	186.8
520/70R – 34	492.5	193.8
18.4 – 34	487.6	191.9
18.4R – 34	498.0	196.0
13.6R – 38	470.1	185.0
16.9 – 38	504.4	198.5
16.9R – 38	506.4	199.3
480/70R – 38	503.8	198.3
540/65R – 38	502.0	197.6
520/70R – 38	525.2	206.8
18.4 – 38	531.1	209.0
18.4R – 38	525.5	206.8
600/65R – 38	526.3	526.3
650/65R – 38	548.2	215.8
20.8R – 38	549.6	216.3
580/70R – 38	550.2	216.6
18.4R – 42	554.1	218.1
14.9R – 46	551.8	217.2
320/90R – 50	558.8	220.0

ENHANCED KEYPAD and PERFORMANCE MONITOR (where fitted)



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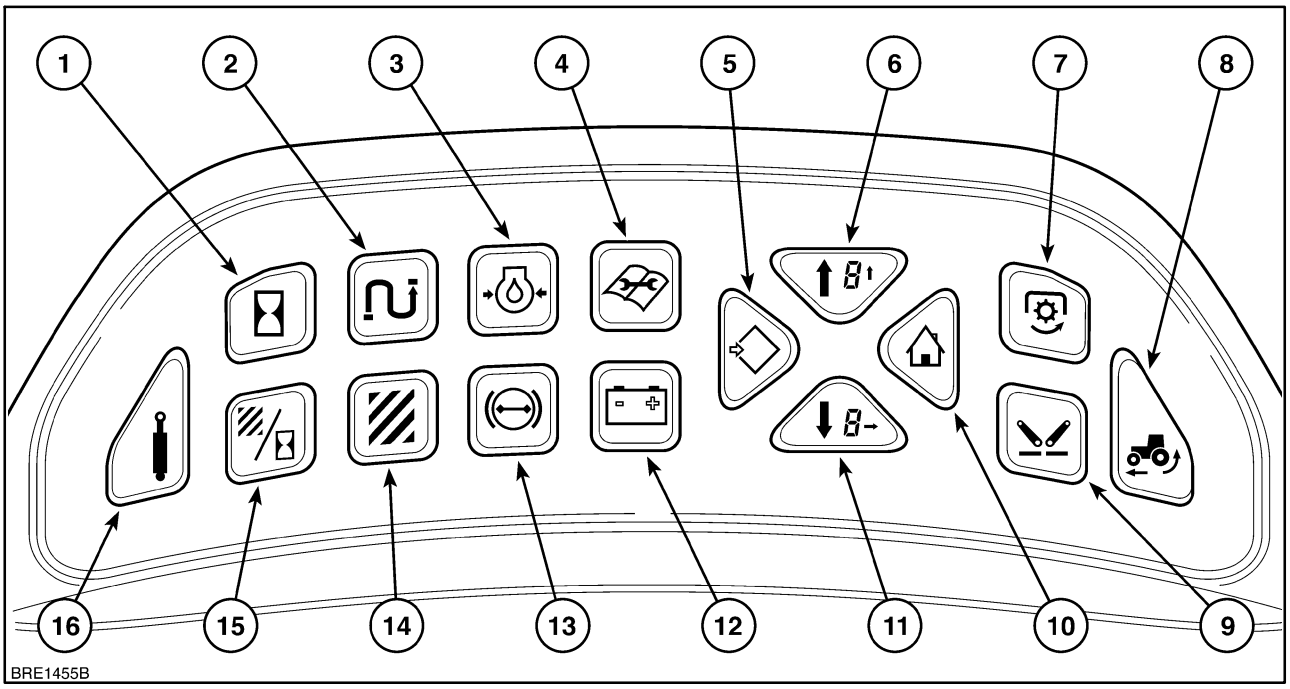
The enhanced keypad consists of 16 buttons or 'keys' that select, control or programme various functions and dispalys in the central and dot matrix screens. Keys 5 to 8 are used to set-up and programme many of the enhanced keypad functions.

Unless otherwise described, depress the keys once to obtain the appropriate display. A symbol will appear in the display to confirm the function selected.

Legend: (D) = Dot Matrix Disply
(C) = Center Digital Display

1. Hourmeter (D). Touch the key to view total number of hours that the tractor has operated. The hours recorded should be used as a guide to the service intervals for the tractor.
2. Odometer (D). The odometer provides a visual record of the distance travelled in kilometres or miles depending on the ground speed unit selected. Two displays are available, 'A' and 'B'.
3. Engine Oil Pressure (D). This key will display the engine oil pressure bargraph.
4. Programmed Maintenance Reminder (D). The maintenance schedule key provides two levels of reminder identified as 'Heavy' and Light.
5. Menu Enter (D). Depress to select set-up and programming modes.
6. Menu Scroll Up or Digit Value (D). Depress this key repeatedly to scroll upwards through the menu or change the value of a number.
7. P.T.O. Speed (C). Depress once to display rear Power Take Off speed, press twice to show front P.T.O. speed (where fitted).
8. Rear Wheel Slip (C). The level of rear wheel slip will appear as a one or two digit percentage (%) figure (with radar option only).



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9. Linkage Height Position (C). Depress once to display the rear linkage height, press twice to show front linkage height (where fitted). The display will show a figure between '0' (fully lowered) and '99' (maximum raised position).
10. Exit/Cancel (D). Use this key to Exit or cancel set-up and programming modes.
11. Menu Scroll Down or Digit Select (D). Depress this key to scroll downwards through the menu or select an alternative digit in the Dot Matrix Display.
12. Battery Voltage (D). With the engine running, touch the key to display the battery symbol together with a digital display of the battery voltage.
13. Trailer Brake Air Pressure (D). Depress to display the trailer brake air pressure bargraph.
14. Area Accumulator (D). The total area worked will be displayed in hectares or acres depending on the ground speed unit selected.
15. Area Per Hour Forecaster (D). Touch this key and the area/hour symbol will display together with a forecast of the area that will be worked in one hour if the current rate of work is continued.

NOTE: *If the radar option is not installed, area per hour calculations are based on axle speed and are subject to inaccuracies caused by any wheel slip that may occur.*

16. Remote Valve Operation (D). The display will show the flow rate through each valve as a percentage (%), the direction of cylinder movement (extend or retract) and the number of the valve selected. (See Electronic Remote Control Valves in Section 3).

ODOMETER (DISTANCE RECORD)

The odometer provides a visual record of the distance travelled in kilometres or miles depending on the ground speed unit selected.

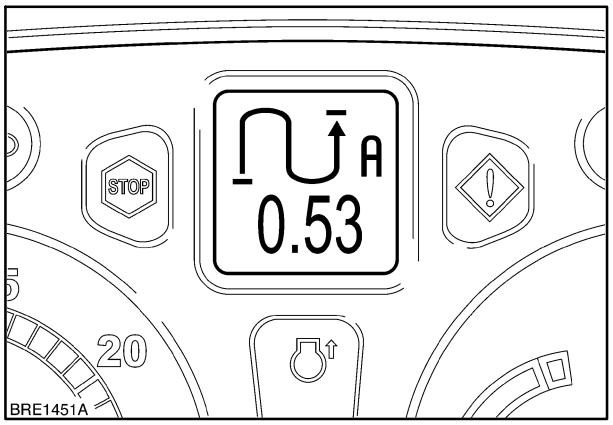
Two displays are available, 'A' and 'B'. 'A' may be used for individual journey distances and 'B' to provide a total for all journeys travelled. Both 'A' and 'B' may be reset to zero.

Touch the key once to select reading 'A', touch again to select reading 'B'. Keeping the key depressed for more than 3 seconds will re-set the selected odometer to zero.

The journey distance in the display (3) will appear in steps of:

0 to 199.99 Km/Miles	0.01 Km/Miles
200 to 1999.9 Km/Miles	0.1 Km/Miles
2000 to 19999 Km/Miles	1.0 Km/Miles

NOTE: *If the radar option is not installed, distance calculations are based on axle rotation and are subject to inaccuracies caused by any wheel slip that may occur.*



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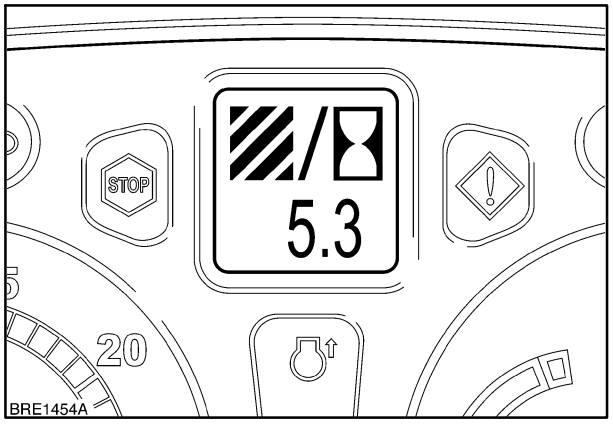
AREA PER HOUR FORECASTER

Touch the AREA/HOUR key (1). The 'AREA/HOUR' symbol will display, together with a forecast (2) of the area that will be worked in one hour if the current rate of work is continued. If the area accumulator is switched OFF, '0' will be displayed whenever the implement is raised.

The area per hour will appear in steps of 0.01 Ha/Acre.

NOTE: *If the radar option is not installed, area per hour calculations are based on axle speed and are subject to inaccuracies caused by any wheel slip that may occur.*



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AREA ACCUMULATOR

NOTE: *Before activating the area accumulator function ensure the correct implement width has been entered into the TPM memory.*

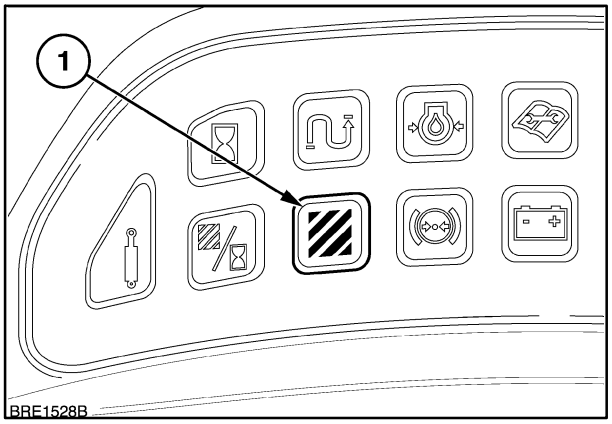
The accumulated area (total area worked) can be displayed by depressing the AREA key (1). Depending on the unit set in the tractor speed display (K/mh or MPH) the reading will be in hectares or acres.

Depress the area accumulator key repeatedly to toggle through the three displays in the dot matrix screen:

1. **OFF**. The area accumulator is off.
2. **ON**. Area accumulator on. Area will be accumulated as the tractor moves irrespective of the position of the implement.
3. **A**. Area accumulation will start recording when the tractor moves and the implement is lowered. It will stop accumulating when the implement is raised.

The area accumulator symbol (2) will appear in the display along with the area figure.

With trailed equipment, area accumulation may be temporarily interrupted, for example, at the headland, by means of a switch connected into the implement status socket.



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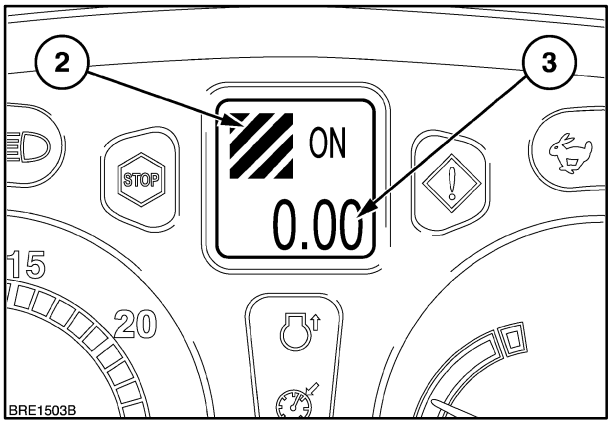
The area measurement in the display (3) will appear in steps of:

0 to 199.99 Ha/acre	0.01 Ha/acre
200 to 1999.9 Ha/acre	0.1 Ha/acre
2000 to 19999 Ha/acre	1.0 Ha/acre

Area accumulation can be reset to zero at any time by selecting OFF and holding down the AREA key (1) Figure 39, until a 'beep' is heard from the audio alarm (approximately 5 seconds).

NOTE: *If the radar option is not installed, area per hour calculations are based on axle speed and are subject to inaccuracies caused by any wheel slip that may occur.*



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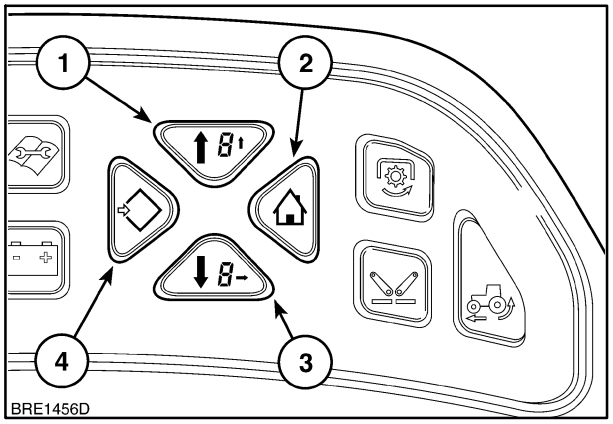
PROGRAMMING THE DISPLAYS

⚠ WARNING ⚠

The radar ground speed sensor, located in front of the right-hand footsteps, emits a low intensity microwave signal which is completely safe in normal use. Although the signal intensity is low, do not look directly into the face of the sensor while in operation so as to avoid eye damage.

Programming Keys

Four keys are used to select, change or memorise the various functions related to the performance monitor and enhanced keypad. All programme information will appear in the Dot Matrix Display (DMD) along with the relevant symbol for the function selected.



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1. Menu Up/Digit Value Key. Use this key to scroll upwards through the function menu or to increase the value of a selected digit during a calibration procedure. Values will increase by one each time the key is depressed.
2. Exit/Cancel Key. Depress this key to exit the calibration mode. The key may be used at any time during a set-up procedure to cancel and exit the calibration mode, however, information not saved will be lost.
3. Menu Down/Digit Select Key. In the calibration mode depress this key to scroll downwards through the menu or to select a digit for re-calibration. Each time the key is depressed the flashing cursor showing the current digit selected will move one space to the right.
4. Menu Enter Key. Depress this key for 3 seconds to enter the programme mode, **SETUP**/**MENU** will appear initially in the display. After 2 seconds the display will change to read **CAL**. This will be accompanied by the Menu Up/Down arrows and the Menu Enter symbol.

   When the appropriate function screen has been selected, depress the Menu/Enter key again to access the calibration mode.

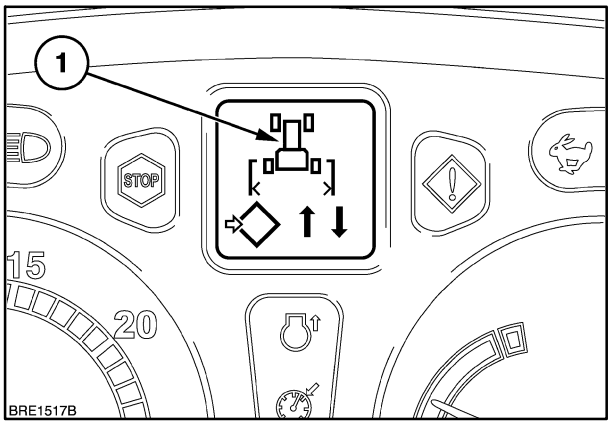
Setting EHR Priority Valve

Depress Menu Enter Key (4), switch on ignition and hold. Initially **SETUP**/**MENU** will display, this will then change to display **CAL.** Press once, (16) as shown on page 29, and the LCD display will show “PEhr” then change to “Ehr_”. Press (16) once and the display will change to “Ehr1”. Subsequent press of (16) will take you as far as “Ehr4”. To select priority valve, press (2) when required valve is displayed. This will then set selection and exit display.

Setting the Implement Width

In order that the micro-processor may calculate the work done, the working width of the implement in use must be entered into the memory. To enter a working width of 4.5 metres (14.76 ft.) carry out the following procedure.

- With the key-start in the ON position, depress and hold the Menu/Enter key for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Using the Menu Up/Down keys, scroll through the menu until the implement width symbol is displayed.



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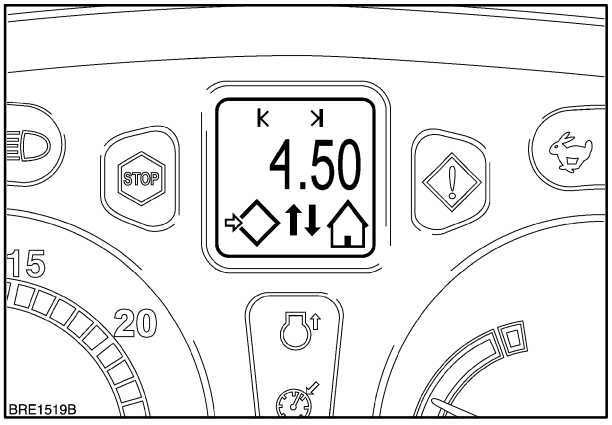
- Depress the Menu/Enter key again to select the set-up screen, a flashing cursor will appear at the first number to be set. Using the Digit Value key enter **'0'** then move the cursor one space to the right with the Digit Select key and enter **'4'.** Move the cursor to the right of the decimal point and enter **'5'**. The reading displayed should now be 04.50 mtrs (14.76 ft.).
- Touch the Menu/Enter key to store the setting and return to the main menu.



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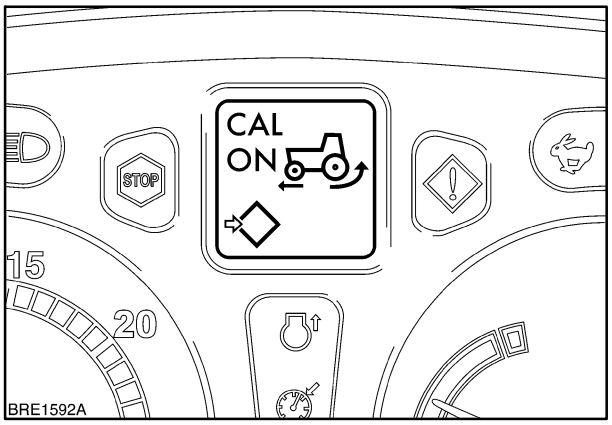
Calibrating for Wheel Slip

Before setting the slip alarm point, a zero wheel slip factor has to be determined. This calibration must be carried out on a hard level surface where wheel slip is unlikely to occur.

- With the key-start in the ON position, depress and hold the Menu/Enter key for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Using the Menu Up/Down keys, scroll through the menu until the wheel slip symbol is displayed.
- Drive the tractor at a constant speed above 5 Km/h (3.1 MPH). When a steady speed has been reached, depress the Menu Enter key, **CAL ON** will appear in the display. After a short distance touch the Menu Enter key again, the display will change to **CAL OK**.
- Touch the Menu/Enter key to store the setting and return to the main menu.



44

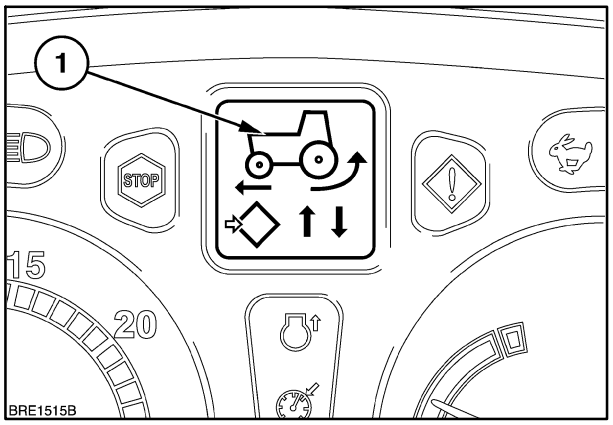
Setting the Slip Alarm Point

NOTE: *If the optional radar unit is not installed, the slip alarm function will be omitted from the display.*

The slip alarm point may be set as a one or two digit figure that, if exceeded, will cause an audible alarm to sound. To set a wheel slip limit of 15% carry out the following procedure.

- With the key-start in the ON position, depress and hold the Menu/Enter key for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Using the Menu Up/Down keys, scroll through the menu until the wheel slip symbol (1) is displayed.
- Depress the Menu/Enter key again to select the set-up screen, a flashing cursor will appear at the first number to be set. Using the Digit Value key enter **'1'**, move the cursor to the right with the Digit Select key and, with the Digit Value key, enter **'5'.** The slip alarm point is now set at 15%.
- Touch the Menu/Enter key to memorise the setting and return to the main menu.

If wheel slip exceeds the pre-set limit, the slip symbol will appear in the DMD and the amber warning light will illuminate on the instrument console.

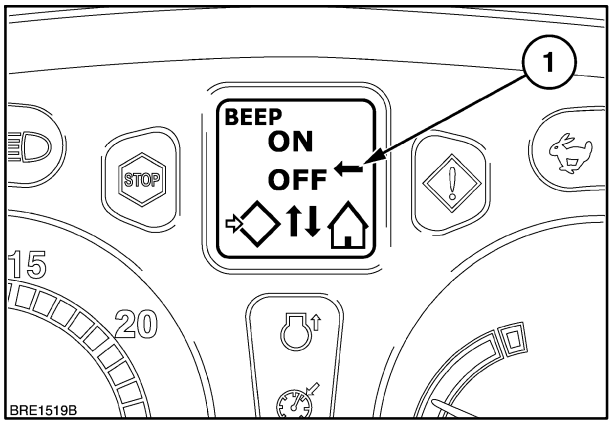


45

Audible Beep - ON/OFF

Each time one of the keys is pressed, an audible 'beep' sound will be heard. The beep can be switched off if required.

- With the key-start in the ON position, depress and hold the Menu/Enter key for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Using the Menu Up/Down keys, scroll through the menu until **BEEP ON/OFF** is displayed.
- Depress the Menu/Enter key again to select the set-up screen. Using the Menu Up/Down keys, align the arrow (1) with ON or OFF as required.
- Touch the Menu/Enter key to store the setting and return to the main menu.



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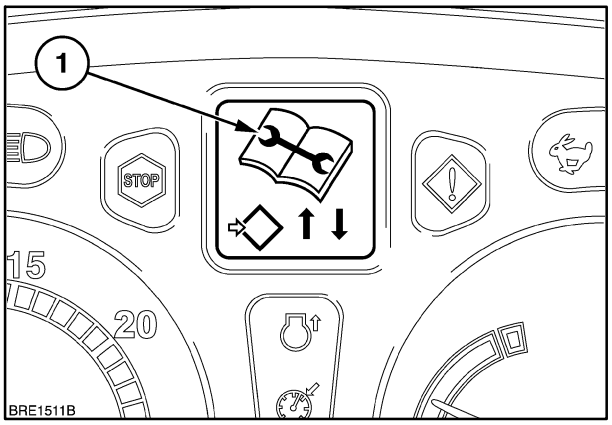
Programming the Service Reminder

The service reminder function allows the operator to programme two service interval reminders using the Enhanced Keypad. The following procedure is the same for LIGHT and HEAVY service intervals.

- With the key-start in the ON position, depress and hold the Menu/Enter key for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Using the Menu Up/Down keys, scroll through the menu until the service reminder symbol (1) appears in the display.



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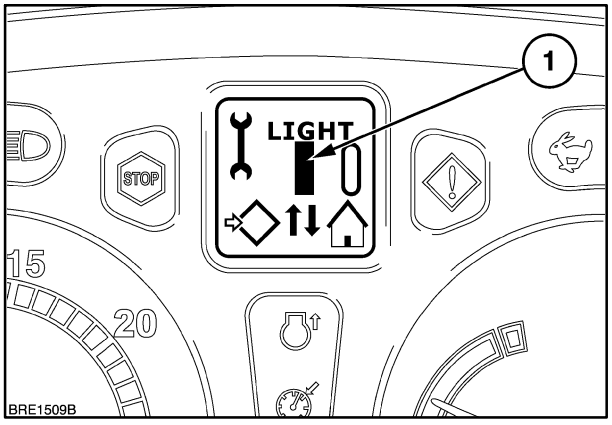
Setting a 300 Hour Reminder (Light)

- Depress the Menu/Enter key again to select the 'Light' set-up screen, a flashing cursor (1) will appear at the first number to be set. Using the Digit Value key enter **'3'**, move the cursor one space to the right with the Digit Select key and, with the Digit Value key, enter **'0'**, repeat for the third digit and enter the value **'0'.** The display will now read **LIGHT**/ **300**.
- Touch the Menu/Enter key to memorise the setting and return to the main menu.

The service reminder is now set for 300 hours. When the 300 hour service becomes due, an audible alarm will sound to advise the operator.



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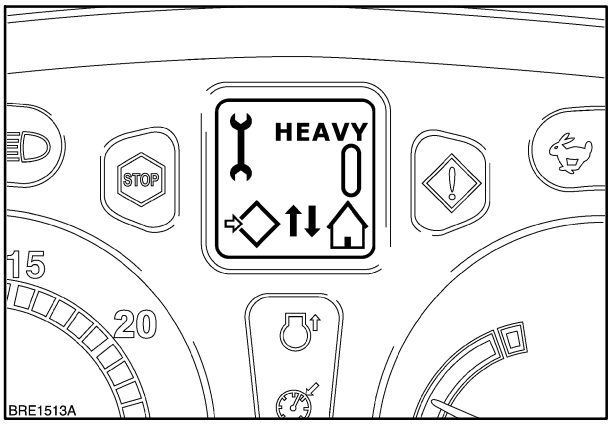
Setting a 600 Hour Reminder (Heavy)

Select **HEAVY** on the main menu and repeat the procedure used for setting the LIGHT service reminder.



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NOTES

SECTION 55 – ELECTRICAL SYSTEM

Chapter 3 – Starting System

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SPECIFICATIONS

	Starter Type Bosch 3 Kw Gear Starter (Up to tractor Serial Number ACP242468)	Starter Type Iskra 4.2 Kw Gear Starter (From tractor Serial Number ACP242469)
Maximum No Load Current Draw at 11.5 volts and 4000 rev/min.	120 amps	120 amps
Minimum Brush Length	12 mm	-
Minimum Commutator Diameter	34.2 mm	-

TIGHTENING TORQUES

	ft-lb	Nm
Starting Motor to Engine Block Retaining Bolts	25	34
Solenoid Cable Nuts	12	18
Starting Motor End Housing Bolts	4.8	6.8
Solenoid Retaining Screws	3.5	4.1
Brush Gear Plate Screws	3.5	4.1

DESCRIPTION AND OPERATION

The type of starting system is dependant on the transmission installed in the tractor. All systems consist of a key start switch, heavy duty wiring, starter motor and solenoid assembly, a starting relay and a clutch pedal switch, these are the components of the basic circuit which is used on the mechanical transmission. Other components are included on the more sophisticated transmissions to ensure that the engine can only be started under the correct conditions.

There are three basic types of transmission, 12 x 12, 24 x 24 and 16 x 16.

The 16 x 16 and 24 x 24 transmissions share the same starting circuit, with 12 x 12 having a unique starting circuit.

The starter is a four pole four brush type with integral solenoid and with a geared drive engagement assembly, rated at 3Kw or 4.2 Kw.

The integral solenoid incorporates two windings connected in parallel. One winding is the low resistance 'pull-in' coil, grounded through the motor, while the other is the high resistance 'hold-in' coil grounded via the solenoid body.

When the key start switch is closed with the clutch pedal depressed and the transmission in neutral (except mechanical) the solenoid coils are energized and the solenoid plunger is magnetically attracted into the solenoid core. This movement, transmitted through a pivoted linkage mechanism forces the drive pinion into mesh with the flywheel ring gear. At ring gear to pinion abutment, the solenoid plunger closes a set of contacts to give a direct feed from the battery to all four field coils, providing full power to the starting motor.

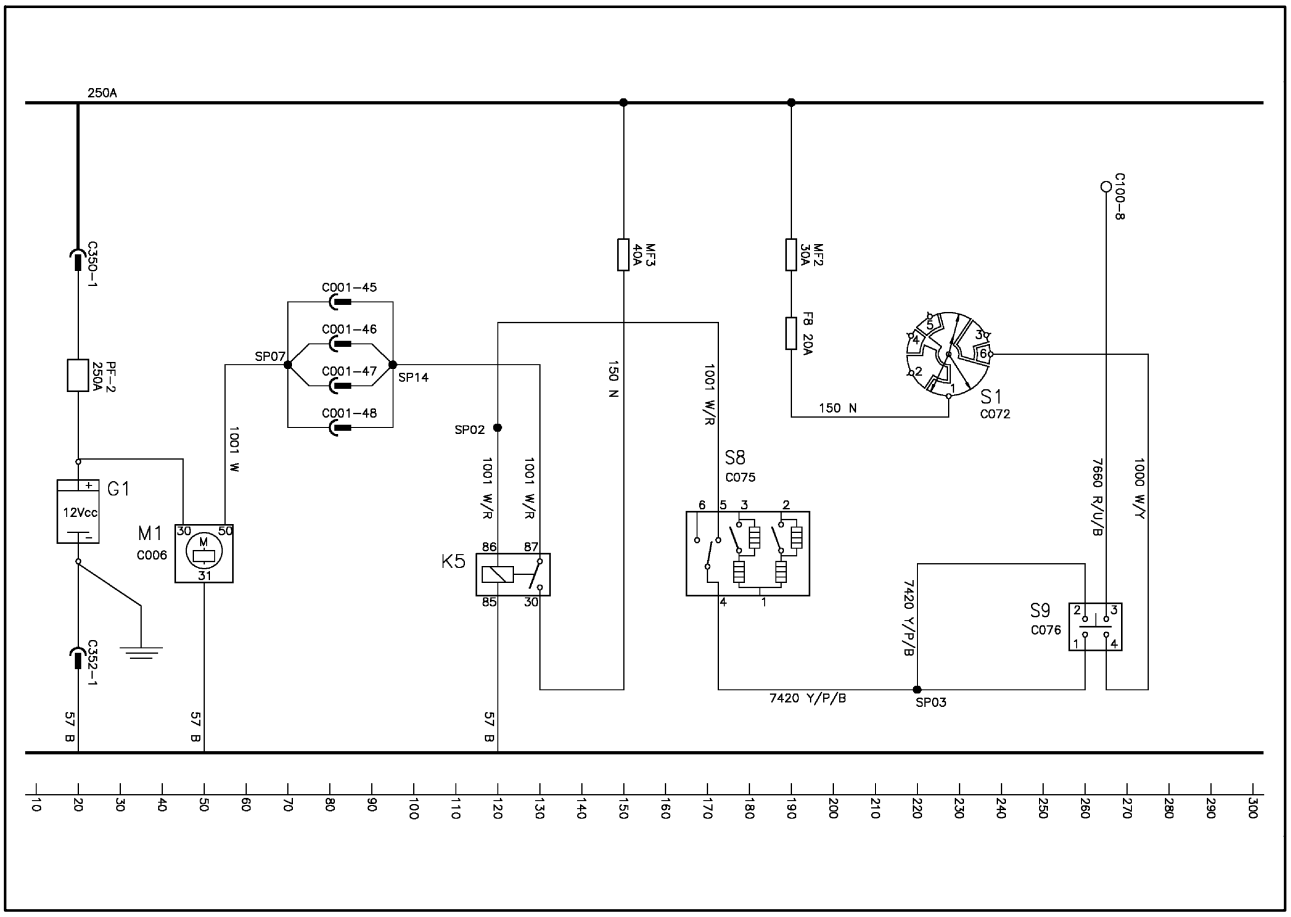
At this point one end of the 'pull-in' coil is connected to battery positive through the starter switch while the other end is connected to positive through the solenoid contacts. The 'pull-in' coil is thus by-passed, drawing no current and the 'hold-in' coil alone keeps the solenoid plunger engaged.

The starter incorporates a single set of contacts and a two piece solenoid plunger which completely closes the contacts even if the pinion and ring gear teeth are misaligned. When this happens, an engagement spring is compressed which forces the pinion into full engagement as soon as the starter begins to turn.

The gear type starter incorporates an epicyclic gear reduction unit. The rotation from the armature drives into the epicyclic and then onto the pinion. The ratio is approximately 3.75:1 (3.75 armature rotations to 1 output rotation). This enables the engine to be cranked over easier, using less battery power compared with non-geared starters, this is especially useful in cold conditions. The starter is also more efficient and maintains its initial cranking speed longer than conventional direct drive starters.

When the key start switch is released, power to the solenoid and motor is removed. The solenoid return spring acting through the pivoted linkage mechanism pulls the drive pinion out of mesh and reopens the solenoid contacts.

Incorporated in the drive pinion assembly is a roller clutch device. This device prevents the armature from rotating excessively if the pinion remains in mesh with the flywheel ring gear after the engine has started.



1

Starter Circuit - Models with 16x16 and 24x24 Transmissions

PF2 Power Fuse 250A

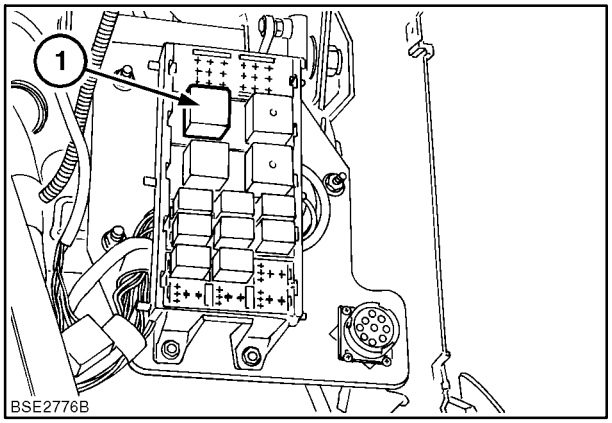
MF2 Maxi Fuse 30A
MF3 Maxi Fuse 40A

G1 Battery

M1 Starter Motor and solenoid

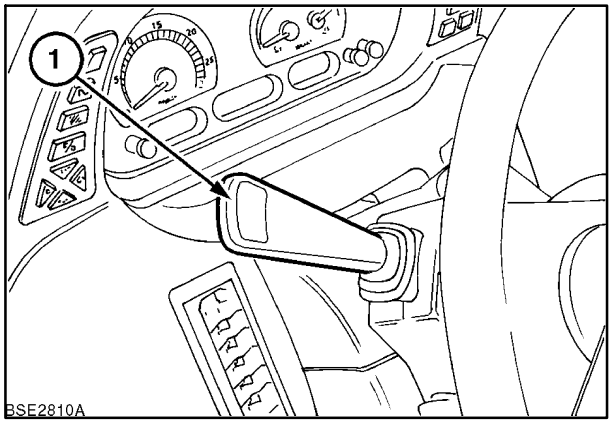
K5 Starter Relay

S1 Ignition Switch
S8 Shuttle switch
S9 Clutch Pedal Switch



2

Starter Relay Location



3

Shuttle Lever Switch

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STARTER SYSTEM TESTING ON TRACTOR

For easier and rapid diagnosis and for most conclusive test results, it is recommended that a battery-starter tester (high rate discharge tester) incorporating a 0-20 volt voltmeter and a 0-1000 amp ammeter be used to diagnose starting system problems.

When using test equipment follow the manufacturers recommended test procedures. If test equipment is not available the following test procedure, using a standard 0-20 volt voltmeter and 0-1000 amp ammeter can be used to determine the correct operation of the starter without removing it from the engine.

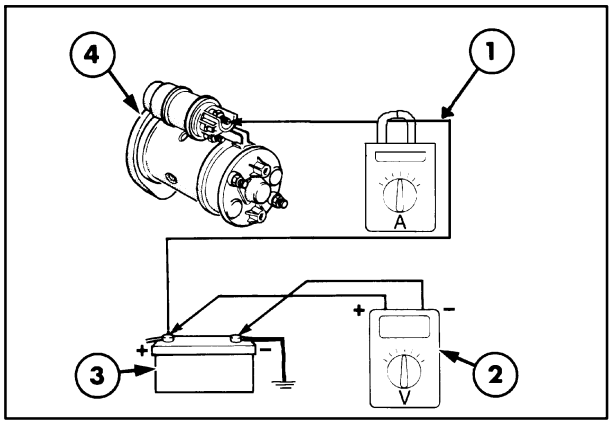
Before testing:

- Check that the battery is fully charged.
- Check the complete starting system wiring circuit for frayed or broken wires or loose terminal connections.
- Check the engine is not seized.

Starter Motor Circuit Current Draw

1. Attach a suitable clamp meter, (1), with a 0-1000amp range, over the battery positive cable.
2. Connect the voltmeter(2) positive lead to the battery positive terminal and the voltmeter negative lead to the battery negative terminal.
3. Disconnect the wire from the fuel injection pump shut off solenoid.
4. Crank the engine while observing the voltmeter and ammeter readings. The voltage should remain steady at around 10-12 volts with between 250-400 amps being drawn.

- If the current draw is within specification the starting motor (4) is functioning correctly. If the voltage drops during the test proceed to 'Starting System Circuit Resistance'.
- If the current draw is greater than specified, check the circuit as outlined below. If the starting system circuit tests are satisfactory the starting motor is defective and must be disassembled to determine the cause.
- If the current draw is less than specified, the starting motor is defective and must be disassembled to determine the cause.



4

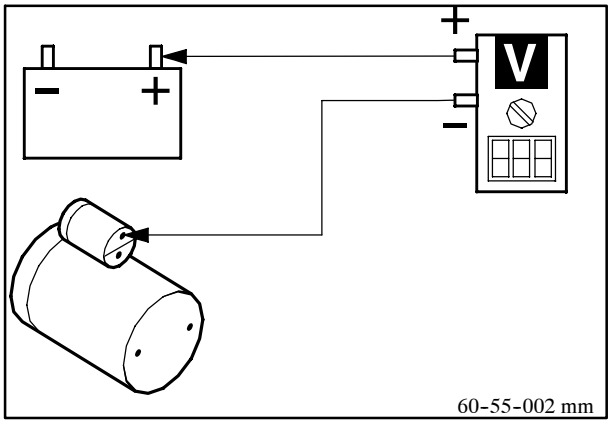
STARTING SYSTEM CIRCUIT RESISTANCE (VOLTAGE DROP)

If there is an excessive current draw the circuit should be checked by recording voltage drops across the individual components in the circuit

IMPORTANT: *Disconnect the fuel injection pump fuel shut off solenoid wire.*

Battery Positive Cable

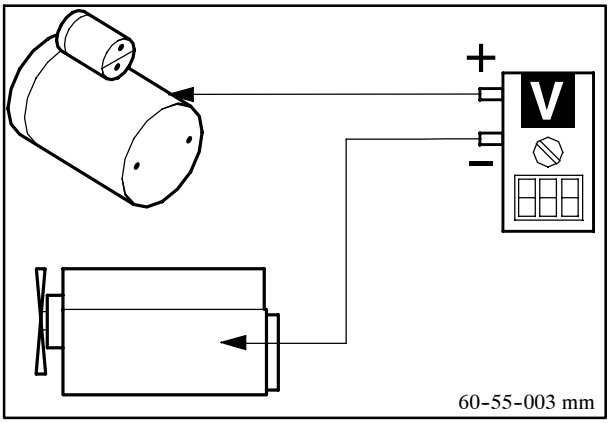
1. Connect the voltmeter positive lead to the battery positive terminal.
2. Connect the voltmeter negative lead to the starting motor solenoid battery terminal.
3. Crank the engine while observing the voltmeter reading. If the voltage exceeds 0.2 volts, check and tighten the cable connections. Recheck the voltage, if still excessive install a new cable.



5

Starting Motor Ground Connections

1. Connect the voltmeter positive lead to the starting motor frame.
2. Connect the voltmeter negative lead to the engine block.
3. Crank the engine while observing the voltmeter reading. If the voltmeter reading exceeds 0.2 volts check the ground connections between the starting motor flange and the rear engine plate.



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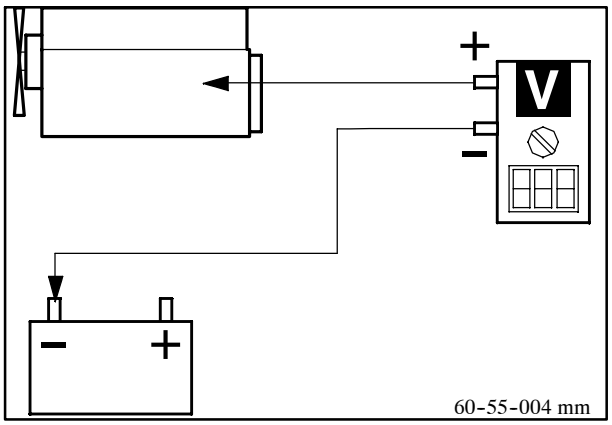
Battery Ground Cable

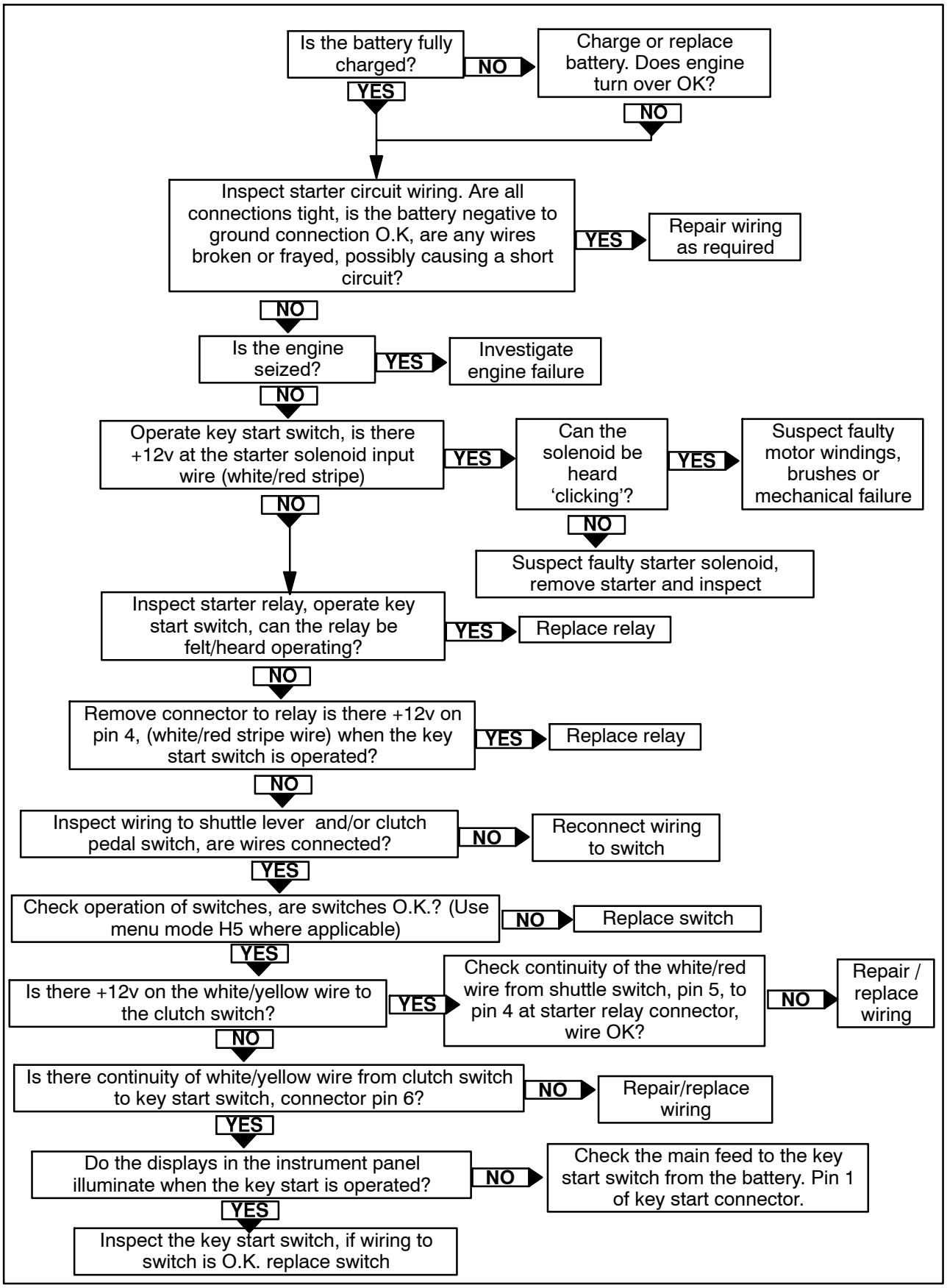
1. Connect the voltmeter positive lead to the engine block.
2. Connect the voltmeter negative lead to the battery negative terminal.
3. Crank the engine while observing the voltmeter reading. If the reading exceeds 0.2 volts, check and tighten the ground cable connections. Recheck the voltage, if it is still excessive install a new ground cable.



7

TROUBLESHOOTING

Engine Does Not Turn Over When Key Start Is Operated, Transmission In Neutral

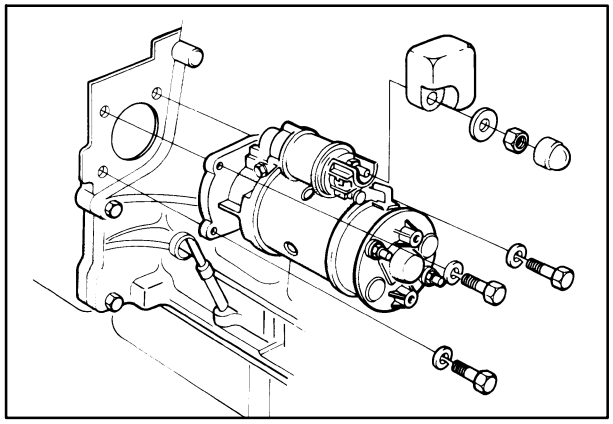


OVERHAUL

STARTER MOTOR

Removal and Installation

1. Disconnect the battery ground (negative) cable from the battery.
2. Remove the protective cover from the solenoid assembly and disconnect the positive cables to the solenoid and the solenoid coil feed wire.
3. Remove the three starting motor mounting bolts and remove the starting motor.
4. Installation is the reverse of the removal procedure.



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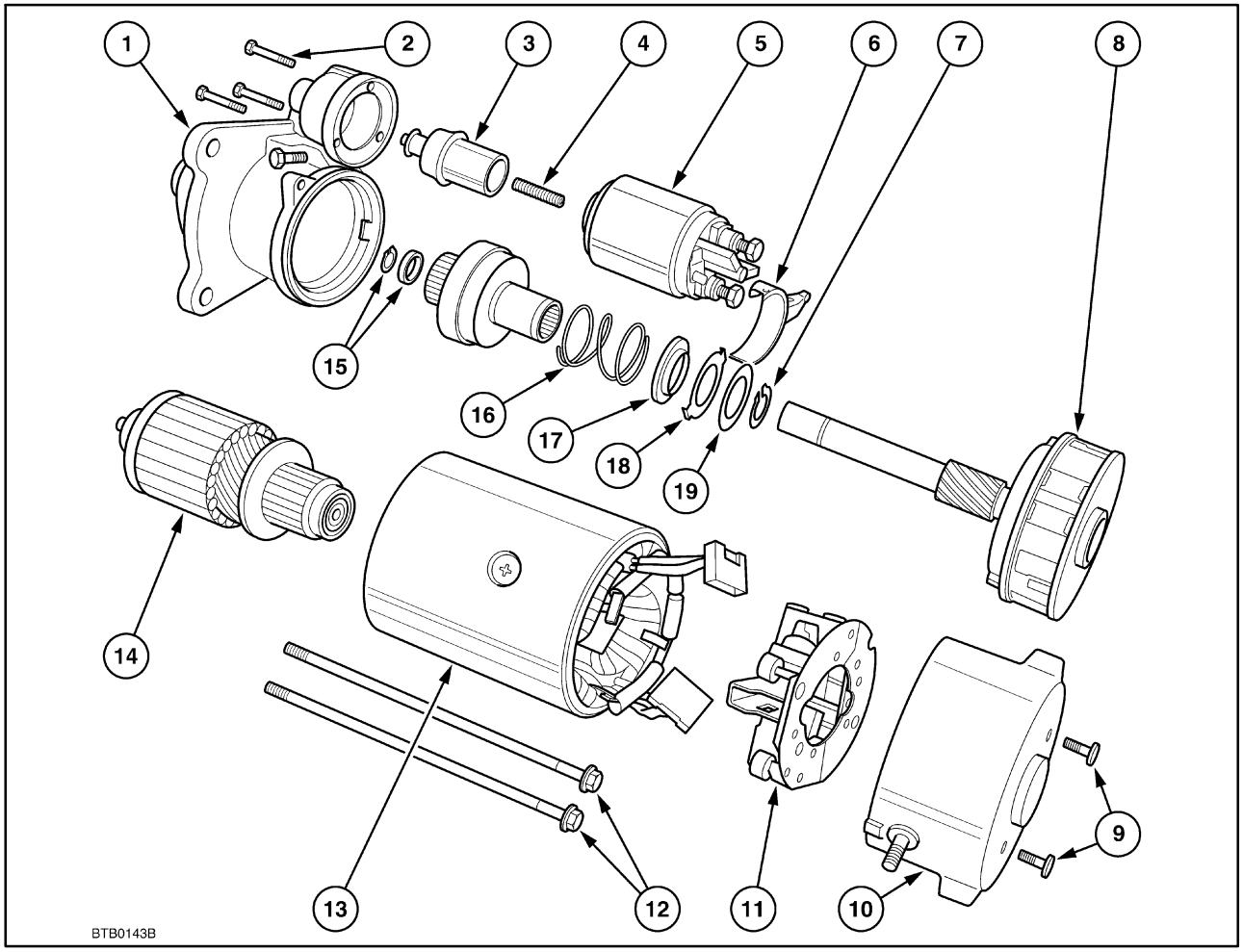


9

Starter Motor - Exploded View

1. Front housing
2. Solenoid screws
3. Plunger
4. Spring
5. Solenoid
6. Engagement lever
7. Circlip
8. Reduction gear unit
9. Screws
10. End housing
11. Brush plate
12. Armature housing bolts
13. Motor casing
14. Armature
15. Snap ring and collar
16. Spring
17. Spring cap
18. Engagement lever plate
19. Washer

Disassembly (Bosch 3 Kw Starter Motor Only)

NOTE: *The Iskra 4.2 Starter Motor is not a serviceable unit..*

With reference to Figure 9.

1. Support the starting motor in a soft jawed vice.
2. Disconnect the thick braided wire from the field coil housing to the solenoid assembly.
3. Remove the three screws from the front housing assembly and withdraw the solenoid assembly. The plunger may be left behind. In this case, pull the plunger from the front housing.

- Mark the starter casing at each end prior to disassembly to ensure correct alignment of components during reassembly.

4. Remove the two armature housing bolts and the two screws retaining the end cap and brush plate to the end housing, withdraw the end housing, leaving the brush gear on the commutator.
5. At this stage of disassembly inspect the brushes and commutator. Check for sticking brushes. If necessary, clean brushes and brush channels using a suitable cleaning solvent. Check brushes for wear. If worn below the minimum length specified, of 7.00mm, it will be necessary to replace the complete starter motor.

NOTE: *The brushes are not serviced separately. They are spot welded into position and not intended to be replaced during the starter motors service life.*

6. Withdraw the brush box and the motor casing from the armature and drive end housing.
7. Withdraw the drive engagement lever pivot pin from the drive end housing.
8. Withdraw the drive assembly and lever together from the front housing.
9. Remove the drive assembly and reduction unit retaining snap ring from the armature shaft by driving the securing thrust collar squarely off the snap ring with a suitable diameter tube and then levering the snap ring from the groove.
10. Separate the reduction unit from the drive assembly.
11. The drive assembly can be further dismantled to replace the pinion gear. Remove the circlip from the drive assembly, relieving the pressure of the spring and disassemble the drive assembly.

Assembly

1. Re-assembly of the starting motor follows the disassembly procedure in reverse, observing the following points:

- Ensure the marks made before disassembly are aligned before final tightening of the two armature housing bolts.
- To aid brush installation over the commutator, insert a thin blade screwdriver under the brush spring to allow the brushes to move freely in their holders.

Prior to installation the starting motor no load function must be tested.

TESTING

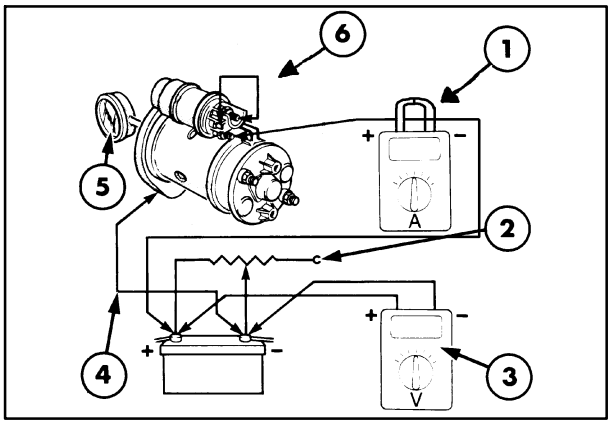
STARTING MOTOR NO-LOAD TEST

NOTE: *A fully charged battery and a battery starter tester (high rate discharge tester) with a carbon pile (variable load resistor) should be used to perform this test.*

1. Secure the starting motor in a vice equipped with soft jaws.
2. Connect the battery negative cable (4) to the starting motor mounting flange.
3. Connect a voltmeter (3) positive lead to the battery positive terminal, the voltmeter negative lead to the battery negative terminal.
4. Connect the battery positive cable to the starting motor terminal and attach a suitable clamp meter (1), over the cable.
5. Connect a short jumper lead (6) between the solenoid battery and solenoid switch terminals.

NOTE: *Connecting the jumper lead will cause the starter to operate.*

6. Hold a hand tachometer (5) on the end of the armature shaft. Set the starting motor by adjusting the carbon pile (2) to give 11.7 volts. When the armature rotates above 4000 rev/min. the maximum current draw should not exceed 150 amperes.
7. If the starting motor does not perform to specification, check for grounded field coils, a rubbing armature or a distorted armature shaft.



10

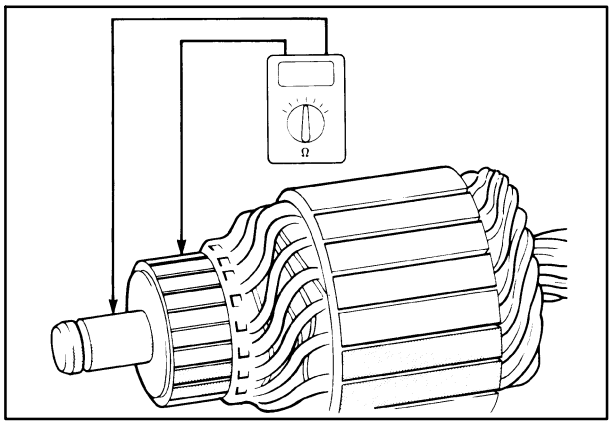
BENCH TESTS

Armature

1. The commutator face should be clean and free from burnt spots. If necessary remove any burnt spots using fine glass paper, not emery cloth. Finally clean the commutator with an alcohol moistened cloth.
2. If it is necessary to skim the commutator ensure the diameter is not reduced below the minimum specified diameter of 42.5mm. Following skimming the commutator should be polished with a fine glass paper and then wiped clean with an alcohol moistened cloth.

NOTE: *Do not cut into the commutator metal when recutting insulation slots.*

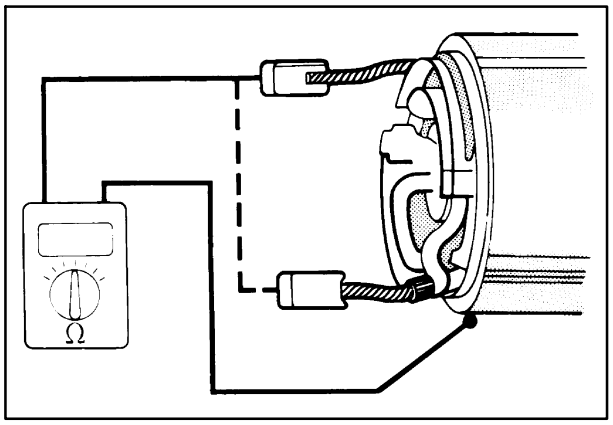
3. Armature insulation can be checked by connecting an ohmmeter between the commutator segments and the armature shaft. There should be an infinity reading, i.e, no continuity. Also, If there are black or burned points this will be an indication that the insulation has cracked.
4. To test the armature for short circuits it is necessary to use suitable armature testing equipment, the only alternative is to check the armature by substitution.
5. If there is evidence that the armature circumference has been in contact with the pole pieces, then the armature bearings are probably excessively worn. First check that the pole pieces are tight and that the armature runs true in a lathe, then if necessary renew the armature bearings.



11

Field Coils

1. To test the insulation of the field coils connect an ohmmeter in turn between each of the field winding brushes and a clean unpainted part of the housing. There should be no reading, i.e, no continuity.
2. To test the field winding continuity connect an ohmmeter in turn between each of the field winding brushes and the main feed terminal (thick braided wire). A reading of 1 MΩ should be indicated.
3. If a fault is indicated in the field windings it will be necessary to replace the complete field coils and housing assembly.



12

Bearing Bushes

1. Inspect the bushes in the brush end plate assembly and pinion drive end housing for wear. Install the armature shaft and observe the free play, replace bushes where free play appears excessive. Inspect the field poles for signs of rubbing by the armature which may also have been caused by worn bushes.

Drive Pinion Assembly

1. Check the operation of the roller clutch. The pinion should rotate clockwise only. If the pinion is stuck or rotates in both directions, or if the pinion teeth are damaged install a new drive assembly.

If damaged pinion teeth are evident, check the flywheel ring gear teeth as described in Section 10, Engine Systems.

SECTION 55 – ELECTRICAL SYSTEM

Chapter 4 – Charging System

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Op. 55 000

SPECIFICATIONS

	Alternator Type	
	A127-70	**A127-120**
Polarity	Negative Ground	Negative Ground
Nominal Voltage	12.0 v	12.0 v
Maximum Rev/Min.	18,000	18,000
Maximum Output	70 Amps	120 Amps
Regulator Controlled Voltage	13.6 - 14.4 v	13.6 - 14.4 v
Rotor Field Winding Resistance	2.6 Ω	2.6 Ω
Stator Field Winding Resistance	0.075 Ω	0.075 Ω
New Brush Length	20.0 mm	20.0 mm
Minimum Brush Length	5.0 mm	5.0 mm
Brush Spring Pressure	1.3 - 2.7 N (4.7 - 9.8 oz)	1.3 - 2.7 N (4.7 - 9.8 oz)

TIGHTENING TORQUES

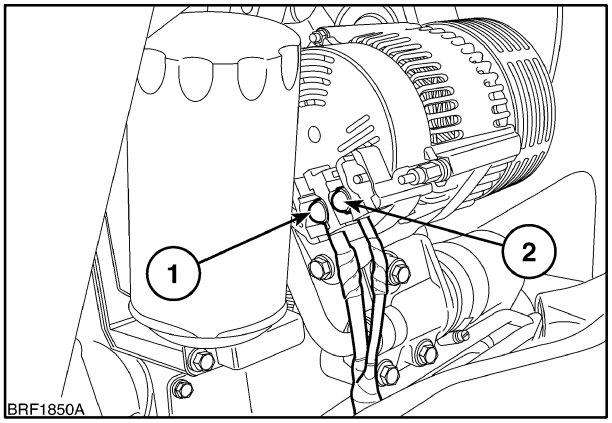
	lbf.ft	**Nm**
Alternator Through Bolts	4.0	5.5
Pulley Retaining Nut	52.0	70.0
Rectifier Attaching Screws	3.0	4.0
Regulator and Brushbox Screws	2.0	2.7
Terminal Nuts	2.0	2.7
Mounting Bolt	16.0	23.0
Adjusting Bolt	8.0	12.0

DESCRIPTION AND OPERATION

Denso A127 type alternators are fitted to all models. Used in the 120 Amp form with an internal cooling fan on with cab models and in 70 Amp form on less cab models. The alternator is mounted high at the front of the engine and is driven from a crankshaft pulley via a 'poly vee' drive belt. The alternators feature integral regulators.

120 Amp Alternator

1. Output Connection (B+ Terminal)
2. Warning Lamp (D+ terminal)



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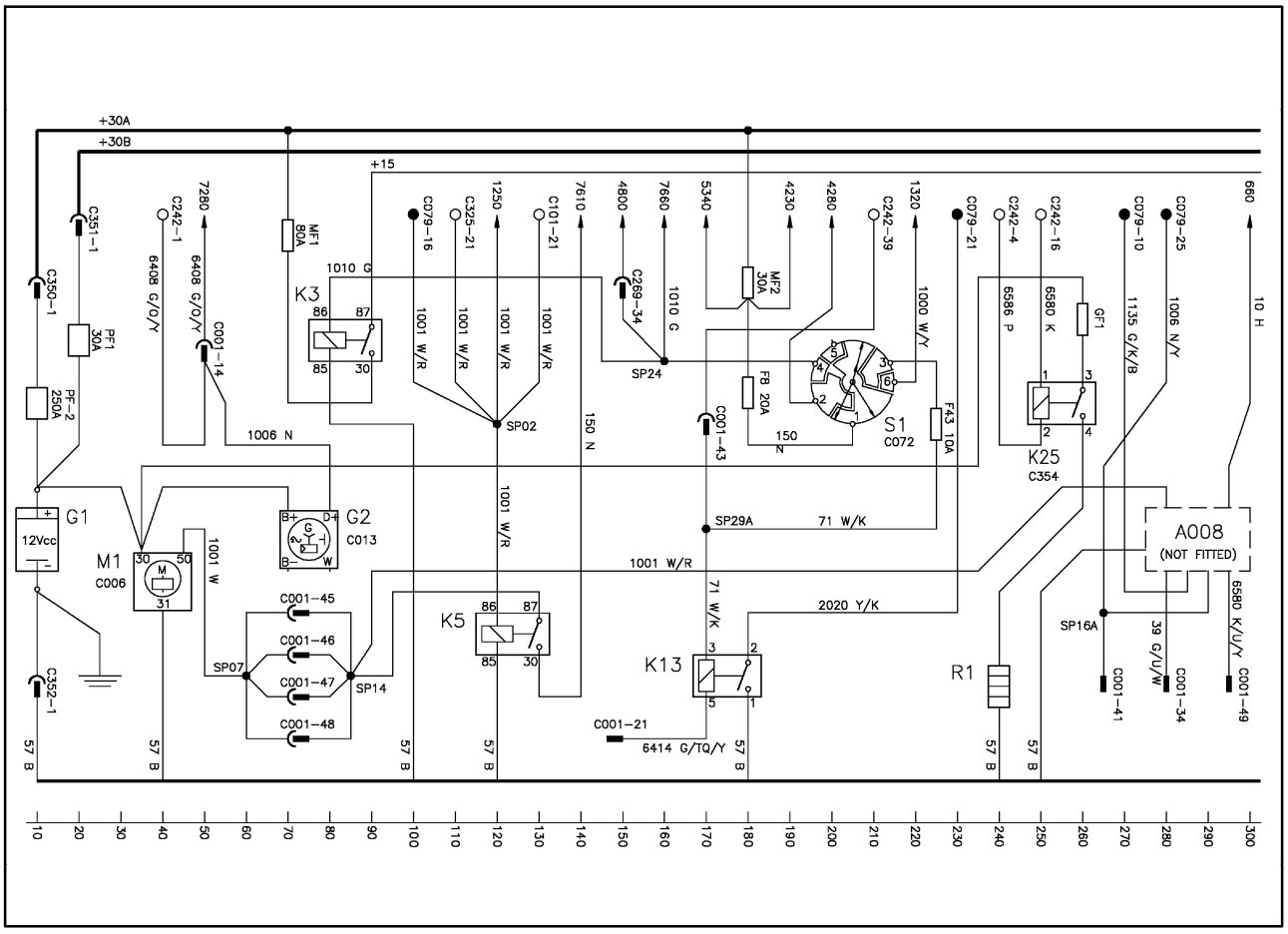


2

Alternator Charging Circuit

G1 Battery
G2 Alternator
M1 Starter Motor and Solenoid
K3 Ignition Relay
K13 Engine Cold Start Advance Relay
S1 Ignition Switch
MF1 Maxi-Fuse - 80A
MF2 Maxi-Fuse - 30A
K5 Start (crank) Relay
K25 Grid Heater Relay
PF1 Power Fuse - 30A
PF2 Power Fuse - 250A
F8 Fuse - 20A
F43 Fuse - 10A
GF1 Grid Heater Fuse
R1 Grid Heater
A008 Grid Heater Module (not fitted)

ALTERNATOR

With reference to Figure 2.

When the key start switch is turned on a small current flows from the battery through the rotor field wiring. The circuit is made via the charge indicator warning lamp, alternator terminal 'D+' the rotor field winding, the alternator regulator and ground.

At this stage the warning light is illuminated and the rotor partially magnetised.

When the engine is started and the partially magnetised rotor revolves within the stator windings a 3-phase alternating current is generated. A constant portion of the generated current is converted to direct current by the three field diodes incorporated in the rectifier pack.

This direct current is fed back to supplement the current flowing through the rotor field winding.

This action results in an ever increasing magnetic influence of the rotor along with an associated rapid rise in generated output current and voltage.

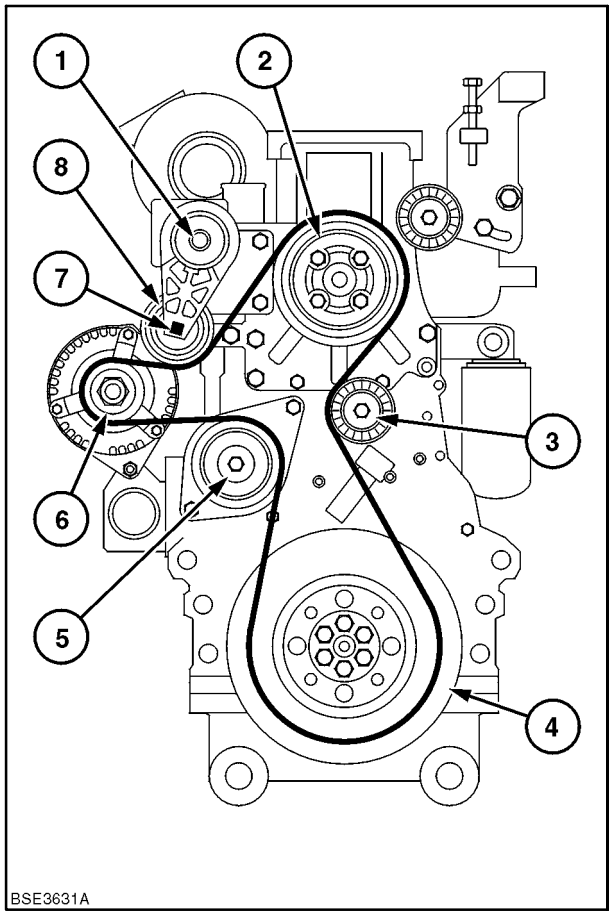
During the rise in generated output voltage (reflected at the 'D+' terminal) the brilliance of the warning lamp is reduced and when the voltage at the 'D+' terminal equates to that at the battery side of the warning light the lamp is extinquished.

The voltage continues to rise until the predetermined regulated voltage level is reached.

In the event of drive belt breakage the voltage will not build up within the alternator and so the charge indicator light will remain on to indicate failure.

FAN BELT TENSIONER

1. Tensioner Attaching Bolt
2. Fan Pulley
3. Idler
4. Crankshaft Pulley
5. Water Pump Pulley
6. Alternator Pulley
7. 1/2 inch Square Drive Hole
8. Tensioner Pulley



3

SYSTEM TESTING, FAULT FINDING, AND OVERHAUL

SERVICE PRECAUTIONS

To avoid damage to the components of the alternator charging system, service precautions must be observed as follows:

- **NEVER** make or break any of the charging circuit connections, including the battery, when the engine is running.
- **NEVER** short any of the charging components to ground.
- **ALWAYS** disconnect the battery ground cable (negative) when charging the battery on the tractor using a battery charger.
- **ALWAYS** observe correct polarity when installing the battery or using a slave battery to start the engine.

CONNECT POSITIVE TO POSITIVE AND NEGATIVE TO NEGATIVE

PRELIMINARY CHECKS

Prior to electrical testing thoroughly inspect the charging and electrical system.

Check all leads and connections for continuity and tightness.

1. Check the battery

Using a hydrometer check the individual battery cells. The battery should be at least 70% charged and in good condition.

2. Check the drive belt

Inspect the alternator drive belt and pulley, ensuring that both are clean, free from oil and grease and in good condition.

The alternator drive belt is automatically tensioned by a spring tensioner mounted at the front of the engine, shown in Figure 3. If the the belt tension is suspect, check the tensioner assembly as follows:

Fan Belt Tensioner Removal

1. The fan belt should be removed in the following manner. Place a lever with 1/2 inch square drive attachment into the 1/2 inch square hole of the tensioner arm and rotate the lever clockwise. Remove the fan belt from the pulley and allow the tensioner to return to its untensioned position once the belt has been removed.
2. Remove the tensioner from the pump by loosening and removing the centre attaching bolt, item 1 Figure 3.

Inspection and Repair

1. Checking of the tensioner assembly operation should be carried out, with the tensioner assembly still attached to the front plate fuel injection pump gear cover. To check the spring load, place a "break back" torque bar pre-set to, 52 – 63 lbf. ft (70 – 85 Nm) (7.1 – 8.7 kgf.m), into the pulley arm 1/2 inch squre drive hole. Raise the lever up through an arc of 20° maximum. If the torque bar does not "break" within the range a new tensioner assembly is required.
2. Ensure the tensioner pulley rotates freely by hand. If not replace with new parts.

Re-Assembly

1. Fit a new pulley to the assembly if required, and torque the attaching bolt to, 34.5 – 44 lbf.ft (46.5 – 60 Nm), (4.7 – 6.1 kgf.m)
2. To re-assemble the arm assembly, position the tensioner on to the front plate fuel injection pump gear cover, fit the mounting bolt through the assembly, and torque the bolt to, 34.5 – 44 lbf.ft (46.5 – 60 Nm), (4.7 – 6.1 kgf.m).
3. Refitment of the fan belt is the reverse of the removal procedure, but ensure the "Poly V" belt, is positioned correctly onto all of the pulleys.

3. Check the Warning Lamp

Turn on the key start switch and check that the warning lamp is fully illuminated.

If the warning lamp is not fully illuminated check the bulb. If the bulb is not the cause of the fault carry out the Alternator wiring connections test as detailed under 'initial tests' in this section.

If the warning lamp is illuminated start the engine and run above idling speed. The lamp should go out.

If the lamp does not go out, stop the engine and remove the wire from the D+ terminal. If the lamp now goes out a faulty alternator component is indicated. Conduct the 'Alternator components tests' as detailed in this section.

If the warning lamp remains illuminated, check for a short circuit to earth (ground) between the 'D+' cable end and the warning lamp.

INITIAL TESTS

The initial tests may be performed without removing any of the charging circuit components from the tractor and enable the following items to be checked:

- Alternator wire connections
- Alternator charging current and controlled voltage
- Alternator charging circuit volt drops
- Alternator maximum output performance

Test Equipment Required

- Voltmeter (0–30 volts moving coil type
- Millivoltmeter (0–1 volt)
- Ammeter (0–110 Amperes moving coil type)
- 1.5 Ohm 110 Amperes variable load resistor

NOTE: *Most commercial test equipment incorporates several testing devices within a single unit . Use such equipment in accordance with the manufacturers instructions.*

1. Alternator Wiring Connections Test

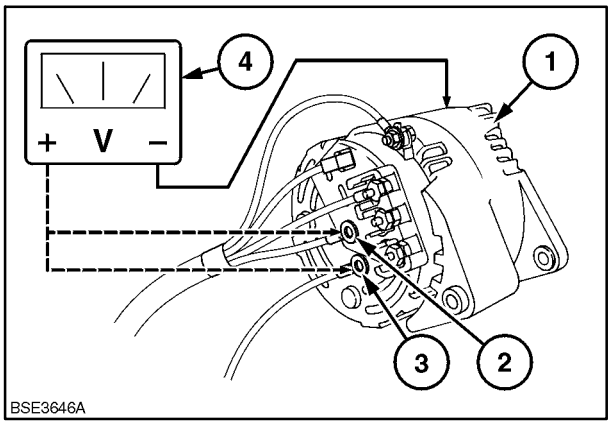
With reference to Figure 4.

1. Disconnect the battery
2. Disconnect the D+(2) and B+(3) terminals from the alternator.
3. Reconnect the battery and turn the key start on but do not start the engine. Connect a voltmeter (4) between each terminal and earth (ground), (1). Battery voltage should be registered.

If battery voltage is not registered a continuity fault in the external cable circuitry must be traced and remedied, refer to the circuit diagram shown in Figure 2.

4. Connect the D+ terminal, warning lamp (brown/yellow) wire, to earth (ground). The warning lamp should illuminate.
5. Disconnect the battery and reconnect the removed alternator cable connections to the alternator.

NOTE: *If the warning lamp fails to illuminate when the cable is reconnected to the alternator, a fault is indicated in the alternator regulator or rotor circuits. Ensure that the D+ terminal is clean and then conduct the alternator component tests as detailed in this section.*



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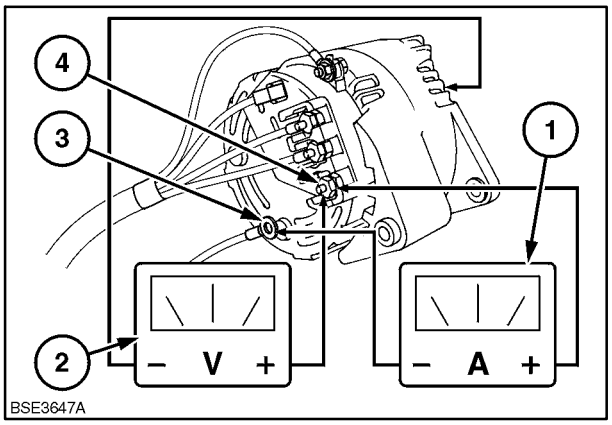
2. Charging Current And Controlled Voltage Tests

With reference to Figure 5.

1. Ensure all tractor electrical components are switched off and the key start switch is in the 'off' position.
2. Disconnect the battery negative terminal and disconnect the B+ terminal (4) of the alternator.
3. Connect an ammeter (1), between the removed (brown) cable (3) and the B+ alternator terminal.
4. Connect a voltmeter (2) between the alternator B+ terminal and earth (ground)
5. Reconnect the battery. Start and run the engine at 2000 rev/min. and observe the ammeter and voltmeter readings.

The voltmeter should register in excess of battery voltage and when the ammeter reading falls below 10 Amperes the voltmeter reading should stabilise at 13.6–14.4 volts.

If the voltmeter reading exceeds 14.4 volts the alternator regulator must be replaced as described in this section. (when a new regulator has been installed conduct tests 4 and 5).



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If the voltmeter reading is below 13.6 volts a faulty alternator component or a high resistance fault in the external connections of the charging system is indicated.

If the ammeter registers zero amperes a faulty alternator component is indicated. Turn off the engine and conduct the 'alternator component tests' as detailed in this chapter.

3. Charging Circuit Volt Drop Tests

(a) Insulated-Side Volt Drop Tests

With reference to Figure 6.

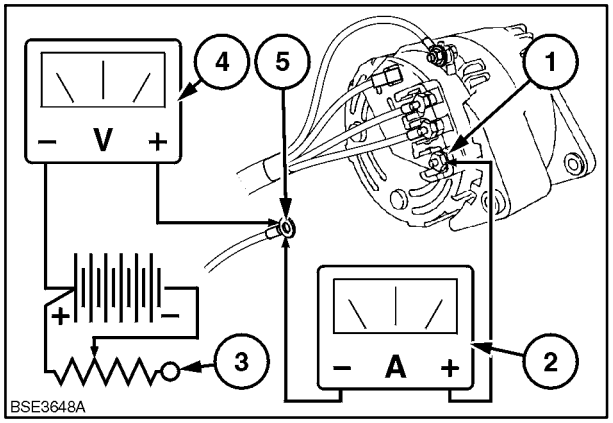
Ensure the key start switch is in the 'off' position.

1. Disconnect the battery negative cable and disconnect the B+ cable (1) from the alternator
2. Connect a millivoltmeter (4) between the battery positive terminal and the B+ cable (5). (Positive side to cable).
3. Securely connect an ammeter (2) between the B+ terminal of the alternator and the B+ cable (negative side to cable)
4. Reconnect the battery negative cable and connect a variable load resistor (3), with the slider in the minimum current draw position (maximum resistance), across the battery terminals.
5. Start the engine and increase the speed to 2000 rev/min.
6. Slowly increase the current loading of the resistor (decrease resistance) until the ammeter registers 100 or 120 Amperes depending on alternator type.
7. Observe the millivoltmeter reading which should not exceed 400 millivolts.

If the reading is in excess of 400 millivolts, a high resistance fault is indicated in the external circuitry.

If the required alternator output cannot be achieved and the millivoltmeter reading is less than 400 millivolts, then a faulty alternator component is indicated. Conduct the 'alternator component tests' as detailed in this section.

8. Stop the engine.



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(b) Ground-Side Volt Drop Test

With reference to Figure 7.

1. Ensure the key start switch is in the 'off' position.
2. The circuit is the same as that used in the previous test except for the millivoltmeter (4) which is now connected between the battery negative terminal and the alternator frame (negative side to frame).

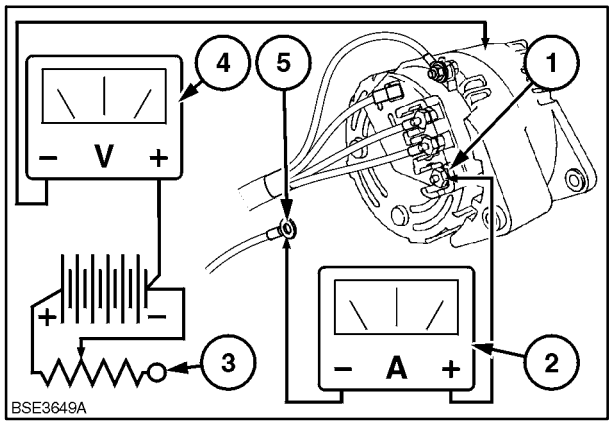
NOTE: *Ensure the variable load resistor(3) is in the minimum current draw position (maximum resistance).*

3. Start the engine and increase the speed to 2000rev/min.
4. Slowly increase the current loading of the resistor (decrease resistance) until the ammeter (2) registers 100 or 120 Amperes depending on alternator type.
5. Observe the voltmeter reading which should not exceed 200 millivolts.

If the reading is in excess of 200 millivolts a high resistance fault is indicated in the external circuitry.

If the required alternator output cannot be achieved and the millivoltmeter reading is less than 200 millivolts then a faulty alternator component is indicated. Conduct the alternator component tests as detailed in this section.

6. Stop the engine.



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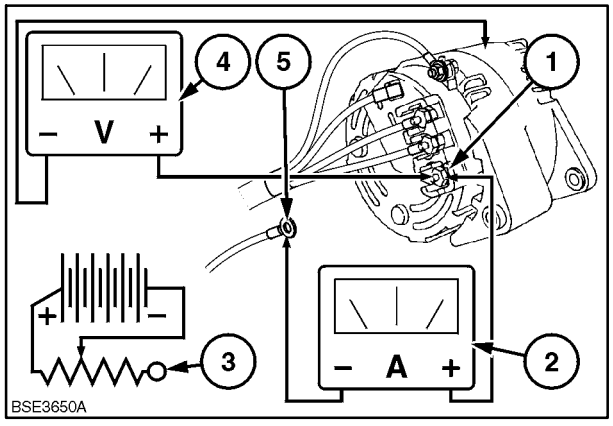
4. Alternator Maximum Output Performance Test

With reference to Figure 8.

1. Ensure the key start switch is in the 'off' position.
2. Disconnect the battery negative cable and disconnect the B+ cable (5) from the alternator.
3. Securely connect an ammeter (2) between the B+ terminal (1) of the alternator and the B+ cable (negative side to cable).
4. Connect a voltmeter (4) between the alternator B+ terminal and earth (ground).
5. Reconnect the battery, start and increase the engine speed to 2000 rev/min.
6. Slowly increase the the current loading of the resistor (3) (decrease resistance) until the ammeter registers either 100 or 120 Amperes depending on alternator type.
7. Observe the voltmeter reading which should not fall below 13.6 volts

If the reading falls below 13.6 volts a faulty alternator component is indicated. Conduct the 'alternator component tests' as detailed in this section.



8

ALTERNATOR COMPONENT TESTS

The component tests which should only be conducted if the INITIAL TESTS have indicated a faulty alternator component, will enable the following items to be checked:

- Regulator
- Rotor Field Winding Continuity
- Brushes and Springs and Rotor Slip Rings

NOTE: *The component tests detailed previously may be performed with the alternator installed on the tractor. Testing of the other alternator components will necessitate removal of the alternator from the tractor. Refer to the 'Overhaul' section of this Chapter.*

IMPORTANT: *Prior to removal of the alternator cables from the alternator ensure that the key start switch is in the 'off' position and the battery negative cable is disconnected.*

Test equipment required:

- 12 volt battery
- Multimeter
- 2.2 Watt Test Lamp

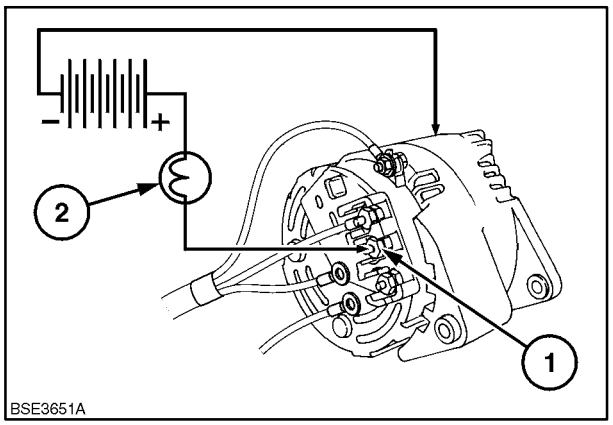
1. Regulator and Rotor Field Circuit Test

With reference to Figure 9

1. Disconnect all of the alternator cables.
2. Connect a 12 volt battery and a 2.2 Watt test lamp(2) in series between the D+(1) and the alternator frame (negative side to frame).
3. The test lamp should illuminate.

If the test lamp is not illuminated a fault is indicated in the rotor circuit. Check brushes, slip rings and continuity of rotor field windings.

If examination indicates these parts to be satisfactory the regulator may be suspect.



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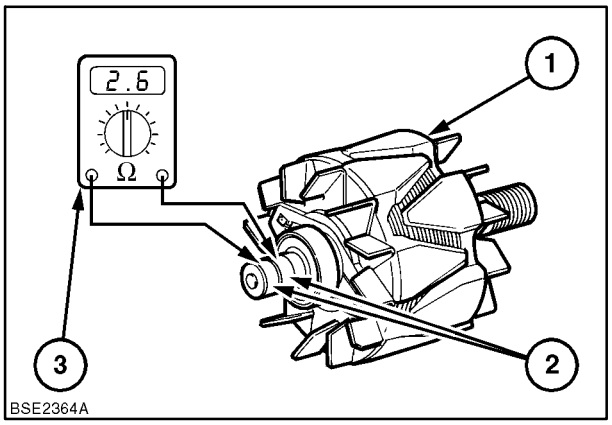
2. Rotor Field Winding Continuity Test

With reference to Figure 10

1. Remove the regulator and brushbox assembly as described in this chapter.
2. Connect an ohmmeter (3) between the two slip rings (2). The resistance should read 2.6 ohms at 20°C.

If the resistance is outside of the specification renew the rotor (1) as detailed in the following overhaul section.



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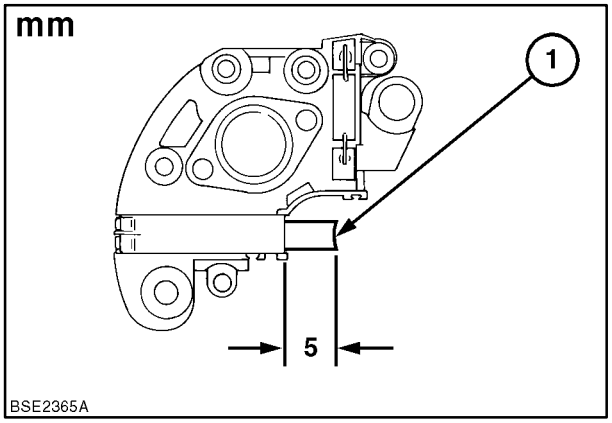
3. Brushes-and-Springs and Rotor Slip Rings

1. Remove the regulator and brushbox assembly as described in this Chapter.
2. Ensure the brushes and slip rings are clean and check for freedom of movement of the brushes in the brushbox moulding.
3. Check the brush spring pressure with a push type spring gauge and record the spring pressure when the brush end face is flush with the moulding. Install a new regulator and brushbox assembly if the pressure is less than specified.

If the visible length of the brushes (1) in the free position is less than 0.25 in. (5mm) this is a probable cause of open circuit in the field circuit and the regulator and brushbox assembly should be renewed, Figure 11.

NOTE: *The brushes are an integral part of the regulator and brushbox assembly and cannot be replaced as individual items.*



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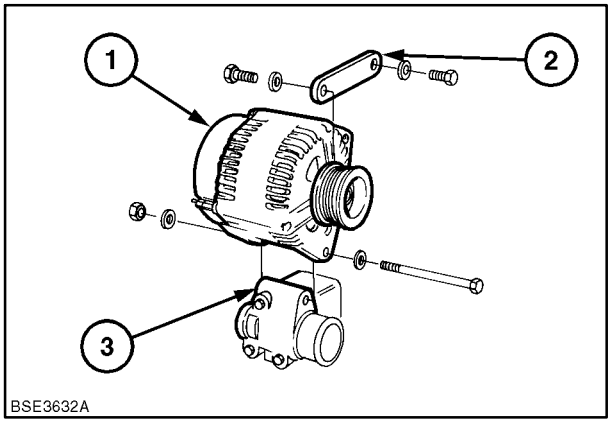
ALTERNATOR OVERHAUL AND COMPONENT TESTING

Removal

With reference to Figure 12

1. Disconnect the battery negative cable.
2. Disconnect the four cables from the rear of the alternator.
3. Remove the alternator drive belt in the following manner. Place a lever with socket attachment, onto the tensioner retaining bolt and gently lever the tensioner up, Figure 3. Remove the fan belt from the pulley, and allow the tensioner to return to its untensioned position once the belt has been removed.
4. Remove the alternator arm (2) and the lower mounting through bolts and remove the alternator (1) from the engine bracket (3).



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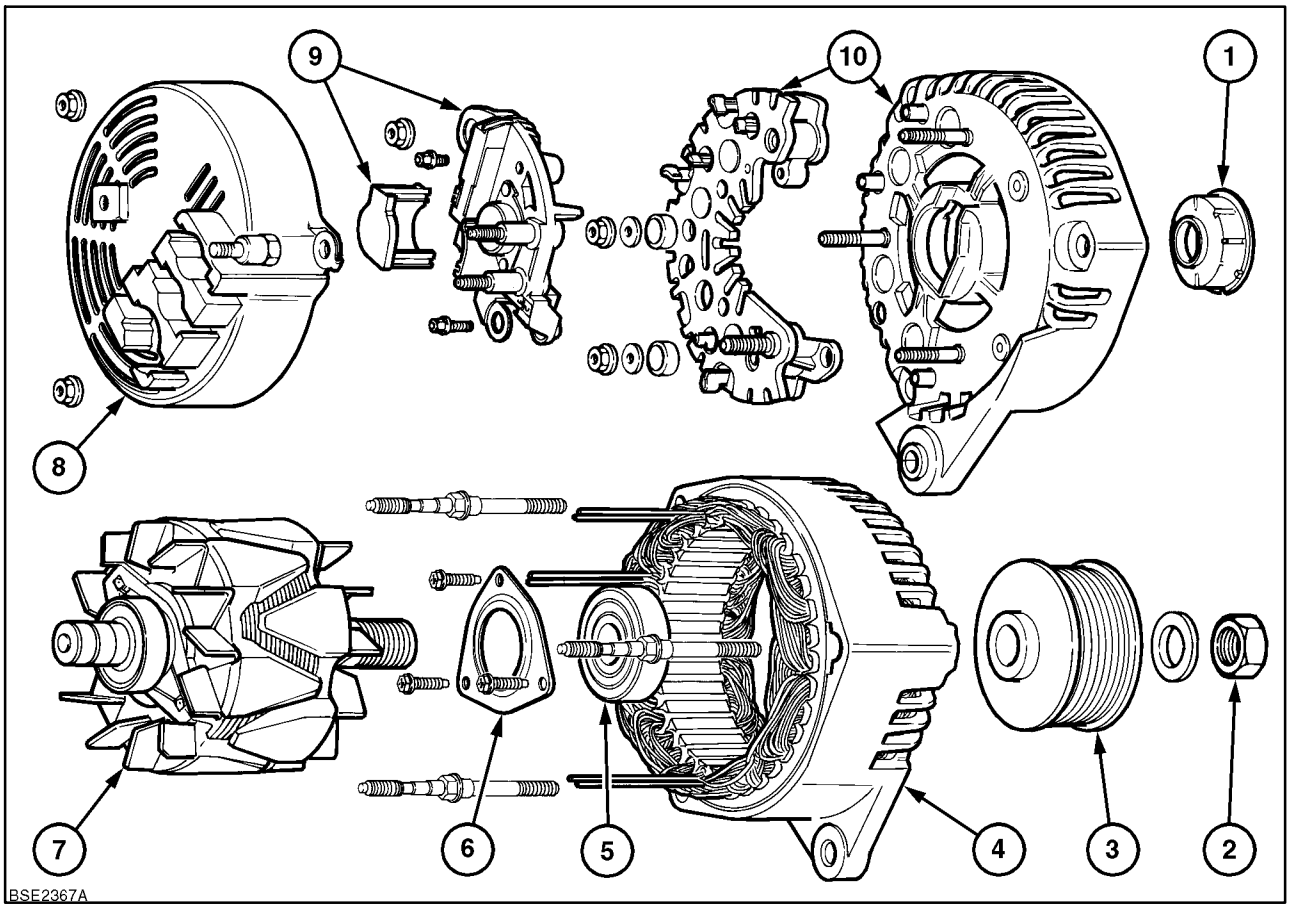

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Alternator Components

1. Shield
2. Pulley Retaining Nut
3. Pulley
4. Stator and Housing Assembly
5. Bearing
6. Bearing retainer Plate
7. Rotor Assembly
8. End Cover
9. Regulator and Brushbox Assembly
10. Rectifier and Housing Assembly

Disassembly - 120 Amp Alternator

With reference to Figure 13

1. Remove the three nuts securing the plastic end cover.
2. Remove the nut securing the blue wire to the warning lamp terminal and disconnect the wire. Remove the two bolts and two nuts securing the regulator and brushbox assembly, withdraw the assembly from the alternator.
3. Using a suitable soldering iron, unsolder the six wires from the stator to rectifier.
4. Remove the three nuts securing the two halves of the outer casing. Mark each half of the casing to aid reassembly and carefully pull the casing apart, it may be necessary to gently tap the casing on the mounting lugs.
5. Remove the nut securing the pulley to the rotor shaft and withdraw the rotor from the casing.
6. It is not necessary to remove the rectifier from the casing as these are serviced as one unit.

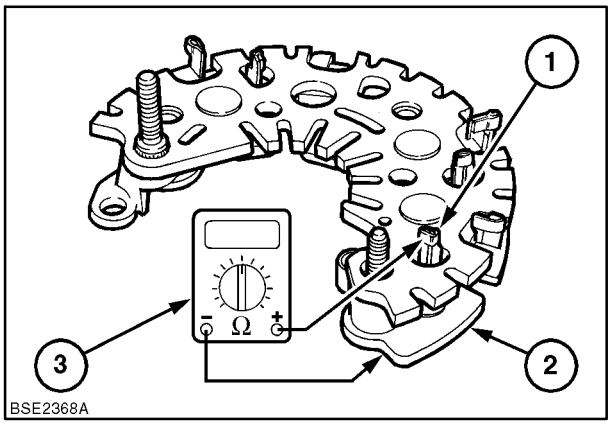
Component Test

Rectifier Assembly - Diode Testing

With reference to Figure 14.

1. Test each of the nine diodes separately, using a multimeter with a diode check facility or a multimeter set on the resistance scale.
2. Connect one test lead onto the lower plate (3) and the other to the diode pin (1).

   On a multimeter (2) with the diode check facility, note if a reading of 0.49 (volts) is shown. Reverse the test lead connections. The meter should indicate 0.49 (volts) during one half of the test and 0 volts with the leads reversed. Repeat this test on all nine diodes. If any one diode fails this test it will be necessary to replace the rectifier and housing assembly.
3. Where only an ohmmeter is available repeat the above test observing the following results, 0 ohms with leads in one direction and when the test leads are reversed a reading of between 900–1000KΩ, again if any one diode fails this test it will be necessary to replace the rectifier and housing assembly.

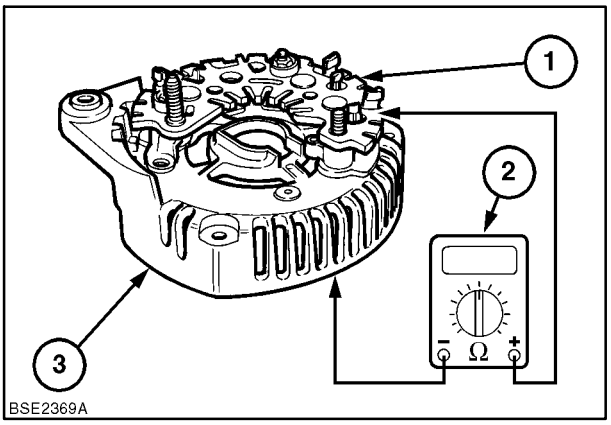


14

Rectifier Insulation

With reference to Figure 15.

1. Check the insulation of the rectifier to the casing. With an ohmmeter (2), connect the test leads between the alternator casing (3) and the positive plate of the diodes(1). An infinity reading should be displayed, therefore indicating an open circuit. If a resistance of any kind is indicated, i.e, a short circuit, the rectifier and housing assembly should be replaced.

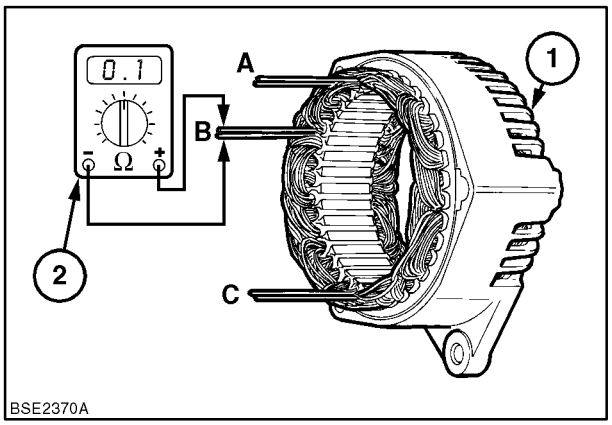


15

Stator Test - Winding Continuity

With reference to Figure 16.

1. Connect the ohmmeter (2) test leads between the pairs of wires, A, B and C. There should be a small resistance of 0.1Ω, between each pair of wires. If a resistance higher than this is registered it will indicate a possible break within the winding, i.e, an open circuit. A lower reading, for example 0.0Ω will indicate a short circuit within the winding. If any one of the three pairs of wires fail the test a new stator (1) and housing assembly will be required.



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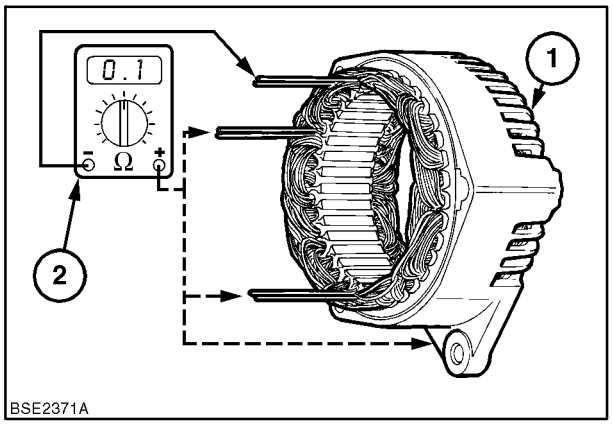
Stator Test - Insulation

With reference to Figure 17.

1. Check the insulation of each pair of windings to each other and then each pair to the alternator casing. There should be no continuity between the three pairs of windings and no continuity to the casing. If any ohmmeter (2) reading other than open circuit is indicated in any test it will be necessary to replace the stator (1) and housing assembly.



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Rotor Test

Prior to performing component tests on the rotor the following slip ring inspection should be carried out.

1. Ensure the slip rings are clean and smooth. If necessary the slip rings may be cleaned with a petrol moistened cloth. If the slip rings are burnt and require re-finishing use very fine glass paper (not emery cloth) and wipe clean.

NOTE: *Ensure the re-finishing glass paper is sufficiently fine to produce a highly polished slip ring surface otherwise excessive brush wear will occur.*

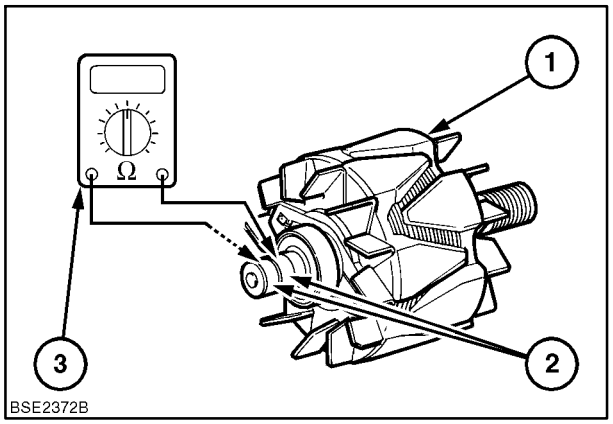
2. If the slip rings are excessively worn a new rotor must be installed.

Rotor Field winding Continuity

with reference to Figure 18

1. Connect an ohmmeter (3) between the two slip rings (2). The resistance should read 2.6 ohms at 20°C.

If the resistance is outside of the specification renew the rotor (1).



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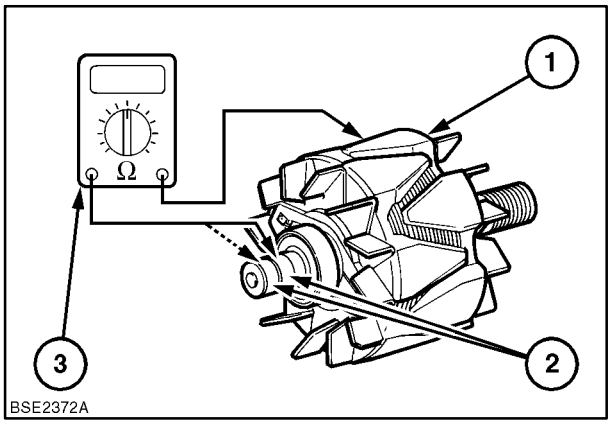
Rotor Field Winding Insulation

With reference to Figure 19.

1. Using an ohmmeter (3) test between each of the slip rings (2) and the rotor poles (1). An infinity reading should be indicated in each case. If any resistance reading is indicated the rotor assembly must be replaced.



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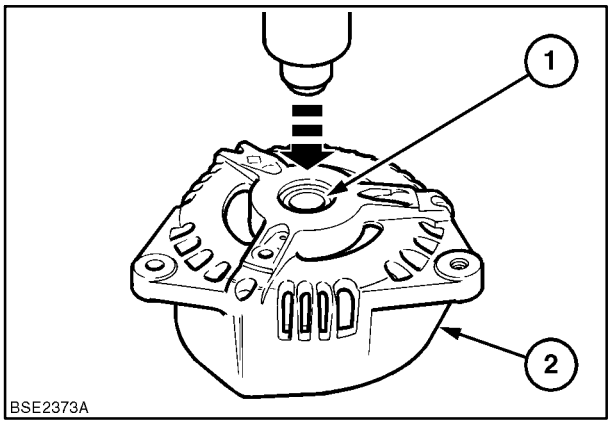
Inspection and Repair

1. Inspect the rotor poles and stator for signs of rubbing. Areas of rubbing indicates possible worn bearings, misaligned housings or a bent rotor assembly shaft.

NOTE: *The end bearing of the stator and housing assembly is retained by a plate which must be removed prior to bearing removal.*



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Assembly

1. Re-assembly of the alternator follows the disassembly procedure in reverse.

Installation

1. Installation of the alternator is the removal procedure in reverse.

On installation observe the following:

- Ensure the battery ground (negative) cable is disconnected from the battery when installing the alternator.
- Adjust the alternator drive belt as previously described in this Chapter.

SECTION 55 – ELECTRICAL SYSTEM

Chapter 5 – Battery

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SPECIFICATIONS

	Single Battery Standard	Single Battery Heavy Duty (Up to Serial Number ACP261702)	Single Battery Heavy Duty (From Serial Number ACP261703)
Capacity (Ampere hour at 20 hour rate)	107	176	132
Cold Cranking Ampere Rating	800	1300	960
Voltage	12	12	12
Cells	6	6	6
Ground Terminal	Negative	Negative	Negative

DESCRIPTION AND OPERATION

All models use a single “low maintenance – hybrid” battery with negative ground of six cell construction and is located on the right hand side of the tractor behind the cab steps.

NOTE: *“Low maintenance” means that under normal charging conditions the battery may lose a small amount of water from the electrolyte. Conditions that may cause water loss include prolonged charging above 14.4volts where gassing occurs as it approaches full charge. This can be caused by a faulty charging system or boost/recovery charging equipment.*

The battery has four major functions:

- To provide a source of current for starting, lighting and instrumentation.
- To help control the voltage in the electrical system.
- To furnish current when the electrical demands exceed the alternator output.
- To support quiescent loads from radio and micro processor memory.

The battery is constructed in such a manner that each cell contains positive and negative plates placed alternatively next to each other. Each positive plate is separated from a negative plate by a non-conducting porous envelope separator. If any of the positive plates should make contact with negative plates within a cell, the cell will short circuit and suffer irreparable damage. All of the positive plates are welded to a bus-bar, forming a positive terminal and all of the negative plates are welded to a similar bus-bar forming a negative terminal.

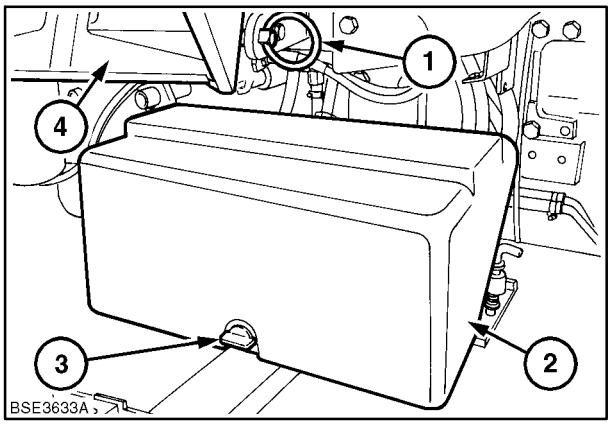
Each positive plate is composed of a lead grid with lead peroxide pasted into the grid openings. The negative plates are composed of a lead grid with spongy lead pasted into the grid openings.

The plates are submerged in a liquid electrolyte solution of diluted sulphuric acid.

BATTERY

Removal

1. Withdraw the pin (1) and raise the steps. Use the pin to hold the steps in the raised position (4).
2. Loosen the retaining screws, (3), and remove the battery cover, (2).
3. Disconnect the Negative lead from the battery terminal (1, Figure 2) and secure out of the way.
4. Disconnect the positive lead from the battery terminal (2, Figure 2) and secure out of the way.
5. Loosen the top bolts securing both battery clamps and remove clamps .
6. Using the flexible handles at each end of the battery, lift the battery from the tractor.

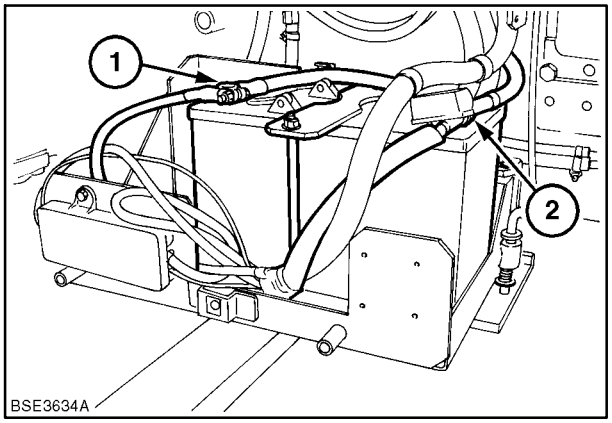


1

Installation

1. Installation of the battery is the removal procedure in reverse, observing the following points:

- Ensure that the battery is clean and dry and that the vent caps are fully installed. Smear the terminals with petroleum jelly, do not use conventional lubricating greases as these can promote electrolytic corrosion.
- Ensure the battery tray and clamps are clean and free from stones or small objects which may puncture the battery casing.
- Ensure that the battery terminal polarity is correct and that the terminal connections are sufficiently tight, but not overtightened.
- The radio, if fitted, will lose its stored information and will require re-programming. It should be noted that on models with electronic instrument panel and micro-processors, that these components will not lose their memories, i.e, electronic draft control and transmission calibrations will not be affected.



2

BATTERY MAINTENANCE AND TESTS

Specific Gravity

The specific gravity of the battery electrolyte indicates the state of charge. Fully charged the specific gravity of the electrolyte is 1.280 minimum at 25°C.

Alternatively the approximate state of charge can be measured by using an accurate digital volt meter (+/- 0.01V) as follows:-

Less than	10.5V Battery un-serviceable*
Less than	11.8V Battery discharged
Less than	12.3V Battery 1/2 charged
Better than	12.6V Battery fully charged

* See note under tests for possible recovery of a mildly sulphated battery.

Battery voltage to be taken with the battery unloaded and:-

A. After the battery has rested unloaded for at least 4 hours.

B. If the vehicle has recently run or battery has recently been charged, switch on headlamps for 2 minutes.

When a battery discharges, sulphuric acid in the electrolyte combines chemically with the plates and this action lowers the specific gravity of the solution.

A battery hydrometer will determine the specific gravity of the electrolyte in a cell and the amount of unused sulphuric acid in the solution is a measure of the degree of charge of that cell.

The lower the temperature at which a battery is required to operate, the more necessary it is that the battery is maintained in a fully charged condition. For example a battery with a low specific gravity of 1.225 at 27°C (80°F) will operate the starting motor at warm ambient temperatures but may not, due to lower battery efficiency at a low temperature.

Table 1 shows the effect of temperature on the efficiency of a typical battery.

Table 1

Temperature	Efficiency of a Fully Charged Battery
25.0°C (77.0°F)	100%
-4.5°C (23.9°F)	82%
-24.0°C (-11.2°F)	64%
-27.5°C (-17.5°F)	58%
-31.0°C (-23.8°C)	50%
-34.5°C (-30.1°C)	40%
-37.5°C (-35.5°C)	33%

Maximum battery life will be obtained if the correct care and periodic inspection is given. It is important that output capacity should not be exceeded by constant and excessive overloading and that charging requirements are maintained.

Servicing The Battery

⚠ WARNING ⚠

Batteries contain sulphuric acid and during charging generate a highly explosive mixture of hydrogen and oxygen gases.

- *Never use equipment that generates flames or sparks in order to control electrolyte level*
- *Do not remove the battery cover plugs without protection for eyes and hands.*

When servicing a battery the following steps should be observed:

1. Maintain the electrolyte to the recommended level of 17 mm (0.67 in.) above the plates. If this is not observed the acid will reach a high concentration that will damage the separators and impair the performance of the plates.
2. Use only distilled or de-mineralised water, do not overfill and never use tap water or water from a rain barrel or other source.
3. Always keep the battery at least 75% charged otherwise the plates will become sulphated and loss of efficiency will result with possible damage from freezing at low temperatures.
4. Avoid overcharging the battery as excessive charging will create high internal heat that will cause plate grid deterioration and produce water loss.
5. When fast charging ensure the battery temperature does not exceed 50°C.
6. Do not add sulphuric acid to a cell unless the electrolyte has been lost through spilling. Before replenishing ensure the solution is at the correct specific gravity. A slow charge is the only method to be employed to fully charge a battery. A high rate charger can be used to quickly boost the battery capacity but this must be followed by a slow charge rate to bring the battery to full capacity.

Dry Charged Batteries

Dry charged batteries must be prepared for service as follows:

1. Remove the battery cell vent plugs.
2. Fill each cell to the recommended level with electrolyte of 1.260 specific gravity.

NOTE: *The electrolyte must be diluted sulphuric acid preferably at a temperature of 21°–32°C (70°–90°F).*

3. After filling, allow the battery to stand for 15 minutes then re-check the electrolyte level and top up if necessary.
4. Charge the battery for 4 hours at a rate of 5–8 amperes and check that all cells are gassing freely.
5. Install the battery cell vent plugs.

Charging The Battery

Before charging a battery:

1. Thoroughly clean the battery casing and cell covers with dilute ammonia or hot water and clean the terminals.
2. Check the level of the electrolyte in each cell and, if below plates, add distilled water to bring above plate level.

Normal (Top-up) Charging

1. With a slow charger use a rate of 3 to 6 amperes for the time necessary to bring the battery to full charge. This may take 36 hours or more if the battery is heavily discharged. A severely sulphated battery might not accept a charge. When the battery is fully charged the cells will gas freely and the specific gravity will remain constant. Remove the charger after three consecutive hydrometer readings taken at hourly intervals indicate that the specific gravity has stopped rising.
2. When using a fast or high rate of charge carefully follow the manufacturers instructions. High rate charging raises the temperature of the electrolyte and unless the charger is equipped with an automatic time or temperature device, the electrolyte temperature could exceed 50°C , which may cause violent battery gassing and damage to internal components.
3. Re-check the level of electrolyte in each cell and add distilled water as necessary.

⚠ WARNING ⚠

When a battery is being charged an explosive gas is produced. Do not smoke or use an exposed flame when checking the electrolyte level and ensure the charger is switched off before connecting or disconnecting to avoid sparks which could ignite the gas.

Recharging Deeply Discharged Batteries

The recommended method to recharge a low maintenance battery is to use a constant voltage charger. For deeply discharged batteries a 48 hours charging period at 16volts is recommended, with current limitation, (47.5A for 107Ah or 88A for 176Ah)

This system is self regulating: high current is delivered at the beginning (when battery voltage is low), lower and lower current is then absorbed when battery reaches full charge (and its voltage is high).

If only constant current chargers are available it is recommended to use the current levels and times shown Table 2 below. The figures are intended for deeply discharged batteries. If the battery is only 50% discharged use one half of the time listed (slow charge programs). For other states of discharge reduce proportionally the time of charge. Whenever possible use the slowest charge program to increase the battery's life.

If when charging the battery, violent gassing or spewing of electrolyte occurs, or the battery case feels hot (50°C or greater), reduce or temporarily halt charging to avoid damaging the battery.

Table 2

	107Ah (800 cca)	176Ah (1300 cca)	132Ah (960 cca)
Slow Charge Programs	25hrs at 5A 12.5hrs at 10A	46hrs at 5A 23hrs at 10A	30hrs at 5A 15hrs at 10A
Fast charge Program (emergencies only)	7hrs at 18A	13hrs at 18A	8.5hrs at 18A

Tests

Before commencing battery tests check the battery for clogged vents, corrosion, raised vent plugs or a cracked case.

Test equipment required:

- Hydrometer
- Battery starter tester (High rate discharge tester)
- Thermometer
- Battery Charger

Specific Gravity: This test will determine the state of battery charge.

1. With the float in the vertical position take the reading.
2. Adjust the hydrometer reading for electrolyte temperature variations by subtracting 4 points (0.004 specific gravity) for every 5.5°C (10°F) below the temperature at which the hydrometer is calibrated and by adding 4 points (0.004 specific gravity) for every 5.5°C (10°F) above this temperature.

The following examples are calculated using a hydrometer calibrated at 30°C (86°F).

Example 1:
Temperature below 30°C (86°F)

Electrolyte temperature	19°C (66°F)
Hydrometer reading	1.270
Subtract 11.0 / 5.5 x 0.004	0.008
Corrected specific gravity =	1.262

Example 2:
Temperature above 30°C (86°F)

Electrolyte temperature	40°C (104°F)
Hydrometer reading	1.220
Add 10.0 / 5.5 x 0.004	0.007
Corrected specific gravity =	1.227

3. Use the following table to determine the state of charge.

State of Charge	Corrected Specific Gravity @15°C	Corrected Specific Gravity @25°C	Average Battery Voltage
100%	1.295	1.287	12.76
75%	1.253	1.246	12.52
50%	1.217	1.210	12.30
25%	1.177	1.170	12.06
Discharged	1.137	1.130	11.84

NOTE: *Specific gravity should not vary more than 0.025 points between cells.*

4. If the specific gravity is 1.280 or more the battery is fully charged and in good operating condition.
5. Should the corrected specific gravity be below 1.280, charge the battery and inspect the charging system to determine the cause of the low battery charge.

NOTE: *If distilled water has recently been added the battery should be recharged for a short period otherwise accurate hydrometer readings will not be obtained.*

If the battery has been charged under static conditions, denser electrolyte will accumulate at the bottom of the cells. The battery should be shaken periodically to mix the electrolyte, this will improve the charge rate and provide a more accurate hydrometer reading when tested.

Performance Test: The performance test is to determine if the battery has adequate capacity to turn the engine. The voltage reading obtained is used to determine the battery condition. Prior to testing, ensure the electrolyte level is correct and the open circuit voltage is 12.5V or more. The battery may be tested on or off the tractor.

1. Set the current control switch of the battery starter tester (high rate discharge tester) to the 'off' position and the voltage selector switch equal to, or slightly higher than, the rated battery voltage. Connect the tester positive leads to the battery positive terminal and the negative leads to the negative battery terminal.
2. Turn the current control knob until the ammeter reading is half the CCA rating of the battery and take the voltage reading.

- If the reading is 9.6 volts or more after 15 seconds, the battery has an acceptable output capacity and will readily accept a normal charge.
- If however the reading is below 9.6 volts, the battery is considered unsatisfactory for service and should be test charged as described below.

⚠ CAUTION ⚠

Do not leave the high discharge load on the battery for periods longer than 15 seconds.

Test Charging: This test is designed only for batteries that have failed the previous capacity test.

1. Attach the battery starter (high rate discharge tester) positive leads to the battery positive terminal and the negative leads to the battery negative terminal.
2. Connect the battery charger positive lead to the battery positive terminal and the negative lead to the battery negative terminal.
3. Turn the charger timer past a '3 minutes' charge indication and then back to the '3 minutes' mark.
4. Set the charging rate as close as possible to 40 amperes.
5. After 3 minutes at this fast charge take the voltmeter reading.

- If the total voltage is over 15.5 volts the battery is unsatisfactory and is probably sulphated or worn out and should be replaced.

NOTE: *A mildly sulphated battery can be recovered by using a multiple battery type charger, with an open circuit upper voltage limit of 50 volts. Owing to the high resistance of a sulphated battery, it will primarily require a high voltage setting to overcome the resistance of the sulphation. initially there may be no visible acceptance of the charge. After a few minutes of inactivity a small charge will be apparent, followed by a rapid increase in the charge rate. The charge rate must not exceed 14.0 amperes or the electrolyte temperature 50°C. When the ampere rate has stabilised, reset the volts until the charge rate is a steady 5 amperes. Continue at this rate until the electrolyte specific gravity stops rising at approximately 1.275–1.280 at 20°C (68°F), this can take up to 48 hours of charging. Stand the battery for 24 hours and then conduct the capacity test detailed previously.*

- If the total voltage is under 15.5 volts, test the specific gravity of each cell and re-charge the battery to the following scale:

Specific Gravity	Fast charge up to:
1.150 or less	60 minutes
1.151 to 1.175	45 minutes
1.176 to 1.200	30 minutes
1.201 to 1.225	15 minutes (Slow charge only)

NOTE: *When battery problems are experienced the fan belt tension and the complete charging system should be checked.*

Common Causes of Battery Failures

1. Internal open circuit.
2. Internal short circuit.
3. Loss of electrolyte.
4. Separation of active materials from grids.
5. Accumulation of sulphate crystals too large to disperse.

These failures are normally caused by the following:

1. Failure of inter cell components.
2. Excessive crystal growth may puncture the separators and cause short circuits.
3. Excessive over charging (charging system malfunction, boost/recovery techniques with high voltage, operation in very high temperatures.
4. Freezing of electrolyte.
   A fully charged battery does not freeze until –65°C. A 50% charged battery freezes between –17°C and –27°C. Fully discharged electrolyte freezes at –3°C to –11°C.
   Excessively high boost charging and gassing will also cause separation of active materials from the grids. Separation destroys the chemical function of the battery.
5. Crystal growth occurs whenever batteries are left discharged. High temperatures and extended discharged periods increase this condition. At room temperature after one week the battery is unlikely to recover on the vehicle. Recharge will require a higher constant voltage. After 3 weeks the battery will have suffered permanent degradation and the procedure detailed previously for charging a 'Deeply Discharged' battery should be followed.

When fully charged, batteries have a long shelf life. The lead calcium type battery self discharges at 3% per month. This means that it will take 16 months to drop to 50% charged. On the tractor the quiescent load is about 50mA. To predict run-down on a static vehicle this should be added as approximately 8Ah per week.

It is worth stressing that when cranking, if a battery starts to fade, it is beneficial to stop and allow two minutes for the battery to recover. The recovery time should be increased as the temperature decreases.

With the dual battery set up, an old battery should not be used with a new one. One battery will always fail first. If the battery has given the service life expected, change both batteries. If one has failed early, i.e, through manufacturing defect, then it is acceptable to replace just one battery.

NOTES

SECTION 55 – ELECTRICAL SYSTEM

Chapter 6 – Wiring Diagrams

CONTENTS

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Circuit Description – All Models	1
How to Use the Linear Wiring Diagrams	2
Symbols	4
Component Identification and Wiring Diagram Location Key	5
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Wire Identification Key	652

Wiring Diagrams Circuit Description – All Models		Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0–300
Circuit 2	Engine	310–1200
Circuit 3	Transmission Circuits	1210–2100
Circuit 4	Hydraulics	2110–3000
Circuit 5	Four Wheel Drive and Differential Lock	3010–3300
Circuit 6	Power Take Off	3310–3900
Circuit 7	Front Suspension	3910–4200
Circuit 8	Cab Accessories	4210–4800
Circuit 9	Main Lamps, Indicators & Hazards	4810–5700
Circuit 10	Work Lamps	5710–6000
Circuit 11	Trailer Braking system circuits	6010–6300
Circuit 12	Sensors / Senders	6310–6600
Circuit 13	Wipers & Washers	6610–6900
Circuit 14	Diagnostic Connectors	6910–7500
Circuit 15	Processor Feed and Ground connections	7510–8100
Circuit 16	Air–Conditioning & Heating	8110–8400

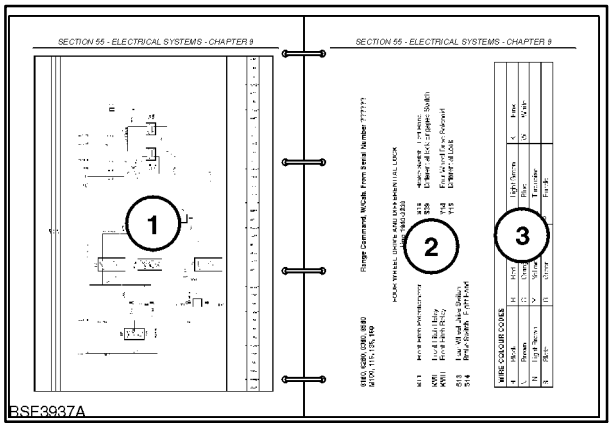
HOW TO USE THE LINEAR WIRING DIAGRAMS

The wiring diagrams have been drawn in a linear style. This means that the complete wiring diagram has been drawn over a number of pages but if joined together would make a complete diagram.

There are a number of guides to help assist in reading and understanding the wiring diagrams.

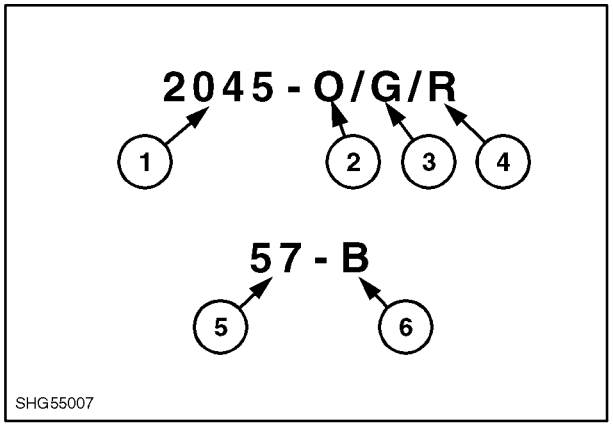
1. The wiring diagrams (1) are located on the left hand pages. The titles and diagram keys (2) are located on the right hand pages and the wire colour code table (3) is located below the key.

   The title and key details the title of the section that the diagram is applicable to and the model configuration, ie, transmission type, with or less cab and engine type. The key then details all the components used within that particular page.



1

2. Every component and connector has its own unique reference number.



2

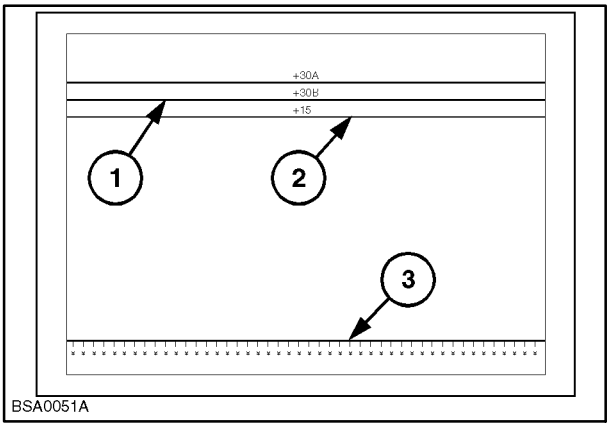
3. Every wire has a code assigned to it (1) this code refers to its function, the code is not marked on the actual wire. A key of all wire codes can be found at the rear of this section. Letters (2), (3) and (4) indicate the wire colour. The first letter (2) indicates the main wire colour. The second letter (3) indicates tracer wire colour, the third letter (4) indicates the band colour, for example wire reference (5) and number 57 is an earth wire, letter (6) B indicates its a solid black wire.

4. Each component and connector pin appears only once in the electrical drawings and has its own location point on the page.

5. The wiring diagrams are drawn in sections. However where a single component is used in a number of circuits such as a processor or multi function switch, it is drawn either on its own or on the circuit which it influences the most.

6. The wiring is drawn between four lines three across the top of the page and one at the bottom of the page.

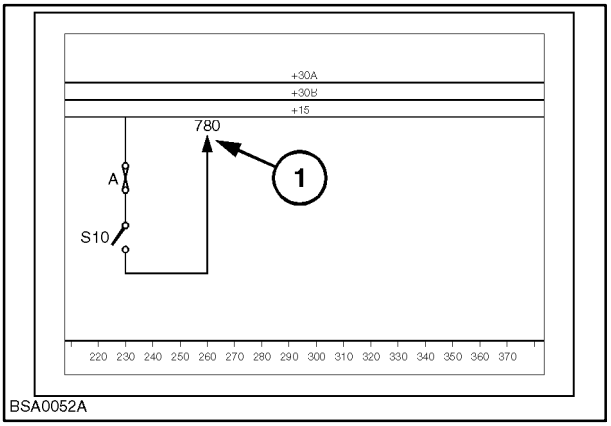
   The two upper most lines (1) marked +30A and +30B are the constant live lines.
   Below the +30 line is the +15 (2) which is the ignition key on live line.
   The lowest line is the ground/earth line.
   On the lower part of the page (3) a line is marked with numbers increasing by ten (10-20-30, etc.).
   This is the line used to reference wires and components.



3

Example

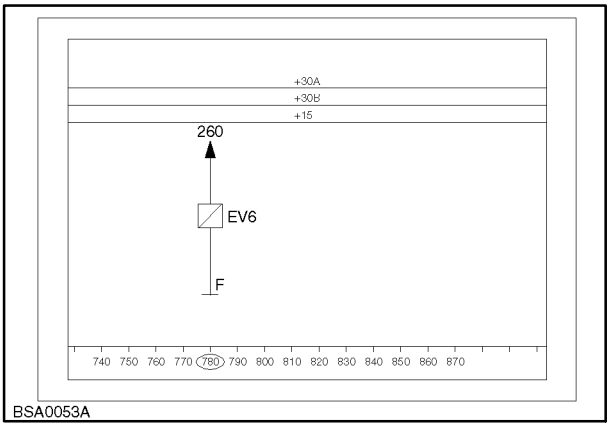
Figures 4 and 5 show a basic circuit drawn over two pages.



4

Power comes in from the ignition on live line +15 through fuse F3, which is located at point 230.

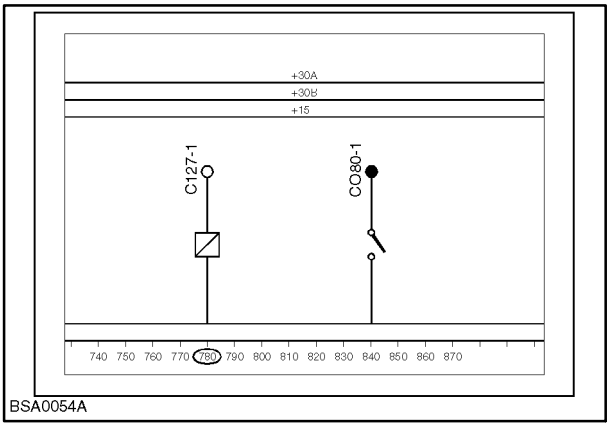
Power comes to switch S10. If the switch is operated, power continues up and stops with an arrow (1) and a number. The arrow indicates the wire continuing to another page. The Number 780 refers to the line reference where it appears on a new page. Note the line reference directly below the wire being traced ie. 260. Following the line reference until 780 is found. Using either the index or following the page reference line. When 780 is located on the reference line the number 260 will be observed at the top of the page. Note the arrow points back to the previous part of the circuit. From this point follow the wire down to solenoid EV6. The diagram now indicates that power goes to ground.



5

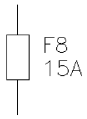
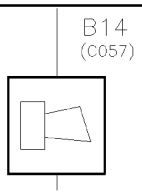
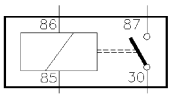
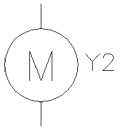
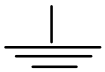
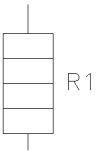
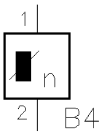
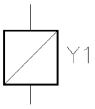
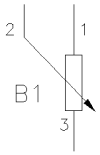
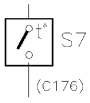
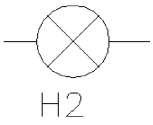
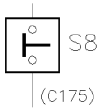
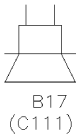
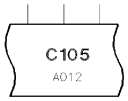
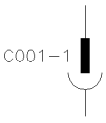
Where a circuit originates or terminates at a processor, ie, Transmission processor, EDC processor, Electronic Management Unit or Instrument cluster, the wire in the diagram is ended with a small circle and a connector reference number. A white circle (1) indicates a processor, a black circle (2) indicates an instrument cluster.

The diagrams have been constructed to ensure the minimum number of pin-outs, detailed above, are used. Due to this, many diagrams have been spread across 2 sheets and it will be necessary to follow from one page across to the next to complete a circuit.



6

SYMBOLS

Fuse		Horn	
Relay		Diode	
Motor		Switch	
Earth/ground point		Resistor	
Sensor		Electro-Valve/solenoid	
Potentiometer		Temperature Switch	
Lamp		Pressure Switch	
Speaker		Processor	
Connector pin			

COMPONENT IDENTIFICATION AND WIRING DIAGRAM LOCATION KEY

SYMBOL	DRAWING LOCATION	DESCRIPTION
(A) PROCESSORS, MODULES AND PANELS		
A001	1670	Gear Shift Indicator
A002	2430	EDC Control
A003	2480	EDC Mouse
A004	2550	EDC Status Lamp Panel
A005	4250	Radio
A006	4620	Instrument Cluster Keypad
A007	5580	Flasher Unit
A008	7540	XCM Central Control Unit (CN1-A)
A009	7540	XCM Auxilliary Control Unit (Front Susp)
A010	7600	XCM Central Control Unit (CN3-A)
A011	7690	Instrument Cluster 1
A012	7820	Instrument Cluster 3
A013	7820	Worklamp ECU
A014	7940	XCM Central Control Unit (CN3-B)
A015	8030	Engine ECU
A016	8090	XCM Central Control Unit (CN2)
A017	8180	HVAC Unit
A018	7620	SCM - Small Control Module
A019	7870	Front Suspension Control CN2
A020	7950	EHR Control Unit CN3-B
A021	7950	EHR Control Unit CN4
A022	8090	EHR Control Unit CN3-A
A023	280	Grid Heater Module
(B) SENSORS, SENDERS AND POTENTIOMETERS		
B1	570	Engine Flywheel Speed Sensor
B2	660	Water in Fuel Sensor
B3	740	Throttle Potentiometer (Mechanical Engine)
B4	810	Hand Throttle
B5	870	Fuel Metering unit
B6	920	Boost Pressure/Temperature Sensor
B7	960	Oil Pressure/Temperature Sensor
B8	1050	Fuel Temperature sensor
B9	1100	Crankshaft Speed Sensor
B10	1140	Camshaft Speed Sensor
B11	1170	Fuel Rail Pressure Sensor
B12	1200	Coolant Temperature Sensor
B13	1220	Clutch Potentiometer
B14	1330	Synchro Position Potentiometer
B15	1580	Speed Sensor
B16	2200	L/H Draft Pin
B17	2200	Rockshaft Potentiometer
B18	2240	R/H Draft Pin
B19	2340	Front HPL Limit Potentiometer
B20	3520	PTO Twist Sensor

SYMBOL	DRAWING LOCATION	DESCRIPTION
B21	3550	Front Hitch Potentiometer
B22	3590	Front PTO Speed Sensor
B23	3710	PTO Speed Sensor
B24	3940	Front Suspension Potentiometer
B25	4210	Speaker L/H Rear
B26	4230	Speaker R/H Front
B27	4270	Speaker R/H Rear
B28	4290	Speaker L/H Front
B29	4520	Horn
B30	4560	Reverse Alarm
B31	6320	Fuel Tank Sender
B32	6410	Radar gun
B33	6470	Steering Angle Sensor
B34	1020	Engine Speed Sensor (mechanical engine only)
B35	1140	Coolant Temperature Sensor
B36	1080	Oil Pressure Sensor
B37	1300	1-4/5-8 Synchro Potentiometer

(E) MISCELLANEOUS

E1	5640	Rotating Beacon L/H
E2	5670	Rotating Beacon R/H
E3	8130	A/C clutch

(F) FUSES

F1	4410	Interior/Puddle Lamp/Handbrake 10A
F2	4460	Cigar Lighter/Power Studs 25A
F3	8170	A/C Clutch 10A
F4	4430	Accessory Sockets 10A
F5	8230	Blower Motor 30A
F6	4230	Radio/Worklamp ECU 10A
F7	5340	Main Lights/Hazard Switch 20A
F8	180	Starter Switch 20A
F9	620	Loader 25A
F11	6710	Front/Rear Windshield wiper 10A
F12	6850	Wiper Switch/Rear Wiper Park 10A
F13	5240	Stoplamps 15A
F14	5360	Main Light Switch/Flasher Unit 15A
F16	6020	Trailer Brake 15A
F17	4480	Accessory Sockets 25A
F18	8230	Blower Motor/Seat 15A
F20	4560	Radar/Diagnostics 10A
F21	670	Grid Heater. 15A
F22	4880	Side Lamps R/H 15A
F23	4920	Side Lamps L/H 15A

SYMBOL	DRAWING LOCATION	DESCRIPTION
F24	4890	Illumination 10A
F25	5130	Dip Beam Headlamps 15A
F26	5270	Main Beam Headlamps 15A
F27	5900	Front Worklamps 15A
F28	5870	Worklamp ECU 15A
F29	5860	Worklamp ECU 30A
F30	5910	Rear/Lower Worklamps 15A
F31	5830	Worklamp ECU 15A
F32	5840	Flasher Unit 30A
F33	7290	Diagnostics Connector/Engine ECU 25A
F34	7770	Instrument Cluster 10A
F35	7620	Processors 10A
F36	7760	Instrument Cluster Ignition 10A
F37	7740	Transmission Ignition 15A
F38	7750	Rear PTO/HPL 10A
F39	2600	HPL/Seat/EDC 10A
F40	4280	Radio 10A
F41	7730	Front Suspension/PTO 15A
F42	2400	Front Suspension 10A
F43	230	Starter Switch (Run) 10A
F44	8230	Front B+ 25A
F45	4780	Front Ignition/Amp Socket 25A
GF1	260	Grid Heater Fuse
(H) LAMP AND LIGHTS		
H1	3390	Rear PTO Lamp
H2	3420	Front PTO Lamp
H3	4310	Console Lamp R/H
H4	4330	Puddle Lamp L/H
H5	4370	Puddle Lamp R/H
H6	4380	Interior Lamp
H7	4530	Console Lamp L/H
H8	4820	Stop/Tail Lamp R/H
H9	4870	Licence Plate Lamp - Fender L/H
H10	4890	Licence Plate Lamp - Fender R/H
H11	4910	Stop/Tail Lamp L/H
H12	4970	Licence Plate lamp L/H
H13	4990	Licence Plate lamp R/H
H14	5080	Worklamp R/H
H15	5100	Worklamp L/H
H16	5180	HeadLamp R/H
H17	5200	HeadLamp L/H
H18	5410	Grabrail Sidelamp R/H
H19	5440	SMV Lamp - Front L/H
H20	5470	SMV Lamp - Rear L/H
H21	5480	Grabrail Sidelamp L/H
H22	5510	SMV Lamp - Front R/H
H23	5530	SMV Lamp - Rear R/H

SYMBOL	DRAWING LOCATION	DESCRIPTION
H24	5710	Worklamp Rear L/H
H25	5730	Worklamp Rear R/H
H26	5750	Worklamp - Grabrail R/H
H27	5770	Worklamp - Grabrail L/H
H28	5790	Worklamp - Upper Front L/H
H29	5810	Worklamp - Upper Front R/H
H30	5830	Corner Lamp R/H
H31	5870	Corner Lamp L/H
H32	2950	Lamp-1
H33	2960	Lamp-2
H34	2975	Lamp-3
H35	2985	Lamp-4
H36	2995	Master Lamp

(G) CHARGING

G1	10	Battery
G2	70	Alternator

(K) RELAYS

K1	6810	Front Windshield Wiper module
K3	80	Ignition Relay
K4	5120	Side Light/Illumination Relay
K5	120	Starter (Crank) Relay
K6	8240	Blower Motor Relay
K7	5140	Dip Beam Headlight Relay
K8	5240	Stoplamp Relay
K9	5270	Main Beam Headlight Relay
K10	6020	Pneumatic Trailer Brake Supply Relay
K11	6080	Hydraulic Trailer Brake Supply Relay
K12	3150	Stoplamp Switch/Air Brake Relay
K13	170	Engine Cold Advance Relay (mechanical engine)
K14	4600	Reverse Alarm Relay
K15	8130	Blower Motor Relay
K16	2925	EHR Power Relay
K17	---	
K18		
K19	5900	Worklamp Lower Front Relay
K20	5970	Worklamp Lower Rear Relay
K21	7670	Electronics Supply
K25	250	Grid Heater Relay

(M) MOTORS

M1	40	Starter Motor and Solenoid
M2	4670	Air Seat Pump
M3	6630	Wiper Motor Front

SYMBOL	DRAWING LOCATION	DESCRIPTION
M4	6750	Washer Motor Rear
M5	6780	Washer Motor Front
M6	6890	Wiper Motor Rear
M7	8280	Blower Unit

(MF) MAXI FUSE

MF1	70	Engine Ignition 80 Amp
MF2	180	Lighting/Ignition/Radio/Worklamps 30 Amp
MF3	7600	B+/Processors 40 Amp
MF4	4710	Implement Socket Rear 40 Amp
MF5	5870	Lighting 100 Amp
MF6	4420	Accessory/Cab 80 Amp

(PF) POWER FUSE

PF1	10	Power E, Electronics Supply 30A
PF2	20	Power B+, Main Supply

(R) RESISTORS

R1	240	Grid Heater
R2	4490	Cigar Lighter
R4	7370	Can Bus Terminator
R5	2905	Can Terminator

(S) SWITCHES

S1	200	Ignition Switch
S2	360	Foot Throttle - Electronic Engine
S3	400	Constant Engine Speed Programme Switch
S4	440	Constant ERPM On/Off Switch
S5	530	Engine Inc/Dec Switch
S6	590	Air Cleaner Switch
S7	630	De-Gas Bottle
S8	1260	Shuttle Switch
S9	1300	Clutch Switch
S10	1390	Duplicate Transmission Control - Downshift
S11	1430	Duplicate Transmission Control - Upshift
S12	1440	Duplicate Transmission Control - Range
S13	1460	Neutral Switch 3/4 Rail
S14	1470	Neutral Switch 1/2 Rail
S15	1480	Creeper Sensing Switch
S16	1490	Creeper Sense Forward Switch
S17	1500	High/Medium Switch

SYMBOL	DRAWING LOCATION	DESCRIPTION
S18	1400	Gearshift
S19	1540	Creeper Gear Switch
S20	1610	Transmission Oil Pressure Switch
S21	1770	Transmission Auto Function Switch
S22	2150	Transmission Oil Temperature Sensor
S23	2260	Oil Temperature Switch
S24	2260	HPL Filter Switch S3
S25	2270	HTS Switch
S26	2560	HPL Switch L/H
S27	2580	HPL Switch R/H
S28	2640	Lo Charge Switch S2
S29	2660	Lift-o-Matic Switch
S30	3040	4WD Activated Switch
S31	3060	Diff Lock Activated Switch
S32	.3100	Diff Lock Switch
S33	3170	Brake Pedal Latch Switch
S34	3190	Stoplamp Switch R/H
S35	3230	Stoplamp Switch L/H
S36	3270	4WD Switch
S37	3310	Ground Speed PTO Switch
S38	3400	Rear PTO Brake Switch
S39	3470	Front PTO Switch
S40	3520	Rear PTO Switch
S41	3760	PTO Management Switch
S42	4090	Front Suspension Switch
S43	4330	Door Switch L/H
S44	4350	Door Switch R/H
S47	5010	Auxilliary Headlamp Switch
S48	5020	PTO Fender Switch L/H
S49	5060	PTO Fender Switch R/H
S50	5320	Multifunction Light Switch
S51	5380	Hazard Switch
S52	6080	Handbrake Switch
S53	6170	Italian Trailer Brake Line Pressure Switch
S54	6170	Italian Trailer Brake Pump Pressure Switch
S55	6220	Air Brake Pressure Switch
S56	6360	Brake Fluid Level Switch
S57	6450	PAS Pressure Switch
S58	6710	Front and Rear Wiper Switch
S59	7190	Calibration/Select Switch
S60	8190	A/C Pressure Switch
S61	8300	Heater/Blower Switch
S62	8280	A/C Switch
S63	1460	High Range Switch
S64	1500	Low Range Switch
S66	990	Oil Pressure Switch
S67	5730	Worklamp Switch - Front
S68	5790	Worklamp Switch - Rear

SYMBOL	DRAWING LOCATION	DESCRIPTION
S69	830	Starter Inhibitor
S70	4620	Reverse Alarm Switch
S71	2850	Switch 1/2 Time/Flow
S72	2775	Switch 3/4 Time/Flow
S73	2825	EHR Lever 1/2
S74	2790	EHR Lever 3/4
S75	2935	Master Switch

(X) POWER SOCKETS / CONNECTORS

XI	310	Joystick Loader Control Socket
X2	360	Joystick Loader Control Socket
X3	4430	10 Amp Terminals
X4	4470	20 Amp Multi Socket
X5	4710	Implement Socket Rear
X6	4770	8 Amp Socket
X7	4800	Dealer Installed Accessory (DIA)
X8	6260	Trailer Socket
X9	6550	Radar Extension Harness Connector
X10	6940	Transmission Diagnostics Connector (TCM)
X11	7090	Auxilliary Diagnostics Connector (ACU)
X12	7360	ADIC Diagnostics Connector
X13	7380	EST Diagnostic Connector
X14	610	Loader Power Connector
X15	2720	Joystick
X16	7490	EHR CAN
X17	7460	Trans CAN
X18	7420	CAN Select

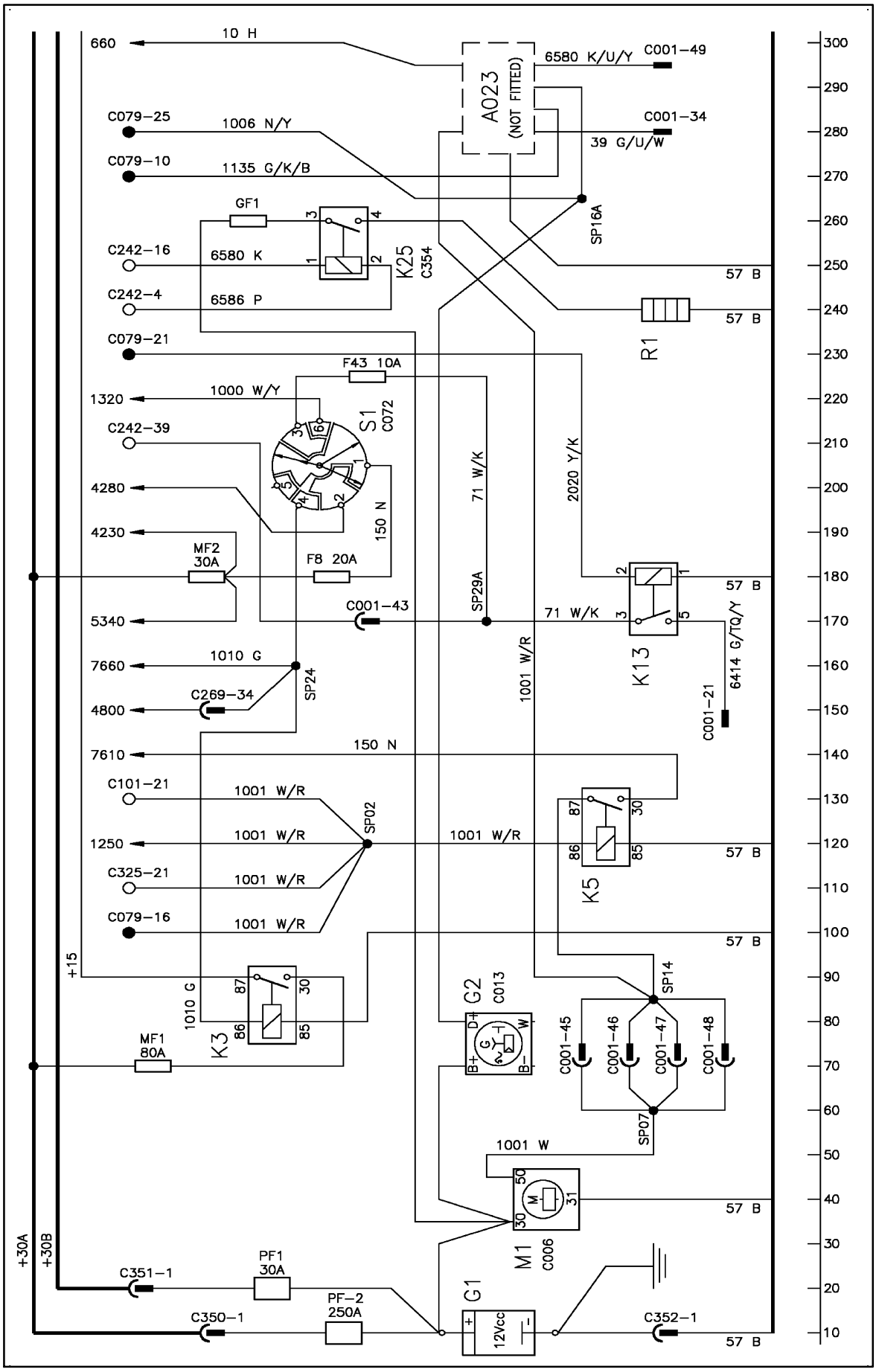
(Y) SOLENOID VALVES

Y1	340	Loader Valve 1
Y2	380	Loader Valve 2
Y3	890	Injector 1
Y4	1000	Injector 2
Y5	1020	Injector 3
Y6	1040	Injector 4
Y7	1080	Injector 5
Y8	1130	Injector 6
Y9	1850	Reverse Synchro Solenoid
Y10	1890	Forward Synchro Solenoid
Y11	1920	Lo PWM Valve
Y12	1950	Hi PWM Valve
Y13	1970	Creeper Gear Solenoid
Y14	2000	17th Gear Dump Solenoid
Y15	2030	17th Gear Solenoid
Y16	2060	Dump Solenoid
Y17	2680	EDC Lower Solenoid

SYMBOL	DRAWING LOCATION	DESCRIPTION
Y18	2700	EDC Raise Solenoid
Y19	3020	Diff Lock Solenoid
Y20	3030	4WD Solenoid
Y21	3630	PTO Brake Solenoid
Y22	3670	PTO Clutch Solenoid
Y23	3810	Front Hitch Valve
Y24	3880	Front PTO Solenoid
Y25	4000	Suspension Lower Solenoid
Y26	4050	Suspension Lower Lockout Solenoid
Y27	4140	Suspension Raise Solenoid
Y28	4180	Suspension Raise Lockout Solenoid
Y29	1300	4/5 Synchro Solenoid
Y30	1790	5-8 Synchro Solenoid
Y31	1820	C1 Valve
Y32	1920	C3 Valve
Y33	1950	C4 Valve
Y34	2060	C2 Valve
Y35	2090	1-4 Synchro Solenoid
Y36	2870	EHR Valve-1
Y37	2880	EHR Valve-2
Y38	2890	EHR Valve-3
Y39	2900	EHR Valve-4
Y40	930	Fuel Shut Off Solenoid
Y41	960	Cold Advance Solenoid
Y42	6180	Italian Trailer Brake Solenoid
Y43	6280	Air Brake Solenoid

16X16 TRANSMISSION, W/CAB, W/ELECTRONIC ENGINE

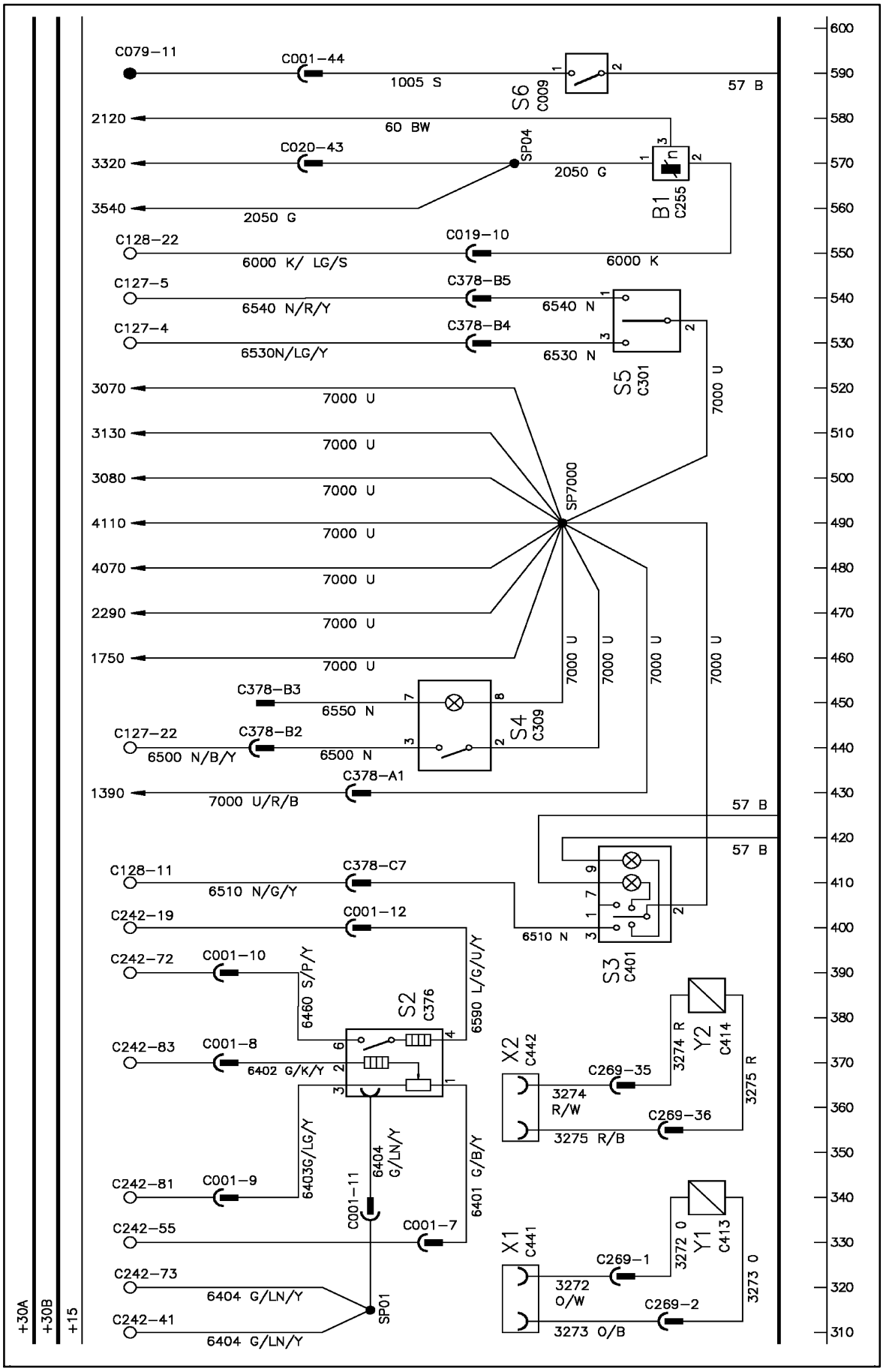
Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400


660
10 H
A023
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C079-25
1006 N/Y
C079-10
1135 G/K/B
GF1
SP16A
C242-16
6580 K
K25
C354
C242-4
6586 P
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
S1
C072
C242-39
4280
4230
MF2
30A
F8 20A
150 N
71 W/K
2020 Y/K
SP29A
C001-43
5340
K13
6414 G/TQ/Y
C001-21
7660
1010 G
SP24
C269-34
4800
1001 W/R
7610
150 N
C101-21
1001 W/R
SP02
1250
C325-21
C079-16
K5
+15
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF1	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A023	Grid Heater Module (not fitted)

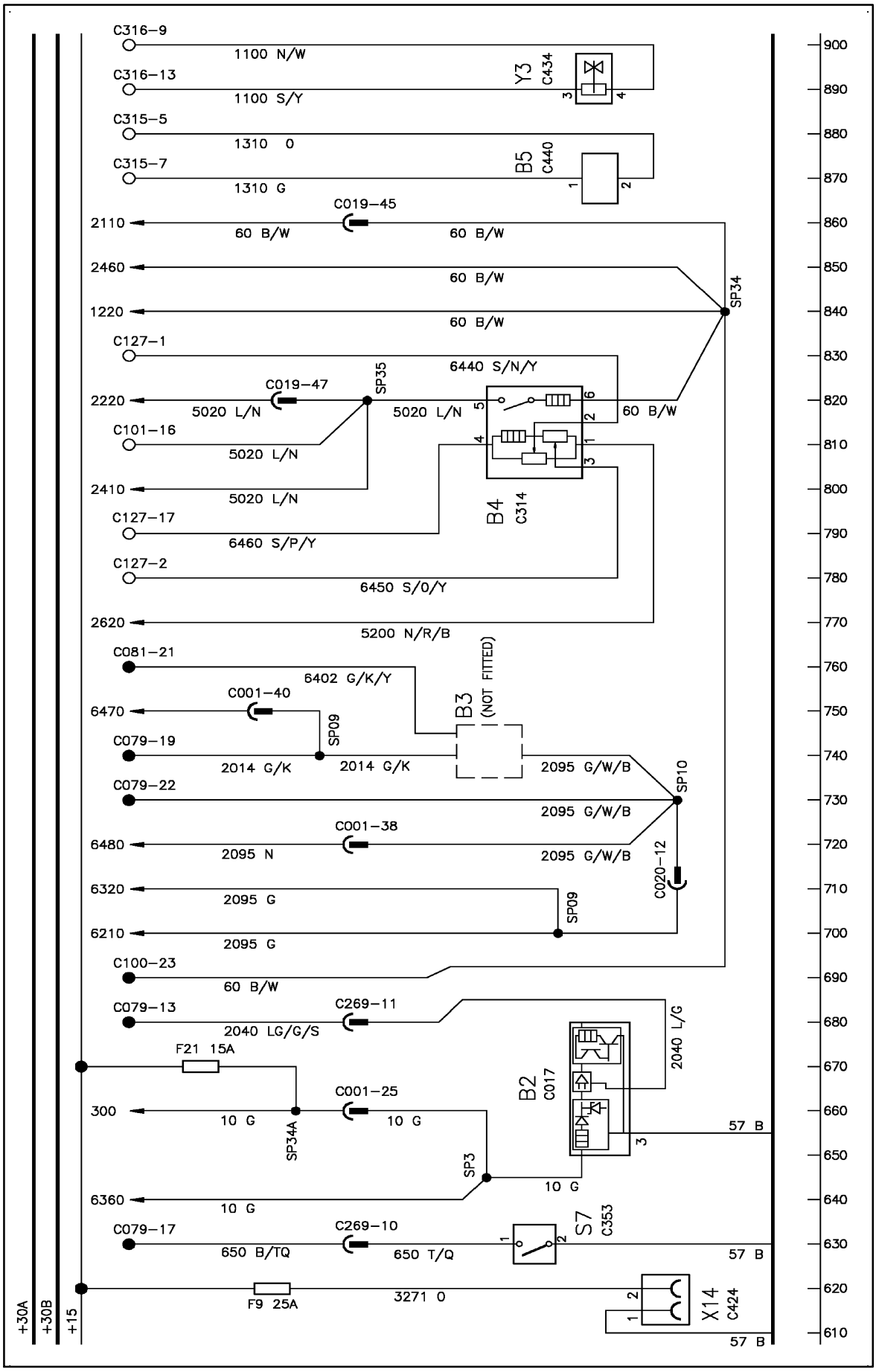
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
3320
C020-43
SP04
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6510 N
S3 C401
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C001-11
C242-81
C001-9
C242-55
C001-7
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

ENGINE 1
line 310-600

B1	Engine Flywheel Speed Sensor
S2	Foot Throttle - Electronic Engine
S3	Constant Engine Speed programme Switch
S4	Constant ERPM On/Off Switch
S5	Engine Inc./Dec. Switch
S6	Air Cleaner Switch
Y1	Loader Valve 1
Y2	Loader Valve 2
X1	Joystick Loader Control Socket 1
X2	Joystick Loader Control Socket 2

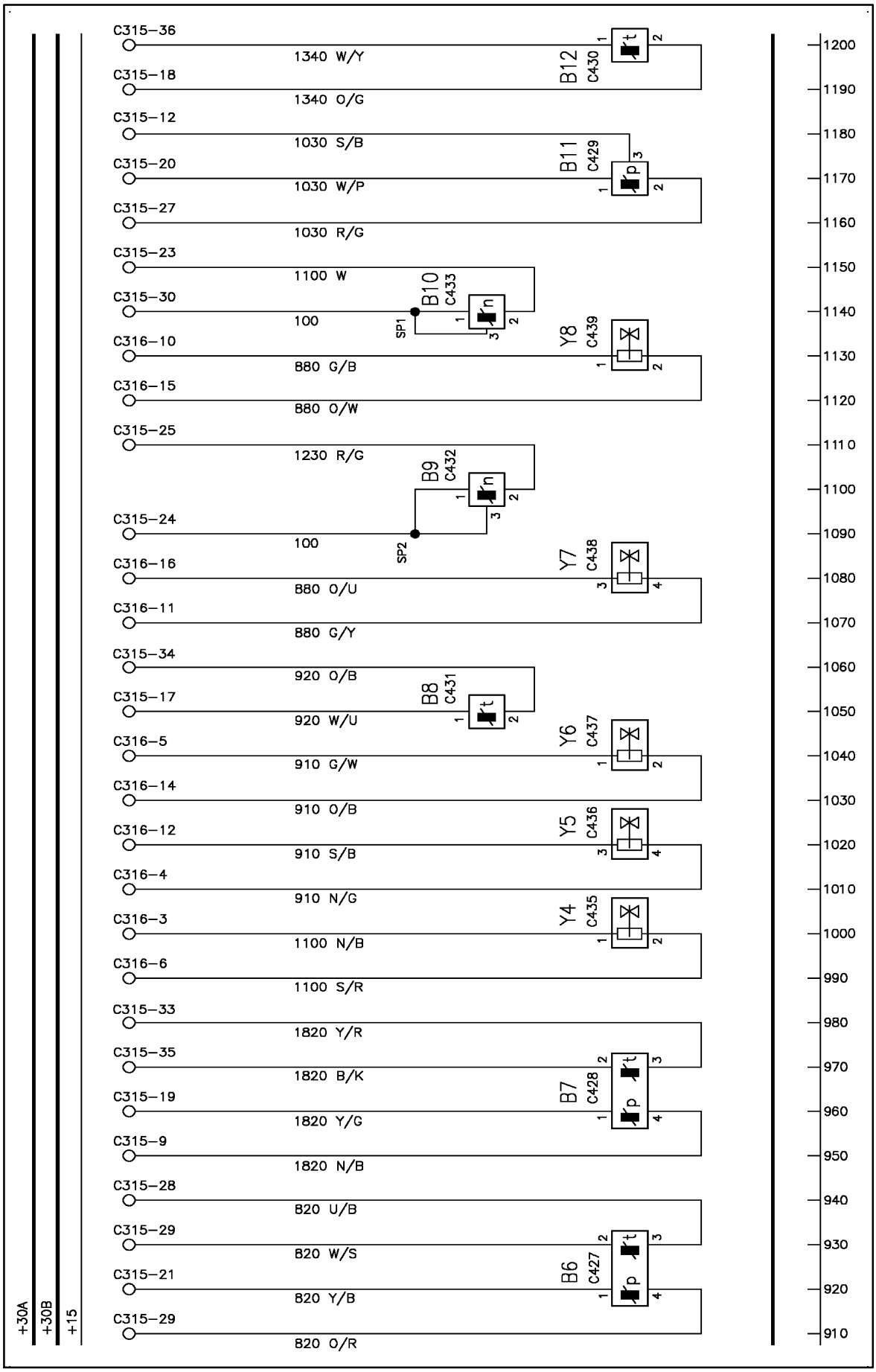
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
SP34
1220
60 B/W
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3
(NOT FITTED)
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
300
10 G
C001-25
10 G
SP34A
SP3
57 B
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A		
		Y3	Injector 1
B2	Water In Fuel Sensor		
B3	Foot Throttle - Mechanical Engine (Not Fitted)	**X14**	Loader Power Connector
B4	Hand Throttle		
B5	Fuel Metering Unit		

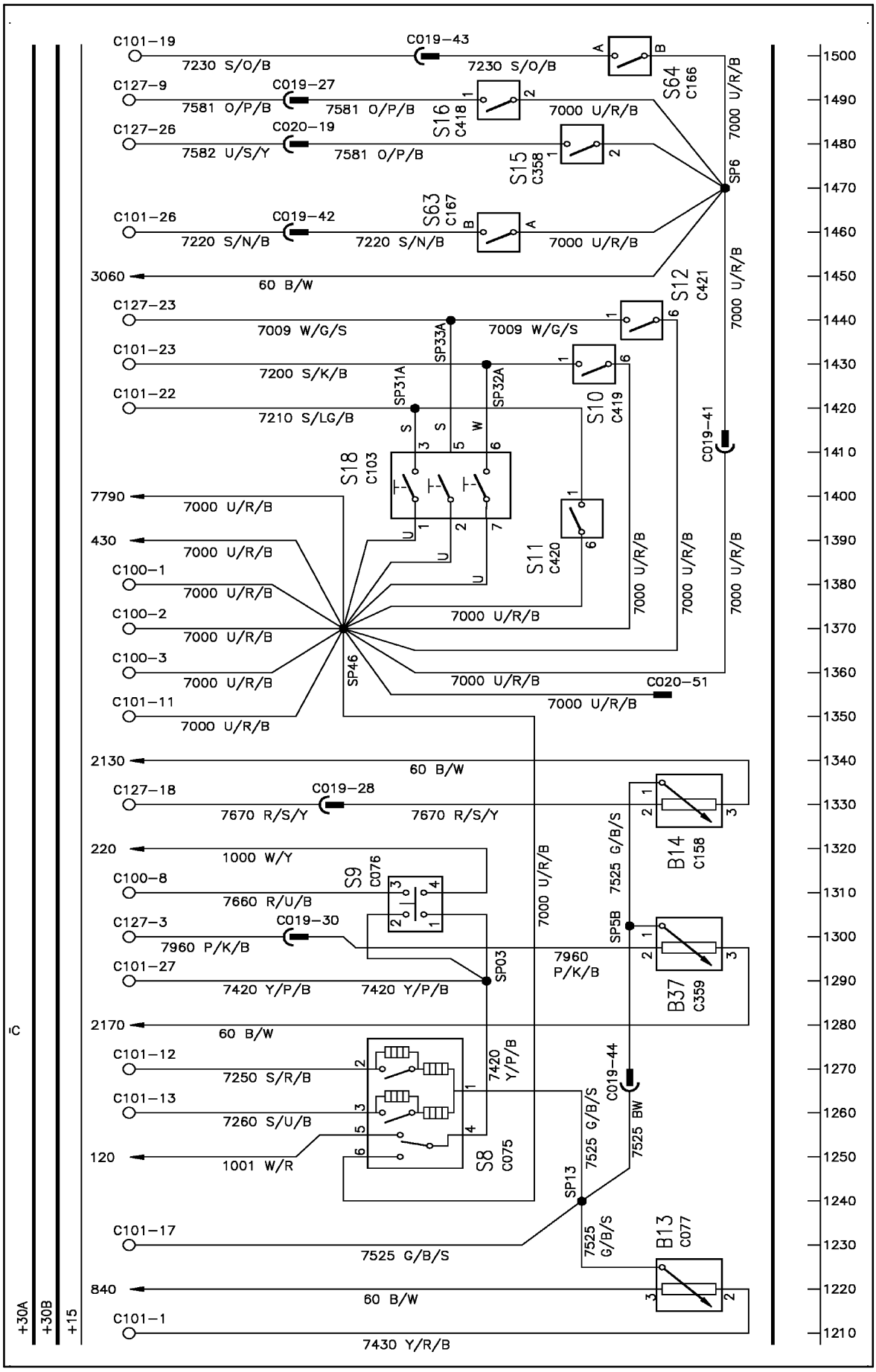
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
C315-12
1030 S/B
C315-20
1030 W/P
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
C315-24
100
C316-16
880 O/U
C316-11
880 G/Y
C315-34
920 O/B
C315-17
920 W/U
C316-5
910 G/W
C316-14
910 O/B
C316-12
910 S/B
C316-4
910 N/G
C316-3
1100 N/B
C316-6
1100 S/R
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B12 C430
B11 C429
B10 C433
B9 C432
B8 C431
B7 C428
B6 C427
Y8 C439
Y7 C438
Y6 C437
Y5 C436
Y4 C435
SP1
SP2
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910

ENGINE 3
line 910-1200

B6	Boost Pressure/Temperature Sensor	**Y4**	Injector 2
B7	Oil Pressure/Temperature Sensor	**Y5**	Injector 3
B8	Fuel Temperature Sensor	**Y6**	Injector 4
B9	Crankshaft Speed Sensor	**Y7**	Injector 5 (6 cyl version)
B10	Camshaft Speed Sensor	**Y8**	Injector 6 (6 cyl version)
B11	Fuel Rail Pressure Sensor		
B12	Coolant Temperature Sensor		

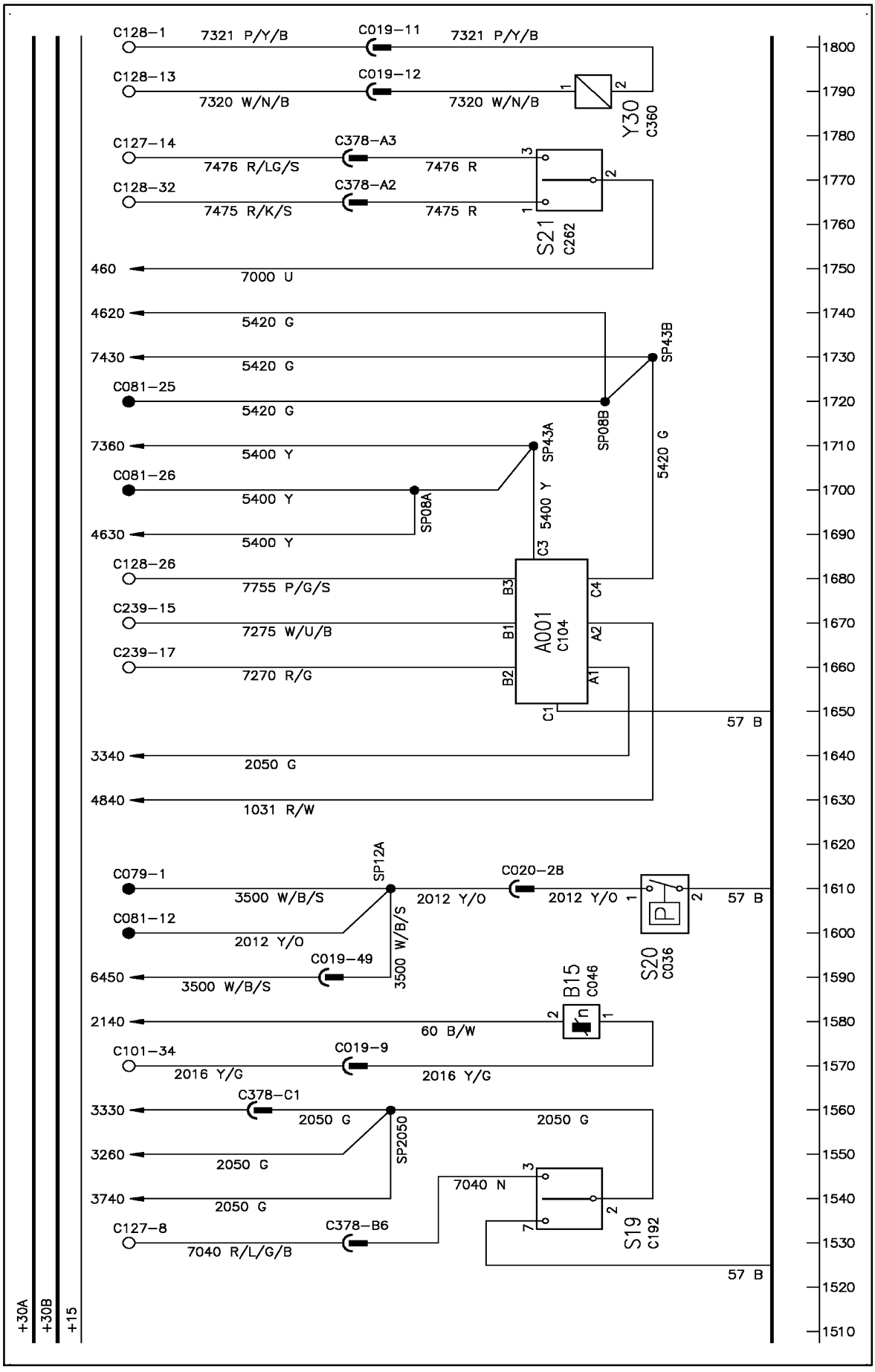
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
SP33A
7009 W/G/S
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S10 C419
C019-41
S18 C103
7790
7000 U/R/B
430
7000 U/R/B
S11 C420
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
SP46
C020-51
C101-11
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
SP03
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
B37 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 G/B/S
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control - Range
B14	Synchro Position Potentiometer	**S15**	Creeper Sensing Switch
B37	1-4/5-8 Synchro Potentiometer	**S16**	Creeper Sense Forward Switch
		S18	Gearshift
S8	Shuttle Switch	**S63**	High Range Switch
S9	Clutch Switch	**S64**	Low Range Switch
S10	Duplicate Transmission Control - Downshift		
S11	Duplicate Transmission Control - Upshift		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
5400 Y
C3
5420 G
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
A001
C104
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
7040 N
3740
2050 G
C127-8
C378-B6
7040 R/L/G/B
S19
C192
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

TRANSMISSION SYSTEM 2
Line 1510-1800

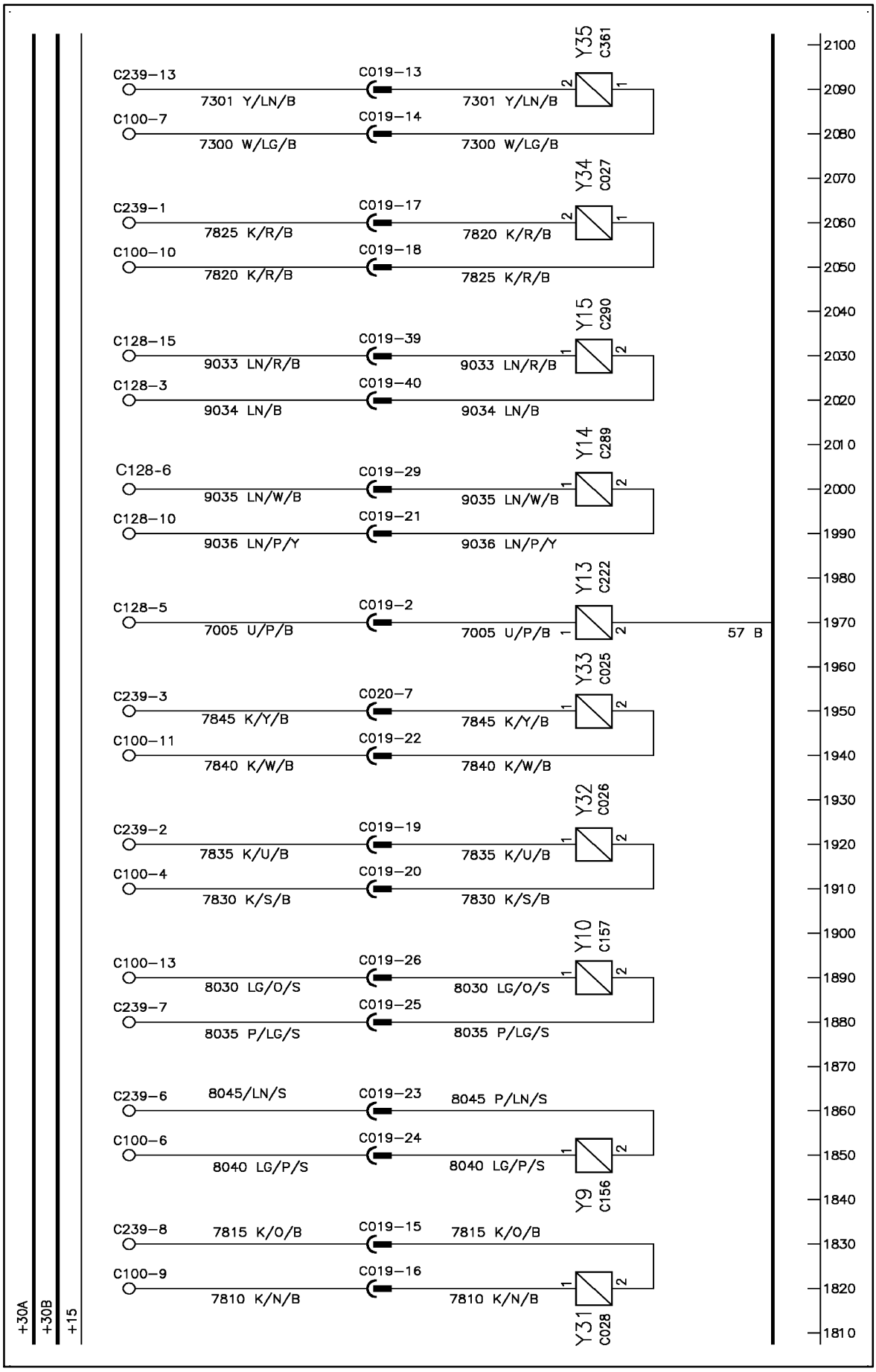
A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch
S20 Transmission Oil Pressure Switch
S21 Transmission Auto Function Switch

Y30 5-8 Synchro Solenoid

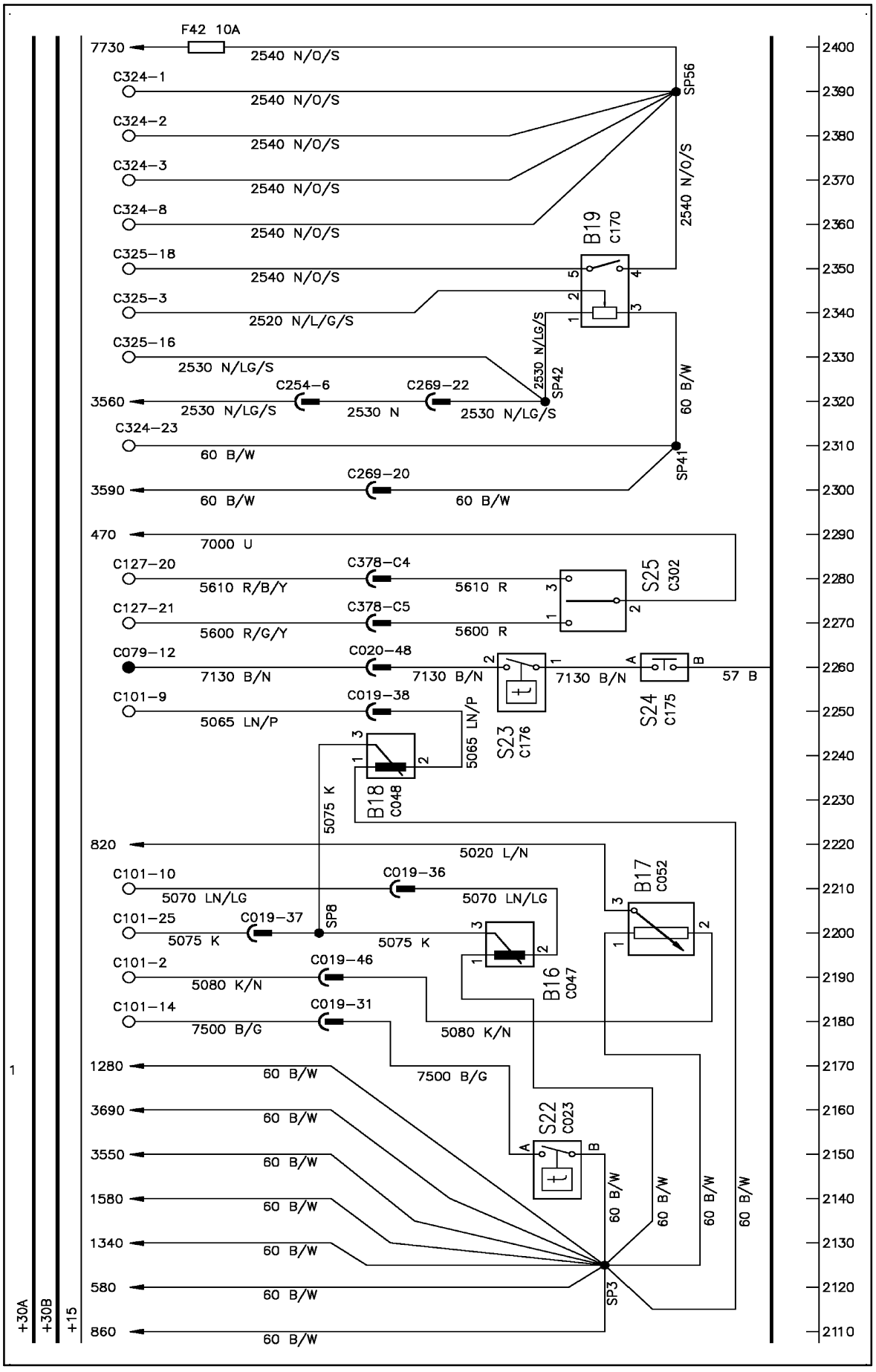
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-6
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9	Reverse Synchro Solenoid
Y10	Forward Synchro Solenoid
Y13	Creeper Gear Solenoid
Y14	17th Gear Dump Solenoid
Y15	17th Gear Solenoid
Y31	C1 Valve
Y32	C3 Valve
Y33	C4 Valve
Y34	C2 Valve
Y35	1-4 Synchro Solenoid

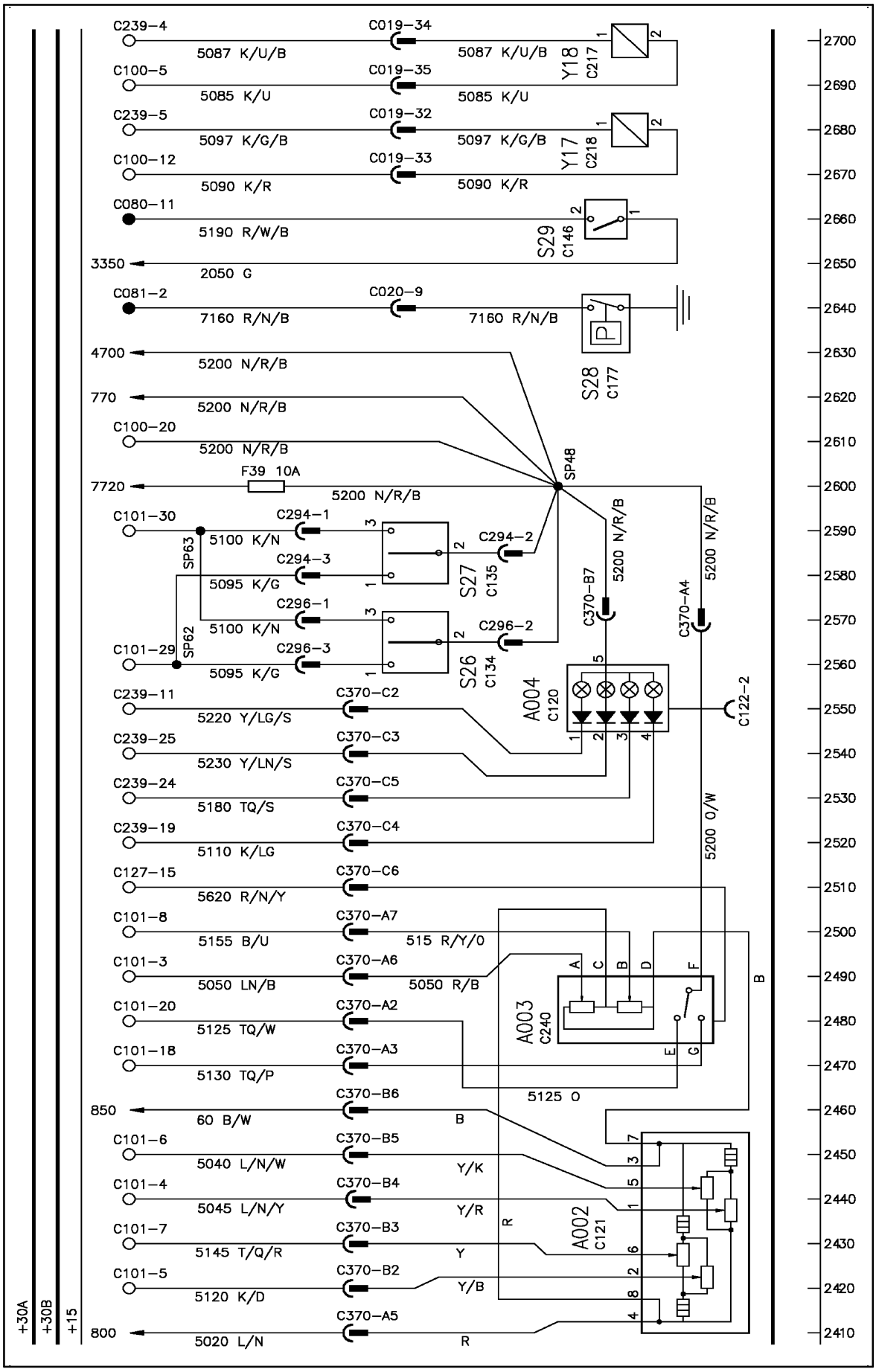
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
C019-37
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
1280
3690
3550
1580
1340
580
860
SP56
SP42
SP41
SP8
SP3
B19 C170
S25 C302
S24 C175
S23 C176
B18 C048
B17 C052
B16 C047
S22 C023
57 B
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A	**S22**	Transmission Oil Temp Sensor
		S23	Oil Temperature Switch
B16	LH Draft Pin	**S24**	HPL Filter Switch
B17	Rockshaft Potentiometer	**S25**	HTS Switch
B18	RH Draft Pin		
B19	Front HPL Limit Potentiometer		

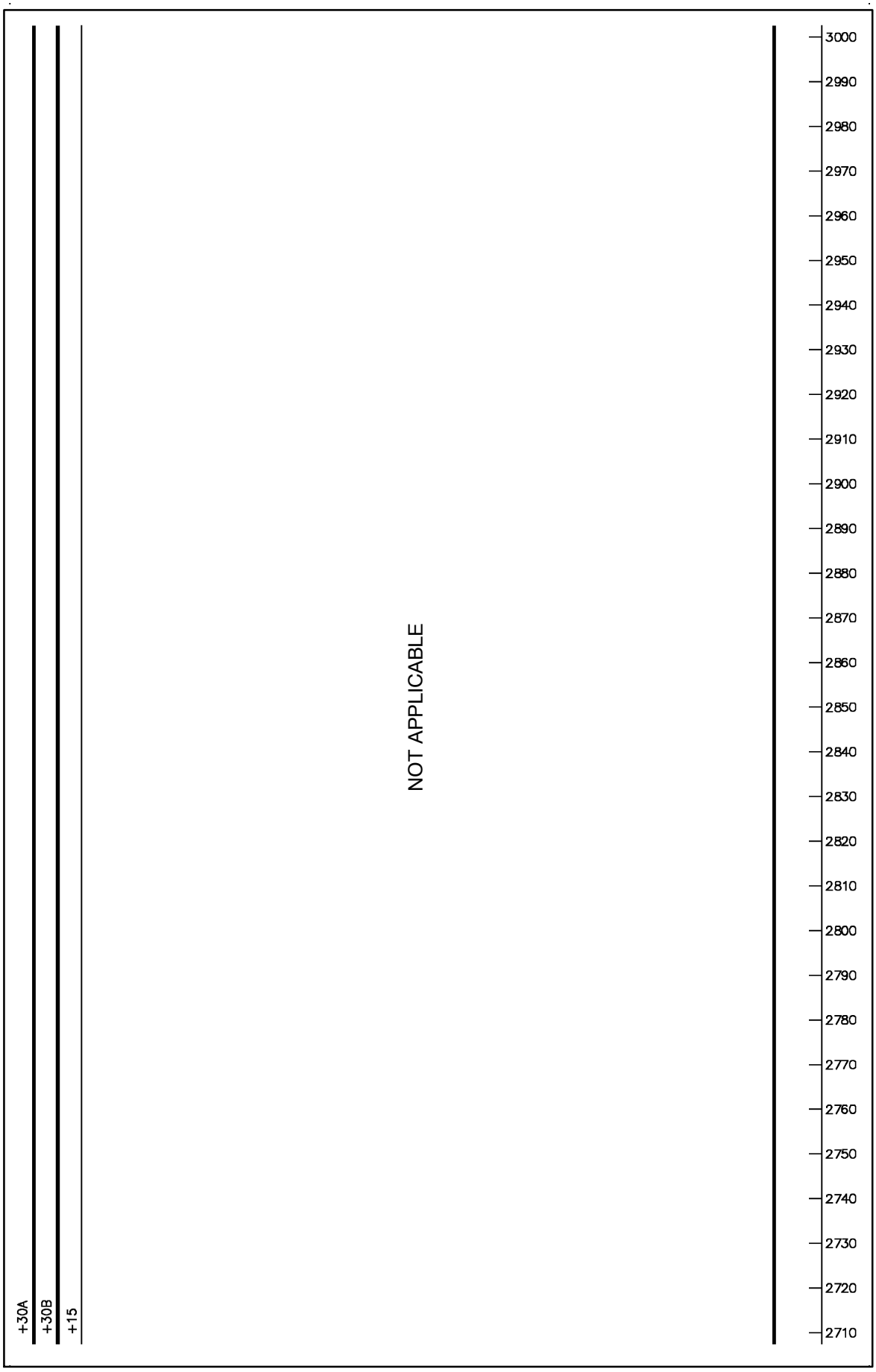
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7720
5200 N/R/B
SP48
C101-30
C294-1
5100 K/N
C294-2
SP63
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
C101-29
SP62
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
C370-A5
800
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

HYDRAULICS 2
Line 2410-2700

F39	Fuse - 10A	**S27**	HPL Switch R/H
		S28	Lo Charge Switch
A002	EDC Control	**S29**	Lift-O-Matic Switch
A003	EDC Mouse		
A004	EDC Status Lamp Panel	**Y17**	EDC Lower Solenoid
		Y18	EDC Raise Solenoid
S26	HPL Switch L/H		

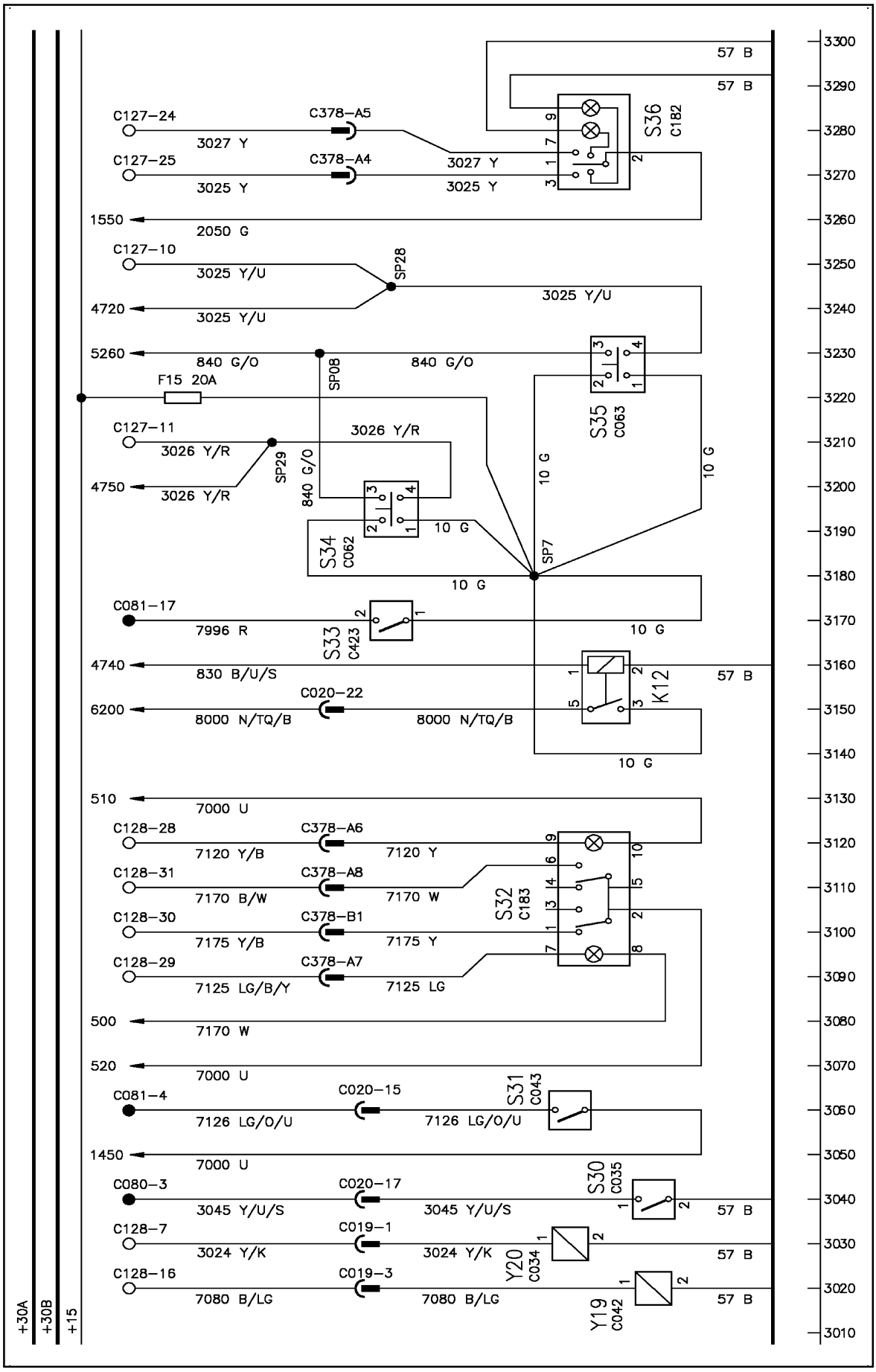
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

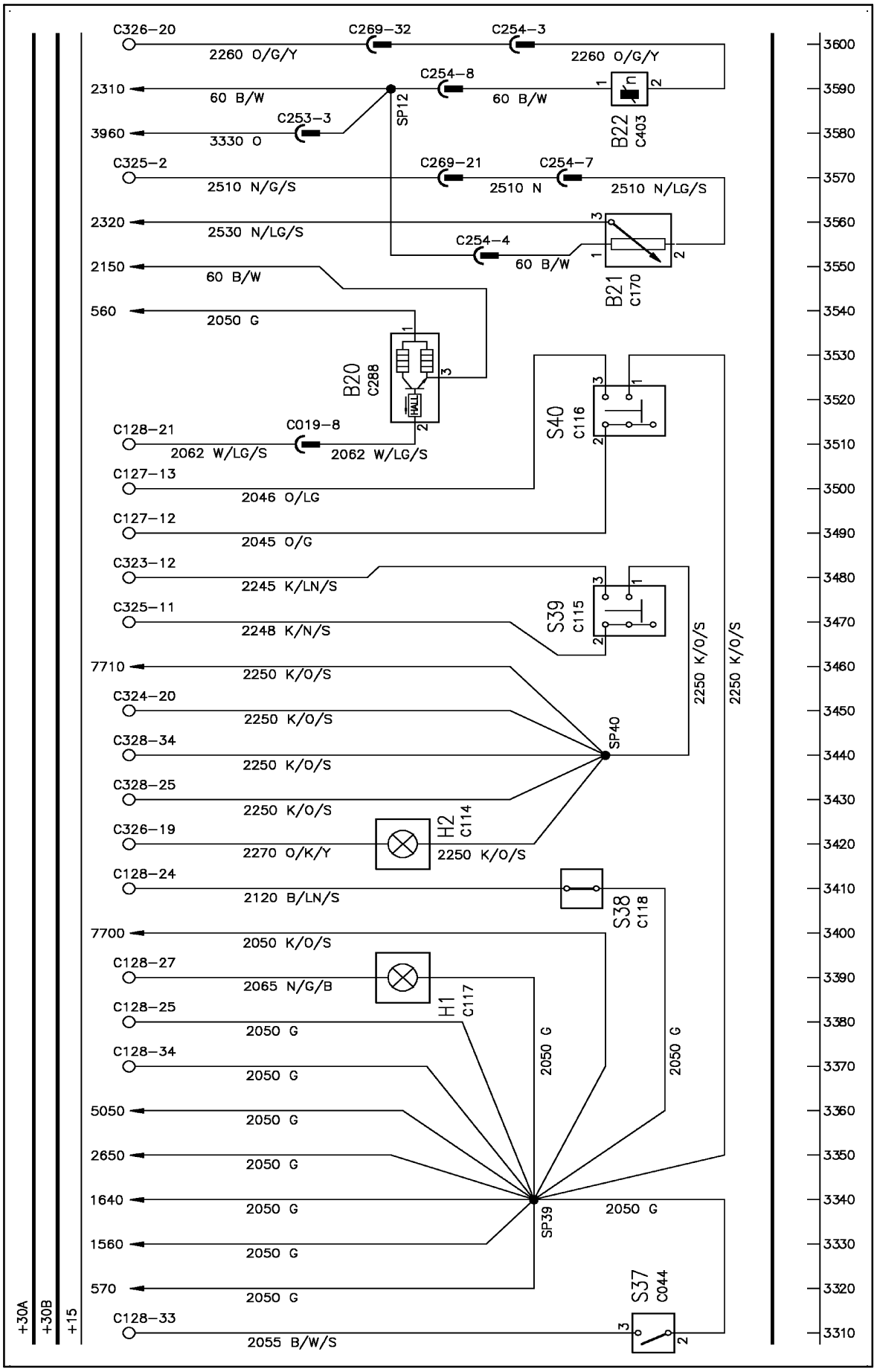
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F15 20A
SP28
SP08
SP29
SP7
S34 C062
S35 C063
S36 C182
S33 C423
S32 C183
S31 C043
S30 C035
K12
Y20 C034
Y19 C042
C127-24
C127-25
C127-10
C127-11
C378-A5
C378-A4
C020-22
C081-17
C128-28
C128-31
C128-30
C128-29
C378-A6
C378-A8
C378-B1
C378-A7
C020-15
C081-4
C080-3
C020-17
C128-7
C019-1
C128-16
C019-3
1550
4720
5260
4750
4740
6200
510
500
520
1450
3027 Y
3025 Y
2050 G
3025 Y/U
840 G/O
3026 Y/R
840 G/O
10 G
7996 R
830 B/U/S
8000 N/TQ/B
7000 U
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
7126 LG/O/U
3045 Y/U/S
3024 Y/K
7080 B/LG
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

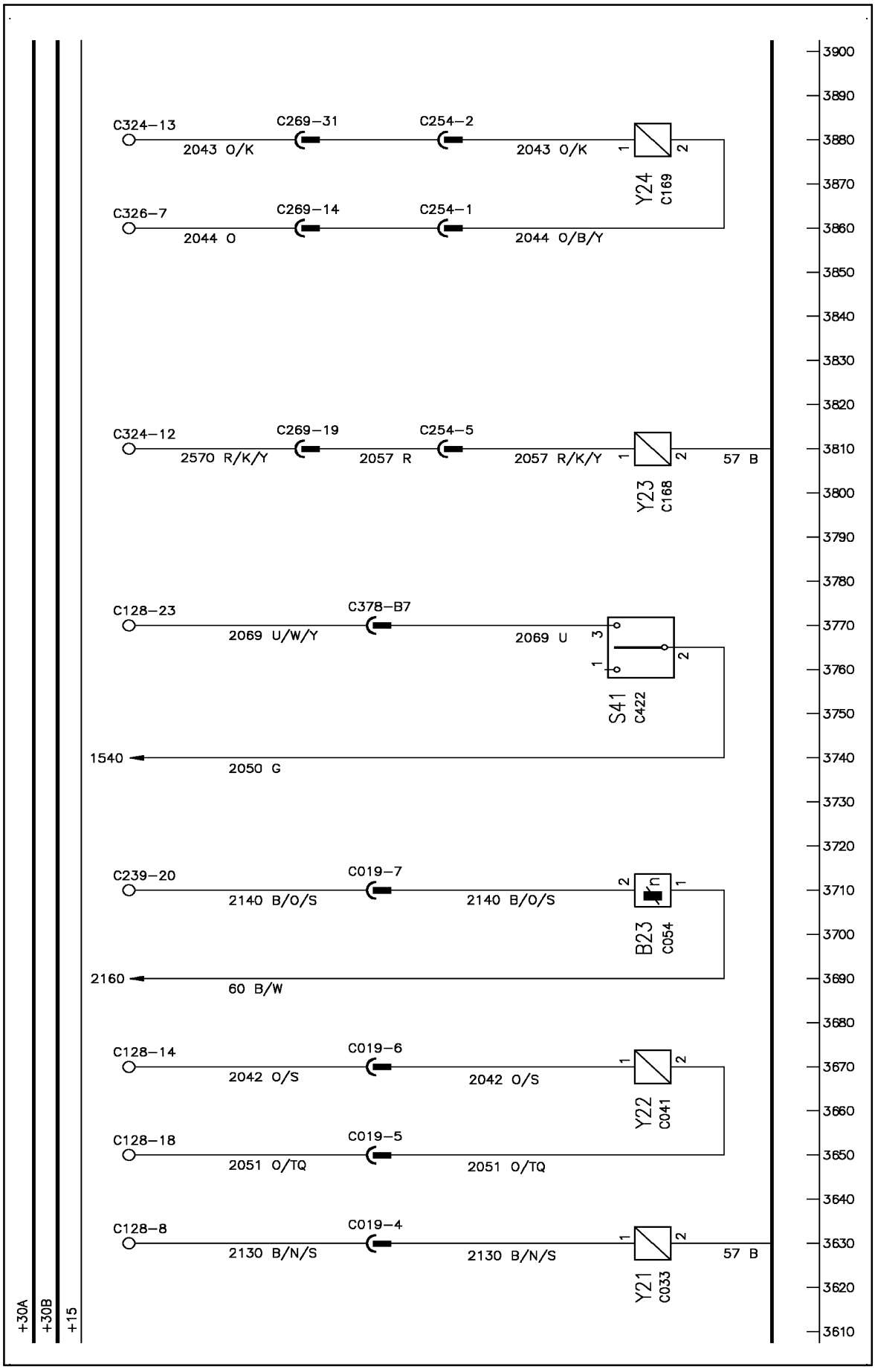
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
C253-3
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

S41 PTO Management Switch

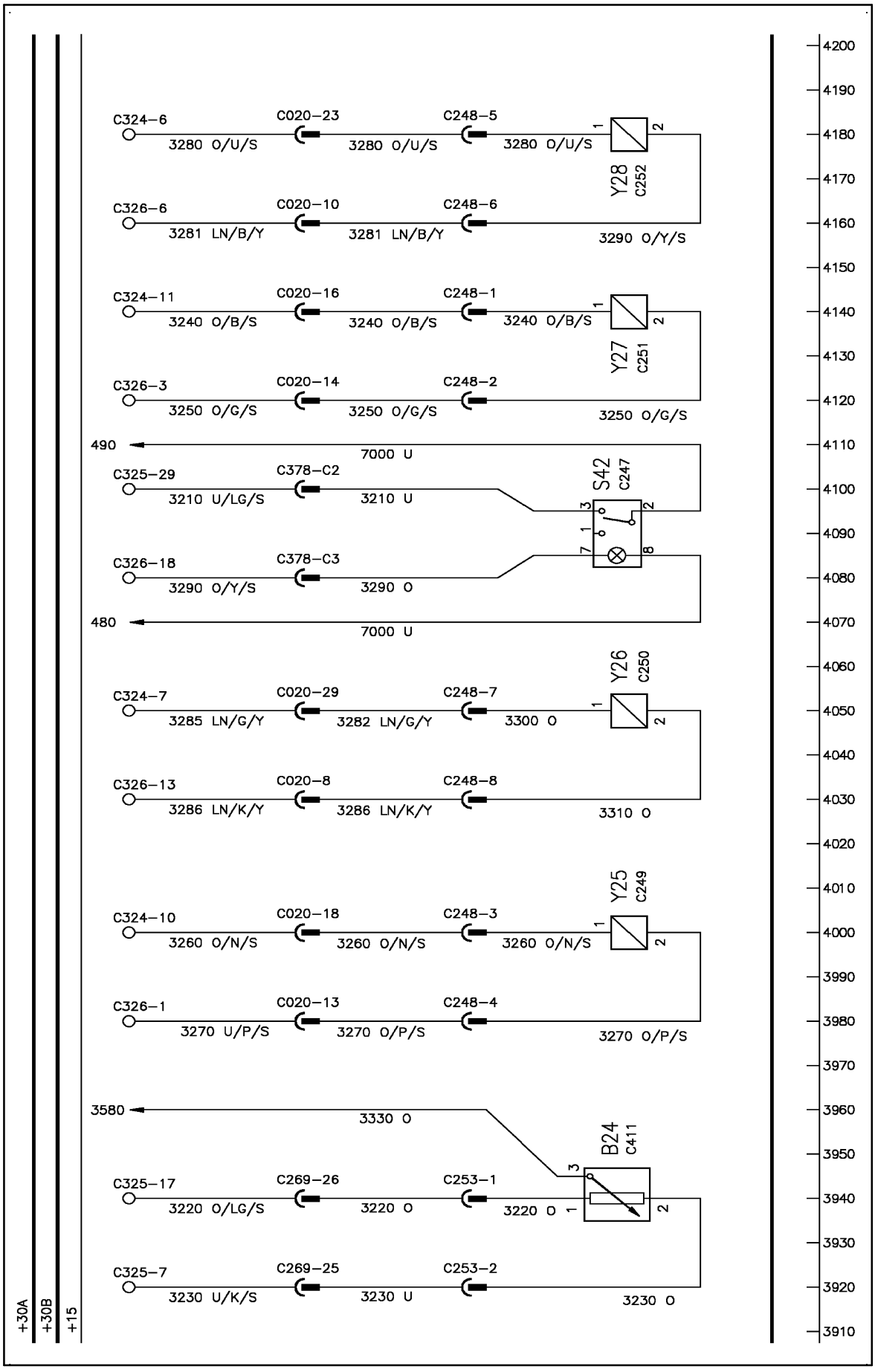
Y21 PTO Brake Solenoid

Y22 PTO Clutch Solenoid

Y23 Front Hitch Valve

Y24 Front PTO Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28
C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27
C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42
C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN/G/Y
3300 O
Y26
C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25
C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24
C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

Y25 Front Suspension Lower Solenoid

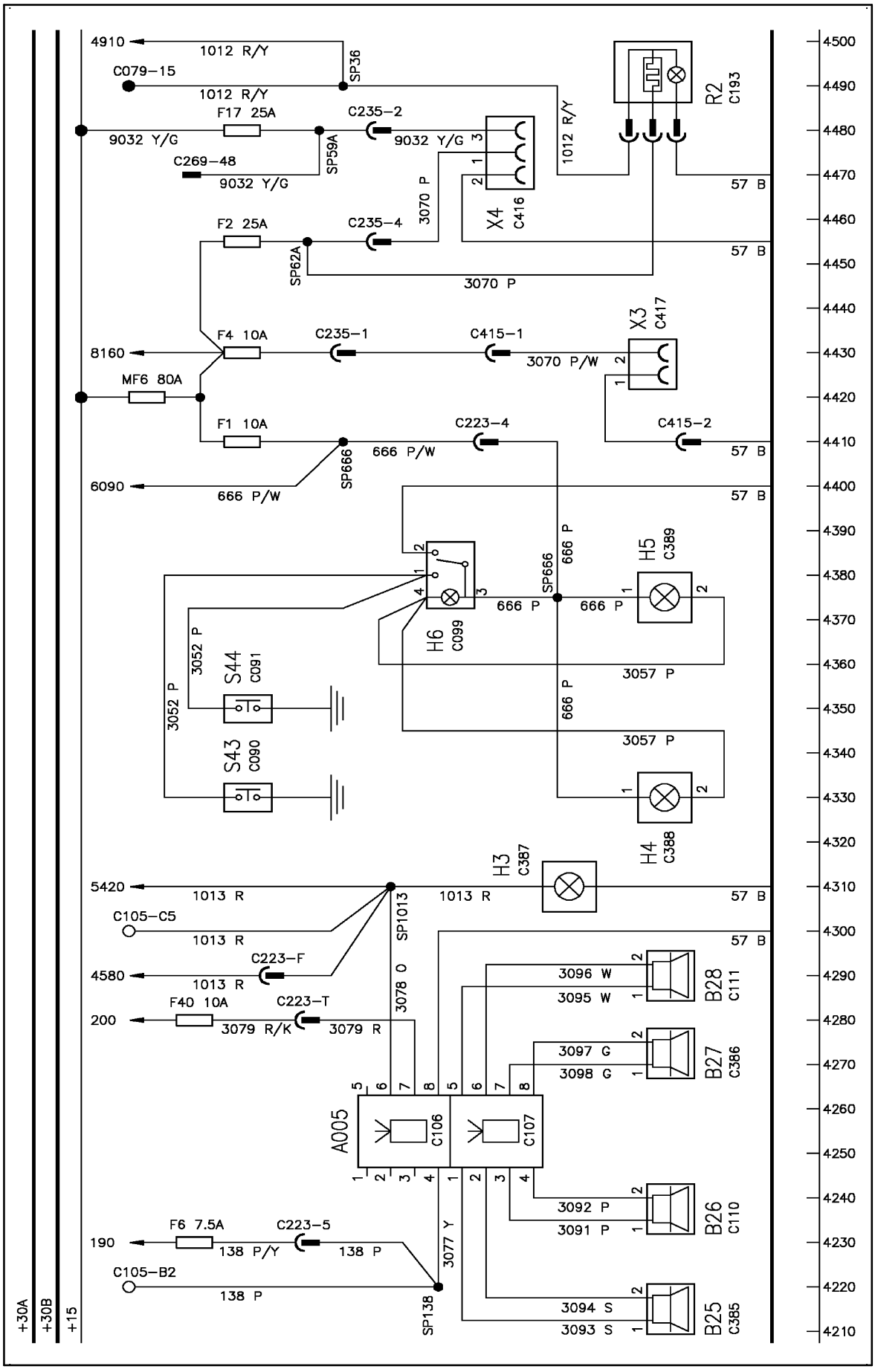
Y26 Front Suspension Lower Lockout Solenoid

Y27 Front Suspension Raise Solenoid

Y28 Front Suspension Raise Lockout Solenoid

S42 Front Suspension Switch

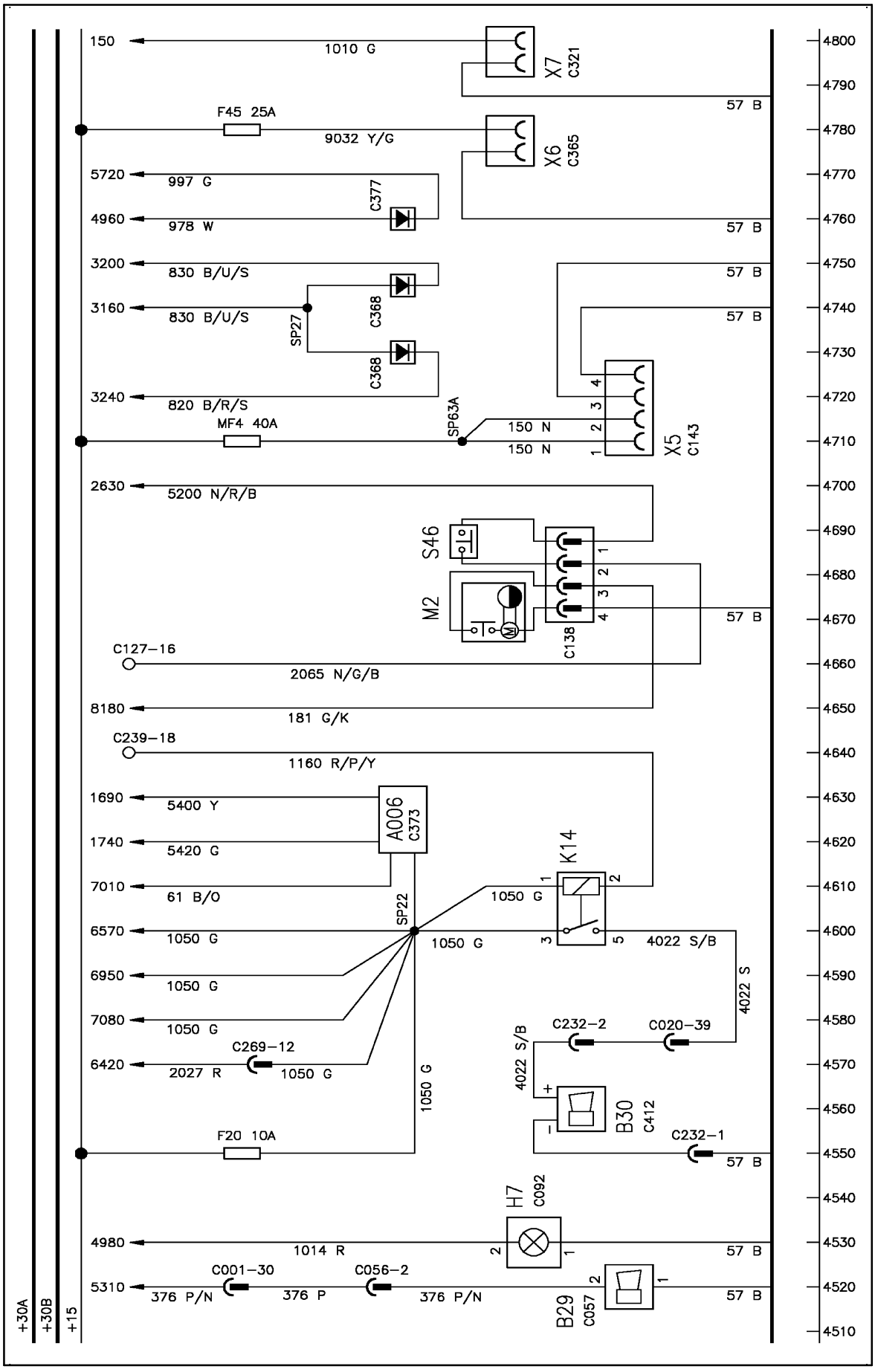
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4910
1012 R/Y
SP36
C079-15
1012 R/Y
F17 25A
C235-2
9032 Y/G
9032 Y/G
SP59A
C269-48
9032 Y/G
3070 P
X4
C416
1012 R/Y
R2
C193
57 B
F2 25A
C235-4
SP62A
3070 P
57 B
8160
F4 10A
C235-1
C415-1
3070 P/W
X3
C417
MF6 80A
F1 10A
C223-4
C415-2
666 P/W
SP666
6090
666 P/W
57 B
H5
C389
SP666
666 P
666 P
666 P
H6
C099
3057 P
3052 P
S44
C091
3052 P
666 P
S43
C090
3057 P
H4
C388
H3
C387
5420
1013 R
1013 R
57 B
C105-C5
1013 R
SP1013
57 B
C223-F
4580
1013 R
3078 O
3096 W
3095 W
B28
C111
F40 10A
C223-T
200
3079 R/K
3079 R
3097 G
3098 G
B27
C386
A005
C106
C107
3092 P
3091 P
B26
C110
F6 7.5A
C223-5
190
138 P/Y
138 P
3077 Y
C105-B2
138 P
SP138
3094 S
3093 S
B25
C385
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

CAB ACCESSORIES 1
Line 4210-4500

MF6	Maxi Fuse - 80A
F1	Fuse - 10A
F2	Fuse - 25A
F4	Fuse - 10A
F6	Fuse - 7.5A
F17	Fuse - 25A
F40	Fuse - 10A
A005	Radio
B25	Speaker L/H Rear
B26	Speaker R/H Front
B27	Speaker R/H Rear
B28	Speaker L/H Front
H3	Console Lamp R/H
H4	Puddle Lamp L/H
H5	Puddle Lamp R/H
H6	Interior Lamp
S43	Door Switch L/H
S44	Door Switch R/H
X3	8 Amp Terminals
X4	20 Amp Multi Socket
R2	Cigar Lighter

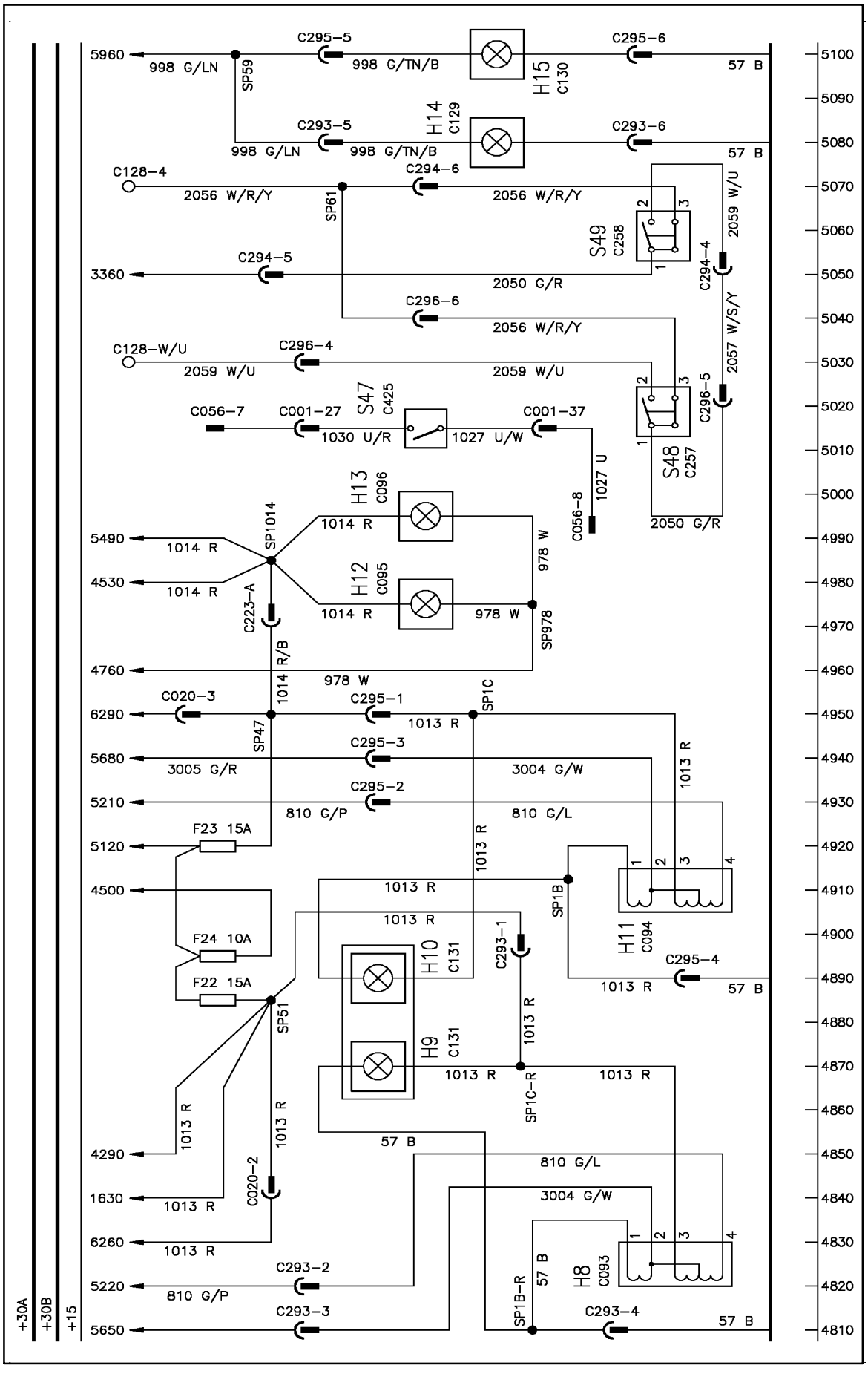
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
C368
57 B
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
7010
61 B/O
SP22
K14
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
4022 S
7080
1050 G
C232-2
C020-39
C269-12
6420
2027 R
1050 G
4022 S/B
1050 G
B30
C412
C232-1
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X6	8 Amp Socket
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode
C377	Diode

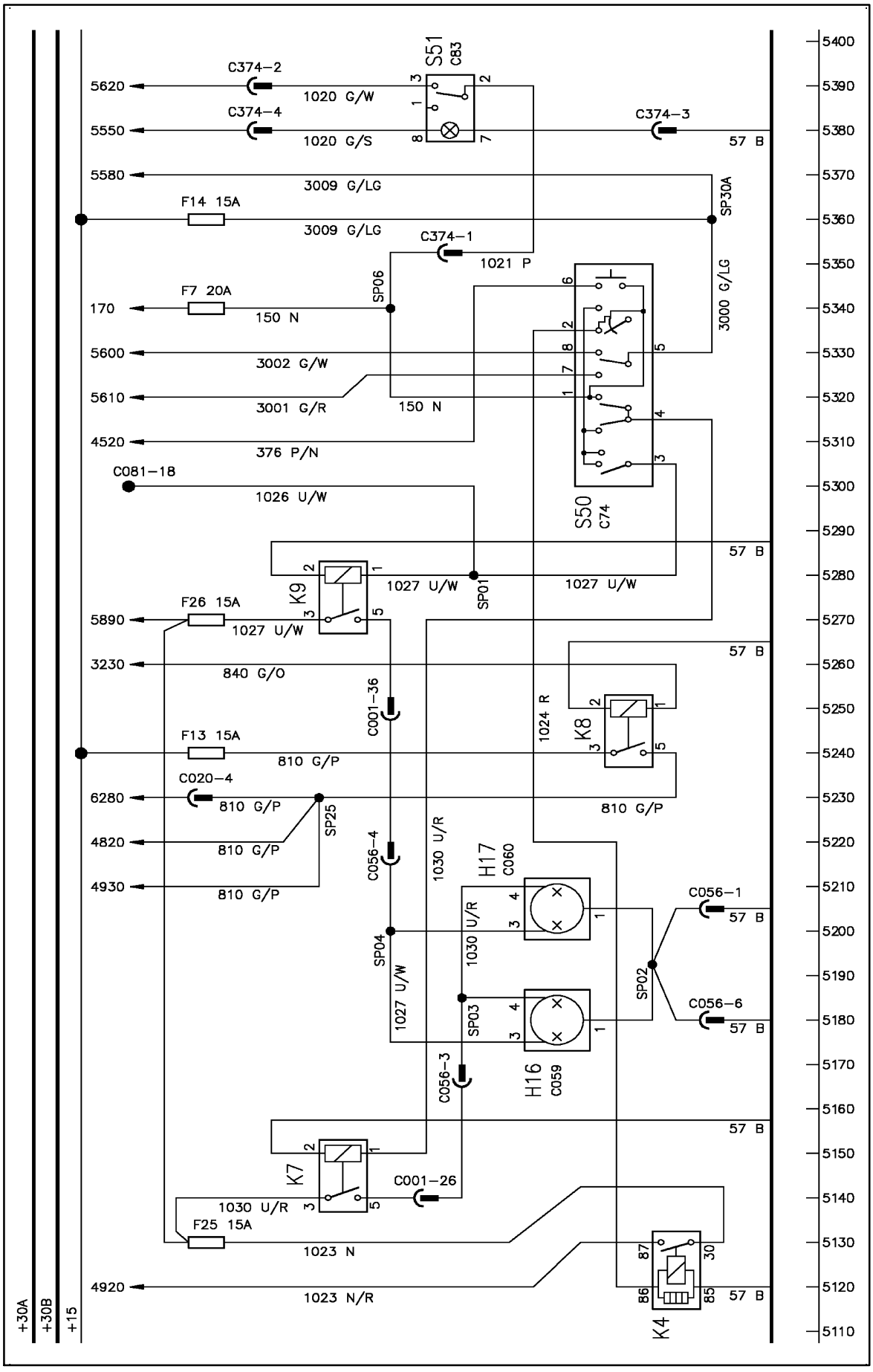
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
C294-4
C294-5
3360
2050 G/R
C296-6
2056 W/R/Y
C128-W/U
2059 W/U
C296-4
2059 W/U
2057 W/S/Y
C296-5
S47 C425
C056-7
C001-27
1030 U/R
1027 U/W
C001-37
S48 C257
1027 U
C056-8
2050 G/R
H13 C096
H12 C095
SP1014
5490
1014 R
4530
1014 R
1014 R
978 W
978 W
SP978
C223-A
4760
1014 R/B
978 W
C020-3
6290
SP47
C295-1
1013 R
SP1C
C295-3
5680
3005 G/R
3004 G/W
C295-2
5210
810 G/P
810 G/L
F23 15A
5120
4500
1013 R
SP1B
H11 C094
C295-4
1013 R
57 B
F24 10A
F22 15A
SP51
H10 C131
H9 C131
C293-1
1013 R
SP1C-R
4290
1630
1013 R
6260
1013 R
C020-2
57 B
810 G/L
3004 G/W
H8 C093
SP1B-R
C293-2
5220
810 G/P
C293-3
5650
C293-4
57 B
+30A
+30B
+15
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A
H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender
H10	Licence Plate Lamp - Fender
H11	Stop/Tail Light L/H
H12	Licence Plate Lamp L/H
H13	Licence Plate Lamp R/H
H14	Worklamp - Fender R/H
H15	Worklamp - Fender L/H
S47	Aux Headlamp Switch
S48	PTO Fender Switch L/H
S49	PTO Fender Switch R/H

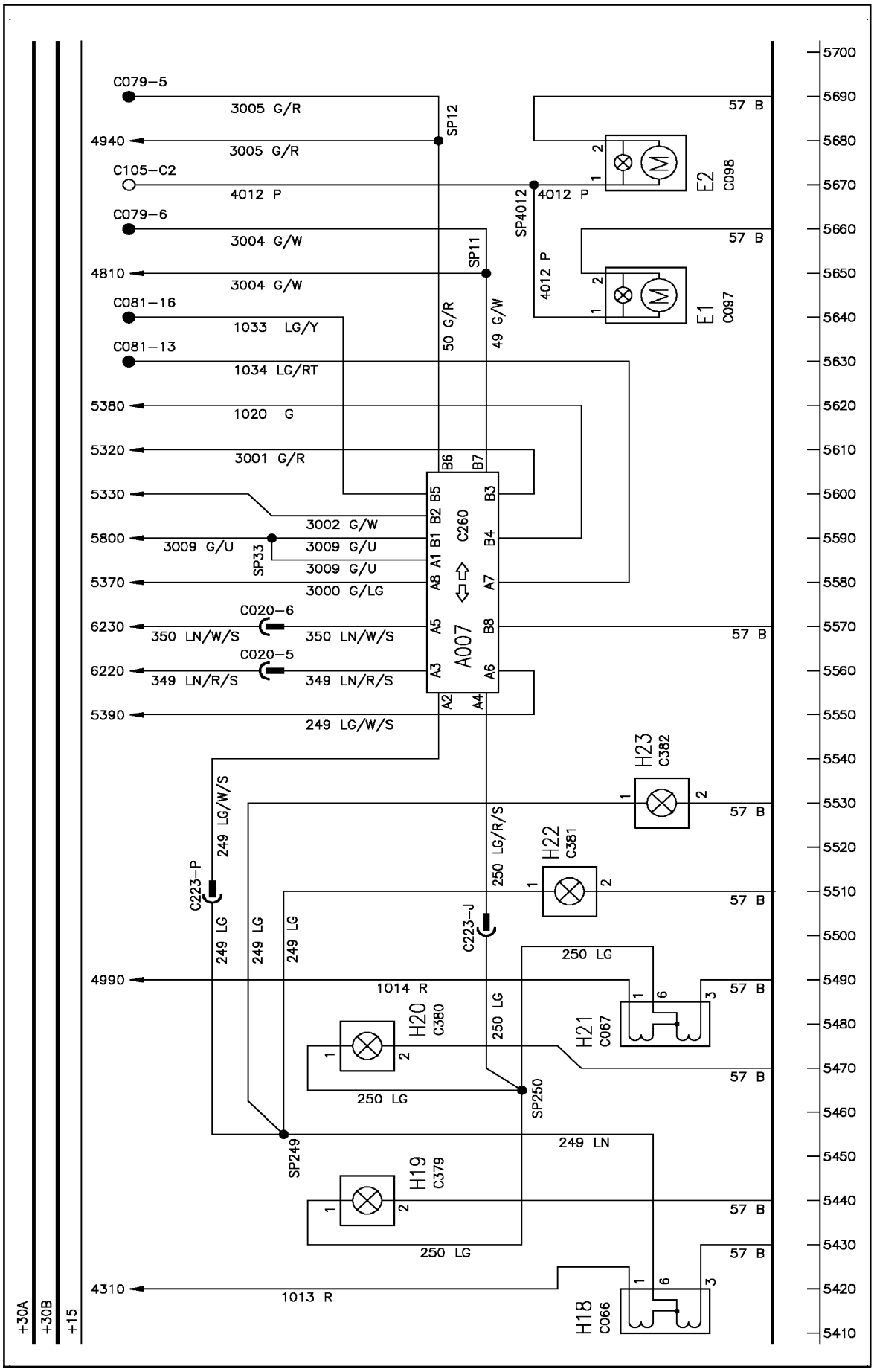
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
5620
5550
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
C374-2
C374-4
1020 G/W
1020 G/S
S51
C83
C374-3
57 B
3009 G/LG
F14 15A
SP30A
C374-1
1021 P
F7 20A
150 N
SP06
3002 G/W
3001 G/R
376 P/N
3000 G/LG
S50
C74
C081-18
1026 U/W
K9
F26 15A
1027 U/W
SP01
840 G/O
C001-36
F13 15A
810 G/P
C020-4
SP25
1024 R
K8
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
C056-3
H16
C059
C056-1
C056-6
SP02
K7
C001-26
F25 15A
1023 N
1023 N/R
K4
87
30
86
85
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

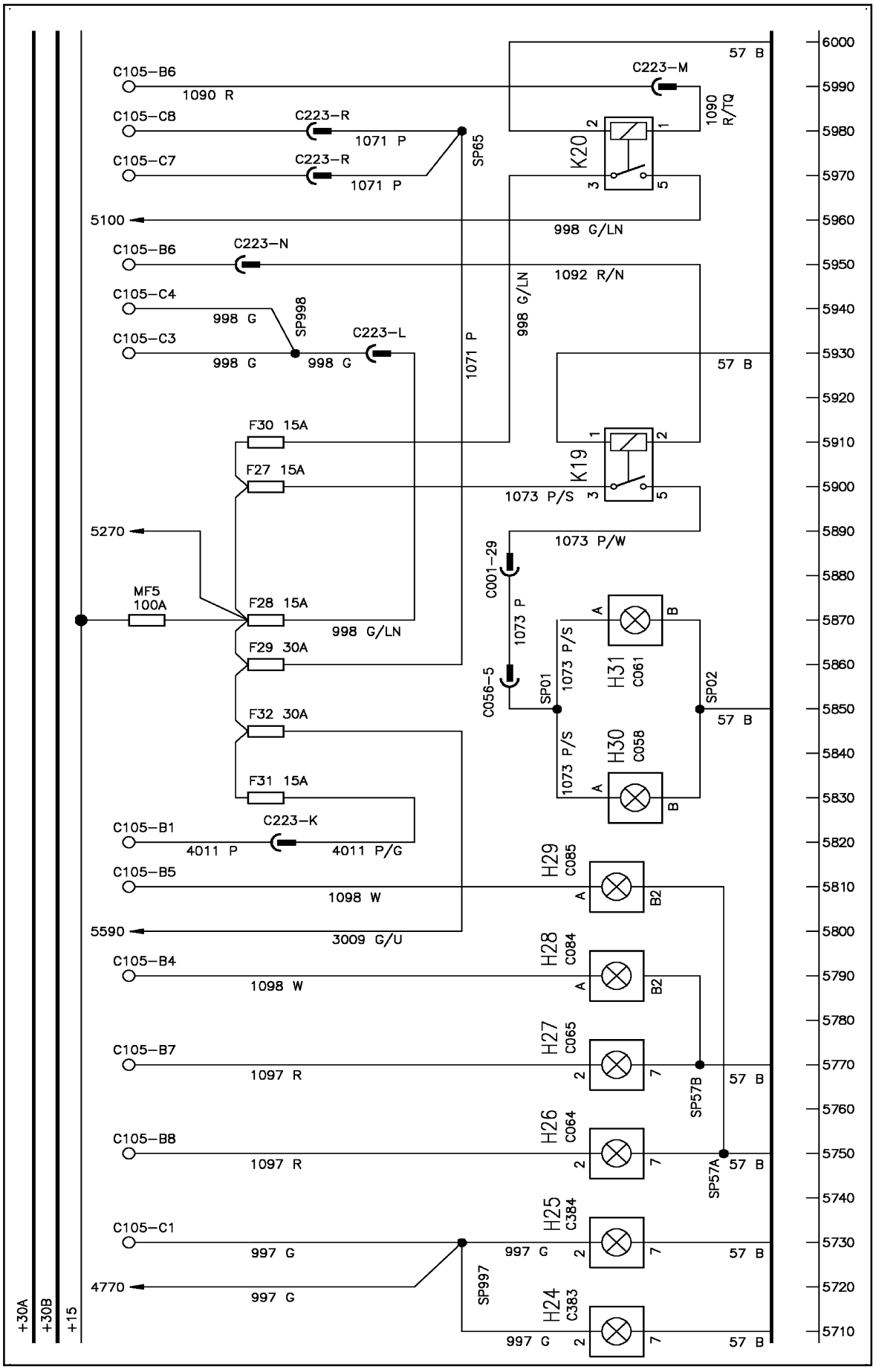
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
C105-C2
4012 P
C079-6
3004 G/W
4810
3004 G/W
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
350 LN/W/S
C020-5
6220
349 LN/R/S
349 LN/R/S
5390
249 LG/W/S
SP12
SP11
SP33
SP4012
SP249
SP250
50 G/R
49 G/W
4012 P
4012 P
57 B
57 B
57 B
57 B
57 B
57 B
57 B
57 B
E2
C098
E1
C097
C260
A007
B6
B7
B5
B2
B1
A1
A8
A5
A3
A2
A4
B3
B4
A7
B8
A6
H23
C382
H22
C381
H20
C380
H21
C067
H19
C379
H18
C066
C223-P
C223-J
249 LG/W/S
249 LG
249 LG
249 LG
250 LG/R/S
250 LG
250 LG
250 LG
249 LN
4990
1014 R
4310
1013 R
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

INDICATORS AND HAZARDS 3
Line 5410-5700

A007	Flasher Unit
E1	Rotating Beacon L/H
E2	Rotating Beacon L/H
H18	Grabrail Side Lamp R/H
H19	SMV Lamp L/H Front
H20	SMV Lamp L/H Rear
H21	Grabrail Side Lamp L/H
H22	SMV Lamp R/H Front
H23	SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C105-B6
1090 R
C105-C8
C223-R
1071 P
C105-C7
C223-R
1071 P
SP65
5100
C105-B6
C223-N
C105-C4
998 G
SP998
C105-C3
998 G
998 G
C223-L
F30 15A
F27 15A
5270
MF5
100A
F28 15A
998 G/LN
F29 30A
F32 30A
F31 15A
C105-B1
4011 P
C223-K
4011 P/G
C105-B5
1098 W
5590
3009 G/U
C105-B4
1098 W
C105-B7
1097 R
C105-B8
1097 R
C105-C1
997 G
4770
997 G
SP997
997 G
997 G
57 B
C223-M
1090
R/TQ
K20
998 G/LN
1092 R/N
998 G/LN
1071 P
57 B
K19
1073 P/S
1073 P/W
C001-29
1073 P
C056-5
SP01
1073 P/S
H31
C061
SP02
57 B
1073 P/S
H30
C058
H29
C085
H28
C084
H27
C065
SP57B
57 B
H26
C064
SP57A
57 B
H25
C384
57 B
H24
C383
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

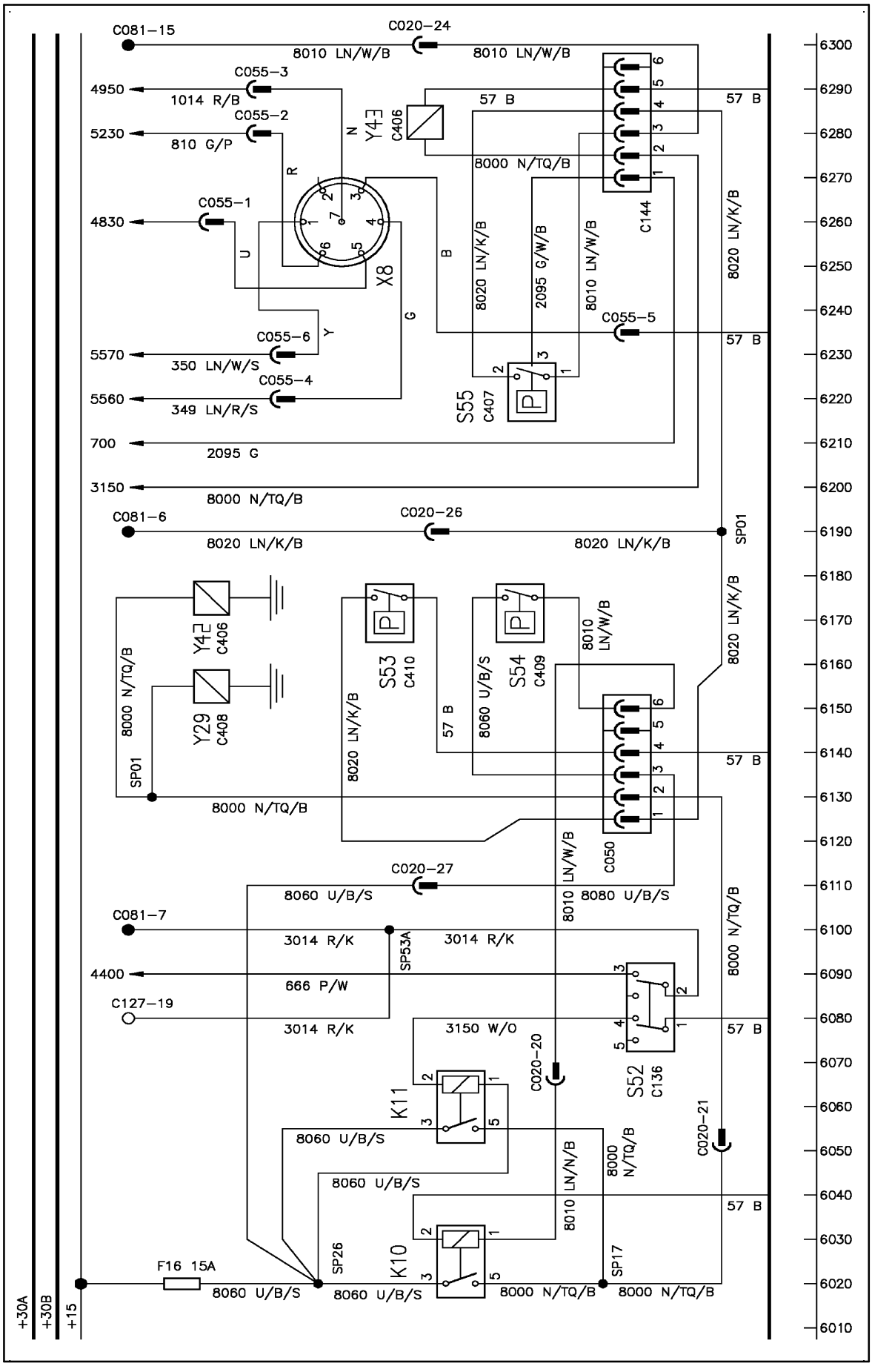
WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F28 Fuse - 15A
F29 Fuse - 30A
F30 Fuse - 15A
F31 Fuse - 15A
F32 Fuse - 30A

H24 Worklamp - Rear L/H
H25 Worklamp - Rear R/H
H26 Worklamp - Grabrail R/H
H27 Worklamp - Grabrail L/H
H28 Worklamp - Upper Front L/H
H29 Worklamp - Upper Front R/H
H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN/W/B
C055-3
4950
1014 R/B
C055-2
5230
810 G/P
C055-1
4830
C055-6
5570
350 LN/W/S
C055-4
5560
349 LN/R/S
Y43 C406
X8
S55 C407
57 B
8000 N/TQ/B
8020 LN/K/B
2095 G/W/B
8010 LN/W/B
C144
C055-5
700
2095 G
3150
8000 N/TQ/B
C081-6
C020-26
8020 LN/K/B
8020 LN/K/B
SP01
Y42 C406
Y29 C408
S53 C410
S54 C409
8060 U/B/S
8010 LN/W/B
C050
C020-27
8060 U/B/S
8010 8080 U/B/S
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3014 R/K
3150 W/O
S52 C136
C020-20
C020-21
K11
K10
8060 U/B/S
8000 N/TQ/B
8010 LN/N/B
SP26
SP17
F16 15A
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

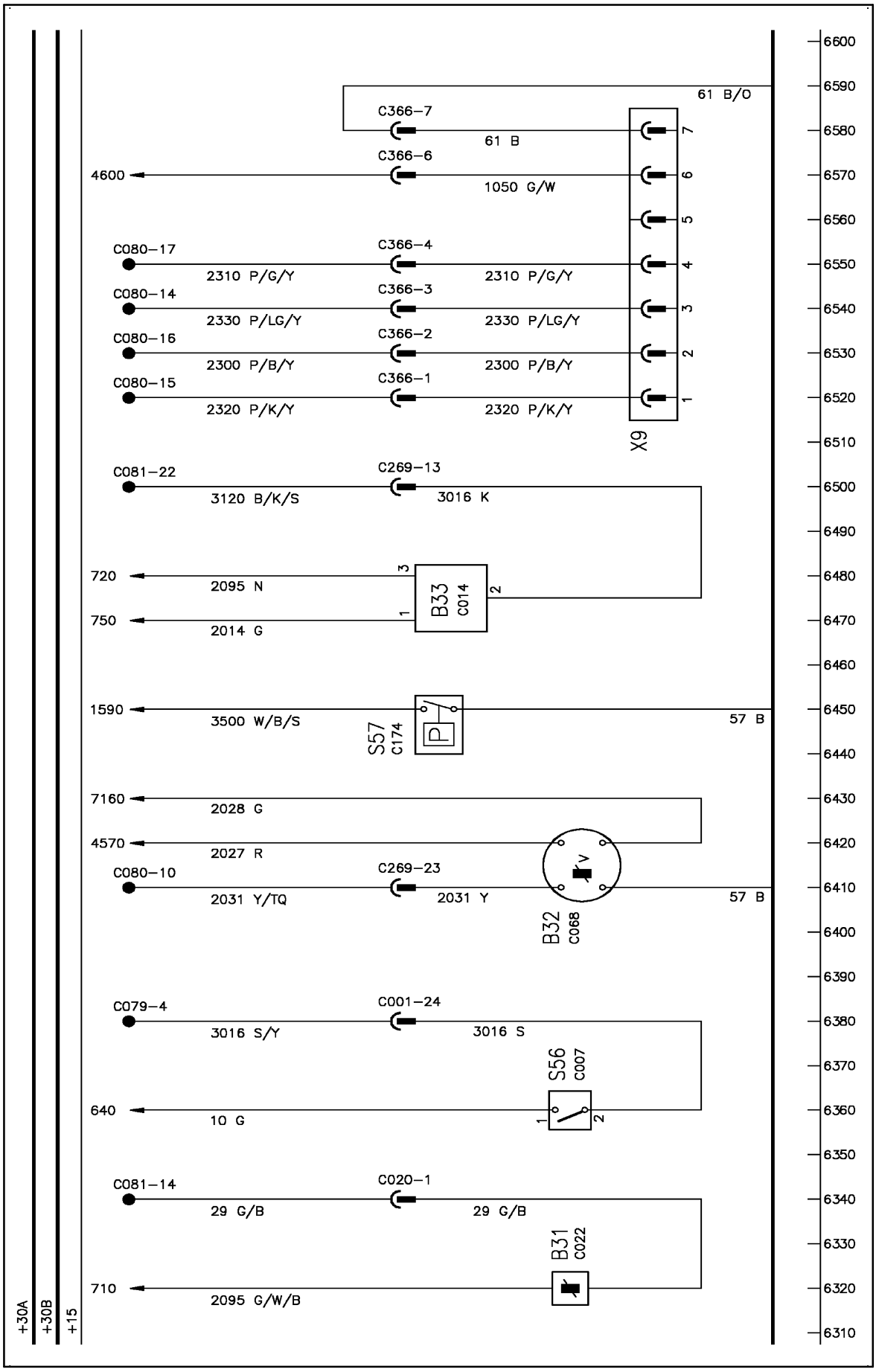
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch
S55 Air Brake Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid
Y43 Air Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
C366-4
2310 P/G/Y
2310 P/G/Y
C080-14
C366-3
2330 P/LG/Y
2330 P/LG/Y
C080-16
C366-2
2300 P/B/Y
2300 P/B/Y
C080-15
C366-1
2320 P/K/Y
2320 P/K/Y
X9
C081-22
C269-13
3120 B/K/S
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
C269-23
2031 Y/TQ
2031 Y
57 B
B32
C068
C079-4
C001-24
3016 S/Y
3016 S
S56
C007
640
10 G
C081-14
C020-1
29 G/B
29 G/B
B31
C022
710
2095 G/W/B

SENSORS
Line 6310-6600

B31 Fuel Tank Sender

B32 Radar Gun

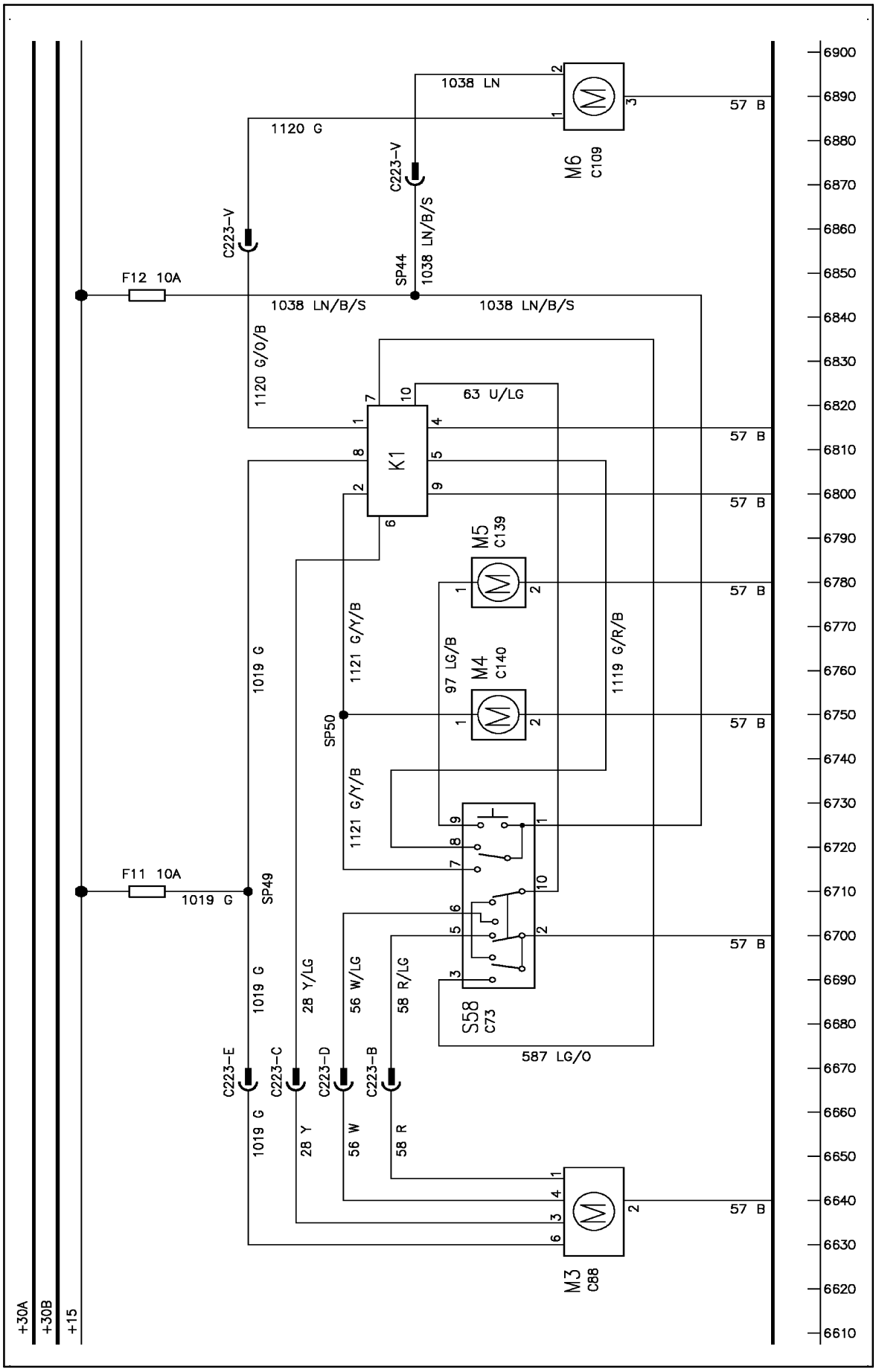
B33 Steering Angle Sensor

S56 Brake Fluid Level Switch

S57 Power Assisted Steering Pressure Switch

X9 Radar Extension Harness Connector

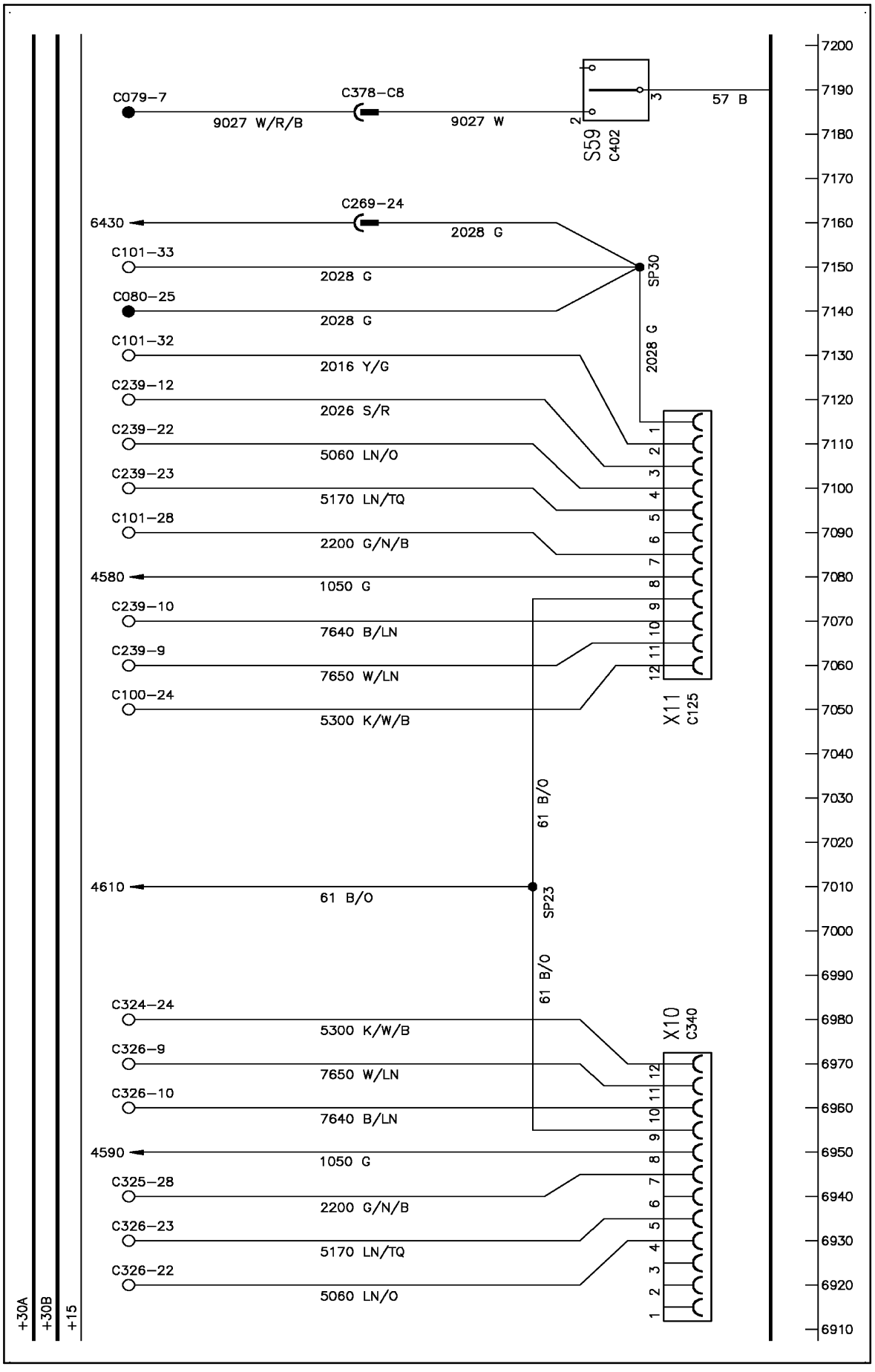
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F12 10A
F11 10A
1038 LN
1120 G
1038 LN/B/S
1120 G/O/B
1019 G
1121 G/Y/B
97 LG/B
1119 G/R/B
63 U/LG
28 Y/LG
56 W/LG
58 R/LG
587 LG/O
57 B
SP44
SP50
SP49
C223-V
C223-E
C223-C
C223-D
C223-B
K1
M6 C109
M5 C139
M4 C140
S58 C73
M3 C88
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

WASHERS AND WIPERS
Line 6510-6900

F11	Fuse - 10A	**M4**	Washer Motor - Rear
F12	Fuse - 10A	**M5**	Washer Motor - Front
K1	Front Windshield Wiper Module	**M6**	Wiper Motor - Rear
M3	Wiper Motor - Front	**S58**	Front and Rear Wiper/washer Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
S59
C402
57 B
C269-24
6430
2028 G
C101-33
2028 G
C080-25
2028 G
SP30
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
61 B/O
4610
61 B/O
SP23
61 B/O
C324-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

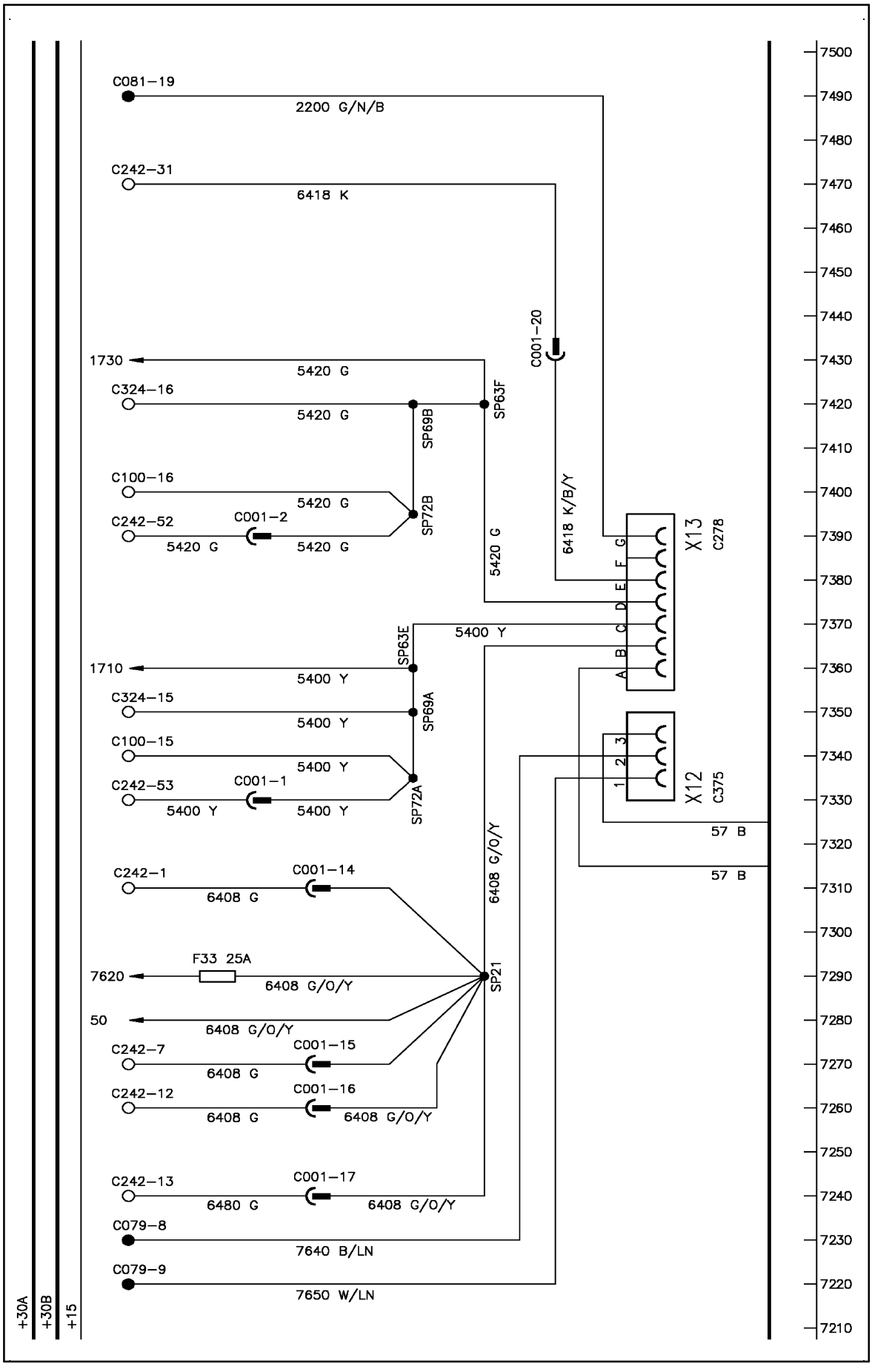
DIAGNOSTIC PLUGS 1
Line 6910-7200

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)

X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-52
C001-2
5420 G
5420 G
SP72B
5420 G
6418 K/B/Y
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
C242-1
C001-14
6408 G
F33 25A
7620
6408 G/O/Y
SP21
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

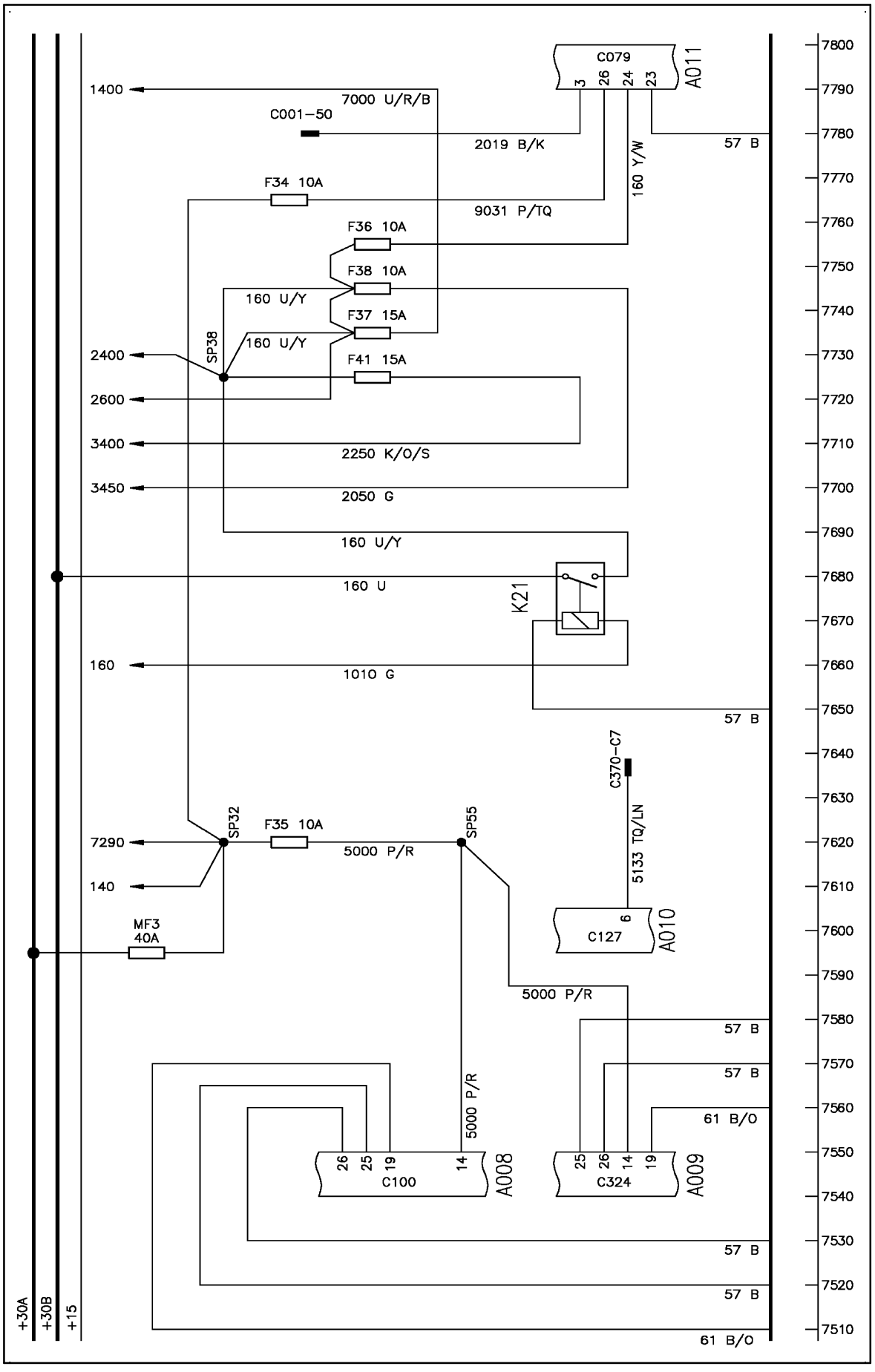
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector

X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079
A011
3
26
24
23
1400
7000 U/R/B
C001-50
2019 B/K
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3400
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C370-C7
SP32
F35 10A
SP55
7290
5000 P/R
5133 TQ/LN
140
MF3
40A
C127
A010
6
5000 P/R
57 B
57 B
61 B/O
5000 P/R
C100
A008
C324
A009
26
25
19
14
25
26
14
19
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
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7640
7630
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7610
7600
7590
7580
7570
7560
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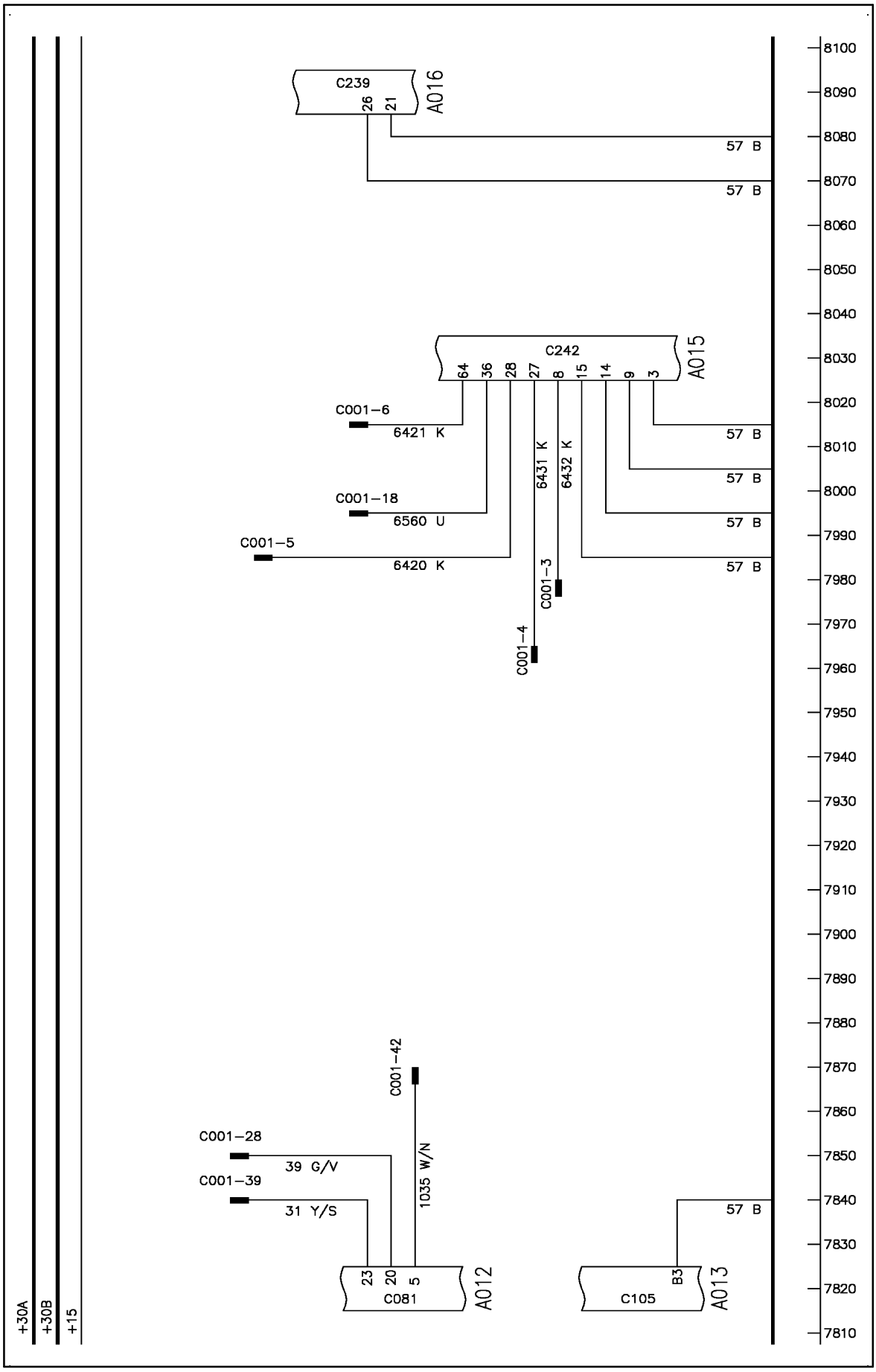
7540
7530
7520
7510

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C239
26
21
A016
57 B
57 B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
C001-3
C001-4
57 B
57 B
57 B
57 B
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012
B3
C105
A013
57 B
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

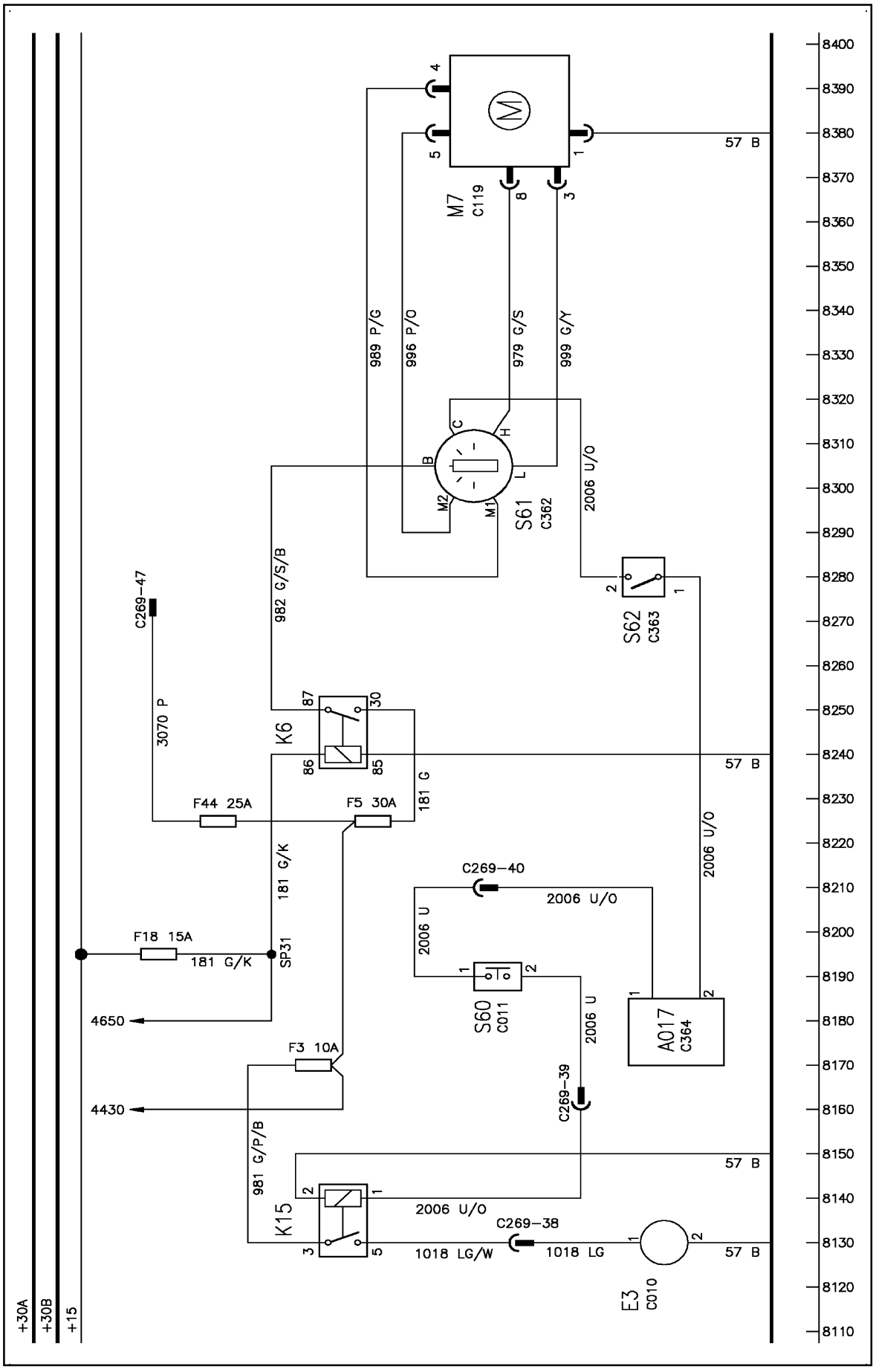
A012 Instrument Cluster 3

A013 Worklamp ECU

A015 Engine ECU

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
M7
C119
57 B
989 P/G
996 P/O
979 G/S
999 G/Y
S61
C362
2006 U/O
S62
C363
C269-47
982 G/S/B
3070 P
K6
87
30
86
85
181 G
F44 25A
F5 30A
181 G/K
F18 15A
SP31
4650
C269-40
2006 U
S60
C011
A017
C364
F3 10A
4430
C269-39
981 G/P/B
K15
2006 U/O
C269-38
1018 LG/W
1018 LG
E3
C010

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

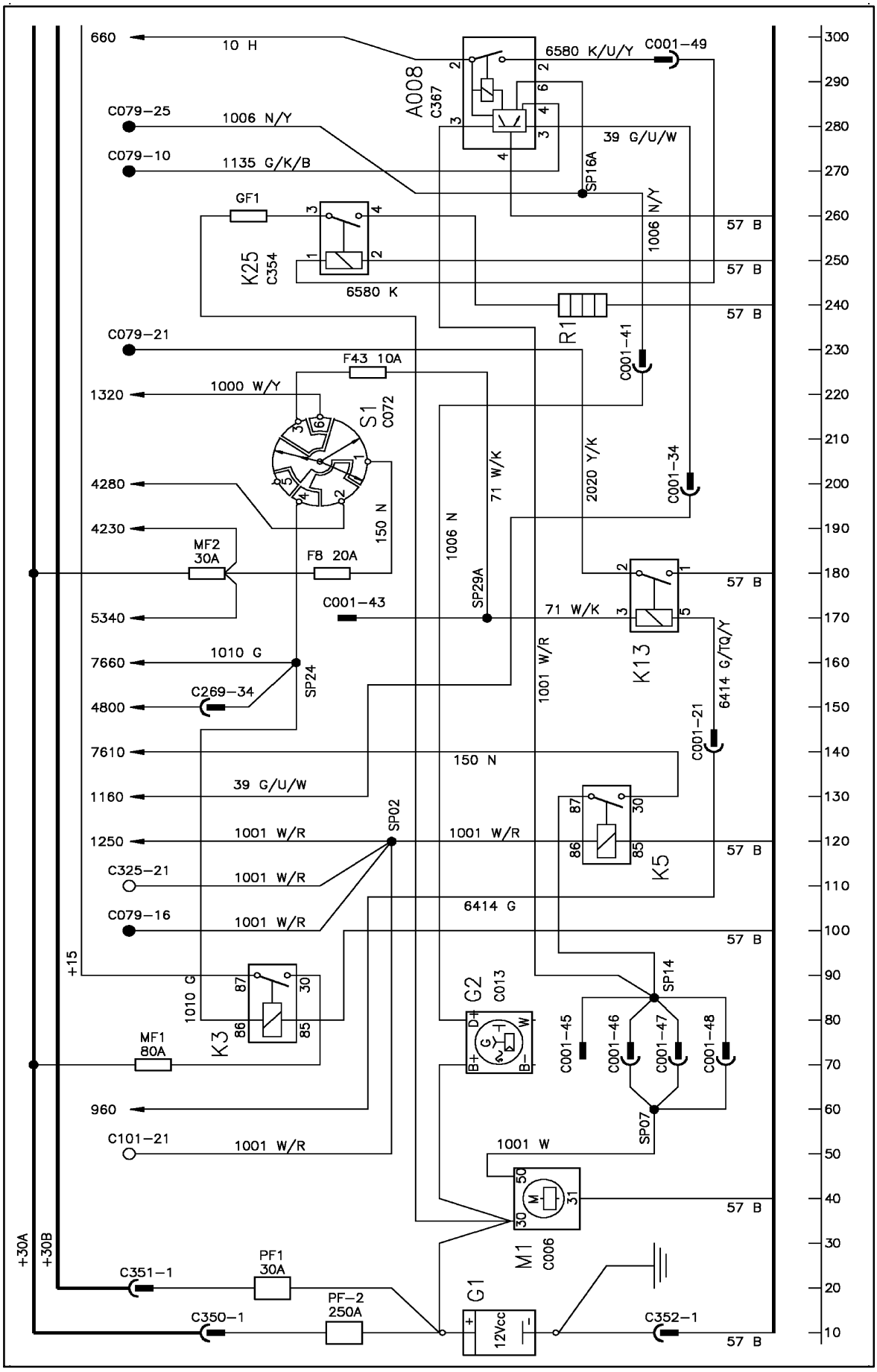
F3	Fuse - 10A	**K6**	Blower Motor Relay
F5	Fuse - 30A	**K15**	A/C Clutch Relay
F18	Fuse - 15A		
F44	Fuse - 25A	**M7**	Blower Unit
A017	HVAC Unit	**S60**	A/C Pressure Switch
		S61	Heater/Blower Switch
E3	A/C Clutch	**S62**	A/C Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

16X16 TRANSMISSION, W/CAB, W/MECHANICAL ENGINE

Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400

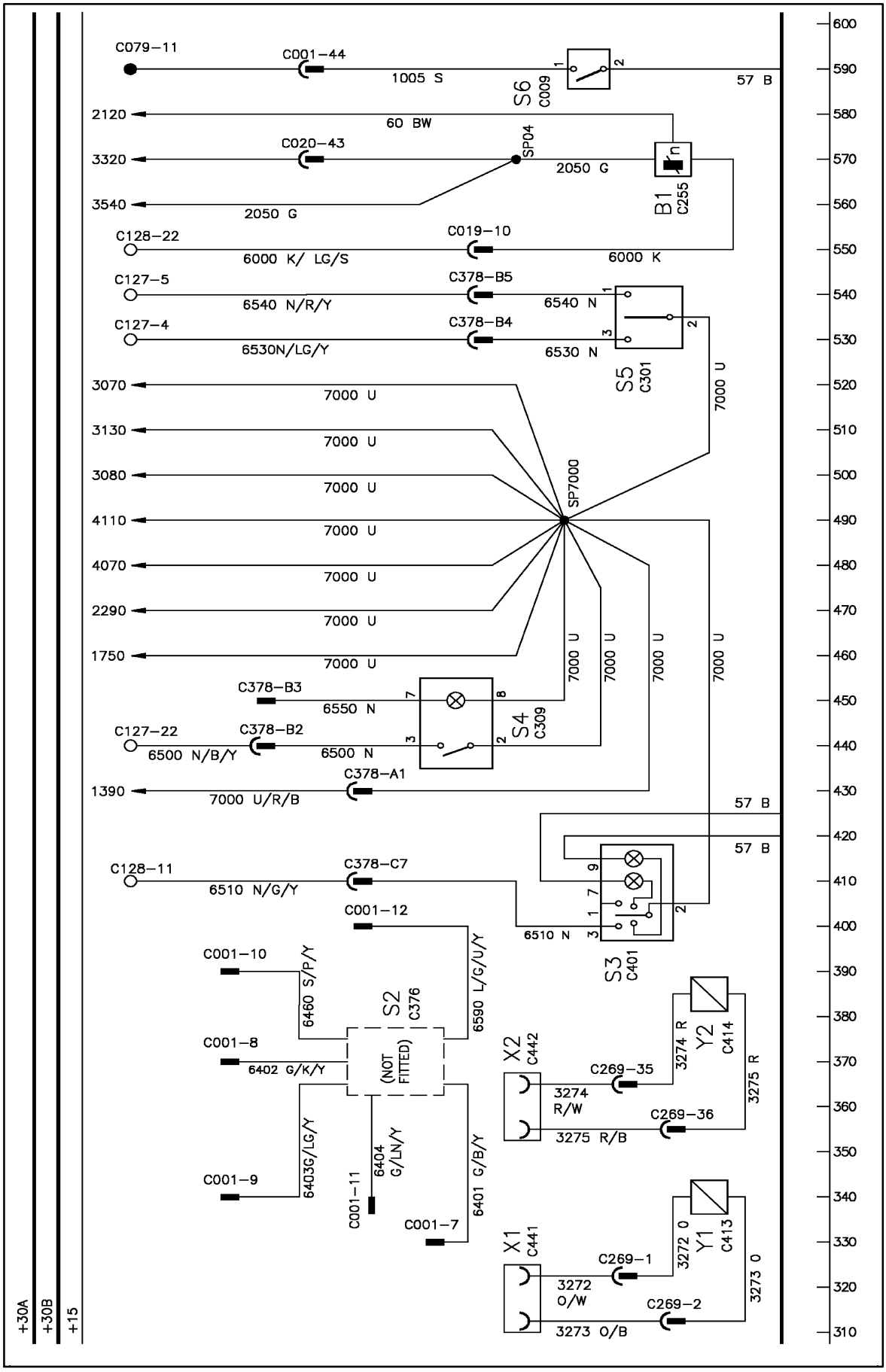

660
10 H
A008
C367
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C079-10
1135 G/K/B
39 G/U/W
SP16A
GF1
K25
C354
6580 K
1006 N/Y
57 B
R1
C001-41
C079-21
F43 10A
1320
1000 W/Y
S1
C072
4280
4230
MF2
30A
F8 20A
150 N
1006 N
71 W/K
2020 Y/K
C001-34
SP29A
C001-43
5340
7660
1010 G
SP24
C269-34
4800
K13
6414 G/TQ/Y
1001 W/R
C001-21
7610
150 N
1160
39 G/U/W
1250
SP02
C325-21
C079-16
K5
6414 G
+15
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
960
SP07
C101-21
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

16x16 Transmission, W/Cab, W/Mechanical Engine

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF1	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A008	Grid Heater Module

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
3320
C020-43
SP04
2050 G
3540
2050 G
B1 C255
C128-22
6000 K/ LG/S
C019-10
6000 K
C127-5
6540 N/R/Y
C378-B5
6540 N
C127-4
6530N/LG/Y
C378-B4
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
6500 N/B/Y
C378-B2
6500 N
S4 C309
1390
C378-A1
7000 U/R/B
57 B
C128-11
6510 N/G/Y
C378-C7
6510 N
S3 C401
C001-12
C001-10
6460 S/P/Y
6590 L/G/U/Y
S2 C376
C001-8
6402 G/K/Y
(NOT FITTED)
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
C001-9
6403G/LG/Y
6404 G/LN/Y
C001-11
C001-7
6401 G/B/Y
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

16x16 Transmission, W/Cab, W/Mechanical Engine

ENGINE 1
line 310-600

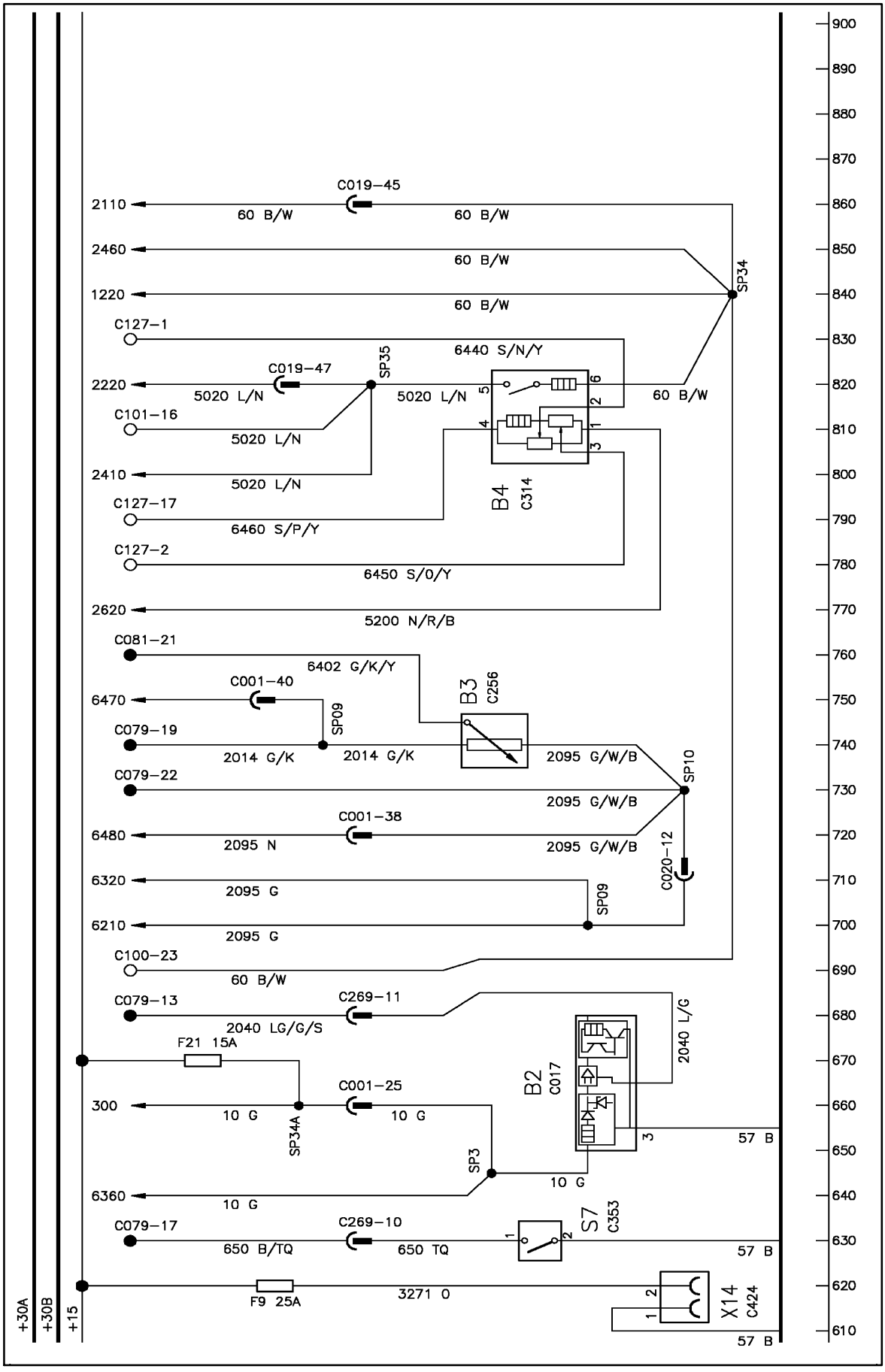
B1 Engine Flywheel Speed Sensor

S2 Foot Throttle - Electronic Engine (not fitted)
S3 Constant Engine Speed programme Switch
S4 Constant ERPM On/Off Switch
S5 Engine Inc./Dec. Switch
S6 Air Cleaner Switch

Y1 Loader Valve 1
Y2 Loader Valve 2

X1 Joystick Loader Control Socket 1
X2 Joystick Loader Control Socket 2

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
2110
2460
1220
C127-1
2220
C101-16
2410
C127-17
C127-2
2620
C081-21
6470
C079-19
C079-22
6480
6320
6210
C100-23
C079-13
300
6360
C079-17
C019-45
C019-47
C001-40
C001-38
C001-25
C269-11
C269-10
SP35
SP34
SP09
SP10
SP34A
SP3
C020-12
60 B/W
5020 L/N
6440 S/N/Y
6460 S/P/Y
6450 S/O/Y
5200 N/R/B
6402 G/K/Y
2014 G/K
2095 G/W/B
2095 N
2095 G
2040 LG/G/S
2040 L/G
10 G
650 B/TQ
650 TQ
57 B
3271 0
F21 15A
F9 25A
B4 C314
B3 C256
B2 C017
S7 C353
X14 C424
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

16x16 Transmission, W/Cab, W/Mechanical Engine

ENGINE 2
line 610-900

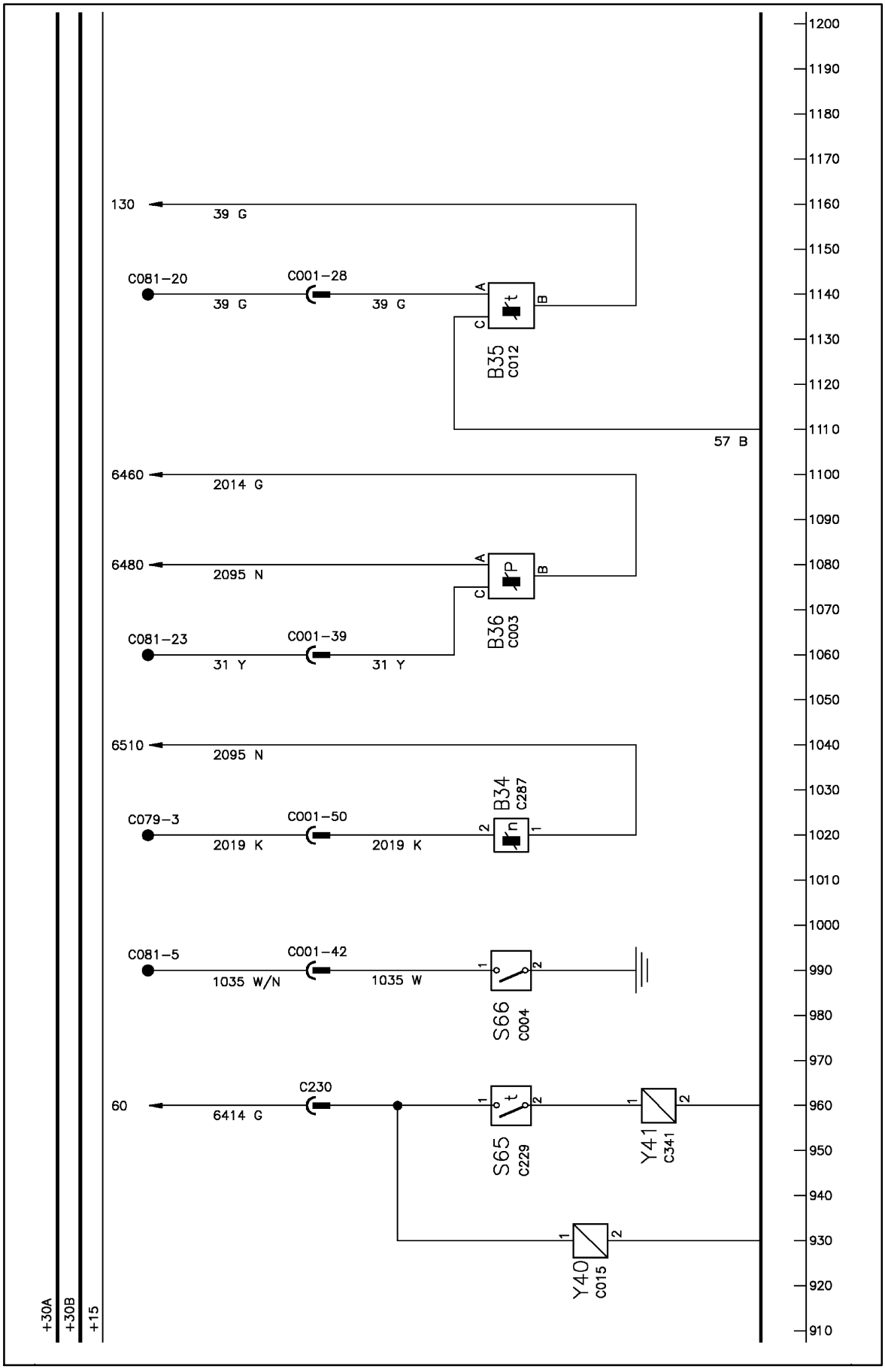
F9 Fuse - 25A
F21 Fuse - 15A

B2 Water In Fuel Sensor
B3 Foot Throttle - Mechanical Engine
B4 Hand Throttle

S7 De-Gas Bottle

X14 Loader Power Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

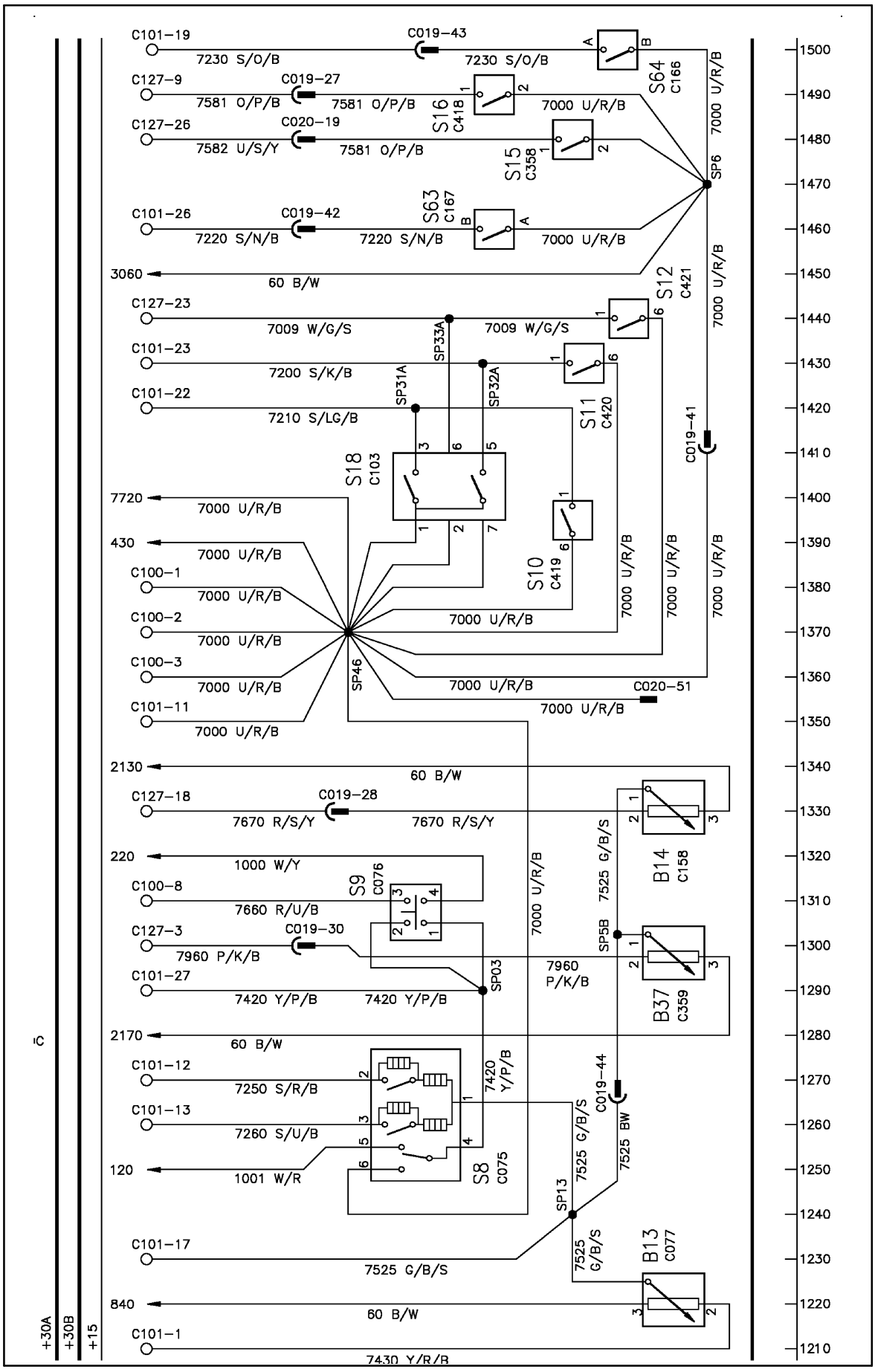

+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
130
39 G
C081-20
39 G
C001-28
39 G
B35
C012
57 B
6460
2014 G
6480
2095 N
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
B34
C287
C079-3
2019 K
C001-50
2019 K
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
C230
S65
C229
Y41
C341
Y40
C015

16x16 Transmission, W/Cab, W/Mechanical Engine

ENGINE 3
line 910-1200

B34	Engine Speed Sensor	**Y40**	Fuel Shut Off Solenoid
B35	Coolant Temperature Sensor	**Y41**	Cold Advance Solenoid
B36	Oil Pressure Sensor		
S65	Thermo Cold Advance Switch		
S66	Oil Pressure Switch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

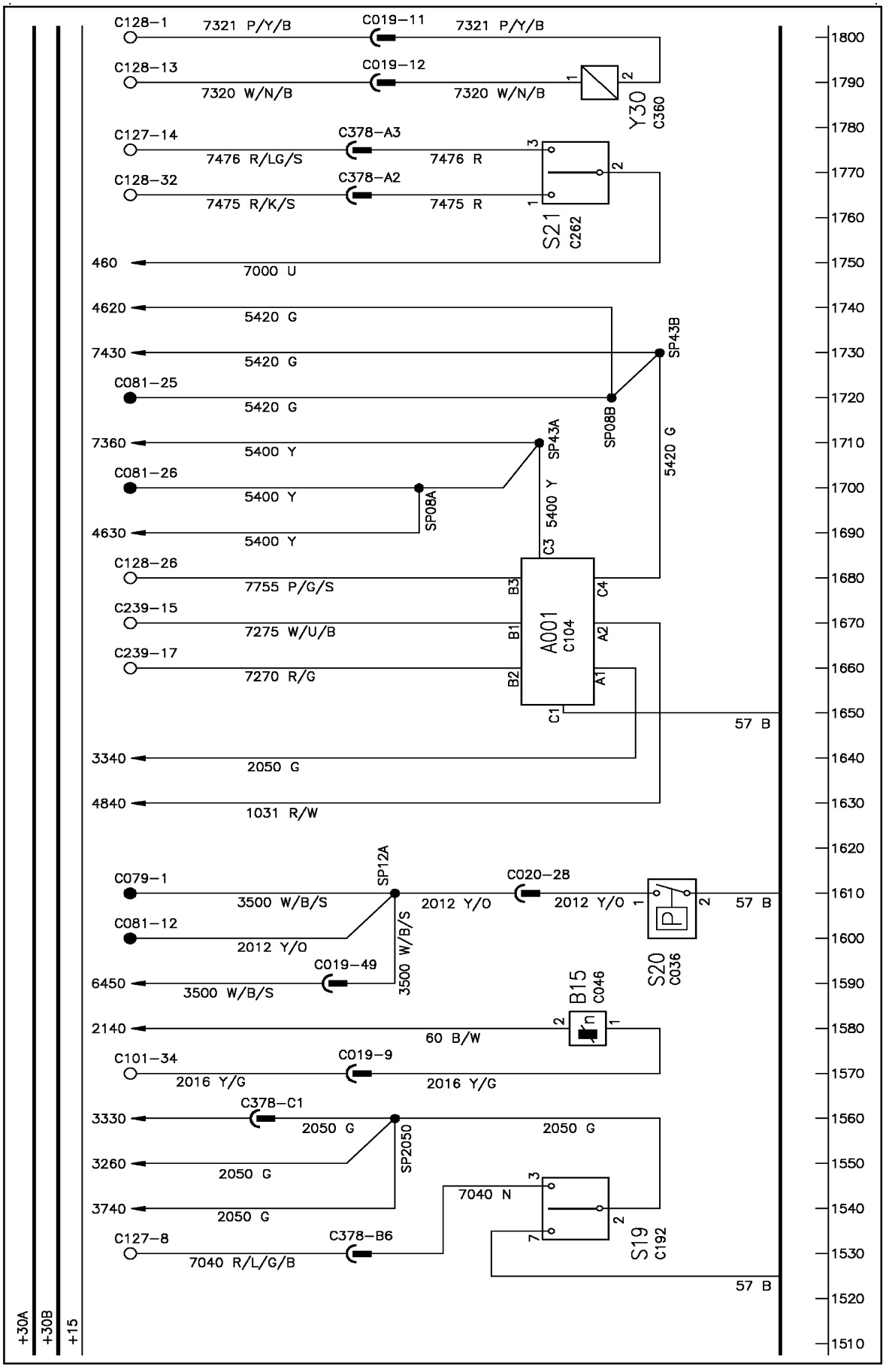

C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
C127-23
S12 C421
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
SP46
C020-51
C101-11
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
B37 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

16x16 Transmission, W/Cab, W/Mechanical Engine

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control - Range
B14	Synchro Position Potentiometer	**S15**	Creeper Sensing Switch
B37	1-4/5-8 Synchro Potentiometer	**S16**	Creeper Sense Forward Switch
		S18	Gearshift
S8	Shuttle Switch	**S63**	High Range Switch
S9	Clutch Switch	**S64**	Low Range Switch
S10	Duplicate Transmission Control - Downshift		
S11	Duplicate Transmission Control - Upshift		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
5420 G
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
A001
C104
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
7040 N
3740
2050 G
C127-8
C378-B6
7040 R/L/G/B
S19
C192
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

16x16 Transmission, W/Cab, W/Mechanical Engine

TRANSMISSION SYSTEM 2
Line 1510-1800

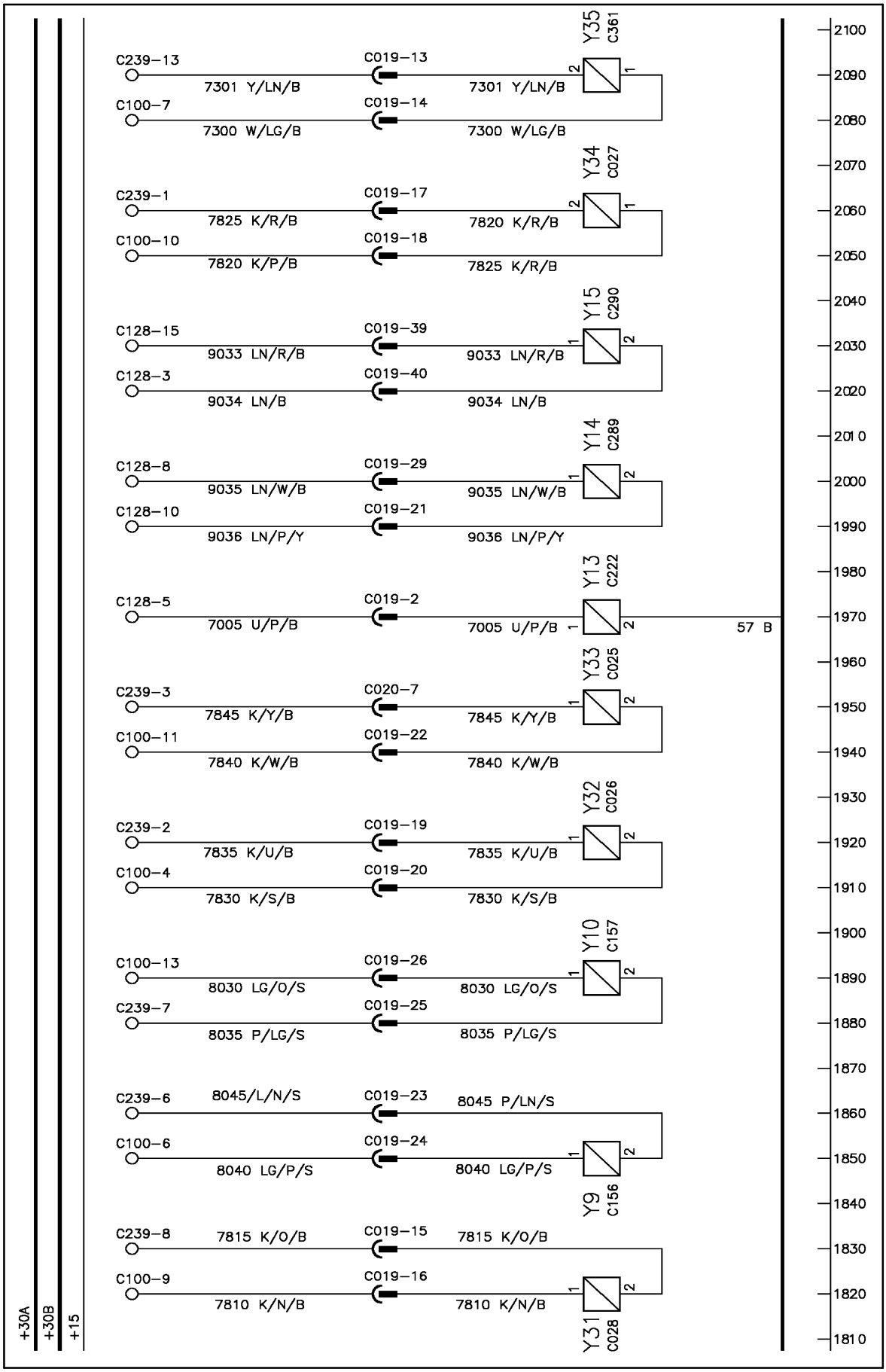
A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch
S20 Transmission Oil Pressure Switch
S21 Transmission Auto Function Switch

Y30 5-8 Synchro Solenoid

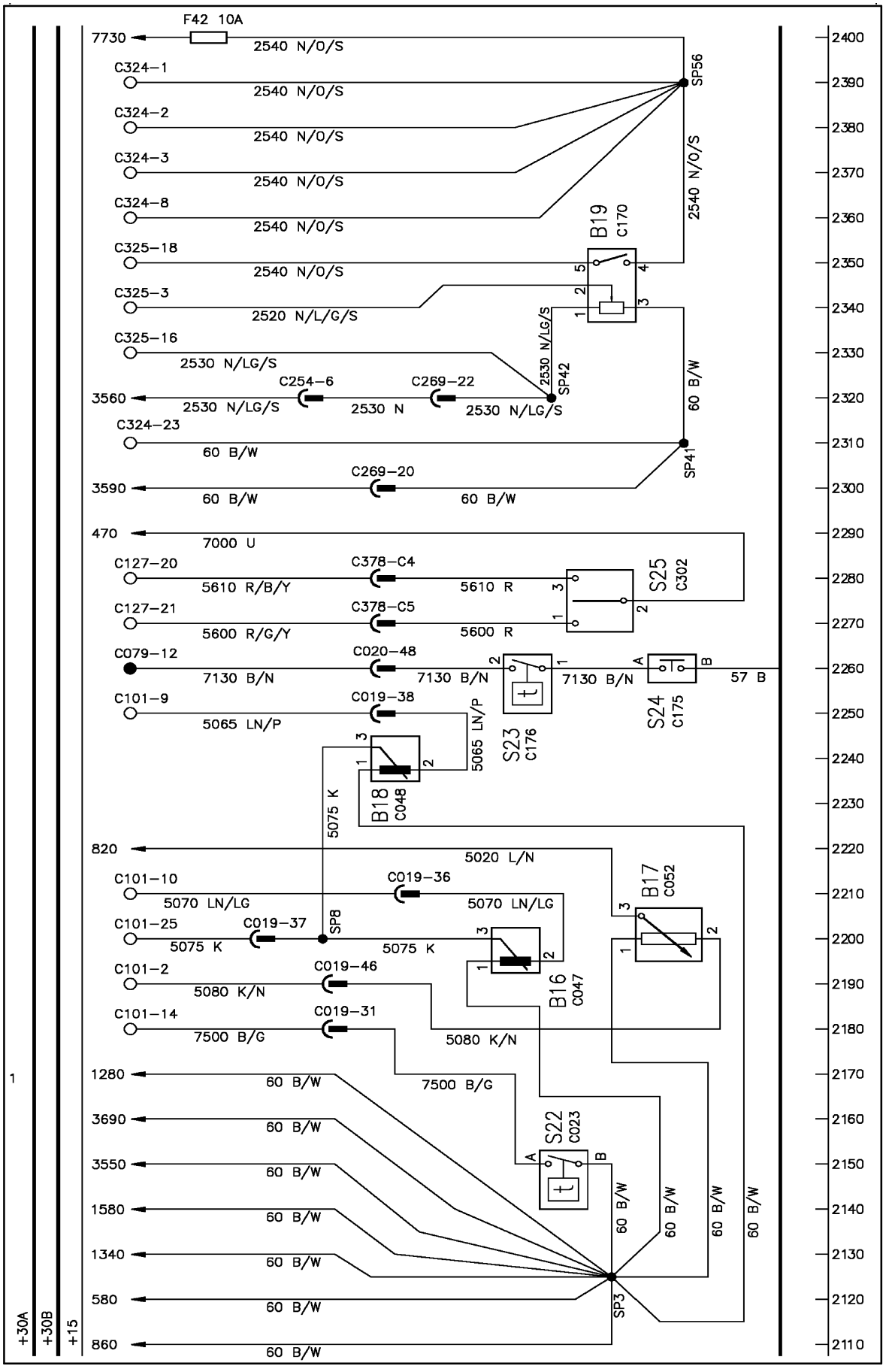
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
Y35 C361
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
Y34 C027
C239-1
7825 K/R/B
C019-17
7820 K/R/B
C100-10
7820 K/P/B
C019-18
7825 K/R/B
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
C128-3
9034 LN/B
C019-40
9034 LN/B
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U/P/B
57 B
Y33 C025
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
C100-11
7840 K/W/B
C019-22
7840 K/W/B
Y32 C026
C239-2
7835 K/U/B
C019-19
7835 K/U/B
C100-4
7830 K/S/B
C019-20
7830 K/S/B
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
8045/L/N/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y31 C1 Valve
Y32 C3 Valve
Y33 C4 Valve
Y34 C2 Valve
Y35 1-4 Synchro Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

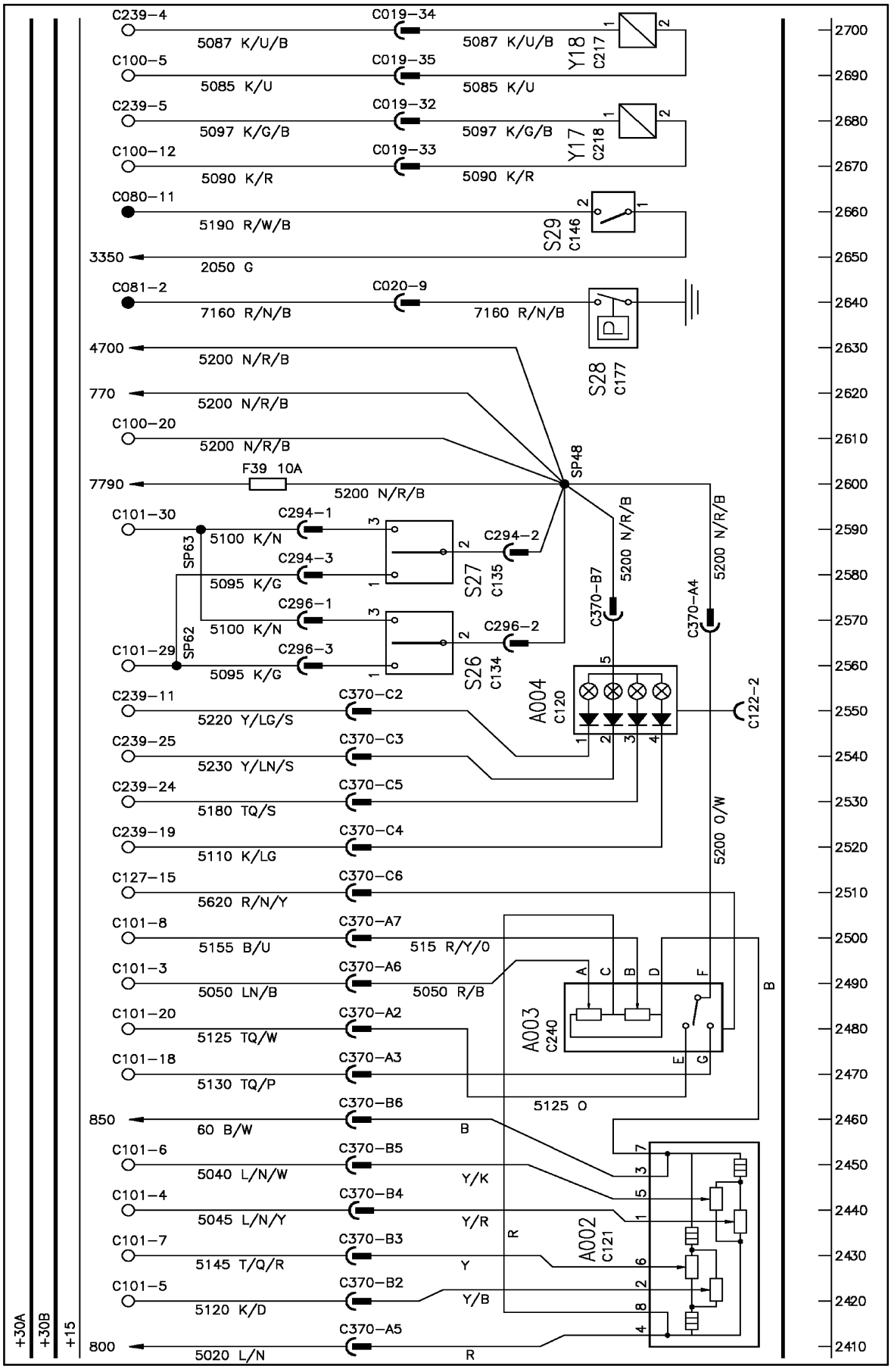

F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
C378-C4
5610 R/B/Y
5610 R
C127-21
C378-C5
5600 R/G/Y
5600 R
S25
C302
C079-12
C020-48
7130 B/N
57 B
C101-9
C019-38
5065 LN/P
S24
C175
S23
C176
B18
C048
5075 K
820
5020 L/N
C101-10
C019-36
5070 LN/LG
C101-25
C019-37
SP8
C101-2
C019-46
5080 K/N
C101-14
C019-31
7500 B/G
B17
C052
B16
C047
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

16x16 Transmission, W/Cab, W/Mechanical Engine

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A
B16	LH Draft Pin
B17	Rockshaft Potentiometer
B18	RH Draft Pin
B19	Front HPL Limit Potentiometer
S22	Transmission Oil Temp Sensor
S23	Oil Temperature Switch
S24	HPL Filter Switch
S25	HTS Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

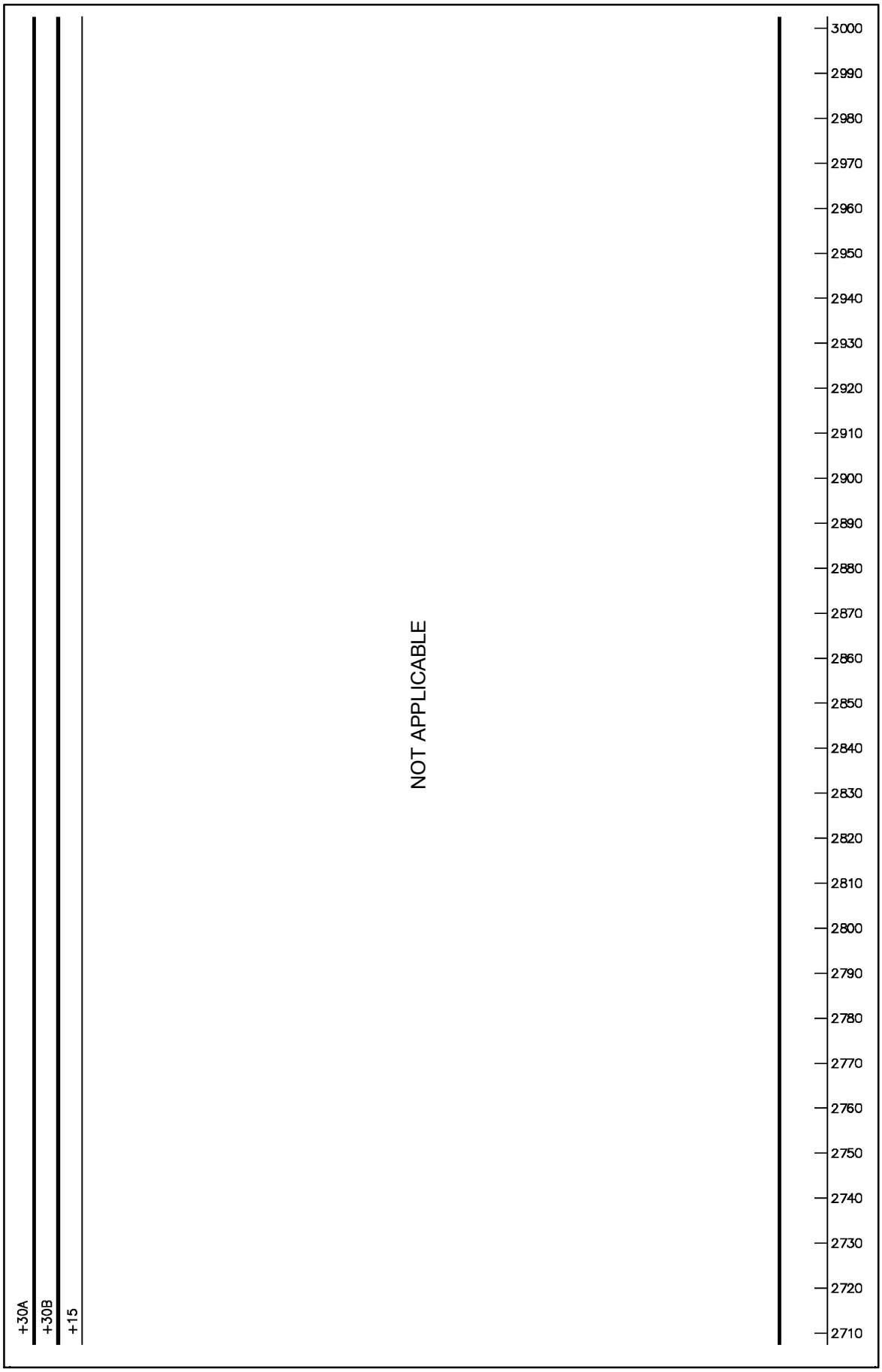

C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7790
5200 N/R/B
SP48
C101-30
C294-1
5100 K/N
C294-2
SP63
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
C127-15
C370-C6
5620 R/N/Y
5200 O/W
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
C370-A5
800
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

16x16 Transmission, W/Cab, W/Mechanical Engine

HYDRAULICS 2
Line 2410-2700

F39	Fuse - 10A	**S27**	HPL Switch R/H
		S28	Lo Charge Switch
A002	EDC Control	**S29**	Lift-O-Matic Switch
A003	EDC Mouse		
A004	EDC Status Lamp Panel	**Y17**	EDC Lower Solenoid
		Y18	EDC Raise Solenoid
S26	HPL Switch L/H		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

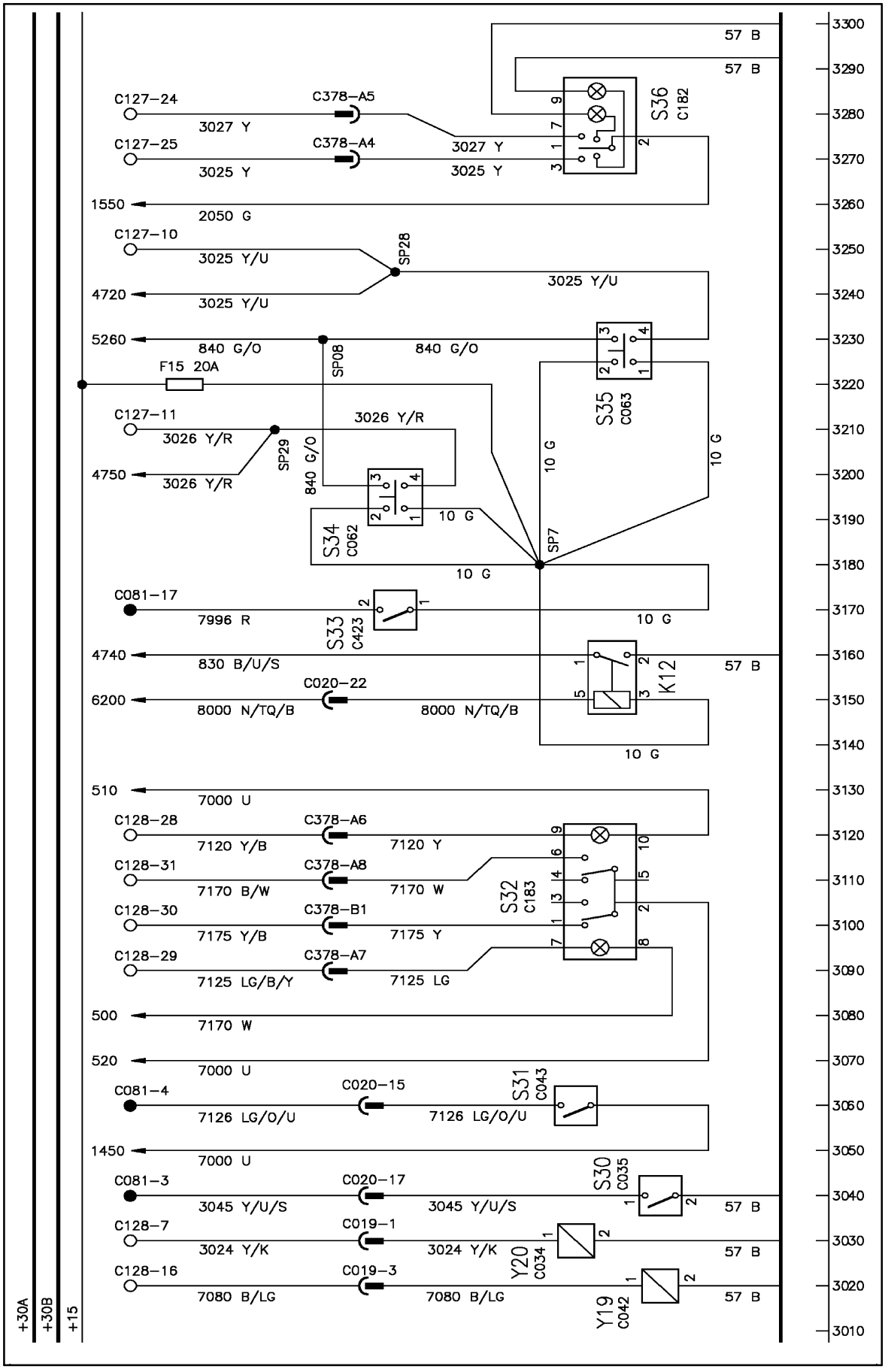

+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

16x16 Transmission, W/Cab, W/Mechanical Engine

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

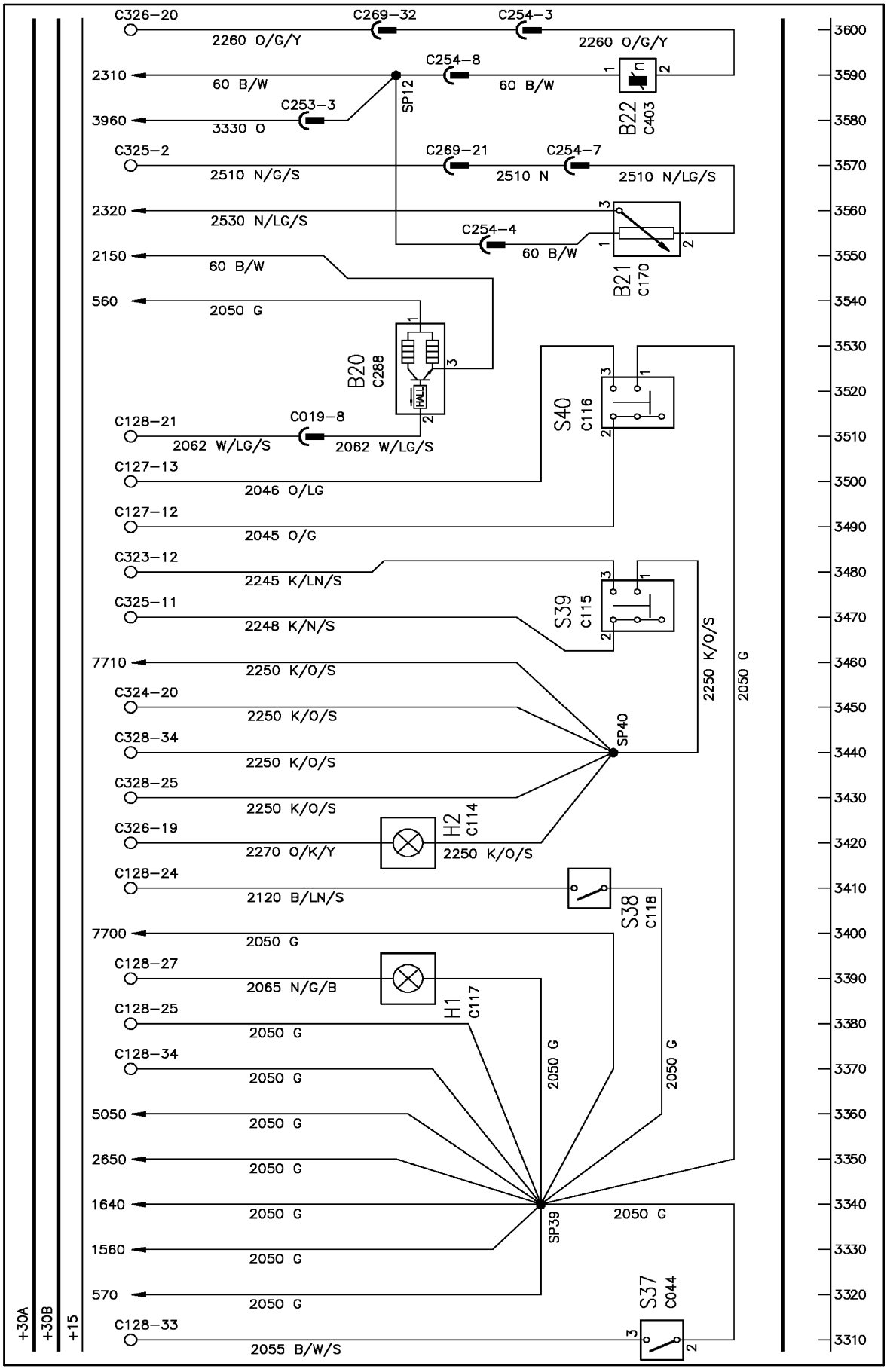

+30A
+30B
+15
F15 20A
SP28
SP08
SP29
SP7
S34 C062
S35 C063
S36 C182
S33 C423
K12
S32 C183
S31 C043
S30 C035
Y20 C034
Y19 C042
C127-24
C127-25
C127-10
C127-11
C128-28
C128-31
C128-30
C128-29
C128-7
C128-16
C081-17
C081-4
C081-3
C378-A5
C378-A4
C378-A6
C378-A8
C378-B1
C378-A7
C020-22
C020-15
C020-17
C019-1
C019-3
3027 Y
3025 Y
3025 Y/U
3026 Y/R
840 G/O
10 G
57 B
1550
2050 G
4720
4750
5260
6200
7996 R
4740
830 B/U/S
8000 N/TQ/B
510
7000 U
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
500
520
7126 LG/O/U
1450
3045 Y/U/S
3024 Y/K
7080 B/LG
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

16x16 Transmission, W/Cab, W/Mechanical Engine

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

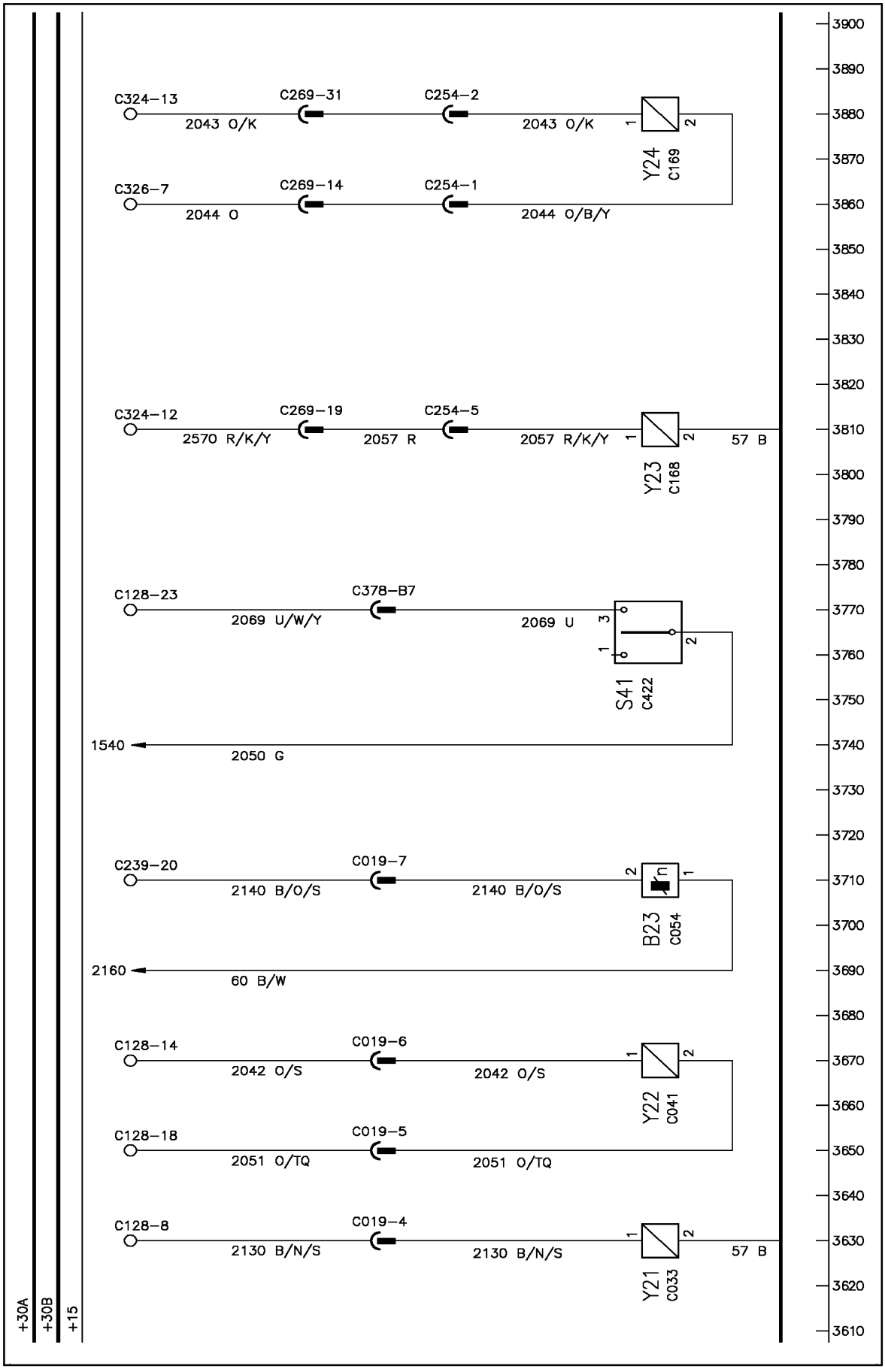

C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2050 G
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
H2
C114
C326-19
2270 O/K/Y
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 G
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

16x16 Transmission, W/Cab, W/Mechanical Engine

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor
B21	Front HPL Limit Potentiometer
B22	Front PTO Speed Sensor
H1	Rear PTO Lamp
H2	Front PTO Lamp
S37	Ground Speed PTO Switch
S38	Rear PTO Brake Switch
S39	Front PTO Switch
S40	Rear PTO Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

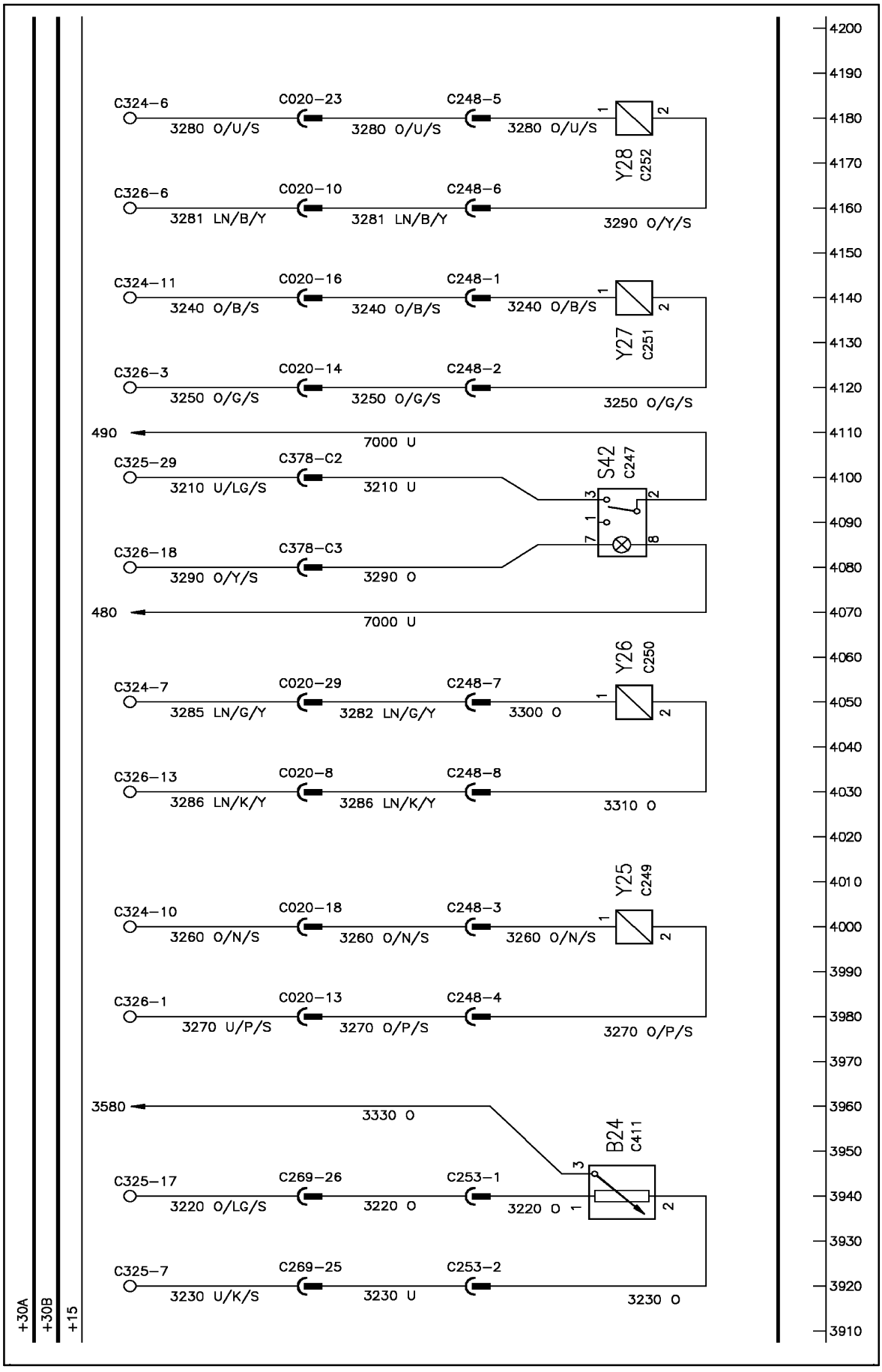

+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

16x16 Transmission, W/Cab, W/Mechanical Engine

POWER TAKE OFF 2
Line 3610-3900

B23	PTO Speed Sensor	**Y22**	PTO Clutch Solenoid
		Y23	Front Hitch Valve
S41	PTO Management Switch	**Y24**	Front PTO Solenoid
Y21	PTO Brake Solenoid		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28
C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27
C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42
C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN/G/Y
3300 O
Y26
C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25
C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24
C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

16x16 Transmission, W/Cab, W/Mechanical Engine

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

Y25 Front Suspension Lower Solenoid

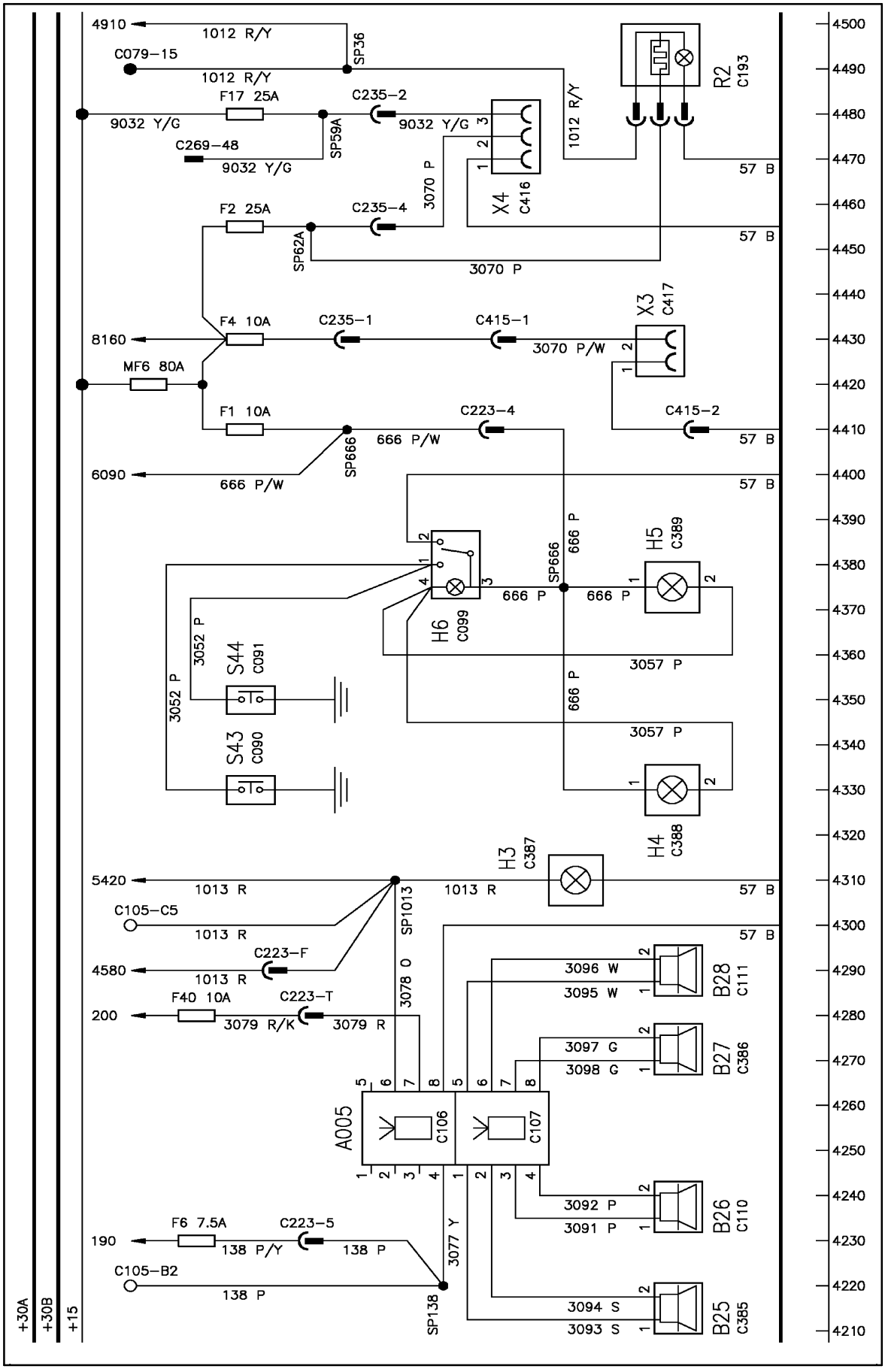
Y26 Front Suspension Lower Lockout Solenoid

Y27 Front Suspension Raise Solenoid

Y28 Front Suspension Raise Lockout Solenoid

S42 Front Suspension Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4910
1012 R/Y
SP36
C079-15
1012 R/Y
F17 25A
C235-2
9032 Y/G
9032 Y/G
SP59A
C269-48
9032 Y/G
3070 P
X4
C416
1012 R/Y
R2
C193
57 B
F2 25A
C235-4
SP62A
3070 P
57 B
F4 10A
C235-1
C415-1
8160
3070 P/W
X3
C417
MF6 80A
F1 10A
C223-4
C415-2
SP666
666 P/W
6090
666 P/W
57 B
57 B
H6
C099
SP666
666 P
666 P
H5
C389
3057 P
3052 P
S44
C091
3052 P
666 P
S43
C090
3057 P
H4
C388
H3
C387
5420
1013 R
1013 R
57 B
C105-C5
1013 R
SP1013
57 B
C223-F
4580
1013 R
3078 O
F40 10A
C223-T
200
3079 R/K
3079 R
3096 W
3095 W
B28
C111
3097 G
3098 G
B27
C386
A005
C106
C107
3092 P
3091 P
B26
C110
F6 7.5A
C223-5
190
138 P/Y
138 P
3077 Y
C105-B2
138 P
SP138
3094 S
3093 S
B25
C385
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

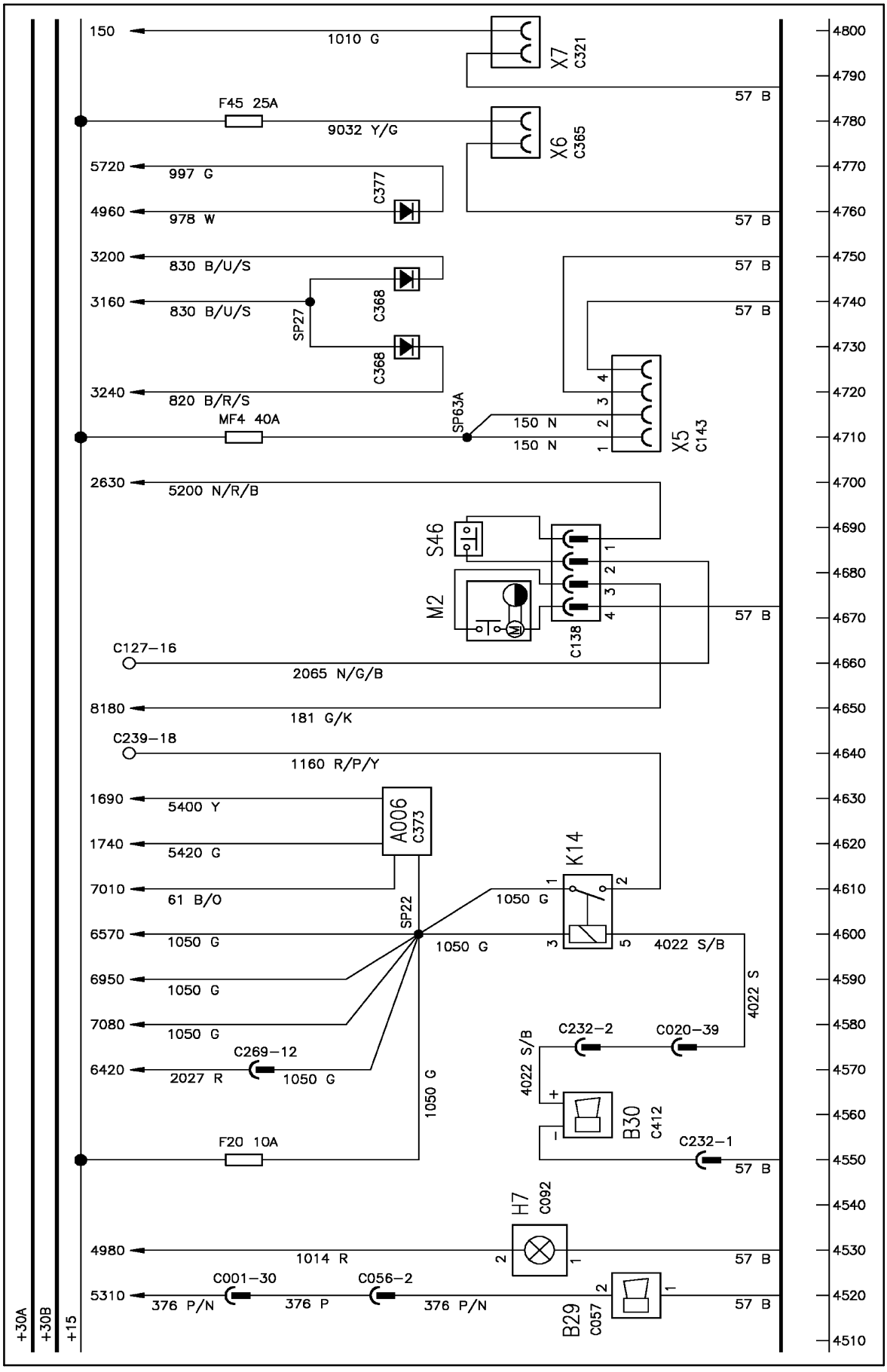
16x16 Transmission, W/Cab, W/Mechanical Engine

CAB ACCESSORIES 1
Line 4210-4500

MF6	Maxi Fuse - 80A
F1	Fuse - 10A
F2	Fuse - 25A
F4	Fuse - 10A
F6	Fuse - 7.5A
F17	Fuse - 25A
F40	Fuse - 10A
A005	Radio
B25	Speaker L/H Rear
B26	Speaker R/H Front
B27	Speaker R/H Rear
B28	Speaker L/H Front

H3	Console Lamp R/H
H4	Puddle Lamp L/H
H5	Puddle Lamp R/H
H6	Interior Lamp
S43	Door Switch L/H
S44	Door Switch R/H
X3	8 Amp Terminals
X4	20 Amp Multi Socket
R2	Cigar Lighter

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

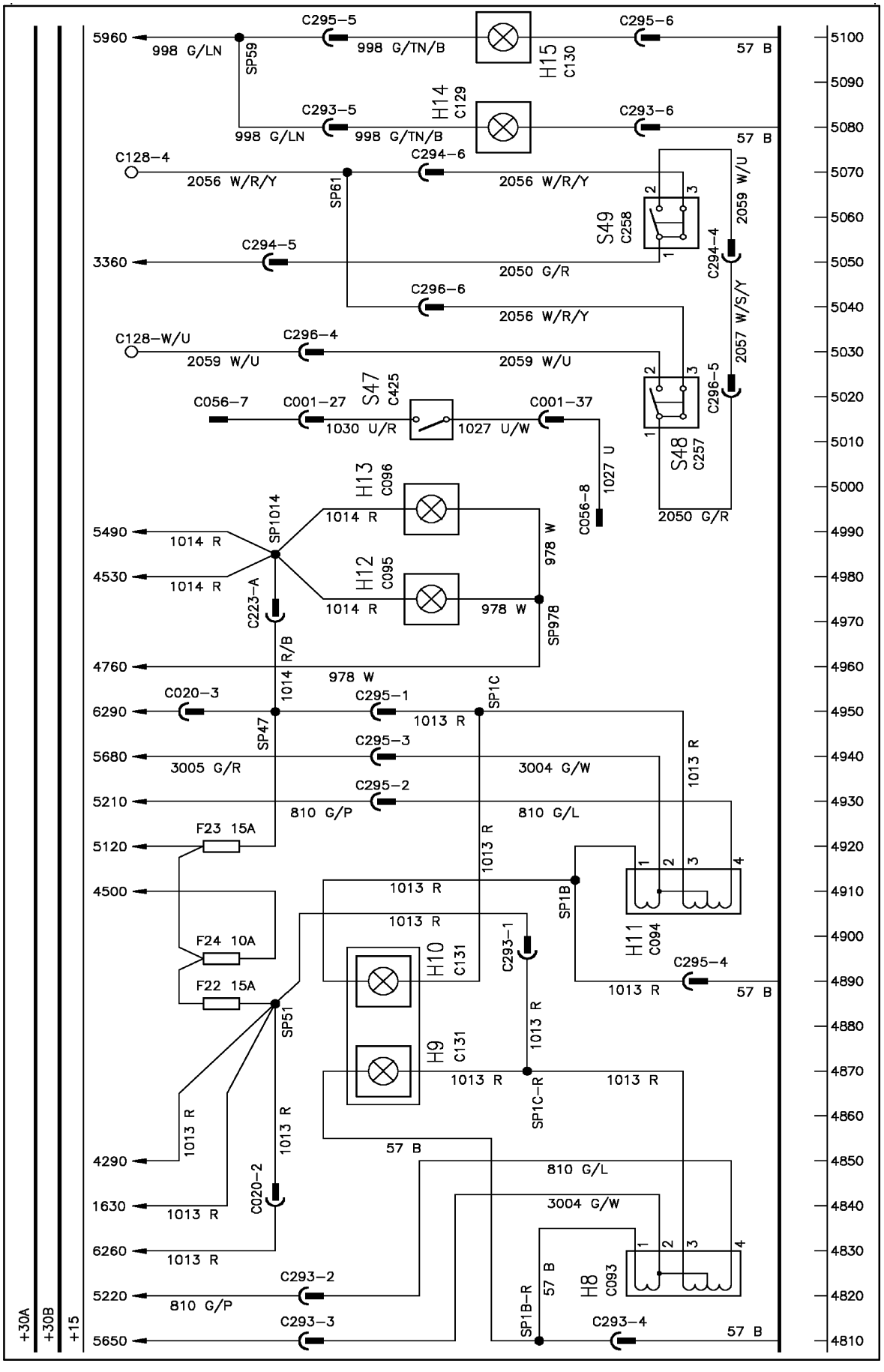

150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
C368
57 B
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
7010
61 B/O
SP22
K14
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
4022 S
7080
1050 G
C232-2
C020-39
C269-12
6420
2027 R
1050 G
4022 S/B
1050 G
B30
C412
C232-1
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

16x16 Transmission, W/Cab, W/Mechanical Engine

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X6	8 Amp Socket
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode
C377	Diode

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

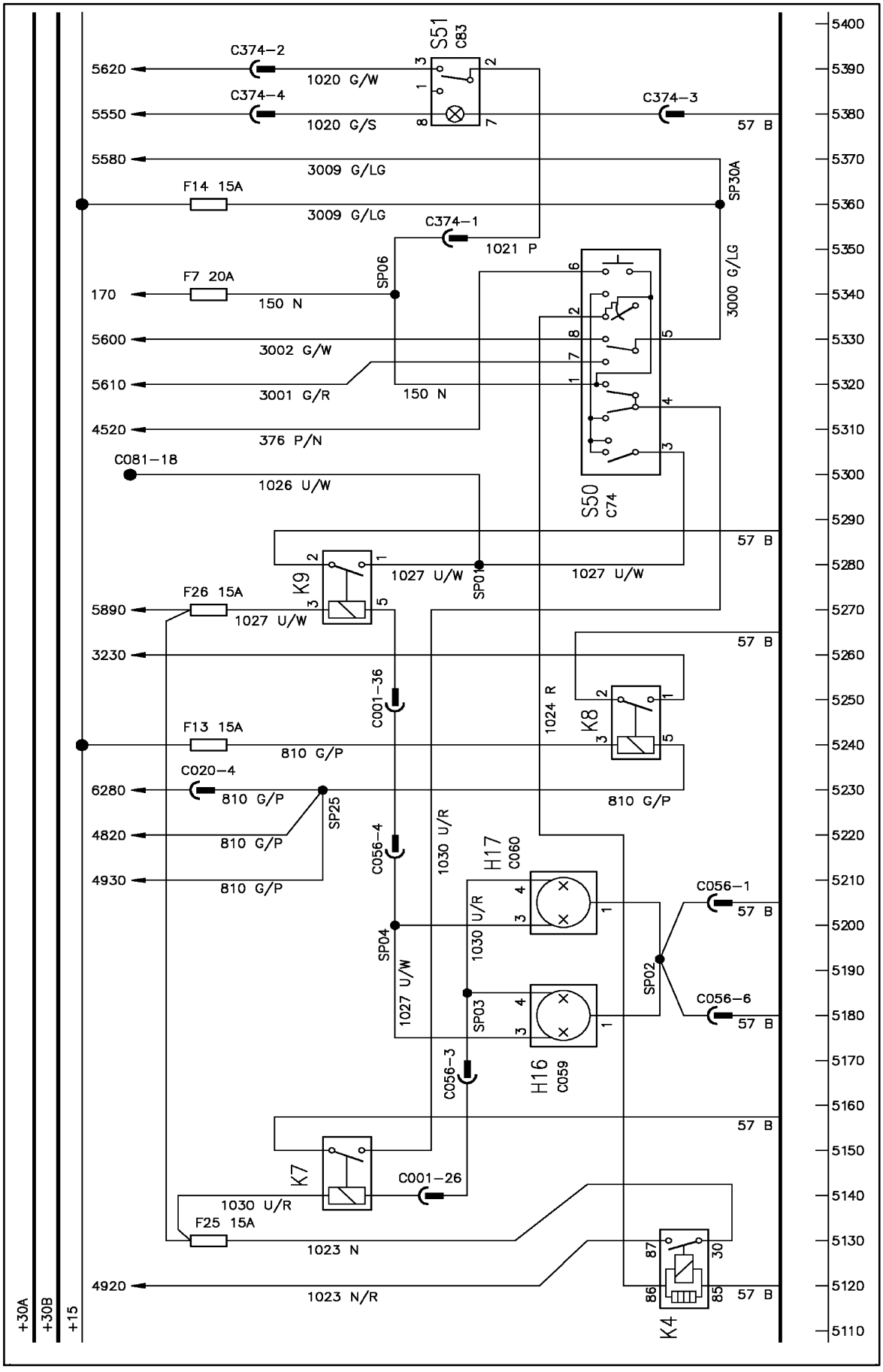

+30A
+30B
+15
5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
C294-4
C294-5
3360
2050 G/R
C296-6
2056 W/R/Y
C128-W/U
2059 W/U
C296-4
2059 W/U
2057 W/S/Y
C296-5
C056-7
C001-27
S47 C425
1030 U/R
1027 U/W
C001-37
1027 U
S48 C257
C056-8
2050 G/R
H13 C096
1014 R
SP1014
5490
1014 R
4530
1014 R
H12 C095
1014 R
978 W
978 W
SP978
C223-A
1014 R/B
4760
978 W
C020-3
6290
SP47
C295-1
1013 R
SP1C
5680
3005 G/R
C295-3
3004 G/W
1013 R
5210
810 G/P
C295-2
810 G/L
F23 15A
5120
4500
1013 R
1013 R
SP1B
H11 C094
C295-4
1013 R
57 B
F24 10A
F22 15A
SP51
H10 C131
C293-1
H9 C131
1013 R
1013 R
1013 R
SP1C-R
1013 R
1013 R
1013 R
4290
1013 R
C020-2
1630
1013 R
57 B
810 G/L
3004 G/W
6260
1013 R
C293-2
5220
810 G/P
SP1B-R
57 B
H8 C093
C293-3
5650
C293-4
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810

16x16 Transmission, W/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A
H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender
H10	Licence Plate Lamp - Fender
H11	Stop/Tail Light L/H
H12	Licence Plate Lamp L/H
H13	Licence Plate Lamp R/H
H14	Worklamp - Fender R/H
H15	Worklamp - Fender L/H
S47	Aux Headlamp Switch
S48	PTO Fender Switch L/H
S49	PTO Fender Switch R/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

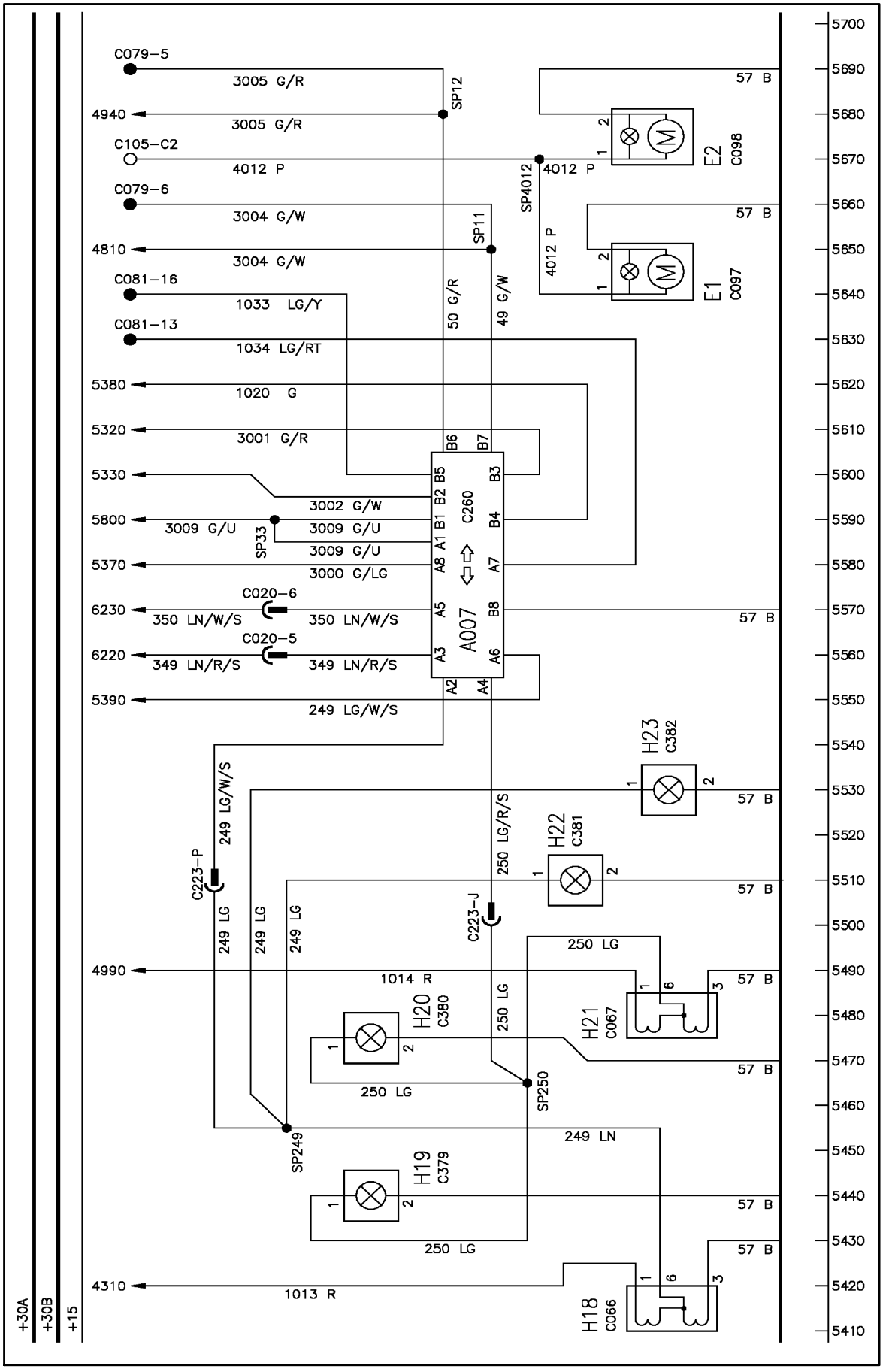

+30A
+30B
+15
5620
5550
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
C374-2
C374-4
1020 G/W
1020 G/S
S51
C83
C374-3
57 B
3009 G/LG
F14 15A
SP30A
C374-1
1021 P
SP06
F7 20A
150 N
3002 G/W
3001 G/R
376 P/N
3000 G/LG
C081-18
1026 U/W
S50
C74
K9
1027 U/W
SP01
F26 15A
C001-36
F13 15A
810 G/P
C020-4
SP25
1024 R
K8
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
H16
C059
C056-3
C056-1
C056-6
SP02
K7
C001-26
F25 15A
1023 N
1023 N/R
87
30
86
85
K4
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

16x16 Transmission, W/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

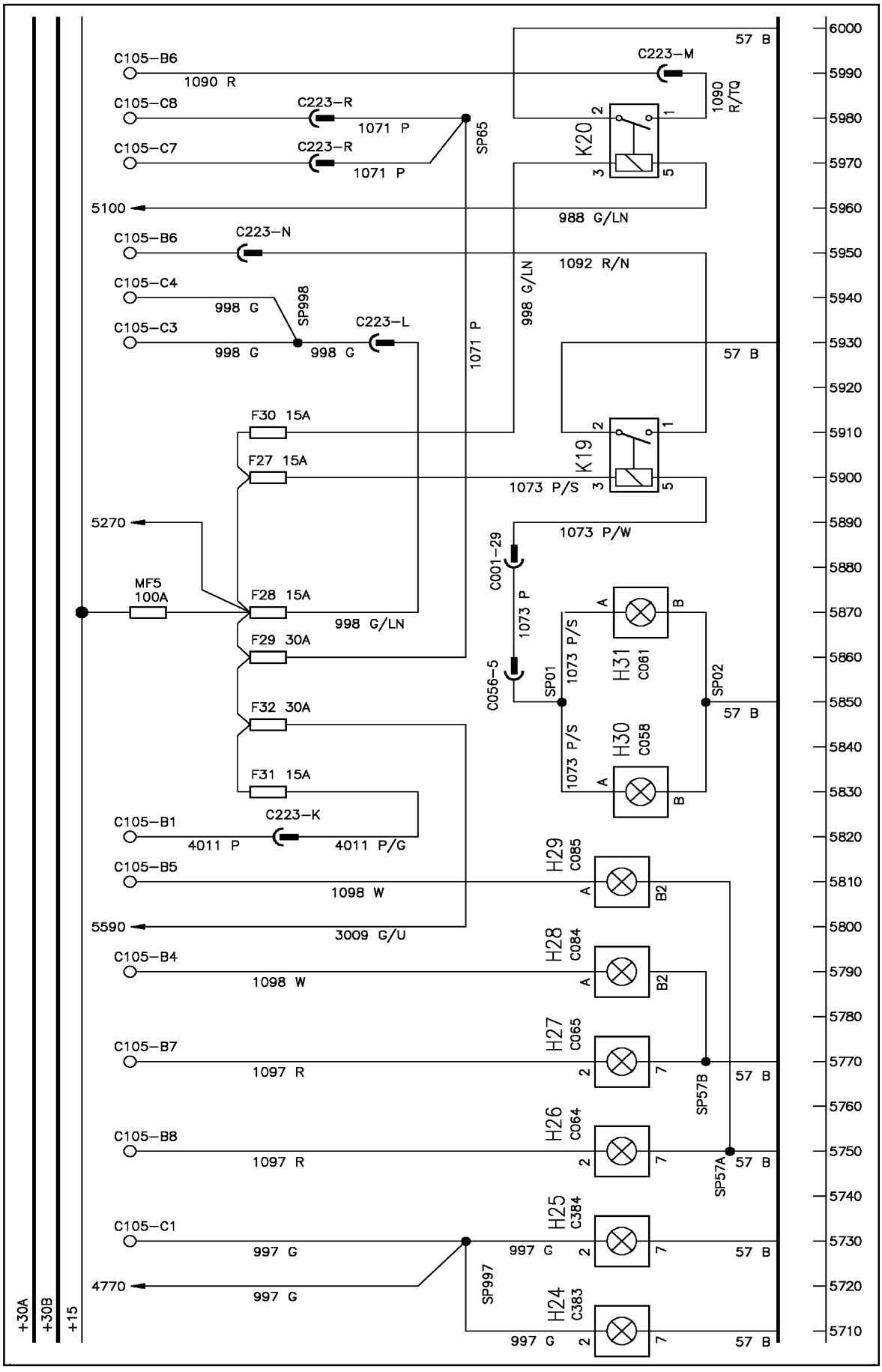

C079-5
3005 G/R
SP12
4940
3005 G/R
C105-C2
4012 P
C079-6
3004 G/W
SP11
4810
3004 G/W
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
350 LN/W/S
C020-5
6220
349 LN/R/S
349 LN/R/S
5390
249 LG/W/S
C223-P
249 LG
249 LG
249 LG
4990
1014 R
SP249
C223-J
250 LG/R/S
250 LG
250 LG
250 LG
SP250
249 LN
4310
1013 R
50 G/R
49 G/W
SP4012
4012 P
4012 P
57 B
57 B
57 B
57 B
57 B
57 B
57 B
57 B
57 B
A007
C260
B6 B7 B5 B3 B2 B4 B1 A1 A8 A7 A5 B8 A3 A6 A2 A4
E2
C098
E1
C097
H23
C382
H22
C381
H20
C380
H21
C067
H19
C379
H18
C066
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

16x16 Transmission, W/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 3
Line 5410-5700

A007	Flasher Unit
E1	Rotating Beacon L/H
E2	Rotating Beacon L/H
H18	Grabrail Side Lamp R/H
H19	SMV Lamp L/H Front
H20	SMV Lamp L/H Rear
H21	Grabrail Side Lamp L/H
H22	SMV Lamp R/H Front
H23	SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C105-B6
1090 R
C105-C8
C223-R
1071 P
C105-C7
C223-R
1071 P
SP65
5100
C105-B6
C223-N
C105-C4
998 G
C105-C3
998 G
SP998
998 G
C223-L
998 G
1071 P
998 G/LN
C223-M
1090 R/TQ
K20
988 G/LN
1092 R/N
57 B
F30 15A
F27 15A
K19
1073 P/S
1073 P/W
5270
MF5
100A
F28 15A
998 G/LN
F29 30A
F32 30A
F31 15A
C105-B1
C223-K
4011 P
4011 P/G
C105-B5
1098 W
5590
3009 G/U
C105-B4
1098 W
C105-B7
1097 R
C105-B8
1097 R
C105-C1
997 G
4770
997 G
SP997
997 G
C001-29
1073 P
C056-5
SP01
1073 P/S
H31
C061
H30
C058
SP02
H29
C085
H28
C084
H27
C065
H26
C064
H25
C384
H24
C383
SP57B
SP57A
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

16x16 Transmission, W/Cab, W/Mechanical Engine

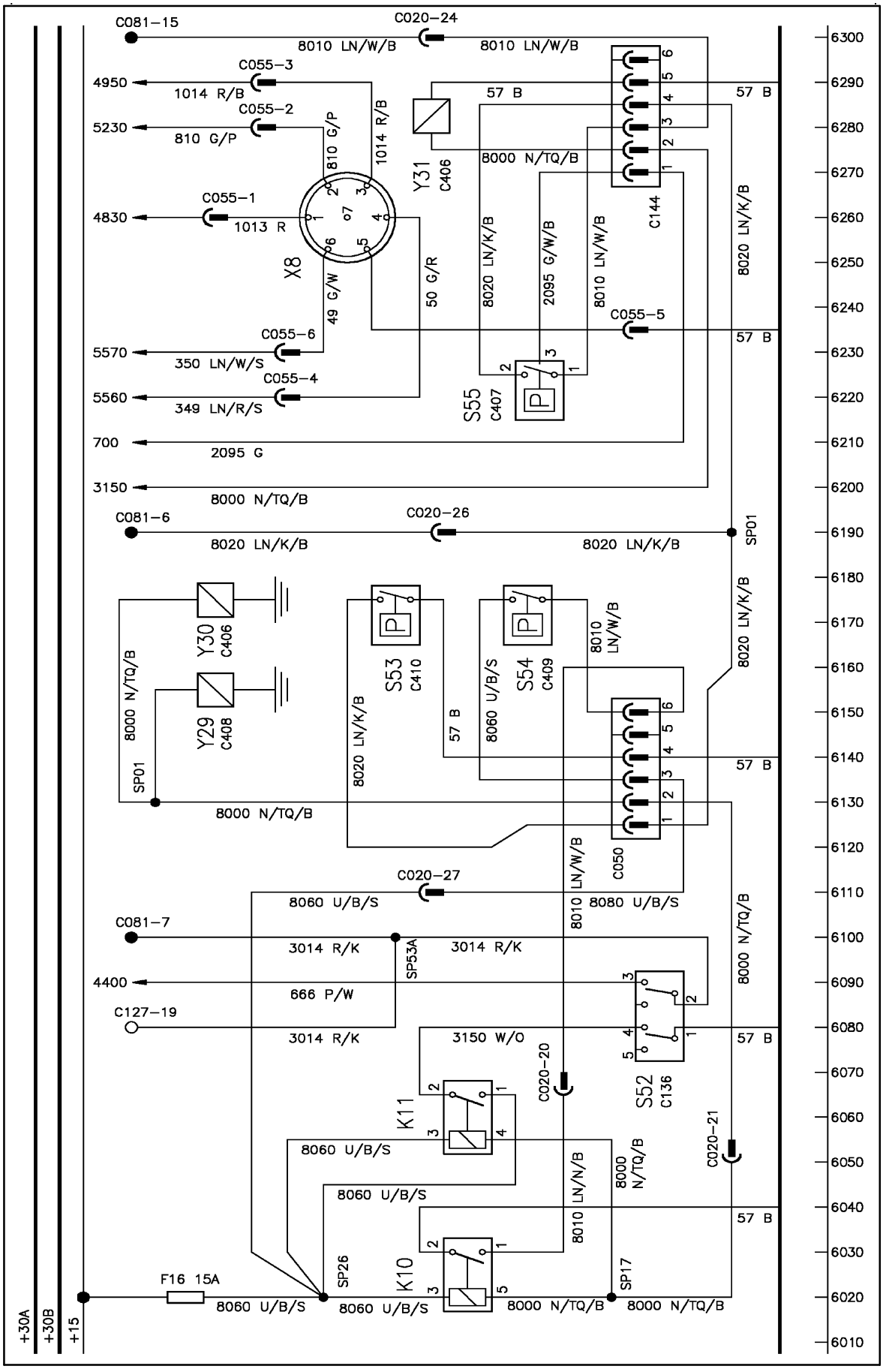
WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F28 Fuse - 15A
F29 Fuse - 30A
F30 Fuse - 15A
F31 Fuse - 15A
F32 Fuse - 30A

H24 Worklamp - Rear L/H
H25 Worklamp - Rear R/H
H26 Worklamp - Grabrail R/H
H27 Worklamp - Grabrail L/H
H28 Worklamp - Upper Front L/H
H29 Worklamp - Upper Front R/H
H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN/W/B
C055-3
4950
1014 R/B
C055-2
5230
810 G/P
C055-1
4830
1013 R
X8
49 G/W
50 G/R
C055-6
5570
350 LN/W/S
C055-4
5560
349 LN/R/S
1014 R/B
810 G/P
Y31
C406
57 B
8000 N/TQ/B
8020 LN/K/B
2095 G/W/B
8010 LN/W/B
C144
C055-5
57 B
S55
C407
700
2095 G
3150
8000 N/TQ/B
C081-6
C020-26
8020 LN/K/B
8020 LN/K/B
SP01
Y30
C406
Y29
C408
8000 N/TQ/B
SP01
S53
C410
S54
C409
8060 U/B/S
8010 LN/W/B
8020 LN/K/B
57 B
8000 N/TQ/B
C050
C020-27
8060 U/B/S
8010 8080 U/B/S
C081-7
3014 R/K
SP53A
3014 R/K
4400
666 P/W
C127-19
3014 R/K
3150 W/O
C020-20
S52
C136
K11
8060 U/B/S
C020-21
8000 N/TQ/B
8060 U/B/S
8010 LN/N/B
57 B
F16 15A
SP26
K10
SP17
8060 U/B/S
8060 U/B/S
8000 N/TQ/B
8000 N/TQ/B
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse – 15A

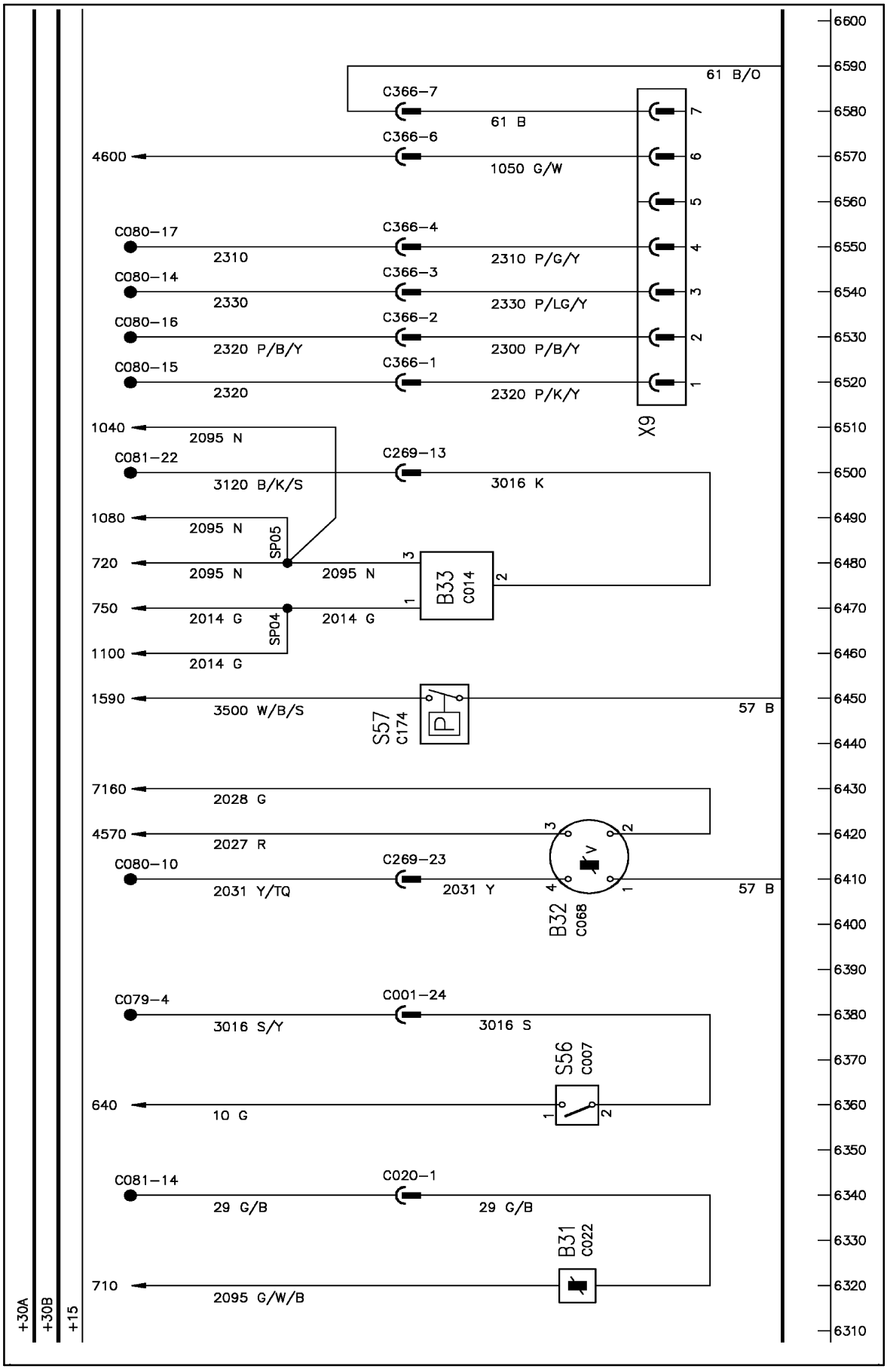
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch
S55 Air Brake Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y30 Italian Trailer Brake Solenoid
Y31 Air Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
1040
2095 N
C081-22
3120 B/K/S
C269-13
3016 K
1080
2095 N
SP05
720
2095 N
2095 N
B33
C014
750
2014 G
SP04
2014 G
1100
2014 G
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
B32
C068
57 B
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G/W/B

16x16 Transmission, W/Cab, W/Mechanical Engine

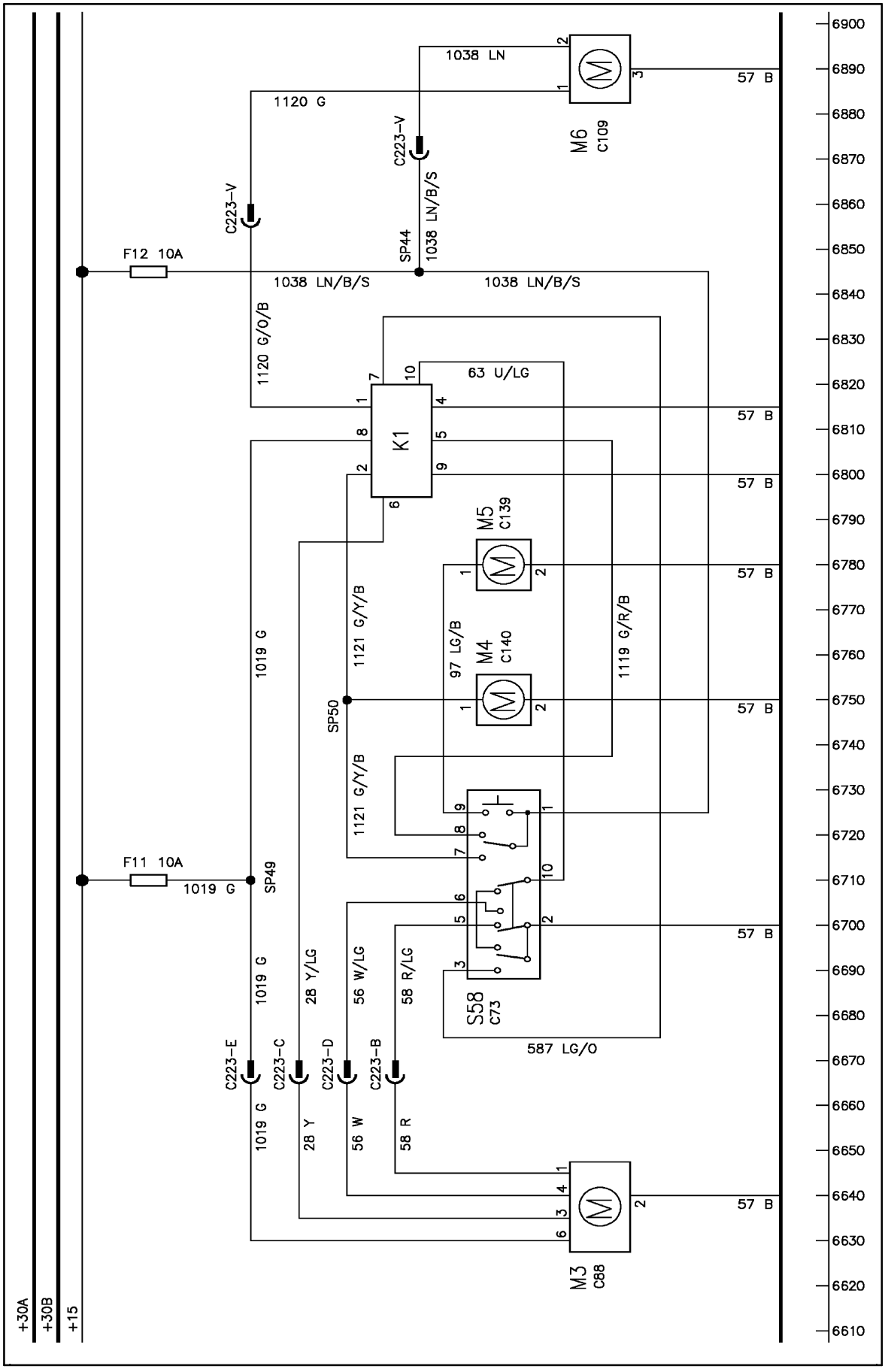
SENSORS
Line 6310-6600

B31 Fuel Tank Sender
B32 Radar Gun
B33 Steering Angle Sensor

S56 Brake Fluid Level Switch
S57 Power Assisted Steering Pressure Switch

X9 Radar Extension Harness Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

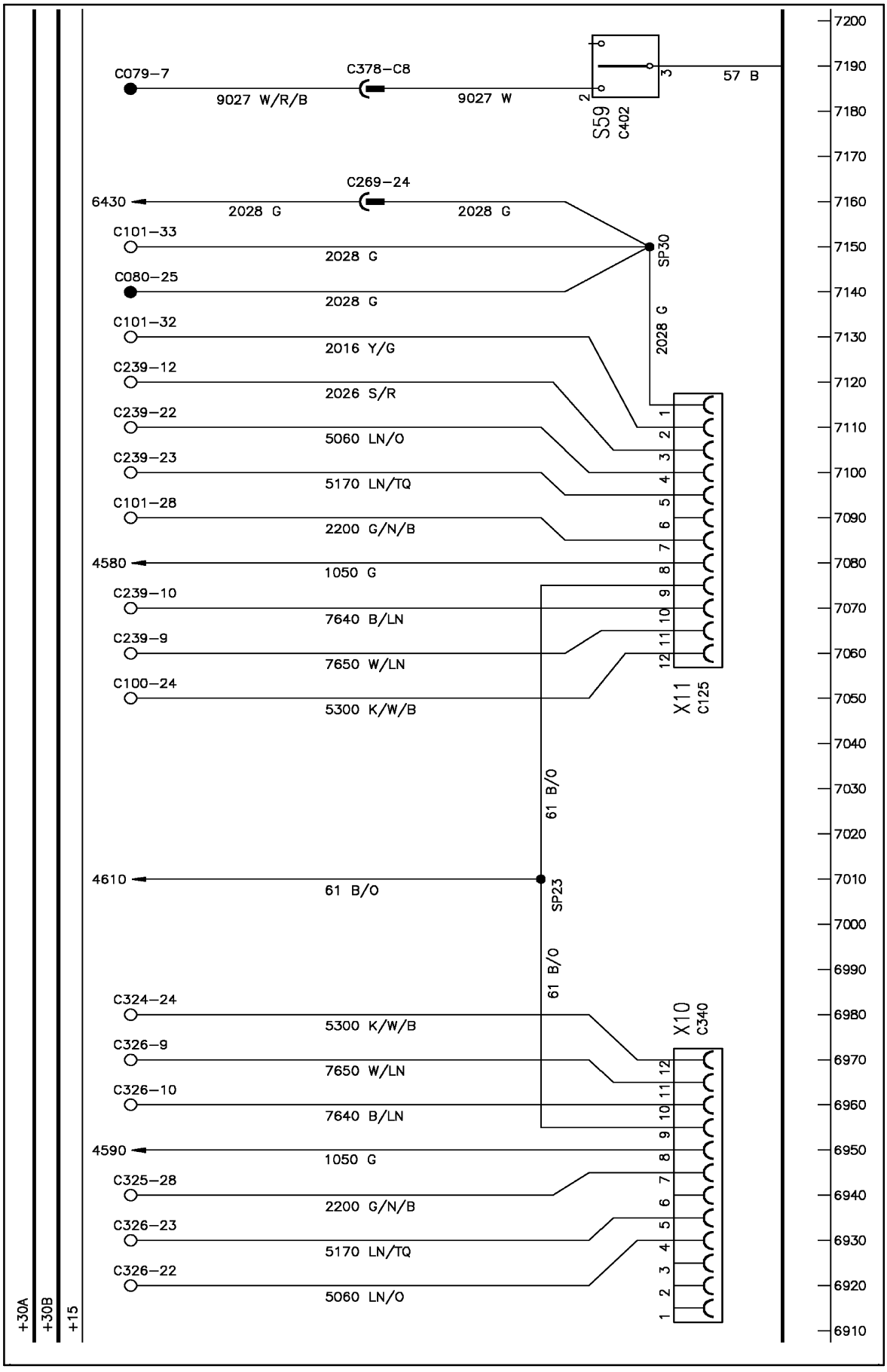

+30A
+30B
+15
F12 10A
F11 10A
1038 LN
1120 G
1038 LN/B/S
1120 G/O/B
1019 G
63 U/LG
57 B
1121 G/Y/B
97 LG/B
1119 G/R/B
28 Y/LG
56 W/LG
58 R/LG
587 LG/O
SP44
SP49
SP50
C223-V
C223-E
C223-C
C223-D
C223-B
K1
M6 C109
M5 C139
M4 C140
M3 C88
S58 C73
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

16x16 Transmission, W/Cab, W/Mechanical Engine

WASHERS AND WIPERS
Line 6610-6900

F11	Fuse - 10A
F12	Fuse - 10A
K1	Front Windshield Wiper Module
M3	Wiper Motor - Front
M4	Washer Motor - Rear
M5	Washer Motor - Front
M6	Wiper Motor - Rear
S58	Front and Rear Wiper/washer Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
2
3
57 B
S59
C402
C269-24
6430
2028 G
2028 G
C101-33
2028 G
SP30
C080-25
2028 G
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
1 2 3 4 5 6 7 8 9 10 11 12
61 B/O
4610
61 B/O
SP23
61 B/O
C324-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
12 11 10 9 8 7 6 5 4 3 2 1
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

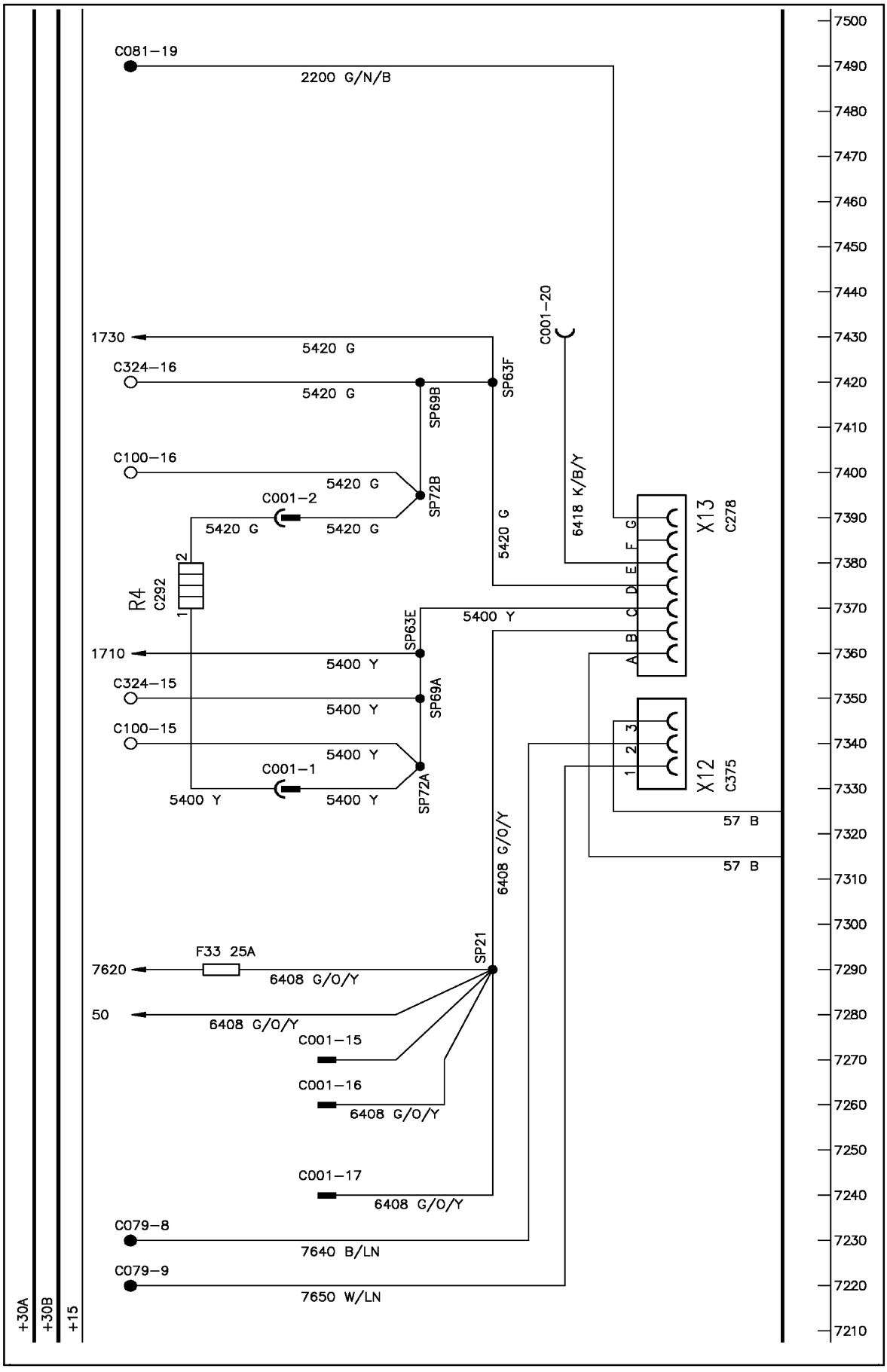
16x16 Transmission, W/Cab, W/Mechanical Engine

DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)
X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C001-2
5420 G
5420 G
SP72B
C001-20
6418 K/B/Y
5420 G
X13
C278
R4
C292
1710
5400 Y
SP63E
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C001-1
5400 Y
5400 Y
SP72A
X12
C375
57 B
57 B
6408 G/O/Y
F33 25A
SP21
7620
6408 G/O/Y
50
6408 G/O/Y
C001-15
C001-16
6408 G/O/Y
C001-17
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

16x16 Transmission, W/Cab, W/Mechanical Engine

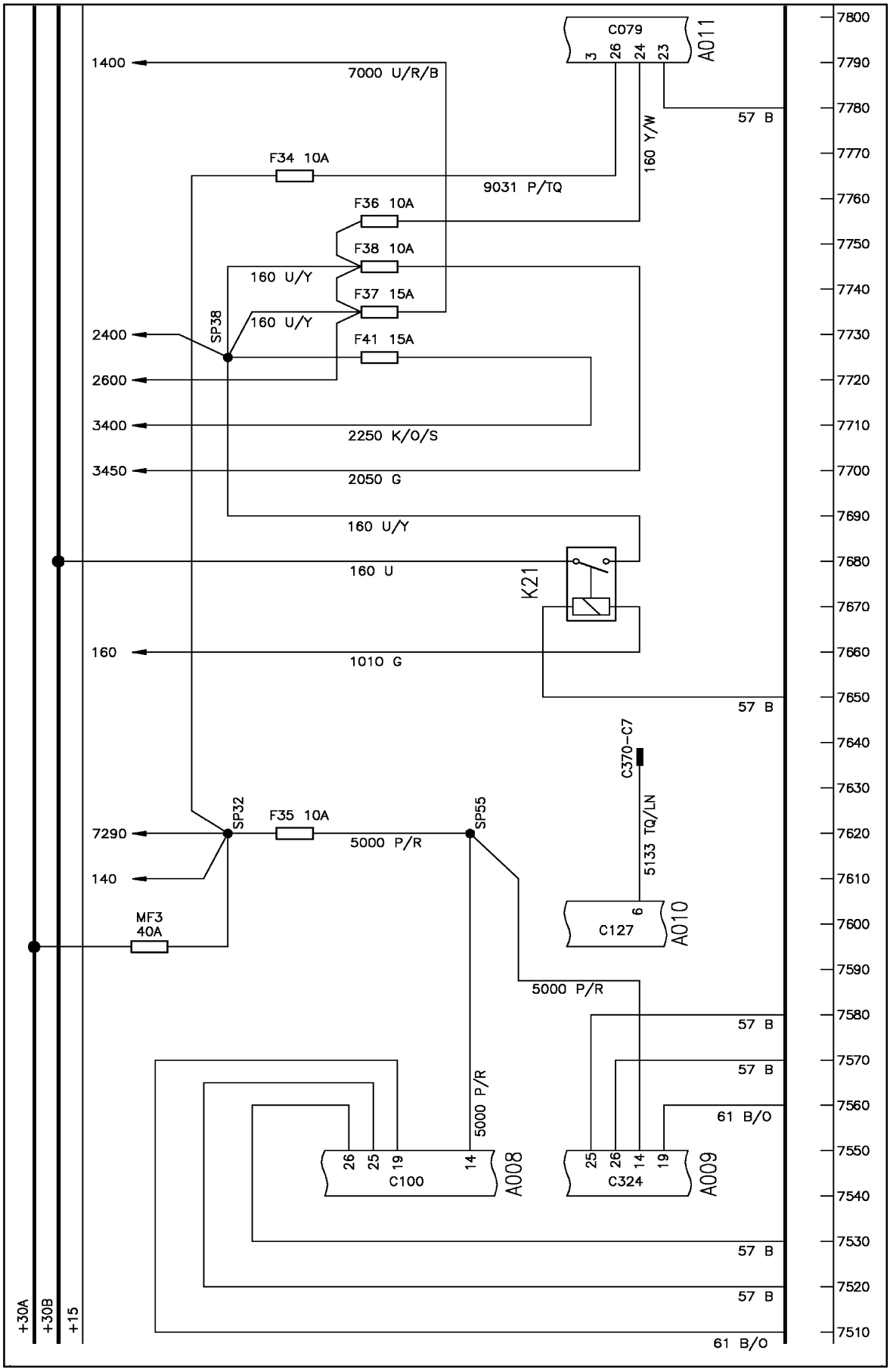
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

R4 Can Bus Terminator

X12 ADIC Diagnostics Connector
X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079
A011
3
26
24
23
1400
7000 U/R/B
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3400
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C370-C7
SP32
F35 10A
SP55
7290
5000 P/R
5133 TQ/LN
140
MF3
40A
C127
A010
6
5000 P/R
57 B
57 B
5000 P/R
61 B/O
C100
A008
26
25
19
14
C324
A009
25
26
14
19
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
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7630
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7600
7590
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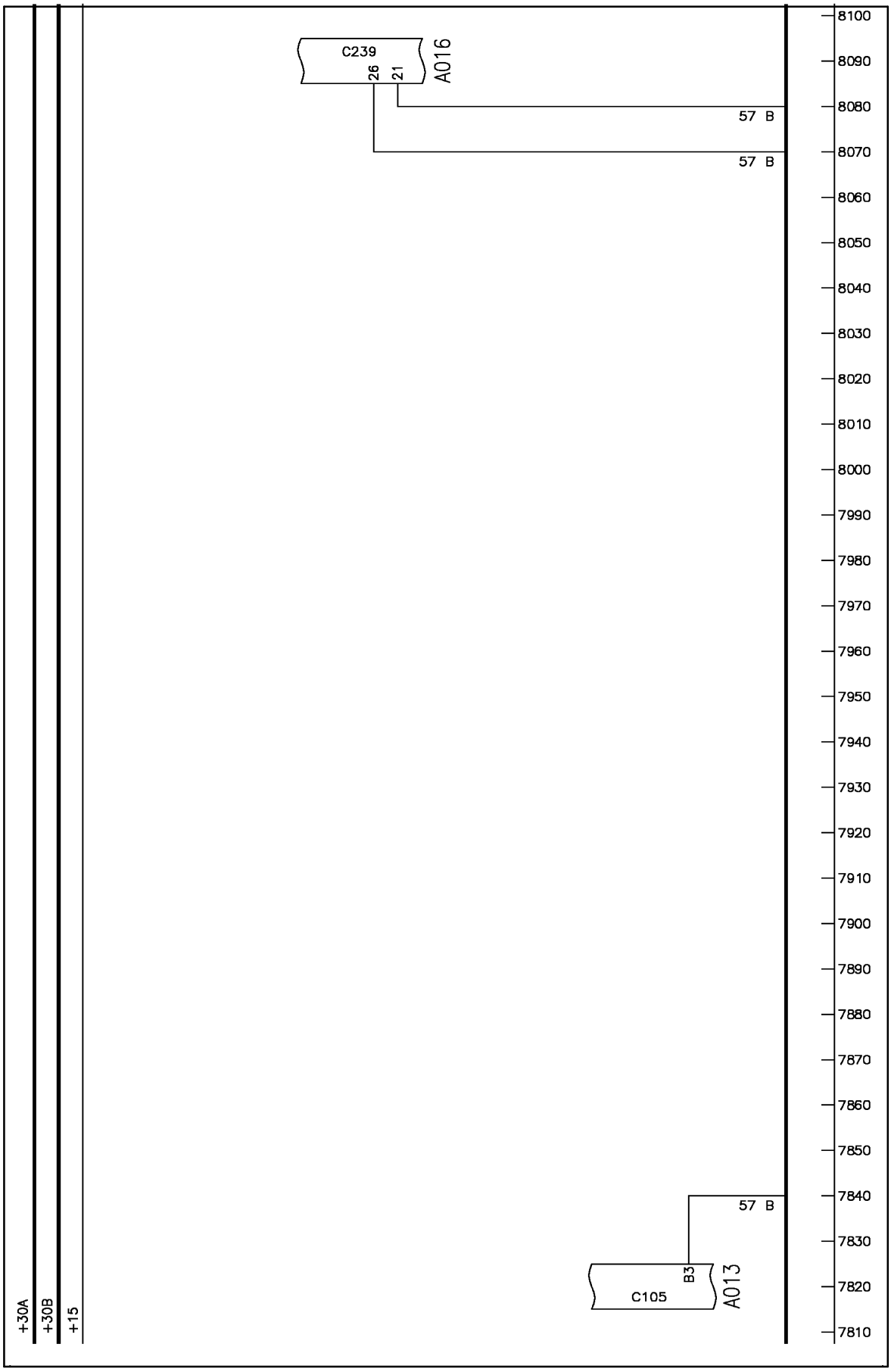
7520
7510

16x16 Transmission, W/Cab, W/Mechanical Engine

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A	**K21**	Electronics Supply Relay
F34	Fuse - 10A		
F35	Fuse - 10A	**A008**	XCM Central Control Unit (CN1-A)
F36	Fuse - 10A	**A009**	XCM Auxilliary Control Unit (Front Susp)
F37	Fuse - 15A	**A010**	XCM Central Control Unit (CN3-A)
F38	Fuse - 10A	**A011**	Instrument Cluster 1
F41	Fuse -15A		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239
26
21
A016
57 B
57 B
57 B
B3
C105
A013
+30A
+30B
+15
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

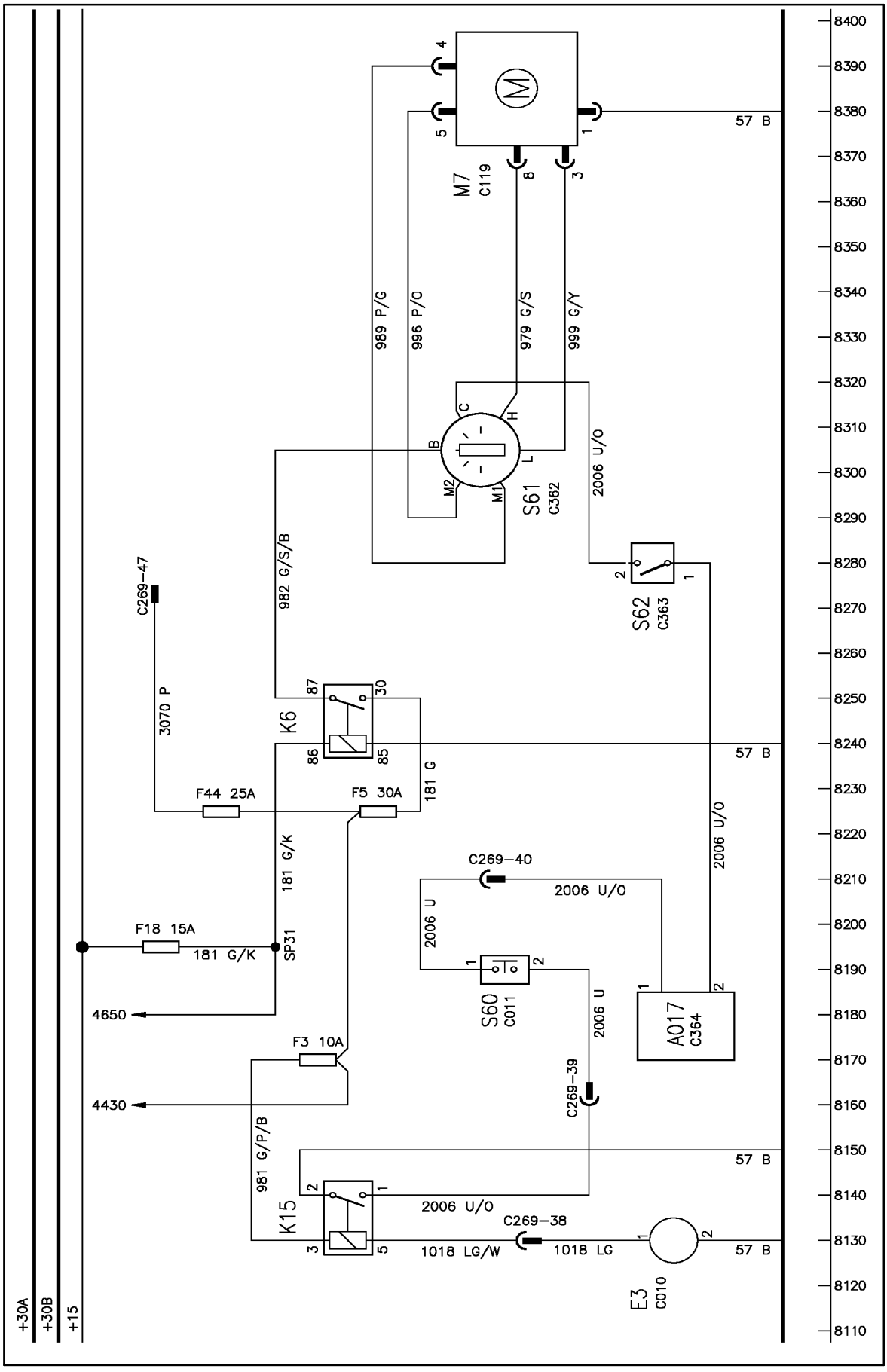
16x16 Transmission, W/Cab, W/Mechanical Engine,

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A013 Worklamp ECU

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		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8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
+30A
+30B
+15
M7
C119
57 B
989 P/G
996 P/O
979 G/S
999 G/Y
S61
C362
2006 U/O
S62
C363
C269-47
3070 P
982 G/S/B
K6
F44 25A
F5 30A
181 G
181 G/K
F18 15A
SP31
4650
C269-40
2006 U
S60
C011
A017
C364
F3 10A
4430
C269-39
981 G/P/B
K15
C269-38
1018 LG/W
1018 LG
E3
C010

16x16 Transmission, W/Cab, W/Mechanical Engine

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

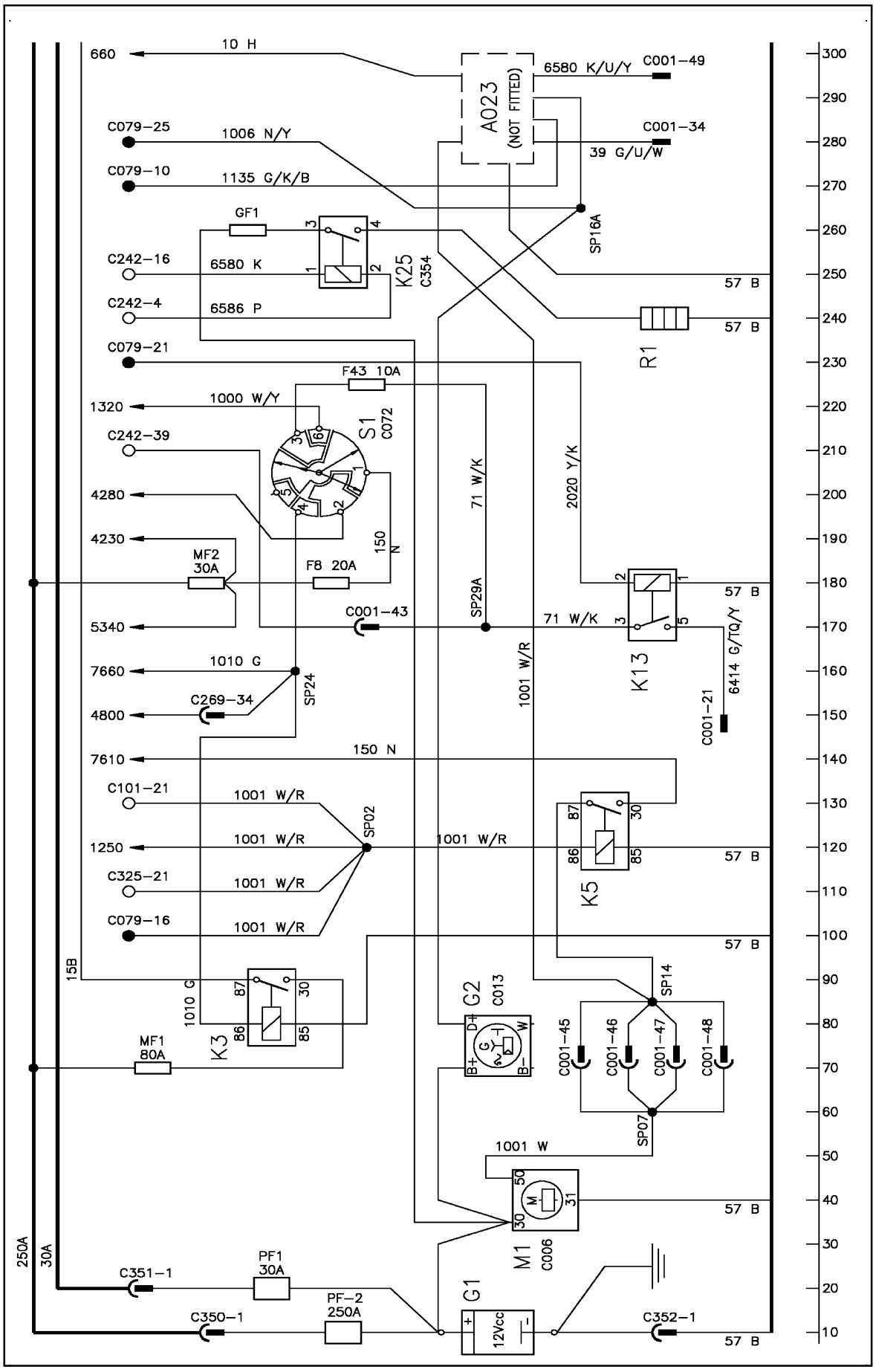
F3	Fuse - 10A	**K6**	Blower Motor Relay
F5	Fuse - 30A	**K15**	A/C Clutch Relay
F18	Fuse - 15A		
F44	Fuse - 25A	**M7**	Blower Unit
A017	HVAC Unit	**S60**	A/C Pressure Switch
		S61	Heater/Blower Switch
E3	A/C Clutch	**S62**	A/C Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

24X24 TRANSMISSION, W/CAB, W/ELECTRONIC ENGINE

Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400

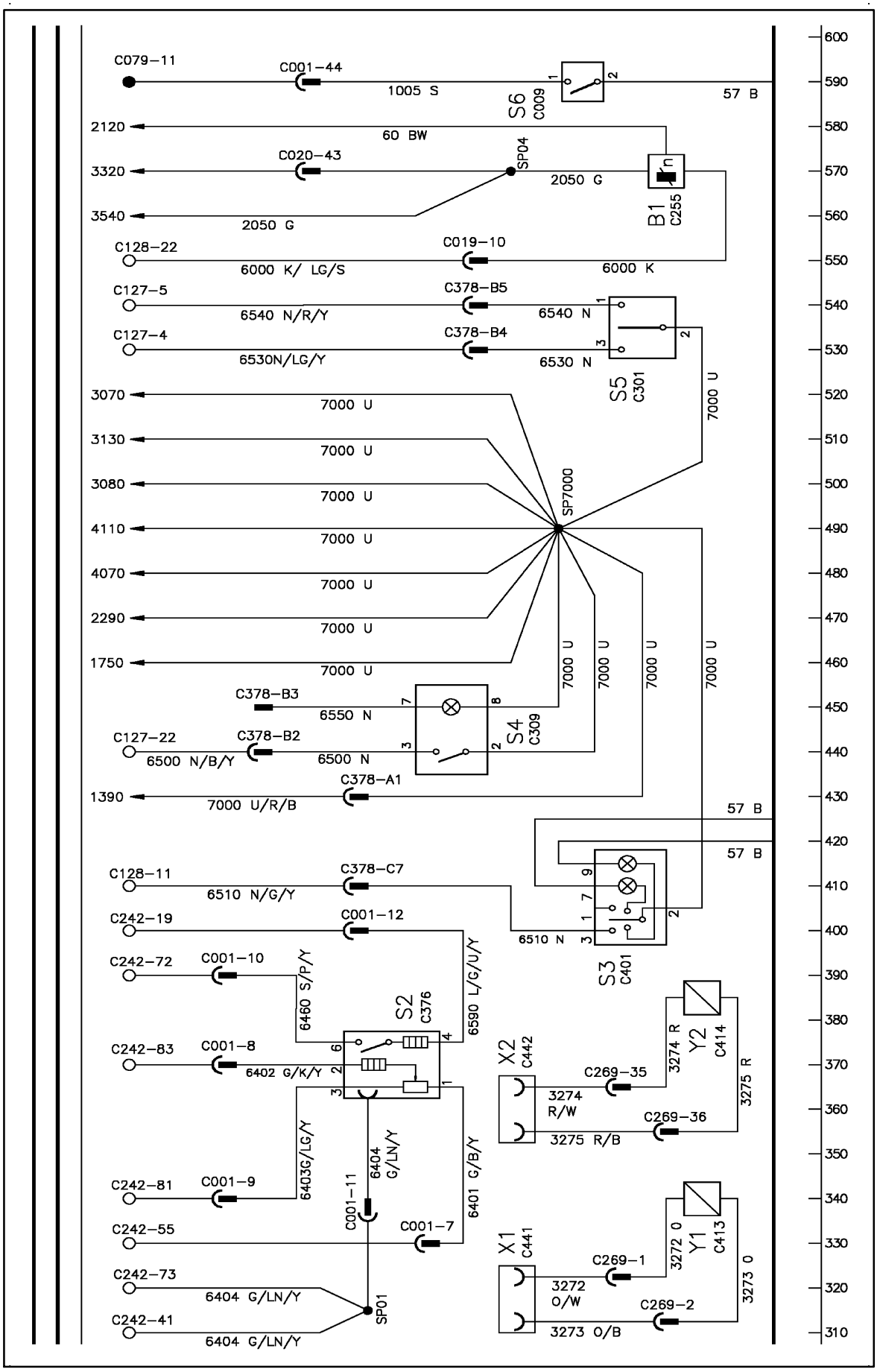

660
10 H
A023
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C079-25
1006 N/Y
C079-10
1135 G/K/B
GF1
SP16A
C242-16
6580 K
K25
C354
C242-4
6586 P
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
S1
C072
C242-39
4280
4230
71 W/K
2020 Y/K
150 N
MF2
30A
F8 20A
SP29A
C001-43
5340
K13
6414 G/TQ/Y
C001-21
7660
1010 G
SP24
C269-34
4800
1001 W/R
7610
150 N
C101-21
1001 W/R
SP02
1250
C325-21
C079-16
K5
15B
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1001 W
M1
C006
250A
30A
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

24x24 Transmission, W/Cab, W/Electronic Engine

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A023	Grid Heater Module (not fitted)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
3320
C020-43
SP04
2050 G
3540
2050 G
B1 C255
C128-22
6000 K/ LG/S
C019-10
6000 K
C127-5
6540 N/R/Y
C378-B5
6540 N
C127-4
6530N/LG/Y
C378-B4
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
6500 N/B/Y
C378-B2
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
6510 N/G/Y
C378-C7
C242-19
C001-12
6510 N
S3 C401
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
Y2 C414
3274 R
3275 R
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C001-11
C242-81
C001-9
C242-55
C001-7
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
Y1 C413
3272 O
3273 O
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

24x24 Transmission, W/Cab, W/Electronic Engine

ENGINE 1
line 310-600

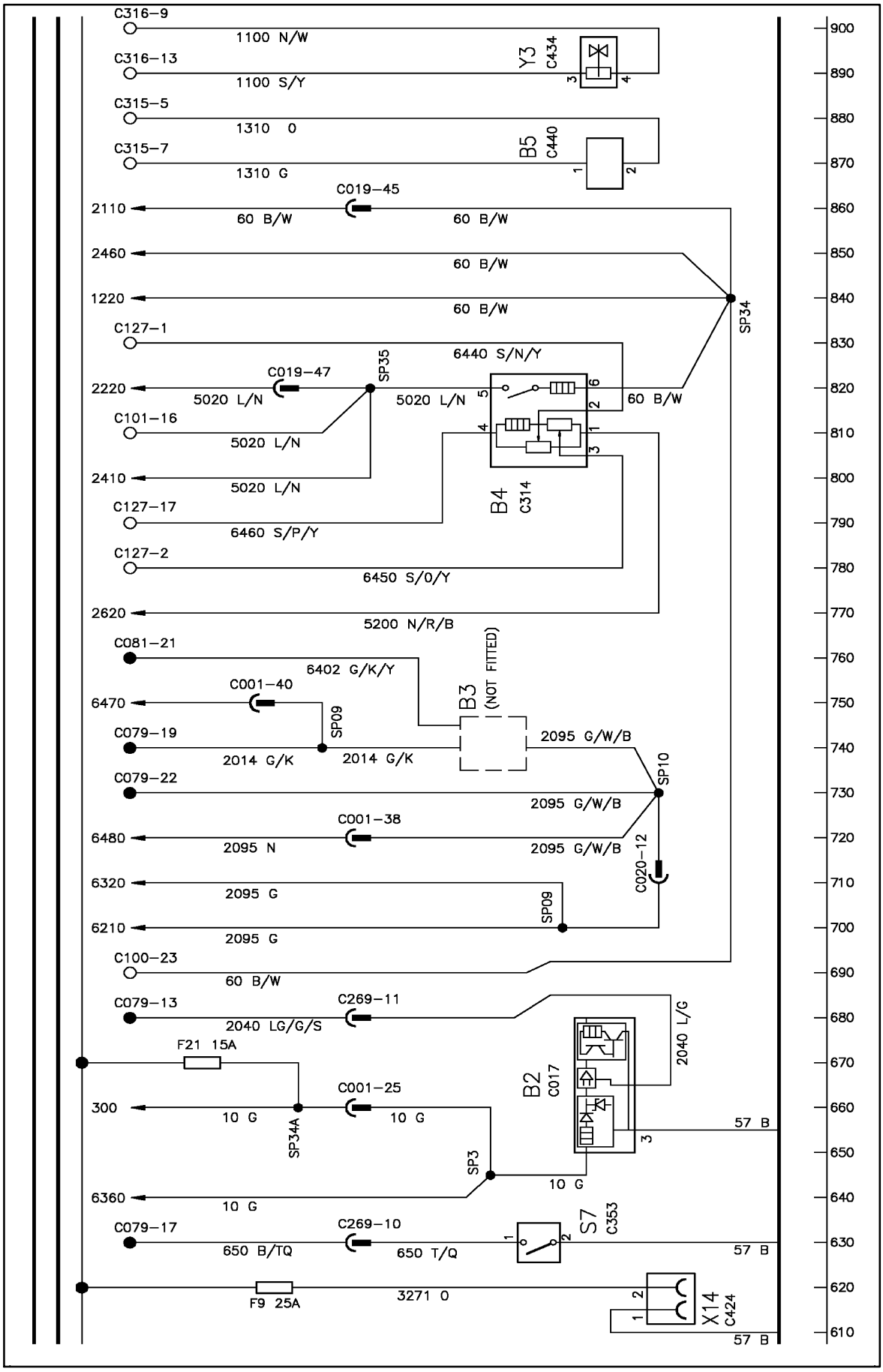
B1 Engine Flywheel Speed Sensor

S2 Foot Throttle - Electronic Engine
S3 Constant Engine Speed programme Switch
S4 Constant ERPM On/Off Switch
S5 Engine Inc./Dec. Switch
S6 Air Cleaner Switch

Y1 Loader Valve 1
Y2 Loader Valve 2

X1 Joystick Loader Control Socket 1
X2 Joystick Loader Control Socket 2

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

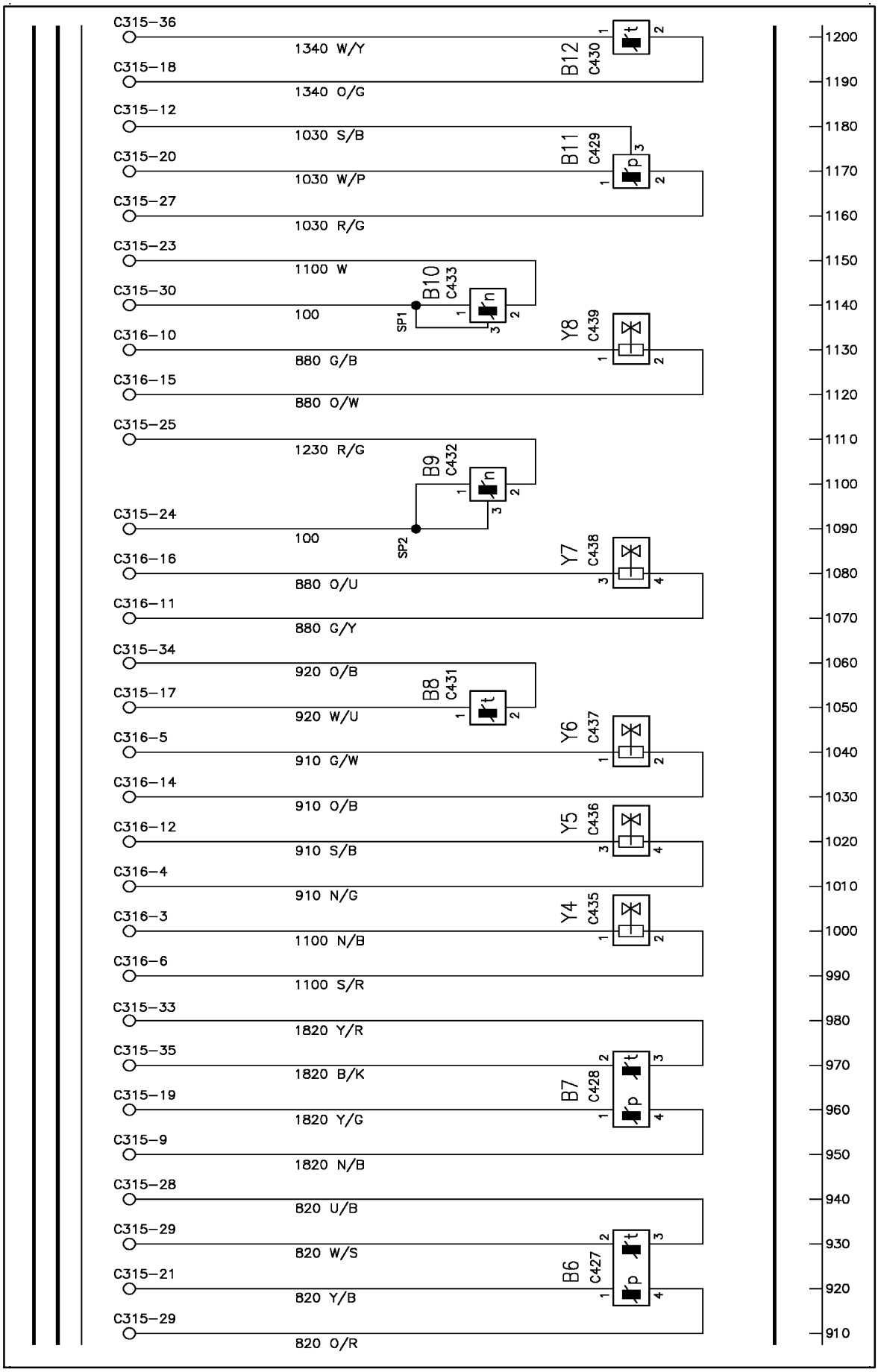

C316-9
1100 N/W
C316-13
1100 S/Y
Y3 C434
C315-5
1310 0
C315-7
1310 G
B5 C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4 C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3 (NOT FITTED)
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2 C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7 C353
57 B
F9 25A
3271 0
X14 C424
57 B
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

24x24 Transmission, W/Cab, W/Electronic Engine

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A		
		Y3	Injector 1
B2	Water In Fuel Sensor		
B3	Foot Throttle - Mechanical Engine (Not Fitted)	**X14**	Loader Power Connector
B4	Hand Throttle		
B5	Fuel Metering Unit		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

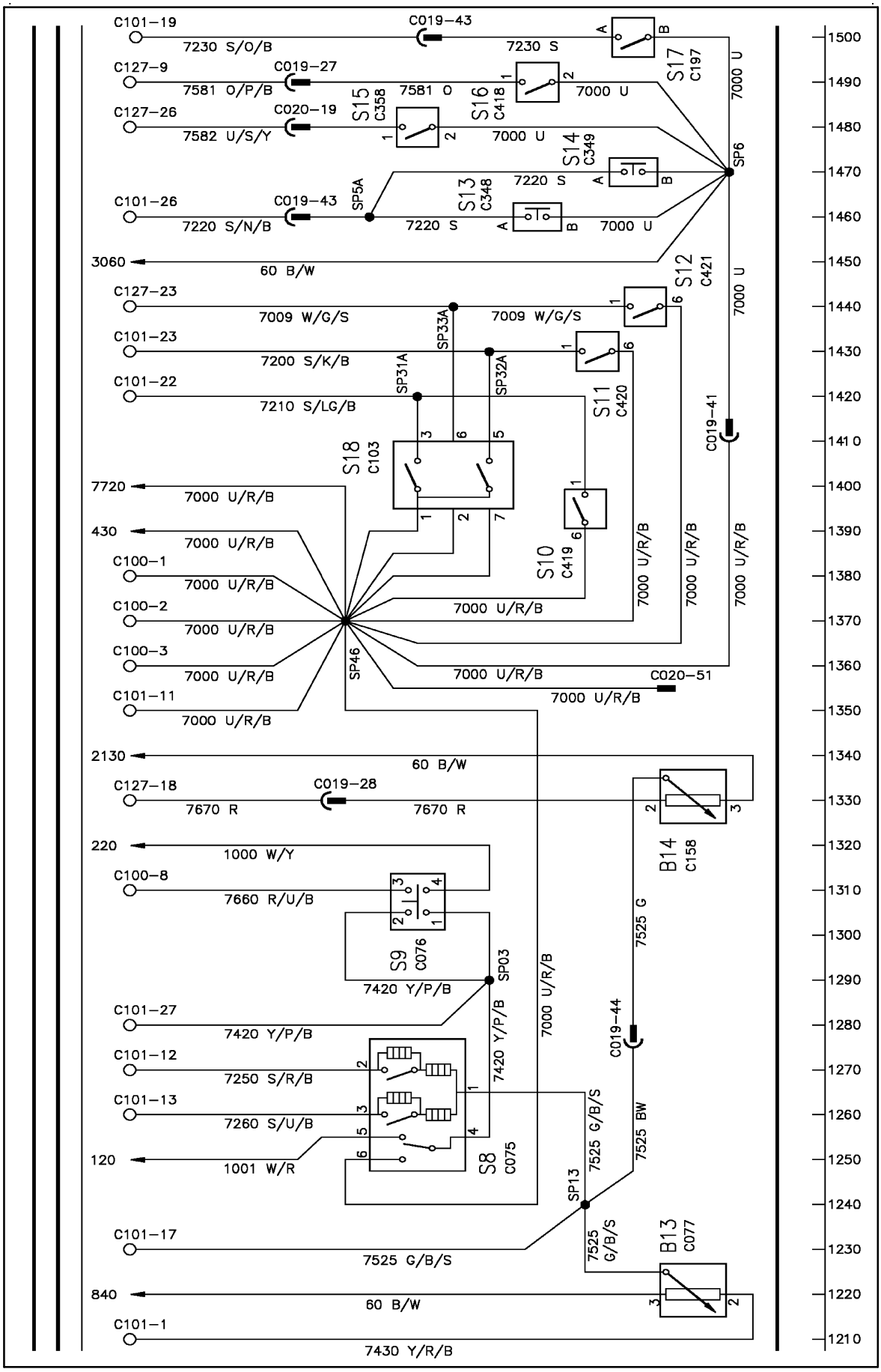

C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
C315-9
1820 N/B
B7
C428
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910

24x24 Transmission, W/Cab, W/Electronic Engine

ENGINE 3
line 910-1200

B6	Boost Pressure/Temperature Sensor	**Y4**	Injector 2
B7	Oil Pressure/Temperature Sensor	**Y5**	Injector 3
B8	Fuel Temperature Sensor	**Y6**	Injector 4
B9	Crankshaft Speed Sensor	**Y7**	Injector 5 (6 cyl version)
B10	Camshaft Speed Sensor	**Y8**	Injector 6 (6 cyl version)
B11	Fuel Rail Pressure Sensor		
B12	Coolant Temperature Sensor		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

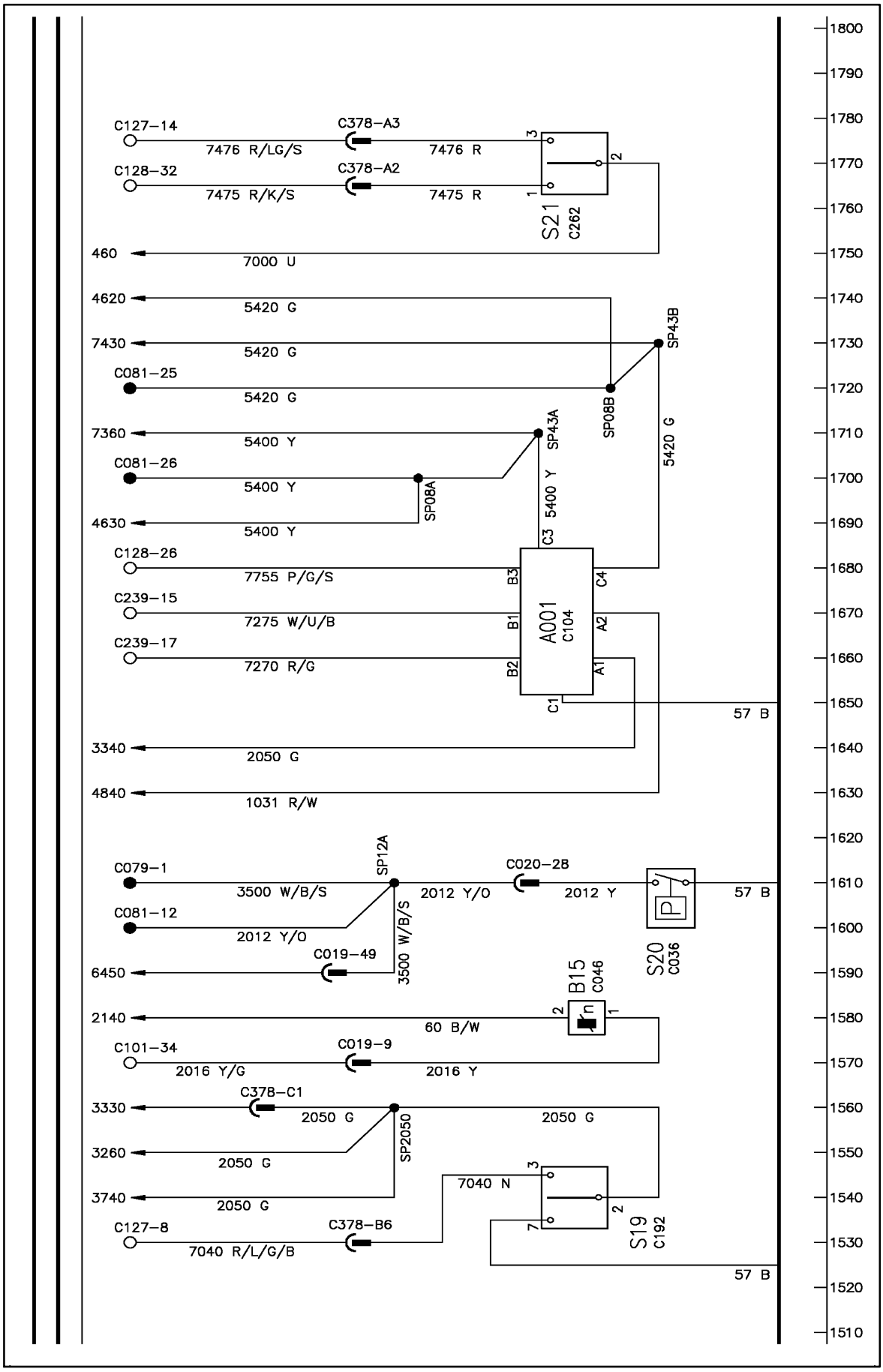

C101-19
7230 S/O/B
C019-43
7230 S
S17 C197
C127-9
7581 O/P/B
C019-27
S15 C358
7581 O
S16 C418
7000 U
C127-26
7582 U/S/Y
C020-19
7000 U
S14 C349
SP6
7220 S
S13 C348
SP5A
C101-26
7220 S/N/B
C019-43
7220 S
7000 U
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
C100-1
C100-2
C100-3
C101-11
S10 C419
SP46
C020-51
2130
60 B/W
C127-18
7670 R
C019-28
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
7420 Y/P/B
SP03
C101-27
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7525 G
C019-44
7525 G/B/S
7525 BW
SP13
C101-17
B13 C077
840
C101-1
7430 Y/R/B
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

24x24 Transmission, W/Cab, W/Electronic Engine

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control - Range
B14	Synchro Position Potentiometer	**S13**	Neutral Switch 3/4 Rail
		S14	Neutral Switch 1/2 Rail
S8	Shuttle Switch	**S15**	Creeper Sensing Switch
S9	Clutch Switch	**S16**	Creeper Sense Forward Switch
S10	Duplicate Transmission Control - Downshift	**S17**	High/Medium Switch
S11	Duplicate Transmission Control - Upshift	**S18**	Gearshift

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
5420 G
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
C239-17
7270 R/G
B2
A001
C104
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
7040 N
3740
2050 G
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

24x24 Transmission, W/Cab, W/Electronic Engine

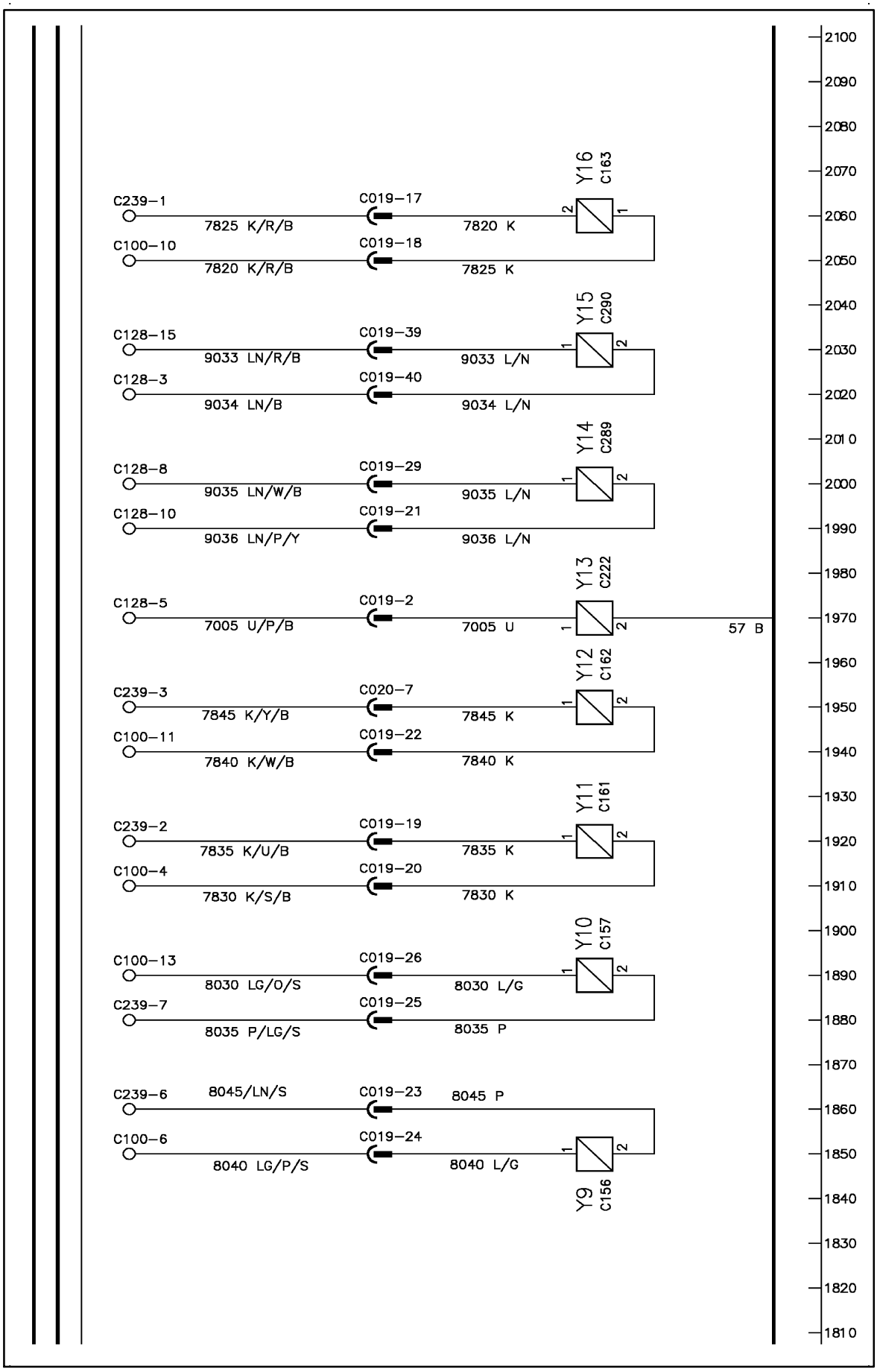
TRANSMISSION SYSTEM 2
Line 1510-1800

A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch
S20 Transmission Oil Pressure Switch
S21 Transmission Auto Function Switch

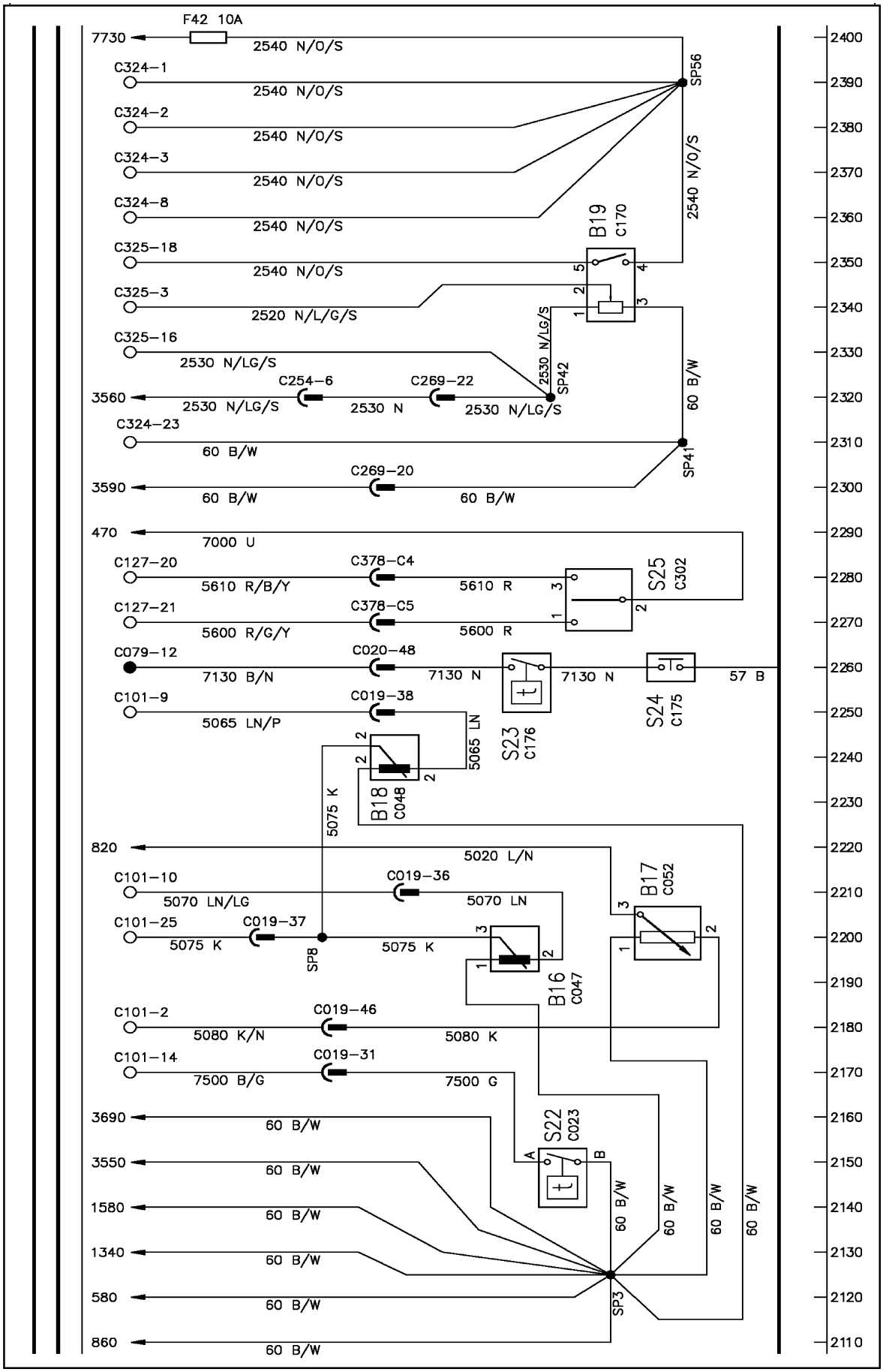
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
C239-6
8045/LN/S
C019-23
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y11 Lo PWM Valve
Y12 Hi PWM Valve
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y16 Dump Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

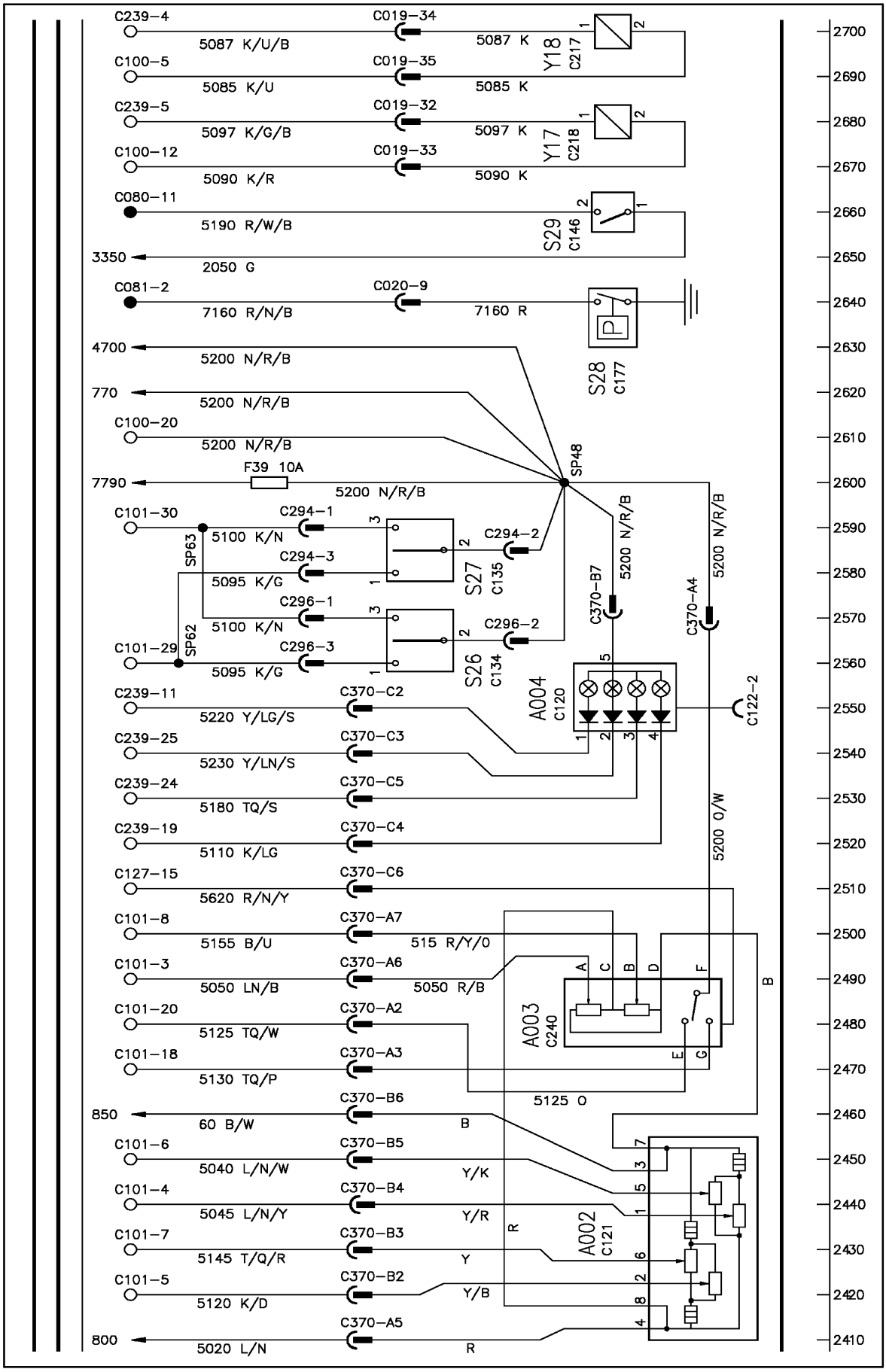

F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
3560
C254-6
C269-22
2530 N
C324-23
60 B/W
3590
C269-20
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
C378-C4
5610 R/B/Y
5610 R
C127-21
C378-C5
5600 R/G/Y
5600 R
S25
C302
C079-12
C020-48
7130 B/N
7130 N
57 B
C101-9
C019-38
5065 LN/P
5065 LN
S23
C176
S24
C175
B18
C048
5075 K
820
5020 L/N
C101-10
C019-36
5070 LN/LG
5070 LN
C101-25
C019-37
5075 K
SP8
B17
C052
B16
C047
C101-2
C019-46
5080 K/N
5080 K
C101-14
C019-31
7500 B/G
7500 G
3690
3550
1580
1340
580
860
S22
C023
SP3
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

24x24 Transmission, W/Cab, W/Electronic Engine

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A	**S22**	Transmission Oil Temp Sensor
		S23	Oil Temperature Switch
B16	LH Draft Pin	**S24**	HPL Filter Switch
B17	Rockshaft Potentiometer	**S25**	HTS Switch
B18	RH Draft Pin		
B19	Front HPL Limit Potentiometer		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

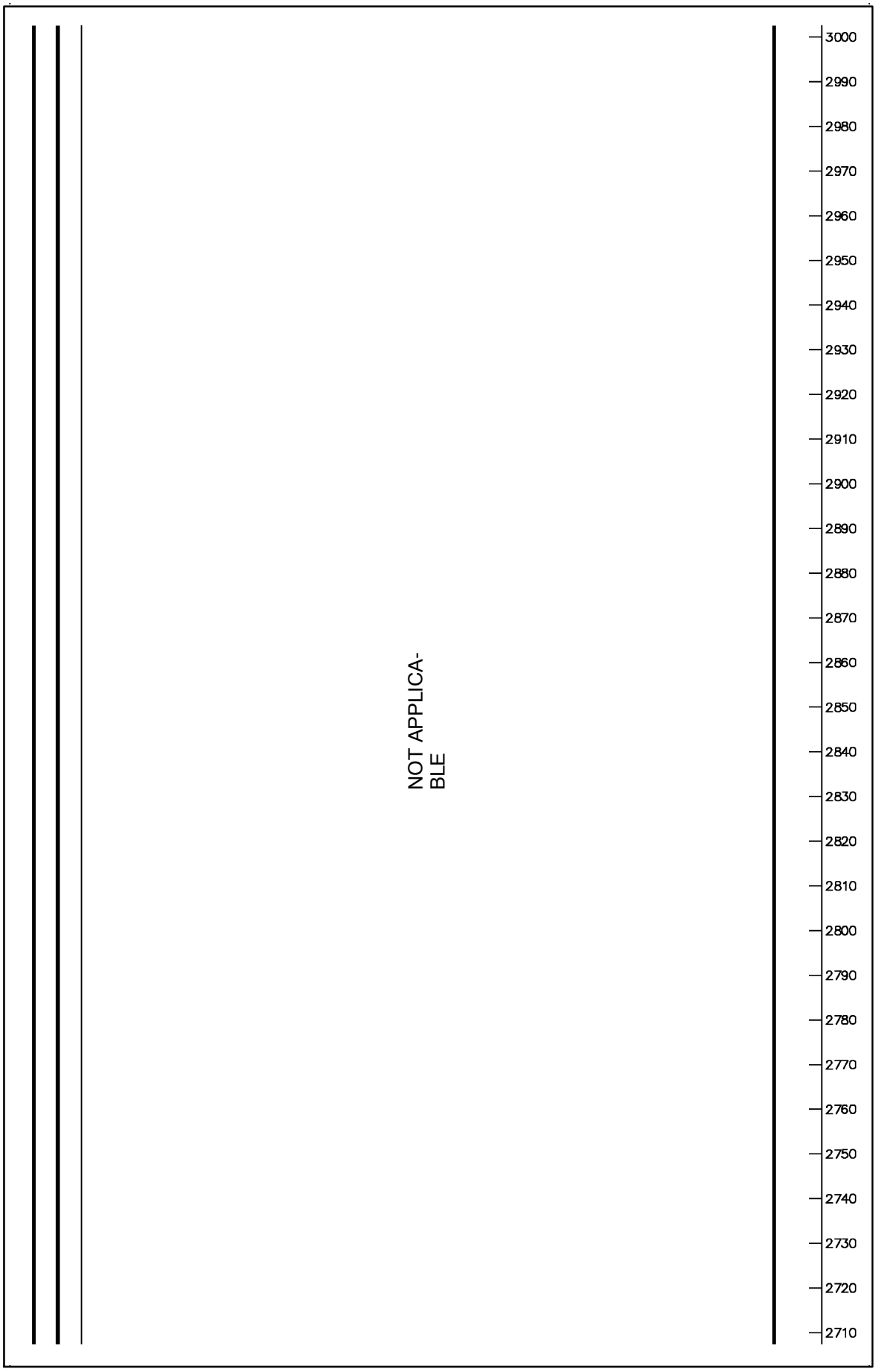

C239-4
C019-34
5087 K/U/B
5087 K
Y18
C217
C100-5
C019-35
5085 K/U
5085 K
C239-5
C019-32
5097 K/G/B
5097 K
Y17
C218
C100-12
C019-33
5090 K/R
5090 K
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
C294-2
SP63
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
C101-29
SP62
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

24x24 Transmission, W/Cab, W/Electronic Engine

HYDRAULICS 2
Line 2410-2700

F30	Fuse - 10A	**S27**	HPL Switch R/H
		S28	Lo Charge Switch
A002	EDC Control	**S29**	Lift-O-Matic Switch
A003	EDC Mouse		
A004	EDC Status Lamp Panel	**Y17**	EDC Lower Solenoid
		Y18	EDC Raise Solenoid
S26	HPL Switch L/H		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

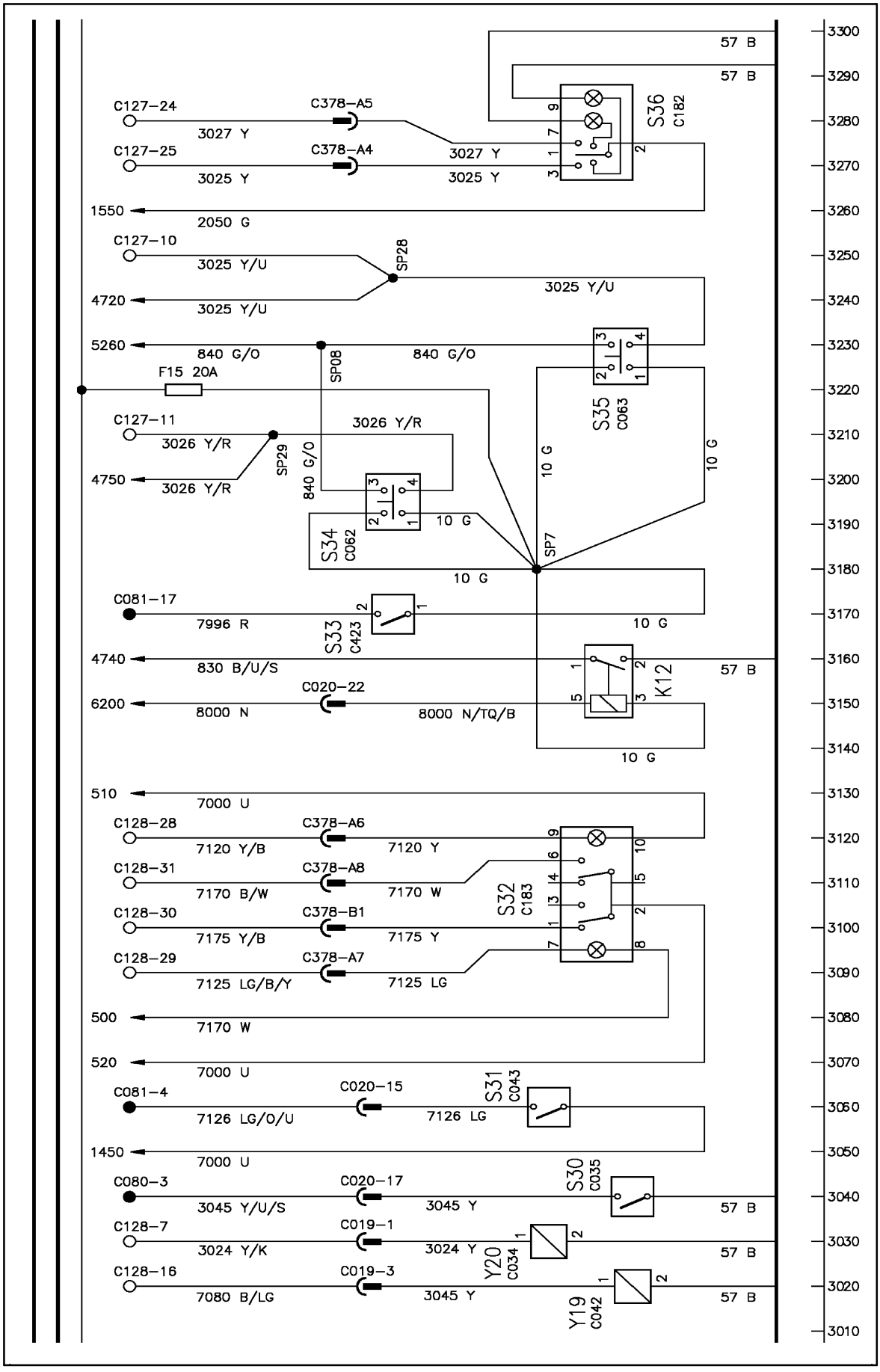

NOT APPLICA-
BLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

24x24 Transmission, W/Cab, W/Electronic Engine

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

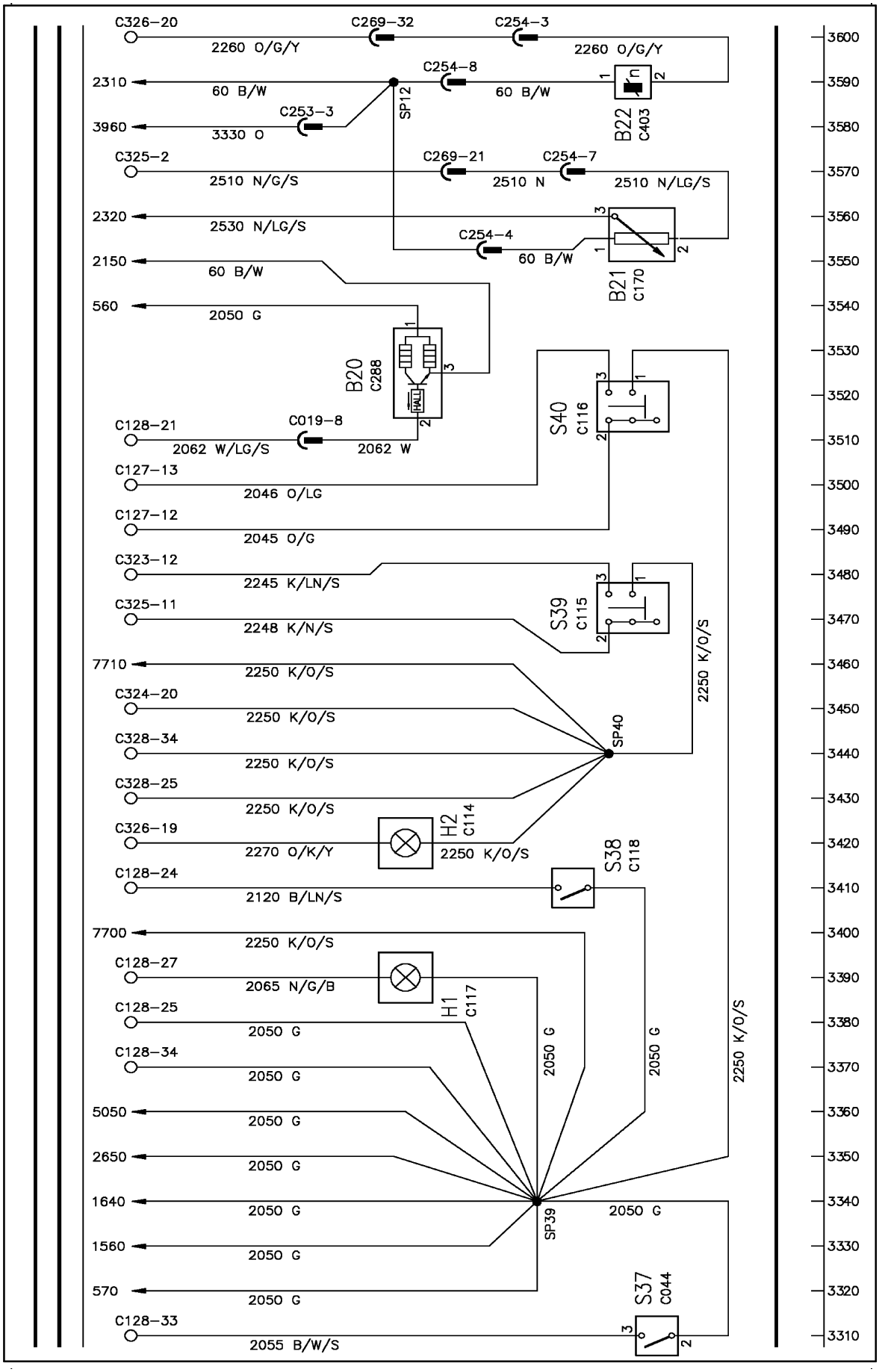

57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3027 Y
3025 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
3025 Y/U
4720
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
4750
3026 Y/R
840 G/O
10 G
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y
57 B
Y20
C034
C128-16
C019-3
7080 B/LG
3045 Y
57 B
Y19
C042
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

24x24 Transmission, W/Cab, W/Electronic Engine

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
K12	Stoplamp Switch/Air Brake Relay	**S35**	Stop Lamp Switch Left
S30	4WD Activated Switch	**S36**	4WD Switch
S31	Diff Lock Activated Switch	**Y19**	Diff Lock Solenoid
S32	Differential Lock Switch	**Y20**	4WD Solenoid
S33	Brake Pedal Latch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

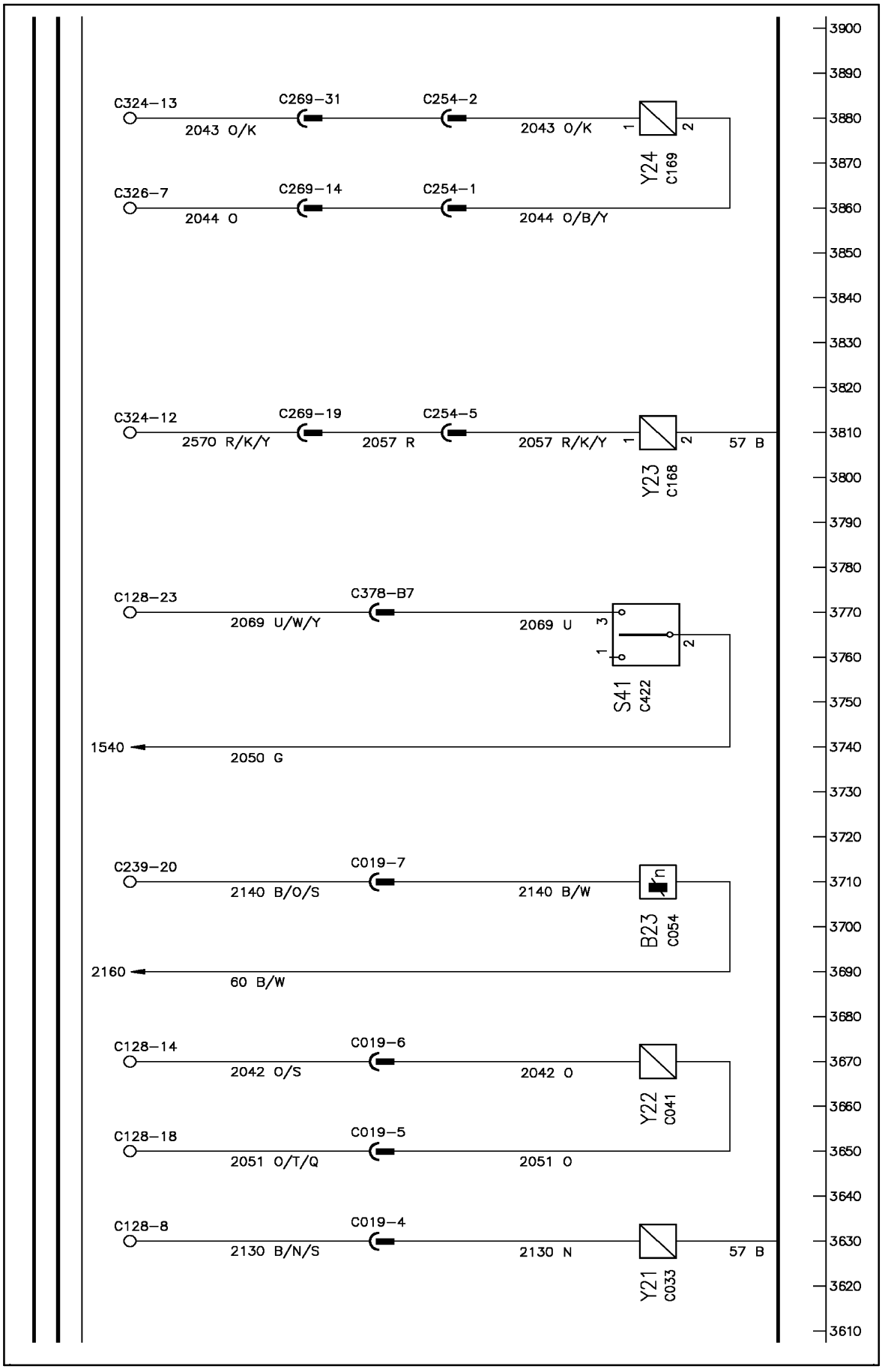

C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
C253-3
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
S38
C118
C128-24
2120 B/LN/S
7700
2250 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

24x24 Transmission, W/Cab, W/Electronic Engine

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/W
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O
Y22
C041
C128-18
C019-5
2051 O/T/Q
2051 O
C128-8
C019-4
2130 B/N/S
2130 N
57 B
Y21
C033

24x24 Transmission, W/Cab, W/Electronic Engine

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

S41 PTO Management Switch

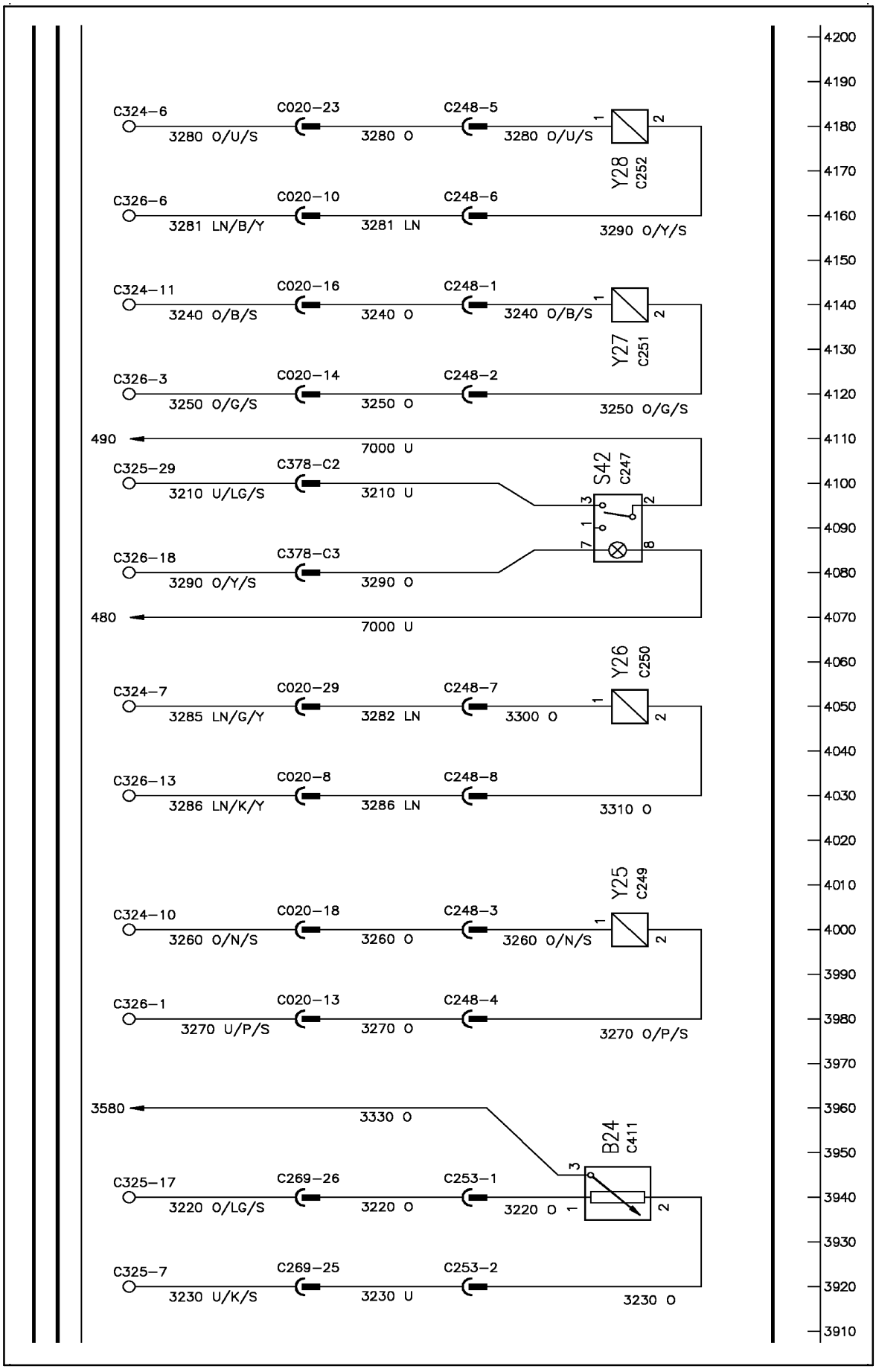
Y21 PTO Brake Solenoid

Y22 PTO Clutch Solenoid

Y23 Front Hitch Valve

Y24 Front PTO Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C324-6
C020-23
C248-5
3280 O/U/S
3280 O
3280 O/U/S
Y28
C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O
3240 O/B/S
Y27
C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42
C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN
3300 O
Y26
C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O
3260 O/N/S
Y25
C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O
3270 O/P/S
3580
3330 O
B24
C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

24x24 Transmission, W/Cab, W/Electronic Engine

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

Y25 Front Suspension Lower Solenoid

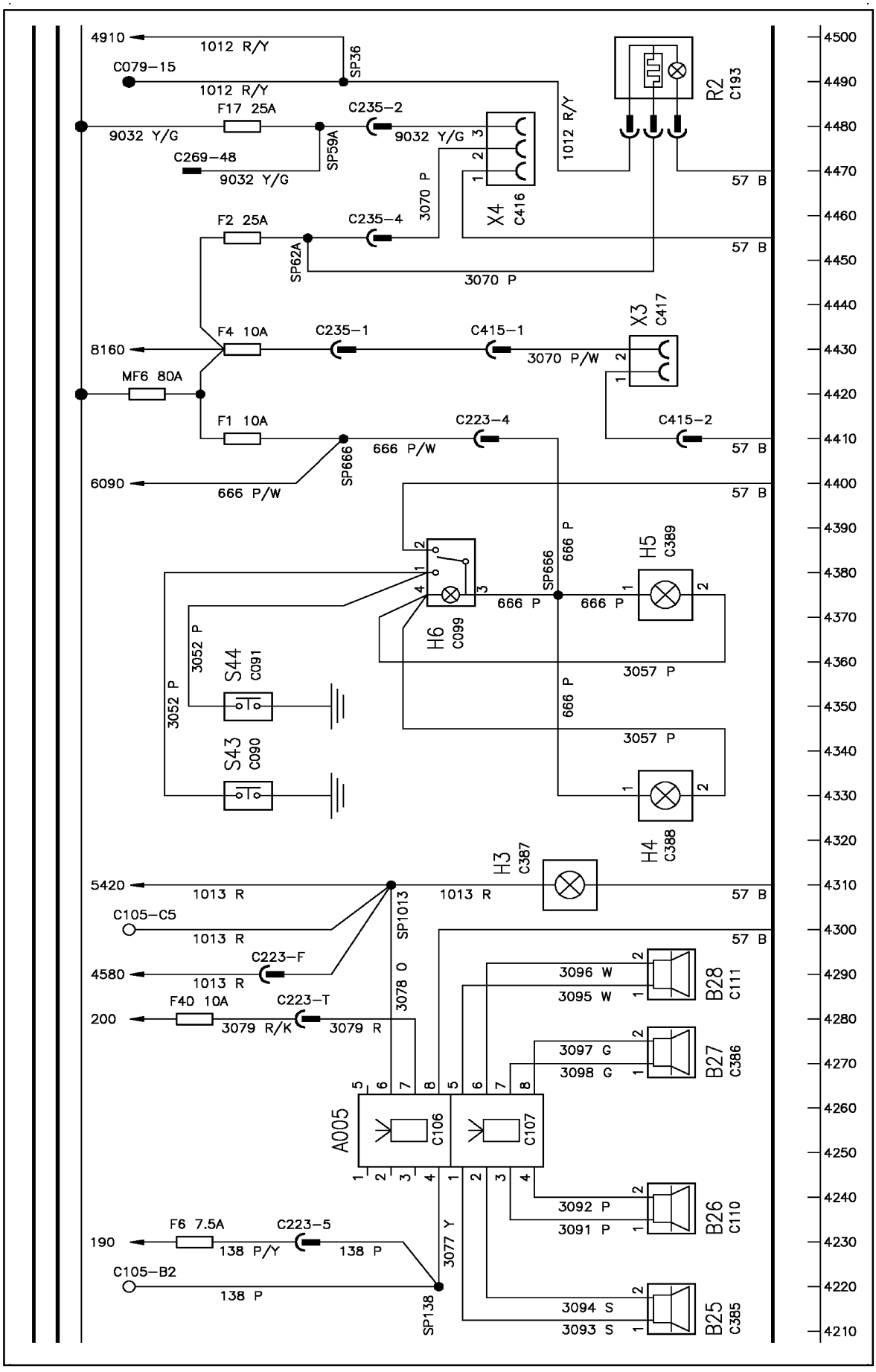
Y26 Front Suspension Lower Lockout Solenoid

Y27 Front Suspension Raise Solenoid

Y28 Front Suspension Raise Lockout Solenoid

S42 Front Suspension Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4910
1012 R/Y
SP36
C079-15
1012 R/Y
F17 25A
C235-2
9032 Y/G
9032 Y/G
SP59A
C269-48
9032 Y/G
3070 P
X4 C416
1012 R/Y
R2 C193
57 B
F2 25A
C235-4
SP62A
3070 P
57 B
F4 10A
C235-1
C415-1
3070 P/W
X3 C417
8160
MF6 80A
F1 10A
C223-4
C415-2
SP666
666 P/W
57 B
6090
666 P/W
57 B
SP666
666 P
H5 C389
666 P
666 P
H6 C099
3057 P
3052 P
S44 C091
3052 P
666 P
3057 P
S43 C090
H4 C388
H3 C387
5420
1013 R
1013 R
57 B
C105-C5
1013 R
SP1013
57 B
C223-F
4580
1013 R
3078 O
3096 W
3095 W
B28 C111
F40 10A
C223-T
200
3079 R/K
3079 R
3097 G
3098 G
B27 C386
A005
C106
C107
3092 P
3091 P
B26 C110
F6 7.5A
C223-5
190
138 P/Y
138 P
3077 Y
C105-B2
138 P
SP138
3094 S
3093 S
B25 C385
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

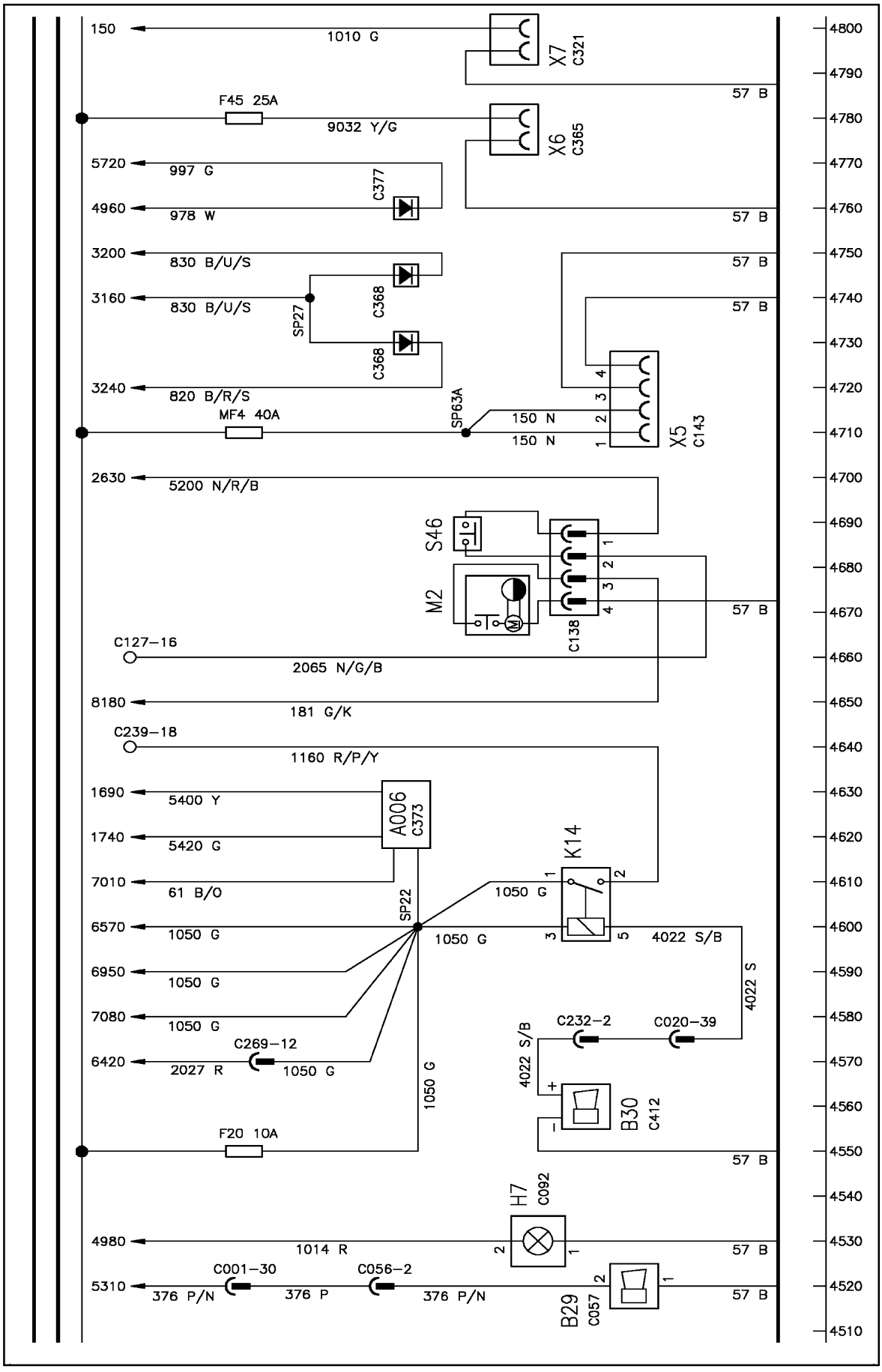
24x24 Transmission, W/Cab, W/Electronic Engine

CAB ACCESSORIES 1
Line 4210-4500

MF6	Maxi Fuse - 80A
F1	Fuse - 10A
F2	Fuse - 25A
F4	Fuse - 10A
F6	Fuse - 7.5A
F17	Fuse - 25A
F40	Fuse - 10A
A005	Radio
B25	Speaker L/H Rear
B26	Speaker R/H Front
B27	Speaker R/H Rear
B28	Speaker L/H Front

H3	Console Lamp R/H
H4	Puddle Lamp L/H
H5	Puddle Lamp R/H
H6	Interior Lamp
S43	Door Switch L/H
S44	Door Switch R/H
X3	8 Amp Terminals
X4	20 Amp Multi Socket
R2	Cigar Lighter

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

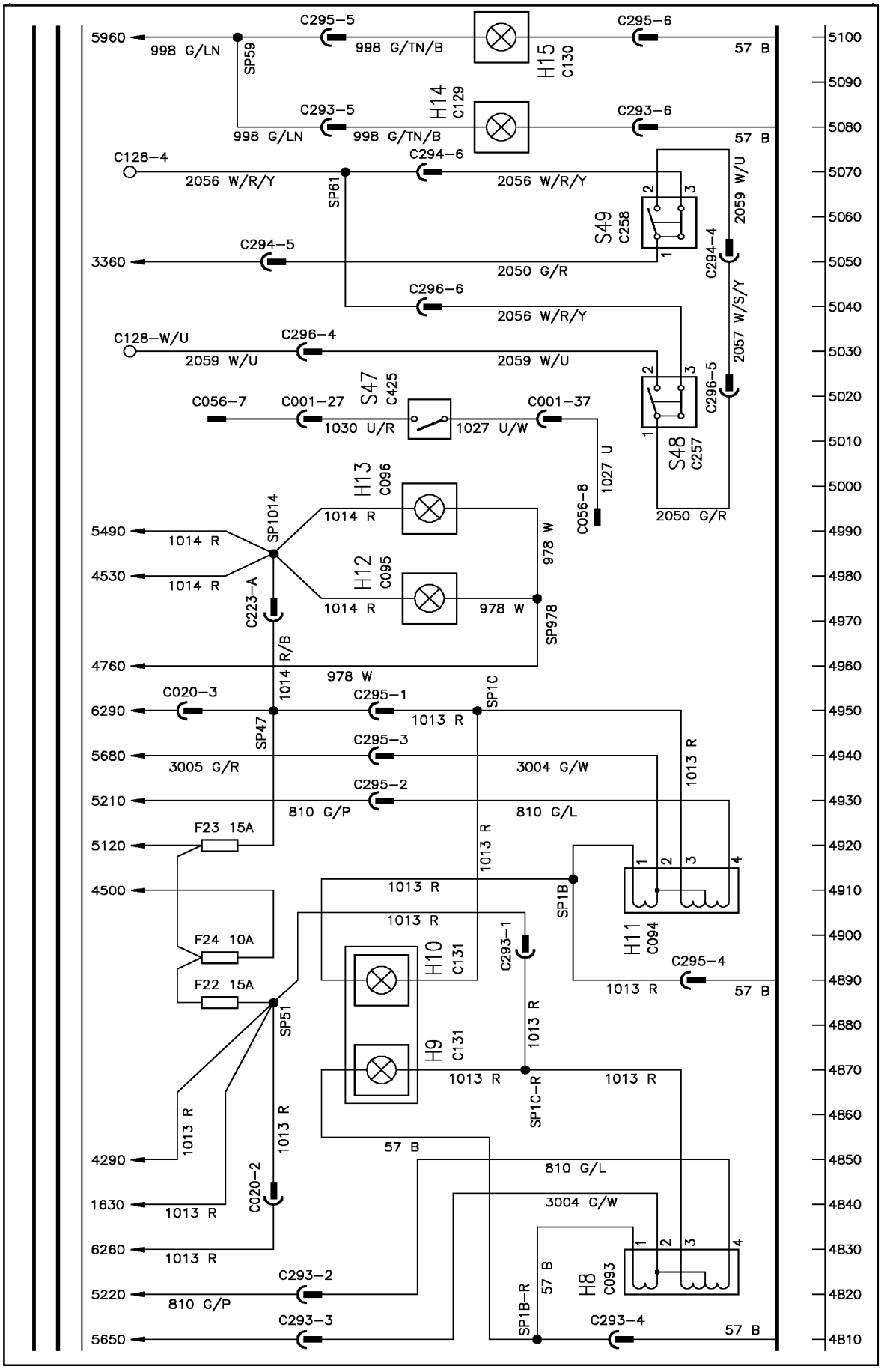

150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
C368
57 B
3240
820 B/R/S
SP63A
MF4 40A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
7010
61 B/O
SP22
K14
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
7080
1050 G
4022 S
C232-2
C020-39
C269-12
6420
2027 R
1050 G
4022 S/B
1050 G
B30
C412
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

24x24 Transmission, W/Cab, W/Electronic Engine

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X6	8 Amp Socket
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode
C377	Diode

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

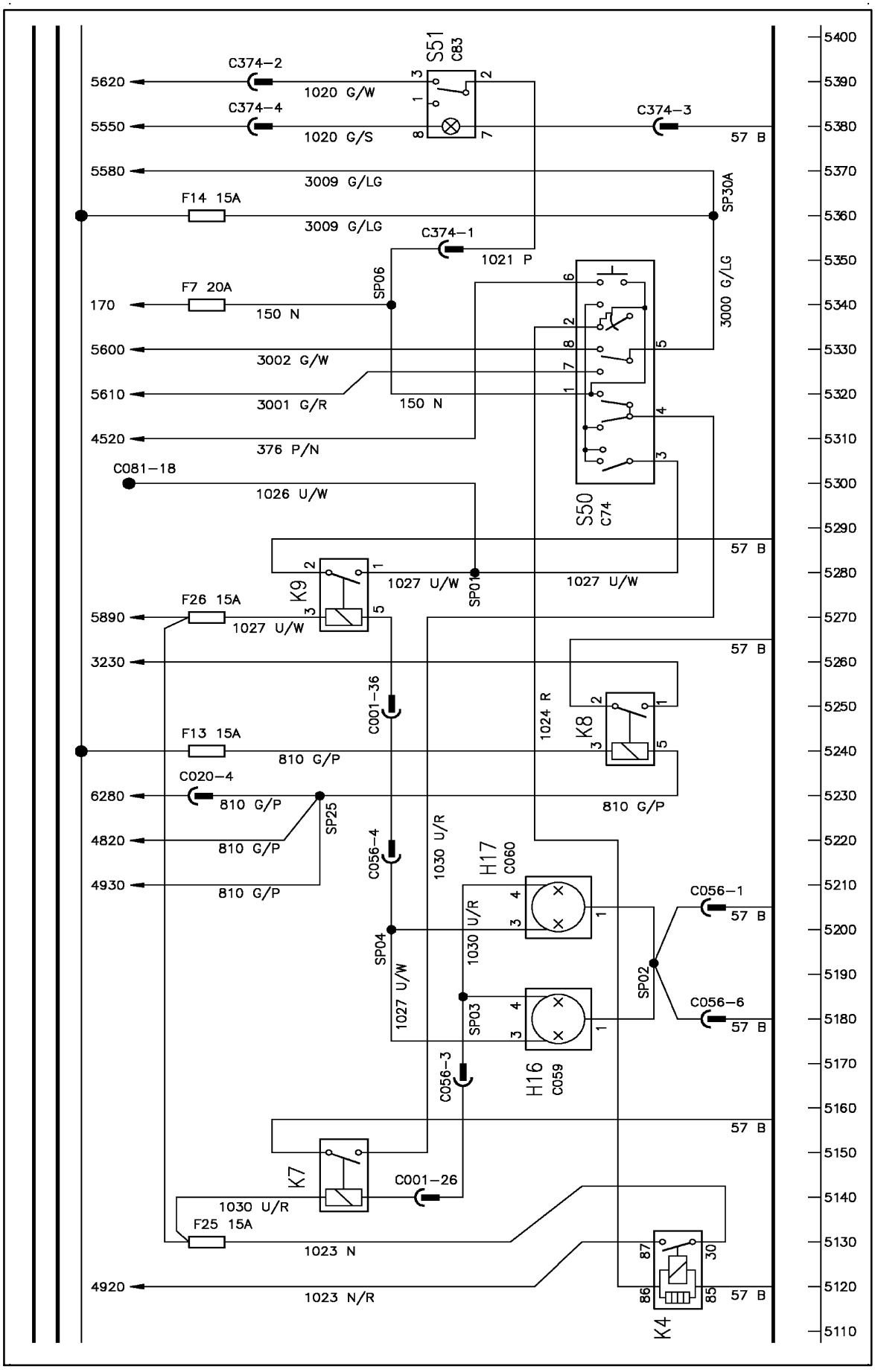

5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
C294-4
C294-5
3360
2050 G/R
C296-6
2056 W/R/Y
C128-W/U
2059 W/U
C296-4
2059 W/U
2057 W/S/Y
C296-5
C056-7
C001-27
S47 C425
1030 U/R
1027 U/W
C001-37
1027 U
S48 C257
C056-8
2050 G/R
H13 C096
SP1014
1014 R
5490
1014 R
4530
1014 R
H12 C095
1014 R
978 W
978 W
SP978
C223-A
4760
1014 R/B
978 W
C020-3
6290
SP47
1014
C295-1
1013 R
SP1C
C295-3
5680
3005 G/R
3004 G/W
1013 R
C295-2
5210
810 G/P
810 G/L
F23 15A
5120
1013 R
4500
1013 R
SP1B
H11 C094
1013 R
F24 10A
1013 R
H10 C131
C293-1
C295-4
1013 R
57 B
F22 15A
SP51
H9 C131
1013 R
1013 R
1013 R
SP1C-R
1013 R
4290
1013 R
1013 R
57 B
C020-2
810 G/L
1630
1013 R
3004 G/W
6260
1013 R
H8 C093
C293-2
5220
810 G/P
SP1B-R
57 B
C293-3
5650
C293-4
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810

24x24 Transmission, W/Cab, W/Electronic Engine

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A
H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender
H10	Licence Plate Lamp - Fender
H11	Stop/Tail Light L/H
H12	Licence Plate Lamp L/H
H13	Licence Plate Lamp R/H
H14	Worklamp - Fender R/H
H15	Worklamp - Fender L/H
S47	Aux Headlamp Switch
S48	PTO Fender Switch L/H
S49	PTO Fender Switch R/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

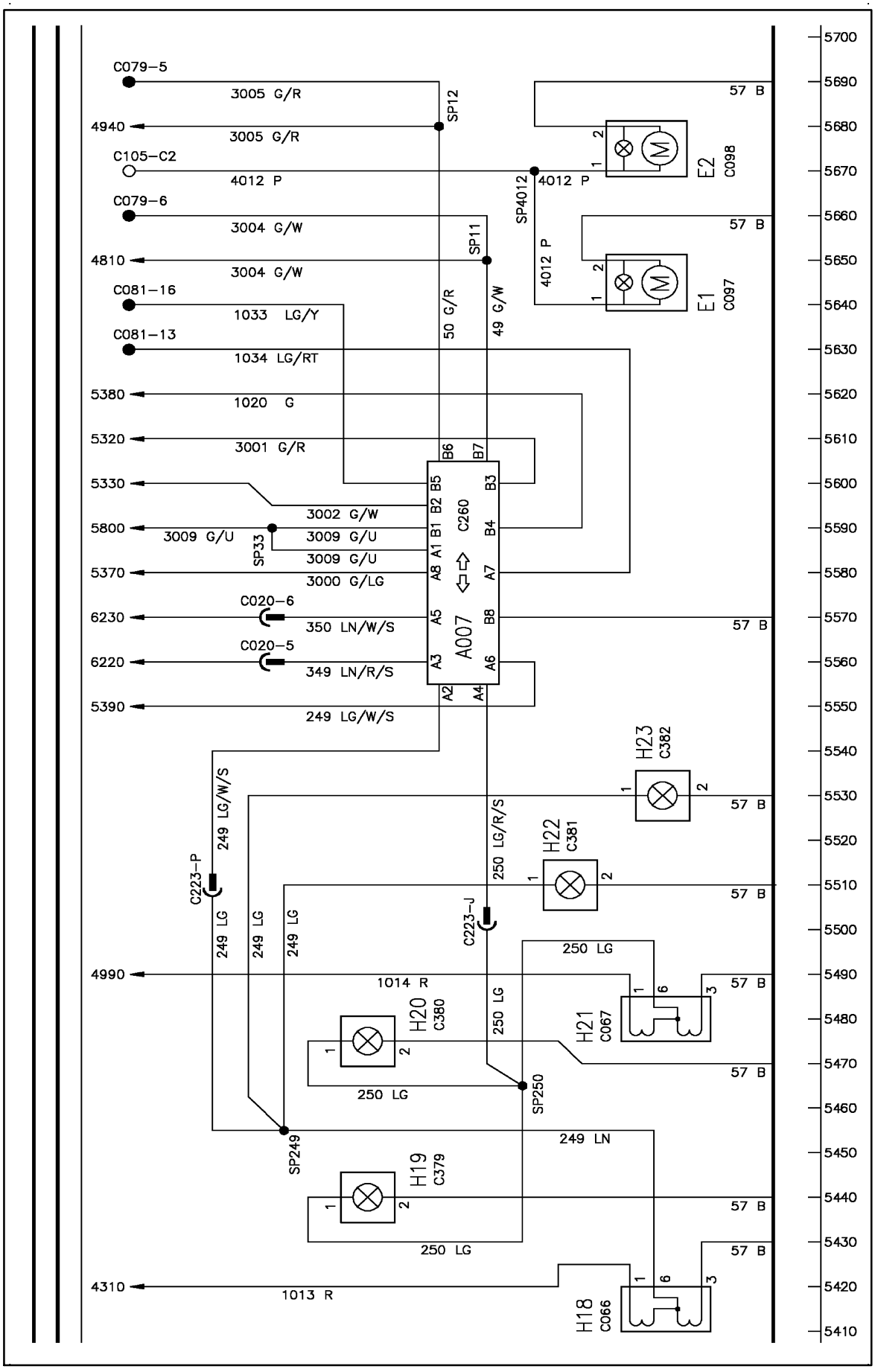

S51
C83
C374-2
C374-4
C374-3
C374-1
5620
5550
5580
1020 G/W
1020 G/S
3009 G/LG
57 B
F14 15A
SP30A
3009 G/LG
1021 P
SP06
F7 20A
170
150 N
5600
3002 G/W
5610
3001 G/R
150 N
4520
376 P/N
3000 G/LG
C081-18
1026 U/W
S50
C74
57 B
K9
1027 U/W
SP01
1027 U/W
F26 15A
5890
1027 U/W
3230
57 B
C001-36
F13 15A
810 G/P
1024 R
K8
C020-4
6280
810 G/P
810 G/P
SP25
4820
810 G/P
4930
810 G/P
C056-4
1030 U/R
H17
C060
C056-1
57 B
SP04
1030 U/R
1027 U/W
SP03
SP02
C056-6
57 B
H16
C059
C056-3
57 B
K7
C001-26
1030 U/R
F25 15A
1023 N
4920
1023 N/R
K4
57 B
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

24x24 Transmission, W/Cab, W/Electronic Engine

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

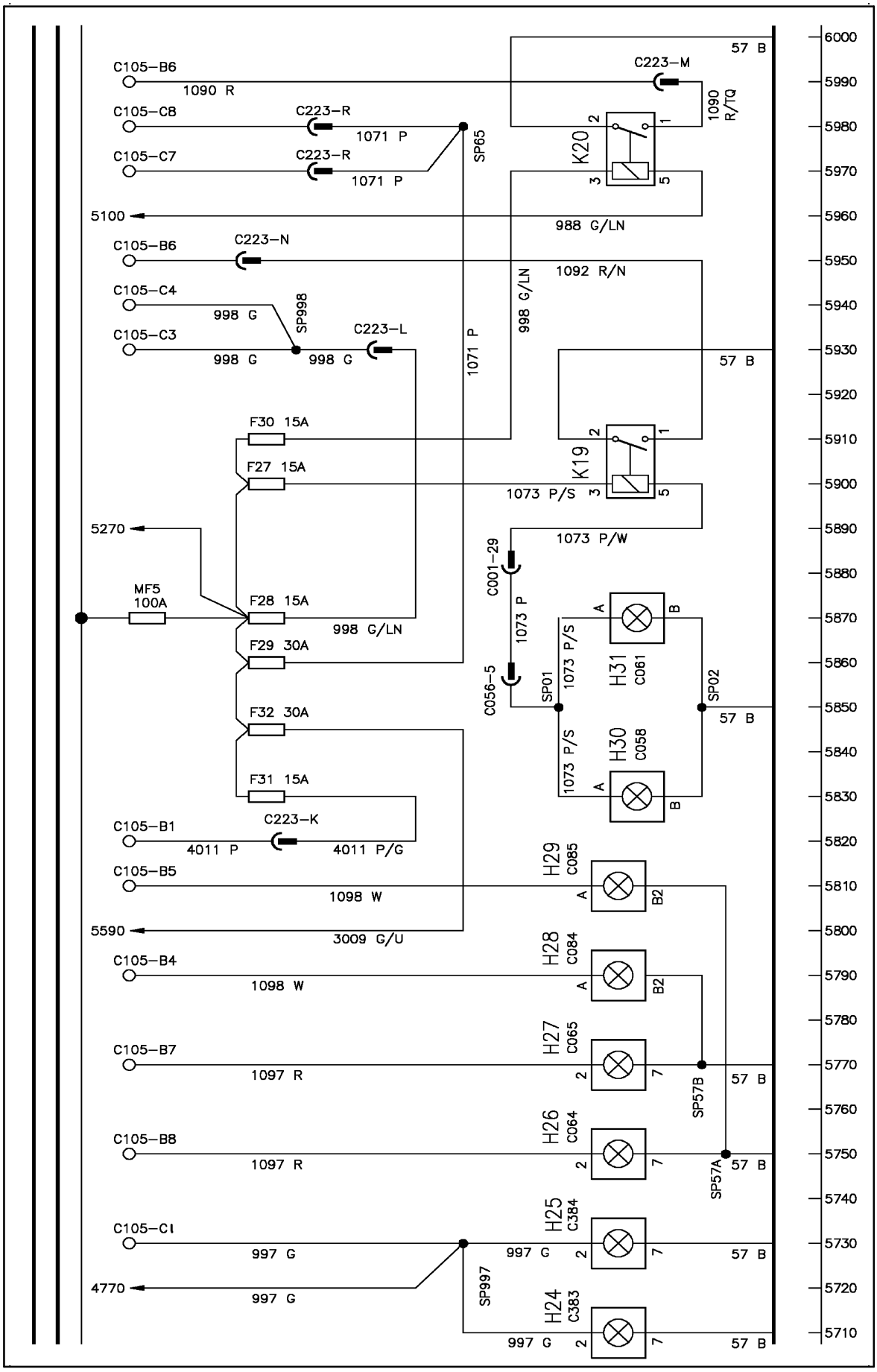

C079-5
3005 G/R
SP12
4940
3005 G/R
C105-C2
4012 P
C079-6
3004 G/W
SP11
4810
3004 G/W
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
C020-5
6220
349 LN/R/S
5390
249 LG/W/S
50 G/R
49 G/W
SP4012
4012 P
4012 P
57 B
E2
C098
E1
C097
A007
C260
B6
B7
B5
B3
B2
B4
B1
A1
A8
A7
A5
B8
A3
A6
A2
A4
H23
C382
H22
C381
250 LG/R/S
C223-P
249 LG
249 LG
249 LG
C223-J
250 LG
4990
1014 R
H20
C380
250 LG
H21
C067
SP250
250 LG
SP249
249 LN
H19
C379
250 LG
4310
1013 R
H18
C066
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

24x24 Transmission, W/Cab, W/Electronic Engine

INDICATORS AND HAZARDS 3
Line 5410-5700

A007	Flasher Unit
E1	Rotating Beacon L/H
E2	Rotating Beacon L/H
H18	Grabrail Side Lamp R/H
H19	SMV Lamp L/H Front
H20	SMV Lamp L/H Rear
H21	Grabrail Side Lamp L/H
H22	SMV Lamp R/H Front
H23	SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C105-B6
1090 R
C105-C8
C223-R
1071 P
C105-C7
C223-R
1071 P
SP65
57 B
C223-M
1090 R/TQ
K20
5100
988 G/LN
C105-B6
C223-N
1092 R/N
C105-C4
998 G
SP998
C105-C3
998 G
998 G
C223-L
998 G/LN
1071 P
57 B
F30 15A
F27 15A
K19
1073 P/S
1073 P/W
5270
C001-29
MF5
100A
F28 15A
998 G/LN
F29 30A
1073 P
C056-5
SP01
1073 P/S
H31
C061
SP02
57 B
F32 30A
1073 P/S
H30
C058
F31 15A
C105-B1
C223-K
4011 P
4011 P/G
C105-B5
1098 W
H29
C085
5590
3009 G/U
C105-B4
1098 W
H28
C084
C105-B7
1097 R
H27
C065
SP57B
57 B
C105-B8
1097 R
H26
C064
SP57A
57 B
C105-C1
997 G
997 G
H25
C384
57 B
4770
997 G
SP997
H24
C383
997 G
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

24x24 Transmission, W/Cab, W/Electronic Engine

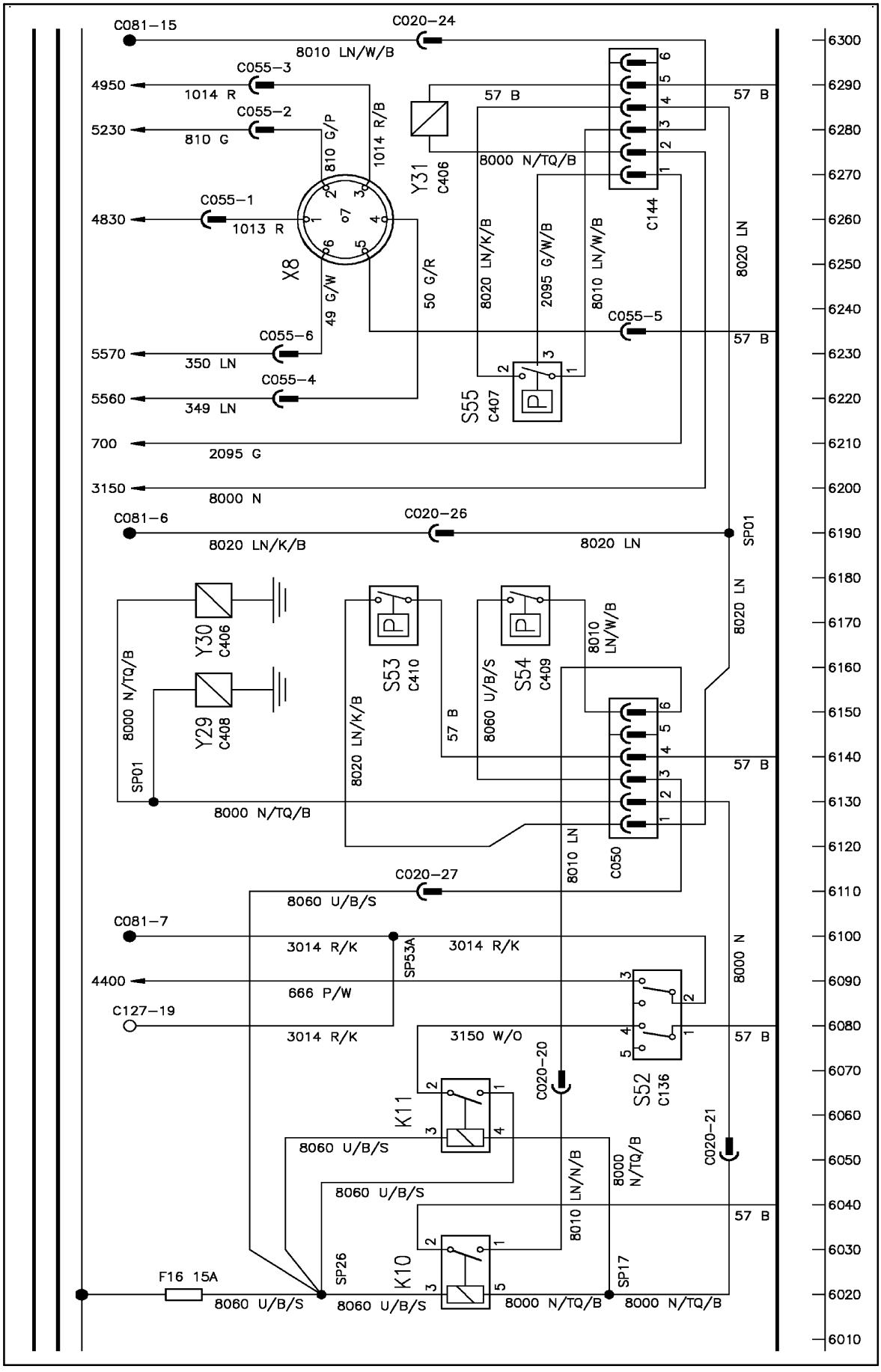
WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F28 Fuse - 15A
F29 Fuse - 30A
F30 Fuse - 15A
F31 Fuse - 15A
F32 Fuse - 30A

H24 Worklamp - Rear L/H
H25 Worklamp - Rear R/H
H26 Worklamp - Grabrail R/H
H27 Worklamp - Grabrail L/H
H28 Worklamp - Upper Front L/H
H29 Worklamp - Upper Front R/H
H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
C055-3
4950
1014 R
C055-2
5230
810 G
C055-1
4830
1013 R
X8
810 G/P
1014 R/B
49 G/W
50 G/R
Y31
C406
57 B
8000 N/TQ/B
8020 LN/K/B
2095 G/W/B
8010 LN/W/B
C144
8020 LN
C055-5
57 B
C055-6
5570
350 LN
C055-4
5560
349 LN
S55
C407
700
2095 G
3150
8000 N
C081-6
C020-26
8020 LN/K/B
8020 LN
SP01
Y30
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8060 U/B/S
8010 LN/W/B
8020 LN/K/B
C050
8010 LN
C020-27
8060 U/B/S
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3150 W/O
C020-20
K11
S52
C136
C020-21
8000 N
8000 LN/N/B
F16 15A
SP26
K10
SP17
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse – 15A

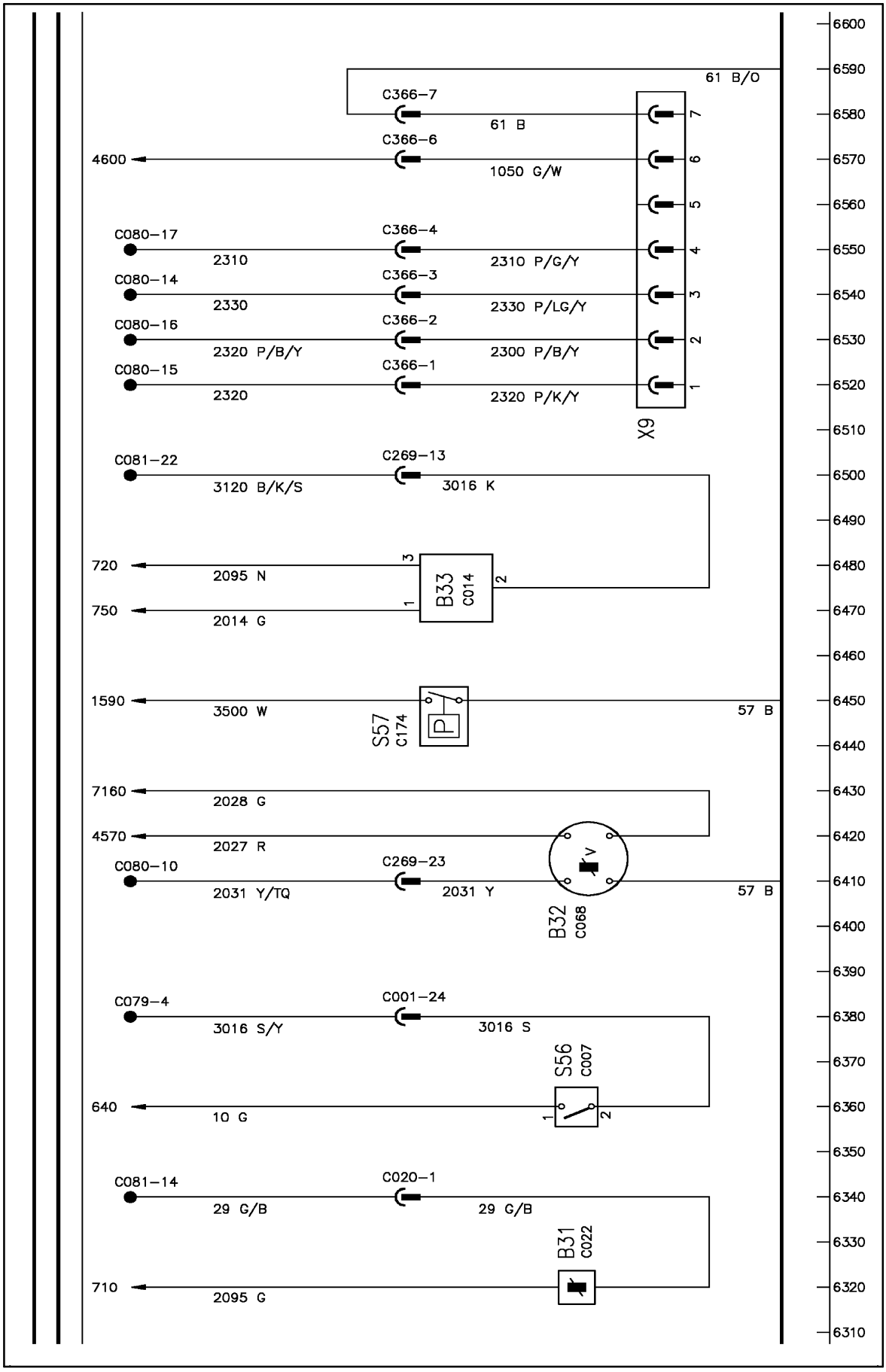
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch
S55 Air Brake Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y30 Italian Trailer Brake Solenoid
Y31 Air Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
57 B
B32
C068
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G

24x24 Transmission, W/Cab, W/Electronic Engine

SENSORS
Line 6310-6600

B31 Fuel Tank Sender

B32 Radar Gun

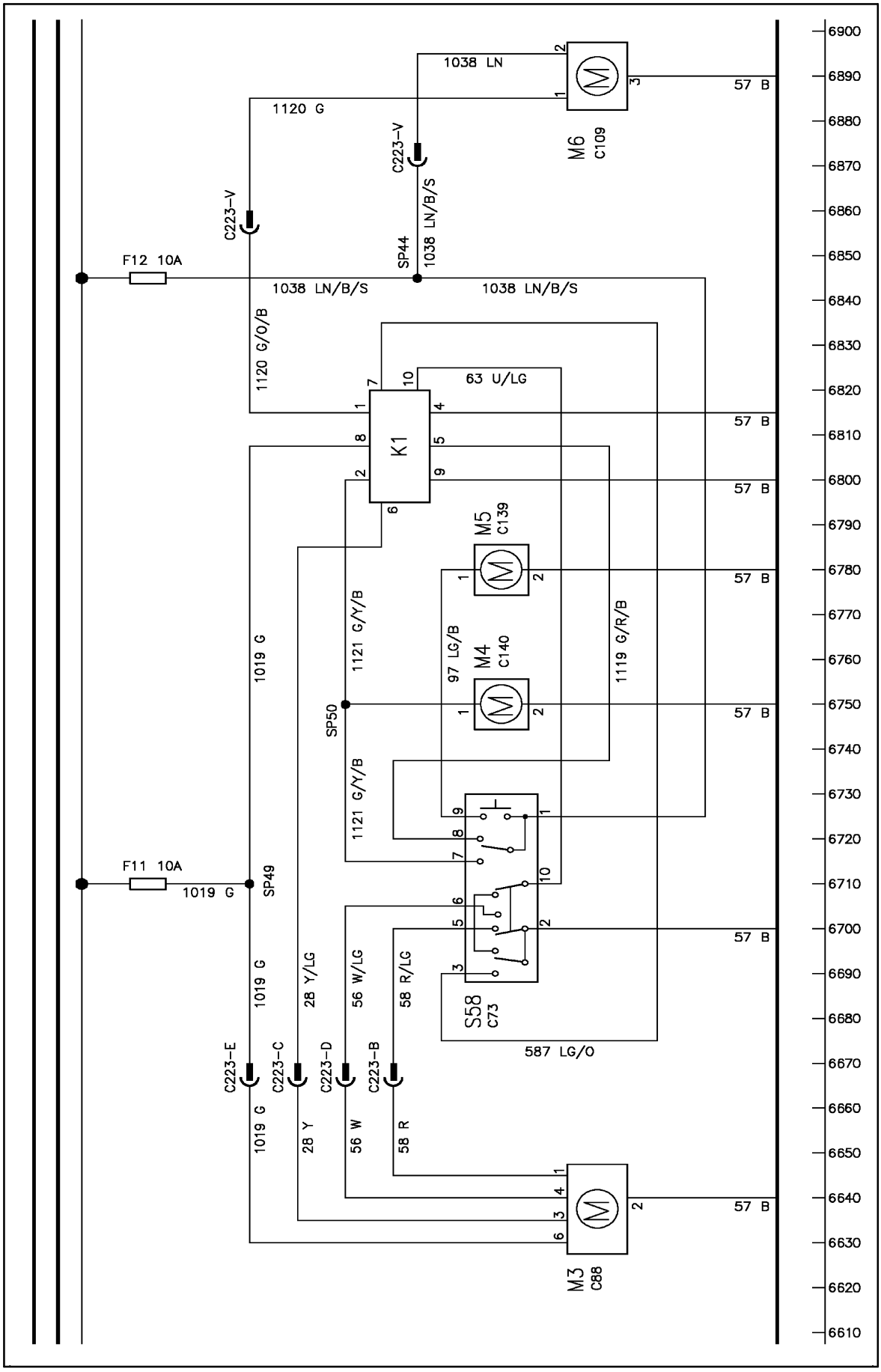
B33 Steering Angle Sensor

S56 Brake Fluid Level Switch

S57 Power Assisted Steering Pressure Switch

X9 Radar Extension Harness Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

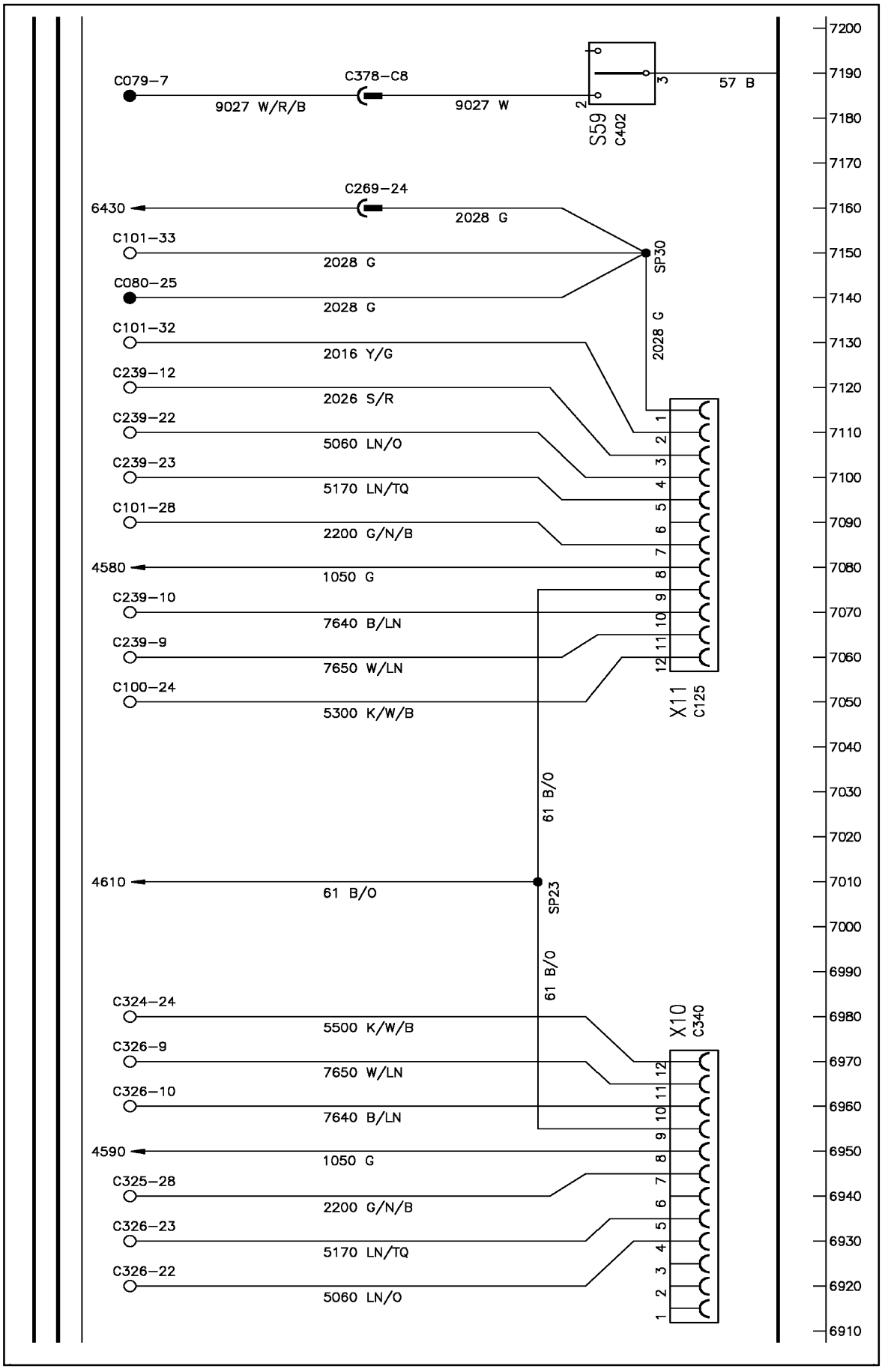

6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610
1038 LN
1120 G
C223-V
C223-V
SP44
1038 LN/B/S
F12 10A
1038 LN/B/S
1038 LN/B/S
1120 G/O/B
63 U/LG
57 B
57 B
57 B
57 B
57 B
57 B
57 B
M6
C109
K1
M5
C139
M4
C140
S58
C73
M3
C88
1019 G
1121 G/Y/B
97 LG/B
1121 G/Y/B
1119 G/R/B
SP50
F11 10A
1019 G
SP49
1019 G
28 Y/LG
56 W/LG
58 R/LG
587 LG/O
C223-E
C223-C
C223-D
C223-B
1019 G
28 Y
56 W
58 R

24x24 Transmission, W/Cab, W/Electronic Engine

WASHERS AND WIPERS
Line 6510-6900

F11	Fuse - 10A	**M4**	Washer Motor - Rear
F12	Fuse - 10A	**M5**	Washer Motor - Front
K1	Front Windshield Wiper Module	**M6**	Wiper Motor - Rear
M3	Wiper Motor - Front	**S58**	Front and Rear Wiper/washer Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
2
3
57 B
S59
C402
C269-24
6430
2028 G
C101-33
2028 G
SP30
C080-25
2028 G
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
61 B/O
4610
61 B/O
SP23
61 B/O
C324-24
5500 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

24x24 Transmission, W/Cab, W/Electronic Engine

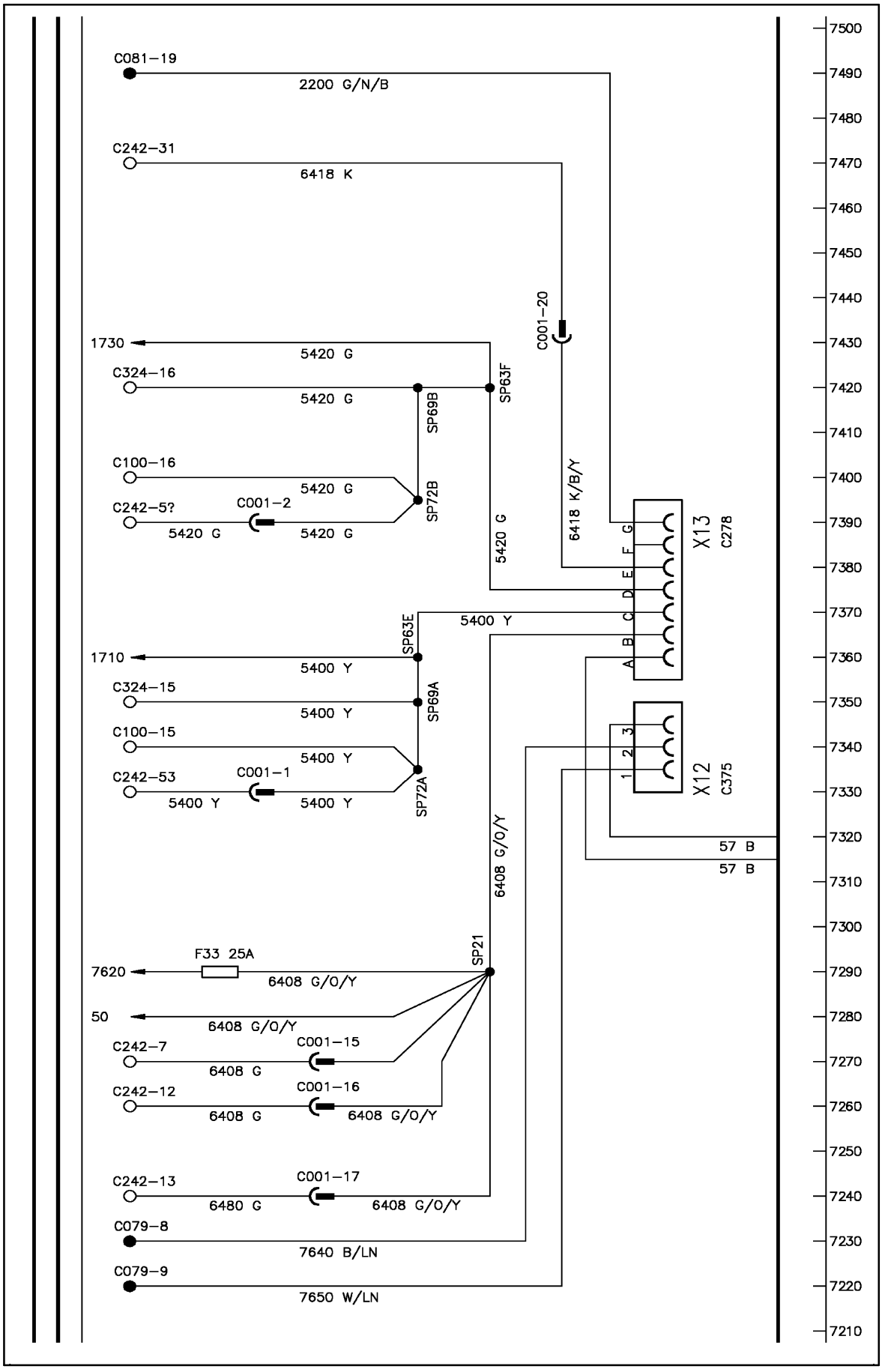
DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)

X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
5420 G
6418 K/B/Y
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

24x24 Transmission, W/Cab, W/Electronic Engine

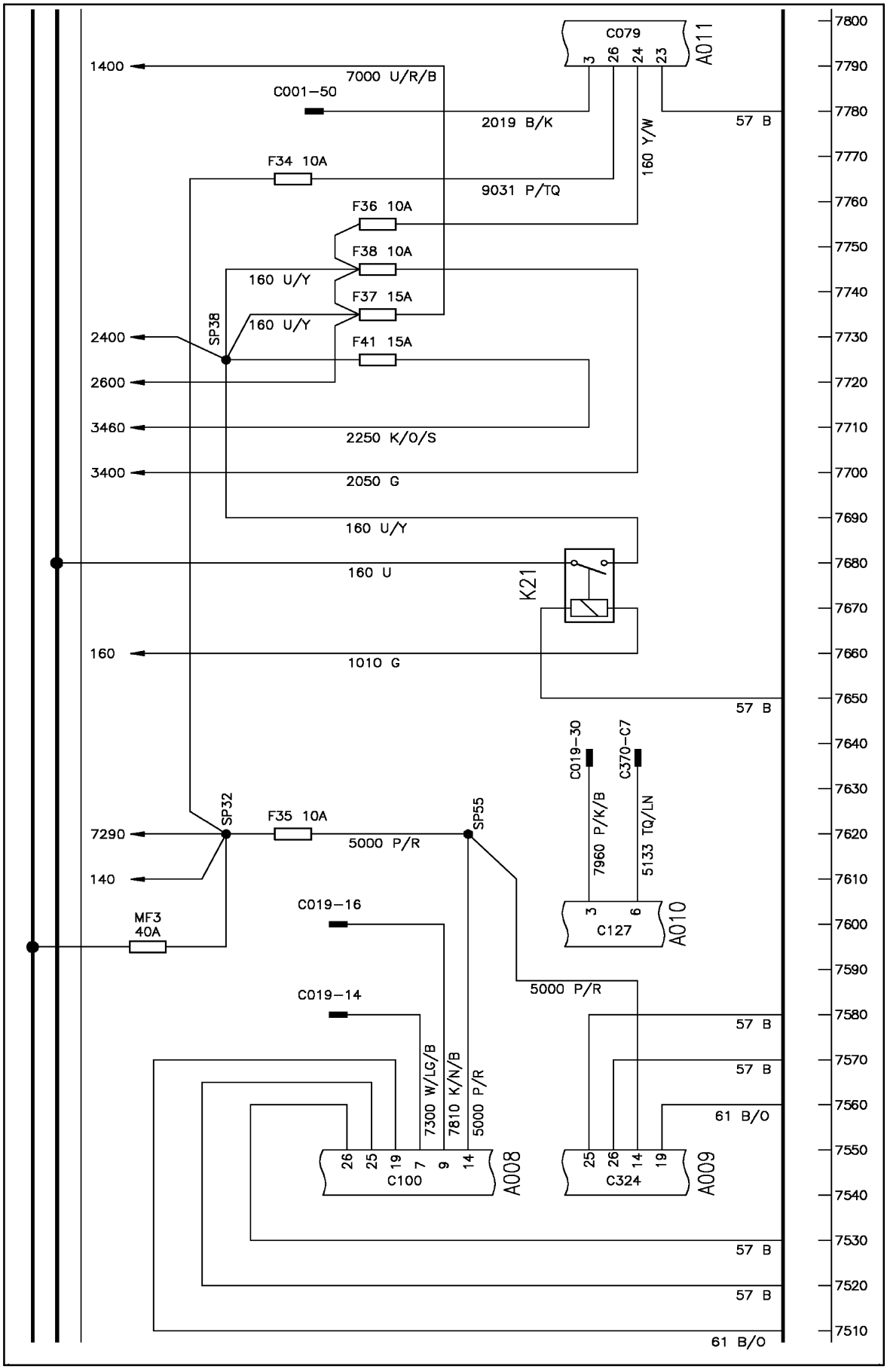
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector

X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079
A011
3
26
24
23
1400
7000 U/R/B
C001-50
2019 B/K
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3460
2250 K/O/S
3400
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C019-30
C370-C7
7960 P/K/B
5133 TQ/LN
SP32
F35 10A
SP55
7290
5000 P/R
140
MF3
40A
C019-16
3
6
C127
A010
5000 P/R
C019-14
57 B
7300 W/LG/B
7810 K/N/B
5000 P/R
57 B
61 B/O
26
25
19
7
9
14
C100
A008
25
26
14
19
C324
A009
57 B
57 B
61 B/O
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

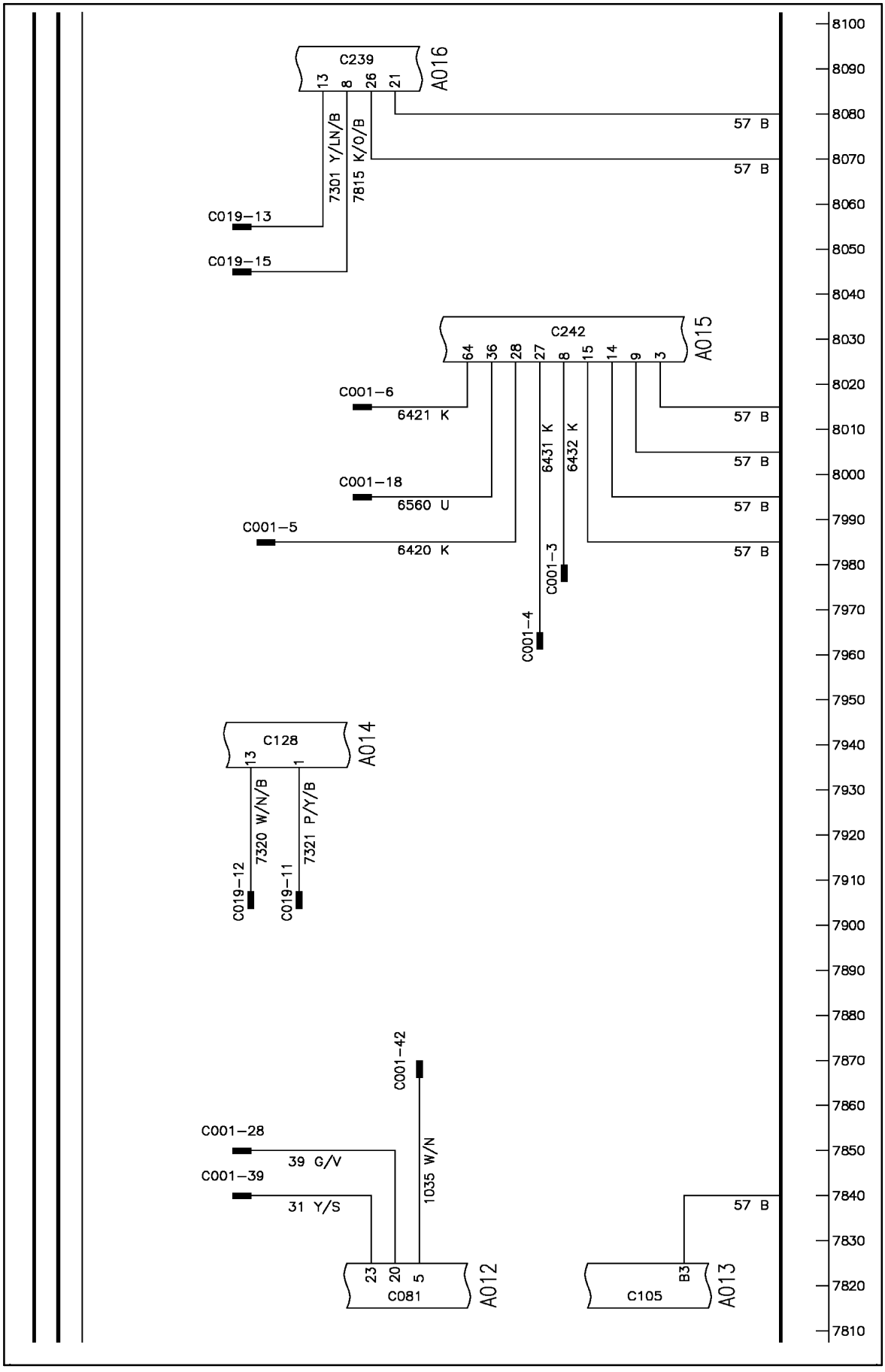
24x24 Transmission, W/Cab, W/Electronic Engine

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239
13
8
26
21
A016
57 B
57 B
7301 Y/LN/B
7815 K/O/B
C019-13
C019-15
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
57 B
57 B
C001-18
6560 U
57 B
C001-5
6420 K
57 B
6431 K
6432 K
C001-3
C001-4
C128
13
1
A014
7320 W/N/B
7321 P/Y/B
C019-12
C019-11
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012
57 B
B3
C105
A013
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

24x24 Transmission, W/Cab, W/Electronic Engine,

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A012 Instrument Cluster 3

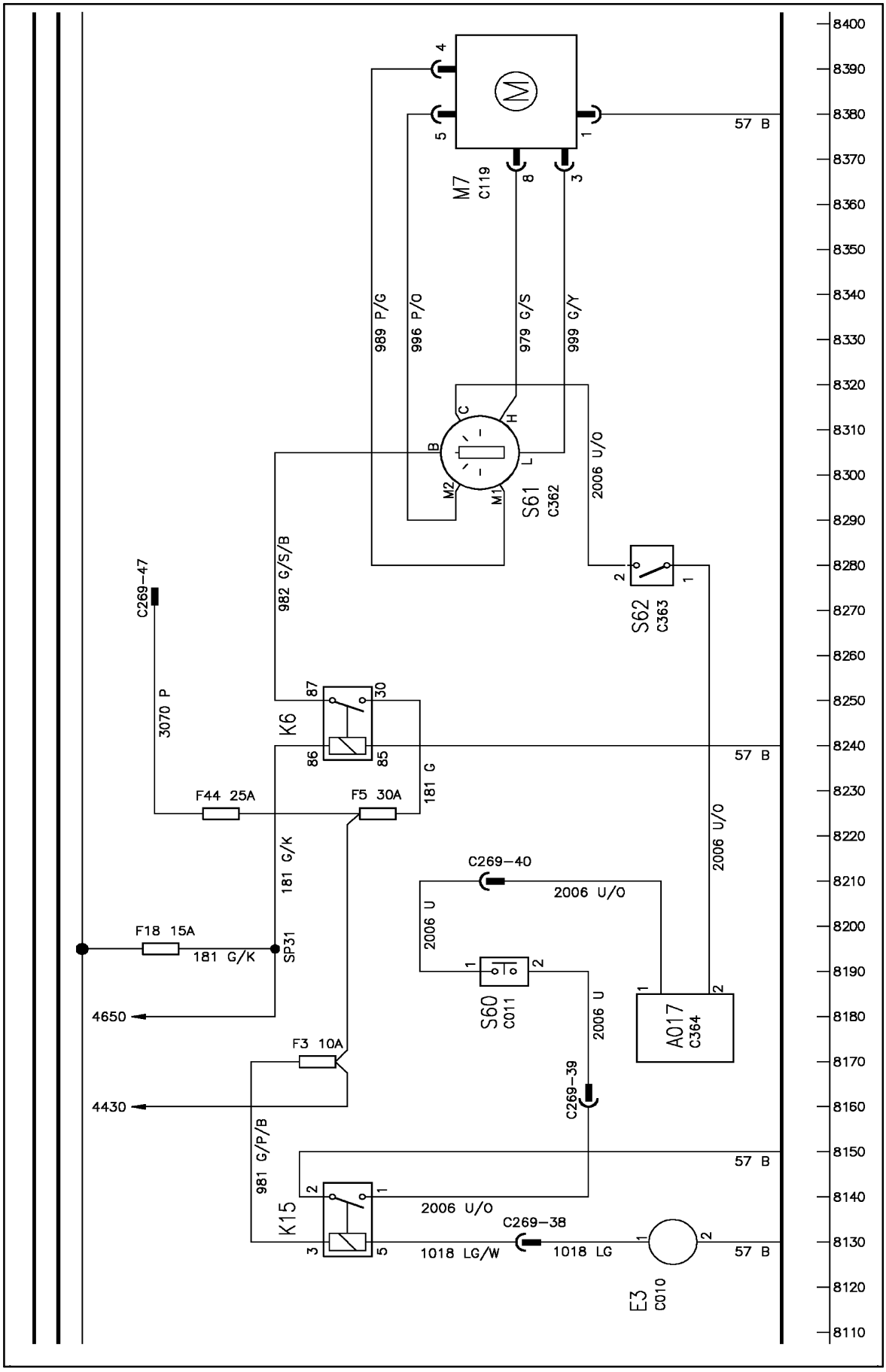
A013 Worklamp ECU

A014 XCM Central Control Unit (CN3-B)

A015 Engine ECU

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
M7
C119
57 B
989 P/G
996 P/O
979 G/S
999 G/Y
S61
C362
2006 U/O
S62
C363
C269-47
982 G/S/B
3070 P
K6
181 G
F44 25A
F5 30A
181 G/K
F18 15A
SP31
4650
C269-40
2006 U
S60
C011
A017
C364
F3 10A
4430
C269-39
981 G/P/B
K15
C269-38
1018 LG/W
1018 LG
E3
C010

24x24 Transmission, W/Cab, W/Electronic Engine

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

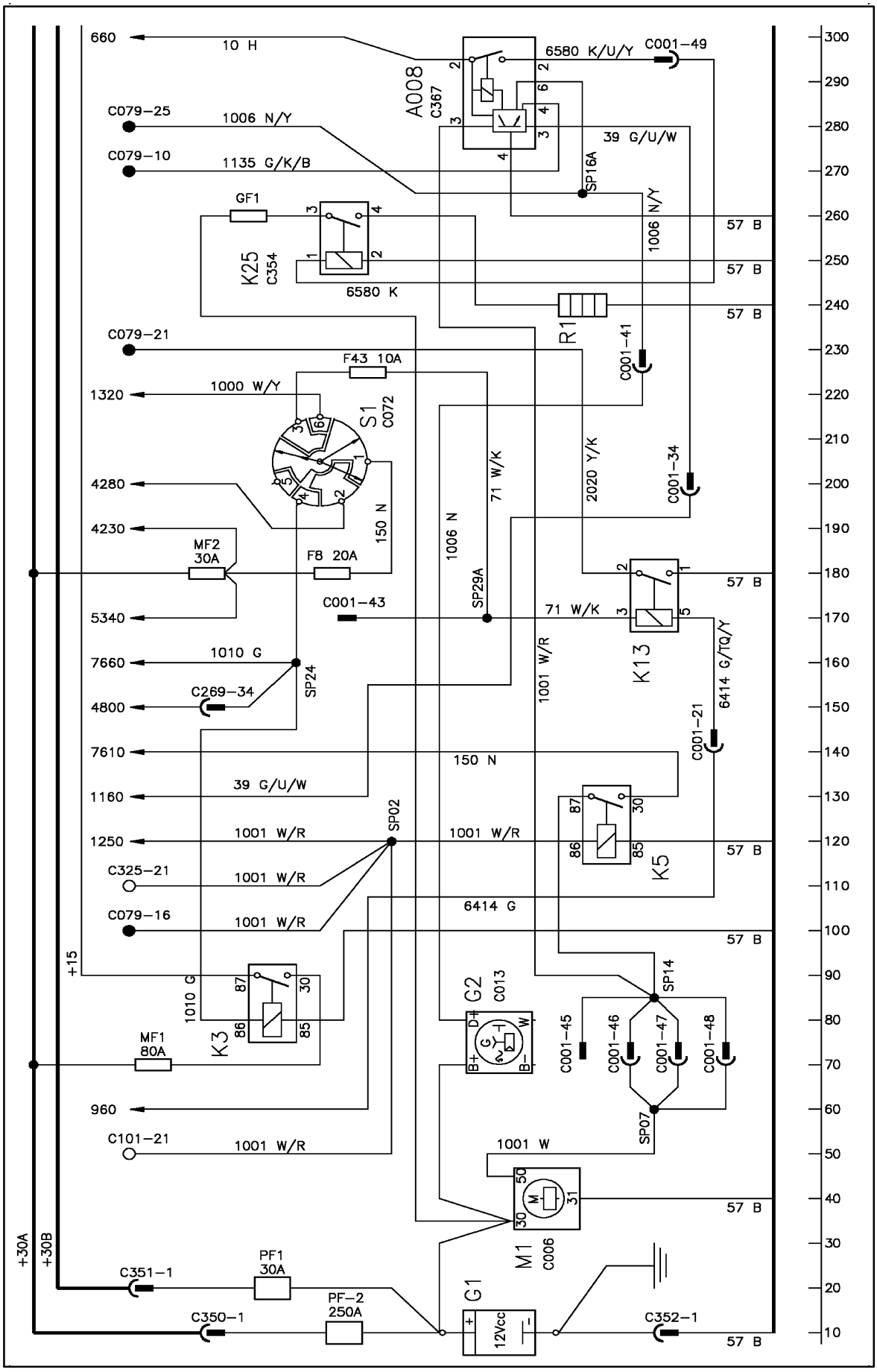
F3	Fuse - 10A	**K6**	Blower Motor Relay
F5	Fuse - 30A	**K15**	A/C Clutch Relay
F18	Fuse - 15A		
F44	Fuse - 25A	**M7**	Blower Unit
A017	HVAC Unit	**S60**	A/C Pressure Switch
		S61	Heater/Blower Switch
E3	A/C Clutch	**S62**	A/C Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

24X24 TRANSMISSION, W/CAB, W/MECHANICAL ENGINE

Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400

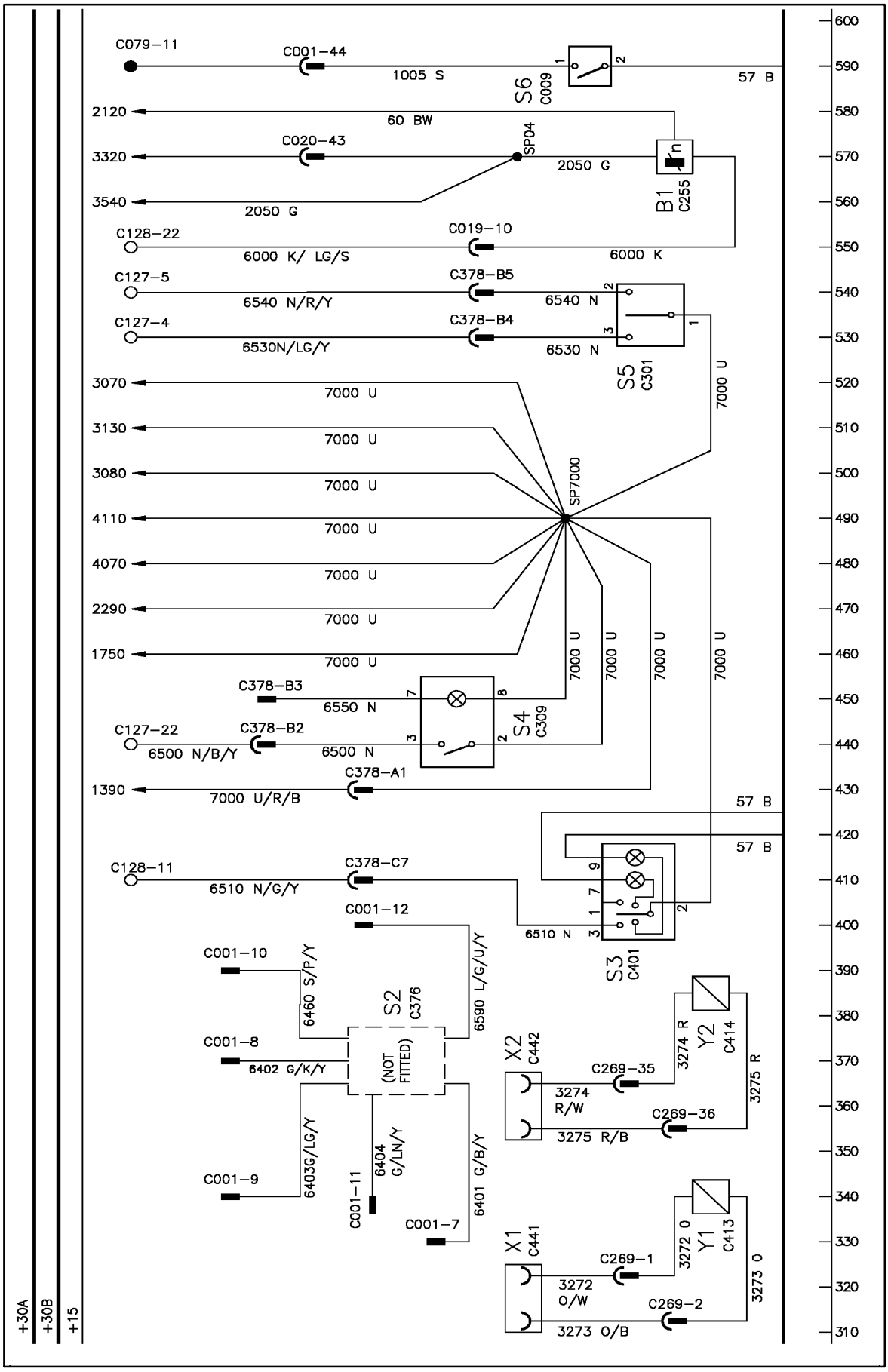

660
10 H
A008
C367
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C079-10
1135 G/K/B
39 G/U/W
SP16A
GF1
K25
C354
6580 K
1006 N/Y
57 B
R1
C001-41
C079-21
F43 10A
1320
1000 W/Y
S1
C072
4280
4230
MF2
30A
F8 20A
150 N
1006 N
71 W/K
2020 Y/K
C001-34
SP29A
C001-43
5340
7660
1010 G
SP24
C269-34
4800
K13
6414 G/TQ/Y
C001-21
7610
150 N
1160
39 G/U/W
1001 W/R
SP02
1250
C325-21
C079-16
K5
6414 G
+15
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
960
SP07
C101-21
1001 W
M1
C006
+30A
+30B
PF1
30A
C351-1
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

24x24 Transmission, W/Cab, W/Mechanical Engine

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A008	Grid Heater Module

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
6510 N
S3 C401
C001-12
C001-10
6460 S/P/Y
6590 L/G/U/Y
S2 C376
C001-8
6402 G/K/Y
(NOT FITTED)
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
C001-9
6403G/LG/Y
C001-11
6404 G/LN/Y
C001-7
6401 G/B/Y
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

24x24 Transmission, W/Cab, W/Mechanical Engine

ENGINE 1
line 310-600

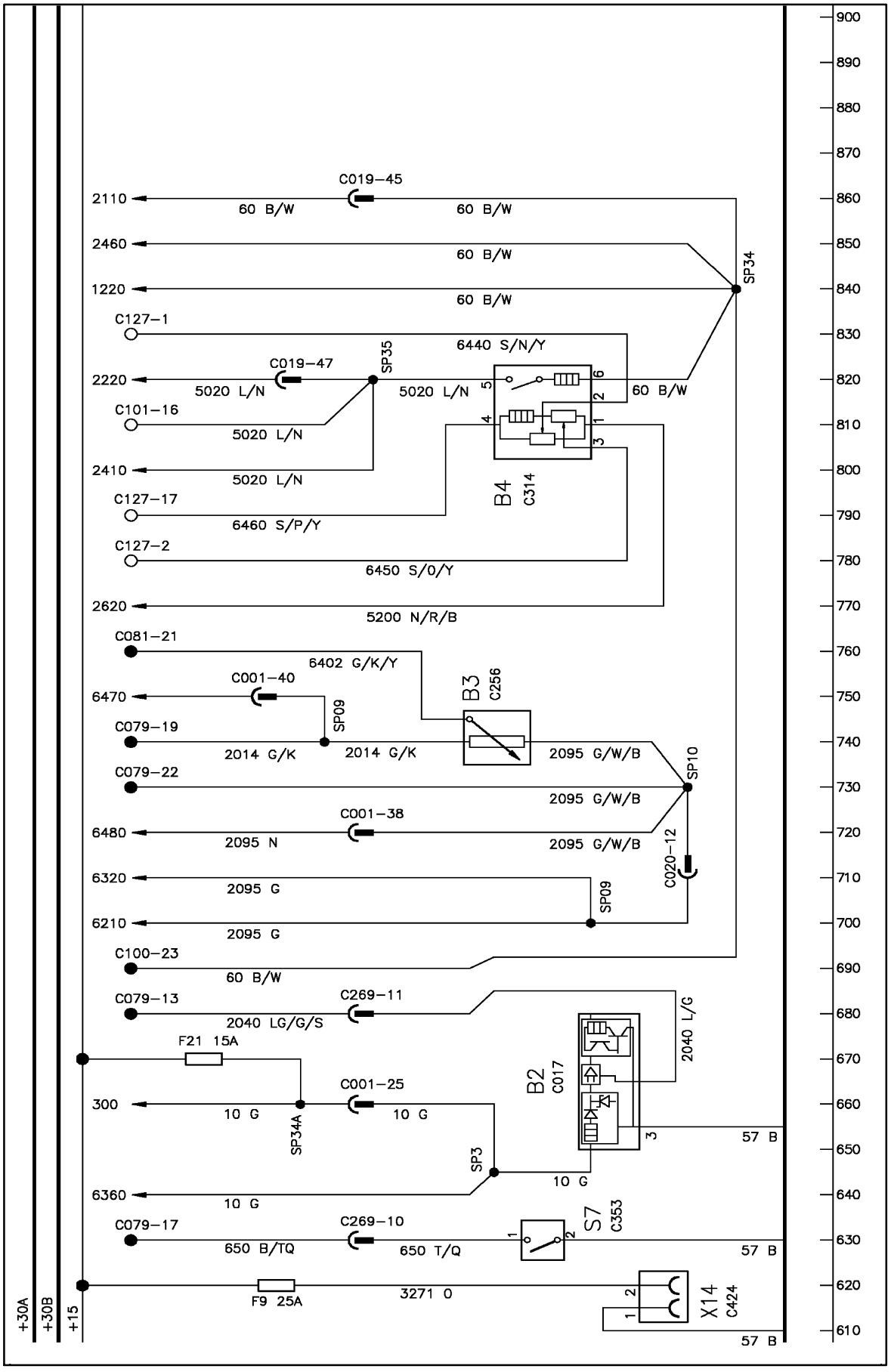
B1 Engine Flywheel Speed Sensor

S2 Foot Throttle - Electronic Engine (not fitted)
S3 Constant Engine Speed programme Switch
S4 Constant ERPM On/Off Switch
S5 Engine Inc./Dec. Switch
S6 Air Cleaner Switch

Y1 Loader Valve 1
Y2 Loader Valve 2

X1 Joystick Loader Control Socket 1
X2 Joystick Loader Control Socket 2

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

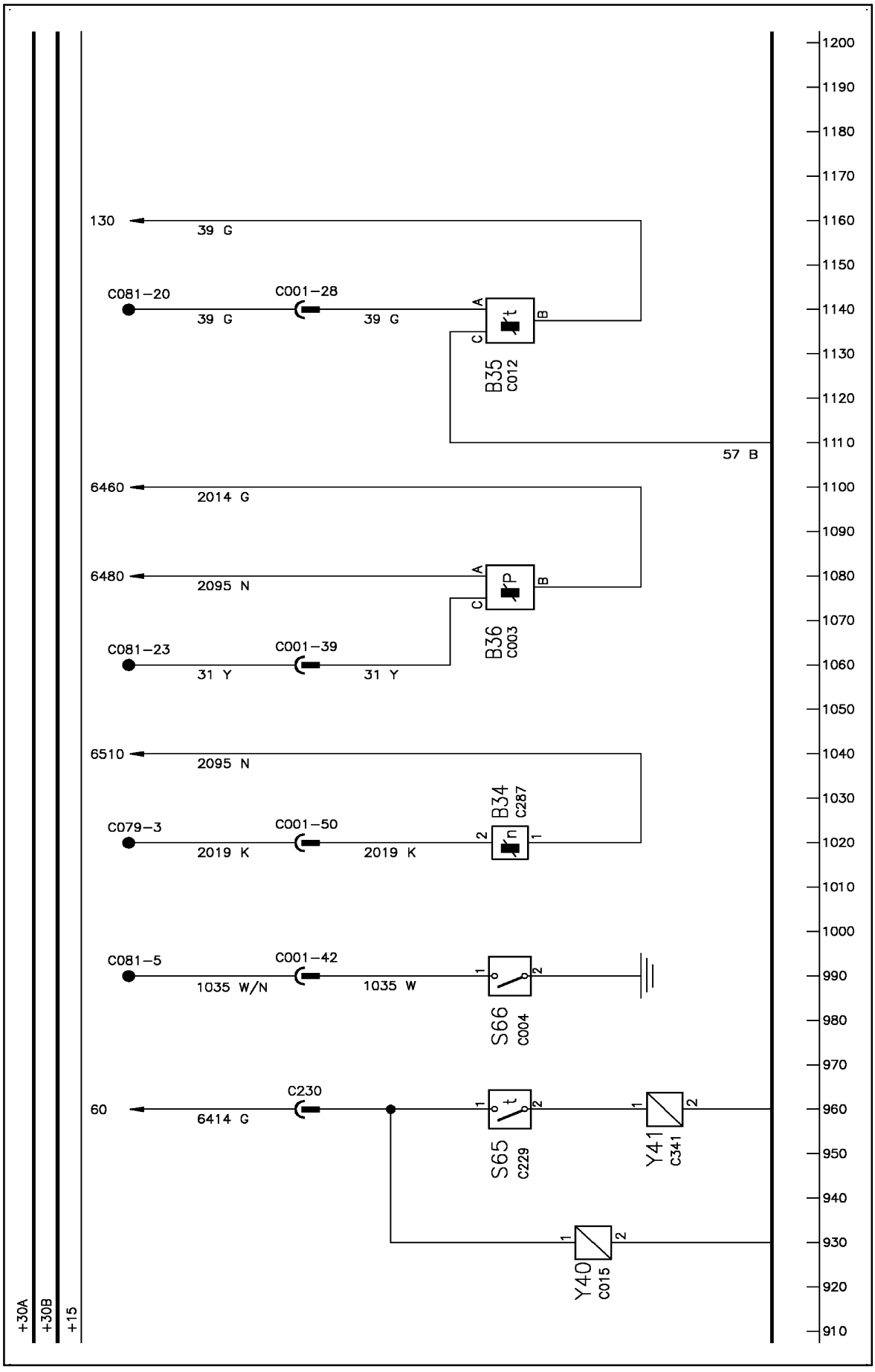

+30A
+30B
+15
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3
C256
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
300
10 G
C001-25
10 G
SP34A
SP3
57 B
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

24x24 Transmission, W/Cab, W/Mechanical Engine

ENGINE 2
line 610-900

F9	Fuse - 25A
F21	Fuse - 15A
B2	Water In Fuel Sensor
B3	Foot Throttle - Mechanical Engine
B4	Hand Throttle
S7	De-Gas Bottle
X14	Loader Power Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
130
39 G
C081-20
39 G
C001-28
39 G
B35
C012
57 B
6460
2014 G
6480
2095 N
C081-23
31 Y
C001-39
31 Y
B36
C003
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
C230
S65
C229
Y41
C341
Y40
C015

24x24 Transmission, W/Cab, W/Mechanical Engine

ENGINE 3
line 910-1200

B34 Engine Speed Sensor

B35 Coolant Temperature Sensor

B36 Oil Pressure Sensor

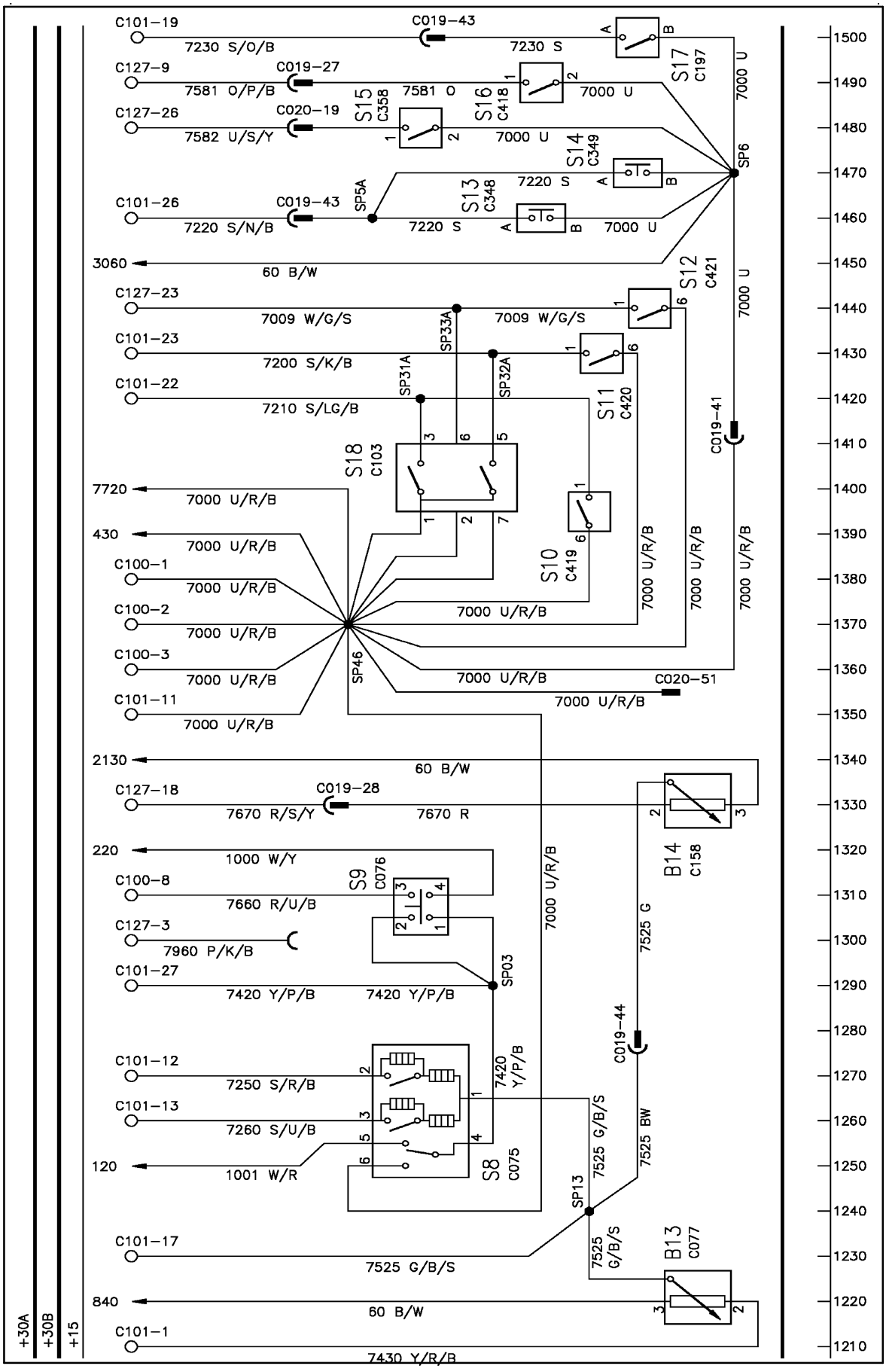
S65 Thermo Cold Advance Switch

S66 Oil Pressure Switch

Y40 Fuel Shut Off Solenoid

Y41 Cold Advance Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

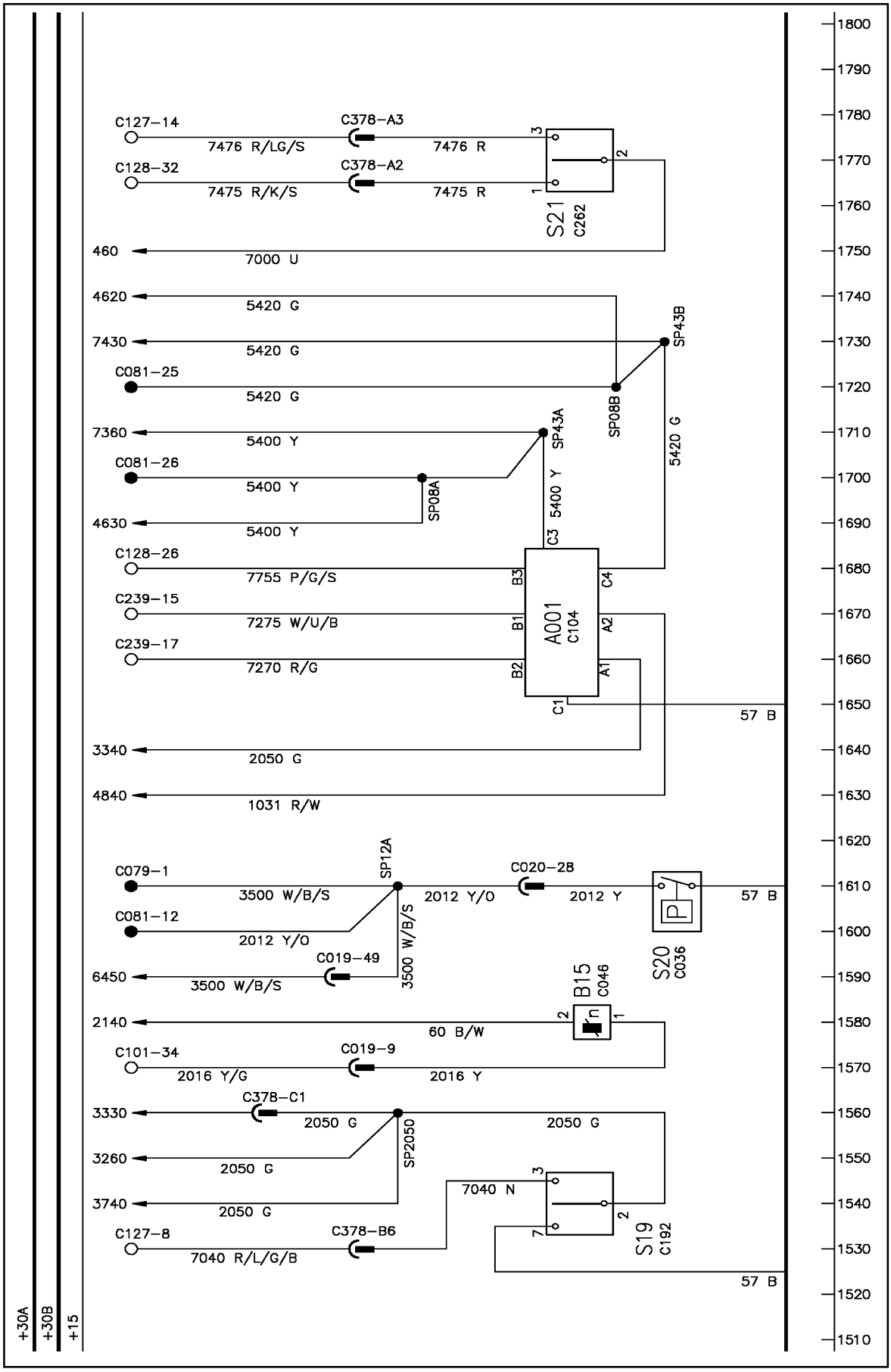

C101-19
C019-43
7230 S/O/B
7230 S
S17 C197
C127-9
C019-27
7581 O/P/B
S15 C358
7581 O
S16 C418
7000 U
C127-26
C020-19
7582 U/S/Y
7000 U
S14 C349
SP6
7220 S
S13 C348
SP5A
C101-26
C019-43
7220 S/N/B
7220 S
7000 U
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
C101-23
SP33A
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R
B14 C158
220
1000 W/Y
S9 C076
C100-8
7660 R/U/B
C127-3
7960 P/K/B
C101-27
SP03
7420 Y/P/B
7420 Y/P/B
7000 U/R/B
7525 G
C019-44
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
7525 G/B/S
7525 BW
SP13
C101-17
7525 G/B/S
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

24x24 Transmission, W/Cab, W/Mechanical Engine

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S13**	Neutral Switch 3/4 Rail
B14	Synchro Position Potentiometer	**S14**	Neutral Switch 1/2 Rai
		S15	Creeper Sensing Switch
S8	Shuttle Switch	**S16**	Creeper Sense Forward Switch
S9	Clutch Switch	**S17**	High/Medium Switch
S10	Duplicate Transmission Control - Downshift	**S18**	Gearshift
S11	Duplicate Transmission Control - Upshift		
S12	Duplicate Transmission Control - Range		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
5420 G
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
C239-17
7270 R/G
B2
A1
A001
C104
C1
57 B
3340
2050 G
4840
1031 R/W
C079-1
SP12A
3500 W/B/S
C020-28
2012 Y/O
2012 Y
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
7040 N
3740
2050 G
C127-8
C378-B6
7040 R/L/G/B
S19
C192
57 B

24x24 Transmission, W/Cab, W/Mechanical Engine

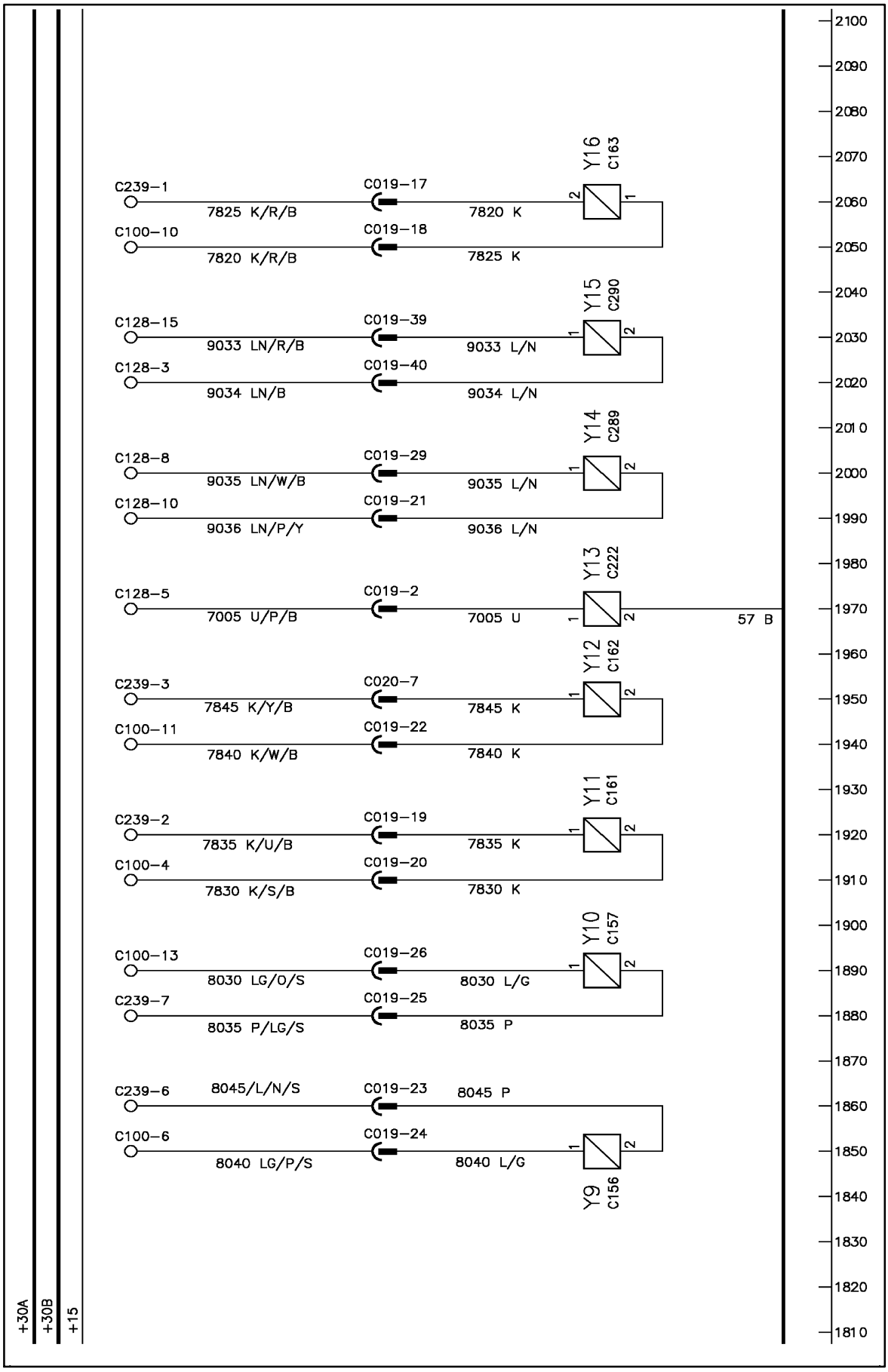
TRANSMISSION SYSTEM 2
Line 1510-1800

A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch
S20 Transmission Oil Pressure Switch
S21 Transmission Auto Function Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

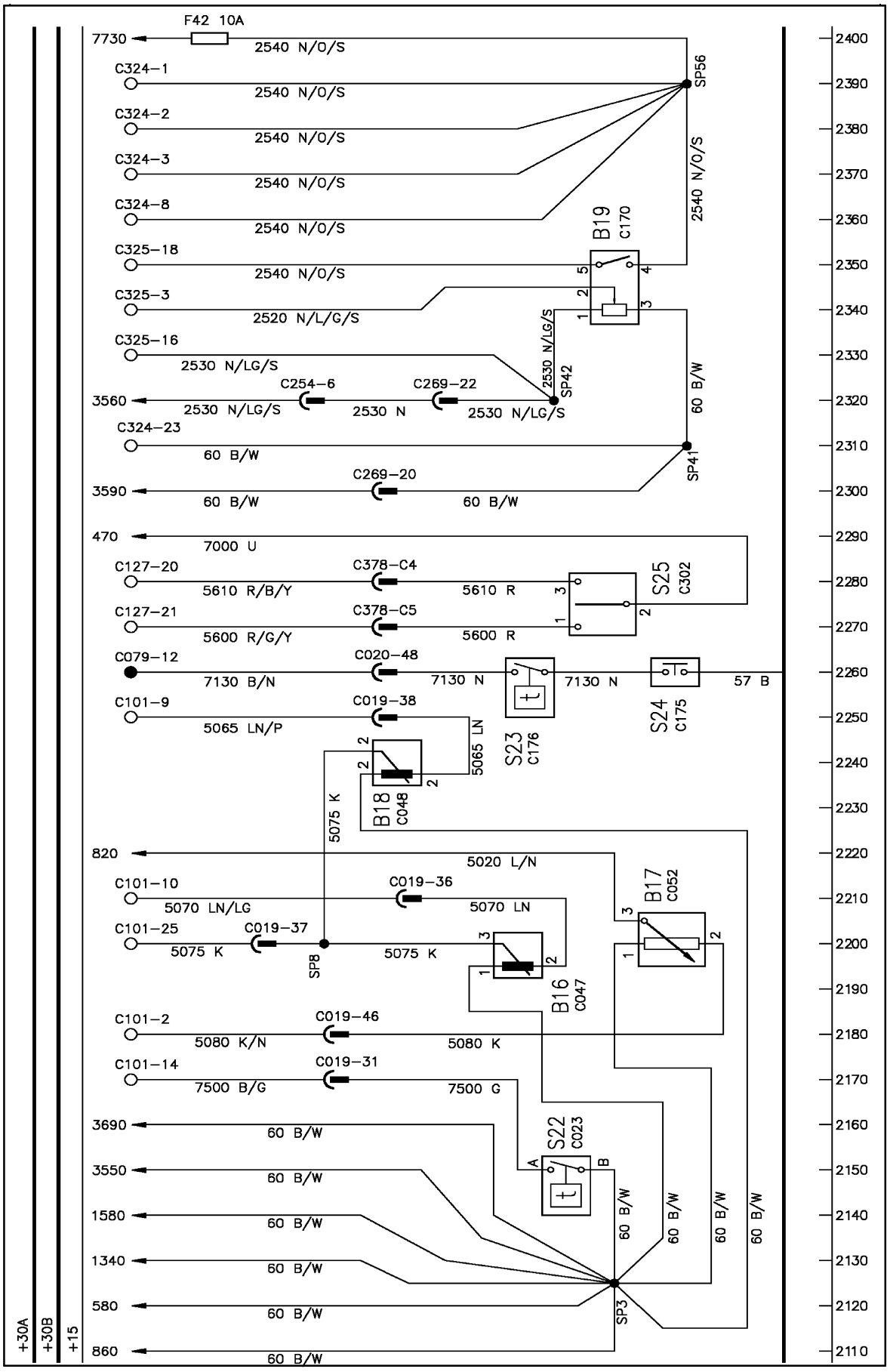

+30A
+30B
+15
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810
Y16 C163
C239-1
C019-17
7825 K/R/B
7820 K
C100-10
C019-18
7820 K/R/B
7825 K
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 L/N
C128-3
C019-40
9034 LN/B
9034 L/N
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 L/N
C128-10
C019-21
9036 LN/P/Y
9036 L/N
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U
57 B
Y12 C162
C239-3
C020-7
7845 K/Y/B
7845 K
C100-11
C019-22
7840 K/W/B
7840 K
Y11 C161
C239-2
C019-19
7835 K/U/B
7835 K
C100-4
C019-20
7830 K/S/B
7830 K
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 L/G
C239-7
C019-25
8035 P/LG/S
8035 P
C239-6
8045/L/N/S
C019-23
8045 P
C100-6
C019-24
8040 LG/P/S
8040 L/G
Y9 C156

24x24 Transmission, W/Cab, W/Mechanical Engine

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y11 Lo PWM Valve
Y12 Hi PWM Valve
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y16 Dump Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

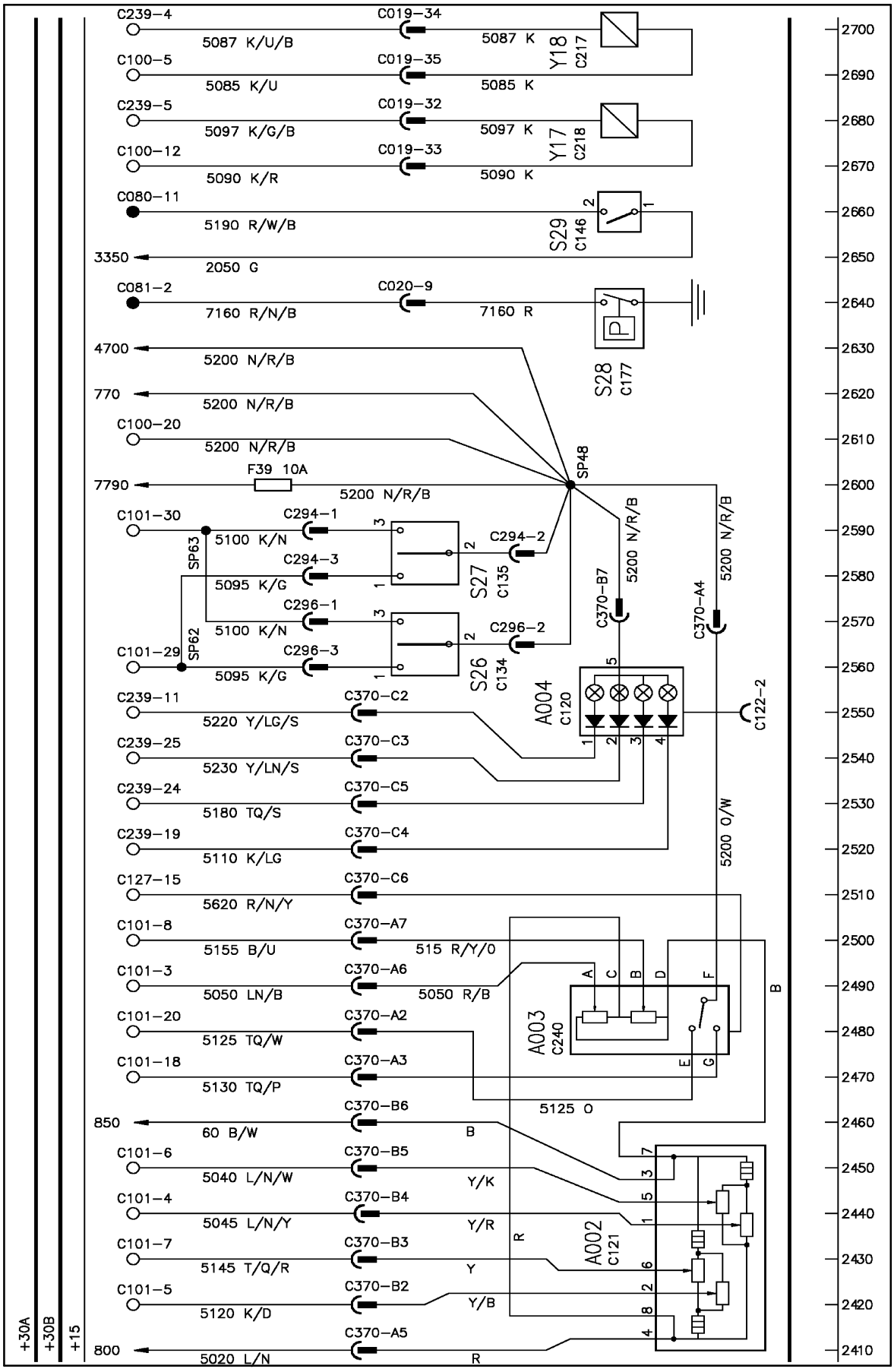

F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP41
SP42
B19
C170
470
7000 U
C127-20
C378-C4
5610 R/B/Y
5610 R
C127-21
C378-C5
5600 R/G/Y
5600 R
S25
C302
C079-12
C020-48
7130 B/N
7130 N
57 B
C101-9
C019-38
5065 LN/P
5065 LN
S23
C176
S24
C175
B18
C048
5075 K
820
5020 L/N
C101-10
C019-36
5070 LN/LG
5070 LN
C101-25
C019-37
SP8
B17
C052
B16
C047
C101-2
C019-46
5080 K/N
5080 K
C101-14
C019-31
7500 B/G
7500 G
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

24x24 Transmission, W/Cab, W/Mechanical Engine

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A	**S22**	Transmission Oil Temp Sensor
		S23	Oil Temperature Switch
B16	LH Draft Pin	**S24**	HPL Filter Switch
B17	Rockshaft Potentiometer	**S25**	HTS Switch
B18	RH Draft Pin		
B19	Front HPL Limit Potentiometer		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

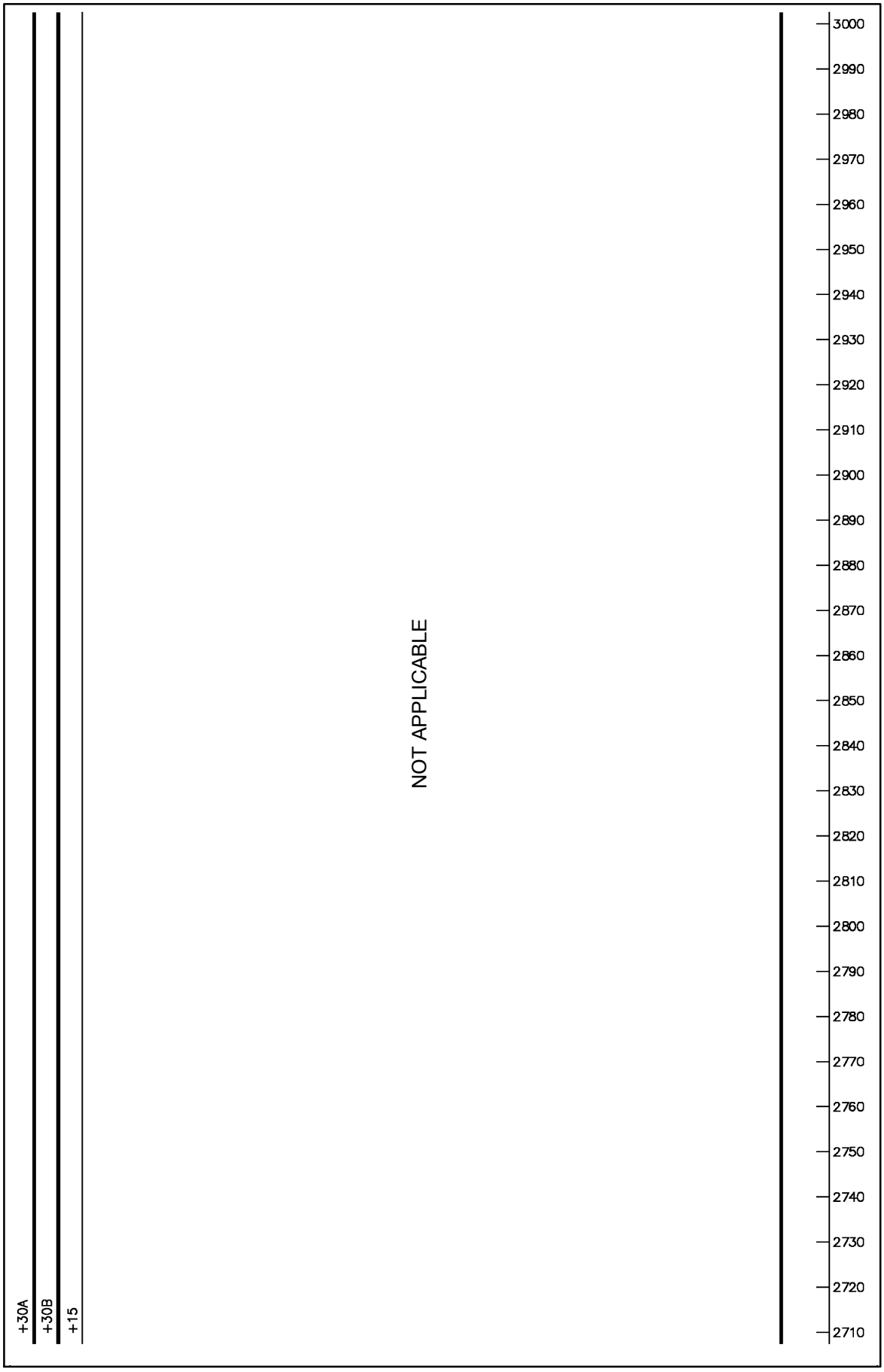

C239-4
C019-34
5087 K/U/B
5087 K
Y18
C217
C100-5
C019-35
5085 K/U
5085 K
C239-5
C019-32
5097 K/G/B
5097 K
Y17
C218
C100-12
C019-33
5090 K/R
5090 K
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7790
5200 N/R/B
SP48
C101-30
C294-1
5100 K/N
C294-2
C294-3
5095 K/G
SP63
S27
C135
C296-1
5100 K/N
C296-2
C101-29
C296-3
5095 K/G
SP62
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

24x24 Transmission, W/Cab, W/Mechanical Engine

HYDRAULICS 2
Line 2410-2700

F30	Fuse - 10A	**S27**	HPL Switch R/H
		S28	Lo Charge Switch
A002	EDC Control	**S29**	Lift-O-Matic Switch
A003	EDC Mouse		
A004	EDC Status Lamp Panel	**Y17**	EDC Lower Solenoid
		Y18	EDC Raise Solenoid
S26	HPL Switch L/H		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

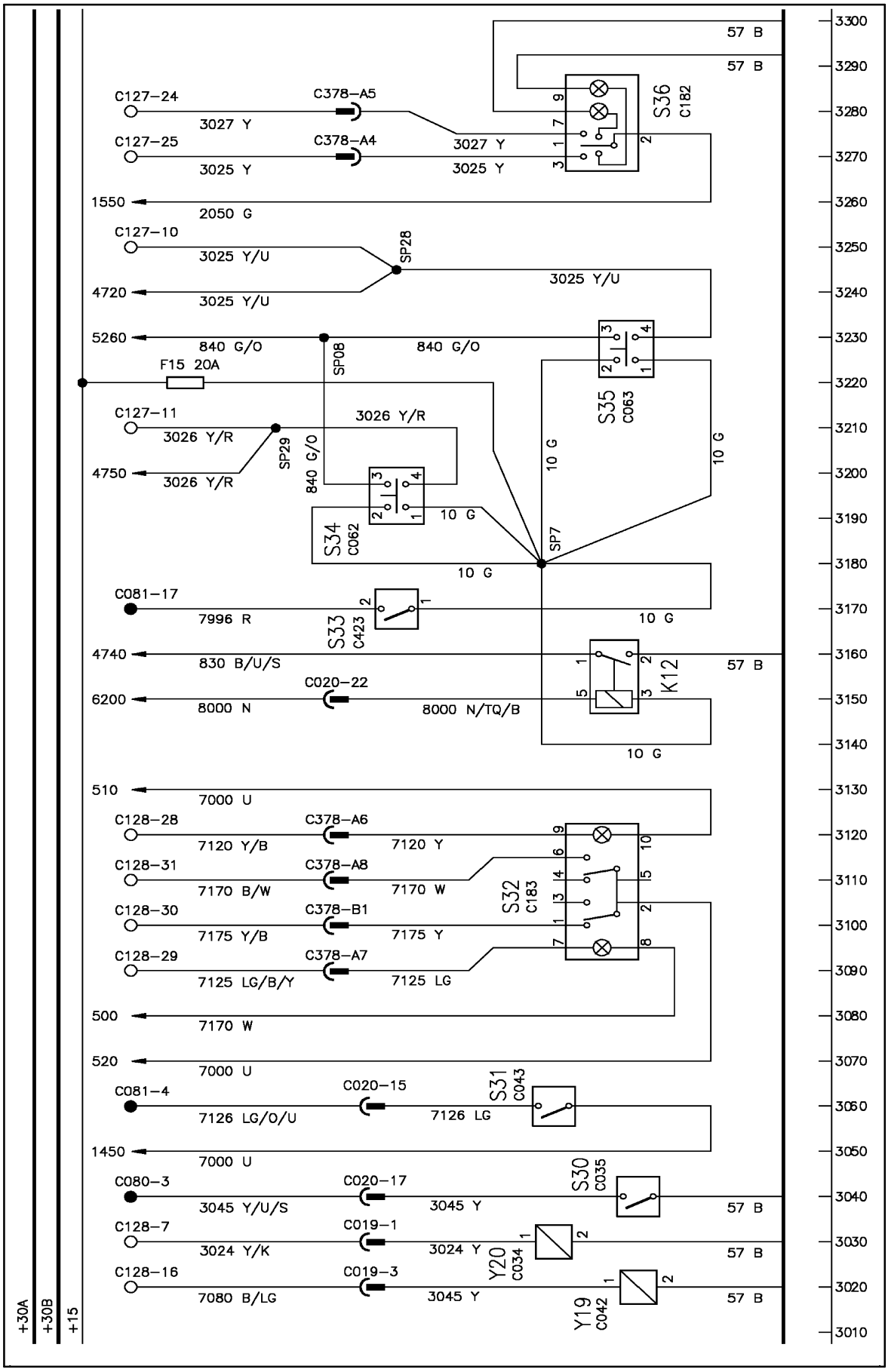

+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

24x24 Transmission, W/Cab, W/Mechanical Engine

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

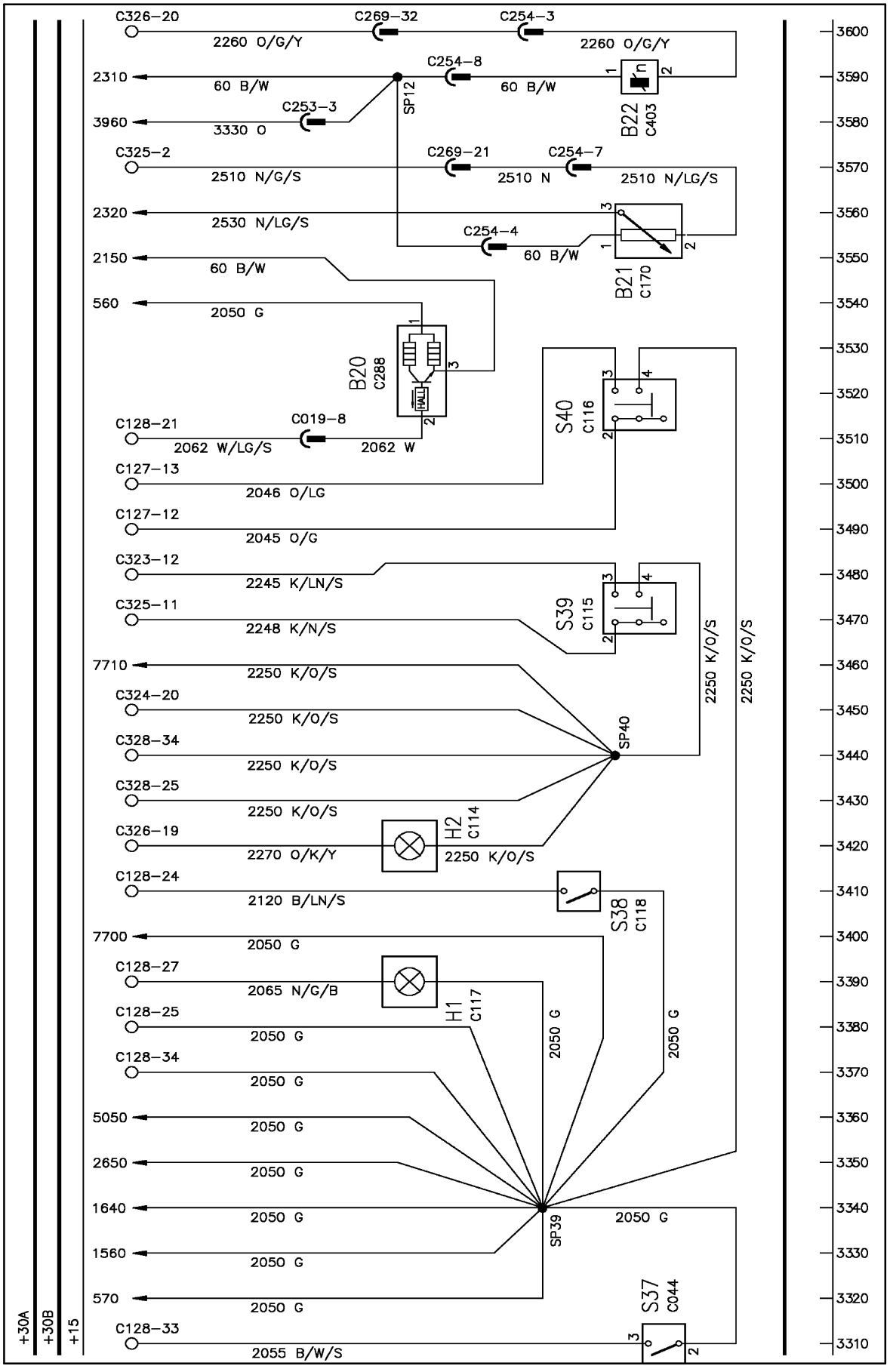

+30A
+30B
+15
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
S36 C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
5260
840 G/O
SP08
F15 20A
S35 C063
C127-11
3026 Y/R
SP29
4750
840 G/O
S34 C062
10 G
SP7
C081-17
7996 R
S33 C423
4740
830 B/U/S
K12
C020-22
6200
8000 N
8000 N/TQ/B
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
S32 C183
500
7170 W
520
C081-4
C020-15
7126 LG/O/U
7126 LG
S31 C043
1450
C080-3
C020-17
3045 Y/U/S
3045 Y
S30 C035
C128-7
C019-1
3024 Y/K
3024 Y
Y20 C034
C128-16
C019-3
7080 B/LG
Y19 C042
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

24x24 Transmission, W/Cab, W/Mechanical Engine

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

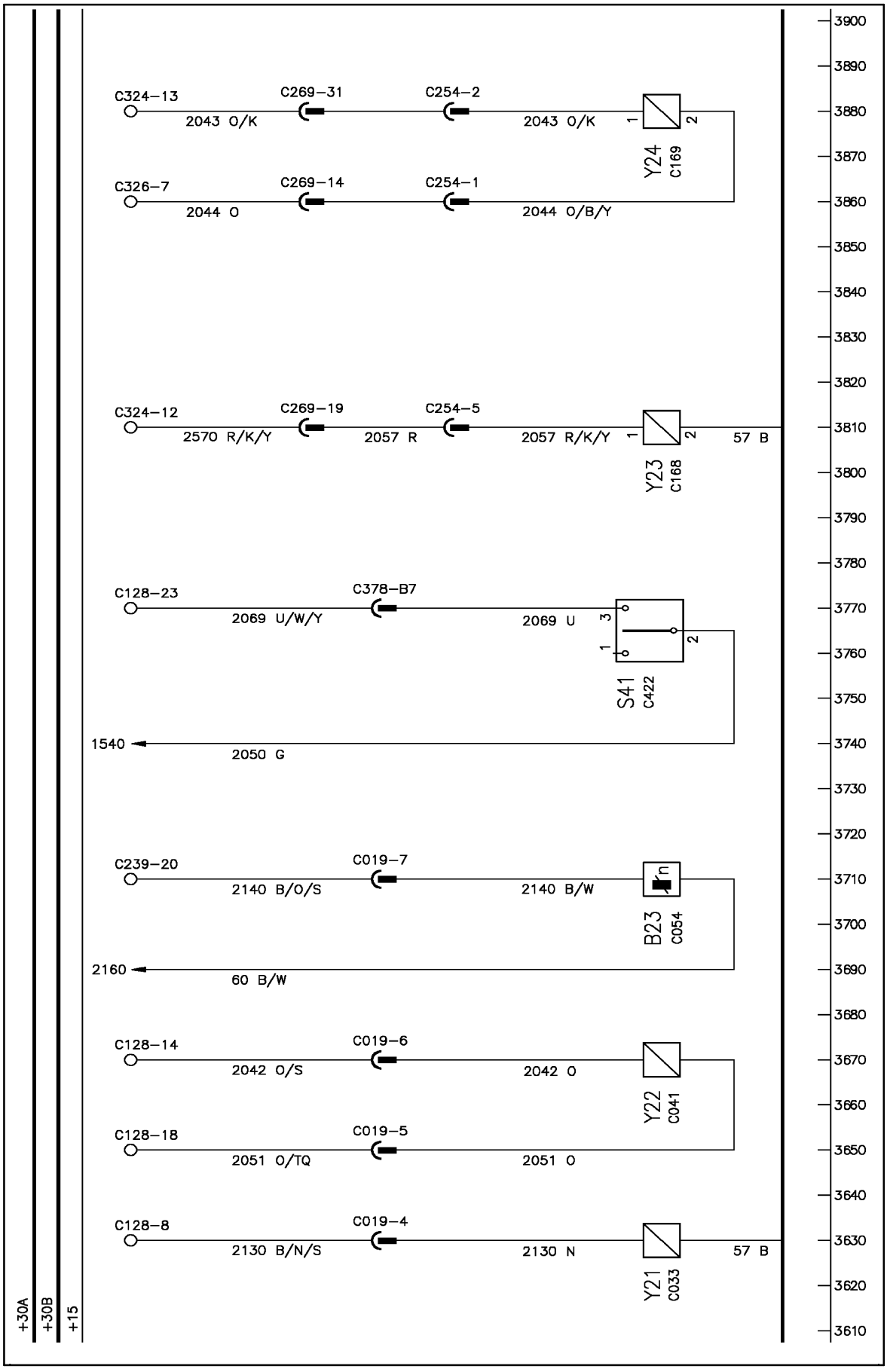

C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
H2
C114
C326-19
2270 O/K/Y
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 G
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

24x24 Transmission, W/Cab, W/Mechanical Engine

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

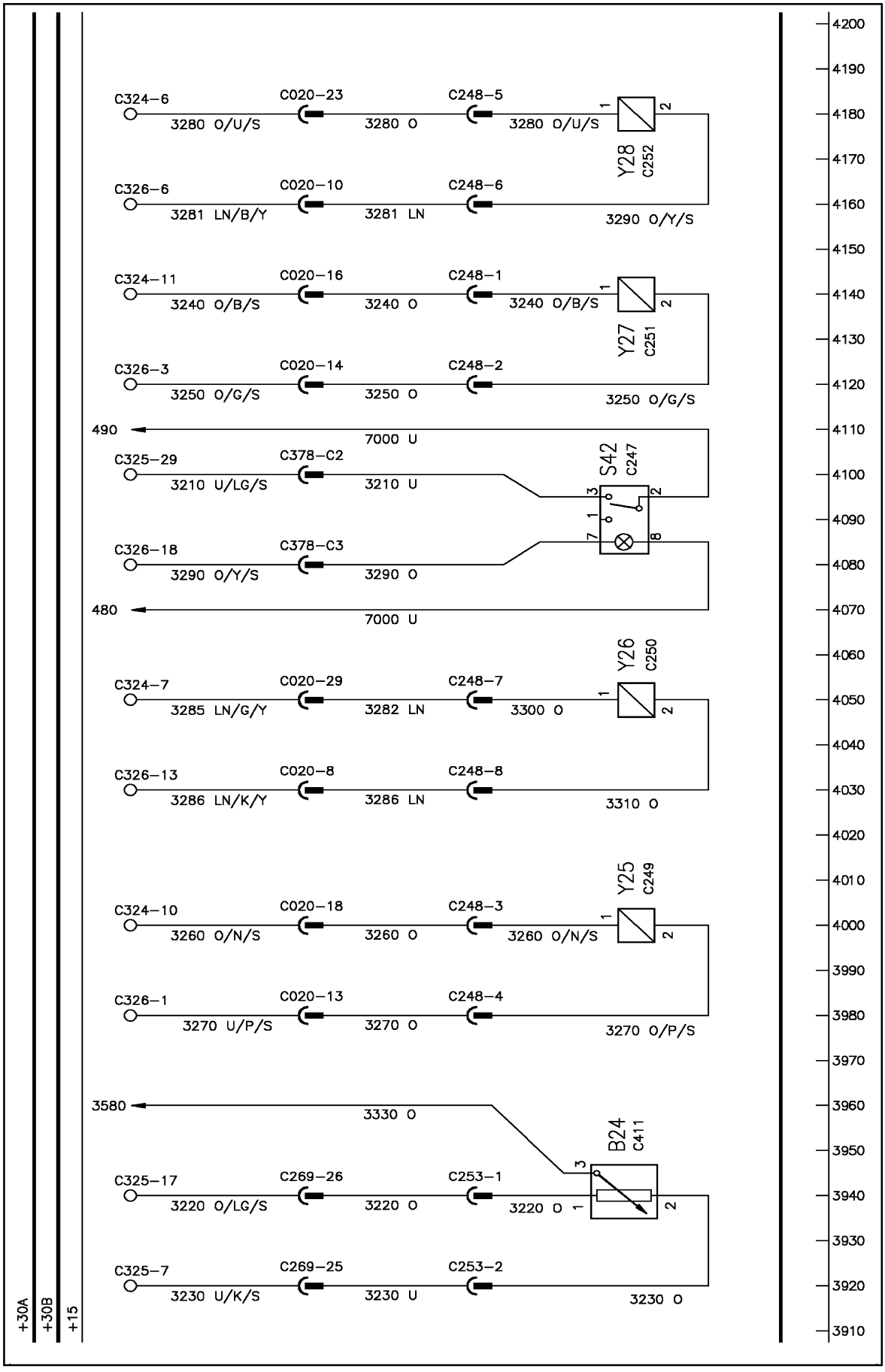

+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/W
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O
C128-8
C019-4
2130 B/N/S
2130 N
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

24x24 Transmission, W/Cab, W/Mechanical Engine

POWER TAKE OFF 2
Line 3610-3900

B23	PTO Speed Sensor	**Y22**	PTO Clutch Solenoid
		Y23	Front Hitch Valve
S41	PTO Management Switch	**Y24**	Front PTO Solenoid
Y21	PTO Brake Solenoid		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-6
3280 O/U/S
C020-23
3280 O
C248-5
3280 O/U/S
Y28
C252
C326-6
3281 LN/B/Y
C020-10
3281 LN
C248-6
3290 O/Y/S
C324-11
3240 O/B/S
C020-16
3240 O
C248-1
3240 O/B/S
Y27
C251
C326-3
3250 O/G/S
C020-14
3250 O
C248-2
3250 O/G/S
490
7000 U
C325-29
3210 U/LG/S
C378-C2
3210 U
S42
C247
C326-18
3290 O/Y/S
C378-C3
3290 O
480
7000 U
C324-7
3285 LN/G/Y
C020-29
3282 LN
C248-7
3300 O
Y26
C250
C326-13
3286 LN/K/Y
C020-8
3286 LN
C248-8
3310 O
C324-10
3260 O/N/S
C020-18
3260 O
C248-3
3260 O/N/S
Y25
C249
C326-1
3270 U/P/S
C020-13
3270 O
C248-4
3270 O/P/S
3580
3330 O
B24
C411
C325-17
3220 O/LG/S
C269-26
3220 O
C253-1
3220 O
C325-7
3230 U/K/S
C269-25
3230 U
C253-2
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

24x24 Transmission, W/Cab, W/Mechanical Engine

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

Y25 Front Suspension Lower Solenoid

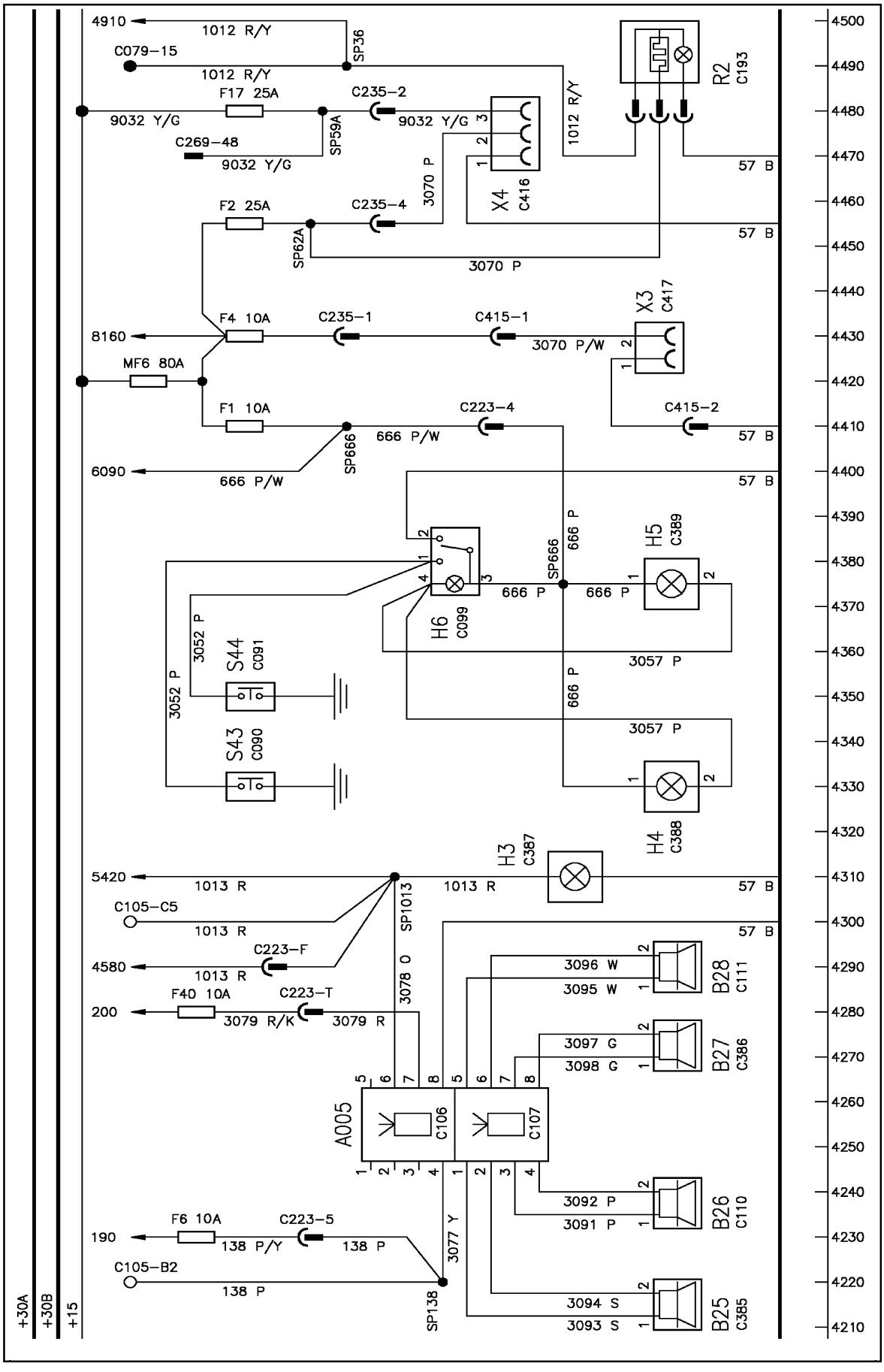
Y26 Front Suspension Lower Lockout Solenoid

Y27 Front Suspension Raise Solenoid

Y28 Front Suspension Raise Lockout Solenoid

S42 Front Suspension Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4910
1012 R/Y
SP36
C079-15
1012 R/Y
F17 25A
C235-2
9032 Y/G
9032 Y/G
SP59A
C269-48
9032 Y/G
3070 P
X4 C416
1012 R/Y
R2 C193
57 B
F2 25A
C235-4
SP62A
3070 P
57 B
F4 10A
C235-1
C415-1
3070 P/W
X3 C417
8160
MF6 80A
F1 10A
C223-4
C415-2
SP666
666 P/W
57 B
6090
666 P/W
57 B
SP666
666 P
H5 C389
666 P
666 P
H6 C099
3057 P
3052 P
S44 C091
3052 P
666 P
S43 C090
3057 P
H4 C388
H3 C387
5420
1013 R
1013 R
57 B
C105-C5
1013 R
SP1013
57 B
C223-F
4580
1013 R
3078 O
F40 10A
C223-T
200
3079 R/K
3079 R
3096 W
3095 W
B28 C111
3097 G
3098 G
B27 C386
A005
C106
C107
3092 P
3091 P
B26 C110
F6 10A
C223-5
190
138 P/Y
138 P
3077 Y
C105-B2
138 P
SP138
3094 S
3093 S
B25 C385
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

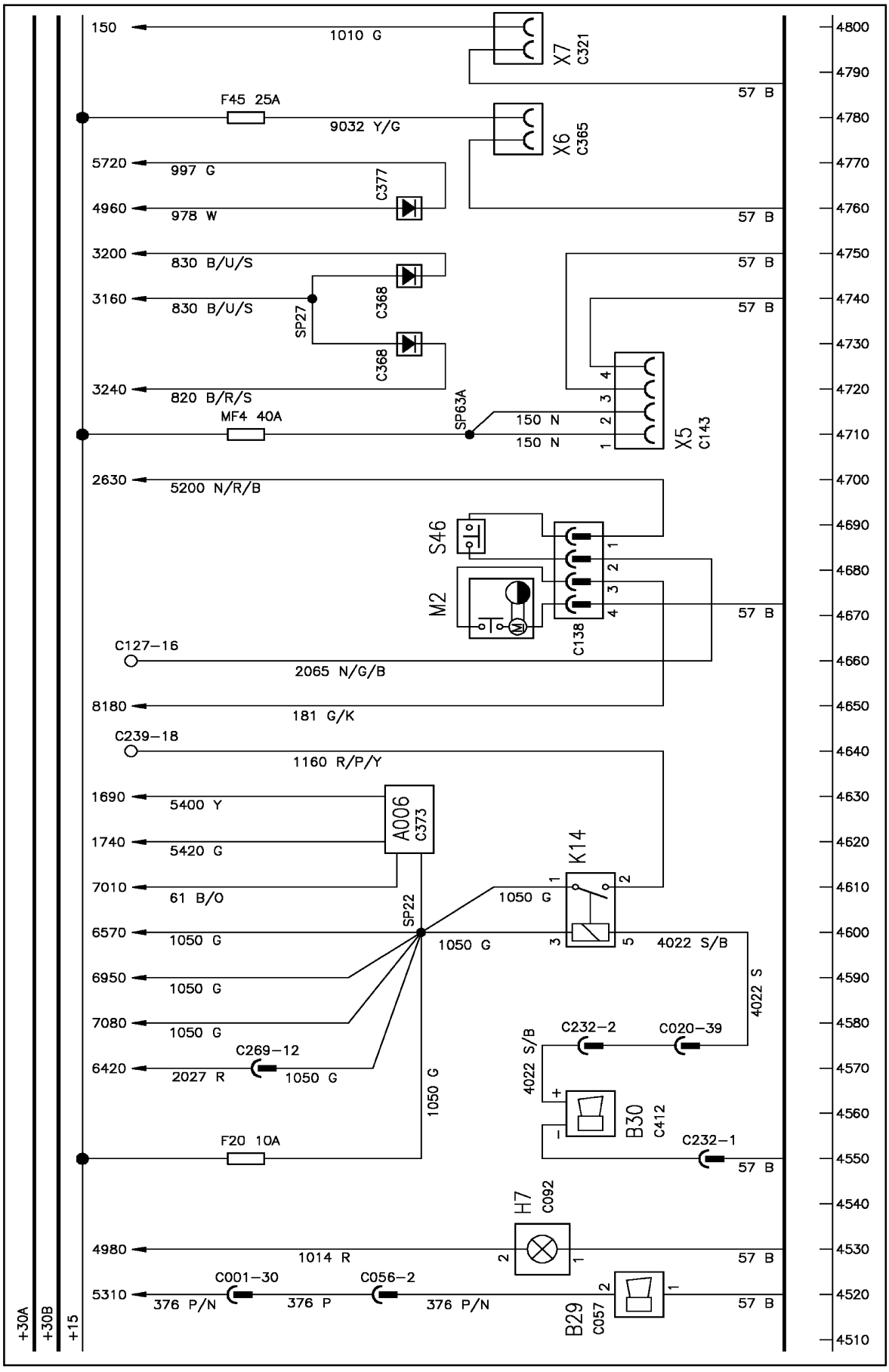
24x24 Transmission, W/Cab, W/Mechanical Engine

CAB ACCESSORIES 1
Line 4210-4500

MF6	Maxi Fuse - 80A
F1	Fuse - 10A
F2	Fuse - 25A
F4	Fuse - 10A
F6	Fuse - 7.5A
F17	Fuse - 25A
F40	Fuse - 10A
A005	Radio
B25	Speaker L/H Rear
B26	Speaker R/H Front
B27	Speaker R/H Rear
B28	Speaker L/H Front

H3	Console Lamp R/H
H4	Puddle Lamp L/H
H5	Puddle Lamp R/H
H6	Interior Lamp
S43	Door Switch L/H
S44	Door Switch R/H
X3	8 Amp Terminals
X4	20 Amp Multi Socket
R2	Cigar Lighter

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
57 B
C368
3240
820 B/R/S
SP63A
MF4 40A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
K14
7010
61 B/O
SP22
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
4022 S
7080
1050 G
C232-2
C020-39
C269-12
6420
2027 R
1050 G
4022 S/B
1050 G
B30
C412
C232-1
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
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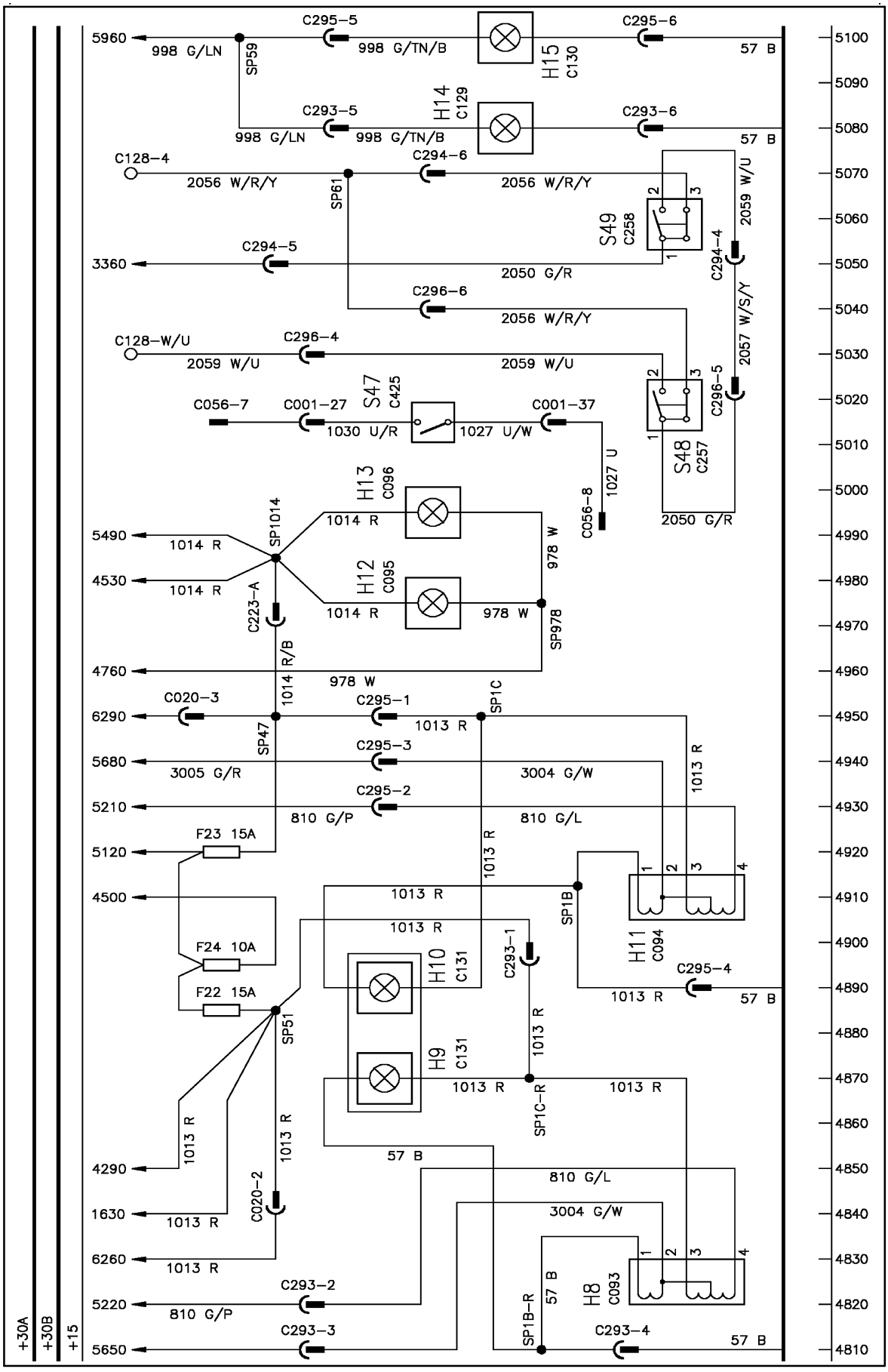
4560
4550
4540
4530
4520
4510

24x24 Transmission, W/Cab, W/Mechanical Engine

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X6	8 Amp Socket
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode
C377	Diode

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

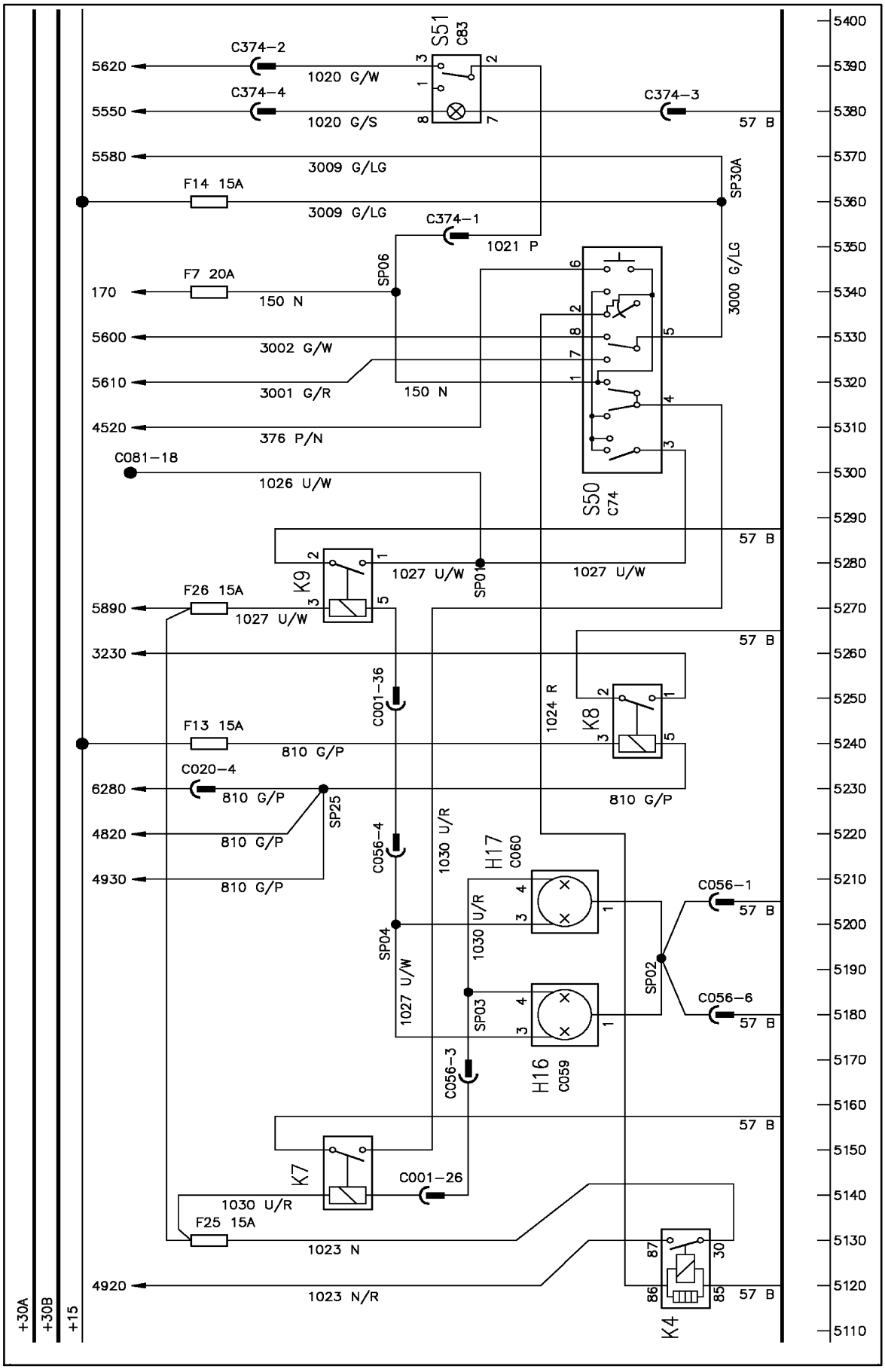

5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
C294-4
C294-5
3360
2050 G/R
C296-6
2056 W/R/Y
C128-W/U
2059 W/U
C296-4
2059 W/U
2057 W/S/Y
C296-5
C056-7
C001-27
S47 C425
1030 U/R
1027 U/W
C001-37
1027 U
S48 C257
C056-8
2050 G/R
H13 C096
1014 R
SP1014
5490
1014 R
4530
1014 R
H12 C095
1014 R
978 W
978 W
SP978
C223-A
4760
1014 R/B
978 W
C020-3
6290
SP47
1014
C295-1
1013 R
SP1C
C295-3
5680
3005 G/R
3004 G/W
1013 R
C295-2
5210
810 G/P
810 G/L
F23 15A
5120
1013 R
4500
1013 R
SP1B
H11 C094
C295-4
1013 R
57 B
F24 10A
F22 15A
SP51
H10 C131
C293-1
1013 R
H9 C131
1013 R
1013 R
SP1C-R
1013 R
57 B
4290
1013 R
1013 R
C020-2
1630
1013 R
810 G/L
3004 G/W
6260
1013 R
H8 C093
C293-2
5220
810 G/P
SP1B-R
57 B
C293-3
5650
C293-4
57 B
+30A
+30B
+15
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810

24x24 Transmission, W/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A	**H13**	Licence Plate Lamp R/H
F23	Fuse 15 A	**H14**	Worklamp - Fender R/H
F24	Fuse 10 A	**H15**	Worklamp - Fender L/H
H8	Stop/Tail Light R/H	**S47**	Aux Headlamp Switch
H9	Licence Plate Lamp - Fender	**S48**	PTO Fender Switch L/H
H10	Licence Plate Lamp - Fender	**S49**	PTO Fender Switch R/H
H11	Stop/Tail Light L/H		
H12	Licence Plate Lamp L/H		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

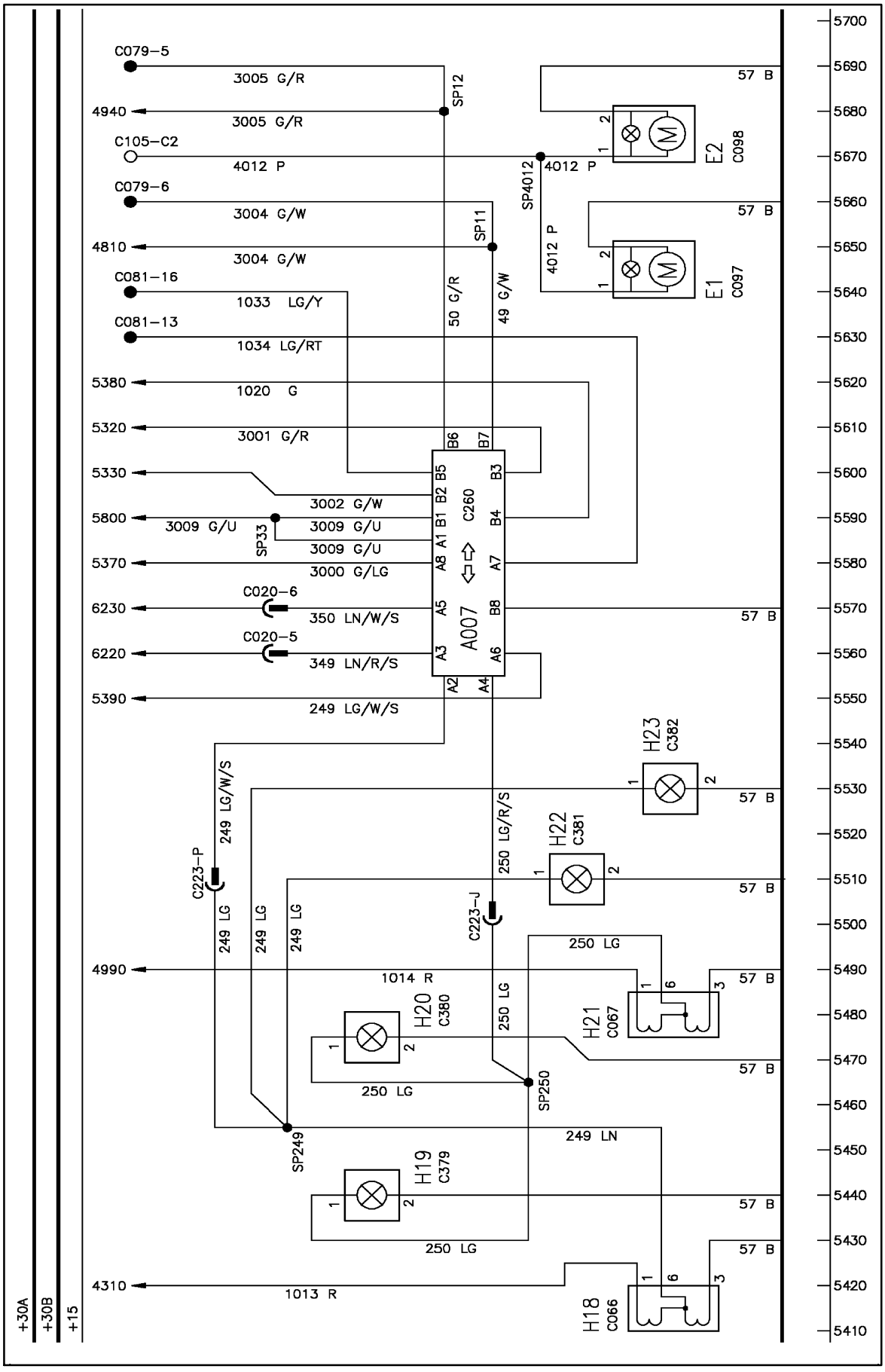

+30A
+30B
+15
5620
5550
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
C374-2
C374-4
1020 G/W
1020 G/S
S51
C83
C374-3
57 B
3009 G/LG
F14 15A
SP30A
C374-1
1021 P
SP06
F7 20A
150 N
3002 G/W
3001 G/R
376 P/N
C081-18
1026 U/W
S50
C74
3000 G/LG
K9
F26 15A
1027 U/W
SP01
K8
1024 R
F13 15A
810 G/P
C020-4
SP25
C001-36
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
H16
C059
C056-3
C056-1
C056-6
SP02
K7
C001-26
F25 15A
1023 N
1023 N/R
K4
87
30
86
85
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

24x24 Transmission, W/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
SP12
4940
3005 G/R
C105-C2
4012 P
C079-6
3004 G/W
SP11
4810
3004 G/W
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
C020-5
6220
349 LN/R/S
5390
249 LG/W/S
C223-P
249 LG
249 LG
249 LG
4990
1014 R
C223-J
250 LG/R/S
250 LG
250 LG
SP249
SP250
249 LN
4310
1013 R
A007
C260
B6
B7
B5
B3
B2
B1
B4
A1
A8
A7
A5
B8
A3
A6
A2
A4
50 G/R
49 G/W
SP4012
4012 P
4012 P
57 B
E2
C098
E1
C097
H23
C382
H22
C381
H20
C380
H21
C067
H19
C379
H18
C066
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
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5480
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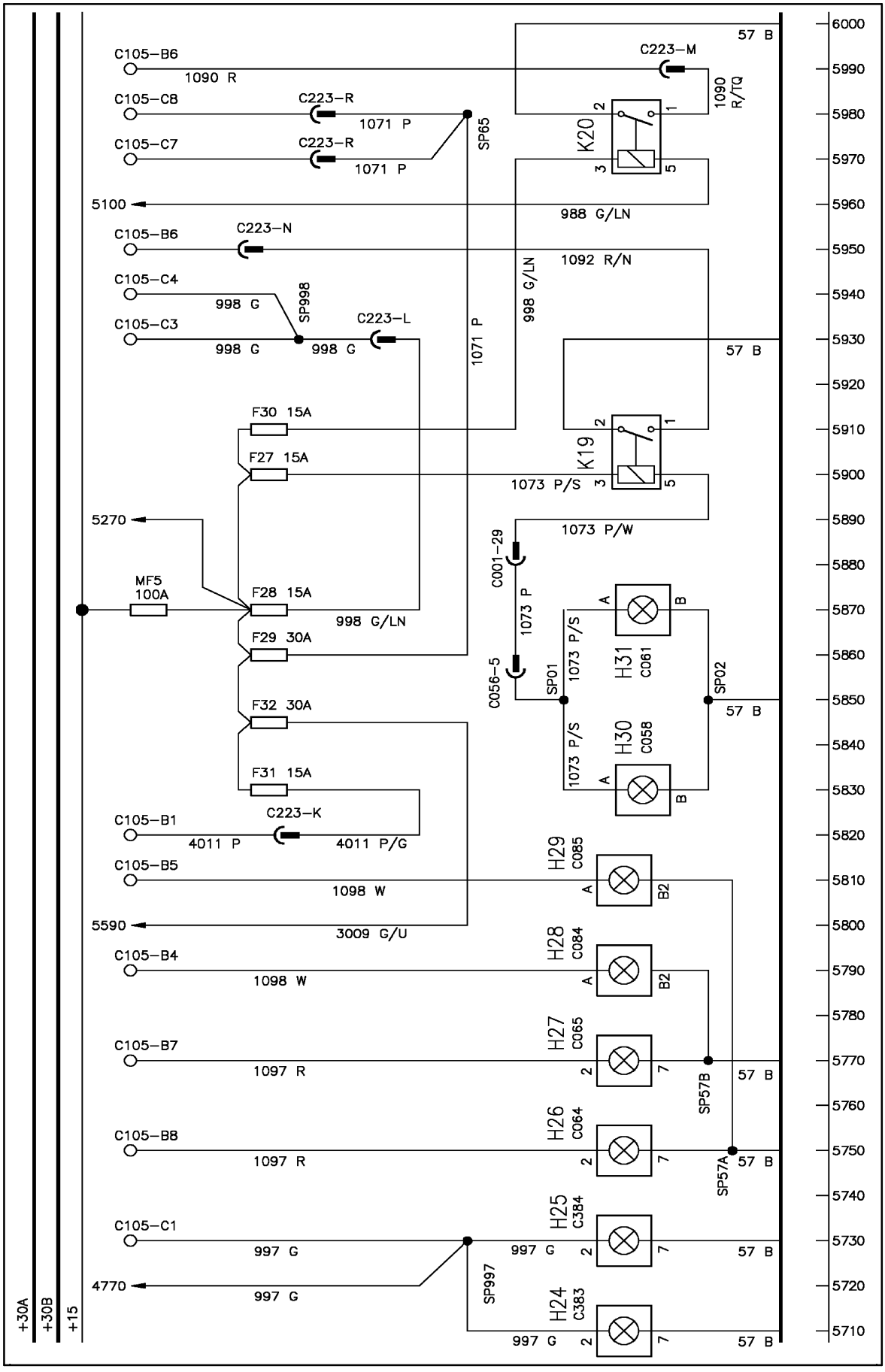
5460
5450
5440
5430
5420
5410

24x24 Transmission, W/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 3
Line 5410-5700

A007	Flasher Unit
E1	Rotating Beacon L/H
E2	Rotating Beacon L/H
H18	Grabrail Side Lamp R/H
H19	SMV Lamp L/H Front
H20	SMV Lamp L/H Rear
H21	Grabrail Side Lamp L/H
H22	SMV Lamp R/H Front
H23	SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C105-B6
1090 R
C105-C8
C223-R
1071 P
C105-C7
C223-R
1071 P
SP65
5100
C105-B6
C223-N
C105-C4
998 G
C105-C3
998 G
SP998
C223-L
998 G
998 G
1071 P
998 G/LN
C223-M
1090 R/TQ
K20
988 G/LN
1092 R/N
57 B
F30 15A
F27 15A
K19
1073 P/S
1073 P/W
5270
MF5
100A
F28 15A
998 G/LN
F29 30A
F32 30A
F31 15A
C105-B1
C223-K
4011 P
4011 P/G
C105-B5
1098 W
5590
3009 G/U
C105-B4
1098 W
C105-B7
1097 R
C105-B8
1097 R
C105-C1
997 G
4770
997 G
SP997
997 G
C001-29
1073 P
C056-5
SP01
1073 P/S
H31
C061
H30
C058
SP02
H29
C085
H28
C084
H27
C065
H26
C064
H25
C384
H24
C383
SP57B
SP57A
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

24x24 Transmission, W/Cab, W/Mechanical Engine

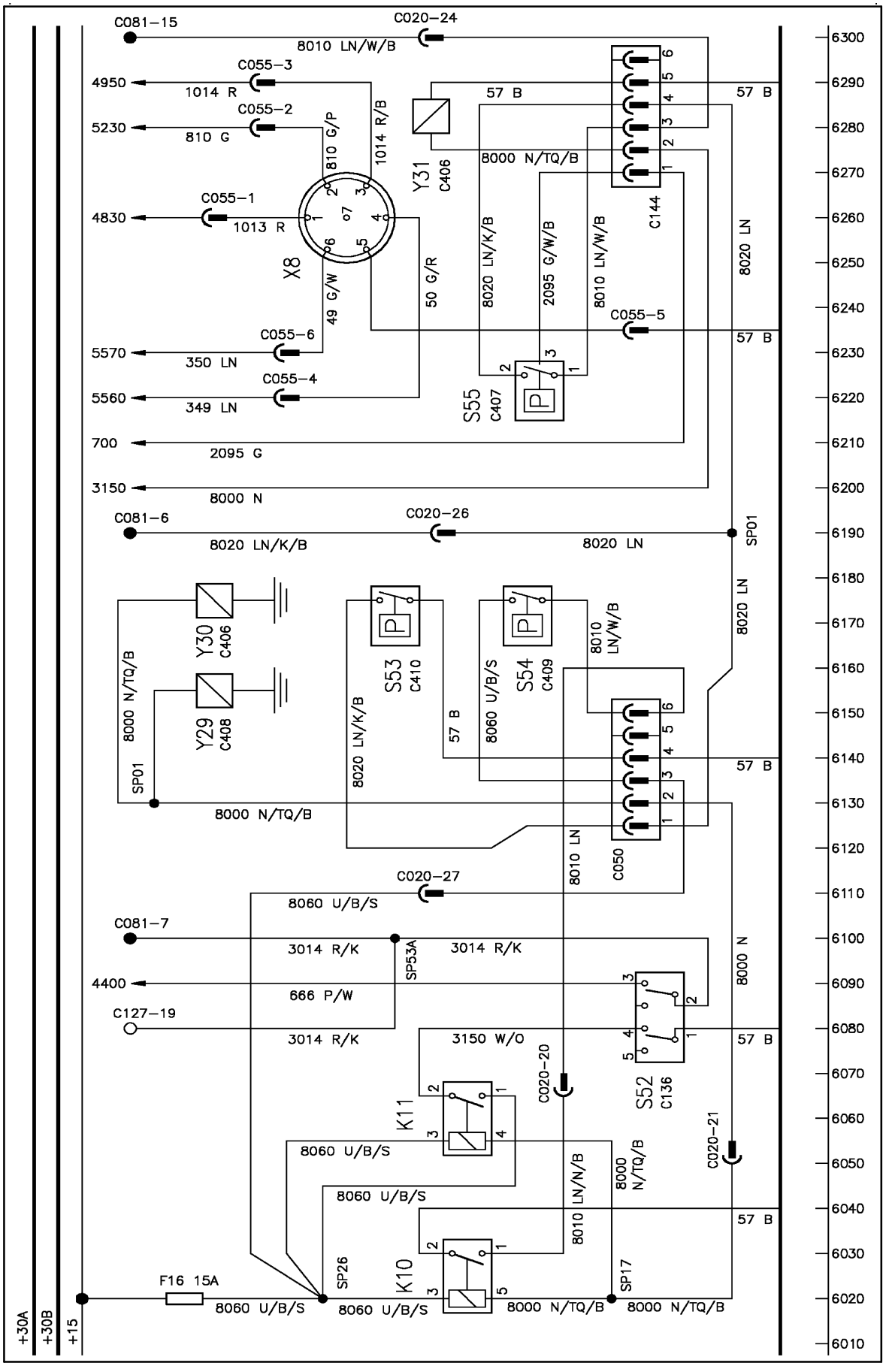
WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F28 Fuse - 15A
F29 Fuse - 30A
F30 Fuse - 15A
F31 Fuse - 15A
F32 Fuse - 30A

H24 Worklamp - Rear L/H
H25 Worklamp - Rear R/H
H26 Worklamp - Grabrail R/H
H27 Worklamp - Grabrail L/H
H28 Worklamp - Upper Front L/H
H29 Worklamp - Upper Front R/H
H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
C055-3
4950
1014 R
C055-2
5230
810 G
C055-1
4830
1013 R
X8
810 G/P
1014 R/B
49 G/W
50 G/R
8020 LN/K/B
2095 G/W/B
8010 LN/W/B
Y31
C406
C144
57 B
8000 N/TQ/B
8020 LN
C055-5
C055-6
5570
350 LN
C055-4
5560
349 LN
S55
C407
700
2095 G
3150
8000 N
C081-6
C020-26
8020 LN/K/B
8020 LN
SP01
Y30
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8060 U/B/S
8010 LN
C050
C020-27
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3150 W/O
C020-20
C020-21
S52
C136
K11
K10
SP26
SP17
F16 15A
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

24x24 Transmission, W/Cab, W/Mechanical Engine

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

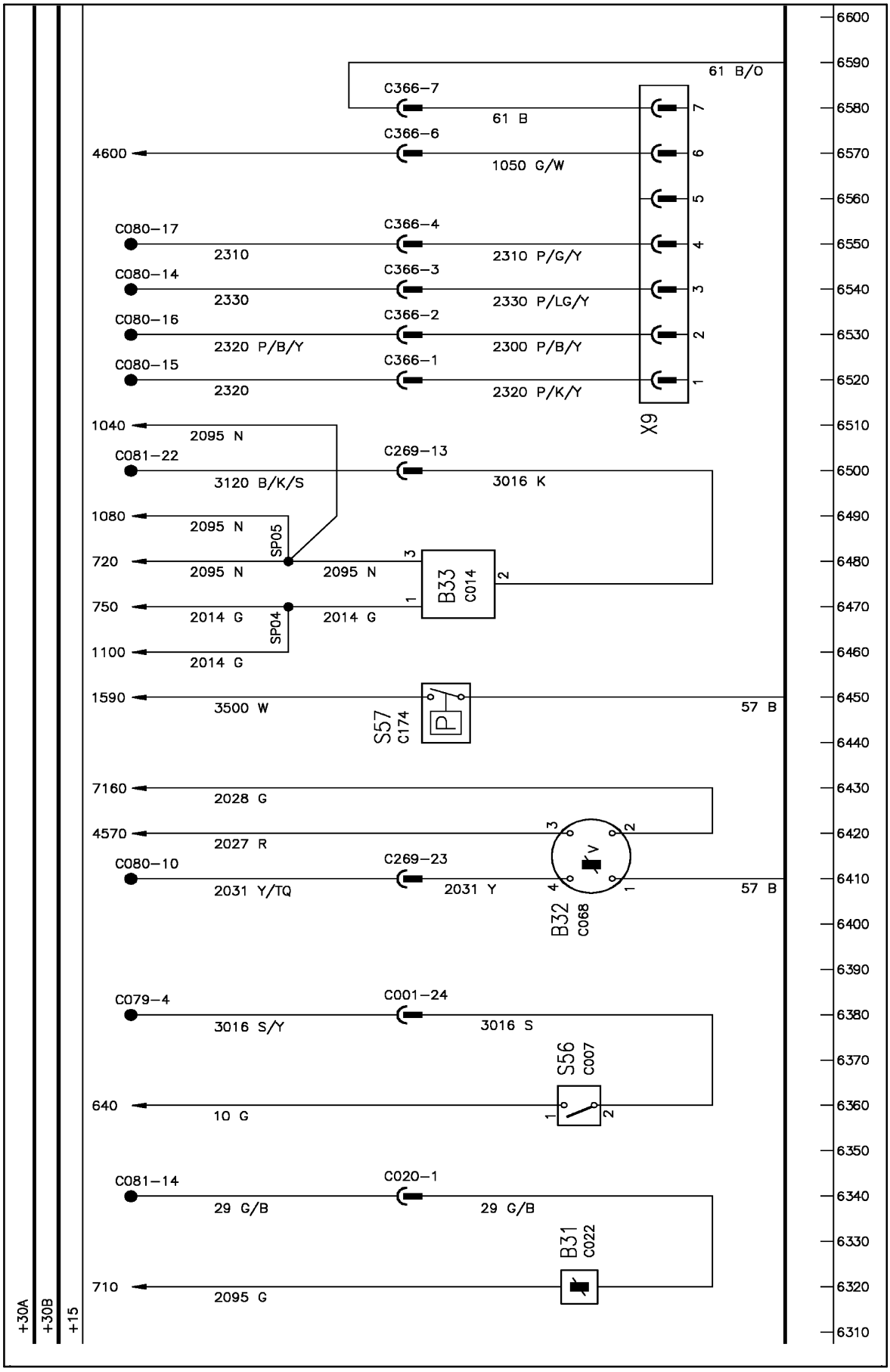
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch
S55 Air Brake Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y30 Italian Trailer Brake Solenoid
Y31 Air Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
1040
2095 N
C081-22
3120 B/K/S
C269-13
3016 K
1080
2095 N
SP05
720
2095 N
2095 N
B33
C014
750
2014 G
2014 G
SP04
1100
2014 G
1590
3500 W
57 B
S57
C174
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
57 B
B32
C068
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G

24x24 Transmission, W/Cab, W/Mechanical Engine

SENSORS
Line 6310-6600

B31 Fuel Tank Sender

B32 Radar Gun

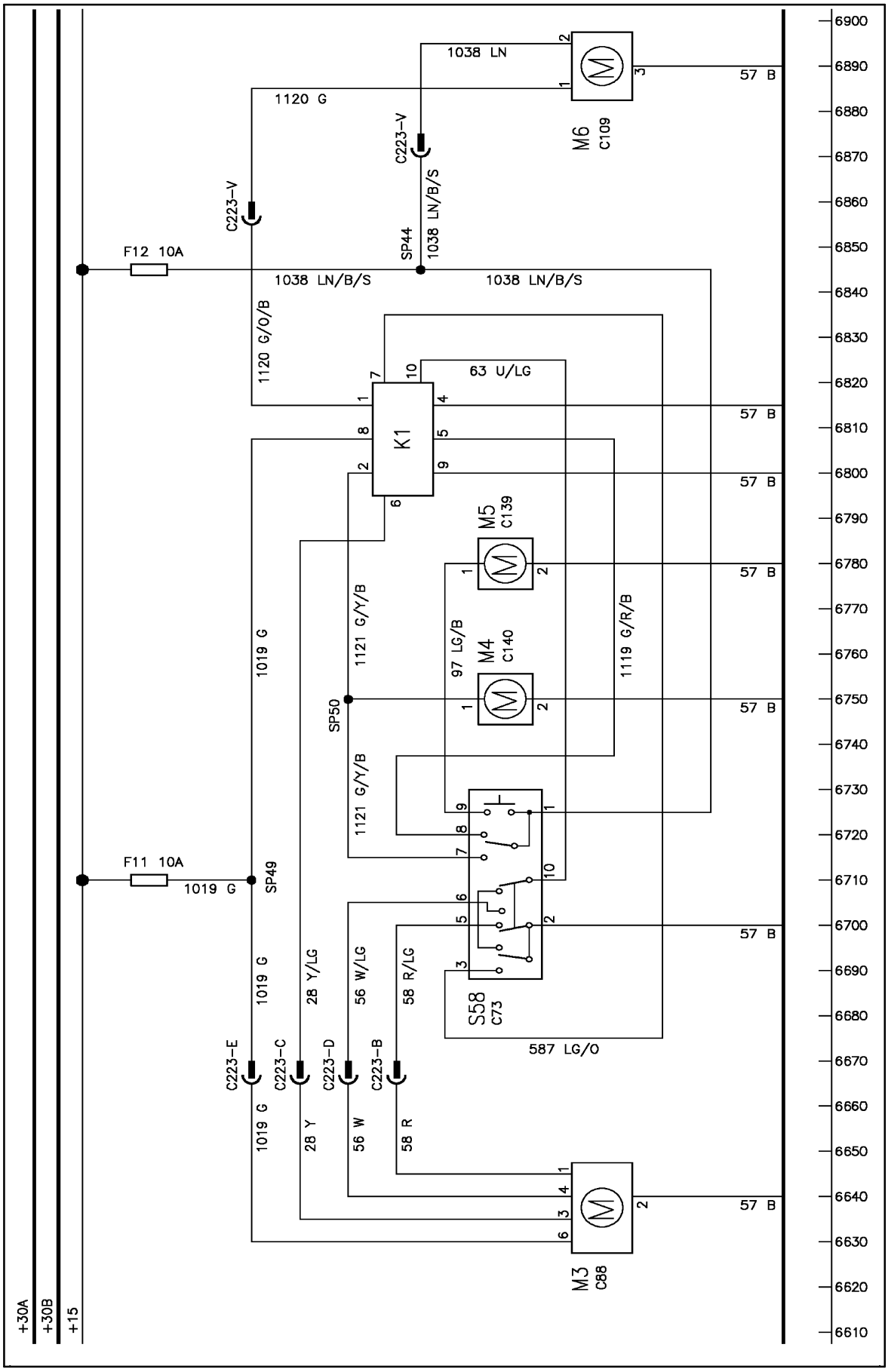
B33 Steering Angle Sensor

S56 Brake Fluid Level Switch

S57 Power Assisted Steering Pressure Switch

X9 Radar Extension Harness Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F12 10A
F11 10A
1038 LN
1120 G
1038 LN/B/S
1120 G/O/B
63 U/LG
1019 G
1121 G/Y/B
97 LG/B
1119 G/R/B
28 Y/LG
56 W/LG
58 R/LG
587 LG/O
57 B
SP44
SP49
SP50
C223-V
C223-E
C223-C
C223-D
C223-B
K1
M6 C109
M5 C139
M4 C140
M3 C88
S58 C73
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

24x24 Transmission, W/Cab, W/Mechanical Engine

WASHERS AND WIPERS
Line 6510-6900

F11 Fuse - 10A

F12 Fuse - 10A

K1 Front Windshield Wiper Module

M3 Wiper Motor - Front

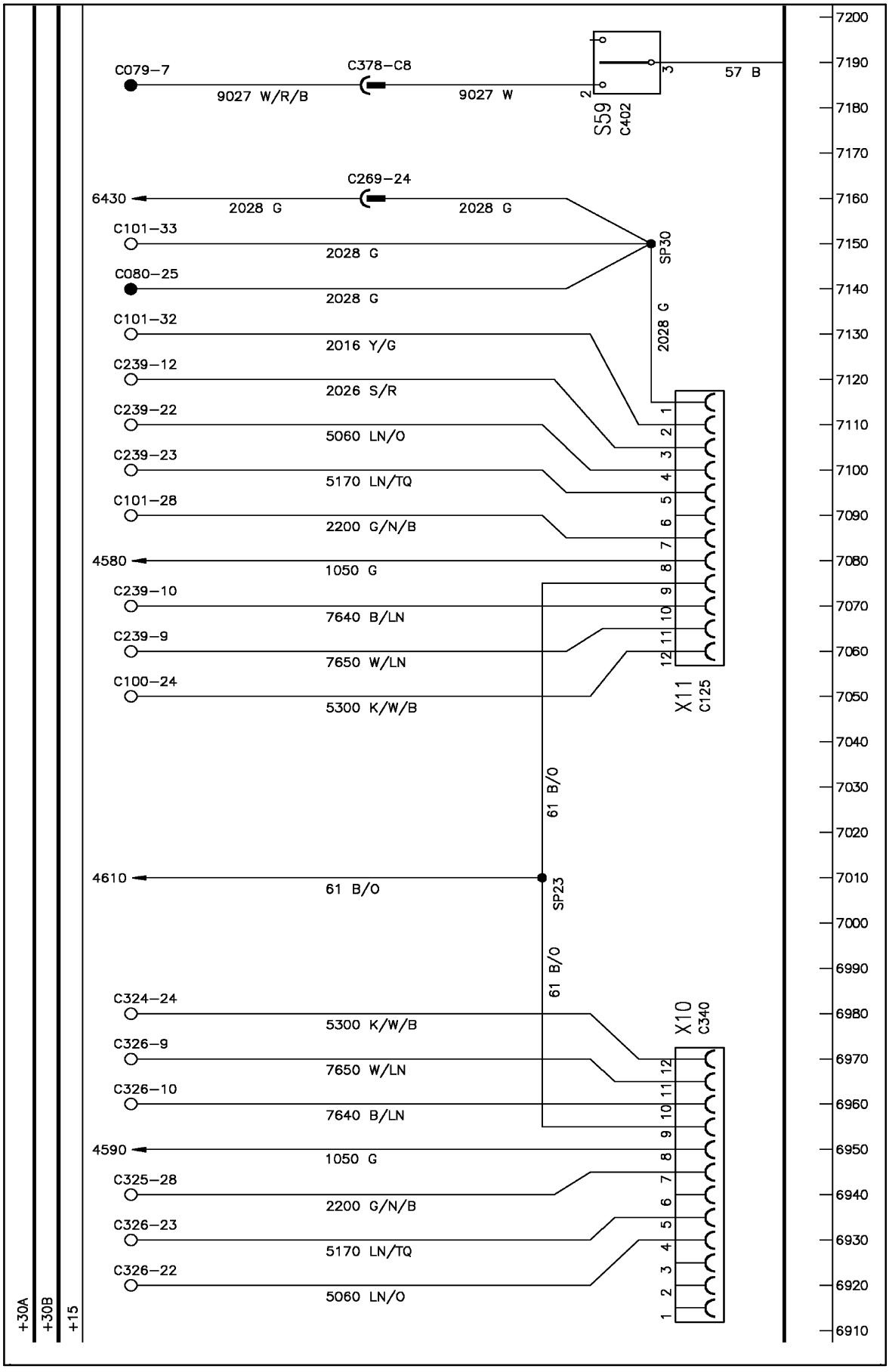
M4 Washer Motor - Rear

M5 Washer Motor - Front

M6 Wiper Motor - Rear

S58 Front and Rear Wiper/washer Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
2
3
57 B
S59
C402
C269-24
6430
2028 G
2028 G
C101-33
2028 G
SP30
C080-25
2028 G
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
1 2 3 4 5 6 7 8 9 10 11 12
61 B/O
4610
61 B/O
SP23
61 B/O
C324-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
12 11 10 9 8 7 6 5 4 3 2 1
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

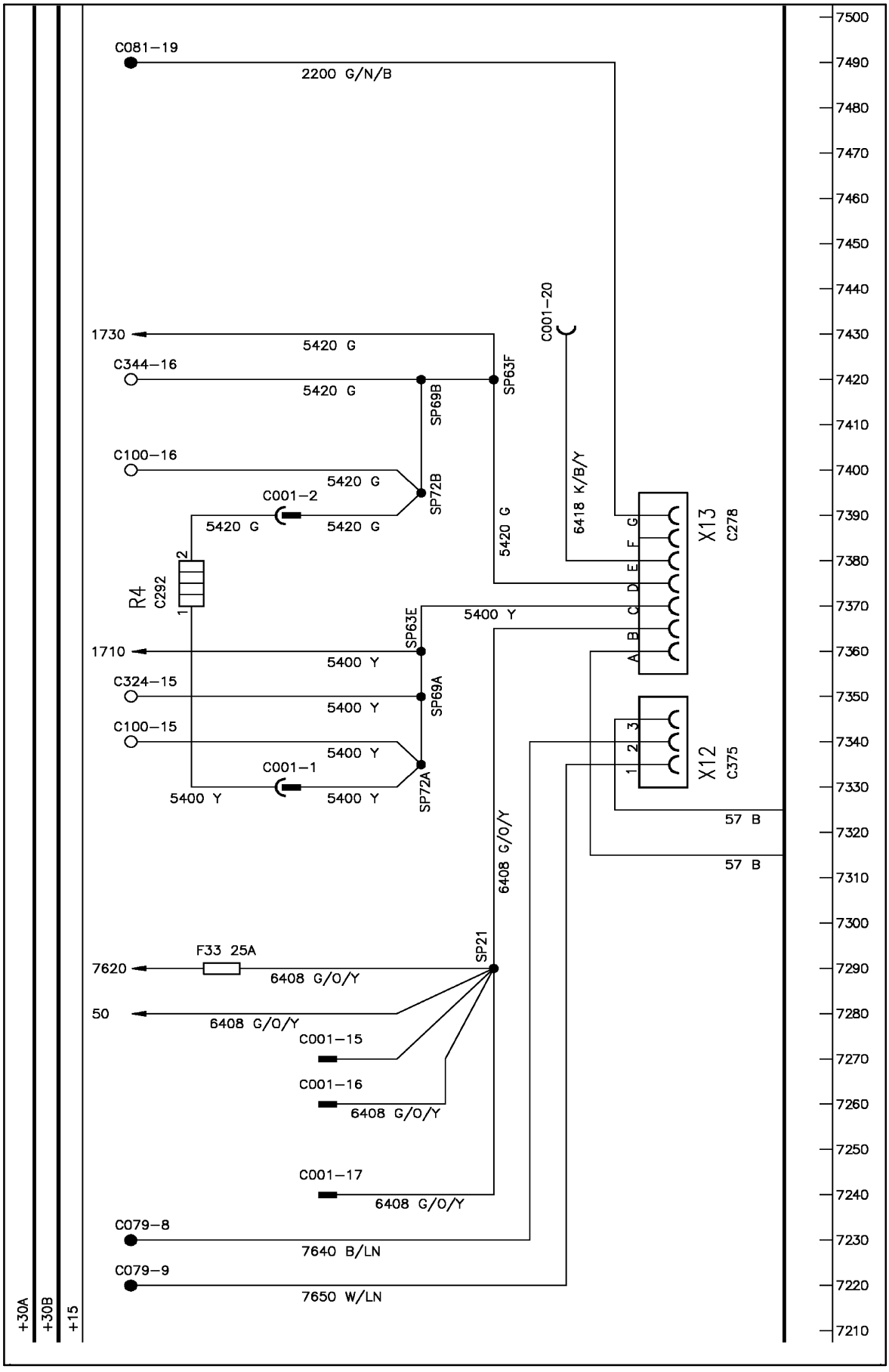
24x24 Transmission, W/Cab, W/Mechanical Engine

DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)
X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
1730
5420 G
C344-16
5420 G
SP63F
SP69B
C100-16
5420 G
C001-2
SP72B
5420 G
5420 G
R4
C292
2
1
5420 G
C001-20
6418 K/B/Y
X13
C278
G
F
E
D
C
B
A
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C001-1
SP72A
5400 Y
5400 Y
X12
C375
3
2
1
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C001-15
C001-16
6408 G/O/Y
C001-17
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

24x24 Transmission, W/Cab, W/Mechanical Engine

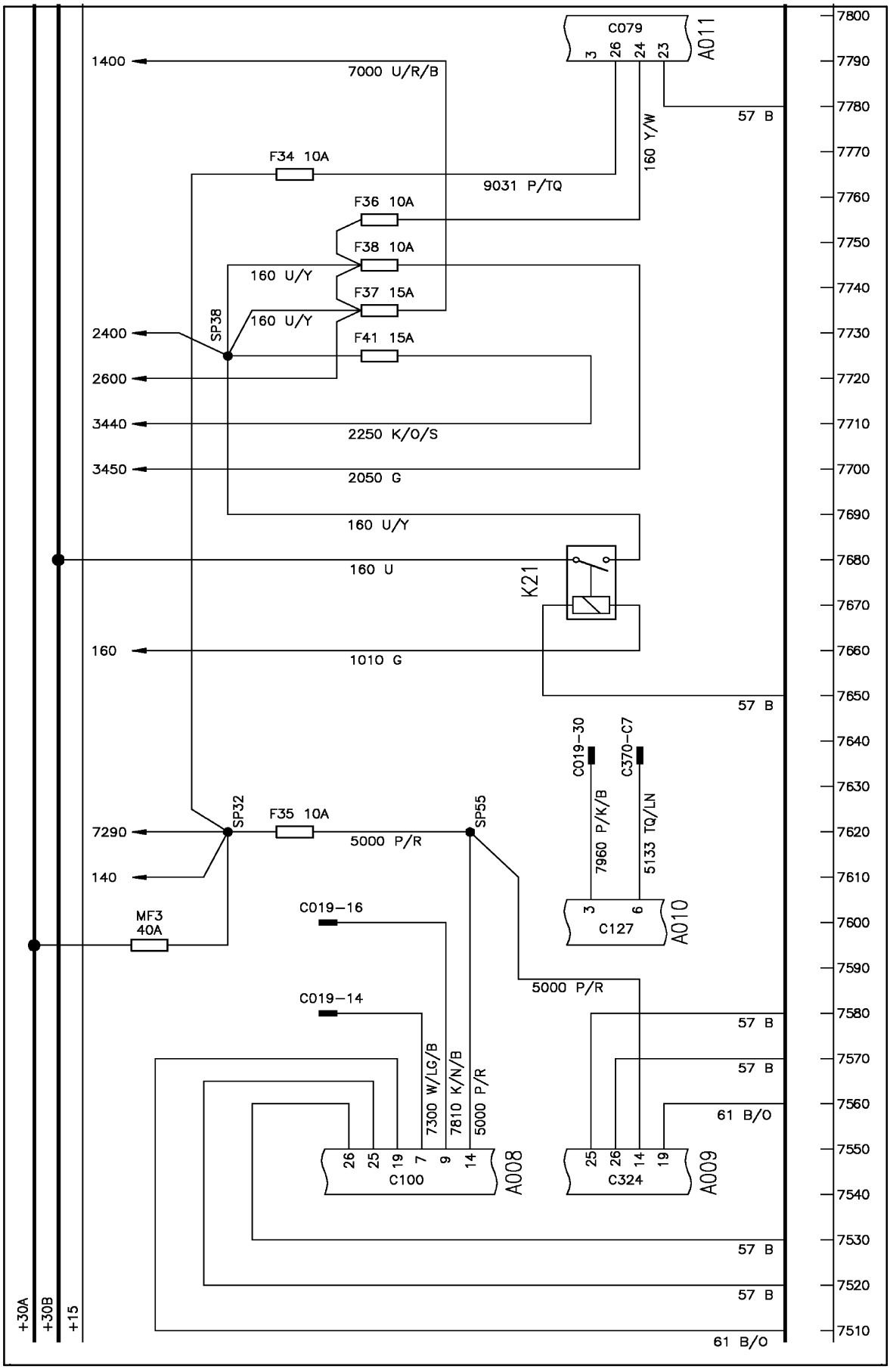
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

R4 Can Bus Terminator

X12 ADIC Diagnostics Connector
X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079
A011
3
26
24
23
1400
7000 U/R/B
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3440
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C019-30
C370-C7
SP32
F35 10A
SP55
7290
5000 P/R
7960 P/K/B
5133 TQ/LN
140
C019-16
MF3
40A
C127
A010
5000 P/R
C019-14
57 B
57 B
7300 W/LG/B
7810 K/N/B
5000 P/R
61 B/O
C100
A008
C324
A009
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

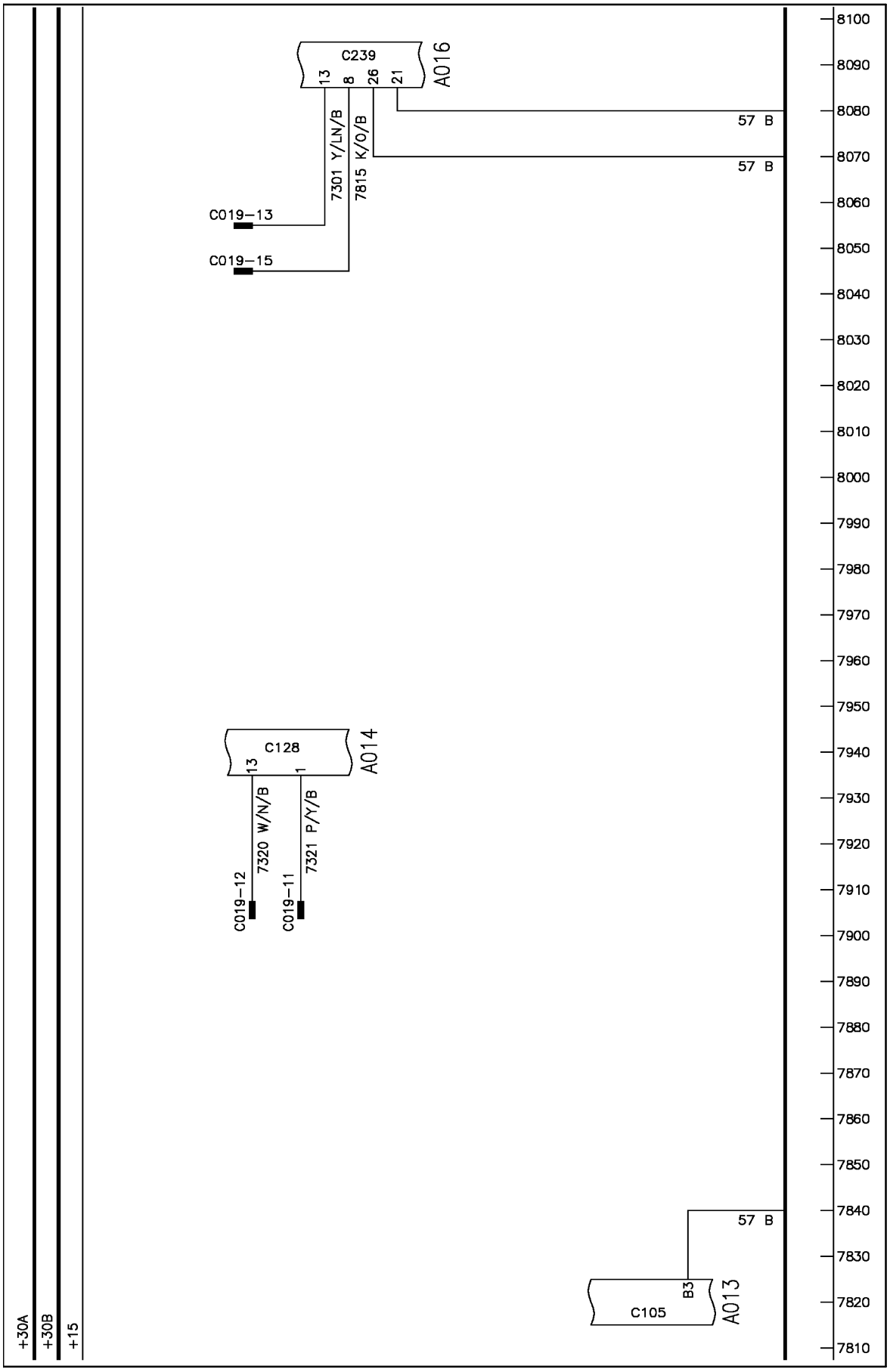
24x24 Transmission, W/Cab, W/Mechanical Engine

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239
13
8
26
21
A016
57 B
57 B
7301 Y/LN/B
7815 K/O/B
C019–13
C019–15
C128
13
1
A014
7320 W/N/B
7321 P/Y/B
C019–12
C019–11
57 B
B3
C105
A013
+30A
+30B
+15
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

24x24 Transmission, W/Cab, W/Mechanical Engine,

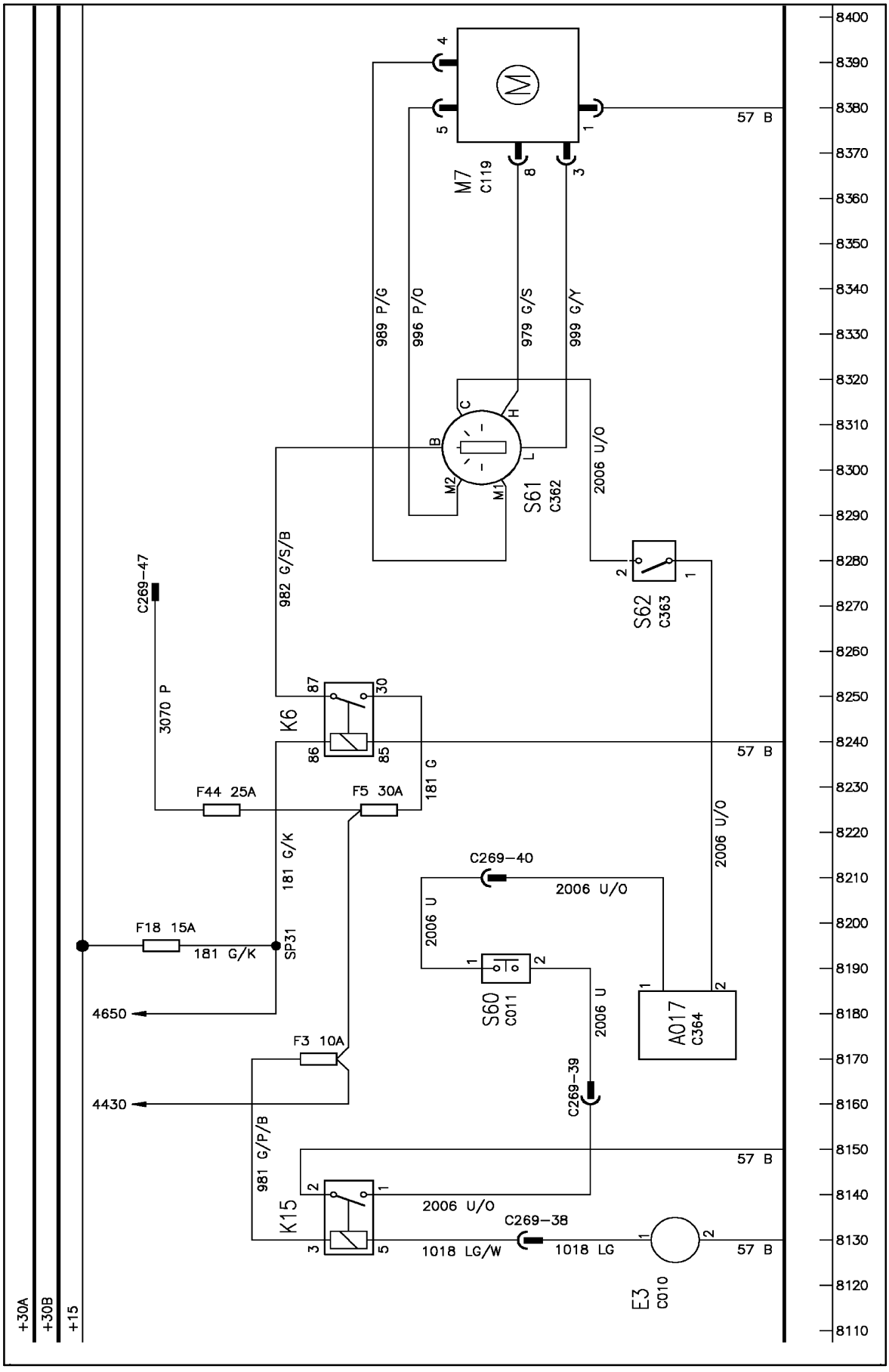
PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A013 Worklamp ECU

A014 XCM Central Control Unit (CN3-B)

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
M7
C119
S61
C362
S62
C363
K6
K15
F44 25A
F5 30A
F18 15A
F3 10A
SP31
S60
C011
A017
C364
E3
C010
C269-47
C269-40
C269-39
C269-38
989 P/G
996 P/O
979 G/S
999 G/Y
2006 U/O
982 G/S/B
3070 P
181 G
181 G/K
2006 U
981 G/P/B
1018 LG/W
1018 LG
57 B
4650
4430
8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110

24x24 Transmission, W/Cab, W/Mechanical Engine

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

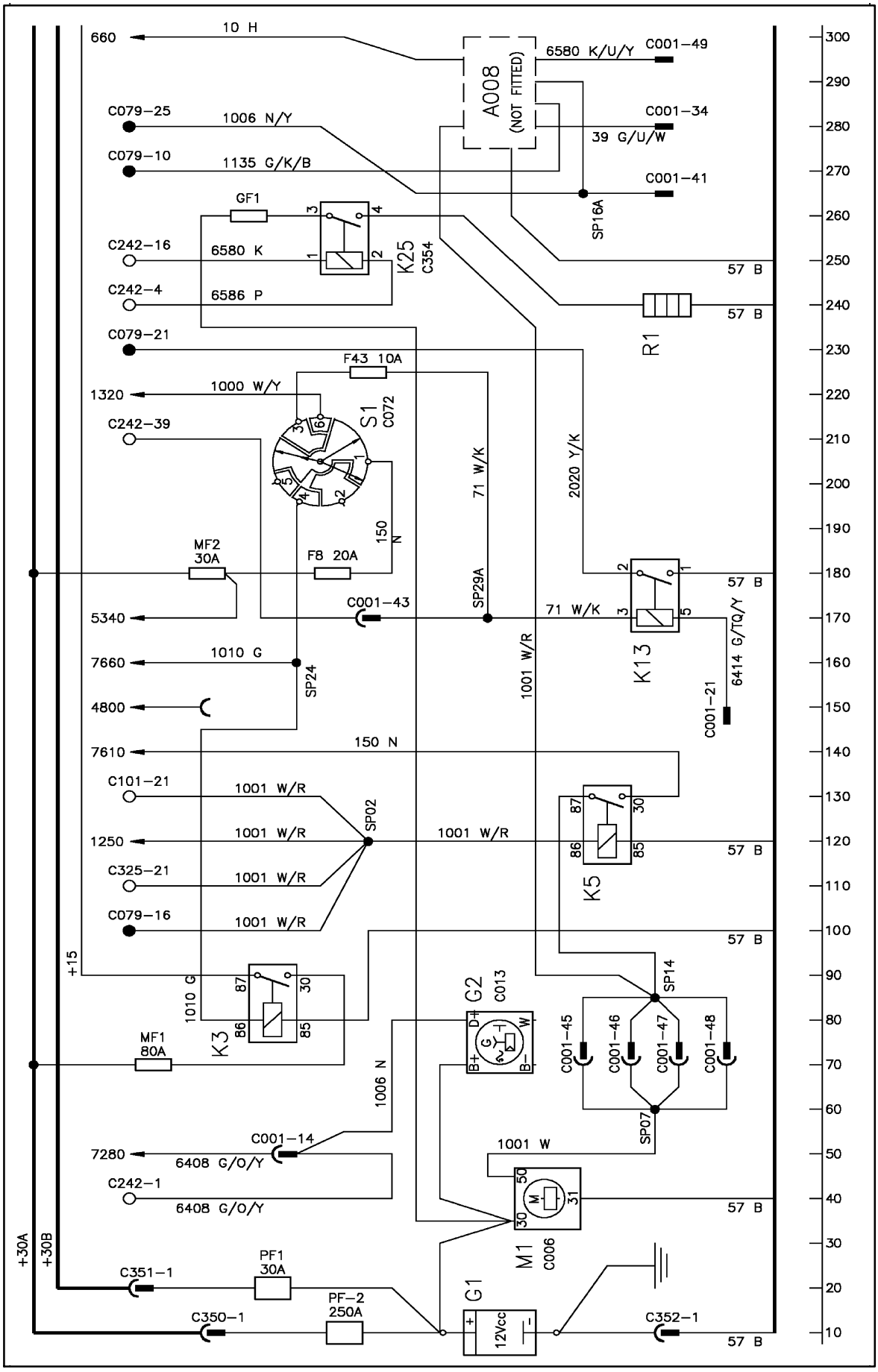
F3	Fuse - 10A	**K6**	Blower Motor Relay
F5	Fuse - 30A	**K15**	A/C Clutch Relay
F18	Fuse - 15A		
F44	Fuse - 25A	**M7**	Blower Unit
A017	HVAC Unit	**S60**	A/C Pressure Switch
		S61	Heater/Blower Switch
E3	A/C Clutch	**S62**	A/C Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

16X16 TRANSMISSION, L/CAB, W/ELECTRONIC ENGINE

Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400

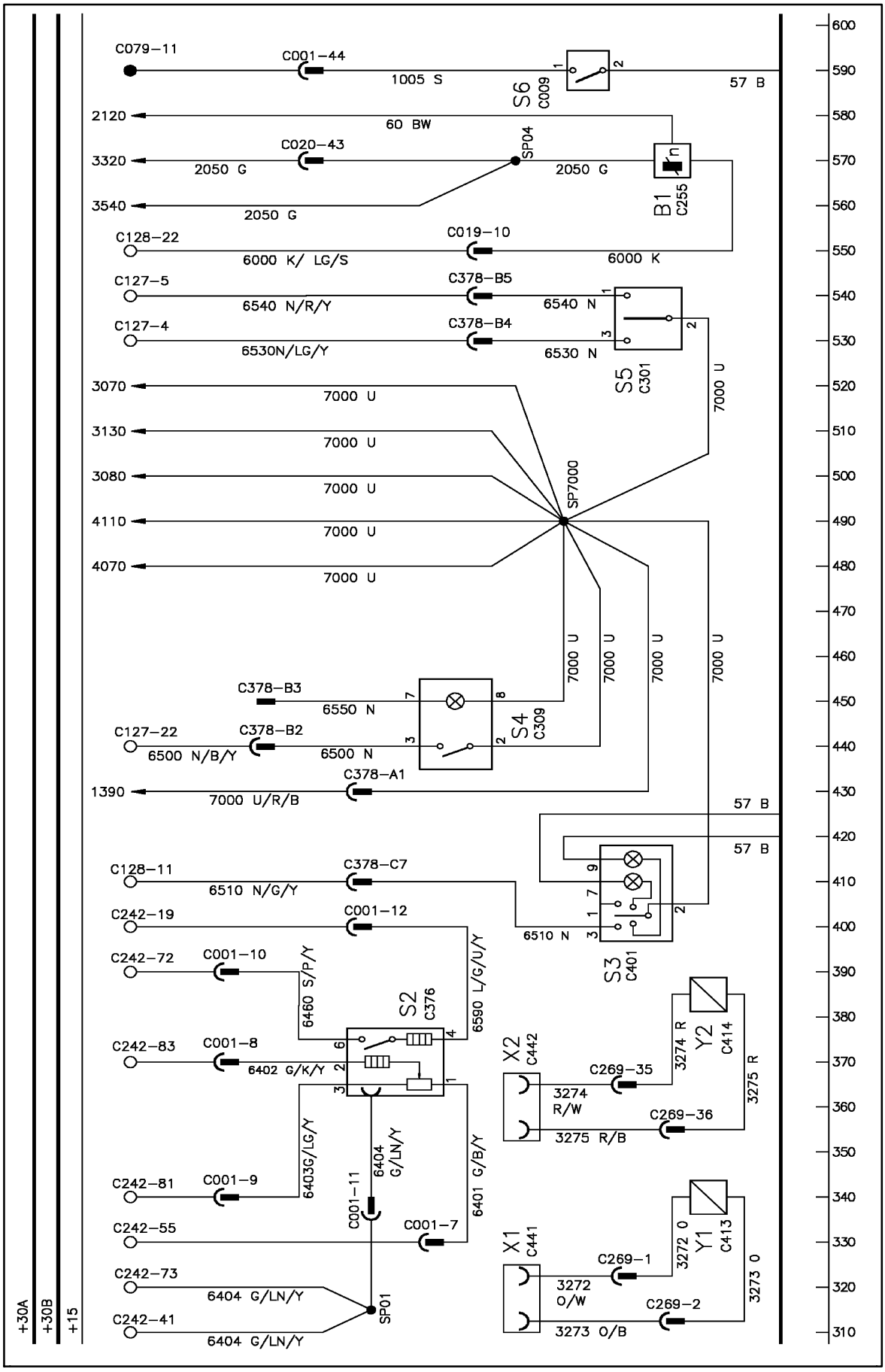

660
10 H
A008
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C001-41
SP16A
C079-25
1006 N/Y
C079-10
1135 G/K/B
GF1
C242-16
6580 K
K25
C354
C242-4
6586 P
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
C242-39
S1
C072
71 W/K
2020 Y/K
150 N
MF2
30A
F8 20A
SP29A
C001-43
5340
71 W/K
K13
6414 G/TQ/Y
C001-21
1001 W/R
7660
1010 G
SP24
4800
7610
150 N
C101-21
1001 W/R
SP02
1250
1001 W/R
C325-21
1001 W/R
C079-16
1001 W/R
K5
+15
1010 G
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1006 N
C001-14
7280
6408 G/O/Y
C242-1
6408 G/O/Y
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1
57 B
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

16x16 Transmission, L/Cab, W/Electronic Engine

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF1	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A008	Grid Heater Module (not fitted)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
3320
C020-43
2050 G
SP04
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
3070
7000 U
3130
7000 U
3080
7000 U
4110
7000 U
4070
7000 U
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
57 B
C128-11
C378-C7
6510 N/G/Y
6510 N
S3 C401
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6590 L/G/U/Y
S2 C376
C242-83
C001-8
6402 G/K/Y
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C001-11
C242-81
C001-9
C242-55
C001-7
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
Y2 C414
3274 R
3275 R
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
Y1 C413
3272 O
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

16x16 Transmission, L/Cab, W/Electronic Engine

ENGINE 1
line 310-600

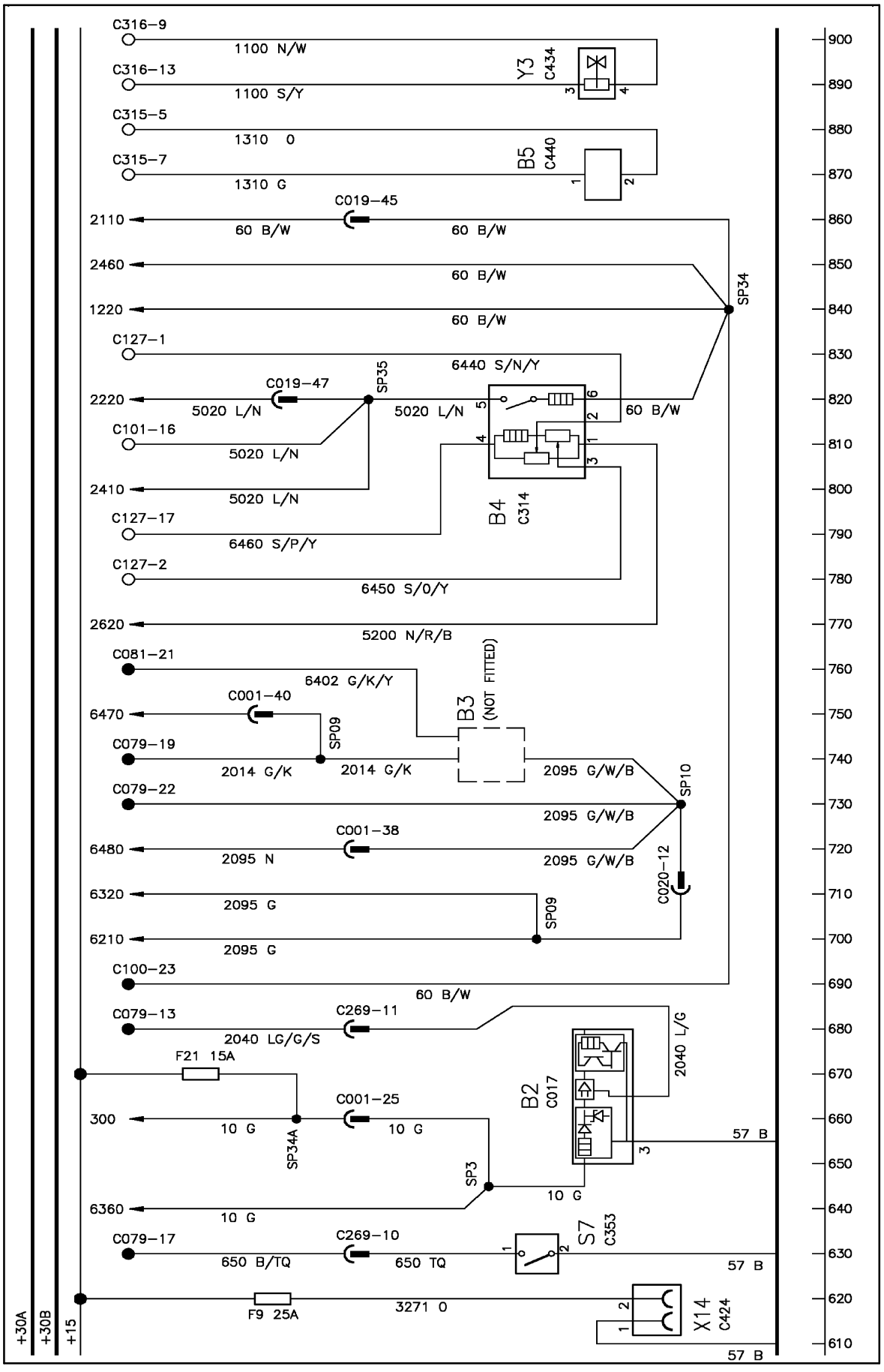
B1 Engine Flywheel Speed Sensor

S2 Foot Throttle - Electronic Engine
S3 Constant Engine Speed programme Switch
S4 Constant ERPM On/Off Switch
S5 Engine Inc./Dec. Switch
S6 Air Cleaner Switch

Y1 Loader Valve 1
Y2 Loader Valve 2

X1 Joystick Loader Control Socket 1
X2 Joystick Loader Control Socket 2

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

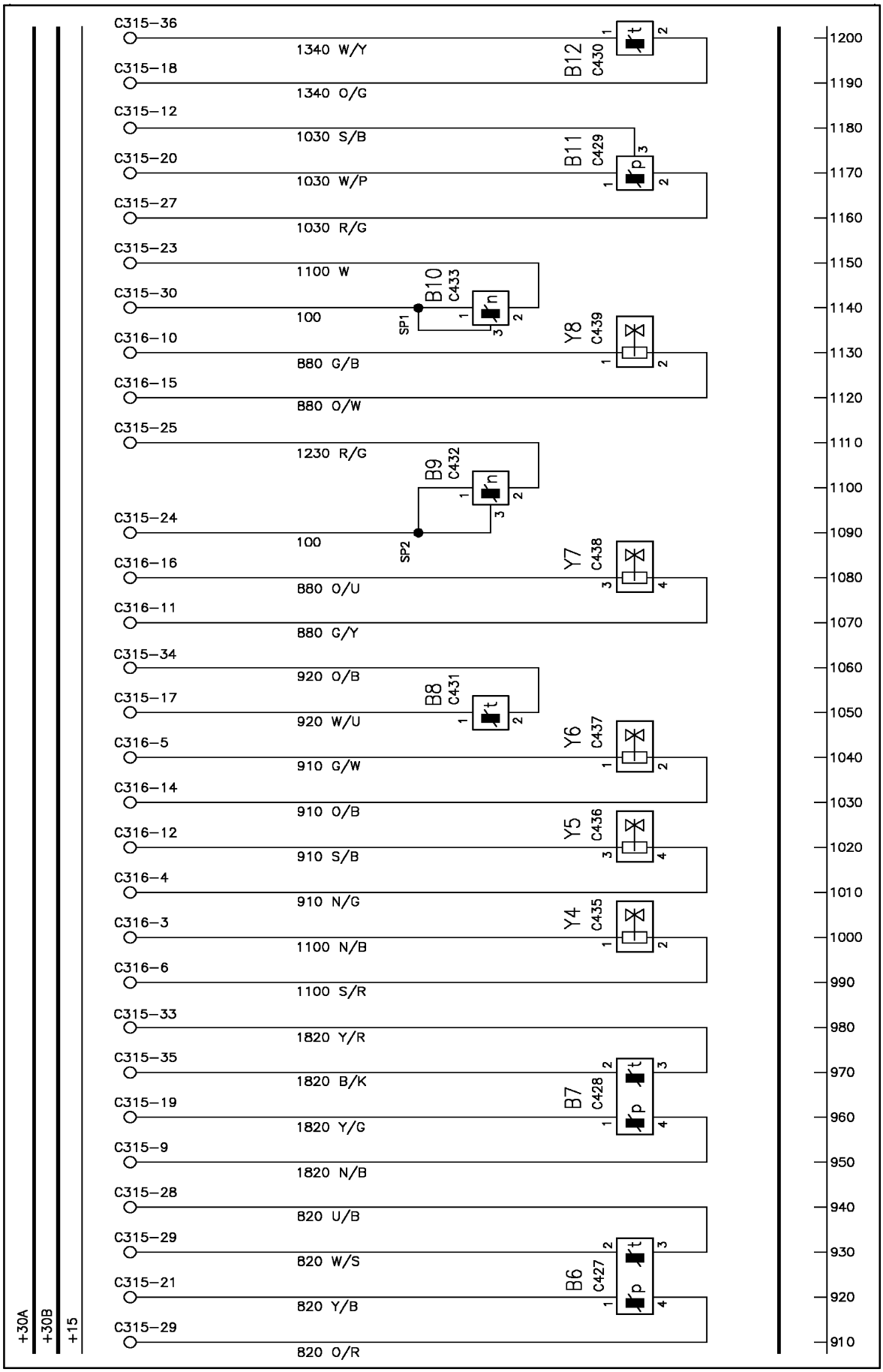

C316-9
1100 N/W
C316-13
1100 S/Y
Y3 C434
C315-5
1310 0
C315-7
1310 G
B5 C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4 C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3 (NOT FITTED)
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2 C017
300
10 G
C001-25
10 G
SP34A
SP3
57 B
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 TQ
S7 C353
57 B
F9 25A
3271 0
X14 C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

16x16 Transmission, L/Cab, W/Electronic Engine

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A		
		Y3	Injector 1
B2	Water In Fuel Sensor		
B3	Foot Throttle - Mechanical Engine (Not Fitted)	**X14**	Loader Power Connector
B4	Hand Throttle		
B5	Fuel Metering Unit		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

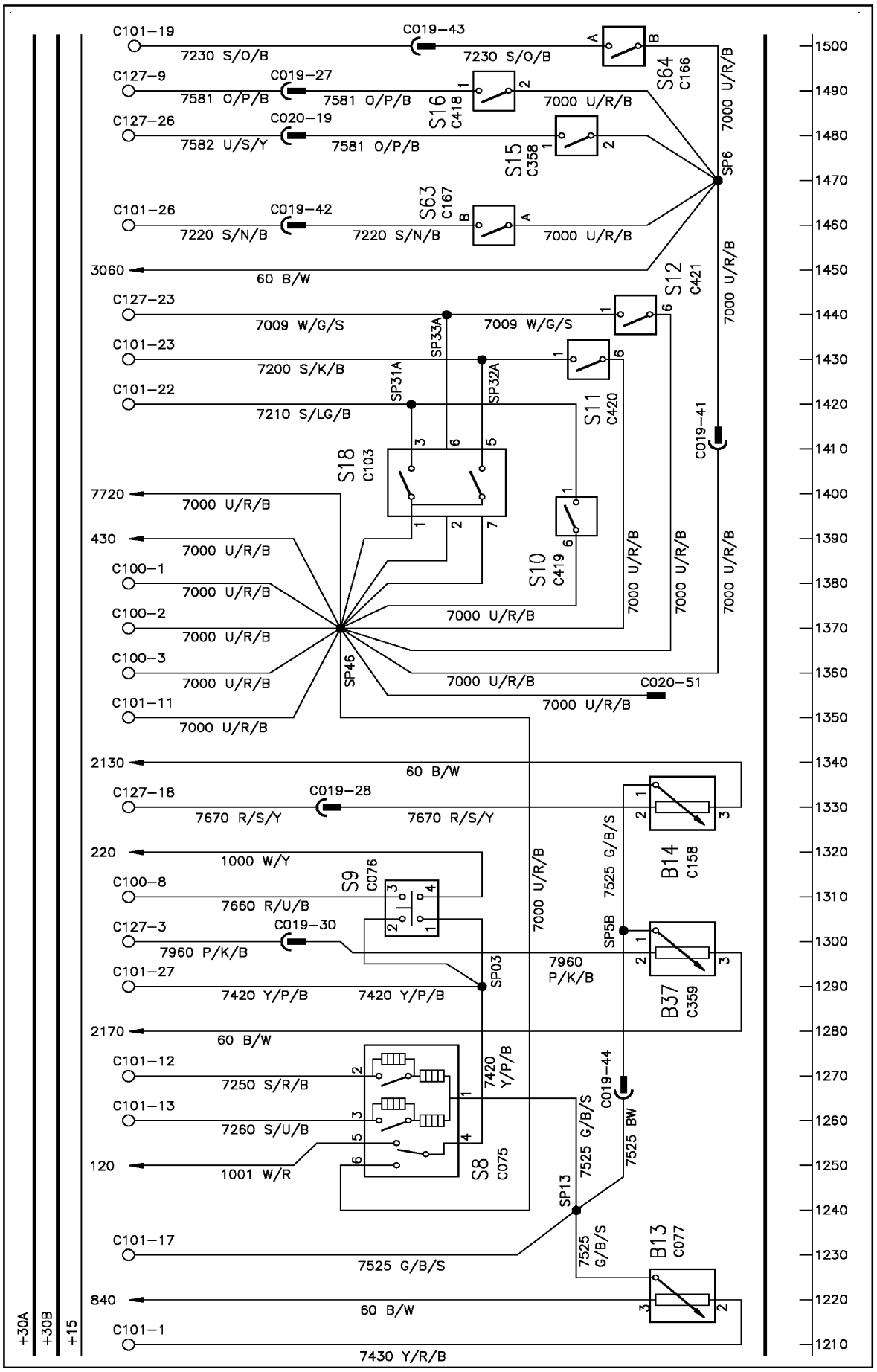

C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
C315-9
1820 N/B
B7 C428
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910

16x16 Transmission, L/Cab, W/Electronic Engine

ENGINE 3
line 910-1200

B6	Boost Pressure/Temperature Sensor	**Y4**	Injector 2
B7	Oil Pressure/Temperature Sensor	**Y5**	Injector 3
B8	Fuel Temperature Sensor	**Y6**	Injector 4
B9	Crankshaft Speed Sensor	**Y7**	Injector 5 (6 cyl version)
B10	Camshaft Speed Sensor	**Y8**	Injector 6 (6 cyl version)
B11	Fuel Rail Pressure Sensor		
B12	Coolant Temperature Sensor		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

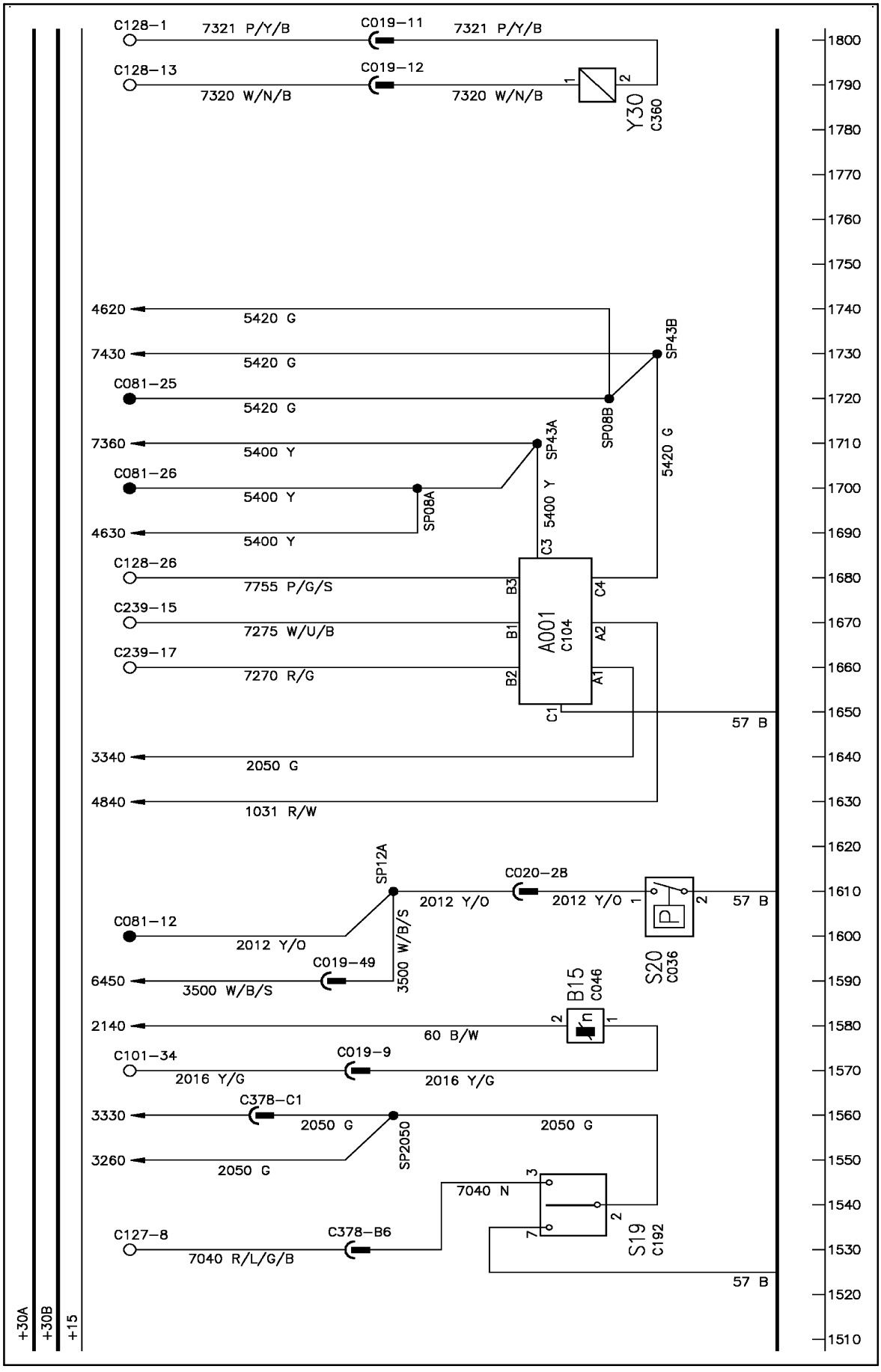

C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
SP46
C020-51
C101-11
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
S9 C076
C100-8
7660 R/U/B
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
B37 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

16x16 Transmission, L/Cab, W/Electronic Engine

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control - Range
B14	Synchro Position Potentiometer	**S15**	Creeper Sensing Switch
B37	1-4/5-8 Synchro Potentiometer	**S16**	Creeper Sense Forward Switch
		S18	Gearshift
S8	Shuttle Switch	**S63**	High Range Switch
S9	Clutch Switch	**S64**	Low Range Switch
S10	Duplicate Transmission Control - Downshift		
S11	Duplicate Transmission Control - Upshift		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
5420 G
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
A001
C104
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C020-28
2012 Y/O
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

16x16 Transmission, L/Cab, W/Electronic Engine

TRANSMISSION SYSTEM 2
Line 1510-1800

A001 Gear Shift Indicator

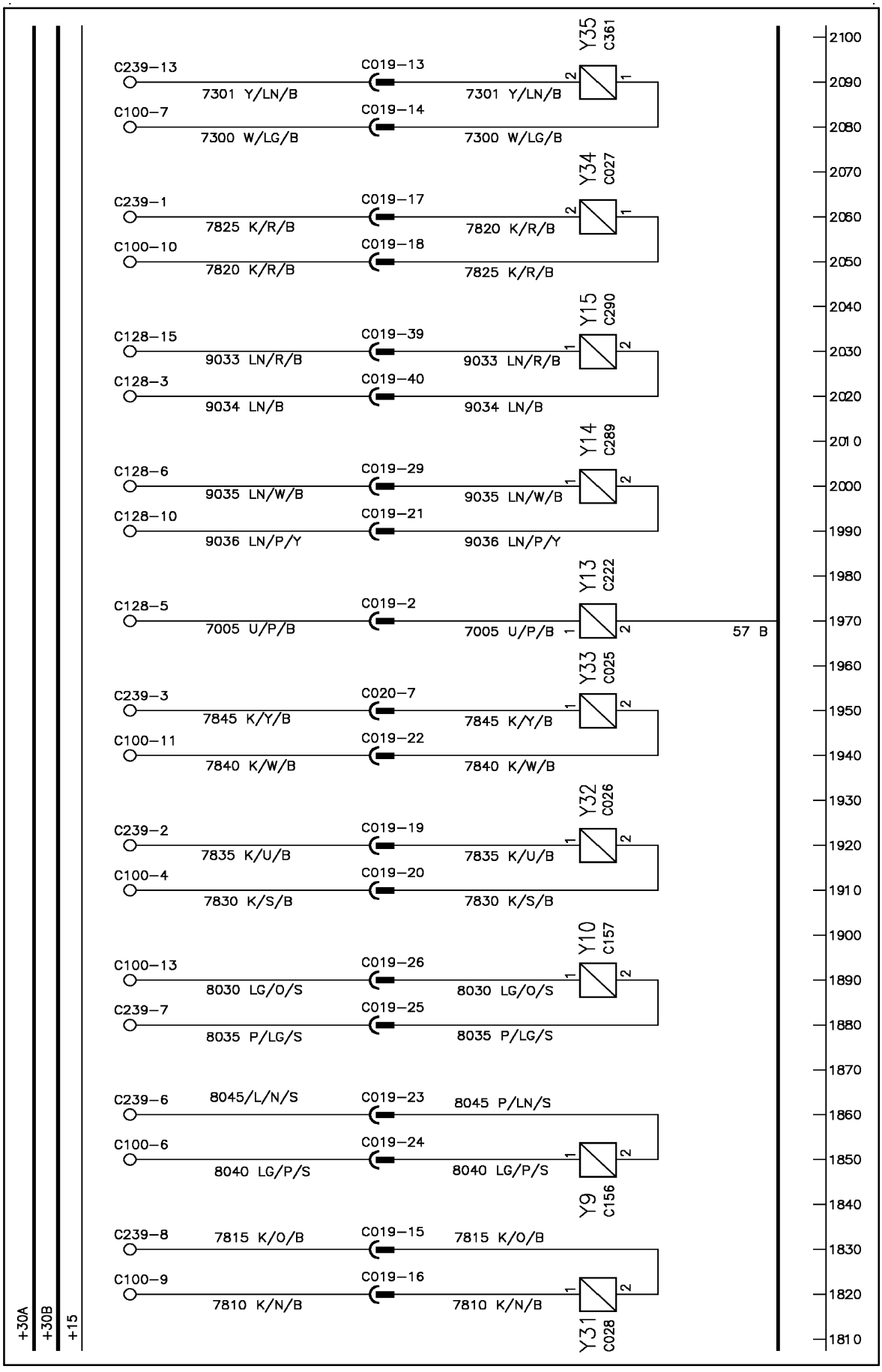
B15 Speed Sensor

S19 Creeper Gear Switch

S20 Transmission Oil Pressure Switch

Y30 5-8 Synchro Solenoid

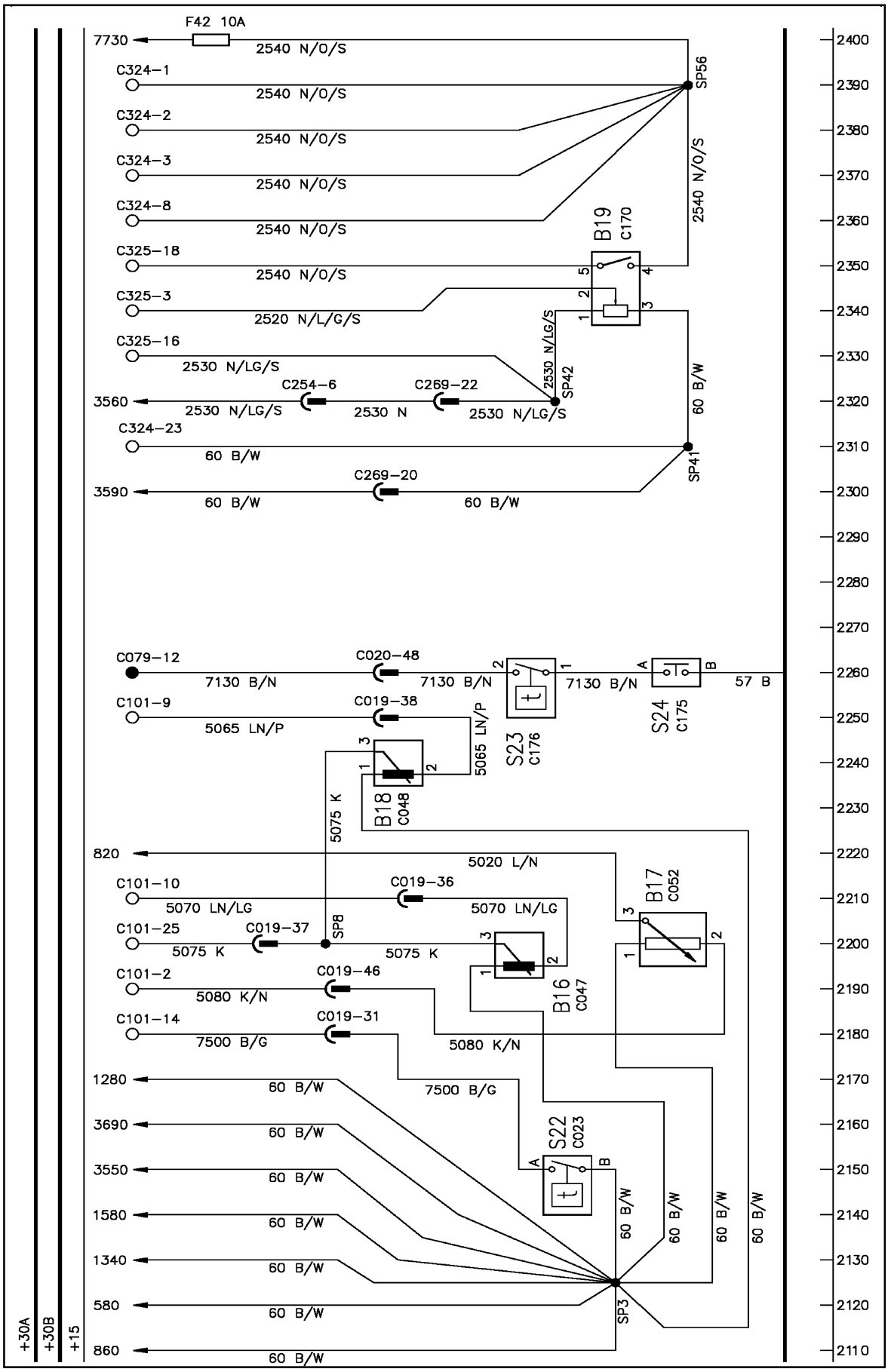
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
Y35 C361
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
Y34 C027
C239-1
7825 K/R/B
C019-17
7820 K/R/B
C100-10
7820 K/R/B
C019-18
7825 K/R/B
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
C128-3
9034 LN/B
C019-40
9034 LN/B
Y14 C289
C128-6
9035 LN/W/B
C019-29
9035 LN/W/B
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U/P/B
57 B
Y33 C025
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
C100-11
7840 K/W/B
C019-22
7840 K/W/B
Y32 C026
C239-2
7835 K/U/B
C019-19
7835 K/U/B
C100-4
7830 K/S/B
C019-20
7830 K/S/B
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
8045/L/N/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y31 C1 Valve
Y32 C3 Valve
Y33 C4 Valve
Y34 C2 Valve
Y35 1-4 Synchro Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

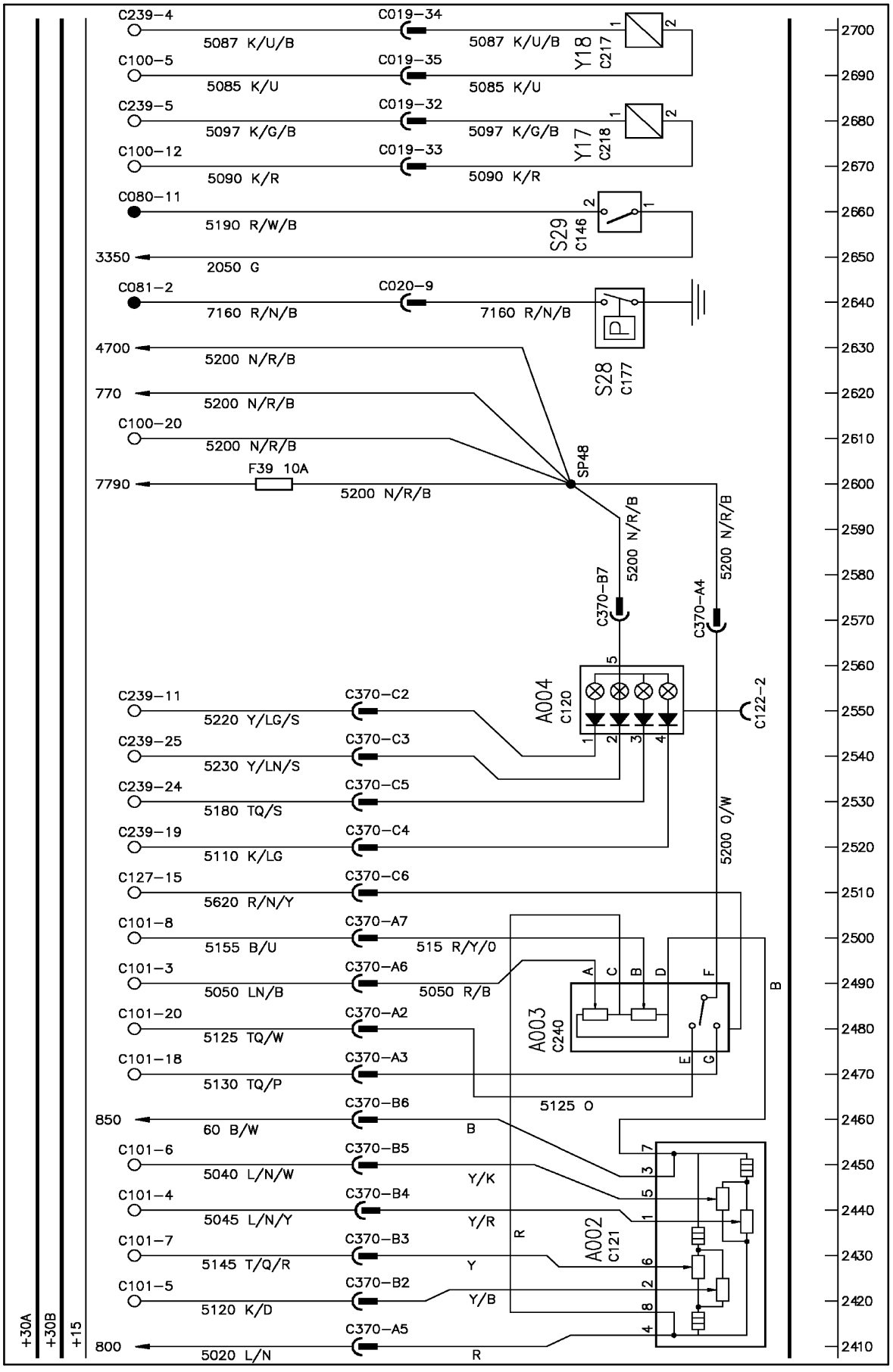

F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
C079-12
C020-48
7130 B/N
C101-9
C019-38
5065 LN/P
S23
C176
S24
C175
57 B
B18
C048
5075 K
820
5020 L/N
C101-10
C019-36
5070 LN/LG
C101-25
C019-37
SP8
C101-2
C019-46
5080 K/N
C101-14
C019-31
7500 B/G
B16
C047
B17
C052
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

16x16 Transmission, L/Cab, W/Electronic Engine

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A
B16	LH Draft Pin
B17	Rockshaft Potentiometer
B18	RH Draft Pin
B19	Front HPL Limit Potentiometer
S22	Transmission Oil Temp Sensor
S23	Oil Temperature Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

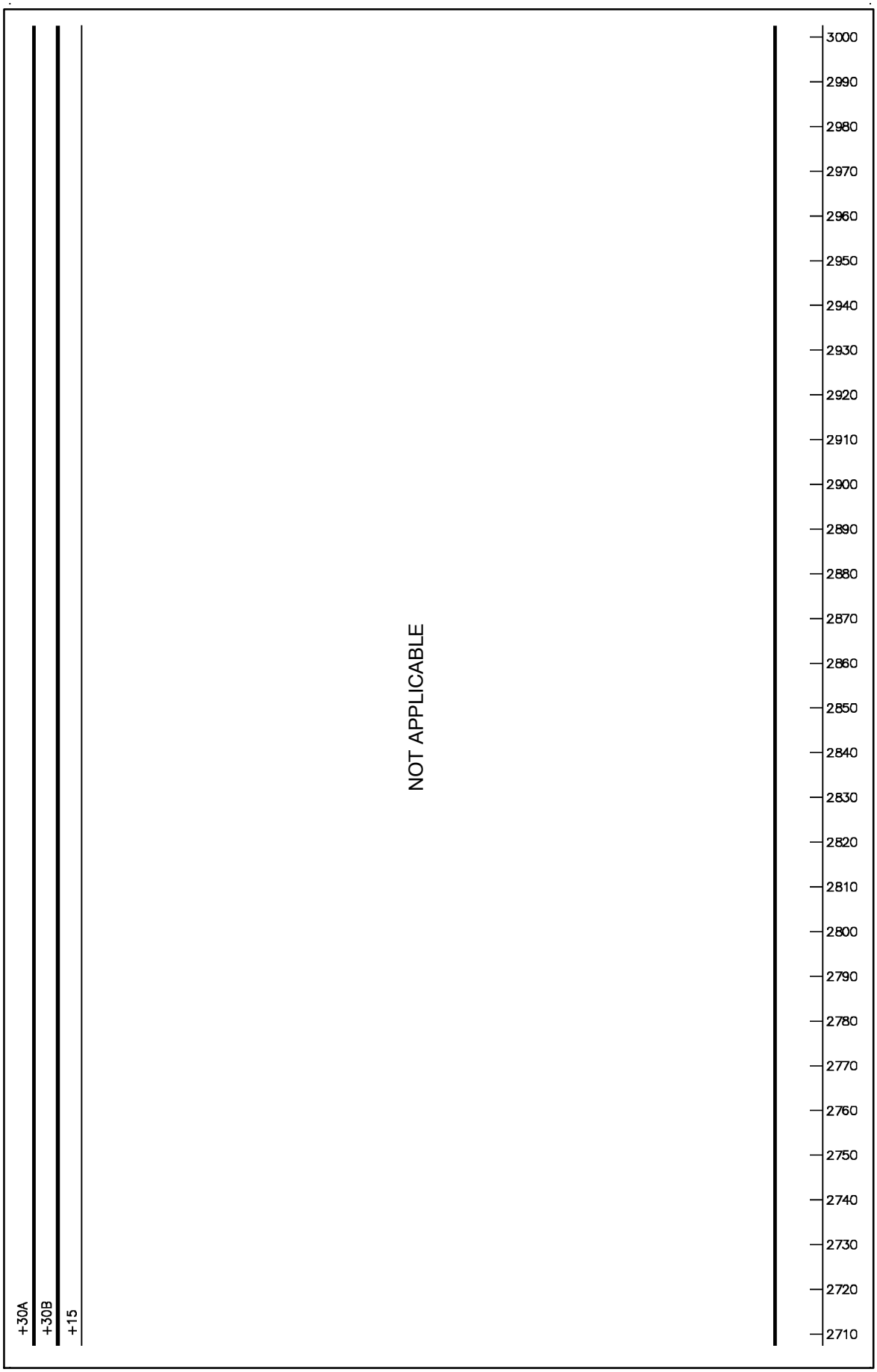

C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7790
5200 N/R/B
SP48
5200 N/R/B
5200 N/R/B
C370-B7
C370-A4
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
C127-15
C370-C6
5620 R/N/Y
5200 O/W
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

16x16 Transmission, L/Cab, W/Electronic Engine

HYDRAULICS 2
Line 2410-2700

F39	Fuse - 10A	**S28**	Lo Charge Switch
		S29	Lift-O-Matic Switch
A002	EDC Control		
A003	EDC Mouse	**Y17**	EDC Lower Solenoid
A004	EDC Status Lamp Panel	**Y18**	EDC Raise Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

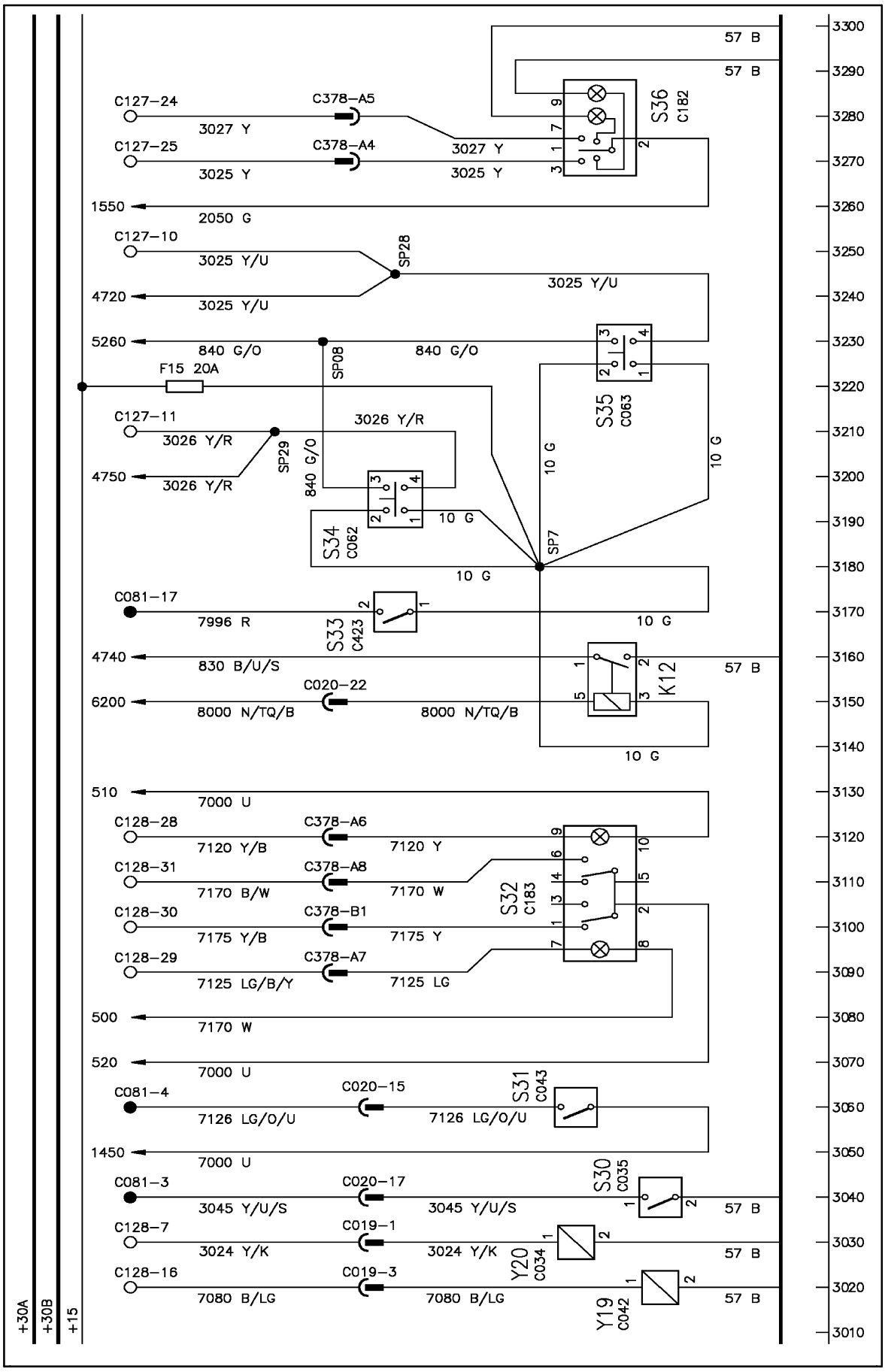

+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

16x16 Transmission, L/Cab, W/Electronic Engine

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

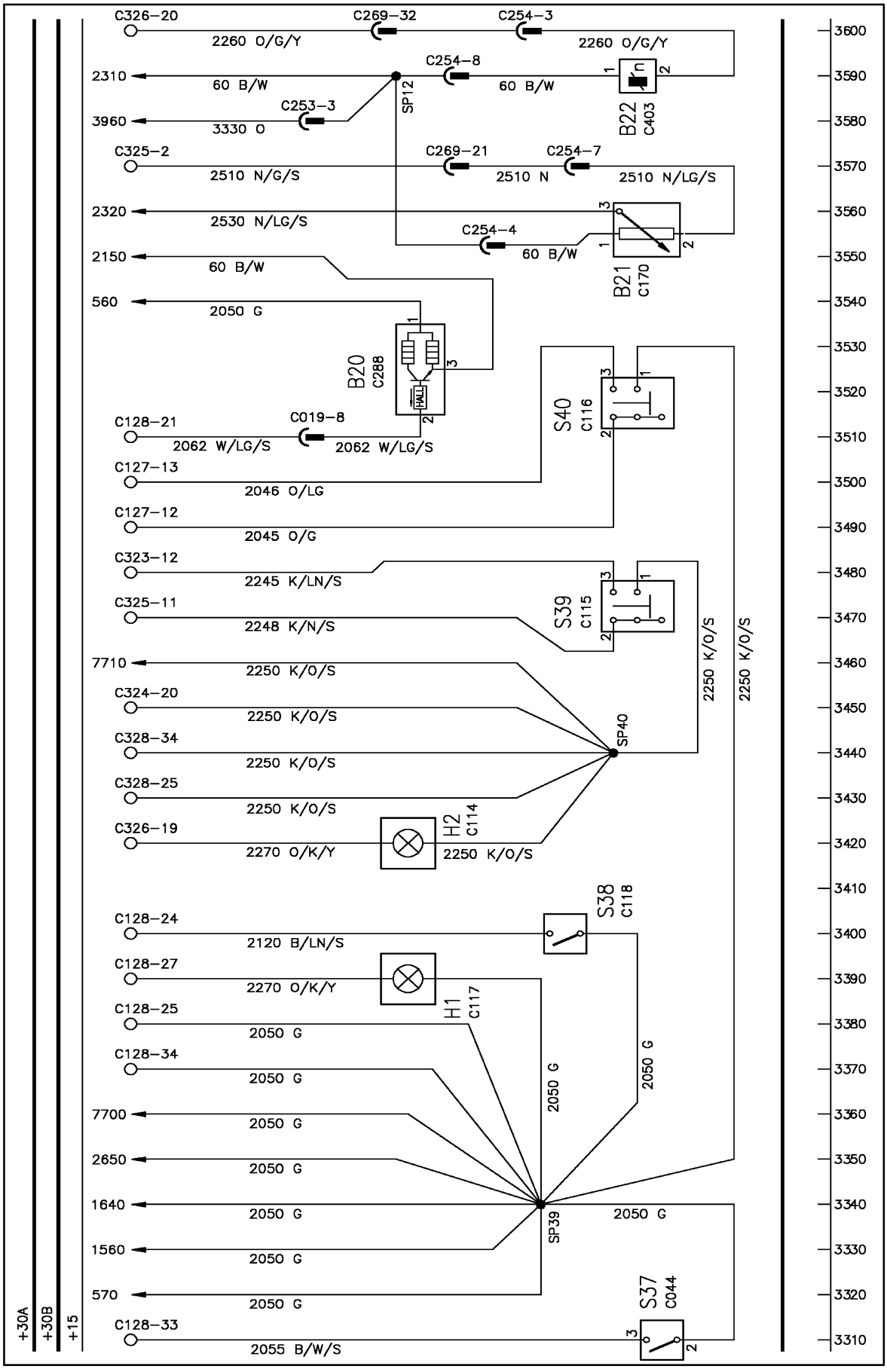

+30A
+30B
+15
F15 20A
SP28
SP29
SP08
SP7
S36 C182
S35 C063
S34 C062
S33 C423
S32 C183
S31 C043
S30 C035
K12
Y20 C034
Y19 C042
C127-24
C127-25
C127-10
C127-11
C081-17
C081-4
C081-3
C128-28
C128-31
C128-30
C128-29
C128-7
C128-16
C378-A5
C378-A4
C378-A6
C378-A8
C378-B1
C378-A7
C020-22
C020-15
C020-17
C019-1
C019-3
3027 Y
3025 Y
3025 Y/U
3026 Y/R
840 G/O
10 G
57 B
2050 G
4720
4750
5260
1550
6200
4740
510
520
500
1450
7996 R
830 B/U/S
8000 N/TQ/B
7000 U
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
7126 LG/O/U
3045 Y/U/S
3024 Y/K
7080 B/LG
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

16x16 Transmission, L/Cab, W/Electronic Engine

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

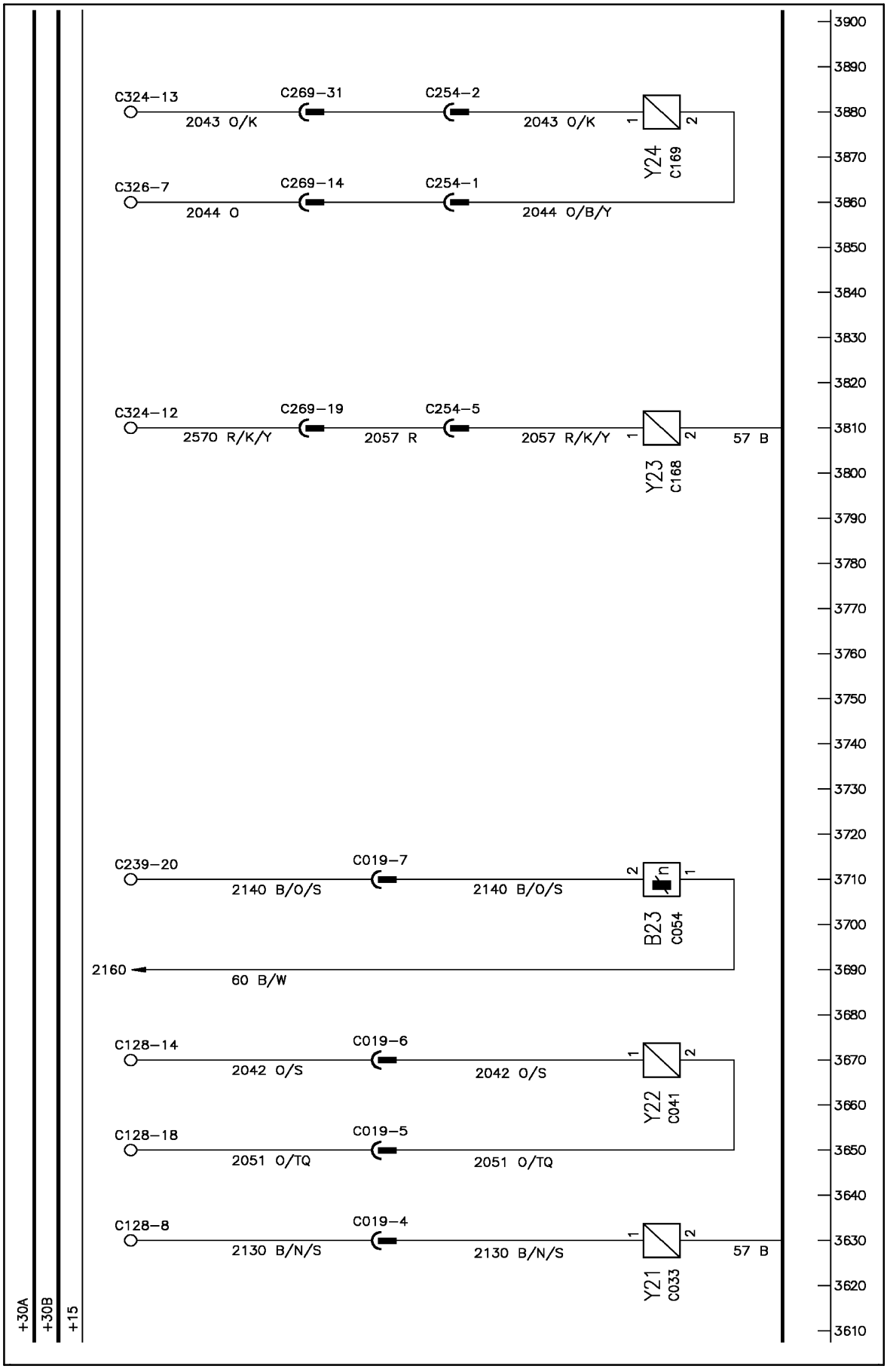

C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
H2
C114
C326-19
2270 O/K/Y
2250 K/O/S
S38
C118
C128-24
2120 B/LN/S
C128-27
2270 O/K/Y
H1
C117
C128-25
2050 G
C128-34
2050 G
2050 G
2050 G
7700
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

16x16 Transmission, L/Cab, W/Electronic Engine

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
+30A
+30B
+15
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

16x16 Transmission, L/Cab, W/Electronic Engine

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

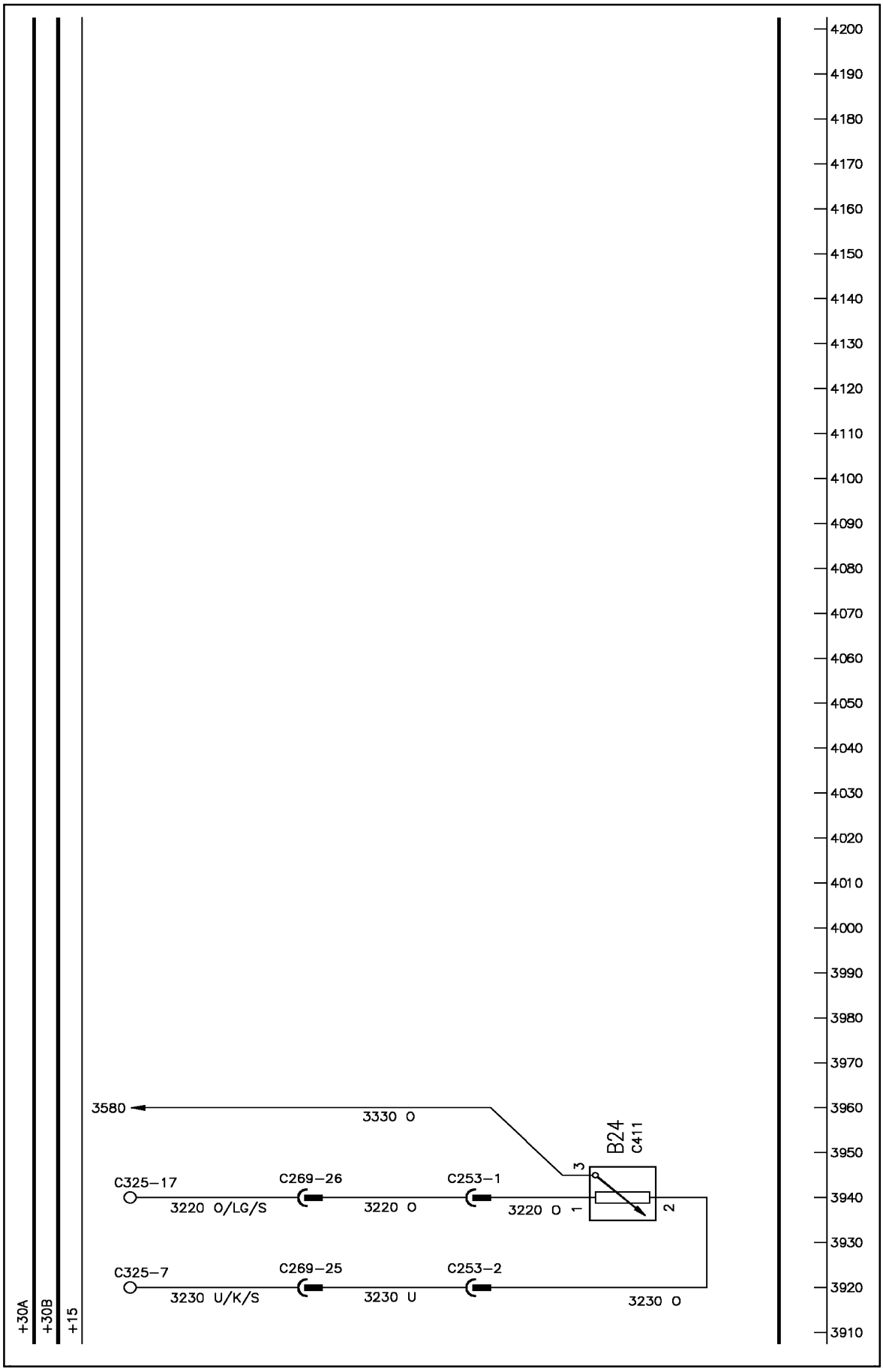
Y21 PTO Brake Solenoid

Y22 PTO Clutch Solenoid

Y23 Front Hitch Valve

Y24 Front PTO Solenoid

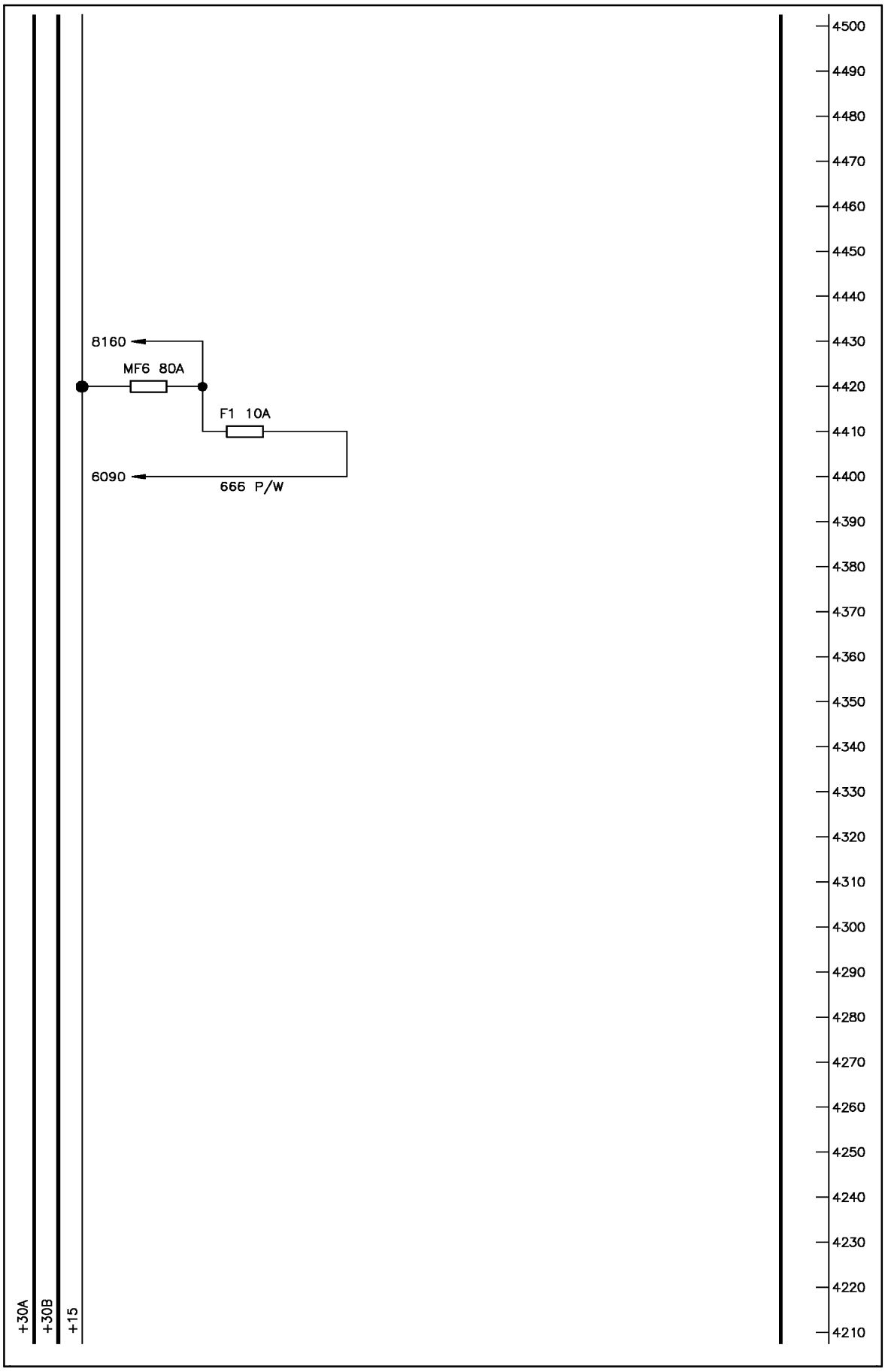
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910
+30A
+30B
+15
3580
3330 O
B24
C411
3
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
1
2
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8160
MF6 80A
F1 10A
6090
666 P/W
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

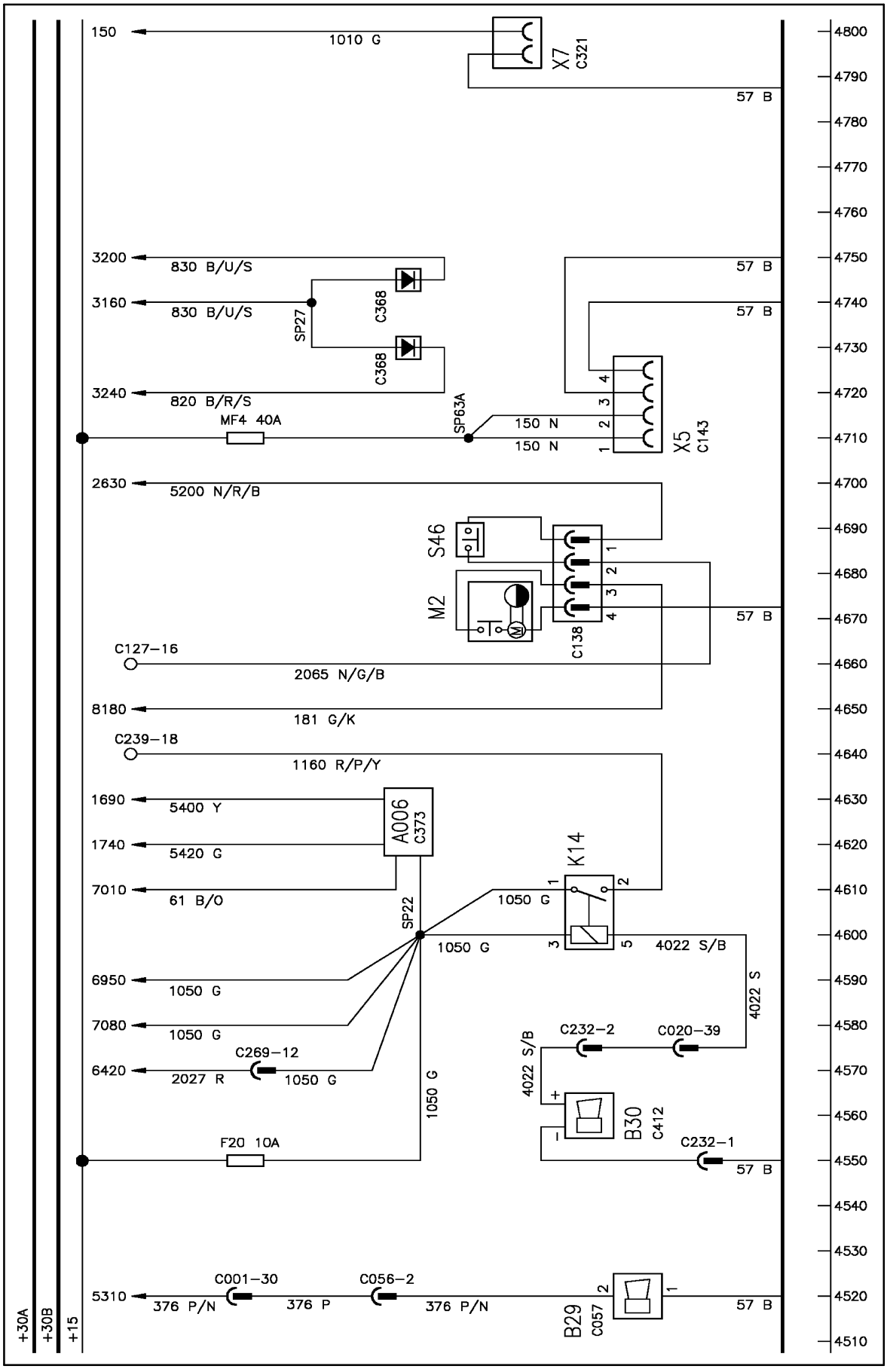
16x16 Transmission, L/Cab, W/Electronic Engine

CAB ACCESSORIES 1
Line 4210-4500

MF6 Maxi Fuse - 80A

F1 Fuse - 10A

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

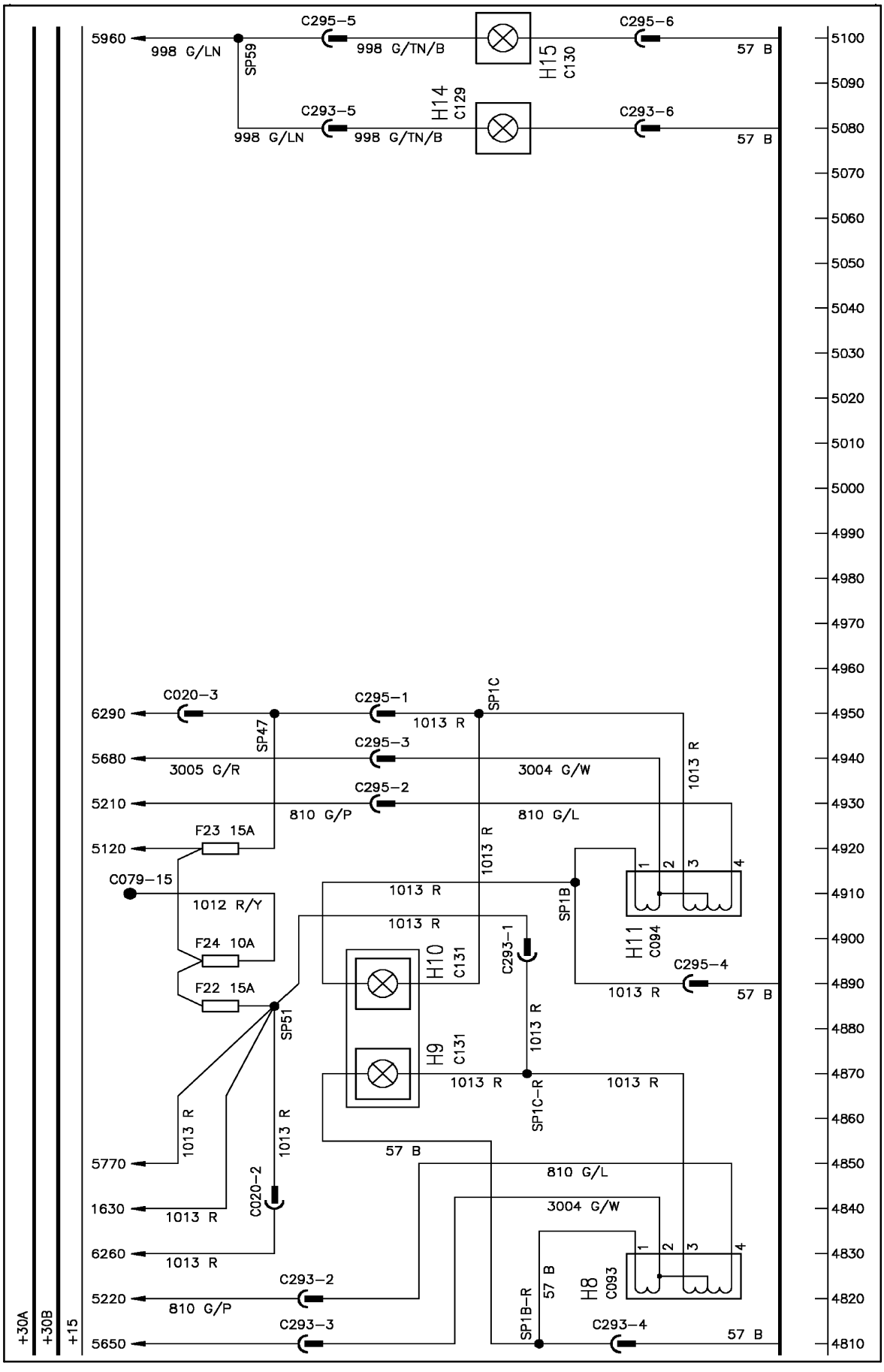

150
1010 G
X7
C321
57 B
3200
830 B/U/S
3160
830 B/U/S
SP27
C368
C368
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
1740
5420 G
7010
61 B/O
A006
C373
SP22
K14
1050 G
1050 G
4022 S/B
4022 S
6950
1050 G
7080
1050 G
6420
2027 R
C269-12
1050 G
1050 G
C232-2
C020-39
4022 S/B
B30
C412
C232-1
57 B
F20 10A
5310
C001-30
376 P/N
C056-2
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

16x16 Transmission, L/Cab, W/Electronic Engine

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode
C377	Diode

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

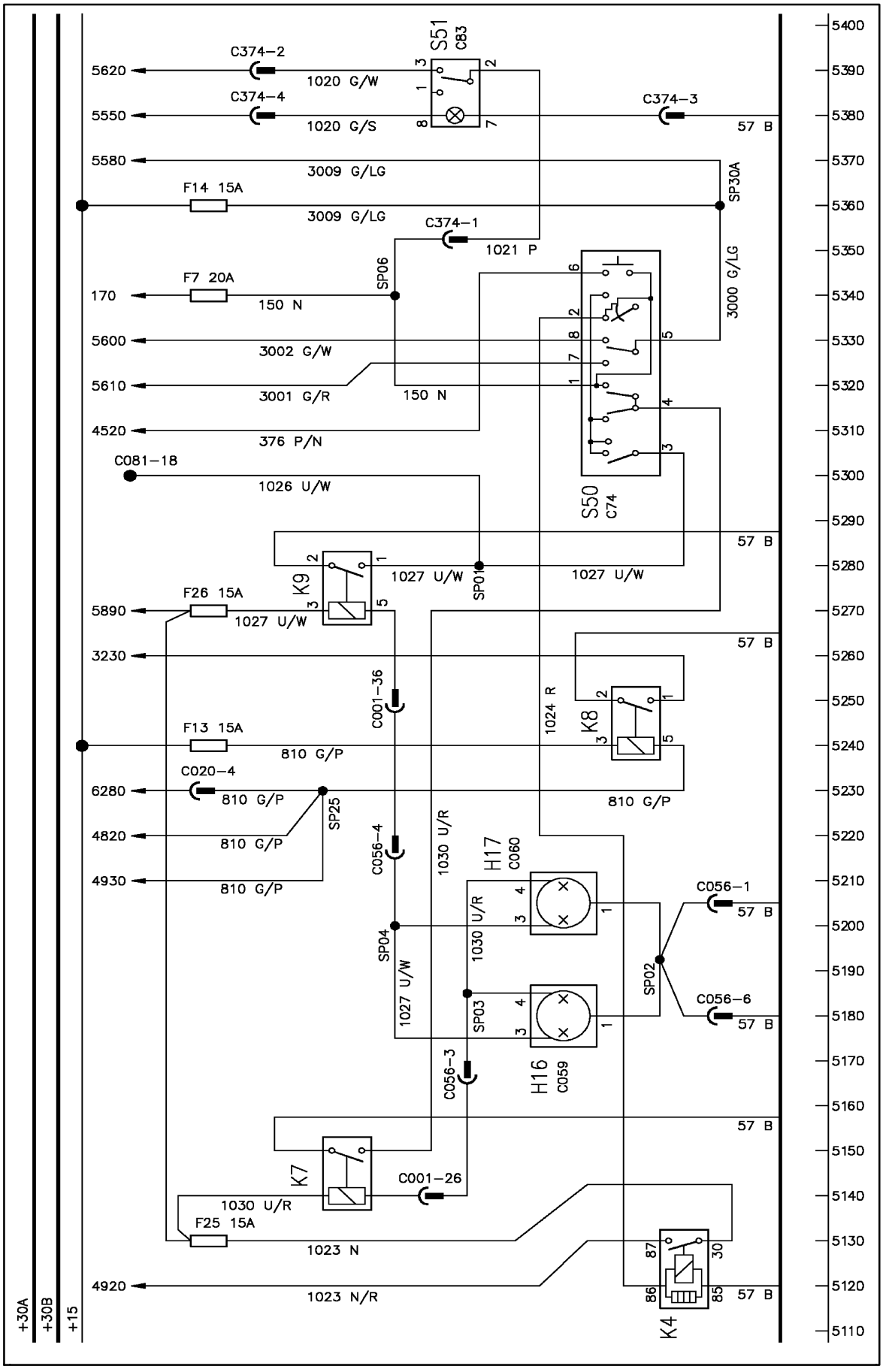

5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15
C130
C295-6
57 B
H14
C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810
C020-3
6290
SP47
C295-1
1013 R
SP1C
5680
3005 G/R
C295-3
3004 G/W
1013 R
5210
810 G/P
C295-2
810 G/L
F23 15A
5120
1013 R
C079-15
1013 R
1012 R/Y
1013 R
SP1B
F24 10A
H10
C131
C293-1
H11
C094
C295-4
F22 15A
1013 R
57 B
SP51
H9
C131
1013 R
1013 R
1013 R
SP1C-R
1013 R
1013 R
1013 R
57 B
5770
C020-2
810 G/L
1630
1013 R
3004 G/W
6260
1013 R
C293-2
5220
810 G/P
H8
C093
SP1B-R
57 B
C293-4
57 B
C293-3
5650
+30A
+30B
+15

16x16 Transmission, L/Cab, W/Electronic Engine

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A
H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender
H10	Licence Plate Lamp - Fender
H11	Stop/Tail Light L/H
H14	Worklamp - Fender R/H
H15	Worklamp - Fender L/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

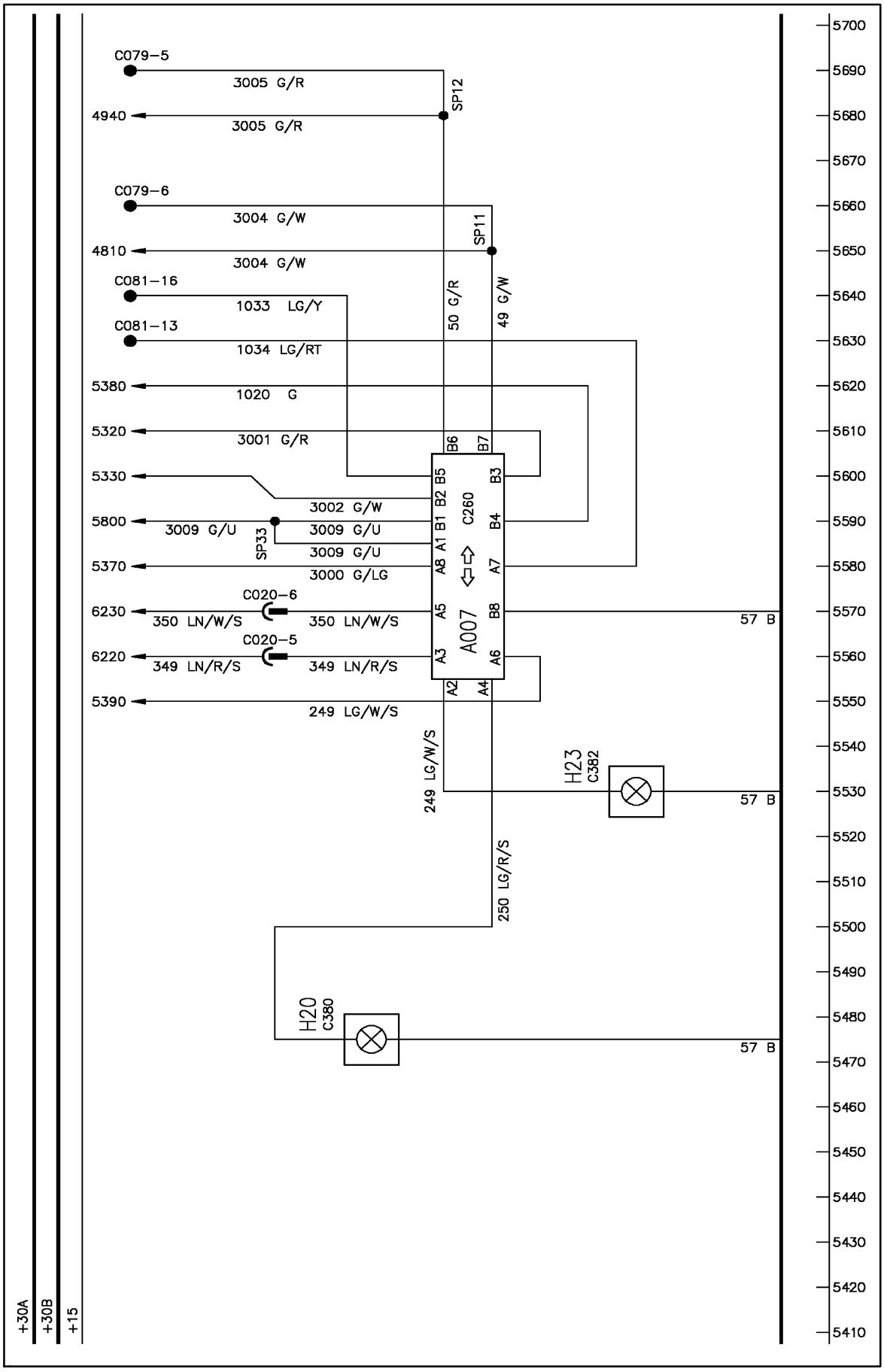

+30A
+30B
+15
5620
5550
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
C374-2
C374-4
1020 G/W
1020 G/S
S51
C83
C374-3
57 B
3009 G/LG
F14 15A
SP30A
C374-1
1021 P
SP06
F7 20A
150 N
3002 G/W
3001 G/R
376 P/N
3000 G/LG
C081-18
1026 U/W
S50
C74
K9
1027 U/W
SP01
F26 15A
C001-36
F13 15A
810 G/P
C020-4
SP25
1024 R
K8
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
H16
C059
C056-3
C056-1
C056-6
SP02
K7
C001-26
F25 15A
1023 N
1023 N/R
K4
87
30
86
85
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

16x16 Transmission, L/Cab, W/Electronic Engine

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
SP12
C079-6
3004 G/W
4810
3004 G/W
SP11
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
350 LN/W/S
C020-5
6220
349 LN/R/S
349 LN/R/S
5390
249 LG/W/S
50 G/R
49 G/W
B6
B7
B5
B3
B2
B1
C260
B4
A1
A8
A7
A5
B8
A007
A3
A6
A2
A4
57 B
H23
C382
249 LG/W/S
250 LG/R/S
H20
C380
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

16x16 Transmission, L/Cab, W/Electronic Engine

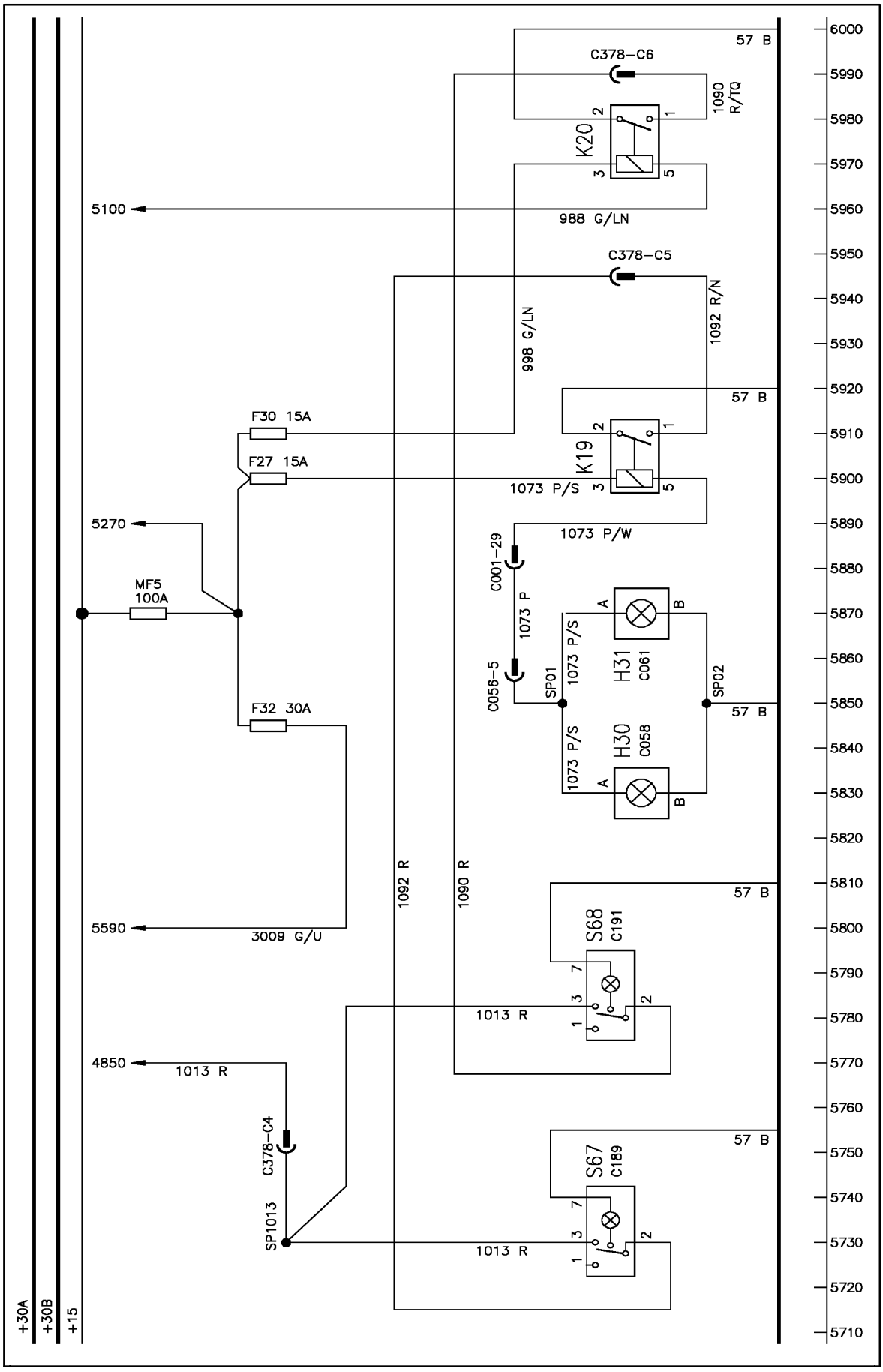
INDICATORS AND HAZARDS 3
Line 5410-5700

A007 Flasher Unit

H20 SMV Lamp L/H Rear

H23 SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
MF5
100A
F30 15A
F27 15A
F32 30A
5100
988 G/LN
5270
5590
3009 G/U
4850
1013 R
C378-C6
C378-C5
C378-C4
SP1013
K20
K19
1090 R/TQ
1092 R/N
998 G/LN
1073 P/S
1073 P/W
1073 P
C001-29
C056-5
SP01
SP02
H31
C061
H30
C058
S68
C191
S67
C189
1092 R
1090 R
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

16x16 Transmission, L/Cab, W/Electronic Engine

WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A

F27 Fuse - 15A
F30 Fuse - 15A
F32 Fuse - 30A

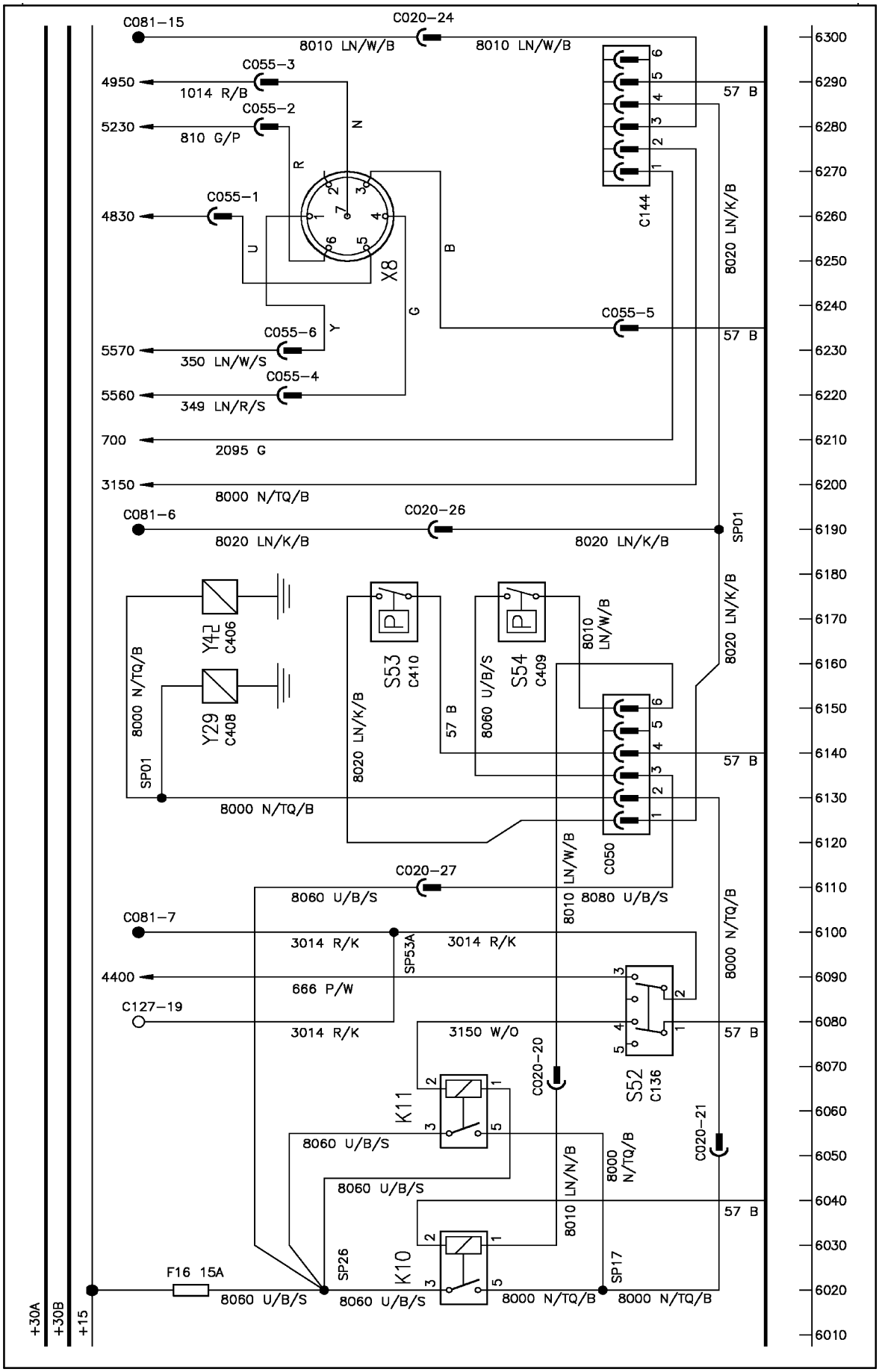
H30 Corner Lamp R/H

H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

S67 Worklamp Switch - Front
S68 Worklamp Switch - Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN/W/B
C055-3
4950
1014 R/B
C055-2
5230
810 G/P
C055-1
4830
C055-6
5570
350 LN/W/S
C055-4
5560
349 LN/R/S
X8
C144
C055-5
57 B
8020 LN/K/B
700
2095 G
3150
8000 N/TQ/B
C081-6
C020-26
8020 LN/K/B
8020 LN/K/B
SP01
Y42 C406
Y29 C408
S53 C410
S54 C409
8010 LN/W/B
8000 N/TQ/B
8020 LN/K/B
57 B
8060 U/B/S
C050
C020-27
8060 U/B/S
8010 8080 U/B/S
C081-7
3014 R/K
3014 R/K
SP53A
4400
666 P/W
C127-19
3014 R/K
3150 W/O
C020-20
S52 C136
C020-21
K11
8060 U/B/S
8060 U/B/S
8010 LN/N/B
8000 N/TQ/B
K10
SP26
SP17
F16 15A
8060 U/B/S
8060 U/B/S
8000 N/TQ/B
8000 N/TQ/B
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse – 15A

K10 Pneumatic Trailer Brake Relay

K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch

S53 Italian Trailer Brake Line Pressure Switch

S54 Italian Trailer Brake Pump Pressure Switch

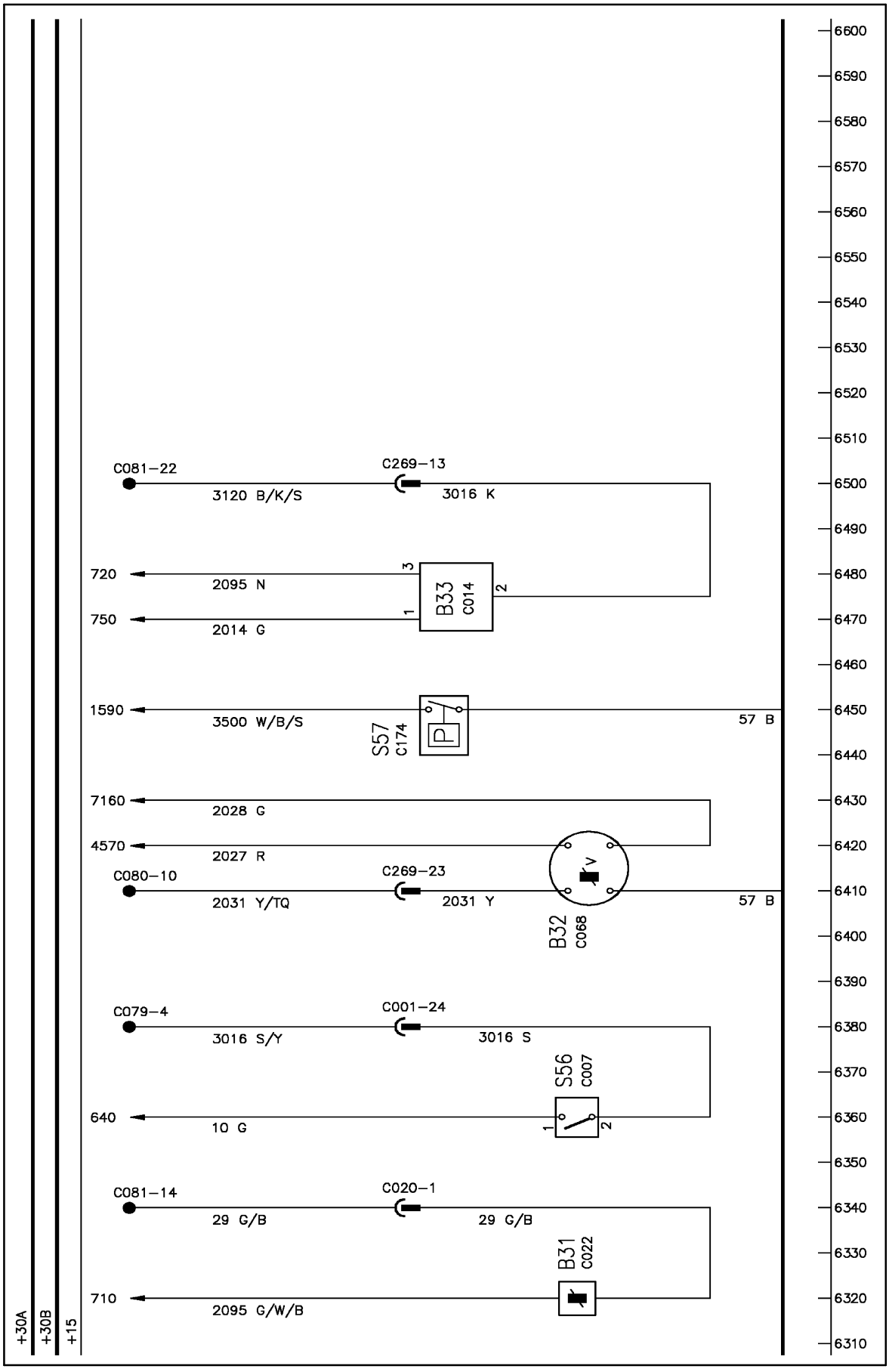
S55 Air Brake Pressure Switch

Y29 Italian Trailer Brake Solenoid

Y42 Italian Trailer Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

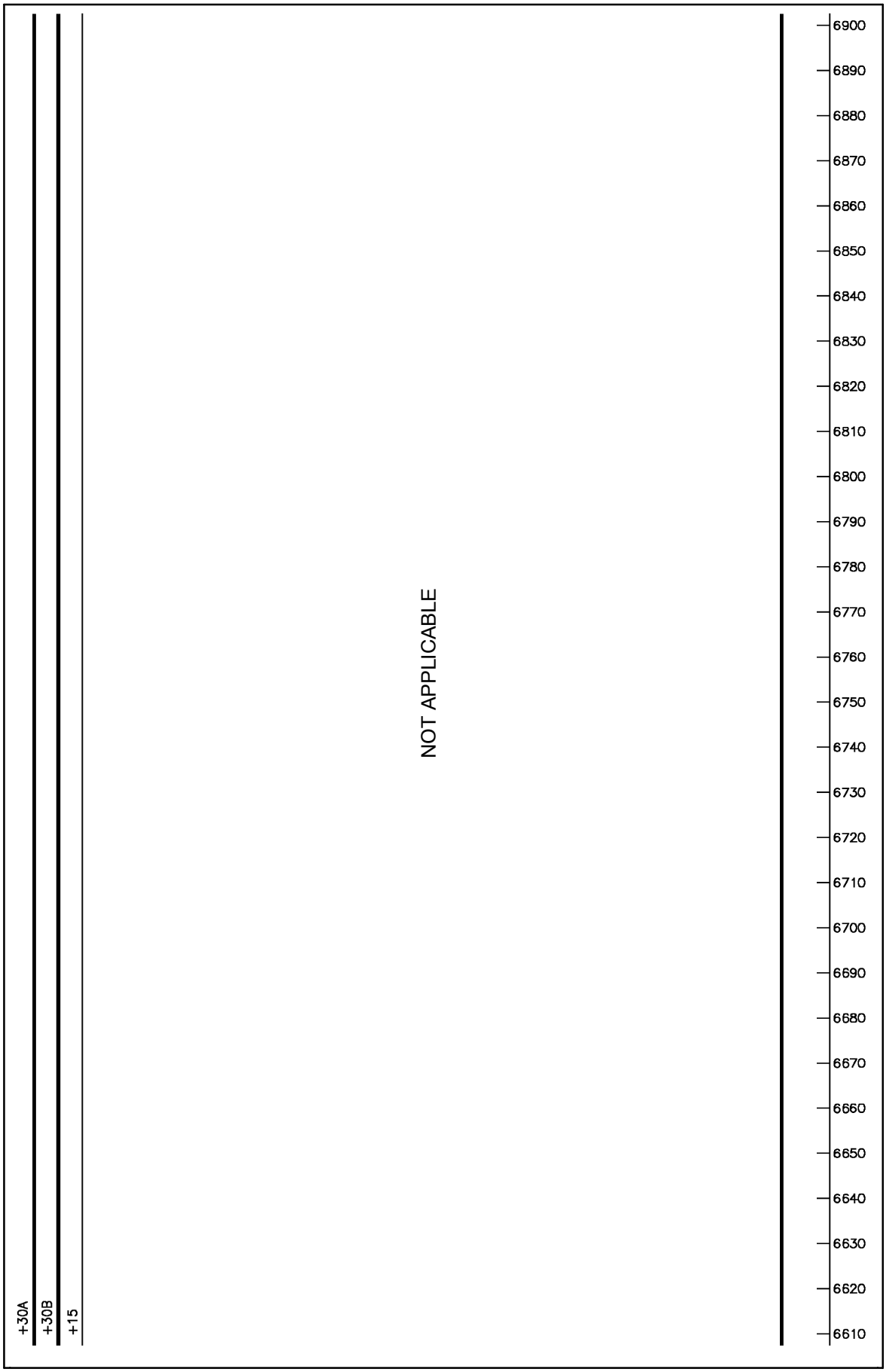

+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
C081–22
3120 B/K/S
C269–13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080–10
2031 Y/TQ
C269–23
2031 Y
57 B
B32
C068
C079–4
3016 S/Y
C001–24
3016 S
S56
C007
640
10 G
C081–14
29 G/B
C020–1
29 G/B
B31
C022
710
2095 G/W/B

16x16 Transmission, L/Cab, W/Electronic Engine

SENSORS
Line 6310-6600

B31 Fuel Tank Sender
B32 Radar Gun
B33 Steering Angle Sensor
S56 Brake Fluid Level Switch
S57 Power Assisted Steering Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

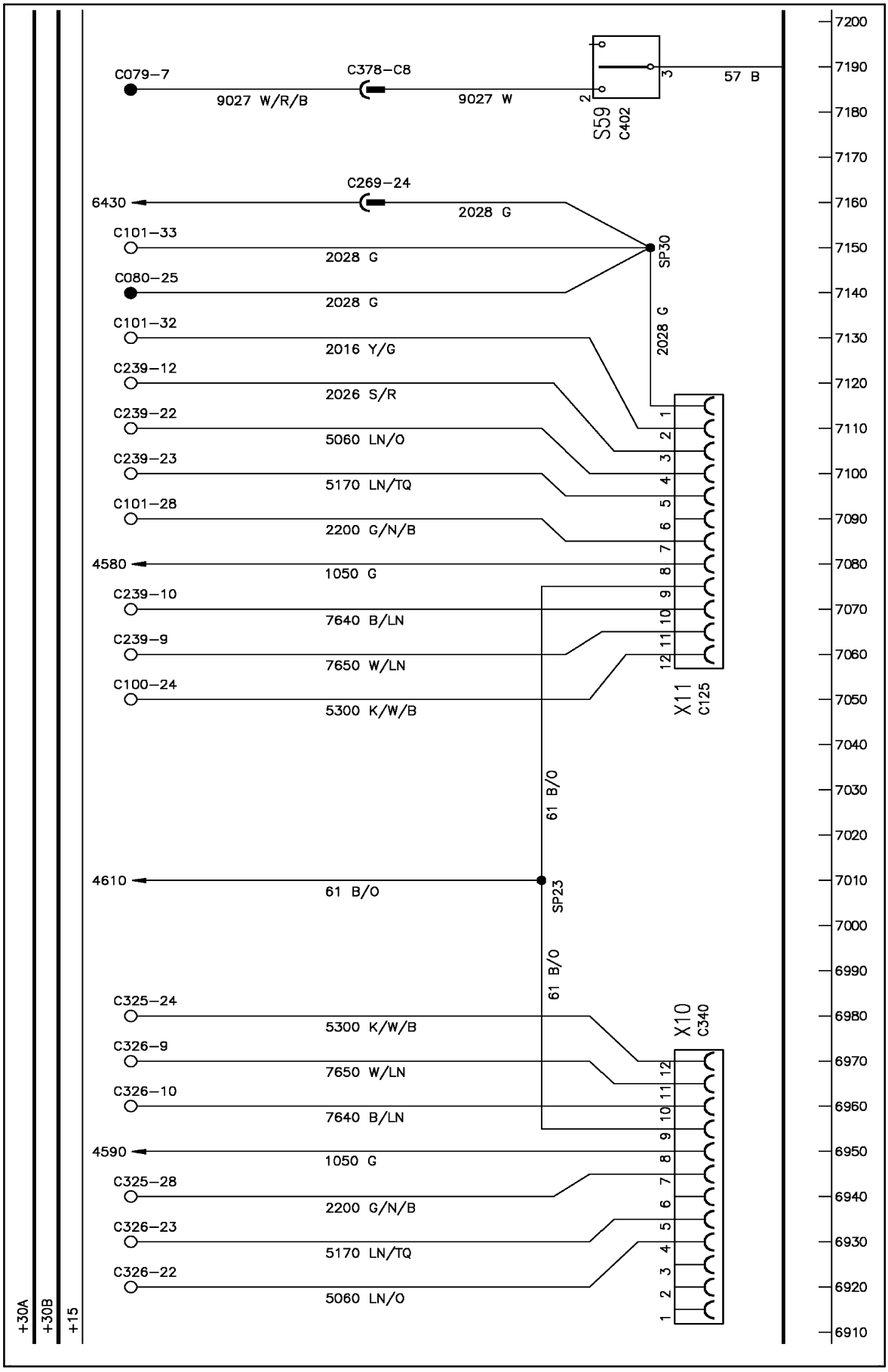

+30A
+30B
+15
NOT APPLICABLE
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

16x16 Transmission, L/Cab, W/Electronic Engine

WASHERS AND WIPERS
Line 6510-6900

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
2
3
57 B
S59
C402
C269-24
6430
2028 G
C101-33
2028 G
SP30
C080-25
2028 G
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
61 B/O
4610
61 B/O
SP23
61 B/O
C325-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

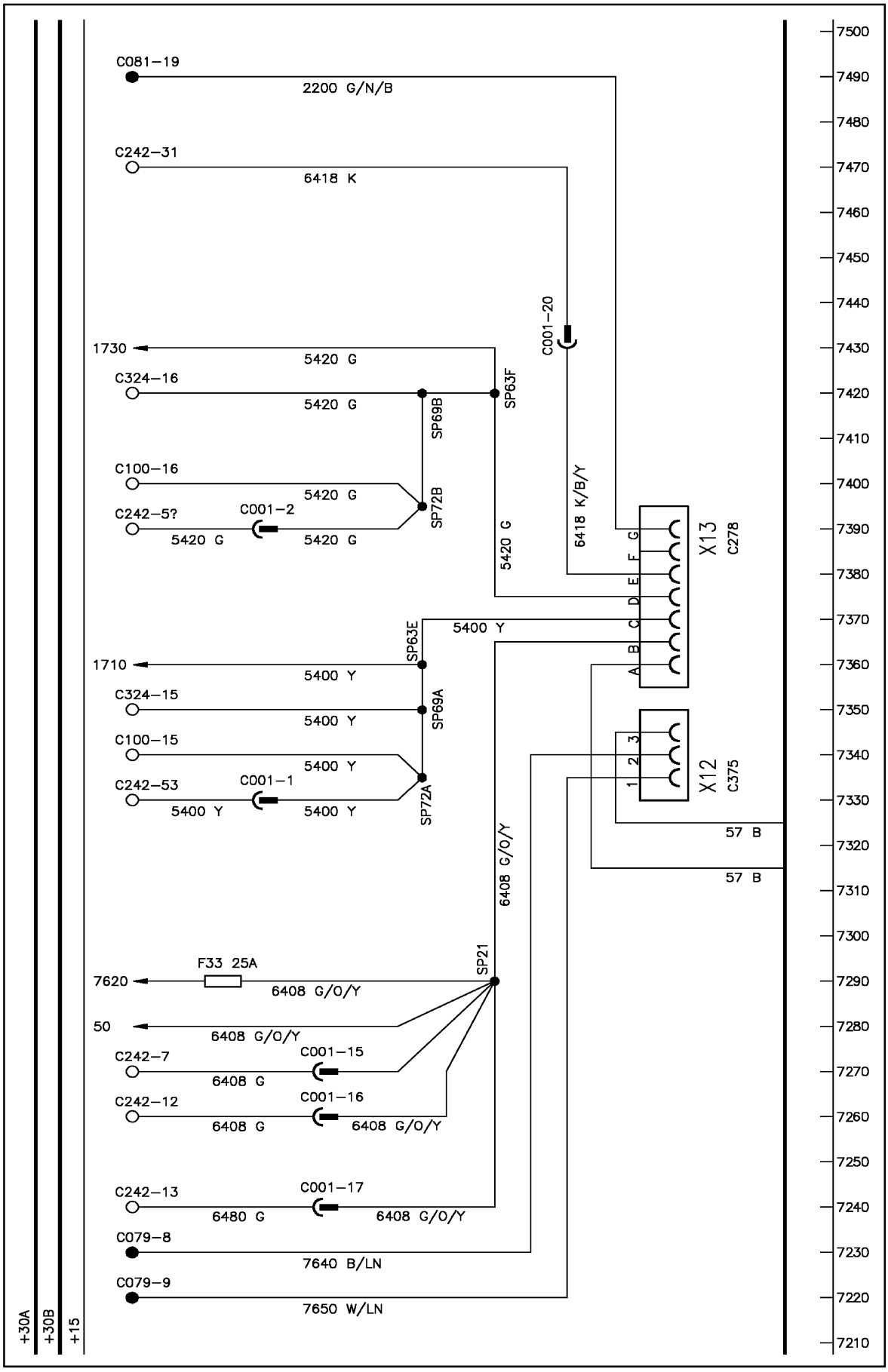
16x16 Transmission, L/Cab, W/Electronic Engine

DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)
X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
5420 G
6418 K/B/Y
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

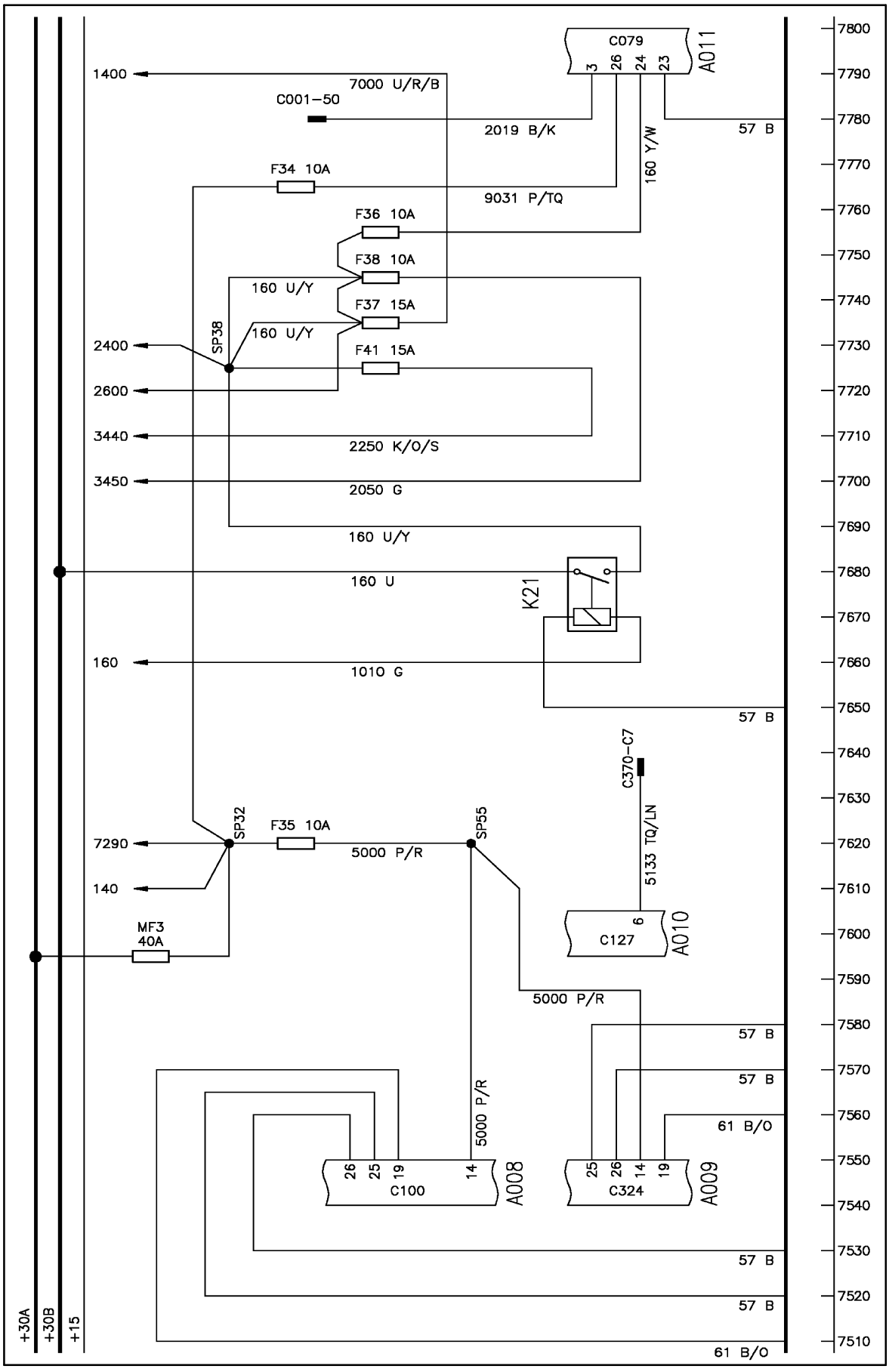
16x16 Transmission, L/Cab, W/Electronic Engine

DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector
X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079
A011
3
26
24
23
1400
7000 U/R/B
C001-50
2019 B/K
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3440
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C370-C7
SP32
F35 10A
SP55
7290
5000 P/R
5133 TQ/LN
140
MF3
40A
C127
A010
6
5000 P/R
57 B
57 B
5000 P/R
61 B/O
C100
A008
26
25
19
14
C324
A009
25
26
14
19
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

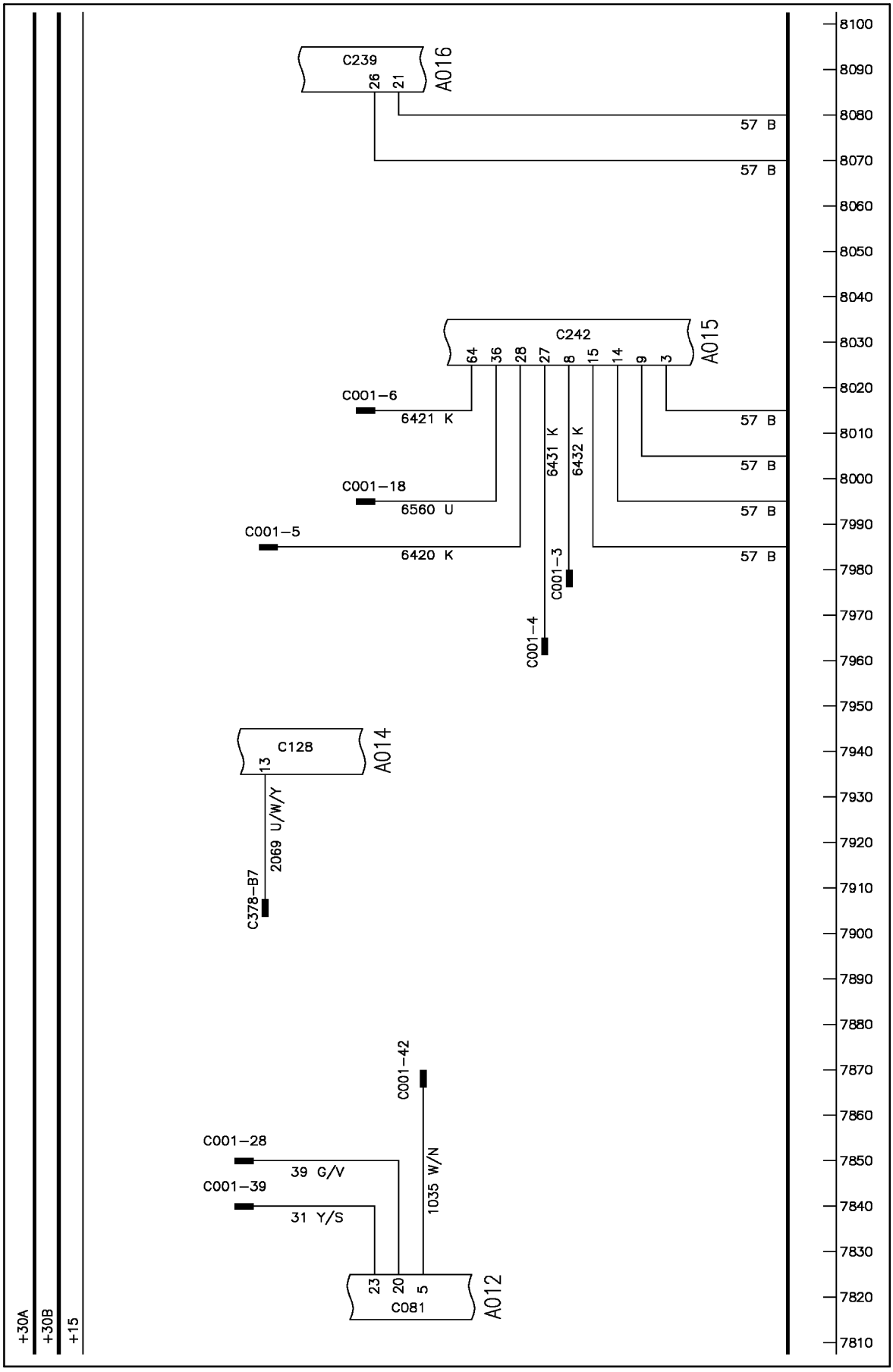
16x16 Transmission, L/Cab, W/Electronic Engine

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C239
26
21
A016
57 B
57 B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
57 B
6431 K
6432 K
57 B
C001-18
6560 U
57 B
C001-5
6420 K
57 B
C001-3
C001-4
C128
13
A014
2069 U/W/Y
C378-B7
C001-42
C001-28
39 G/V
1035 W/N
C001-39
31 Y/S
23
20
5
C081
A012
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

16x16 Transmission, L/Cab, W/Electronic Engine,

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A012 Instrument Cluster 3

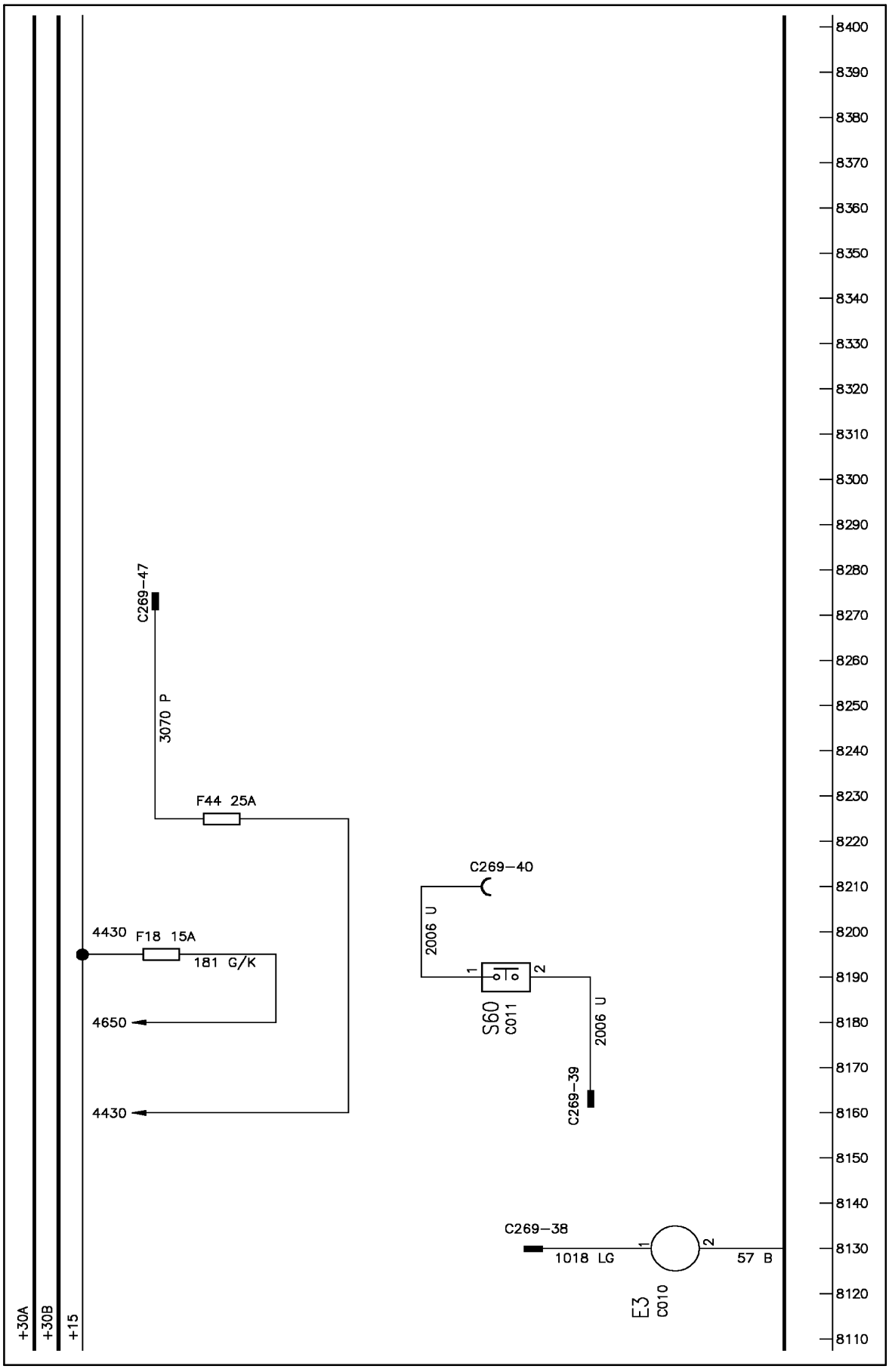
A013 Worklamp ECU

A014 XCM Central Control Unit (CN3-B)

A015 Engine ECU

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
+30A
+30B
+15
C269-47
3070 P
F44 25A
4430
F18 15A
181 G/K
4650
4430
C269-40
2006 U
1
2
S60
C011
2006 U
C269-39
C269-38
1018 LG
1
2
57 B
E3
C010

16x16 Transmission, L/Cab, W/Electronic Engine

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

F18 Fuse - 15A

F44 Fuse - 25A

E3 A/C Clutch

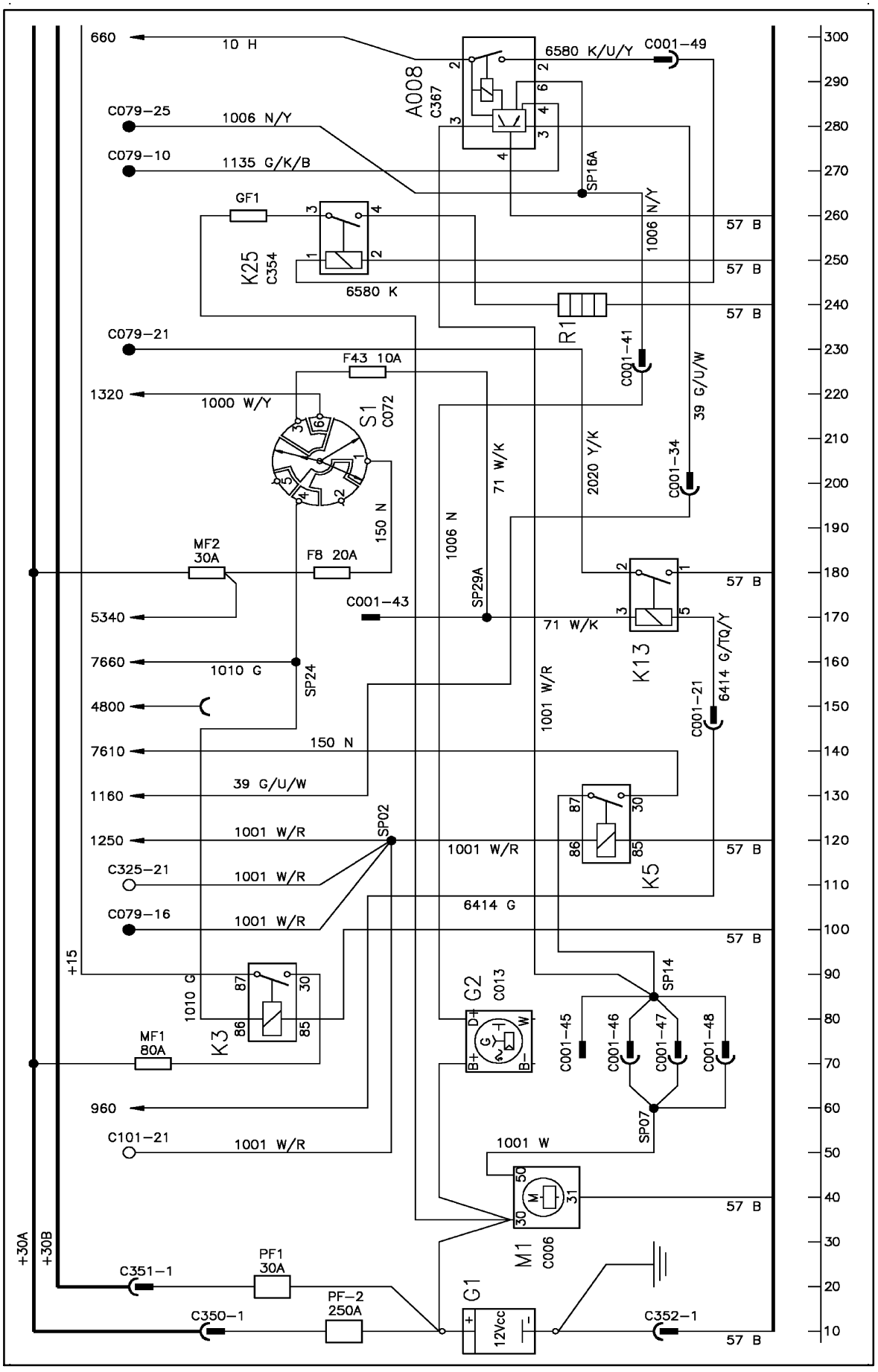
S60 A/C Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

16X16 TRANSMISSION, L/CAB, W/MECHANICAL ENGINE

Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400

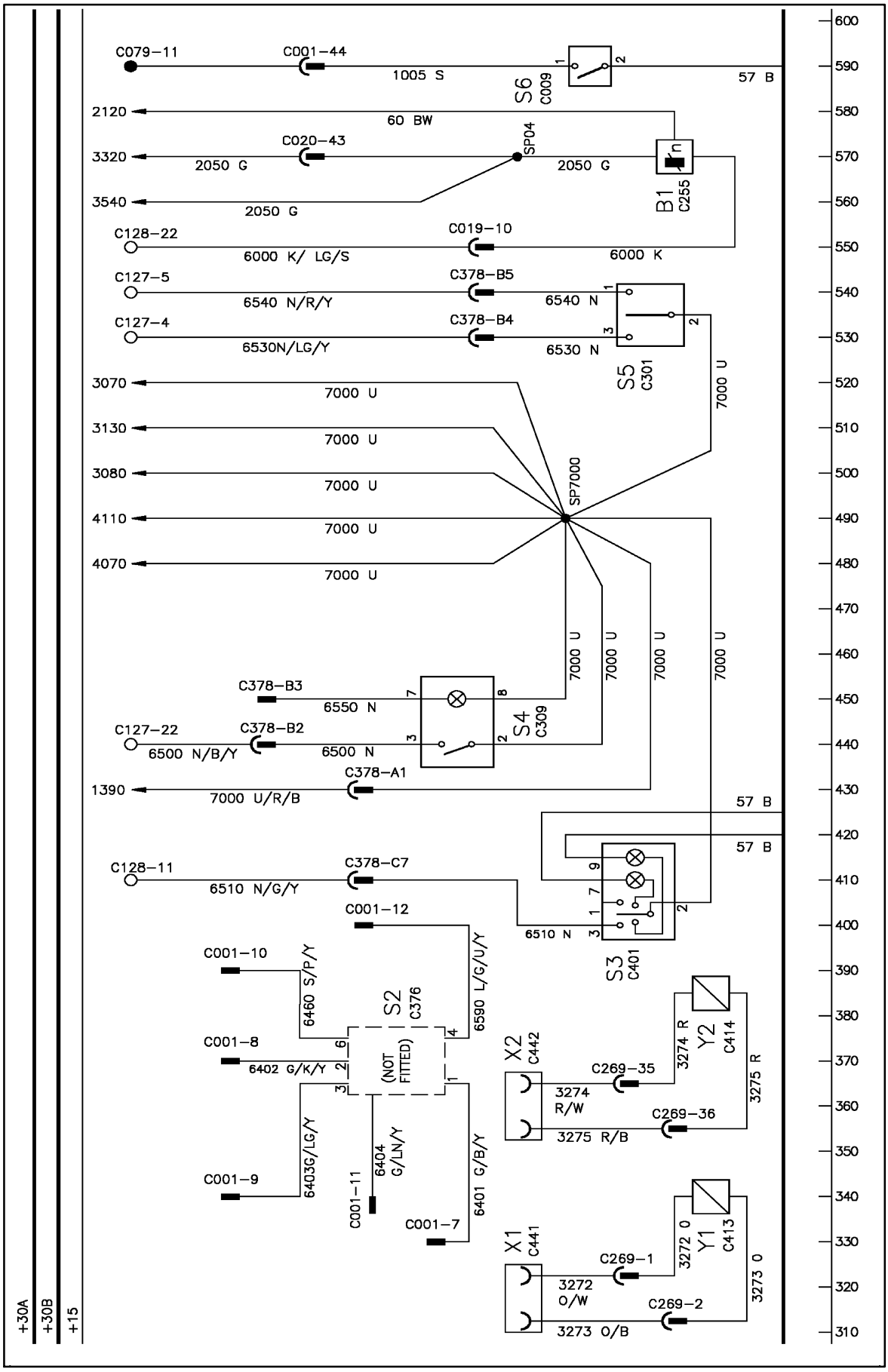

660
10 H
A008
C367
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C079-10
1135 G/K/B
SP16A
GF1
K25
C354
6580 K
1006 N/Y
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
S1
C072
C001-41
39 G/U/W
2020 Y/K
C001-34
71 W/K
1006 N
150 N
MF2
30A
F8 20A
SP29A
C001-43
5340
71 W/K
K13
6414 G/TQ/Y
7660
1010 G
SP24
4800
1001 W/R
C001-21
7610
150 N
1160
39 G/U/W
1250
SP02
1001 W/R
K5
C325-21
C079-16
6414 G
+15
1010 G
K3
G2
C013
SP14
MF1
80A
C001-45
C001-46
C001-47
C001-48
960
SP07
C101-21
1001 W
+30A
+30B
PF1
30A
M1
C006
C351-1
PF-2
250A
G1
12Vcc
C350-1
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

16x16 Transmission, L/Cab, W/Mechanical Engine

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF1	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A008	Grid Heater Module

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
3320
C020-43
2050 G
SP04
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
C128-11
C378-C7
6510 N/G/Y
6510 N
S3 C401
C001-12
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C001-8
6402 G/K/Y
(NOT FITTED)
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
Y2 C414
3274 R
3275 R
C001-9
6403G/LG/Y
C001-11
6404 G/LN/Y
C001-7
6401 G/B/Y
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
Y1 C413
3272 O
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

16x16 Transmission, L/Cab, W/Mechanical Engine

ENGINE 1
line 310-600

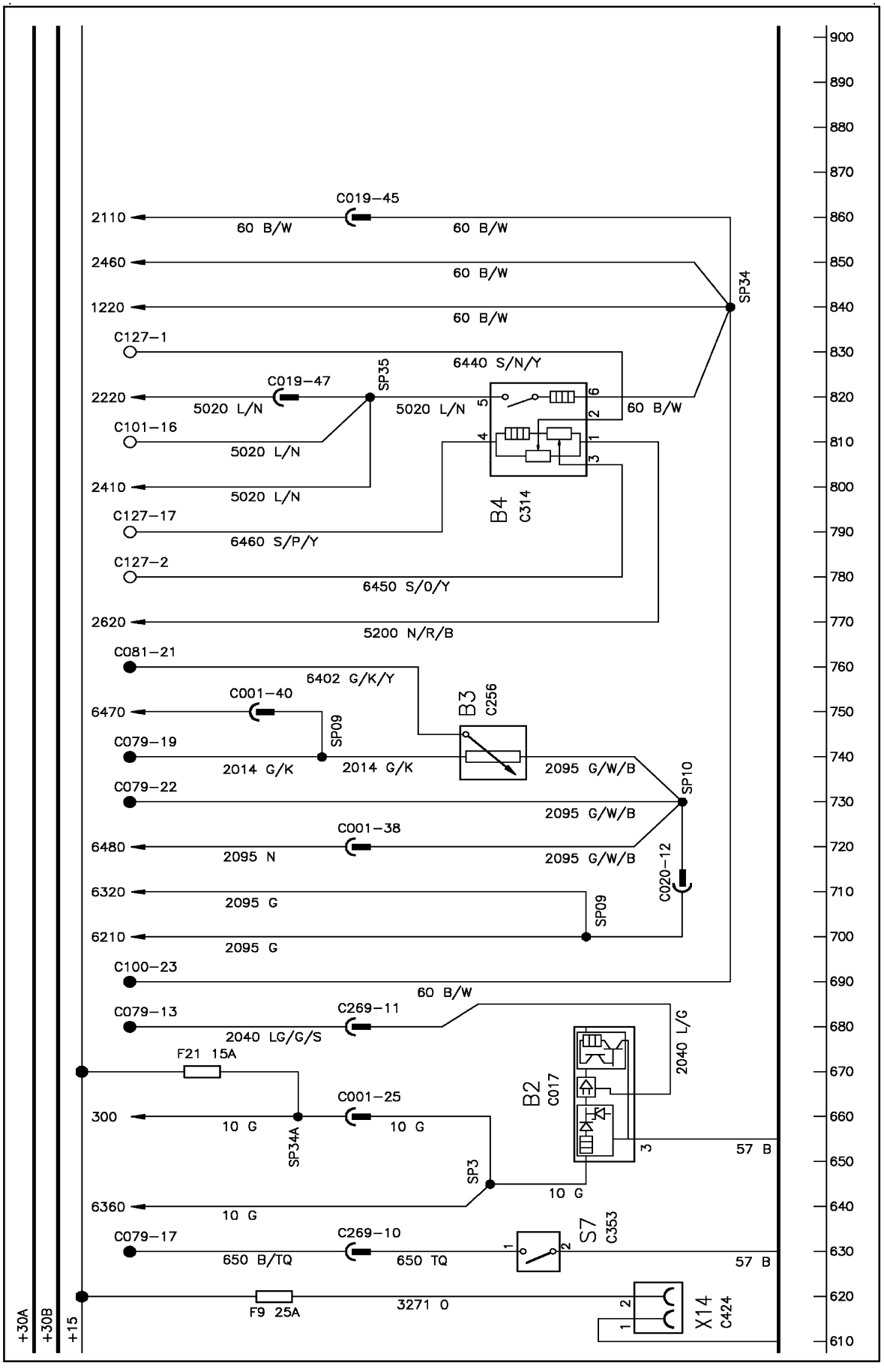
B1 Engine Flywheel Speed Sensor

S2 Foot Throttle - Electronic Engine (Not Fitted)
S3 Constant Engine Speed programme Switch
S4 Constant ERPM On/Off Switch
S5 Engine Inc./Dec. Switch
S6 Air Cleaner Switch

Y1 Loader Valve 1
Y2 Loader Valve 2

X1 Joystick Loader Control Socket 1
X2 Joystick Loader Control Socket 2

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

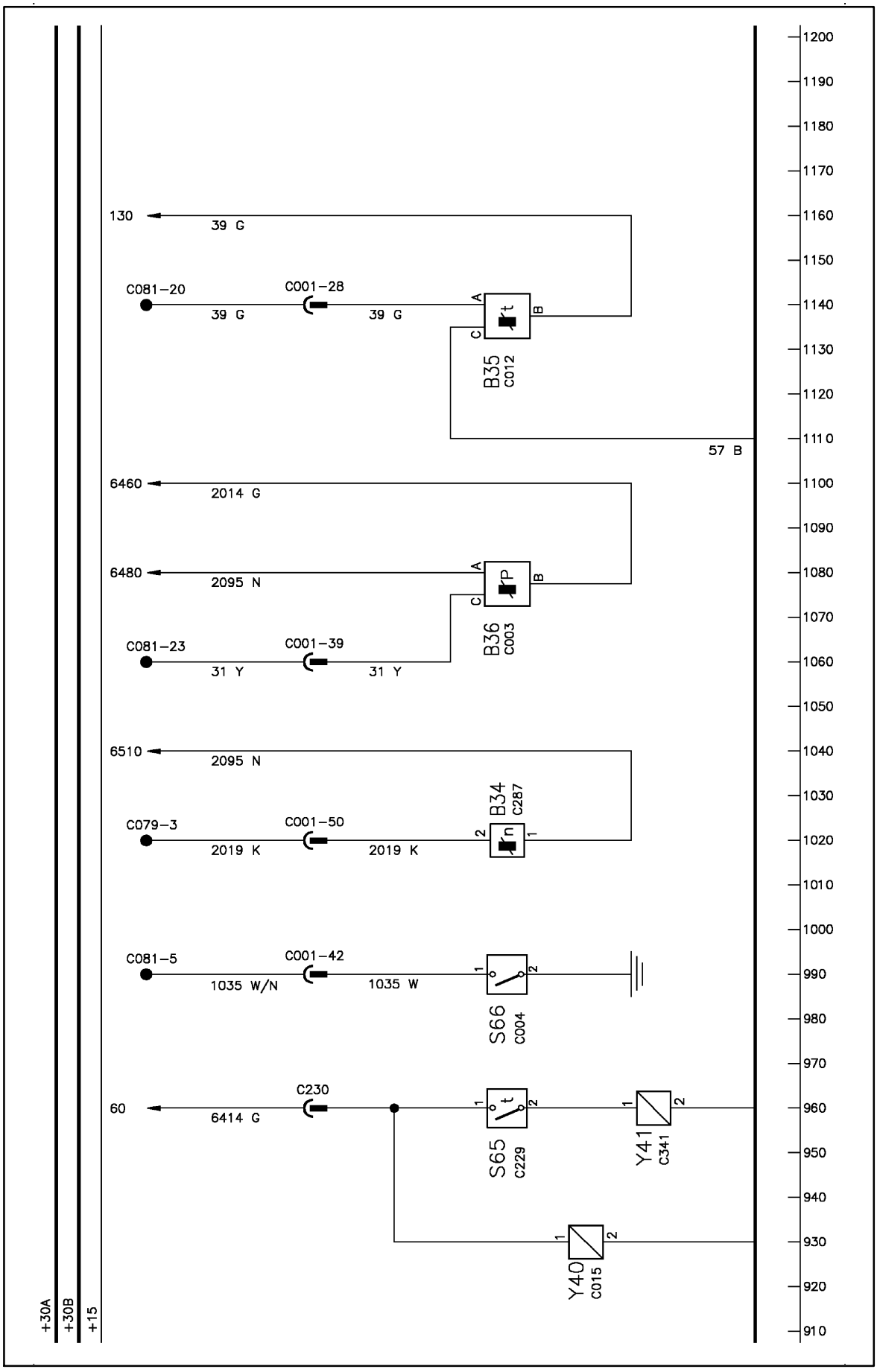

+30A
+30B
+15
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
SP34
1220
60 B/W
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3
C256
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
SP3
3
57 B
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 TQ
S7
C353
57 B
F9 25A
3271 0
X14
C424
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

16x16 Transmission, L/Cab, W/Mechanical Engine

ENGINE 2
line 610-900

F9	Fuse - 25A
F21	Fuse - 15A
B2	Water In Fuel Sensor
B3	Foot Throttle - Mechanical Engine
B4	Hand Throttle
S7	De-Gas Bottle
X14	Loader Power Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
130
39 G
C081-20
39 G
C001-28
39 G
B35
C012
57 B
6460
2014 G
6480
2095 N
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
B34
C287
C079-3
2019 K
C001-50
2019 K
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
C230
S65
C229
Y41
C341
Y40
C015

16x16 Transmission, L/Cab, W/Mechanical Engine

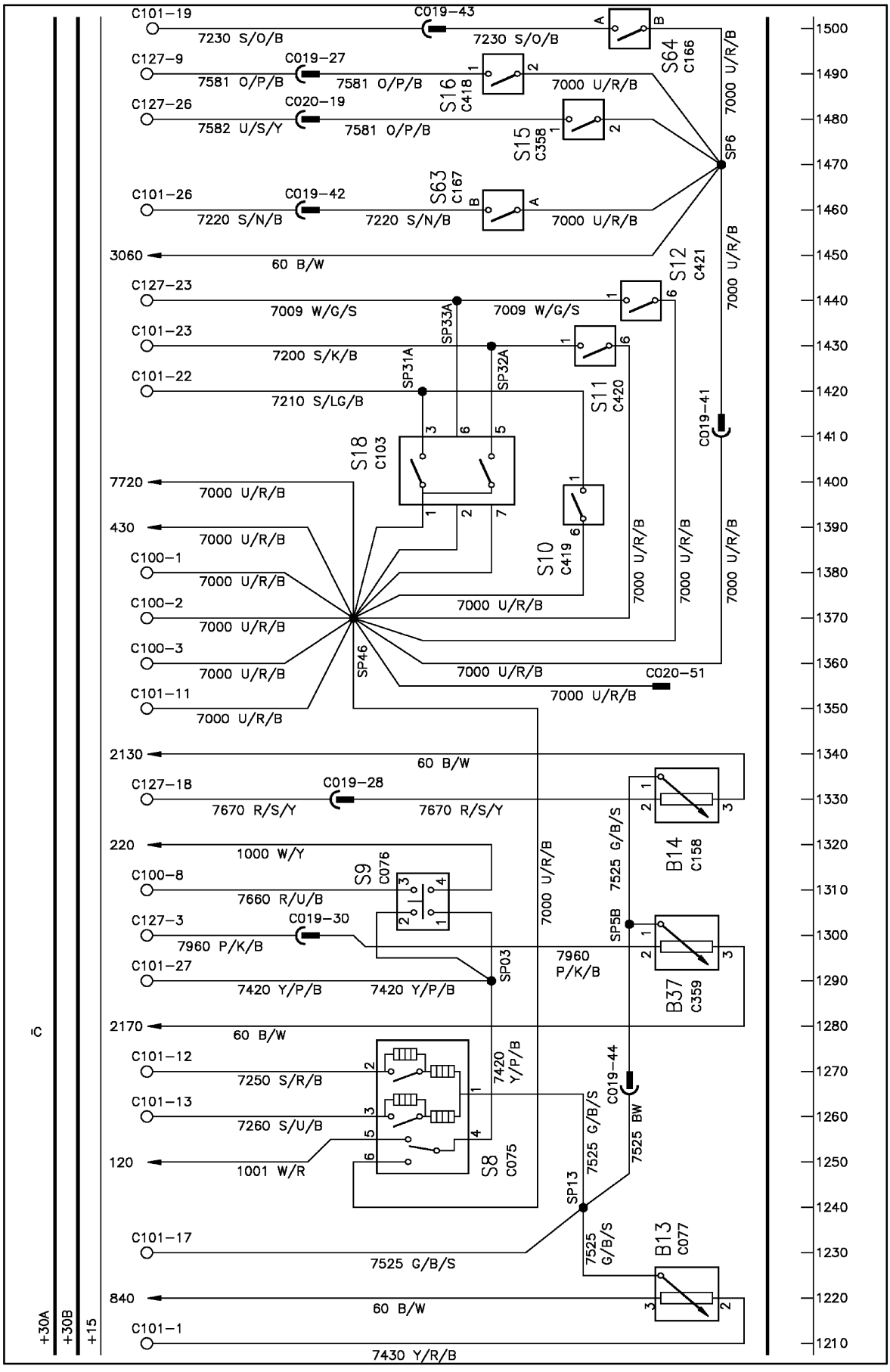
ENGINE 3
line 910-1200

B34 Engine Speed Sensor
B35 Coolant Temperature Sensor
B36 Oil Pressure Sensor

S65 Thermo Cold Advance Switch
S66 Oil Pressure Switch

Y40 Fuel Shut Off Solenoid
Y41 Cold Advance Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C101-19
7230 S/O/B
C019-43
7230 S/O/B
S64 C166
7000 U/R/B
C127-9
7581 O/P/B
C019-27
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
7582 U/S/Y
C020-19
7581 O/P/B
S15 C358
SP6
S63 C167
C101-26
7220 S/N/B
C019-42
7220 S/N/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
S10 C419
C019-41
7720
430
C100-1
C100-2
C100-3
C101-11
SP46
C020-51
2130
C127-18
C019-28
7670 R/S/Y
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
C101-27
7420 Y/P/B
SP03
B14 C158
B37 C359
SP5B
7525 G/B/S
2170
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
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1350
1340
1330
1320
1310
1300
1290
1280
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1260
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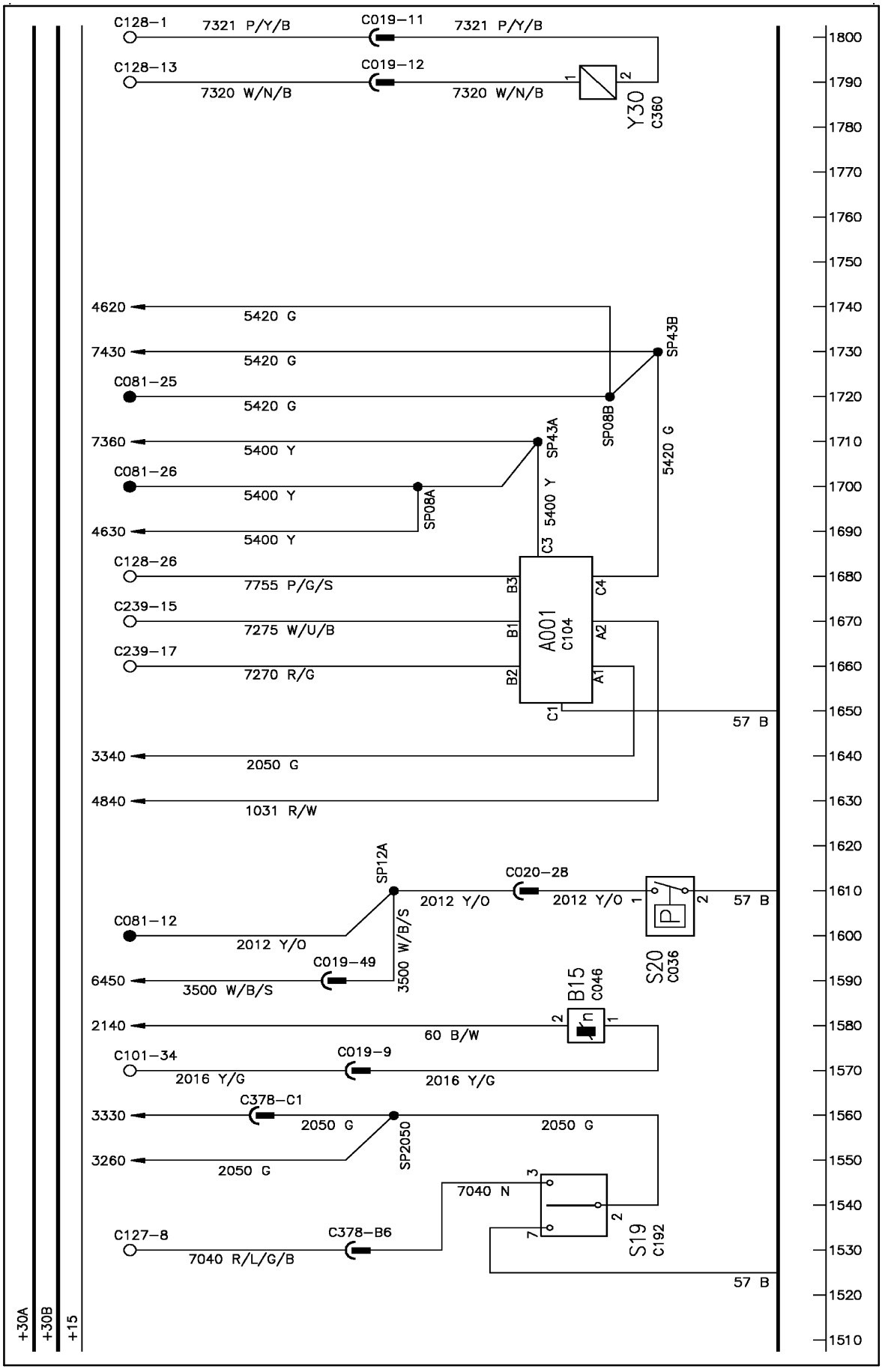
1240
1230
1220
1210

16x16 Transmission, L/Cab, W/Mechanical Engine

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control - Range
B14	Synchro Position Potentiometer	**S15**	Creeper Sensing Switch
B37	1-4/5-8 Synchro Potentiometer	**S16**	Creeper Sense Forward Switch
		S18	Gearshift
S8	Shuttle Switch	**S63**	High Range Switch
S9	Clutch Switch	**S64**	Low Range Switch
S10	Duplicate Transmission Control - Downshift		
S11	Duplicate Transmission Control - Upshift		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
5420 G
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
A001
C104
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C020-28
2012 Y/O
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

16x16 Transmission, L/Cab, W/Mechanical Engine

TRANSMISSION SYSTEM 2
Line 1510-1800

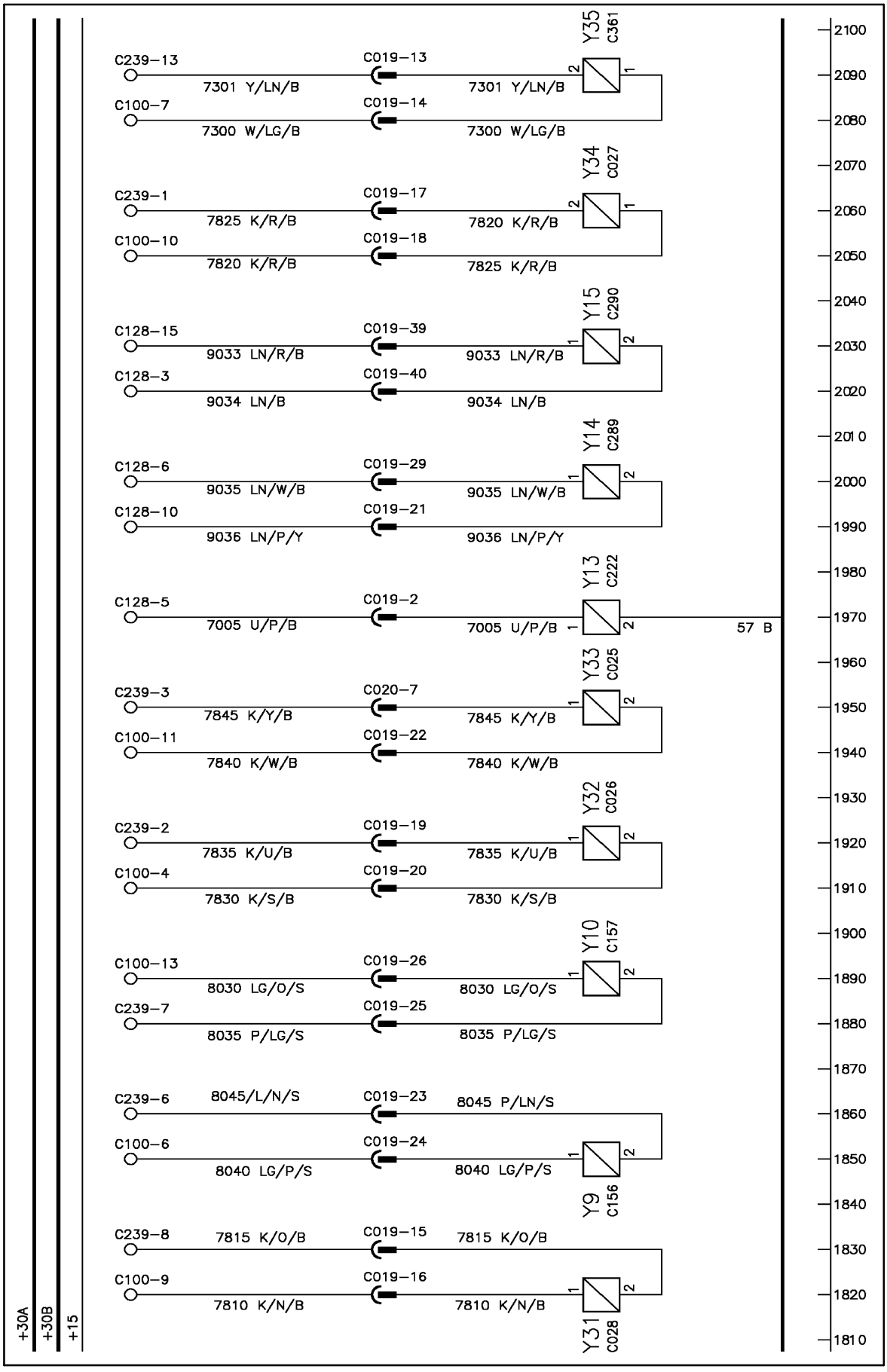
A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch
S20 Transmission Oil Pressure Switch

Y30 5-8 Synchro Solenoid

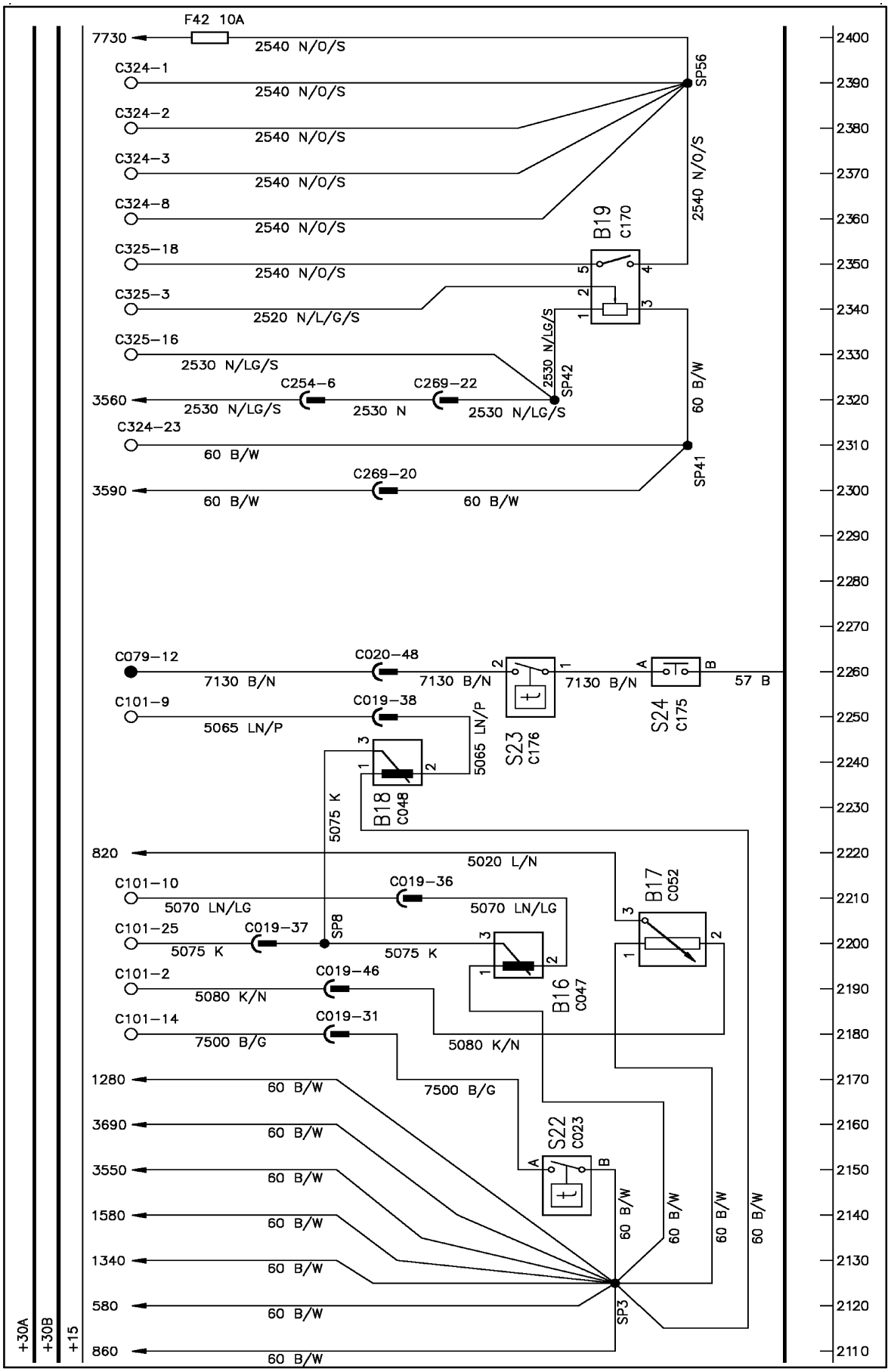
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-6
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/L/N/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y31 C1 Valve
Y32 C3 Valve
Y33 C4 Valve
Y34 C2 Valve
Y35 1-4 Synchro Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
C079-12
C020-48
7130 B/N
C101-9
C019-38
5065 LN/P
S23
C176
S24
C175
57 B
B18
C048
5075 K
820
5020 L/N
C101-10
C019-36
5070 LN/LG
C101-25
C019-37
SP8
C101-2
C019-46
5080 K/N
C101-14
C019-31
7500 B/G
B16
C047
B17
C052
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

16x16 Transmission, L/Cab, W/Mechanical Engine

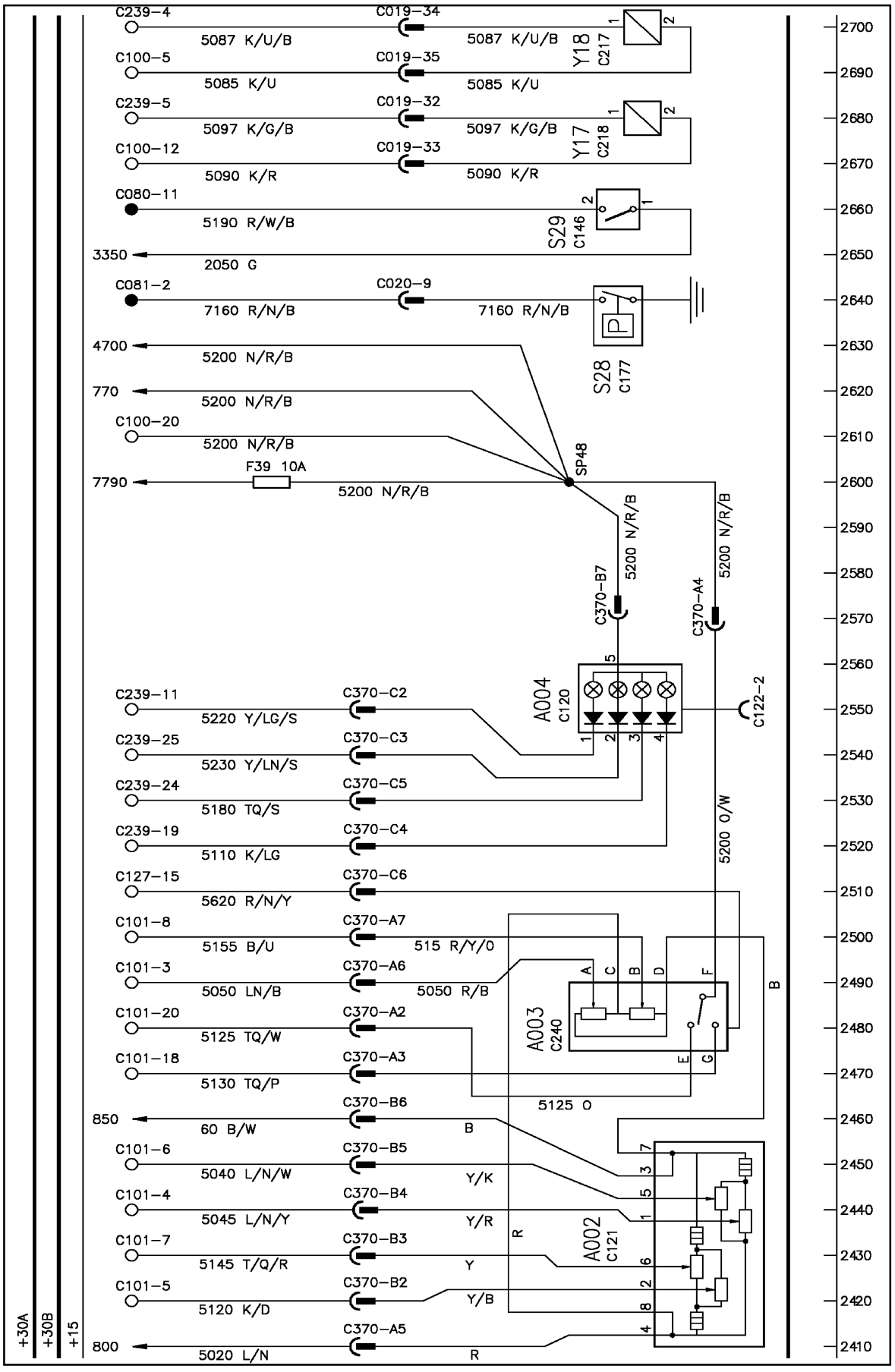
HYDRAULICS 1
Line 2110-2400

F42 Fuse - 10A

B16 LH Draft Pin
B17 Rockshaft Potentiometer
B18 RH Draft Pin
B19 Front HPL Limit Potentiometer

S22 Transmission Oil Temp Sensor
S23 Oil Temperature Switch
S24 HPL Filter Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

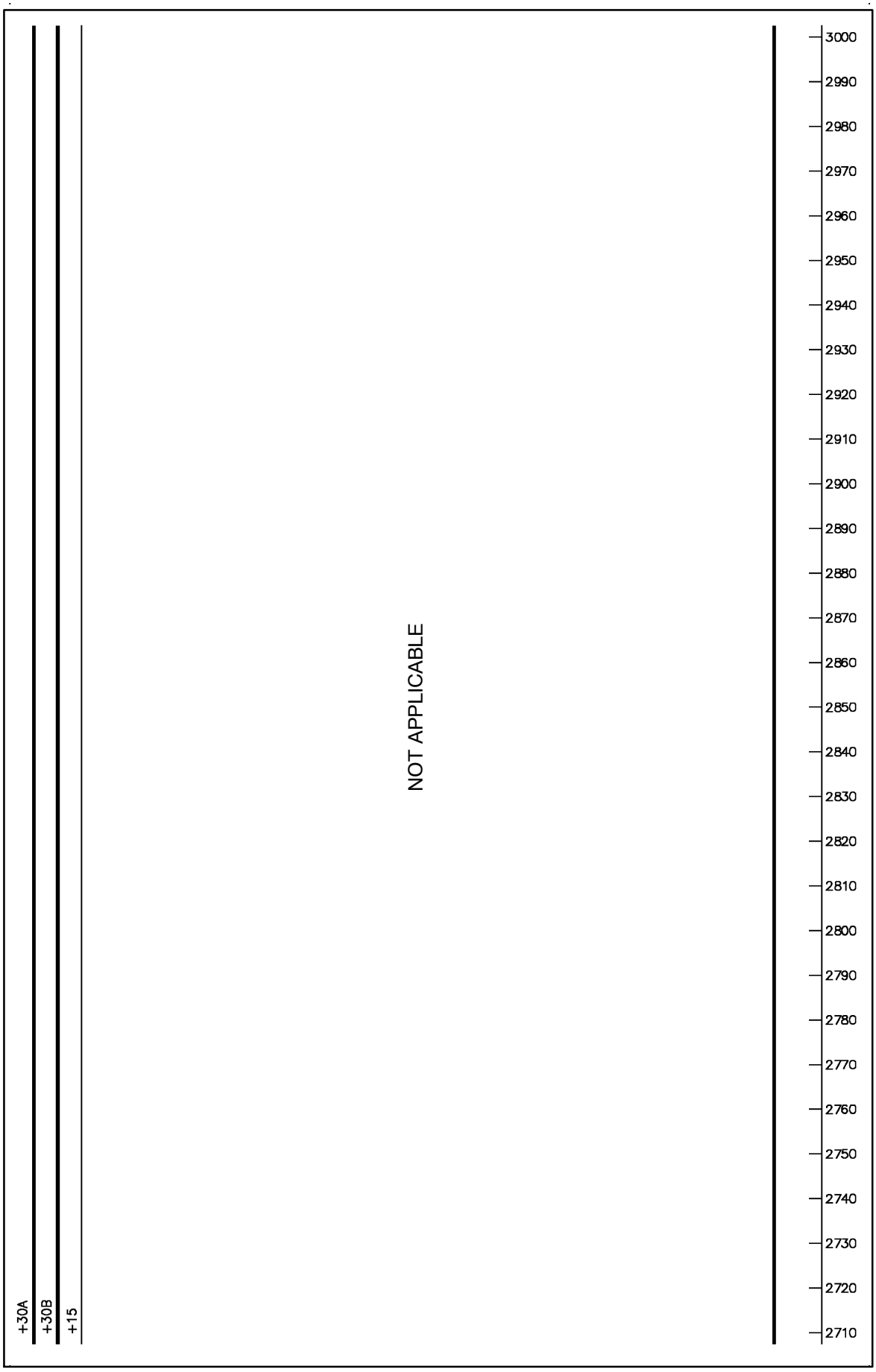

C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7790
5200 N/R/B
SP48
5200 N/R/B
5200 N/R/B
C370-B7
C370-A4
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
C127-15
C370-C6
5620 R/N/Y
5200 O/W
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

16x16 Transmission, L/Cab, W/Mechanical Engine

HYDRAULICS 2
Line 2410-2700

F39	Fuse - 10A	**S28**	Lo Charge Switch
		S29	Lift-O-Matic Switch
A002	EDC Control		
A003	EDC Mouse	**Y17**	EDC Lower Solenoid
A004	EDC Status Lamp Panel	**Y18**	EDC Raise Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

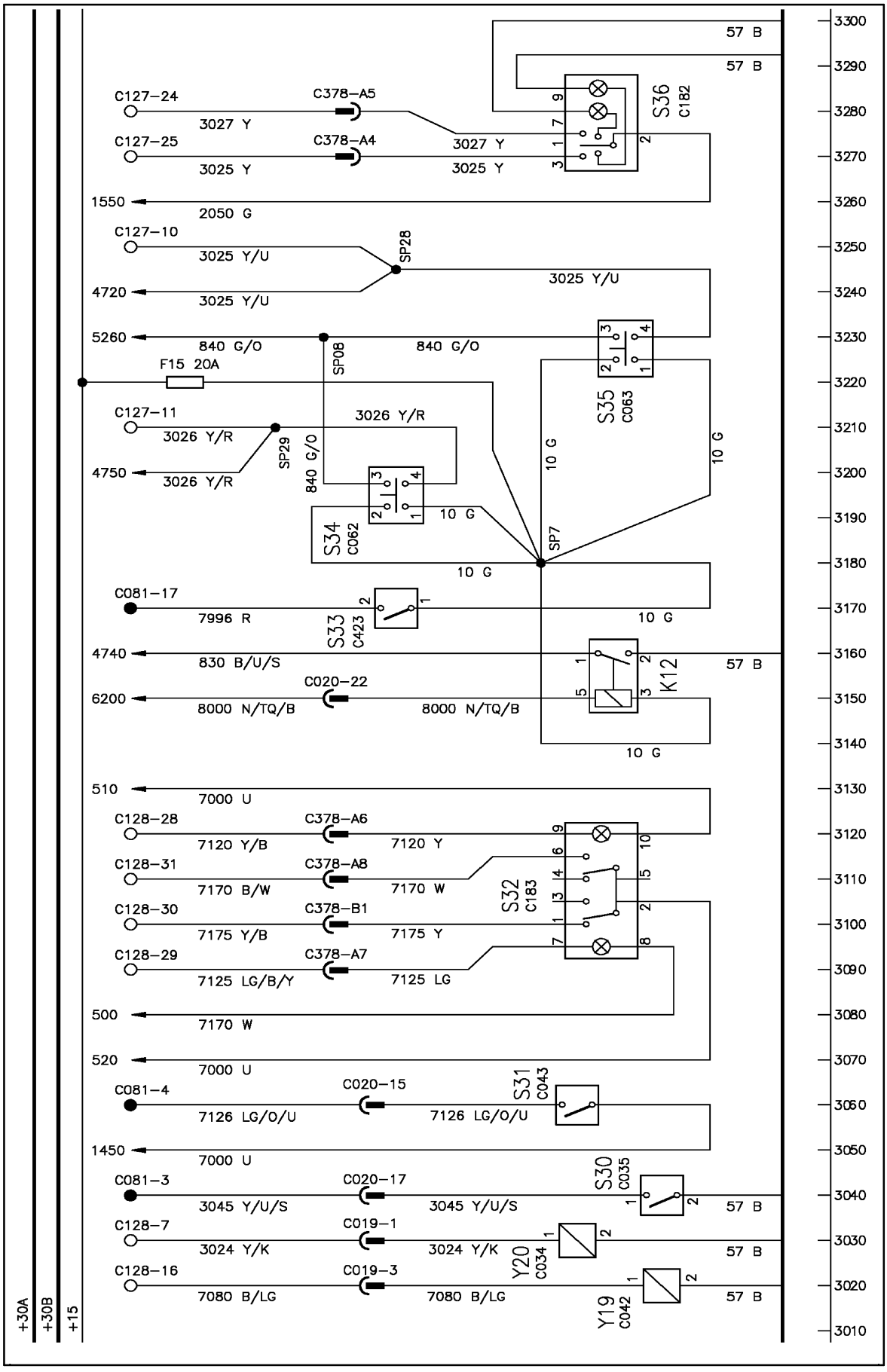

+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

16x16 Transmission, L/Cab, W/Mechanical Engine

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

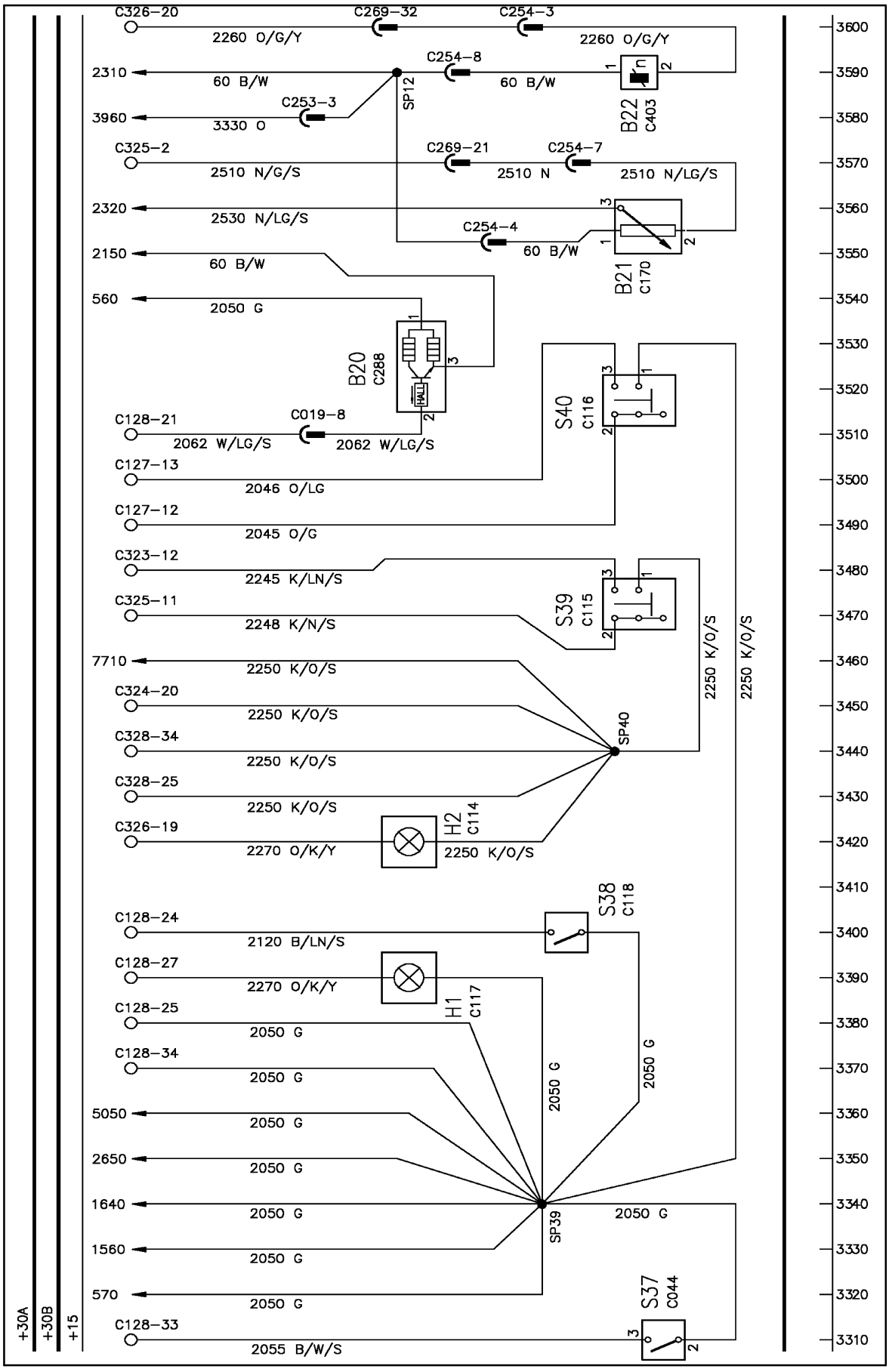

+30A
+30B
+15
F15 20A
SP28
SP08
SP29
SP7
S34 C062
S35 C063
S36 C182
S33 C423
K12
S32 C183
S31 C043
S30 C035
Y20 C034
Y19 C042
C127-24
C127-25
C127-10
C127-11
C128-28
C128-31
C128-30
C128-29
C128-7
C128-16
C081-17
C081-4
C081-3
C378-A5
C378-A4
C378-A6
C378-A8
C378-B1
C378-A7
C020-22
C020-15
C020-17
C019-1
C019-3
3027 Y
3025 Y
3025 Y/U
3026 Y/R
840 G/O
10 G
57 B
7996 R
830 B/U/S
8000 N/TQ/B
7000 U
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
7126 LG/O/U
3045 Y/U/S
3024 Y/K
7080 B/LG
1550
2050 G
4720
4750
5260
6200
510
500
520
1450
4740
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

16x16 Transmission, L/Cab, W/Mechanical Engine

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

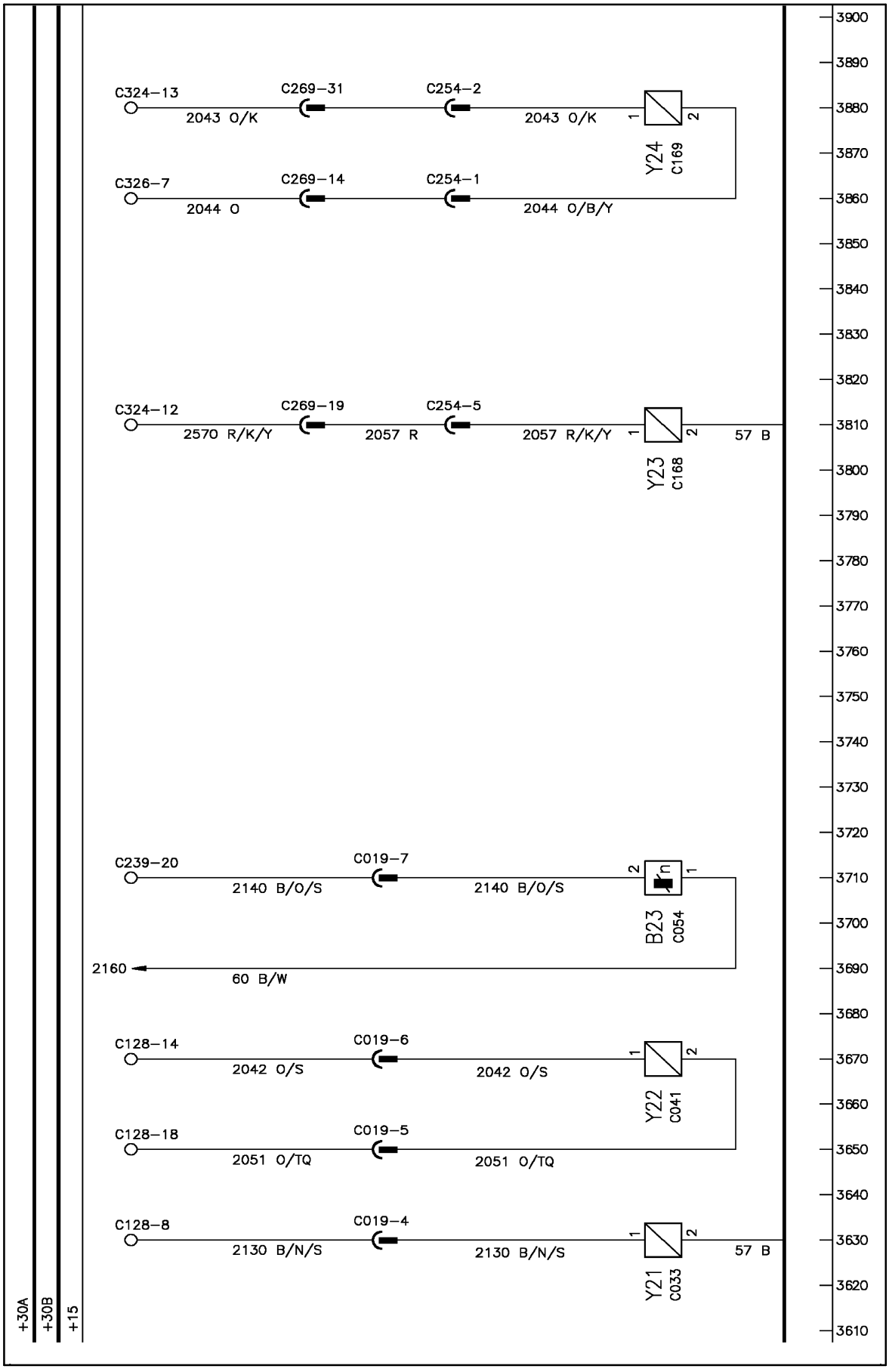

C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
H2
C114
C326-19
2270 O/K/Y
2250 K/O/S
S38
C118
C128-24
2120 B/LN/S
C128-27
2270 O/K/Y
H1
C117
C128-25
2050 G
C128-34
2050 G
2050 G
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

16x16 Transmission, L/Cab, W/Mechanical Engine

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

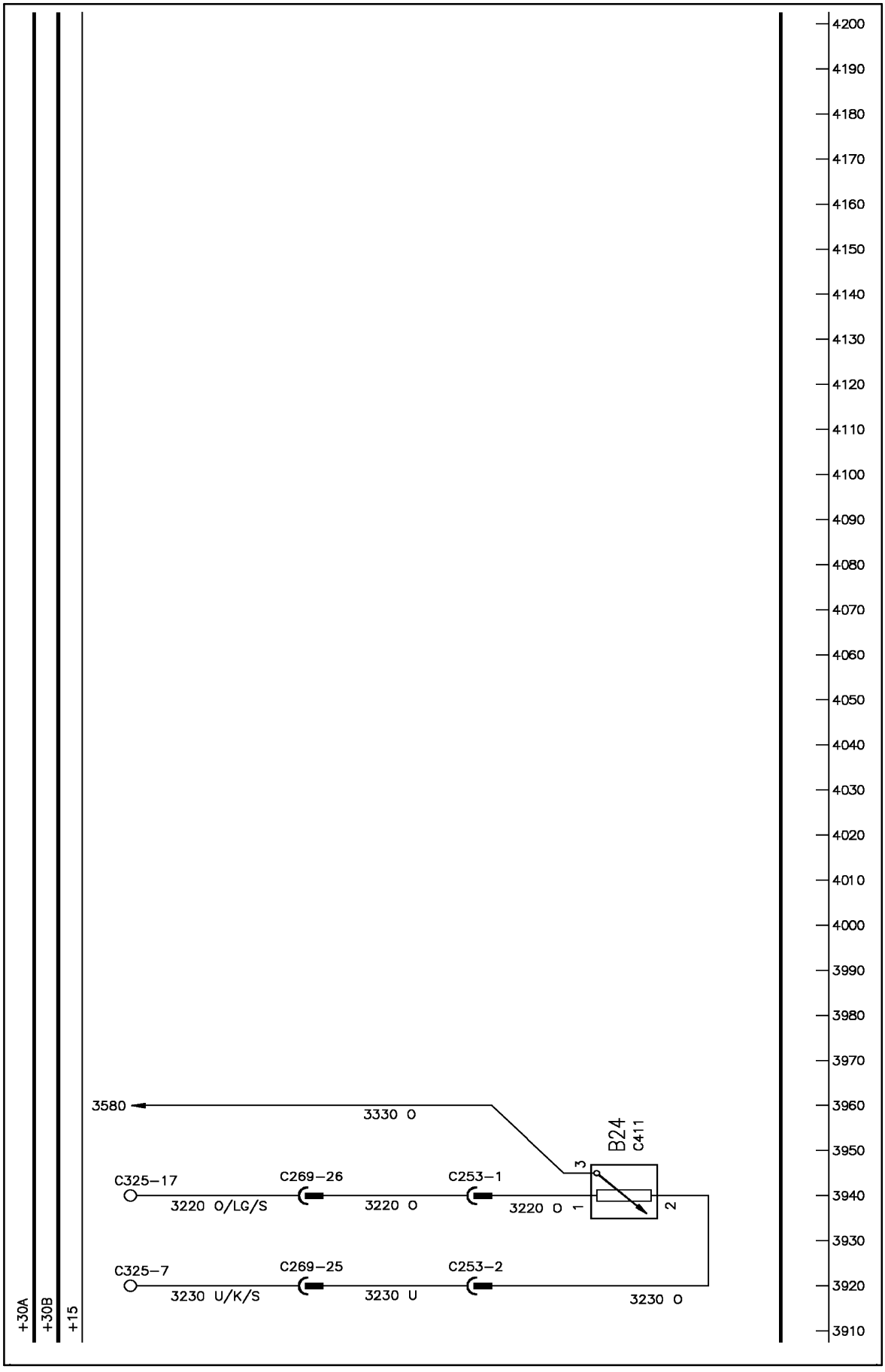

+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

16x16 Transmission, L/Cab, W/Mechanical Engine

POWER TAKE OFF 2
Line 3610-3900

B23	PTO Speed Sensor	**Y23**	Front Hitch Valve
		Y24	Front PTO Solenoid
Y21	PTO Brake Solenoid		
Y22	PTO Clutch Solenoid		

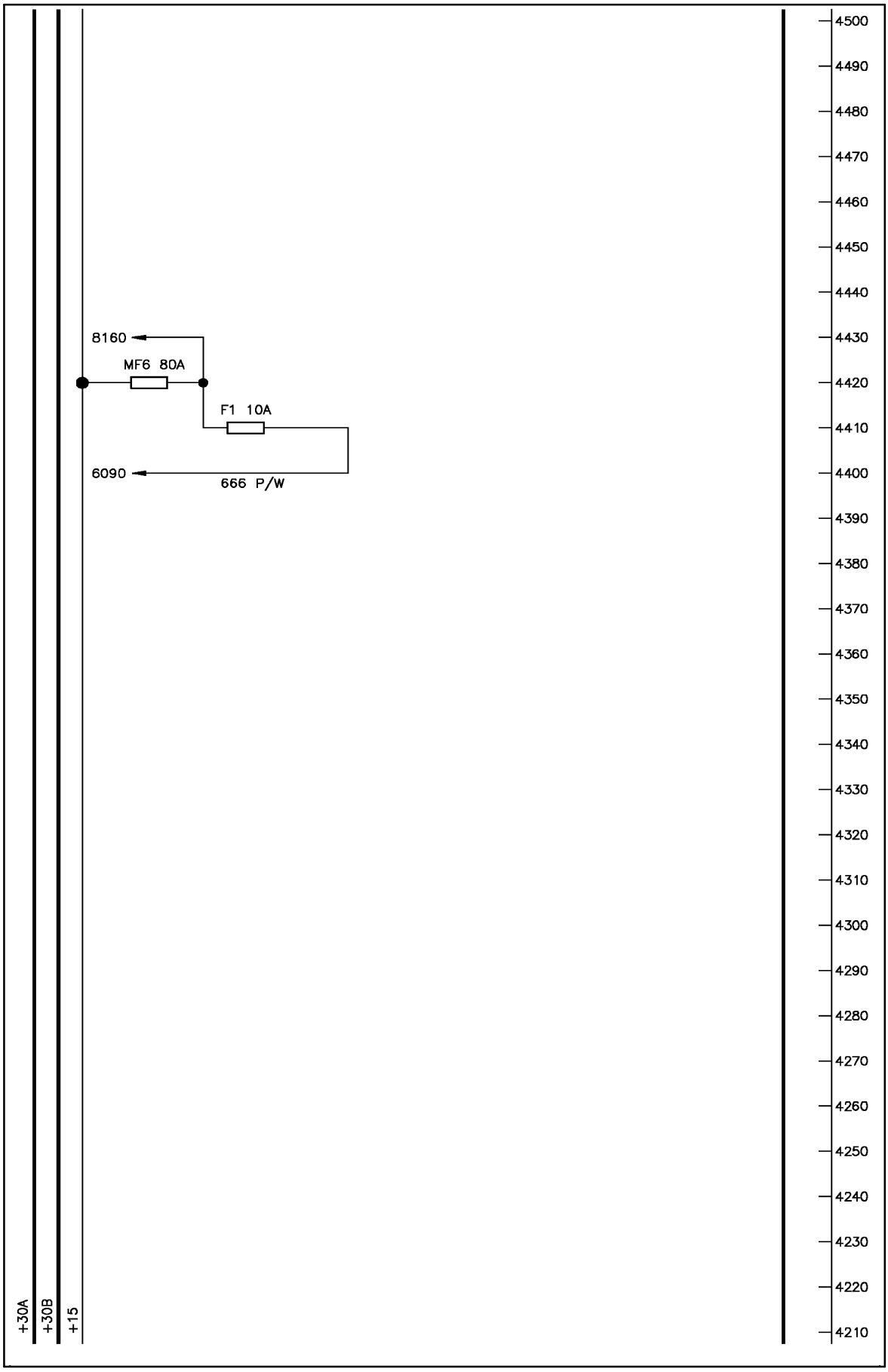
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910
+30A
+30B
+15
3580
3330 O
B24
C411
3
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
1
2
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8160
MF6 80A
F1 10A
6090
666 P/W
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

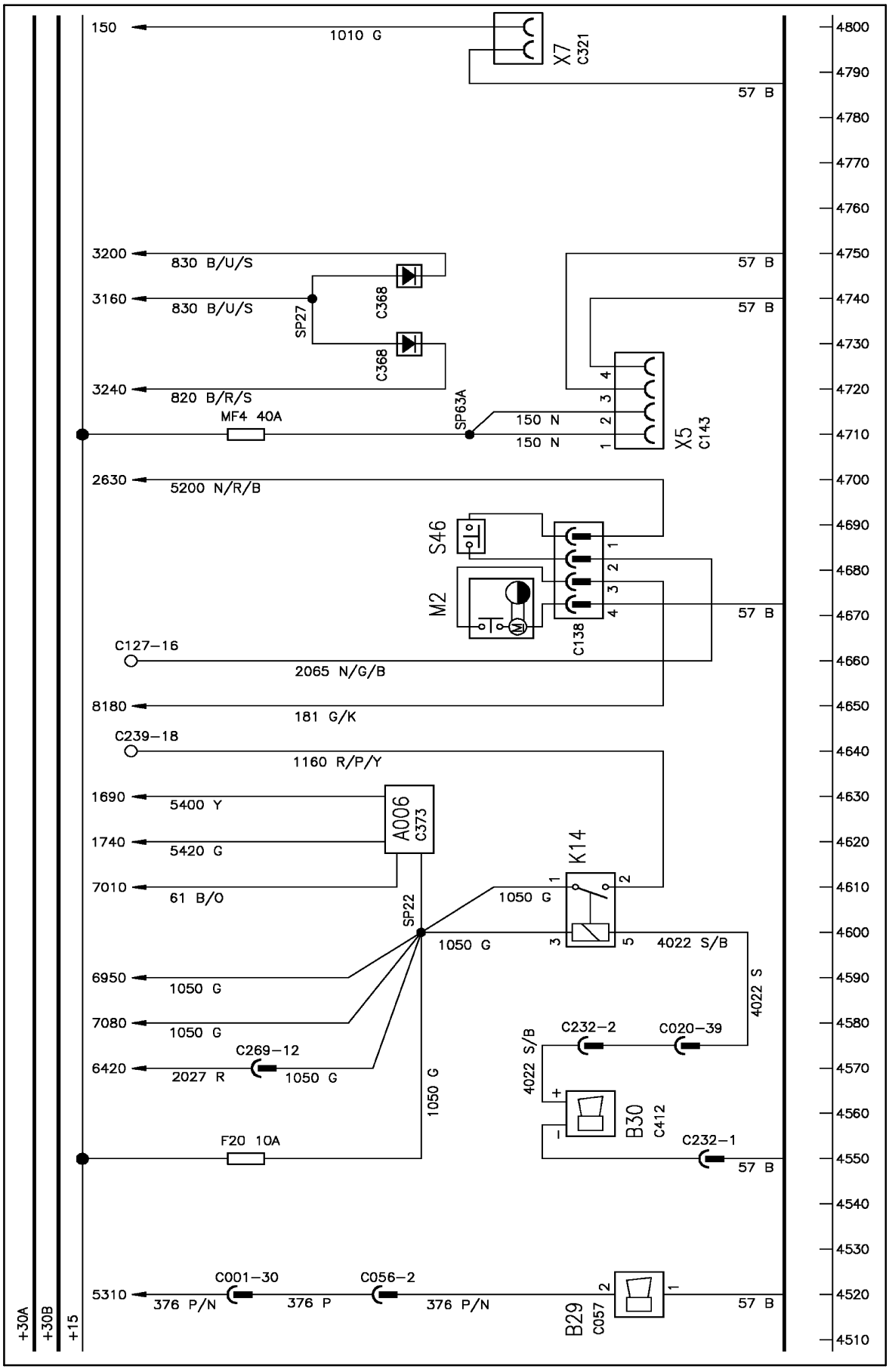
16x16 Transmission, L/Cab, W/Mechanical Engine

CAB ACCESSORIES 1
Line 4210-4500

MF6 Maxi Fuse - 80A

F1 Fuse - 10A

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

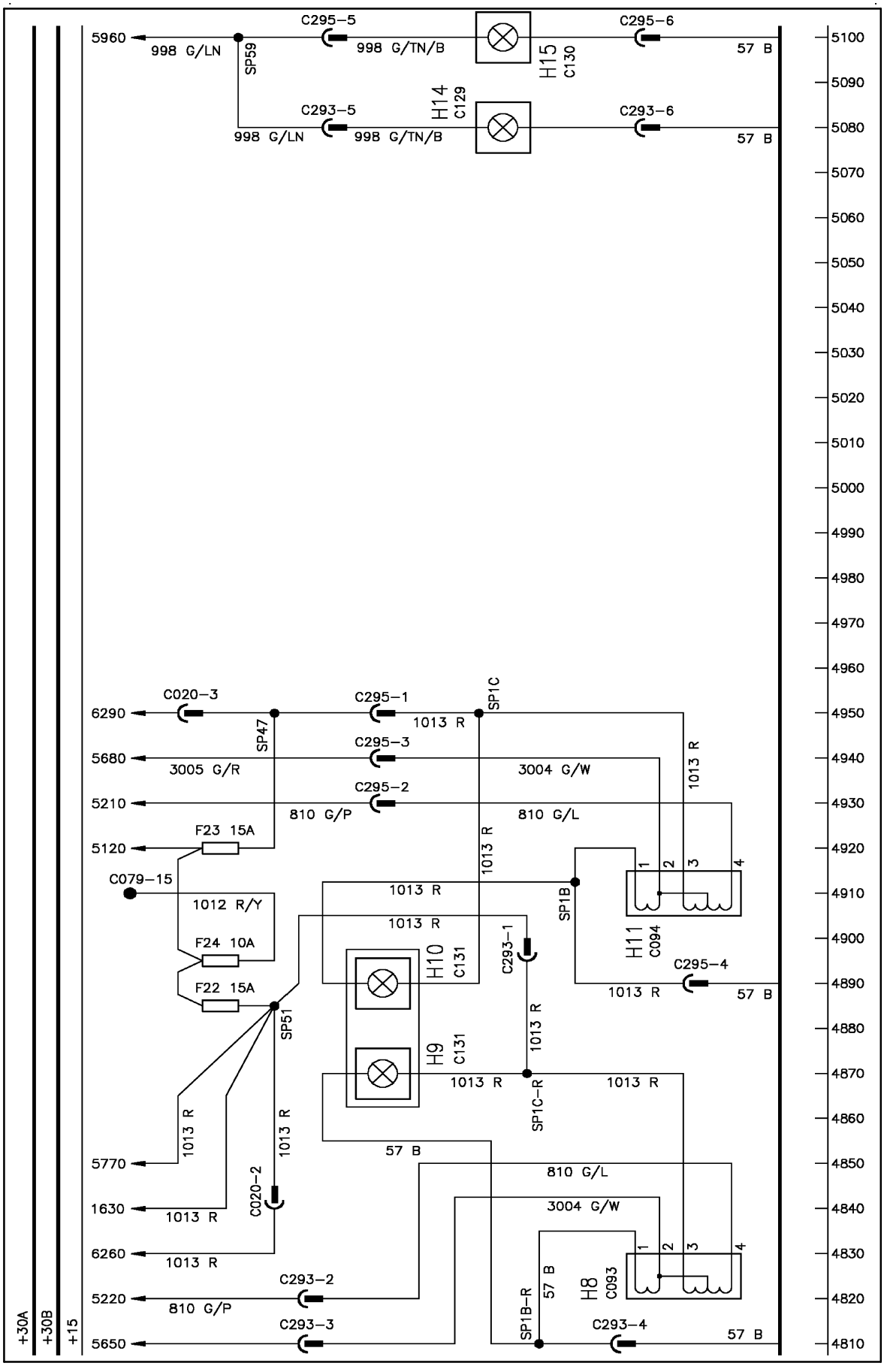

150
1010 G
X7
C321
57 B
3200
830 B/U/S
3160
830 B/U/S
SP27
C368
C368
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
1740
5420 G
7010
61 B/O
A006
C373
SP22
K14
1050 G
1050 G
4022 S/B
4022 S
6950
1050 G
7080
1050 G
C269-12
6420
2027 R
1050 G
1050 G
C232-2
C020-39
4022 S/B
B30
C412
C232-1
57 B
F20 10A
5310
C001-30
376 P/N
C056-2
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

16x16 Transmission, L/Cab, W/Mechanical Engine

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15
C130
C295-6
57 B
H14
C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810
C020-3
6290
SP47
C295-1
1013 R
SP1C
5680
3005 G/R
C295-3
3004 G/W
1013 R
5210
810 G/P
C295-2
810 G/L
F23 15A
5120
C079-15
1012 R/Y
F24 10A
F22 15A
SP51
1013 R
SP1B
H10
C131
H9
C131
C293-1
H11
C094
C295-4
57 B
SP1C-R
5770
1630
1013 R
C020-2
6260
1013 R
57 B
810 G/L
3004 G/W
H8
C093
SP1B-R
C293-2
5220
810 G/P
C293-3
5650
C293-4
+30A
+30B
+15

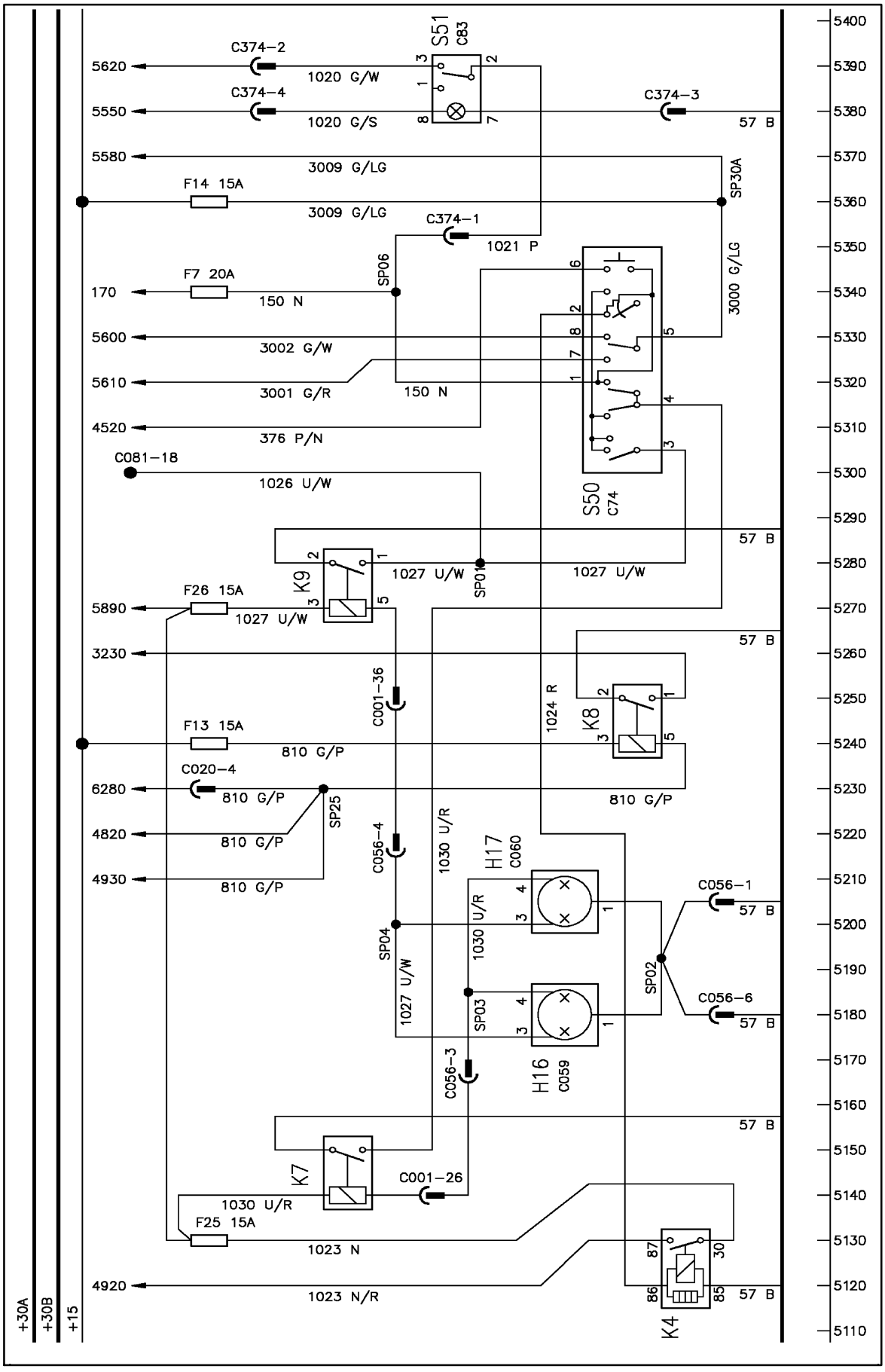
16x16 Transmission, L/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 1
Line 4810-5100

F22 Fuse 15 A
F23 Fuse 15 A
F24 Fuse 10 A

H8 Stop/Tail Light R/H
H9 Licence Plate Lamp - Fender
H10 Licence Plate Lamp - Fender
H11 Stop/Tail Light L/H
H14 Worklamp - Fender R/H
H15 Worklamp - Fender L/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

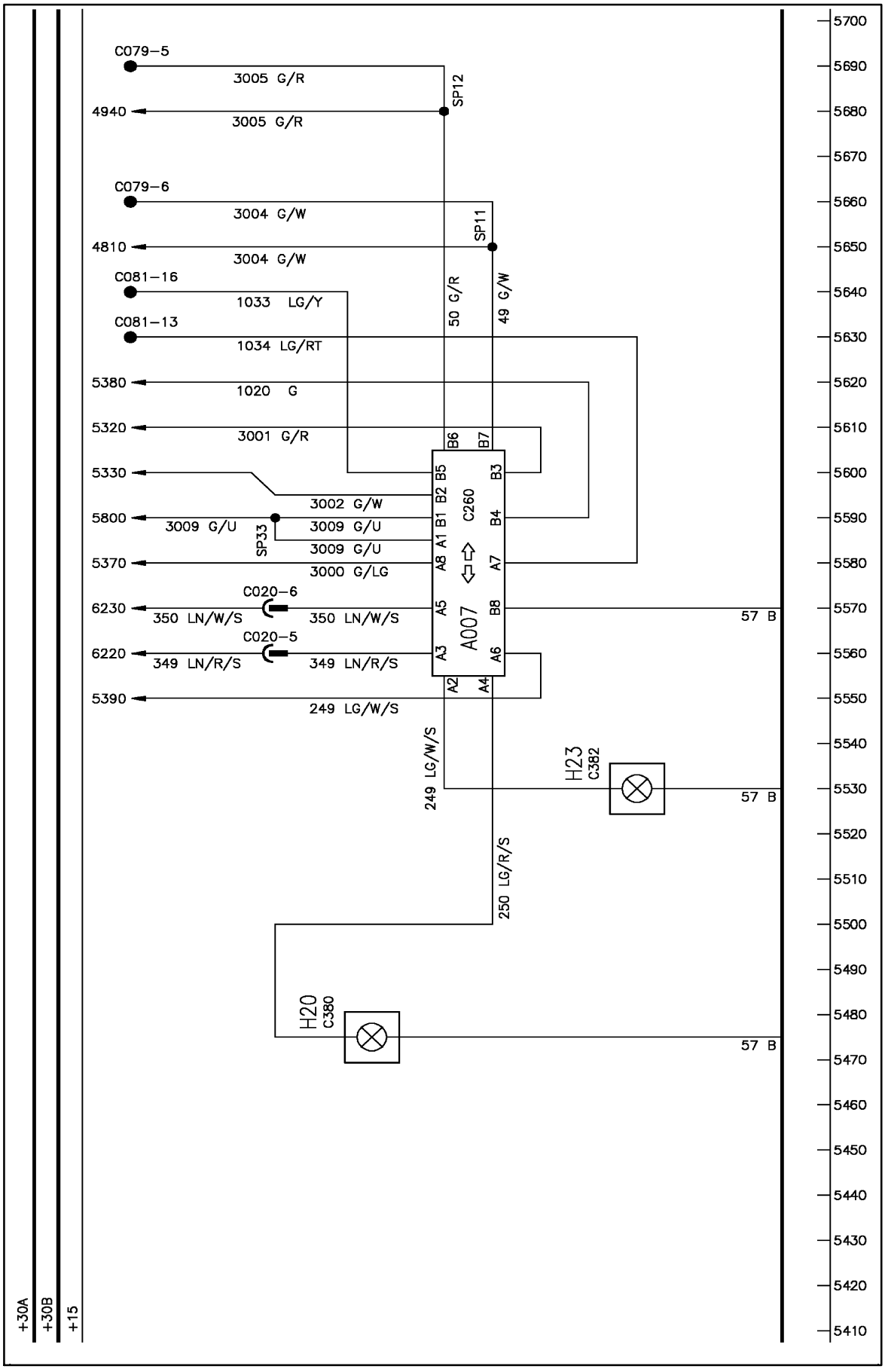

S51
C83
C374-2
C374-4
C374-3
C374-1
5620
5550
5580
1020 G/W
1020 G/S
3009 G/LG
57 B
F14 15A
SP30A
F7 20A
SP06
170
150 N
1021 P
3000 G/LG
5600
5610
4520
3002 G/W
3001 G/R
376 P/N
C081-18
1026 U/W
S50
C74
K9
F26 15A
5890
1027 U/W
SP01
3230
K8
1024 R
C001-36
F13 15A
810 G/P
C020-4
6280
4820
4930
SP25
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
H16
C059
C056-1
C056-6
SP02
C056-3
K7
C001-26
F25 15A
1023 N
4920
1023 N/R
K4
87
30
86
85
+30A
+30B
+15
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

16x16 Transmission, L/Cab, W/Mechanical Engine

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
SP12
C079-6
3004 G/W
4810
3004 G/W
SP11
C081-16
1033 LG/Y
C081-13
1034 LG/RT
50 G/R
49 G/W
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
350 LN/W/S
C020-5
6220
349 LN/R/S
349 LN/R/S
5390
249 LG/W/S
B6 B7 B5 B3 B2 B4 B1 A1 A8 A7 A5 B8 A3 A6 A2 A4
C260
A007
57 B
249 LG/W/S
H23
C382
57 B
250 LG/R/S
H20
C380
57 B
+30A
+30B
+15
5700 5690 5680 5670 5660 5650 5640 5630 5620 5610 5600 5590 5580 5570 5560 5550 5540 5530 5520 5510 5500 5490 5480 5470 5460 5450 5440 5430 5420 5410

16x16 Transmission, L/Cab, W/Mechanical Engine

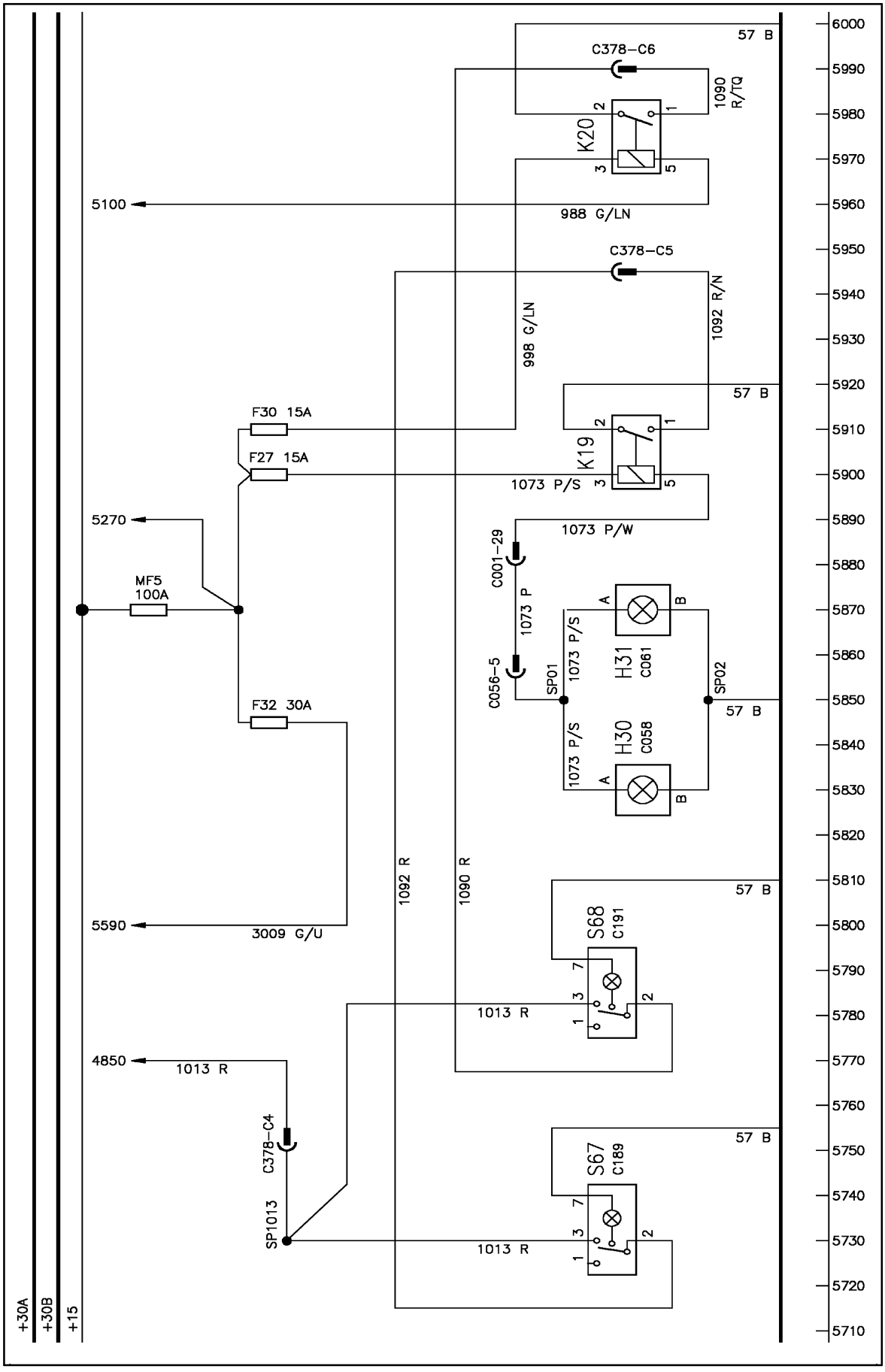
INDICATORS AND HAZARDS 3
Line 5410-5700

A007 Flasher Unit

H20 SMV Lamp L/H Rear

H23 SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
MF5
100A
F30 15A
F27 15A
F32 30A
5100
988 G/LN
5270
5590
3009 G/U
4850
1013 R
C378-C6
C378-C5
C378-C4
SP1013
K20
K19
1090 R/TQ
1092 R/N
998 G/LN
1073 P/S
1073 P/W
1073 P
C001-29
C056-5
SP01
SP02
H31
C061
H30
C058
S68
C191
S67
C189
1092 R
1090 R
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

16x16 Transmission, L/Cab, W/Mechanical Engine

WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A

F27 Fuse - 15A
F30 Fuse - 15A
F32 Fuse - 30A

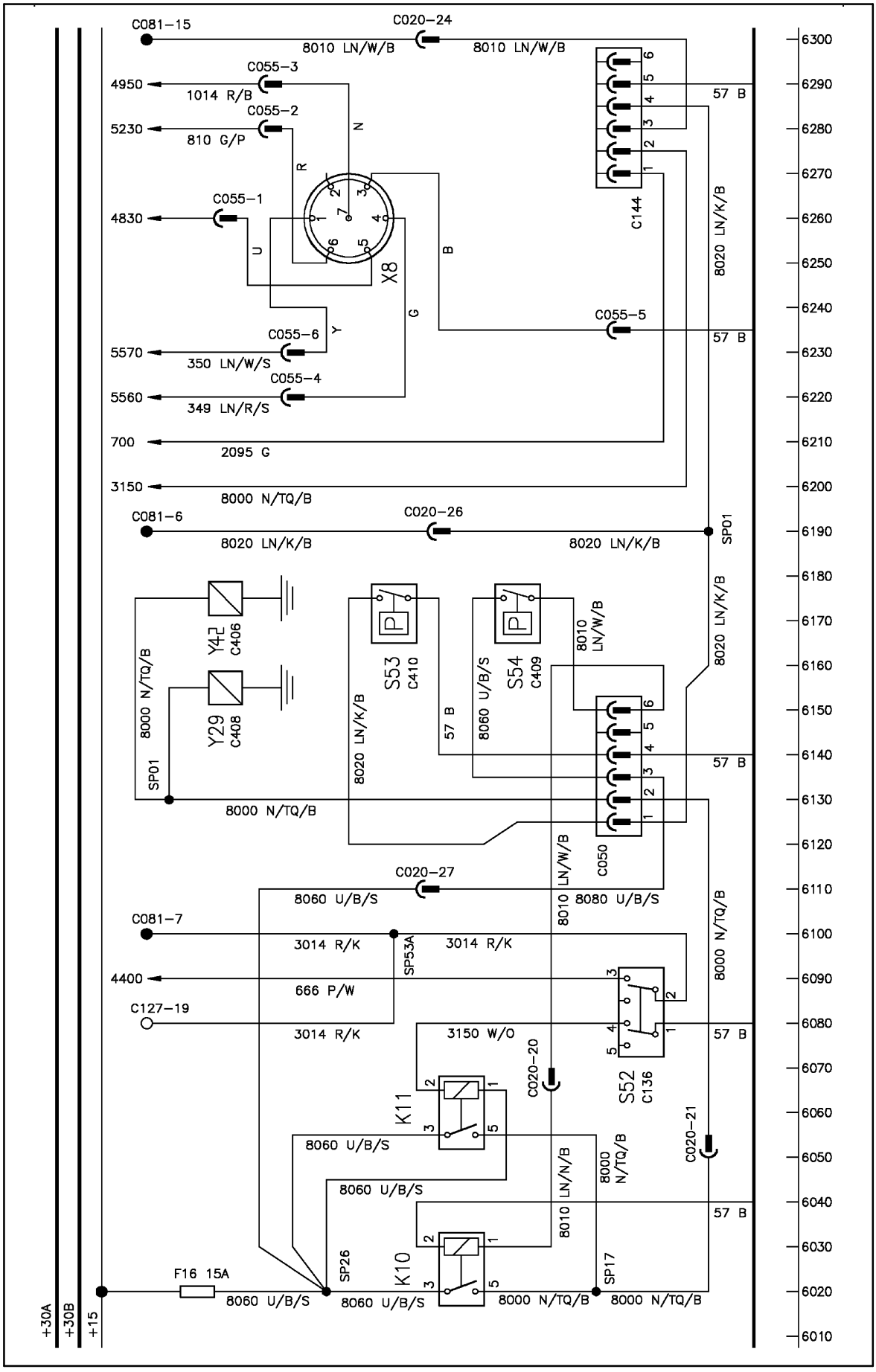
H30 Corner Lamp R/H

H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

S67 Worklamp Switch - Front
S68 Worklamp Switch - Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN/W/B
C055-3
4950
1014 R/B
C055-2
5230
810 G/P
C055-1
4830
C055-6
5570
350 LN/W/S
C055-4
5560
349 LN/R/S
700
2095 G
3150
8000 N/TQ/B
C144
57 B
8020 LN/K/B
C055-5
X8
C081-6
C020-26
8020 LN/K/B
8020 LN/K/B
SP01
Y42 C406
Y29 C408
8000 N/TQ/B
S53 C410
S54 C409
8010 LN/W/B
8060 U/B/S
8020 LN/K/B
C050
C020-27
8060 U/B/S
8010 8080 U/B/S
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3150 W/O
C020-20
S52 C136
K11
C020-21
8060 U/B/S
8000 N/TQ/B
8010 LN/N/B
F16 15A
SP26
K10
SP17
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

16x16 Transmission, L/Cab, W/Mechanical Engine

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

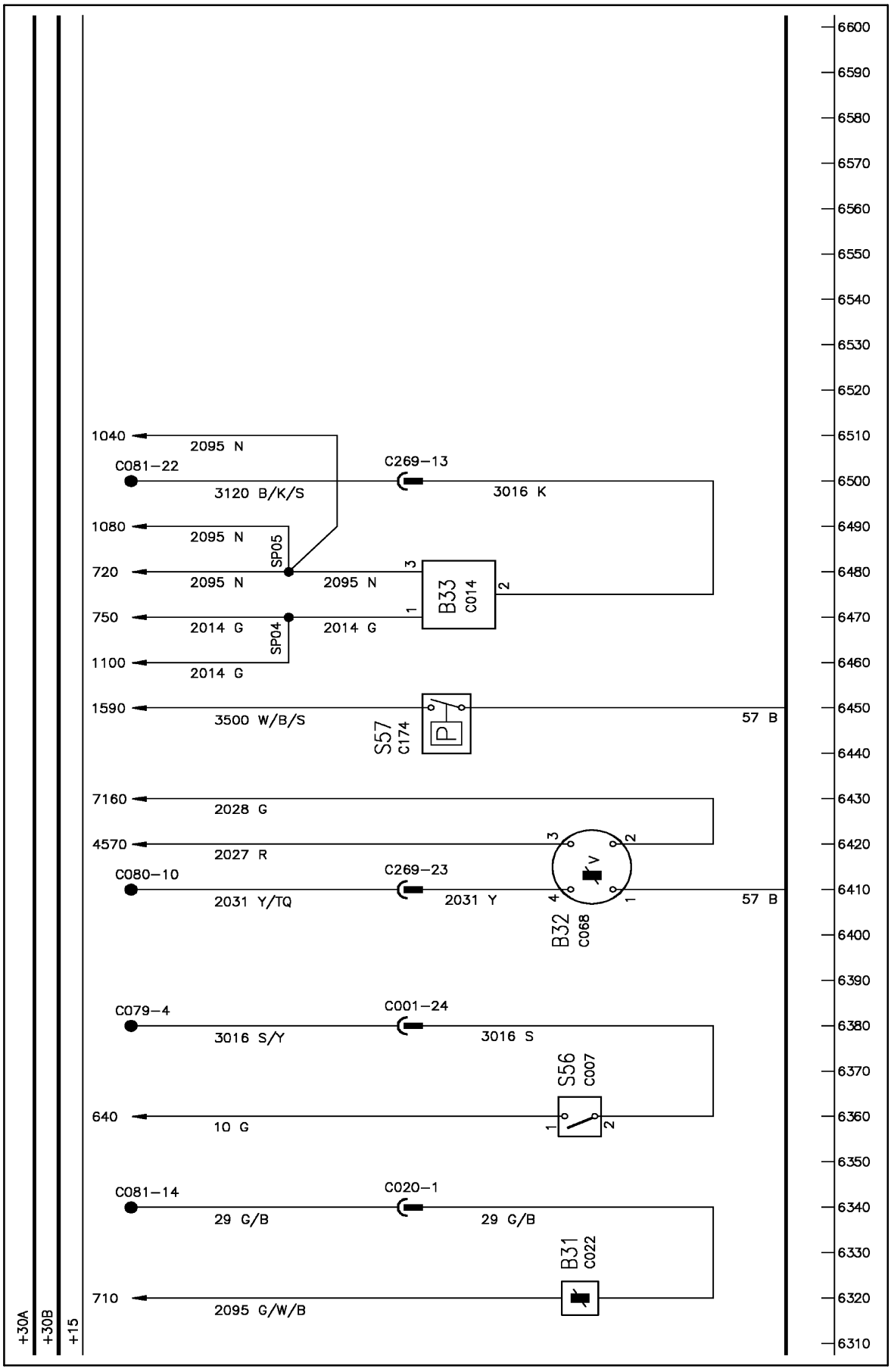
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1040
2095 N
C081-22
C269-13
3120 B/K/S
3016 K
1080
2095 N
SP05
720
2095 N
2095 N
B33
C014
750
2014 G
2014 G
SP04
1100
2014 G
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
C269-23
2031 Y/TQ
2031 Y
B32
C068
57 B
C079-4
C001-24
3016 S/Y
3016 S
S56
C007
640
10 G
C081-14
C020-1
29 G/B
29 G/B
B31
C022
710
2095 G/W/B
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310

16x16 Transmission, L/Cab, W/Mechanical Engine

SENSORS
Line 6310-6600

B31 Fuel Tank Sender

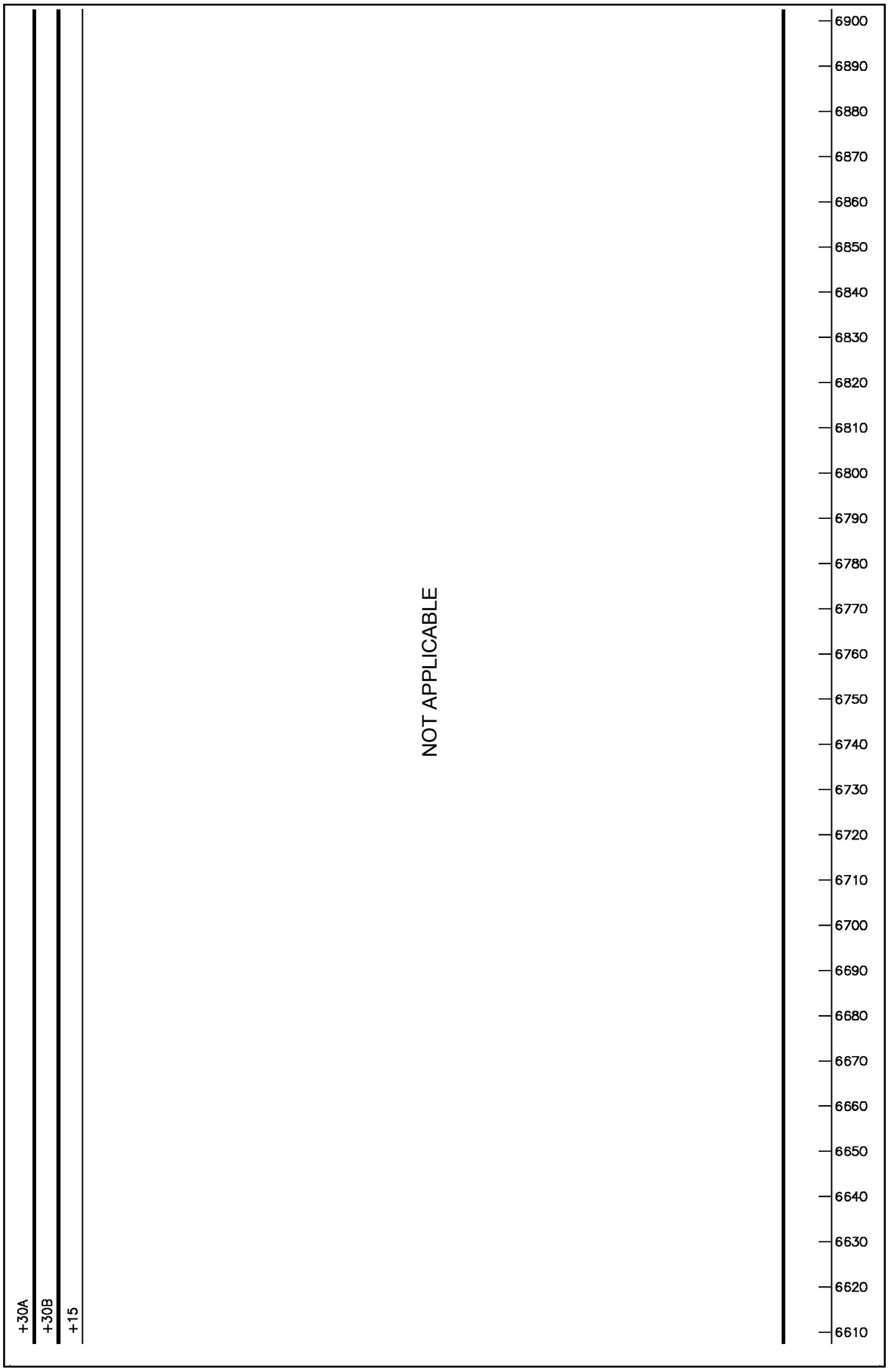
B32 Radar Gun

B33 Steering Angle Sensor

S56 Brake Fluid Level Switch

S57 Power Assisted Steering Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

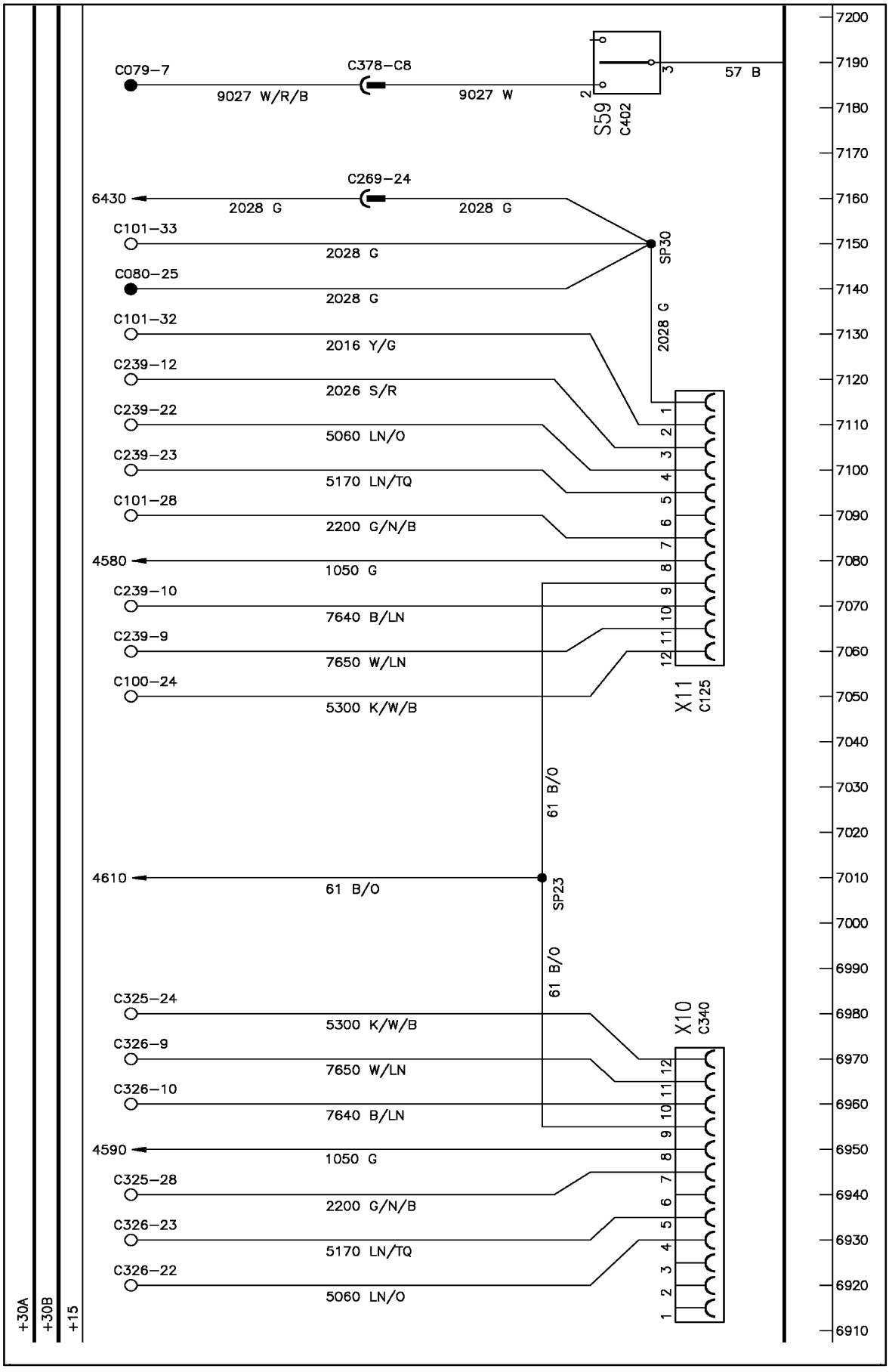

+30A
+30B
+15
NOT APPLICABLE
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

16x16 Transmission, L/Cab, W/Mechanical Engine

WASHERS AND WIPERS
Line 6510-6900

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
2
3
57 B
S59
C402
C269-24
6430
2028 G
2028 G
C101-33
2028 G
SP30
C080-25
2028 G
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
1 2 3 4 5 6 7 8 9 10 11 12
61 B/O
4610
61 B/O
SP23
61 B/O
C325-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
X10
C340
12 11 10 9 8 7 6 5 4 3 2 1
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

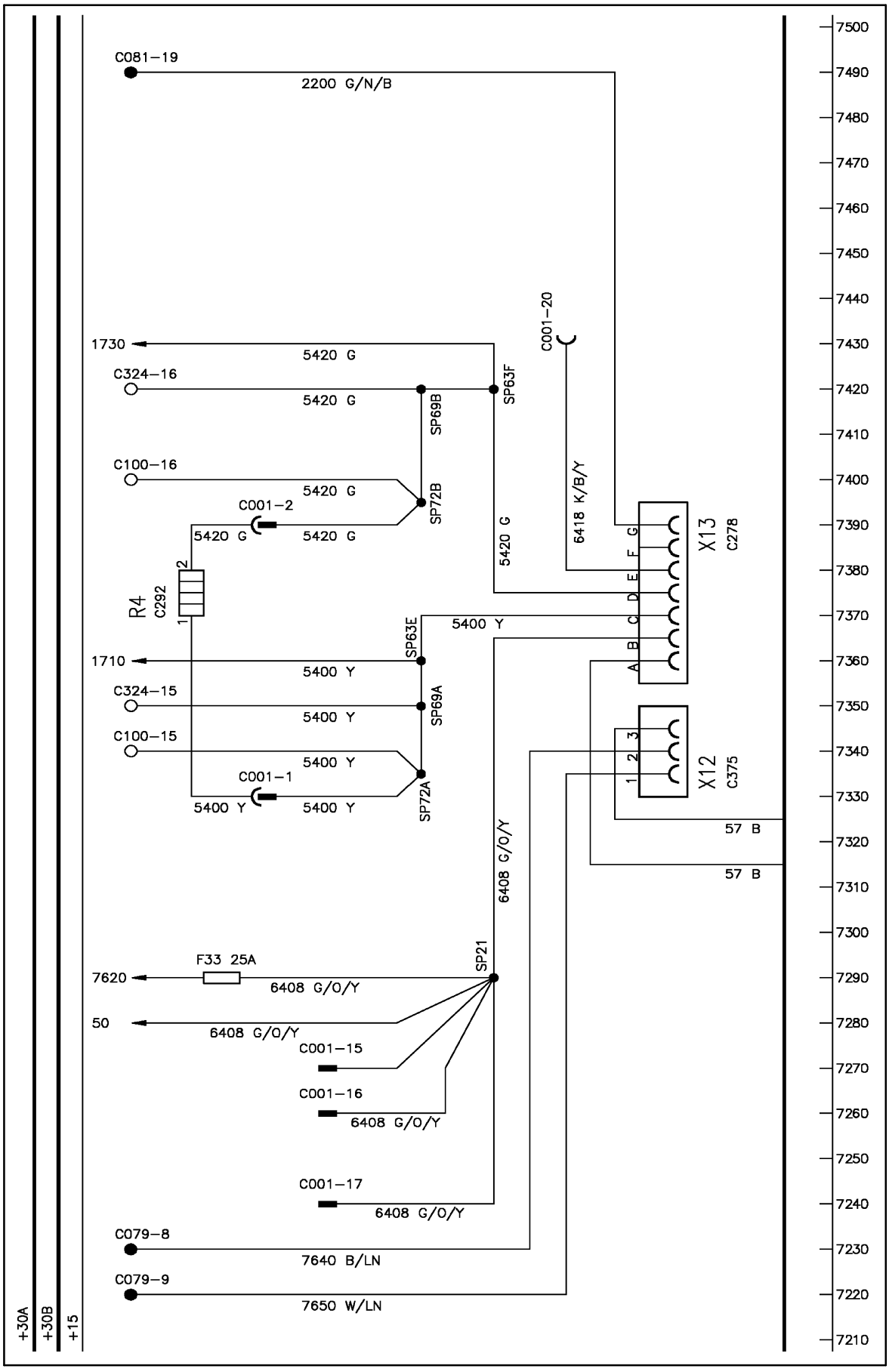
16x16 Transmission, L/Cab, W/Mechanical Engine

DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)
X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
SP72B
C001-2
5420 G
5420 G
R4
C292
2
1
1710
5400 Y
SP63E
C324-15
5400 Y
SP69A
C100-15
5400 Y
C001-1
5400 Y
5400 Y
SP72A
C001-20
6418 K/B/Y
5420 G
5400 Y
X13
C278
A B C D E F G
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C001-15
C001-16
6408 G/O/Y
C001-17
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

16x16 Transmission, L/Cab, W/Mechanical Engine

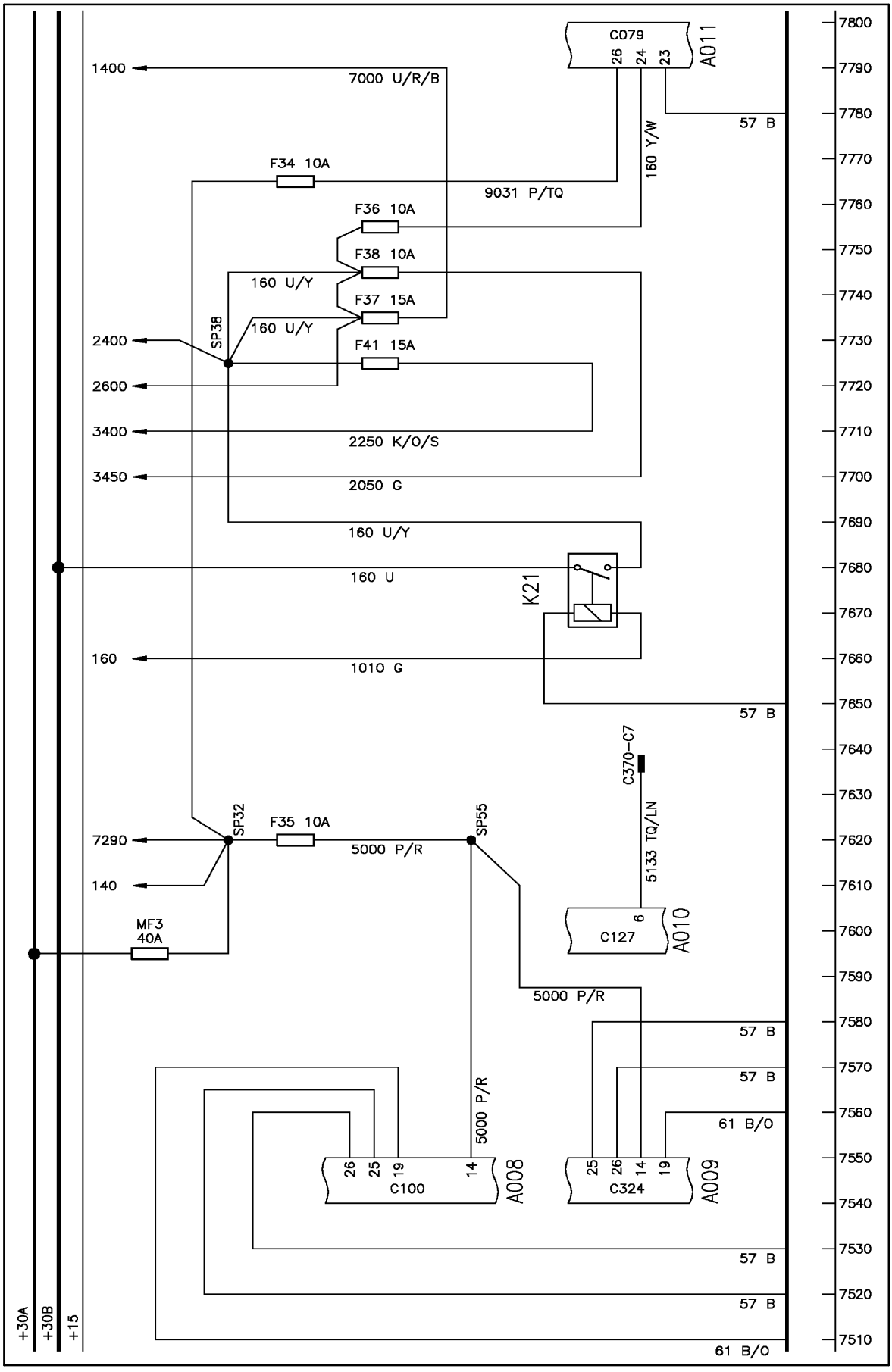
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

R4 Can Bus Terminator

X12 ADIC Diagnostics Connector
X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079
26
24
23
A011
1400
7000 U/R/B
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3400
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C370-C7
SP32
F35 10A
SP55
7290
5000 P/R
5133 TQ/LN
140
MF3
40A
6
C127
A010
5000 P/R
57 B
57 B
5000 P/R
61 B/O
26
25
19
C100
14
A008
25
26
14
19
C324
A009
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

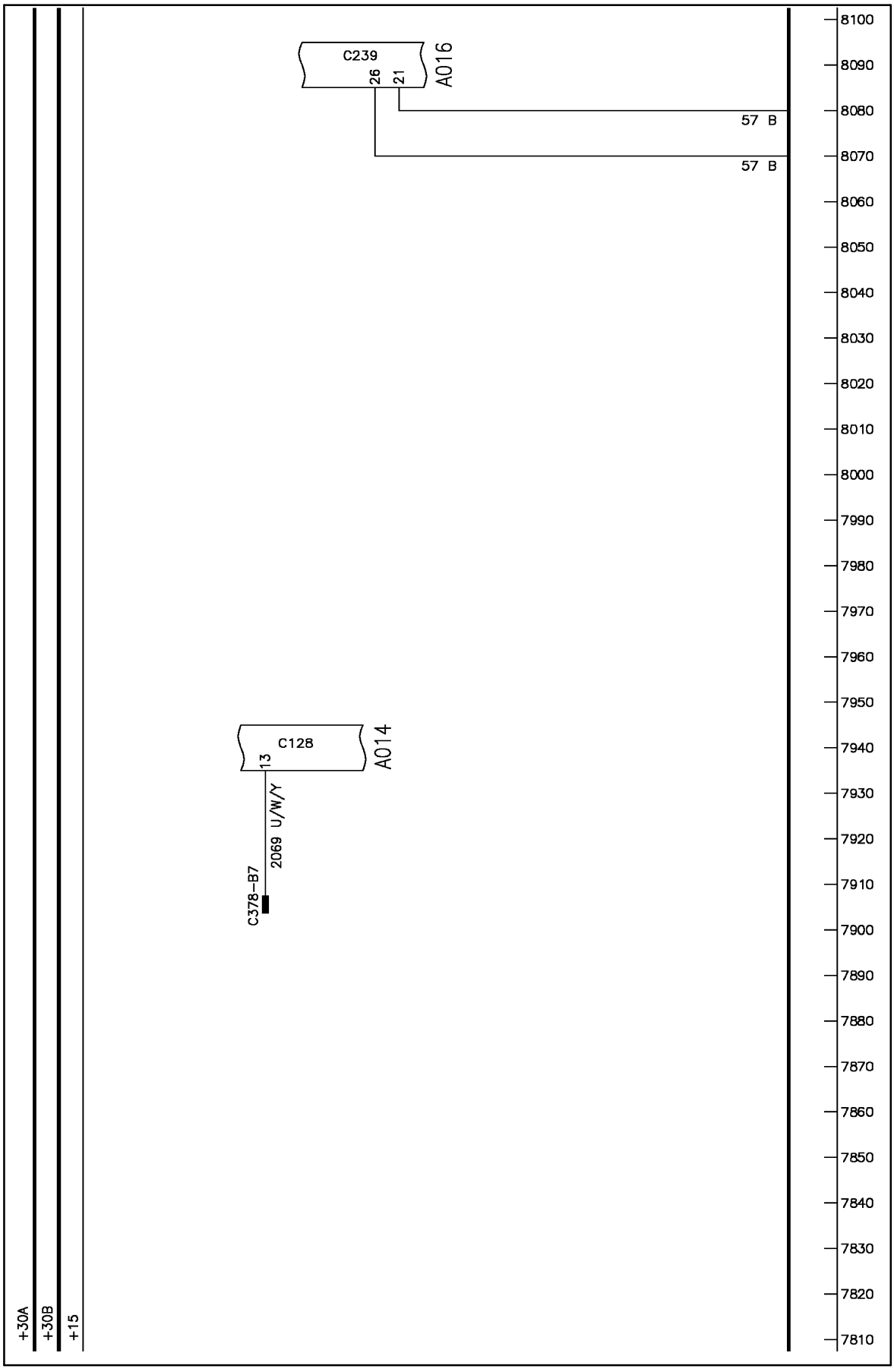
16x16 Transmission, L/Cab, W/Mechanical Engine

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239
26
21
A016
57 B
57 B
C128
13
A014
2069 U/W/Y
C378-B7
+30A
+30B
+15
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

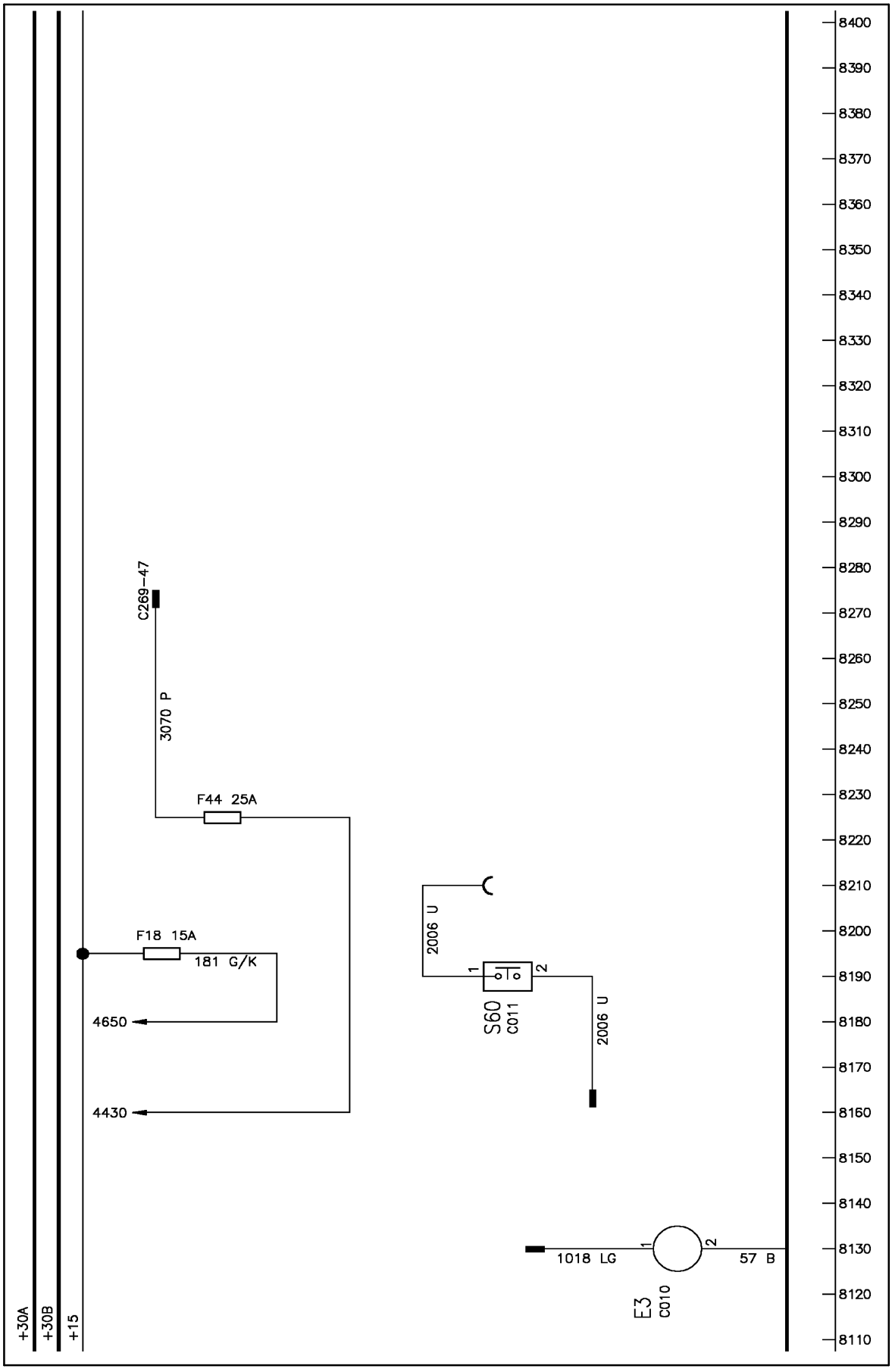
16x16 Transmission, L/Cab, W/Mechanical Engine,

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A014 XCM Central Control Unit (CN3-B)

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
C269-47
3070 P
F44 25A
F18 15A
181 G/K
4650
4430
2006 U
1
2
S60
C011
2006 U
1018 LG
1
2
57 B
E3
C010
+30A
+30B
+15

16x16 Transmission, L/Cab, W/Mechanical Engine

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

F18 Fuse - 15A

F44 Fuse - 25A

E3 A/C Clutch

S60 A/C Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

SECTION 55 – ELECTRICAL SYSTEM

Chapter 6 – Wiring Diagrams (Continued)

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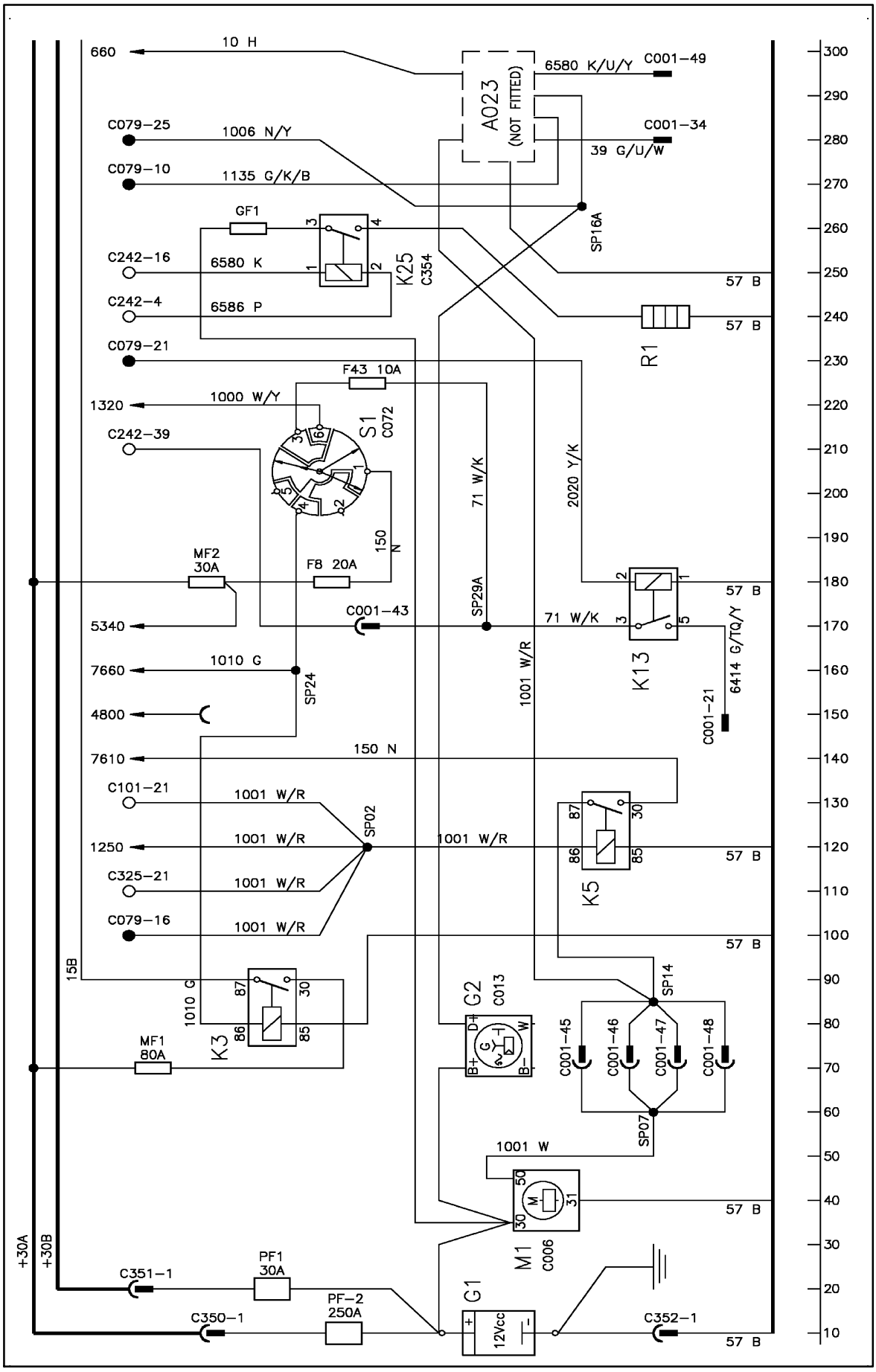
Wire Identification Key	652

Wiring Diagrams Circuit Description – All Models		Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0–300
Circuit 2	Engine	310–1200
Circuit 3	Transmission Circuits	1210–2100
Circuit 4	Hydraulics	2110–3000
Circuit 5	Four Wheel Drive and Differential Lock	3010–3300
Circuit 6	Power Take Off	3310–3900
Circuit 7	Front Suspension	3910–4200
Circuit 8	Cab Accessories	4210–4800
Circuit 9	Main Lamps, Indicators & Hazards	4810–5700
Circuit 10	Work Lamps	5710–6000
Circuit 11	Trailer Braking system circuits	6010–6300
Circuit 12	Sensors / Senders	6310–6600
Circuit 13	Wipers & Washers	6610–6900
Circuit 14	Diagnostic Connectors	6910–7500
Circuit 15	Processor Feed and Ground connections	7510–8100
Circuit 16	Air–Conditioning & Heating	8110–8400

24X24 TRANSMISSION, L/CAB, W/ELECTRONIC ENGINE

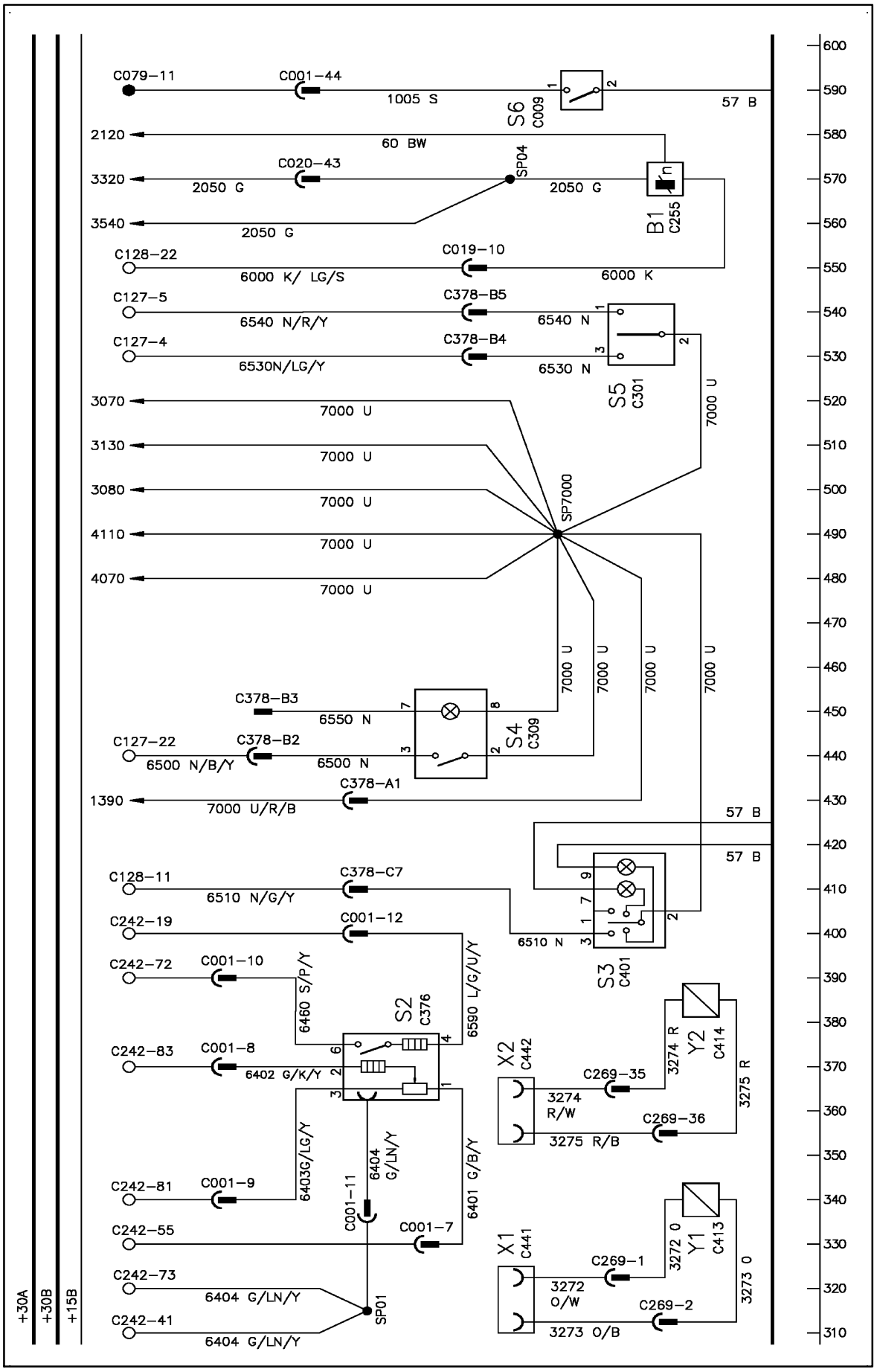
Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400


660
10 H
A023
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C079-25
1006 N/Y
C079-10
1135 G/K/B
SP16A
GF1
C242-16
6580 K
K25
C354
C242-4
6586 P
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
C242-39
S1
C072
71 W/K
2020 Y/K
150 N
MF2
30A
F8 20A
SP29A
C001-43
5340
K13
6414 G/TQ/Y
C001-21
7660
1010 G
SP24
1001 W/R
4800
7610
150 N
C101-21
1001 W/R
SP02
1250
C325-21
C079-16
K5
15B
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1001 W
M1
C006
+30A
+30B
PF1
30A
C351-1
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A023	Grid Heater Module (not fitted)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

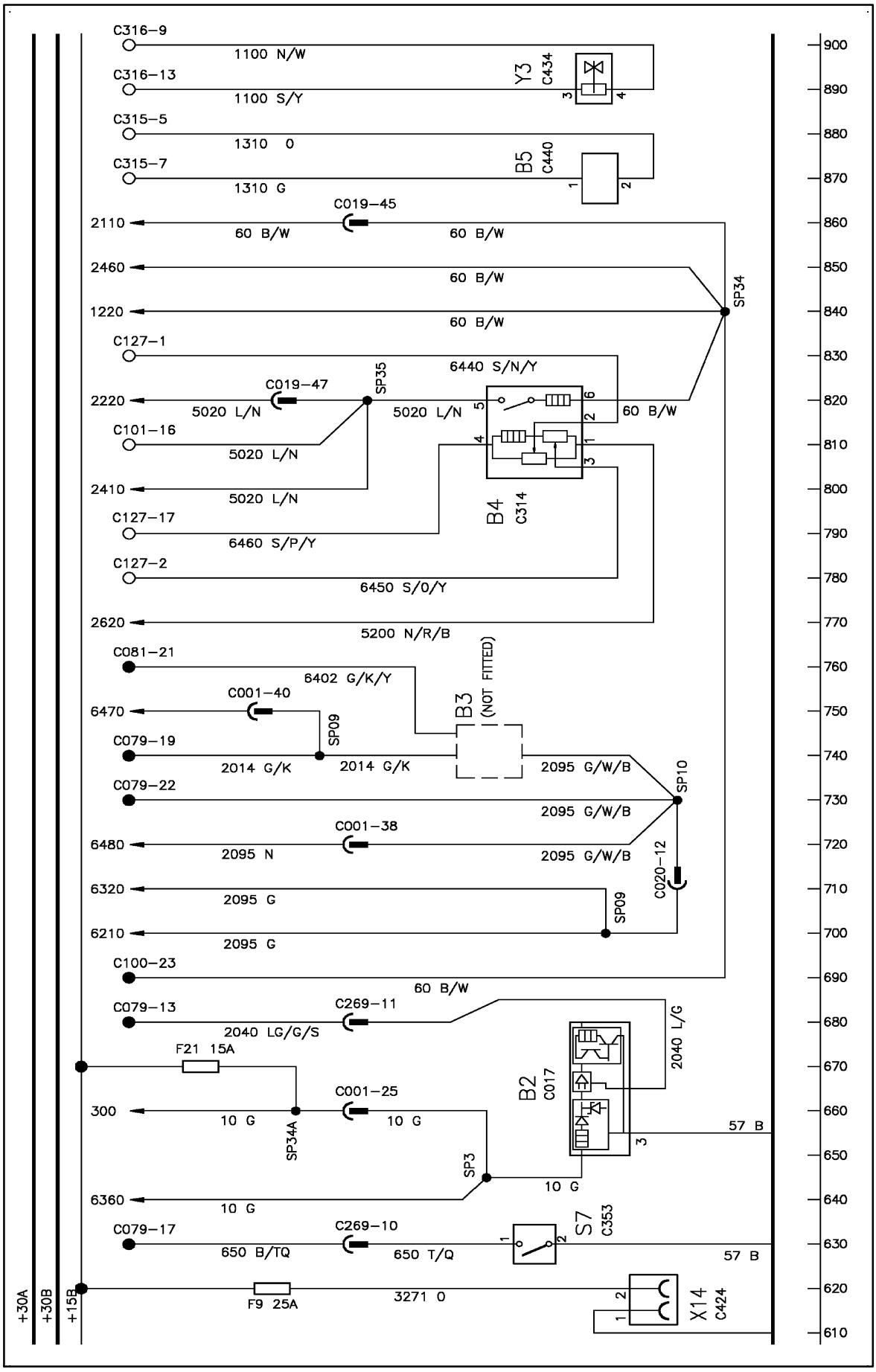

C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
3320
2050 G
SP04
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
7000 U
3130
7000 U
3080
7000 U
SP7000
4110
7000 U
4070
7000 U
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
6510 N
S3 C401
C242-72
C001-10
6460 S/P/Y
6590 L/G/U/Y
S2 C376
C242-83
C001-8
6402 G/K/Y
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C001-11
C242-81
C001-9
C242-55
C001-7
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15B
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

24x24 Transmission, L/Cab, W/Electronic Engine

ENGINE 1
line 310-600

B1	Engine Flywheel Speed Sensor
S2	Foot Throttle - Electronic Engine
S3	Constant Engine Speed programme Switch
S4	Constant ERPM On/Off Switch
S5	Engine Inc./Dec. Switch
S6	Air Cleaner Switch
Y1	Loader Valve 1
Y2	Loader Valve 2
X1	Joystick Loader Control Socket 1
X2	Joystick Loader Control Socket 2

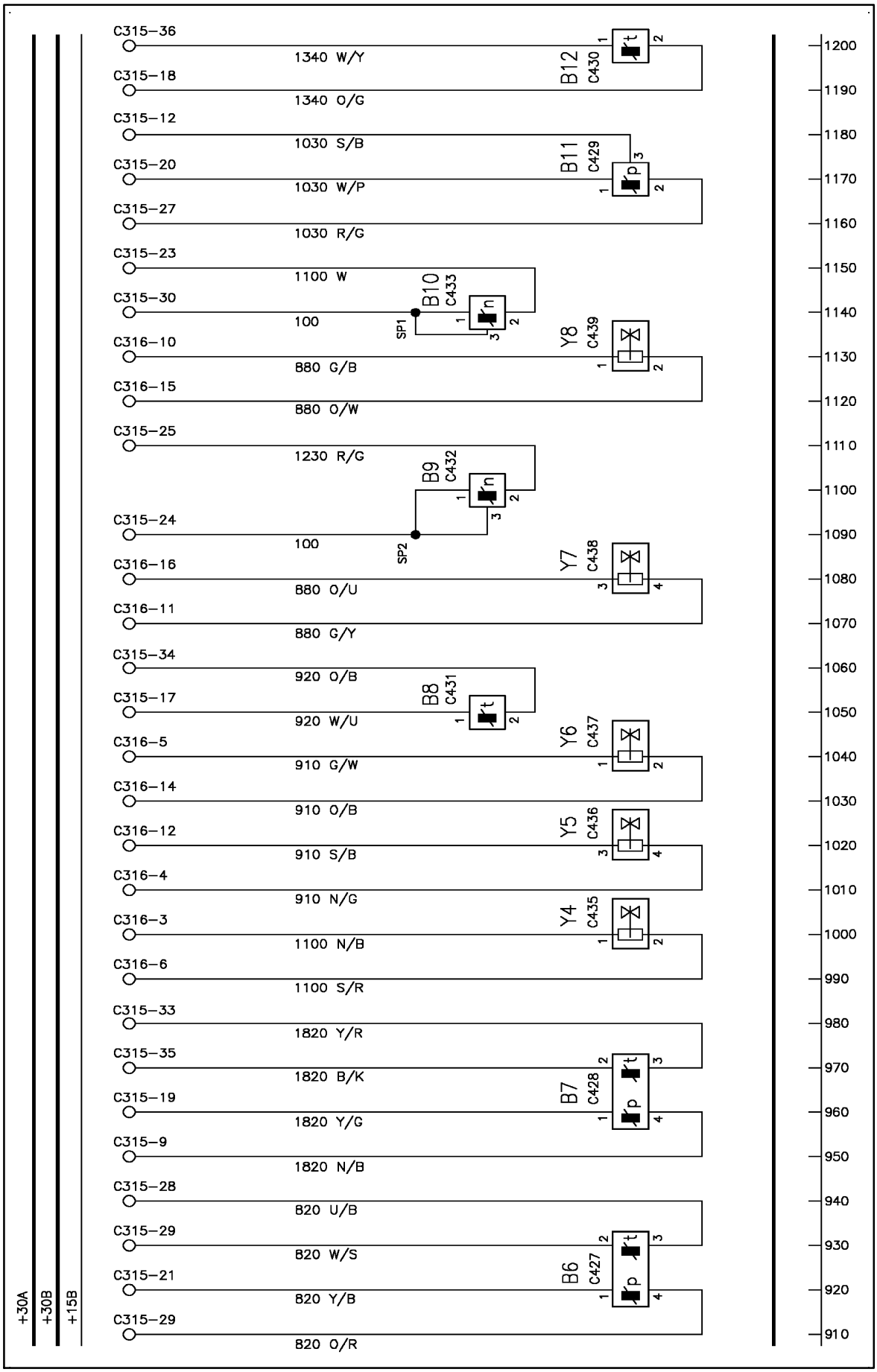
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3
(NOT FITTED)
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
300
10 G
C001-25
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
+30A
+30B
+15B
F9 25A
3271 0
X14
C424
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A		
		Y3	Injector 1
B2	Water In Fuel Sensor		
B3	Foot Throttle - Mechanical Engine (Not Fitted)	**X14**	Loader Power Connector
B4	Hand Throttle		
B5	Fuel Metering Unit		

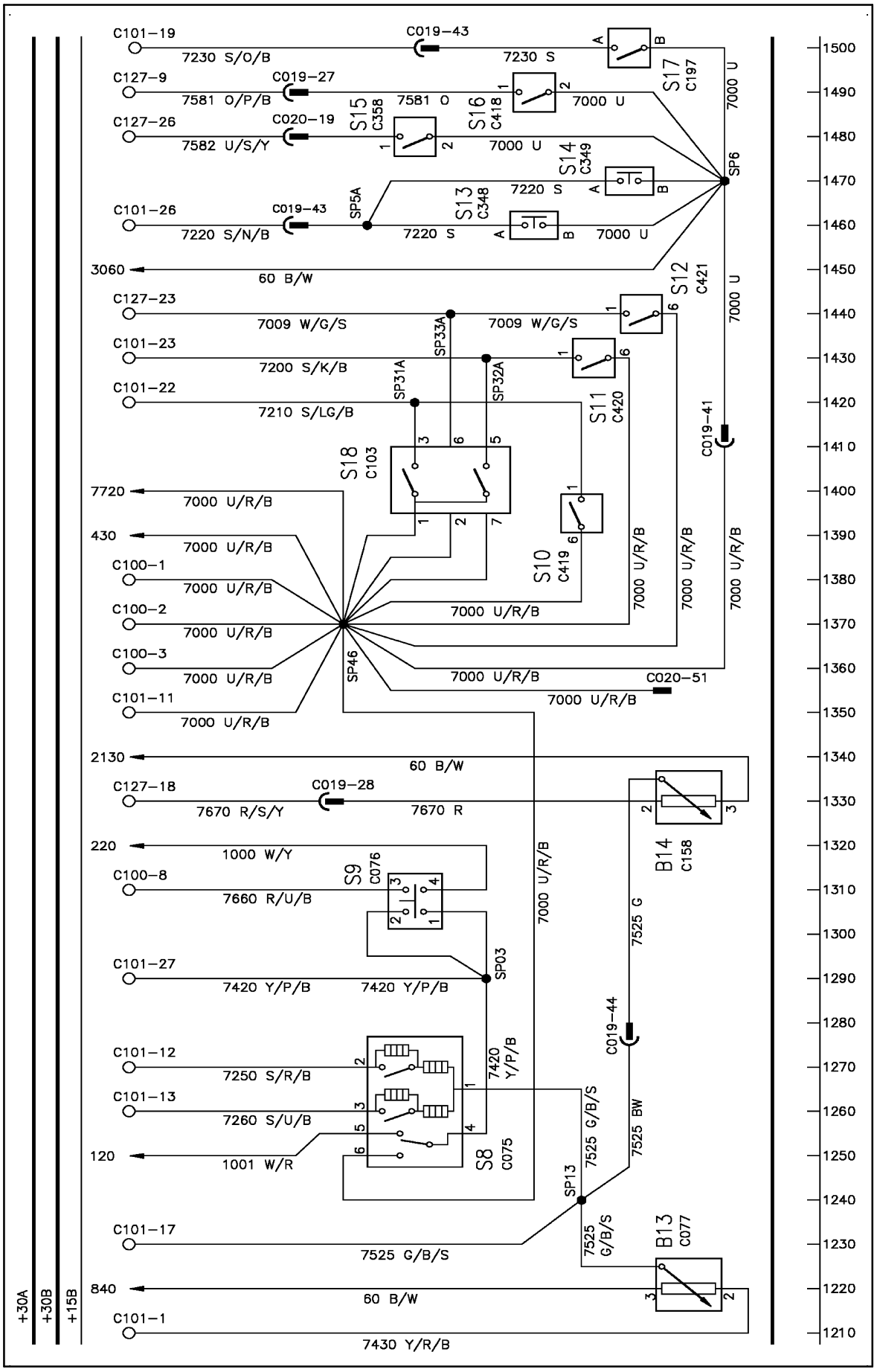
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
C315-27
1030 R/G
B11
C429
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
C315-9
1820 N/B
B7
C428
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910

ENGINE 3
line 910-1200

B6	Boost Pressure/Temperature Sensor	**Y4**	Injector 2
B7	Oil Pressure/Temperature Sensor	**Y5**	Injector 3
B8	Fuel Temperature Sensor	**Y6**	Injector 4
B9	Crankshaft Speed Sensor	**Y7**	Injector 5 (6 cyl version)
B10	Camshaft Speed Sensor	**Y8**	Injector 6 (6 cyl version)
B11	Fuel Rail Pressure Sensor		
B12	Coolant Temperature Sensor		

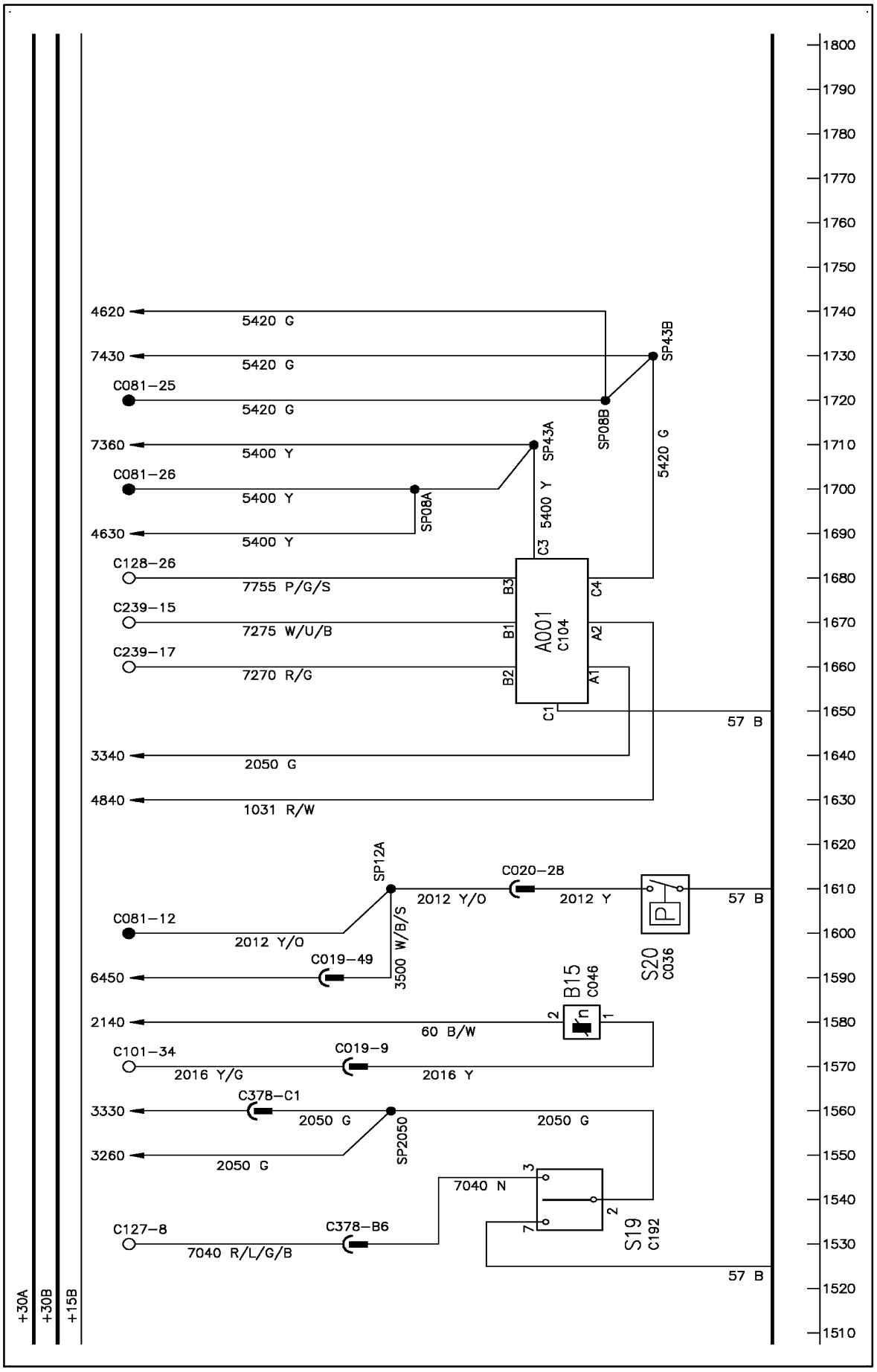
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C101-19
7230 S/O/B
C019-43
7230 S
S17 C197
C127-9
7581 O/P/B
C019-27
S15 C358
7581 O
S16 C418
7000 U
C127-26
7582 U/S/Y
C020-19
7000 U
S14 C349
SP6
C101-26
7220 S/N/B
C019-43
SP5A
S13 C348
7220 S
3060
60 B/W
C127-23
7009 W/G/S
SP33A
S12 C421
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
S10 C419
C100-1
C100-2
C100-3
C101-11
SP46
C020-51
2130
C127-18
7670 R/S/Y
C019-28
7670 R
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C101-27
7420 Y/P/B
SP03
C019-44
7525 G
7525 BW
7525 G/B/S
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
SP13
C101-17
B13 C077
840
C101-1
7430 Y/R/B
+30A
+30B
+15B
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control - Range
B14	Synchro Position Potentiometer	**S13**	Neutral Switch 3/4 Rail
		S14	Neutral Switch 1/2 Rail
S8	Shuttle Switch	**S15**	Creeper Sensing Switch
S9	Clutch Switch	**S16**	Creeper Sense Forward Switch
S10	Duplicate Transmission Control - Downshift	**S17**	High/Medium Switch
S11	Duplicate Transmission Control - Upshift	**S18**	Gearshift

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
4620
5420 G
7430
5420 G
C081-25
5420 G
SP43B
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
B3
C4
A001
C104
C239-15
7275 W/U/B
B1
A2
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C020-28
2012 Y/O
2012 Y
57 B
C081-12
2012 Y/O
C019-49
3500 W/B/S
6450
S20
C036
B15
C046
2140
60 B/W
C101-34
2016 Y/G
C019-9
2016 Y
3330
C378-C1
2050 G
2050 G
3260
2050 G
SP2050
7040 N
C127-8
7040 R/L/G/B
C378-B6
S19
C192
57 B
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

TRANSMISSION SYSTEM 2
Line 1510-1800

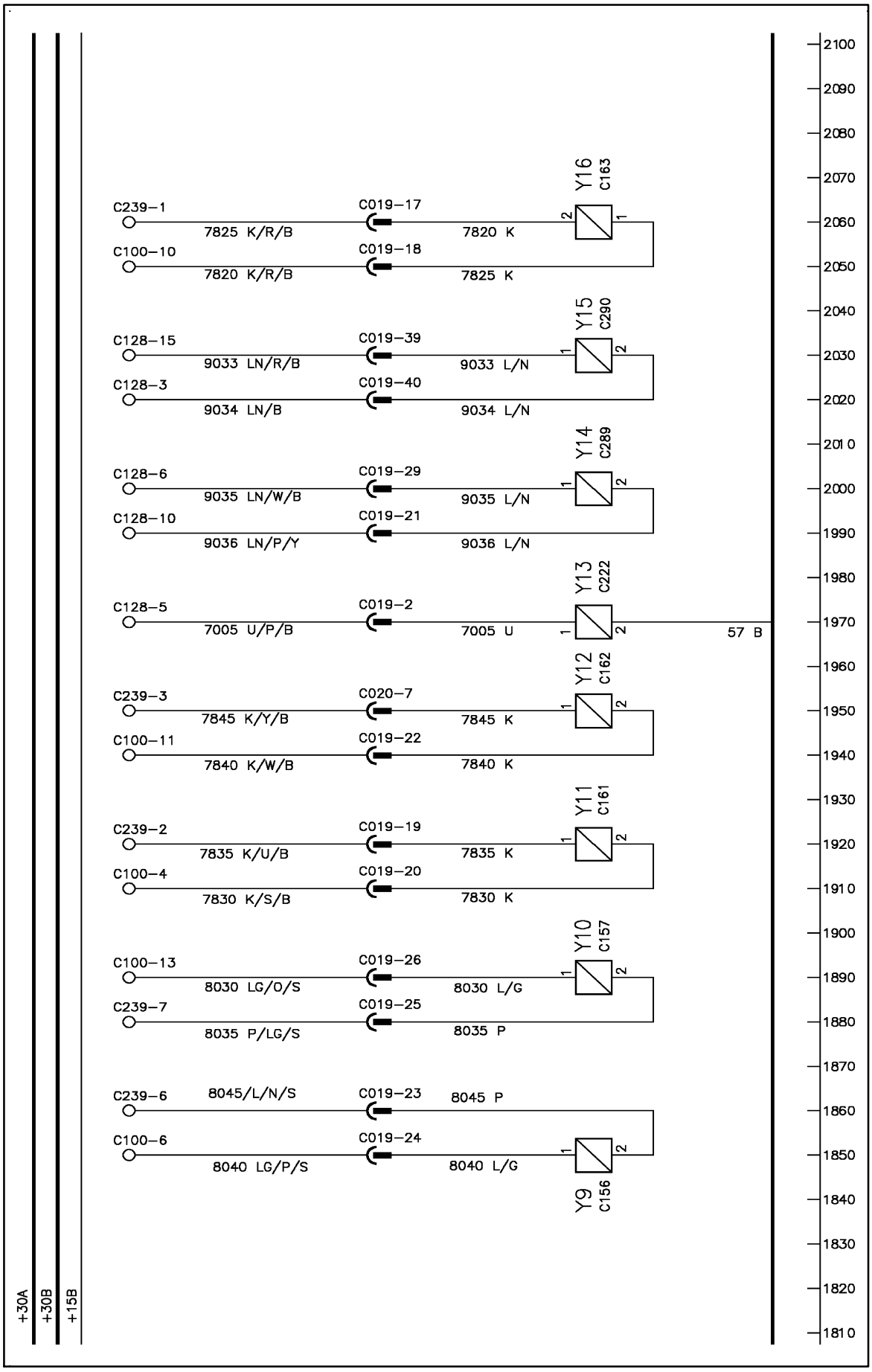
A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch

S20 Transmission Oil Pressure Switch

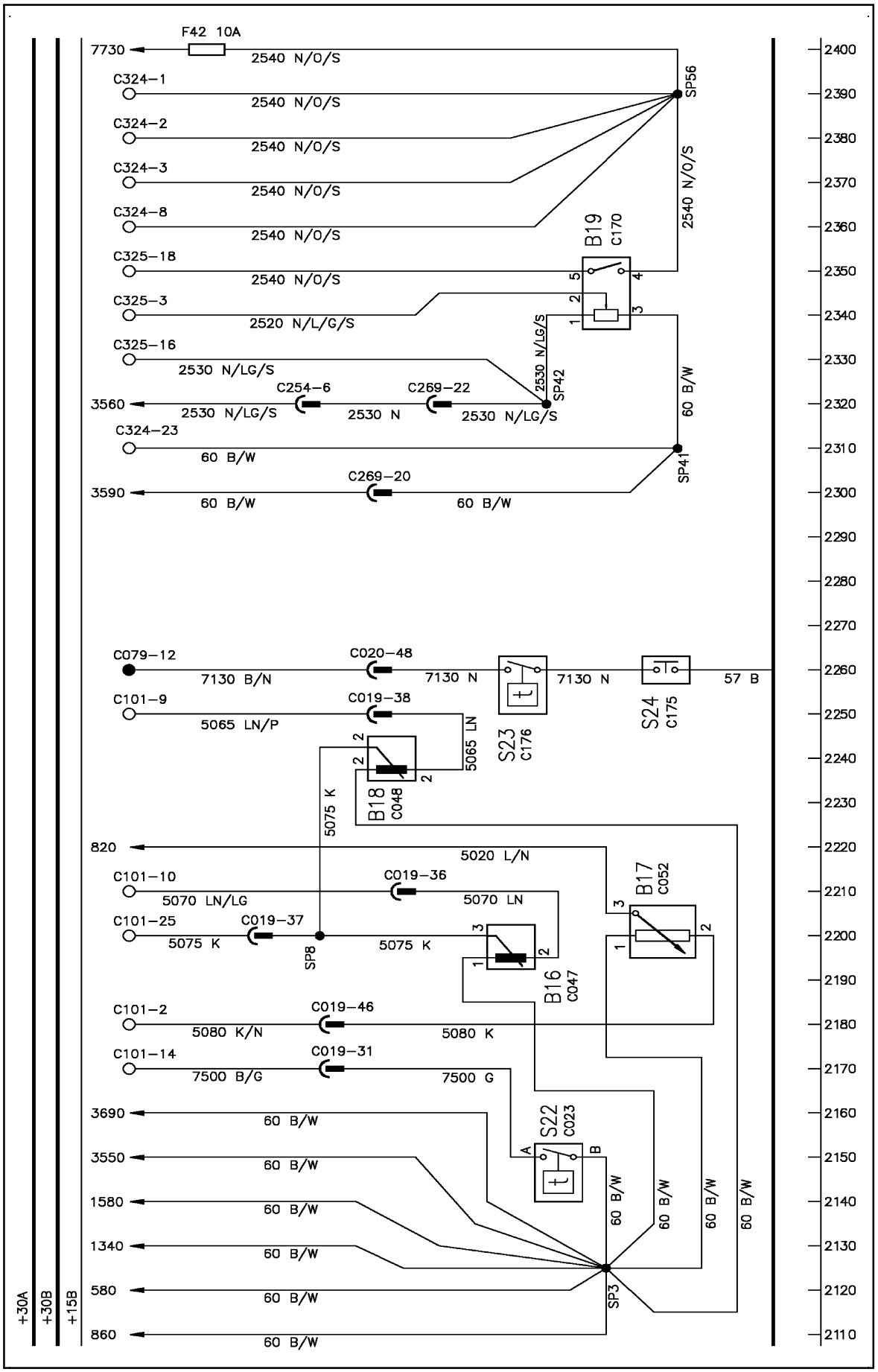
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-6
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
C239-6
8045/L/N/S
C019-23
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y11 Lo PWM Valve
Y12 Hi PWM Valve
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y16 Dump Solenoid

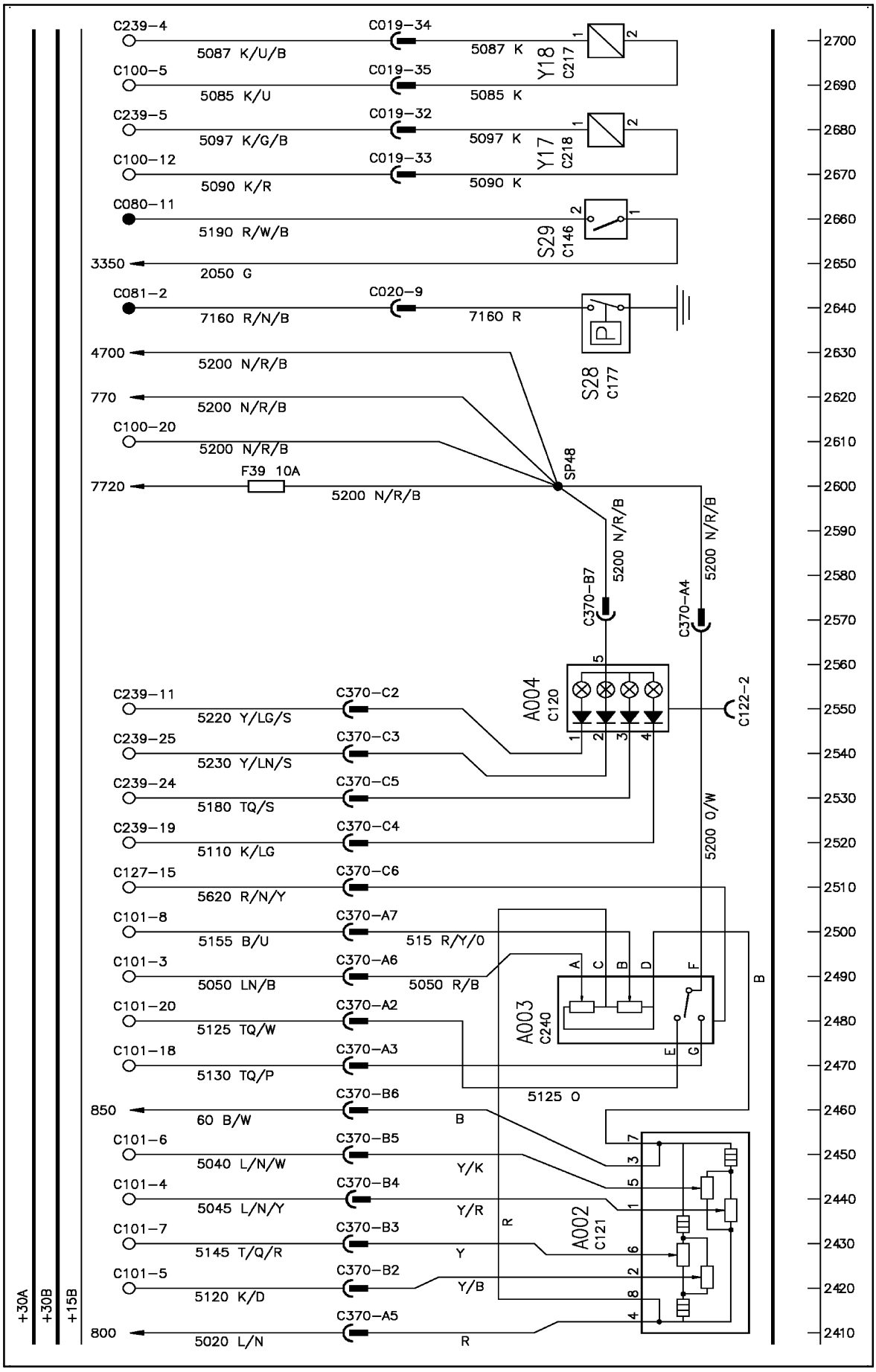
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP41
SP42
B19
C170
C079-12
7130 B/N
C020-48
7130 N
S23
C176
S24
C175
57 B
C101-9
5065 LN/P
C019-38
5065 LN
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
5070 LN
B17
C052
C101-25
5075 K
C019-37
SP8
B16
C047
C101-2
5080 K/N
C019-46
5080 K
C101-14
7500 B/G
C019-31
7500 G
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15B
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A	**B19**	Front HPL Limit Potentiometer
		S22	Transmission Oil Temp Sensor
B16	LH Draft Pin	**S23**	Oil Temperature Switch
B17	Rockshaft Potentiometer	**S24**	HPL Filter Switch
B18	RH Draft Pin		

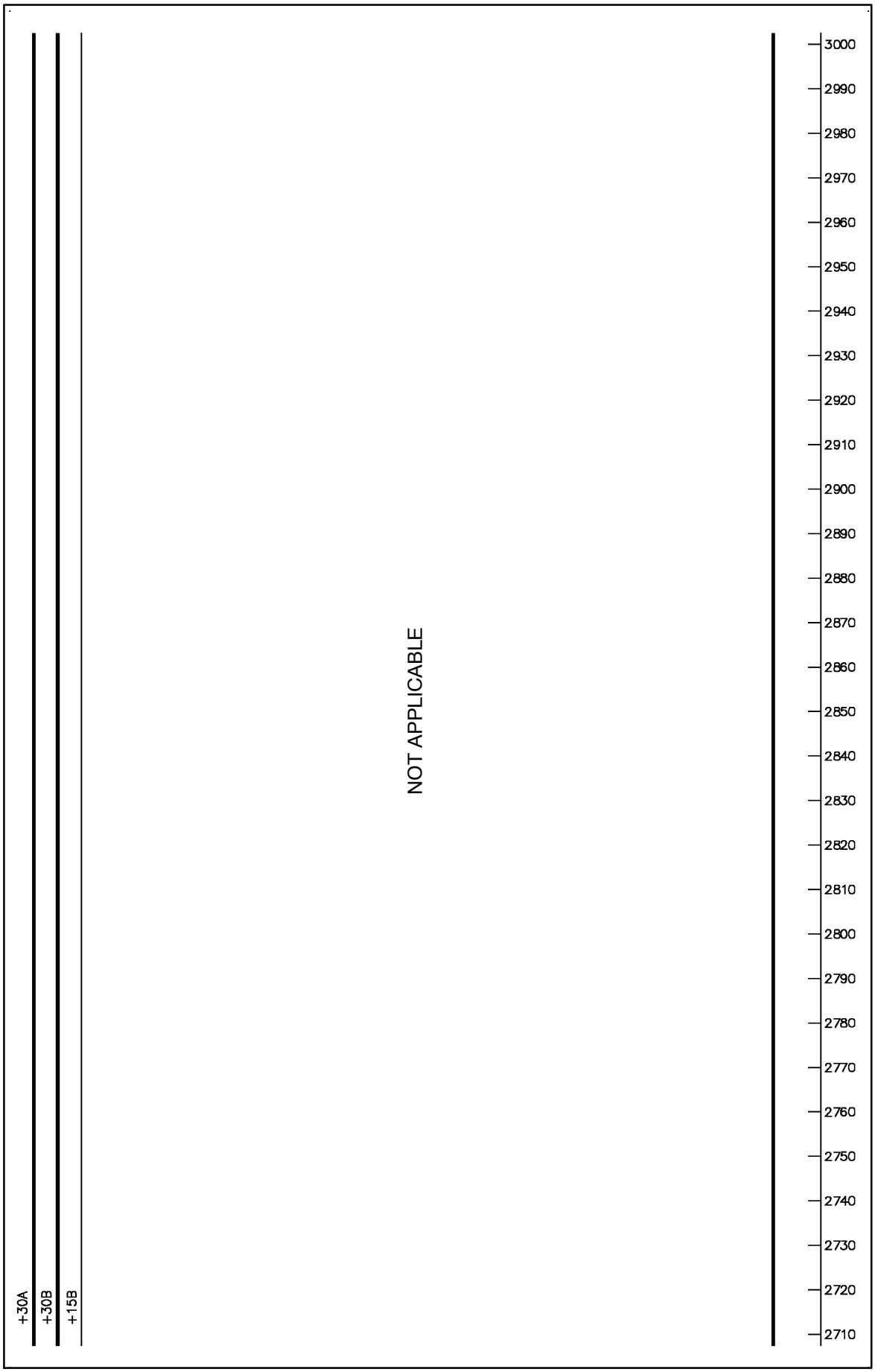
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239-4
C019-34
5087 K/U/B
5087 K
Y18
C217
C100-5
C019-35
5085 K/U
5085 K
C239-5
C019-32
5097 K/G/B
5097 K
Y17
C218
C100-12
C019-33
5090 K/R
5090 K
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7720
5200 N/R/B
SP48
C370-B7
C370-A4
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
A003
C240
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
A002
C121
5200 O/W
+30A
+30B
+15B
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

HYDRAULICS 2
Line 2410-2700

F30	Fuse - 10A	**S28**	Lo Charge Switch
		S29	Lift-O-Matic Switch
A002	EDC Control		
A003	EDC Mouse	**Y17**	EDC Lower Solenoid
A004	EDC Status Lamp Panel	**Y18**	EDC Raise Solenoid

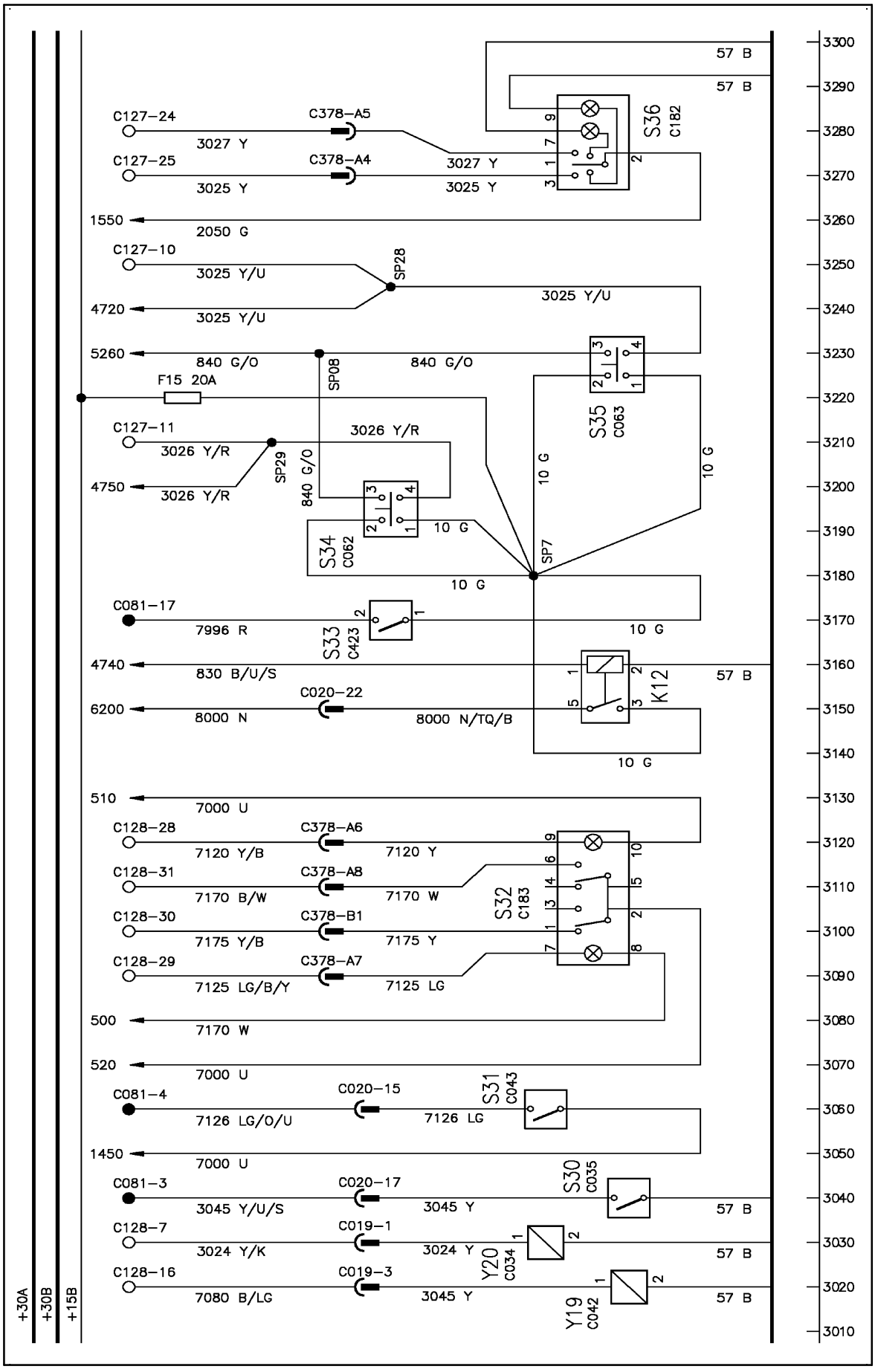
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

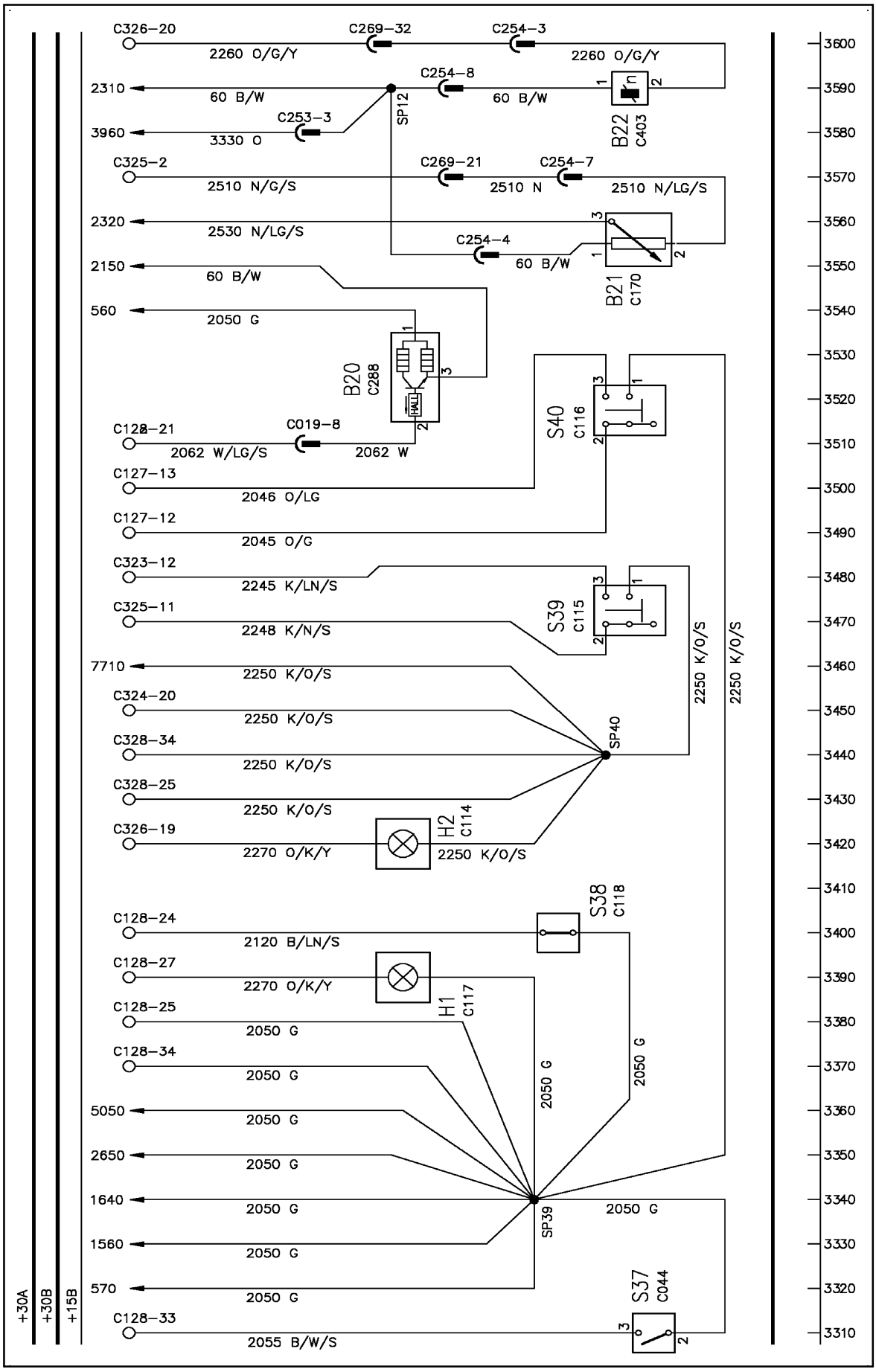
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
F15 20A
SP28
SP08
SP29
SP7
S36 C182
S35 C063
S34 C062
S33 C423
S32 C183
S31 C043
S30 C035
K12
Y20 C034
Y19 C042
C127-24
C127-25
C127-10
C127-11
C081-17
C081-4
C081-3
C128-28
C128-31
C128-30
C128-29
C128-7
C128-16
C378-A5
C378-A4
C378-A6
C378-A8
C378-B1
C378-A7
C020-22
C020-15
C020-17
C019-1
C019-3
1550
4720
5260
4750
4740
6200
510
500
520
1450
6200
3027 Y
3025 Y
2050 G
3025 Y/U
840 G/O
3026 Y/R
840 G/O
10 G
7996 R
830 B/U/S
8000 N
8000 N/TQ/B
7000 U
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
7126 LG/O/U
3045 Y/U/S
3045 Y
3024 Y/K
3024 Y
7080 B/LG
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

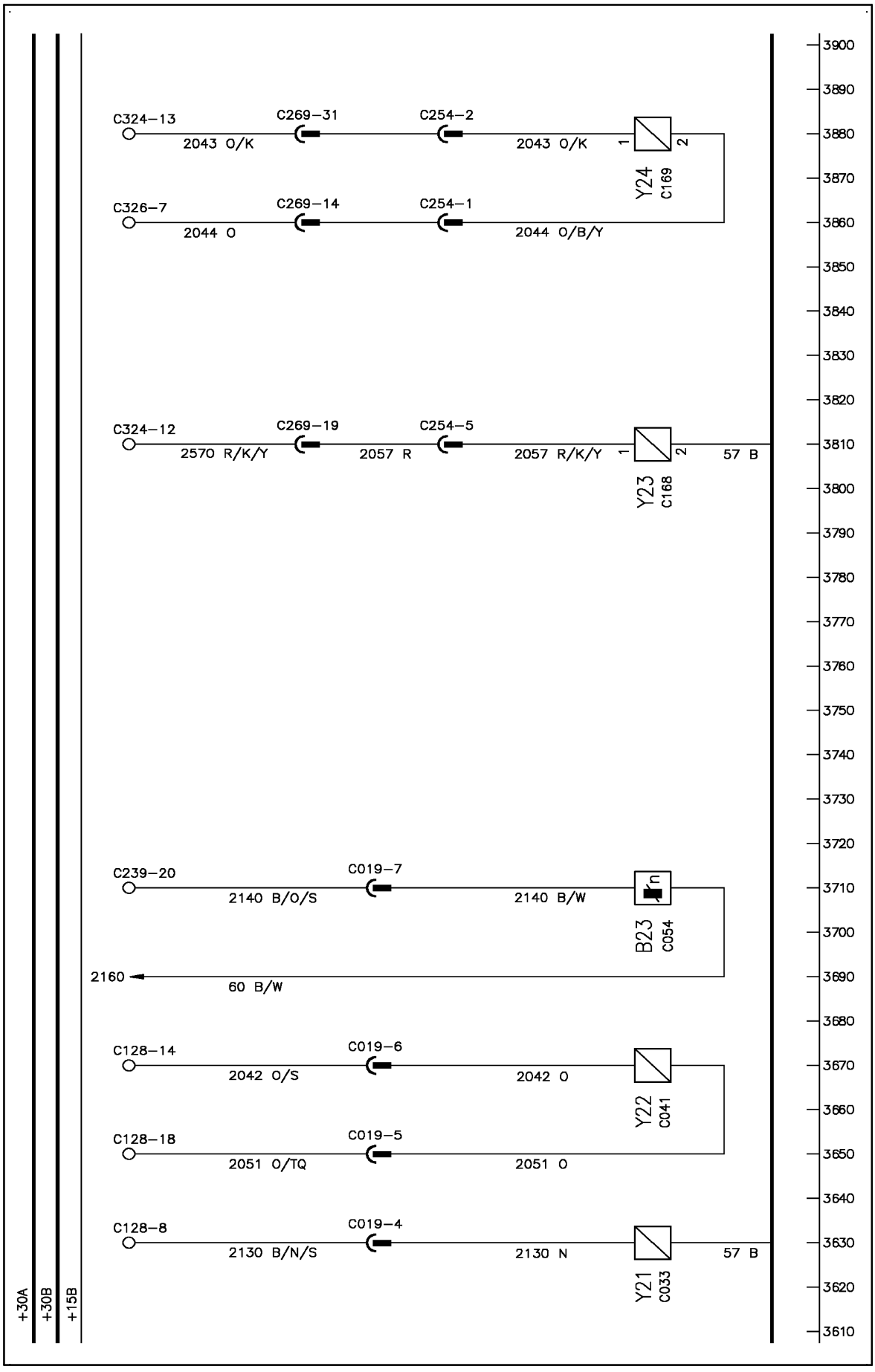
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C326-20
2260 O/G/Y
C269-32
C254-3
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
2510 N/G/S
C269-21
2510 N
C254-7
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
2062 W/LG/S
C019-8
2062 W
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
C328-25
2250 K/O/S
SP40
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
2250 K/O/S
S38
C118
C128-24
2120 B/LN/S
C128-27
2270 O/K/Y
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
1560
2050 G
570
2050 G
2050 G
2050 G
SP39
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15B
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C239-20
C019-7
2140 B/O/S
2140 B/W
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O
C128-8
C019-4
2130 B/N/S
2130 N
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

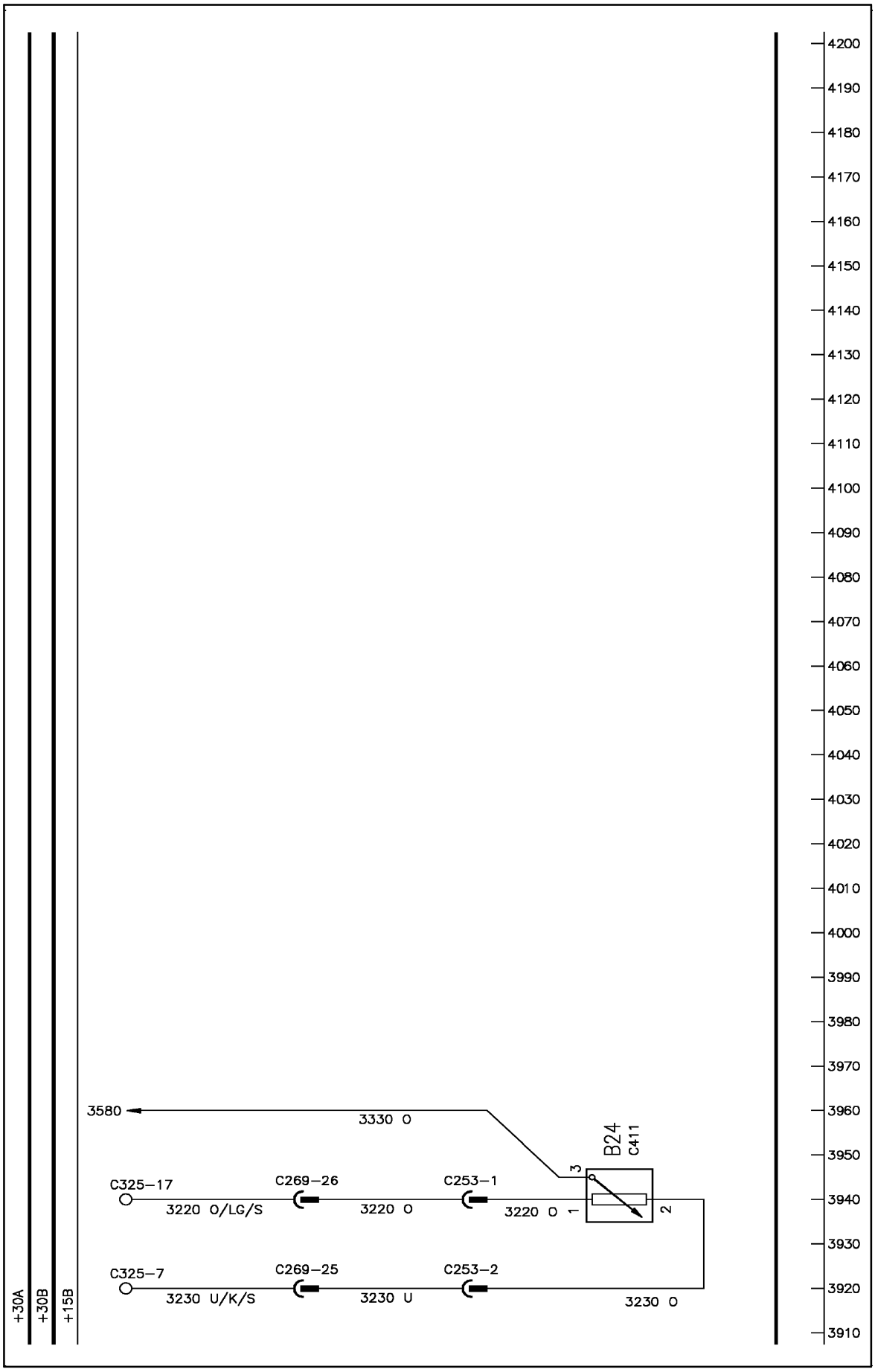
Y21 PTO Brake Solenoid

Y22 PTO Clutch Solenoid

Y23 Front Hitch Valve

Y24 Front PTO Solenoid

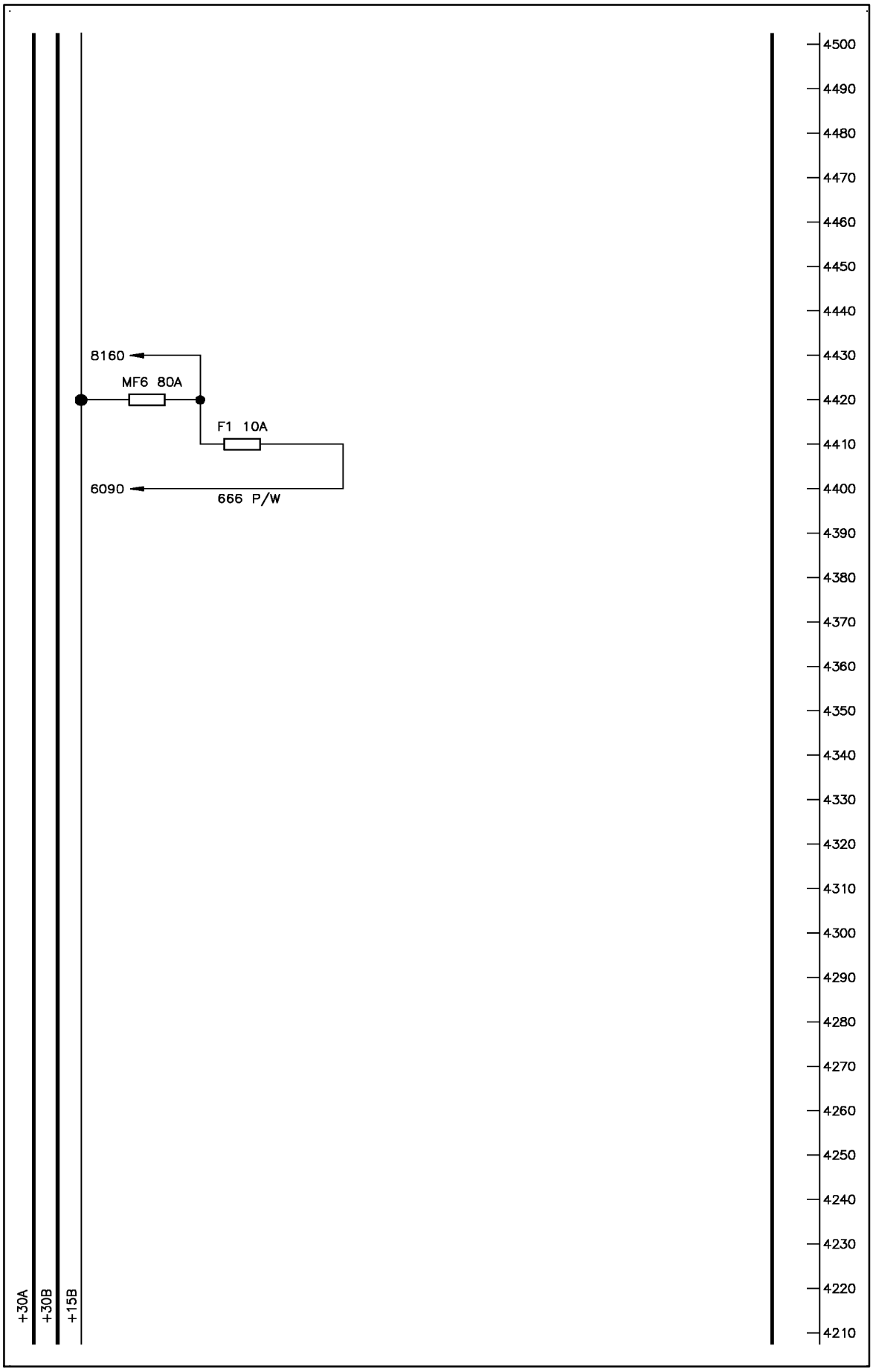
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910
+30A
+30B
+15B
3580
3330 O
B24
C411
3
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
1
2
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

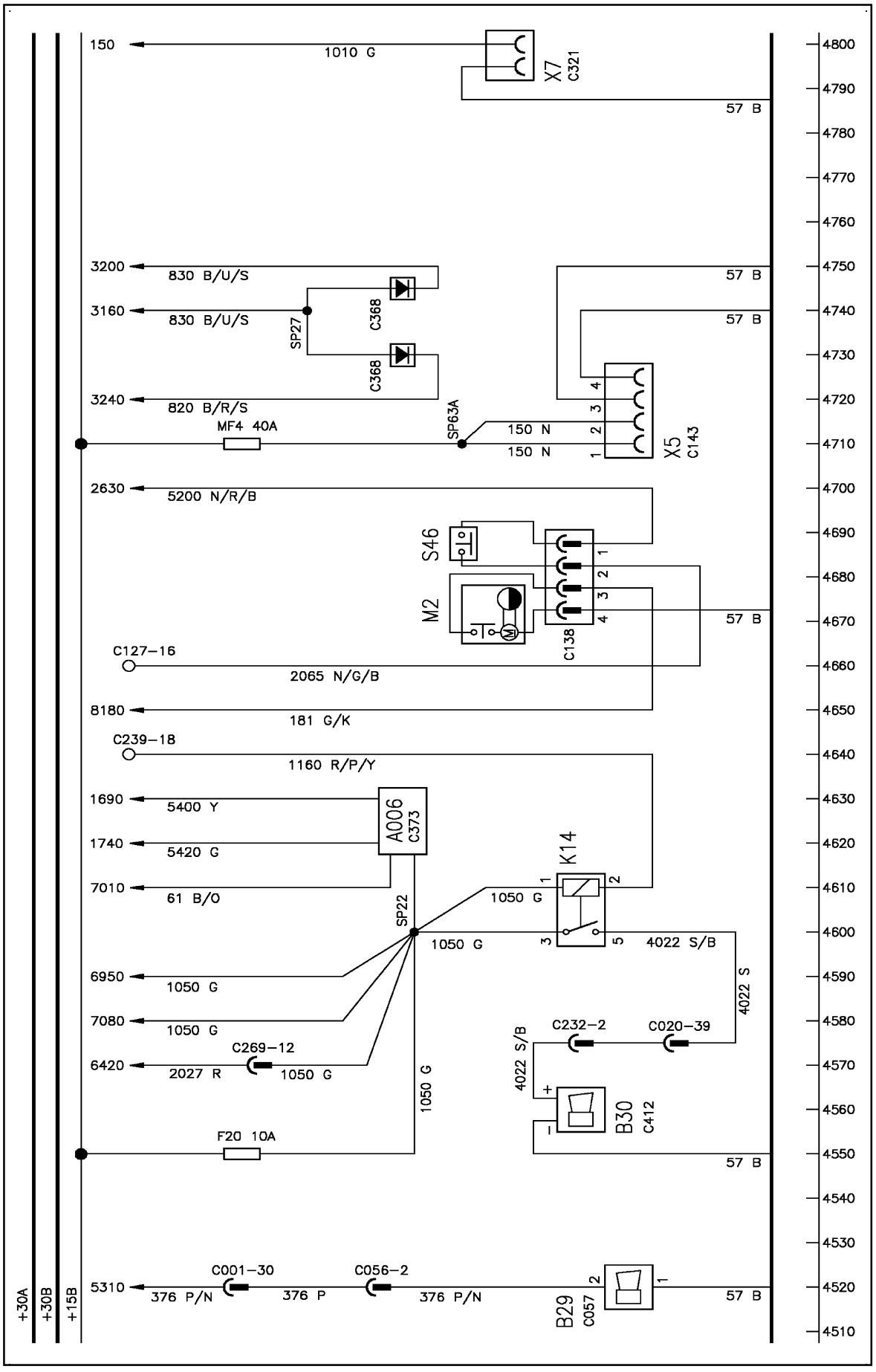

8160
MF6 80A
F1 10A
6090
666 P/W
+30A
+30B
+15B
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

CAB ACCESSORIES 1
Line 4210-4500

MF6 Maxi Fuse - 80A

F1 Fuse - 10A

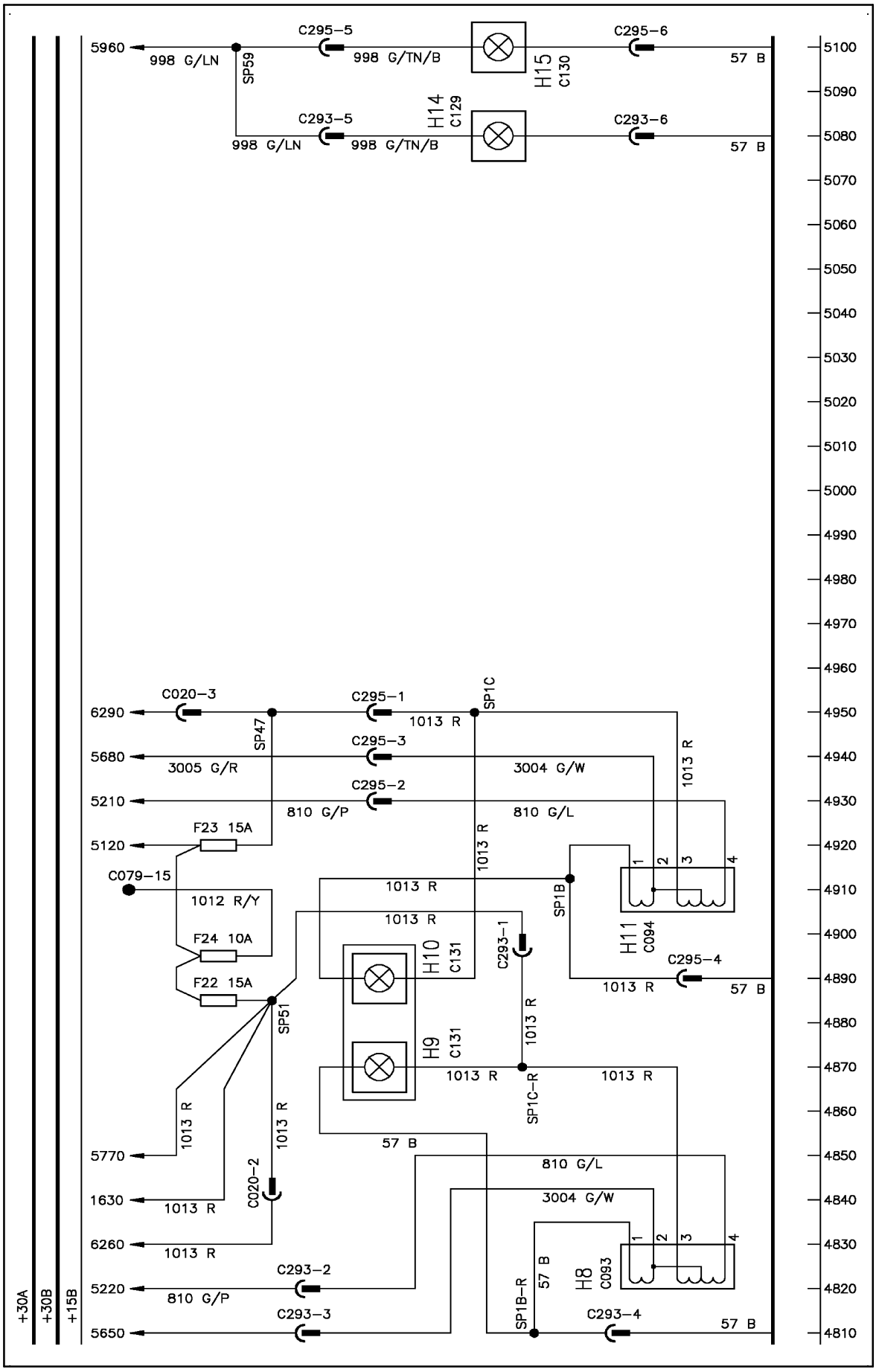
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


150
1010 G
X7
C321
57 B
3200
830 B/U/S
3160
830 B/U/S
SP27
C368
C368
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
1740
5420 G
7010
61 B/O
A006
C373
SP22
K14
1050 G
1050 G
4022 S/B
4022 S
6950
1050 G
7080
1050 G
C269-12
6420
2027 R
1050 G
1050 G
C232-2
C020-39
4022 S/B
B30
C412
F20 10A
5310
C001-30
376 P/N
C056-2
376 P
376 P/N
B29
C057
+30A
+30B
+15B
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

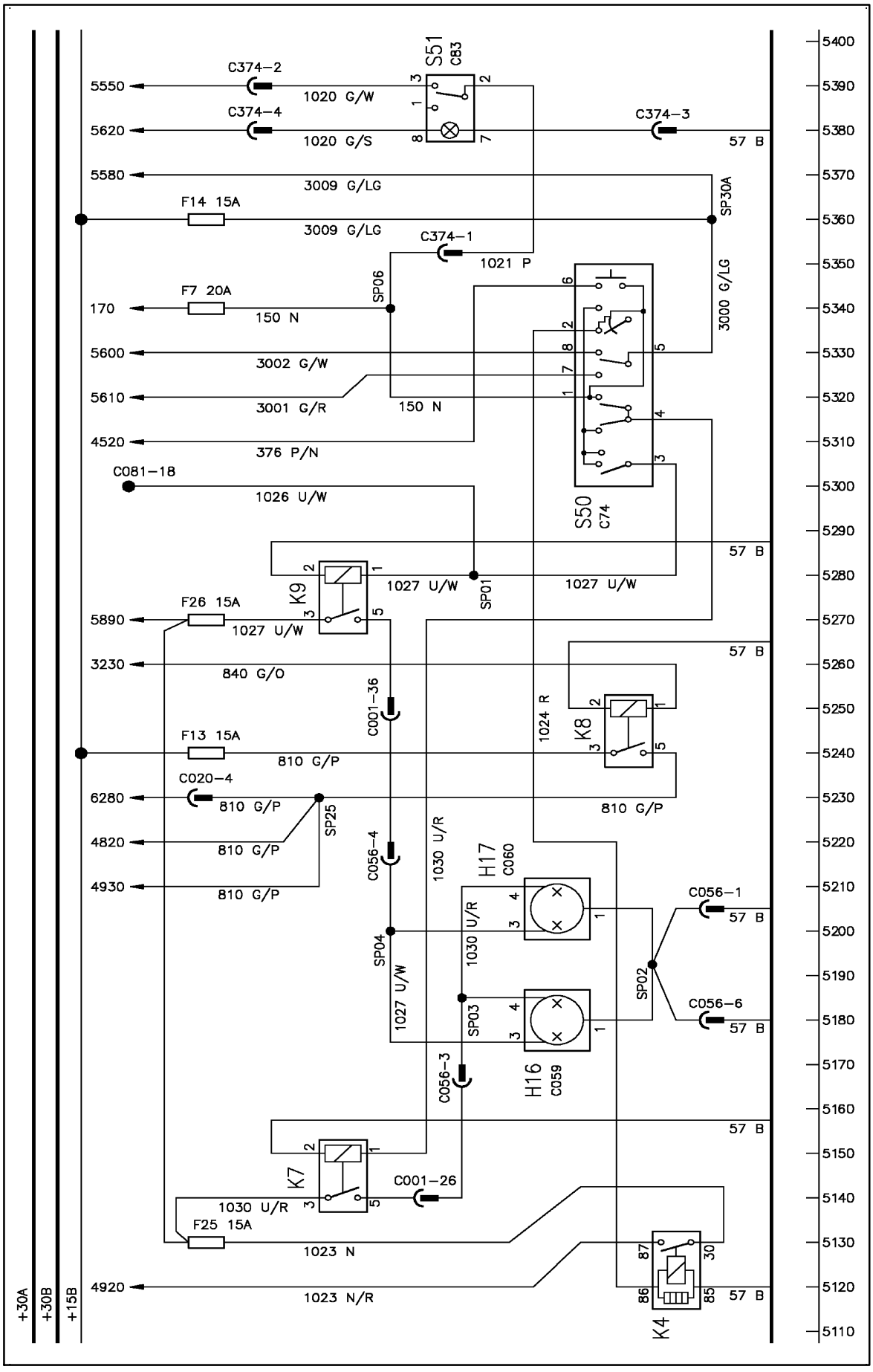

5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15
C130
C295-6
57 B
H14
C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810
C020-3
6290
SP47
C295-1
1013 R
SP1C
5680
3005 G/R
C295-3
3004 G/W
1013 R
5210
810 G/P
C295-2
810 G/L
F23 15A
5120
C079-15
1012 R/Y
F24 10A
F22 15A
SP51
1013 R
H10
C131
H9
C131
C293-1
SP1B
H11
C094
1 2 3 4
C295-4
57 B
SP1C-R
5770
1630
1013 R
C020-2
6260
1013 R
C293-2
5220
810 G/P
C293-3
5650
57 B
SP1B-R
H8
C093
C293-4
+30A
+30B
+15B

INDICATORS AND HAZARDS 1
Line 4810-5100

F22 Fuse 15 A
F23 Fuse 15 A
F24 Fuse 10 A

H8 Stop/Tail Light R/H
H9 Licence Plate Lamp - Fender
H10 Licence Plate Lamp - Fender
H11 Stop/Tail Light L/H
H14 Worklamp - Fender R/H
H15 Worklamp - Fender L/H

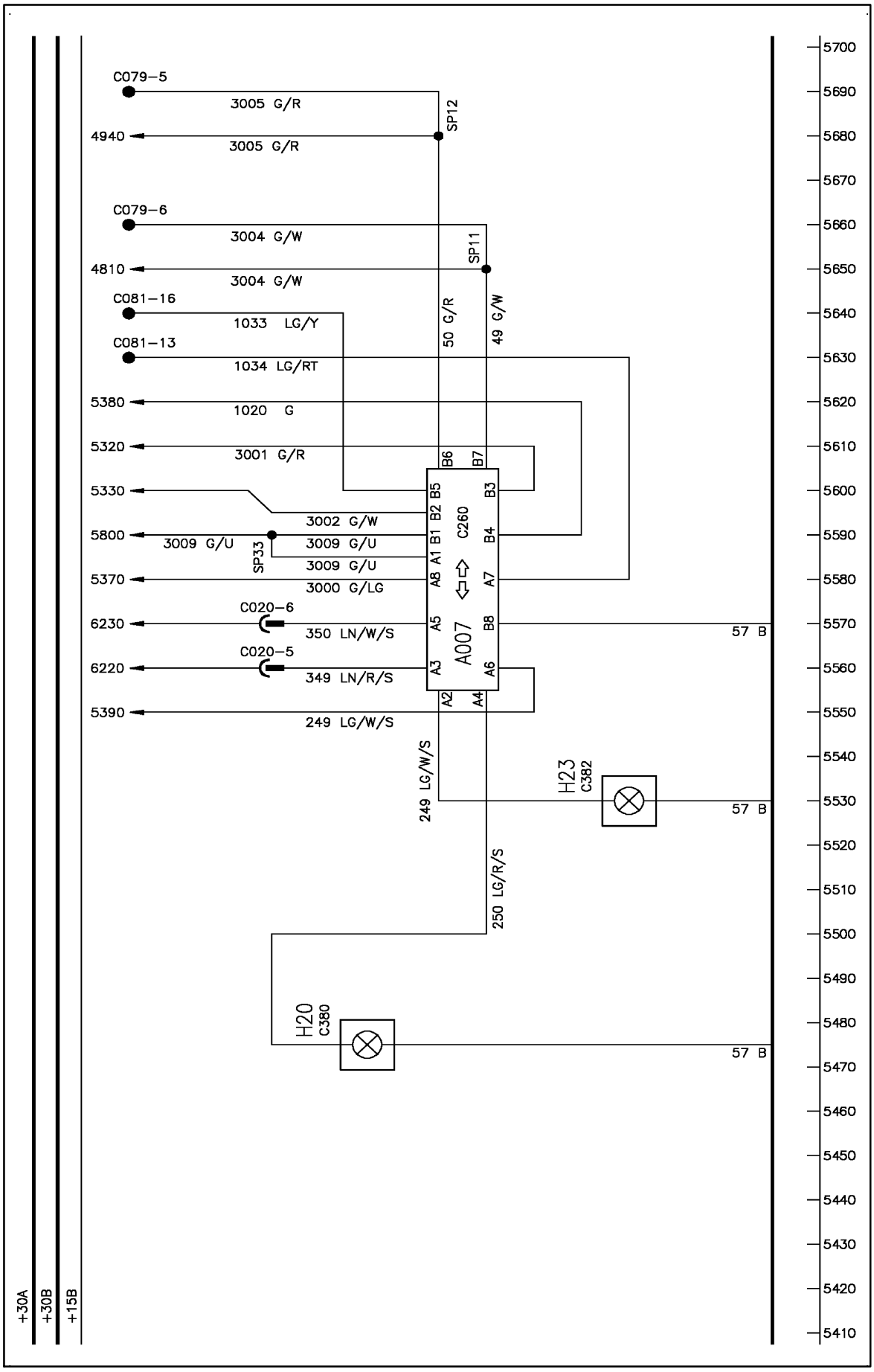
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
5550
5620
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
C374-2
C374-4
1020 G/W
1020 G/S
S51
C83
C374-3
57 B
3009 G/LG
F14 15A
SP30A
C374-1
1021 P
F7 20A
150 N
SP06
3002 G/W
3001 G/R
376 P/N
C081-18
1026 U/W
S50
C74
3000 G/LG
K9
1027 U/W
SP01
F26 15A
840 G/O
C001-36
F13 15A
810 G/P
C020-4
SP25
1024 R
K8
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
C056-1
C056-6
SP02
H16
C059
C056-3
K7
C001-26
F25 15A
1023 N
1023 N/R
K4
87
30
86
85
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
SP12
C079-6
3004 G/W
4810
3004 G/W
SP11
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN/W/S
C020-5
6220
349 LN/R/S
5390
249 LG/W/S
50 G/R
49 G/W
B6 B7
B5 B3
B2 C260
B1 B4
A1
A8 A7
A5 B8
A007
A3 A6
A2 A4
249 LG/W/S
250 LG/R/S
H23
C382
H20
C380
57 B
57 B
57 B
+30A
+30B
+15B
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

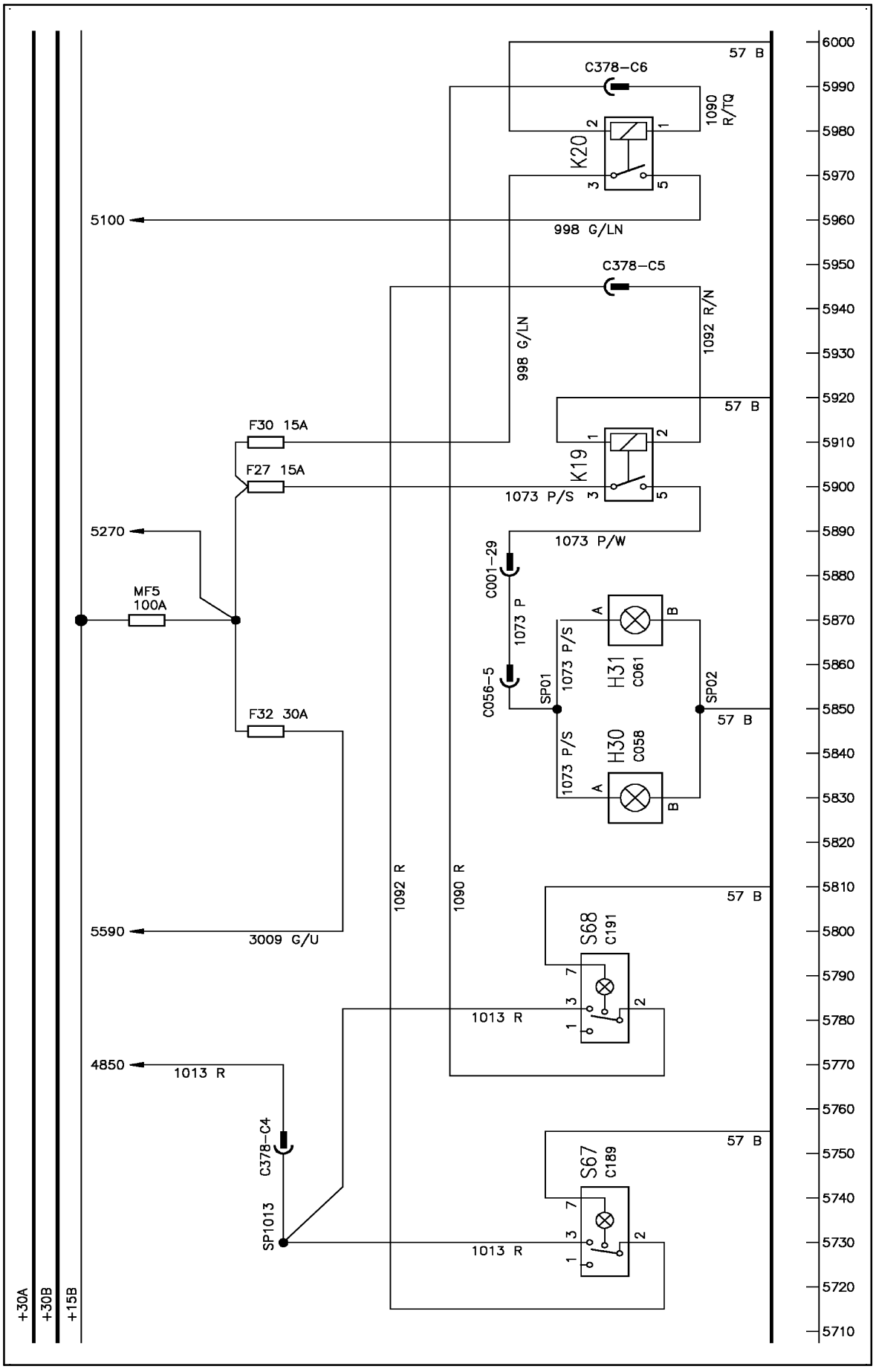
INDICATORS AND HAZARDS 3
Line 5410-5700

A007 Flasher Unit

H20 SMV Lamp L/H Rear

H23 SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
MF5
100A
F30 15A
F27 15A
F32 30A
5100
998 G/LN
5270
1073 P/S
1073 P/W
5590
3009 G/U
4850
1013 R
1092 R
1090 R
1092 R/N
1090 R/TQ
57 B
C378-C6
C378-C5
C378-C4
K20
K19
C001-29
C056-5
1073 P
SP01
SP02
SP1013
H31
C061
H30
C058
S68
C191
S67
C189
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

WORKLAMPS
Line 5710-6000

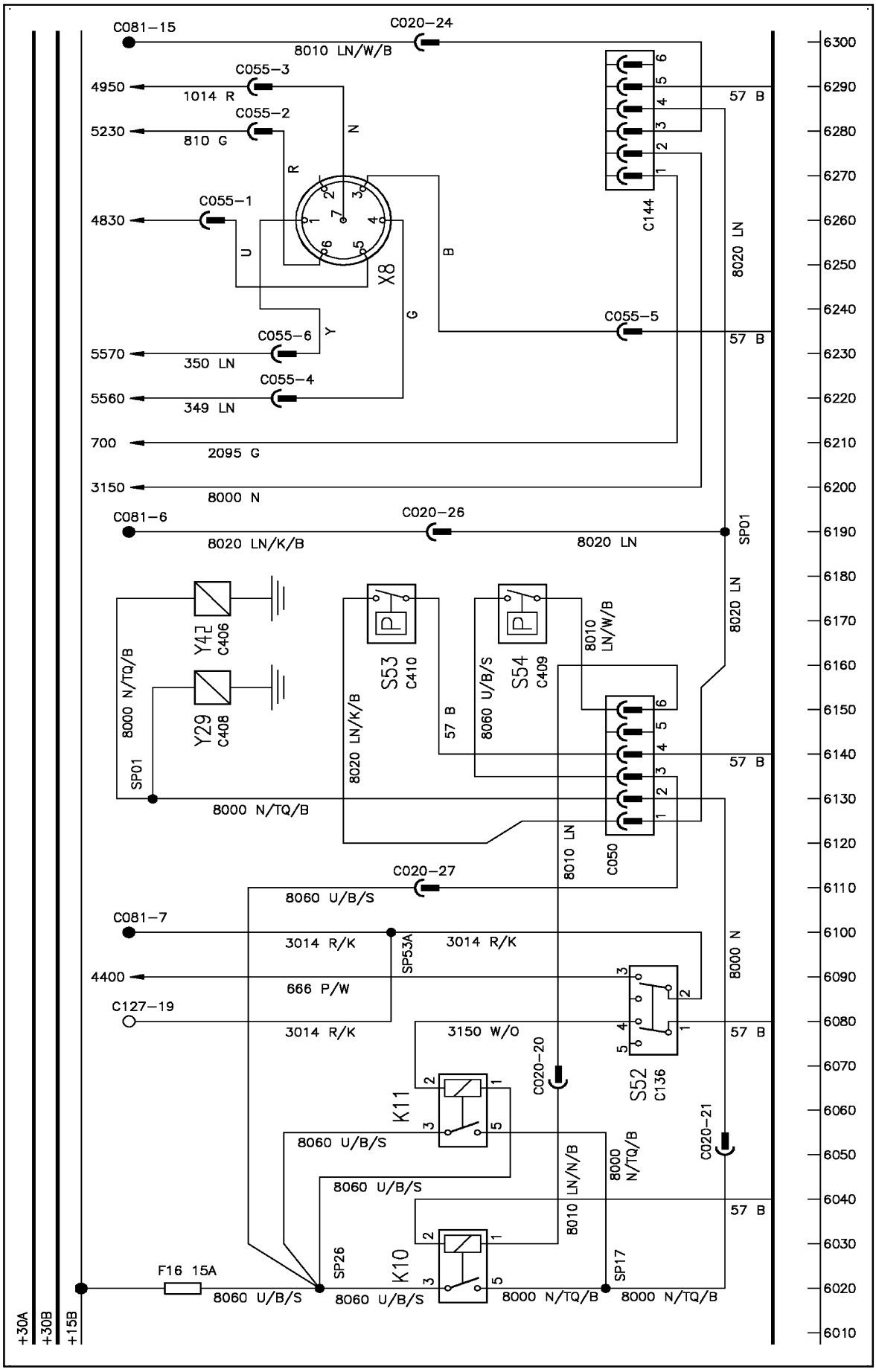
MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F30 Fuse - 15A
F32 Fuse - 30A

H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

S67 Worklamp Switch - Front
S68 Worklamp Switch - Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
C055-3
4950
1014 R
C055-2
5230
810 G
C055-1
4830
C055-6
5570
350 LN
C055-4
5560
349 LN
700
2095 G
3150
8000 N
C055-5
57 B
C144
X8
8020 LN
C081-6
C020-26
8020 LN/K/B
8020 LN
SP01
Y42
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8010 LN/W/B
8020 LN/K/B
8060 U/B/S
C050
C020-27
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3150 W/O
S52
C136
C020-20
C020-21
K11
K10
8000 N/TQ/B
8010 LN/N/B
F16 15A
SP26
SP17
+30A
+30B
+15B
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

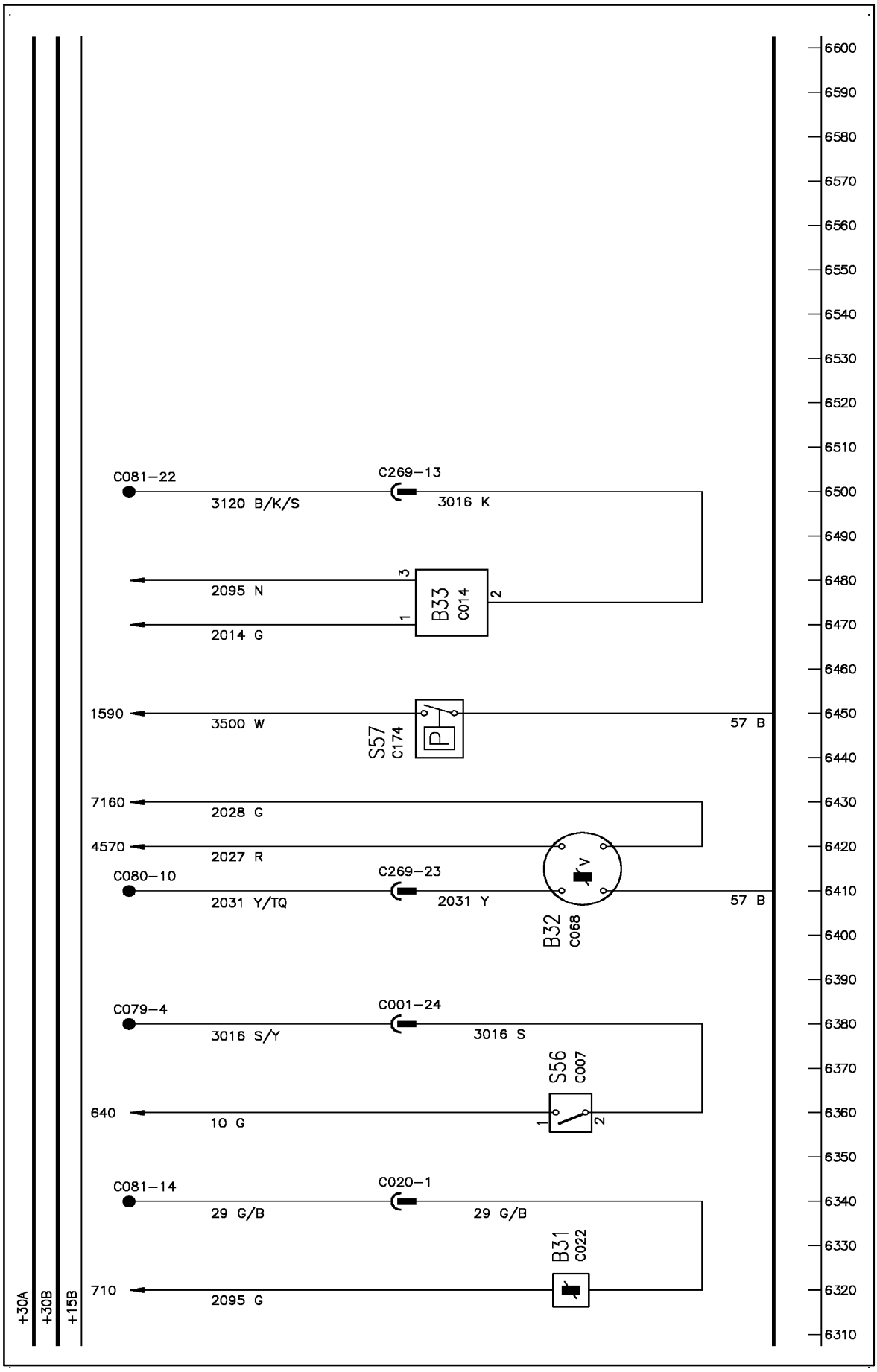
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid

X8 Trailer Socket

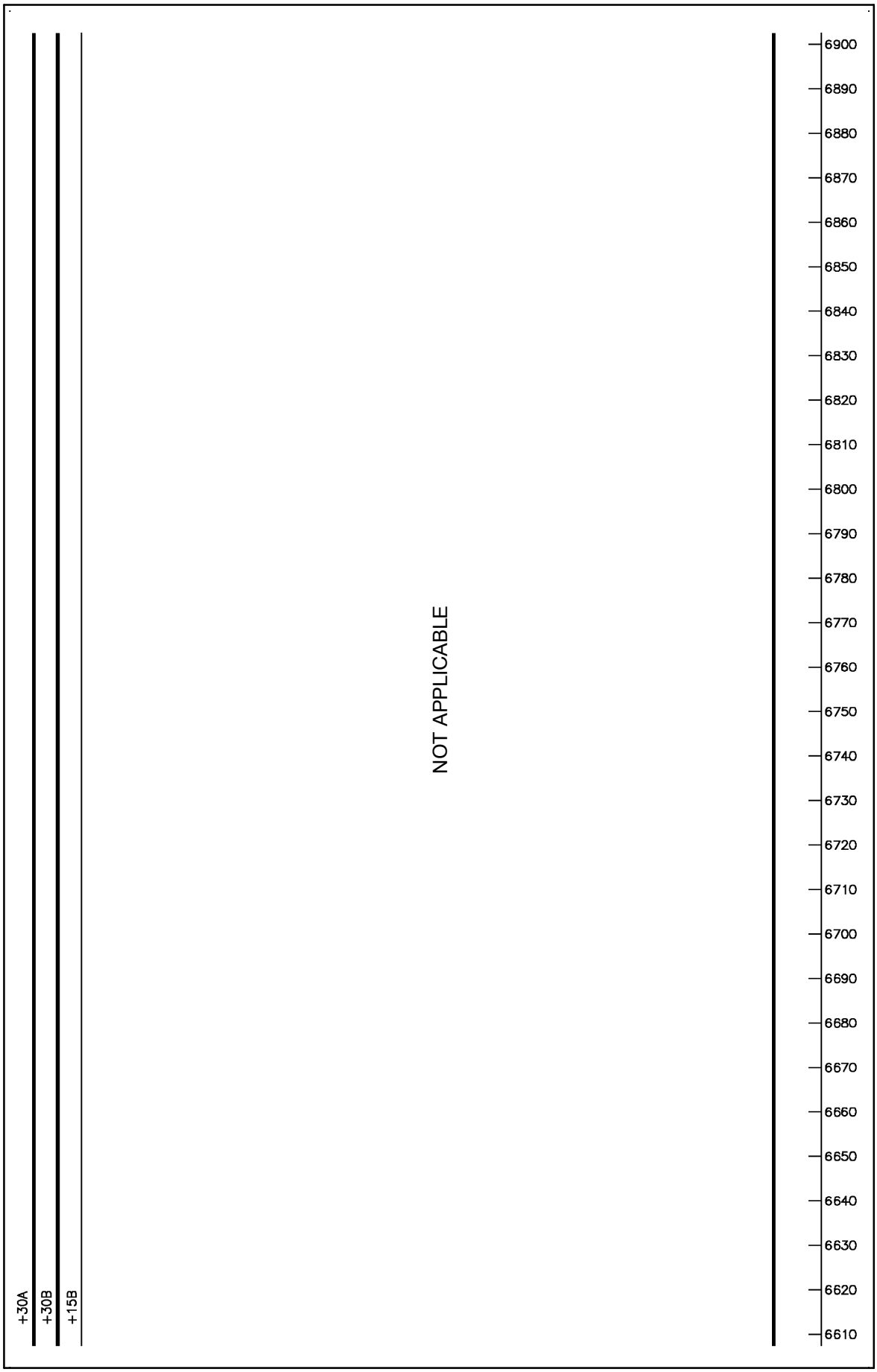
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
C081–22
3120 B/K/S
C269–13
3016 K
2095 N
2014 G
B33
C014
1590
3500 W
S57
C174
57 B
7160
2028 G
4570
2027 R
C080–10
2031 Y/TQ
C269–23
2031 Y
57 B
B32
C068
C079–4
3016 S/Y
C001–24
3016 S
S56
C007
640
10 G
C081–14
29 G/B
C020–1
29 G/B
B31
C022
710
2095 G

SENSORS
Line 6310-6600

B31 Fuel Tank Sender
B32 Radar Gun
B33 Steering Angle Sensor
S56 Brake Fluid Level Switch
S57 Power Assisted Steering Pressure Switch

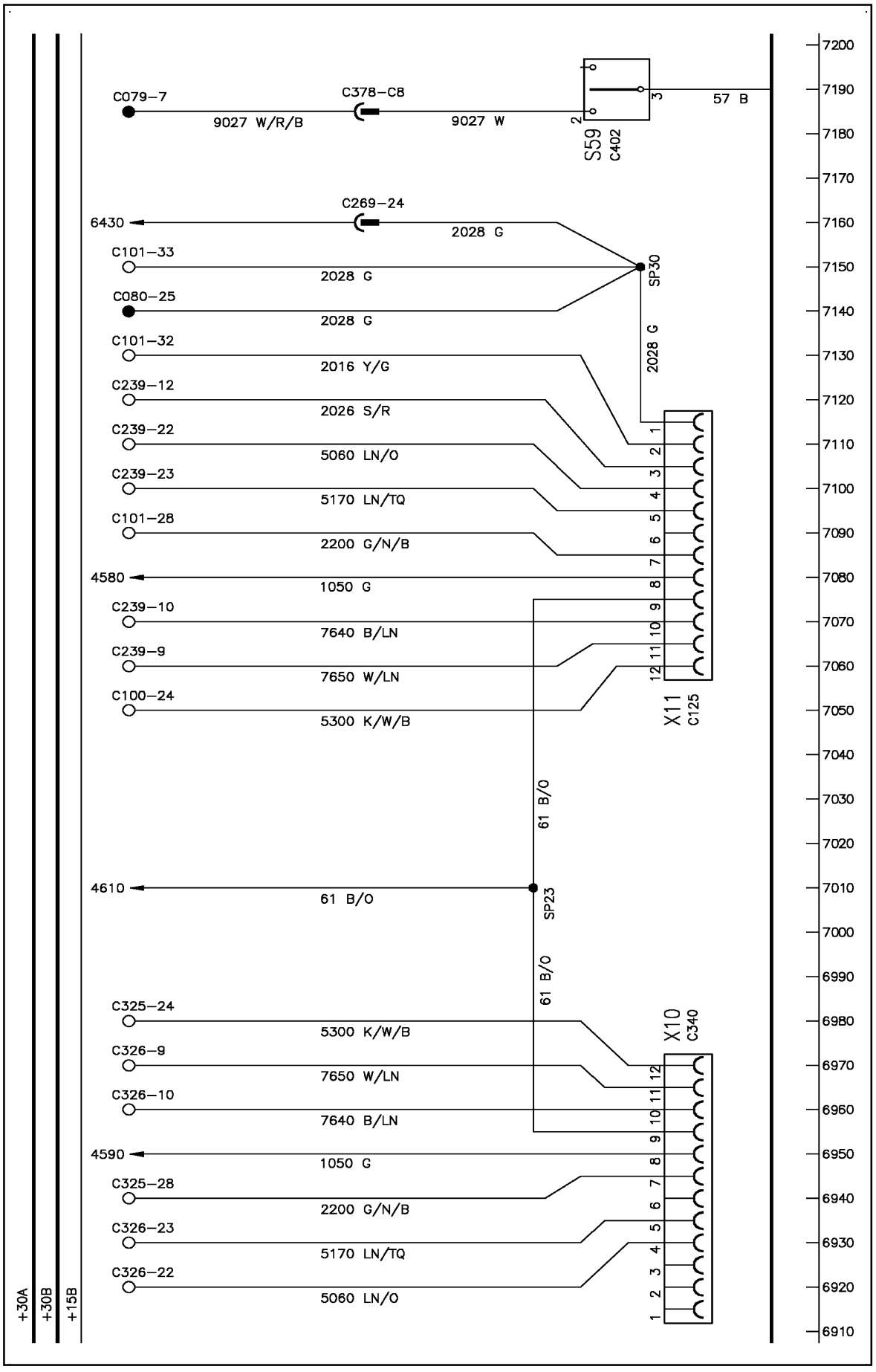
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
NOT APPLICABLE
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

WASHERS AND WIPERS
Line 6510-6900

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

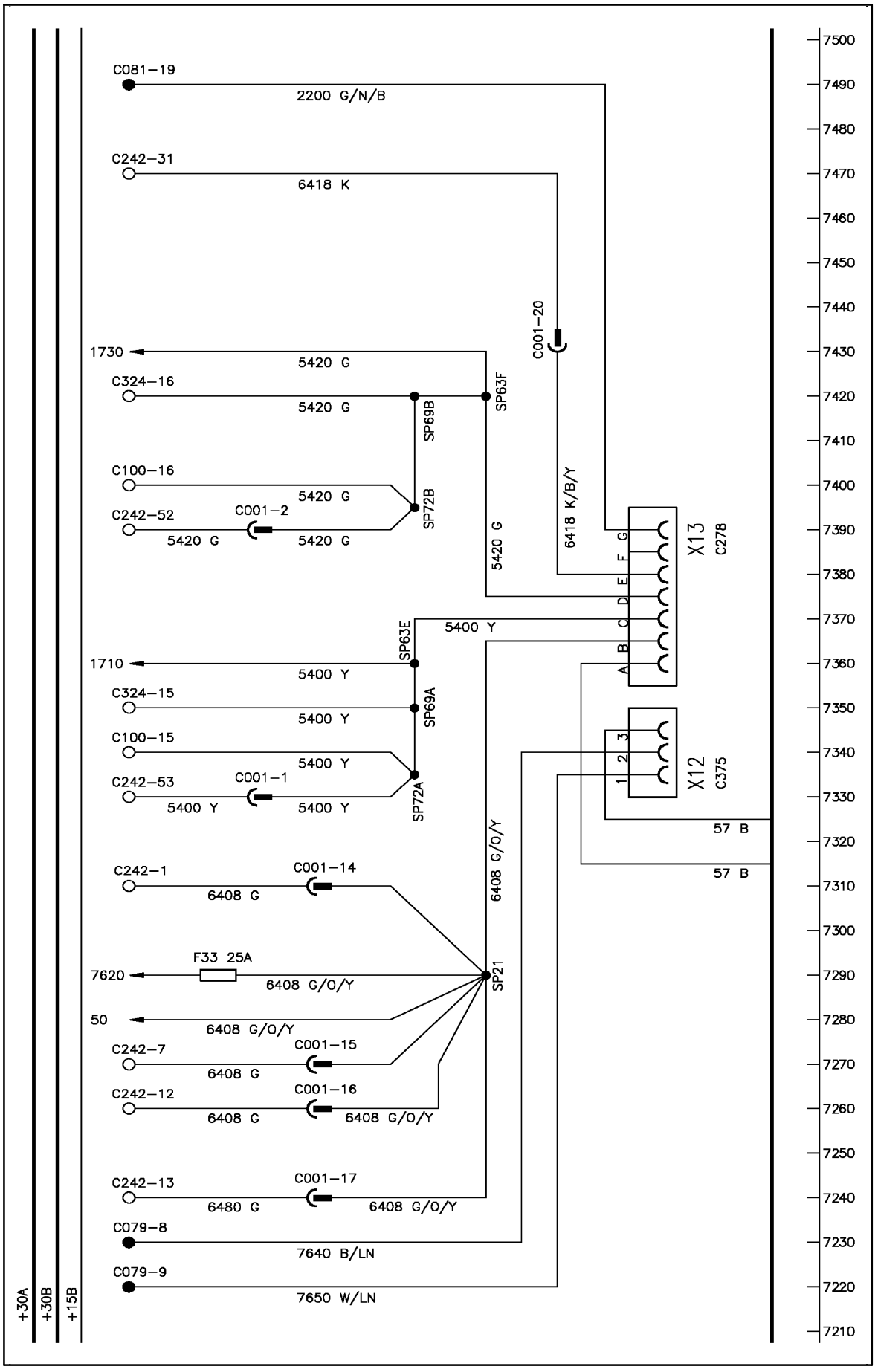

C079-7
C378-C8
9027 W/R/B
9027 W
S59
C402
57 B
C269-24
6430
2028 G
C101-33
2028 G
C080-25
2028 G
SP30
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
61 B/O
4610
61 B/O
SP23
61 B/O
C325-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15B
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)
X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-52
C001-2
5420 G
5420 G
SP72B
5420 G
6418 K/B/Y
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
C242-1
C001-14
6408 G
F33 25A
7620
6408 G/O/Y
SP21
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15B
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

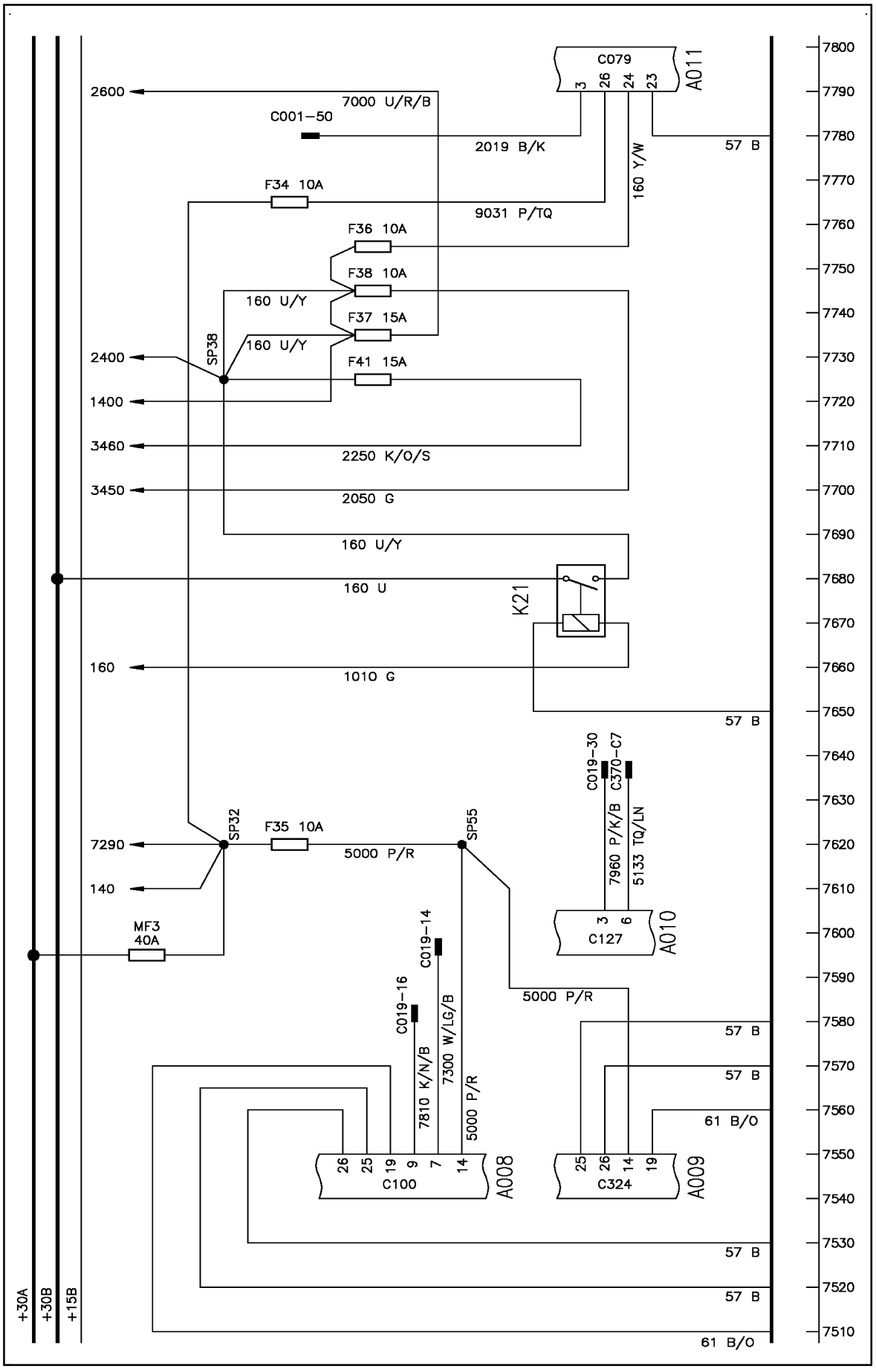
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector

X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

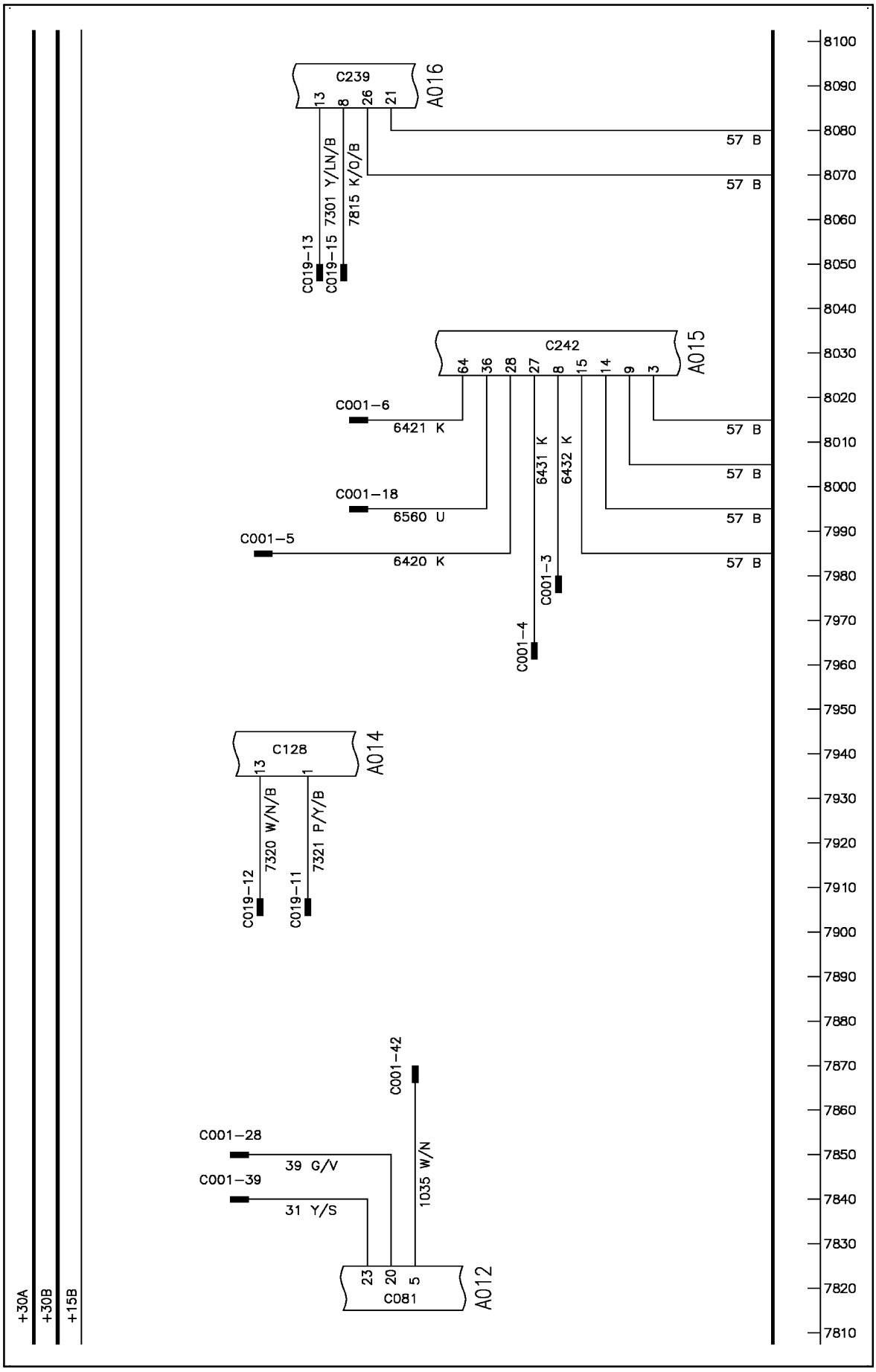

C079
A011
2600
7000 U/R/B
C001-50
2019 B/K
57 B
160 Y/W
9031 P/TQ
F34 10A
F36 10A
F38 10A
160 U/Y
F37 15A
160 U/Y
SP38
2400
F41 15A
1400
3460
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C019-30
C370-C7
7960 P/K/B
5133 TQ/LN
C127
A010
SP32
F35 10A
SP55
7290
5000 P/R
140
MF3
40A
C019-14
C019-16
7810 K/N/B
7300 W/LG/B
5000 P/R
5000 P/R
57 B
57 B
61 B/O
C100
A008
C324
A009
57 B
57 B
61 B/O
+30A
+30B
+15B
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810
C239
13
8
26
21
A016
57 B
57 B
C019-13
C019-15
7301 Y/LN/B
7815 K/O/B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
57 B
57 B
57 B
57 B
C001-3
C001-4
C128
13
1
A014
C019-12
C019-11
7320 W/N/B
7321 P/Y/B
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

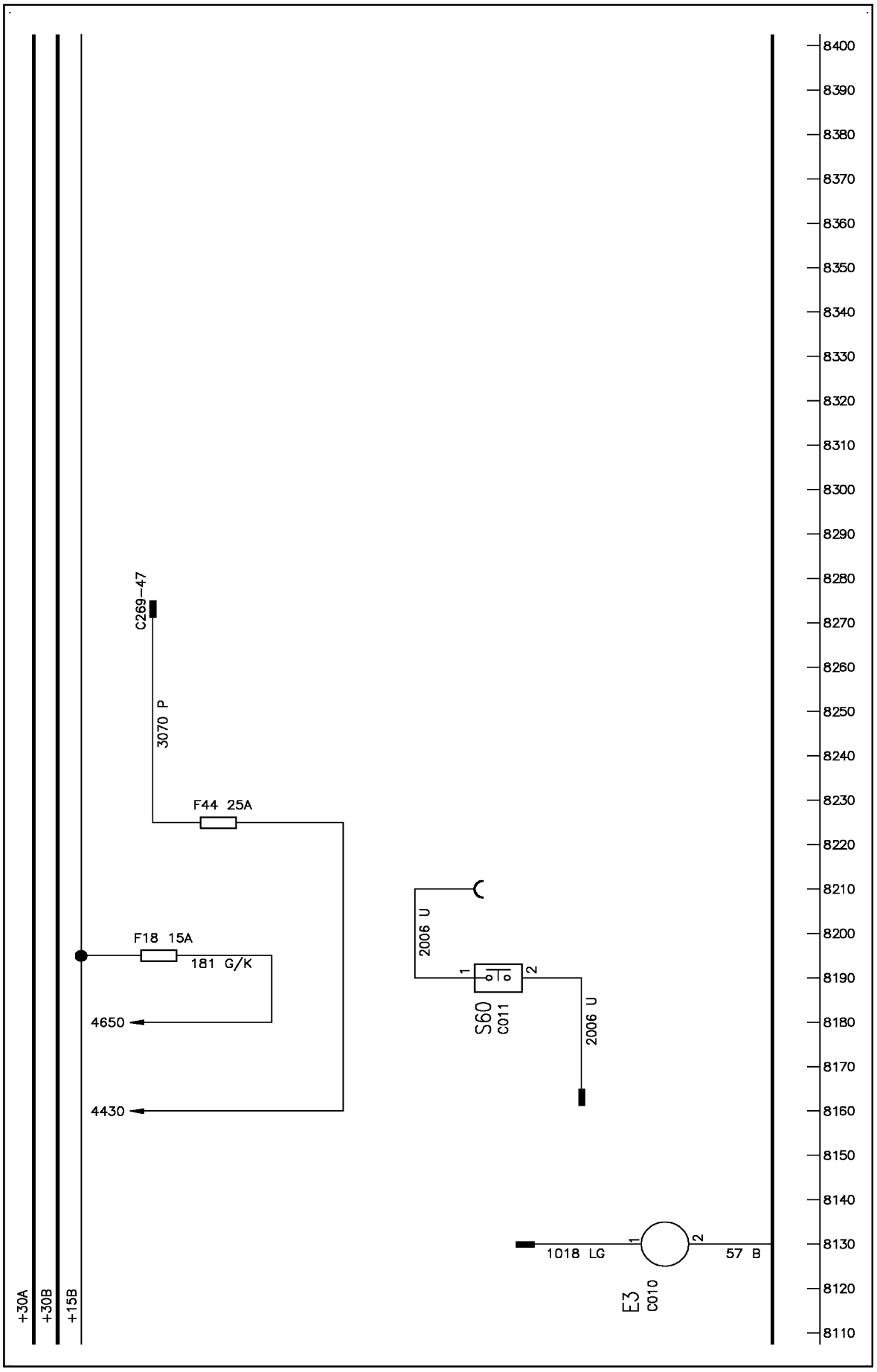
A012 Instrument Cluster 3

A014 XCM Central Control Unit (CN3-B)

A015 Engine ECU

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
C269-47
3070 P
F44 25A
F18 15A
181 G/K
4650
4430
2006 U
1
2
S60
C011
2006 U
1018 LG
1
2
57 B
E3
C010
+30A
+30B
+15B

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

F18 Fuse - 15A

F44 Fuse - 25A

E3 A/C Clutch

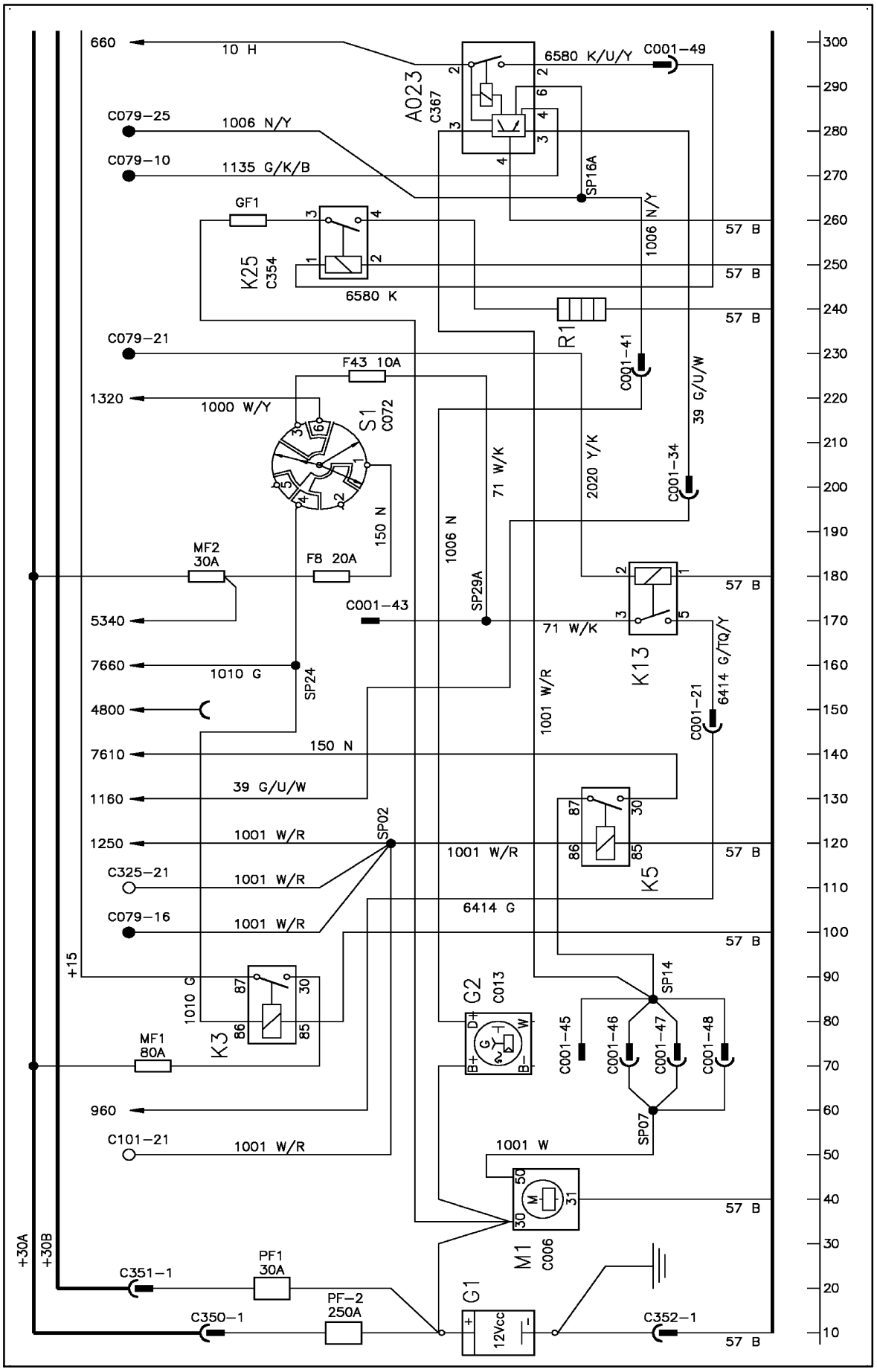
S60 A/C Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

24X24 TRANSMISSION, L/CAB, W/MECHANICAL ENGINE

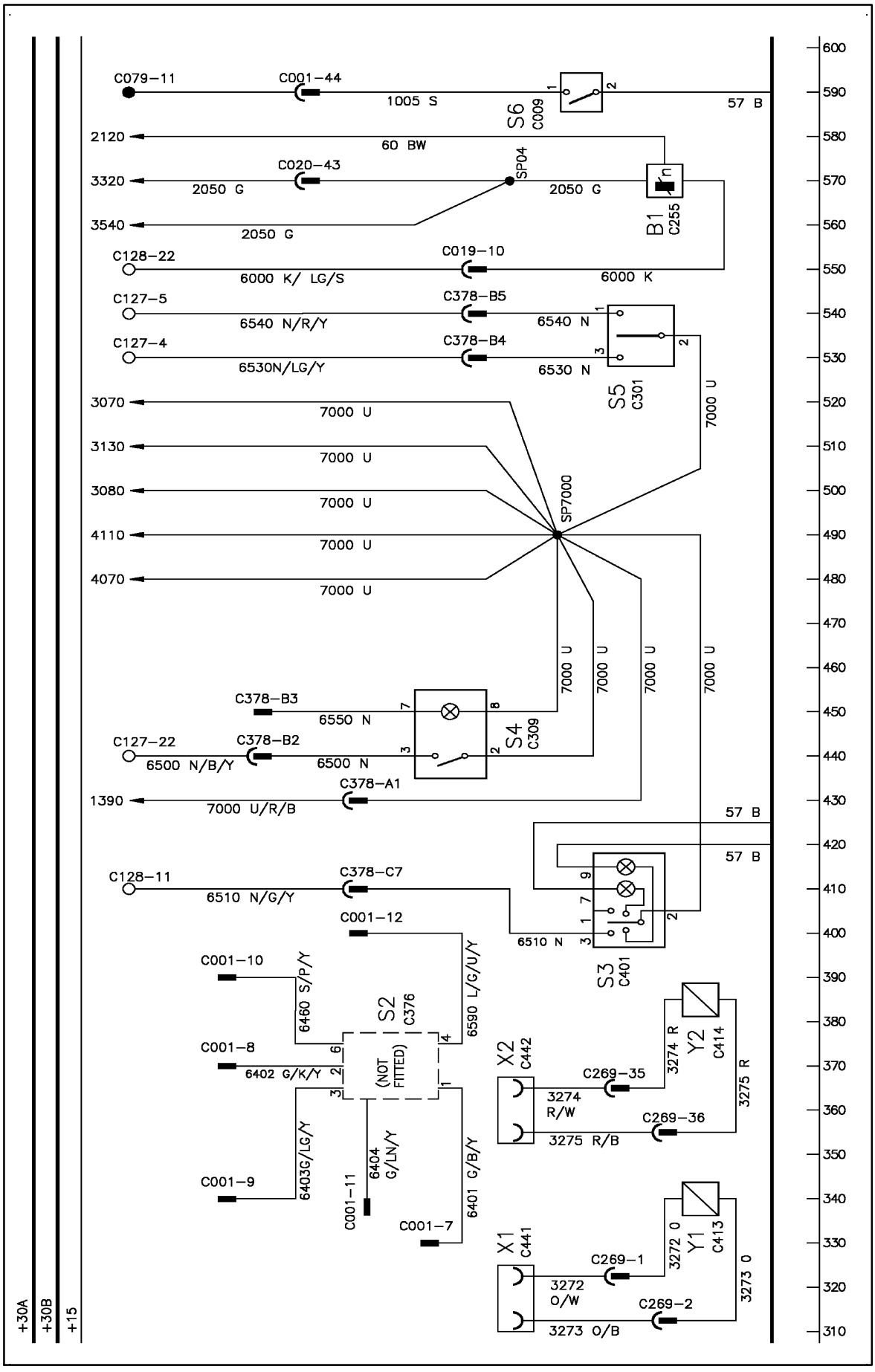
Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400


660
10 H
A023
C367
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C079-10
1135 G/K/B
SP16A
GF1
K25
C354
6580 K
1006 N/Y
57 B
R1
C079-21
F43 10A
C001-41
39 G/U/W
1320
1000 W/Y
S1
C072
71 W/K
2020 Y/K
C001-34
150 N
1006 N
MF2
30A
F8 20A
SP29A
C001-43
5340
7660
1010 G
SP24
71 W/K
K13
6414 G/TQ/Y
4800
1001 W/R
C001-21
7610
150 N
1160
39 G/U/W
1250
1001 W/R
SP02
K5
C325-21
C079-16
6414 G
+15
1010 G
K3
G2
C013
SP14
MF1
80A
C001-45
C001-46
C001-47
C001-48
960
SP07
C101-21
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
G1
12Vcc
C350-1
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A023	Grid Heater Module

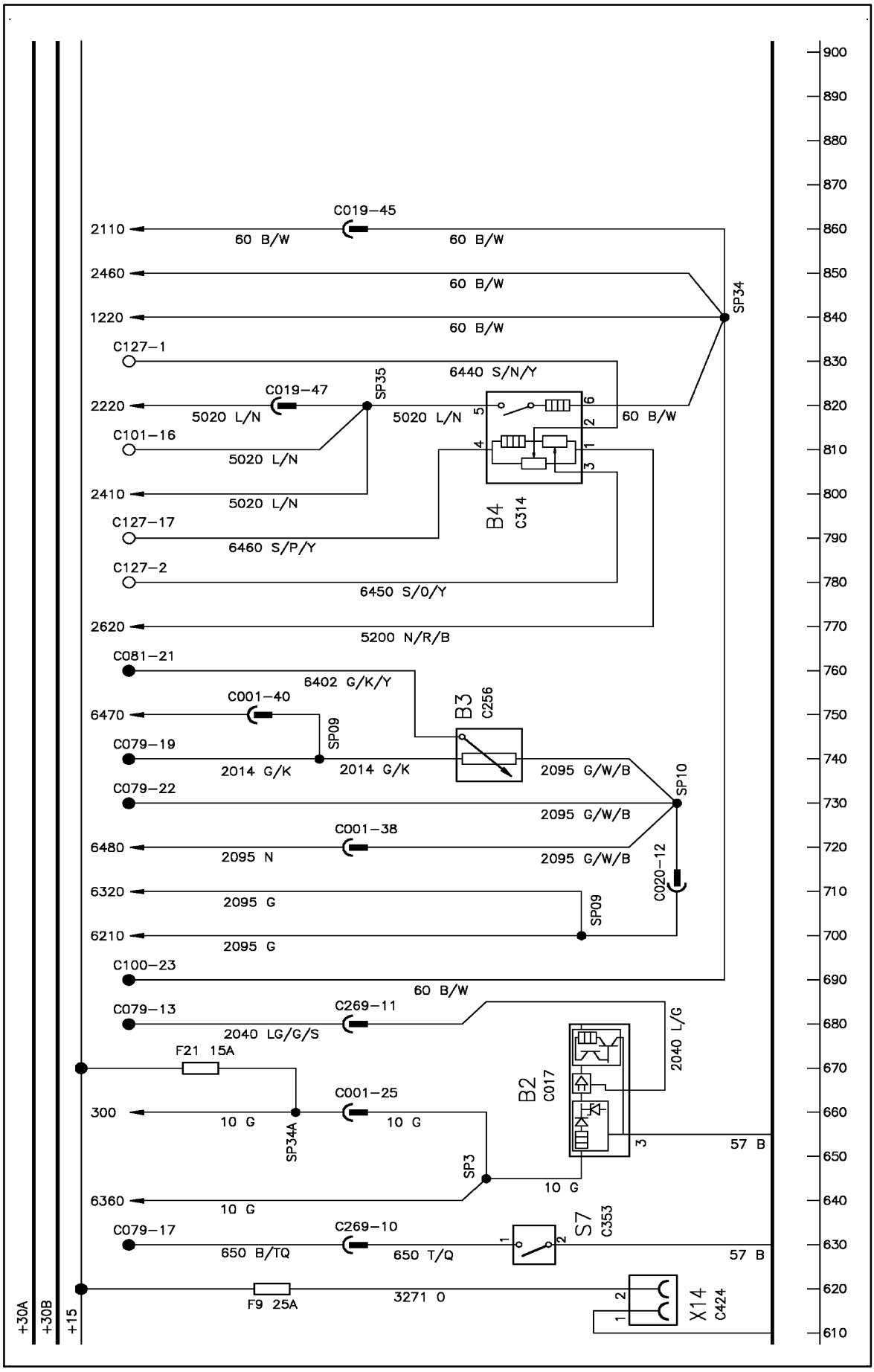
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 S
S6
C009
57 B
2120
60 BW
C020-43
3320
2050 G
SP04
2050 G
3540
2050 G
B1
C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5
C301
7000 U
3070
3130
3080
4110
4070
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4
C309
C378-A1
1390
7000 U/R/B
C128-11
C378-C7
6510 N/G/Y
6510 N
S3
C401
C001-12
C001-10
6460 S/P/Y
6590 L/G/U/Y
S2
C376
C001-8
6402 G/K/Y
(NOT FITTED)
6403G/LG/Y
C001-9
C001-11
6404 G/LN/Y
C001-7
6401 G/B/Y
X2
C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2
C414
3275 R
X1
C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1
C413
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

ENGINE 1
line 310-600

B1	Engine Flywheel Speed Sensor
S2	Foot Throttle - Electronic Engine (Not Fitted)
S3	Constant Engine Speed programme Switch
S4	Constant ERPM On/Off Switch
S5	Engine Inc./Dec. Switch
S6	Air Cleaner Switch
Y1	Loader Valve 1
Y2	Loader Valve 2
X1	Joystick Loader Control Socket 1
X2	Joystick Loader Control Socket 2

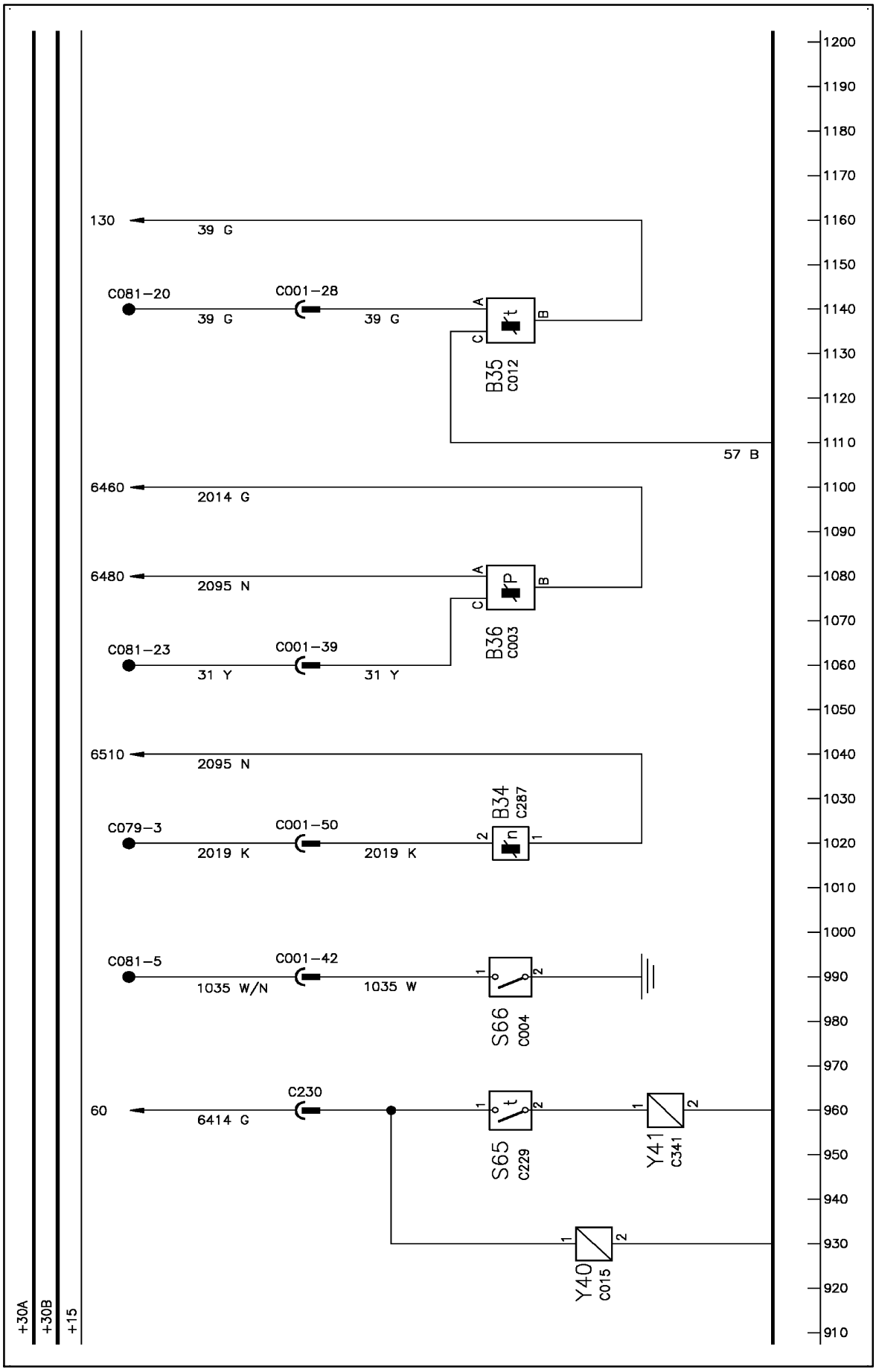
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
SP34
1220
60 B/W
C127-1
6440 S/N/Y
SP35
C019-47
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
C001-40
6470
SP09
B3
C256
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
SP3
57 B
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A		
		X14	Loader Power Connector
B2	Water In Fuel Sensor		
B3	Foot Throttle - Mechanical Engine		
B4	Hand Throttle		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
130
39 G
C081-20
39 G
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
B34
C287
C079-3
2019 K
C001-50
2019 K
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
C230
S65
C229
Y41
C341
Y40
C015

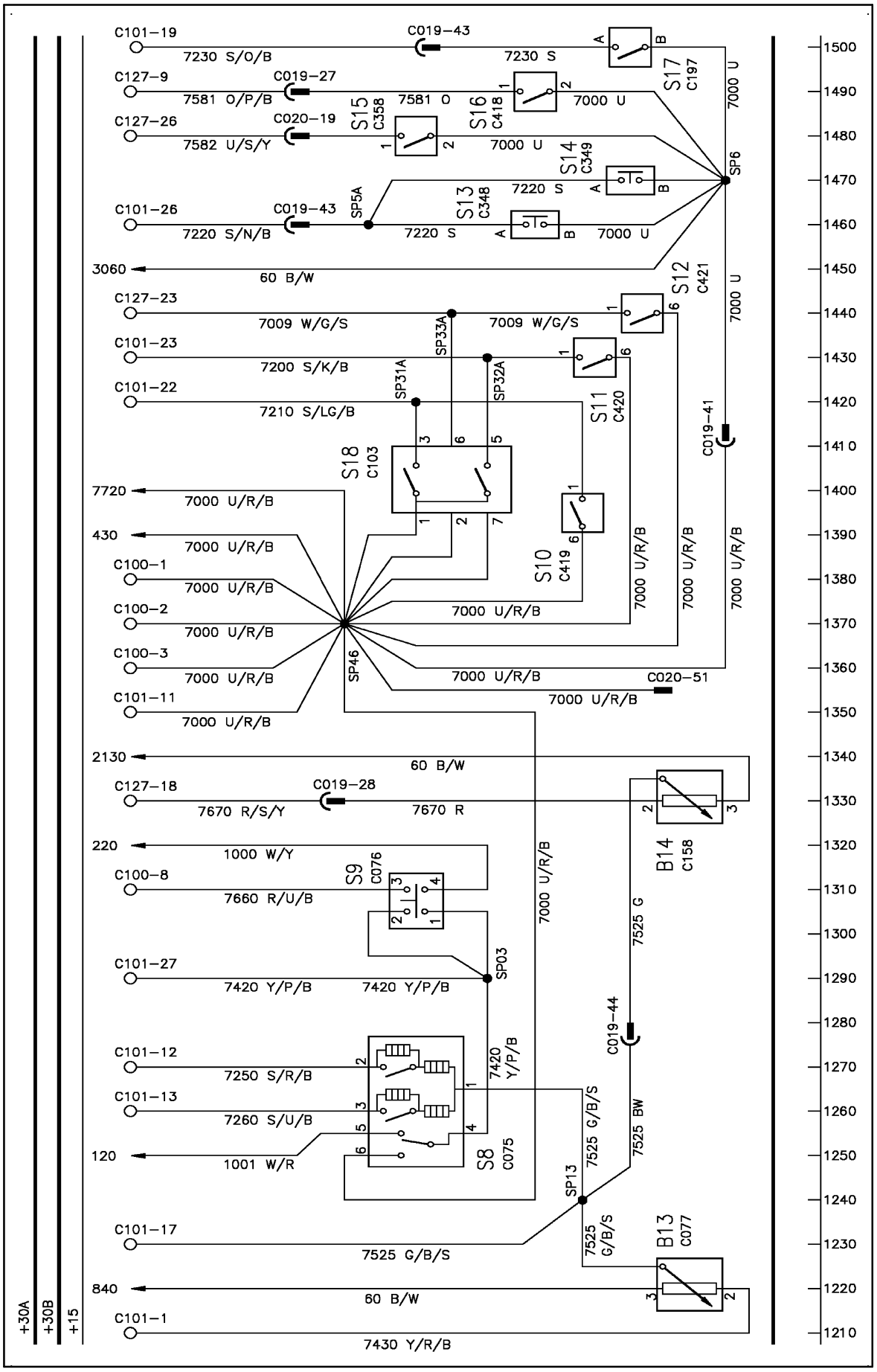
ENGINE 3
line 910-1200

B34 Engine Speed Sensor
B35 Coolant Temperature Sensor
B36 Oil Pressure Sensor

S65 Thermo Cold Advance Switch
S66 Oil Pressure Switch

Y40 Fuel Shut Off Solenoid
Y41 Cold Advance Solenoid

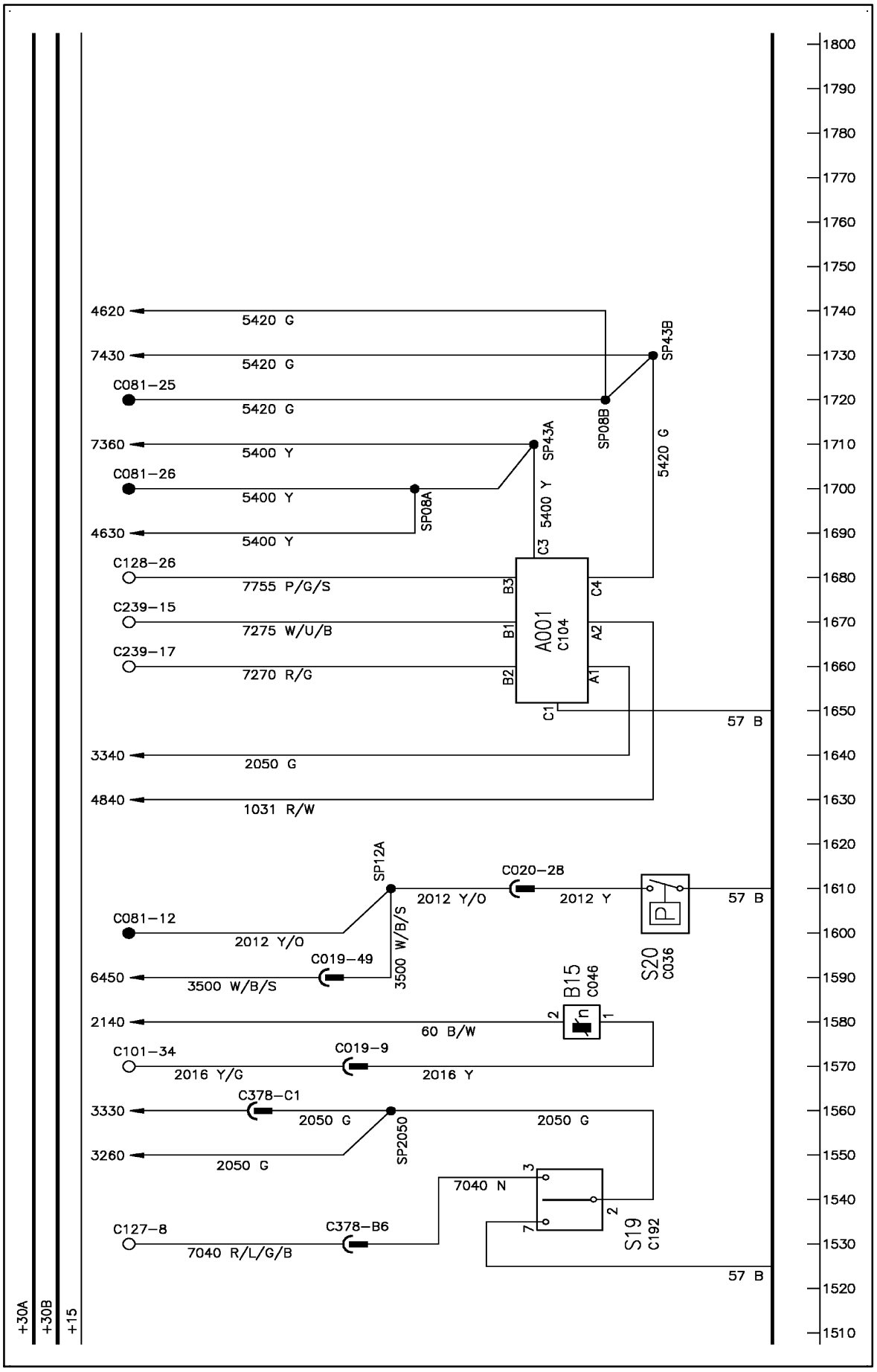
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C101-19
7230 S/O/B
C019-43
7230 S
S17 C197
C127-9
7581 O/P/B
C019-27
S15 C358
7581 O
S16 C418
7000 U
C127-26
7582 U/S/Y
C020-19
7000 U
S14 C349
SP6
C101-26
7220 S/N/B
C019-43
SP5A
S13 C348
7220 S
3060
60 B/W
C127-23
7009 W/G/S
SP33A
S12 C421
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
C100-1
C100-2
C100-3
C101-11
S10 C419
SP46
C020-51
2130
C127-18
7670 R/S/Y
C019-28
7670 R
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C101-27
7420 Y/P/B
SP03
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
C019-44
7525 G
7525 G/B/S
7525 BW
SP13
C101-17
B13 C077
840
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer	**S12**	Duplicate Transmission Control – Range
B14	Synchro Position Potentiometer	**S13**	Neutral Switch 3/4 Rail
		S14	Neutral Switch 1/2 Rail
S8	Shuttle Switch	**S15**	Creeper Sensing Switch
S9	Clutch Switch	**S16**	Creeper Sense Forward Switch
S10	Duplicate Transmission Control – Downshift	**S17**	High/Medium Switch
S11	Duplicate Transmission Control – Upshift	**S18**	Gearshift

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
5420 G
4630
5400 Y
C3 5400 Y
C128-26
7755 P/G/S
B3
A001
C104
C4
C239-15
7275 W/U/B
B1
A2
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C020-28
2012 Y/O
2012 Y
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
7040 N
C127-8
C378-B6
7040 R/L/G/B
S19
C192
57 B

TRANSMISSION SYSTEM 2
Line 1510-1800

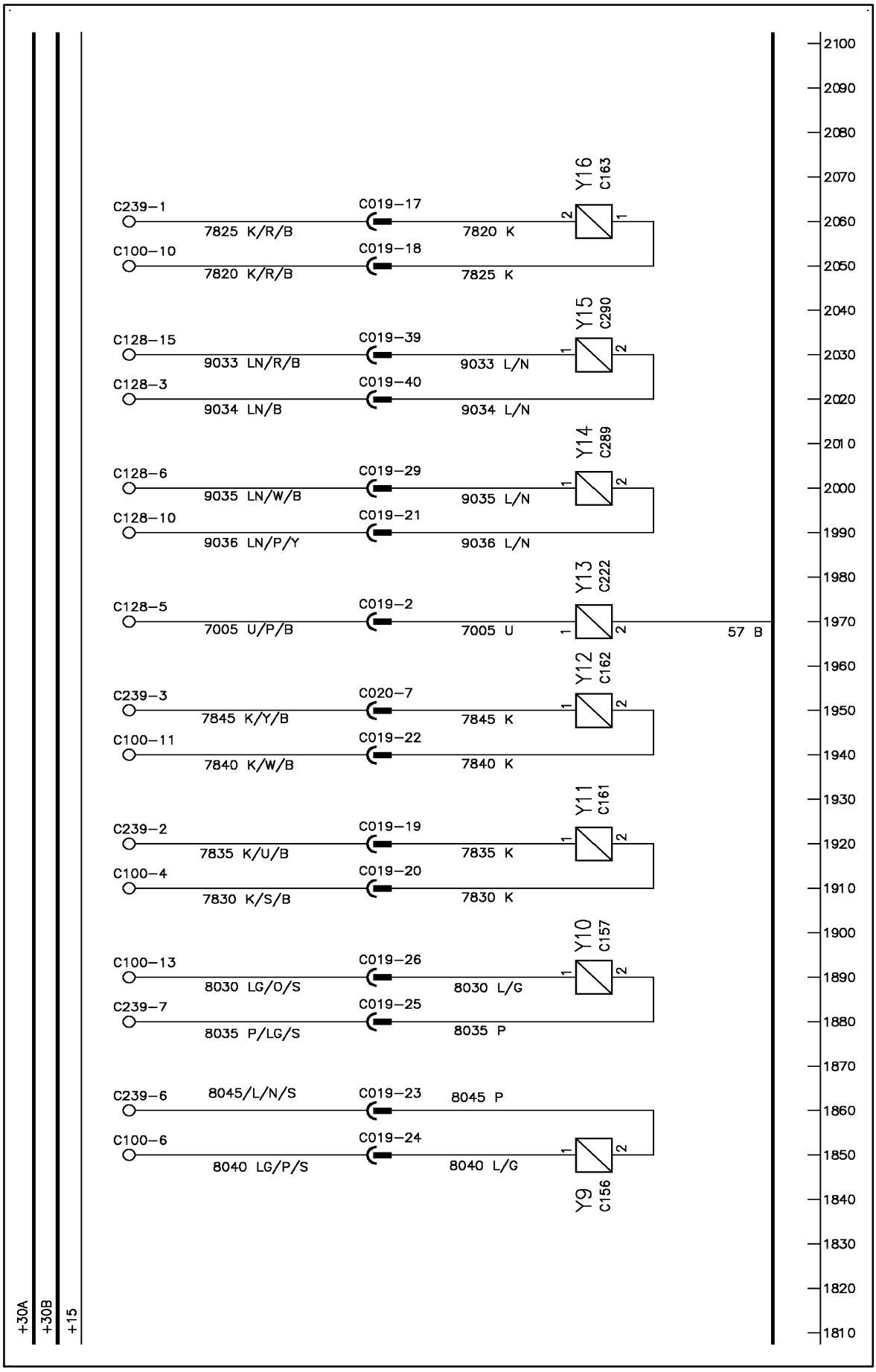
A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch

S20 Transmission Oil Pressure Switch

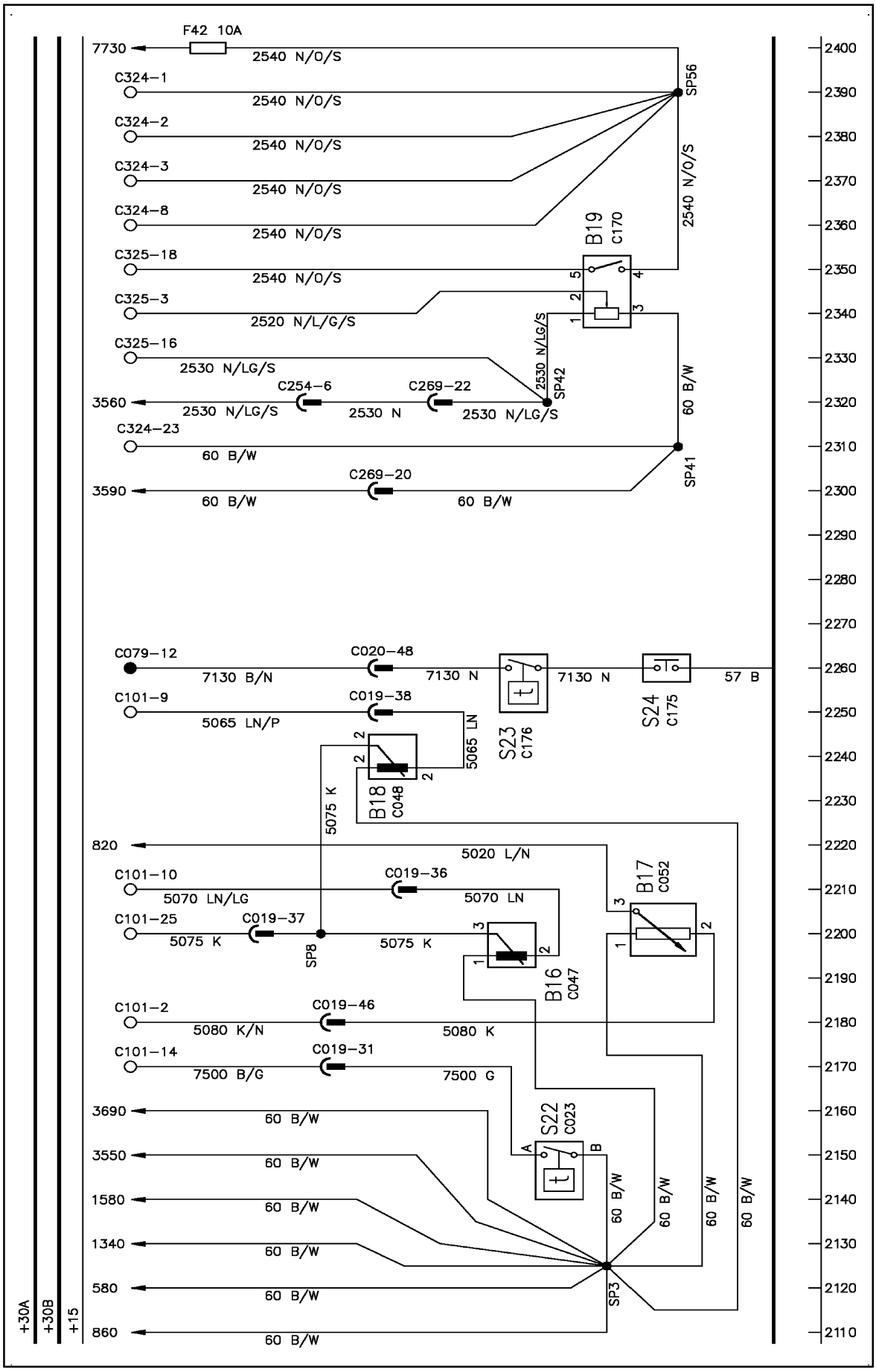
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-6
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
C239-6
8045/L/N/S
C019-23
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y11 Lo PWM Valve
Y12 Hi PWM Valve
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y16 Dump Solenoid

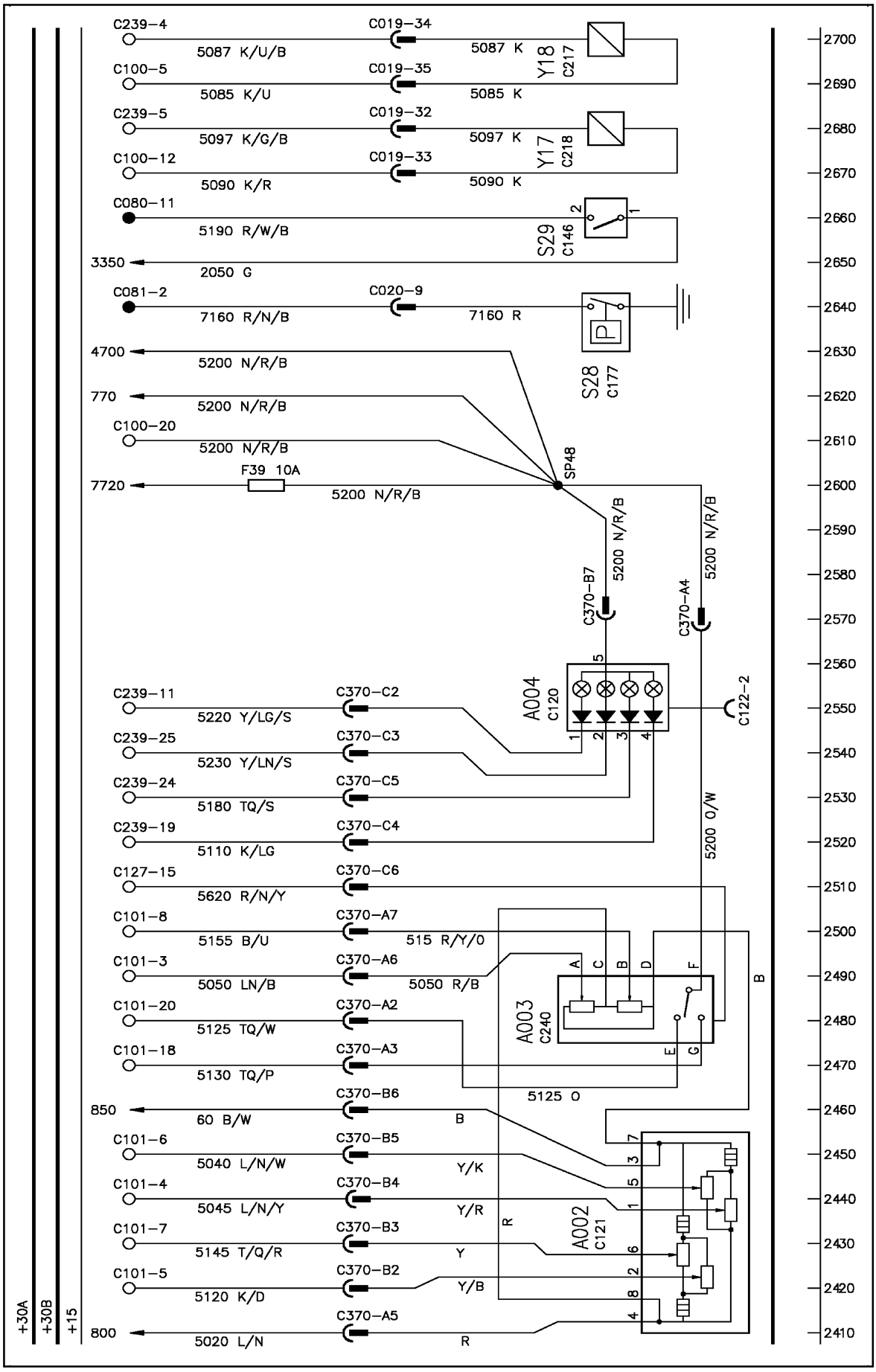
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
C079-12
7130 B/N
C020-48
7130 N
57 B
C101-9
5065 LN/P
C019-38
5065 LN
S23
C176
S24
C175
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
5070 LN
C101-25
C019-37
SP8
B17
C052
B16
C047
C101-2
5080 K/N
C019-46
5080 K
C101-14
7500 B/G
C019-31
7500 G
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A	**B19**	Front HPL Limit Potentiometer
		S22	Transmission Oil Temp Sensor
B16	LH Draft Pin	**S23**	Oil Temperature Switch
B17	Rockshaft Potentiometer	**S24**	HPL Filter Switch
B18	RH Draft Pin		

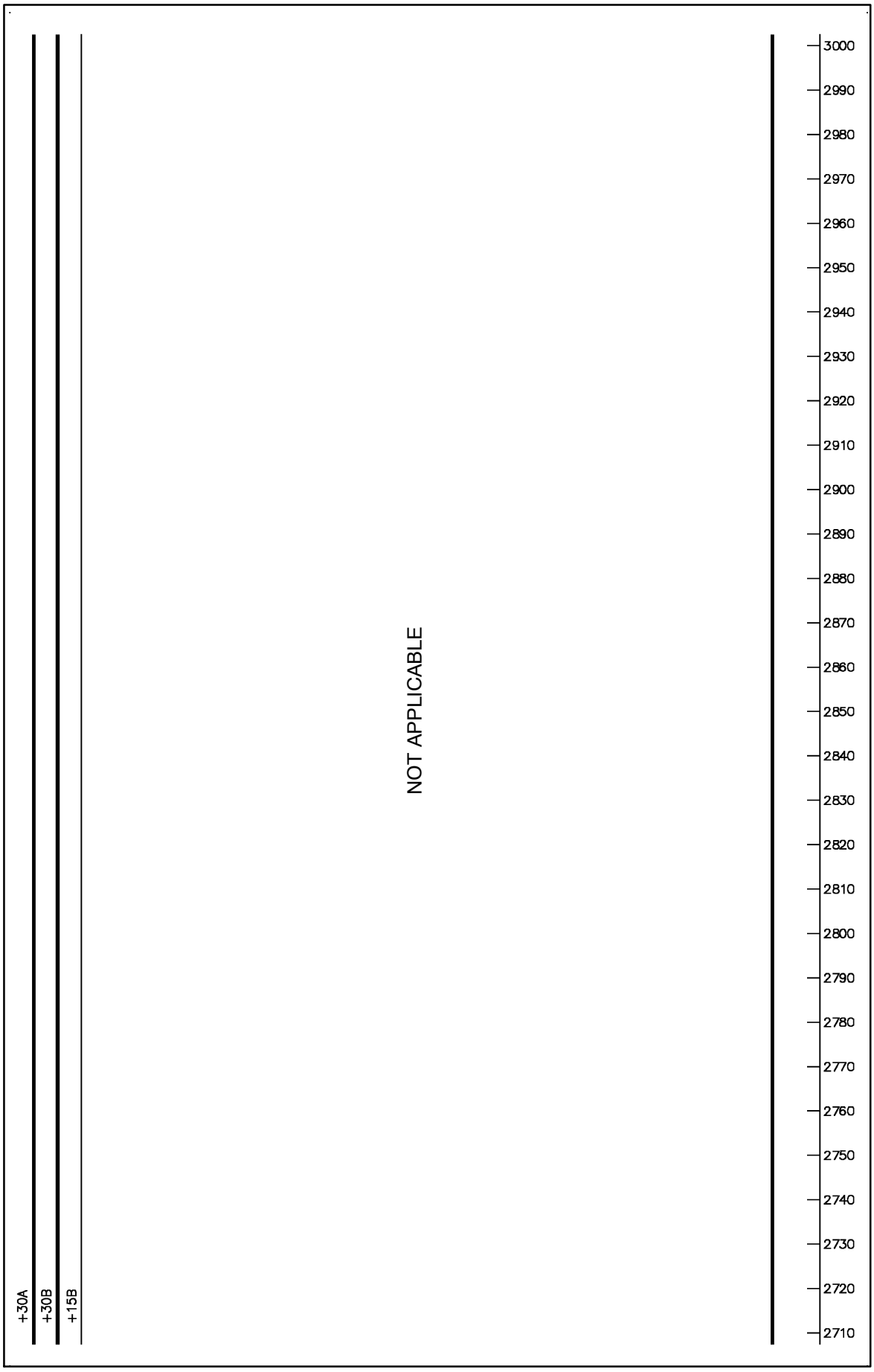
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239-4
C019-34
5087 K/U/B
5087 K
Y18
C217
C100-5
C019-35
5085 K/U
5085 K
C239-5
C019-32
5097 K/G/B
5097 K
Y17
C218
C100-12
C019-33
5090 K/R
5090 K
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7720
5200 N/R/B
SP48
C370-B7
C370-A4
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
A003
C240
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
A002
C121
800
C370-A5
5020 L/N
R
5200 O/W
B
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

HYDRAULICS 2
Line 2410-2700

F30	Fuse - 10A	**S28**	Lo Charge Switch
		S29	Lift-O-Matic Switch
A002	EDC Control		
A003	EDC Mouse	**Y17**	EDC Lower Solenoid
A004	EDC Status Lamp Panel	**Y18**	EDC Raise Solenoid

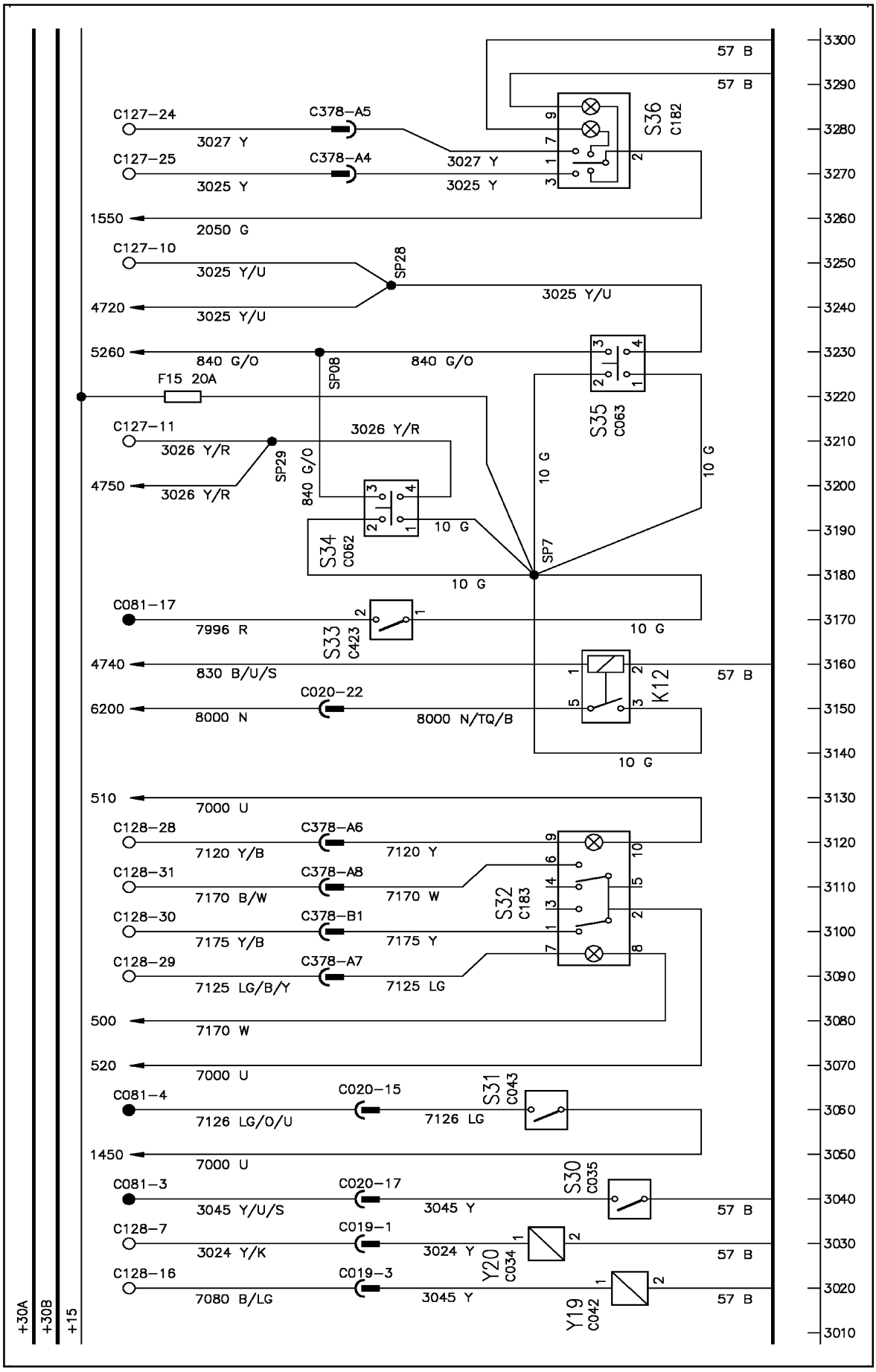
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

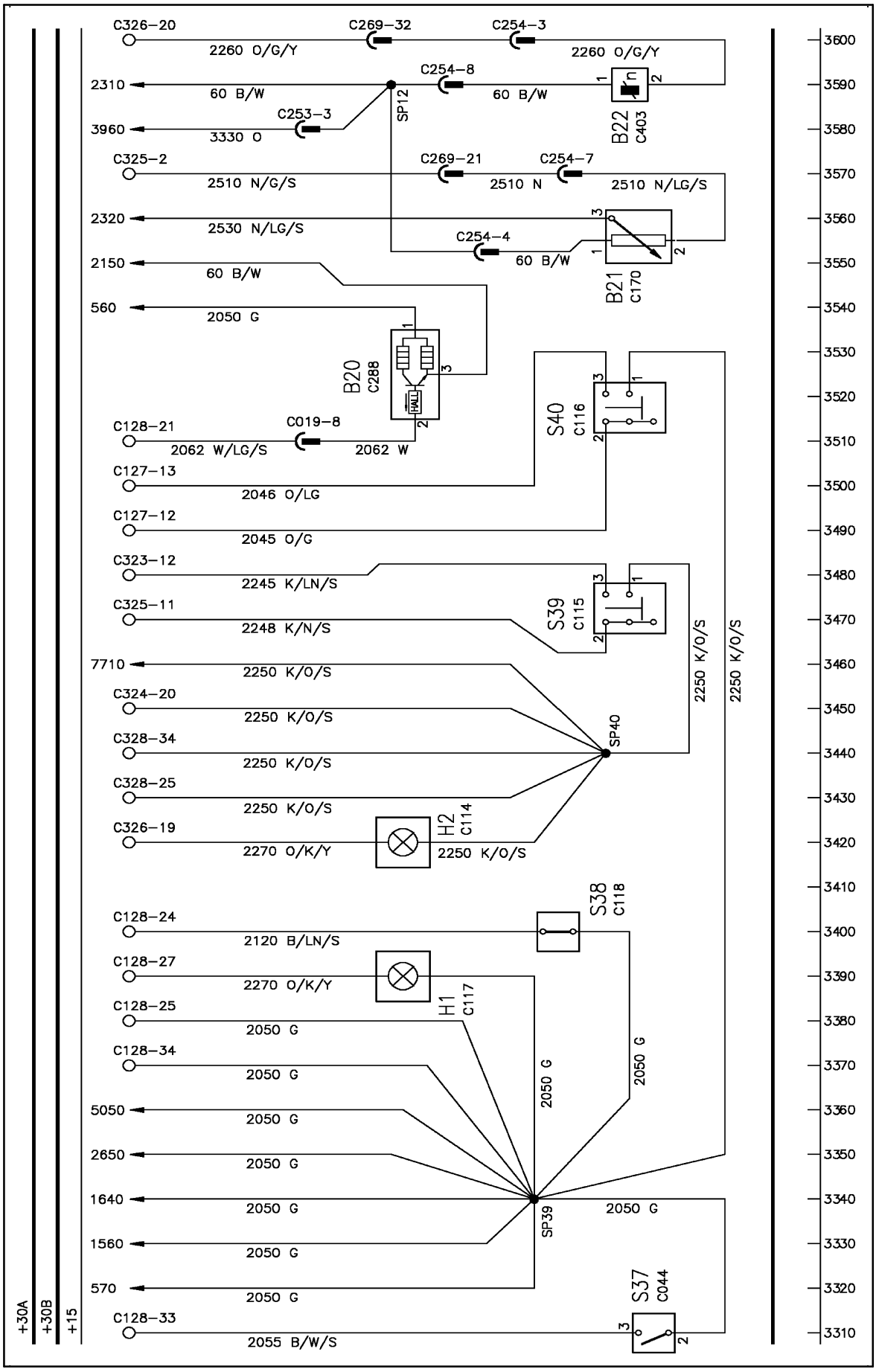
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F15 20A
SP28
SP29
SP08
SP7
S36 C182
S35 C063
S34 C062
S33 C423
S32 C183
S31 C043
S30 C035
K12
Y20 C034
Y19 C042
C127-24
C127-25
C127-10
C127-11
C128-28
C128-31
C128-30
C128-29
C128-7
C128-16
C081-17
C081-4
C081-3
C378-A5
C378-A4
C378-A6
C378-A8
C378-B1
C378-A7
C020-22
C020-15
C020-17
C019-1
C019-3
3027 Y
3025 Y
3025 Y/U
3026 Y/R
840 G/O
10 G
57 B
1550
2050 G
4720
4750
5260
6200
4740
510
500
520
1450
7000 U
7996 R
830 B/U/S
8000 N
8000 N/TQ/B
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
7126 LG/O/U
3045 Y/U/S
3045 Y
3024 Y/K
3024 Y
7080 B/LG
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

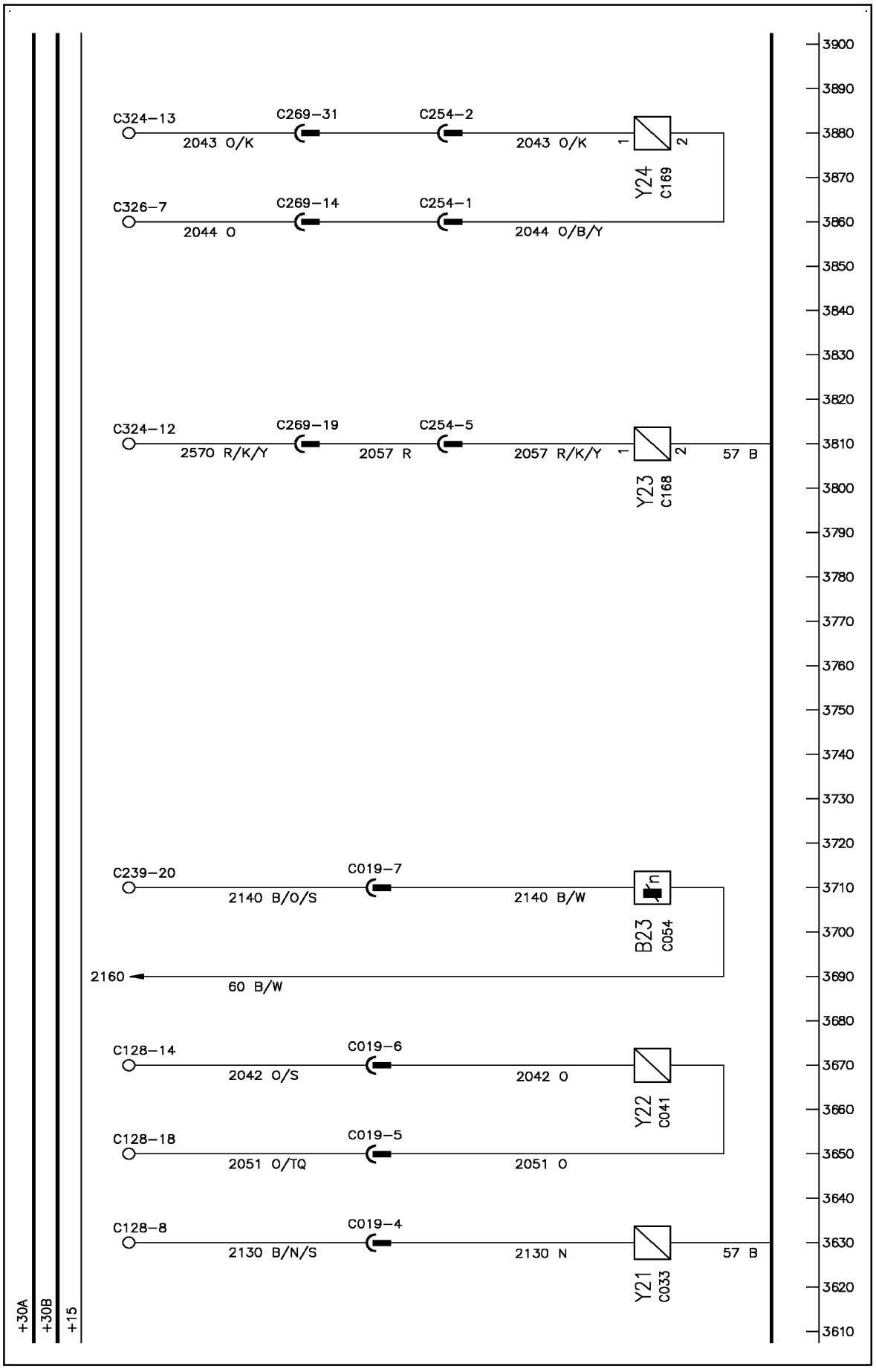
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
H2
C114
C326-19
2270 O/K/Y
2250 K/O/S
S38
C118
C128-24
2120 B/LN/S
C128-27
2270 O/K/Y
H1
C117
C128-25
2050 G
C128-34
2050 G
2050 G
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor	**S37**	Ground Speed PTO Switch
B21	Front HPL Limit Potentiometer	**S38**	Rear PTO Brake Switch
B22	Front PTO Speed Sensor	**S39**	Front PTO Switch
		S40	Rear PTO Switch
H1	Rear PTO Lamp		
H2	Front PTO Lamp		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C239-20
C019-7
2140 B/O/S
2140 B/W
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O
C128-8
C019-4
2130 B/N/S
2130 N
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

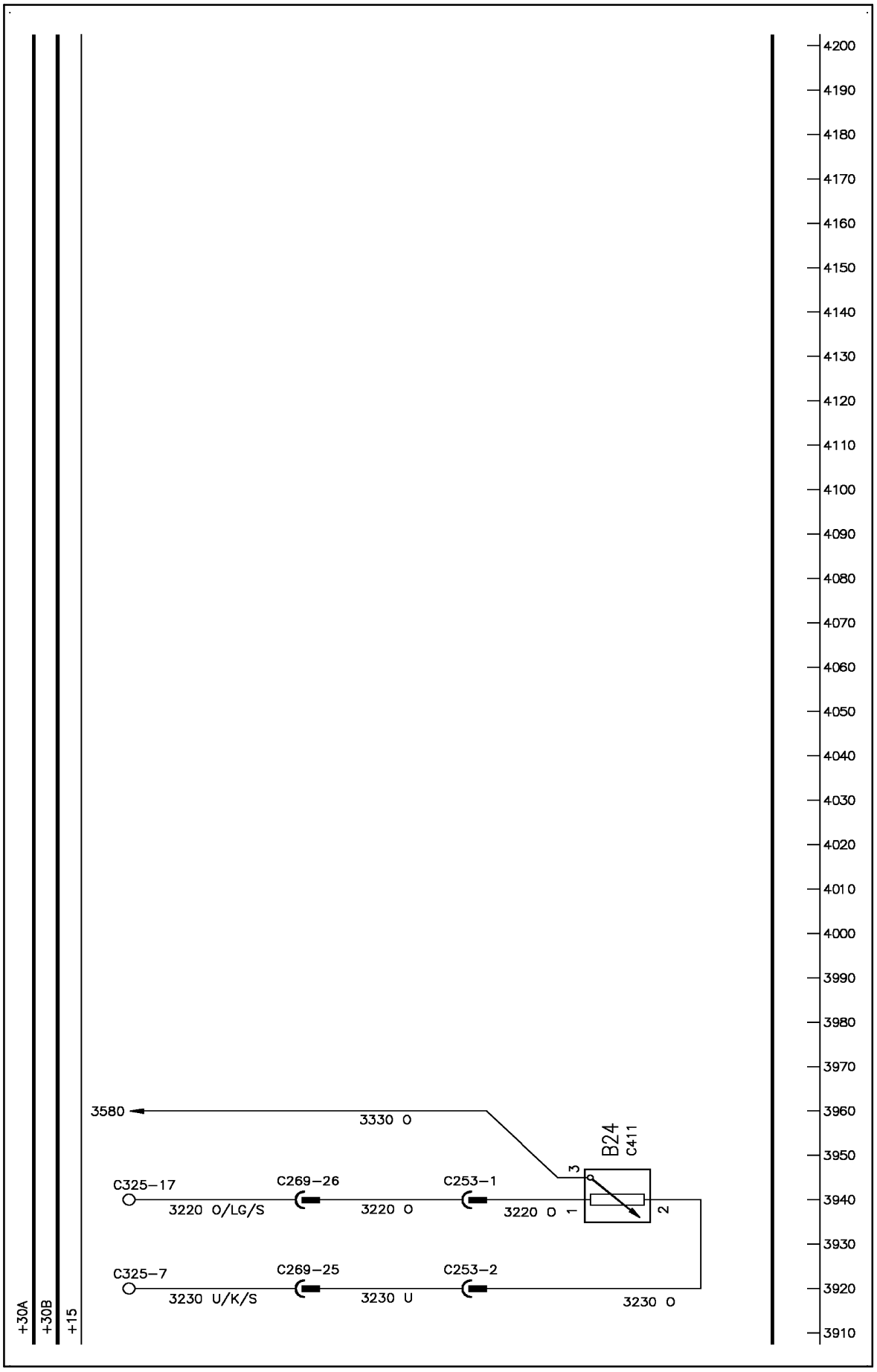
Y21 PTO Brake Solenoid

Y22 PTO Clutch Solenoid

Y23 Front Hitch Valve

Y24 Front PTO Solenoid

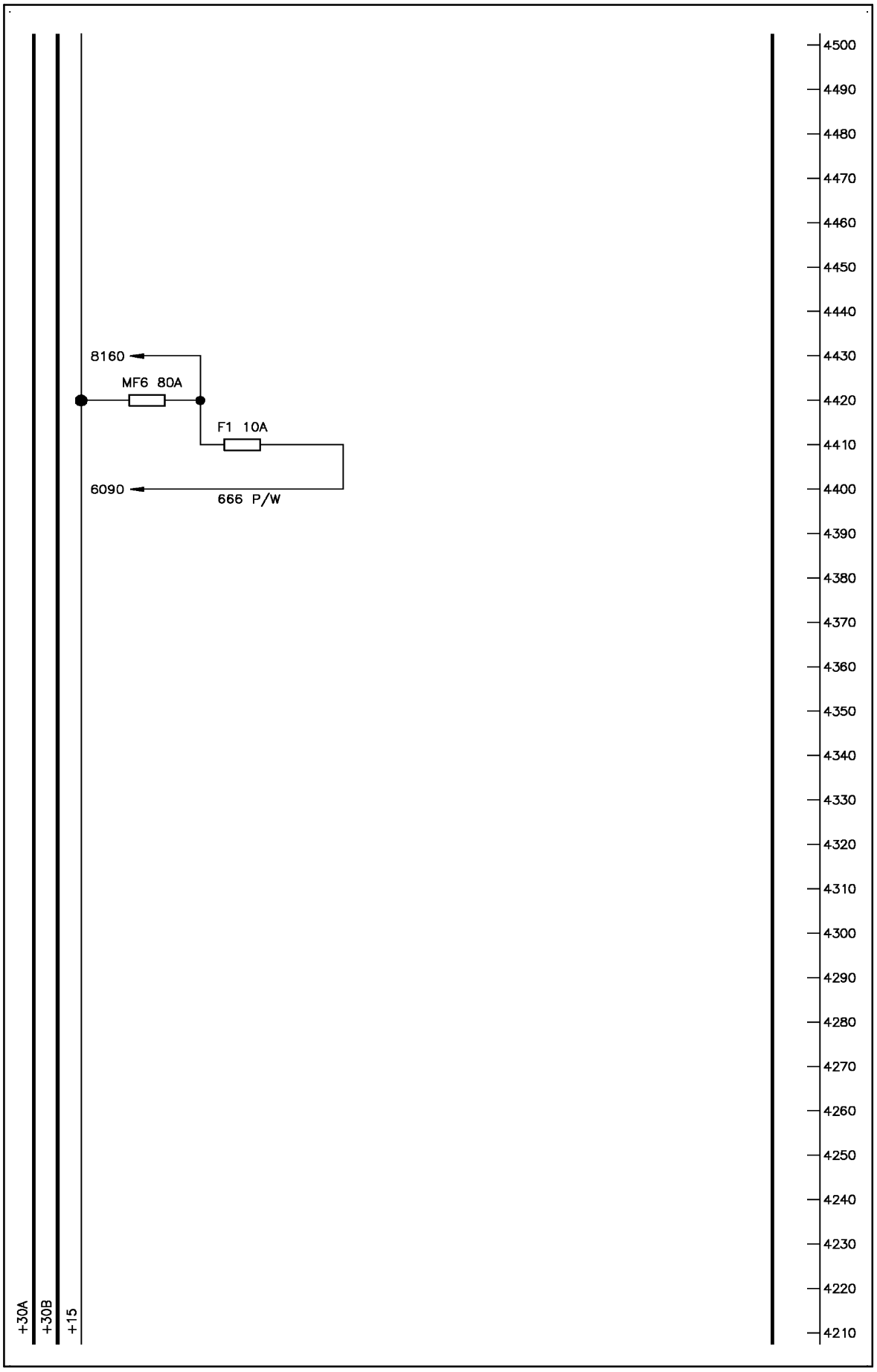
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910
+30A
+30B
+15
3580
3330 O
B24
C411
3
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
1
2
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

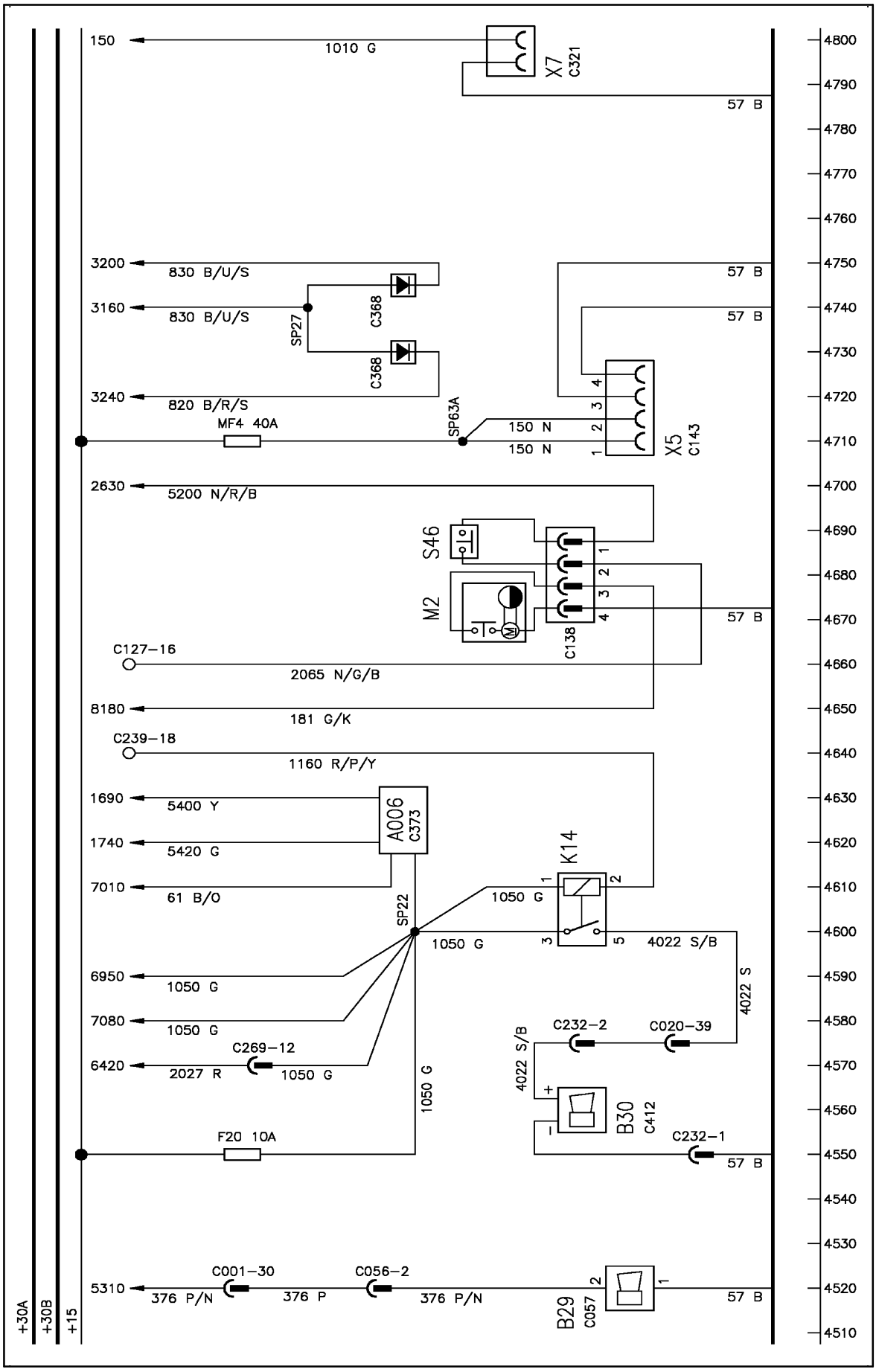

8160
MF6 80A
F1 10A
6090
666 P/W
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

CAB ACCESSORIES 1
Line 4210-4500

MF6 Maxi Fuse - 80A

F1 Fuse - 10A

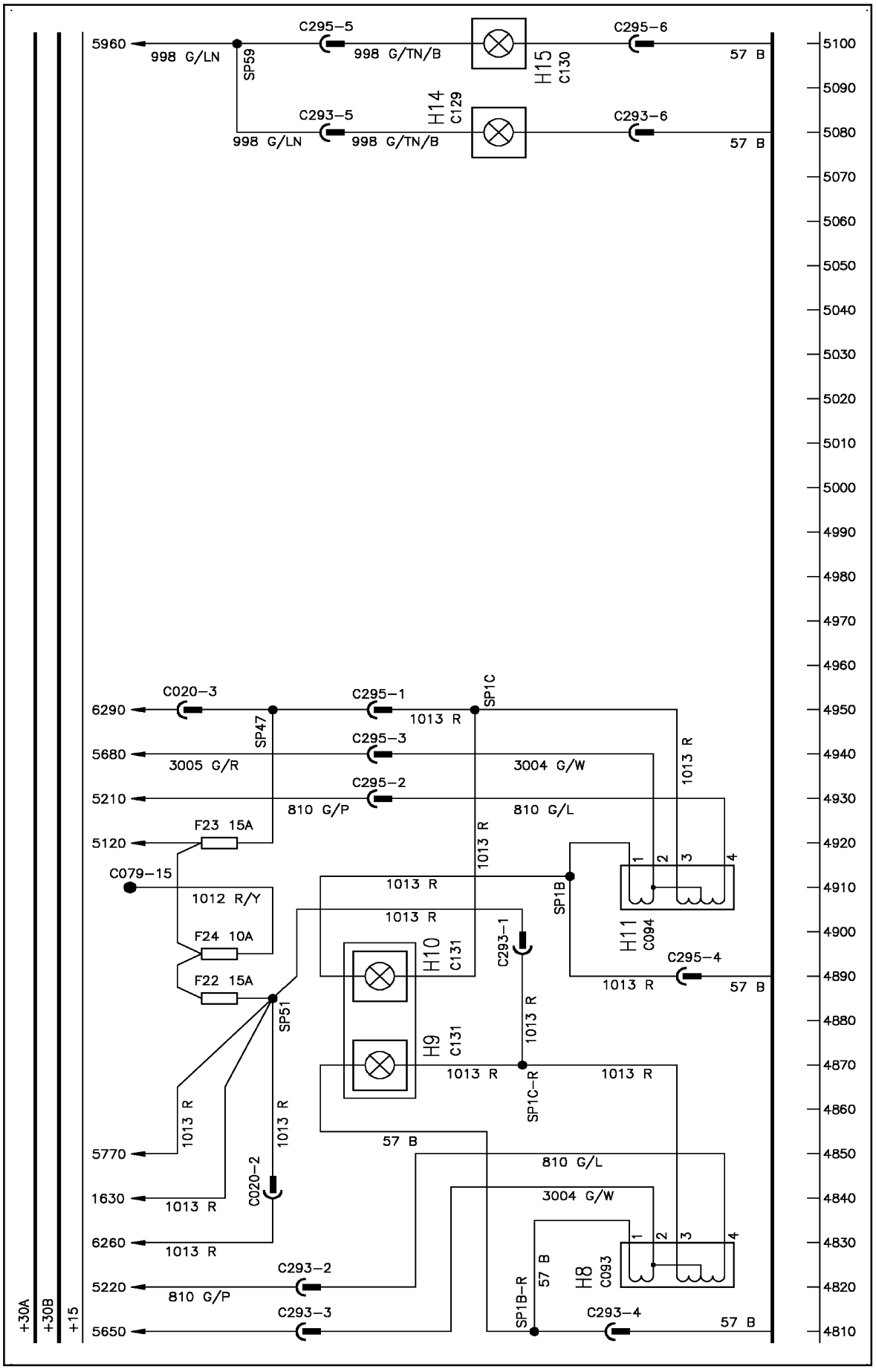
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


150
1010 G
X7
C321
57 B
3200
830 B/U/S
3160
830 B/U/S
SP27
C368
C368
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
1740
5420 G
7010
61 B/O
A006
C373
SP22
K14
1050 G
1050 G
4022 S/B
4022 S
6950
1050 G
7080
1050 G
C269-12
6420
2027 R
1050 G
1050 G
C232-2
C020-39
4022 S/B
B30
C412
C232-1
57 B
F20 10A
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode

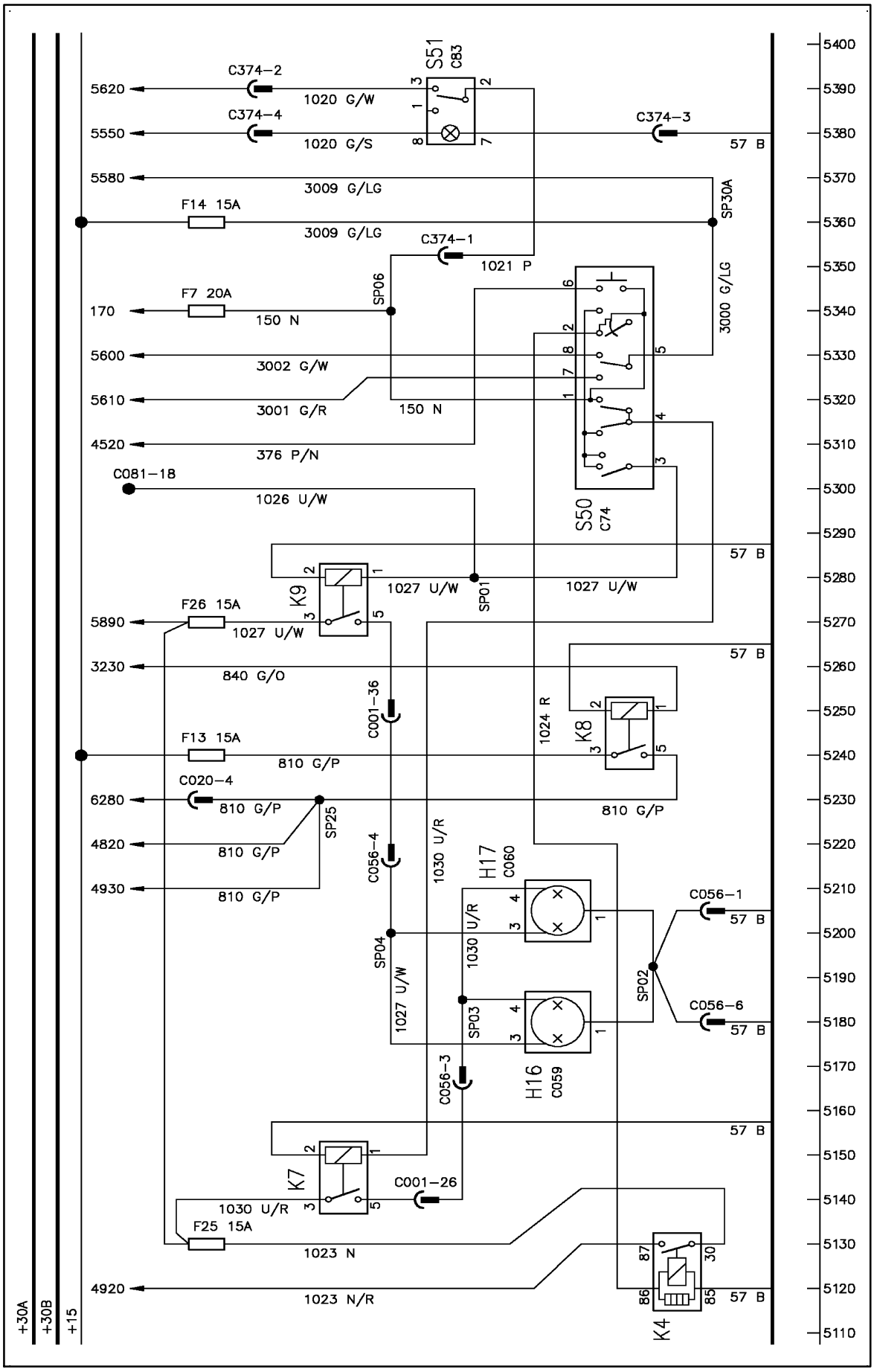
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15
C130
C295-6
57 B
C293-5
998 G/LN
H14
C129
998 G/TN/B
C293-6
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810
C020-3
6290
SP47
C295-1
1013 R
SP1C
5680
3005 G/R
C295-3
3004 G/W
1013 R
5210
810 G/P
C295-2
810 G/L
F23 15A
5120
C079-15
1012 R/Y
F24 10A
F22 15A
SP51
1013 R
SP1B
H11
C094
C295-4
57 B
H10
C131
C293-1
H9
C131
SP1C-R
5770
1630
C020-2
6260
C293-2
5220
810 G/P
C293-3
5650
SP1B-R
H8
C093
C293-4
+30A
+30B
+15

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A
H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender
H10	Licence Plate Lamp - Fender
H11	Stop/Tail Light L/H
H14	Worklamp - Fender R/H
H15	Worklamp - Fender L/H

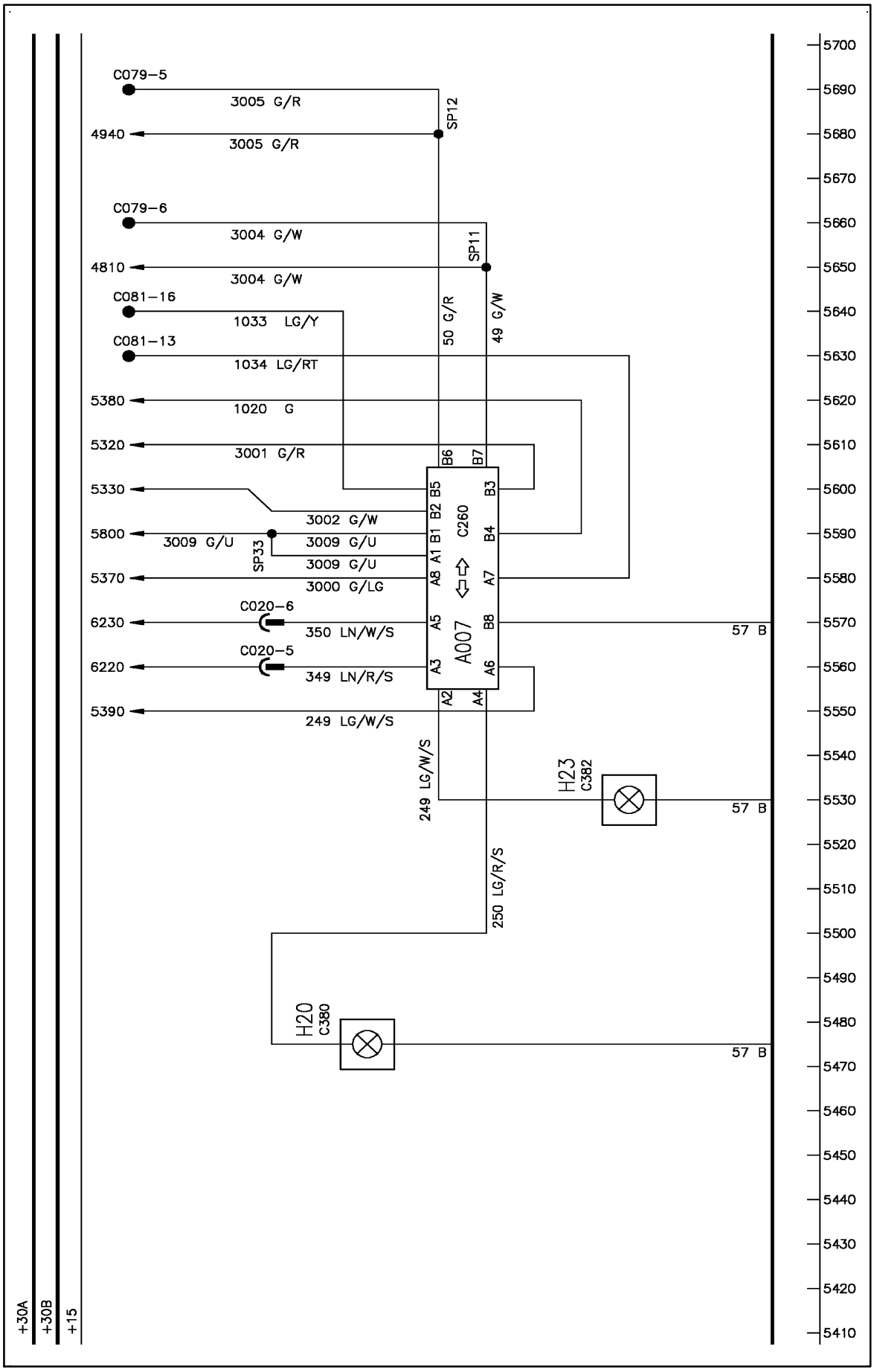
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
5620
5550
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110
C374-2
C374-4
C374-3
C374-1
S51
C83
1020 G/W
1020 G/S
57 B
3009 G/LG
F14 15A
SP30A
3000 G/LG
F7 20A
150 N
SP06
3002 G/W
3001 G/R
376 P/N
C081-18
1026 U/W
S50
C74
K9
1027 U/W
SP01
F26 15A
840 G/O
C001-36
1024 R
K8
F13 15A
810 G/P
C020-4
SP25
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
H16
C059
C056-3
SP02
C056-1
C056-6
K7
C001-26
F25 15A
1023 N
1023 N/R
K4
87
30
86
85

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
SP12
C079-6
3004 G/W
SP11
4810
3004 G/W
C081-16
1033 LG/Y
50 G/R
49 G/W
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
B6
B7
5330
B5
B3
3002 G/W
5800
3009 G/U
SP33
3009 G/U
B2
B1
C260
B4
3009 G/U
A1
5370
A8
A7
3000 G/LG
C020-6
6230
A5
B8
350 LN/W/S
57 B
C020-5
6220
A3
A007
A6
349 LN/R/S
A2
A4
5390
249 LG/W/S
249 LG/W/S
H23
C382
57 B
250 LG/R/S
H20
C380
57 B
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

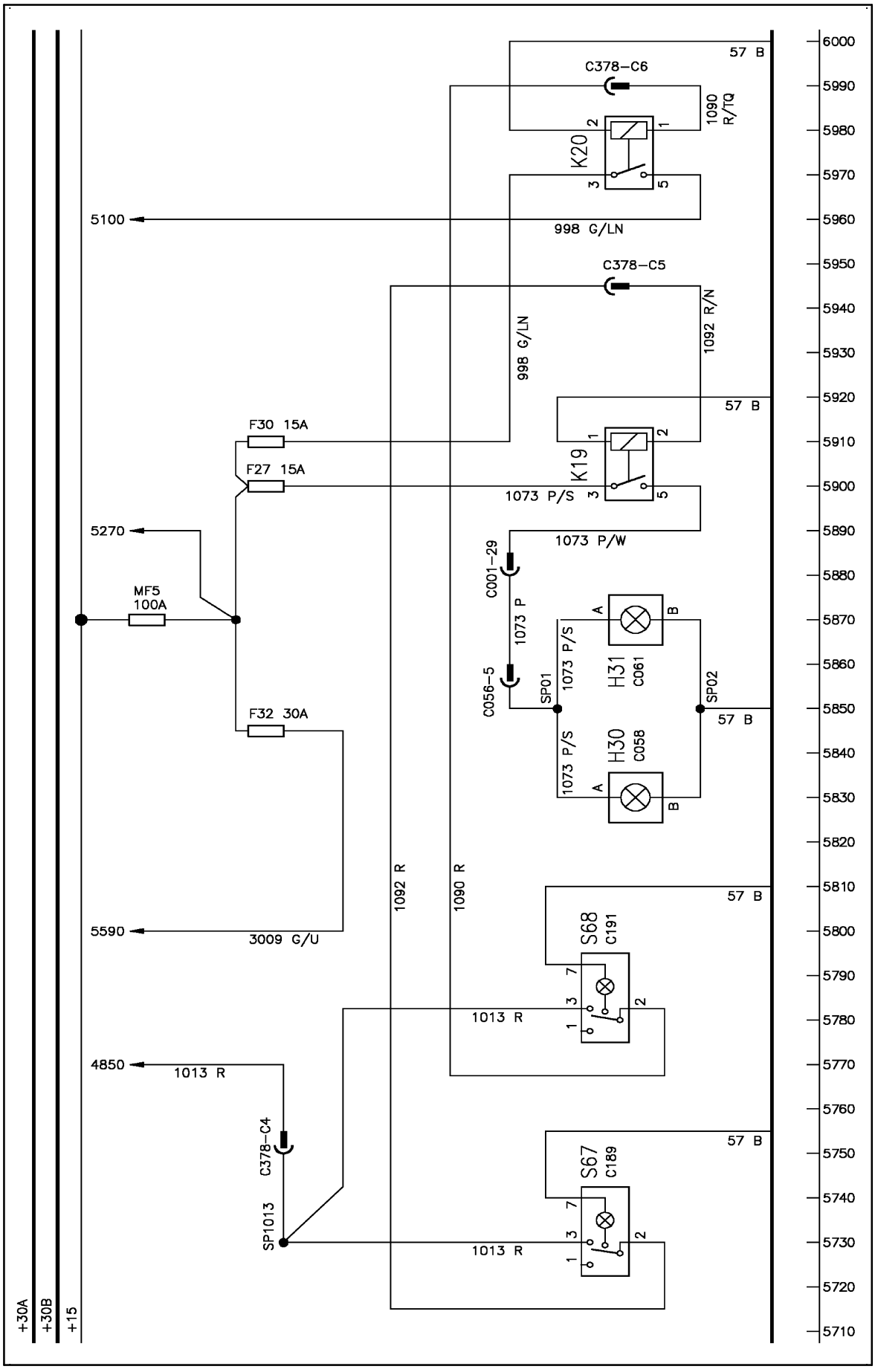
INDICATORS AND HAZARDS 3
Line 5410-5700

A007 Flasher Unit

H20 SMV Lamp L/H Rear

H23 SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
MF5
100A
F30 15A
F27 15A
F32 30A
5270
5100
5590
4850
3009 G/U
1013 R
998 G/LN
1092 R/N
1090 R/TQ
1073 P/S
1073 P/W
1073 P
1092 R
1090 R
C378-C6
C378-C5
C378-C4
K20
K19
C001-29
C056-5
SP01
SP02
SP1013
H31
C061
H30
C058
S68
C191
S67
C189
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

WORKLAMPS
Line 5710-6000

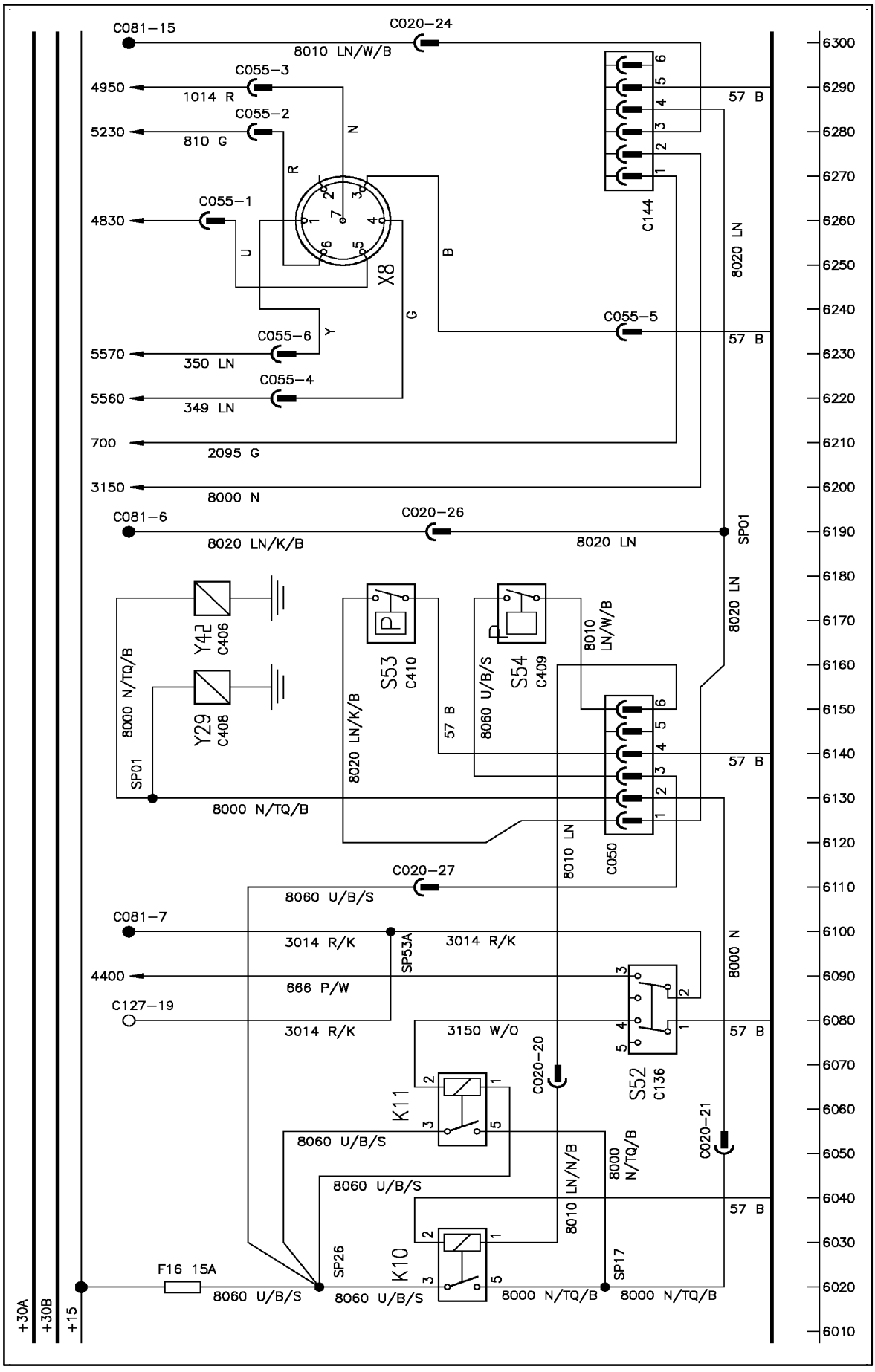
MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F30 Fuse - 15A
F32 Fuse - 30A

H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

S67 Worklamp Switch - Front
S68 Worklamp Switch - Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
C055-3
4950
1014 R
C055-2
5230
810 G
C055-1
4830
C055-6
5570
350 LN
C055-4
5560
349 LN
700
2095 G
3150
8000 N
C055-5
57 B
C144
8020 LN
X8
C081-6
C020-26
8020 LN/K/B
8020 LN
SP01
Y42
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8010 LN/W/B
8060 U/B/S
8020 LN/K/B
C050
C020-27
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3150 W/O
S52
C136
K11
K10
C020-20
C020-21
8000 N/TQ/B
8010 LN/N/B
F16 15A
SP26
SP17
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

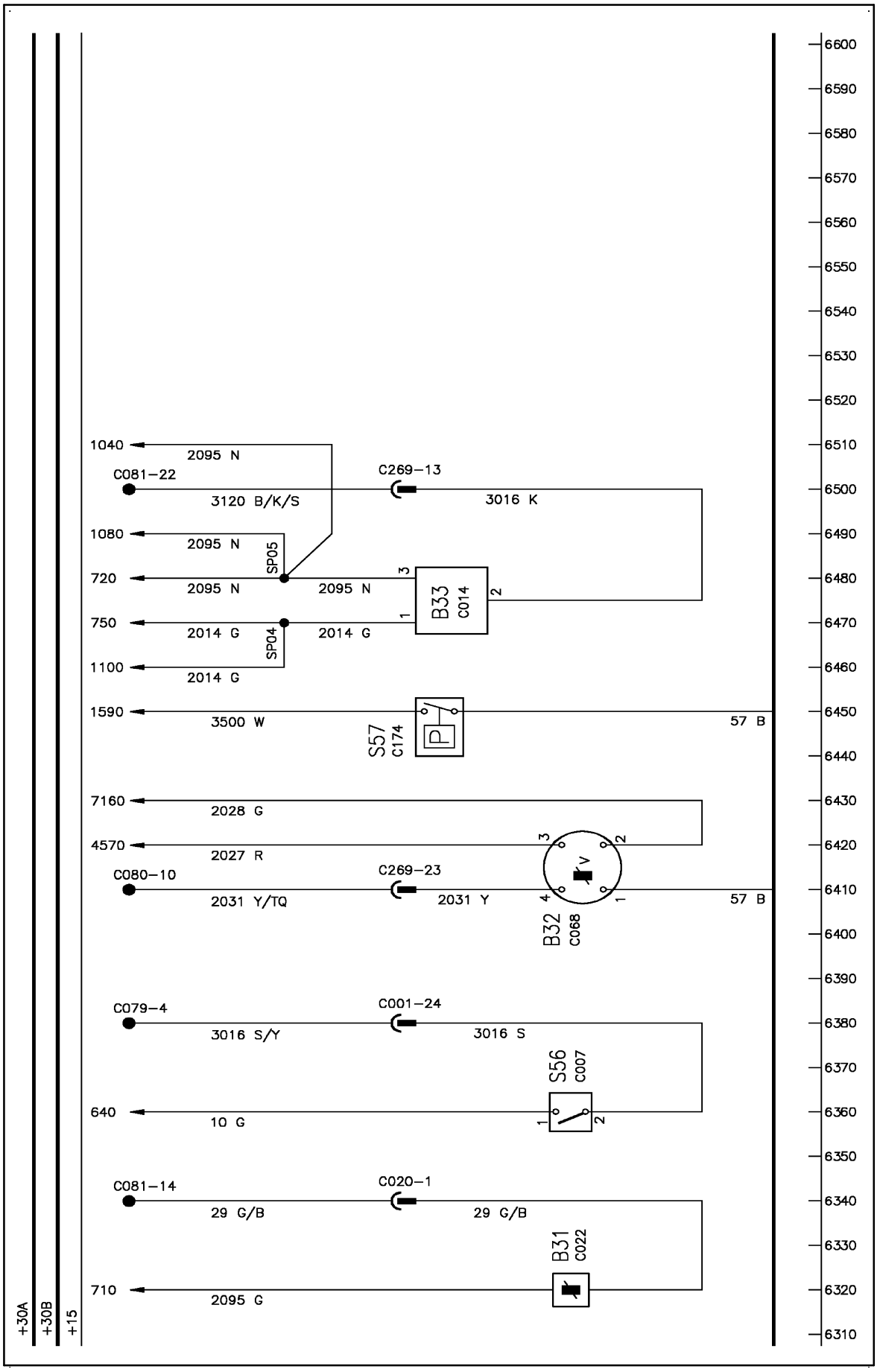
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid

X8 Trailer Socket

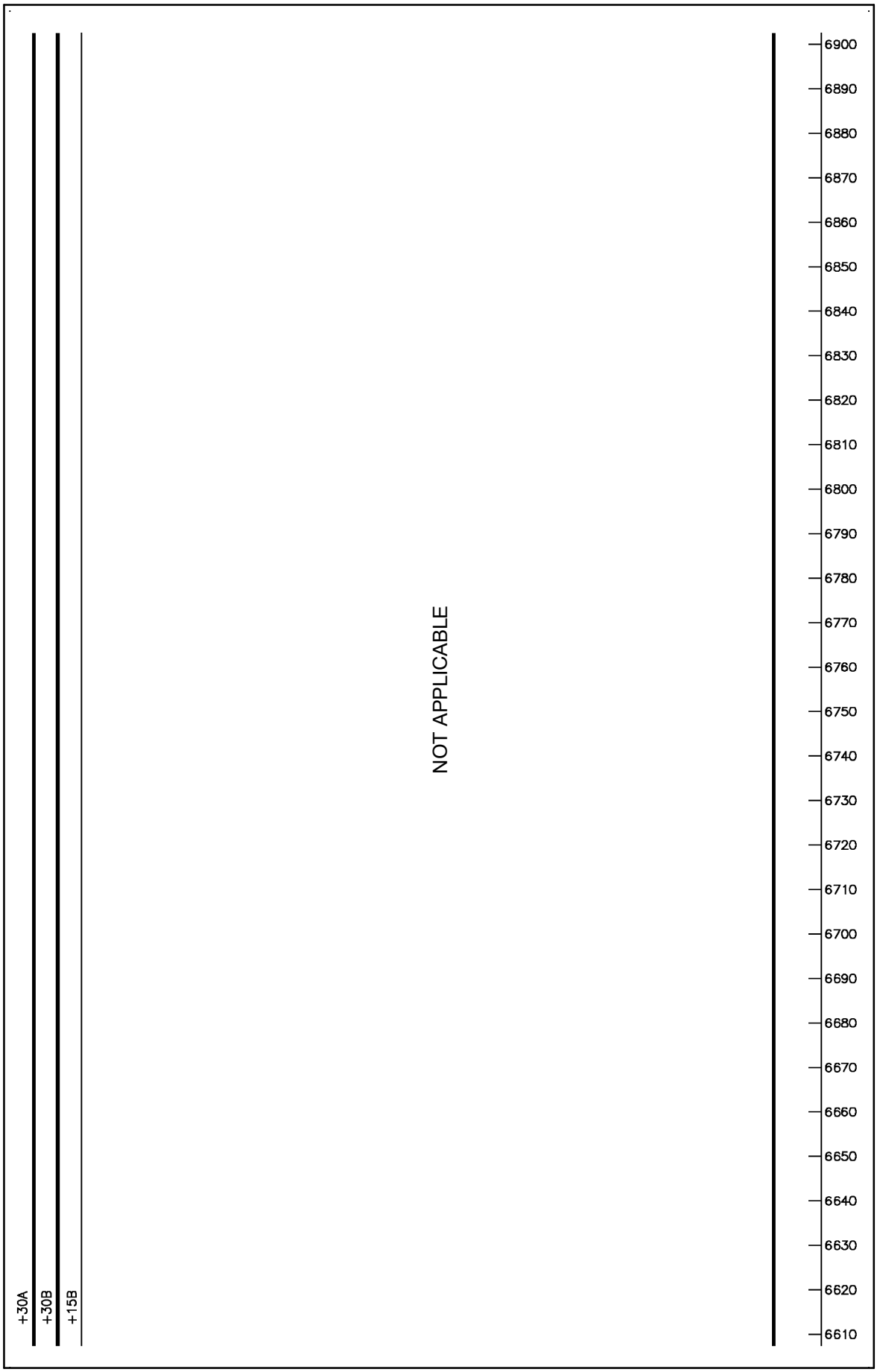
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
1040
2095 N
C081–22
C269–13
3120 B/K/S
3016 K
1080
2095 N
SP05
720
2095 N
2095 N
B33
C014
750
2014 G
2014 G
SP04
1100
2014 G
1590
3500 W
57 B
S57
C174
7160
2028 G
4570
2027 R
C080–10
C269–23
2031 Y/TQ
2031 Y
57 B
B32
C068
C079–4
C001–24
3016 S/Y
3016 S
S56
C007
640
10 G
C081–14
C020–1
29 G/B
29 G/B
B31
C022
710
2095 G

SENSORS
Line 6310-6600

B31 Fuel Tank Sender
B32 Radar Gun
B33 Steering Angle Sensor
S56 Brake Fluid Level Switch
S57 Power Assisted Steering Pressure Switch

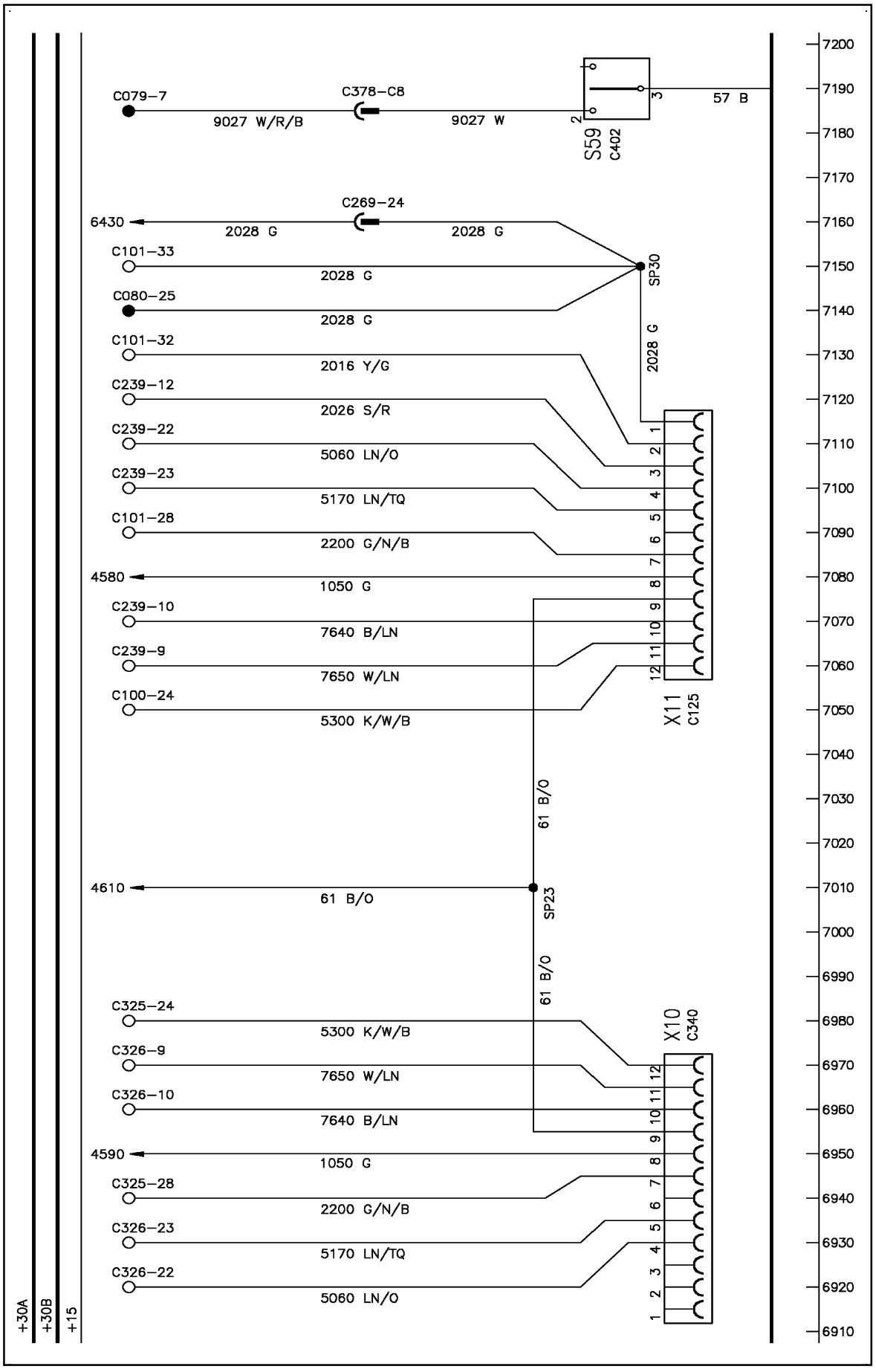
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15B
NOT APPLICABLE
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

WASHERS AND WIPERS
Line 6510-6900

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

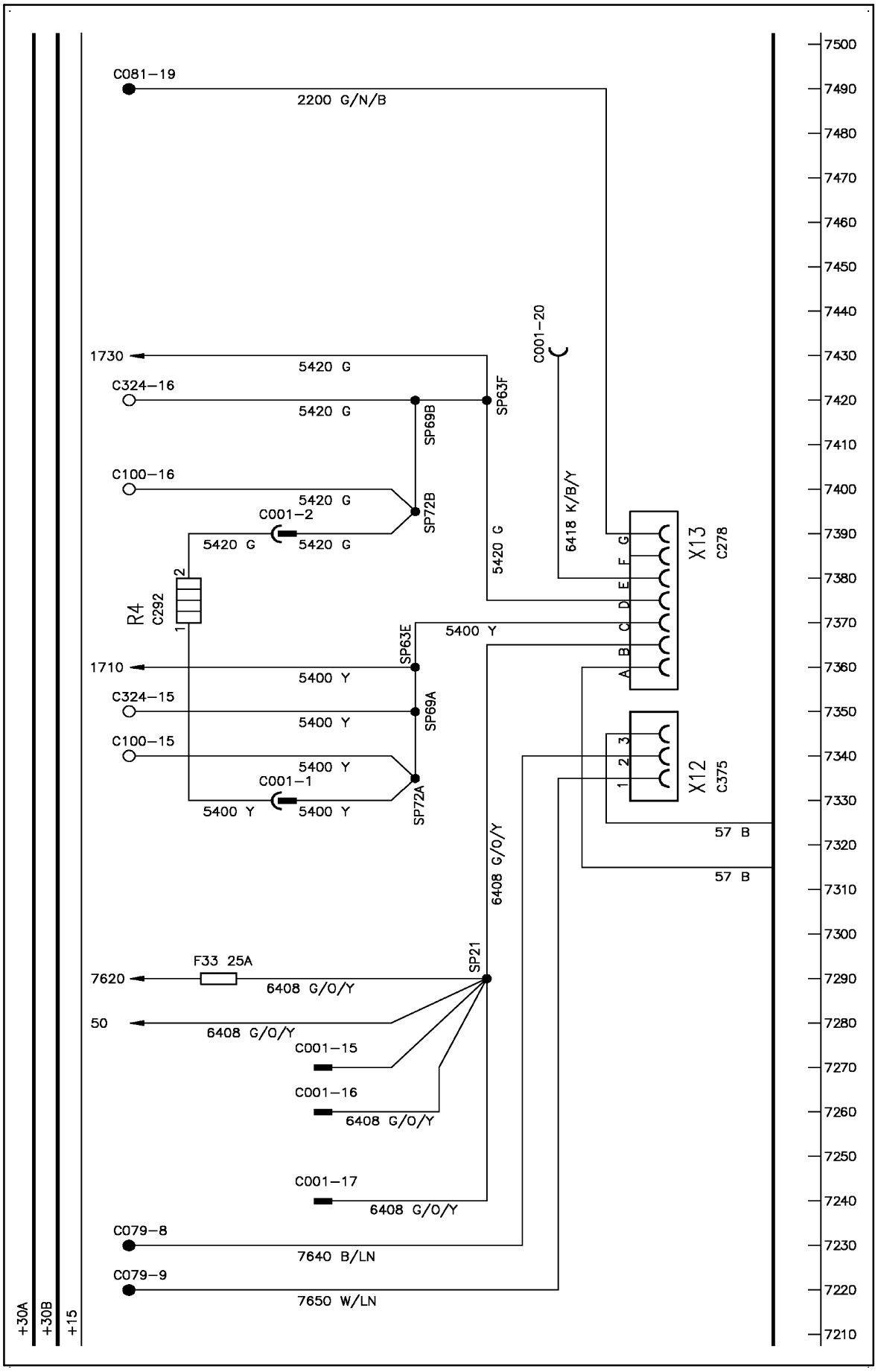

C079-7
C378-C8
9027 W/R/B
9027 W
S59
C402
57 B
C269-24
6430
2028 G
2028 G
C101-33
2028 G
C080-25
2028 G
SP30
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
61 B/O
4610
61 B/O
SP23
61 B/O
C325-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

DIAGNOSTIC PLUGS 1
Line 6910-7110

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)
X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C001-2
SP72B
5420 G
5420 G
R4
C292
2
1
C001-20
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C001-1
SP72A
5400 Y
5400 Y
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C001-15
C001-16
6408 G/O/Y
C001-17
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

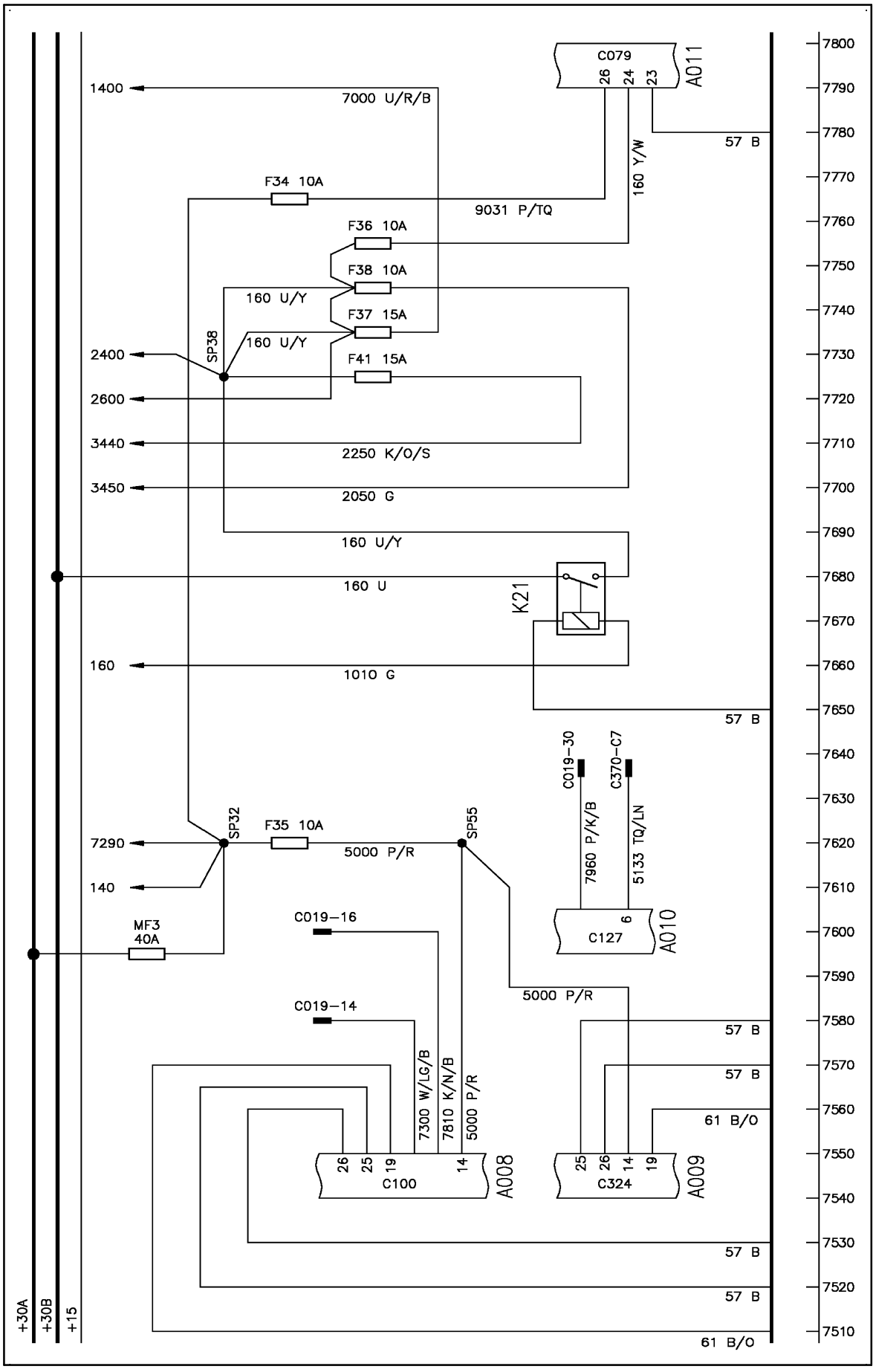
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector
X13 EST Diagnostics Connector

R4 Can Bus Terminator

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

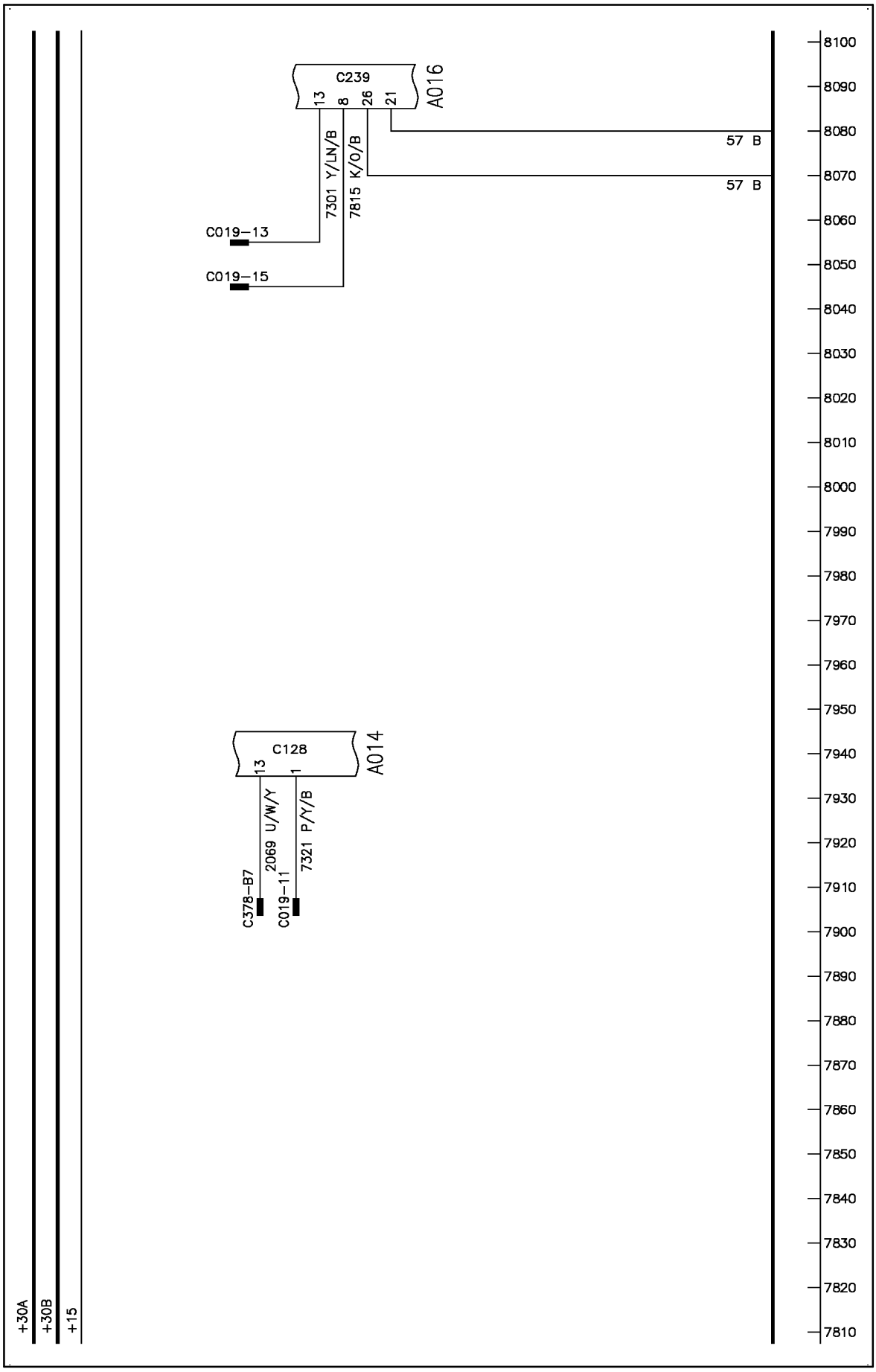

C079
26
24
23
A011
1400
7000 U/R/B
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2400
F41 15A
2600
3440
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C019-30
C370-C7
7960 P/K/B
5133 TQ/LN
SP32
F35 10A
SP55
7290
5000 P/R
140
C019-16
C127
6
A010
MF3
40A
5000 P/R
C019-14
57 B
7300 W/LG/B
7810 K/N/B
5000 P/R
57 B
61 B/O
26
25
19
C100
14
A008
25
26
14
19
C324
A009
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

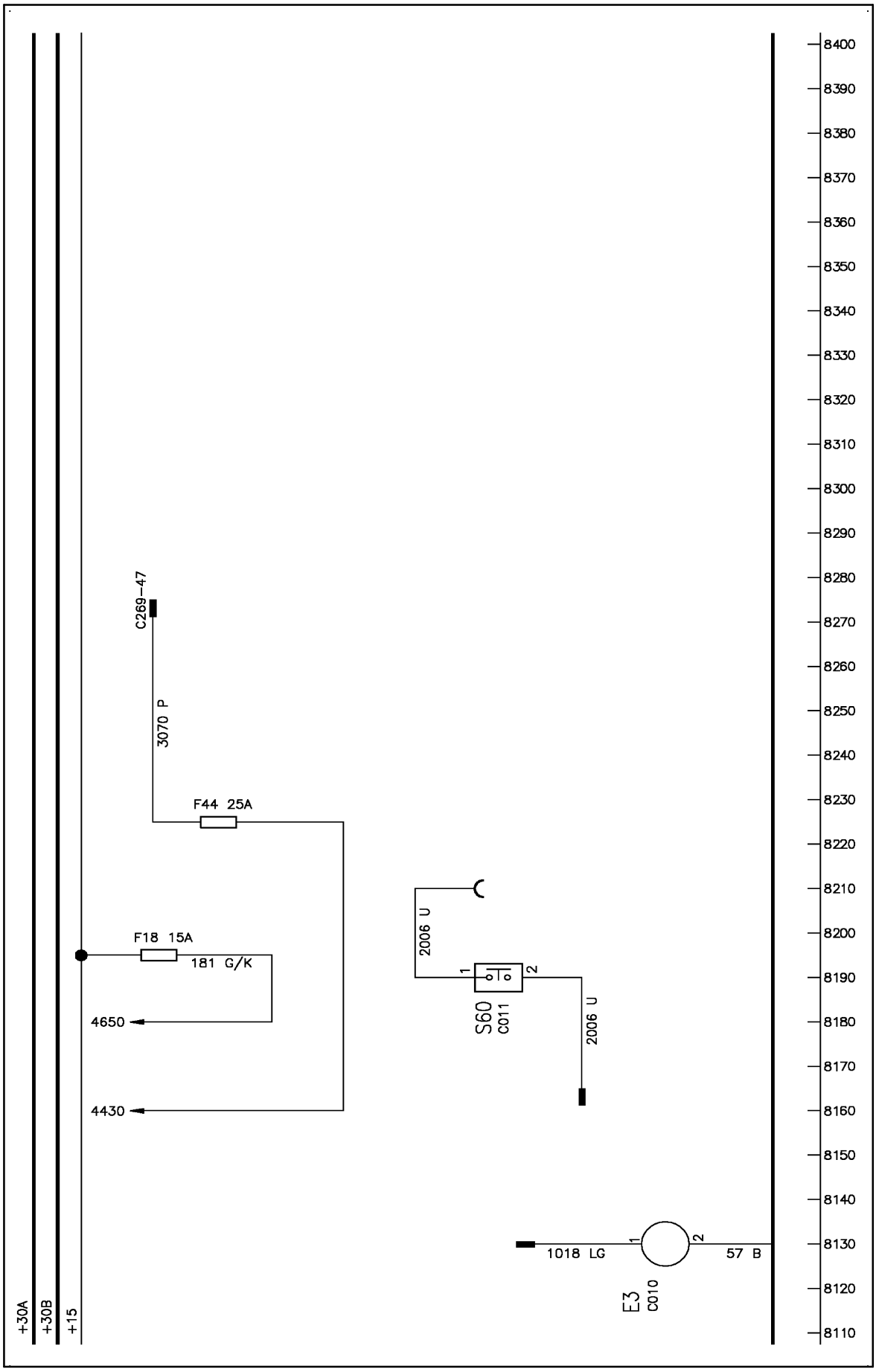

C239
13
8
26
21
A016
57 B
57 B
7301 Y/LN/B
7815 K/O/B
C019–13
C019–15
C128
13
1
A014
2069 U/W/Y
7321 P/Y/B
C378–B7
C019–11
+30A
+30B
+15
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A014 XCM Central Control Unit (CN3-B)

A016 XCM Central Control Unit (CN2)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
C269-47
3070 P
F44 25A
F18 15A
181 G/K
4650
4430
2006 U
1
2
S60
C011
2006 U
1018 LG
1
2
57 B
E3
C010
+30A
+30B
+15

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

F18 Fuse - 15A

F44 Fuse - 25A

E3 A/C Clutch

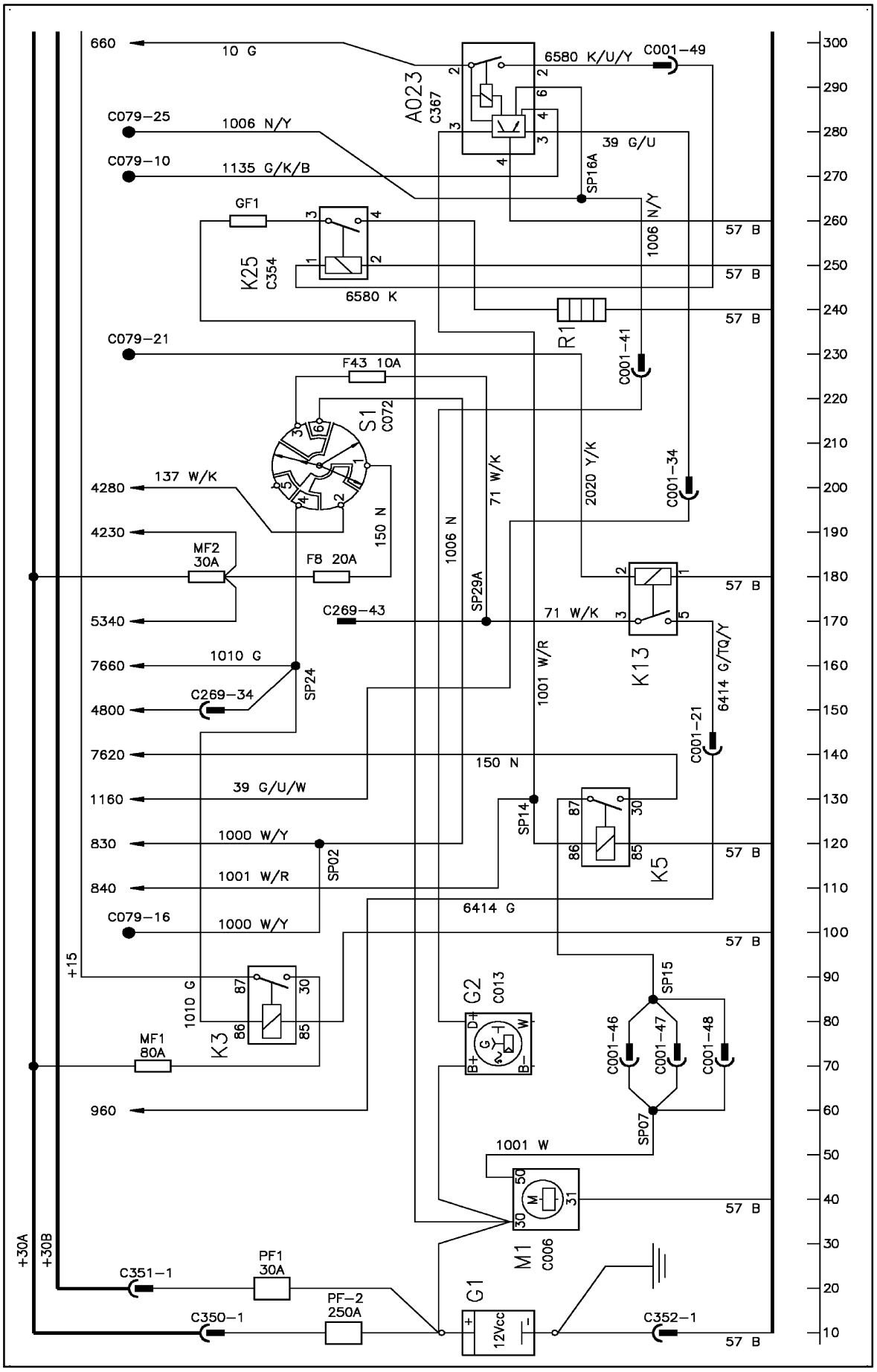
S60 A/C Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

12X12 TRANSMISSION, W/CAB, W/MECHANICAL ENGINE

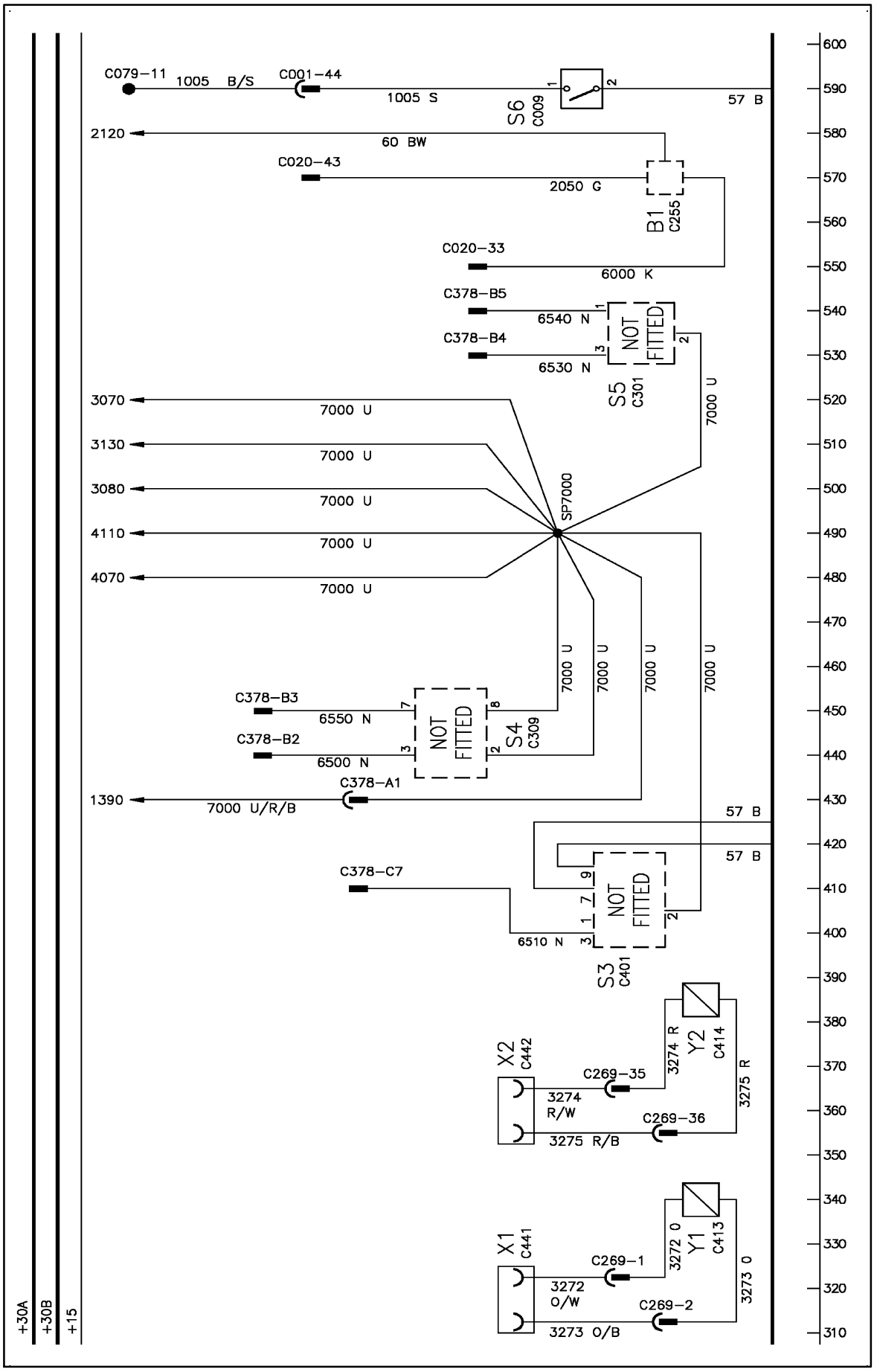
Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400


660
10 G
A023
C367
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C079-10
1135 G/K/B
39 G/U
SP16A
GF1
K25
C354
6580 K
1006 N/Y
57 B
R1
C001-41
C079-21
F43 10A
S1
C072
137 W/K
4280
4230
MF2
30A
F8 20A
150 N
1006 N
71 W/K
2020 Y/K
C001-34
SP29A
C269-43
71 W/K
5340
1010 G
7660
SP24
C269-34
4800
1001 W/R
K13
6414 G/TQ/Y
C001-21
7620
150 N
1160
39 G/U/W
SP14
830
1000 W/Y
SP02
K5
840
1001 W/R
6414 G
C079-16
1000 W/Y
+15
1010 G
K3
G2
C013
SP15
MF1
80A
C001-46
C001-47
C001-48
960
SP07
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
G1
12Vcc
C350-1
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

STARTING AND CHARGING
line 0-300

MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF	Grid Heater Fuse
PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
F8	Fuse - 20A
F43	Fuse - 10A
A023	Grid Heater Module
G1	Battery
G2	Alternator
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
M1	Starter Motor and Solenoid
R1	Grid Heater
S1	Ignition Switch

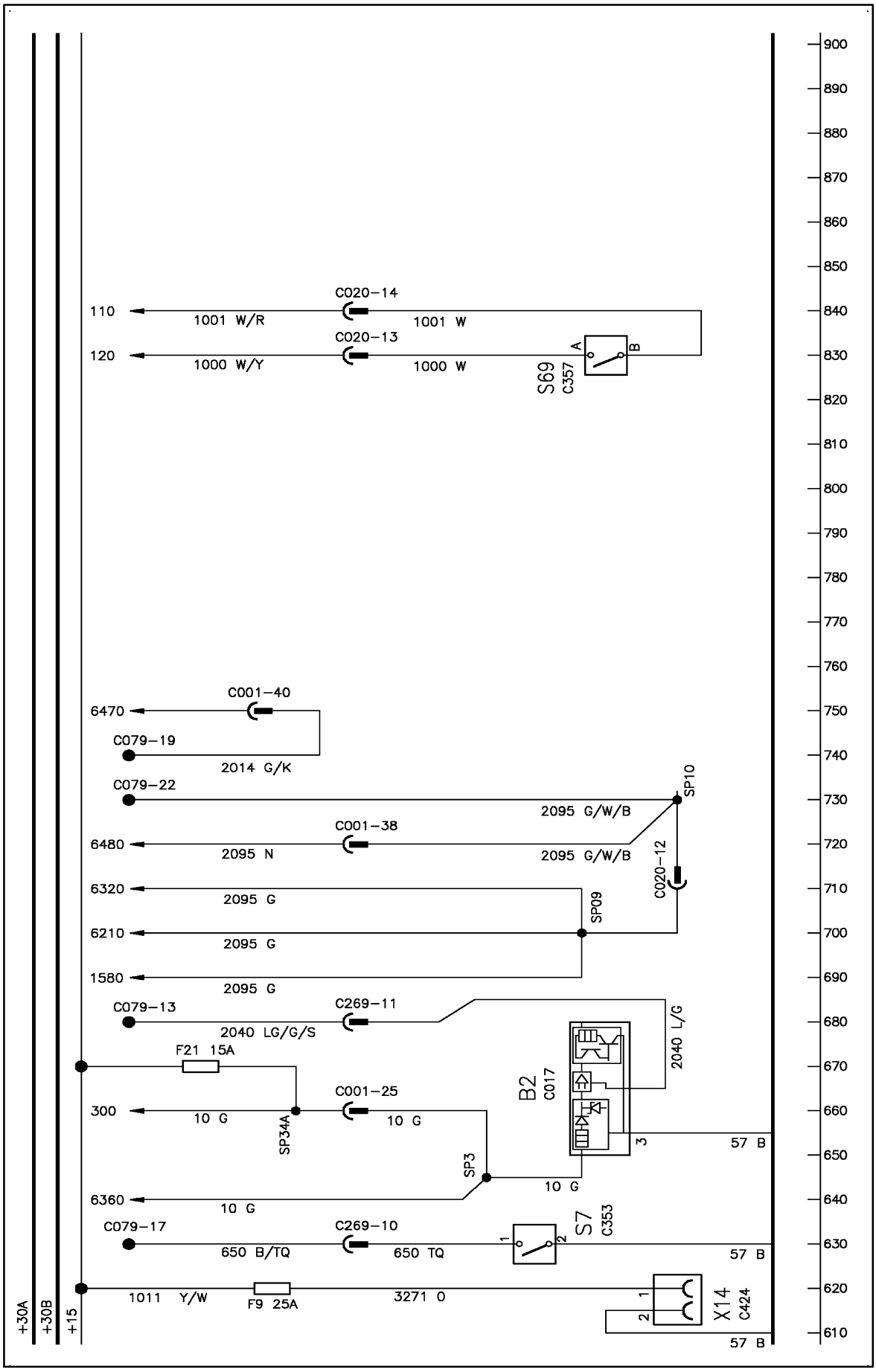
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
1005 B/S
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
2050 G
B1 C255
C020-33
6000 K
C378-B5
6540 N
C378-B4
6530 N
NOT FITTED
S5 C301
7000 U
3070
3130
3080
4110
4070
SP7000
C378-B3
6550 N
C378-B2
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C378-C7
6510 N
S3 C401
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

ENGINE 1
line 310-600

B1	Engine Flywheel Speed Sensor
S3	Constant Engine Speed programme Switch (Not Fitted)
S4	Constant ERPM On/Off Switch (Not Fitted)
S5	Engine Inc./Dec. Switch (Not Fitted)
S6	Air Cleaner Switch
Y1	Loader Valve 1
Y2	Loader Valve 2
X1	Joystick Loader Control Socket 1
X2	Joystick Loader Control Socket 2

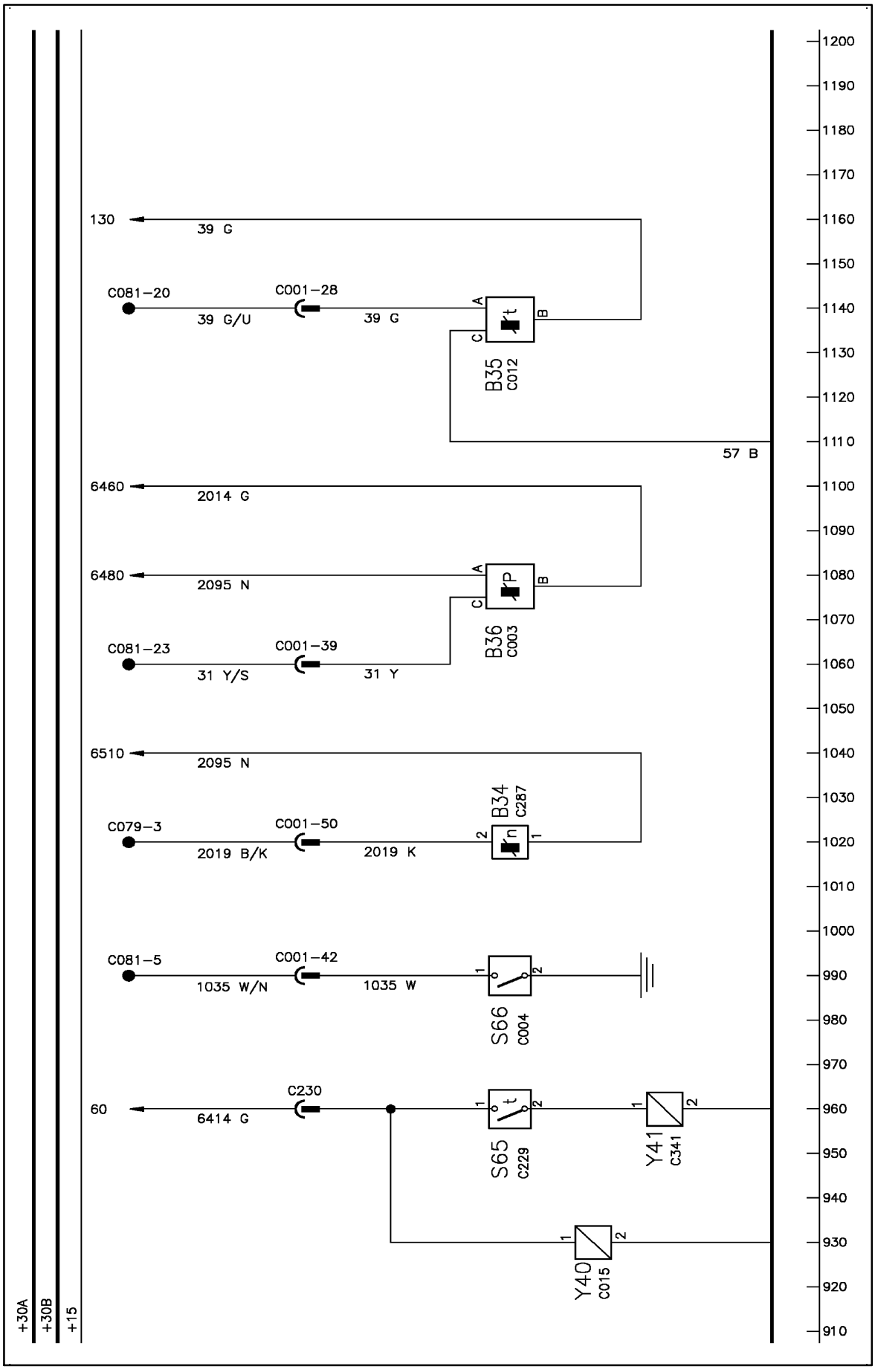
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
110
1001 W/R
C020-14
1001 W
120
1000 W/Y
C020-13
1000 W
S69
C357
A
B
6470
C001-40
C079-19
2014 G/K
C079-22
2095 G/W/B
SP10
6480
C001-38
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
1580
2095 G
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
300
10 G
SP34A
C001-25
10 G
3
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 TQ
S7
C353
57 B
1011 Y/W
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A	**S69**	Starter Inhibitor
B2	Water In Fuel Sensor	**X14**	Loader Power Connector

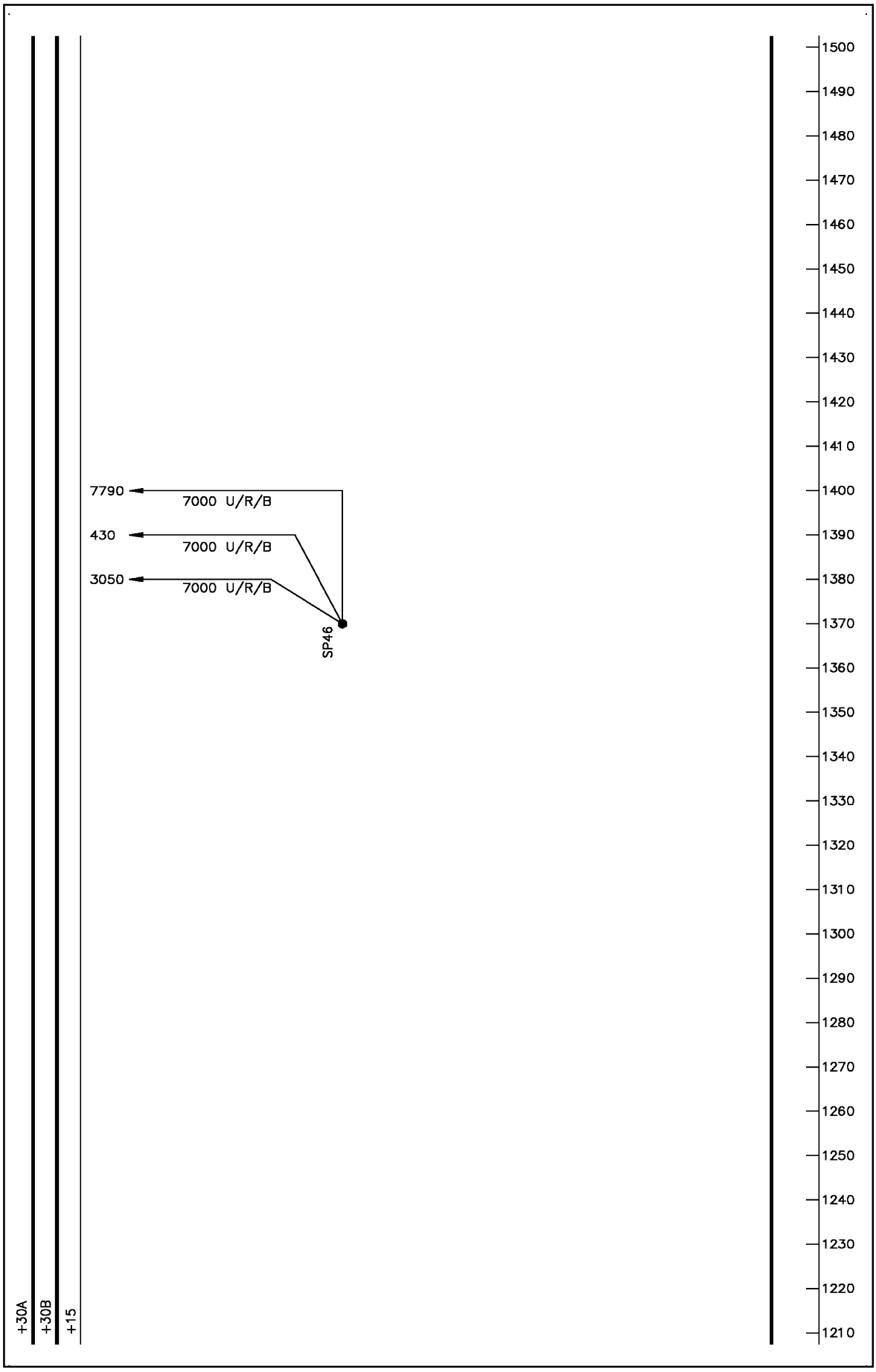
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
130
39 G
C081-20
39 G/U
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
C081-23
31 Y/S
C001-39
31 Y
B36
C003
6510
2095 N
C079-3
2019 B/K
C001-50
2019 K
B34
C287
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
C230
S65
C229
Y41
C341
Y40
C015

ENGINE 3
line 910-1200

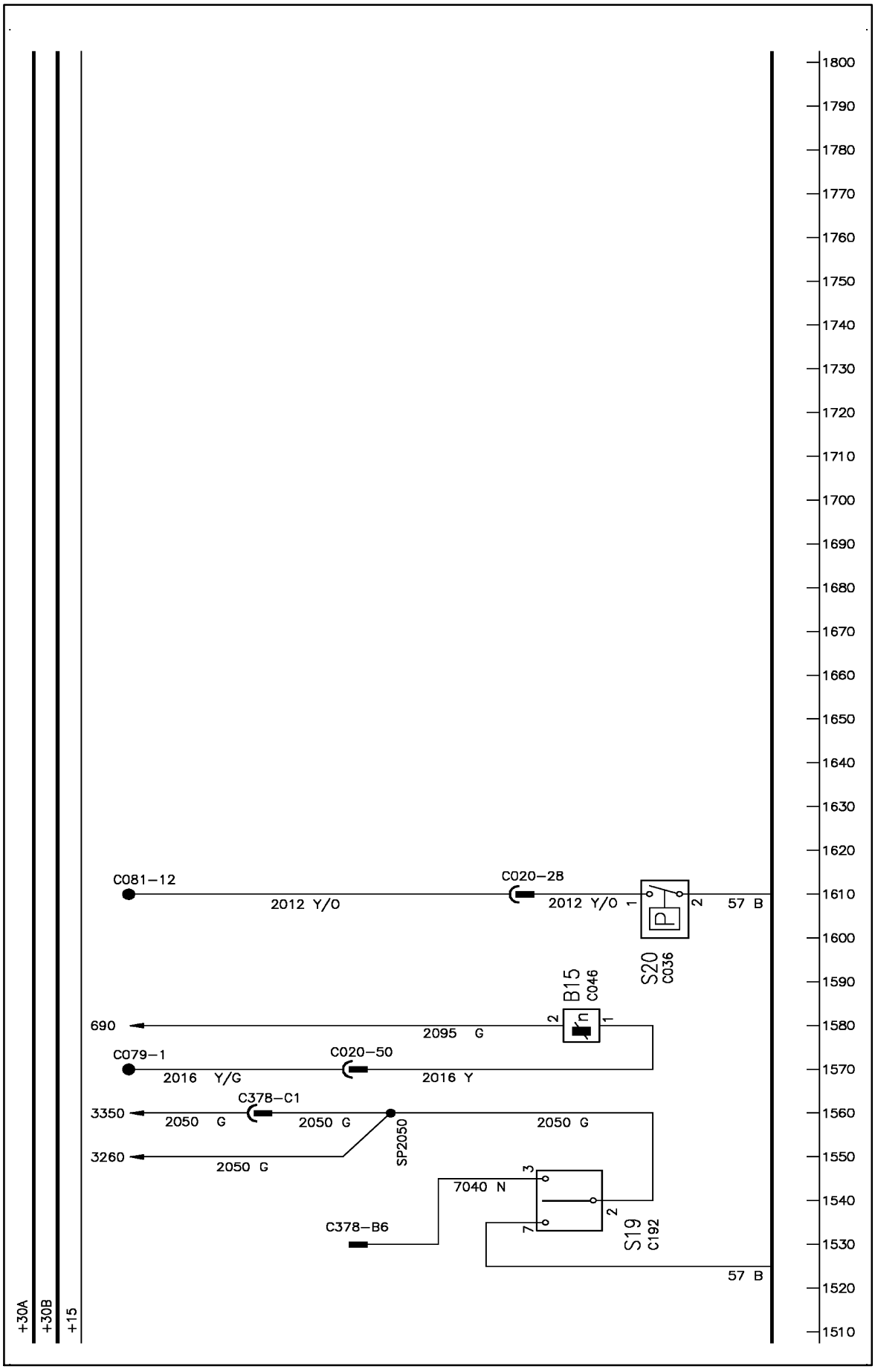
B34	Engine Speed Sensor		
B35	Coolant Temperature Sensor	**Y40**	Fuel Shut Off Solenoid
B36	Oil Pressure Sensor	**Y41**	Cold Advance Solenoid
S65	Thermo Cold Advance Switch		
S66	Oil Pressure Switch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
7790
7000 U/R/B
430
7000 U/R/B
3050
7000 U/R/B
SP46
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

TRANSMISSION SYSTEM 1
Line 1210-1500

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510
C081-12
2012 Y/O
C020-28
2012 Y/O
1
P
2
57 B
S20
C036
B15
C046
2
n
1
690
2095 G
C079-1
2016 Y/G
C020-50
2016 Y
C378-C1
3350
2050 G
2050 G
2050 G
3260
2050 G
SP2050
3
7040 N
2
7
S19
C192
C378-B6
57 B

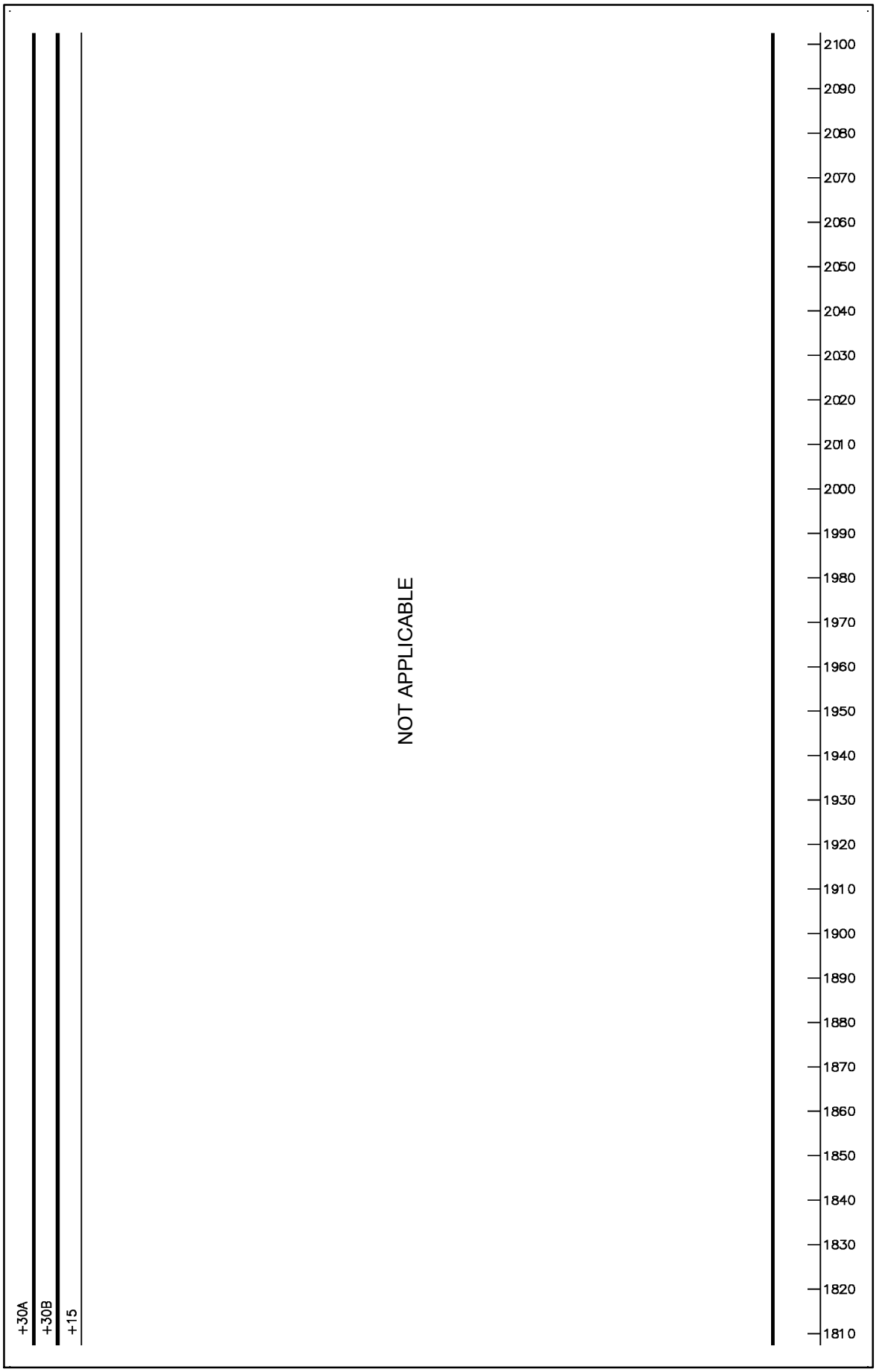
TRANSMISSION SYSTEM 2
Line 1510-1800

B15 Speed Sensor

S19 Creeper Gear Switch

S20 Transmission Oil Pressure Switch

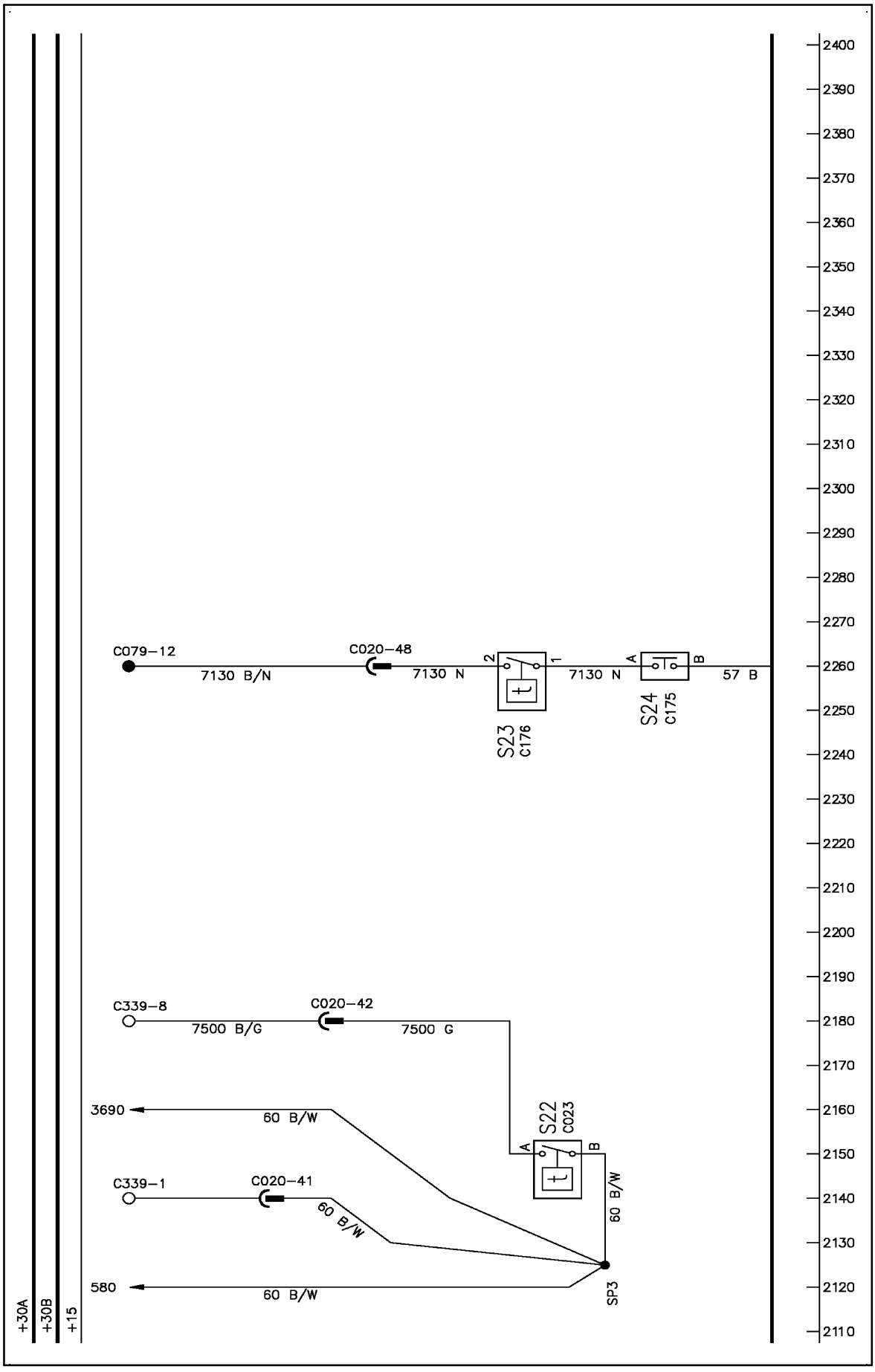
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110
C079-12
7130 B/N
C020-48
7130 N
2
1
7130 N
A
B
57 B
S23
C176
S24
C175
C339-8
7500 B/G
C020-42
7500 G
3690
60 B/W
S22
C023
A
B
C339-1
C020-41
60 B/W
60 B/W
580
60 B/W
SP3
+30A
+30B
+15

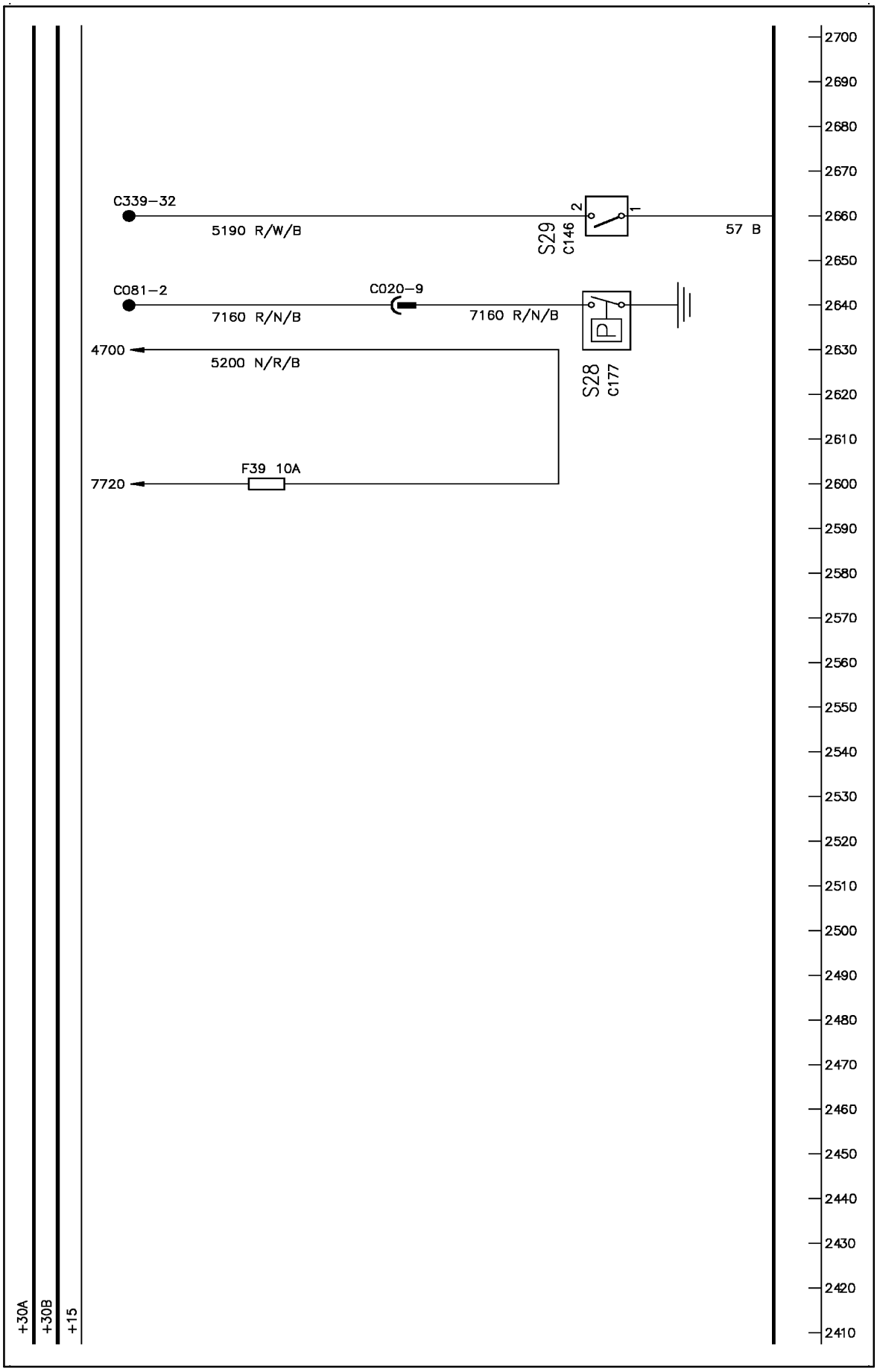
HYDRAULICS 1
Line 2110-2400

S22 Transmission Oil Temp Sensor

S23 Oil Temperature Switch

S24 HPL Filter Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C339-32
5190 R/W/B
S29
C146
2
1
57 B
C081-2
7160 R/N/B
C020-9
7160 R/N/B
P
S28
C177
4700
5200 N/R/B
F39 10A
7720
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

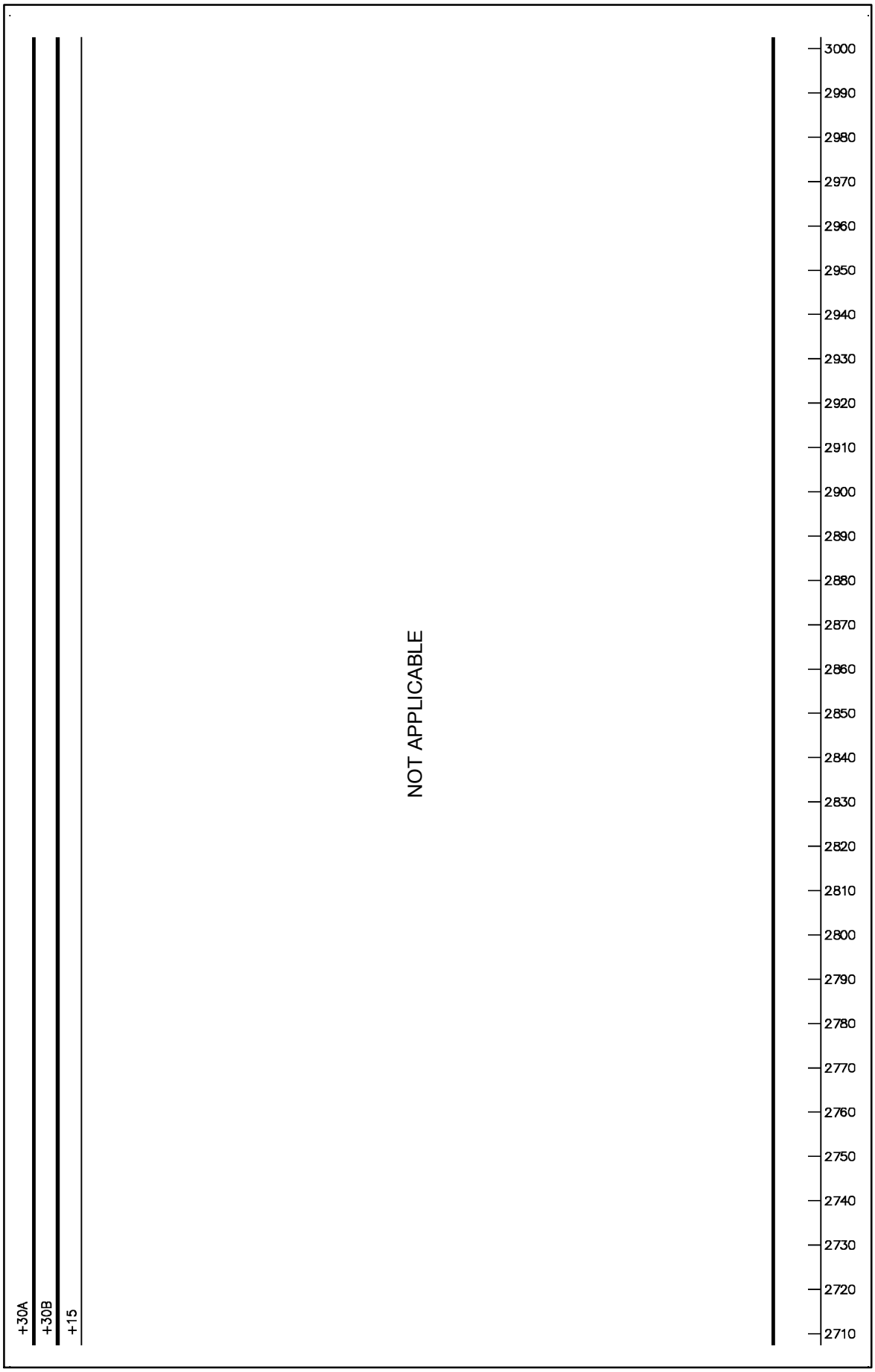
HYDRAULICS 2
Line 2410-2700

F39 Fuse - 10A

S28 Lo Charge Switch

S29 Lift-O-Matic Switch

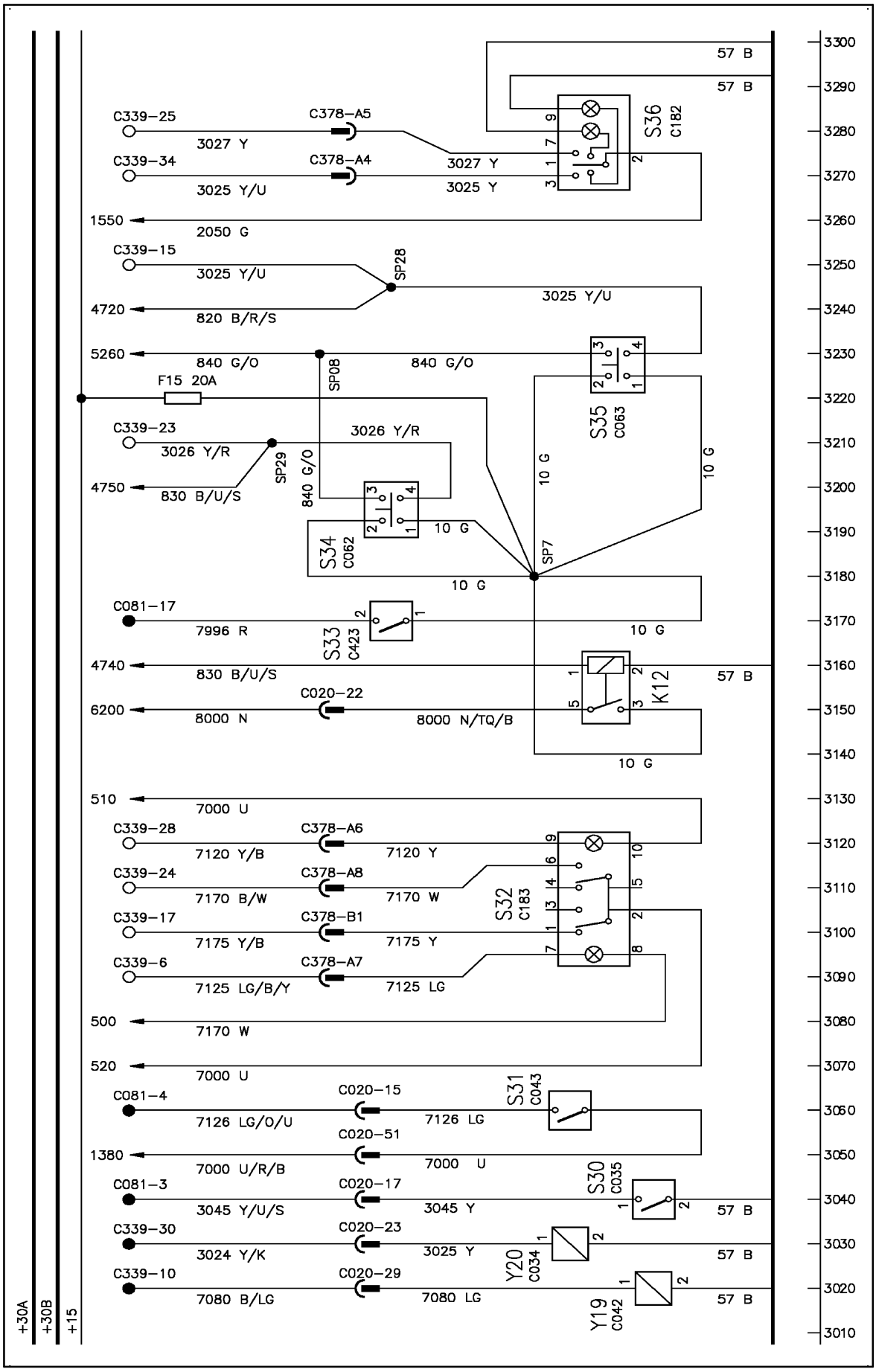
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

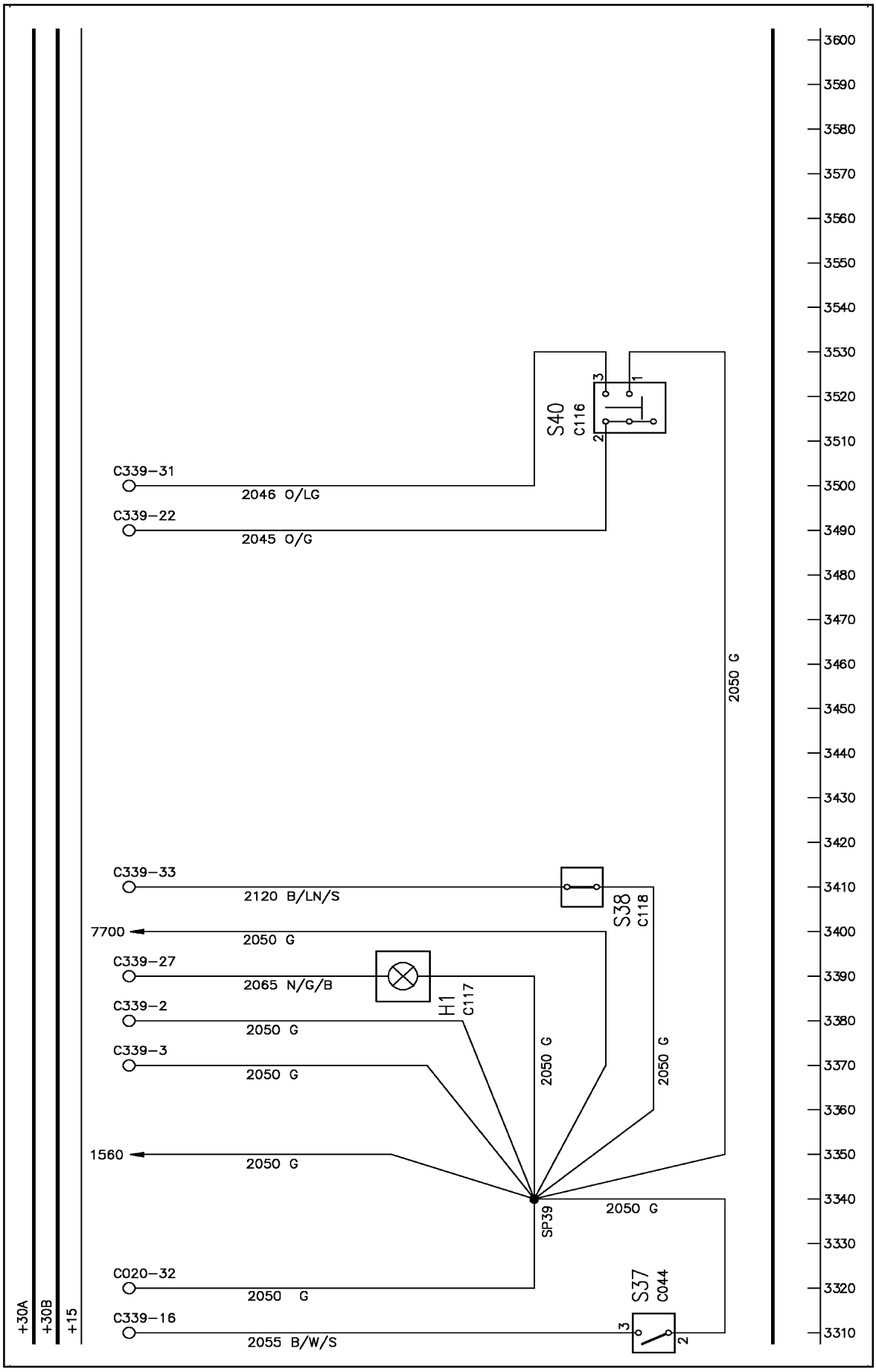
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
57 B
C339-25
C378-A5
3027 Y
C339-34
C378-A4
3025 Y/U
3027 Y
3025 Y
S36
C182
1550
2050 G
C339-15
3025 Y/U
SP28
4720
820 B/R/S
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C339-23
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
830 B/U/S
10 G
S34
C062
SP7
C081-17
7996 R
S33
C423
4740
830 B/U/S
C020-22
6200
8000 N
8000 N/TQ/B
K12
510
7000 U
C339-28
C378-A6
7120 Y/B
7120 Y
C339-24
C378-A8
7170 B/W
7170 W
C339-17
C378-B1
7175 Y/B
7175 Y
C339-6
C378-A7
7125 LG/B/Y
7125 LG
S32
C183
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG
S31
C043
C020-51
1380
7000 U/R/B
7000 U
C081-3
C020-17
3045 Y/U/S
3045 Y
S30
C035
C339-30
C020-23
3024 Y/K
3025 Y
Y20
C034
C339-10
C020-29
7080 B/LG
7080 LG
Y19
C042
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

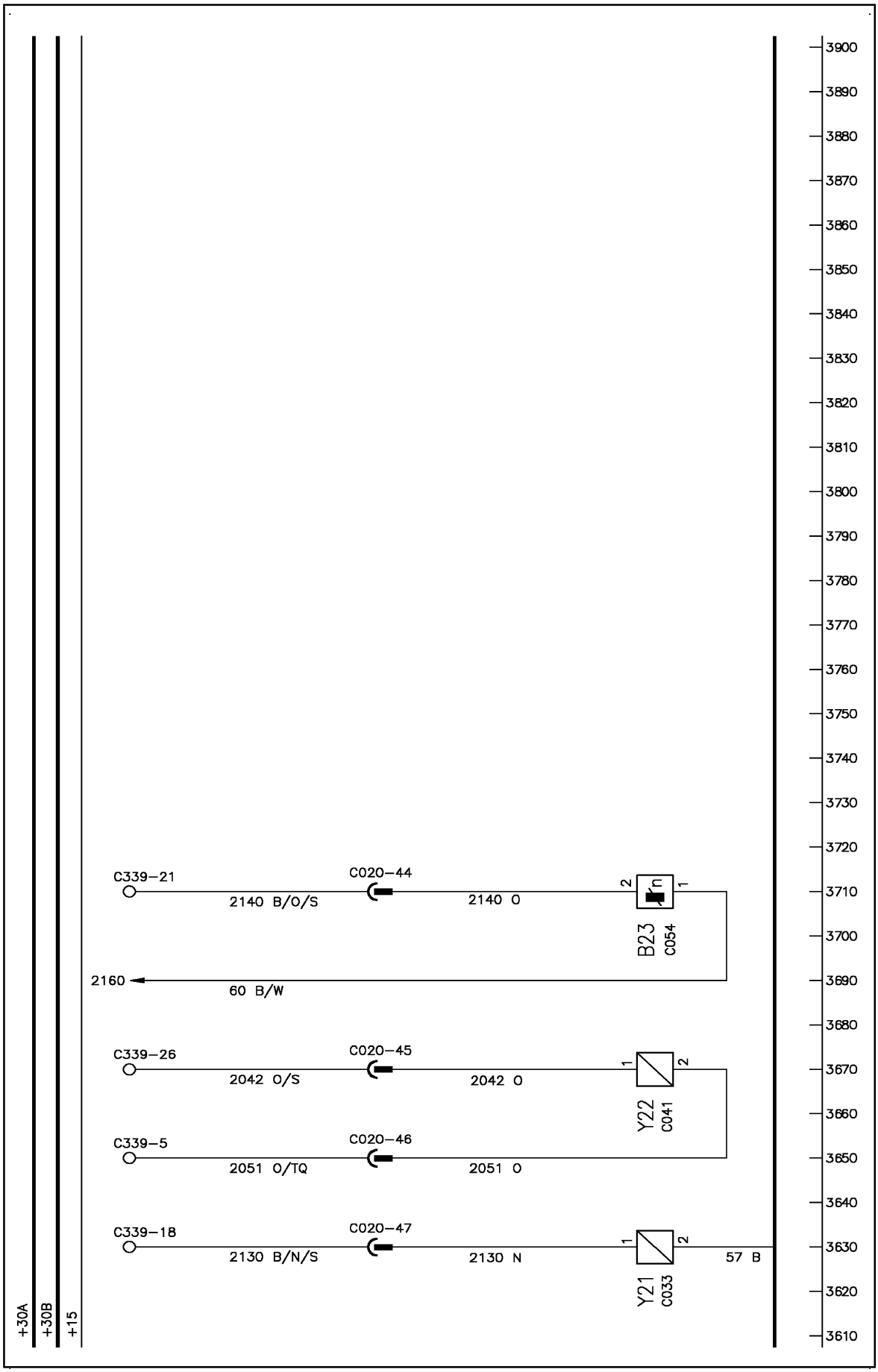

+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310
S40
C116
3
1
2
C339-31
2046 O/LG
C339-22
2045 O/G
2050 G
C339-33
2120 B/LN/S
S38
C118
7700
2050 G
C339-27
2065 N/G/B
H1
C117
C339-2
2050 G
C339-3
2050 G
2050 G
2050 G
1560
2050 G
SP39
2050 G
C020-32
2050 G
S37
C044
C339-16
2055 B/W/S
3
2

POWER TAKE OFF 1
Line 3310-3600

H1 Rear PTO Lamp

S37 Ground Speed PTO Switch
S38 Rear PTO Brake Switch
S40 Rear PTO Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

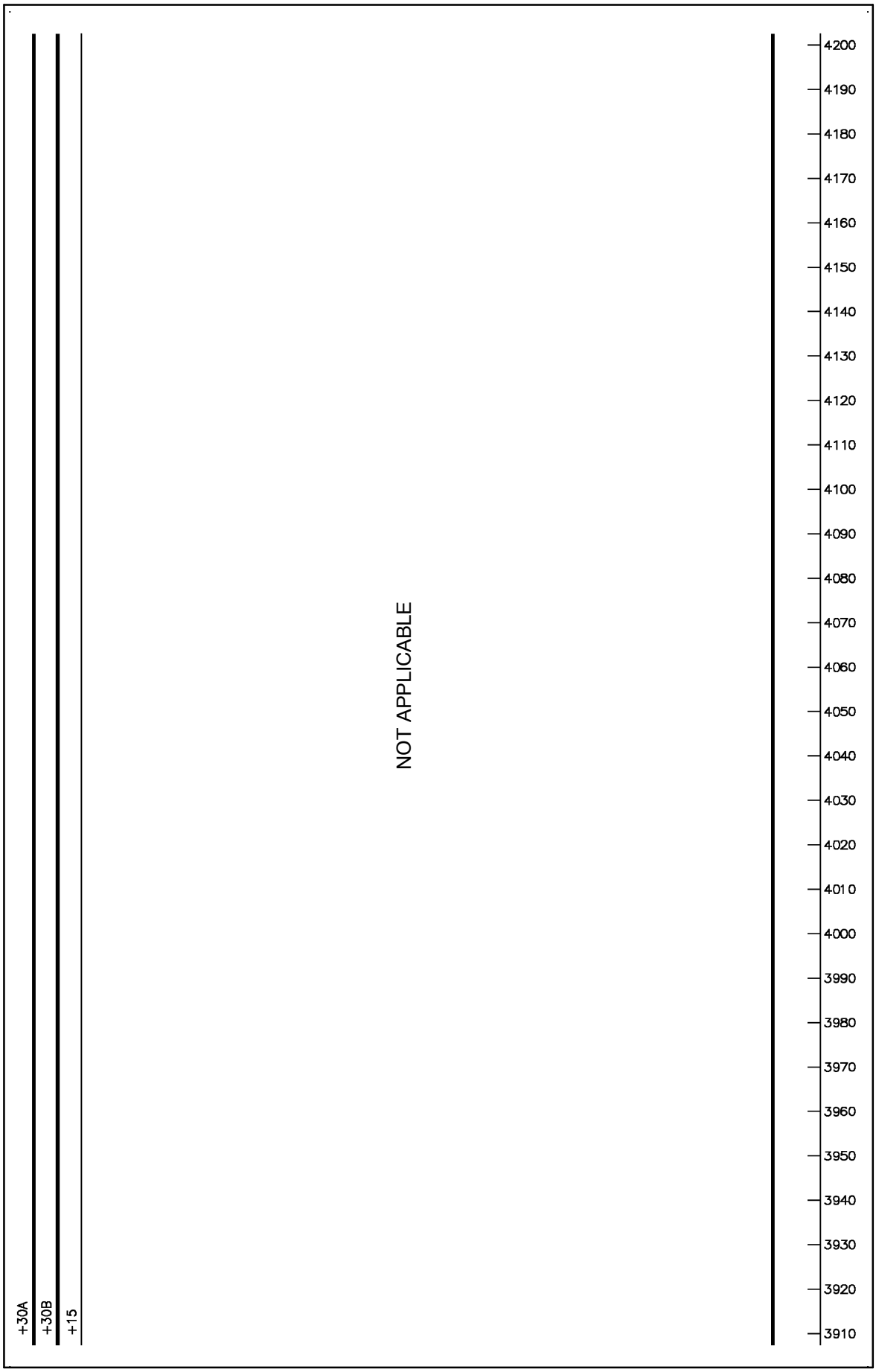

+30A
+30B
+15
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610
C339-21
2140 B/O/S
C020-44
2140 O
2
1
B23
C054
2160
60 B/W
C339-26
2042 O/S
C020-45
2042 O
1
2
Y22
C041
C339-5
2051 O/TQ
C020-46
2051 O
C339-18
2130 B/N/S
C020-47
2130 N
57 B
Y21
C033

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

Y21 PTO Brake Solenoid
Y22 PTO Clutch Solenoid

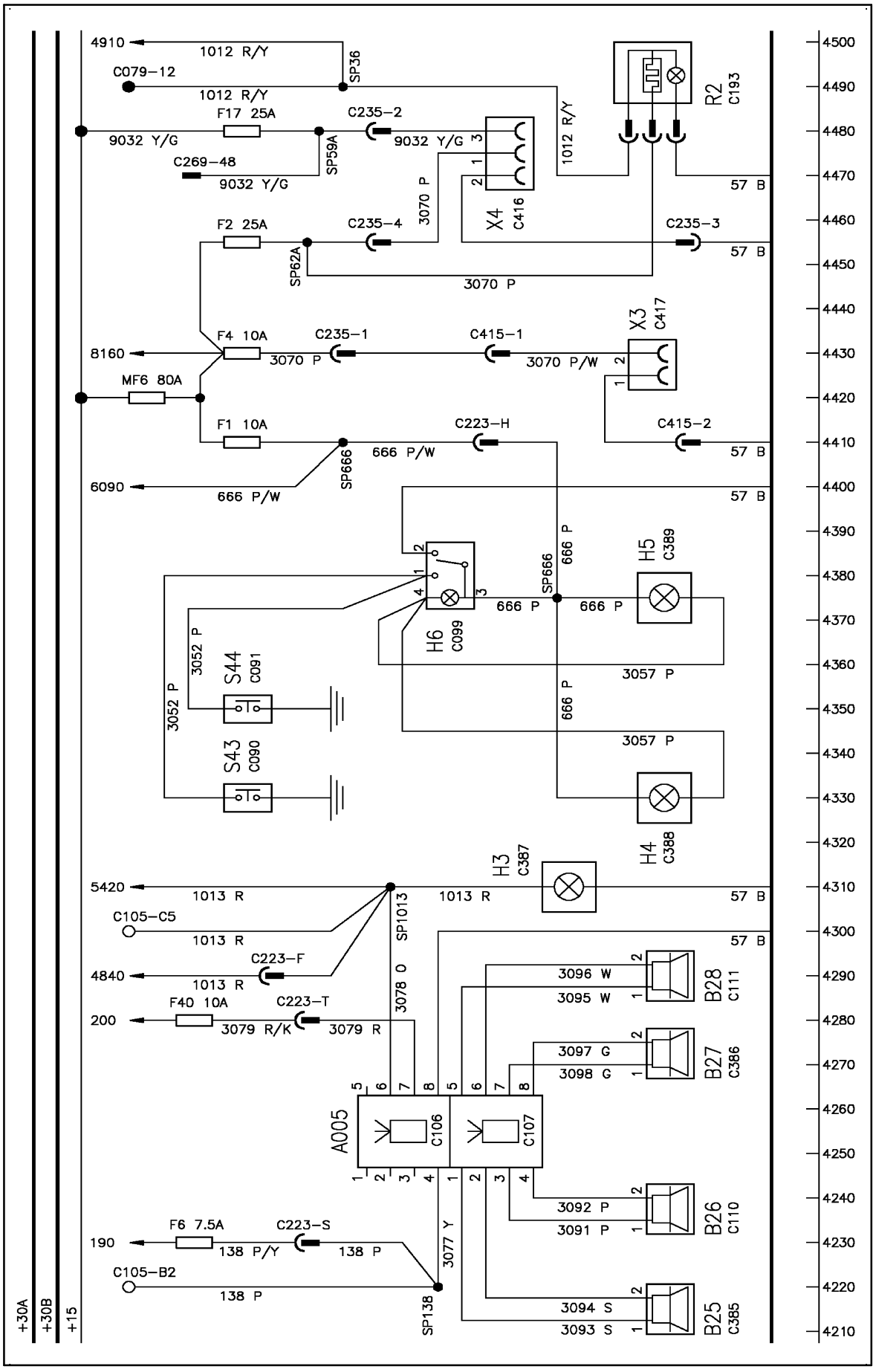
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

NOT APPLICABLE

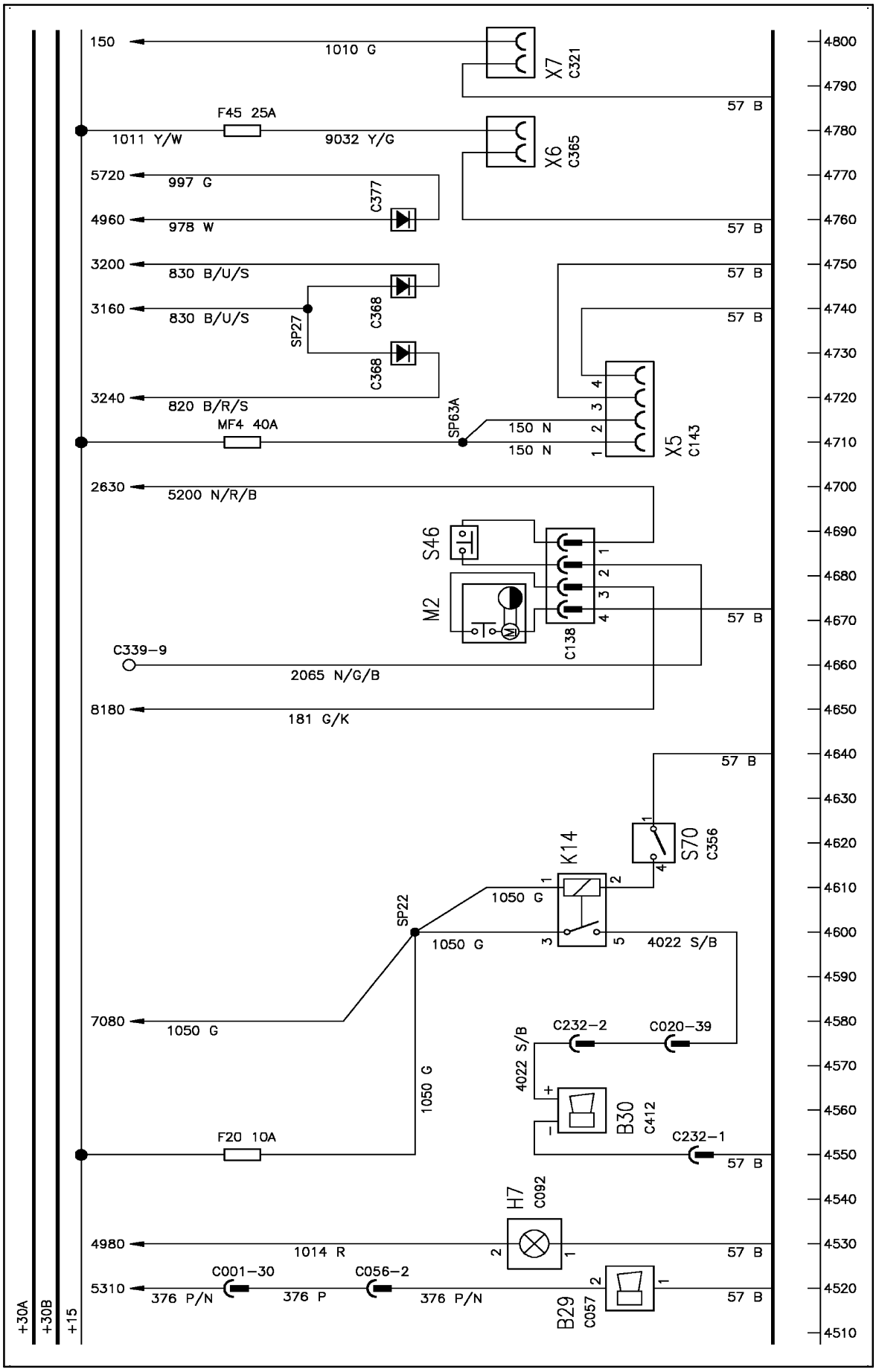
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4910
1012 R/Y
SP36
C079-12
1012 R/Y
F17 25A
C235-2
9032 Y/G
9032 Y/G
SP59A
C269-48
9032 Y/G
3070 P
X4 C416
1012 R/Y
R2 C193
57 B
F2 25A
C235-4
C235-3
SP62A
57 B
3070 P
X3 C417
F4 10A
C235-1
C415-1
8160
3070 P
3070 P/W
MF6 80A
F1 10A
C223-H
C415-2
SP666
666 P/W
57 B
6090
666 P/W
H5 C389
666 P
666 P
H6 C099
3052 P
S44 C091
3057 P
3052 P
666 P
S43 C090
3057 P
H4 C388
H3 C387
5420
1013 R
1013 R
57 B
C105-C5
1013 R
SP1013
C223-F
4840
1013 R
3078 O
F40 10A
C223-T
200
3079 R/K
3079 R
3096 W
3095 W
B28 C111
3097 G
3098 G
B27 C386
A005
C106
C107
3092 P
3091 P
B26 C110
F6 7.5A
C223-S
190
138 P/Y
138 P
3077 Y
C105-B2
138 P
SP138
3094 S
3093 S
B25 C385
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

CAB ACCESSORIES 1
Line 4210-4500

MF6	Maxi Fuse - 80A
F1	Fuse - 10A
F2	Fuse - 25A
F4	Fuse - 10A
F6	Fuse - 7.5A
F17	Fuse - 25A
F40	Fuse - 10A
A005	Radio
B25	Speaker L/H Rear
B26	Speaker R/H Front
B27	Speaker R/H Rear
B28	Speaker L/H Front
H3	Console Lamp R/H
H4	Puddle Lamp L/H
H5	Puddle Lamp R/H
H6	Interior Lamp
R2	Cigar Lighter
S43	Door Switch L/H
S44	Door Switch R/H
X3	8 Amp Terminals
X4	20 Amp Multi Socket

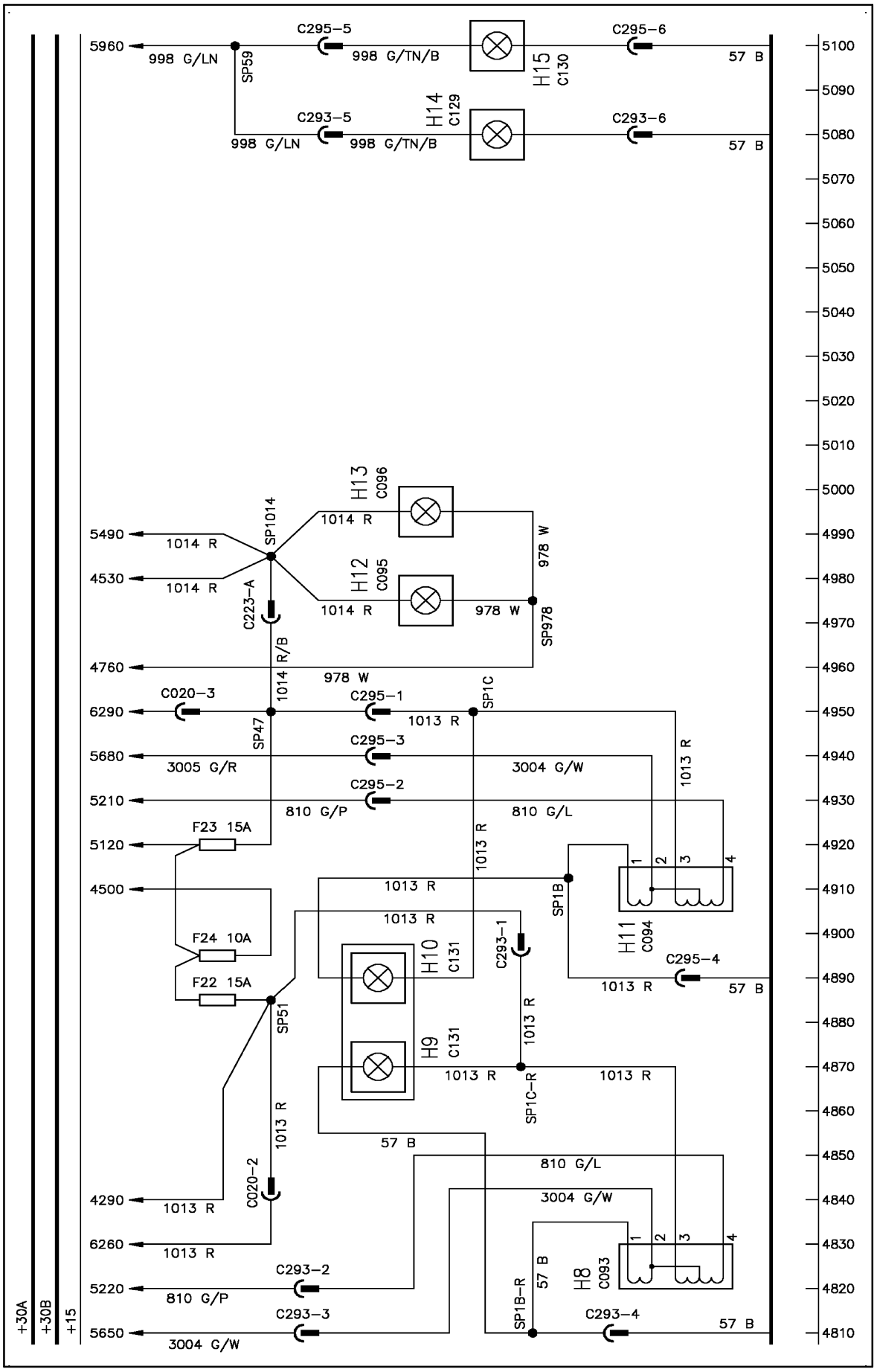
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


150
1010 G
X7
C321
57 B
F45 25A
1011 Y/W
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
57 B
C368
3240
820 B/R/S
SP63A
MF4 40A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C339-9
2065 N/G/B
8180
181 G/K
57 B
S70
C356
K14
SP22
1050 G
1050 G
4022 S/B
7080
1050 G
C232-2
C020-39
4022 S/B
B30
C412
C232-1
1050 G
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
B29	Horn
B30	Reverse Alarm
C368(1)	Diode
C368(2)	Diode
C377	Diode
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
S70	Reverse Alarm Switch
X5	Implement Socket Rear
X6	8 Amp Socket
X7	Dealer Installed Accessory(DIA)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

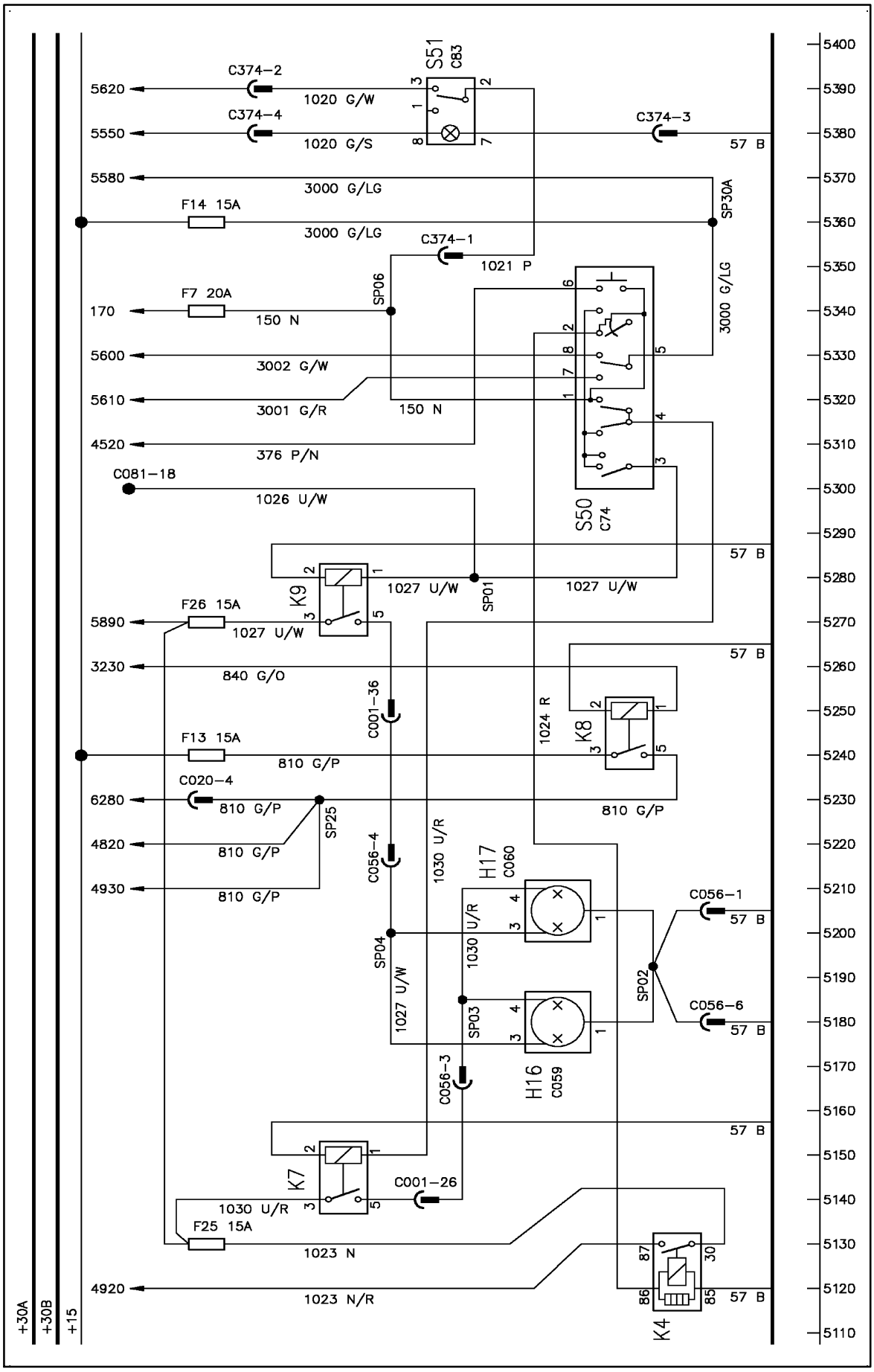

5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15
C130
C295-6
57 B
H14
C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810
H13
C096
SP1014
5490
1014 R
1014 R
H12
C095
978 W
4530
1014 R
C223-A
1014 R
978 W
SP978
4760
1014 R/B
978 W
C020-3
6290
SP47
1014
C295-1
1013 R
SP1C
C295-3
5680
3005 G/R
3004 G/W
1013 R
C295-2
5210
810 G/P
810 G/L
F23 15A
5120
1013 R
4500
1013 R
SP1B
1 2 3 4
H11
C094
F24 10A
1013 R
H10
C131
C293-1
C295-4
F22 15A
1013 R
57 B
SP51
H9
C131
1013 R
1013 R
1013 R
SP1C-R
57 B
810 G/L
C020-2
4290
1013 R
3004 G/W
6260
1013 R
1 2 3 4
H8
C093
C293-2
5220
810 G/P
57 B
SP1B-R
C293-3
5650
3004 G/W
C293-4
57 B
+30A
+30B
+15

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A

H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender L/H
H10	Licence Plate Lamp - Fender R/H
H11	Stop/Tail Light L/H
H12	Licence Plate Lamp L/H
H13	Licence Plate Lamp R/H
H14	Worklamp R/H
H15	Worklamp L/H

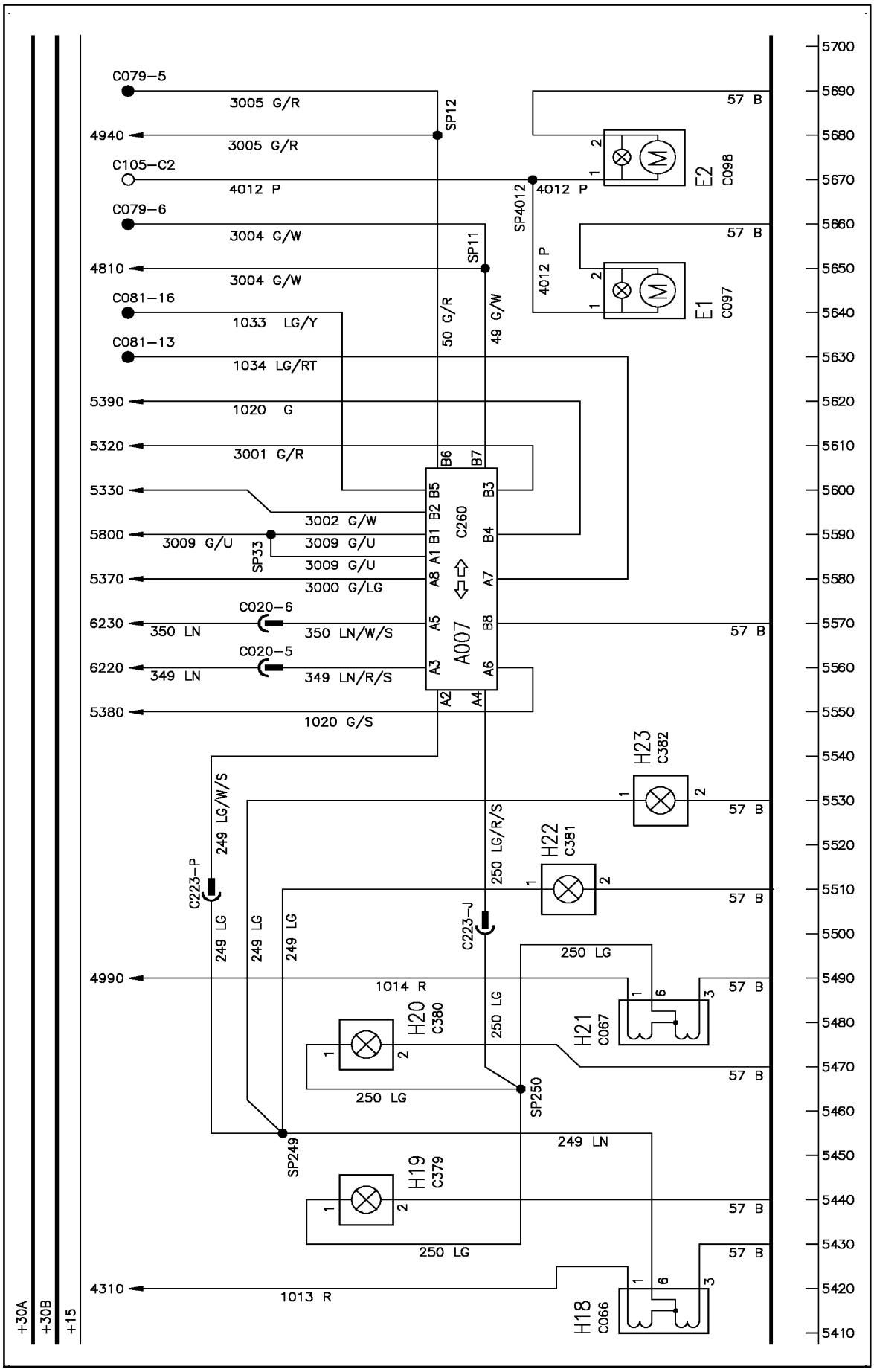
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
5620
C374-2
1020 G/W
5550
C374-4
1020 G/S
S51
C83
C374-3
57 B
5580
3000 G/LG
F14 15A
3000 G/LG
SP30A
C374-1
1021 P
SP06
170
F7 20A
150 N
5600
3002 G/W
5610
3001 G/R
150 N
4520
376 P/N
C081-18
1026 U/W
S50
C74
57 B
K9
1027 U/W
SP01
1027 U/W
5890
F26 15A
1027 U/W
3230
840 G/O
C001-36
1024 R
K8
F13 15A
810 G/P
6280
C020-4
810 G/P
SP25
4820
810 G/P
4930
810 G/P
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
1030 U/R
SP03
C056-3
H16
C059
C056-1
C056-6
SP02
K7
C001-26
1030 U/R
F25 15A
1023 N
4920
1023 N/R
K4
87
30
86
85
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

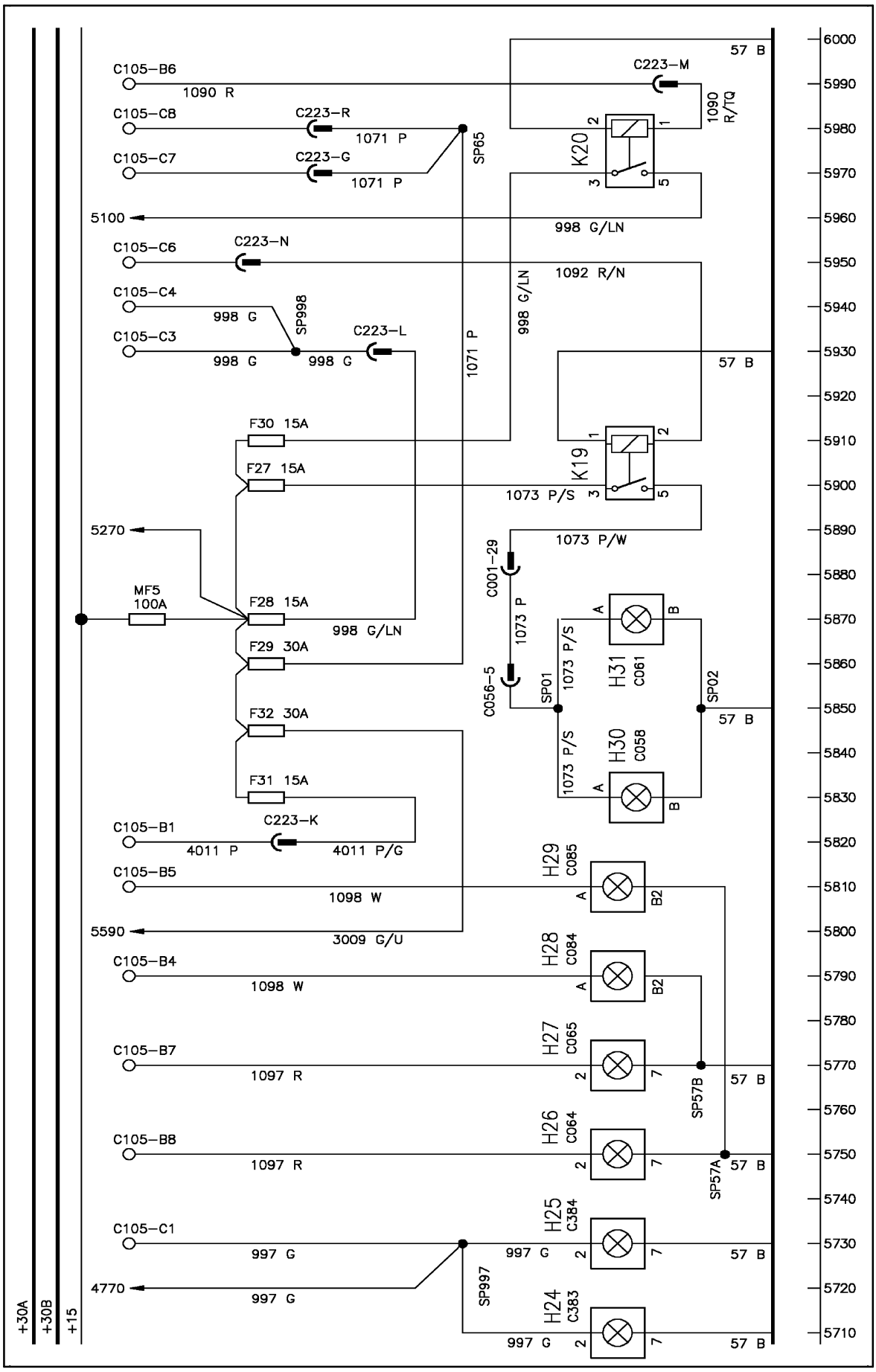
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
C105-C2
4012 P
C079-6
3004 G/W
4810
3004 G/W
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5390
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN
350 LN/W/S
C020-5
6220
349 LN
349 LN/R/S
5380
1020 G/S
SP12
SP11
50 G/R
49 G/W
SP4012
4012 P
4012 P
57 B
E2
C098
57 B
E1
C097
A007
C260
B6 B7 B5 B3 B2 B1 B4 A8 A1 A7 A5 B8 A3 A6 A2 A4
57 B
H23
C382
57 B
H22
C381
250 LG/R/S
57 B
C223-P
249 LG/W/S
249 LG
249 LG
249 LG
C223-J
250 LG
4990
1014 R
57 B
H20
C380
250 LG
H21
C067
57 B
250 LG
SP250
SP249
249 LN
H19
C379
57 B
250 LG
57 B
4310
1013 R
H18
C066
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410
+30A
+30B
+15

INDICATORS AND HAZARDS 3
Line 5410-5700

A007	Flasher Unit
E1	Rotating Beacon L/H
E2	Rotating Beacon R/H
H18	Grabrail Sidelamp R/H
H19	SMV Lamp - Front L/H
H20	SMV Lamp - Rear L/H
H21	Grabrail Sidelamp L/H
H22	SMV Lamp - Front R/H
H23	SMV Lamp - Rear R/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C105-B6
1090 R
C105-C8
C223-R
1071 P
C105-C7
C223-G
1071 P
SP65
5100
C105-C6
C223-N
C105-C4
998 G
C105-C3
998 G
SP998
998 G
C223-L
998 G
1071 P
998 G/LN
C223-M
1090 R/TQ
K20
998 G/LN
1092 R/N
57 B
F30 15A
F27 15A
K19
1073 P/S
1073 P/W
5270
MF5
100A
F28 15A
998 G/LN
F29 30A
F32 30A
F31 15A
C105-B1
C223-K
4011 P
4011 P/G
C001-29
1073 P
C056-5
SP01
1073 P/S
H31
C061
H30
C058
SP02
57 B
C105-B5
1098 W
H29
C085
5590
3009 G/U
C105-B4
1098 W
H28
C084
C105-B7
1097 R
H27
C065
SP57B
C105-B8
1097 R
H26
C064
SP57A
C105-C1
997 G
4770
997 G
SP997
H25
C384
H24
C383
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

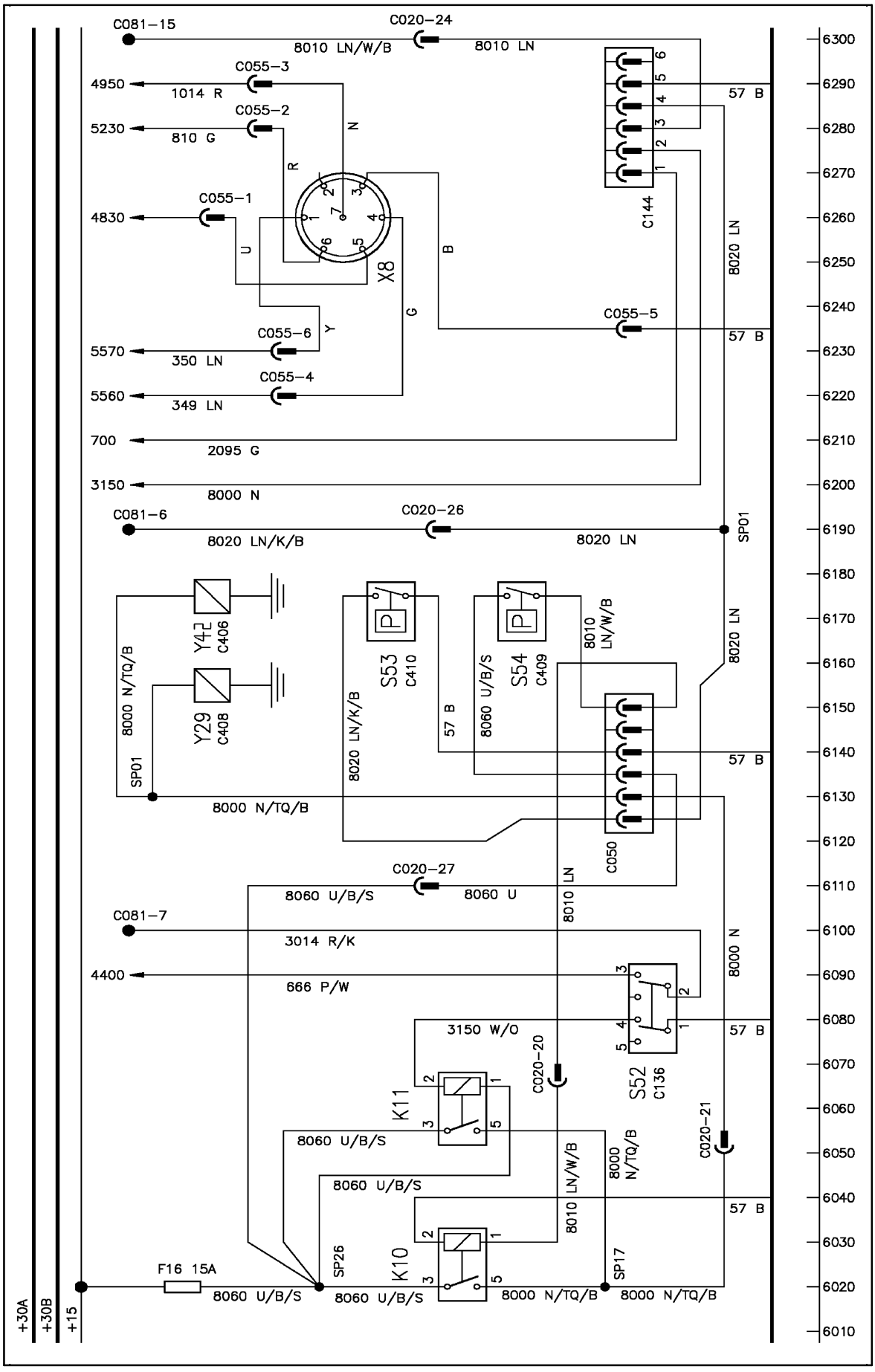
WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F28 Fuse - 15A
F29 Fuse - 30A
F30 Fuse - 15A
F31 Fuse - 15A
F32 Fuse - 30A

H24 Worklamp - Rear L/H
H25 Worklamp - Rear R/H
H26 Worklamp - Grabrail R/H
H27 Worklamp - Grabrail L/H
H28 Worklamp - Upper Front L/H
H29 Worklamp - Upper Front R/H
H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN
C055-3
4950
1014 R
C055-2
5230
810 G
C055-1
4830
C055-6
5570
350 LN
C055-4
5560
349 LN
700
2095 G
3150
8000 N
C144
57 B
8020 LN
C055-5
X8
C081-6
C020-26
8020 LN/K/B
8020 LN
SP01
Y42
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8010 LN/W/B
8060 U/B/S
8020 LN/K/B
57 B
C050
C020-27
8060 U
8010 LN
C081-7
3014 R/K
4400
666 P/W
3150 W/O
C020-20
S52
C136
K11
C020-21
8000 N/TQ/B
K10
SP26
SP17
F16 15A
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

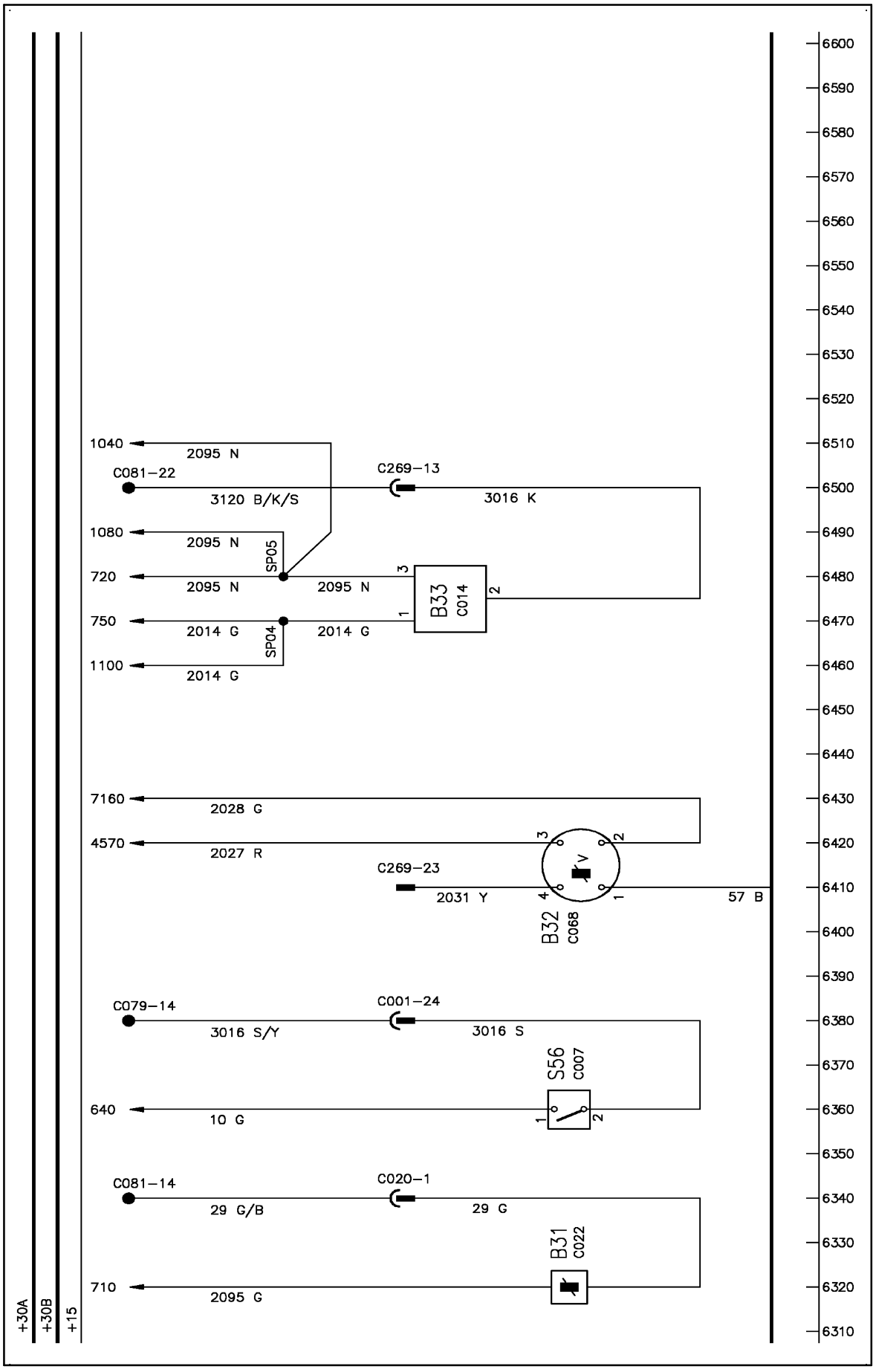
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		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6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
1040
2095 N
C081–22
C269–13
3120 B/K/S
3016 K
1080
2095 N
SP05
720
2095 N
2095 N
3
B33
C014
2
750
2014 G
2014 G
1
SP04
1100
2014 G
7160
2028 G
4570
2027 R
3
2
C269–23
2031 Y
4
1
57 B
B32
C068
C079–14
C001–24
3016 S/Y
3016 S
S56
C007
640
10 G
1
2
C081–14
C020–1
29 G/B
29 G
B31
C022
710
2095 G
+30A
+30B
+15

SENSORS
Line 6310-6600

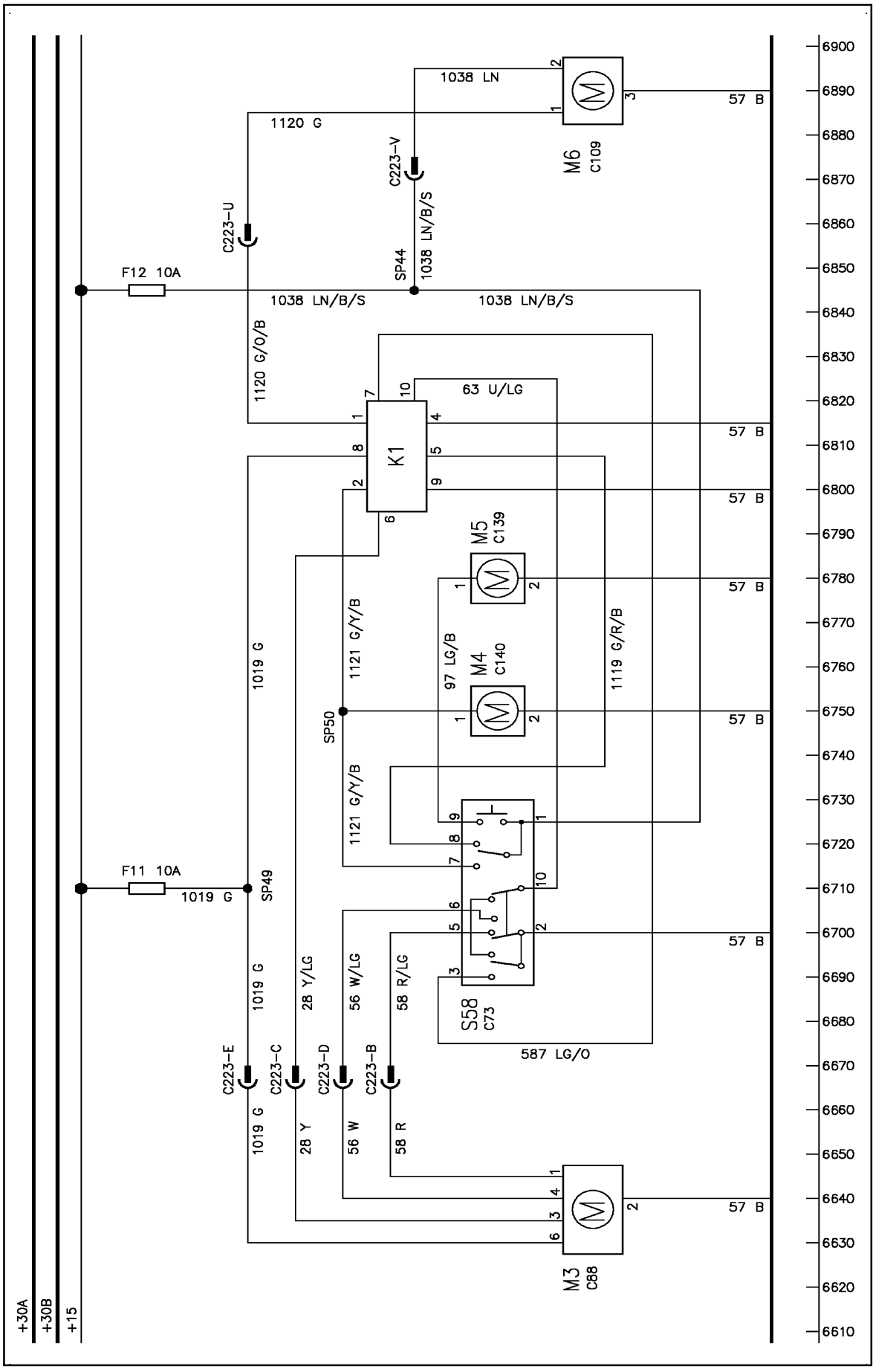
B31 Fuel Tank Sender

B32 Radar Gun

B33 Steering Angle Sensor

S56 Brake Fluid Level Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F12 10A
F11 10A
1038 LN
1120 G
1038 LN/B/S
1120 G/O/B
1019 G
1121 G/Y/B
97 LG/B
1119 G/R/B
63 U/LG
28 Y/LG
56 W/LG
58 R/LG
587 LG/O
28 Y
56 W
58 R
57 B
SP44
SP49
SP50
C223-U
C223-V
C223-E
C223-C
C223-D
C223-B
M6 C109
M5 C139
M4 C140
M3 C88
K1
S58 C73
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

WASHERS AND WIPERS
Line 6610-6900

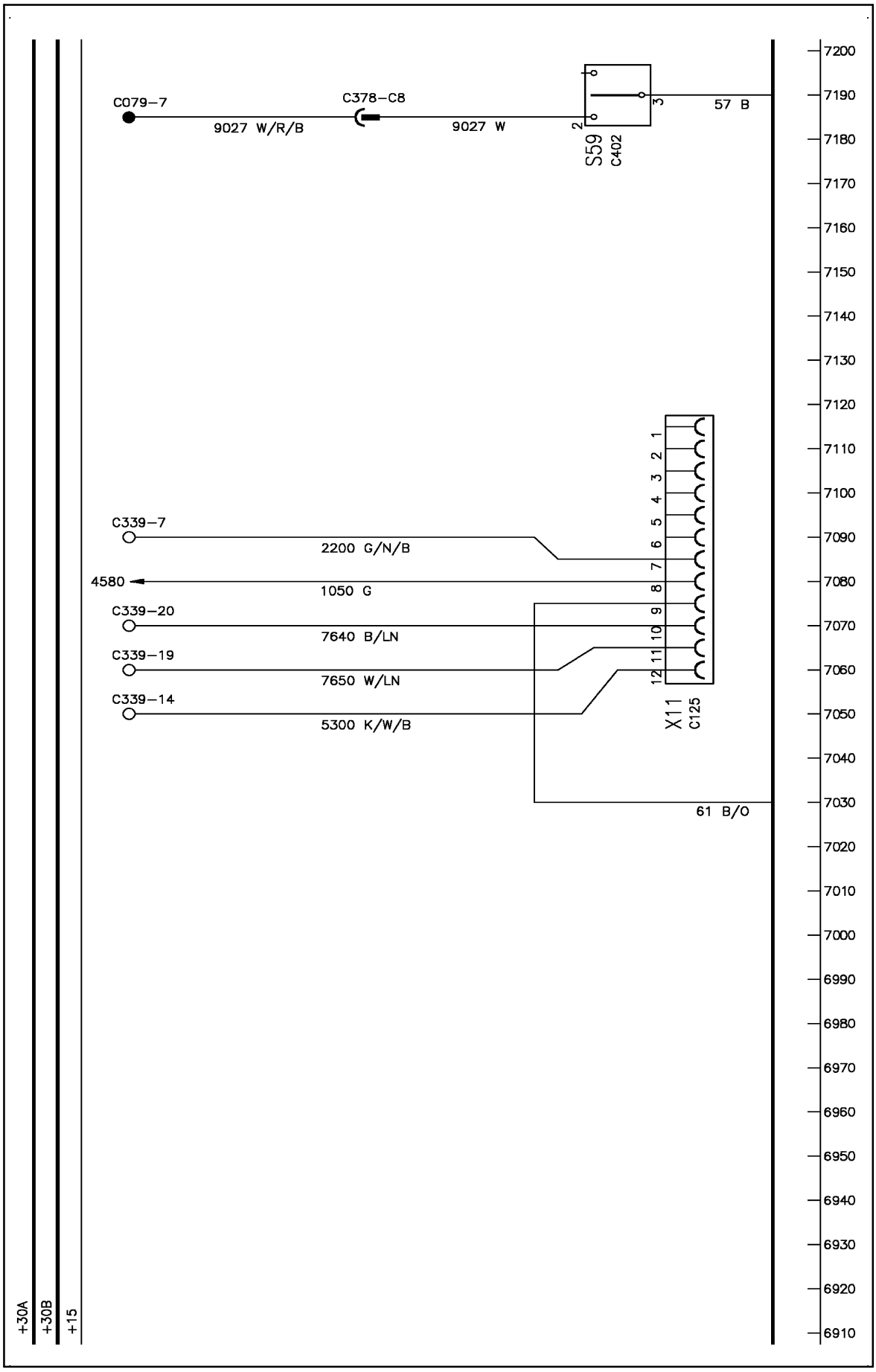
F11 Fuse 10A
F12 Fuse 10A

K1 Front Windshield Wiper Module

M3 Wiper Motor - Front
M4 Washer Motor - Rear
M5 Washer Motor - Front
M6 Wiper Motor - Rear

S58 Front and Rear Wiper Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

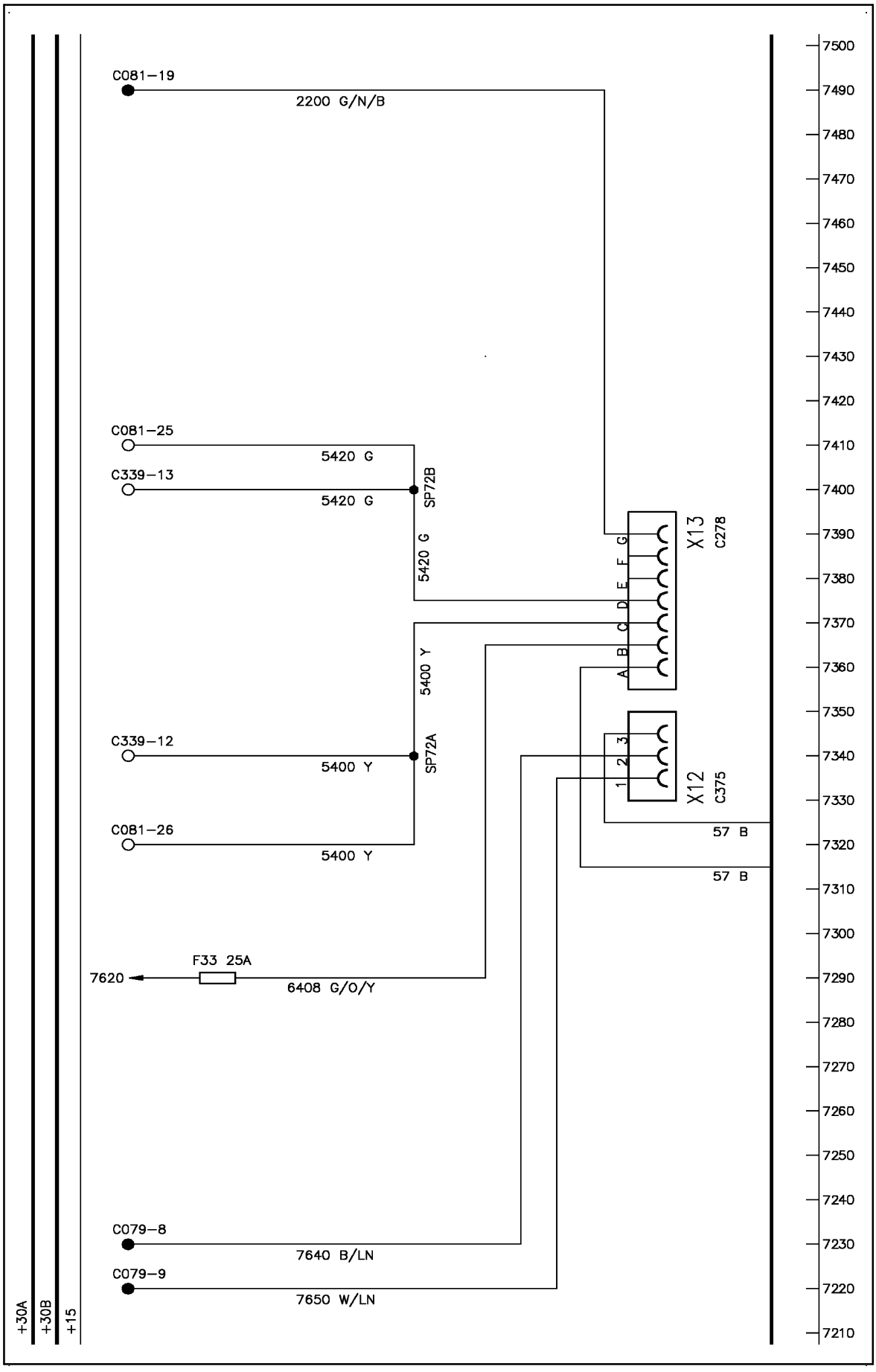

C079-7
9027 W/R/B
C378-C8
9027 W
S59
C402
57 B
X11
C125
C339-7
2200 G/N/B
4580
1050 G
C339-20
7640 B/LN
C339-19
7650 W/LN
C339-14
5300 K/W/B
61 B/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

DIAGNOSTIC PLUGS 1
Line 6910-7200

S59 Calibration/Select Switch

X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
C081-25
5420 G
C339-13
5420 G
SP72B
5420 G
5400 Y
C339-12
5400 Y
SP72A
C081-26
5400 Y
X13
C278
A B C D E F G
X12
C375
1 2 3
57 B
57 B
F33 25A
7620
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

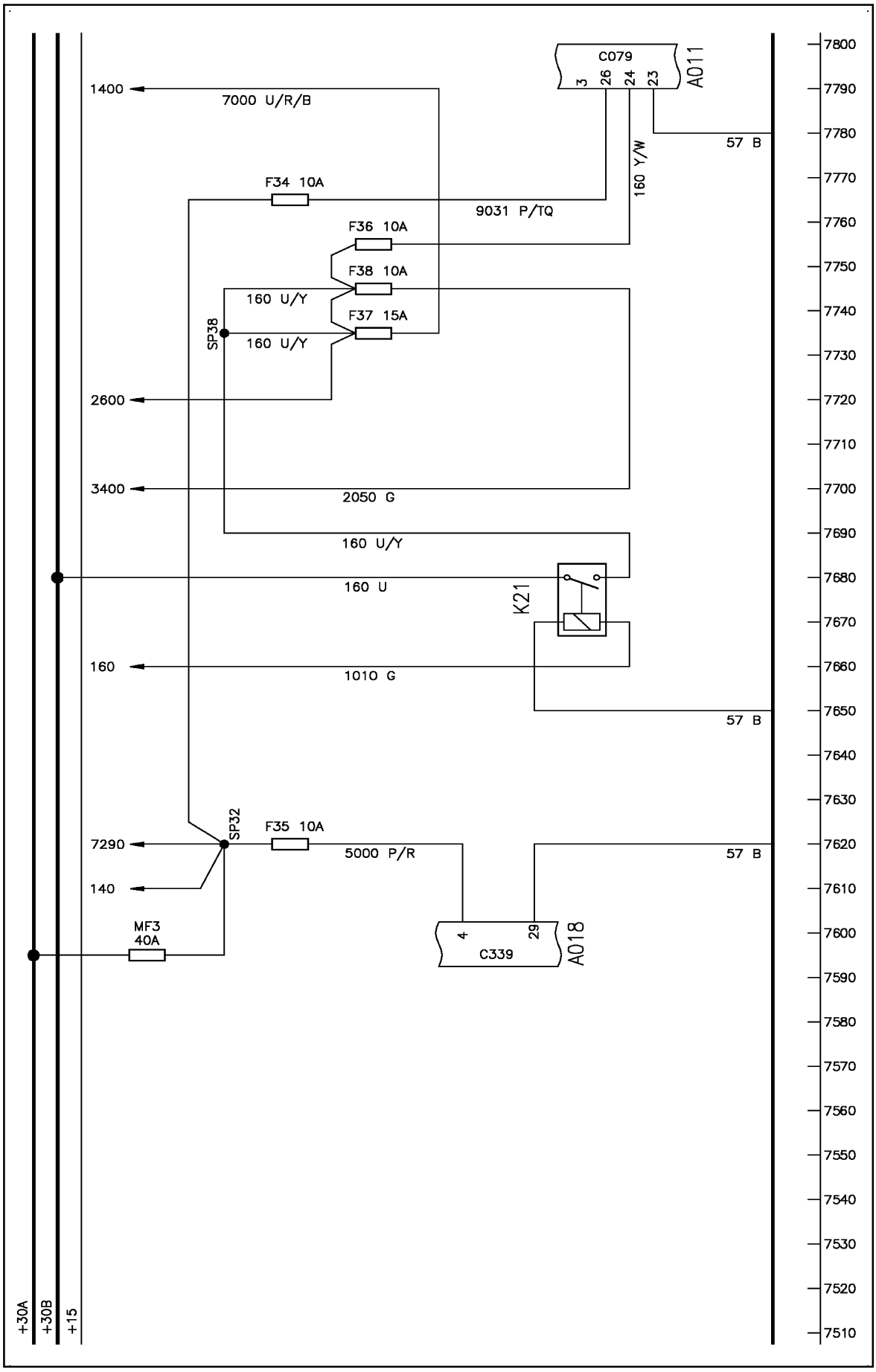
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector

X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

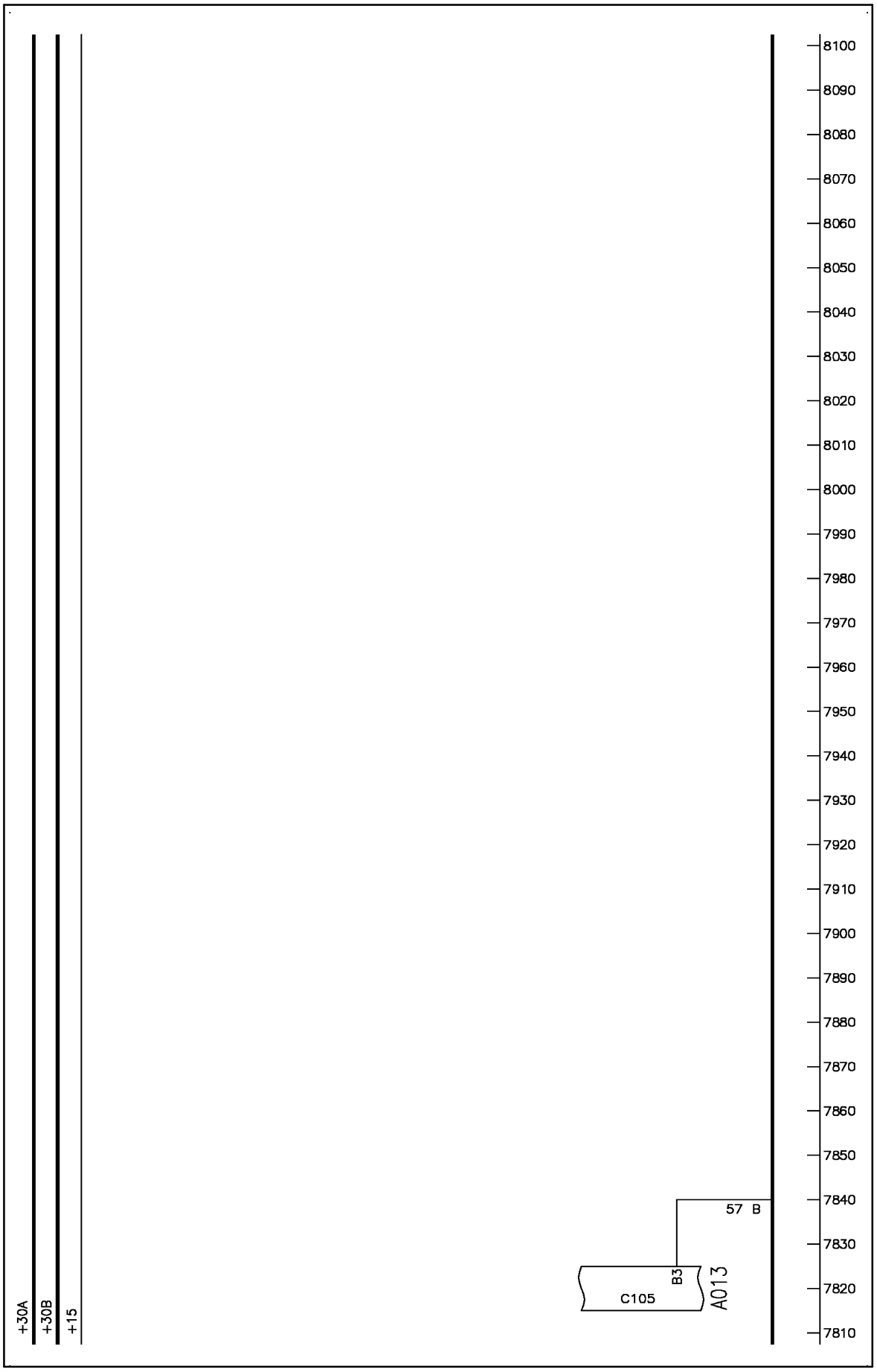

C079
3
26
24
23
A011
1400
7000 U/R/B
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2600
3400
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
SP32
F35 10A
7290
5000 P/R
57 B
140
MF3
40A
4
29
C339
A018
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A

K21	Electronics Supply Relay
A011	Instrument Cluster 1
A018	SCM - Small Control Module

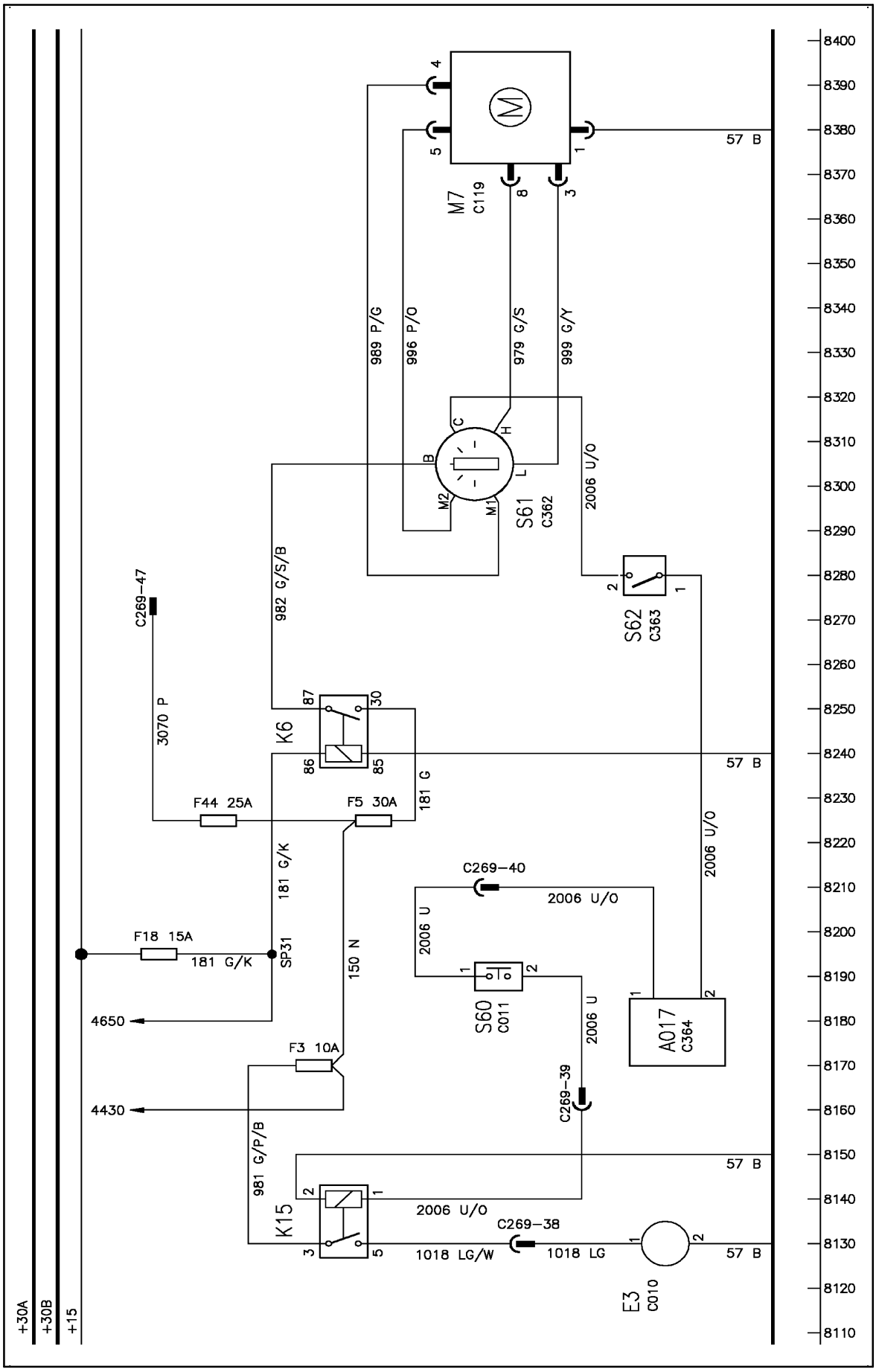
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810
57 B
B3
C105
A013

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A013 Worklamp ECU

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
M7
C119
57 B
989 P/G
996 P/O
979 G/S
999 G/Y
S61
C362
2006 U/O
S62
C363
C269-47
3070 P
982 G/S/B
K6
F44 25A
F5 30A
181 G
181 G/K
C269-40
2006 U/O
2006 U
F18 15A
181 G/K
SP31
150 N
S60
C011
A017
C364
4650
F3 10A
4430
C269-39
981 G/P/B
K15
2006 U/O
C269-38
1018 LG/W
1018 LG
E3
C010

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

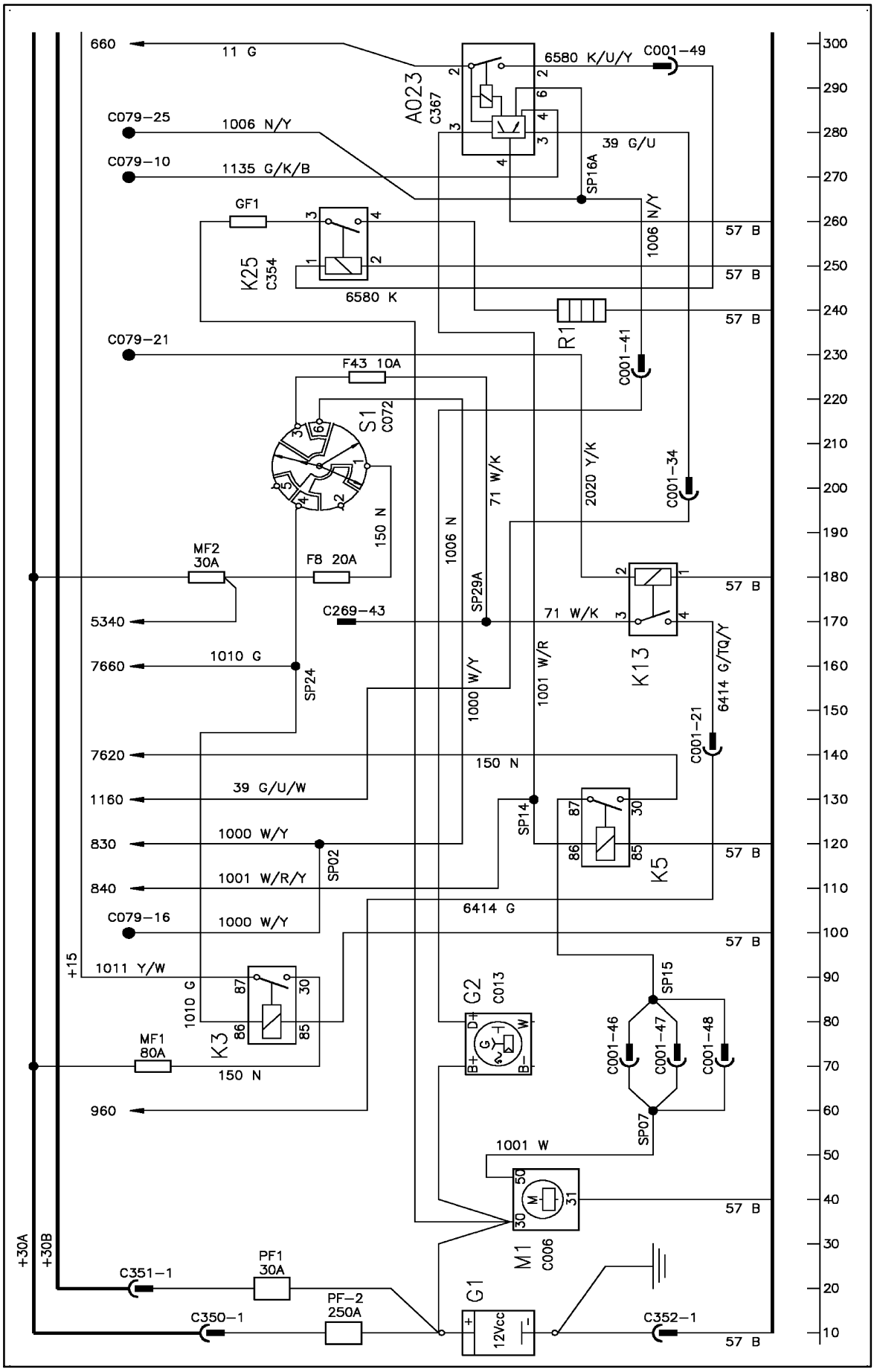
F3	Fuse 10A
F5	Fuse 30A
F18	Fuse - 15A
F44	Fuse - 25A
A017	HVAC Unit
E3	A/C Clutch
K6	Blower Motor Relay
K15	Blower Motor Relay
M7	Blower Unit
S60	A/C Pressure Switch
S61	Heater/Blower Switch
S62	A/C Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

12X12 TRANSMISSION, L/CAB, W/MECHANICAL ENGINE

Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400

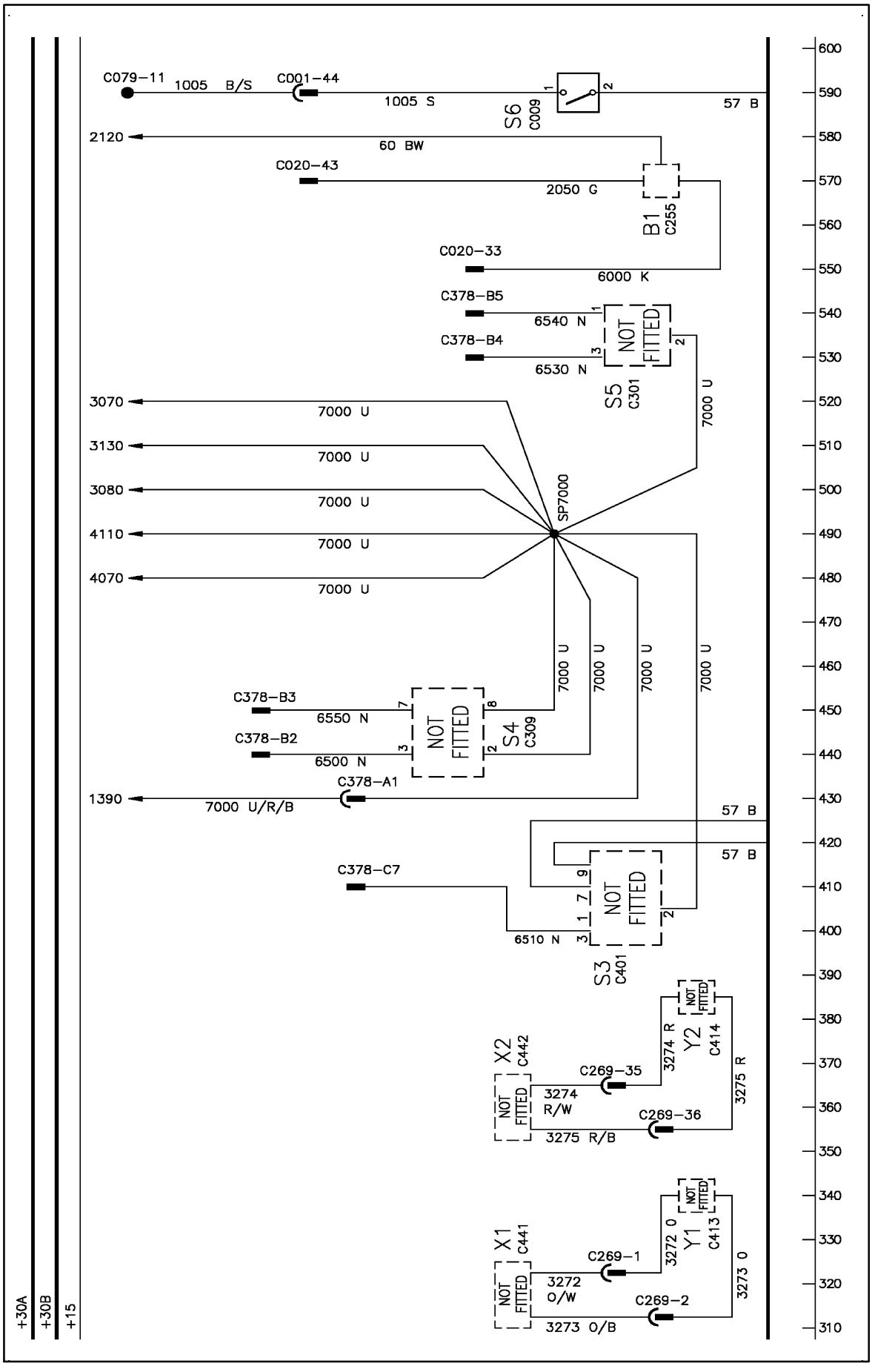

660
11 G
A023
C367
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C079-10
1135 G/K/B
39 G/U
SP16A
GF1
K25
C354
6580 K
1006 N/Y
57 B
R1
C001-41
C079-21
F43 10A
S1
C072
2020 Y/K
C001-34
71 W/K
1006 N
150 N
MF2
30A
F8 20A
SP29A
5340
C269-43
71 W/K
K13
6414 G/TQ/Y
7660
1010 G
SP24
1000 W/Y
1001 W/R
C001-21
7620
150 N
1160
39 G/U/W
SP14
K5
830
1000 W/Y
SP02
840
1001 W/R/Y
6414 G
C079-16
1000 W/Y
+15
1011 Y/W
1010 G
K3
G2
C013
SP15
MF1
80A
150 N
C001-46
C001-47
C001-48
960
SP07
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
G1
12Vcc
C350-1
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

12x12 Transmission, L/Cab, W/Mechanical Engine

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
A023	Grid Heater Module
G1	Battery
G2	Alternator
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
M1	Starter Motor and Solenoid
R1	Grid Heater
S1	Ignition Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
1005 B/S
C001-44
1005 S
S6
C009
57 B
2120
60 BW
C020-43
2050 G
B1
C255
C020-33
6000 K
C378-B5
6540 N
C378-B4
6530 N
NOT FITTED
S5
C301
7000 U
3070
3130
3080
4110
4070
SP7000
C378-B3
6550 N
C378-B2
6500 N
S4
C309
C378-A1
1390
7000 U/R/B
C378-C7
6510 N
S3
C401
X2
C442
C269-35
3274 R/W
C269-36
3275 R/B
Y2
C414
3274 R
3275 R
X1
C441
C269-1
3272 O/W
C269-2
3273 O/B
Y1
C413
3272 O
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

ENGINE 1
line 310-600

B1 Engine Flywheel Speed Sensor

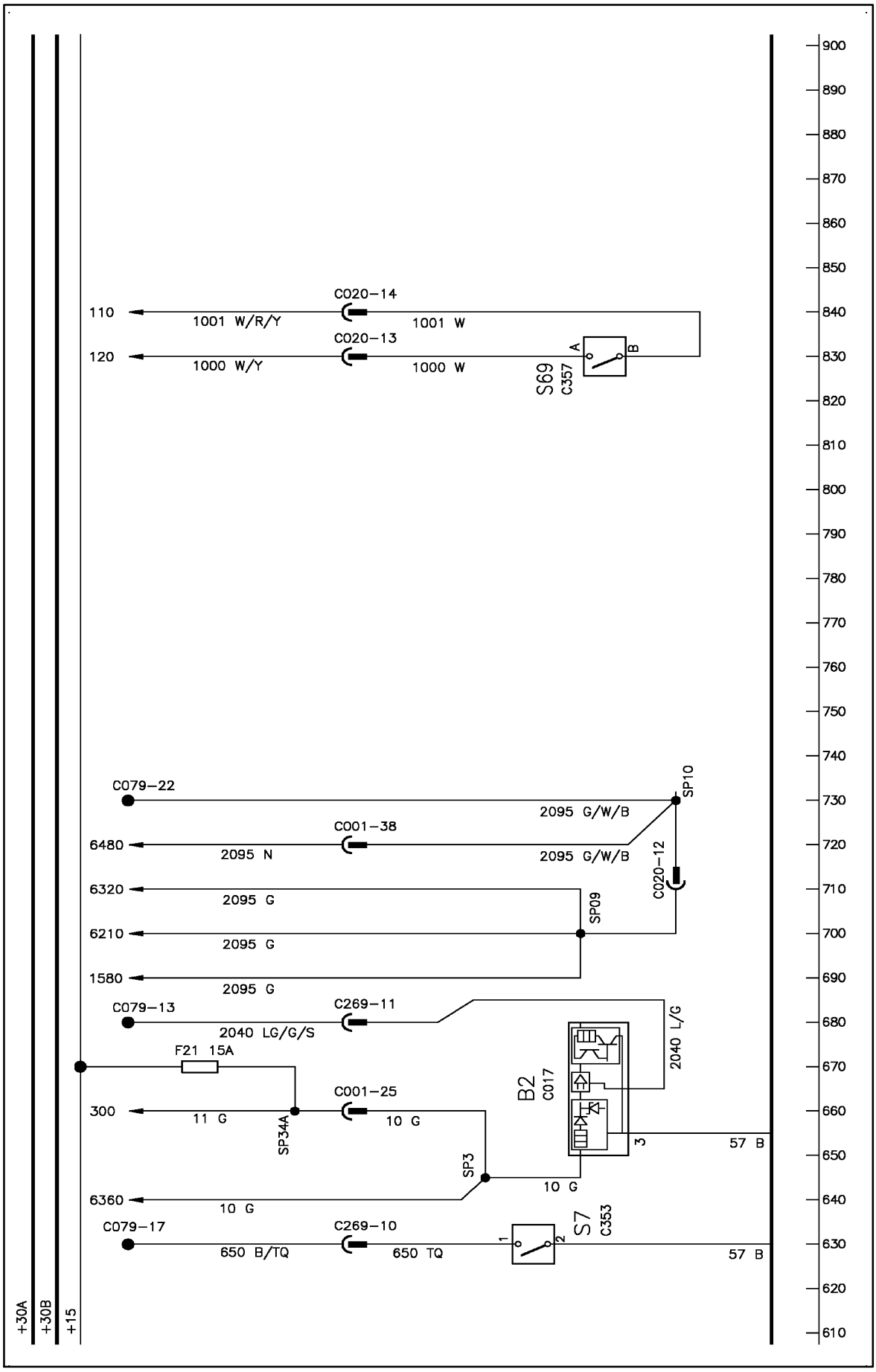
S3 Constant Engine Speed programme Switch (Not Fitted)
S4 Constant ERPM On/Off Switch (Not Fitted)
S5 Engine Inc./Dec. Switch (Not Fitted)

S6 Air Cleaner Switch

Y1 Loader Valve 1 (Not Fitted)
Y2 Loader Valve 2 (Not Fitted)

X1 Joystick Loader Control Socket 1 (Not Fitted)
X2 Joystick Loader Control Socket 2 (Not Fitted)

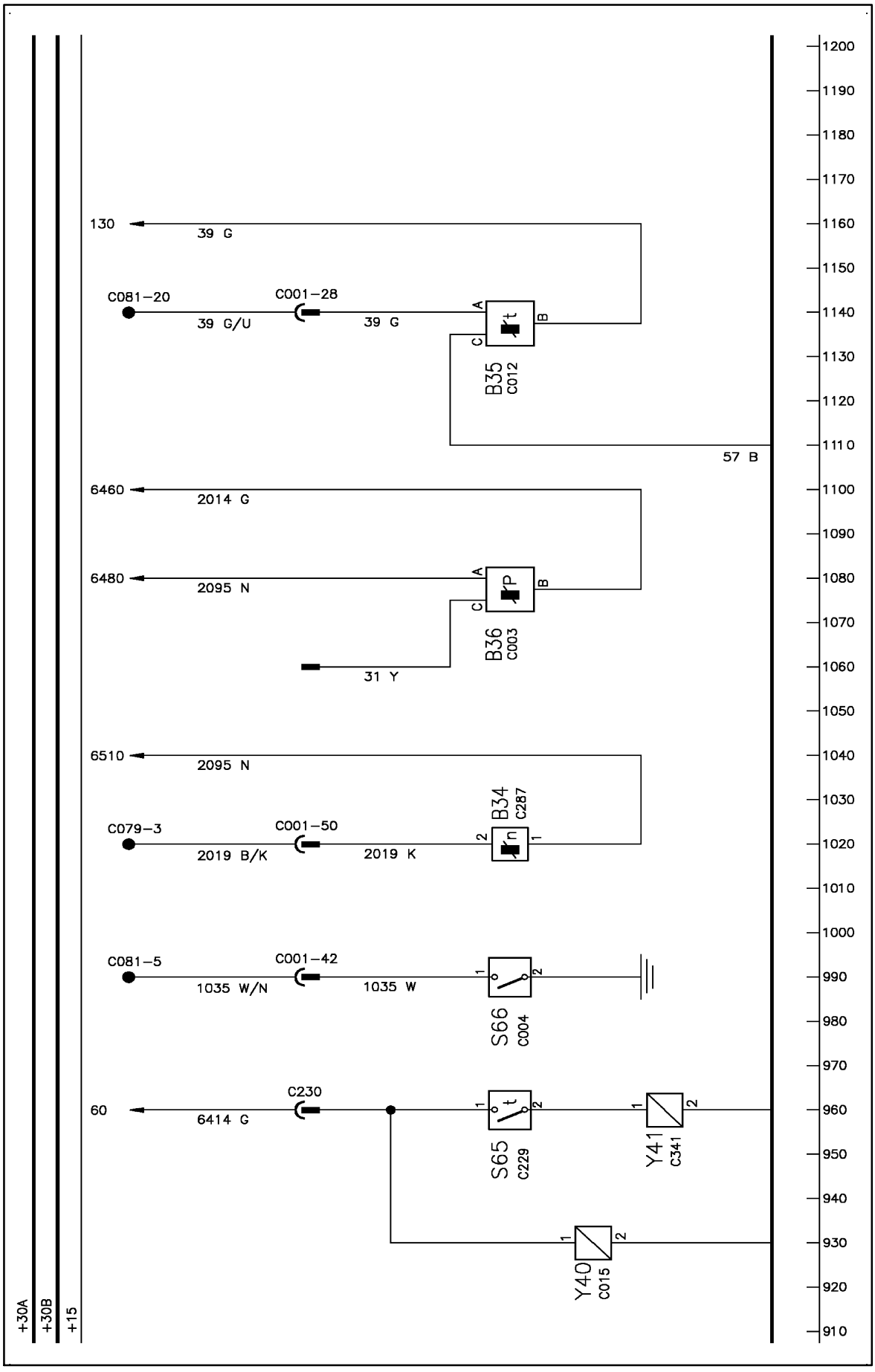
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
110
120
C020-14
C020-13
1001 W/R/Y
1000 W/Y
1001 W
1000 W
S69
C357
A
B
C079-22
6480
6320
6210
1580
C001-38
2095 G/W/B
2095 N
2095 G
2095 G
2095 G
2095 G/W/B
SP10
C020-12
SP09
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
300
11 G
SP34A
C001-25
10 G
B2
C017
3
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 TQ
S7
C353
1
2
57 B
+30A
+30B
+15

ENGINE 2
line 610-900

F21	Fuse - 15A	**S7**	De-Gas Bottle
		S69	Starter Inhibitor
B2	Water In Fuel Sensor		

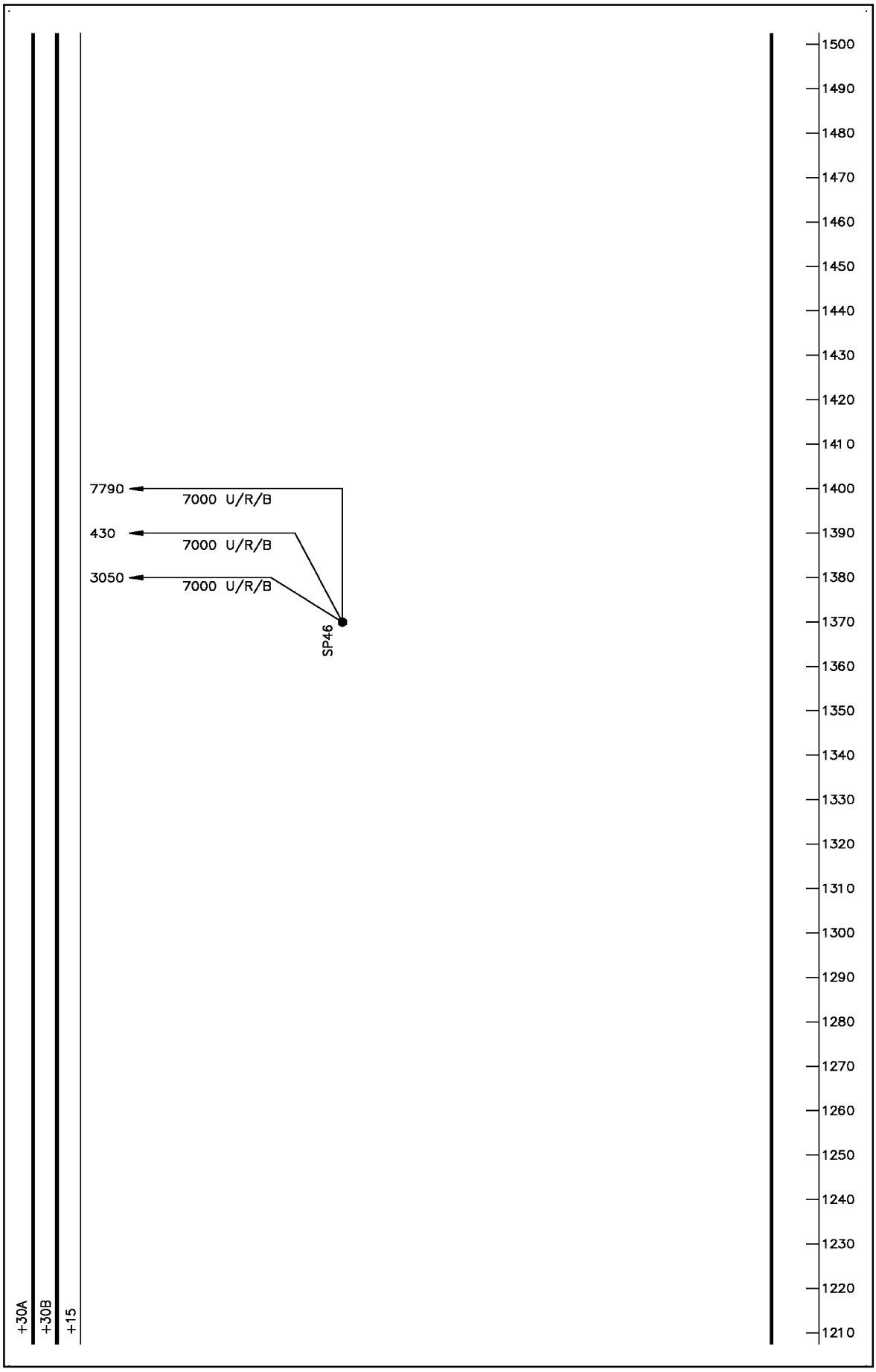
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
130
39 G
C081-20
39 G/U
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
A
B
C
B36
C003
31 Y
6510
2095 N
B34
C287
C079-3
2019 B/K
C001-50
2019 K
2
1
C081-5
1035 W/N
C001-42
1035 W
1
2
S66
C004
60
6414 G
C230
1
2
S65
C229
1
2
Y41
C341
1
2
Y40
C015

ENGINE 3
line 910-1200

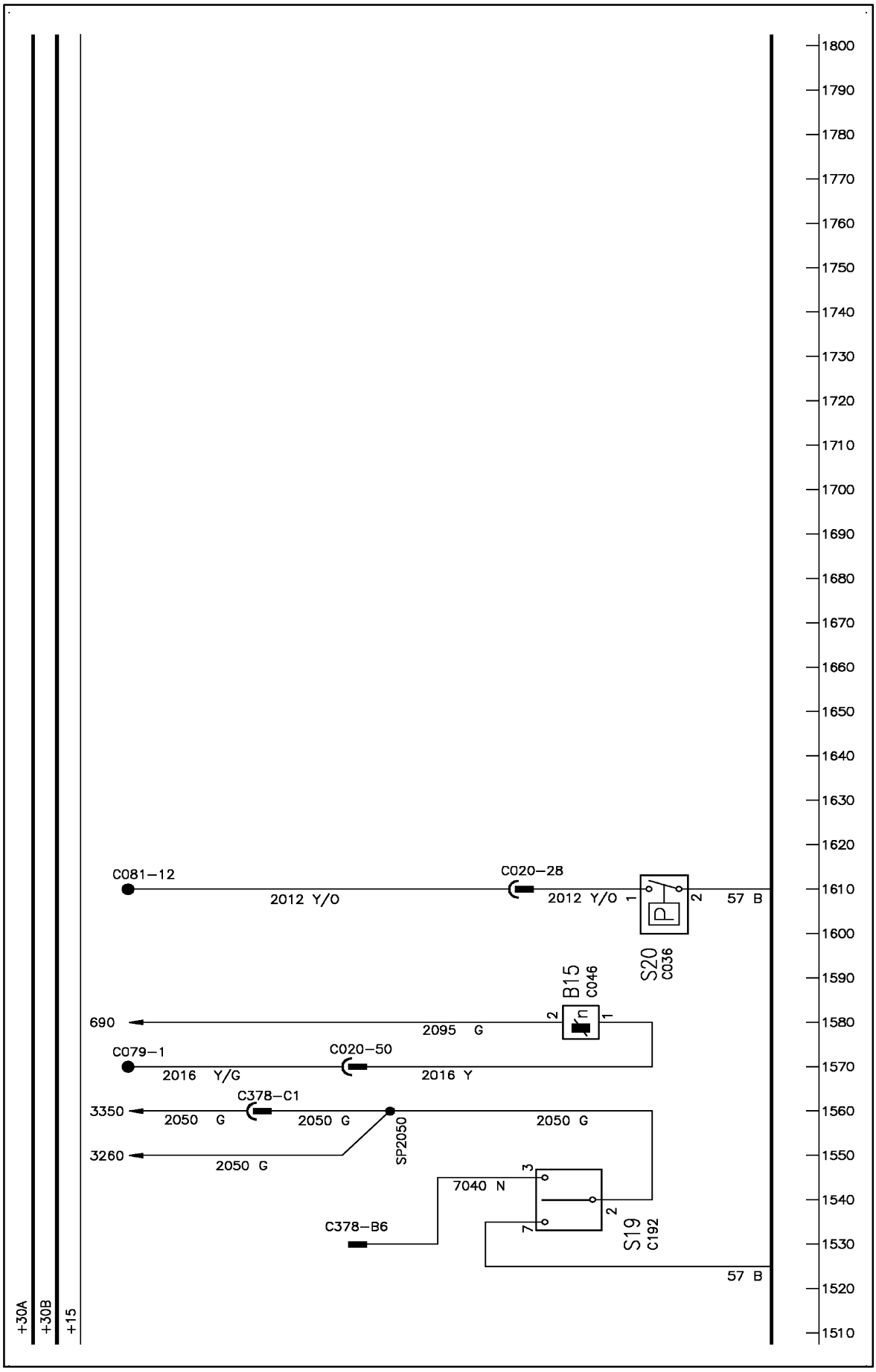
B34	Engine Speed Sensor		
B35	Coolant Temperature Sensor	**Y40**	Fuel Shut Off Solenoid
B36	Oil Pressure Sensor	**Y41**	Cold Advance Solenoid
S65	Thermo Cold Advance Switch		
S66	Oil Pressure Switch		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
7790
7000 U/R/B
430
7000 U/R/B
3050
7000 U/R/B
SP46
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

TRANSMISSION SYSTEM 1
Line 1210-1500

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510
C081-12
2012 Y/O
C020-28
2012 Y/O
1
P
2
57 B
S20
C036
B15
C046
2
1
690
2095 G
C079-1
2016 Y/G
C020-50
2016 Y
C378-C1
3350
2050 G
2050 G
2050 G
SP2050
3260
2050 G
3
7040 N
2
7
S19
C192
C378-B6
57 B

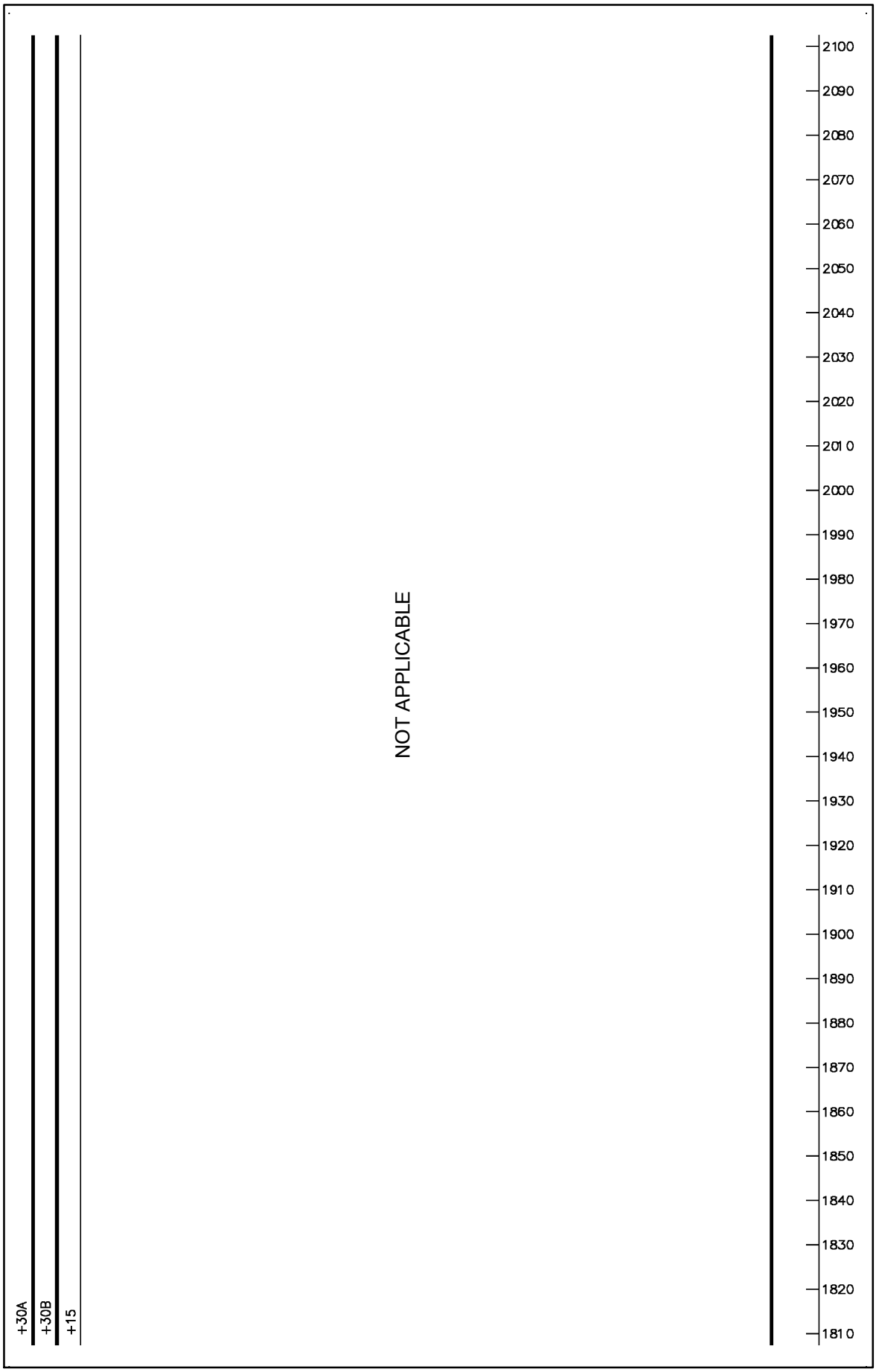
TRANSMISSION SYSTEM 2
Line 1510-1800

B15 Speed Sensor

S19 Creeper Gear Switch

S20 Transmission Oil Pressure Switch

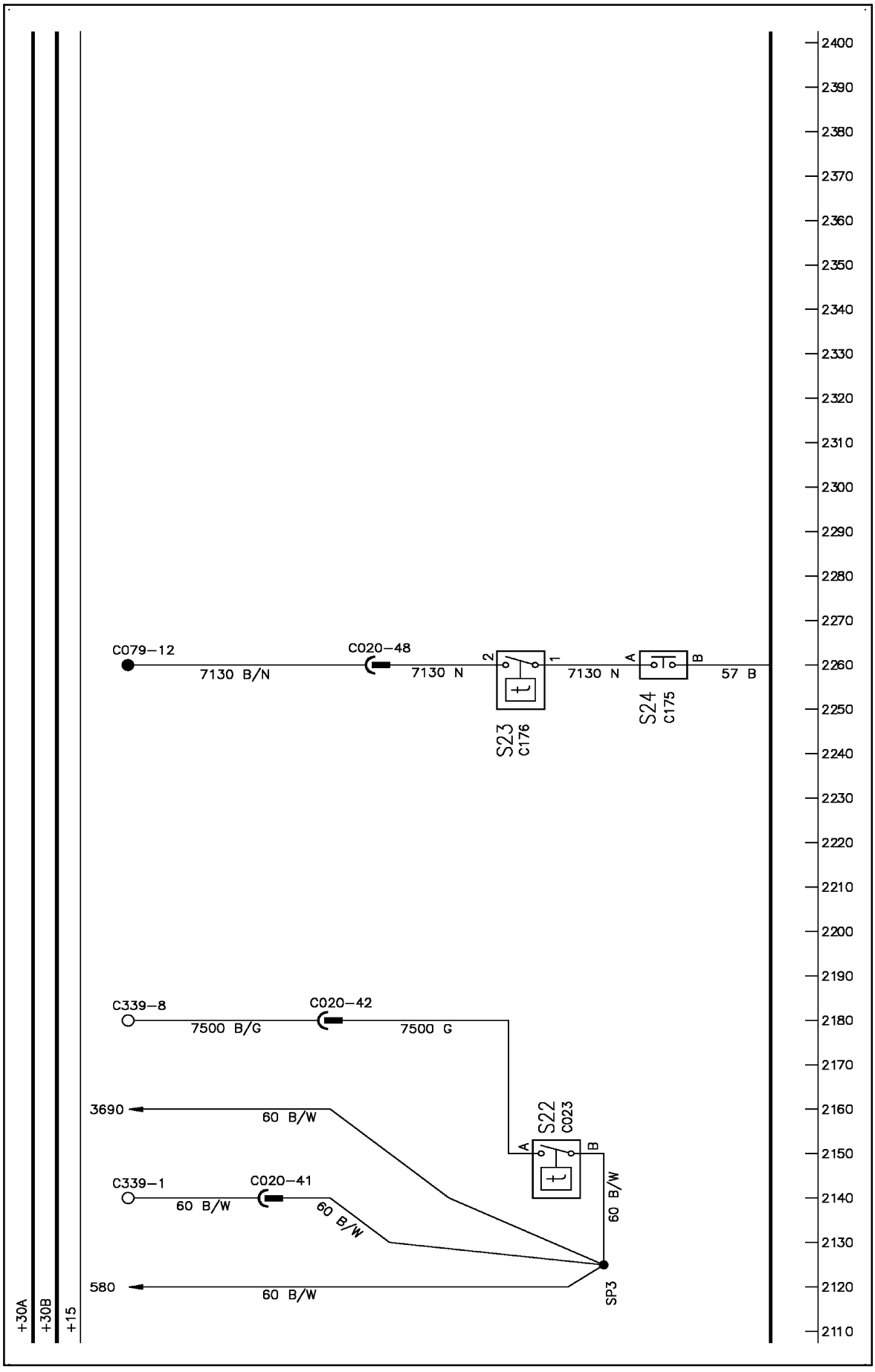
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110
C079-12
7130 B/N
C020-48
7130 N
2
1
7130 N
A
B
57 B
S23
C176
S24
C175
C339-8
7500 B/G
C020-42
7500 G
3690
60 B/W
S22
C023
C339-1
C020-41
60 B/W
60 B/W
60 B/W
580
60 B/W
SP3
+30A
+30B
+15

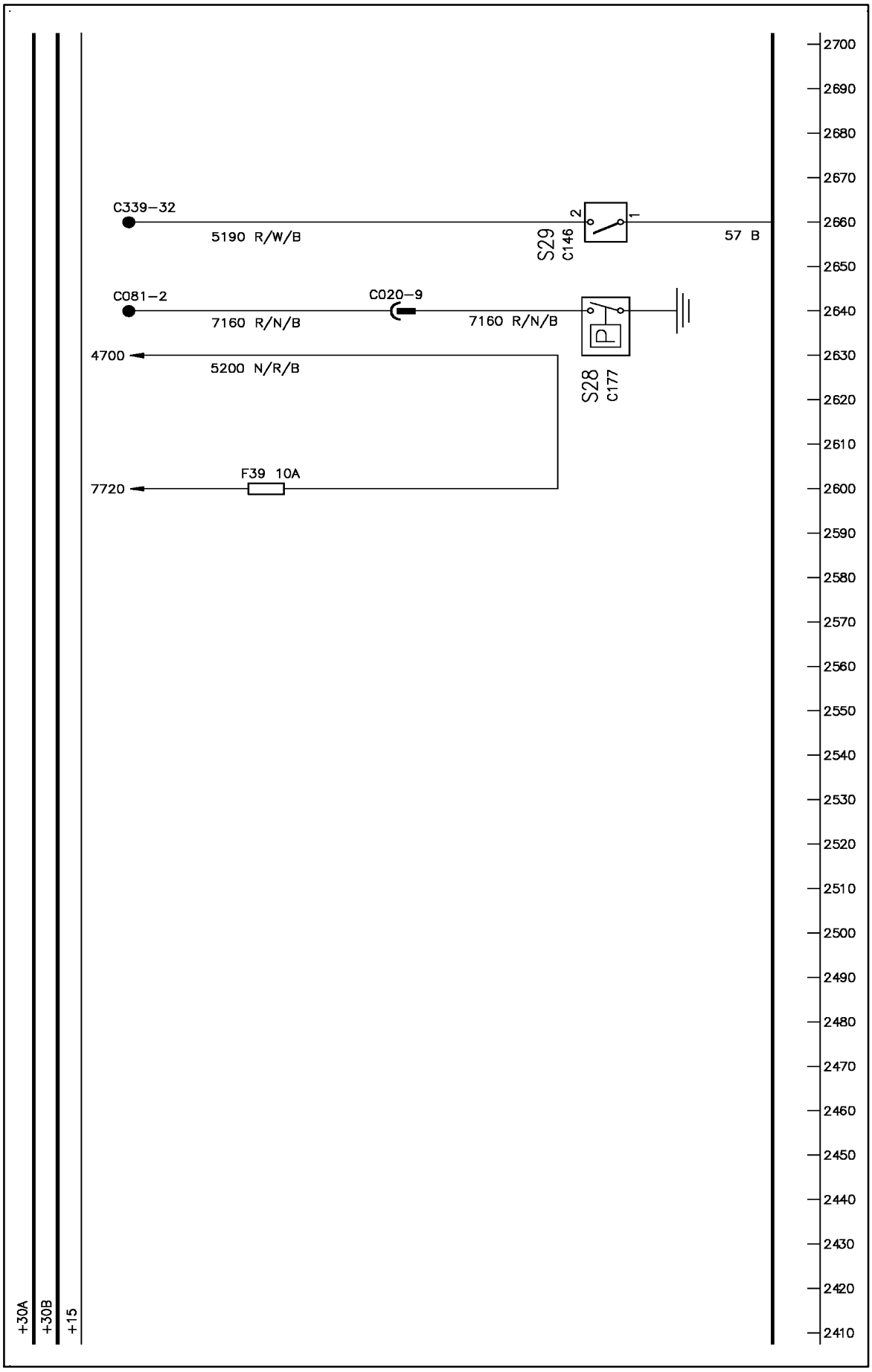
HYDRAULICS 1
Line 2110-2400

S22 Transmission Oil Temp Sensor

S23 Oil Temperature Switch

S24 HPL Filter Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C339-32
5190 R/W/B
S29
C146
2
1
57 B
C081-2
7160 R/N/B
C020-9
7160 R/N/B
P
S28
C177
4700
5200 N/R/B
F39 10A
7720
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

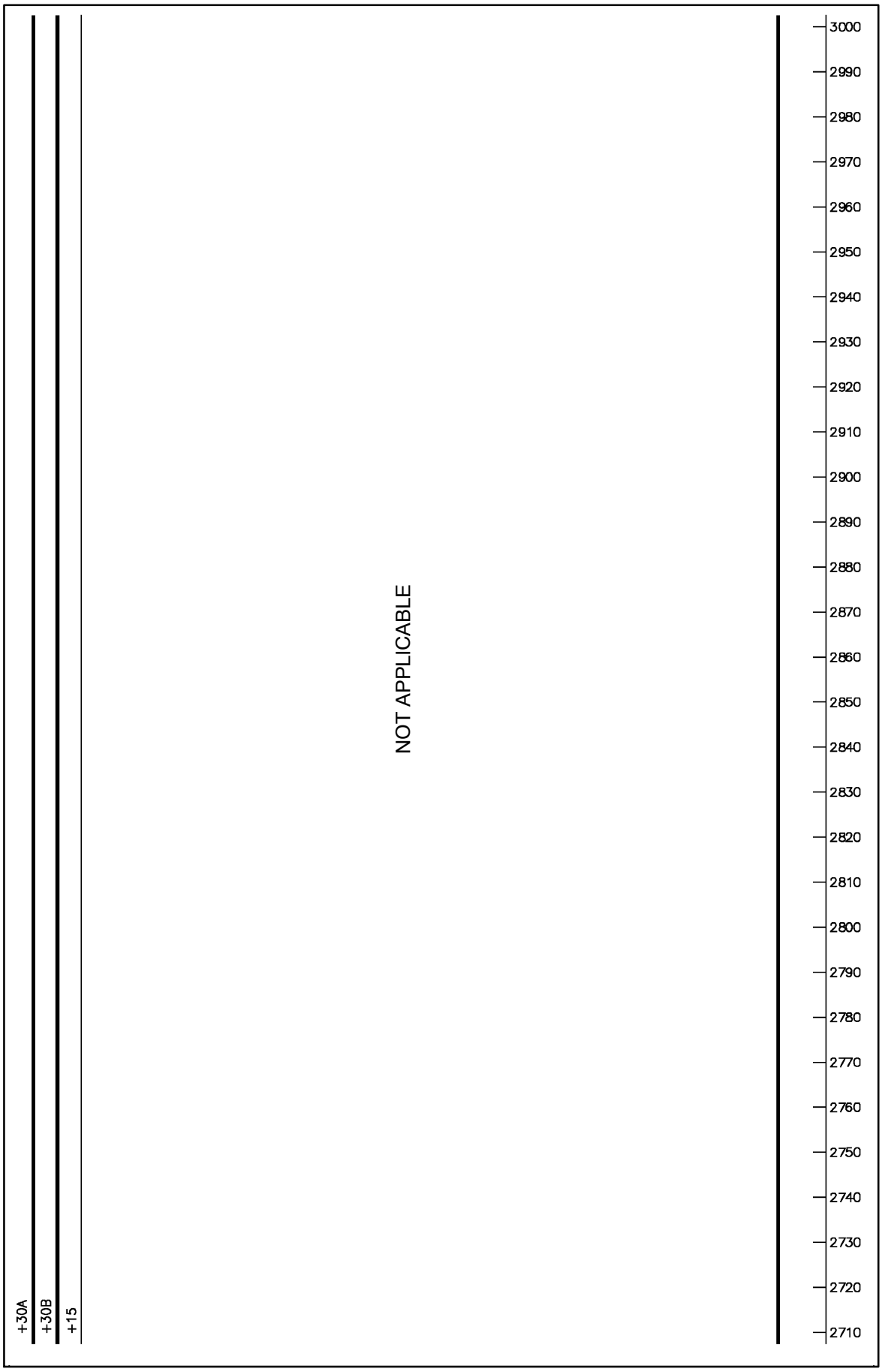
HYDRAULICS 2
Line 2410-2700

F39 Fuse - 10A

S28 Lo Charge Switch

S29 Lift-O-Matic Switch

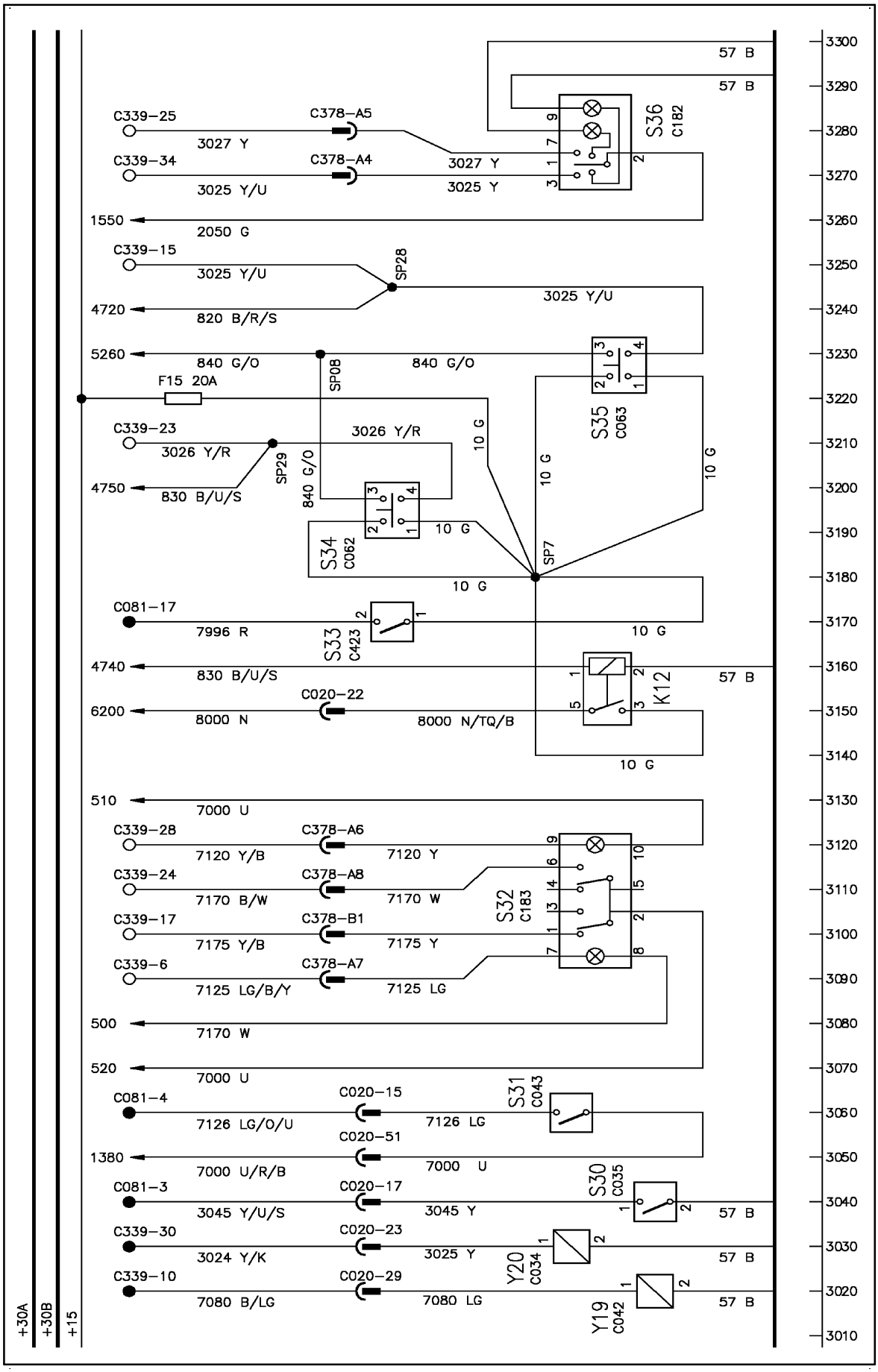
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760
2750
2740
2730
2720
2710

HYDRAULICS 3
Line 2710-3000

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
57 B
C339-25
C378-A5
3027 Y
C339-34
C378-A4
3025 Y/U
3027 Y
3025 Y
S36
C182
1550
2050 G
C339-15
3025 Y/U
SP28
4720
820 B/R/S
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
C339-23
3026 Y/R
SP29
4750
830 B/U/S
3026 Y/R
840 G/O
10 G
S35
C063
S34
C062
SP7
C081-17
7996 R
S33
C423
4740
830 B/U/S
C020-22
6200
8000 N
8000 N/TQ/B
K12
510
7000 U
C339-28
C378-A6
7120 Y/B
7120 Y
C339-24
C378-A8
7170 B/W
7170 W
C339-17
C378-B1
7175 Y/B
7175 Y
C339-6
C378-A7
7125 LG/B/Y
7125 LG
S32
C183
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG
S31
C043
1380
C020-51
7000 U/R/B
7000 U
C081-3
C020-17
3045 Y/U/S
3045 Y
S30
C035
C339-30
C020-23
3024 Y/K
3025 Y
Y20
C034
C339-10
C020-29
7080 B/LG
7080 LG
Y19
C042
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

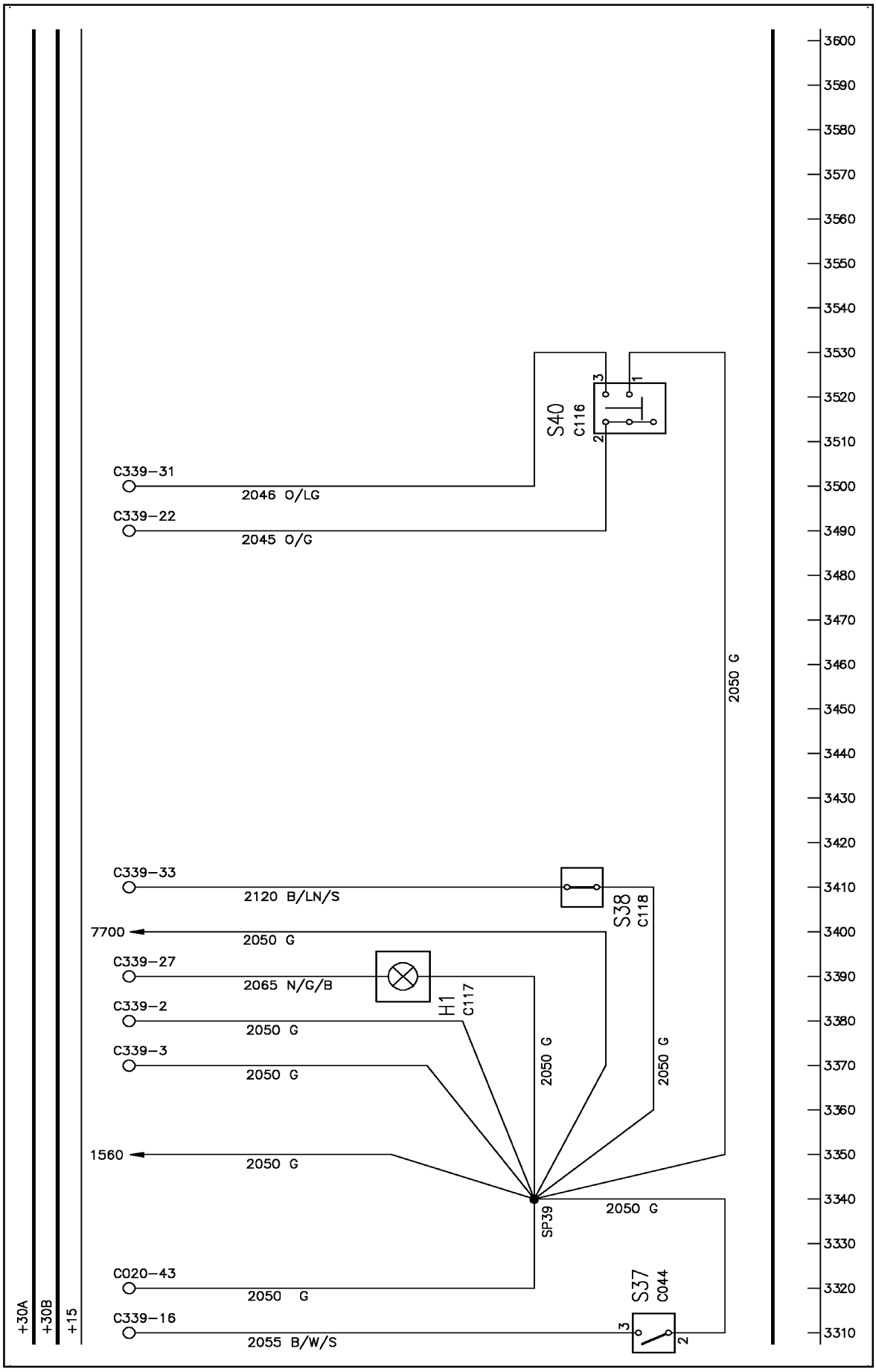
F15 Fuse - 20A

K12 Stoplamp Switch/Air Brake Relay

S30 4WD Activated Switch
S31 Diff Lock Activated Switch
S32 Differential Lock Switch
S33 Brake Pedal Latch
S34 Stop Lamp Switch Right
S35 Stop Lamp Switch Left
S36 4WD Switch

Y19 Diff Lock Solenoid
Y20 4WD Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

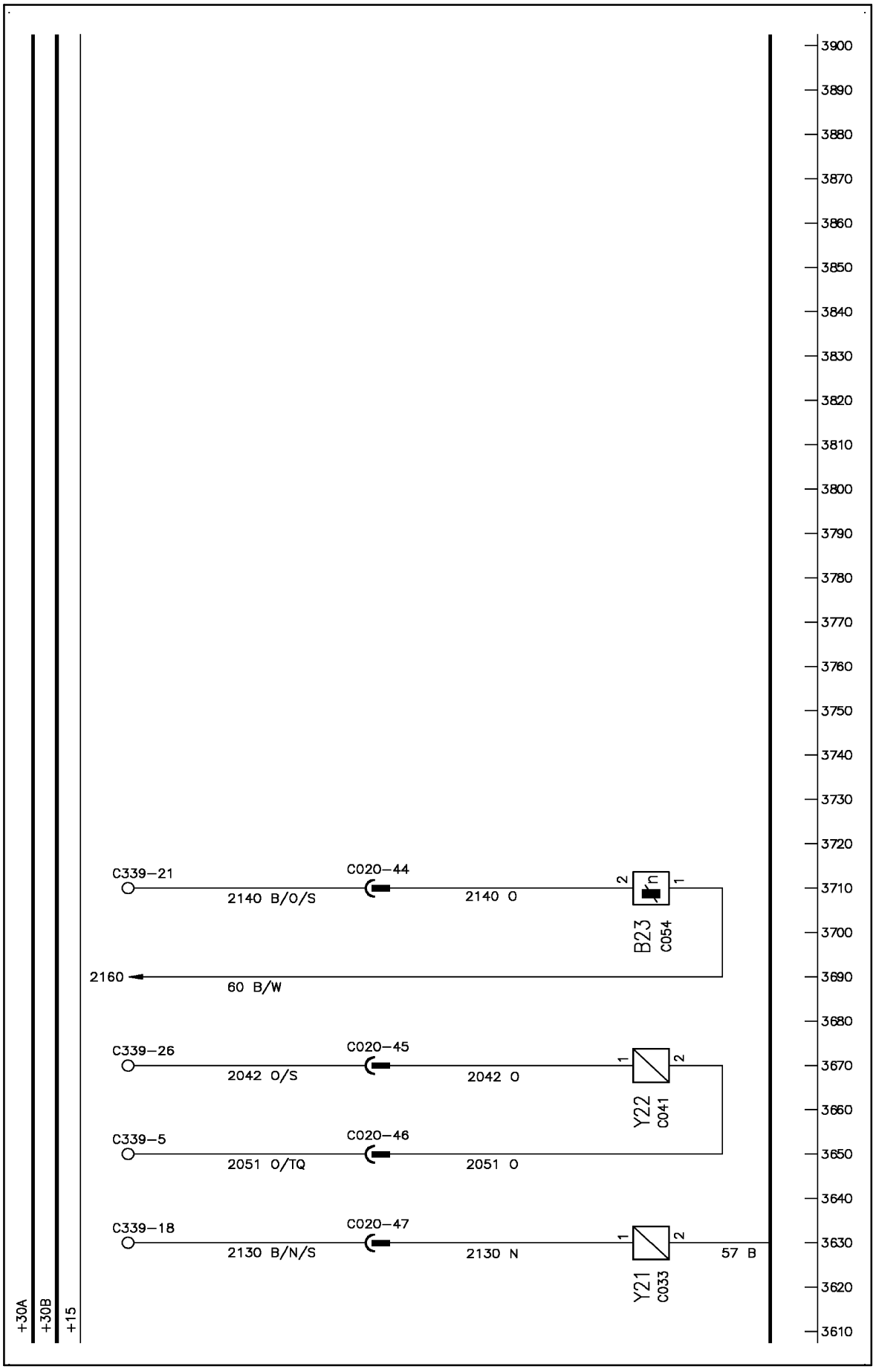

+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310
S40
C116
3
1
2
C339-31
2046 O/LG
C339-22
2045 O/G
2050 G
C339-33
2120 B/LN/S
S38
C118
7700
2050 G
C339-27
2065 N/G/B
H1
C117
C339-2
2050 G
C339-3
2050 G
2050 G
2050 G
1560
2050 G
SP39
2050 G
C020-43
2050 G
S37
C044
C339-16
2055 B/W/S
3
2

POWER TAKE OFF 1
Line 3310-3600

H1 Rear PTO Lamp

S37 Ground Speed PTO Switch
S38 Rear PTO Brake Switch
S40 Rear PTO Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

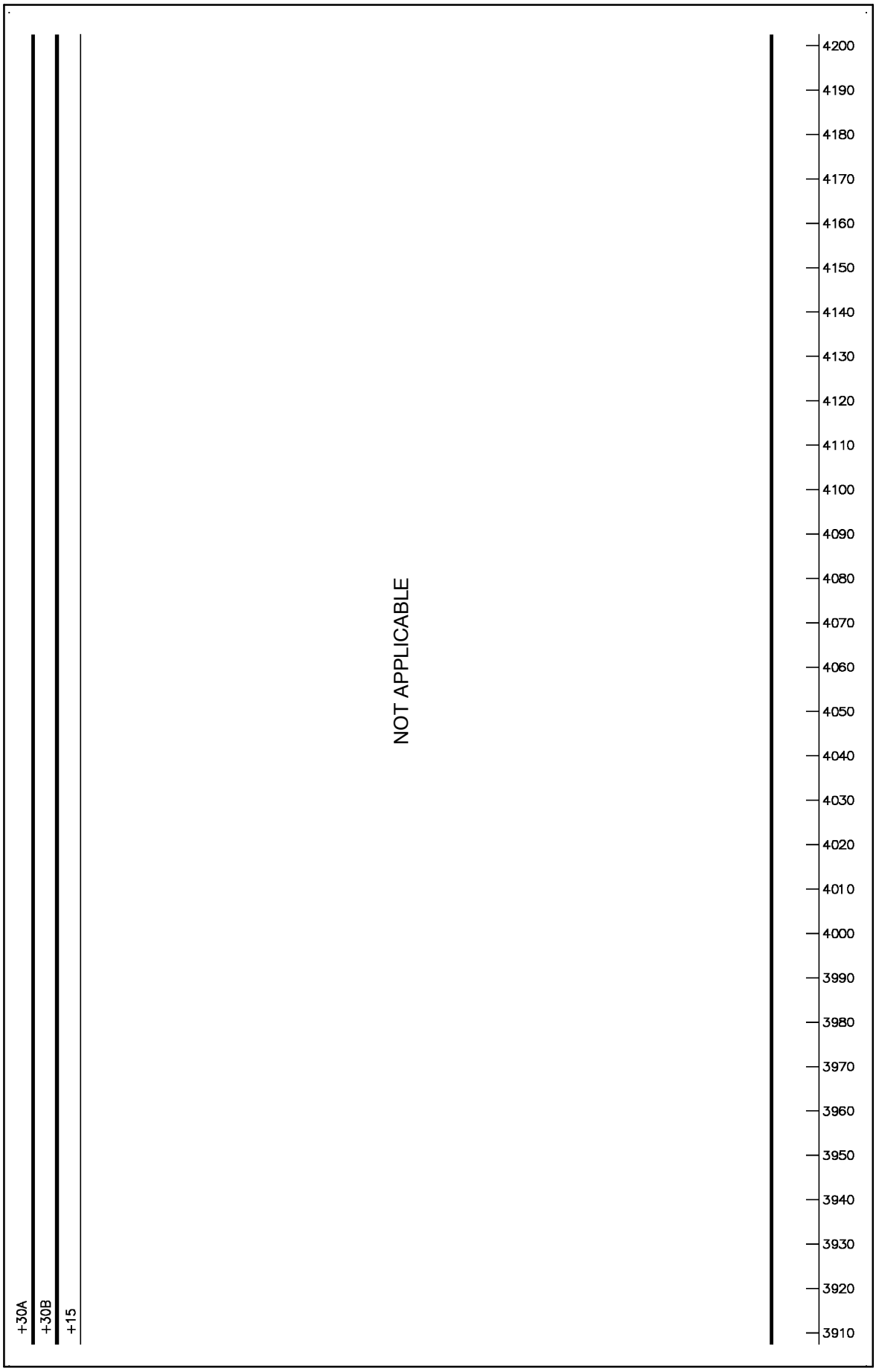

+30A
+30B
+15
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610
C339-21
C020-44
2140 B/O/S
2140 O
2
1
B23
C054
2160
60 B/W
C339-26
C020-45
2042 O/S
2042 O
1
2
Y22
C041
C339-5
C020-46
2051 O/TQ
2051 O
C339-18
C020-47
2130 B/N/S
2130 N
57 B
Y21
C033

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

Y21 PTO Brake Solenoid
Y22 PTO Clutch Solenoid

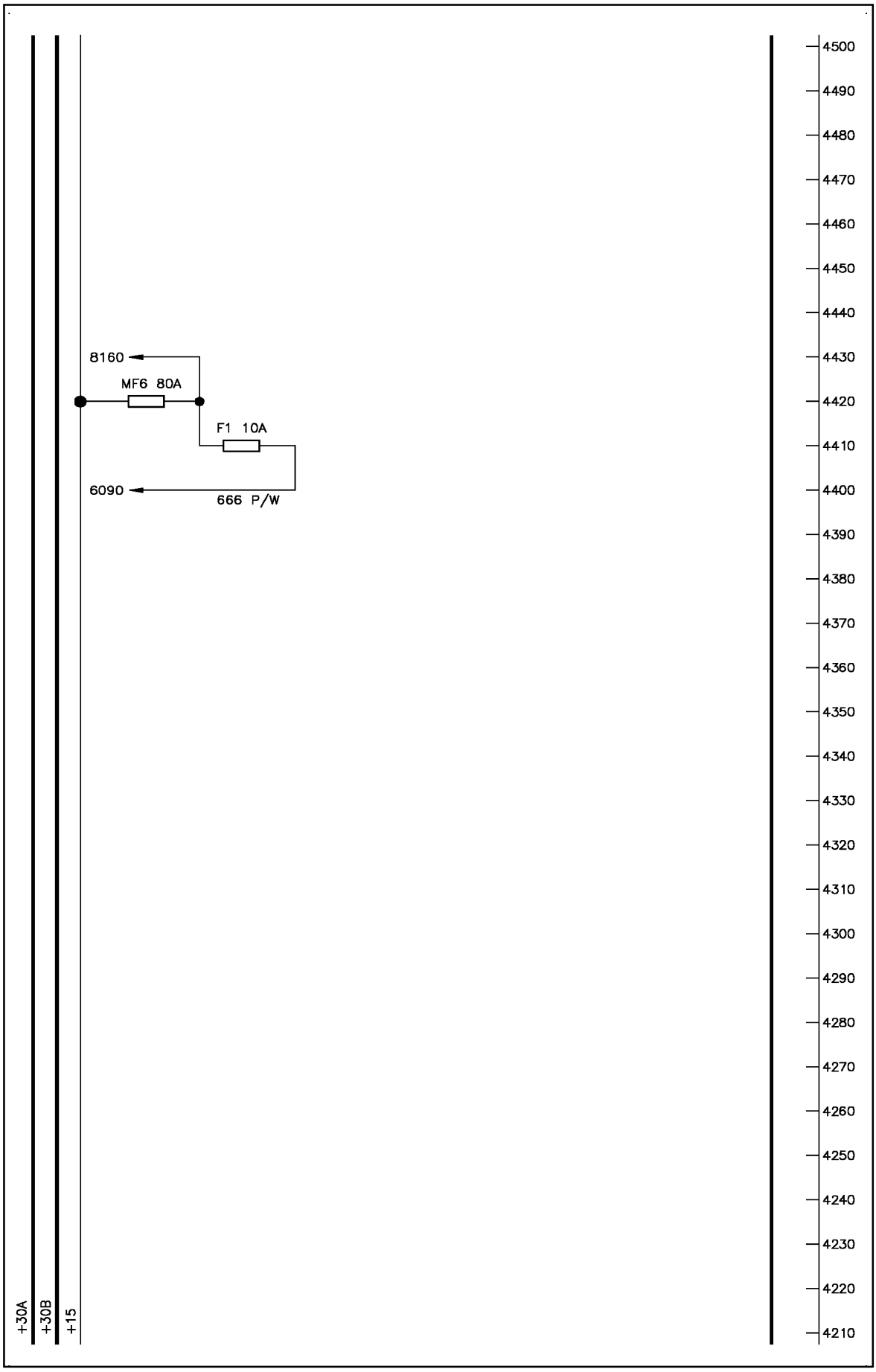
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

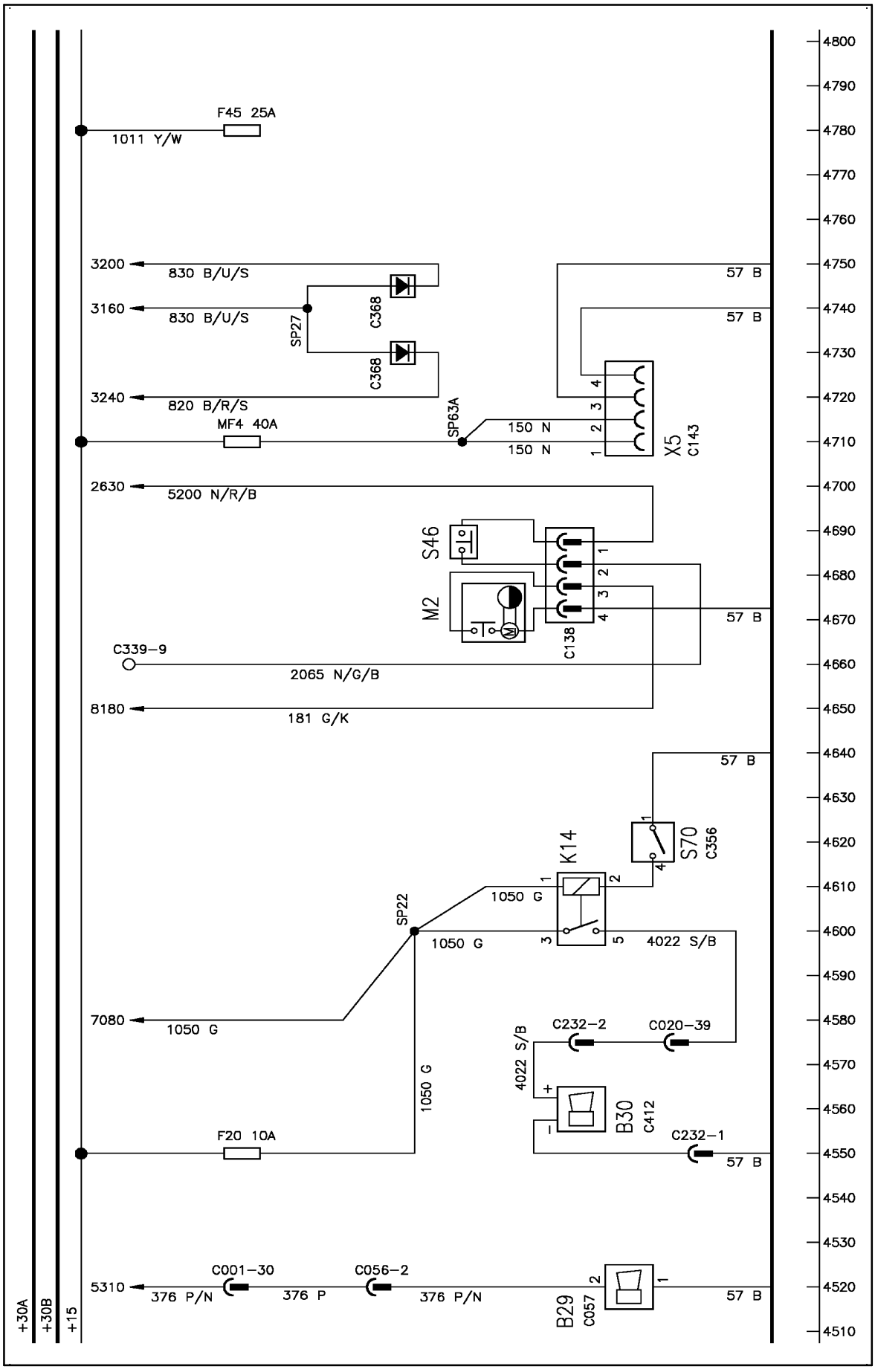

8160
MF6 80A
F1 10A
6090
666 P/W
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

CAB ACCESSORIES 1
Line 4210-4500

MF6 Maxi Fuse - 80A

F1 Fuse - 10A

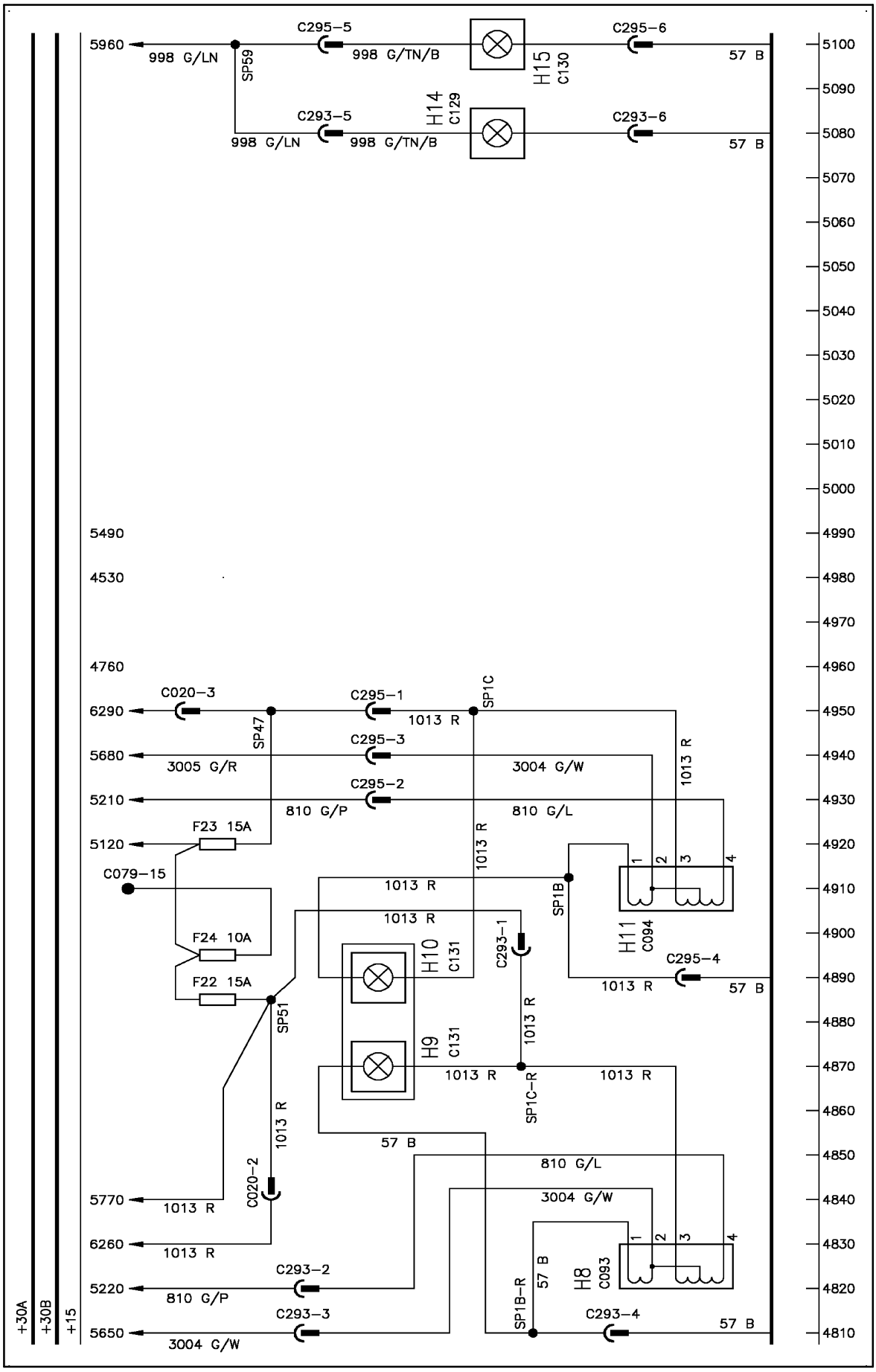
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


F45 25A
1011 Y/W
3200
830 B/U/S
3160
830 B/U/S
SP27
C368
C368
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
57 B
57 B
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C339-9
2065 N/G/B
8180
181 G/K
57 B
S70
C356
K14
SP22
1050 G
1050 G
4022 S/B
7080
1050 G
C232-2
C020-39
4022 S/B
B30
C412
C232-1
57 B
F20 10A
1050 G
5310
C001-30
C056-2
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A	**K14**	Reverse Alarm Relay
F20	Fuse - 10A		
F45	Fuse - 25A	**M2**	Seat Pump
B29	Horn	**S46**	Seat Switch
B30	Reverse Alarm	**S70**	Reverse Alarm Switch
C368(1)	Diode	**X5**	Implement Socket Rear
C368(2)	Diode		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

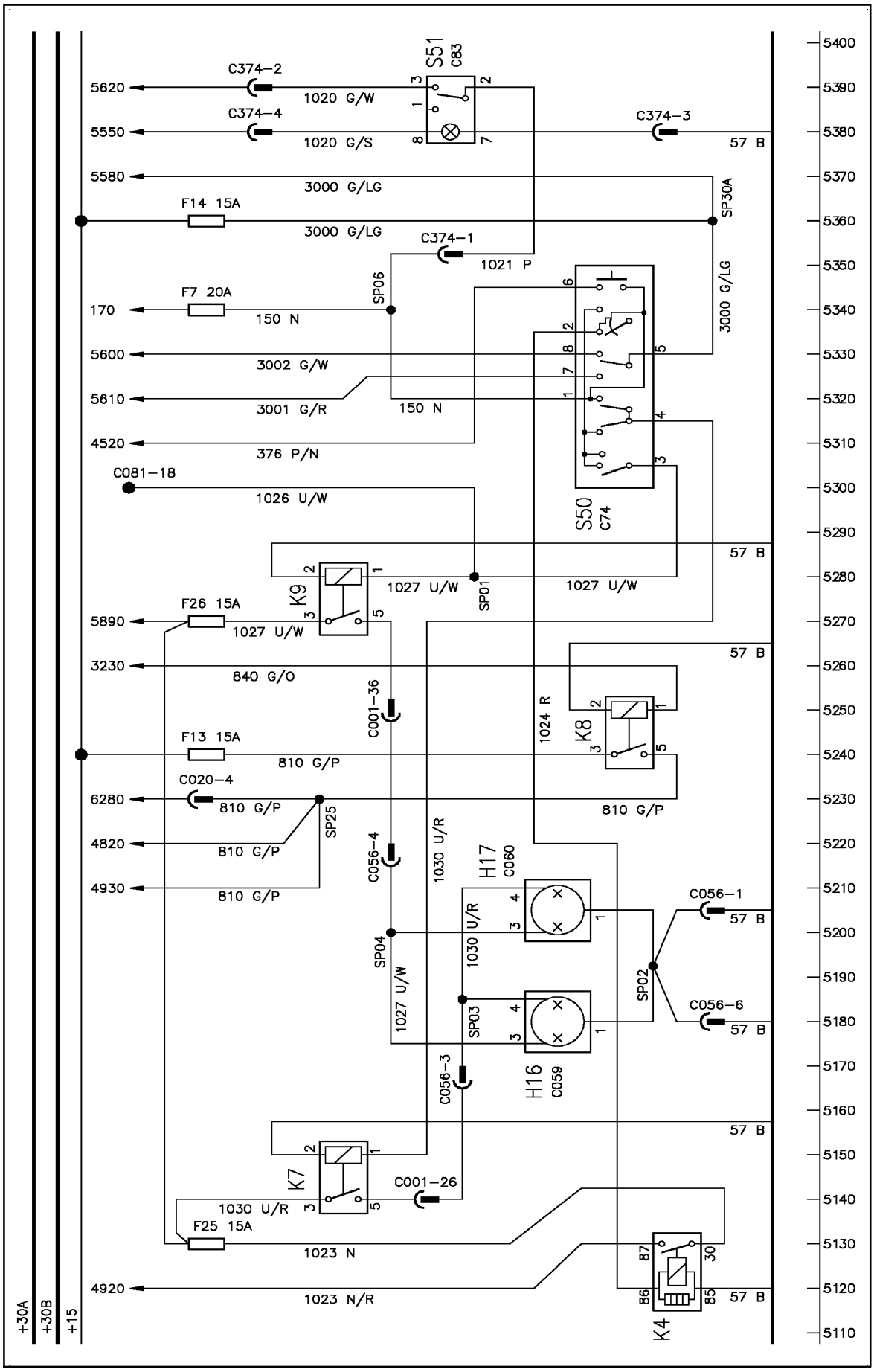

C295-5
C295-6
5960
998 G/LN
SP59
998 G/TN/B
57 B
H15
C130
H14
C129
C293-5
C293-6
998 G/LN
998 G/TN/B
57 B
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810
5490
4530
4760
C020-3
C295-1
SP1C
6290
1013 R
SP47
C295-3
5680
3005 G/R
3004 G/W
1013 R
C295-2
5210
810 G/P
810 G/L
F23 15A
5120
1013 R
C079-15
1013 R
SP1B
1 2 3 4
H11
C094
1013 R
F24 10A
C293-1
C295-4
F22 15A
1013 R
57 B
SP51
H10
C131
H9
C131
1013 R
1013 R
1013 R
SP1C-R
1013 R
57 B
810 G/L
C020-2
5770
1013 R
3004 G/W
6260
1013 R
1 2 3 4
H8
C093
C293-2
57 B
5220
810 G/P
SP1B-R
C293-3
C293-4
57 B
5650
3004 G/W
+30A
+30B
+15

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A

H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender L/H
H10	Licence Plate Lamp - Fender R/H
H11	Stop/Tail Light L/H
H14	Worklamp R/H
H15	Worklamp L/H

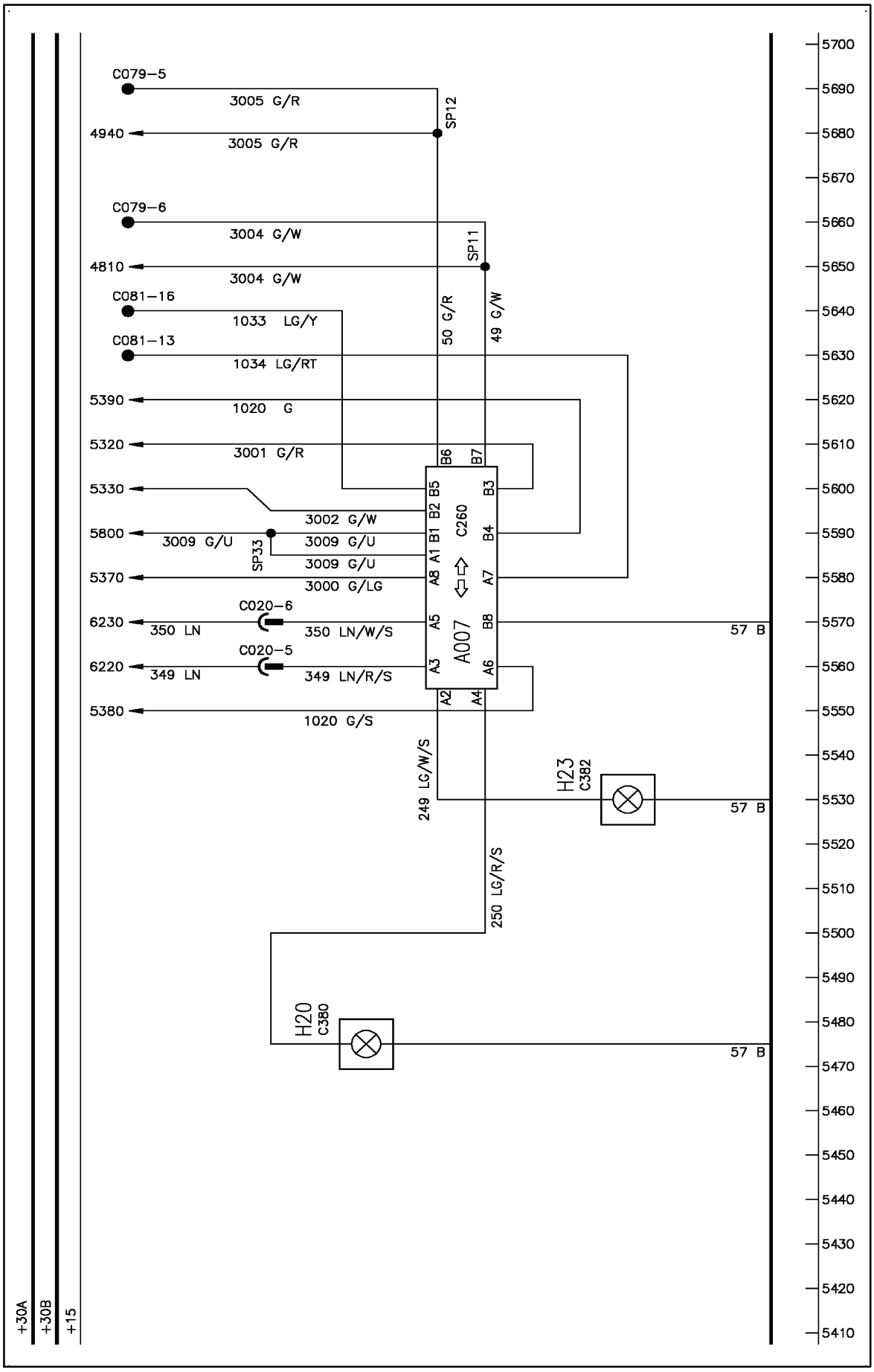
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
5620
C374-2
1020 G/W
S51
C83
5550
C374-4
1020 G/S
C374-3
57 B
5580
3000 G/LG
SP30A
F14 15A
3000 G/LG
C374-1
1021 P
SP06
F7 20A
170
150 N
5600
3002 G/W
5610
3001 G/R
150 N
4520
376 P/N
C081-18
1026 U/W
S50
C74
3000 G/LG
57 B
K9
1027 U/W
SP01
1027 U/W
F26 15A
5890
1027 U/W
3230
840 G/O
C001-36
1024 R
K8
F13 15A
810 G/P
C020-4
6280
810 G/P
SP25
4820
810 G/P
4930
810 G/P
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
1030 U/R
SP03
H16
C059
C056-3
C056-1
C056-6
SP02
K7
C001-26
1030 U/R
F25 15A
1023 N
4920
1023 N/R
K4
87
30
86
85
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
SP12
C079-6
3004 G/W
4810
3004 G/W
SP11
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5390
1020 G
5320
3001 G/R
5330
3002 G/W
5800
3009 G/U
SP33
3009 G/U
3009 G/U
5370
3000 G/LG
C020-6
6230
350 LN
350 LN/W/S
C020-5
6220
349 LN
349 LN/R/S
5380
1020 G/S
50 G/R
49 G/W
B6 B7
B5 B3
B2 B4
B1 C260
A1 A7
A8
A5 B8
A3 A6
A2 A4
A007
249 LG/W/S
250 LG/R/S
H23
C382
H20
C380
57 B
57 B
57 B
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

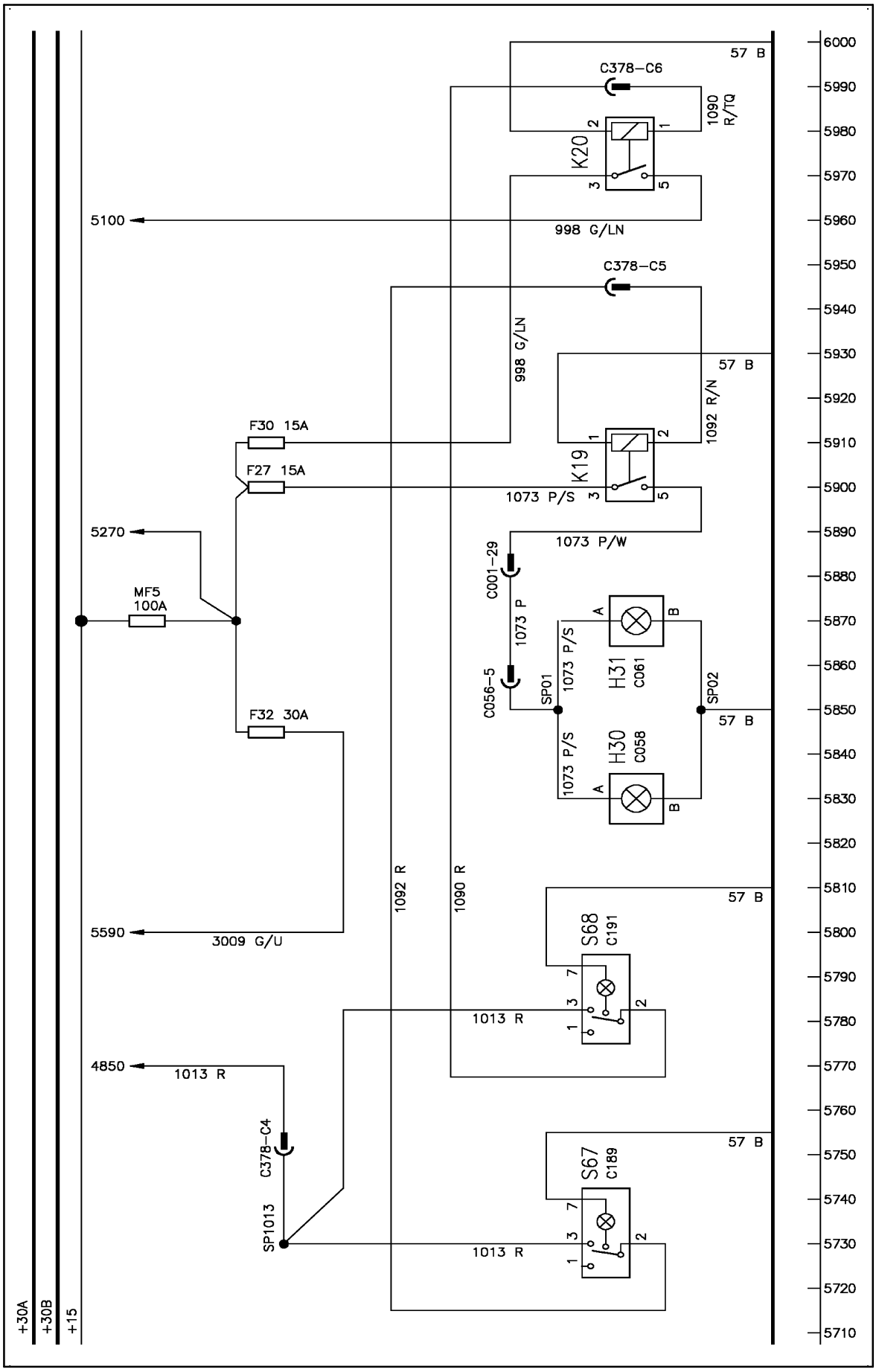
INDICATORS AND HAZARDS 3
Line 5410-5700

A007 Flasher Unit

H20 SMV Lamp - Rear L/H

H23 SMV Lamp - Rear R/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
MF5
100A
F30 15A
F27 15A
F32 30A
5270
5100
5590
3009 G/U
998 G/LN
1073 P/S
1073 P/W
1092 R
1090 R
1092 R/N
1090 R/TQ
C378-C6
C378-C5
K20
K19
C001-29
1073 P
C056-5
SP01
H31
C061
H30
C058
SP02
S68
C191
S67
C189
1013 R
4850
C378-C4
SP1013
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

WORKLAMPS
Line 5710-6000

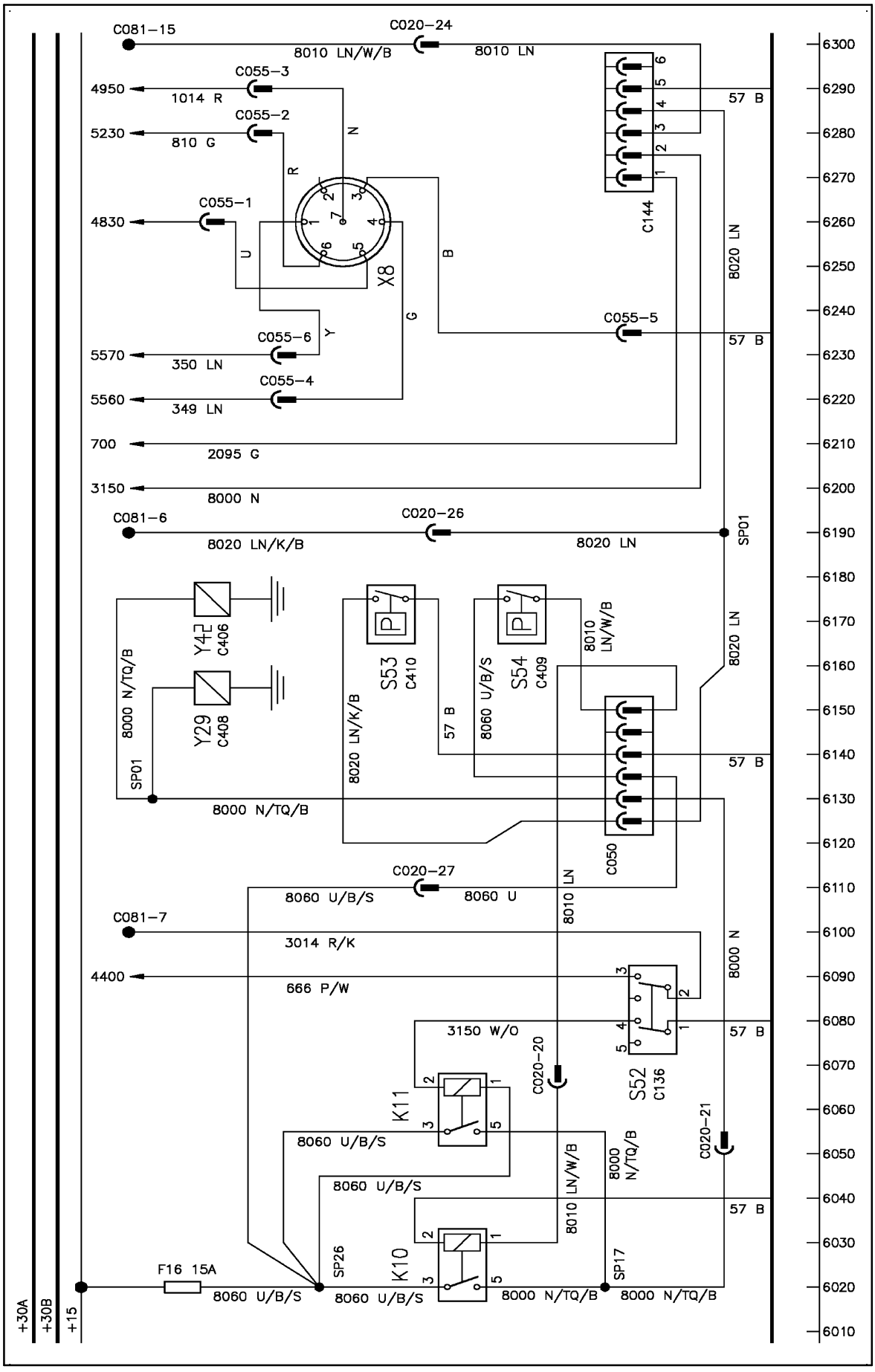
MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F30 Fuse - 15A
F32 Fuse - 30A

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

S67 Worklamp Switch - Front
S68 Worklamp Switch - Rear

H30 Corner Lamp R/H
H31 Corner Lamp L/H

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN
C055-3
4950
1014 R
C055-2
5230
810 G
C055-1
4830
C055-6
5570
350 LN
C055-4
5560
349 LN
X8
C144
57 B
8020 LN
C055-5
700
2095 G
3150
8000 N
C081-6
C020-26
8020 LN/K/B
8020 LN
SP01
Y42
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8060 U/B/S
8010 LN/W/B
8020 LN/K/B
C050
C020-27
8060 U
8010 LN
C081-7
3014 R/K
4400
666 P/W
3150 W/O
S52
C136
C020-20
C020-21
K11
K10
8000 N/TQ/B
SP26
SP17
F16 15A
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

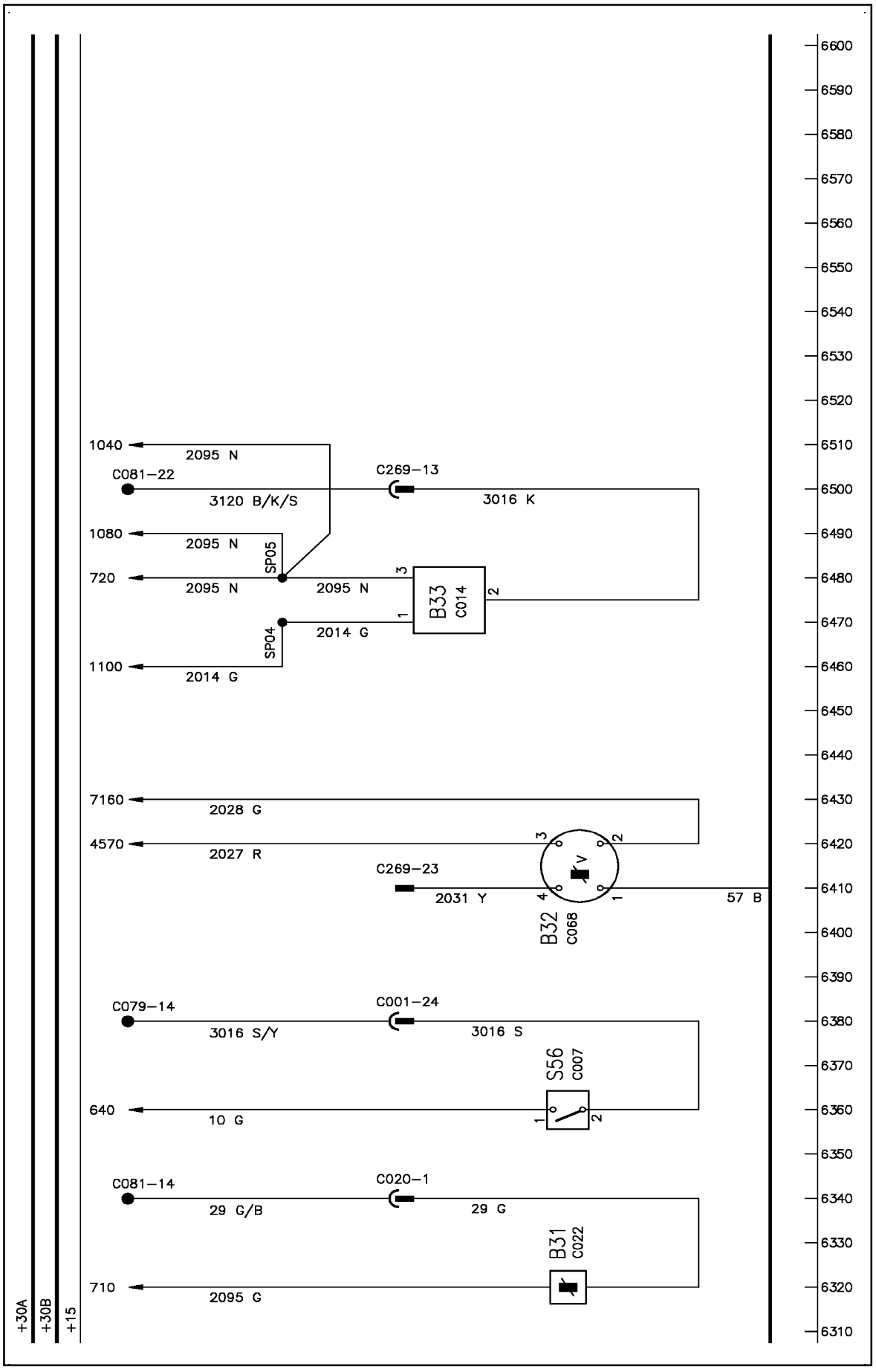
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
1040
2095 N
C081–22
3120 B/K/S
C269–13
3016 K
1080
2095 N
SP05
720
2095 N
2095 N
B33
C014
2014 G
SP04
1100
2014 G
7160
2028 G
4570
2027 R
C269–23
2031 Y
57 B
B32
C068
C079–14
3016 S/Y
C001–24
3016 S
S56
C007
640
10 G
C081–14
29 G/B
C020–1
29 G
B31
C022
710
2095 G
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310

SENSORS
Line 6310-6600

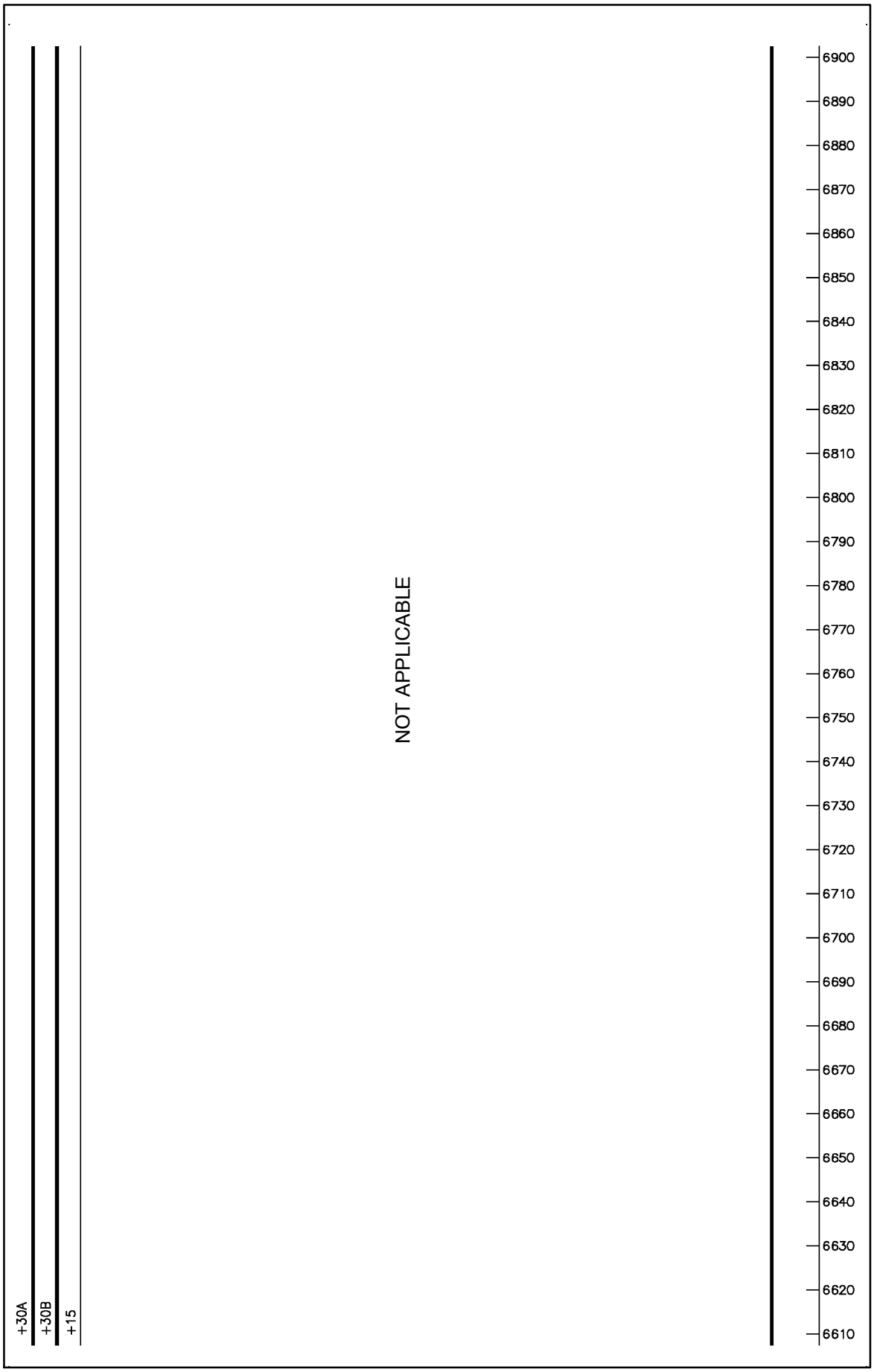
B31 Fuel Tank Sender

B32 Radar Gun

B33 Steering Angle Sensor

S56 Brake Fluid Level Switch

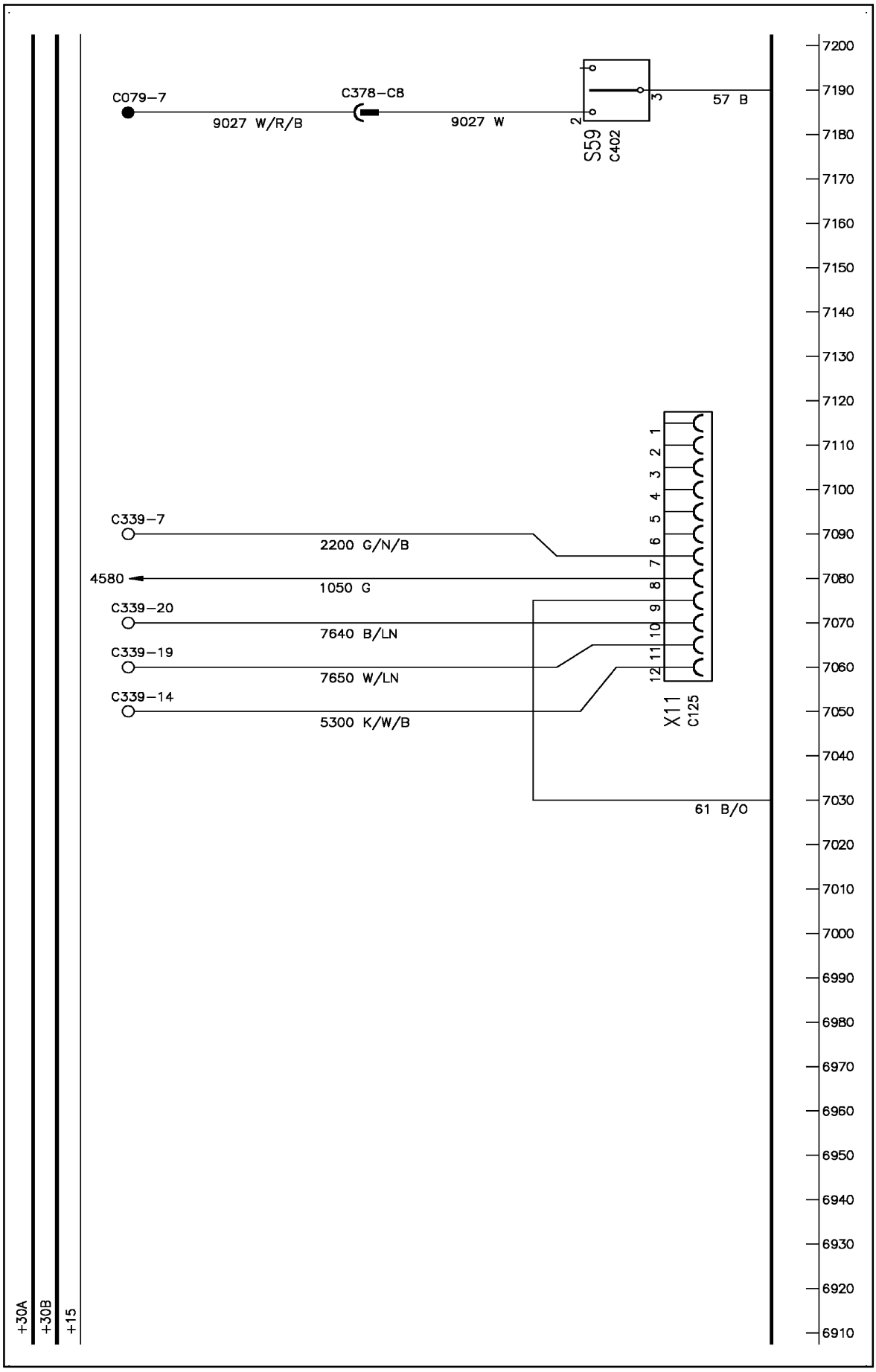
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
NOT APPLICABLE
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

WASHERS AND WIPERS
Line 6610-6900

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

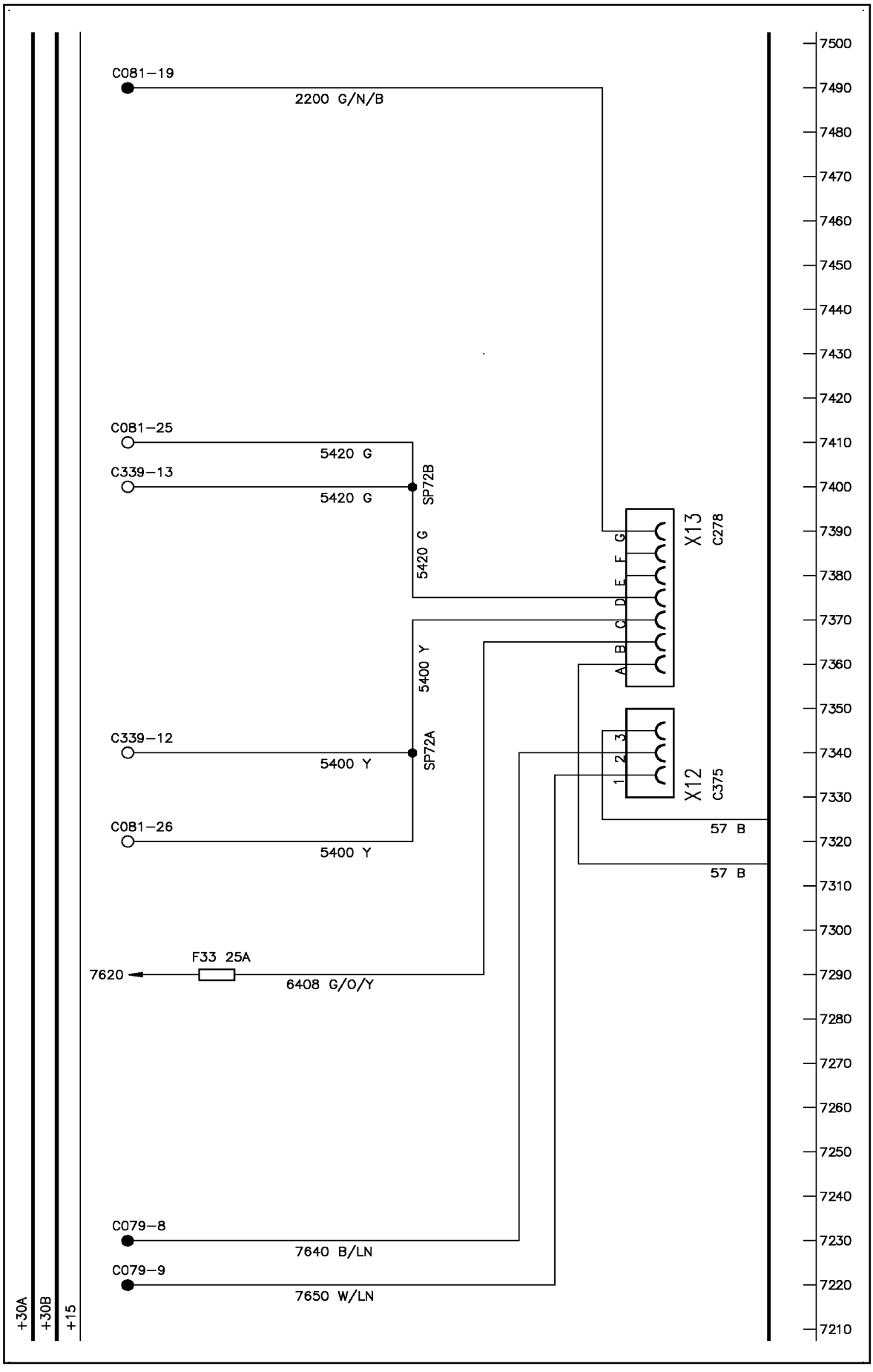

C079-7
9027 W/R/B
C378-C8
9027 W
S59
C402
57 B
C339-7
2200 G/N/B
4580
1050 G
C339-20
7640 B/LN
C339-19
7650 W/LN
C339-14
5300 K/W/B
X11
C125
61 B/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

DIAGNOSTIC PLUGS 1
Line 6910-7200

S59 Calibration/Select Switch

X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-19
2200 G/N/B
C081-25
5420 G
C339-13
5420 G
SP72B
5420 G
5400 Y
C339-12
5400 Y
SP72A
C081-26
5400 Y
X13
C278
A B C D E F G
X12
C375
1 2 3
57 B
57 B
F33 25A
7620
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

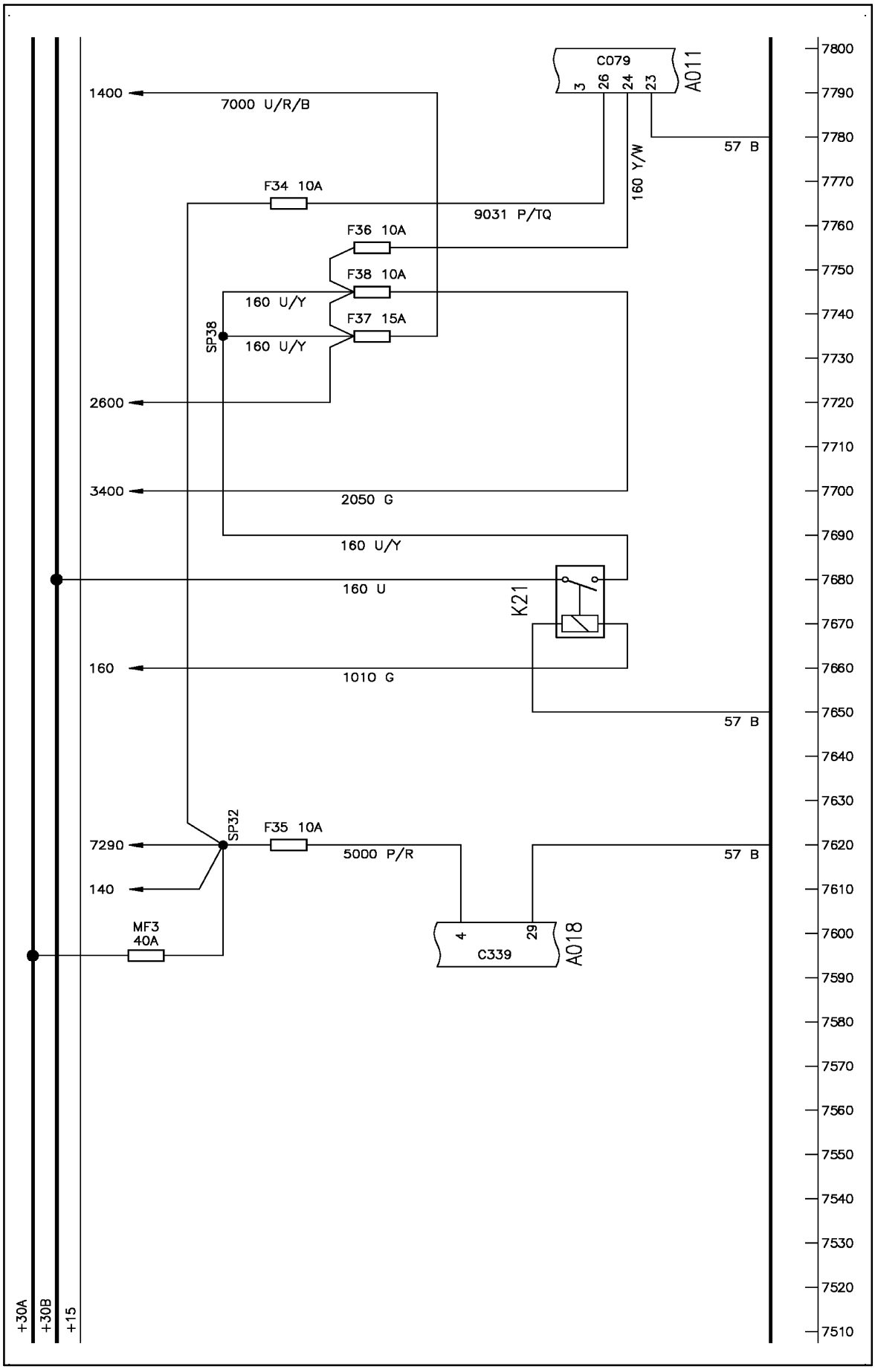
DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector

X13 EST Diagnostics Connector

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

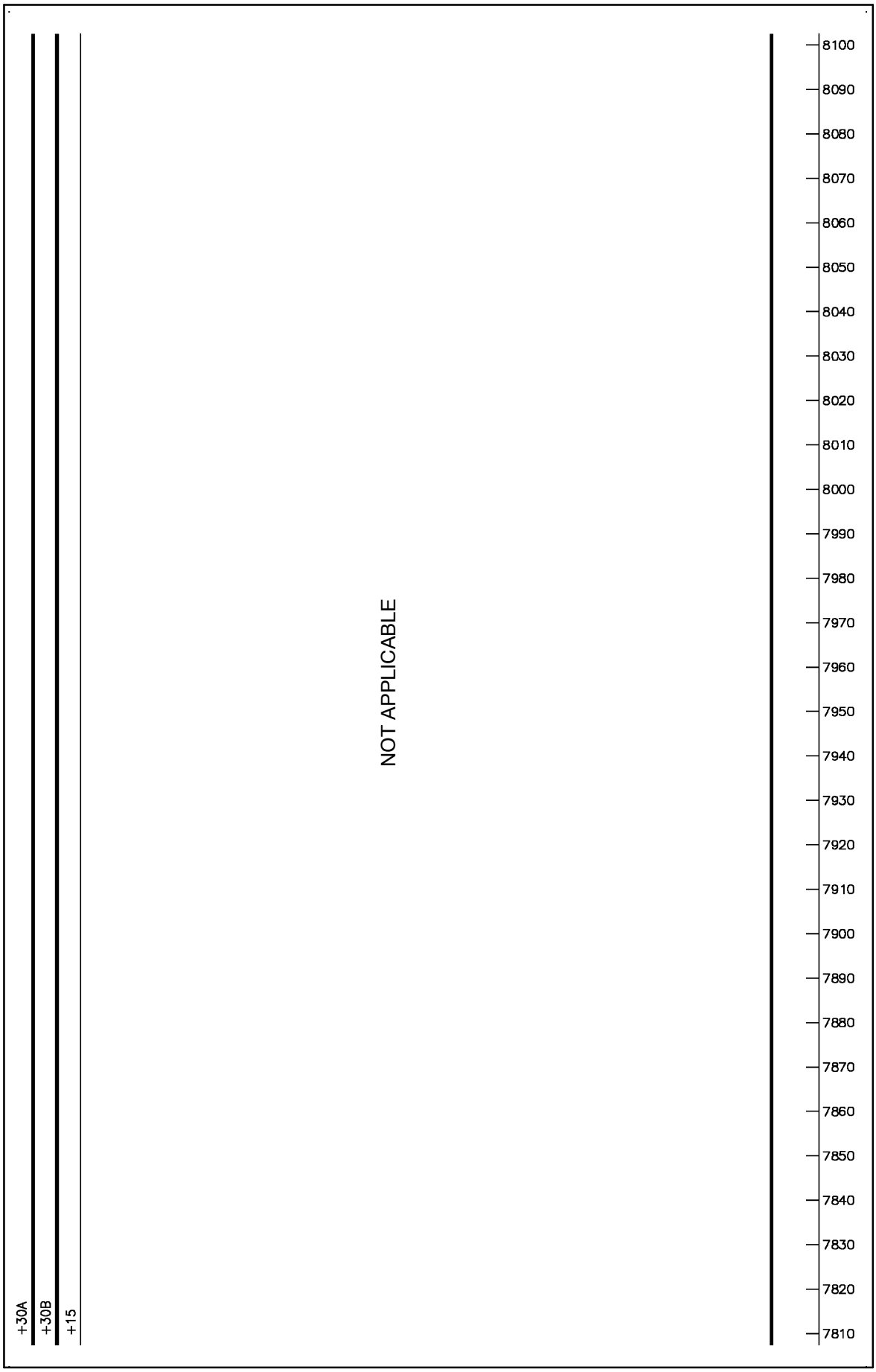

C079
3
26
24
23
A011
1400
7000 U/R/B
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
SP38
160 U/Y
2600
3400
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
SP32
F35 10A
7290
5000 P/R
57 B
140
MF3
40A
4
29
C339
A018
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A

K21	Electronics Supply Relay
A011	Instrument Cluster 1
A018	SCM - Small Control Module

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

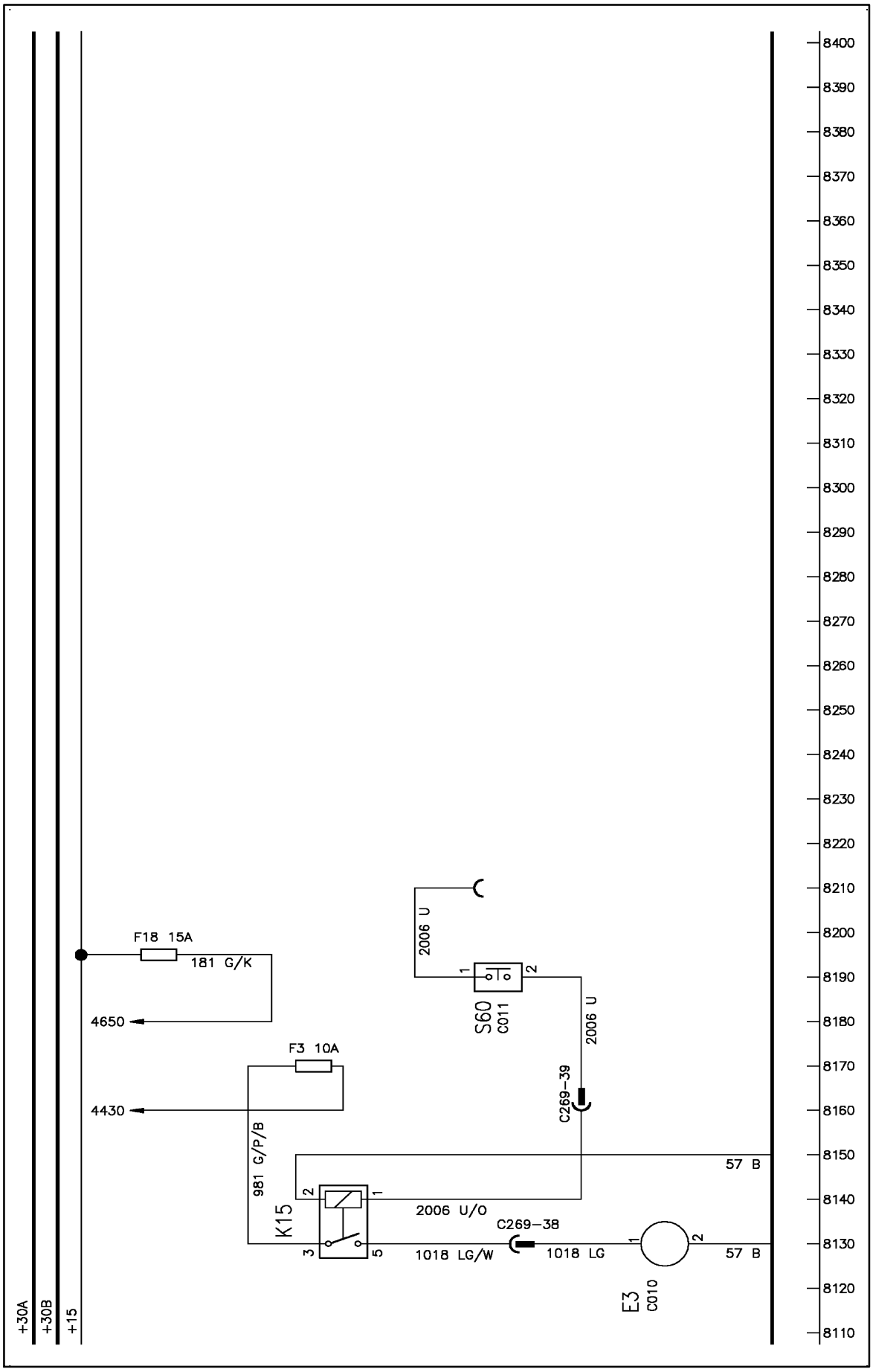

+30A
+30B
+15
NOT APPLICABLE
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

12x12 Transmission, L/Cab, W/Mechanical Engine,

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

NOT APPLICABLE

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


8400
8390
8380
8370
8360
8350
8340
8330
8320
8310
8300
8290
8280
8270
8260
8250
8240
8230
8220
8210
8200
8190
8180
8170
8160
8150
8140
8130
8120
8110
+30A
+30B
+15
F18 15A
181 G/K
4650
F3 10A
4430
981 G/P/B
K15
2006 U
S60
C011
2006 U
C269-39
57 B
2006 U/O
C269-38
1018 LG/W
1018 LG
57 B
E3
C010

12x12 Transmission, L/Cab, W/Mechanical Engine,

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

F3 Fuse 10A

F18 Fuse - 15A

E3 A/C Clutch

K15 Blower Motor Relay

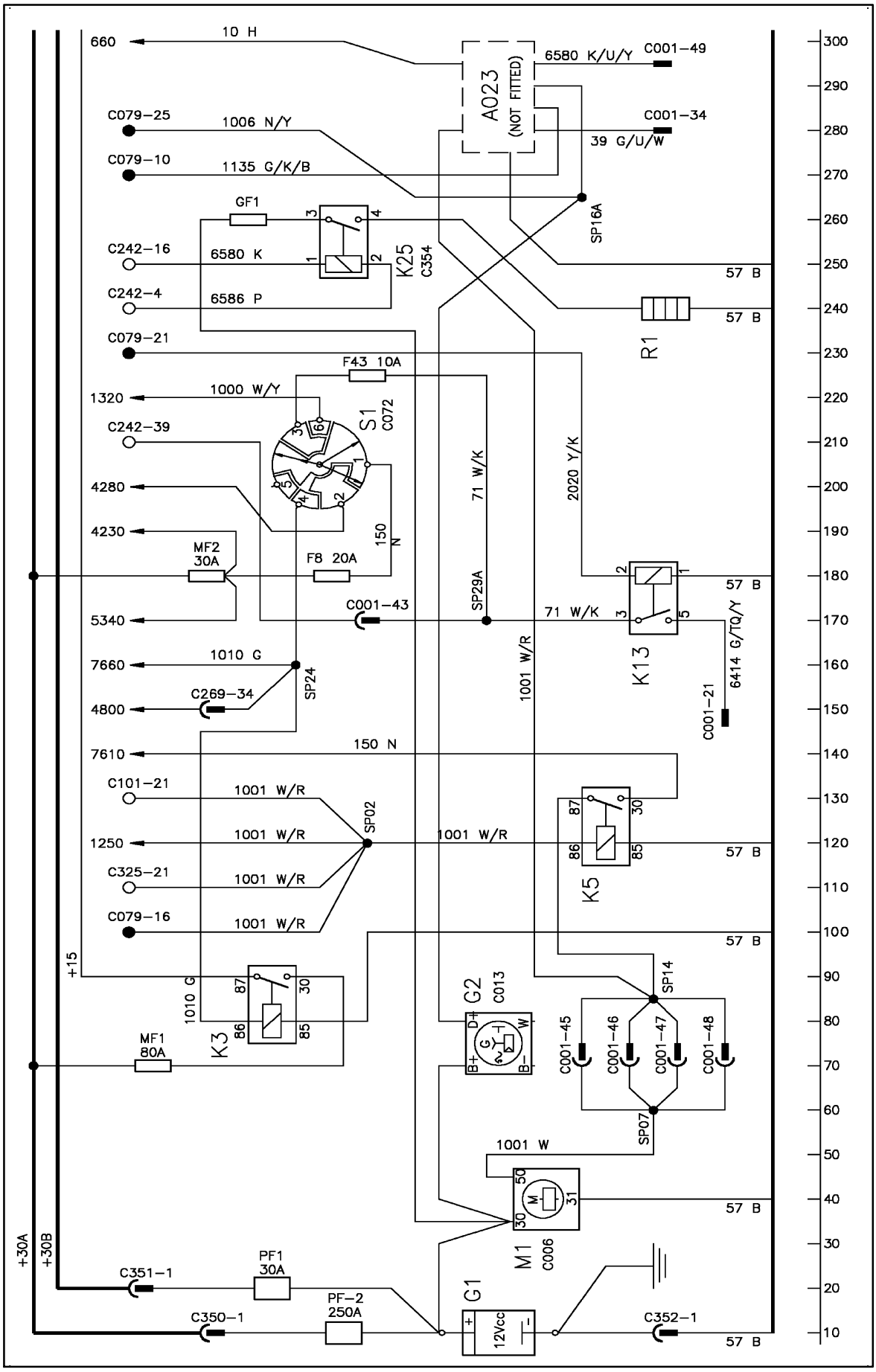
S60 A/C Pressure Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

NOTES

16X16 TRANSMISSION, W/CAB, W/ELECTRONIC ENGINE

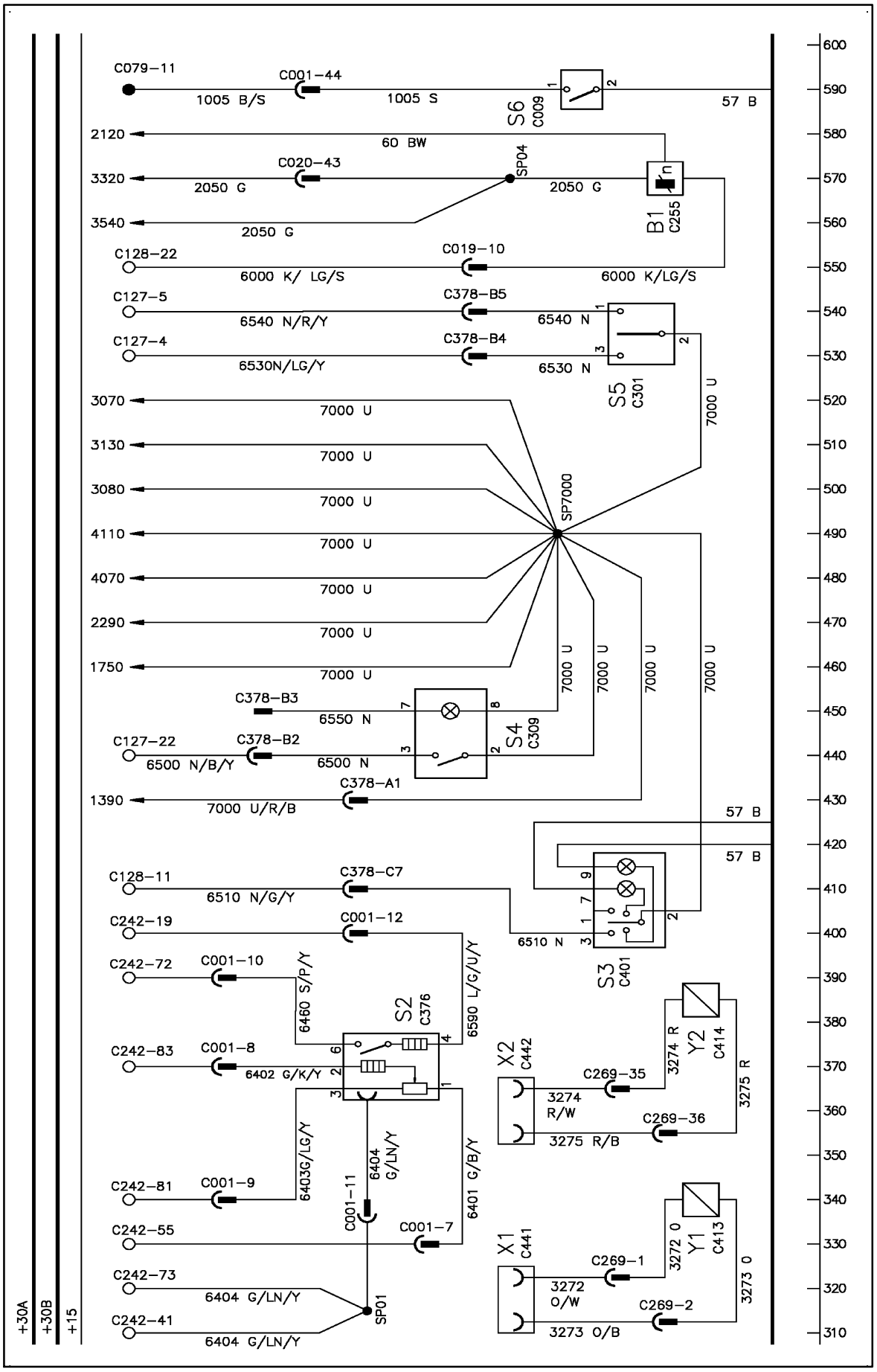
Wiring Diagrams	Circuit Description	Line Reference Range
Circuit 1	Starting, Charging, Thermostart, Fuel Injection Pump	0-300
Circuit 2	Engine	310-1200
Circuit 3	Transmission Circuits	1210-2100
Circuit 4	Hydraulics	2110-3000
Circuit 5	Four Wheel Drive and Differential Lock	3010-3300
Circuit 6	Power Take Off	3310-3900
Circuit 7	Front Suspension	3910-4200
Circuit 8	Cab Accessories	4210-4800
Circuit 9	Main Lamps, Indicators & Hazards	4810-5700
Circuit 10	Work Lamps	5710-6000
Circuit 11	Trailer Braking system circuits	6010-6300
Circuit 12	Sensors / Senders	6310-6600
Circuit 13	Wipers & Washers	6610-6900
Circuit 14	Diagnostic Connectors	6910-7500
Circuit 15	Processor Feed and Ground connections	7510-8100
Circuit 16	Air-Conditioning & Heating	8110-8400


660
10 H
A023
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C079-25
1006 N/Y
C079-10
1135 G/K/B
GF1
C242-16
6580 K
C242-4
6586 P
K25
C354
SP16A
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
S1
C072
C242-39
4280
4230
MF2
30A
F8 20A
150 N
71 W/K
2020 Y/K
SP29A
C001-43
5340
K13
6414 G/TQ/Y
C001-21
7660
1010 G
SP24
C269-34
4800
1001 W/R
7610
150 N
C101-21
1001 W/R
SP02
1250
C325-21
C079-16
K5
K3
+15
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

STARTING AND CHARGING
line 0-300

PF1	Power Fuse - 30A
PF2	Power Fuse - 250A
MF1	Maxi Fuse - 80A
MF2	Maxi Fuse - 30A
GF1	Grid Heater Fuse
F8	Fuse - 20A
F43	Fuse - 10A
G1	Battery
G2	Alternator
M1	Starter Motor and Solenoid
K3	Ignition Relay
K5	Starter (crank) Relay
K13	Engine Cold Start Advance Relay
K25	Grid Heater Relay
R1	Grid Heater
S1	Ignition Switch
A023	Grid Heater Module (not fitted)

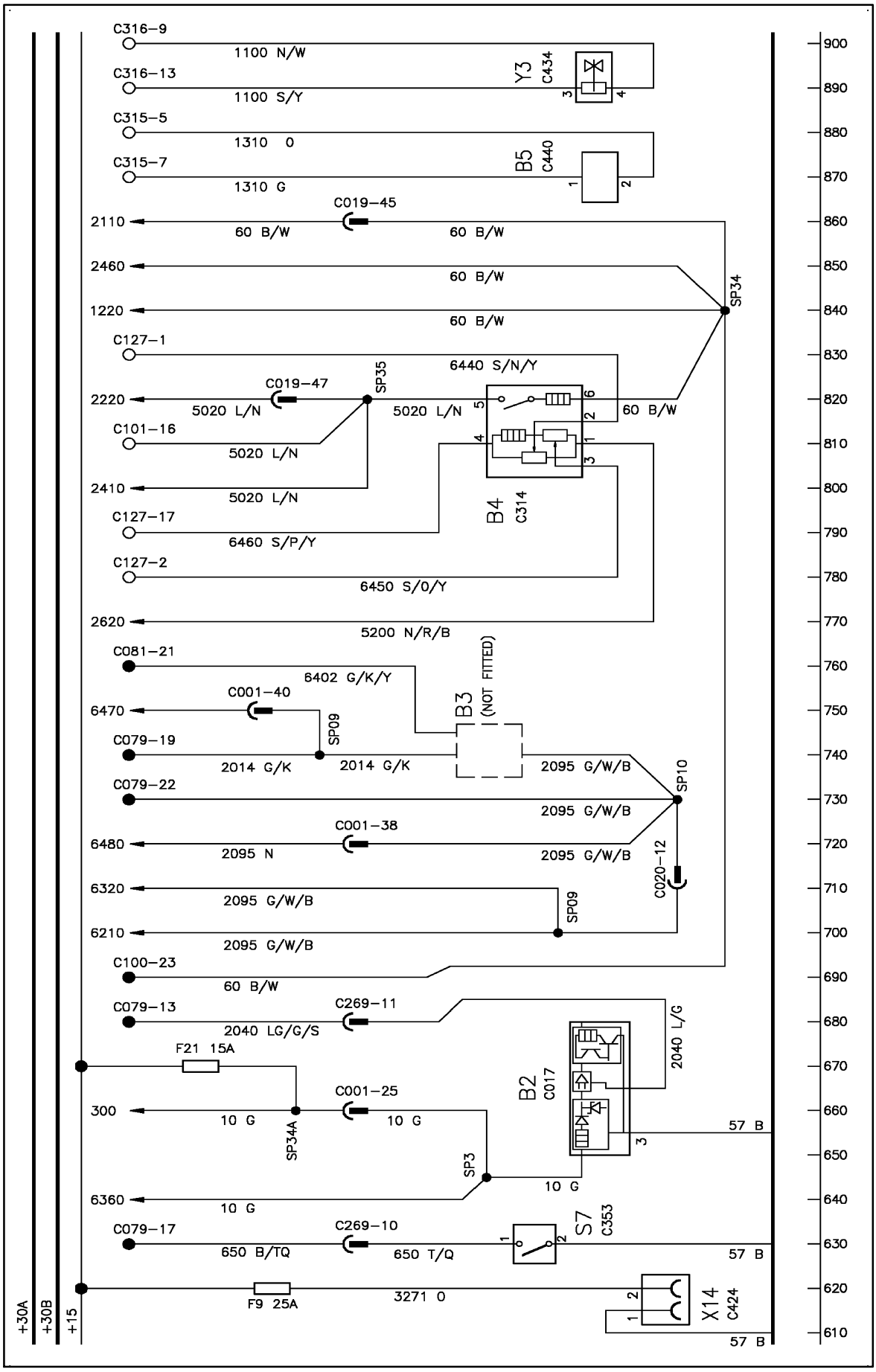
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-11
C001-44
1005 B/S
1005 S
S6 C009
57 B
2120
60 BW
3320
C020-43
2050 G
SP04
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K/LG/S
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6510 N
S3 C401
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C001-11
C242-81
C001-9
C242-55
C001-7
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310

ENGINE 1
line 310-600

B1	Engine Flywheel Speed Sensor
S2	Foot Throttle - Electronic Engine
S3	Constant Engine Speed programme Switch
S4	Constant ERPM On/Off Switch
S5	Engine Inc./Dec. Switch
S6	Air Cleaner Switch
Y1	Loader Valve 1
Y2	Loader Valve 2
X1	Joystick Loader Control Socket 1
X2	Joystick Loader Control Socket 2

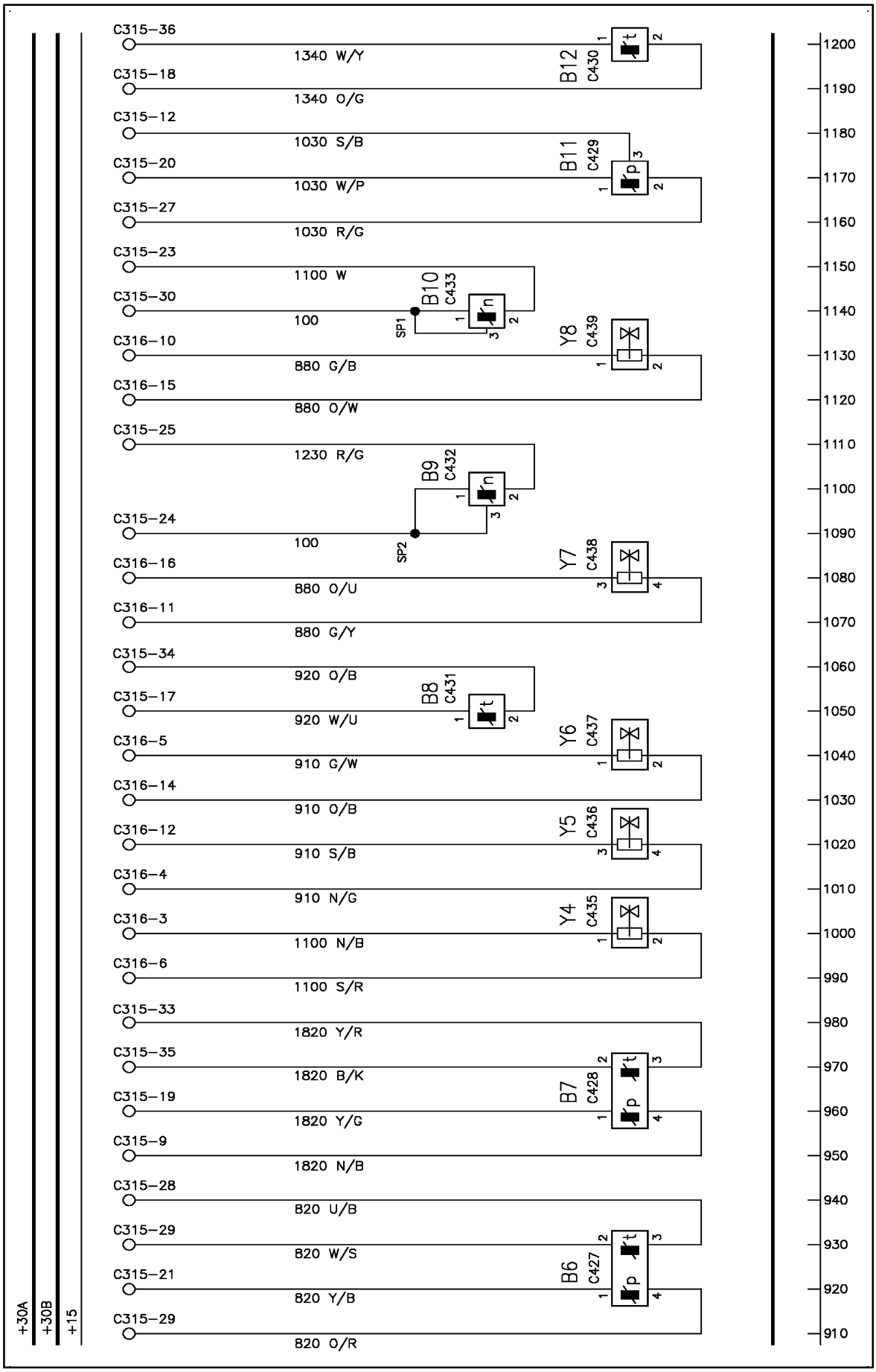
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
SP34
1220
60 B/W
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/O/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G/W/B
SP09
6210
2095 G/W/B
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
300
10 G
C001-25
10 G
SP34A
SP3
57 B
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

ENGINE 2
line 610-900

F9	Fuse - 25A	**S7**	De-Gas Bottle
F21	Fuse - 15A		
		Y3	Injector 1
B2	Water In Fuel Sensor		
B3	Foot Throttle - Mechanical Engine (Not Fitted)	**X14**	Loader Power Connector
B4	Hand Throttle		
B5	Fuel Metering Unit		

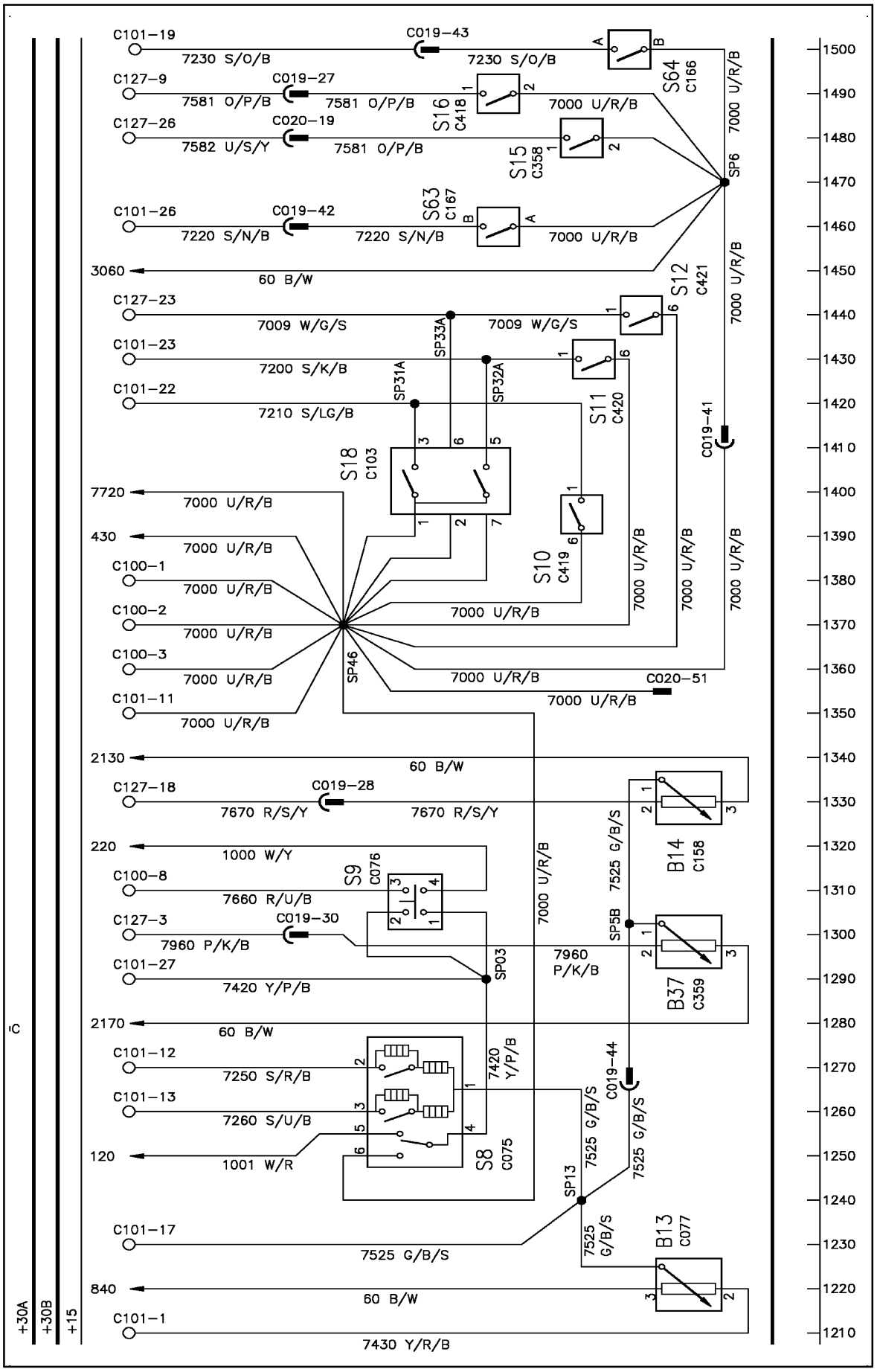
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
C315-27
1030 R/G
B11 C429
C315-23
1100 W
C315-30
100
SP1
B10 C433
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
C315-9
1820 N/B
B7 C428
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910

ENGINE 3
line 910-1200

B6	Boost Pressure/Temperature Sensor	**Y4**	Injector 2
B7	Oil Pressure/Temperature Sensor	**Y5**	Injector 3
B8	Fuel Temperature Sensor	**Y6**	Injector 4
B9	Crankshaft Speed Sensor	**Y7**	Injector 5 (6 cyl version)
B10	Camshaft Speed Sensor	**Y8**	Injector 6 (6 cyl version)
B11	Fuel Rail Pressure Sensor		
B12	Coolant Temperature Sensor		

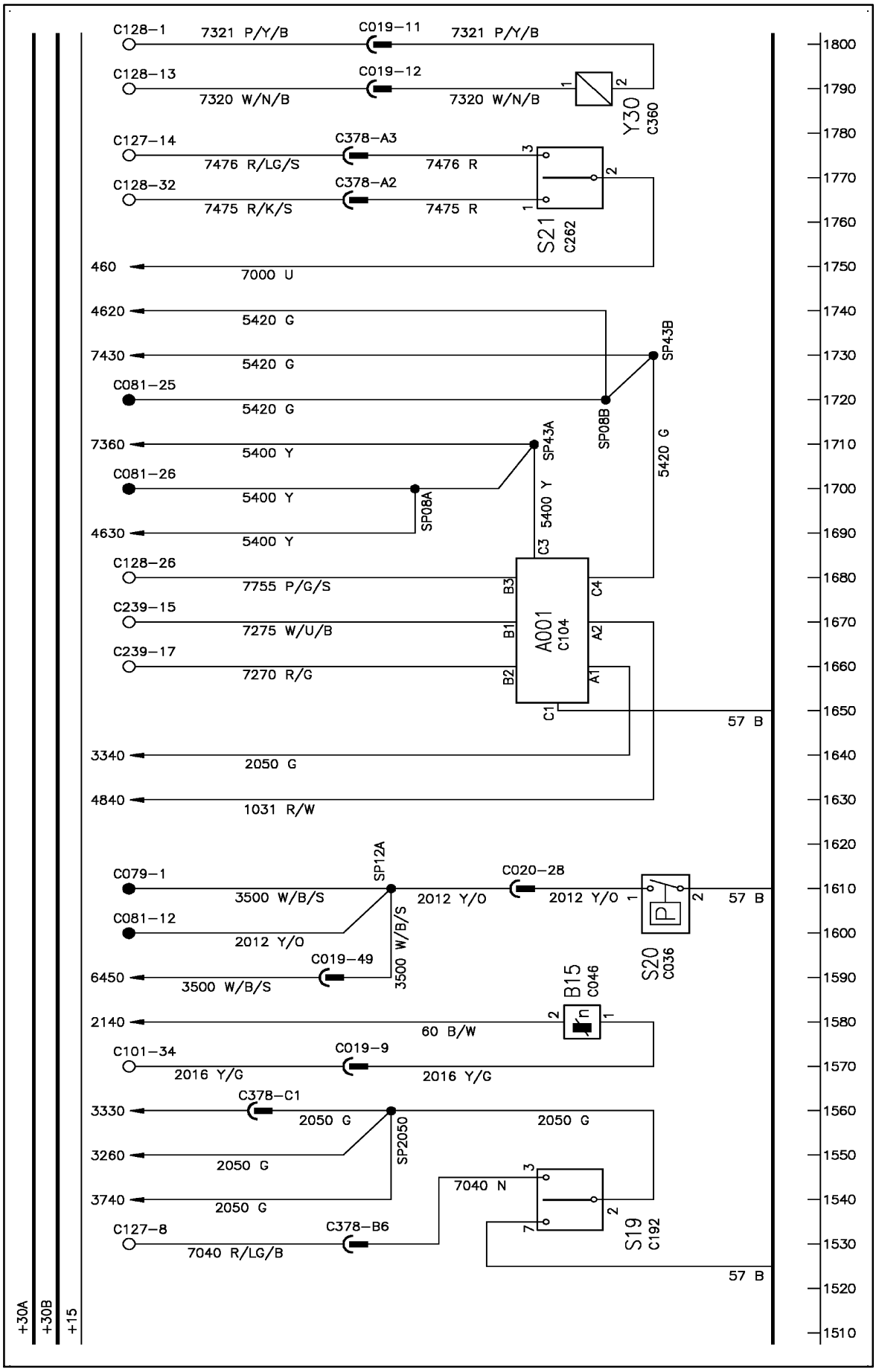
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
SP33A
7009 W/G/S
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
7525 G/B/S
SP5B
C127-3
C019-30
7960 P/K/B
7960 P/K/B
SP03
B37 C359
C101-27
7420 Y/P/B
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 G/B/S
SP13
7525 G/B/S
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210

TRANSMISSION SYSTEM 1
Line 1210-1500

B13	Clutch Potentiometer
B14	Synchro Position Potentiometer
B37	1-4/5-8 Synchro Potentiometer
S8	Shuttle Switch
S9	Clutch Switch
S10	Duplicate Transmission Control - Downshift
S11	Duplicate Transmission Control - Upshift
S12	Duplicate Transmission Control - Range
S15	Creeper Sensing Switch
S16	Creeper Sense Forward Switch
S18	Gearshift
S63	High Range Switch
S64	Low Range Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
B3
C4
C239-15
7275 W/U/B
B1
A2
A001
C104
C239-17
7270 R/G
B2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/LG/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510

TRANSMISSION SYSTEM 2
Line 1510-1800

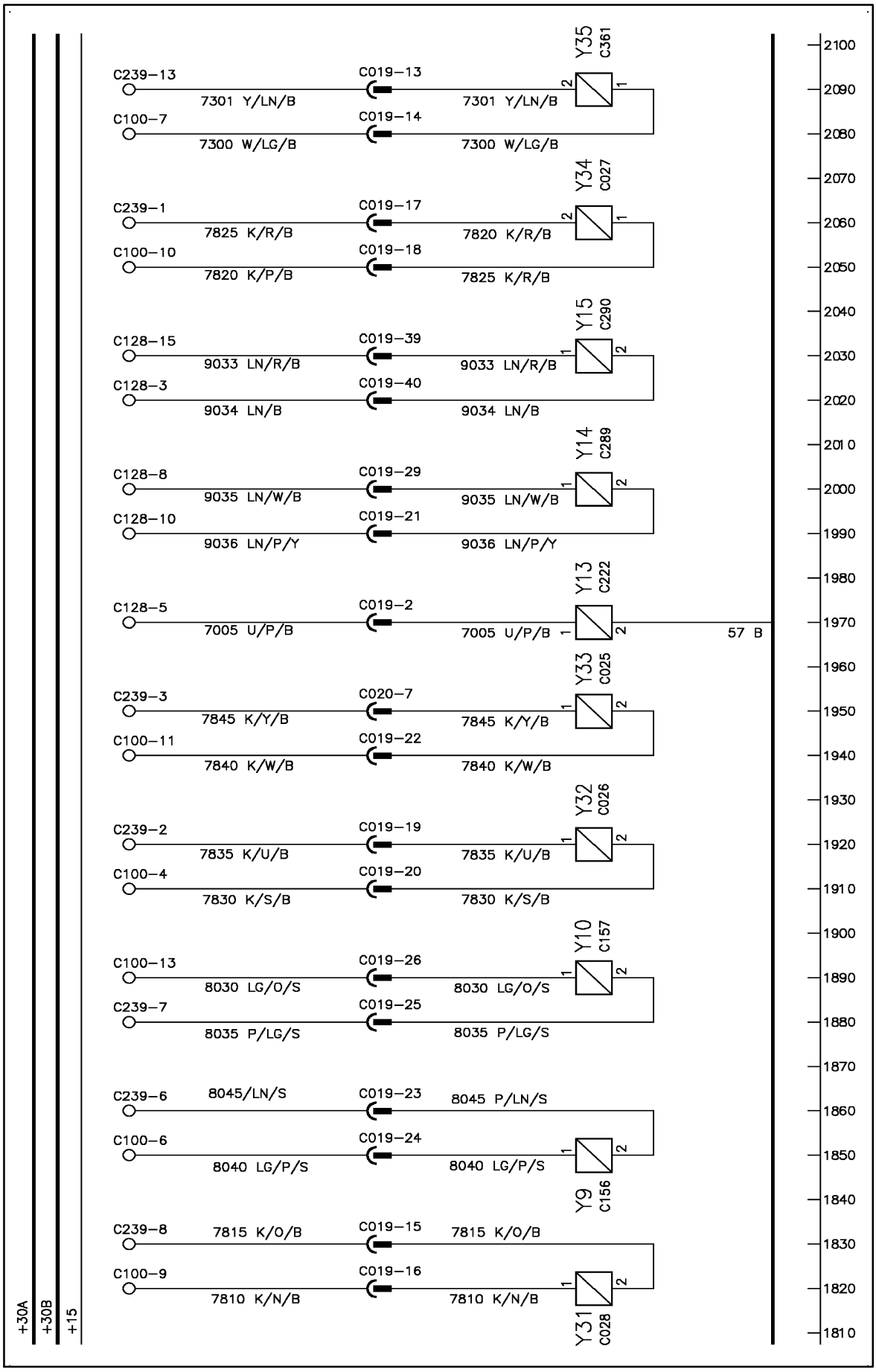
A001 Gear Shift Indicator

B15 Speed Sensor

S19 Creeper Gear Switch
S20 Transmission Oil Pressure Switch
S21 Transmission Auto Function Switch

Y30 5-8 Synchro Solenoid

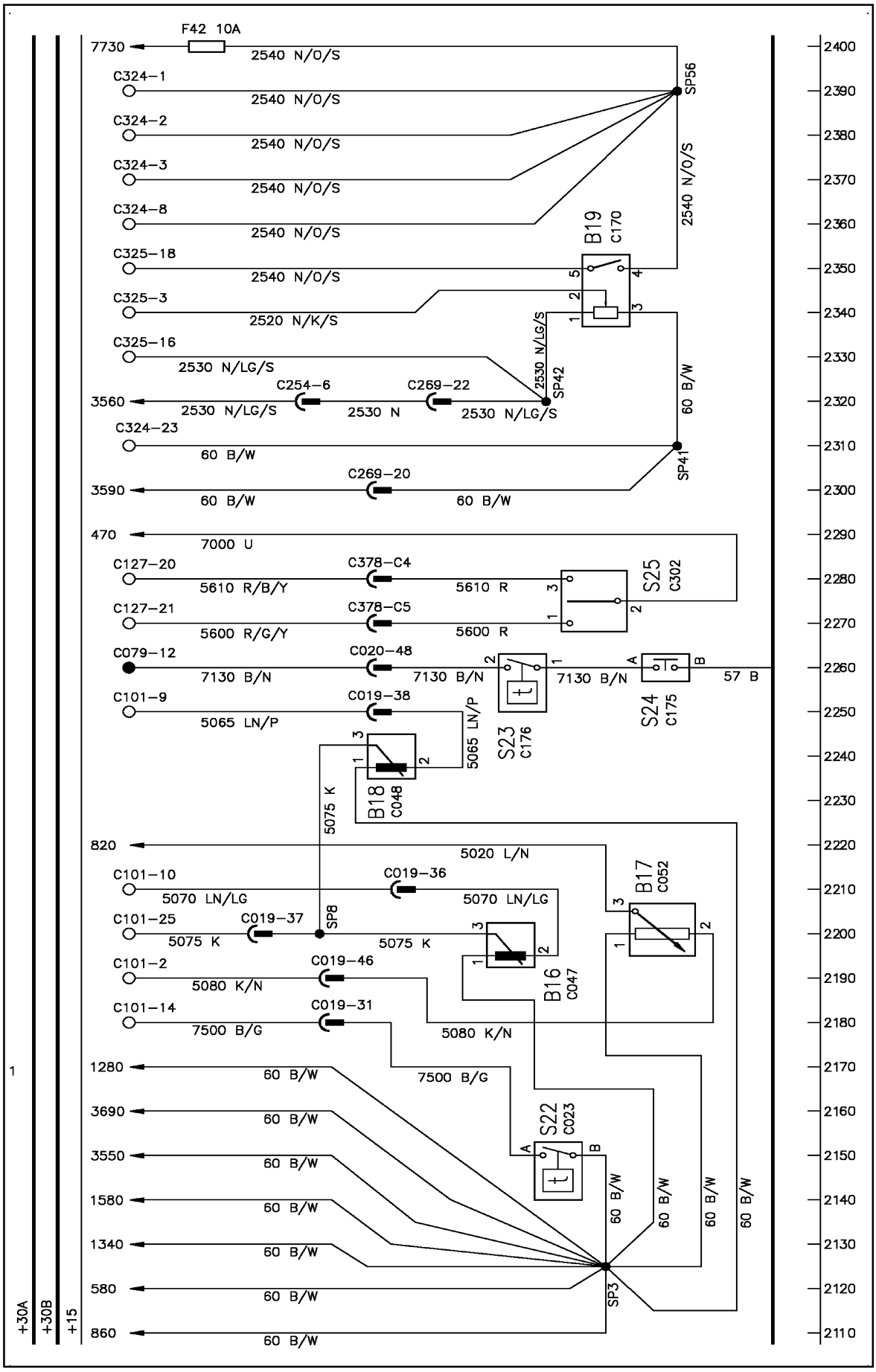
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
Y35 C361
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
C239-1
7825 K/R/B
C019-17
7820 K/R/B
Y34 C027
C100-10
7820 K/P/B
C019-18
7825 K/R/B
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
Y15 C290
C128-3
9034 LN/B
C019-40
9034 LN/B
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
Y14 C289
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
C128-5
7005 U/P/B
C019-2
7005 U/P/B
Y13 C222
57 B
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
Y33 C025
C100-11
7840 K/W/B
C019-22
7840 K/W/B
C239-2
7835 K/U/B
C019-19
7835 K/U/B
Y32 C026
C100-4
7830 K/S/B
C019-20
7830 K/S/B
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
Y10 C157
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810

TRANSMISSION SYSTEM 3
Line 1810-2100

Y9 Reverse Synchro Solenoid
Y10 Forward Synchro Solenoid
Y13 Creeper Gear Solenoid
Y14 17th Gear Dump Solenoid
Y15 17th Gear Solenoid
Y31 C1 Valve
Y32 C3 Valve
Y33 C4 Valve
Y34 C2 Valve
Y35 1-4 Synchro Solenoid

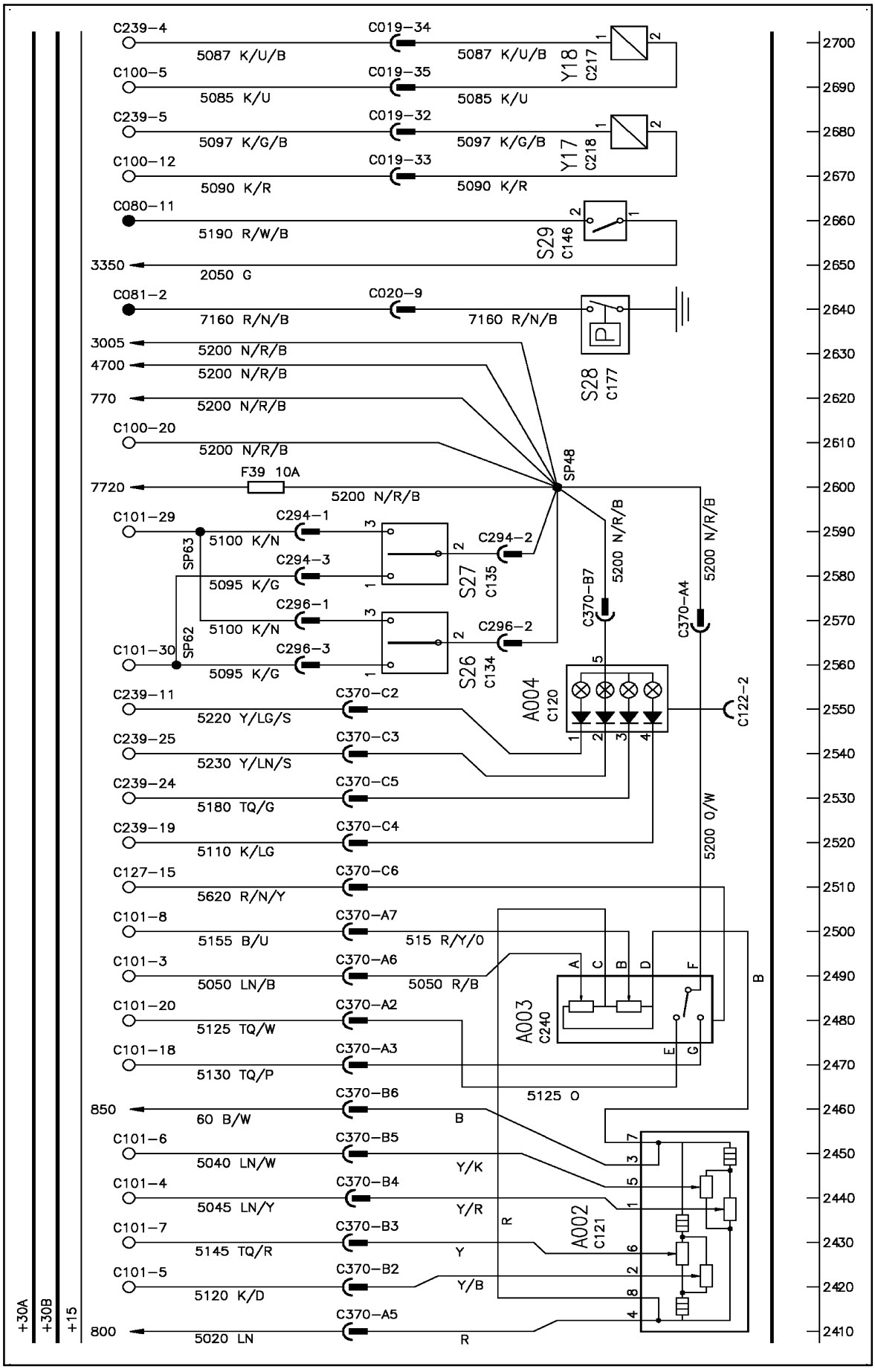
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/K/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP41
SP42
B19 C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25 C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S23 C176
S24 C175
57 B
B18 C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B16 C047
B17 C052
1280
3690
3550
1580
1340
580
860
S22 C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

HYDRAULICS 1
Line 2110-2400

F42	Fuse - 10A
B16	LH Draft Pin
B17	Rockshaft Potentiometer
B18	RH Draft Pin
B19	Front HPL Limit Potentiometer
S22	Transmission Oil Temp Sensor
S23	Oil Temperature Switch
S24	HPL Filter Switch
S25	HTS Switch

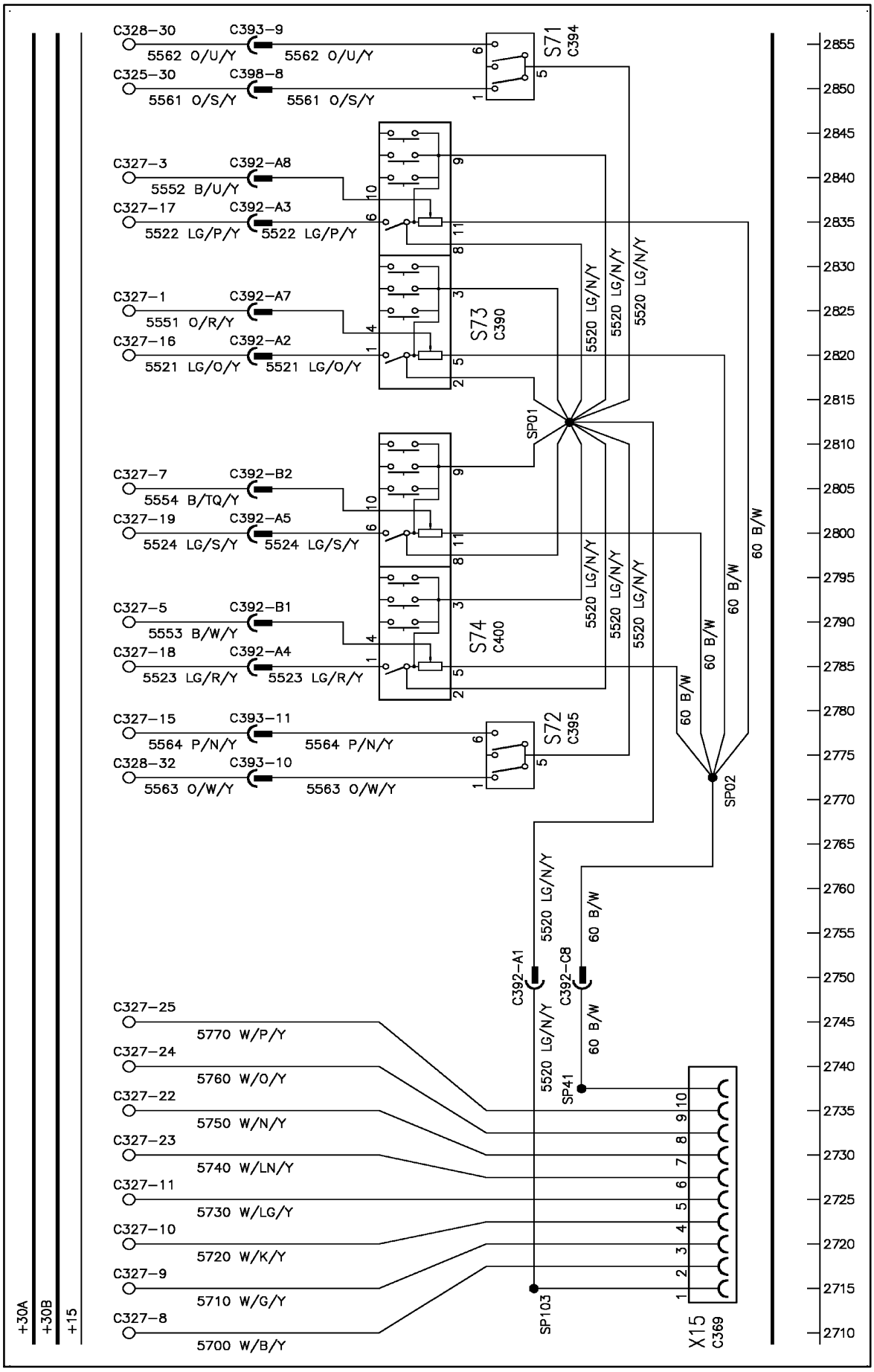
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
3005
5200 N/R/B
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7720
5200 N/R/B
C101-29
C294-1
5100 K/N
C294-3
5095 K/G
C294-2
S27
C135
SP63
C296-1
5100 K/N
C296-3
5095 K/G
C296-2
S26
C134
SP62
C101-30
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/G
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 LN/W
Y/K
C101-4
C370-B4
5045 LN/Y
Y/R
C101-7
C370-B3
5145 TQ/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 LN
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
2470
2460
2450
2440
2430
2420
2410

HYDRAULICS 2
Line 2410-2700

F39	Fuse - 10A	**S27**	HPL Switch R/H
		S28	Lo Charge Switch
A002	EDC Control	**S29**	Lift-O-Matic Switch
A003	EDC Mouse		
A004	EDC Status Lamp Panel	**Y17**	EDC Lower Solenoid
		Y18	EDC Raise Solenoid
S26	HPL Switch L/H		

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
5520 LG/N/Y
60 B/W
SP02
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
SP103
X15
C369
+30A
+30B
+15
2855
2850
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790
2785
2780
2775
2770
2765
2760
2755
2750
2745
2740
2735
2730
2725
2720
2715
2710

HYDRAULICS 3
Line 2710-2855

S71 Switch 1/2 Time/Flow

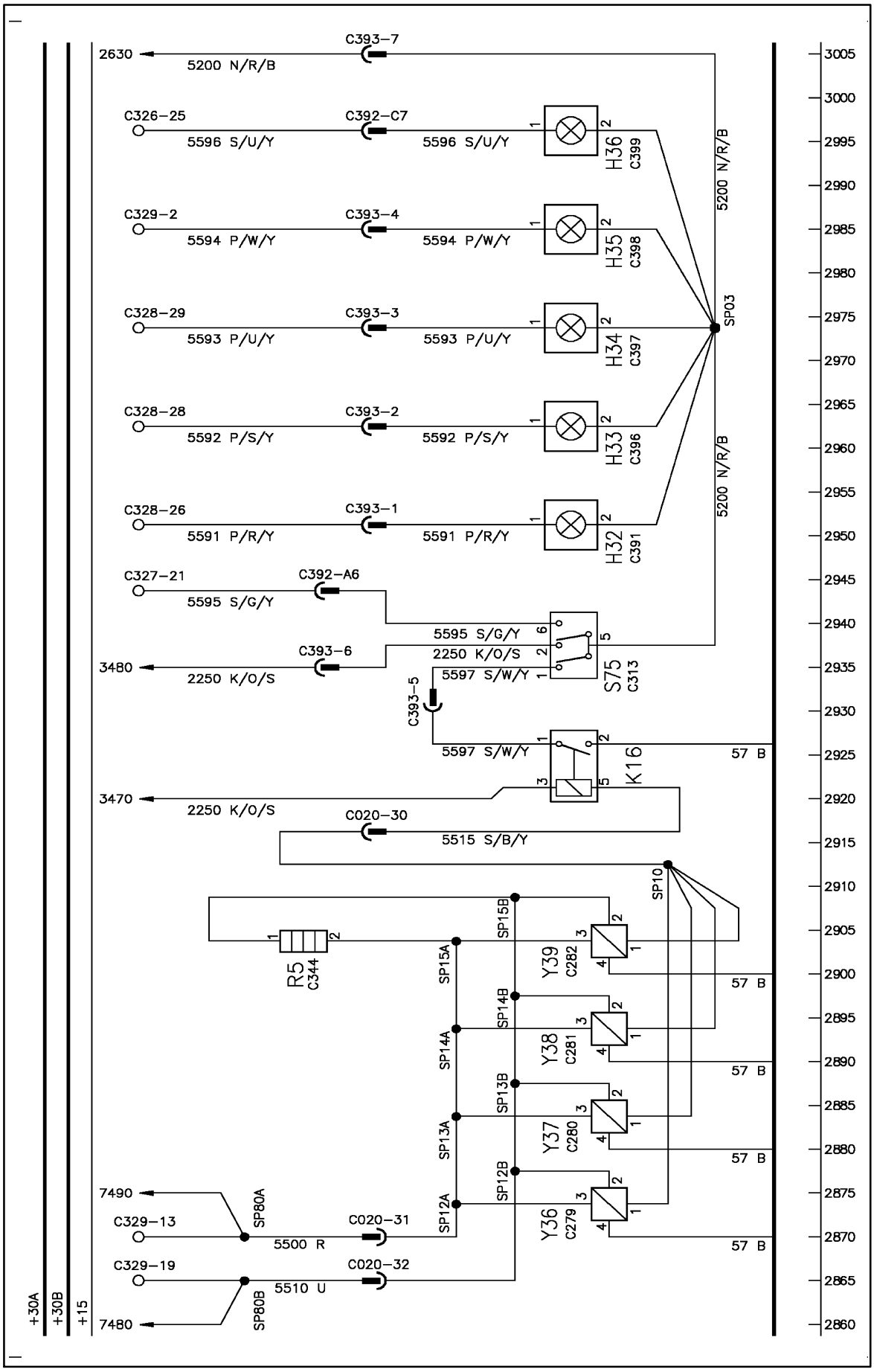
S72 Switch 3/4 Time/Flow

S73 EHR Lever 1/2

S74 EHR Lever 3/4

X15 Joystick

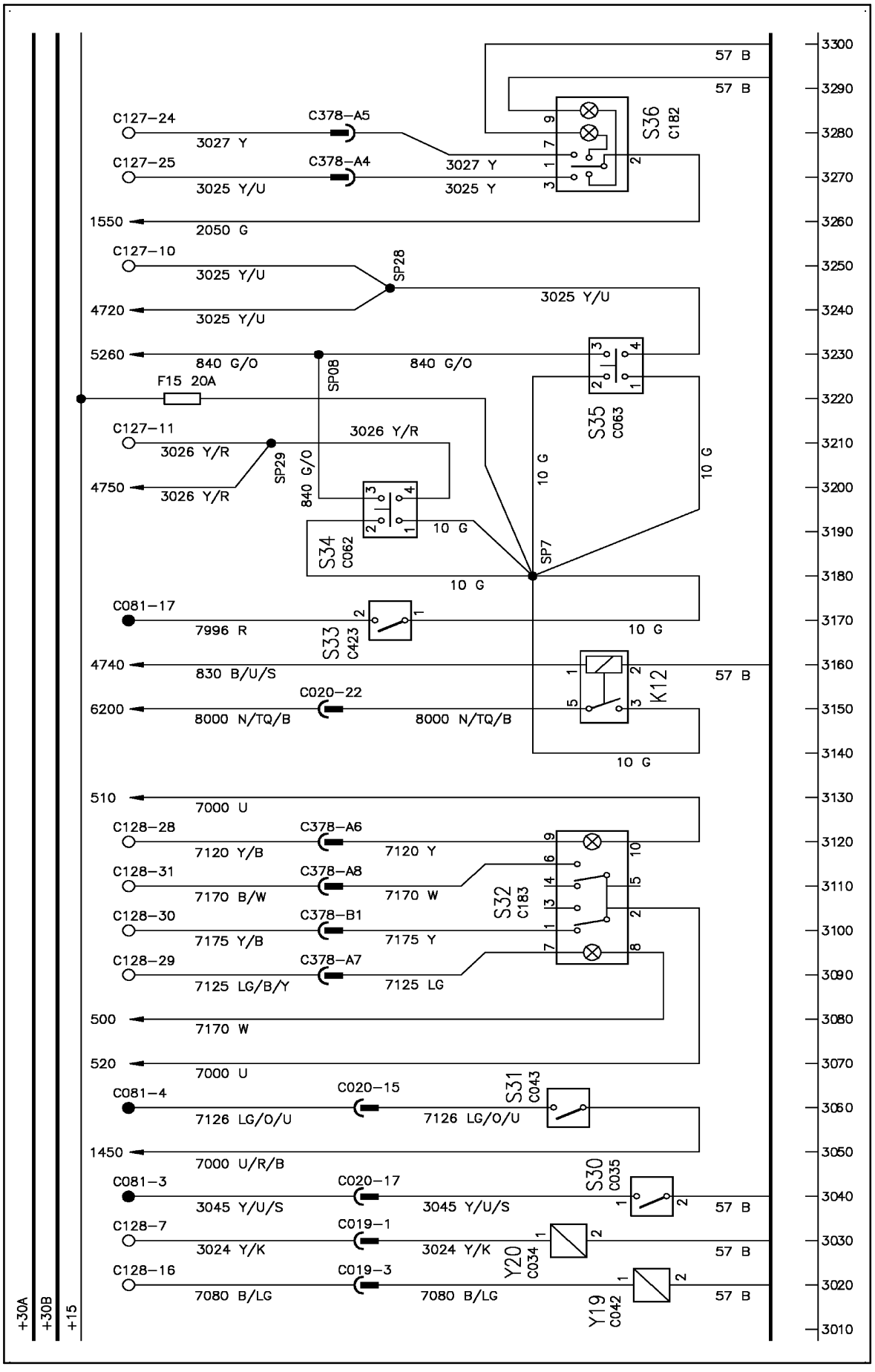
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C393-7
2630
5200 N/R/B
C326-25
C392-C7
5596 S/U/Y
5596 S/U/Y
H36 C399
C329-2
C393-4
5594 P/W/Y
5594 P/W/Y
H35 C398
C328-29
C393-3
5593 P/U/Y
5593 P/U/Y
H34 C397
C328-28
C393-2
5592 P/S/Y
5592 P/S/Y
H33 C396
C328-26
C393-1
5591 P/R/Y
5591 P/R/Y
H32 C391
5200 N/R/B
SP03
5200 N/R/B
C327-21
C392-A6
5595 S/G/Y
5595 S/G/Y
2250 K/O/S
5597 S/W/Y
S75 C313
3480
C393-6
2250 K/O/S
C393-5
5597 S/W/Y
57 B
K16
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
SP15B
SP15A
R5 C344
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
7480
SP80B
+30A
+30B
+15
3005
3000
2995
2990
2985
2980
2975
2970
2965
2960
2955
2950
2945
2940
2935
2930
2925
2920
2915
2910
2905
2900
2895
2890
2885
2880
2875
2870
2865
2860

HYDRAULICS 3
Line 2860-3005

H32	Lamp 1
H33	Lamp 2
H34	Lamp 3
H35	Lamp 4
H36	Master Lamp
K16	EHR Power Relay
R5	Can Terminator
S75	Master Switch
Y36	EHR Valve - 1
Y37	EHR Valve - 2
Y38	EHR Valve - 3
Y39	EHR Valve - 4

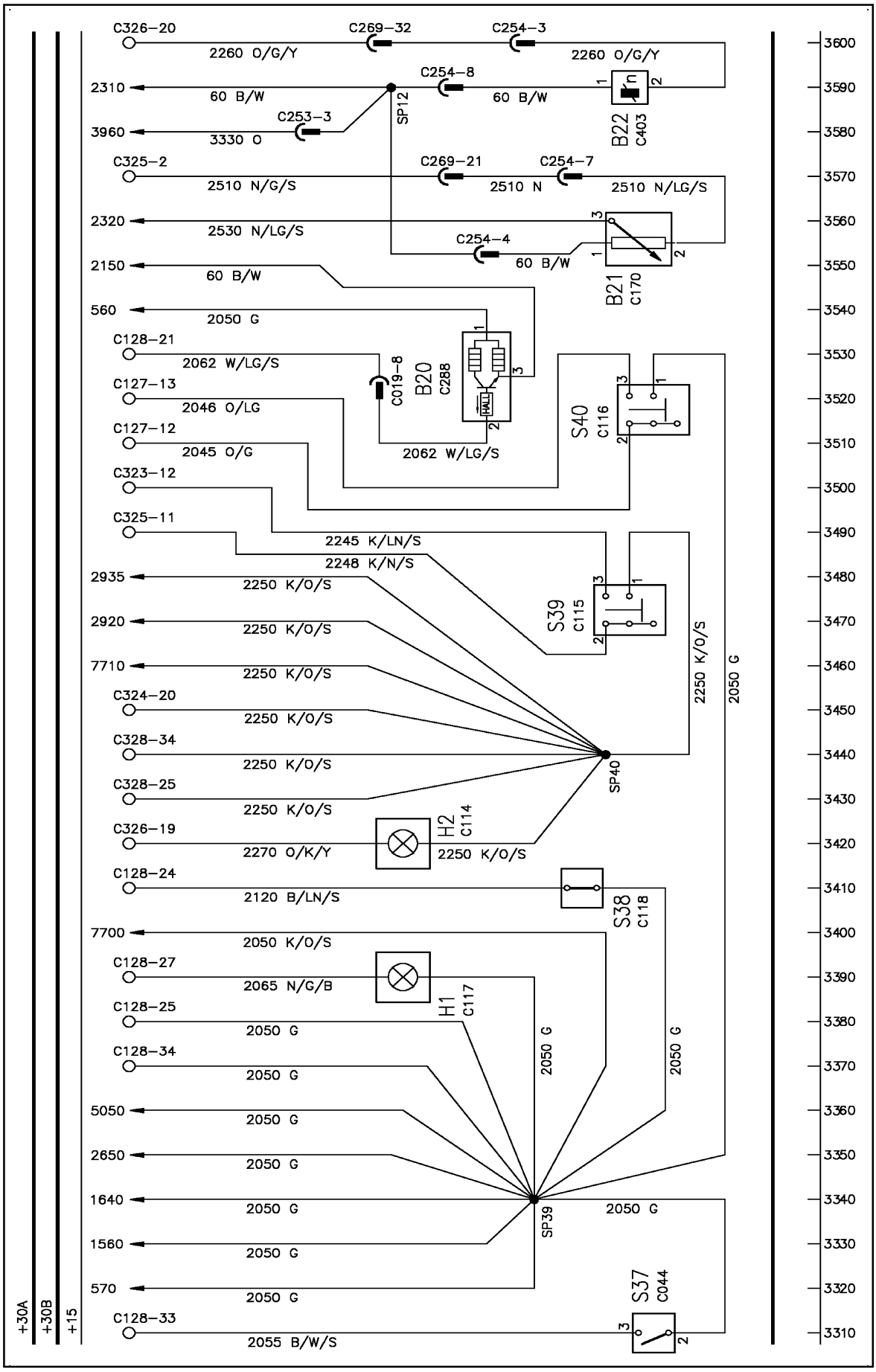
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F15 20A
S36 C182
S35 C063
S34 C062
S33 C423
S32 C183
S31 C043
S30 C035
K12
Y20 C034
Y19 C042
SP28
SP08
SP29
SP7
C127-24
C127-25
C127-10
C127-11
C081-17
C081-4
C081-3
C128-28
C128-31
C128-30
C128-29
C128-7
C128-16
C378-A5
C378-A4
C378-A6
C378-A8
C378-B1
C378-A7
C020-22
C020-15
C020-17
C019-1
C019-3
3027 Y
3025 Y/U
3026 Y/R
840 G/O
10 G
57 B
1550
2050 G
4720
4750
5260
6200
510
7000 U
500
7170 W
520
1450
7000 U/R/B
7996 R
4740
830 B/U/S
7120 Y/B
7120 Y
7170 B/W
7170 W
7175 Y/B
7175 Y
7125 LG/B/Y
7125 LG
7126 LG/O/U
8000 N/TQ/B
3045 Y/U/S
3024 Y/K
7080 B/LG
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010

FOUR WHEEL DRIVE AND DIFFERENTIAL LOCK
Line 3010-3300

F15	Fuse - 20A	**S34**	Stop Lamp Switch Right
		S35	Stop Lamp Switch Left
K12	Stoplamp Switch/Air Brake Relay	**S36**	4WD Switch
S30	4WD Activated Switch	**Y19**	Diff Lock Solenoid
S31	Diff Lock Activated Switch	**Y20**	4WD Solenoid
S32	Differential Lock Switch		
S33	Brake Pedal Latch		

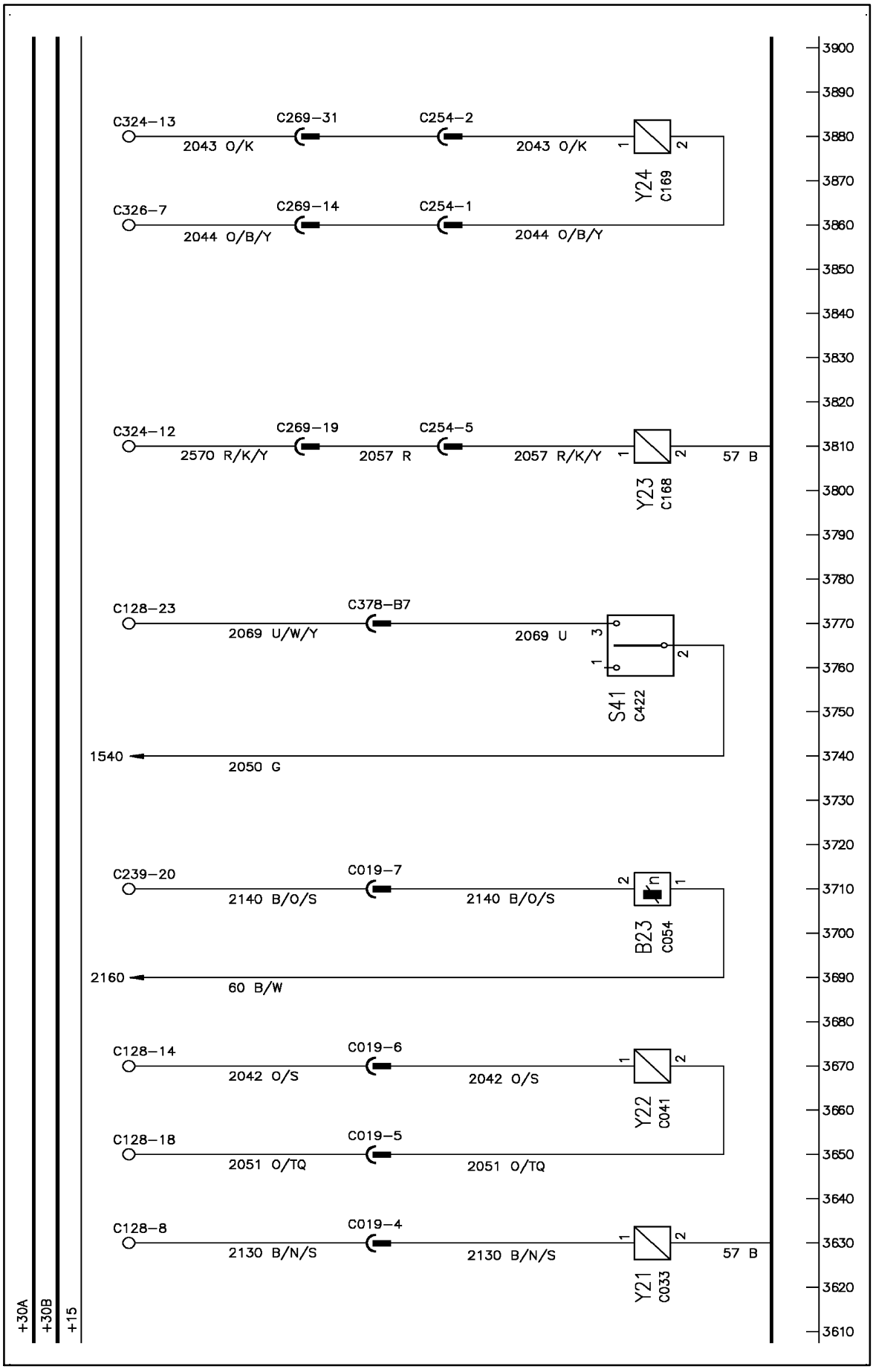
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
2310
60 B/W
C254-8
60 B/W
SP12
B22
C403
3960
3330 O
C253-3
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
C128-21
2062 W/LG/S
C019-8
B20
C288
C127-13
2046 O/LG
C127-12
2045 O/G
2062 W/LG/S
S40
C116
C323-12
C325-11
2245 K/LN/S
2248 K/N/S
2935
2250 K/O/S
S39
C115
2920
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
C328-25
2250 K/O/S
SP40
2250 K/O/S
2050 G
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
3470
3460
3450
3440
3430
3420
3410
3400
3390
3380
3370
3360
3350
3340
3330
3320
3310

POWER TAKE OFF 1
Line 3310-3600

B20	PTO Twist Sensor
B21	Front HPL Limit Potentiometer
B22	Front PTO Speed Sensor
H1	Rear PTO Lamp
H2	Front PTO Lamp
S37	Ground Speed PTO Switch
S38	Rear PTO Brake Switch
S39	Front PTO Switch
S40	Rear PTO Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O/B/Y
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
3890
3880
3870
3860
3850
3840
3830
3820
3810
3800
3790
3780
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610

POWER TAKE OFF 2
Line 3610-3900

B23 PTO Speed Sensor

S41 PTO Management Switch

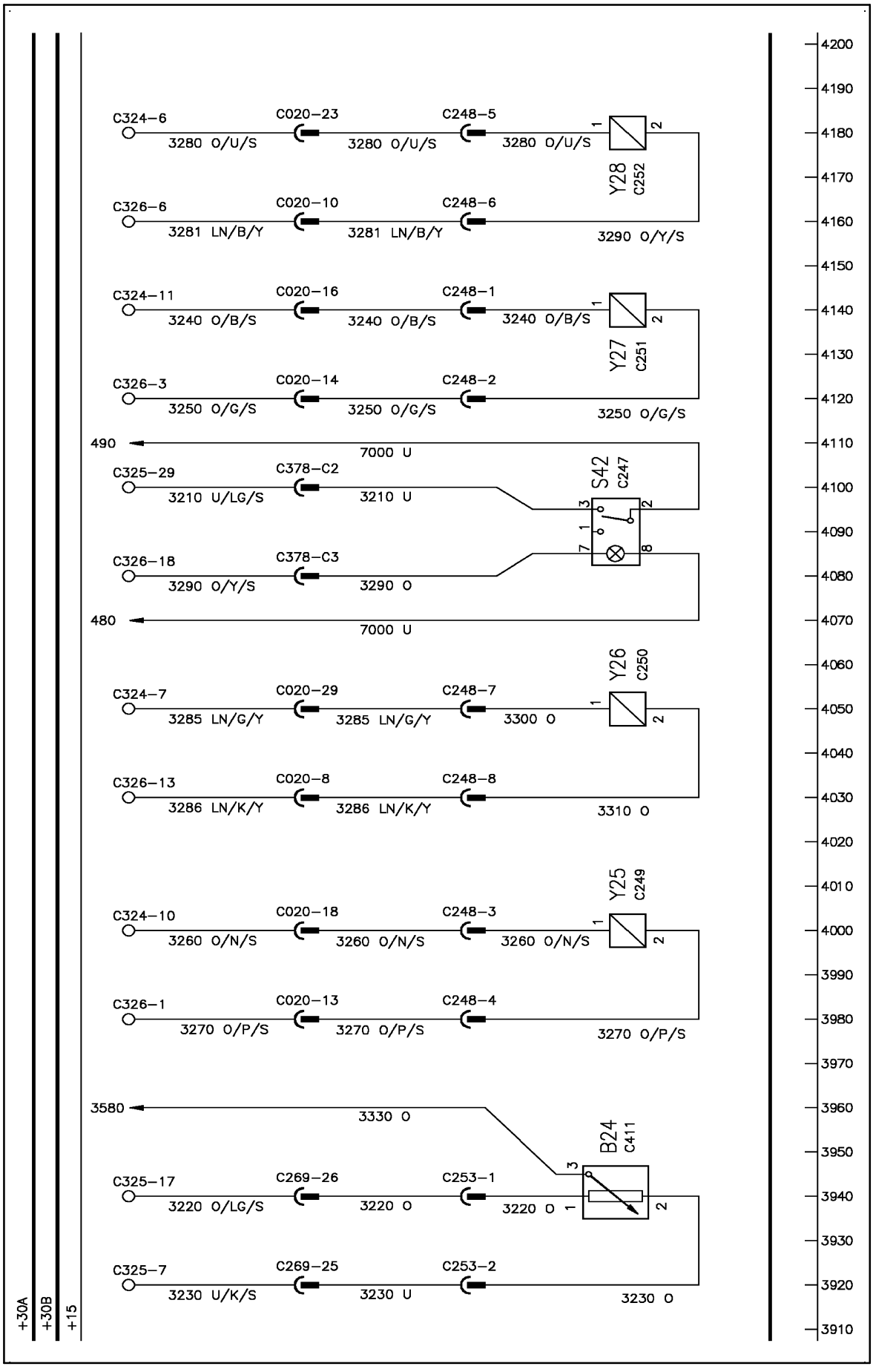
Y21 PTO Brake Solenoid

Y22 PTO Clutch Solenoid

Y23 Front Hitch Valve

Y24 Front PTO Solenoid

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28
C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27
C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42
C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3285 LN/G/Y
3300 O
Y26
C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25
C249
C326-1
C020-13
C248-4
3270 O/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24
C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
4050
4040
4030
4020
4010
4000
3990
3980
3970
3960
3950
3940
3930
3920
3910

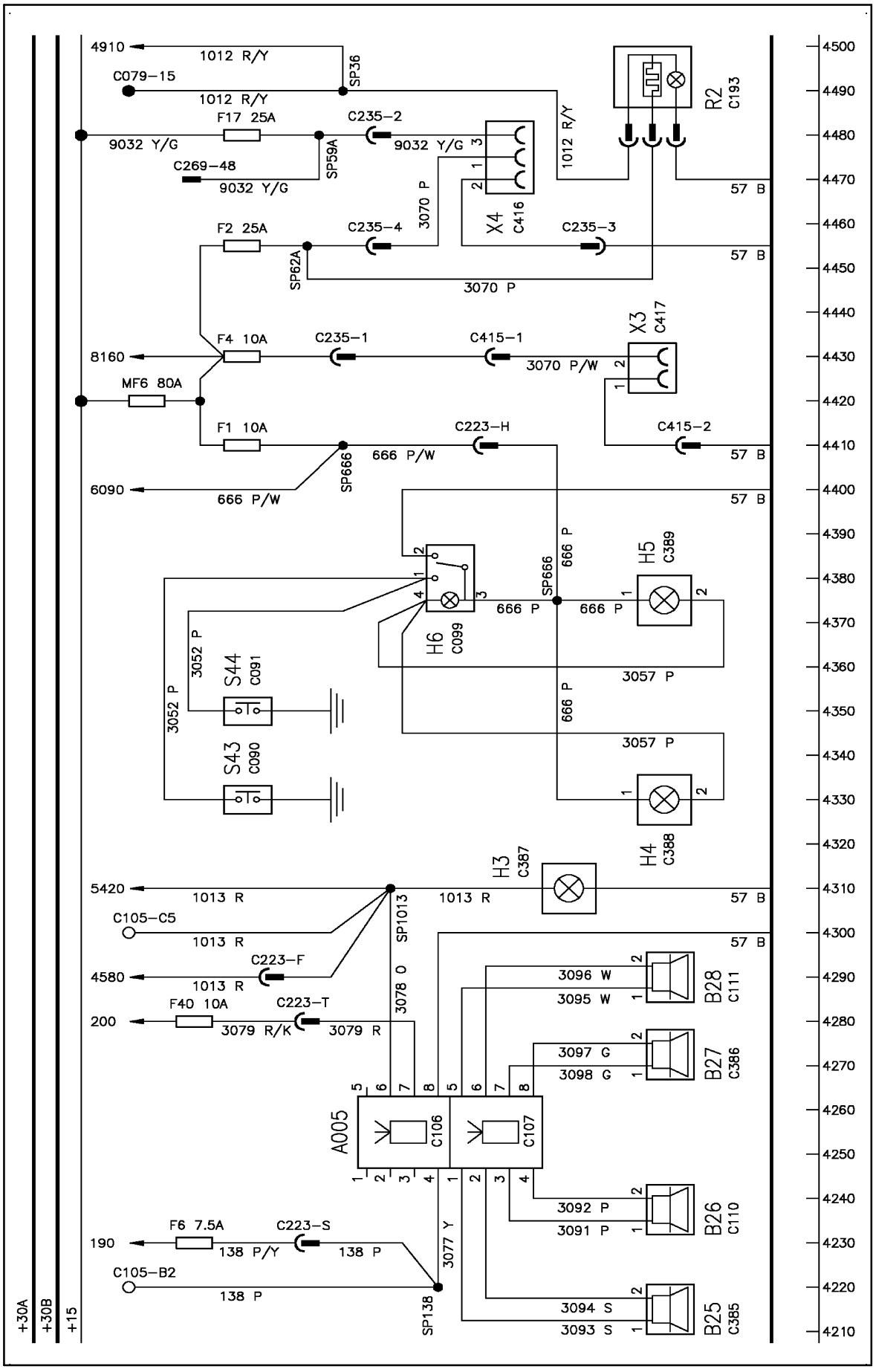
FRONT AXLE SUSPENSION SYSTEM
Line 3910-4200

B24 Front Suspension Potentiometer

Y25 Front Suspension Lower Solenoid
Y26 Front Suspension Lower Lockout Solenoid
Y27 Front Suspension Raise Solenoid
Y28 Front Suspension Raise Lockout Solenoid

S42 Front Suspension Switch

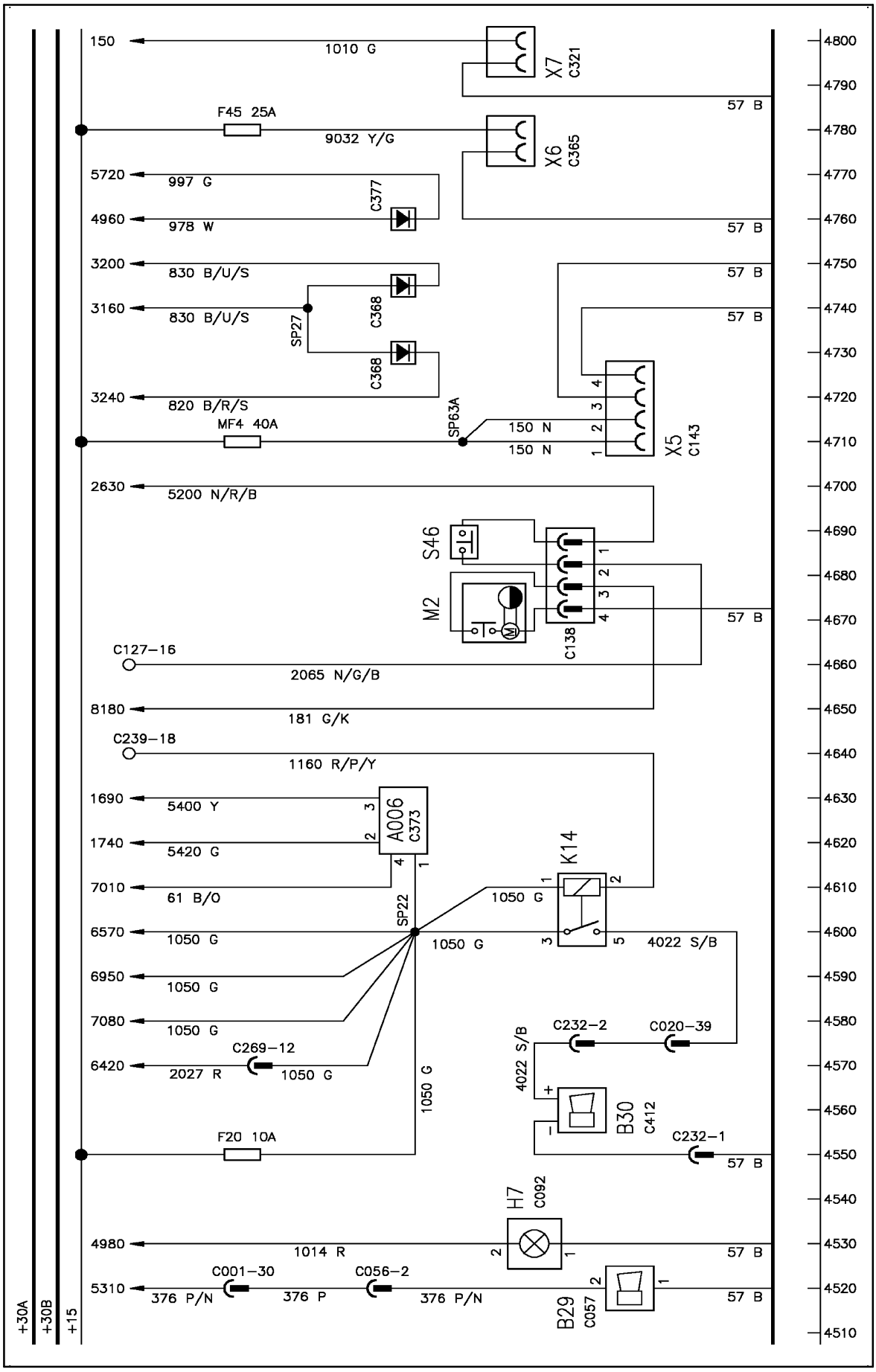
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


4910
1012 R/Y
SP36
C079-15
1012 R/Y
F17 25A
C235-2
9032 Y/G
SP59A
C269-48
9032 Y/G
9032 Y/G
3070 P
X4 C416
1012 R/Y
R2 C193
57 B
F2 25A
C235-4
C235-3
SP62A
3070 P
57 B
8160
F4 10A
C235-1
C415-1
3070 P/W
X3 C417
MF6 80A
F1 10A
C223-H
C415-2
666 P/W
SP666
6090
666 P/W
57 B
H5 C389
H6 C099
S44 C091
S43 C090
3052 P
3057 P
666 P
H4 C388
H3 C387
5420
1013 R
C105-C5
1013 R
C223-F
4580
1013 R
SP1013
3078 O
F40 10A
C223-T
200
3079 R/K
3079 R
3096 W
3095 W
B28 C111
3097 G
3098 G
B27 C386
A005
C106
C107
3092 P
3091 P
B26 C110
F6 7.5A
C223-S
190
138 P/Y
138 P
C105-B2
138 P
3077 Y
SP138
3094 S
3093 S
B25 C385
+30A
+30B
+15
4500
4490
4480
4470
4460
4450
4440
4430
4420
4410
4400
4390
4380
4370
4360
4350
4340
4330
4320
4310
4300
4290
4280
4270
4260
4250
4240
4230
4220
4210

CAB ACCESSORIES 1
Line 4210-4500

MF6	Maxi Fuse - 80A
F1	Fuse - 10A
F2	Fuse - 25A
F4	Fuse - 10A
F6	Fuse - 7.5A
F17	Fuse - 25A
F40	Fuse - 10A
A005	Radio
B25	Speaker L/H Rear
B26	Speaker R/H Front
B27	Speaker R/H Rear
B28	Speaker L/H Front
H3	Console Lamp R/H
H4	Puddle Lamp L/H
H5	Puddle Lamp R/H
H6	Interior Lamp
S43	Door Switch L/H
S44	Door Switch R/H
X3	8 Amp Terminals
X4	20 Amp Multi Socket
R2	Cigar Lighter

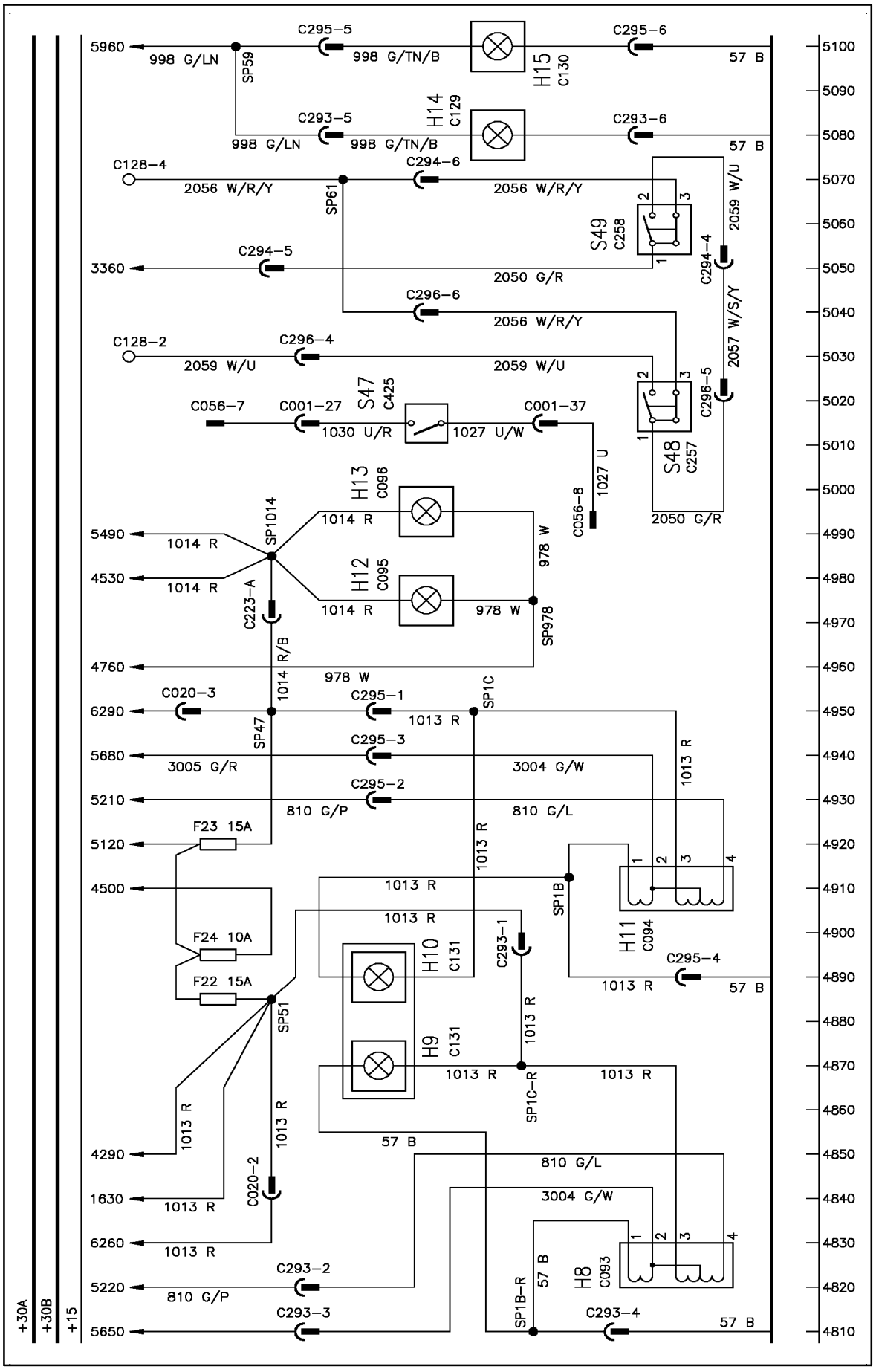
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
C368
57 B
3240
820 B/R/S
SP63A
MF4 40A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
7010
61 B/O
SP22
K14
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
7080
1050 G
C269-12
6420
2027 R
1050 G
1050 G
C232-2
C020-39
4022 S/B
B30
C412
C232-1
57 B
F20 10A
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
4650
4640
4630
4620
4610
4600
4590
4580
4570
4560
4550
4540
4530
4520
4510

CAB ACCESSORIES 2
Line 4510-4800

MF4	Maxi Fuse - 40A
F20	Fuse - 10A
F45	Fuse - 25A
A006	Instrument Cluster Keypad
B29	Horn
B30	Reverse Alarm
H7	Console Lamp L/H
K14	Reverse Alarm Relay
M2	Seat Pump
S46	Seat Switch
X5	Implement Socket Rear
X6	8 Amp Socket
X7	Dealer Installed Accessory(DIA)
C368(1)	Diode
C368(2)	Diode
C377	Diode

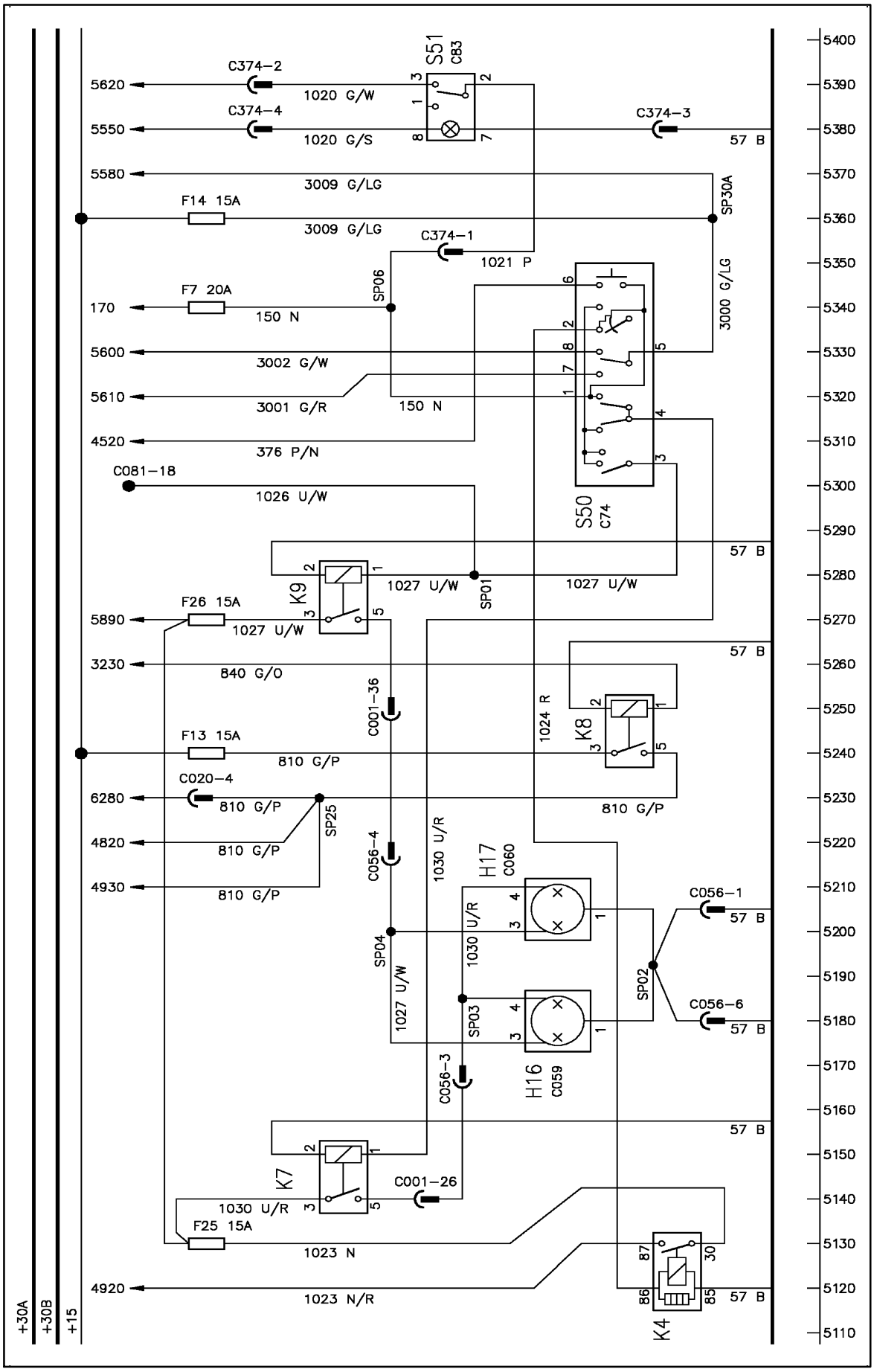
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15
C130
C295-6
57 B
C293-5
H14
C129
C293-6
C128-4
2056 W/R/Y
SP61
C294-6
2059 W/U
S49
C258
C294-4
C294-5
3360
2050 G/R
C296-6
2057 W/S/Y
C128-2
C296-4
C296-5
S47
C425
C056-7
C001-27
1030 U/R
1027 U/W
C001-37
1027 U
S48
C257
C056-8
H13
C096
1014 R
SP1014
5490
4530
H12
C095
978 W
SP978
C223-A
4760
1014 R/B
C020-3
6290
SP47
C295-1
SP1C
1013 R
C295-3
5680
3005 G/R
3004 G/W
C295-2
5210
810 G/P
810 G/L
F23 15A
5120
4500
SP1B
H11
C094
C295-4
F24 10A
F22 15A
SP51
H10
C131
C293-1
H9
SP1C-R
4290
1630
6260
C020-2
C293-2
5220
C293-3
5650
H8
C093
SP1B-R
C293-4
+30A
+30B
+15
5100
5090
5080
5070
5060
5050
5040
5030
5020
5010
5000
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4880
4870
4860
4850
4840
4830
4820
4810

INDICATORS AND HAZARDS 1
Line 4810-5100

F22	Fuse 15 A
F23	Fuse 15 A
F24	Fuse 10 A
H8	Stop/Tail Light R/H
H9	Licence Plate Lamp - Fender
H10	Licence Plate Lamp - Fender
H11	Stop/Tail Light L/H
H12	Licence Plate Lamp L/H
H13	Licence Plate Lamp R/H
H14	Worklamp - Fender R/H
H15	Worklamp - Fender L/H
S47	Aux Headlamp Switch
S48	PTO Fender Switch L/H
S49	PTO Fender Switch R/H

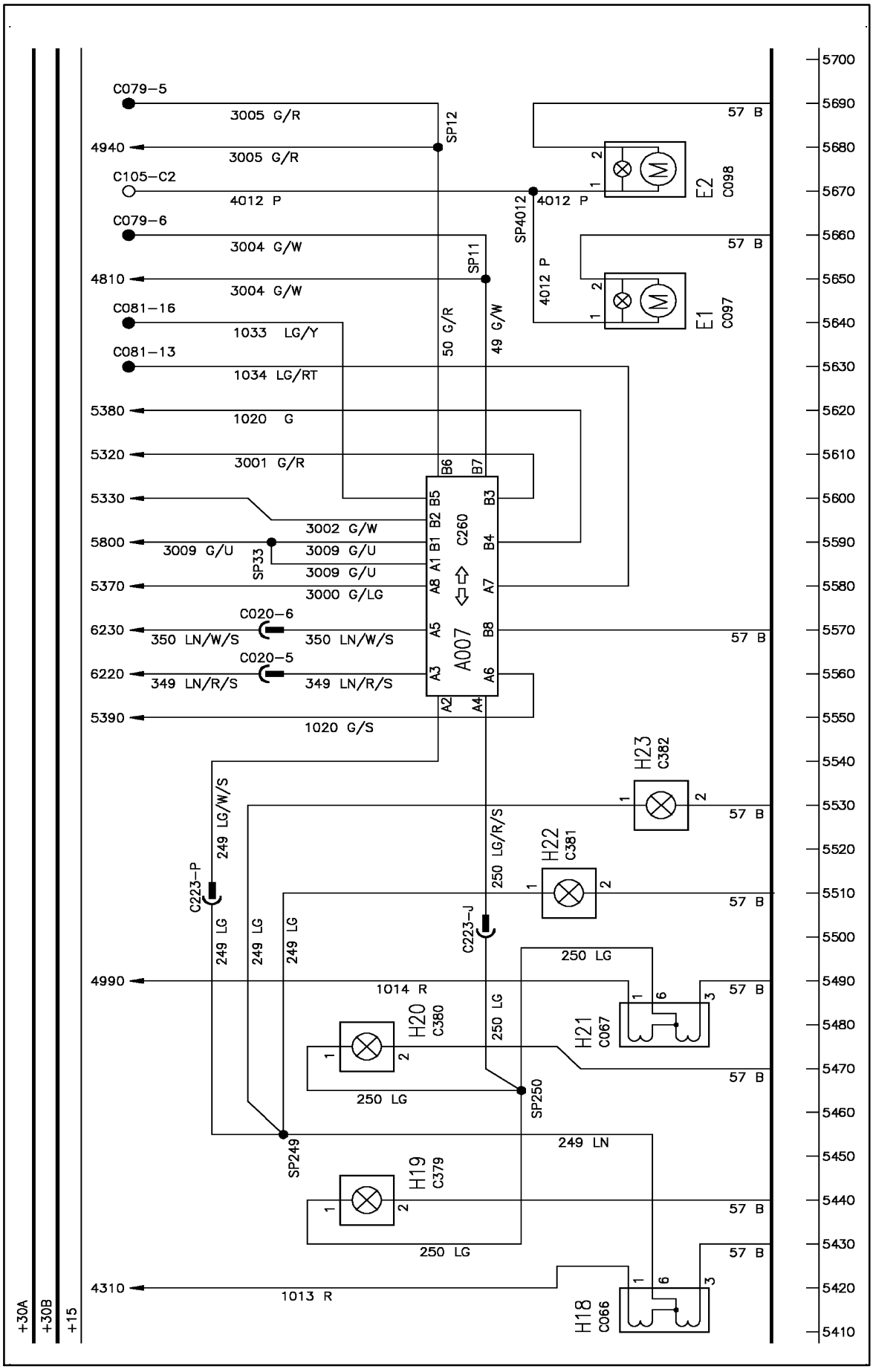
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
5620
5550
5580
5600
5610
4520
170
5890
3230
6280
4820
4930
4920
C374-2
C374-4
1020 G/W
1020 G/S
S51
C83
C374-3
57 B
3009 G/LG
F14 15A
SP30A
C374-1
1021 P
SP06
F7 20A
150 N
3002 G/W
3001 G/R
376 P/N
C081-18
1026 U/W
3000 G/LG
S50
C74
K9
1027 U/W
SP01
F26 15A
840 G/O
C001-36
F13 15A
810 G/P
C020-4
SP25
1024 R
K8
C056-4
1030 U/R
H17
C060
SP04
1027 U/W
SP03
H16
C059
C056-3
C056-1
C056-6
SP02
K7
C001-26
F25 15A
1023 N
1023 N/R
87
30
86
85
K4
5400
5390
5380
5370
5360
5350
5340
5330
5320
5310
5300
5290
5280
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110

INDICATORS AND HAZARDS 2
Line 5110-5400

F7	Fuse 20A
F13	Fuse 15A
F14	Fuse 15A
F25	Fuse 15A
F26	Fuse 15A
H16	Headlamp R/H
H17	Headlamp L/H
K4	Side light/Illumination Relay
K7	Dip Beam Relay
K8	Stoplamp Relay
K9	Main Beam Relay
S50	Multi-Function Light Switch
S51	Hazard Warning Lights Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-5
3005 G/R
4940
3005 G/R
C105-C2
4012 P
C079-6
3004 G/W
4810
3004 G/W
C081-16
1033 LG/Y
C081-13
1034 LG/RT
5380
1020 G
5320
3001 G/R
5330
5800
3009 G/U
5370
6230
350 LN/W/S
6220
349 LN/R/S
5390
1020 G/S
SP12
SP11
SP4012
SP33
SP249
SP250
50 G/R
49 G/W
4012 P
3002 G/W
3009 G/U
3009 G/U
3000 G/LG
C020-6
350 LN/W/S
C020-5
349 LN/R/S
C260
A007
B6
B7
B5
B2
B3
B1
B4
A1
A8
A7
A5
B8
A3
A6
A2
A4
57 B
E2
C098
E1
C097
H23
C382
H22
C381
H20
C380
H21
C067
H19
C379
H18
C066
C223-P
249 LG/W/S
249 LG
249 LG
249 LG
C223-J
250 LG/R/S
250 LG
250 LG
250 LG
4990
1014 R
4310
1013 R
249 LN
+30A
+30B
+15
5700
5690
5680
5670
5660
5650
5640
5630
5620
5610
5600
5590
5580
5570
5560
5550
5540
5530
5520
5510
5500
5490
5480
5470
5460
5450
5440
5430
5420
5410

INDICATORS AND HAZARDS 3
Line 5410-5700

A007 Flasher Unit

E1 Rotating Beacon L/H

E2 Rotating Beacon L/H

H18 Grabrail Side Lamp R/H

H19 SMV Lamp L/H Front

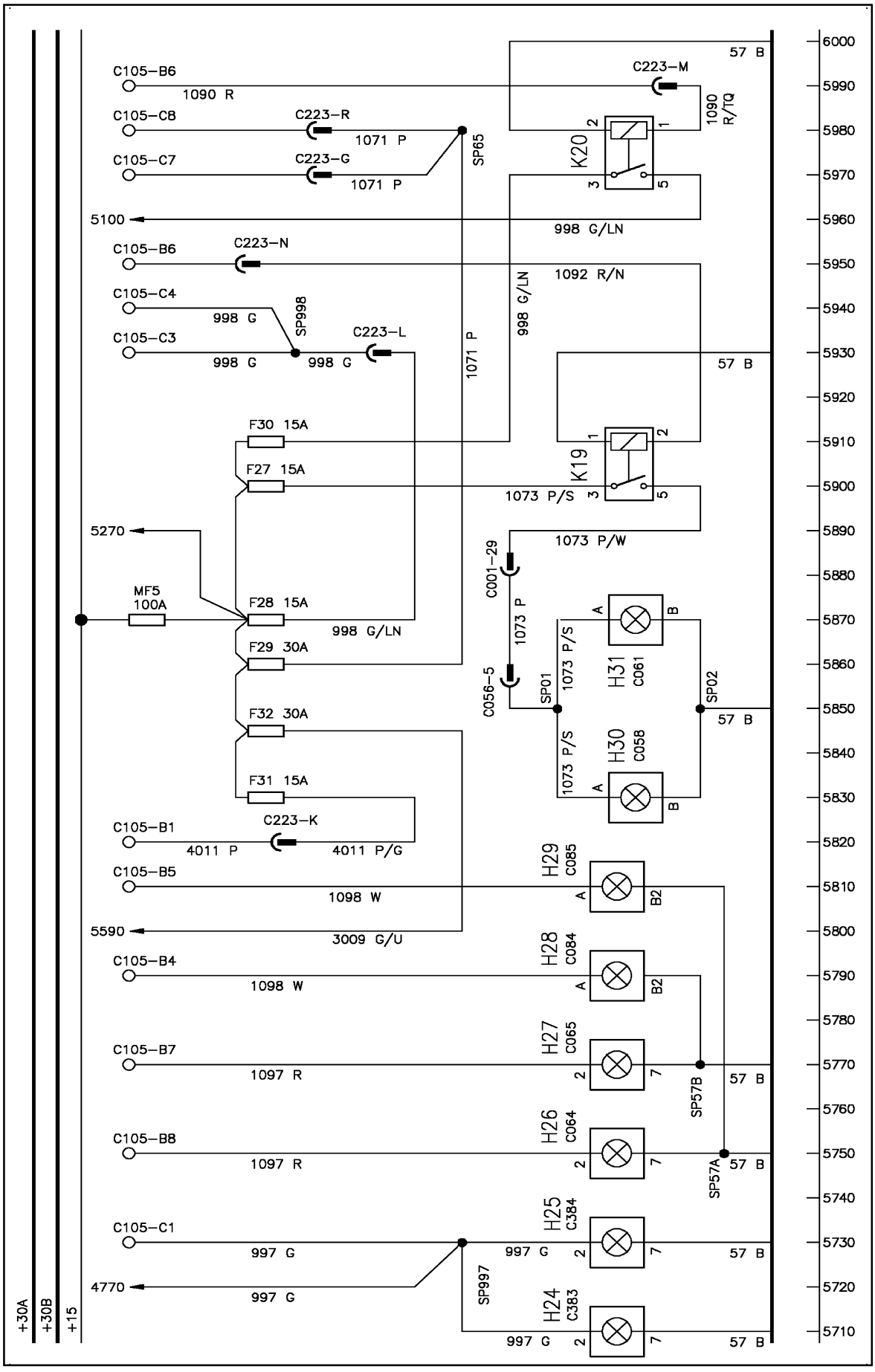
H20 SMV Lamp L/H Rear

H21 Grabrail Side Lamp L/H

H22 SMV Lamp R/H Front

H23 SMV Lamp R/H Rear

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C105-B6
1090 R
C105-C8
C223-R
1071 P
C105-C7
C223-G
1071 P
SP65
5100
C105-B6
C223-N
C105-C4
998 G
SP998
C105-C3
998 G
998 G
C223-L
F30 15A
F27 15A
5270
MF5
100A
F28 15A
998 G/LN
F29 30A
F32 30A
F31 15A
C105-B1
4011 P
C223-K
4011 P/G
C105-B5
1098 W
5590
3009 G/U
C105-B4
1098 W
C105-B7
1097 R
C105-B8
1097 R
C105-C1
997 G
4770
997 G
SP997
997 G
997 G
57 B
C223-M
1090
R/TQ
K20
998 G/LN
1092 R/N
998 G/LN
1071 P
57 B
K19
1073 P/S
1073 P/W
C001-29
1073 P
C056-5
SP01
1073 P/S
H31
C061
1073 P/S
H30
C058
SP02
57 B
H29
C085
H28
C084
H27
C065
H26
C064
H25
C384
H24
C383
SP57B
SP57A
57 B
57 B
57 B
57 B
6000
5990
5980
5970
5960
5950
5940
5930
5920
5910
5900
5890
5880
5870
5860
5850
5840
5830
5820
5810
5800
5790
5780
5770
5760
5750
5740
5730
5720
5710

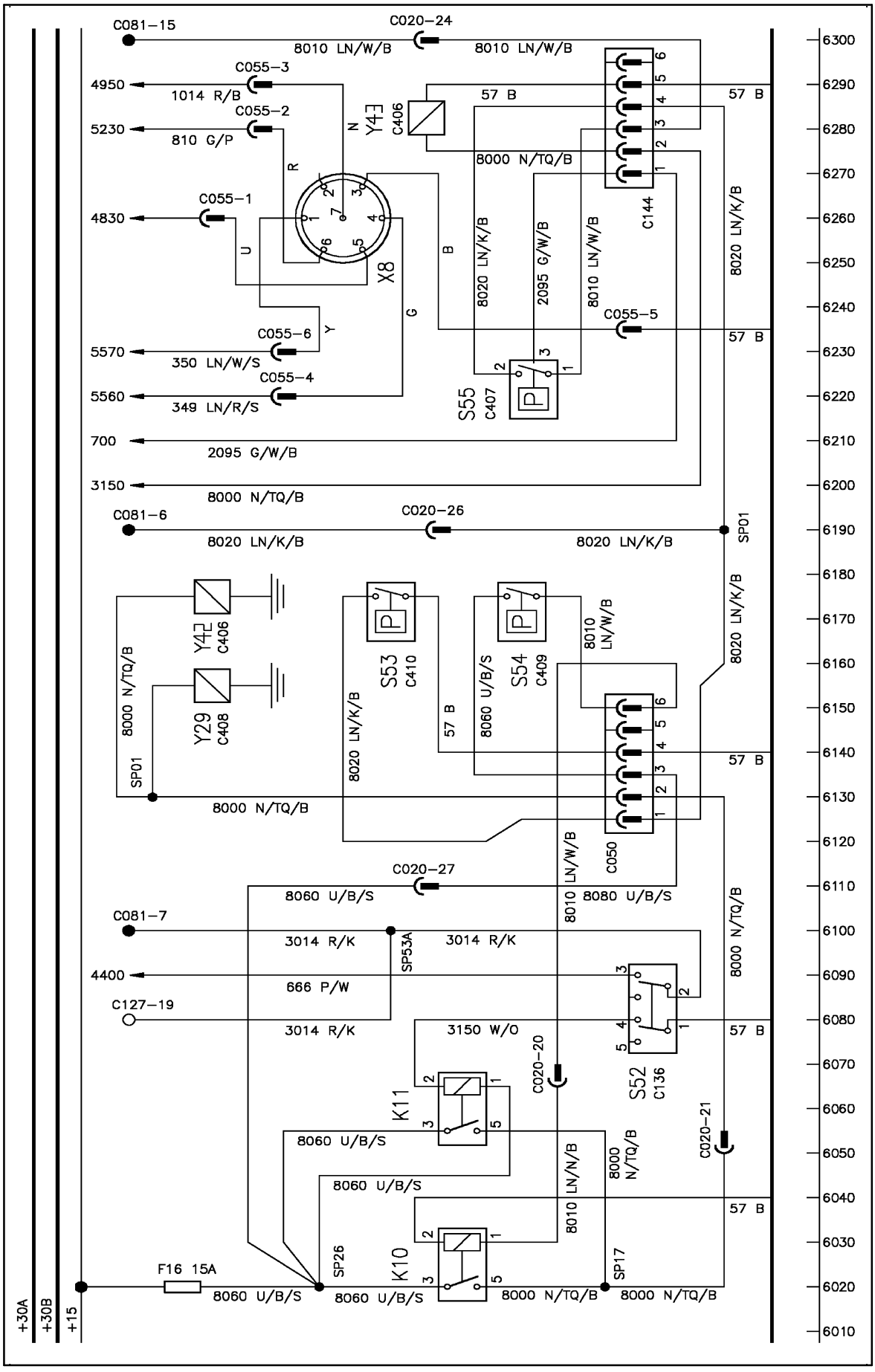
WORKLAMPS
Line 5710-6000

MF5 Maxi Fuse - 100A
F27 Fuse - 15A
F28 Fuse - 15A
F29 Fuse - 30A
F30 Fuse - 15A
F31 Fuse - 15A
F32 Fuse - 30A

H24 Worklamp - Rear L/H
H25 Worklamp - Rear R/H
H26 Worklamp - Grabrail R/H
H27 Worklamp - Grabrail L/H
H28 Worklamp - Upper Front L/H
H29 Worklamp - Upper Front R/H
H30 Corner Lamp R/H
H31 Corner Lamp L/H

K19 Worklamp Lower Front Relay
K20 Worklamp Lower Rear Relay

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C081-15
C020-24
8010 LN/W/B
8010 LN/W/B
C055-3
4950
1014 R/B
C055-2
5230
810 G/P
C055-1
4830
C055-6
5570
350 LN/W/S
C055-4
5560
349 LN/R/S
Y43 C406
X8
S55 C407
57 B
8000 N/TQ/B
C144
8020 LN/K/B
2095 G/W/B
8010 LN/W/B
C055-5
700
2095 G/W/B
3150
8000 N/TQ/B
C081-6
C020-26
8020 LN/K/B
8020 LN/K/B
SP01
Y42 C406
Y29 C408
S53 C410
S54 C409
8060 U/B/S
8010 LN/W/B
C050
C020-27
8060 U/B/S
8080 U/B/S
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3014 R/K
3150 W/O
S52 C136
C020-20
C020-21
K11
K10
8060 U/B/S
8000 N/TQ/B
8010 LN/N/B
SP26
SP17
F16 15A
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
6160
6150
6140
6130
6120
6110
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010

TRAILER BRAKE SYSTEMS
Line 6010-6300

F16 Fuse - 15A

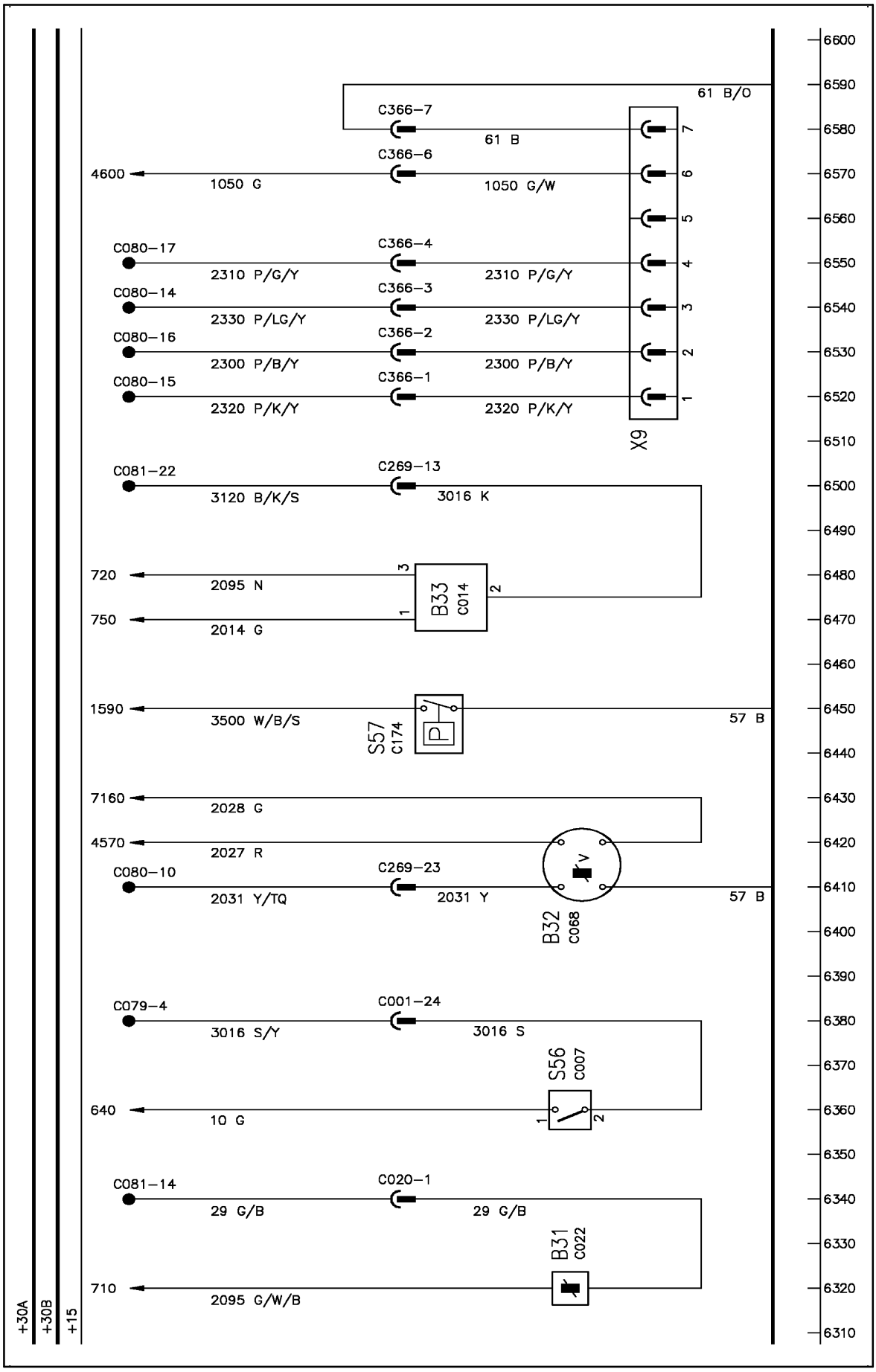
K10 Pneumatic Trailer Brake Relay
K11 Hydraulic Trailer Brake Relay

S52 Handbrake Switch
S53 Italian Trailer Brake Line Pressure Switch
S54 Italian Trailer Brake Pump Pressure Switch
S55 Air Brake Pressure Switch

Y29 Italian Trailer Brake Solenoid
Y42 Italian Trailer Brake Solenoid
Y43 Air Brake Solenoid

X8 Trailer Socket

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G
1050 G/W
C080-17
C366-4
2310 P/G/Y
2310 P/G/Y
C080-14
C366-3
2330 P/LG/Y
2330 P/LG/Y
C080-16
C366-2
2300 P/B/Y
2300 P/B/Y
C080-15
C366-1
2320 P/K/Y
2320 P/K/Y
X9
C081-22
C269-13
3120 B/K/S
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
57 B
S57
C174
7160
2028 G
4570
2027 R
C080-10
C269-23
2031 Y/TQ
2031 Y
57 B
B32
C068
C079-4
C001-24
3016 S/Y
3016 S
S56
C007
640
10 G
C081-14
C020-1
29 G/B
29 G/B
B31
C022
710
2095 G/W/B

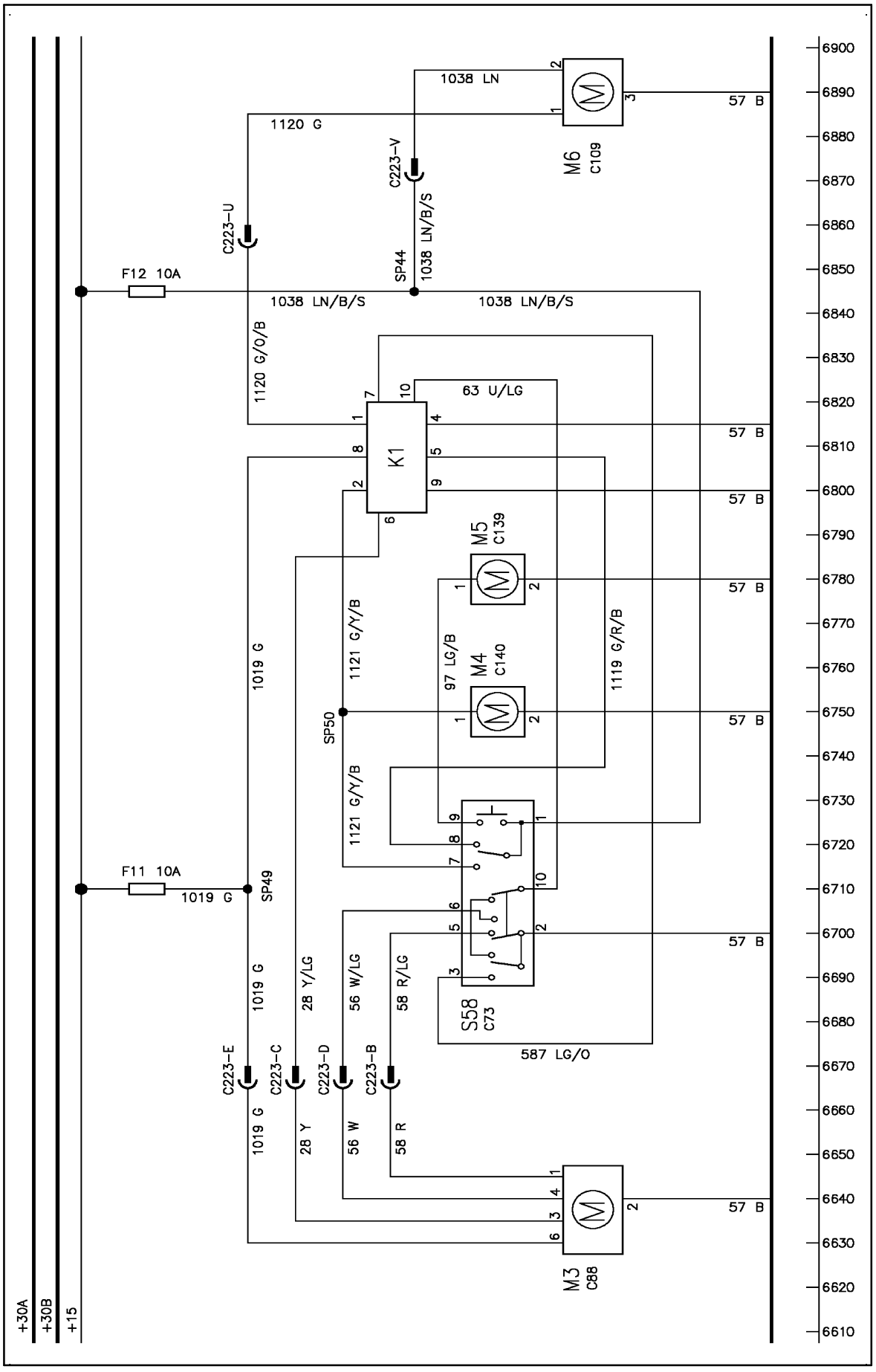
SENSORS
Line 6310-6600

B31 Fuel Tank Sender
B32 Radar Gun
B33 Steering Angle Sensor

S56 Brake Fluid Level Switch
S57 Power Assisted Steering Pressure Switch

X9 Radar Extension Harness Connector

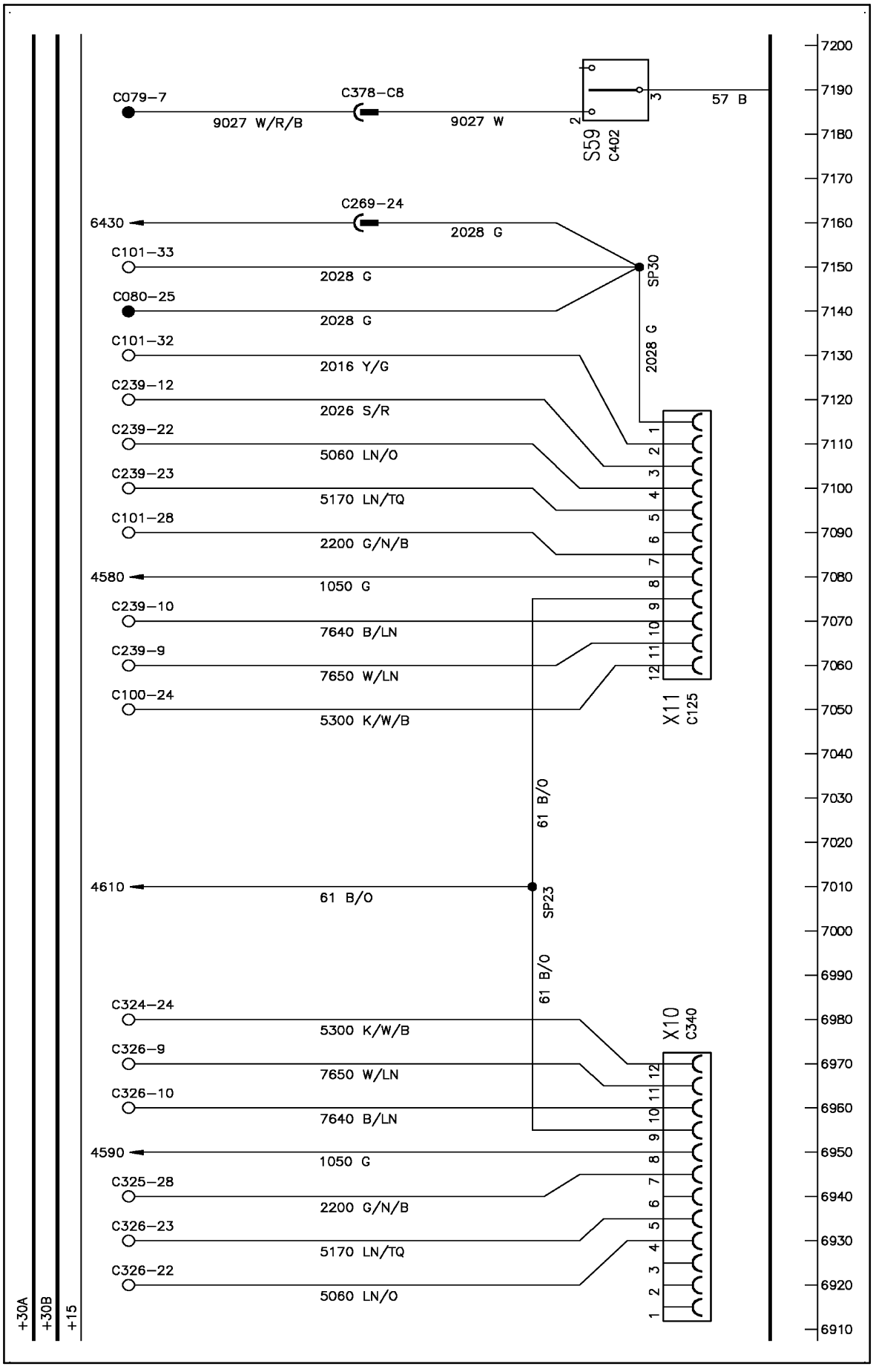
WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
F12 10A
F11 10A
1038 LN
1120 G
1038 LN/B/S
1120 G/O/B
1019 G
63 U/LG
1121 G/Y/B
97 LG/B
1119 G/R/B
28 Y/LG
56 W/LG
58 R/LG
587 LG/O
28 Y
56 W
58 R
57 B
SP44
SP50
SP49
C223-U
C223-V
C223-E
C223-C
C223-D
C223-B
K1
M6 C109
M5 C139
M4 C140
M3 C88
S58 C73
6900
6890
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
6770
6760
6750
6740
6730
6720
6710
6700
6690
6680
6670
6660
6650
6640
6630
6620
6610

WASHERS AND WIPERS
Line 6610-6900

F11	Fuse - 10A	**M4**	Washer Motor - Rear
F12	Fuse - 10A	**M5**	Washer Motor - Front
K1	Front Windshield Wiper Module	**M6**	Wiper Motor - Rear
M3	Wiper Motor - Front	**S58**	Front and Rear Wiper/washer Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


C079-7
9027 W/R/B
C378-C8
9027 W
S59
C402
57 B
C269-24
6430
2028 G
C101-33
2028 G
C080-25
2028 G
SP30
2028 G
C101-32
2016 Y/G
C239-12
2026 S/R
C239-22
5060 LN/O
C239-23
5170 LN/TQ
C101-28
2200 G/N/B
4580
1050 G
C239-10
7640 B/LN
C239-9
7650 W/LN
C100-24
5300 K/W/B
X11
C125
61 B/O
4610
61 B/O
SP23
61 B/O
C324-24
5300 K/W/B
C326-9
7650 W/LN
C326-10
7640 B/LN
X10
C340
4590
1050 G
C325-28
2200 G/N/B
C326-23
5170 LN/TQ
C326-22
5060 LN/O
+30A
+30B
+15
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
7080
7070
7060
7050
7040
7030
7020
7010
7000
6990
6980
6970
6960
6950
6940
6930
6920
6910

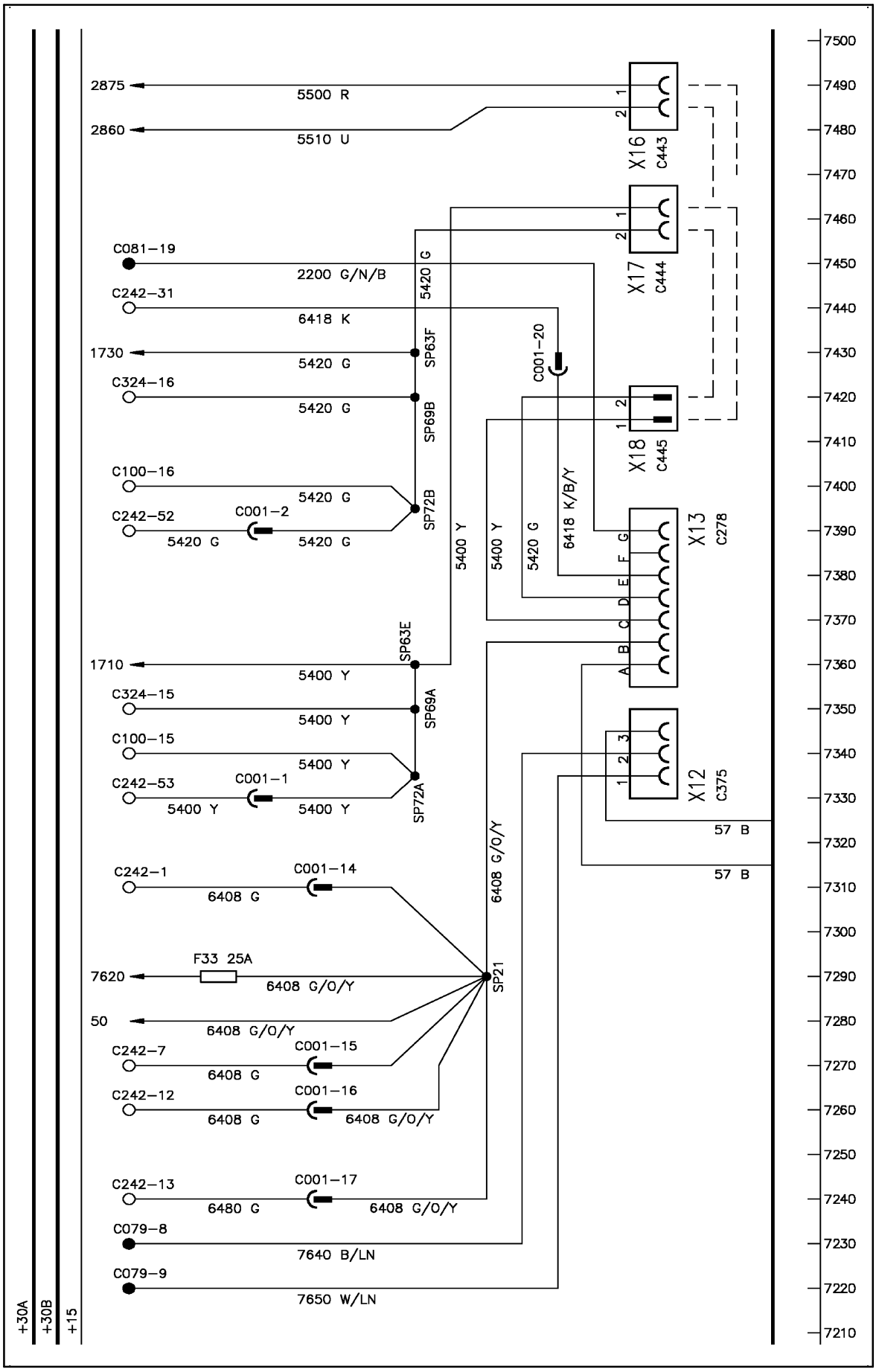
DIAGNOSTIC PLUGS 1
Line 6910-7200

S59 Calibration/Select Switch

X10 Transmission Diagnostics Connector (TCM)

X11 Auxilliary Diagnostics Connector (ACU)

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

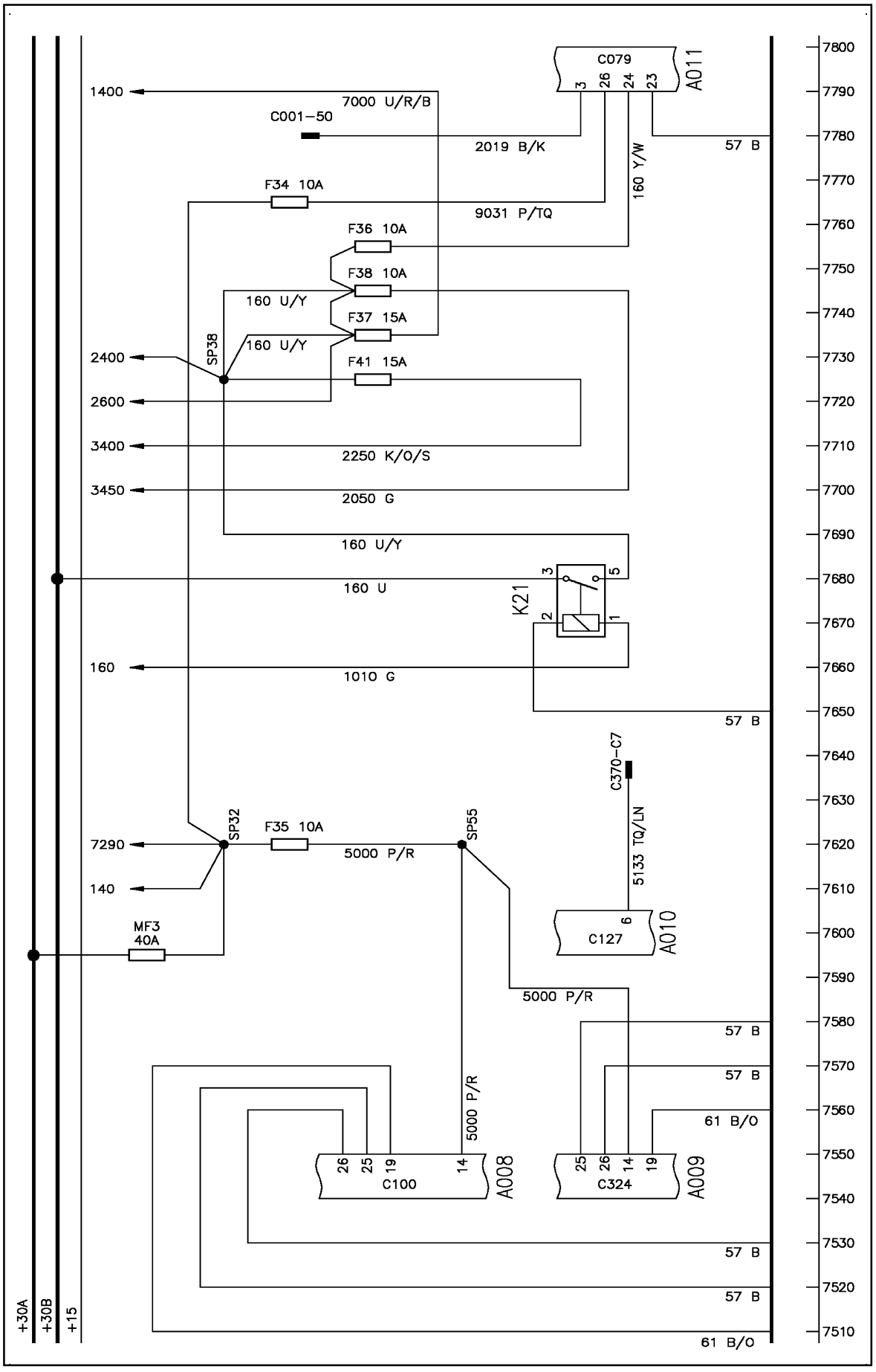

+30A
+30B
+15
2875
5500 R
2860
5510 U
X16
C443
X17
C444
X18
C445
X13
C278
X12
C375
C081-19
2200 G/N/B
5420 G
C242-31
6418 K
1730
5420 G
SP63F
C324-16
5420 G
SP69B
C100-16
5420 G
C242-52
C001-2
5420 G
5420 G
SP72B
C001-20
5400 Y
5400 Y
5420 G
6418 K/B/Y
1710
5400 Y
SP63E
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
57 B
57 B
C242-1
C001-14
6408 G
6408 G/O/Y
F33 25A
7620
6408 G/O/Y
SP21
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210

DIAGNOSTIC PLUGS 2
Line 7210-7500

F33 Fuse - 25A

X12 ADIC Diagnostics Connector
X13 EST Diagnostics Connector
X16 EHR CAN
X17 Trans CAN
X18 CAN Select

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

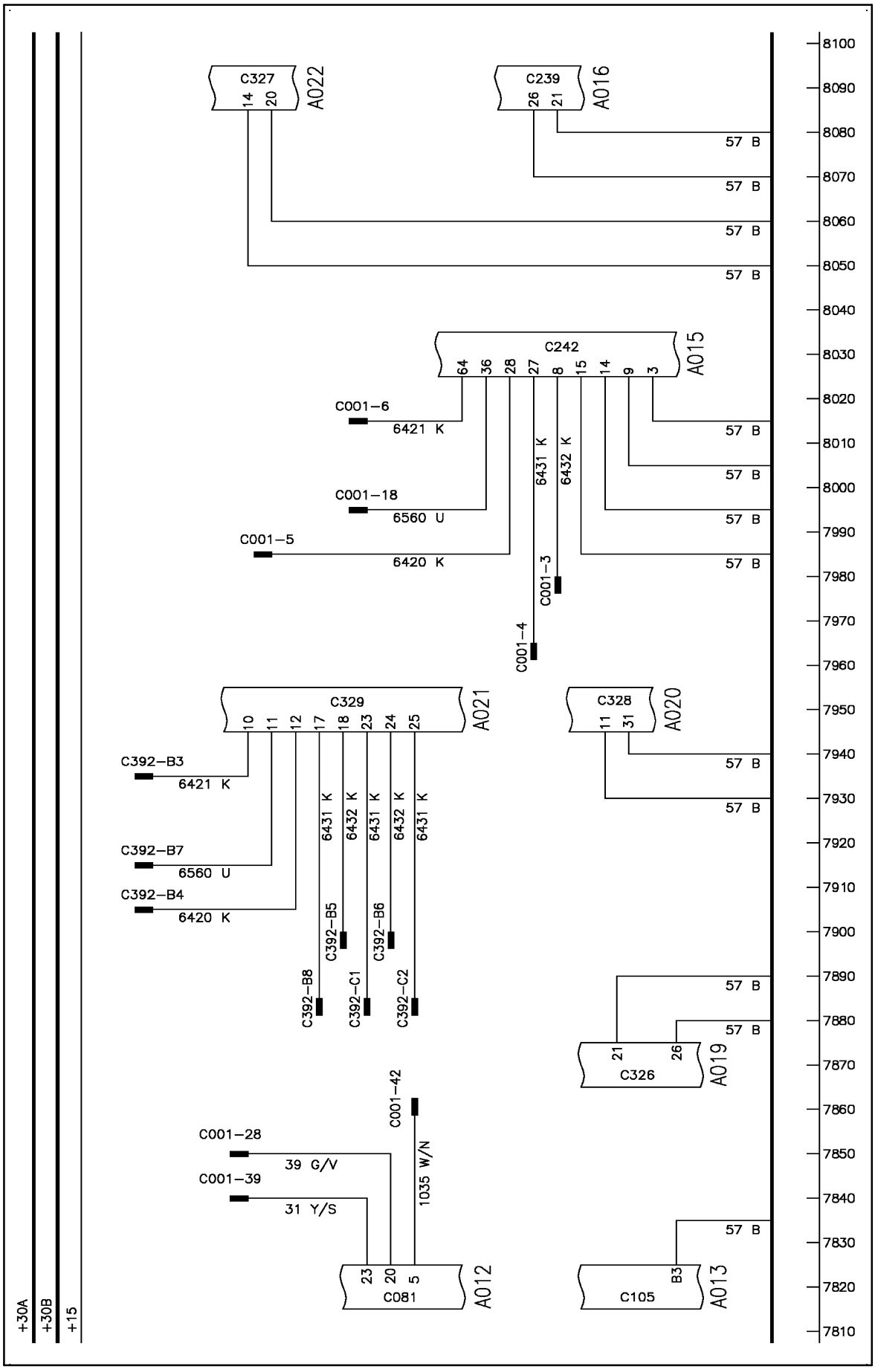

C079
A011
1400
7000 U/R/B
C001-50
2019 B/K
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
160 U/Y
SP38
2400
F41 15A
2600
3400
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C370-C7
5133 TQ/LN
SP32
F35 10A
SP55
7290
5000 P/R
140
MF3
40A
C127
A010
5000 P/R
57 B
57 B
61 B/O
5000 P/R
C100
A008
C324
A009
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
7750
7740
7730
7720
7710
7700
7690
7680
7670
7660
7650
7640
7630
7620
7610
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510

PROCESSOR FEEDS AND GROUNDS 1
Line 7510-7800

MF3	Maxi Fuse - 40A
F34	Fuse - 10A
F35	Fuse - 10A
F36	Fuse - 10A
F37	Fuse - 15A
F38	Fuse - 10A
F41	Fuse -15A

K21	Electronics Supply Relay
A008	XCM Central Control Unit (CN1-A)
A009	XCM Auxilliary Control Unit (Front Susp)
A010	XCM Central Control Unit (CN3-A)
A011	Instrument Cluster 1

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
C327
14
20
A022
C239
26
21
A016
57 B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
C001-3
C001-4
C329
10
11
12
17
18
23
24
25
A021
C328
11
31
A020
C392-B3
C392-B7
C392-B4
C392-B5
C392-B6
C392-B8
C392-C1
C392-C2
C326
21
26
A019
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
C081
23
20
5
A012
C105
B3
A013
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
7870
7860
7850
7840
7830
7820
7810

PROCESSOR FEEDS AND GROUNDS 2
Line 7810-8100

A012 Instrument Cluster 3

A013 Worklamp ECU

A015 Engine ECU

A016 XCM Central Control Unit (CN2)

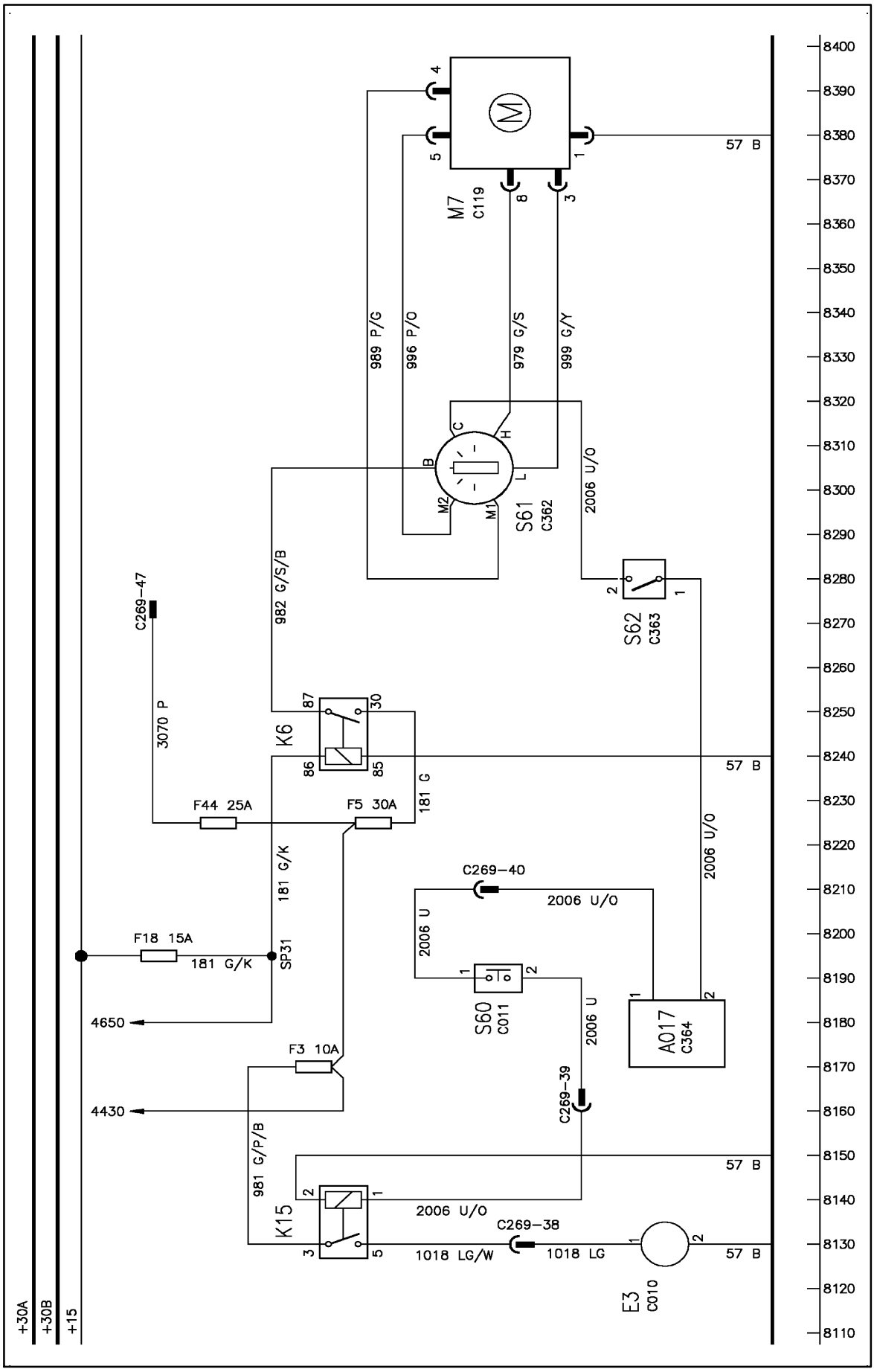
A019 Front Suspension Control CN2

A020 EHR Control Unit CN3-B

A021 EHR Control Unit CN4

A022 EHR Control Unit CN3-A

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		


+30A
+30B
+15
8400
8390
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8170
8160
8150
8140
8130
8120
8110
M7
C119
57 B
989 P/G
996 P/O
979 G/S
999 G/Y
S61
C362
2006 U/O
S62
C363
C269-47
982 G/S/B
3070 P
K6
87
30
86
85
181 G
F44 25A
F5 30A
181 G/K
SP31
F18 15A
4650
C269-40
2006 U/O
2006 U
S60
C011
A017
C364
F3 10A
4430
C269-39
981 G/P/B
K15
2006 U/O
C269-38
1018 LG/W
1018 LG
E3
C010

AIR CONDITIONING AND CAB HEATING
Line 8110-8400

F3	Fuse - 10A
F5	Fuse - 30A
F18	Fuse - 15A
F44	Fuse - 25A
A017	HVAC Unit
E3	A/C Clutch
K6	Blower Motor Relay
K15	A/C Clutch Relay
M7	Blower Unit
S60	A/C Pressure Switch
S61	Heater/Blower Switch
S62	A/C Switch

WIRE COLOUR CODES							
B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

WIRE IDENTIFICATION KEY

Table 1, below, details the wire colour and circuit codes as used in the wiring diagrams in this chapter. Due to a change in the production methods of the harnesses after the production of these diagrams, where the actual wiring has adopted a single colour with the circuit number printed directly onto wire, Table 2, has been produced to provide a reference of this new production method, although as a rule, the original base colour, first letter, is the new single colour used on the wire.

Wire codes - Table 1

CIRC	COLOUR	DESCRIPTION
10	G	STOPLAMP SWITCH FEED
11	G/S	IGNITION SUPPLY (2ND)
12	U/W	MAIN BEAM HEADLAMP FUSE SUPPLY
13	U/R	DIP BEAM HEADLAMP FUSE SUPPLY
15	U	LIGHTING SWITCH SUPPLY
28	Y/LG	WIPER MOTOR (PARK RETURN)
29	G/B	MAIN FUEL SENDER SIGNAL
31	Y/S	ENGINE OIL PRESSURE SENDER SIGNAL
39	G/U	TEMPERATURE GAUGE SIGNAL
44	LG/N	FLASHER UNIT (49A)
49	G/W	RIGHT HAND TURN SIGNAL
50	G/R	LEFT HAND TURN SIGNAL
56	W/LG	WIPER MOTOR-HIGH
57	B	EARTH (ALL)
58	R/LG	WIPER MOTOR-LOW
60	B/W	SENSOR GROUND
61	B/O	CASE GROUND
63	U/LG	WIPER MOTOR-PARK FEED
65	W	DUAL POWER/4 WHEEL DRIVE SWITCH FEED
71	W	IGNITION SWITCHED FEEDS (UNFUSED)
84	G	WINDSHIELD WASHER SWITCH FEED
90	G	DUAL POWER / FOUR WHEEL DRIVE SWITCH
97	LG/B	WINDSHIELD WASHER FEED
137	W/K	RADIO FEED
138	P P/TQ	RADIO KAM
150	N	BATTERY FEED (UNFUSED)(ALL)
155	G	BATTERY FEED (FUSED)
160	U	BATTERY SUPPLY ELECTRONICS
170	K/N/B	BATTERY ISOLATOR CONTROL SWITCH
171	W/TQ/B	BATTERY ISOLATOR RELAY COIL
181	G	BLOWER MOTOR FEED
182	P/LG	THERMOSTATIC SWITCH FEED

249	LG/W/S	SMV LAMPS RH
250	LG/R/S	SMV LAMPS LH
252	N/G	ALTERNATOR FIELD
349	LN/R/S	TRAILER TURN LAMPS RH
350	LN/W/S	TRAILER TURN LAMPS LH
365	G/O	LOW FUEL WARNING LAMP (DELAY ON)
366	O/U	LOW FUEL WARNING LAMP (DELAY SWITCH)
376	P/N	HORN FEED
587	LG/O	W1NDSHIELD WIPER INTERMITTENT DELAY
649	B/O R/LN	COOLANT TEMPERATURE SWITCH
650	B/TQ	COOLANT LEVEL SWITCH
666	P/W	DOMELAMP SWITCH FEED
787	G	AUXILIARY FUEL PUMP SUPPLY
810	G/P	STOPLAMPS
820	B/R/S	STOPLAMP SWITCH LH
830	B/U/S	STOPLAMP SWITCH RH
840	G/O	R & L STOPLAMP SIGNAL
979	G/S	BLOWER MOTOR HIGH SPEED (4th)
980	N/U	THERMOSTAT SWITCH SUPPLY
981	G/P/B	A/C CLUTCH RELAY FEED
982	G/S/B	BLOWER MOTOR FEED
984	P/G	TEMPERATURE CONTROL POT. INPUT
986	P/K	TEMPERATURE CONTROL POT. OUTPUT
989	P/G	BLOWER MOTOR MEDIUM SPEED (2nd)
996	P/O	BLOWER MOTOR HIGH SPEED (3RD)
997	G/N	WORK LAMP-REAR FEED (OUTER)
998	G/LN	WORK LAMP-REAR FEED (INNER)
999	G/Y	BLOWER MOTOR LOW SPEED (1st)
1000	W/Y	SAFETY START SWITCH SUPPLY
1001	W/R	STARTER SOLENOID FEED
1002	P	IMPLEMENT LAMP SWITCH SUPPLY
1003	G	SUPPLY TO GAUGES
1004	G	SUPPLY TO HORN AND HEADLAMP FLASH
1005	B/S	AIR CLEANER WARNING LAMP
1006	N/Y	ALTERNATOR WARNING LAMP
1007	W	ETHER START BUTTON SUPPLY
1008	N/K	ETHER START SOLENOID SUPPLY
1009	N/P	ALTERNATOR FIELD
1010	G	IGNITION RELAY (COIL)
1011	Y/W	SUPPLY TO FUSES
1012	R/Y	ILLUMINATION
1013	R	RIGHT HAND LAMPS

1014	R/B	LEFT HAND LAMPS
1015	P	DOME LAMP SWITCH FEED
1016	P/N	HORN FEED
1017	LG/G	AIR CON. THERMOSTATIC SWITCH FEED
1018	LG/W	AIR CONDITIONER CLUTCH
1019	G	WINDSHIELD WIPER FEED
1020	G	HAZARD SWITCH SUPPLY
1021	P	HAZARD SWITCH SUPPLY (BATTERY)
1022	N/R	THERMOSTART
1023	N	LIGHT SWITCH FEED
1024	R	RIGHT & LEFT HAND SIDELAMP FEED
1025	G	HZD SWITCH IGN FEED
1026	U/W	HIGH BEAM INDICATOR LAMP
1027	U/W	HEADLAMP MAIN BEAM
1028	U/W	HEADLAMP MAIN BEAM FUSE
1029	U/R	HEADLAMP DIP BEAM FUSE
1030	U/R	HEADLAMP DIP BEAM
1031	R/W	INSTRUMENT ILLUMINATION
1032	LG/P	TURN SIGNAL WARNING LAMP (TERM C)
1033	LG/Y	TURN SIGNAL WARNING LAMP (TERM C2)
1034	LG/R	TURN SIGNAL WARNING LAMP (TERM C3)
1035	W/N	ENGINE OIL PRESSURE WARNING LAMP
1036	N	IGNITION SWITCH (BATTERY)
1037	LG/N	FLASHER UNIT (TERM 49A)
1038	LN/B/S	WINDSHIELD WIPER FEED-REAR
1040	LG/K	FLASHER SWITCH TO RELAY-RHS CUT OUT
1041	LG/U	FLASHER SWITCH TO RELAY-LHS CUT OUT
1042	U	RELAY FEED ELECTRONICS
1043	U/Y	RELAY FEED TO FUSES
1044	W/U/S	GRID HEATER FEEDBACK
1050	G	ACCESSORY FEED
1051	Y/S	SIDE LIGHTS RELAY COIL FEED
1070	R	FRONT WORKLAMP SWITCH FEED
1071	P	WORKLAMP FRONT FEED
1072	P/U	WORKLAMP FRONT RELAY SUPPLY
1073	P	WORKLAMP FRONT FEED
1090	R	REAR WORKLAMP RELAY SIGNAL
1091	R	FRONT WORKLAMP LOWER RELAY SIGNAL
1092	R	FRONT WORKLAMP RELAY SIGNAL
1093	R	FENDER WORKLAMP RELAY SIGNAL
1096	R/Y	WORKLAMP FENDER MOUNTED
1097	R/S	FEED FRONT WORKLAMP OUTER

1098	W/B	FRONT WORKLAMP RELAY GROUND
1099	R/O	FEED FRONT WORKLAMP INNER
1119	G/R/B	RR WINDSHIELD WIPER
1120	G/O/B	RR WINDSHIELD WIPER PARK RETURN
1121	G/Y/B	RR WINDSHIELD WASH
1130	N/S	ENGINE HEATER CONTROL TO IGN SWITCH
1135	G/K/B	THERMOSTART WARNING LAMP
1140	K/W/S	THERMOSTART INITIATE SIGNAL TO RELAY
1141	N	GRID HEATER +
1142	N/G	GRID HEATER FUSE TO PWR. RELAY
1143	N/Y	POWER RELAY TO GRID HEATER
1150	N/W/S	CAL/SEL SWITCH
1160	R/P/Y	REVERSE ALARM
2001	N/G	BATTERY TEMPERATURE SENSOR
2002	N/P	BATTERY TEMP SENSOR (ALT OUTPUT)
2003	W/R	STARTER SOLENOID FEED
2006	U/O	DE-ICING SWITCH - AIR CONDITIONER
2009	G	FUEL PUMP SUPPLY
2010	LG/W	AIRCON PLUG TO DE-ICING SWITCH
2011	P/B	HORN RETURN
2012	Y/O	TRANS OIL PRESSURE WARNING LAMP
2013	Y/R	PTO OVERSPEED WARNING LAMP
2014	G/K	ENGINE OIL PRESSURE SENDER (+5 VOLT)
2015	W/S	TACHOMETER SENSOR-SIGNAL
2016	Y/G	REAR AXLE SPEED SENSOR-SIGNAL
2017	B/P	BULB TEST (EIC)
2018	B/R	RADAR PRESENT
2019	B/K	ENGINE RPM (TACHO MODULE TO TPM)
2020	Y/K	ENGINE SHUT DOWN (TACHO MODULE TO TPM)
2021	Y/P	AXLE GROUND SPEED (TACHO MODULE TO TPM)
2022	B/Y	PTO 540/1000 RPM (TACHO MODULE TO TPM)
2023	S	TPM TO EIC (AXLE SPEED DRIVE)
2024	S/N	RADAR SIGNAL DRIVE
2025	S/U	AUDIO ALARM CONTROL
2026	S/R	IMPLEMENT SWITCH SIGNAL
2027	R	RADAR ASSEMBLY (GUN) POWER
2028	G	RADAR ASSEMBLY (GUN) SIGNAL
2029	P	INSTRUMENT MEMORY SUPPLY
2030	N/O	ELECTRONIC DRAFT CONTROL
2031	Y/TQ	RADAR PRESENT
2040	LG/G/S	WATER IN FUEL SENSOR
2041	P/Y	FUEL SHUT OFF

2042	O/S	PTO SOLENOID-REAR
2043	O/K	PTO SOLENOID-FRONT
2044	O/B/Y	PTO SOLENOID-FRONT RETURN(-)
2045	O/G	PTO SWITCH TO MODULE
2046	O/LG	PTO SWITCH (VCC)
2047	O/W	PTO SWITCH (VCCO)
2048	O/Y	PTO SWITCH (VCCS)
2049	O/P	PTO SWITCH 1000RPM WARNING LAMP
2050	G	PTO SUPPLY / DOG SUPPLY
2051	O/TQ	PTO SOLENOID RETURN (-)
2052	W/R/B	PTO LUBE SOL
2053	P/W/B	PTO LUBE SOL RETURN
2055	B/W/S	PTO SYNCHRO GROUND SPEED ENGAGED
2056	W/R/Y	PTO FENDER PTO SWITCH ON
2057	W/S/Y	PTO FENDER SWITCH LH - RH LINK
2059	W/U	FENDER PTO SWITCH INPUT
2060	O/LG	PTO 540/1000 SWITCH
2062	W/LG/S	PTO TWIST SENSOR
2065	N/G/B	PTO ENGAGED
2068	N/U/Y	PTO SOFT START
2069	U/W/Y	PTO MANAGEMENT ON
2070	O/U/B	ENGINE SHUT OFF RELAY +12V
2080	O/R	ENGINE SHUT OFF RELAY
2087	O/LG/B	EXHAUST BRAKE SOLENOID
2090	W/U	STARTER RELAY TO START INHIBIT SWITCH
2095	G/W/B	INSTRUMENT SIGNAL GROUND
2100	G/U/B	A/C CONDENSER MOTOR FEED
2120	B/LN/S	PTO BRAKE SIGNAL
2130	B/N/S	PTO BRAKE SOLENOID
2140	B/O/S	PTO SPEED SENSOR
2150	B/P/S	PTO EXT. SWITCH OFF
2200	G/N/B	SERVICE MODE INITIATE
2245	K/LN/S	PTO FRONT - SWITCH TO MODULE (MOM)
2248	K/N/S	PTO FRONT - SWITCH (VCCS)
2250	K/O/S	PTO FRONT - SUPPLY
2260	O/G/Y	PTO FRONT - SPEED SIGNAL
2270	O/K/Y	PTO FRONT - WARNING LAMP
2300	P/B/Y	THEORETICAL GROUND SPEED ISO 11786 SKT.PIN#2
2310	P/G/Y	IN/OUT OF WORK-HPL MODE ISO11786 SKT.PIN#4
2320	P/K/Y	TRUE GROUND SPEED ISO 11786 SKT.PIN#1
2330	PLG/Y	PTO SPEED ISO11876 SKT.PIN#3
2500	N/B/S	FRONT HITCH SOLENOID

2510	N/G/S	FRONT HITCH POSITION SIGNAL
2520	N/K/S	FRONT HITCH SET POSITION SIGNAL
2530	N/LG/S	FRONT HITCH V REF
2540	N/O/S	FRONT HITCH +12v IGN
2550	N/P/S	FRONT HITCH OVERIDE SWITCH
2560	N/R/S	FRONT HITCH 0v REF
2570	R/K/Y	FRONT HITCH RAISE SOLENOID
2571	S/K/Y	FRONT HITCH RAISE SOLENOID RETURN(–)
2580	R/LG/Y	FRONT HITCH LOWER SOLENOID
2581	S/LG/Y	FRONT HITCH LOWER SOLENOID RETURN (–)
2582	LG/K/Y	STEYR – EXT SWITCHES
2583	LN/O/Y	STEYR – EXT SWITCHES.
2584	W/U/Y	OILMOTOR MODE
2585	LN/R/Y	EFH RAISE SWITCH
2586	LN/S/Y	EFH WORK SWITCH
2587	N/O/Y	EFH EXTERNAL SWITCH +
2588	P/O/Y	EFH EXTERNAL SWITCH UP
2589	R/O/Y	EFH EXTERNAL SWITCH DOWN
2590	LN/U/Y	EXTERNAL SWITCH FHPL UP
2591	LN/W/Y	EXTERNAL SWITCH FHPL DOWN
2592	N/S/Y	EFH VALVE DOWN +
2593	N/TQ/Y	EFH VALVE DOWN –
2594	O/TQ/Y	EFH POSITION SENSOR +
2595	P/TQ/Y	EFH POSITION SENSOR SIGNAL
2596	R/TQ/Y	EFH POSITION SENSOR –
2597	LN/TQ/Y	EFH PRESSURE SENSOR SIGNAL
2598	S/R/Y	EFH ACCUMULATOR 14 BAR
2599	N/W/Y	EFH ACCUMULATOR 40 BAR
2600	Y/G/S	REAR AXLE SPEED MONITOR
3000	G/LG	FLASHER UNIT SUPPLY (TERMINAL 49)
3001	G/R	LEFT HAND FLASHER CIRCUIT
3002	G/W	RIGHT HAND FLASHER CIRCUIT
3003	W/K	RADIO FEED
3004	G/W	RIGHT HAND TURN SIGNAL WARNING LAMP
3005	G/R	LEFT HAND TURN SIGNAL WARNING LAMP
3006	G/S	AUXILIARY FUEL TANK SENDER
3007	G/B	FUEL GAUGE FEED
3008	U/B	WORKLAMP WARNING LIGHT
3009	G/U	FLASHER UNIT SUPPLY B+
3010	R/Y	FOGLAMP FEED
3011	R/Y	FOGLAMP FEED
3012	G	HANDBRAKE WARNING FEED

3013	LG/S	AUXILIARY FUEL TANK SIGNAL
3014	R/K	HANDBRAKE WARNING LAMP SIGNAL
3015	P/K	ACCESSORY SOCKET (POWER)
3016	S/Y	NOT KNOWN
3018	G/U	FLASHER UNIT BUZZER FEED
3020	Y	DUAL POWER SOLENOID SUPPLY
3022	Y/N	DUAL POWER (HIGH) WARNING LAMP
3024	Y/K	NOT KNOWN
3025	Y/U	FOUR WHEEL DRIVE SOLENOID (MANUAL)
3026	Y/R	NOT KNOWN
3027	Y	FOUR WHEEL DRIVE SOLENOID (AUTO)
3030	W/K	ACCESSORY RELAY SIGNAL
3045	Y/U/S	FOUR WHEEL DRIVE WARNING LAMP
3050	P	AUXILIARY FEED CONNECTOR SUPPLY
3051	P	CIGAR LIGHTER SUPPLY
3052	P/W	DOME LAMP TO DOOR SWITCH
3053	S/O	SPEAKER RIGHT HAND
3054	S/Y	SPEAKER NEGATIVE RH
3055	S/K	SPEAKER LEFT HAND
3056	N/B	SPEAKER NEGATIVE LH
3060	P	IMPLEMENT SOCKET RELAY
3061	P/S	IMPLEMENT SOCKET
3062	P/O	IMPLEMENT SOCKET SWITCH
3070	P	'B' PILLAR SKT SUPPLY
3075	O	TRAILER SOCKET (ACCESSORY FEED)
3076	O/N	ACCESSORY SWITCH FEED
3077	Y	RADIO +12VB
3078	O	RADIO +12V ILLUMINATION
3079	R	RADIO +12V IGNITION
3080	P/LN	CONSOLE LAMP
3090	Y/LN	SEAT PUMP SUPPLY
3091	P	SPEAKER RR–RHS +
3092	P/B	SPEAKER RR–RHS –
3093	S	SPEAKER FRT–RHS +
3094	S/B	SPEAKER FRT–RHS –
3095	W	SPEAKER FRT–LHS +
3096	W/B	SPEAKER FRT–LHS –
3097	G	SPEAKER RR–LHS +
3098	G/B	SPEAKER RR–LHS –
3100	B/G/S	STEERING SENSOR +5v
3120	B/K/S	STEERING SENSOR SIGNAL
3140	B/LG/S	STEERING SENSOR GROUND

3150	W/O	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
3155	W/G	HANDBRAKE TRANS INTERLOCK
3200	O/R/S	SUSPENSION SWITCH FEED
3210	U/LG/S	SUSPENSION SWITCH RETURN
3215	tbc	SUSPENSION LAMP
3220	O/LG/S	AXLE HEIGHT SENSOR 5V REF
3230	U/K/S	AXLE HEIGHT SENSOR POSITION
3240	O/B/S	RAISE SOLENOID PWR
3250	O/G/S	RAISE SOLENOID RET
3260	O/N/S	LOWER SOLENOID PWR
3270	O/P/S	LOWER SOLENOID RET
3271		LOADER RELAY FEED
3272	O/W	LOADER VALVE #1 OUT
3273	O/B	LOADER VALVE #1 RETURN
3274	R/W	LOADER VALVE #2 OUT
3275	R/B	LOADER VALVE #2 RETURN
3276	G/U	LOADER VALVE
3280	O/U/S	SUSPENSION LOCKOUT SOLENOID UPPER
3281	LN/B/Y	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)
3285	LN/G/Y	SUSPENSION LOCKOUT SOLENOID LOWER
3286	LN/K/Y	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)
3290	O/Y/S	SUSPENSION LOCKOUT LAMP (OR SOLENOID RET)
3300	O/W/S	SENSE LINE CONTROL SOLENOID
3310	U/LN/S	RAISE LOCKOUT SOLENOID
3500	W/B/S	POWER STEERING PRESSURE SIGNAL
4001	R/U	TRANSMISSION OIL WARNING LAMP (TEMP)
4002	R/U	TRANSMISSION OIL WARNING LAMP SWITCH
4010	N/W	RETURN TO DIG
4011	P/G	ROTATING BEACON SWITCH SUPPLY
4012	P/R	ROTATING BEACON FEED
4013	U/N	TRANS CONTROL FEED
4014	U/G	FORWARD CLUTCH SOLENOID FEED
4015	U/Y	REVERSE CLUTCH SOLENOID FEED
4016	U/K	TORQUE CONVERTOR LOCK-UP RELAY FEED
4017	U/S	TORQUE CONVERTOR LOCK-UP LAMP
4018	S/P	TORQUE CONVERTOR LOCK-UP SOLENOID FEED
4019	S/G	HYDRAULIC FILTER BY-PASS SWITCH FEED
4020	S/LG	HYDRAULIC FILTER BY-PASS LAMP
4021	S/W	BACK-UP ALARM RELAY FEED
4022	S/B	BACK-UP ALARM FEED
4025	Y/LN	4 IN 1 BUCKET FEED
4040	G	LINK LEVEL SWITCH SUPPLY

4050	W/P	LINK LEVEL RAISE
4051	W/G	LINK LEVEL LOWER
4052	W/O/S	LINK LEVEL EXTEND SIDE
4053	W/P/S	LINK LEVEL RETRACT SIDE
4054	W/R/S	LINK LEVEL SAFETY VALVE (DUMP)
4100	TQ/Y	TRANS RANGE ENABLE SWITCH SUPPLY
4101	TQ/B	TRANS RANGE ENABLE
5000	P	EDC MEMORY POWER
5005	N/O	EDC KEY SWITCH FEED
5010	B	EDC EARTH
5011	B	EDC EARTH CASE RFI
5015	R	EDC CONTROLS BACKLIGHTING
5020	LN	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
5021	K/Y	EDC PROCESSOR REF VOLT (+5V) ROCKSHAFT
5022	K/B	EDC PROCESSOR REF VOLT +5V QUADRANT
5023	K/S	EDC PROCESSOR REF VOLT +5V HEIGHT LIMIT
5025	LN/U	EDC LOWER SIGNAL
5030	LN/R	EDC RAISE SIGNAL
5035	LN/G	EDC RETURN REF. VOLTAGE EARTH
5040	LN/W	EDC DRAFT POSITION
5045	LN/Y	EDC DROP RATE
5050	LN/B	EDC QUADRANT
5055	LN/S	EDC CLOCK LINE TO DISPLAY
5060	LN/O	SERIAL DATA TO CLUSTER
5065	LN/P	EDC RIGHT PIN
5070	LN/LG	EDC LEFT PIN
5075	K	EDC VOLTAGE TO PINS
5080	K/N	EDC ROCKSHAFT
5085	K/U	EDC VALVE UP
5087	K/U/B	EDC VALVE UP RETURN
5090	K/R	EDC VALVE DOWN
5095	K/G	EDC EXTERNAL SWITCH DOWN
5097	K/G/B	EDC VALVE DOWN RETURN
5100	K/W	EDC EXTERNAL SWITCH UP
5105	S/R	EDC IMPLEMENT STATUS SWITCH
5110	K/LG	EDC LAMP SIGNAL
5115	K/P	EDC SLIP SIGNAL
5120	K/O	EDC HEIGHT LIMIT SIGNAL
5125	TQ/W	EDC RAISE SIGNAL–RAISE WORK SWITCH
5130	TQ/P	EDC WORK SIGNAL–RAISE WORK SWITCH
5132	TQ/K	EDC FLOAT
5133	TQ/LN	EDC STOP

5135	TQ	EDC +WHEEL SPEED SIGNAL
5140	TQ/N	EDC -WHEEL SPEED SIGNAL
5145	TQ/R	EDC SLIP LIMIT POT
5150	G	EDC EXTERNAL SWITCH SUPPLY
5155	B/U	EDC LOWER LIMIT POT
5160	TQ/O	EDC HEIGHT LIMIT POT FEED
5170	LN/TQ	SERIAL DATA FROM CLUSTER
5175	R/Y/S	ADIC KEY PAD DISABLE
5180	TQ/G	EDC SLIP INDICATOR LAMP
5190	R/W/B	HPL INTERLOCK / LIFT-O-MATIC
5200	N/R/B	EDC VALVE SUPPLY
5210	N/S/B	EDC VALVE ENABLE
5220	Y/LG/S	EDC RAISE LAMP
5230	Y/LN/S	EDC LOWER LAMP
5240	O/LG/Y	EDC RAISE SIGNAL-RAISE WORK SWITCH No.2
5250	O/N/Y	EDC WORK SIGNAL-RAISE WORK SWITCH No.2
5260	LN/O/S	HYDRAULIC MASTER SW #1
5265	LN/P/S	HYDRAULIC MASTER SW #2
5300	K/W/B	ECU FLASH PROGRAM SIGNAL
5400	Y	CAN H
5420	G	CAN L
5500	Y	EHR CAN HIGH
5510	G	EHR CAN LOW
5515	S/B/Y	EHR +12V IGN.
5520	LG/N/Y	EHR 5V Ref
5521	LG/O/Y	EHR Motor #1
5522	LG/P/Y	EHR Motor #2
5523	LG/R/Y	EHR Motor #3
5524	LG/S/Y	EHR Motor #4
5531	LG/U/Y	EHR NEUTRAL SWITCH VALVE #1
5532	B/G/Y	EHR NEUTRAL SWITCH VALVE #2
5533	B/K/Y	EHR NEUTRAL SWITCH VALVE #3
5534	B/LG/Y	EHR NEUTRAL SWITCH VALVE #4
5535	LG/W/Y	EHR FLOAT SWITCH VALVE#1
5536	B/LN/Y	EHR FLOAT SWITCH VALVE#2
5537	B/N/Y	EHR FLOAT SWITCH VALVE#3
5538	B/O/Y	EHR FLOAT SWITCH VALVE#4
5541	O/P/Y	EHR MAX.FLOW SWITCH VALVE #1
5542	B/P/Y	EHR MAX.FLOW SWITCH VALVE #2
5543	B/S/Y	EHR MAX.FLOW SWITCH VALVE #3
5544	B/TQ/Y	EHR MAX.FLOW SWITCH VALVE #4
5551	O/R/Y	EHR POTENTIOMETER SIGNAL VALVE#1

5552	B/U/Y	EHR POTENTIOMETER SIGNAL VALVE#2
5553	B/W/Y	EHR POTENTIOMETER SIGNAL VALVE#3
5554	U/R/Y	EHR POTENTIOMETER SIGNAL VALVE#4
5561	O/S/Y	EHR TIMED FLOW SWITCH #1
5562	O/U/Y	EHR TIMED FLOW SWITCH #2
5563	O/W/Y	EHR TIMED FLOW SWITCH #3
5564	P/N/Y	EHR TIMED FLOW SWITCH #4
5591	P/R/Y	EHR WARNING LAMP#1
5592	P/S/Y	EHR WARNING LAMP#2
5593	P/U/Y	EHR WARNING LAMP#3
5594	P/W/Y	EHR WARNING LAMP#4
5595	S/G/Y	EHR MASTER STOP SWITCH
5596	S/U/Y	EHR MASTER STOP LAMP
5597	S/W/Y	EHR MASTER ENABLE
5600	R/B/Y	HTS LIVE SIGNAL
5610	R/G/Y	HTS PROGRAM
5620	R/N/Y	HTS ON/OFF SWITCH
5625	R/W/B	LIFT-O-MATIC SWITCH
5700	W/B/Y	EHR J-STICK X+
5710	W/G/Y	EHR J-STICK X ACTIVE SWITCH
5720	W/K/Y	EHR J-STICK X FULL FLOW SWITCH
5730	W/LG/Y	EHR J-STICK X FLOAT SWITCH
5740	W/LN/Y	EHR J-STICK Y+
5750	W/N/Y	EHR J-STICK Y ACTIVE SWITCH
5760	W/O/Y	EHR J-STICK Y FULL FLOW SWITCH
5770	W/P/Y	EHR J-STICK Y FLOAT SWITCH
5820	S	EDC ROCKSHAFT POT
6000	K/LG/S	ENGINE SPEED SIGNAL
6001	B	ENGINE ECU RESISTOR #1
6002	W	ENGINE ECU RESISTOR #2
6003	R	ENGINE ECU RESISTOR #3
6004	G	ENGINE ECU RESISTOR #4
6057	B/Y	ENGINE STARTER RELAY GROUND
6010	B/TQ/S	THROTTLE POSITION SWITCH
6100	U	ENGINE COLD ADVANCE CONTROL
6200	R	MANIFOLD (GRID) HEATER SUPPLY
6300	N/U/S	FAN SPEED
6310	N/W/S	FAN SOLENOID
6320	N/Y/S	FAN 5V REF.
6400	LN/G/S	ECU BATTERY SUPPLY
6401	G/B/Y	ECU TO THROTTLE POT.+5V
6402	G/K/Y	ECU TO THROTTLE POT. VAR

6403	G/LG/Y	ECU TO THROTTLE POT.–
6404	G/LN/Y	THROTTLE POT. TO LOW IDLE SWITCH
6405	G/N/Y	ECU TO THROTTLE POT. SWITCH
6408	G/O/Y	FUSED B+ TO ECU (1)
6409	G/P/Y	FUSED B+ TO ECU (2)
6410	G/R/Y	FUSED B+ TO ECU (3)
6411	G/S/Y	FUSED B+ TO ECU (4)
6414	G/TQ/Y	FUSED IGN.+ TO ECU
6415	G/U/Y	ECU TO J1939 TERFACE CAN#1 CONN.(HI)
6416	G/W/Y	ECU TO J1939 TERFACE CAN#1 CONN.(LO)
6417	NOT REQD.	SCREEN BRAID FOR 6415 & 6416
6418	K/B/Y	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO K
6419	K/G/Y	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO L
6420	K/LG/Y	ECU SINK DRIVER#6 TO DIAGNOSTIC LAMP
6421	K/LN/Y	ECU SINK DRIVER#6 TO DIAGNOSTIC LAMP
6422	K/N/Y	ENGINE MOUNTED B– TO ECU (1)
6423	K/O/Y	ENGINE MOUNTED B– TO ECU (2)
6424	K/P/Y	ENGINE MOUNTED B– TO ECU (3)
6425	K/R/Y	ENGINE MOUNTED B– TO ECU (4)
6427	K/S/Y	ECU TO MULTIPLE STATE SWITCH (PASS.INPUT#06)
6428	K/TQ/Y	ECU TO MULTIPLE STATE SWITCH (PASS.INPUT#06)
6431	K/U/Y	ECU TO DIAGNOSTIC REQUEST SWITCH (DIG 15)
6432	K/W/Y	ECU SWITCHED BATT OUTPUT TO DIAGNOSTIC REQUEST SWITCH
6440	S/N/Y	HAND THROTTLE POSITION 1
6450	S/O/Y	HAND THROTTLE POSITION 2
6460	S/P/Y	HAND THROTTLE SWITCH (NOT IDLE)
6500	N/B/Y	CONSTANT ERPM ON/OFF
6510	N/G/Y	CONSTANT ERPM SET 1
6520	N/K/Y	CONSTANT ERPM SET 2
6530	N/LG/Y	CONSTANT ERPM INCREASE
6540	N/R/Y	CONSTANT ERPM DECREASE
6550	N/P/Y	CONSTANT ERPM SET LAMP
6560	B/U/Y	ECU TO FUEL FILTER HEATER
6570	G/U/Y	ECU TO FUEL FILTER HEATER RETURN
6580	K/U/Y	ECU TO GRID HEATER RELAY#1
6585	O/U/Y	ECU TO GRID HEATER RELAY#2
6586	P/U/Y	ECU TO GRID HEATER RELAY RETURN
6590	LG/U/Y	ECU DIGITAL GROUND
6600	LN/U/Y	ECU BATTERY SUPPLY
6610	N/U/Y	ECU IGNITION SUPPLY
6620	O	ECU COOLANT TEMP. SIGNAL

6630	O	ECU COOLANT TEMP. GROUND
6640	O	ECU AC PRESSURE NOT HIGH SWITCH
6650	O	ECU BOOST GROUND
6660	O	ECU BOOST TEMP.
6670	O	ECU 5V BOOST
6680	O	ECU BOOST PRESSURE
6690	O	ECU SOLENOID VALVE SHUT OFF
6700	O	ECU CRANK SHAFT OUTPUT SHAFT
6710	O	ECU ENGINE SPEED
7000	U/R/B	TRANS CONTROL SUPPLY
7001	U/0/B	TRANS DISPLAY ILLUMINATION
7002	U/Y/B	TRANS MAIN CLUTCH SOL (C3/C4)
7003	U/G/B	TRANS DUMP SOL
7004	U/B	TRANS FRONT CLUTCH SOL (C1/C2)
7005	U/P/B	TRANS CREEPER GR SOL
7007	R/P/B	TRANS DUAL POWER PRESSURE SWITCH HIGH
7008	R/S/B	TRANS DUAL POWER PRESSURE SWITCH LOW
7009	W/G/S	TRANS RANGE DISABLE SWITCH
7010	U/N/B	TRANS RANGE INDICATOR SWITCH (GR 1-4)
7020	U/W/B	TRANS RANGE INDICATOR SWITCH (GR 5-8)
7025	R/TQ/Y	TRANS DISPLAY ENABLE
7030	U/LG/B	TRANS RANGE INDICATOR SWITCH COMMON
7035	N/LG/B	TRANS DUMP SOLEN0ID FEED
7040	U/LN/B	TRANS CREEPER SWITCH
7050	R/G/B	TRANS RELAY SUPPLY - RUN
7060	R/K/B	TRANS RELAY SUPPLY - START
7068		TRANS CVT POWER SUPPLY (CVT)
7070	R/LG/B	TRANS FEED (IGN +)
7071	N/K/B	FEED HYD FILTER RESTRICTION IND LAMP
7080	B/LG	DIFF-LOCK SOLENOID FEED
7090	LG	DIFF-LOCK SWITCH TO BRAKE SWITCH
7100	N/LG	DIFF-LOCK RELAY TO BRAKE SWITCH
7110	R/Y/B	PTO INHIBITOR SWITCH TO TRANS
7120	Y/B	DIFF-LOCK WNG LP (MAUAL)
7125	LG/B/Y	DIFF-LOCK WNG LP (AUTO)
7126	LG/O/U	DIFF LOCK PRESSURE SWITCH
7130	B/N	HYD FILTER WNG LP
7140	O/B	DIFF-LOCK OFF SOLENOID
7150	S/G/B	LOW OIL PRESSURE WRN FEED
7160	R/N/B	HYD LOW CHARGE WARNING
7170	B/W	DIFF LOCK SWITCH (AUTO ON)
7175	Y/B	DIFF LOCK SWITCH (MANUAL ON)

7180	U/TQ	CREEPER SWITCH MOM SIGNAL
7190	K/G/S	TRANS SOLENOID VALVE SUPPLY
7195	K/U/S	TRANS SOLENOID VALVE RETURN
7196		TRANS FR/REV LOW SIDE RETURN (CVT)
7197		TRANS RANGE LOW SIDE RETURN (CVT)
7198		TRANS HYROSTATIC LOW SIDE RETURN (CVT
7200	S/K/B	TRANSMISSION SHIFT DOWN
7210	S/LG/B	TRANSMISSION SHIFT UP
7220	S/N/B	TRANSMISSION HIGH RANGE
7225	W/LG/B	TRANS HI RANGE SOL - RET
7230	S/O/B	TRANSMISSION LOW RANGE
7235	Y/LN/B	TRANS LOW RANGE SOL - RET
7240	S/P/B	TRANSMISSION DISPLAY SWITCH
7245	LN/U/S	DEADMAN
7250	S/R/B	TRANSMISSION FORWARD SIGNAL
7260	S/U/B	TRANSMISSION REVERSE SIGNAL
7265	K/Y/S	TRANS NEUTRAL SWITCH TO PROCESSOR (GR.SW 1)
7267	LG/N/S	TRANS NEUTRAL SWITCH 2 TO PROCESSOR
7270	R/G	TCM SERIAL DATA IN-DISPLY DATA OUT
7275	W/U/B	TCM SERIAL DATA OUT-DISPLY DATA IN
7280	W/G/B	LIMP HOME SWITCH 18x18 TRANS.
7290	W/K/B	DIRECTIONAL INTERRUPT RELAY TO SOLENOID
7300	W/LG/B	SOLENOID 1 18x9 TRANSMISSION
7301	Y/LN/B	SOLENOID 1 18x9 RETURN
7320	W/N/B	SOLENOID 2 18x9 TRANSMISSION
7321	P/Y/B	SOLENOID 2 18x9 RETURN
7330	W/P/B	SOLENOID 3 18x9 TRANSMISSION
7331	Y/S/B	SOLENOID 3 18x9 RETURN
7340	W/R/B	SOLENOID F1 18x9 TRANSMISSION
7341	Y/W/B	SOLENOID F1 18x9 RETURN
7350	W/S/B	SOLENOID F2 18x9 TRANSMISSION
7351	S/W/B	SOLENOID F2 18x9 RETURN
7355	S/Y/B	SOLENOID R 18x9 TRANSMISSION
7356	U/S/B	SOLENOID R 18x9 RETURN
7360	W/Y/B	SOLENOID A 18x9 TRANSMISSION
7361	P/LG/B	SOLENOID A 18x9 RETURN
7370	Y/G/B	SOLENOID B 18x9 TRANSMISSION
7371	P/N/B	SOLENOID B 18x9 RETURN
7380	Y/K/B	SOLENOID C 18x9 TRANSMISSION
7381	P/O/B	SOLENOID C 18x9 RETURN
7390	Y/LG/B	SOLENOID PMW (F1) 18x9 TRANSMISSION
7391	P/R/B	SOLENIOD PWM (F1) 18x9 RETURN

7392	O/G/B	SOLENOID PWM (F2) 18x9 TRANSMISSION
7393	O/N/B	SOLENOID PWM (F2) 18x9 RETURN
7395	P/S/B	SOLENOID CREEP 18x9 TRANSMISSION
7396	P/W/B	SOLENOID CREEP 18x9 RETURN
7400	Y/N/B	TRANS RPM SPEED SENSOR TO TCM INPUT
7401	P/B/G	TRANS RPM SPEED SENSOR
7402		TRANS WHLSP FORWARD (CVT)
7403		TRANS WHLSP REVERSE (CVT)
7404		TRANS HYDROSTAT FORWARD (CVT)
7405		TRANS HYDROSTAT REVERSE (CVT)
7406		TRANS BI-DI SPEED SENSOR RET (CVT)
7410	Y/O/B	TRANS RPM SPEED SENSOR TO TCM OUTPUT
7420	Y/P/B	TCM TO CLUTCH POSITION SWITCH
7430	Y/R/B	CLUTCH POSITION SIGNAL
7431	TQ/W/B	CLUTCH 'A' SUPPY
7440	Y/U/B	TCM TO TRACTOR EIC-AXLE OUTPUT
7450	W/LN/B	TRANS CREEPER INTERLOCK SUPPLY
7460	W/O/B	TRANS CREEPER CLUTCH ENGAGED
7470	S/LN/B	TRANS CREEPER CLUTCH DISENGAGED
7475	R/K/S	TRANS AUTO OFF
7476	R/LG/S	TRANS AUTO ON
7480	G/K/S	TRANS AUTO FUNCTION 1
7482	G/K/S	TRANS AUTO ON/INCREASE
7485	K/P/S	TRANS AUTO FUNCTION LAMP 1
7490	G/LG/S	TRANS AUTO FUNCTION 2
7492	G/LG/S	TRANS AUTO OFF/DECREASE
7495	K/R/S	TRANS AUTO FUNCTION LAMP 2
7500	B/G	TRANS OIL TEMP. SENSOR
7520	G/N/S	TRANS SENSOR SUPPLY 8v
7525	G/B/S	TRANS SENSOR SUPPLY 5v
7560	G/LN/S	TRANS WARNING LAMP
7570	B	SIGNAL GROUND
7580	U/K/B	CREEPER SOLENOID MONITOR
7581	O/P/B	CREEPER POSITION SIGNAL
7582	U/S/Y	CREEPER RAIL SWITCH NOT
7590	O/W/B	TRANS CREEPER GEAR STATUS LAMP
7600	N/W/B	TRANS FEATHERING SOLENOID
7620	N/Y/B	TRANS FEATHERING SOL. MONITOR
7630	N/U/B	TRANS MAIN CLUTCH PRESSURE SWITCH
7640	B/LN	DIAGNOSTIC PLUG RS232 IN
7650	W/LN	DIAGNOSTIC PLUG RS232 OUT
7660	R/U/B	TRANS CLUTCH DISCONNECT

7670	R/S/Y	TRANS FRONT SYNCHRO POSITION
7700	LN/N/B	TRANS SHUTTLE DUMP SWITCH
7710	LN/O/B	TRANS OIL TEMPERATURE SWITCH
7735	LN/P/B	TRANS MID SPEED SIGNAL +
7740	LN/R/B	TRANS MID SPEED SIGNAL –
7750	R/B/S	TCM TO DOG 30/40 KPH SELECT
7755	P/G/S	DOG ENABLE
7760	W/N/B	TORQUE SENSOR
7770	U/N/S	TRANS FORWARD PRESSURE SWITCH
7780	U/O/S	TRANS FORWARD PRESSURE SWITCH
7790		TRANS RANGE INPUT DIGITAL FEEDBACK (CVT)
7800		TRANS FR / REV INPUT DIGITAL FEEDBACK (CVT)
7810	K/N/B	TRANS PWM SOLENOID C1
7815	K/O/B	TRANS PWM SOLENOID C1 RETURN
7820	K/P/B	TRANS PWM SOLENOID C2
7825	K/R/B	TRANS PWM SOLENOID C2 RETURN
7830	K/S/B	TRANS PWM SOLENOID C3
7835	K/U/B	TRANS PWM SOLENOID C3 RETURN
7840	K/W/B	TRANS PWM SOLENOID C4
7845	K/Y/B	TRANS PWM SOLENOID C4 RETURN
7846		TRANS BRAKE SOLENOID (CVT)
7847		TRANS HYROSTATIC – POSITIVE SOLENOID (CVT)
7848		TRANS HYROSTATIC – NEGATIVE SOLENOID (CVT)
7850	G/P/S	TRANS DIAGNOSTIC PROGRAM VOLTAGE
7855	G/R/S	TRANS DIAGNOSTIC EA
7860	G/U/S	TRANS DIAGNOSTIC RCV
7865	G/W/S	TRANS DIAGNOSTIC XMT
7870	G/Y/S	TRANS DIAGNOSTIC RTS
7875	K/B/S	TRANS DIAGNOSTIC CTS
7880	B	T C M SIGNAL GROUND
7890		TRANS L–LINE DIAGNOSTIC (CVT)
7900	TQ/K/B	CLUTCH 'A' SIGNAL
7910	TQ/N/B	CLUTCH 'B' SIGNAL
7915	P/O/S	TCM CLUTCH B RETURN
7920	TQ/O/B	CLUTCH 'C' SIGNAL
7925	P/R/S	TCM CLUTCH C RETURN
7930	TQ/R/B	CLUTCH 'D' SIGNAL
7935	P/N/S	TCM CLUTCH D RETURN
7940	TQ/S/B	CLUTCH 'E' SIGNAL
7945	P/TQ/S	TCM CLUTCH E RETURN
7950	TQ/Y/B	CLUTCH SUPPLY
7960	P/K/B	TRANS SLOW/FAST

7965	P/K/S	HI/LO SYNCHRO SIGNAL
7970	P/TQ/B	TRANS MED/REV
7980	K/B/S	TRANS MED RANGE
7982	W/P/B	TRANS MED RANGE RET
7985	G/O/S	TRANS REVERSE RANGE
7990	K/R/B	TRANS BRAKE
7995	K/Y/S	BRAKE FLUID LEVEL
7996	R	BRAKE PEDALS UNLATCHED SIGNAL
8000	N/TQ/B	TRAILER BRAKE SOLENOID
8010	LN/W/B	TRAILER BRAKE PRESSURE
8020	LN/K/B	TRAILER BRAKE PRESSURE
8030	LG/O/S	TRANS FWD SOLENIOD
8035	P/LG/S	TRANS FWD SOL RET
8040	LG/P/S	TRANS REV SOLENIOD
8045	P/LN/S	TRANS REV SOL RET
8050	R/U/S	TRANS REV PRESSURE
8060	U/B/S	TRAILER BRAKE SUPPLY
8070	P/W/S	TRAILER PARK BRAKE SOLENOID
9000	LN/S/B	DIVERTER VALVE
9010	LN/U/B	DIVERTER VALVE SUPPLY
9020	LN/Y/B	HYDRAULIC REMOTE VALVE SOL
9025	LN/G/B	HYDRAULIC REMOTE VALVE SWITCH
9026	W/G/B	NOT KNOWN
9027	W/R/B	NOT KNOWN
9028	W/TQ/B	NOT KNOWN
9029	W/O/B	NOT KNOWN
9030	W/L/B	NOT KNOWN
9031	P/TQ	NOT KNOWN
9032	Y/G	IGN.+ TO POWER SKT.
9033	LN/R/B	50KPH SOLENOID+
9034	LN/B	50KPH SOLENOID–
9035	LN/W/B	50KPH DUMP SOLENOID
9036	LN/P/Y	50KPH DUMP SOLENOID RETURN

Wire codes - Table 2 (For single colour wires with code printed on wire)

CIRC	COLOUR	DESCRIPTION
1	R	BATTERY SUPPLY
10	G	STOPLAMP SWITCH FEED
11	G	IGNITION SUPPLY (2ND)
12	U	MAIN BEAM HEADLAMP FUSE SUPPLY
13	U	DIP BEAM HEADLAMP FUSE SUPPLY
15	U	LIGHTING SWITCH SUPPLY
28	Y	WIPER MOTOR (PARK RETURN)
29	G	MAIN FUEL SENDER SIGNAL
31	Y	ENGINE OIL PRESSURE SENDER SIGNAL
39	G	TEMPERATURE GAUGE SIGNAL
44	L	FLASHER UNIT (49A)
49	G	RIGHT HAND TURN SIGNAL
50	G	LEFT HAND TURN SIGNAL
56	W	WIPER MOTOR-HIGH
57	B	EARTH (ALL)
58	R	WIPER MOTOR-LOW
60	B	SENSOR GROUND
61	B	CASE GROUND
63	U	WIPER MOTOR-PARK FEED
65	W	DUAL POWER/4 WHEEL DRIVE SWITCH FEED
71	W	IGNITION SWITCHED FEEDS (UNFUSED)
84	G	WINDSHIELD WASHER SWITCH FEED
90	G	DUAL POWER / FOUR WHEEL DRIVE SWITCH
97	L	WINDSHIELD WASHER FEED
137	W	RADIO FEED
138	P	RADIO KAM
150	N	BATTERY FEED (UNFUSED)(ALL)
155	G	BATTERY FEED (FUSED)
160	U	BATTERY SUPPLY ELECTRONICS
170	K/	BATTERY ISOLATOR CONTROL SWITCH
171	W	BATTERY ISOLATOR RELAY COIL
181	G	BLOWER MOTOR FEED
182	P	THERMOSTATIC SWITCH FEED
249	LG	SMV LAMPS RH
250	LG	SMV LAMPS LH
252	N	ALTERNATOR FIELD
349	LN	TRAILER TURN LAMPS RH
350	LN	TRAILER TURN LAMPS LH

365	G	LOW FUEL WARNING LAMP (DELAY ON)
366	O	LOW FUEL WARNING LAMP (DELAY SWITCH)
376	P	HORN FEED
587	LG	W1NDSHIELD WIPER INTERMITTENT DELAY
649	O	COOLANT TEMPERATURE SWITCH
650	TQ	COOLANT LEVEL SWITCH
666	P	DOMELAMP SWITCH FEED
787	G	AUXILIARY FUEL PUMP SUPPLY
810	G	STOPLAMPS
820	R	STOPLAMP SWITCH LH
830	U	STOPLAMP SWITCH RH
840	G	R & L STOPLAMP SIGNAL
979	S	BLOWER MOTOR HIGH SPEED (4th)
980	N	THERMOSTAT SWITCH SUPPLY
981	G	A/C CLUTCH RELAY FEED
982	G	BLOWER MOTOR FEED
984	P	TEMPERATURE CONTROL POT. INPUT
986	P	TEMPERATURE CONTROL POT. OUTPUT
989	P	BLOWER MOTOR MEDIUM SPEED (2nd)
996	P	BLOWER MOTOR HIGH SPEED (3RD)
997	G	WORK LAMP-REAR FEED (OUTER)
998	G	WORK LAMP-REAR FEED (INNER)
999	G	BLOWER MOTOR LOW SPEED (1st)
1000	W	SAFETY START SWITCH SUPPLY
1001	W	STARTER SOLENOID FEED
1002	P	IMPLEMENT LAMP SWITCH SUPPLY
1003	G	SUPPLY TO GAUGES
1004	G	SUPPLY TO HORN AND HEADLAMP FLASH
1005	S	AIR CLEANER WARNING LAMP
1006	N	ALTERNATOR WARNING LAMP
1007	W	ETHER START BUTTON SUPPLY
1008	N	ETHER START SOLENOID SUPPLY
1009	N	ALTERNATOR FIELD
1010	G	IGNITION RELAY (COIL)
1011	Y	SUPPLY TO FUSES
1012	R	ILLUMINATION
1013	R	RIGHT HAND LAMPS
1014	R	LEFT HAND LAMPS
1015	P	DOME LAMP SWITCH FEED
1016	P	HORN FEED
1017	LG	AIR CON. THERMOSTATIC SWITCH FEED
1018	LG	AIR CONDITIONER CLUTCH

1019	G	WINDSHIELD WIPER FEED
1020	G	HAZARD SWITCH SUPPLY
1021	P	HAZARD SWITCH SUPPLY (BATTERY)
1022	N	THERMOSTART
1023	N	LIGHT SWITCH FEED
1024	R	RIGHT & LEFT HAND SIDELAMP FEED
1025	G	HZD SWITCH IGN FEED
1026	U	HIGH BEAM INDICATOR LAMP
1027	U	HEADLAMP MAIN BEAM
1028	U	HEADLAMP MAIN BEAM FUSE
1029	U	HEADLAMP DIP BEAM FUSE
1030	U	HEADLAMP DIP BEAM
1031	R	INSTRUMENT ILLUMINATION
1032	LG	TURN SIGNAL WARNING LAMP (TERM C)
1033	LG	TURN SIGNAL WARNING LAMP (TERM C2)
1034	LG	TURN SIGNAL WARNING LAMP (TERM C3)
1035	W	ENGINE OIL PRESSURE WARNING LAMP
1036	N	IGNITION SWITCH (BATTERY)
1037	LG	FLASHER UNIT (TERM 49A)
1038	LN	WINDSHIELD WIPER FEED-REAR
1040	LG	FLASHER SWITCH TO RELAY-RHS CUT OUT
1041	LG	FLASHER SWITCH TO RELAY-LHS CUT OUT
1042	U	RELAY FEED ELECTRONICS
1043	U	RELAY FEED TO FUSES
1044	W	GRID HEATER FEEDBACK
1050	G	ACCESSORY FEED
1051	Y	SIDE LIGHTS RELAY COIL FEED
1070	R	FRONT WORKLAMP SWITCH FEED
1071	P	WORKLAMP FRONT FEED
1072	P	WORKLAMP FRONT RELAY SUPPLY
1073	P	WORKLAMP FRONT FEED
1090	R	REAR WORKLAMP RELAY SIGNAL
1091	R	FRONT WORKLAMP LOWER RELAY SIGNAL
1092	R	FRONT WORKLAMP RELAY SIGNAL
1093	R	FENDER WORKLAMP RELAY SIGNAL
1096	R	WORKLAMP FENDER MOUNTED
1097	R	FEED FRONT WORKLAMP OUTER
1098	W	FRONT WORKLAMP RELAY GROUND
1099	R	FEED FRONT WORKLAMP INNER
1119	G	RR WINDSHIELD WIPER
1120	G	RR WINDSHIELD WIPER PARK RETURN
1121	G	RR WINDSHIELD WASH

1130	N	ENGINE HEATER CONTROL TO IGN SWITCH
1135	G	THERMOSTART WARNING LAMP
1140	K	THERMOSTART INITIATE SIGNAL TO RELAY
1141	N	GRID HEATER +
1142	N	GRID HEATER FUSE TO PWR. RELAY
1143	N	POWER RELAY TO GRID HEATER
1150	N	CAL/SEL SWITCH
1160	R	REVERSE ALARM
2001	N	BATTERY TEMPERATURE SENSOR
2002	N	BATTERY TEMP SENSOR (ALT OUTPUT)
2003	W	STARTER SOLENOID FEED
2006	U	DE-ICING SWITCH - AIR CONDITIONER
2009	G	FUEL PUMP SUPPLY
2010	LG	AIRCON PLUG TO DE-ICING SWITCH
2011	P	HORN RETURN
2012	Y	TRANS OIL PRESSURE WARNING LAMP
2013	Y	PTO OVERSPEED WARNING LAMP
2014	G	ENGINE OIL PRESSURE SENDER (+5 VOLT)
2015	W	TACHOMETER SENSOR-SIGNAL
2016	Y	REAR AXLE SPEED SENSOR-SIGNAL
2017	P	BULB TEST (EIC)
2018	R	RADAR PRESENT
2019	K	ENGINE RPM (TACHO MODULE TO TPM)
2020	Y	ENGINE SHUT DOWN (TACHO MODULE TO TPM)
2021	Y	AXLE GROUND SPEED (TACHO MODULE TO TPM)
2022	Y	PTO 540/1000 RPM (TACHO MODULE TO TPM)
2023	S	TPM TO EIC (AXLE SPEED DRIVE)
2024	S	RADAR SIGNAL DRIVE
2025	S	AUDIO ALARM CONTROL
2026	S	IMPLEMENT SWITCH SIGNAL
2027	R	RADAR ASSEMBLY (GUN) POWER
2028	G	RADAR ASSEMBLY (GUN) SIGNAL
2029	P	INSTRUMENT MEMORY SUPPLY
2030	N	ELECTRONIC DRAFT CONTROL
2031	Y	RADAR PRESENT
2040	LG	WATER IN FUEL SENSOR
2041	P	FUEL SHUT OFF
2042	O	PTO SOLENOID-REAR
2043	O	PTO SOLENOID-FRONT
2044	O	PTO SOLENOID-FRONT RETURN(-)
2045	O	PTO SWITCH TO MODULE
2046	O	PTO SWITCH (VCC)

2047	O	PTO SWITCH (VCCO)
2048	O	PTO SWITCH (VCCS)
2049	OP	PTO SWITCH 1000RPM WARNING LAMP
2050	G	PTO SUPPLY / DOG SUPPLY
2051	O	PTO SOLENOID RETURN (-)
2052	W	PTO LUBE SOL
2053	P	PTO LUBE SOL RETURN
2055	W	PTO SYNCHRO GROUND SPEED ENGAGED
2056	W	PTO FENDER PTO SWITCH ON
2057	W	PTO FENDER SWITCH LH - RH LINK
2059	W	FENDER PTO SWITCH INPUT
2060	O	PTO 540/1000 SWITCH
2062	W	PTO TWIST SENSOR
2065	N	PTO ENGAGED
2068	N	PTO SOFT START
2069	U	PTO MANAGEMENT ON
2070	O	ENGINE SHUT OFF RELAY +12V
2080	O	ENGINE SHUT OFF RELAY
2087	O	EXHAUST BRAKE SOLENOID
2090	W	STARTER RELAY TO START INHIBIT SWITCH
2095	G	INSTRUMENT SIGNAL GROUND
2100	G	A/C CONDENSER MOTOR FEED
2120	LN	PTO BRAKE SIGNAL
2130	N	PTO BRAKE SOLENOID
2140	O	PTO SPEED SENSOR
2150	P	PTO EXT. SWITCH OFF
2200	G	SERVICE MODE INITIATE
2245	K	PTO FRONT - SWITCH TO MODULE (MOM)
2248	K	PTO FRONT - SWITCH (VCCS)
2250	K	PTO FRONT - SUPPLY
2260	O	PTO FRONT - SPEED SIGNAL
2270	O	PTO FRONT - WARNING LAMP
2300	P	THEORETICAL GROUND SPEED ISO 11786 SKT.PIN#2
2310	P	IN/OUT OF WORK-HPL MODE ISO11786 SKT.PIN#4
2320	P	TRUE GROUND SPEED ISO 11786 SKT.PIN#1
2330	P	PTO SPEED ISO11876 SKT.PIN#3
2500	N	FRONT HITCH SOLENOID
2510	N	FRONT HITCH POSITION SIGNAL
2520	N	FRONT HITCH SET POSITION SIGNAL
2530	N	FRONT HITCH V REF
2540	N	FRONT HITCH +12v IGN
2550	N	FRONT HITCH OVERIDE SWITCH

2560	N	FRONT HITCH 0v REF
2570	R	FRONT HITCH RAISE SOLENOID
2571	S	FRONT HITCH RAISE SOLENOID RETURN(–)
2580	R	FRONT HITCH LOWER SOLENOID
2581	S	FRONT HITCH LOWER SOLENOID RETURN (–)
2582	LG	STEYR – EXT SWITCHES
2583	LN	STEYR – EXT SWITCHES.
2584	W	OILMOTOR MODE
2585	LN	EFH RAISE SWITCH
2586	LN	EFH WORK SWITCH
2587	N	EFH EXTERNAL SWITCH +
2588	P	EFH EXTERNAL SWITCH UP
2589	R	EFH EXTERNAL SWITCH DOWN
2590	LN	EXTERNAL SWITCH FHPL UP
2591	LN	EXTERNAL SWITCH FHPL DOWN
2592	N	EFH VALVE DOWN +
2593	N	EFH VALVE DOWN –
2594	O	EFH POSITION SENSOR +
2595	P	EFH POSITION SENSOR SIGNAL
2596	R	EFH POSITION SENSOR –
2597	LN	EFH PRESSURE SENSOR SIGNAL
2598	S	EFH ACCUMULATOR 14 BAR
2599	N	EFH ACCUMULATOR 40 BAR
2600	Y	REAR AXLE SPEED MONITOR
3000	G	FLASHER UNIT SUPPLY (TERMINAL 49)
3001	G	LEFT HAND FLASHER CIRCUIT
3002	G	RIGHT HAND FLASHER CIRCUIT
3003	W	RADIO FEED
3004	G	RIGHT HAND TURN SIGNAL WARNING LAMP
3005	G	LEFT HAND TURN SIGNAL WARNING LAMP
3006	G	AUXILIARY FUEL TANK SENDER
3007	G	FUEL GAUGE FEED
3008	U	WORKLAMP WARNING LIGHT
3009	G	FLASHER UNIT SUPPLY B+
3010	R	FOGLAMP FEED
3011	R	FOGLAMP FEED
3012	G	HANDBRAKE WARNING FEED
3013	LG	AUXILIARY FUEL TANK SIGNAL
3014	R	HANDBRAKE WARNING LAMP SIGNAL
3015	P	ACCESSORY SOCKET (POWER)
3016	S	NOT KNOWN
3018	G	FLASHER UNIT BUZZER FEED

3020	Y	DUAL POWER SOLENOID SUPPLY
3022	Y	DUAL POWER (HIGH) WARNING LAMP
3024	Y	NOT KNOWN
3025	Y	FOUR WHEEL DRIVE SOLENOID (MANUAL)
3026	Y	NOT KNOWN
3027	Y	FOUR WHEEL DRIVE SOLENOID (AUTO)
3030	W	ACCESSORY RELAY SIGNAL
3045	Y	FOUR WHEEL DRIVE WARNING LAMP
3050	P	AUXILIARY FEED CONNECTOR SUPPLY
3051	P	CIGAR LIGHTER SUPPLY
3052	P	DOME LAMP TO DOOR SWITCH
3053	S	SPEAKER RIGHT HAND
3054	S	SPEAKER NEGATIVE RH
3055	S	SPEAKER LEFT HAND
3056	N	SPEAKER NEGATIVE LH
3060	P	IMPLEMENT SOCKET RELAY
3061	P	IMPLEMENT SOCKET
3062	P	IMPLEMENT SOCKET SWITCH
3070	P	'B' PILLAR SKT SUPPLY
3075	O	TRAILER SOCKET (ACCESSORY FEED)
3076	O	ACCESSORY SWITCH FEED
3077	Y	RADIO +12VB
3078	O	RADIO +12V ILLUMINATION
3079	R	RADIO +12V IGNITION
3080	P	CONSOLE LAMP
3090	Y	SEAT PUMP SUPPLY
3091	P	SPEAKER RR-RHS +
3092	P	SPEAKER RR-RHS -
3093	S	SPEAKER FRT-RHS +
3094	S	SPEAKER FRT-RHS -
3095	W	SPEAKER FRT-LHS +
3096	S	SPEAKER FRT-LHS -
3097	G	SPEAKER RR-LHS +
3098	G	SPEAKER RR-LHS -
3100	G	STEERING SENSOR +5v
3120	K	STEERING SENSOR SIGNAL
3140	LG	STEERING SENSOR GROUND
3150	W	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
3155	W	HANDBRAKE TRANS INTERLOCK
3200	O	SUSPENSION SWITCH FEED
3210	U	SUSPENSION SWITCH RETURN
3215	U	SUSPENSION LAMP

3220	O	AXLE HEIGHT SENSOR 5V REF
3230	U	AXLE HEIGHT SENSOR POSITION
3240	O	RAISE SOLENOID PWR
3250	O	RAISE SOLENOID RET
3260	O	LOWER SOLENOID PWR
3270	O	LOWER SOLENOID RET
3271	U	LOADER RELAY FEED
3272	O	LOADER VALVE #1 OUT
3273	O	LOADER VALVE #1 RETURN
3274	R	LOADER VALVE #2 OUT
3275	R	LOADER VALVE #2 RETURN
3276	G	LOADER VALVE
3280	O	SUSPENSION LOCKOUT SOLENOID UPPER
3281	LN	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)
3285	LN	SUSPENSION LOCKOUT SOLENOID LOWER
3286	LN	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)
3290	O	SUSPENSION LOCKOUT LAMP (OR SOLENOID RET)
3300	O	SENSE LINE CONTROL SOLENOID
3310	U	RAISE LOCKOUT SOLENOID
3500	W	POWER STEERING PRESSURE SIGNAL
4001	R	TRANSMISSION OIL WARNING LAMP (TEMP)
4002	R	TRANSMISSION OIL WARNING LAMP SWITCH
4010	N	RETURN TO DIG
4011	P	ROTATING BEACON SWITCH SUPPLY
4012	P	ROTATING BEACON FEED
4013	U	TRANS CONTROL FEED
4014	U	FORWARD CLUTCH SOLENOID FEED
4015	U	REVERSE CLUTCH SOLENOID FEED
4016	U	TORQUE CONVERTOR LOCK-UP RELAY FEED
4017	U	TORQUE CONVERTOR LOCK-UP LAMP
4018	S	TORQUE CONVERTOR LOCK-UP SOLENOID FEED
4019	S	HYDRAULIC FILTER BY-PASS SWITCH FEED
4020	S	HYDRAULIC FILTER BY-PASS LAMP
4021	S	BACK-UP ALARM RELAY FEED
4022	S	BACK-UP ALARM FEED
4025	Y	4 IN 1 BUCKET FEED
4040	G	LINK LEVEL SWITCH SUPPLY
4050	W	LINK LEVEL RAISE
4051	W	LINK LEVEL LOWER
4052	W	LINK LEVEL EXTEND SIDE
4053	W	LINK LEVEL RETRACT SIDE
4054	W	LINK LEVEL SAFETY VALVE (DUMP)

4100	TQ	TRANS RANGE ENABLE SWITCH SUPPLY
4101	TQ	TRANS RANGE ENABLE
5000	P	EDC MEMORY POWER
5005	N	EDC KEY SWITCH FEED
5010	B/W	EDC EARTH
5011	B	EDC EARTH CASE RFI
5015	R	EDC CONTROLS BACKLIGHTING
5020	LN	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
5021	K	EDC PROCESSOR REF VOLT (+5V) ROCKSHAFT
5022	K	EDC PROCESSOR REF VOLT +5V QUADRANT
5023	K	EDC PROCESSOR REF VOLT +5V HEIGHT LIMIT
5025	LN	EDC LOWER SIGNAL
5030	LN	EDC RAISE SIGNAL
5035	LN	EDC RETURN REF. VOLTAGE EARTH
5040	LN	EDC DRAFT POSITION
5045	LN	EDC DROP RATE
5050	LN	EDC QUADRANT
5055	LN	EDC CLOCK LINE TO DISPLAY
5060	LN	SERIAL DATA TO CLUSTER
5065	LN	EDC RIGHT PIN
5070	LN	EDC LEFT PIN
5075	K	EDC VOLTAGE TO PINS
5080	K	EDC ROCKSHAFT
5085	K	EDC VALVE UP
5087	K	EDC VALVE UP RETURN
5090	K	EDC VALVE DOWN
5095	K	EDC EXTERNAL SWITCH DOWN
5097	K	EDC VALVE DOWN RETURN
5100	K	EDC EXTERNAL SWITCH UP
5105	S	EDC IMPLEMENT STATUS SWITCH
5110	K	EDC LAMP SIGNAL
5115	K	EDC SLIP SIGNAL
5120	K	EDC HEIGHT LIMIT SIGNAL
5125	TQ	EDC RAISE SIGNAL-RAISE WORK SWITCH
5130	TQ	EDC WORK SIGNAL-RAISE WORK SWITCH
5132	TQ	EDC FLOAT
5133	TQ	EDC STOP
5135	TQ	EDC +WHEEL SPEED SIGNAL
5140	TQ	EDC -WHEEL SPEED SIGNAL
5145	TQ	EDC SLIP LIMIT POT
5150	G	EDC EXTERNAL SWITCH SUPPLY
5155	U	EDC LOWER LIMIT POT

5160	TQ	EDC HEIGHT LIMIT POT FEED
5170	LN	SERIAL DATA FROM CLUSTER
5175	R	ADIC KEY PAD DISABLE
5180	TQ	EDC SLIP INDICATOR LAMP
5190	R	HPL INTERLOCK / LIFT-O-MATIC
5200	N	EDC VALVE SUPPLY
5210	N	EDC VALVE ENABLE
5220	Y	EDC RAISE LAMP
5230	Y	EDC LOWER LAMP
5240	O	EDC RAISE SIGNAL-RAISE WORK SWITCH No.2
5250	O	EDC WORK SIGNAL-RAISE WORK SWITCH No.2
5260	LN	HYDRAULIC MASTER SW #1
5265	LN	HYDRAULIC MASTER SW #2
5300	K	ECU FLASH PROGRAM SIGNAL
5400	Y	CAN H
5420	G	CAN L
5500	Y	EHR CAN HIGH
5510	G	EHR CAN LOW
5515	S	EHR +12V IGN.
5520	LG	EHR 5V Ref
5521	LG	EHR Motor #1
5522	LG	EHR Motor #2
5523	LG	EHR Motor #3
5524	LG	EHR Motor #4
5531	LG	EHR NEUTRAL SWITCH VALVE #1
5532	G	EHR NEUTRAL SWITCH VALVE #2
5533	K	EHR NEUTRAL SWITCH VALVE #3
5534	LG	EHR NEUTRAL SWITCH VALVE #4
5535	LG	EHR FLOAT SWITCH VALVE#1
5536	LN	EHR FLOAT SWITCH VALVE#2
5537	N	EHR FLOAT SWITCH VALVE#3
5538	O	EHR FLOAT SWITCH VALVE#4
5541	O	EHR MAX.FLOW SWITCH VALVE #1
5542	P	EHR MAX.FLOW SWITCH VALVE #2
5543	S	EHR MAX.FLOW SWITCH VALVE #3
5544	TQ	EHR MAX.FLOW SWITCH VALVE #4
5551	O	EHR POTENTIOMETER SIGNAL VALVE#1
5552	U	EHR POTENTIOMETER SIGNAL VALVE#2
5553	W	EHR POTENTIOMETER SIGNAL VALVE#3
5554	U	EHR POTENTIOMETER SIGNAL VALVE#4
5561	O	EHR TIMED FLOW SWITCH #1
5562	O	EHR TIMED FLOW SWITCH #2

5563	O	EHR TIMED FLOW SWITCH #3
5564	P	EHR TIMED FLOW SWITCH #4
5591	P	EHR WARNING LAMP#1
5592	P	EHR WARNING LAMP#2
5593	P	EHR WARNING LAMP#3
5594	P	EHR WARNING LAMP#4
5595	S	EHR MASTER STOP SWITCH
5596	S	EHR MASTER STOP LAMP
5597	S	EHR MASTER ENABLE
5600	R	HTS LIVE SIGNAL
5610	R	HTS PROGRAM
5620	R	HTS ON/OFF SWITCH
5625	R	LIFT-O-MATIC SWITCH
5700	W	EHR J-STICK X+
5710	W	EHR J-STICK X ACTIVE SWITCH
5720	W	EHR J-STICK X FULL FLOW SWITCH
5730	W	EHR J-STICK X FLOAT SWITCH
5740	W	EHR J-STICK Y+
5750	W	EHR J-STICK Y ACTIVE SWITCH
5760	W	EHR J-STICK Y FULL FLOW SWITCH
5770	W	EHR J-STICK Y FLOAT SWITCH
5820	S	EDC ROCKSHAFT POT
6000	K	ENGINE SPEED SIGNAL
6001	B	ENGINE ECU RESISTOR #1
6002	W	ENGINE ECU RESISTOR #2
6003	R	ENGINE ECU RESISTOR #3
6004	G	ENGINE ECU RESISTOR #4
6057	Y	ENGINE STARTER RELAY GROUND
6010	TQ	THROTTLE POSITION SWITCH
6100	U	ENGINE COLD ADVANCE CONTROL
6200	R	MANIFOLD (GRID) HEATER SUPPLY
6300	N	FAN SPEED
6310	N	FAN SOLENOID
6320	N	FAN 5V REF.
6400	LN	ECU BATTERY SUPPLY
6401	G	ECU TO THROTTLE POT.+5V
6402	G	ECU TO THROTTLE POT. VAR
6403	G	ECU TO THROTTLE POT.-
6404	G	THROTTLE POT. TO LOW IDLE SWITCH
6405	G	ECU TO THROTTLE POT. SWITCH
6408	G	FUSED B+ TO ECU (1)
6409	G	FUSED B+ TO ECU (2)

6410	G	FUSED B+ TO ECU (3)
6411	G	FUSED B+ TO ECU (4)
6414	G	FUSED IGN.+ TO ECU
6415	G	ECU TO J1939 TERFACE CAN#1 CONN.(HI)
6416	G	ECU TO J1939 TERFACE CAN#1 CONN.(LO)
6417	NOT REQD.	SCREEN BRAID FOR 6415 & 6416
6418	K	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO K
6419	K	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO L
6420	K	ECU SINK DRIVER#6 TO DIAGNOSTIC LAMP
6421	K	ECU SINK DRIVER#6 TO DIAGNOSTIC LAMP
6422	K	ENGINE MOUNTED B– TO ECU (1)
6423	K	ENGINE MOUNTED B– TO ECU (2)
6424	K	ENGINE MOUNTED B– TO ECU (3)
6425	K	ENGINE MOUNTED B– TO ECU (4)
6427	K	ECU TO MULTIPLE STATE SWITCH (PASS.INPUT#06)
6428	K	ECU TO MULTIPLE STATE SWITCH (PASS.INPUT#06)
6431	K	ECU TO DIAGNOSTIC REQUEST SWITCH (DIG 15)
6432	K	ECU SWITCHED BATT OUTPUT TO DIAGNOSTIC REQUEST SWITCH
6440	S	HAND THROTTLE POSITION 1
6450	S	HAND THROTTLE POSITION 2
6460	S	HAND THROTTLE SWITCH (NOT IDLE)
6500	N	CONSTANT ERPM ON/OFF
6510	N	CONSTANT ERPM SET 1
6520	N	CONSTANT ERPM SET 2
6530	N	CONSTANT ERPM INCREASE
6540	N	CONSTANT ERPM DECREASE
6550	N	CONSTANT ERPM SET LAMP
6560	U	ECU TO FUEL FILTER HEATER
6570	G	ECU TO FUEL FILTER HEATER RETURN
6580	K/	ECU TO GRID HEATER RELAY#1
6585	O	ECU TO GRID HEATER RELAY#2
6586	P	ECU TO GRID HEATER RELAY RETURN
6590	LG	ECU DIGITAL GROUND
6600	LN	ECU BATTERY SUPPLY
6610	N	ECU IGNITION SUPPLY
6620	O	ECU COOLANT TEMP. SIGNAL
6630	O	ECU COOLANT TEMP. GROUND
6640	O	ECU AC PRESSURE NOT HIGH SWITCH
6650	O	ECU BOOST GROUND
6660	O	ECU BOOST TEMP.
6670	O	ECU 5V BOOST

6680	O	ECU BOOST PRESSURE
6690	O	ECU SOLENOID VALVE SHUT OFF
6700	O	ECU CRANK SHAFT OUTPUT SHAFT
6710	O	ECU ENGINE SPEED
7000	U	TRANS CONTROL SUPPLY
7001	U	TRANS DISPLAY ILLUMINATION
7002	U	TRANS MAIN CLUTCH SOL (C3/C4)
7003	U	TRANS DUMP SOL
7004	UB	TRANS FRONT CLUTCH SOL (C1/C2)
7005	U	TRANS CREEPER GR SOL
7007	R	TRANS DUAL POWER PRESSURE SWITCH HIGH
7008	R	TRANS DUAL POWER PRESSURE SWITCH LOW
7009	W	TRANS RANGE DISABLE SWITCH
7010	U	TRANS RANGE INDICATOR SWITCH (GR 1-4)
7020	U	TRANS RANGE INDICATOR SWITCH (GR 5-8)
7025	R	TRANS DISPLAY ENABLE
7030	U	TRANS RANGE INDICATOR SWITCH COMMON
7035	N	TRANS DUMP SOLEN0ID FEED
7040	N	TRANS CREEPER SWITCH
7050	R	TRANS RELAY SUPPLY - RUN
7060	R	TRANS RELAY SUPPLY - START
7068	U	TRANS CVT POWER SUPPLY (CVT)
7070	R	TRANS FEED (IGN +)
7071	N	FEED HYD FILTER RESTRICTION IND LAMP
7080	LG	DIFF-LOCK SOLENOID FEED
7090	LG	DIFF-LOCK SWITCH TO BRAKE SWITCH
7100	N	DIFF-LOCK RELAY TO BRAKE SWITCH
7110	R	PTO INHIBITOR SWITCH TO TRANS
7120	Y	DIFF-LOCK WNG LP (MAUAL)
7125	LG	DIFF-LOCK WNG LP (AUTO)
7126	LG	DIFF LOCK PRESSURE SWITCH
7130	N	HYD FILTER WNG LP
7140	OB	DIFF-LOCK OFF SOLENOID
7150	S	LOW OIL PRESSURE WRN FEED
7160	R	HYD LOW CHARGE WARNING
7170	W	DIFF LOCK SWITCH (AUTO ON)
7175	Y	DIFF LOCK SWITCH (MANUAL ON)
7180	U	CREEPER SWITCH MOM SIGNAL
7190	K	TRANS SOLENOID VALVE SUPPLY
7195	K	TRANS SOLENOID VALVE RETURN
7196	Y	TRANS FR/REV LOW SIDE RETURN (CVT)
7197	Y	TRANS RANGE LOW SIDE RETURN (CVT)

7198	U	TRANS HYROSTATIC LOW SIDE RETURN (CVT
7200	S	TRANSMISSION SHIFT DOWN
7210	S	TRANSMISSION SHIFT UP
7220	S	TRANSMISSION HIGH RANGE
7225	W	TRANS HI RANGE SOL - RET
7230	S	TRANSMISSION LOW RANGE
7235	Y	TRANS LOW RANGE SOL - RET
7240	S	TRANSMISSION DISPLAY SWITCH
7245	LN	DEADMAN
7250	S	TRANSMISSION FORWARD SIGNAL
7260	S	TRANSMISSION REVERSE SIGNAL
7265	K	TRANS NEUTRAL SWITCH TO PROCESSOR (GR.SW 1)
7267	LG	TRANS NEUTRAL SWITCH 2 TO PROCESSOR
7270	R	TCM SERIAL DATA IN-DISPLY DATA OUT
7275	W	TCM SERIAL DATA OUT-DISPLY DATA IN
7280	W	LIMP HOME SWITCH 18x18 TRANS.
7290	W	DIRECTIONAL INTERRUPT RELAY TO SOLENOID
7300	W	SOLENOID 1 18x9 TRANSMISSION
7301	Y	SOLENOID 1 18x9 RETURN
7320	W	SOLENOID 2 18x9 TRANSMISSION
7321	P	SOLENOID 2 18x9 RETURN
7330	W	SOLENOID 3 18x9 TRANSMISSION
7331	Y	SOLENOID 3 18x9 RETURN
7340	W	SOLENOID F1 18x9 TRANSMISSION
7341	Y	SOLENOID F1 18x9 RETURN
7350	W	SOLENOID F2 18x9 TRANSMISSION
7351	S	SOLENOID F2 18x9 RETURN
7355	S	SOLENOID R 18x9 TRANSMISSION
7356	U	SOLENOID R 18x9 RETURN
7360	W	SOLENOID A 18x9 TRANSMISSION
7361	P	SOLENOID A 18x9 RETURN
7370	Y	SOLENOID B 18x9 TRANSMISSION
7371	P	SOLENOID B 18x9 RETURN
7380	Y	SOLENOID C 18x9 TRANSMISSION
7381	P	SOLENOID C 18x9 RETURN
7390	Y	SOLENOID PMW (F1) 18x9 TRANSMISSION
7391	P	SOLENIOD PWM (F1) 18x9 RETURN
7392	O	SOLENOID PWM (F2) 18x9 TRANSMISSION
7393	O	SOLENOID PWM (F2) 18x9 RETURN
7395	P	SOLENOID CREEP 18x9 TRANSMISSION
7396	P	SOLENOID CREEP 18x9 RETURN
7400	Y	TRANS RPM SPEED SENSOR TO TCM INPUT

7401	P	TRANS RPM SPEED SENSOR
7402	Y	TRANS WHLSP FORWARD (CVT)
7403	Y	TRANS WHLSP REVERSE (CVT)
7404	Y	TRANS HYDROSTAT FORWARD (CVT)
7405	Y	TRANS HYDROSTAT REVERSE (CVT)
7406	LG	TRANS BI-DI SPEED SENSOR RET (CVT)
7410	Y	TRANS RPM SPEED SENSOR TO TCM OUTPUT
7420	Y	TCM TO CLUTCH POSITION SWITCH
7430	Y	CLUTCH POSITION SIGNAL
7431	TQ	CLUTCH 'A' SUPPY
7440	Y	TCM TO TRACTOR EIC-AXLE OUTPUT
7450	W	TRANS CREEPER INTERLOCK SUPPLY
7460	W	TRANS CREEPER CLUTCH ENGAGED
7470	S	TRANS CREEPER CLUTCH DISENGAGED
7475	R	TRANS AUTO OFF
7476	R	TRANS AUTO ON
7480	G	TRANS AUTO FUNCTION 1
7482	G	TRANS AUTO ON/INCREASE
7485	K	TRANS AUTO FUNCTION LAMP 1
7490	G	TRANS AUTO FUNCTION 2
7492	G	TRANS AUTO OFF/DECREASE
7495	K	TRANS AUTO FUNCTION LAMP 2
7500	G	TRANS OIL TEMP. SENSOR
7520	G	TRANS SENSOR SUPPLY 8v
7525	G	TRANS SENSOR SUPPLY 5v
7560	G	TRANS WARNING LAMP
7570	B/W	SIGNAL GROUND
7580	U	CREEPER SOLENOID MONITOR
7581	O	CREEPER POSITION SIGNAL
7582	U	CREEPER RAIL SWITCH NOT
7590	O	TRANS CREEPER GEAR STATUS LAMP
7600	N	TRANS FEATHERING SOLENOID
7620	N	TRANS FEATHERING SOL. MONITOR
7630	N	TRANS MAIN CLUTCH PRESSURE SWITCH
7640	LN	DIAGNOSTIC PLUG RS232 IN
7650	W	DIAGNOSTIC PLUG RS232 OUT
7660	R	TRANS CLUTCH DISCONNECT
7670	R	TRANS FRONT SYNCHRO POSITION
7700	LN	TRANS SHUTTLE DUMP SWITCH
7710	LN	TRANS OIL TEMPERATURE SWITCH
7735	LN	TRANS MID SPEED SIGNAL +
7740	LN	TRANS MID SPEED SIGNAL -

7750	R	TCM TO DOG 30/40 KPH SELECT
7755	P	DOG ENABLE
7760	W	TORQUE SENSOR
7770	U	TRANS FORWARD PRESSURE SWITCH
7780	U	TRANS FORWARD PRESSURE SWITCH
7790	TQ	TRANS RANGE INPUT DIGITAL FEEDBACK (CVT)
7800	TQ	TRANS FR / REV INPUT DIGITAL FEEDBACK (CVT)
7810	K	TRANS PWM SOLENOID C1
7815	K	TRANS PWM SOLENOID C1 RETURN
7820	K	TRANS PWM SOLENOID C2
7825	K	TRANS PWM SOLENOID C2 RETURN
7830	K	TRANS PWM SOLENOID C3
7835	K	TRANS PWM SOLENOID C3 RETURN
7840	K	TRANS PWM SOLENOID C4
7845	K	TRANS PWM SOLENOID C4 RETURN
7846	TQ	TRANS BRAKE SOLENOID (CVT)
7847	TQ	TRANS HYROSTATIC – POSITIVE SOLENOID (CVT)
7848	TQ	TRANS HYROSTATIC – NEGATIVE SOLENOID (CVT)
7850	G	TRANS DIAGNOSTIC PROGRAM VOLTAGE
7855	G	TRANS DIAGNOSTIC EA
7860	G	TRANS DIAGNOSTIC RCV
7865	G	TRANS DIAGNOSTIC XMT
7870	G	TRANS DIAGNOSTIC RTS
7875	K	TRANS DIAGNOSTIC CTS
7880	B/W	T C M SIGNAL GROUND
7890	TQ	TRANS L–LINE DIAGNOSTIC (CVT)
7900	TQ	CLUTCH 'A' SIGNAL
7910	TQ	CLUTCH 'B' SIGNAL
7915	P	TCM CLUTCH B RETURN
7920	TQ	CLUTCH 'C' SIGNAL
7925	P	TCM CLUTCH C RETURN
7930	TQ	CLUTCH 'D' SIGNAL
7935	P	TCM CLUTCH D RETURN
7940	TQ	CLUTCH 'E' SIGNAL
7945	P	TCM CLUTCH E RETURN
7950	TQ	CLUTCH SUPPLY
7960	P	TRANS SLOW/FAST
7965	P	HI/LO SYNCHRO SIGNAL
7970	P	TRANS MED/REV
7980	K	TRANS MED RANGE
7982	W	TRANS MED RANGE RET
7985	G	TRANS REVERSE RANGE

7990	K	TRANS BRAKE
7995	K	BRAKE FLUID LEVEL
7996	R	BRAKE PEDALS UNLATCHED SIGNAL
8000	N	TRAILER BRAKE SOLENOID
8010	LN	TRAILER BRAKE PRESSURE
8020	LN	TRAILER BRAKE PRESSURE
8030	LG	TRANS FWD SOLENIOD
8035	P	TRANS FWD SOL RET
8040	LG	TRANS REV SOLENIOD
8045	P	TRANS REV SOL RET
8050	R	TRANS REV PRESSURE
8060	U	TRAILER BRAKE SUPPLY
8070	P	TRAILER PARK BRAKE SOLENOID
9000	LN	DIVERTER VALVE
9010	LN	DIVERTER VALVE SUPPLY
9020	LN	HYDRAULIC REMOTE VALVE SOL
9025	LN	HYDRAULIC REMOTE VALVE SWITCH
9026	W	NOT USED
9027	W	NOT USED
9028	W	NOT USED
9029	W	NOT USED
9030	W	NOT USED
9031	P	NOT USED
9032	Y	IGN.+ TO POWER SKT.
9033	LN	50KPH SOLENOID+
9034	LN	50KPH SOLENOID–
9035	LN	50KPH DUMP SOLENOID
9036	LN	50KPH DUMP SOLENOID RETURN

SECTION 55 – ELECTRICAL SYSTEM

Chapter 7 – Electrical Harnesses

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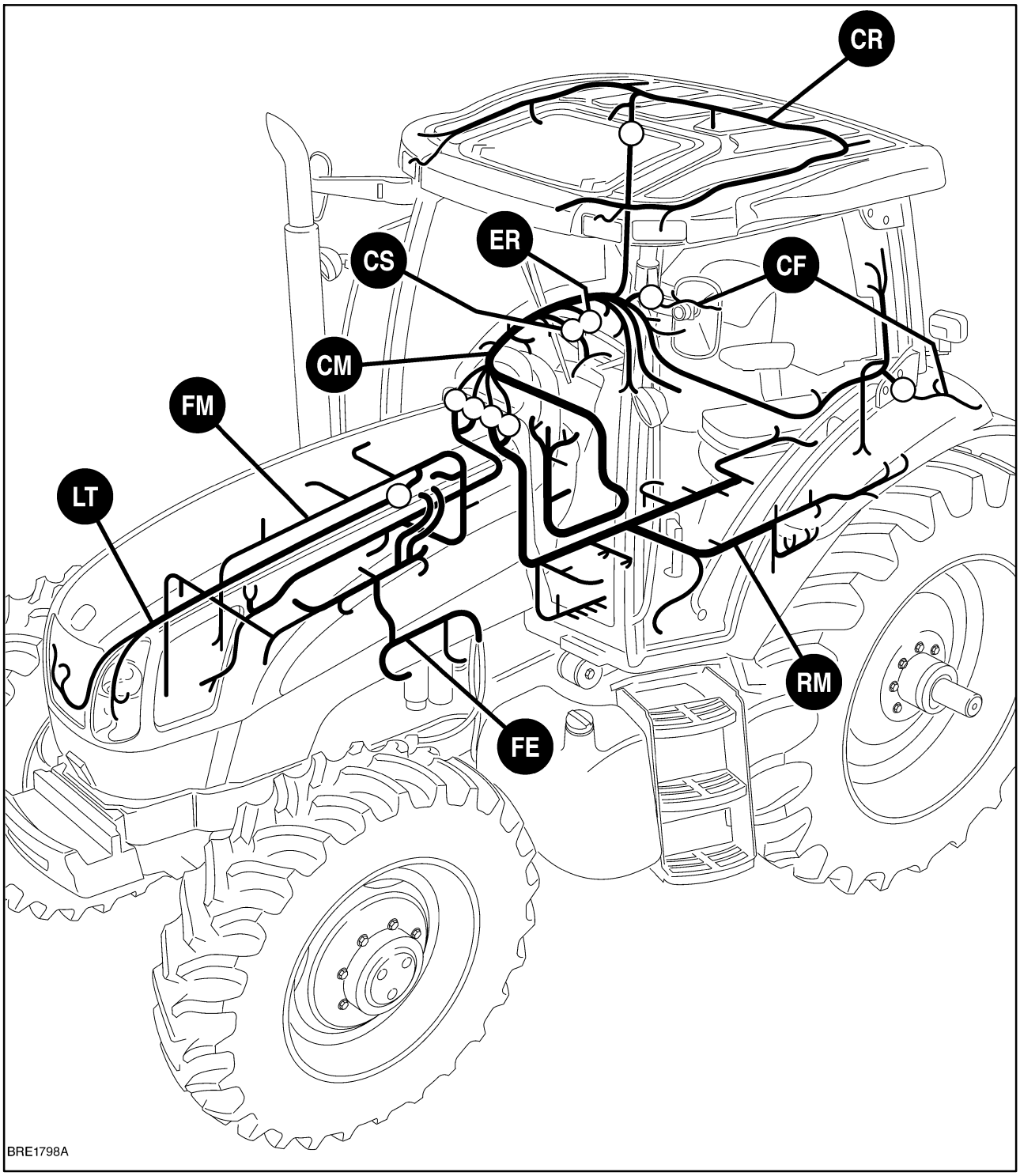
DESCRIPTION AND OPERATION

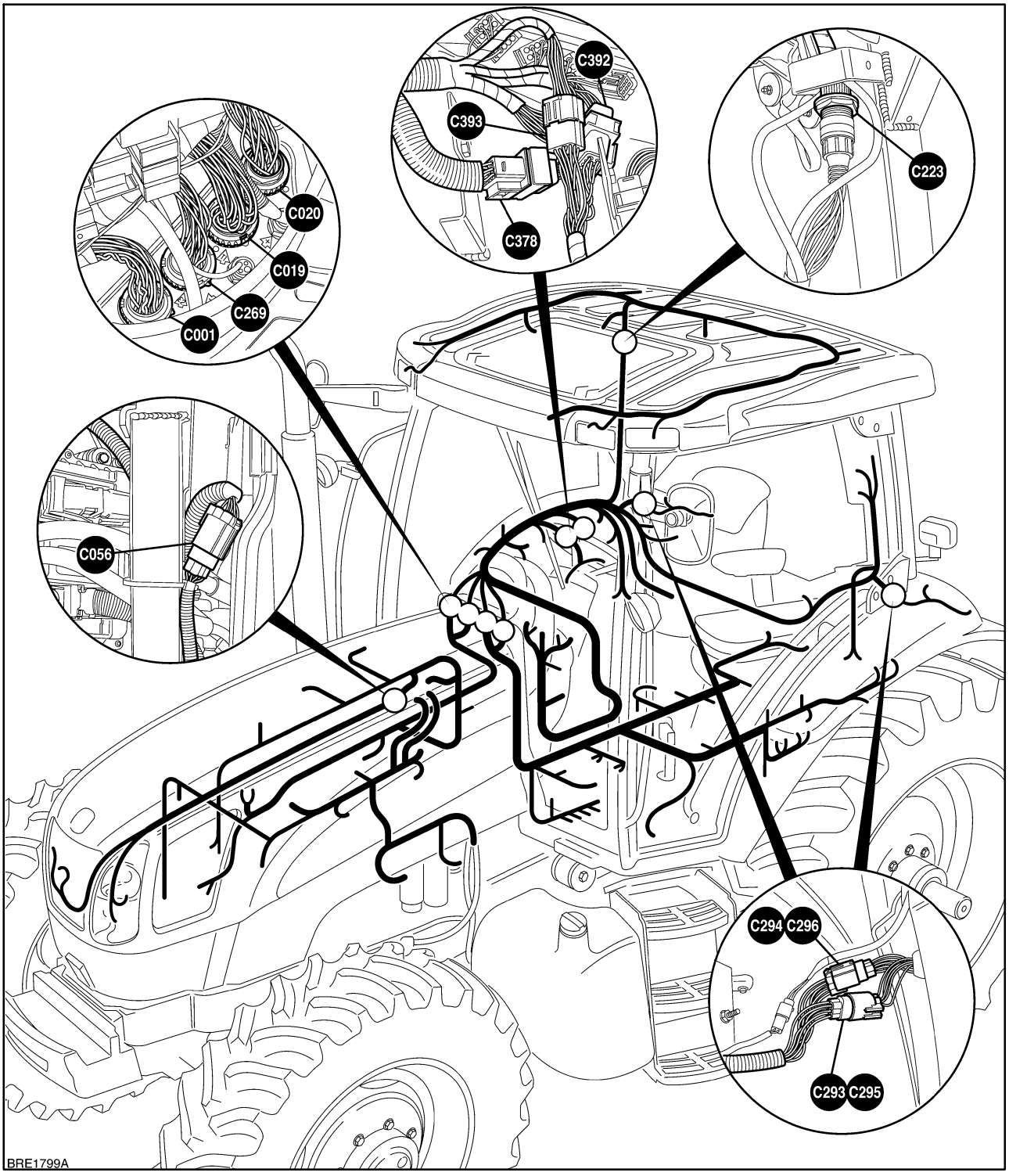
HARNESS IDENTIFICATION



There are nine electrical wiring harnesses used on TSA series tractors

1. **LT** Lighting Harness
2. **FM** Front Main (Engine) Harness
3. **FE** Front Electrical (Engine) Harness
4. **RM** Rear Main (Transmission) Harness
5. **CM** Cab Main Harness
6. **CS** Cab Switch Panel Harness
7. **CF** Cab Fender Harness
8. **ER** Electronic Remotes Harness
9. **RF** Roof Harness

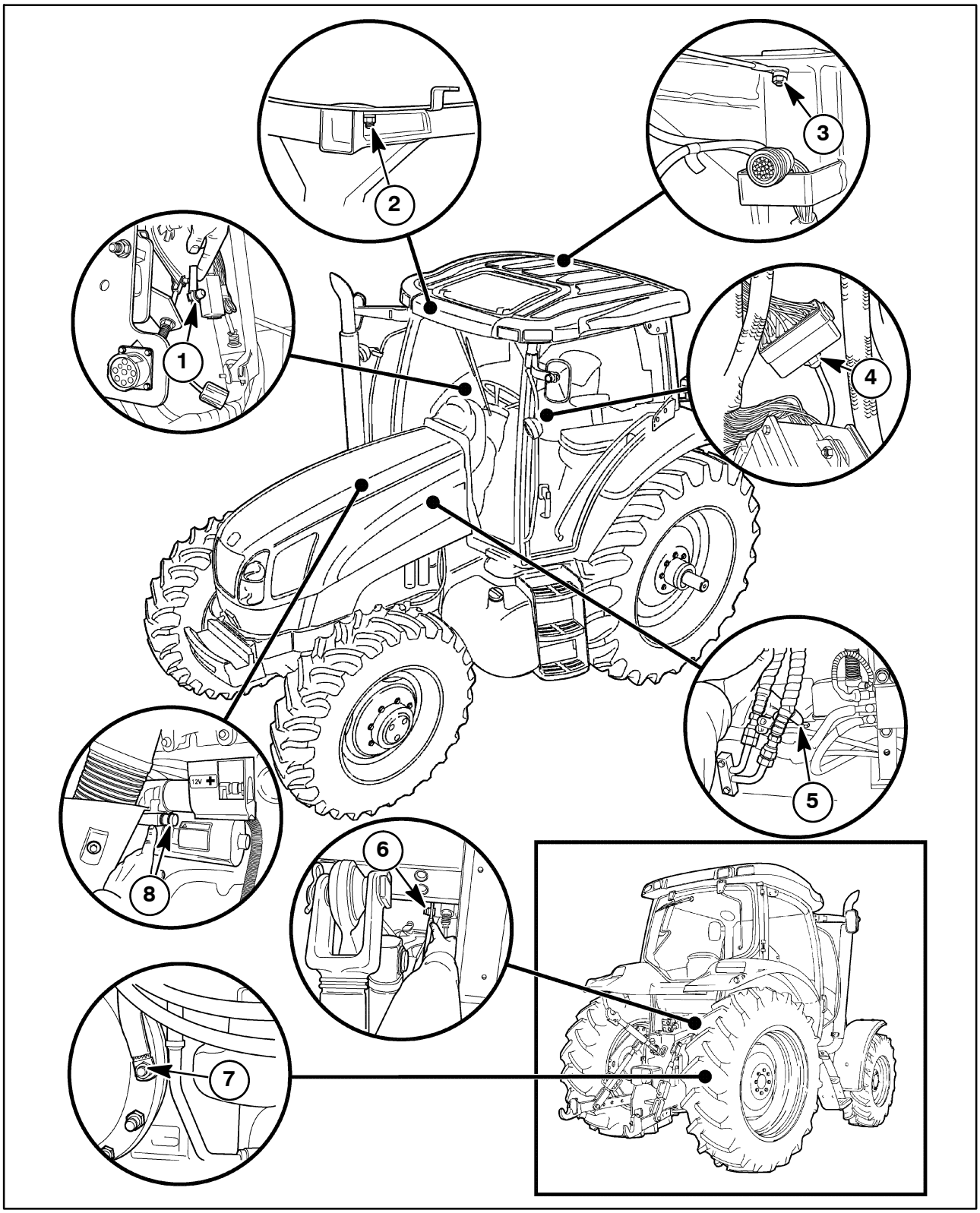
MAIN EXTENSION CONNECTORS



The location of the main Harness to Harness connectors is shown above.

C001 – Engine to Cab Harness
C019 – Transmission to Cab Harness
C020 – Transmission to Cab Harness
C056 – Engine to Lighting Harness
C269 – Engine to Cab Harness
C223 – Cab to Roof Harness
C293 / **295** – Cab to Fender Harness
C294 / **296** – Cab to Fender Harness
C378 – Cab to Switch Panel Harness
C392 – Cab to Electronic Remotes Harness
C393 – Cab to Electronic Remotes Harness

HARNESS GROUND LOCATIONS



1. Behind Right-Hand Console Access Cover
2. Right Front Cab Post
3. Right Rear Cab Post
4. Under Right Rear Access Cover Behind Seat
5. Intake Manifold – Electronic Engine
6. Right Rear Cab (Outside)
7. Right Rear Axle Housing
8. Starter
9. (Not Shown) Under Right-Hand Step (Battery Negative Terminal Stud)

WIRE COLORS

Each wire entering a connector on a harness has a colour.

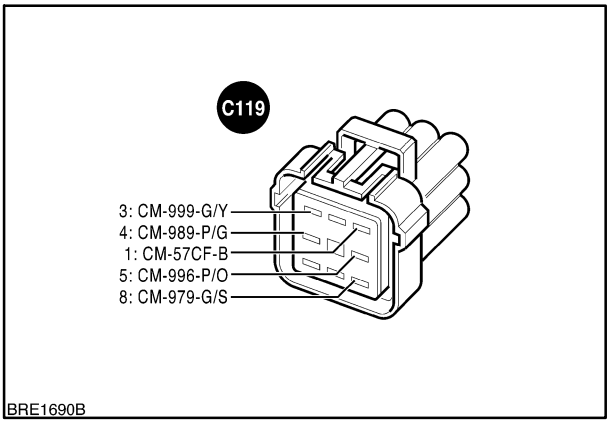
Below is a list of the colours used and their identifiying letter.

B	Black (Ground)
N	Brown (12v Unfused)
LN	Light Brown
S	Slate
R	Red (General Lighting)
O	Orange
Y	Yellow
G	Green (12v Fused Key On)

LG	Light Green
U	Blue (Headlamps)
TQ	Turquoise (Prossesor Signal)
L	Lilac (12v Fused Battery Feed
K	Pink
W	White (12v Unfused Key ON)

WIRE CODES

The following pages show in detail each wiring harness, the general location of the connectors on that harness, followed by a more detailed location. Also each connector is detailed with pinouts and the wire code relating to each wire.



1

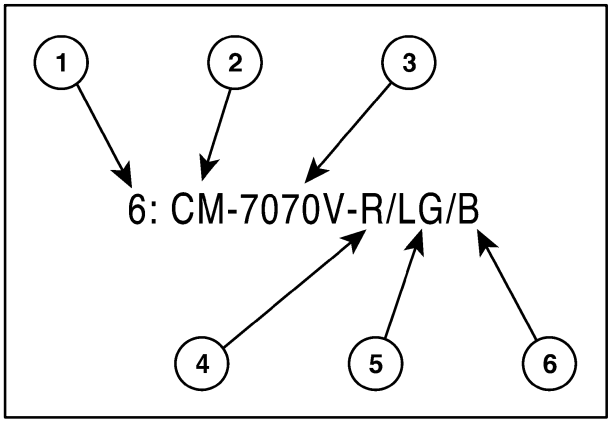
The wire codes can be read as follows.

1 – Indicates the connector pin number.

2 – Indicates the Wiring harness.

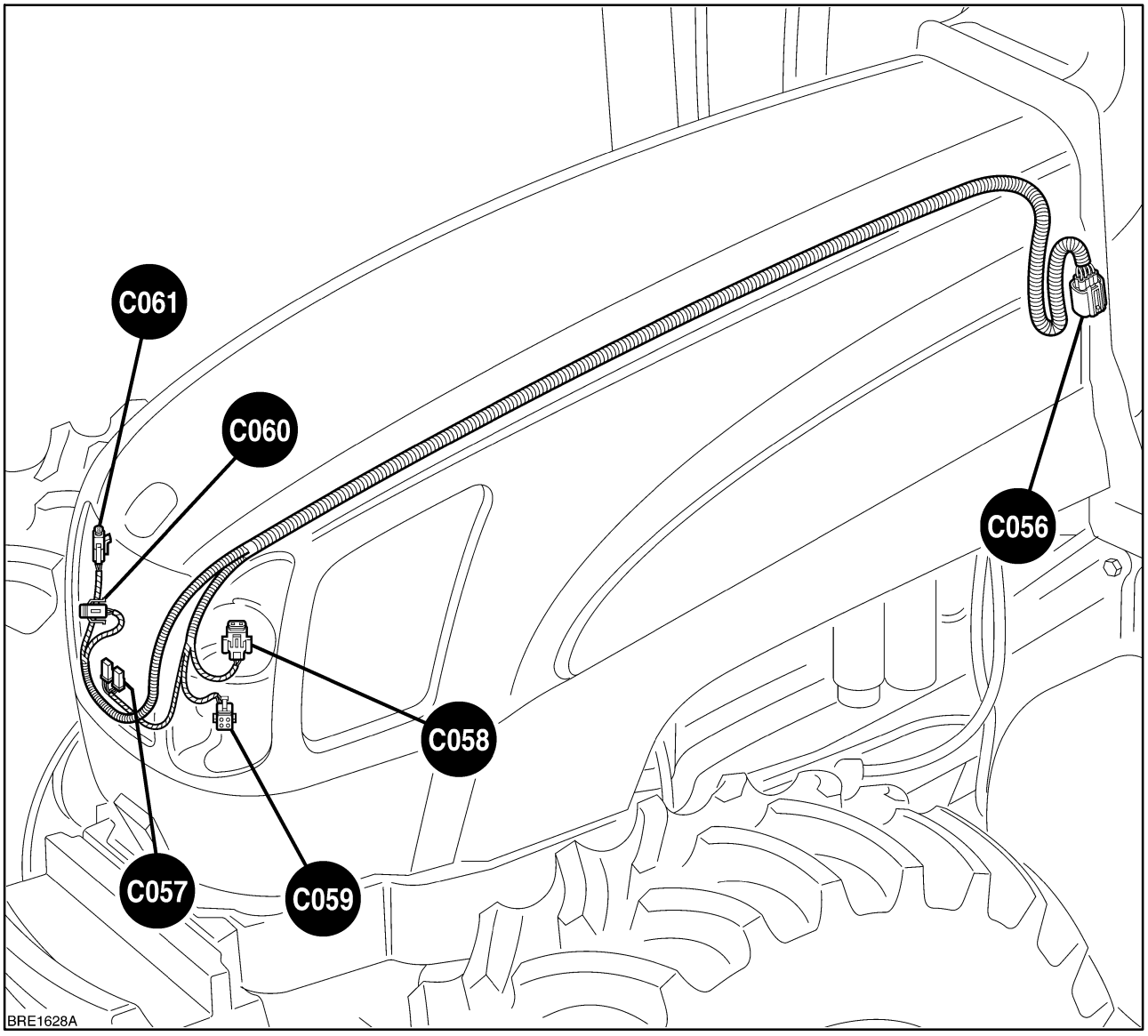
3 – Indicates the circuit and spur.

4 – Indicates wire colour where the first letter **4** is the base colour, the second **5** is a tracer colour and the third **6** is the colour of any rings.



2

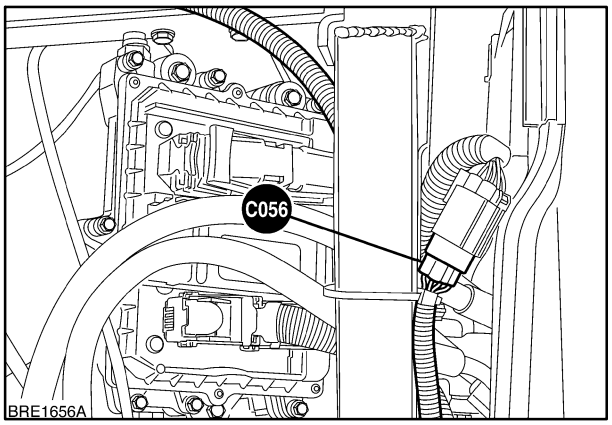
LIGHTING HARNESS



LIGHTING HARNESS CONNECTORS

1. **C056** Lighting Harness Main Connector *(Location Fig 1, Connector Fig 4)*
2. **C057** Horn *(Location Fig 2, Connector Fig 5)*
3. **C058** Right Hand Corner Lamp *(Location Fig 3, Connector Fig 6)*
4. **C059** Right Hand Headlamp *(Location Fig 3, Connector Fig 6)*
5. **C060** Left Hand Headlamp *(Location Fig 7, Connector Fig 8)*
6. **C061** Left Hand Corner Lamp *(Location Fig 7, Connector Fig 8)*

LIGHTING HARNESS CONNECTOR LOCATIONS



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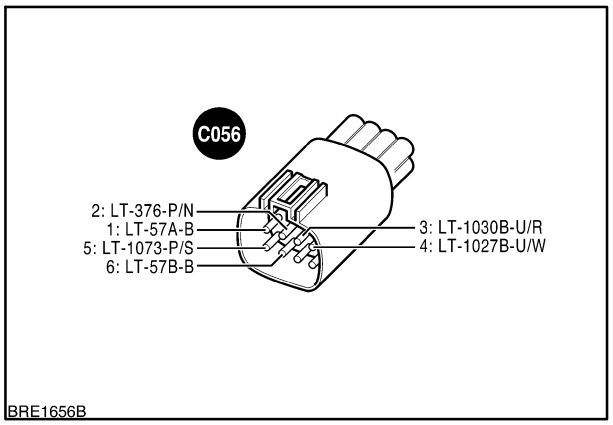

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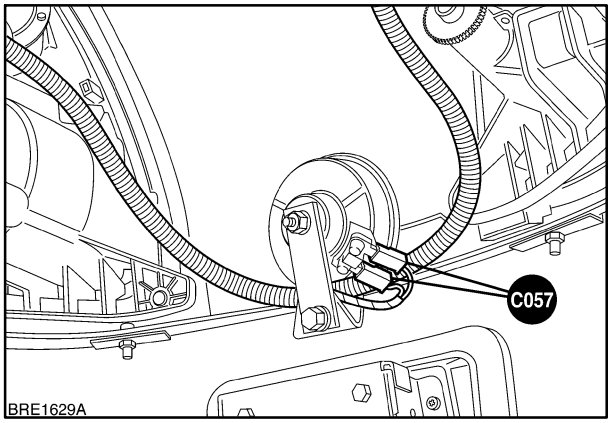

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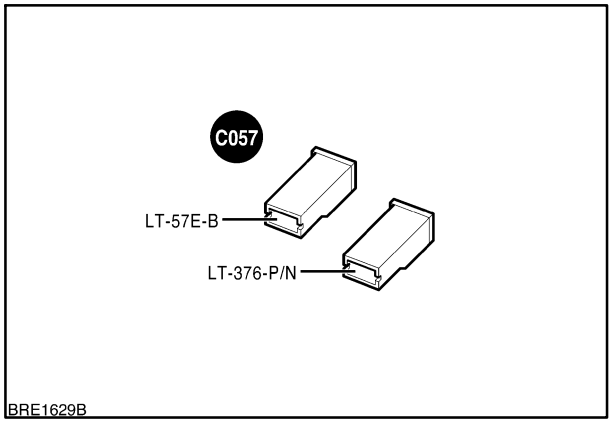

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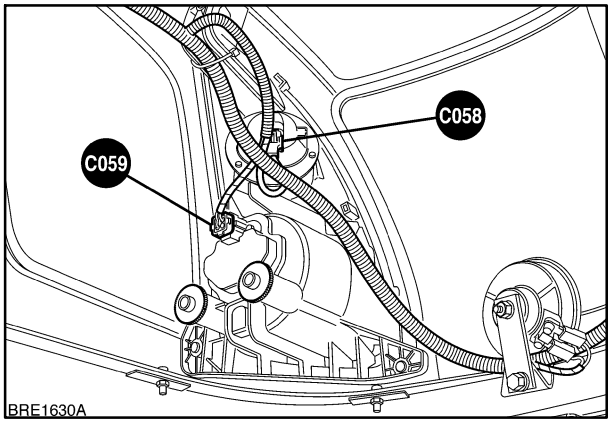

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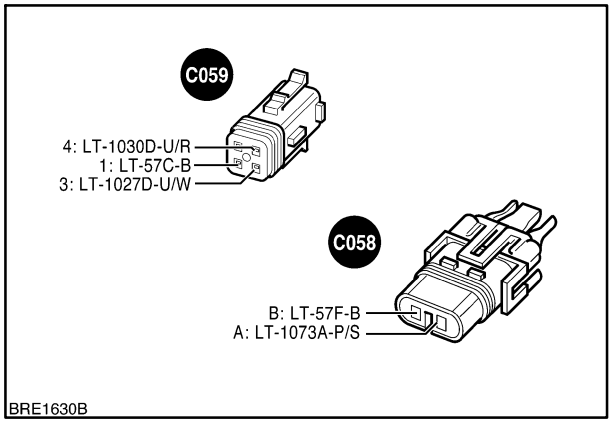

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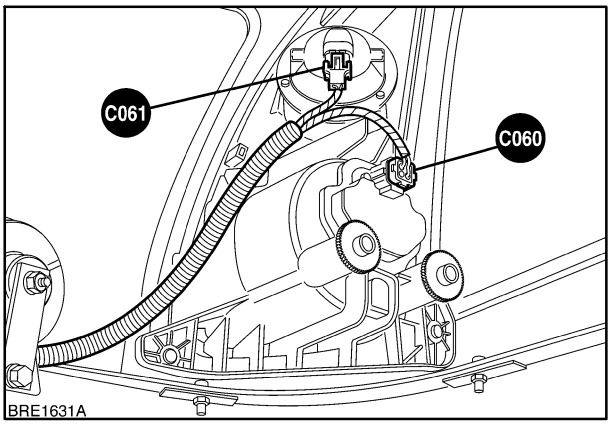
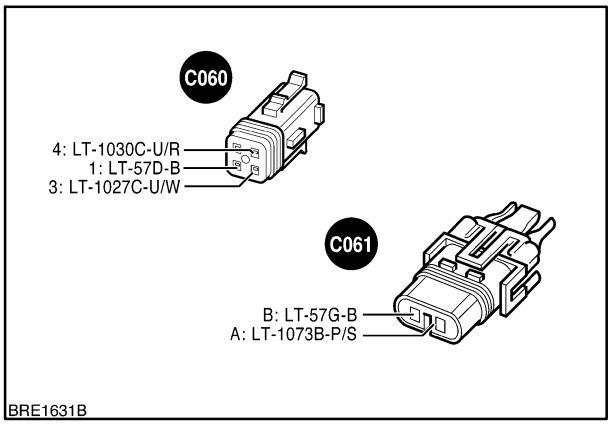
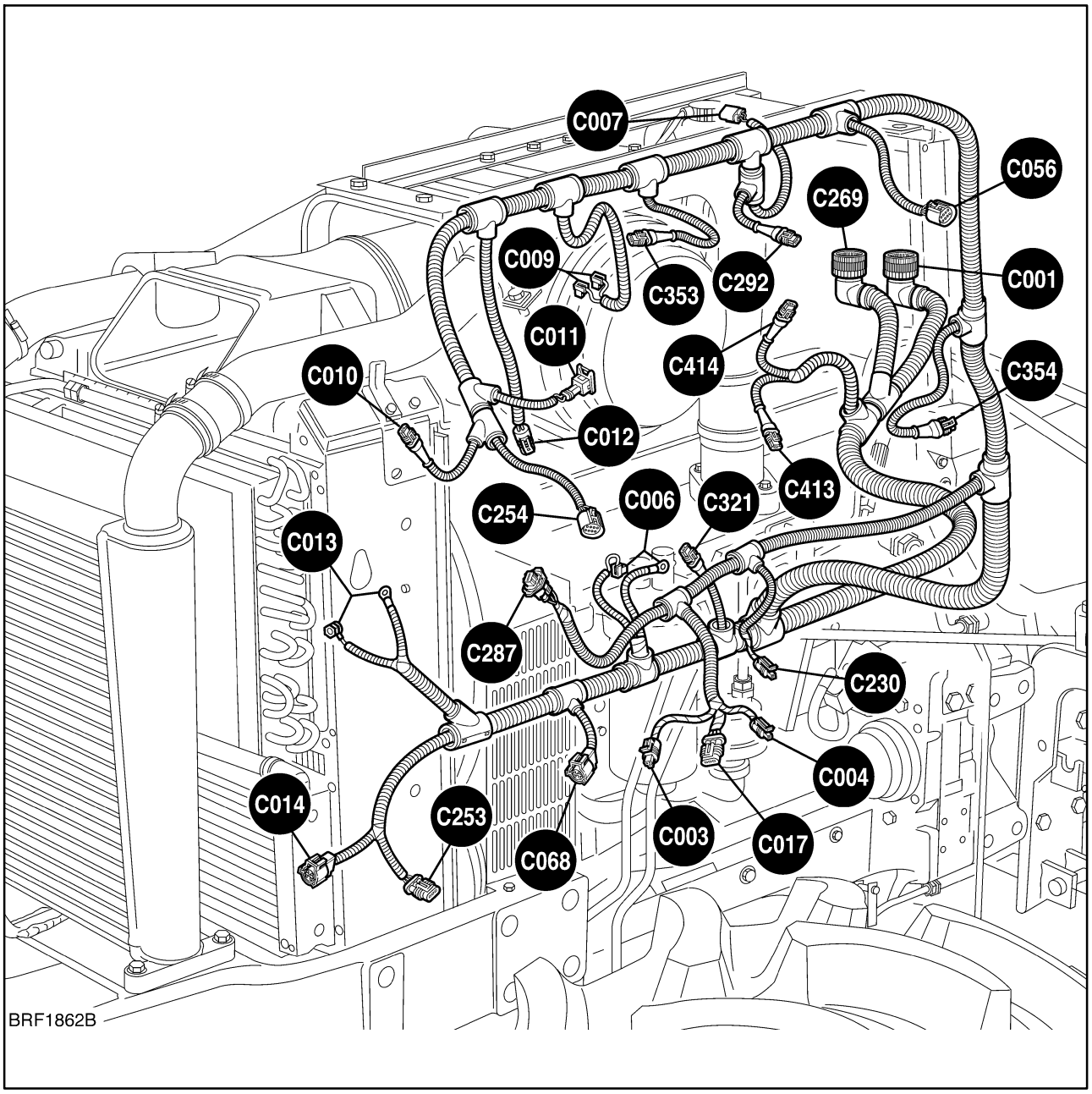

C061
C060
BRE1631A

7


C060
4: LT-1030C-U/R
1: LT-57D-B
3: LT-1027C-U/W
C061
B: LT-57G-B
A: LT-1073B-P/S
BRE1631B

8

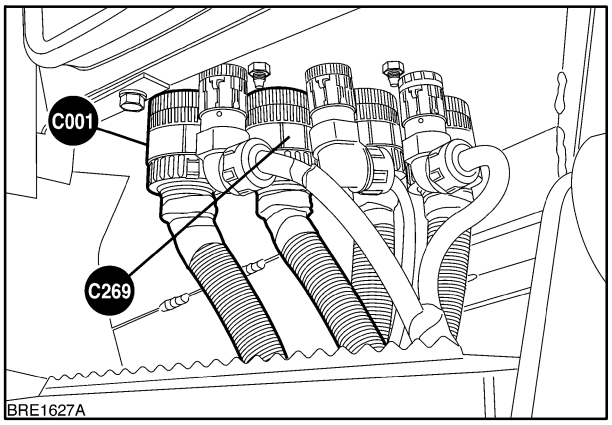
ENGINE HARNESS – 4 & 6 CYLINDER MECHANICAL



ENGINE HARNESS - 4 & 6 CYLINDER MECHANICAL CONNECTORS

1. **C001** Engine to Cab Main Harness connector E1 *(Location Fig 1, Connector Fig 2)*
2. **C003** Oil Pressure Sensor *(Location Fig 3, Connector Fig 5)*
3. **C004** Oil Light Switch *(Location Fig 3, Connector Fig 5)*
4. **C006** Starter Solenoid *(Location Fig 4, Connector Fig 6)*
5. **C007** Brake Fluid Level Switch *(Location Fig 7, Connector Fig 11)*
6. **C009** Air Cleaner Vacuum Switch *(Location Fig 8, Connector Fig 12)*
7. **C010** Air Conditioning Compressor Connector *(Location Fig 9, Connector Fig 13)*
8. **C011** Air Conditioning Pressure Switch *(Location Fig 9, Connector Fig 13)*
9. **C013** Alternator Connector *(Location Fig 10, Connector Fig 14)*
10. **C014** Steering Angle Sensor *(Location Fig 15, Connector Fig 18)*
11. **C017** Water in Fuel Sensor *(Location Fig 3, Connector Fig 5)*
12. **C056** Engine to Lighting Harness Connector *(Location Fig 16, Connector Fig 19)*
13. **C068** Radar Gun *(Location Fig 17, Connector Fig 20)*
14. **C230** Thermo Switch Cold Advance *(Location Fig 21, Connector Fig 22)*
15. **C253** Axle Height Sensor *(Location Fig 15, Connector Fig 18)*
16. **C254** Front Hitch / Front PTO Connector *(Location Fig 9, Connector Fig 13)*
17. **C269** Engine to Cab Main Harness Connector E2 *(Location Fig 1, Connector Fig 2)*
18. **C287** Engine Speed Sensor *(Location Fig 3, Connector Fig 5)*
19. **C292** Can Bus Terminator *(Location Fig 16, Connector Fig 19)*
20. **C353** De-Gass Bottle *(Location Fig 23, Connector Fig 26)*
21. **C354** Grid Heater Relay *(Location Fig 24, Connector Fig 27)*
22. **C413** Loader Valve Connector 1 *(Location Fig 25, Connector Fig 28)*
23. **C414** Loader Valve Connector 2 *(Location Fig 25, Connector Fig 28)*
24. **C012** Coolant Temperature Sender (*Location Fig 26, Connector Fig 30)*
25. **C321** DIA in-line Connector (*Location Fig 4, Connector Fig 6)*

ENGINE HARNESS – 4 CYLINDER MECHANICAL CONNECTOR LOCATIONS



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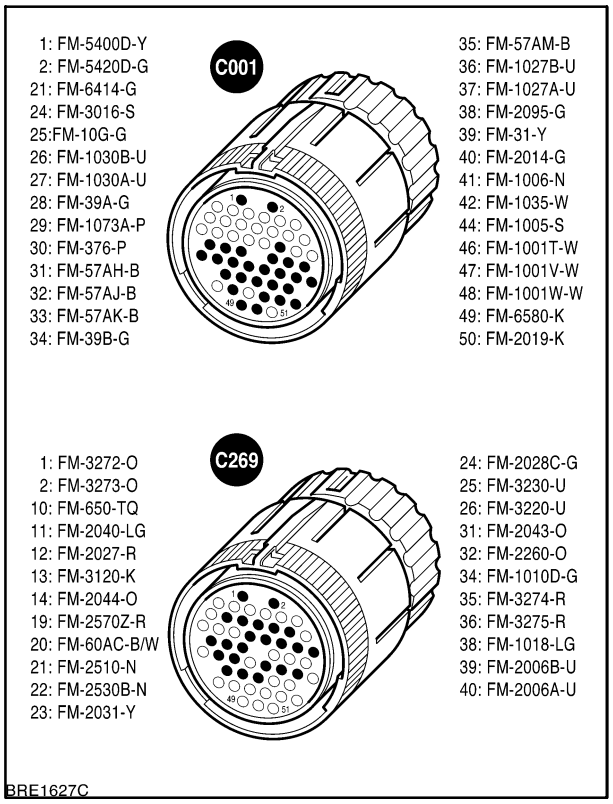

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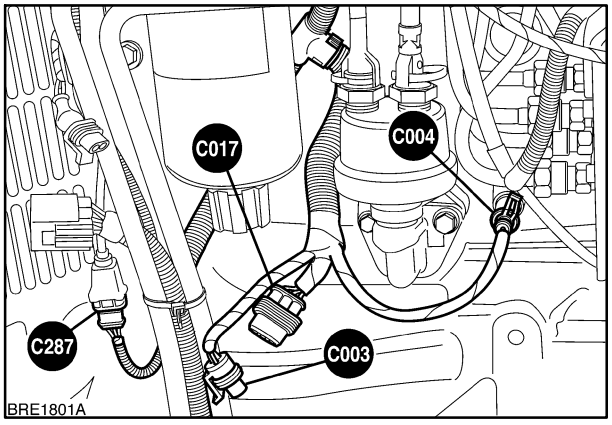

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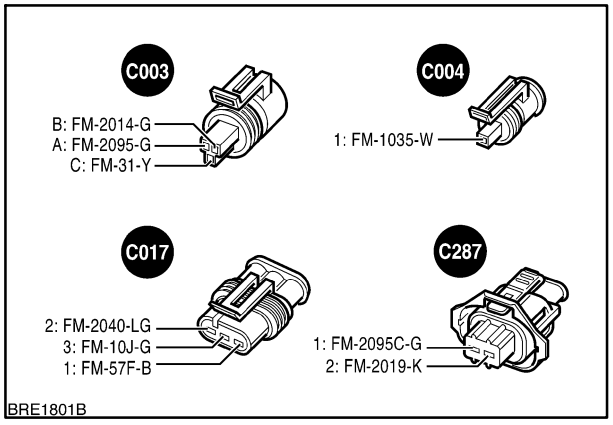

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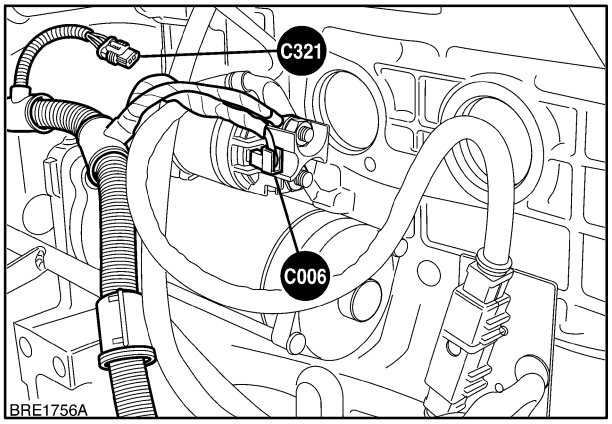

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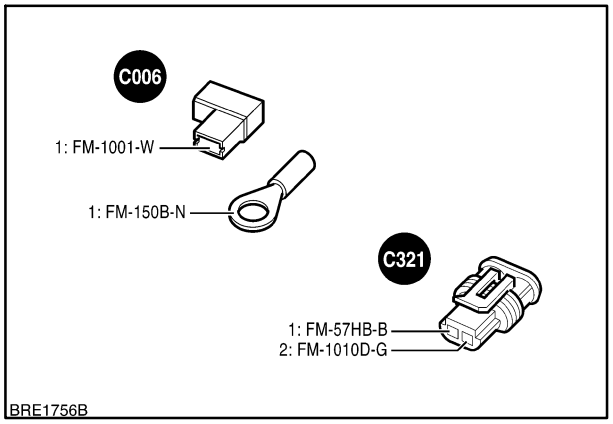

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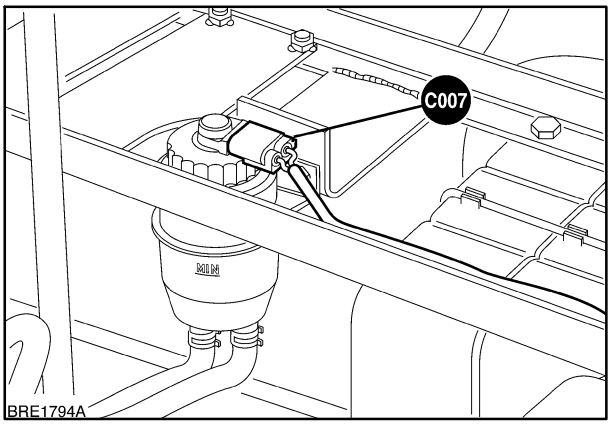
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BRE1794A

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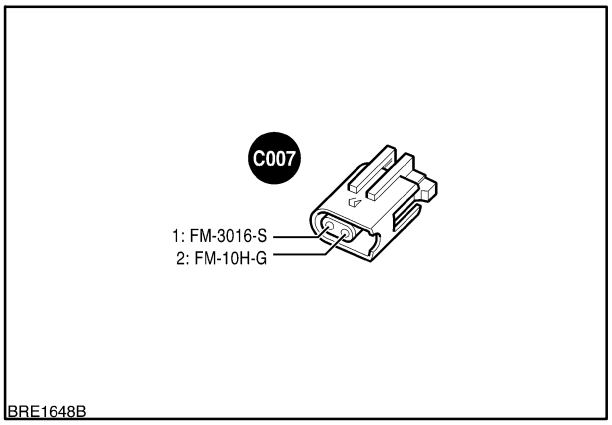
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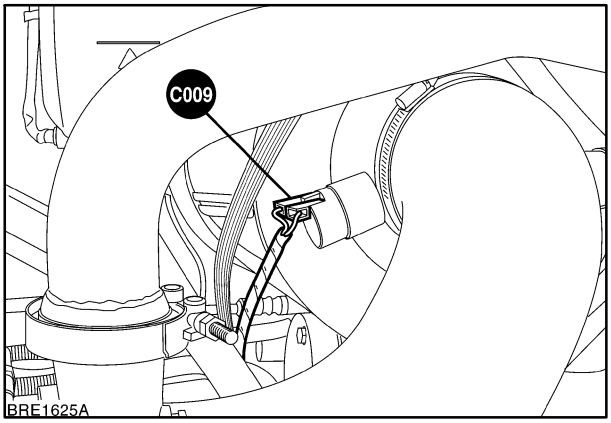
1: FM-3016-S
2: FM-10H-G
BRE1648B

10


C009
BRE1625A

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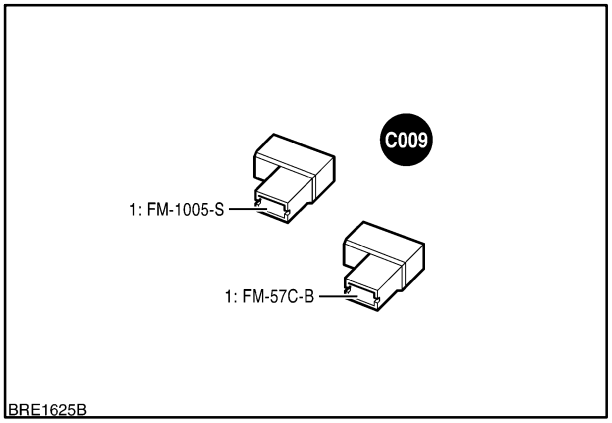
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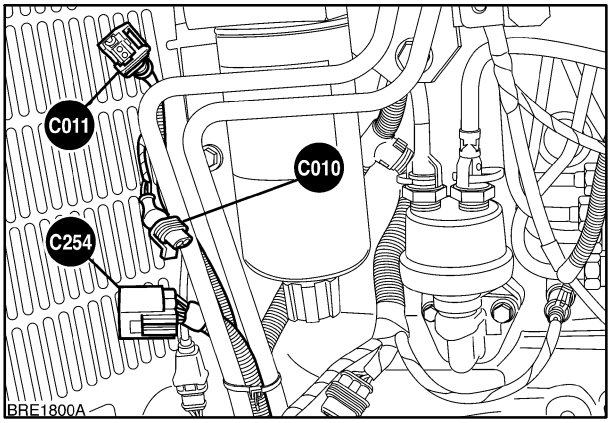
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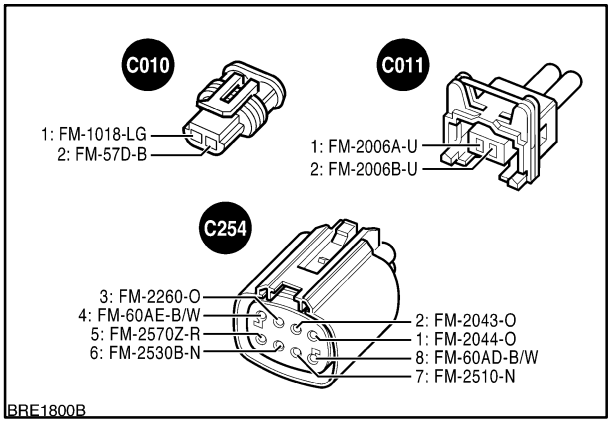
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C011
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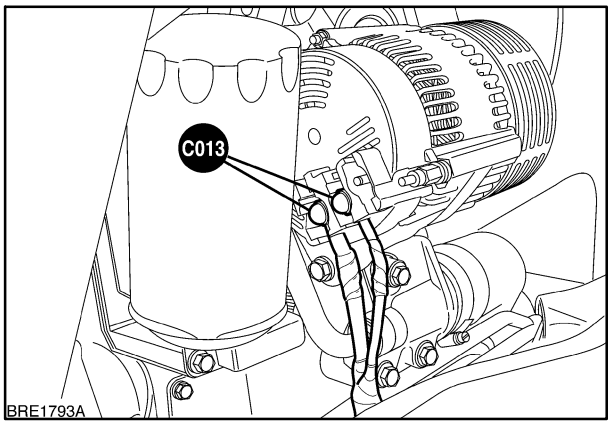
2: FM-2006B-U
C254
3: FM-2260-O
4: FM-60AE-B/W
5: FM-2570Z-R
6: FM-2530B-N
2: FM-2043-O
1: FM-2044-O
8: FM-60AD-B/W
7: FM-2510-N
BRE1800B

12



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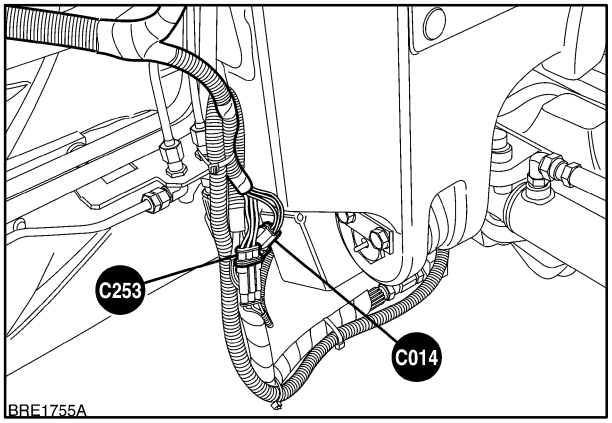

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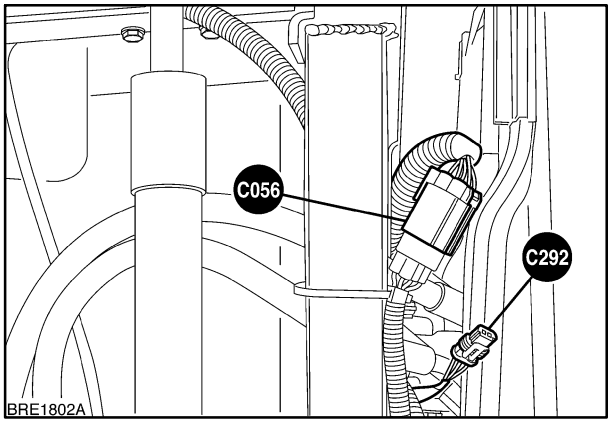

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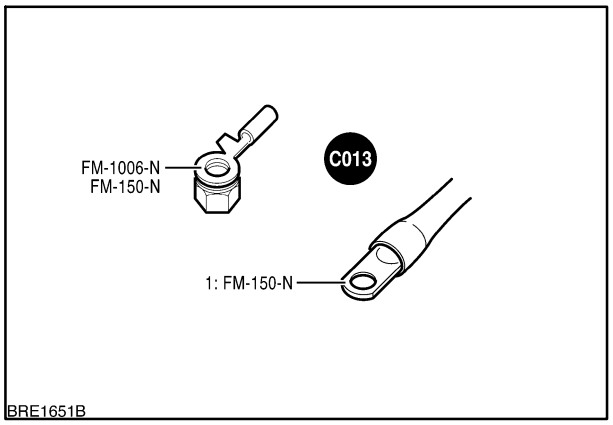

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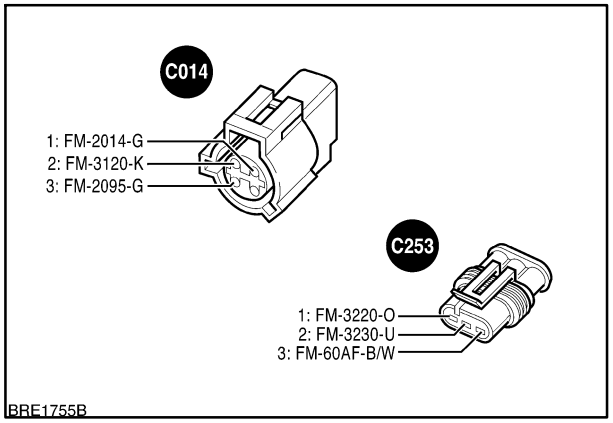

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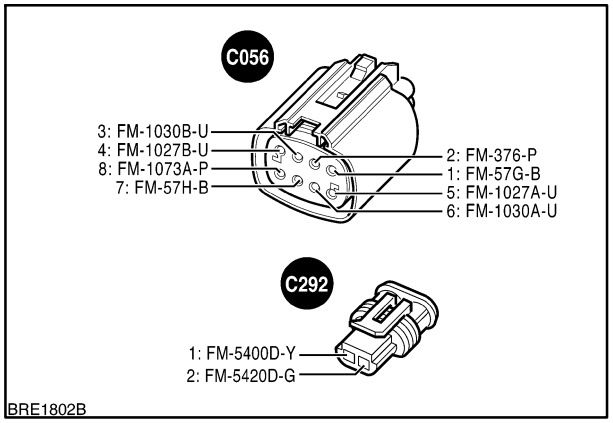

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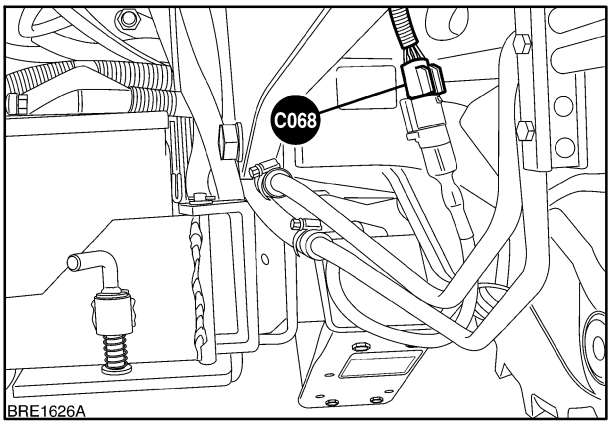

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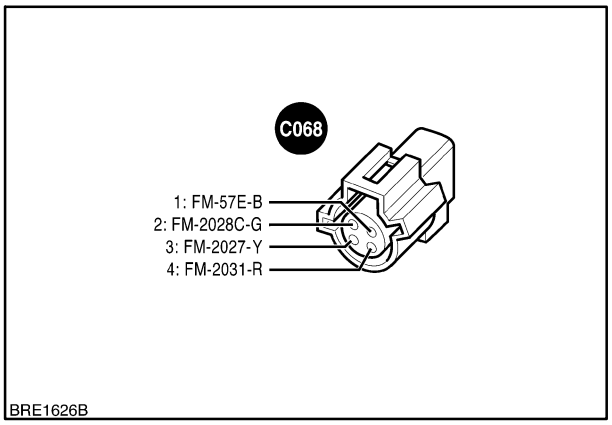

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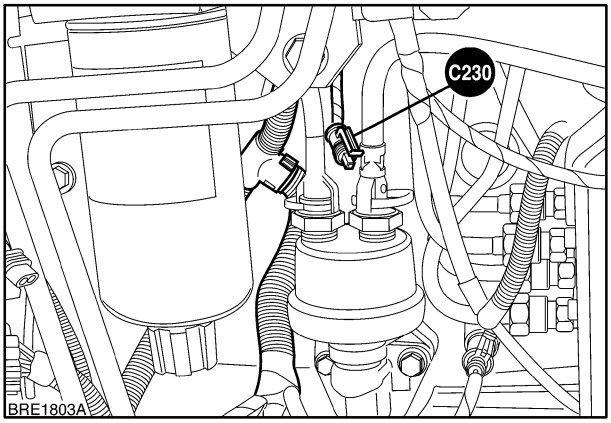

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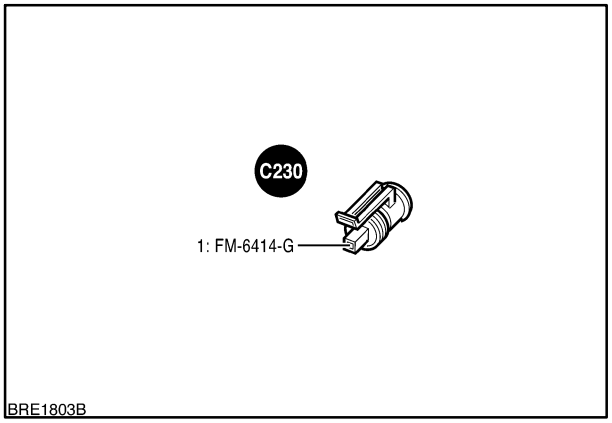

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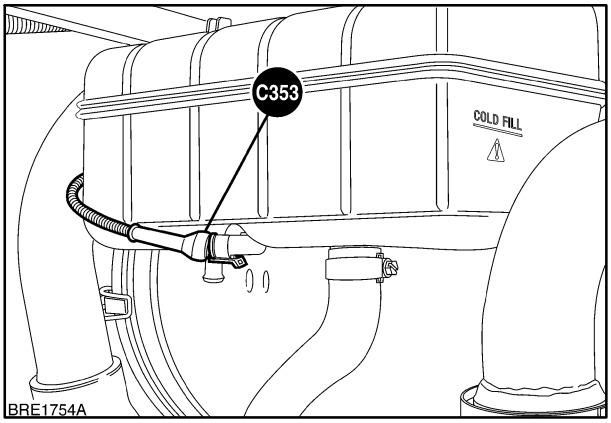

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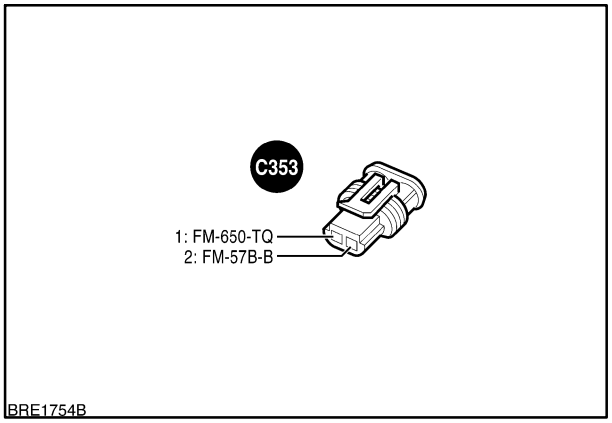

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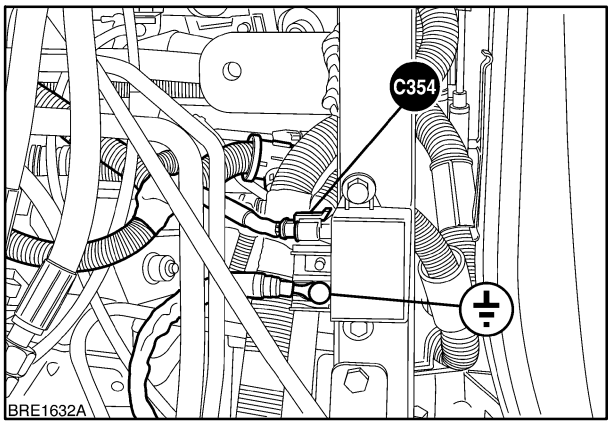

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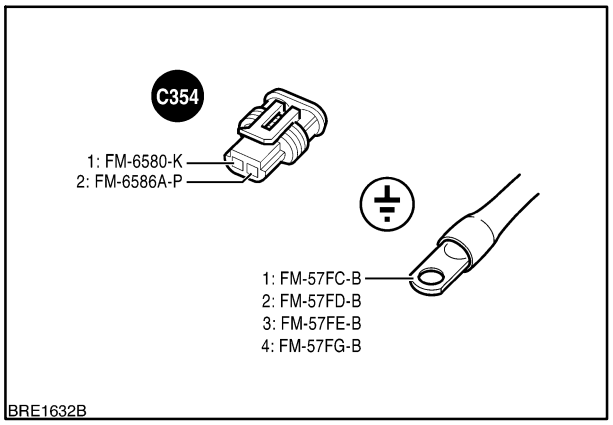

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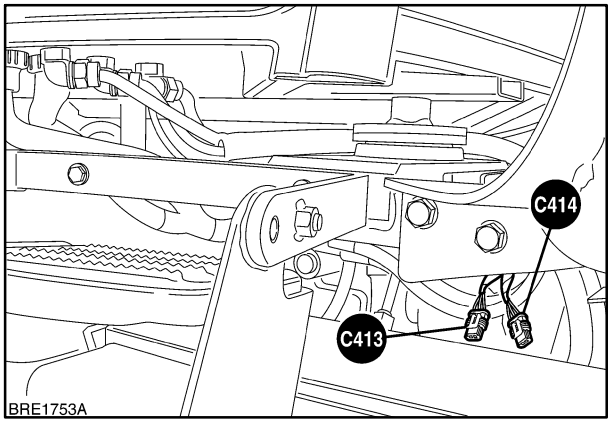

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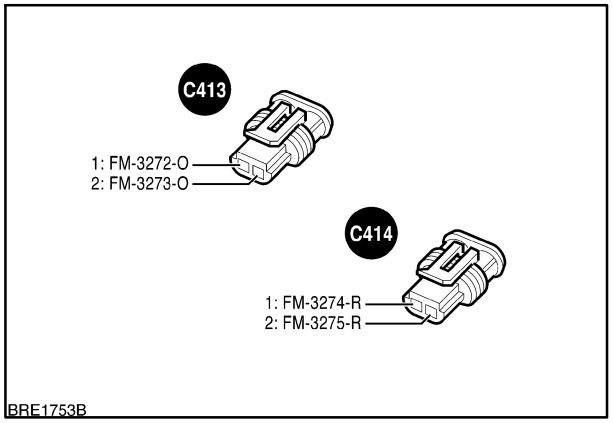

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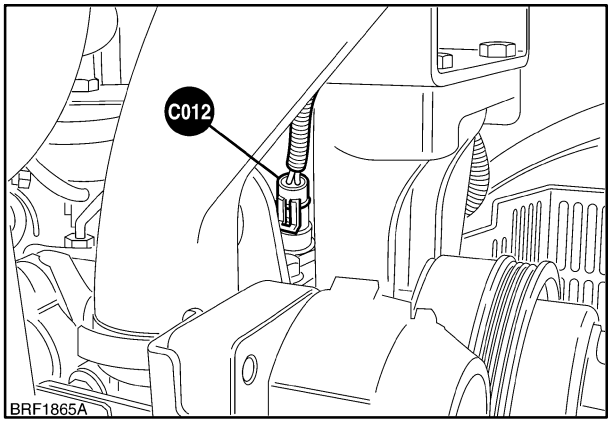

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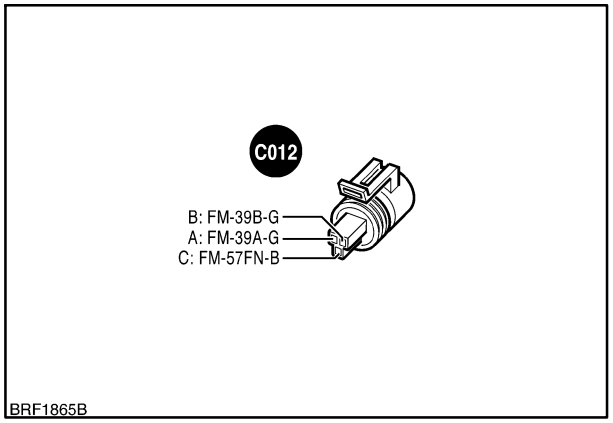

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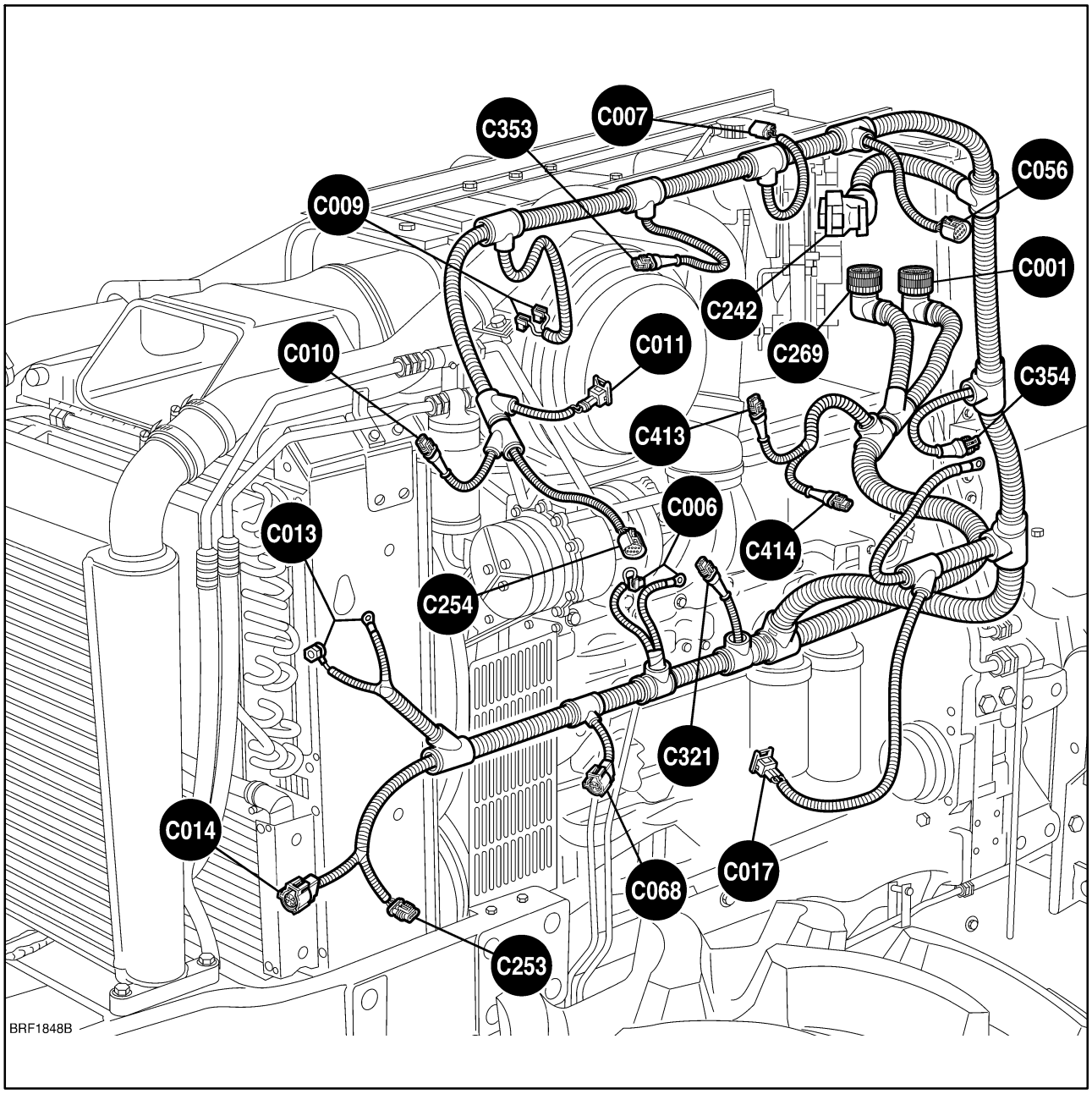
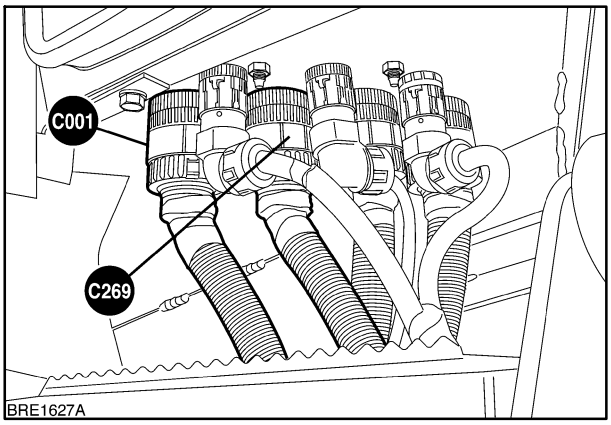
ENGINE HARNESS – 4 & 6 CYLINDER ELECTRONIC



ENGINE HARNESS - 4 & 6 CYLINDER CONNECTORS

1. **C001** Engine to Cab Main Harness connector E1 *(Location Fig 1, Connector Fig 2)*
2. **C006** Starter Solenoid *(Location Fig 3, Connector Fig 5)*
3. **C007** Brake Fluid Level Switch *(Location Fig 4, Connector Fig 6)*
4. **C009** Air Cleaner Vacuum Switch *(Location Fig 7, Connector Fig 11)*
5. **C010** Air Conditioning Compressor Connector *(Location Fig 8, Connector Fig 12)*
6. **C011** Air Conditioning Pressure Switch *(Location Fig 8, Connector Fig 12)*
7. **C013** Alternator Connector *(Location Fig 9, Connector Fig 13)*
8. **C014** Steering Angle Sensor *(Location Fig 10, Connector Fig 14)*
9. **C017** Water in Fuel Sensor *(Location Fig 15, Connector Fig 18)*
10. **C056** Engine to Lighting Harness Connector *(Location Fig 16, Connector Fig 19)*
11. **C068** Radar Gun *(Location Fig 17, Connector Fig 20)*
12. **C242** Main Processor Connector *(Location Fig 21, Connector Fig 22)*
13. **C253** Axle Height Sensor *(Location Fig 10, Connector Fig 14)*
14. **C254** Front Hitch / Front PTO Connector *(Location Fig 23, Connector Fig 27)*
15. **C269** Engine to Cab Main Harness Connector E2 *(Location Fig 1, Connector Fig 2)*
16. **C353** De-Gass Bottle *(Location Fig 24, Connector Fig 28)*
17. **C354** Grid Heater Relay *(Location Fig 25, Connector Fig 29)*
18. **C413** Loader Valve Connector 1 *(Location Fig 26, Connector Fig 30)*
19. **C414** Loader Valve Connector 2 *(Location Fig 26, Connector Fig 30)*
20. **C321** DIA in-line Connector *(Location Fig 3, Connector Fig 5)*

ENGINE HARNESS - 6 CYLINDER CONNECTOR LOCATIONS



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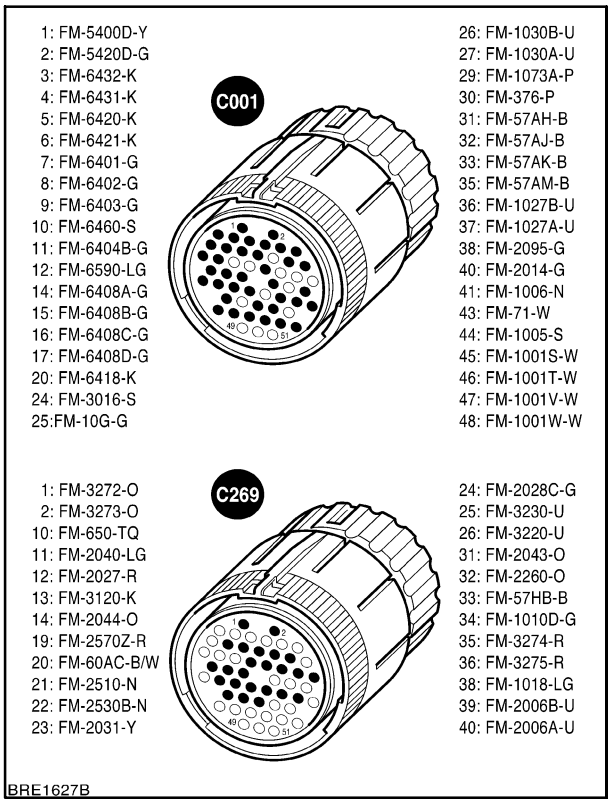

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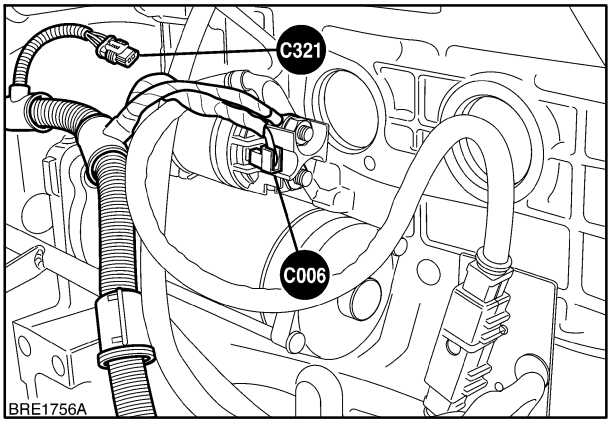

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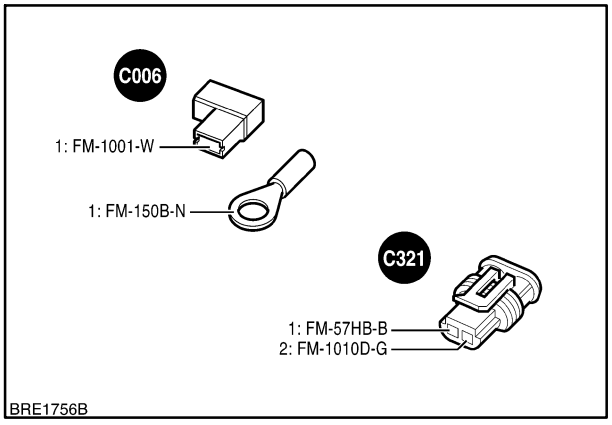

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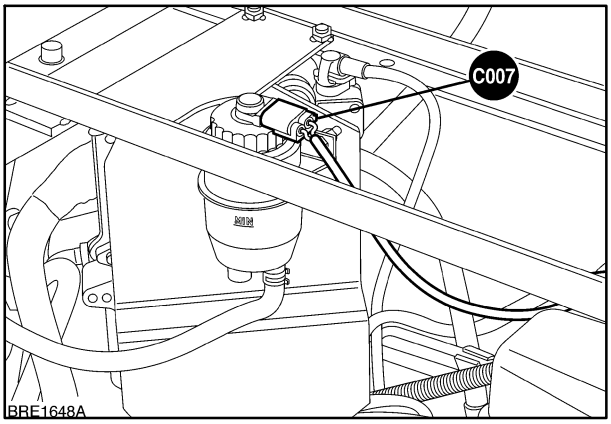

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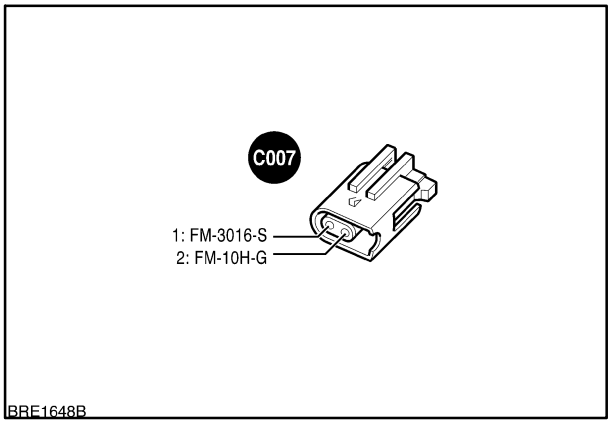

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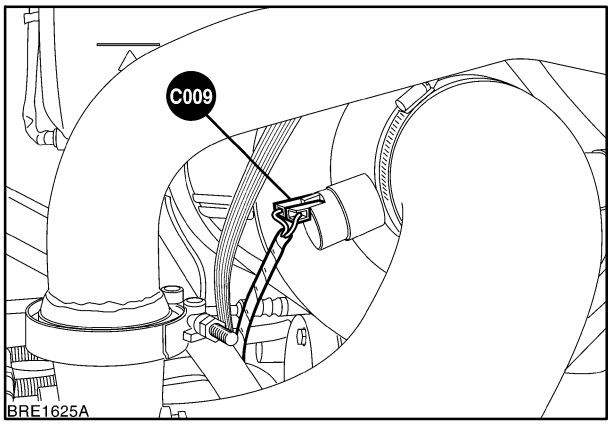
C009
BRE1625A

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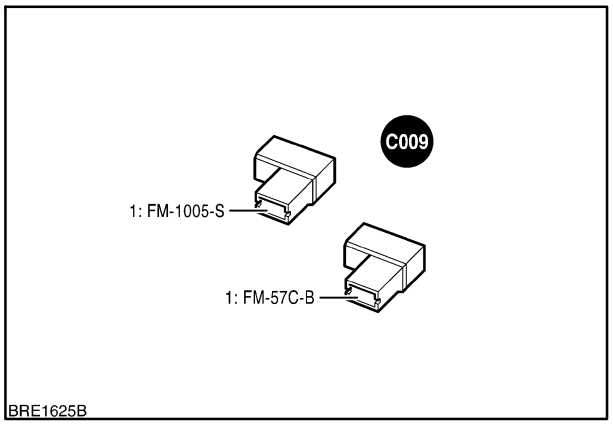
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1: FM-57C-B
BRE1625B

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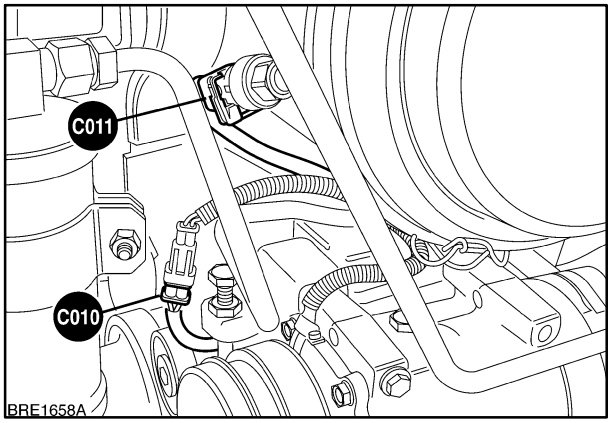
C011
C010
BRE1658A

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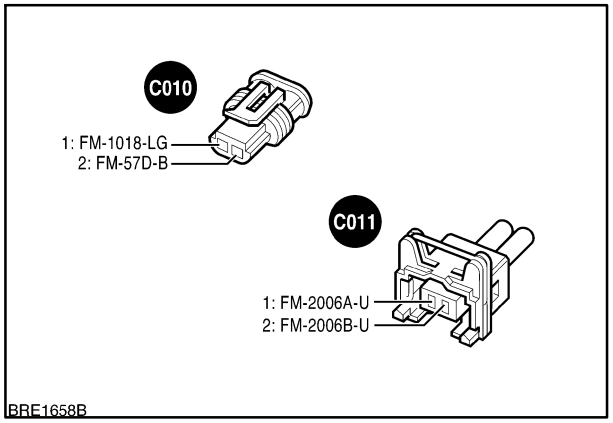
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2: FM-57D-B
C011
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2: FM-2006B-U
BRE1658B

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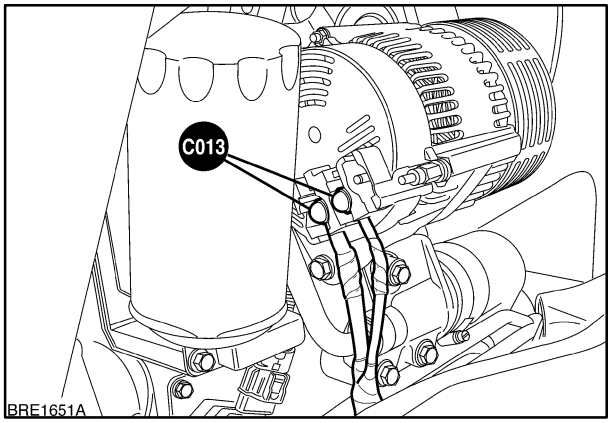
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BRE1651A

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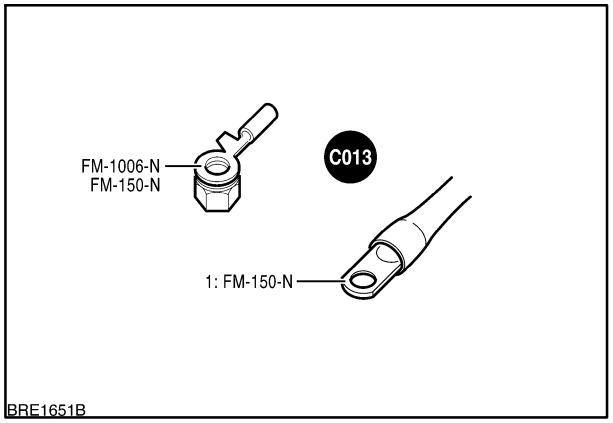
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C013
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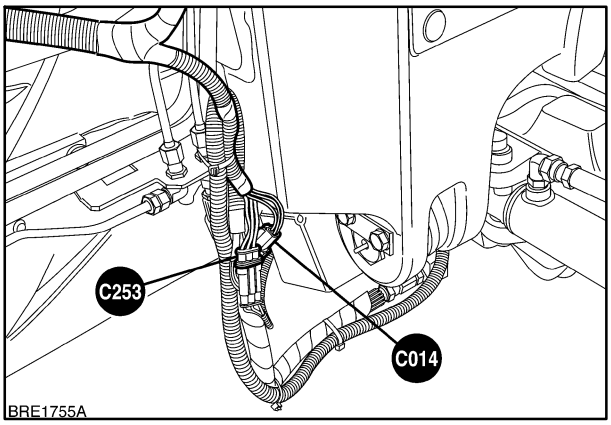

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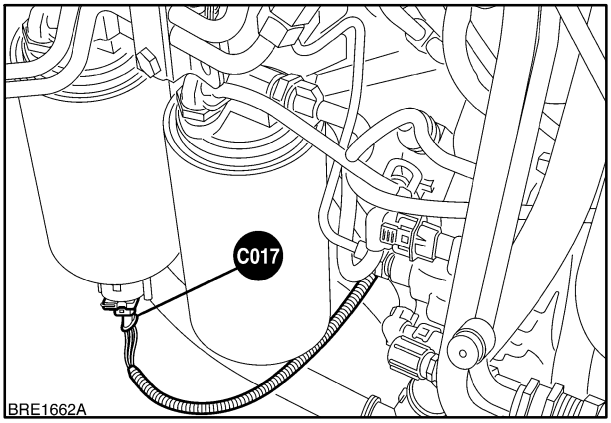

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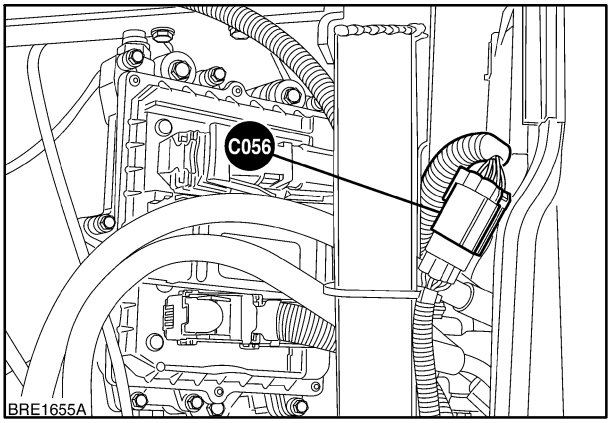

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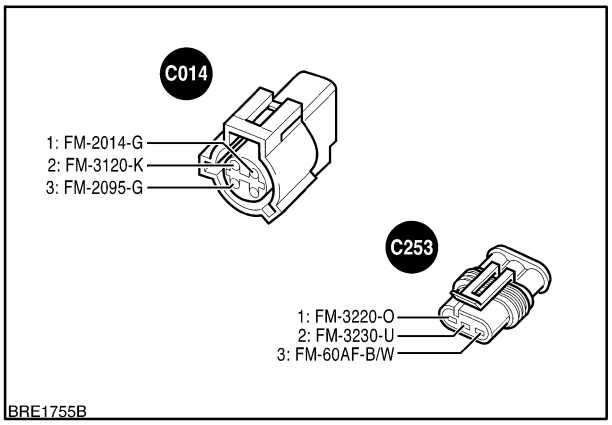

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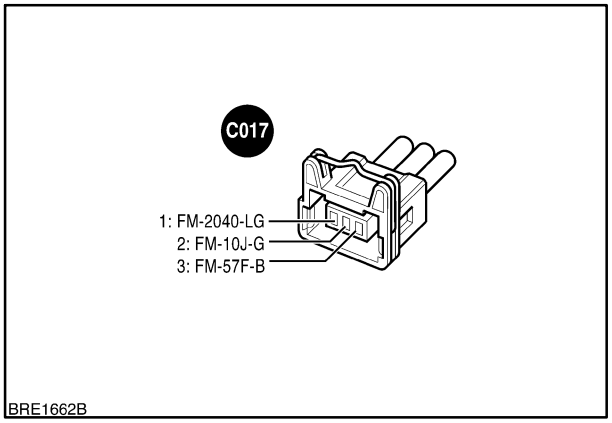

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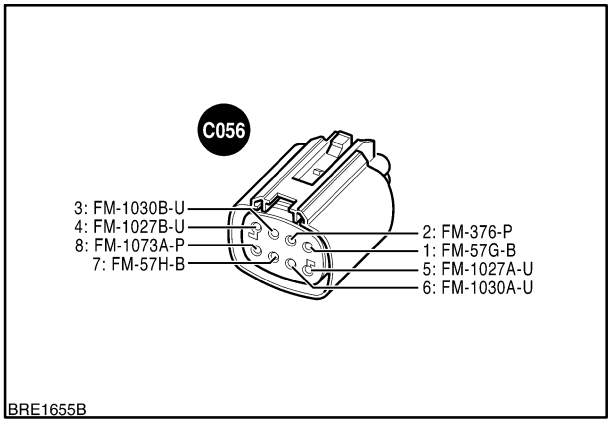

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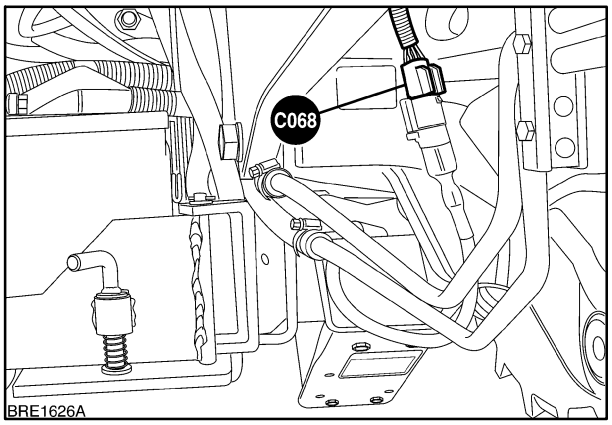

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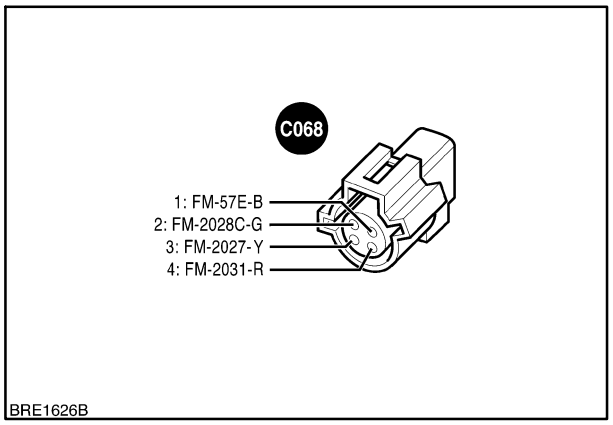

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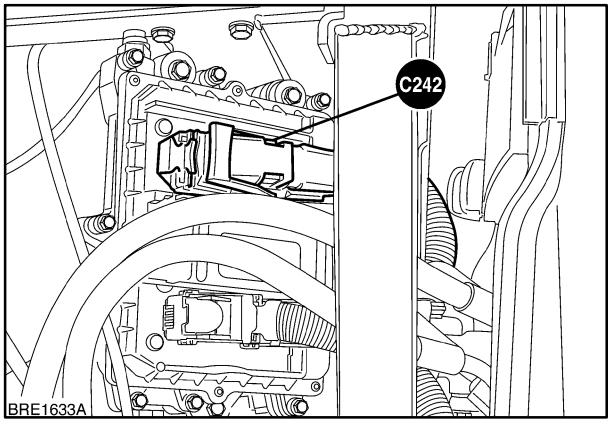

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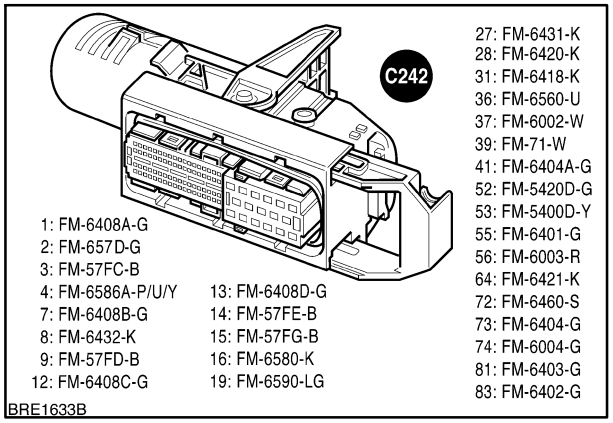

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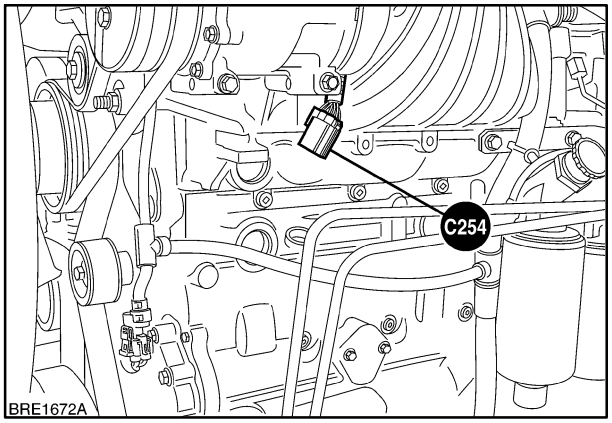

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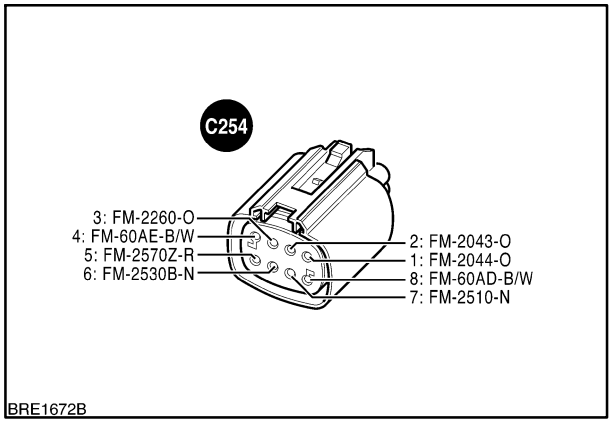

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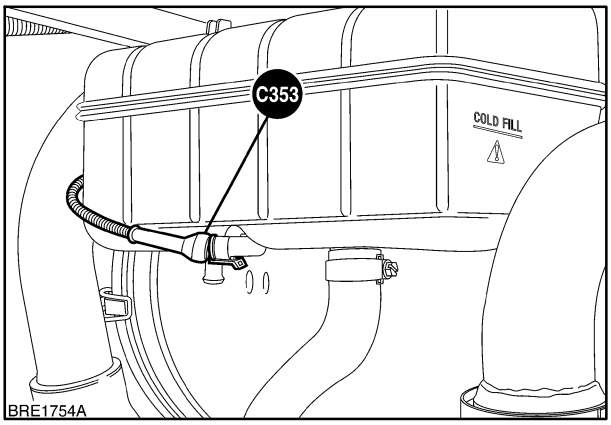

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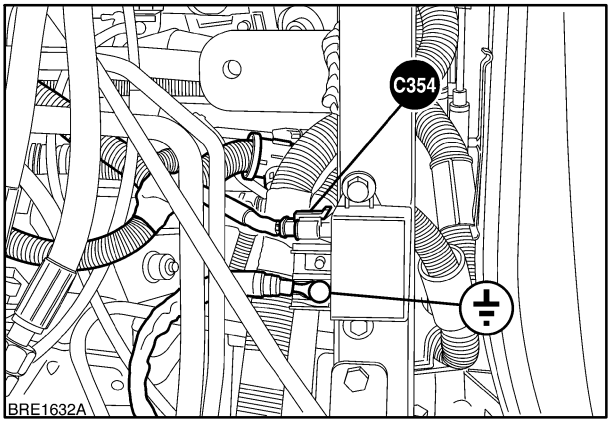

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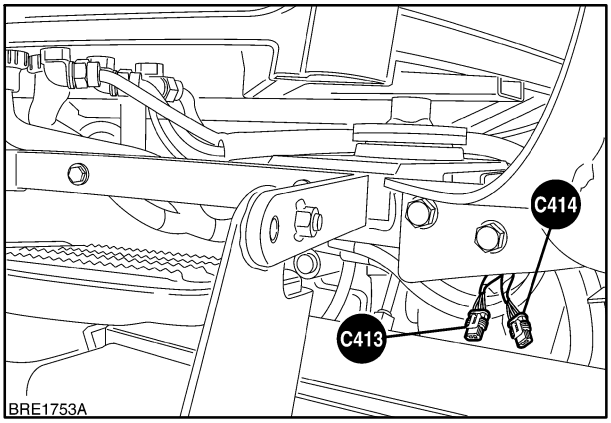

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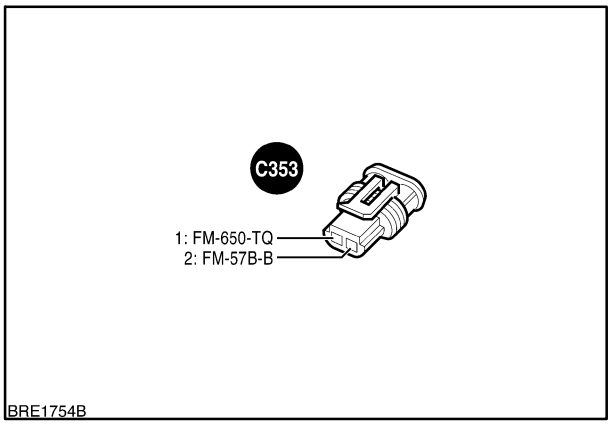

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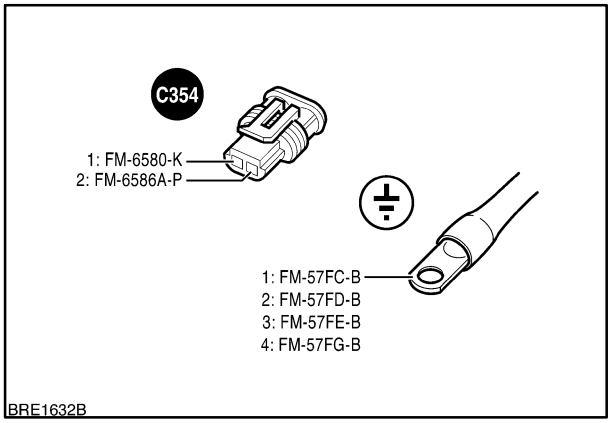

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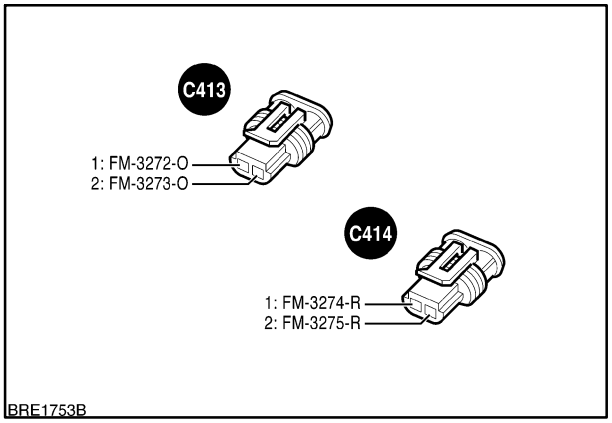

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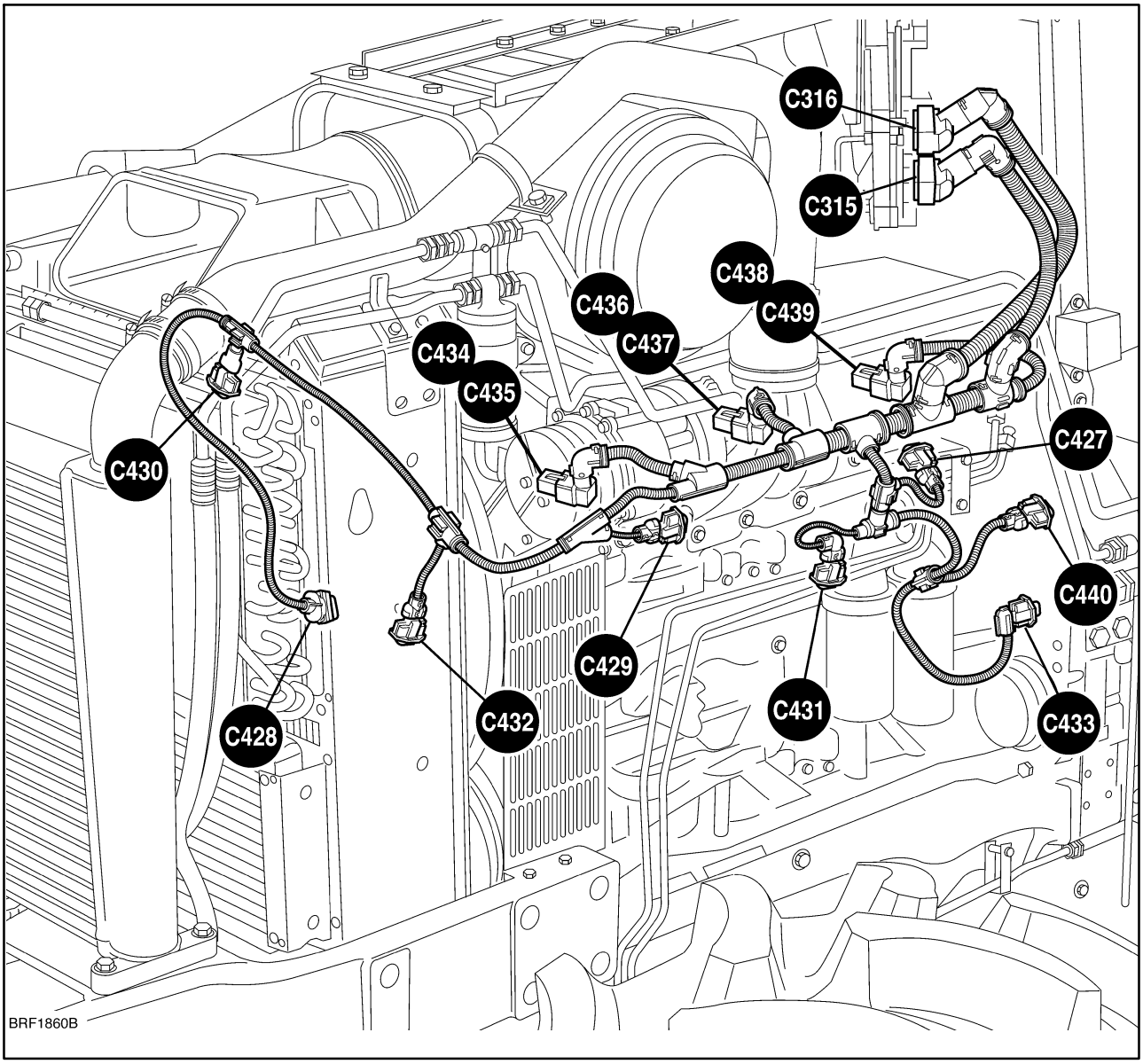
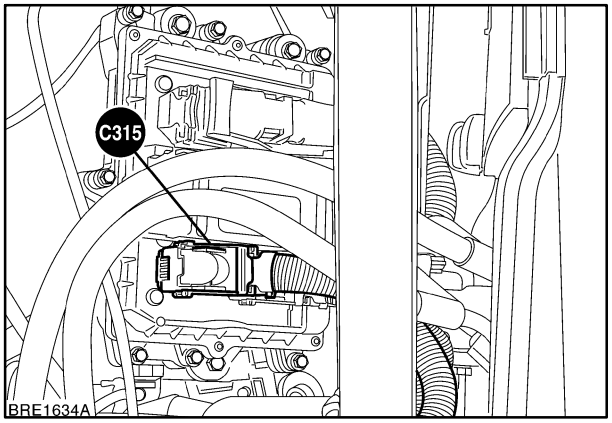
FRONT ELECTRICAL ENGINE HARNESS (W/ELECTRONIC ENGINE)



ENGINE HARNESS – ELECTRICAL CONNECTORS

1. **C315** Main Processor Connector
   (Location Fig 1, Connector Fig 4)
2. **C316** Main Processor Connector
   (Location Fig 2, Connector Fig 5)
3. **C427** Boost Pressure / Boost Temperature Sensor
   (Location Fig 3, Connector Fig 6)
4. **C428** Oil Pressure / Oil Temperature Sensor
   (Location Fig 7, Connector Fig 11)
5. **C429** Rail Pressure Sensor
   (Location Fig 8, Connector Fig 12)
6. **C430** Coolant Temperature
   (Location Fig 9, Connector Fig 13)
7. **C431** Fuel Temperature
   (Location Fig 10, Connector Fig 14)
8. **C432** Crankshaft Speed Sensor
   (Location Fig 15, Connector Fig 17)
9. **C433** Camshaft Speed Sensor
   (Location Fig 10, Connector Fig 14)
10. **C434** Injector 1
    (Location Fig 8, Connector Fig 12)
11. **C435** Injector 2
    (Location Fig 8, Connector Fig 12)
12. **C436** Injector 3
    (Location Fig 16, Connector Fig 18)
13. **C437** Injector 4
    (Location Fig 16, Connector Fig 18))
14. **C438** Injector 5
    (Location Fig 16, Connector Fig 18)
15. **C439** Injector 6
    (Location Fig 16, Connector Fig 18)
16. **C440** Fuel Metering Unit
    (Location Fig 10, Connector Fig 14)

ENGINE HARNESS -ELECTRICAL CONNECTOR LOCATIONS



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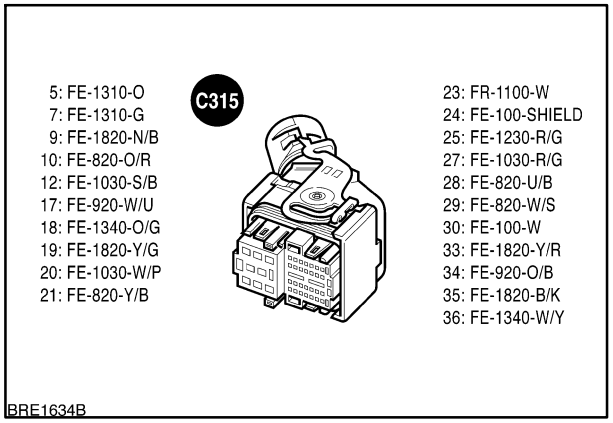

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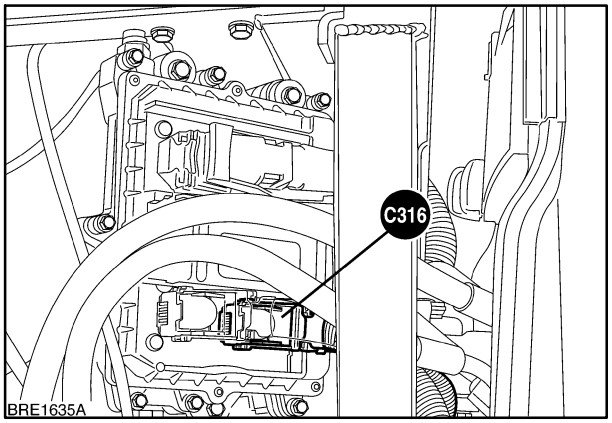

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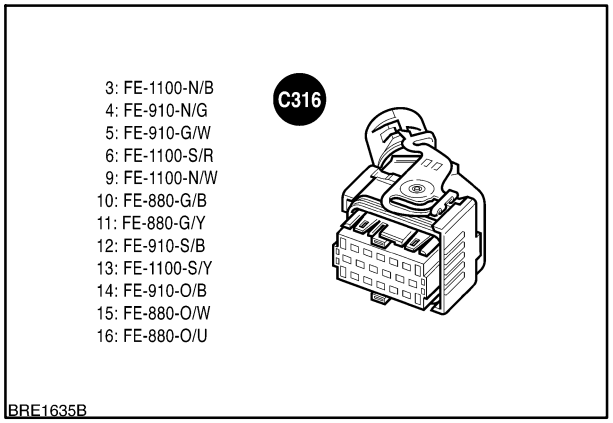

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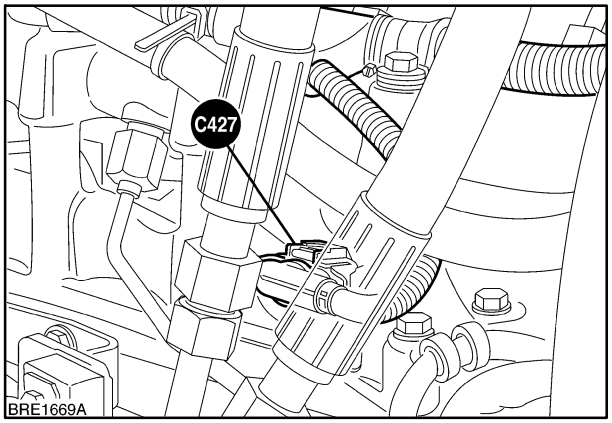

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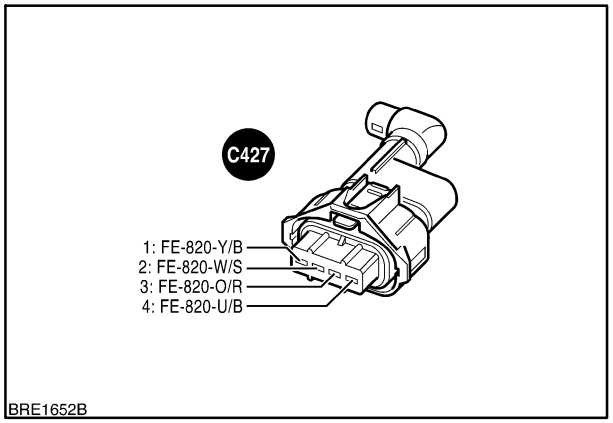

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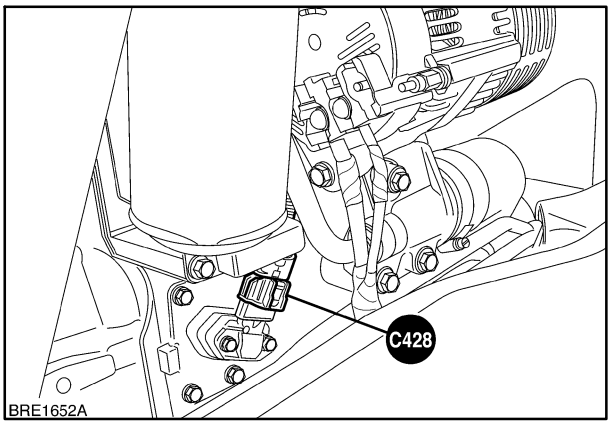
C428
BRE1652A

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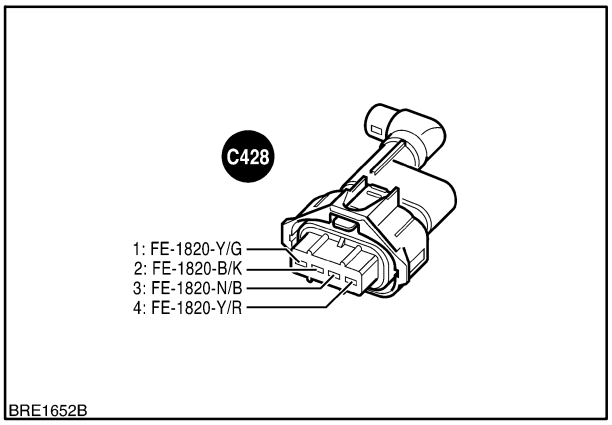
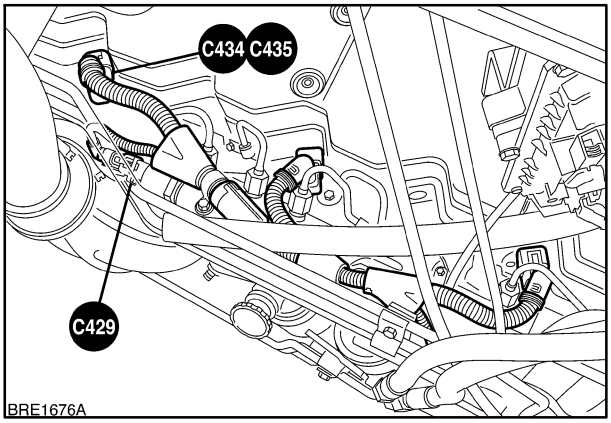
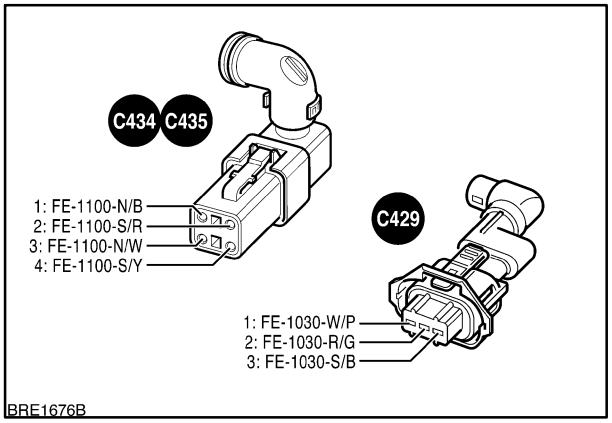

C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B

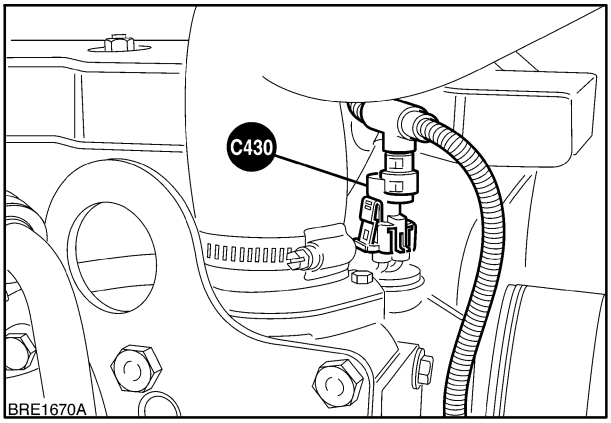
10


C434 C435
C429
BRE1676A

8


C434 C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

11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BRE1670A

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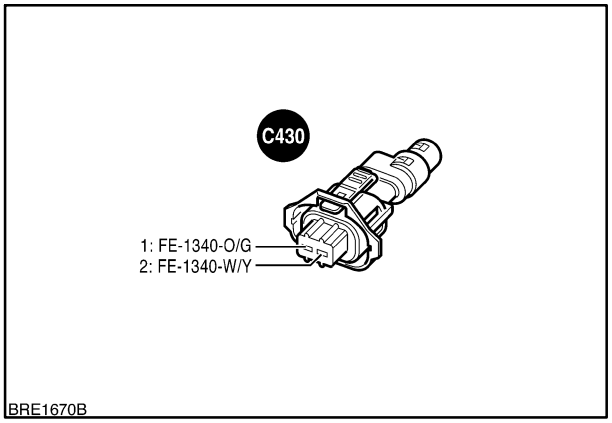
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BRE1670B

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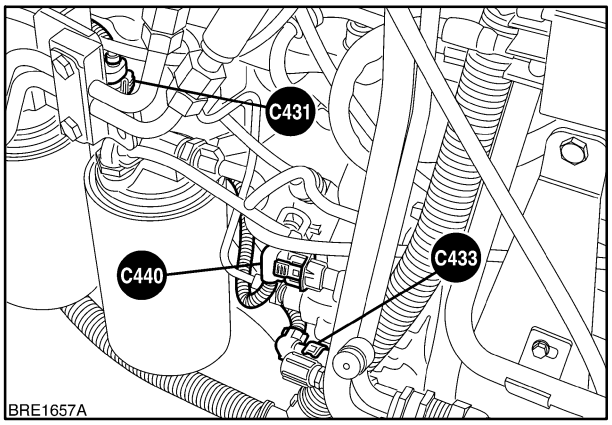

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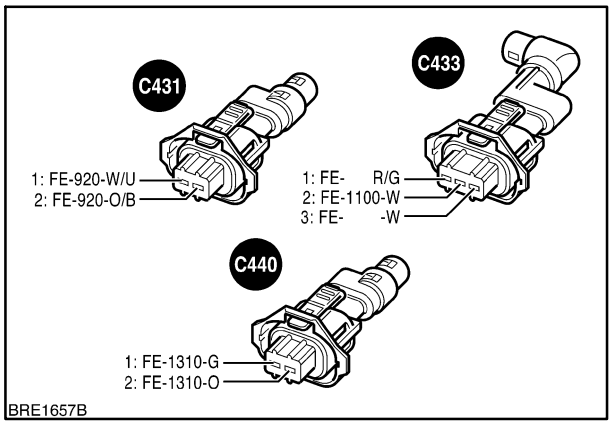

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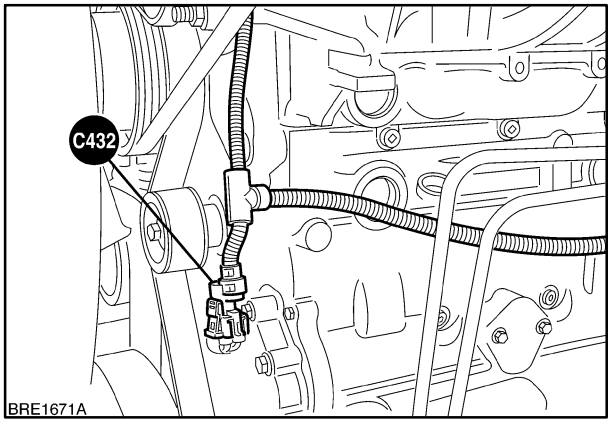

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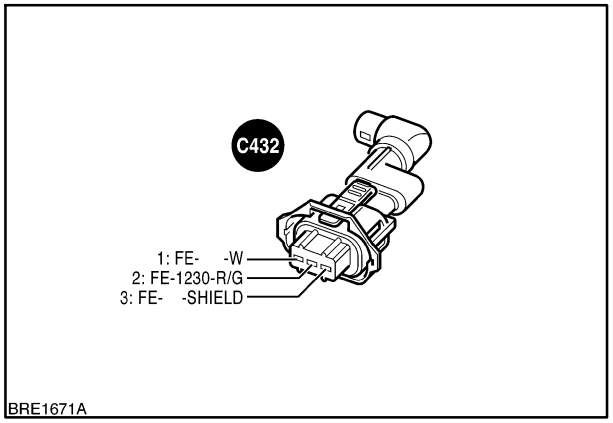

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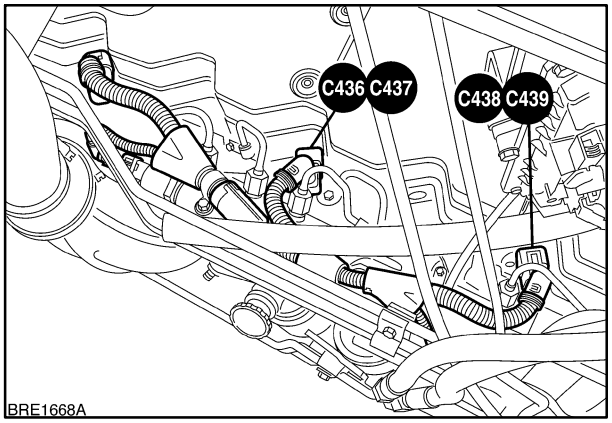

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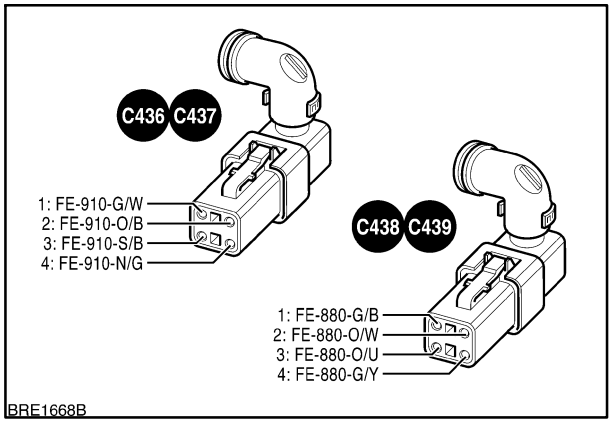

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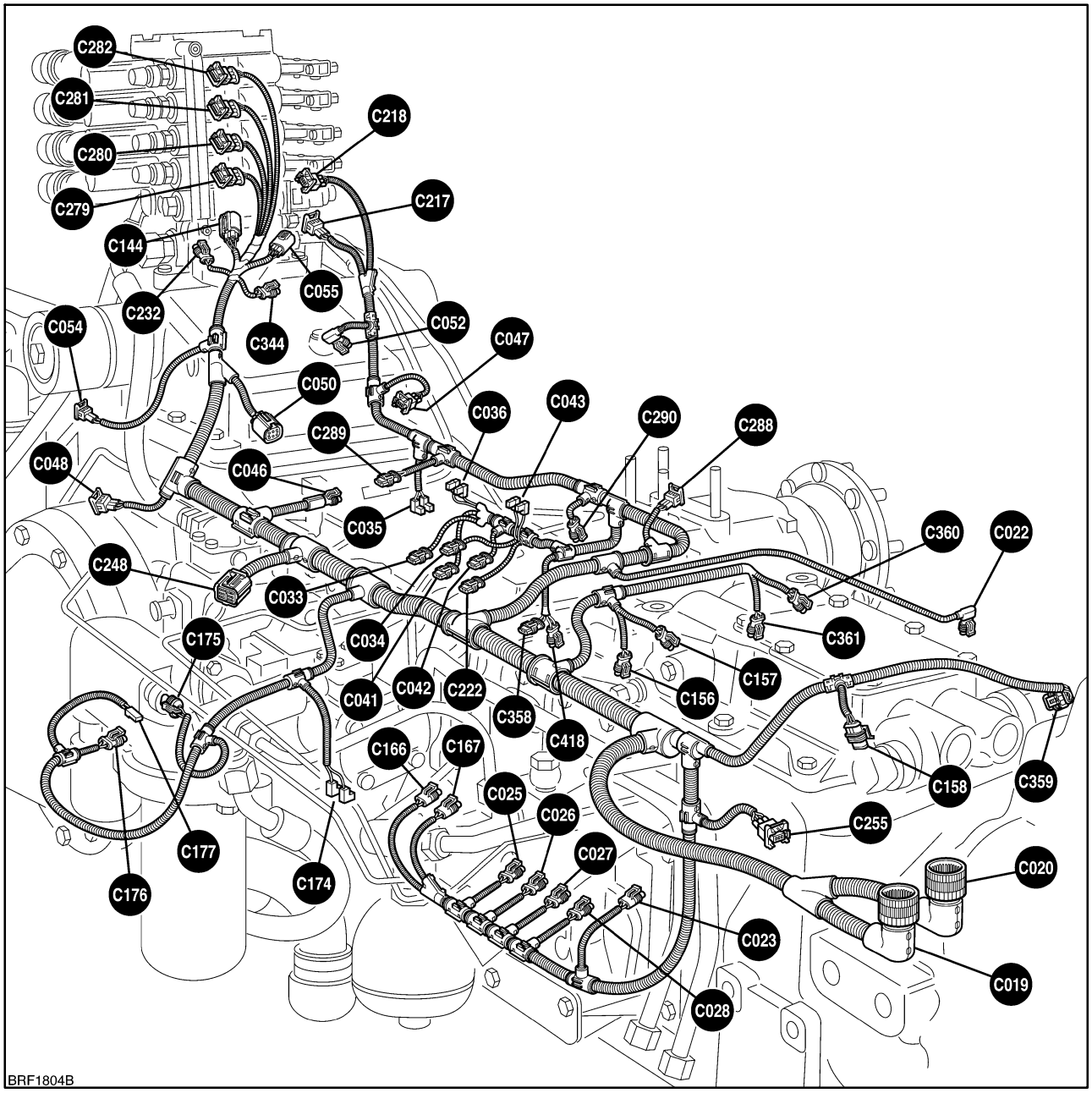
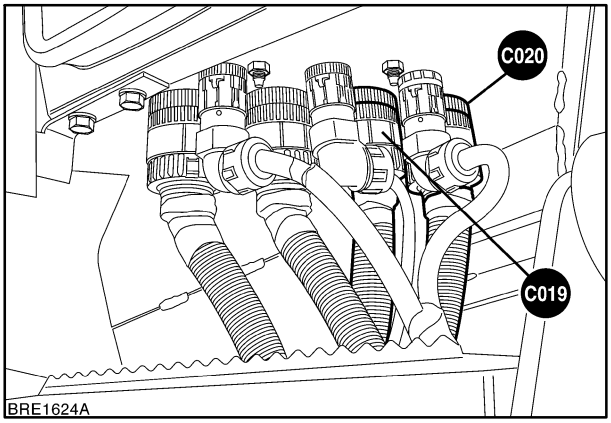
TRANSMISSION HARNESS - 16 X 16



TRANSMISSION HARNESS - 16X16 CONNECTORS

1. **C019** Chassis to Cab Main Connector T1 F
   (Location Fig 1, Connector Fig 2)
2. **C020** Chassis to Cab Main Connectorr T2 F
   (Location Fig 1, Connector Fig 2)
3. **C022** Fuel Tank Sender
   (Location Fig 3, Connector Fig 4)
4. **C023** Transmission Oil Temp Sensor
   (Location Fig 5, Connector Fig 9)
5. **C025** C4 Valve
   (Location Fig 6, Connector Fig 10)
6. **C026** C3 Valve
   (Location Fig 6, Connector Fig 10)
7. **C027** C2 Valve
   (Location Fig 6, Connector Fig 10)
8. **C028** C1 Valve
   (Location Fig 6, Connector Fig 10)
9. **C033** PTO Brake Solenoid
   (Location Fig 7, Connector Fig 11)
10. **C034** Four Wheel Drive Solenoid
    (Location Fig 8, Connector Fig 12)
11. **C035** MFD Pressure Switch
    (Location Fig 13, Connector Fig 17)
12. **C036** Transmission Oil Pressure Switch
    (Location Fig 7, Connector Fig 11)
13. **C041** PTO Solenoid
    (Location Fig 7, Connector Fig 11)
14. **C042** Differential Lock Solenoid
    (Location Fig 8, Connector Fig 12)
15. **C043** Diff Lock Pressure Switch
    (Location Fig 8, Connector Fig 12)
16. **C046** Speed Sensor
    (Location Fig 14, Connector Fig 18)
17. **C047** Left Hand Draft Sensing Pin
    (Location Fig 15, Connector Fig 19)
18. **C048** Right Hand Draft Sensing Pin
    (Location Fig 14, Connector Fig 18)
19. **C050** Trailer Brake Connector
    (Location Fig 16, Connector Fig 20)
20. **C052** Rockshaft Potentiometer
    (Location Fig 15, Connector Fig 19)
21. **C054** PTO Speed Sensor
    (Location Fig 21, Connector Fig 25)
22. **C055** Trailer Socket
    (Location Fig 22, Connector Fig 26)
23. **C144** Air Brakes Connector
    (Location Fig 22, Connector Fig 26)
24. **C156** Reverse Synchro Solenoid
    (Location Fig 23, Connector Fig 27)
25. **C157** Forward Synchro Solenoid
    (Location Fig 23, Connector Fig 27)
26. **C158** Synchro Position Potentiometer
    (Location Fig 24, Connector Fig 28)
27. **C166** Low Range Switch
    (Location Fig 29, Connector Fig 32)
28. **C167** High Range Switch
    (Location Fig 29, Connector Fig 32)
29. **C174** PAS Pressure Switch
    (Location Fig 30, Connector Fig 33)
30. **C175** Hydraulic Filter
    (Location Fig 30, Connector Fig 33)
31. **C176** Hydraulic Oil Temp Switch
    (Location Fig 31, Connector Fig 34)
32. **C177** Hydraulic Low Charge Switch
    (Location Fig 31, Connector Fig 34)
33. **C217** EDC Raise Solenoid
    (Location Fig 35, Connector Fig 36)
34. **C218** EDC Lower Solenoid
    (Location Fig 35, Connector Fig 36)
35. **C222** Creeper Gear Solenoid
    (Location Fig 8, Connector Fig 12)
36. **C232** Reverse Alarm Connector
    (Location Fig 37, Connector Fig 39)
37. **C248** SFA Valves
    (Location Fig 14, Connector Fig 18)
38. **C255** Engine Flywheel Speed Sensor
    (Location Fig 38, Connector Fig 40)
39. **C279** EHR1
    (Location Fig 41, Connector Fig 43)
40. **C280** EHR2
    (Location Fig 41, Connector Fig 43)
41. **C281** EHR3
    (Location Fig 42, Connector Fig 44)
42. **C282** EHR4
    (Location Fig 42, Connector Fig 44)
43. **C288** Rear PTO Shaft Twist Sensor
    (Location Fig 45, Connector Fig 47)
44. **C289** 50 KPH Dump Solenoid
    (Location Fig 13, Connector Fig 17)
45. **C290** 50 KPH Solenoid
    (Location Fig 13, Connector Fig 17)
46. **C344** Terminating Resistor
    (Location Fig 37, Connector Fig 39)
47. **C358** Creeping Sensing Switch Rear
    (Location Fig 46, Connector Fig 48)
48. **C359** 4/5
    (Location Fig 24, Connector Fig 28)
49. **C360** 5-8 Synchro Solenoid
    (Location Fig 23, Connector Fig 27)
50. **C361** 1-4 Synchro Solenoid
    (Location Fig 23, Connector Fig 27)
51. **C418** Creeping Sensing Switch Front
    (Location Fig 46, Connector Fig 48)

TRANSMISSION HARNESS – 16X16 CONNECTOR LOCATIONS



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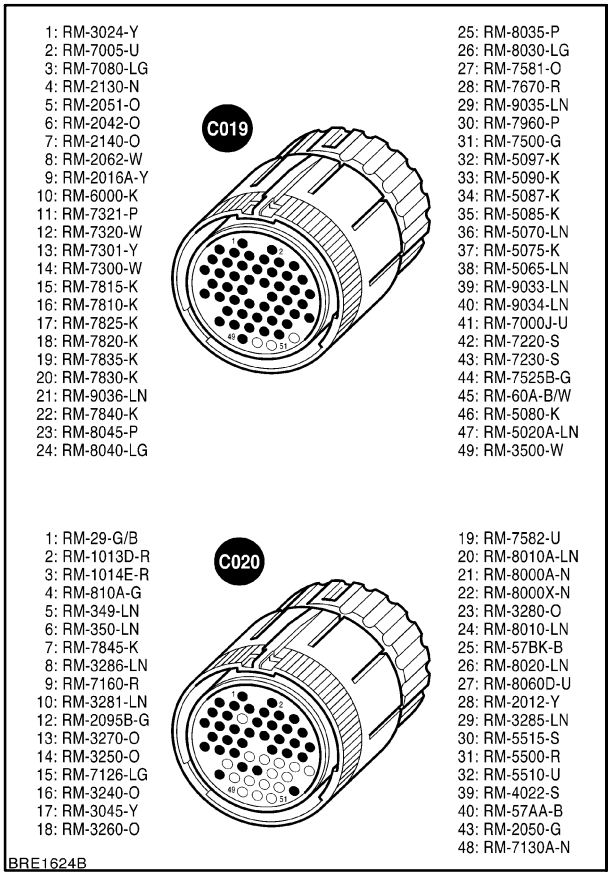

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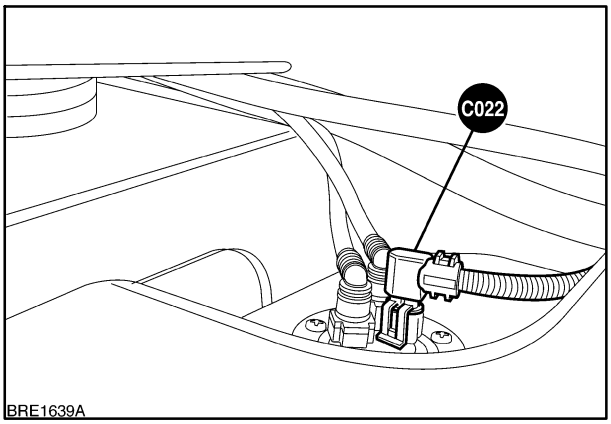

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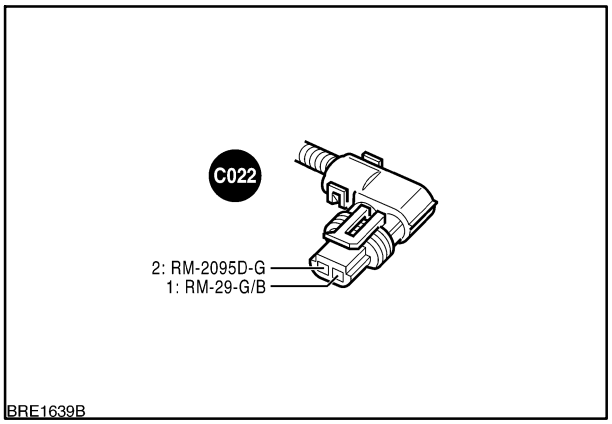

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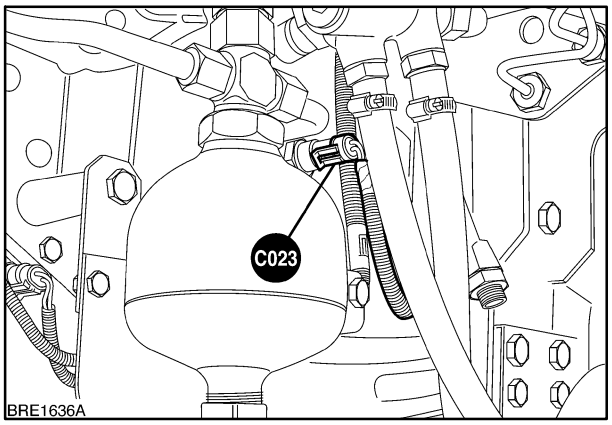
C023
BRE1636A

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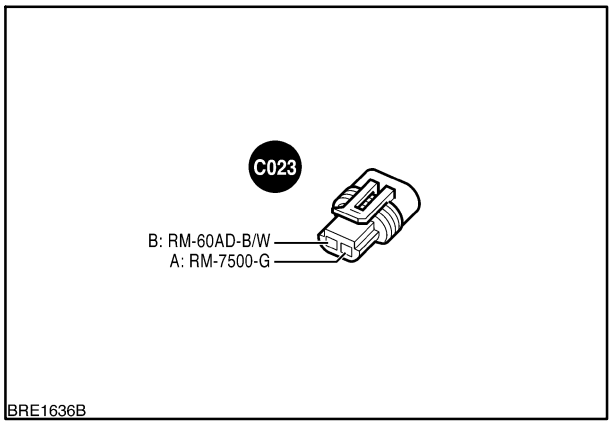
C023
B: RM-60AD-B/W
A: RM-7500-G
BRE1636B

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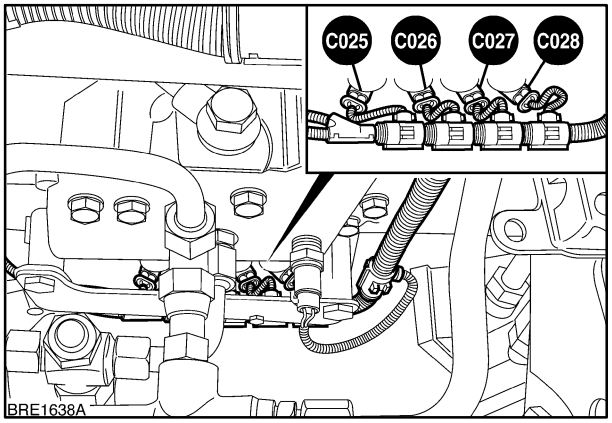
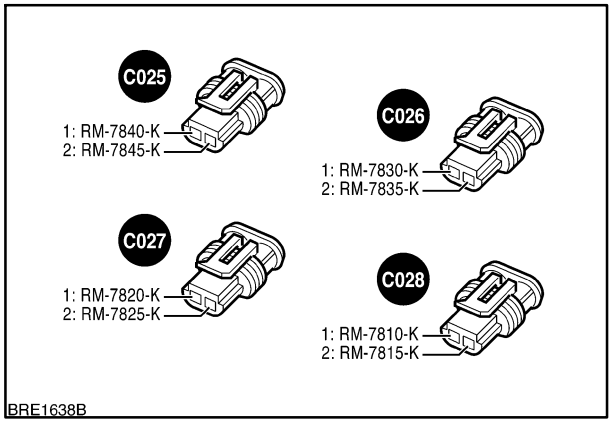

C025
C026
C027
C028
BRE1638A

6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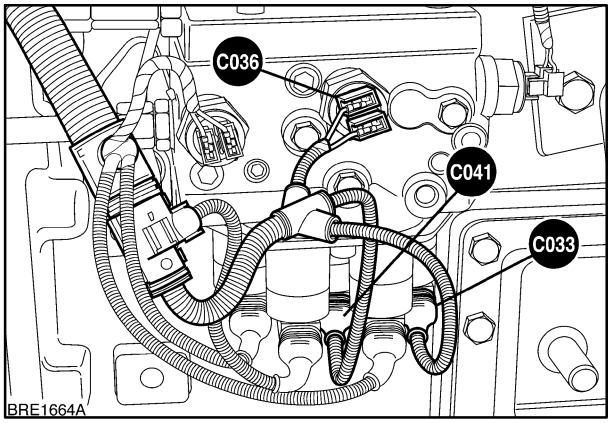
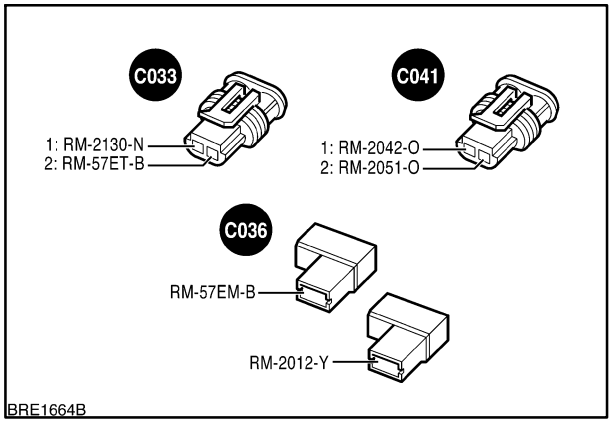
2: RM-7845-K
C026
1: RM-7830-K
2: RM-7835-K
C027
1: RM-7820-K
2: RM-7825-K
C028
1: RM-7810-K
2: RM-7815-K
BRE1638B

9


C036
C041
C033
BRE1664A

7


C033
1: RM-2130-N
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C041
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2: RM-2051-O
C036
RM-57EM-B
RM-2012-Y
BRE1664B

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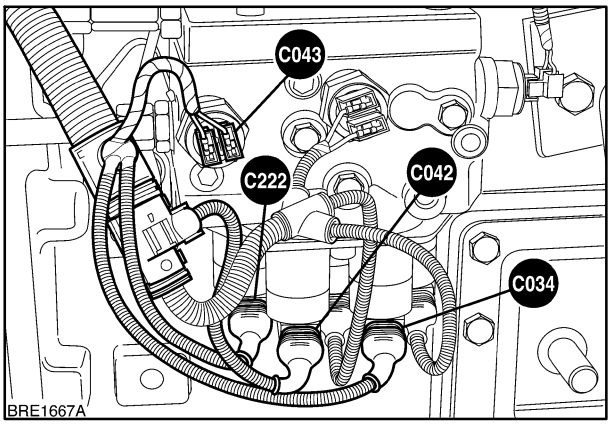

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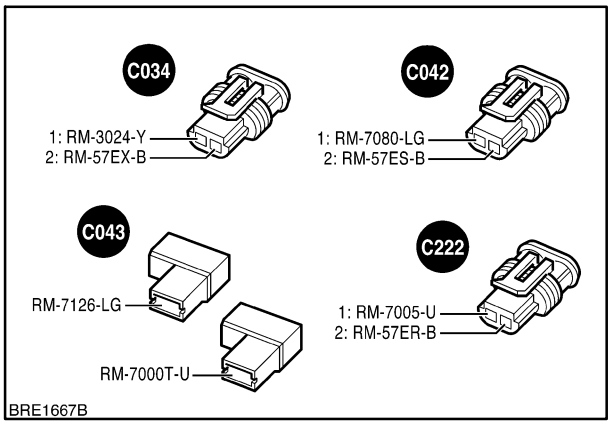

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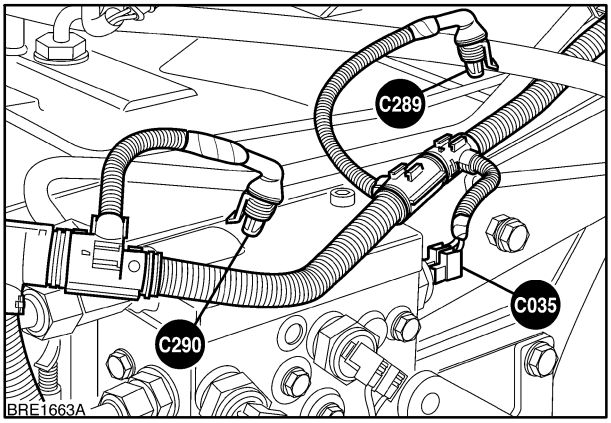

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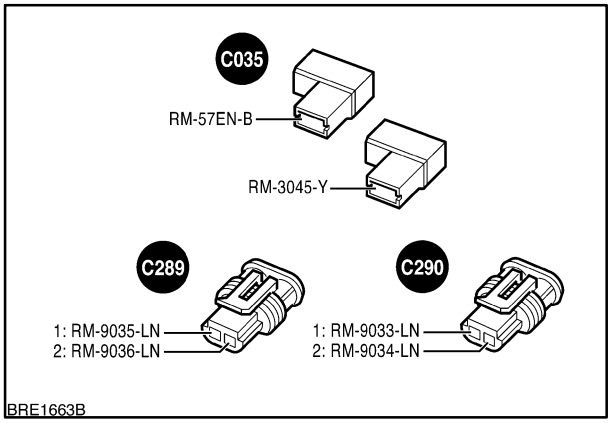

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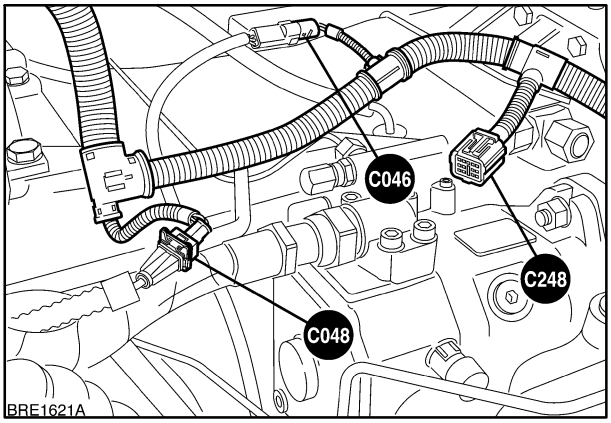

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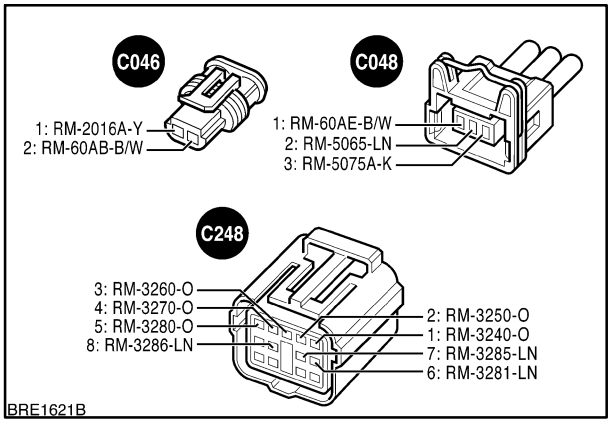

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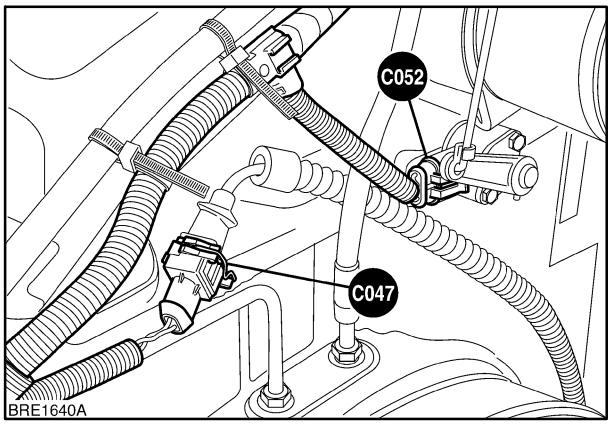

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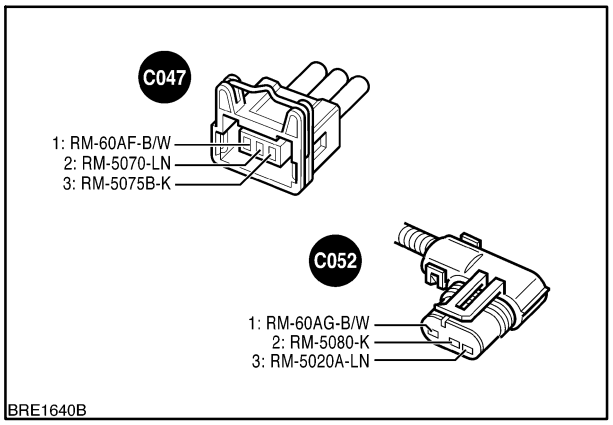

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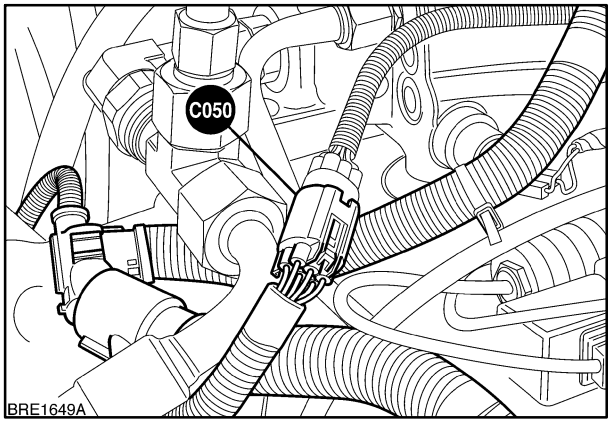

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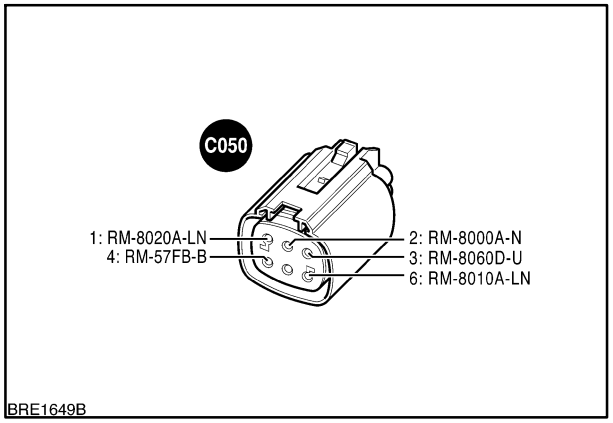

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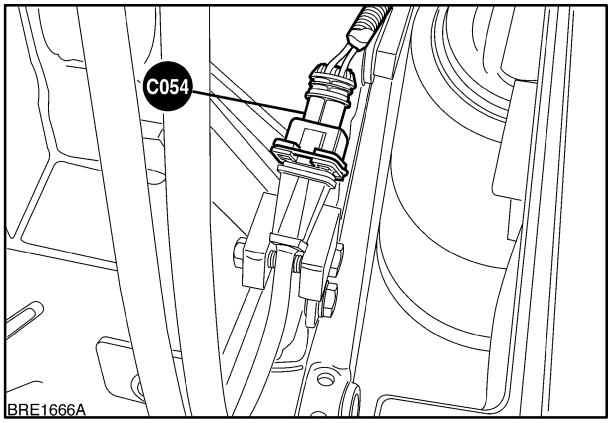

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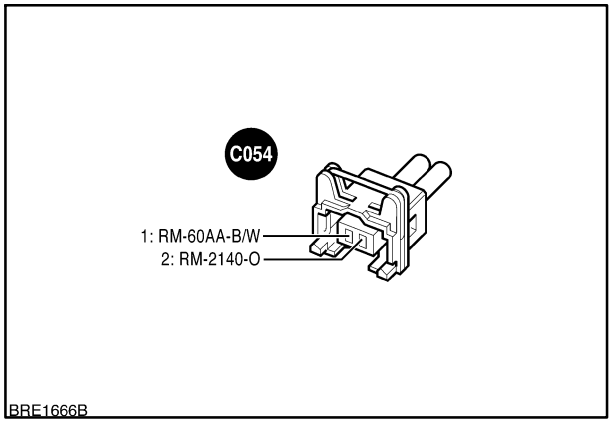

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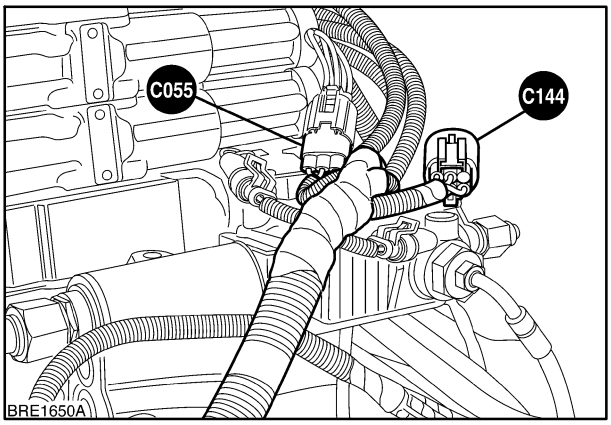

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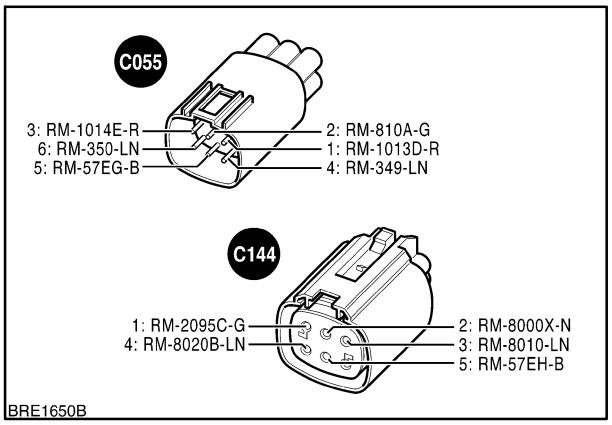

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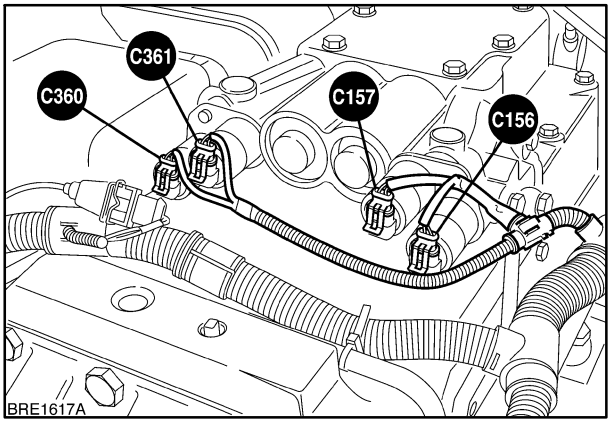

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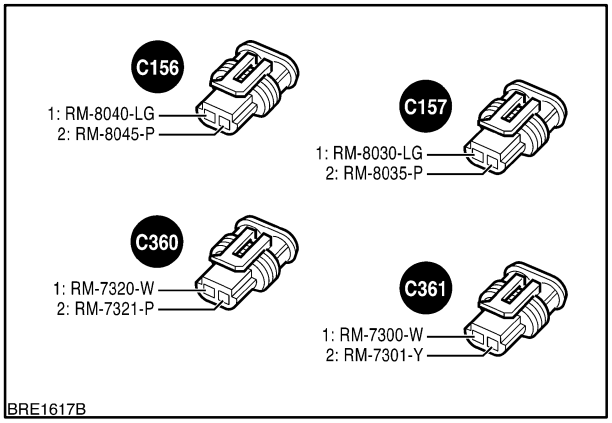

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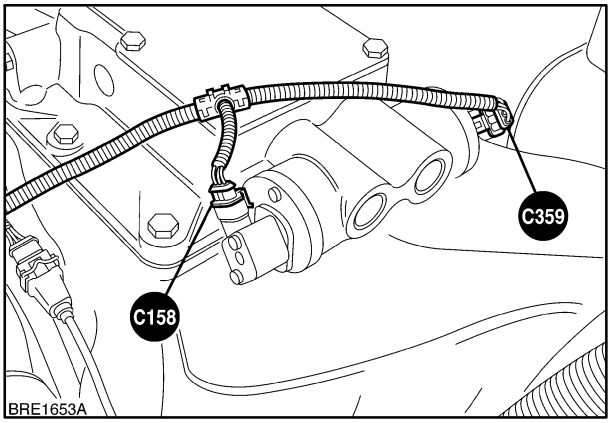

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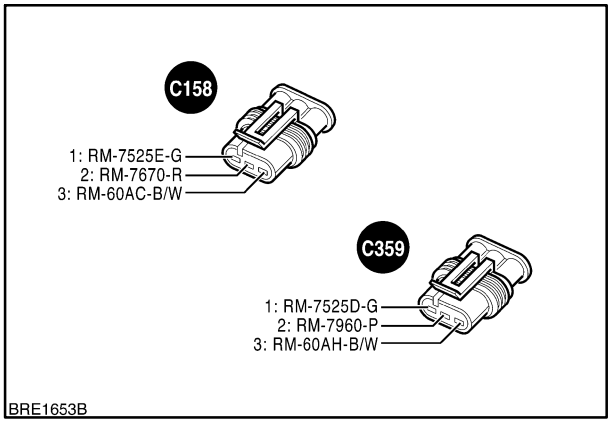

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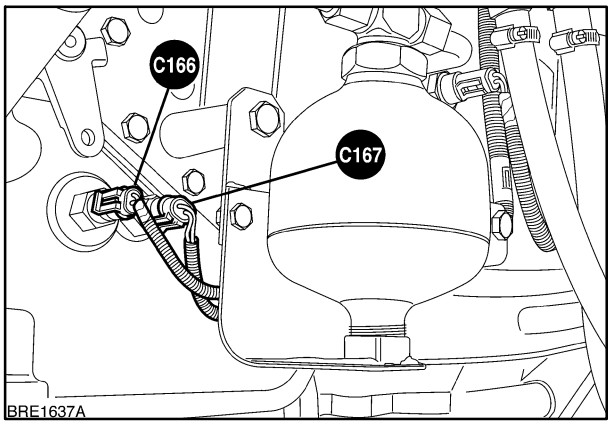

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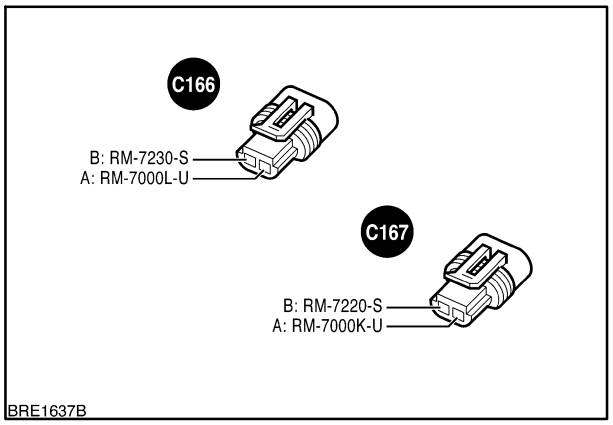

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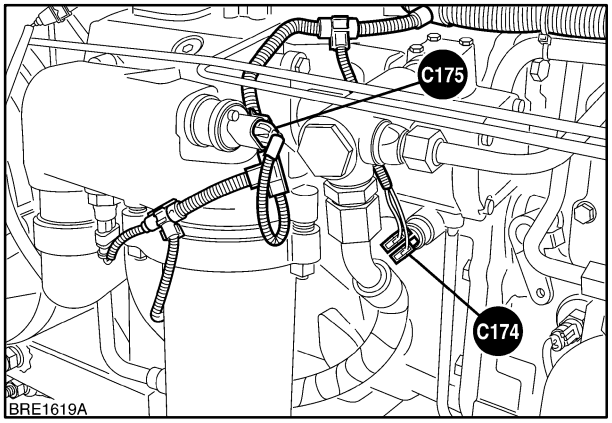

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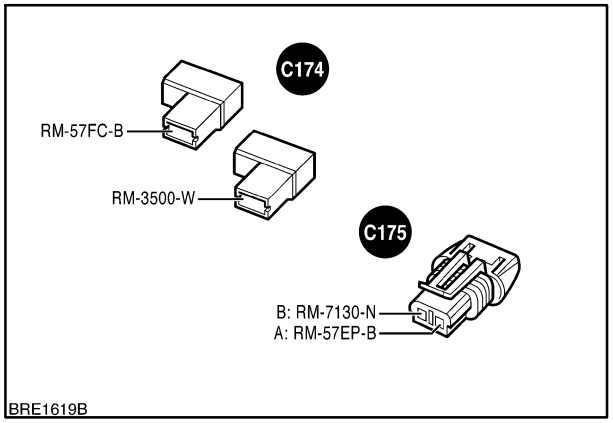

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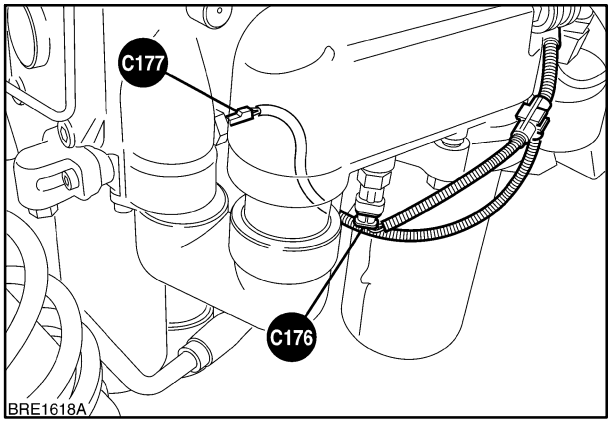

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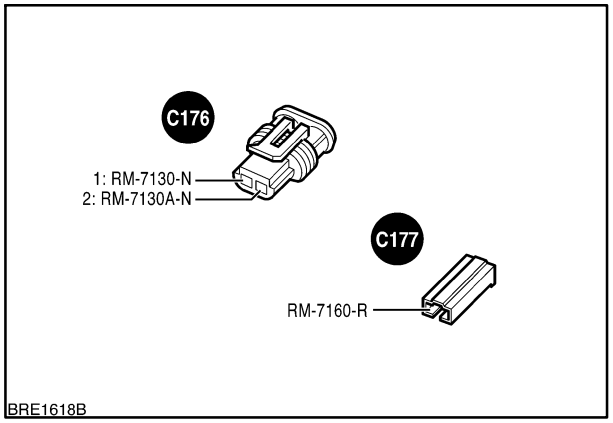

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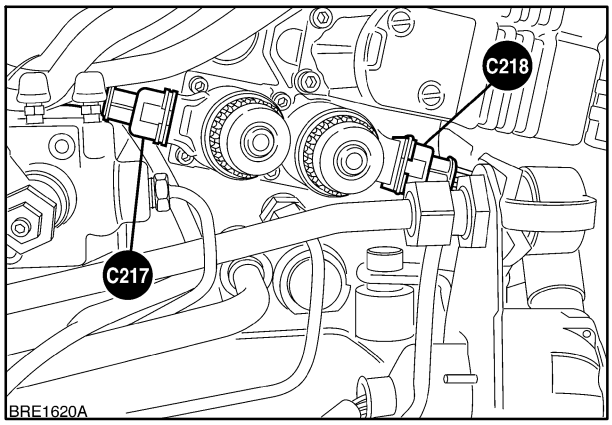

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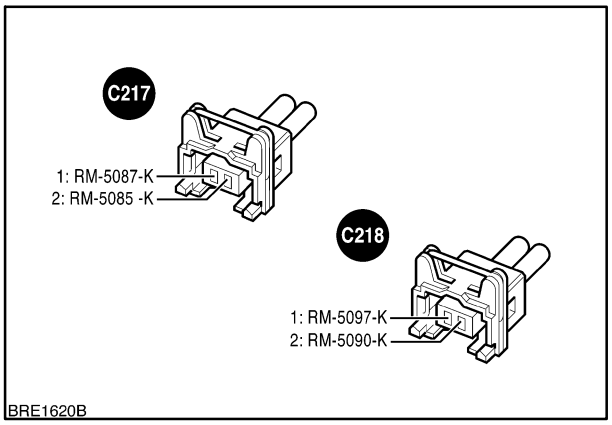

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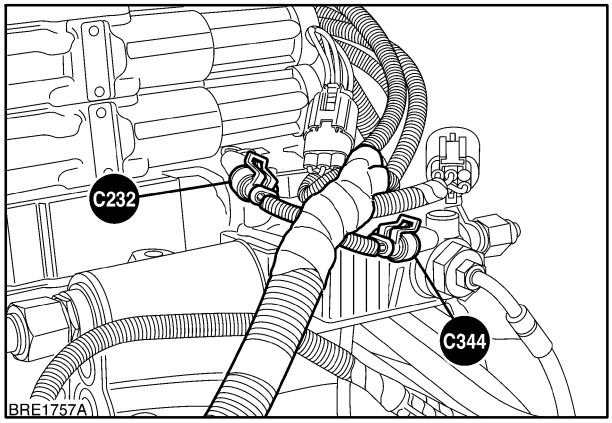

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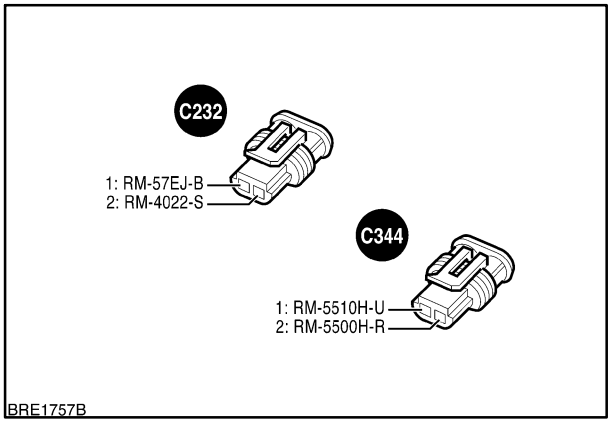

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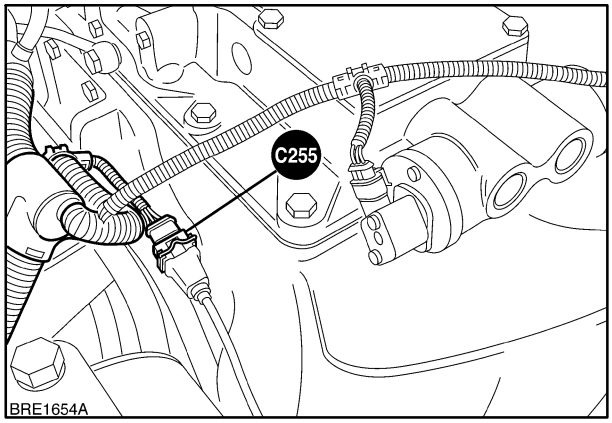

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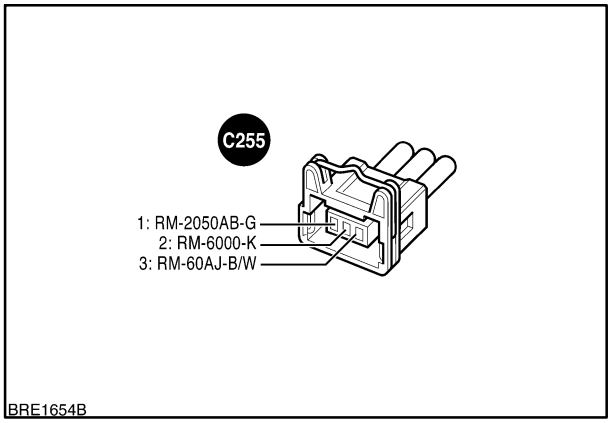

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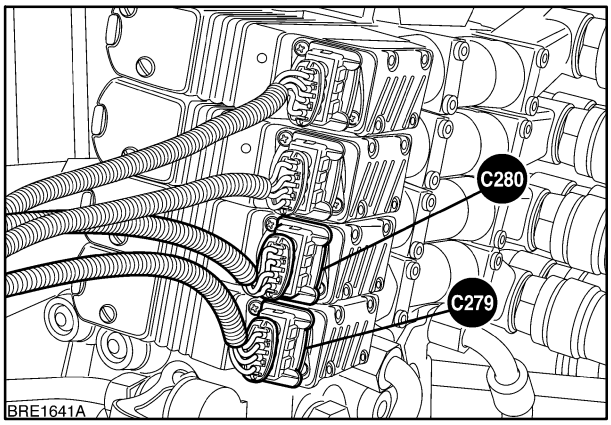

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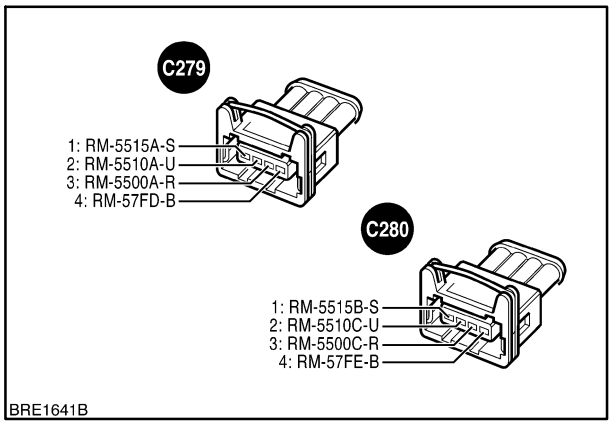

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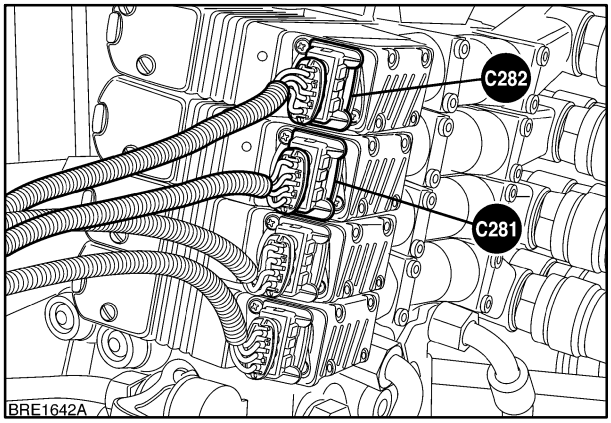

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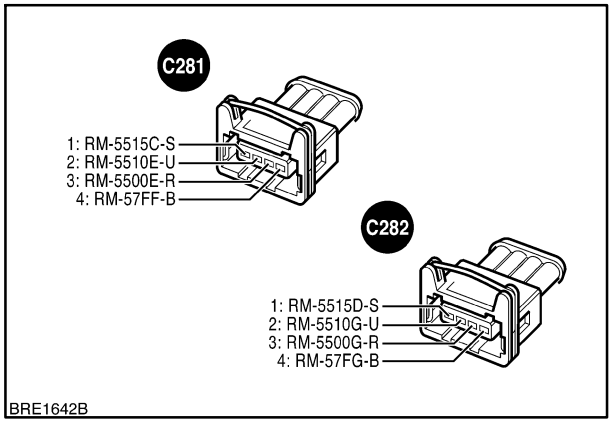

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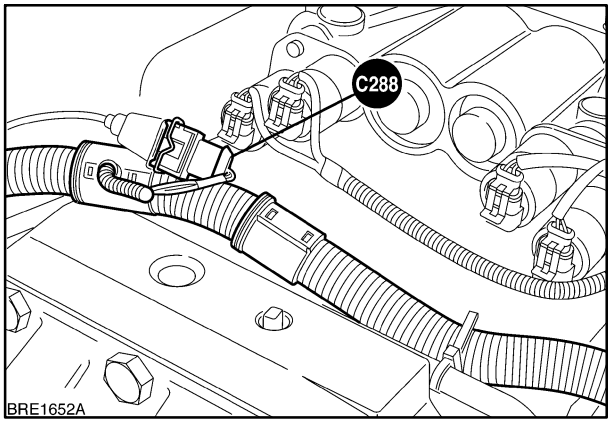

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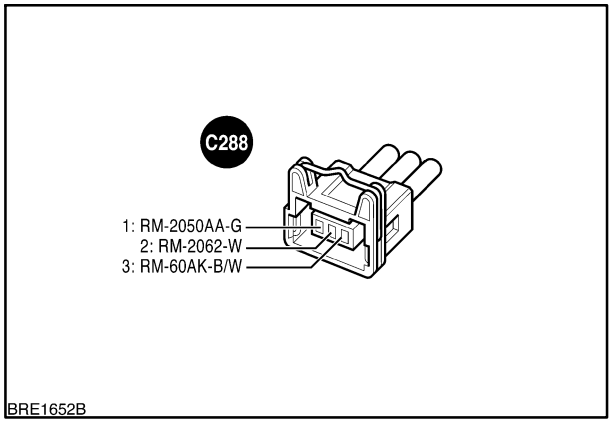

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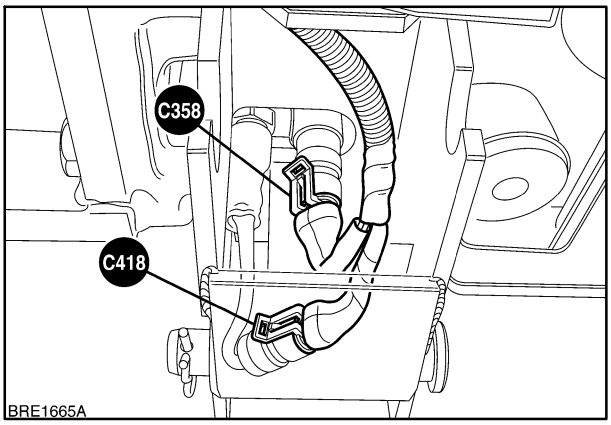
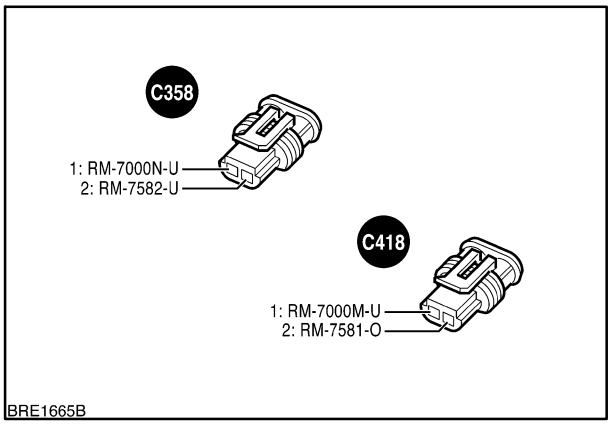
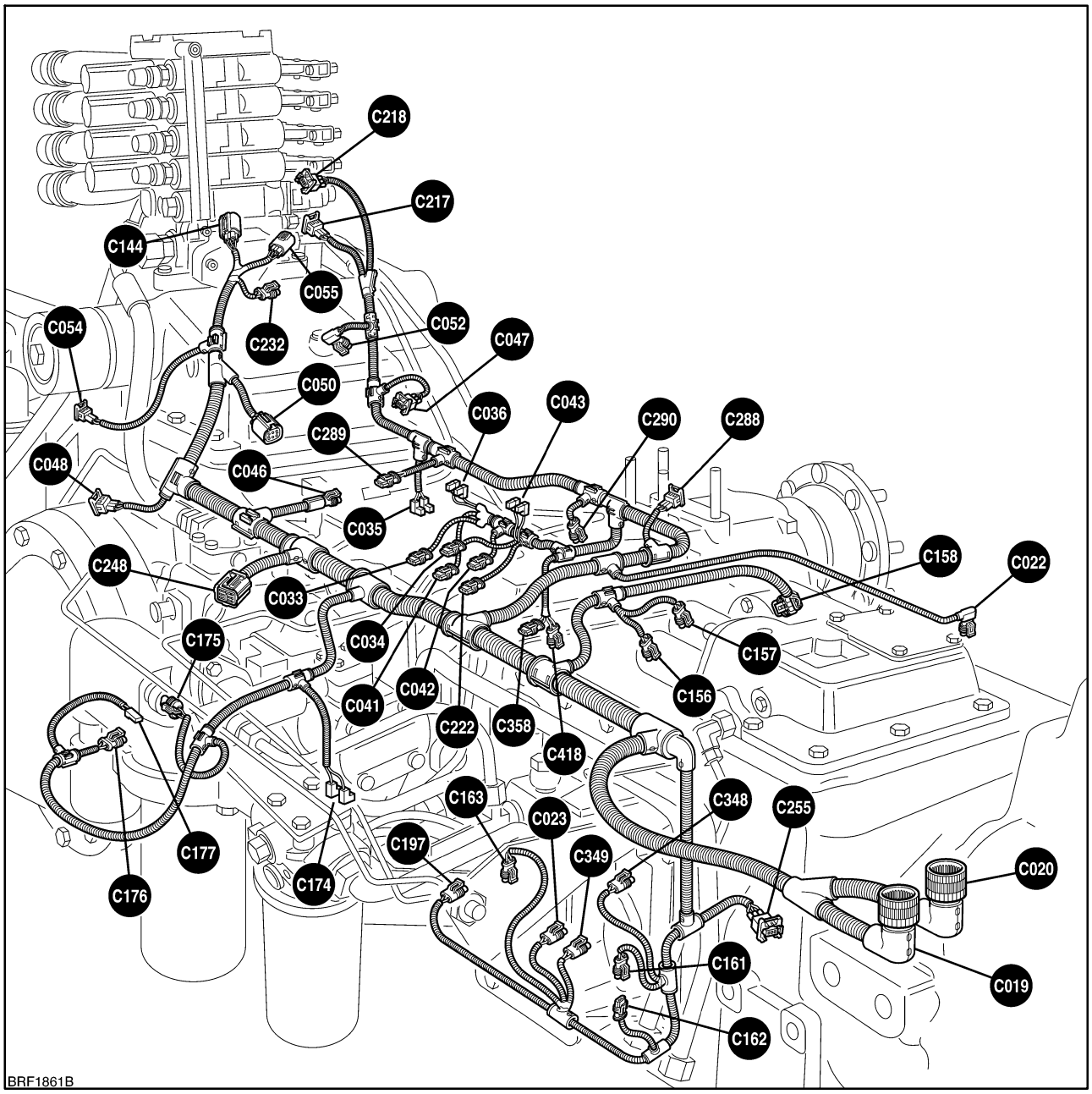

C358
C418
BRE1665A

47


C358
1: RM-7000N-U
2: RM-7582-U
C418
1: RM-7000M-U
2: RM-7581-O
BRE1665B

48

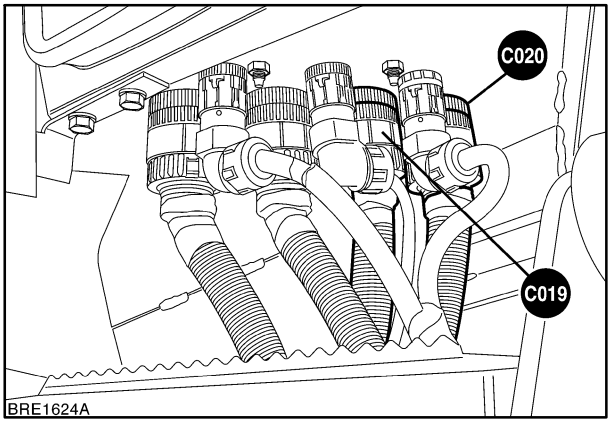
TRANSMISSION HARNESS - 24 X 24



TRANSMISSION HARNESS - 24 X 24 CONNECTORS

1. **C019** Chassis to Cab Main Connector T1 F
   (Location Fig 1, Connector Fig 2)
2. **C020** Chassis to Cab Main Connector T2 F
   (Location Fig 1, Connector Fig 2)
3. **C022** Fuel Tank Sender
   (Location Fig 3, Connector Fig 4)
4. **C023** Transmission Oil Temperature Sensor
   (Location Fig 5, Connector Fig 9)
5. **C033** PTO Brake Solenoid
   (Location Fig 6, Connector Fig 10)
6. **C034** Four Wheel Drive Solenoid
   (Location Fig 7, Connector Fig 11)
7. **C035** MFD Pressure Switch
   (Location Fig 8, Connector Fig 12)
8. **C036** Transmission Oil Pressure Switch
   (Location Fig 6, Connector Fig 10)
9. **C041** PTO Solenoid
   (Location Fig 6, Connector Fig 10)
10. **C042** Differential Lock Solenoid
    (Location Fig 7, Connector Fig 11)
11. **C043** Differential Lock Pressure Switch
    (Location Fig 7, Connector Fig 11)
12. **C046** Speed Sensor
    (Location Fig 13, Connector Fig 17)
13. **C047** Left Hand Draft Sensing Pin
    (Location Fig 14, Connector Fig 18)
14. **C048** Right Hand Draft Sensing Pin
    (Location Fig 13, Connector Fig 17)
15. **C050** Trailer Brake Connector
    (Location Fig 15, Connector Fig 19)
16. **C052** Rockshaft Potentiometer
    (Location Fig 14, Connector Fig 18)
17. **C054** PTO Speed Sensor
    (Location Fig 16, Connector Fig 20)
18. **C055** Trailer Socket
    (Location Fig 21, Connector Fig 25)
19. **C144** Air Brakes Connector
    (Location Fig 21, Connector Fig 25)
20. **C156** Reverse Synchro Solenoid
    (Location Fig 22, Connector Fig 26)
21. **C157** Forward Synchro Solenoid
    (Location Fig 22, Connector Fig 26)
22. **C158** Synchro Position Potentiometer
    (Location Fig 22, Connector Fig 26)
23. **C161** Lo PWM Valve
    (Location Fig 23, Connector Fig 27)
24. **C162** Hi PWM Valve
    (Location Fig 23, Connector Fig 27)
25. **C163** Dump Solenoid
    (Location Fig 24, Connector Fig 28)
26. **C174** PAS Pressure Switch
    (Location Fig 29, Connector Fig 32)
27. **C175** Hydraulic Filter
    (Location Fig 29, Connector Fig 32)
28. **C176** Hydraulic Oil Temp Switch
    (Location Fig 30, Connector Fig 33)
29. **C177** Hydraulic Low Charge Switch
    (Location Fig 30, Connector Fig 33)
30. **C197** High/Medium Range Switch
    (Location Fig 24, Connector Fig 28)
31. **C217** EDC Raise Solenoid
    (Location Fig 31, Connector Fig 34)
32. **C218** EDC Lower Solenoid
    (Location Fig 31, Connector Fig 34)
33. **C222** Creeper Gear Solenoid
    (Location Fig 7, Connector Fig 11)
34. **C232** Reverse Alarm Connector
    (Location Fig 21, Connector Fig 25)
35. **C248** SFA Valves
    (Location Fig 13, Connector Fig 17)
36. **C255** Engine Flywheel Speed Sensor
    (Location Fig 35, Connector Fig 36)
37. **C288** Rear PTO Shaft Twist Sensor
    (Location Fig 37, Connector Fig 39)
38. **C289** 50kph Dump Solenoid
    (Location Fig 8, Connector Fig 12)
39. **C290** 50kph Gear Solenoid
    (Location Fig 8, Connector Fig 12)
40. **C348** Neutral Switch 3/4 Rail
    (Location Fig 35, Connector Fig 36)
41. **C349** Neutral Switch 1/2 Rail
    (Location Fig 5, Connector Fig 9)
42. **C358** Creeping Sensing Switch Rear
    (Location Fig 38, Connector Fig 40)
43. **C418** Creeping Sensing Switch Front
    (Location Fig 38, Connector Fig 40)

TRANSMISSION HARNESS – 24 X 24 CONNECTOR LOCATIONS



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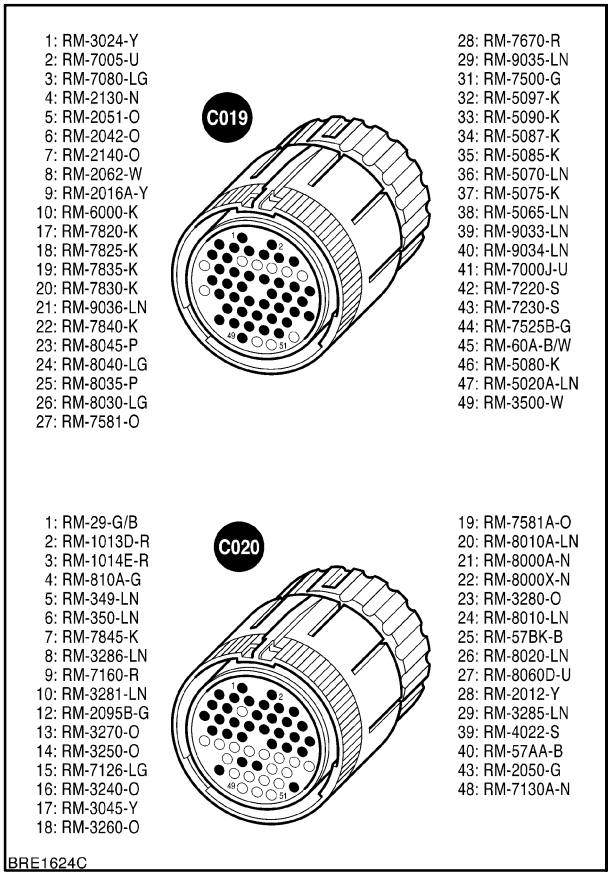

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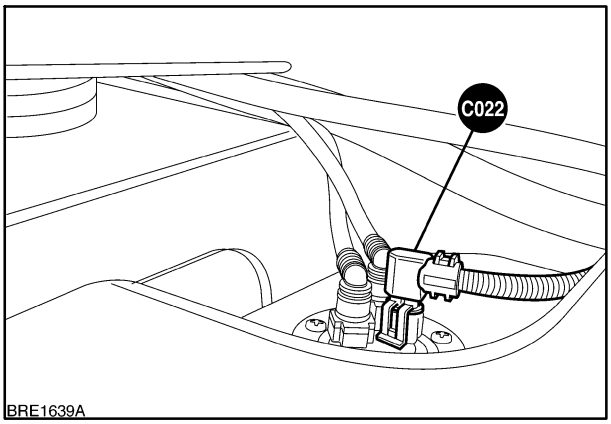

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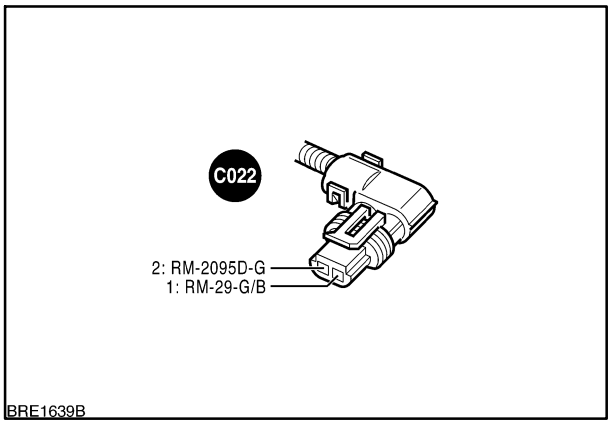

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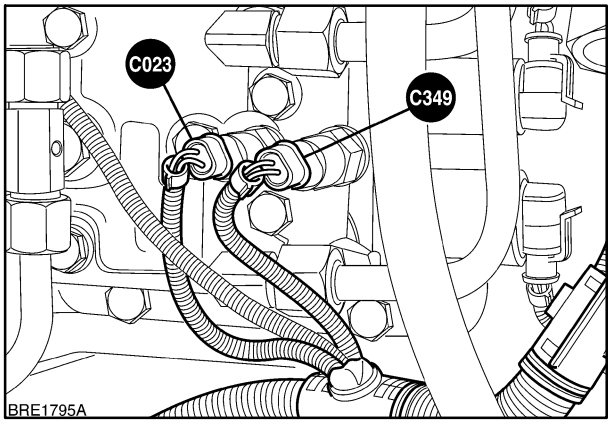
C023
C349
BRE1795A

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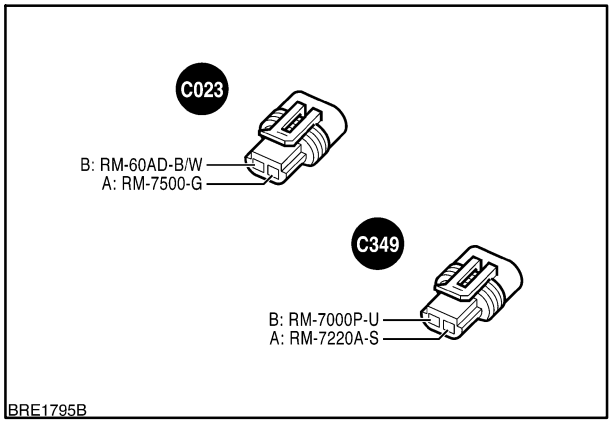
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A: RM-7500-G
C349
B: RM-7000P-U
A: RM-7220A-S
BRE1795B

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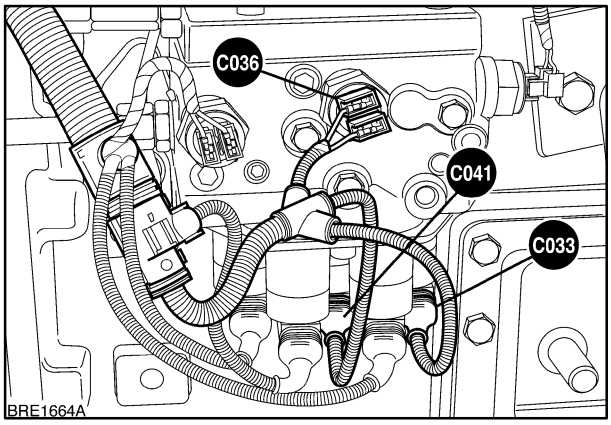
C036
C041
C033
BRE1664A

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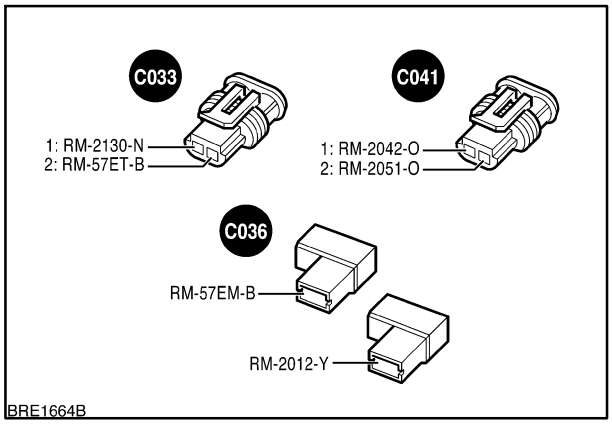
C033
1: RM-2130-N
2: RM-57ET-B
C041
1: RM-2042-O
2: RM-2051-O
C036
RM-57EM-B
RM-2012-Y
BRE1664B

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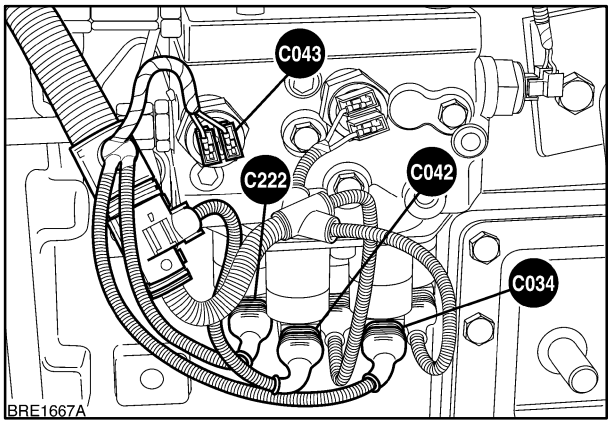
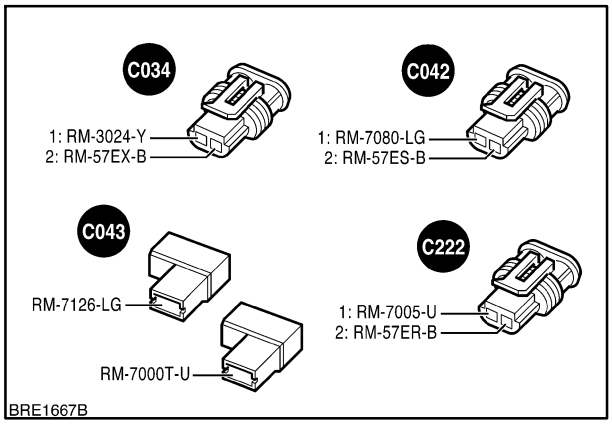

C043
C222
C042
C034
BRE1667A

7


C034
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2: RM-57EX-B
C042
1: RM-7080-LG
2: RM-57ES-B
C043
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RM-7000T-U
C222
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2: RM-57ER-B
BRE1667B

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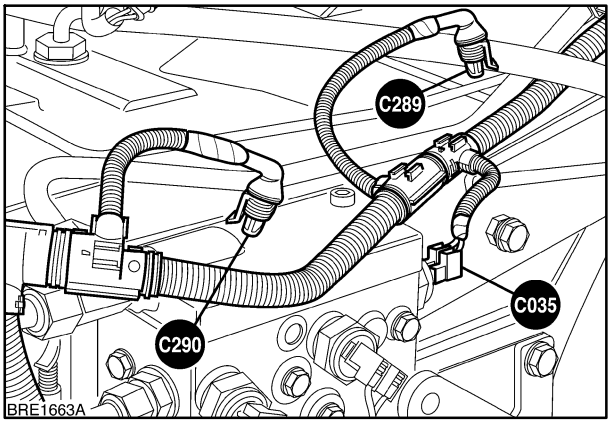

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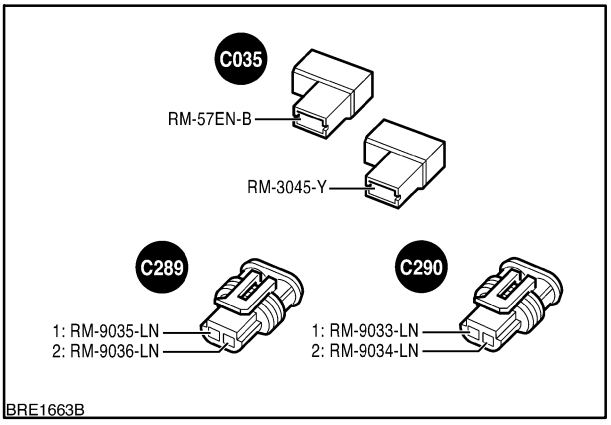

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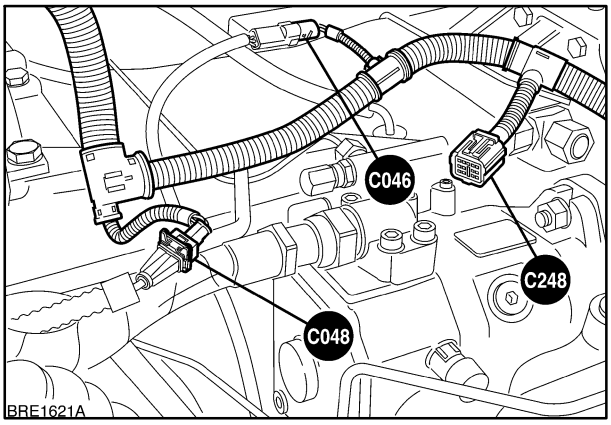

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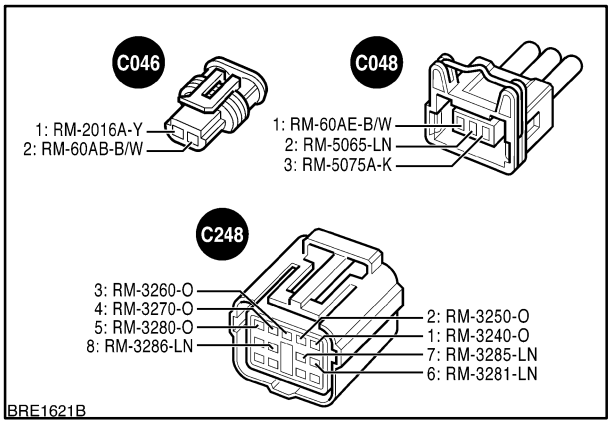

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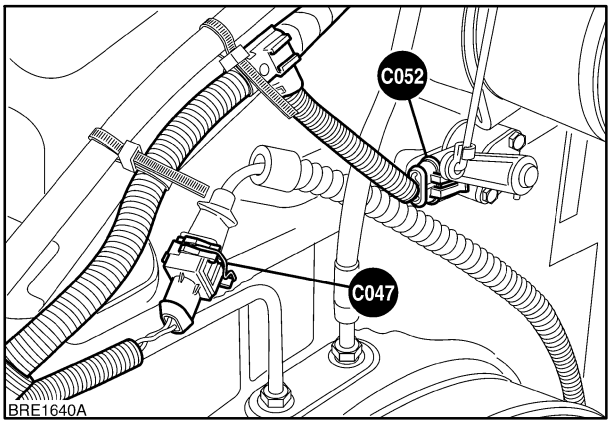

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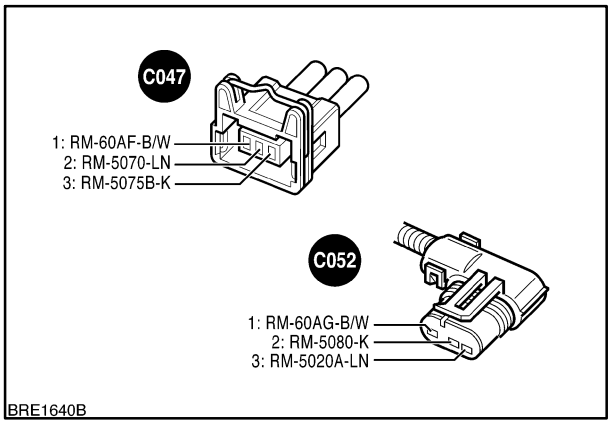

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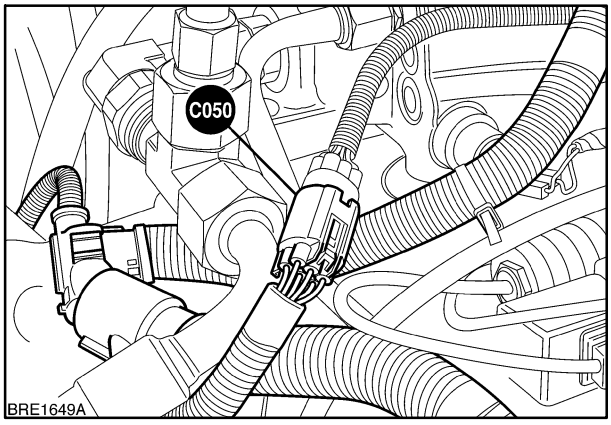

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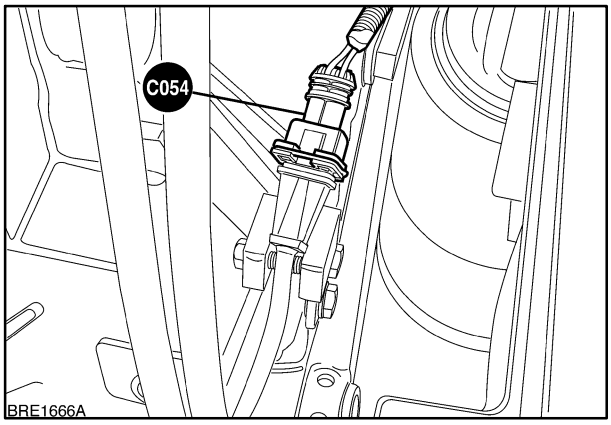

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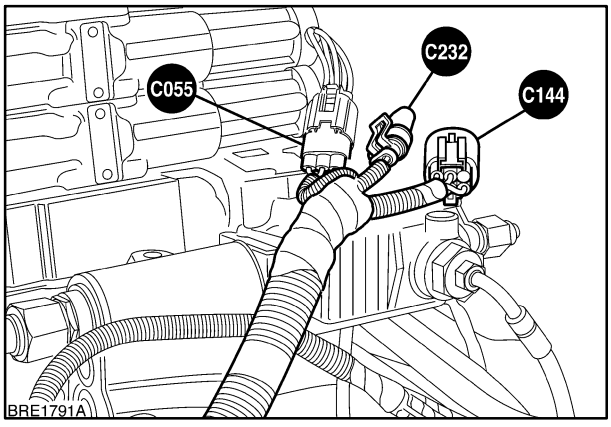

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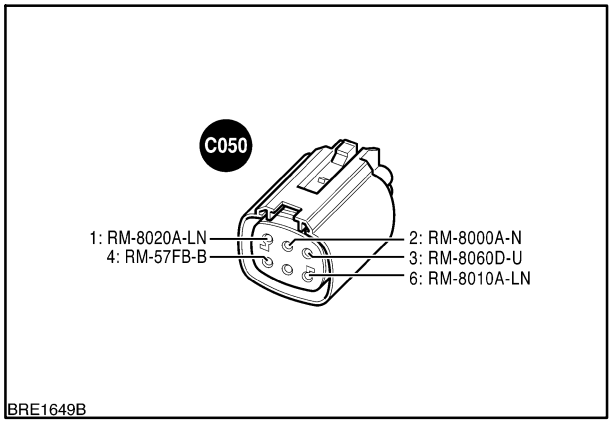

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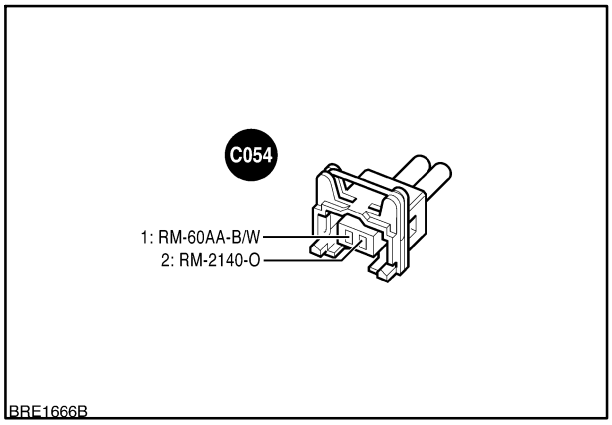

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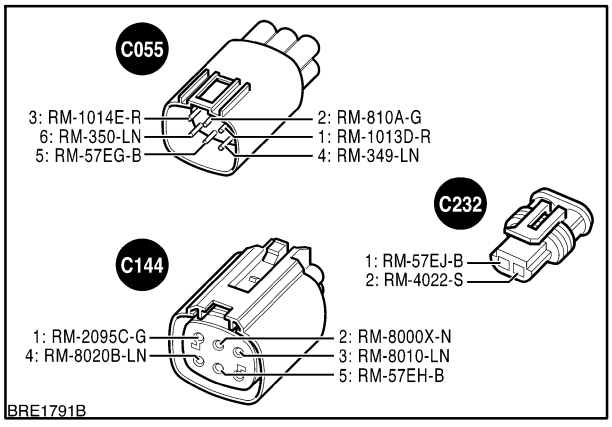

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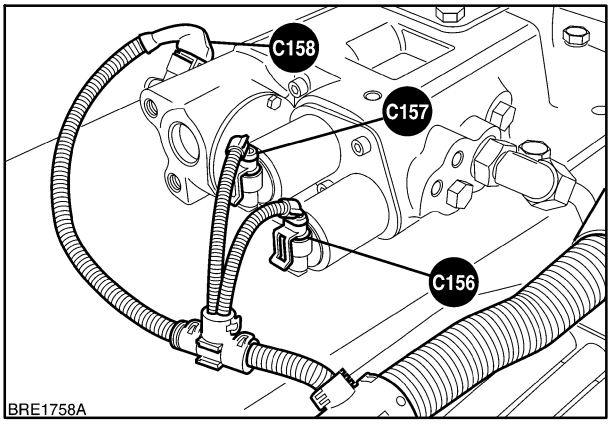

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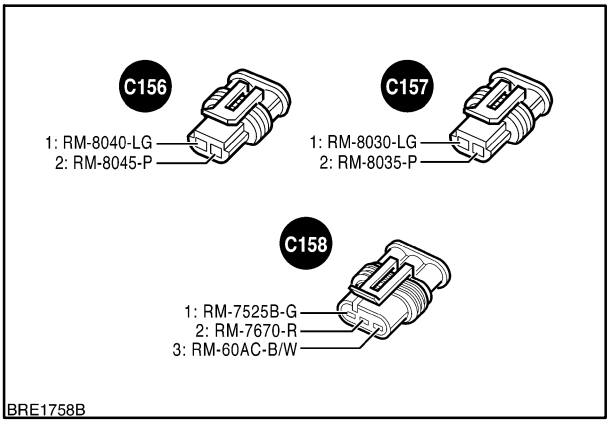

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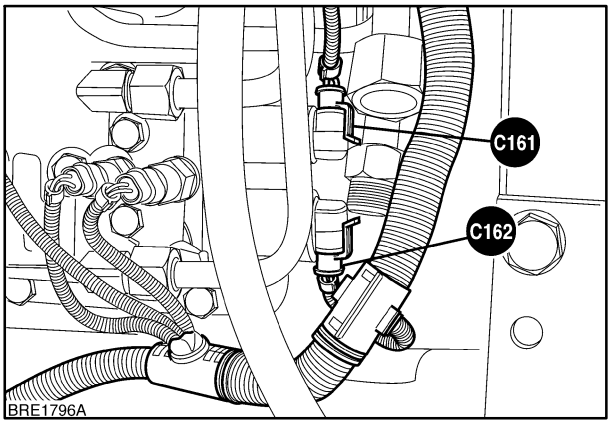

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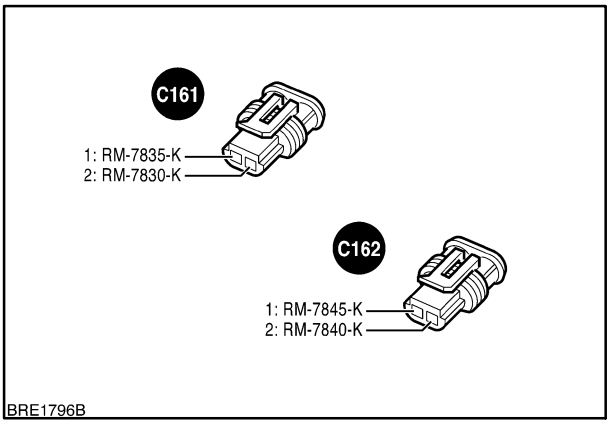

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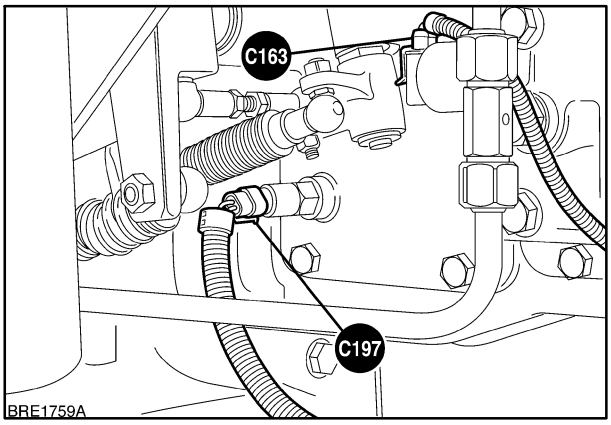

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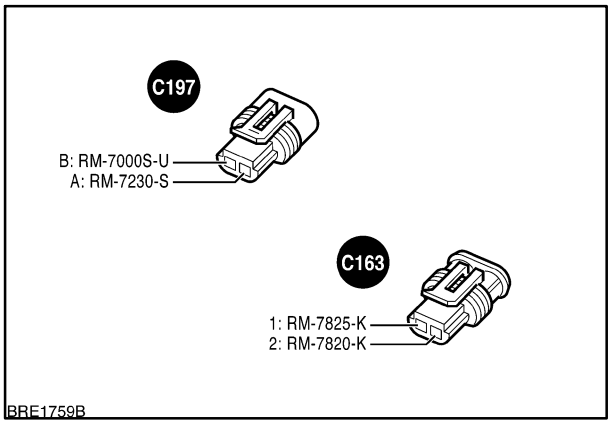

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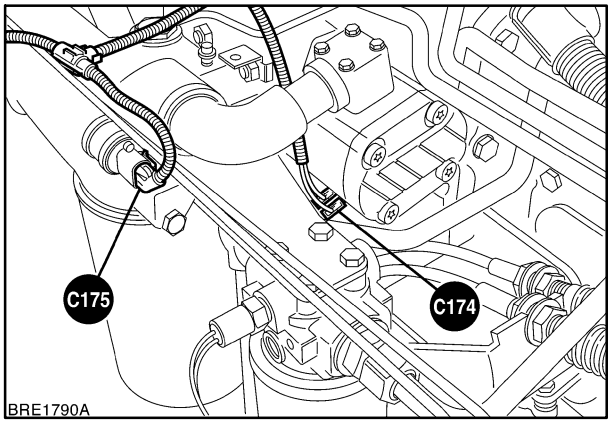

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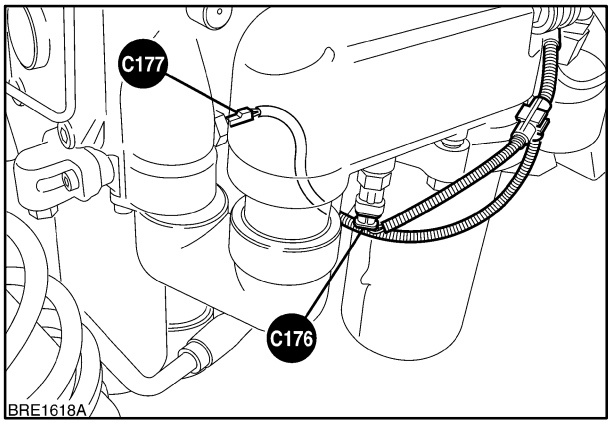

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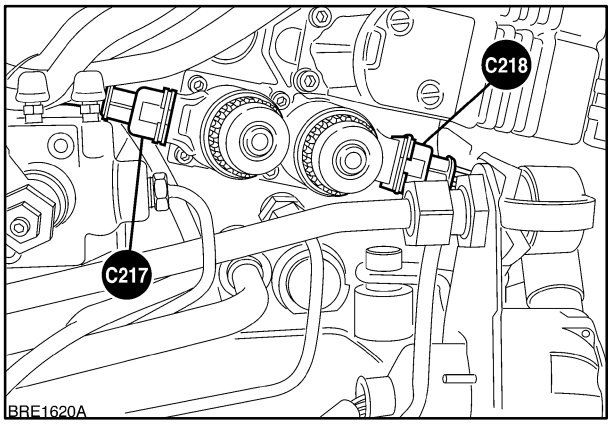

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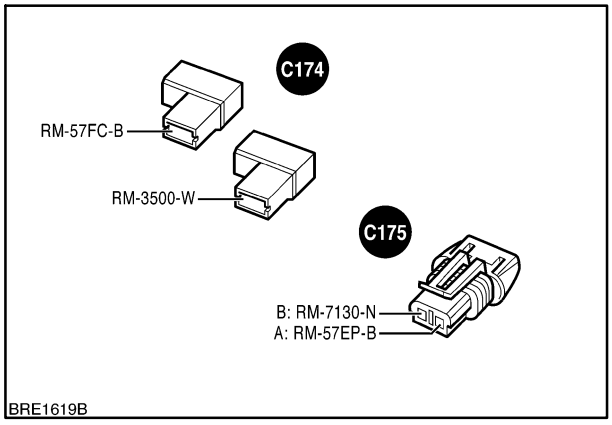

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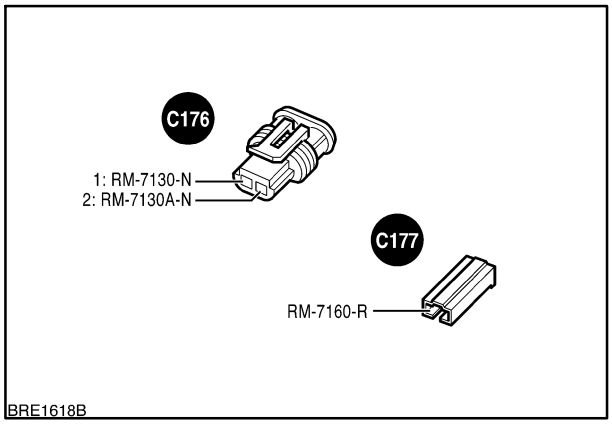

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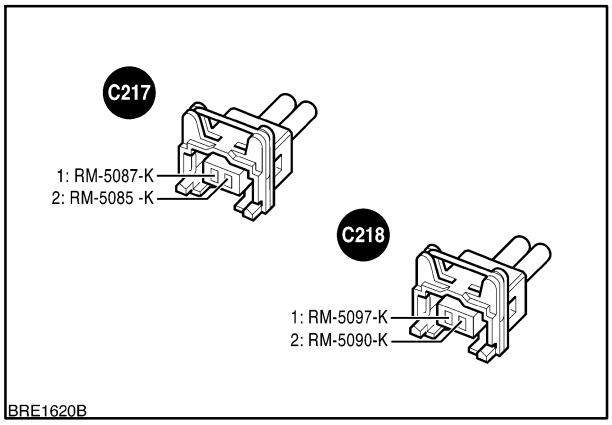

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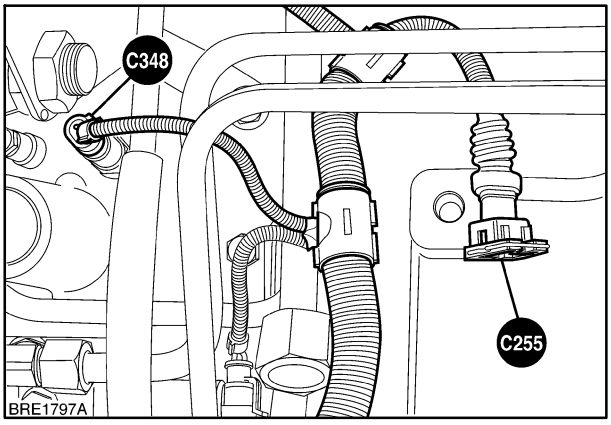

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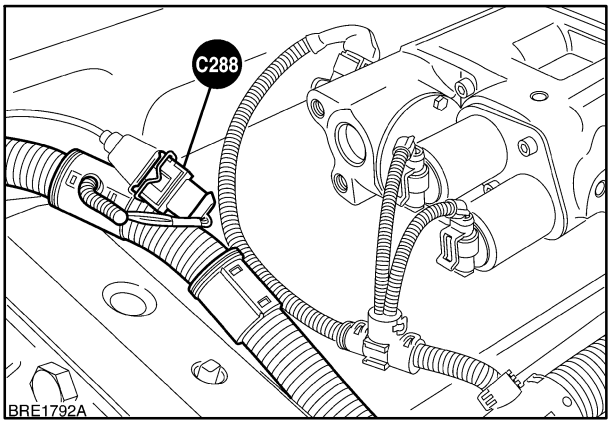

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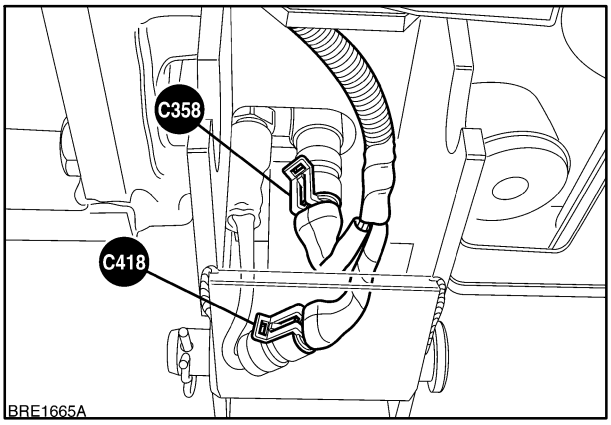

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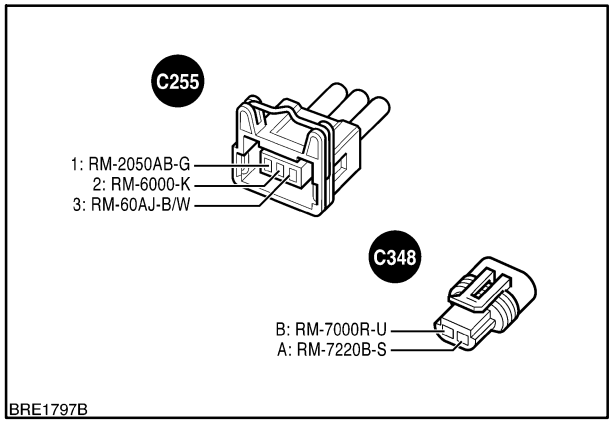

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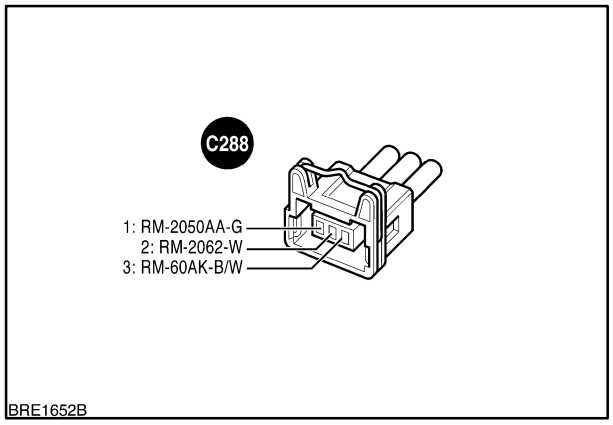

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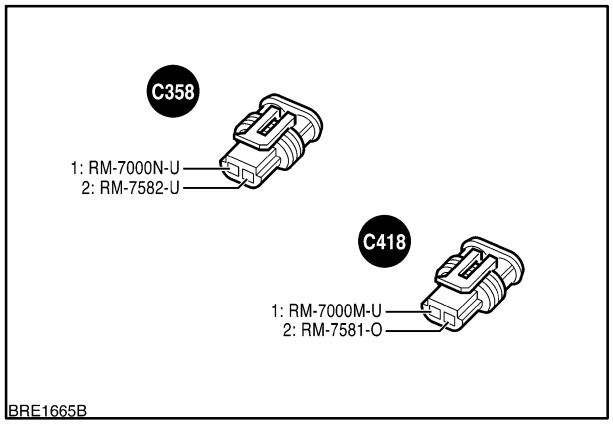
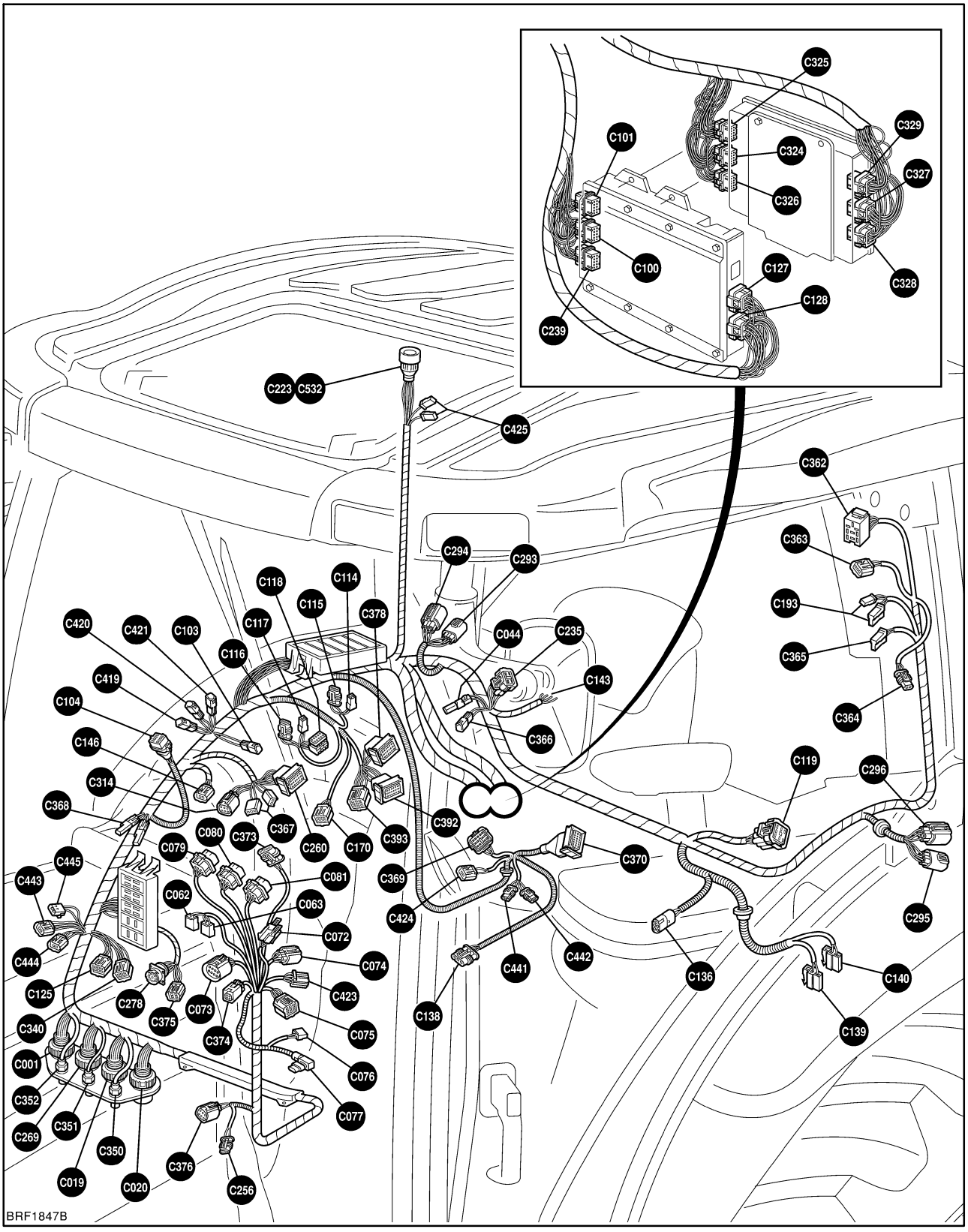


40

CAB HARNESS – 16 x 16 & 24 x 24

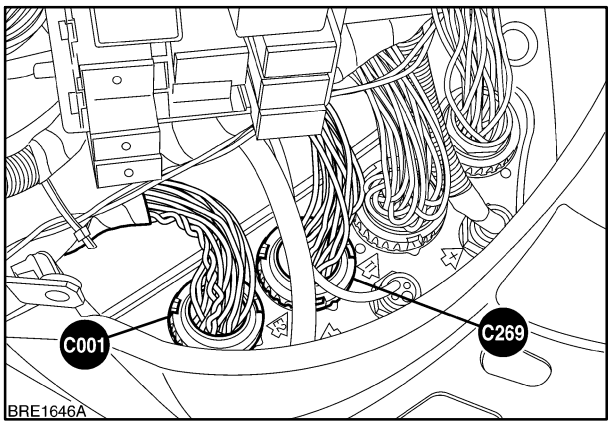


CAB MAIN HARNESS - 16X16 AND 24X24 CONNECTORS

1. **C001** Cab to Engine Main Connector E1
   (Location Fig 1, Connector Fig 2)
2. **C019** Cab to Transmission Main Connector T1
   (Location Fig 7, Connector Fig 8)
3. **C020** Cab to Transmission Main Connector T2
   (Location Fig 7, Connector Fig 8)
4. **C044** Ground Speed PTO Switch
   (Location Fig 3, Connector Fig 5)
5. **C062** Right Hand Stop Lamp Switch
   (Location Fig 4, Connector Fig 6)
6. **C063** Left Hand Stop Lamp Switch
   (Location Fig 4, Connector Fig 6)
7. **C072** Key Start Switch
   (Location Fig 9, Connector Fig 10)
8. **C073** Front & Rear Windshield Wiper Switch
   (Location Fig 11, Connector Fig 15)
9. **C074** Turn Switch
   (Location Fig 11, Connector Fig 15)
10. **C075** ShuttleLever Switch
    (Location Fig 12, Connector Fig 16)
11. **C076** Clutch Pedal Switch
    (Location Fig 13, Connector Fig 17)
12. **C077** Clutch Pedal Potentiometer
    (Location Fig 13, Connector Fig 17)
13. **C079** Instrument Cluster "A"
    (Location Fig 19, Connector Fig 20)
14. **C080** Instrument Cluster "B"
    (Location Fig 19, Connector Fig 20)
15. **C081** Instrument Cluster "C"
    (Location Fig 19, Connector Fig 20)
16. **C100** TCM - Transmission Control Module (CN1a)
    (Location Fig 25, Connector Fig 26)
17. **C101** TCM - Transmission Control Module (CN1b)
    (Location Fig 25, Connector Fig 26)
18. **C103** Gear Shift Connector
    (Location Fig 14, Connector Fig 18)
19. **C104** Gear Shift Indicator
    (Location Fig 21, Connector Fig 23)
20. **C114** Front PTO Engaged Lamp
    (Location Fig 22, Connector Fig 24)
21. **C115** Front PTO Switch
    (Location Fig 27, Connector Fig 28)
22. **C116** Rear PTO Switch
    (Location Fig 27, Connector Fig 28)
23. **C117** Rear PTO Lamp
    (Location Fig 22, Connector Fig 24)
24. **C118** Rear PTO Brake Switch
    (Location Fig 31, Connector Fig 33)
25. **C119** Heater / Air Conditioning Connector
    (Location Fig 32, Connector Fig 34)
26. **C125** Transmission Diagnostics (TCM)
    (Location Fig 35, Connector Fig 38)
27. **C127** TCM - Transmission Control Module (CN3a)
    (Location Fig 29, Connector Fig 30)
28. **C128** TCM - Transmission Control Module (CN3b)
    (Location Fig 29, Connector Fig 30)
29. **C136** Hand Brake Switch
    (Location Fig 36, Connector Fig 39)
30. **C138** Seat Air Pump
    (Location Fig 37, Connector Fig 40)
31. **C139** Front Washer Motor
    (Location Fig 41, Connector Fig 42)
32. **C140** Rear Washer Motor
    (Location Fig 41, Connector Fig 42)
33. **C143** Rear Implement Connector
    (Location Fig 44, Connector Fig 47)
34. **C146** Lift-O-matic
    (Location Fig 43, Connector Fig 46)
35. **C170** Front HPL Limit Pot
    (Location Fig 45, Connector Fig 48)
36. **C193** Cigar Lighter
    (Location Fig 49, Connector Fig 50)
37. **C223** Cab to Roof Harness
    (Location Fig 51, Connector Fig 54)
38. **C235** 30 Amp Socket & Power Studs
    (Location Fig 52, Connector Fig 55)
39. **C239** TCM - Transmission Control Module (CN2)
    (Location Fig 25, Connector Fig 26)
40. **C256** Foot Throttle Mechanical
    (Location Fig 53, Connector Fig 56)
41. **C260** Indicator Flasher Unit
    (Location Fig 57, Connector Fig 58)
42. **C269** Cab to Engine Main Connector E2
    (Location Fig 1, Connector Fig 2)
43. **C278** Diagnostics Connector
    (Location Fig 59, Connector Fig 62)
44. **C293** RH Fender 2
    (Location Fig 61, Connector Fig 64)
45. **C294** RH Fender 1
    (Location Fig 61, Connector Fig 64)
46. **C295** LH Fender 1
    (Location Fig 65, Connector Fig 66)
47. **C296** LH Fender 2
    (Location Fig 65, Connector Fig 66)
48. **C314** Hand Throttle
    (Location Fig 14, Connector Fig 18)
49. **C324** ACU - Auxilliary Control Module (CN1a)
    (Location Fig 67, Connector Fig 68)
50. **C325** ACU - Auxilliary Control Module (CN1b)
    (Location Fig 67, Connector Fig 68)
51. **C326** ACU - Auxilliary Control Module (CN2)
    (Location Fig 67, Connector Fig 68)
52. **C327** ACU - Auxilliary Control Module (CN3a)
    (Location Fig 69, Connector Fig 70)
53. **C328** ACU - Auxilliary Control Module (CN3b)
    (Location Fig 69, Connector Fig 70)
54. **C329** ACU - Auxilliary Control Module (CN4)
    (Location Fig 69, Connector Fig 70)
55. **C340** Auxilliary ECU Diagnostics (ACU)
    (Location Fig 60, Connector Fig 63)
56. **C350** 1 Power B+ Connector
    (Location Fig 71, Connector Fig 74)
57. **C351** 2 Power E Connector
    (Location Fig 71, Connector Fig 74)
58. **C352** 3 Power B- Connector
    (Location Fig 71, Connector Fig 74)
59. **C362** Heater Blower Switch
    (Location Fig 72, Connector Fig 75)
60. **C363** Air Conditioning Switch
    (Location Fig 73, Connector Fig 76)

61. **C364** HVAC Switch
(Location Fig 49, Connector Fig 50)
62. **C365** 8 Amp Socket
(Location Fig 49, Connector Fig 50)
63. **C366** Radar Socket Connector
(Location Fig 3, Connector Fig 5)
64. **C367** Grid Heater
(Location Fig 43, Connector Fig 46)
65. **C368** Diode Connectors
(Location Fig 77, Connector Fig 78)
66. **C369** Joystick Loader Control
(Location Fig 79, Connector Fig 83)
67. **C370** Command Arm
(Location Fig 80, Connector Fig 84)
68. **C373** Instrument Cluster Keypad
(Location Fig 81, Connector Fig 85)
69. **C374** Hazard Switch Harness
(Location Fig 9, Connector Fig 10)
70. **C375** ADIC Diagnostic Connector
(Location Fig 59, Connector Fig 62)
71. **C376** Foot Throttle Electronic
(Location Fig 53, Connector Fig 56)
72. **C378** Cab to Switch Harness Connector
(Location Fig 82, Connector Fig 86)
73. **C392** Cab to EHR Harness Connector 1
(Location Fig 87, Connector Fig 88)
74. **C393** Cab to EHR Harness Connector 2
(Location Fig 87, Connector Fig 88)
75. **C424** Loader Power Connector
(Location Fig 89, Connector Fig 91)
76. **C425** Auxillary Headlamp Switch
(Location Fig 90, Connector Fig 92)
77. **C441** Loader Valve No.1
(Location Fig 89, Connector Fig 91)
78. **C442** Loader Valve No.2
(Location Fig 89, Connector Fig 91)
79. **C423** Brake Pedals latched Connector
(Location Fig 12, Connector Fig 16)
80. **C443** EHR Can Connector
(Location Fig 93, Connector Fig 94)
81. **C444** Trans Can Connector
(Location Fig 93, Connector Fig 94)
82. **C445** Select Can Diagnostic Connector
(Location Fig 93, Connector Fig 94)
83. **C532** Cab to Roof Harness (after 06-2005)
(Location Fig 95, Connector Fig 96)

CAB MAIN HARNESS - 16 X 16 & 24 X 24 CONNECTOR LOCATIONS



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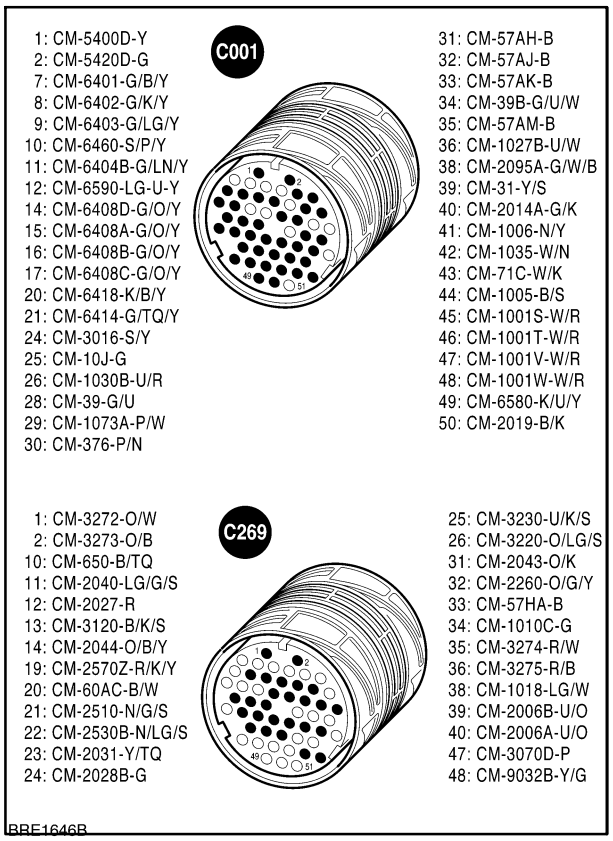

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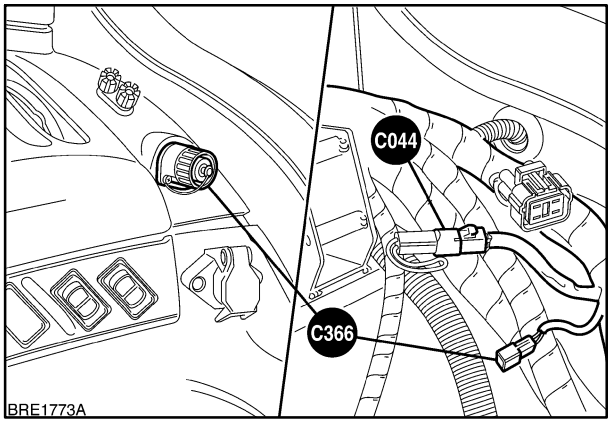

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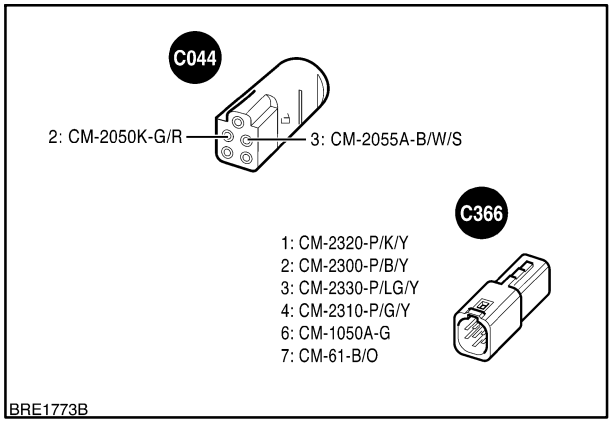

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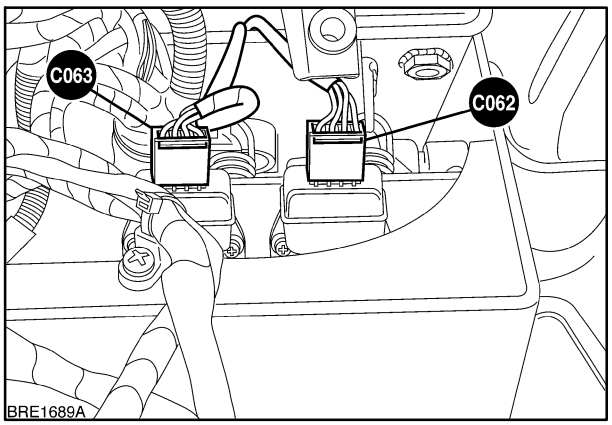

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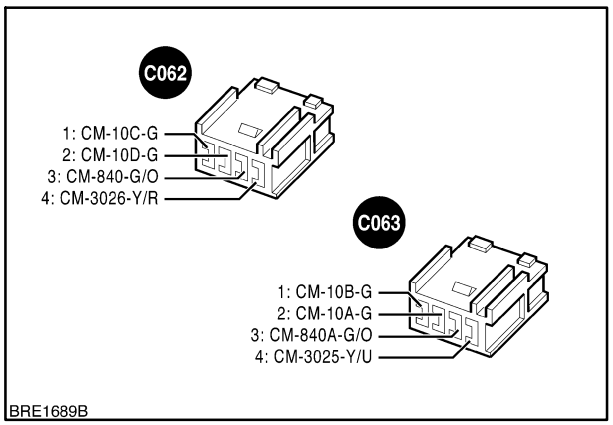

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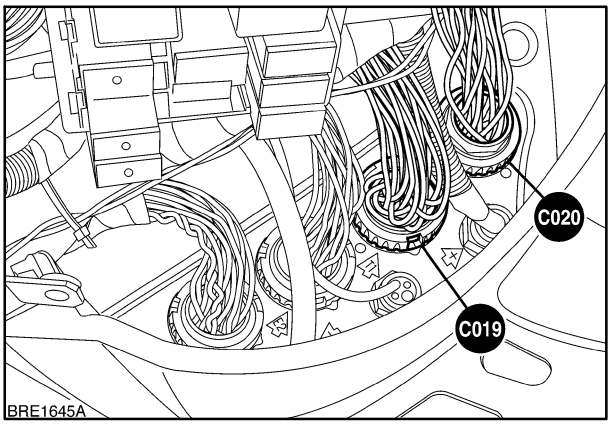
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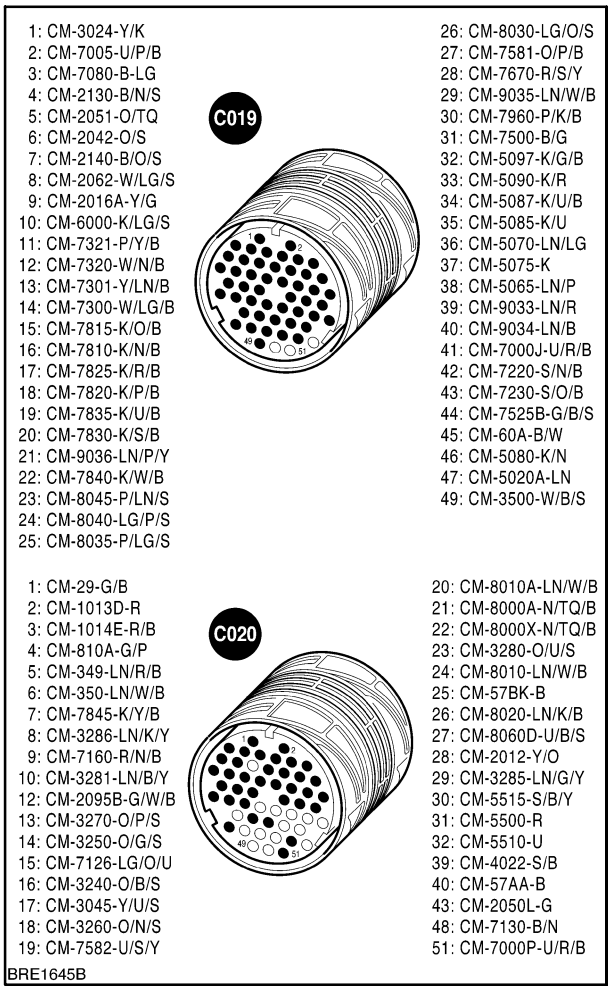
C019
BRE1645A

7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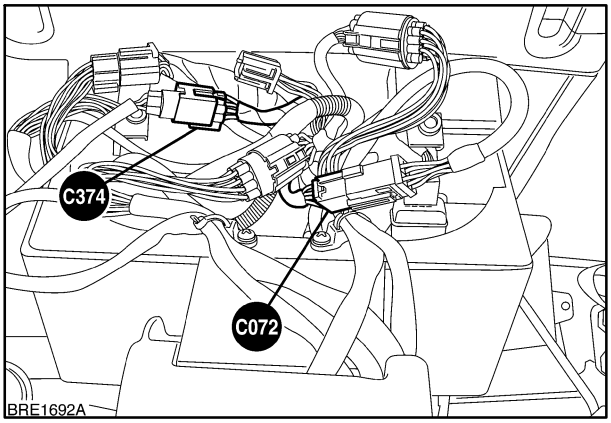
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
C019
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
C020
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
30: CM-5515-S/B/Y
31: CM-5500-R
32: CM-5510-U
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B
BRE1645B

8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C072
BRE1692A

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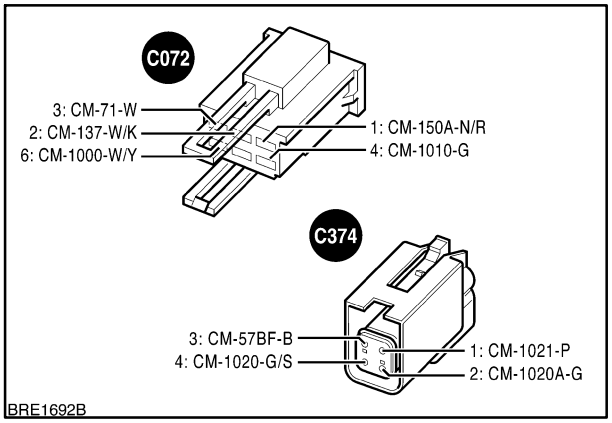
C072
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6: CM-1000-W/Y
1: CM-150A-N/R
4: CM-1010-G
C374
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4: CM-1020-G/S
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2: CM-1020A-G
BRE1692B

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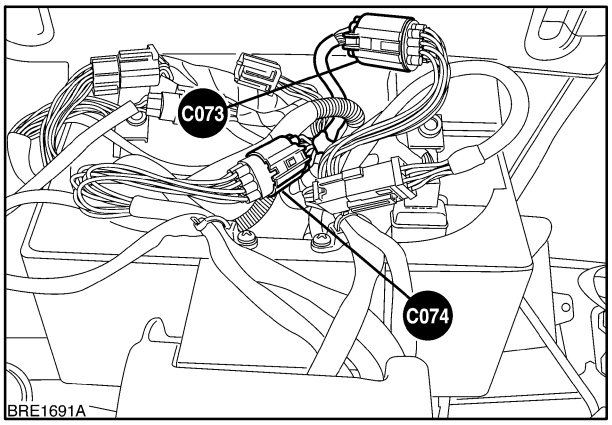

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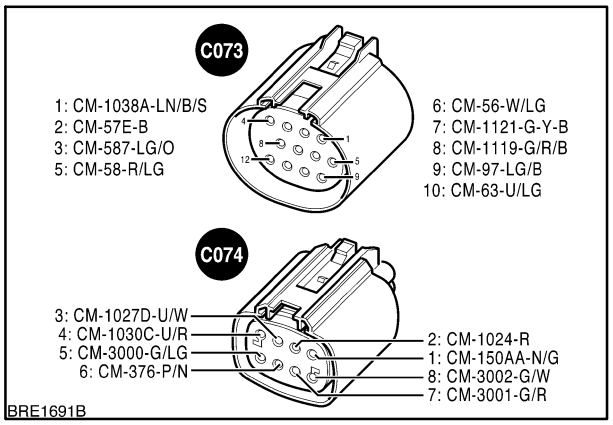

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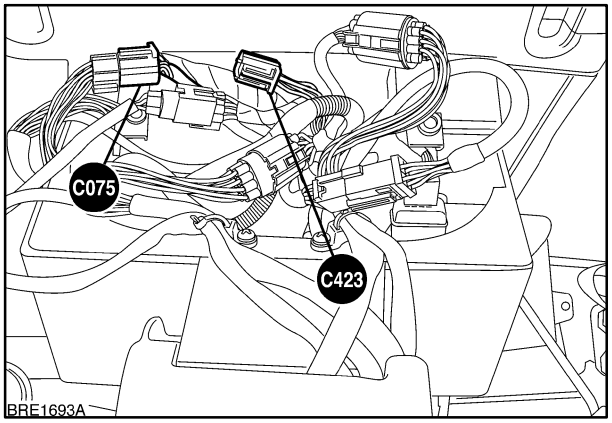

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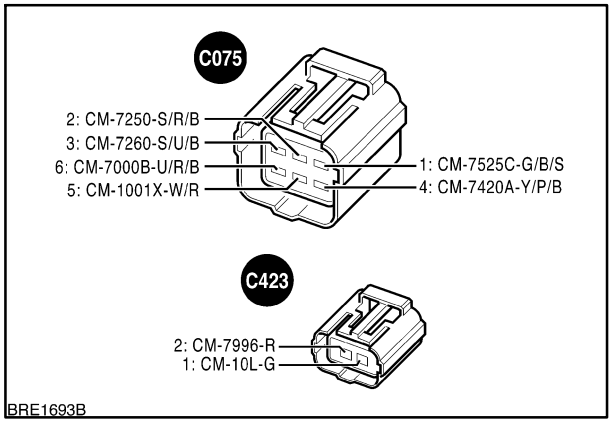

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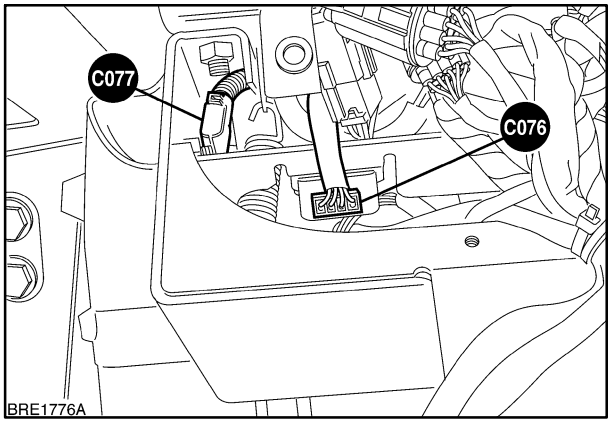

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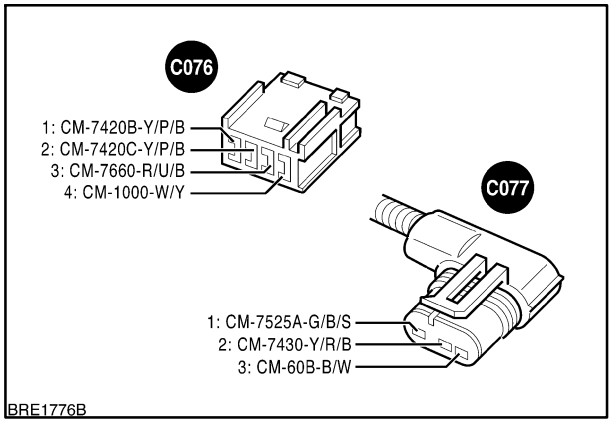

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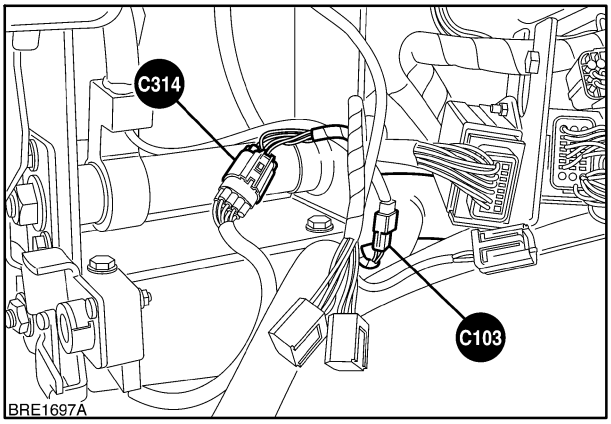
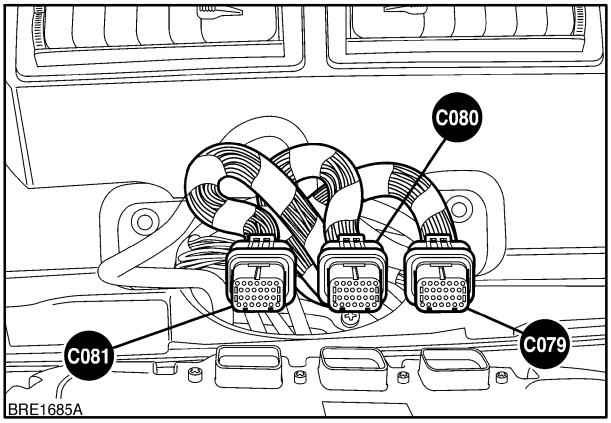

C314
C103
BRE1697A

17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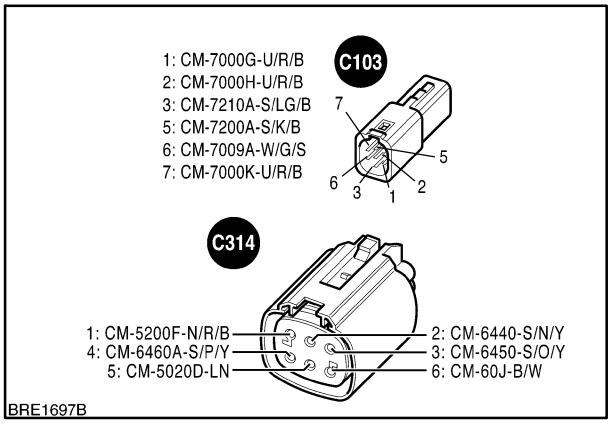
BRE1685A

18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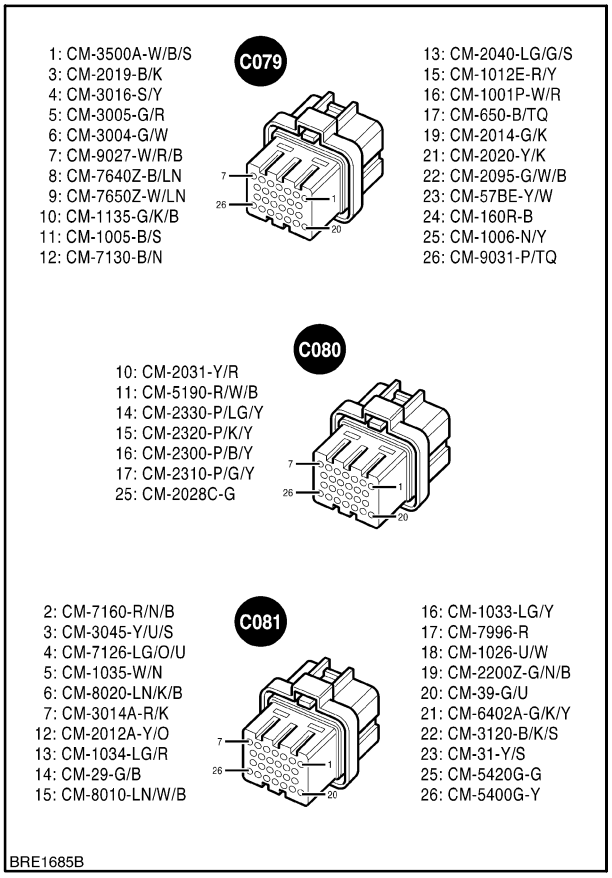
6: CM-7009A-W/G/S
7: CM-7000K-U/R/B
C103
C314
1: CM-5200F-N/R/B
4: CM-6460A-S/P/Y
5: CM-5020D-LN
2: CM-6440-S/N/Y
3: CM-6450-S/O/Y
6: CM-60J-B/W
BRE1697B

19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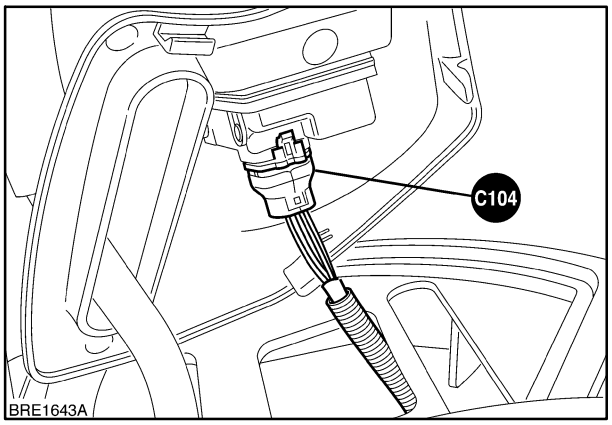
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
C079
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

20


C104
BRE1643A

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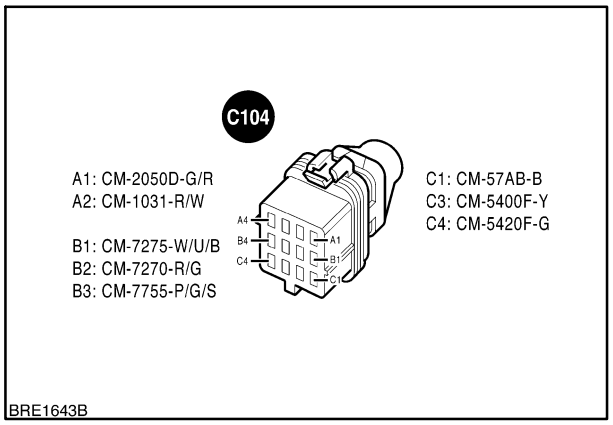
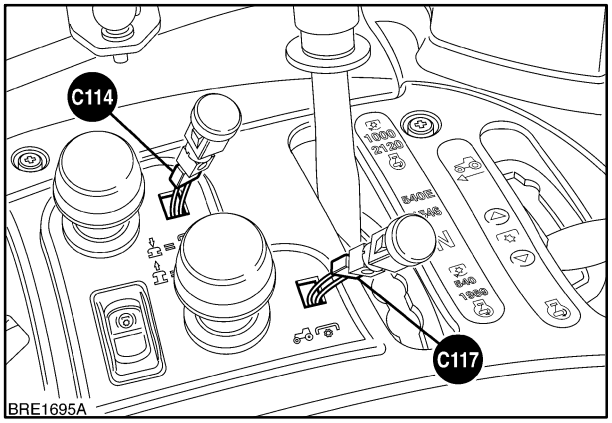
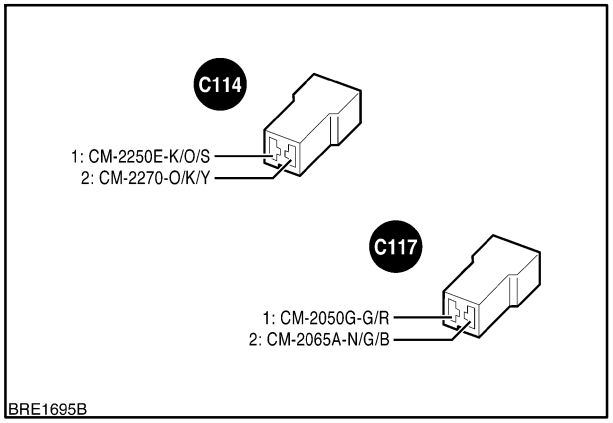

C104
A1: CM-2050D-G/R
A2: CM-1031-R/W
B1: CM-7275-W/U/B
B2: CM-7270-R/G
B3: CM-7755-P/G/S
C1: CM-57AB-B
C3: CM-5400F-Y
C4: CM-5420F-G
A4
B4
C4
A1
B1
C1
BRE1643B

23


C114
C117
BRE1695A

22


C114
1: CM-2250E-K/O/S
2: CM-2270-O/K/Y
C117
1: CM-2050G-G/R
2: CM-2065A-N/G/B
BRE1695B

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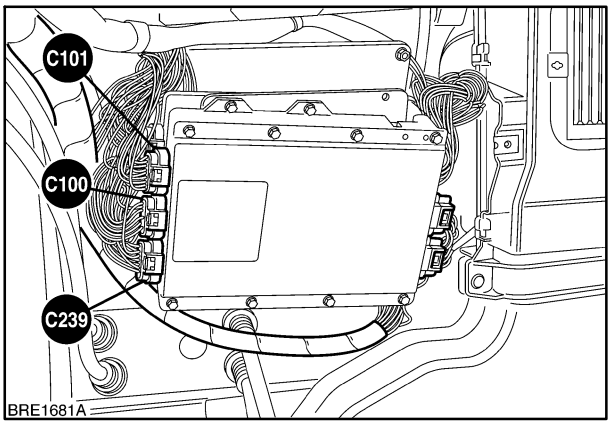

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C100

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2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101

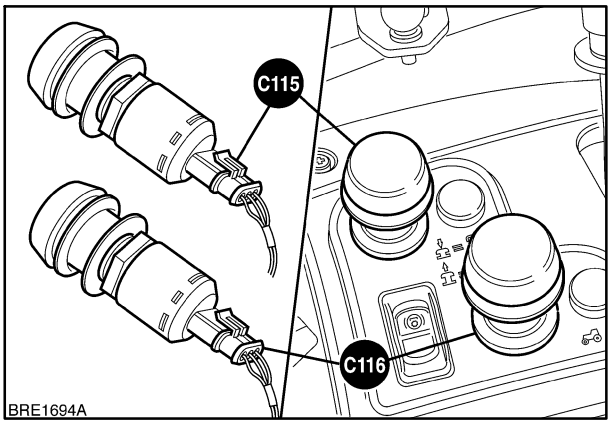
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

27



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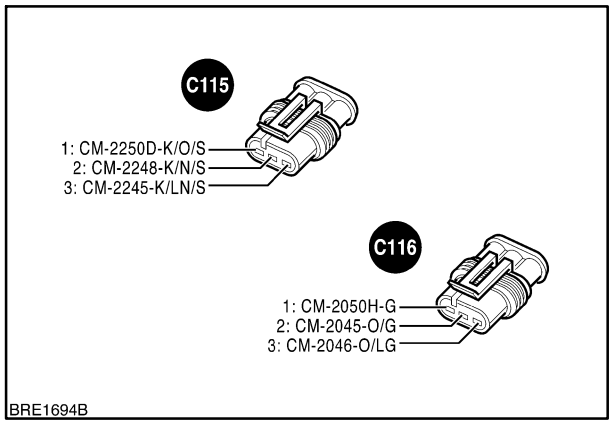

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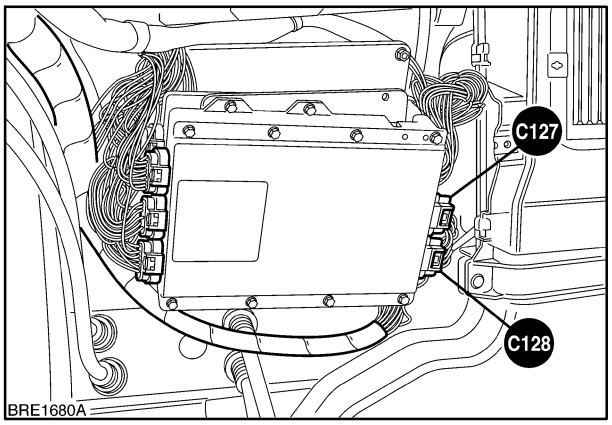

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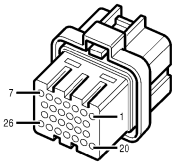
C127



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3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18: CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
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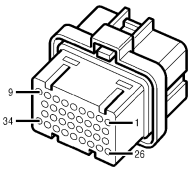
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128



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2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
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33: CM-2055A-B/W/S
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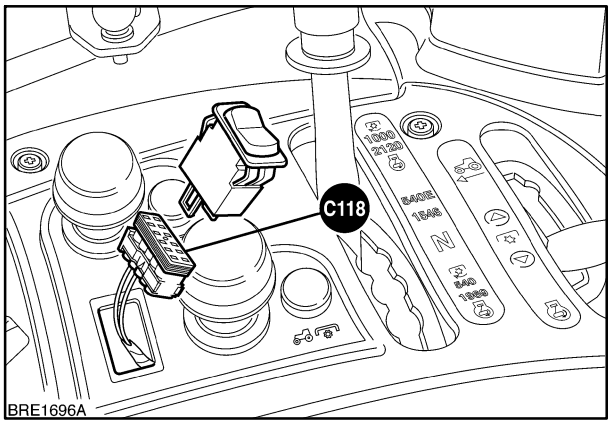
BRE1680B

30



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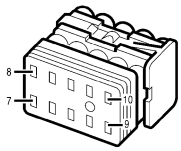
C118



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2: CM-2050J-G/R

BRE1696B

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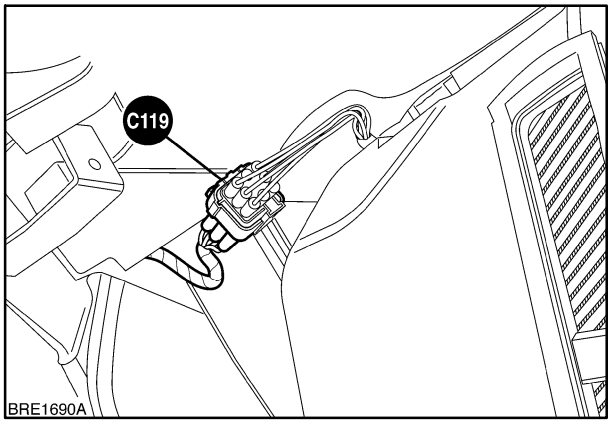

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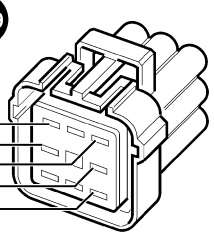
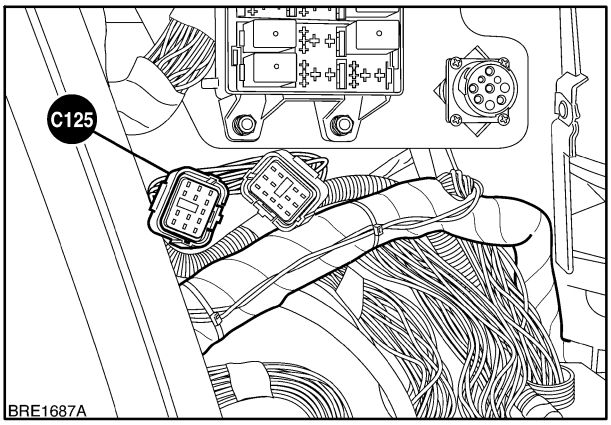
C119



3: CM-999-G/Y
4: CM-989-P/G
1: CM-57CF-B
5: CM-996-P/O
8: CM-979-G/S

BRE1690B

34



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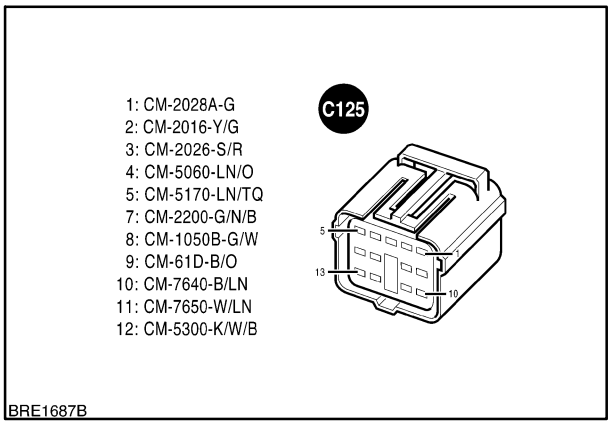

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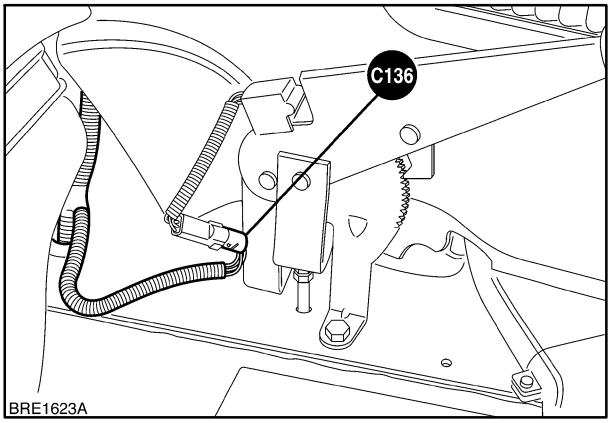

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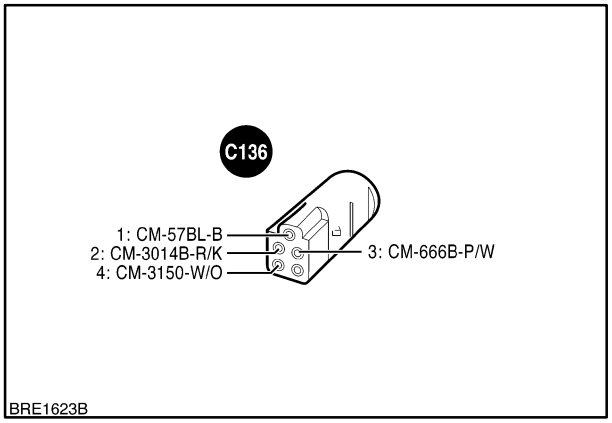

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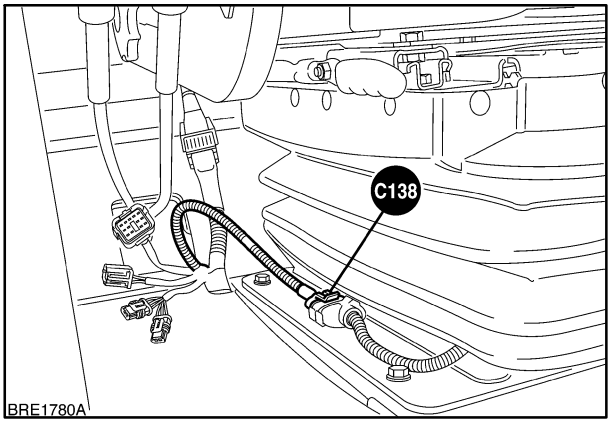

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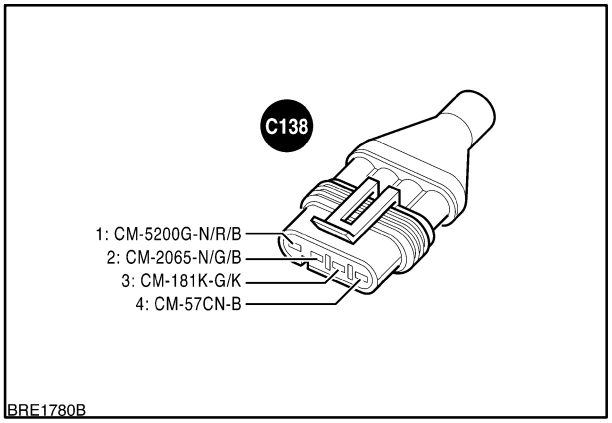

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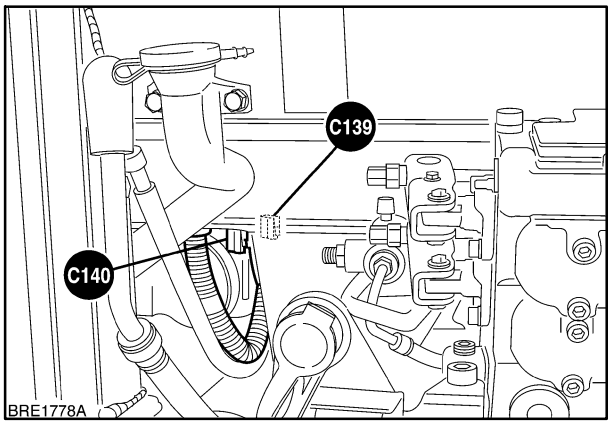

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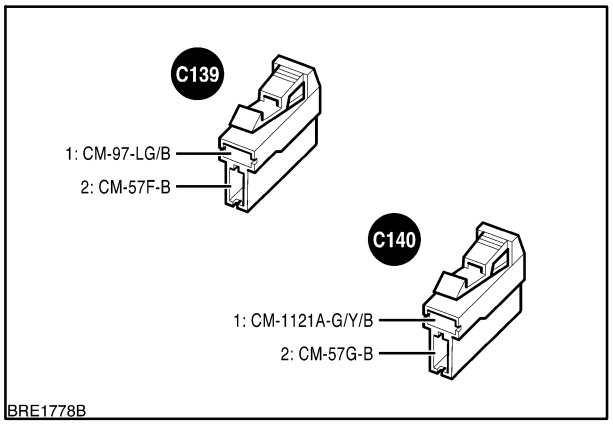

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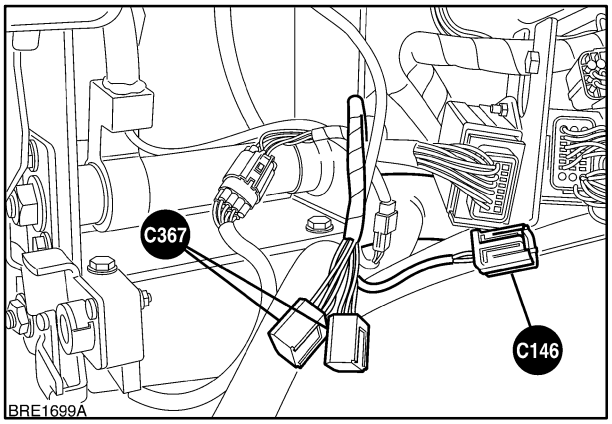

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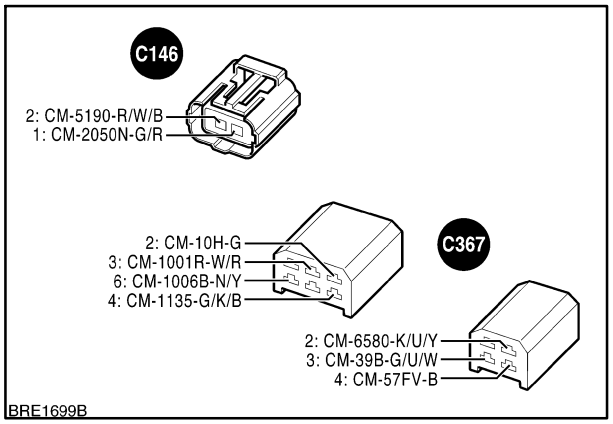

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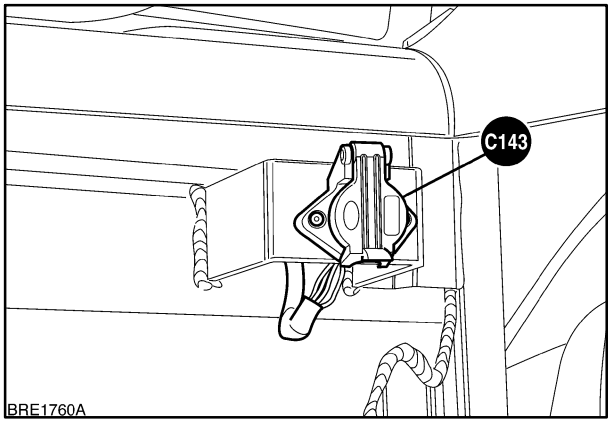

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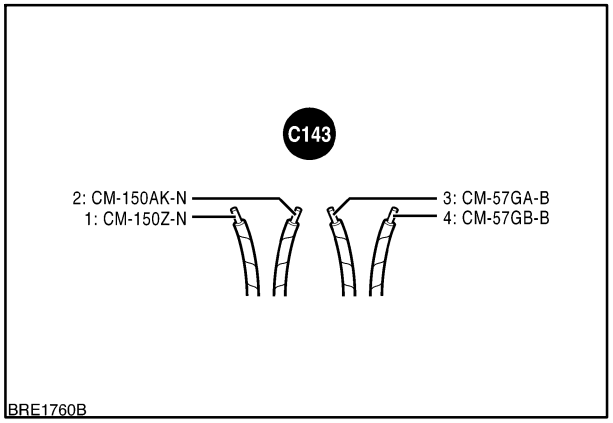

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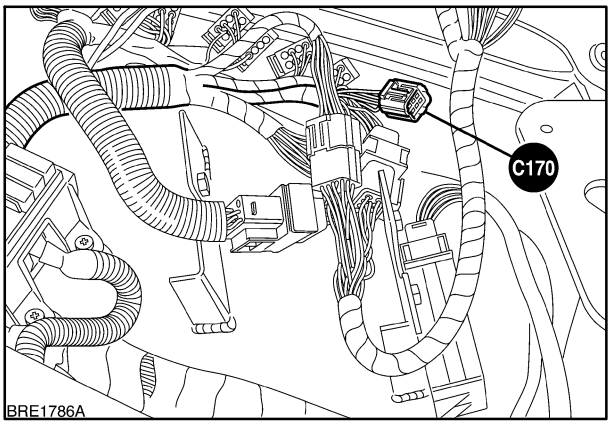

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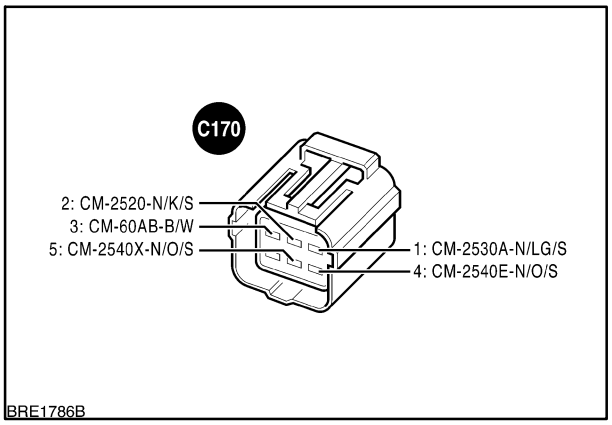

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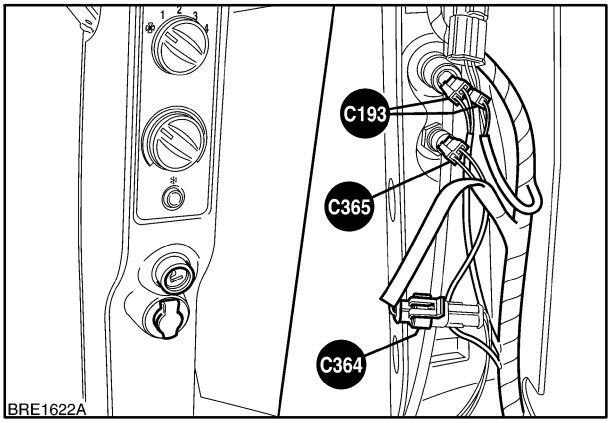

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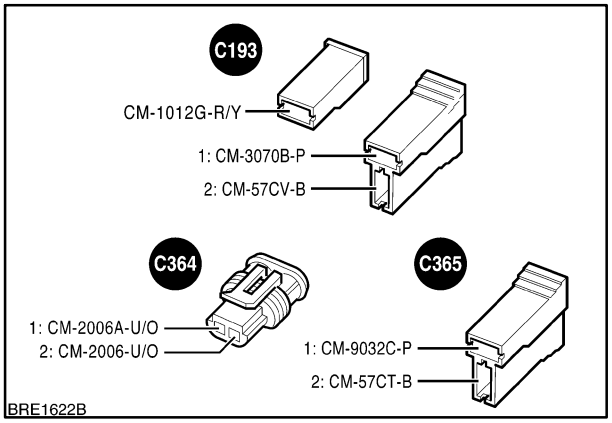

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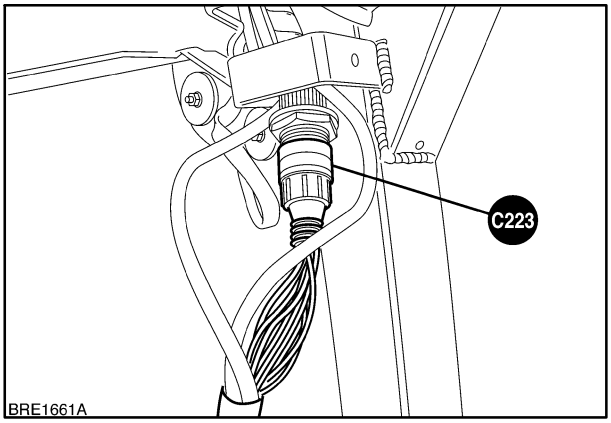

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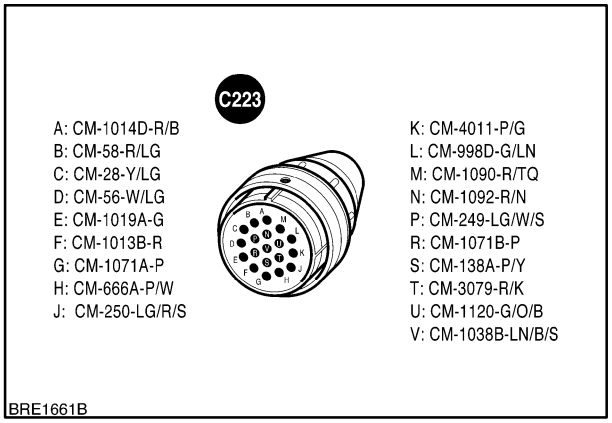

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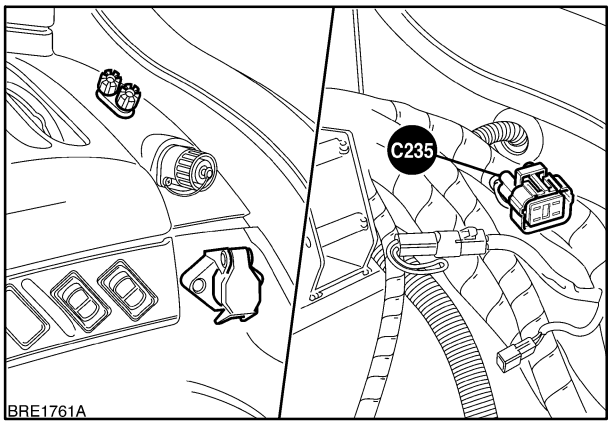

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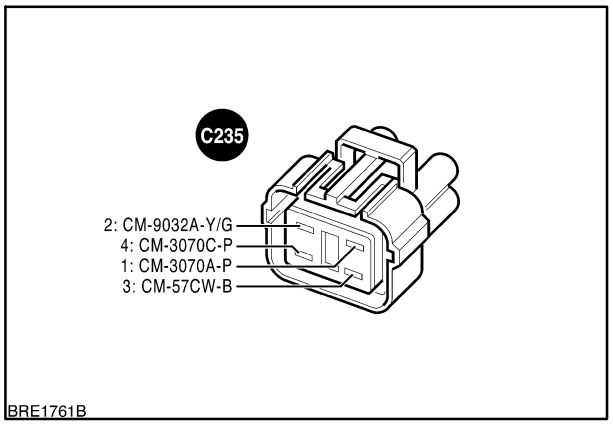

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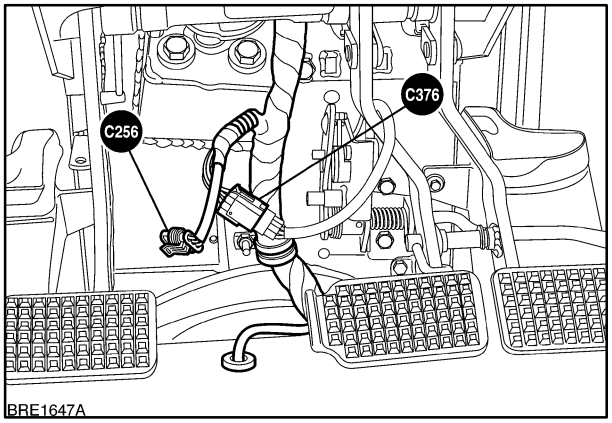

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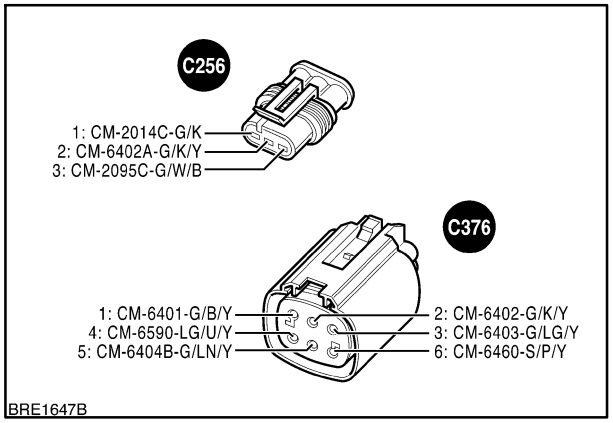

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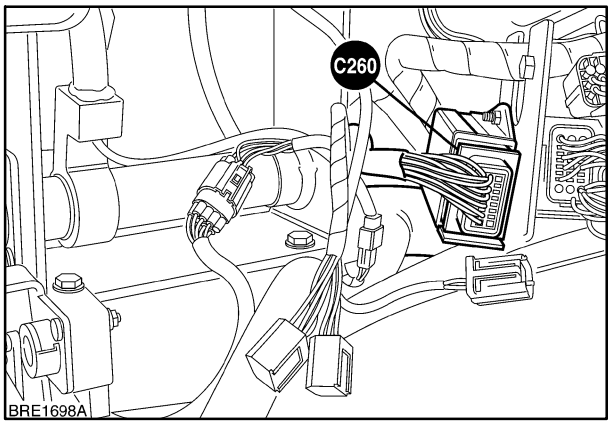

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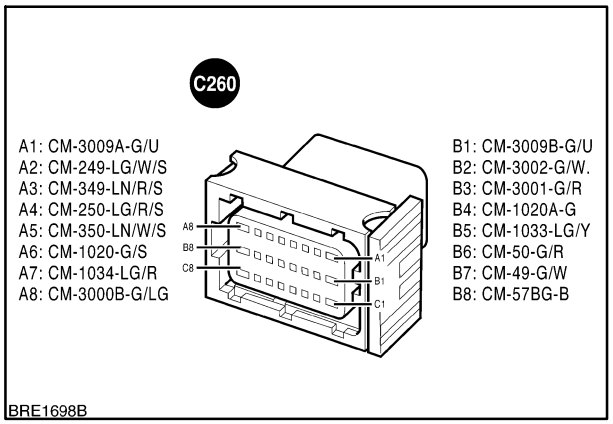

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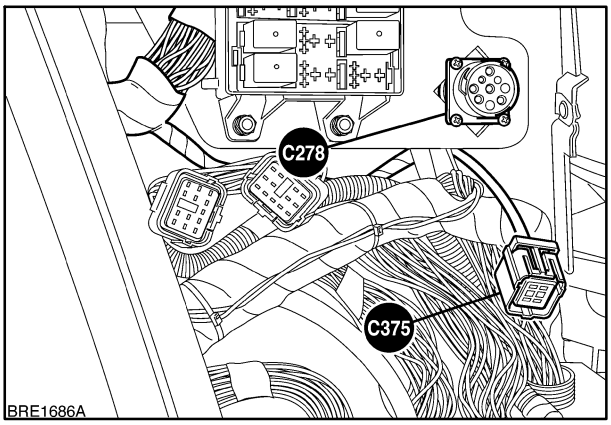

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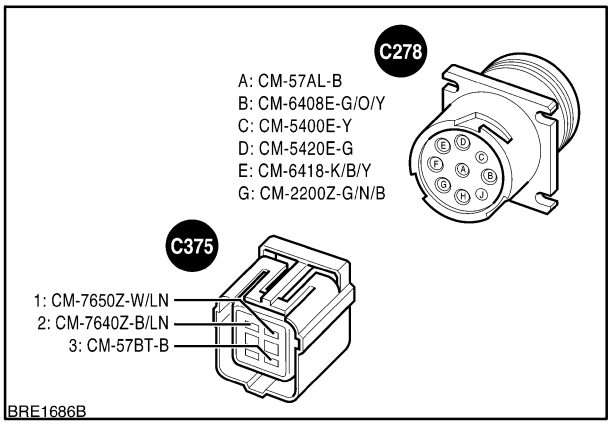

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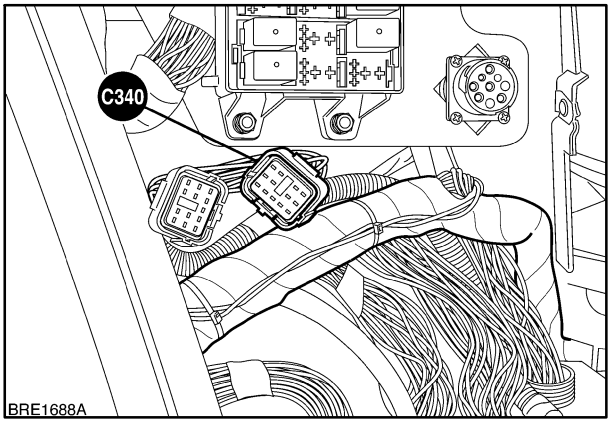

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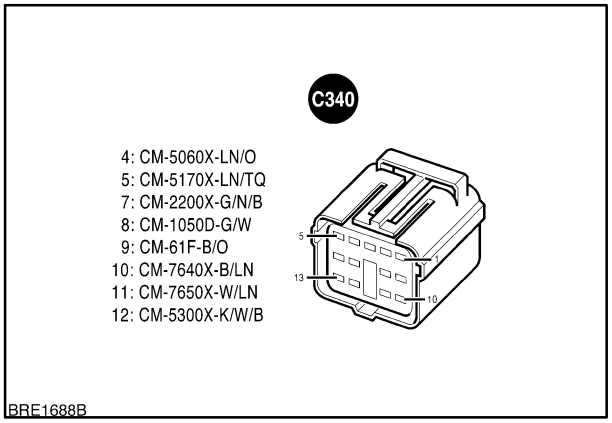

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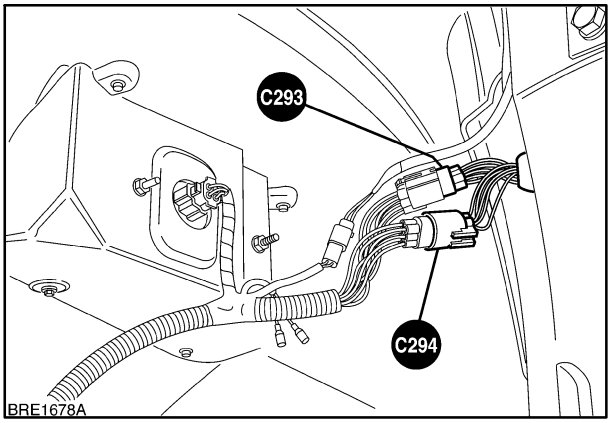

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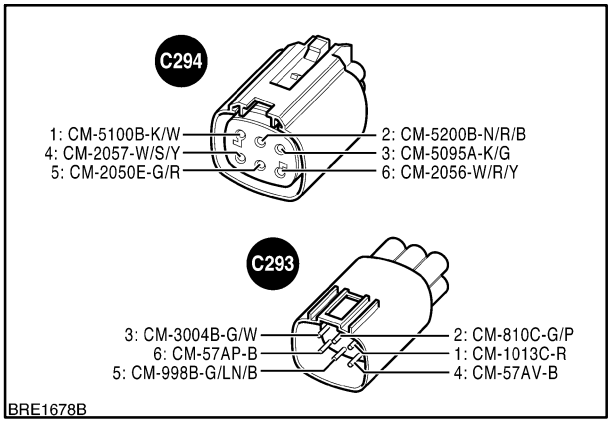

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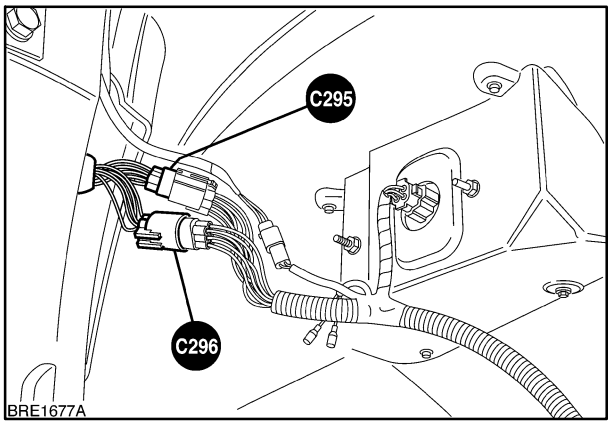
C295
C296
BRE1677A

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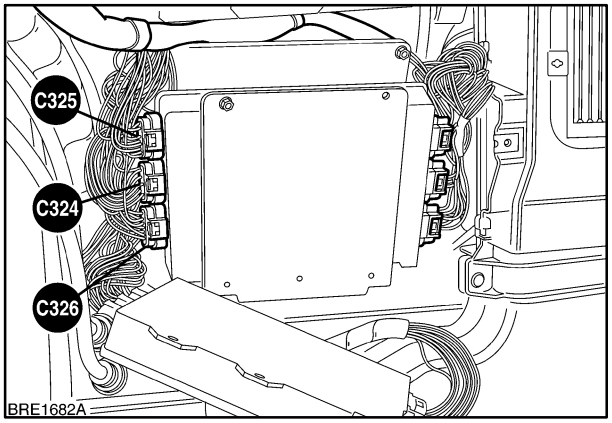
C325
C324
C326
BRE1682A

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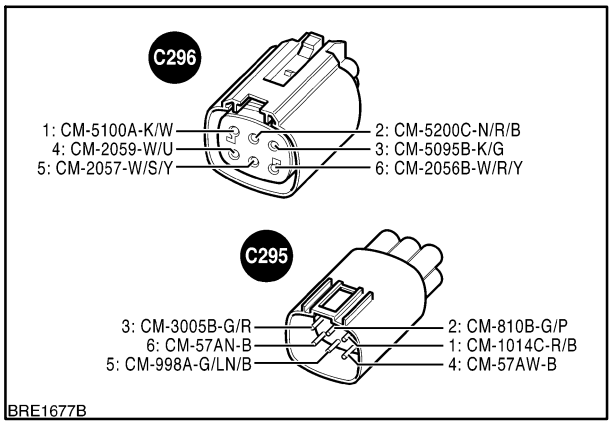
C296
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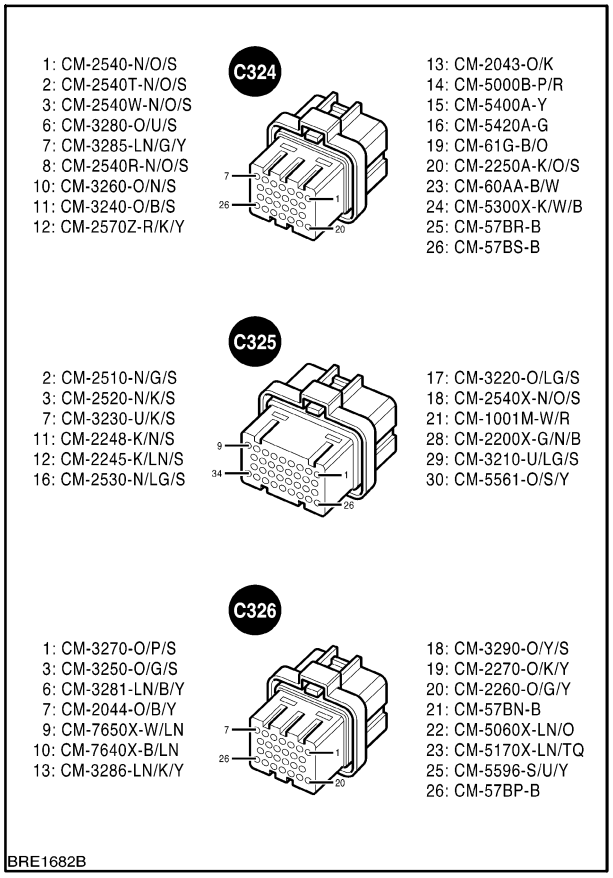
4: CM-2059-W/U
5: CM-2057-W/S/Y
2: CM-5200C-N/R/B
3: CM-5095B-K/G
6: CM-2056B-W/R/Y
C295
3: CM-3005B-G/R
6: CM-57AN-B
5: CM-998A-G/LN/B
2: CM-810B-G/P
1: CM-1014C-R/B
4: CM-57AW-B
BRE1677B

67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3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y
13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B
C325
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S
17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y
C326
1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y
18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
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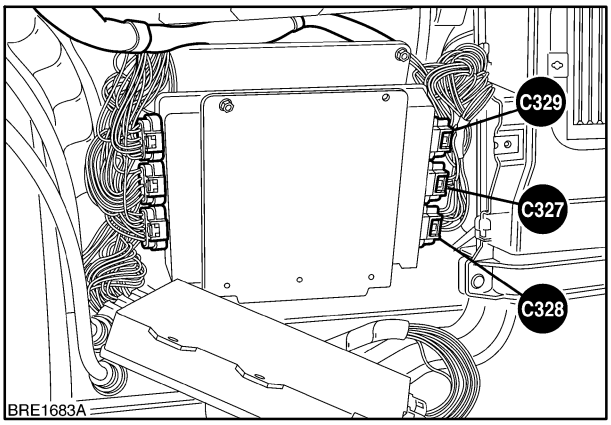
26: CM-57BP-B
BRE1682B

68


C329
C327
C328
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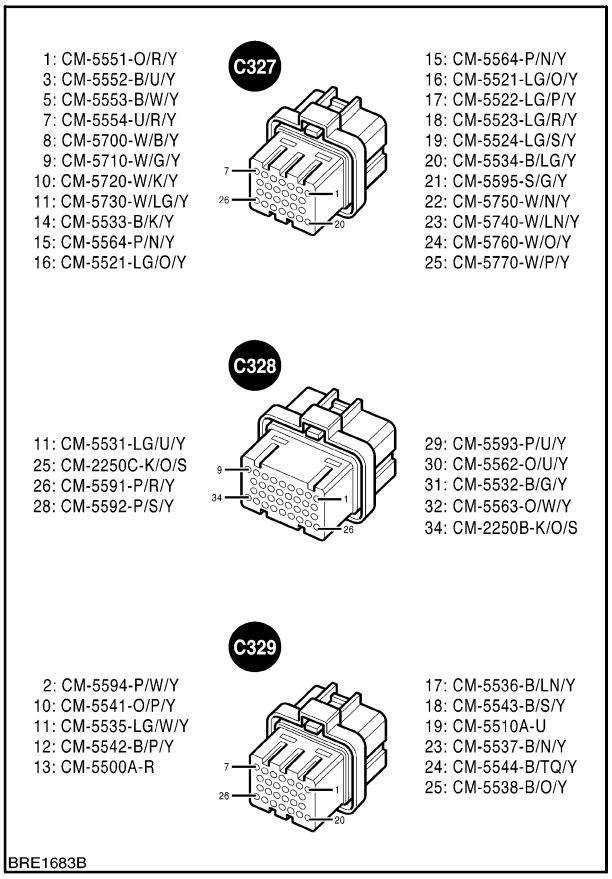
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8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y
7
26
1
20
C328
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y
29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S
9
34
1
26
C329
2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R
17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
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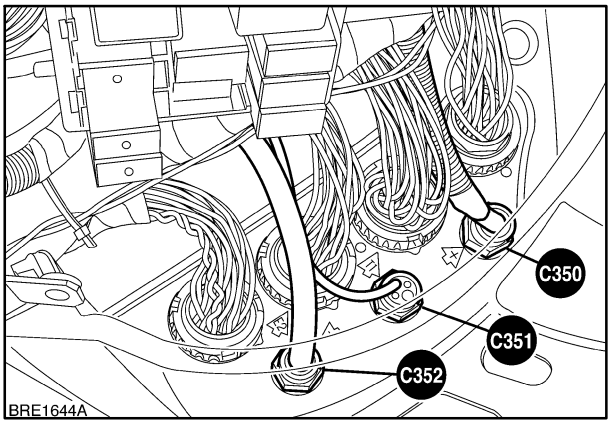
1
20
BRE1683B

70


C350
C351
C352
BRE1644A

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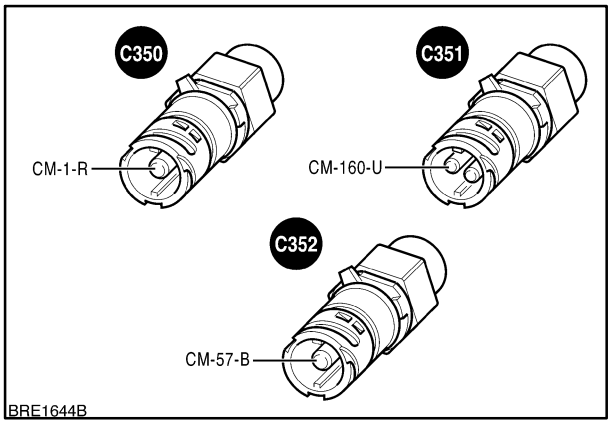
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C351
CM-160-U
C352
CM-57-B
BRE1644B

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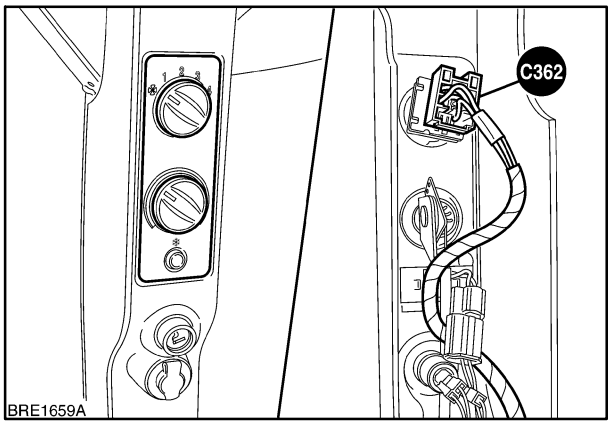

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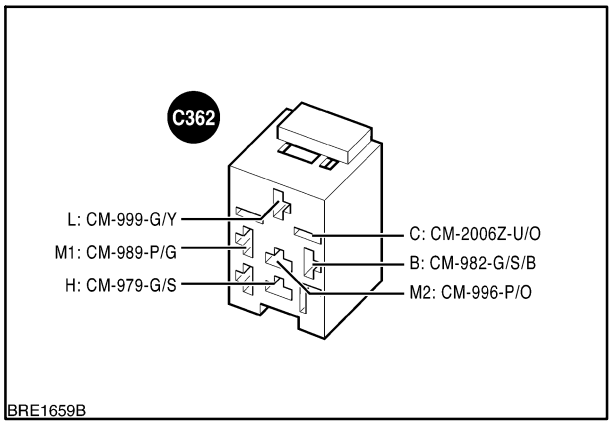

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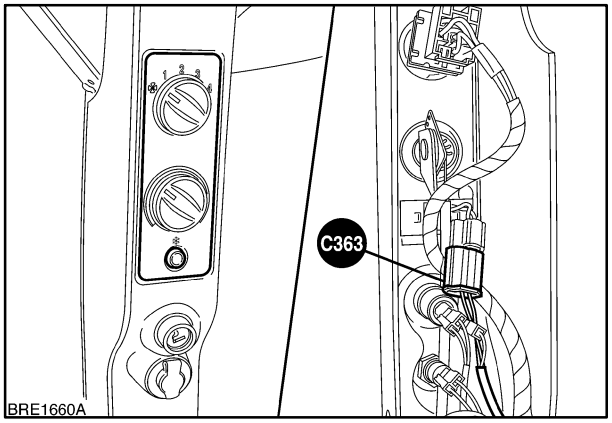

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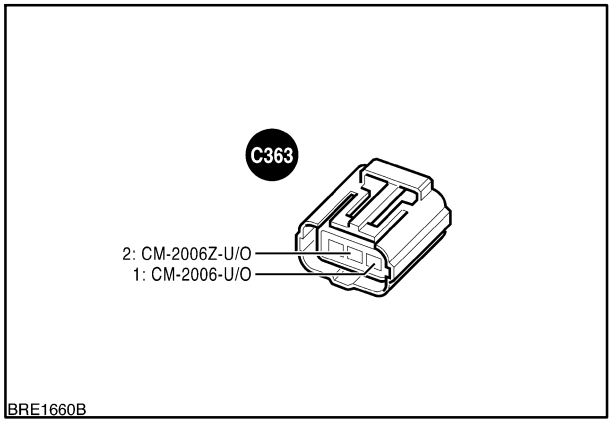

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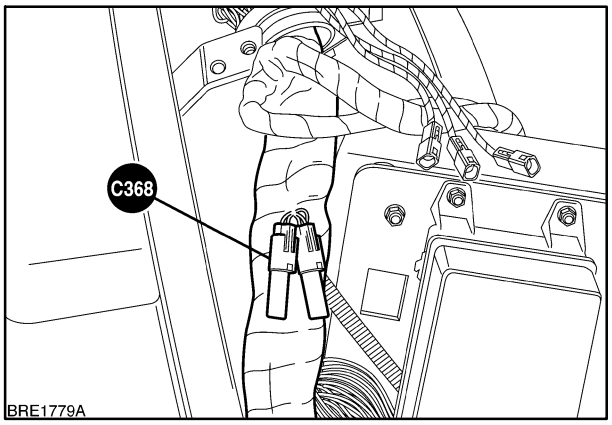

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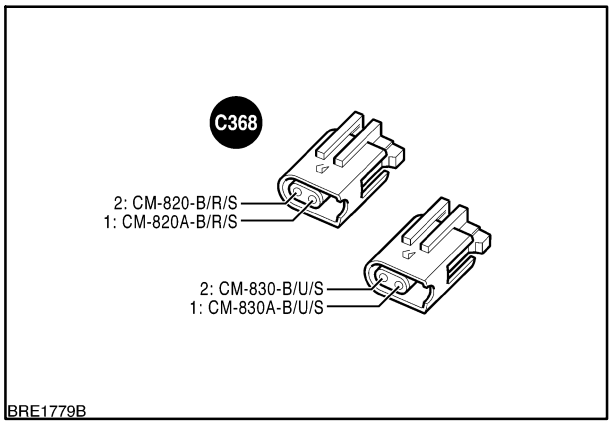

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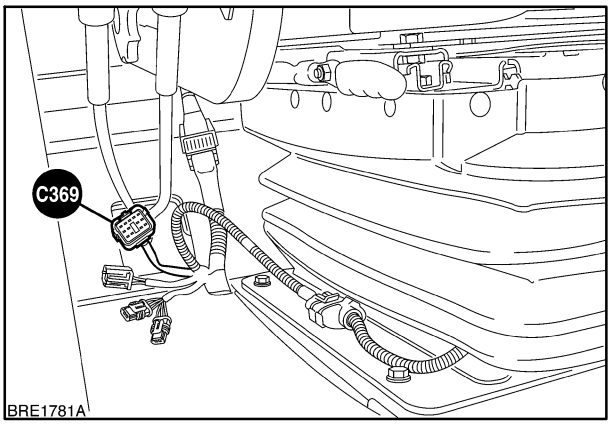

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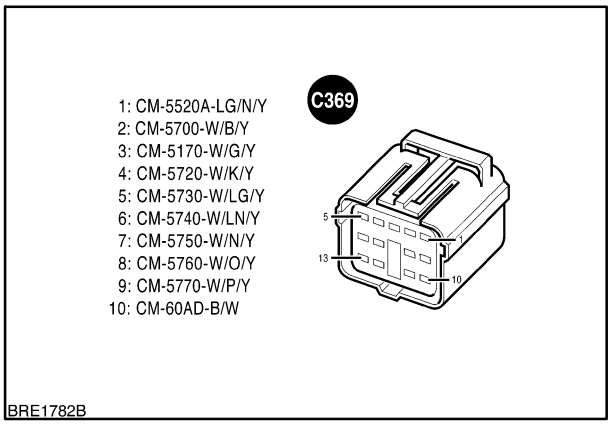

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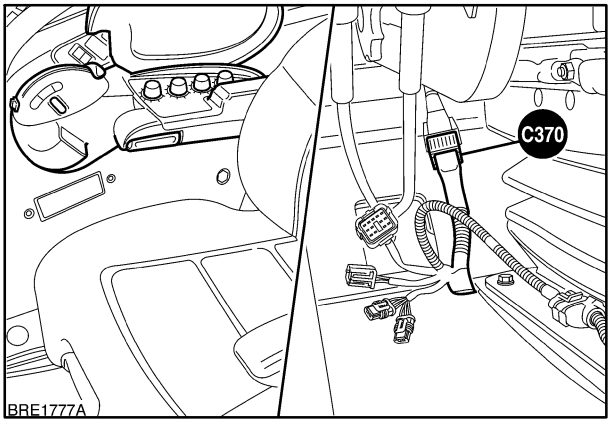

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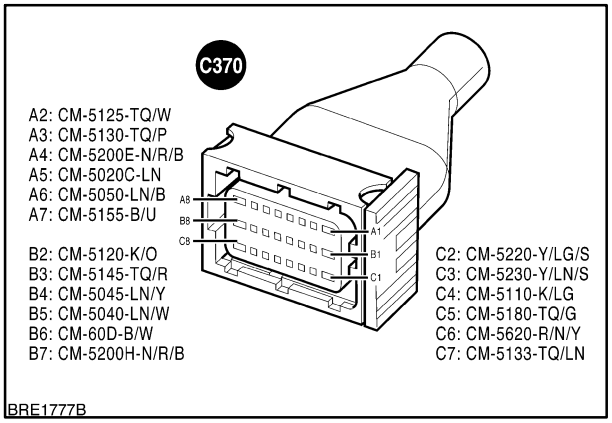

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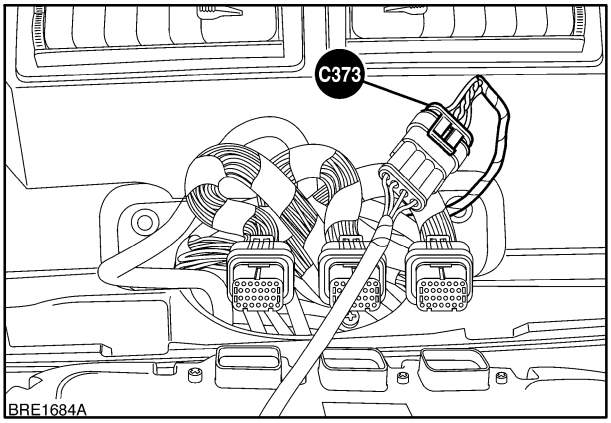

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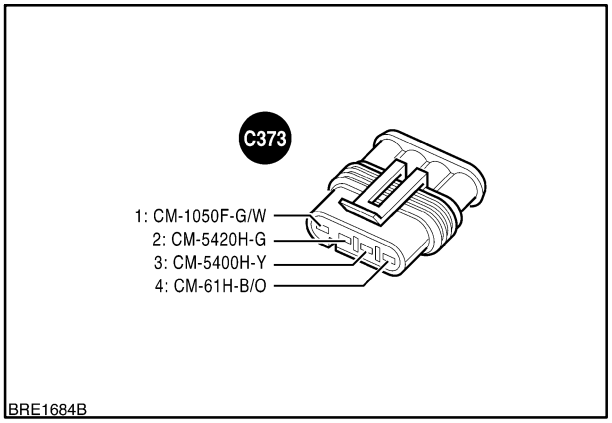

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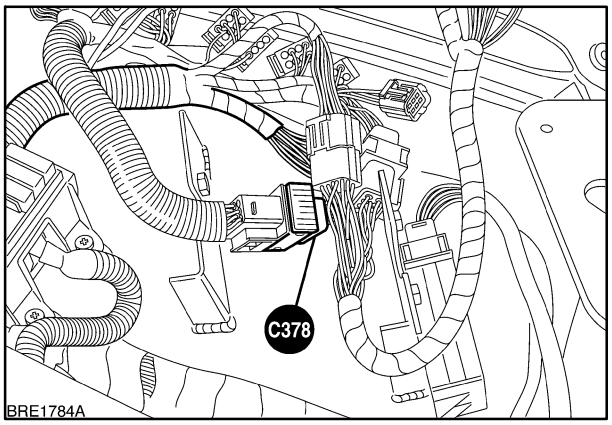
C378
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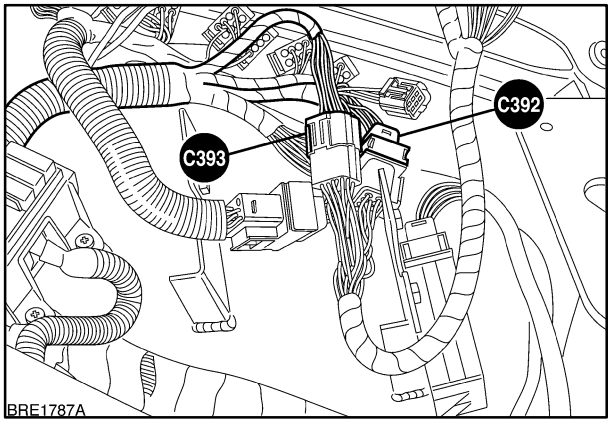
C392
C393
BRE1787A

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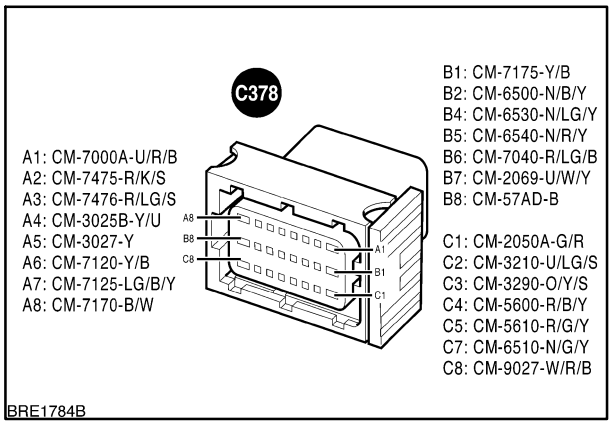
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A4: CM-3025B-Y/U
A5: CM-3027-Y
A6: CM-7120-Y/B
A7: CM-7125-LG/B/Y
A8: CM-7170-B/W
A8
B8
C8
A1
B1
C1
B1: CM-7175-Y/B
B2: CM-6500-N/B/Y
B4: CM-6530-N/LG/Y
B5: CM-6540-N/R/Y
B6: CM-7040-R/LG/B
B7: CM-2069-U/W/Y
B8: CM-57AD-B
C1: CM-2050A-G/R
C2: CM-3210-U/LG/S
C3: CM-3290-O/Y/S
C4: CM-5600-R/B/Y
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BRE1784B

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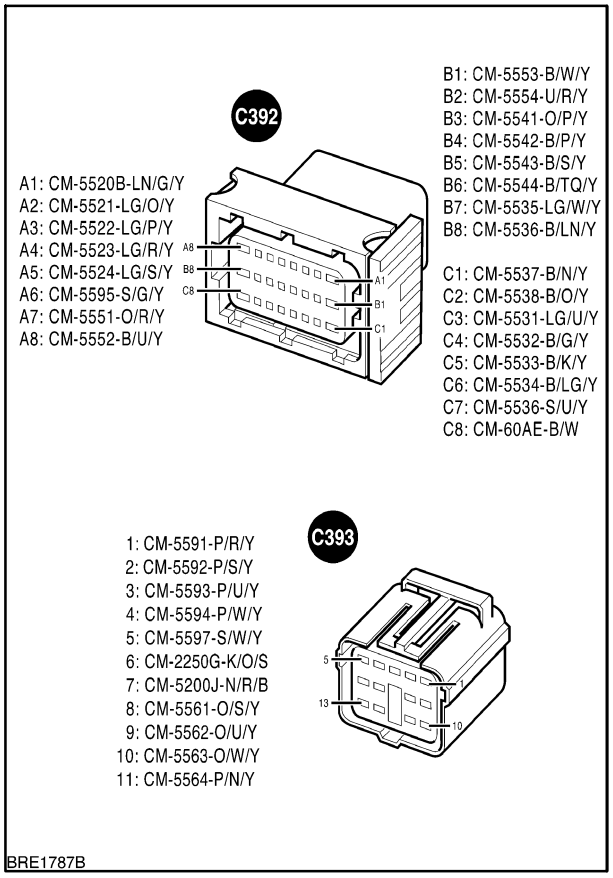
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A4: CM-5523-LG/R/Y
A5: CM-5524-LG/S/Y
A6: CM-5595-S/G/Y
A7: CM-5551-O/R/Y
A8: CM-5552-B/U/Y
A8
B8
C8
A1
B1
C1
B1: CM-5553-B/W/Y
B2: CM-5554-U/R/Y
B3: CM-5541-O/P/Y
B4: CM-5542-B/P/Y
B5: CM-5543-B/S/Y
B6: CM-5544-B/TQ/Y
B7: CM-5535-LG/W/Y
B8: CM-5536-B/LN/Y
C1: CM-5537-B/N/Y
C2: CM-5538-B/O/Y
C3: CM-5531-LG/U/Y
C4: CM-5532-B/G/Y
C5: CM-5533-B/K/Y
C6: CM-5534-B/LG/Y
C7: CM-5536-S/U/Y
C8: CM-60AE-B/W
C393
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2: CM-5592-P/S/Y
3: CM-5593-P/U/Y
4: CM-5594-P/W/Y
5: CM-5597-S/W/Y
6: CM-2250G-K/O/S
7: CM-5200J-N/R/B
8: CM-5561-O/S/Y
9: CM-5562-O/U/Y
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13
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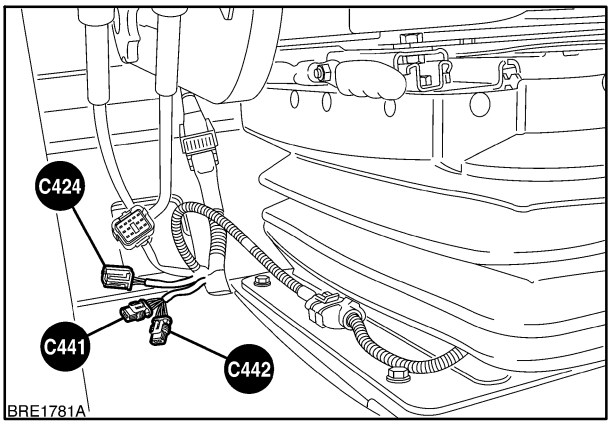
10
BRE1787B

88



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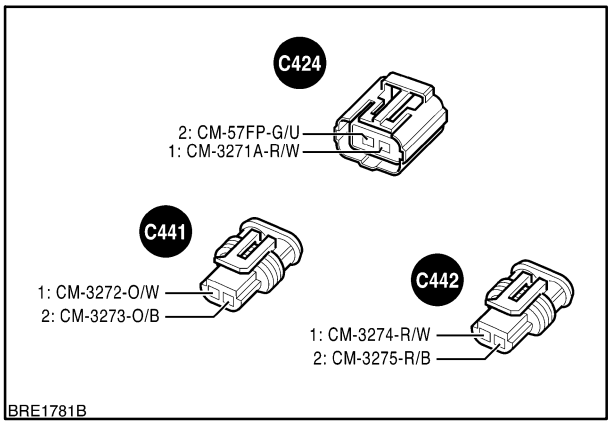

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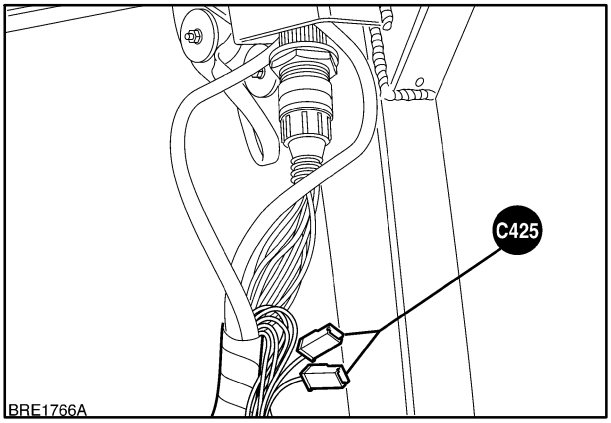

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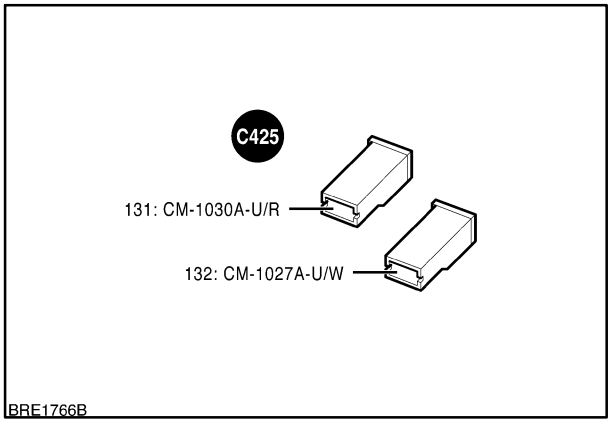

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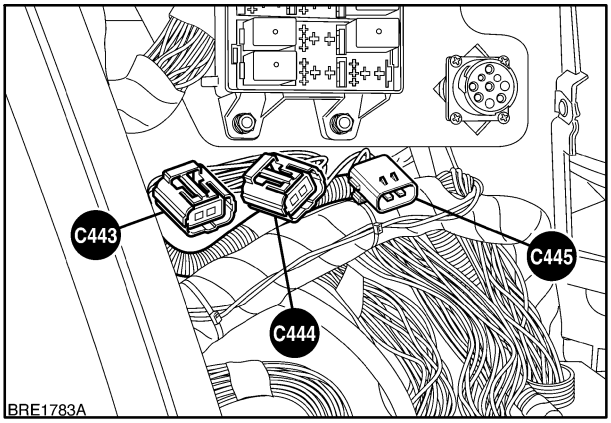

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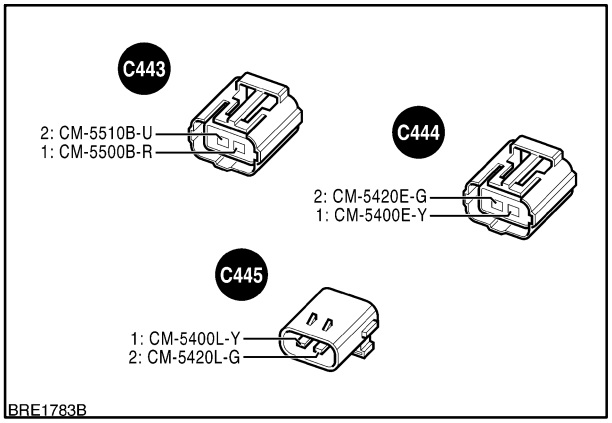

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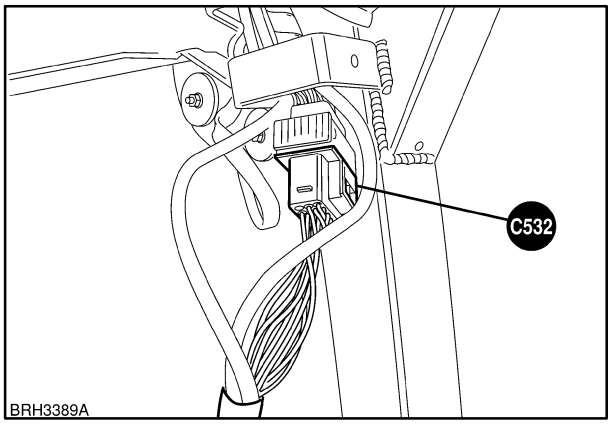
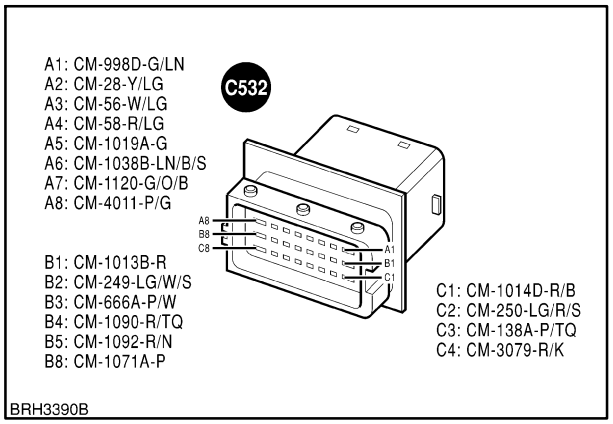
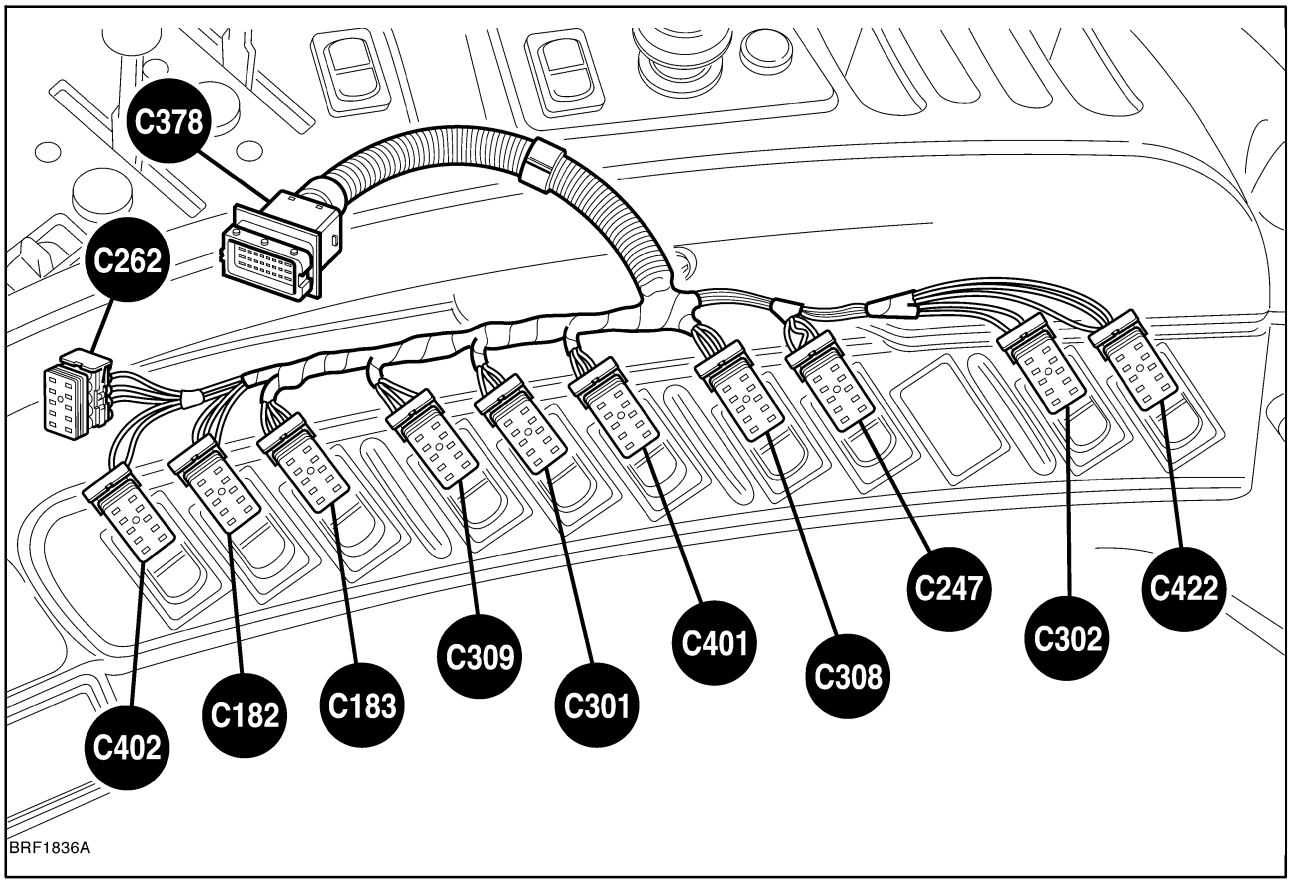

C532
BRH3389A

95


A1: CM-998D-G/LN
A2: CM-28-Y/LG
A3: CM-56-W/LG
A4: CM-58-R/LG
A5: CM-1019A-G
A6: CM-1038B-LN/B/S
A7: CM-1120-G/O/B
A8: CM-4011-P/G
B1: CM-1013B-R
B2: CM-249-LG/W/S
B3: CM-666A-P/W
B4: CM-1090-R/TQ
B5: CM-1092-R/N
B8: CM-1071A-P
C532
A8
B8
C8
A1
B1
C1
C1: CM-1014D-R/B
C2: CM-250-LG/R/S
C3: CM-138A-P/TQ
C4: CM-3079-R/K
BRH3390B

96

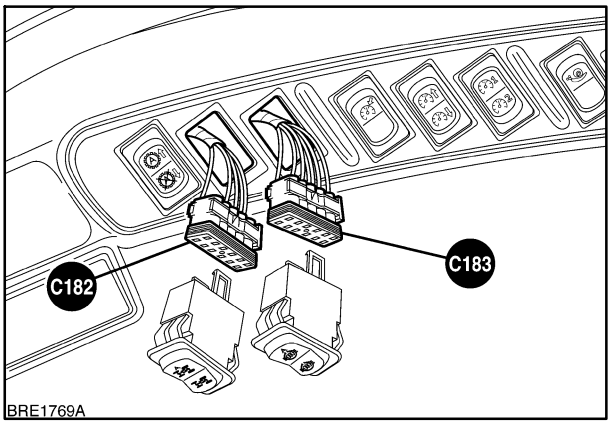
SWITCH PANEL HARNESS



SWITCH PANEL HARNESS CONNECTORS

1. **C182** Auto 4WD Switch
   (Location Fig 1, Connector Fig 4)
2. **C183** Auto Diff Lock Switch
   (Location Fig 1, Connector Fig 4)
3. **C247** Suspension Lock Switch
   (Location Fig 2, Connector Fig 5)
4. **C262** Auto Trans Switch
   (Location Fig 3, Connector Fig 6)
5. **C301** Constant + / – ERPM Switch
   (Location Fig 7, Connector Fig 11)
6. **C302** HTS Programme Switch
   (Location Fig 7, Connector Fig 11)
7. **C308** Creeper Switch
   (Location Fig 8, Connector Fig 11)
8. **C309** Constant ERPM Switch
   (Location Fig 7, Connector Fig 11)
9. **C378** Switch Harness to Cab Main Connector
   (Location Fig 9, Connector Fig 12)
10. **C401** ERPM Set Switch
    (Location Fig 8, Connector Fig 11)
11. **C402** CAL / SEL Switch
    (Location Fig 3, Connector Fig 6)
12. **C422** PTO MGT Switch
    (Location Fig 2, Connector Fig 5)

SWITCH PANEL HARNESS CONNECTOR LOCATIONS



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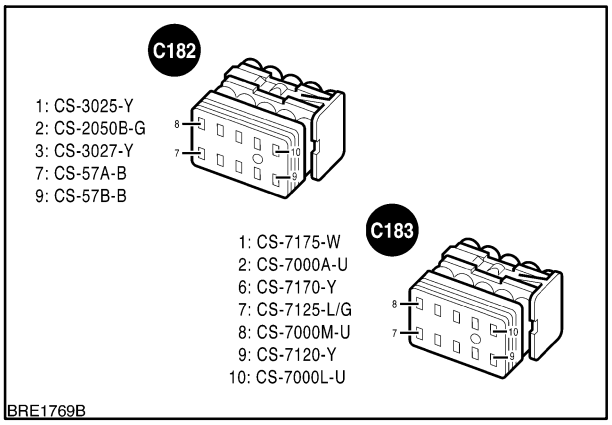

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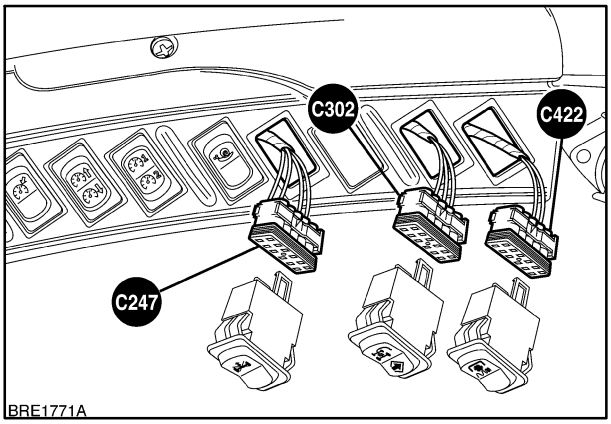

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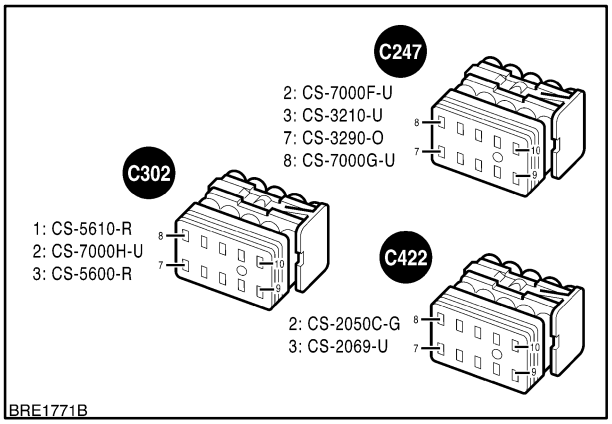

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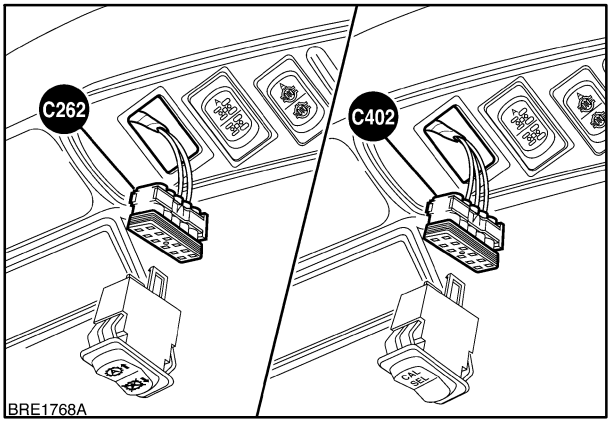

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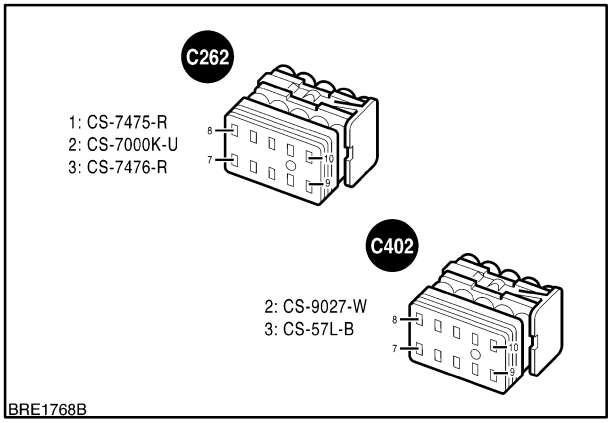

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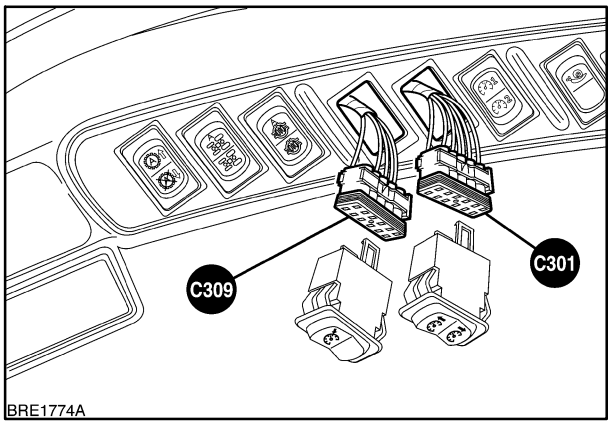
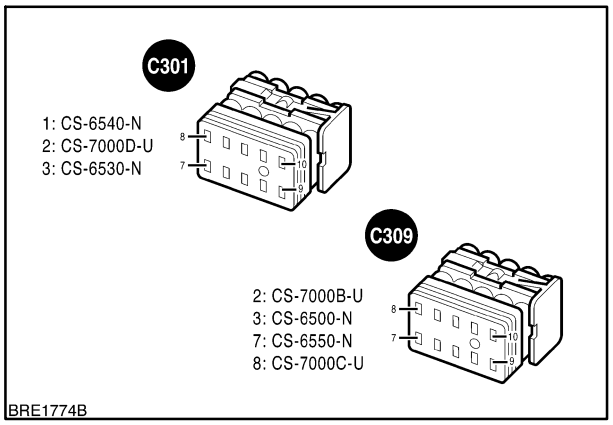
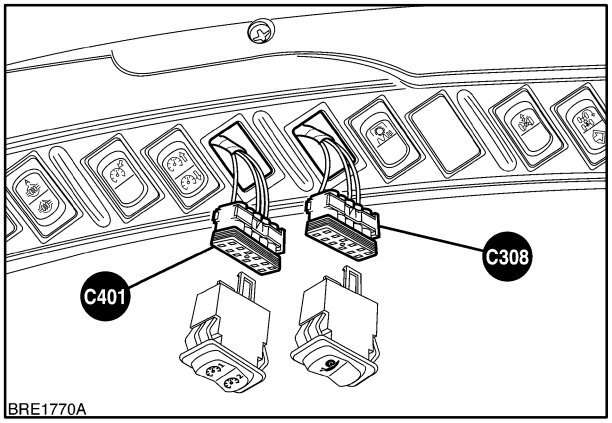

C309
C301
BRE1774A

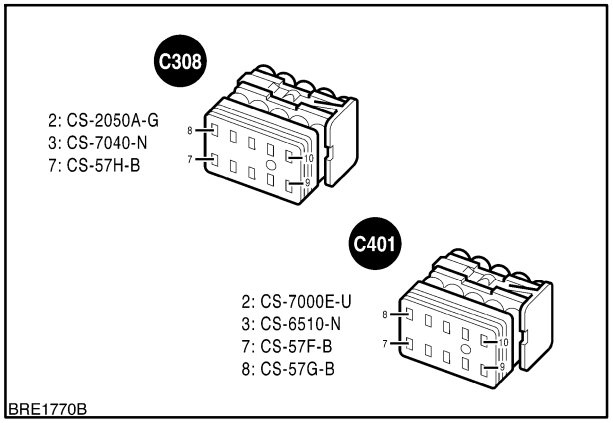
7


C301
1: CS-6540-N
2: CS-7000D-U
3: CS-6530-N
C309
2: CS-7000B-U
3: CS-6500-N
7: CS-6550-N
8: CS-7000C-U
BRE1774B

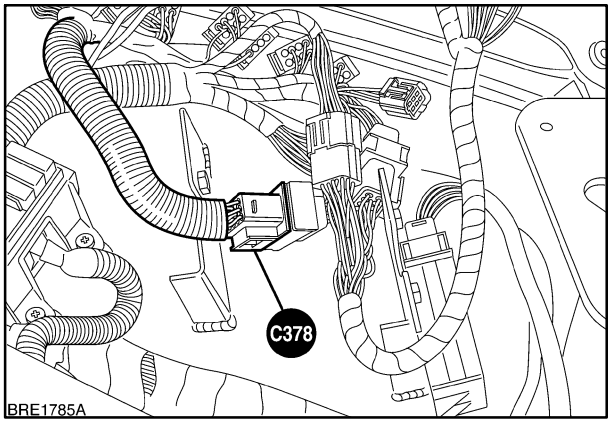
10


C308
C401
BRE1770A

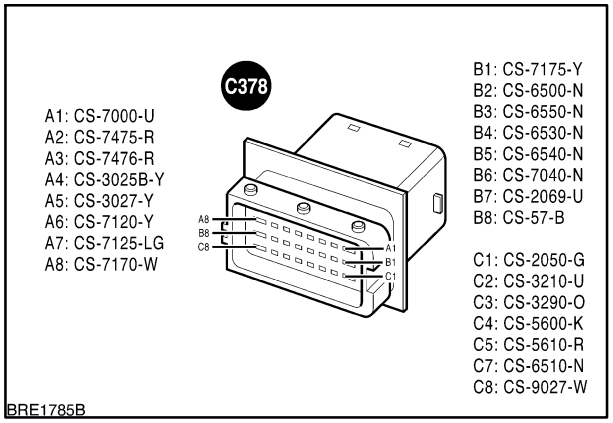
8


C308
2: CS-2050A-G
3: CS-7040-N
7: CS-57H-B
C401
2: CS-7000E-U
3: CS-6510-N
7: CS-57F-B
8: CS-57G-B
BRE1770B

11

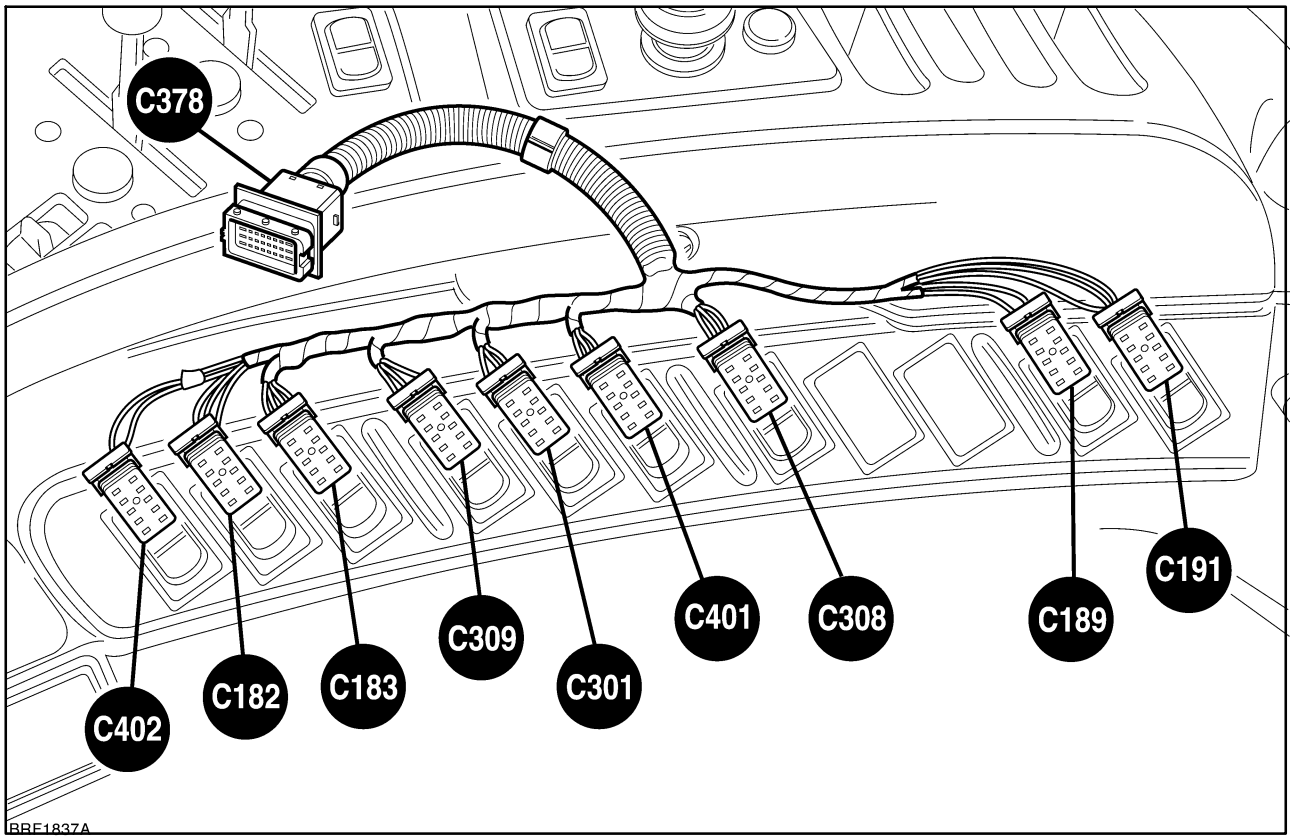

C378
BRE1785A

9


C378
A1: CS-7000-U
A2: CS-7475-R
A3: CS-7476-R
A4: CS-3025B-Y
A5: CS-3027-Y
A6: CS-7120-Y
A7: CS-7125-LG
A8: CS-7170-W
B1: CS-7175-Y
B2: CS-6500-N
B3: CS-6550-N
B4: CS-6530-N
B5: CS-6540-N
B6: CS-7040-N
B7: CS-2069-U
B8: CS-57-B
C1: CS-2050-G
C2: CS-3210-U
C3: CS-3290-O
C4: CS-5600-K
C5: CS-5610-R
C7: CS-6510-N
C8: CS-9027-W
BRE1785B

12

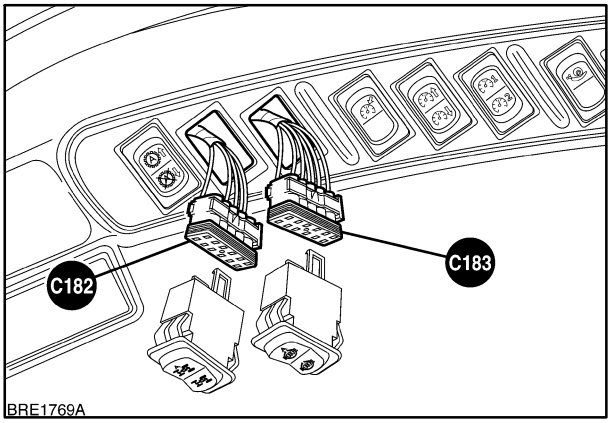
SWITCH PANEL 12 X 12 HARNESS



SWITCH PANEL (12 X 12) HARNESS CONNECTORS

1. **C182** Auto 4WD Switch
   (Location Fig 1, Connector Fig 4)
2. **C183** Auto Diff Lock Switch
   (Location Fig 1, Connector Fig 4)
3. **C189** Front Worklamp Switch
   (Location Fig 2, Connector Fig 5)
4. **C191** Rear Worklamp Switch
   (Location Fig 2, Connector Fig 5)
5. **C301** Constant + / - ERPM Switch
   (Location Fig 3, Connector Fig 6)
6. **C302** HTS Programme Switch
   (Location Fig 7, Connector Fig 11)
7. **C308** Creeper Switch
   (Location Fig 7, Connector Fig 10)
8. **C309** Constant ERPM Switch
   (Location Fig 3, Connector Fig 6)
9. **C378** Switch Harness to Cab Main Connector
   (Location Fig 9, Connector Fig 12)
10. **C401** ERPM Set Switch
    (Location Fig 7, Connector Fig 10)
11. **C402** CAL / SEL Switch
    (Location Fig 8, Connector Fig 11)

SWITCH PANEL (12 X 12) HARNESS CONNECTOR LOCATIONS



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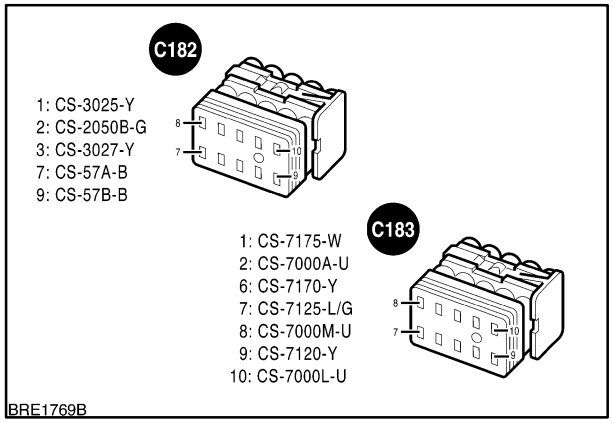
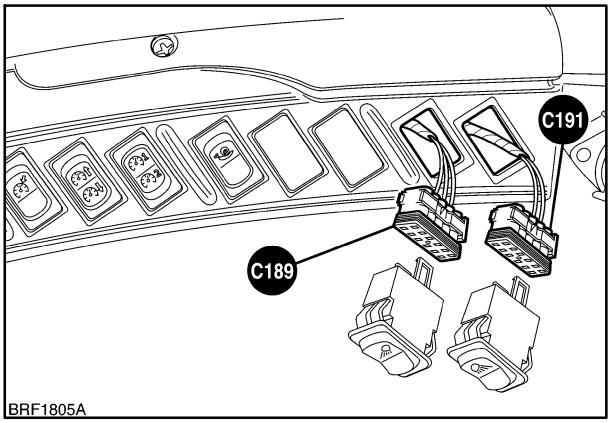


4



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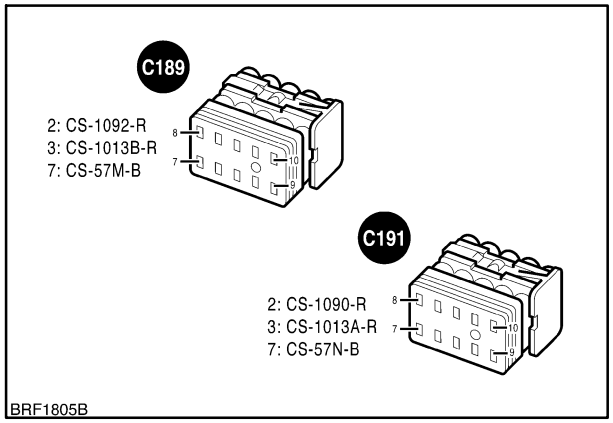

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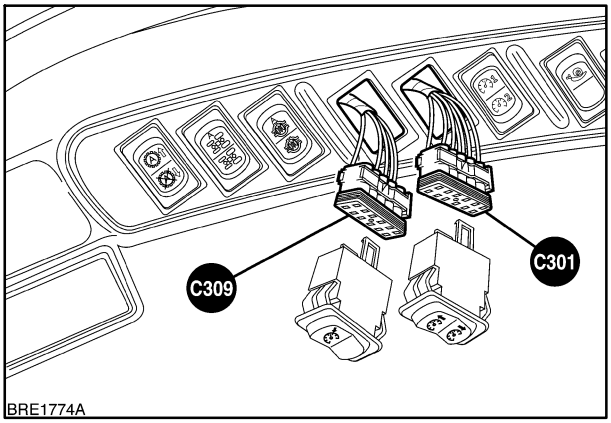

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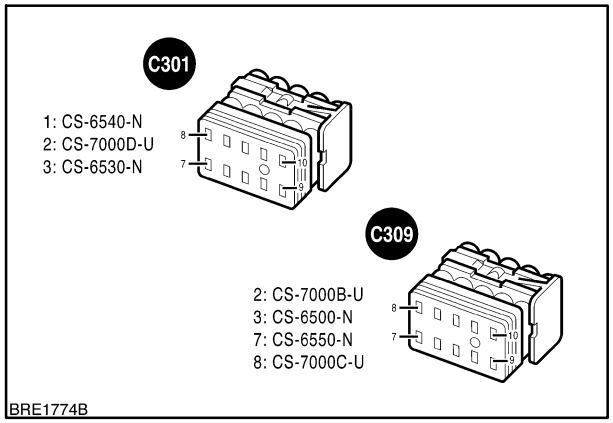

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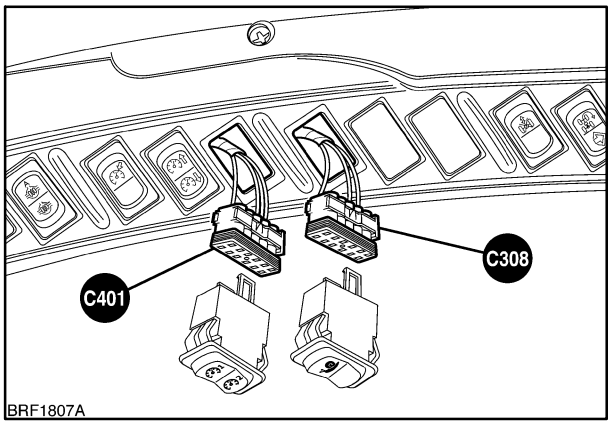
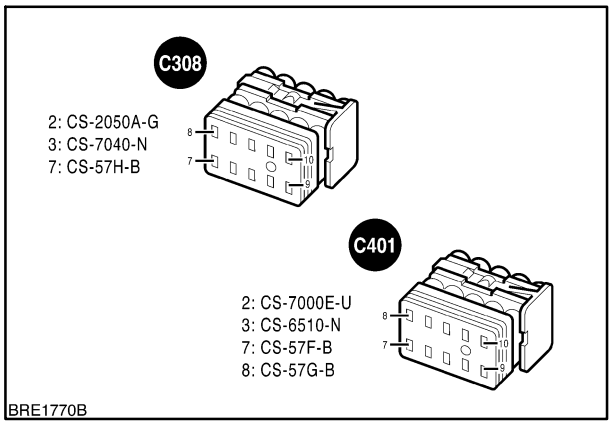
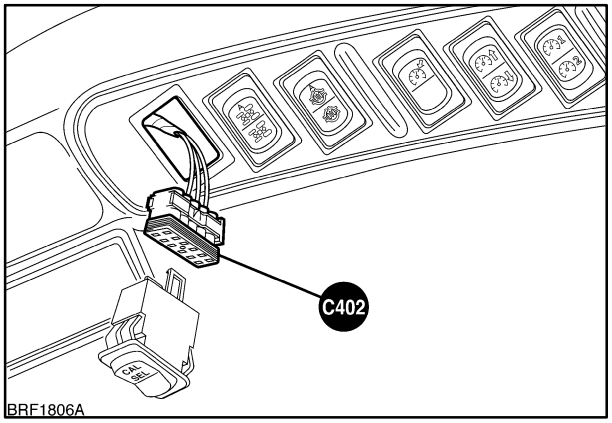

C308
C401
BRF1807A

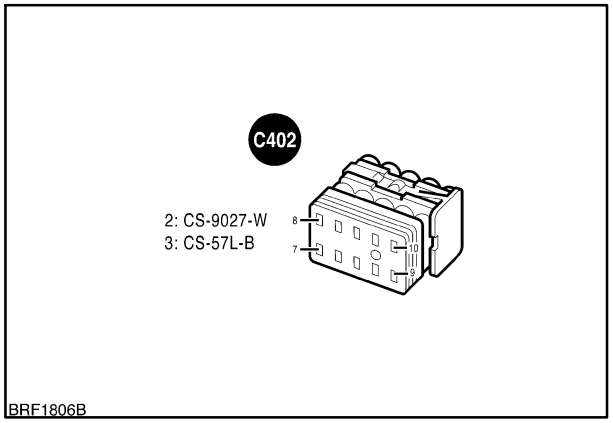
7


C308
2: CS-2050A-G
3: CS-7040-N
7: CS-57H-B
C401
2: CS-7000E-U
3: CS-6510-N
7: CS-57F-B
8: CS-57G-B
BRE1770B

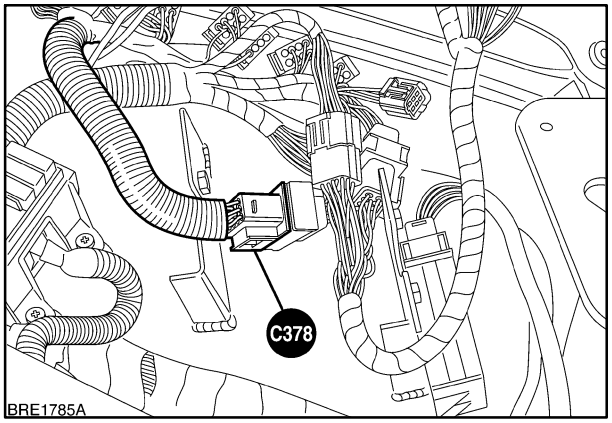
10


C402
BRF1806A

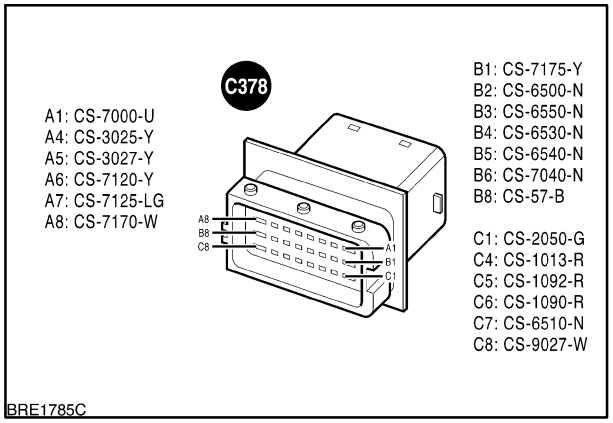
8


C402
2: CS-9027-W
3: CS-57L-B
BRF1806B

11

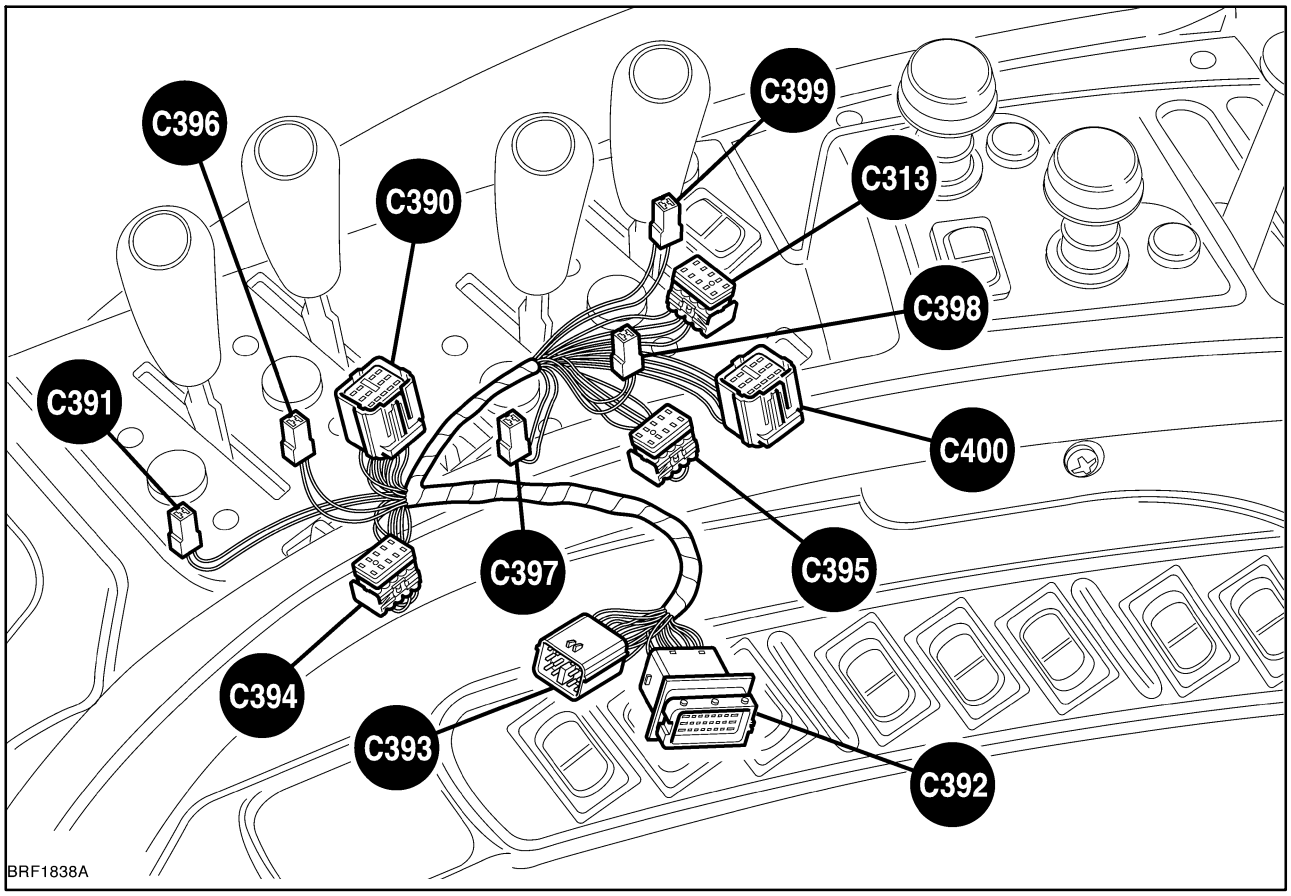

C378
BRE1785A

9


C378
A1: CS-7000-U
A4: CS-3025-Y
A5: CS-3027-Y
A6: CS-7120-Y
A7: CS-7125-LG
A8: CS-7170-W
B1: CS-7175-Y
B2: CS-6500-N
B3: CS-6550-N
B4: CS-6530-N
B5: CS-6540-N
B6: CS-7040-N
B8: CS-57-B
C1: CS-2050-G
C4: CS-1013-R
C5: CS-1092-R
C6: CS-1090-R
C7: CS-6510-N
C8: CS-9027-W
BRE1785C

12

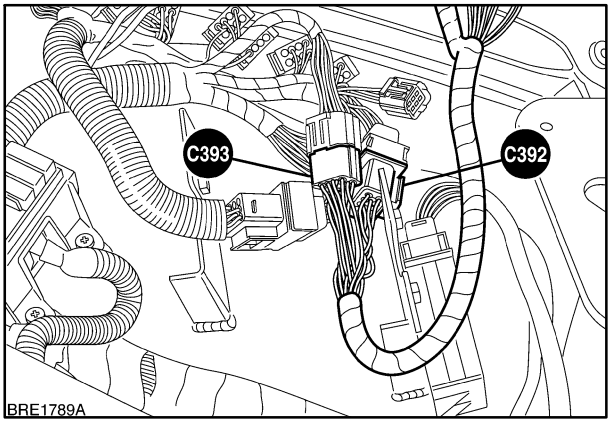
ELECTRONIC REMOTES



ELECTRONIC REMOTES HARNESS CONNECTORS

1. **C313** Master Switch
   (Location Fig 3, Connector Fig 4)
2. **C390** Lever 1 / 2
   (Location Fig 5, Connector Fig 8)
3. **C391** Lamp 1
   (Location Fig 6, Connector Fig 9)
4. **C392** EHR to Cab Main Connector 1
   (Location Fig 1, Connector Fig 2)
5. **C393** EHR to Cab Main Connector 2
   (Location Fig 1, Connector Fig 2)
6. **C394** Switch 1/2 Time / Flow
   (Location Fig 7, Connector Fig 10)
7. **C395** Switch 3/4 Time / Flow
   (Location Fig 3, Connector Fig 4)
8. **C396** Lamp 2
   (Location Fig 6, Connector Fig 9)
9. **C397** Lamp 3
   (Location Fig 11, Connector Fig 12)
10. **C398** Lamp 4
    (Location Fig 11, Connector Fig 12)
11. **C399** Master Lamp
    (Location Fig 13, Connector Fig 15)
12. **C400** Lever 3 / 4
    (Location Fig 14, Connector Fig 16)

ELECTRONIC REMOTES HARNESS CONNECTOR LOCATIONS



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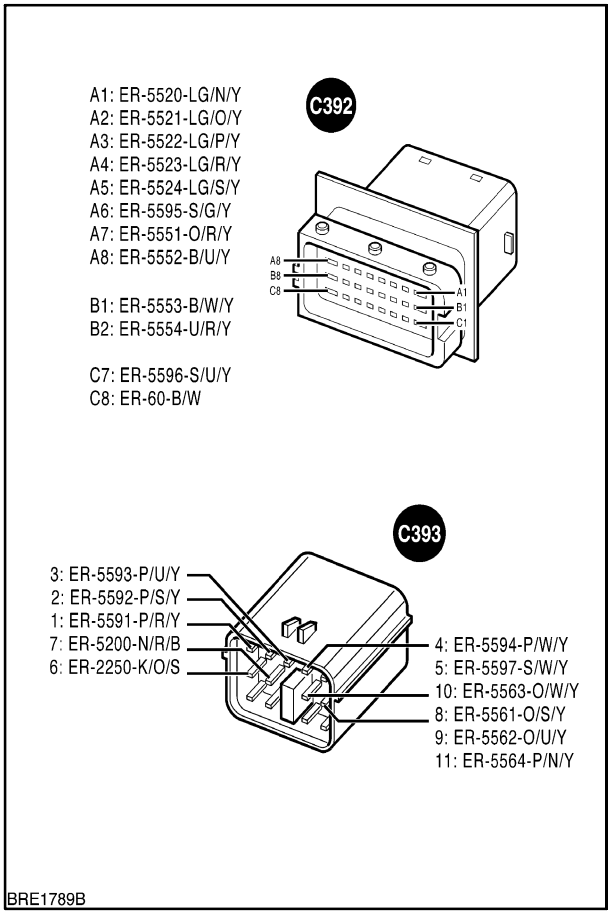

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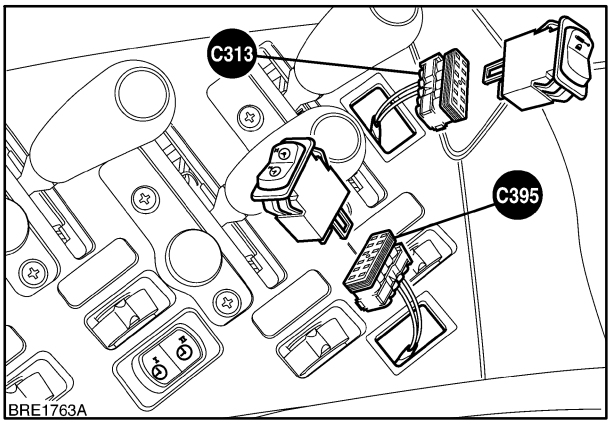

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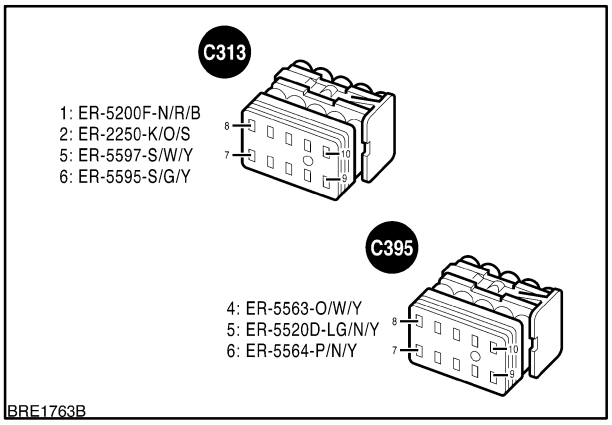

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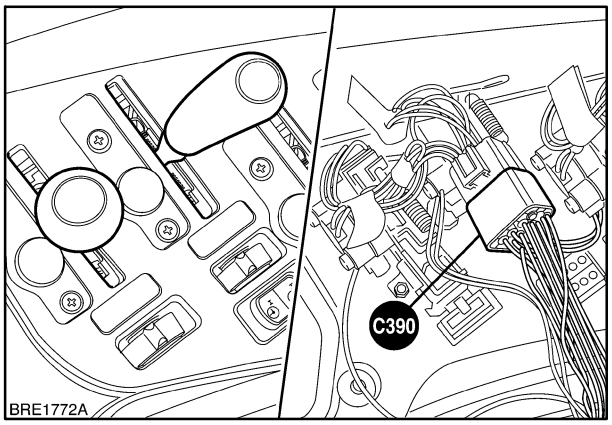
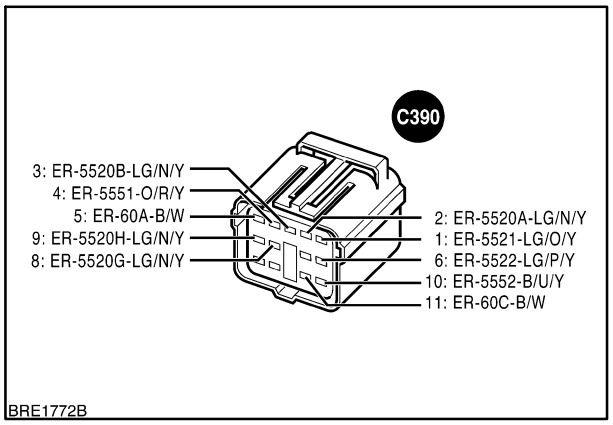
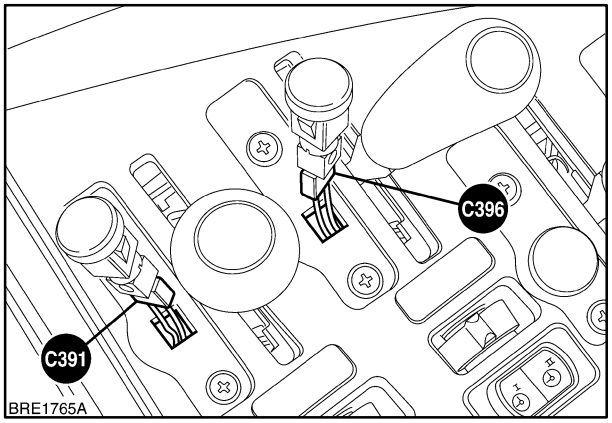

C390
BRE1772A

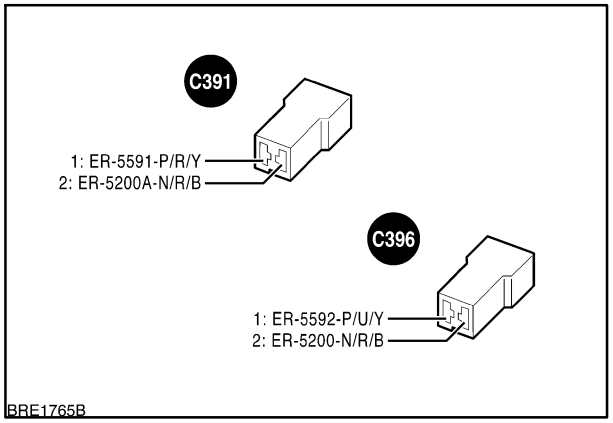
5


C390
3: ER-5520B-LG/N/Y
4: ER-5551-O/R/Y
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B

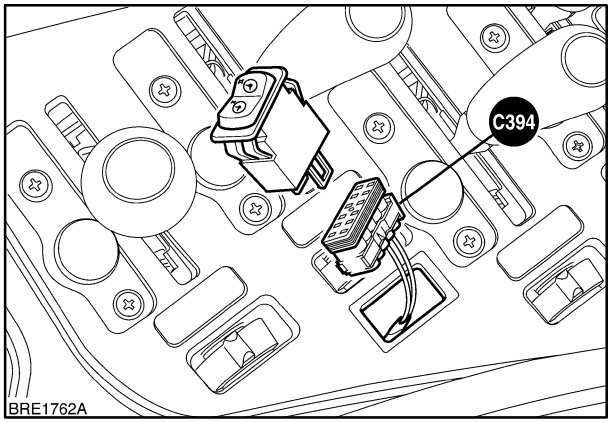
8


C396
C391
BRE1765A

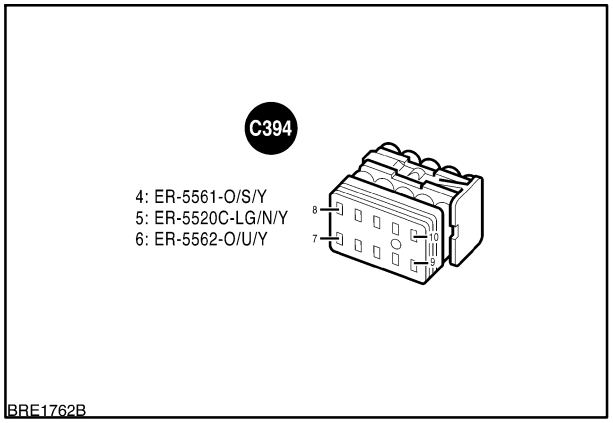
6


C391
1: ER-5591-P/R/Y
2: ER-5200A-N/R/B
C396
1: ER-5592-P/U/Y
2: ER-5200-N/R/B
BRE1765B

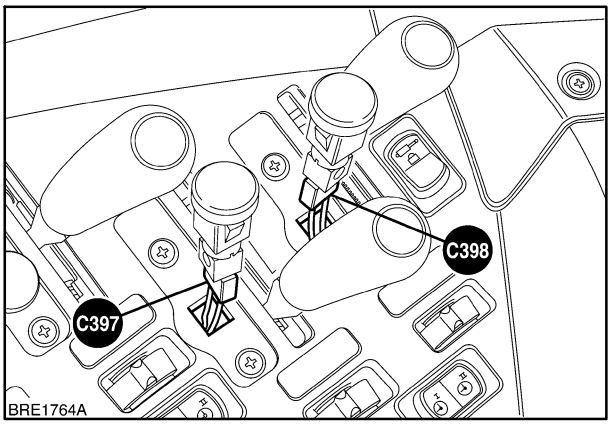
9


C394
BRE1762A

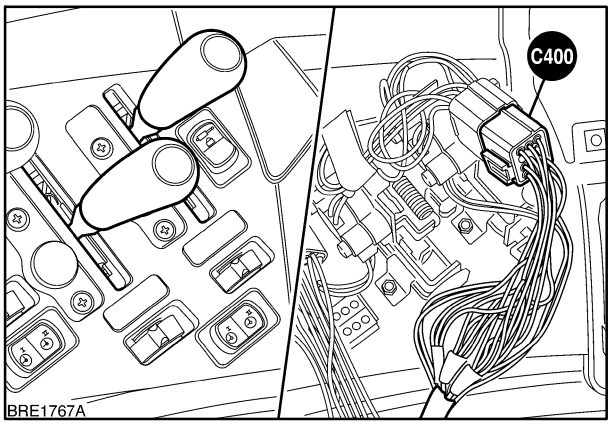
7


C394
4: ER-5561-O/S/Y
5: ER-5520C-LG/N/Y
6: ER-5562-O/U/Y
BRE1762B

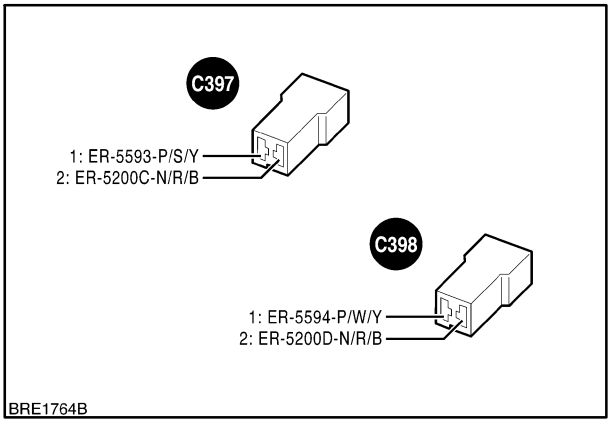
10



11



14



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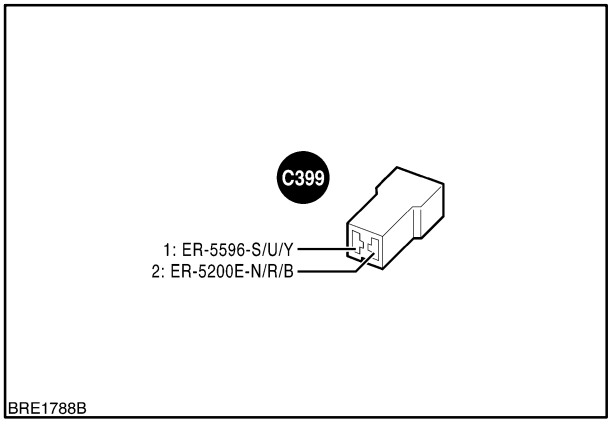

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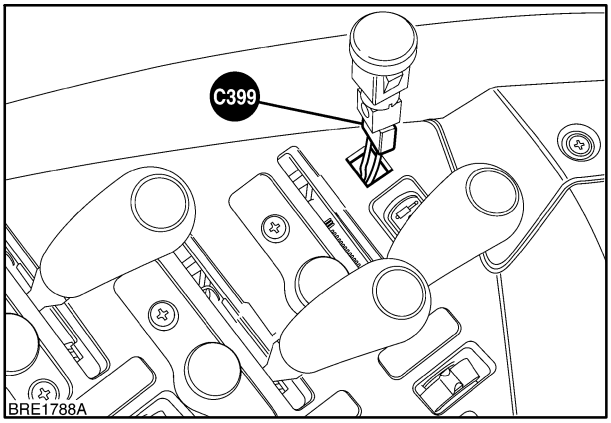

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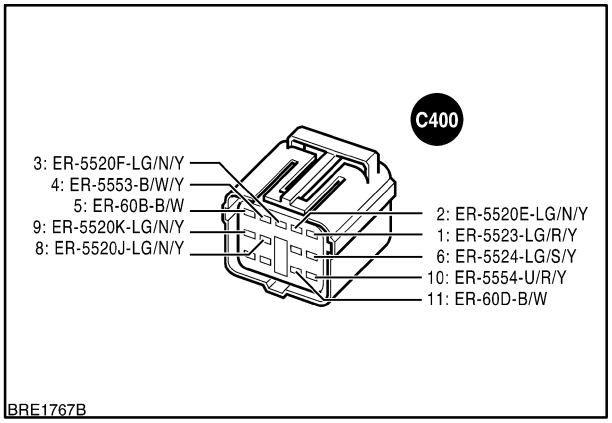

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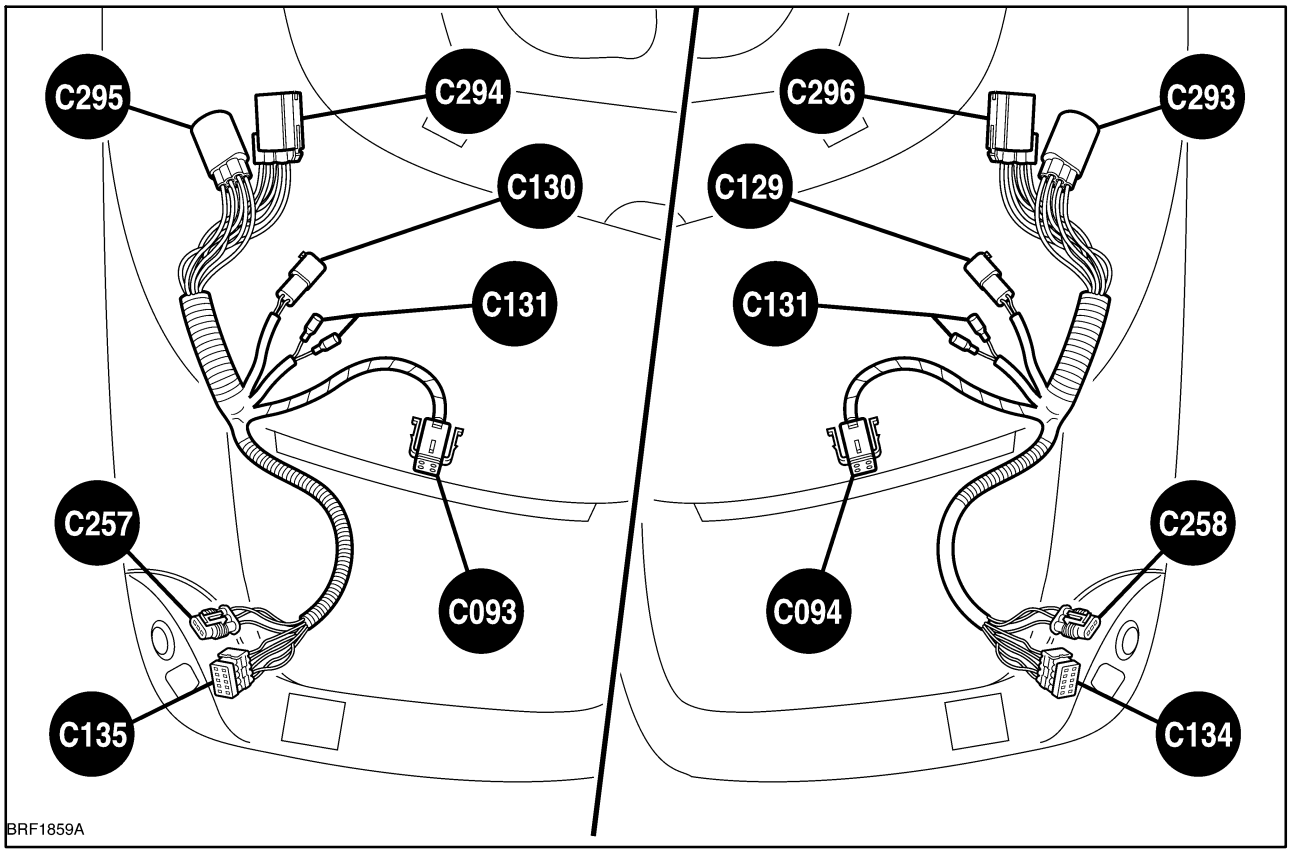
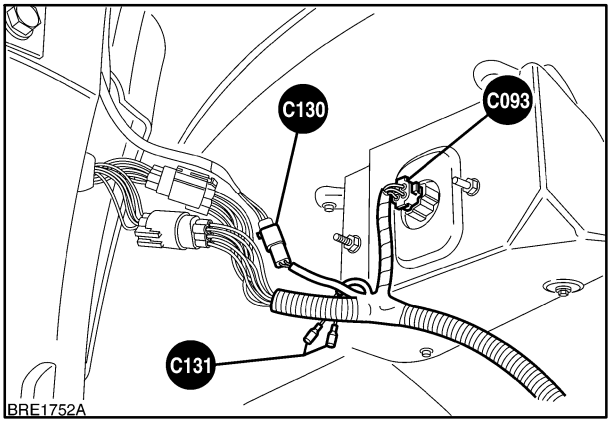
FENDER HARNESS



FENDER HARNESS CONNECTORS

1. **C093** Stop / Tail Light LH
   (Location Fig 1, Connector Fig 4)
2. **C094** Stop / Tail Light RH
   (Location Fig 2, Connector Fig 5)
3. **C129** Worklamp RH
   (Location Fig 2, Connector Fig 5)
4. **C130** Worklamp LH
   (Location Fig 1, Connector Fig 4)
5. **C131** Licence Plate Lamp
   (Location Fig 1/2, Connector Fig 4/5)
6. **C134** HPL Switch RH
   (Location Fig 3, Connector Fig 6)
7. **C135** HPL Switch LH
   (Location Fig 7, Connector Fig 10)
8. **C257** PTO Switch LH
   (Location Fig 7, Connector Fig 10)
9. **C258** PTO Switch RH
   (Location Fig 3, Connector Fig 6)
10. **C293** Fender to Cab Main Connector 1
    (Location Fig 8, Connector Fig 11)
11. **C294** Fender to Cab Main Connector 2
    (Location Fig 8, Connector Fig 11)
12. **C295** Fender to Cab Main Connector 1
    (Location Fig 9, Connector Fig 12)
13. **C296** Fender to Cab Main Connector 2
    (Location Fig 9, Connector Fig 12)

FENDER HARNESS CONNECTOR LOCATIONS



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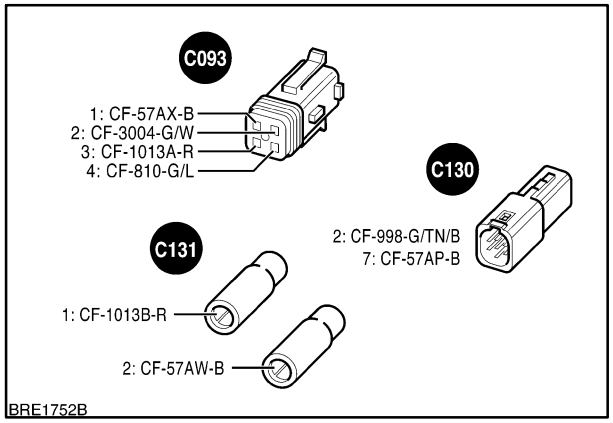

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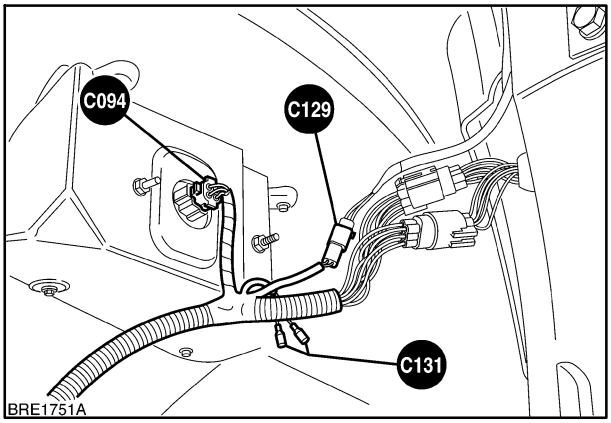

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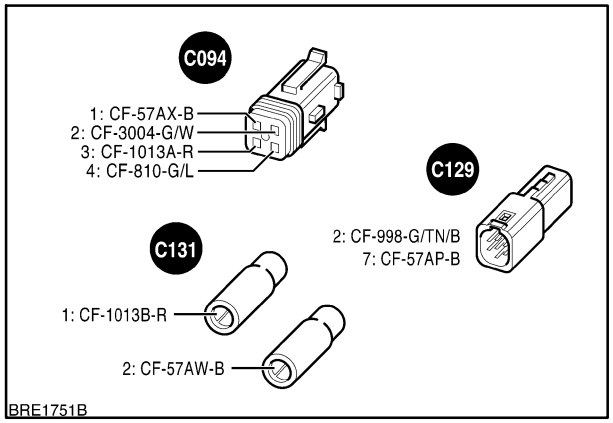

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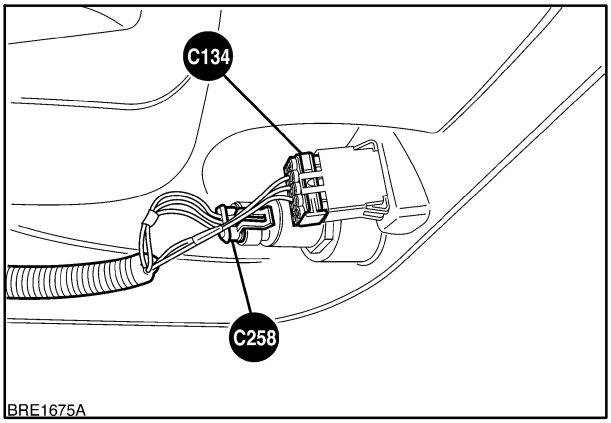

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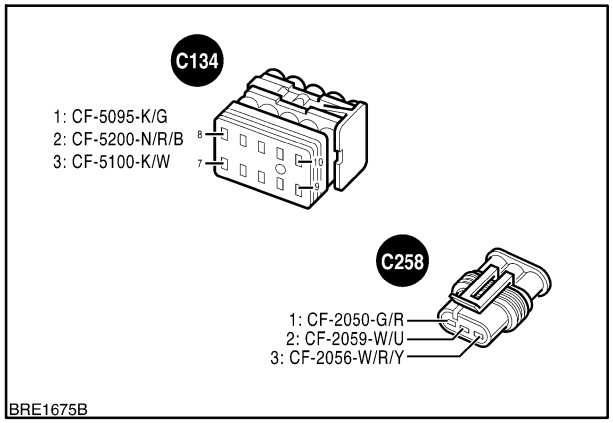

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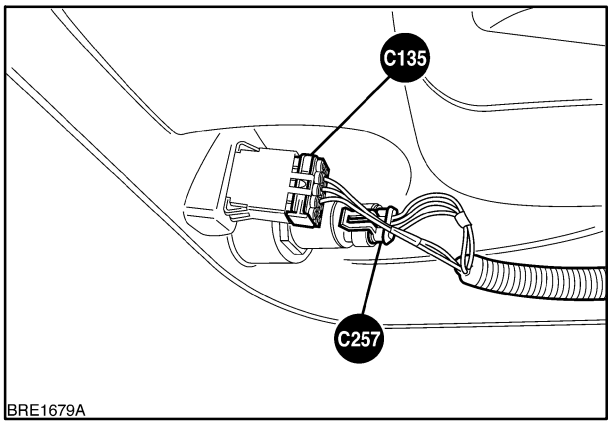
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C257
BRE1679A

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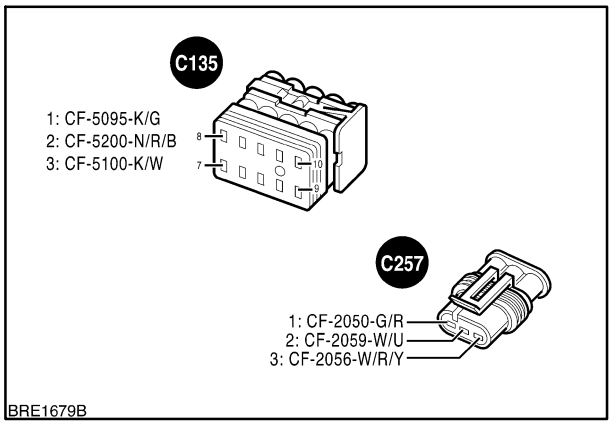
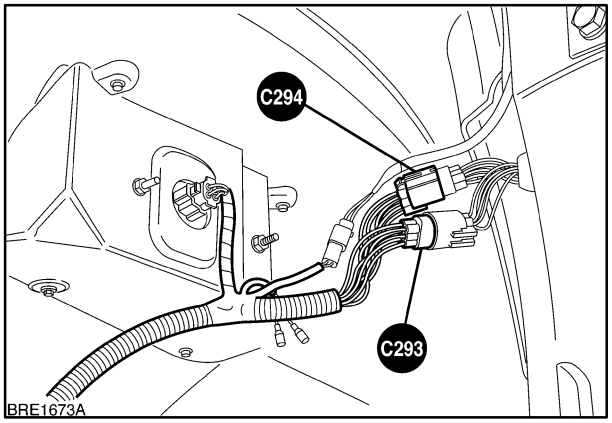

C135
1: CF-5095-K/G
2: CF-5200-N/R/B
3: CF-5100-K/W
8
7
10
9
C257
1: CF-2050-G/R
2: CF-2059-W/U
3: CF-2056-W/R/Y
BRE1679B

10


C294
C293
BRE1673A

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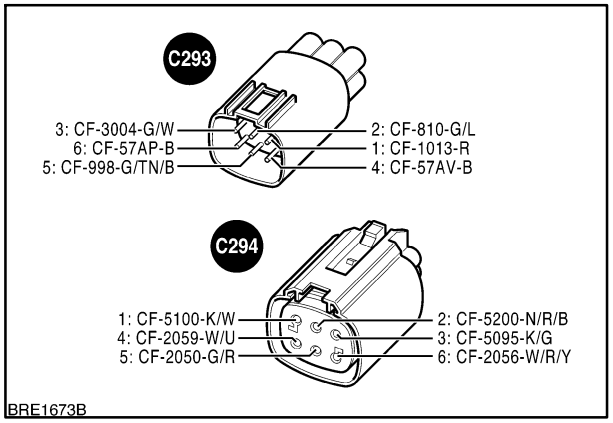
C293
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5: CF-998-G/TN/B
2: CF-810-G/L
1: CF-1013-R
4: CF-57AV-B
C294
1: CF-5100-K/W
4: CF-2059-W/U
5: CF-2050-G/R
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BRE1673B

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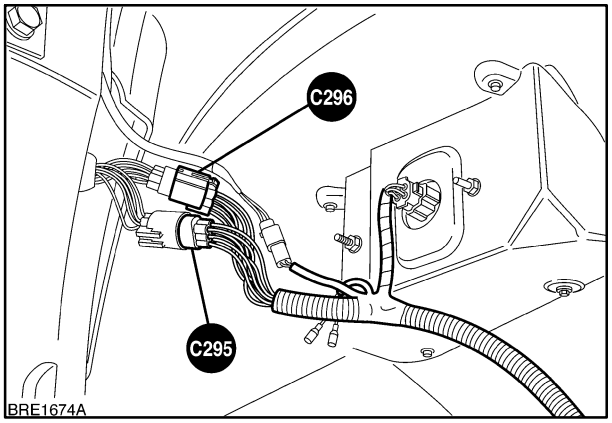
C296
C295
BRE1674A

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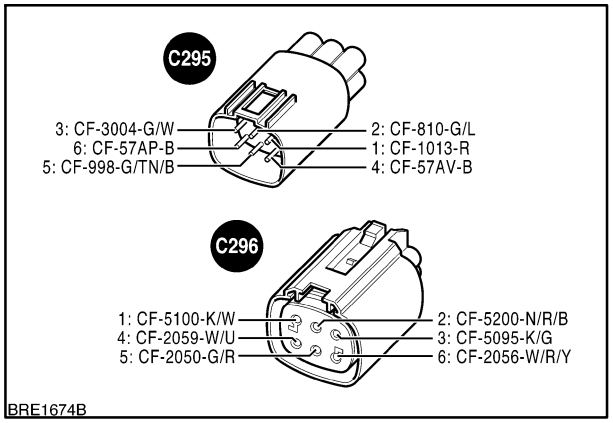
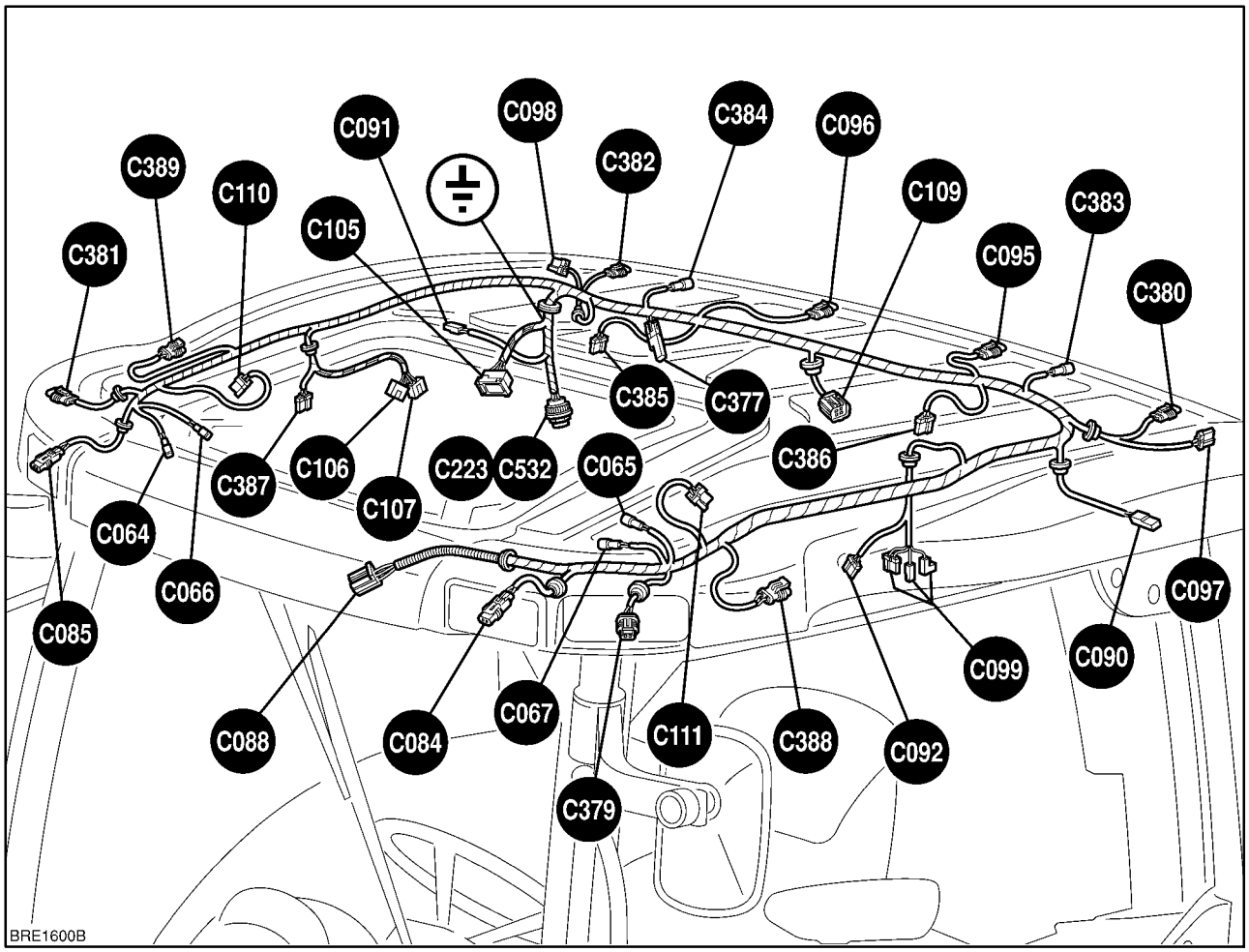

C295
3: CF-3004-G/W
6: CF-57AP-B
5: CF-998-G/TN/B
2: CF-810-G/L
1: CF-1013-R
4: CF-57AV-B
C296
1: CF-5100-K/W
4: CF-2059-W/U
5: CF-2050-G/R
2: CF-5200-N/R/B
3: CF-5095-K/G
6: CF-2056-W/R/Y
BRE1674B

12

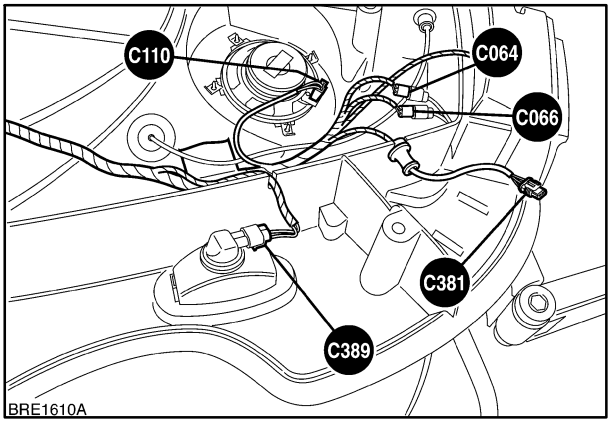
ROOF HARNESS



ROOF HARNESS CONNECTORS

1. **C064** Grab Rail Worklamp RH
   (Location Fig 1, Connector Fig 4)
2. **C065** Grab Rail Worklamp LH
   (Location Fig 2, Connector Fig 5)
3. **C066** Grab Rail Sidelamp RH
   (Location Fig 1, Connector Fig 4)
4. **C067** Grab Rail SidelampLH
   (Location Fig 2, Connector Fig 5)
5. **C084** Upper Front Worklamp LH
   (Location Fig 3, Connector Fig 6)
6. **C085** Upper Front Worklamp RH
   (Location Fig 7, Connector Fig 11)
7. **C088** Front Wiper Motor
   (Location Fig 8, Connector Fig 12)
8. **C090** Door Switch LH
   (Location Fig 9, Connector Fig 13)
9. **C091** Door Switch RH
   (Location Fig 9, Connector Fig 13)
10. **C092** Console Lamp LH
    (Location Fig 10, Connector Fig 14)
11. **C095** Rear Licence Plate / Worklamp LH
    (Location Fig 15, Connector Fig 19)
12. **C096** Rear Licence Plate / Worklamp RH
    (Location Fig 16, Connector Fig 20)
13. **C097** Beacon LH
    (Location Fig 17, Connector Fig 21)
14. **C098** Beacon RH
    (Location Fig 18, Connector Fig 22)
15. **C099** Interior Lamp
    (Location Fig 10, Connector Fig 14)
16. **C105** Worklamp ECU
    (Location Fig 23, Connector Fig 27)
17. **C106** Radio Connector A
    (Location Fig 24, Connector Fig 28)
18. **C107** Radio Connector B
    (Location Fig 24, Connector Fig 28)
19. **C109** Rear Wiper Motor
    (Location Fig 25, Connector Fig 29)
20. **C110** Front Speaker Connector RH
    (Location Fig 1, Connector Fig 4)
21. **C111** Front Speaker Connector LH
    (Location Fig 2, Connector Fig 5)
22. **C223** Roof to Cab Main Connector
    (Location Fig 26, Connector Fig 30)
23. **C377** Diode
    (Location Fig 16, Connector Fig 20)
24. **C379** Front SMV Lamp LH
    (Location Fig 2, Connector Fig 5)
25. **C380** Rear SMV Lamp LH
    (Location Fig 17, Connector Fig 21)
26. **C381** Front SMV Lamp RH
    (Location Fig 1, Connector Fig 4)
27. **C382** Rear SMV Lamp RH
    (Location Fig 18, Connector Fig 22)
28. **C383** Rear Worklamp LH
    (Location Fig 15, Connector Fig 19)
29. **C384** Rear Worklamp RH
    (Location Fig 16, Connector Fig 20)
30. **C385** Rear Speaker Connector LH
    (Location Fig 17, Connector Fig 21)
31. **C386** Rear Speaker Connector RH
    (Location Fig 18, Connector Fig 22)
32. **C387** Console Lamp RH
    (Location Fig 31, Connector Fig 32)
33. **C388** Puddle Lamp LH
    (Location Fig 2, Connector Fig 5)
34. **C389** Puddle Lamp RH
    (Location Fig 1, Connector Fig 4)
35. **C532** Roof to Cab Connector (after 06-2005)
    (Location Fig 33, Connector Fig 34)

ROOF HARNESS CONNECTOR LOCATIONS



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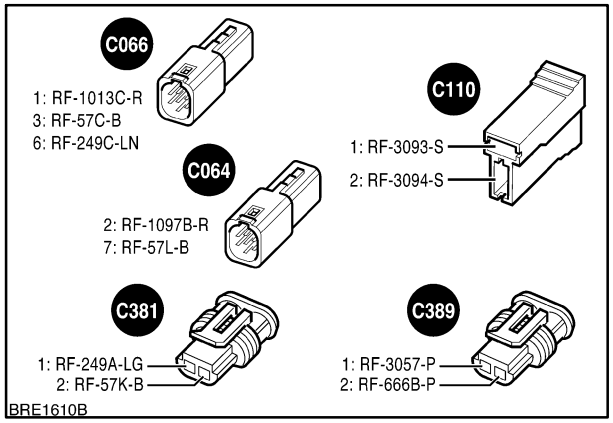

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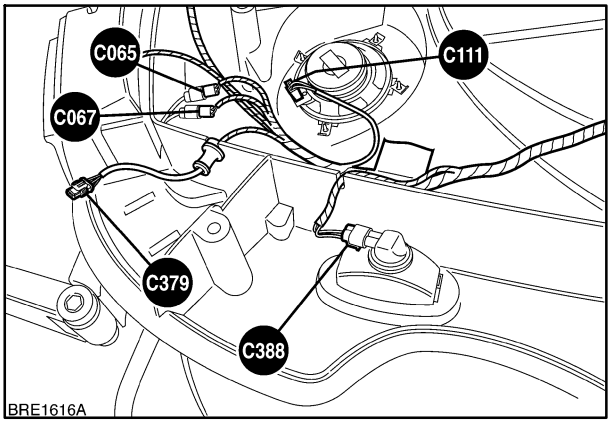

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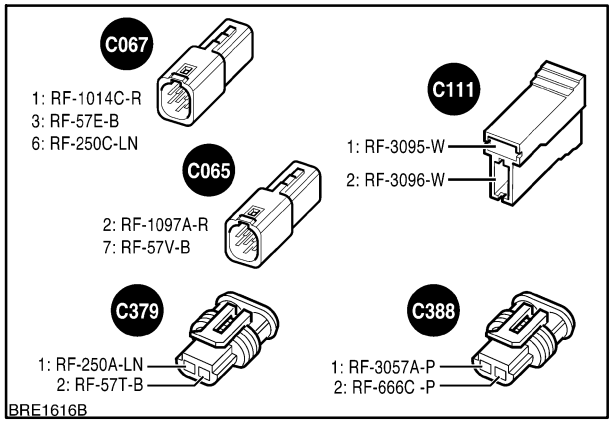

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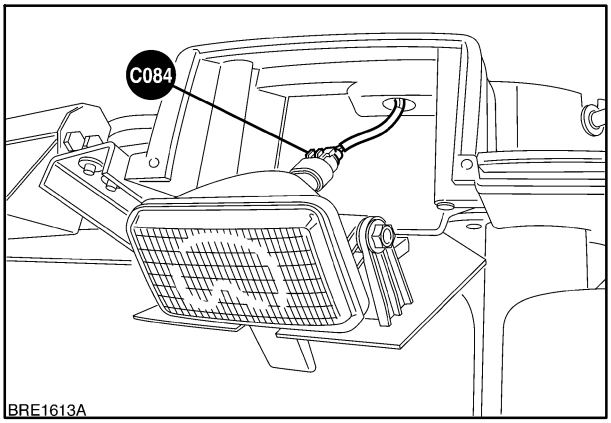

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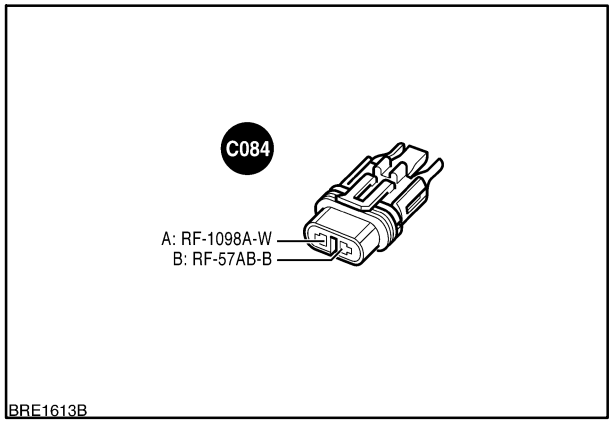

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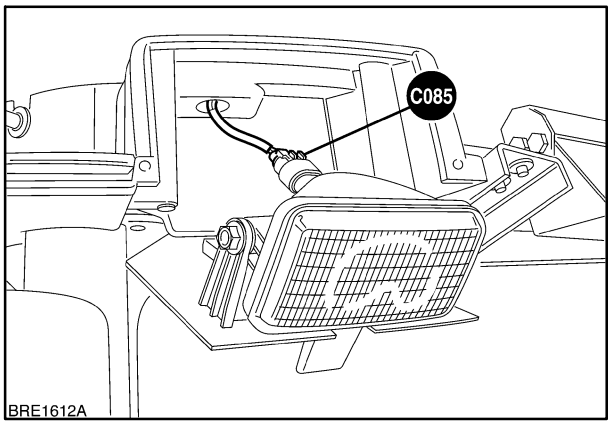
C085
BRE1612A

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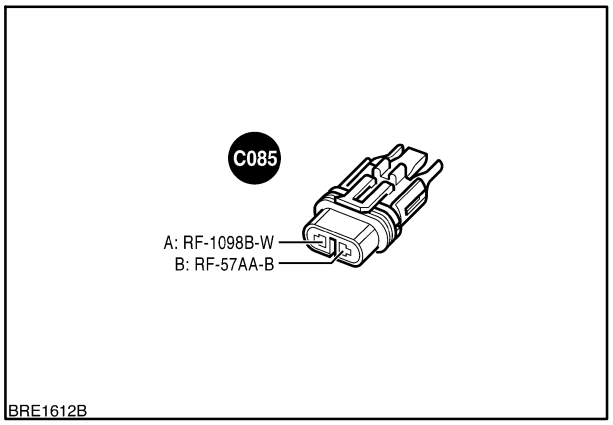
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B: RF-57AA-B
BRE1612B

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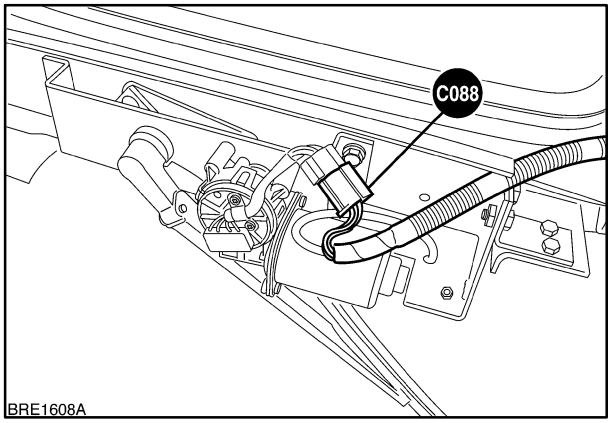
C088
BRE1608A

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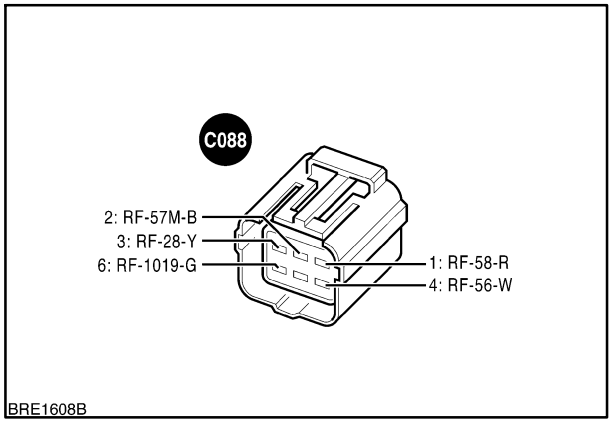
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4: RF-56-W
BRE1608B

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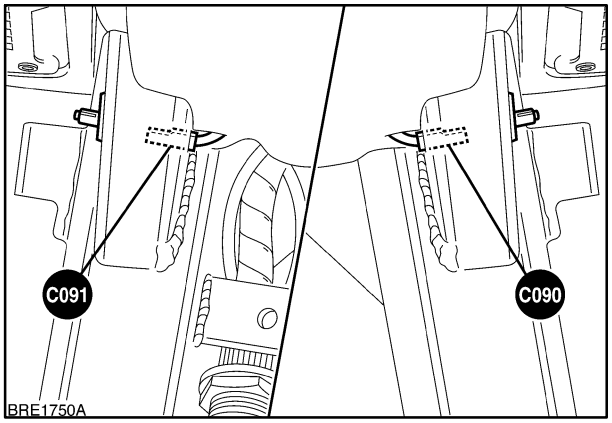
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C090
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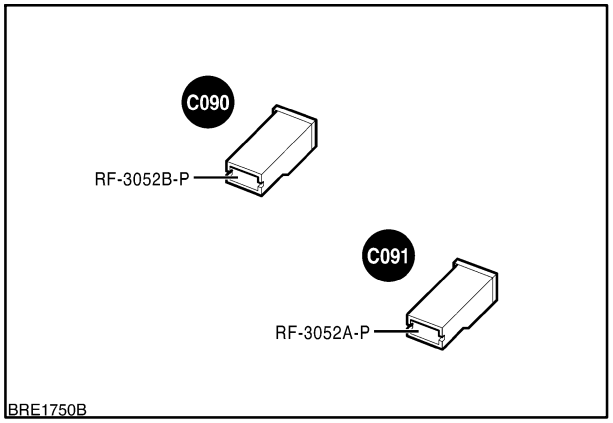
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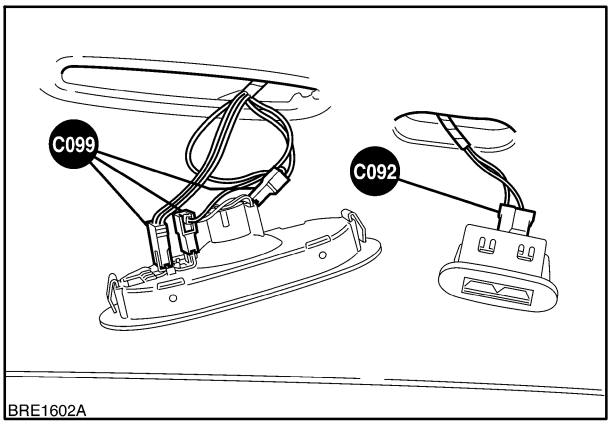

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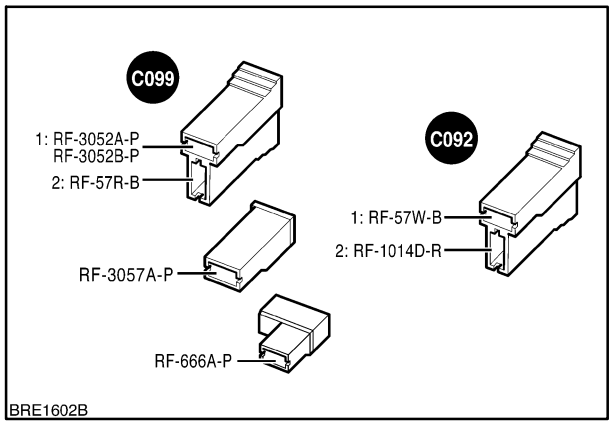

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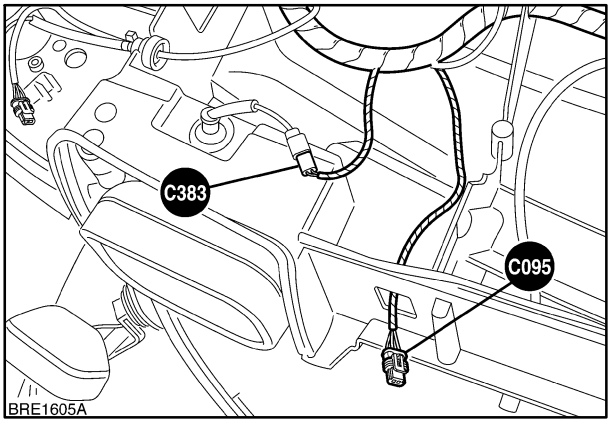

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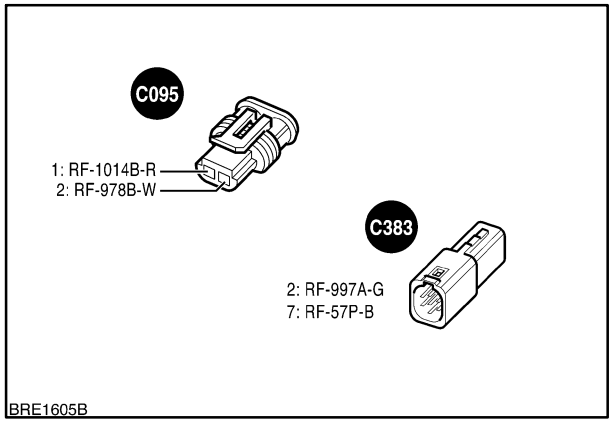

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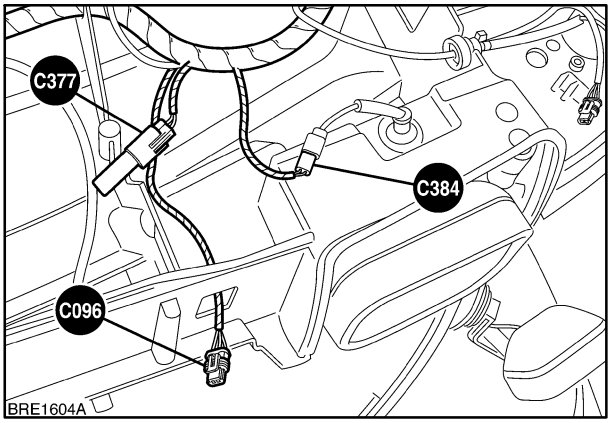

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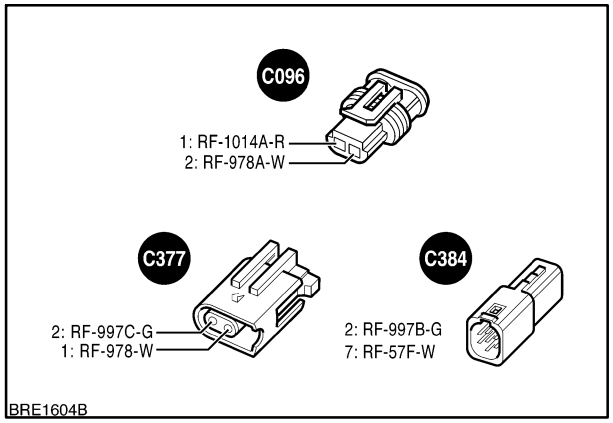

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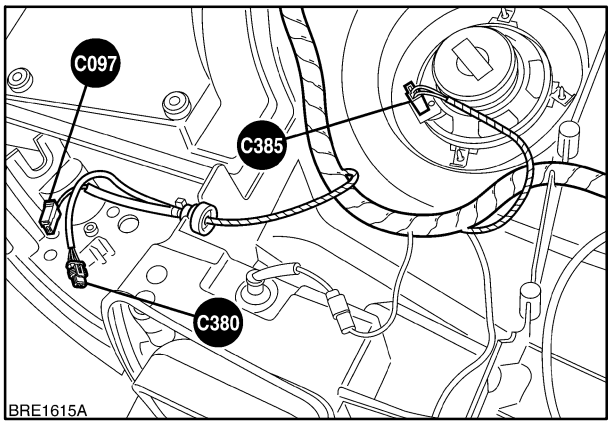

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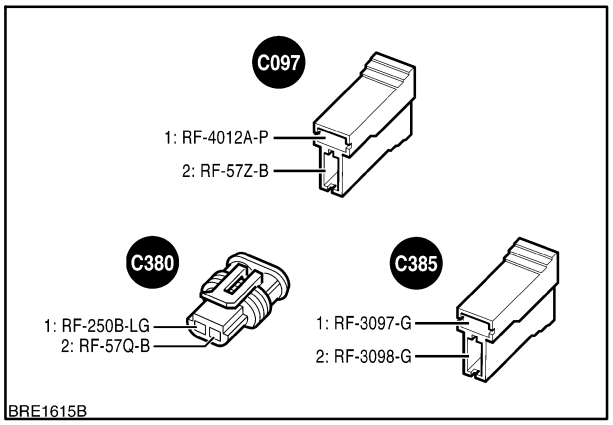

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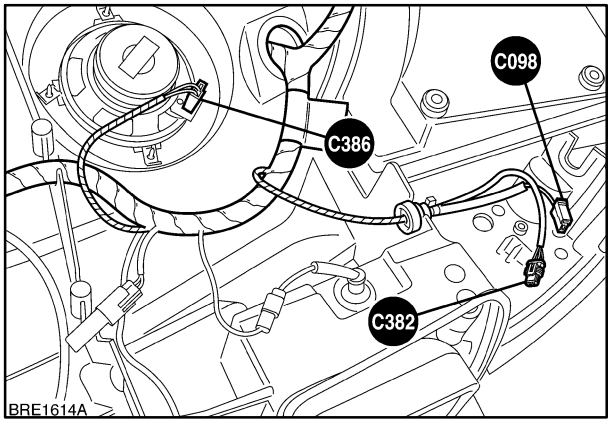

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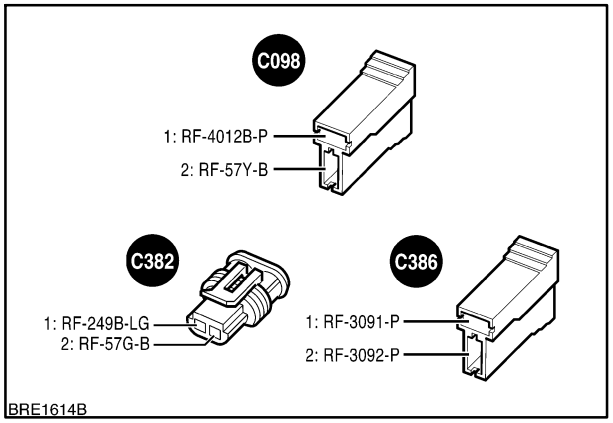

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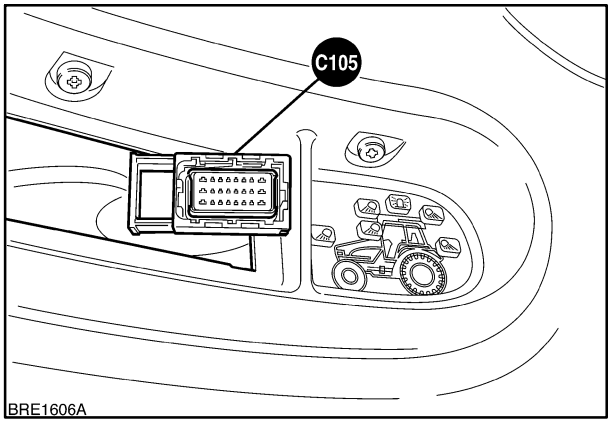

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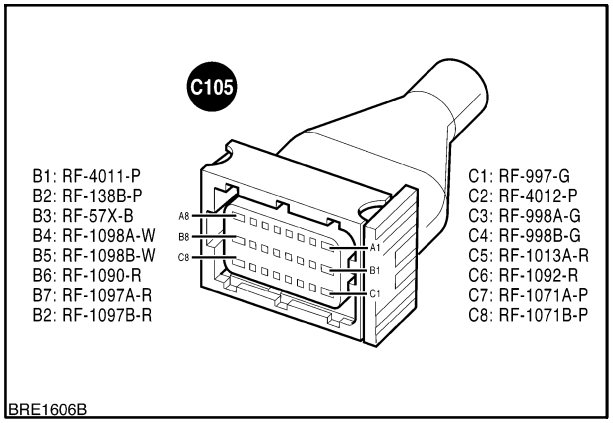

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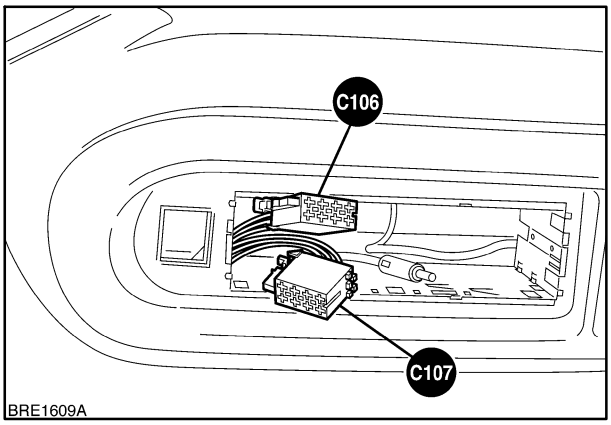

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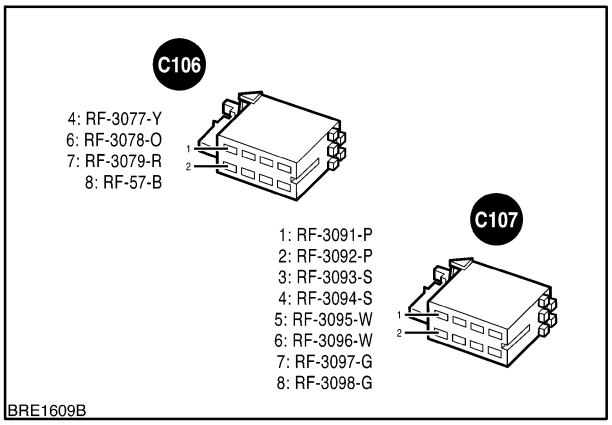

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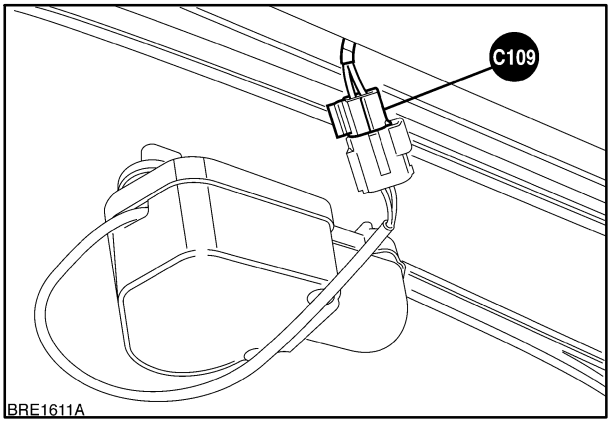

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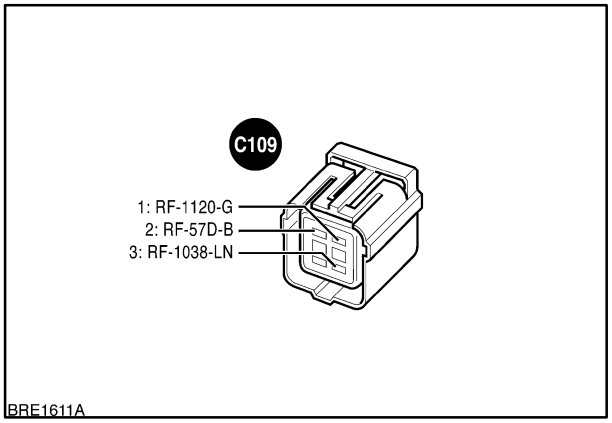

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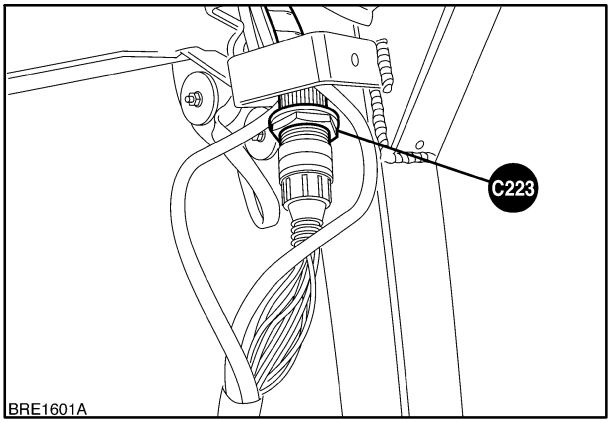

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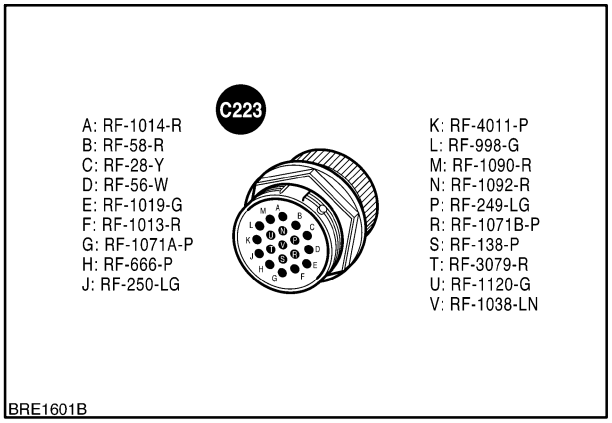

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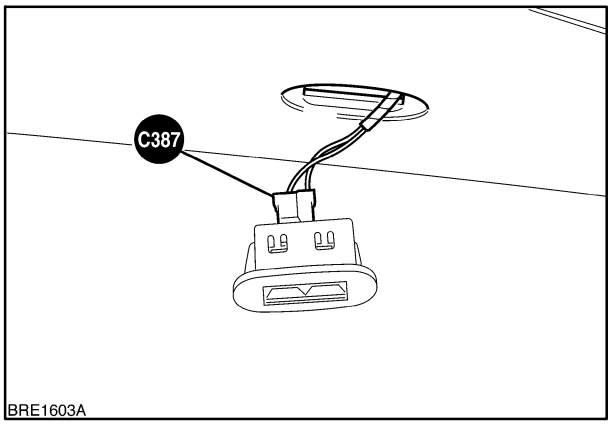
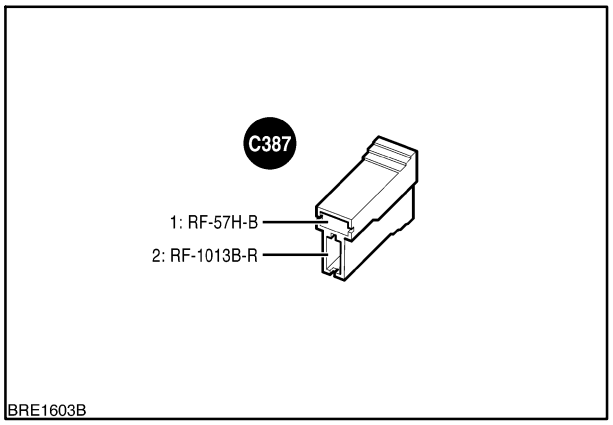
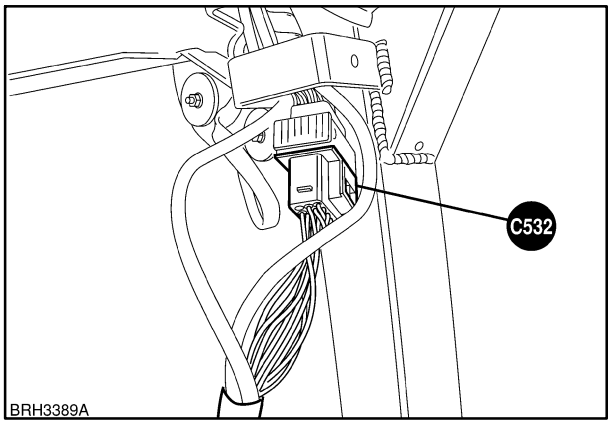

C387
BRE1603A

31


C387
1: RF-57H-B
2: RF-1013B-R
BRE1603B

32


C532
BRH3389A

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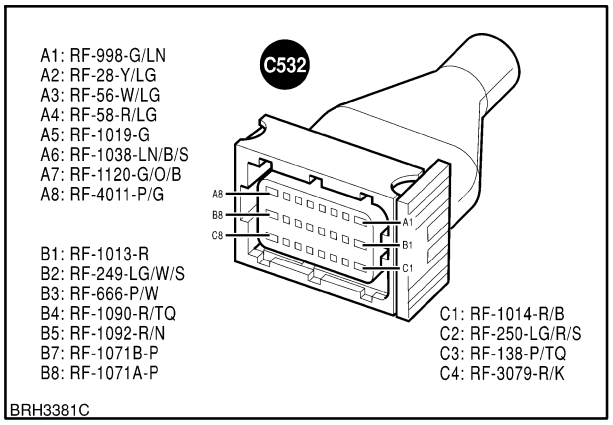
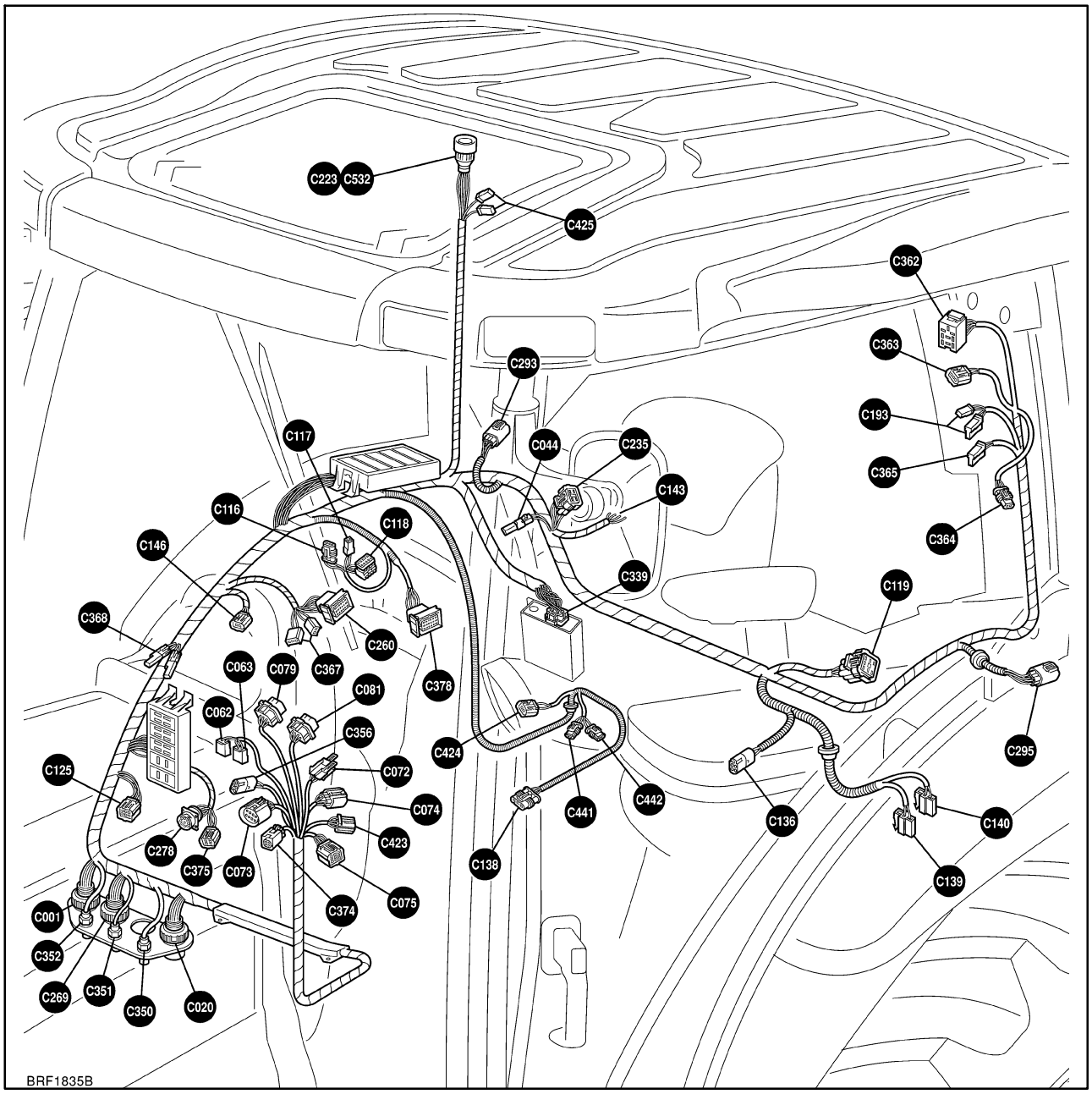

A1: RF-998-G/LN
A2: RF-28-Y/LG
A3: RF-56-W/LG
A4: RF-58-R/LG
A5: RF-1019-G
A6: RF-1038-LN/B/S
A7: RF-1120-G/O/B
A8: RF-4011-P/G
B1: RF-1013-R
B2: RF-249-LG/W/S
B3: RF-666-P/W
B4: RF-1090-R/TQ
B5: RF-1092-R/N
B7: RF-1071B-P
B8: RF-1071A-P
C532
A8
B8
C8
A1
B1
C1
C1: RF-1014-R/B
C2: RF-250-LG/R/S
C3: RF-138-P/TQ
C4: RF-3079-R/K
BRH3381C

34

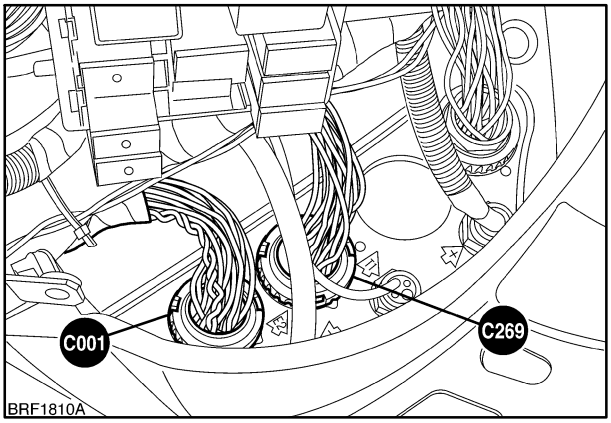
CAB MAIN HARNESS 12 x 12



CAB MAIN HARNESS - 12 X 12 CONNECTORS

1. **C001** Cab to Engine Main Connector E1
   (Location Fig 1, Connector Fig 2)
2. **C020** Cab to Transmission Main Connector T2
   (Location Fig 3, Connector Fig 5)
3. **C044** Ground Speed PTO Switch
   (Location Fig 4, Connector Fig 6)
4. **C062** Right Hand Stop Lamp Switch
   (Location Fig 7, Connector Fig 11)
5. **C063** Left Hand Stop Lamp Switch
   (Location Fig 7, Connector Fig 11)
6. **C072** Key Start Switch
   (Location Fig 8, Connector Fig 12)
7. **C073** Front & Rear Windshield Wiper Switch
   (Location Fig 9, Connector Fig 13)
8. **C074** Turn Switch
   (Location Fig 9, Connector Fig 13)
9. **C079** Instrument Cluster "A"
   (Location Fig 15, Connector Fig 16)
10. **C081** Instrument Cluster "C"
    (Location Fig 15, Connector Fig 16)
11. **C116** Rear PTO Switch
    (Location Fig 10, Connector Fig 14)
12. **C117** Rear PTO Lamp
    (Location Fig 17, Connector Fig 19)
13. **C118** Rear PTO Brake Switch
    (Location Fig 18, Connector Fig 20)
14. **C119** Heater / Air Conditioning Connector
    (Location Fig 21, Connector Fig 23)
15. **C125** Transmission Diagnostics (TCM)
    (Location Fig 22, Connector Fig 24)
16. **C136** Hand Brake Switch
    (Location Fig 25, Connector Fig 27)
17. **C138** Seat Air Pump
    (Location Fig 26, Connector Fig 28)
18. **C139** Front Washer Motor
    (Location Fig 29, Connector Fig 31)
19. **C140** Rear Washer Motor
    (Location Fig 29, Connector Fig 31)
20. **C143** Rear Implement Socket
    (Location Fig 30, Connector Fig 32)
21. **C146** Lift-o-matic
    (Location Fig 33, Connector Fig 35)
22. **C193** Cigar Lighter
    (Location Fig 34, Connector Fig 36)
23. **C223** Cab to Roof Harness
    (Location Fig 37, Connector Fig 39)
24. **C235** 30 Amp Socket & Power Studs
    (Location Fig 4, Connector Fig 6)
25. **C260** Indicator Flasher Unit
    (Location Fig 38, Connector Fig 40)
26. **C269** Cab to Engine Main Connector E2
    (Location Fig 1, Connector Fig 2)
27. **C279** Diagnostics Connector
    (Location Fig 41, Connector Fig 43)
28. **C293** RH Fender 1
    (Location Fig 42, Connector Fig 44)
29. **C295** LH Fender 1
    (Location Fig 45, Connector Fig 47)
30. **C339** Small Control Module (SCM)
    (Location Fig 46, Connector Fig 48)
31. **C350** 1 Power B+ Connector
    (Location Fig 49, Connector Fig 51)
32. **C351** 2 Power E Connector
    (Location Fig 49, Connector Fig 51)
33. **C352** 3 Power B- Connector
    (Location Fig 49, Connector Fig 51)
34. **C356** Reverse Alarm Harness Connector
    (Location Fig 54, Connector Fig 58)
35. **C362** Heater Blower Switch
    (Location Fig 50, Connector Fig 52)
36. **C363** Air Conditioning Switch
    (Location Fig 53, Connector Fig 57)
37. **C364** HVAC Switch
    (Location Fig 34, Connector Fig 36)
38. **C365** 8 Amp Socket
    (Location Fig 34, Connector Fig 36)
39. **C367** Grid Heater
    (Location Fig 33, Connector Fig 35)
40. **C368** Diode Connector
    (Location Fig 55, Connector Fig 59)
41. **C374** Hazard Switch Harness
    (Location Fig 8, Connector Fig 12)
42. **C375** ADIC Diagnostic Connector
    (Location Fig 41, Connector Fig 43)
43. **C378** Cab to Switch Harness Connector
    (Location Fig 61, Connector Fig 63)
44. **C423** Brake Pedals Latched
    (Location Fig 54, Connector Fig 58)
45. **C424** Loader Power Connector
    (Location Fig 56, Connector Fig 60)
46. **C425** Auxillary Headlamp Switch
    (Location Fig 62, Connector Fig 64)
47. **C441** Loader Valve No.1
    (Location Fig 56, Connector Fig 60)
48. **C442** Loader Valve No.2
    (Location Fig 56, Connector Fig 60)
49. **C532** Cab to Roof Harness (after 06-2005)
    (Location Fig 65, Connector Fig 66)

CAB MAIN HARNESS - 12 X 12 CONNECTOR LOCATIONS



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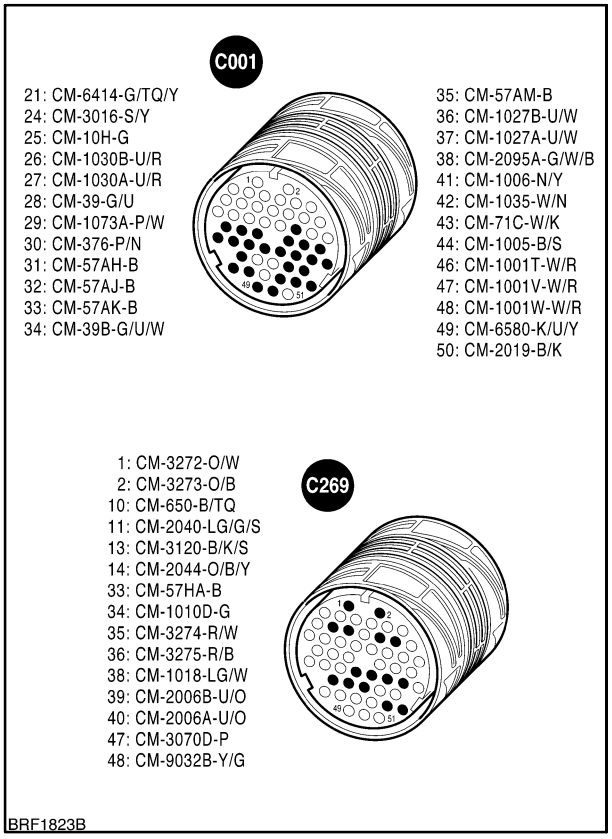

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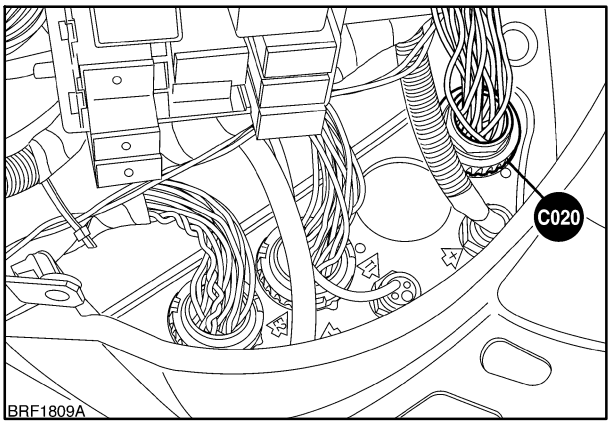

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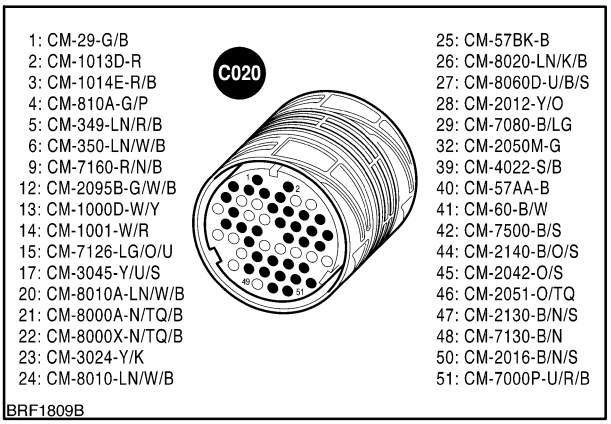

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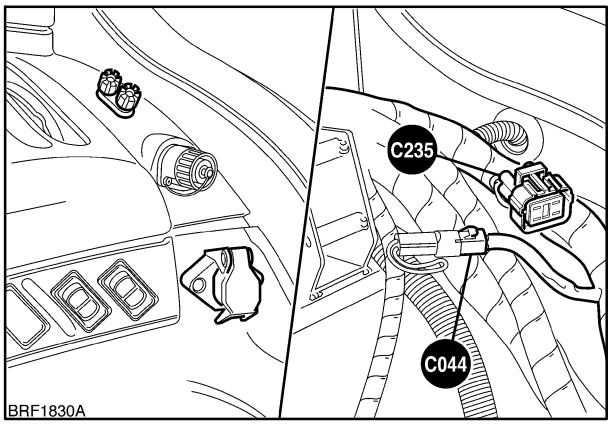
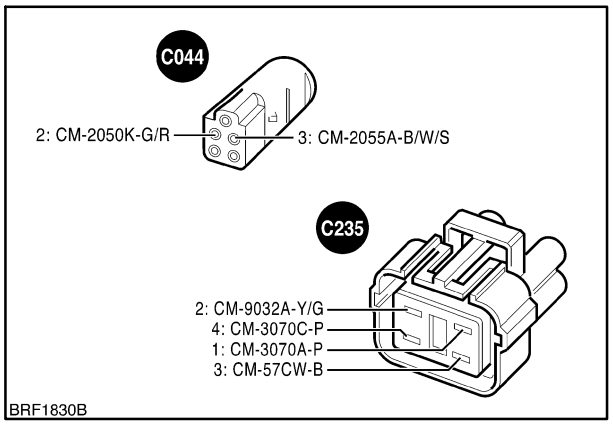
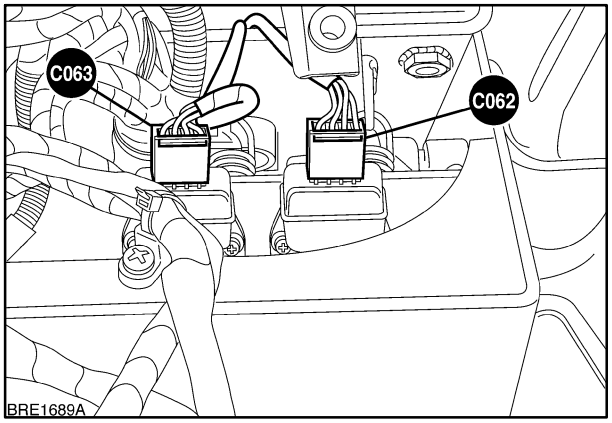

C235
C044
BRF1830A

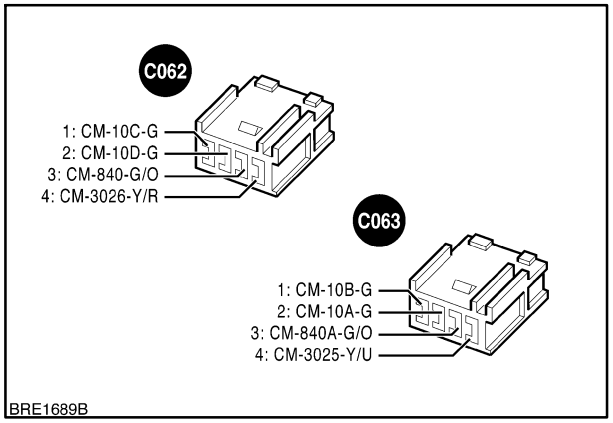
5


C044
2: CM-2050K-G/R
3: CM-2055A-B/W/S
C235
2: CM-9032A-Y/G
4: CM-3070C-P
1: CM-3070A-P
3: CM-57CW-B
BRF1830B

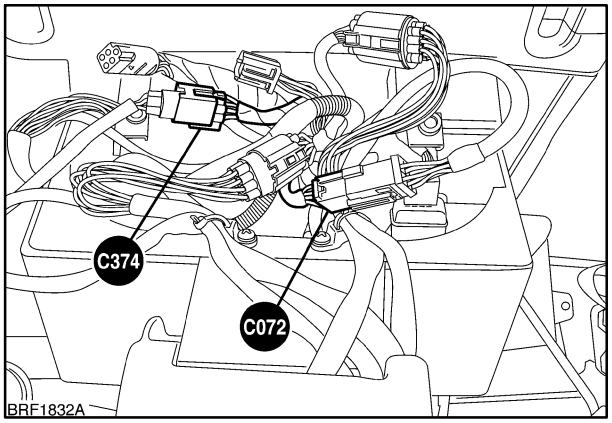
8


C063
C062
BRE1689A

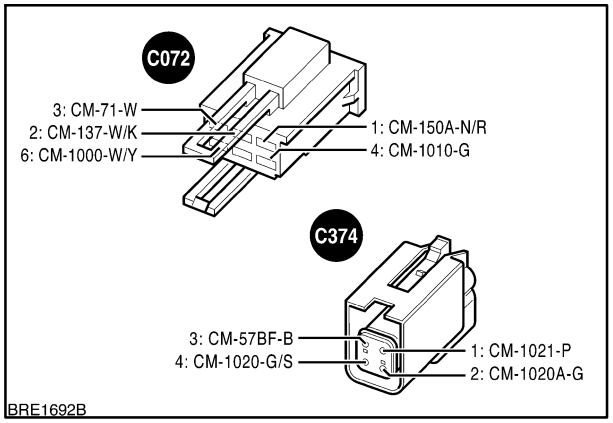
6


C062
1: CM-10C-G
2: CM-10D-G
3: CM-840-G/O
4: CM-3026-Y/R
C063
1: CM-10B-G
2: CM-10A-G
3: CM-840A-G/O
4: CM-3025-Y/U
BRE1689B

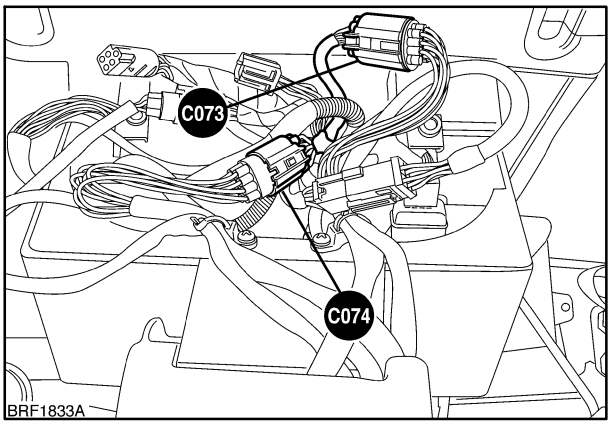
9


C374
C072
BRF1832A

7


C072
3: CM-71-W
2: CM-137-W/K
6: CM-1000-W/Y
1: CM-150A-N/R
4: CM-1010-G
C374
3: CM-57BF-B
4: CM-1020-G/S
1: CM-1021-P
2: CM-1020A-G
BRE1692B

10


C073
C074
BRF1833A

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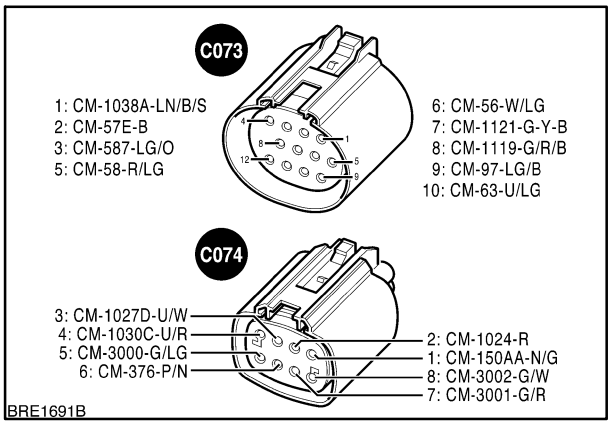
C073
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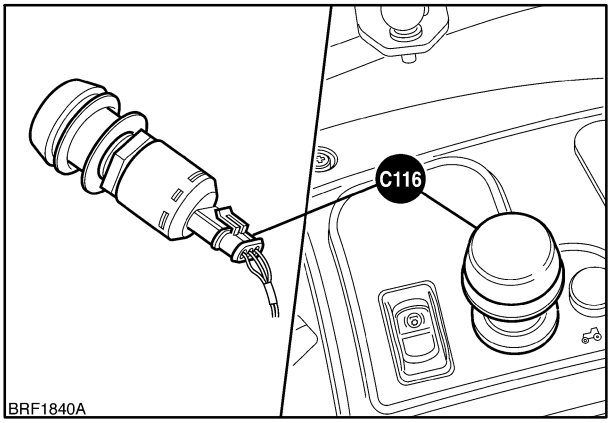
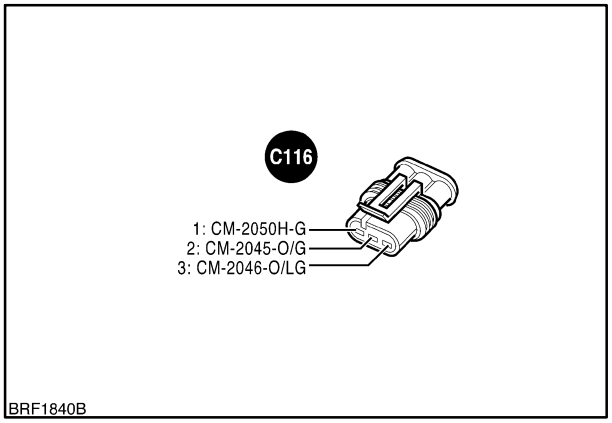
2: CM-57E-B
3: CM-587-LG/O
5: CM-58-R/LG
6: CM-56-W/LG
7: CM-1121-G-Y-B
8: CM-1119-G/R/B
9: CM-97-LG/B
10: CM-63-U/LG
C074
3: CM-1027D-U/W
4: CM-1030C-U/R
5: CM-3000-G/LG
6: CM-376-P/N
2: CM-1024-R
1: CM-150AA-N/G
8: CM-3002-G/W
7: CM-3001-G/R
BRE1691B

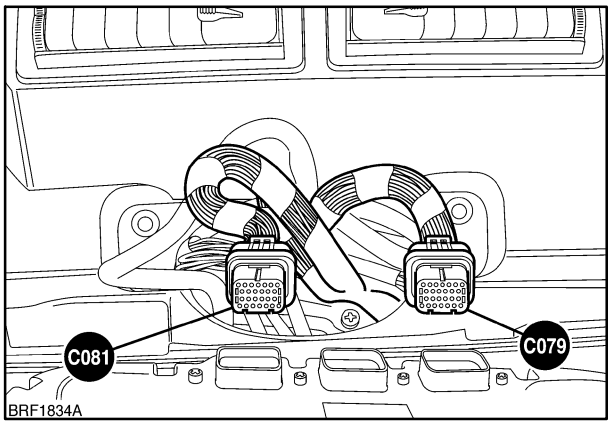
13


C116
BRF1840A

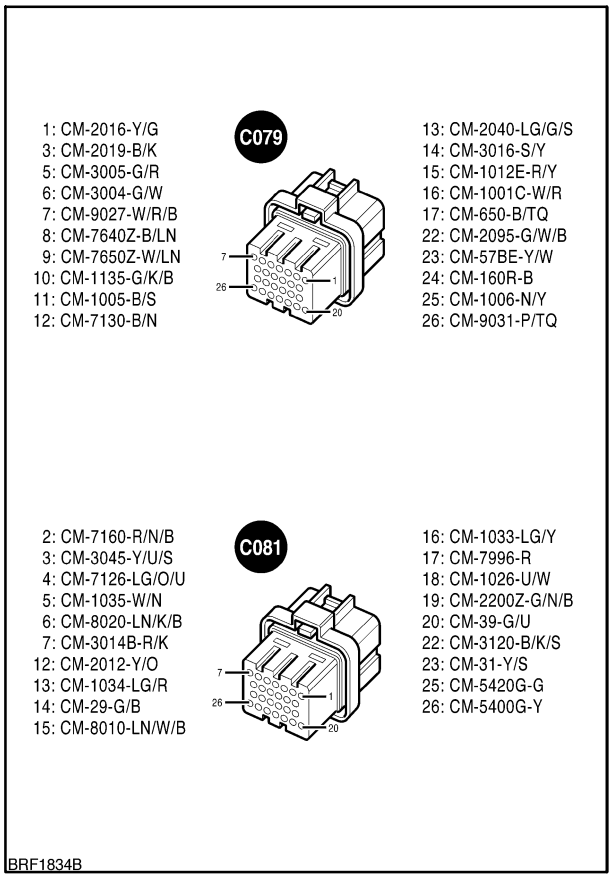
12


C116
1: CM-2050H-G
2: CM-2045-O/G
3: CM-2046-O/LG
BRF1840B

14


C081
C079
BRF1834A

15


C079
1: CM-2016-Y/G
3: CM-2019-B/K
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
14: CM-3016-S/Y
15: CM-1012E-R/Y
16: CM-1001C-W/R
17: CM-650-B/TQ
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
7
26
1
20
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014B-R/K
12: CM-2012-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
22: CM-3120-B/K/S
23: CM-31-Y/S
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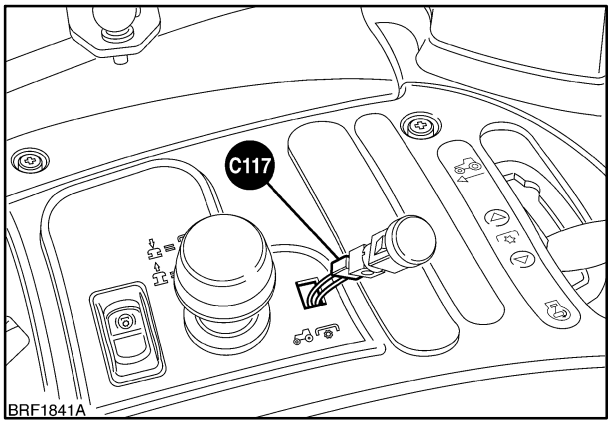
26
1
20
BRF1834B

16


C117
BRF1841A

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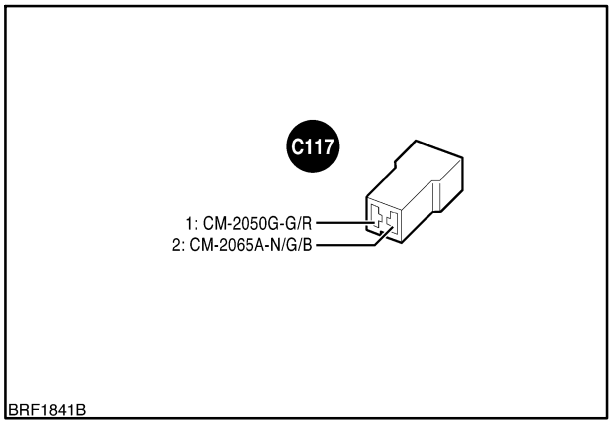
C117
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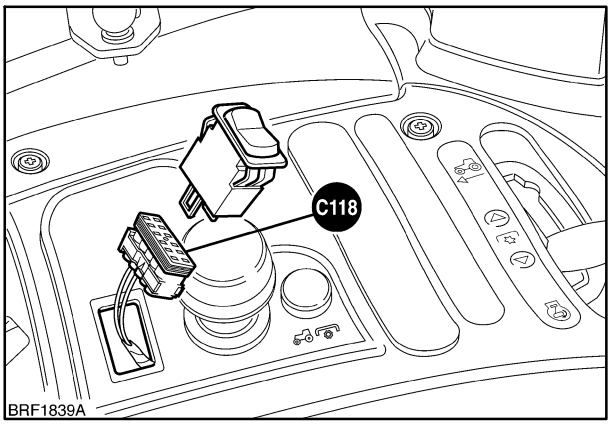
2: CM-2065A-N/G/B
BRF1841B

18



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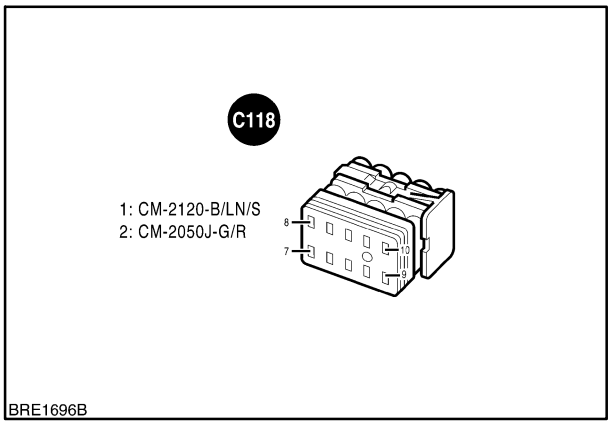

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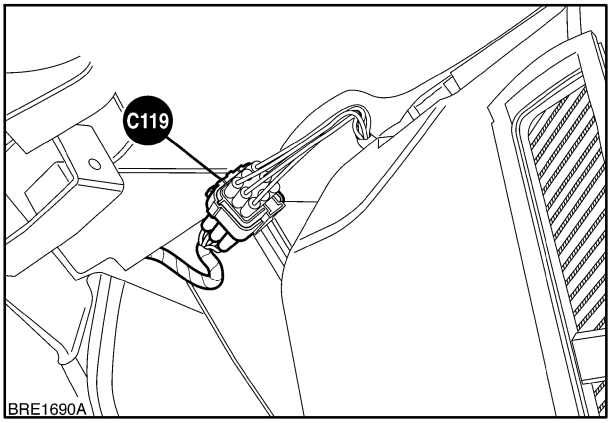

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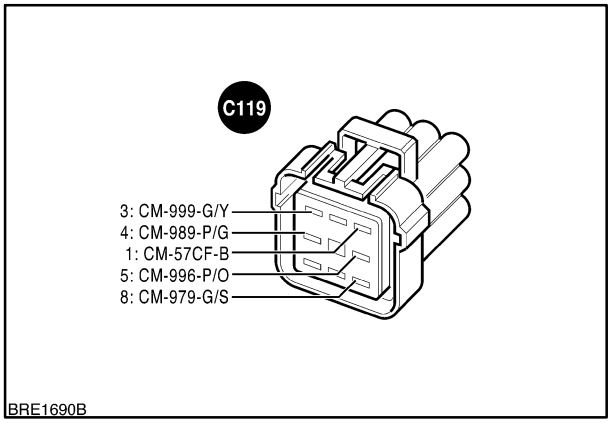

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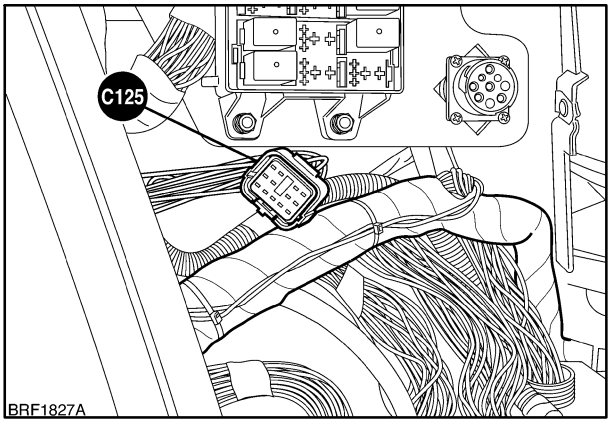

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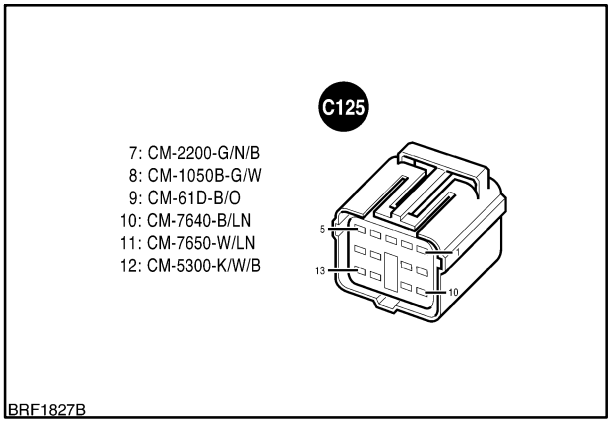

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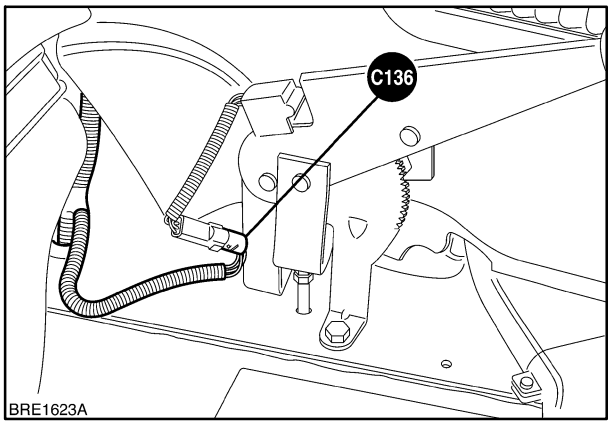

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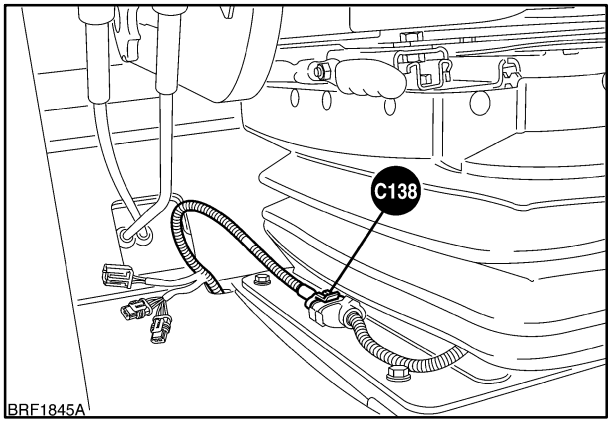

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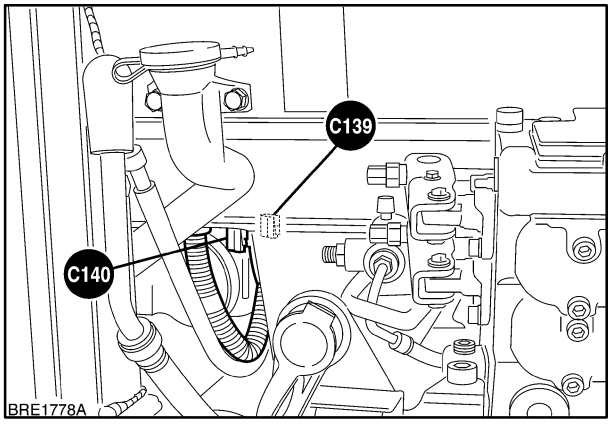

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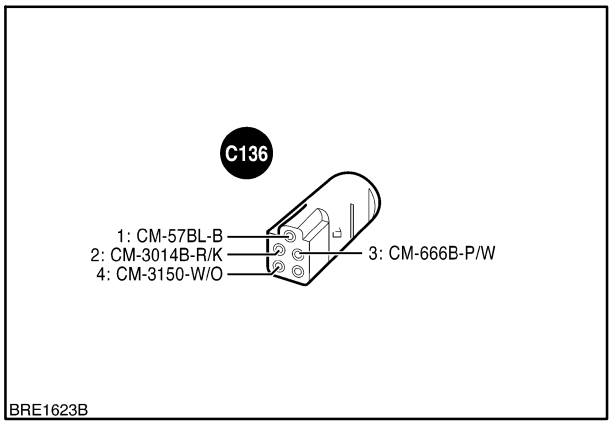

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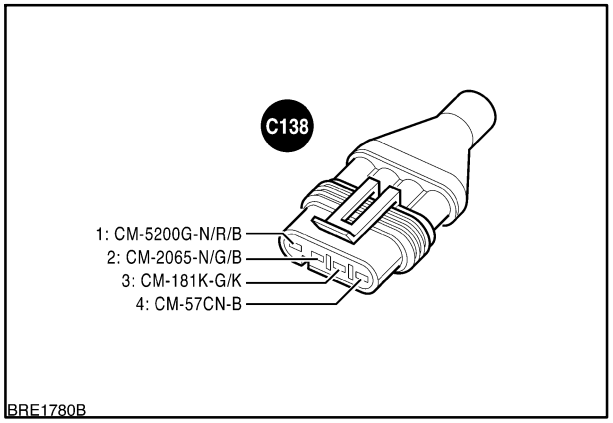

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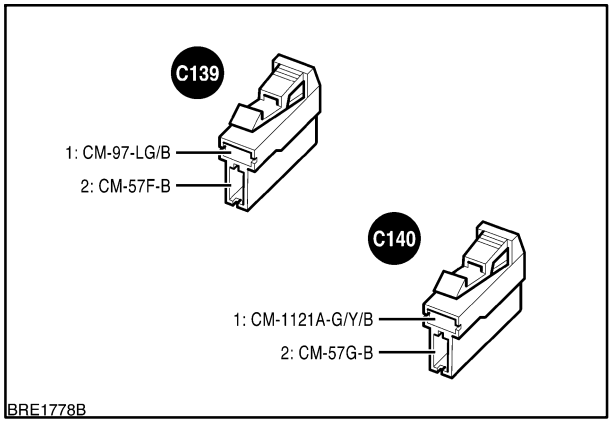

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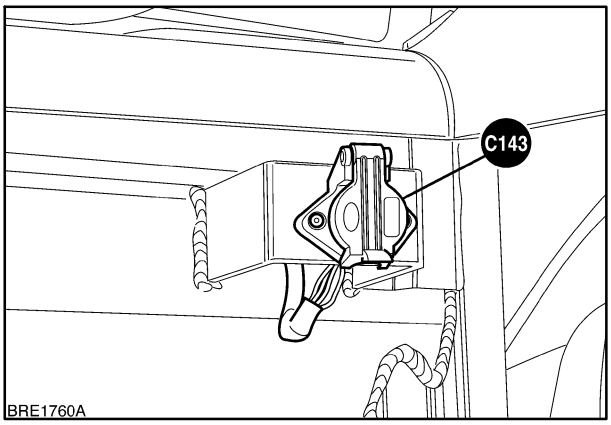

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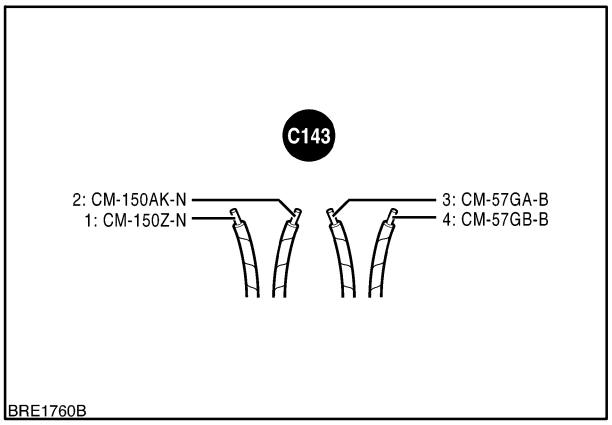

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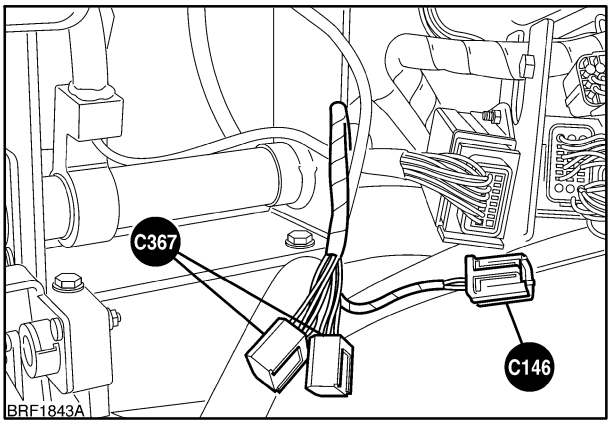

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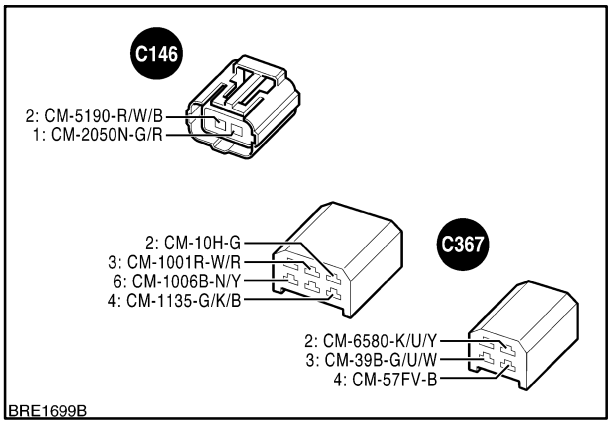

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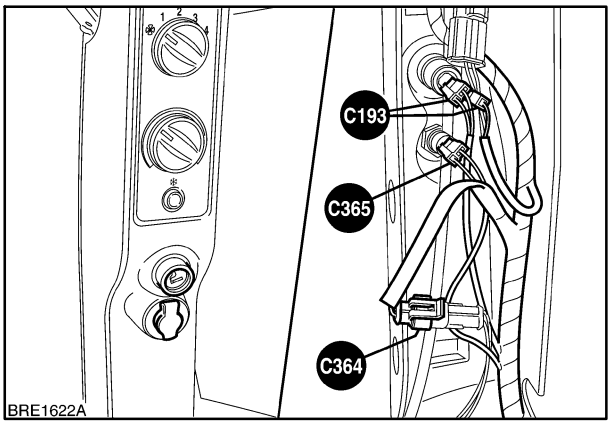

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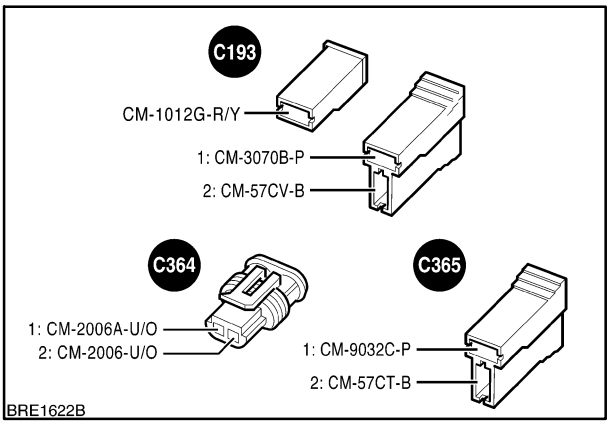

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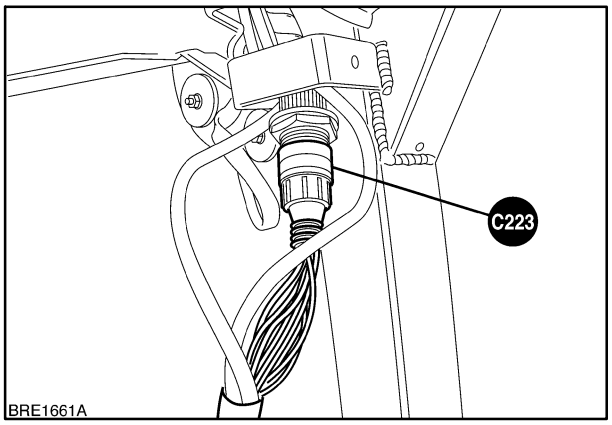

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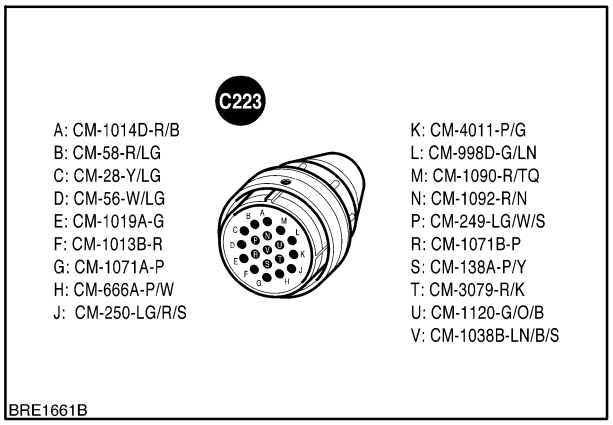

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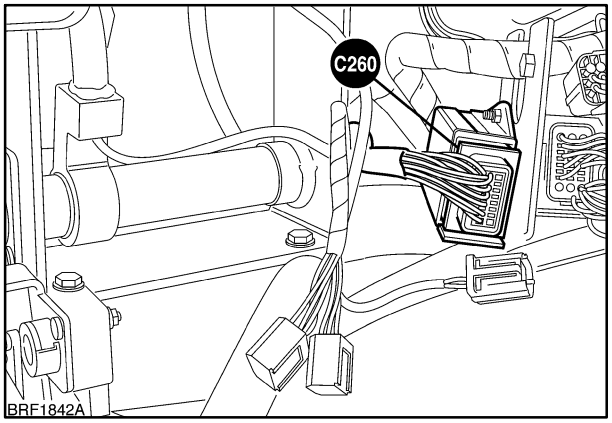

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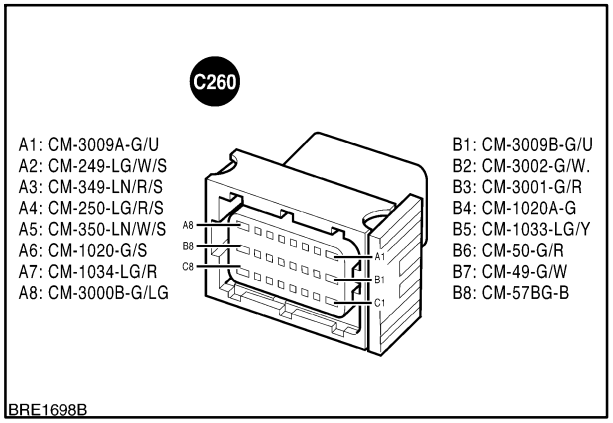

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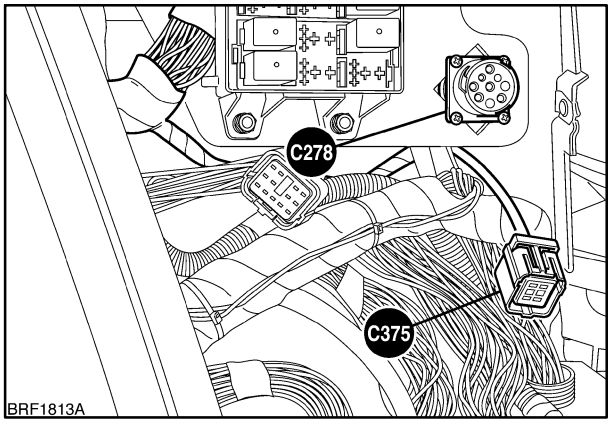

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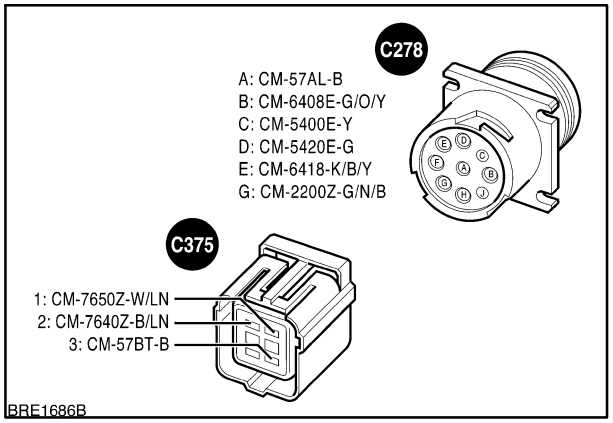

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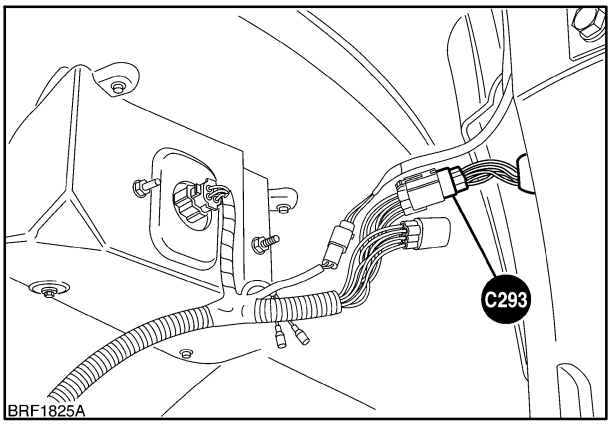

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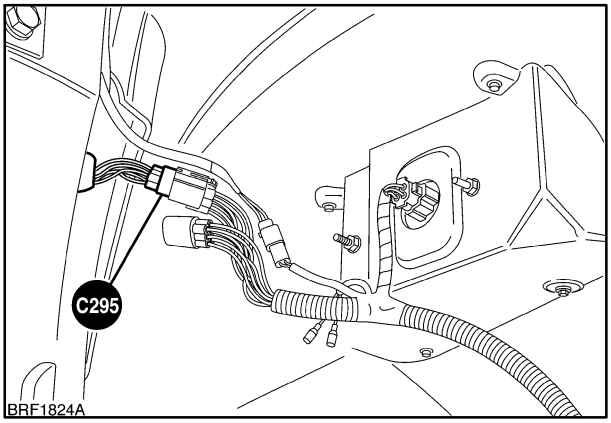

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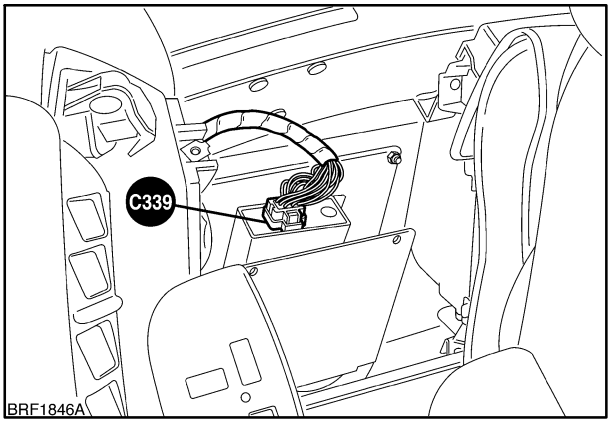

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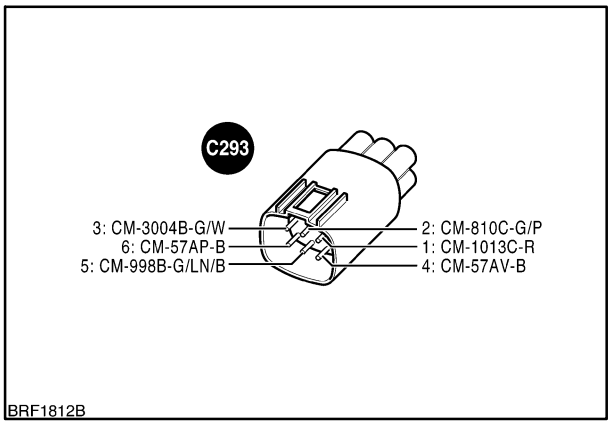

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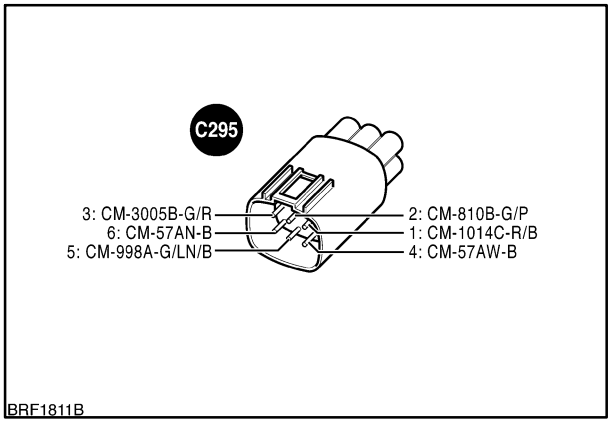

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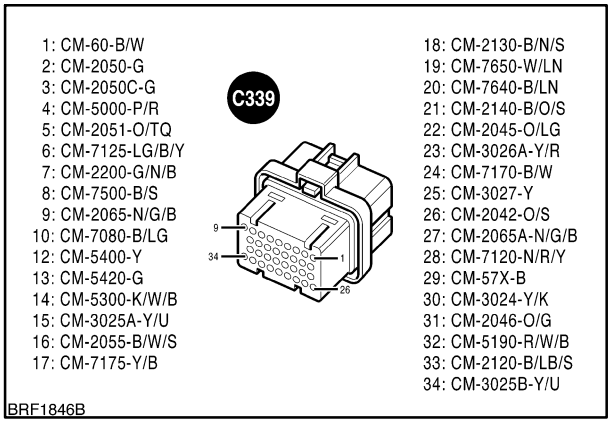

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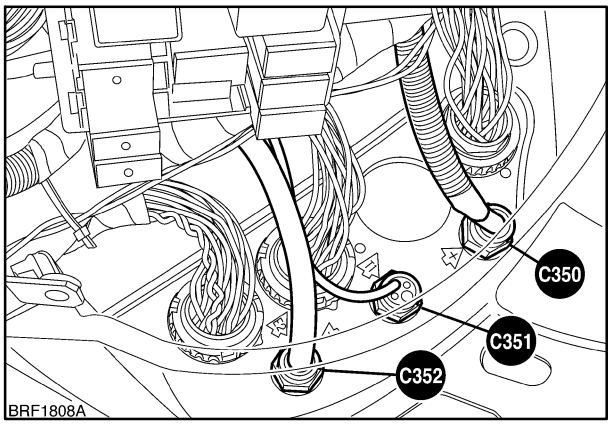

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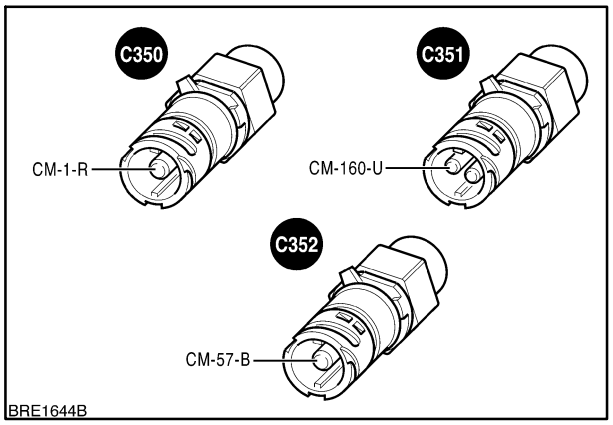

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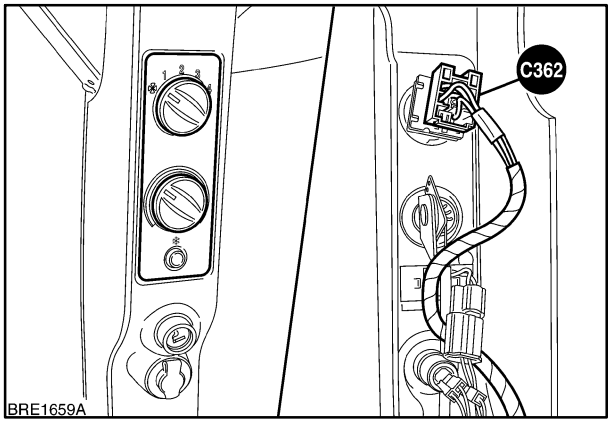

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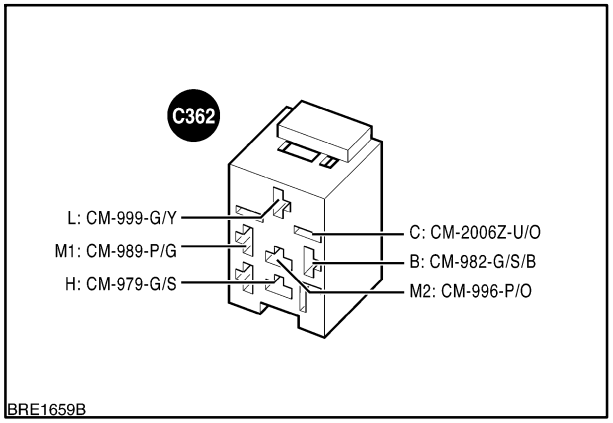

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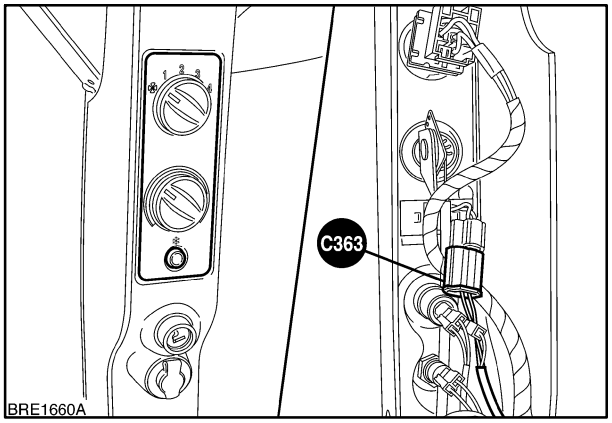

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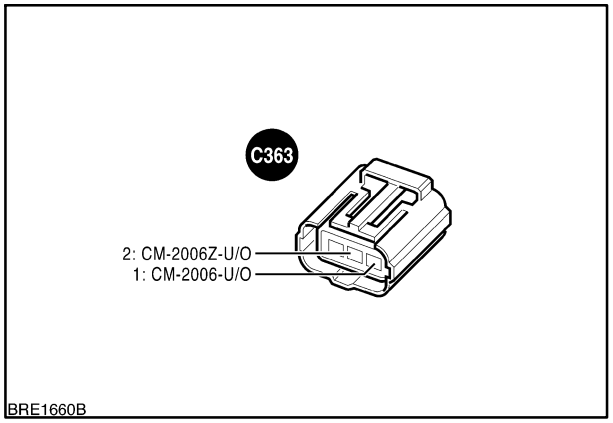

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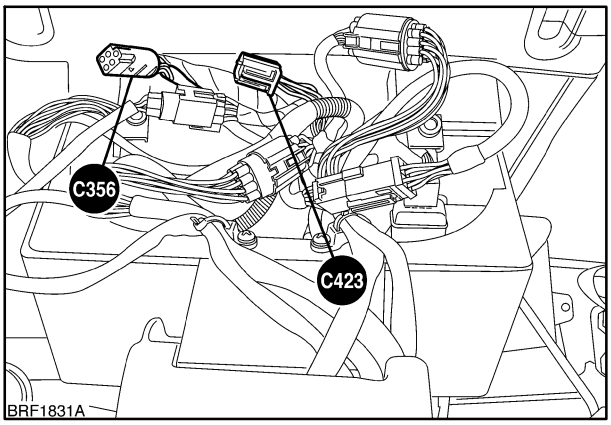

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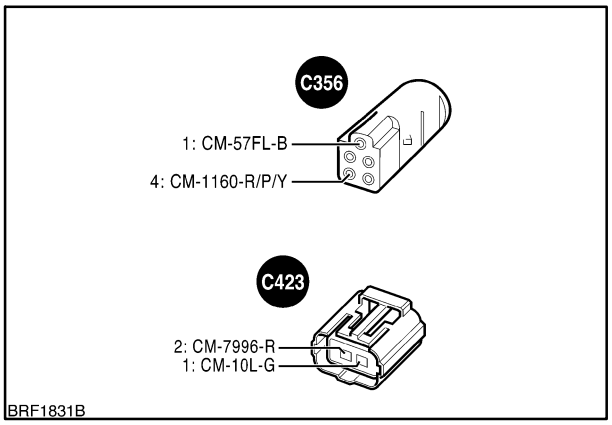

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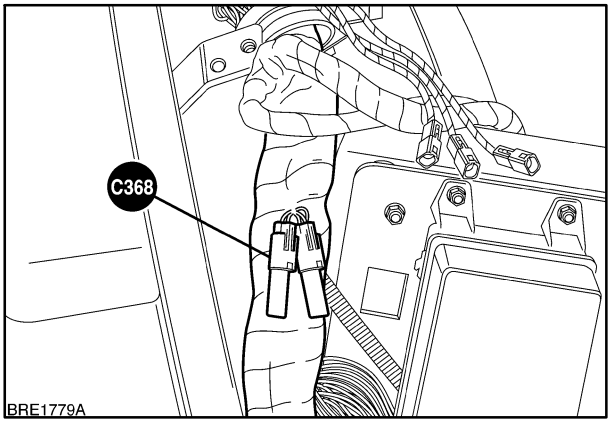

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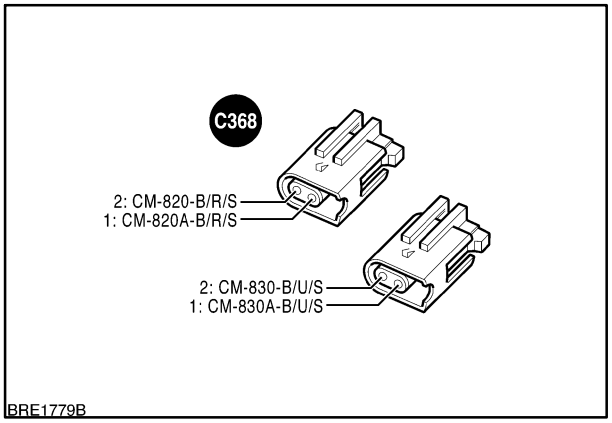

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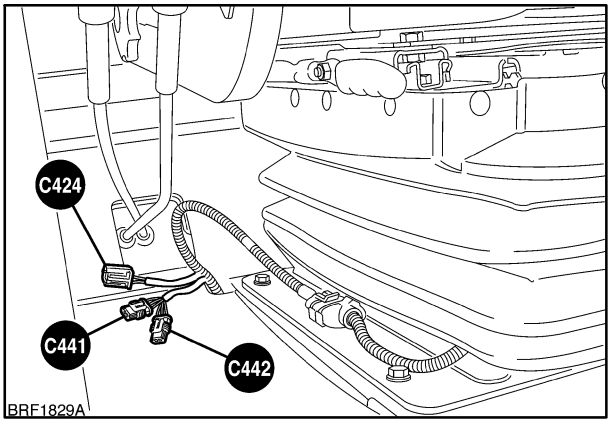

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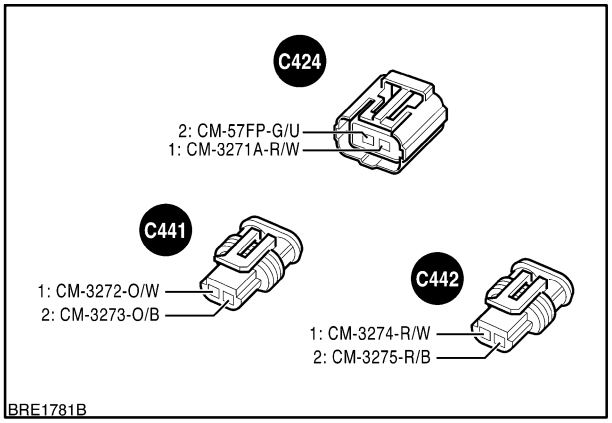

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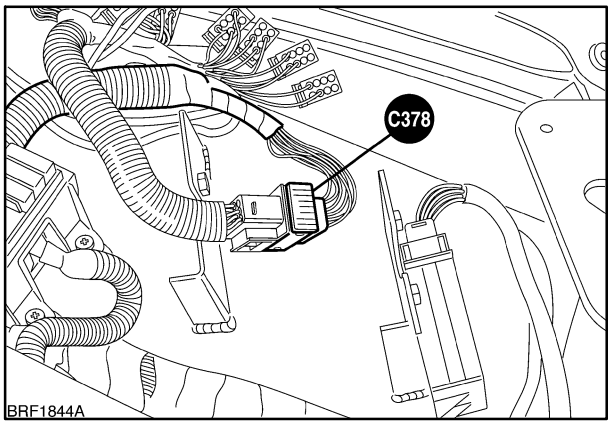

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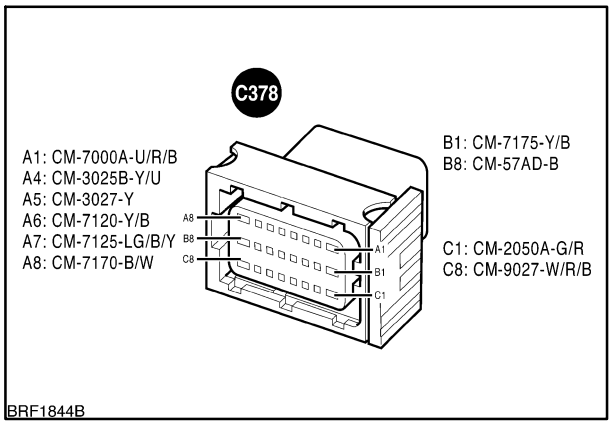

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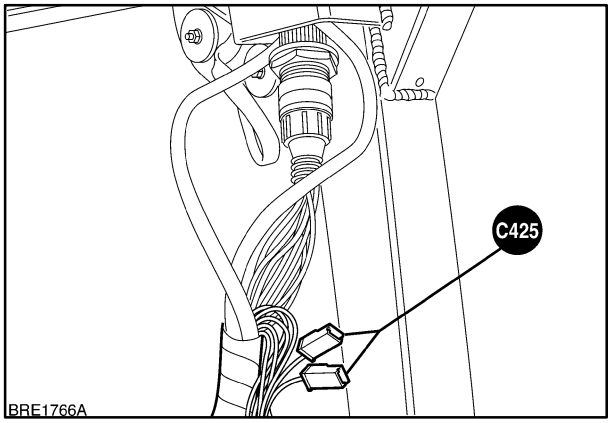

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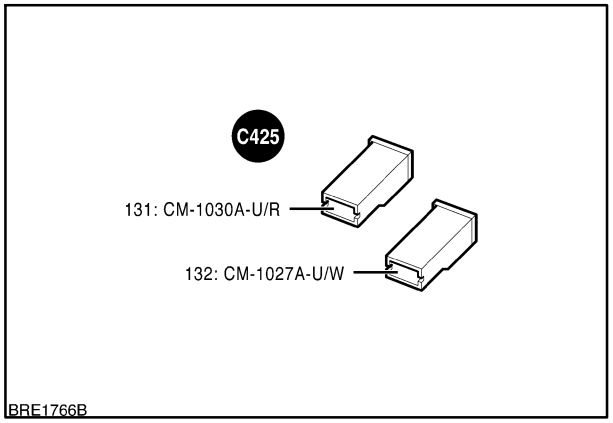

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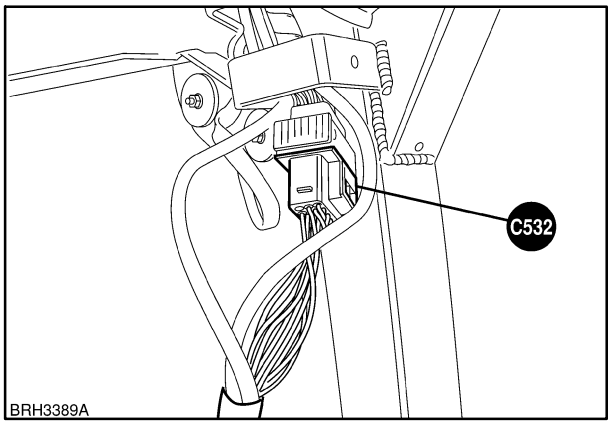

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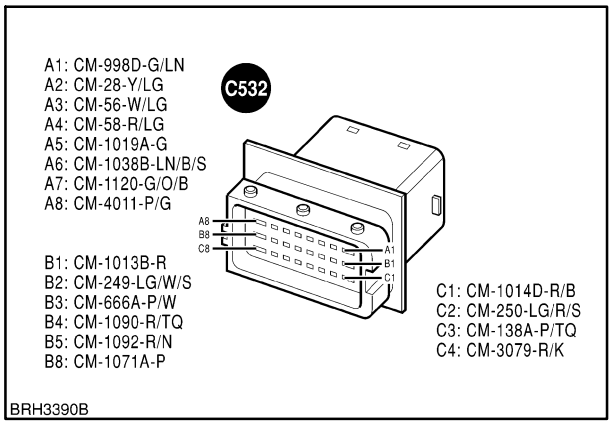

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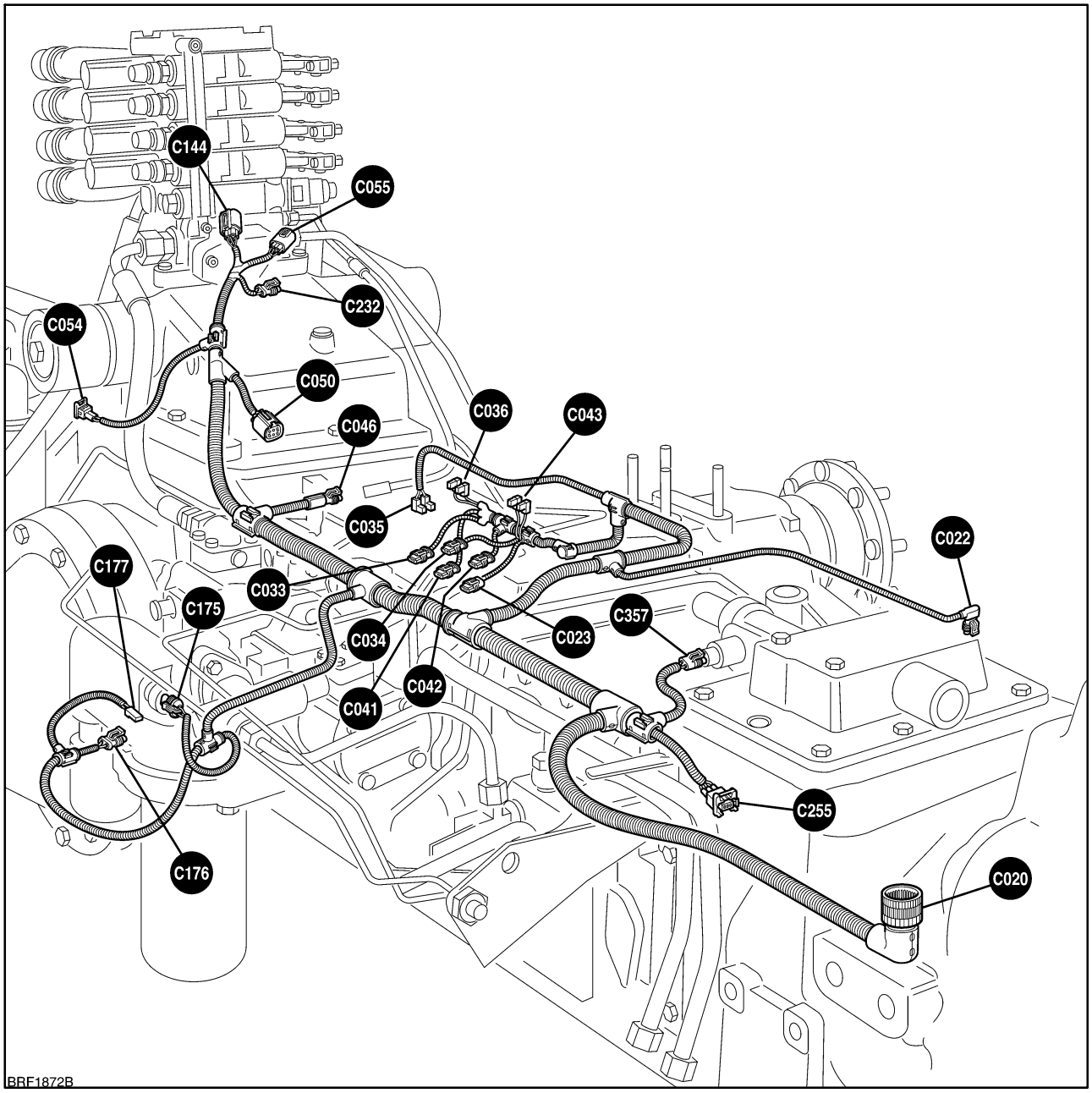
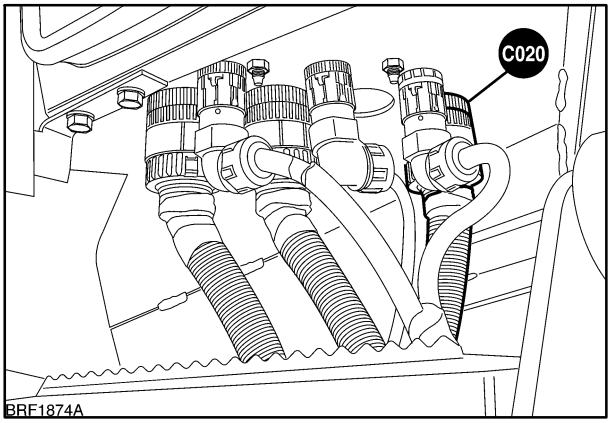
TRANSMISSION HARNESS - 12 x 12



TRANSMISSION HARNESS – 12 X 12 CONNECTORS

1. **C020** Chassis to Cab Main Connector T2 F
   (Location Fig 1, Connector Fig 4)
2. **C022** Fuel Tank Sender
   (Location Fig 2, Connector Fig 5)
3. **C023** Transmission Oil Temperature Sender
   (Location Fig 3, Connector Fig 6)
4. **C033** PTO Brake Solenoid
   (Location Fig 7, Connector Fig 8)
5. **C034** Four Wheel Drive Solenoid
   (Location Fig 3, Connector Fig 6)
6. **C035** 4WD Sensor
   (Location Fig 7, Connector Fig 8)
7. **C036** Transmission Oil Pressure Switch
   (Location Fig 7, Connector Fig 8)
8. **C041** PTO Solenoid
   (Location Fig 7, Connector Fig 8)
9. **C042** Differential Lock Solenoid
   (Location Fig 3, Connector Fig 6)
10. **C043** Differential Lock Sensor
    (Location Fig 3, Connector Fig 6)
11. **C046** Speed Sensor
    (Location Fig 9, Connector Fig 10)
12. **C050** Trailer Brake Connector
    (Location Fig 11, Connector Fig 13)
13. **C054** PTO Speed Sensor
    (Location Fig 12, Connector Fig 14)
14. **C055** Trailer Socket
    (Location Fig 15, Connector Fig 19)
15. **C144** Air Brakes Connector
    (Location Fig 15, Connector Fig 19)
16. **C175** Hydraulic Filter
    (Location Fig 16, Connector Fig 20)
17. **C176** Hydraulic Oil Temp Switch
    (Location Fig 17, Connector Fig 21)
18. **C177** Hydraulic Low Charge Switch
    (Location Fig 17, Connector Fig 21)
19. **C232** Reverse Alarm Connector
    (Location Fig 15, Connector Fig 19)
20. **C255** Engine Flywheel Speed Sensor
    (Location Fig 18, Connector Fig 22)
21. **C357** Starter Inhibitor Switch
    (Location Fig 18, Connector Fig 22)

TRANSMISSION HARNESS – 24 X 24 CONNECTOR LOCATIONS



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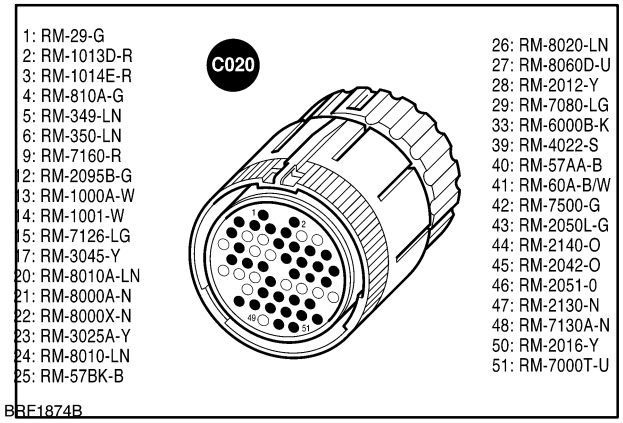

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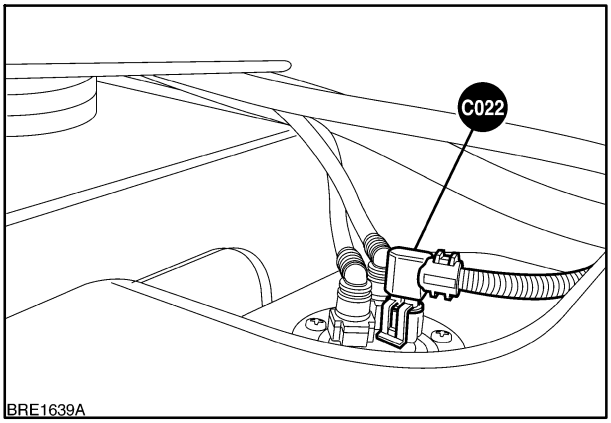

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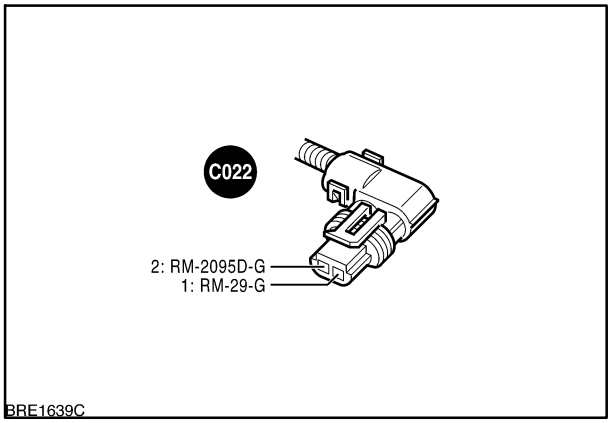

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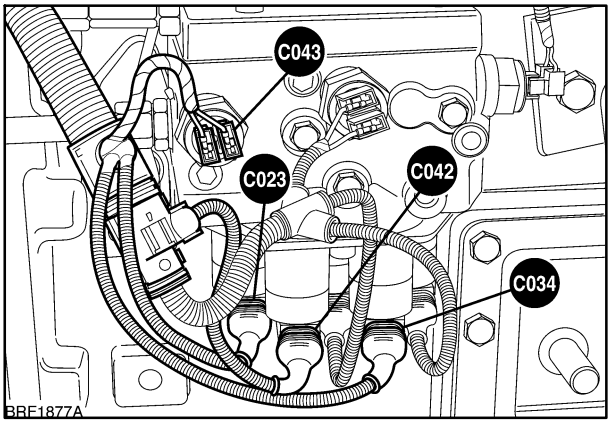

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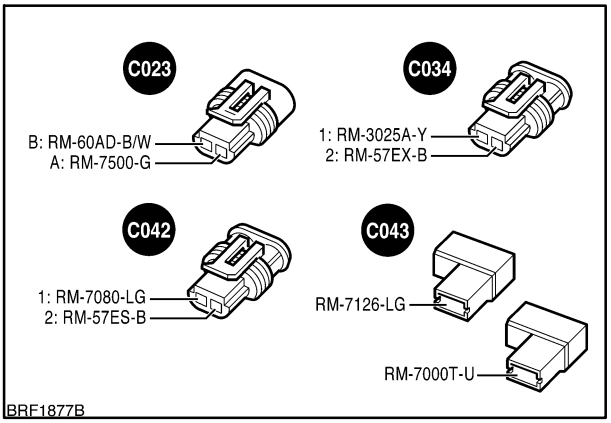

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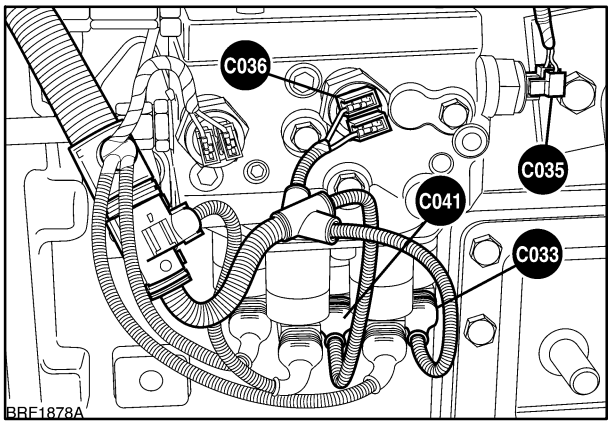
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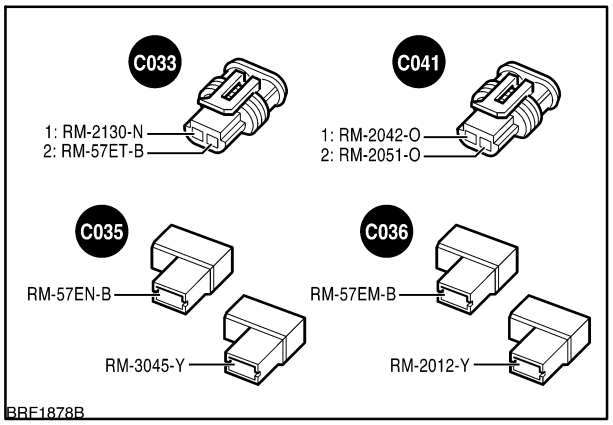
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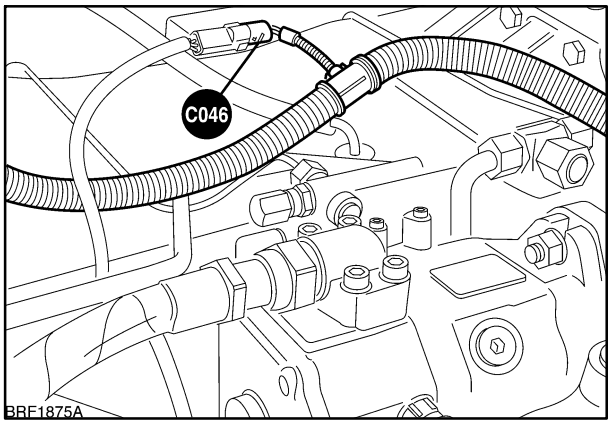
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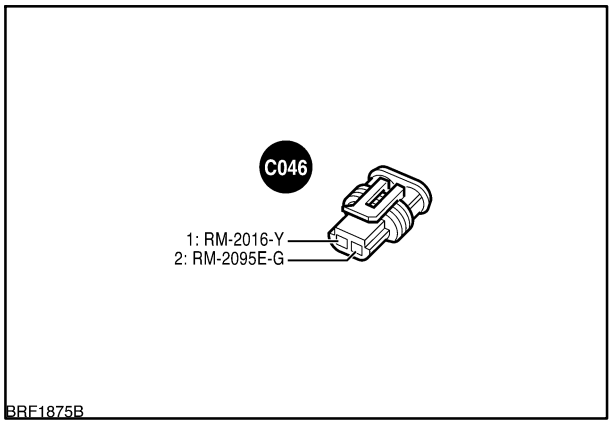
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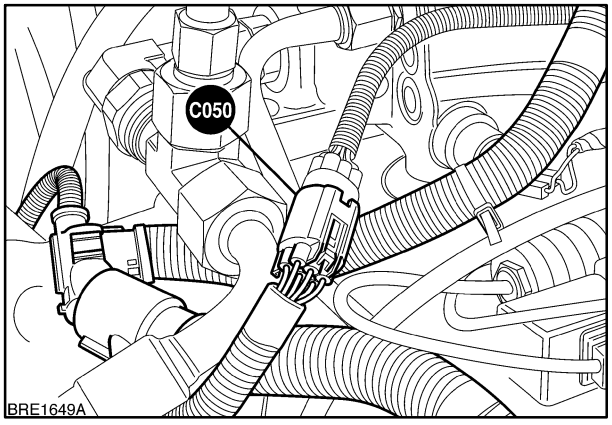
C050
BRE1649A

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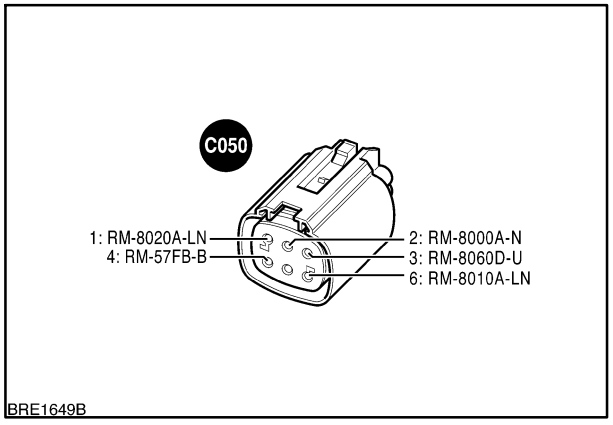
C050
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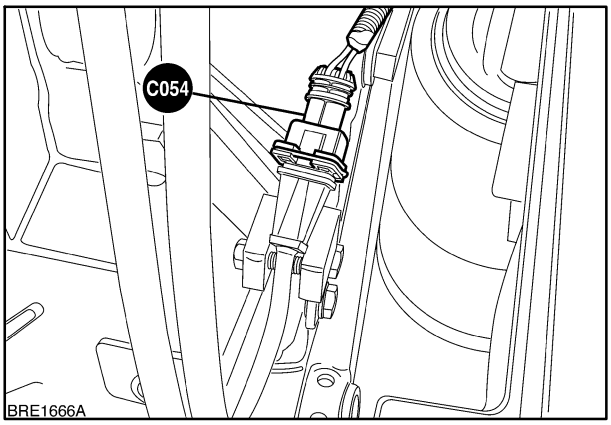
4: RM-57FB-B
2: RM-8000A-N
3: RM-8060D-U
6: RM-8010A-LN
BRE1649B

12



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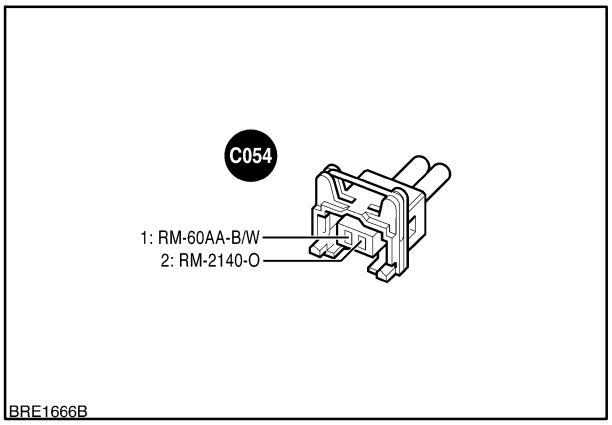

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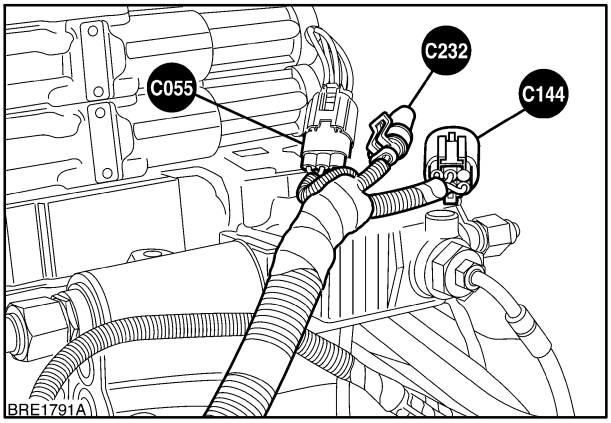

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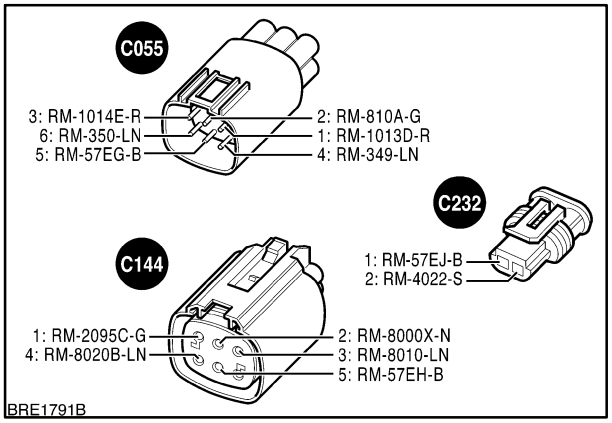

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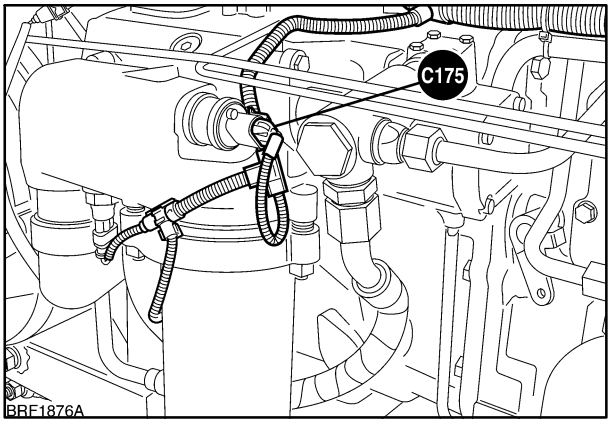

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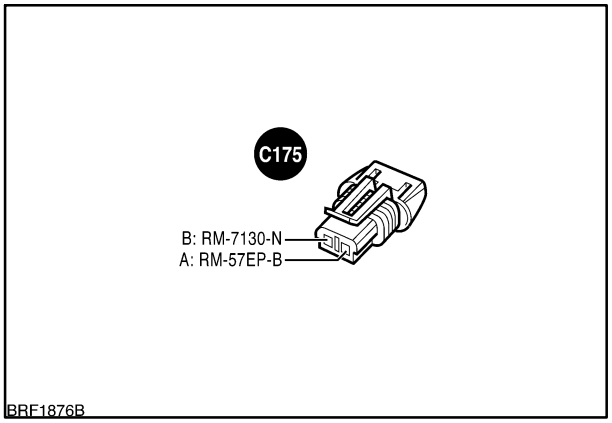

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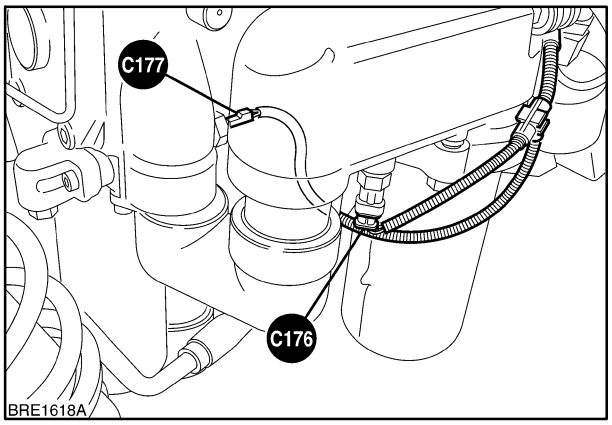
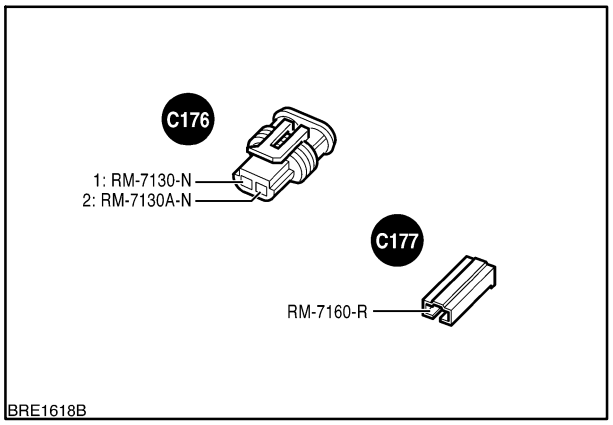
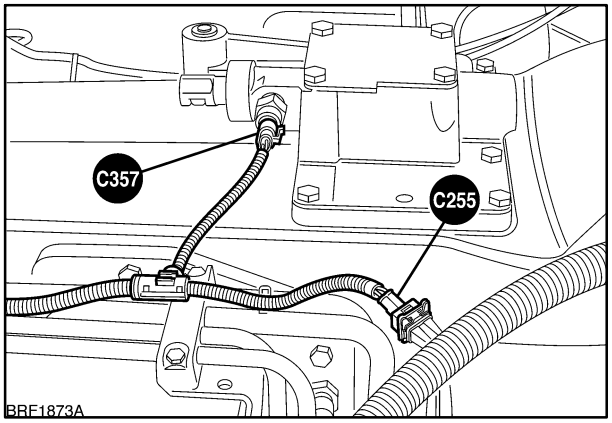

C177
C176
BRE1618A

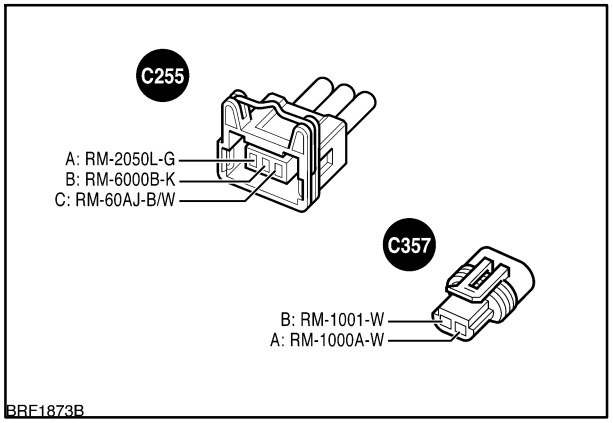
19


C176
1: RM-7130-N
2: RM-7130A-N
C177
RM-7160-R
BRE1618B

21

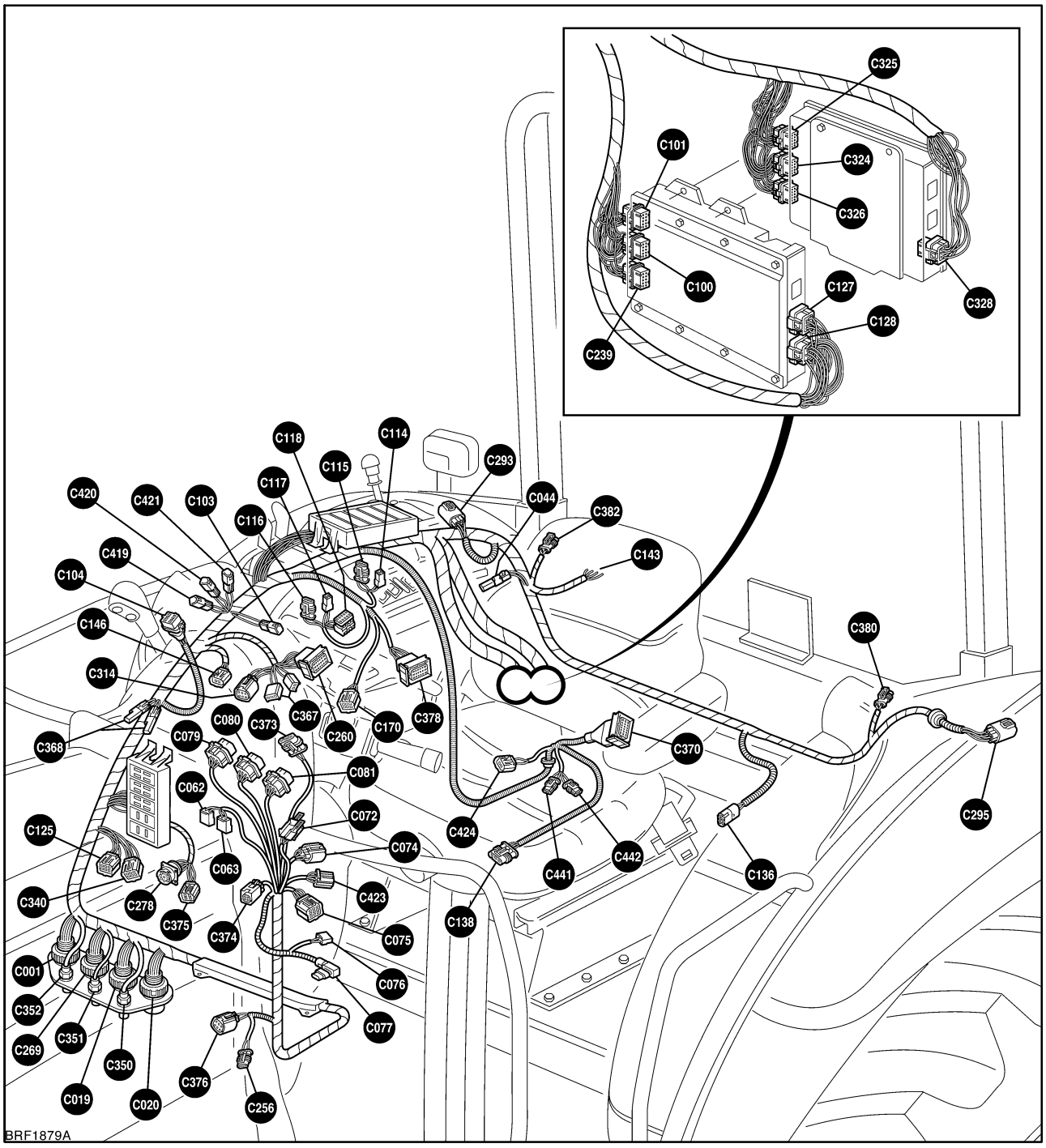

C357
C255
BRF1873A

20


C255
A: RM-2050L-G
B: RM-6000B-K
C: RM-60AJ-B/W
C357
B: RM-1001-W
A: RM-1000A-W
BRF1873B

22

LESS CAB HARNESS – 16 x 16 & 24 x 24

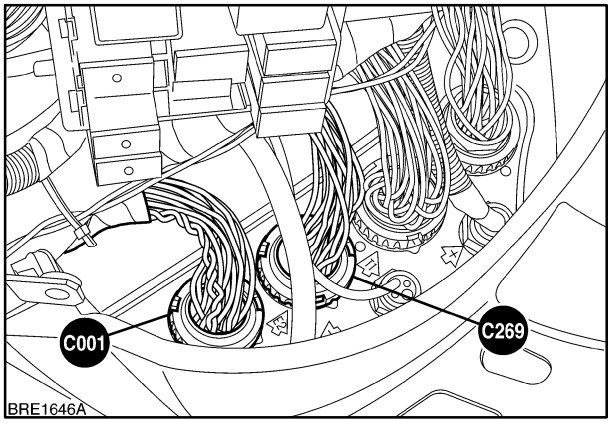


LESS CAB MAIN HARNESS - 16X16 & 24X24 CONNECTORS

1. **C001** Cab to Engine Main Connector E1 *(Location Fig 1, Connector Fig 2)*
2. **C019** Cab to Transmission Main Connector T1 *(Location Fig 7, Connector Fig 8)*
3. **C020** Cab to Transmission Main Connector T2 *(Location Fig 7, Connector Fig 8)*
4. **C044** Ground Speed PTO Switch *(Location Fig 3, Connector Fig 5)*
5. **C062** Right Hand Stop Lamp Switch *(Location Fig 4, Connector Fig 6)*
6. **C063** Left Hand Stop Lamp Switch *(Location Fig 4, Connector Fig 6)*
7. **C072** Key Start Switch *(Location Fig 9, Connector Fig 10)*
8. **C074** Turn Switch *(Location Fig 11, Connector Fig 15)*
9. **C075** ShuttleLever Switch *(Location Fig 12, Connector Fig 16)*
10. **C076** Clutch Pedal Switch *(Location Fig 13, Connector Fig 17)*
11. **C077** Clutch Pedal Potentiometer *(Location Fig 13, Connector Fig 17)*
12. **C079** Instrument Cluster "A" *(Location Fig 19, Connector Fig 20)*
13. **C080** Instrument Cluster "B" *(Location Fig 19, Connector Fig 20)*
14. **C081** Instrument Cluster "C" *(Location Fig 19, Connector Fig 20)*
15. **C100** TCM - Transmission Control Module (CN1a) *(Location Fig 25, Connector Fig 26)*
16. **C101** TCM - Transmission Control Module (CN1b) *(Location Fig 25, Connector Fig 26)*
17. **C103** Gear Shift Connector *(Location Fig 14, Connector Fig 18)*
18. **C104** Gear Shift Indicator *(Location Fig 21, Connector Fig 23)*
19. **C114** Front PTO Engaged Lamp *(Location Fig 22, Connector Fig 24)*
20. **C115** Front PTO Switch *(Location Fig 27, Connector Fig 28)*
21. **C116** Rear PTO Switch *(Location Fig 27, Connector Fig 28)*
22. **C117** Rear PTO Lamp *(Location Fig 22, Connector Fig 24)*
23. **C118** Rear PTO Brake Switch *(Location Fig 31, Connector Fig 33)*
24. **C125** Transmission Diagnostics (TCM) *(Location Fig 32, Connector Fig 34)*
25. **C127** TCM - Transmission Control Module (CN3a) *(Location Fig 29, Connector Fig 30)*
26. **C128** TCM - Transmission Control Module (CN3b) *(Location Fig 29, Connector Fig 30)*
27. **C136** Hand Brake Switch *(Location Fig 35, Connector Fig 39)*
28. **C138** Seat Air Pump *(Location Fig 36, Connector Fig 40)*
29. **C143** Rear Implement Connector *(Location Fig 37, Connector Fig 41)*
30. **C146** Lift-O-matic *(Location Fig 43, Connector Fig 47)*
31. **C170** Front HPL Limit Pot *(Location Fig 38, Connector Fig 42)*
32. **C239** TCM - Transmission Control Module (CN2) *(Location Fig 25, Connector Fig 26)*
33. **C256** Foot Throttle Mechanical *(Location Fig 44, Connector Fig 48)*
34. **C260** Indicator Flasher Unit *(Location Fig 45, Connector Fig 49)*
35. **C269** Cab to Engine Main Connector E2 *(Location Fig 1, Connector Fig 2)*
36. **C278** Diagnostics Connector *(Location Fig 46, Connector Fig 50)*
37. **C293** RH Fender 2 *(Location Fig 51, Connector Fig 53)*
38. **C295** LH Fender 1 *(Location Fig 52, Connector Fig 54)*
39. **C314** Hand Throttle *(Location Fig 14, Connector Fig 18)*
40. **C324** ACU - Auxilliary Control Module (CN1a) *(Location Fig 59, Connector Fig 60)*
41. **C325** ACU - Auxilliary Control Module (CN1b) *(Location Fig 59, Connector Fig 60)*
42. **C326** ACU - Auxilliary Control Module (CN2) *(Location Fig 59, Connector Fig 60)*
43. **C328** ACU - Auxilliary Control Module (CN3b) *(Location Fig 59, Connector Fig 60)*
44. **C340** Auxilliary ECU Diagnostics (ACU) *(Location Fig 55, Connector Fig 57)*
45. **C350** 1 Power B+ Connector *(Location Fig 56, Connector Fig 58)*
46. **C351** 2 Power E Connector *(Location Fig 56, Connector Fig 58)*
47. **C352** 3 Power B- Connector *(Location Fig 56, Connector Fig 58)*
48. **C367** Grid Heater *(Location Fig 44, Connector Fig 47)*
49. **C368** Diode Connectors *(Location Fig 61, Connector Fig 63)*
50. **C370** Command Arm *(Location Fig 62, Connector Fig 64)*
51. **C373** Instrument Cluster Keypad *(Location Fig 65, Connector Fig 67)*
52. **C374** Hazard Switch Harness *(Location Fig 9, Connector Fig 10)*
53. **C375** ADIC Diagnostic Connector *(Location Fig 46, Connector Fig 50)*
54. **C376** Foot Throttle Electronic *(Location Fig 44, Connector Fig 48)*
55. **C378** Cab to Switch Harness Connector *(Location Fig 66, Connector Fig 68)*
56. **C380** Left Rear SMV Lamp *(Location Fig 69, Connector Fig 71)*
57. **C382** Right Rear SMV Lamp *(Location Fig 69, Connector Fig 71)*
58. **C419** Duplicate Transmission Controls (Downshift) *(Location Fig 70, Connector Fig 72)*
59. **C420** Duplicate Transmission Controls (Range) *(Location Fig 70, Connector Fig 72)*
60. **C421** Duplicate Transmission Controls (Upshift) *(Location Fig 70, Connector Fig 72)*

61. **C423** Brake Pedals latched Connector
(Location Fig 12, Connector Fig 16)
62. **C424** Loader Power Connector
(Location Fig 73, Connector Fig 74)
63. **C441** Loader Valve No.1
(Location Fig 73, Connector Fig 74)
64. **C442** Loader Valve No.2
(Location Fig 73, Connector Fig 74)

LESS CAB MAIN HARNESS – 16 X 16 & 24 X 24 CONNECTOR LOCATIONS



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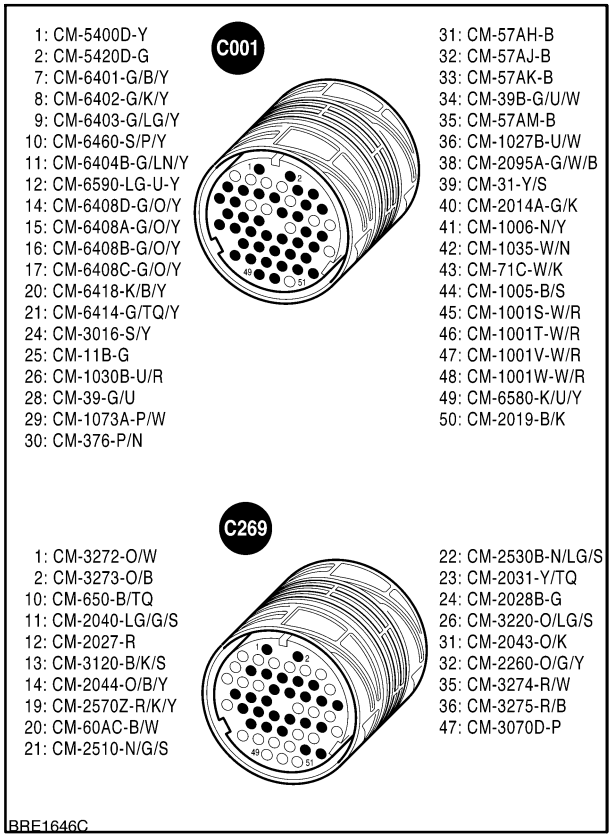

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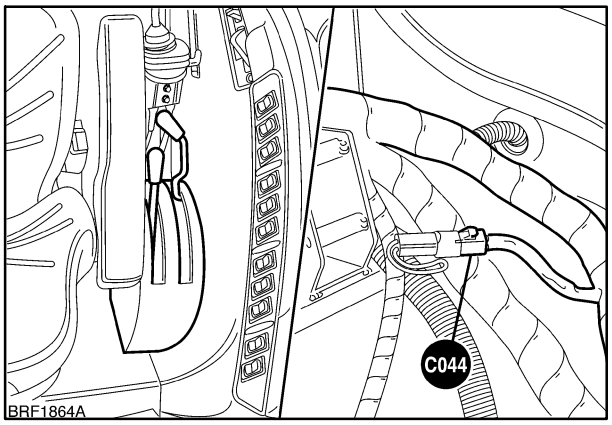

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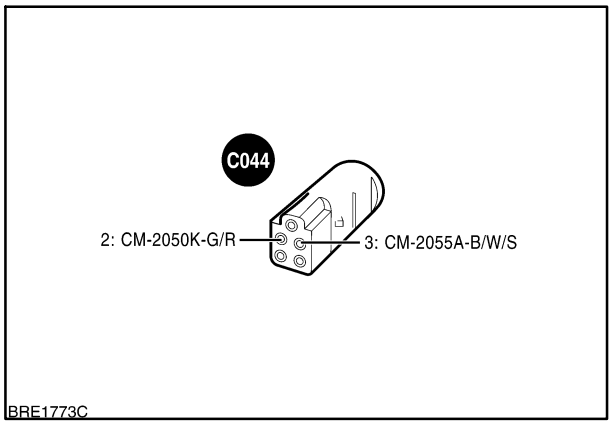

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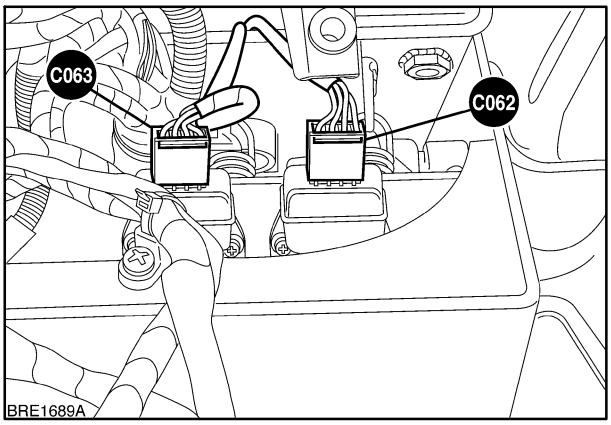
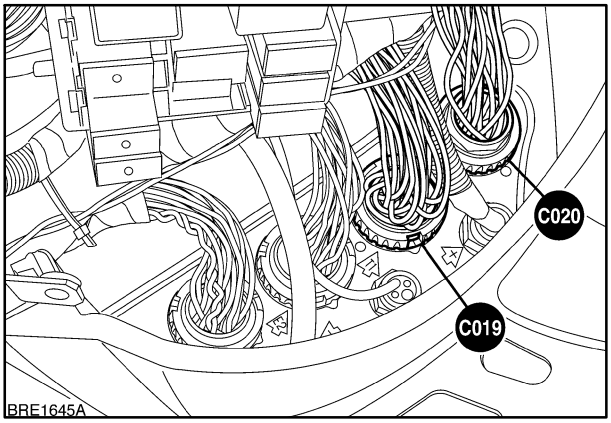
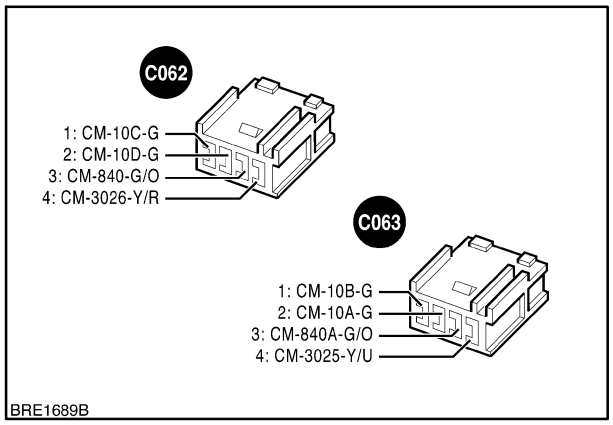

C063
C062
BRE1689A

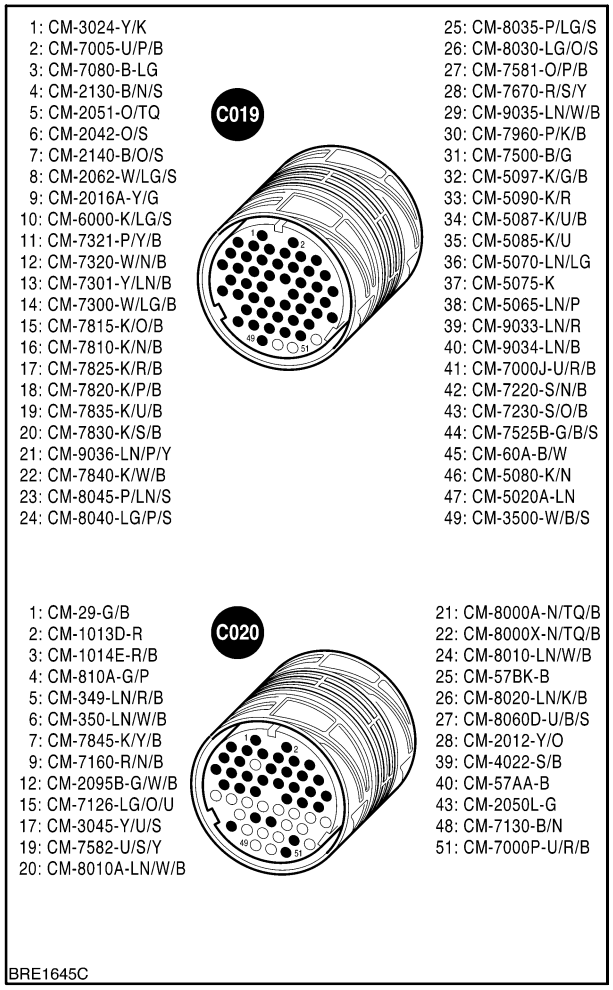
5


C020
C019
BRE1645A

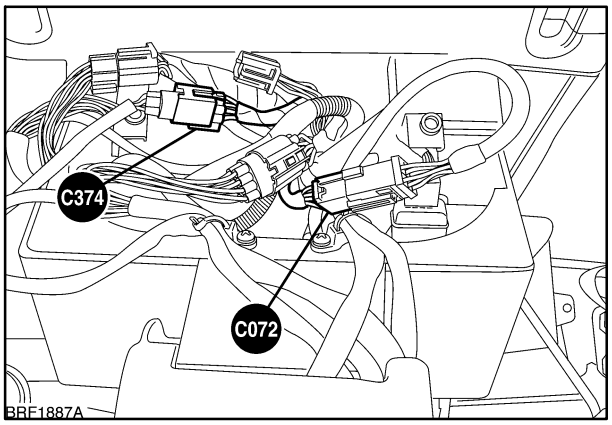
6


C062
1: CM-10C-G
2: CM-10D-G
3: CM-840-G/O
4: CM-3026-Y/R
C063
1: CM-10B-G
2: CM-10A-G
3: CM-840A-G/O
4: CM-3025-Y/U
BRE1689B

7


1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
C019
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
9: CM-7160-R/N/B
12: CM-2095B-G/W/B
15: CM-7126-LG/O/U
17: CM-3045-Y/U/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
C020
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B
BRE1645C

8



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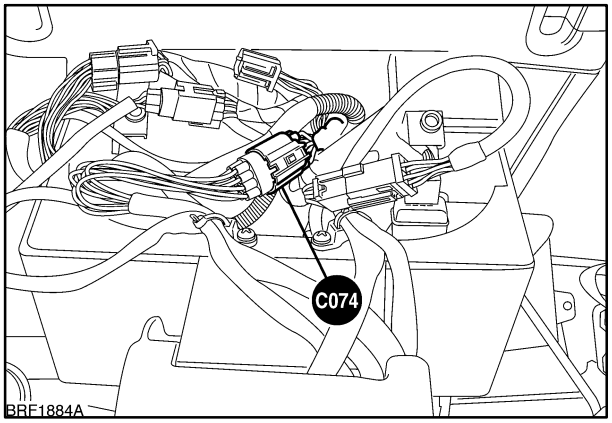

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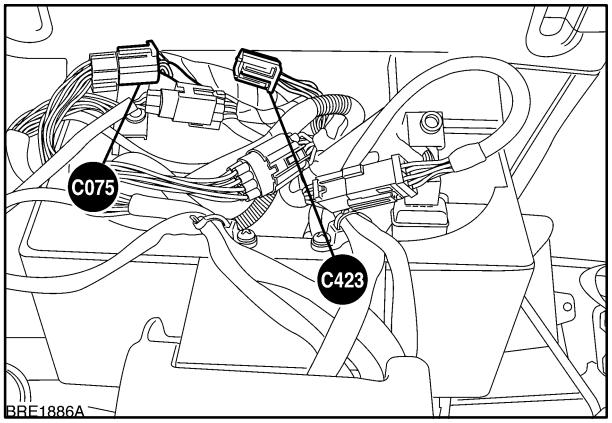

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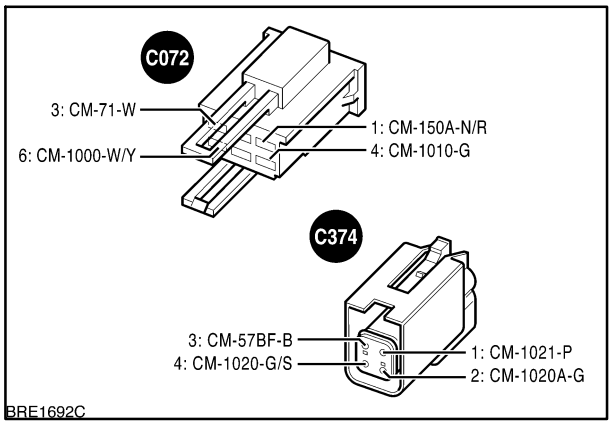

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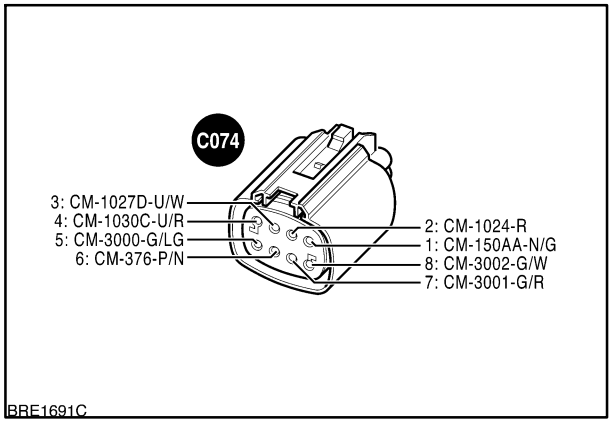

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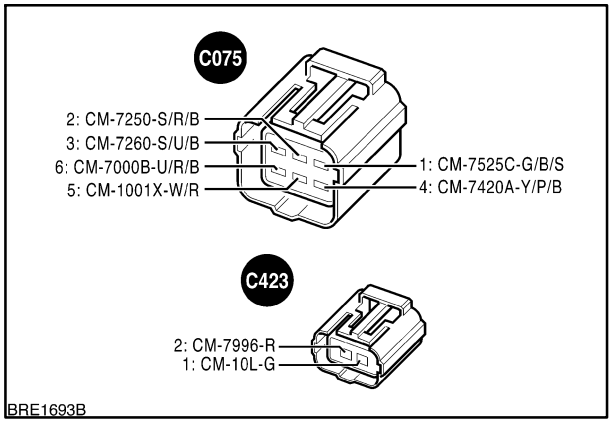

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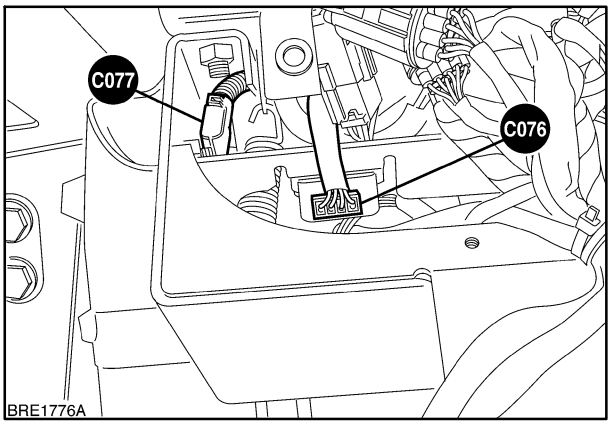
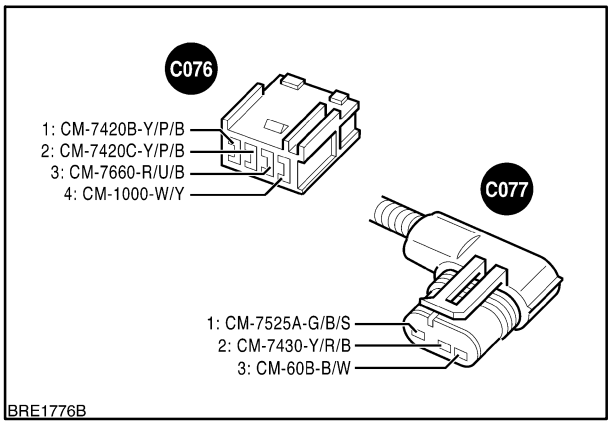
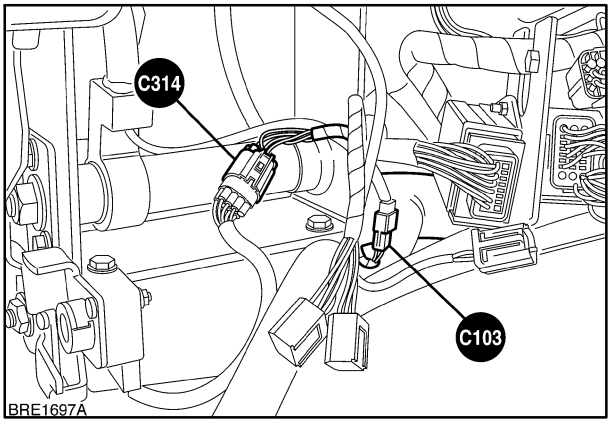

C077
C076
BRE1776A

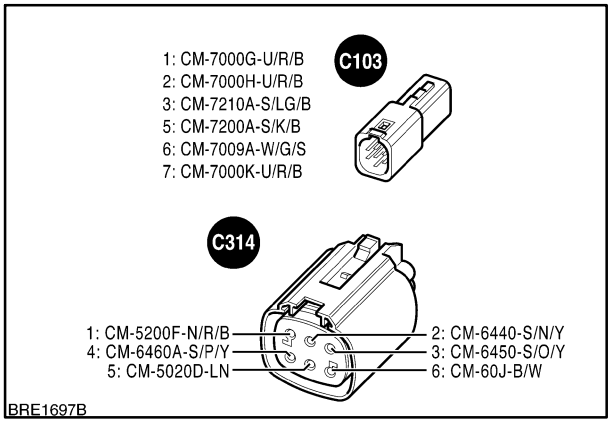
15


C076
1: CM-7420B-Y/P/B
2: CM-7420C-Y/P/B
3: CM-7660-R/U/B
4: CM-1000-W/Y
C077
1: CM-7525A-G/B/S
2: CM-7430-Y/R/B
3: CM-60B-B/W
BRE1776B

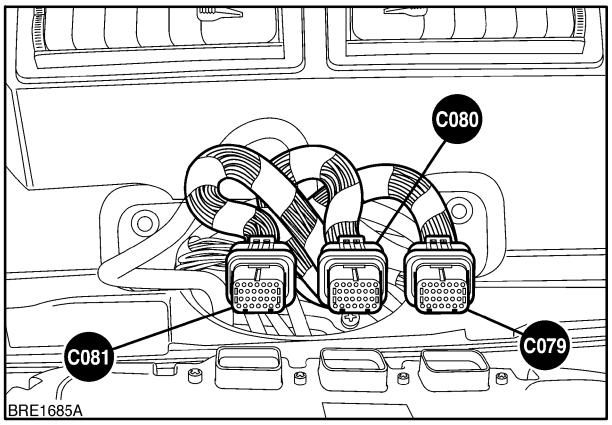
17


C314
C103
BRE1697A

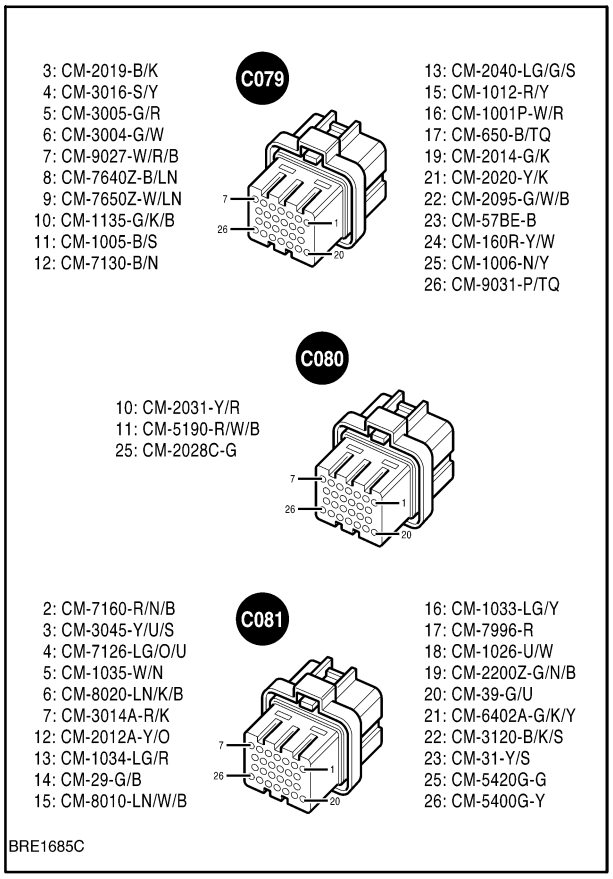
16


1: CM-7000G-U/R/B
2: CM-7000H-U/R/B
3: CM-7210A-S/LG/B
5: CM-7200A-S/K/B
6: CM-7009A-W/G/S
7: CM-7000K-U/R/B
C103
C314
1: CM-5200F-N/R/B
4: CM-6460A-S/P/Y
5: CM-5020D-LN
2: CM-6440-S/N/Y
3: CM-6450-S/O/Y
6: CM-60J-B/W
BRE1697B

18


C080
C081
C079
BRE1685A

19


C079
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-B
24: CM-160R-Y/W
25: CM-1006-N/Y
26: CM-9031-P/TQ
7
26
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C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
25: CM-2028C-G
7
26
1
20
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
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26: CM-5400G-Y
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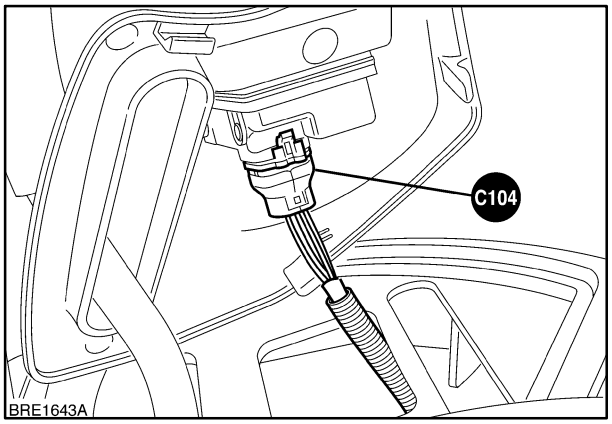
BRE1685C

20


C104
BRE1643A

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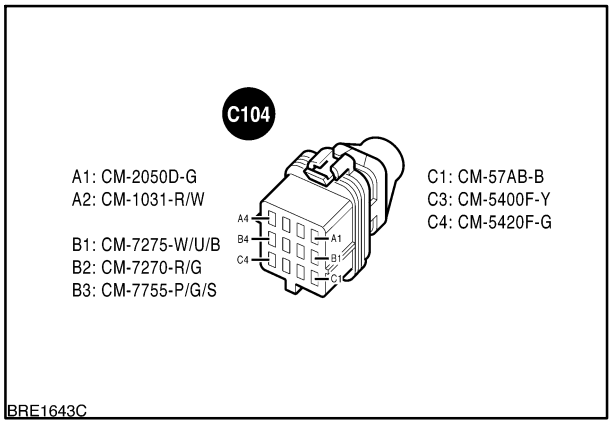
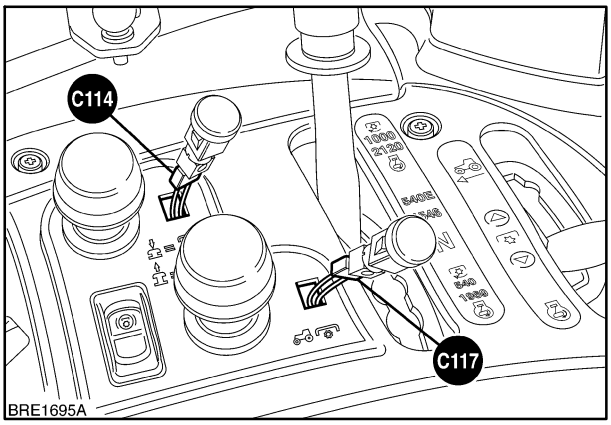

C104
A1: CM-2050D-G
A2: CM-1031-R/W
B1: CM-7275-W/U/B
B2: CM-7270-R/G
B3: CM-7755-P/G/S
C1: CM-57AB-B
C3: CM-5400F-Y
C4: CM-5420F-G
A4
B4
C4
A1
B1
C1
BRE1643C

22


C114
C117
BRE1695A

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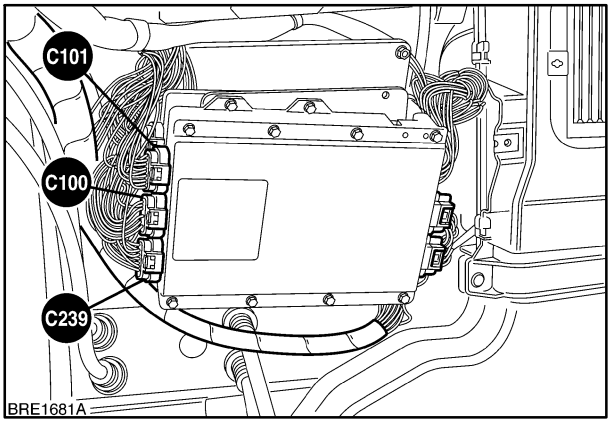
C101
C100
C239
BRE1681A

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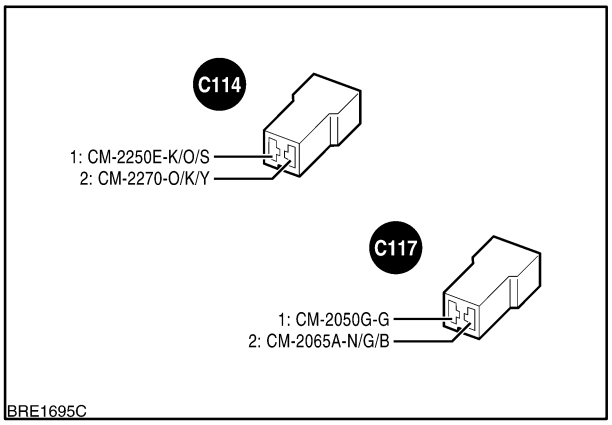
C114
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C117
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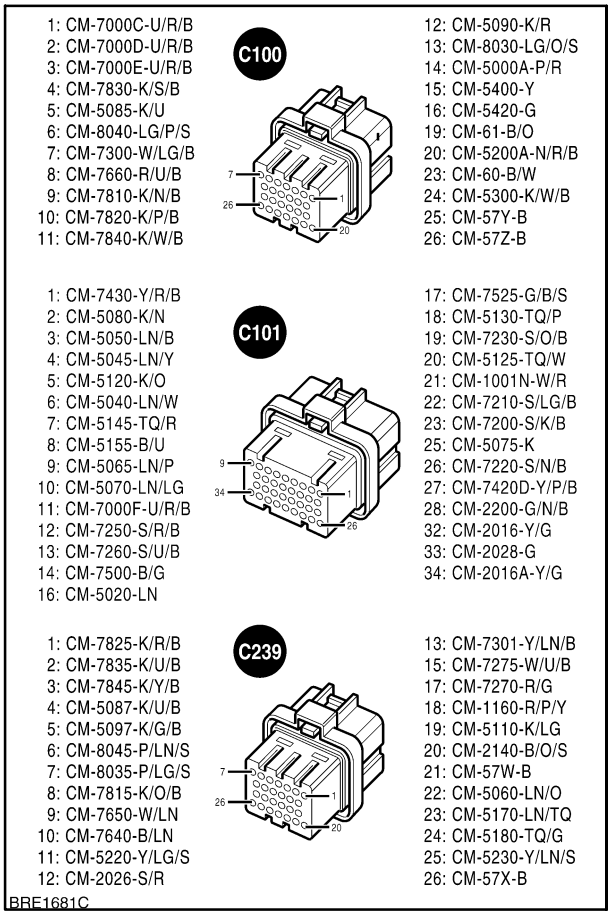
2: CM-2065A-N/G/B
BRE1695C

25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2: CM-7000D-U/R/B
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4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
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BRE1681C

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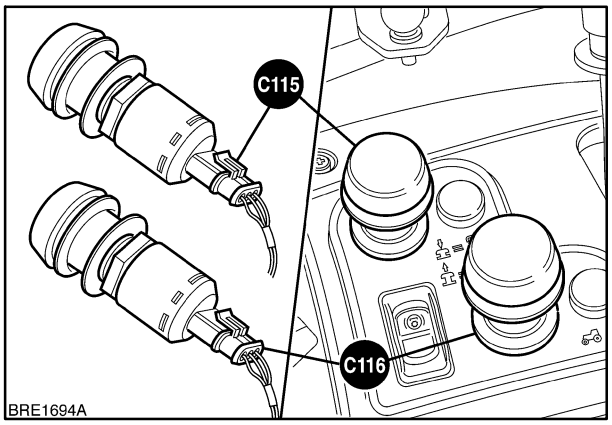
C115
C116
BRE1694A

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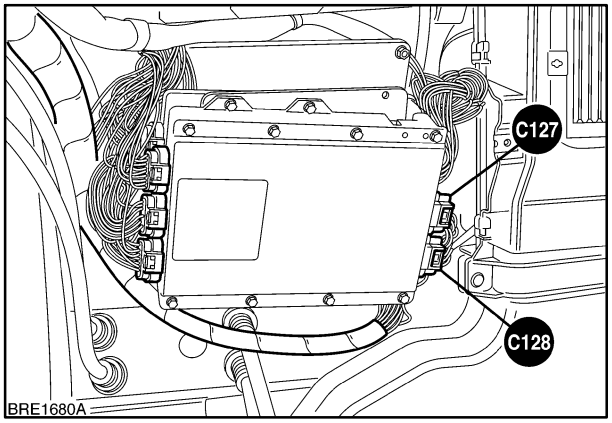
C127
C128
BRE1680A

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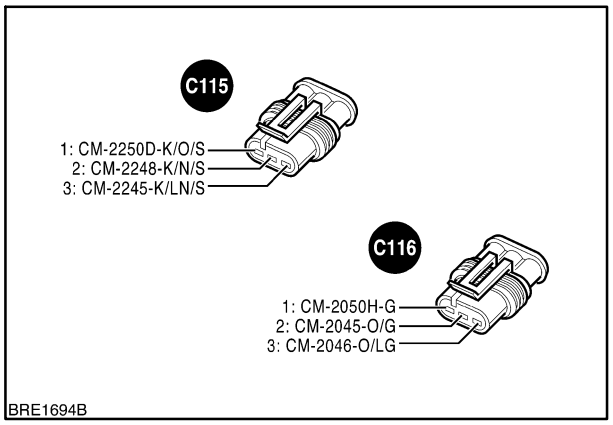
C115
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2: CM-2248-K/N/S
3: CM-2245-K/LN/S
C116
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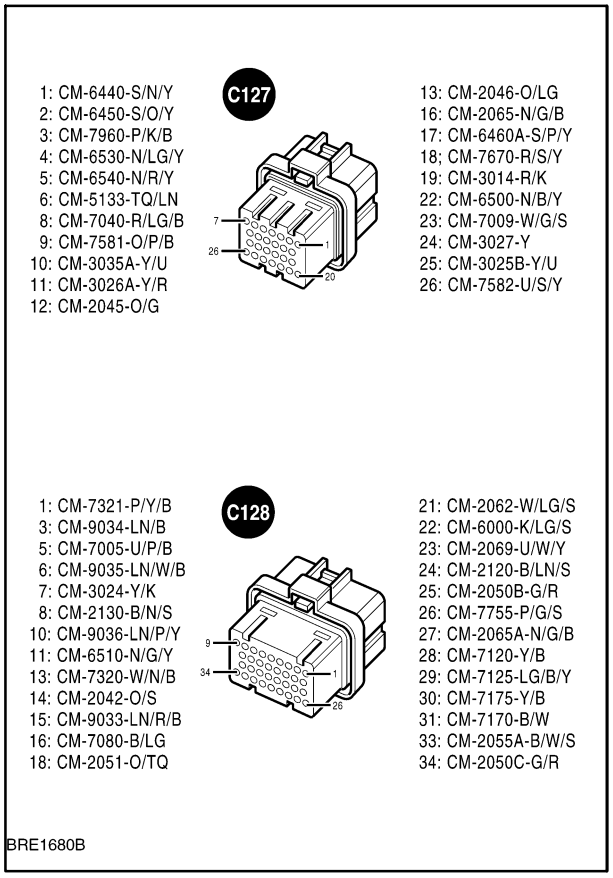
2: CM-2045-O/G
3: CM-2046-O/LG
BRE1694B

29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3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
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6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y
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C128
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3: CM-9034-LN/B
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
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BRE1680B

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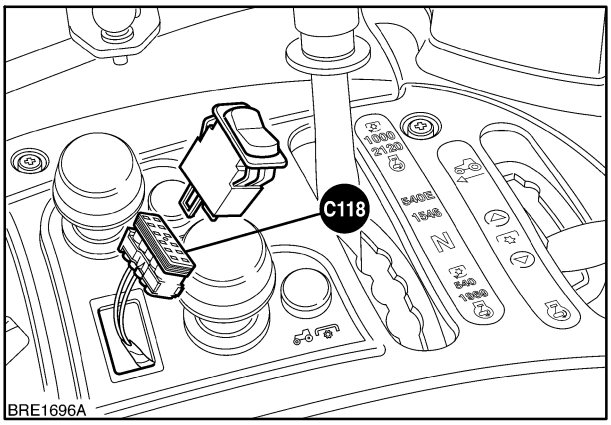

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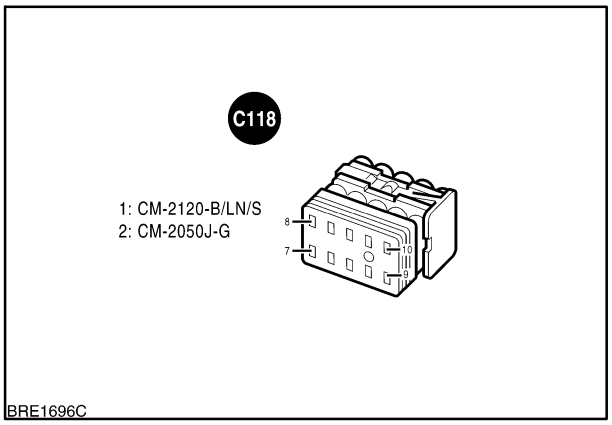

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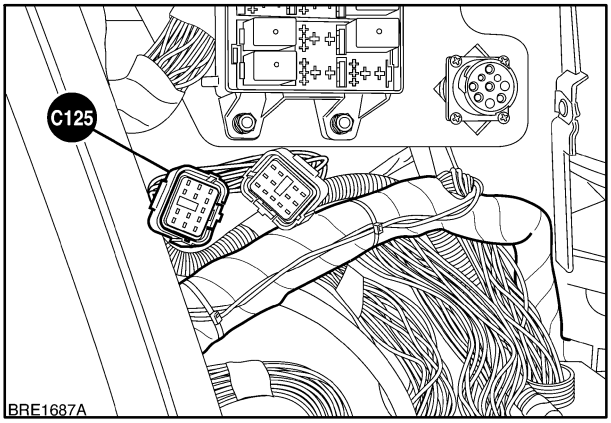

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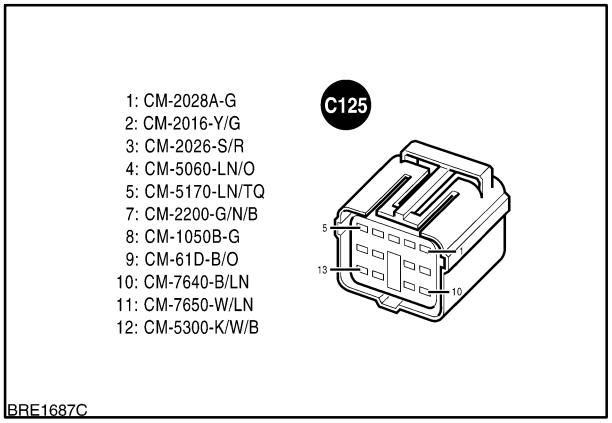

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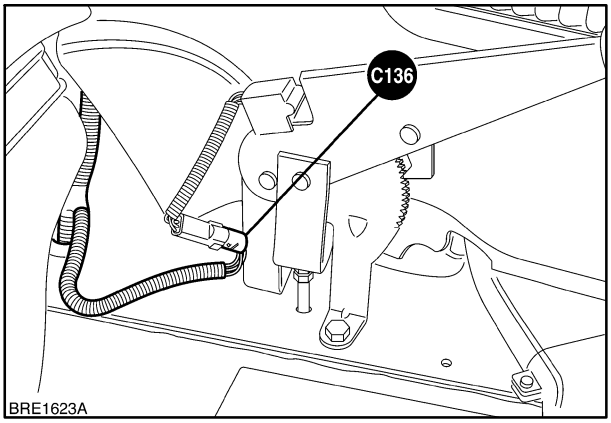

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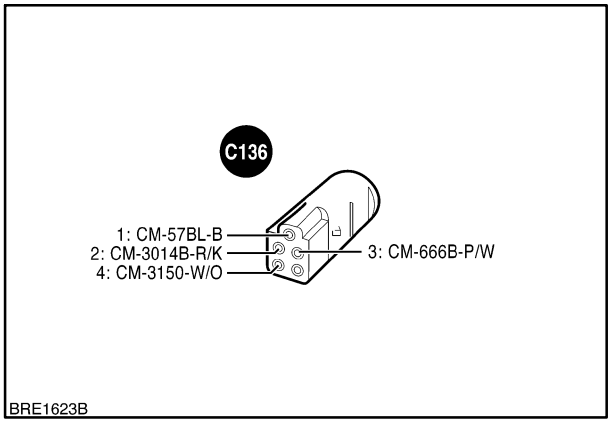

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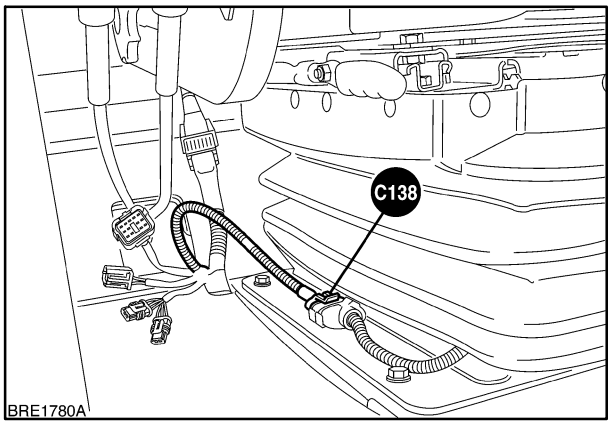

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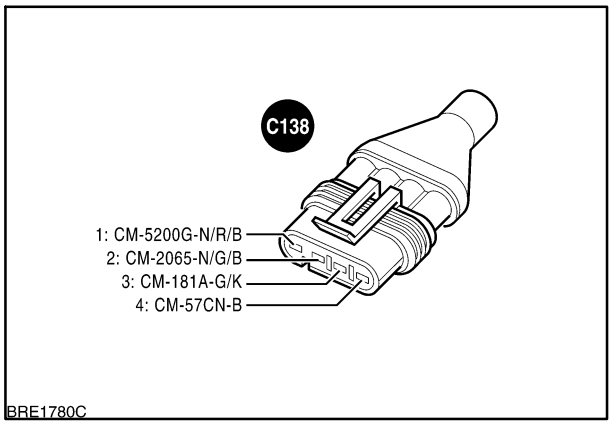

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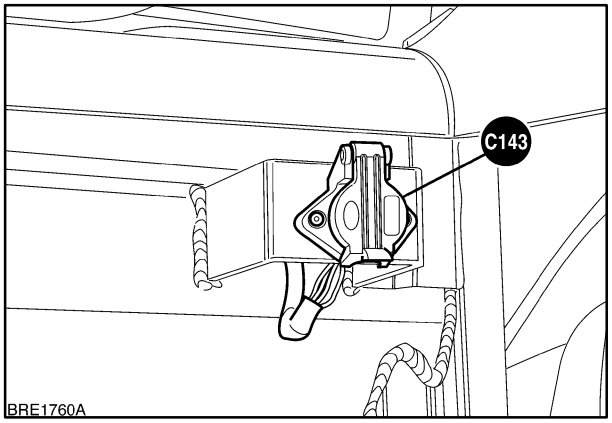

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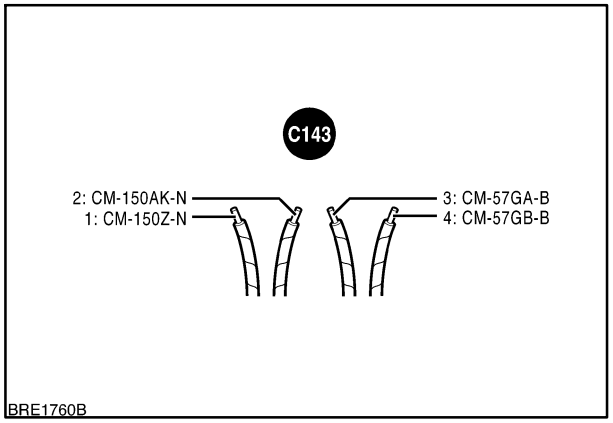

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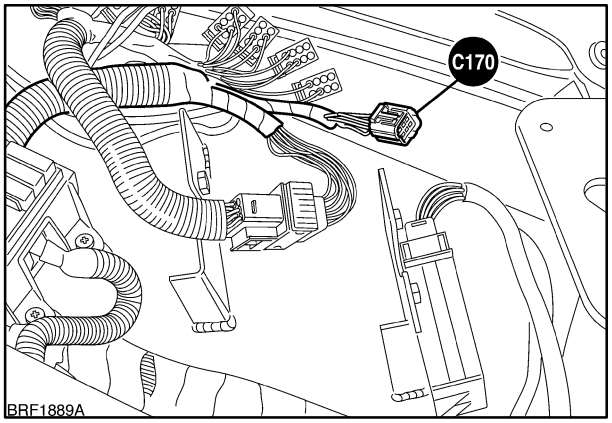

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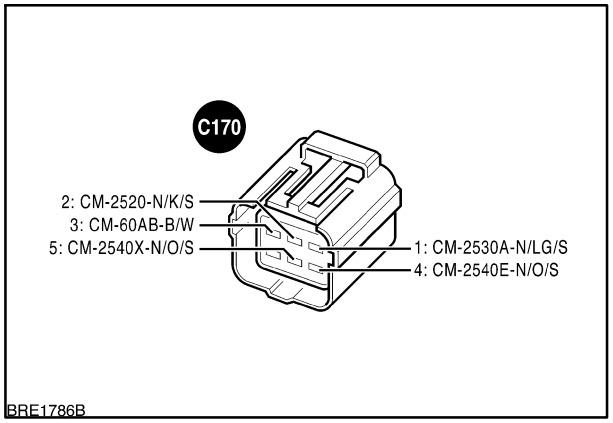

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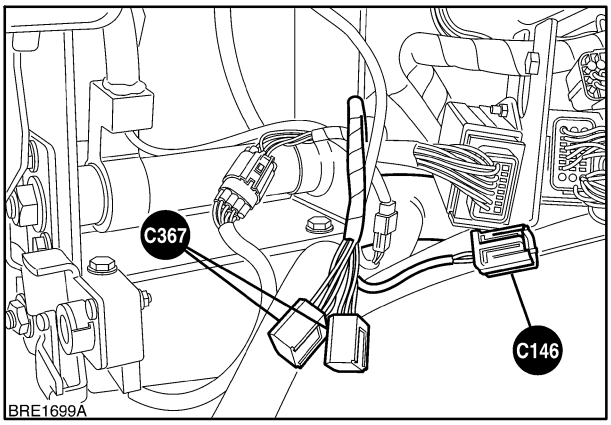

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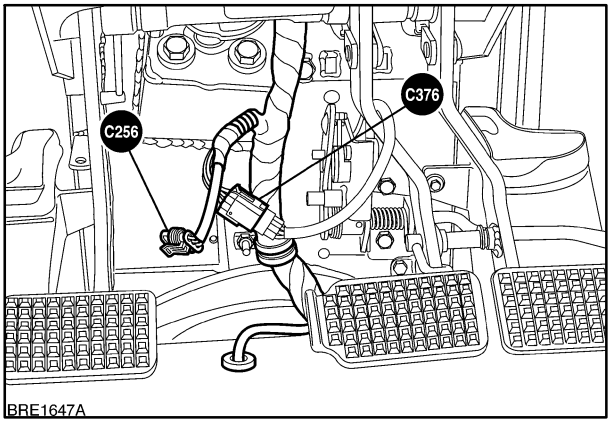

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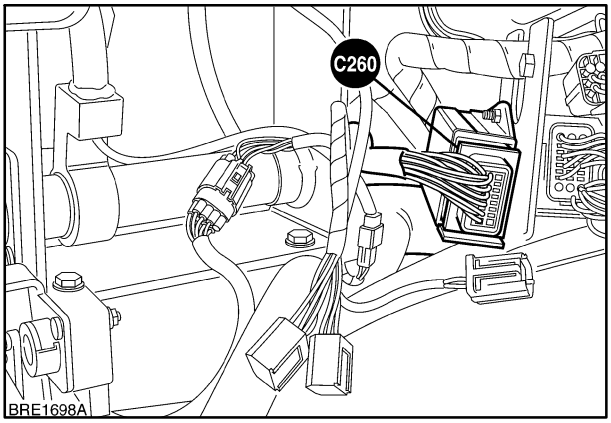

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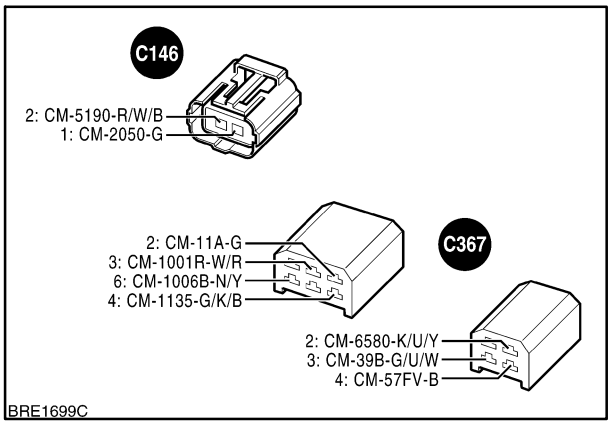

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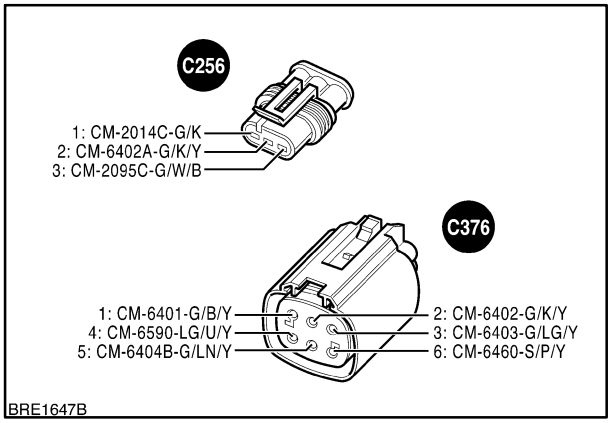

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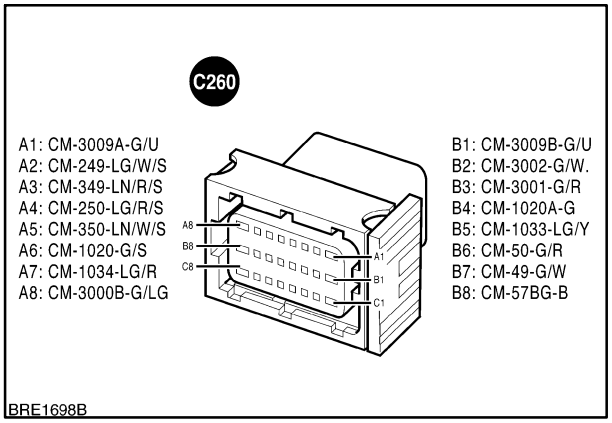

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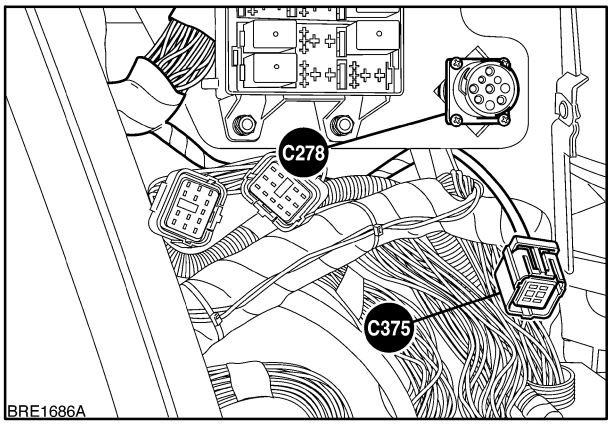

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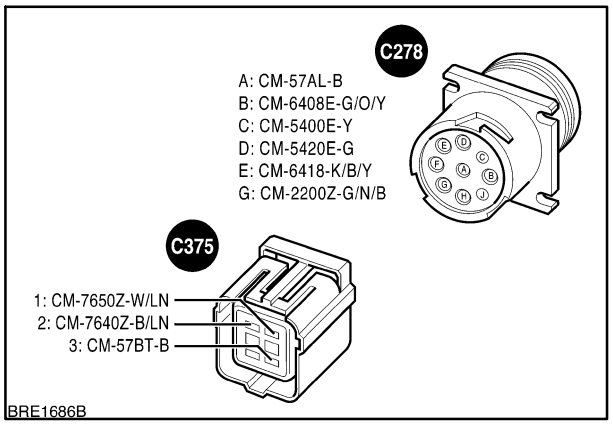

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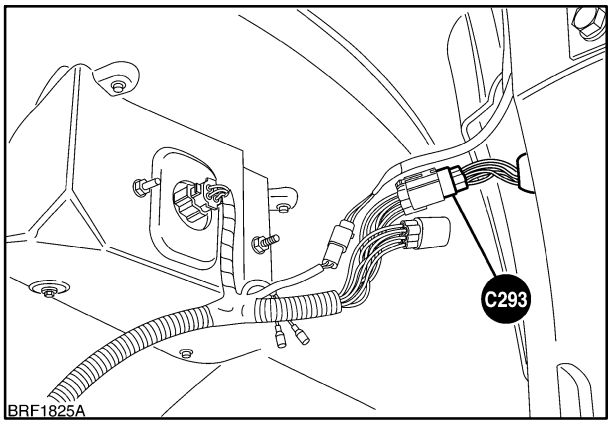

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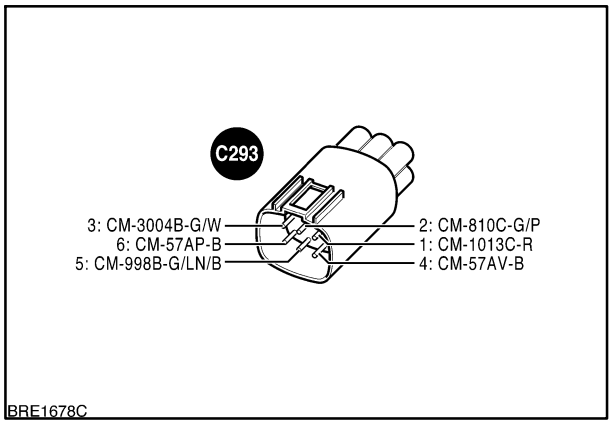

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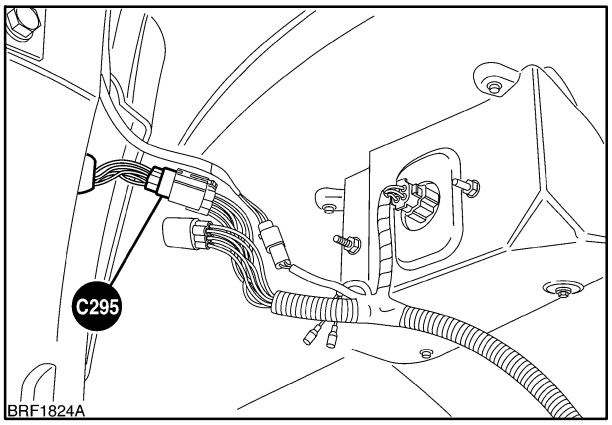

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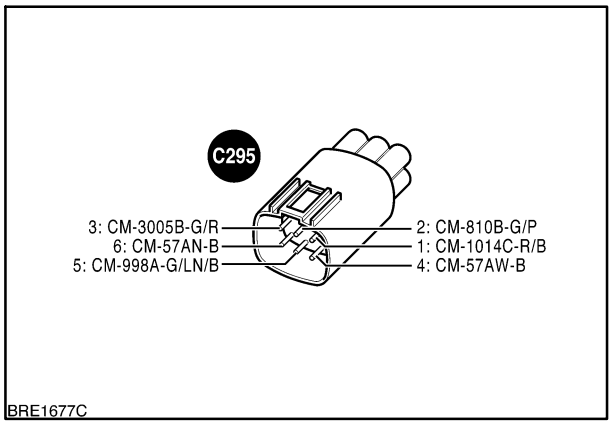

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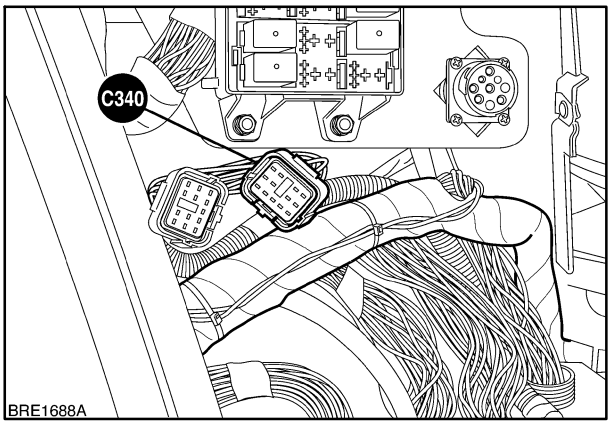
C340
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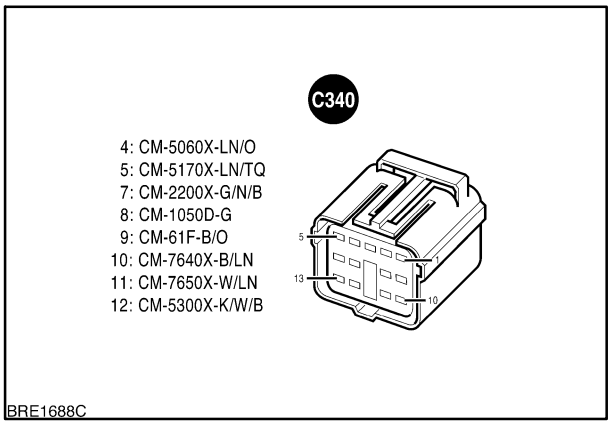
C340
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5: CM-5170X-LN/TQ
7: CM-2200X-G/N/B
8: CM-1050D-G
9: CM-61F-B/O
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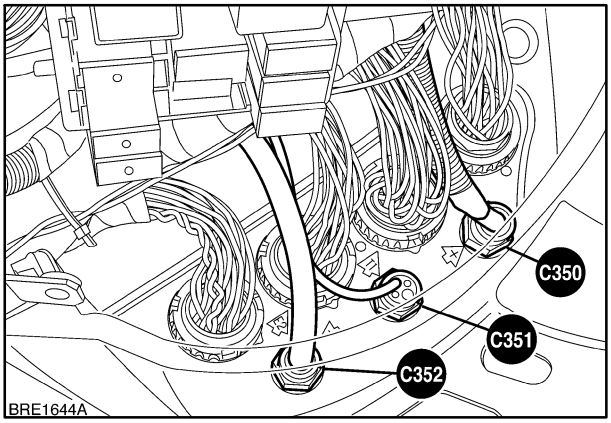
BRE1688C

57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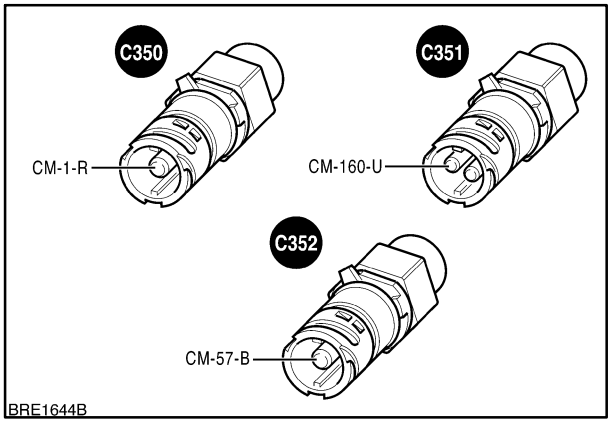
C350
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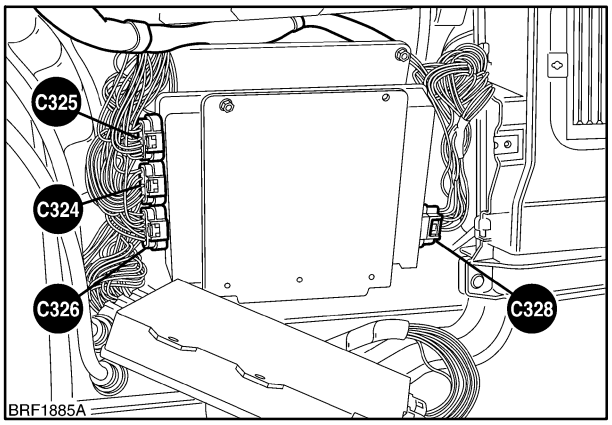
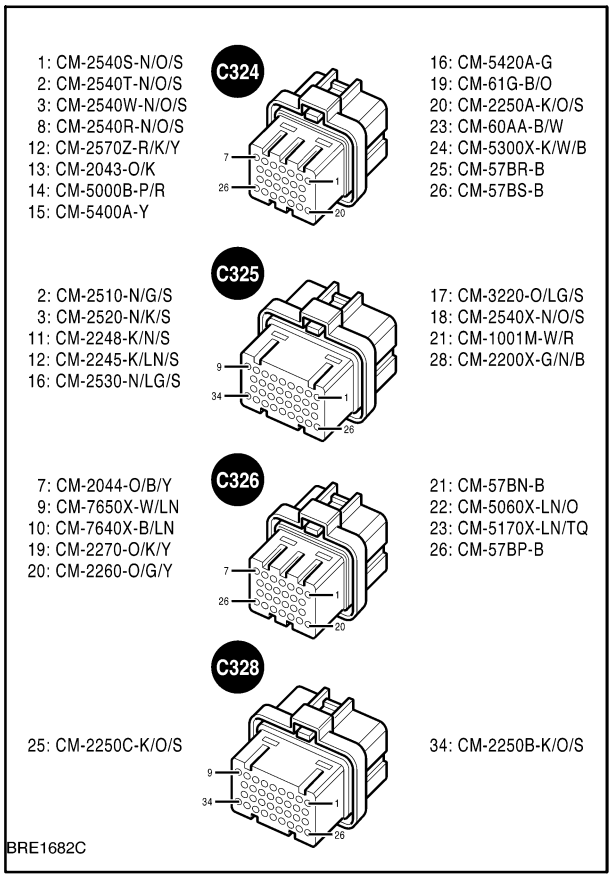
C351
CM-160-U
C352
CM-57-B
BRE1644B

58


C325
C324
C326
C328
BRF1885A

59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2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
8: CM-2540R-N/O/S
12: CM-2570Z-R/K/Y
13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
C324
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B
2: CM-2510-N/G/S
3: CM-2520-N/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S
C325
17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
C326
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
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C328
25: CM-2250C-K/O/S
34: CM-2250B-K/O/S
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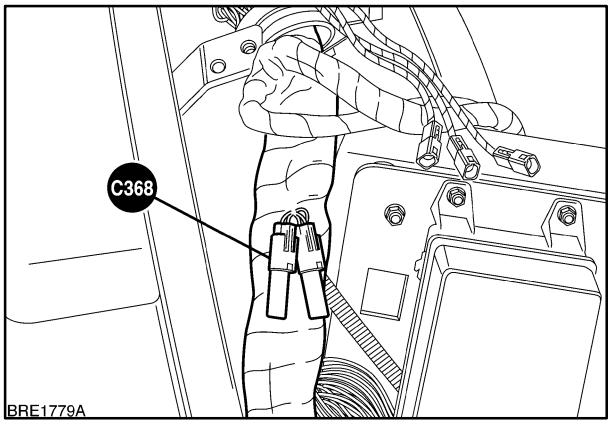
C368
BRE1779A

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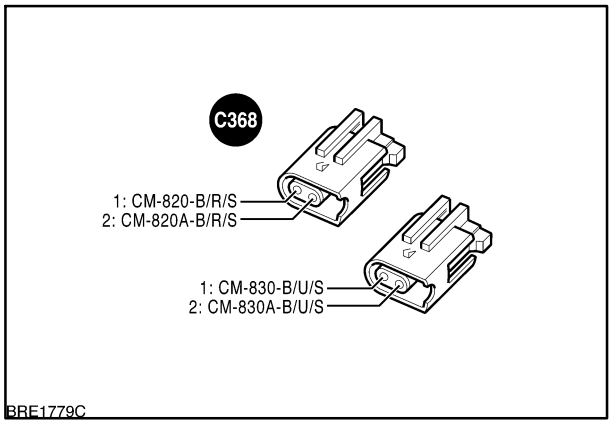
C368
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2: CM-820A-B/R/S
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2: CM-830A-B/U/S
BRE1779C

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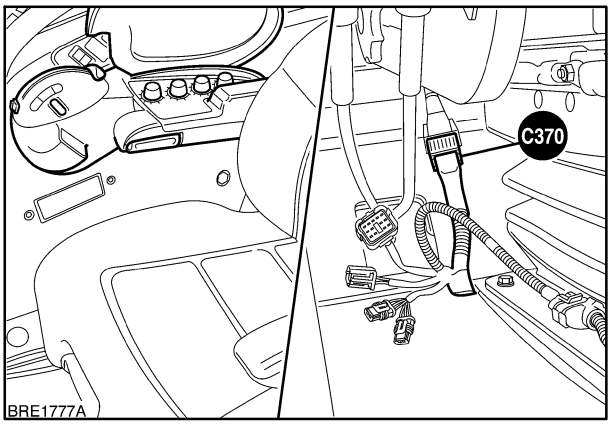

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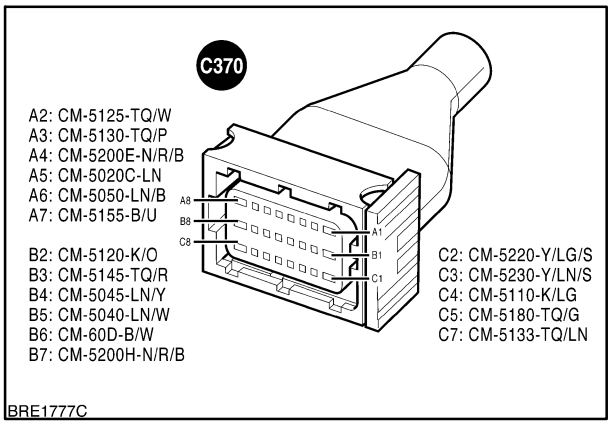

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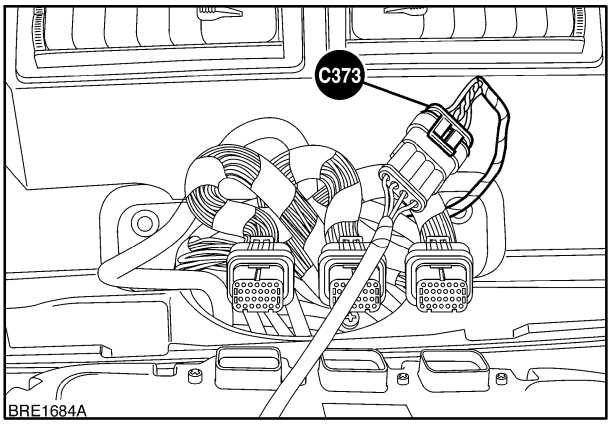

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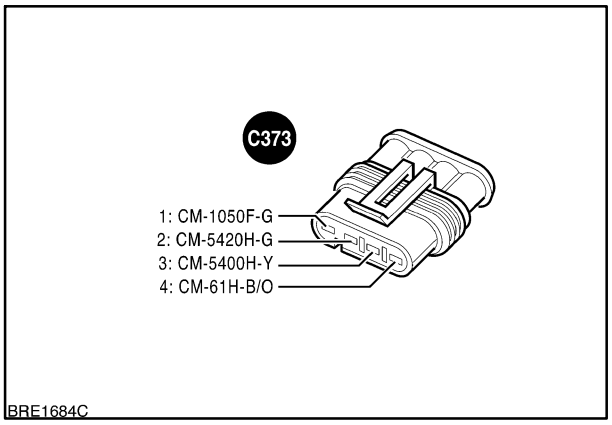

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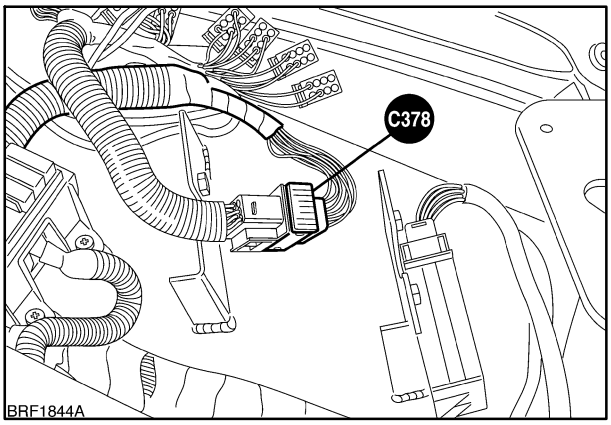

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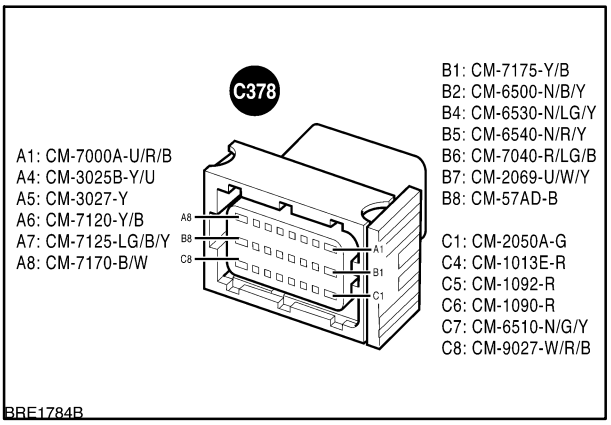

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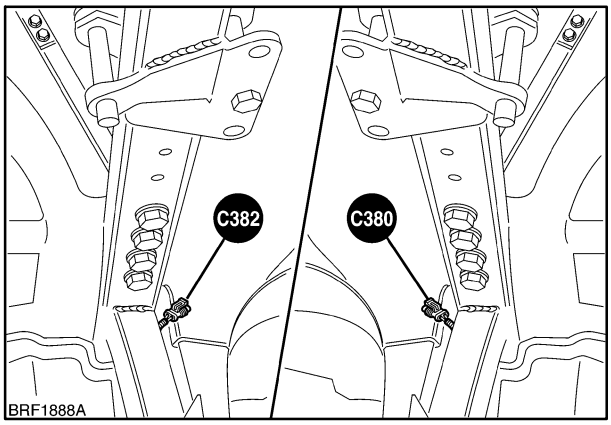

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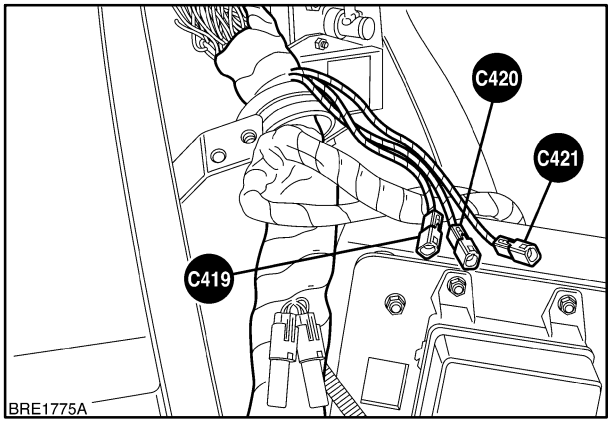

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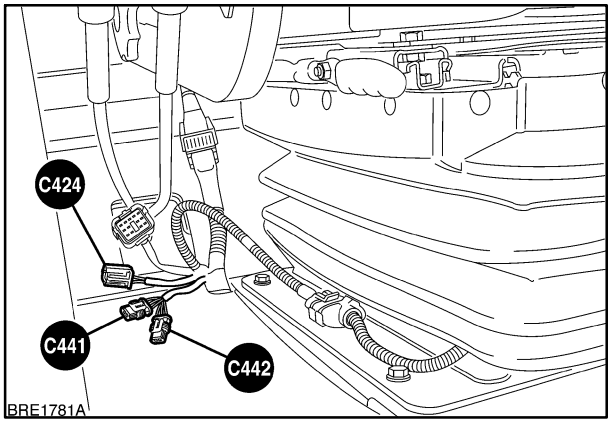

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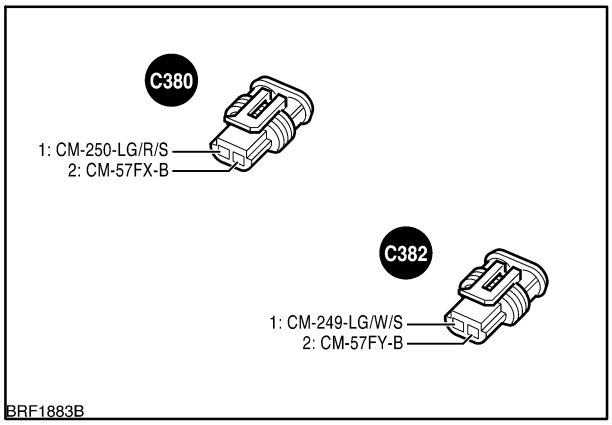

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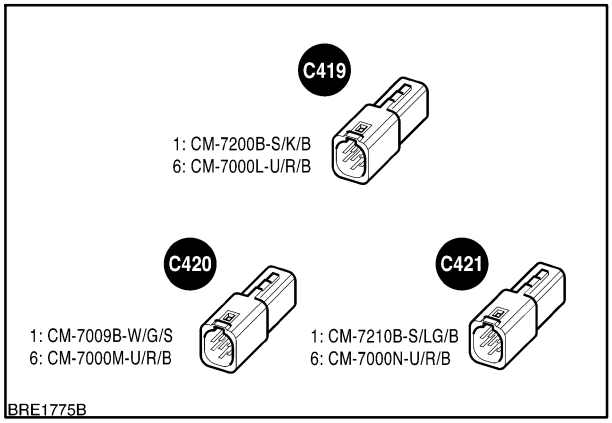

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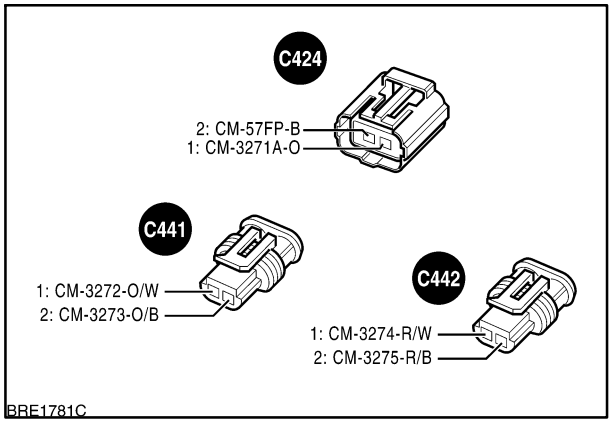
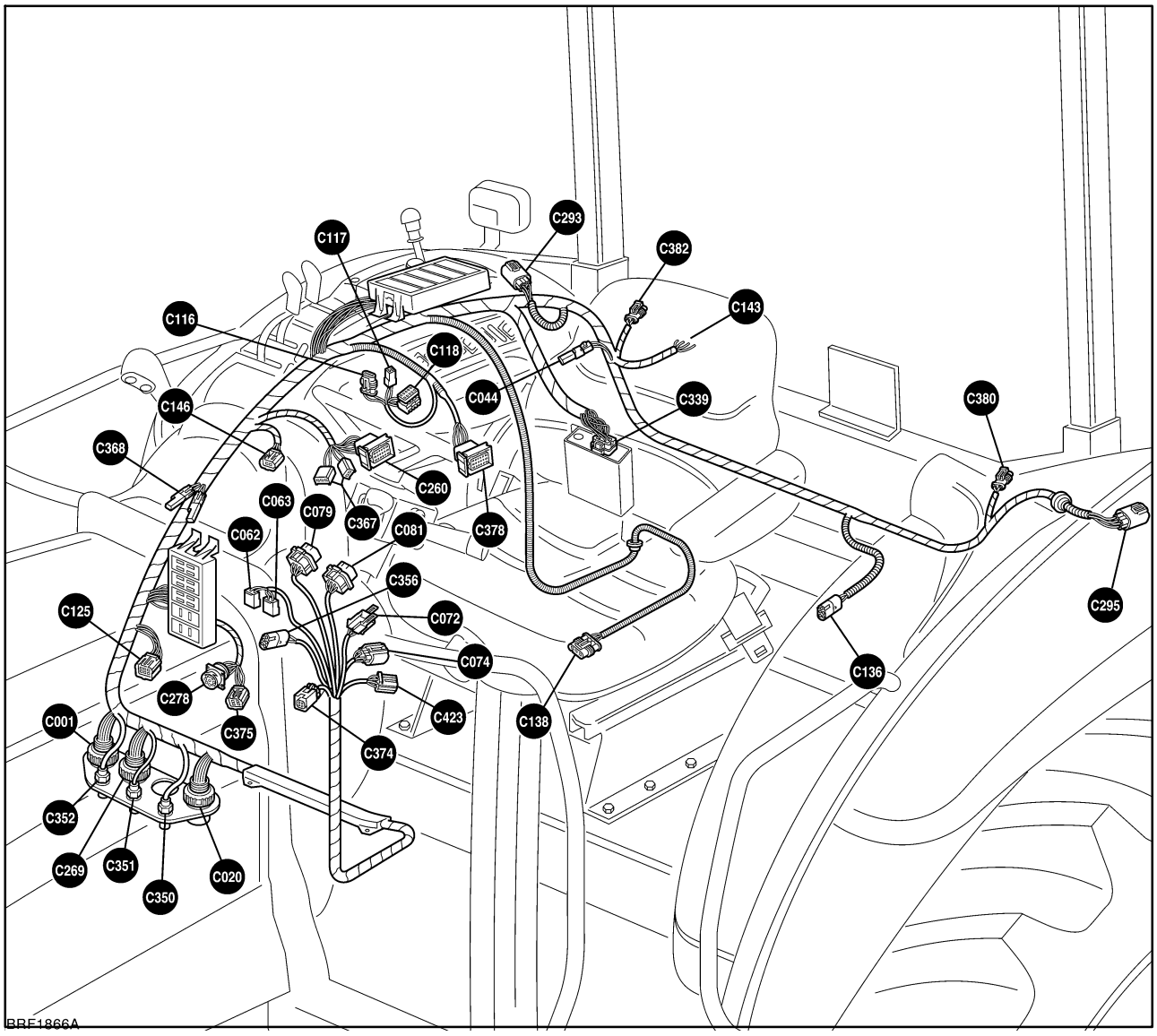


74

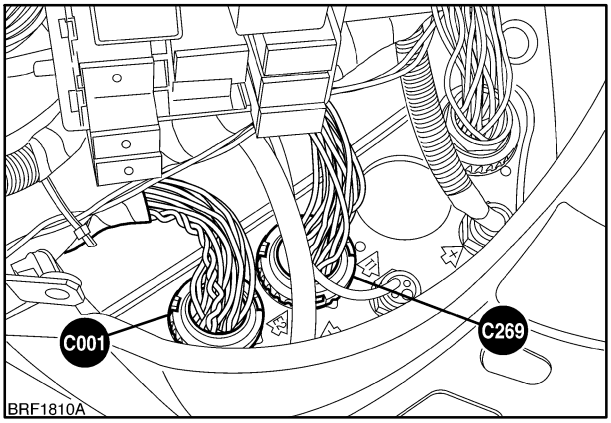
LESS CAB MAIN HARNESS 12 x 12



LESS CAB MAIN HARNESS - 12 X 12 CONNECTORS

1. **C001** Cab to Engine Main Connector E1 *(Location Fig 1, Connector Fig 2)*
2. **C020** Cab to Transmission Main Connector T2 *(Location Fig 3, Connector Fig 5)*
3. **C044** Ground Speed PTO Switch *(Location Fig 4, Connector Fig 6)*
4. **C062** Right Hand Stop Lamp Switch *(Location Fig 7, Connector Fig 11)*
5. **C063** Left Hand Stop Lamp Switch *(Location Fig 7, Connector Fig 11)*
6. **C072** Key Start Switch *(Location Fig 8, Connector Fig 12)*
7. **C074** Turn Switch *(Location Fig 9, Connector Fig 13)*
8. **C079** Instrument Cluster "A" *(Location Fig 15, Connector Fig 16)*
9. **C081** Instrument Cluster "C" *(Location Fig 15, Connector Fig 16)*
10. **C116** Rear PTO Switch *(Location Fig 10, Connector Fig 14)*
11. **C117** Rear PTO Lamp *(Location Fig 17, Connector Fig 19)*
12. **C118** Rear PTO Brake Switch *(Location Fig 18, Connector Fig 20)*
13. **C125** Transmission Diagnostics (TCM) *(Location Fig 21, Connector Fig 23)*
14. **C136** Hand Brake Switch *(Location Fig 22, Connector Fig 24)*
15. **C138** Seat Air Pump *(Location Fig 25, Connector Fig 27)*
16. **C143** Rear Implement Socket *(Location Fig 26, Connector Fig 28)*
17. **C146** Lift-o-matic *(Location Fig 29, Connector Fig 31)*
18. **C260** Indicator Flasher Unit *(Location Fig 30, Connector Fig 32)*
19. **C269** Cab to Engine Main Connector E2 *(Location Fig 1, Connector Fig 2)*
20. **C278** Diagnostics Connector *(Location Fig 33, Connector Fig 35)*
21. **C293** RH Fender 1 *(Location Fig 34, Connector Fig 36)*
22. **C295** LH Fender 1 *(Location Fig 37, Connector Fig 41)*
23. **C339** Small Control Module (SCM) *(Location Fig 38, Connector Fig 42)*
24. **C350** 1 Power B+ Connector *(Location Fig 39, Connector Fig 43)*
25. **C351** 2 Power E Connector *(Location Fig 39, Connector Fig 43)*
26. **C352** 3 Power B- Connector *(Location Fig 39, Connector Fig 43)*
27. **C356** Reverse Alarm Harness Connector *(Location Fig 40, Connector Fig 44)*
28. **C367** Grid Heater *(Location Fig 29, Connector Fig 31)*
29. **C368** Diode Connector *(Location Fig 45, Connector Fig 48)*
30. **C374** Hazard Switch Harness *(Location Fig 8, Connector Fig 12)*
31. **C375** ADIC Diagnostic Connector *(Location Fig 33, Connector Fig 35)*
32. **C378** Cab to Switch Harness Connector *(Location Fig 46, Connector Fig 49)*
33. **C380** Left Rear SMV Lamp *(Location Fig 47, Connector Fig 50)*
34. **C382** Right Rear SMV Lamp *(Location Fig 47, Connector Fig 50)*
35. **C423** Brake Pedals Latched *(Location Fig 40, Connector Fig 44)*

LESS CAB MAIN HARNESS – 12 X 12 CONNECTOR LOCATIONS



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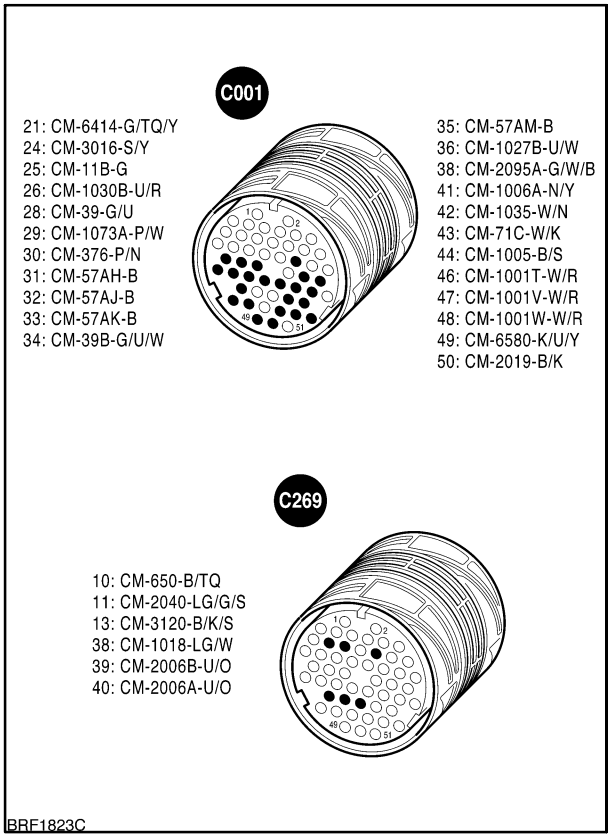

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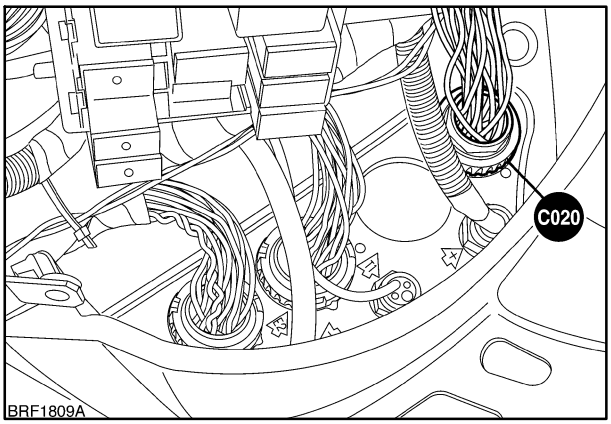

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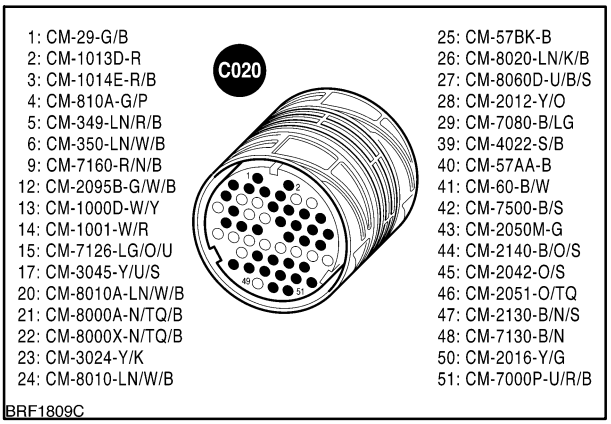

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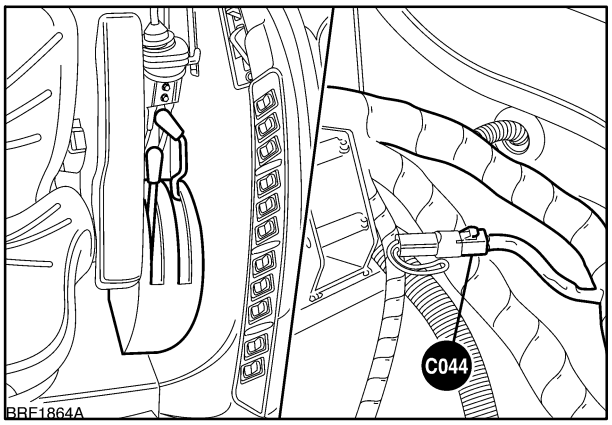
C044
BRE1864A

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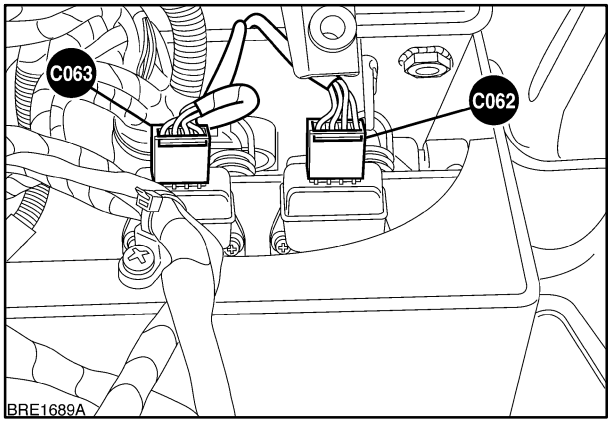
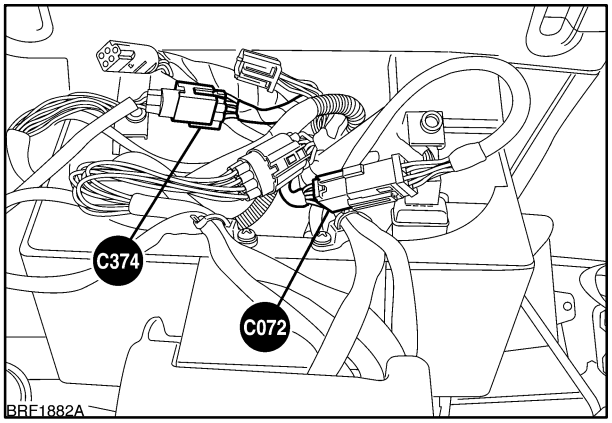

C063
C062
BRE1689A

6


C374
C072
BRF1882A

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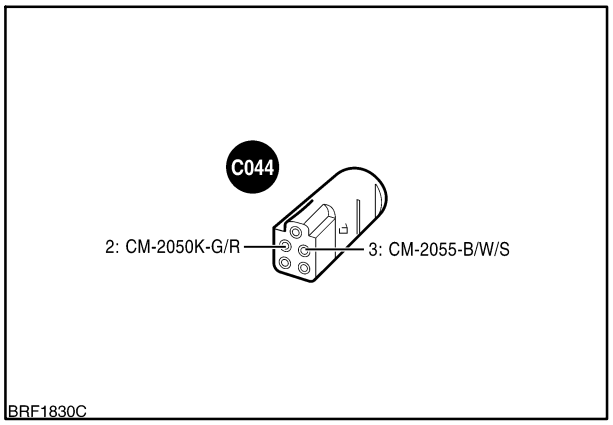
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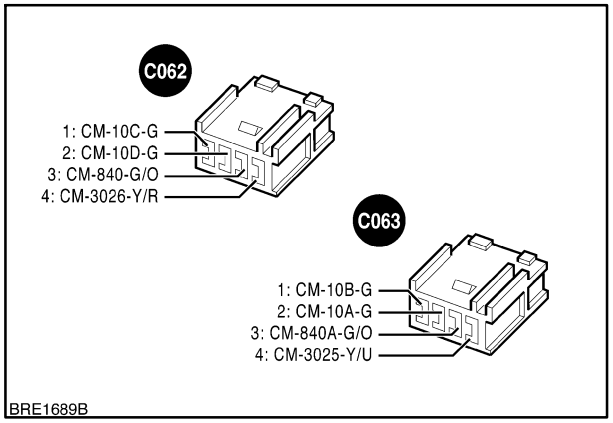
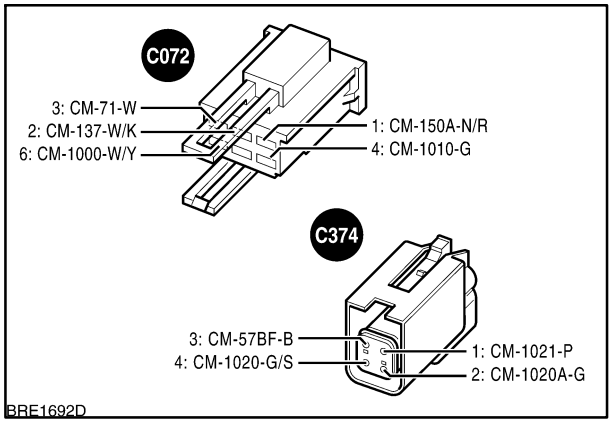
BRF1830C

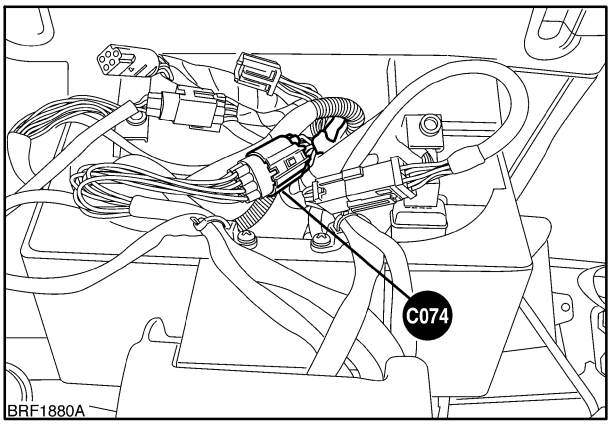
8


C062
1: CM-10C-G
2: CM-10D-G
3: CM-840-G/O
4: CM-3026-Y/R
C063
1: CM-10B-G
2: CM-10A-G
3: CM-840A-G/O
4: CM-3025-Y/U
BRE1689B

9


C072
3: CM-71-W
2: CM-137-W/K
6: CM-1000-W/Y
1: CM-150A-N/R
4: CM-1010-G
C374
3: CM-57BF-B
4: CM-1020-G/S
1: CM-1021-P
2: CM-1020A-G
BRE1692D

10


C074
BRF1880A

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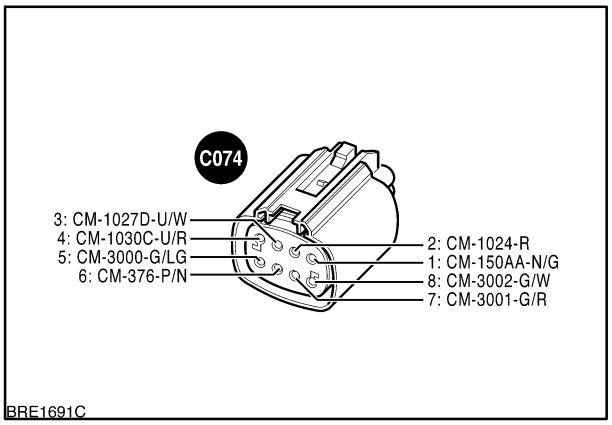
C074
3: CM-1027D-U/W
4: CM-1030C-U/R
5: CM-3000-G/LG
6: CM-376-P/N
2: CM-1024-R
1: CM-150AA-N/G
8: CM-3002-G/W
7: CM-3001-G/R
BRE1691C

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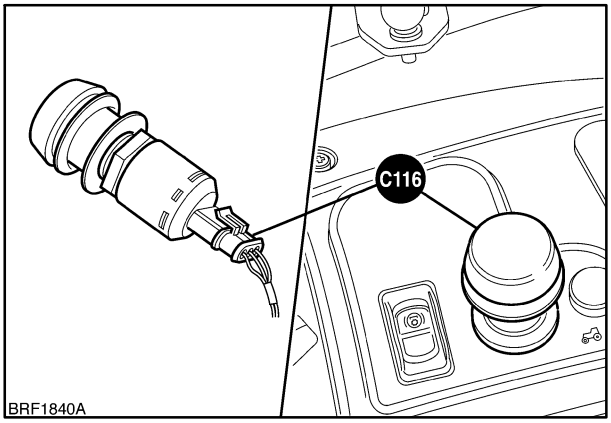
C116
BRF1840A

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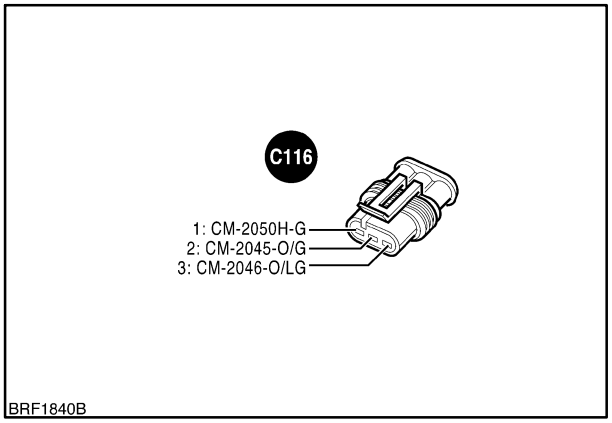
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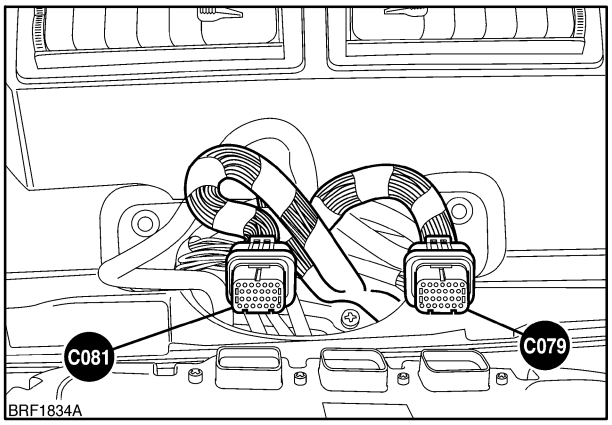
2: CM-2045-O/G
3: CM-2046-O/LG
BRF1840B

14


C081
C079
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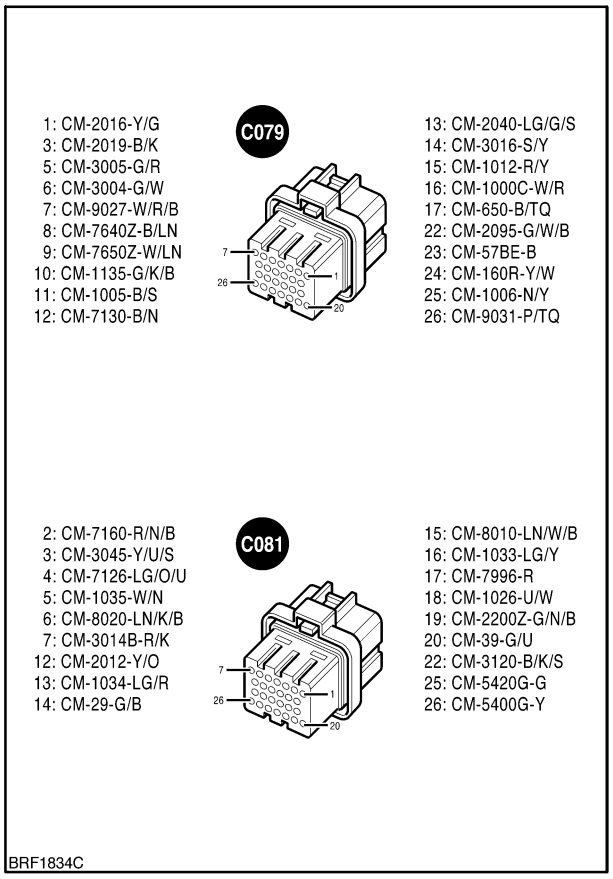
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7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
C079
7
26
1
20
13: CM-2040-LG/G/S
14: CM-3016-S/Y
15: CM-1012-R/Y
16: CM-1000C-W/R
17: CM-650-B/TQ
22: CM-2095-G/W/B
23: CM-57BE-B
24: CM-160R-Y/W
25: CM-1006-N/Y
26: CM-9031-P/TQ
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014B-R/K
12: CM-2012-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
C081
7
26
1
20
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
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22: CM-3120-B/K/S
25: CM-5420G-G
26: CM-5400G-Y
BRF1834C

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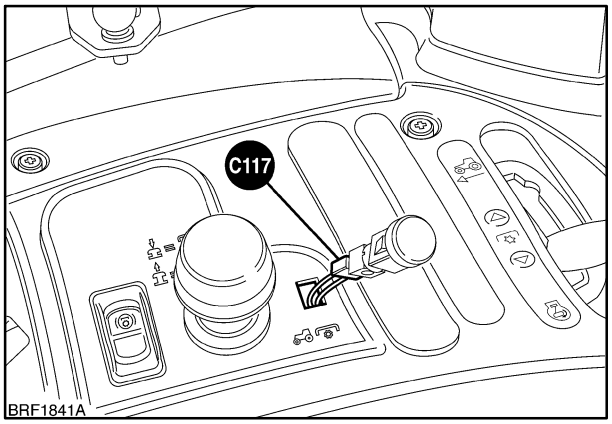
C117
BRF1841A

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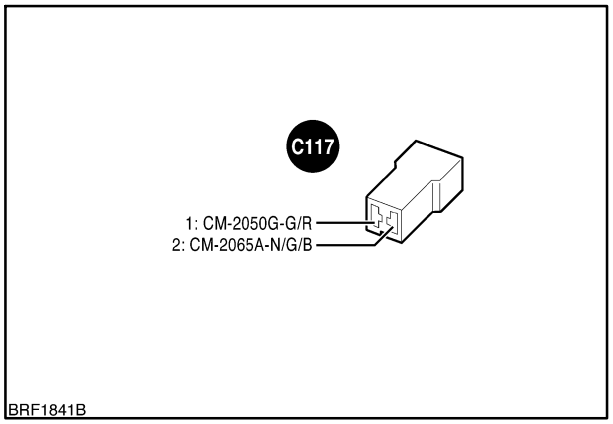
C117
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BRF1841B

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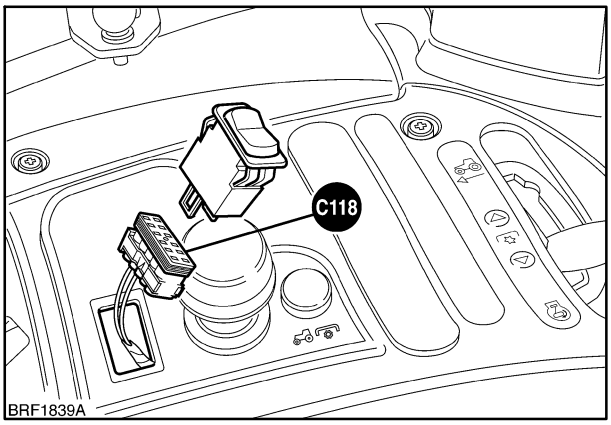

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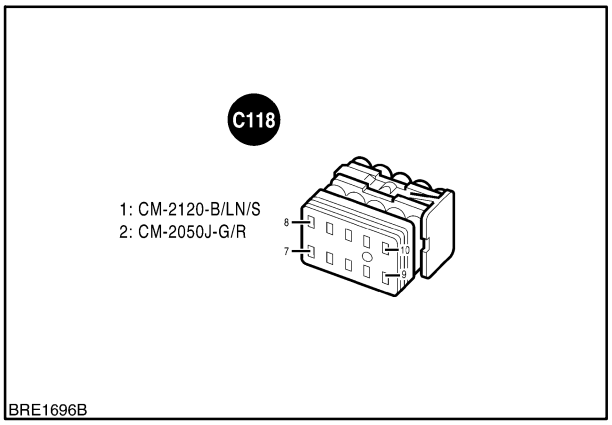

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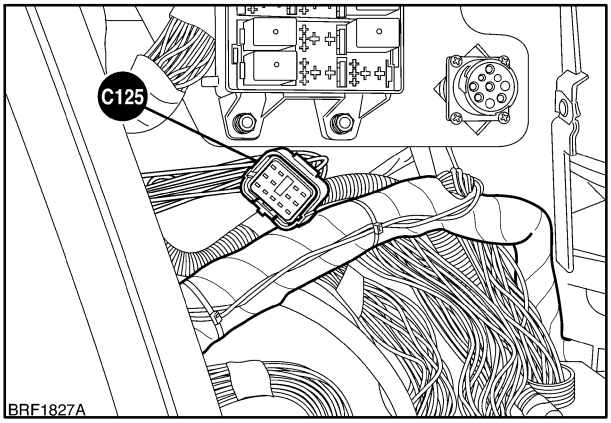

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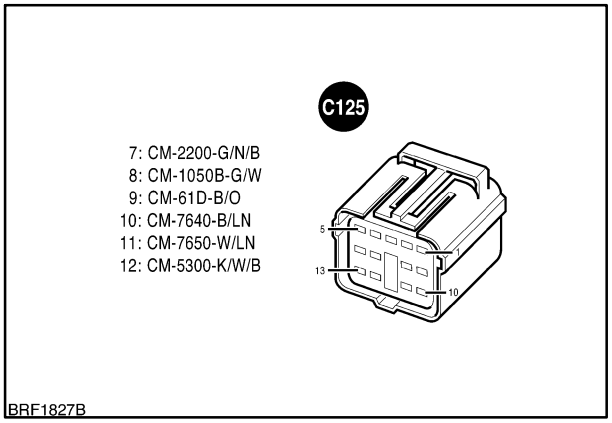

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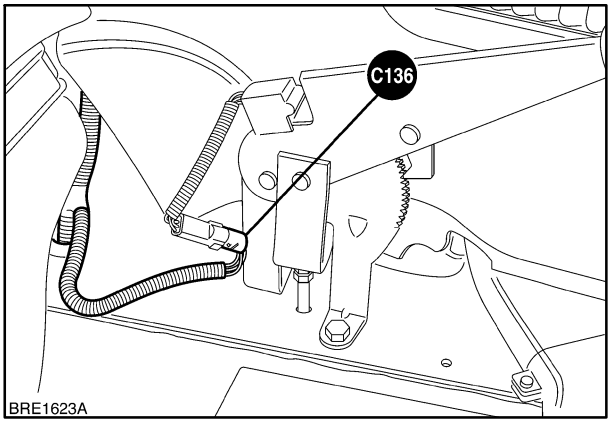

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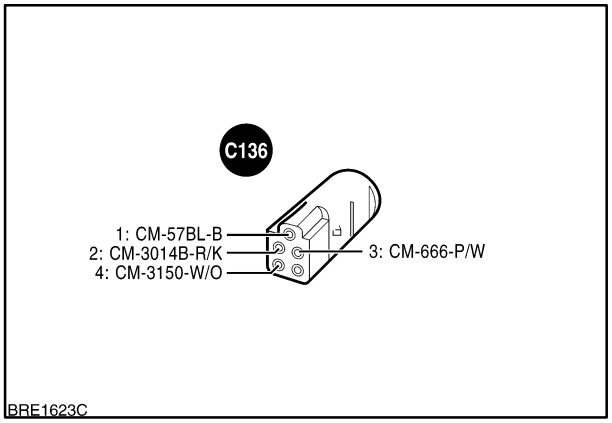

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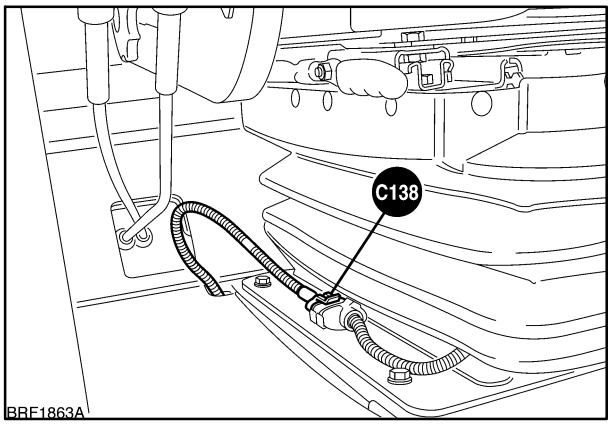

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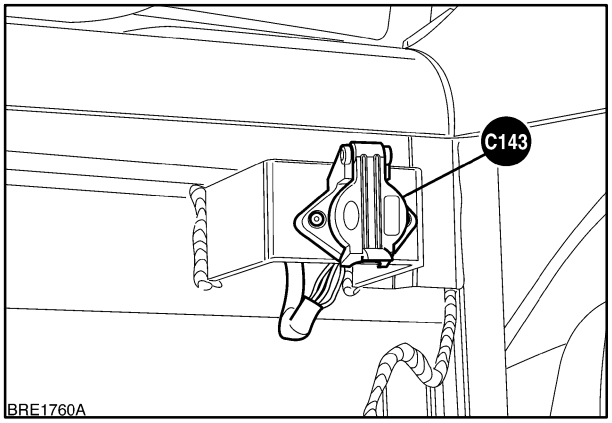

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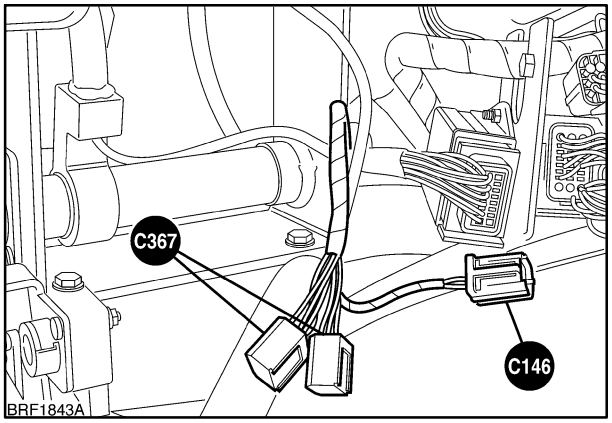

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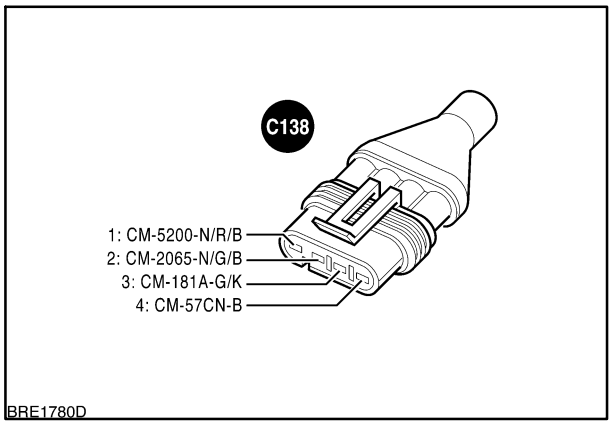

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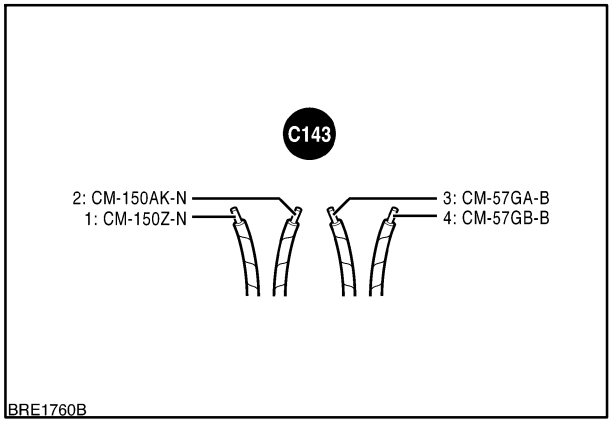

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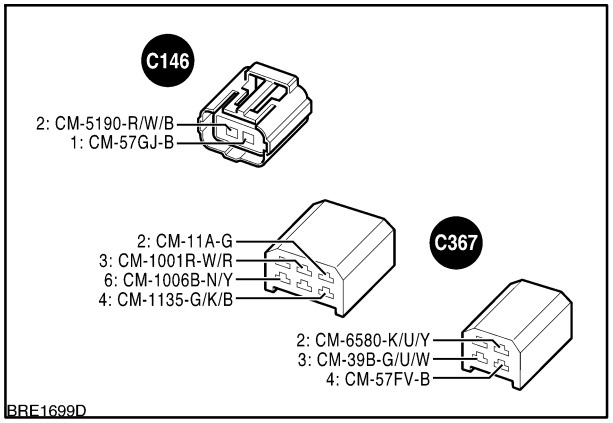

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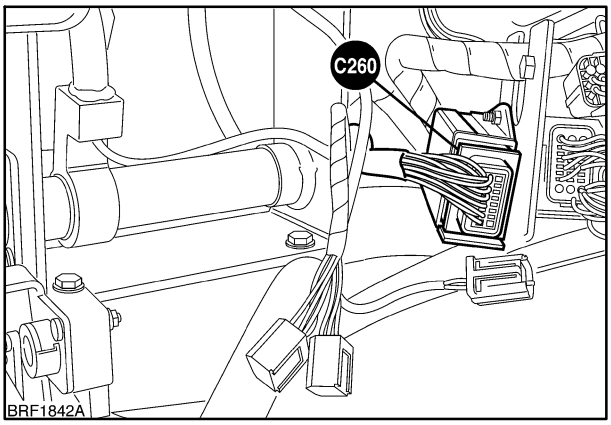

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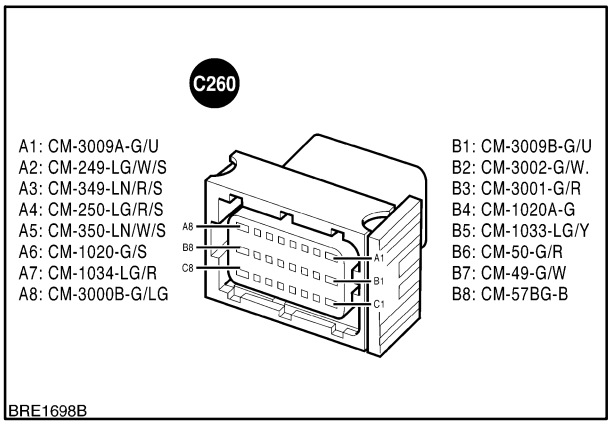

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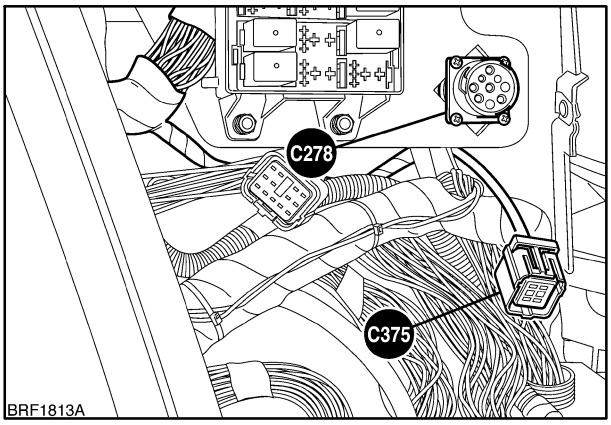

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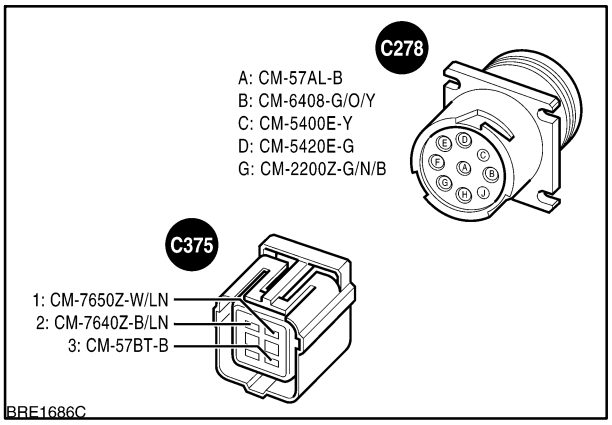

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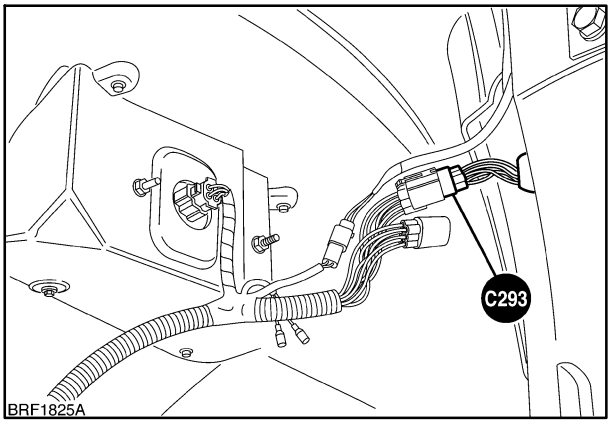

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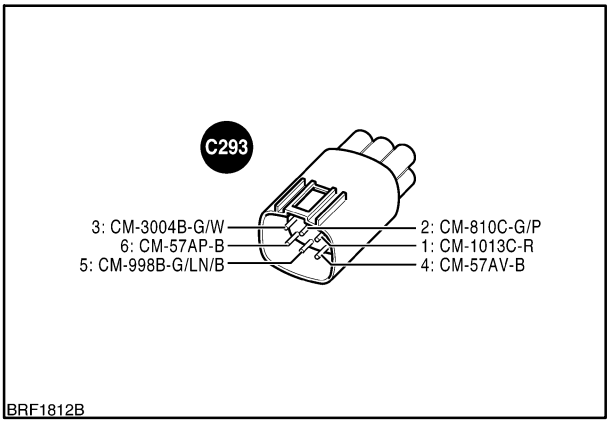

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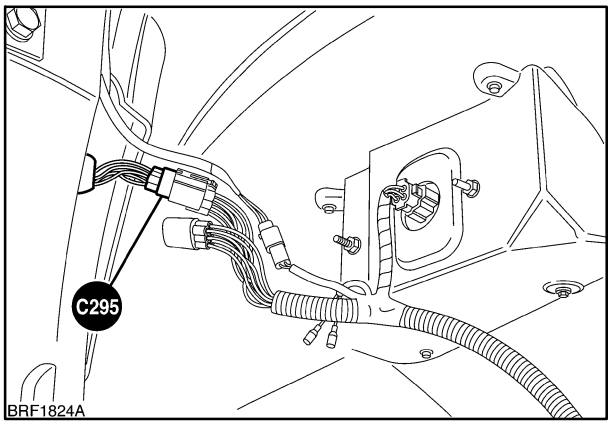

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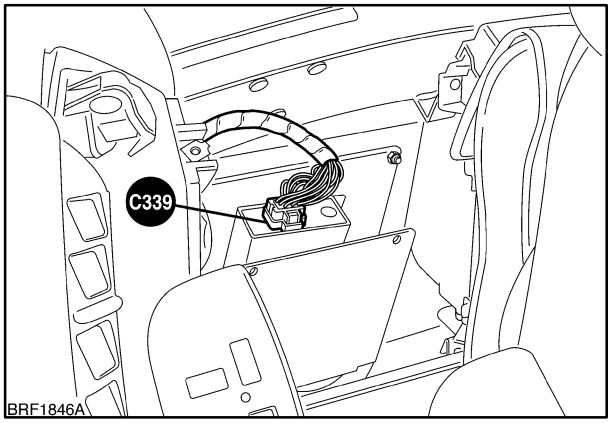

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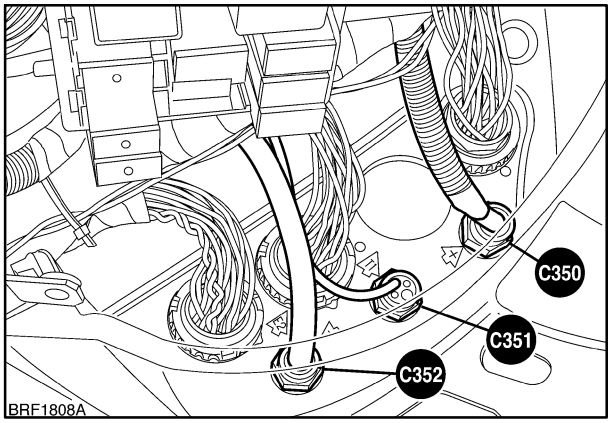

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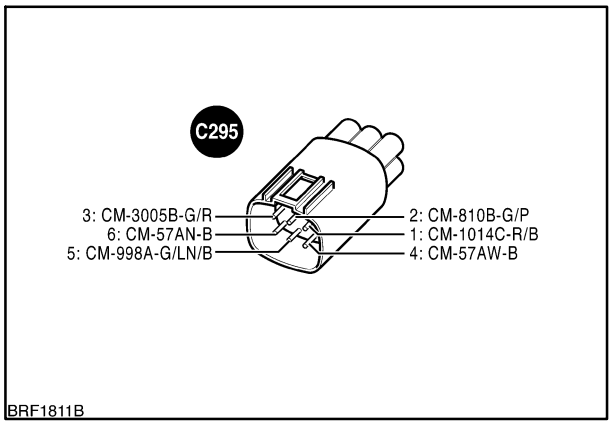

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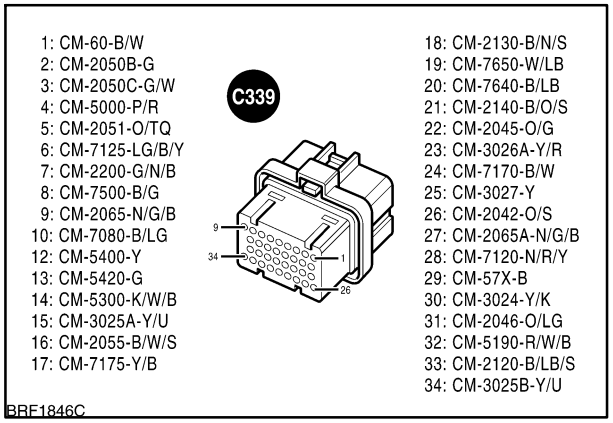

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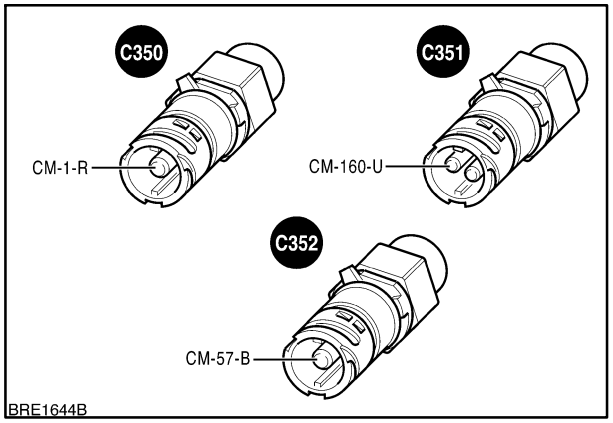

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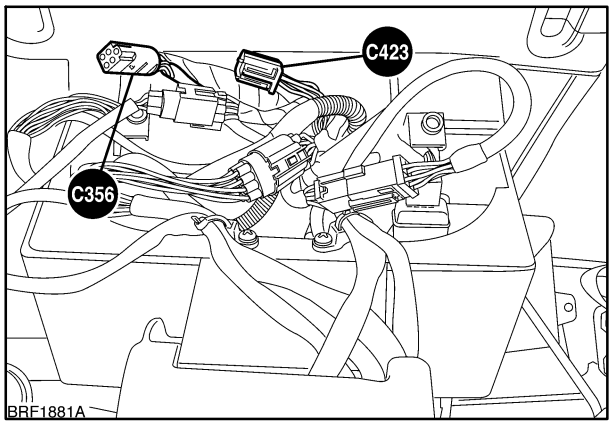

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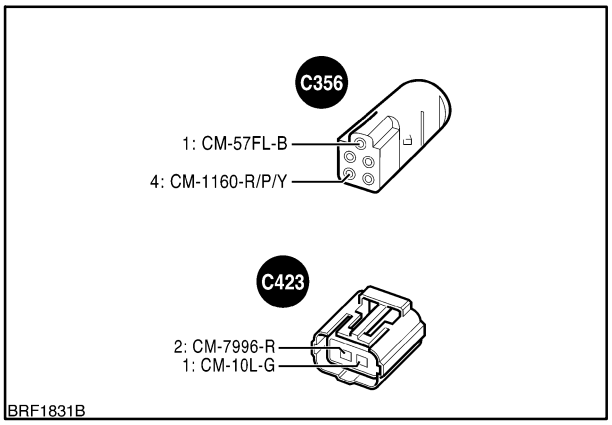

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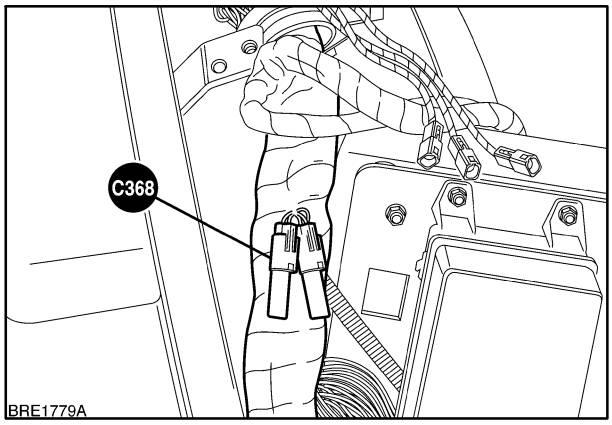

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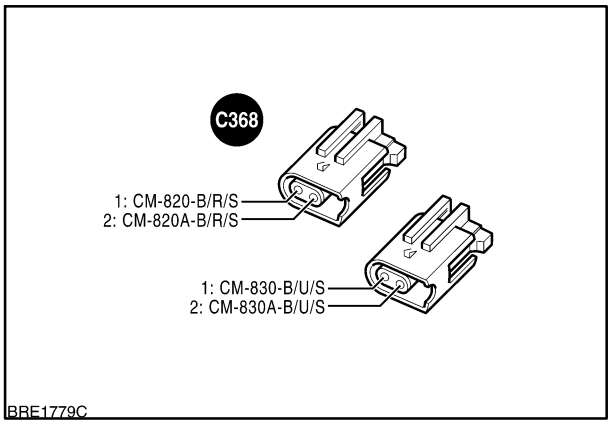

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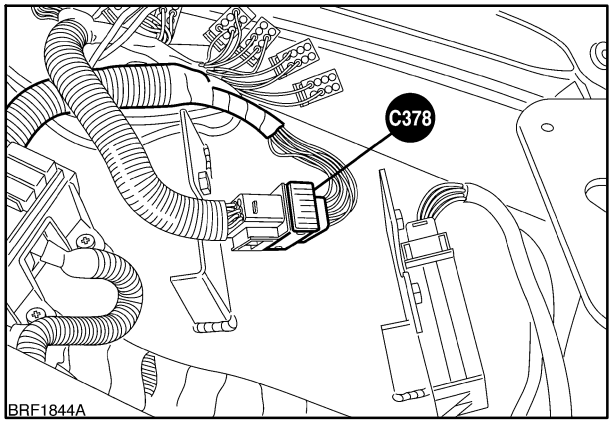

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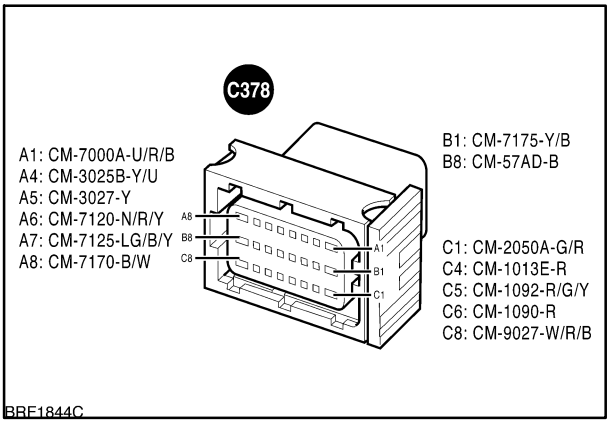

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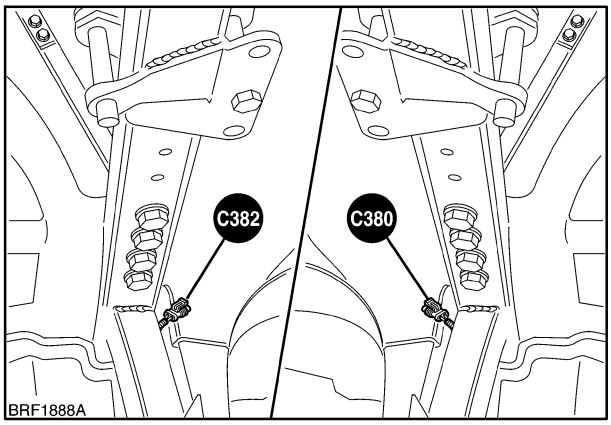
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C380
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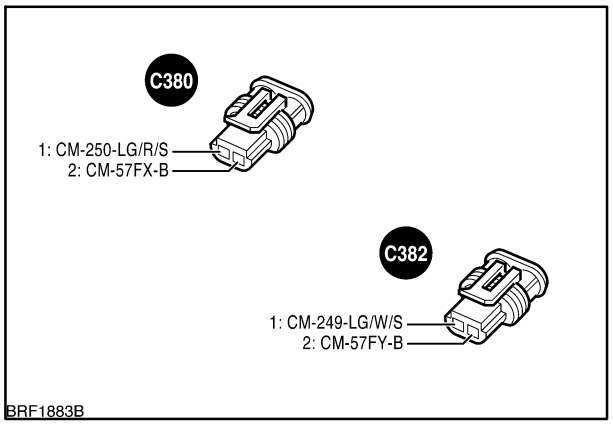
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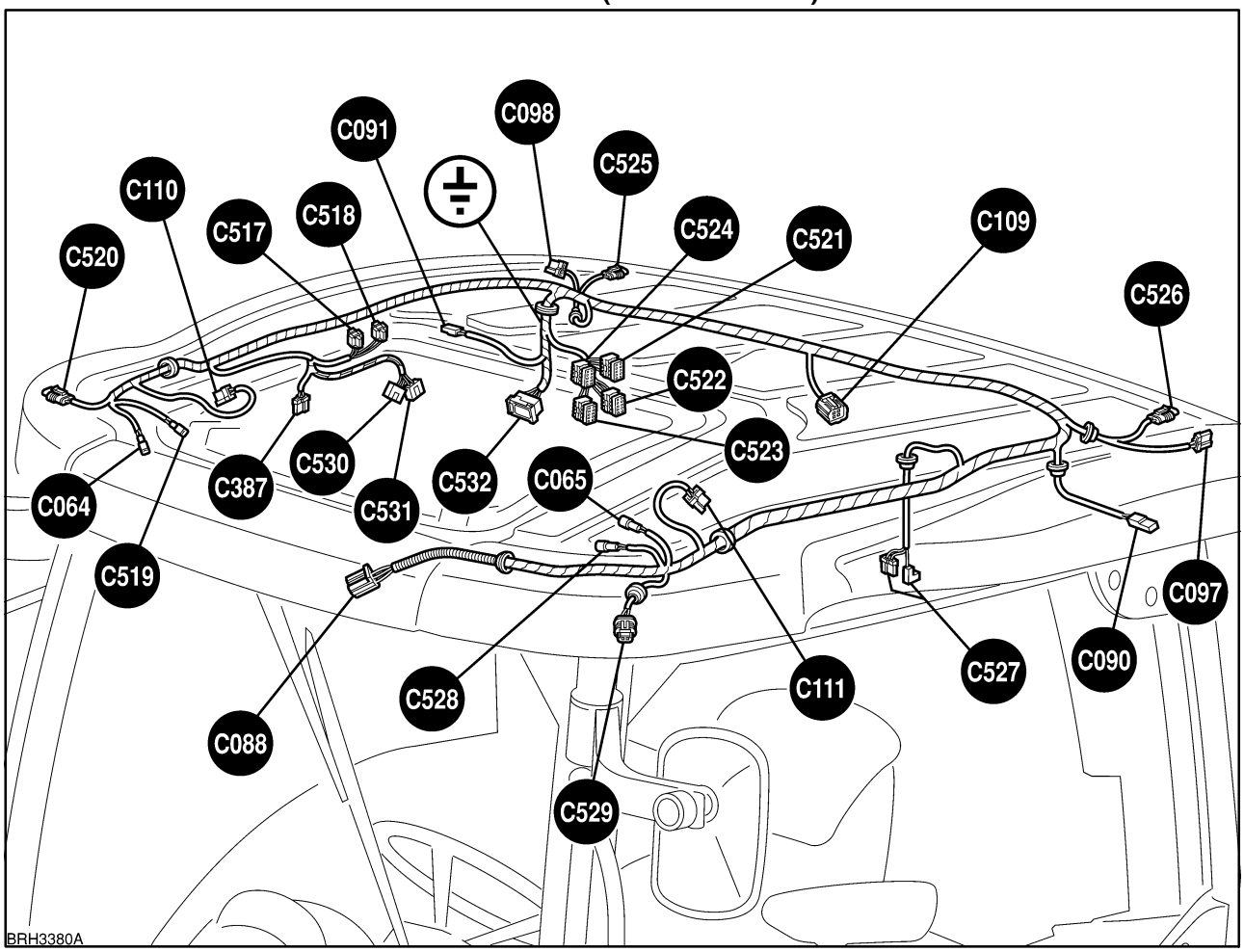
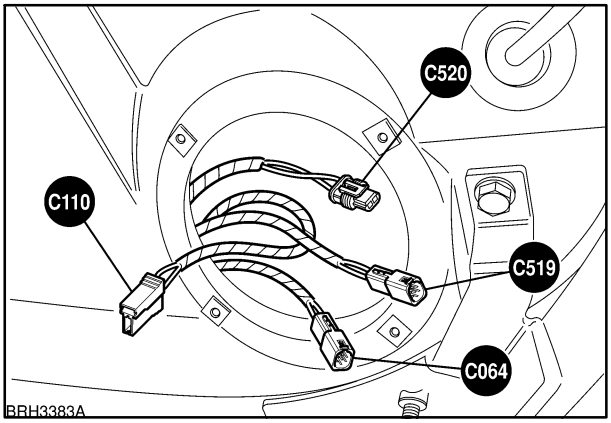
CAB ROOF HARNESS- LOW PROFILE CAB (FROM 06-2005)



LOW PROFILE CAB ROOF HARNESS CONNECTORS

1. **C064** Grab Rail Worklamp RH *(Location Fig 1, Connector Fig 4)*
2. **C065** Grab Rail Worklamp LH *(Location Fig 2, Connector Fig 5)*
3. **C088** Front Wiper Motor *(Location Fig 3, Connector Fig 6)*
4. **C090** Door Switch LH *(Location Fig 7, Connector Fig 11)*
5. **C091** Door Switch RH *(Location Fig 7, Connector Fig 11)*
6. **C097** Beacon LH *(Location Fig 8, Connector Fig 12)*
7. **C098** Beacon RH *(Location Fig 9, Connector Fig 13)*
8. **C109** Rear Wiper Motor *(Location Fig 10, Connector Fig 14)*
9. **C110** Front Speaker Connector RH *(Location Fig 1, Connector Fig 4)*
10. **C111** Front Speaker Connector LH *(Location Fig 2, Connector Fig 5)*
11. **C387** Console Lamp RH *(Location Fig 15, Connector Fig 19)*
12. **C517** Grabrail Worklamp Relay *(Location Fig 16, Connector Fig 20)*
13. **C518** Beacon Relay *(Location Fig 16, Connector Fig 20)*
14. **C519** Grab Rail Sidelamp RH *(Location Fig 1, Connector Fig 4)*
15. **C520** Front SMV Lamp RH *(Location Fig 1, Connector Fig 4)*
16. **C521** Beacon Switch *(Location Fig 17, Connector Fig 21)*
17. **C522** Fender Worklamp Switch *(Location Fig 17, Connector Fig 21)*
18. **C523** Front Worklamp Switch *(Location Fig 18, Connector Fig 22)*
19. **C524** Grabrail Worklamp Switch *(Location Fig 18, Connector Fig 22)*
20. **C525** Rear SMV Lamp RH *(Location Fig 9, Connector Fig 13)*
21. **C526** Rear SMV Lamp LH *(Location Fig 8, Connector Fig 12)*
22. **C527** Interior Lamp *(Location Fig 23, Connector Fig 26)*
23. **C528** Grab Rail SidelampLH *(Location Fig 2, Connector Fig 5)*
24. **C529** Front SMV Lamp LH *(Location Fig 2, Connector Fig 5)*
25. **C530** Radio Connector A *(Location Fig 24, Connector Fig 27)*
26. **C531** Radio Connector B *(Location Fig 24, Connector Fig 27)*
27. **C532** Roof to Cab Main Connector *(Location Fig 25, Connector Fig 28)*

LOW PROFILE CAB ROOF HARNESS CONNECTOR LOCATIONS



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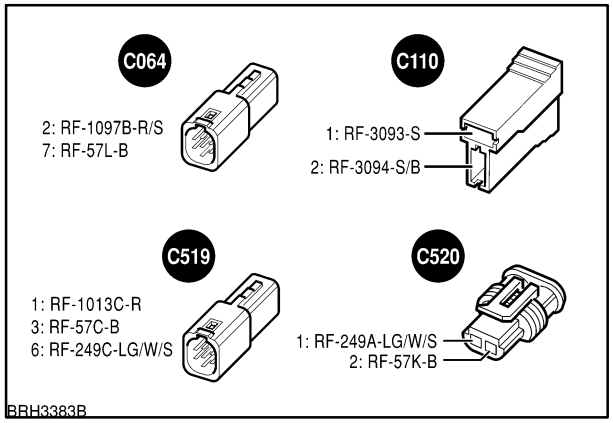

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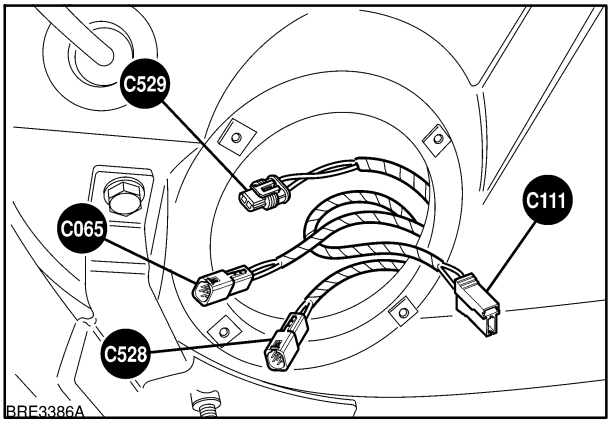

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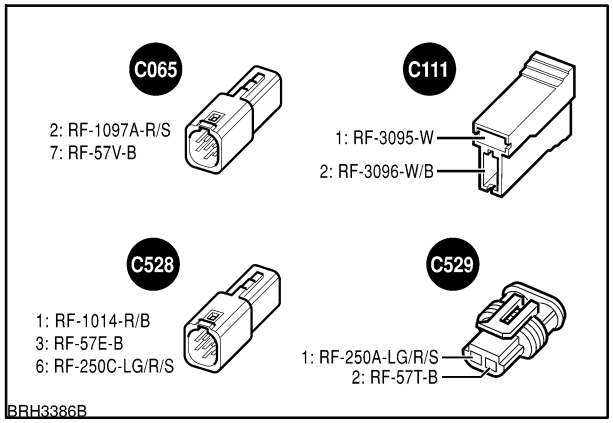

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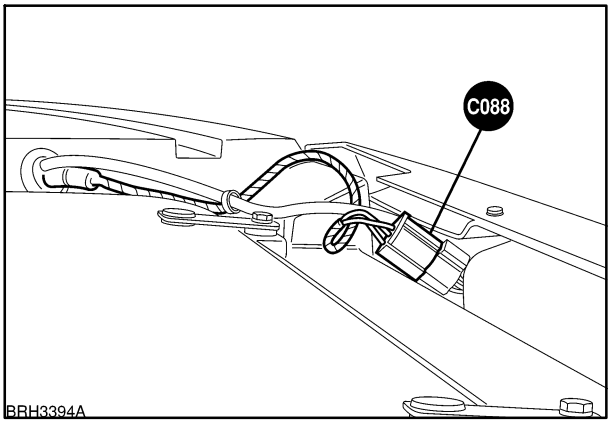

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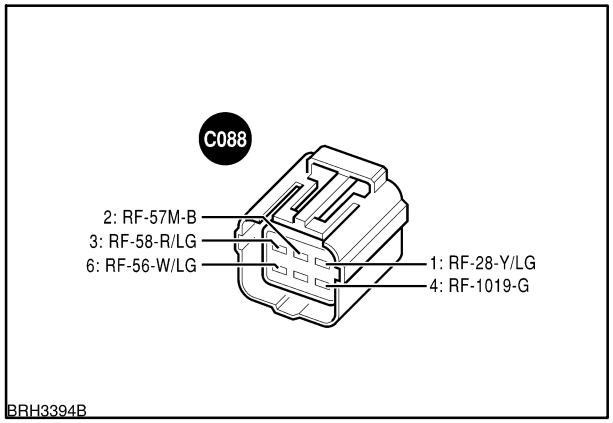

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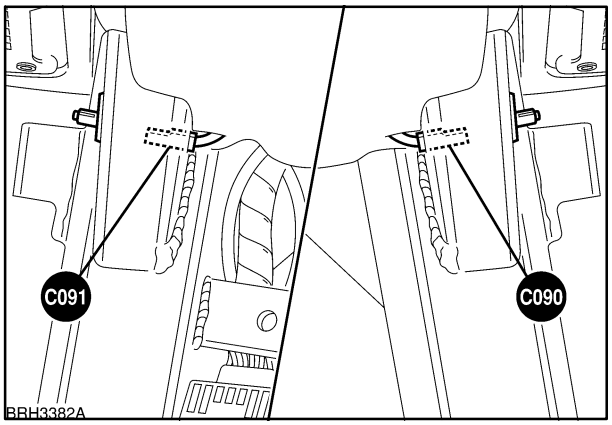
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C090
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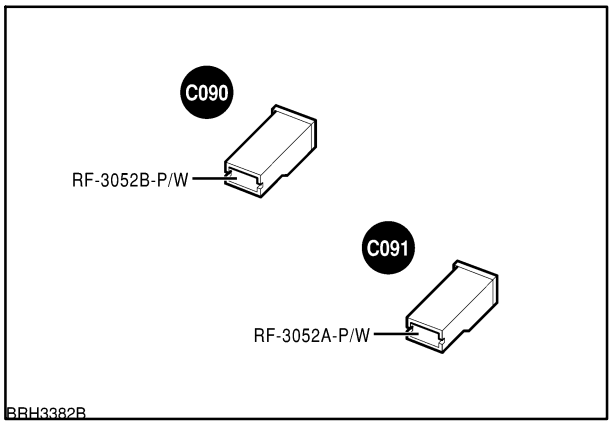
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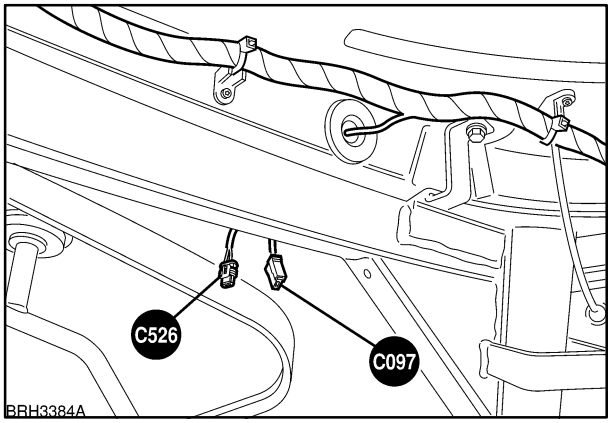
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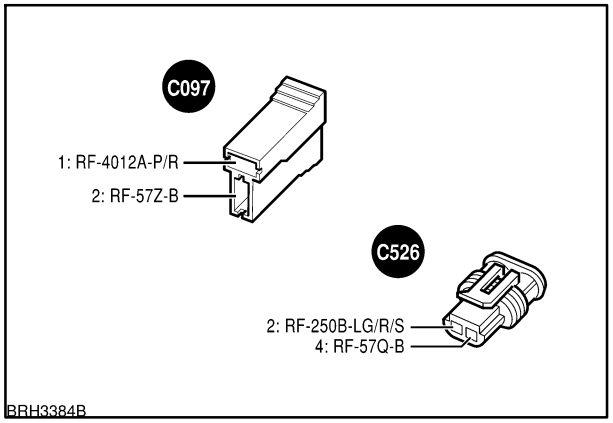
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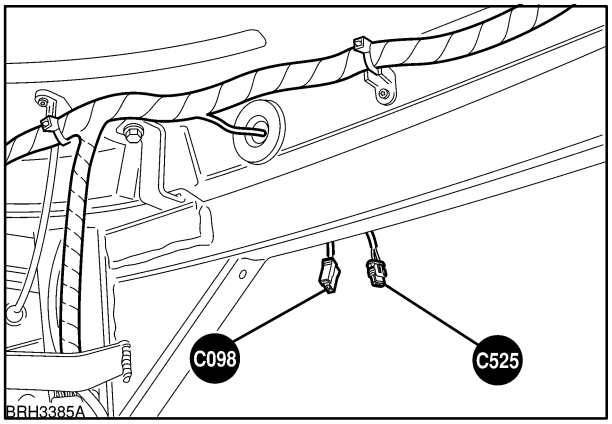
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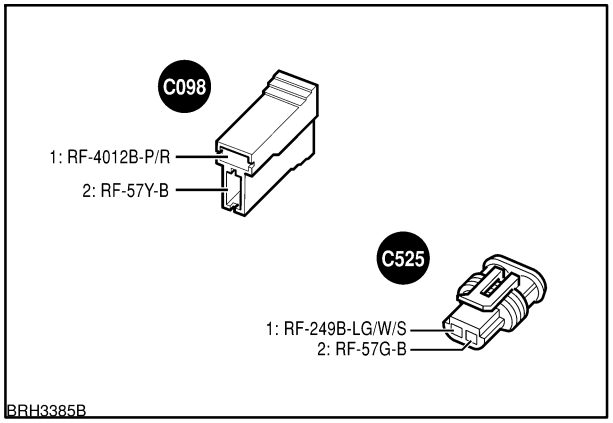
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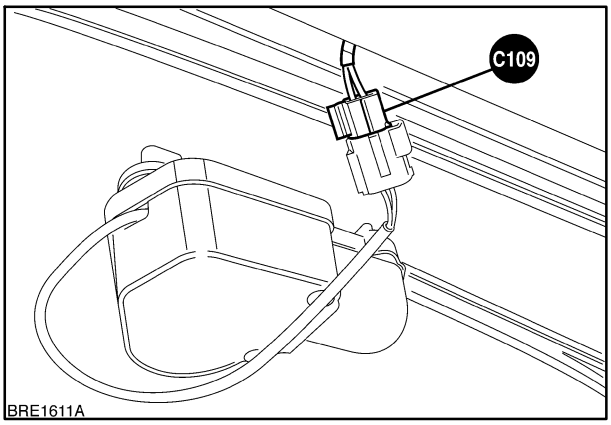

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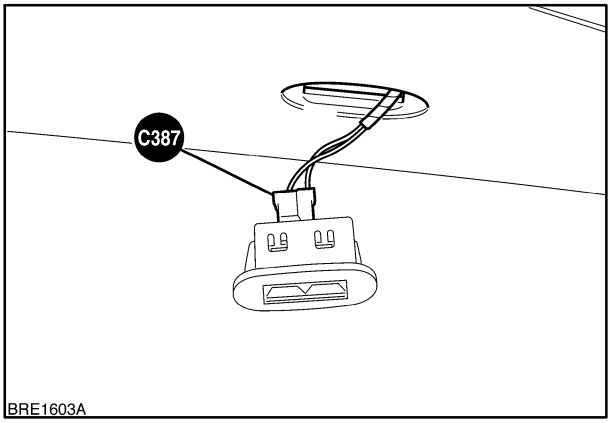

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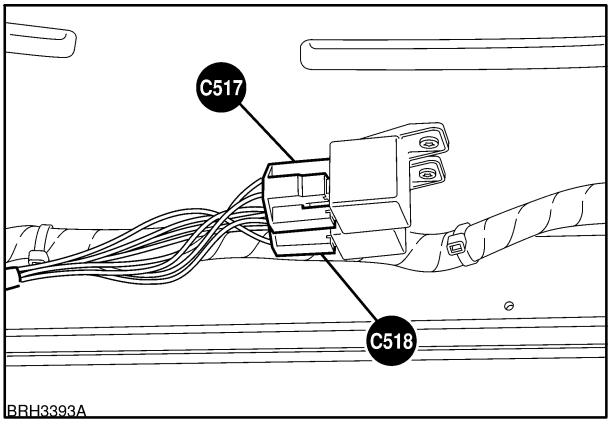

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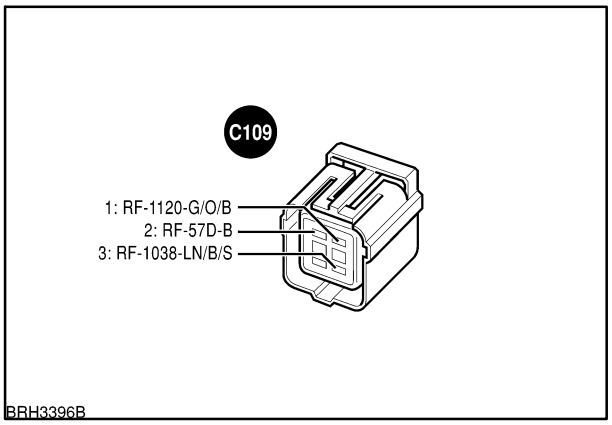

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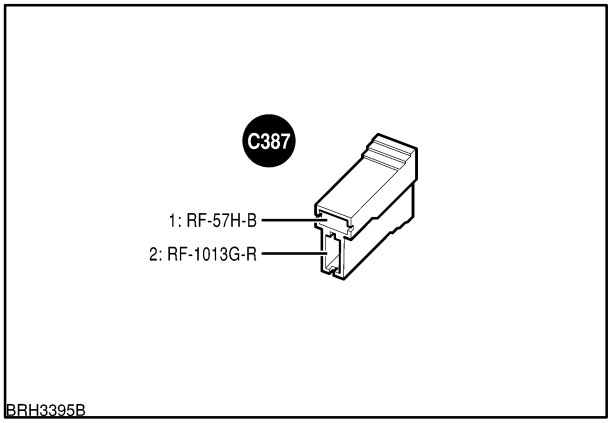

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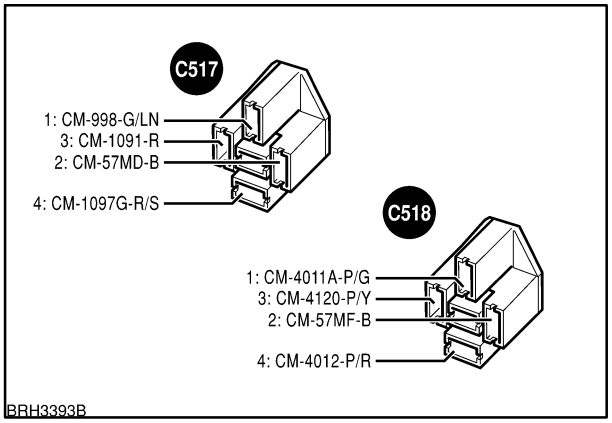

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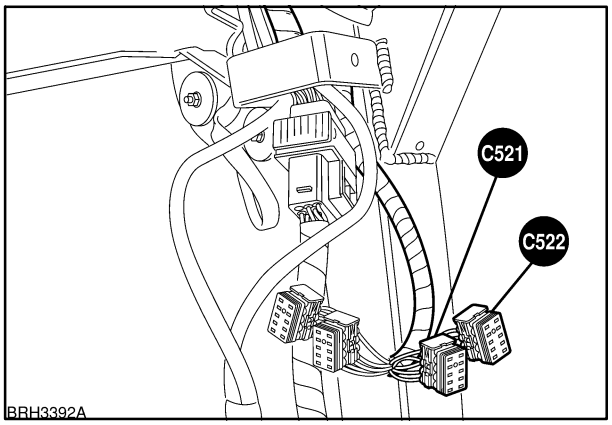

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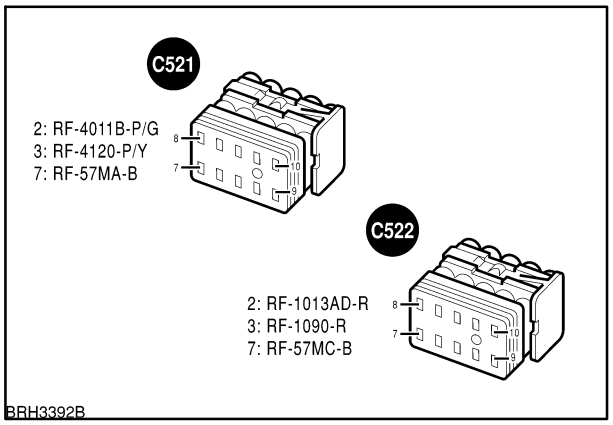

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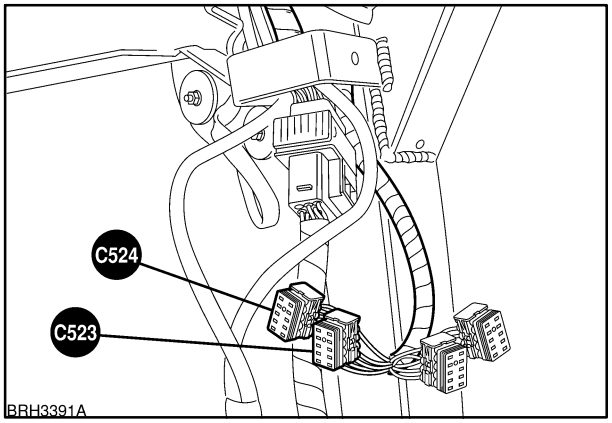

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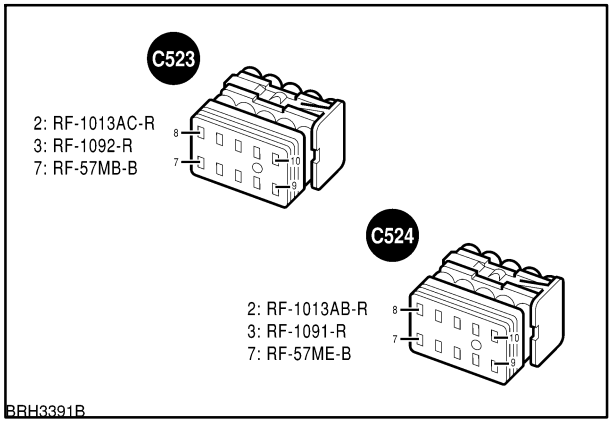

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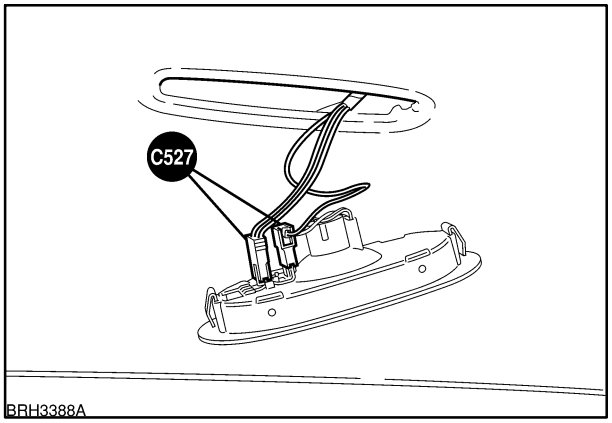

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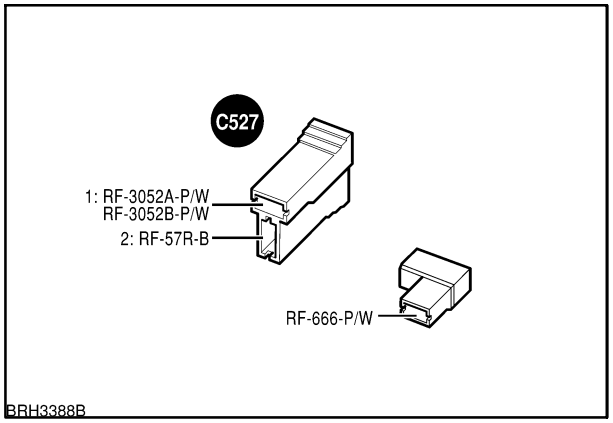

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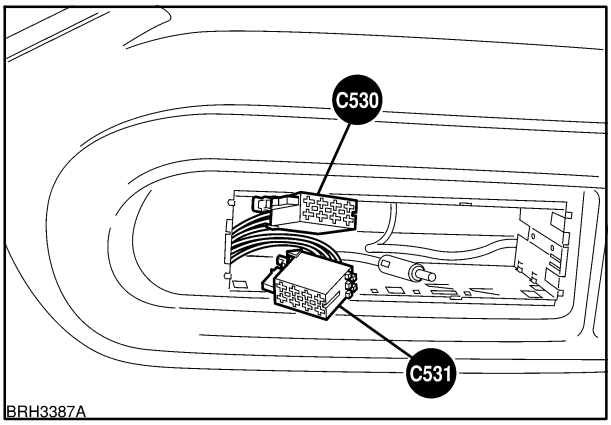
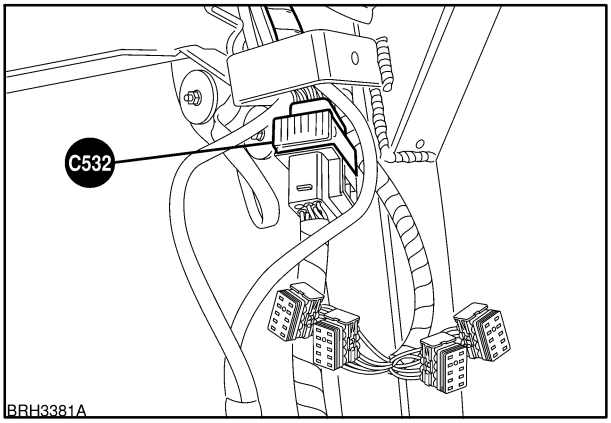
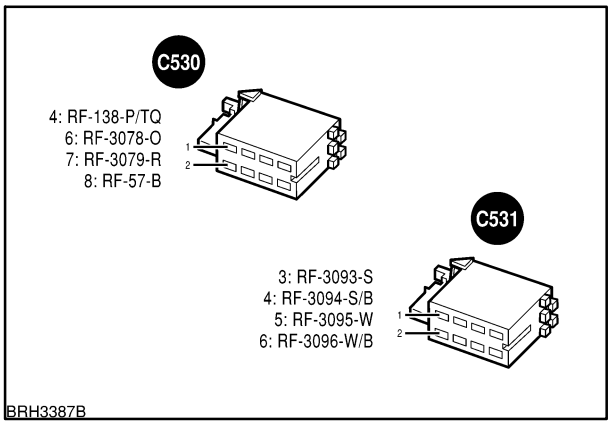

C530
C531
BRH3387A

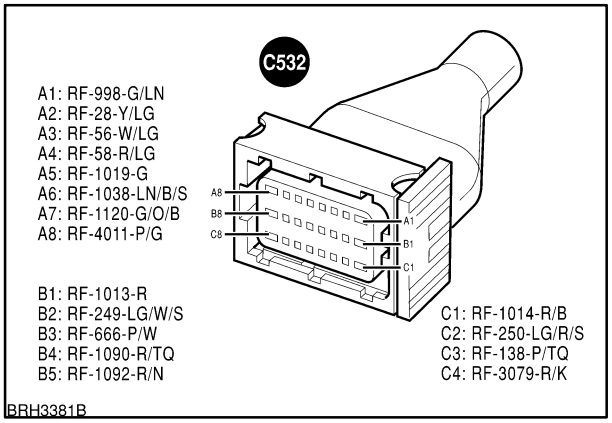
25


C532
BRH3381A

26


C530
4: RF-138-P/TQ
6: RF-3078-O
7: RF-3079-R
8: RF-57-B
1
2
C531
3: RF-3093-S
4: RF-3094-S/B
5: RF-3095-W
6: RF-3096-W/B
1
2
BRH3387B

27


C532
A1: RF-998-G/LN
A2: RF-28-Y/LG
A3: RF-56-W/LG
A4: RF-58-R/LG
A5: RF-1019-G
A6: RF-1038-LN/B/S
A7: RF-1120-G/O/B
A8: RF-4011-P/G
A8
B8
C8
A1
B1
C1
B1: RF-1013-R
B2: RF-249-LG/W/S
B3: RF-666-P/W
B4: RF-1090-R/TQ
B5: RF-1092-R/N
C1: RF-1014-R/B
C2: RF-250-LG/R/S
C3: RF-138-P/TQ
C4: RF-3079-R/K
BRH3381B

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SECTION 55 - ELECTRICAL SYSTEM

Chapter 8 - Calibration Procedures

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CALIBRATIONS

CALIBRATION SET UP PROCEDURES

NOTE: Prior to any installation of program download or any Calibration Set Up Procedure, ensure that the H8, memory reset, of the selected system has been performed.

Required When :

- A calibration Fault code is Present.

NOTE: *The Fault code will not be displayed on the screen, but can be viewed in H-menu mode HB*

- The non volatile memory has been reset (H8) in the controller.

NOTE: *After a full memory reset, in H8, it will be necessary to perform the tractor configuration procedure. Refer to H3 in the H-Menu Chapter of the Electrical Systems Section.*

- The microprocessor has been replaced.
- A PWM solenoid valve has been replaced.
- A potentiometer has been replaced.
- A mechanical repair has been effected.
- **TRANSMISSION ONLY** - The shift quality or clutch featherability has noticeably deteriorated.
- **EDC ONLY** - A new lift arm potentiometer is fitted, in which case error code 1024 will have to be induced by disconnecting the potentiometer with the key switch in the "ON" position and then re-connecting it.

Set Up Procedure :

Prior to conducting a clutch and synchroniser calibration, the following points should be checked:-

- The transmission oil is at the correct temperature - this can be checked in mode H1.
  All transmissions should be calibrated between 60°C-105°C.
- The parking brake is applied.
- The air conditioning (if fitted) is switched off.
- All electrical and hydraulic services are deselected.
- **Electronic Lift only** - A weight of approximately 200 Kg is placed on the lift arms (to overcome any resistance of the lift linkage).
- **Electronic lift only** - All EDC controls are turned to the highest setting.
- **Electronic lift only** - The raise / work switch is positioned and held in the WORK position.

NOTE: *If the set up procedure has not been followed correctly a "U" Fault Code will be displayed.*

U FAULT CODES

U Code	Calibration Procedure – U Fault Codes
Err	An error has occurred during calibration. Please key OFF.
U01	Front axle potentiometer open circuit.
U02	Front axle potentiometer threshold is higher than set limit.
U03	Front axle potentiometer short circuit.
U04	Front axle potentiometer threshold is lower than set limit.
U05	Suspension is not reaching its minimum/maximum position during ACP procedure.
U06	Not used.
U07	Suspension is stationary during the raise command in the ACP procedure.
U08	Suspension is unable to reach maximum height within 20 seconds.
U09	Suspension is stationary during the lowering command in the ACP procedure.
U10	Suspension unable to reach minimum height within 25 seconds.
U11	Unable to calibrate suspension.
U12	ACP stopped, vehicle not stationary.
U13	Front suspension option not activated.
U19	Transmission oil temperature low.
U20	Handbrake is not set.
U21	ERPM is below 1150, increase throttle.
U22	ERPM is above 1350 or Auto Trans Switch not depressed.
U23	Shuttle lever is in neutral, shift to forward.
U24	4/5 shift lever is not in 5, shift to 5. Not used.
U25	Range lever is in low, shift out of low.
U26	Clutch pedal is not up, release clutch pedal.
U27	C3 cal. value too low.
U28	C3 cal. value too high.
U29	C4 cal. value too low.
U30	C4 cal. value too high.
U31	Wheel speed sensed.
U32	C1 cal. value too low.
U33	C1 cal. value too high.
U34	C2 cal. value too low.
U35	C2 cal. value too high.
U37	Synchroniser pot signal is out of range for reverse.
U38	Synchroniser pot signal is out of range for forward.

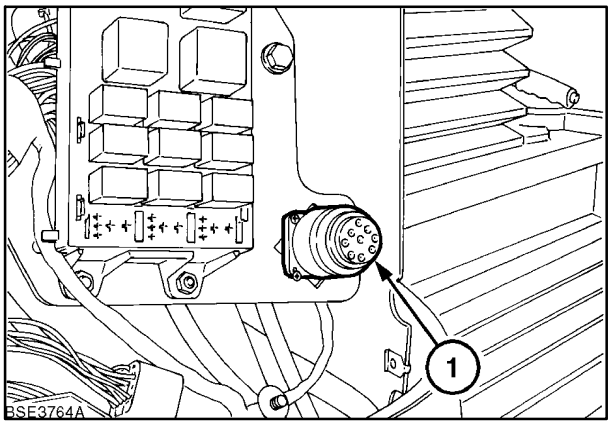
U39	Synchroniser did not move toward reverse, even at max pressure.
U40	Synchroniser did not move toward forward, even at max pressure.
U41	Synchroniser pot signal is out of range for 4 position.
U42	Synchroniser pot signal is out of range for 5 position.
U43	Synchroniser did not move toward 4.
U44	Synchroniser did not move toward 5, even at max pressure.
U45	50 Kph Clutch 5 Calibration values too low.
U46	50 Kph Clutch 5 Calibration values too high.
U47	50 Kph Clutch 5 solenoid not present.
U51	Engine speed error.
U52	Constant ERPM switch detected.
U53	Ground Speed drive selected.
U54	PTO brake switch detected.
U55	PTO started.
U56	PTO stopped.
U57	PTO Shaft Rotation not detected.
U58	PTO twist sensor open circuit.
U59	PTO twist sensor short circuit.
U60	Lever No. 1 not in neutral. (New Holland/Case only)
U61	Lever No. 2 not in neutral. (New Holland/Case only)
U62	Lever No. 3 not in neutral. (New Holland/Case only)
U63	Lever No. 4 not in neutral. (New Holland/Case only)
U65	Engine operating when trying to perform H8 Procedure.
U66	PTO shaft speed detected too early during PTO calibration procedure.
U67	PTO switch in the wrong position when completing calibration procedure.
U70	PTO twist sensor not calibrated.
U71	Fast Steer System Enable Switch Off.
U72	Proximity Switch 'Open' out of range.
U73	Proximity Switch 'Closed' out of range.
U74	LVDT (Linear variable differential transformer) Calibration unsuccessful. (Out of range after 5th attempt.)
U80	Flywheel torque sensor Calibration unsuccessful, try again.
U81	No signal from flywheel torque sensor.
U82	No 12VD 24 x 24 and 16 x 16. No power for C3 and C4 solenoids.
U83	4-5 Synchronizer did not shift to 4 for calibration of flywheel torque sensor.
U84	Not sensing enough current on synchronizer test.

16X16 TRANSMISSION - CLUTCH AND SYNCHRONIZER CALIBRATION

⚠ WARNING ⚠

The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear.

1. Install the diagnostic connector, Tool No. **380000843** or alternatively, hold the upshift button and start the engine and then within 3 seconds press the downshift button..
2. Start the engine, if not already done so.
3. Using the hour, minute and light dimming buttons on the instrument cluster navigate through to H1 on the DB processor.



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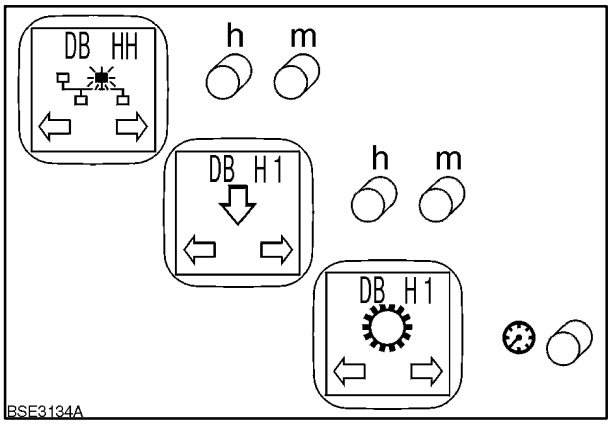
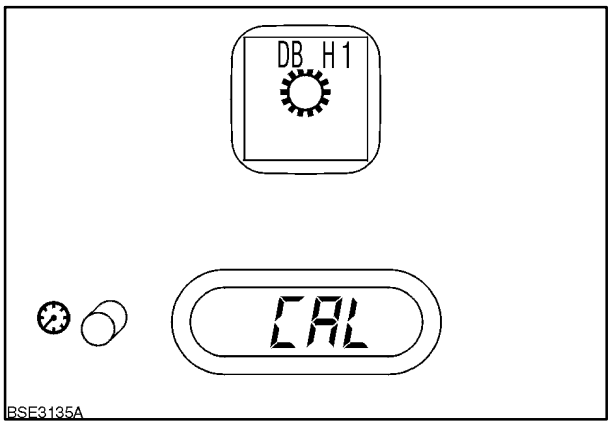


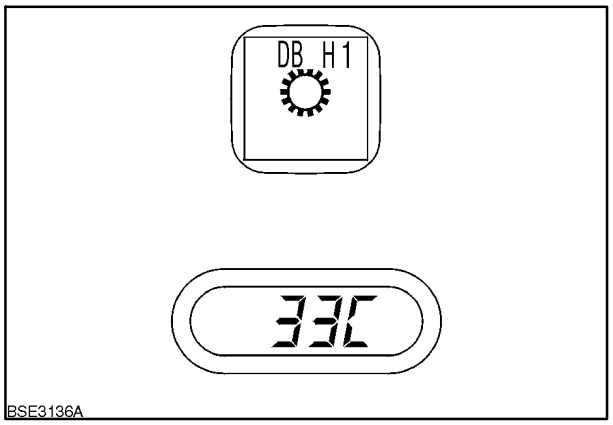
2

4. With H1 displayed press the light dimming button to confirm selection.
5. CAL will be displayed.



3

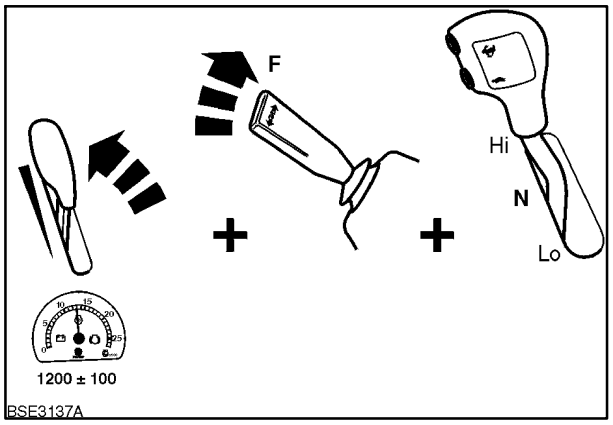
6. After a few seconds the display will change to show oil temperature.



4

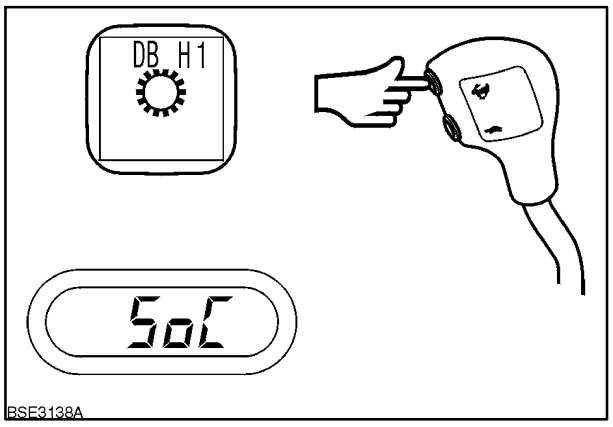
7. Set the engine rev/min to 1200 ± 100, Shift the shuttle lever to forward, ensure that the range lever is in neutral and release the clutch pedal.

NOTE: *The engine speed must be stable, adjust the throttle slightly to achieve a stable rev/min.*



5

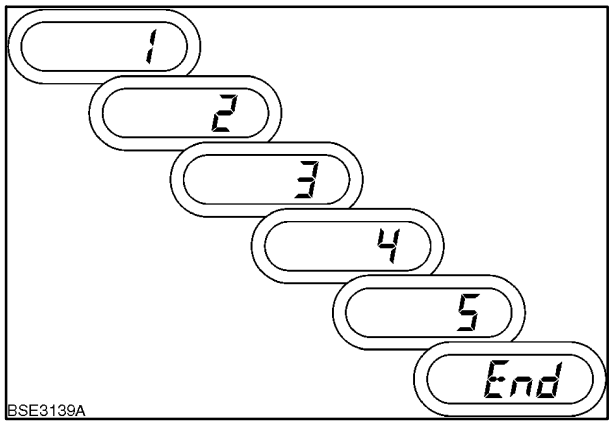
8. The synchronisers will be calibrated first. Press and hold the upshift switch, SOC will be displayed.



6

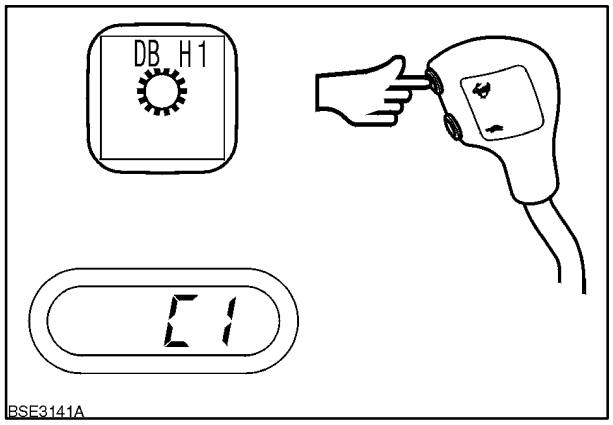
9. The display will change to show 1 and will cycle through to 5 and then end when the synchronisers are calibrated.
10. Release the upshift switch.

    Step 1 = Forward & 5th
    Step 2 = Reverse
    Step 3 = Forward
    Step 4 = 4th & 5th
    Step 5 = 4th & 5th
    End.



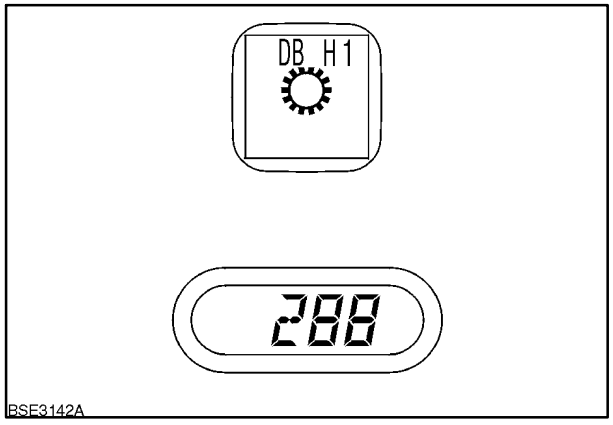
7

11. Press and hold the upshift switch again to commence calibration of the C1 clutch.



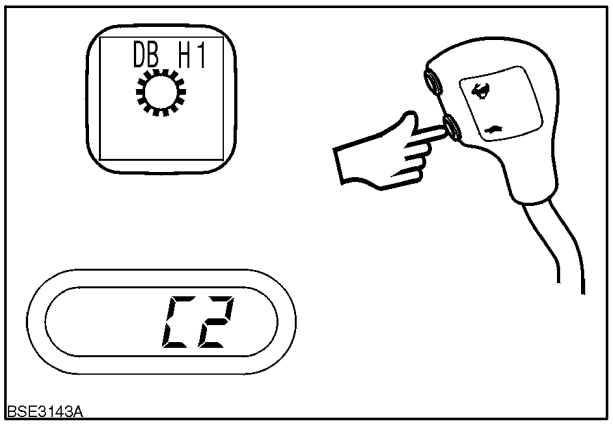
8

12. When the calibration is complete the display will alternate between the calibration value and C1 for as long as the switch is held.
13. When the switch is released CAL will be displayed followed by the oil temperature in °C.



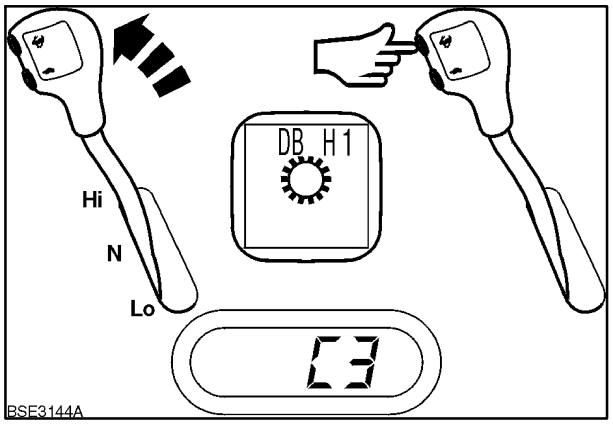
9

14. Press and hold the downshift switch to calibrate C2 clutch. The routine will then be same as for C1 clutch.



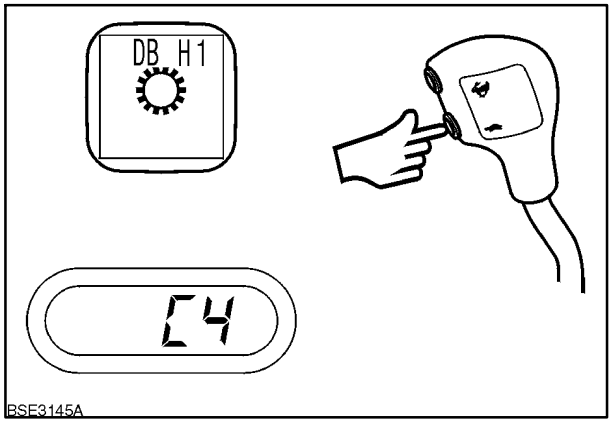
10

15. To calibrate clutches C3 and C4 shift the range lever to 'Hi'.
16. Press and hold the upshift switch to calibrate the C3 clutch. The routine will be the same as for C1 clutch.



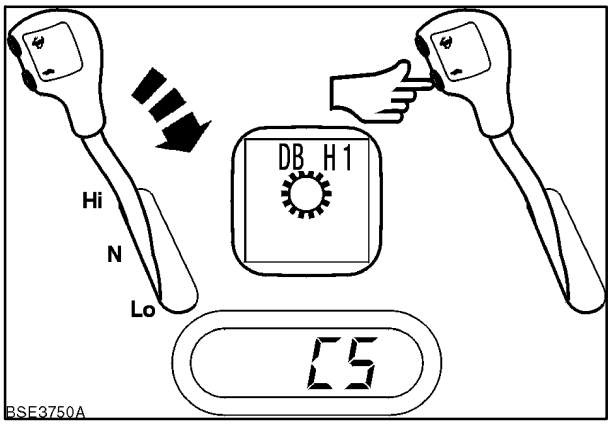
11

17. Press and hold the downshift switch to calibrate C4 clutch. The routine will then be same as for C1 clutch.



12

18. Shift the range lever to 'Lo'.

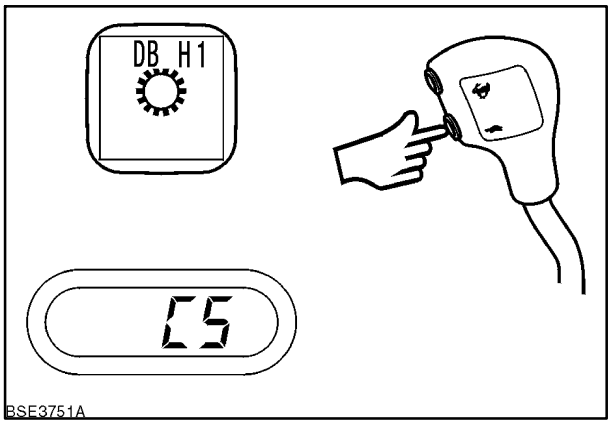


13

19. Press and hold the downshift switch. The routine will be the same as clutches C1, C2, C3 and C4.

NOTE: *Error code U47 will be displayed if C5 (50Km/h) clutch is not present.* ***DO NOT KEY OFF.***

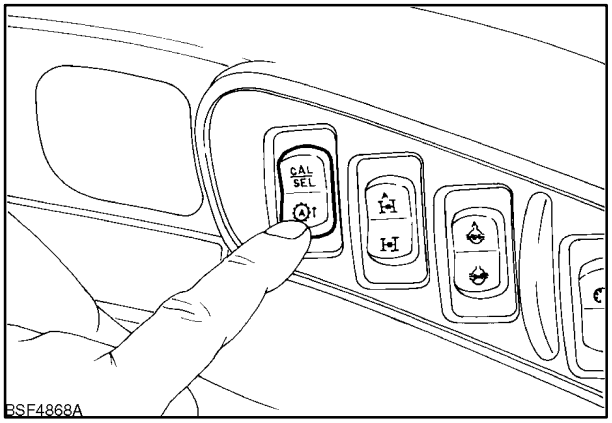
NOTE: *Proceed to Flywheel Torque Sensor Calibrations, complete, then "Key Off" to store both Clutch and Synchroniser Calibration and Flywheel Torque Sensor Calibrations.*



14

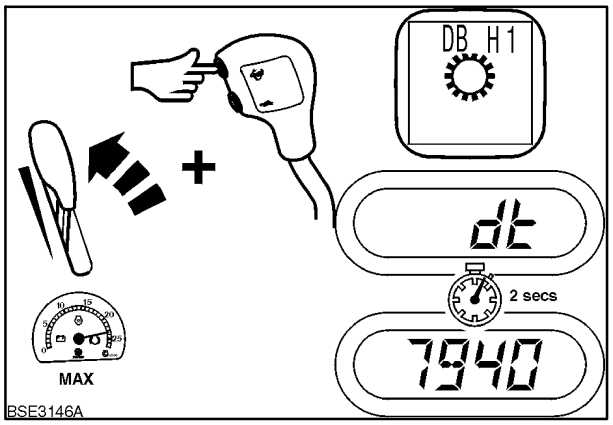
Flywheel Torque Sensor Calibration

1. If the tractor has the Auto-Shift option the flywheel torque sensor must be calibrated. Auto-Shift will not be enabled if this calibration has not been completed.
2. Range lever to "Hi" position, shuttle lever in forward position.
3. To calibrate the flywheel torque sensor, press the Auto-trans switch once.



15

4. Increase the engine speed to maximum rev/min, press and hold the **UPSHIFT** switch, 'dt' will be displayed.
5. Keep the upshift switch depressed until calibration is completed. The engine will lug down and the lower central display will alternate between '**dt**' and the calibration value, when calibration is complete. At this time, the **UPSHIFT** switch can be released.
6. Reduce the engine rev/min to low idle, return the range lever to neutral and turn the key start off for at least 1 second to store the calibration values.



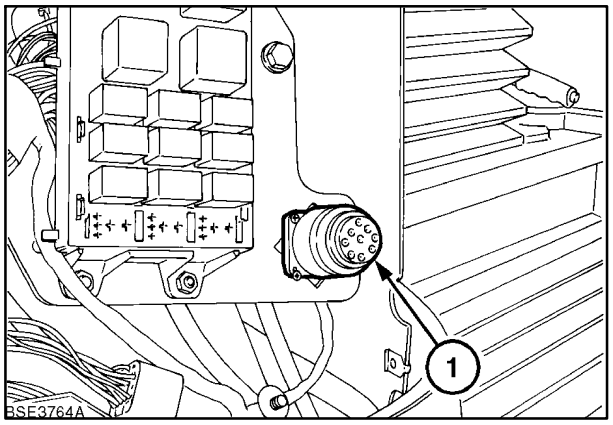
16

16 x 16 TRANSMISSION CALIBRATION

Manual Adjustment of C3/C4 clutches

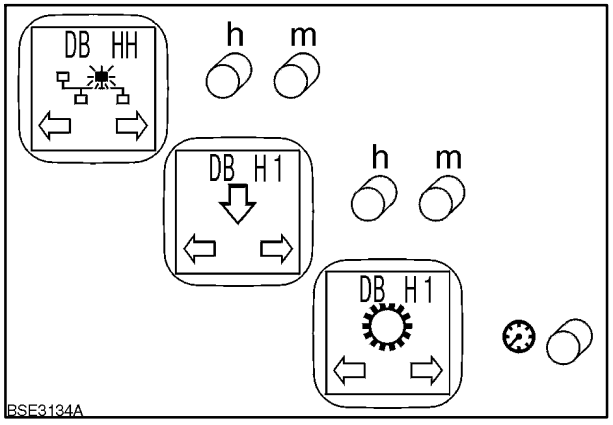
NOTE: *The transmission oil temperature should be warm to hot but no lower than 40 ℃.*

1. Install the diagnostic connector, Tool No. **380000843** and start the engine.



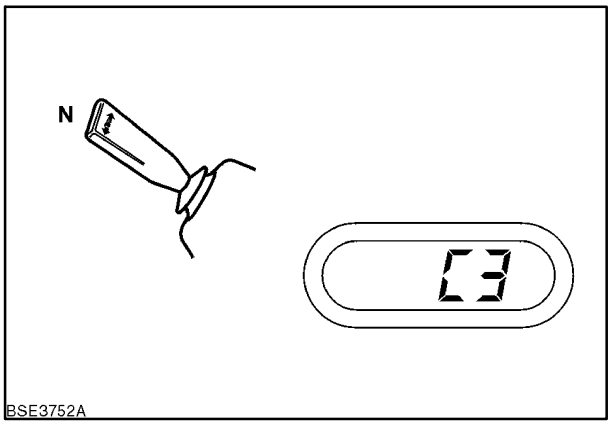
17

2. Using the hour, minute and light dimming buttons on the instrument cluster navigate through to H1 on the DB processor.
3. Press the hour switch while the shuttle lever is in neutral to select the C3/C4 clutches manual adjustment mode.



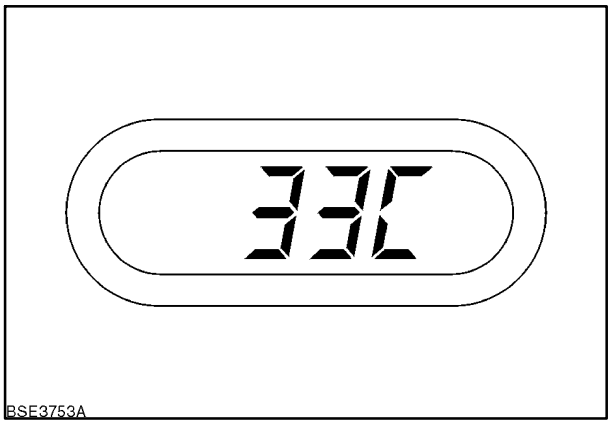
18

4. With the shuttle lever in neutral C3 or C4 is displayed, depending on the gear selected. The gear can be changed while the shuttle lever is in neutral and the tractor can be driven in any gear but powershifts are not possible.



19

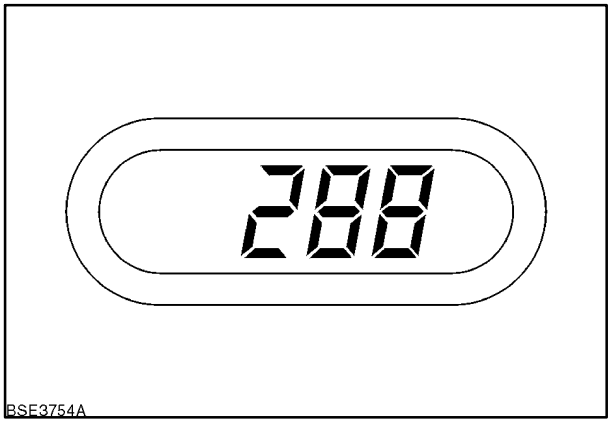
5. If the range lever is in neutral with the shuttle lever in forward or reverse, the transmission oil temperature will be displayed.



20

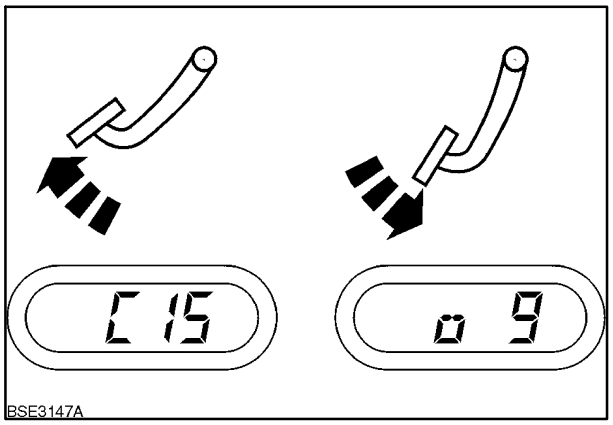
6. With the range lever and shuttle lever engaged and the clutch pedal in either the fully released or fully depressed position the clutch calibration value will be displayed.

NOTE: *With the range and shuttle levers engaged the tractor will drive if the clutch pedal is released.*



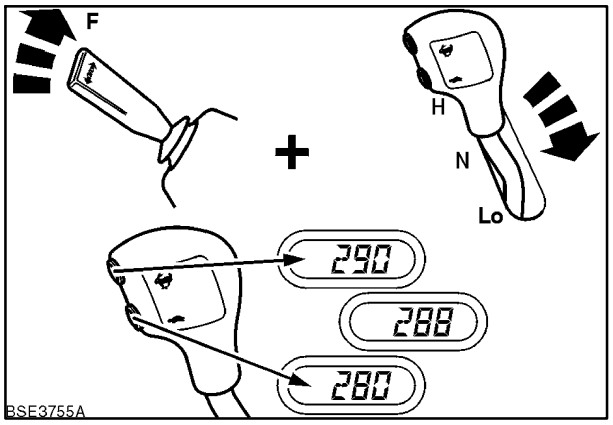
21

7. With the range lever and shuttle lever engaged and the clutch pedal position between 3% and 98%, the display will show the clutch pedal position in percent, preceded by 'c' if the clutch pedal switch is closed and 'o' if it is open.



22

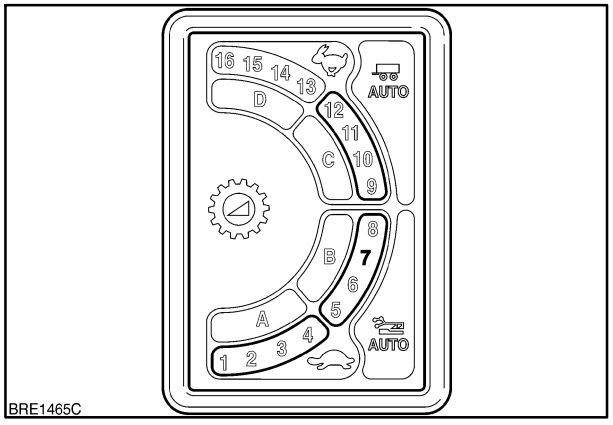
8. With the range lever and shuttle lever engaged the calibration value for the appropriate clutch can be adjusted using the upshift and downshift switches.
9. It is recommended that the clutches are adjusted to optimise shuttle shifts in gears 7Lo and 8Lo at 1500–1800 engine rev/min.
10. Select gear 7Lo, drive the tractor and shuttle shift, using only the lever, not the clutch pedal, adjust the calibration value until the smoothest shuttle shift is obtained.



23

11. Shift the shuttle lever to neutral and select gear 8Lo, repeat the procedure described for gear 7Lo.

NOTE: *It is possible to drive the tractor in other gears and at other engine speeds but it is not recommended to make adjustments while in the high range as the low range is much more sensitive. A slightly harsh shift in high range may be a severely jerky shift in low range.*



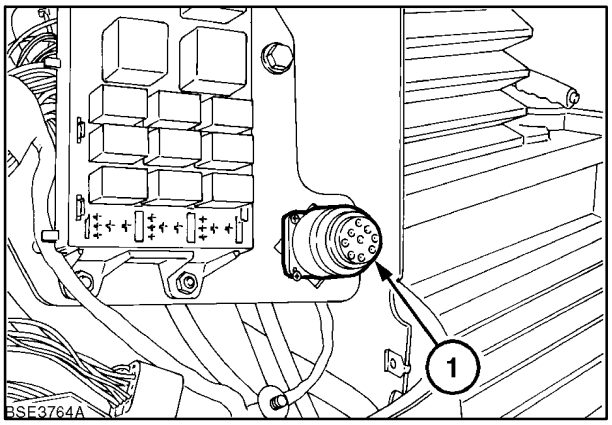
24

24 x 24 TRANSMISSION - CLUTCH AND SYNCHRONISER CALIBRATION

⚠ WARNING ⚠

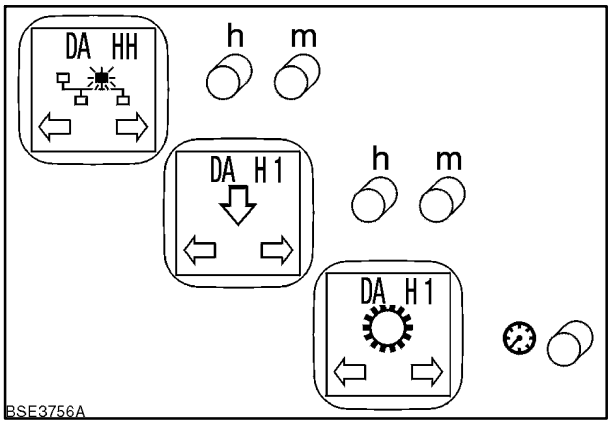
The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear.

1. Install the diagnostic connector, Tool No. **380000843** or alternatively, hold the upshift button and start the engine and then press the downshift button within 3 seconds.



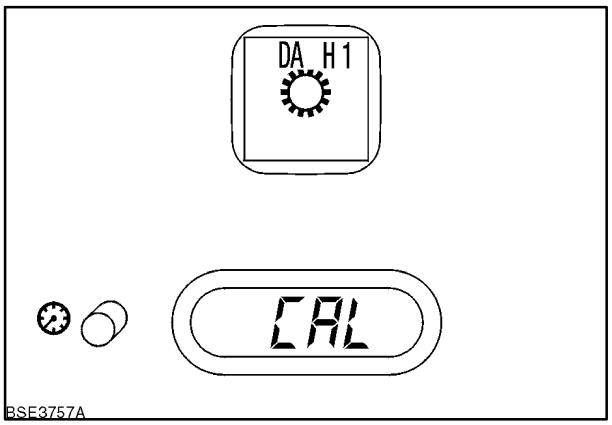
25

2. Start the engine, if not already done so.
3. Using the hour, minute and light dimming buttons on the instrument cluster navigate through to H1 on the DA processor.



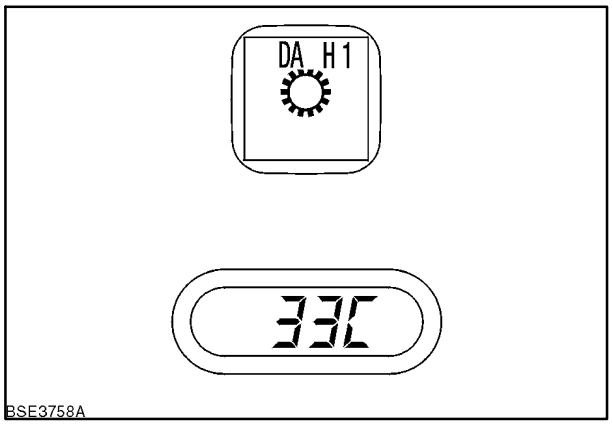
26

4. With H1 displayed press the light dimming button to confirm selection.
5. CAL will be displayed.



27

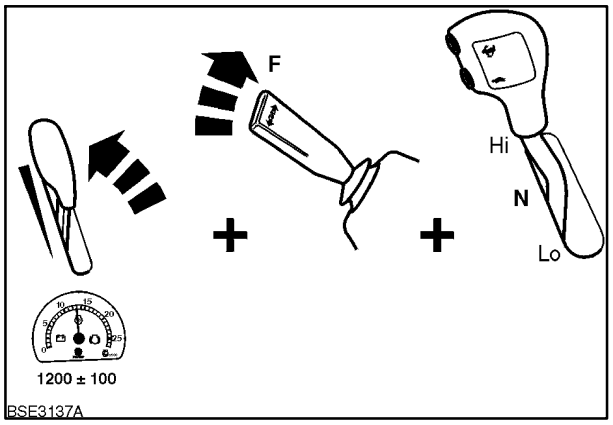
6. After a few seconds the display will change to show oil temperature.



28

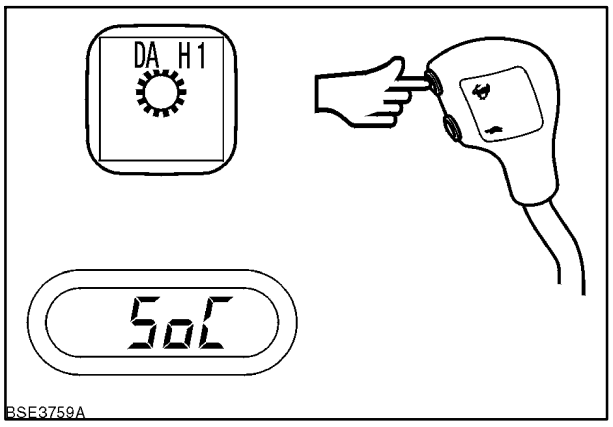
7. Set the engine rev/min to 1200 ± 100, Shift the shuttle lever to forward, ensure that the range lever is in neutral and release the clutch pedal.

NOTE: *The engine speed must be stable, adjust the throttle slightly to achieve a stable rev/min.*



29

8. The synchronisers will be calibrated first. Press and hold the upshift switch, SOC will be displayed.



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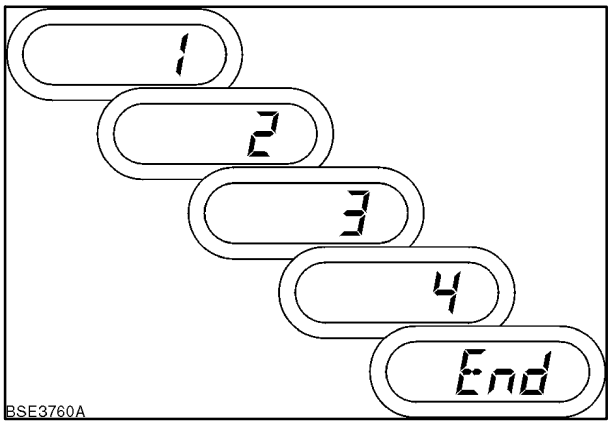
9. The display will change to show 1 and will cycle through to 4 and then end when the synchronisers are calibrated.
10. Release the upshift switch.



31

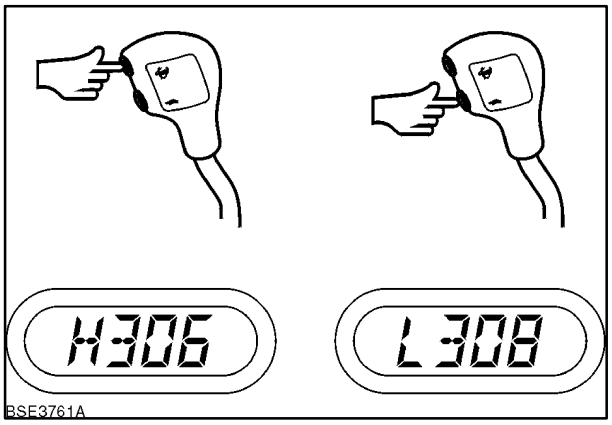
11. Clutch calibration can now be performed.

NOTE: *The clutches are calibrated using a manual procedure only.*

12. Depress the clutch pedal, select a gear and range and release the handbrake.

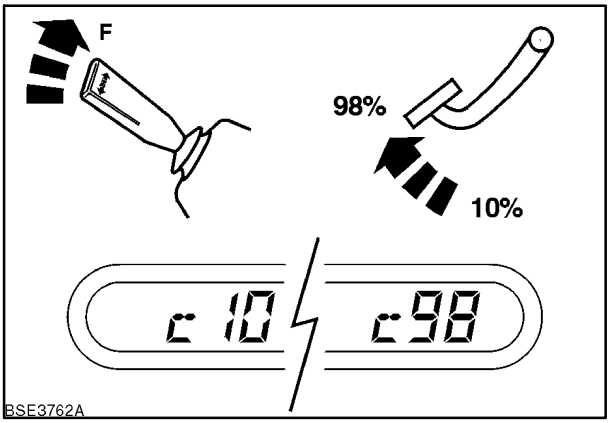
NOTE: *The oil temperature can be checked during the procedure by shifting the main lever into neutral. The oil temperature will be displayed in the lower display in °C.*

13. With the shuttle lever in neutral press either the upshift switch to select the 'Hi' clutch or downshift switch to select the 'Lo' clutch. H or L will be displayed in the lower display area.



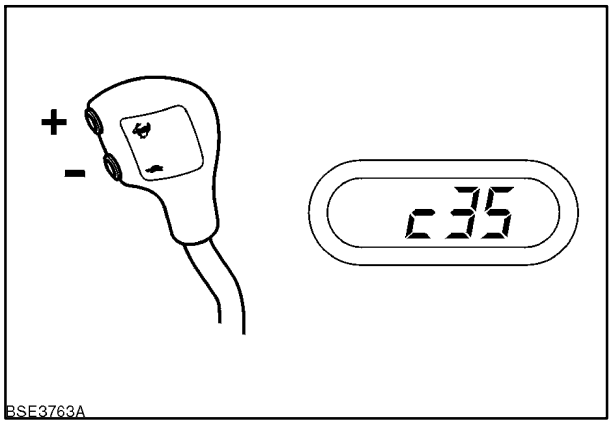
32

14. Shift the shuttle lever into forward and slowly release the clutch pedal to check the engagement point. The clutch pedal position will be displayed when pedal position is between 10% and 98%, otherwise the selected clutch calibration value will be displayed.



33

15. Adjust the calibration value using the upshift and downshift switches to obtain a clutch engagement position of 35% of clutch pedal travel.
16. Check the performance of the clutch calibration by performing shuttle shifts. If required fine tune the calibration using the upshift and downshift switches.



34

17. Repeat the above procedure on the other clutch. After calibration turn off the key start to store the calibration values.

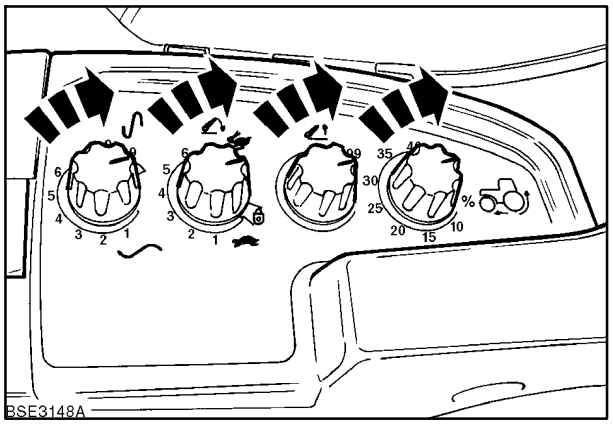
ELECTRONIC DRAFT CONTROL CALIBRATIONS

Lift Lever/Arm Potentiometers

1. Lower lift arms and disconnect vertical rods from hanger on automatic pick-up hitch (where fitted). This will allow the lift arms to raise to their maximum position.

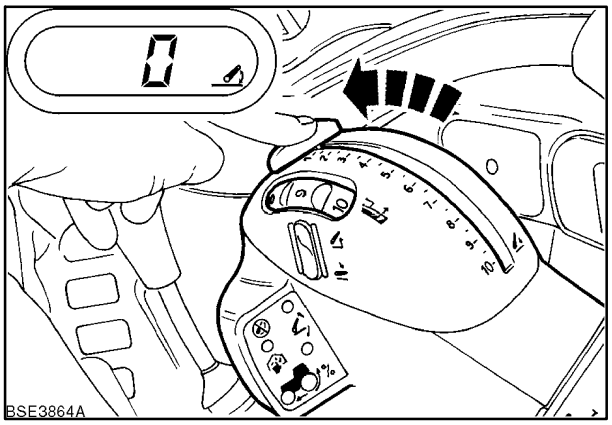
   or

   Using the fast raise/lower switch, hold the switch in the raise position and start the engine.
2. Turn all the EDC operator controls fully clockwise and set the draft wheel to the 0 position.



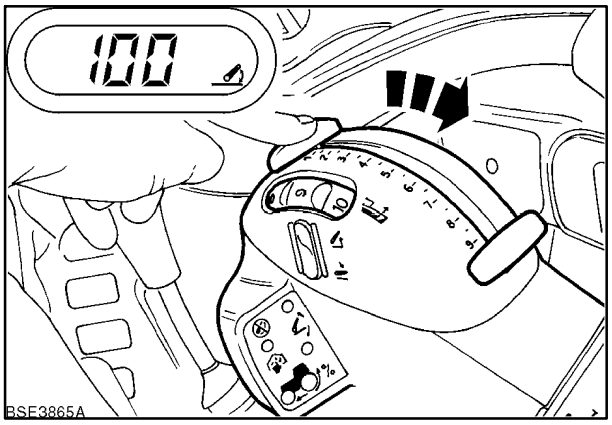
35

3. Start engine and set speed to approximately 1100 rpm.
   Move lift control lever to fully lower the lift.
   Rotate the draft wheel from 0 - 10 (min. to max.).



36

4. Fully raise the hydraulic lift and ensure pick-up hitch rods do not catch or jam on lift linkage.When the lift arms reach the fully raised position the pump will momentarily reach high pressure standby.
5. Check that the lift arm position display increases to 100.

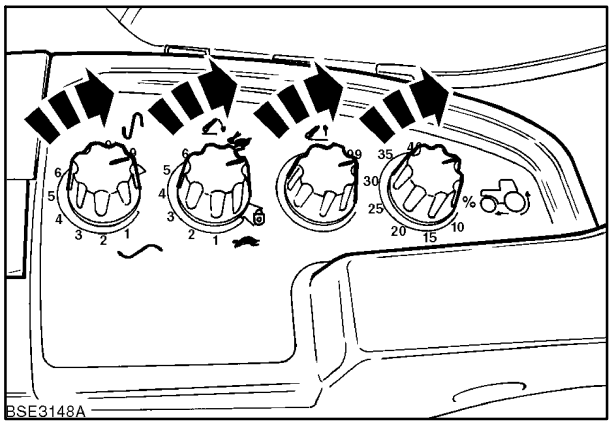


37

Reconnect and adjust the rod on the automatic pick-up hitch as follows:-
Move the lift control lever sufficiently to to allow the lift arms to lower slightly.
Reconnect the pick-up hitch lift rods.
Adjust the length of the lift rods so that when the hydraulic lift is fully raised using the external fender switches, the lift rods are slightly loose.
Check that the automatic pick-up hitch operates correctly.

EDC Valve Solenoids

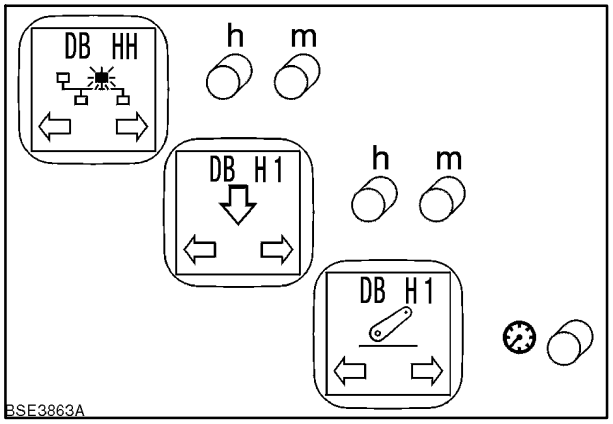
1. Rotate all of the Electronic lift controls to the highest setting.



38

2. Install the diagnostic tool, **380000843** and start the engine. Navigate through the menu and enter H1 mode for the DB processor with the hydraulic lift symbol displaying.

or



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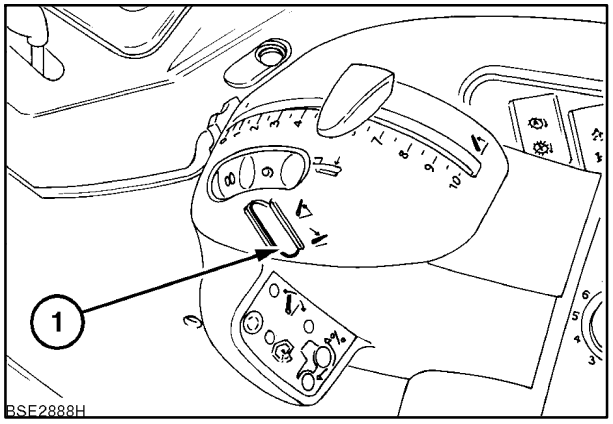
3. Press and hold the fast raise lower switch in lowering, Fast Dig, position against the spring and at the same time start the engine.
4. Set the engine speed to 1200 ± 100 rev/min.



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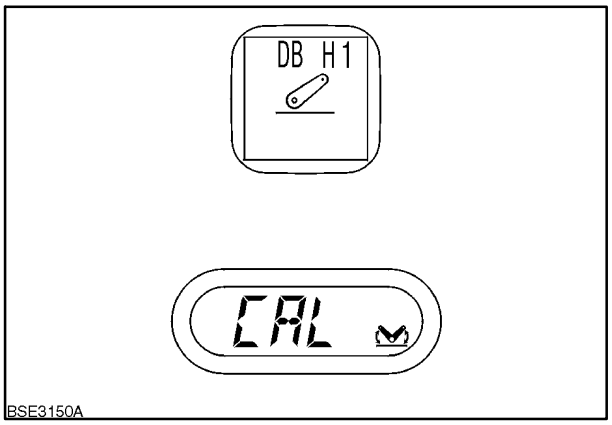
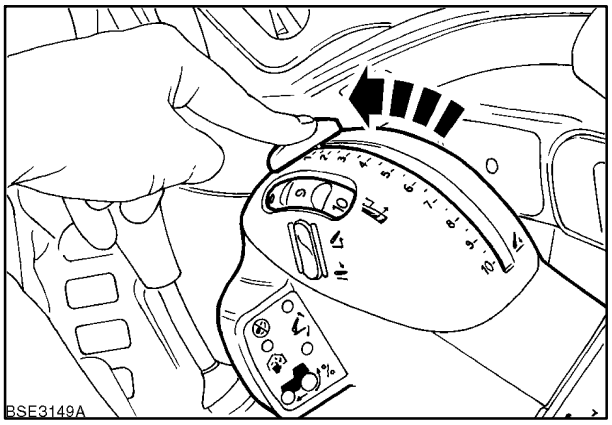
5. The display will change to CAL.



41

6. Capture the hitch, then fully lower and raise the hitch to between 70% and 90% to start the calibration.

NOTE: *Ensure that the lift arms* ***are not*** *in the fully raised position. If in fully raised position, reposition to 70–90% of maximum to enable movement when calibrating.*

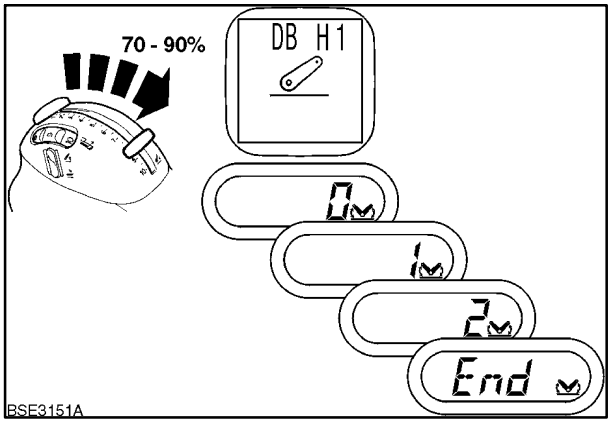


42

7. The lift will then perform a series of three very small raise/lower corrections.

   Each time the hitch makes a correction the display will progressively change from 0 to 1 to 2 and then End.

8. Key off the tractor to store the calibrations.



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Calibrating the Ground Speed Display

Should you wish to install alternative rear tyre equipment that would provide a radius difference of more than 13 mm (0.5 in), then the electronic control module should be re-calibrated to display an accurate ground speed figure. To re-calibrate use one of the following methods:

IMPORTANT: *If your tractor is equipped with the optional slip control feature, then the ground speed displayed is a true speed as sensed by a radar unit, calibration is therefore* ***not*** *required.*

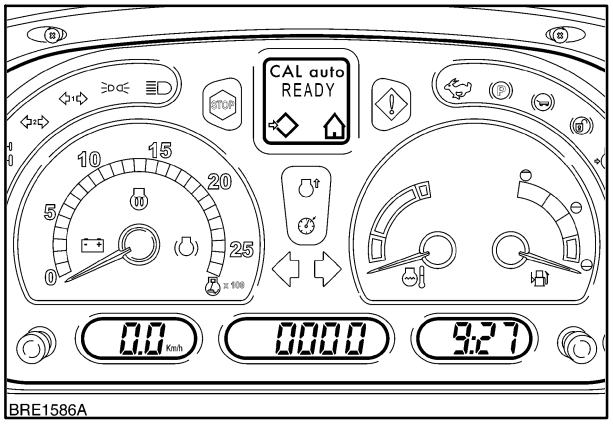
- Ensure that the tyre pressures are correct for the load being carried. (See Tyre Load/Inflation tables in Section 3 of this manual).
- Select a stretch of dry, firm, level ground (preferably concrete) and carefully measure out a distance of exactly 100.0 m (328 feet). Mark the start and finish of this measured distance with a bold chalk line.

Auto Calibration with CAL/SEL Button

- Park the tractor a short distance from the start line and, with the engine running, depress and hold the CAL/SEL button for 3 seconds to enter the calibration mode. **SETUP_MENU** will appear in the Dot Matrix Display. After approximately two seconds the display will change to **CAL**. Using the clock Min/Hour buttons select **CAL auto.** Depress the CAL/SEL button to confirm selection of **CAL auto**, the central LCD display will read **0000.**

NOTE: *The set up procedure may be cancelled at any time by depressing the LCD dimmer control button or by turning the key-start off.*

- Select a suitable transmission ratio to provide a speed above 3 km/h (1.8 MPH) and drive up to the start line. Depress the CAL/SEL button to select **CAL auto ready.** As the centre of the front tyres passes over the start line, press and release the CAL/SEL button. The speed display will flash **CAL auto ON** and the central LCD will show a four digit figure that will increase as the tractor moves forward.
- As the centre of the front tyres passes over the finish line, press and release the CAL/SEL button again, **CAL auto OK** will appear in the Dot Matrix Display. Depress the CAL/SEL button again to exit setup and return to the main menu.



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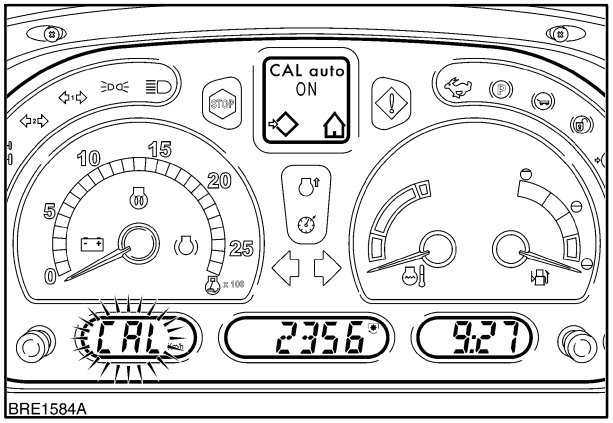

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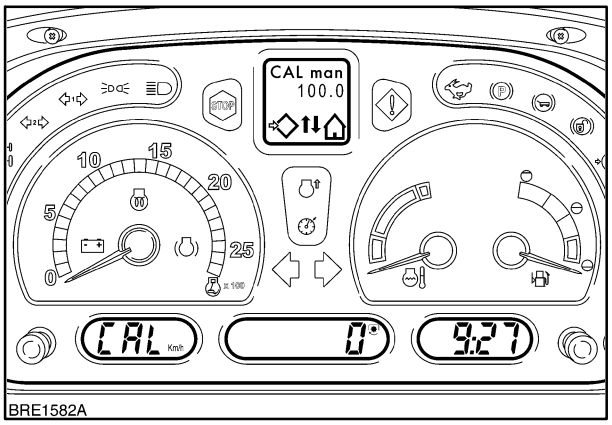
Manual Calibration with CAL/SEL Button
The manual calibration allows the operator to set the rolling circumference of the rear tyre (if known) without the need to drive over a measured distance.

- With the tractor stationary and the key-start on, depress and hold the CAL/SEL button for 3 seconds to enter the calibration mode. **CAL man** will appear in the Dot Matrix Display. After approximately two seconds the display will change to **CAL**. Depress the CAL/SEL button again to select **CAL man_100.0**.



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NOTE: *The set up procedure may be cancelled at any time by depressing the LCD dimmer control button or by turning the key-start off.*

IMPORTANT: *When entering new tyre rolling circumference figures, use metric values (centimetres) with* ***Km/h*** *speedometer reading and Imperial values (inches) with* ***MPH*** *reading, see table on page 23.*

- By depressing the 'h' and 'm' clock buttons, the rolling circumference of the rear tyre may be entered into the numerical display (**100.0**).

- Depress the 'h' button to select the first digit to be changed, repeated operation of the 'h' button will cycle the cursor through all the digits in turn. To alter the value of the digit selected, momentarily depress the 'm' button until the correct figure is shown.

- With the new rolling circumference figure entered into the display, depress the CAL/SEL button again to save the setting and return to the main menu.

Auto Calibration with Enhanced Keypad (where fitted)

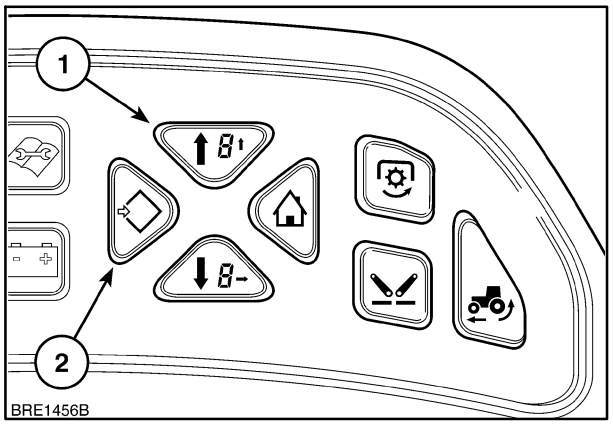
- With the the tractor stationary and the engine running, depress and hold the Menu/Enter key (2) for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Depress the Enter key and **CAL man** will be appear. Using the Menu Up key (1), scroll through the menu until **CAL auto** is displayed.
- Depress the Menu/Enter key again and **CAL auto ready** will appear in the DMD. Select a suitable transmission ratio to provide a forward speed above 3 km/h (1.8 MPH). As the centre of the front tyres passes over the start line, press and release the Menu/Enter key. The speed display will start to flash **CAL** and the central LCD will show a four digit figure that will increase as the tractor moves forward. The display will change to read **CAL auto ON**.
- As the centre of the front tyres passes over the finish line, press and release the Menu/Enter key. **CAL auto OK** will appear in the Dot Matrix Display. Depress the Menu/Enter key to store the setting.

Manual Calibration with Enhanced Keypad (where fitted)

- With the key-start in the ON position, depress and hold the Menu/Enter button (2) for 3 seconds. The DMD will read **SETUP_MENU,** this will change to **CAL** after 2 seconds. Depress the Enter key and **CAL man** will appear. (It may be necessary to use the Menu Up/Down buttons to scroll through the menu until **CAL man** is displayed).
- Depress the Menu/Enter key again to change the DMD display to **CAL_Man_100.0.** Using the Digit Select key choose the first digit to be set, the digit will commence to flash. Enter the first number using the Digit Value key, repeat the procedure to set the remaining calibration figures that correspond to the size of rear tyre fitted to your tractor.

IMPORTANT: *When entering new tyre rolling circumference figures, use metric values (centimetres) with* ***Km/h*** *speedometer reading and Imperial values (inches) with* ***MPH*** *reading, see table on page 23.*

- Depress the Menu/Enter key to memorise the setting and return to the main menu screen, depress Exit/Cancel to exit set up and return to the original display.



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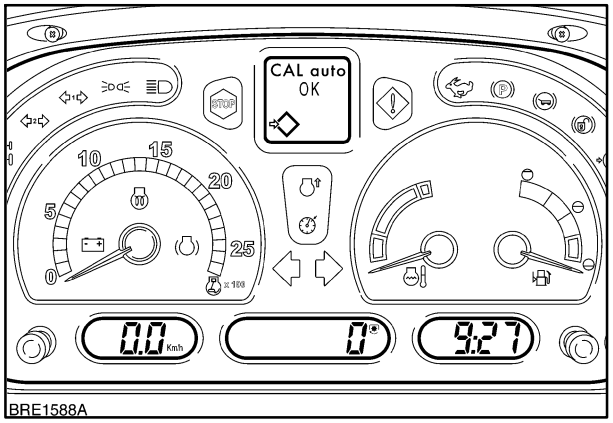

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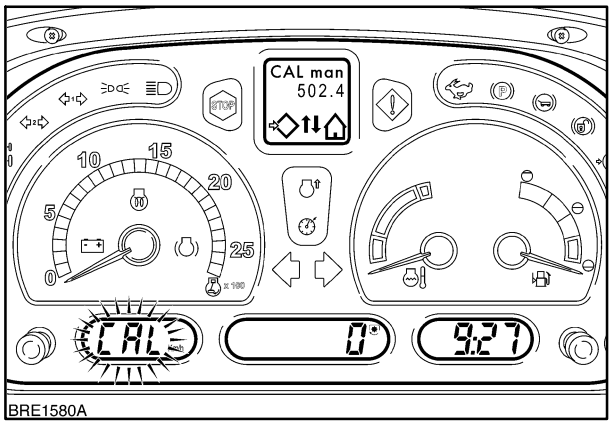

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Ground Speed Calibration Numbers

The rolling circumference for any given tyre size will vary depending on tyre manufacturer. The figures shown in the table are an average based on rolling circumference data supplied by several manufacturers. To obtain an accurate figure for your rear tyres, consult your authorised dealer or tyre supplier.

If the size of tyre on your tractor is not listed, then the road speed calibration may be carried out using one of the following procedures.

Carry out the Auto calibration as previously described or measure the rear tyre rolling circumference.

1. To measure the rolling circumference of the rear tyre, park the tractor on a level surface and make a vertical chalk mark on the sidewall where the tyre tread contacts the ground. Make a second chalk mark on the ground aligning with the mark on the tyre.

2. Slowly drive the tractor forward until the rear wheel has made one revolution and the chalk mark on the sidewall is again in contact with the ground. Mark the ground again and measure the distance between the two chalk marks.

IMPORTANT: *If your tractor is equipped with the optional slip control feature, then the ground speed displayed is a true speed as sensed by a radar unit, calibration is therefore* ***not*** *required.*

⚠ WARNING ⚠

The radar ground speed sensor emits a low intensity microwave signal which will not cause any ill effects in normal use. Although the signal intensity is low, do not look directly into the face of the sensor while in operation so as to avoid eye damage.

Rear Tyre Rolling Circumferences 1.

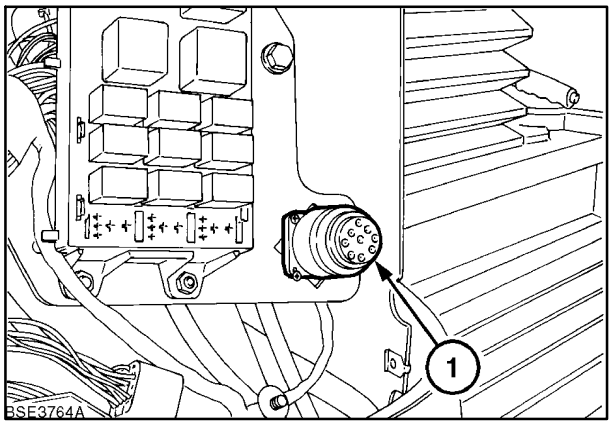
Tyre Size	Tyre Rolling Circumference	
	Centimetres	Inches
16.9 – 24	400.0	157.4
18.4 – 28	442.8	174.3
18.4 – 30	458.4	180.4
18.4R – 30	461.5	181.6
16.9 – 34	463.8	182.5
16.9R – 34	473.0	186.2
480/70R – 34	474.5	186.8
520/70R – 34	492.5	193.8
18.4 – 34	487.6	191.9
18.4R – 34	498.0	196.0
13.6R – 38	470.1	185.0
16.9 – 38	504.4	198.5
16.9R – 38	506.4	199.3
480/70R – 38	503.8	198.3
540/65R – 38	502.0	197.6
520/70R – 38	525.2	206.8
18.4 – 38	531.1	209.0
18.4R – 38	525.5	206.8
600/65R – 38	526.3	207.2
650/65R – 38	548.2	215.8
20.8R – 38	549.6	216.3
580/70R – 38	550.2	216.6
18.4R – 42	554.1	218.1
14.9R – 46	551.8	217.2
320/90R – 50	558.8	220.0

SUSPENDED FRONT AXLE CALIBRATION (H1)

⚠ WARNING ⚠

The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing.

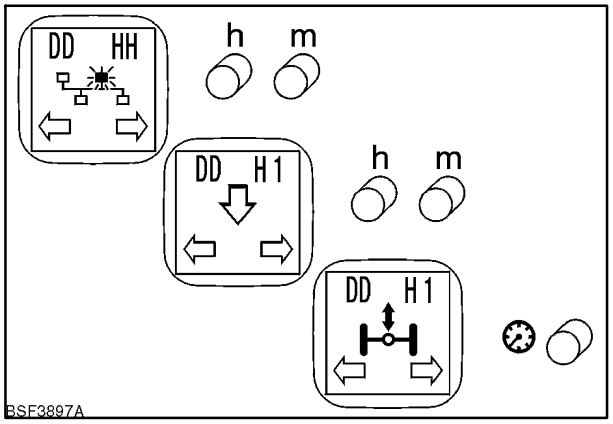
1. Install the diagnostic connector, Tool No. **380000843** and start the engine.



50

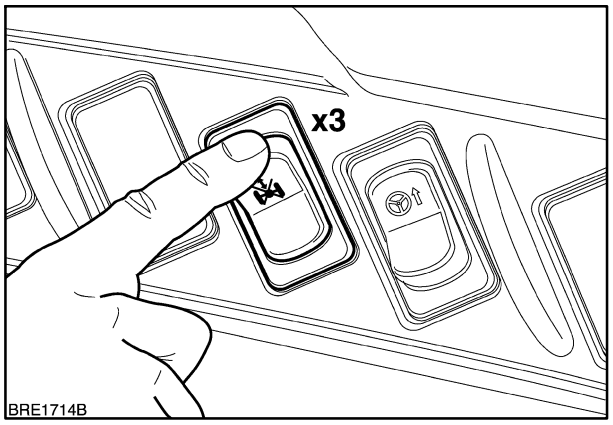
NOTE: *On a new module or after a H8, the controller will default the vehicle to 'NO' suspension. Set the option to 'YES' in the H3 menu mode.*

2. Using the hour, minute and light dimming buttons on the instrument cluster navigate through to H1 and the suspension symbol on the DD processor.
3. Set the engine to 1200 rev/min.



51

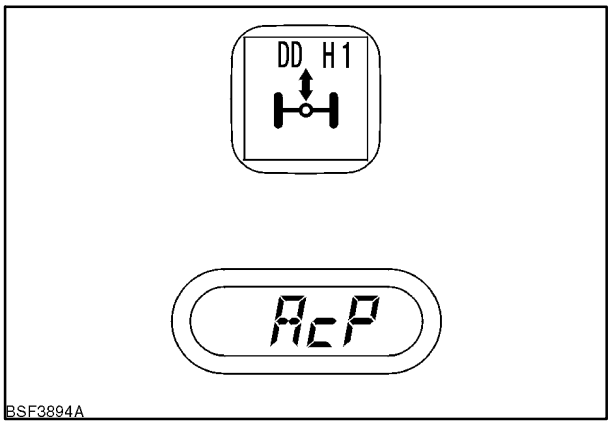
CAL will be displayed. Toggle the suspension switch ON/OFF three times to enter suspension calibration mode,



52

ACP will be displayed.

NOTE: *If the calibration procedure needs to be stopped at any time press the suspension switch once.*



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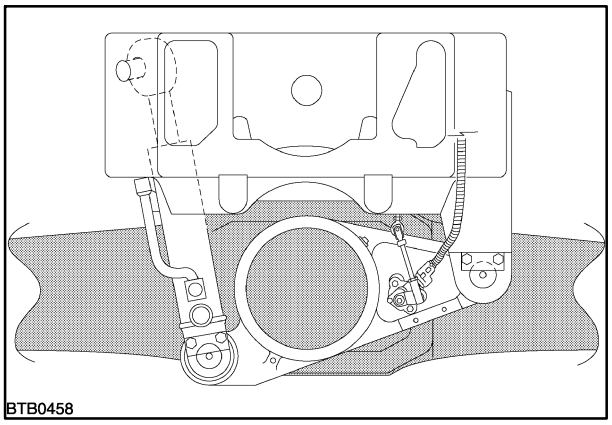
The display will show an initial ramping up of the system (approx. 290).
The suspension will then fully lower and raise, (display indicating approx. 640), and then lower (display showing approx. 290).
The suspension will then raise to an approximate mid point, and the display will change to show END.

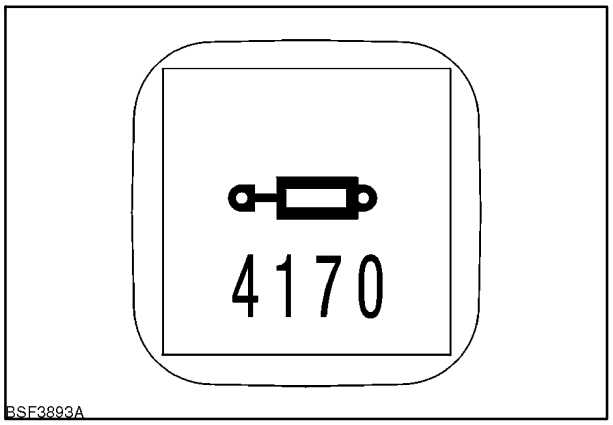


54

All components of the suspension system are now calibrated.
Turn OFF the key–start to store the calibration.

RE-CALIBRATING ELECTRONIC REMOTE VALVE LEVERS

Should one of the control levers lose synchronisation with the remote valve itself, an error code will appear in lower central area of the instrument panel display. The code displayed will show 4170 (or 4173, 4177, 4180) identifying the valve requiring re-calibration. To re-synchronise lever and valve, carry out the following procedure.



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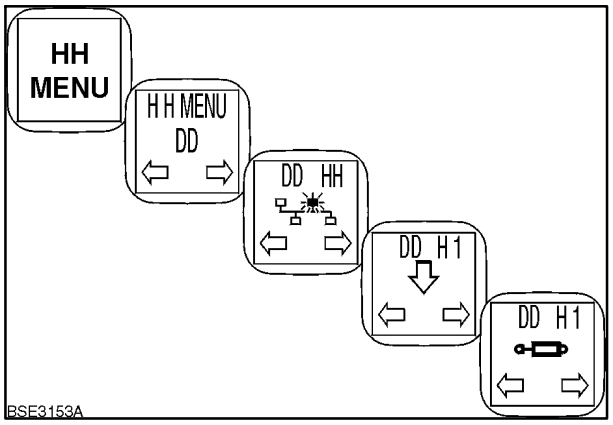
1. Park the tractor on a flat surface and apply the parking brake. Disconnect all implements from the rear remotes. Ensure that all of the EHR program switches are in the 'OFF' position.
2. Install the diagnostic connector, Tool No. **380000843**.

NOTE: *It is not necessary to start the engine.*

3. Using the hour, minute and light dimming buttons on the instrument cluster navigate through to H1 and the hydraulic ram symbol on the DD processor.
4. 'CAL' will be displayed.



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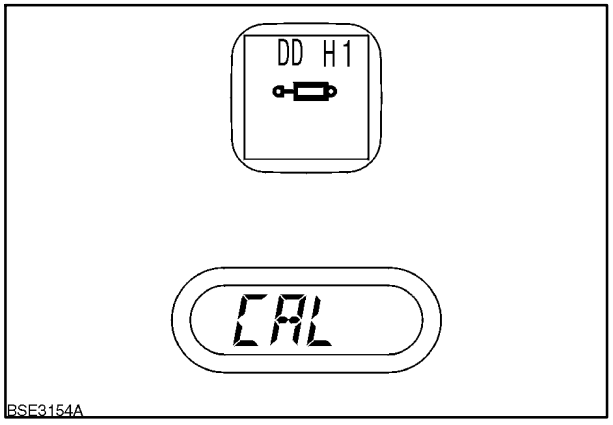
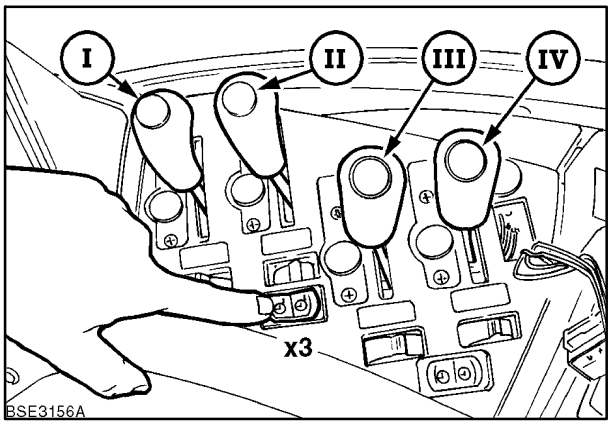


57

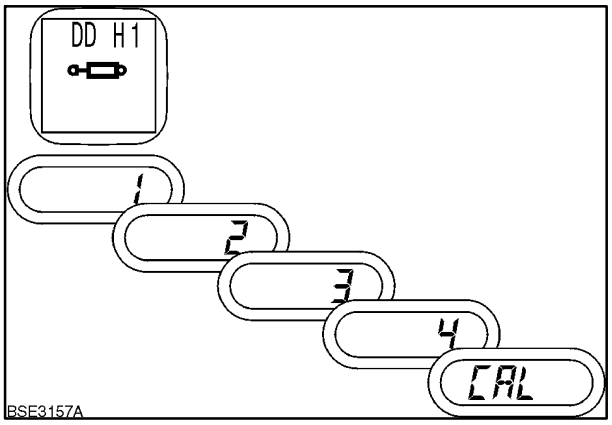
5. Press the program switch of the lever to be calibrated 3 times within 4 seconds.



58

6. The calibration will proceed and the display will Change to 1, the program lamp will illuminate. when the neutral position is established the display will change to 2, the program light will switch off.
7. While 2 is displayed move the lever to the raise position, the program light will illuminate. When the raise position is established the display will change to 3, the program light will switch off.
8. While 3 is displayed move the lever to the lower position, the program light will illuminate. When the lower position is established the display will change to 4, the program light will switch off.
9. While 4 is displayed move the lever to the float position, the program light will illuminate. When the float position is established the display will change to CAL and the program light will switch off.
10. When CAL is displayed this signals the end of calibration for that particular lever, repeat the procedure for the remaining levers as required.
11. Key off to store the new calibration values.

NOTE: *If a lever is not calibrated then the program lamp is switched on regardless of the state of the program switch.*



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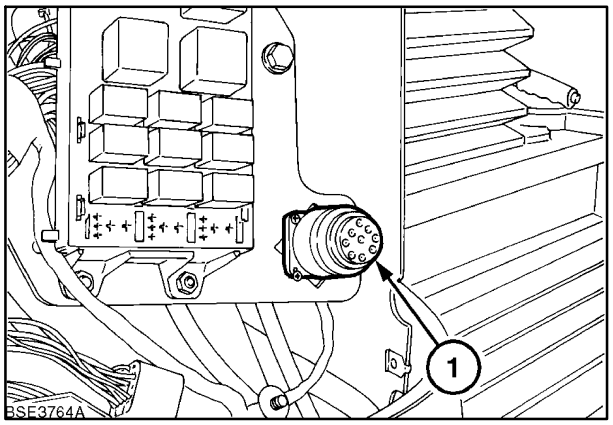
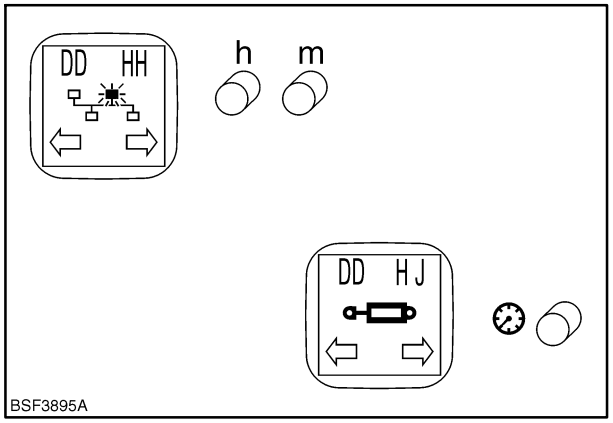
EHR VALVE NUMBER PROGRAMMING

Each electro hydraulic remote valve has its own built in processor. The processor stores in its memory the valves number within the remote stack, ie, whether it is valve No.1,2 ,3 ,4 or 5. If it becomes necessary to replace a valve assembly then it becomes necessary to reprogram the number of each valve within the complete valve assembly. Valve assemblies are supplied from parts with no number assigned. To reprogram the valve number sequence use the following procedure:



60

1. With all the remote valves connected to the harness, install diagnostic connector, tool No. **380000843**. Turn the Key Start switch ON and select H-menu Mode HJ on the DD processor.

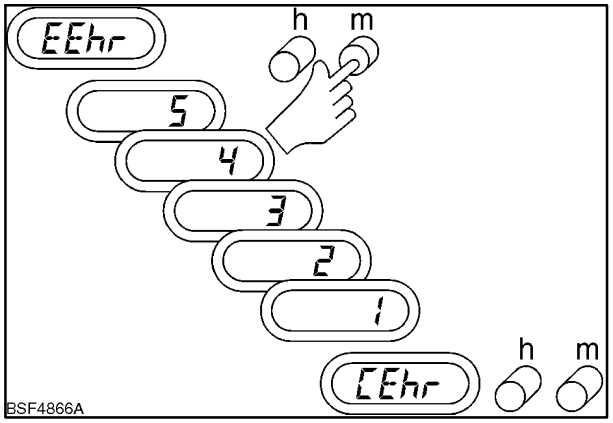


61

2. The display will change to show 'EEhr'
3. Depress and hold the minute button. The display will change to 5 and countdown to 1, then change to 'CEhr', this means that the valve numbers have been cleared.

NOTE: *If the procedure is aborted or the minute button released the display will return to 'EEhr'*

4. Turn the Key start switch OFF.



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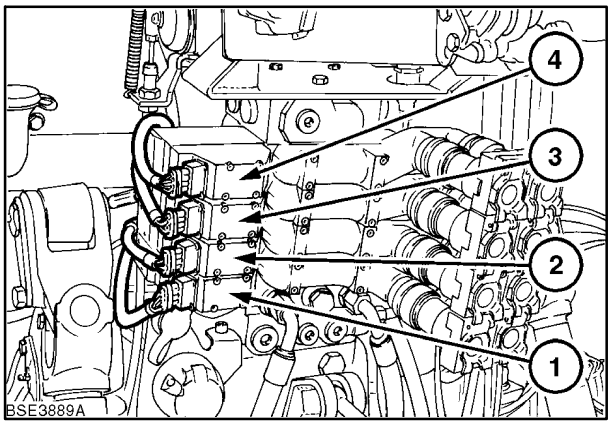
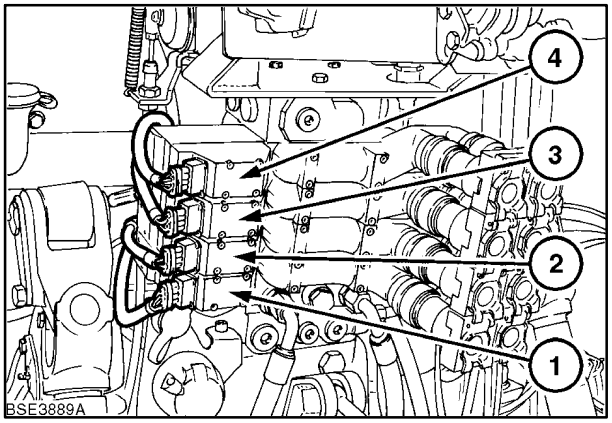
5. Disconnect the connectors from each remote valve.



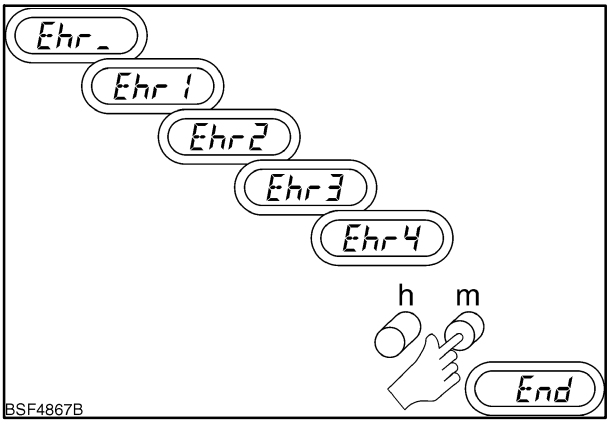
63

6. Turn the Key Start switch ON and select H Menu mode HJ.
7. The instrument cluster display will flash **'EHr_'**.
8. ***Reconnect each valve in the correct order, ie, No.1 being the lowest valve.*** As each valve is connected an audible beep will signify that the valve is recognised.



64

9. The display will change to **'EHr1'** then flash **'EHr2'** to signify that the controller is ready for the next valve to be connected. As each valve is connected the display will change to show the next valve number to be connected until **'Ehr4'** is displayed.
10. When all the valves are connected, depress and hold the minute button, the display will change to **'End'** to signify that the programming is complete.



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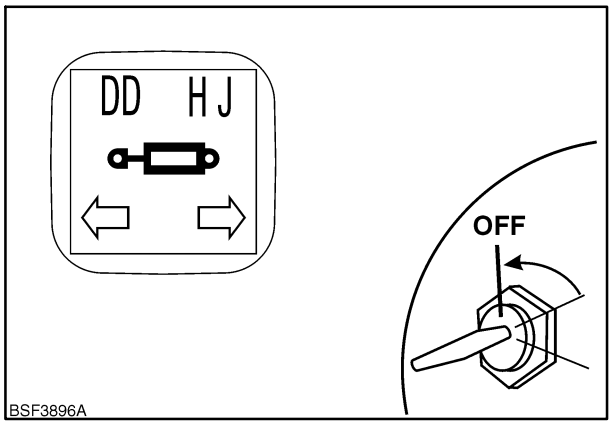
11. Turn the key start switch OFF to store the programming.



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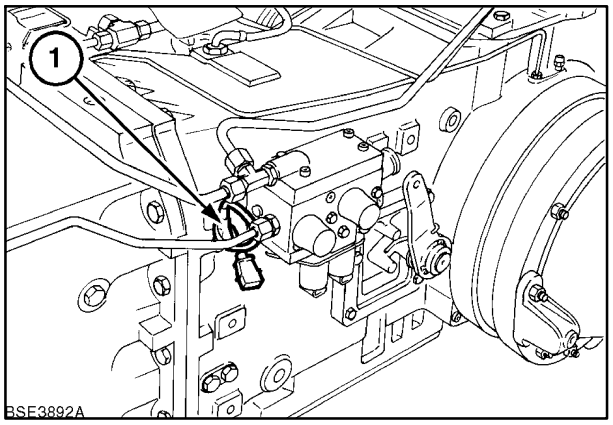
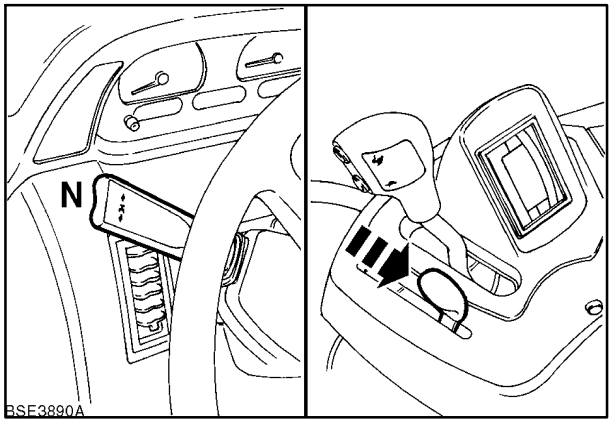
PTO TORQUE SENSOR CALIBRATION

Required if the PTO torque sensor has been removed or replaced, the processor has been replaced or the memory erased using the 'H8' mode or if the transmission and engine are split.



67

1. Disconnect all implements and any external hydraulic connections.
2. Park the tractor on level ground with the front wheels pointing straight ahead..
3. Set the shuttle lever to neutral and the throttle lever to low idle.
4. Stop the engine if running and apply the handbrake.



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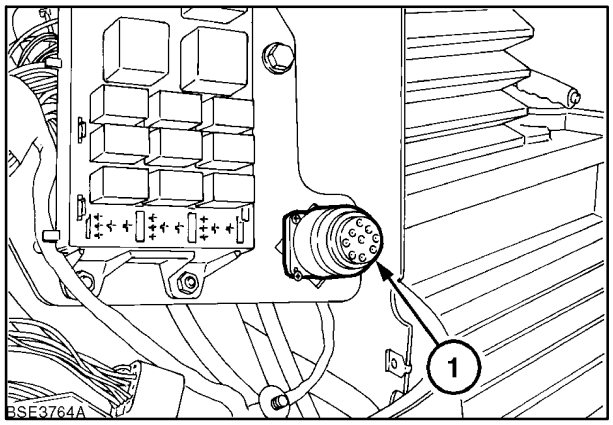
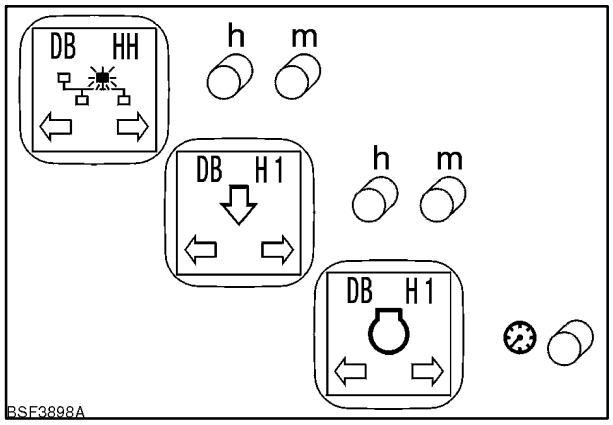
5. Install the diagnostic tool, no.**380000843**, into the diagnostic connector located under the front right hand trim, beneath the transmission levers.



69

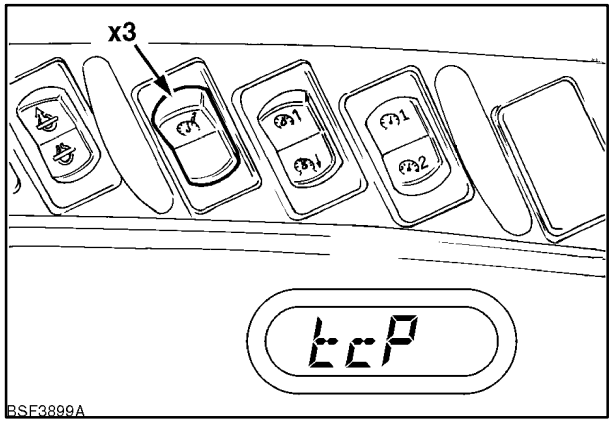
6. Start the tractor and navigate through to 'H1' on the DA/DB controller with the ENGINE symbol displaying on the instrument cluster.
7. After a few seconds this will change to 'CAL'



70

8. Operate the Constant engine speed rocker switch 3 times within 4 seconds. The display will change to show 'TCP' and the 'CRPM' activated lamp will flash indicating that the procedure has started.

NOTE: *If the calibration needs to be halted at any stage, depress the CRPM switch once.*



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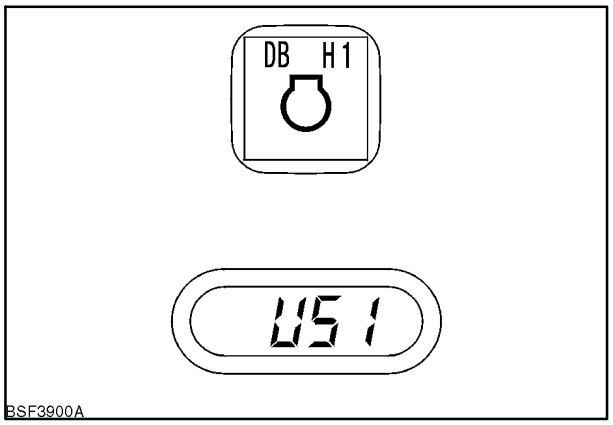
9. The engine speed will automatically rise to 1600±50 rev/min.

NOTE: *Error code 'U51' will be displayed if the engine speed is not correctly set.*



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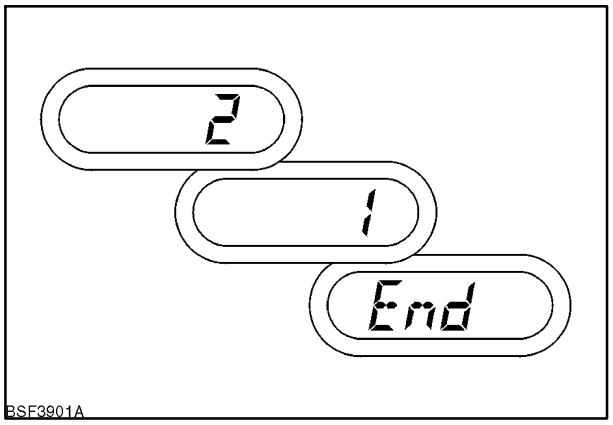
10. After a few seconds a countdown will commence with the display showing '2', '1'.
11. At the end of the countdown the engine speed will return to low idle, the constant speed lamp will stop flashing and 'END' will be displayed in the instrument cluster.
12. Key OFF for several seconds to store the calibration values.

NOTE: *If an error occurs during calibration a 'U' code will be displayed and the procedure will need to be repeated. Refer to the 'U' code listing at the beginning of this Chapter.*



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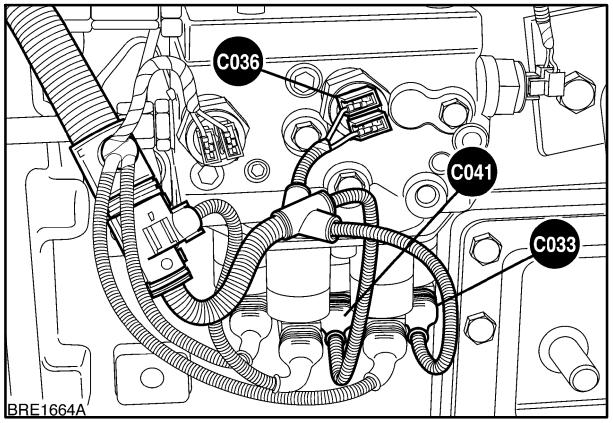
PTO CLUTCH CALIBRATION

Required when the central controller (DB Module) has had its memory erased after H8 has been used, the PWM clutch solenoid (C041) has been replaced or the PTO clutch unit overhauled.

NOTE: *After a H8 or new module installation the controller will default to 'YES' for the fitment of rear PTO fender switches. If the tractor does not have fender switches set the switch option to 'NO' in the H3 menu mode.*



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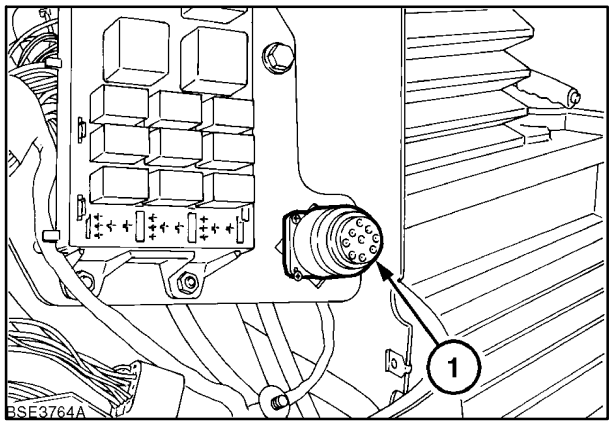
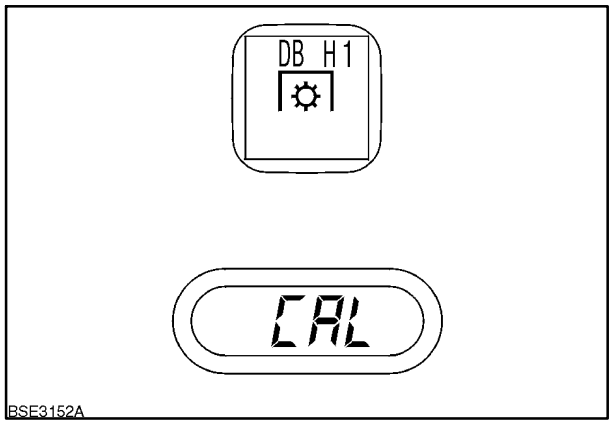
1. Install the diagnostic, tool no.**380000843**, into the diagnostic connector located under the front trim beneath the transmission levers.
2. Disconnect all implements from the rear PTO and ensure the tractor is stationary with the handbrake applied.



75

3. Start the tractor and navigate through to 'H1' in the DB module with the PTO symbol displaying on the instrument cluster.
4. After a few seconds this will change to 'CAL'



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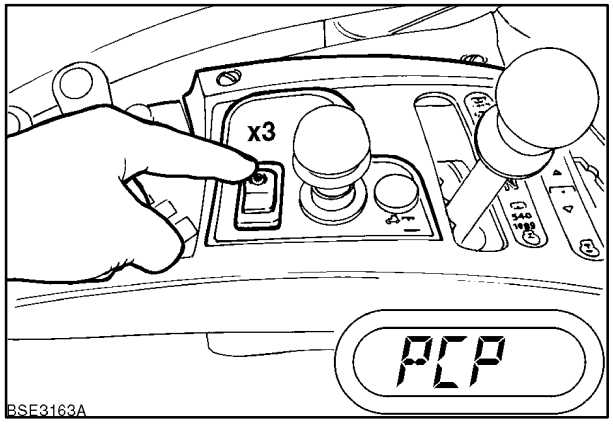
5. For mechanical engines only, set the engine speed to 1200±100 rev/min.

NOTE: *On Electronic engines the speed is automatically controlled by the engine control module.*

6. Operate the PTO brake rocker switch 3 times within 4 seconds. The display will change to show 'PCP'.
7. After a few seconds, the display will show: - 'PC1' = oil temperature is correct, - 'CL' = oil temperature is cold, or - 'CH' = oil temperature is hot.



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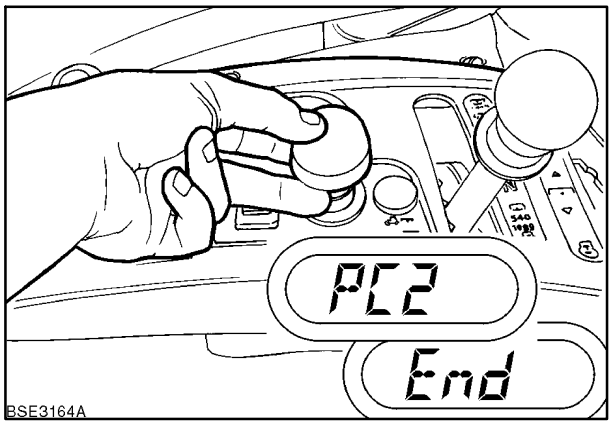
8. Start the PTO using the cab PTO switch.

NOTE: *Ensure PTO Fender switches are configurated before starting calibration in H3 Channel 2.*

9. 'PC2' will be displayed and the PTO overspeed light will flash, followed by 'END'.
10. Turn the key start off for several seconds to store the calibration.

NOTE: *If an error occurs during calibration a 'U' code will be displayed and the procedure will need to be repeated. Refer to the 'U' code listing at the beginning of this Chapter.*



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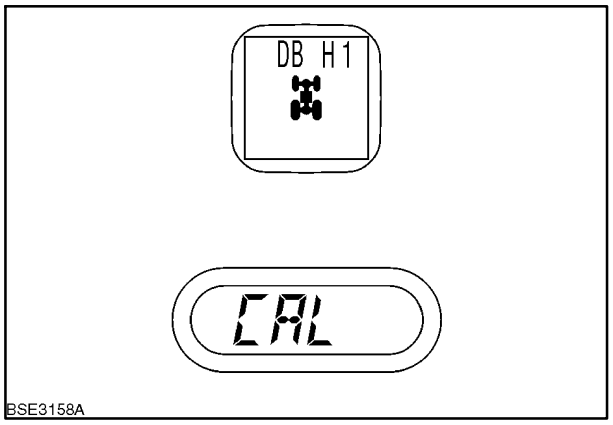
STEERING ANGLE SENSOR CALIBRATION

1. Park the tractor on flat level ground and apply the handbrake.
2. Install the diagnostic tool, No.**380000843** in the diagnostic connector located behind the front right hand trim, beneath the transmission levers.
3. Start the tractor and navigate through to 'H1' of the DA/DB controller with the FWD symbol displaying on the instrument cluster.



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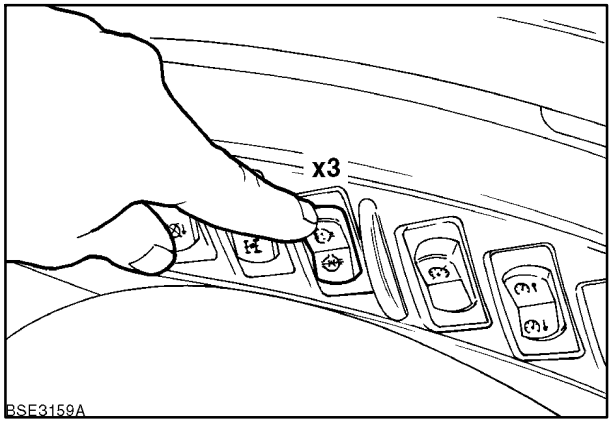
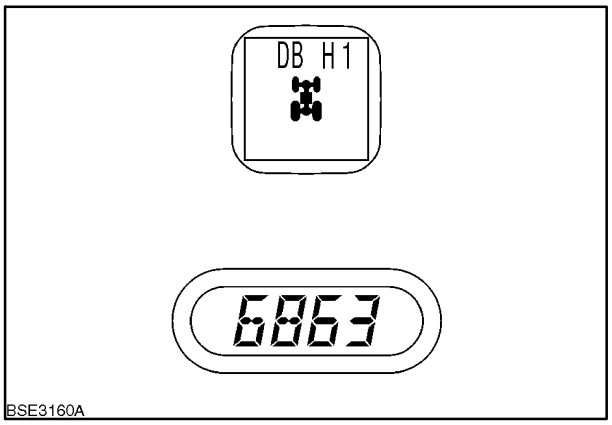
4. Press the auto diff lock switch 3 times to enter the calibration mode.



80

5. The current position of the steering sensor will flash in the display.
6. Turn the steering wheel to get the wheels in the straight ahead position. The value is typically between 6000 and 7000.
7. To store this setting press the auto diff lock switch 3 times again. The steering angle position will now display permanently.

NOTE: *If '**-1**' is displayed in the lower LCD it is necessary to H8 the HA (cluster) controller to reset the steering signal.*



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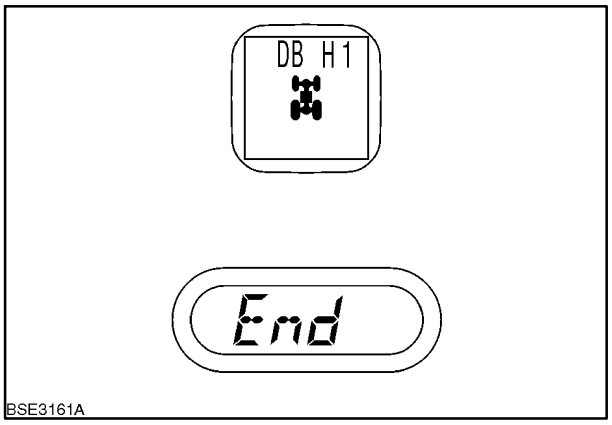
8. To obtain a more accurate value, whilst in the calibration mode, display flashing, drive the tractor forward and backward ensuring that the tractor travels in a straight line. Store this setting as described previously, After a few seconds 'End' will display to confirm calibration is complete.
9. Key off to store the calibration value.



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SECTION 55 - ELECTRICAL SYSTEM

Chapter 9 - Fault Codes

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INTRODUCTION

FAULT CODES AND FAULT FINDING

The tractors have an inbuilt self diagnostic facility. This facility utilises the digital display of the Instrument cluster to indicate, in coded format, malfunctions in the electrical and electronic circuitry and in the micro-processor. It should be noted that the self diagnostic capability is generally limited to diagnosis of the electrical and electronic circuitry and related components, however, there are some codes, which can be generated if pressure switch circuits are not closed because of an actual lack of hydraulic pressure. Any malfunction of the mechanical and hydraulic components must be diagnosed using conventional techniques, performance characteristics and tooling, such as pressure testing equipment.

Trouble-shooting and fault finding should always be carried out in a logical and planned sequence, many apparent faults associated with electronic components are often hastily diagnosed and result in the replacement of expensive components. An extra few minutes confirming the apparent fault will result in a more positive and cost effective repair.

With the use of micro-processors it is often that this item is blamed for any malfunction but the real truth is that this item is usually sound and that the fault is due to poor contacts in the associated connectors.

Each electrical connector illustrated and identified in the wiring diagrams and referred to in the following fault finding procedures, has the same identification reference. For example, one of the processor connectors is referred to as Connector C100 in the illustration and also referred to as C100 in the fault finding procedure. In the fault finding procedure the connector, pin and wire colour are shown as, C100 pin 21 (GY). If all the wires are the same colour, the circuit number is also included to aid in wire identification. For example, C100 pin 21 (694-GY). This is broken down as follows:

C176	Connector number
694	Circuit number
GY	Wire colour

All tests are carried out on the harness side of the connector, unless otherwise stated.

Refer to the relevant chapter for complete wiring diagrams and how to use them.

Where the fault finding procedure requires checks for continuity a visual inspection of the wiring should be made prior to conducting tests to ensure that obvious 'mechanical' damage has not occurred to the harness or the connectors.

A good quality multi-meter is an essential item to perform fault finding. It should be capable of measuring resistance of at least 20,000 ohms and measuring voltage and current. When using the multi-meter it is good practice to select a high range and work downwards to avoid damaging the instrument. Refer to the 'Basic Multi-Meter use' section of this chapter for further details.

IMPORTANT: *Care should be used when using the multi-meter, only use the instrument as instructed to avoid damage to the internal elements of the micro-processor. When checking the continuity of wiring, sensors or switches it is necessary to isolate the electronic micro-processor and ensure the keystart is turned off to prevent possible further damage. The keystart should only be switched on and the processor connected where specifically instructed in the fault finding procedure.*

If it is found necessary to clean the connectors a contact spray should be used. DO NOT USE ANY OTHER METHOD FOR CLEANING TERMINALS. Do not use a cleaner that contains Trichloro-ethylene, this solvent will damage the plastic body of the connector. It is preferable to use a cleaner with a Freon T.F. base.

SPECIAL TOOLS

Description	Tool No.
Electrical Repair Tool Kit (North America Only)	FNH 01000
Harness Repair Kit (Except North America)	294070
Test Probe Kit (Except North America)	297448

WIRING HARNESS REPAIRS

TEMPORARY WIRING HARNESS REPAIR

⚠ WARNING ⚠

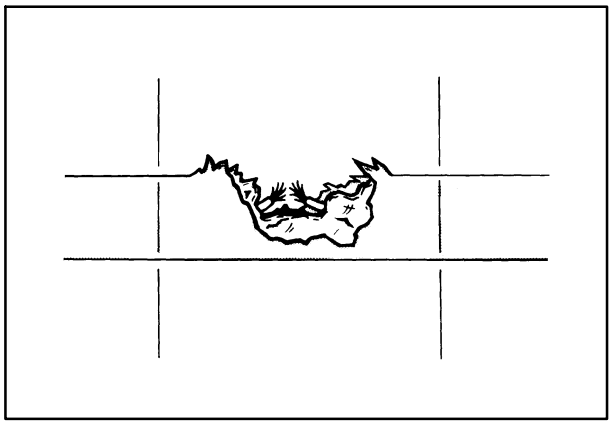
It is acceptable to use the following repair procedure on the CAN BUS wiring. It is important though to ensure that the wire lengths are not altered from the original as this will affect the performance of the CAN BUS system.

The following method to repair wiring is a temporary expedient only. Wiring should be replaced as soon as possible. Do not attempt to repair the wire on any system sensors as these are sealed and should only be replaced with a new component.

NOTE: *When conducting a cable repair it is important that only RESIN CORED SOLDER is used. Use of other types of solder may result in further cable damage.*

To carry out a temporary repair, proceed as follows:-

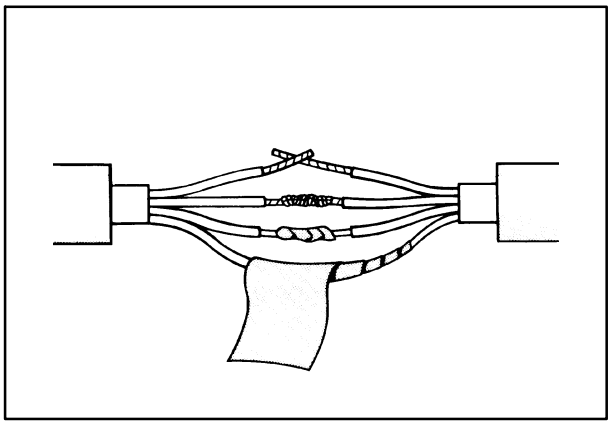
1. Locate damaged portion of cable then cut away outer protective cover on both sides of the damaged area, Figure 1.



1

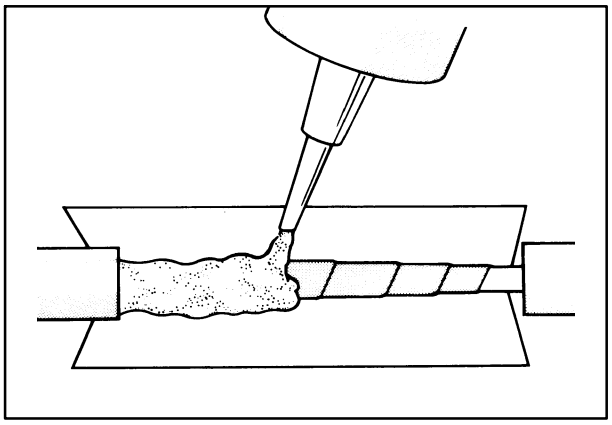
2. Using a suitable solvent, clean about 2 inches (50 mm) from each cover end. Clean the grey cable cover and the individual leads.

3. Twist two bare leads together for each damaged lead, being careful to match wire colours, then solder the leads using resin cored solder. Tape each repaired lead with vinyl insulation tape, Figure 2.



2

4. Wind a layer of vinyl insulation tape up to the grey cable cover at each end of the repair section. Make a paper trough, Figure 3, then apply silicon rubber compound (non hardening sealant) over the repaired section up to the cover ends. Sufficient sealant must be used to fill the ends of the cut away area.

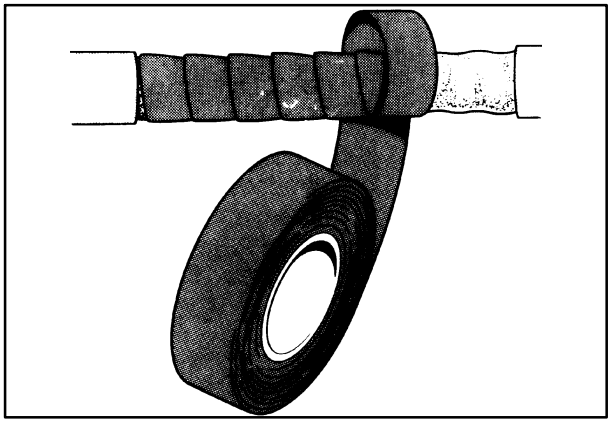


3

5. Allow the compound to cure then cover the area with insulating tape taking the tape well over each end of the repair. An overlap of at least 2 inches (50 mm) of tape at each end is necessary, Figure 4.

6. Check to ensure the repair is satisfactory and secure the repaired cable so that repeat damage is avoided.

NOTE: *This is a temporary repair only. Ensure the damaged cable is replaced as soon as possible to prevent ingress of water or chemicals.*



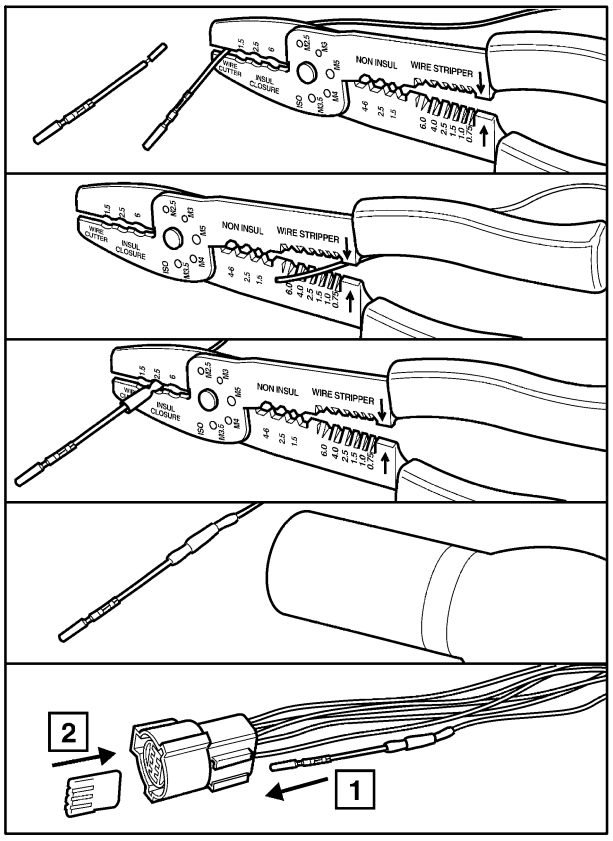
4

HARNESS WIRE REPLACEMENT

If a wire within the harness is found to be beyond repair or is open circuit, a jumper wire may be installed as a temporary repair until such time when a new harness assembly can be installed. Use the following procedure to install an additional wire:

1. Locate the faulty wire using the procedures described in the fault code charts.
2. Disconnect the affected connectors.
3. If fitted carefully roll back the seal between the connector and harness outer covering.
4. Remove the pins from the connector blocks of the affected wire using the appropriate removal tool found in the harness repair kit.

NOTE: *Use the instructions supplied with the kit to ensure correct pin removal.*



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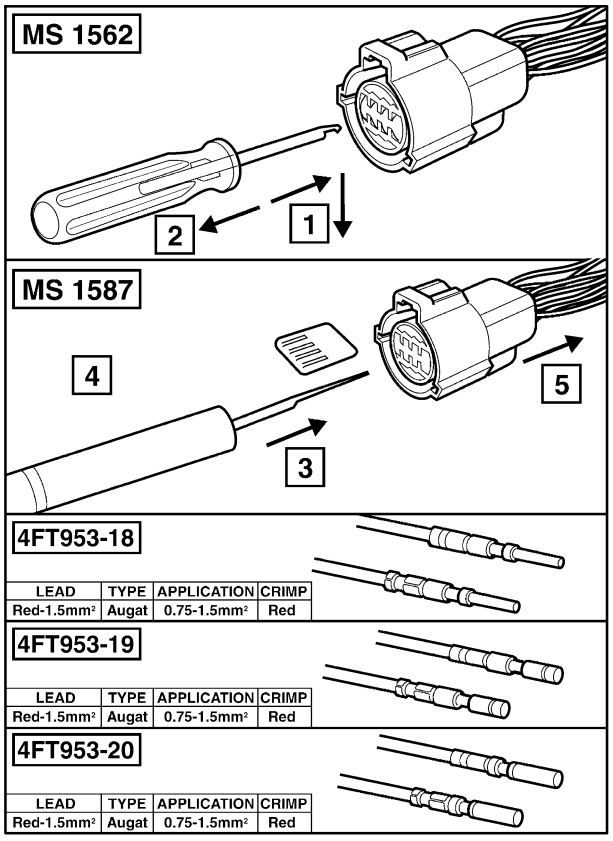
5. From the harness repair kit select the correct pin for the connectors. Obtain locally the correct cross-sectional size wire and measure out the length required by following the harness routing.
6. Join the new wire to the new pins as described in the harness repair kit and install one of the pins into its connector.
7. If possible attempt to run the new wire within the existing harness outer covering, if this is not possible run the wire along the harness, securing regularly with suitable ties. With the wire correctly routed instal the second terminal into its connector block. Replace the connector seal if removed.
8. To ensure that the repair has been effective check for continuity of the new wire using a suitable multi-meter.

NOTE: *This is a temporary repair only. Ensure the damaged cable is replaced as soon as possible to prevent ingress of water or chemicals.*



6

TESTING

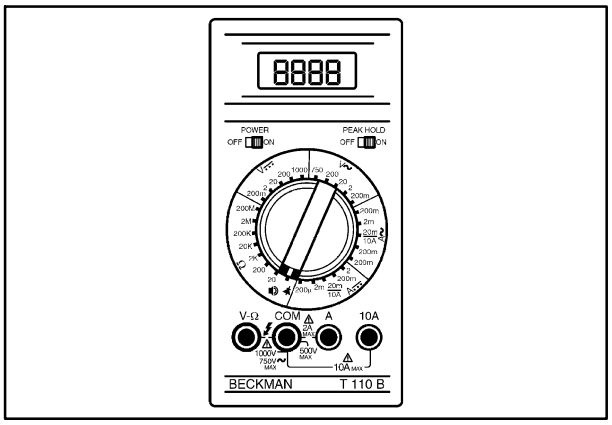
DIGITAL MULTI-METER

NOTE: *This section is only intended as a general guide to using a digital multimeter.*
Always refer to the manufactures operators manual for correct operation

A multimeter is an electronic measuring device. The different types of measurement that can be made depend upon the make and model of the multimeter. Most types of multimeter have the capacity to measure:

- Current (A) ac or dc
- Resistance (Ω)
- Voltage (V) ac or dc
- Continuity (Buzz test)

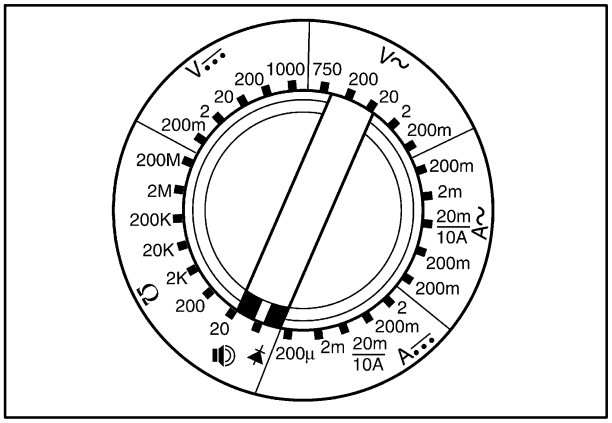
More expensive multimeters have other functions, such as the capacity to measure frequency (Hz) and test diodes.



7

General Operation:

Before proceeding with a test, decide on what is going to be measured (Voltage, Current etc.). Rotate the dial until the pointer is within the relevant zone. Within each zone there are different scales. The scale that is selected will represent the maximum value that the multimeter will read. Always select a scale which is greater than the value that you intend to measure. If you are unsure of the value to be measured, always select the highest scale and then reduce the scale once you have an idea of the measured value.



8

Why are there different scales ?

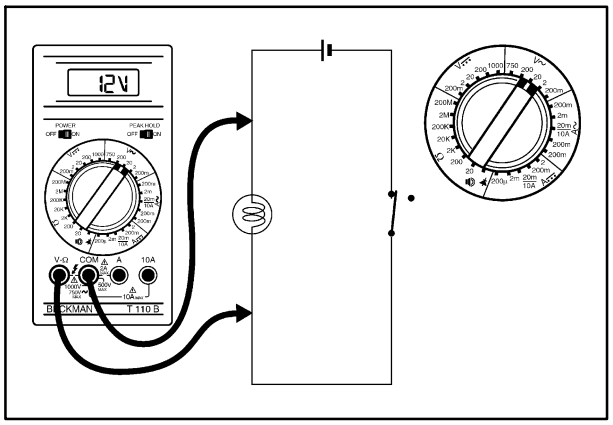
The closer that the scale is to the measured value, the more accurate the reading will be
e.g. If measuring the voltage of a battery with the scale set at 200V, the display may read 12V. However, if the scale was set to 20V the display may read a more accurate reading of 12.27V

Giga	G	1,000,000,000	10^{9}
Mega	M	1,000,000	10^{6}
Kilo	K	1,000	10^{3}
milli	m	0.001	10^{-3}
micro	µ	0.000 001	10^{-6}
nano	n	0.000 000 001	10^{-9}
pico	p	0.000 000 000 001	10^{-12}

9

Measuring Voltage (Volts):

Set the range dial to either ac or dc volts. Connect the Black test probe to the ”COM” terminal and the Red test probe to the ”V/Ω” terminal. Place the test probes across the component to be measured with the circuit complete (closed). Read off the display value

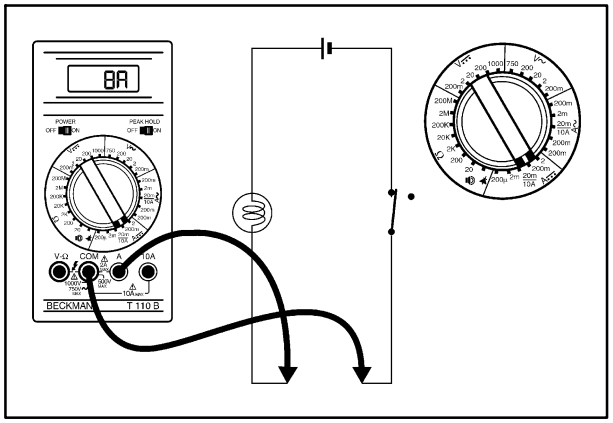


10

Measuring Current (Amps):

Set the range dial to either ac or dc current. When measuring current up to 2 amps, connect the Red test probe to the “A” terminal. When measuring current up to 10 amps, connect the Red test probe to the 10 “A” terminal. Always connect the Black test probe to the “COM” terminal. When taking measurement of current, always break the circuit and connect the multi meter in series with the circuit. Read off the display value.

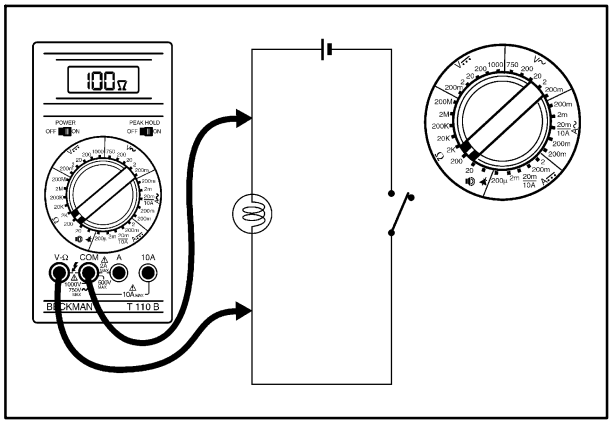
NOTE: For protection, multi meters are usually fused at 1OA.



11

Measuring Resistance (Ohms):

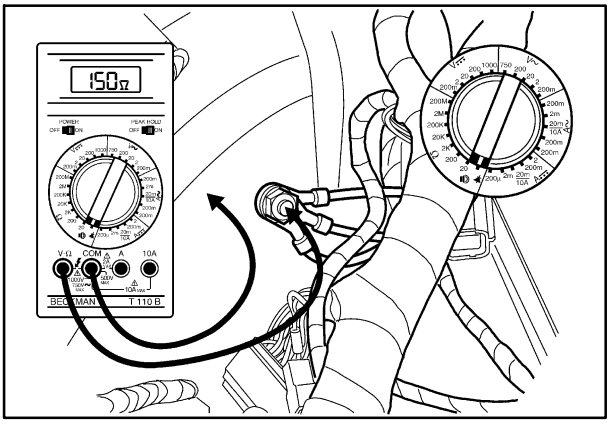
Set the range dial to the desired Q position. Connect the Red test probe to the “V/Ω” terminal. Connect the Black test test probe to the “COM” terminal. If the resistance being measured is connected in a circuit, then turn off the power to the circuit. Connect the test probes to the measuring point and read off the display value.



12

Continuity (Buzzer) test:

Set the range dial to the “Buzz” position. Connect the Red test probe to the “V/Ω” terminal. Connect the Black test probe to the “COM” terminal. Connect the test probes to the measuring point. In general, if the resistance is less than 50Ω then the buzzer will sound, indicating continuity.

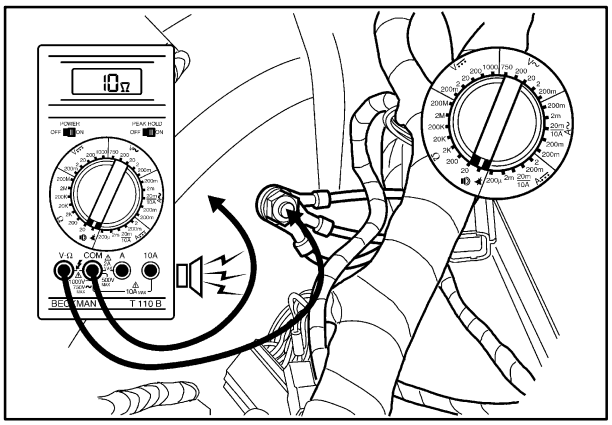


13

Note: Buzzers on different multi meters will sound at different ohmic values, depending on the quality of the meter. This can often be misleading. For example, when checking a corroded earth point. A poor quality multi meter may buzz at 150Ω, indicating continuity and no problem. When using a higher quality multi meter for the same test, it would not buzz due to the high resistance. When carrying out such tests, we should always check the value of resistance as well as listening out for the buzz.

A good connection gives low resistance.

A bad connection gives high resistance.



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SUMMARY:

When measuring –

Voltage (V):
Connect across the component with the circuit closed.

Current (A):
Connect in series with the circuit. Circuit closed.

Resistance (Ω):
Connect across the component with the circuit open.

Continuity (Buzz):
Connect the meter across the component with the circuit open. (Always check the value of resistance as well!!)

ELECTRICAL TEST PROCEDURES

Four electrical tests will be required to properly troubleshoot electrical concerns on the vehicle.

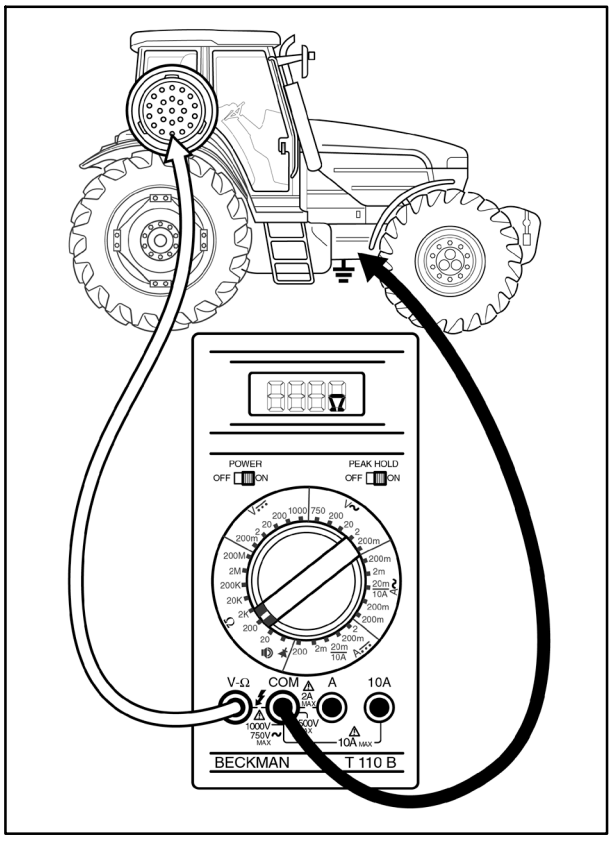
Each test is described in detail. Ensure that all steps are reviewed and followed when testing.

1. Continuity Test, Short to ground
2. Voltage measurement, short to 12 volts
3. Resistance test for components
4. Continuity test, Open circuits

Electrical Test Procedure 1: Continuity Test - Short to Ground

Conditions For Performing Tests:

1. Power OFF, Keyswitch OFF, (sometimes battery disconnected or fuse pulled out if specified in procedure).
2. Connectors at each end or ends of circuit disconnected to prevent false readings.
3. Set meter to measure resistance or ohms, and measure circuit resistance. Use black lead to make contact with a plated metal part on the chassis such as a jump start post if fitted. Make sure the surface of the part is not corroded. Use the red meter lead to touch the connector pins, one pin at a time, and avoid contact with the case of metal connectors.
4. Determine if measured resistance falls within guidelines specified in the procedure. 3 to 4 ohms indicates a direct short to chassis ground and must be located and repaired. Higher resistances usually indicate circuit paths through modules, and that an additional connector needs to be disconnected to perform the test. More than 100K ohms indicates that the circuit is free of shorts to ground.



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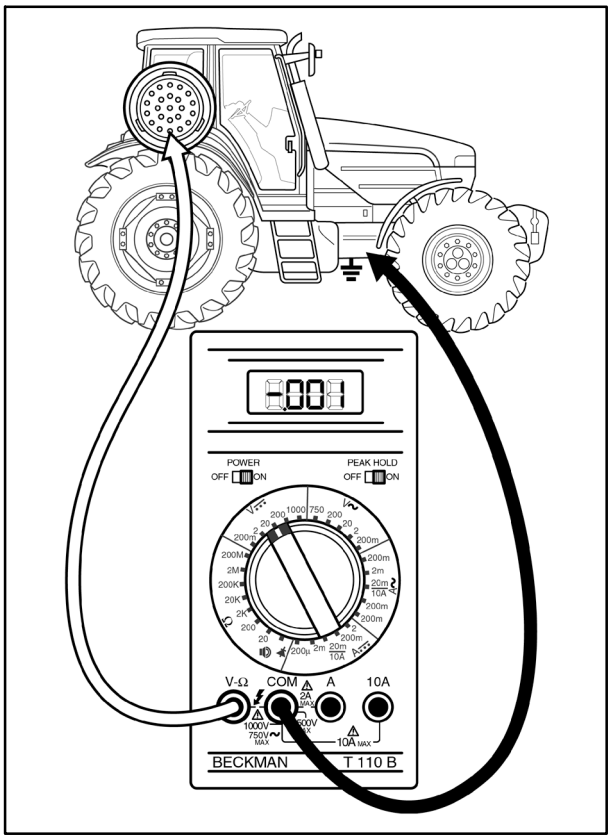
Electrical Test Procedure 2: Voltage Measurement or Short to Positive Supply Volts

Conditions For Performing Short To Positive Supply Tests:

1. Keyswitch ON (sometimes OFF, if specified in procedure).
2. Connectors at sensor, switch or potentiometer end disconnected. All other connectors must be reconnected to perform test.
3. Set meter to measure DC VOLTS, and measure circuit voltage as illustrated. Use the red meter lead to touch the connector pins, one pin at a time, and avoid contact with the case of metal connectors. Use the black lead to make contact with a plated metal part on the chassis such as a jump start post if fitted. Make sure the surface of the part is not corroded.
4. Determine if measured voltage falls within guidelines specified in the procedure.



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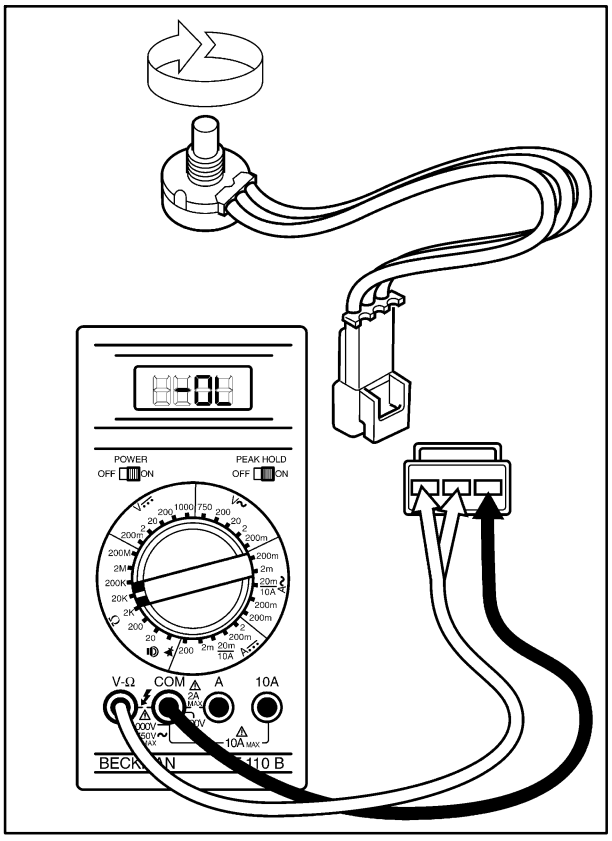
Electrical Test Procedure 3: Resistance Test for Electrical Parts

Conditions For Performing Resistance Test:

1. Disconnect tractor part by unplugging electrical connectors to expose the part assembly connector for testing.
2. Set electrical meter to measure resistance or Ohms and insert test probes into connector terminals specified in procedure. When checking potentiometers, measure from wiper terminal to each of the other terminals while TURNING THE POT SHAFT. This will ensure no open spots escape detection. When checking rocker or rotary switches, actuate the switch while measuring for opens and shorts.
3. Compare measured values to values specified in the fault code procedures. Allow plus or minus 5 percent of range tolerance for all measurements.



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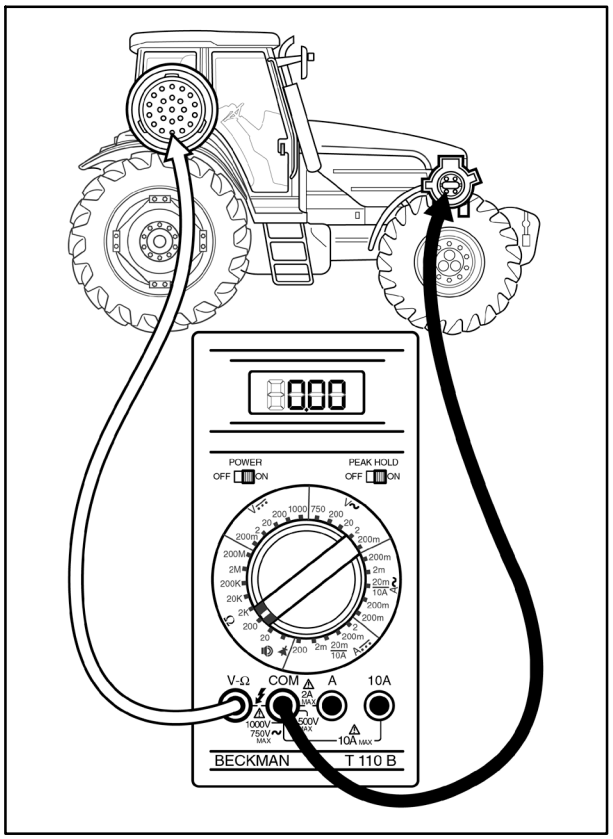
Electrical Test Procedure 4:
Continuity Test - Check for Open Circuits

Conditions For Performing Continuity Tests:

1. Keyswitch OFF (sometimes disconnect battery or pull fuses).
2. Connectors at both ends of the circuit disconnected. All other connectors must be reconnected to perform test.
3. Set meter to measure resistance or ohms, and measure circuit resistance as illustrated.
   Use the red meter lead to touch the connector pins, one pin at a time, and avoid contact with the case of metal connectors.
   Use the black lead to make contact with the connector pin at the other end of the circuit. Avoid contact with other pins in the connector and the connector case, if it is metal.
4. Determine if measured resistance falls within guidelines specified in the procedure. If the resistance is no more than 3 to 4 ohms, the circuit is continuous. More resistance usually indicates dirty or corroded terminals in connectors, and 100K ohms indicates an open circuit.



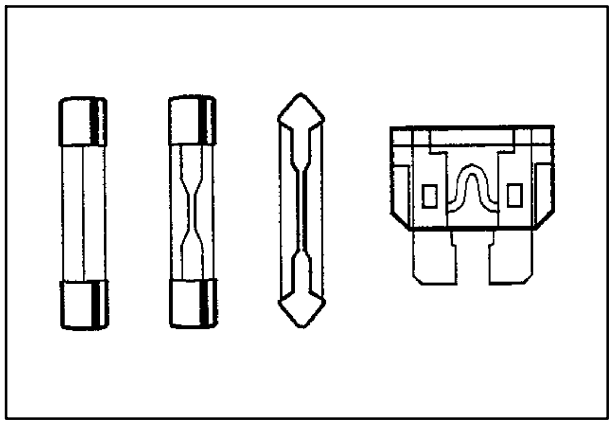
18

DESCRIPTION AND OPERATION

CIRCUIT COMPONENTS

Circuit Protection Devices

Circuit protection devices are used to protect wiring and components from excessive current. Three different types of protection are fitted in tractors. Two of them (fuses and fusible links) are currently used, while circuit breakers are no longer used.



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FUSES, FUSIBLE LINKS

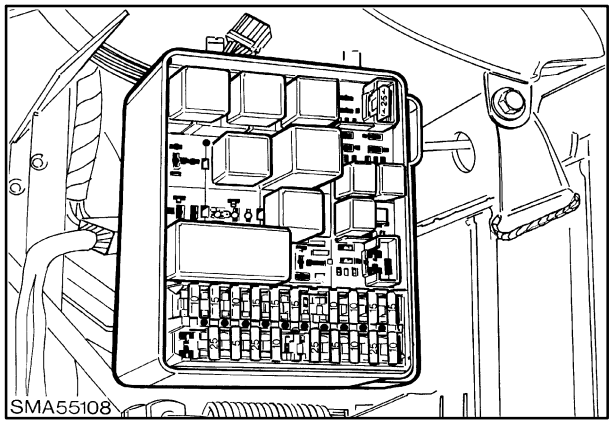
Fuses and fusible links protect circuits with thin pieces of metal and wire which heat up and melt to open up the circuit when too much current flows through them.

Fuses are used to protect the circuit from overload. This can occur in the event of a short circuit or by connecting equipment which demands a current greater than the circuit is designed to carry.

There are several types of fuses, but they all consist of a metal conductor which is capable of carrying a limited current. If the specified current is exceeded then the metal conductor will overheat, causing it to melt and break. This will in turn cause an open circuit.

The rating of the fuse relates to the current that the fuse can carry continuously.

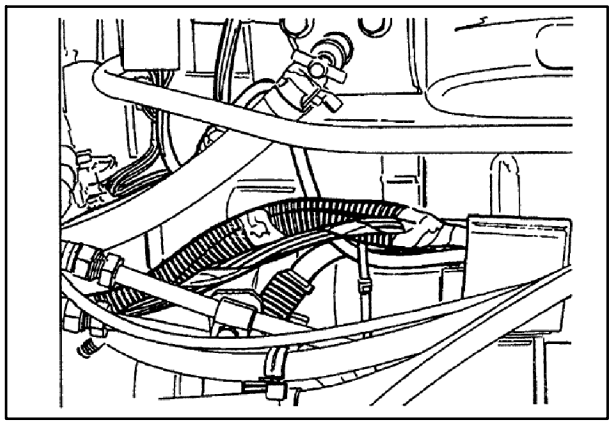
If a fuse blows, it must be replaced with a fuse of the correct rating, and if it blows again, then the cause must be investigated.



20

FUSE LINKS

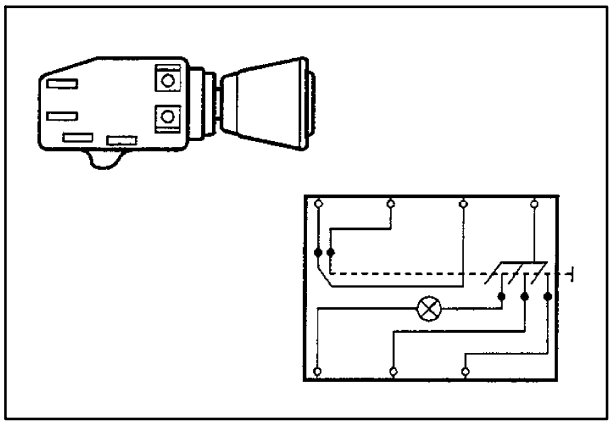
A fuse link is a wire that acts like a fuse, breaking down and causing an open circuit when the current that passes through it exceeds a certain amperage. For primary fuse protection the main supplies from the starter solenoid are fitted with fuse links.



21

CIRCUIT CONTROL DEVICES

Some of the components in a circuit are used to interrupt and direct current flow either through an action of the operator or automatically. The current interrupters you are probably most familiar with are switches.



22

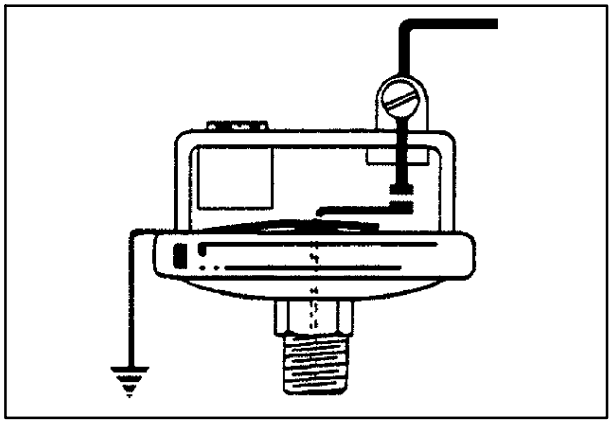
SWITCHES

Switches are a vital part of an electric circuit, providing a method of controlling the circuit itself. One switch can control a number of different circuits at the same time. This is achieved by having several separate connections and/or multi-connector switches (several switch 'positions').

There are several types of switch, and they may incorporate a warning light.

Switches can be as simple as that used to turn on an implement lamp or as complex as the ones used to operate the starting and lighting systems. Checking the operation of switches is usually just a matter of testing for power going into the switch and for power leaving the switch at the appropriate contacts when the switch is operated.

One of the most common type of switches is the pressure switch (Fig. 23), a switch opened or closed by a fluid pressure. An example of this type of switch is the engine oil pressure switch, a simple on/off device that opens (or closes) when oil pressure rises above 10 psi.

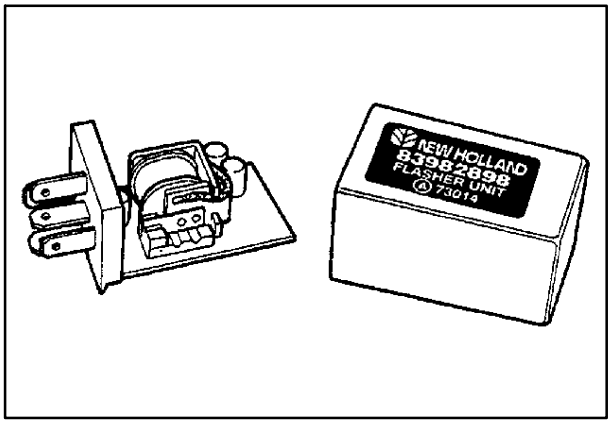


23

FLASHERS

Flashers work automatically to interrupt and connect the flow of current. Their operation is similar to that of the circuit breaker described earlier.

In the flasher, a heating element warms a bimetallic strip. The strip bends, breaking contact with the power source. When it cools, the bimetallic strip once again makes contact and the process begins again.



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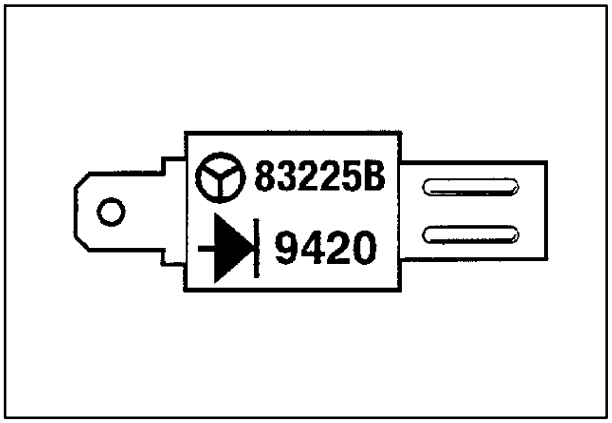
DIODES

Some components use a semiconductor material instead of moving parts to direct current. Diodes for example, allow current flow in one direction only.

They are essential in converting the alternating current that an alternator produces to the direct current that the tractor electrical system components use.



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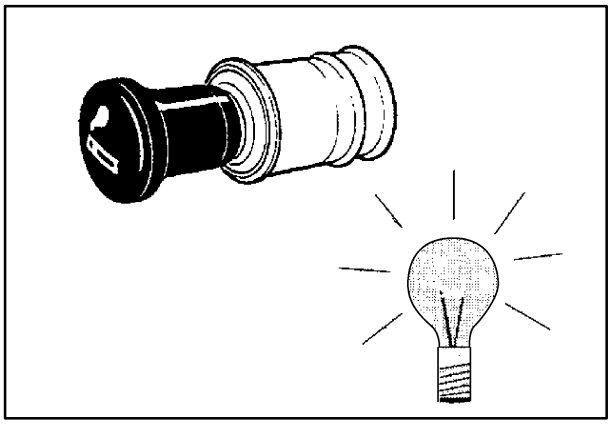
RESISTANCE DEVICES

A number of electrical components alter or make use of electricity through their resistance to current flow. Resistors are components which are generally used to regulate the supply of voltage and current to other electrical components.

In some cases, the purpose of resistance in an electrical circuit is to provide light or heat. Lamps and cigar lighters are examples. Lamps convert electricity into light, and cigar lighters convert it into heat. Both lamps and lighters make use of the same physical principle, that is Ohms Law.



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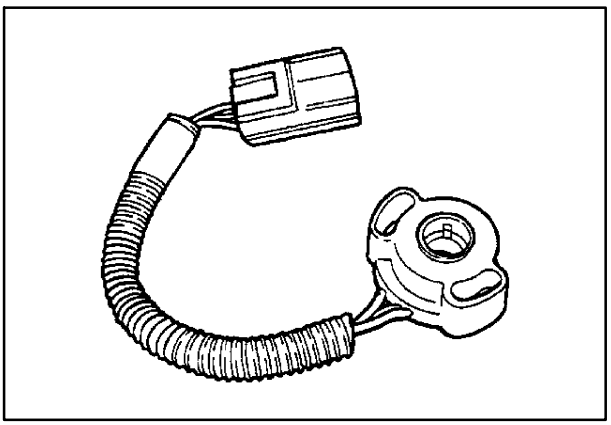
POTENTIOMETERS

Potentiometers are variable resistors which are dependant on mechanical movement, i.e. Lateral float movement, to vary the resistance of the component and therefore alter the output voltage.

In order to verify the correct operation of a potentiometer, the resistance should be measured at the minimum and maximum positions and a smooth and continuous change of resistance should be observed between. As the resistance varies with temperature, the test specifications are usually given at 20 °C.



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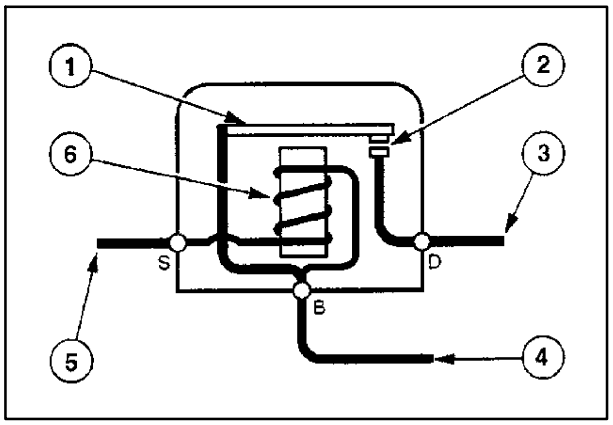
ELECTROMAGNETIC DEVICES

In general, they use the magnetic field created by flowing current to move metal parts within the components.

RELAYS

The relay is an electromagnetic switch that uses a small amount of current to switch a larger amount on and off.

When the operator closes a switch, current flows through the relay's control circuit. In this circuit there are windings surrounding an iron core which is fixed in place (see Fig. 28).



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Current turns the iron core into an electromagnet. The core then attracts an arm which has a contact point on it. When the point on the arm contacts the stationary point, current flows through the power circuit.

Relays are basically electrically operated switches. They are used to switch a circuit on/off in similar way to a manual switch.

Two circuits are connected to the relay:

- A work circuit, which is switched on/off by the relay, and provides the supply for the equipment to be operated, i.e., bulbs, solenoids, etc.;
- A control circuit, switched on/off by manual switches, used to operate the relay.

The part of the relay which is connected to the control circuit consists of the winding of an electro-magnet. When the control circuit is switched off, the contacts are kept apart by a return spring. When the control circuit is switched on, a current flows through the coil and a magnetic force is produced. This force, which is stronger than the spring pressure, pulls the contacts of the relay together, causing the work circuit to operate.

A switch-relay system has two main advantages over a simple switch:

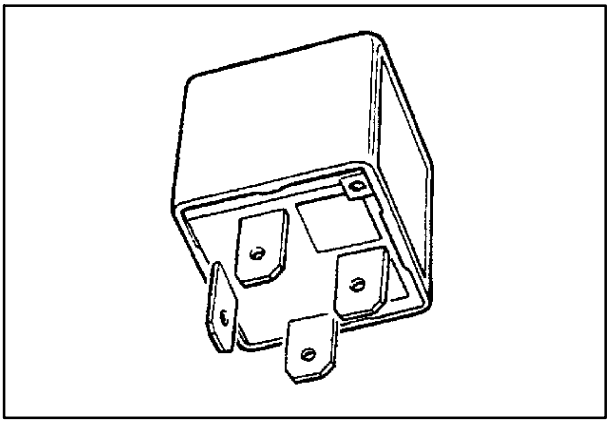
- The current that flows through the switch is not the same as all the current requested by the equipment to be operated, but usually by a smaller current: this allows the usage of smaller and less expensive switches;
- The distance from the supply, to the equipment, can be made as short as possible to minimise voltage drop.

There are several types of relays. They can be normally open or normally closed. They may have internal electronic circuits to give special operating features. For example, they can turn the switch on/off at timed intervals (flasher relay), be sensitive to current, temperature, etc. The relay cover usually gives information about the features of the relay.

On the relay cover there are usually 4 or 5 terminal markings :

- 30: input terminal direct from battery positive, normally live.
- 85: winding output terminal, usually to ground.
- 86: winding input terminal.
- 87: output terminal for normally closed contact.
- 87a: output terminal for normally open contact.

Brown relays are normally open relays, blue ones are normally closed.



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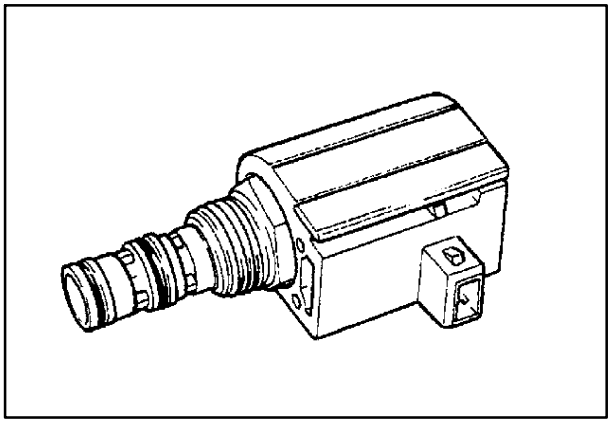
SOLENOIDS

Solenoids (Fig. 30) work in much the same way as relays, except that the iron core is not fixed in place. As a result, the windings in the control circuit cause the iron core to move.

In the starting system, for example, the movement of this core is used to send large amounts of current to the starter motor.

A solenoid is basically a winding around an iron core. In the centre of the core there is a plunger which is free to move through the core. When an electrical current passes through the winding an electro-magnetic force is produced which causes the plunger to move through the core. If the current is switched off, the magnetic force is stopped and the plunger is returned by a spring.



30

The solenoid plunger may have different uses: the most common are moving a hydraulic spool or a mechanical lever.

The use of solenoids to control hydraulic pressure instead of the hydraulic valves is highly recommended wherever there is a long distance between the control panel and the valve (more than 10 meters) or a fast action is required.

A coil should:

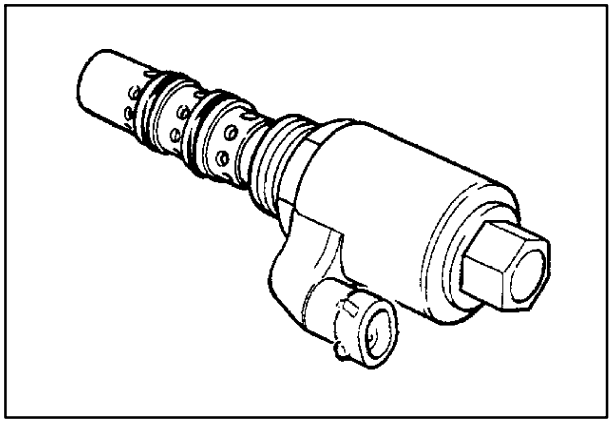
- Be non-sensitive to vibrations;
- Be silent in operation
- Have large frequency of activation (30-35 times per second)
- It should be possible to fit it in any position.
- Be insulated, in order to function correctly for a wide range of temperatures (-40 to +85°C), and with high humidity conditions.

The MOST COMMON FAULTS that can occur are:

- Short circuit winding: if a section of the winding allows the current to pass directly from positive (+) to negative (-) terminals without passing through the winding, this will cause the relevant circuit fuse to blow.
- Broken winding: causing an open circuit, it will not allow the current to pass through the winding, so the solenoid will not operate.
- Seized plunger (and/or connected components): the solenoid will only move the plunger if all components are free to move.

PWM SOLENOID VALVES

Whenever it is necessary to provide proportional control to the solenoid valves, it is much better to use a principle of operation called pulse width modulation (PWM). PWM is a variable DC voltage signal that is used to control the solenoid valves. The voltage signal is pulsed on and off many times a second (at a constant frequency of 500 Hz) at a constant supply voltage of 12 V.



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The processors contain transistors that are supplied with a constant input voltage which is switched on and off to achieve the variable input range. In this way the control module is able to limit the armature movement, so the hydraulic output flow of the solenoid is proportional to the average DC voltage. The lower voltage also allows the solenoid to operate with less residual magnetism and so the entire circuit will operate smoother.

The variable DC voltage signal level is determined by varying the duration of the ON pulse relative to the OFF pulse (see Fig. 32). The ratio between the ON time and the cycle time is called duty cycle and is stated as a percentage of one complete cycle.

With reference to Fig. 32, diagrams 1 to 3 show the normal operating range of the PWM valve, and diagram 4 shows the initial 12V programming and fill time only. The diagrams in column A show the voltage signal that is sent to the valve, whereas column B shows the relevant spring pressure and column C the reading on a voltmeter connected to the solenoid valve.

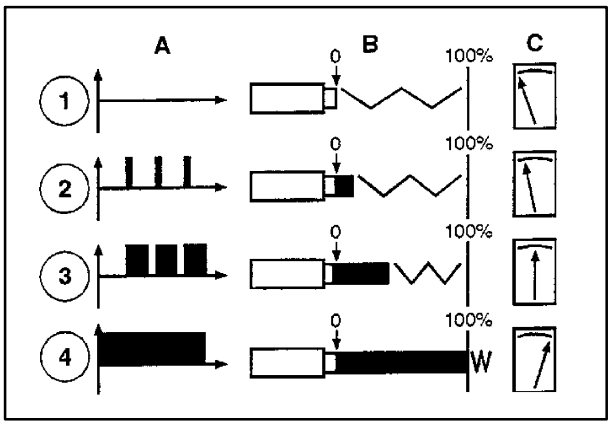

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Diagram 1 shows the OFF position: no signal is directed to the valve, which means no spring pressure in the valve at all and results in a zero voltage reading. Increasing the duty cycle causes some pressure to be made on the circuit (Diagram 2), which results in a voltmeter reading increase. Diagram 3 shows the maximum signal that is used during the normal activity of the valve: its duty cycle is around 0.5, which results in a spring pressure for the half of its run and in an indication of a 6 volt average DC current.

The electrical circuit to the solenoids can be checked by using a digital or analogue DC voltmeter, which will indicate the average voltage readings.

SENSORS

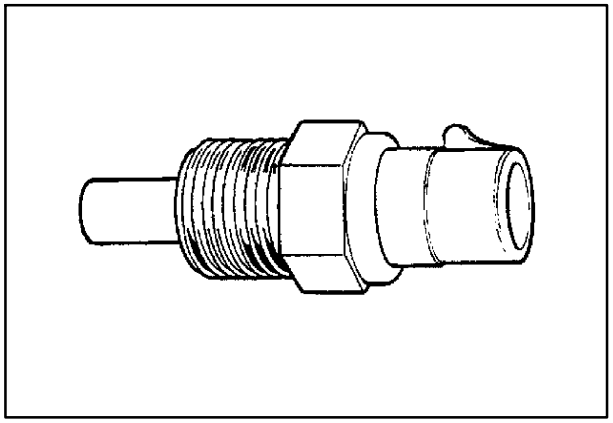
A sensor is the primary component of a measurement chain that converts the input variable (temperature, capacitance, reluctance) into a signal suitable for measurement. The relationship between the input variable and the measured signal is a characteristic of the sensor.

In the above mentioned measurement chain the signal is filtered and treated in order to adapt it to its use. It consists of three elements: the sensor itself; the converter, which converts the output signal from the sensor (in most of the cases into an electric signal); and the conditioner, which transforms the output signal from the converter in the most suitable form. Generally the term sensor indicates the entire measurement chain.

TEMPERATURE SENSORS

Generally based on a simple circuit with a thermistor. A thermistor is a resistor that changes its resistance according to the temperature.

There are two groups of thermistors: NTC (Negative Temperature Coefficient) and PTC (positive Temperature Coefficient). In the first case the higher the temperature, the lower is the resistance, and for the PTC the higher the temperature, the higher the resistance. The NTC are often used as sensors to indicate temperature change in fluids, such as the engine coolant fluid.



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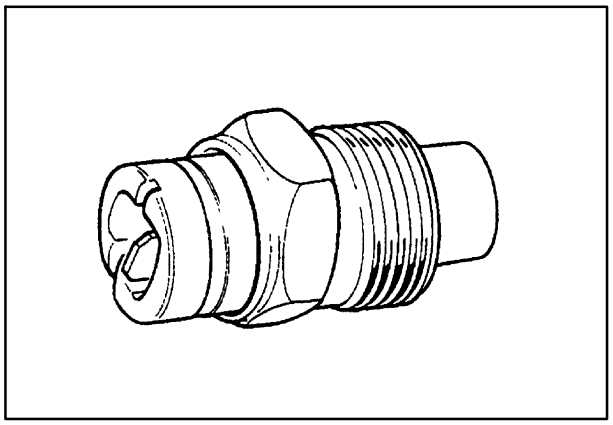
An example of these type of senders is the coolant temperature sender. The changes in its resistance (which varies with temperature) are relayed to the Instrument Cluster, which operates the bargraph and the warning indicators accordingly.

PRESSURE SENDER

A pressure sender receives a supply signal and it varies it according to the (oil) pressure. An example is the oil pressure sender, which receives a 5 volt signal and varies it according to the oil pressure. The Instrument Cluster keeps track of these variations and changes its readouts and warnings accordingly.



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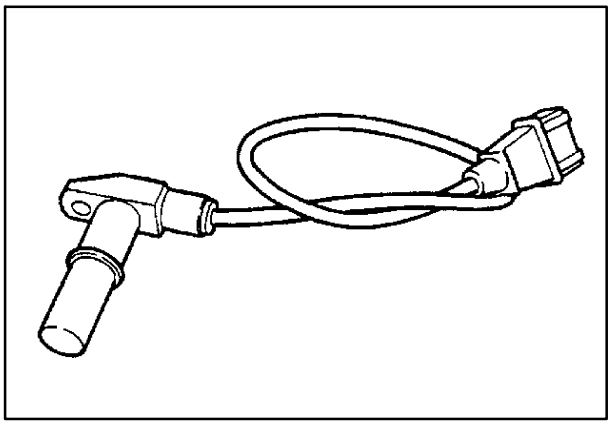
SPEED SENSOR

The speed sensor is typically a reluctance sensor. An example is the axle speed sender, which is fitted into the transmission and gets pulses off the gears, counting the gear teeth. The sender uses a pickup coil close to four wheel drive coupling. The action of the gear close to the pickup creates pulses which are relayed to the Instrument Cluster. The Instrument Cluster converts the frequency of the pulses into ground speed.

Possible failures are due to vibration, open circuits.



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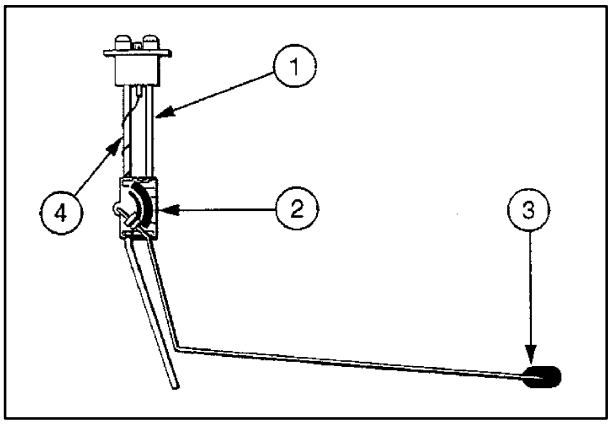
FLUID LEVEL SENDER

It operates by varying resistance through the movement of a float. An example is the fuel level sender.



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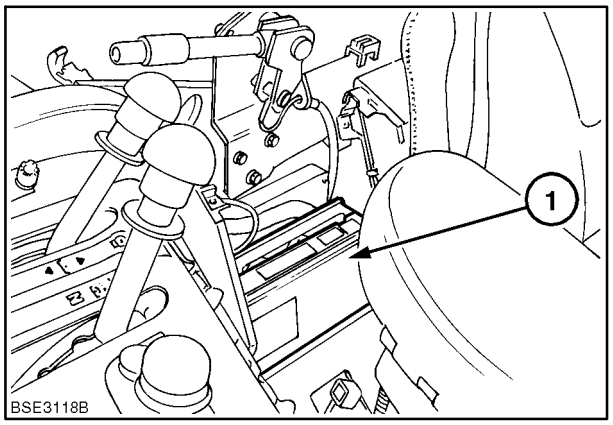
ELECTRONIC MODULES

The electronic modules are the ”black boxes” that provide control on many of the functions of the tractor. These functions may vary according to the options that are fitted on the tractor.

Inside these ”black boxes” there is a processor, the ”thinking part” of the module, and inside some of them there is one or more memories, which may allow the module to store calibration values, the configuration of the vehicle (which optional tools or devices have been installed) and the error codes.



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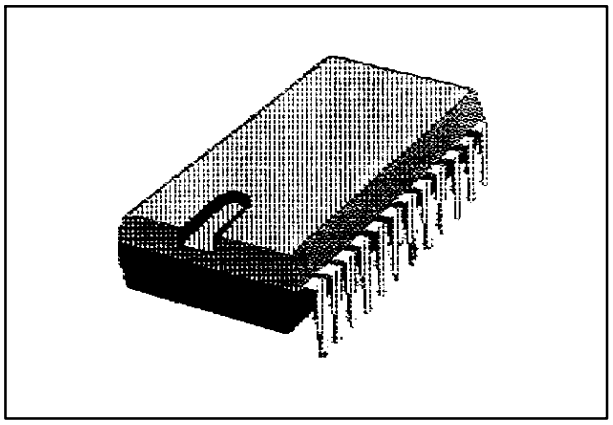
A processor has a series of pins, which are electrical contacts (see Fig. 38). There are three main types of pins: for the inputs of the signals, for the outputs and for the processor supply.



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The processor, the memories and the link between them form the hardware of the module, its ”physical” part.

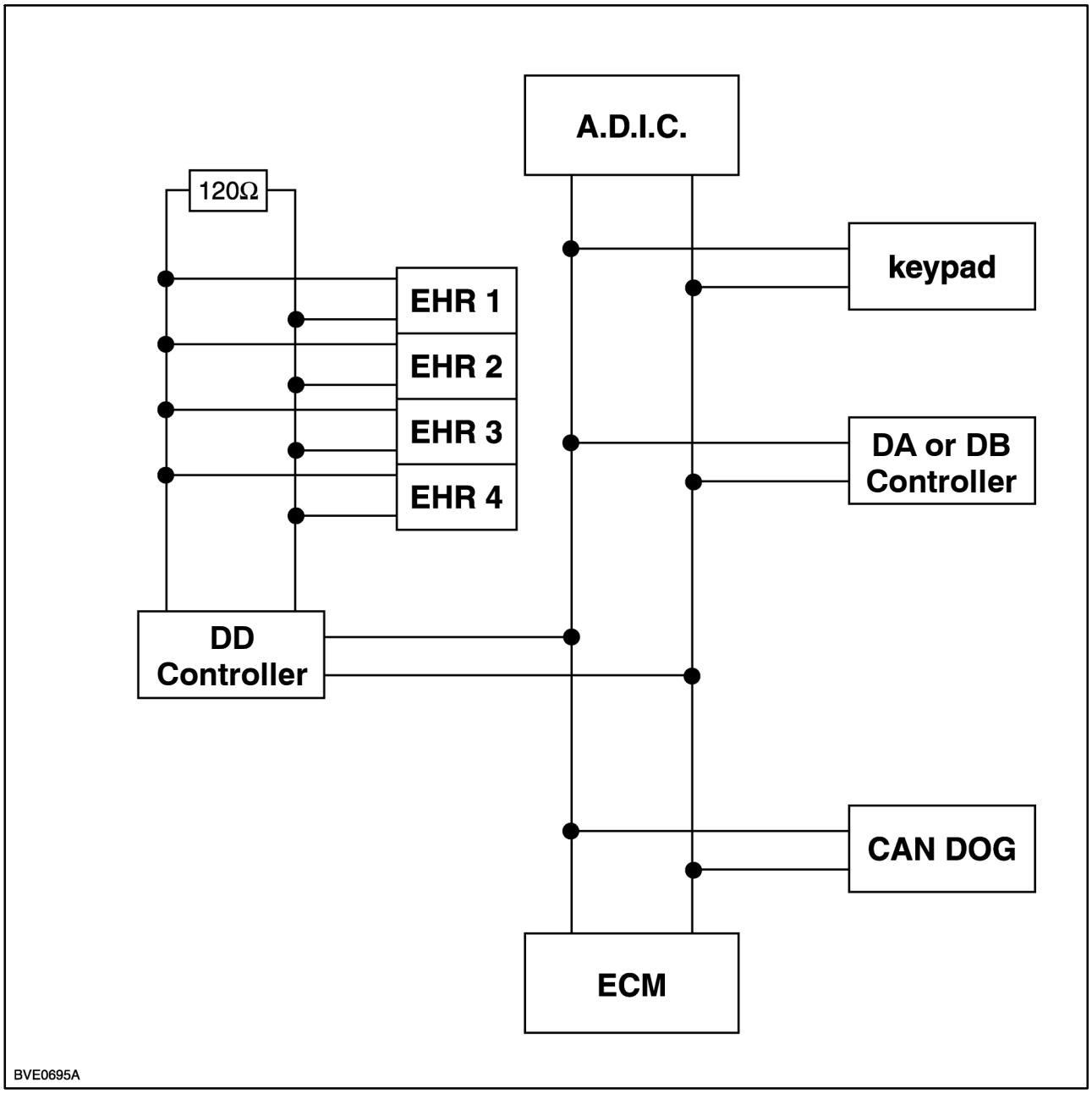
Then some software is needed, to handle the communication between the processor and the memories and to manage the various signals going into and out of the processor. The software is designed to operate in a different way for every module, and is called functional code.

A serial data link is a kind of communication where data is sent along a single wire, so the information regarding different functions of the same processor are sent to the Instrument Cluster in different moments.

To provide a continuous control on components, the processor continuously scans all the inputs in a time-sharing mode, with a cycle lasting 1Oms. This means that all the components controlled by the processor are checked one by one, and that every component is checked 100 times per second.

The electronic modules are often blamed as responsible for most of the problems of the modern tractors, while they are for certain among the most protected parts of the tractor. In fact, the pins of the module are protected against spikes (high pulses) of current, and the signals are filtered by the hardware and by the software in input and in output to give the best handling of information.

CONTROLLER AREA NETWORK (CAN) SYSTEM



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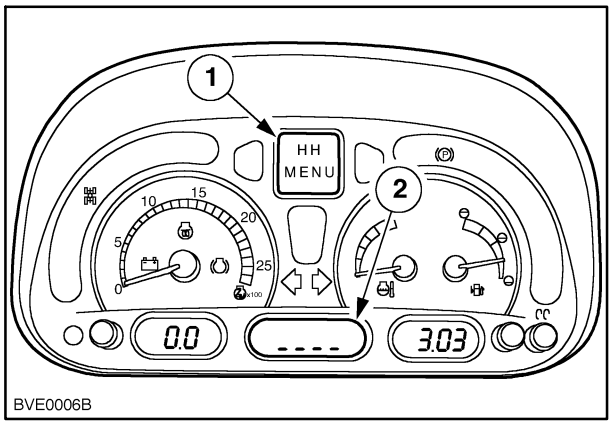
The tractor utilises a CAN (Controller Area Network) in addition to the standard wiring harnesses. The CAN is a 2-wire system which uses a series of numeric values sent at very high speed to transmit data between controllers and components. A CAN system has the advantage of being able to use one component for many applications without the need for hard wiring to each application, as in a conventional system.

Depending on the model specification, controllers are used to control a number of systems on the tractor.

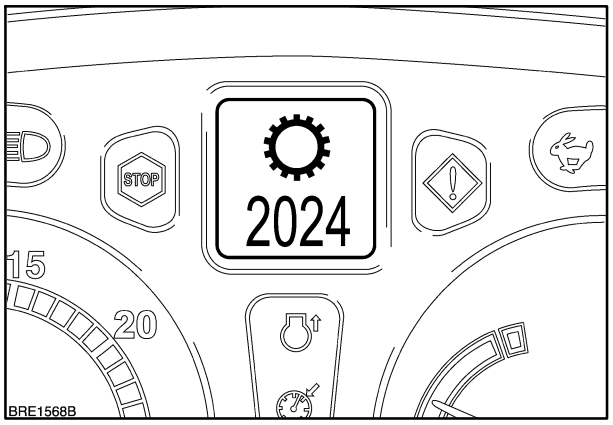
FAULT CODE DISPLAYS

All fault codes are displayed on on the analog digital instrument cluster (ADIC) dot matrix display (1) and the lower central display (2).



40

Disabling errors will be displayed on the instrument cluster dot matrix display and will be visible to the operator.



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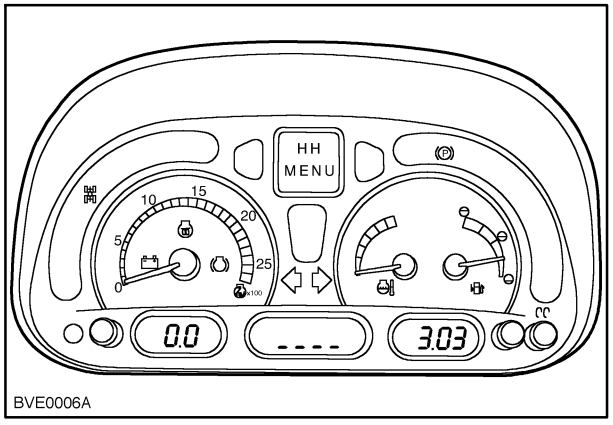
Hidden and all stored fault codes can be viewed by using the H-Menu diagnostic mode and are not visible to the operator.



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Fault Code Symbols

1. Engine		7. P.T.O. system	
2. Transmission		8. Electronic remote valves	
3. Differential lock		9. Front suspension	
4. CAN malfunction		10. Four wheel drive	
5. Electronic draft control		11. Instrument panel electrical fault	
6. Front hitch		12. Fast steer system	

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The ADIC will display a symbol accompanied by a four or five digit code to indicate a fault has occured. The symbol represents the system in which the fault is detected and the code specifies the cause of the detected fault.

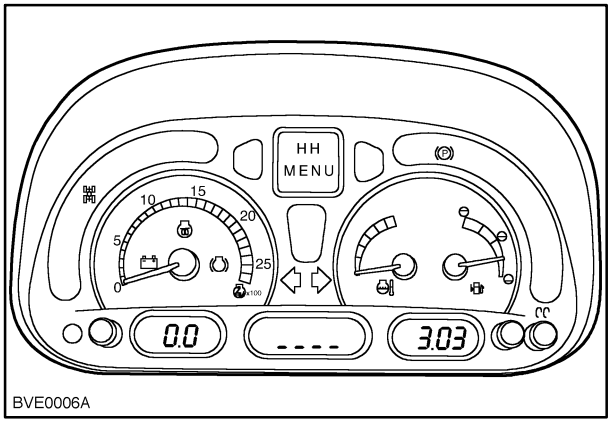
The fault codes are grouped by system using the following numbered ranges:

- 0001-1000 (General error codes)
- 1001-2000 (Transmission)
- 2001-3000 (Engine)
- 3001-4000 (Electronic draft control)
- 4001-5000 (Electronic hydraulic remote valves)
- 5001-6000 (Rear PTO)
- 6001-7000 (Four wheel drive)
- 7001-8000 (Differential lock)
- 8001-9000 (Front PTO)
- 9001-10000 (Front hitch)
- 10001-11000 (Front suspension)
- 14001-15000 (Instrument cluster)

H-MENU DIAGNOSTIC MODE

The H-menu diagnostic mode can be used to access and clear the fault codes which may be stored in the various controllers. The H-menu diagnostic mode also contains many other useful functions which may be used to assist with diagnostics.

Refer to the Diagnostic H Routines chapter in this Section.



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ERROR CODE LISTING

GENERAL

Error Code	Error description
0001	No CAN messages from the ADIC to the central controller
0003	Four wheel drive solenoid stuck off
0004	Four wheel drive solenoid open circuit

ELECTRONIC DRAFT CONTROL

Error Code	Error description
1002	Poor or no signal from tractor performance monitor radar
1003	Radar (ground speed) greater than wheel speed
1004	Wheel speed less than maximum speed of tractor
1006	Slip control voltage low (short or open circuit)
1007	Slip control voltage high (damaged potentiometer or short to +Ve Voltage)
1008	Raise / work switch failure
1009	Both external HPL fender switches are being operated simultaneously
1010	Height limit control voltage low (short or open circuit)
1011	Height limit control voltage high (damaged potentiometer or short to +Ve Voltage)
1012	Drop rate control voltage low (short or open circuit)
1013	Drop rate control voltage high (damaged potentiometer or short to +Ve Voltage)
1014	Right hand load sensing pin signal too low
1015	Right hand load sensing pin signal too high
1016	Left hand load sensing pin signal too low
1017	Left hand load sensing pin signal too hiigh
1018	Both load sensing pins disconnected
1019	Load sensing pin voltage less than 8 Volts (short or open circuit)
1020	Load sensing pin voltage greater than 8 Volts (short to +12 Volts)
1021	Draft sensitivity control voltage low (short or open circuit)
1022	Draft sensitivity control voltage high (damaged potentiometer or short to +Ve Voltage)
1023	Control panel disconnected
1024	Perform the hydraulic lift autocalibration
1025	Position control potentiometer control voltage low (short or open circuit)
1026	Position control potentiometer control voltage high (damaged potentiometer or short to +Ve Voltage)
1027	Lift arm position sensing control voltage low (short or open circuit)
1028	Lift arm position sensing control voltage high (damaged potentiometer or short to +Ve Voltage)
1029	Hydraulic control valve disconnected
1030	Signal ground open circuit
1031	Chassis harness disconnected
1032	Draft control potentiometer control voltage high (damaged potentiometer or short to +Ve Voltage)
1033	Draft control potentiometer control voltage low (short or open circuit)
1049	Wheel speed sensor open or short circuit
1053	Controller 5 Volt reference shorted to +Ve Voltage
1054	Controller 5 Volt reference short to ground

1059	8 Volt ref. draft pins only. Too high (> +9V) too low (< +7V)
1063	EDC Hydraulic valve lower solenoid open circuit
1064	EDC Hydraulic valve raise solenoid open circuit
1065	EDC Hydraulic valve lower solenoid short circuit
1066	EDC Hydraulic valve raise solenoid short circuit
1067	EDC Hydraulic valve supply voltage low
1068	Height limit calibration error

TRANSMISSION

Error Code	Error description
2001	CR – Shuttle too fast error
2002	Flashing N error
2003	CP – Clutch pedal required
2004	P – Handbrake error
2005	Creeper selection error
2011	Clutch pedal potentiometer signal low
2012	Clutch pedal potentiometer signal high
2013	Upshift and downshift switches both closed
2015	High and low range switches both closed
2016	Creeper solenoid short to ground or high voltage
2021	Chassis harness disconnected
2024	All clutches and synchronisers require calibration
2026	Engine speed too high
2027	Engine speed too low
2035	Dump solenoid short to ground or high voltage
2036	Dump solenoid open circuit
2037	Clutch pedal disconnect switch open circuit
2038	Clutch C4 solenoid short to ground or high voltage (16x16)
2038	Low range PWM valve short to ground or high voltage (24x24)
2039	Clutch C4 solenoid open circuit (16x16)
2039	Low range PWM valve open circuit (24x24)
2040	Clutch C3 solenoid short to ground or high voltage (16x16)
2040	High range PWM valve short to ground or high voltage (24x24)
2041	Clutch C3 solenoid open circuit (16x16)
2041	High range PWM valve open circuit (24x24)
2042	Clutch C2 solenoid short to ground or high voltage
2043	Clutch C2 solenoid open circuit
2044	Clutch C1 solenoid short to ground or high voltage
2045	Clutch C1 solenoid open circuit
2046	Fuse 35 open circuit
2047	Clutch disconnect switch set too high
2048	Clutch disconnect switch set too low
2049	Wheel speed sensor open circuit, short to ground or high voltage
2051	Oil temperature sensor open circuit
2052	Oil temperature sensor short to ground or high voltage
2053	5 Volt reference voltage too high
2054	5 Volt reference voltage too low
2055	No signal from wheel speed sensor
2056	Low range switch open
2057	High Range switch open

2058	Seat switch closed
2059	Shuttle lever switch disagreement
2060	Forward synchroniser no longer engaged
2061	Forward/reverese synchroniser potentiometer signal high
2062	Forward/reverese synchroniser potentiometer signal low
2063	Forward synchroniser did not engage
2064	Reverse synchroniser did not engage
2065	Forward synchroniser solenoid open circuit
2066	Reverse synchroniser solenoid open circuit
2067	Forward solenoid short to ground or high voltage
2068	Reverese solenoid short to ground or high voltage
2069	Reverse synchroniser no longer engaged
2070	Shuttle lever forward switch voltage high
2071	Shuttle lever forward switch voltage low
2072	Shuttle lever reverse switch voltage high
2073	Shuttle lever reverse switch voltage low
2075	No signal from flywheel speed sensor
2076	Flywheel speed sensor open circuit
2077	Flywheel speed sensor short to ground or high voltage
2080	1-4 (9-12) range synchroniser no longer engaged
2081	4/5 range synchroniser potentiometer signal high
2082	4/5 range synchroniser potentiometer signal low
2083	1-4 (9-12) range synchroniser engaged error
2084	5-8 (13-16) range synchroniser engaged error
2085	1-4 (9-12) range synchroniser solenoid open circuit
2086	5-8 (13-16) range synchroniser solenoid open circuit
2087	1-4 (9-12) range synchroniser solenoid short to ground or high voltage
2088	5-8 (13-16) range synchroniser solenoid short to ground or high voltage
2089	5-8 (13- 16) range synchroniser no longer engaged
2090	Output speed to high for creeper engage
2091	Clutch C3 not calibrated
2092	Clutch C4 not calibrated
2093	High clutch not calibrated
2094	Low clutch not calibrated
2095	Clutch C1 not calibrated
2096	Clutch C2 not calibrated
2097	Clutch C5 not calibrated
2098	C5 solenoid short circuit
2099	C5 solenoid open circuit
2100	C5 dump solenoid short circuit
2101	C5 dump solenoid open circuit
2124	Flywheel torque sensor not calibrated
2199	Creeper option not enabled

ELECTRONIC HYDRAULIC REMOTES (EHR)

Error Code	Error description
4100	Remote No.1 no control message received
4101	Remote No.1 control message not plausible
4102	Remote No.1 EEPROM Error
4103	Remote No.1 switched to failsafe
4104	Remote No.1 under voltage
4105	Remote No.1 over voltage
4106	Remote No.1 spool movement too low
4107	Remote No.1 spool movement too high
4108	Remote No.1 Float position not reached
4109	Remote No.1 manually operated
4110	Remote No.1 driver faulty
4111	Remote No.1 POT faulty
4112	Remote No.1 unable to reach neutral
4113	Remote No.1 spool not in neutral at key on
4114	Remote No.2 no control message received
4115	Remote No.2 control message not plausible
4116	Remote No.2 EEPROM error
4117	Remote No.2 switched to failsafe
4118	Remote No.2 under voltage
4119	Remote No.2 over voltage
4120	Remote No.2 spool movement too low
4121	Remote No.2 spool movement too high
4122	Remote No.2 float position not reached
4123	Remote No.2 manually operated
4124	Remote No.2 driver faulty
4125	Remote No.2 POT faulty
4126	Remote No.2 unable to reach neutral
4127	Remote No.2 spool not in neutral at key on
4128	Remote No.3 no control message received
4129	Remote No.3 control message not plausible
4130	Remote No.3 EEPROM error
4131	Remote No.3 switched to failsafe
4132	Remote No.3 under voltage
4133	Remote No.3 over voltage
4134	Remote No.3 spool movement too low
4135	Remote No.3 spool movement too high
4136	Remote No.3 float position not reached
4137	Remote No.3 manually operated
4138	Remote No.3 driver faulty
4139	Remote No.3 POT faulty

4140	Remote No.3 unable to reach neutral
4141	Remote No.3 spool not in neutral at key on
4142	Remote No.4 no control message received
4143	Remote No.4 control message not plausible
4144	Remote No.4 EEPROM error
4145	Remote No.4 switched to failsafe
4146	Remote No.4 under voltage
4147	Remote No.4 over voltage
4148	Remote No.4 spool movement too low
4149	Remote No.4 spool movement too high
4150	Remote No.4 float position not reached
4151	Remote No.4 manually operated
4152	Remote No.4 driver faulty
4153	Remote No.4 POT faulty
4154	Remote No.4 unable to reach neutral
4155	Remote No.4 spool not on neutral at key on
4170	EHR control No.1 not calibrated
4171	EHR control No.1 open circuit
4172	EHR control No.1 short circuit
4173	EHR control No.2 not calibrated
4174	EHR control No.2 open circuit
4175	EHR control No.2 short circuit
4176	Timer switch No.1 /No.2 not connected
4177	EHR Control No.3 not calibrated
4178	EHR control No.3 open circuit
4179	EHR control No.3 short circuit
4180	EHR control No.4 not calibrated
4181	EHR control No.4 open circuit
4182	EHR control No.4 short circuit
4183	Timer switch No.3/No.4 not connected
4184	EHR joystick POT X open circuit
4185	EHR joystick POT X short circuit
4186	EHR joystick POT Y open circuit
4187	EHR joystick POT Y short circuit
4190	No communication from EHR No.1
4191	No communication from EHR No.2
4192	No communication from EHR No.3
4193	No communication from EHR No.4
4194	Motor mode No.1 switch faulty
4195	Motor mode No.2 switch faulty
4196	Motor mode No.3 switch faulty
4197	Motor mode No.4 switch faulty

Electronic Hydraulic Remotes Flash Code Listing

NOTE: *EHR valve may need the paint removed from the valve casing, next to the connector.*

Flash codes are displayed on the EHR valve. The LED is internal and can be seen flashing through the plastic part of the valve casing, located next to the valve harness connector.

First flash sequence will be after a long pause, next sequence will be after a short pause.

E.G. flash code 16 – Long pause then 1 flash, short pause then 6 flashes, long pause then 1 flash.....

Flash Code	Fault	Description
11	No control message	CAN BUS message fault
13	Implausible control message	CAN BUS message fault
16	EEPROM inconsistent	Software fault
17	Messages not received in the specified time	CAN BUS message fault
21	Under voltage	Supply voltage low
22	Over voltage	Supply voltage high
23	Spool deflection too short	Valve internal fault, possibly mechanical
24	Spool deflection excessive	Valve internal fault, possibly mechanical
25	Open centre position not reached	Valve internal fault, possibly mechanical
26	Manual operation detected	Valve has been operated manually
31	Under 8 Volts	Displayed only if the valve does not shut–down automatically. Valve will shut off the output stage.
32	Over 36 or 45 Volts	Displayed only if the valve does not shut–down automatically. Valve will shut off the output stage.
41	Over 45 Volts	Valve will internally shut–down
42	Output stage for the pilot solenoid valve fault	Valve internal fault
43	Position transducer fault	Position of the spool detected by the transducer
81	Valve spool cannot be returned to neutral	Valve internal fault, possibly mechanical
82	Valve spool not in neutral when switched on	Valve internal fault, possibly mechanical
83	Checksum error	Self diagnostic check of the system

ENGINE

Error Code	Fault description
3001	Foot throttle pedal position sensor low idle switch not plausible
3002	Foot throttle pedal positon sensor high voltage
3003	Foot throttle pedal positon sensor low voltage
3004	Foot throttle pedal position sensor open circuit or sensor disconnected
3005	Foot throttle pedal position sensor power supply short to +Ve or ground
3006	Coolant temperature sensor high value
3007	Coolant temperature sensor high voltage
3008	Coolant temperature sensor low voltage
3009	Coolant temperature sensor open circuit or sensor disconnected
3010	Boost temperature sensor high voltage
3011	Boost temperature sensor signal low voltage
3012	Boost temperature sensor open circuit or sensor disconnected
3014	Fuel temperature sensor high value
3015	Fuel temperature sensor high voltage
3016	Fuel temperature sensor low voltage
3017	Fuel temperature sensor open circuit or sensor disconnected
3018	Boost pressure sensor high value
3019	Boost pressure sensor high voltage
3020	Boost pressure sensor low voltage
3021	Boost pressure sensor open circuit or sensor disconnected
3022	Boost pressure signal power supply short to +Ve or ground
3023	Atmospheric pressure sensor high value
3024	Atmospheric pressure sensor high voltage
3025	Atmospheric pressure sensor low voltage
3026	Atmospheric pressure sensor open circuit
3027	Oil pressure sensor high value
3028	Oil pressure sensor low value
3029	Oil pressure sensor high voltage
3030	Oil pressure sensor low voltage
3031	Oil pressure sensor open circuit or sensor disconnected
3032	Oil pressure sensor signal power supply short to +Ve or ground
3033	Oil temperature sensor high value
3034	Oil temperature sensor high voltage
3035	Oil temperature sensor low voltage
3036	Oil temperature sensor open circuit or sensor disconnected
3037	Fuel filter heater relay short to VCC
3038	Fuel filter heater relay short to ground
3039	Fuel filter heater relay disconnected or open circuit

3040	Cold start heater relay short to VCC
3041	Cold start heater relay short to ground
3042	Cold start heater relay disconnected or open circuit
3049	Battery voltage signal high value
3050	Battery voltage signal low value
3051	Battery voltage signal high voltage
3052	Battery voltage signal low voltage
3060	Fuel injector solenoid cyl 1 current decreased to fast
3061	Fuel injector solenoid cyl 1 short to VCC
3062	Fuel injector solenoid cyl 1 short to ground
3063	Fuel injector solenoid cyl 1 disconnected or open circuit
3064	Fuel injector solenoid cyl 5 current decreased to fast
3065	Fuel injector solenoid cyl 5 short to VCC
3066	Fuel injector solenoid cyl 5 short to ground
3067	Fuel injector solenoid cyl 5 disconnected or open circuit
3068	Fuel injector solenoid cyl 3 current decreased to fast
3069	Fuel injector solenoid cyl 3 short to VCC
3070	Fuel injector solenoid cyl 3 short to ground
3071	Fuel injector solenoid cyl 3 disconnected or open circuit
3072	Fuel injector solenoid cyl 6 current decreased to fast
3073	Fuel injector solenoid cyl 6 short to VCC
3074	Fuel injector solenoid cyl 6 short to ground
3075	Fuel injector solenoid cyl 6 disconnected or open circuit
3076	Fuel injector solenoid cyl 2 current decreased to fast
3077	Fuel injector solenoid cyl 2 short to VCC
3078	Fuel injector solenoid cyl 2 short to ground
3079	Fuel injector solenoid cyl 2 disconnected or open circuit
3080	Fuel injector solenoid cyl 4 current decreased to fast
3081	Fuel injector solenoid cyl 4 short to VCC
3082	Fuel injector solenoid cyl 4 short to ground
3083	Fuel injector solenoid cyl 4 disconnected or open circuit
3084	Fuel injector boost capacitor 1 high voltage
3085	Fuel injector boost capacitor 1 low voltage
3086	Fuel injector boost capacitor 2 high voltage
3087	Fuel injector boost capacitor 2 low voltage
3088	Increment speed signal error or reversed connections
3089	Increment speed signal excessive noise on circuit
3090	Segment speed signal phase error detection
3091	Segment speed signal error or reversed connections
3092	Engine speed signals, camshaftt or crankshaft signals not plausible
3093	Engine speed sensor high voltage

3094	Engine speed sensor low voltage
3095	Engine speed readings camshaft or crankshaft signals missing on start
3096	CAN A line no signal
3097	CAN B line no signal
3098	CAN TE control source low
3099	CAN TE control no signal
3100	CAN AE control source low
3101	CAN AE control no signal
3102	Fuel pressure monitoring low pressure
3103	Fuel pressure signal high value
3104	Fuel pressure signal high voltage
3105	Fuel pressure signal low voltage
3106	Fuel pressure sensor open circuit or disconnected
3107	Fuel metering unit short to VCC
3108	Fuel metering unit short to ground
3109	Fuel metering unit load diconnected or short to ground
3110	Fuel pressure relief value to high for long duration
3111	Fuel pressure relief value open
3112	Fuel pressure monitoring high pressure
3113	Main relay (Transistor supply UB2 is defective)
3114	Main relay (Transistor supply UB3 is defective)
3115	Main relay (Transistor supply UB4 is defective)
3116	Main relay (Controller internal source high)
3117	Self test not complete before power down
3117	ECU Self test shutoff paths (After run)
3118	Power supply for sensors not correct
3119	Power supply for sensors disconnected or failed
3120	Power supply for sensors high or low detected
3121	PTO twist sensor open circuit
3122	PTO twist sensor short to ground
3123	PTO twist sensor not calibrated
3124	Hand throttle position sensor potentiometer 2 over voltage
3125	Hand throttle position sensor potentiometer 2 under voltage
3126	Hand throttle position sensor potentiometer 1 over voltage
3127	Hand throttle position sensor potentiometer 1 under voltage
3128	Hand throttle position sensor difference error
3131	ECU self test shutoff paths (start up)
3132	CRPM switch short

REAR PTO

Error code	Error description
5001	Rear PTO brake solenoid stuck off
5002	Rear PTO brake solenoid stuck on
5003	Rear PTO brake output open circuit
5004	Rear PTO brake driver over temperature
5005	Brake switch open circuit
5007	Rear PTO solenoid stuck off
5008	Rear PTO solenoid overcurrent
5024	Rear PTO not calibrated
5027	Rear PTO speed sensor open circuit
5033	Rear PTO cab normally closed switch open circuit
5034	Fender mounted rear PTO switch open circuit or short to ground
5035	Fender mounted rear PTO switch input short to +Ve Voltage
5036	PTO failed to start
5037	Rear PTO cab normally open switch stuck closed
5038	Cab and fender PTO switches operated within 2 seconds
5039	Incorrect voltage on fender mounted rear PTO switch
5042	PTO management switch started
5099	Auto PTO mode not enabled

FOUR WHEEL DRIVE

Error Code	Error description
6020	Four wheel drive switch error
6021	Four wheel drive solenoid stuck on
6022	Four wheel drive solenoid stuck off
6023	Four wheel drive solenoid open circuit

DIFFERENTIAL LOCK

Error Code	Error description
7014	Differential lock switch error
7015	Differential lock solenoid stuck off
7016	Differential lock solenoid stuck on
7017	Differential lock solenoid open circuit
7018	Differential lock driver over temperature
7024	Steering angle sensor not calibrated
7031	Steering angle sensor out of maximum range
7032	Steering angle sensor out of minimum range

FRONT PTO

Error code	Error description
8007	Front PTO solenoid stuck off
8008	Front PTO solenoid circuit overcurrent
8024	Front PTO not calibrated
8027	Front PTO speed sensor open circuit
8033	Front PTO cab normally closed switch open circuit
8036	PTO failed to start
8037	Front PTO cab normally open switch stuck closed
8099	Front PTO option not enabled

FRONT HPL

Error code	Error description
9001	Front HPL POT open circuit
9002	Front HPL POT short circuit

SUSPENDED FRONT AXLE

Fault Code	Fault description
10001	Upper lockout solenoid error
10002	Raise solenoid error
10003	Lower solenoid error
10004	Front axle potentiometer threshold is higher than the set limit
10005	Front axle potentiometer threshold is lower than the set limit
10007	Front axle weight has been reduced but the suspension is unable to reset nominal height
10008	Front axle weight has been increased but the suspension is unable to reset nominal height
10009	Lower lockout solenoid error
10024	The front suspension is not calibrated
10099	Front suspension mode not enabled

INSTRUMENT CLUSTER

Error Code	Error description
14001	Rear power take off (PTO) solenoid overcurrent
14002	Rear power take off (PTO) solenoid stuck off
14011	Engine speed sensor open circuit or short to high voltage
14012	Engine speed sensor short to ground
14021	Radar sensor open circuit or short to high voltage
14022	Radar sensor short to ground
14031	Front PTO solenoid overcurrent
14032	Front PTO solenoid stuck off
14041	Engine coolant temperature sensor short to high voltage
14042	Engine coolant temperature sensor open circuit or short to ground
14051	Fuel tank level sender open circuit or short to high voltage
14052	Fuel tank level sender short to ground
14061	Airbrake pressure sensor open circuit or short to high voltage
14071	Front hitch position potentiometer short circuit
14072	Front hitch position potentiometer open circuit
14081	Engine oil pressure sensor short to high voltage
14082	Engine oil pressure sensor open circuit or short to ground
14091	Wheel speed sensor open circuit or short to high volltage
14092	Wheel speed sensor short to ground
14100	Airbrake option needs to be set
14200	Error with Electrical Programmable Read Only Memory (EEPROM)
14900	Central controller not connected
14901	Engine module missing
14902	Auxiliary controller not connected
14903	Small control module not connected
14905	Instrument cluster key pad not connected
14906	FSS (Fast Steer System) missing
14907	Gear shift indicator missing

FAST STEERING

Error Code	Error description
15002	Steering wheel control proximity sensor open cicuit
15003	Steering wheel control proximity sensor short circuit
15006	Split valve LVDT sensor open circuit
15007	Split valve LVDT sensor short circuit
15008	Change valve solenoid open circuit and short to ground
15009	Change valve solenoid short circuit across itself
15010	Safety Switch fail
15011	Maximum engagement time elapsed (5 minutes)
15012	Split valve spool stuck open
15013	Change valve or Split valve spools stuck closed
15014	Split valve spool stuck in transition zone, system can't identify which steering mode the tractor is in.
15024	System not calibrated

U-CODE LISTING

Error code	Error description
Err	An error has occurred during calibration - The calibration procedure cannot continue please key off
U01	Front axle potentiometer open circuit
U02	Front axle potentiometer threshold too high
U03	Front axle potentiometer short circuit
U04	Front axle potentiometer threshold too low
U05	Suspension out of range
U07	Suspension not moving when raise solenoid is active
U08	Suspension did not reach maximum within 20 seconds
U09	Suspension not moving when lower solenoid is active
U10	Suspension did not reach minimum within 25 seconds
U11	Unable to complete calibration procedure
U12	Calibration procedure stopped, vehicle not staitonary
U13	Front suspension not enabled (will not calibrate)
U19	Transmission oil temperature low
U20	Handbrake is not set
U21	ERPM is below 1150, increase engine speed (Rear PTO/Transmission)
U21	ERPM is below 1300, increase engine speed (Fast Steer)
U22	ERPM is above 1350, reduce engine speed
U23	Shuttle lever is in neutral, shift lever to forward
U24	Not used
U25	Range lever is in low, shift out of low
U26	Clutch pedal is not up, release clutch pedal
U27	C3 calibration value too low
U28	C3 calibration value too high
U29	C4 calibration value too low
U30	C4 calibration value too high
U31	Wheel speed sensed
U32	C1 calibration value too low
U33	C1 calibration value too high
U34	C2 calibration value too low
U35	C2 calibration value too high
U37	Syncro potentiometer signal is out of range for reverse
U38	Syncro potentiometer signal is out of range for forward
U39	Syncro did not move toward reverse, even at the max pressure
U40	Syncro did not move toward forward, even at the max pressure
U41	Syncro potentiometer signal is out of range for 4 position

U42	Syncro potentiometer signal is out of range for 5 position
U43	Syncro did not move toward 4
U44	Syncro did not move toward 5, even at the max pressure
U45	50Kph clutch 5 calibration values too low
U46	50Kph clutch 5 calibration values too high
U47	50Kph clutch 5 solenoid not present
U51	Engine speed error
U52	Constant ERPM switch detected
U53	Ground speed drive selected
U54	PTO brake switch detected
U55	PTO started
U56	PTO stopped
U57	No PTO speed sensor selected
U58	PTO twist sensor open circuit
U59	PTO twist sensor short circuit
U60	Lever No.1 not in neutral
U61	Lever No.2 not in neutral
U62	Lever No.3 not in neutral
U63	Lever No.4 not in neutral
U65	Engine running during “H8” procedure
U66	PTO shaft speed detected to early during PTO calibration procedure
U67	PTO switch in the wrong position when completing calibration procedure
U70	PTO twist sensor not calibrated
U71	Fast Steer Enable switch off
U72	Fast Steer Proximity sensor – Open, out of range
U73	Fast Steer Proximity sensor – Closed, out of range
U74	Fast Steer LVDT calibration unsuccessful (out of range after 5th attempt)
U80	Flywheel torque sensor calibration unsuccessful, try again
U81	No signal from flywheel torque sensor
U82	No 12VD – No power for C3 and C4 solenoids
U83	4–5 synchro did not shift to 4 for calibration of flywheel torque sensor
U84	Insufficient current sensed on synchro test
U99	There is a transmission error, check the upper display

ERROR CODE ERR – AN ERROR HAS OCCURRED DURING CALIBRATION (THE CALIBRATION PROCEDURE CANNOT CONTINUE PLEASE KEY OFF)

Possible failure modes:

1. Short or open circuit solenoid for clutch No.1 is detected
2. Short or open circuit solenoid for clutch No.2 is detected
3. Short or open circuit solenoid for clutch No.3 is detected
4. Short or open circuit solenoid for clutch No.4 is detected

NOTE: The vehicle can be driven without calibration – error codes for the faulty solenoid will appear.

ERROR CODE U01 – FRONT AXLE POTENTIOMETER OPEN CIRCUIT

Possible failure modes:

1. Check for other error codes
2. ACP will not work
3. Potentiometer signal below 10%
4. Check wiring to the potentiometer
5. Faulty potentiometer

NOTE: Use the H9 voltmeter to detect signal.

ERROR CODE U02 – FRONT AXLE POTENTIOMETER THRESHOLD TO HIGH

Possible failure modes:

1. Check for other error codes
2. Potentiometer signal above 85%
3. Check wiring to the potentiometer (short to +5 Volts)
4. Faulty potentiometer

NOTE: Use the H9 voltmeter to detect signal.

ERROR CODE U03 – FRONT AXLE POTENTIOMETER SHORT CIRCUIT

Possible failure modes:

1. Check for other error codes
2. Potentiometer signal above 90%
3. Check wiring to the potentiometer (short to +12 Volts)
4. Faulty potentiometer

NOTE: Use the H9 voltmeter to detect signal.

ERROR CODE U04 – FRONT AXLE POTENTIOMETER THRESHOLD TO LOW

Possible failure modes:

1. Potentiometer signal below 20%
2. Check potentiometer installation
3. Faulty potentiometer

NOTE: Use the H9 voltmeter to detect signal.

ERROR CODE U05 – SUSPENSION OUT OF RANGE

Possible failure modes:

1. Check potentiometer installation
2. Mechanical fault
3. Faulty raise solenoid
4. Low hydrualic pressure

ERROR CODE U07 – SUSPENSION NOT MOVING WHEN RAISE SOLENOID IS ACTIVE

Possible failure modes:

1. Check harness installation (red label for raise solenoid)
2. Check solenoid harness and connector
3. Low hydraulic pressure
4. Hydraulic leak in suspension manifold
5. Mechanical fault
6. Faulty raise solenoid

ERROR CODE U08 – SUSPENSION DID NOT REACH MAXIMUM WITHIN 20 SECONDS

Possible failure modes:

1. Low hydraulic pressure
2. Check potentiometer installation
3. Check solenoid connection (raise solenoid fitted to lockout harness)
4. Hydraulic leak in suspension manifold
5. Mechanical fault
6. Faulty raise solenoid

ERROR CODE U09 – SUSPENSION NOT MOVING WHEN LOWER SOLENOID IS ACTIVE

Possible failure modes:

1. Check harness installation (green label for lower solenoid)
2. Check solenoid and harness connector
3. Mechanical fault
4. Faulty lower solenoid

ERROR CODE U10 – SUSPENSION DID NOT REACH MINIMUM WITHIN 25 SECONDS

Possible failure modes:

1. Check potentiometer installation
2. Mechanical fault
3. Faulty lower solenoid

ERROR CODE U11 – UNABLE TO COMPLETE CALIBRATION PROCEDURE

Possible failure modes:

1. Lockout switch pressed more than three times or during calibration
2. Intermittent harness connection between switch and controller
3. Check suspension mechanics
4. Check hydraulic pressure

ERROR CODE U12 – CALIBRATION PROCEDURE STOPPED, VEHICLE NOT STATIONARY

Possible failure modes:

1. Handbrake not applied
2. Rear axle speed sensor faulty

ERROR CODE U13 – FRONT SUSPENSION NOT ENABLED (WILL NOT CALIBRATE)

Possible failure modes:

1. Option not enabled
2. Rear axle speed sensor faulty

NOTE: Go into H3 then the front suspension option and set the option to “yes”.

ERROR CODE U19 – TRANSMISSION OIL TEMPERATURE LOW

Possible failure modes:

1. Transmission oil is vey cold
2. Open circuit for the transmission oil temperature sensor
3. Faulty oil temperature sensor
4. Oil temperature sensor shorted to ground

NOTE: Use the H5 switch diagnostics to detect if the handbrake is connected.

ERROR CODE U20 – HANDBRAKE IS NOT SET

Possible failure modes:

1. Handbrake not applied
2. Open circuit for the handbrake feed into the controller
3. Faulty handbrake switch
4. Switched 12V supply fuse blown

NOTE: Use the H5 switch diagnostics to detect if the handbrake is connected.

ERROR CODE U21 – ERPM IS BELOW 1150, INCREASE ENGINE SPEED (REAR PTO / TRANSMISSION)

Possible failure modes:

1. Operator has not set the correct engine speed
2. Open circuit between the engine speed sensor and the instrument cluster – Mechanical engines only
3. Instrument cluster is not powered
4. Faulty CAN circuit

NOTE: Use the HE in the transmission module to see if the engine speed is being detected.

ERROR CODE U21 – ERPM IS BELOW 1300, INCREASE ENGINE SPEED (FAST STEER)

Possible failure modes:

1. Operator has not set the correct engine speed
2. Open circuit between the engine speed sensor and the instrument cluster – Mechanical engines only
3. Instrument cluster is not powered
4. Faulty CAN circuit

NOTE: Use the HE in the fast steer module to see if the engine speed is being detected.

ERROR CODE U22 – ERPM IS ABOVE 1350, REDUCE ENGINE SPEED

Possible failure modes:

1. Operator has not set the correct engine speed

ERROR CODE U23 – SHUTTLE LEVER IS IN NEUTRAL, SHIFT LEVER TO FORWARD

Possible failure modes:

1. Operator has not selected forward on the shuttle lever
2. Open circuit between the shuttle lever and the controller
3. Switched 12V supply fuse blown

NOTE: Use the H5 switch diagnostics to detect if the switch is connected.

ERROR CODE U25 – RANGE LEVER IS IN LOW, SHIFT OUT OF LOW

Possible failure modes:

1. Operator has not moved the range lever out of neutral
2. The low range switch is faulty
3. The gear linkage is out of adjustment

NOTE: Use the H5 switch diagnostics to detect if the switch is connected.

ERROR CODE U26 – CLUTCH PEDAL IS NOT UP, RELEASE CLUTCH PEDAL

Possible failure modes:

1. Operator has not released the clutch pedal
2. The clutch potentiometer linkage is sticking or broken

NOTE: Use the H9 in the transmission module to see if the clutch input is OK.

ERROR CODE U27 – C3 CALIBRATION VALUE TOO LOW

Possible failure modes:

1. RPM dropped too soon
2. Clutch pressure is not being controlled properly
3. Engine speed adjusted whilst completing calibration

ERROR CODE U28 – C3 CALIBRATION VALUE TOO HIGH

Possible failure modes:

1. RPM did not drop
2. No pressure to clutch
3. Mechanical failure breaking the torque path

ERROR CODE U29 – C4 CALIBRATION VALUE TOO LOW

Possible failure modes:

1. RPM dropped too soon
2. Clutch pressure is not being controlled properly
3. Engine speed adjusted whilst completing calibration

ERROR CODE U30 – C4 CALIBRATION VALUE TOO HIGH

Possible failure modes:

1. RPM did not drop
2. No pressure to clutch
3. Mechanical failure breaking the torque path

ERROR CODE U31 – WHEEL SPEED SENSED

Possible failure modes:

1. Handbrake not applied
2. Brakes not working

NOTE: If the brakes are OK move the vehicle slightly forward and repeat calibration.

ERROR CODE U32 – C1 CALIBRATION VALUE TOO LOW

Possible failure modes:

1. RPM dropped too soon
2. Clutch pressure is not being controlled properly
3. Engine speed adjusted whilst completing calibration

ERROR CODE U33 – C1 CALIBRATION VALUE TOO HIGH

Possible failure modes:

1. RPM did not drop
2. No pressure to clutch
3. Mechanical failure breaking the torque path

ERROR CODE U34 – C2 CALIBRATION VALUE TOO LOW

Possible failure modes:

1. RPM dropped too soon
2. Clutch pressure is not being controlled properly
3. Engine speed adjusted whilst completing calibration

ERROR CODE U35 – C2 CALIBRATION VALUE TOO HIGH

Possible failure modes:

1. RPM did not drop
2. No pressure to clutch
3. Mechanical failure breaking the torque path

ERROR CODE U37 – SYNCRO POTENTIOMETER SIGNAL IS OUT OF RANGE FOR REVERSE

Possible failure modes:

1. Syncro potentiometer has been painted through production
2. Syncro potentiometer connector has been damaged
3. Syncro assembly is very tight / sticky

NOTE: Use the voltmeter to check the syncro potentiometer signal. If OK then repeat calibration to free up syncro.

ERROR CODE U38 – SYNCRO POTENTIOMETER SIGNAL IS OUT OF RANGE FOR FORWARD

Possible failure modes:

1. Syncro potentiometer has been painted through production
2. Syncro potentiometer connector has been damaged
3. Syncro assembly is very tight / sticky

NOTE: Use the voltmeter to check the syncro potentiometer signal. If OK then repeat calibration to free up syncro.

ERROR CODE U39 – SYNCRO DID NOT MOVE TOWARD REVERSE, EVEN AT THE MAX PRESSURE

Possible failure modes:

1. The forward and reverse solenoid connectors need to be swapped
2. The reverse solenoid is faulty
3. No oil pressure to shift the syncro
4. Syncro potentiometer has been painted through production
5. Syncro potentiometer connector has been damaged

NOTE: Remove the transmission top cover and watch the syncro movement to help detect failure or use H9 and look at the potentiometer signal with a voltmeter.

ERROR CODE U40 - SYNCRO DID NOT MOVE TOWARD FORWARD, EVEN AT THE MAX PRESSURE

Possible failure modes:

1. The forward and reverse solenoid connectors need to be swapped
2. The forward solenoid is faulty
3. No oil pressure to shift the syncro
4. Syncro potentiometer has been painted through production
5. Syncro potentiometer connector has been damaged

NOTE: Remove the transmission top cover and watch the syncro movement to help detect failure or use H9 and look at the potentiometer signal with a voltmeter.

ERROR CODE U41 - SYNCRO POTENTIOMETER SIGNAL IS OUT OF RANGE FOR 4 POSITION

Possible failure modes:

1. Syncro potentiometer has been painted through production
2. Syncro potentiometer connector has been damaged
3. Syncro assembly is very tight / sticky

NOTE: Use the voltmeter to check the syncro potentiometer signal. If OK then repeat calibration to free up syncro.

ERROR CODE U42 - SYNCRO POTENTIOMETER SIGNAL IS OUT OF RANGE FOR 5 POSITION

Possible failure modes:

1. Syncro potentiometer has been painted through production
2. Syncro potentiometer connector has been damaged
3. Syncro assembly is very tight / sticky

NOTE: Use the voltmeter to check the syncro potentiometer signal. If OK then repeat calibration to free up syncro.

ERROR CODE U43 - SYNCRO DID NOT MOVE TOWARD 4

Possible failure modes:

1. The 4 and 5 solenoid connectors need to be swapped
2. The 4 solenoid is faulty
3. No oil pressure to shift the syncro
4. Syncro potentiometer has been painted through production
5. Syncro potentiometer connector has been damaged

NOTE: Remove the transmission top cover and watch the syncro movement to help detect failure or use H9 and look at the potentiometer signal with a voltmeter.

ERROR CODE U44 – SYNCRO DID NOT MOVE TOWARD 5, EVEN AT MAX PRESSURE

Possible failure modes:

1. The 4 and 5 solenoid connectors need to be swapped
2. The 5 solenoid is faulty
3. No oil pressure to shift the syncro
4. Syncro potentiometer has been painted through production
5. Syncro potentiometer connector has been damaged

NOTE: Remove the transmission top cover and watch the syncro movement to help detect failure or use H9 and look at the potentiometer signal with a voltmeter.

ERROR CODE U45 – 50KPH CLUTCH 5 CALIBRATION VALUES TOO LOW

Possible failure modes:

1. RPM dropped to soon
2. Clutch pressure is not being controlled properly
3. Engine speed adjusted whilst completing calibration

ERROR CODE U46 – 50KPH CLUTCH 5 CALIBRATION VALUES TOO HIGH

Possible failure modes:

1. RPM did not drop
2. No pressure to the clutch
3. Mechanical failure breaking the torque path

ERROR CODE U47 – 50KPH CLUTCH SOLENOID NOT PRESENT

Possible failure modes:

1. Open circuit to clutch 5 solenoid
2. Solenoid failure

ERROR CODE U51 – ENGINE SPEED ERROR

Possible failure modes:

1. Check that engine speed sensor is fitted
2. Open circuit for the engine speed sensor going to the instrument cluster – Mechanical Engines only
3. Instrument cluster is not powered
4. CAN BUS open circuit

NOTE: *Use the HE in the transmission module to see if the engine speed is being detected.*

ERROR CODE U52 – CONSTANT ERPM SWITCH DETECTED

Possible failure modes:

1. CRPM switch activation during calibration proceudre
2. CPRM switch pressed more than three times to start the calibration procedure
3. Intermittant short to 12V in the CRPM harness
4. Faulty CRPM switch

ERROR CODE U53 – GROUND SPEED DRIVE SELECTED

Possible failure modes:

1. Ground drive been engaged when completing the rear PTO calibration
2. Harness link missing (only fitted when the ground drive lever is not fitted)
3. Ground speed PTO switch open circuit
4. Ground speed PTO switch short to ground
5. Faulty switch

NOTE: Turn on the ignition and select the PTO speed display to see if the ground PTO state is active, or use the H5 switch diagnostics to determine the state.

ERROR CODE U54 – PTO BRAKE SWITCH DETECTED

Possible failure modes:

1. PTO brake switch pressed during the calibration procedure

ERROR CODE U55 – PTO STARTED

Possible failure modes:

1. Rear PTO operated during the calibration procedure (for PTO calibration, must wait for “CL” or “CH”)

ERROR CODE U56 – PTO STOPPED

Possible failure modes:

1. Rear PTO operated during the calibration procedure
2. Faulty harness between the rear PTO switch and the controller
3. Faulty PTO switch

ERROR CODE U57 – NO PTO SPEED SENSOR DETECTED

Possible failure modes:

1. PTO speed sensor not fitted
2. PTO speed selector in neutral
3. Check PTO speed sensor connections

NOTE: Use the HE in the controller to see if the PTO speed sensor is being detected.

ERROR CODE U58 – PTO TWIST SENSOR OPEN CIRCUIT

Possible failure modes:

1. Check for other error codes
2. Check signal in “HF” menu
3. Open circuit to PTO twist sensor
4. Check the CAB connector
5. Mechanical problem with the gear wheel

ERROR CODE U59 – PTO TWIST SENSOR SHORT CIRCUIT

Possible failure modes:

1. Check for other error codes
2. Check signal in “HF” menu
3. Short to +12V circuit to PTO twist sensor
4. Check the CAB connector

ERROR CODE U60 – LEVER NO.1 NOT IN NEUTRAL

ERROR CODE U61 – LEVER NO.2 NOT IN NEUTRAL

ERROR CODE U62 – LEVER NO.3 NOT IN NEUTRAL

ERROR CODE U63 – LEVER NO.4 NOT IN NEUTRAL

ERROR CODE U65 – ENGINE RUNNING DURING “H8” PROCEDURE

Possible failure modes:

1. Shutdown engine
2. Restart “H8” procedure

ERROR CODE U66 – PTO SHAFT SPEED DETECTED TOO EARLY DURING PTO CALIBRATION

Possible failure modes:

1. Brake solenoid has low pressure
2. PTO valve sticky
3. Oil temperature too low, warm up tractor and repeat calibration

ERROR CODE U67 – PTO SWITCH IN THE WRONG POSITION WHEN COMPLETING CALIBRATION PROCEDURE

Possible failure modes:

1. PTO switch set in start position (Turn switch “OFF”)
2. Faulty PTO switch

ERROR CODE U70 – PTO TWIST SENSOR NOT CALIBRATED

Possible failure modes:

1. Perform PTO twist sensor calibration procedure

ERROR CODE U71 – FAST STEER SYSTEM ENABLE SWITCH OFF

Possible failure modes:

1. Turn on the enable switch and repeat calibration
2. Faulty enable switch – Check enable switch and connector

ERROR CODE U72 – FAST STEER PROXIMITY SENSOR – OPEN, OUT OF RANGE

Possible failure modes:

1. Incorrect position of the steering wheel
2. Faulty proximity sensor – Check sensor and connector

ERROR CODE U73 – FAST STEER PROXIMITY SENSOR – CLOSED, OUT OF RANGE

Possible failure modes:

1. Incorrect position of the steering wheel
2. Faulty proximity sensor – Check sensor and connector

ERROR CODE U74 – FAST STEER LVDT CALIBRATION UNSUCCESSFUL (OUT OF RANGE AFTER 5TH ATTEMPT)

Possible failure modes:

1. Faulty LVDT sensor – Check LVDT sensor and connector
2. Faulty Fast Steer System hydraulic valve
3. Incorrect assembly of hydraulic valve

ERROR CODE U84 – INSUFFICIENT CURRENT SENSED ON SYNCHRO TEST

Possible failure modes:

1. Check harness connection to synchro
2. Faulty synchro

ERROR CODE U99 – THERE IS A TRANSMISSION ERROR, CHECK THE UPPER DISPLAY

0001 – 1000 GENERAL ERROR CODE LISTING

Error Code	Error description
0001	No CAN messages from the ADIC to the central controller
0003	Four wheel drive solenoid stuck off
0004	Four wheel drive solenoid open circuit

ERROR CODE 0001 – NO CAN MESSAGES FROM THE ADIC TO THE CENTRAL CONTROLLER

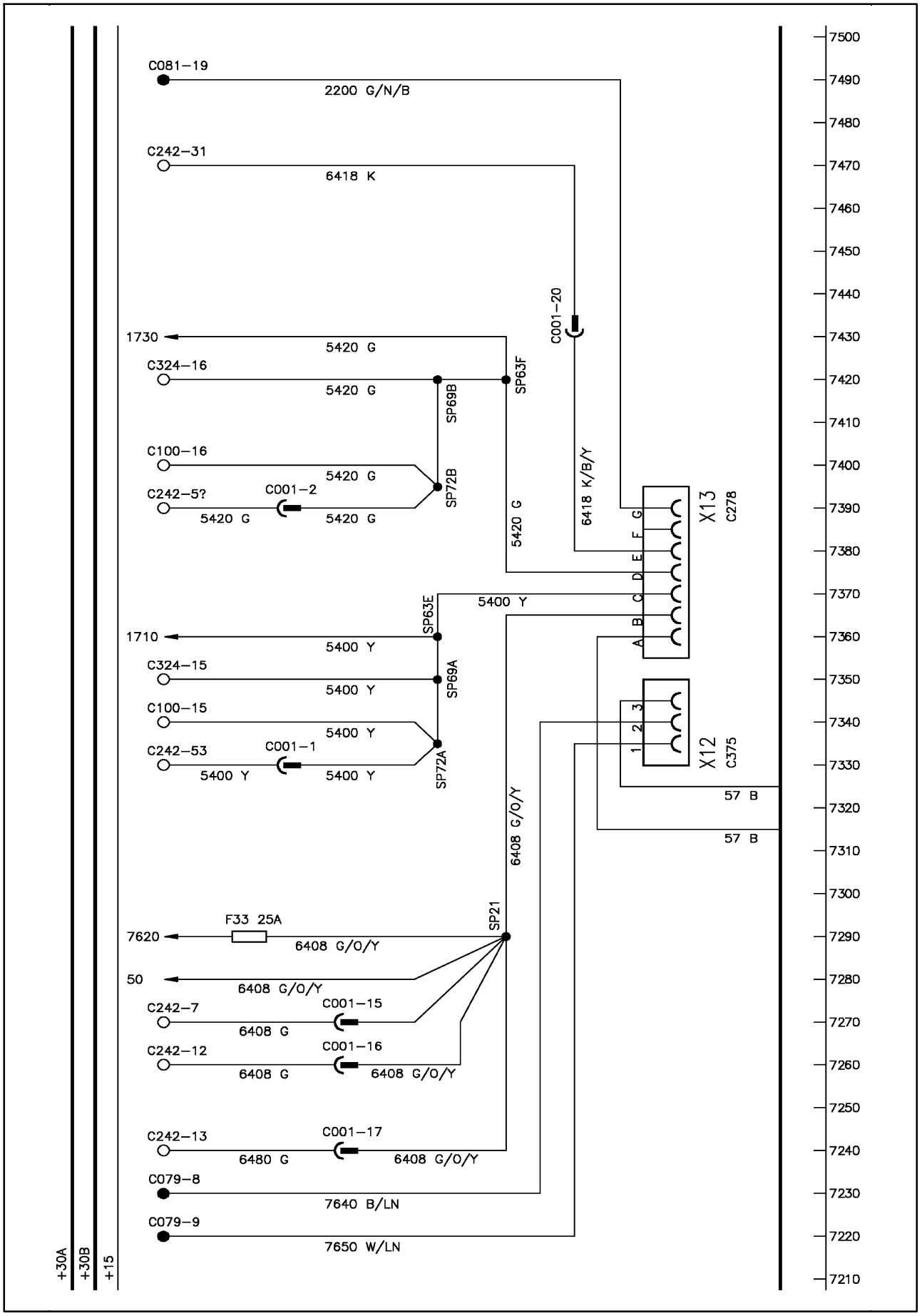
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the central controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the controller connector **C100**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C100**. Check between connector:
   C278 (High) pin **C (Y)** and **C100** pin **15 (Y)**
   C278 (Low) pin **D (G)** and **C100** pin **16 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C081 (High) pin **26 (Y)** and **C100** pin **15 (Y)**
   C081 (Low) pin **25 (G)** and **C100** pin **16 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the controller.


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
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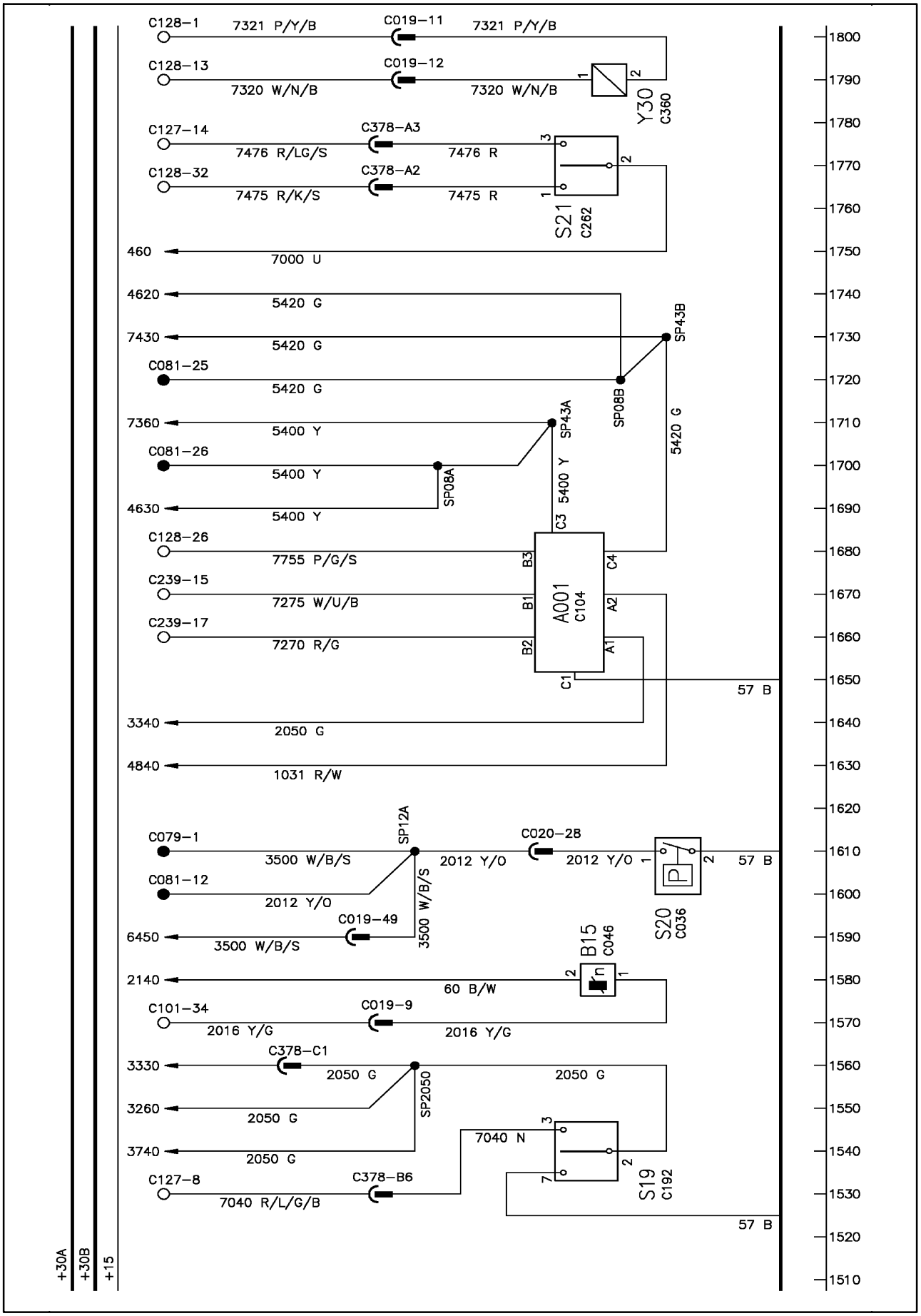
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
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1600
1590
1580
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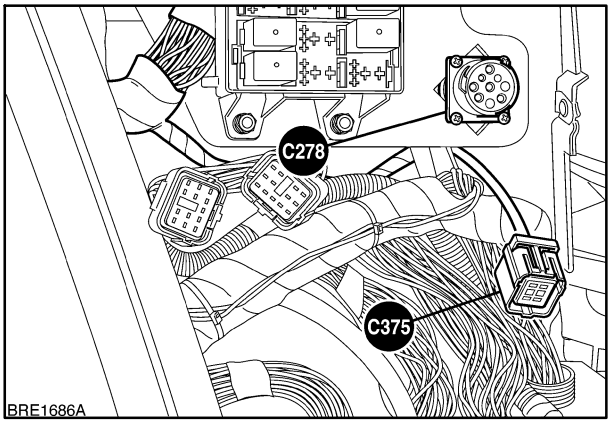
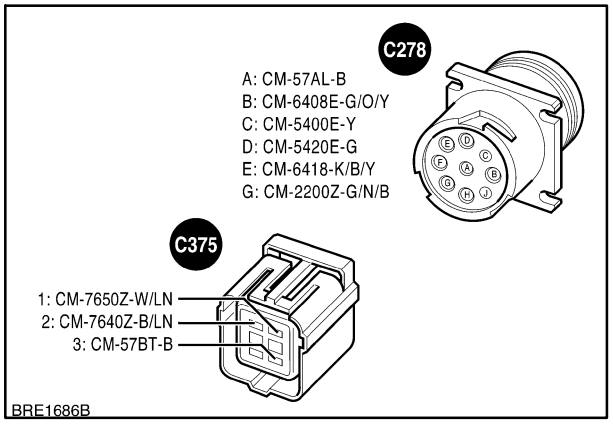
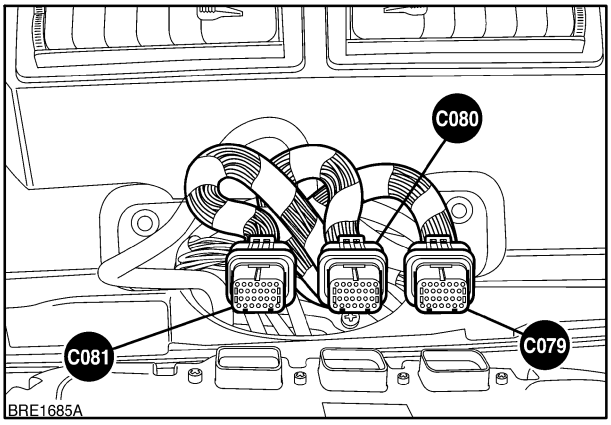
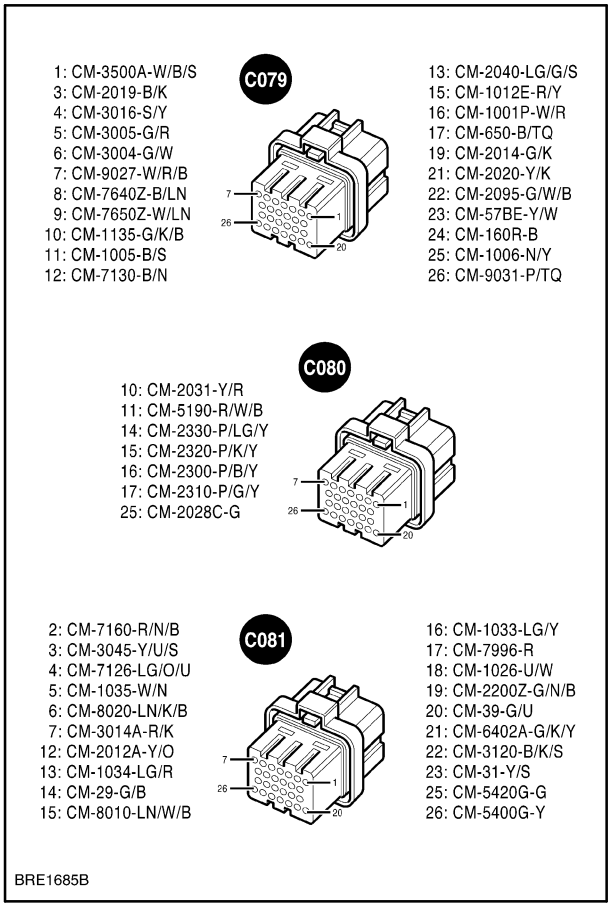
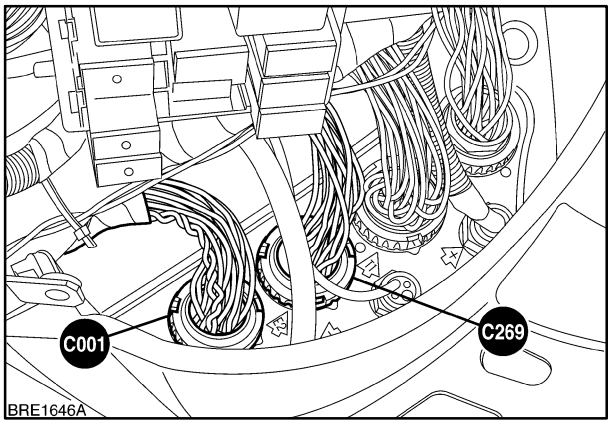
1560
1550
1540
1530
1520
1510


C278
C375
BRE1686A

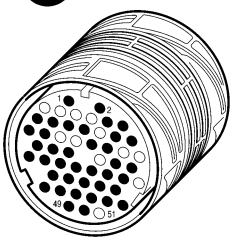

C278
A: CM-57AL-B
B: CM-6408E-G/O/Y
C: CM-5400E-Y
D: CM-5420E-G
E: CM-6418-K/B/Y
G: CM-2200Z-G/N/B
C375
1: CM-7650Z-W/LN
2: CM-7640Z-B/LN
3: CM-57BT-B
BRE1686B


C080
C081
C079
BRE1685A


C079
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

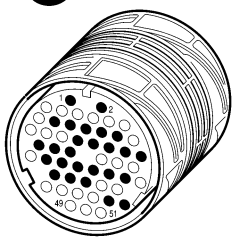


C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 0003 – FOUR WHEEL DRIVE SOLENOID STUCK OFF

Possible failure modes:

1. Faulty solenoid
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. Turn the keystart OFF. Disconnect the 4WD solenoid connector **C034**. Turn the keystart ON and make sure 2WD is selected. Turn the Keystart OFF and ON. If only error code 0003 or 6022 is displayed continue to step 2.

   B. If error code 0004, 6021 or 6023 are displayed, continue to step 3.

2. Check for a short to ground.

   A. Turn the keystart OFF. Disconnect the controller connector **C128**. Check between connector **C128** pin **7 (Y/K)** and **ground**. If a short to ground is indicated, disconnect the inline harness connector **C019** and check between connector:

   C128 pin **7 (Y/K)** and **ground**

   C034 pin **1 (Y)** and **ground**

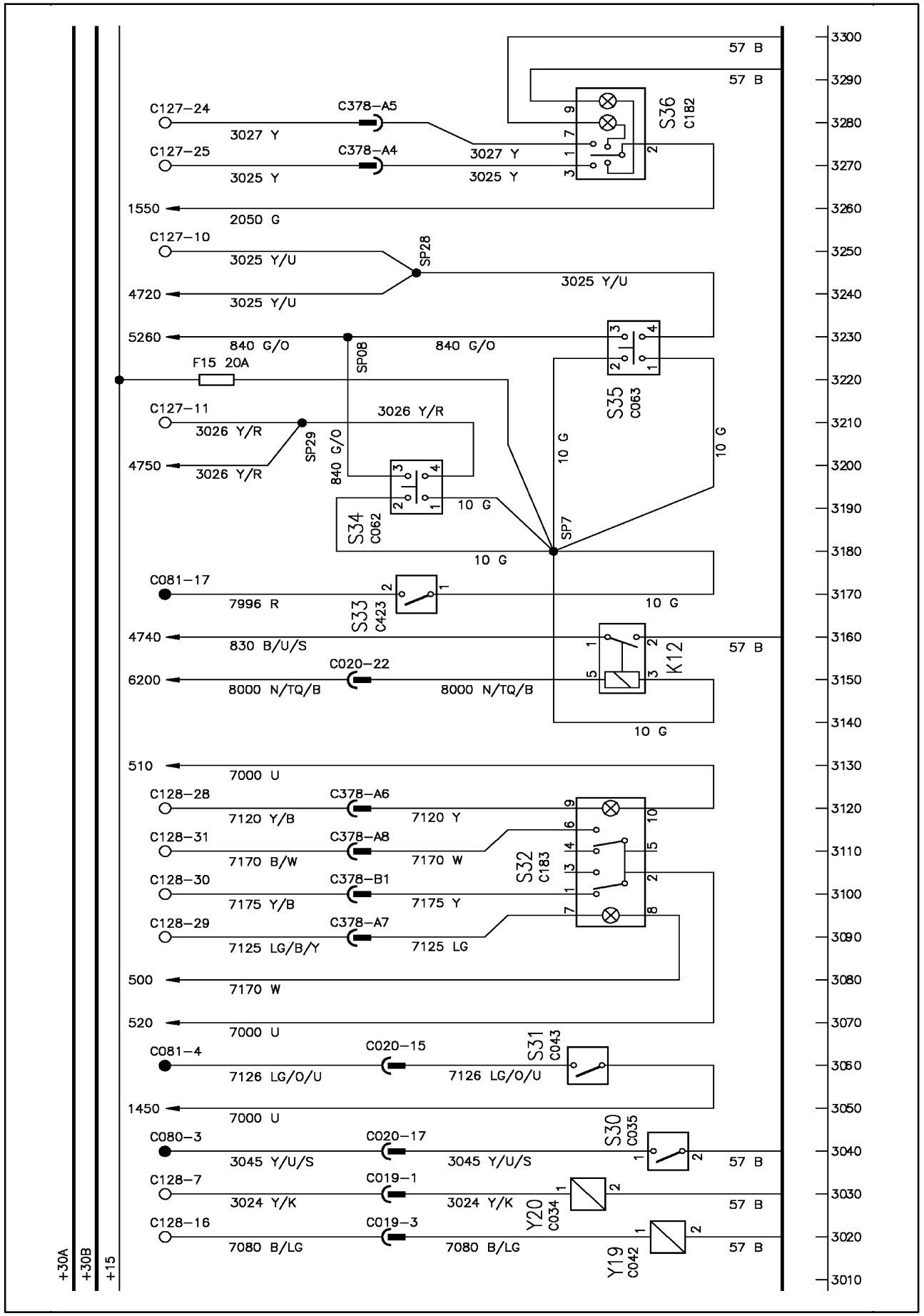
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.

3. Check the 4WD solenoid.

   A. Measure the resistance between the solenoid terminals. If the resistance indicated is not between 5 – 11 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the solenoid is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
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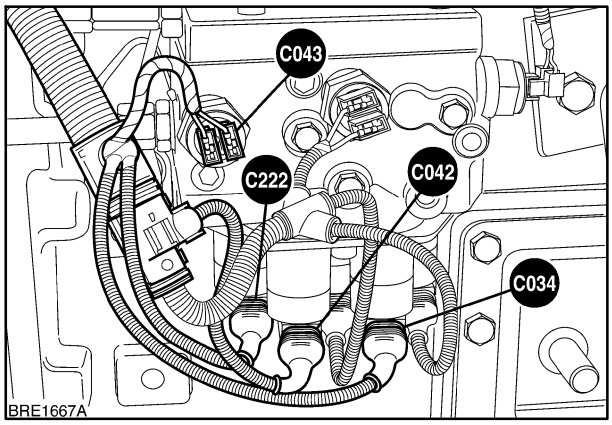
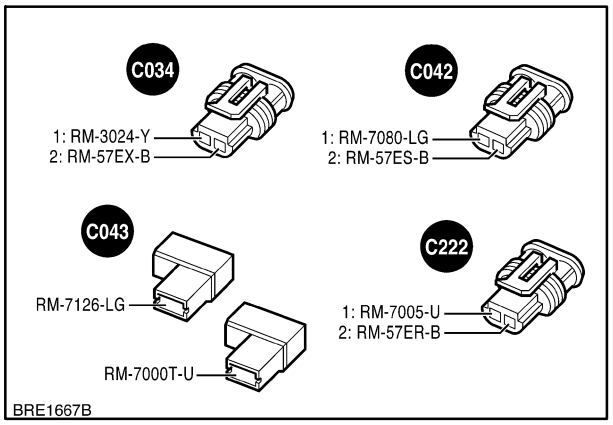
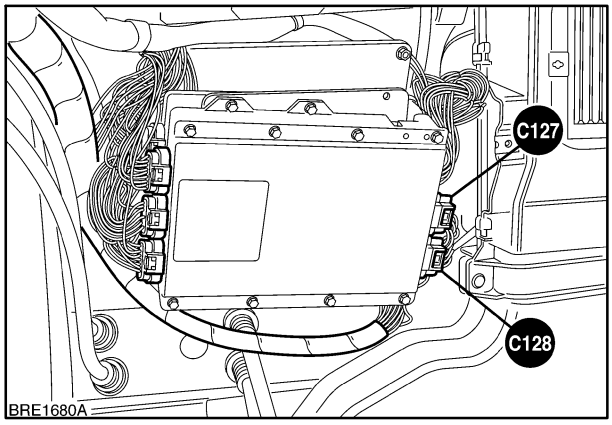
3020
3010







C127

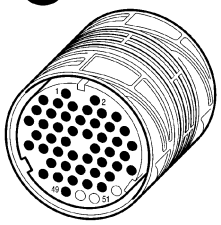
1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

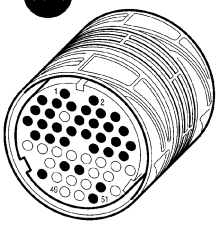
BRE1680B

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 0004 – FOUR WHEEL DRIVE SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 4WD solenoid connector **C034**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the solenoid for an open.

   A. Disconnect connector **C034**. Check between the solenoid terminals. If an open circuit is indicated, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for an open circuit.

   A. Check between connector **C034** pin **2 (B)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connector **C128**. Check between connector **C128** pin **7 (Y/K)** and **C034** pin **1 (Y)**. If an open circuit is indicated, disconnect the inline harness connector **C019** and check between connector:

   C019 pin **1 (Y)** and **C034** pin **1 (Y)**

   C019 pin **1 (Y/K)** and **C128** pin **7 (Y/K)**

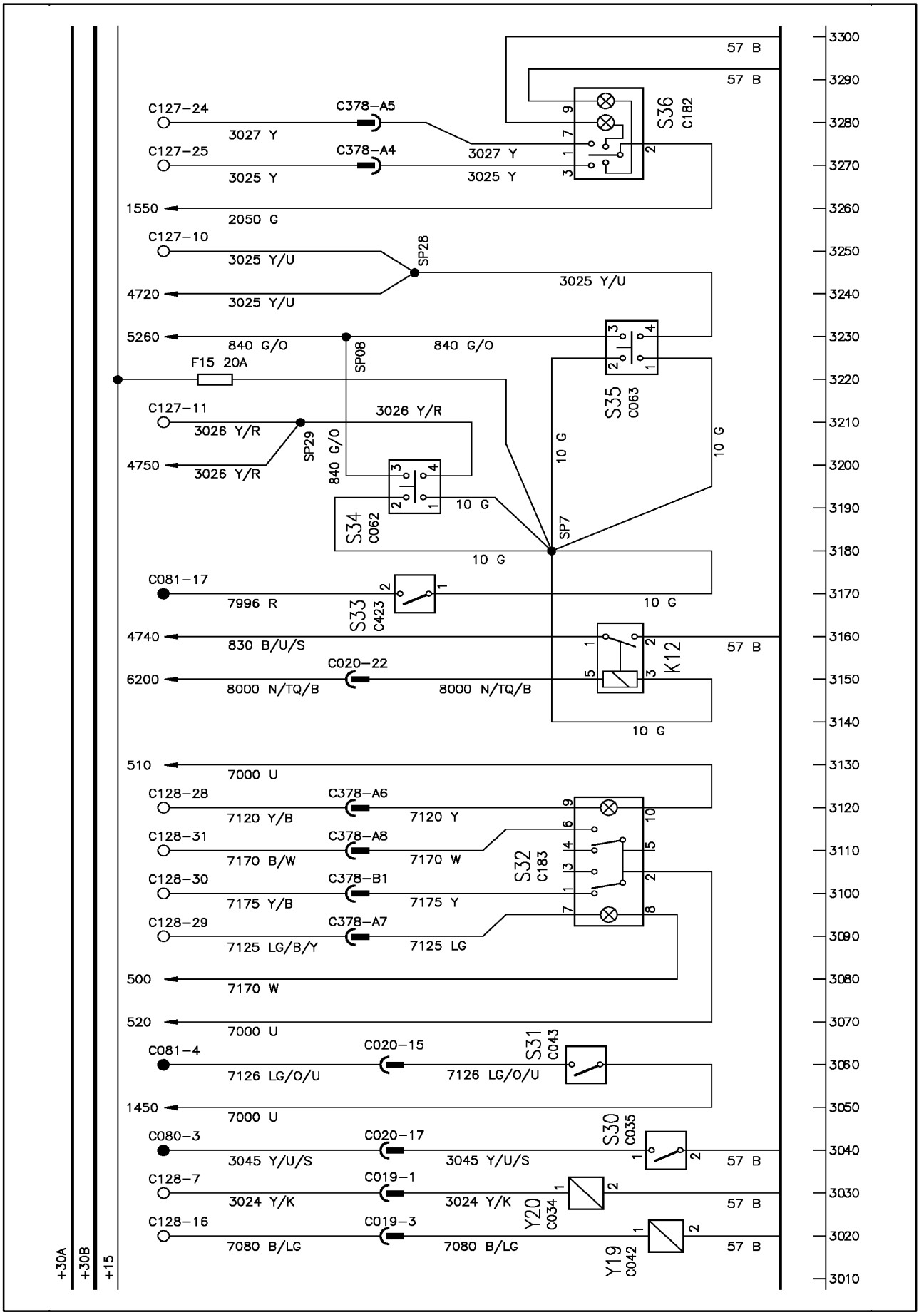
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check connectors **C128** and **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
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3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
4750
3026 Y/R
840 G/O
10 G
10 G
S34
C062
10 G
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
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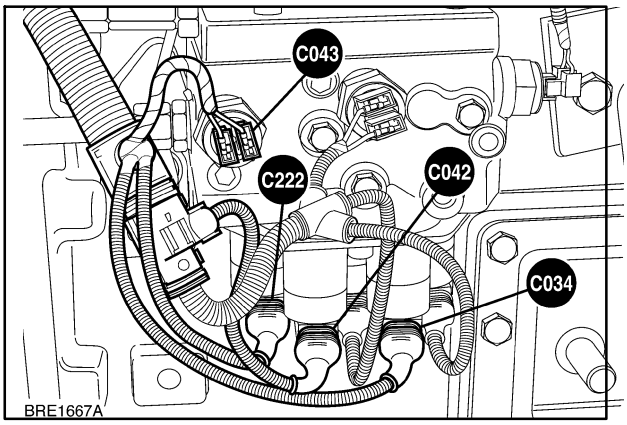
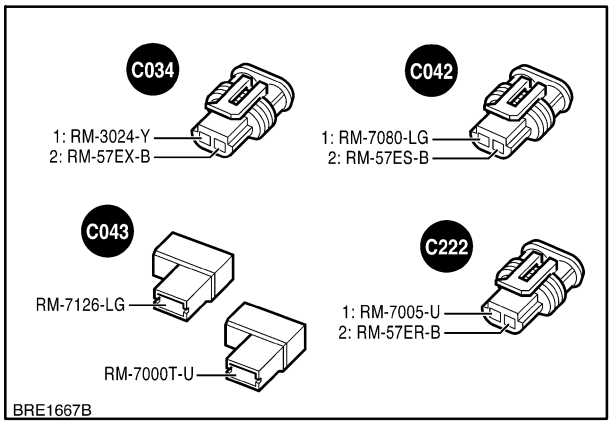
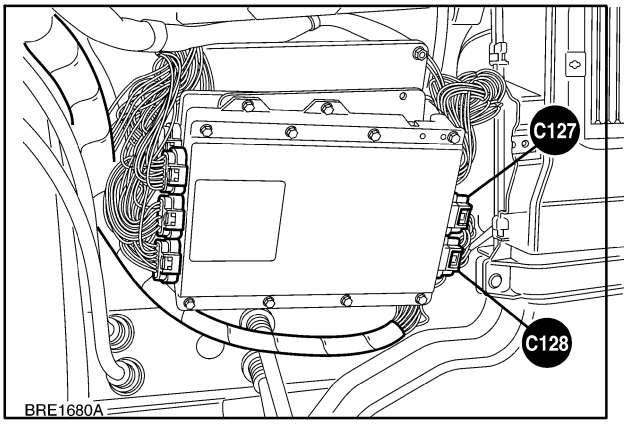
3010







C127

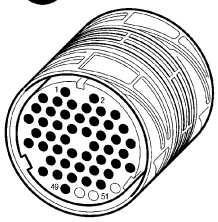
1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

C019



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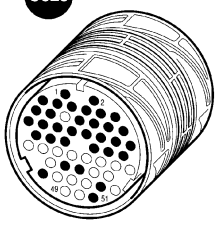
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

1001 – 2000 ELECTRONIC DRAFT CONTROL LISTING

Error Code	Error description
1002	Poor or no signal from tractor performance monitor radar
1003	Radar (ground speed) greater than wheel speed
1004	Wheel speed less than maximum speed of tractor
1006	Slip control voltage low (short or open circuit)
1007	Slip control voltage high (damaged potentiometer or short to +Ve Voltage)
1008	Raise / work switch failure
1009	Both external HPL fender switches are being operated simultaneously
1010	Height limit control voltage low (short or open circuit)
1011	Height limit control voltage high (damaged potentiometer or short to +Ve Voltage)
1012	Drop rate control voltage low (short or open circuit)
1013	Drop rate control voltage high (damaged potentiometer or short to +Ve Voltage)
1014	Right hand load sensing pin signal too low
1015	Right hand load sensing pin signal too high
1016	Left hand load sensing pin signal too low
1017	Left hand load sensing pin signal too hiigh
1018	Both load sensing pins disconnected
1019	Load sensing pin voltage less than 8 Volts (short or open circuit)
1020	Load sensing pin voltage greater than 8 Volts (short to +12 Volts)
1021	Draft sensitivity control voltage low (short or open circuit)
1022	Draft sensitivity control voltage high (damaged potentiometer or short to +Ve Voltage)
1023	Control panel disconnected
1024	Perform the hydraulic lift autocalibration
1025	Position control potentiometer control voltage low (short or open circuit)
1026	Position control potentiometer control voltage high (damaged potentiometer or short to +Ve Voltage)
1027	Lift arm position sensing control voltage low (short or open circuit)
1028	Lift arm position sensing control voltage high (damaged potentiometer or short to +Ve Voltage)
1029	Hydraulic control valve disconnected
1030	Signal ground open circuit
1031	Chassis harness disconnected
1032	Draft control potentiometer control voltage high (damaged potentiometer or short to +Ve Voltage)
1033	Draft control potentiometer control voltage low (short or open circuit)
1049	Wheel speed sensor open or short circuit
1053	Controller 5 Volt reference shorted to +Ve Voltage
1054	Controller 5 Volt reference short to ground

1059	8 Volt ref. draft pins only. Too high (> +9V) too low (< +7V)
1063	EDC Hydraulic valve lower solenoid open circuit
1064	EDC Hydraulic valve raise solenoid open circuit
1065	EDC Hydraulic valve lower solenoid short circuit
1066	EDC Hydraulic valve raise solenoid short circuit
1067	EDC Hydraulic valve supply voltage low
1068	Height limit calibration error

ERROR CODE 1002 – POOR OR NO SIGNAL FROM TRACTOR PERFORMANCE MONITOR RADAR

Possible failure modes:

1. Faulty connector
2. Faulty tractor performance monitor radar
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for instrument cluster error codes 14021 or 14022 also being displayed.

   A. If 14021 or 14022 is being displayed, continue to these tests.

   B. If only error code 1002 diplayed, continue to step 2.
2. Check the tractor performance monitor radar connector **C068** and the controller connector **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace connector as required.

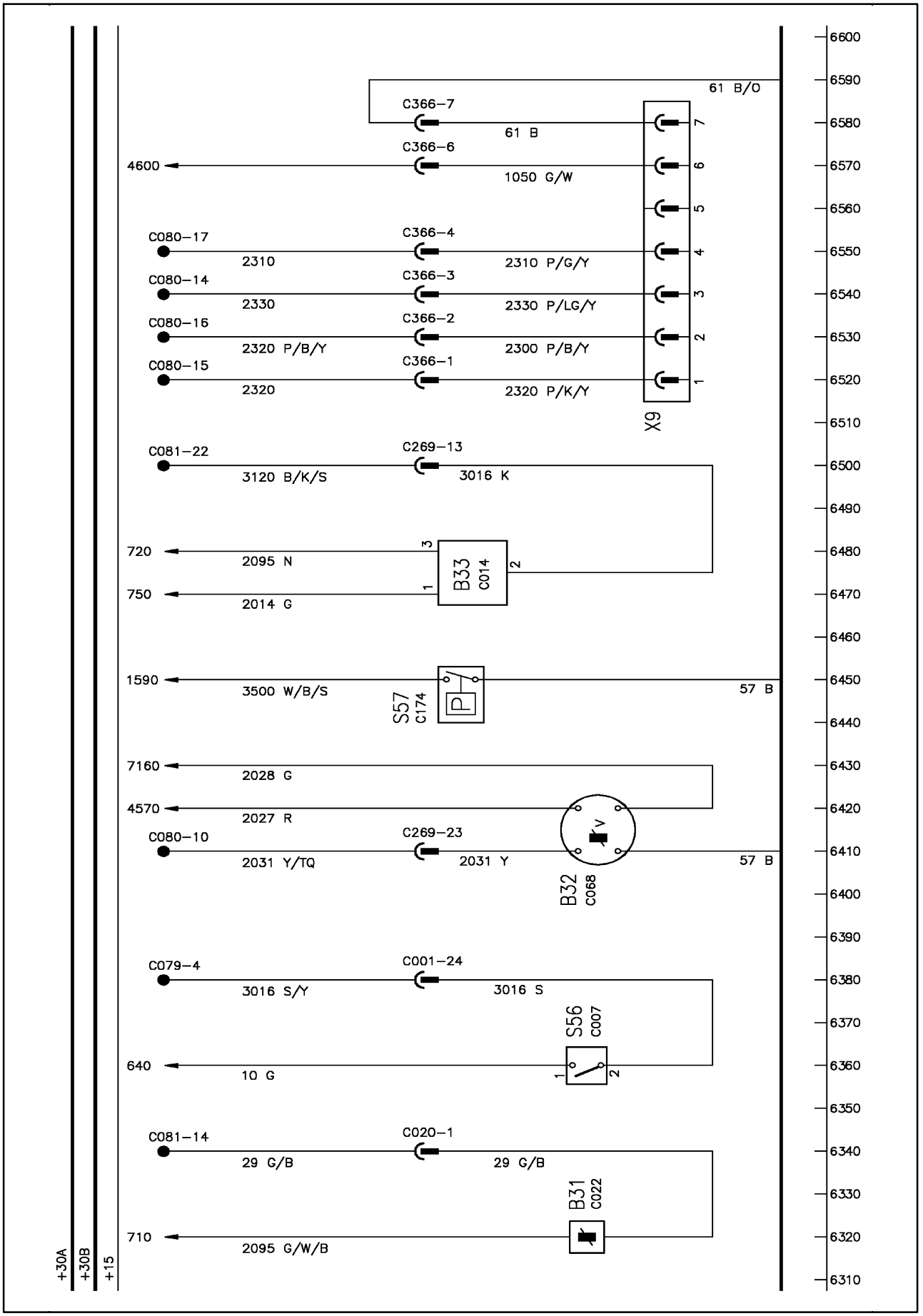
   B. If the connectors are okay, continue to step 3.
3. Check for an open circuit.

   A. Disconnect connectors **C068** and **C101**. Check between connector **C068** pin **2 (G)** and **C101** pin **33 (G)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.
4. Check the position of the radar.

   A. If the radar is pointing at the tractor wheel or excessively vibrating, point the radar at the ground and tighten the fixings.

   B. If the radar mounting and position is okay, remove and replace the radar assembly.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+30B
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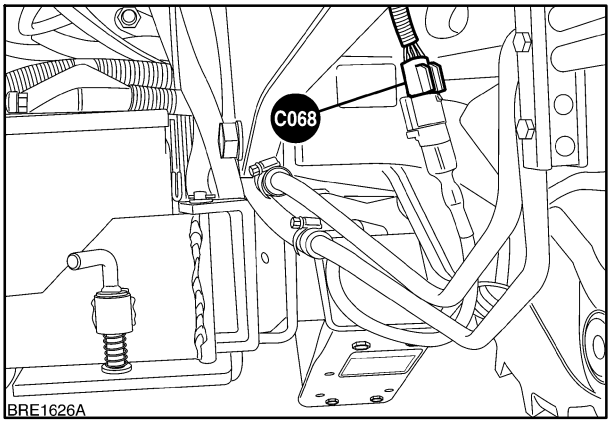
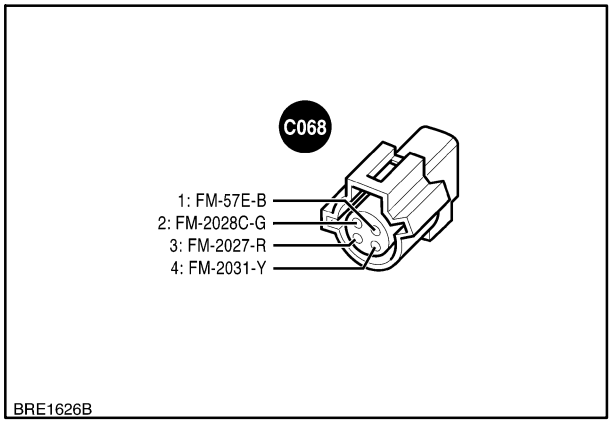
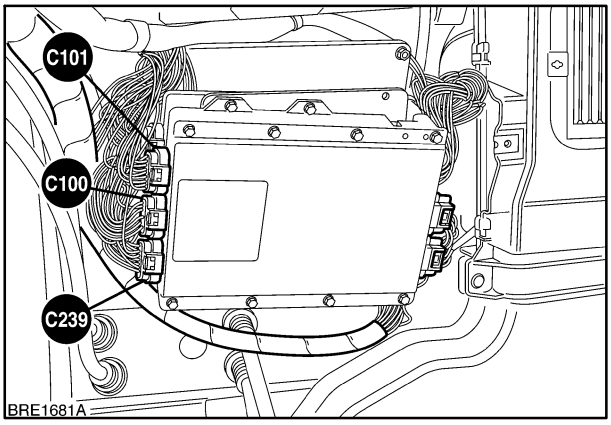
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
B32
C068
57 B
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G/W/B



BRE1626A



BRE1626B



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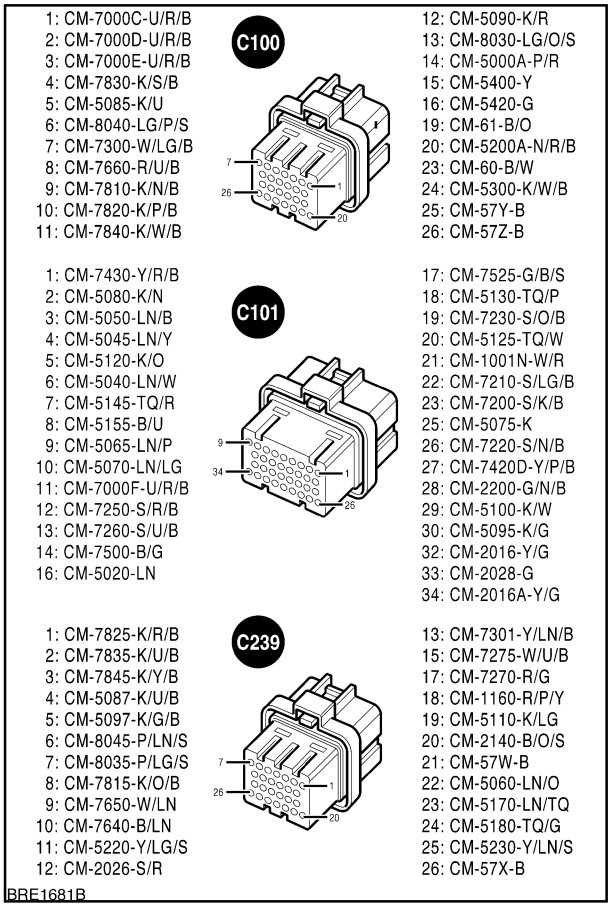


BRE1681B

ERROR CODE 1003 – RADAR (GROUND SPEED) GREATER THAN WHEEL SPEED

Possible failure modes:

1. Faulty connector
2. Incorrect tractor performance monitor radar alignment
3. Faulty speed sensor
4. Faulty tractor performance radar
5. Faulty harness
6. Faulty speed pickup gear

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for error codes being displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Check the position of the radar.
   A. If the radar is pointing at the tractor wheel or excessively vibrating, point the radar at the ground and tighten the fixings.
   B. If the radar mounting and position is okay, continue to step 3.
3. Check the speed sensor.
   A. If the speed sensor is loose in the rear axle housing or damaged, re–tighten or remove and replace the speed sensor as required.
   B. If the speed sensor is okay, continue to step 4.
4. Check the speed pickup gear.
   A. Remove the speed sensor and check for damage to the speed pickup gear inside the rear axle. If any damage is indicated, disassemble the rear axle and replace the speed pickup gear.
   B. If the speed pickup gear is okay, remove and replace the speed sensor.

ERROR CODE 1004 - WHEEL SPEED LESS THAN MAXIMUM SPEED OF TRACTOR

Possible failure modes:

1. Faulty connector
2. Incorrect tractor performance monitor radar alignment
3. Faulty speed sensor
4. Faulty tractor performance radar
5. Faulty harness
6. Faulty speed pickup gear

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for error codes being displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Check the position of the radar.
   A. If the radar is pointing at the tractor wheel or excessively vibrating, point the radar at the ground and tighten the fixings.
   B. If the radar mounting and position is okay, continue to step 3.
3. Check the speed sensor.
   A. If the speed sensor is loose in the rear axle housing or damaged, re-tighten or remove and replace the speed sensor as required.
   B. If the speed sensor is okay, continue to step 4.
4. Check the speed pickup gear.
   A. Remove the speed sensor and check for damage to the speed pickup gear inside the rear axle. If any damage is indicated, disassemble the rear axle and replace the speed pickup gear.
   B. If the speed pickup gear is okay, remove and replace the speed sensor.

ERROR CODE 1006 – SLIP CONTROL VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
2. Faulty slip control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the slip control potentiometer in H9 Channel 37.

   A. Turn the slip control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 37 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 37 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the slip control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the slip control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **6 (Y)**

   C121 pin **3 (B)** and **C121** pin **6 (Y)**

   If the resistances indicated are not between 80 – 340 Ohms, replace the control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to ground.

   A. Check between connector:

   C121 pin **4 (R)** and **ground**

   C121 pin **6 (Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C100** and **101**. Check between connector:

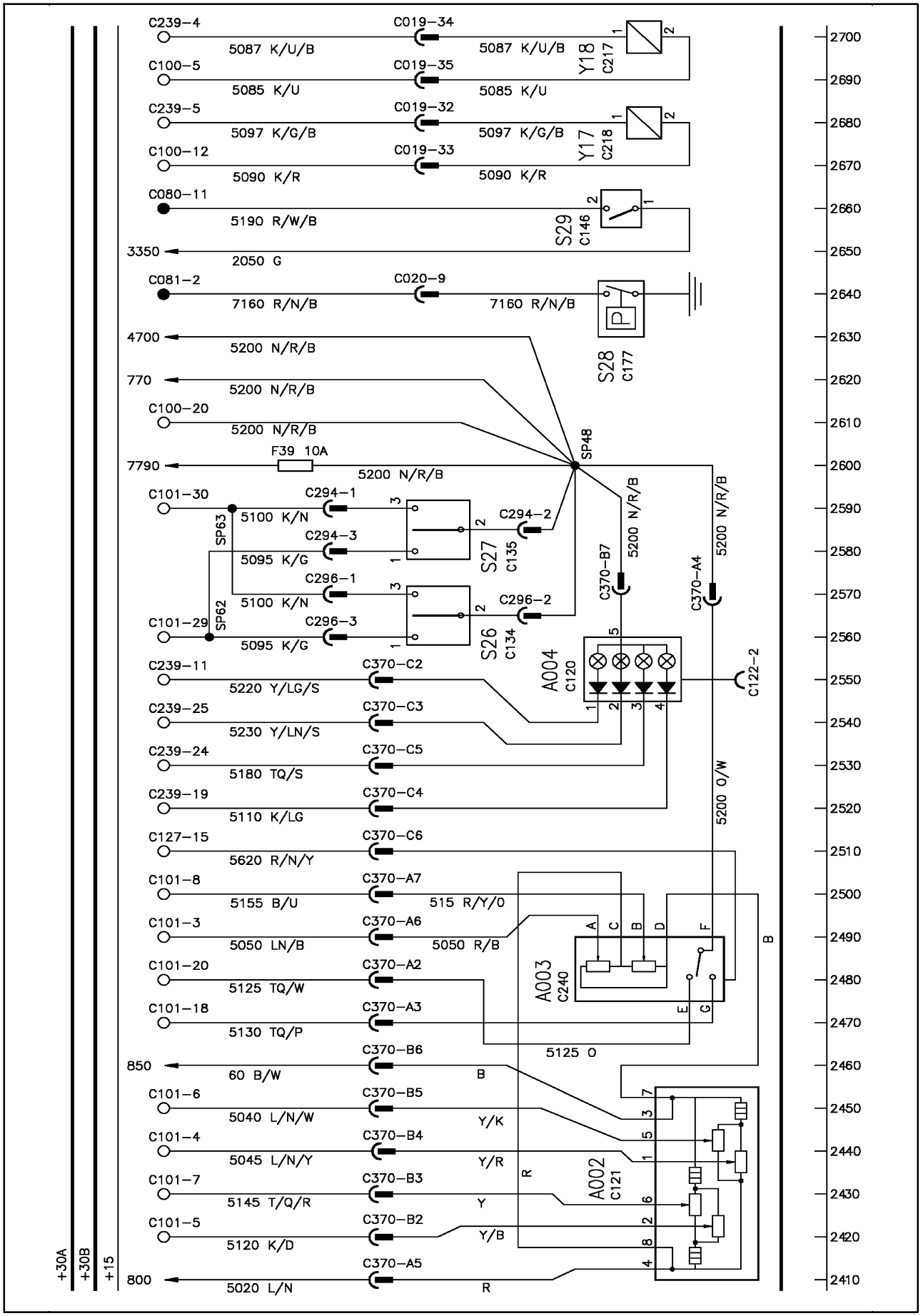
   C121 pin **4 (R)** and **C101** pin **101** pin **16 (R)**

   C121 pin **3 (B)** and **C100** pin **23 (B/W)**

   C121 pin **6 (Y)** and **C101** pin **7 (TQ/R)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
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2630
2620
2610
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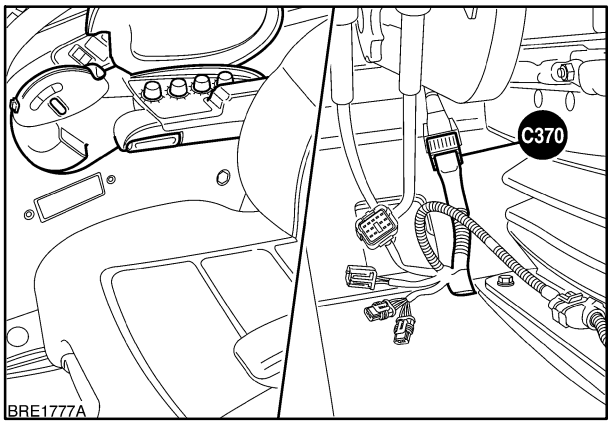
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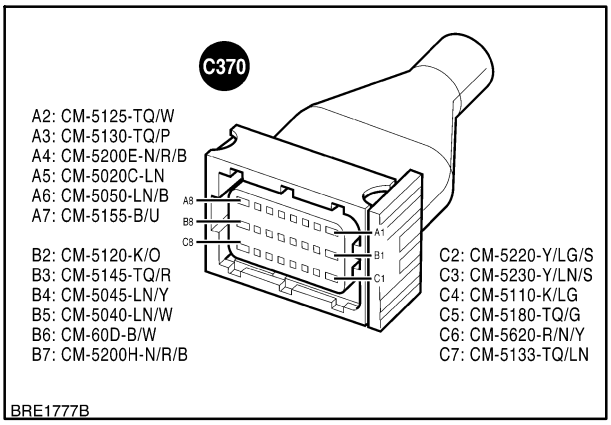
BRE1777A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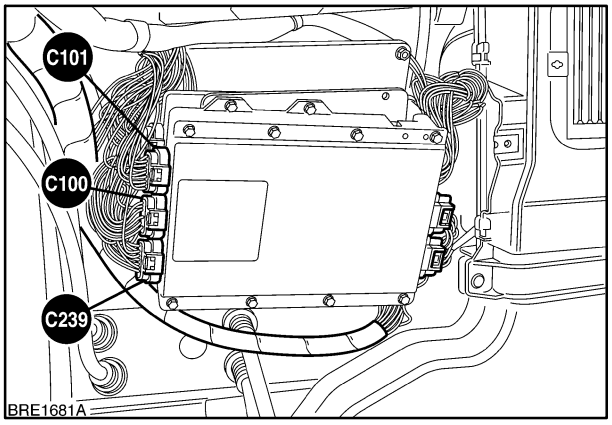
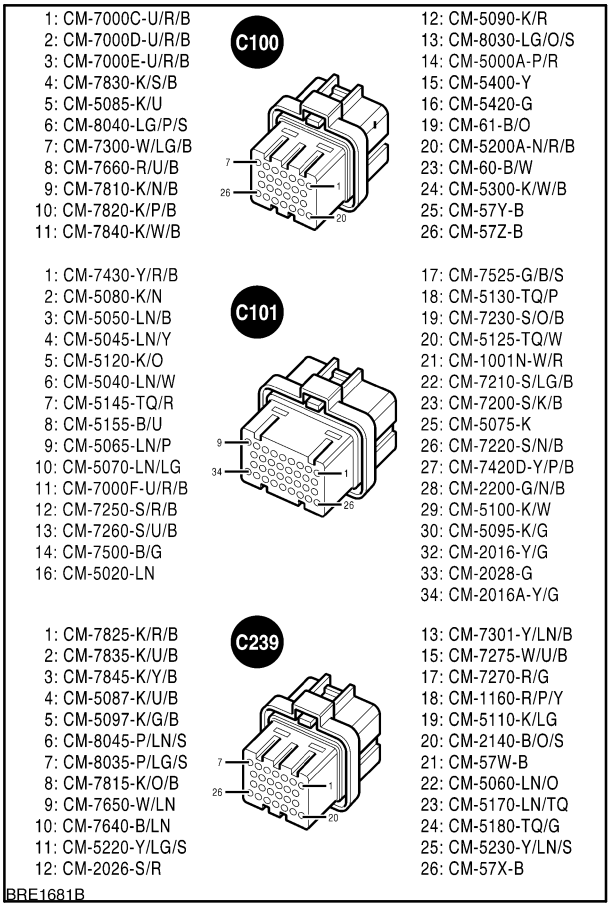
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1007 – SLIP CONTROL VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty slip control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the slip control potentiometer in H9 Channel 37.

   A. Turn the slip control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 37 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 37 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the slip control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the slip control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **6 (Y)**

   C121 pin **3 (B)** and **C121** pin **6 (Y)**

   If the resistances indicated are not between 80 – 340 Ohms, replace the control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C121** pin **4 (R)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

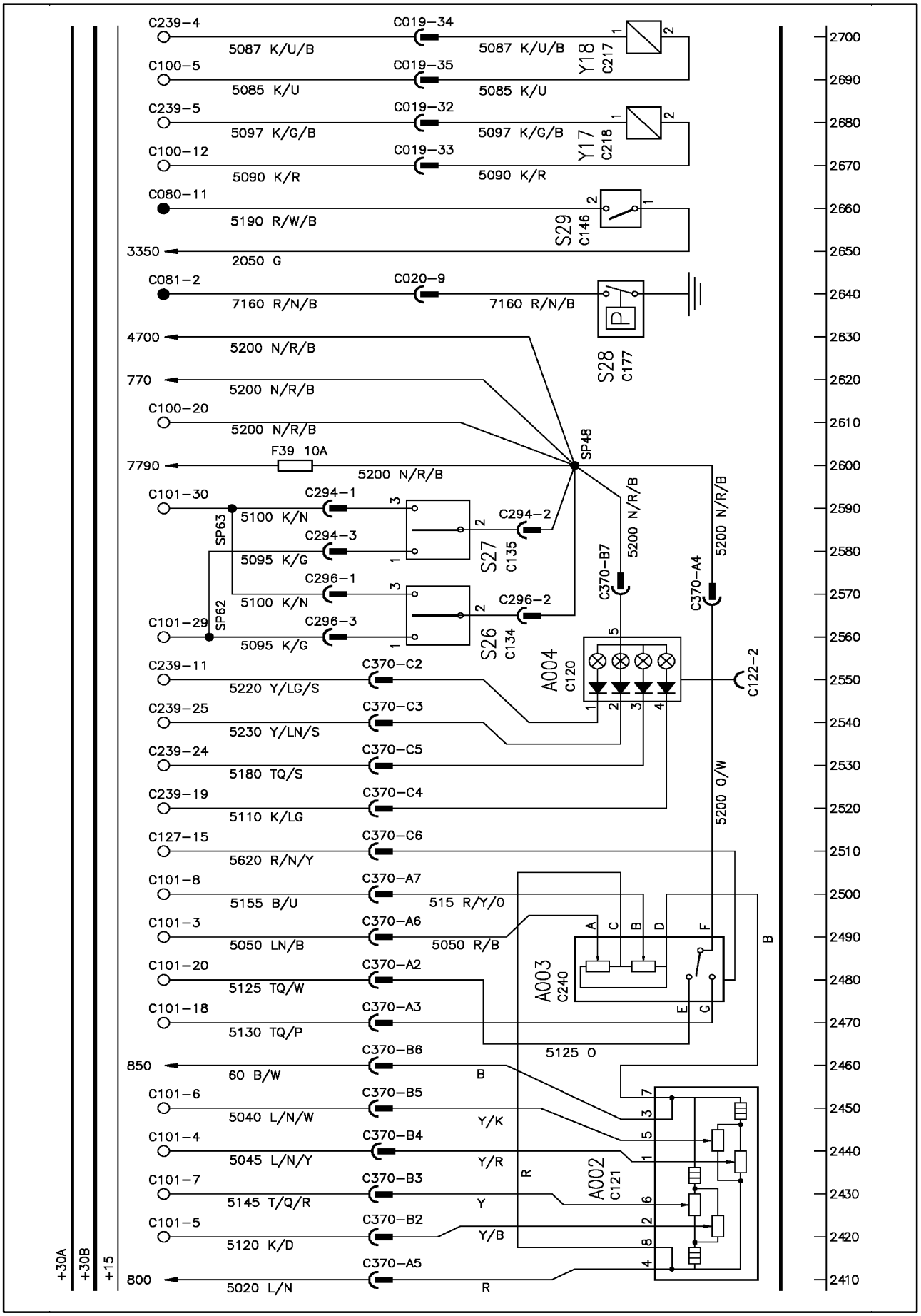
   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Measure the voltage between connector **C121** pin **6 (Y)** and **ground**.

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
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5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
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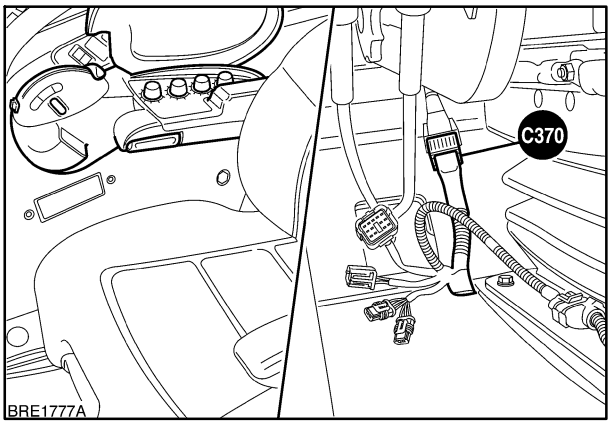
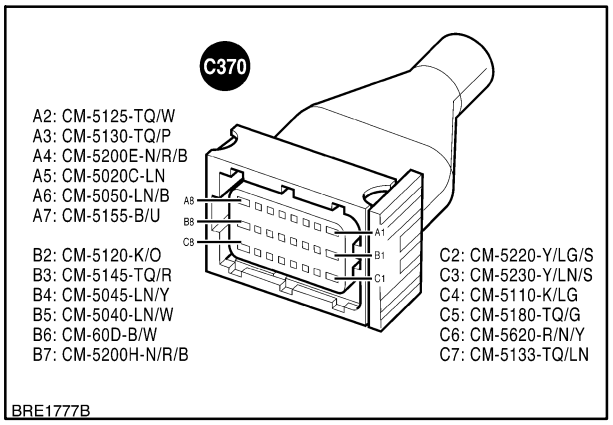

C370
BRE1777A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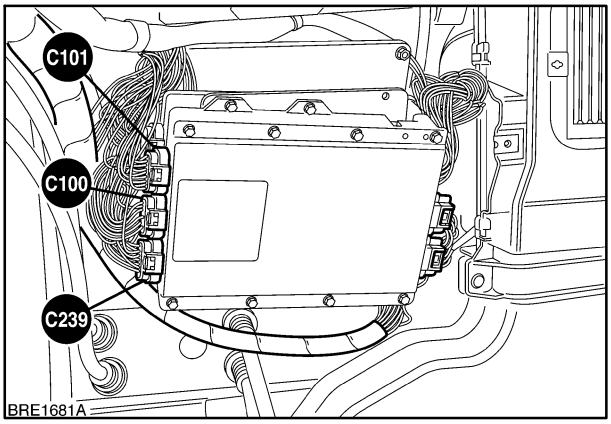
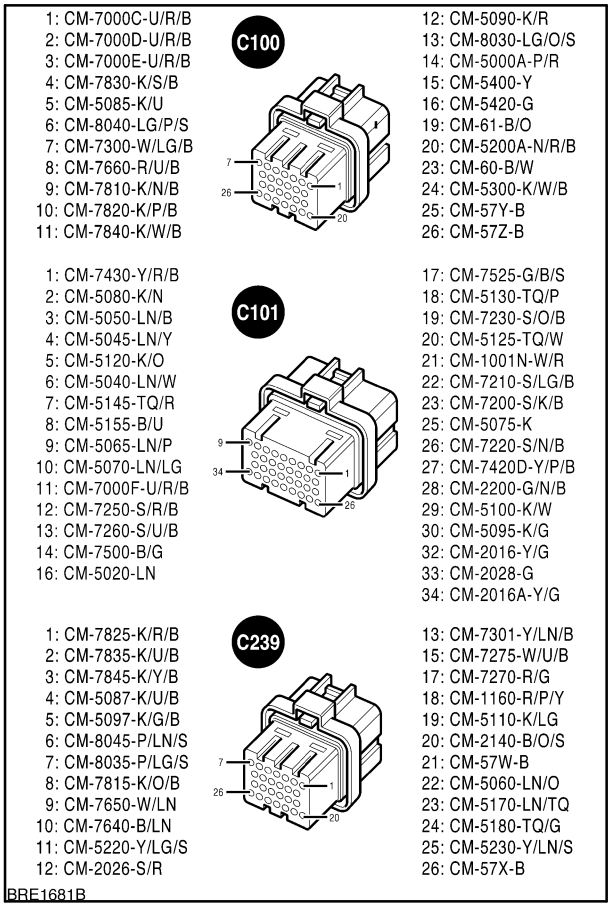
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
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26
1
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13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
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3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
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13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
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19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
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7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
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19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1008 - RAISE/WORK SWITCH FAILURE

Possible failure modes:

1. Fauly connector
2. Faulty raise/work switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the raise/work switch in H5.

   A. The display will show d0. Move the fast raise/work switch between the raise and work positions several times, and check the display. If the display does not change, continue to step 8.

   B. If the display changes between d0, d3 and d4 the switch and the circuit is okay. If the display shows d3 and d0, continue to step 2.

   C. If the display shows d4 and d0, continue to step 5.

2. Check the raise/work switch.

   A. Disconnect the raise/work switch connector **C240**. With the switch in the raise position, check between the component side of connector **C240** pin **F** and **C240** pin **E**. If an open circuit is indicated, replace the raise/work switch.

   B. If the raise/work switch is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector **C240** pin **E (O)** and **C101** pin **20 (T/Q/W)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short circuit or short to ground.

   A. Check between connector:

   C240 pin **E (O)** and **C240** pin **F (O/W)**

   C240 pin **E (O**) and **ground**

   C240 pin **F (O/W)** and **ground**

   If a short circuit or short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.

5. Check the raise/work switch.

   A. With the switch in the work position, check between the component side of connector **C240** pin **G (O/B)** and **C240** pin **F (O/W)**. If an open circuit is indicated, replace the raise/work switch.

   B. If the switch is okay, continue to step 6.

6. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector **C240** pin **G (O/B)** and **C101** pin **18 (T/Q/P)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 7.

7. Check for a short circuit or short to ground.

   A. Check between connector:

   C240 pin **F (O/W)** and **C240** pin **G (O/B)**

   C240 pin **F (O/W)** and **ground**

   C240 pin **G (O/B)** and **ground**

   If a short circuit or short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.

8. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the raise/work switch connector **C240**. Check between connector **C240** pin **F (O/W)** and **fuse 39**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 9.

9. Check the raise/work switch.

   A. Check between the component side of connector:

   C240 pin **F** and **C240** pin **E** with the raise/work switch held in raise position

   C240 pin **F** and **C240** pin **G** with the raise/work switch held in lower position

   If an open circuit is indicated in either of the tests, remove and replace the switch.

   B. If the switch is okay, continue to step 10.

10. Check for a short circuit.

    A. Disconnect the controller connector **C101**. Check between connector **C101** pin **18 (T/Q/P)** and **C101** pin **20 (T/Q/W)**. If a short circuit is indicated, repair the short circuit between connector **C101** pin **18** and pin **20** to the raise/work switch connector **C240** or replace the harness as required.

    B. If a short circuit is not indicated, continue to step 11.

11. Check for an open circuit.

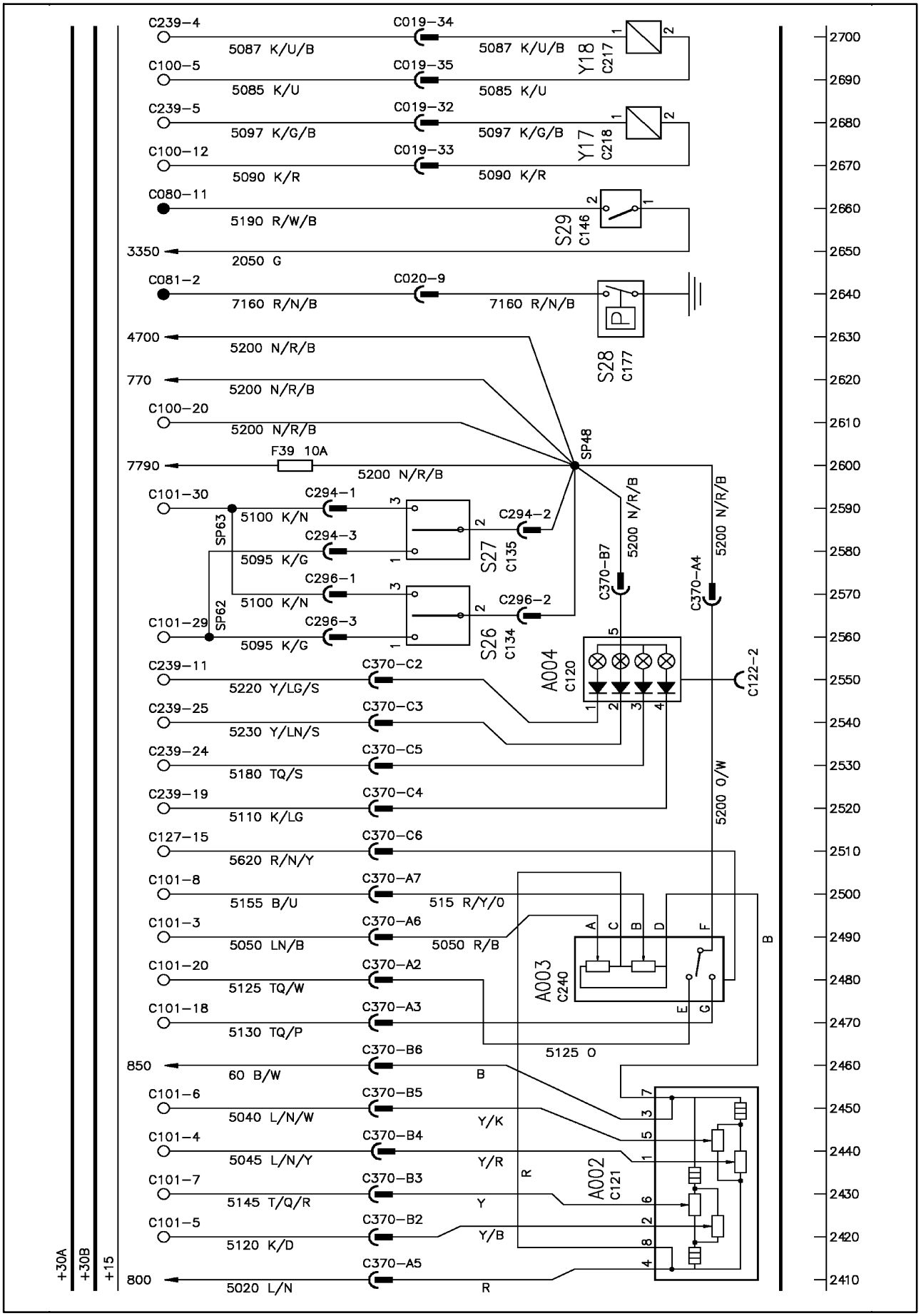
    A. Check between connector **C240** pin **E (O)** and **C101** pin **20 (T/Q/W)**. If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit is not indicated, continue to step 12.

12. Check for an open circuit.

    A. Check between connector **C240** pin **G (O)** and **C101** pin **18 (T/Q/P)**. If an open circuit is indicated, repair or replace the harness as required.

    B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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Y18
C217
C100-5
C019-35
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C239-5
C019-32
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Y17
C218
C100-12
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C146
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S28
C177
4700
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SP48
7790
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C101-30
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SP63
C294-2
C294-3
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S27
C135
C296-1
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SP62
C101-29
C296-3
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C134
C370-B7
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C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
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C101-3
C370-A6
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A003
C240
C101-20
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C101-18
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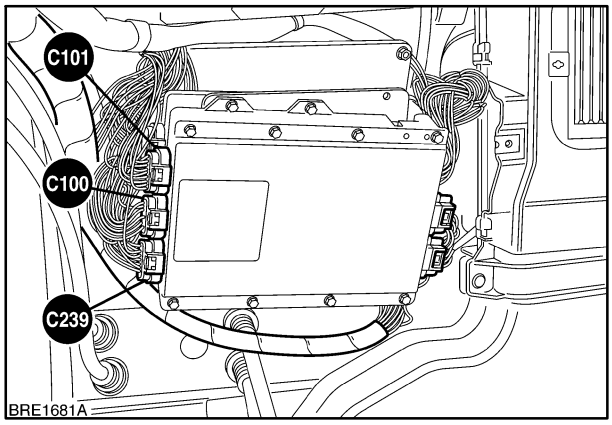
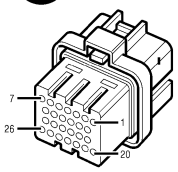


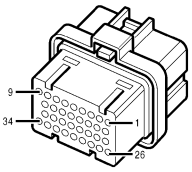
BRE1681A

C100



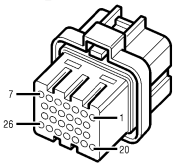
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1009 – BOTH EXTERNAL HPL FENDER SWITCHES ARE BEING OPERATED SIMULTANEOUSLY

Possible failure modes:

1. Faulty connector
1. HPL fender switch(es) sticking
2. Faulty HPL fender switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the HPL fender switches are not sticking in the raise or lower position.

   A. If the switches are sticking, clean, repair or replace as required.

   B. If the fender switches are not sticking, continue to step 2.

2. Check the HPL fender switches have not been operated simultaneously.

   A. Clear the error codes. Test the system for normal operation. If error code 1009 is still displayed, continue to step 3.

3. Check the L/H HPL fender switch connector **C134**, the HPL fender R/H switch connector **C135**, the inline harness connectors **C294** and **C296** and the controller connector **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Disconnect connectors **C134** and **C135**. Turn the keystart ON. Measure the voltage between connector:

   C134 pin **1 (K/G)** and **ground**

   C134 pin **3 (K/N)** and **ground**

   C135 pin **1 (K/G)** and **ground**

   C135 pin **3 (K/N)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated continue to step 5.

5. Check the L/H HPL fender switch for a short circuit.

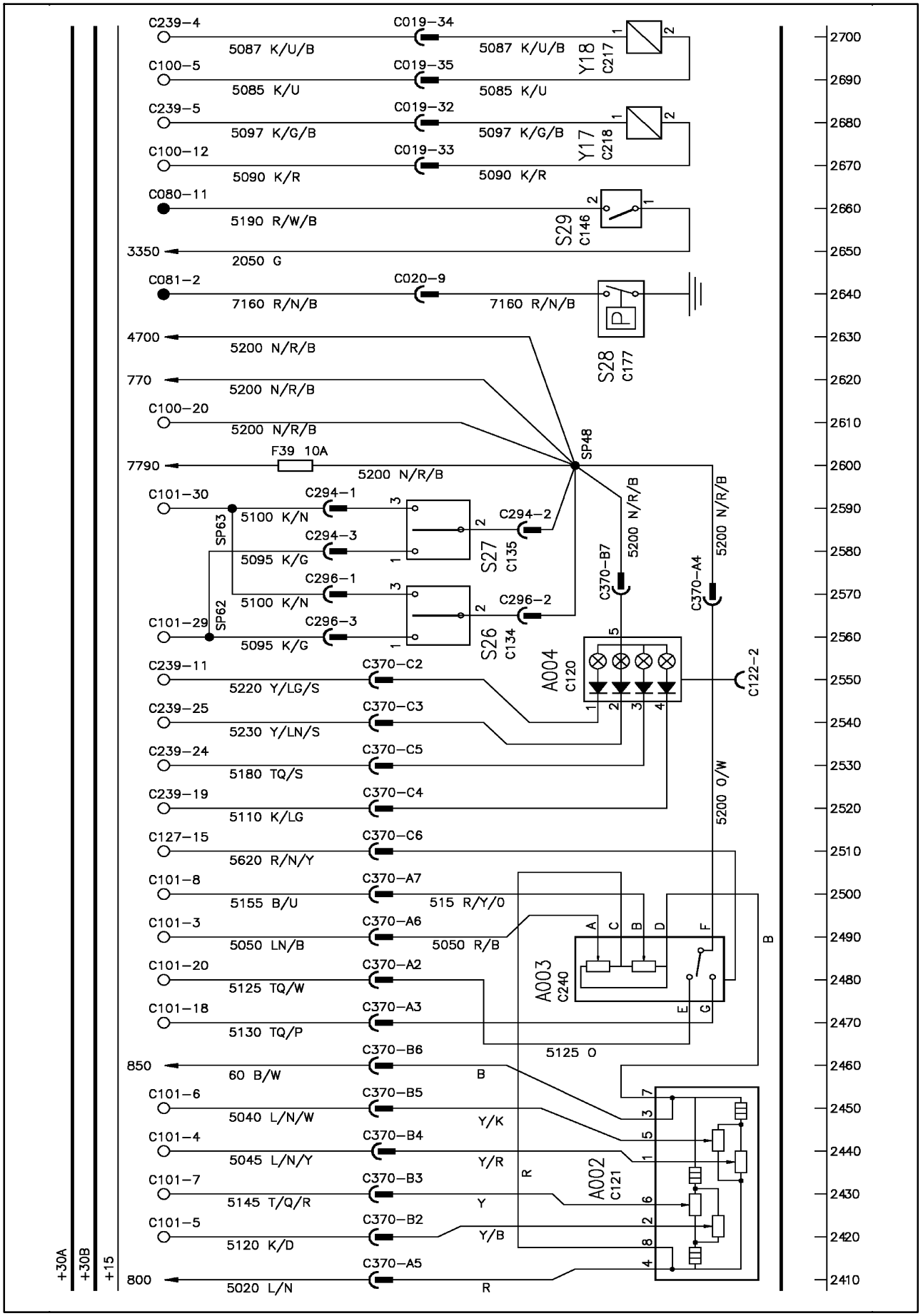
   A. While operating the L/H HPL fender switch in the raise and then lower position, check between the component side of connector **C134** pin **1 (K/G)** and **C134** pin **3 (K/N)**. If a short circuit is indicated, replace the L/H HPL fender switch.

   B. If the switch is okay, continue to step 6.

6. Check the R/H HPL fender switch for a short circuit.

   A. While operating the R/H HPL fender switch in the raise and then lower position, check between the component side of connector **C135** pin **1 (K/G)** and **C135** pin **3 (K/N)**. If a short circuit is indicated, replace the R/H HPL fender switch.

   B. If the switch is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
C294-2
SP63
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
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2580
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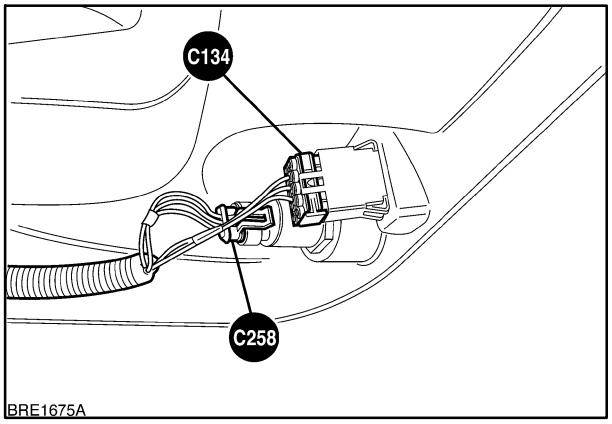
2410



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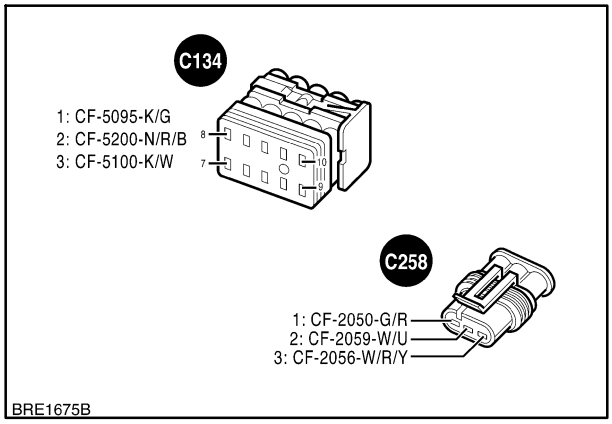
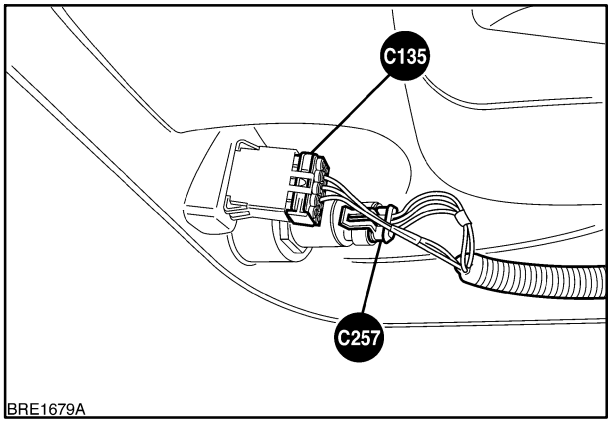
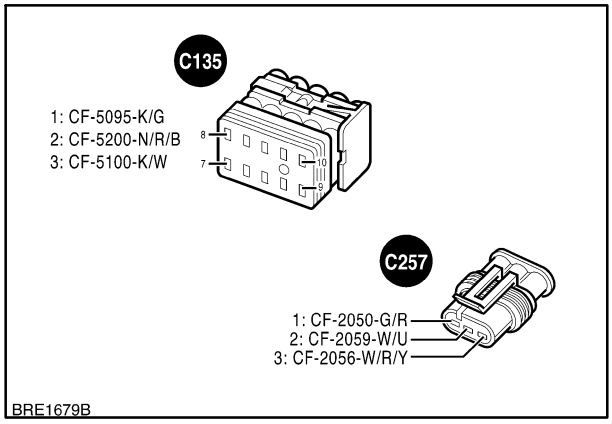


BRE1675B



BRE1679A



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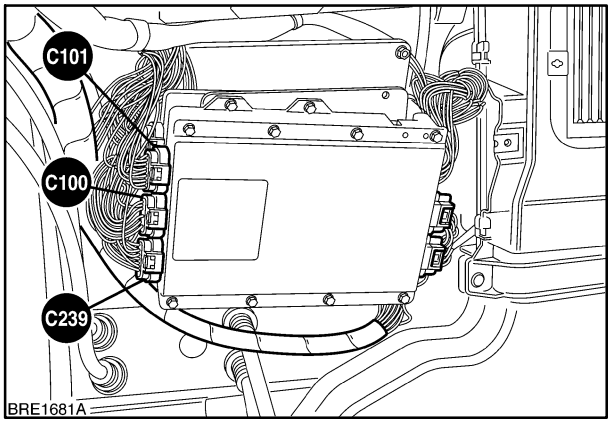
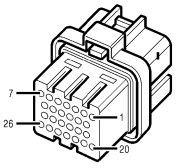


BRE1681A

1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B

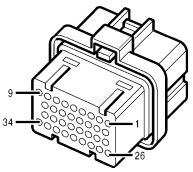
C100



12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN

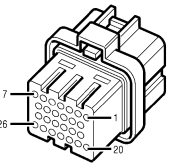
C101



17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

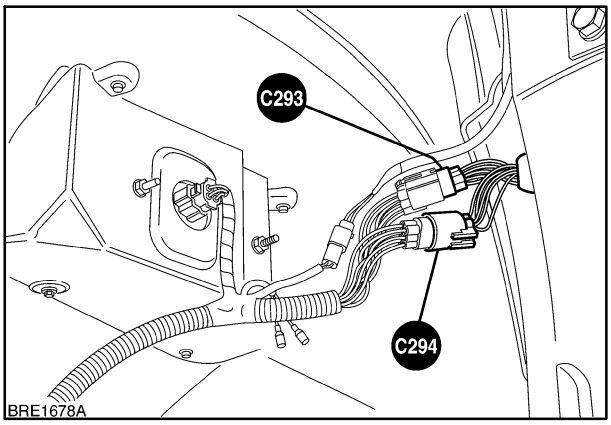
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R

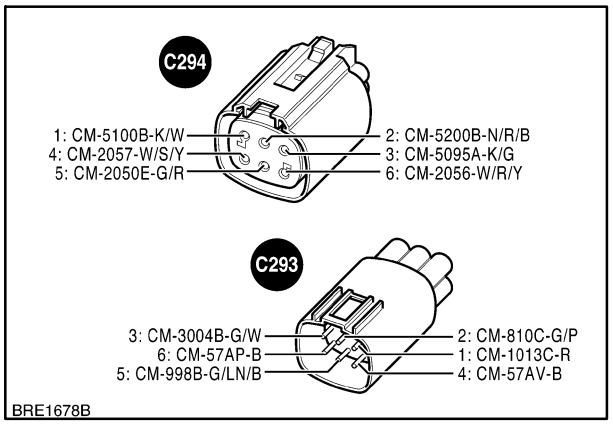
C239

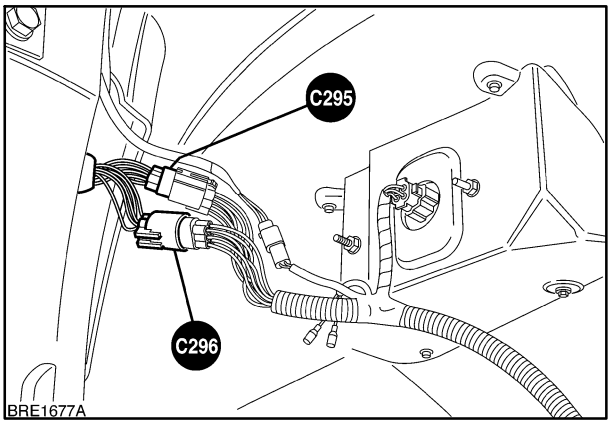


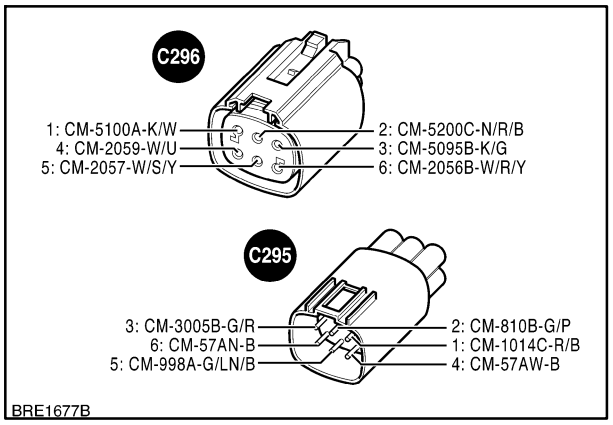
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B


C293
C294
BRE1678A


C294
1: CM-5100B-K/W
4: CM-2057-W/S/Y
5: CM-2050E-G/R
2: CM-5200B-N/R/B
3: CM-5095A-K/G
6: CM-2056-W/R/Y
C293
3: CM-3004B-G/W
6: CM-57AP-B
5: CM-998B-G/LN/B
2: CM-810C-G/P
1: CM-1013C-R
4: CM-57AV-B
BRE1678B


C295
C296
BRE1677A


C296
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4: CM-2059-W/U
5: CM-2057-W/S/Y
2: CM-5200C-N/R/B
3: CM-5095B-K/G
6: CM-2056B-W/R/Y
C295
3: CM-3005B-G/R
6: CM-57AN-B
5: CM-998A-G/LN/B
2: CM-810B-G/P
1: CM-1014C-R/B
4: CM-57AW-B
BRE1677B

ERROR CODE 1010 – HEIGHT LIMIT CONTROL VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
2. Faulty height limit control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the height limit control potentiometer in H9 Channel 35.

   A. Turn the height limit control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 35 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 35 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the height limit control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the height limit control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **2 (Y/B)**

   C121 pin **3 (B)** and **C121** pin **2 (Y/B)**

   If the resistances indicated are not between 90 – 360 Ohms (with slip control) and 170 – 520 Ohms (without slip control), replace the control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to ground.

   A. Check between connector:

   C121 pin **4 (R)** and **ground**

   C121 pin **2 (Y/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C100** and **101**. Check between connector:

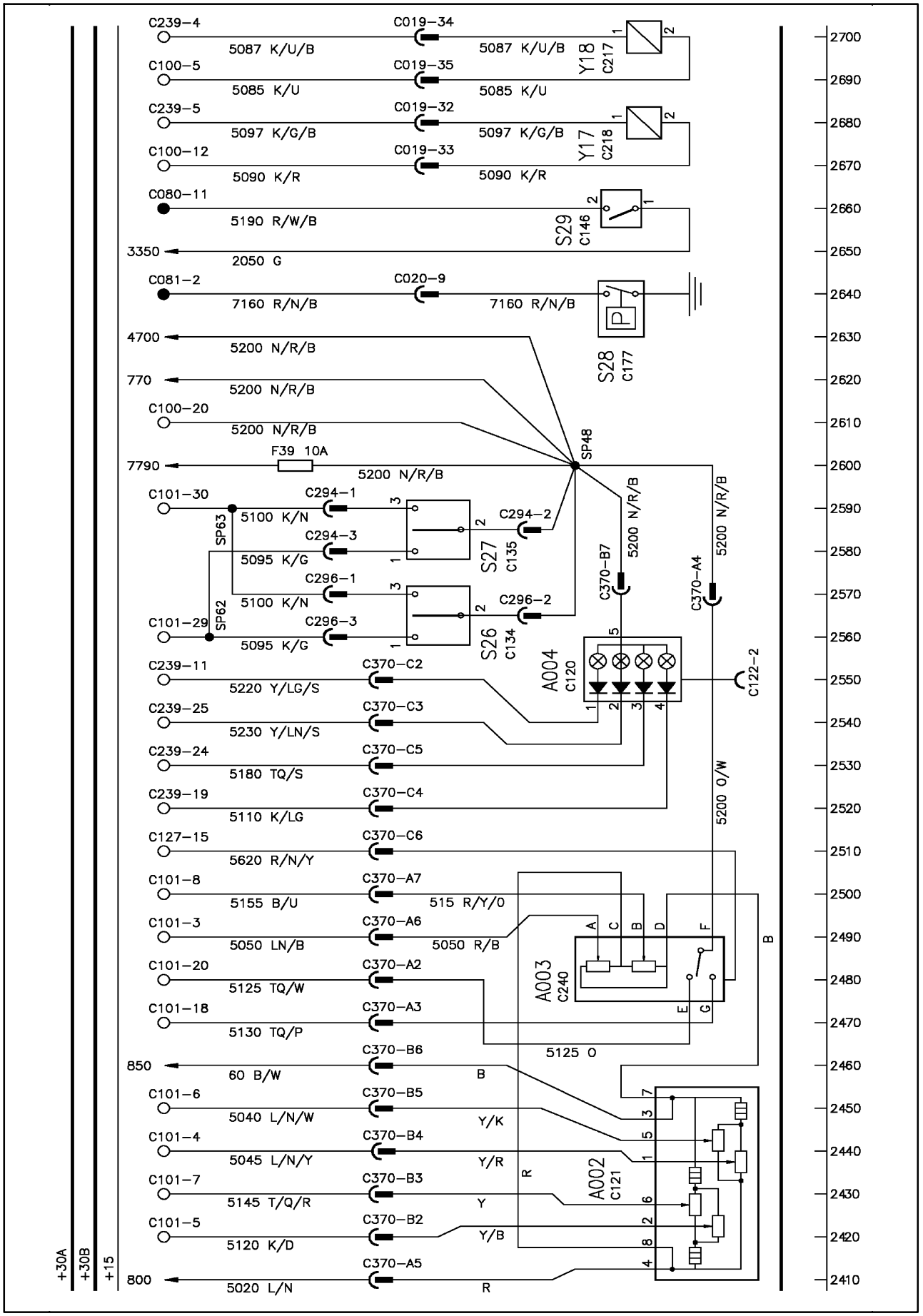
   C121 pin **4 (R)** and **C101** pin **16 (R)**

   C121 pin **3 (B)** and **C100** pin **23 (B/W)**

   C121 pin **2 (Y/B)** and **C101** pin **5 (K/O)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
B
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
R
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
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C370-A5
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R
+30A
+30B
+15
2700
2690
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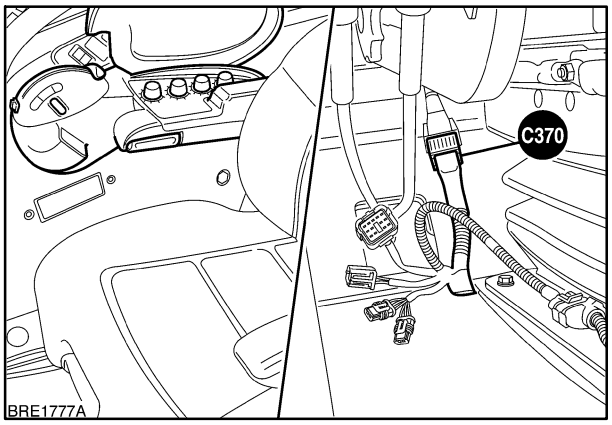
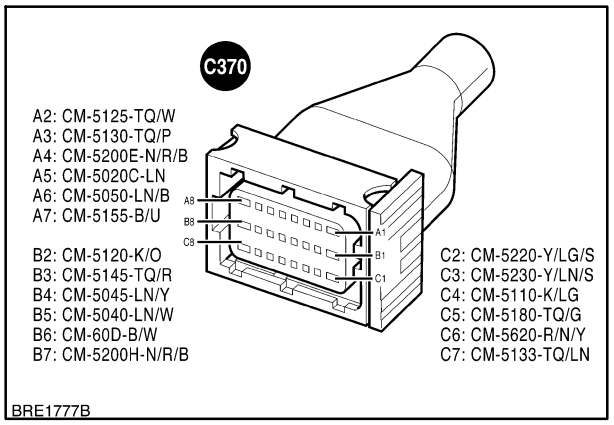

C370
BRE1777A


C370
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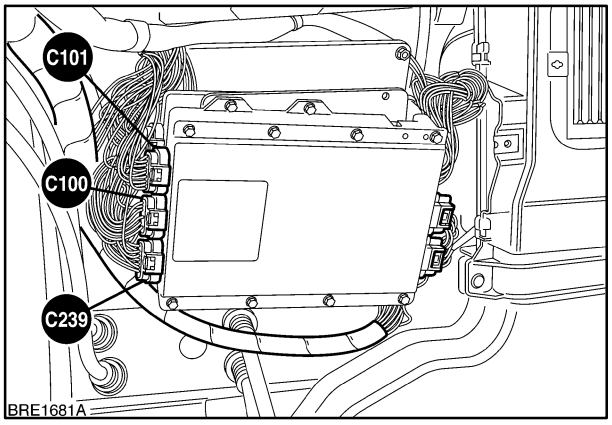
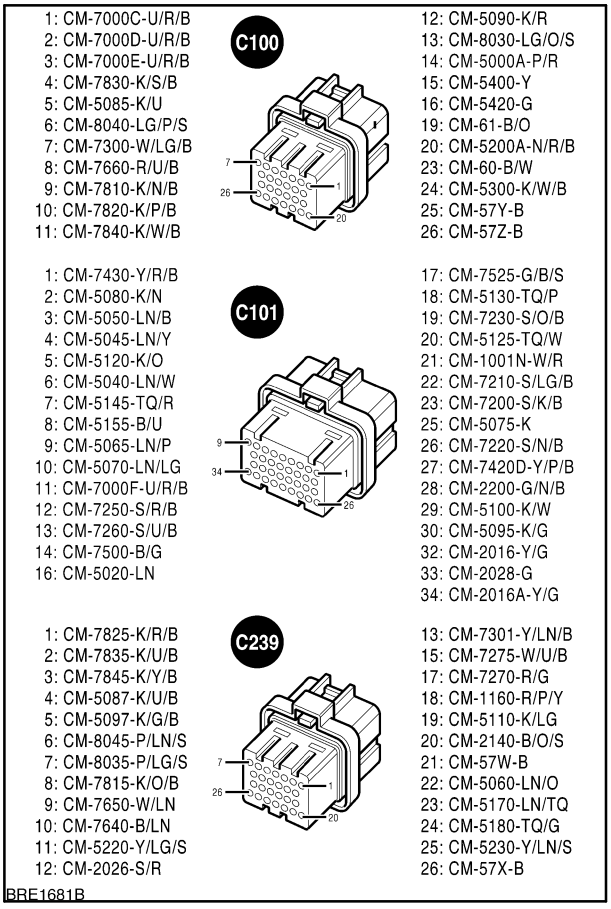
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
7
26
1
20
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
34
1
26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
7
26
1
20
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1011 – HEIGHT LIMIT CONTROL VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty height limit control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the height limit control potentiometer in H9 Channel 35.

   A. Turn the height limit control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 35 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 35 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the height limit control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the height limit control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **2 (Y/B)**

   C121 pin **3 (B)** and **C121** pin **2 (Y/B)**

   If the resistances indicated are not between 90 – 360 Ohms (with slip control) and 170 – 520 Ohms (without slip control), replace the control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C121** pin **4 (R)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

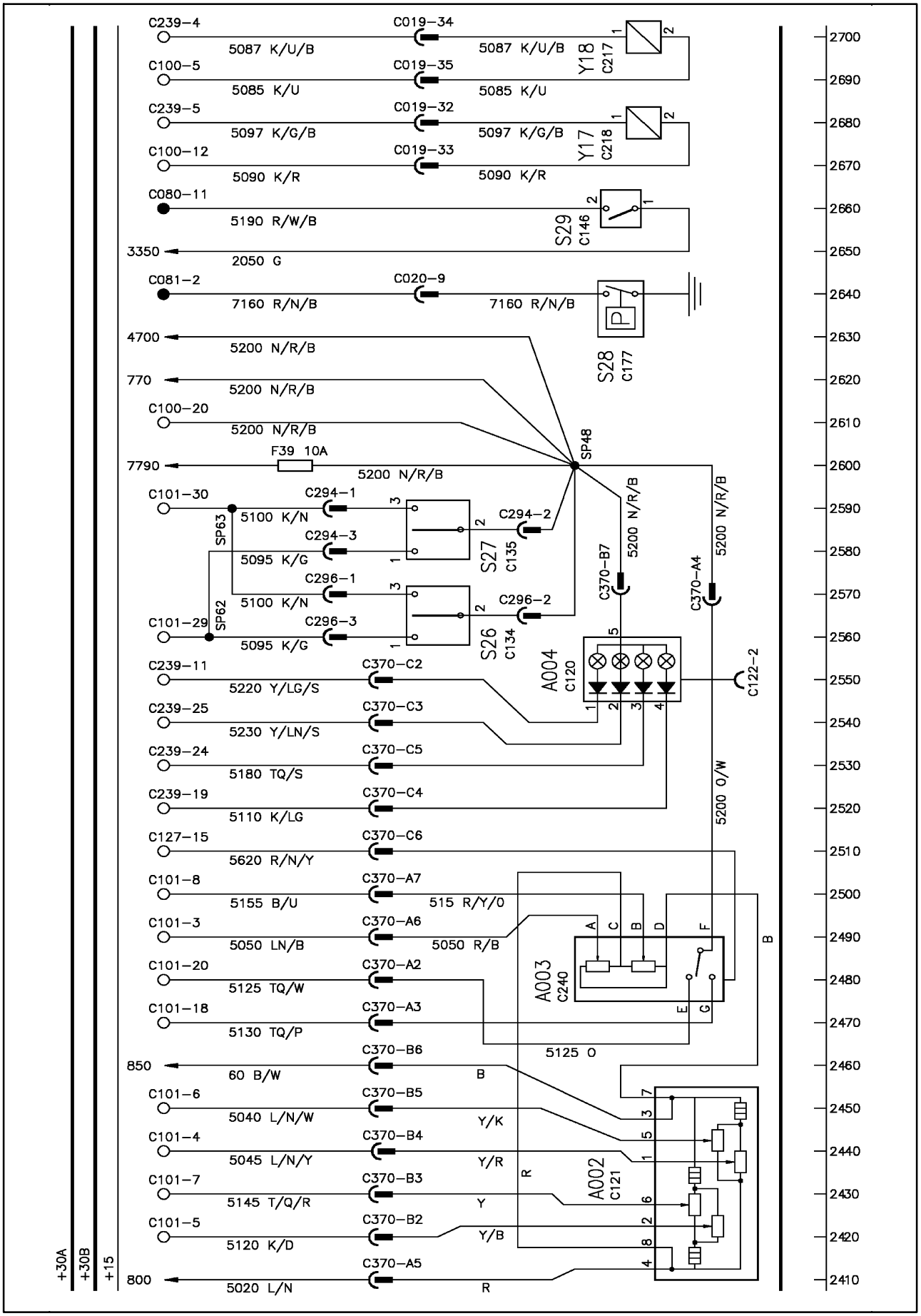
   B. If the voltage indicated is approximately +5 Volts, continue to step 4

4. Check for a short to +Ve Voltage

   A. Measure the voltage between connector **C121** pin **2 (Y/B)** and **ground**.

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
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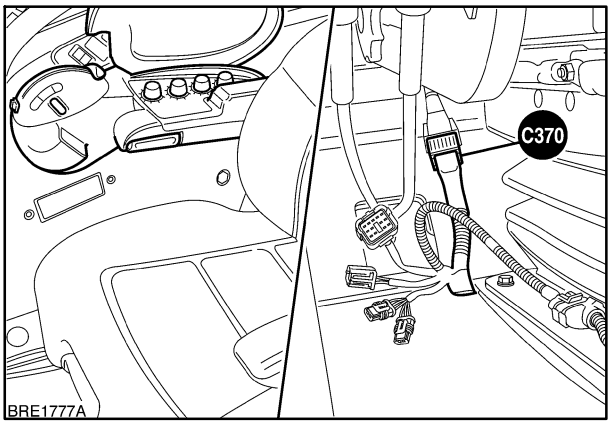
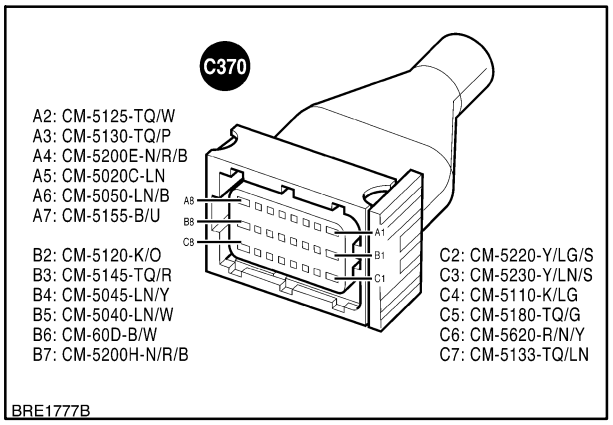
2410


C370
BRE1777A


C370
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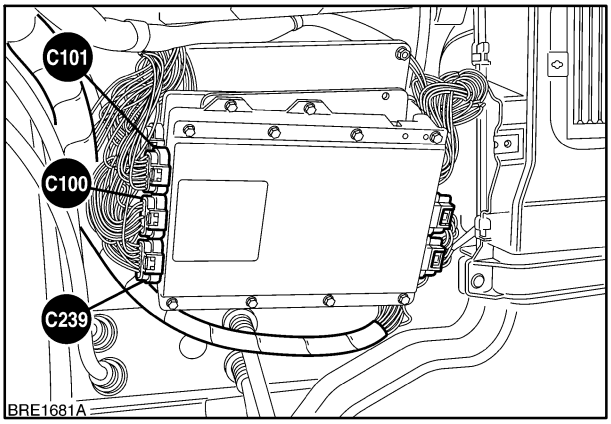
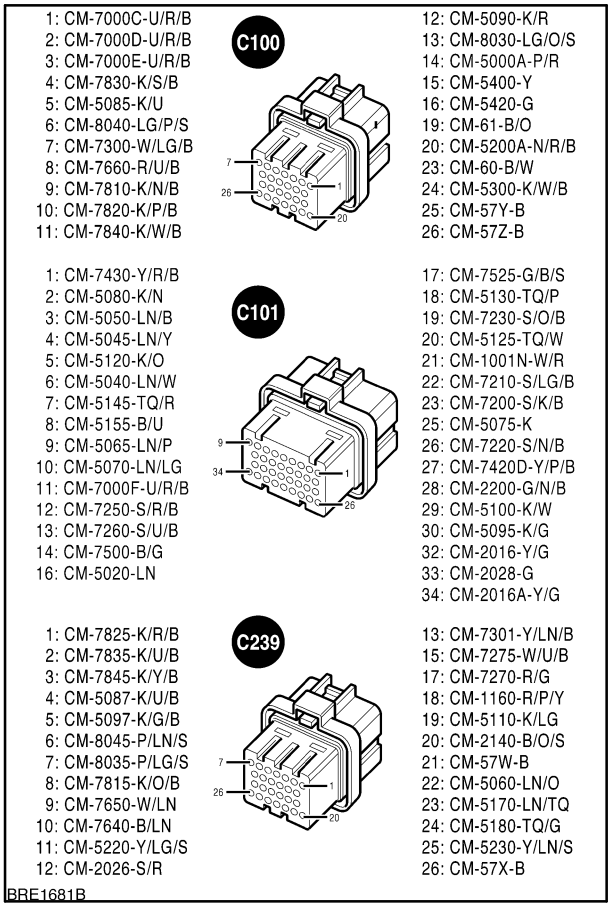
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
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26
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20
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
34
1
26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
7
26
1
20
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1012 – DROP RATE CONTROL VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
1. Faulty drop rate control potentiometer
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the drop rate control potentiometer in H9 Channel 34.

   A. Turn the drop rate control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 34 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 34 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the drop rate control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the drop rate control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **1 (Y/R)**

   C121 pin **3 (B)** and **C121** pin **1 (Y/R)**

   If the resistances indicated are not between 90 – 360 Ohms (with slip control) and 170 – 520 Ohms (without slip control), replace the EDC control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to ground.

   A. Check between connector:

   C121 pin **4 (R)** and **ground**

   C121 pin **1 (Y/R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C100** and **C101**. Check between connector:

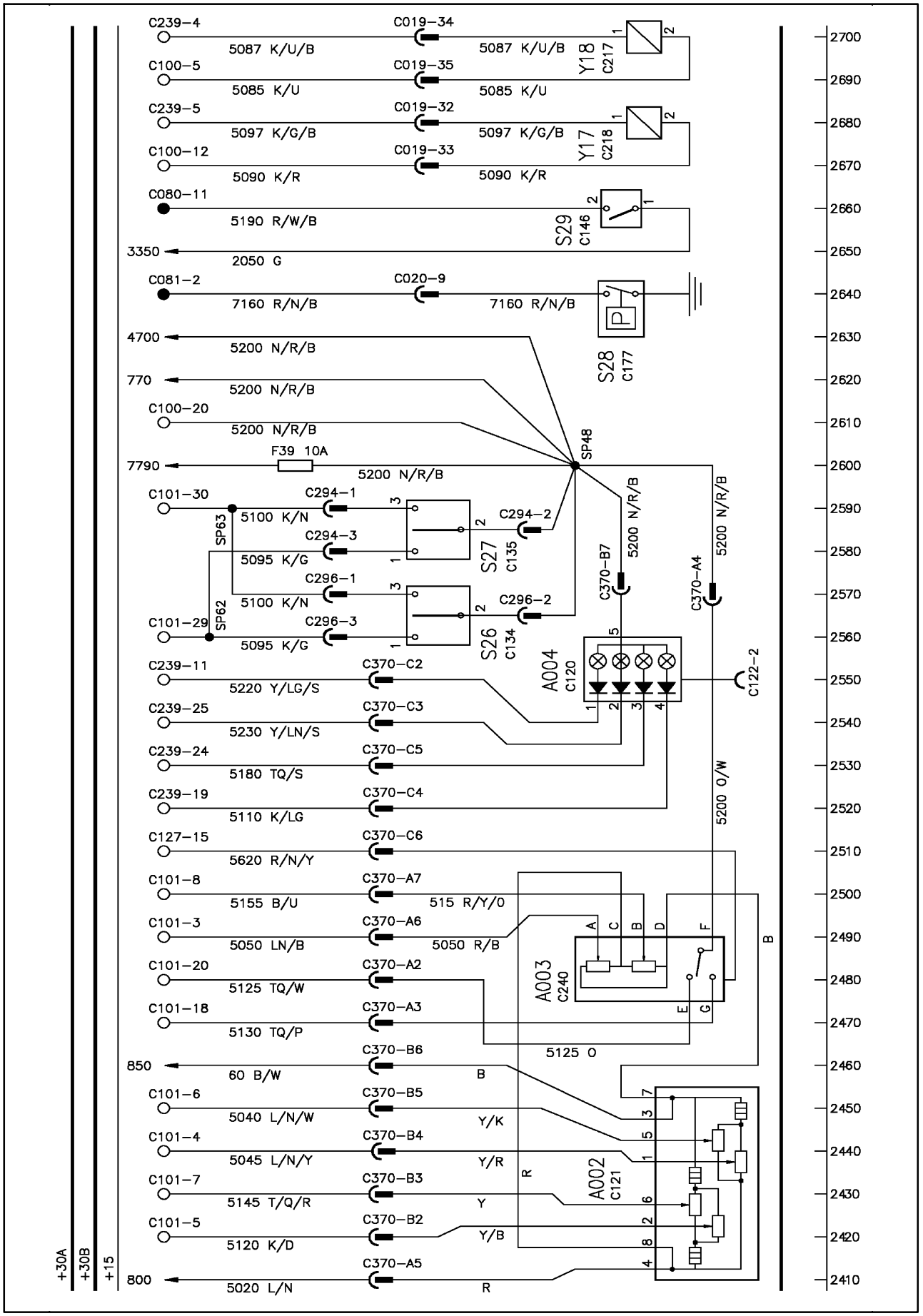
   C121 pin **4 (R)** and **C101** pin **101** pin **16 (R)**

   C121 pin **3 (B)** and **C100** pin **23 (B/W)**

   C121 pin **1 (Y/R)** and **C101** pin **4 (L/N/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
B
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
R
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
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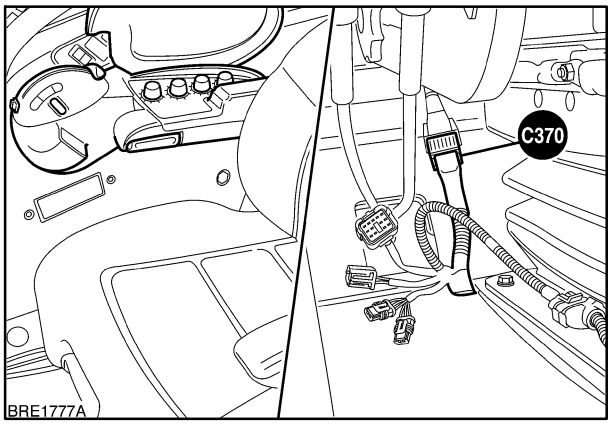
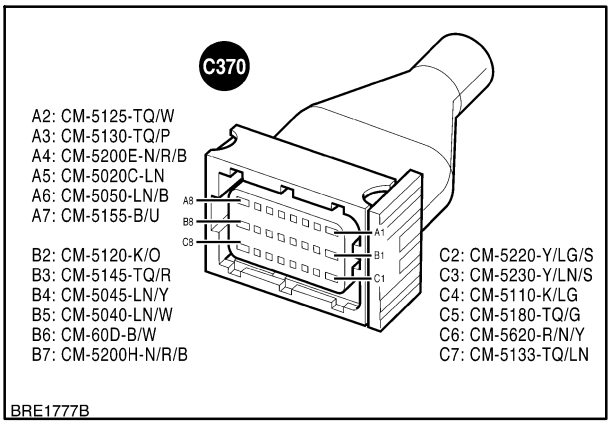

C370
BRE1777A


C370
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A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
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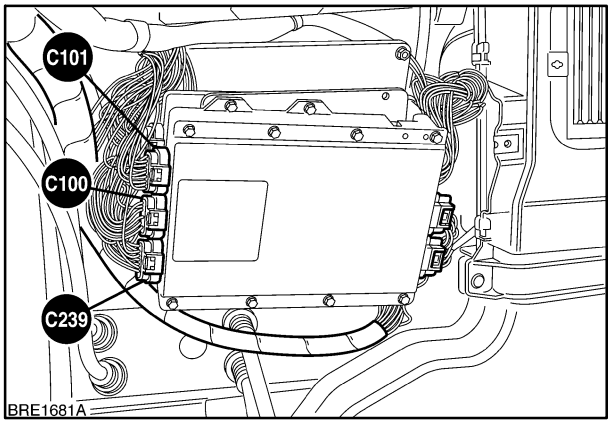
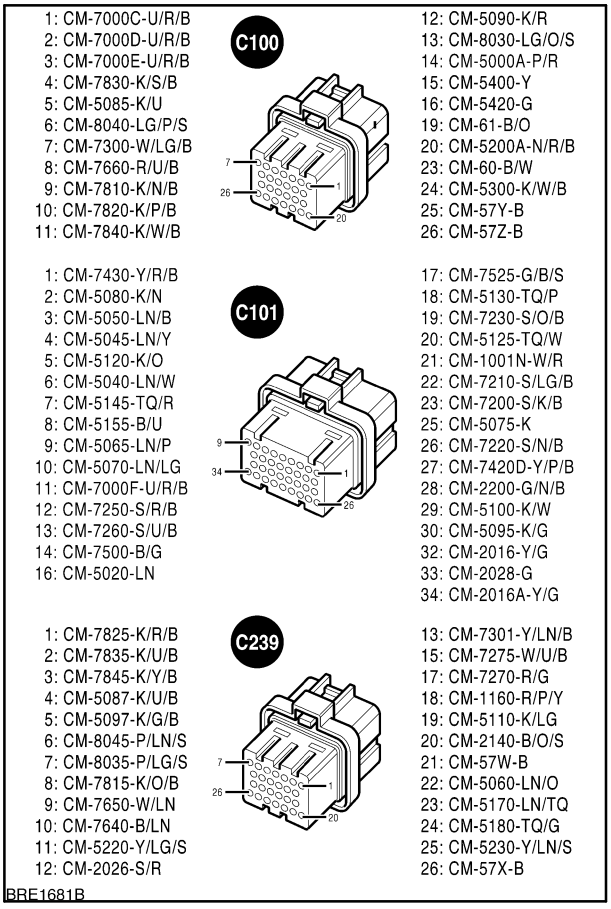
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1013 – DROP RATE CONTROL VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty drop rate control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the drop rate control potentiometer in H9 Channel 34.

   A. Turn the drop rate control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 34 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 34 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the drop rate control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the drop rate control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **1 (Y/R)**

   C121 pin **3 (B)** and **C121** pin **1 (Y/R)**

   If the resistances indicated are not between 90 – 360 Ohms (with slip control) and 170 – 520 Ohms (without slip control), replace the control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C121** pin **4 (R)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

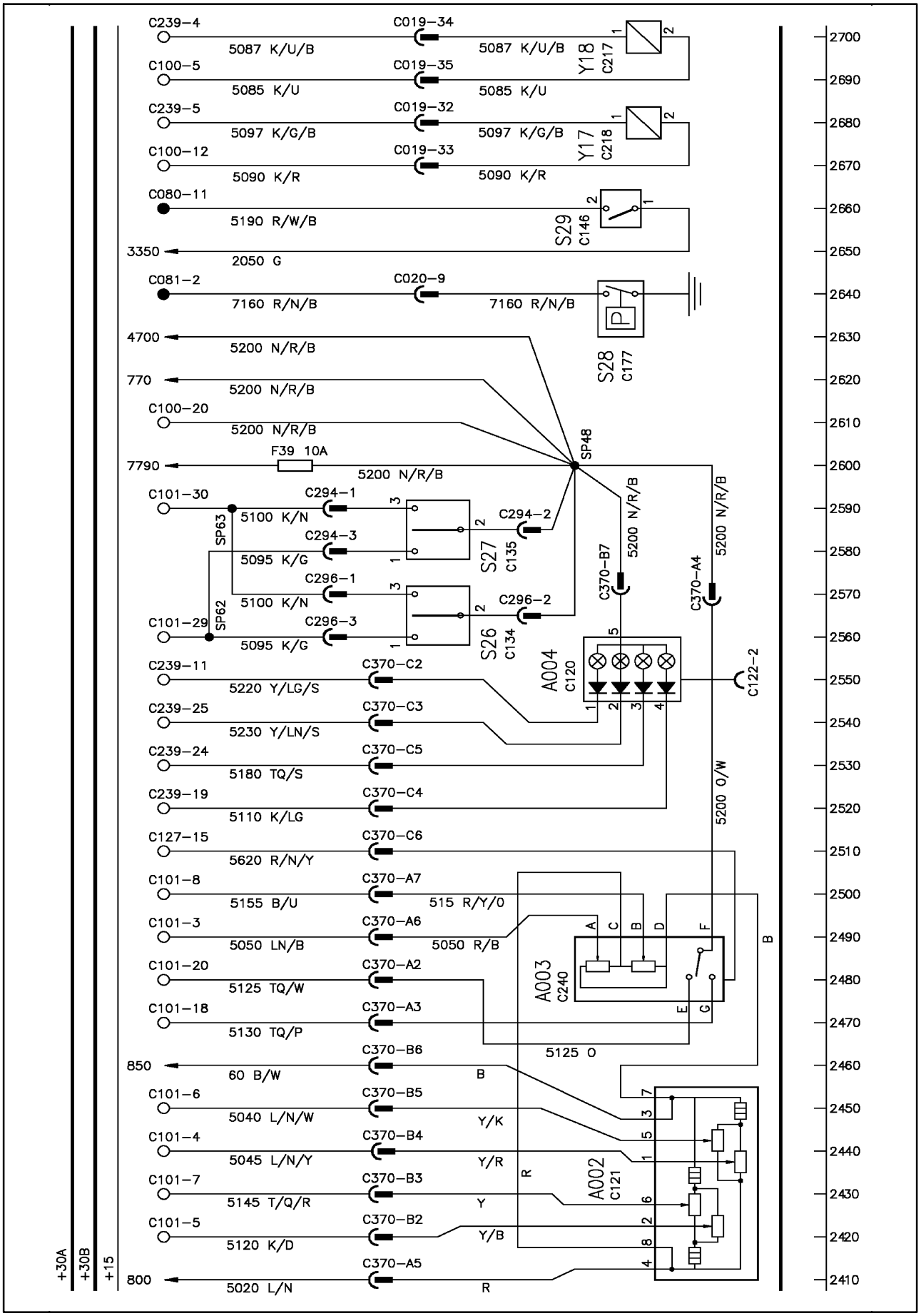
   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Measure the voltage between connector **C121** pin **1 (Y/R)** and **ground**.

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7790
5200 N/R/B
SP48
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
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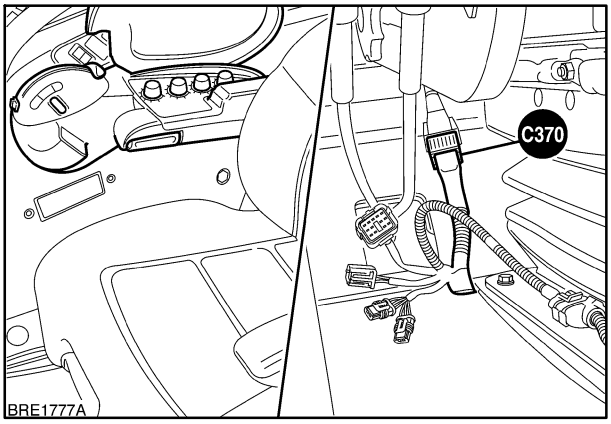
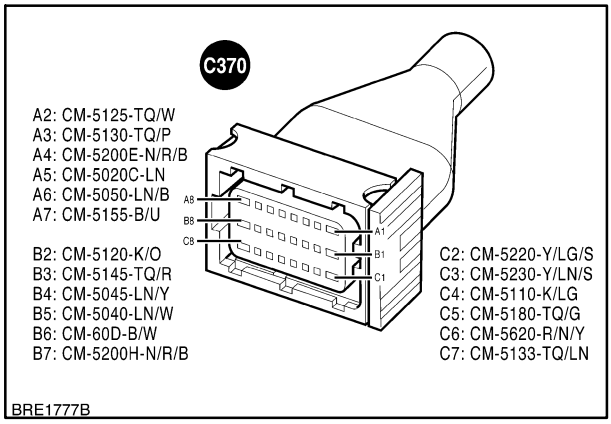

C370
BRE1777A


C370
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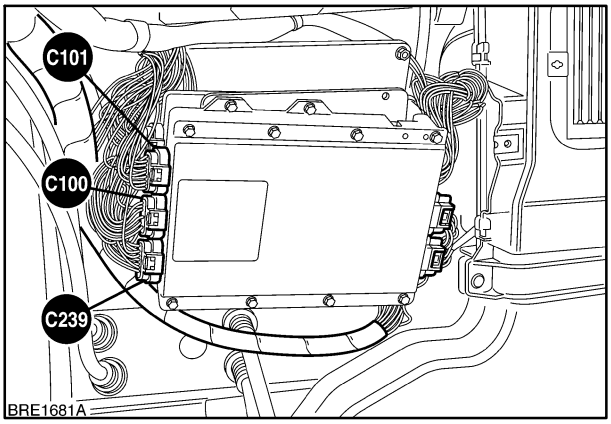
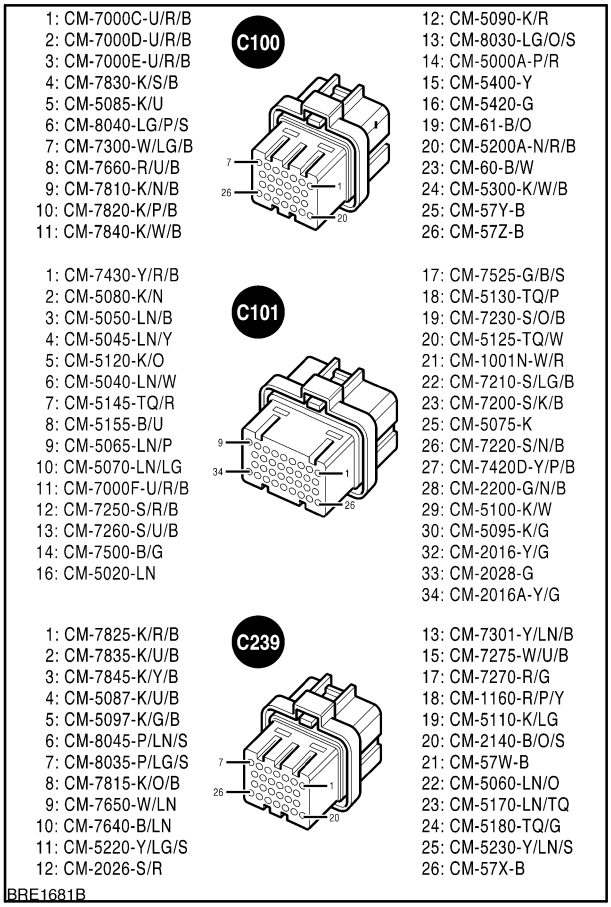
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
7
26
1
20
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
34
1
26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
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20
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1014 - RIGHT HAND LOAD SENSING PIN SIGNAL TOO LOW

Possible failure modes:

1. Faulty connector
2. Faulty load sensing pin
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the right hand side load sensing pin connecter **C048**, the inline harness connector **C019** and the controller connector **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the load sensing pin in H9 channel 38.

   A. Where possible, remove any implements to ensure the load sensing pins are not under any draft loading. If the value displayed is approximately 48, check for an intermittent circuit to the load sensing pin, repair or replace the harness as required. If the error re-occurs and no intermittent circuit is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.

   B. If the value displayed in H9 channel 38 is not approximately 48, continue to step 3.

3. Replace the load sensing pin.

   A. Turn the keystart OFF. Remove and replace the load sensing pin. (If a new pin is not available interchange the left and right hand load sensing pins). If the error is cleared, remove and replace the faulty sensing pin.

   B. If the error re-occurs, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C101** and both load sensing pin connectors **C048** and **C047**. Check between connector:

   C048 pin **2 (LN/P)** and **ground**

   C048 pin **3 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Check between connector:

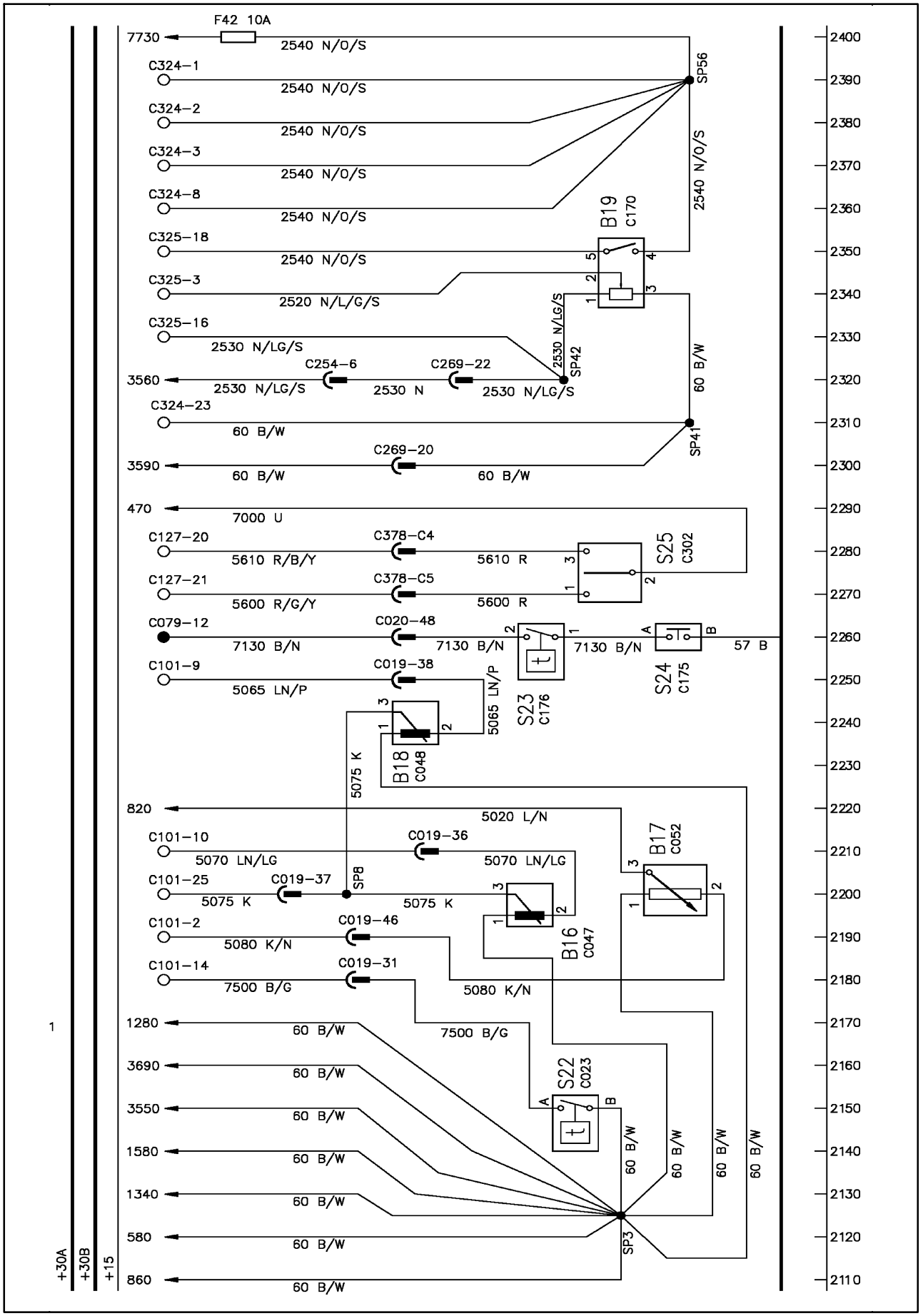
   C048 pin **1 (B/W)** and **ground**.

   C048 pin **2 (LN)** and **C101** pin **10 (LN/P)**

   C048 pin **3 (K)** and **C101** pin **25 (K)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N/LG/S
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19 C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25 C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S23 C176
S24 C175
57 B
B18 C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B16 C047
B17 C052
1280
3690
3550
1580
1340
580
860
S22 C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
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2280
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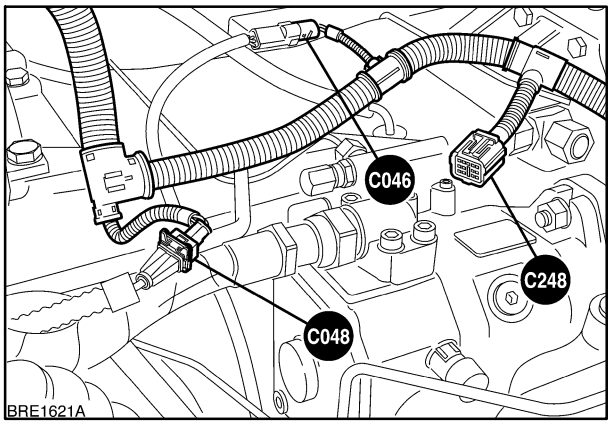
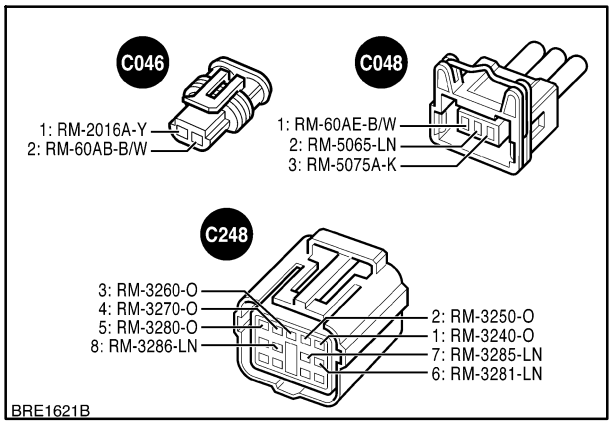


BRE1621A



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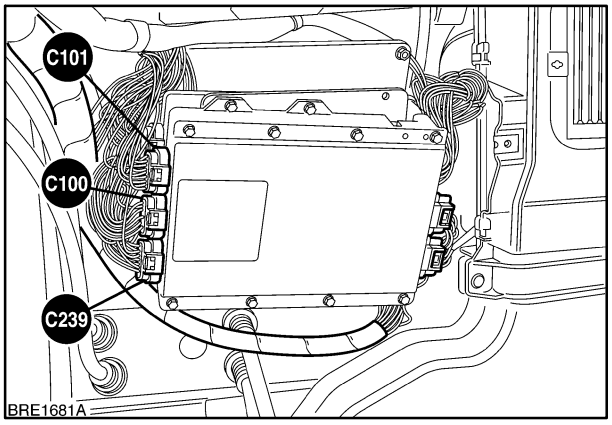
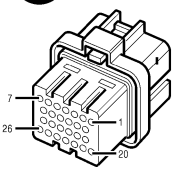


BRE1681A

C100



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3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
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24: CM-5300-K/W/B
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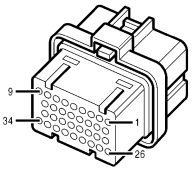
26: CM-57Z-B

C101



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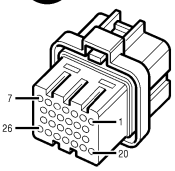
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1015 - RIGHT HAND LOAD SENSING PIN SIGNAL TOO HIGH

Possible failure modes:

1. Faulty connector
2. Faulty load sensing pin
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the right hand side load sensing pin connecter **C048**, the inline harness connector **C019** and the controller connector **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the load sensing pin in H9 channel 38.

   A. Where possible, remove any implements to ensure the load sensing pins are not under any draft loading. If the value displayed is approximately 48, check for an intermittent circuit to the load sensing pin, repair or replace the harness as required. If the error re-occurs and no intermittent circuit is indicated, download the correct level of software. If the fault re-occurs, remove and replace controller.

   B. If the value displayed in H9 channel 38 is not approximately 48, continue to step 3.

3. Replace the load sensing pin.

   A. Turn the keystart OFF. Remove and replace the load sensing pin. (If a new pin is not available interchange the left and right hand load sensing pins). If the error is cleared, remove and replace the faulty sensing pin.

   B. If the error re-occurs, continue to step 4.

4. Check for a short to +12 Volts.

   A. Disconnect connector **C101** and both load sensing pin connectors **C048** and **C047**. Turn the keystart ON. Check between connector:

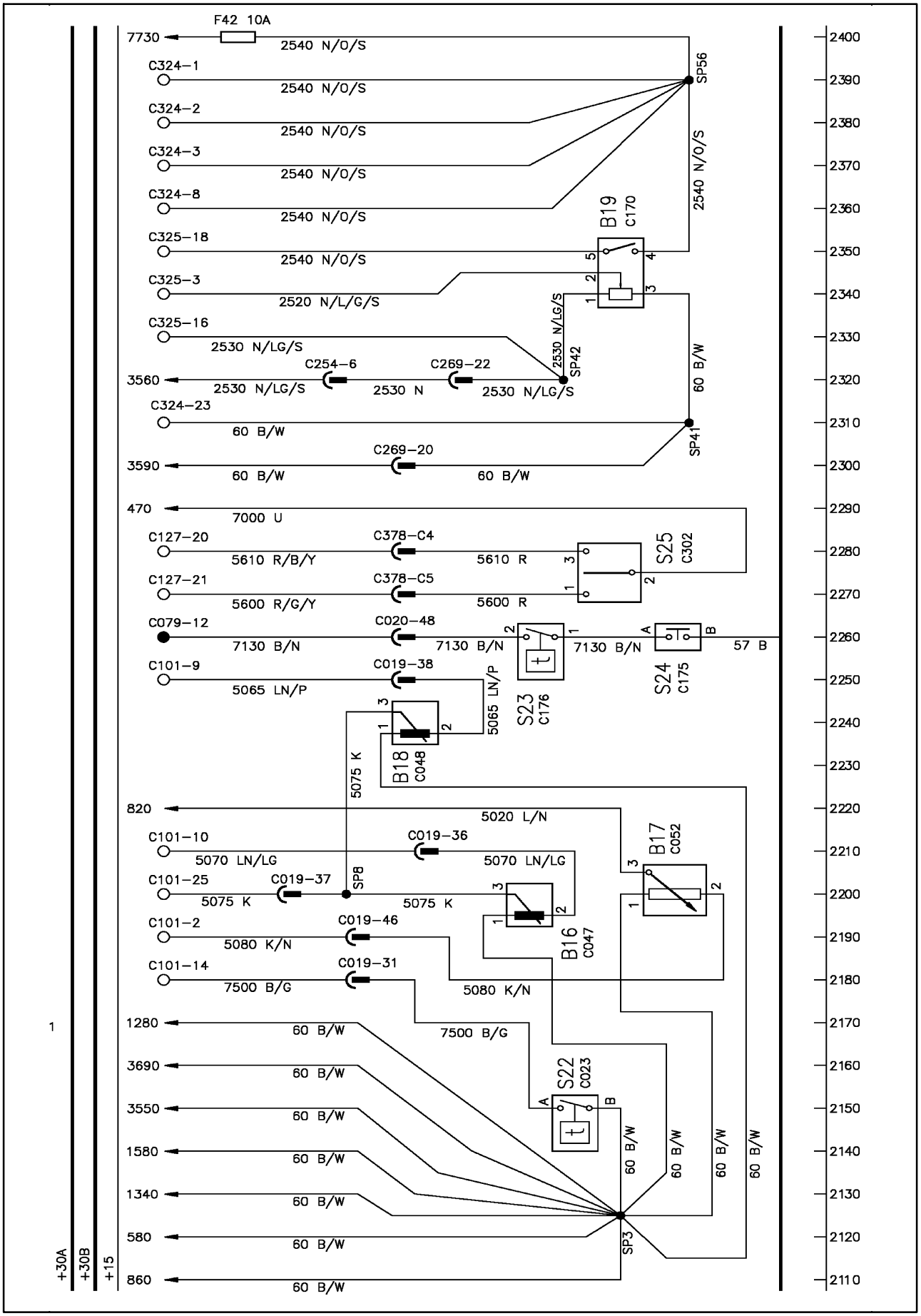
   C048 pin **1 (B/W)** and **ground**

   C048 pin **2 (LN)** and **ground**

   C048 pin **3 (K)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
57 B
S24
C175
C101-9
5065 LN/P
C019-38
S23
C176
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B17
C052
B16
C047
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
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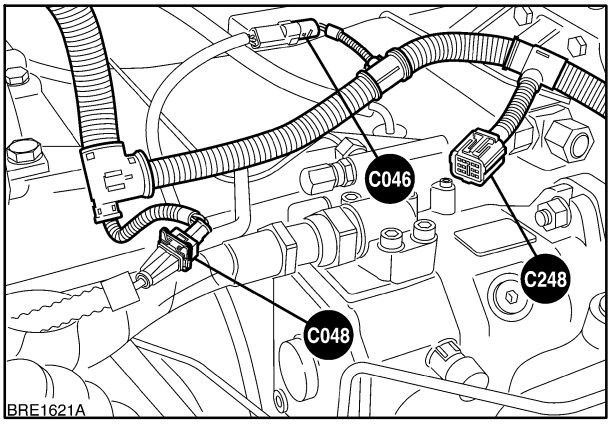
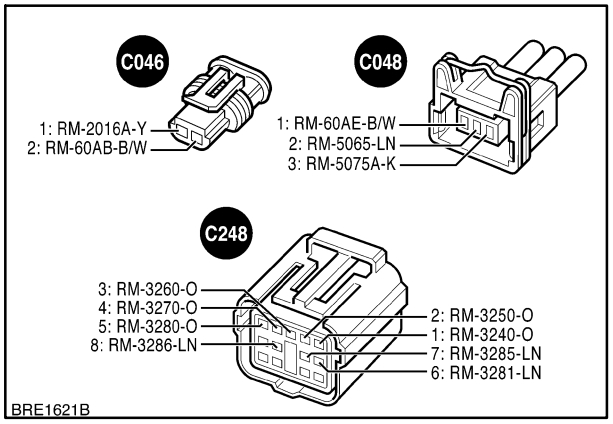
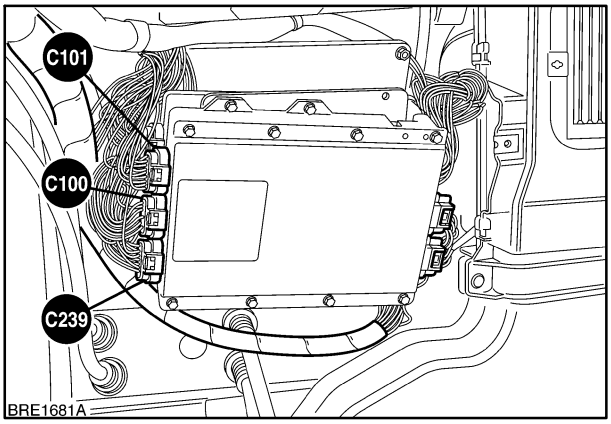
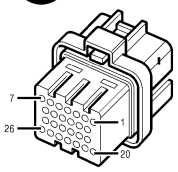






C100



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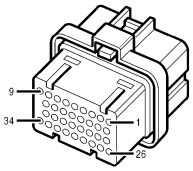
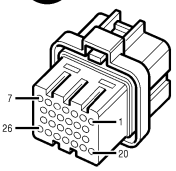
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1016 - LEFT HAND LOAD SENSING PIN SIGNAL TOO LOW

Possible failure modes:

1. Faulty connector
2. Faulty load sensing pin
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the left hand side load sensing pin connecter **C047**, the inline harness connector **C019** and the controller connector **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the load sensing pin in H9 channel 39.

   A. Where possible, remove any implements to ensure the load sensing pins are not under any draft loading. If the value displayed is approximately 48, check for an intermittent circuit to the load sensing pin, repair or replace the harness as required. If the error re-occurs and no intermittent circuit is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.

   B. If the value displayed in H9 channel 39 is not approximately 48, continue to step 3.

3. Replace the load sensing pin.

   A. Turn the keystart OFF. Remove and replace the load sensing pin. (If a new pin is not available interchange the left and right hand load sensing pins). If the error is cleared, remove and replace the faulty sensing pin.

   B. If the error re-occurs, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C101** and both load sensing pin connectors **C048** and **C047**. Check between connector:

   C047 pin **2 (LN/LG)** and **ground**

   C047 pin **3 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Check between connector:

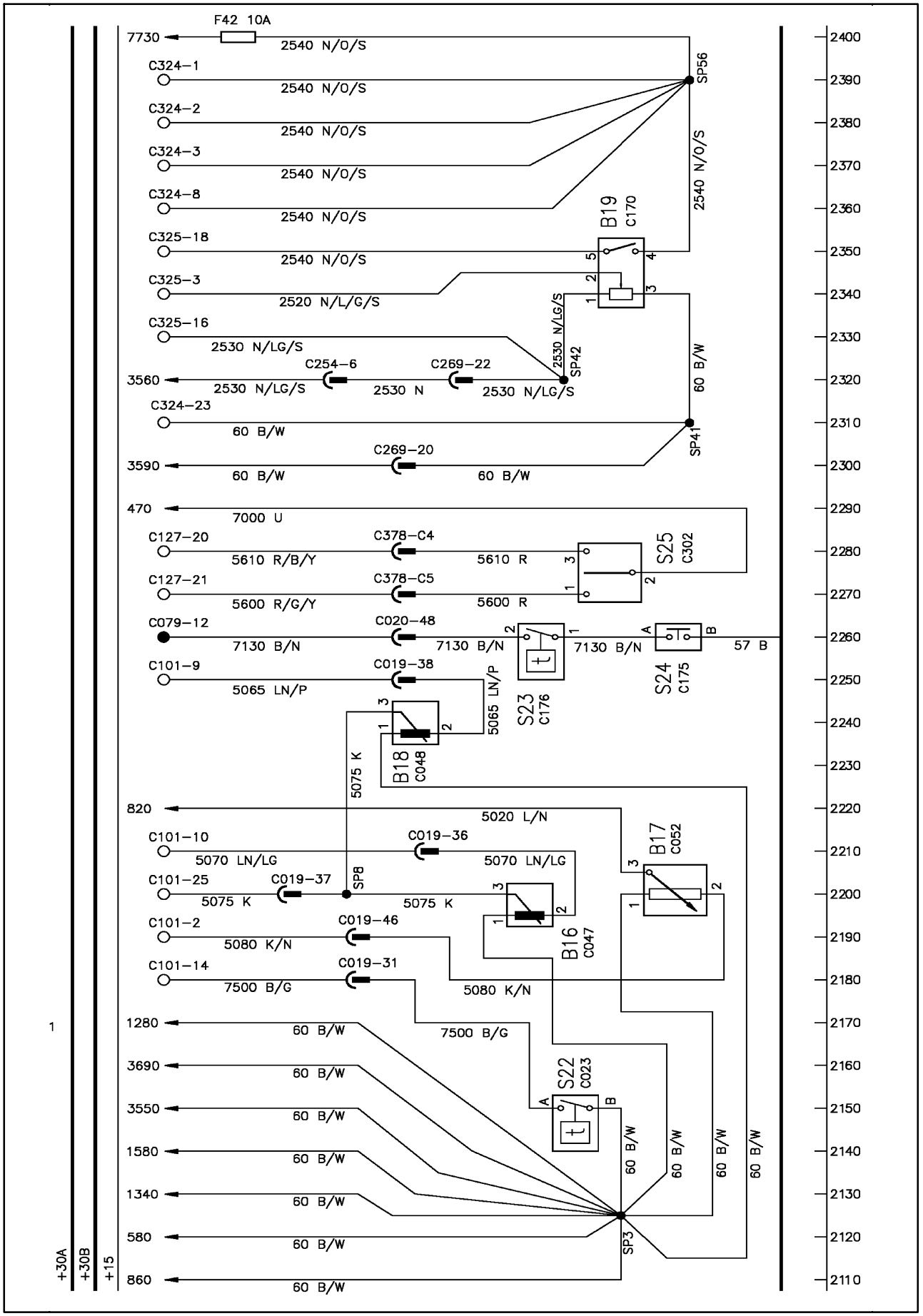
   C047 pin **1 (B/W)** and **ground**

   C047 pin **2 (LN)** and **C101** pin **9 (LN/P)**

   C047 pin **3 (K)** and **C101** pin **25 (K)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
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C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
57 B
S24
C175
C101-9
5065 LN/P
C019-38
S23
C176
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B16
C047
B17
C052
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
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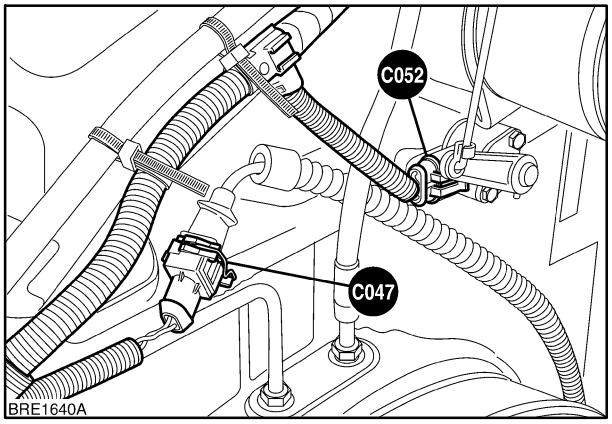
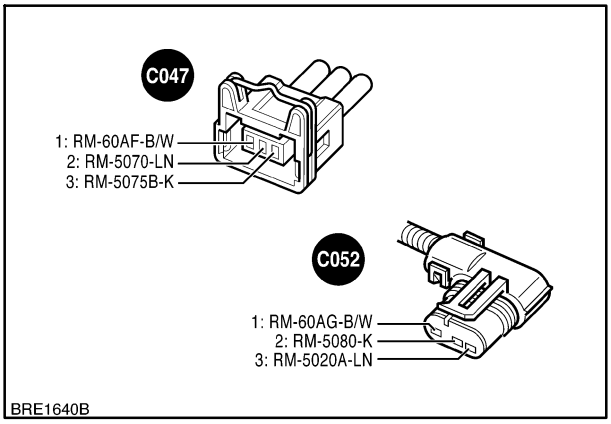
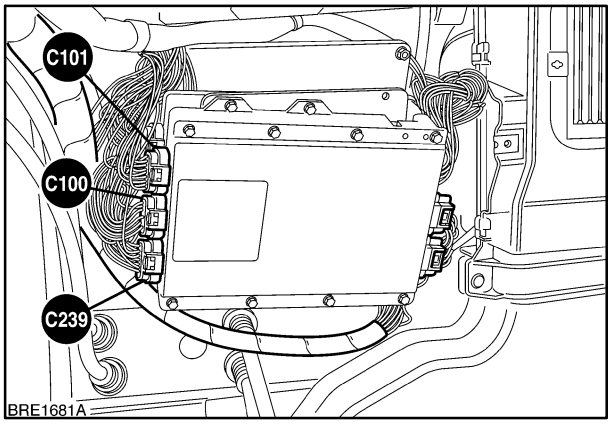


BRE1640A

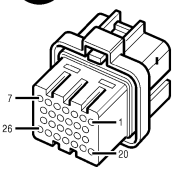


BRE1640B



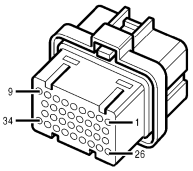
BRE1681A

C100



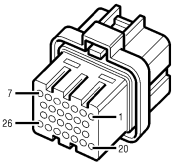
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1017 - LEFT HAND LOAD SENSING PIN SIGNAL TOO HIGH

Possible failure modes:

1. Faulty connector
2. Faulty load sensing pin
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the left hand side load sensing pin connecter **C047**, the inline harness connector **C019** and the controller connector **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the load sensing pin in H9 channel 39.

   A. Where possible, remove any implements to ensure the load sensing pins are not under any draft loading. If the value displayed is approximately 48, check for an intermittent circuit to the load sensing pin, repair or replace the harness as required. If the error re-occurs and no intermittent circuit is indicated, download the correct level of software. If the fault re-occurs, remove and replace controller.

   B. If the value displayed in H9 channel 39 is not approximately 48, continue to step 3.

3. Replace the load sensing pin.

   A. Turn the keystart OFF. Remove and replace the load sensing pin. (If a new pin is not available interchange the left and right hand load sensing pins). If the error is cleared, remove and replace the faulty sensing pin.

   B. If the error re-occurs, continue to step 4.

4. Check for a short to +12 Volts.

   A. Disconnect connector **C101** and both load sensing pin connectors **C048** and **C047**. Turn the keystart ON. Check between connector:

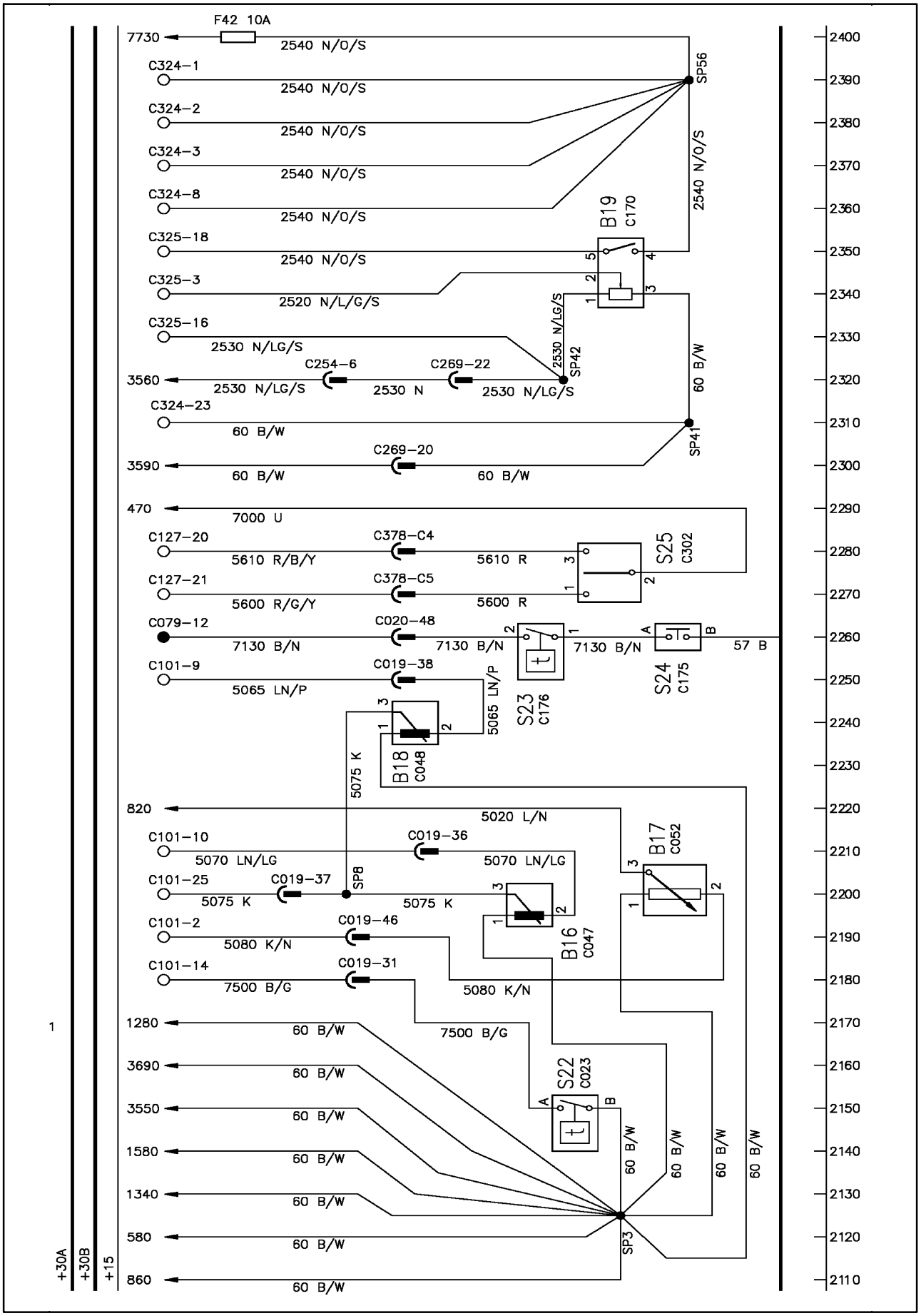
   C047 pin **1 (B/W)** and **ground**

   C047 pin **2 (LN)** and **ground**

   C047 pin **3 (K)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
57 B
S24
C175
C101-9
5065 LN/P
C019-38
S23
C176
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B17
C052
B16
C047
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
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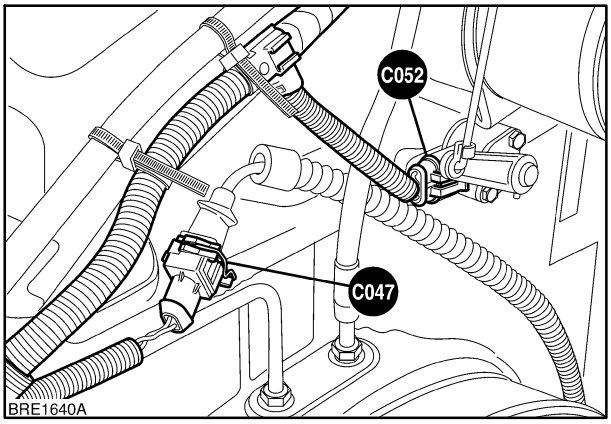
2120
2110



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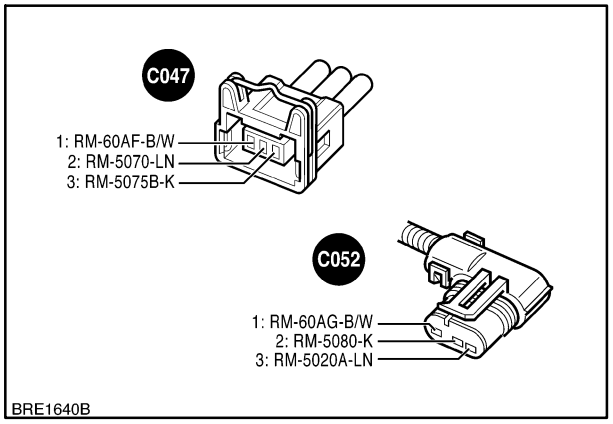
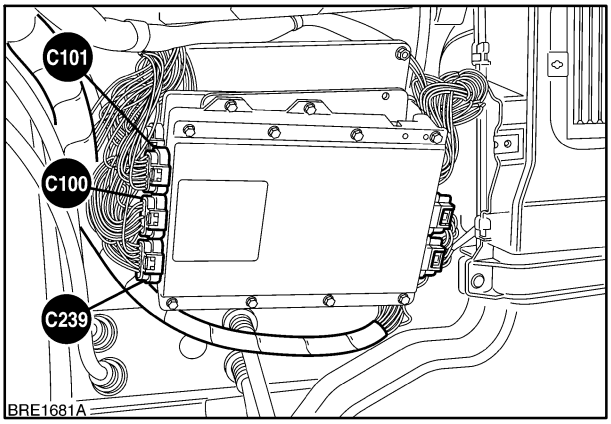


BRE1640B



BRE1681A

C100

1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101

1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1018 – BOTH LOAD SENSING PINS DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the inline harness connector **C019**, the controller connector **C101** and both load sensing pin connectors **C048** and **C047**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Visually check the harness to both pins for any damage.

   A. If the harness is damaged, repair or replace as required.

   B. If no visible damage to the harness is indicated, continue to step 3.
3. Check for an open circuit.

   A. Disconnect the controller connector **C101** and both load sensing pin connectors **C048** and **C047**. Check between connector:

   C048 pin **1 (B/W)** and **ground**

   C048 pin **2 (LN)** and **C101** pin **10 (LN/LG)**

   C048 pin **3 (K)** and **C101** pin **25 (K)**

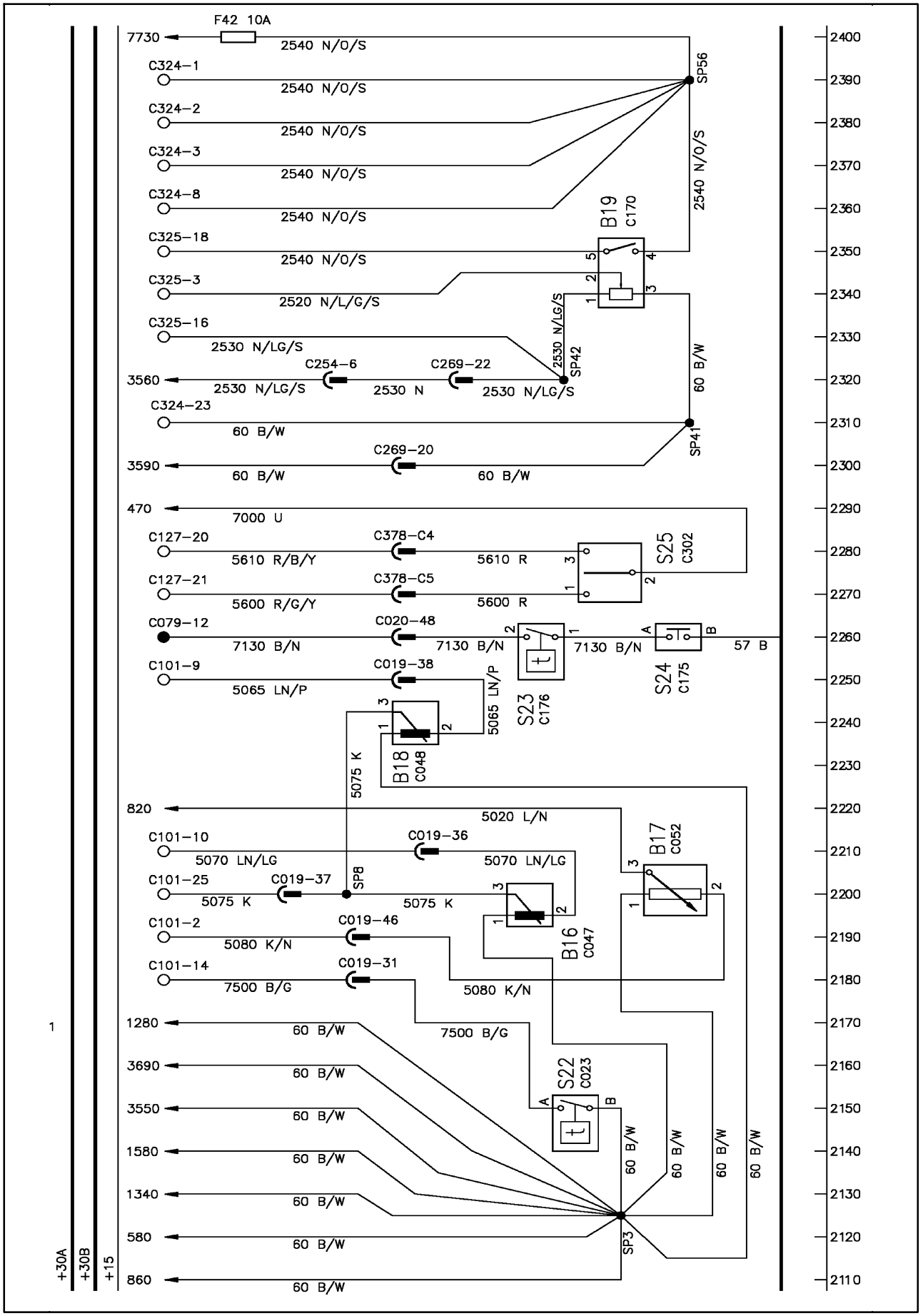
   C047 pin **1 (B/W)** and **ground**

   C047 pin **2 (LN)** and **C101** pin **9 (LN/P)**

   C047 pin **3 (K)** and **C101** pin **25 (K)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S24
C175
S23
C176
B18
C048
5075 K
57 B
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B17
C052
B16
C047
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
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2210
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2180
2170
2160
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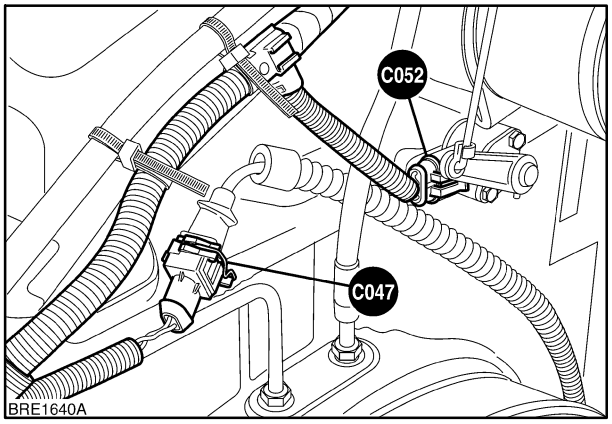
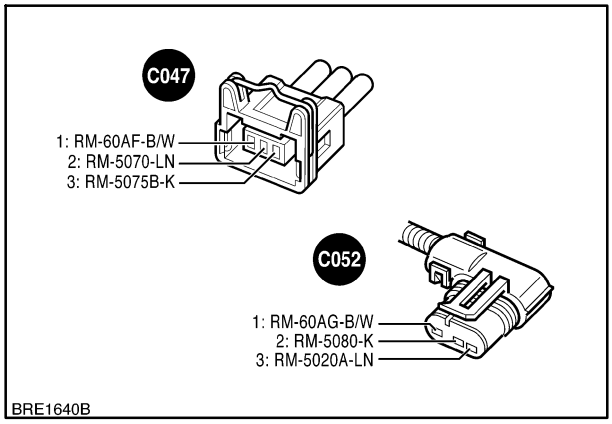
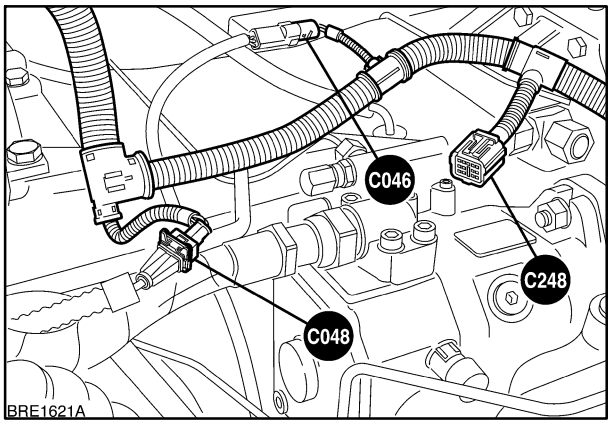
2140
2130
2120
2110



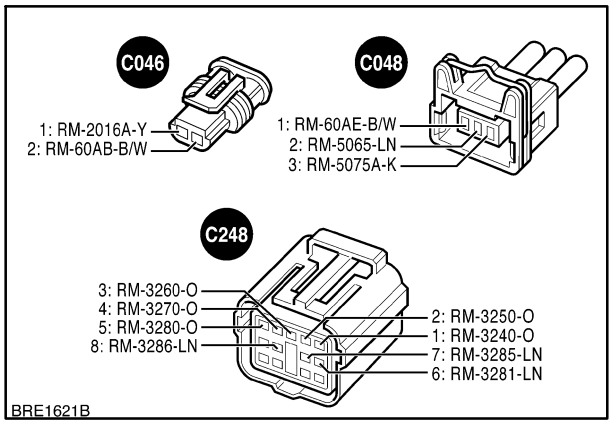
BRE1640A



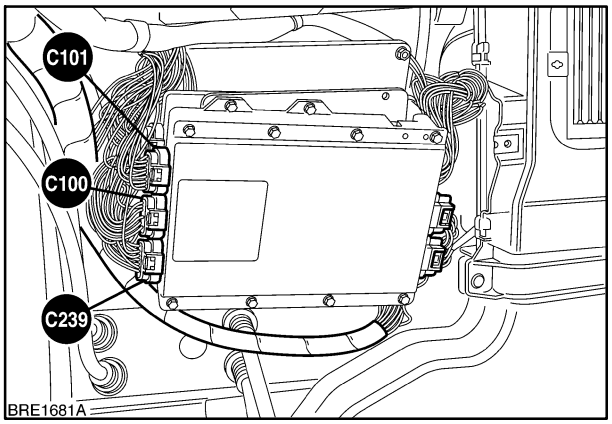
BRE1640B



BRE1621A



BRE1621B



BRE1681A

C100

1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101

1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1019 – LOAD SENSING PIN VOLTAGE LESS THAN 8 VOLTS (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty load sensing pin
2. Faulty load sensing pin
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 8 Volts sensor supply in H9 channel 6.

   A. If the value displayed is approximately 80, check for an intermittent circuit to the load sensing pin, repair or replace the harness as required. If the error re-occurs and no intermittent circuit is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.

   B. If the value displayed is not approximately 80, continue to step 2.

2. Check for a short to ground.

   A. Disconnect both load sensing pin connectors **C048** and **C047**. Check between connector:

   C048 pin **3 (K)** and **ground**

   C047 pin **3 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector:

   C048 pin **3 (K)** and **C101** pin **25 (K)**

   C048 pin **1 (B/W)** and **ground**

   C047 pin **3 (K)** and **C101** pin **25 (K)**

   C047 pin **1 (B/W)** and **ground**

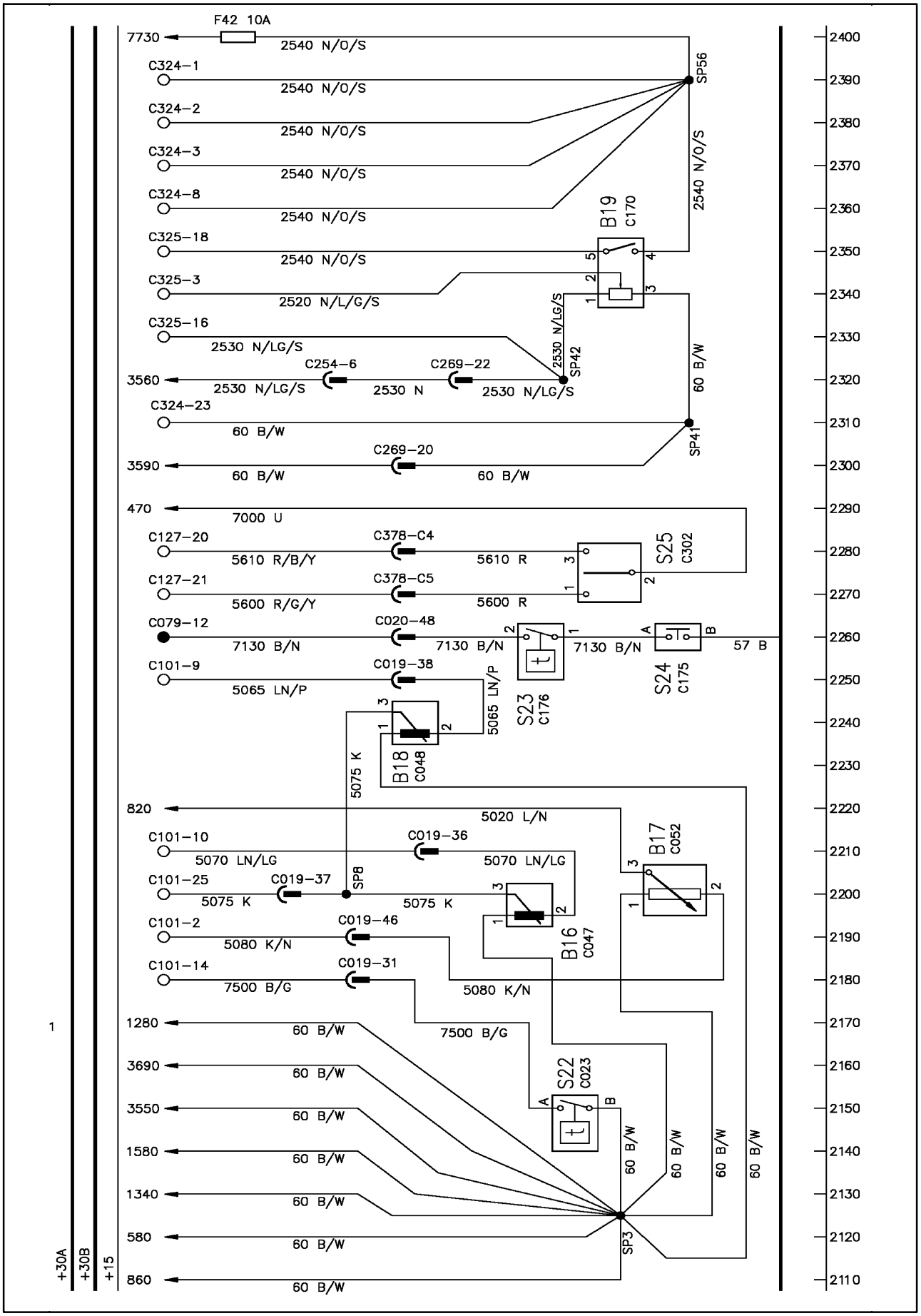
   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.

4. Replace the load sensing pin(s).

   A. Remove and replace the load sensing pin(s).

   B. If the error re-occurs, refit the old load sensing pins and download the correct level of software. If the fault re-occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19 C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25 C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S23 C176
S24 C175
57 B
B18 C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B16 C047
B17 C052
1280
3690
3550
1580
1340
580
860
S22 C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
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2160
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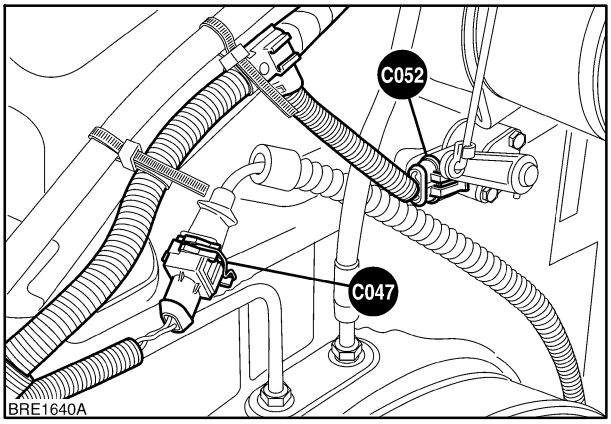
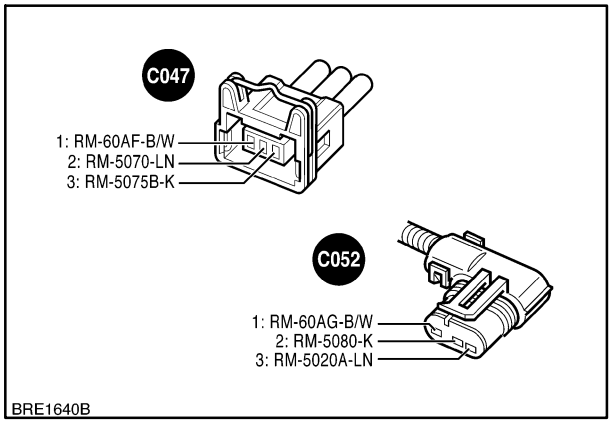
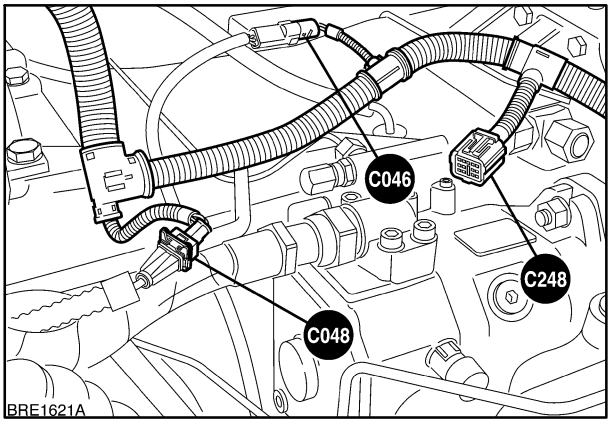
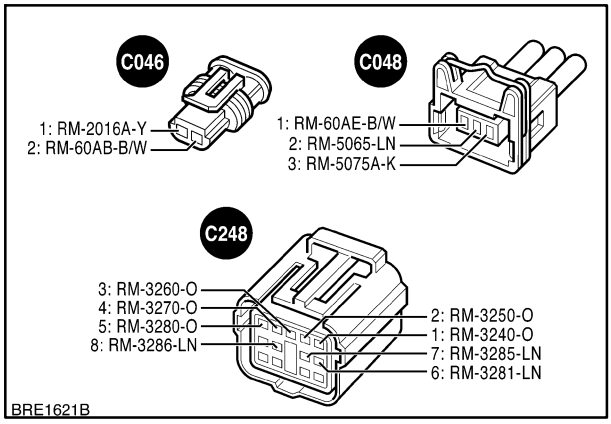
2140
2130
2120
2110


C052
C047
BRE1640A


C047
1: RM-60AF-B/W
2: RM-5070-LN
3: RM-5075B-K
C052
1: RM-60AG-B/W
2: RM-5080-K
3: RM-5020A-LN
BRE1640B


C046
C248
C048
BRE1621A


C046
1: RM-2016A-Y
2: RM-60AB-B/W
C048
1: RM-60AE-B/W
2: RM-5065-LN
3: RM-5075A-K
C248
3: RM-3260-O
4: RM-3270-O
5: RM-3280-O
8: RM-3286-LN
2: RM-3250-O
1: RM-3240-O
7: RM-3285-LN
6: RM-3281-LN
BRE1621B

ERROR CODE 1020 - LOAD SENSING PIN VOLTAGE GREATER THAN 8 VOLTS (SHORT TO +12 VOLTS)

Possible failure modes:

1. Faulty connector
2. Faulty load sensing pin
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 8 Volts sensor supply in H9 channel 6.

   A. If the value displayed is approximately 80, check for an intermittent circuit to the load sensing pin, repair or replace the harness as required. If the error re-occurs and no intermittent circuit is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.

   B. If the value displayed is not approximately 80, continue to step 2.

2. Check for a short to +12 Volts.

   A. Disconnect the controller connector **C101** and both load sensing pin connectors **C047** and **C048**. Turn the keystart ON. Check between connector:

   C048 pin **1 (B/W)** and **ground**

   C048 pin **2 (LN/P)** and **ground**

   C048 pin **3 (K)** and **ground**

   C048 pin **1 (B/W)** and **ground**

   C047 pin **2 (LN/LG)** and **ground**

   C047 pin **3 (K)** and **ground**

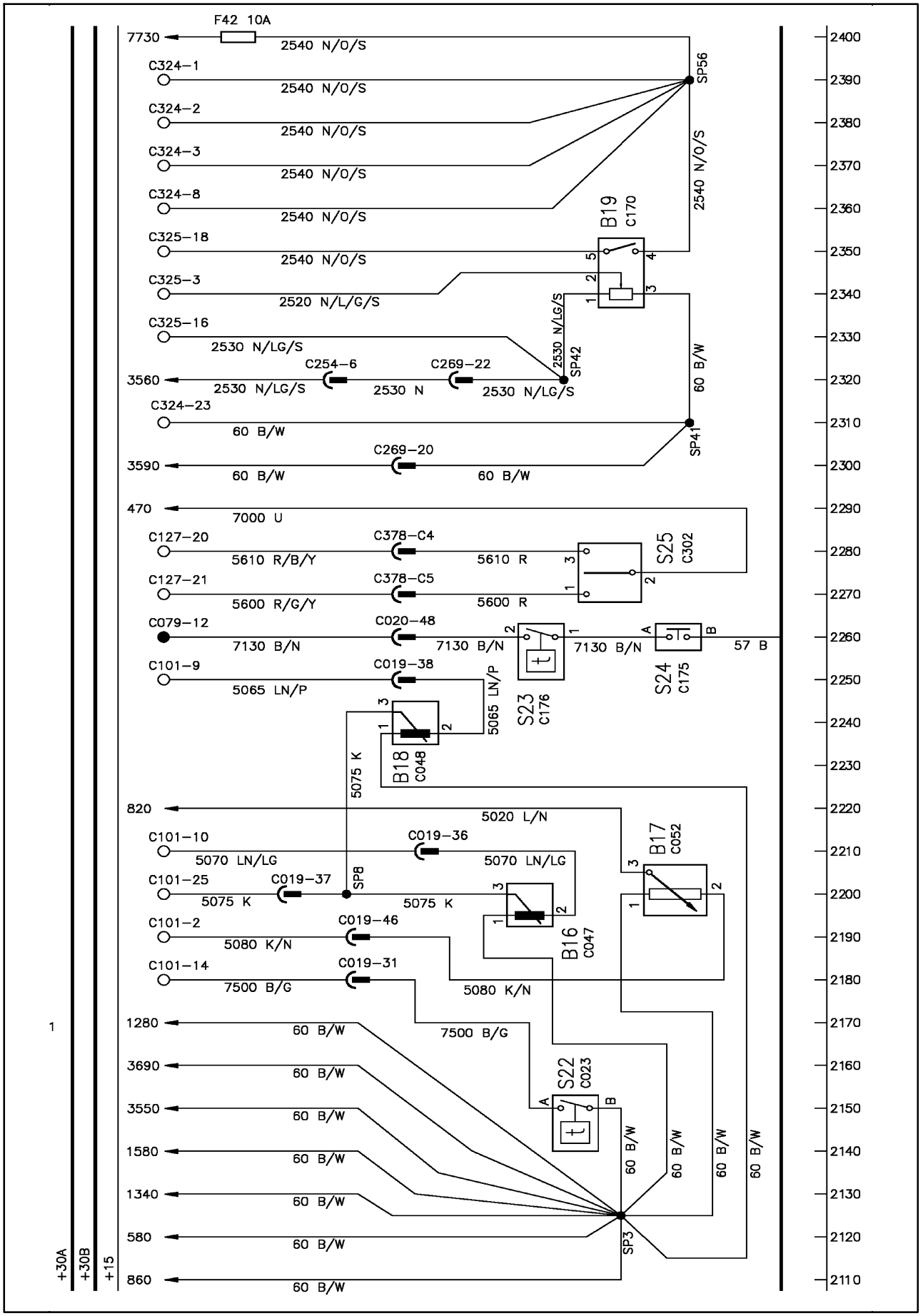
   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 3.

3. Replace the load sensing pin(s).

   A. Remove and replace the load sensing pin(s).

   B. If the error re-occurs, refit the old load sensing pins and download the correct level of software. If the fault re-occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N/LG/S
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19 C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25 C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S24 C175
57 B
S23 C176
B18 C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B17 C052
B16 C047
1280
3690
3550
1580
1340
580
860
S22 C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
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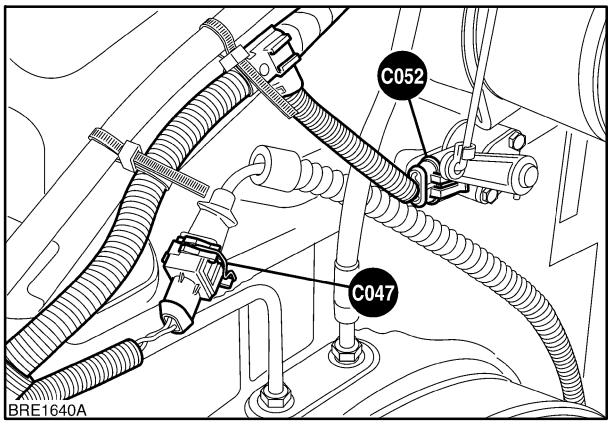
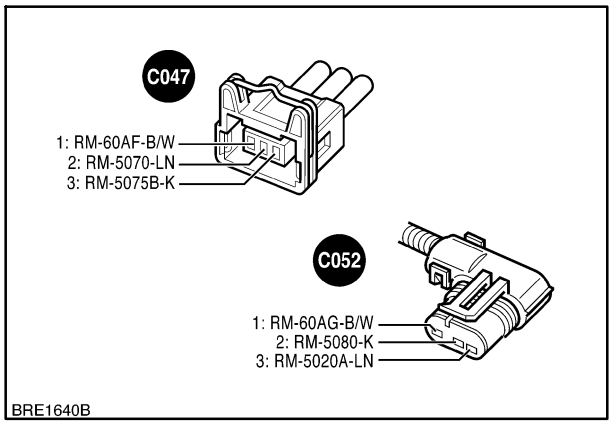
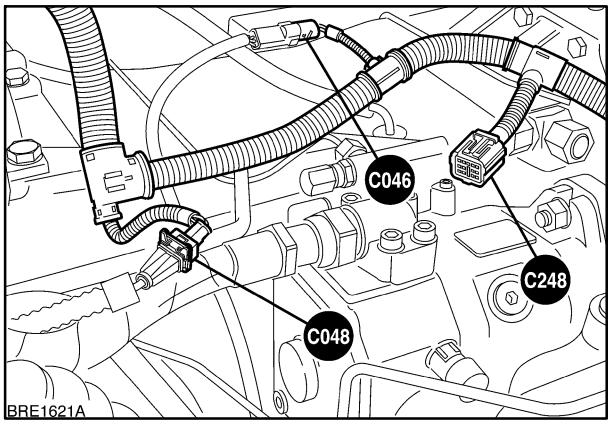
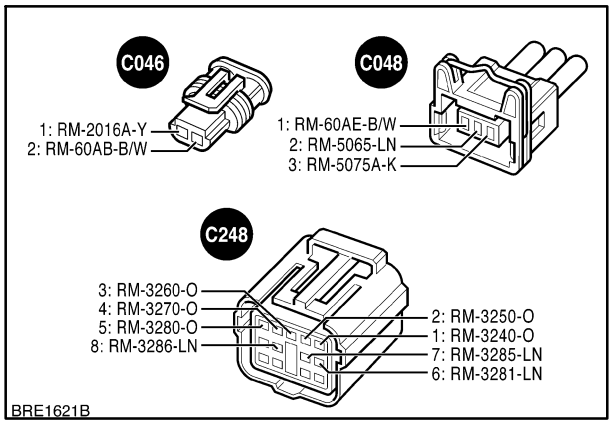
2120
2110


C052
C047
BRE1640A


C047
1: RM-60AF-B/W
2: RM-5070-LN
3: RM-5075B-K
C052
1: RM-60AG-B/W
2: RM-5080-K
3: RM-5020A-LN
BRE1640B


C046
C248
C048
BRE1621A


C046
1: RM-2016A-Y
2: RM-60AB-B/W
C048
1: RM-60AE-B/W
2: RM-5065-LN
3: RM-5075A-K
C248
3: RM-3260-O
4: RM-3270-O
5: RM-3280-O
8: RM-3286-LN
2: RM-3250-O
1: RM-3240-O
7: RM-3285-LN
6: RM-3281-LN
BRE1621B

ERROR CODE 1021 – DRAFT SENSITIVITY CONTROL VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
2. Faulty draft sensitivity control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the draft sensitivity control potentiometer in H9 Channel 36.

   A. Turn the draft sensitivity control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 36 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 36 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the draft sensitivity control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the draft sensitivity control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **5 (Y/G)**

   C121 pin **3 (B)** and **C121** pin **5 (Y/G)**

   If the resistances indicated are not between 90 – 360 Ohms (with slip control) and 170 – 520 Ohms (without slip control), replace the EDC control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to ground.

   A. Check between connector:

   C121 pin **4 (R)** and **ground**

   C121 pin **5 (Y/G)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C100** and **101**. Check between connector:

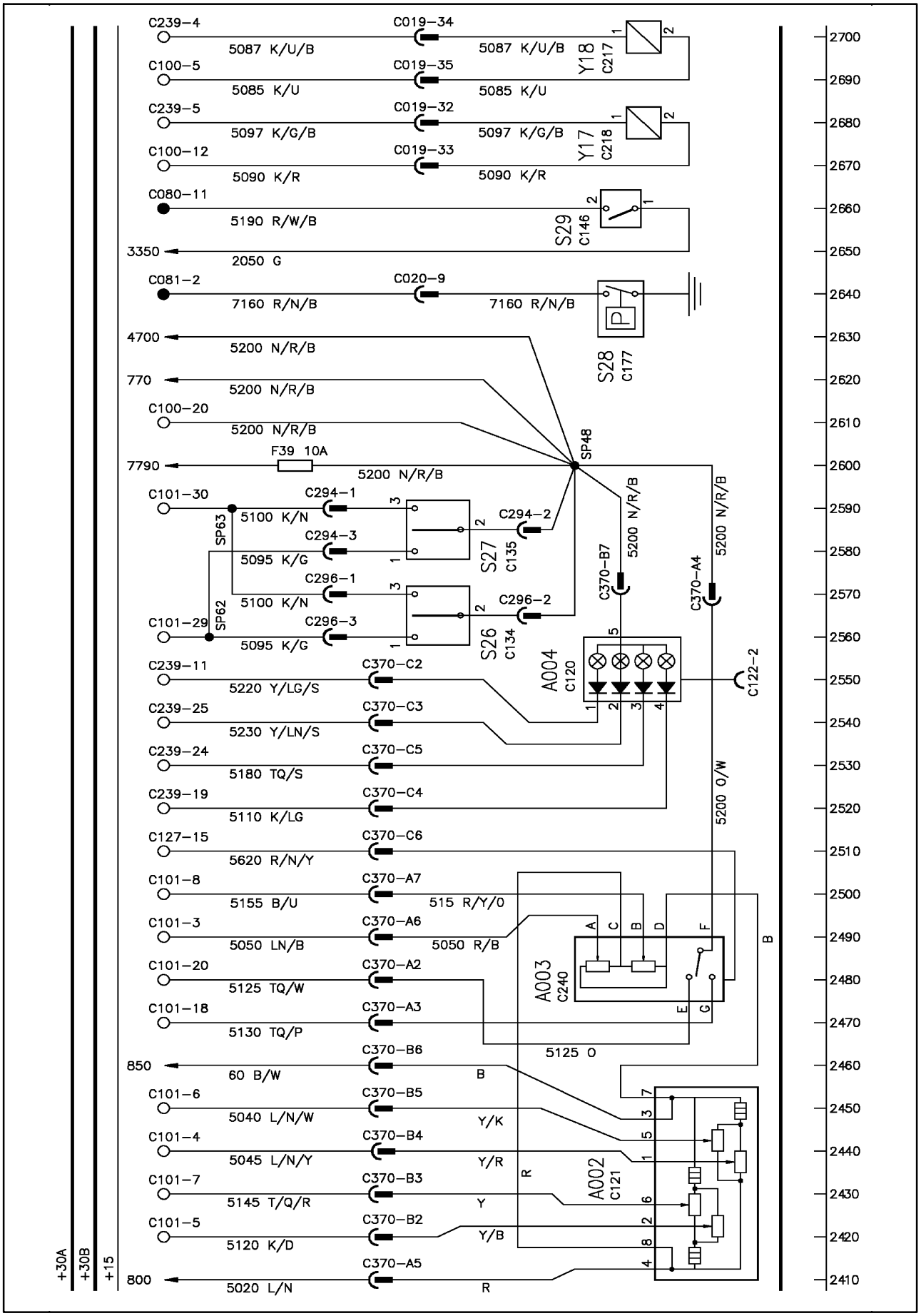
   C121 pin **4 (R)** and **C101** pin **101** pin **16 (R)**

   C121 pin **3 (B)** and **C100** pin **23 (B/W)**

   C121 pin **5 (Y/G)** and **C101** pin **6 (L/N/W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
A002
C121
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
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2610
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2590
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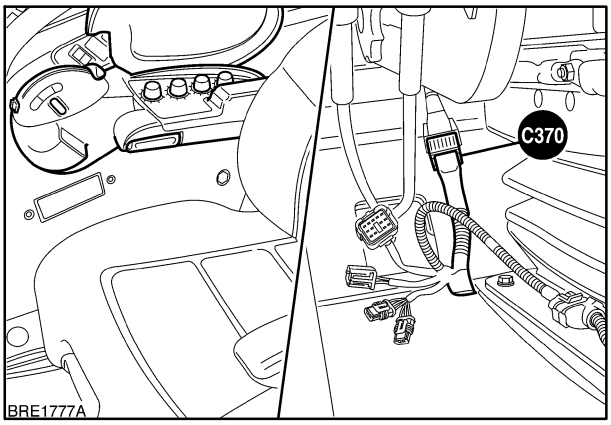
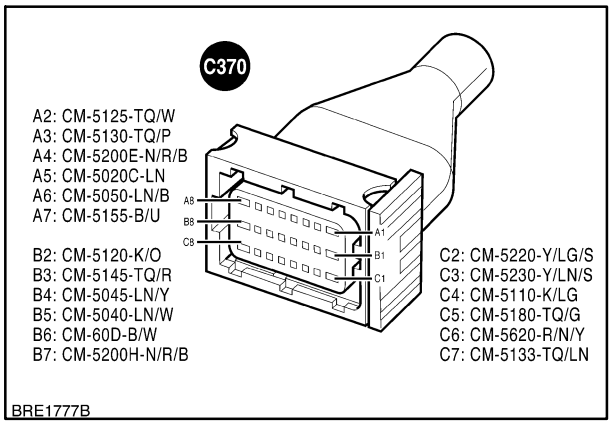
2410


C370
BRE1777A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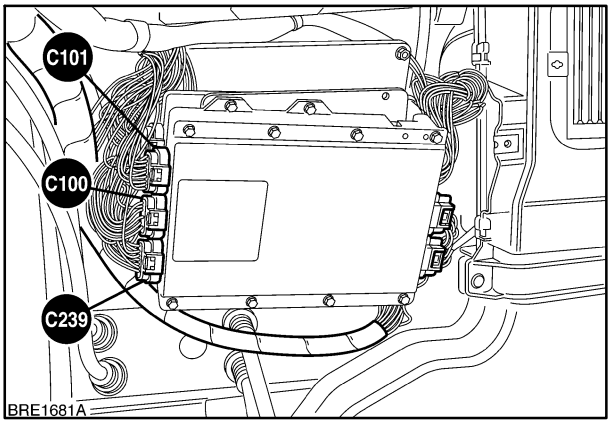
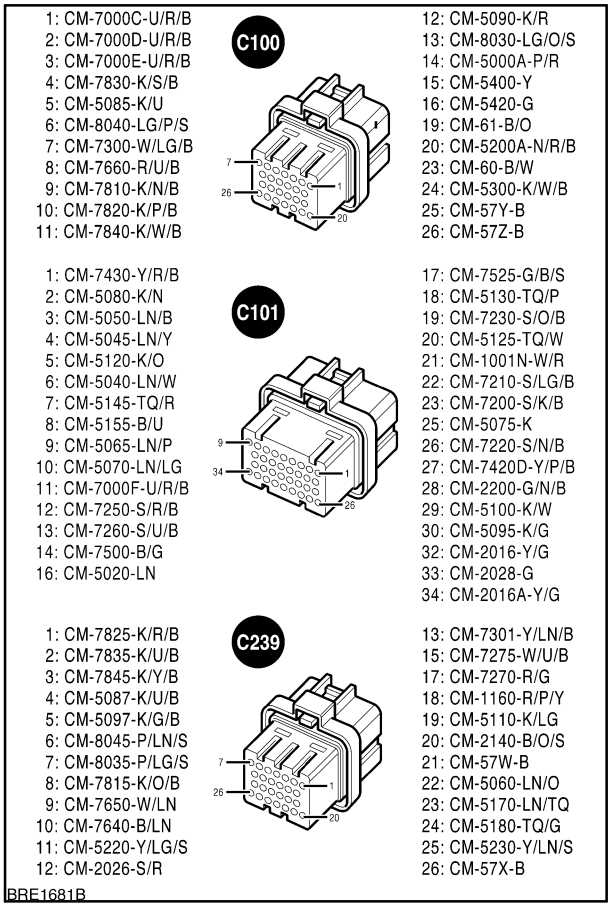
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
7
26
1
20
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
34
1
26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
7
26
1
20
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1022 – DRAFT SENSITIVITY CONTROL VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty draft sensitivity control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the draft sensitivity control potentiometer in H9 Channel 36.

   A. Turn the draft sensitivity control knob fully clockwise and then fully counter clockwise. If the values displayed are not between 84 to 14, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 36 wiggle the harness and the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101** to check for an intermittent circuit. Channel 36 values will change if an intermittent circuit is indicated, repair or replace as required.

2. Check the drop rate control potentiometer.

   A. Remove the EDC control panel and disconnect the connector **C121**. While turning the draft sensitivity control knob fully clockwise and then fully counter clockwise, measure the resistance between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **5 (Y/G)**

   C121 pin **3 (B)** and **C121** pin **5 (Y/G)**

   If the resistances indicated are not between 90 – 360 Ohms (with slip control) and 170 – 520 Ohms (without slip control), replace the control panel.

   B. If the EDC control panel is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C121** pin **4 (R)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

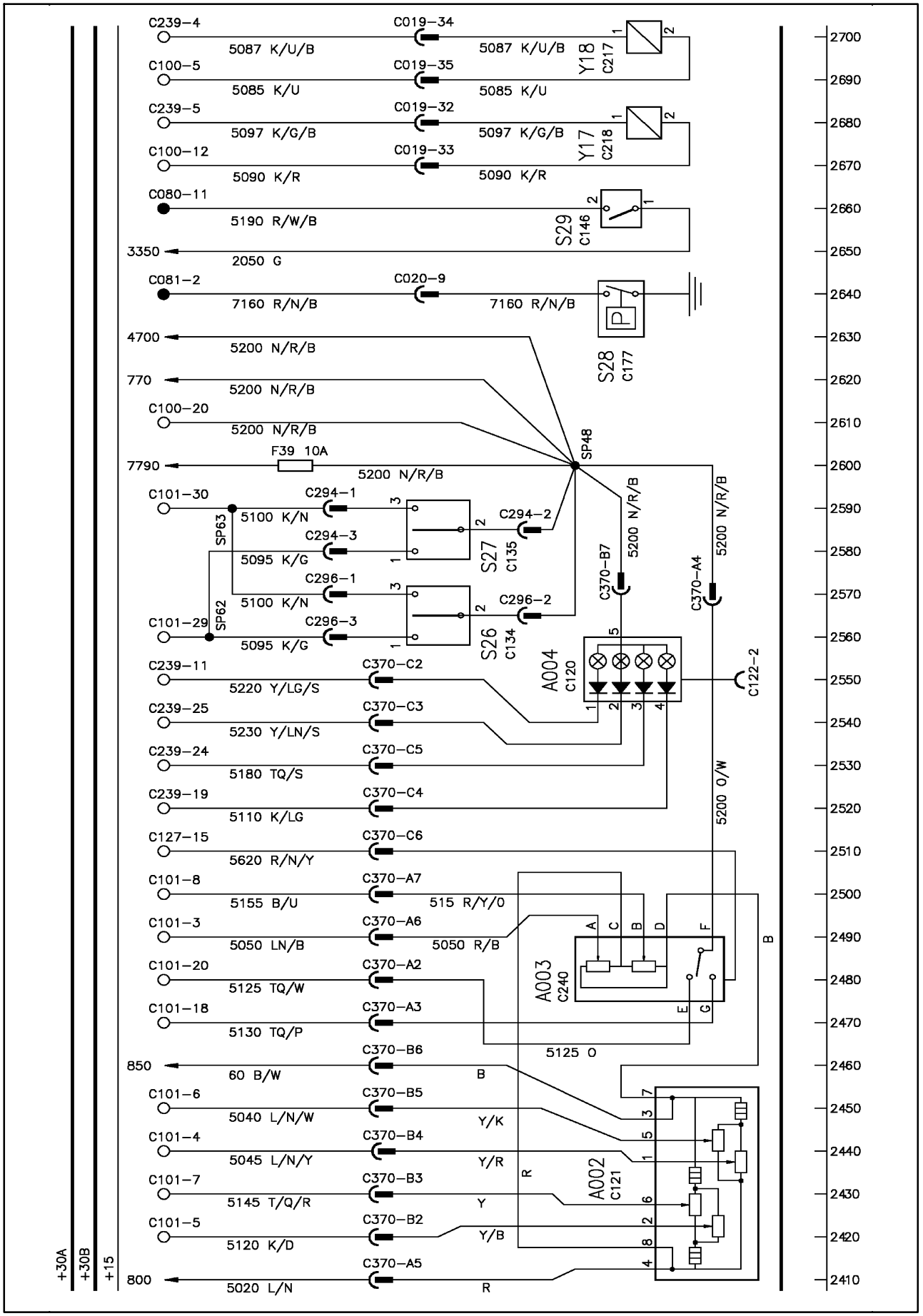
   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Measure the voltage between connector **C121** pin **5 (Y/G)** and **ground**.

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
A002
C121
R
800
C370-A5
5020 L/N
R
B
+30A
+30B
+15
2700
2690
2680
2670
2660
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2610
2600
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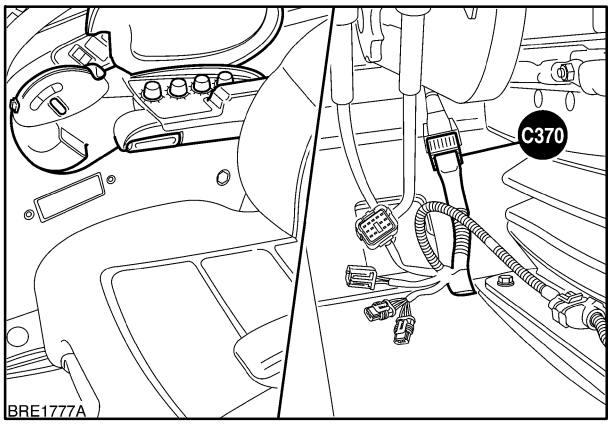
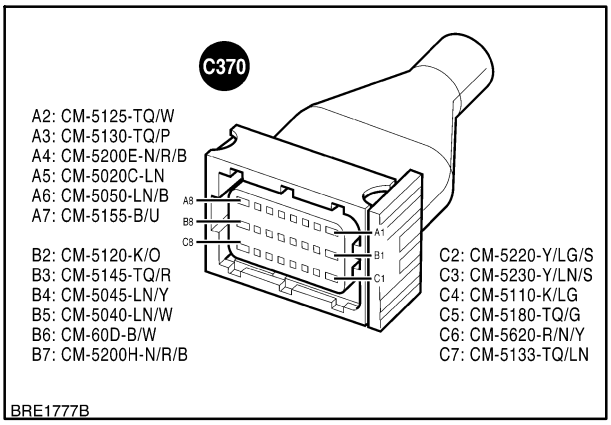
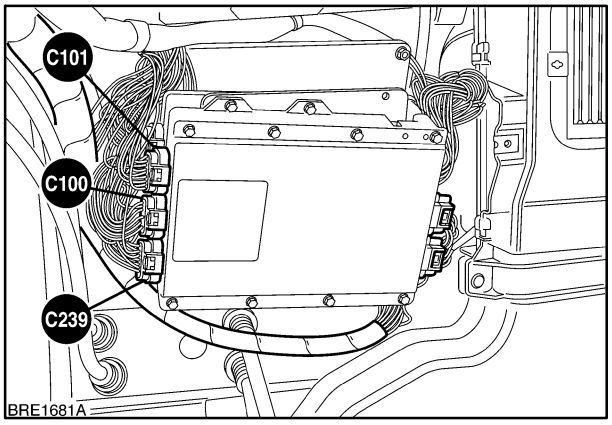
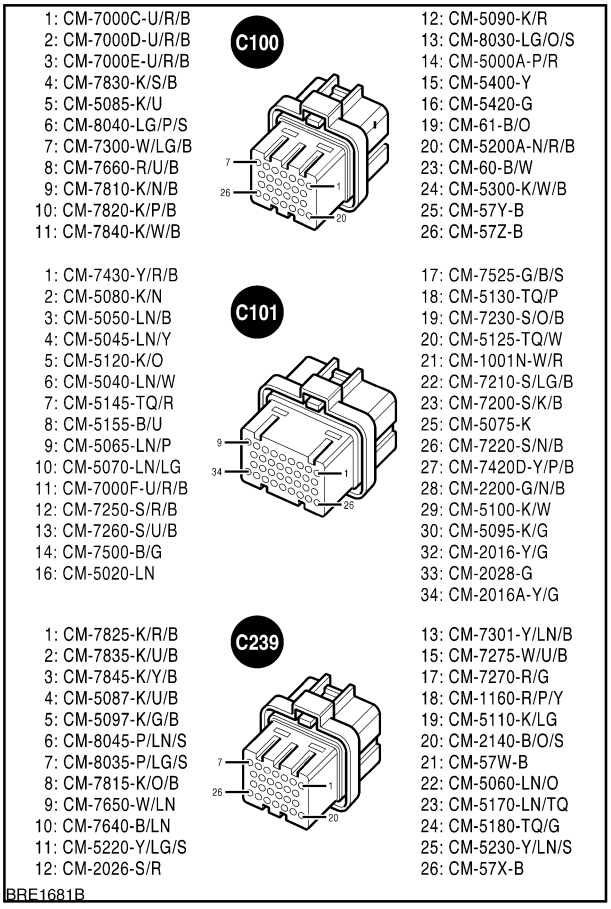
2410


C370
BRE1777A


C370
A2: CM-5125-TQ/W
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1023 – CONTROL PANEL DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty EDC control panel
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connectors **C100** and **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

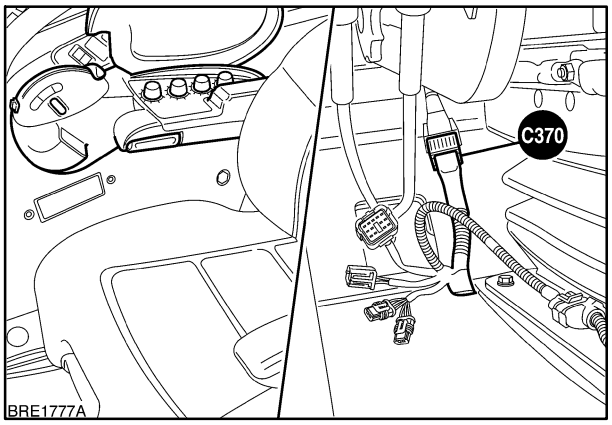
   B. If the connectors are okay, continue to step 2.
2. Visually check the harness to the control panel for any damage.

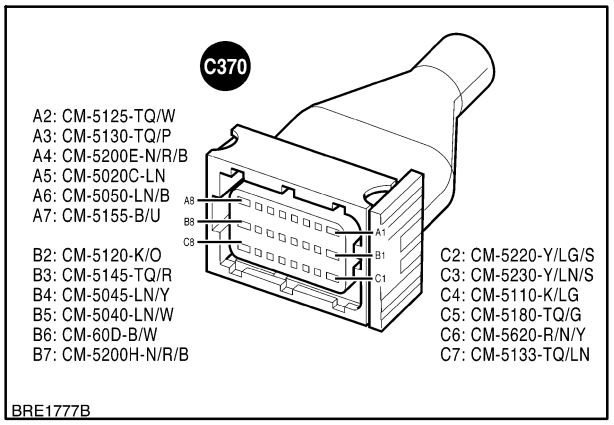
   A. If the harness is damaged, repair or replace as required.

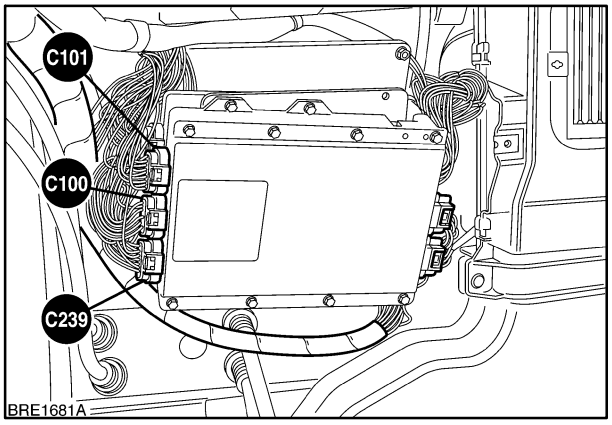
   B. If the harness is not damaged, continue to step 3.
3. Check all harness connectors are connected.

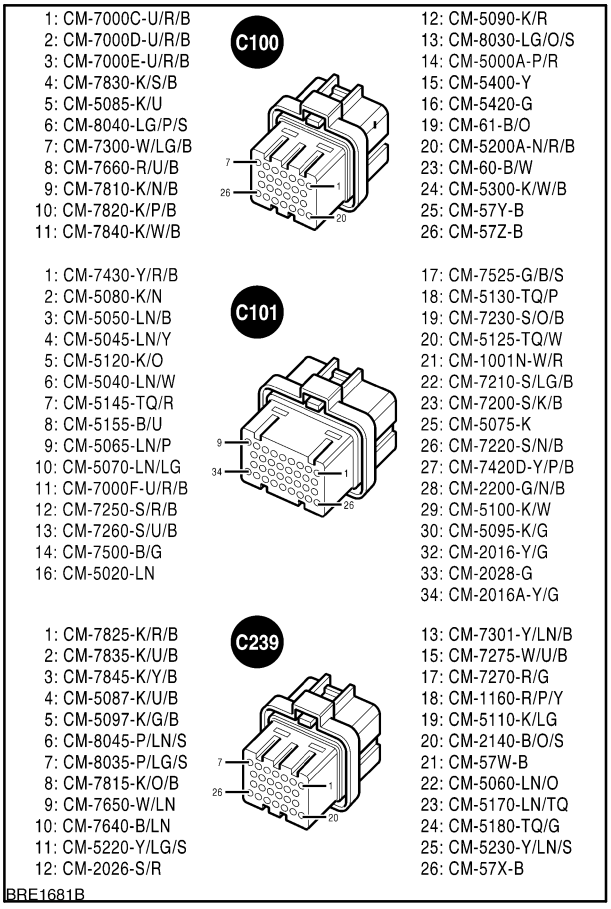
   A. If any connectors are disconnected, connect the connectors as required.

   B. If the harness is okay, remove and replace the EDC control panel.


C370
BRE1777A


C370
A2: CM-5125-TQ/W
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1024 – PERFORM THE HYDRAULIC LIFT AUTCALIBRATION

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the hydraulic lift calibration procedure.

ERROR CODE 1025 – POSITION CONTROL POTENTIOMETER CONTROL VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
2. Faulty position control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the position control potentiometer for any damage.

   A. If the potentiometer is damaged, remove and replace the potentiometer.

   B. If the potentiometer is okay, continue to step 2.

2. Check the position control potentiometer in H9 Channel 33.

   A. Fully lower and then raise the position control potentiometer. If the values displayed are not between 25 to 74, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 33, wiggle the harness, the EDC control unit connector **C240**, the EDC control panel **C121** connector, the inline harness connector **C370** and the controller connector **C101** to check for an intermittent circuit. Channel 33 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the position control potentiometer.

   A. Disconnect connector **C240**. While moving the position control potentiometer from the minimum to maximum position, measure the resistance between the component side of connector:

   C240 pin **A (R/B)** and **C240** pin **C (R)**

   C240 pin **A (R/B)** and **C240** pin **D (B)**

   If the values indicated do not range between 100 – 600 Ohms, remove and replace the EDC control unit.

   B. If the EDC control unit is okay, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C121**. Check between connector:

   C240 pin **A (R/B)** and **ground**

   C240 pin **C (R)** and **ground**

   C121 pin **4 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check the EDC control panel for an open cicuit.

   A. Check between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **8 (R)**

   C121 pin **3 (B)** and **C121** pin **7 (B)**

   If an open circuit is indicated, remove and replace the EDC control panel.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for an open circuit.

   A. Disconnect connector **C101**. Check between connector:

   C240 pin **A (R/B)** and **C101** pin **3 (LN/B)**

   C240 pin **C (R)** and **C121** pin **8 (R)**

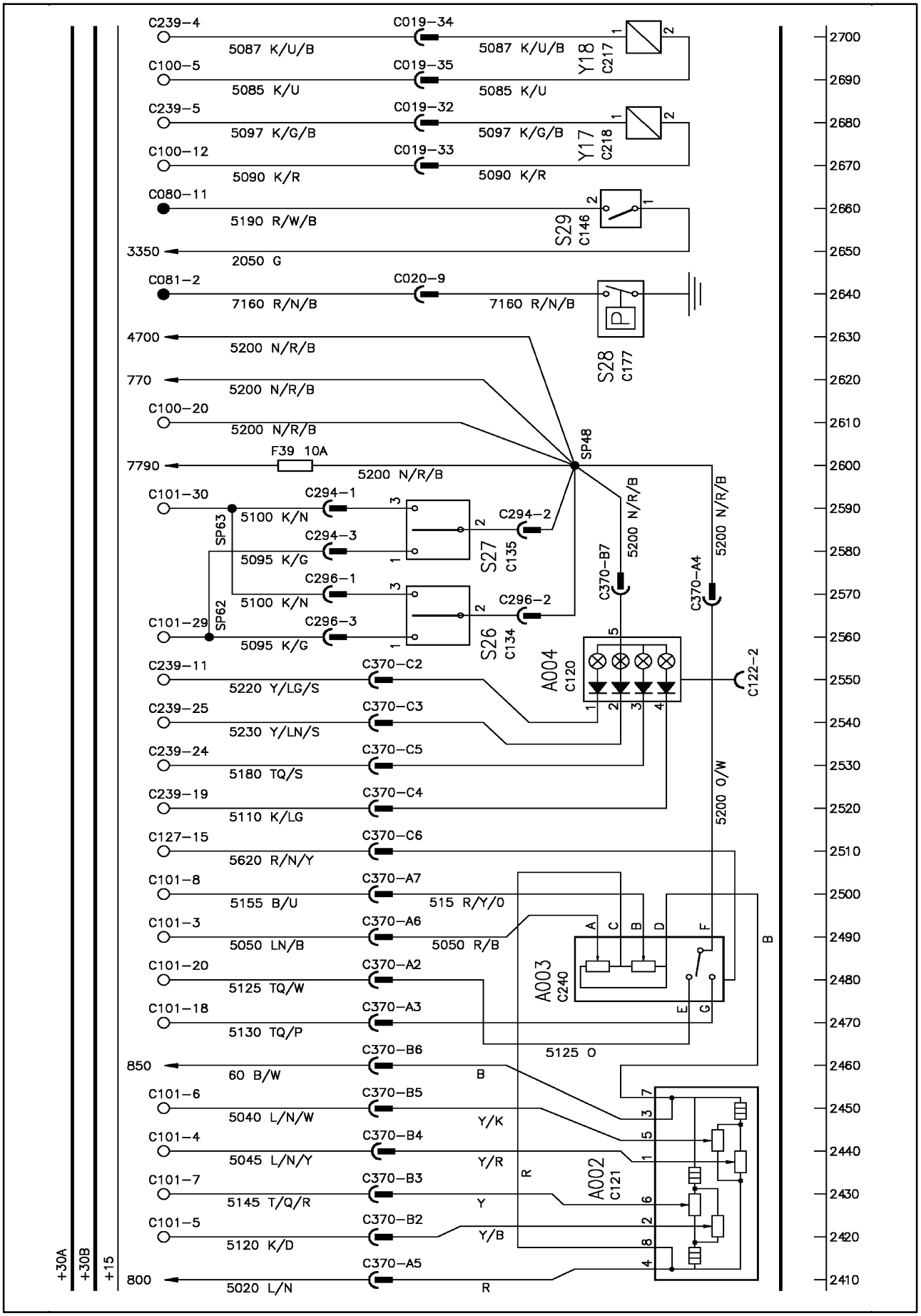
   C240 pin **D (B)** and **C121** pin **7 (B)**

   C121 pin **4 (R)** and **C101** pin **16 (LN)**

   C121 pin **3 (B)** and **ground**

If an open circuit is indicated, repair or replace the harness as required.

B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
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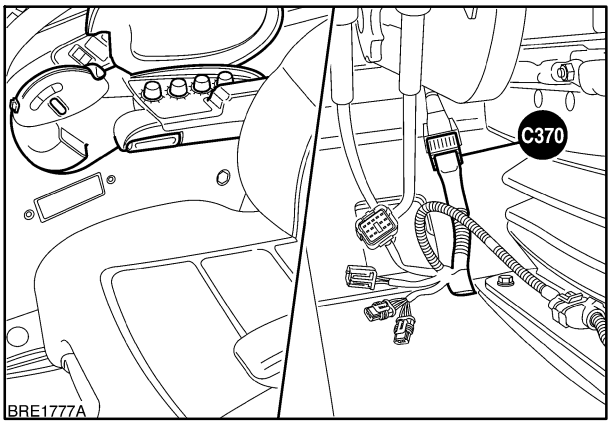
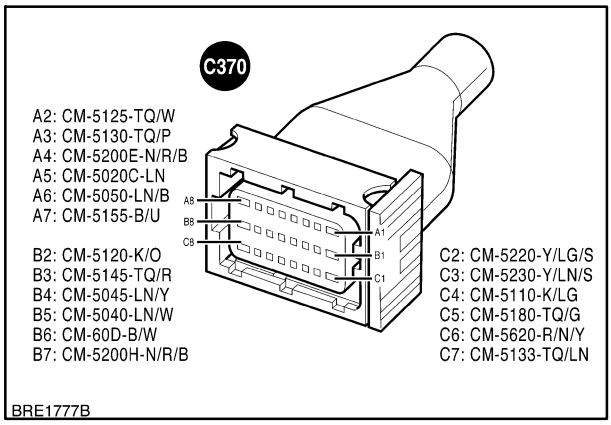

C370
BRE1777A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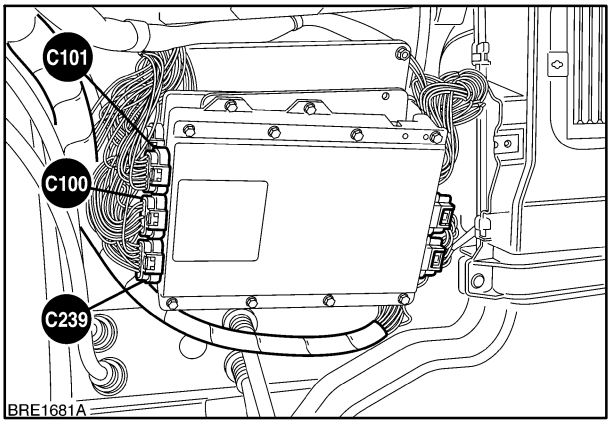
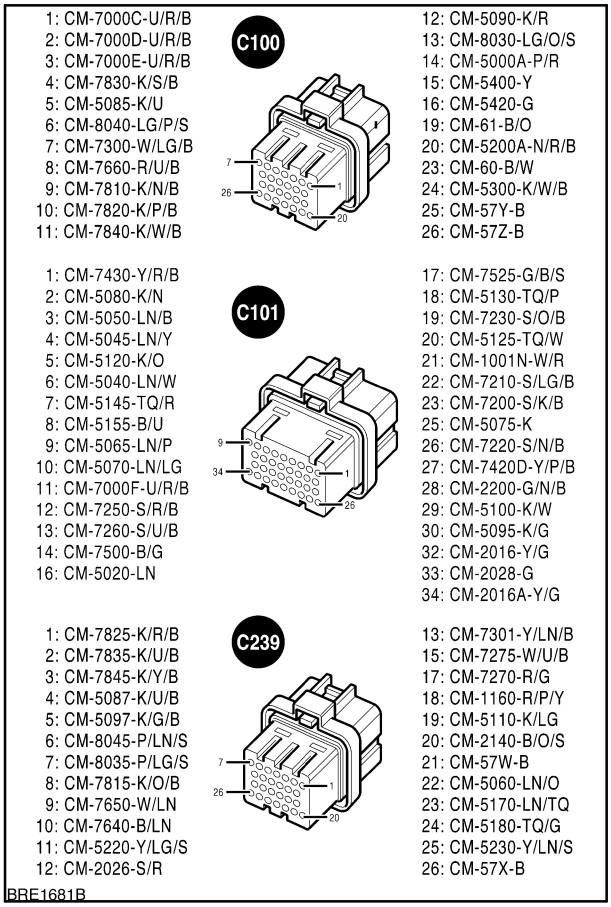
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
7
26
1
20
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
34
1
26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
7
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13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1026 – POSITION CONTROL POTENTIOMETER CONTROL VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty position control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the position control potentiometer for any damage.

   A. If the potentiometer is damaged, remove and replace the potentiometer.

   B. If the potentiometer is okay, continue to step 2.

2. Check the position control potentiometer in H9 Channel 33.

   A. Fully lower and then raise the position control potentiometer. If the values displayed are not between 25 to 74, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 33, wiggle the harness, the EDC control unit connector **C240**, the EDC control panel **C121** connector, the inline harness connector **C370** and the controller connector **C101** to check for an intermittent circuit. Channel 33 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the position control potentiometer.

   A. Disconnect connector **C240**. While moving the position control potentiometer from the minimum to maximum position, measure the resistance between the component side of connector:

   C240 pin **A (R/B)** and **C240** pin **C (R)**

   C240 pin **A (R/B)** and **C240** pin **D (B)**

   If the values indicated do not range between 100 – 600 Ohms, remove and replace the EDC control unit.

   B. If the EDC control unit is okay, continue to step 4.

4. Check for a short to +8 or +12 Volts.

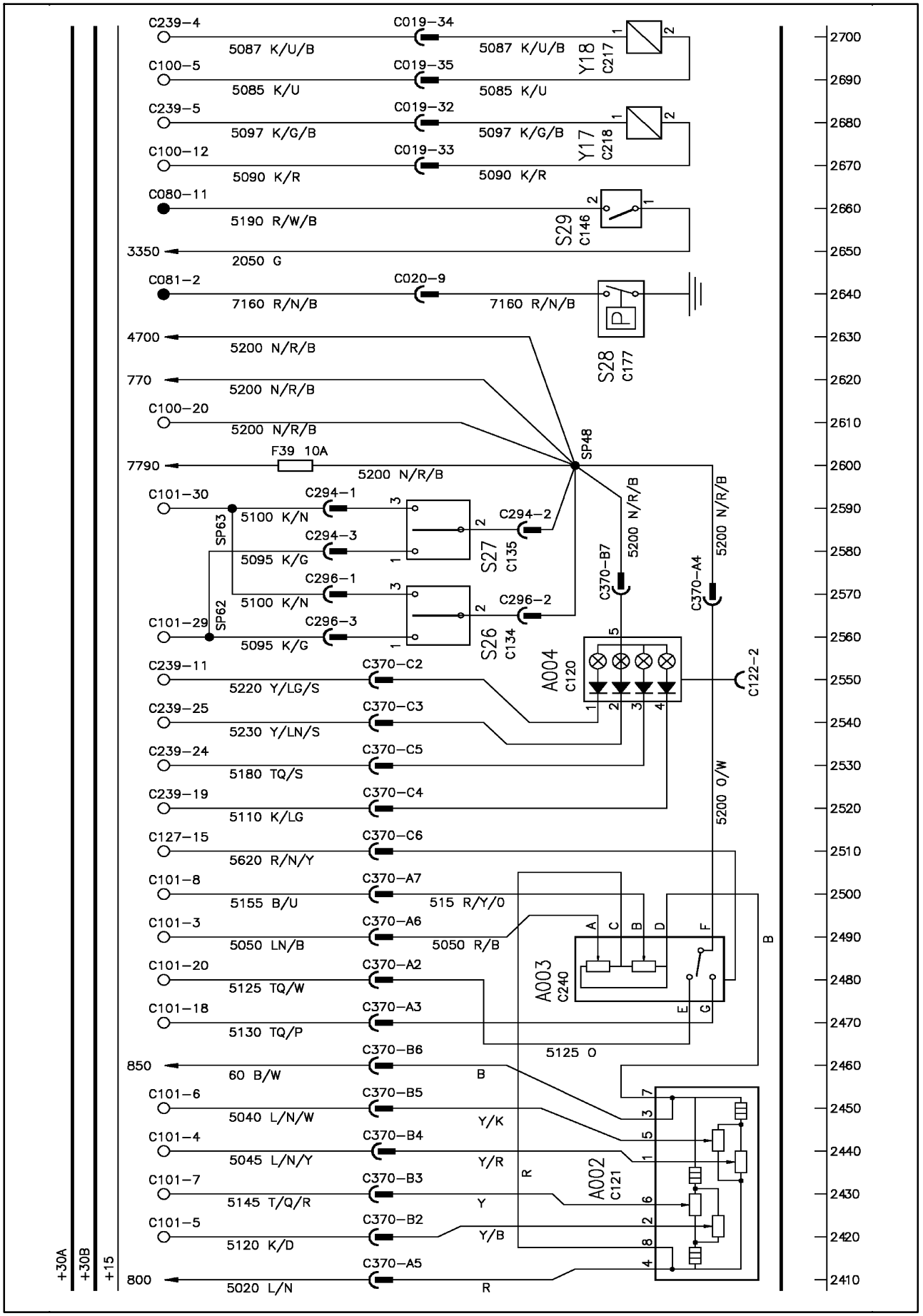
   A. Turn the keystart ON. Measure the voltage between connector **C240** pin **C (R)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to Ve Voltage.

   A. Measure the voltage between connector **C240** pin **A (R/B)** and **ground**. If a voltage is indicated, remove and replace the EDC control panel.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
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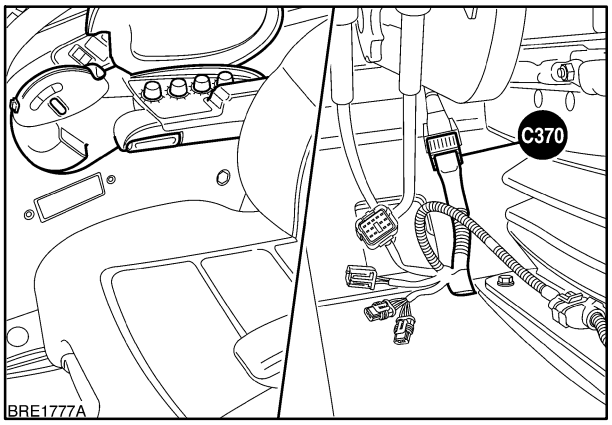
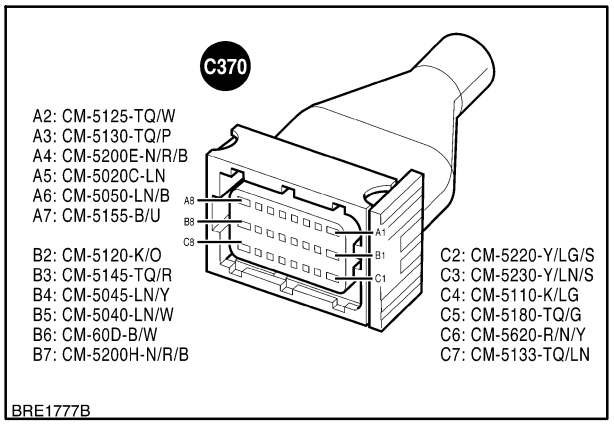

C370
BRE1777A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A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
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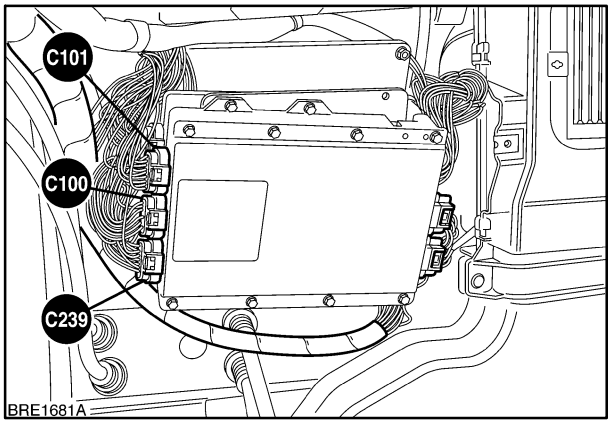
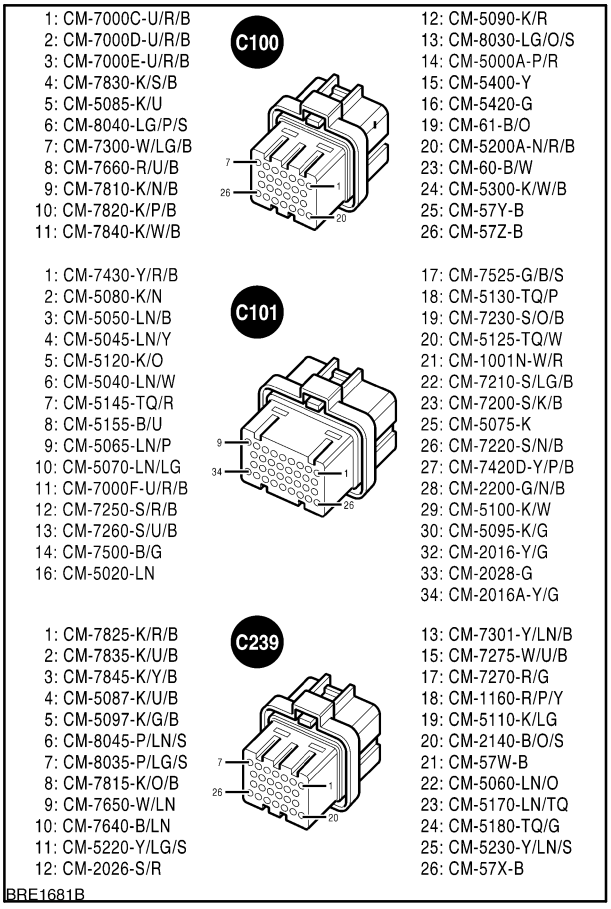
BRE1777B


C101
C100
C239
BRE1681A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5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
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2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1027 – LIFT ARM POSITION SENSING CONTROL VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
1. Faulty lift arm position sensing control potentiometer
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lift arm position sensing potentiometer and its linkage for any damage.

   A. If the potentiometer or linkage is damaged, repair or replace as required.

   B. If the potentiometer and the linkage is okay, continue to step 2.

2. Check the lift arm position sensing potentiometer in H9 Channel 32.

   A. Fully lower and then raise the hydraulic lift arms. (Ensure the pick up hitch lift rods do not restrict the maximum movement of the arms). If the values displayed are not between 79 to 6, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 32, wiggle the harness, the lift arm position potentiometer connector **C052**, the inline harness connector **C019** and the controller connector **C101** to check for an intermittent circuit. Channel 32 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the lift arm position sensing potentiometer.

   A. Disconnect connector **C052** and remove the potentiometer. While turning the potentiometer, measure the resistance between the component side of connector:

   C052 pin **2 (K)** and **C052** pin **3 (L/N)**

   C052 pin **2 (K)** and **C052** pin **1 (B/W)**

   If the resistances indicated do not range between approximately 1.0 – 4.0K Ohms, replace the lift arm position sensing potentiometer.

   B. If the values are okay, refit the potentiometer and continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

   C052 pin **2 (K)** and **ground**

   C052 pin **3 (L/N)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector:

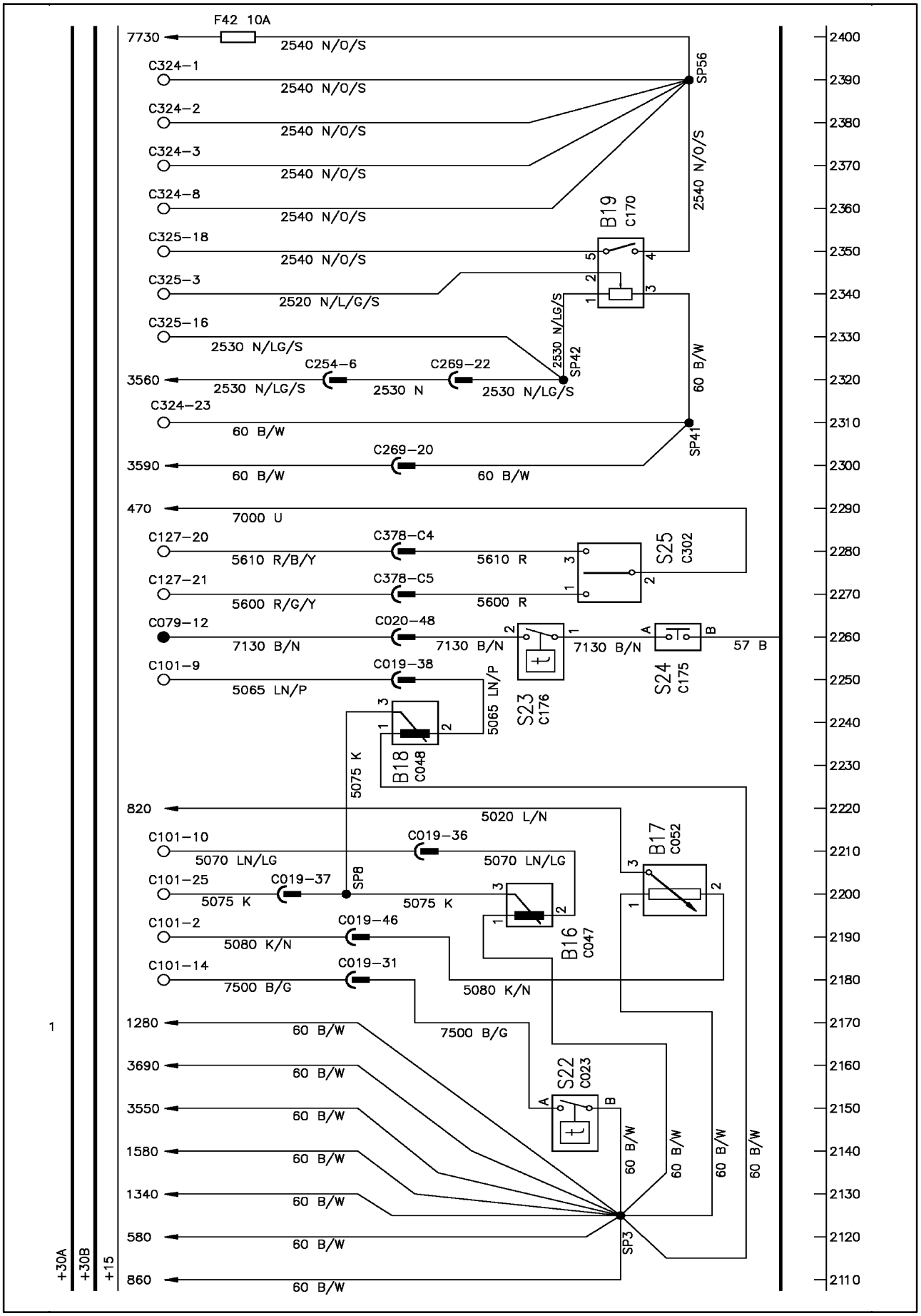
   C052 pin **1 (B/W)** and **ground**

   C052 pin **2 (K)** and **C101** pin **2 (K/N)**

   C052 pin **3 (L/N)** and **C101** pin **16 (L/N)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S23
C176
S24
C175
57 B
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B16
C047
B17
C052
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
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2320
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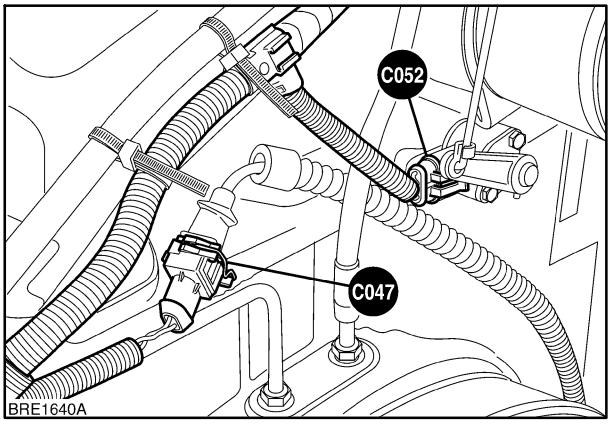

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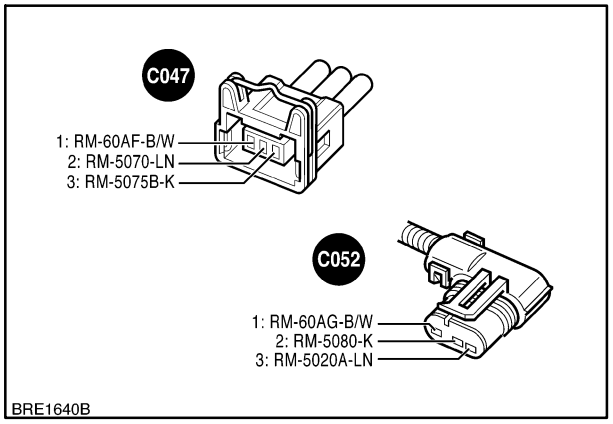

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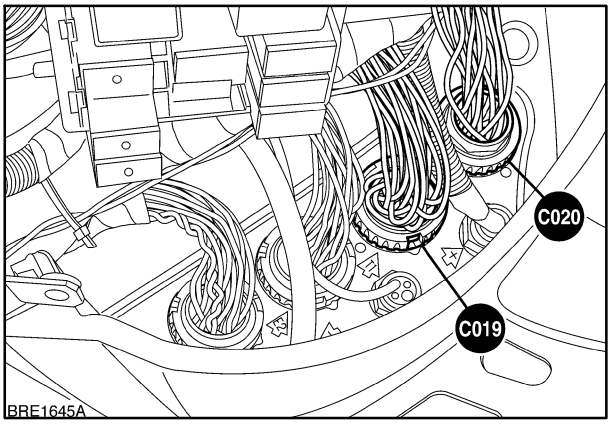

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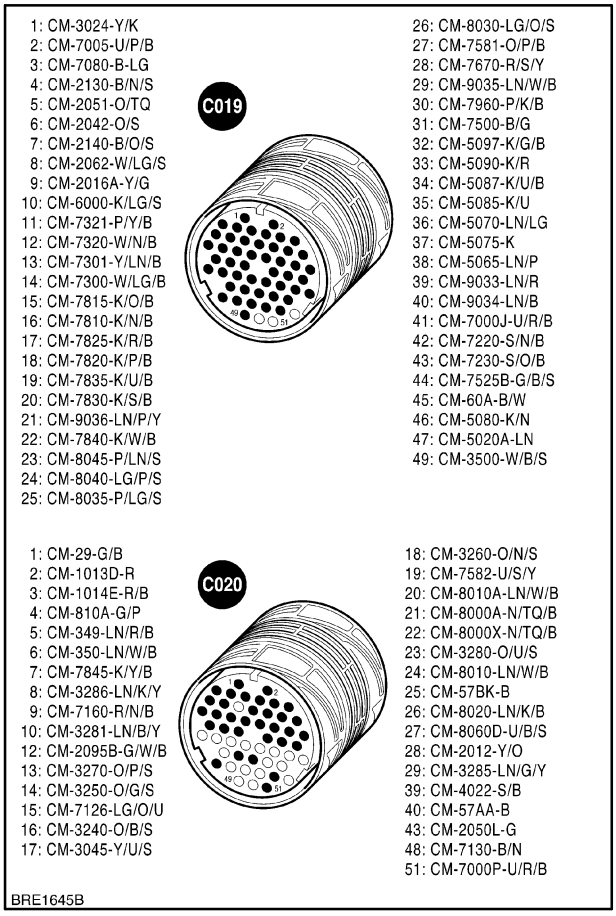

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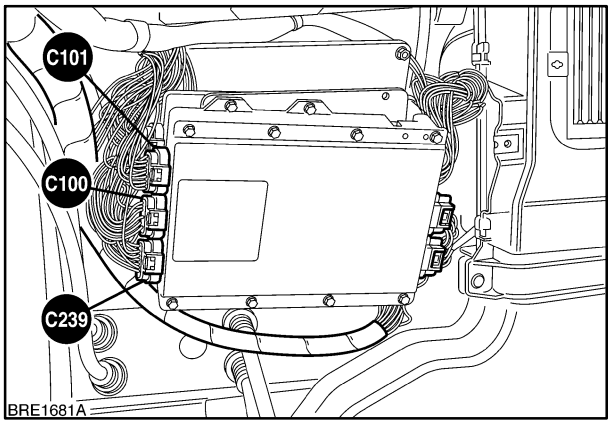

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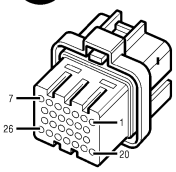
C100



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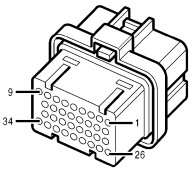
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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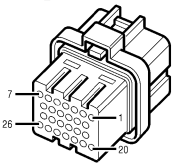
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1028 – LIFT ARM POSITION SENSING CONTROL VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty lift arm position sensing control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lift arm position sensing potentiometer and its linkage for any damage.

   A. If the potentiometer or linkage is damaged, repair or replace as required.

   B. If the potentiometer and the linkage is okay, continue to step 2.

2. Check the lift arm position sensing potentiometer in H9 Channel 32.

   A. Fully lower and then raise the hydraulic lift arms. (Ensure the pick up hitch lift rods do not restrict the maximum movement of the arms). If the values displayed are not between 79 to 6, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 32, wiggle the harness, the lift arm position potentiometer connector **C052**, the inline harness connector **C019** and the controller connector **C101** to check for an intermittent circuit. Channel 32 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the lift arm position sensing potentiometer.

   A. Disconnect connector **C052** and remove the potentiometer. While turning the potentiometer, measure the resistance between the component side of connector:

   C052 pin **2 (K)** and **C052** pin **3 (L/N)**

   C052 pin **2 (K)** and **C052** pin **1 (B/W)**

   If the resistances indicated do not range between approximately 1.0 – 4.0K Ohms, replace the lift arm position sensing potentiometer.

   B. If the values are okay, refit the potentiometer and continue to step 4.

4. Check for a short to +8 or +12 Volts.

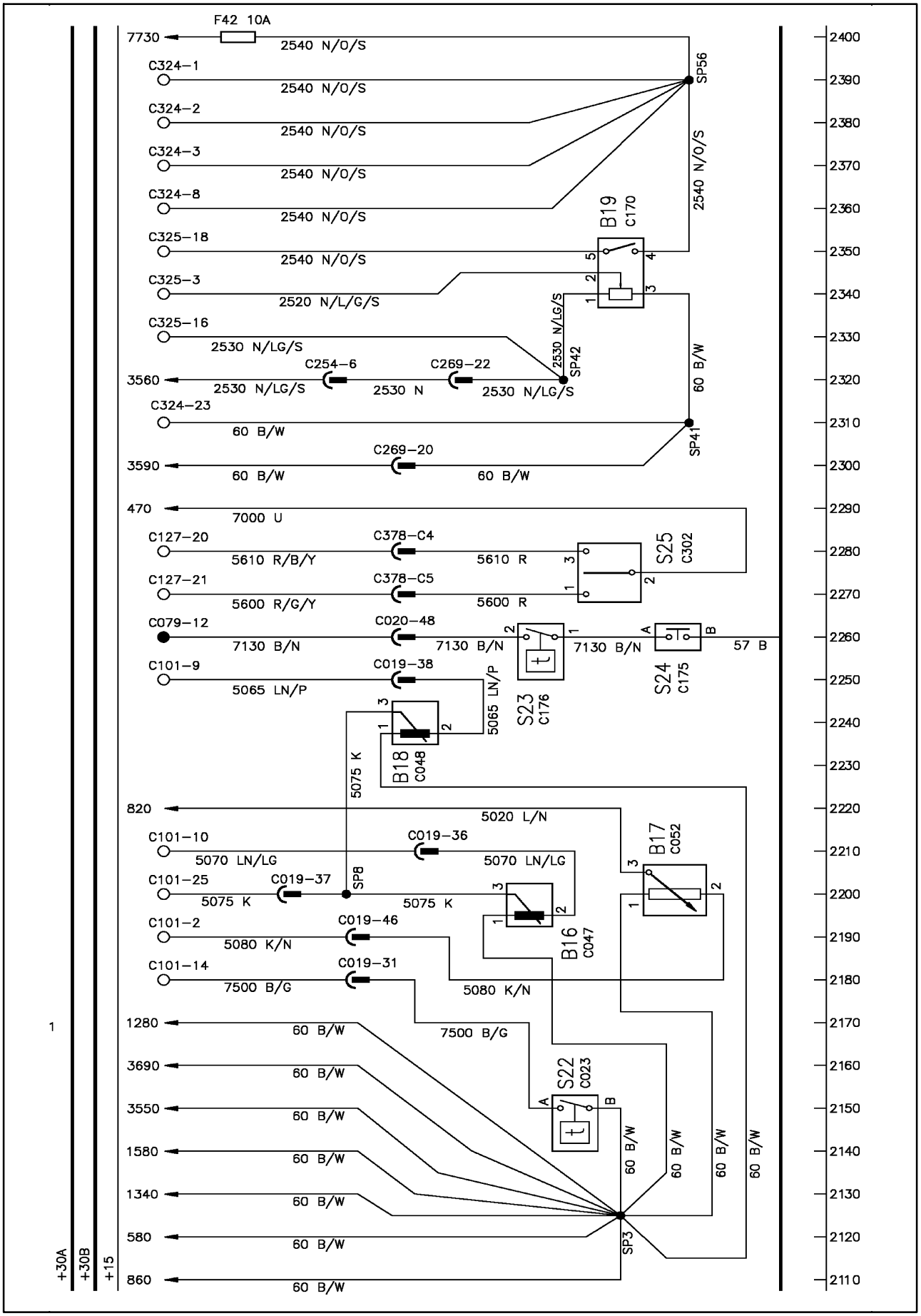
   A. Turn the keystart ON. Measure the voltage between connector **C052** pin **3 (L/N)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve Voltage.

   A. Measure the voltage between connector **C052** pin **2 (K)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
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C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
57 B
S24
C175
C101-9
5065 LN/P
C019-38
S23
C176
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B16
C047
B17
C052
1280
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3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
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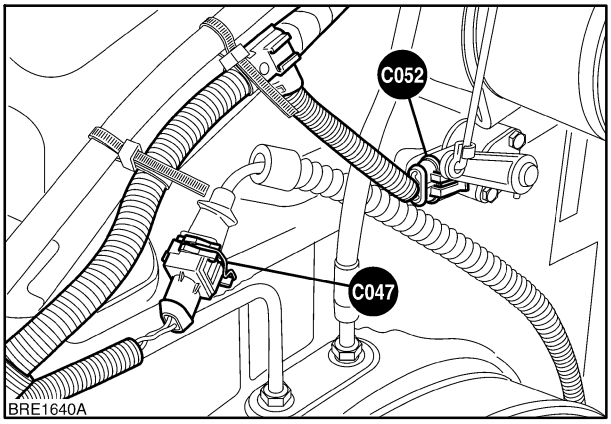

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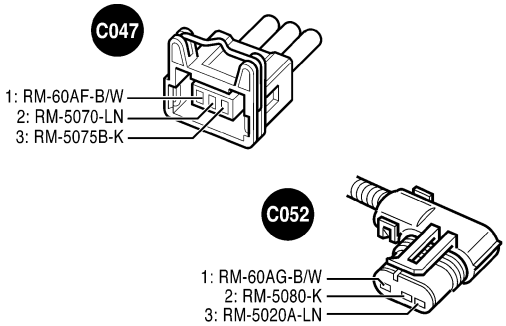

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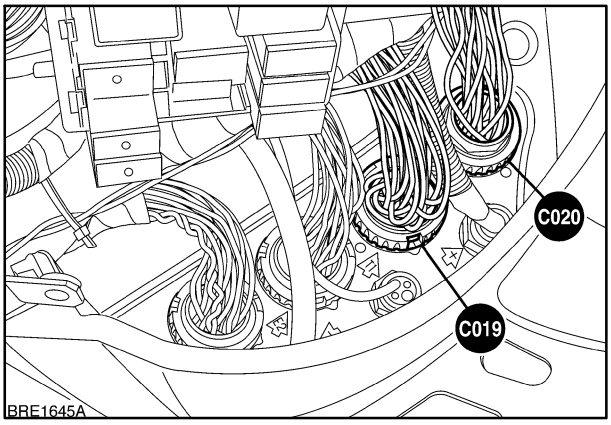

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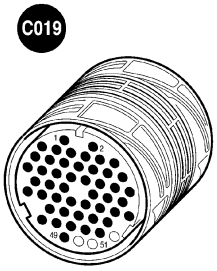

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3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
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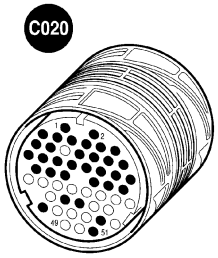

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6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
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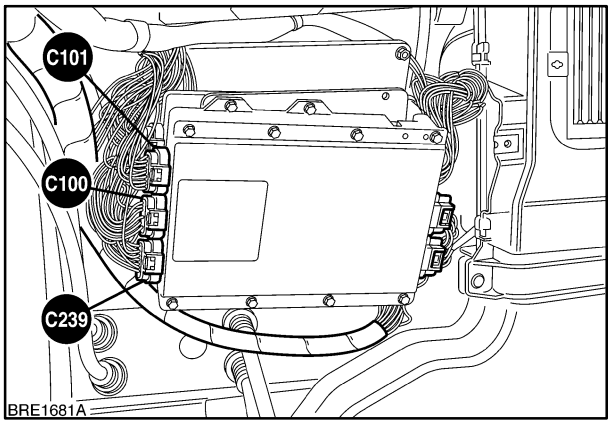
BRE1645B



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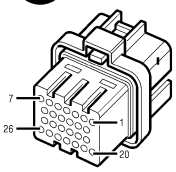
C100



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3: CM-7000E-U/R/B
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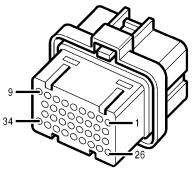
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
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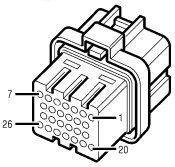
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1029 – HYDRAULIC CONTROL VALVE DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty hydraulic control valve solenoid
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are being displayed, continue to step 2.

2. Check the hydraulic control valve solenoid connectors **C217**, **C218** and the controller connectors **C100** and **C239**.

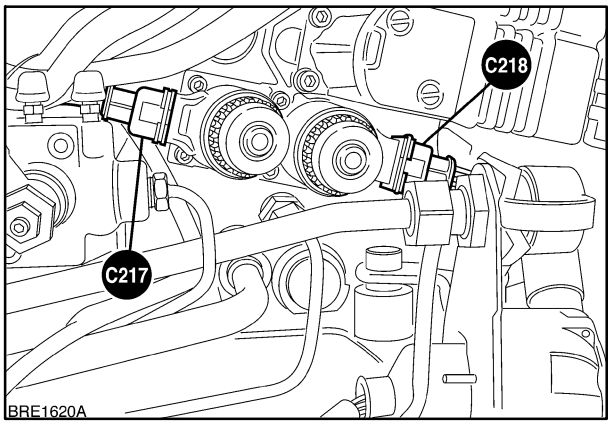
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as necessary.

   B. If the connectors are okay, continue to step 3.

3. Visibly check the harness any damage.

   A. Check the harness from the controller connectors **C100** and **C239** to the hydraulic control valve connectors **C217** and **C218** for damage. If damage to the harness is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.



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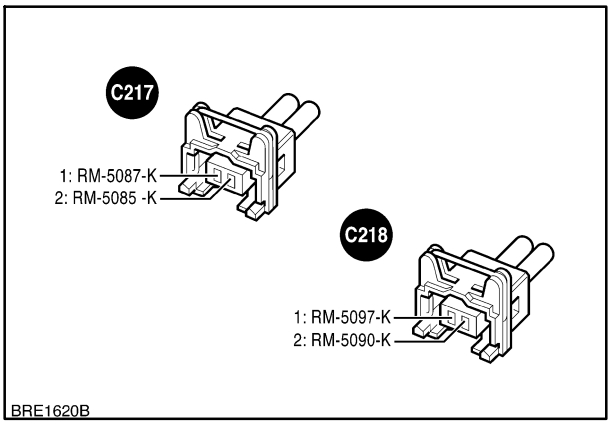
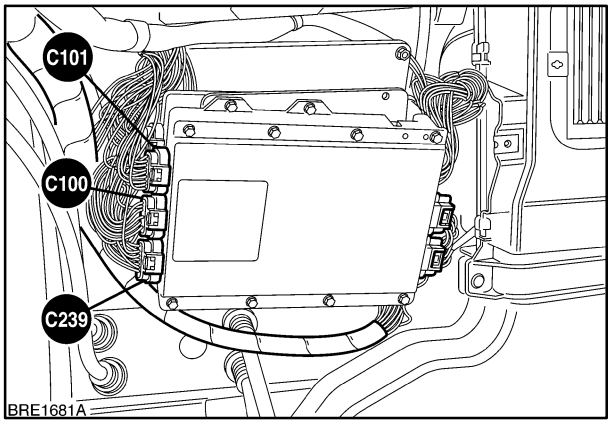
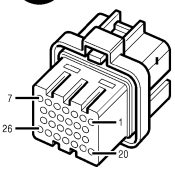


BRE1620B



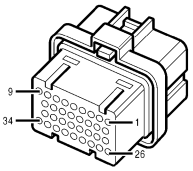
BRE1681A

C100



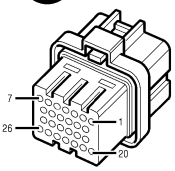
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1030 – SIGNAL GROUND OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are being displayed, continue to step 2.

2. Check the controller connector **C100**, the inline harness connector **C370**, the hand throttle connector **C314** and clutch pedal potentiometer **C077**.

   A. Ensure the connectors are connected, not damaged , the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the connectors **C100**, **C370**, **C314** and **C077**. Check between connector:

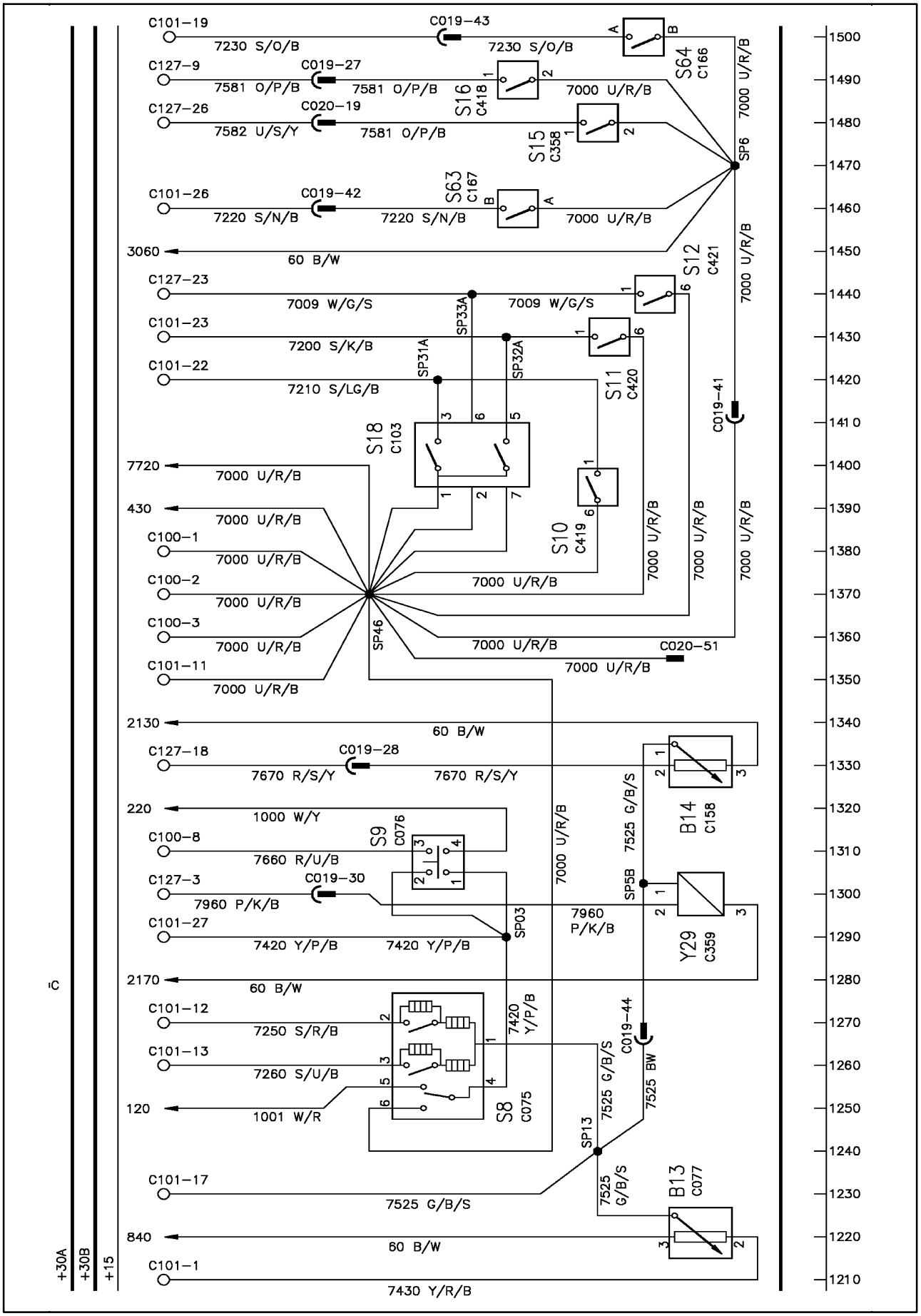
   C100 pin **23 (B/W)** and **C370** pin **B6 (B/W)**

   C100 pin **23 (B/W)** and **C314** pin **6 (B/W)**

   C100 pin **23 (B/W)** and **C077** pin **3 (B/W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
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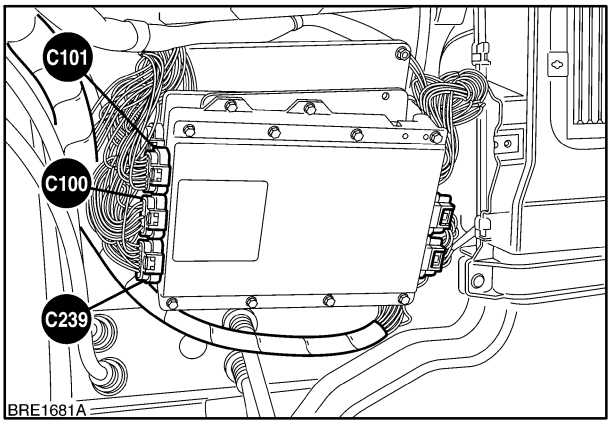
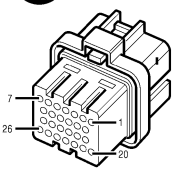
1210

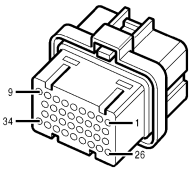


C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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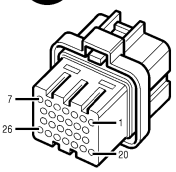
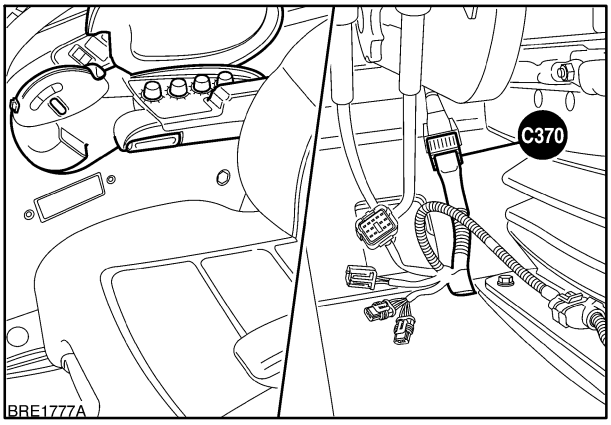
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

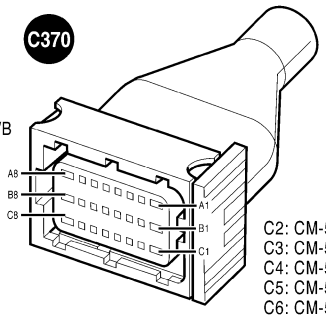


1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



C370

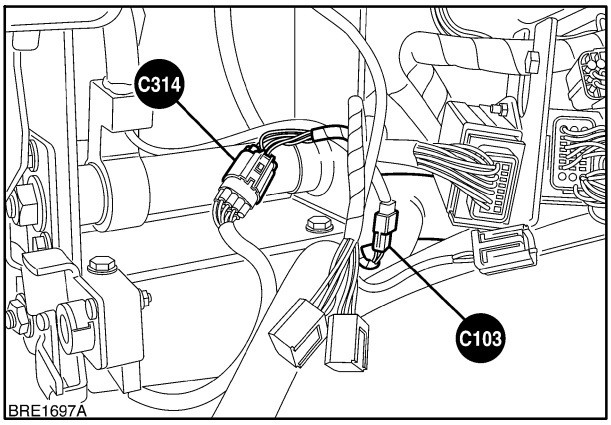


A2: CM-5125-TQ/W
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U

B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B

C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN

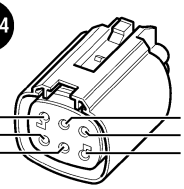
BRE1777B



1: CM-7000G-U/R/B
2: CM-7000H-U/R/B
3: CM-7210A-S/LG/B
5: CM-7200A-S/K/B
6: CM-7009A-W/G/S
7: CM-7000K-U/R/B

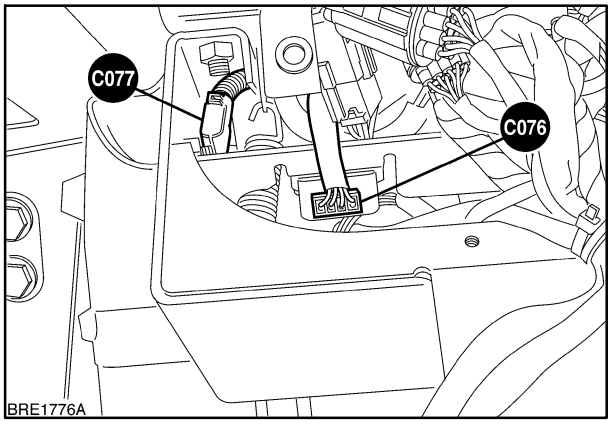
C103

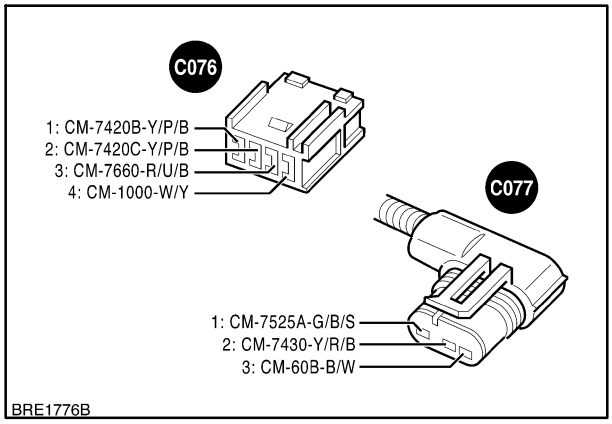
C314



1: CM-5200F-N/R/B
4: CM-6460A-S/P/Y
5: CM-5020D-LN
2: CM-6440-S/N/Y
3: CM-6450-S/O/Y
6: CM-60J-B/W

BRE1697B


C077
C076
BRE1776A


C076
1: CM-7420B-Y/P/B
2: CM-7420C-Y/P/B
3: CM-7660-R/U/B
4: CM-1000-W/Y
C077
1: CM-7525A-G/B/S
2: CM-7430-Y/R/B
3: CM-60B-B/W
BRE1776B

ERROR CODE 1031 – CHASSIS HARNESS DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the chassis harness connectors **C019** and **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and the fit is tight. Repair or replace as required.

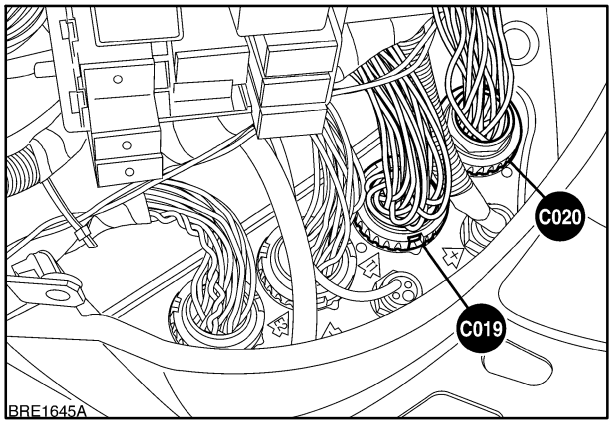
   B. If the chassis harness connectors are okay, continue to step 2.
2. Visually check the chassis harness for any damage.

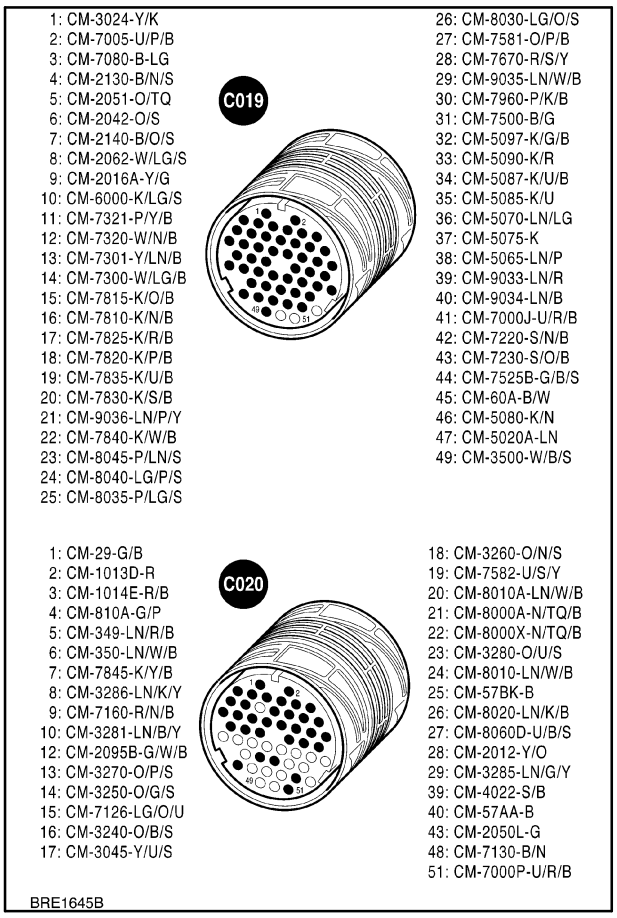
   A. If the harness is damaged, repair or replace as required.

   B. If harness okay, continue to step 3.
3. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are being displayed, download the correct level of software. If the fault re-occurs, remove and replace the controller.





ERROR CODE 1032 – DRAFT CONTROL POTENTIOMETER VOLTAGE HIGH (DAMAGED POTENTIOMETER OR SHORT TO +VE VOLTAGE)

Possible failure modes:

1. Faulty connector
2. Faulty draft control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the draft control potentiometer for any damage.

   A. If the potentiometer is damaged, remove and replace the potentiometer.

   B. If the potentiometer is okay, continue to step 2.

2. Check the draft control potentiometer in H9 Channel 40.

   A. Move the draft control potentiometer from the maximum to the minimum position. If the values displayed are not between 25 to 74, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 40, wiggle the harness, the EDC control unit connector **C240**, the EDC control panel **C121** connector, the inline harness connector **C370** and the controller connector **C101** to check for an intermittent circuit. Channel 40 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the draft control potentiometer.

   A. Disconnect connector **C240**. While moving the draft control potentiometer from the minimum to maximum position, measure the resistance between the component side of connector:

   C240 pin **B (R/Y/O)** and **C240** pin **C (R)**

   C240 pin **B (R/Y/O)** and **C240** pin **D (B)**

   If the values indicated do not range between 100 – 600 Ohms, remove and replace the EDC control unit.

   B. If the EDC control unit is okay, continue to step 4.

4. Check for a short to +8 or +12 Volts.

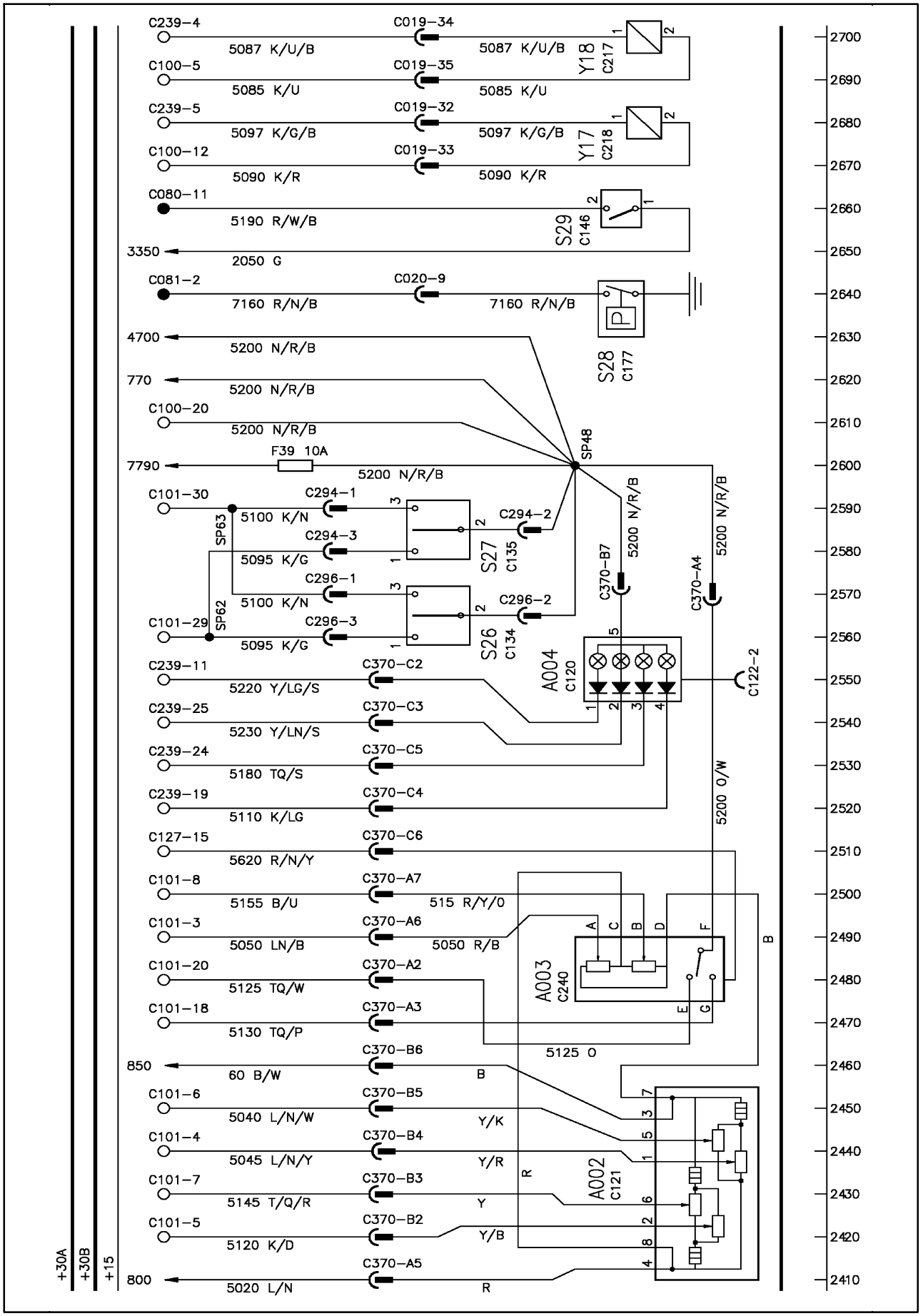
   A. Turn the keystart ON. Measure the voltage between connector **C240** pin **C (R)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to Ve Voltage.

   A. Measure the voltage between connector **C240** pin **B (R/Y/O)** and **ground**. If a voltage is indicated, remove and replace the EDC control panel.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
7790
5200 N/R/B
SP48
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
B
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
R
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
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2600
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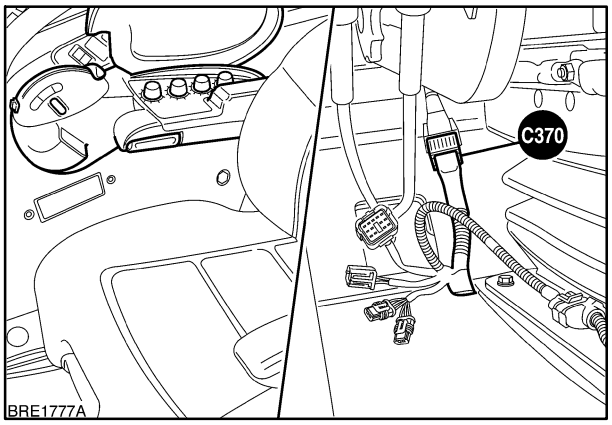
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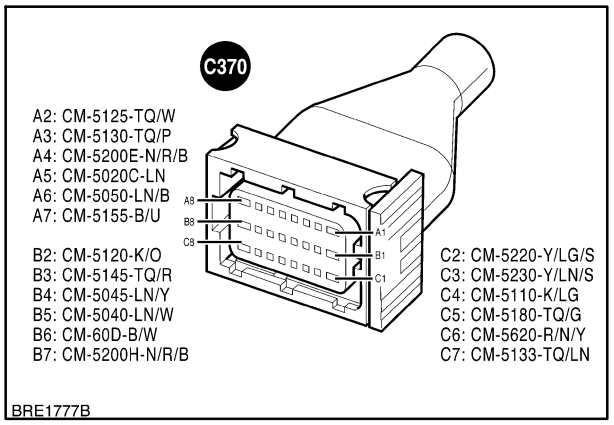
BRE1777A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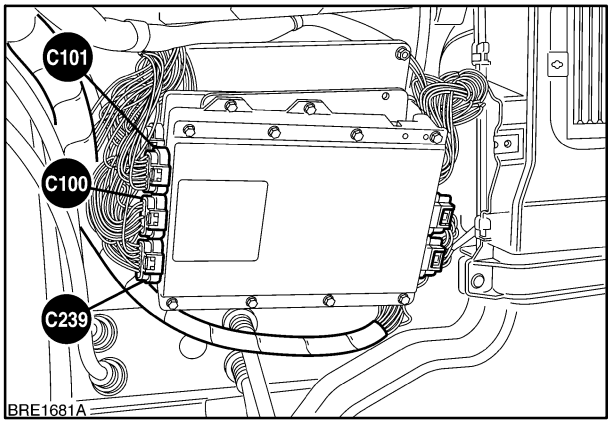
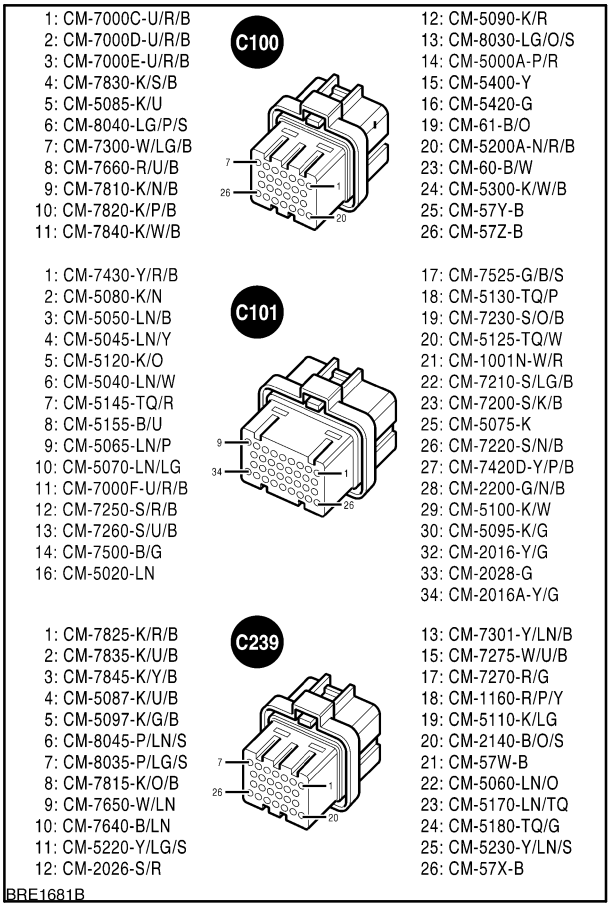
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1033 – DRAFT CONTROL POTENTIOMETER VOLTAGE LOW (SHORT OR OPEN CIRCUIT)

Possible failure modes:

1. Faulty connector
2. Faulty draft control potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the draft control potentiometer for any damage.

   A. If the potentiometer is damaged, remove and replace the potentiometer.

   B. If the potentiometer is okay, continue to step 2.

2. Check the draft control potentiometer in H9 Channel 40.

   A. Move the draft control potentiometer from the maximum to the minimum position. If the values displayed are not between 14 to 84, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 40, wiggle the harness, the EDC control unit connector **C240**, the EDC control panel **C121** connector, the inline harness connector **C370** and the controller connector **C101** to check for an intermittent circuit. Channel 40 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the draft control potentiometer.

   A. Disconnect connector **C240**. While moving the draft control potentiometer from the minimum to maximum position, measure the resistance between the component side of connector:

   C240 pin **B (R/Y/O)** and **C240** pin **C (R)**

   C240 pin **B (R/Y/O)** and **C240** pin **D (B)**

   If the values indicated do not range between 100 – 600 Ohms, remove and replace the EDC control unit.

   B. If the EDC control unit is okay, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C121**. Check between connector:

   C240 pin **B (R/Y/O)** and **ground**

   C240 pin **C (R)** and **ground**

   C121 pin **4 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check the EDC control panel for an open cicuit.

   A. Check between the component side of connector:

   C121 pin **4 (R)** and **C121** pin **8 (R)**

   C121 pin **3 (B)** and **C121** pin **7 (B)**

   If an open circuit is indicated, remove and replace the EDC control panel.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for an open circuit.

   A. Disconnect connector **C101**. Check between connector:

   C240 pin **B (R/Y/O)** and **C101** pin **8 (B/U)**

   C240 pin **C (R)** and **C121** pin **8 (R)**

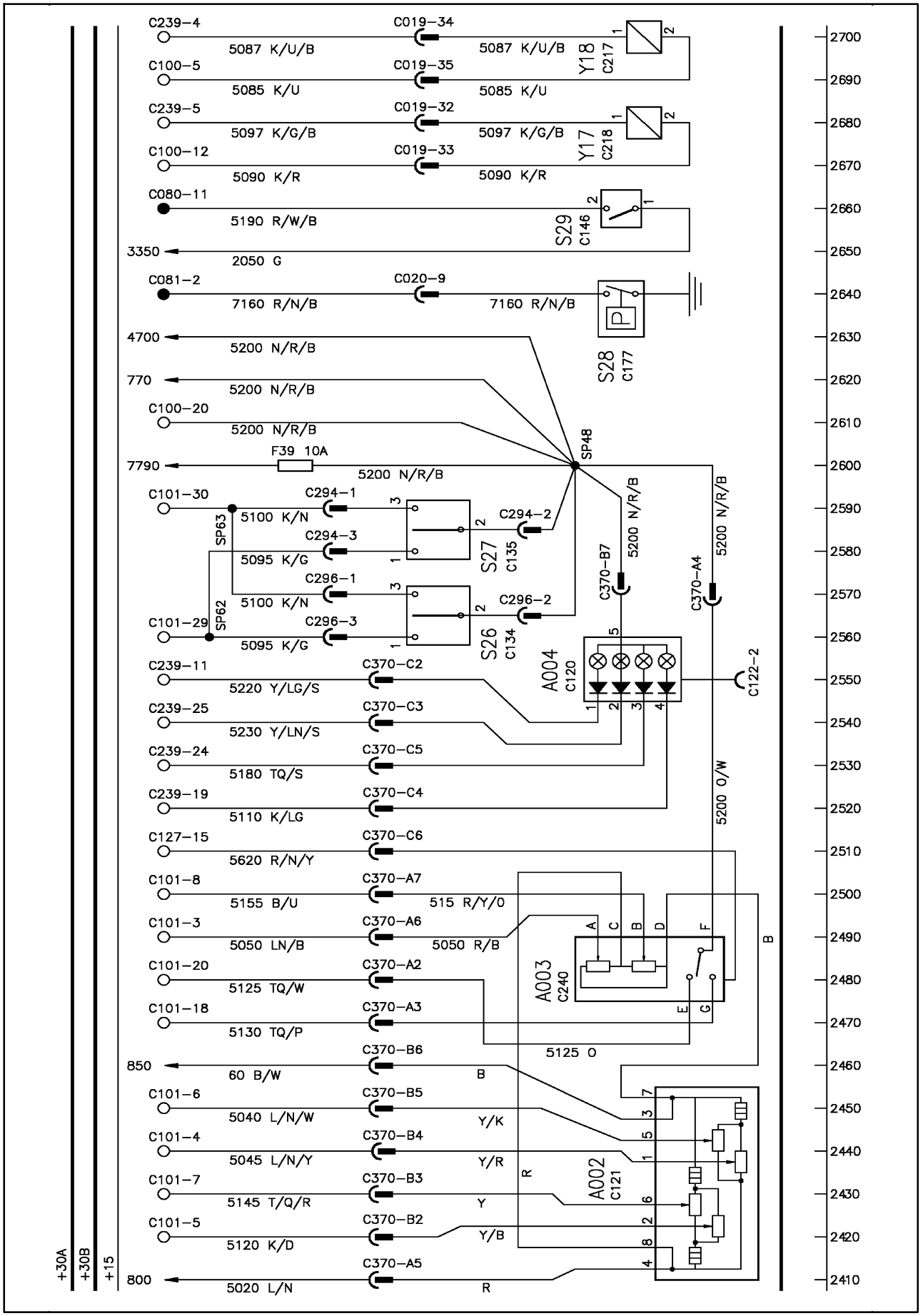
   C240 pin **D (B)** and **C121** pin **7 (B)**

   C121 pin **4 (R)** and **C101** pin **16 (L/N)**

C121 pin **3 (B)** and **ground**

If an open circuit is indicated, repair or replace the harness as required.

B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
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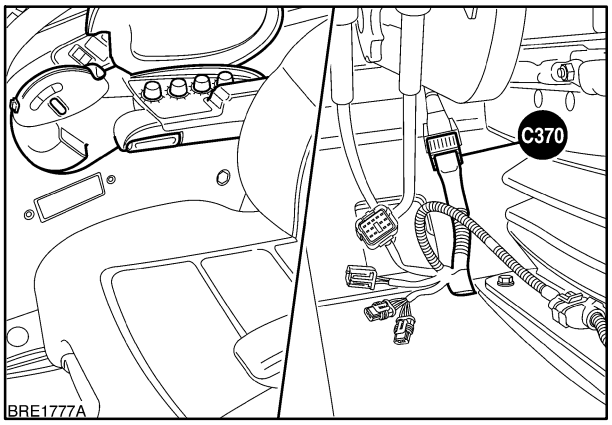
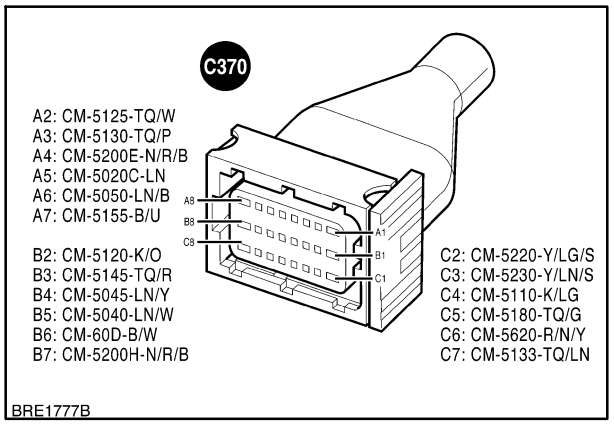

C370
BRE1777A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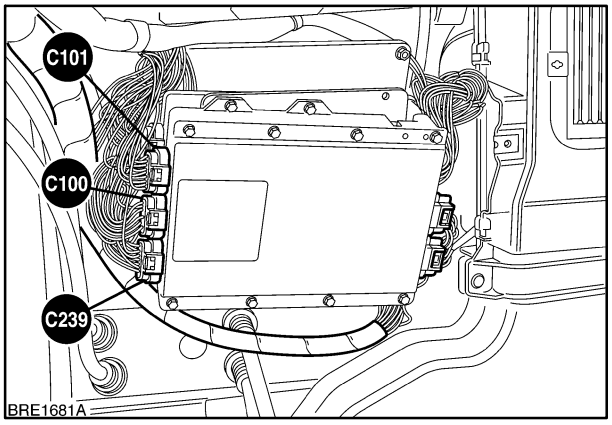
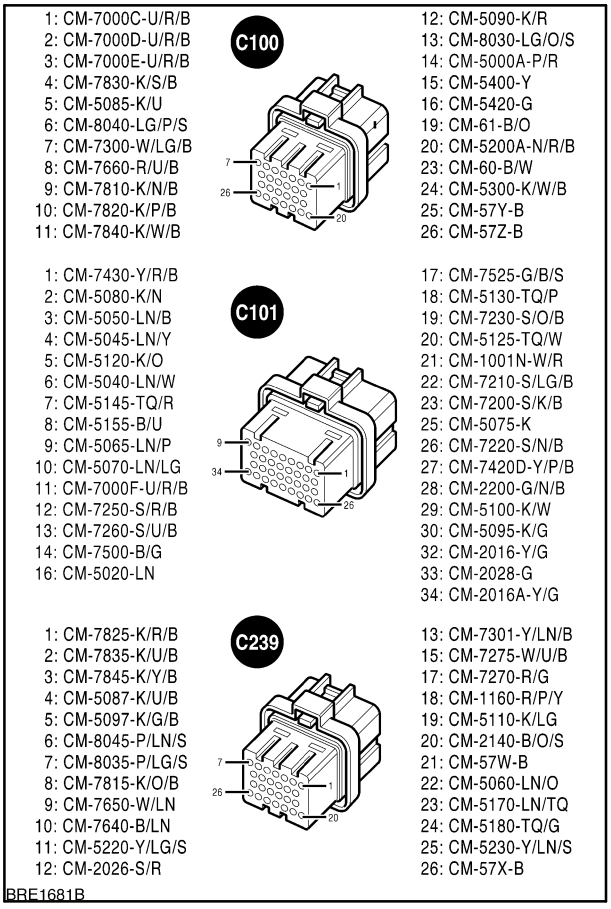
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A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5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
7
26
1
20
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2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
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32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
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34
1
26
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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
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8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
7
26
1
20
BRE1681B

ERROR CODE 1049 – WHEEL SPEED SENSOR OPEN OR SHORT CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty wheel speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the wheel speed sensor connector **C046**, the controller connectors **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the wheel speed sensor.

   A. Disconnect connector **C046**. Measure the resistance between the component side of connector.

   C046 pin **1** and **2**. If the resistance indicated is not between 0.80K Ohms – 1.2K Ohms at 20 degrees centigrade, remove and replace the wheel speed sensor.

   B. If the wheel speed sensor is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector:

   C046 pin **1 (Y)** and **C101** pin **34 (Y/G)**

   C046 pin **2 (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground.

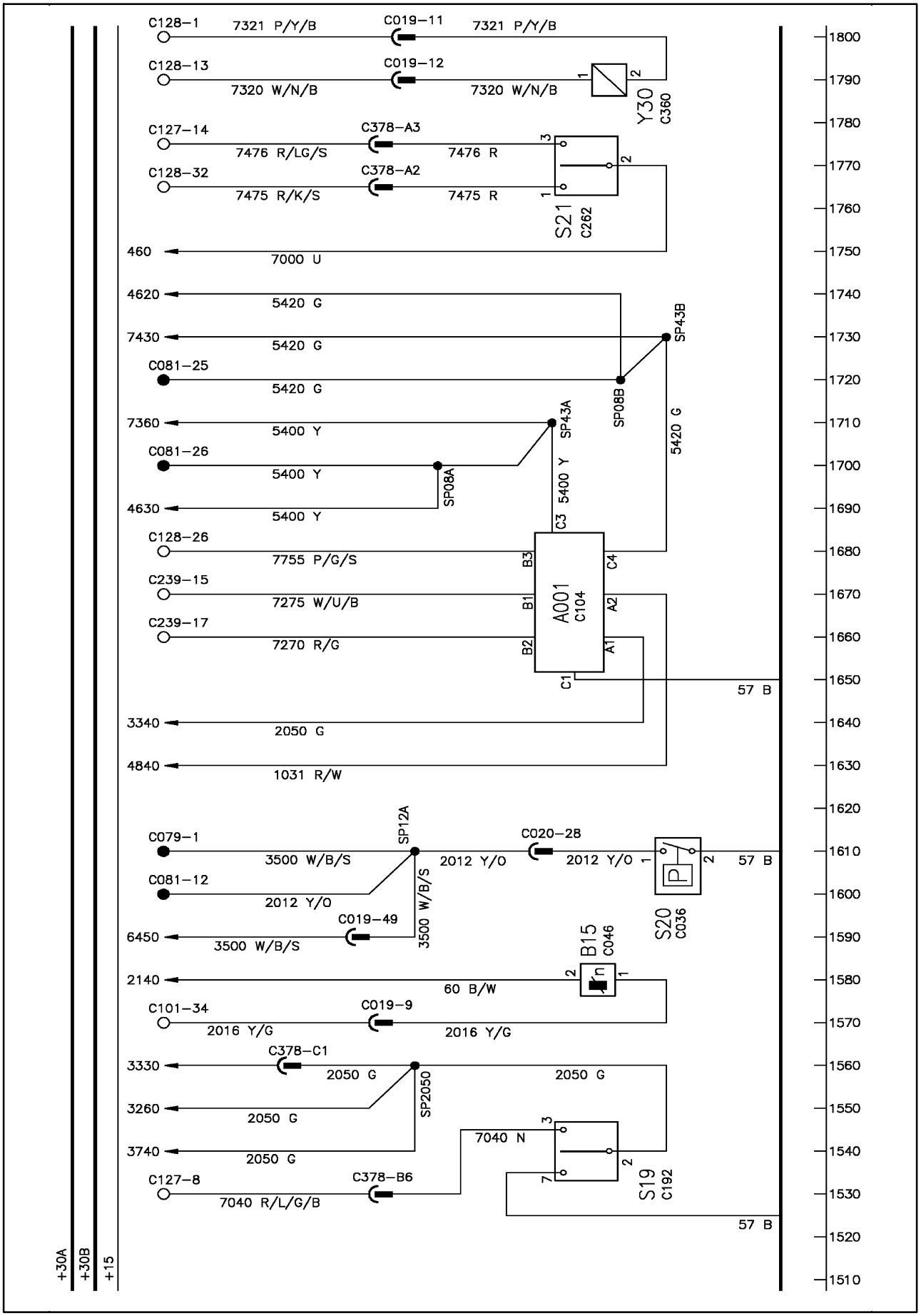
   A. Check between connector:

   C046 pin **1 (Y)** and **ground**

   C046 pin **2 (B/W)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
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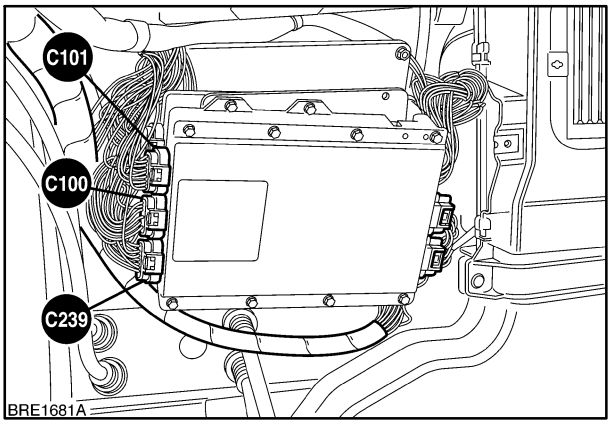
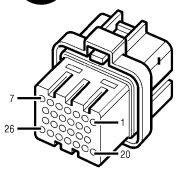
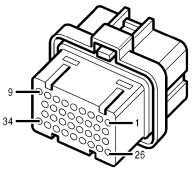


C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
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22: CM-7210-S/LG/B
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25: CM-5075-K
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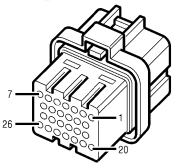
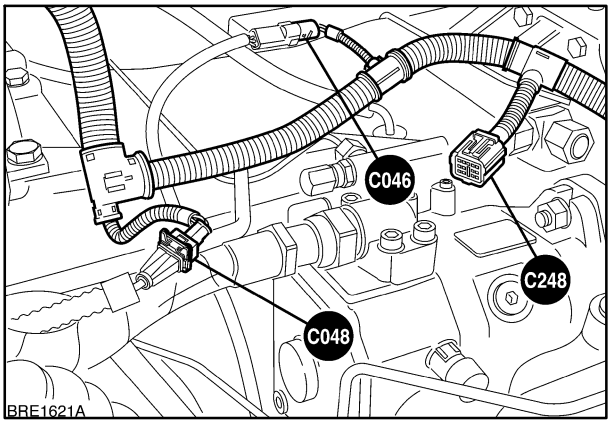
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

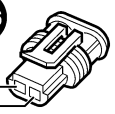


1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

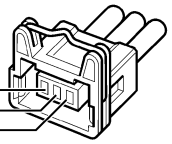


C046



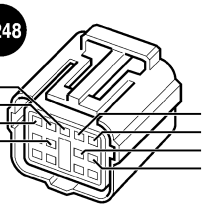
1: RM-2016A-Y
2: RM-60AB-B/W

C048



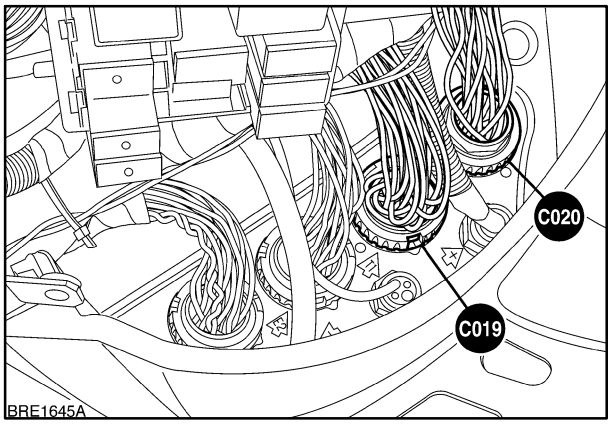
1: RM-60AE-B/W
2: RM-5065-LN
3: RM-5075A-K

C248



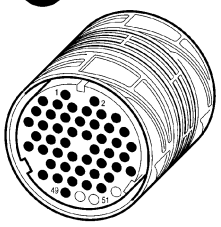
3: RM-3260-O
4: RM-3270-O
5: RM-3280-O
8: RM-3286-LN
2: RM-3250-O
1: RM-3240-O
7: RM-3285-LN
6: RM-3281-LN

BRE1621B



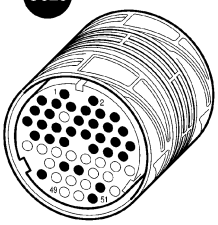
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 1053 – CONTROLLER 5 VOLT REFERENCE SHORTED TO +VE VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are being displayed, continue to step 2.

2. Check the +5 Volt sensor supply reference in H9 Channel 5.

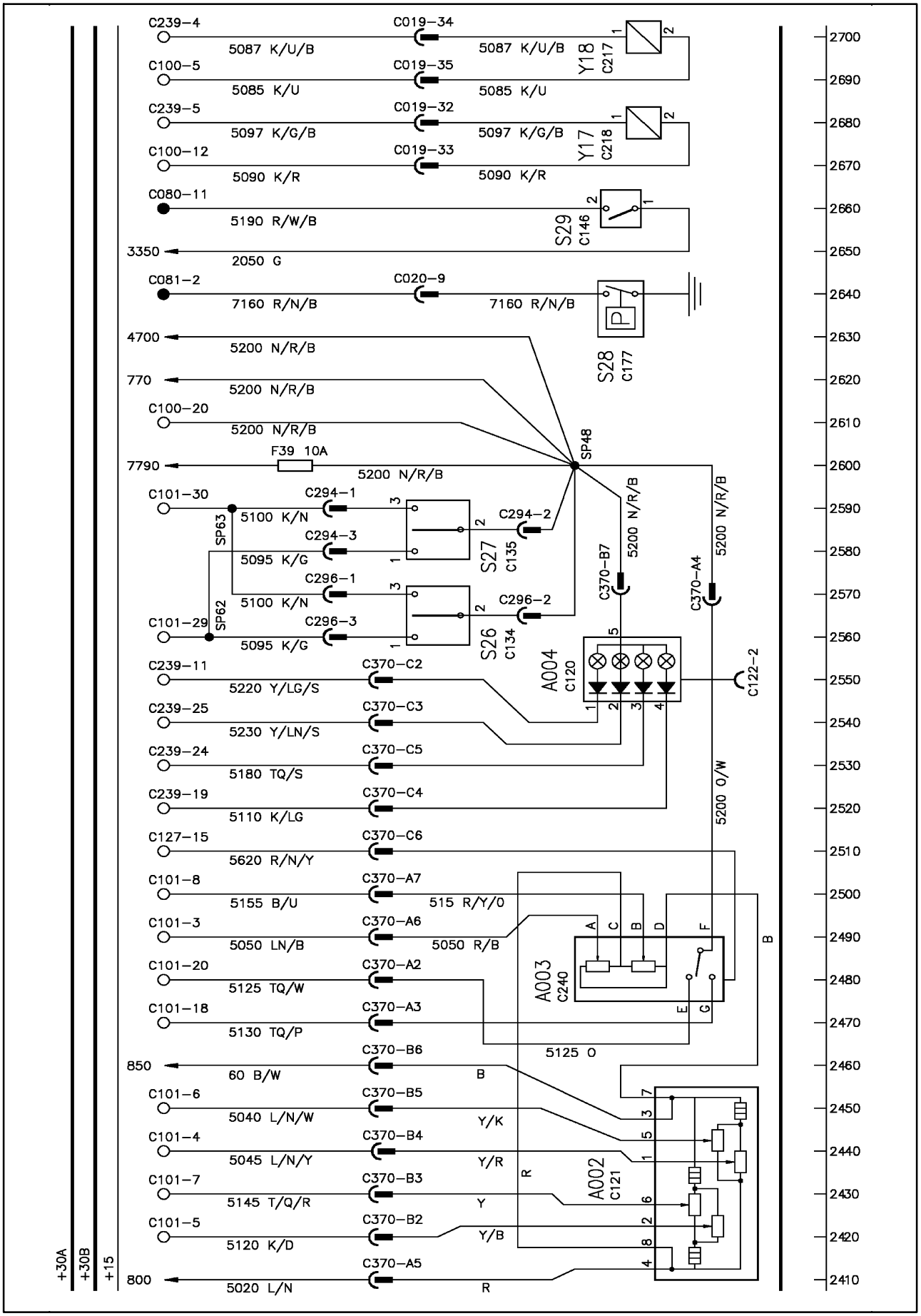
   A. If the value displayed is not approximately 49, continue to step 3.

   B. If the value displayed is approximately 49, while still in H9 Channel 5, wiggle the harness, the EDC control unit connector **C240**, the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connector **C101** to check for an intermittent circuit. Channel 5 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check for a short to +Ve Voltage.

   A. Disconnect connector **C101**. Turn the keystart ON. Measure the voltage between connector **C101** pin **16 (L/N)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
2570
2560
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2500
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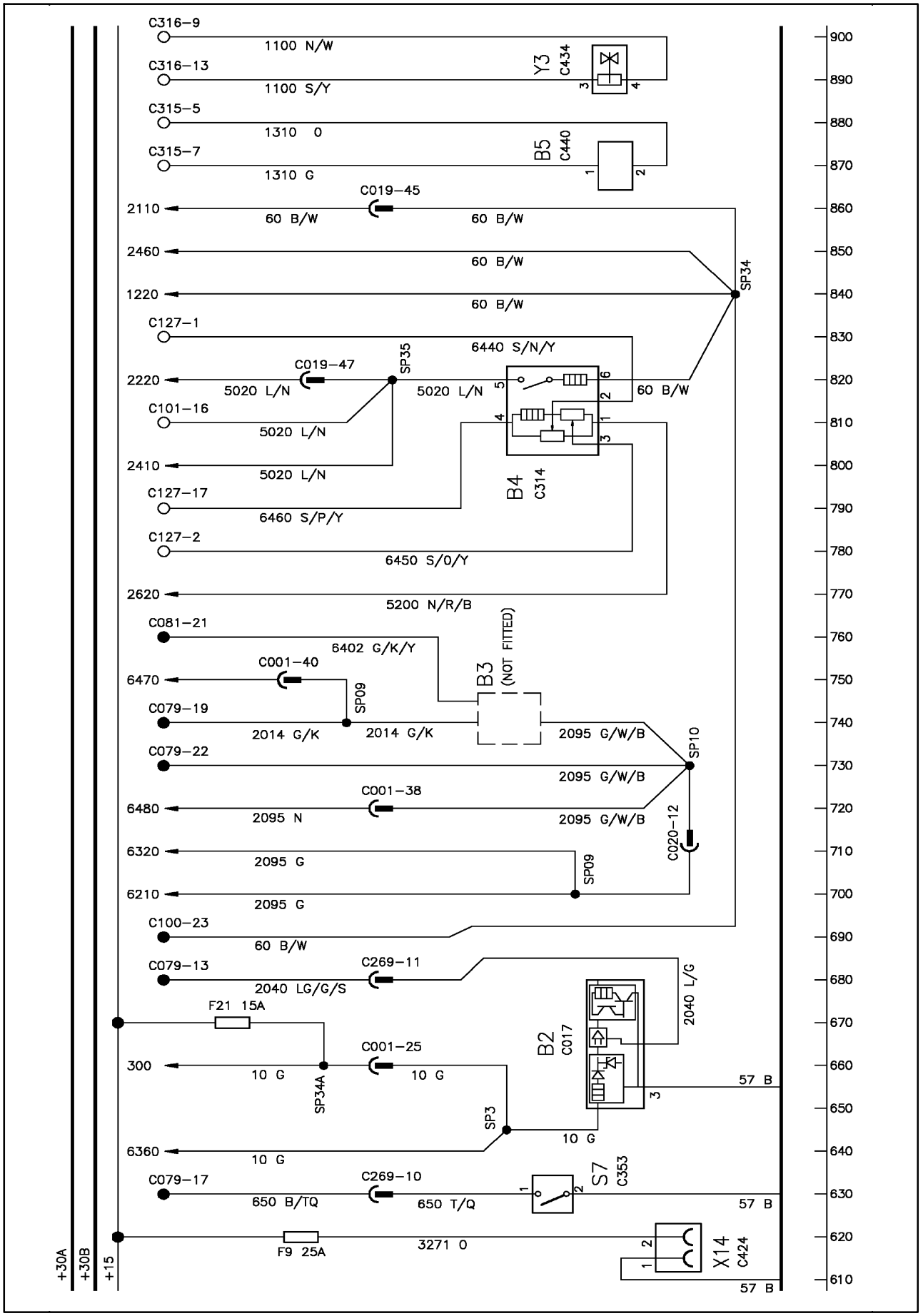
2420
2410


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
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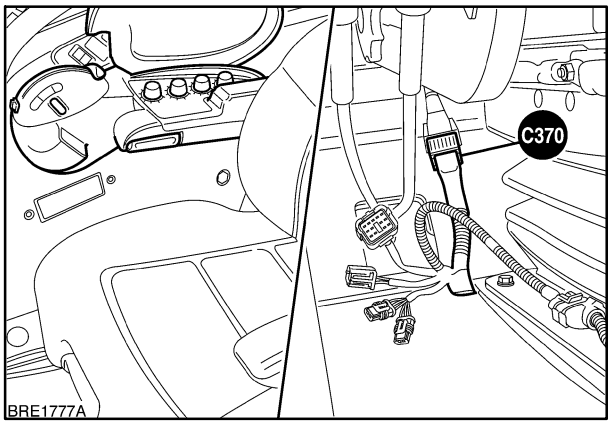
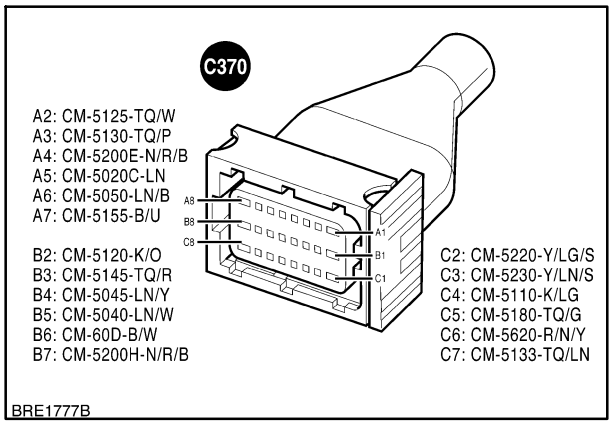
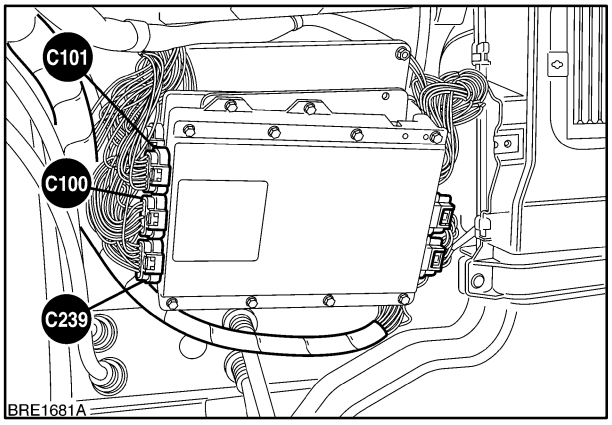
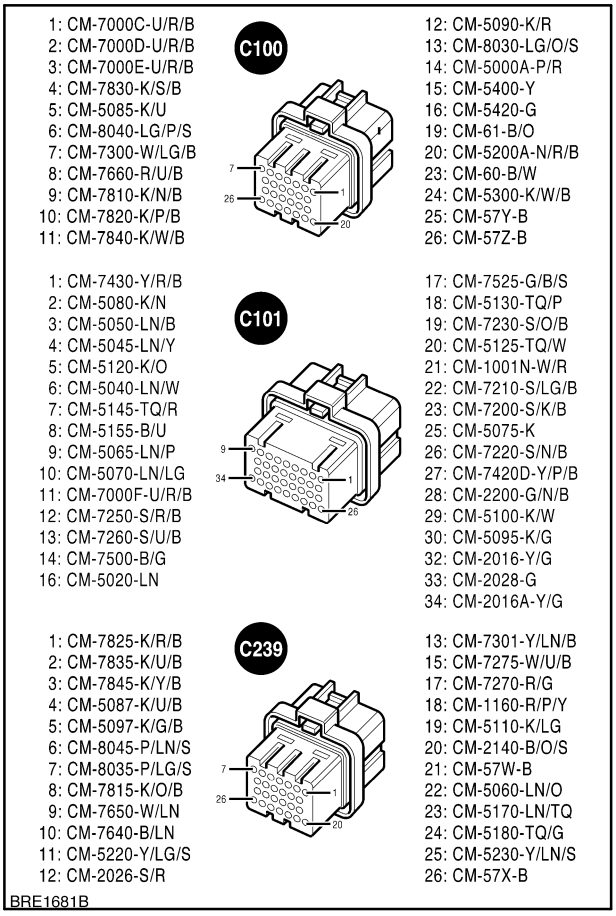
660
650
640
630
620
610


C370
BRE1777A


C370
A2: CM-5125-TQ/W
A3: CM-5130-TQ/P
A4: CM-5200E-N/R/B
A5: CM-5020C-LN
A6: CM-5050-LN/B
A7: CM-5155-B/U
B2: CM-5120-K/O
B3: CM-5145-TQ/R
B4: CM-5045-LN/Y
B5: CM-5040-LN/W
B6: CM-60D-B/W
B7: CM-5200H-N/R/B
A8
B8
C8
A1
B1
C1
C2: CM-5220-Y/LG/S
C3: CM-5230-Y/LN/S
C4: CM-5110-K/LG
C5: CM-5180-TQ/G
C6: CM-5620-R/N/Y
C7: CM-5133-TQ/LN
BRE1777B


C101
C100
C239
BRE1681A


1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
7
26
1
20
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
9
34
1
26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
7
26
1
20
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 1054 - CONTROLLER 5 VOLT REFERENCE SHORT TO GROUND

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are being displayed, continue to step 2.

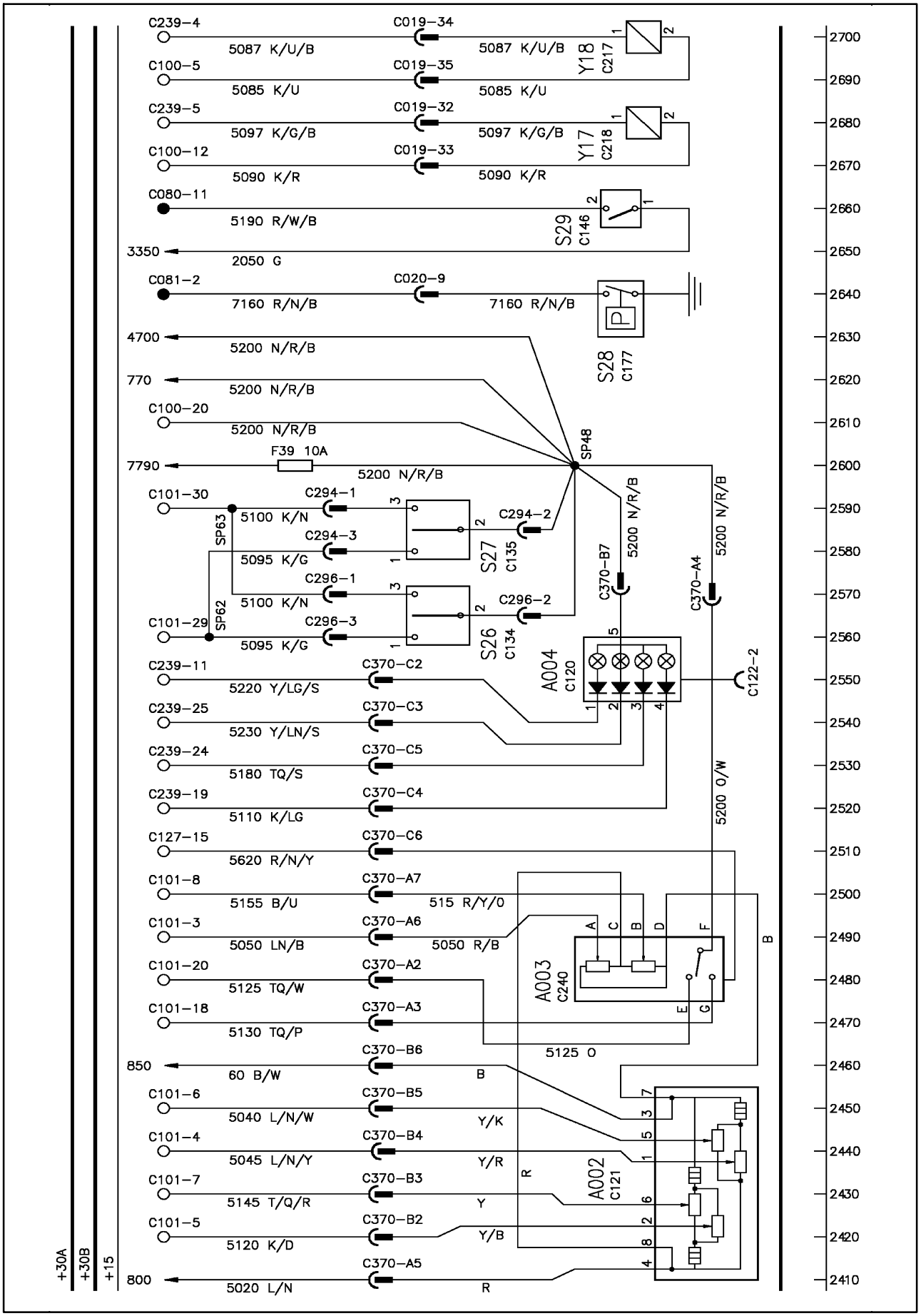
2. Check the +5 Volt sensor supply reference in H9 Channel 5.

   A. If the value displayed is not approximately 49, continue to step 3.

   B. If the value displayed is approximately 49, while still in H9 Channel 5, wiggle the harness, the EDC control unit connector **C240**, the EDC control panel connector **C121**, the inline harness connector **C370** and the controller connector **C101** to check for an intermittent circuit. Channel 5 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check for a short to ground.

   A. Disconnect connector **C101**. Check between connector **C101** pin **16 (L/N)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
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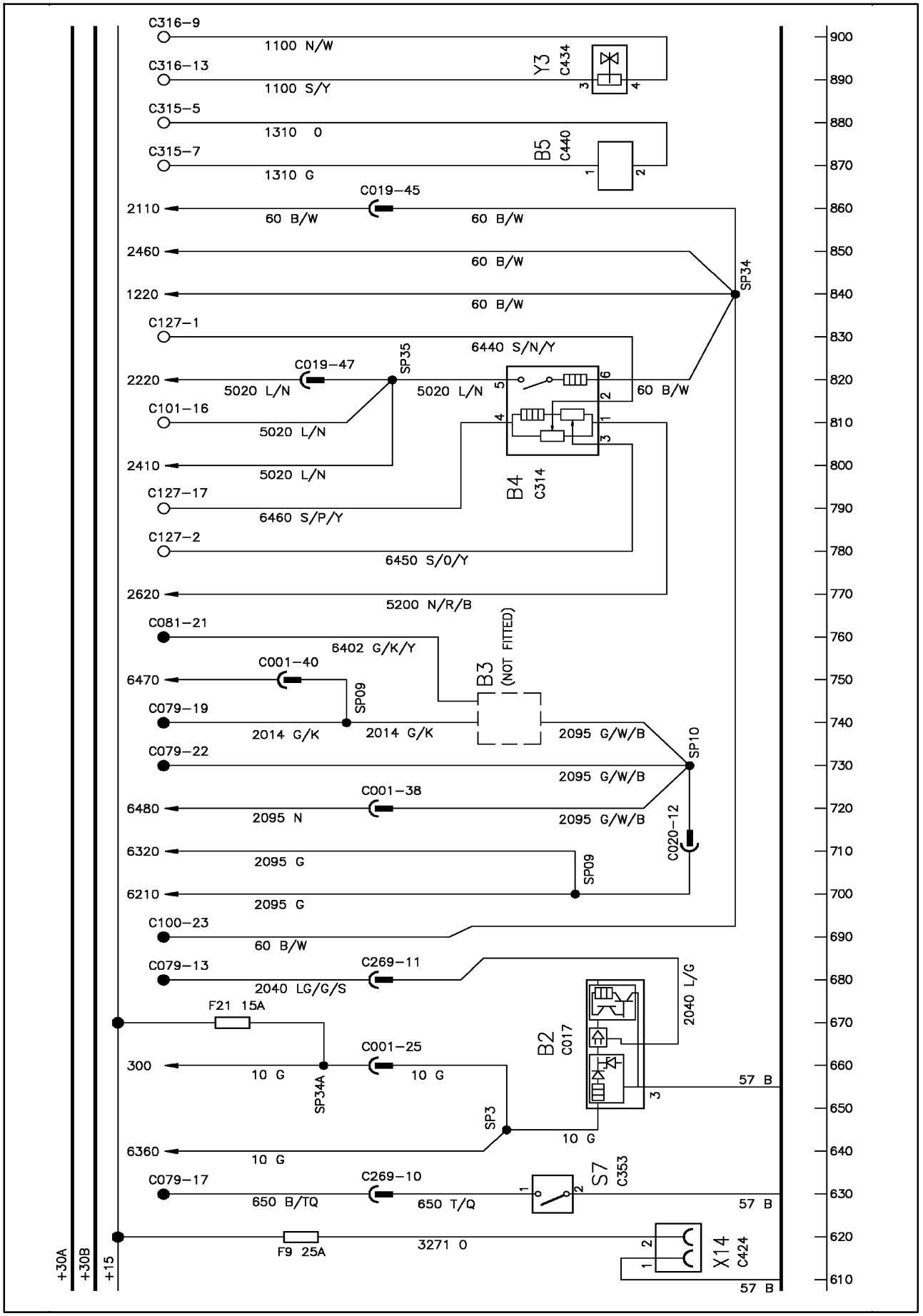
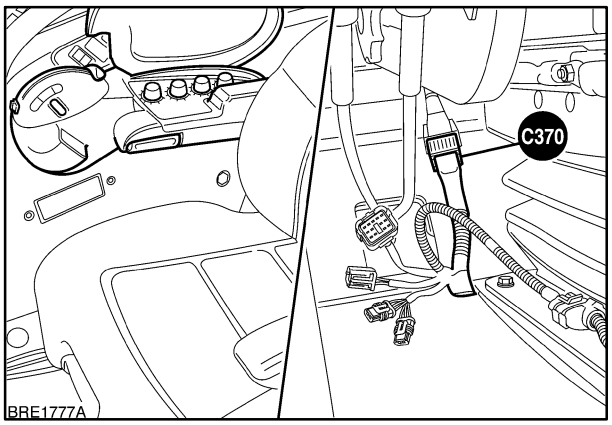
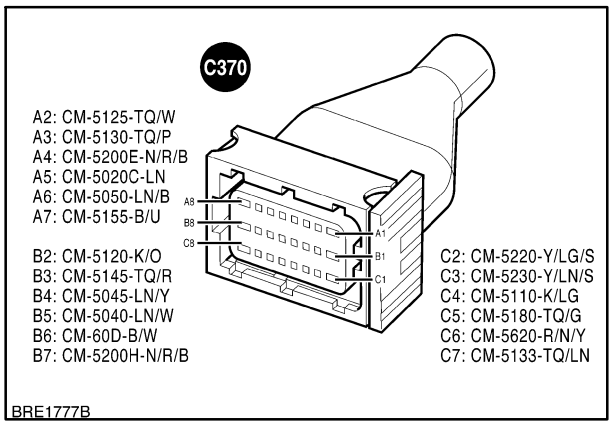
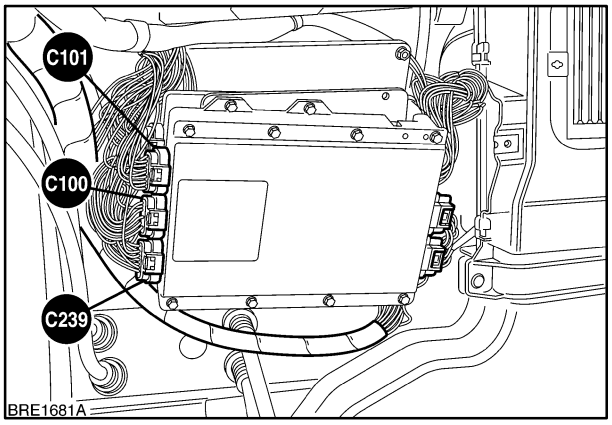
2420
2410

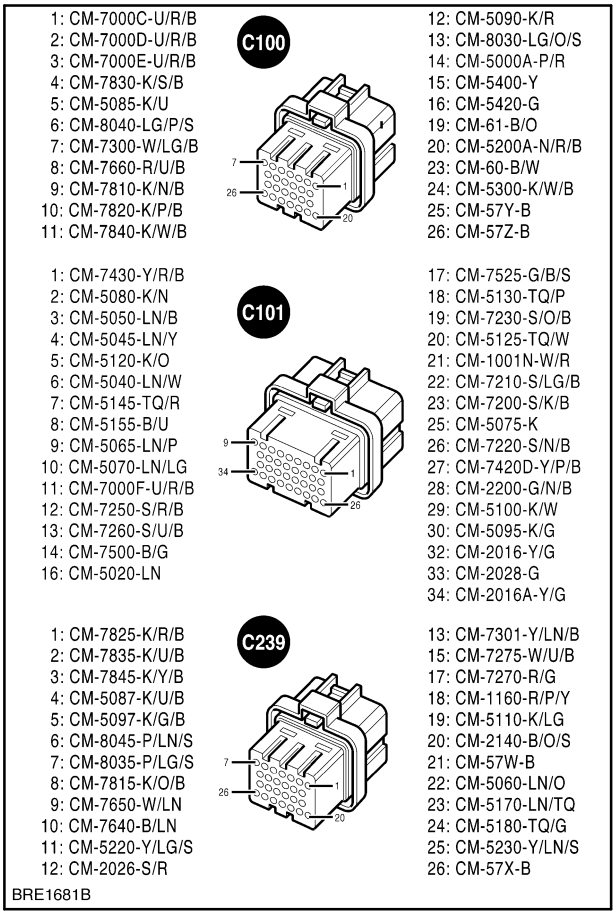

C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610

B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.









ERROR CODE 1059 – 8 VOLT REFERENCE. DRAFT PINS, TOO HIGH (> +9V), TOO LOW (< +7V)

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are being displayed, continue to step 2.

2. Check the +8 Volt sensor supply reference in H9 Channel 6.

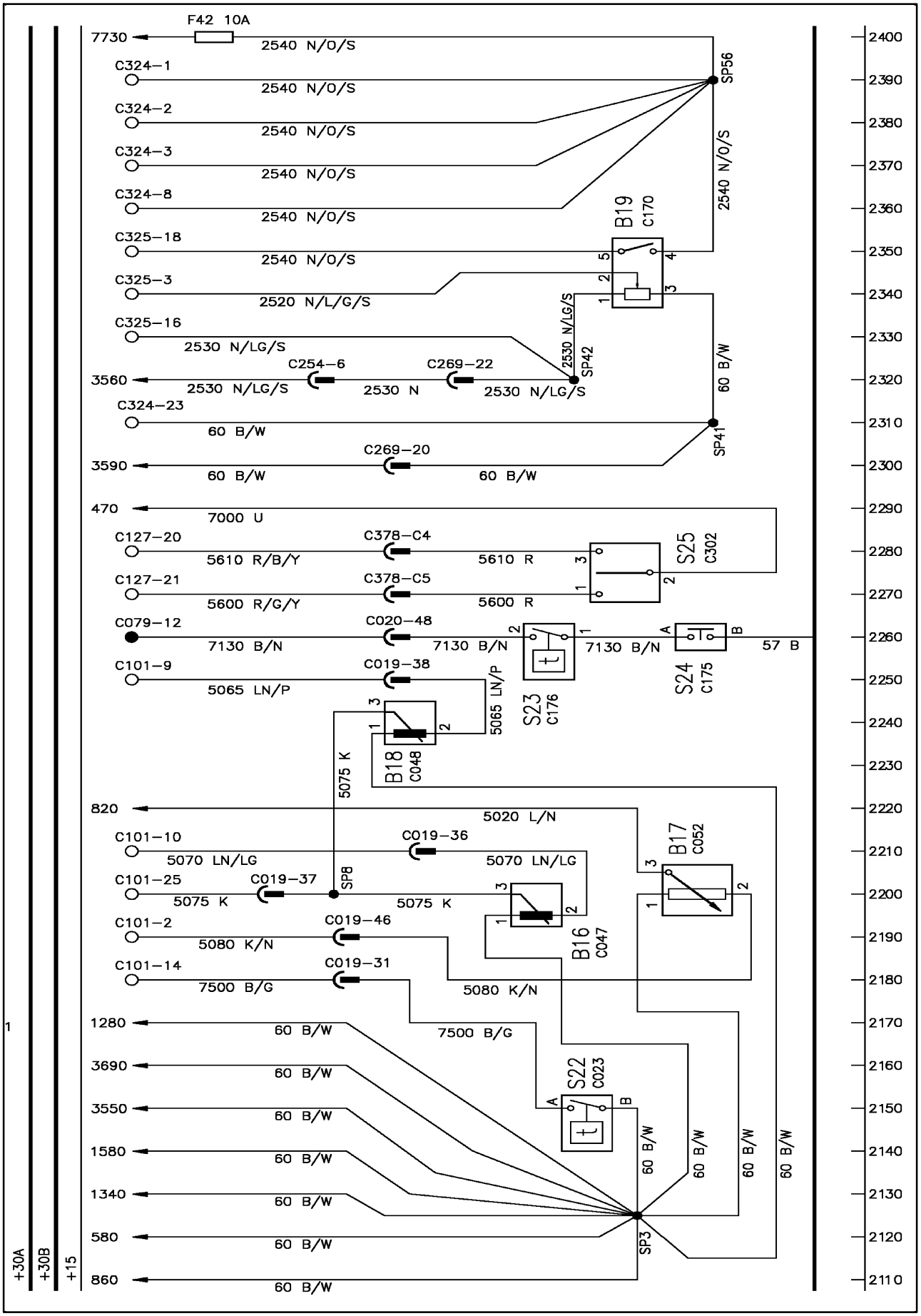
   A. If the value displayed is not approximately 79, continue to step 3.

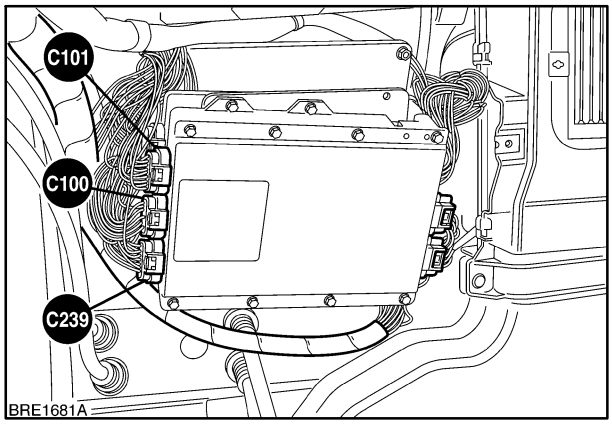
   B. If the value displayed is approximately 79, while still in H9 Channel 6, wiggle the harness, **C019** and the controller connector **C101,** to check for an intermittent circuit. Channel 6 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check for an open circuit.

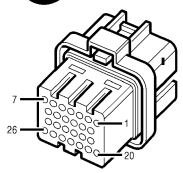
   A. Disconnect connectors **C101** and **C019**. Check between connector **C101** pin **25 (K)** and **C019** pin **37 (K)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S23
C176
S24
C175
57 B
B18
C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
C019-37
SP8
B17
C052
B16
C047
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
2160
2150
2140
2130
2120
2110

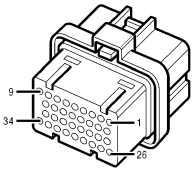


C100



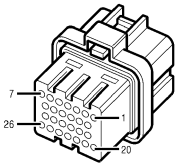
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



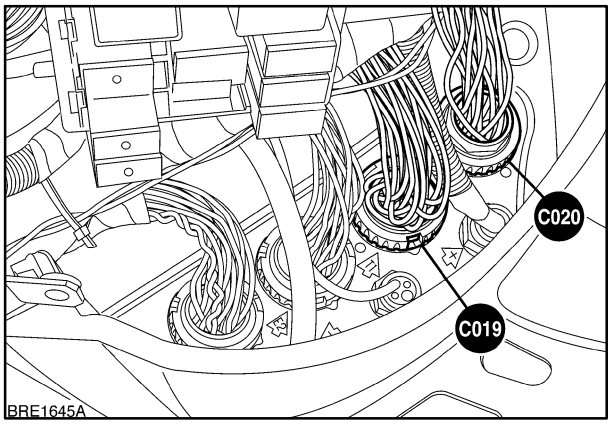
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



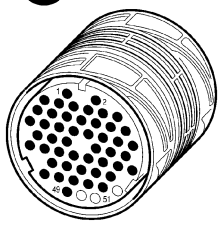
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



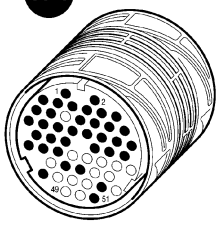
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
30: CM-5515-S/B/Y
31: CM-5500-R
32: CM-5510-U
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 1063 - EDC HYDRAULIC VALVE LOWER SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty EDC valve lower solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EDC valve lower solenioid connector **C218**, the inline harness connector **C019** and the controller connectors **C100** and **C239**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the EDC valve lower solenoid.

   A. Disconnect the EDC valve lower solenoid connector **C218**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 2 Ohms, remove and replace the EDC valve lower solenoid.

   B. If the solenoid is okay, continue to step 2.

3. Check for a short to ground.

   A. Check between connector **C218** pin **2 (K)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for a short to ground.

   A. Disconnect the controller connector **C239**. Check between connector **218** pin **1 (K)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for an open circuit.

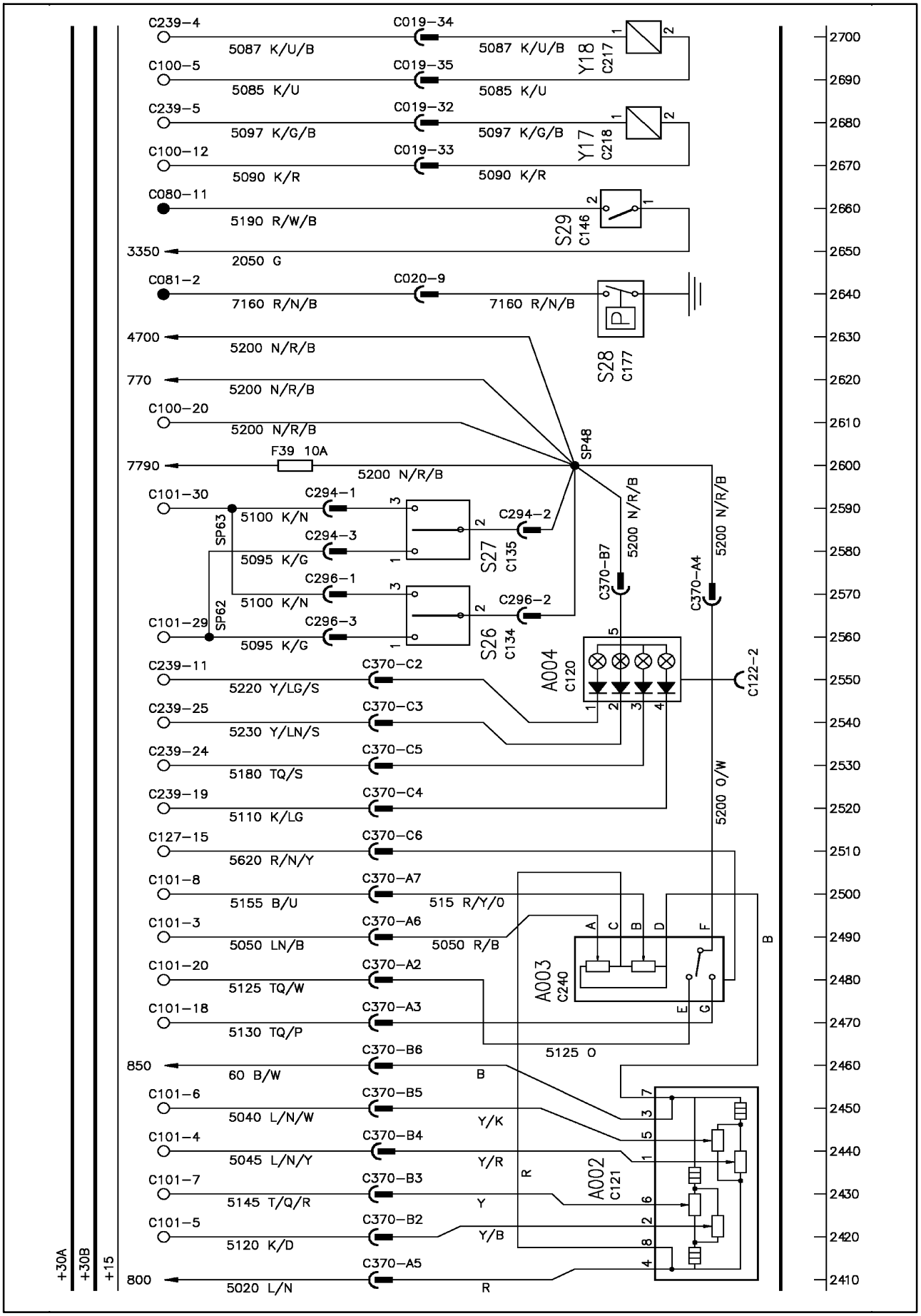
   A. Disconnect the controller connector **C100**. Check between connector:

   C218 pin **2 (K)** and **C100** pin **12 (K/R)**

   C218 pin **1 (K)** and **C239** pin **5 (K/G/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
2580
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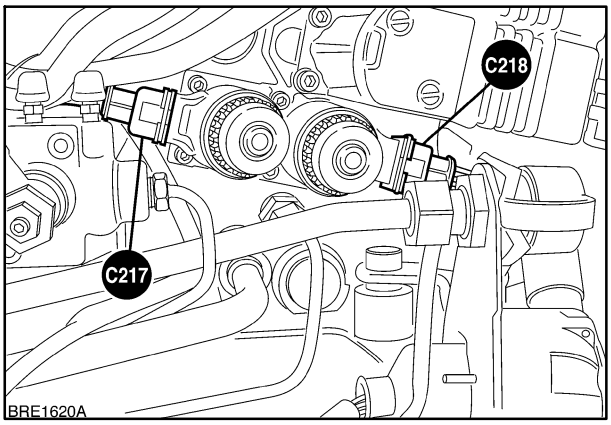
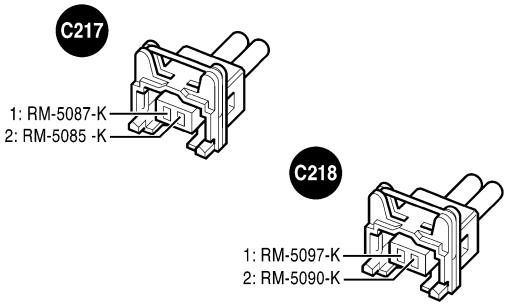
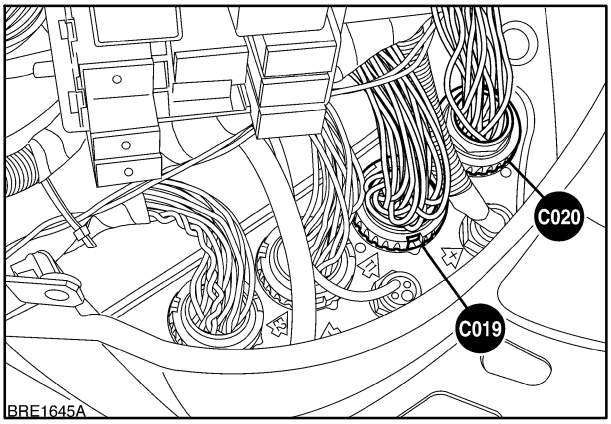
2410



BRE1620A

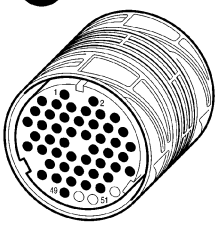


BRE1620B



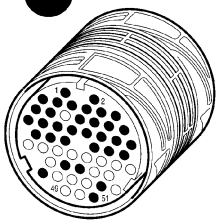
BRE1645A

C019



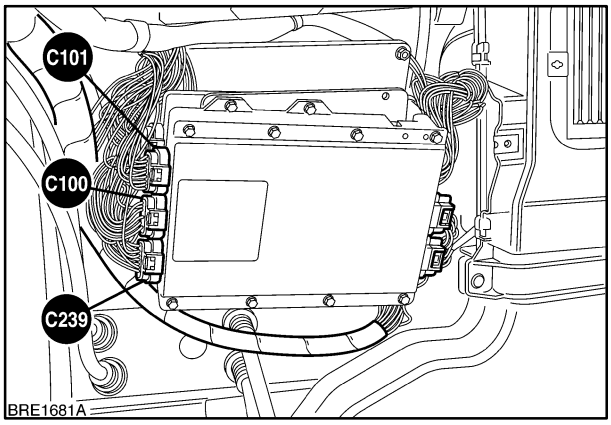
1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



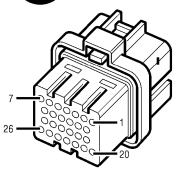
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



BRE1681A

C100



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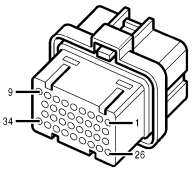
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
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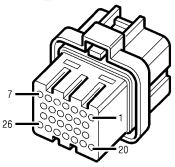
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1064 - EDC HYDRAULIC VALVE RAISE SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty EDC valve raise solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EDC valve lower solenioid connector **C217**, the inline harness connector **C019** and the controller connectors **C100** and **C239**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the EDC valve raise solenoid.

   A. Disconnect the EDC valve raise solenoid connector **C217**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 2 Ohms, remove and replace the EDC valve raise solenoid.

   B. If the solenoid is okay, continue to step 2.

3. Check for a short to ground.

   A.. Check between connector **C217** pin **2 (K)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for a short to ground.

   A. Disconnect the controller connector **C239**. Check between connector **217** pin **1 (K)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for an open circuit.

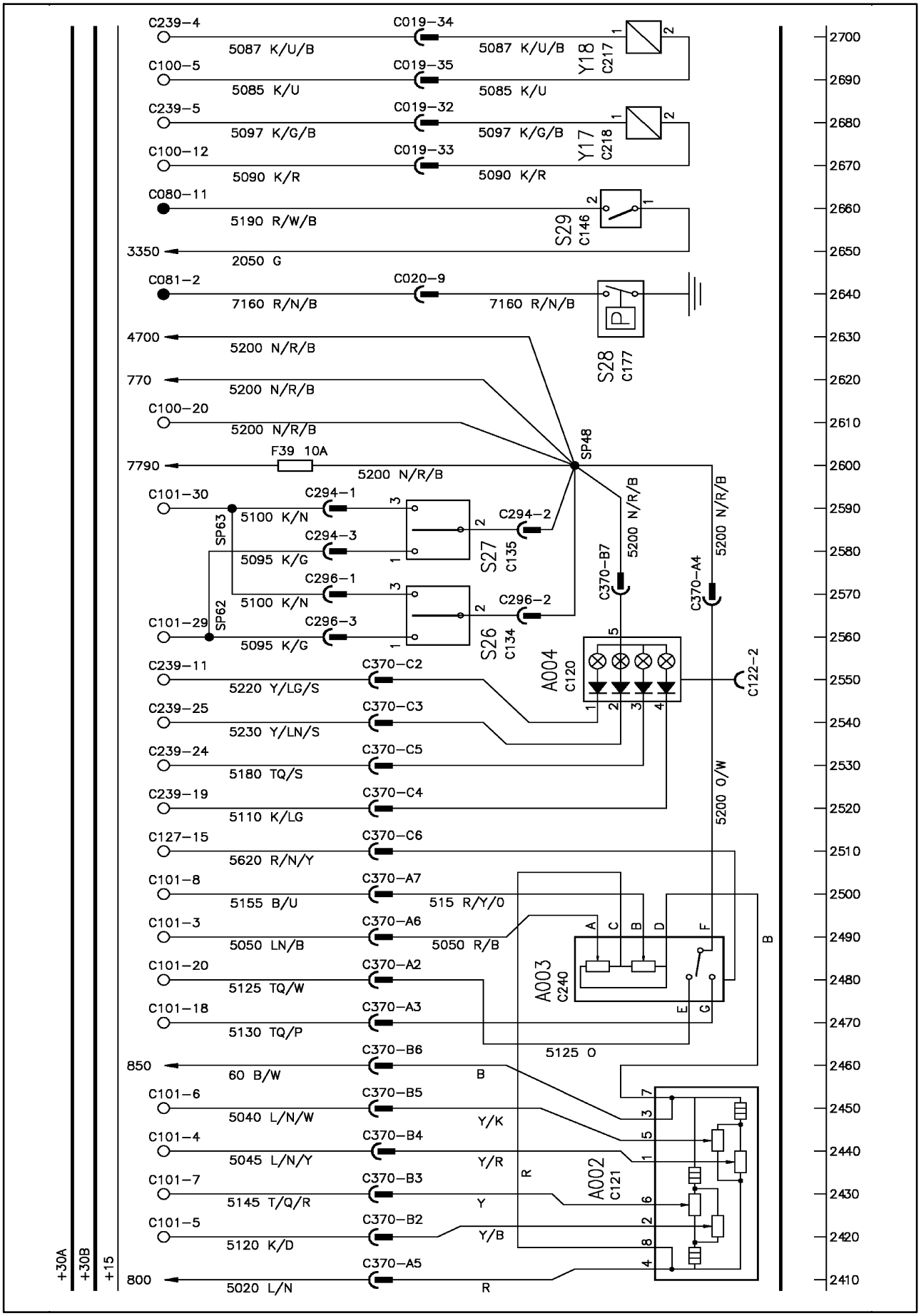
   A. Disconnect the controller connector **C100**. Check between connector:

   C217 pin **2 (K)** and **C100** pin **5 (KU)**

   C217 pin **1 (K)** and **C239** pin **4 (K)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-3
5095 K/G
C294-2
S27
C135
C296-1
5100 K/N
SP62
C101-29
C296-3
5095 K/G
C296-2
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
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2680
2670
2660
2650
2640
2630
2620
2610
2600
2590
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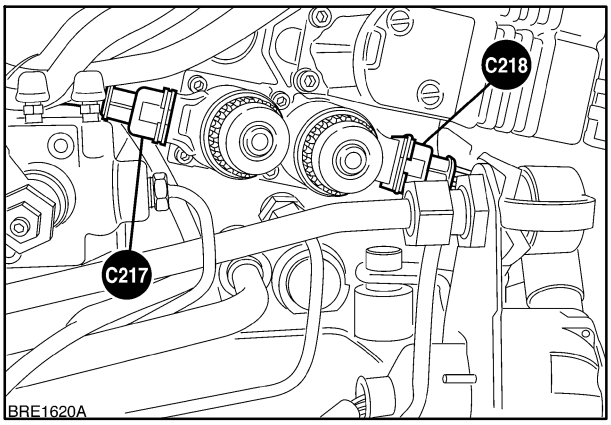
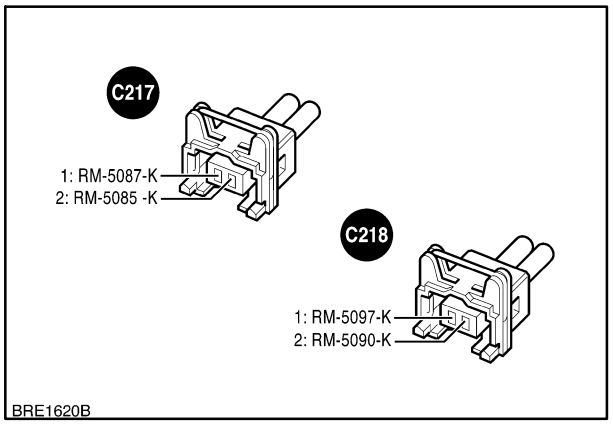
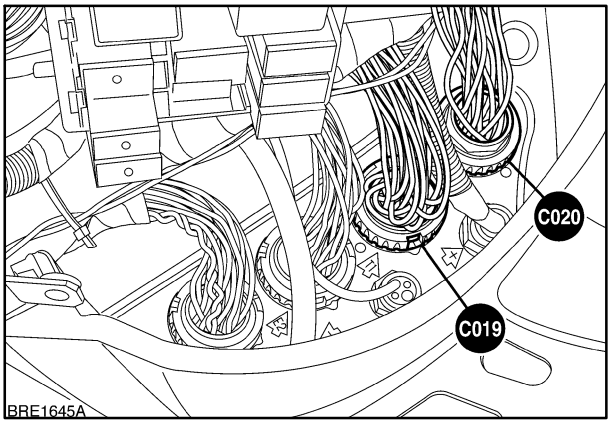
2410



BRE1620A

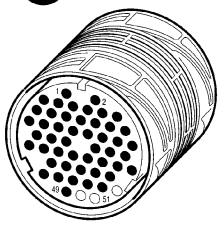


BRE1620B



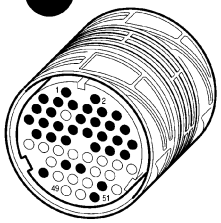
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
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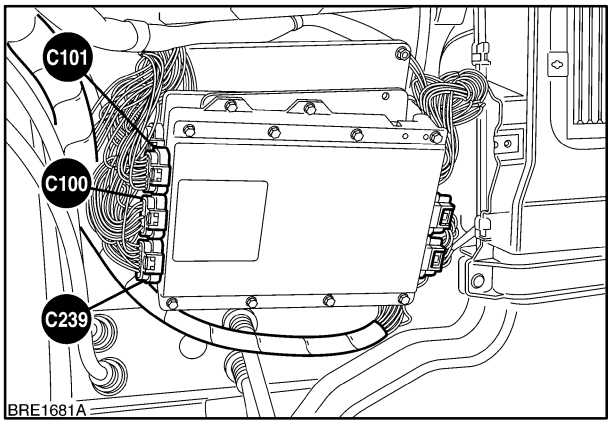
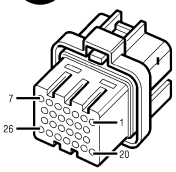
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



BRE1681A

C100



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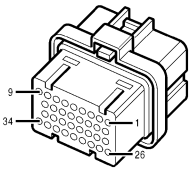
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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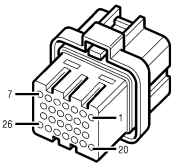
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1065 - EDC HYDRAULIC VALVE LOWER SOLENOID SHORT CIRCUIT

Possible failure modes:

1. Faulty connector
1. Faulty EDC valve lower solenoid
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EDC valve lower solenoid connector **C218**, the inline harness connector **C019** and the controller connectors **C100** and **C239**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the EDC valve lower solenoid.

   A. Disconnect the EDC valve lower solenoid connector **C218**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 2 Ohms, remove and replace the EDC valve lower solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for a short to +Ve Voltage.

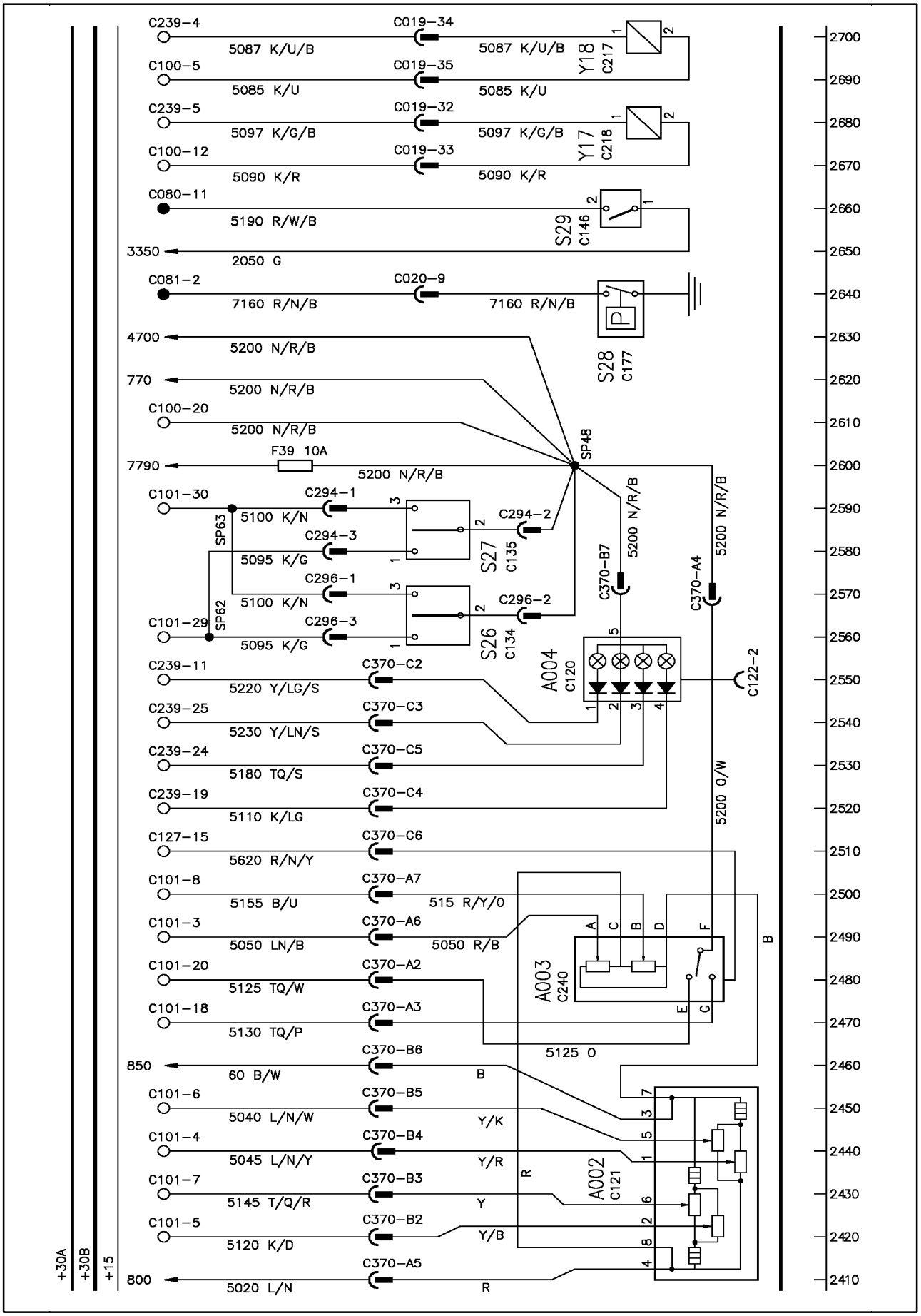
   A. Turn the keystart ON. Measure the voltage between connector **C218** pin **1 (K)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Turn the keystart OFF. Disconnect the controller connector **C100**. Turn the keystart ON. Measure the voltage between connector **C218** pin **2 (K)**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
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SP48
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C101-30
C294-1
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SP63
C294-2
C294-3
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S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
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C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/0
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C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
850
C370-B6
60 B/W
B
C101-6
C370-B5
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Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
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C121
C101-7
C370-B3
5145 T/Q/R
Y
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
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R
+30A
+30B
+15
2700
2690
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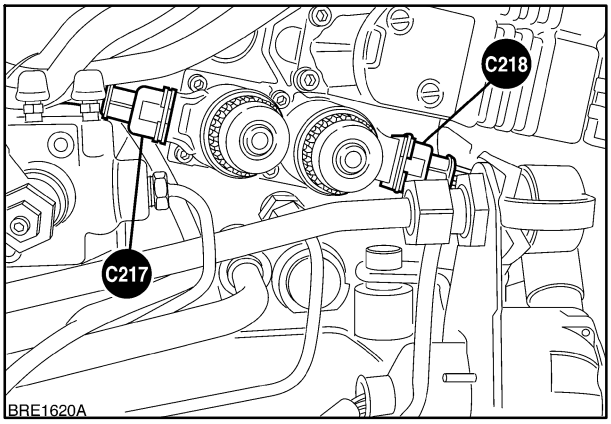
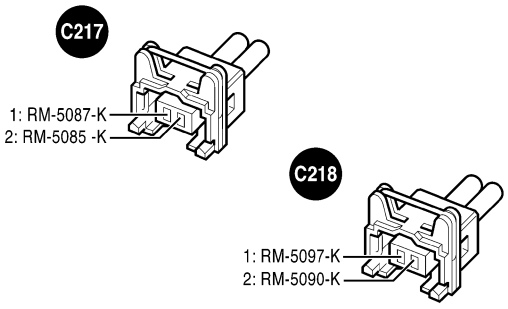


BRE1620A



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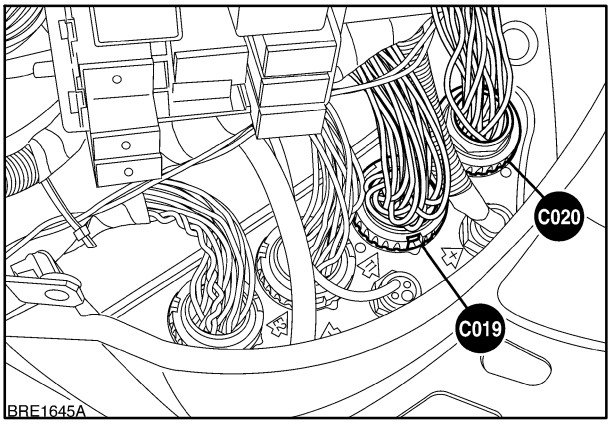
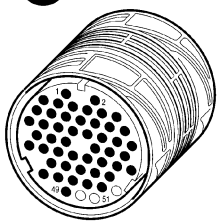


BRE1645A

C019



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5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
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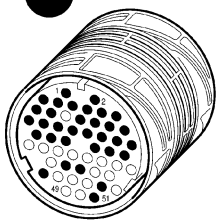
C020



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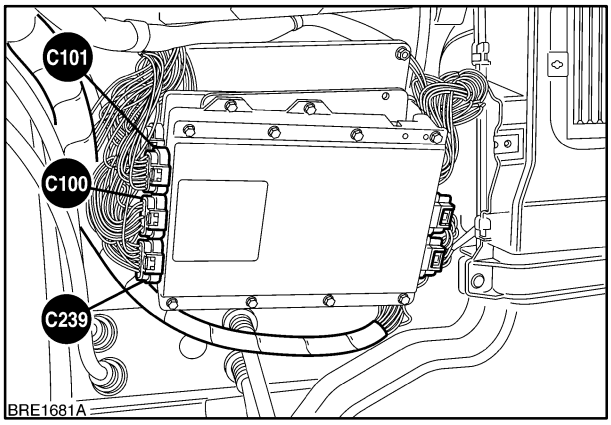
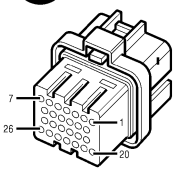
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



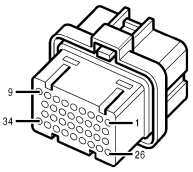
BRE1681A

C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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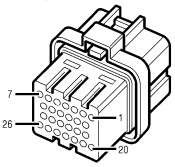
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1066 – EDC HYDRAULIC VALVE RAISE SOLENOID SHORT CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty EDC valve raise solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EDC valve raise solenoid connector **C217**, the inline harness connector **C019** and the controller connectors **C100** and **C239**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the EDC valve raise solenoid.

   A. Disconnect the EDC valve raise solenoid connector **C217**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 2 Ohms, remove and replace the EDC valve raise solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for a short to +Ve Voltage.

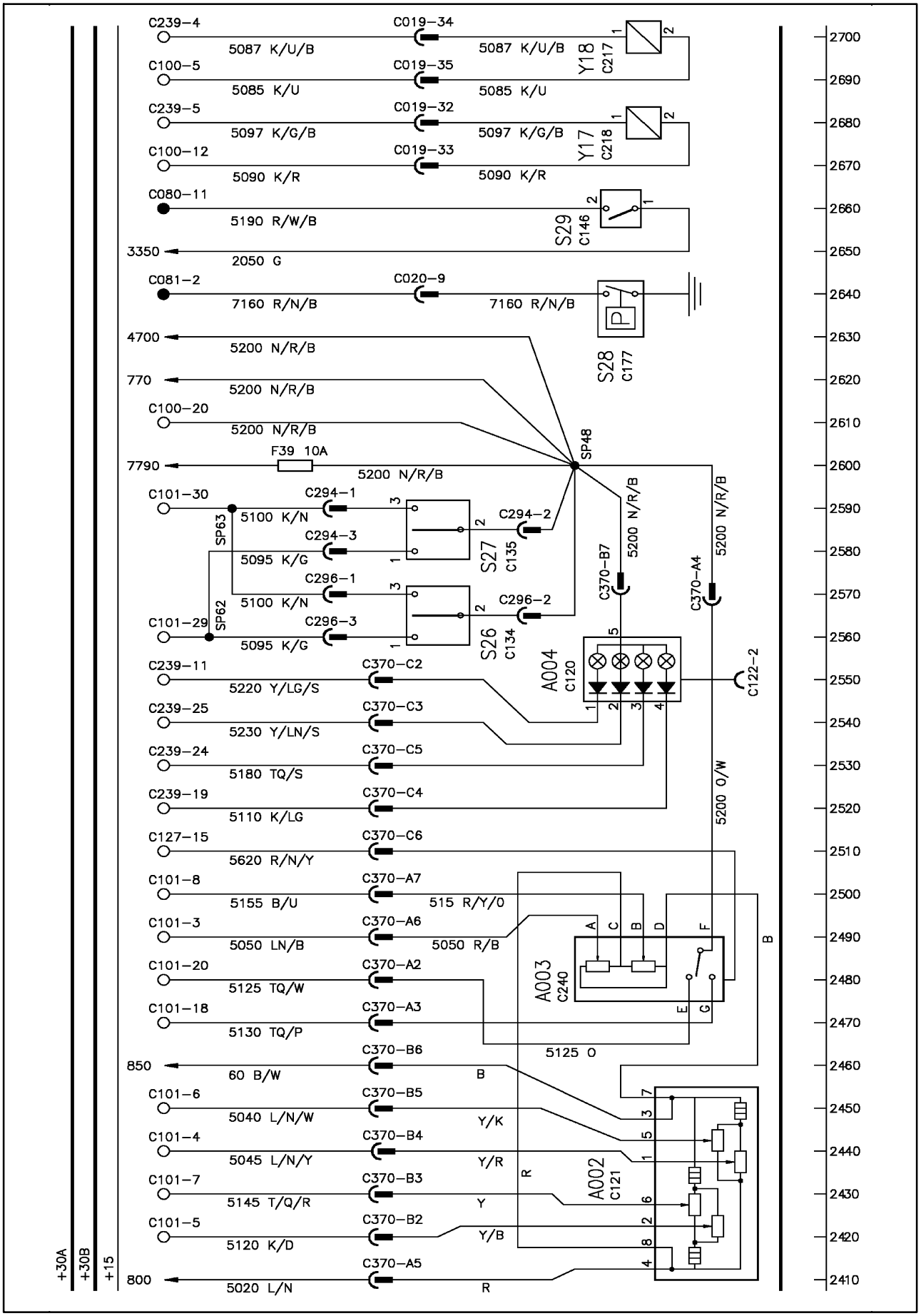
   A. Turn the keystart ON. Measure the voltage between connector **C217** pin **1 (K)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Turn the keystart OFF. Disconnect the controller connector **C100**. Turn the keystart ON. Measure the voltage between connector **C217** pin **2 (K)**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
B
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
R
C101-5
C370-B2
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Y/B
800
C370-A5
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R
+30A
+30B
+15
2700
2690
2680
2670
2660
2650
2640
2630
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2610
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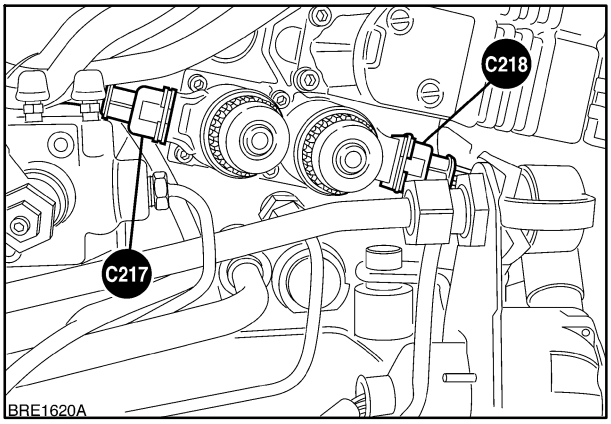

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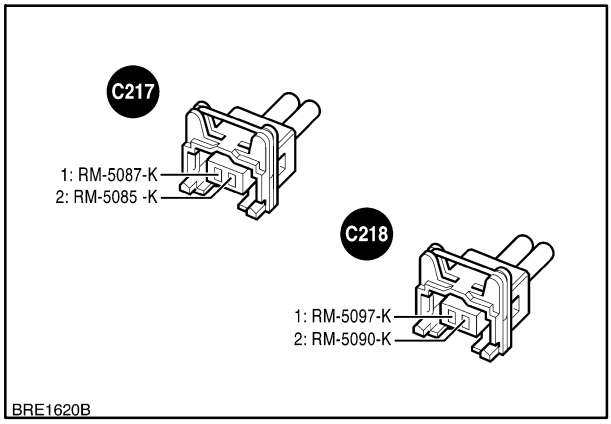

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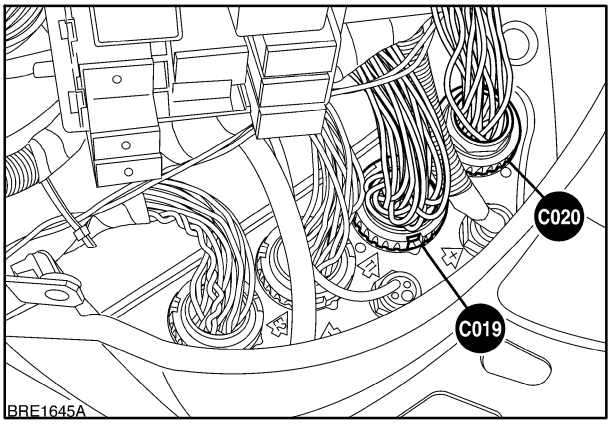

BRE1645A

C019

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3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020

1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
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43: CM-2050L-G
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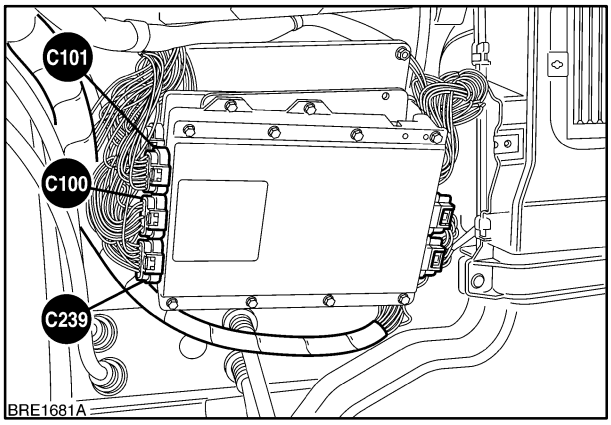
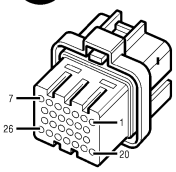
51: CM-7000P-U/R/B

BRE1645B



BRE1681A

C100



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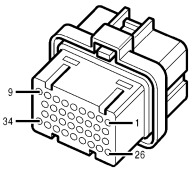
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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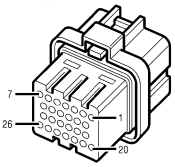
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1067 - EDC HYDRAULIC VALVE SUPPLY VOLTAGE TOO LOW

Possible failure modes:

1. Faulty harness
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the +12 Volt reference in H9 channel 9.

   A. If the value displayed is approximately 44, continue to test for error codes 1063, 1064, 1065 and 1066.

   B. If the value displayed is not approximately 44, continue to step 2.

2. Check for +12 Volts at fuse 14.

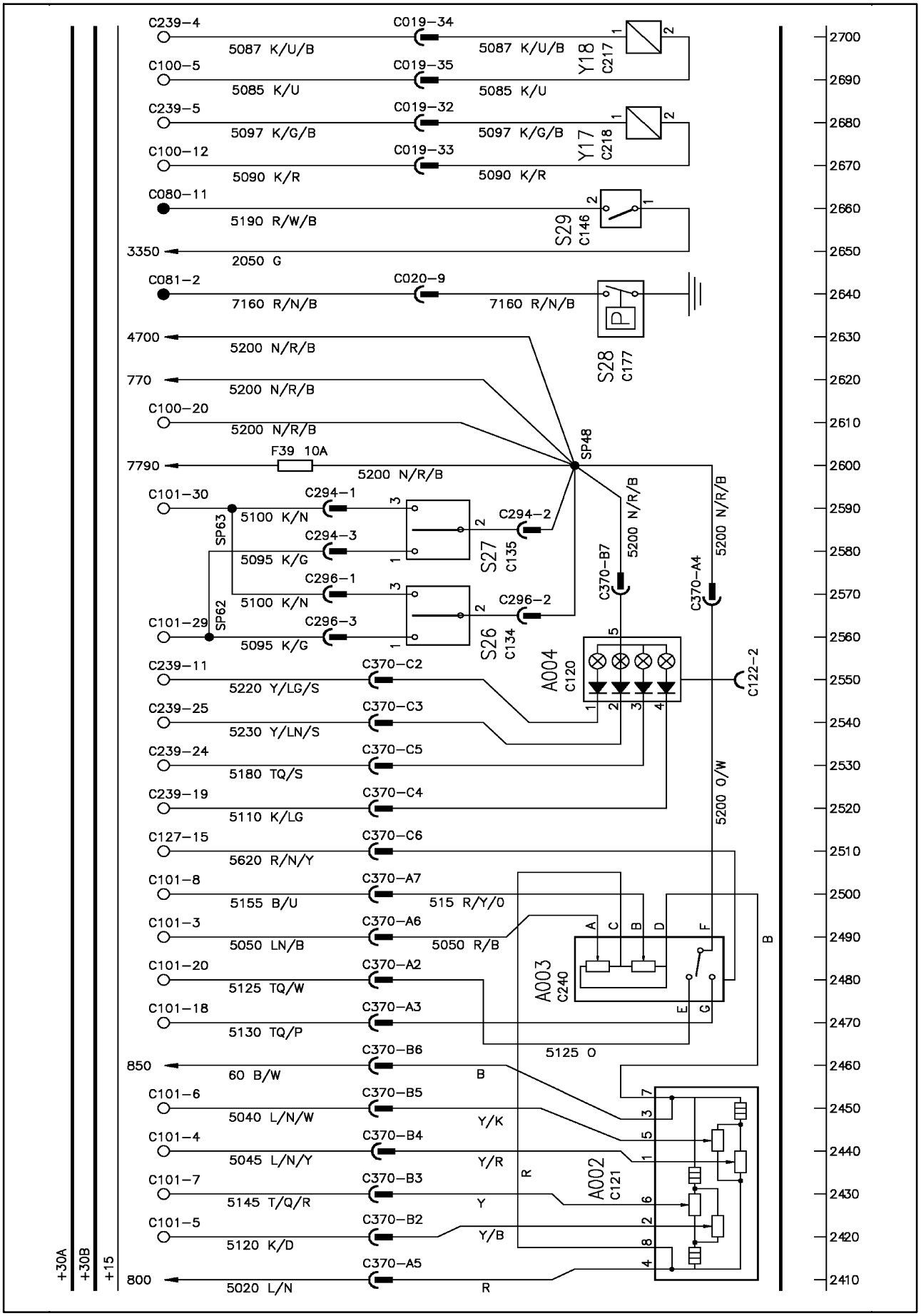
   A. Turn the keystart ON. Measure the voltage at fuse 14, If the voltage indicated is approximately +12 Volts, continue to step 3.

   B. If the voltage indicated is not okay, check the supply from the battery to fuse 14.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the secondary controller connector **C100**. Check between connector **C100** pin **20 (N/R/B)** and **fuse 14**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C239-4
C019-34
5087 K/U/B
5087 K/U/B
Y18
C217
C100-5
C019-35
5085 K/U
5085 K/U
C239-5
C019-32
5097 K/G/B
5097 K/G/B
Y17
C218
C100-12
C019-33
5090 K/R
5090 K/R
C080-11
5190 R/W/B
S29
C146
3350
2050 G
C081-2
C020-9
7160 R/N/B
7160 R/N/B
S28
C177
4700
5200 N/R/B
770
5200 N/R/B
C100-20
5200 N/R/B
F39 10A
SP48
7790
5200 N/R/B
C101-30
C294-1
5100 K/N
SP63
C294-2
C294-3
5095 K/G
S27
C135
C296-1
5100 K/N
C296-2
SP62
C101-29
C296-3
5095 K/G
S26
C134
C370-B7
5200 N/R/B
C370-A4
5200 N/R/B
A004
C120
C122-2
C239-11
C370-C2
5220 Y/LG/S
C239-25
C370-C3
5230 Y/LN/S
C239-24
C370-C5
5180 TQ/S
C239-19
C370-C4
5110 K/LG
5200 O/W
C127-15
C370-C6
5620 R/N/Y
C101-8
C370-A7
5155 B/U
515 R/Y/O
C101-3
C370-A6
5050 LN/B
5050 R/B
A003
C240
C101-20
C370-A2
5125 TQ/W
C101-18
C370-A3
5130 TQ/P
5125 O
B
850
C370-B6
60 B/W
B
C101-6
C370-B5
5040 L/N/W
Y/K
C101-4
C370-B4
5045 L/N/Y
Y/R
A002
C121
C101-7
C370-B3
5145 T/Q/R
Y
R
C101-5
C370-B2
5120 K/D
Y/B
800
C370-A5
5020 L/N
R
+30A
+30B
+15
2700
2690
2680
2670
2660
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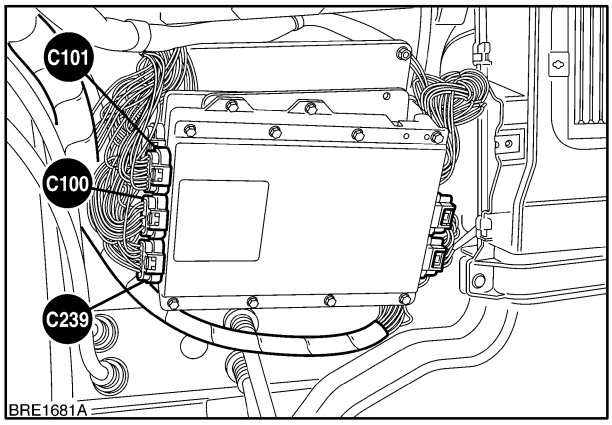
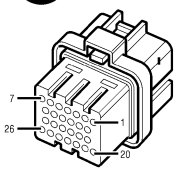


C100



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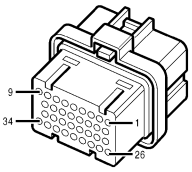
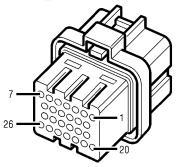
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 1068 – HEIGHT LIMIT CALIBRATION ERROR

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

NOTE: *If the height limit control has not been turned fully clockwise to the maximum height position, this error code will be displayed.*

1. Turn the height limit control to the maximum height position when performing the hydraulic lift calibration procedure.

SECTION 55 - ELECTRICAL SYSTEM

Chapter 9 - Fault Codes (Continued)

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2001 – 3000 TRANSMISSION ERROR CODE LISTING

Error Code	Error description
2001	CR – Shuttle too fast error
2002	Flashing N error
2003	CP – Clutch pedal required
2004	P – Handbrake error
2005	Creeper selection error
2011	Clutch pedal potentiometer signal low
2012	Clutch pedal potentiometer signal high
2013	Upshift and downshift switches both closed
2015	High and low range switches both closed
2016	Creeper solenoid short to ground or high voltage
2021	Chassis harness disconnected
2024	All clutches and synchronisers require calibration
2026	Engine speed too high
2027	Engine speed too low
2035	Dump solenoid short to ground or high voltage
2036	Dump solenoid open circuit
2037	Clutch pedal disconnect switch open circuit
2038	Clutch C4 solenoid short to ground or high voltage (16x16)
2038	Low range PWM valve short to ground or high voltage (24x24)
2039	Clutch C4 solenoid open circuit (16x16)
2039	Low range PWM valve open circuit (24x24)
2040	Clutch C3 solenoid short to ground or high voltage (16x16)
2040	High range PWM valve short to ground or high voltage (24x24)
2041	Clutch C3 solenoid open circuit (16x16)
2041	High range PWM valve open circuit (24x24)
2042	Clutch C2 solenoid short to ground or high voltage
2043	Clutch C2 solenoid open circuit
2044	Clutch C1 solenoid short to ground or high voltage
2045	Clutch C1 solenoid open circuit
2046	Fuse 35 open circuit
2047	Clutch disconnect switch set too high
2048	Clutch disconnect switch set too low
2049	Wheel speed sensor open circuit, short to ground or high voltage
2051	Oil temperature sensor open circuit
2052	Oil temperature sensor short to ground or high voltage
2053	5 Volt reference voltage too high
2054	5 Volt reference voltage too low

2055	No signal from wheel speed sensor
2056	Low range switch open
2057	High Range switch open
2058	Seat switch closed
2059	Shuttle lever switch disagreement
2060	Forward synchroniser no longer engaged
2061	Forward/reverese synchroniser potentiometer signal high
2062	Forward/reverese synchroniser potentiometer signal low
2063	Forward synchroniser did not engage
2064	Reverse synchroniser did not engage
2065	Forward synchroniser solenoid open circuit
2066	Reverse synchroniser solenoid open circuit
2067	Forward solenoid short to ground or high voltage
2068	Reverese solenoid short to ground or high voltage
2069	Reverse synchroniser no longer engaged
2070	Shuttle lever forward switch voltage high
2071	Shuttle lever forward switch voltage low
2072	Shuttle lever reverse switch voltage high
2073	Shuttle lever reverse switch voltage low
2075	No signal from flywheel speed sensor
2076	Flywheel speed sensor open circuit
2077	Flywheel speed sensor short to ground or high voltage
2080	1-4 (9-12) range synchroniser no longer engaged
2081	4/5 range synchroniser potentiometer signal high
2082	4/5 range synchroniser potentiometer signal low
2083	1-4 (9-12) range synchroniser engaged error
2084	5-8 (13-16) range synchroniser engaged error
2085	1-4 (9-12) range synchroniser solenoid open circuit
2086	5-8 (13-16) range synchroniser solenoid open circuit
2087	1-4 (9-12) range synchroniser solenoid short to ground or high voltage
2088	5-8 (13-16) range synchroniser solenoid short to ground or high voltage
2089	5-8 (13- 16) range synchroniser no longer engaged
2090	Output speed to high for creeper engage
2091	Clutch C3 not calibrated
2092	Clutch C4 not calibrated
2093	High clutch not calibrated
2094	Low clutch not calibrated
2095	Clutch C1 not calibrated
2096	Clutch C2 not calibrated
2097	Clutch C5 not calibrated

2098	C5 solenoid short circuit
2099	C5 solenoid open circuit
2100	C5 dump solenoid short circuit
2101	C5 dump solenoid open circuit
2124	Flywheel torque sensor not calibrated
2199	Creeper option not enabled

ERROR CODE 2001 (CR) – SHUTTLE TOO FAST ERROR

Effects:

Transmission disabled.

Possible failure modes:

1. Tractor speed too high for shift from forward to reverse or reverse to forward

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Reduce the tractor speed to rest. Depress the clutch pedal, move the shuttle lever into neutral, and release the handbrake.
   A. If CR is not displayed, test the system for normal operation.
   B. If CR is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   Pay particular attention to the clutch pedal, shuttle switch and wheel speed sensor error codes.

ERROR CODE 2002 (N) – FLASHING N ERROR

Effects:

Transmission disabled.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Shift to neutral to re–enable transmission.

ERROR CODE 2003 (CP) - CLUTCH PEDAL REQUIRED

Effects:

Transmission disabled.

Possible failure modes:

1. Forward or reverse selected without the clutch pedal depressed, while Auto-Take-Off (ATO) is disabled
2. Driver out of seat for more than one second and forward or reverse selected

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Depress the clutch pedal, move the shuttle lever into neutral, and release the handbrake to re-enable ATO and shuttle shifting.
   A. If CP is not displayed, test the system for normal operation.
   B. If CP is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   Pay particular attention to the clutch pedal, shuttle switch error codes and driver seat electrical circuit.

ERROR CODE 2004 (P) – HANDBRAKE ERROR

Effects:

Transmission disabled.

Possible failure modes:

1. Forward or reverse is selected while the handbrake is on.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Depress the clutch pedal, move the shuttle lever into neutral, and release the handbrake.
   A. If P is not displayed, test the system for normal operation.
   B. If P is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   Pay particular attention to the clutch pedal, shuttle switch error codes and handbrake electrical circuit.

ERROR CODE 2005 - CREEPER SELECTION ERROR

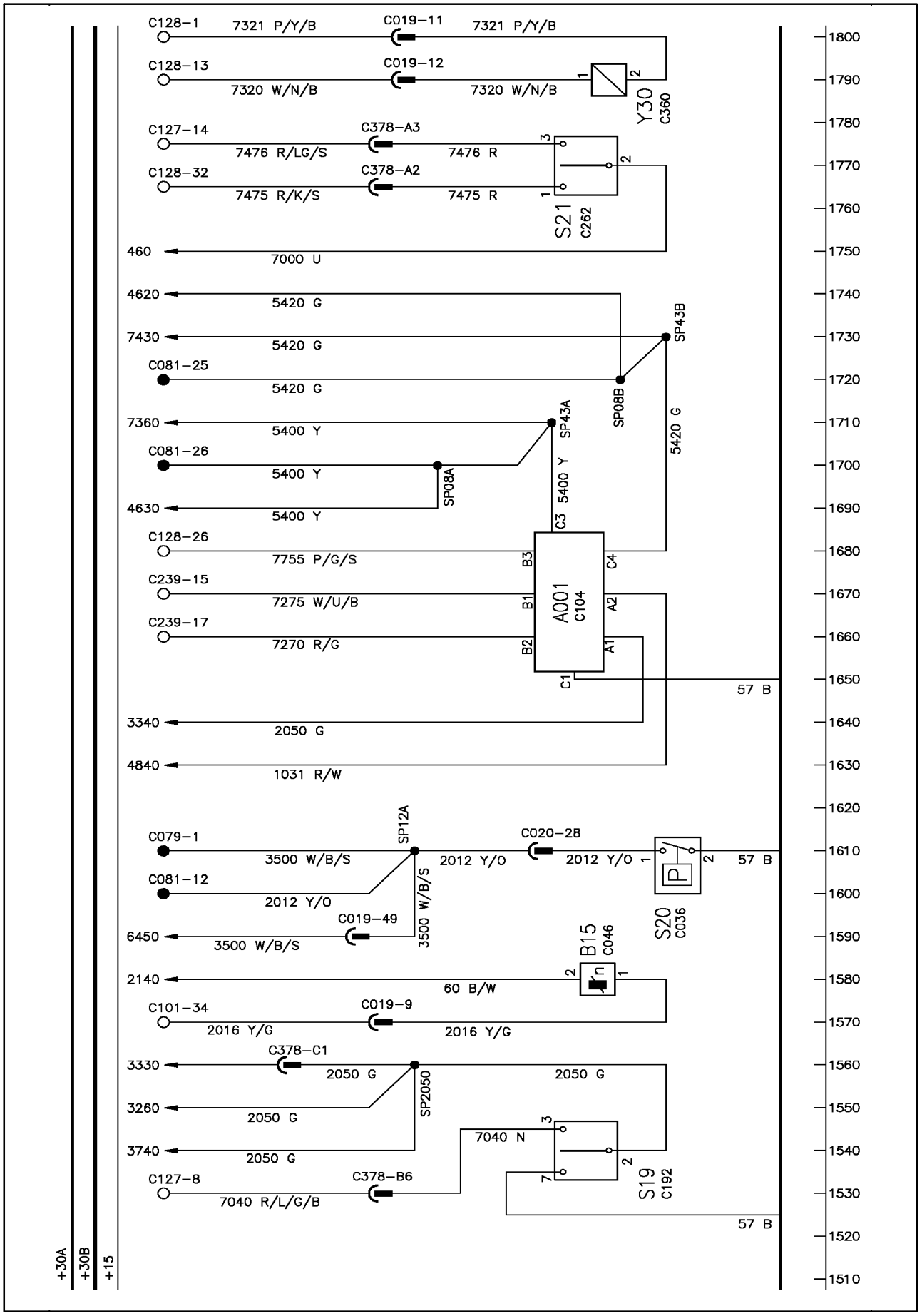
Possible failure modes:

1. Faulty creeper soleniod
2. Faulty creeper rail switch
3. Faulty hydraulic circuit
4. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the creeper solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
5. Check the creeper rail switch.
   A. Disconnect connector **C192**. Remove the creeper rail switch. Check between the component side of the connector:
   C192 pin **2** and pin **3**
   C192 pin **2** and pin **7**
   Operate the switch, the readings should alternate between open and closed circuit.
   If the reading are not as expected, replace the creeper rail switch.
   B. If the readings are as expected, continue to step 5.
6. Check for short to +Ve.
   A. Check between:
   C192 pin **2 (G)** and **ground**
   C192 pin **3 (N)** and **ground**
   If a short to +Ve is indicated, repair or replace the harness as required.
   B. If a short to+ Ve is not indicated, the readings are as expected, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
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3500 W/B/S
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C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
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1710
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1660
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1630
1620
1610
1600
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1510

ERROR CODE 2011 - CLUTCH PEDAL POTENTIOMETER SIGNAL LOW

Effects:

If the error code occurs while driving it will disable the transmission. Cycling the shuttle lever will re-enable the transmission. The tractor may be used on the shuttle lever. If the clutch pedal is depressed the transmission will be disabled again until the shuttle lever has been cycled.

Possible failure modes:

1. Faulty connector
2. Faulty clutch pedal potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch pedal potentiometer in H9 Channel 0.

   A. Operate the clutch pedal. If the values displayed do not change continuously between approximately 76 to 26, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 0 wiggle the harness, the clutch pedal potentiometer connector **C077** and the controller connector **C101** to check for an intermittent circuit. Channel 0 values will change if an intermittent circuit is detected. Repair or replace as required.
2. Check the connectors **C077** and **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch pedal potentiometer.

   A. Disconnect connector **C077**. While operating the clutch pedal, measure the resistance between the component side of connector:

   C077 pin **2 (Y/R/B)** and **C077** pin **3 (B/W)** should indicate between 0.9K Ohms and 3.7K Ohms

   C077 pin **2 (Y/R/B)** and **C077** pin **1 (G/B/S)** should indicate between 3.7K Ohms and 0.9K Ohms

   If the resistances indicated are not okay, remove and replace the clutch pedal potentiometer.

   B. If the clutch pedal potentiometer is okay, continue to step 4.
4. Check for an open circuit.

   A. Disconnect connectors **C101**. Check between connector:

   C077 pin **1 (G/B/S)** and **C101** pin **17 (G/B/S)**

   C077 pin **2 (Y/R/B)** and **C101** pin **1 (Y/R/B)**

   C077 pin **3 (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.
5. Check for a short to ground.

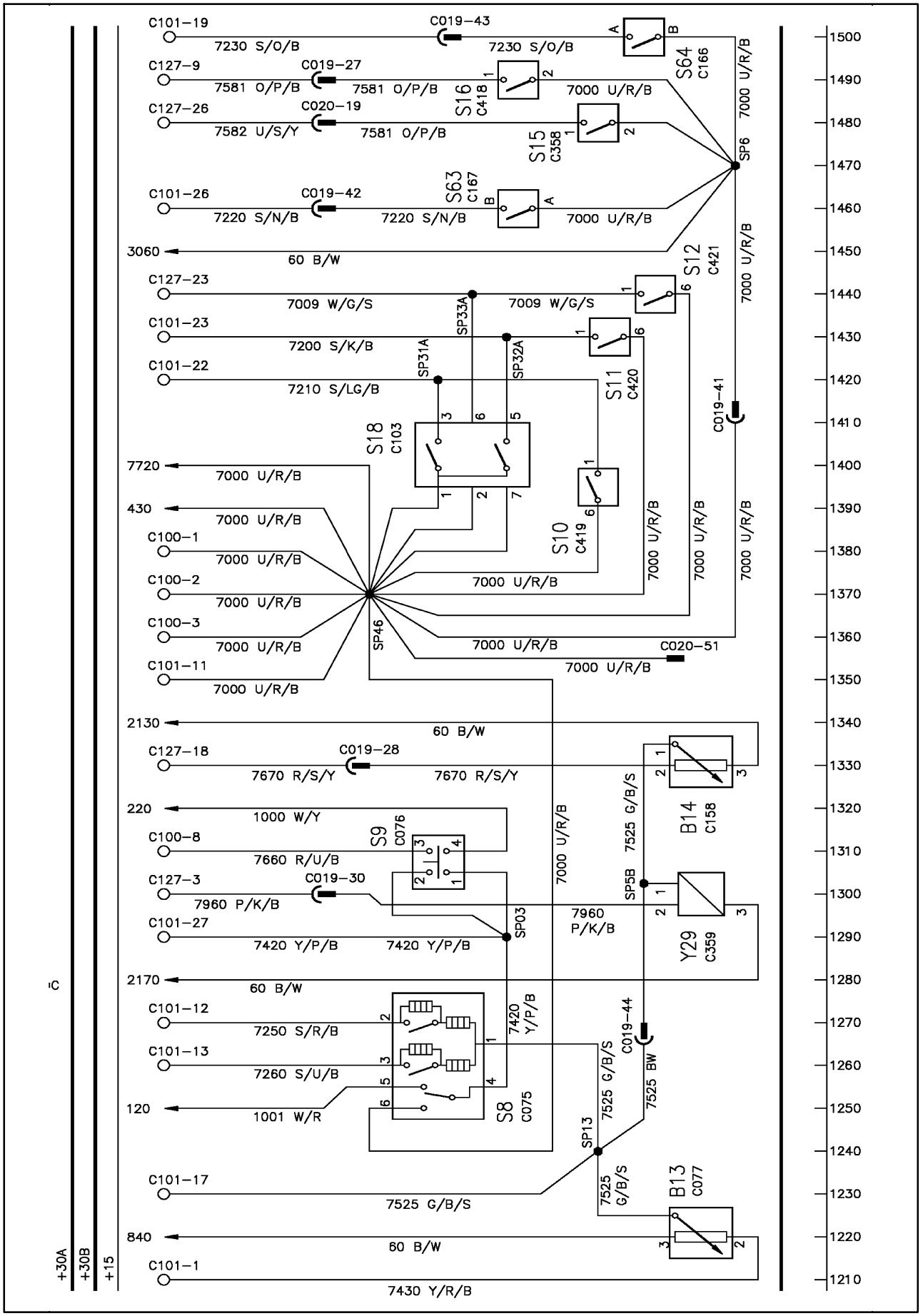
   A. Check between connector:

   C077 pin **1 (G/B/S)** and **ground**

   C077 pin **2 (Y/R/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
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C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
C101-11
7000 U/R/B
S10 C419
7000 U/R/B
SP46
C020-51
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7525 G/B/S
SP5B
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
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SP13
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C101-17
7525 G/B/S
B13 C077
840
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C101-1
7430 Y/R/B
+30A
+30B
+15
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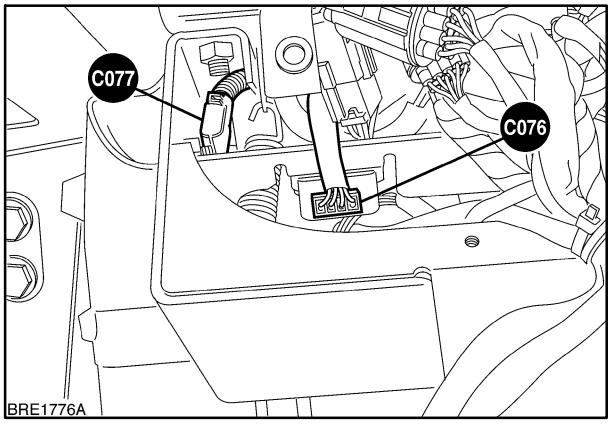
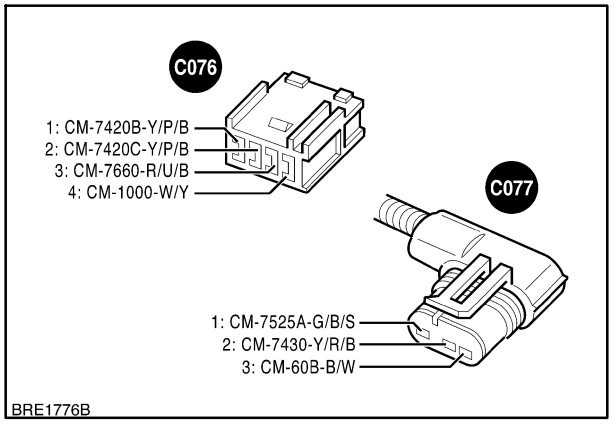
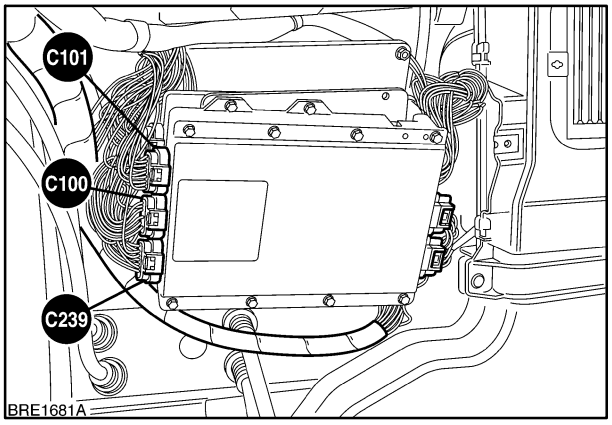
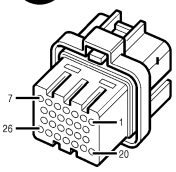






C100



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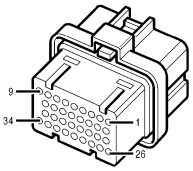
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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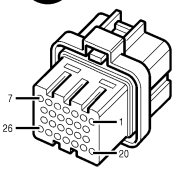
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2012 - CLUTCH PEDAL POTENTIOMETER SIGNAL HIGH

Effects:

If the error code occurs while driving it will disable the transmission. Cycling the shuttle lever will re-enable the transmission. The tractor may be used on the shuttle lever. If the clutch pedal is depressed the transmission will be disabled again until the shuttle lever has been cycled.

Possible failure modes:

1. Faulty connector
2. Faulty clutch pedal potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch pedal potentiometer in H9 Channel 0.

   A. Operate the clutch pedal. If the values displayed do not change continuously between 76 to 26, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 0 wiggle the harness, the clutch pedal potentiometer connector **C077** and the controller connector **C101** to check for an intermittent circuit. Channel 0 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch pedal potentiometer connector **C077**, the controller connectors **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch pedal potentiometer.

   A. Disconnect the clutch pedal potentiometer connector **C077**. While operating the clutch pedal, measure the resistance between the component side of connector:

   C077 pin **2 (Y/R/B)** and **C077** pin **3 (B/W)** should indicate between 0.90 K Ohms and 3.7 K Ohms

   C077 pin **2 (Y/R/B)** and **C077** pin **1 (G/B/S)** should indicate between 3.7 K Ohms and 0.90 K Ohms

   If the resistances indicated are not okay, remove and replace the clutch pedal potentiometer.

   B. If the clutch pedal potentiometer is okay, continue to step 4.
4. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C077** pin **1 (G/B/S)** and **ground**.

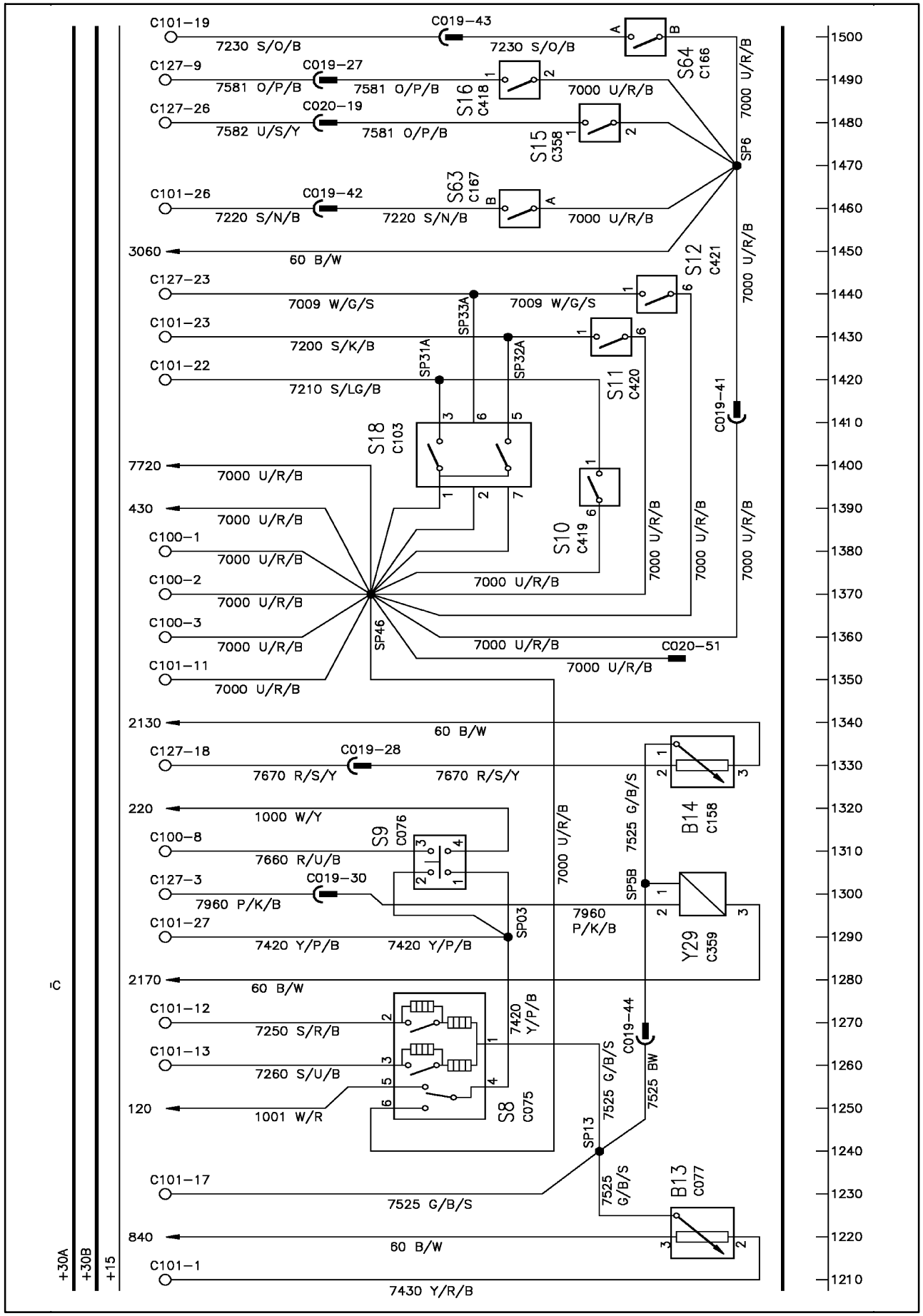
   If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.
5. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C077** pin **2 (Y/R/B)** and **ground**.

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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7230 S/O/B
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C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
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7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
7525 G/B/S
C127-3
C019-30
7960 P/K/B
SP5B
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C101-27
7420 Y/P/B
7420 Y/P/B
SP03
Y29 C359
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7420 Y/P/B
C019-44
C101-13
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120
1001 W/R
S8 C075
SP13
C101-17
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B13 C077
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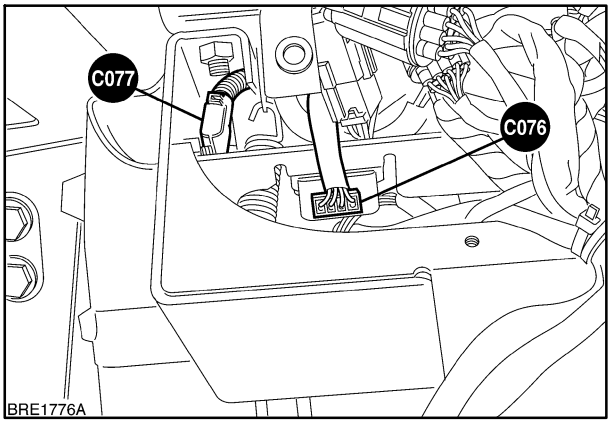
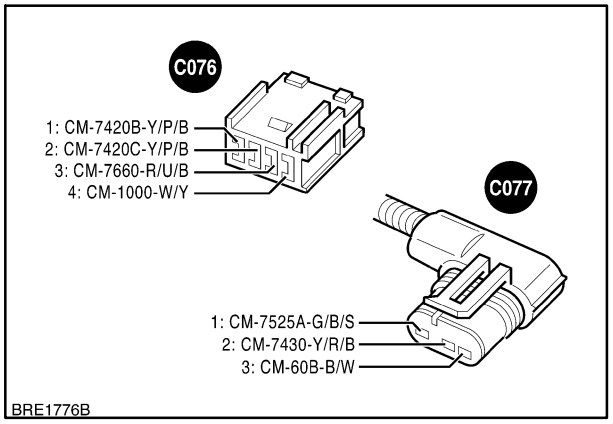

C077
C076
BRE1776A


C076
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3: CM-7660-R/U/B
4: CM-1000-W/Y
C077
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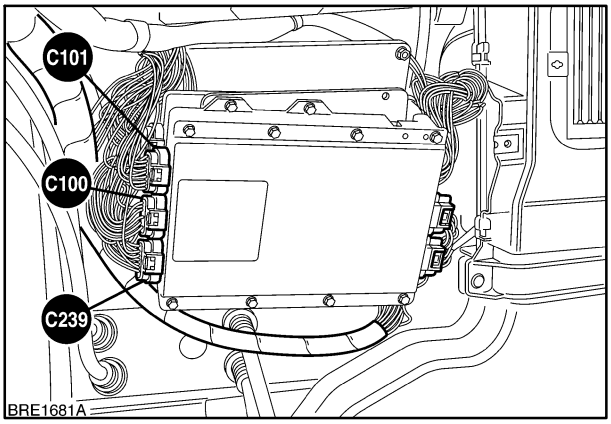
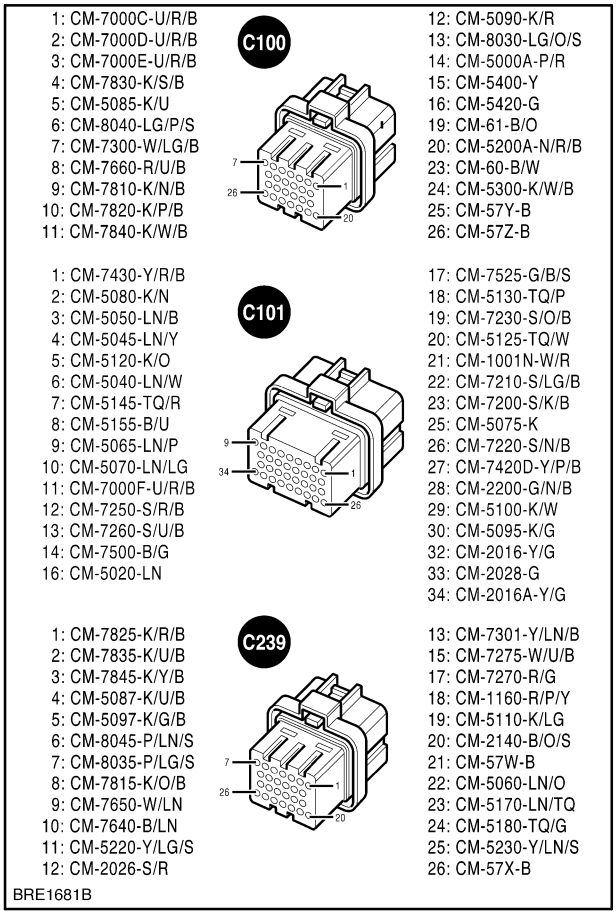
2: CM-7430-Y/R/B
3: CM-60B-B/W
BRE1776B


C101
C100
C239
BRE1681A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3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
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13: CM-8030-LG/O/S
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15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
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3: CM-5050-LN/B
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5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
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26
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
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33: CM-2028-G
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19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B

ERROR CODE 2013 - UPSHIFT AND DOWNSHIFT SWITCHES BOTH CLOSED

Effects:

Tractor will continue to drive but attempts to shift will not be recognised.

Possible failure modes:

1. Faulty connector
2. Both the upshift and downshift switches depressed at the same time
3. Faulty gear shift switch
4. Faulty harness
5. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Have both the upshift and downshift switches been depressed at the same time.

   A. Clear the error code and test the system for normal operation.

   B. If the error code re-occurs, continue to step 2.

2. Check the upshift switch in H5.

   A. Turn the keystart ON. Depress the upshift switch, d18 should be displayed as the switch is operated and extinguish when released. If the display is okay, continue to step 3.

   B. If the display is not okay, continue to step 6.

3. Check the harness connectors in H5.

   A. While still in H5 with the upshift switch released, wiggle the harness, the gear selector connector **C103** and the controller connector **C101** to check for a circuit fault.

   If d18 is displayed a fault is present, repair or replace as required.

   B. If d18 is not displayed, continue to step 4.

4. Check the downshift switch in H5.

   A. Turn the keystart ON. Depress the downshift switch, d17 should be displayed as the switch is operated and extinguish when released. If the display is okay, continue to step 5.

   B. If the display is not okay, continue to step 6.

5. Check the harness connectors in H5.

   A. While still in H5 with the downshift switch released, wiggle the harness, the gear selector connector **C103** and the controller connector **C101** to check for a circuit fault.

   If d17 is displayed a fault is present, repair or replace as required.

   B. If d17 is not displayed, download the correct level of software. If the fault re-occurs, remove and replace the controller.

6. Check for a short to +Ve voltage.

   A. Disconnect the gear selector switch connector **C103** and the controller connectors **C101**.

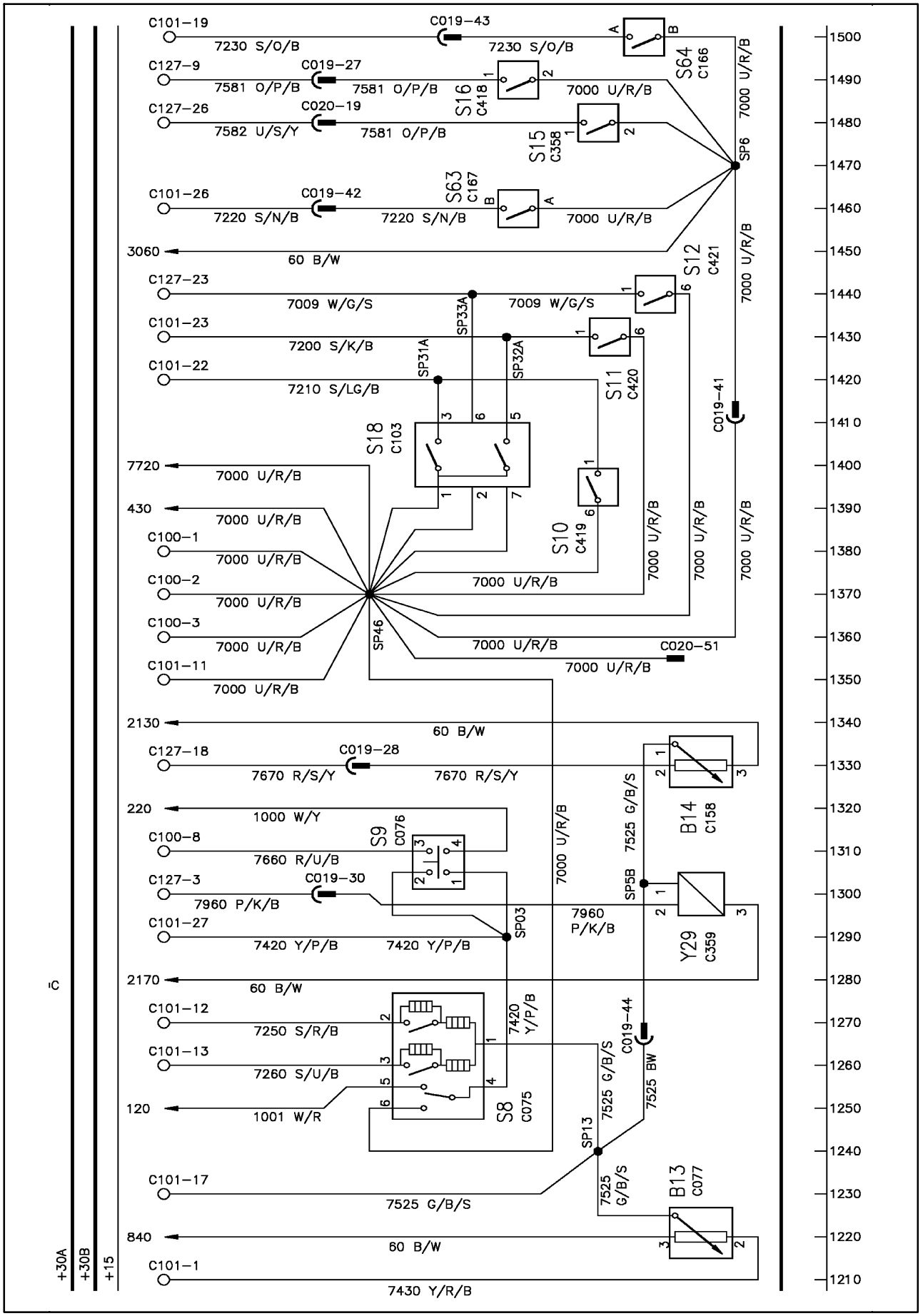
   Turn the keystart ON. Check between connector:

   C103 pin **3 (S/LG/B)** and **ground**

   C103 pin **5 (S/K/B)** and **ground**

   If a short to +Ve voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the gear shift switch.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C019-43
7230 S/O/B
7230 S/O/B
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C127-9
C019-27
7581 O/P/B
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S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
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60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
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C100-1
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C101-11
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7000 U/R/B
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C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
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1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
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Y29 C359
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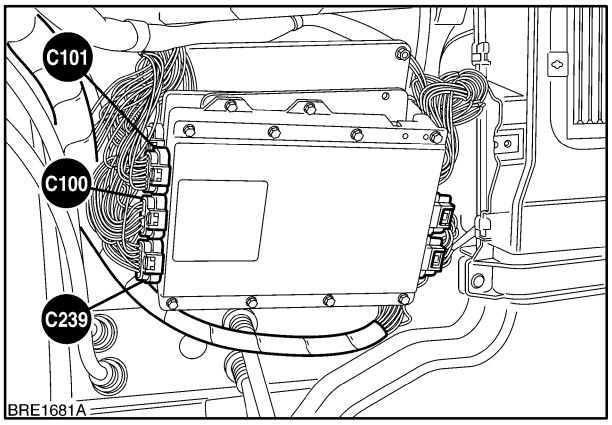
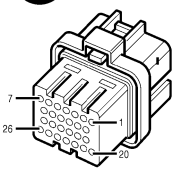
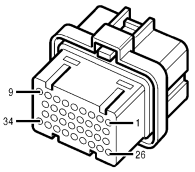


C100



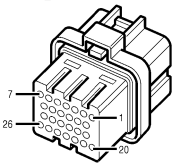
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



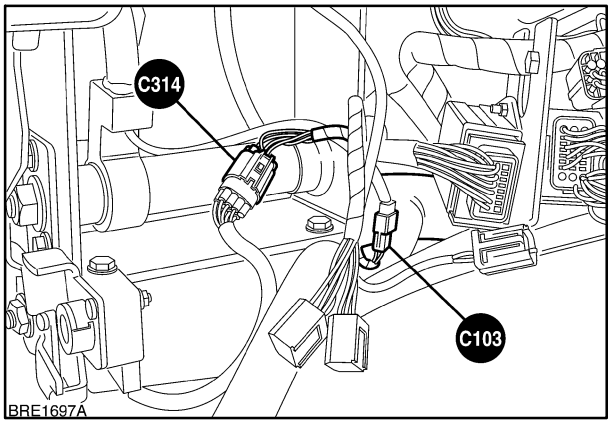
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

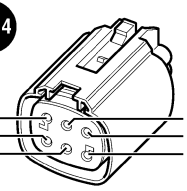
BRE1681B



C103

1: CM-7000G-U/R/B
2: CM-7000H-U/R/B
3: CM-7210A-S/LG/B
5: CM-7200A-S/K/B
6: CM-7009A-W/G/S
7: CM-7000K-U/R/B

C314



1: CM-5200F-N/R/B
4: CM-6460A-S/P/Y
5: CM-5020D-LN
2: CM-6440-S/N/Y
3: CM-6450-S/O/Y
6: CM-60J-B/W

BRE1697B

ERROR CODE 2015 – HIGH AND LOW RANGE SWITCHES BOTH CLOSED

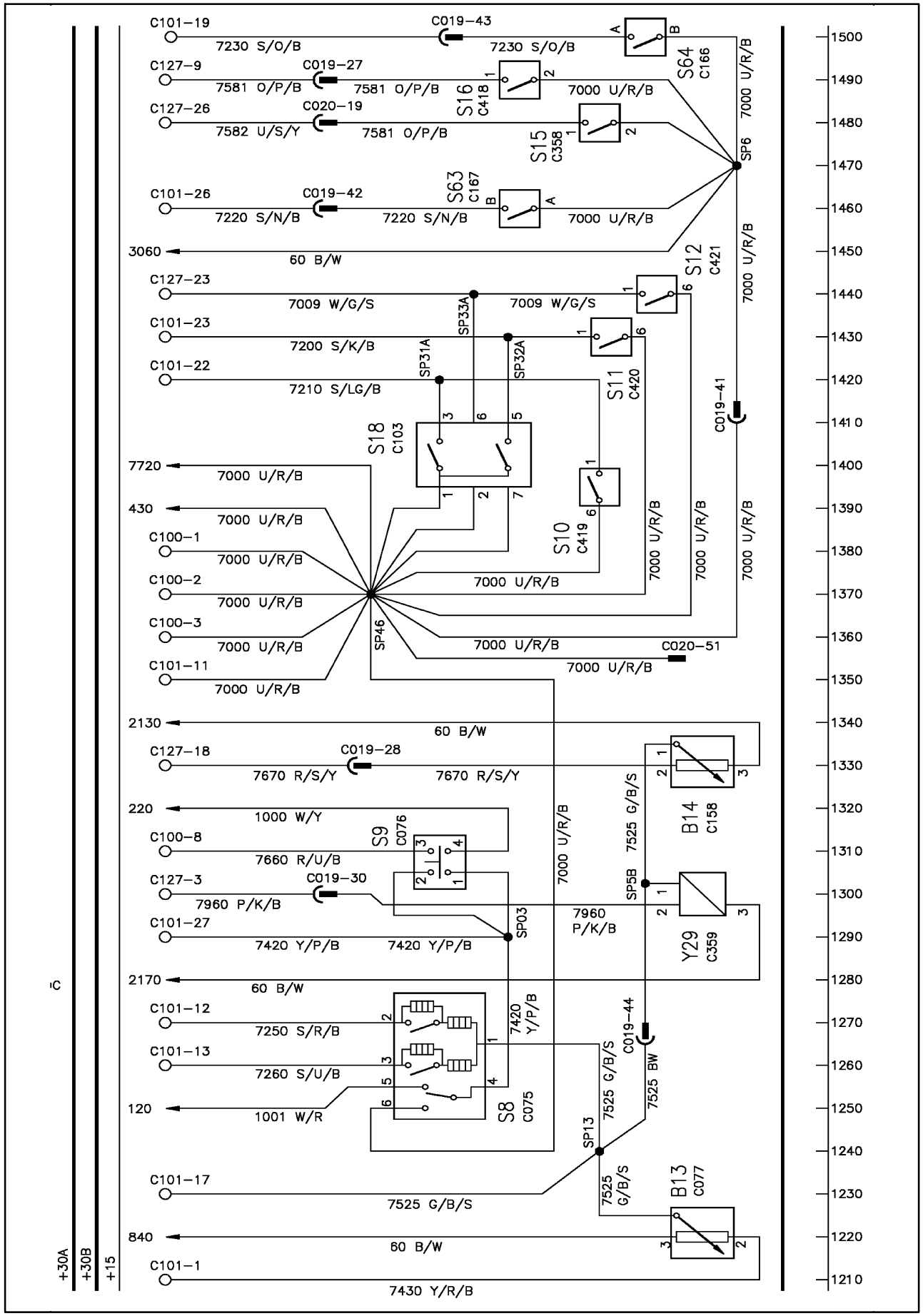
Possible failure modes:

1. Both the High and Low switches depressed at the same time
2. Faulty connector
3. Faulty High range switch
4. Faulty Low range switch
5. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Have both the high and low range switches been depressed at the same time.
   A. Clear the error code and test the system for normal operation.
   B. If the error code re-occurs, continue to step 2.
2. Check the high range switch in H5.
   A. Turn the keystart ON. Select high range, d26 should be displayed in H5 when in high range. If the display is okay, continue to step 3.
   B. If the dispay is not okay, continue to step 5.
3. Check the low range switch in H5.
   A. Select low range, d27 should be displayed in H5 when in low range. If the display is okay, continue to step 4.
   B. If the display is not okay, continue to step 5.
4. Check the harness connectors in H5.
   A. While in H5, wiggle the harness, the high/low range switch connector **C167** and controller connector **C101** to check for a circuit fault. If d26 or d27 is display a fault is present, repair or replace as required.
5. Check high range switch for a short to +Ve voltage.
   A. Disconnect connectors **C167** and **C101**.
   Turn the keystart ON. Check between connector, **C101** pin **26 (S/N/B)** and **ground**.
   If a short to +Ve is indicated, repair or replace the harness as required.
   B. If the harness is okay, remove and replace the high range switch.
6. Check low range switch for a short circuit to +Ve voltage.
   A. Disconnect connectors **C166** and **C101**.
   Turn the keystart ON. Check between connector, **C101** pin **19 (S/O/B)** and **ground**.
   If a short to +Ve iis indicated, repair or replace the harness as required.
   B. If the harness is okay, remove and replace the low range switch.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
7525 G/B/S
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7960 P/K/B
C101-27
SP03
7420 Y/P/B
7420 Y/P/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 G/B/S
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
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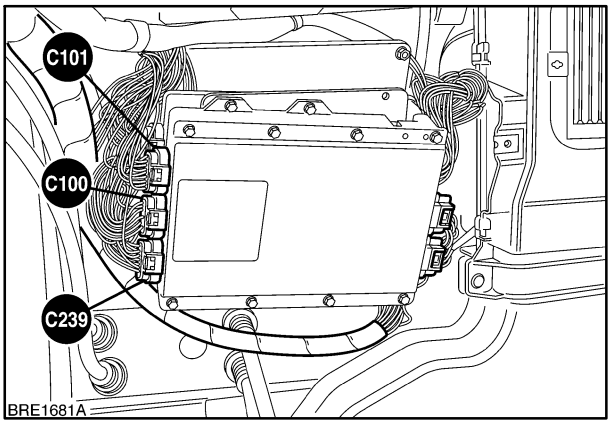
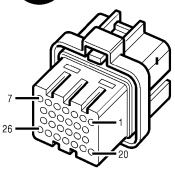
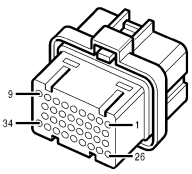


C100



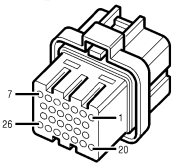
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



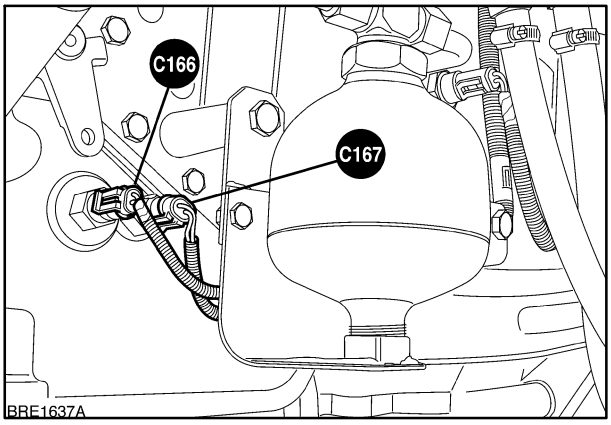
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

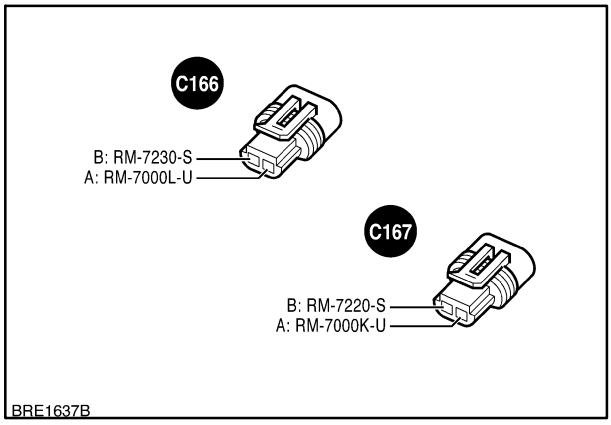
C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B





ERROR CODE 2016 - CREEPER SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Failure to engage creeper gear

Possible failure modes:

1. Faulty connector
2. Faulty creeper solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the creeper solenoid connector **C222**, the controller connector **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the creeper solenoid for short to ground.

   A. Disconnect connector **C222**. Check between the component side of connector:

   C222 pin **1** and **ground**

   C222 pin **2** and **ground**

   If short to ground is indicated, remove and replace the creeper solenoid.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for short to ground.

   A. Disconnect connector **C128**. Check between connector:

   C222 pin **1 (U)** and **ground**

   C222 pin **2 (B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to +Ve Voltage.

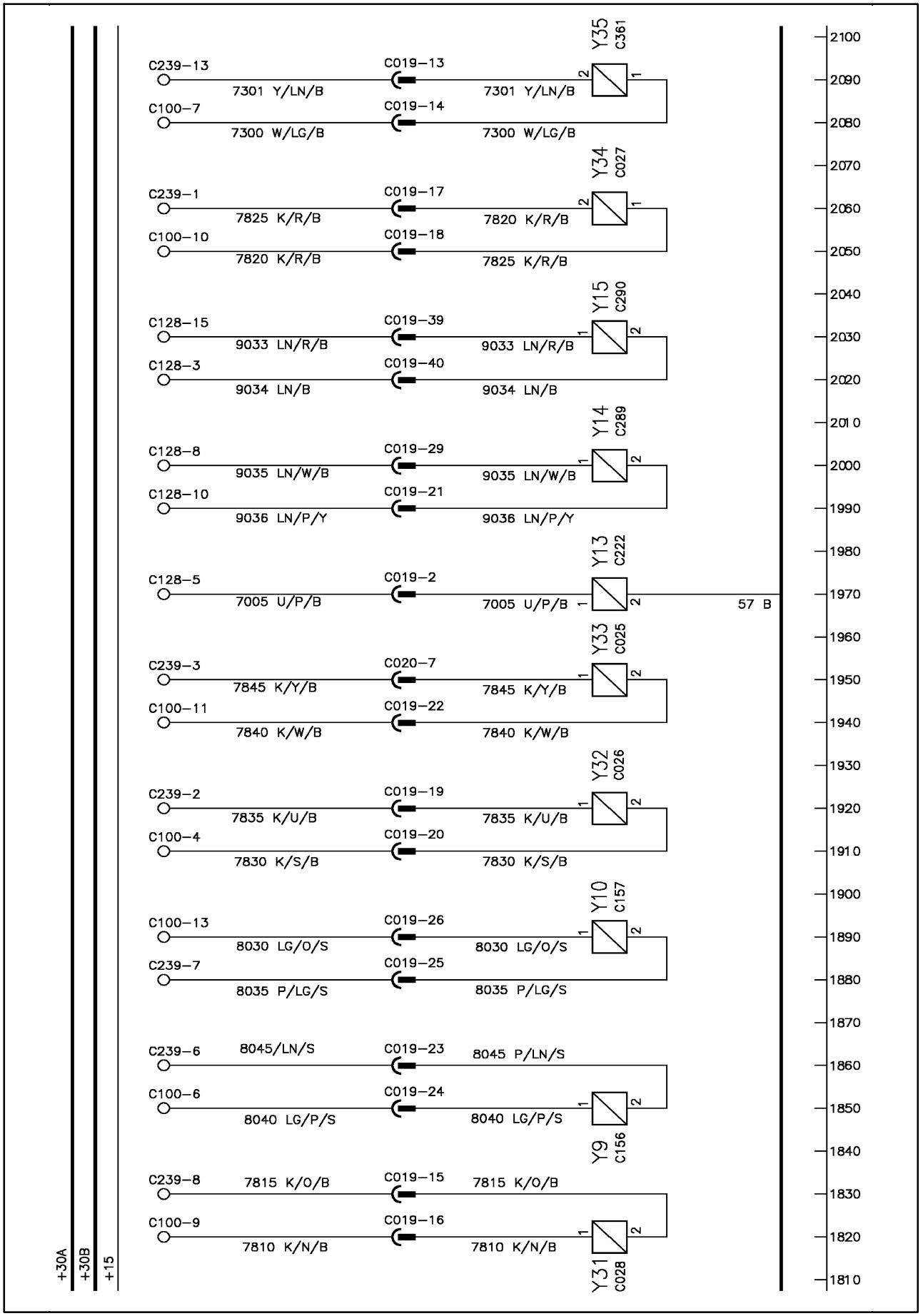
   A. Turn the keystart ON. check between connector:

   C222 pin **1 (U)** and **ground**

   C222 pin **2 (B)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
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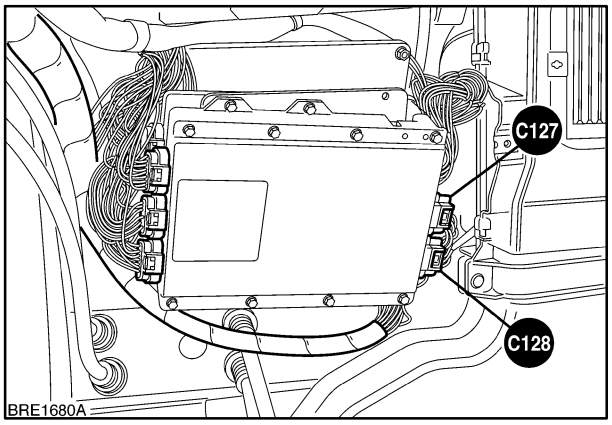
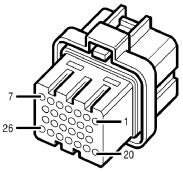


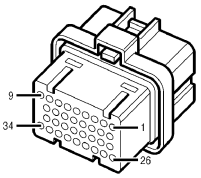
BRE1680A

C127



1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128



1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
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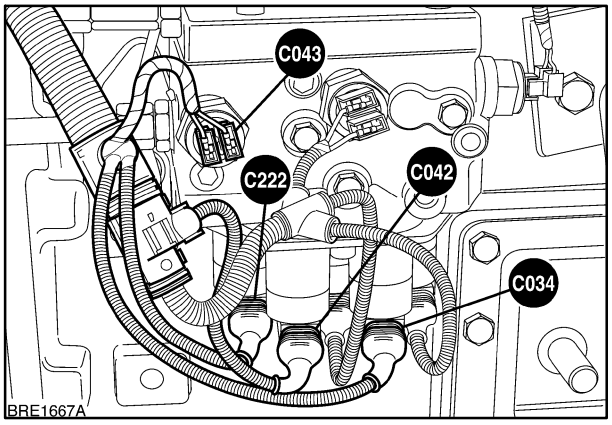
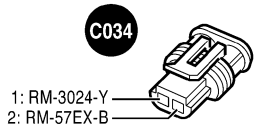
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



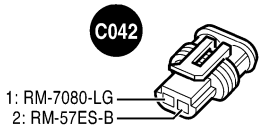
BRE1667A

C034



1: RM-3024-Y
2: RM-57EX-B

C042



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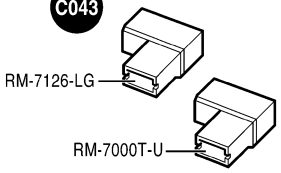
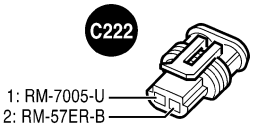
2: RM-57ES-B

C043



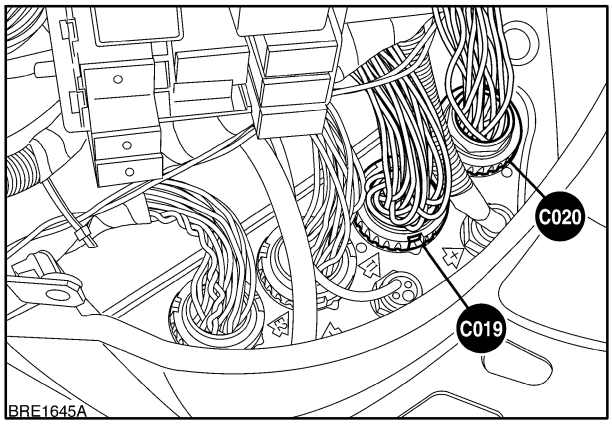
RM-7126-LG
RM-7000T-U

C222



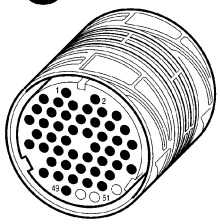
1: RM-7005-U
2: RM-57ER-B

BRE1667B



BRE1645A

C019



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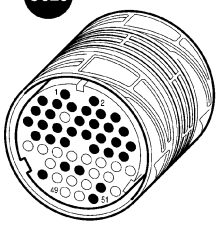
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2021 – CHASSIS HARNESS DISCONNECTED

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connectors
2. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the chassis harness connectors **C019** and **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

ERROR CODE 2024 - ALL CLUTCHES AND SYNCHRONISERS REQUIRE CALIBRATION

Effects:

Transmission disabled.

Possible failure modes:

1. Transmission not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the transmission was calibrated.

   A. If the transmission was not calibrated after a replacement of the controller, or after using H8, clear the Electrical Erasable Programmable Read Only Memory (EEPROM), and perform the transmission calibration procedure.

   B. If the transmission was calibrated, download the correct level of software and re-perform the calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 2026 – ENGINE SPEED TOO HIGH

Possible failure modes:

1. Engine rpm too high

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Decrease the engine rpm to approximately 1200 rev/min.

ERROR CODE 2027 – ENGINE SPEED TOO LOW

Possible failure modes:

1. Engine rpm too low

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Increase the engine rpm to approximately 1200 rev/min.

ERROR CODE 2035 – DUMP SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty dump solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the dump solenoid connector **C163**, and the controller connector **C100** and **C239** the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the dump solenoid for short to ground.

   A. Disconnect connector **C289**. Check between the component side of connector:

   C163 pin **1** and **ground**

   C163 pin **2** and **ground**

   If short to ground is indicated, remove and replace the dump solenoid.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for a short to ground.

   A. Check between connector:

   C163 pin **1 (K)** and **ground**

   C163 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to +12 Volts.

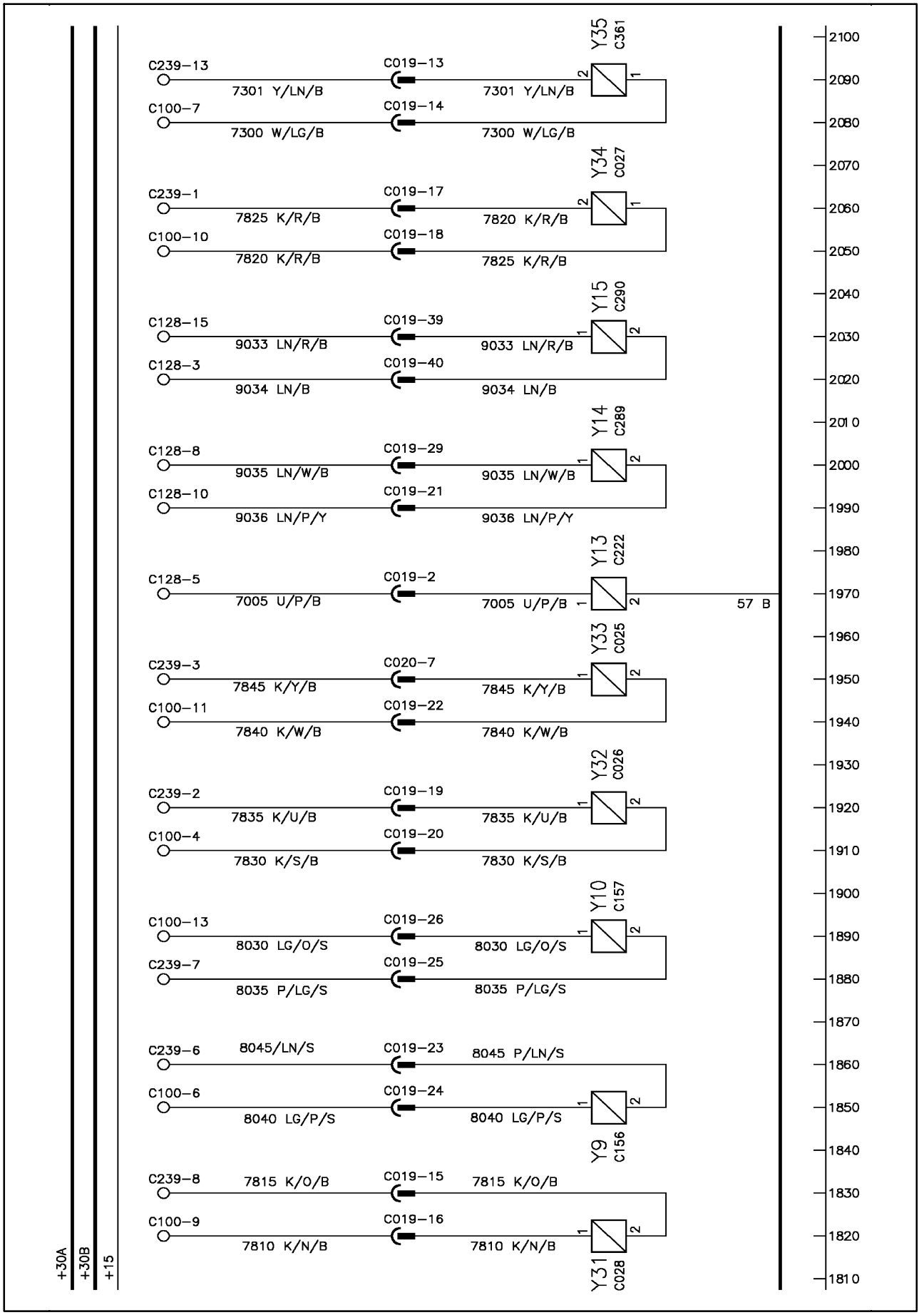
   A. Turn the keystart ON. Measure the voltage between connector:

   C163 pin **1 (K)** and **ground**

   C163 pin **2 (K)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
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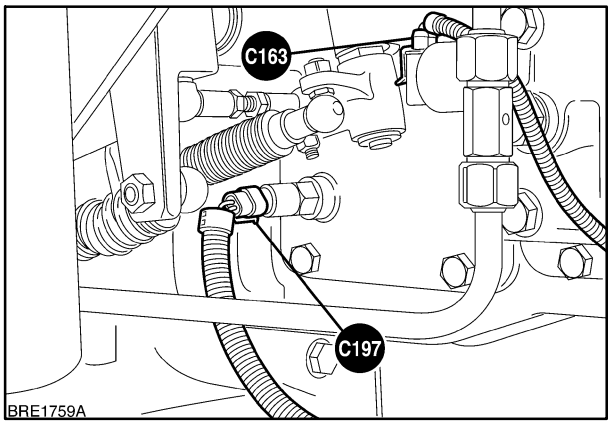
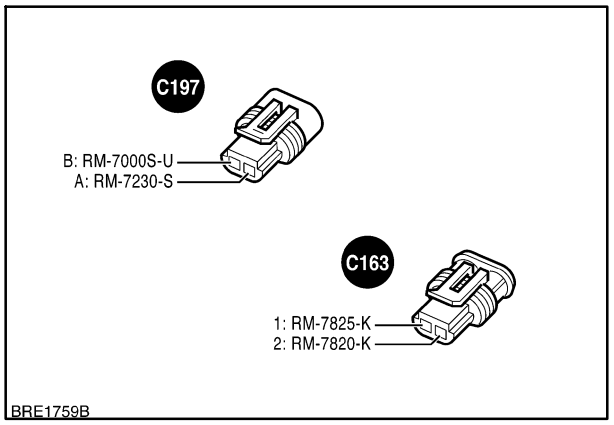
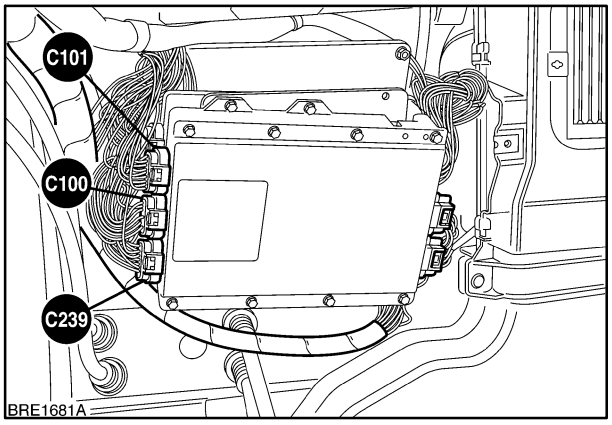


BRE1759A

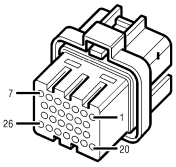


BRE1759B



BRE1681A

C100



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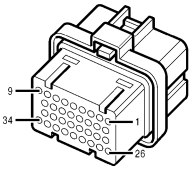
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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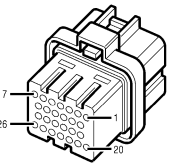
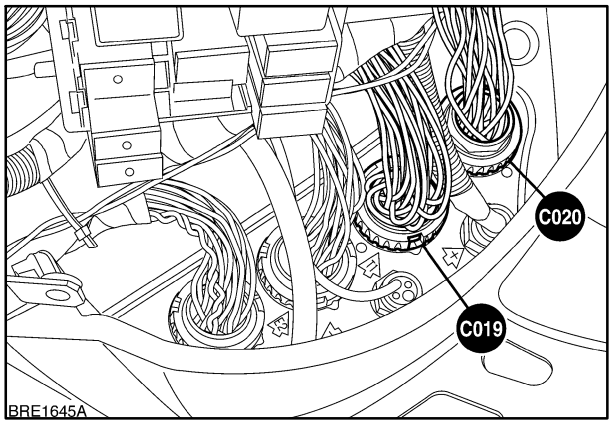
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



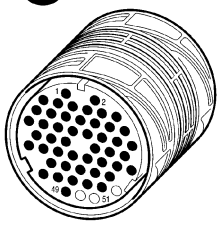
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



BRE1645A

C019



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2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
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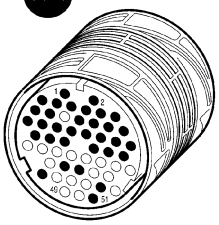
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2036 – DUMP SOLENOID OPEN CIRCUIT.

Possible failure modes:

1. Faulty connector
2. Faulty dump solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the dump solenoid connector **C163**, the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors areconnected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the dump solenoid.

   A. Disconnect connector **C163**. Measure the resistance between the component side of connector,

   C163 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove or replace the dump solenoid.

   B. If the dump solenoid is okay, continue to step 3.

3. Check for an open circuit.

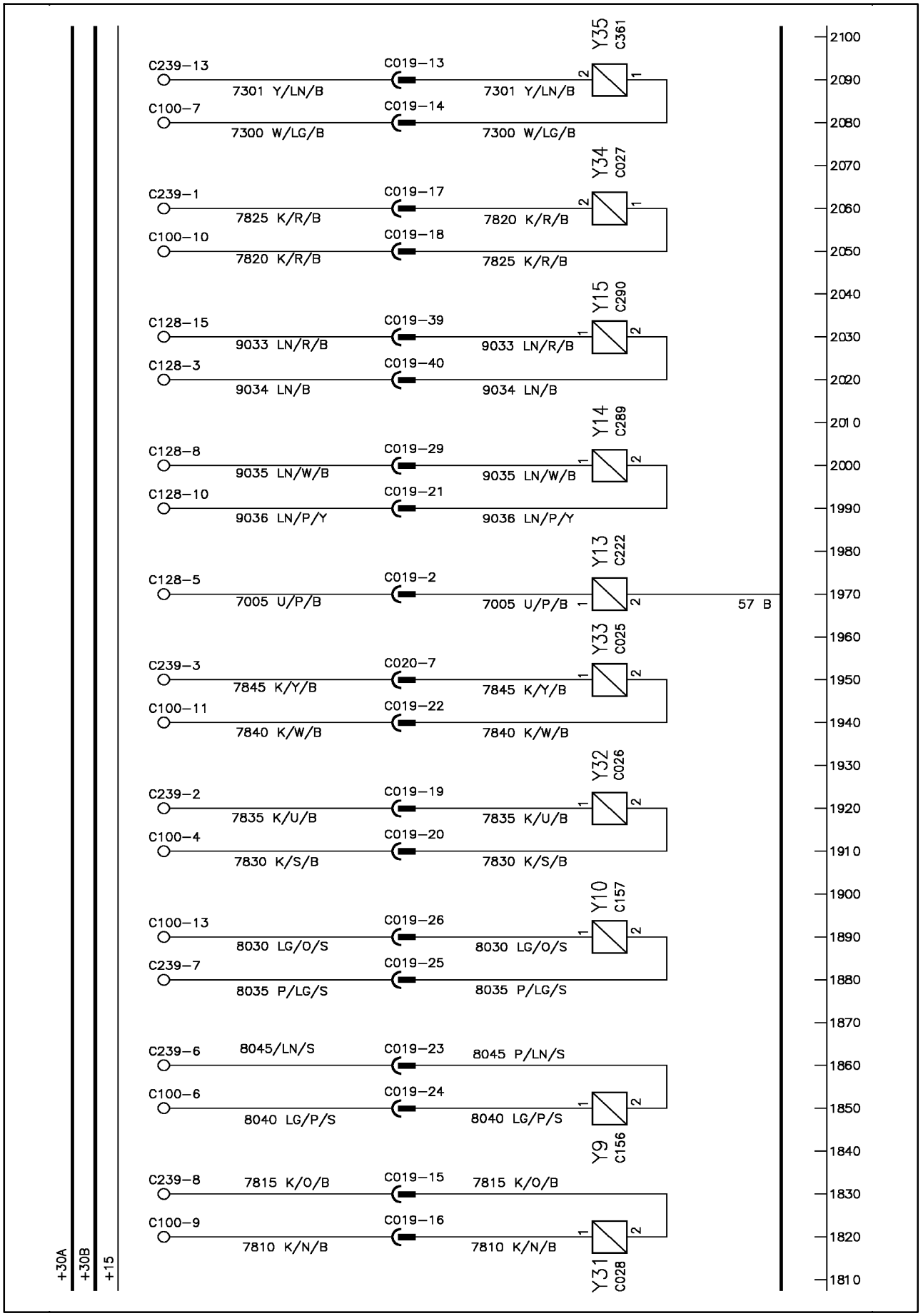
   A. Disconnect connector **C100** and **C239**. Check between connector:

   C163 pin **1 (K)** and **C100** pin **10 (K/R/B)**

   C289 pin **2 (K)** and **C239** pin **1 (K/R/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
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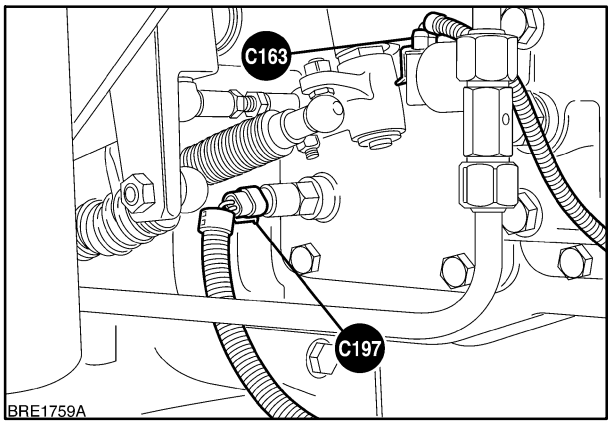

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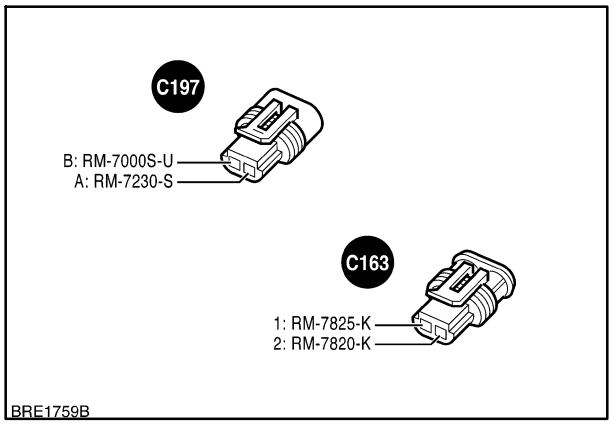

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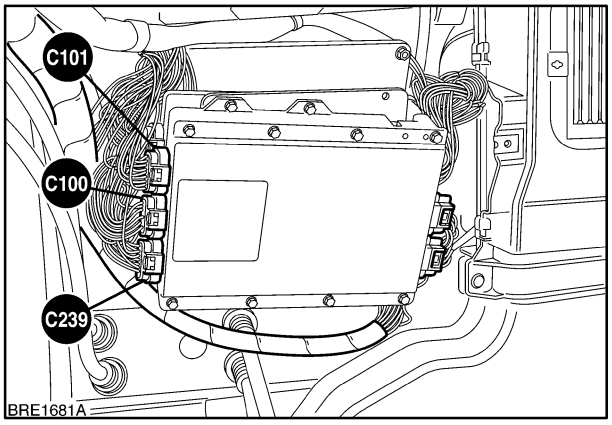
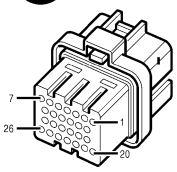


BRE1681A

C100



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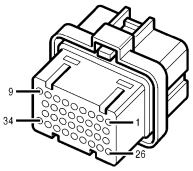
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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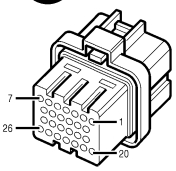
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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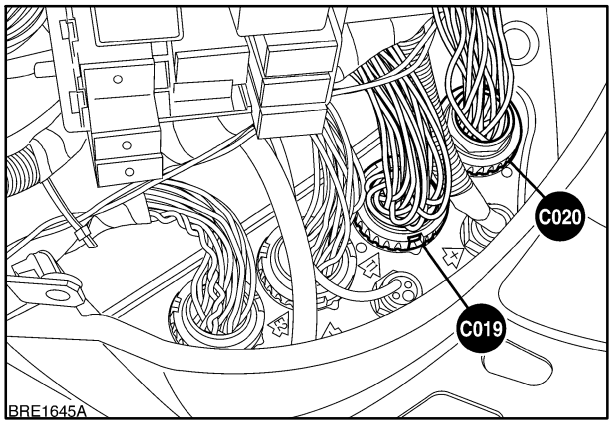
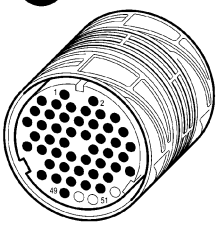
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



BRE1645A

C019



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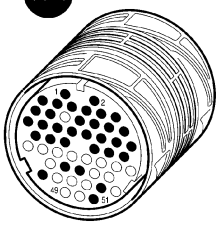
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2037 - CLUTCH PEDAL DISCONNECT SWITCH OPEN CIRCUIT

Effects:

Non start.

Transmission disabled.

Possible failure modes:

1. Faulty connector
2. Incorrect clutch disconnect switch adjustment
3. Faulty clutch disconnect switch
4. Faulty harness
5. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch disconnect switch in H5.

   A. Depress the clutch pedal, d14 should be displayed as the switch is operated, an audible click should be heard from the disconnect switch when the pedal is depressed.

   If reading is not as expected, continue to step 2.

   B. If the readings are as expected while still in H5 and the clutch pedal depressed, wiggle the harness, the clutch disconnect switch connector **C076** and controller connectors **C100** and **C101** to check for an intermittent circuit.

   The display will change if an intermittent circuit is detected, repair or replace the harness as required.
2. Check the clutch disconnect switch connector **C076** and the controller connectors **C100** and **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch disconnect switch.

   A. Disconnect connector **C076**. Check between the component side of connector:

   C076 pin **2 (Y/P/B)** and **C076** pin **3 (R/U/B)** should indicate a closed circuit with the pedal released and an open circuit with the pedal depressed.

   C076 pin **1 (Y/P/B)** and **C076** pin **4 (W/Y)** should indicate an open circuit with the pedal released and a closed circuit with the pedal depressed.

   If the switch is not okay, remove and replace the clutch disconnect switch.

   B. If the switch is okay, continue to step 4.
4. Check for +12 Volts.

   A. Turn the keystart ON. Measure the voltage between **C076** pin **4 (W/Y)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required to **fuse 26**.

   B. If +12 volts is indicated, continue to step 5.
5. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect connectors **C100** and **C101**.

   Check between connector:

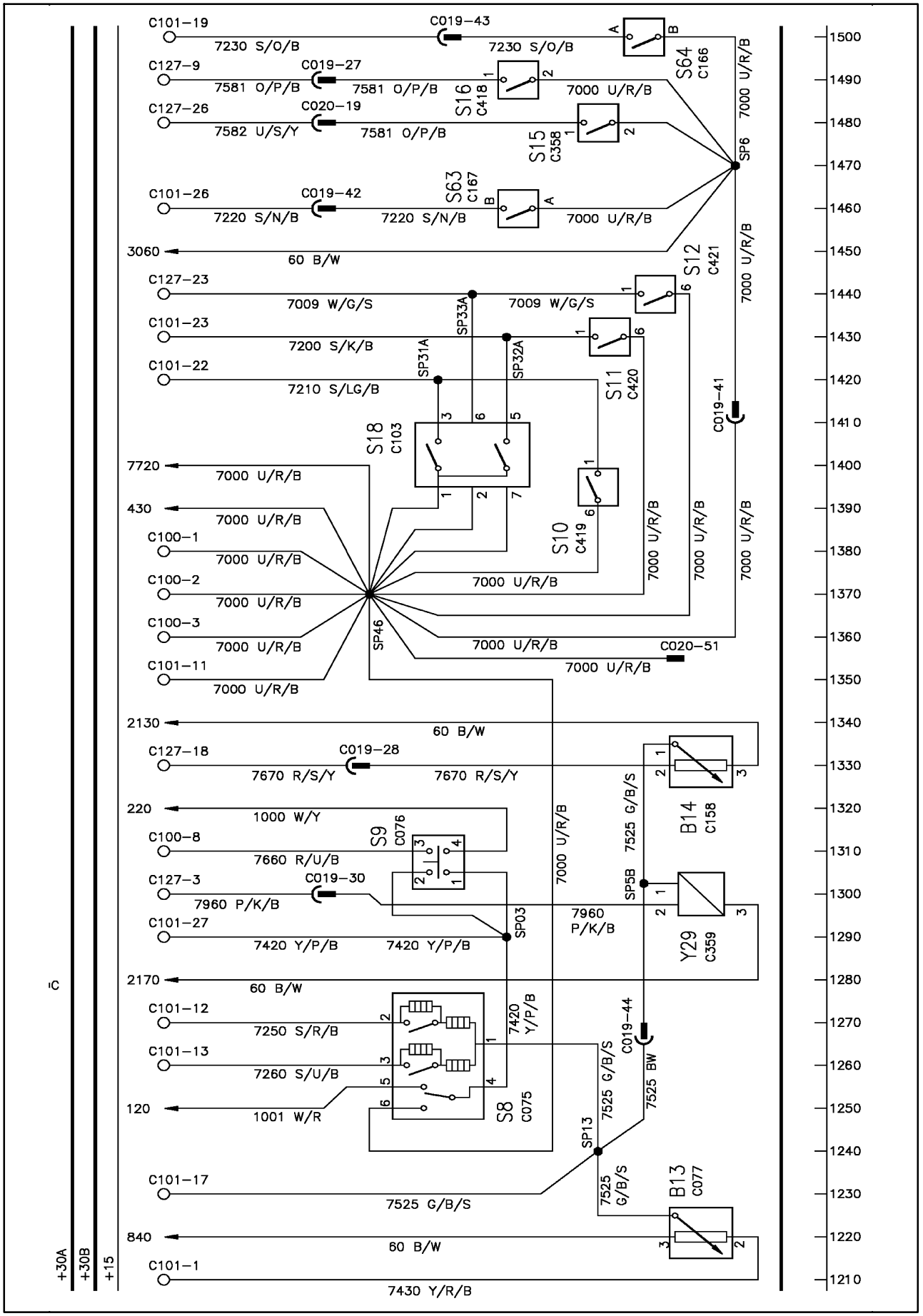
   C076 pin **1 (Y/P/B)** and **C101**pin **27 (Y/P/B)**

   C076 pin **2 (Y/P/B)** and **C101** pin **27 (Y/P/B)**

   C076 pin **3 (R/U/B)** and **C100** pin **8 (R/U/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
C101-11
7000 U/R/B
S10 C419
7000 U/R/B
SP46
C020-51
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7525 G/B/S
SP5B
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
7525 G/B/S
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
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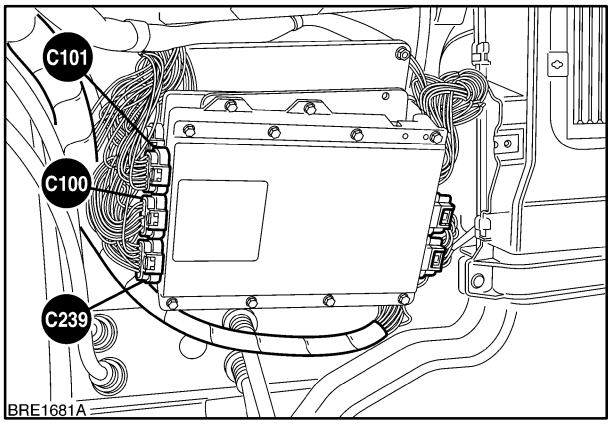
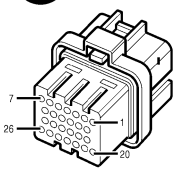
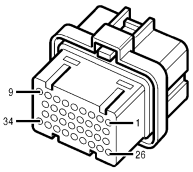


C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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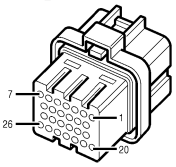
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

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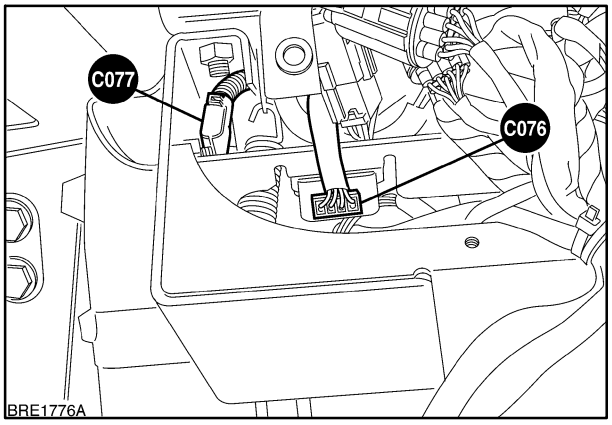
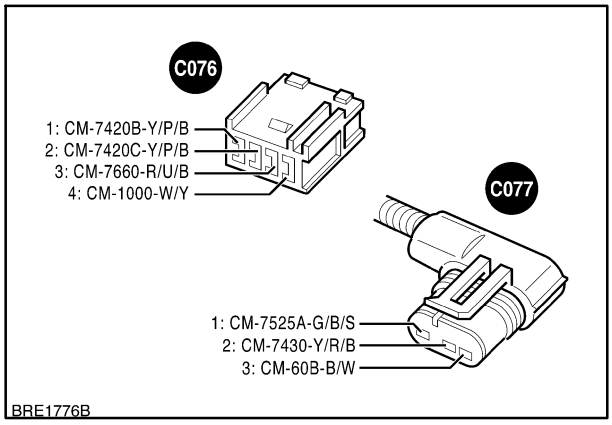




ERROR CODE 2038 (16X16) – CLUTCH C4 SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 4 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 4 solenoid in H9 Channel 46.

   A. Start the engine and select 5th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 46 wiggle the harness, the clutch 4 connector **C025**, controller connectors **C100** and **C239**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 46 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 3 solenoid connector **C026**, the controller connectors **C100** and **C239**, and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 4 solenoid for short to ground.

   A. Disconnect connector **C025**. Check between the component side of connector:

   C025 pin **1** and **ground**

   C025 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the clutch solenoid.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connector **C100** and **C239**. Check between connector:

   C025 pin **1 (K)** and **ground**

   C025 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for a short to +12 Volts.

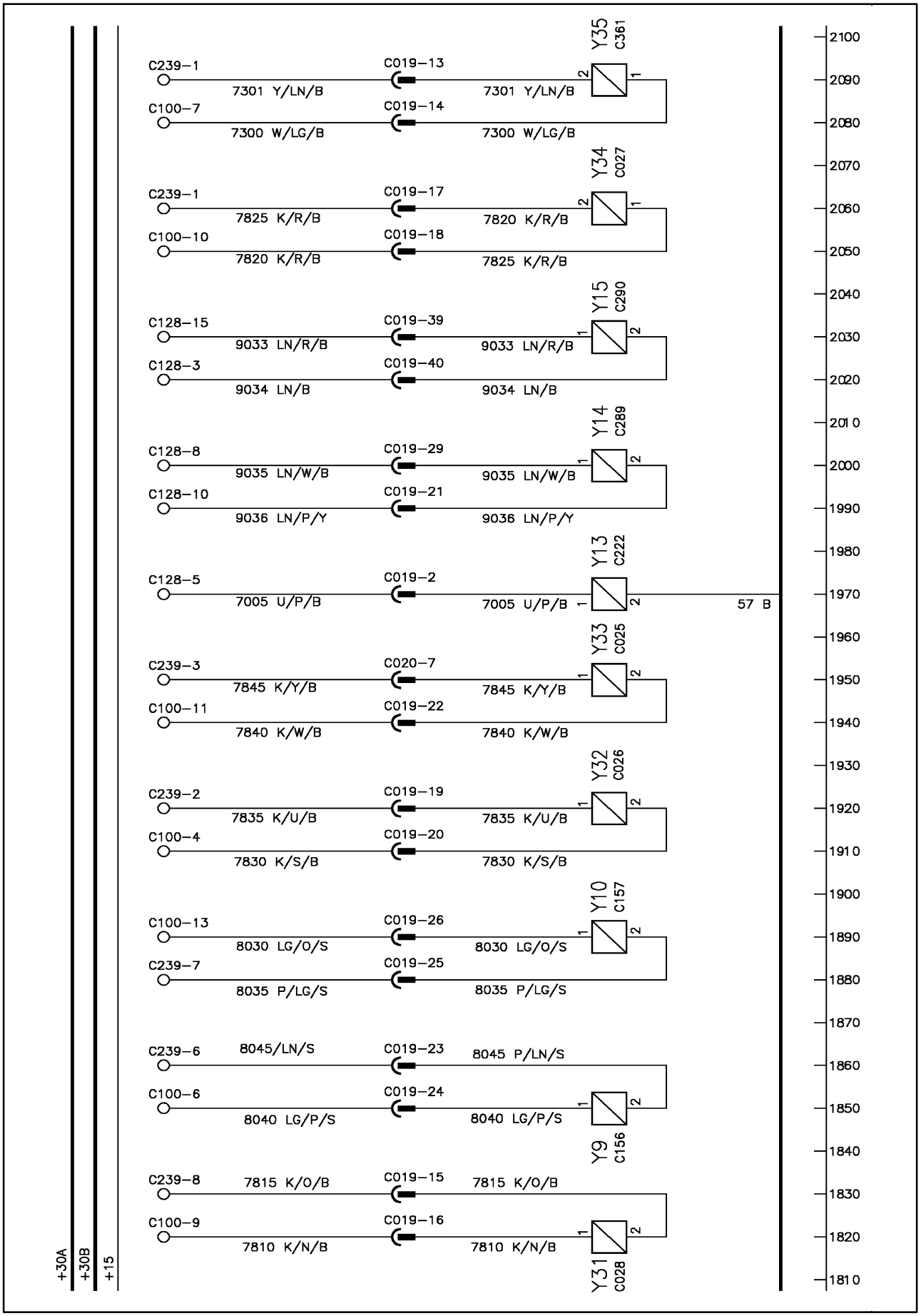
   A. Turn the keystart ON. Measure the voltage between connector:

   C025 pin **1 (K)** and **ground**

   C025 pin **2 (K)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-1
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
2090
2080
2070
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1990
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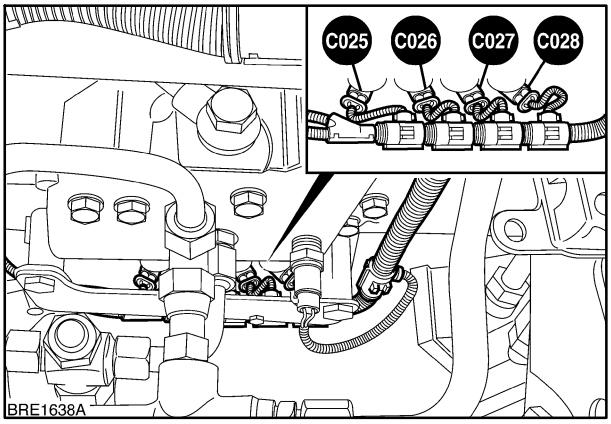
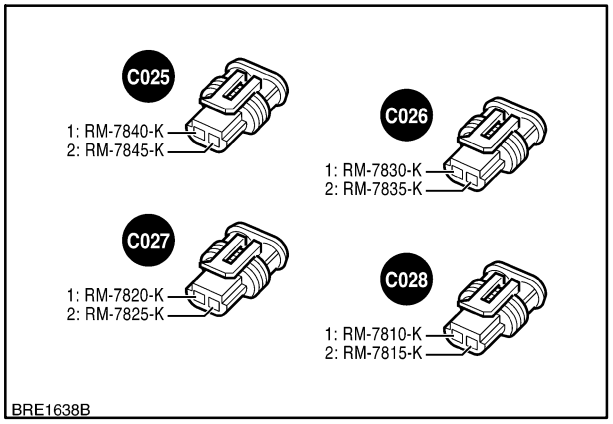
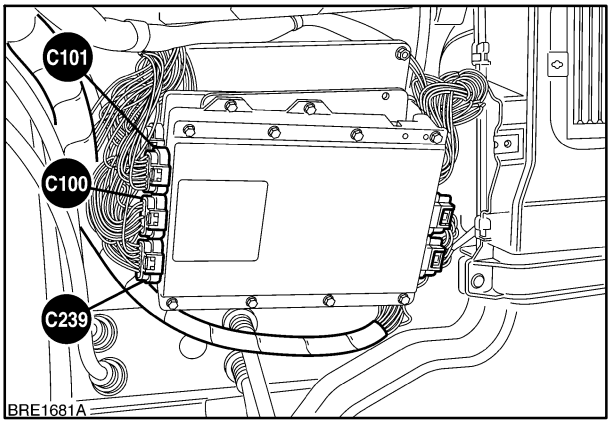
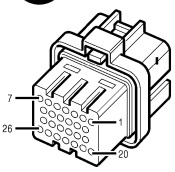




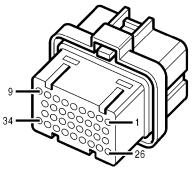


C100



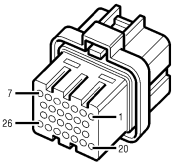
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



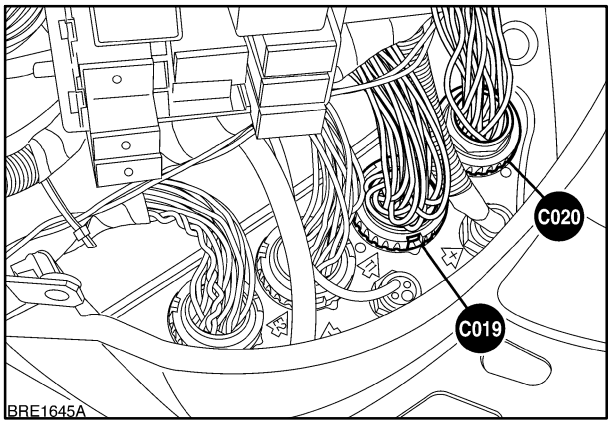
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



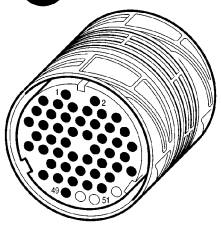
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



BRE1645A

C019



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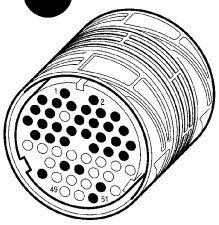
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2038 (24X24) – LOW RANGE PWM VALVE SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled.

Possible failure modes:

1. Faulty connector
2. Faulty low range PWM valve
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the low range PWM valve in H9 Channel 45.

   A. Start the engine and select 6th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 45 wiggle the harness, the low range PWM valve connector **C161**, controller connectors **C101** and **C239**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 45 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the low range PWM valve connector **C161**, the controller connectors **C100** and **C239**, and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the low range PWM valve for a short to ground.

   A. Disconnect connector **C161**. Check between the component side of connector:

   C161 pin **1** and **ground**

   C161 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the low range PWM valve.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connector **C100** and **C239**. Check between connector:

   C161 pin **1 (K)** and **ground**

   C161 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for a short to +12 Volts.

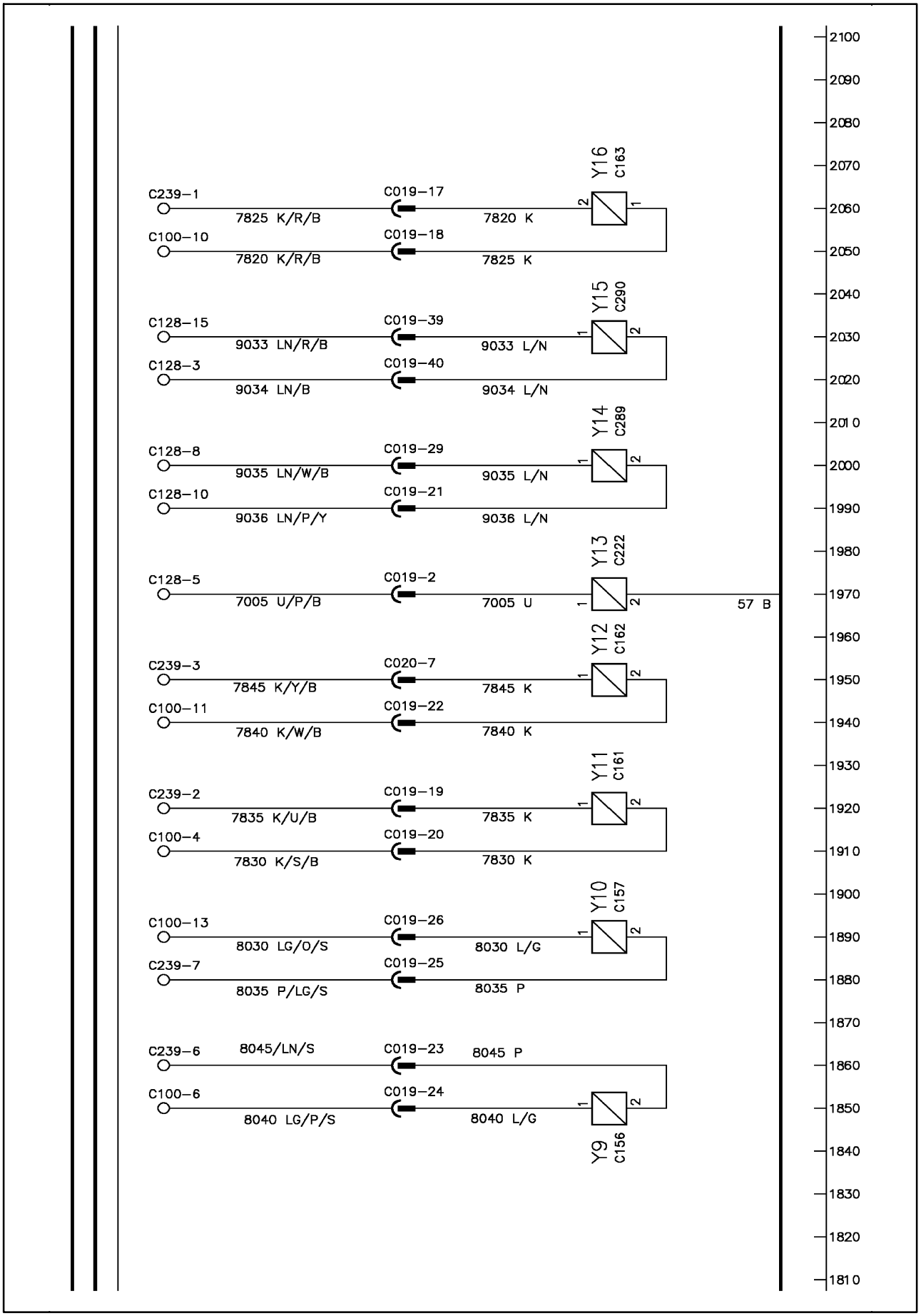
   A. Turn the keystart ON. Measure the voltage between connector:

   C161 pin **1 (K)** and **ground**

   C161 pin **2 (K)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


2100
2090
2080
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2060
2050
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2020
2010
2000
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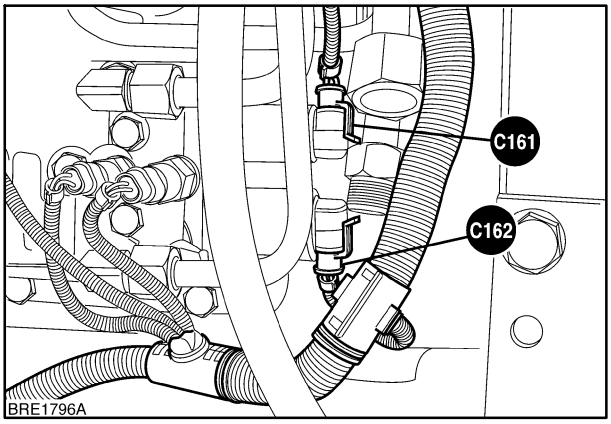
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
C239-6
8045/LN/S
C019-23
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156



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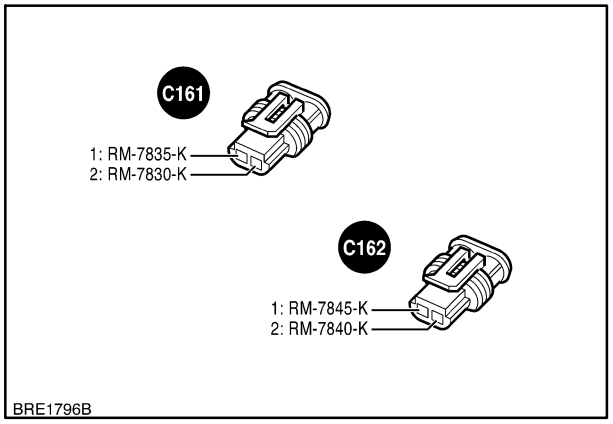
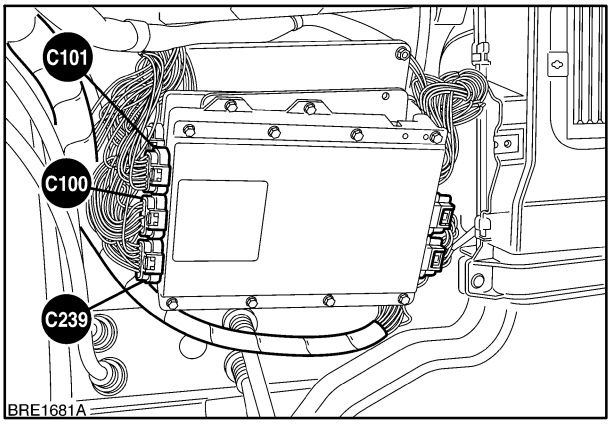
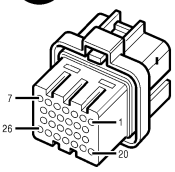


BRE1796B



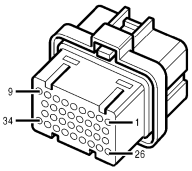
BRE1681A

C100



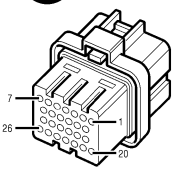
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
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24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
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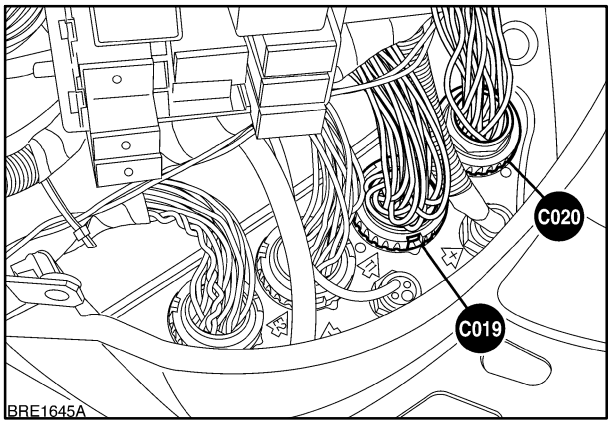
BRE1681B



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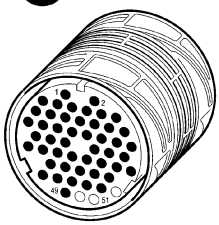
C019



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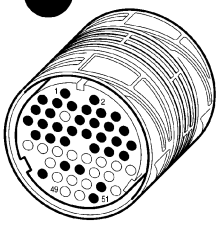
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2039 (16X16) – CLUTCH C3 SOLENOID OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 4 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 4 solenoid in H9 Channel 46.

   A. Start the engine and select 5th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 46 wiggle the harness, the clutch 3 connector **C025**, controller connectors **C100** and **C239**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 46 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 4 solenoid connector **C025**, the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 4 solenoid.

   A. Disconnect connector **C025**. Measure the resistance between the component side of connector,

   C025 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the clutch 3 solenoid.

   B. If the clutch 4 solenoid is okay, continue to step 4.
4. Check for an open circuit.

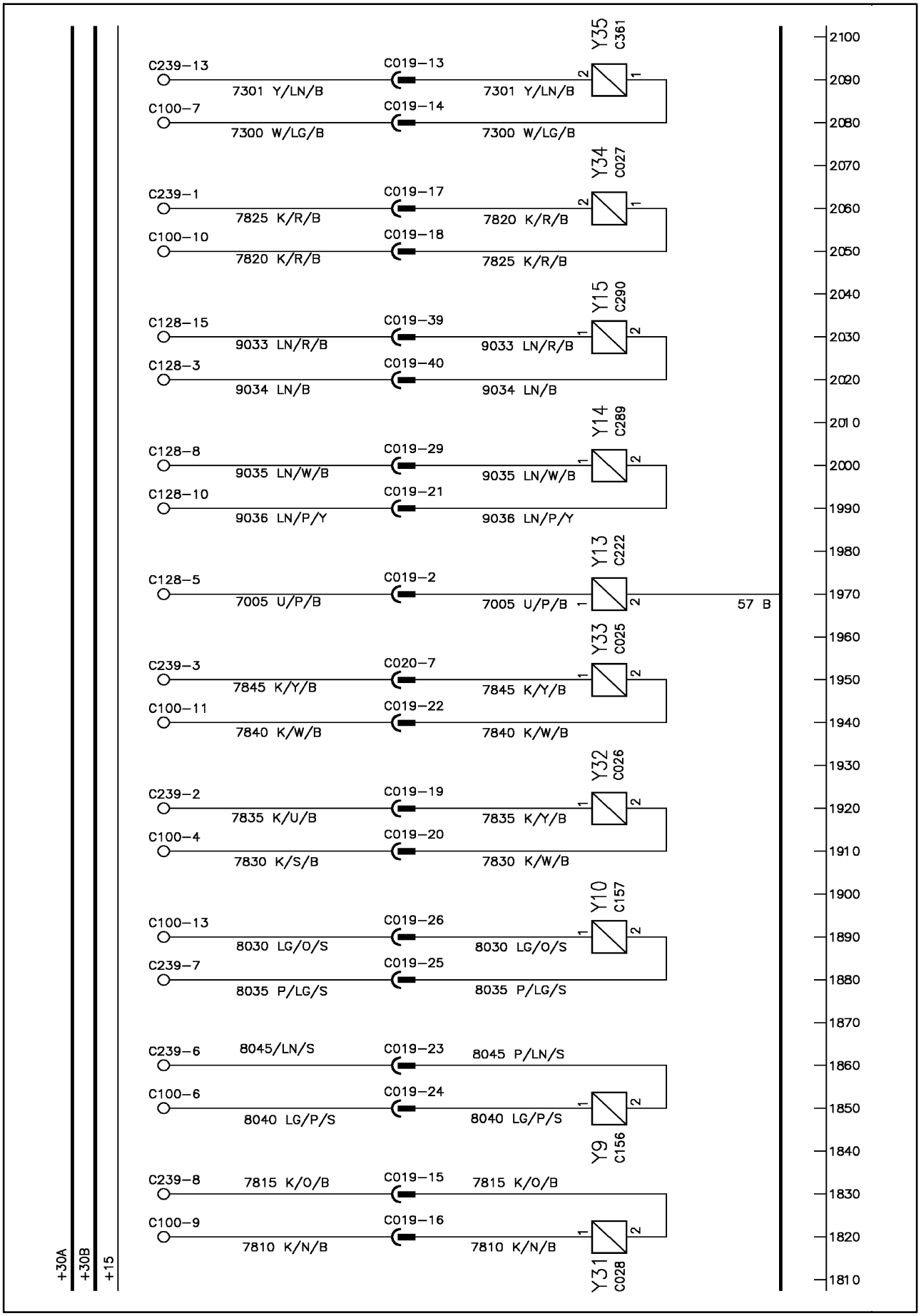
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C025 pin **1 (K)** and **C100** pin **11 (K/W/B)**

   C025 pin **2 (K)** and **C239** pin **3 (K/Y/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/Y/B
C100-4
C019-20
7830 K/S/B
7830 K/W/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
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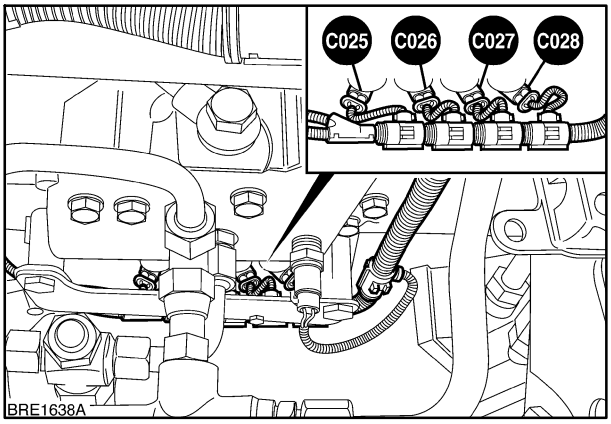
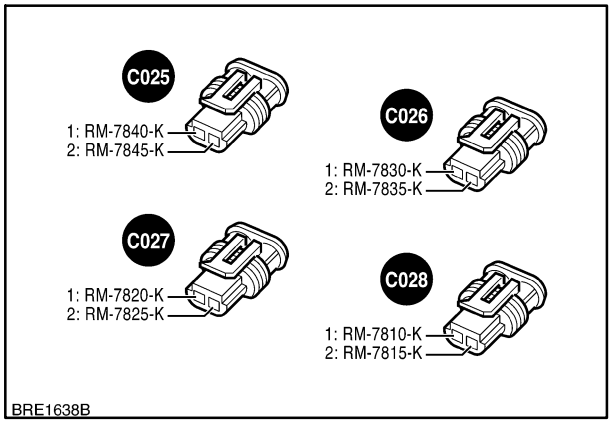
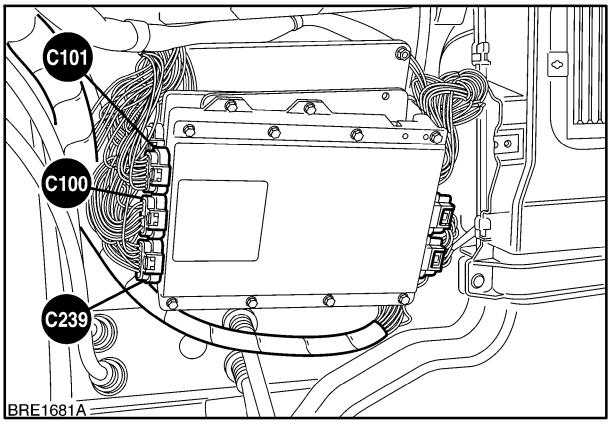
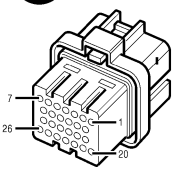




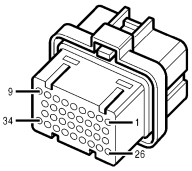


C100



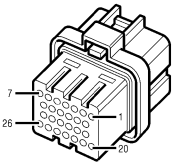
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/W/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



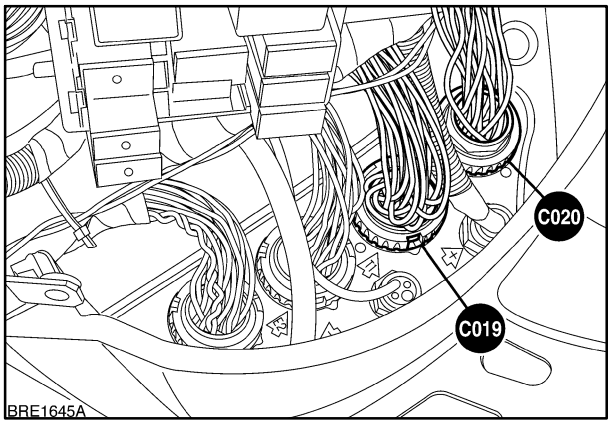
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



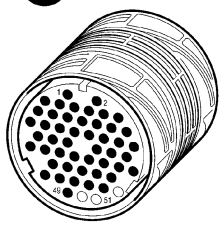
1: CM-7825-K/R/B
2: CM-7835-K/Y/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



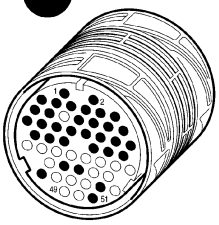
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2039 (24X24) – LOW RANGE PWM VALVE OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty low range PWM valve
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the low range PWM valve in H9 Channel 45.

   A. Start the engine and select 6th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 45 wiggle the harness, the low range PWM valve connector **C161**, controller connectors **C100** and **C239**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 45 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the low range PWM valve connector **C161** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the low range PWM valve.

   A. Disconnect connector **C026**. Measure the resistance between the component side of connector,

   C161 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the low range PWM valve.

   B. If the low range PWM valve is okay, continue to step 4.
4. Check for an open circuit.

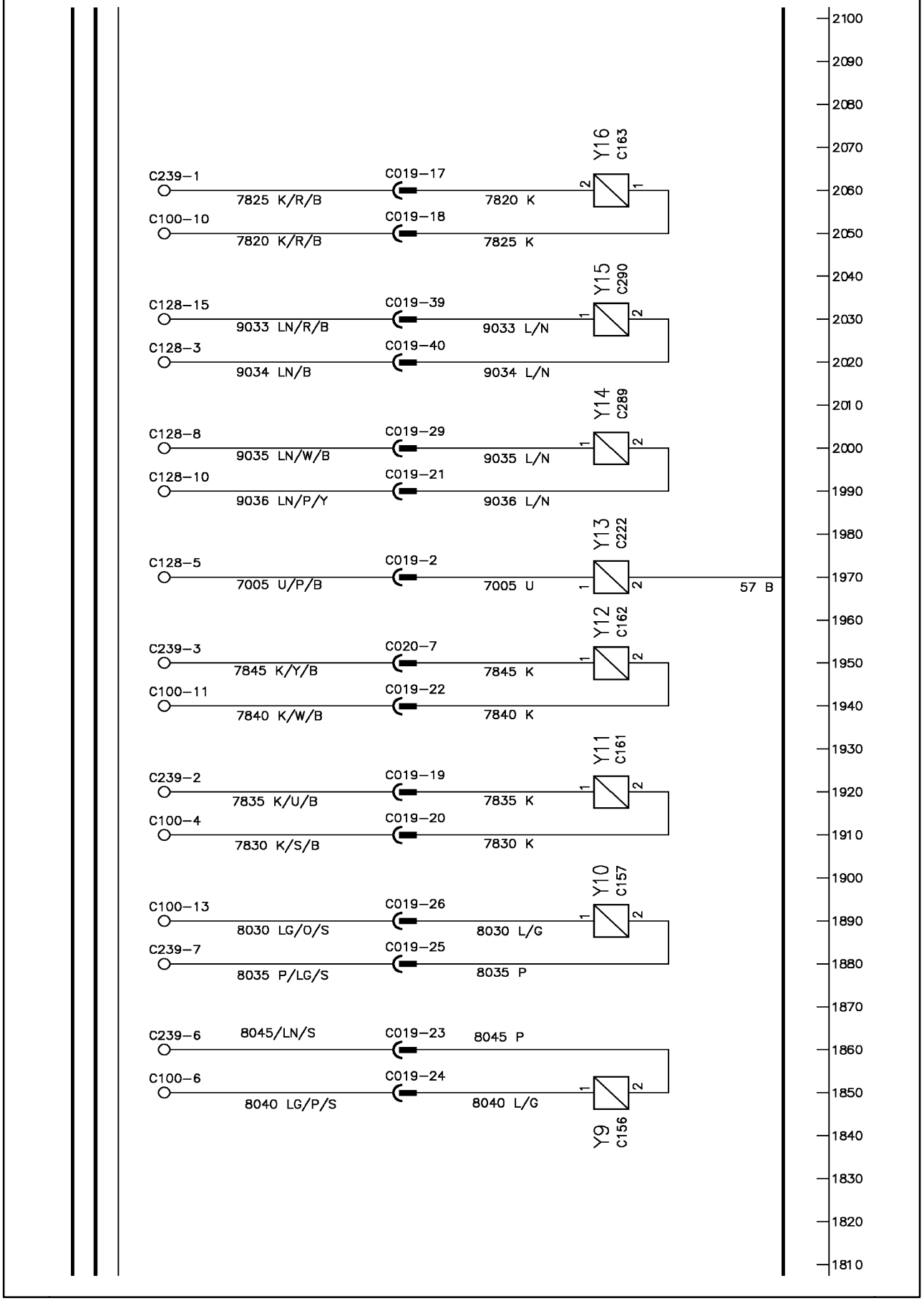
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C161 pin **1 (K)** and **C100** pin **4 (K/S/B)**

   C161 pin **2 (K)** and **C239** pin **2 (K/U/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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1860
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1840
1830
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
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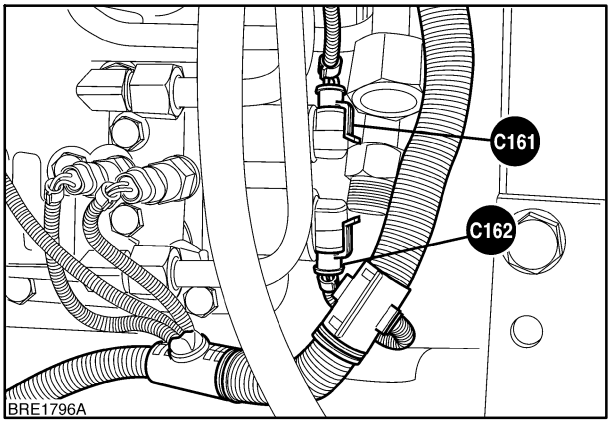
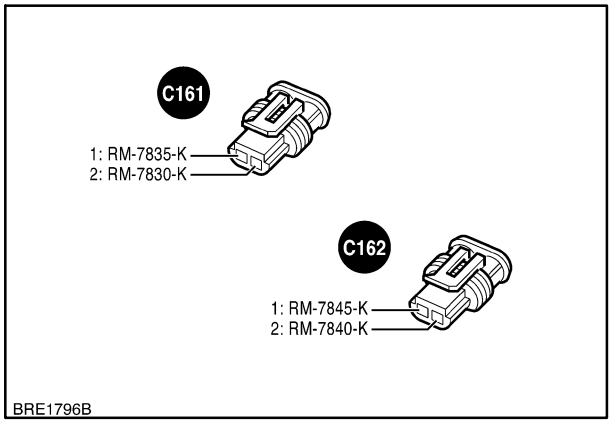
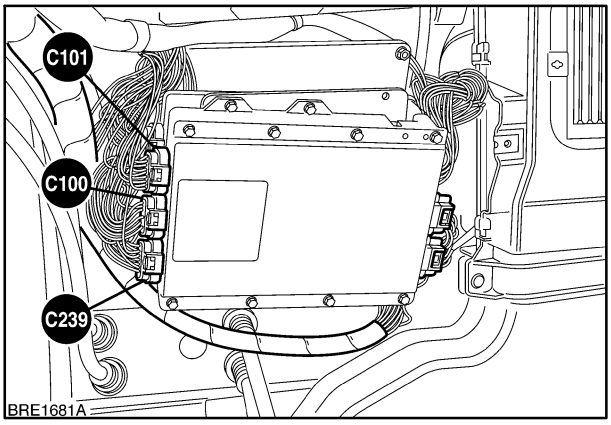
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156



BRE1796A

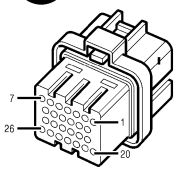


BRE1796B



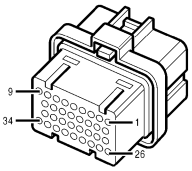
BRE1681A

C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
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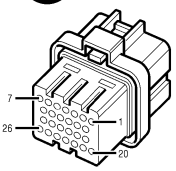
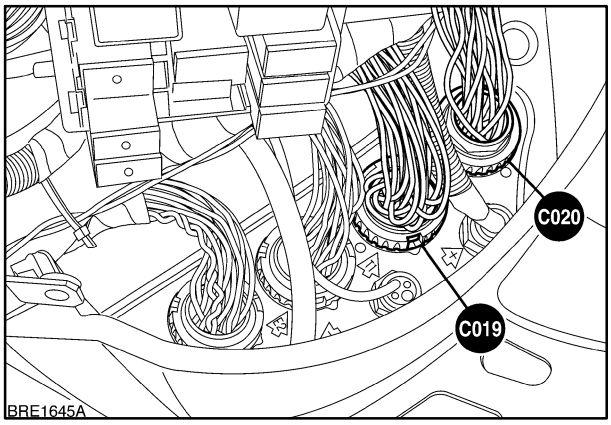
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



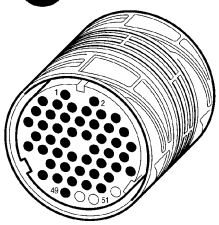
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



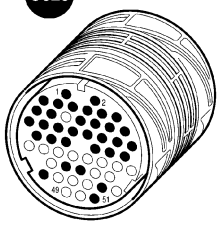
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2040 (16X16) - CLUTCH C3 SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 3 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 3 solenoid in H9 Channel 45.

   A. Start the engine and select 6th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 45 wiggle the harness, the clutch 3 connector **C026**, controller connectors **C101** and **C239**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 45 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 3 solenoid connector **C026**, the controller connectors **C100** and **C239**, and the inline harness connector **C019**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 3 solenoid for a short to ground.

   A. Disconnect connector **C026**. Measure the resistance between the component side of connector:

   C026 pin **1** and **ground**

   C026 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the clutch solenoid.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C026 pin **1 (K)** and **ground**

   C026 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for a short to +12 Volts.

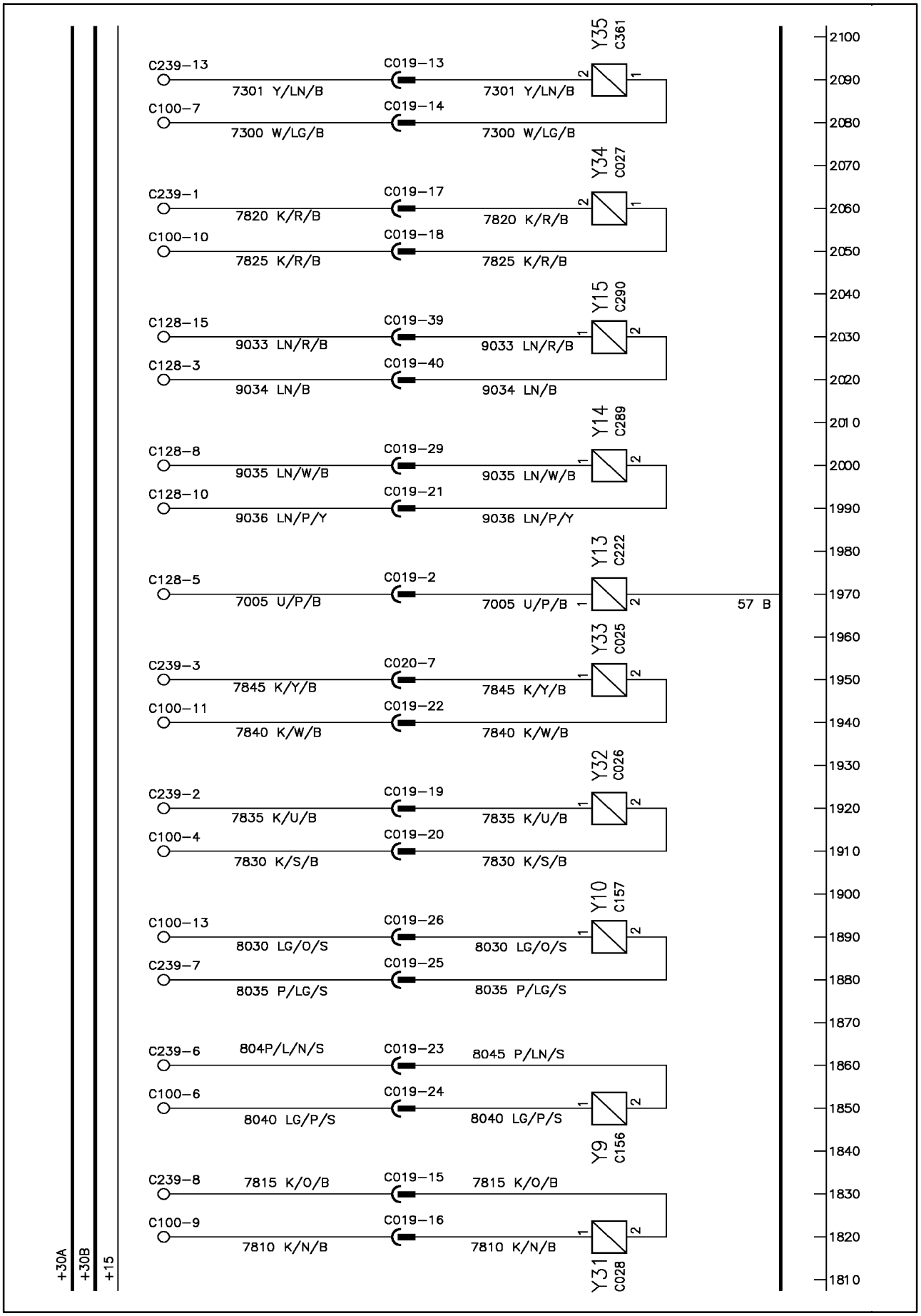
   A. Turn the keystart ON. Measure the voltage between connector:

   C026 pin **1 (K)** and **ground**

   C026 pin **2 (K)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
Y35 C361
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
C239-1
7820 K/R/B
C019-17
7820 K/R/B
Y34 C027
C100-10
7825 K/R/B
C019-18
7825 K/R/B
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
Y15 C290
C128-3
9034 LN/B
C019-40
9034 LN/B
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
Y14 C289
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
C128-5
7005 U/P/B
C019-2
7005 U/P/B
Y13 C222
57 B
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
Y33 C025
C100-11
7840 K/W/B
C019-22
7840 K/W/B
C239-2
7835 K/U/B
C019-19
7835 K/U/B
Y32 C026
C100-4
7830 K/S/B
C019-20
7830 K/S/B
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
Y10 C157
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
804P/L/N/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
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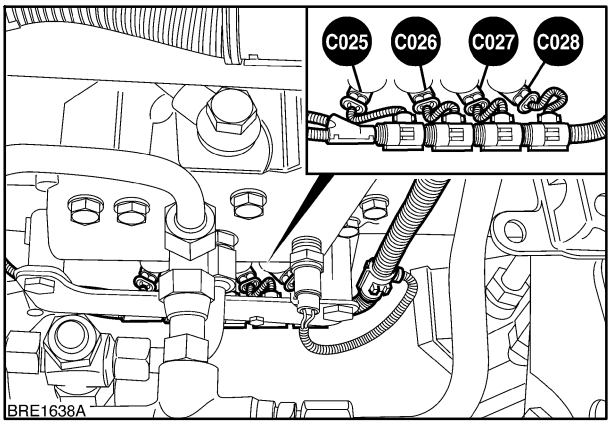
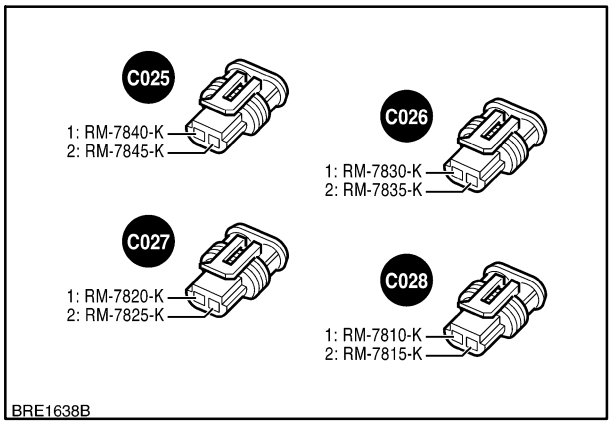
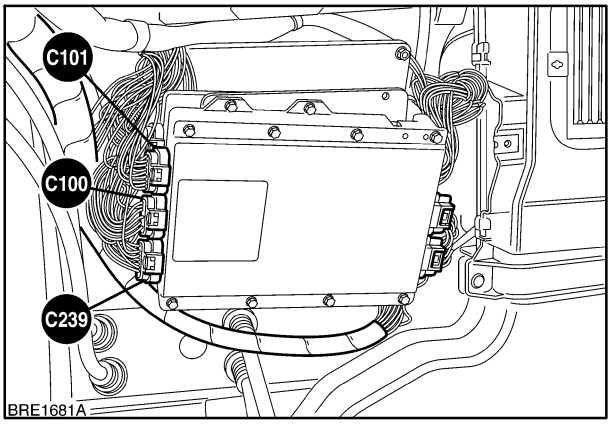
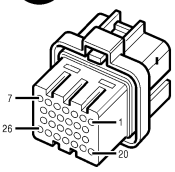




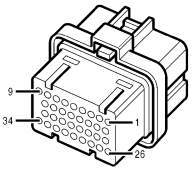


C100



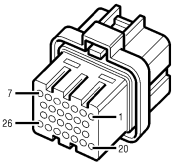
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



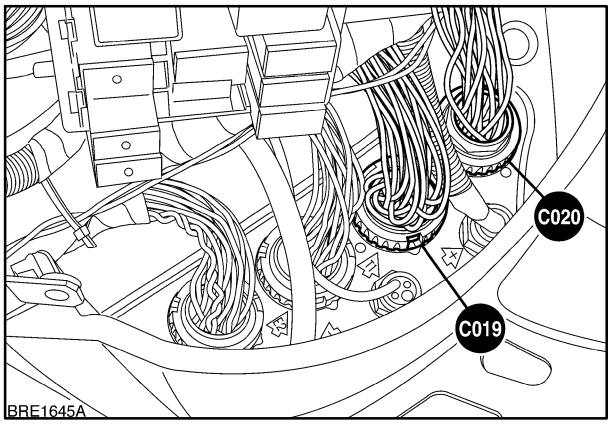
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



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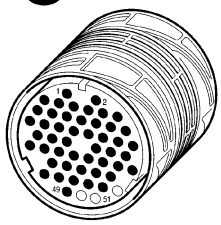
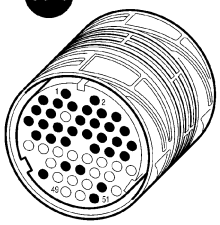


1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2040 (24X24) – HIGH RANGE PWM VALVE SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty high range PWM valve
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the high range PWM valve in H9 Channel 46.

   A. Start the engine and select 5th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 46 wiggle the harness, the high range PWM valve connector **C162**, controller connectors **C100** and **C239**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 46 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the high range PWM valve connector **C162**, the controller connectors **C100** and **C239**, and the inline harness connector **C019**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the high range PWM valve for short to ground.

   A. Disconnect connector **C162**. Measure the resistance between the component side of connector:

   C162 pin **1** and **ground**

   C162 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the clutch solenoid.

   B. If a short to ground is not indicated, continue to step 3.
4. Check for a short to ground.

   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C162 pin **1 (K)** and **ground**

   C162 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.
5. Check for a short to +12 Volts.

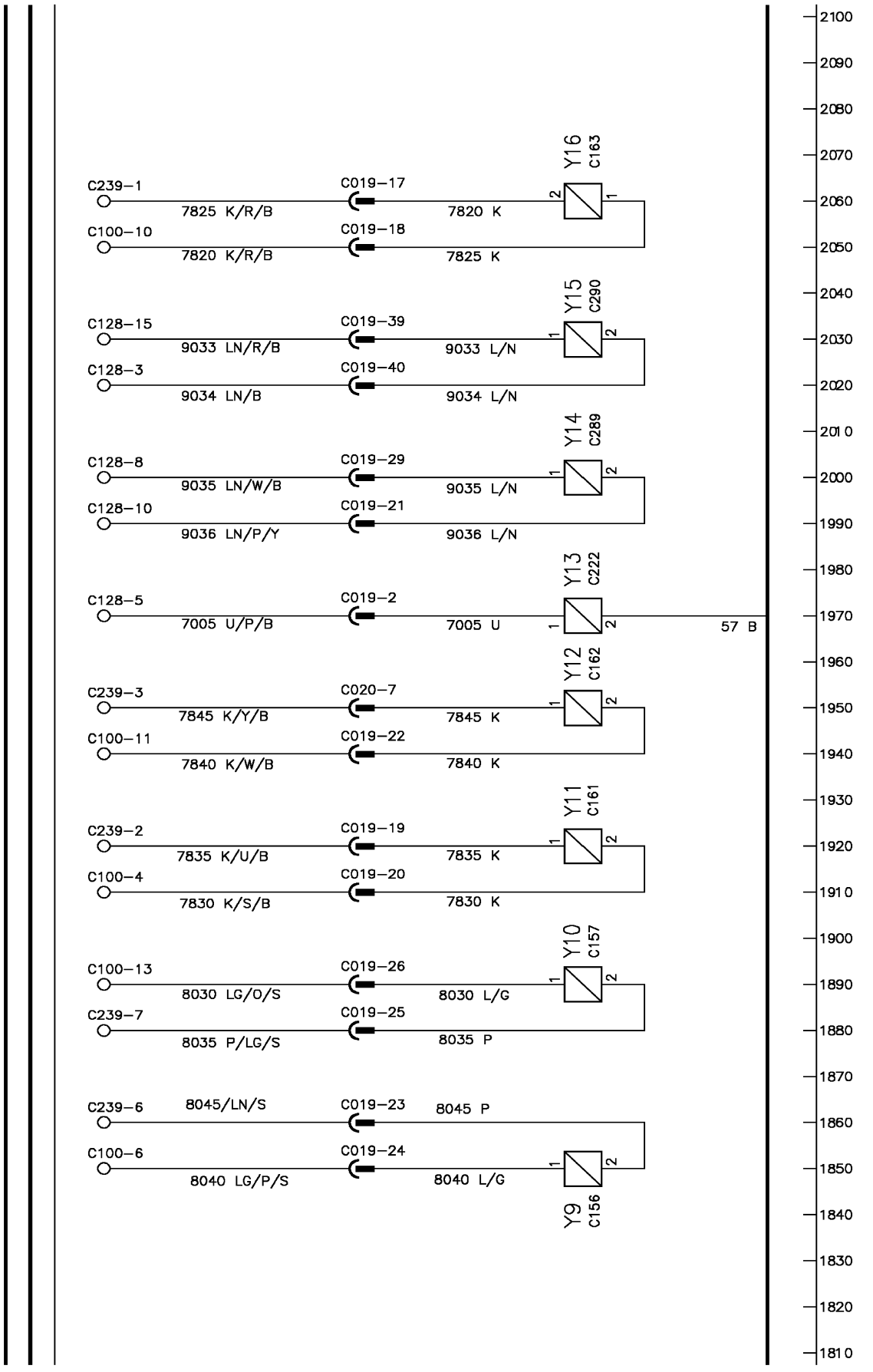
   A. Turn the keystart ON. Measure the voltage between connector:

   C162 pin **1 (K)** and **ground**

   C162 pin **2 (K)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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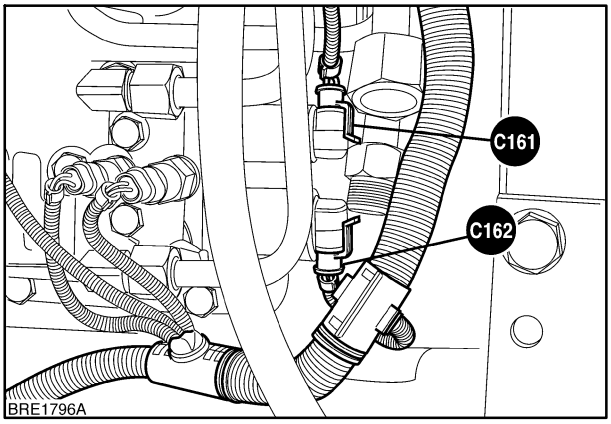
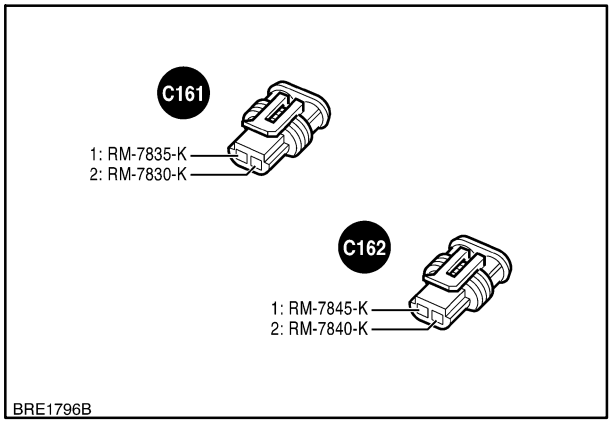
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
C239-6
8045/LN/S
C019-23
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156



BRE1796A



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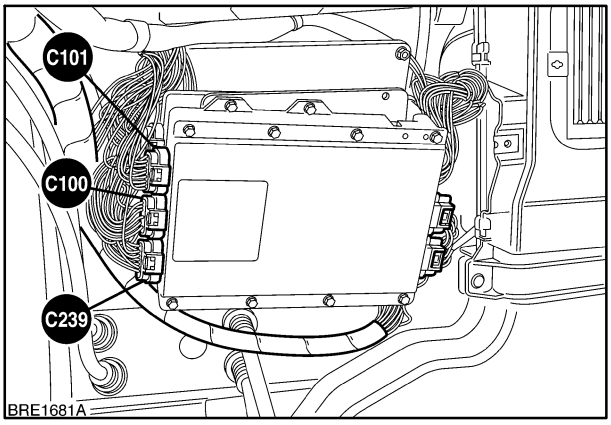
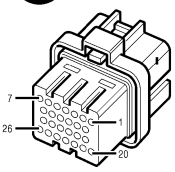


BRE1681A

C100



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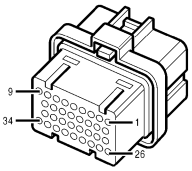
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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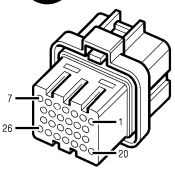
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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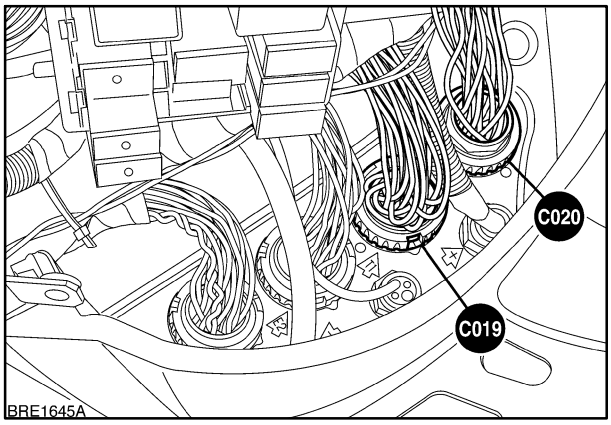
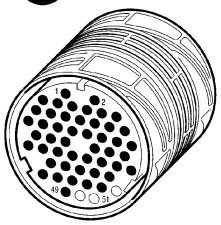
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



BRE1645A

C019



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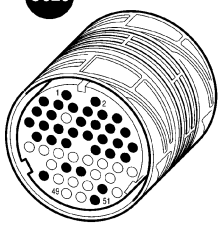
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2041 (16X16)- CLUTCH C3 SOLENOID OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 3 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 3 solenoid in H9 Channel 45.

   A. Start the engine and select 6th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 46 wiggle the harness, the clutch 4 connector **C026**, controller connectors **C100** and **C239** and the inline harness connector **C019** to check for an intermittent circuit. Channel 45 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 3 solenoid connector **C026** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 3 solenoid.

   A. Disconnect connector **C026**. Measure the resistance between the component side of connector,

   C026 pin **1** and **2**. If the resistance indicated is not between 8 Ohms - 12 Ohms at 20 degrees centigrade, remove and replace the clutch solenoid.

   B. If the clutch 3 solenoid is okay, continue to step 4.
4. Check for an open circuit.

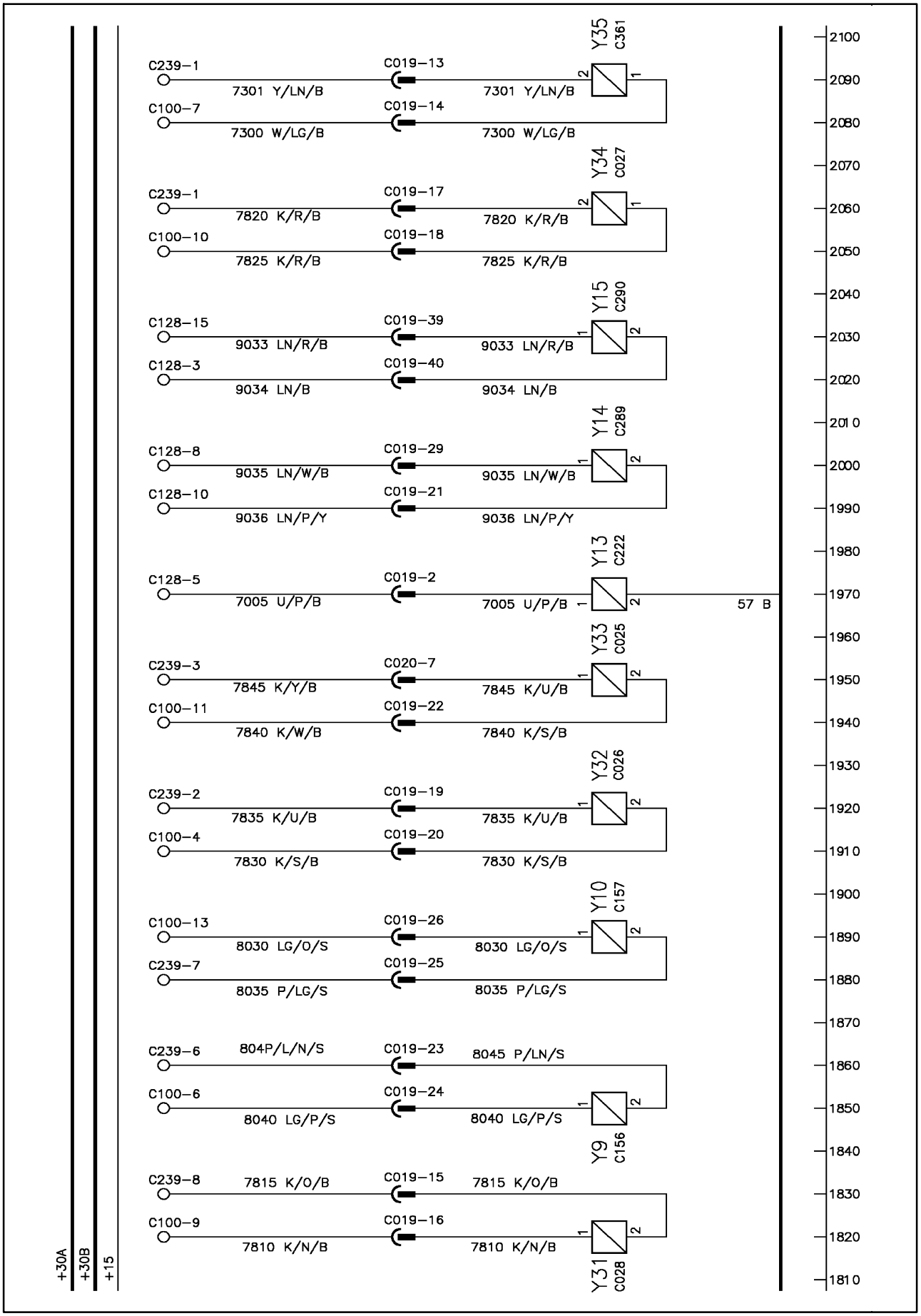
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C026 pin **1 (K)** and **C100** pin **11 (K/S/B)**

   C026 pin **2 (K)** and **C239** pin **3 (K/U/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-1
7301 Y/LN/B
C019-13
7301 Y/LN/B
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
Y34 C027
C239-1
7820 K/R/B
C019-17
7820 K/R/B
C100-10
7825 K/R/B
C019-18
7825 K/R/B
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
C128-3
9034 LN/B
C019-40
9034 LN/B
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U/P/B
57 B
Y33 C025
C239-3
7845 K/Y/B
C020-7
7845 K/U/B
C100-11
7840 K/W/B
C019-22
7840 K/S/B
Y32 C026
C239-2
7835 K/U/B
C019-19
7835 K/U/B
C100-4
7830 K/S/B
C019-20
7830 K/S/B
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
804P/L/N/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
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2020
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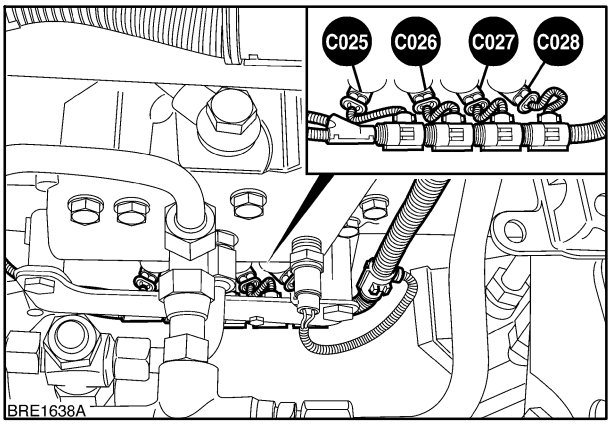
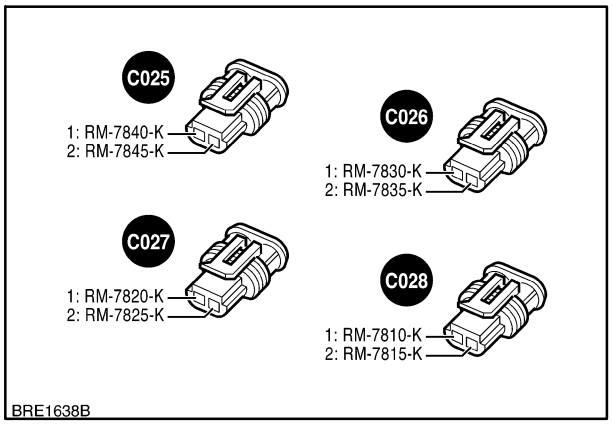
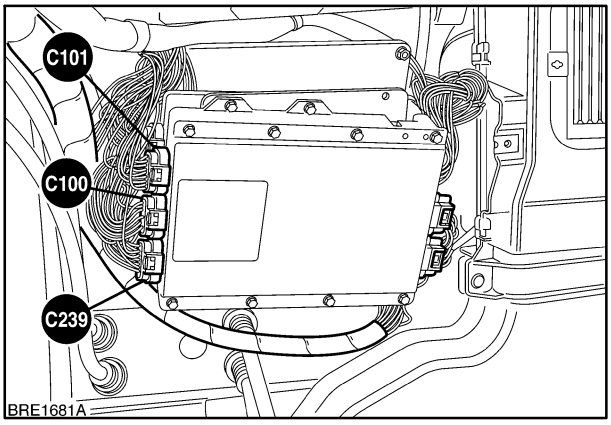
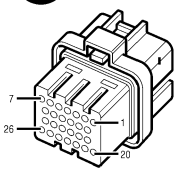






C100



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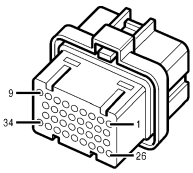
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/S/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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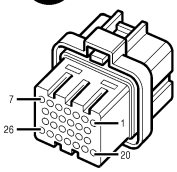
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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3: CM-7845-K/U/B
4: CM-5087-K/U/B
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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
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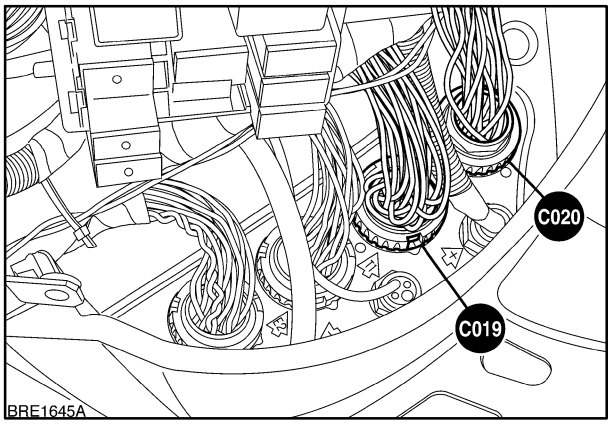
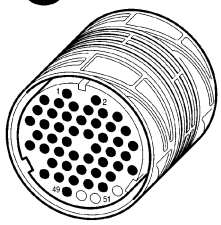
BRE1681B



C019



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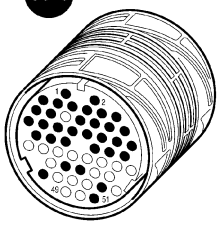
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2041 (24X24)– HIGH RANGE PWM VALVE OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty high range PWM valve
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the high range PWM valve in H9 Channel 46.

   A. Start the engine and select 5th gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 46 wiggle the harness, the high range PWM valve connector **C025**, controller connectors **C100** and **C239** and the inline harness connector **C019** to check for an intermittent circuit. Channel 46 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the high range PWM valve connector **C025** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the high range PWM valve.

   A. Disconnect connector **C025**. Measure the resistance between the component side of connector,

   C025 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the high range PWM valve.

   B. If the high range PWM valve is okay, continue to step 4.
4. Check for an open circuit.

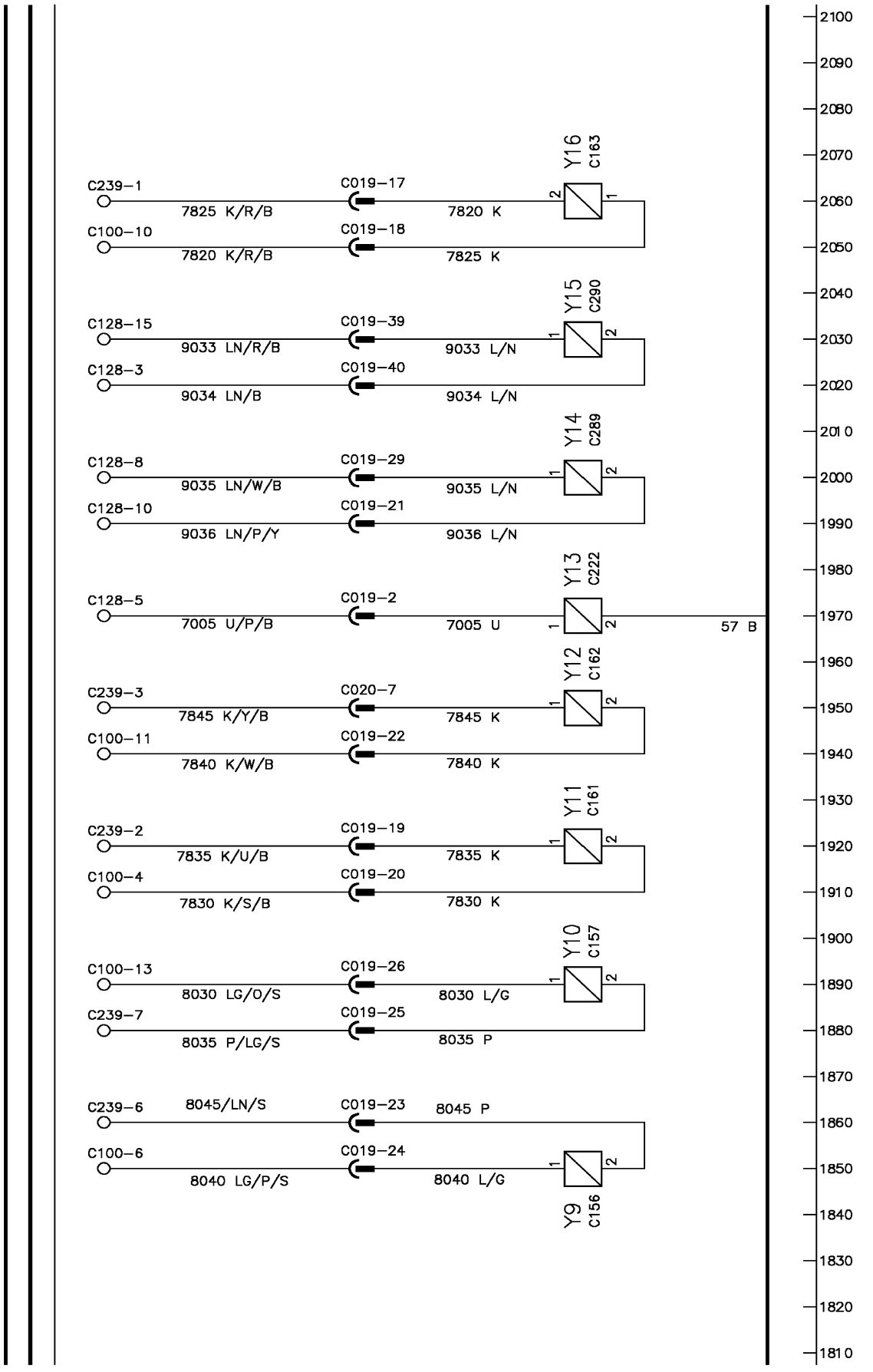
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C161 pin **1 (K)** and **C100** pin **11 (K/W/B)**

   C161 pin **2 (K)** and **C239** pin **3 (K/Y/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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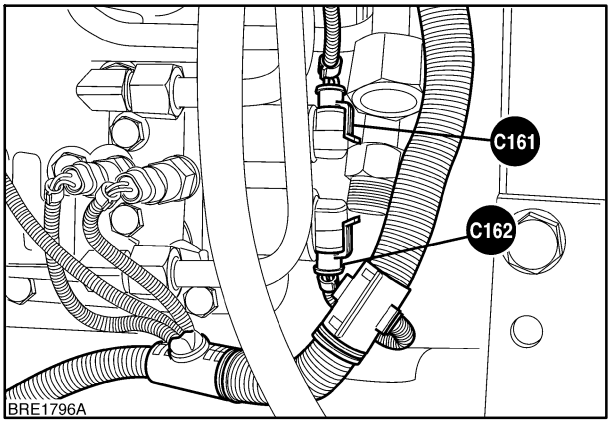
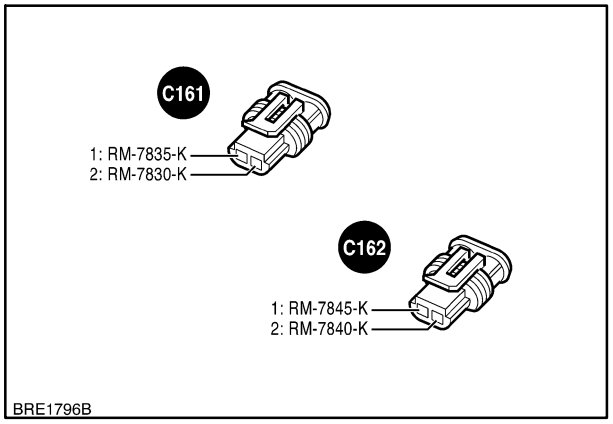
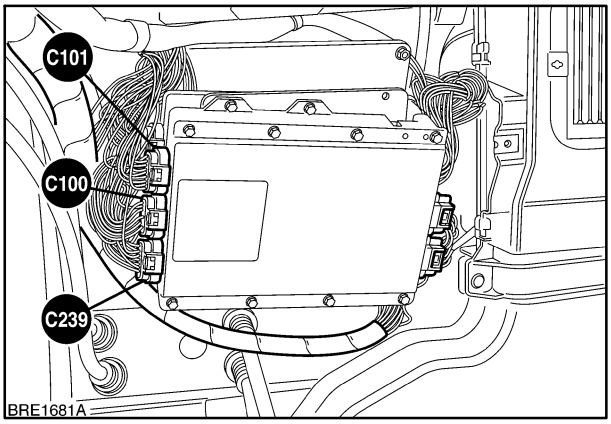
1870
1860
1850
1840
1830
1820
1810
Y16 C163
C239-1
7825 K/R/B
C019-17
7820 K
C100-10
7820 K/R/B
C019-18
7825 K
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 L/N
C128-3
9034 LN/B
C019-40
9034 L/N
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 L/N
C128-10
9036 LN/P/Y
C019-21
9036 L/N
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U
57 B
Y12 C162
C239-3
7845 K/Y/B
C020-7
7845 K
C100-11
7840 K/W/B
C019-22
7840 K
Y11 C161
C239-2
7835 K/U/B
C019-19
7835 K
C100-4
7830 K/S/B
C019-20
7830 K
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 L/G
C239-7
8035 P/LG/S
C019-25
8035 P
C239-6
8045/LN/S
C019-23
8045 P
C100-6
8040 LG/P/S
C019-24
8040 L/G
Y9 C156







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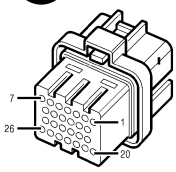
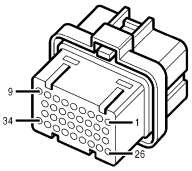


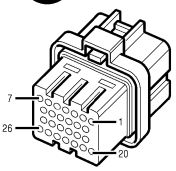
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



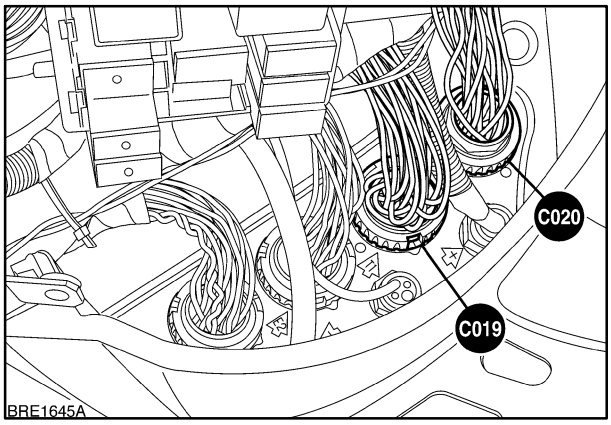
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

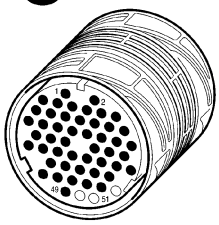


1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

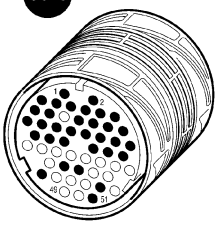


C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2042 - CLUTCH C2 SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 2 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 2 solenoid in H9 Channel 44.

   A. Start the engine and select 2nd gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 44 wiggle the harness, the clutch 2 connector **C027**, controller connectors **C100** and **C239** and the inline harness connector **C019** to check for an intermittent circuit. Channel 44 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 2 solenoid connector **C027** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 2 solenoid for short to ground.

   A. Disconnect connector **C027**. Check between the component side of connector:

   C027 pin **1** and **ground**.

   C027 pin **2** and **ground**.

   If a short to ground is indicated, remove and replace the clutch solenoid.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C027 pin **1 (K)** and **ground**

   C027 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for a short to +12 Volts.

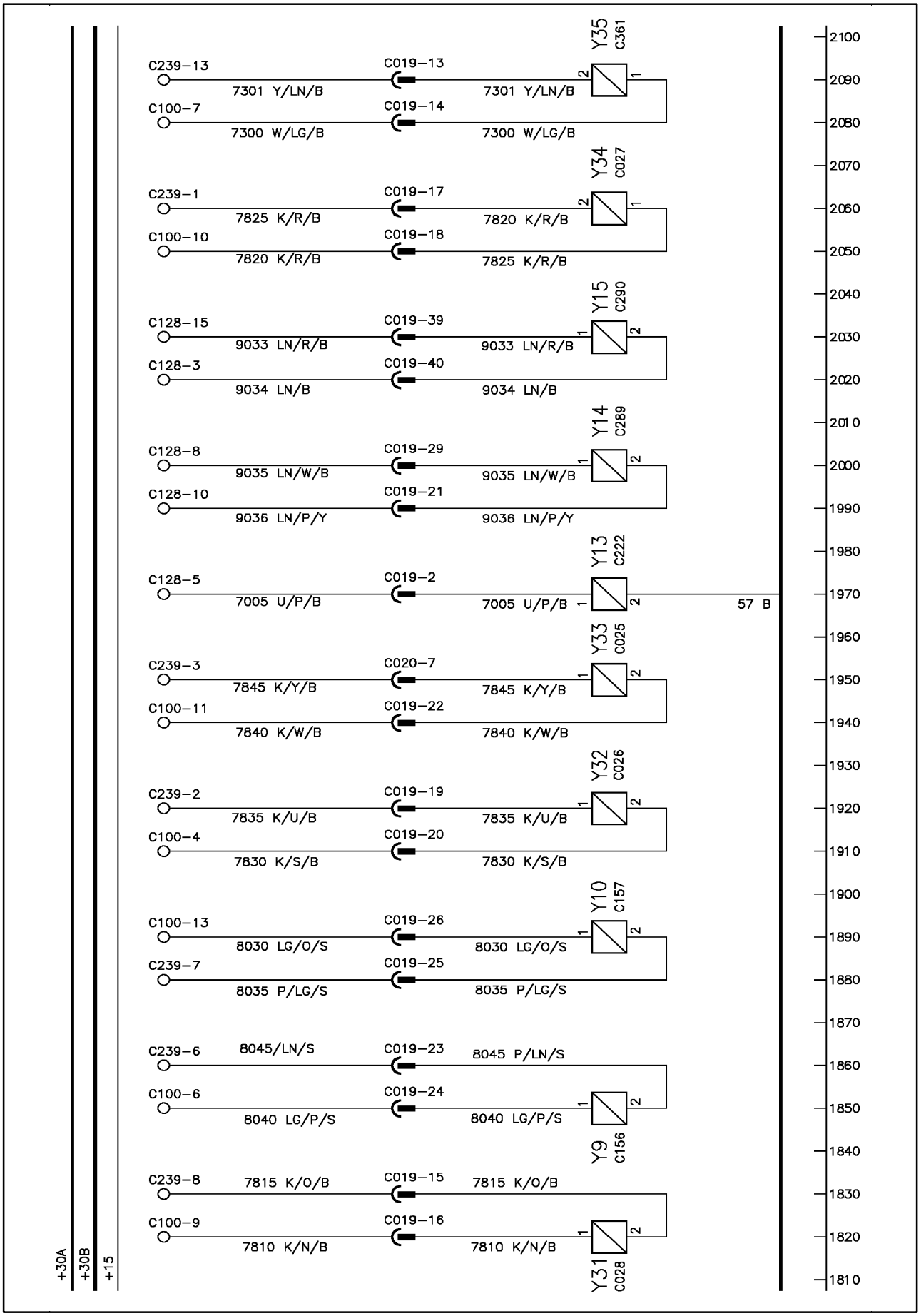
   A. Turn the keystart ON. Measure the voltage between connector:

   C027 pin **1 (K)** and **ground**

   C027 pin **2 (K)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
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C100-11
C019-22
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C239-2
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C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
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8030 LG/O/S
C239-7
C019-25
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8035 P/LG/S
C239-6
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C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
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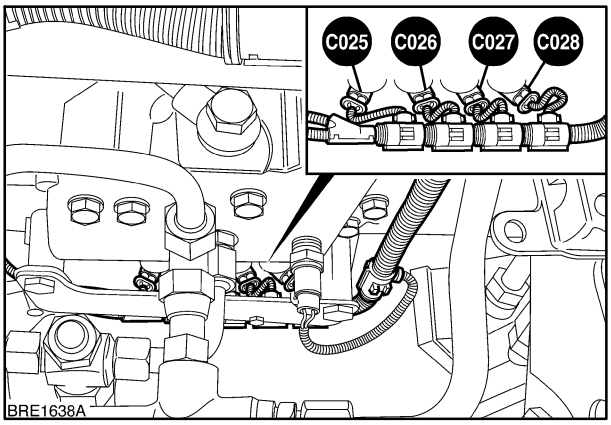
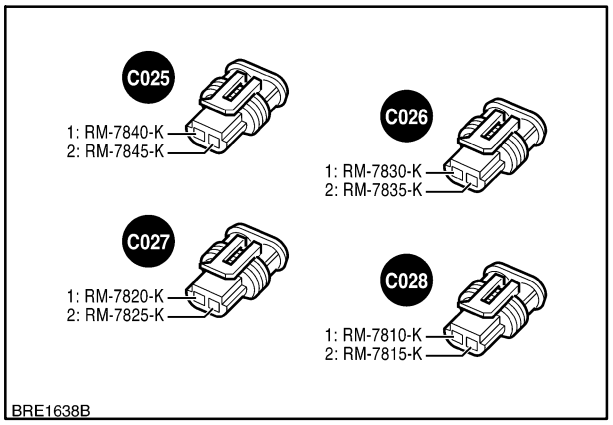

C025
C026
C027
C028
BRE1638A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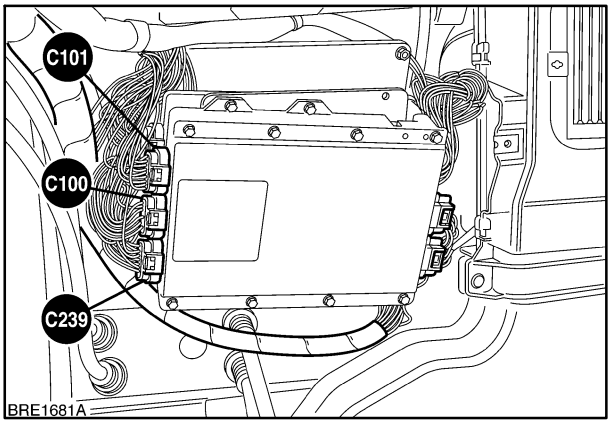
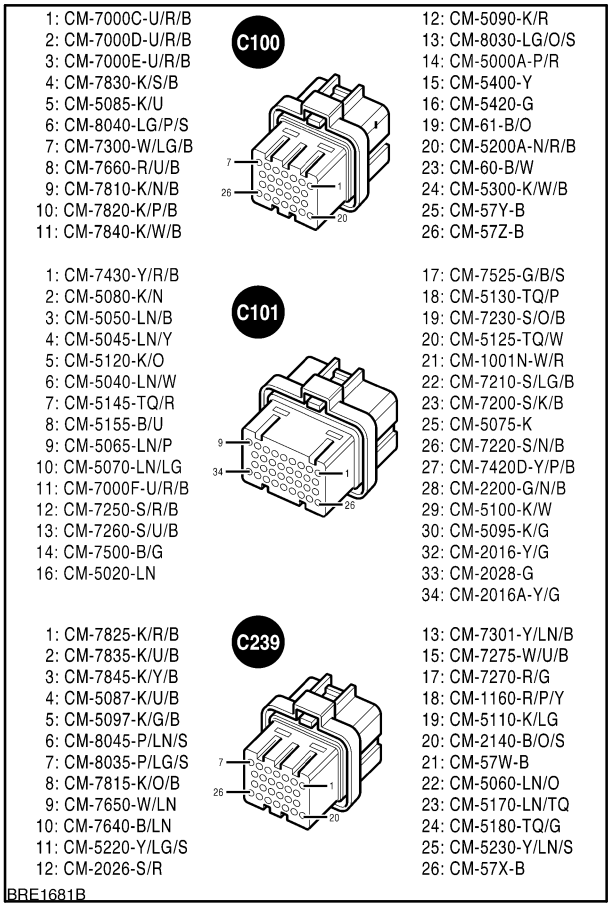
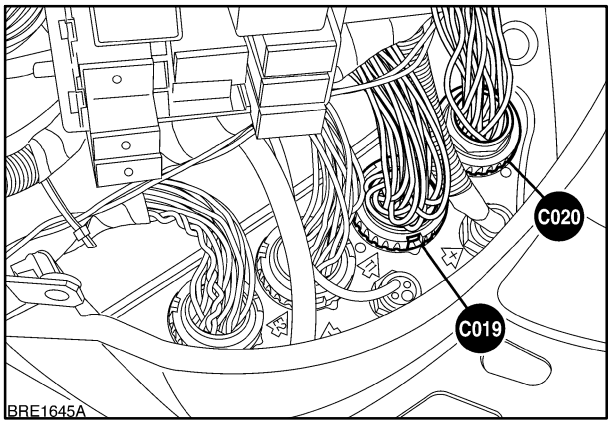
2: RM-7845-K
C026
1: RM-7830-K
2: RM-7835-K
C027
1: RM-7820-K
2: RM-7825-K
C028
1: RM-7810-K
2: RM-7815-K
BRE1638B

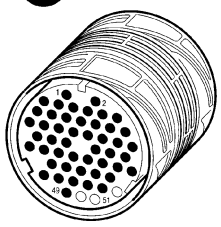

C101
C100
C239
BRE1681A


1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B



BRE1645A

C019



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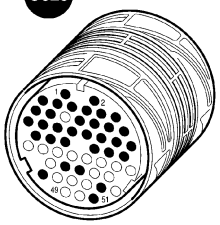
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2043 – CLUTCH C2 SOLENOID OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 2 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 2 solenoid in H9 Channel 44.

   A. Start the engine and select 2nd gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 44 wiggle the harness, the clutch 2 connector **C027**, controller connectors **C100** and **C239** and the inline harness connector **C019** to check for an intermittent circuit. Channel 44 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 2 solenoid connector **C027** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 2 solenoid.

   A. Disconnect connector **C027**. Measure the resistance between the component side of connector,

   C027 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the clutch solenoid.

   B. If the clutch 2 solenoid is okay, continue to step 4.
4. Check for an open circuit.

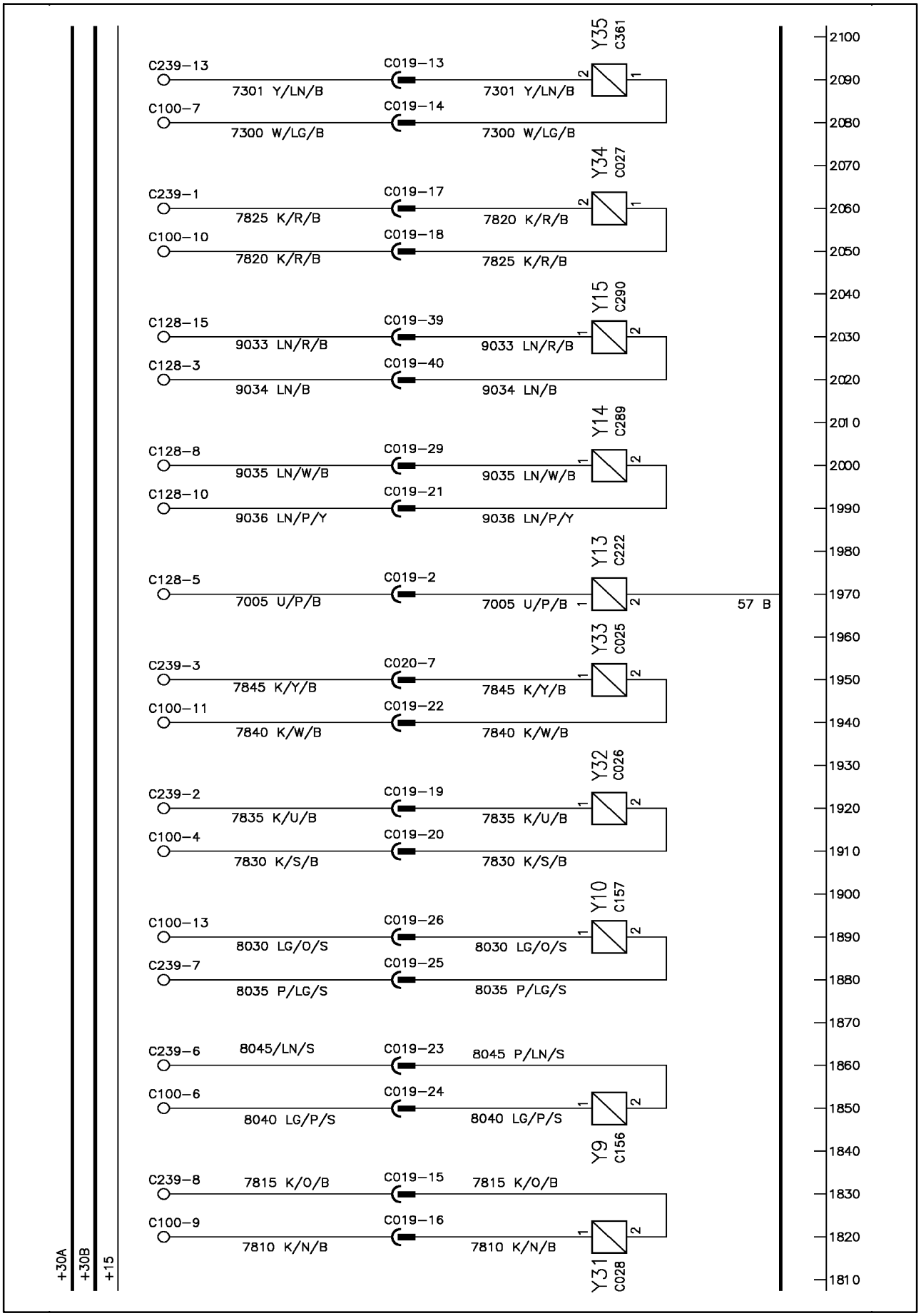
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C027 pin **1 (K)** and **C100** pin **10 (K/P/B)**

   C027 pin **2 (K)** and **C239** pin **1 (K/R/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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+30B
+15
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
Y35 C361
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
C239-1
7825 K/R/B
C019-17
7820 K/R/B
Y34 C027
C100-10
7820 K/R/B
C019-18
7825 K/R/B
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
Y15 C290
C128-3
9034 LN/B
C019-40
9034 LN/B
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
Y14 C289
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
C128-5
7005 U/P/B
C019-2
7005 U/P/B
Y13 C222
57 B
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
Y33 C025
C100-11
7840 K/W/B
C019-22
7840 K/W/B
C239-2
7835 K/U/B
C019-19
7835 K/U/B
Y32 C026
C100-4
7830 K/S/B
C019-20
7830 K/S/B
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
Y10 C157
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
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2030
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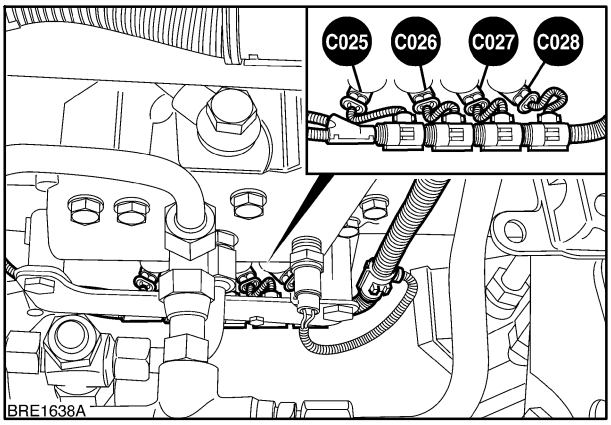
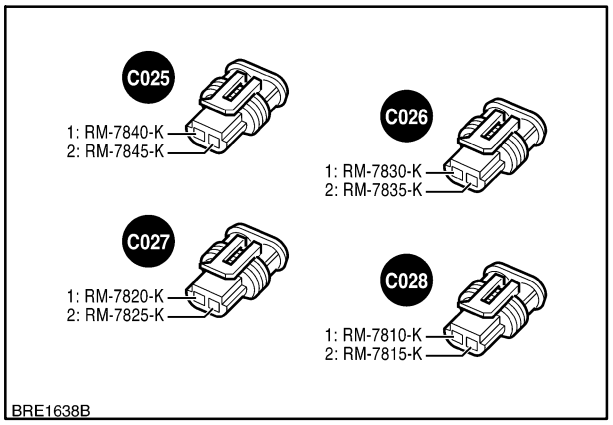

C025
C026
C027
C028
BRE1638A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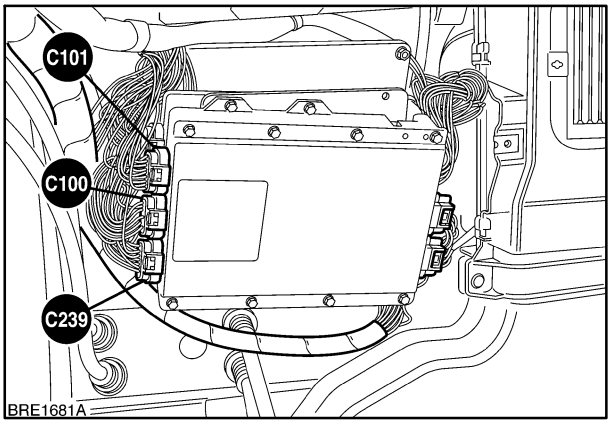
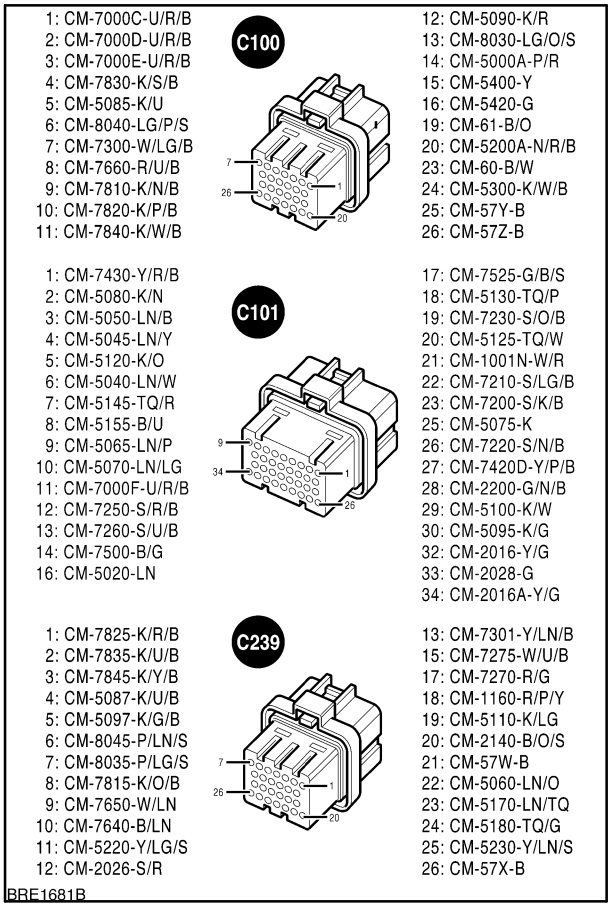
2: RM-7845-K
C026
1: RM-7830-K
2: RM-7835-K
C027
1: RM-7820-K
2: RM-7825-K
C028
1: RM-7810-K
2: RM-7815-K
BRE1638B


C101
C100
C239
BRE1681A


C100
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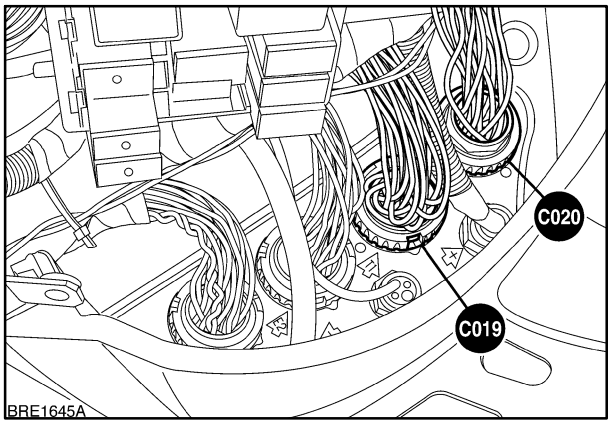
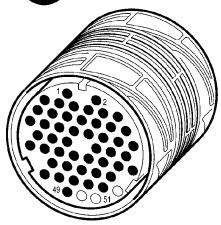
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
C101
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
C239
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B



C019



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3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
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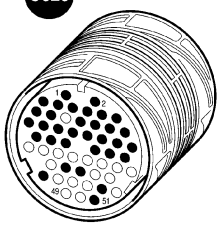
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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3: CM-1014E-R/B
4: CM-810A-G/P
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6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2044 – CLUTCH C1 SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 1 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 1 solenoid in H9 Channel 43.

   A. Start the engine and select 3rd gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 43 wiggle the harness, the clutch 1 connector **C028**, controller connectors **C100** and **C239** and the inline harness connector **C019** to check for an intermittent circuit. Channel 43 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 1 solenoid connector **C028** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 1 solenoid for short to ground.

   A. Disconnect connector **C028**. Check between the component side of connector:

   C028 pin **1** and **ground**

   C028 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the clutch solenoid.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connector **C100** and **C239**. Check between connector:

   C028 pin **1 (K)** and **ground**

   C028 pin **2 (K)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for short to +12 Volts.

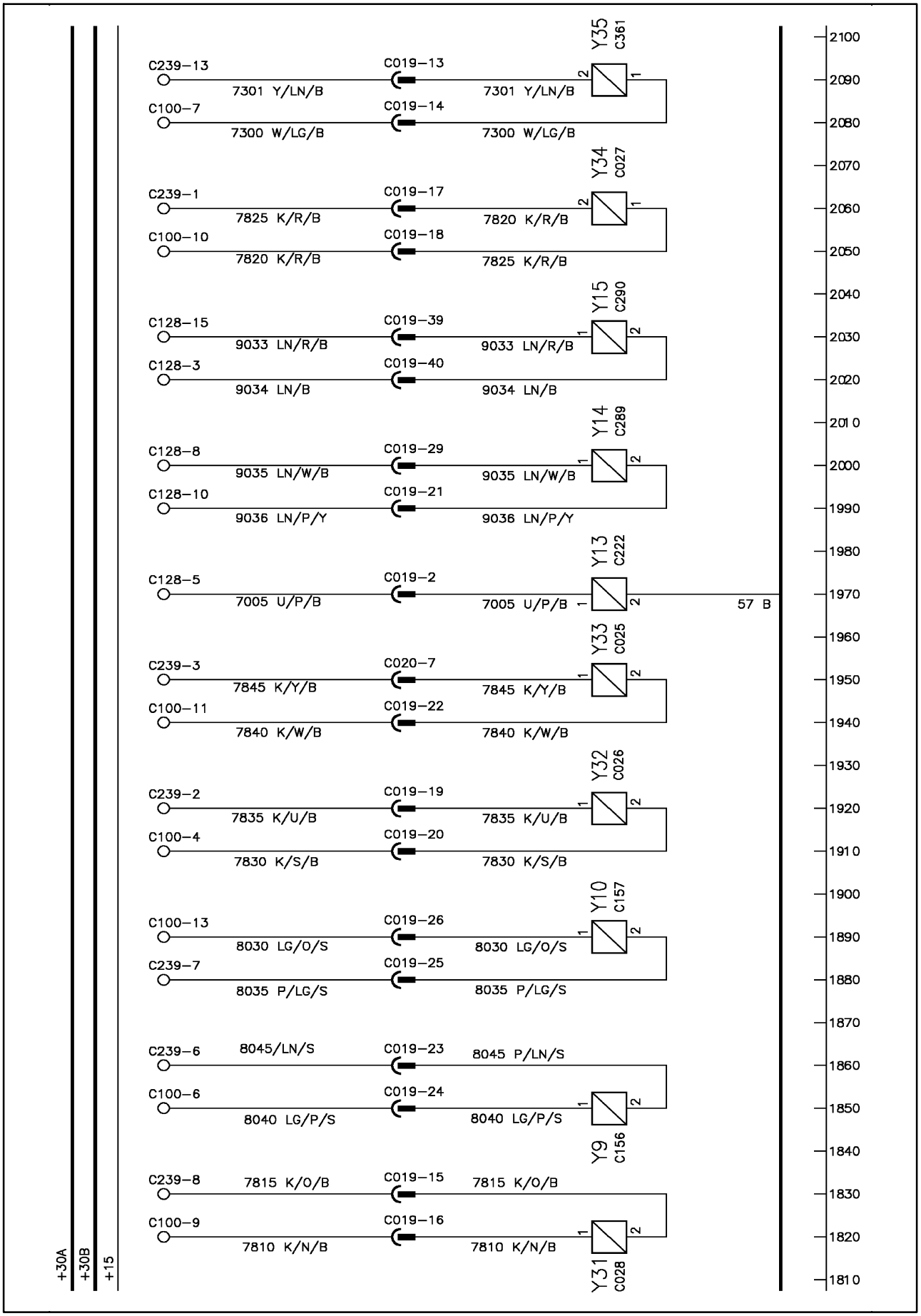
   A. Turn the keystart ON. Measure the voltage between connector:

   C028 pin **1 (K)** and **ground**

   C028 pin **2 (K)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
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C019-22
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C239-2
C019-19
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Y10 C157
C100-13
C019-26
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8030 LG/O/S
C239-7
C019-25
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8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
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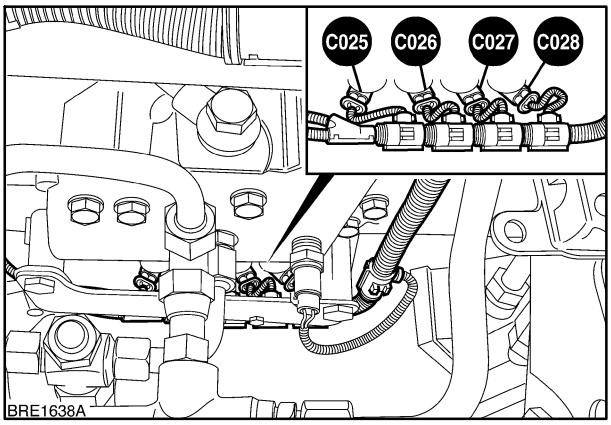
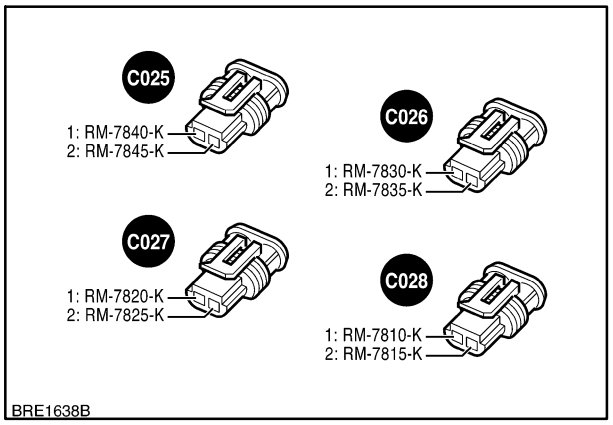

C025
C026
C027
C028
BRE1638A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C026
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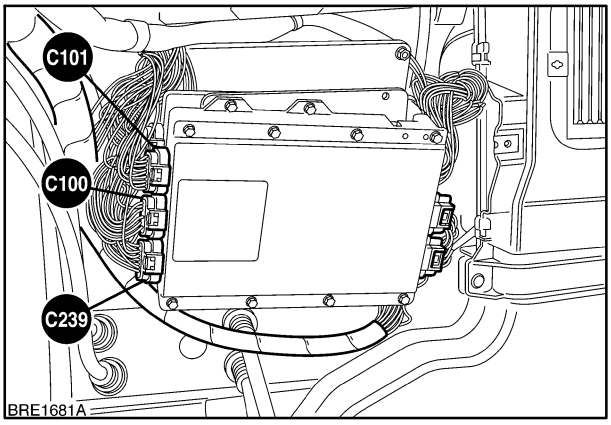
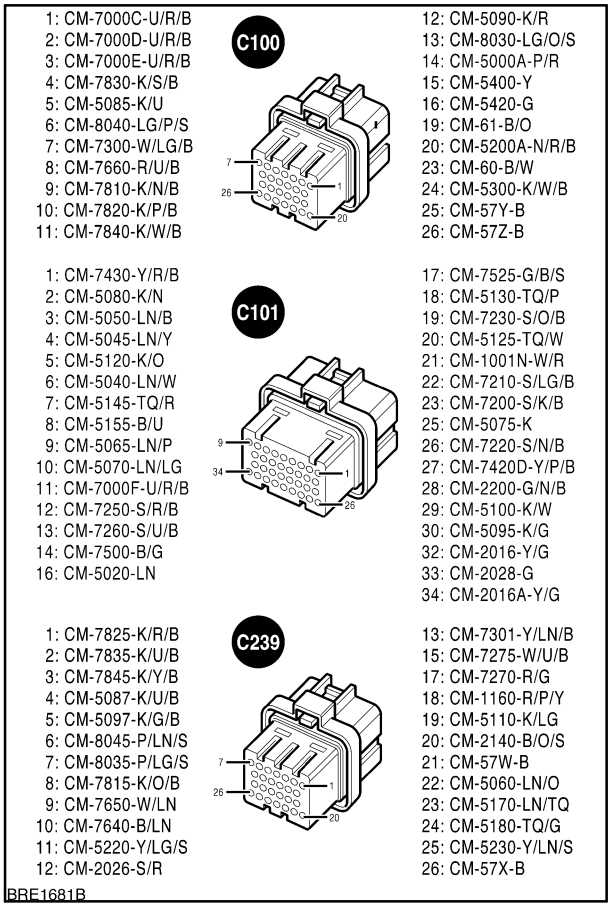
2: RM-7835-K
C027
1: RM-7820-K
2: RM-7825-K
C028
1: RM-7810-K
2: RM-7815-K
BRE1638B


C101
C100
C239
BRE1681A


C100
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
C101
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
C239
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
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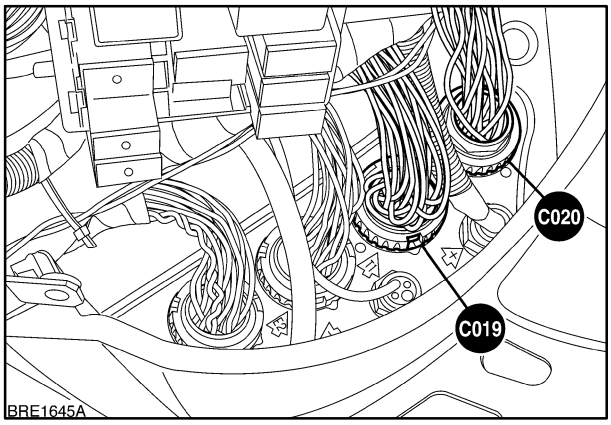
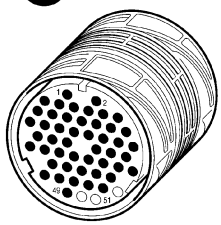
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B



C019



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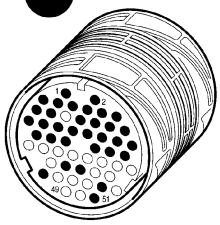
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2045 – CLUTCH C1 SOLENOID OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 1 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 1 solenoid in H9 Channel 43.

   A. Start the engine and select 3rd gear, the H9 reading should change from 0 clutch OFF to 30 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 43 wiggle the harness, the clutch 1 connector **C028**, controller connectors **C100** and **C239** and the inline harness connector **C019** to check for an intermittent circuit. Channel 43 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 1 solenoid connector **C028** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 1 solenoid.

   A. Disconnect connector **C028**. Measure the resistance between the component side of connector.

   C028 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the clutch solenoid.

   B. If the clutch 1 solenoid is okay, continue to step 4.
4. Check for an open circuit.

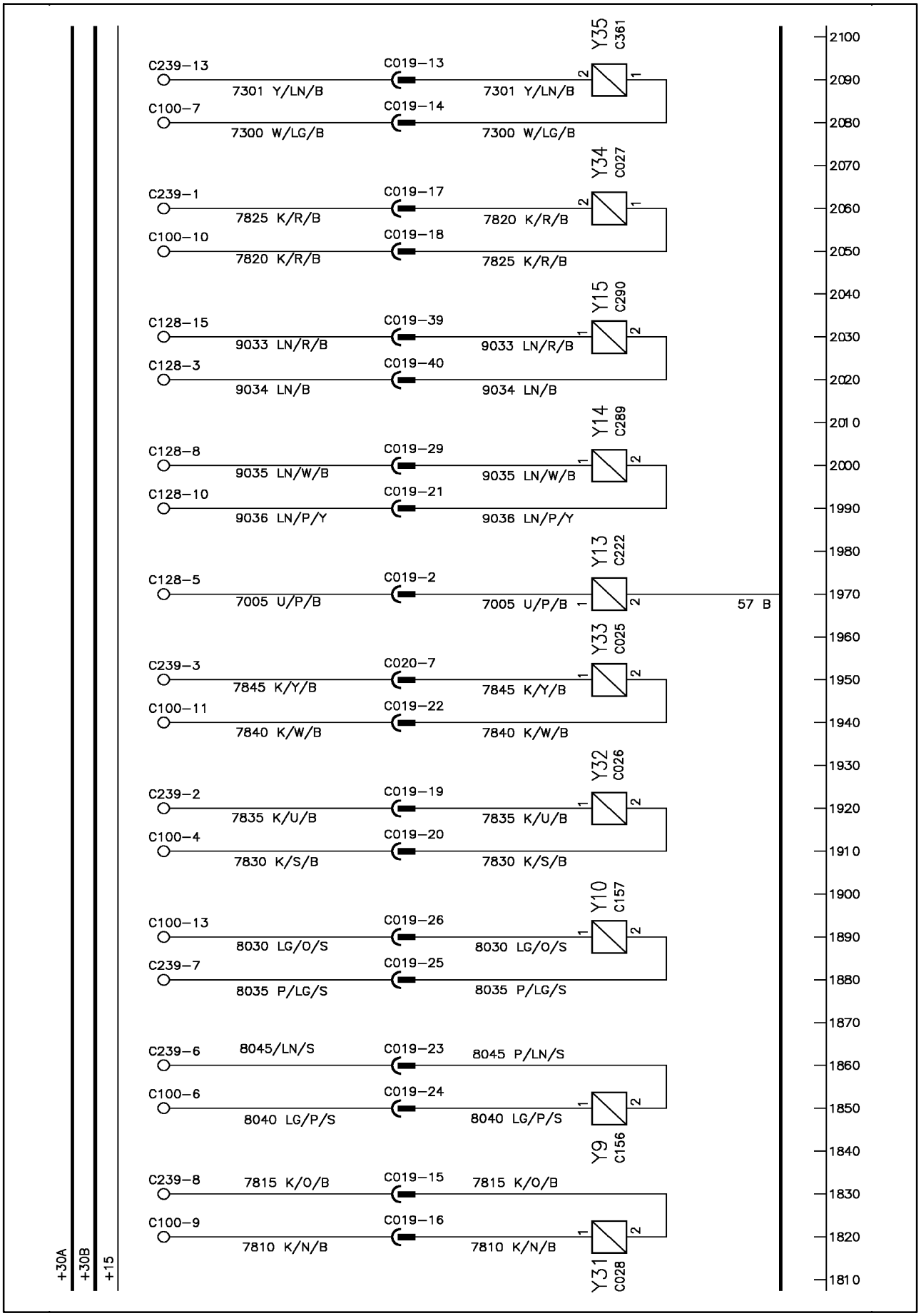
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C028 pin **1 (K)** and **C100** pin **9 (K/N/B)**

   C028 pin **2 (K)** and **C239** pin **8 (K/O/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
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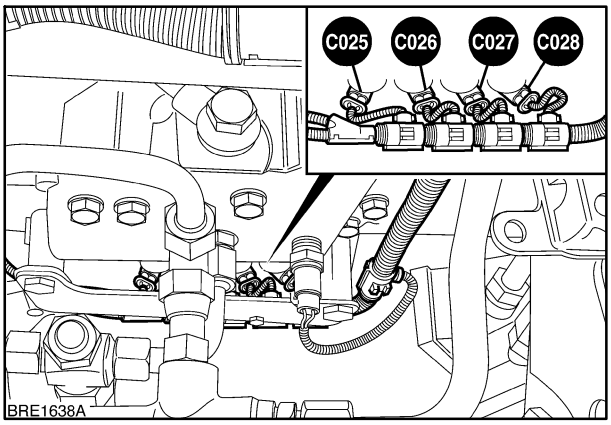
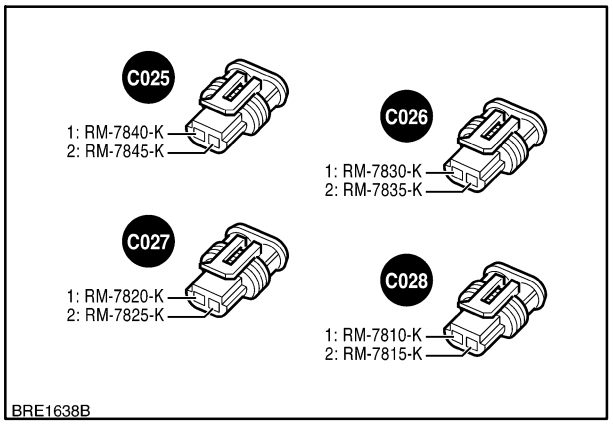
1810


C025
C026
C027
C028
BRE1638A


C025
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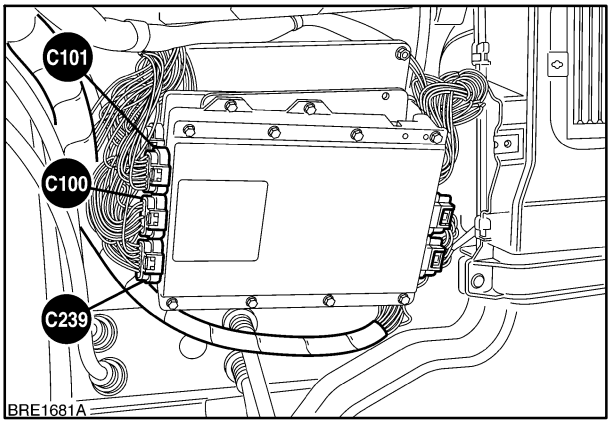
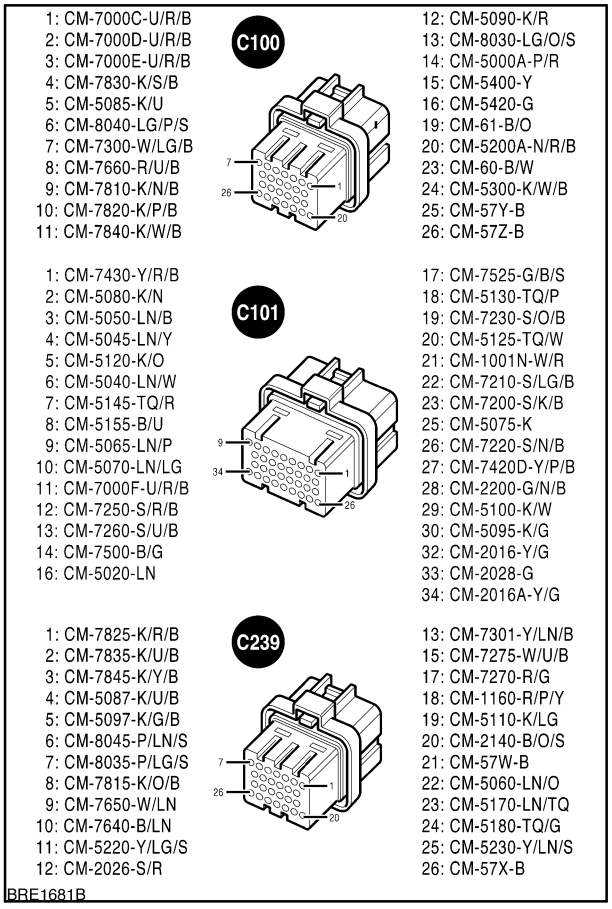
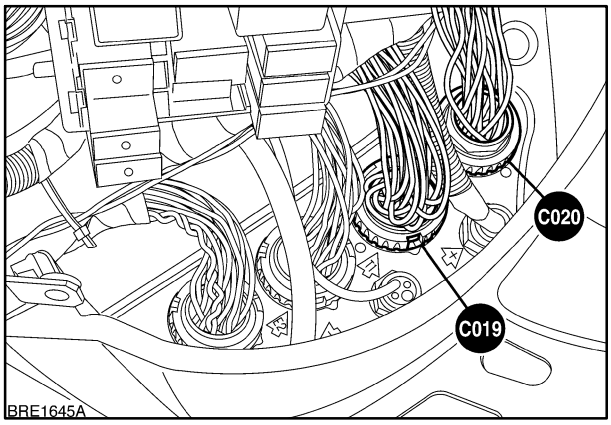
2: RM-7845-K
C026
1: RM-7830-K
2: RM-7835-K
C027
1: RM-7820-K
2: RM-7825-K
C028
1: RM-7810-K
2: RM-7815-K
BRE1638B

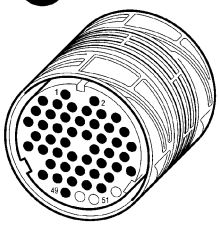

C101
C100
C239
BRE1681A


1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
C100
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
C101
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
C239
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B
BRE1681B



BRE1645A

C019



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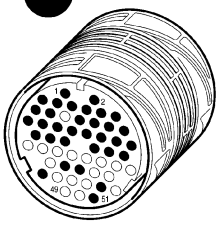
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2046 - FUSE 35 OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty fuse 35
2. Faulty connector
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check fuse 35.

   A. If a fault is indicated with fuse 35, replace with a correctly rated fuse and test the system for normal operation. If the fuse fails again, continue to step 2.

   B. If the fuse is okay, continue to step 3.

2. Check for a short to ground.

   A. Disconnect the controller connector **C100**, and remove fuse 35. Check between connector **C100** pin **14** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, remove and replace the controller

3. Check connector **C100**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

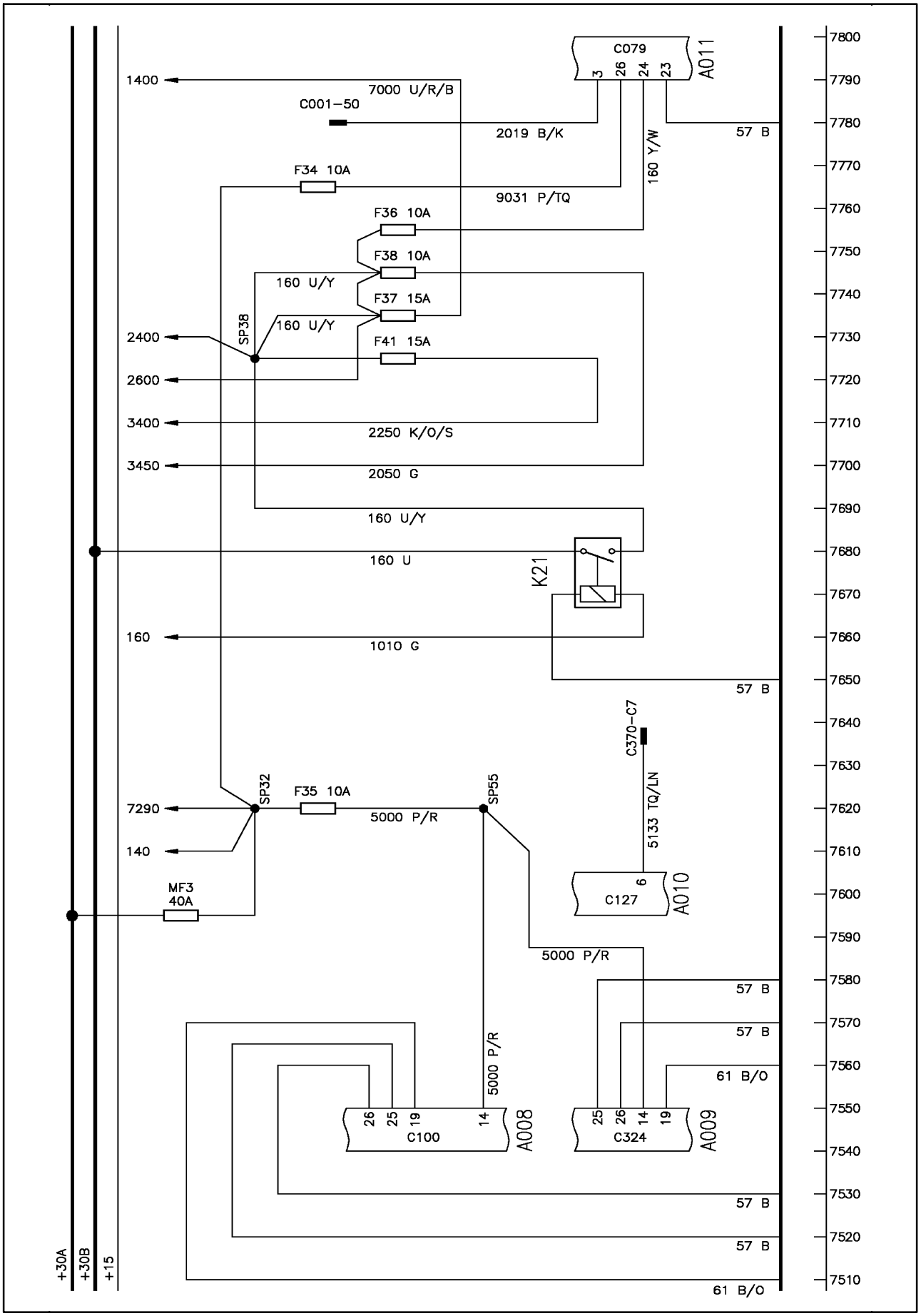
   B. If the connector is okay, continue to step 4.

4. Check for +12 Volts.

   A. Disconnect the connector **C100**. Turn the keystart ON.

   Measure the voltage between connector **C100** pin **14** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C079
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3
26
24
23
1400
7000 U/R/B
C001-50
2019 B/K
57 B
160 Y/W
F34 10A
9031 P/TQ
F36 10A
F38 10A
160 U/Y
F37 15A
160 U/Y
SP38
2400
F41 15A
2600
3400
2250 K/O/S
3450
2050 G
160 U/Y
160 U
K21
160
1010 G
57 B
C370-C7
SP32
F35 10A
SP55
7290
5000 P/R
5133 TQ/LN
140
MF3
40A
6
C127
A010
5000 P/R
57 B
57 B
5000 P/R
61 B/O
26
25
19
14
C100
A008
25
26
14
19
C324
A009
57 B
57 B
61 B/O
+30A
+30B
+15
7800
7790
7780
7770
7760
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7740
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7710
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7690
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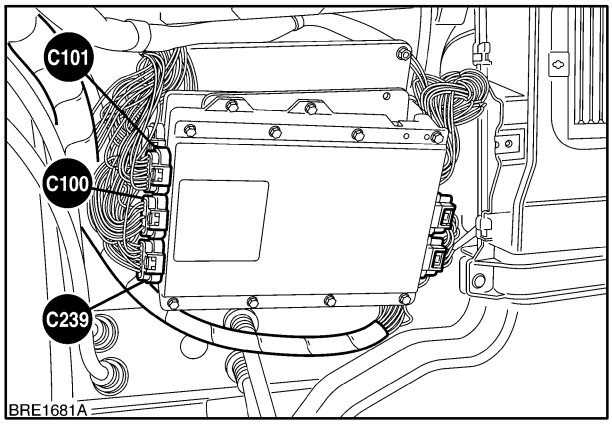
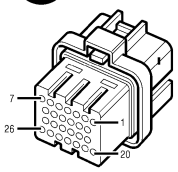


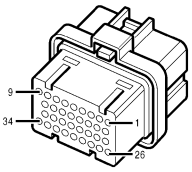
BRE1681A

C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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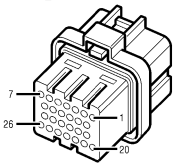
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2047 – CLUTCH DISCONNECT SWITCH SET TOO HIGH

Possible failure modes:

1. Faulty connector
2. Incorrect clutch pedal potentiometer calibration
3. Incorrect clutch disconnect switch adjustment
4. Faulty clutch disconnect switch
5. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch pedal potentiometer in H7.

   A. Operate the clutch pedal. If the values displayed do not change continuously between 0 to 99, perform the clutch potentiometer calibration procedure.

   B. If the values displayed are okay, continue to step 2.

2. Check the clutch disconnect switch adjustment.

   A. Depress the clutch pedal. While still in H7, check that the disconnect switch operates between open and closed, indicated by “o” or “c”, when the pedal is being raised between 5 – 15%. Adjust the disconnect switch as required.

   B. If the disconnect switch is adjusted correctly, continue to step 3.

3. Check the clutch disconnect switch connector **C076** and the controller connectors **C100** and **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.

4. Check the clutch disconnect switch.

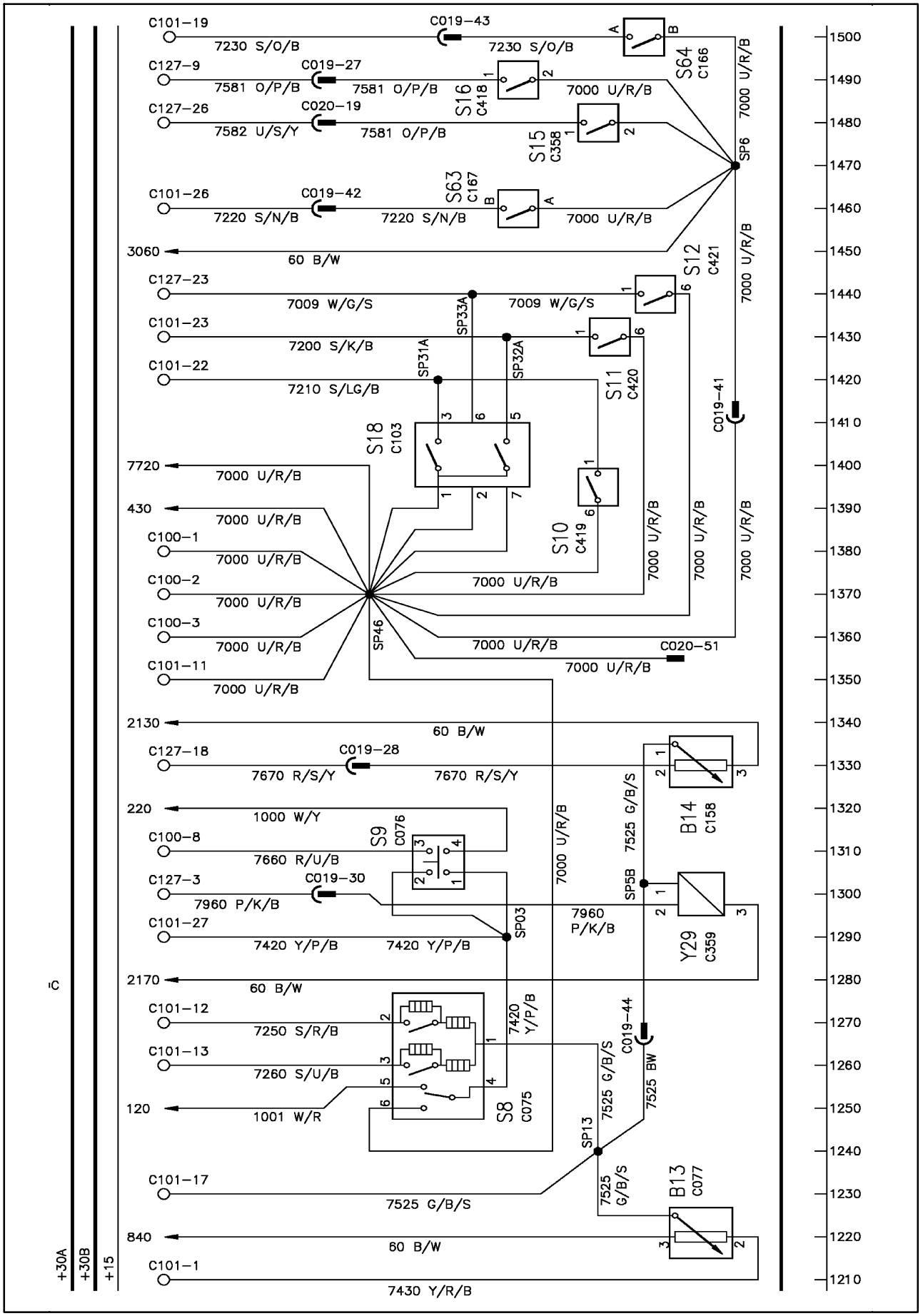
   A. Disconnect connector **C076**. Check between the component side of connector:

   C076 pin **2 (Y/P/B)** and **C076** pin **3 (R/U/B)** should indicate a closed circuit with the pedal released and an open circuit with the pedal depressed.

   C076 pin **1 (Y/P/B)** and **C076** pin **4 (W/Y)** should indicate an open circuit with the pedal released and a closed circuit with the pedal depressed.

   If the switch is not okay, remove and replace the clutch disconnect switch.

   B. If the switch is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
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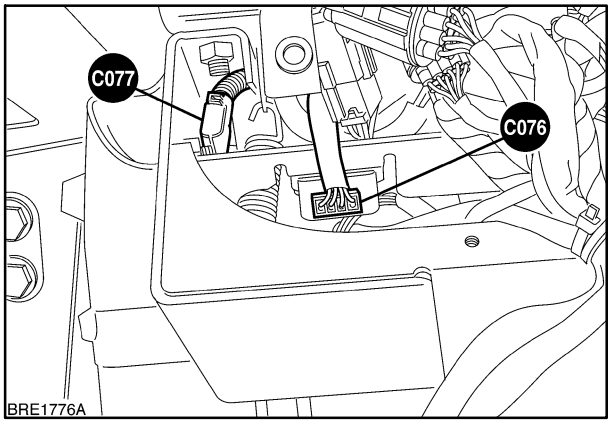
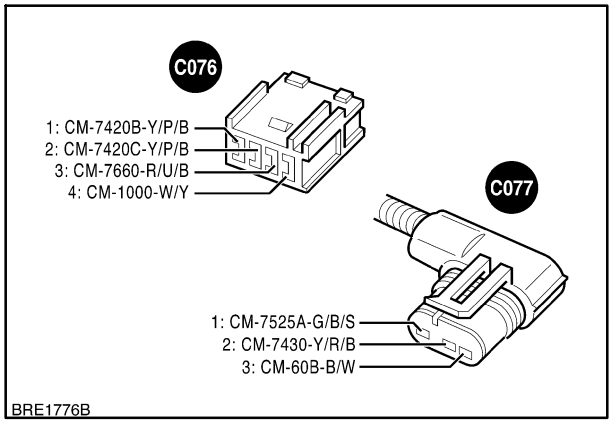
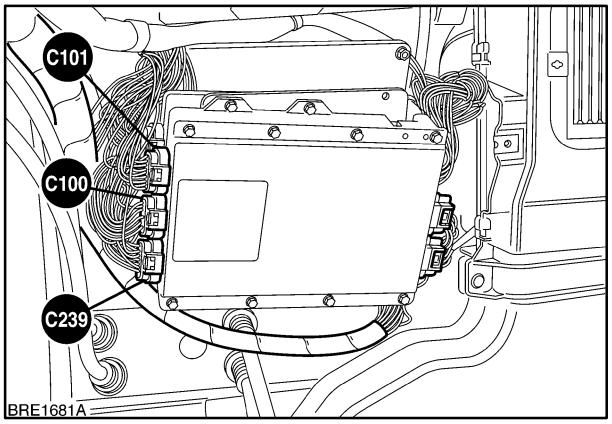
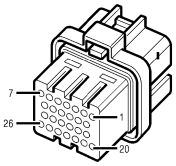




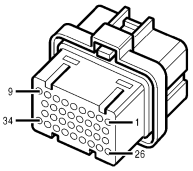


C100



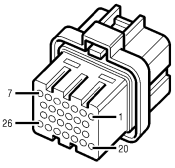
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2048 – CLUTCH DISCONNECT SWITCH SET TOO LOW

Possible failure modes:

1. Faulty connector
2. Incorrect clutch pedal potentiometer calibration
3. Incorrect clutch disconnect switch adjustment
4. Faulty clutch disconnect switch
5. Faulty harness
6. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch pedal potentiometer in H7.

   A. Operate the clutch pedal. If the values displayed do not change continuously between 0 to 99, perform the clutch potentiometer calibration procedure.

   B. If the values displayed are okay, continue to step 2.

2. Check the clutch disconnect switch adjustment.

   A. Depress the clutch pedal. While still in H7, check that the disconnect switch operates between open and closed, indicated by “o” or “c”, when the pedal is being raised between 5 – 15%. Adjust the disconnect switch as required.

   B. If the disconnect switch is adjusted correctly, continue to step 3.

3. Check the clutch disconnect switch connector **C076** and the secondary controller connectors **C100** and **C101**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.

4. Check the clutch disconnect switch.

   A. Disconnect connector **C076**. Check between the component side of connector:

   C076 pin **2 (Y/P/B)** and **C076** pin **3 (R/U/B)** should indicate a closed circuit with the pedal released and an open circuit with the pedal depressed.

   C076 pin **1 (Y/P/B)** and **C076** pin **4 (W/Y)** should indicate an open circuit with the pedal released and a closed circuit with the pedal depressed.

   If the switch is not okay, remove and replace the clutch disconnect switch.

   B. If the switch is okay, continue to step 5.

5. Check for a short to +Ve voltage.

   A. Disconnect the shuttle lever connector **C075**. Turn the keystart ON. Check between connector:

   C076 pin **3 (R/U/B)** and **ground**

   C076 pin **2 (Y/P/B)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 6.

6. Check for a short circuit or short to ground.

   A. Turn the keystart OFF. Disconnect connectors **C100** and **C101**. Check between connector:

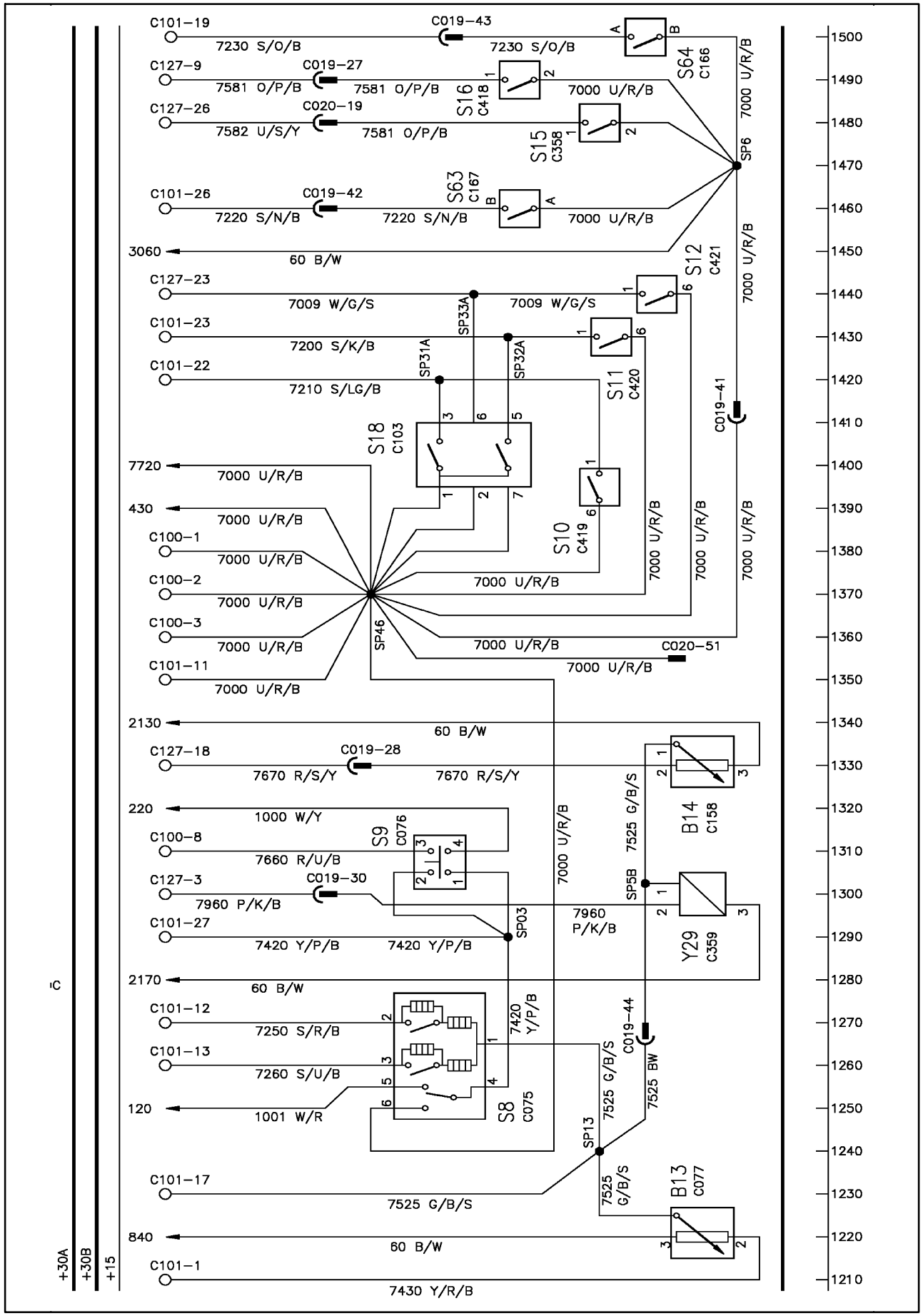
   C076 pin **2 (Y/P/B)** and **C076** pin **3 (R/U/B)**

   C076 pin **3 (R/U/B)** and **ground**

   C076 pin **2 (Y/P/B)** and **ground**

   If a short circuit or short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
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1470
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1450
1440
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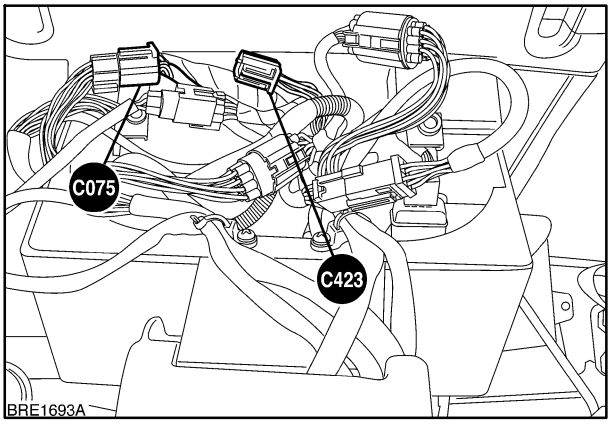

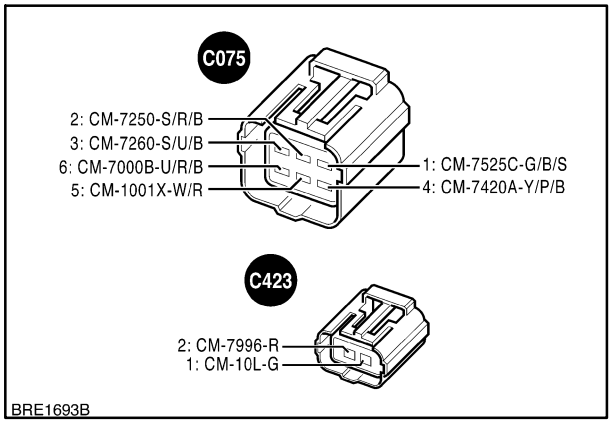

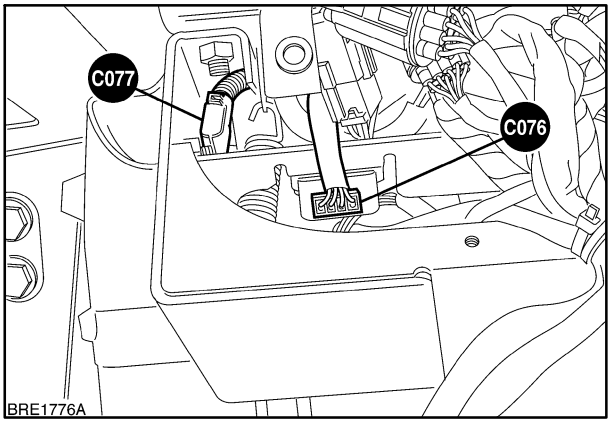

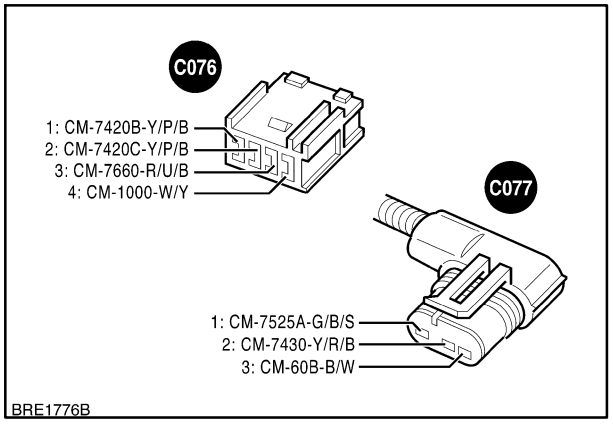

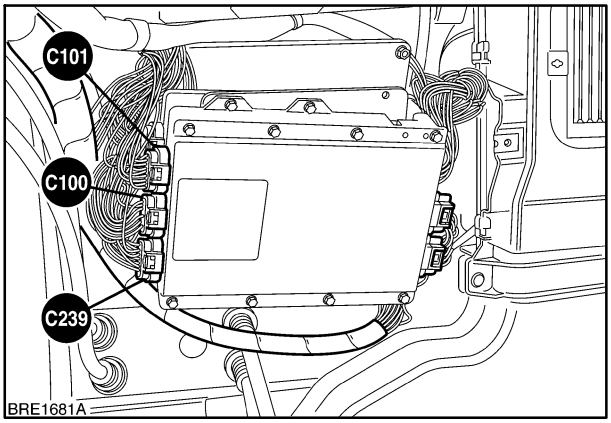

C100

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2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101

1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2049 - WHEEL SPEED SENSOR OPEN CIRCUIT, SHORT TO GROUND OR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty wheel speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the wheel speed sensor connector **C046** the controller connectors **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the wheel speed sensor.

   A. Disconnect connector **C046**. Measure the resistance between the component side of connector.

   C046 pin **1** and **2**. If the resistance indicated is not between 0.8 K Ohms - 1.2 K Ohms at 20 degrees centigrade, remove and replace the wheel speed sensor.

   B. If the wheel speed sensor is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector:

   C046 pin **1 (Y)** and **C101** pin **34 (Y/G)**

   C046 pin **2 (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If a open circuit is not indicated, continue to step 4.

4. Check for short circuit to ground.

   A. Check between connector:

   C046 pin **1 (Y)** and **ground**

   C046 pin **2 (B/W)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for short to +Ve volts.

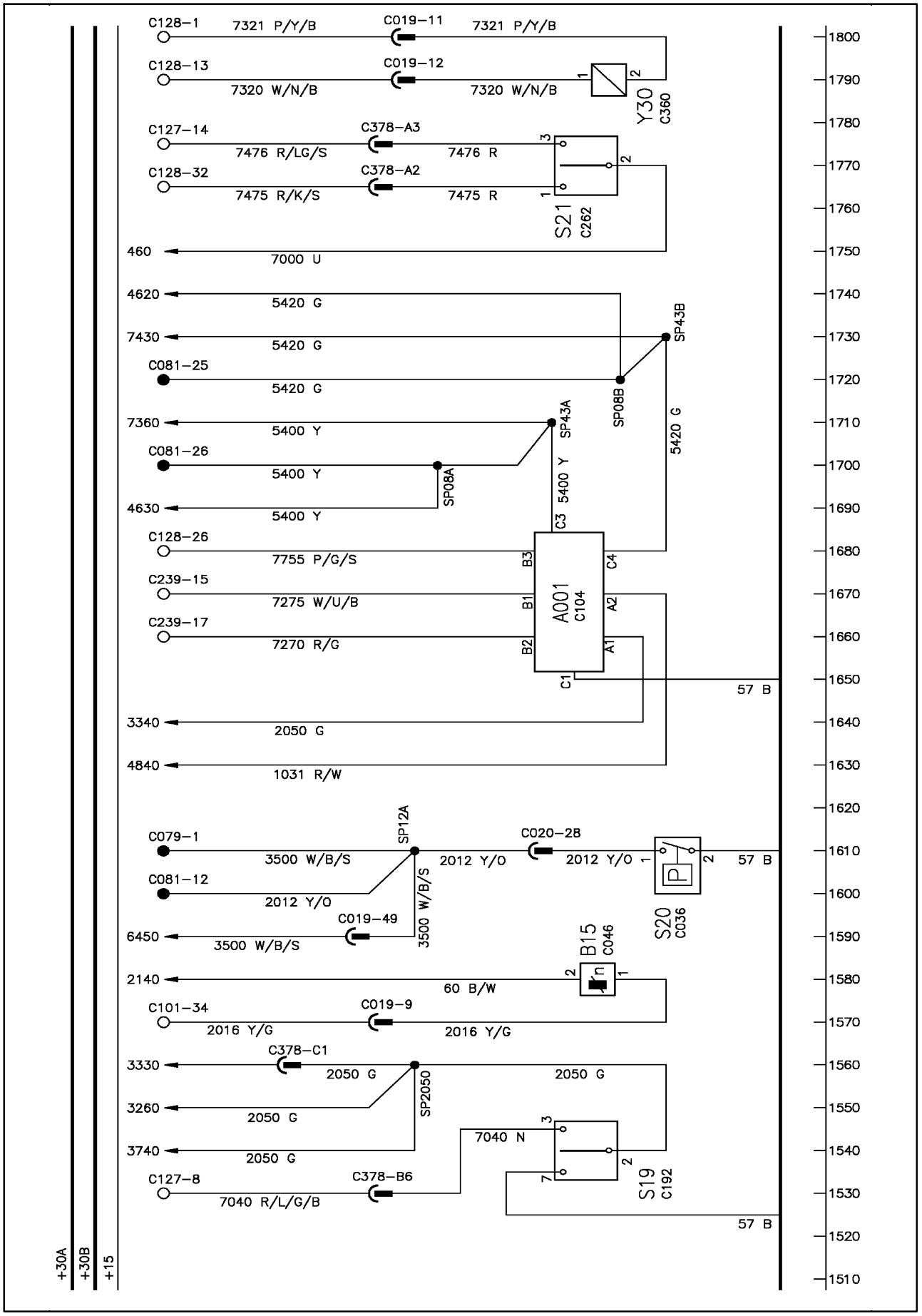
   A. Turn the keystart ON, check between connector:

   C046 pin **1 (Y)** and **ground**

   C046 pin **2 (B/W)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
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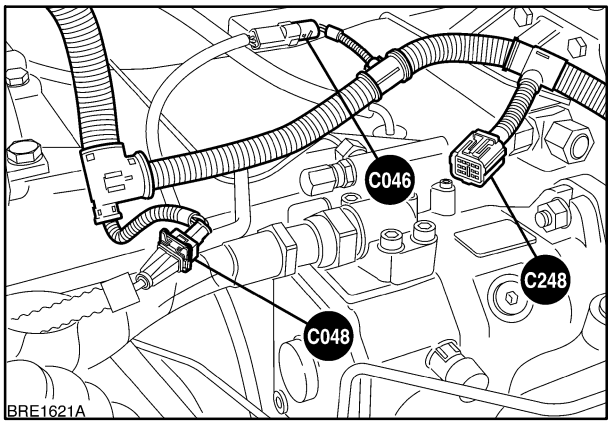
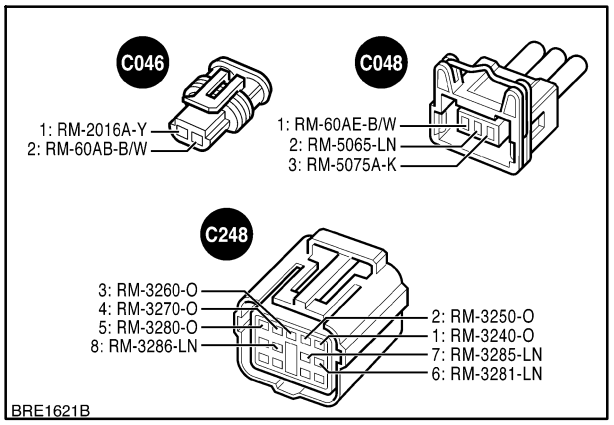
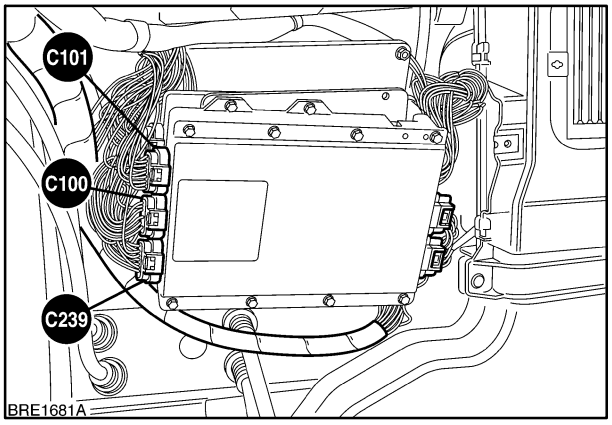
1510



BRE1621A

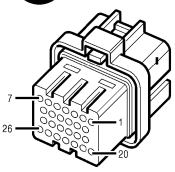


BRE1621B



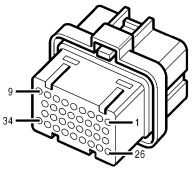
BRE1681A

C100



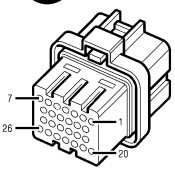
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



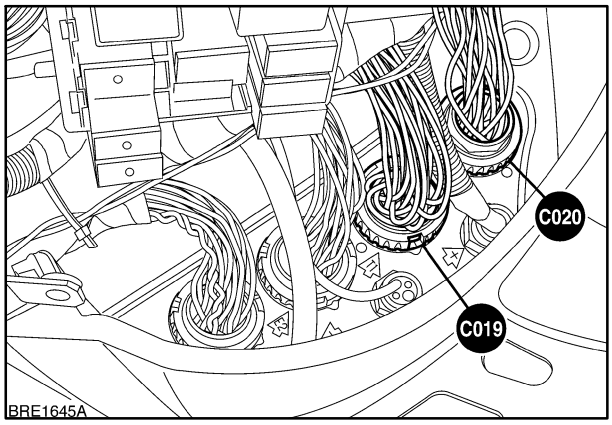
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

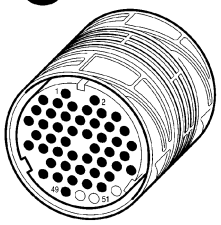


1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

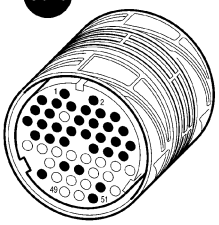


C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2051 – OIL TEMPERATURE SENSOR OPEN CIRCUIT

Effects:

Hot oil is assumed. If the oil is cold, sluggish shifting and a higher than normal clutch pedal bite point will be indicated.

Possible failure modes:

1. Faulty connector
2. Faulty oil temperature sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the transmission oil temperature sensor in H9 Channel 1.

   A. The value will change dependant on temperature, at 40 degrees centigrade 75% is displayed, if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 1 wiggle the harness, the transmission oil temperature sensor connector **C023**, the controller connector **C101** and the inline harness connector **C019** to check for an intermittent circuit. Channel 1 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the temperature sensor connector **C023**, controller connector **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the temperature sensor.

   A. Disconnect connector **C023**. Measure the resistance between the component side of connector:

   If the resistance indicated is not between 460 Ohms – 540 Ohms at 25 degrees centigrade, remove and replace the temperature sensor.

   B. If the temperature sensor is okay, continue to step 4.
4. Check for an open circuit.

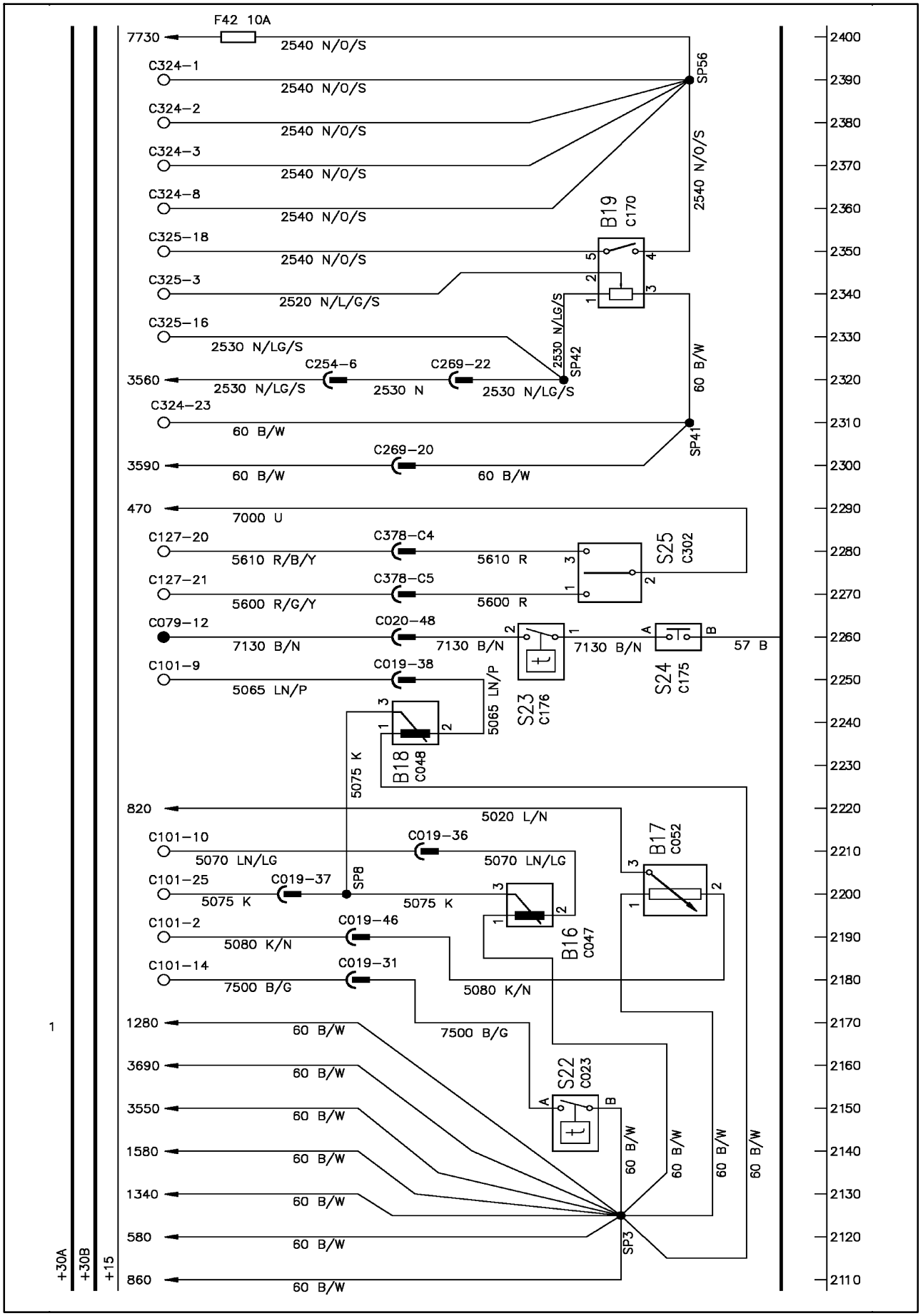
   A. Disconnect connector **C101**. Check between connector:

   C023 pin **A (B/G)** and **C101** pin **14 (B/G)**

   C023 pin **B (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N/LG/S
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19 C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25 C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S24 C175
57 B
S23 C176
B18 C048
5075 K
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B17 C052
B16 C047
1280
3690
3550
1580
1340
580
860
S22 C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
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2250
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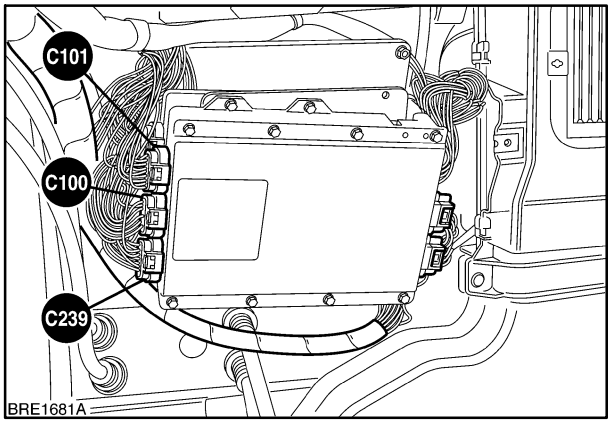
2110

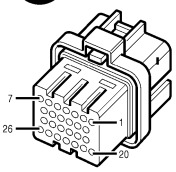
All Transmissions



BRE1681A

C100

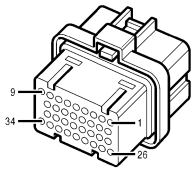
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B



12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101

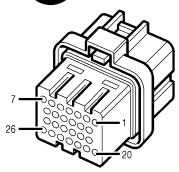
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN



17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

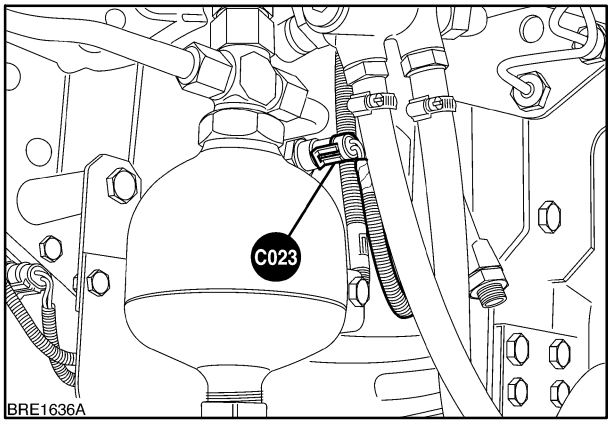
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R



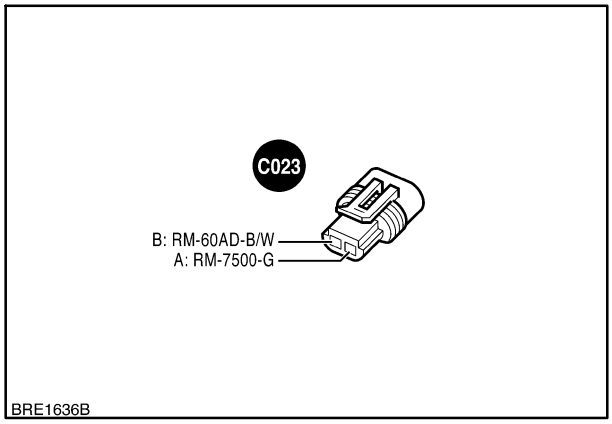
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

16x16 Transmission

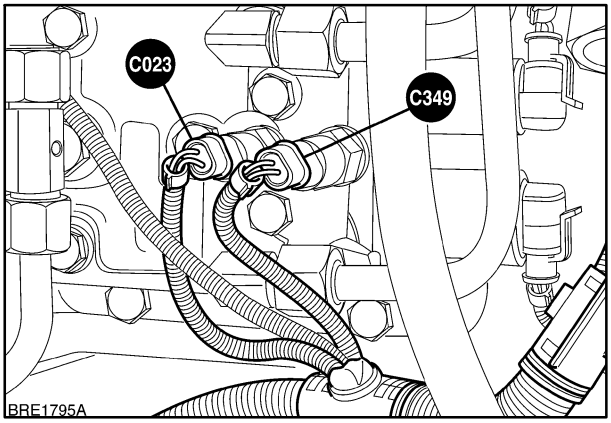


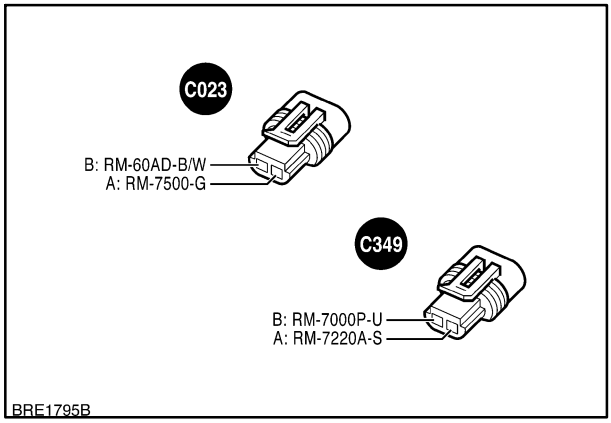
BRE1636A



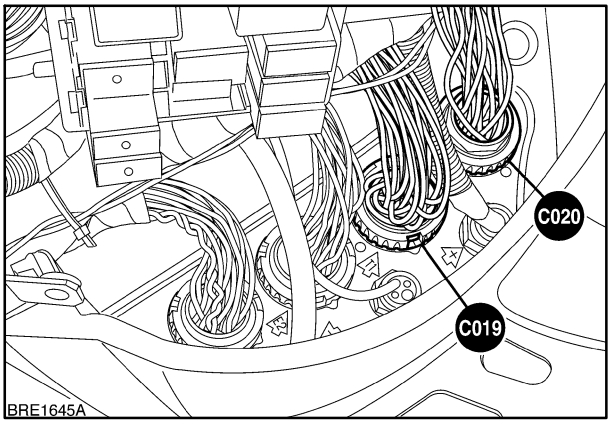
BRE1636B

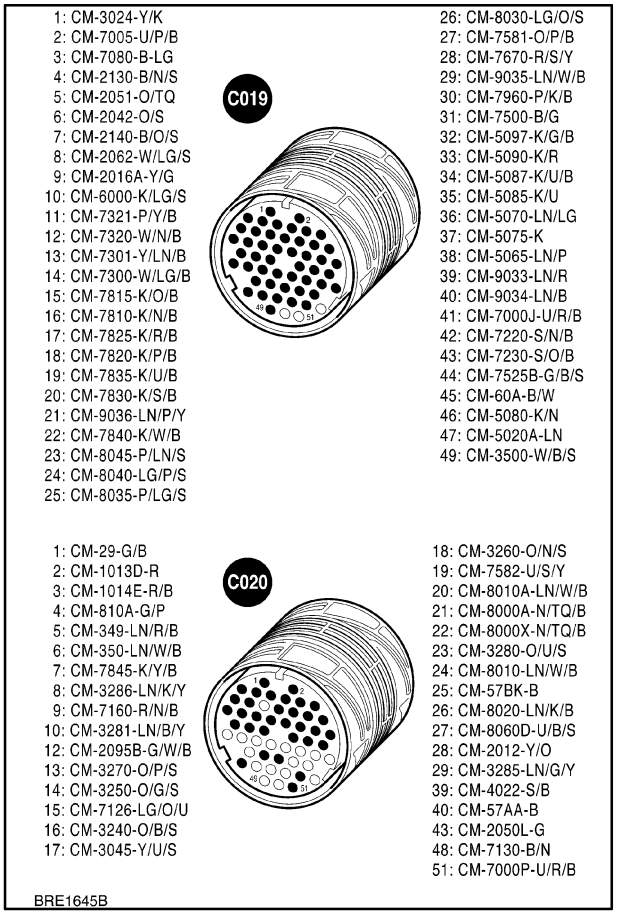
24x24 Transmission





All Transmissions





ERROR CODE 2052 – OIL TEMPERATURE SENSOR SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Hot oil is assumed. If the oil is cold, sluggish shifting and a higher than normal clutch pedal bite point will be indicated

Possible failure modes:

1. Faulty connector
2. Faulty oil temperature sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the transmission oil temperature sensor in H9 Channel 1.

   A. The value will change dependant on temperature, at 40 degrees centirgrade 75% is displayed, if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 1 wiggle the harness, the transmission oil temperature sensor connector **C023**, the controller connector **C101** and the inline harness connector **C019** to check for an intermittent circuit. Channel 1 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the temperature sensor connector **C023**, the controller connector **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the temperature sensor for a short to ground.

   A. Disconnect connector **C023**. Check between the component side of connector:

   C023 pin **A** and **ground**

   C023 pin **B** and **ground**

   If short to ground is indicated, remove and replace the temperature sensor.

   B. If the temperature sensor is okay, continue to step 4.

4. Check for short to ground.

   A. Disconnect connector **C101**. Check between connector:

   C023 pin **A (G)** and **ground**

   C023 pin **B (B/W)** and **ground**

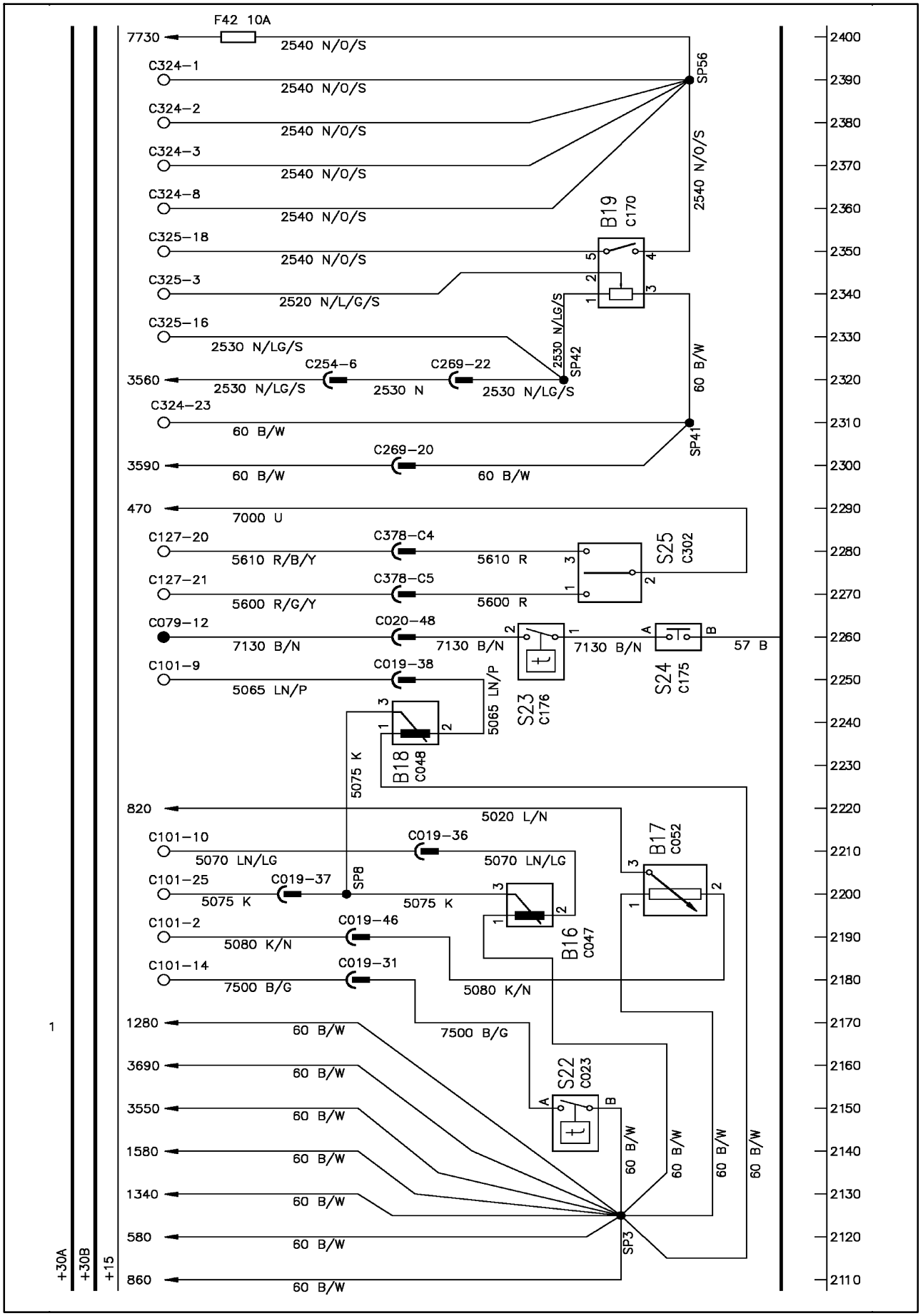
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C023** pin **A (B/G)** and **ground**. If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


F42 10A
7730
2540 N/O/S
C324-1
C324-2
C324-3
C324-8
C325-18
C325-3
2520 N/L/G/S
C325-16
2530 N/LG/S
C254-6
C269-22
3560
2530 N
C324-23
60 B/W
C269-20
3590
SP56
SP42
SP41
B19
C170
470
7000 U
C127-20
5610 R/B/Y
C378-C4
5610 R
C127-21
5600 R/G/Y
C378-C5
5600 R
S25
C302
C079-12
7130 B/N
C020-48
C101-9
5065 LN/P
C019-38
S24
C175
S23
C176
B18
C048
5075 K
57 B
820
5020 L/N
C101-10
5070 LN/LG
C019-36
C101-25
5075 K
C019-37
SP8
C101-2
5080 K/N
C019-46
C101-14
7500 B/G
C019-31
B17
C052
B16
C047
1280
3690
3550
1580
1340
580
860
S22
C023
SP3
+30A
+30B
+15
1
2400
2390
2380
2370
2360
2350
2340
2330
2320
2310
2300
2290
2280
2270
2260
2250
2240
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2200
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2180
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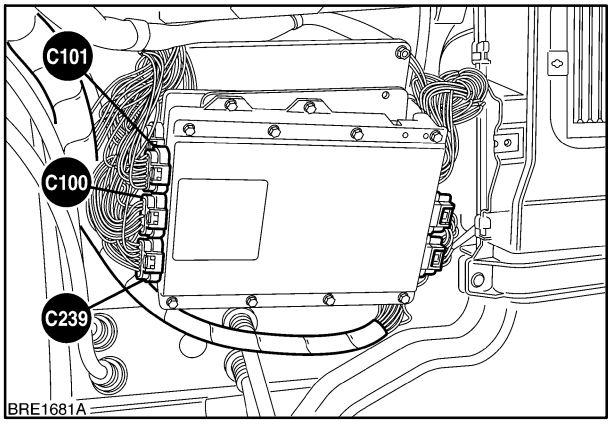
2130
2120
2110

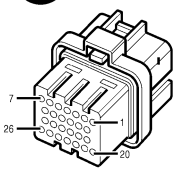
All Transmissions



BRE1681A

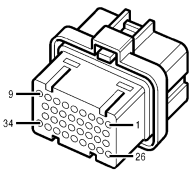
C100

1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B



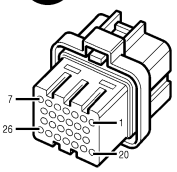
C101

1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G



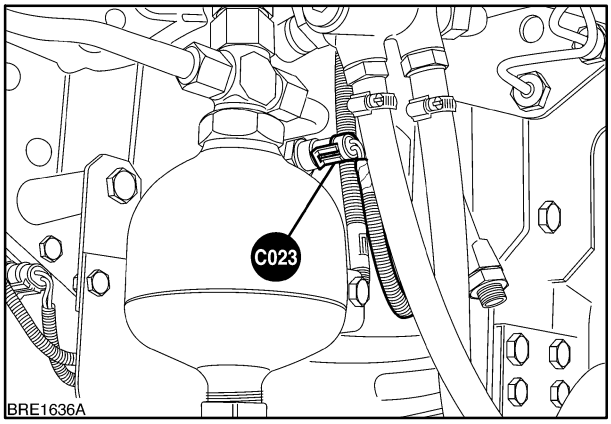
C239

1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

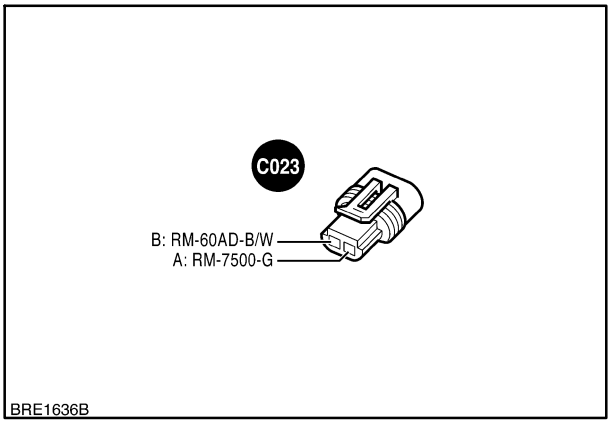


BRE1681B

16x16 Transmission

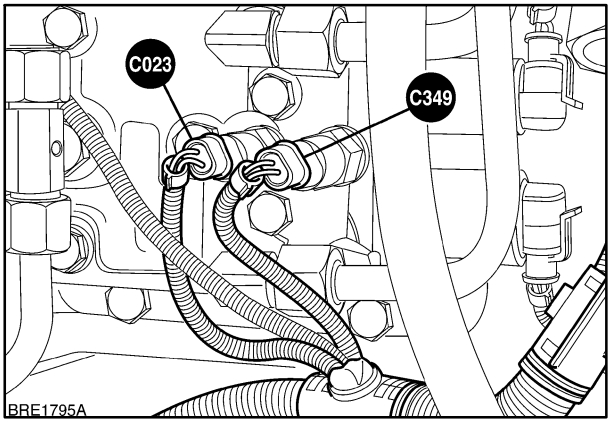


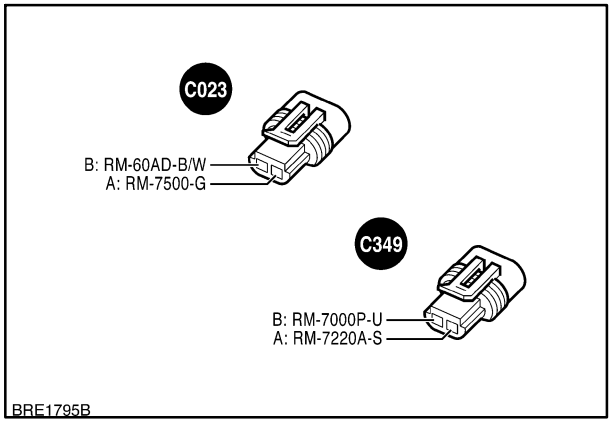
BRE1636A



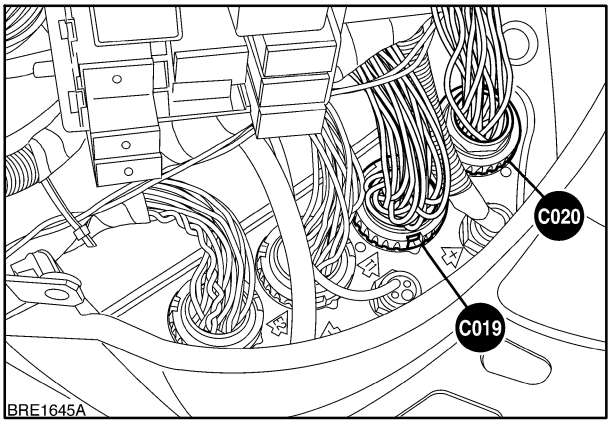
BRE1636B

24x24 Transmission





All Transmissions



C019

1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020

1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2053 - +5 VOLT REFERENCE VOLTAGE TOO HIGH

Effects:

Transmission disabled.

Possible failure modes:

1. Faulty clutch pedal potentiometer
2. Faulty 4/5 syncro potentiometer
3. Faulty Forward/Reverse potentiometer
4. Faulty Shuttle lever Forward/Reverse switch
5. Faulty harness
6. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If other error codes are displayed, continue with these tests.

   B. If no other error codes are displayed, continue to step 2.
2. Check the clutch pedal potentiometer.

   A. Disconnect the clutch pedal potentiometer connector **C077**. Clear error codes and re-check, if 2053 is cleared, remove and replace the clutch pedal potentiometer.

   B. If error code 2053 is still displayed, continue to step 3.
3. Check the 4/5 syncro potentiometer.

   A. Disconnect the 4/5 syncro potentiometer connector **C359**. Clear error codes and re-check, if 2053 is cleared, remove and replace the forward/reverse shuttle lever.

   B. If error code 2053 is still displayed, continue to step 4.
4. Check the Forward/Reverse potentiometer

   A. Disconnect the Forward/Reverse potentiometer connector **C157**. Clear error codes and re-check, if 2053 is cleared, remove and replace the Forward/Reverse potentiometer.

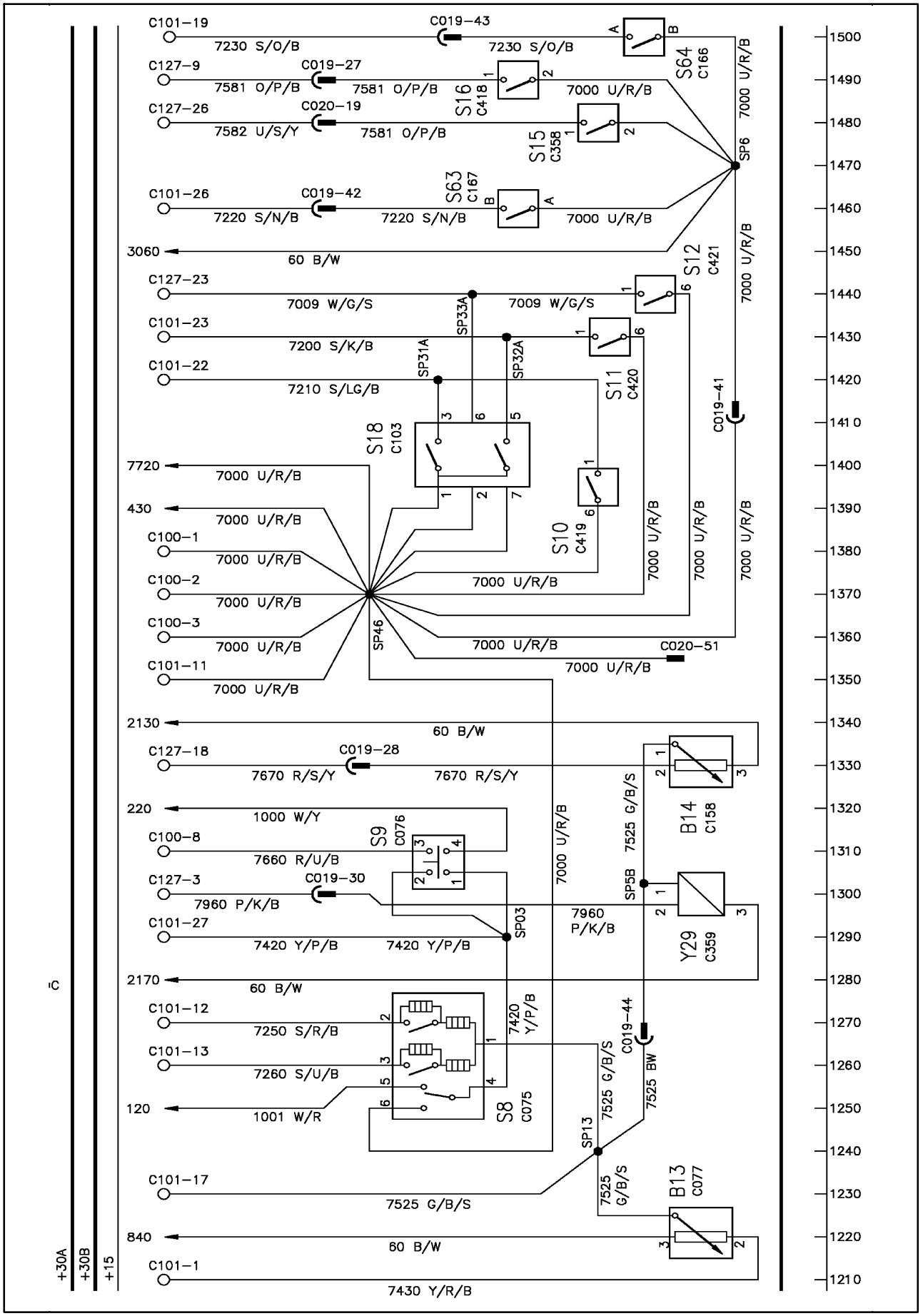
   B. If error code 2053 is still displayed, continue to step 5.
5. Check the shuttle lever switch.

   A. Disconnect the shuttle lever Forward/Reverse switch connector **C075**. Clear error codes and re-check, if 2053 is cleared, remove and replace the shuttle lever switch.

   B. If error code 2053 is still displayed, continue to step 6.
6. Check for a short to +8 and +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C101** pin **17 (G/B/S)** and **ground**. If the voltage indicated is above +5 volts, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
C101-11
7000 U/R/B
S10 C419
7000 U/R/B
SP46
C020-51
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
7525 G/B/S
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
SP5B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
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1420
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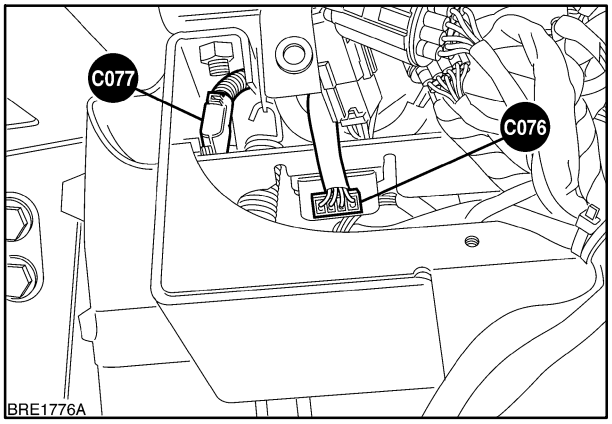
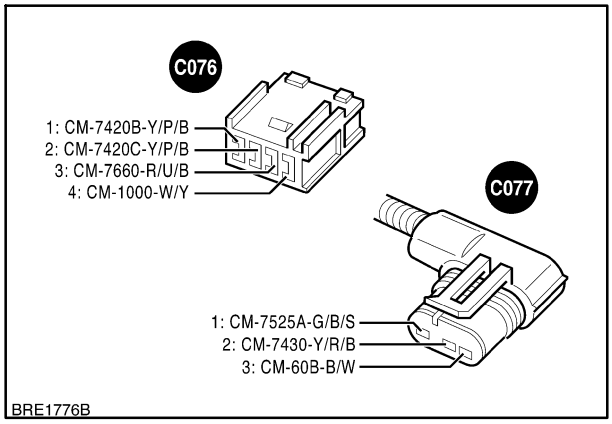
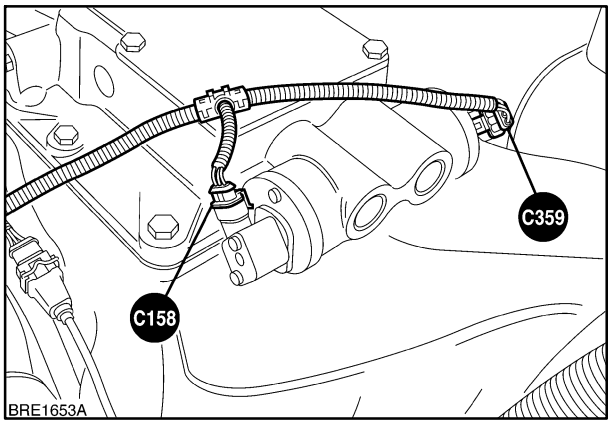
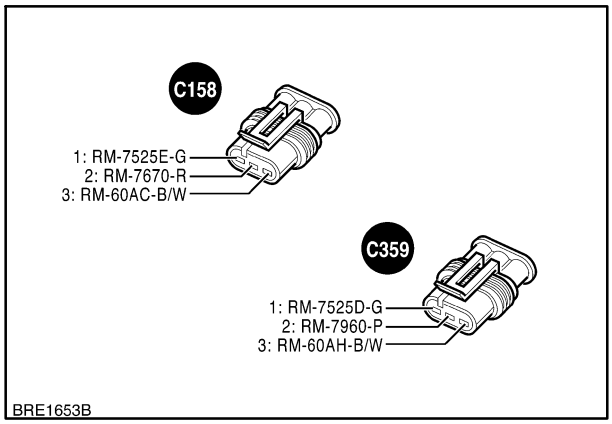
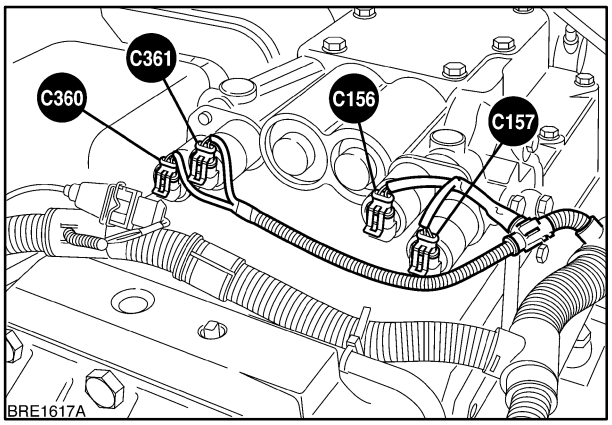
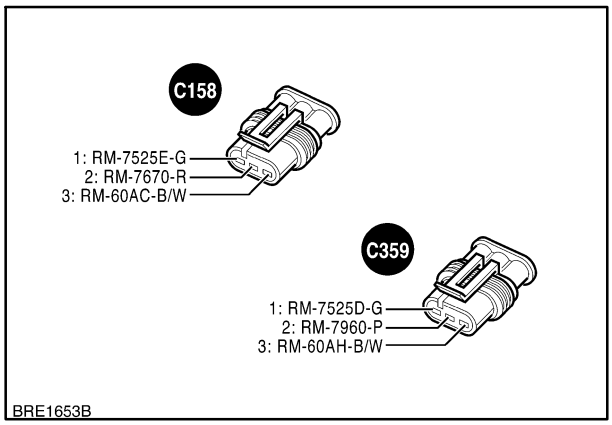

C077
C076
BRE1776A

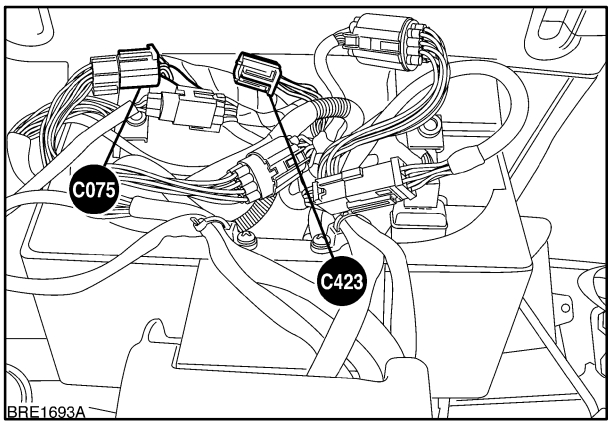

C076
1: CM-7420B-Y/P/B
2: CM-7420C-Y/P/B
3: CM-7660-R/U/B
4: CM-1000-W/Y
C077
1: CM-7525A-G/B/S
2: CM-7430-Y/R/B
3: CM-60B-B/W
BRE1776B

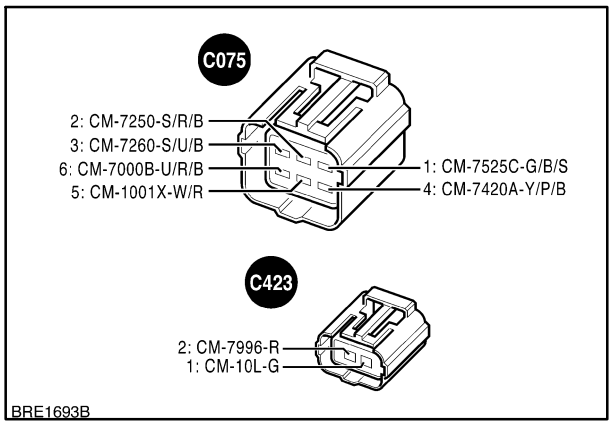

C359
C158
BRE1653A

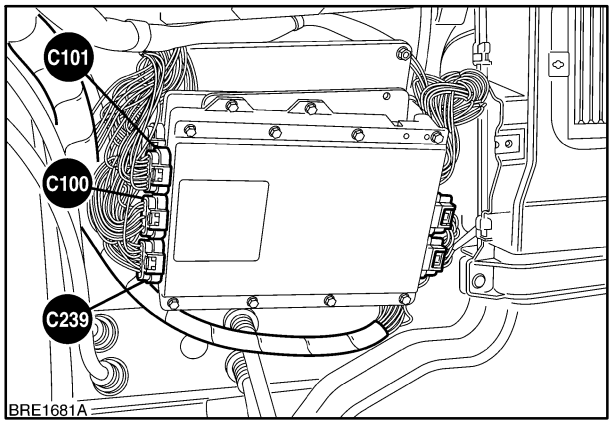

C158
1: RM-7525E-G
2: RM-7670-R
3: RM-60AC-B/W
C359
1: RM-7525D-G
2: RM-7960-P
3: RM-60AH-B/W
BRE1653B


C361
C360
C156
C157
BRE1617A


C158
1: RM-7525E-G
2: RM-7670-R
3: RM-60AC-B/W
C359
1: RM-7525D-G
2: RM-7960-P
3: RM-60AH-B/W
BRE1653B

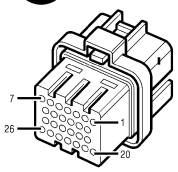

C075
C423
BRE1693A


C075
2: CM-7250-S/R/B
3: CM-7260-S/U/B
6: CM-7000B-U/R/B
5: CM-1001X-W/R
1: CM-7525C-G/B/S
4: CM-7420A-Y/P/B
C423
2: CM-7996-R
1: CM-10L-G
BRE1693B



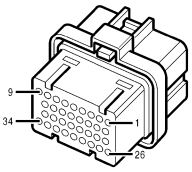
BRE1681A

C100



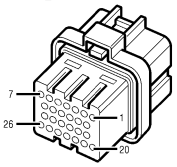
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2054 - +5 VOLT REFERENCE VOLTAGE TOO LOW

Effects:

Transmission disabled.

Possible failure modes:

1. Faulty clutch pedal potentiometer
2. Faulty 4/5 syncro potentiometer
3. Faulty Forward/Reverse potentiometer
4. Faulty Shuttle lever Forward/Reverse switch
5. Faulty harness
6. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If other error codes are displayed, continue with these tests.

   B. If no other error codes are displayed, continue to step 2.
2. Check the clutch pedal potentiometer.

   A. Disconnect the clutch pedal potentiometer connector **C077**. Clear error codes and re-check, if 2045 is cleared, remove and replace the clutch pedal potentiometer.

   B. If error code 2054 is still displayed, continue to step 3.
3. Check the 4/5 syncro potentiometer.

   A. Disconnect the 4/5 syncro potentiometer connector **C359**. Clear error codes and re-check, if 2045 is cleared, remove and replace the forward/reverse shuttle lever.

   B. If error code 2054 is still displayed, continue to step 4.
4. Check the Forward/Reverse potentiometer

   A. Disconnect the Forward/Reverse potentiometer connector **C157**. Clear error codes and re-check, if 2045 is cleared, remove and replace the Forward/Reverse potentiometer.

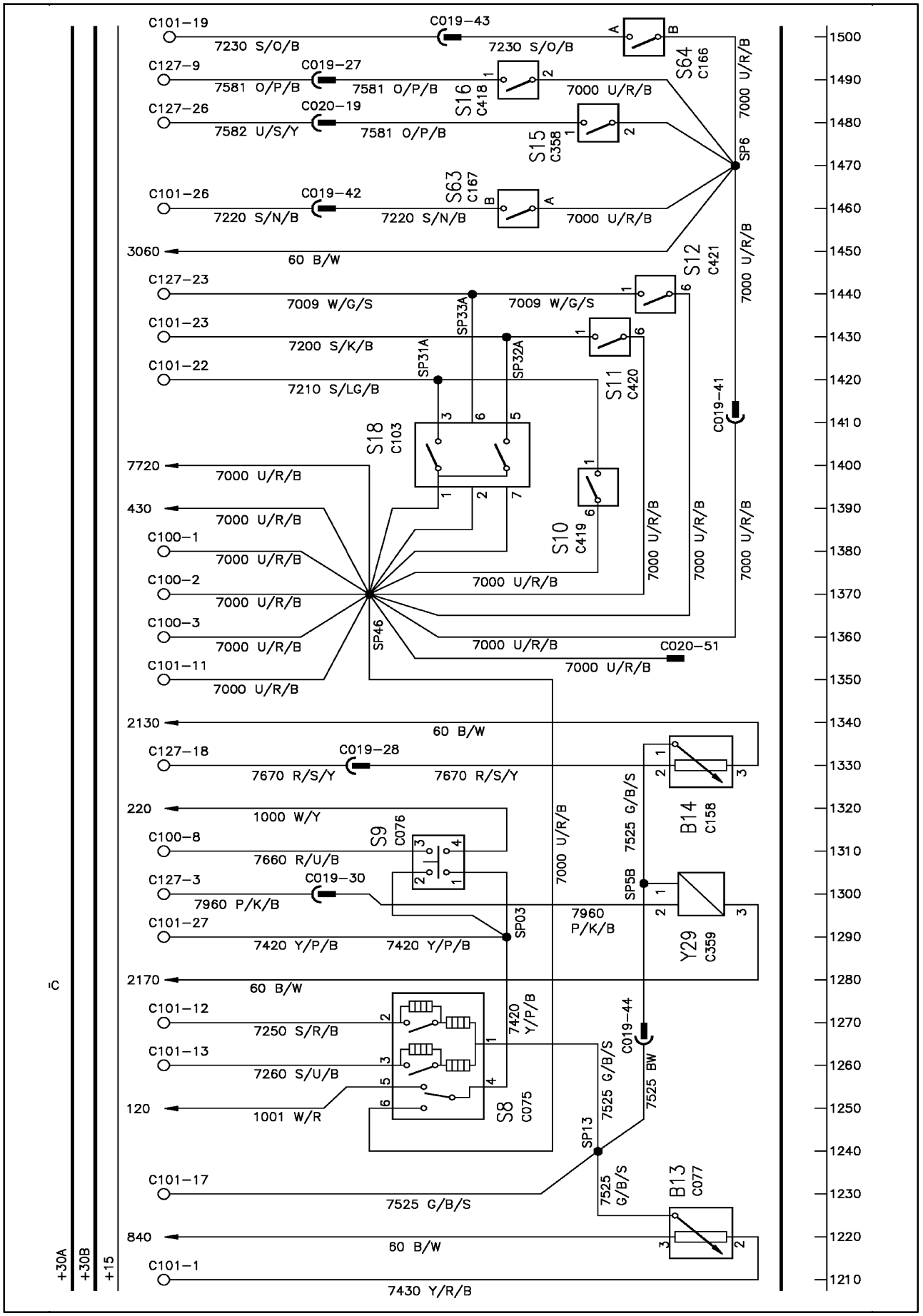
   B. If error code 2054 is still displayed, continue to step 5.
5. Check the shuttle lever switch.

   A. Disconnect the shuttle lever Forward/Reverse switch connector **C75**. Clear error codes and re-check, if 2045 is cleared, remove and replace the shuttle lever switch.

   B. If error code 2054 is still displayed, continue to step 6.
6. Check for a short to ground.

   A. Disconnect the controller connector **C101**. With all of the above connectors disconnected, check between connector **C101** pin **17 (G/B/S)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
C101-11
7000 U/R/B
S10 C419
7000 U/R/B
SP46
C020-51
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7525 G/B/S
SP5B
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
7525 G/B/S
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
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1420
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1390
1380
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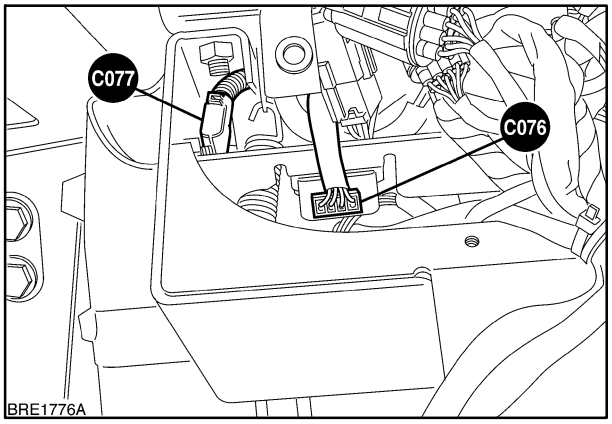
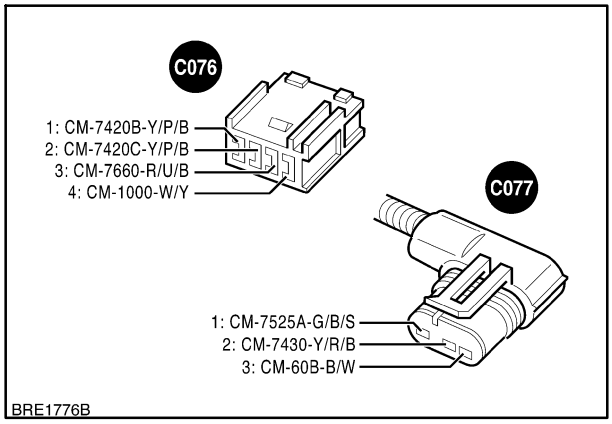
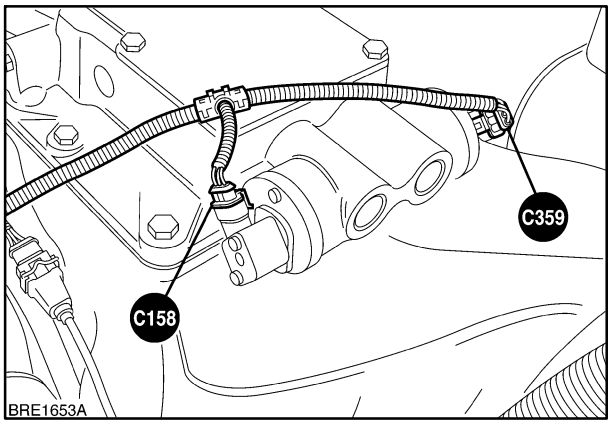
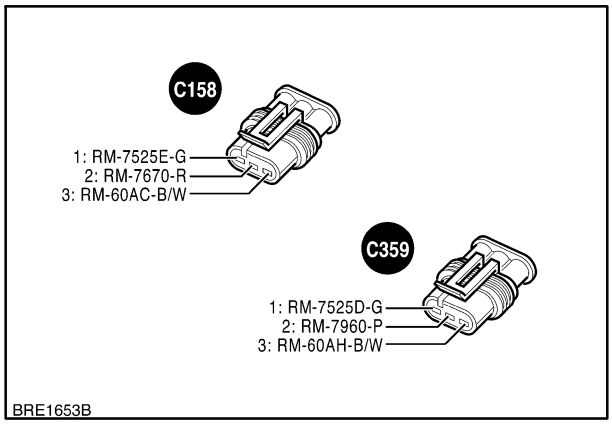
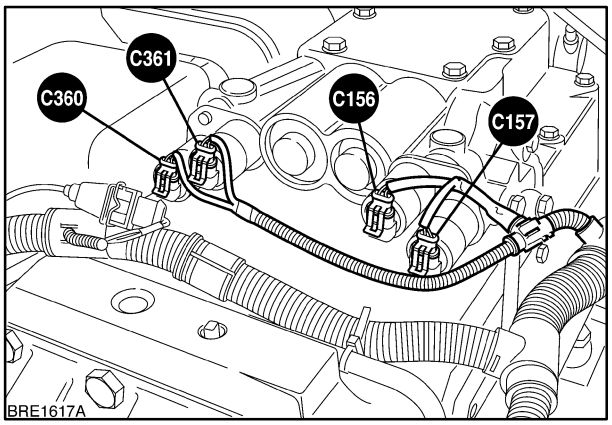
1210

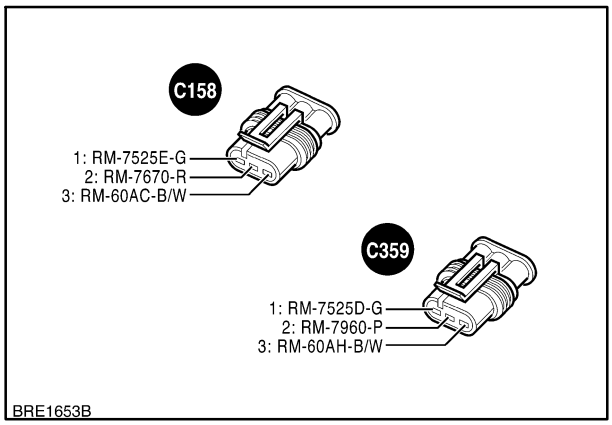

C077
C076
BRE1776A

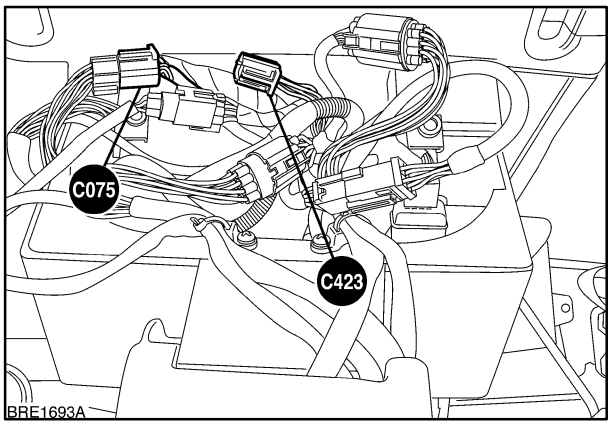

C076
1: CM-7420B-Y/P/B
2: CM-7420C-Y/P/B
3: CM-7660-R/U/B
4: CM-1000-W/Y
C077
1: CM-7525A-G/B/S
2: CM-7430-Y/R/B
3: CM-60B-B/W
BRE1776B

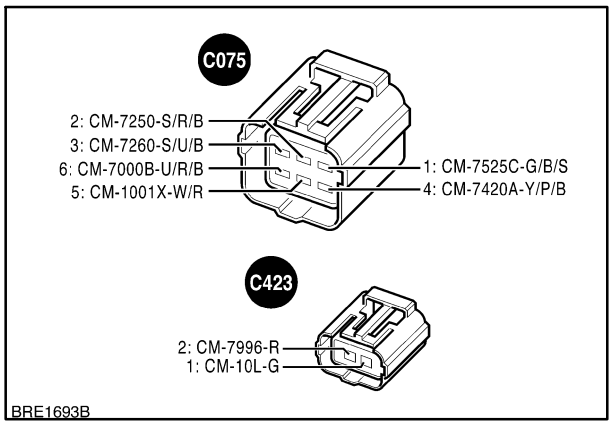

C359
C158
BRE1653A

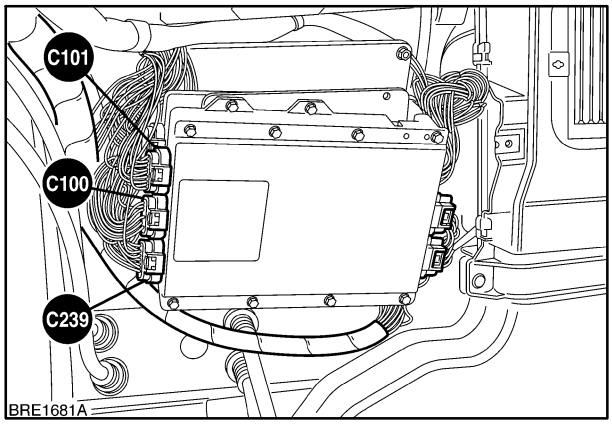

C158
1: RM-7525E-G
2: RM-7670-R
3: RM-60AC-B/W
C359
1: RM-7525D-G
2: RM-7960-P
3: RM-60AH-B/W
BRE1653B


C361
C360
C156
C157
BRE1617A

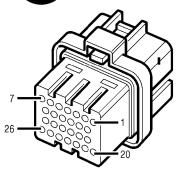

C158
1: RM-7525E-G
2: RM-7670-R
3: RM-60AC-B/W
C359
1: RM-7525D-G
2: RM-7960-P
3: RM-60AH-B/W
BRE1653B


C075
C423
BRE1693A


C075
2: CM-7250-S/R/B
3: CM-7260-S/U/B
6: CM-7000B-U/R/B
5: CM-1001X-W/R
1: CM-7525C-G/B/S
4: CM-7420A-Y/P/B
C423
2: CM-7996-R
1: CM-10L-G
BRE1693B



C100



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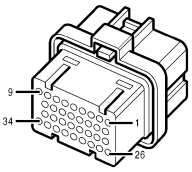
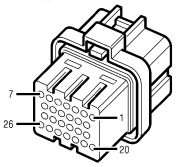
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2055 – NO SIGNAL FROM WHEEL SPEED SENSOR

Possible failure modes:

1. Faulty connectors
2. Faulty wheel speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the wheel speed sensor connector **C046** the controller connector **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the wheel speed sensor.

   A. Disconnect connector **C046**, measure the resistance between the component side of connector.

   C046 pin **1** and **2**. If the resistance indicated is not between 0.8 K Ohms – 1.2 K Ohms at 20 degrees centigrade, remove and replace the wheel speed sensor.

   B. If the wheel speed sensor is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector:

   C046 pin **1 (Y)** and **C101** pin **34 (Y/G)**

   C046 pin **2 (B/W)** and **ground**

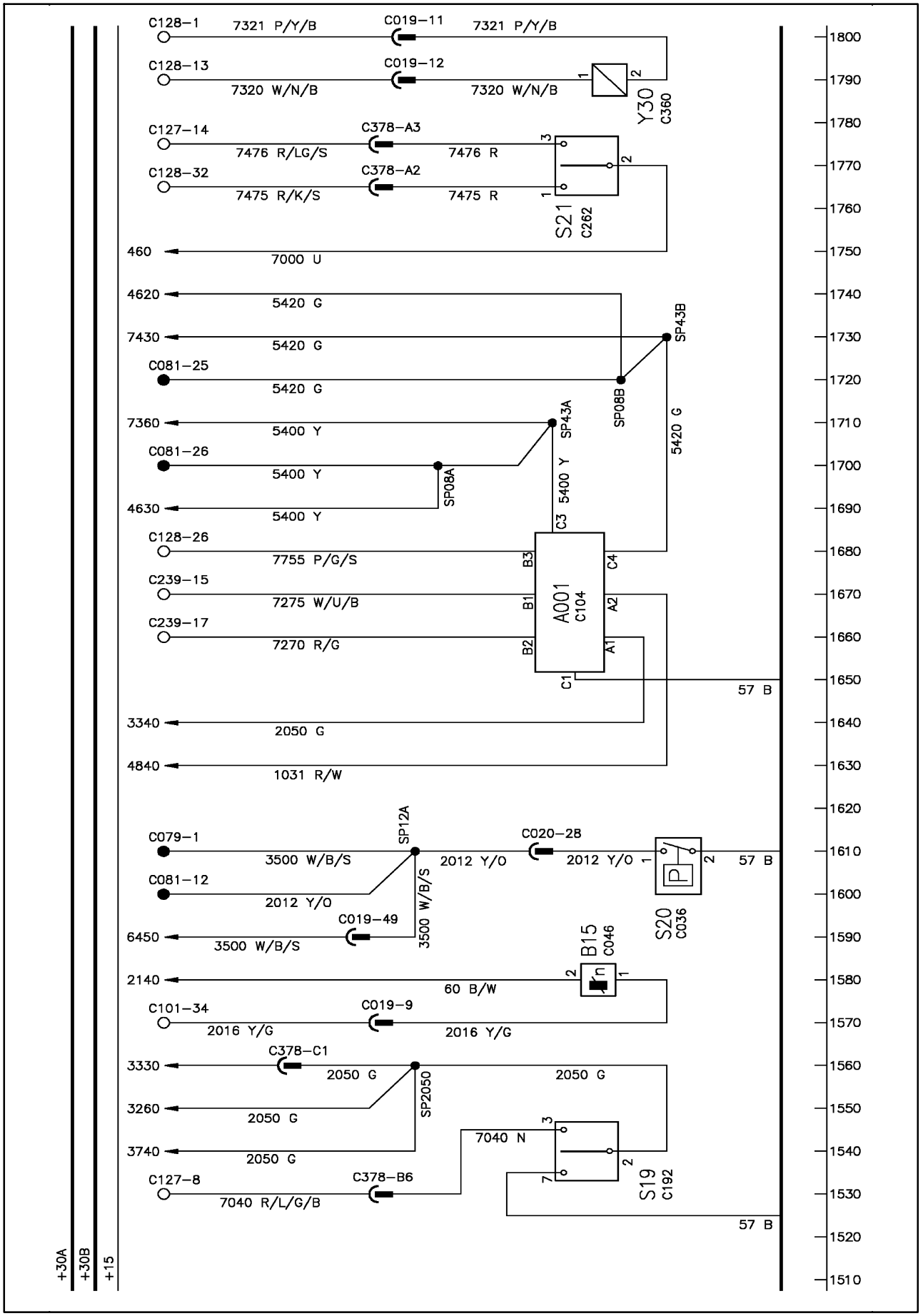
   If an open circuit is indicated, repair or replace the harness as required.

   B. If a open circuit is not indicated, continue to step 4.

4. Check for other wheel speed sensor error codes displayed.

   A. If other error codes are displayed, continue with these tests.

   B. If no other error codes are displayed, download the correct level of software. If fault re–occurs, remove and replace the controller.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
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1780
1770
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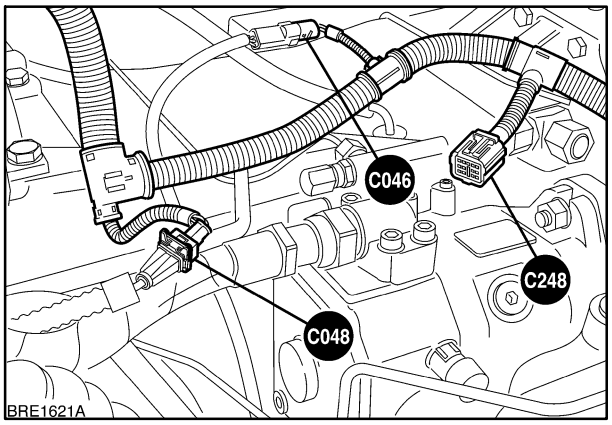
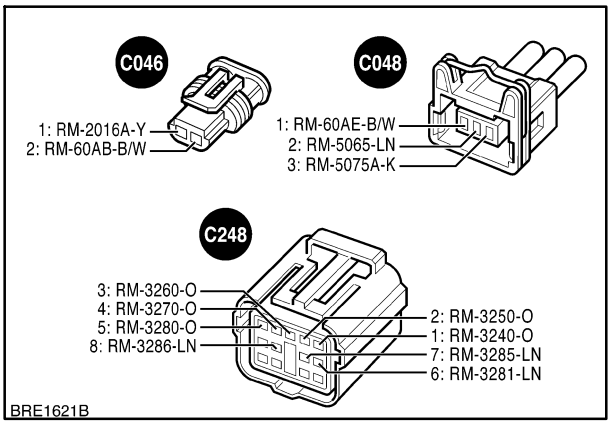


BRE1621A



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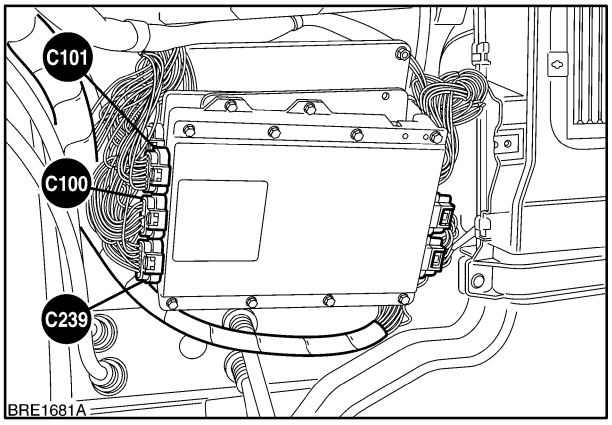

BRE1681A

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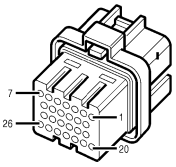

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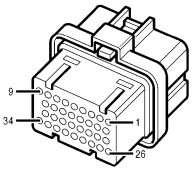
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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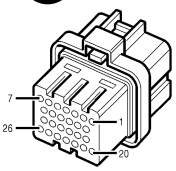
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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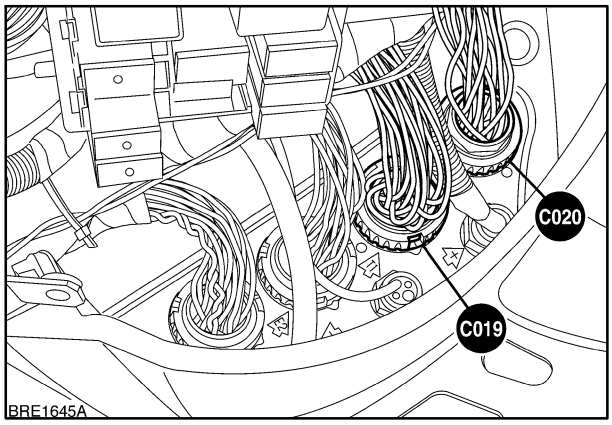
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



BRE1645A

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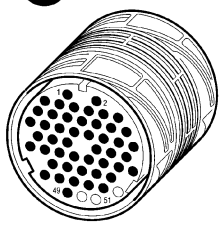

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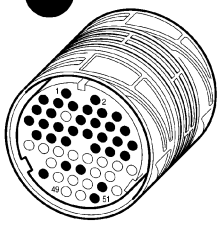
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2056 - LOW RANGE SWITCH OPEN

Possible failure modes:

1. Faulty connector
2. Faulty switch
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Low Range switch in H5.

   A. Turn the keystart ON. Move the shift lever into low range, d27 should be displayed. If the value displayed is okay, while in H5, wiggle the harness, the low range switch connector **C166,** the controller connector **C101** and the inline harness connector **C019** to check for intermittent circuit. The value changes should an intermittent fault be detected, repair or replace as required.

   B. If display is not okay, continue to step 2.

2. Check the low range switch connector **C166**, the controller connector **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check switch operation.

   A. Disconnect connector **C166**, remove and check the operation of the switch and with the aid of a multimeter. Renew and/or replace switch as required.

   B. If switch operation okay, continue to step 4.

4. Check for open circuit

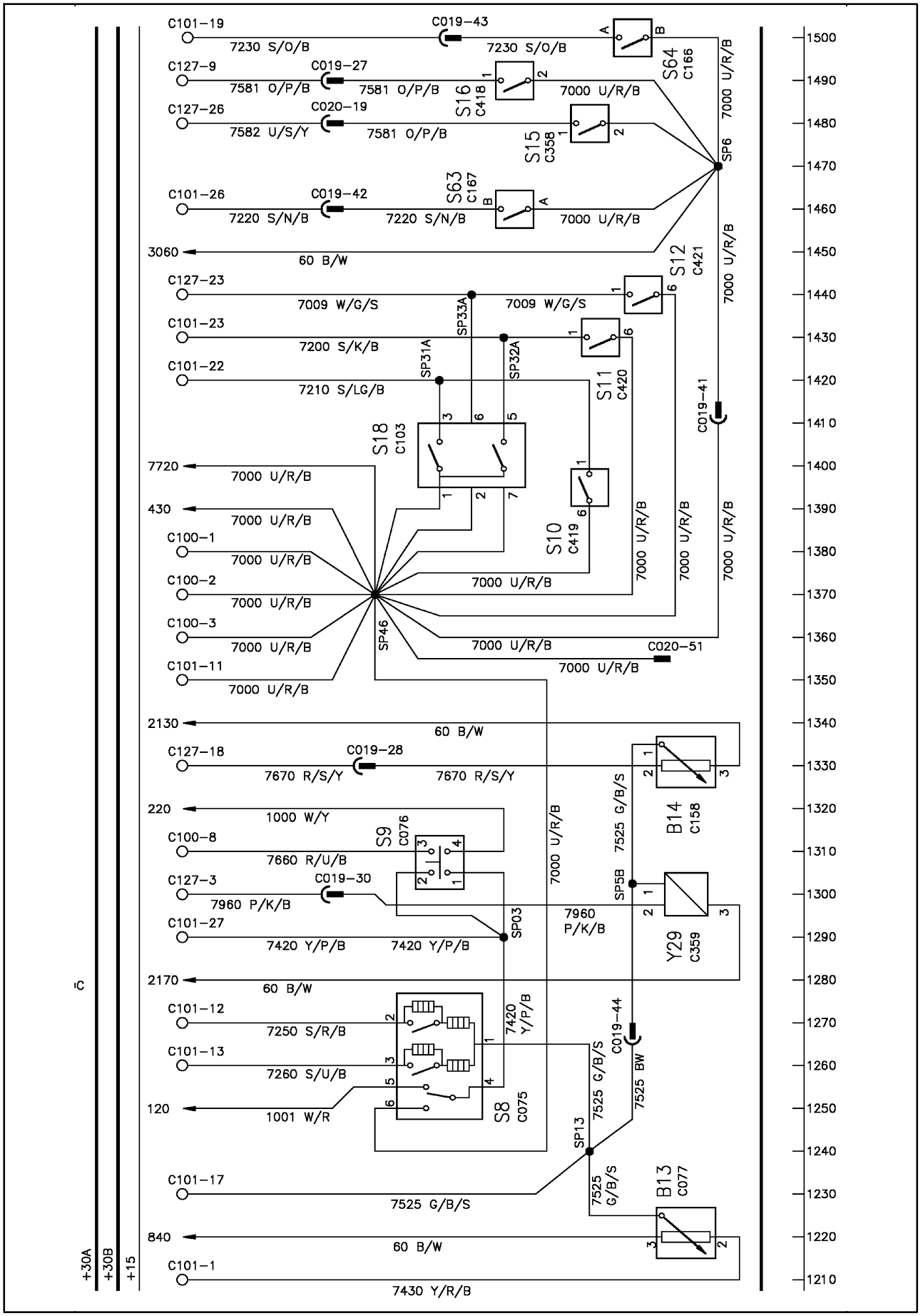
   A. Disconnect the connector **C101**. Check between connector:

   C166 pin **A (S/O/B)** and **C101** pin **19 (S/O/B)**

   C166 pin **A (S/O/B)** and **C101** pin **43 (S/O/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
S9 C076
C100-8
7660 R/U/B
C127-3
C019-30
7960 P/K/B
7525 G/B/S
SP5B
7960 P/K/B
C101-27
SP03
7420 Y/P/B
7420 Y/P/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
7420 Y/P/B
C101-13
7260 S/U/B
C019-44
7525 G/B/S
7525 BW
120
1001 W/R
S8 C075
SP13
C101-17
7525 G/B/S
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
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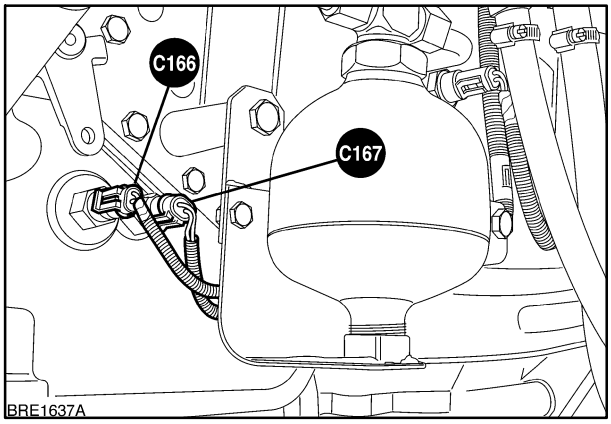

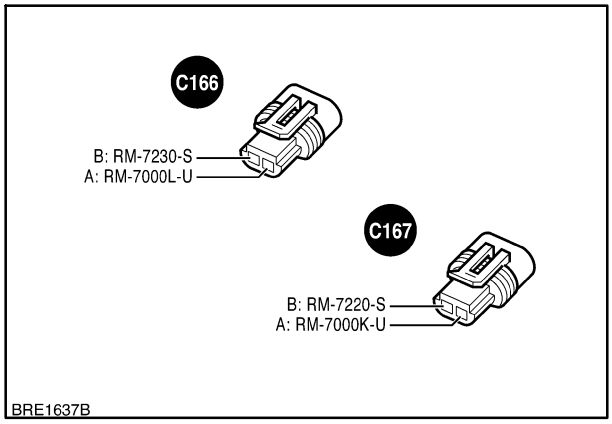

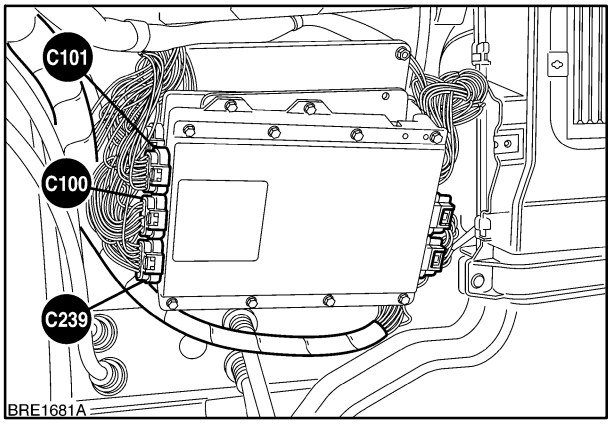

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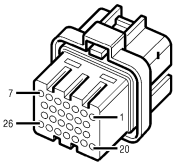
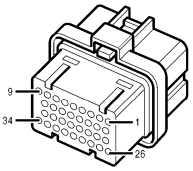


1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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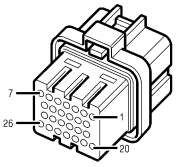
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
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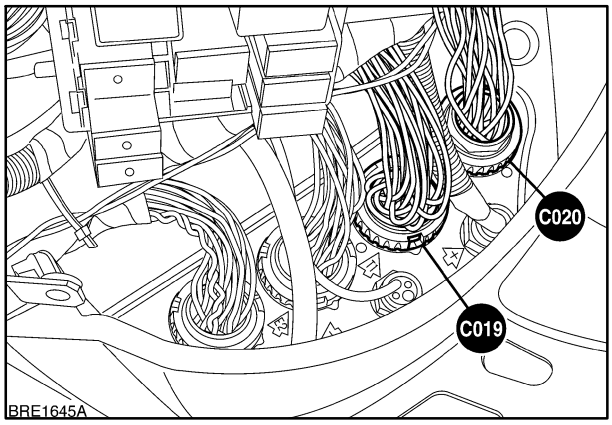
26: CM-57X-B

BRE1681B



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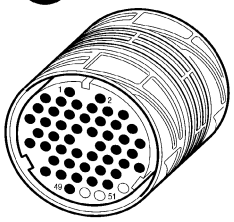

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2: CM-7005-U/P/B
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4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
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29: CM-9035-LN/W/B
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33: CM-5090-K/R
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41: CM-7000J-U/R/B
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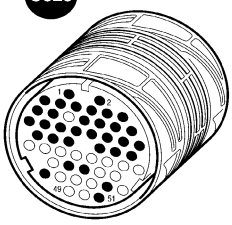
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
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3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
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22: CM-8000X-N/TQ/B
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24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2057 - HIGH RANGE SWITCH OPEN

Possible failure modes:

1. Faulty connector
2. Faulty switch
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the high Range switch in H5.

   A. Turn the keystart ON. Move the shift lever into high range, d26 should be displayed. If the value displayed is okay, while in H5, wiggle the harness, the low range switch connector **C167,** the controller connector **C101** and the inline harness connector **C019** to check for intermittent circuit. The value changes should an intermittent fault be detected, repair or replace as required.

   B. If display is not okay, continue to step 2.

2. Check the low range switch connector **C167**, the controller connector **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check switch operation.

   A. Disconnect connector **C167**, remove and check the operation of the switch and with the aid of a multimeter. Renew and/or replace switch as required.

   B. If switch operation okay, continue to step 4.

4. Check for open circuit

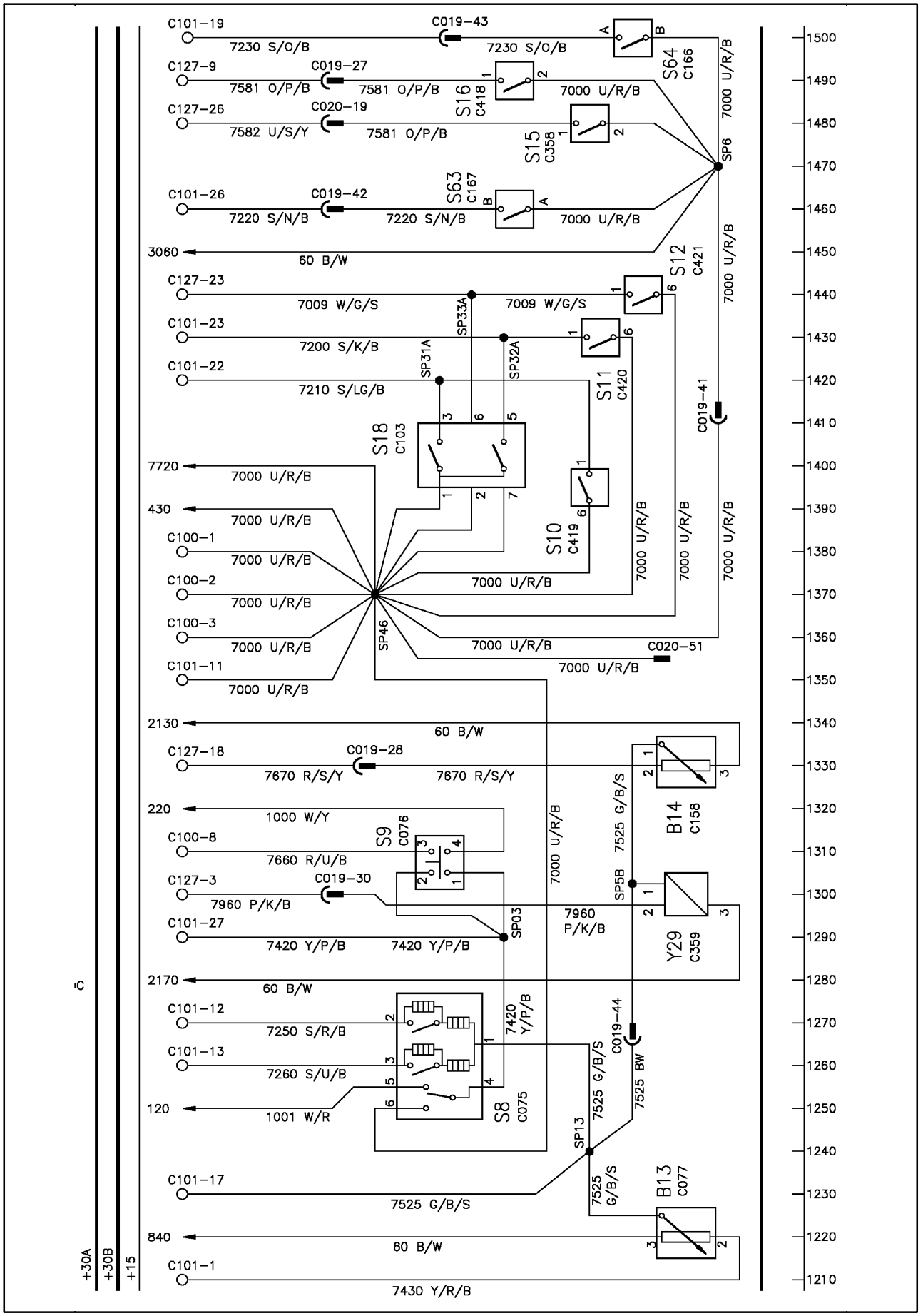
   A. Disconnect the connector **C101**. Check between connector:

   C167pin **A (S/O/B)** and **C101** pin **26 (S/O/B)**

   C167 pin **A (S/O/B)** and **C101** pin **42 (S/O/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
S9 C076
C100-8
7660 R/U/B
C127-3
C019-30
7960 P/K/B
7525 G/B/S
SP5B
7960 P/K/B
C101-27
SP03
7420 Y/P/B
7420 Y/P/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
7420 Y/P/B
C019-44
C101-13
7260 S/U/B
7525 G/B/S
7525 BW
120
1001 W/R
S8 C075
SP13
C101-17
7525 G/B/S
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
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1440
1430
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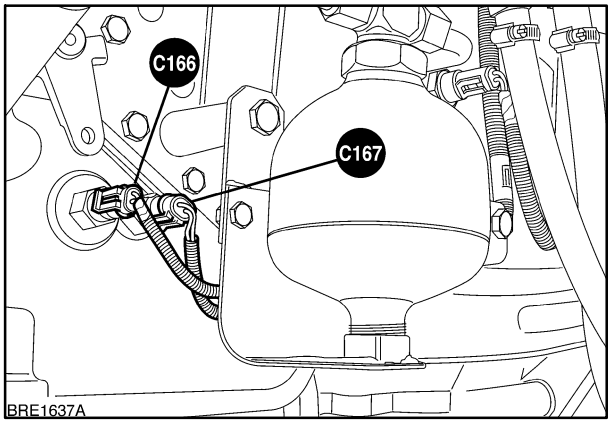
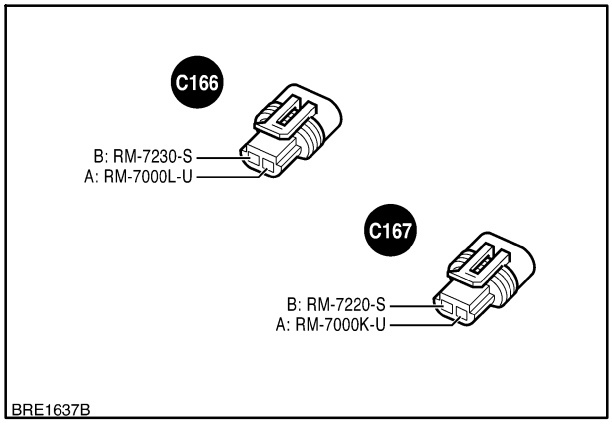
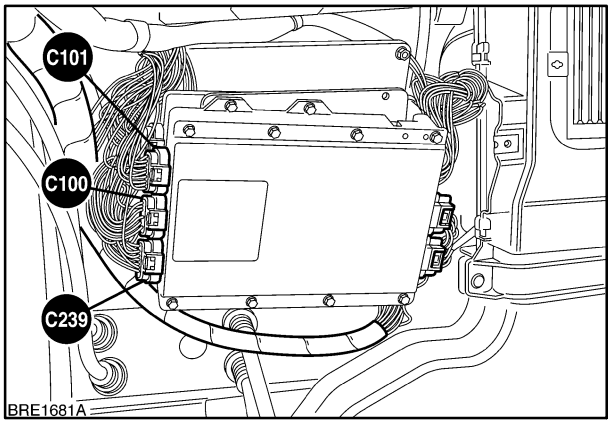


BRE1637A

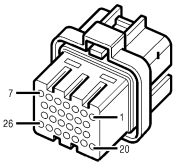


BRE1637B



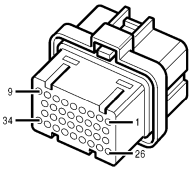
BRE1681A

C100



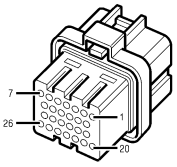
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



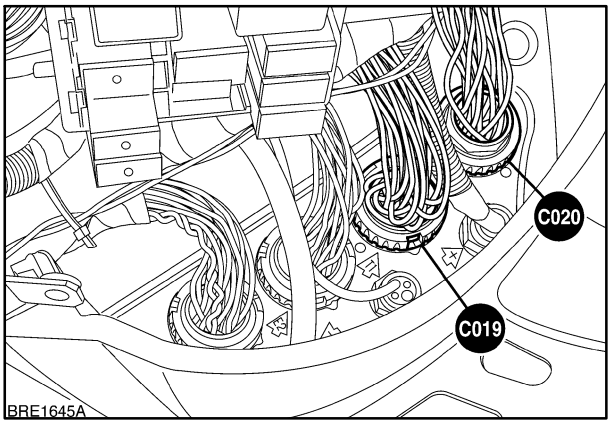
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

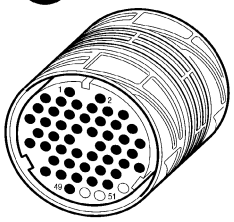


1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

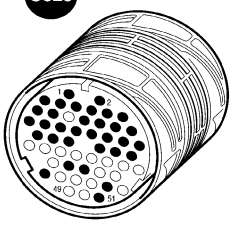


C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2058 - SEAT SWITCH CLOSED (FOR 25 HOURS +)

Possible failure modes:

1. Faulty connector
2. Faulty switch
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Seat switch in H5.

   A. While seated in operators seat, turn the keystart ON, d-- should be displayed. When the seat is vacated d10, should be displayed. If the value displayed is okay, while in H5, wiggle the harness, the seat switch connector **C138** and the controller connector **C127** to check for intermittent circuit. The value changes should an intermittent fault be detected, repair or replace as required.

   B. If display is not okay, continue to step 2.

2. Check the seat switch connector **C138** and the controller connector **C127**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check switch operation.

   A. Disconnect connector **C138**, check the operation of the switch and with the aid of a multimeter. Renew and/or replace switch as required.

   B. If switch operation okay, continue to step 4.

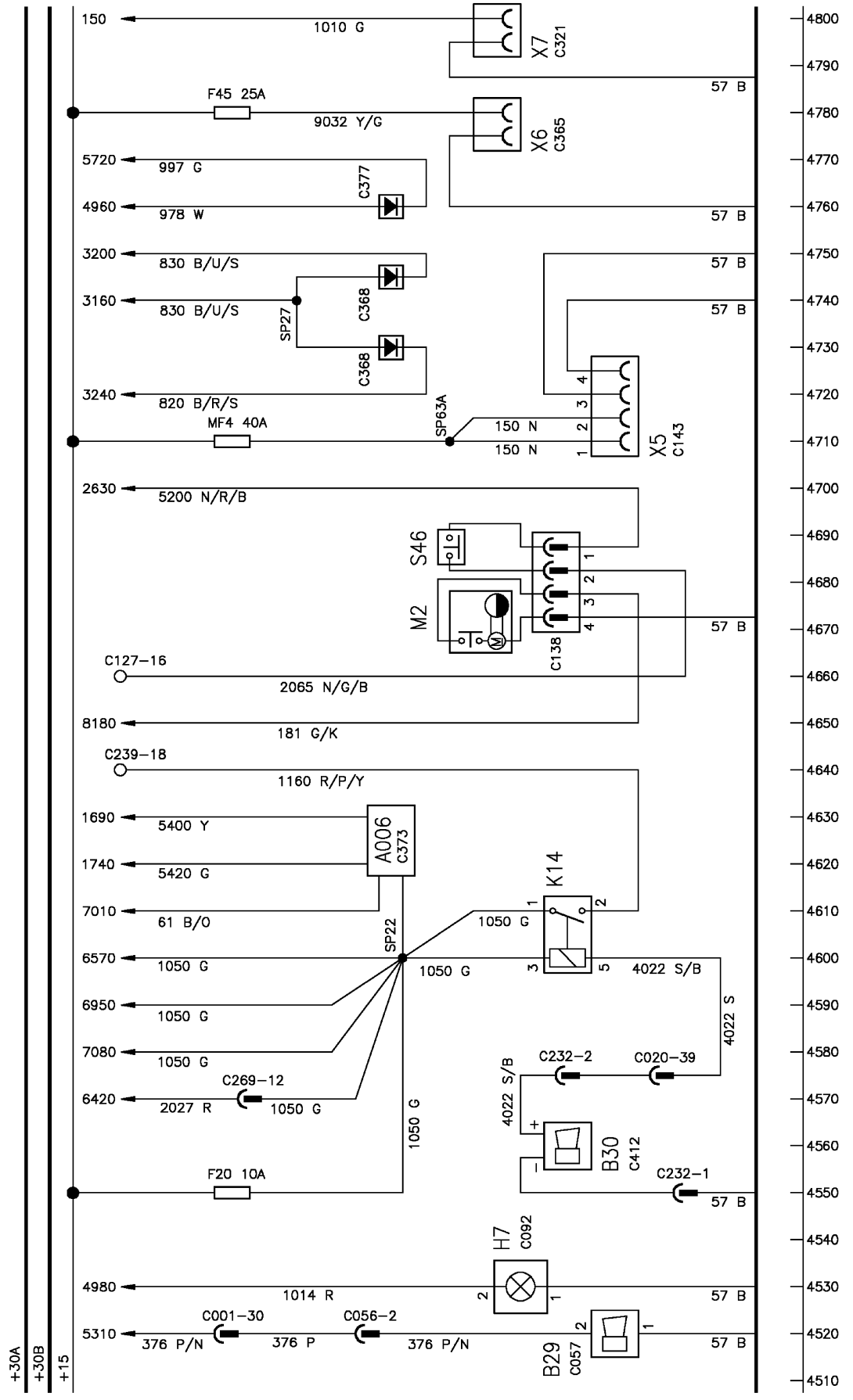
4. Check for short circuit

   A. Disconnect the connector **C138**. Check between connector:

   C138 pin **1 N/G/B)** and **C138** pin **2 (N/G/B))**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
57 B
C368
3240
820 B/R/S
MF4 40A
SP63A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
K14
7010
61 B/O
SP22
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
4022 S
7080
1050 G
C232-2
C020-39
C269-12
6420
2027 R
1050 G
4022 S/B
B30
C412
1050 G
C232-1
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
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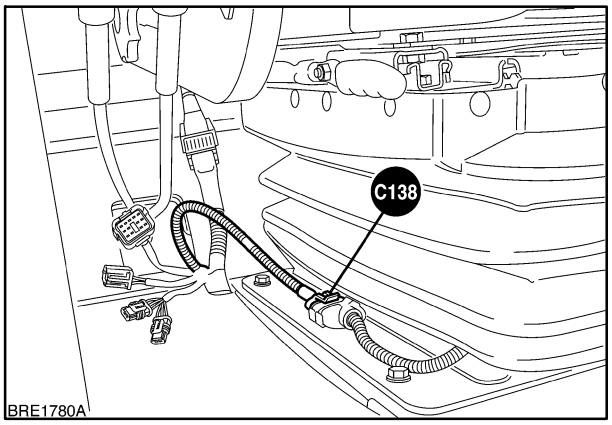
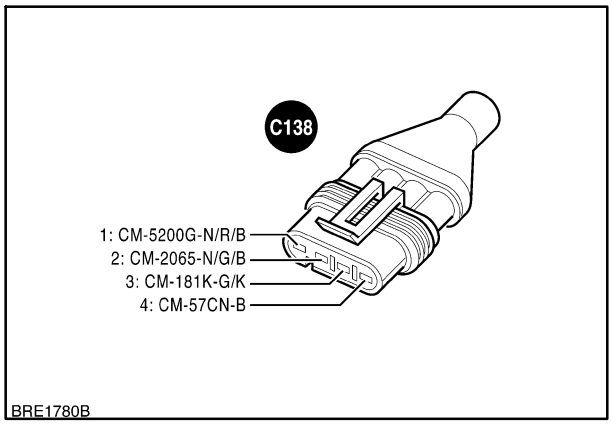
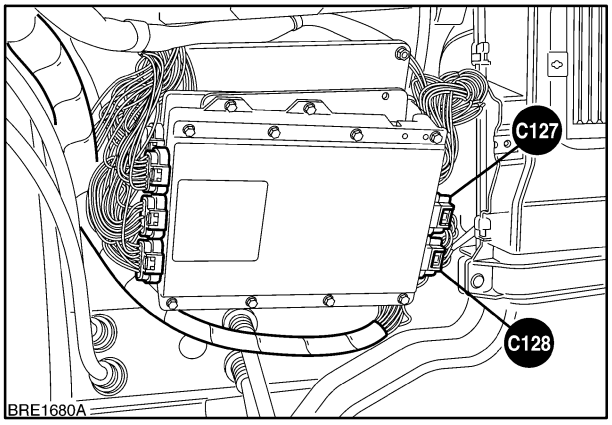
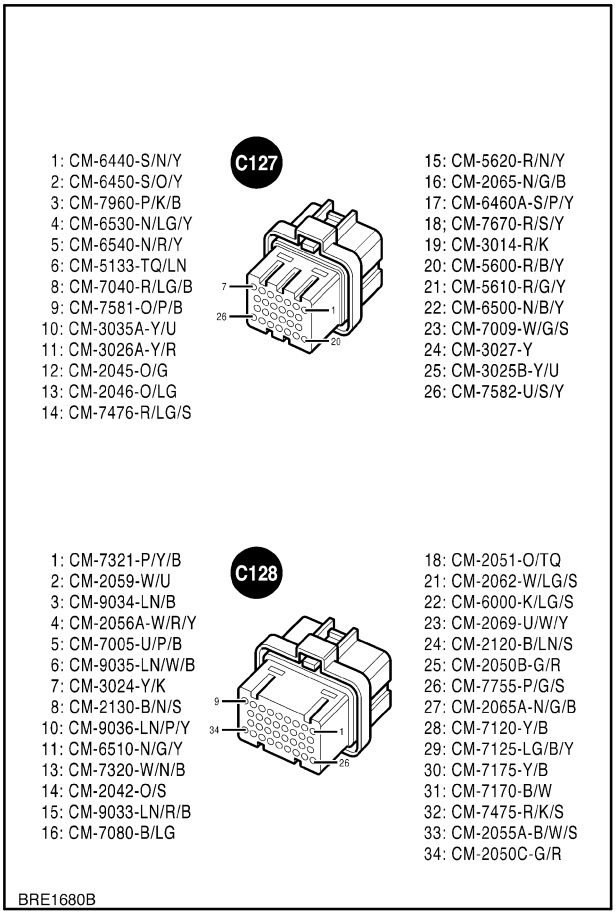

C138
BRE1780A


C138
1: CM-5200G-N/R/B
2: CM-2065-N/G/B
3: CM-181K-G/K
4: CM-57CN-B
BRE1780B


C127
C128
BRE1680A


C127
1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y
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1
20
C128
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R
9
34
1
26
BRE1680B

ERROR CODE 2059 - SHUTTLE LEVER SWITCH DISAGREEMENT

Possible failure modes:

1. Faulty connector
2. Faulty shuttle lever
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are displayed, continue to step 3.

3. Check the shuttle lever forward switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into forward. If the display does not change to d15, continue to step 5.

   B. If the display does change to d15, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

4. Check the shuttle lever reverse switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into reverse. If the display does not change to d16, continue to step 6.

   B. If the display does change to d16, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

5. Check the shuttle lever forward switch.

   A. Disconnect the shuttle lever connector **C075**. Move the shuttle lever to forward and measure the resistance between the component side of connector **C075** pin **1 (G/B/S)** and **C075** pin **2 (S/R/B)**, if the resistance indicated is not approximately 2.56K Ohms, and then in neutral approximately 0.56K Ohms, remove and replace the shuttle lever switch.

   B. If the shuttle lever switch is okay, continue to step 7.

6. Check the shuttle lever reverse switch.

   A. Disconnect the shuttle lever connector **C075**. Move the shuttle lever to reverse and measure the resistance between the component side of connector **C075** pin **1 (G/B/S)** and **C075** pin **3 (S/U/B)**, if the resistance indicated is not approximately 2.56K Ohms, and then in neutral approximately 0.56K Ohms, remove and replace the shuttle lever switch.

   B. If the shuttle lever reverse switch is okay, continue to step 7.

7. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C075** pin **1 (G/B/S)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

8. Check for a short to +Ve voltage.

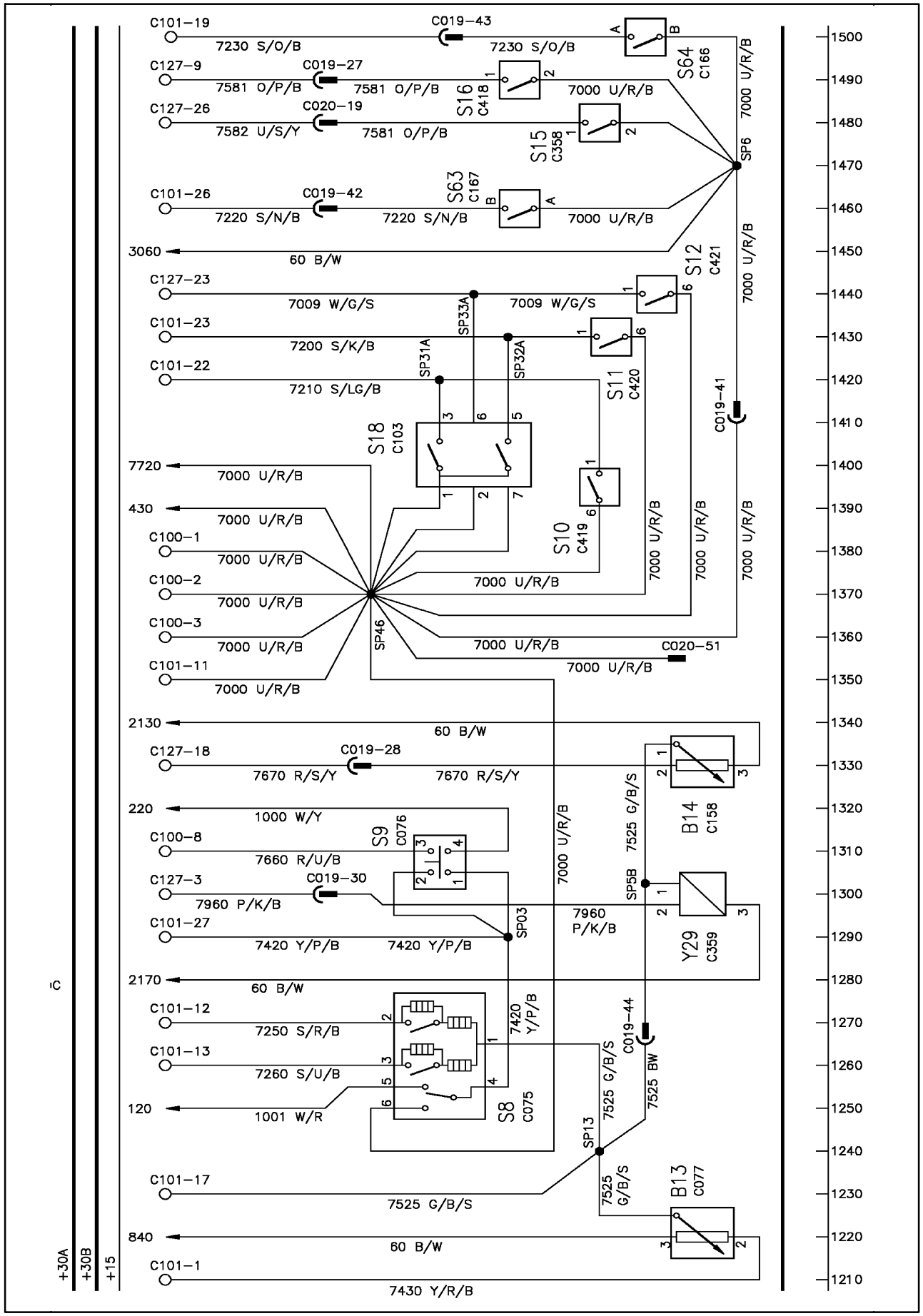
   A. Turn the keystart ON. Measure the voltage between connectors:

   C075 pin **2 (S/R/B)** and **ground**

   C075 pin **3 (S/U/B)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C019-43
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7230 S/O/B
S64 C166
C127-9
C019-27
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S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
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7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
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C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
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7660 R/U/B
S9 C076
C127-3
C019-30
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SP5B
7525 G/B/S
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
7525 G/B/S
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
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+30B
+15
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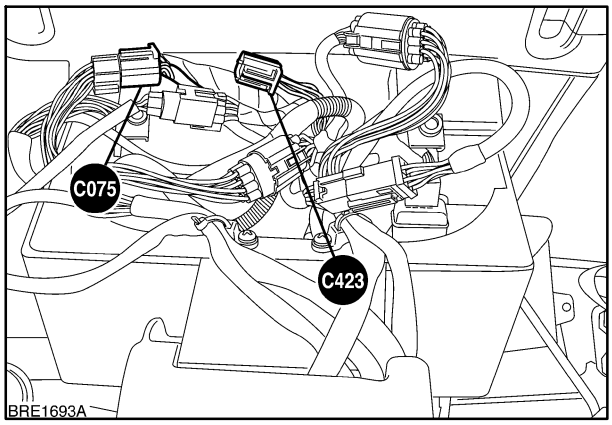
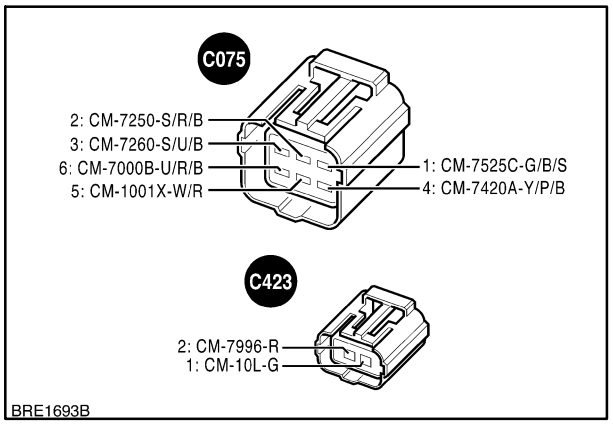

C075
C423
BRE1693A


C075
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3: CM-7260-S/U/B
6: CM-7000B-U/R/B
5: CM-1001X-W/R
1: CM-7525C-G/B/S
4: CM-7420A-Y/P/B
C423
2: CM-7996-R
1: CM-10L-G
BRE1693B

ERROR CODE 2060 - FORWARD SYNCRONISER NO LONGER ENGAGED

Possible failure modes:

1. Faulty forward synchroniser solenoid
2. Faulty forward/reverse potentiometer
3. Faulty hydraulic circuit
4. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the forward solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2061 – FORWARD/REVERSE SYNCRONISER POTENTIOMETER SIGNAL HIGH

Possible failure modes:

1. Faulty connector
1. Faulty Forward/Reverse synroniser potentiometer
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Forward/Reverse (F/R) potentiometer in H9 Channel 72.

   A. Operate the shuttle lever Forward/Reverse switch, If the values displayed do not change continuously between 14 to 76, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 72, wiggle the harness and the F/R potentiometer connector **C158**, the controller connectors **C127** and **C101**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 72 values will change if an intermittant circuit is detected, repair or replace as required.

2. Check the F/R potentiometer connector **C158,** the controller connectors **C127** and **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the F/R syncro potentiometer.

   A. Disconnect the connector **C158**. Measure the resistance between the component side of connector:

   C158 pin **2** and **C158** pin **3** should indicate between 0.90K Ohms and 3.7K Ohms

   C158 pin **2** and **C158** pin **1** should indicate between 3.7K Ohms and 0.90K Ohms

   If the resistances indicated are not okay, remove and replace the potentiometer.

   B. If the clutch pedal potentiometer is okay, continue to step 4.

4. Check for a short to +8 or +12 Volts.

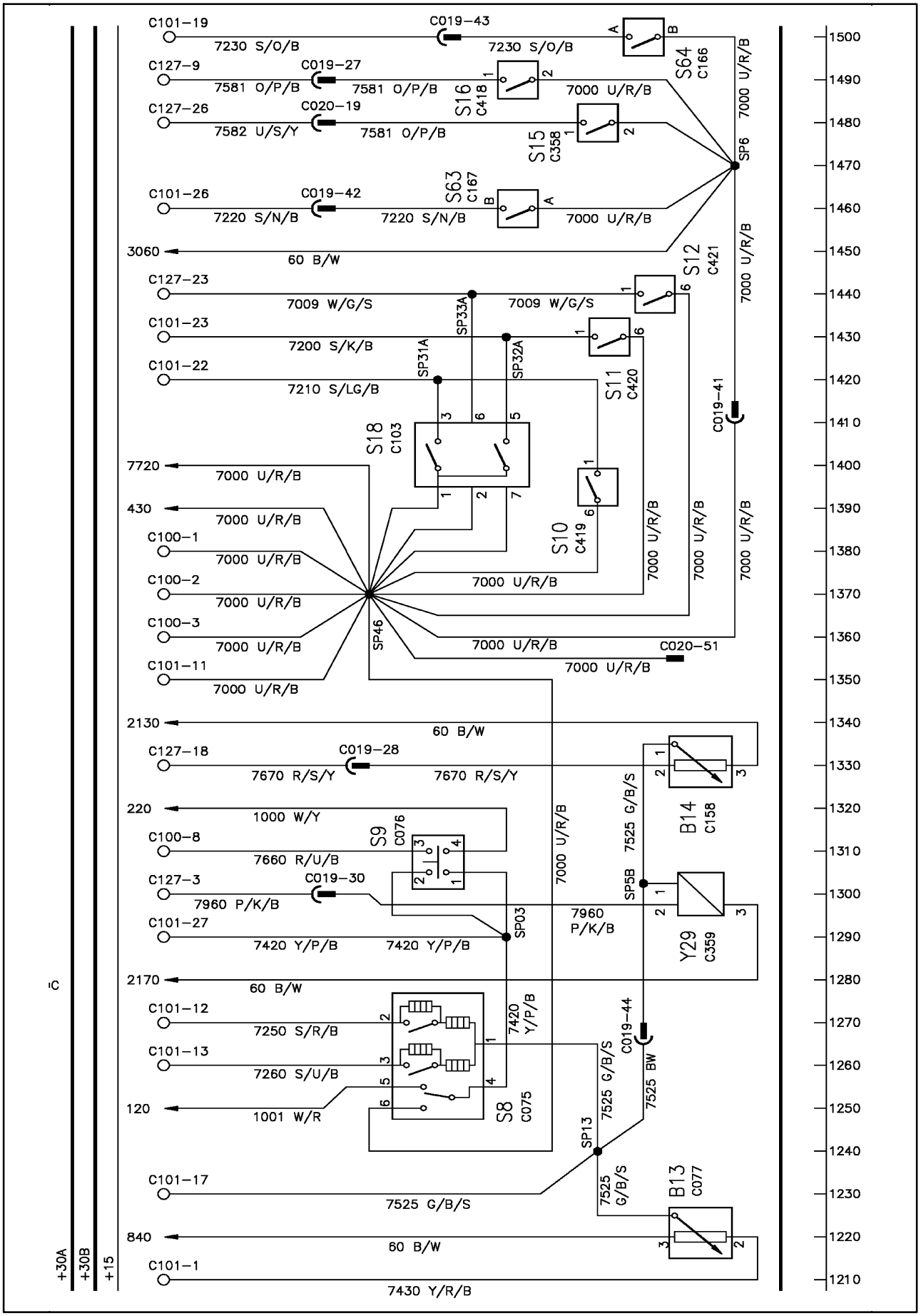
   A. Disconnect connectors **C127** and **C101**. Turn the keystart ON. Measure the voltage between connector **C158** pin **1 (G)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C158** pin **2 (R)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
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C019-41
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7000 U/R/B
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S10 C419
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Y29 C359
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C101-13
7260 S/U/B
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1001 W/R
S8 C075
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C019-44
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SP13
C101-17
7525 G/B/S
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C101-1
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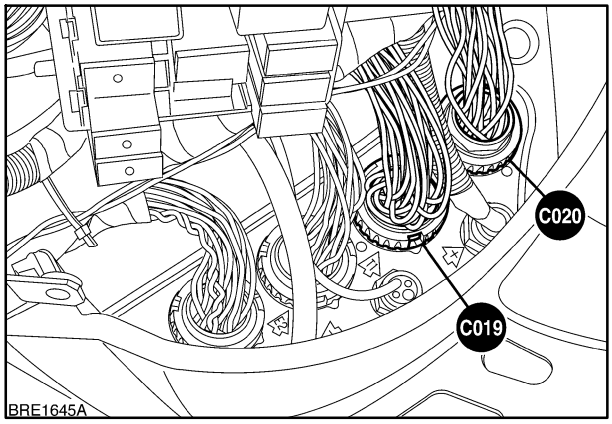
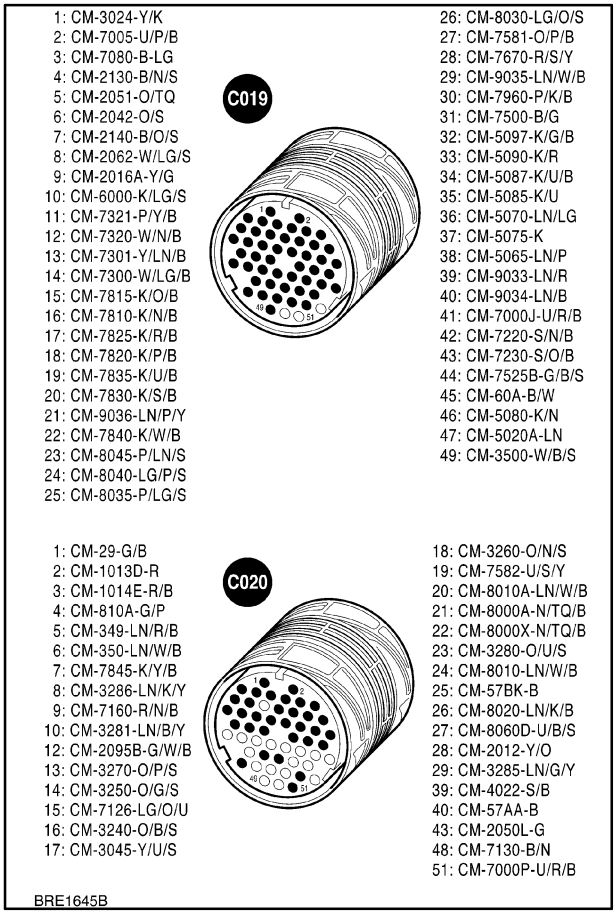
All Transmissions





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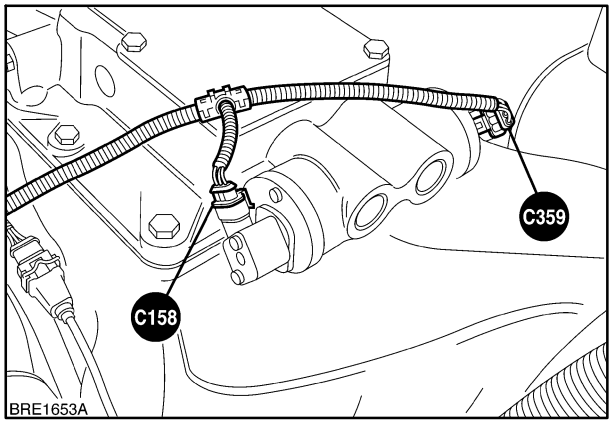

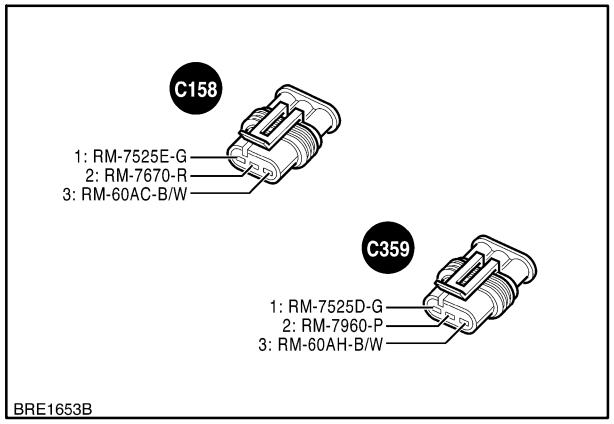

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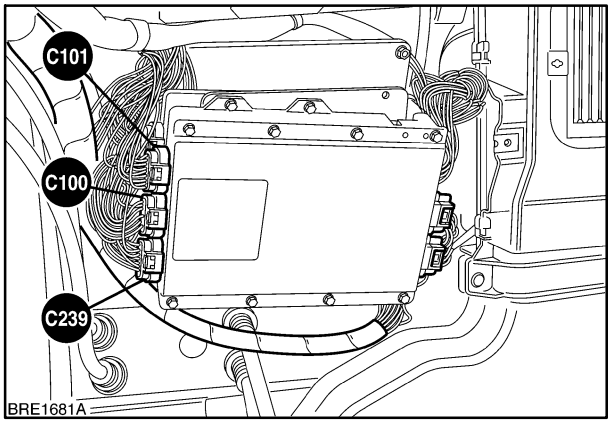

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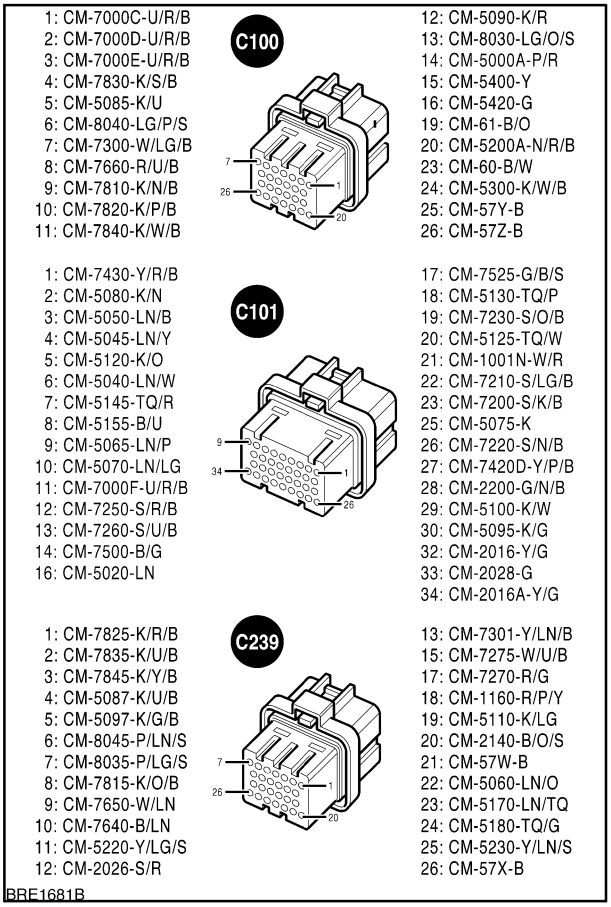
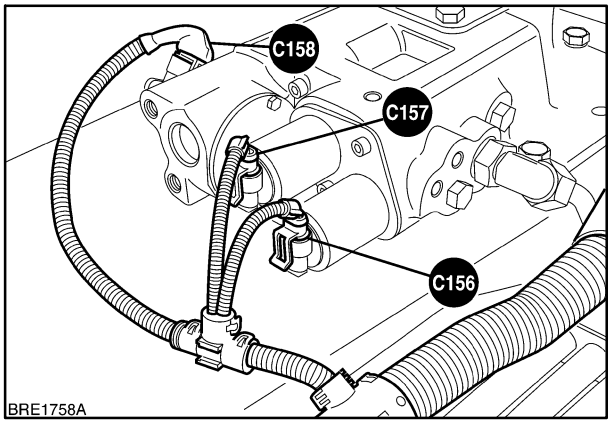


BRE1681B

24x24 Transmission



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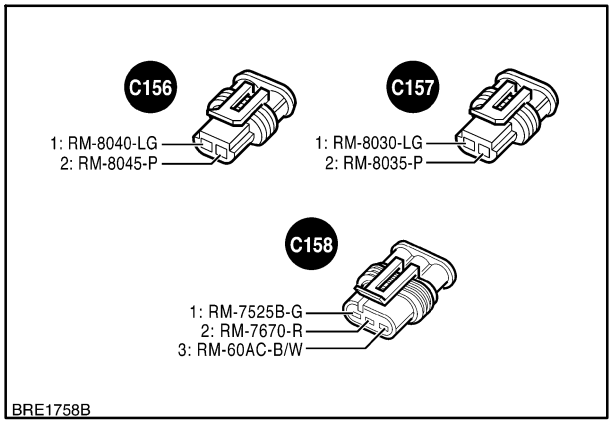

BRE1758B

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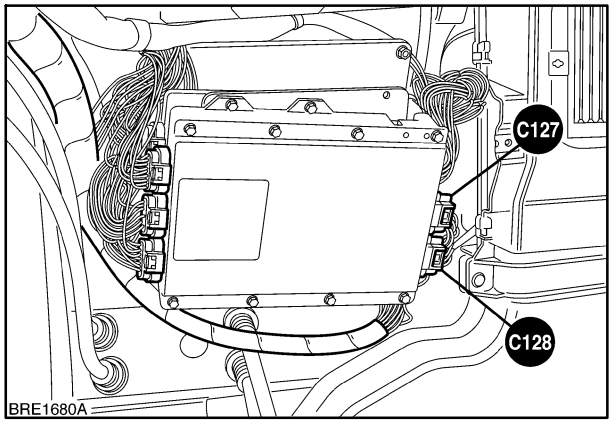

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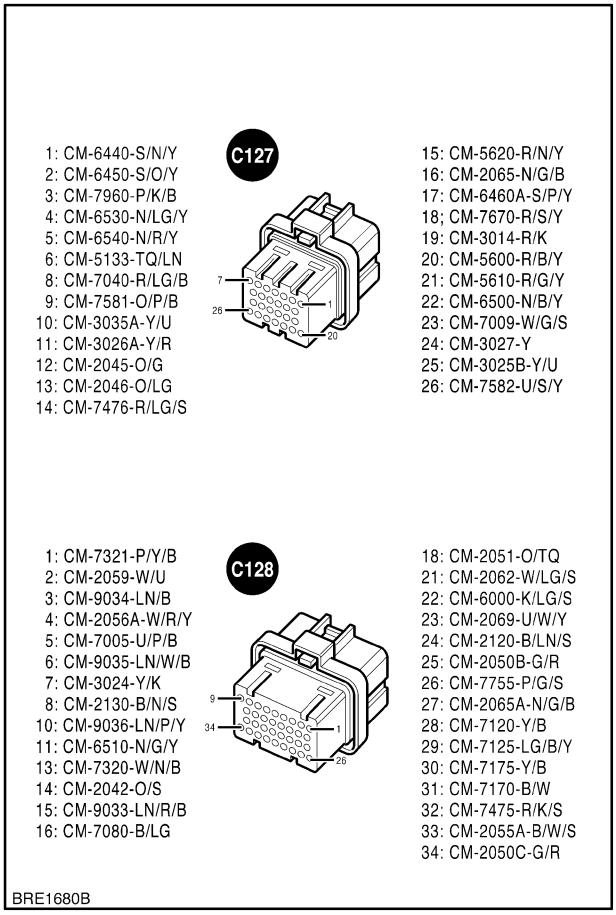


BRE1680B

ERROR CODE 2062 - FORWARD/REVERSE SYNCRONISER POTENTIOMETER SIGNAL LOW

Possible failure modes:

1. Faulty connector
2. Faulty Foward/Reverse syncroniser potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Forward/Reverse (F/R) potentiometer in H9 Channel 72.

   A. Operate the shuttle lever Forward/Reverse switch. If the values displayed do not change continuously between 14 to 76, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 72, wiggle the harness and the F/R potentiometer connector **C158**, the controller connectors **C127** and **C101**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 72 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the F/R potentiometer connector **C158**, the controller connectors **C127** and **C101** and the inline harness connector **C019**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the F/R potentiometer for open circuit.

   A. Disconnect connector **C157**. Measure the resistance between the component side of connector:

   C158 pin **2** and **C158** pin **3** should indicate between 0.9K Ohms and 3.7K Ohms

   C158 pin **2** and **C158** pin **1** should indicate between 3.7K Ohms and 0.9K Ohms

   If the resistances indicated are not okay, remove and replace the F/R potentiometer.

   B. If the F/R potentiometer is okay, continue to step 4.

4. Check for an open circuit.

   A. Disconnect connectors **C127** and **C101**. Check between connector:

   C158 pin **1 (G)** and **C101** pin **17 (G/B/S)**

   C158 pin **2 (R)** and **C127** pin **18 (R/S/Y)**

   C158 pin **3 (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to ground.

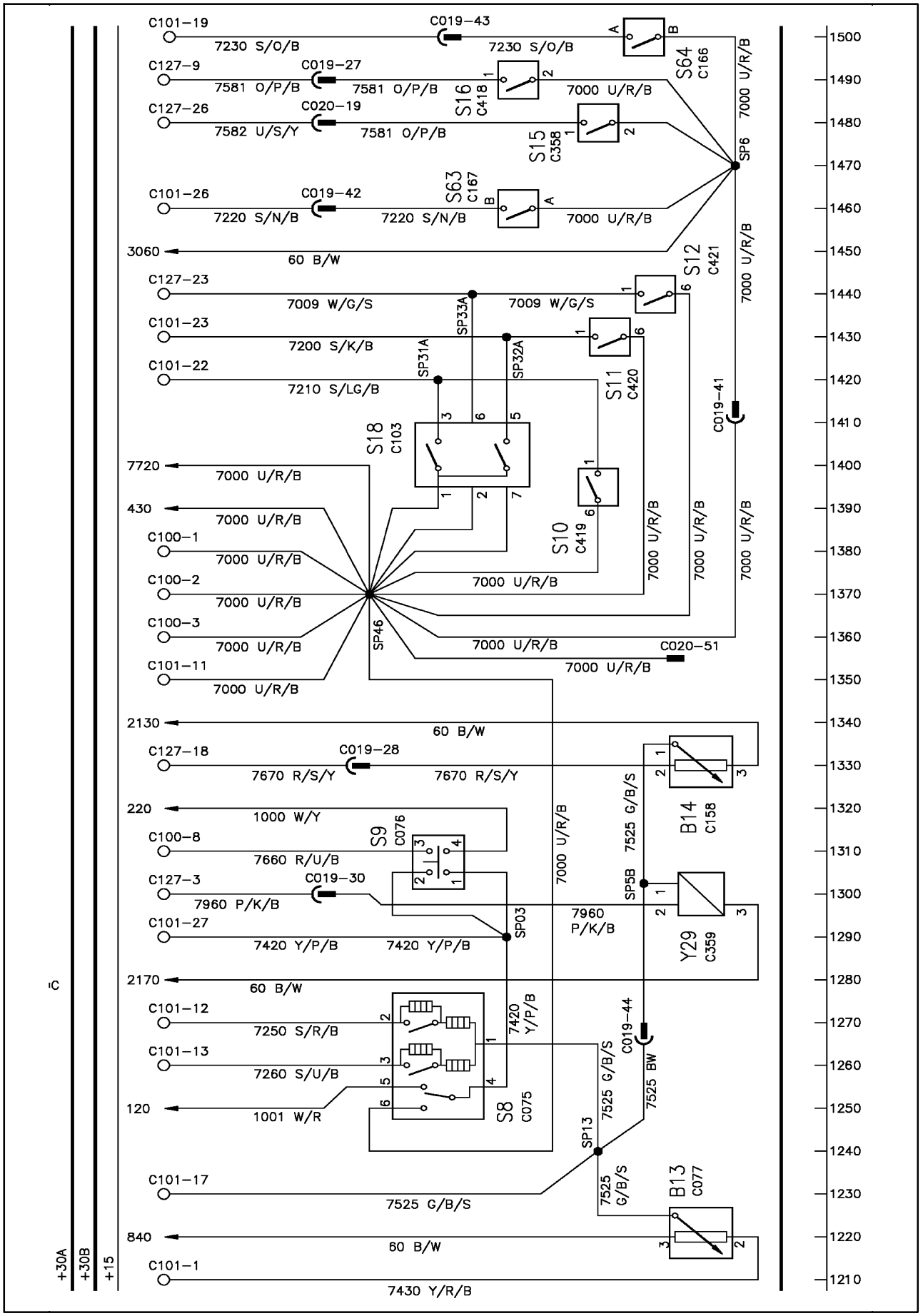
   A. Check between connector:

   C158 pin **1 (G)** and **ground**

   C158 pin **2 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C019-43
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7230 S/O/B
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C127-9
C019-27
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7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
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C101-23
7200 S/K/B
SP31A
SP32A
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S11 C420
S18 C103
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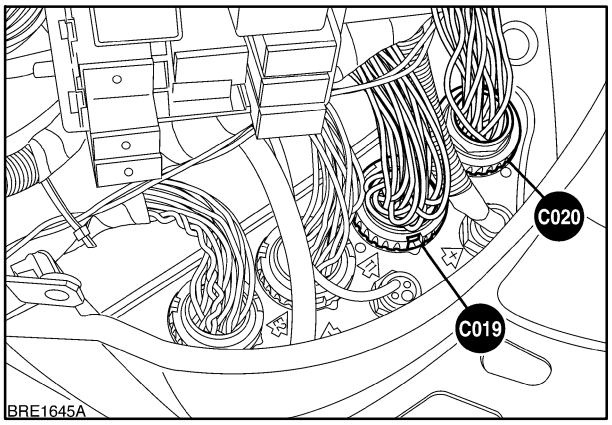
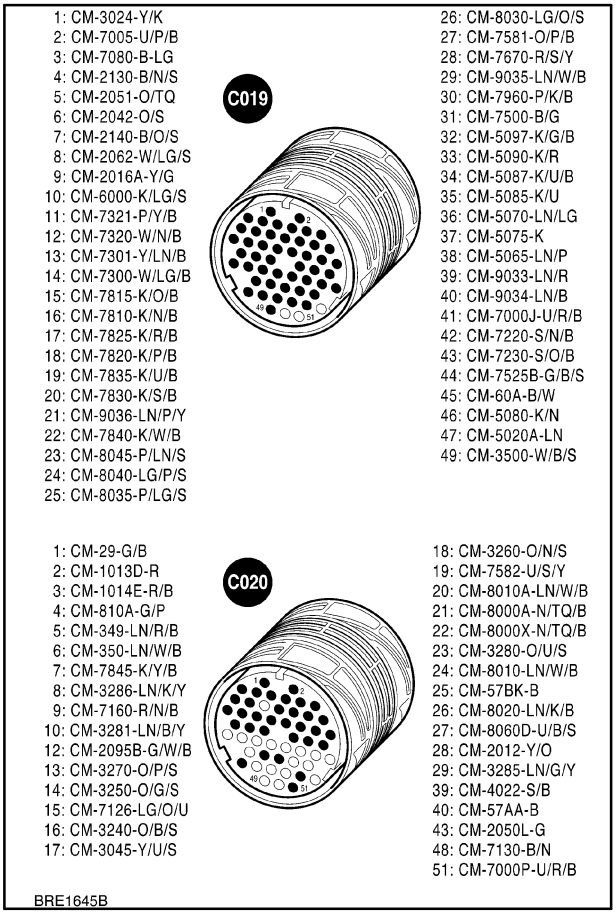
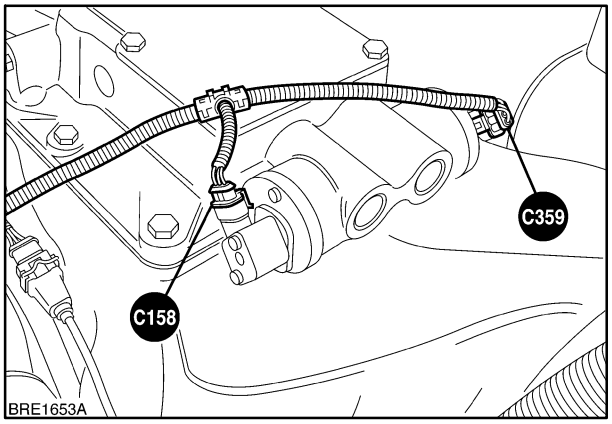
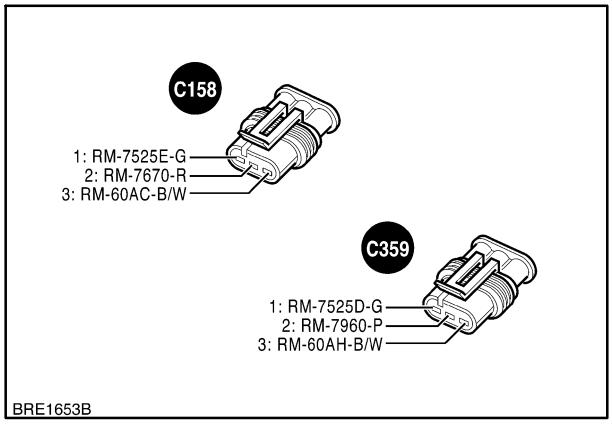


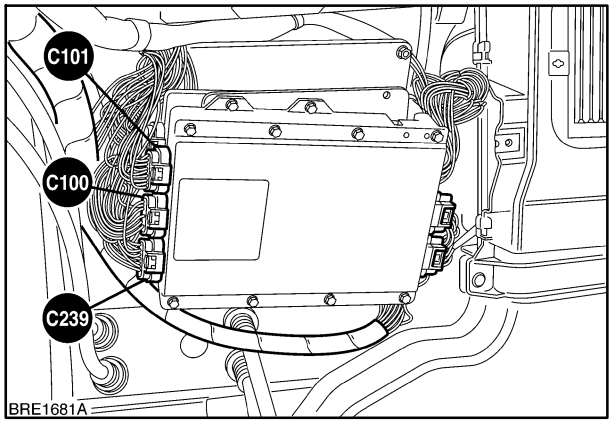


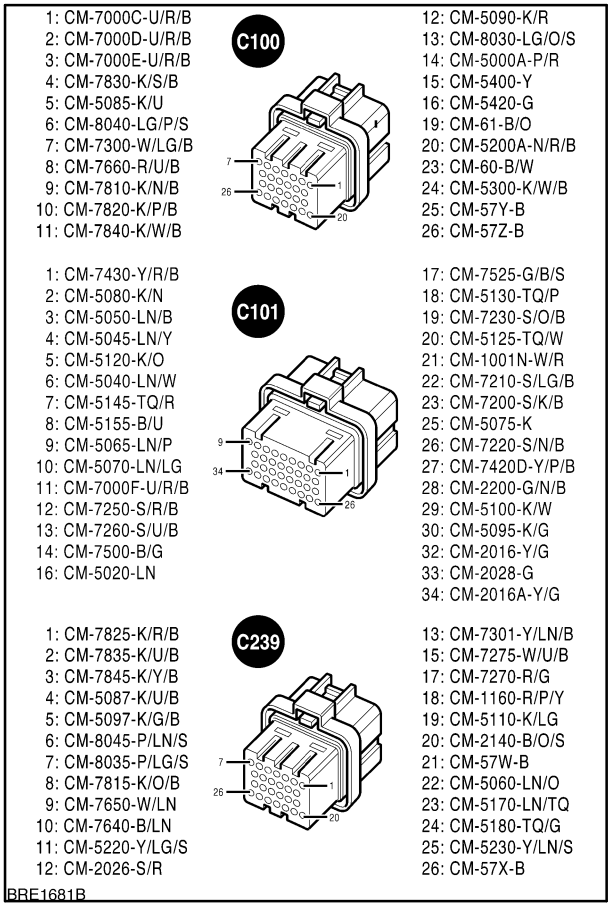
16x16 Transmission



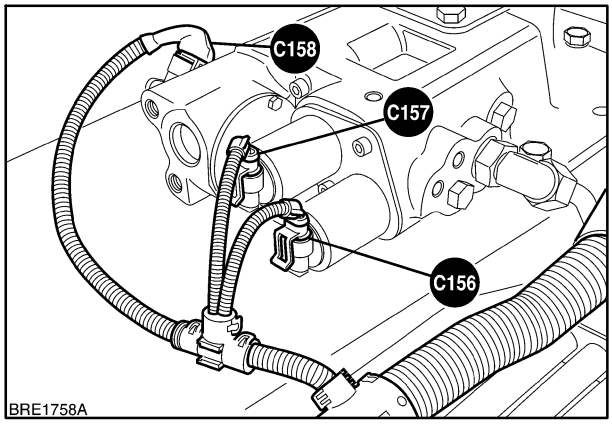


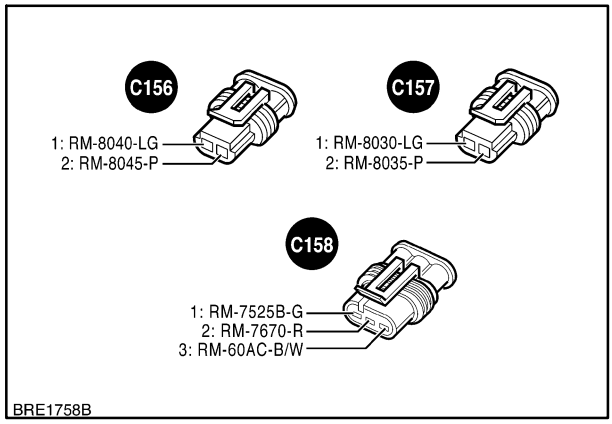
All Transmissions





24x24 Transmission





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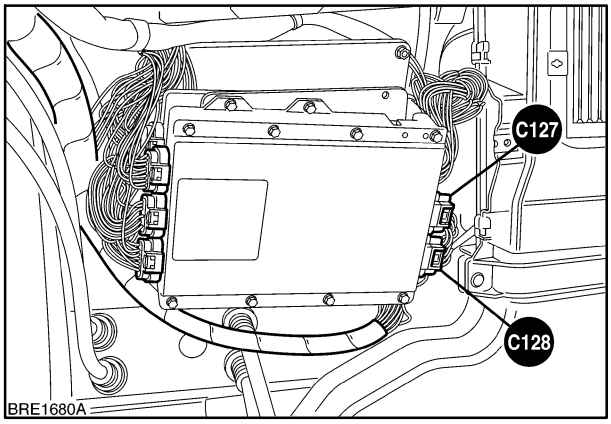
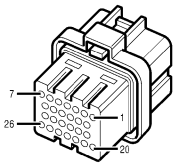


BRE1680A

C127



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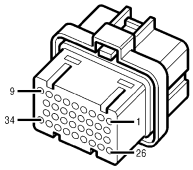
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128



1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 2063 – FORWARD SYNCRONISER DID NOT ENGAGE

Possible failure modes:

1. Faulty forward synchroniser solenoid
2. Faulty forward/reverse potentiometer
3. Faulty hydraulic circuit
4. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the forward solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2064 - REVERSE SYNCRONISER DID NOT ENGAGE

Possible failure modes:

1. Faulty reverse synchroniser solenoid
2. Faulty forward/reverse potentiometer
3. Faulty hydraulic circuit
4. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the reverse solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2065 – FORWARD SYNCRONISER SOLENOID OPEN CIRCUIT

Effects:

Failure to engage reverse gear

Possible failure modes:

1. Faulty connector
2. Faulty forward syncroniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the forward syncroniser solenoid connector **C157**, the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the forward syncroniser solenoid.

   A. Disconnect connector **C157**. Check between the component side of connector.

   C157 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the forward gear solenoid.

   B. If the forward syncroniser solenoid is okay, continue to step 3.
3. Check for an open circuit.

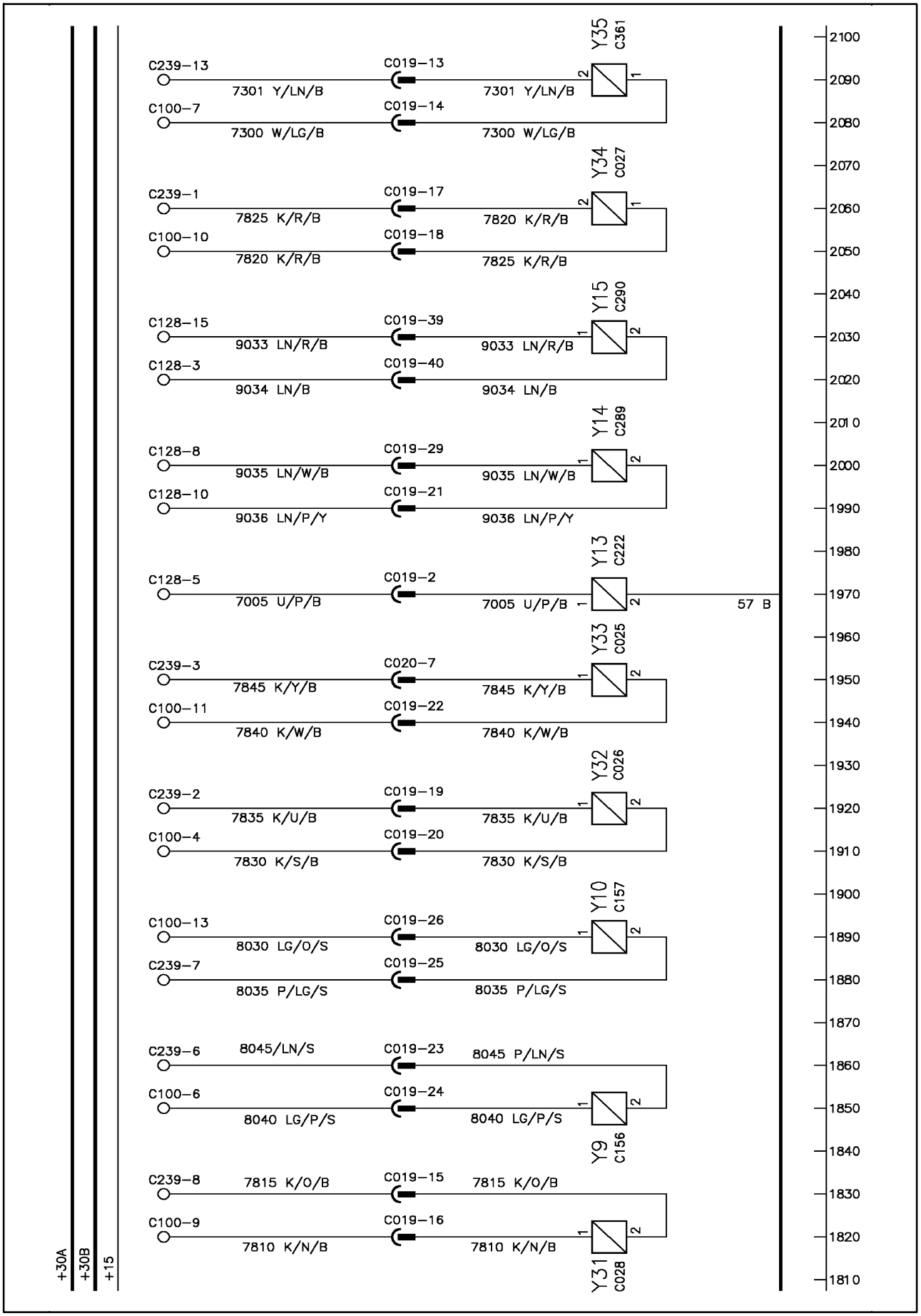
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C157 pin **1 (L/G)** and **C100** pin **13 (LG/O/S)**

   C157 pin **2 (P)** and **C239** pin **7 (P/LG/S)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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C019-13
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C100-7
C019-14
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Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
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9036 LN/P/Y
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C128-5
C019-2
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C239-3
C020-7
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C019-22
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C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
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C239-7
C019-25
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C239-6
8045/LN/S
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C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
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C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
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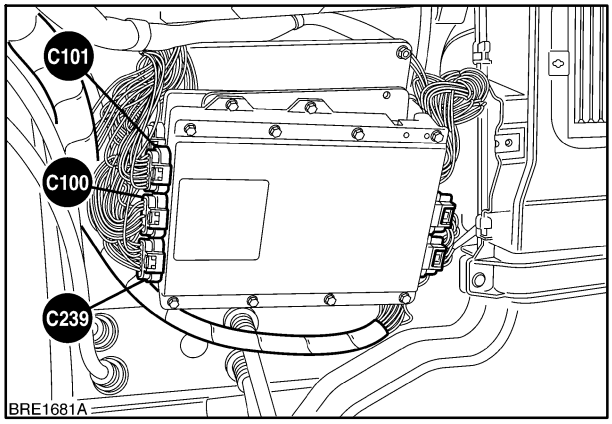
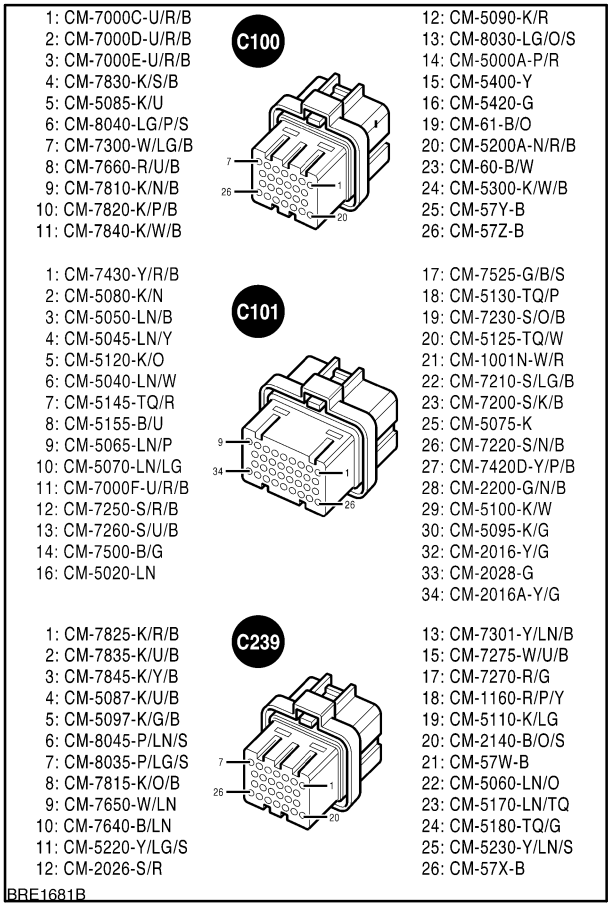
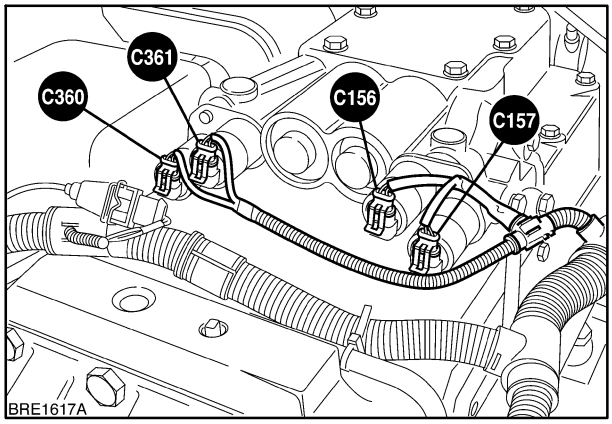
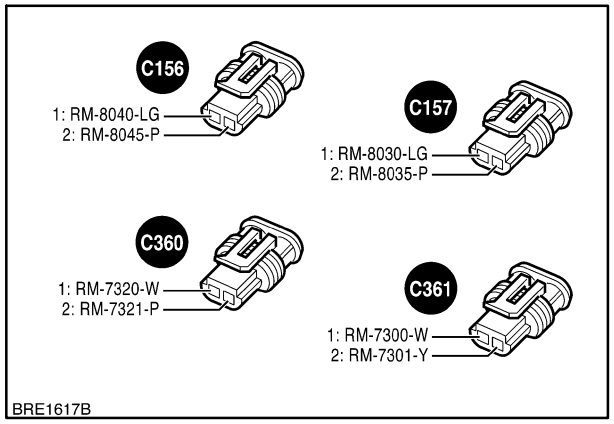
All Transmissions





16x16 Transmission





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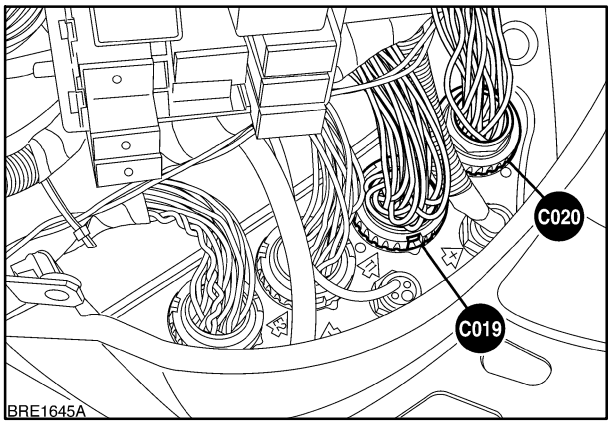
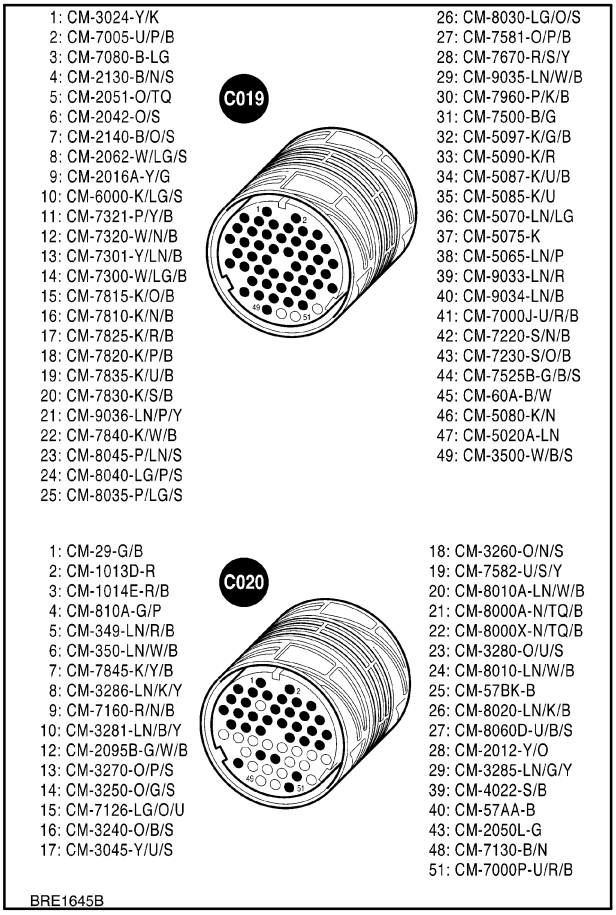
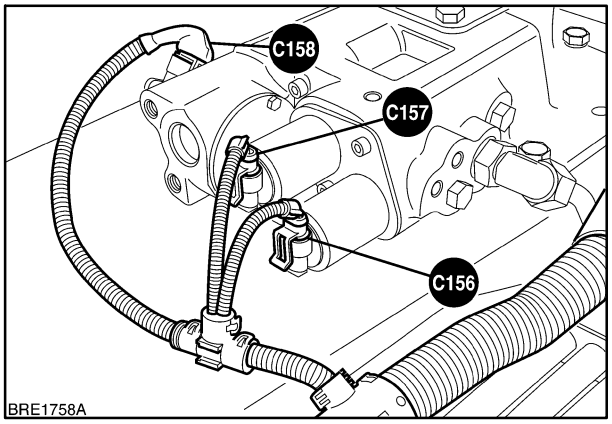
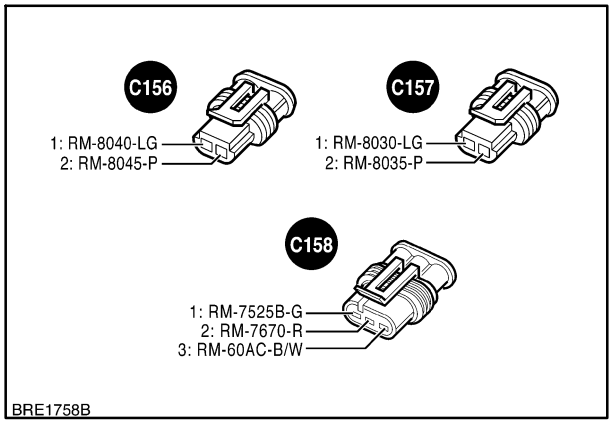




24x24 Transmission





ERROR CODE 2066 – REVERSE SYNCRONISER SOLENIOD OPEN CIRCUIT

Effects:

Failure to engage reverse gear

Possible failure modes:

1. Faulty connector
2. Faulty reverse syncroniser soleniod
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the reverse syncroniser soleniod connector **C156** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the reverse syncroniser soleniod.

   A. Disconnect connector **C156**. Check between the component side of connector.

   C156 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, replace the reverse syncroniser soleniod.

   B. If the reverse syncroniser soleniod is okay, continue to step 3.
3. Check for an open circuit.

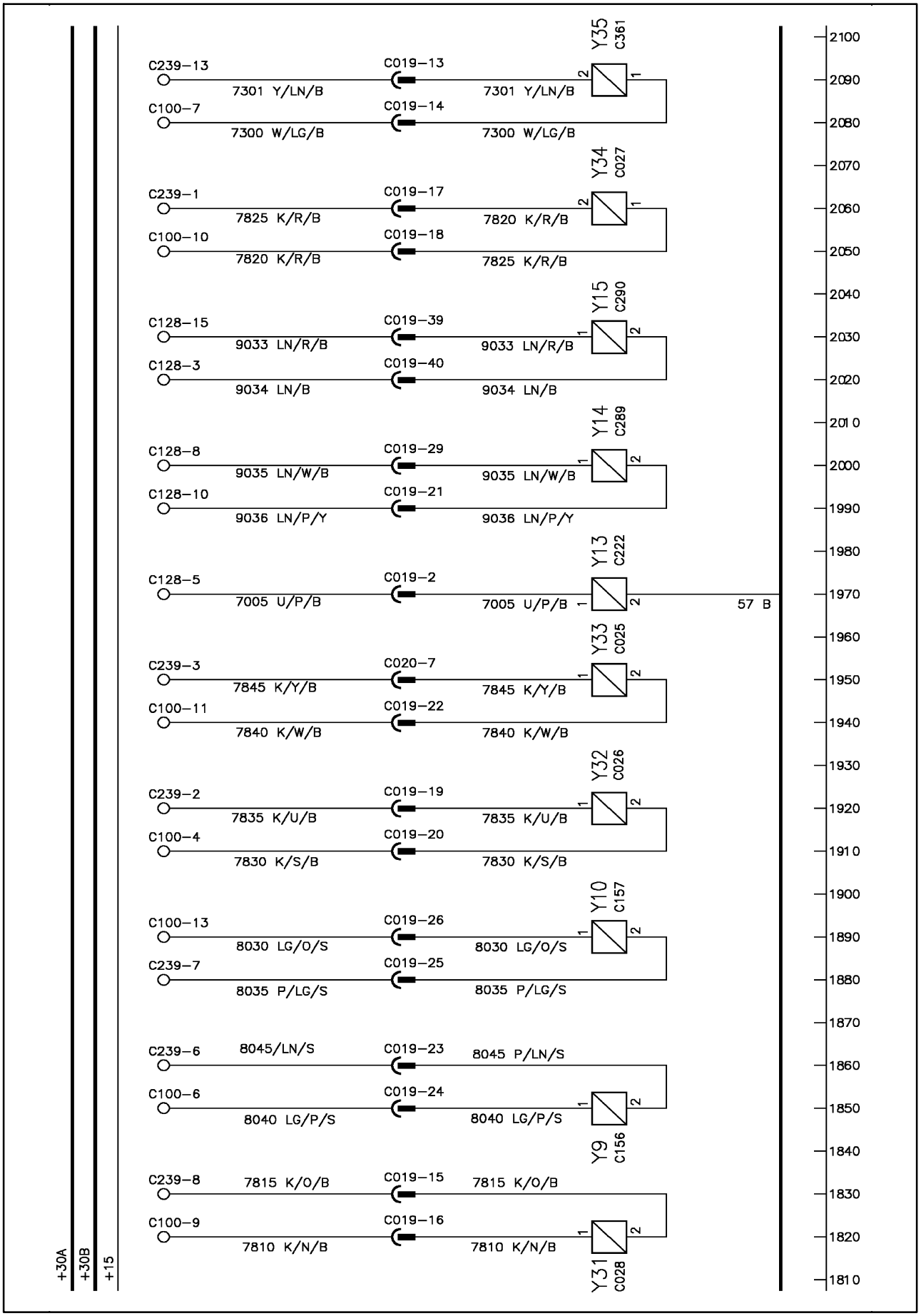
   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C156 pin **1 (L/G)** and **C100** pin **6 (LG/P/S)**

   C156 pin **2 (P)** and **C239** pin **6 (L/N/S)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, replace and replace the controller.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C100-7
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C019-14
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C239-1
7825 K/R/B
C019-17
7820 K/R/B
Y34 C027
C100-10
7820 K/R/B
C019-18
7825 K/R/B
C128-15
9033 LN/R/B
C019-39
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Y15 C290
C128-3
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C019-40
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C128-10
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C128-5
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C019-2
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Y13 C222
57 B
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C019-19
7835 K/U/B
Y32 C026
C100-4
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C019-20
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C100-13
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C019-26
8030 LG/O/S
Y10 C157
C239-7
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C019-25
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
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C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
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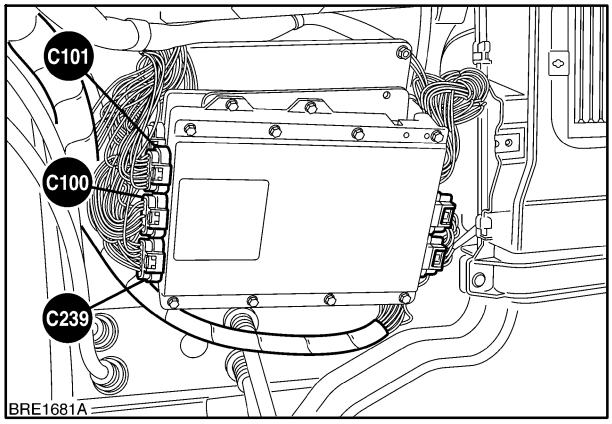
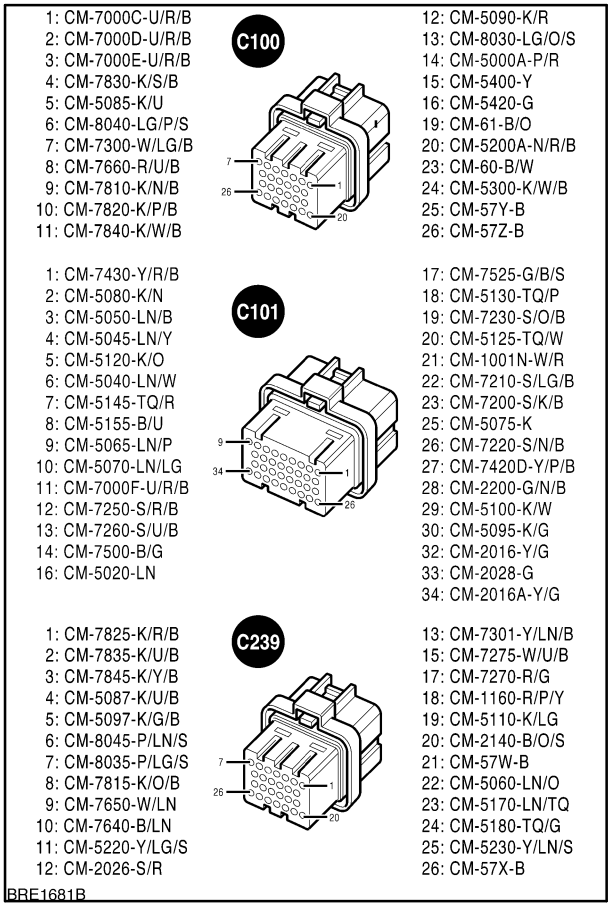
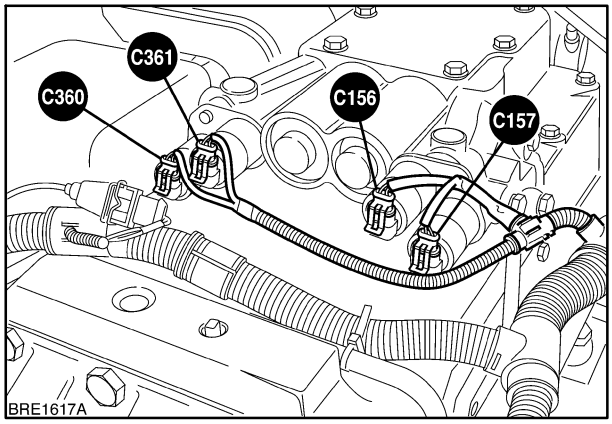
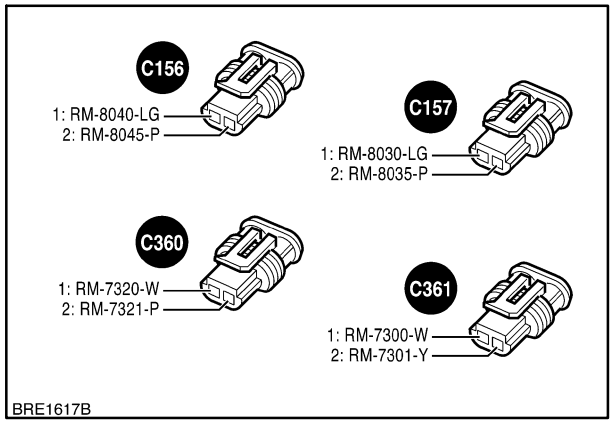
All Transmissions



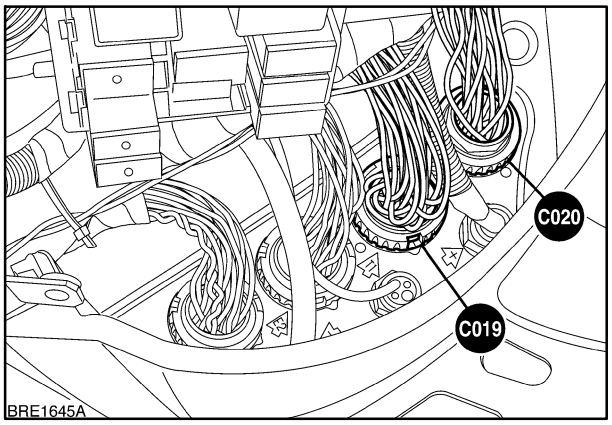


16x16 Transmission

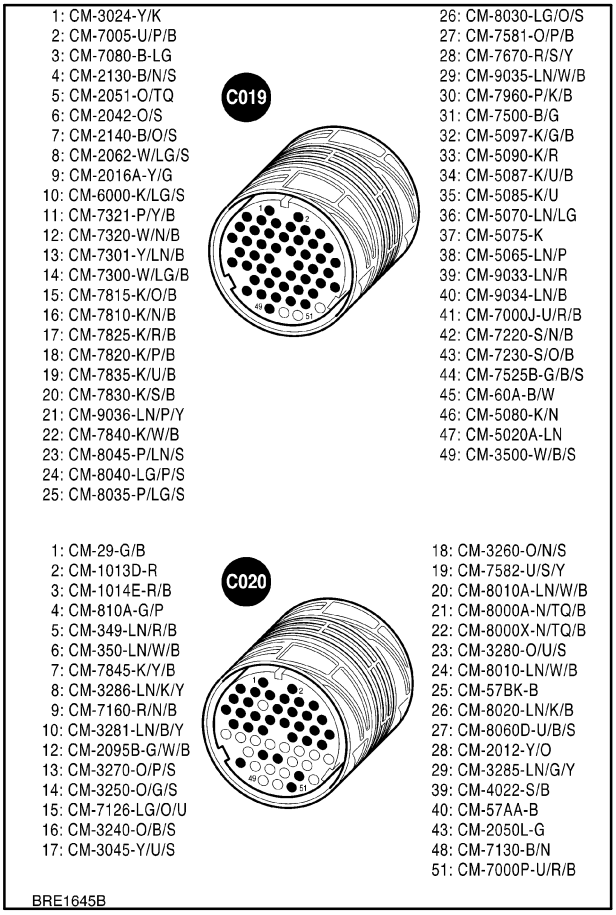




All Transmissions

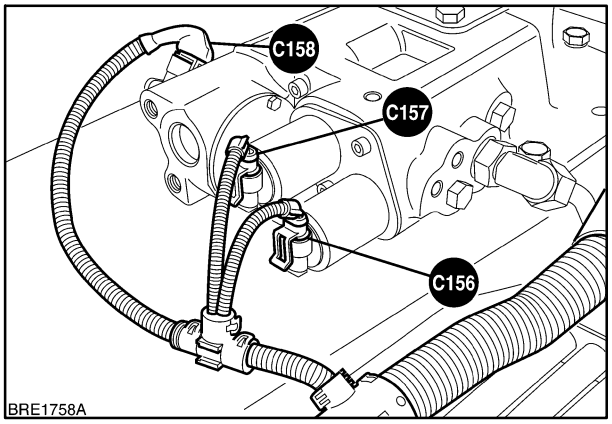


BRE1645A

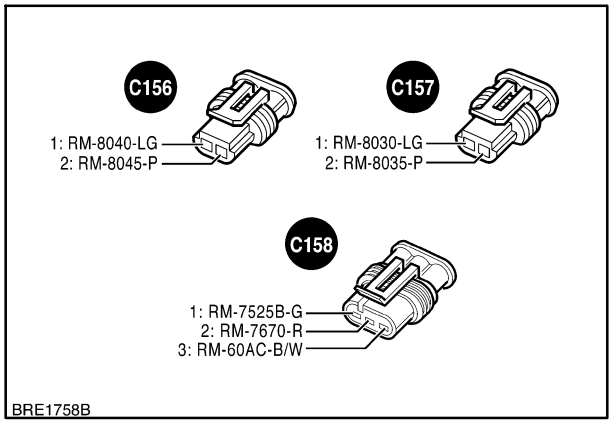


BRE1645B

24x24 Transmission



BRE1758A



BRE1758B

ERROR CODE 2067 – FORWARD SYNRCHONISER SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty forward synrchoniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the forward synrchoniser solenoid connector **C157** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the forward synrchoniser solenoid for short to ground.

   A. Disconnect connector **C157**. Check between the component side of connector:

   C157 pin **1** and **ground**

   C157 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the forward synrchoniser solenoid.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for a short to ground.

   A. Disconnect connector **C100** and **C239**. Check between connector:

   C157 pin **1 (L/G)** and **ground**

   C157 pin **2 (P)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the a short to ground is not indicated, continue to step 4.
4. Check for a short to +Ve Voltage.

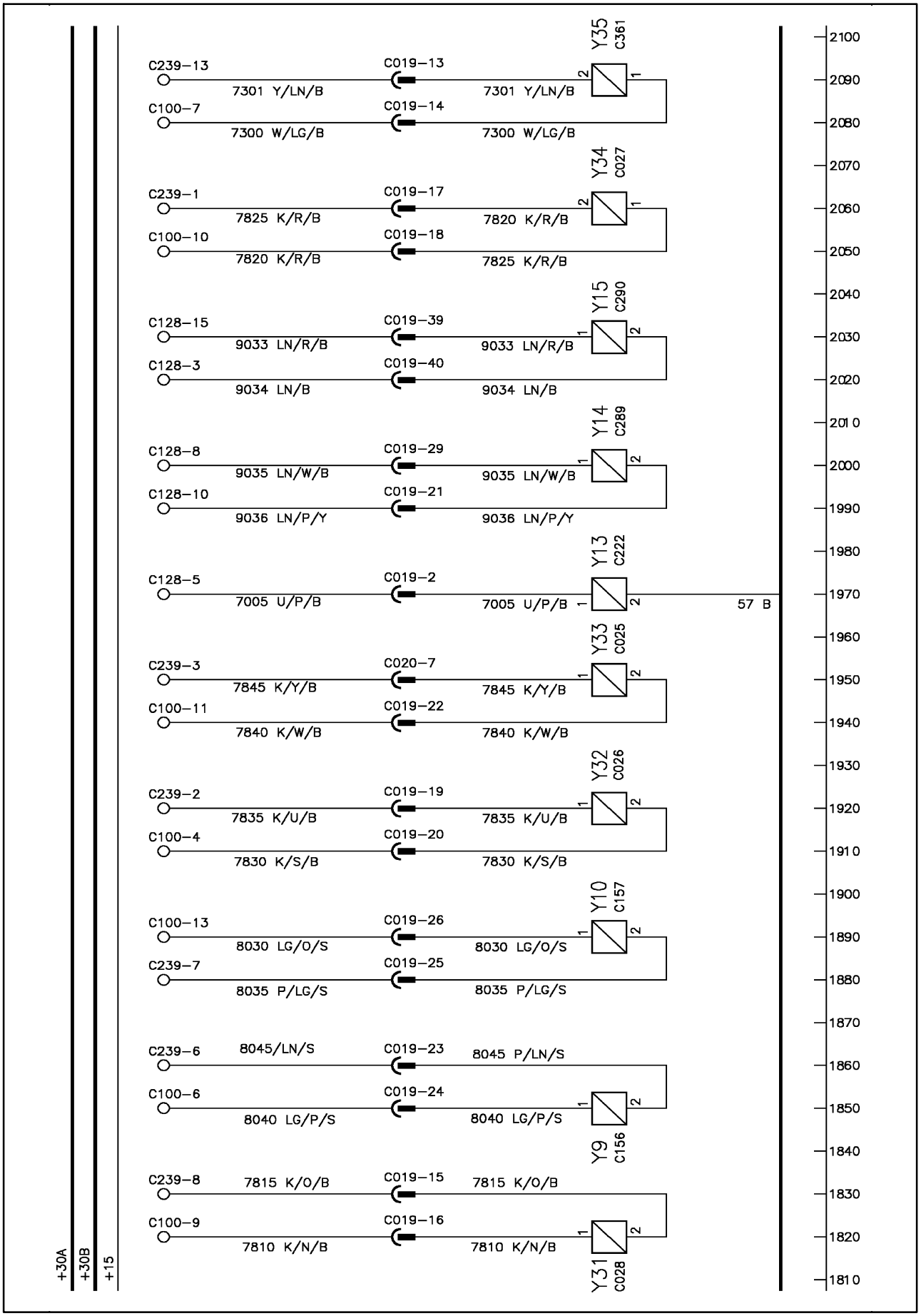
   A. Turn the keystart ON. Measure the voltage between connector:

   C157 pin **1 (L/G)** and **ground**

   C157 pin **2 (P)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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C019-13
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C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
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C128-3
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9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
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7845 K/Y/B
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8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
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C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
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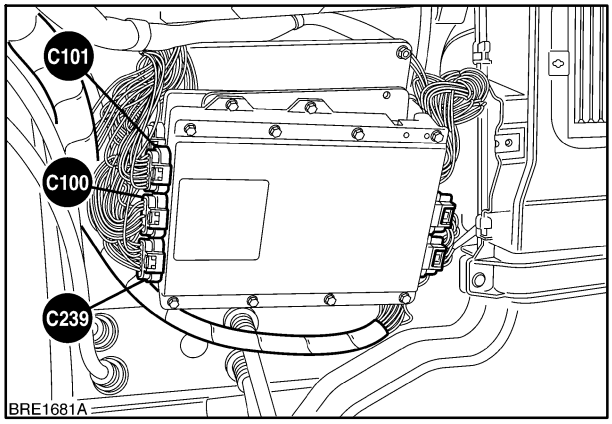
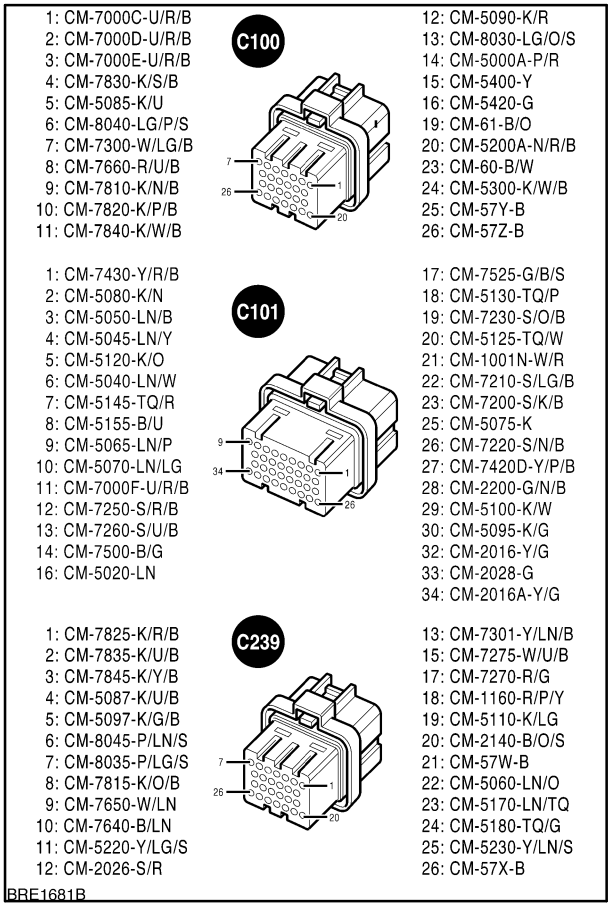
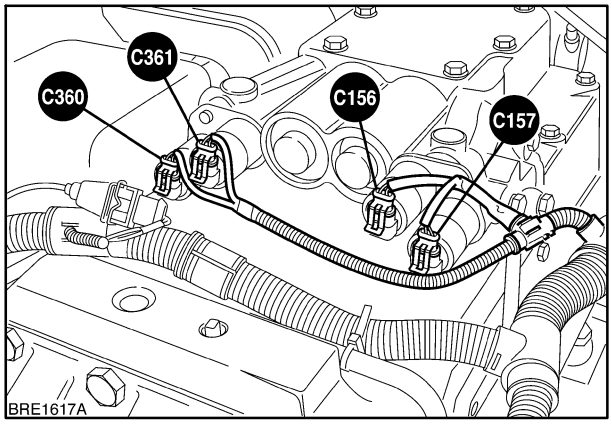
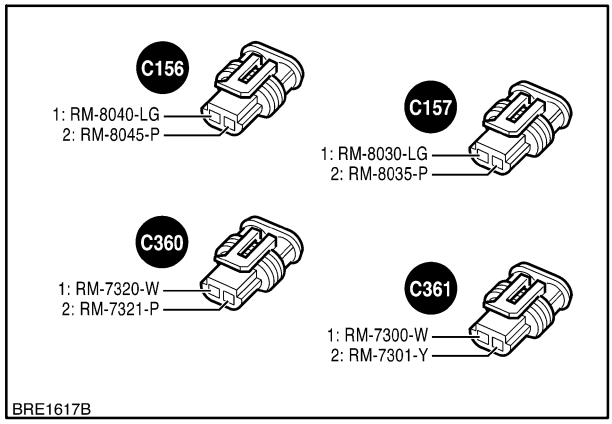
All Transmissions



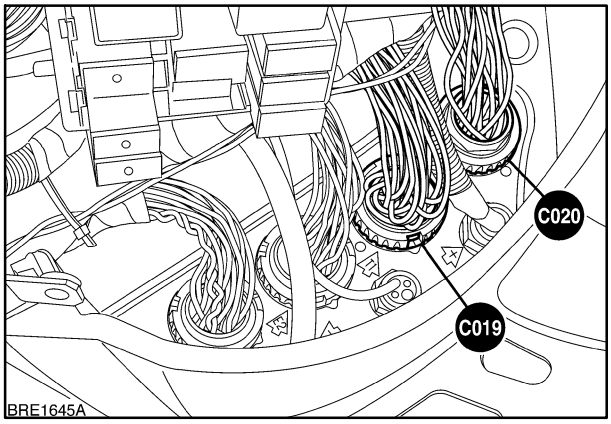


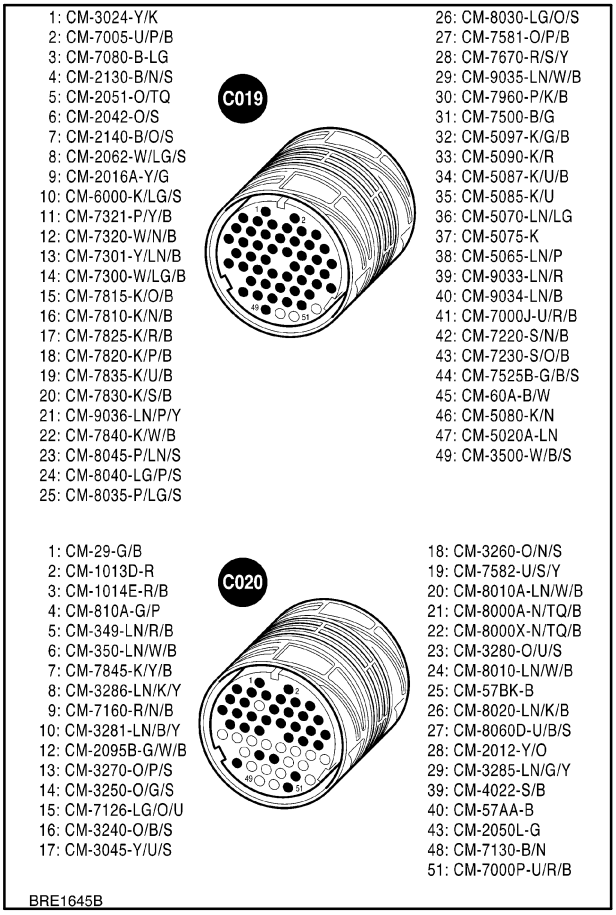
16x16 Transmission



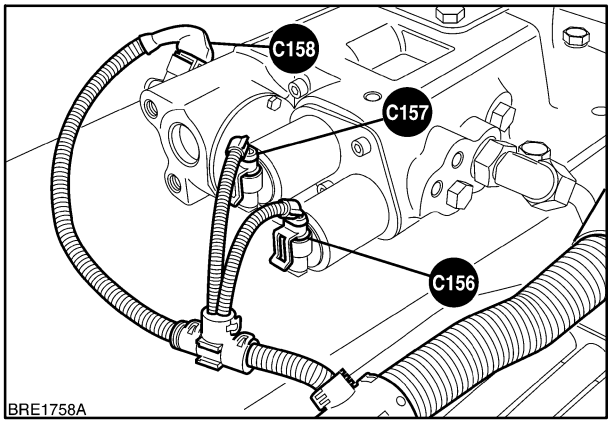


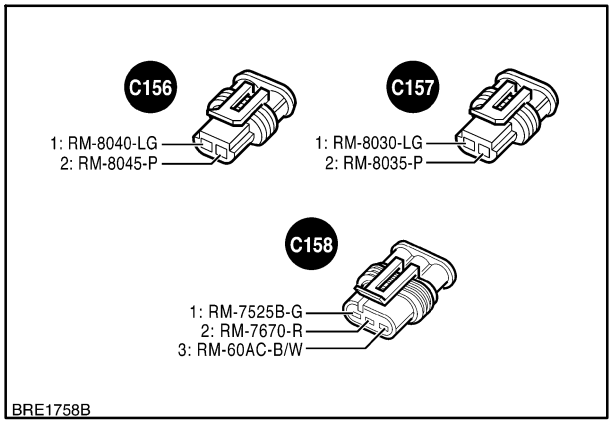
All Transmissions





24x24 Transmission





ERROR CODE 2068 – REVERSE SYNCHONISER SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty reverse synchoniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the reverse synchoniser solenoid connector **C156** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the reverse synchoniser solenoid for short to ground.

   A. Disconnect connector **C156**. Check between the component side of connector:

   C156 pin **1** and **ground**

   C156 pin **2** and **ground**

   If a short to ground is indicated, replace the reverse synchoniser solenoid.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for a short to ground.

   A. Disconnect connectors **C100** and **C239**. Check between connector:

   C156 pin **1 (L/G)** and **ground**

   C156 pin **2 (P)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to +Ve voltage.

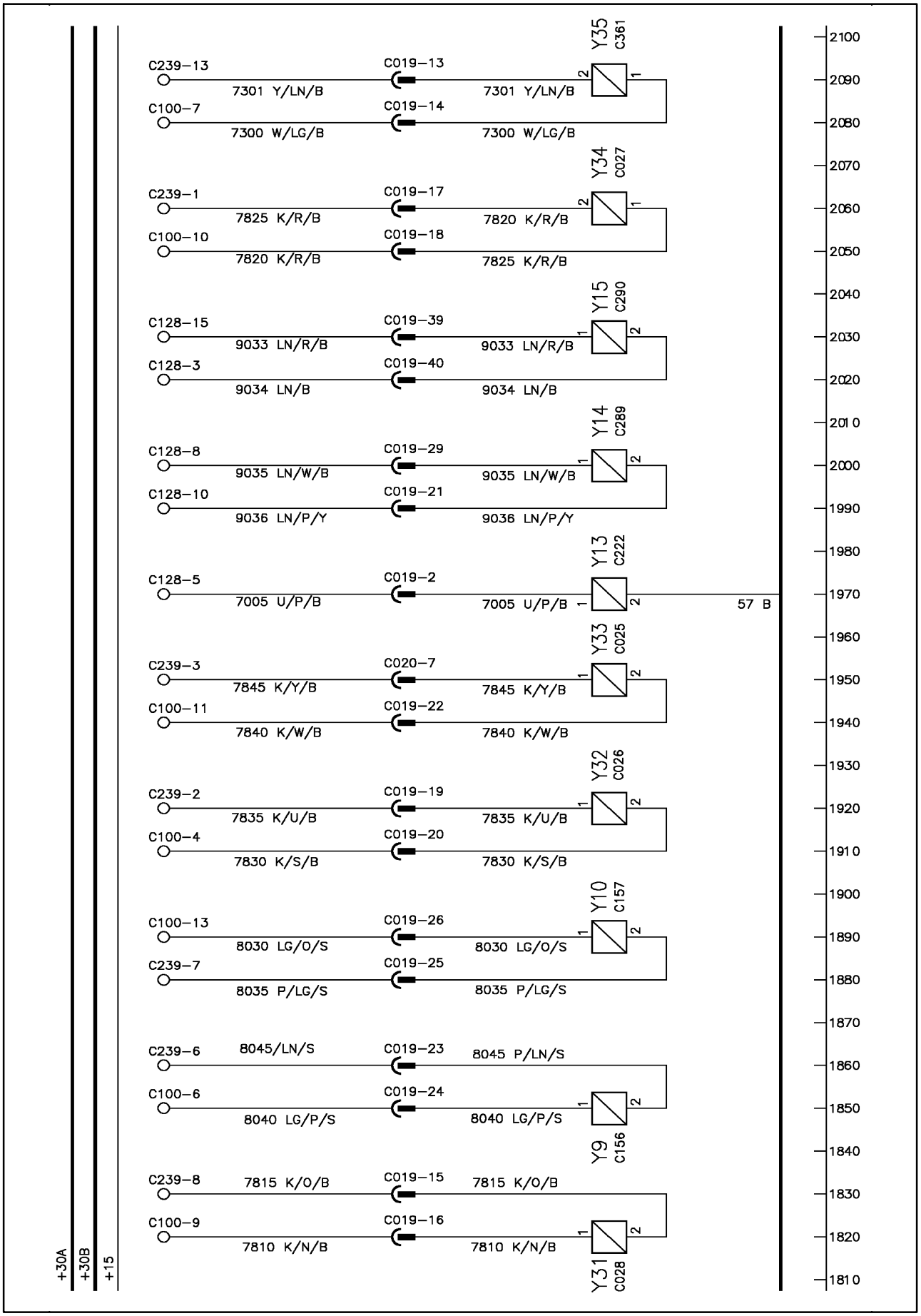
   A. Turn the keystart ON. Measure the voltage between connector:

   C156 pin **1 (L/G)** and **ground**

   C156 pin **2 (P)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
Y35 C361
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
C239-1
7825 K/R/B
C019-17
7820 K/R/B
Y34 C027
C100-10
7820 K/R/B
C019-18
7825 K/R/B
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
Y15 C290
C128-3
9034 LN/B
C019-40
9034 LN/B
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
Y14 C289
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
C128-5
7005 U/P/B
C019-2
7005 U/P/B
Y13 C222
57 B
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
Y33 C025
C100-11
7840 K/W/B
C019-22
7840 K/W/B
C239-2
7835 K/U/B
C019-19
7835 K/U/B
Y32 C026
C100-4
7830 K/S/B
C019-20
7830 K/S/B
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
Y10 C157
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
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2030
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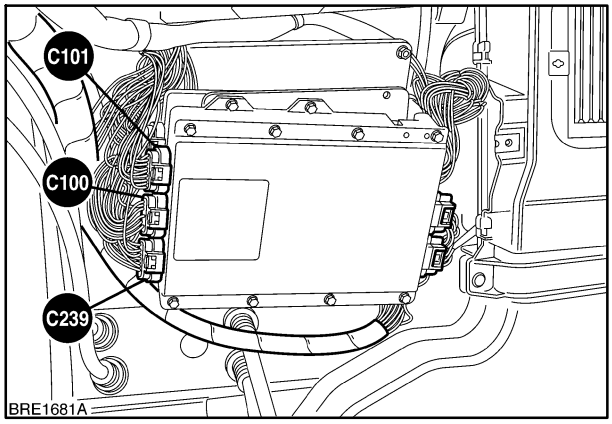
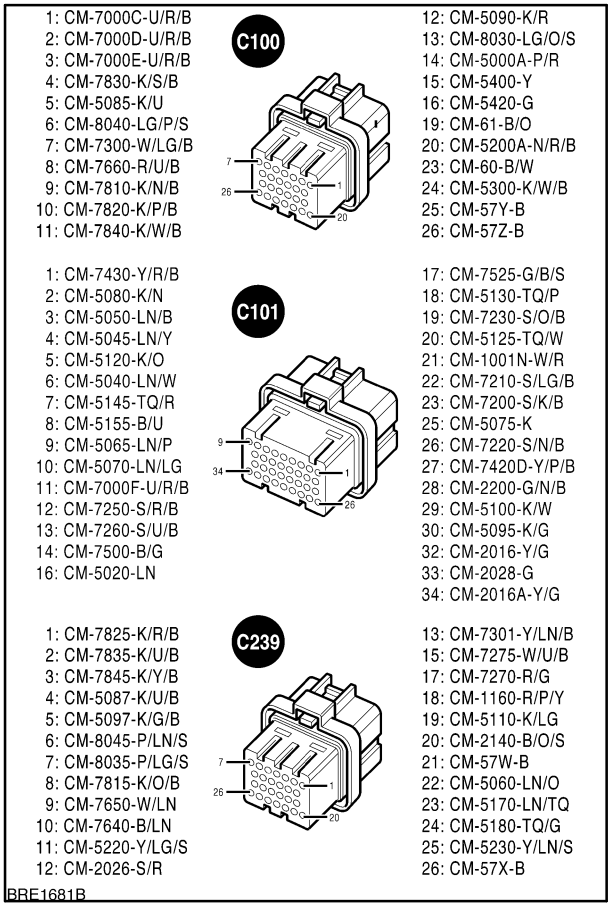
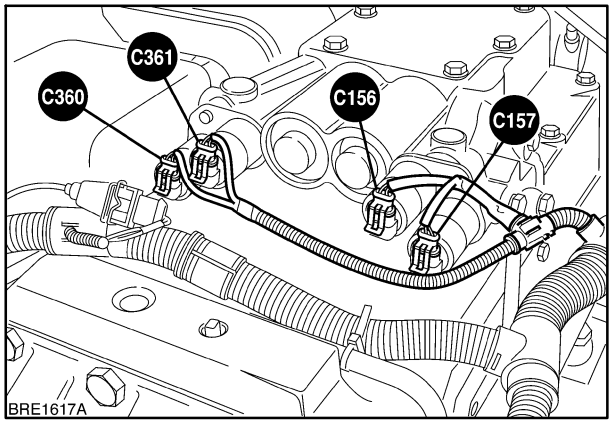
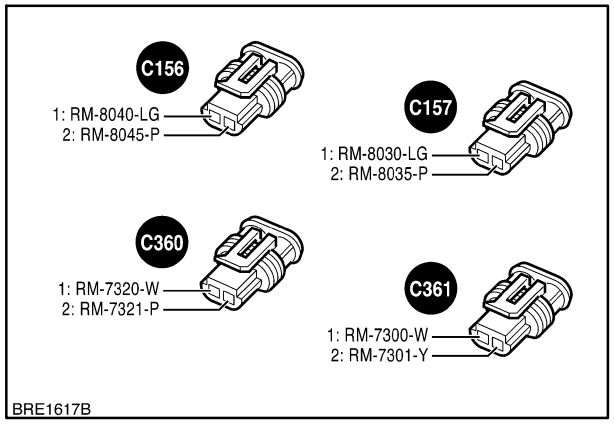
All Transmissions



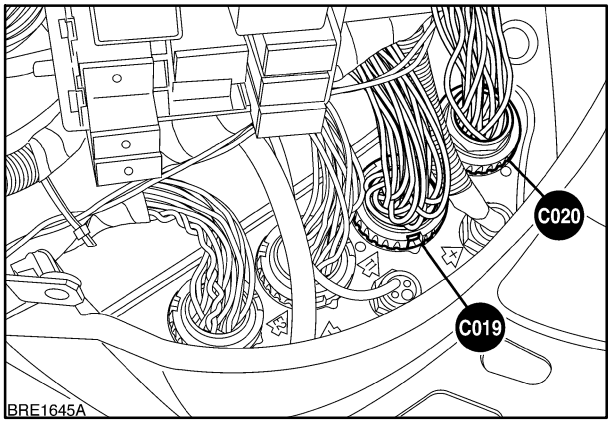


16x16 Transmission

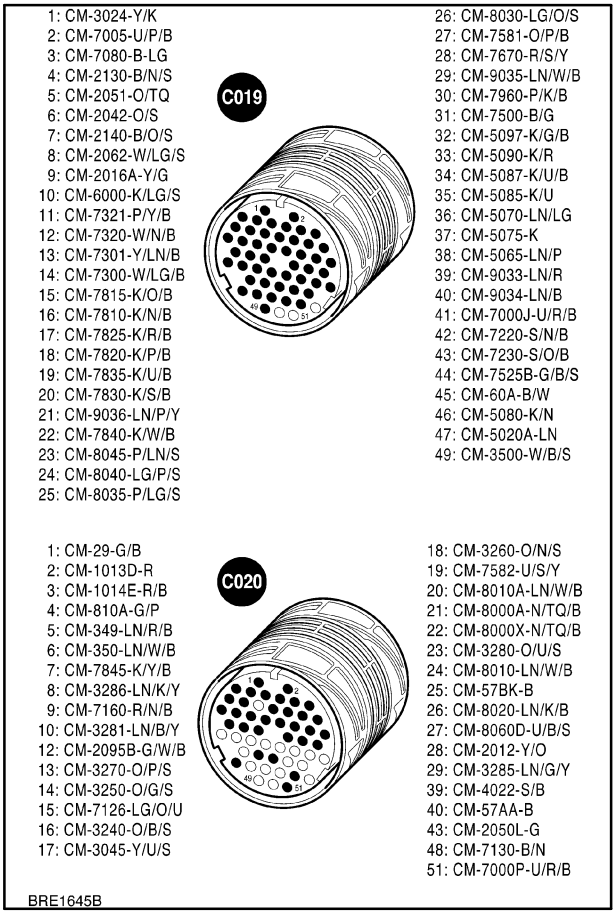




All Transmissions

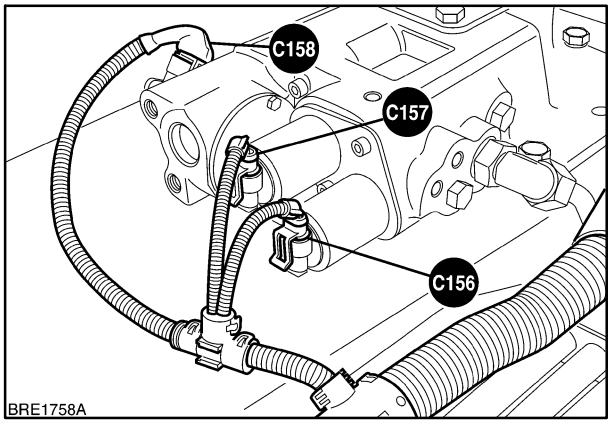


BRE1645A

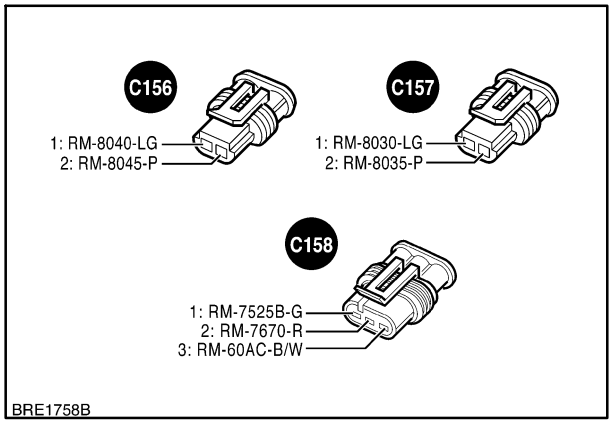


BRE1645B

24x24 Transmission



BRE1758A



BRE1758B

ERROR CODE 2069 - REVERSE SYNCRONISER SOLENOID NO LONGER ENGAGED

Possible failure modes:

1. Faulty reverse synchroniser solenoid
1. Faulty forward/reverse synchroniser potentiometer
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the reverse synchroniser solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2070 - SHUTTLE LEVER FORWARD SWITCH VOLTAGE HIGH

Effects:

There will be a short delay recognising that forward has been selected

Possible failure modes:

1. Faulty connector
2. Faulty shuttle lever forward switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the shuttle lever forward switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into forward. If the display does not change to d15, continue to step 2.

   B. If the display does change to d15, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the shuttle lever forward switch.

   A. Disconnect the shuttle lever connector **C075**. Move the shuttle lever to forward and measure the resistance between the component side of connector **C075** pin **1 (G/B/S)** and **C075** pin **2 (S/R/B)**, if the resistance indicated is not approximately 0.56K Ohms, and then in neutral approximately 2.56K Ohms, remove and replace the shuttle lever switch.

   B. If the shuttle lever switch is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

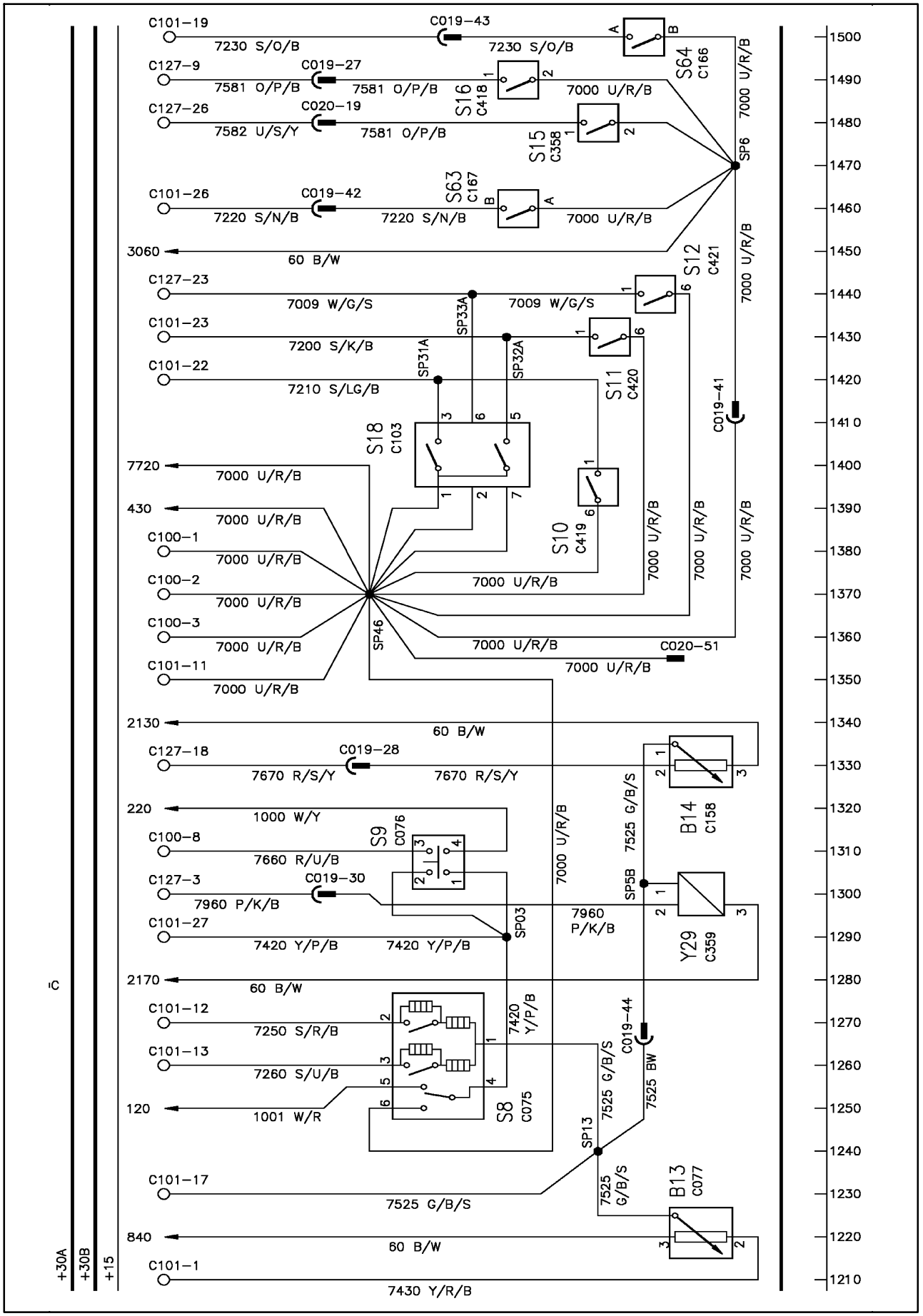
   A. Turn the keystart ON. Measure the voltage between connector **C075** pin **1 (G/B/S)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C075** pin **2 (S/R/B)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
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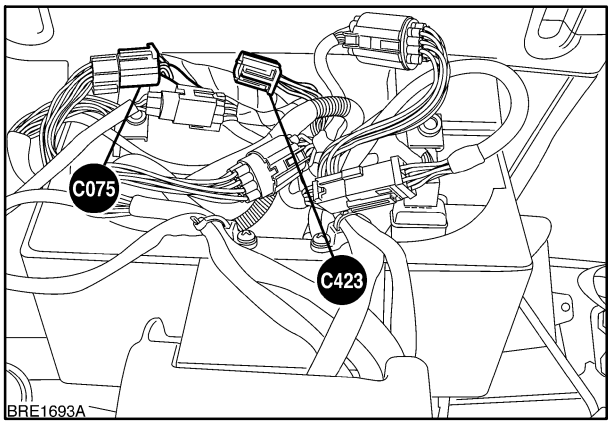
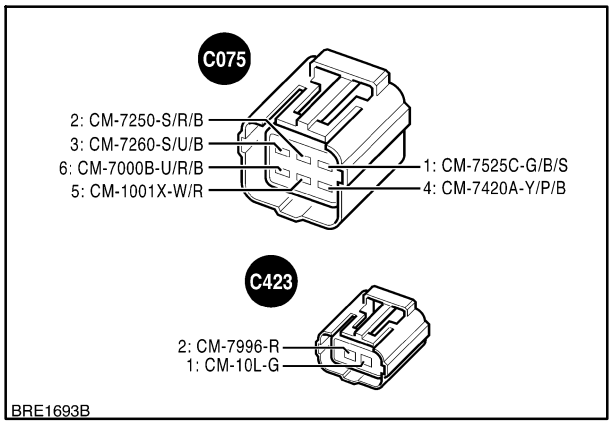

C075
C423
BRE1693A


C075
2: CM-7250-S/R/B
3: CM-7260-S/U/B
6: CM-7000B-U/R/B
5: CM-1001X-W/R
1: CM-7525C-G/B/S
4: CM-7420A-Y/P/B
C423
2: CM-7996-R
1: CM-10L-G
BRE1693B

ERROR CODE 2071 - SHUTTLE LEVER FORWARD SWITCH VOLTAGE LOW

Effects:

There will be a short delay recognising that forward has been selected

Possible failure modes:

1. Faulty connector
1. Faulty shuttle lever forward switch
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the shuttle lever forward switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into forward. If the display does not change to d15, continue to step 2.

   B. If the display does change to d15, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the shuttle lever forward switch.

   A. Disconnect the shuttle lever connector **C075**. Move the shuttle lever to forward and measure the resistance between the component side of connector **C075** pin **1 (G/B/S)** and **C075** pin **2 (S/R/B)**, if the resistance indicated is not approximately 0.56K Ohms, and then in neutral approximately 2.56K Ohms, remove and replace the shuttle lever switch.

   B. If the shuttle lever forward switch is okay, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the controller connector **C101**.

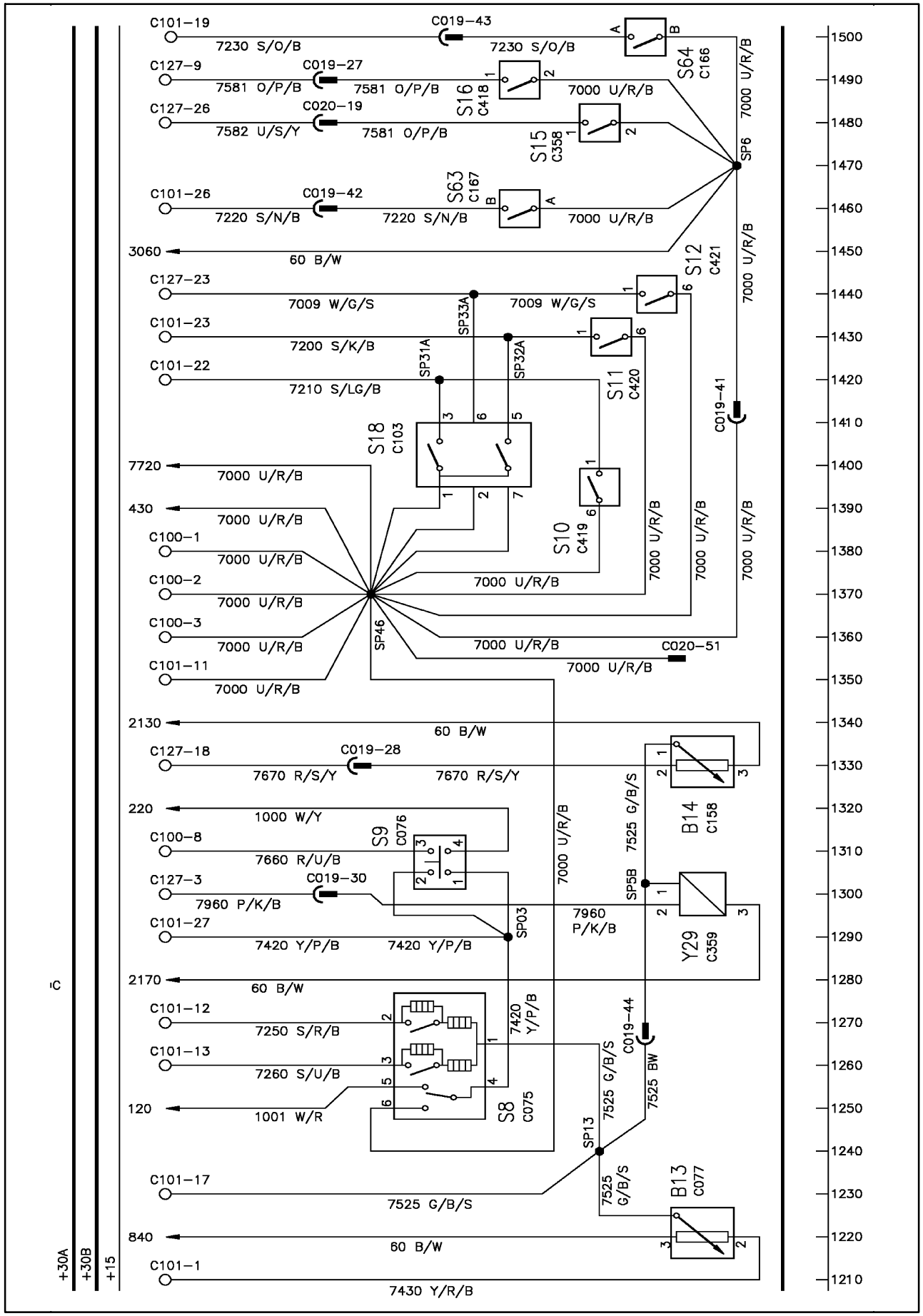
   Check between connector **C101** pin **12 (S/R/B)** and **C075** pin **2 (S/R/B)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground.

   A. Check between connector **C101** pin **12 (S/R/B)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
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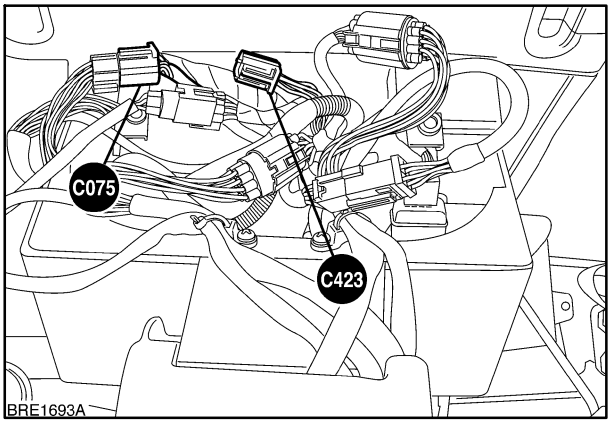
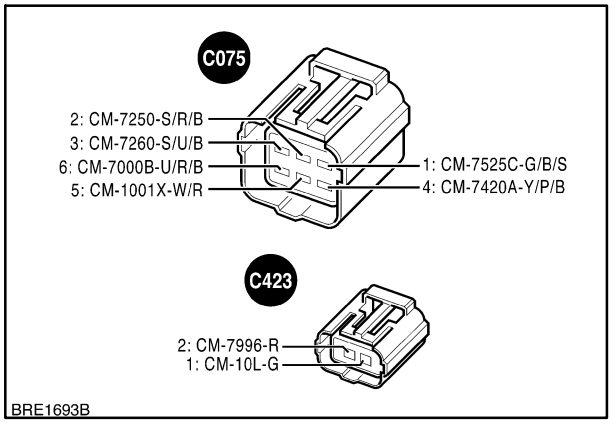
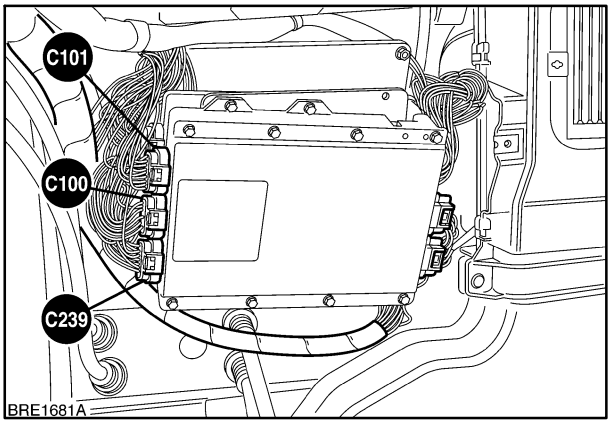
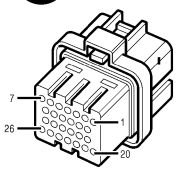






C100



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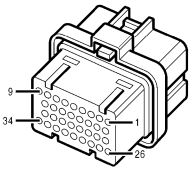
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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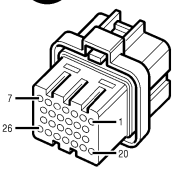
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2072 - SHUTTLE LEVER REVERSE SWITCH VOLTAGE HIGH

Effects:

There will be a short delay recognising that forward has been selected

Possible failure modes:

1. Faulty connector
1. Faulty shuttle lever reverse switch
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the shuttle lever reverse switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into reverse. If the display does not change to d16, continue to step 2.

   B. If the display does change to d16, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the shuttle lever reverse switch.

   A. Disconnect the shuttle lever connector **C075**. Move the shuttle lever to reverse and measure the resistance between the component side of connector **C075** pin **1 (G/B/S)** and **C075** pin **3 (S/U/B)**, if the resistance indicated is not approximately 0.56K Ohms, and then in neutral approximately 2.56K Ohms, remove and replace the shuttle lever switch.

   B. If the shuttle lever reverse switch is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C075** pin **1 (G/B/S)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

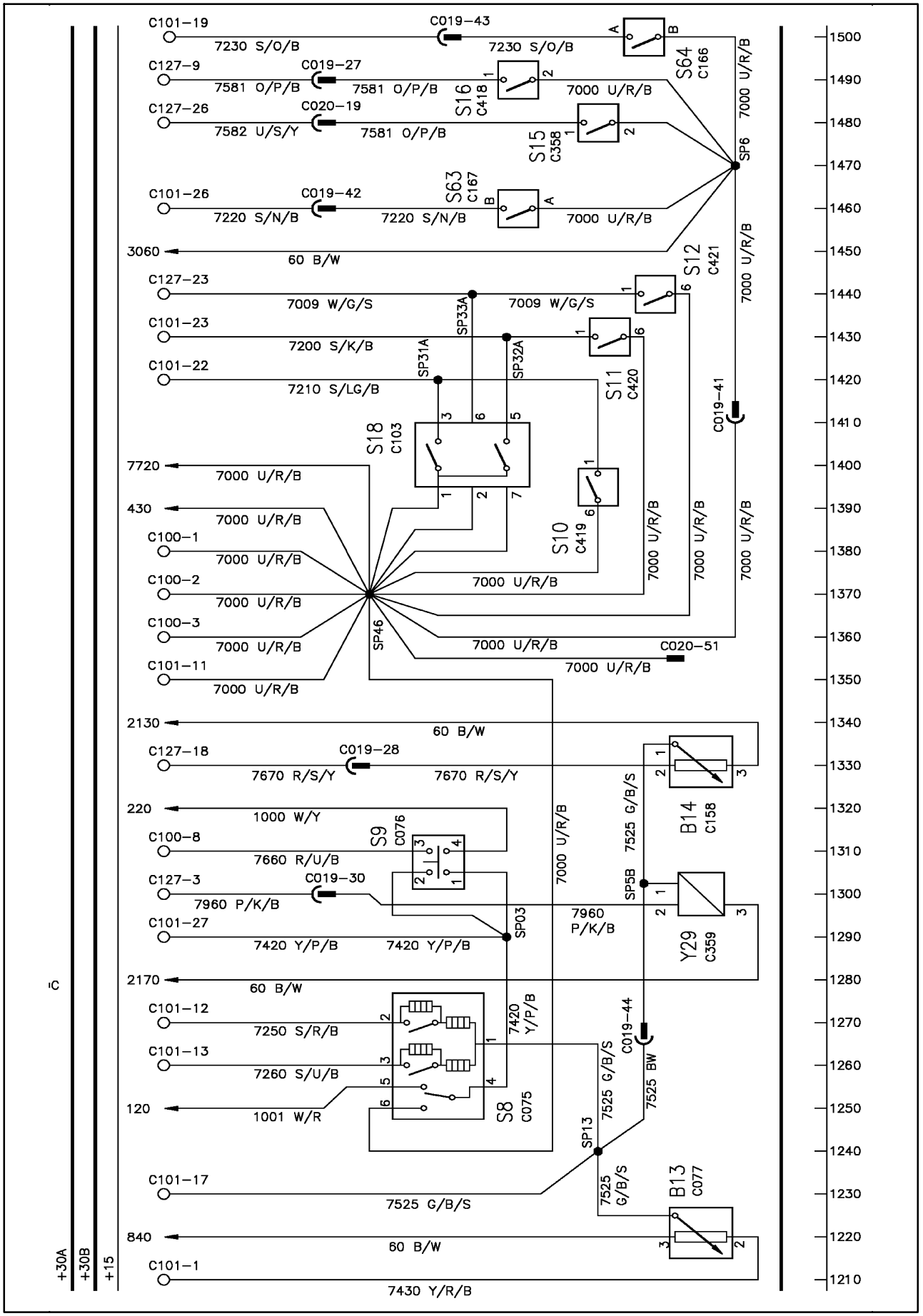
   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Measure the voltage between connector **C075** pin **3 (S/U/B)** and **ground**.

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
S10 C419
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
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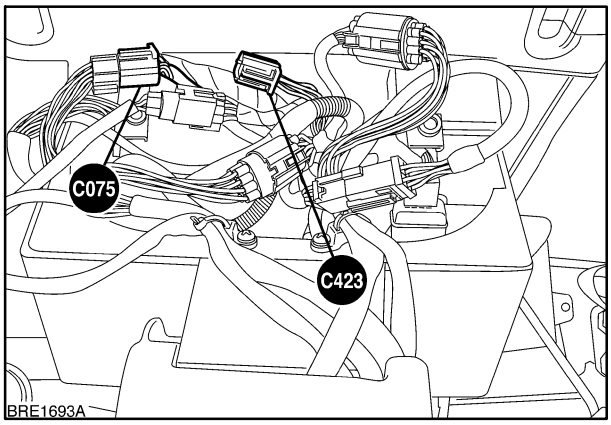
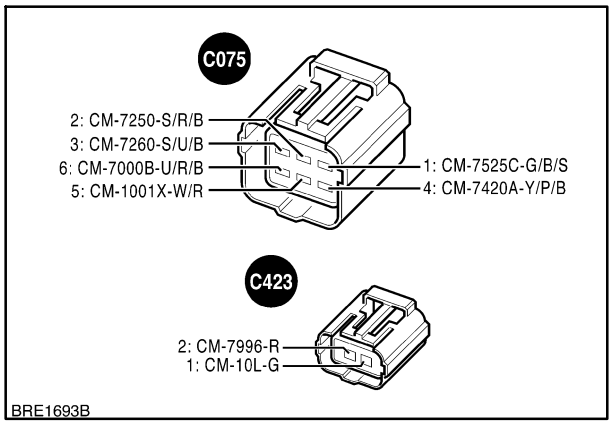

C075
C423
BRE1693A


C075
2: CM-7250-S/R/B
3: CM-7260-S/U/B
6: CM-7000B-U/R/B
5: CM-1001X-W/R
1: CM-7525C-G/B/S
4: CM-7420A-Y/P/B
C423
2: CM-7996-R
1: CM-10L-G
BRE1693B

ERROR CODE 2073 – SHUTTLE LEVER REVERSE SWITCH VOLTAGE LOW

Effects:

There will be a short delay recognising that reverse has been selected

Possible failure modes:

1. Faulty connector
2. Faulty shuttle lever reverse switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the shuttle lever reverse switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into reverse. If the display does not change to d16, continue to step 2.

   B. If the display does change to d16, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the shuttle lever switch.

   A. Disconnect the shuttle lever connector **C075**. Move the shuttle lever to reverse and measure the resistance between the component side of connector **C075** pin **1 (G/B/S)** and **C075** pin **3 (S/U/B)**, if the resistance indicated is not approximately 0.56K Ohms, and then in neutral approximately 2.56K Ohms, remove and replace the shuttle lever switch.

   B. If the shuttle lever reverse switch is okay, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the controller connector **C101**.

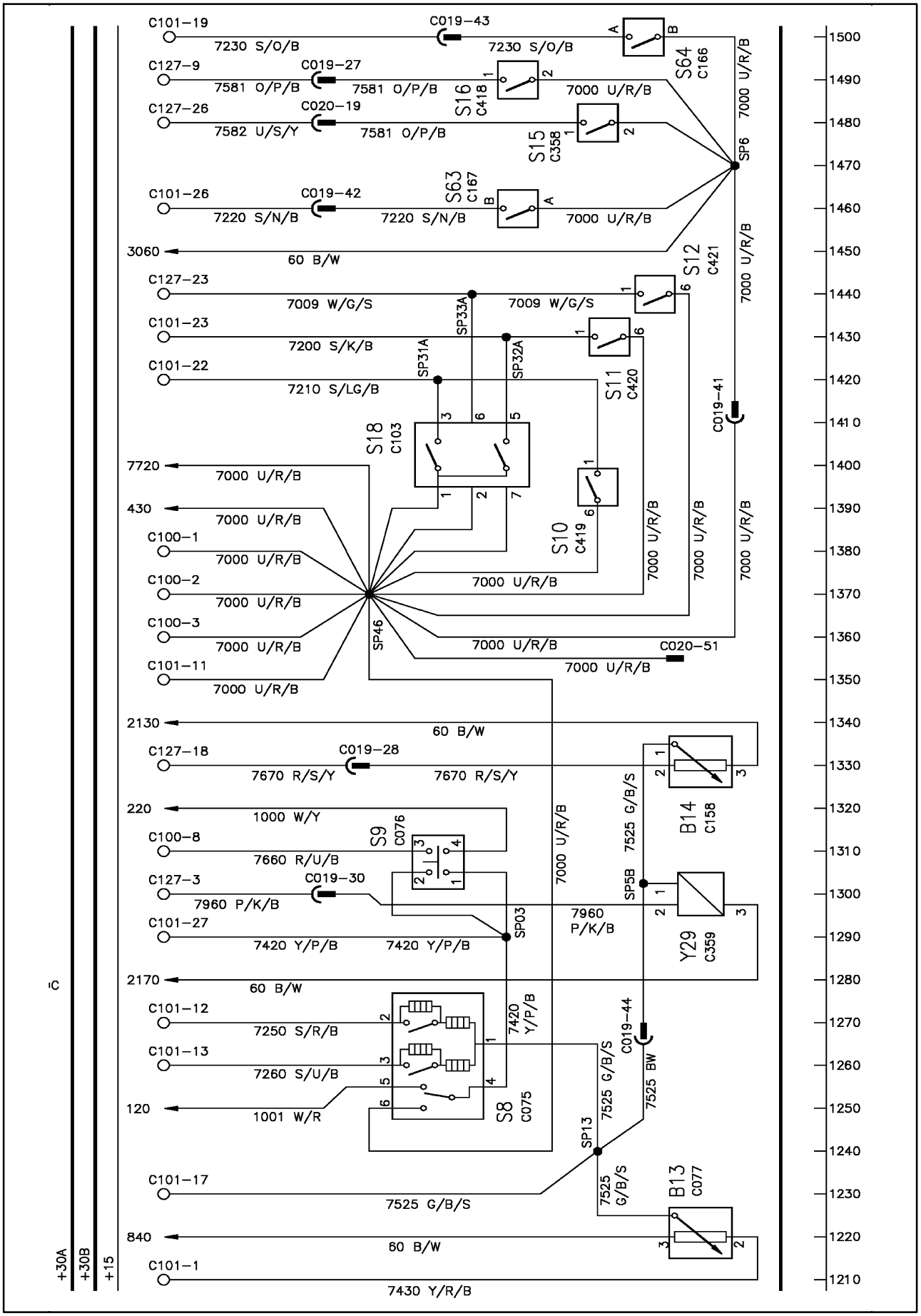
   Check between connector **C101** pin **13 (S/U/B)** and **C075** pin **3 (S/U/B)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground.

   A. Check between connector **C101** pin **13 (S/U/B)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
7000 U/R/B
C100-3
7000 U/R/B
SP46
7000 U/R/B
C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
7525 G/B/S
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
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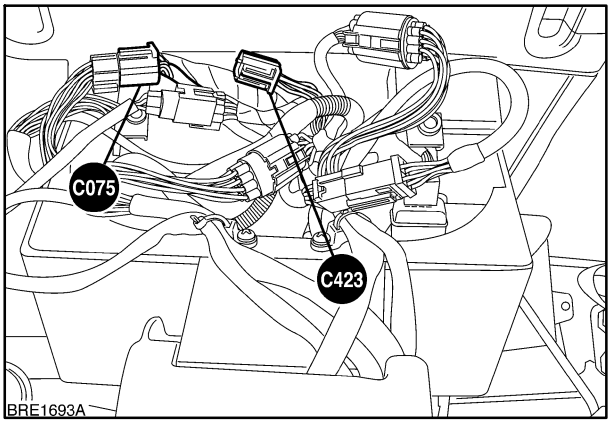
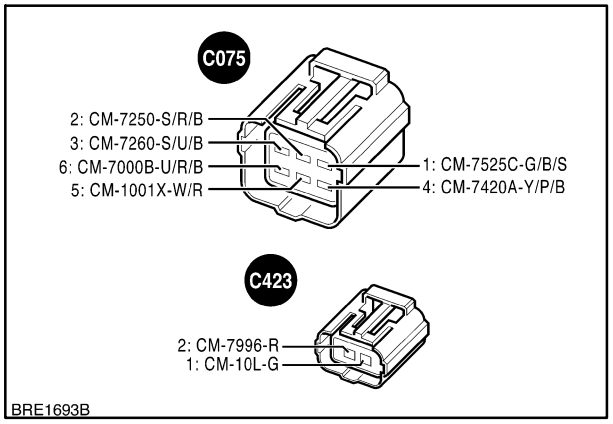
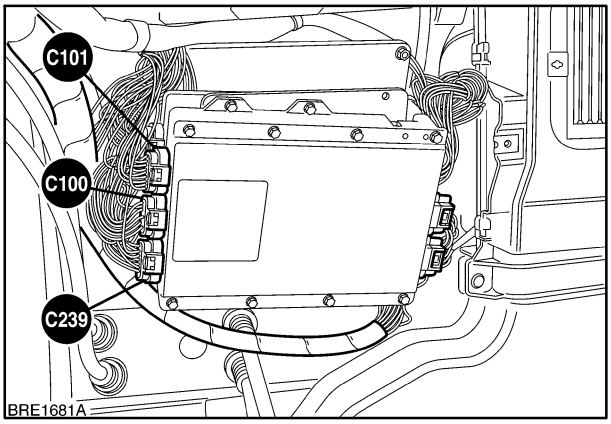
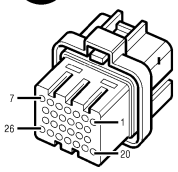






C100



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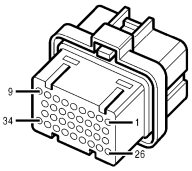
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
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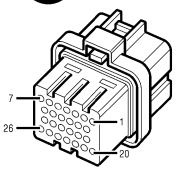
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2075 - NO SIGNAL FROM FLYWHEEL SPEED SENSOR

Possible failure modes:

1. Faulty connector
2. Faulty flywheel speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the flywheel speed sensor in H9 Channel 94

   A. Increase the engine speed to maximum and decrease to idle. If the values displayed do not change continuously, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 94 wiggle the harness, the flywheel speed sensor connector **C255,** the controller connector **C128** and the inline harness connector **C019** to check for an intermittent circuit. Channel 94 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the flywheel speed sensor connector **C255**, the controller connectors **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for 12 volts.

   A. Disconnect connector **C255**. Turn the keystart ON, measure the voltage between connector **C255** pin **1 (G)** and **ground**. If a voltage is not indicated, repair or replace the harness as required to fuse 19.

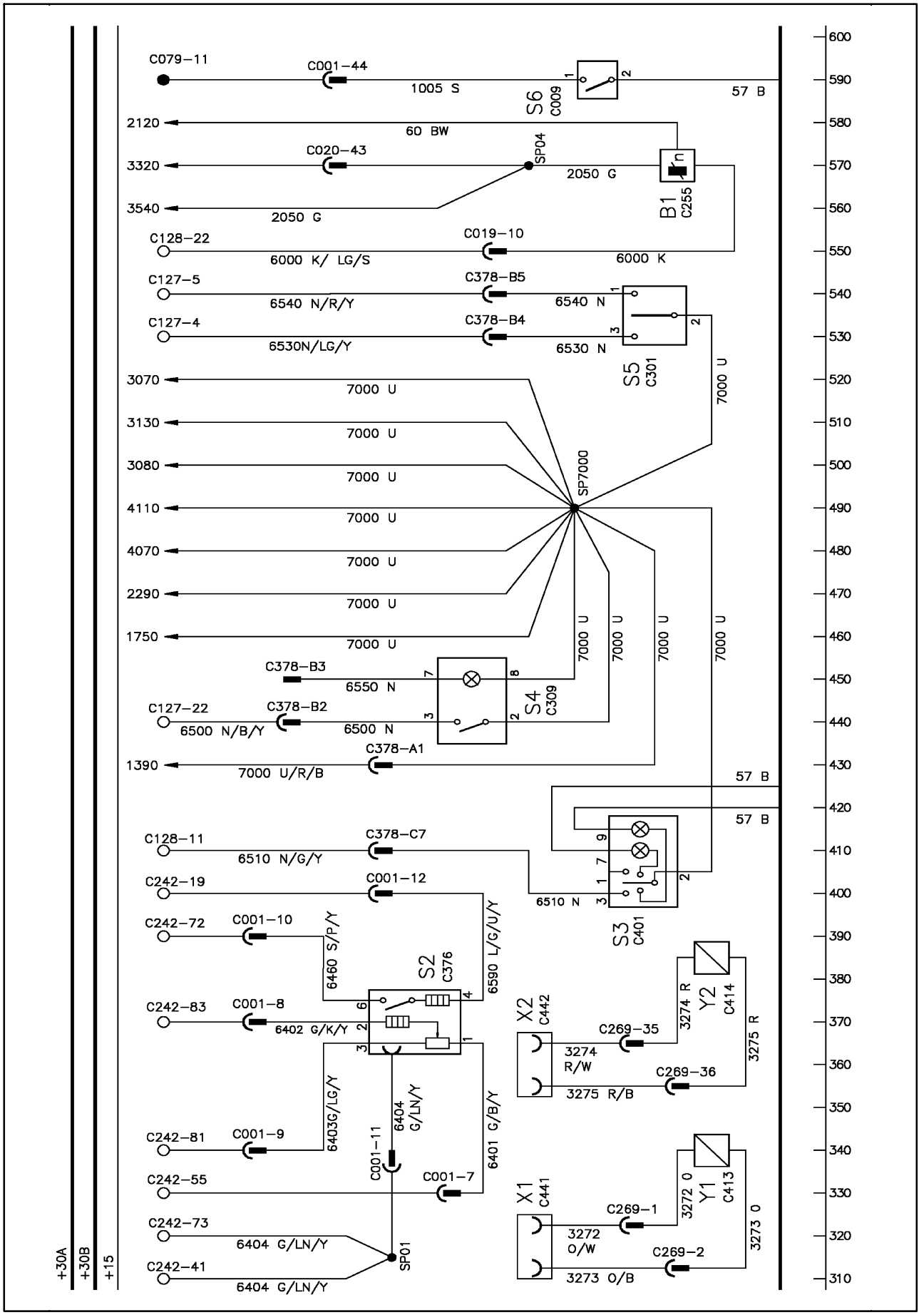
   B. If 12 volts is indicated, continue to step 4.

4. Check for other flywheel speed sensor error codes displayed.

   A. If other error codes are displayed, continue with these tests.

   B. If no other error codes are displayed, remove and replace the engine flywheel speed sensor.

   If the fault is still present, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C001-7
C242-55
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
6510 N
S3 C401
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
+30A
+30B
+15
600
590
580
570
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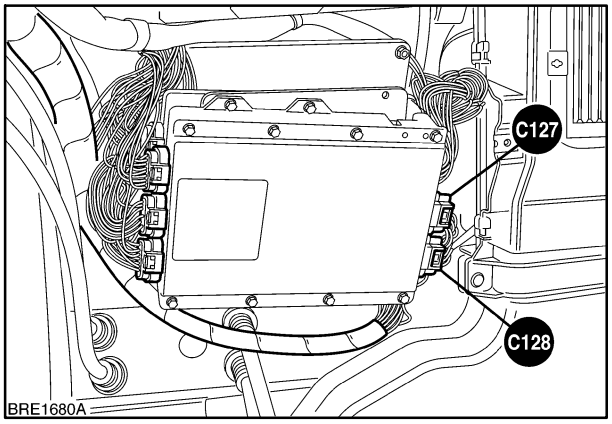
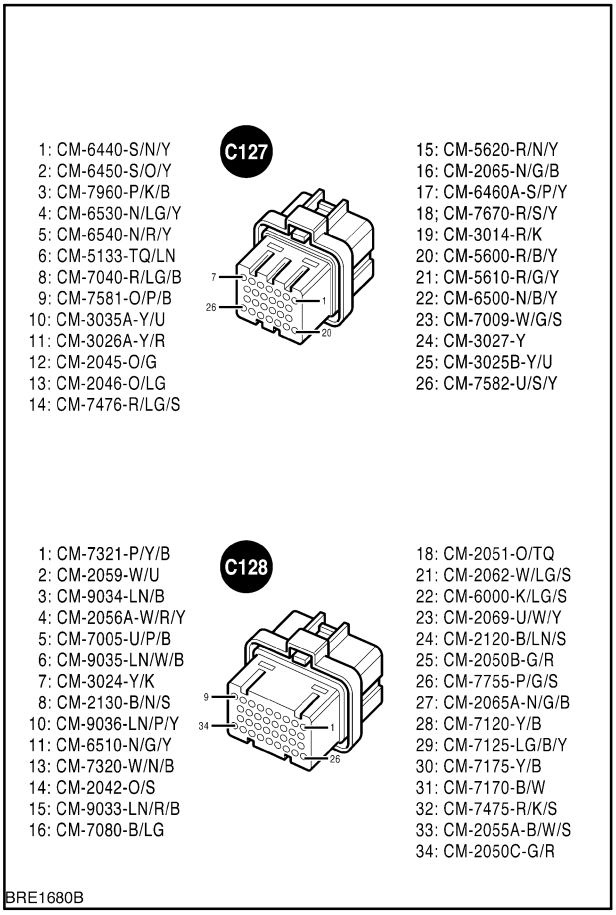
All Transmissions

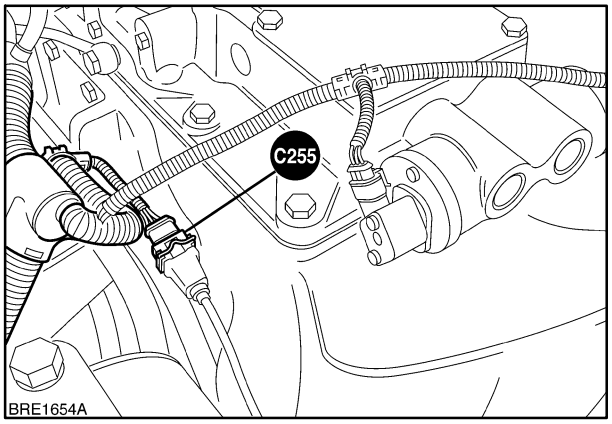


BRE1680A



BRE1680B

16x16 Transmission



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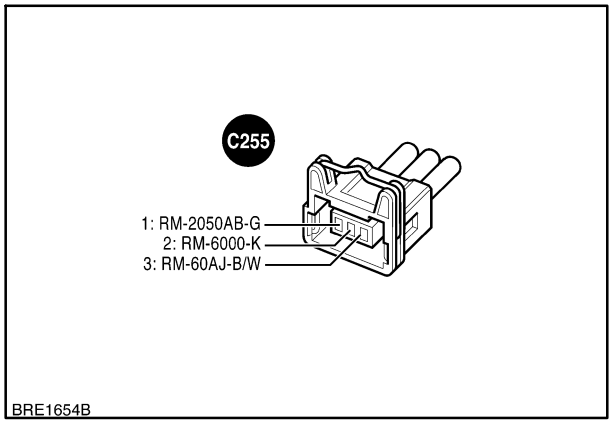
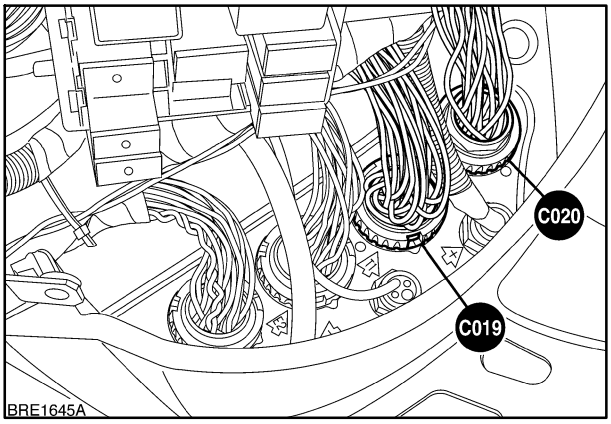
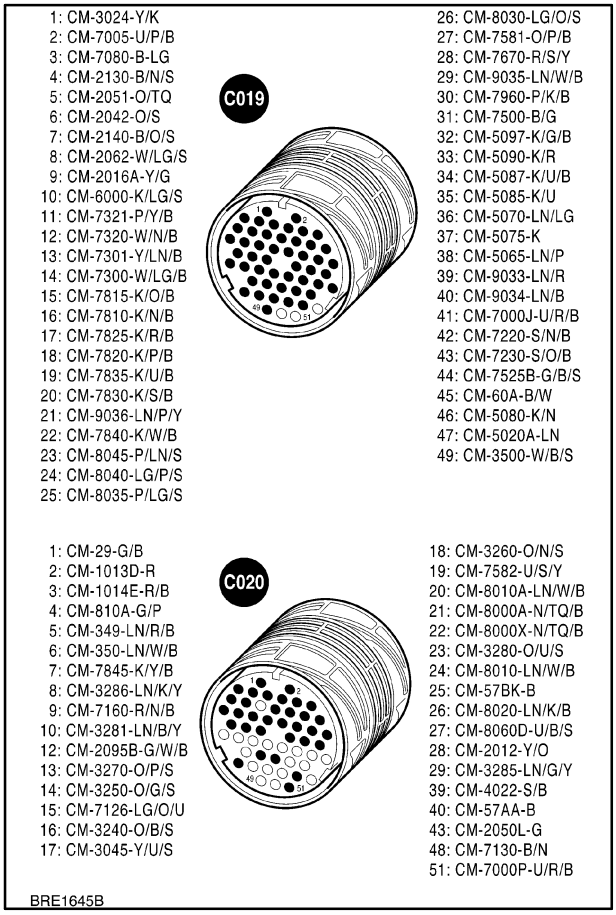


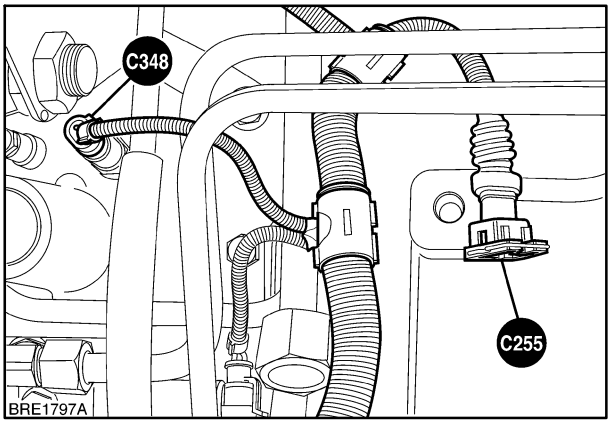
BRE1654B

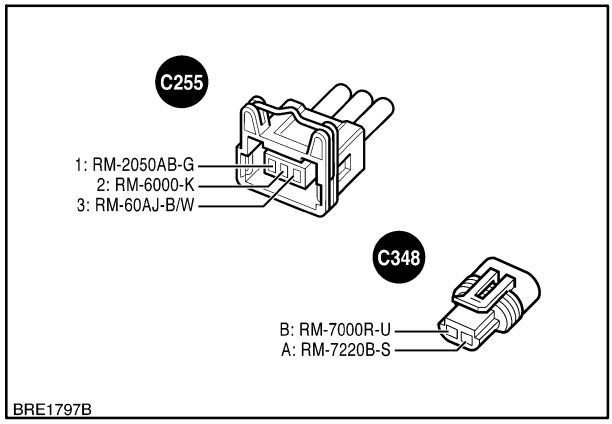
All Transmissions





24x24 Transmission





ERROR CODE 2076 – FLYWHEEL SPEED SENSOR OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty flywheel speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the flywheel speed sensor in H9 Channel 94

   A. Increase the engine speed to maximum and decrease to idle. If the values displayed do not change continuously, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 94 wiggle the harness, the flywheel speed sensor connector **C255,** the controller connector **C128**, and the inline harness connector **C019** to check for an intermittent circuit. Channel 94 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the flywheel speed sensor connector **C255**, the controller connectors **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for +12 volts.

   A. Disconnect connector **C255**. Turn the keystart ON, measure the voltage between connector:

   C255 pin **1 (G)** and **ground**

   If a voltage is not indicated, repair or replace the harness as required to fuse 19.

   B. If +12 volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Check between connector:

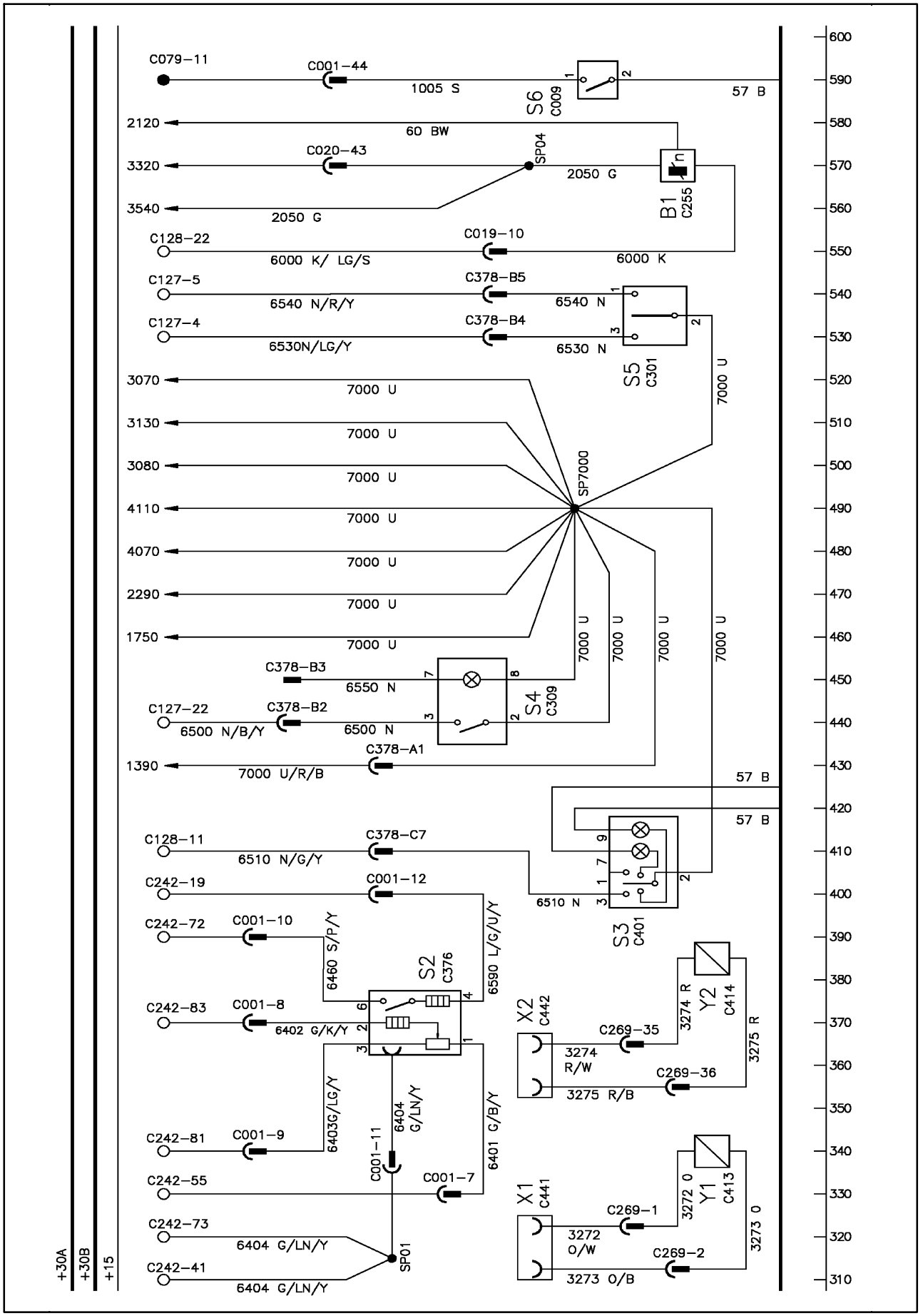
   C255 pin **2 (K)** and **C128** pin **22 (K/LG/S)**

   C255 pin **3 (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the engine flywheel speed sensor.

   If the fault is still present, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C079-11
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1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
6510 N
S3 C401
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
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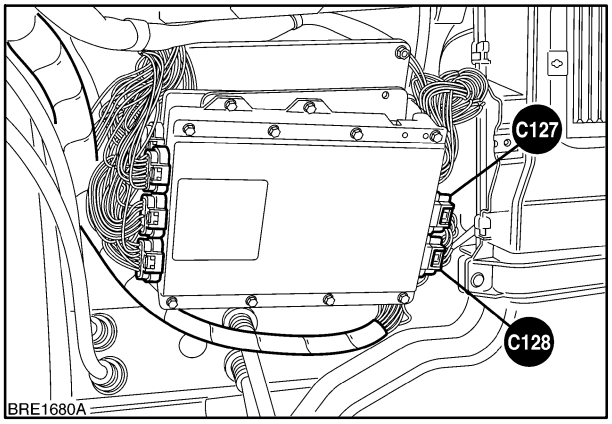
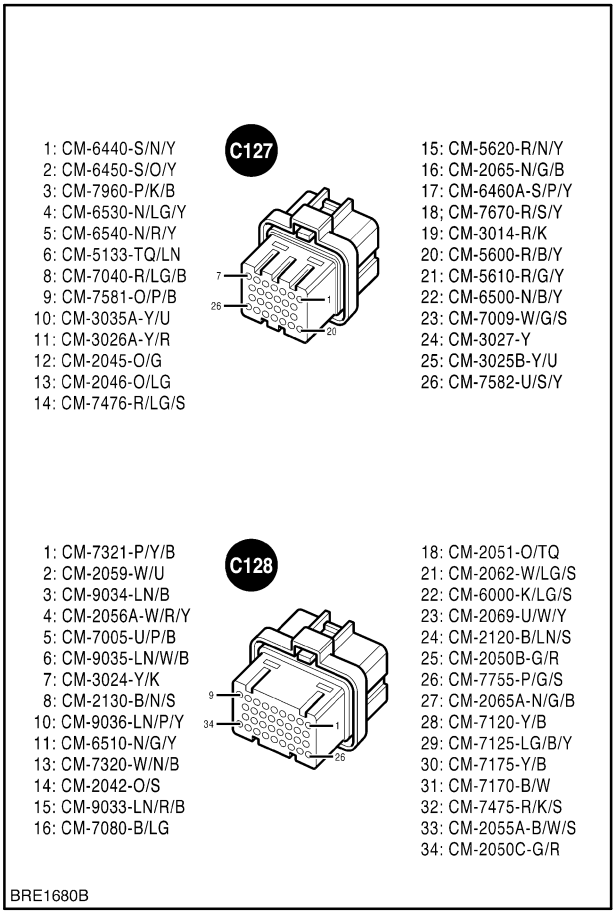
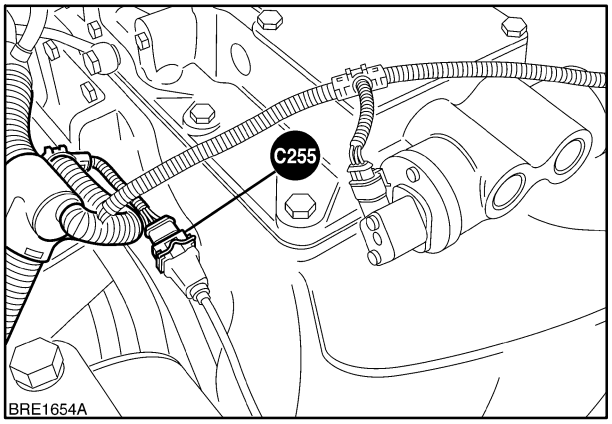
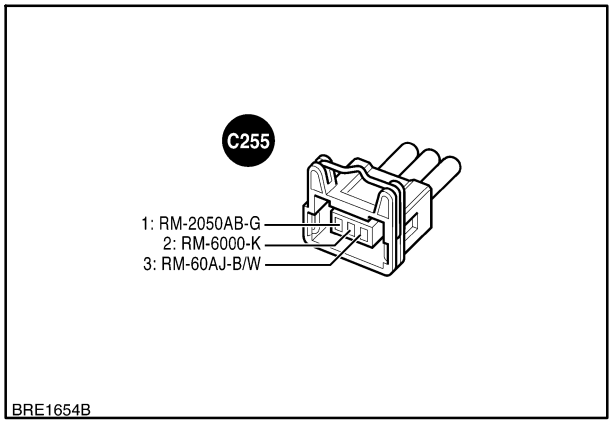
All Transmissions



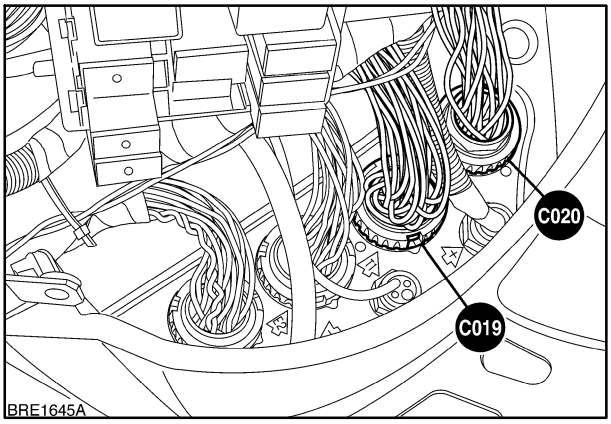


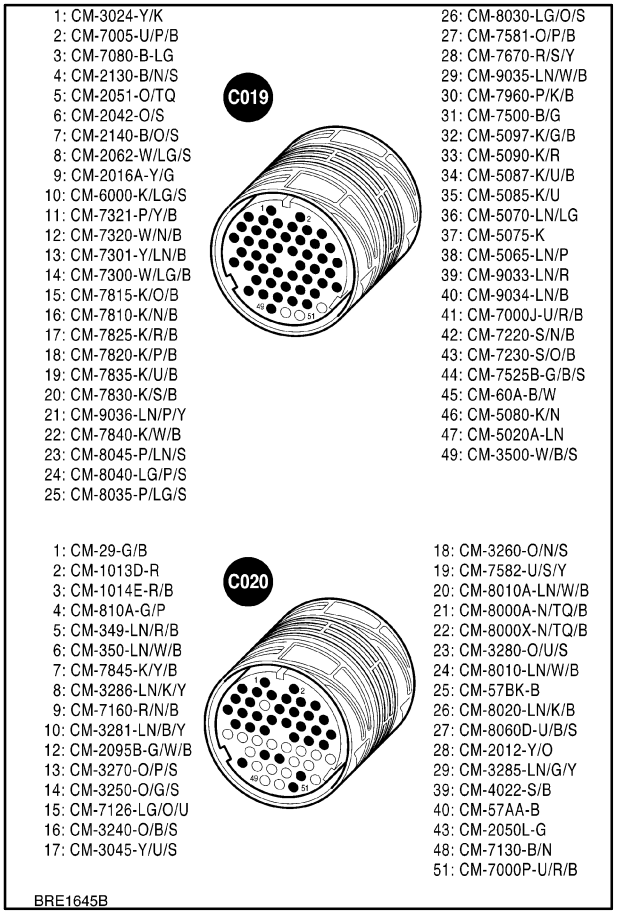
16x16 Transmission



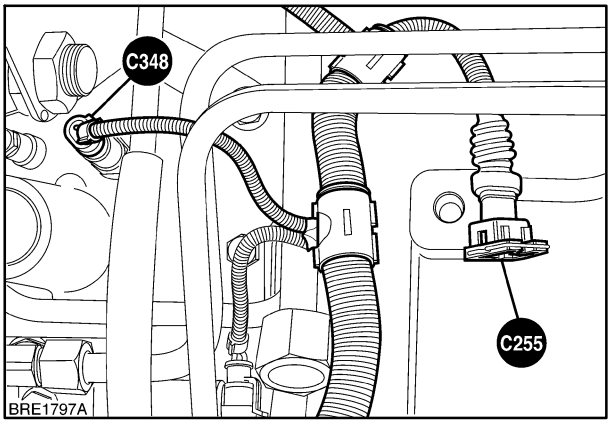


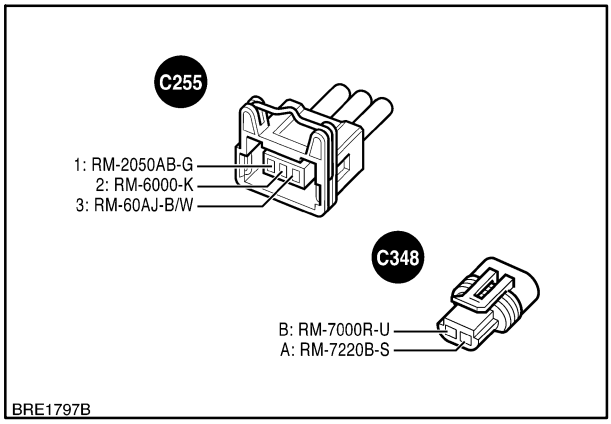
All Transmissions





24x24 Transmission





ERROR CODE 2077 - FLYWHEEL SPEED SENSOR SHORT TO GROUND OR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty flywheel speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the flywheel speed sensor in H9 Channel 94

   A. Increase the engine speed to maximum and decrease to idle. If the values displayed do not change continuously, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 94 wiggle the harness, the flywheel speed sensor connector **C255,** the controller connector **C128** and the inline harness connector **C019** to check for an intermittent circuit. Channel 94 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the flywheel speed sensor connector **C255**, the controller connectors **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +Ve voltage.

   A. Measure the voltage between connector, **C255** pin **2 (K)** and **ground**.

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 4.

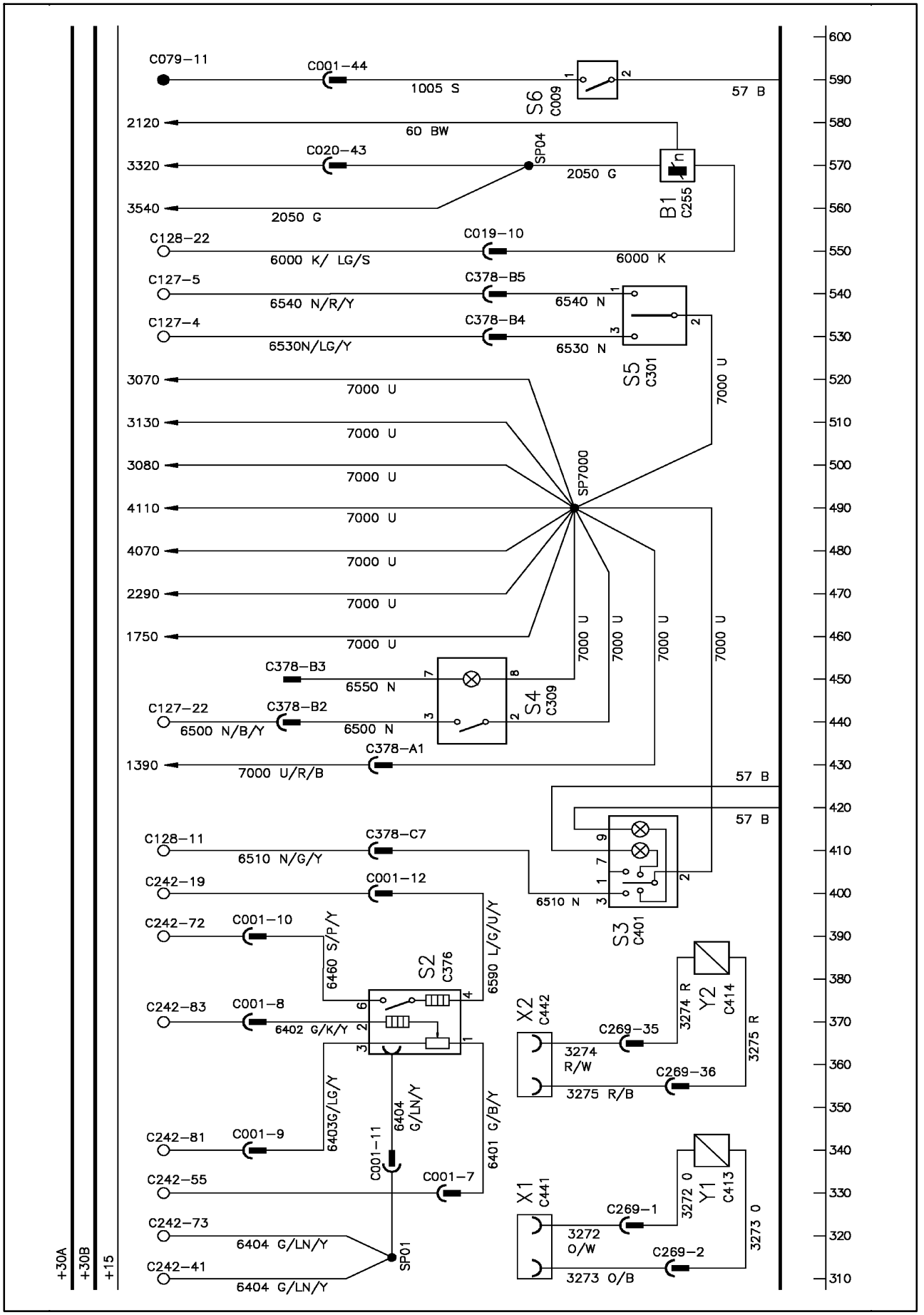
4. Check for a short to ground.

   A. Check between connector, **C255** pin **2 (K/LG/S)** and **ground**.

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the flywheel speed sensor.

   If fault is still present, download the correct level of software. If the fault re-occurs, remove and replace the controller.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1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6510 N
S3 C401
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
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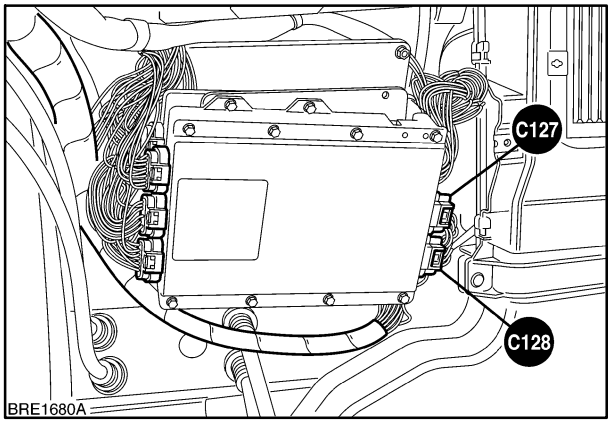
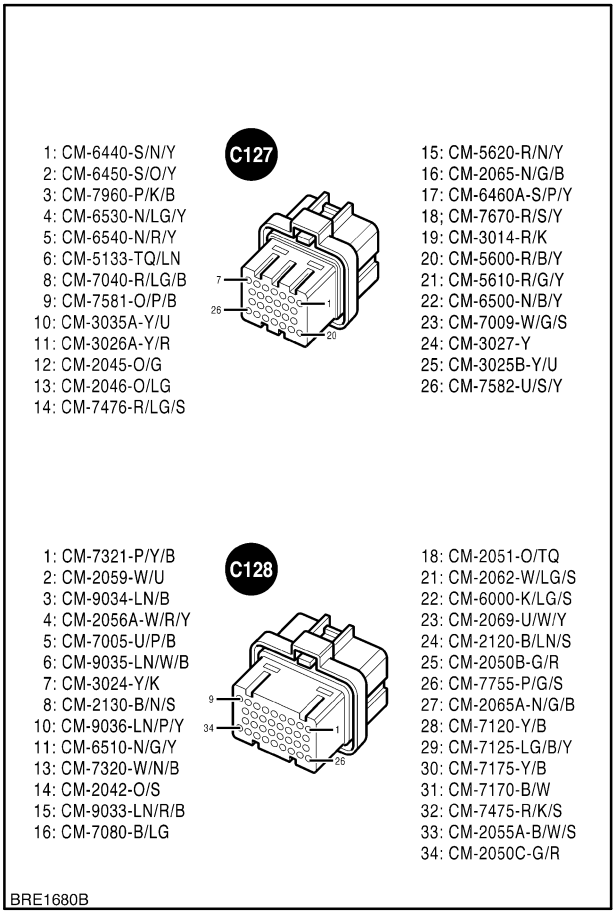
All Transmissions

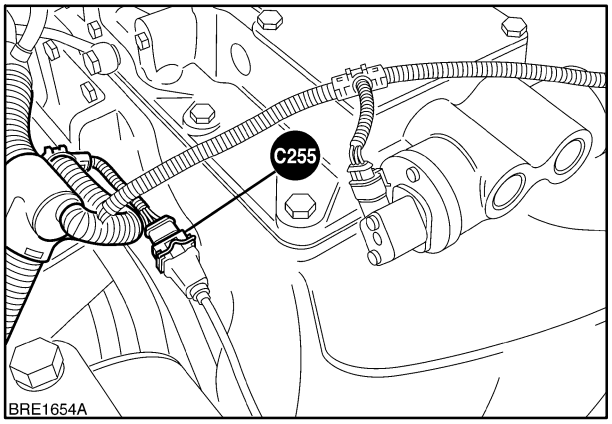


BRE1680A

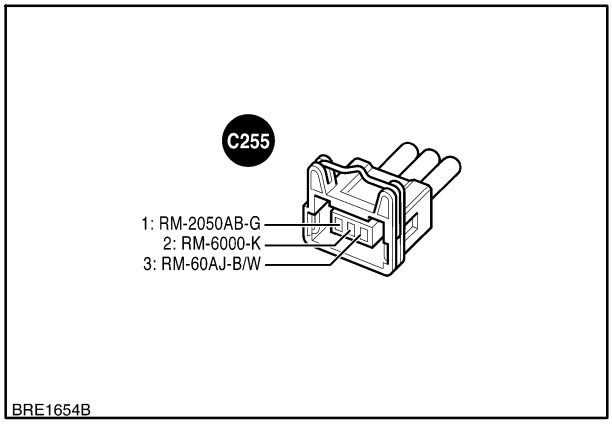


BRE1680B

16x16 Transmission

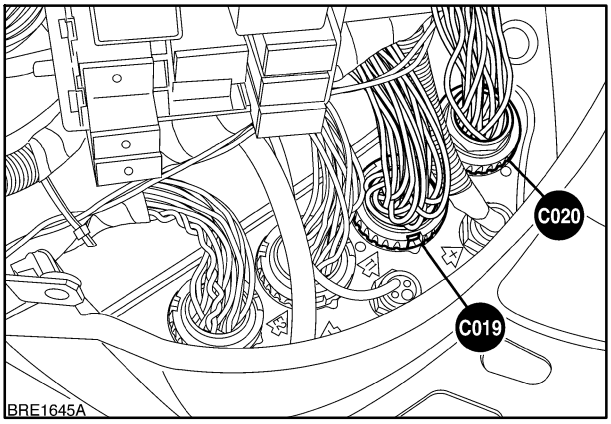


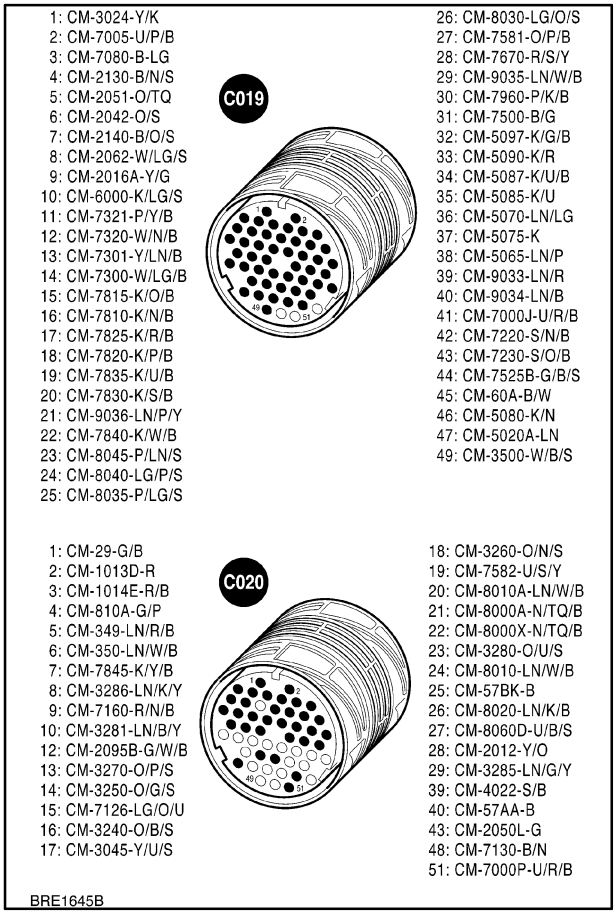
BRE1654A



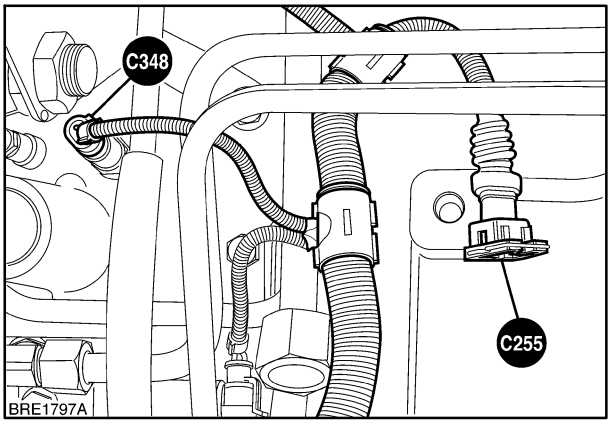
BRE1654B

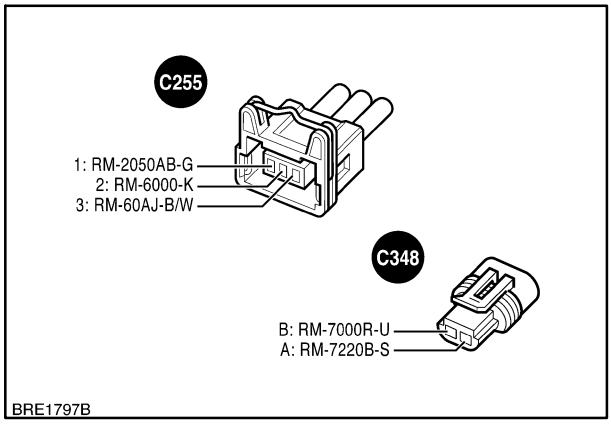
All Transmissions





24x24 Transmission





ERROR CODE 2080 - 1-4 (9- 12) RANGE SYNCHRONISER NO LONGER ENGAGED

Possible failure modes:

1. Faulty 1-4 synchroniser solenoid
1. Faulty 4-5 synchroniser potentiometer
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the 1-4 synchroniser solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2081 - 4/5 RANGE SYNCHRONISER POTENTIOMETER SIGNAL HIGH

Possible failure modes:

1. Faulty connector
2. Faulty 4/5 synchroniser potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 4/5 synchroniser potentiometer in H9 Channel 73.

   A. With 4th gear selected, change from 4th to 5th gear, if the values displayed do not change continuously between 14 to 76, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 73, wiggle the harness and the 4/5 synrco potentiometer connector **C359**, the controller connectors **C127** and **C101**, and the inline harness connector **C019** to check for an intermittent circuit.

2. Check the 4/5 synchroniser potentiometer connector **C359,** the controller connectors **C127** and **C101** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the 4/5 synchroniser potentiometer.

   A. Disconnect connector **C359**. Remove the potentiometer. While operating the potentiometer, measure the resistance between the component side of connector:

   C359 pin **2** and **C359** pin **3** should indicate between 0.90K Ohms and 3.7K Ohms

   C359 pin **2** and **C359** pin **1** should indicate between 3.7K Ohms and 0.90K Ohms

   If the resistances indicated are not okay, remove and replace the 4/5 synchroniser potentiometer.

   B. If the 4/5 synchroniser potentiometer is okay, continue to step 4.

4. Check for a short to +8 or +12 Volts.

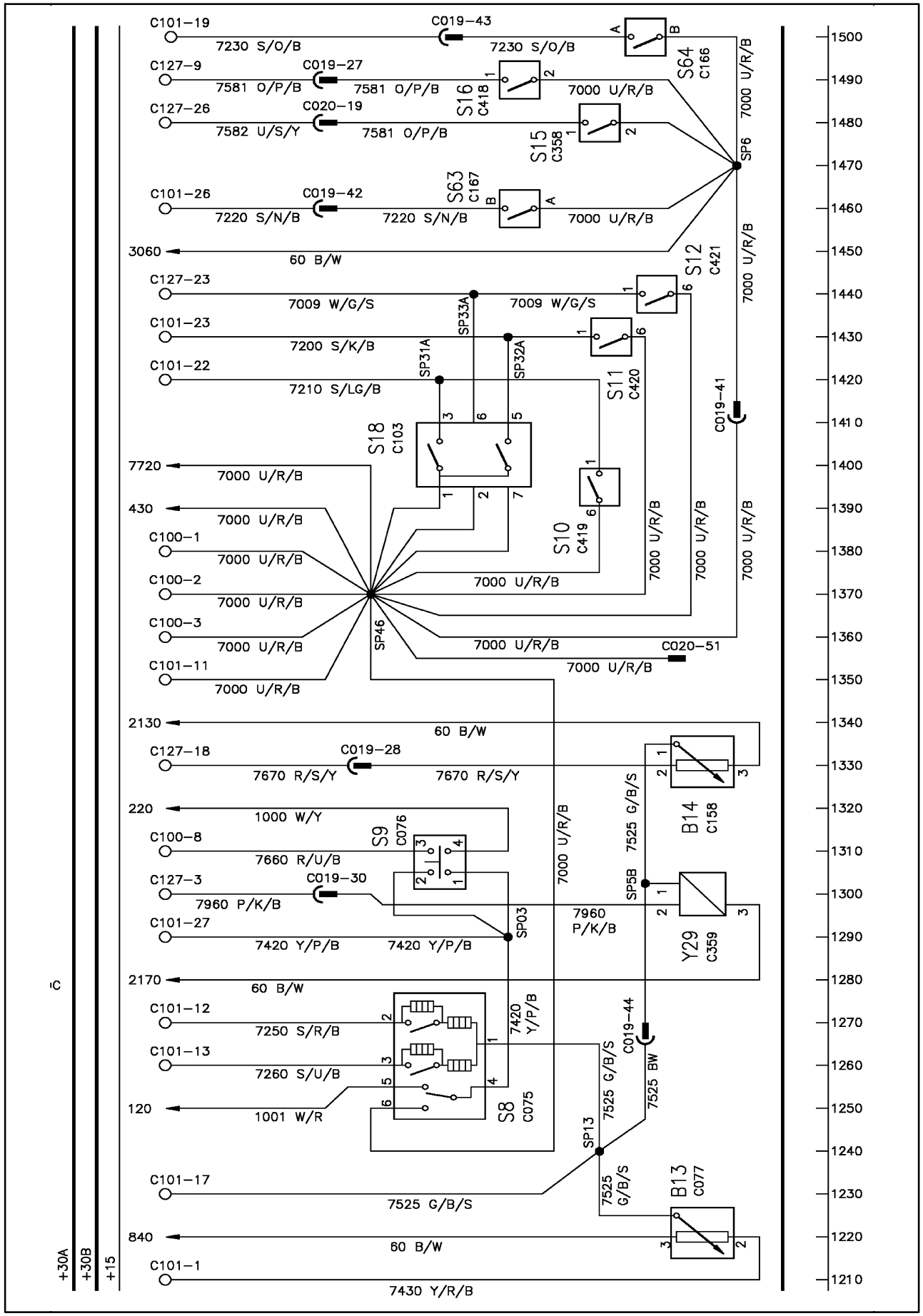
   A. Disconnect the connector **C127** and **C101**. Turn the keystart ON. Measure the voltage between connector **C359** pin **1 (G/B/S)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C359** pin **2 (P/K/B)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
C101-26
C019-42
S63 C167
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
S18 C103
C019-41
7720
7000 U/R/B
430
7000 U/R/B
S10 C419
C100-1
7000 U/R/B
C100-2
7000 U/R/B
7000 U/R/B
C100-3
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SP46
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C020-51
C101-11
7000 U/R/B
7000 U/R/B
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
SP5B
7525 G/B/S
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
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+30A
+30B
+15
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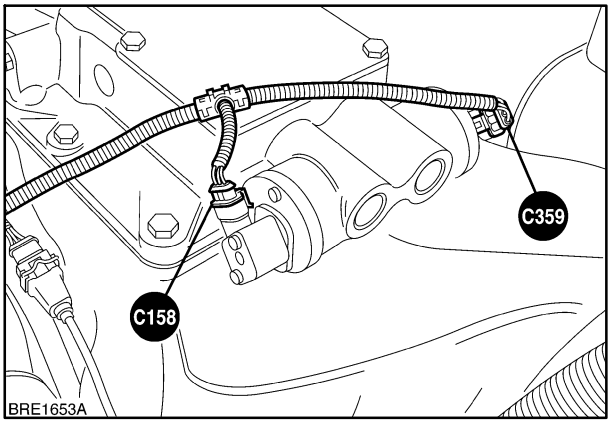
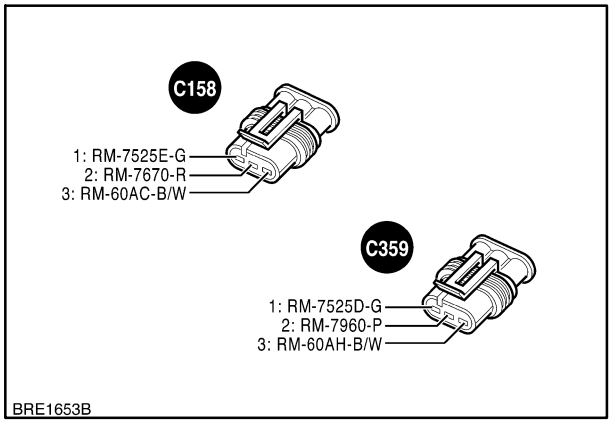
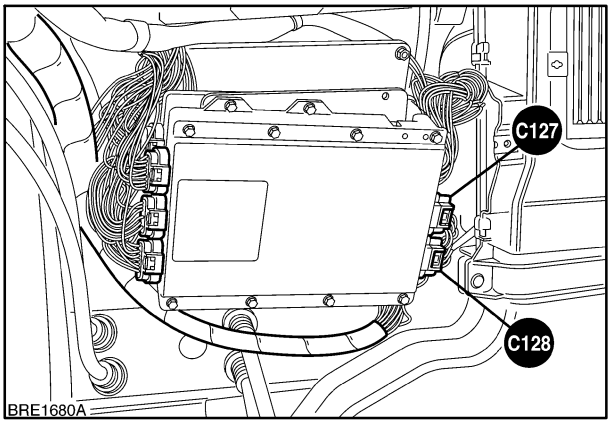
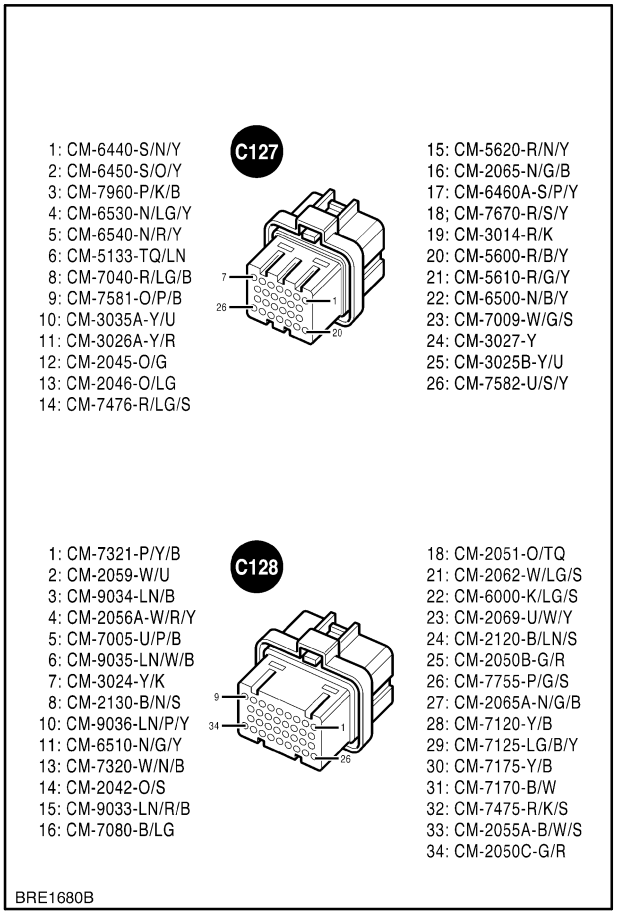

C359
C158
BRE1653A


C158
1: RM-7525E-G
2: RM-7670-R
3: RM-60AC-B/W
C359
1: RM-7525D-G
2: RM-7960-P
3: RM-60AH-B/W
BRE1653B


C127
C128
BRE1680A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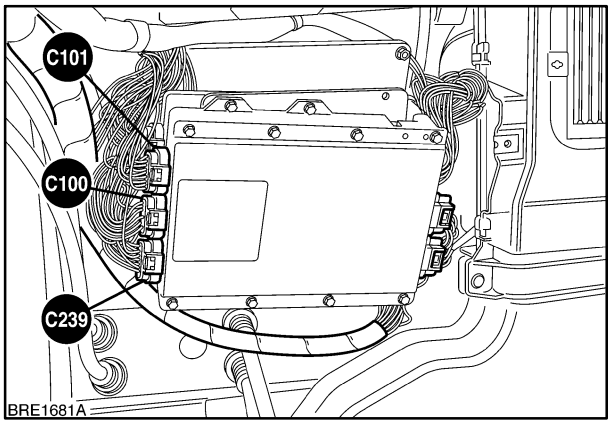
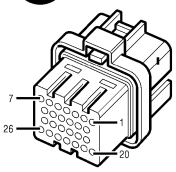
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
C127
7
26
1
20
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
C128
9
34
1
26
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R
BRE1680B



BRE1681A

C100



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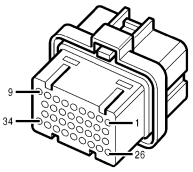
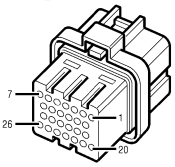
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2082 – 4/5 RANGE SYNCHRONISER POTENTIOMETER SIGNAL LOW

Possible failure modes:

1. Faulty connector
2. Faulty 4/5 synchroniser potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 4/5 synchroniser potentiometer in H9 Channel 73.

   A. With 4th gear selected, change from 4th to 5th gear, if the values displayed do not change continuously between 14 to 76, continue to step 2.

   B. If the values displayed are okay, while still in H9 Channel 73, wiggle the harness, the 4/5 synchroniser potentiometer connector **C359**, the controller connectors **C127** and **C101**, and the inline harness connector **C019** to check for an intermittent circuit.

   Channel 72 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the 4/5 synchroniser potentiometer connector **C359,** the controller connectors **C127** and **C101** and the inline harness connector **C019**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the 4/5 synchroniser potentiometer for open circuit.

   A. Disconnect connector **C359**. Remove the potentiometer. While operating the potentiometer, measure the resistance between the component side of connector:

   C359 pin **2** and **C359** pin **3** should indicate between 0.90K Ohms and 3.7K Ohms

   C359 pin **2** and **C359** pin **1** should indicate between 3.7K Ohms and 0.9K Ohms

   If the resistances indicated are not okay, remove and replace the 4/5 synchroniser potentiometer.

   B. If the 4/5 synchroniser potentiometer is okay, continue to step 4.

4. Check for an open circuit.

   A. Disconnect connectors **C127** and **C101**. Check between connector:

   C359 pin **1 (G/B/S)** and **C101** pin **17 (G/B/S)**

   C359 pin **2 (P/K/B)** and **C127** pin **30 (P/K/B)**

   C358 pin **3 (B/W)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to ground.

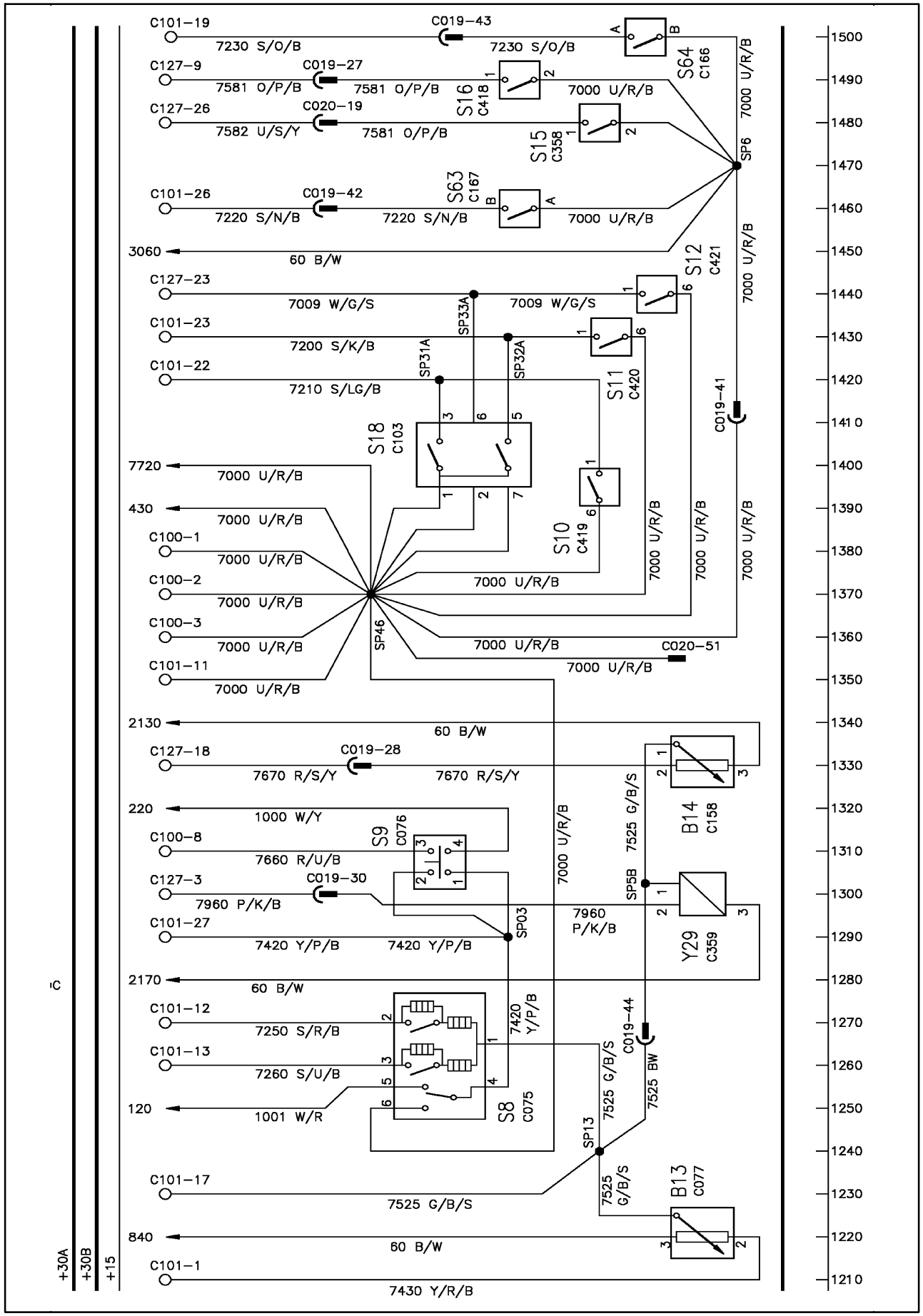
   A. Check between connector:

   C359 pin **1 (G/B/S)** and **ground**

   C359 pin **2 (P/K/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C101-19
C019-43
7230 S/O/B
7230 S/O/B
S64 C166
C127-9
C019-27
7581 O/P/B
7581 O/P/B
S16 C418
7000 U/R/B
C127-26
C020-19
7582 U/S/Y
7581 O/P/B
S15 C358
SP6
7000 U/R/B
S63 C167
C101-26
C019-42
7220 S/N/B
7220 S/N/B
7000 U/R/B
3060
60 B/W
S12 C421
C127-23
7009 W/G/S
7009 W/G/S
SP33A
C101-23
7200 S/K/B
SP31A
SP32A
C101-22
7210 S/LG/B
S11 C420
C019-41
S18 C103
7720
7000 U/R/B
430
7000 U/R/B
C100-1
7000 U/R/B
C100-2
7000 U/R/B
C100-3
7000 U/R/B
C101-11
7000 U/R/B
S10 C419
7000 U/R/B
SP46
C020-51
2130
60 B/W
C127-18
C019-28
7670 R/S/Y
7670 R/S/Y
B14 C158
7525 G/B/S
220
1000 W/Y
C100-8
7660 R/U/B
S9 C076
C127-3
C019-30
7960 P/K/B
C101-27
7420 Y/P/B
7420 Y/P/B
SP03
SP5B
7960 P/K/B
Y29 C359
2170
60 B/W
C101-12
7250 S/R/B
C101-13
7260 S/U/B
120
1001 W/R
S8 C075
7420 Y/P/B
C019-44
7525 BW
SP13
C101-17
7525 G/B/S
B13 C077
840
60 B/W
C101-1
7430 Y/R/B
+30A
+30B
+15
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
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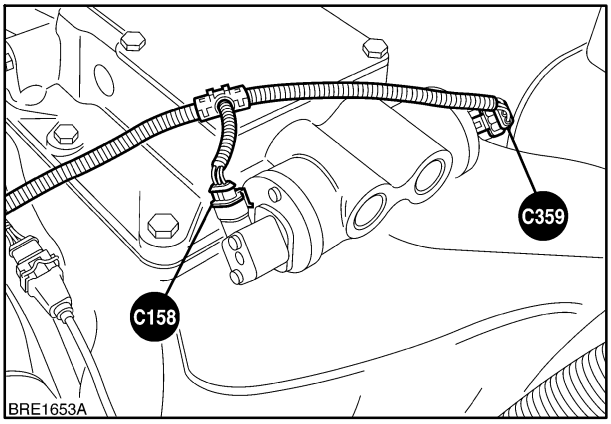
1210



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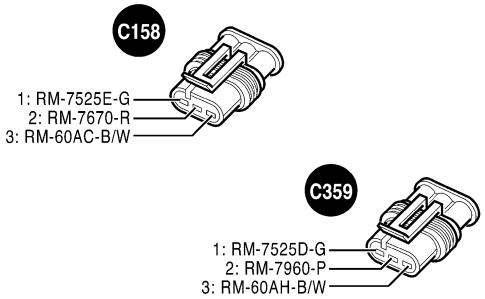
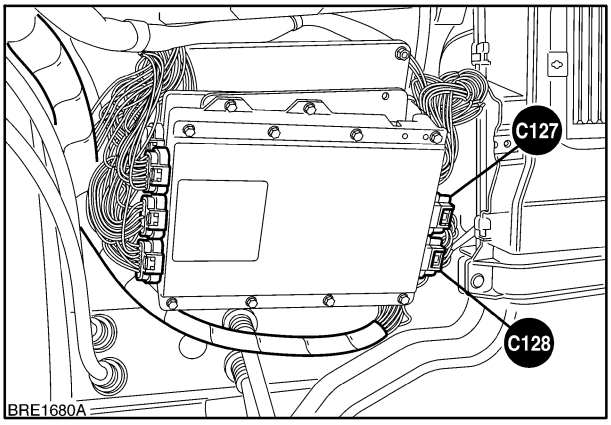
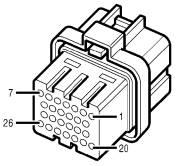


BRE1653B



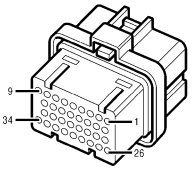
BRE1680A

C127



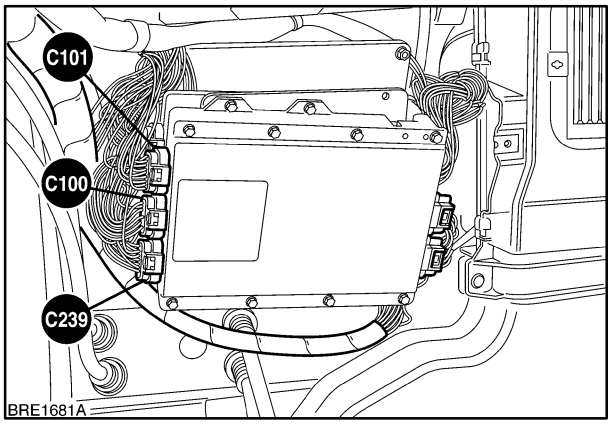
1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128



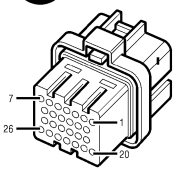
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



BRE1681A

C100



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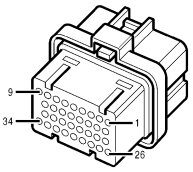
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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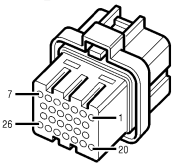
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 2083 - 1-4 (9- 12) RANGE SYNCHRONISER SOLENOID ENGAGED ERROR

Possible failure modes:

1. Faulty 1-4 synchroniser solenoid
1. Faulty 4/5 synchroniser potentiometer
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the 1-4 synchroniser solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2084 - 5-8 (13- 16) RANGE SYNCHRONISER ENGAGED ERROR

Possible failure modes:

1. Faulty 5-8 synchroniser solenoid
1. Faulty 4/5 synchroniser potentiometer
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the 5-8 synchroniser solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2085 - 1-4 (9-12) RANGE SYNCHRONISER SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty 1-4 synchroniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 1-4 synchroniser solenoid connector **C361** the controller connectors **C100** and **C239**, and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the 4 synchroniser solenoid.

   A. Disconnect connector **C361**. Measure the resistance between the component side of connector.

   C361 pin **1** and **2**. If the resistance indicated is not between 8 Ohms - 12 Ohms at 20 degrees centigrade, remove and replace the 1-4 synchroniser solenoid.

   B. If the 1-4 synchroniser solenoid is okay, continue to step 3.

3. Check for an open circuit.

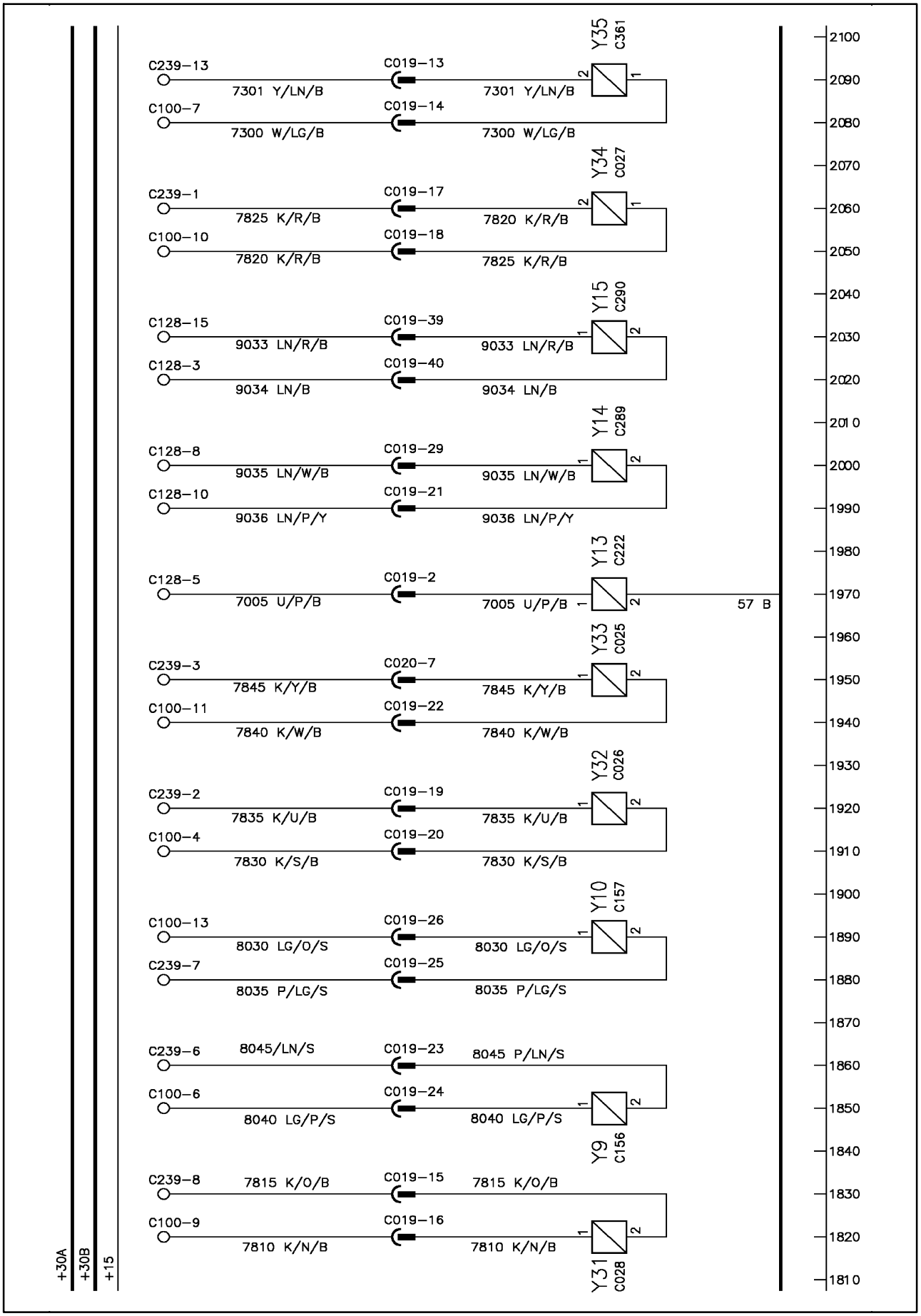
   A. Disconnect connector **C100** and **C239**. Check between connector:

   C361 pin **1 (W/LG/B)** and **C100** pin **7 (W/LG/B)**

   C361 pin **2 (Y/LN/B)** and **C239** pin **13 (Y/LN/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C239-13
7301 Y/LN/B
C019-13
7301 Y/LN/B
Y35 C361
C100-7
7300 W/LG/B
C019-14
7300 W/LG/B
C239-1
7825 K/R/B
C019-17
7820 K/R/B
Y34 C027
C100-10
7820 K/R/B
C019-18
7825 K/R/B
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
Y15 C290
C128-3
9034 LN/B
C019-40
9034 LN/B
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
Y14 C289
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
C128-5
7005 U/P/B
C019-2
7005 U/P/B
Y13 C222
57 B
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
Y33 C025
C100-11
7840 K/W/B
C019-22
7840 K/W/B
C239-2
7835 K/U/B
C019-19
7835 K/U/B
Y32 C026
C100-4
7830 K/S/B
C019-20
7830 K/S/B
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
Y10 C157
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
2100
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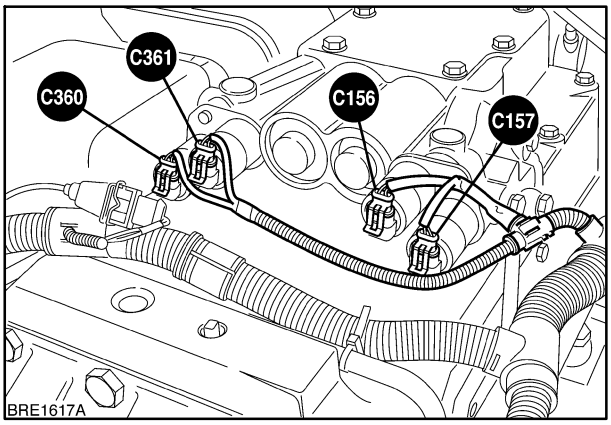

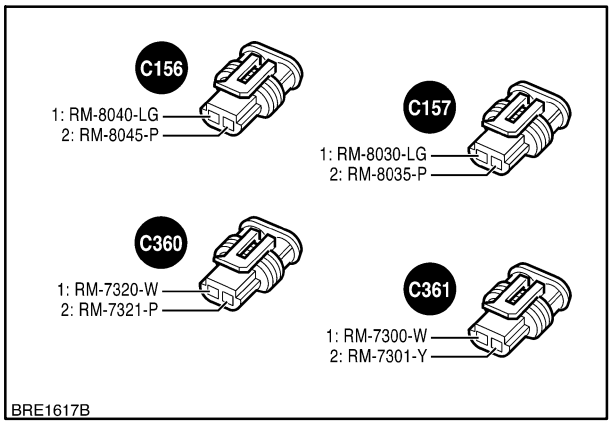

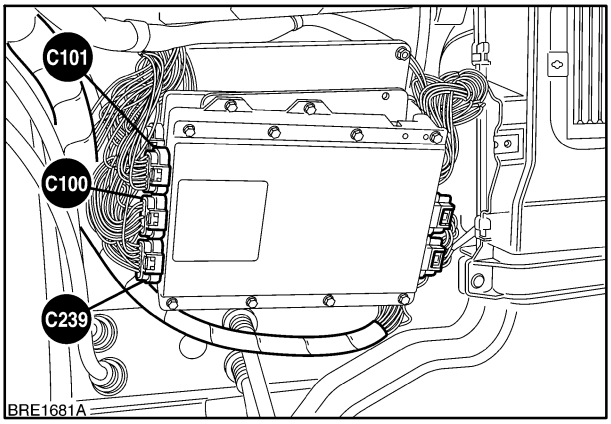

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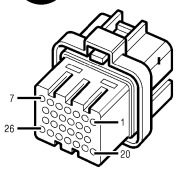

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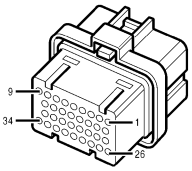
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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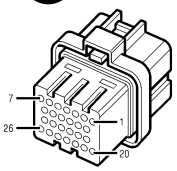
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
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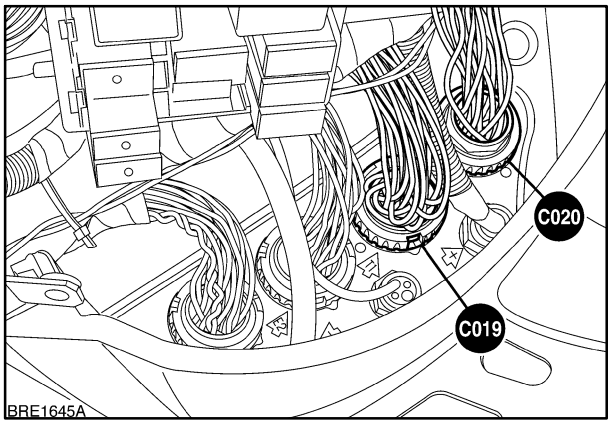
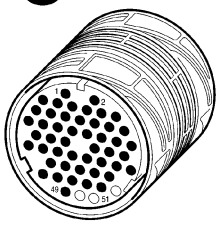
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



C019



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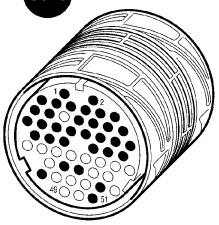
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2086 - 5-8 (13-16) RANGE SYNCHRONISER SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty 5-8 synchroniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 5-8 synchroniser solenoid connector **C360** the controller connectors **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the 5-8 synchroniser solenoid.

   A. Disconnect connector **C360**. Measure the resistance between the component side of connector.

   C360 pin **1** and **2**. If the resistance indicated is not between 8 Ohms - 12 Ohms at 20 degrees centigrade, replace the 5-8 synchroniser solenoid.

   B. If the 5-8 synchroniser solenoid is okay, continue to step 3.

3. Check for an open circuit.

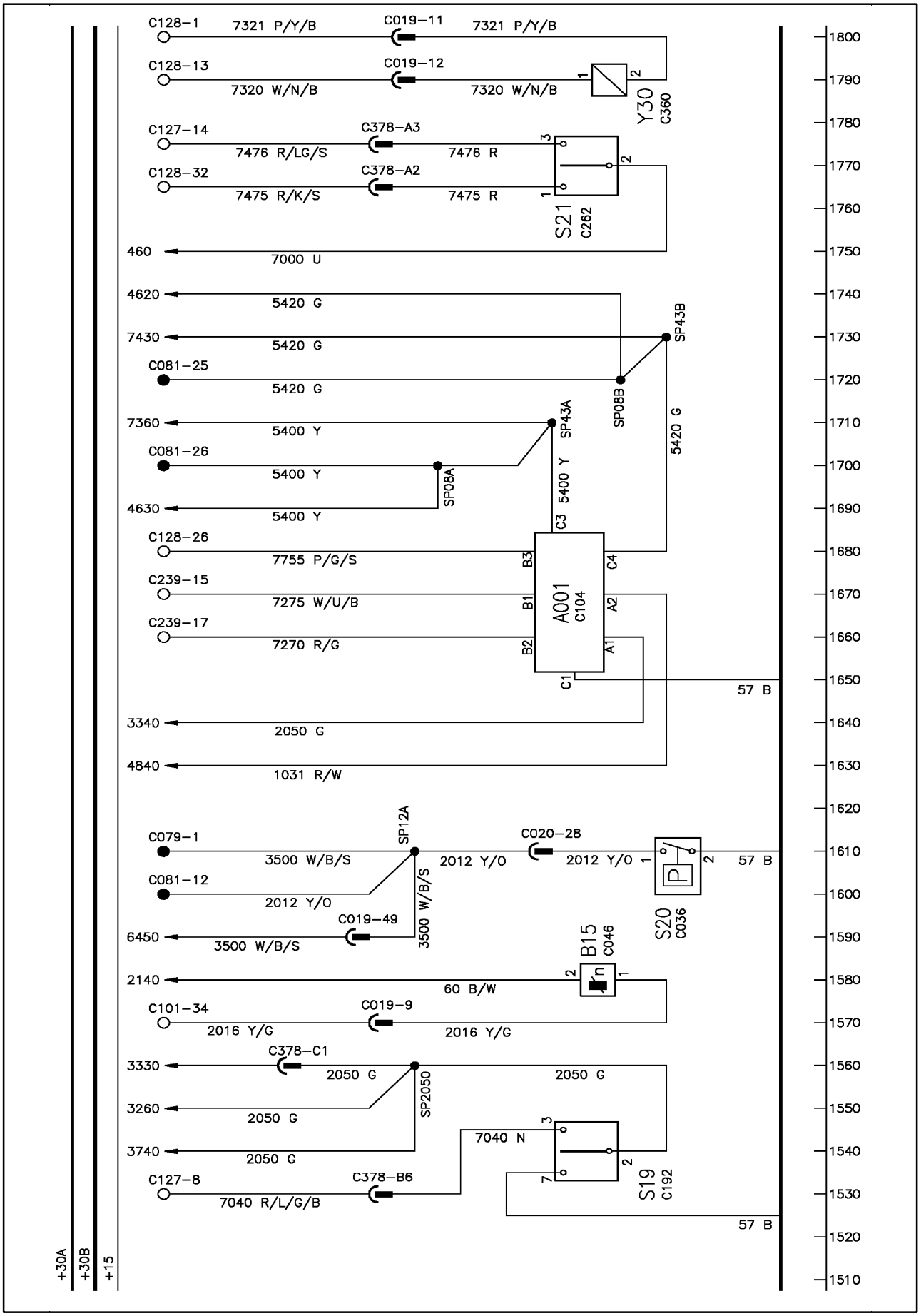
   A. Disconnect connector **C128**. Check between connector:

   C360 pin **1 (W/N/B)** and **C128** pin **13 (W/N/B)**

   C360 pin **2 (P/Y/B)** and **C128** pin **1 (P/Y/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
C019-49
6450
3500 W/B/S
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
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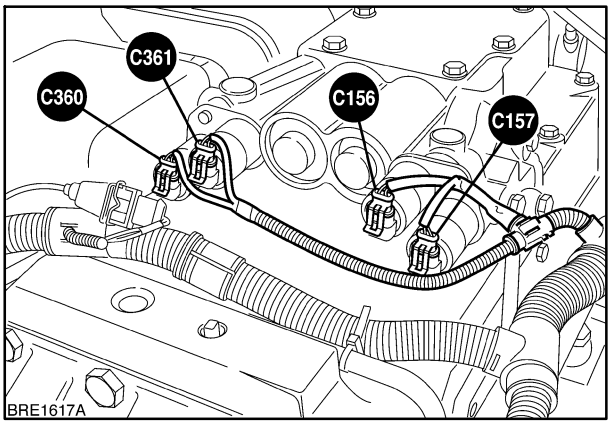

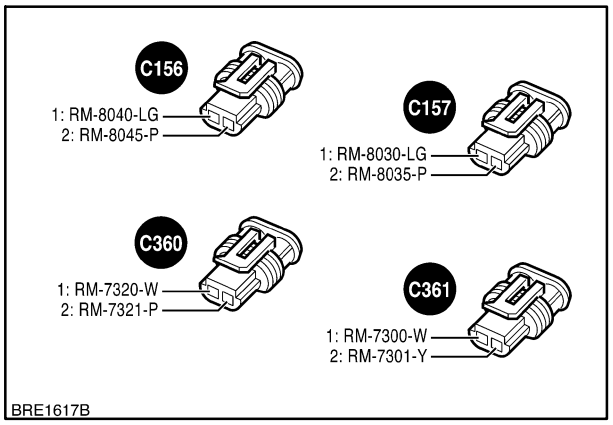

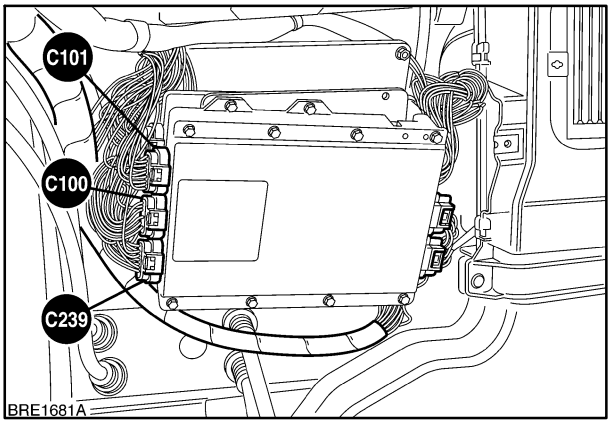

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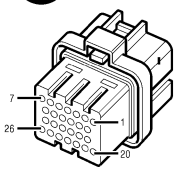
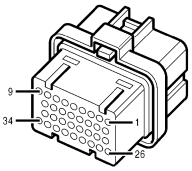


1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
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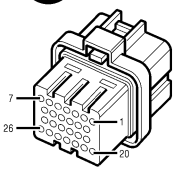
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
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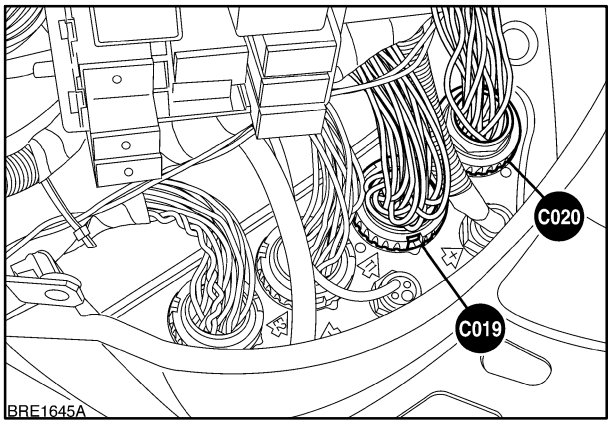
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



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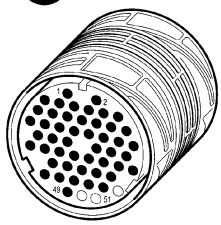

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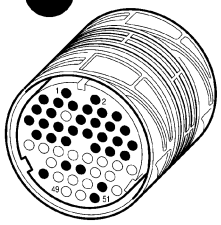
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2087 - 1-4 (9-12) RANGE SYNCHRONISER SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connectors
2. Faulty 1-4 synchroniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 1-4 synchroniser solenoid connector **C361** the controller connectors **C100** and **C239** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.
2. Check the 1-4 synchroniser solenoid for a short to ground.

   A. Disconnect connector **C361**. Check between the component side of connector:

   C361 pin **1** and **ground**

   C361 pin **2** and **ground**

   If a short to ground is indicated, replace the 1-4 synchroniser solenoid.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for a short to ground.

   A. Disconnect connector **C100** and **C239**. Check between connector:

   C361 pin **1 (W/LG/B)** and **ground**

   C361 pin **2 (Y/LN/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to +Ve Voltage.

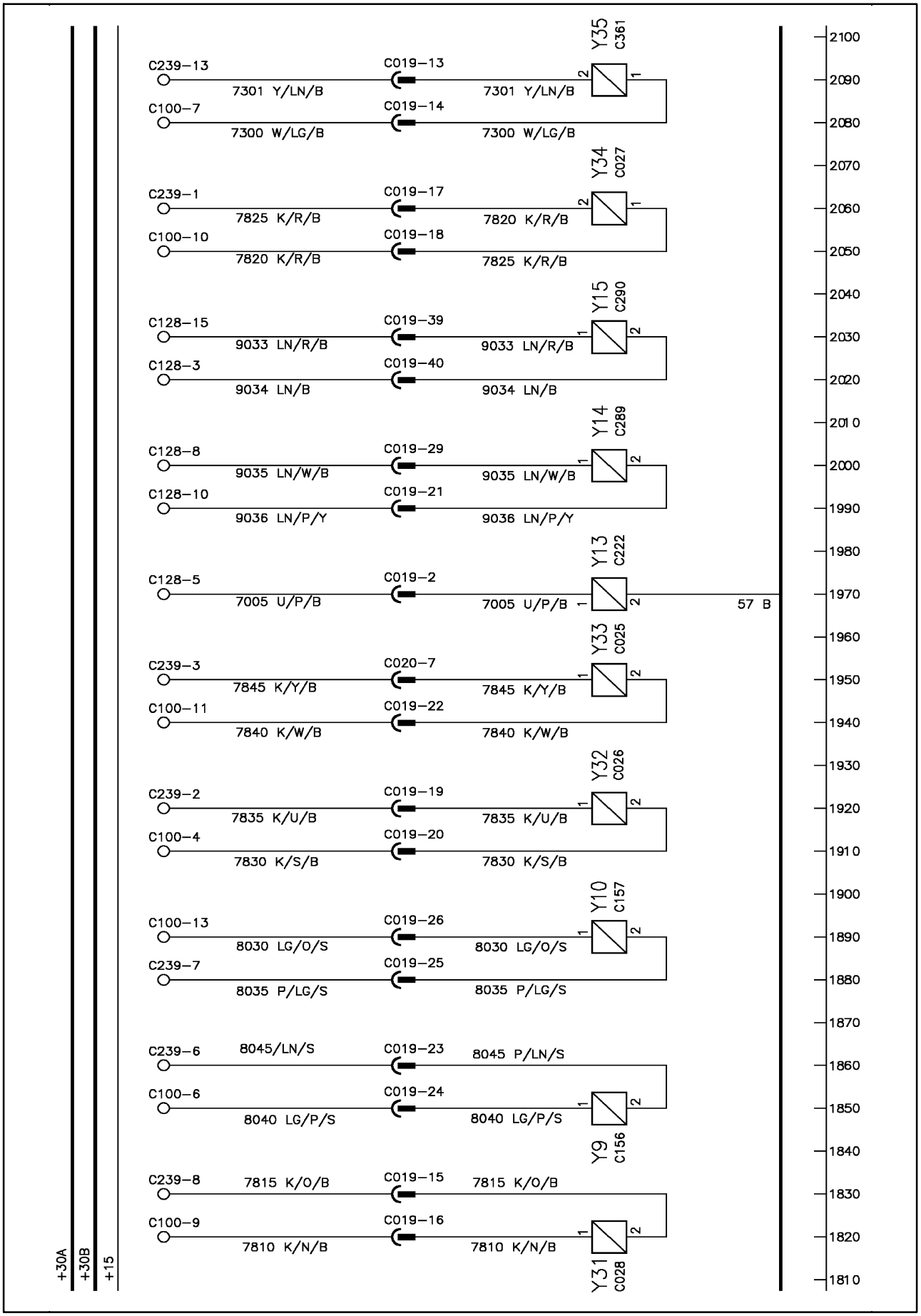
   A. Turn the keystart ON. Measure the voltage between connector:

   C361 pin **1 (W/LG/B)** and **ground**

   C361 pin **2 (Y/LN/B)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-13
C019-13
7301 Y/LN/B
7301 Y/LN/B
C100-7
C019-14
7300 W/LG/B
7300 W/LG/B
Y34 C027
C239-1
C019-17
7825 K/R/B
7820 K/R/B
C100-10
C019-18
7820 K/R/B
7825 K/R/B
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 LN/R/B
C128-3
C019-40
9034 LN/B
9034 LN/B
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 LN/W/B
C128-10
C019-21
9036 LN/P/Y
9036 LN/P/Y
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U/P/B
57 B
Y33 C025
C239-3
C020-7
7845 K/Y/B
7845 K/Y/B
C100-11
C019-22
7840 K/W/B
7840 K/W/B
Y32 C026
C239-2
C019-19
7835 K/U/B
7835 K/U/B
C100-4
C019-20
7830 K/S/B
7830 K/S/B
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 LG/O/S
C239-7
C019-25
8035 P/LG/S
8035 P/LG/S
C239-6
8045/LN/S
C019-23
8045 P/LN/S
C100-6
C019-24
8040 LG/P/S
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
C019-16
7810 K/N/B
7810 K/N/B
Y31 C028
2100
2090
2080
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2030
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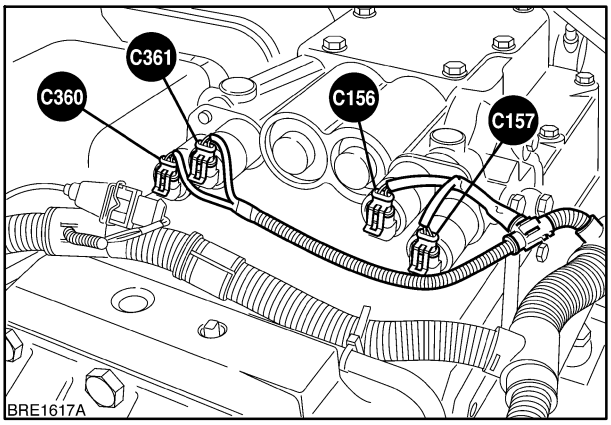
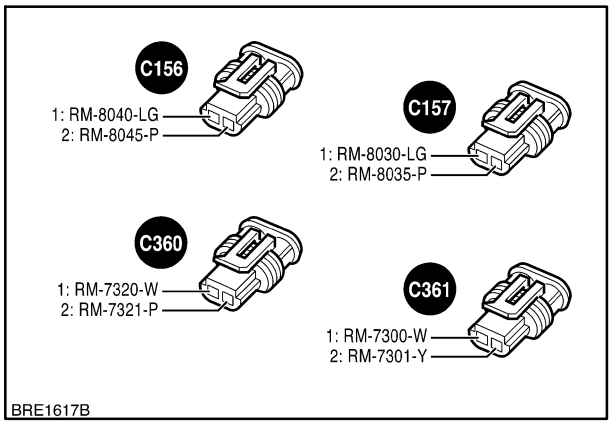
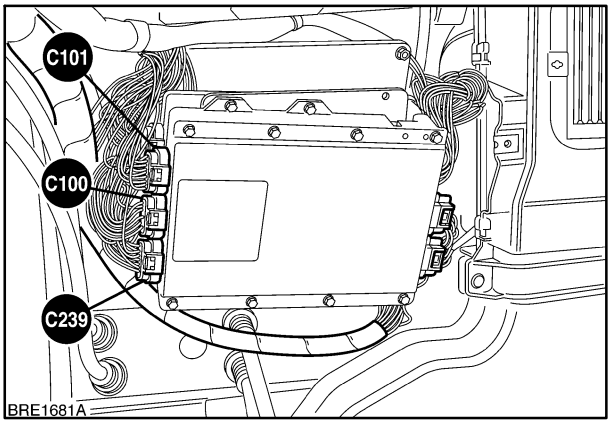
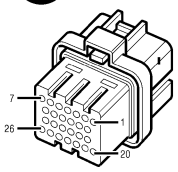




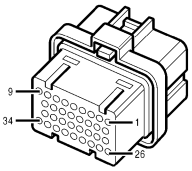


C100



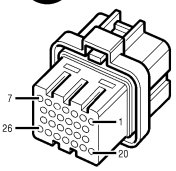
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



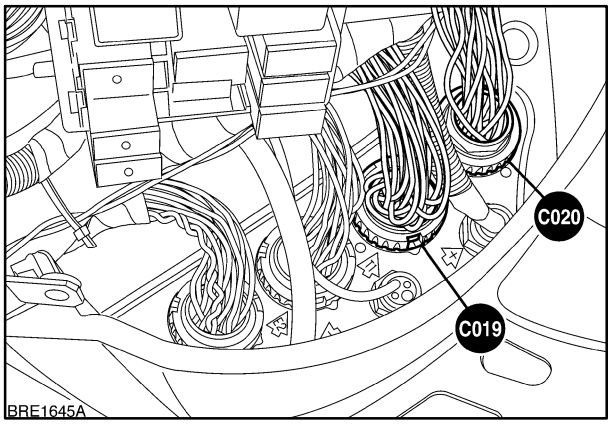
1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



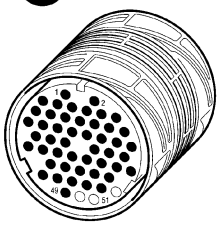
1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B



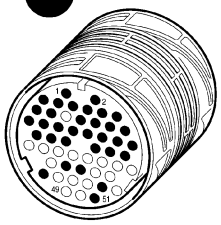
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2088 - 5-18 (13-16) SYNCHRONISER SOLENOID SHORT TO GROUND OR HIGH VOLTAGE

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connectors
2. Faulty 5-8 synchroniser solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 5-8 synchroniser solenoid connector **C360** the controller connector **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.
2. Check the 5-8 synchroniser solenoid for short to ground.

   A. Disconnect connector **C360**. Check between the component side of connector:

   C360 pin **1** and **ground**

   C360 pin **2** and **ground**

   If a short to ground is indicated, replace the 5-8 synchroniser solenoid.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for a short to ground.

   A. Disconnect connector **C128**. Check between connector:

   C360 pin **1 (W/N/B)** and **ground**

   C360 pin **2 (P/Y/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to +Ve voltage.

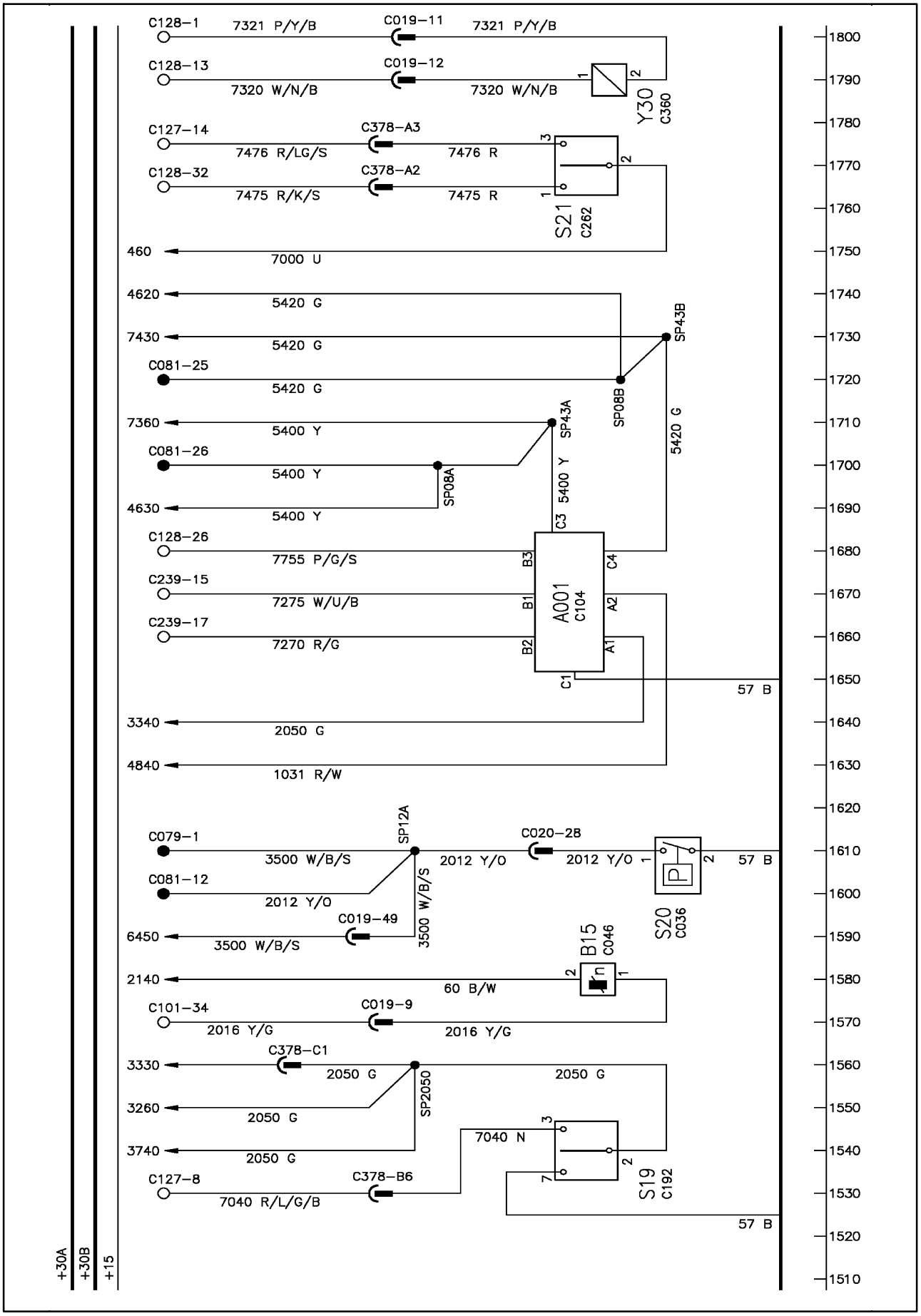
   A. Turn the keystart ON. Measure the voltage between connector:

   C360 pin **1 (W/N/B)** and **ground**

   C360 pin **2 (P/Y/B)** and **ground**

   If a to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
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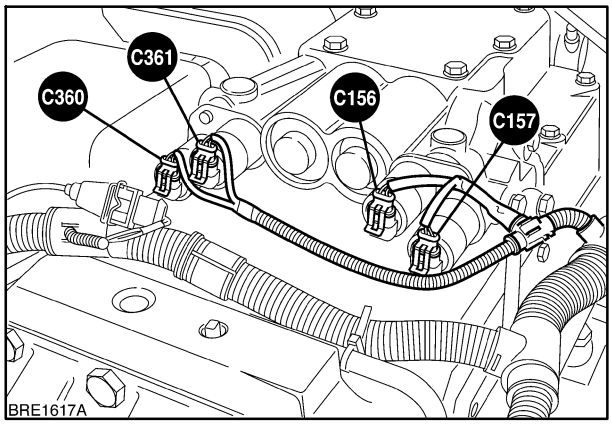
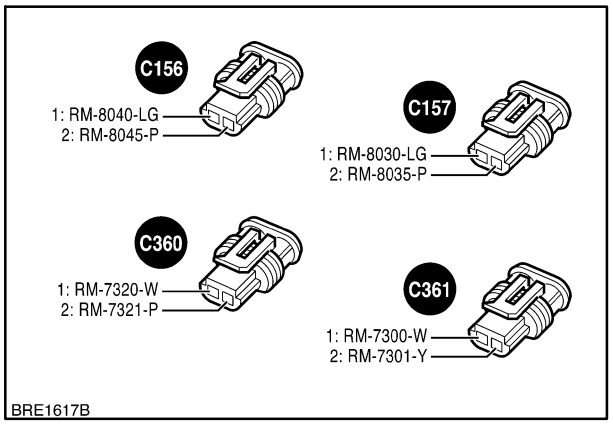
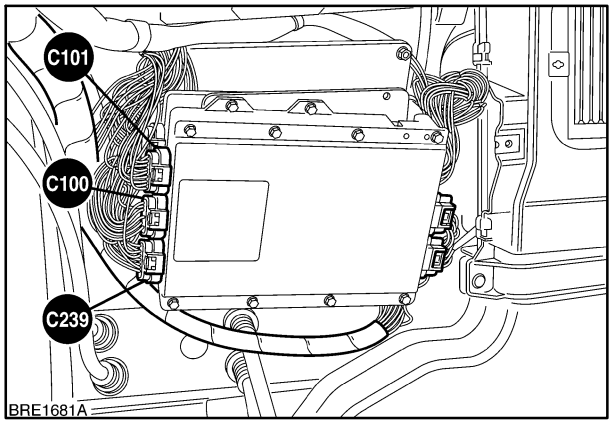
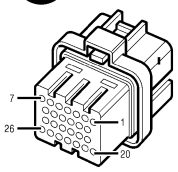




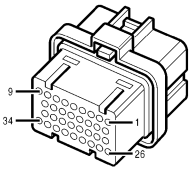


C100



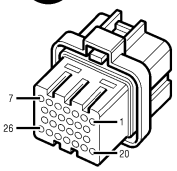
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
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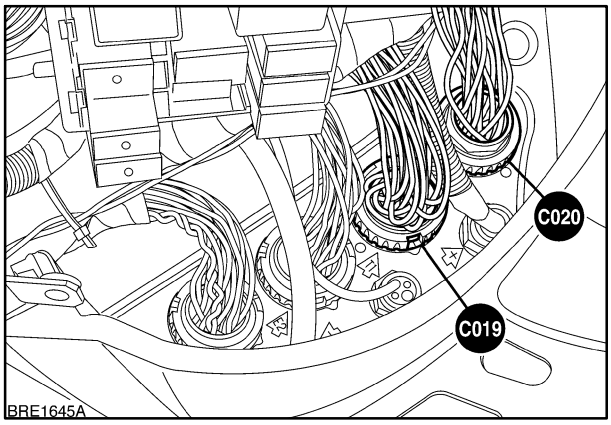
BRE1681B



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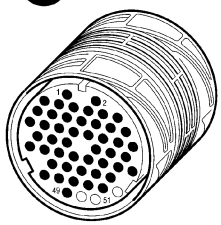

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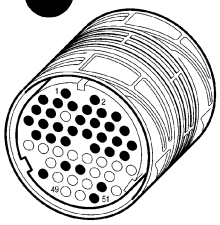

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BRE1645B

ERROR CODE 2089 - 5-8 (13-16) RANGE SYNCHRONISER NO LONGER ENGAGED

Possible failure modes:

1. Faulty 5-8 synchroniser solenoid
1. Faulty 4/5 synchroniser potentiometer
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Clear the error code and test the system for normal operation.
   A. If the error code re-occurs, continue to step 3.
3. Check the 5-8 synchroniser solenoid.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the hydraulic pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressure is low, continue to hydraulic troubleshooting procedures.
   B. If the pressure is correct investigate the mechanical operation.

ERROR CODE 2090 - OUTPUT SPEED TO HIGH FOR CREEPER ENGAGE

Possible failure modes:

1. Operator action

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check downshifting to 10th gear.

   A. Downshift to 10th gear or lower or stop and disengage the creeper. If error code 2090 is still displayed, continue to step 2.

   B. If no other error codes are displayed, continue to step 2.

2. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

   B. If no other error codes are displayed, investigate the mechanical operation.

ERROR CODE 2091 – CLUTCH C3 NOT CALIBRATED

Effects:

Poor clutch performance of the uncalibrated clutch

Possible failure modes:

1. Faulty clutch 3 solenoid
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2092 – CLUTCH C4 NOT CALIBRATED

Effects:

Poor clutch performance of the uncalibrated clutch

Possible failure modes:

1. Faulty clutch 4 solenoid
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2093 – HIGH CLUTCH NOT CALIBRATED

Possible failure modes:

1. Faulty high clutch solenoid
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2094 – LOW CLUTCH NOT CALIBRATED

Possible failure modes:

1. Faulty low clutch soleniod
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2095 – CLUTCH C1 NOT CALIBRATED

Effects:

Poor clutch performance of the uncalibrated clutch

Possible failure modes:

1. Faulty clutch 1 solenoid
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2096 – CLUTCH C2 NOT CALIBRATED

Effects:

Poor clutch performance of the uncalibrated clutch

Possible failure modes:

1. Faulty clutch 2 solenoid
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2097 – CLUTCH C5 NOT CALIBRATED

Effects:

Poor clutch performance of the uncalibrated clutch

Possible failure modes:

1. Faulty clutch 5 solenoid
2. Faulty hydraulic circuit
3. Mechanical fault

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the transmission calibration procedure.
   A. If the error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.
   A. Remove the solenoid, clean or replace as required.
   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.
   A. If the pressures indicated are approximately 18 bar, possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.
   B. If the pressures indicated are not approximately 18 bar on one or more of the clutches. Suspect possible transmission internal leakage.

ERROR CODE 2098 - C5 (17TH GEAR) SOLENOID SHORT CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 5 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 5 solenoid in H9 Channel 47.

   A. Start the engine and select 17th gear, the H9 reading should change from 0 clutch OFF to 60 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 47 wiggle the harness, the clutch 5 connector **C290**, controller connector **C128** and the inline harness connector **C019** to check for an intermittent circuit. Channel 47 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 5 solenoid connector **C290** the controller connector **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 5 solenoid for short to ground.

   A. Disconnect connector **C290**. Check between the component side of connector:

   C290 pin **1** and **ground**

   C290 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the clutch solenoid.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground in the wiring harness.

   A. Disconnect connector **C128**. Check between connector:

   C290 pin **1 (LN)** and **ground**

   C290 pin **2 (LN)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for short to +12 Volts.

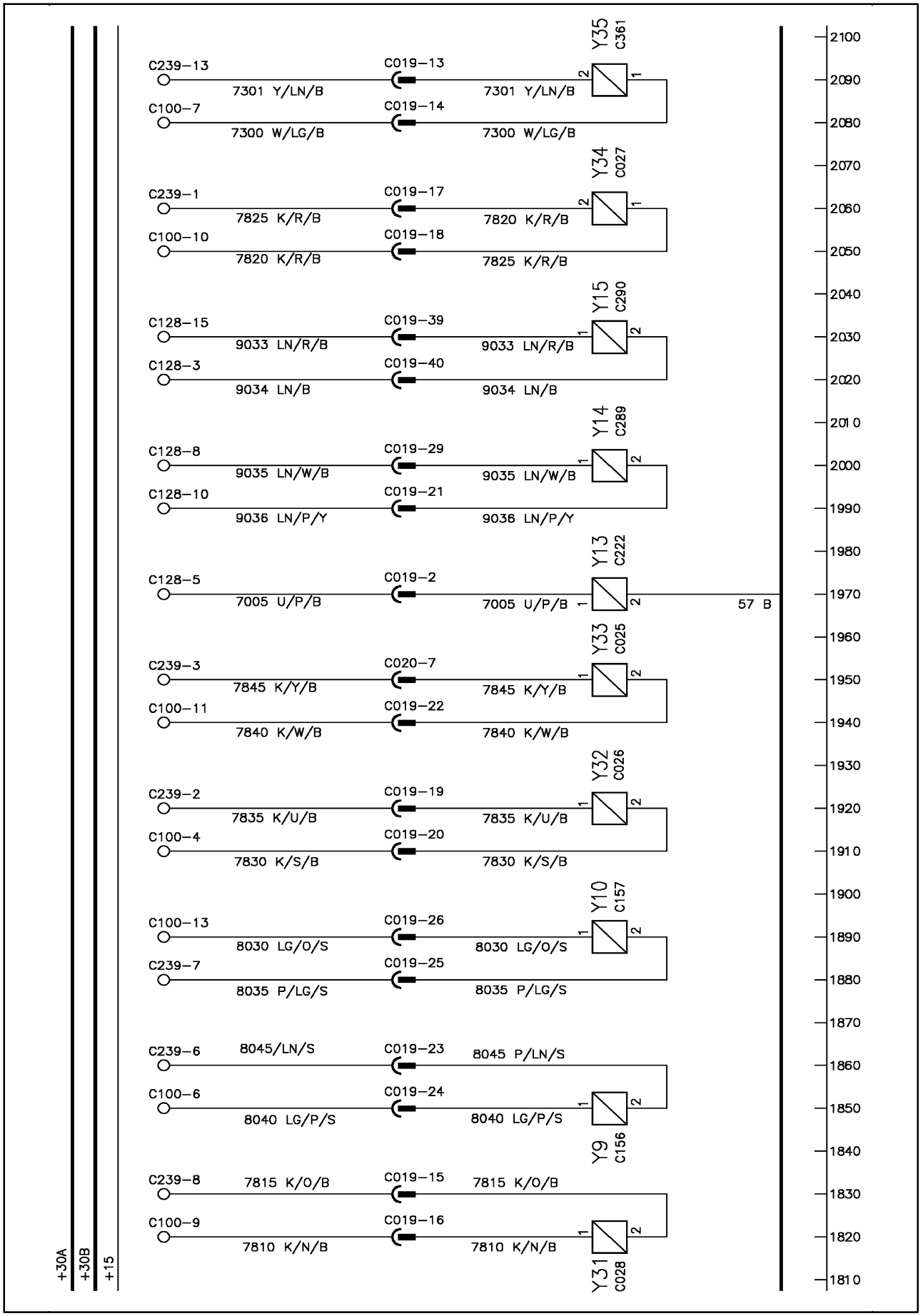
   A. Turn the keystart ON. Measure the voltage between connector:

   C290 pin **1 (LN)** and **ground**

   C290 pin **2 (LN)** and **ground**

   If +12 Volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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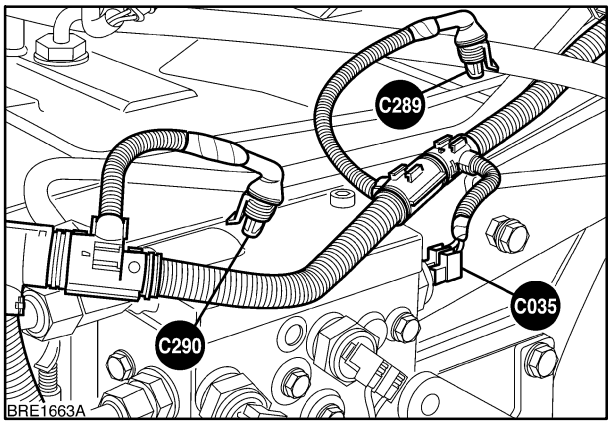
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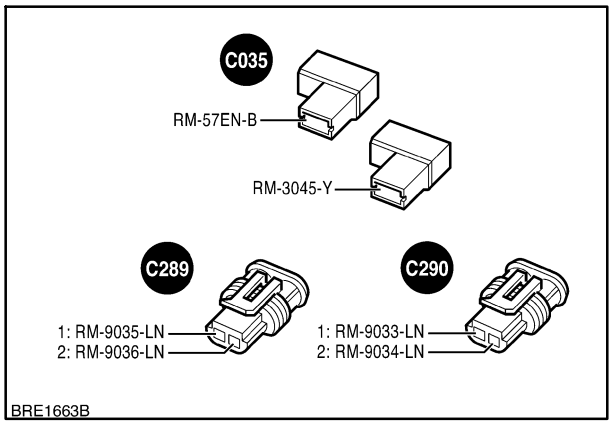
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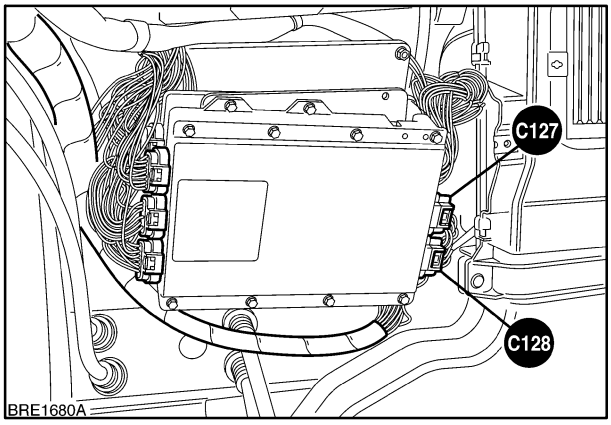
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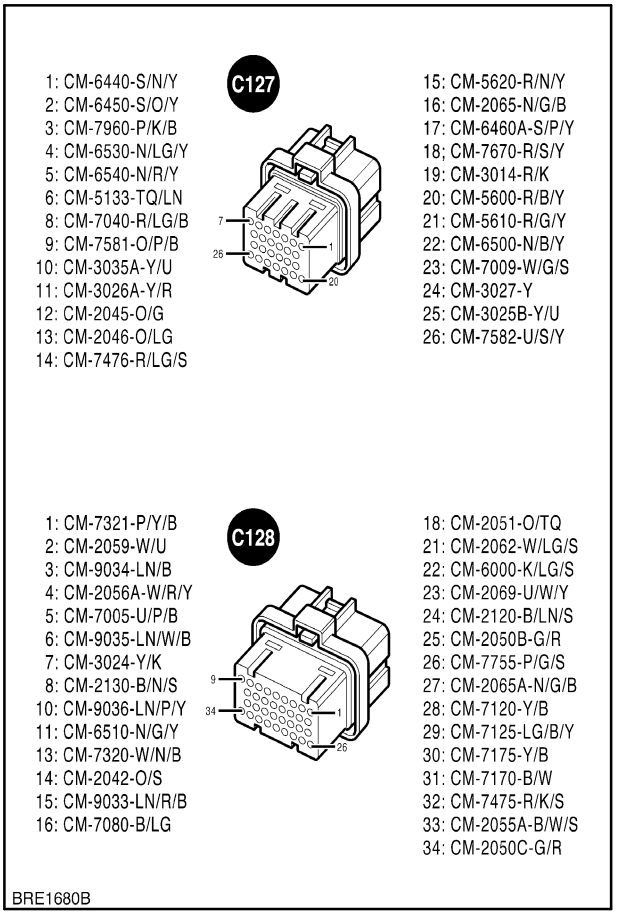
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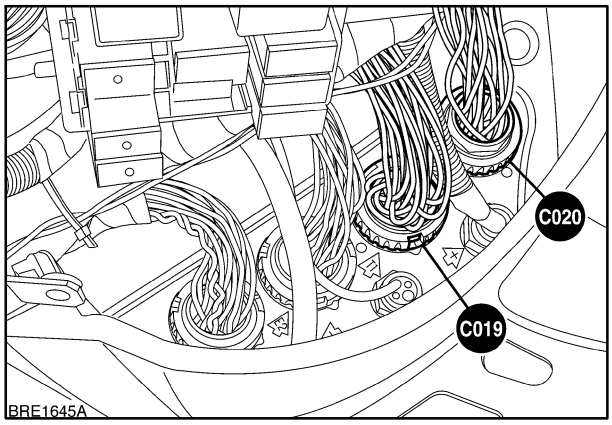

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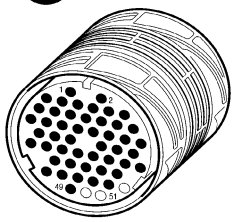

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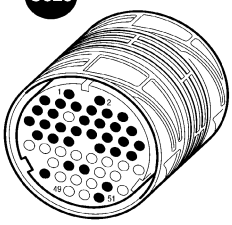

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6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2099 – C5 (17TH GEAR) SOLENOID OPEN CIRCUIT

Effects:

Transmission disabled

Possible failure modes:

1. Faulty connector
2. Faulty clutch 5 solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch 5 solenoid in H9 Channel 47.

   A. Start the engine and select 17th gear, the H9 reading should change from 0 clutch OFF to 60 clutch ON if reading is incorrect, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 47 wiggle the harness, the clutch 5 connector **C290**, controller connector **C128** and the inline harness connector **C019** to check for an intermittent circuit. Channel 47 values will change if an intermittent circuit is detected, repair or replace as required.
2. Check the clutch 5 solenoid connector **C290** the controller connector **C128** and the inline harness connector **C019**.

   A. Ensure the connectors is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the clutch 5 solenoid.

   A. Disconnect connector **C290**. Measure the resistance between the component side of connector,

   C290 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove and replace the clutch solenoid.

   B. If the clutch 5 solenoid is okay, continue to step 4.
4. Check for an open circuit.

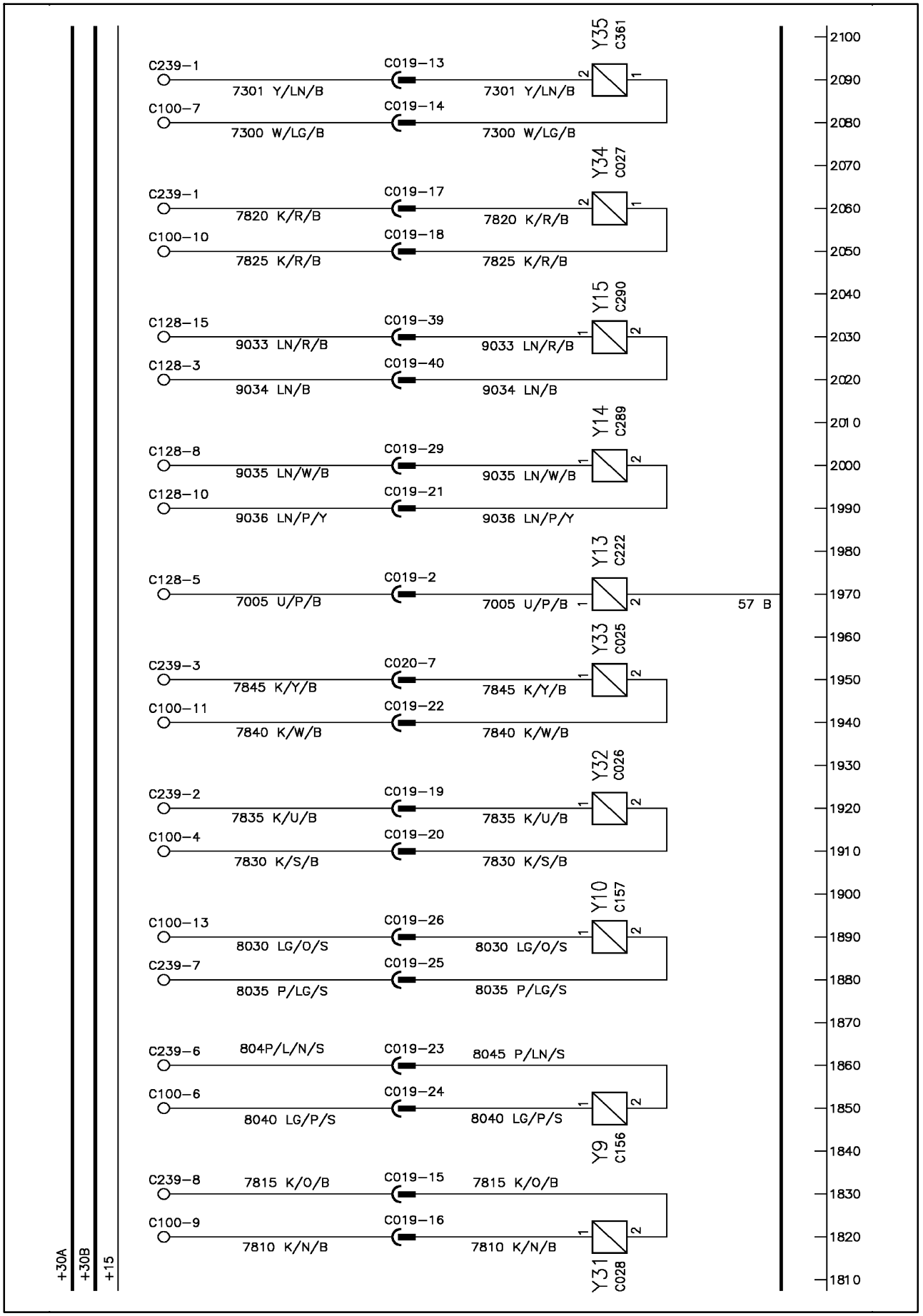
   A. Disconnect connector **C128**. Check between connector:

   C290 pin **1 (LN)** and **C128** pin **3 (LN/B)**

   C290 pin **2 (LN)** and **C128** pin **15 (LN/R/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
Y35 C361
C239-1
7301 Y/LN/B
C019-13
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C100-7
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C019-14
7300 W/LG/B
Y34 C027
C239-1
7820 K/R/B
C019-17
7820 K/R/B
C100-10
7825 K/R/B
C019-18
7825 K/R/B
Y15 C290
C128-15
9033 LN/R/B
C019-39
9033 LN/R/B
C128-3
9034 LN/B
C019-40
9034 LN/B
Y14 C289
C128-8
9035 LN/W/B
C019-29
9035 LN/W/B
C128-10
9036 LN/P/Y
C019-21
9036 LN/P/Y
Y13 C222
C128-5
7005 U/P/B
C019-2
7005 U/P/B
57 B
Y33 C025
C239-3
7845 K/Y/B
C020-7
7845 K/Y/B
C100-11
7840 K/W/B
C019-22
7840 K/W/B
Y32 C026
C239-2
7835 K/U/B
C019-19
7835 K/U/B
C100-4
7830 K/S/B
C019-20
7830 K/S/B
Y10 C157
C100-13
8030 LG/O/S
C019-26
8030 LG/O/S
C239-7
8035 P/LG/S
C019-25
8035 P/LG/S
C239-6
804P/L/N/S
C019-23
8045 P/LN/S
C100-6
8040 LG/P/S
C019-24
8040 LG/P/S
Y9 C156
C239-8
7815 K/O/B
C019-15
7815 K/O/B
C100-9
7810 K/N/B
C019-16
7810 K/N/B
Y31 C028
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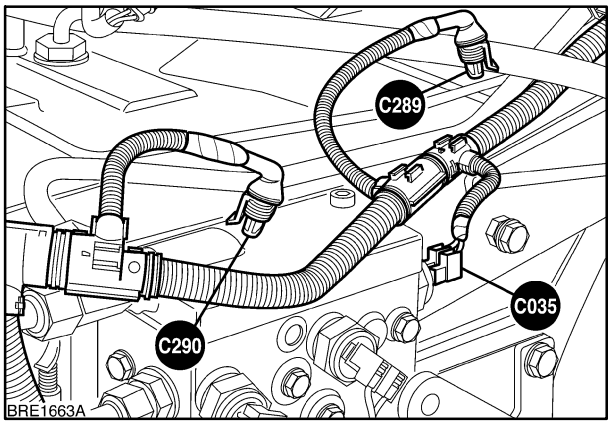

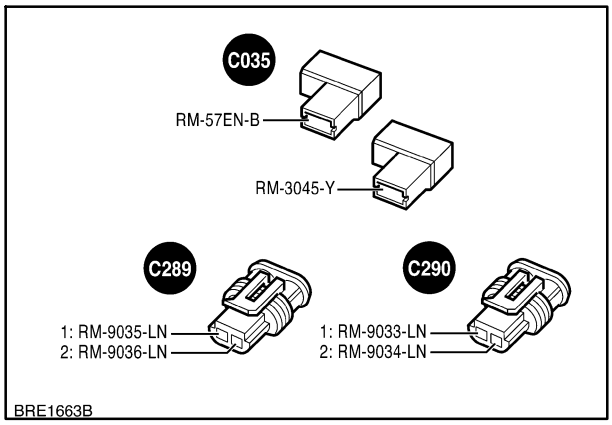

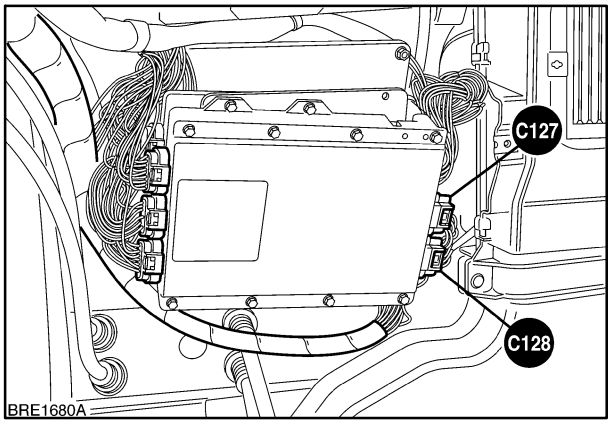

C127

1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
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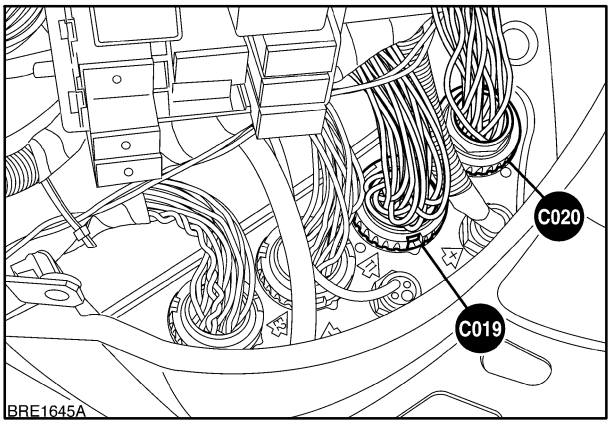
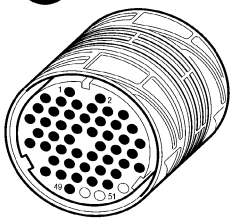
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



BRE1645A

C019



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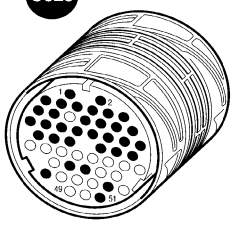
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2100 – C5 (17TH GEAR) DUMP SOLENOID SHORT CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty dump solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the dump solenoid connector **C289**, and the controller connector **C128** the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the dump solenoid for short to ground.

   A. Disconnect connector **C289**. Check between the component side of connector:

   C289 pin **1** and **ground**

   C289 pin **2** and **ground**

   If short to ground is indicated, remove and replace the dump solenoid.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for a short to ground within the wiring harness.

   A. Check between connector:

   C289 pin **1 (LN)** and **ground**

   C289 pin **2 (LN)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for a short to +12 Volts.

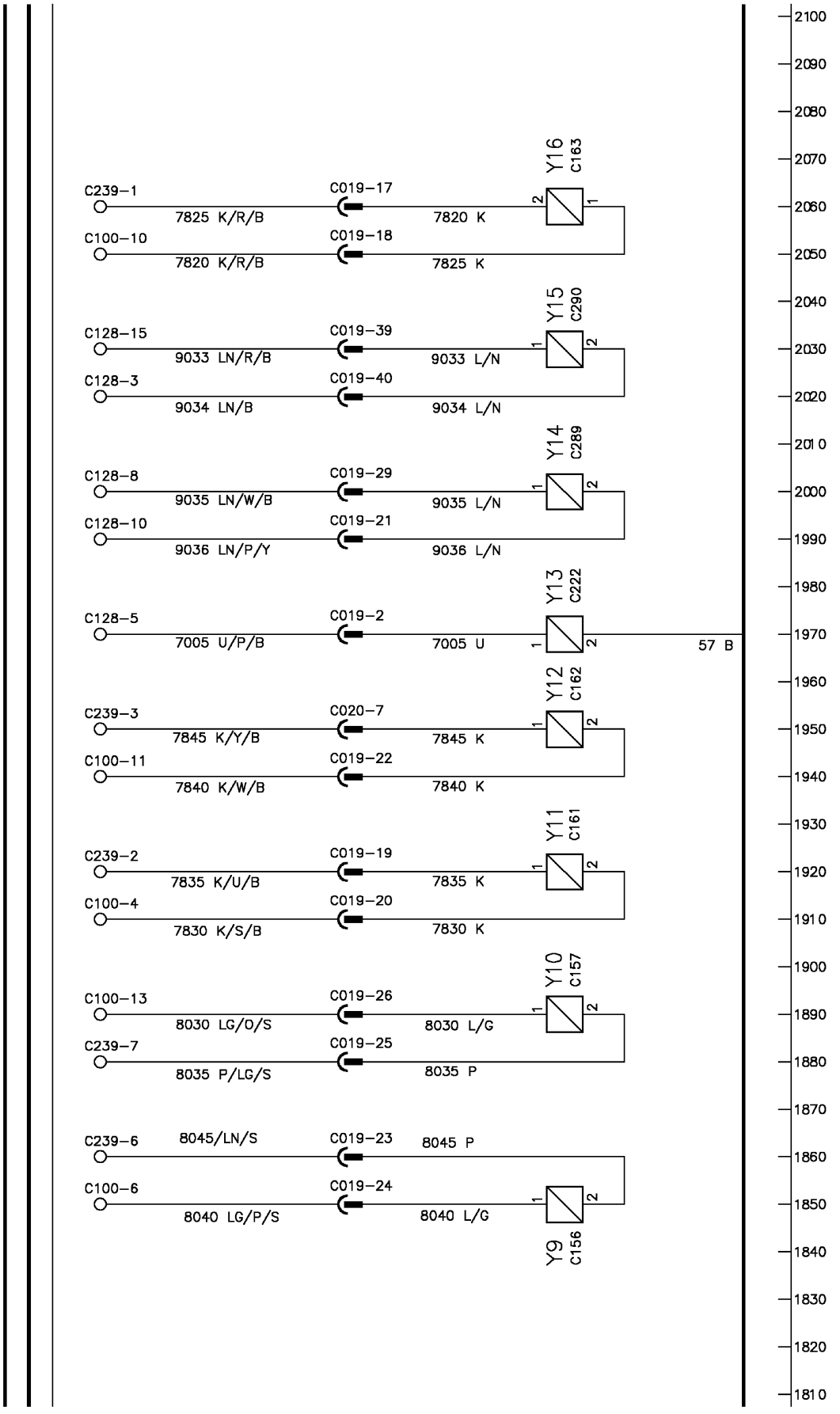
   A. Turn the keystart ON. Measure the voltage between connector:

   C289 pin **1 (LN)** and **ground**

   C289 pin **2 (LN)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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1810
Y16 C163
C239-1
C019-17
7825 K/R/B
7820 K
C100-10
C019-18
7820 K/R/B
7825 K
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 L/N
C128-3
C019-40
9034 LN/B
9034 L/N
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 L/N
C128-10
C019-21
9036 LN/P/Y
9036 L/N
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U
57 B
Y12 C162
C239-3
C020-7
7845 K/Y/B
7845 K
C100-11
C019-22
7840 K/W/B
7840 K
Y11 C161
C239-2
C019-19
7835 K/U/B
7835 K
C100-4
C019-20
7830 K/S/B
7830 K
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 L/G
C239-7
C019-25
8035 P/LG/S
8035 P
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8045 P
C100-6
C019-24
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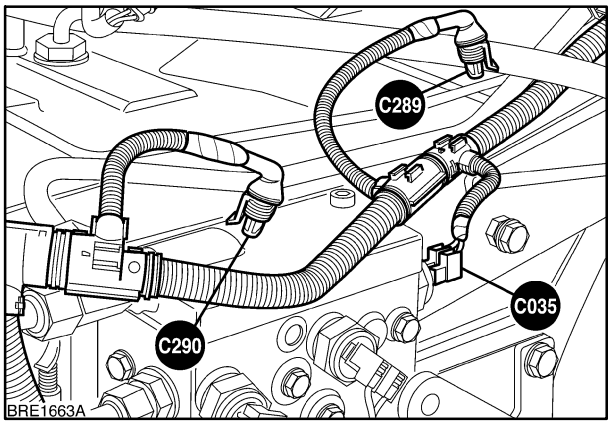
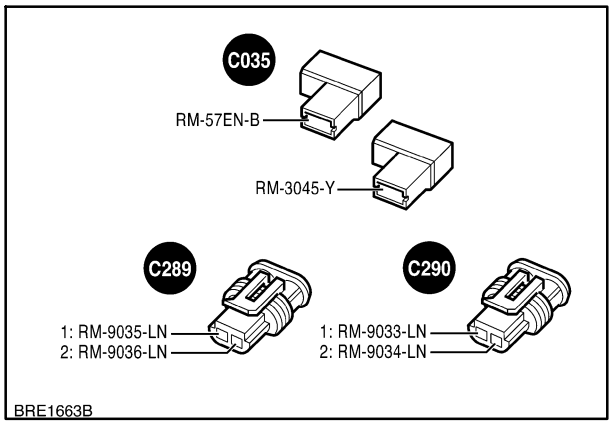
8040 L/G
Y9 C156


C289
C035
C290
BRE1663A


C035
RM-57EN-B
RM-3045-Y
C289
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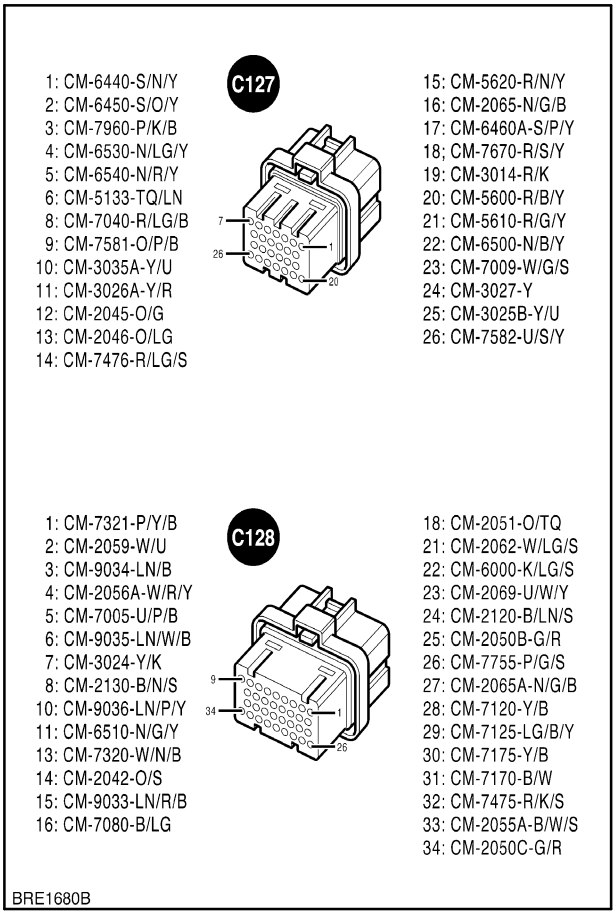
2: RM-9036-LN
C290
1: RM-9033-LN
2: RM-9034-LN
BRE1663B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6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
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15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
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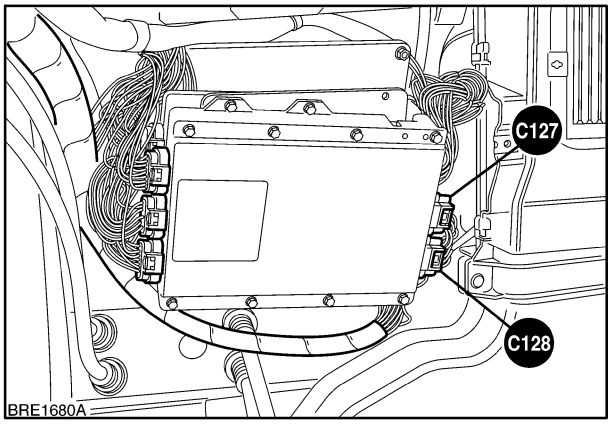
26: CM-7582-U/S/Y


C127
C128
BRE1680A

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3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
C128
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18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
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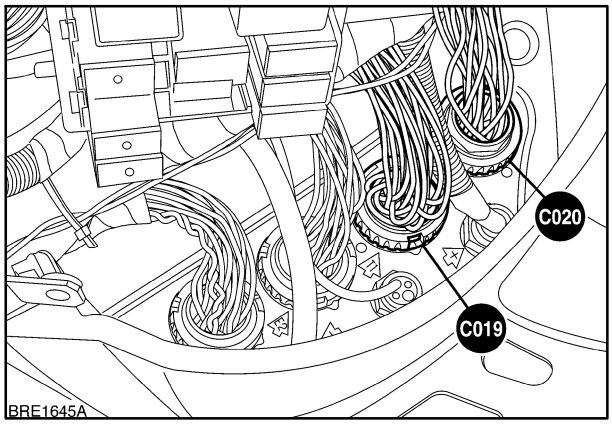
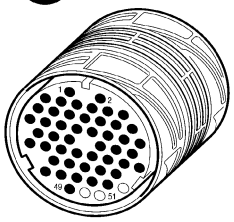
34: CM-2050C-G/R
BRE1680B



BRE1645A

C019



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5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
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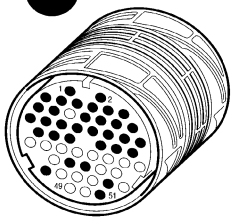
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2101 – C5 (17TH GEAR) DUMP SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty dump solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the dump solenoid connector **C289**, and the controller connector **C128** the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

   A. Disconnect connector **C289**. Measure the resistance between the component side of connector,

   C289 pin **1** and **2**. If the resistance indicated is not between 8 Ohms – 12 Ohms at 20 degrees centigrade, remove or replace the dump solenoid.

   B. If the dump solenoid is okay, continue to step 3.

2. Check for an open circuit.

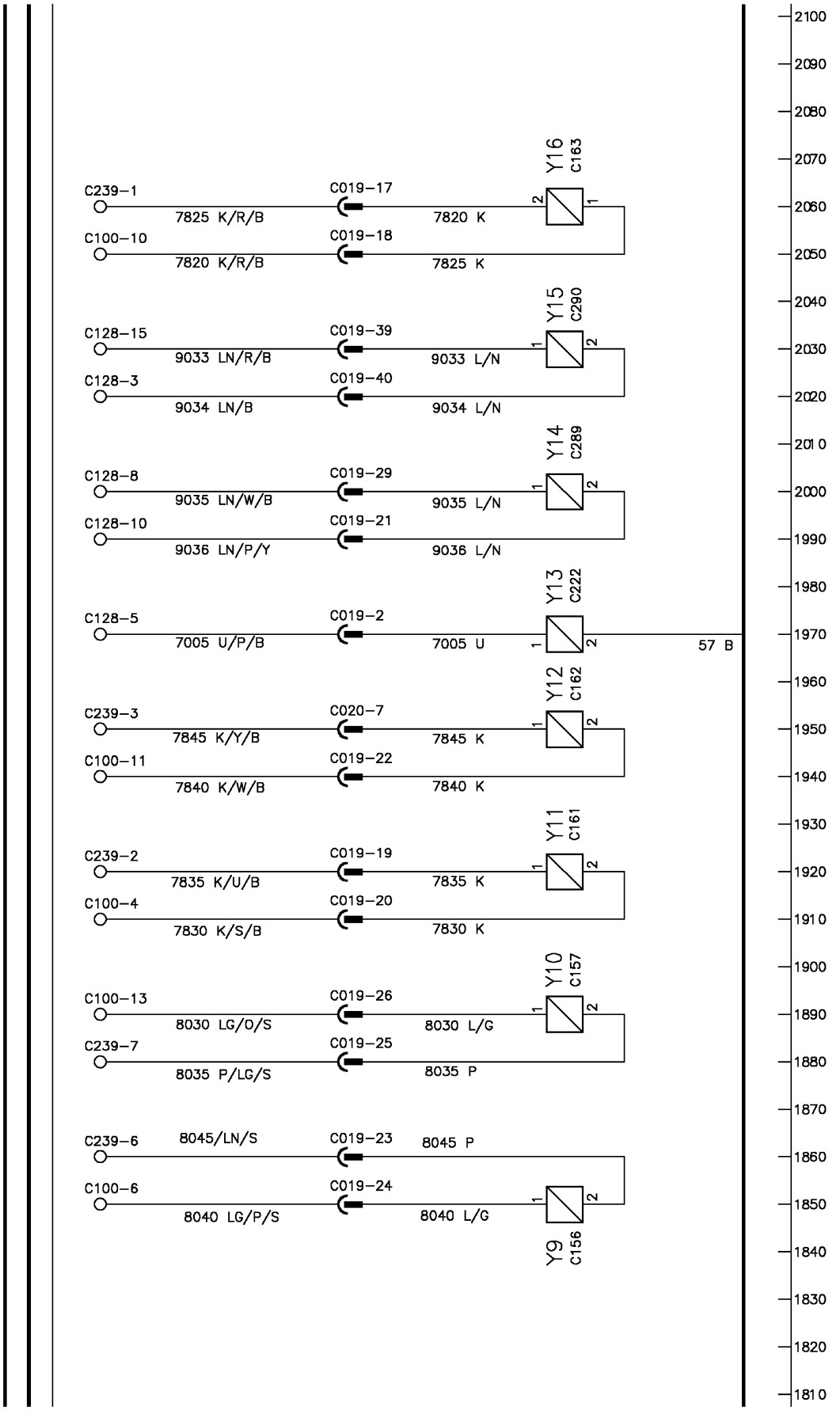
   A. Disconnect connector **C128**. Check between connector:

   C289 pin **1 (K)** and **C128** pin **10 (LN/P/Y)**

   C289 pin **2 (K)** and **C128** pin **6 (LN/W/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


Y16 C163
C239-1
C019-17
7825 K/R/B
7820 K
C100-10
C019-18
7820 K/R/B
7825 K
Y15 C290
C128-15
C019-39
9033 LN/R/B
9033 L/N
C128-3
C019-40
9034 LN/B
9034 L/N
Y14 C289
C128-8
C019-29
9035 LN/W/B
9035 L/N
C128-10
C019-21
9036 LN/P/Y
9036 L/N
Y13 C222
C128-5
C019-2
7005 U/P/B
7005 U
57 B
Y12 C162
C239-3
C020-7
7845 K/Y/B
7845 K
C100-11
C019-22
7840 K/W/B
7840 K
Y11 C161
C239-2
C019-19
7835 K/U/B
7835 K
C100-4
C019-20
7830 K/S/B
7830 K
Y10 C157
C100-13
C019-26
8030 LG/O/S
8030 L/G
C239-7
C019-25
8035 P/LG/S
8035 P
C239-6
8045/LN/S
C019-23
8045 P
C100-6
C019-24
8040 LG/P/S
8040 L/G
Y9 C156
2100
2090
2080
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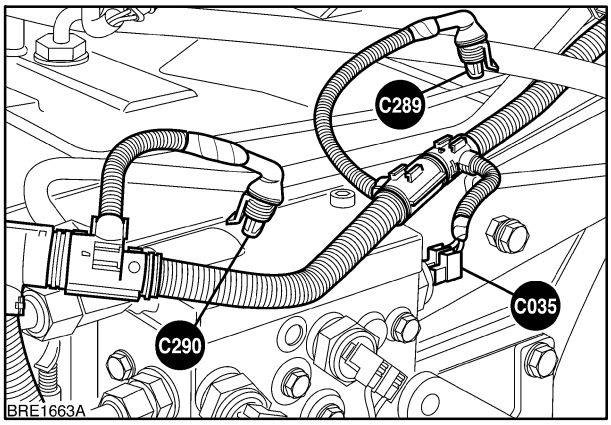
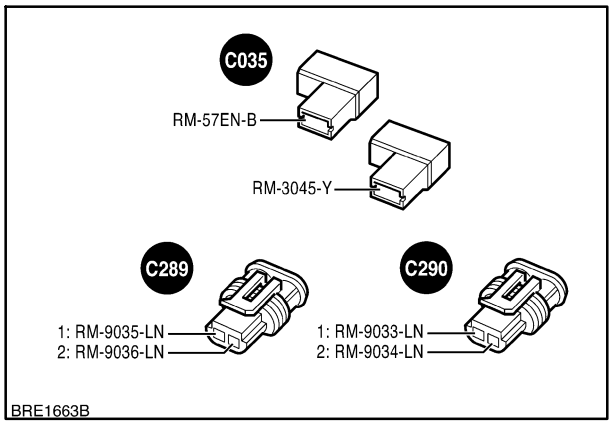
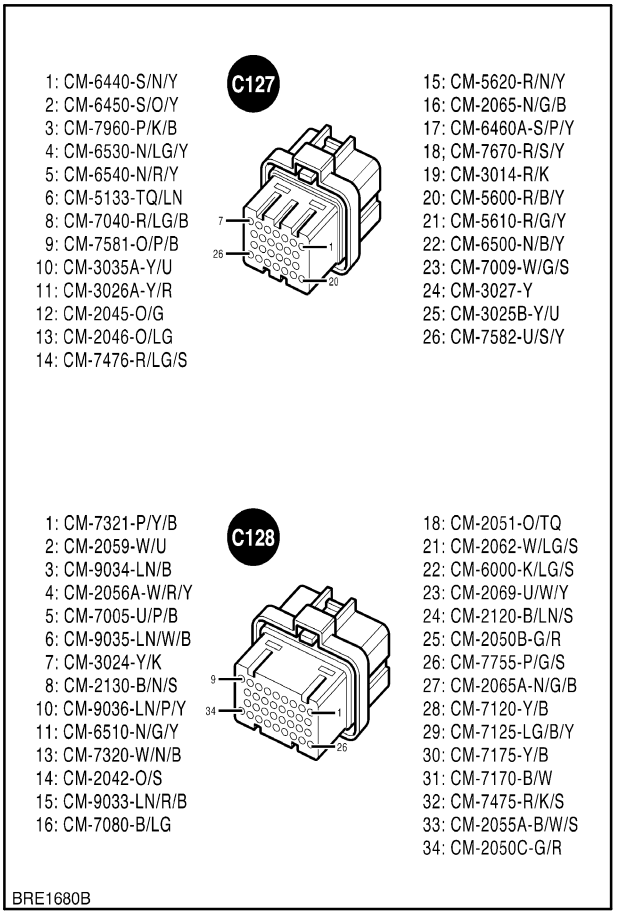
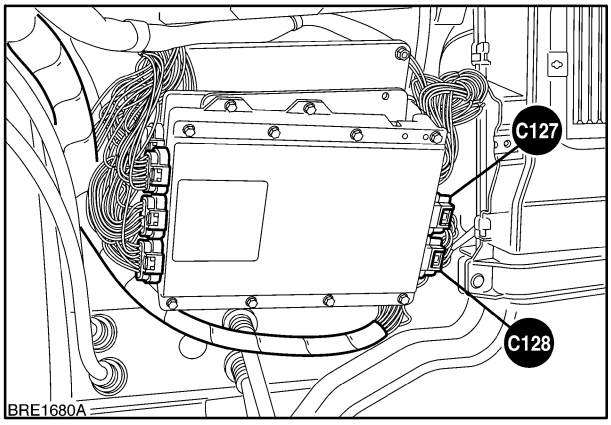
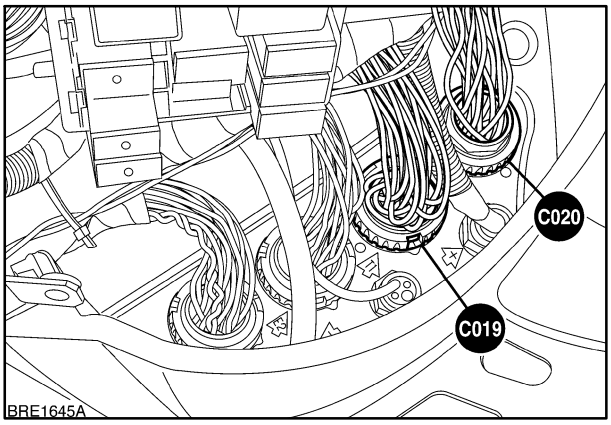

C289
C035
C290
BRE1663A


C035
RM-57EN-B
RM-3045-Y
C289
1: RM-9035-LN
2: RM-9036-LN
C290
1: RM-9033-LN
2: RM-9034-LN
BRE1663B


1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
C127
7
1
26
20
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

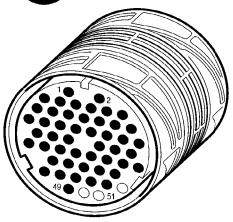

C127
C128
BRE1680A

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
C128
9
34
1
26
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R
BRE1680B



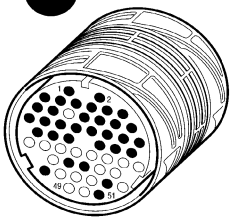
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 2124 – FLYWHEEL TORQUE SENSOR NOT CALIBRATED(16X16)

Possible failure modes:

1. Faulty flywheel torque sensor
2. Mechanical fault.
3. Faulty controller unit

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Clear error code and perform the flywheel torque sensor calibration procedure.
   A. If error code is still displayed, continue to step 2.
2. Check for other error codes being displayed.
   A. If any other error codes are being displayed, continue to these tests.
   B. If no other error codes are diplayed, continue to step 3.
3. Replace controller unit.

ERROR CODE 2124 – FLYWHEEL SENSOR FITTED IN ERROR (24X24 MECHANICAL ENGINE ONLY)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Sensor not required. Disconnect and remove flywheel sensor.

ERROR CODE 2199 – CREEPER OPTION NOT ENABLED

Effects:

Unable to select Creeper facility.

Possible failure modes:

1. Creeper option not configured.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Enable Creeper option in H3 menu screen of DA/DB processors.

SECTION 55 - ELECTRICAL SYSTEM

Chapter 9 - Fault Codes (Continued)

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3001 – 4000 ENGINE FAULT CODE LISTING

Error Code	Fault description
3001	Foot throttle pedal position sensor low idle switch not plausible
3002	Foot throttle pedal positon sensor high voltage
3003	Foot throttle pedal positon sensor low voltage
3004	Foot throttle pedal position sensor open circuit or sensor disconnected
3005	Foot throttle pedal position sensor power supply short to +Ve or ground
3006	Coolant temperature sensor high value
3007	Coolant temperature sensor high voltage
3008	Coolant temperature sensor low voltage
3009	Coolant temperature sensor open circuit or sensor disconnected
3010	Boost temperature sensor high voltage
3011	Boost temperature sensor signal low voltage
3012	Boost temperature sensor open circuit or sensor disconnected
3014	Fuel temperature sensor high value
3015	Fuel temperature sensor high voltage
3016	Fuel temperature sensor low voltage
3017	Fuel temperature sensor open circuit or sensor disconnected
3018	Boost pressure sensor high value
3019	Boost pressure sensor high voltage
3020	Boost pressure sensor low voltage
3021	Boost pressure sensor open circuit or sensor disconnected
3022	Boost pressure signal power supply short to +Ve or ground
3023	Atmospheric pressure sensor high value
3024	Atmospheric pressure sensor high voltage
3025	Atmospheric pressure sensor low voltage
3026	Atmospheric pressure sensor open circuit
3027	Oil pressure sensor high value
3028	Oil pressure sensor low value
3029	Oil pressure sensor high voltage
3030	Oil pressure sensor low voltage
3031	Oil pressure sensor open circuit or sensor disconnected
3032	Oil pressure sensor signal power supply short to +Ve or ground
3033	Oil temperature sensor high value
3034	Oil temperature sensor high voltage
3035	Oil temperature sensor low voltage
3036	Oil temperature sensor open circuit or sensor disconnected
3037	Fuel filter heater relay short to VCC
3038	Fuel filter heater relay short to ground

3039	Fuel filter heater relay disconnected or open circuit
3040	Cold start heater relay short to VCC
3041	Cold start heater relay short to ground
3042	Cold start heater relay disconnected or open circuit
3049	Battery voltage signal high value
3050	Battery voltage signal low value
3051	Battery voltage signal high voltage
3052	Battery voltage signal low voltage
3060	Fuel injector solenoid cyl 1 current decreased to fast
3061	Fuel injector solenoid cyl 1 short to VCC
3062	Fuel injector solenoid cyl 1 short to ground
3063	Fuel injector solenoid cyl 1 disconnected or open circuit
3064	Fuel injector solenoid cyl 5 current decreased to fast
3065	Fuel injector solenoid cyl 5 short to VCC
3066	Fuel injector solenoid cyl 5 short to ground
3067	Fuel injector solenoid cyl 5 disconnected or open circuit
3068	Fuel injector solenoid cyl 3 current decreased to fast
3069	Fuel injector solenoid cyl 3 short to VCC
3070	Fuel injector solenoid cyl 3 short to ground
3071	Fuel injector solenoid cyl 3 disconnected or open circuit
3072	Fuel injector solenoid cyl 6 current decreased to fast
3073	Fuel injector solenoid cyl 6 short to VCC
3074	Fuel injector solenoid cyl 6 short to ground
3075	Fuel injector solenoid cyl 6 disconnected or open circuit
3076	Fuel injector solenoid cyl 2 current decreased to fast
3077	Fuel injector solenoid cyl 2 short to VCC
3078	Fuel injector solenoid cyl 2 short to ground
3079	Fuel injector solenoid cyl 2 disconnected or open circuit
3080	Fuel injector solenoid cyl 4 current decreased to fast
3081	Fuel injector solenoid cyl 4 short to VCC
3082	Fuel injector solenoid cyl 4 short to ground
3083	Fuel injector solenoid cyl 4 disconnected or open circuit
3084	Fuel injector boost capacitor 1 high voltage
3085	Fuel injector boost capacitor 1 low voltage
3086	Fuel injector boost capacitor 2 high voltage
3087	Fuel injector boost capacitor 2 low voltage
3088	Increment speed signal error or reversed connections
3089	Increment speed signal excessive noise on circuit
3090	Segment speed signal phase error detection
3091	Segment speed signal error or reversed connections

3092	Engine speed signals, camshaftt or crankshaft signals not plausible
3093	Engine speed sensor high voltage
3094	Engine speed sensor low voltage
3095	Engine speed readings camshaft or crankshaft signals missing on start
3096	CAN A line no signal
3097	CAN B line no signal
3098	CAN TE control source low
3099	CAN TE control no signal
3100	CAN AE control source low
3101	CAN AE control no signal
3102	Fuel pressure monitoring low pressure
3103	Fuel pressure signal high value
3104	Fuel pressure signal high voltage
3105	Fuel pressure signal low voltage
3106	Fuel pressure sensor open circuit or disconnected
3107	Fuel metering unit short to VCC
3108	Fuel metering unit short to ground
3109	Fuel metering unit load diconnected or short to ground
3110	Fuel pressure relief value to high for long duration
3111	Fuel pressure relief value open
3112	Fuel pressure monitoring high pressure
3113	Main relay (Transistor supply UB2 is defective)
3114	Main relay (Transistor supply UB3 is defective)
3115	Main relay (Transistor supply UB4 is defective)
3116	Main relay (Controller internal source high)
3117	Self test not complete before power down
3117	ECU Self test shutoff paths (After run)
3118	Power supply for sensors not correct
3119	Power supply for sensors disconnected or failed
3120	Power supply for sensors high or low detected
3121	PTO twist sensor open circuit
3122	PTO twist sensor short to ground
3123	PTO twist sensor not calibrated
3124	Hand throttle position sensor potentiometer 2 over voltage
3125	Hand throttle position sensor potentiometer 2 under voltage
3126	Hand throttle position sensor potentiometer 1 over voltage
3127	Hand throttle position sensor potentiometer 1 under voltage
3128	Hand throttle position sensor difference error
3131	ECU self test shutoff paths (start up)
3132	CRPM switch short

ERROR CODE 3001 – FOOT THROTTLE PEDAL POSITION SENSOR LOW IDLE SWITCH NOT PLAUSIBLE

Effects:

Engine enabled – maximum engine speed restricted to 1760 RPM

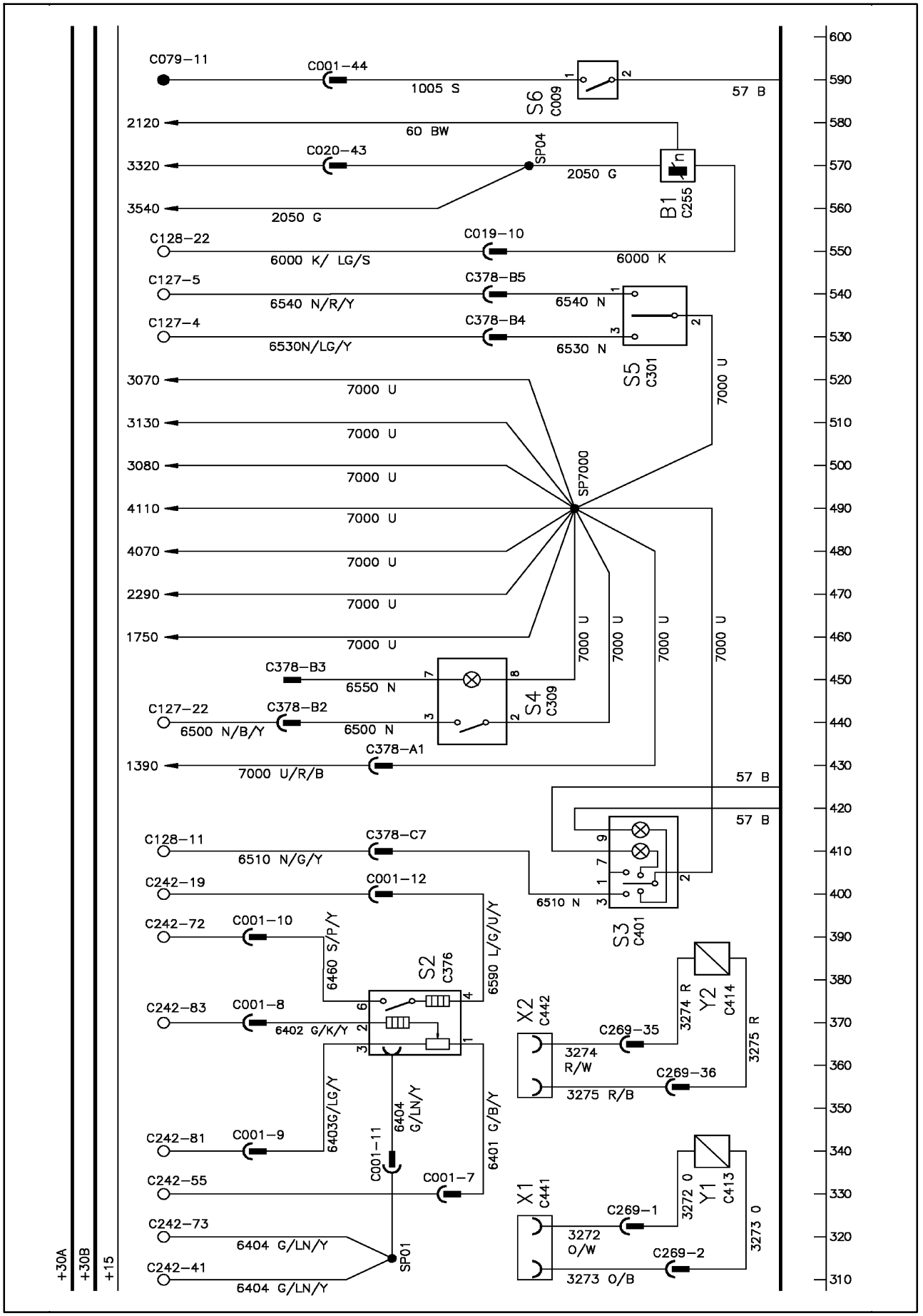
Possible failure modes:

1. Faulty connector
2. Foot throttle position sensor not calibrated
3. Foot throttle position sensor not adjusted correctly
4. Faulty foot throttle position sensor (potentiometer or idle switch)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the foot throttle position sensor connector **C376**, engine controller connector **C242** and the inline connector **C001**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 4.
4. Check the foot throttle idle switch in H5.
   A. Turn the keystart ON. Operate the foot throttle from low to high idle, d60 should be displayed when the pedal is operated. If d60 is not displayed, remove and replace the foot throttle position sensor.
   B. If the display does change to d60, continue to step 5.
5. Check the calibration of the foot throttle position sensor setup.
   A. Carry out the foot throttle position sensor setup procedure.
   B. If unable to cary out the setup procedure, remove and replace the foot throttle position sensor.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
1390
C378-A1
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6590 L/G/U/Y
6510 N
S3 C401
S2 C376
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R
Y2 C414
3274 R/W
3275 R
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3272 O/W
3273 O
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
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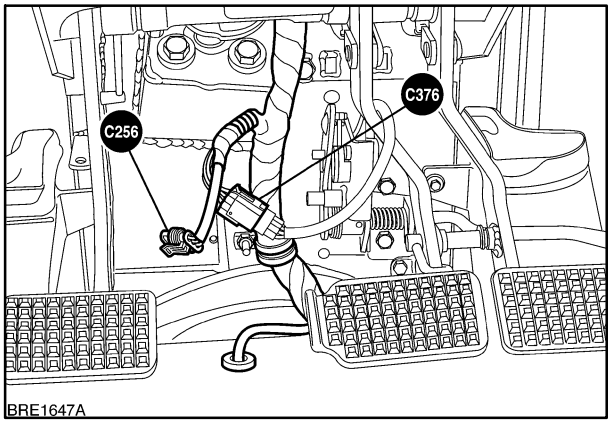

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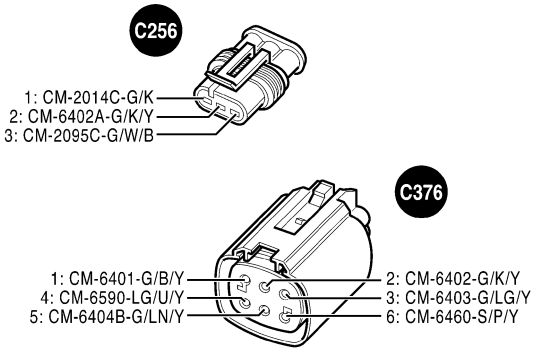
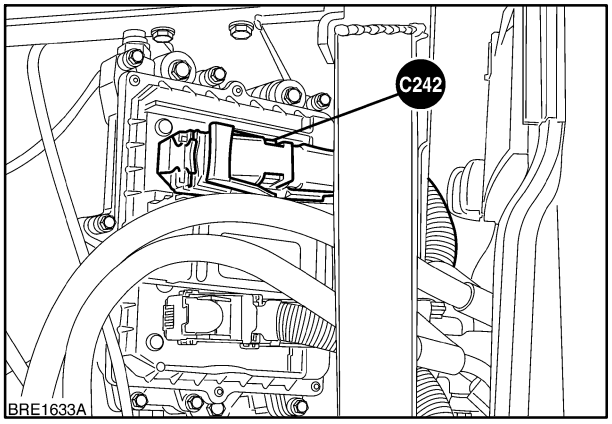


BRE1647B



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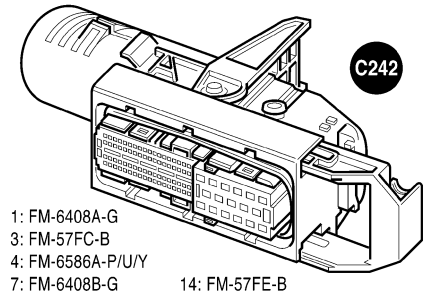
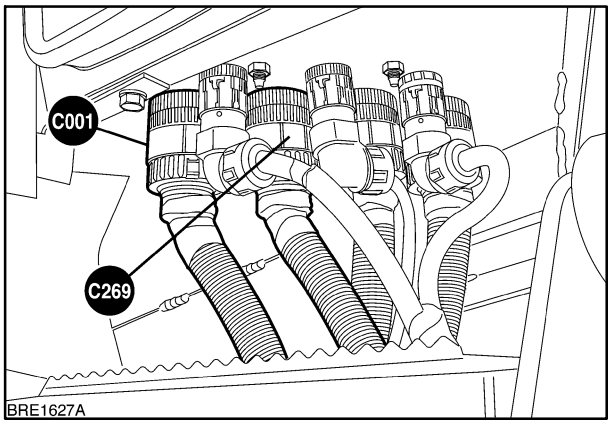


1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B



BRE1627A

1: FM-5400D-Y
2: FM-5420D-G
3: FM-6432-K
4: FM-6431-K
5: FM-6420-K
6: FM-6421-K
7: FM-6401-G
8: FM-6402-G
9: FM-6403-G
10: FM-6460-S
11: FM-6404B-G
12: FM-6590-LG
14: FM-6408A-G
15: FM-6408B-G
16: FM-6408C-G
17: FM-6408D-G
20: FM-6418-K
24: FM-3016-S
25:FM-10G-G
26: FM-1030B-U
27: FM-1030A-U
29: FM-1073A-P
30: FM-376-P
31: FM-57AH-B
32: FM-57AJ-B
33: FM-57AK-B
35: FM-57AM-B
36: FM-1027B-U
37: FM-1027A-U
38: FM-2095-G
40: FM-2014-G
41: FM-1006-N
43: FM-71-W
44: FM-1005-S
45: FM-1001S-W
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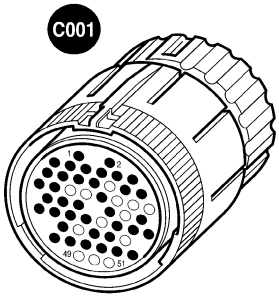
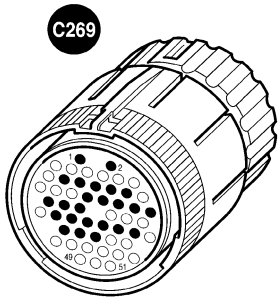
47: FM-1001V-W
48: FM-1001W-W



1: FM-3272-O
2: FM-3273-O
10: FM-650-TQ
11: FM-2040-LG
12: FM-2027-R
13: FM-3120-K
14: FM-2044-O
19: FM-2570Z-R
20: FM-60AC-B/W
21: FM-2510-N
22: FM-2530B-N
23: FM-2031-Y
24: FM-2028C-G
25: FM-3230-U
26: FM-3220-U
31: FM-2043-O
32: FM-2260-O
33: FM-57HB-B
34: FM-1010D-G
35: FM-3274-R
36: FM-3275-R
38: FM-1018-LG
39: FM-2006B-U
40: FM-2006A-U



BRE1627B

ERROR CODE 3002 – FOOT THROTTLE PEDAL POSITION SENSOR HIGH VOLTAGE

Effects:

Engine enabled – maximum engine speed restricted to 1760 RPM

Possible failure modes:

1. Faulty connector
2. Faulty foot throttle position sensor (potentiometer or idle switch)
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the foot throttle position sensor connector **C376**, and the engine controller connector **C242** and the inline connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the foot throttle potentiometer in H9 Channel 91.

   A. Operate the foot throttle from low to high idle. If the values displayed do not change continuously between 0 to 100, continue to step 4.

   B. If the values displayed are okay, while in H9 Channel 91 wiggle the harness and the connectors to check for an intermittent circuit. If an intermittent circuit is indicated, repair or replace as required.

4. Check for a short to +8 or +12 Volts.

   A. Disconnect connector **C376**, Turn the keystart ON. Measure the voltage between, **C376** pin **1 (G/B/Y)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 5.

5. Check for a short to +Ve.

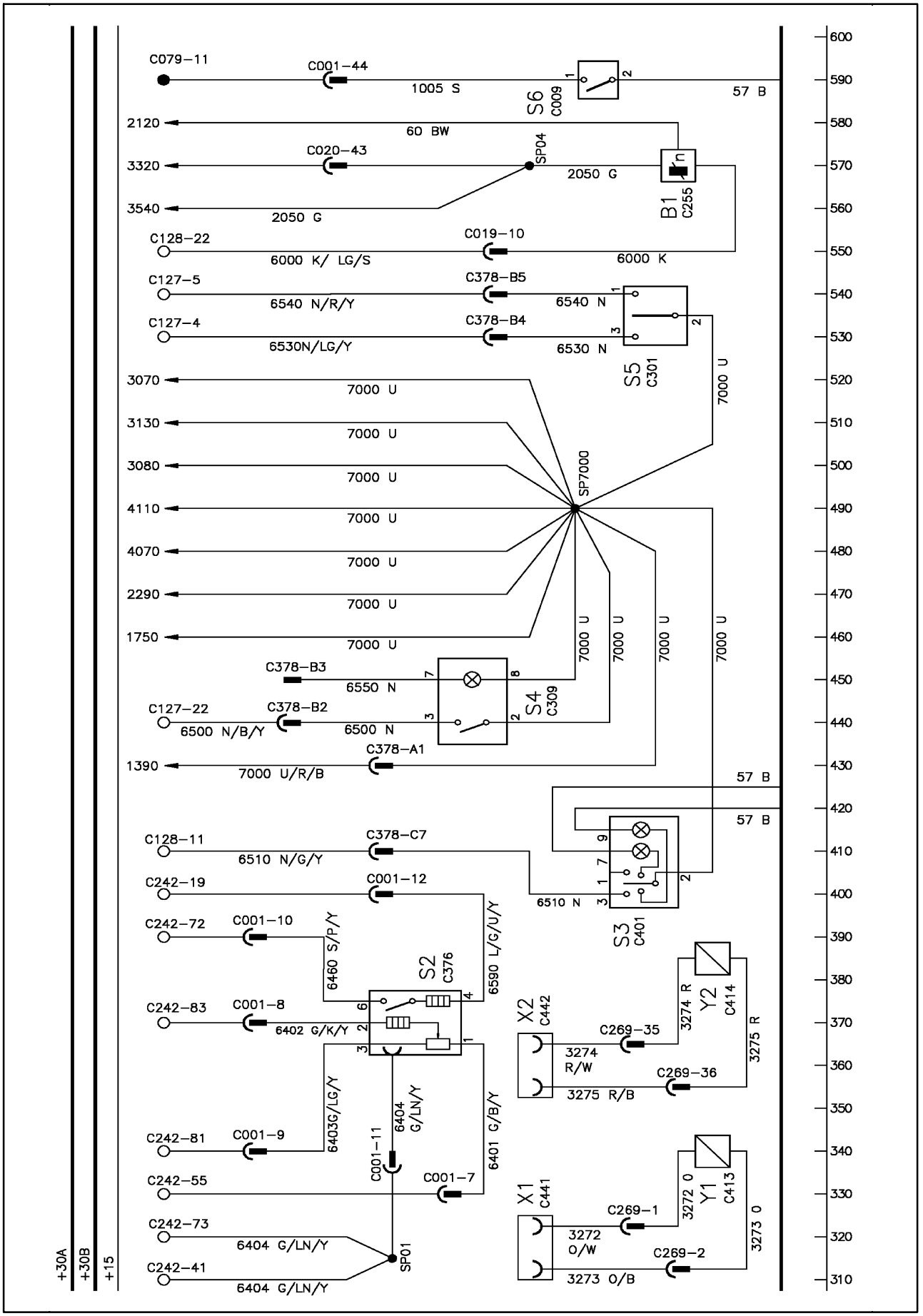
   A. Disconnect connector **C376**, Turn the keystart ON. Measure the voltage between:

   C376 pin **2 (G/K/Y)** and **ground**

   C376 pin **3 (G/LG/Y)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If fault re-occurs, remove and replace the engine controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
6510 N
S3 C401
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
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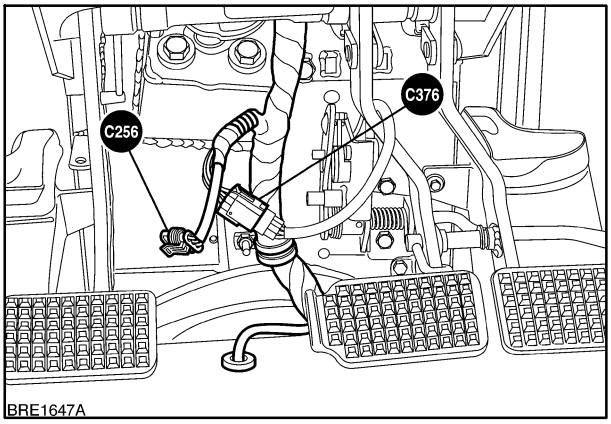
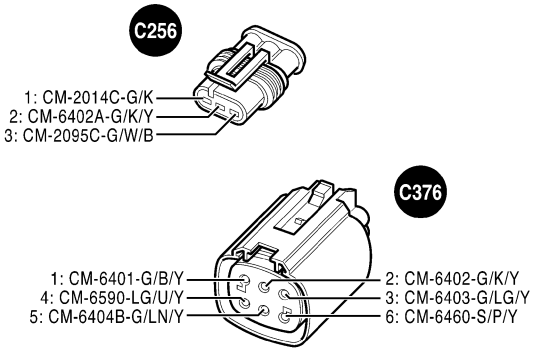
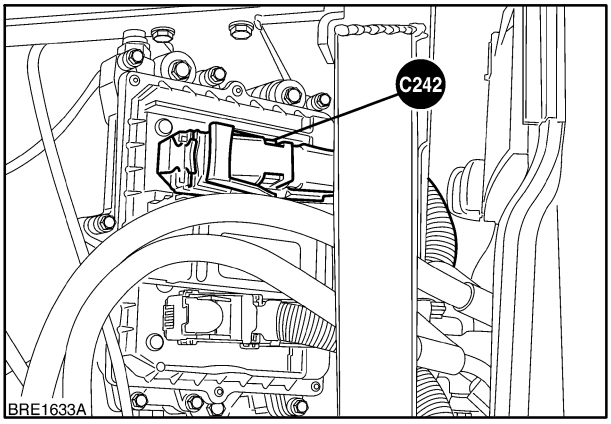


BRE1647A



BRE1647B



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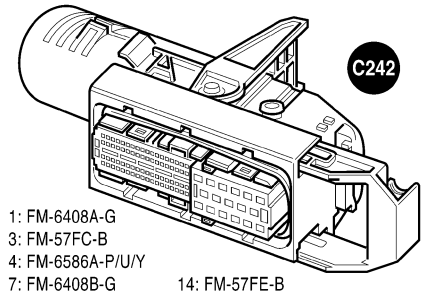
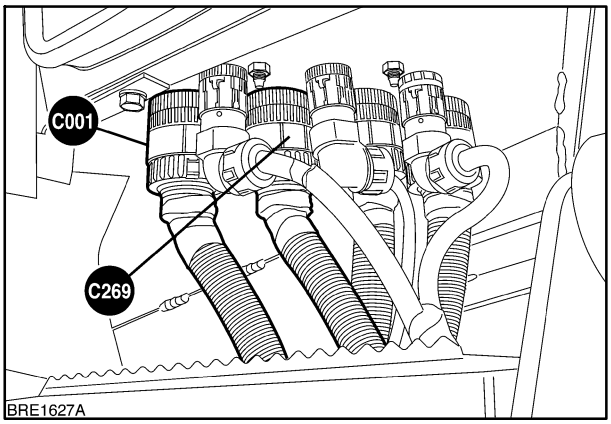


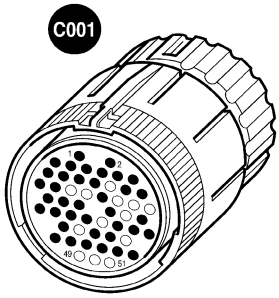
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B



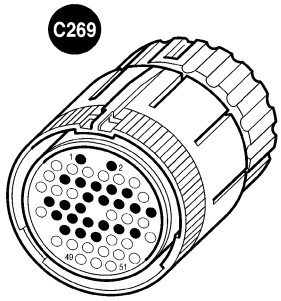
BRE1627A

1: FM-5400D-Y
2: FM-5420D-G
3: FM-6432-K
4: FM-6431-K
5: FM-6420-K
6: FM-6421-K
7: FM-6401-G
8: FM-6402-G
9: FM-6403-G
10: FM-6460-S
11: FM-6404B-G
12: FM-6590-LG
14: FM-6408A-G
15: FM-6408B-G
16: FM-6408C-G
17: FM-6408D-G
20: FM-6418-K
24: FM-3016-S
25:FM-10G-G



26: FM-1030B-U
27: FM-1030A-U
29: FM-1073A-P
30: FM-376-P
31: FM-57AH-B
32: FM-57AJ-B
33: FM-57AK-B
35: FM-57AM-B
36: FM-1027B-U
37: FM-1027A-U
38: FM-2095-G
40: FM-2014-G
41: FM-1006-N
43: FM-71-W
44: FM-1005-S
45: FM-1001S-W
46: FM-1001T-W
47: FM-1001V-W
48: FM-1001W-W

1: FM-3272-O
2: FM-3273-O
10: FM-650-TQ
11: FM-2040-LG
12: FM-2027-R
13: FM-3120-K
14: FM-2044-O
19: FM-2570Z-R
20: FM-60AC-B/W
21: FM-2510-N
22: FM-2530B-N
23: FM-2031-Y



24: FM-2028C-G
25: FM-3230-U
26: FM-3220-U
31: FM-2043-O
32: FM-2260-O
33: FM-57HB-B
34: FM-1010D-G
35: FM-3274-R
36: FM-3275-R
38: FM-1018-LG
39: FM-2006B-U
40: FM-2006A-U

BRE1627B

ERROR CODE 3003 – FOOT THROTTLE PEDAL POSITION SENSOR LOW VOLTAGE

Effects:

Engine enabled – maximum engine speed restricted to 1760 RPM

Possible failure modes:

1. Faulty connector
2. Faulty foot throttle position sensor (potentiometer or idle switch)
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check the foot throttle position sensor connector **C376**, engine controller connector **C242** and the inline connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the foot throttle position sensor potentiometer in H9 Channel 91.

   A. Operate the foot throttle from low to high idle. If the values displayed do not change continuously between 0 to 100, continue to step 4.

   B. If the values displayed are okay, while in H9 Channel 91 wiggle the harness and the connectors to check for an intermittent circuit. If an intermittent circuit is indicated, repair or replace as required.
4. Check for a short to ground.

   A. Disconnect connector **C376**. Check between:

   C376 pin **1 (G/B/Y)** and **ground**

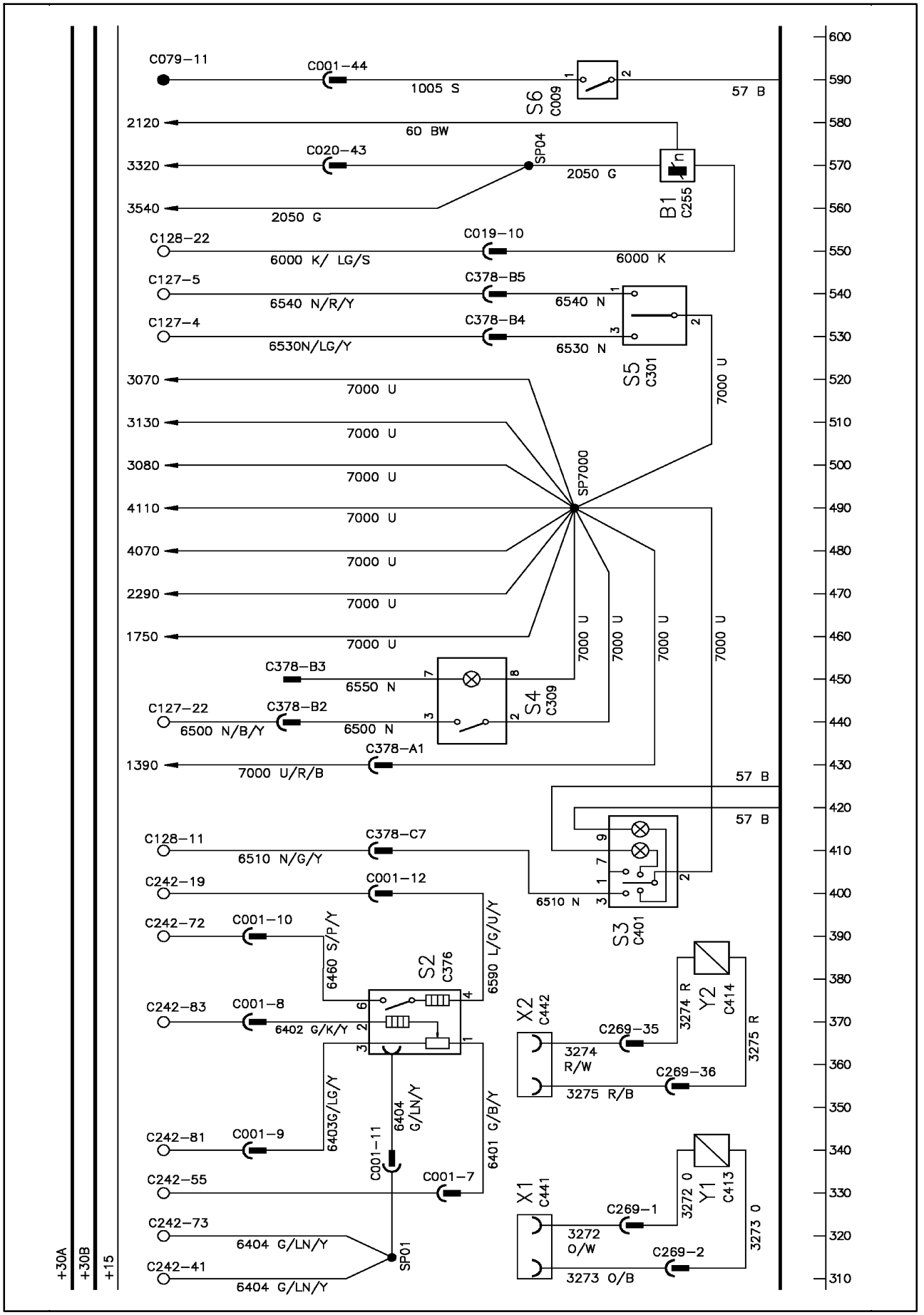
   C376 pin **2 (G/K/Y)** and **ground**

   C376 pin **3 (G/LG/Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the foot throttle position sensor.

   If the fault is still present, download the correct level of software. If fault re-occurs, remove and replace the engine controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6510 N
S3 C401
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
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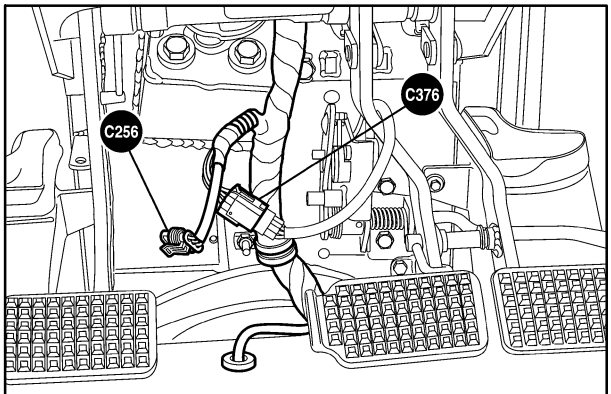

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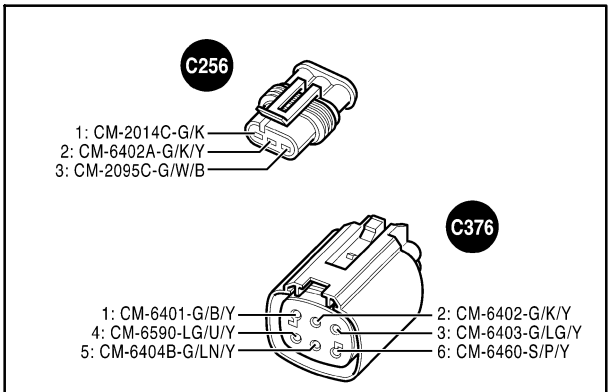
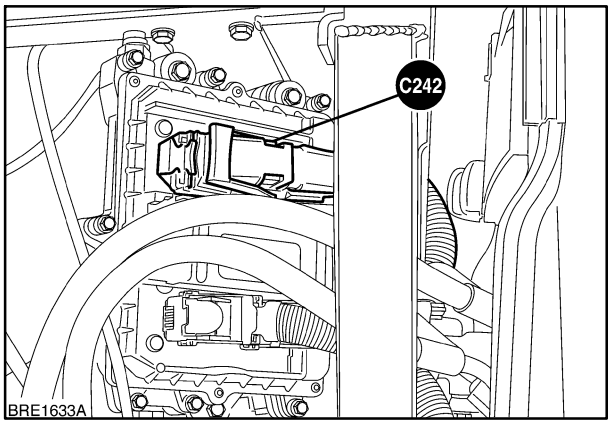


BRE1647B



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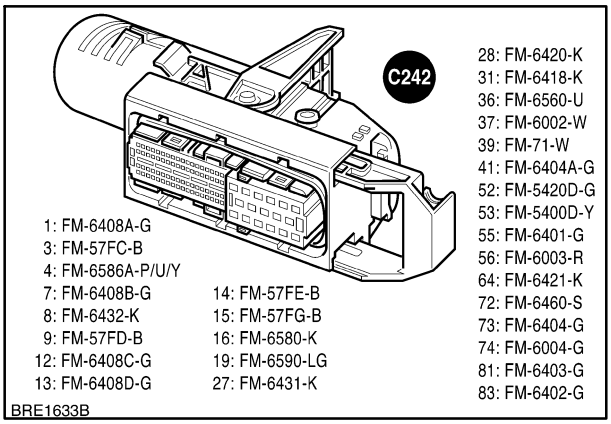

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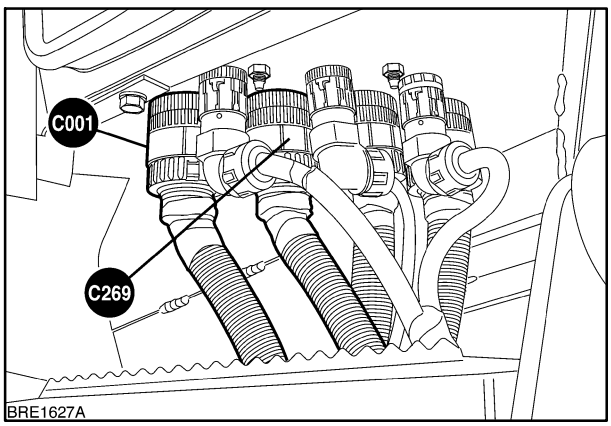
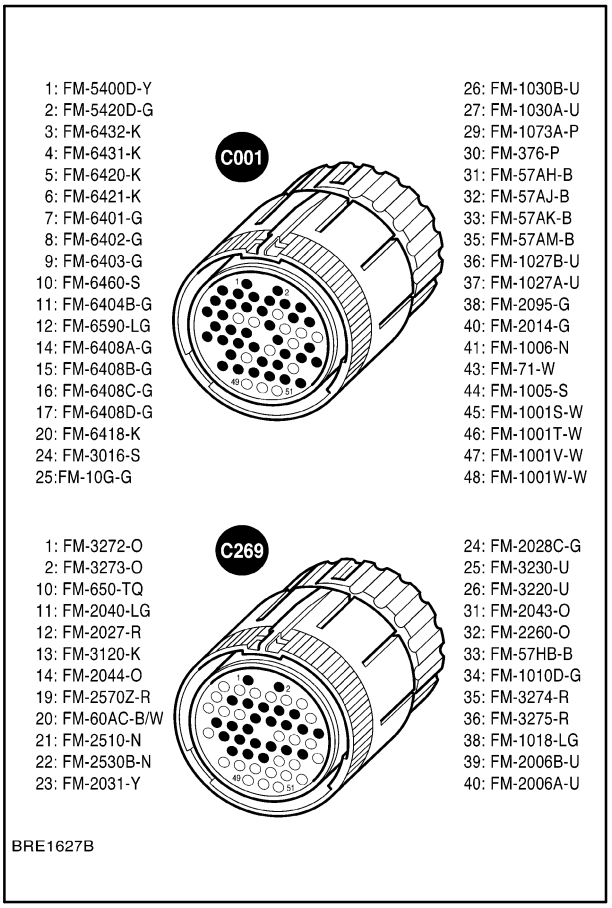


BRE1627A



BRE1627B

ERROR CODE 3004 – FOOT THROTTLE PEDAL POSITION SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Effects:

Engine enabled – maximum engine speed restricted to 1760 RPM

Possible failure modes:

1. Faulty connector
2. Faulty foot throttle position sensor (potentiometer or idle switch)
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the foot throttle position sensor connector **C376**, engine controller connector **C242** and the inline connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the foot throttle position sensor potentiometer in H9 Channel 91.

   A. Operate the foot throttle from low to high idle. If the values displayed do not change continuously between 0 to 100, continue to step 4.

   B. If the values displayed are okay, while in H9 Channel 91 wiggle the harness and the connectors to check for an intermittent circuit. If an intermittent circuit is indicated, repair or replace as required.

4. Check for an open circuit.

   A. Disconnect connector **C376** and **C242**. Check between:

   C376 pin **1 (G/B/Y)** and **C242** pin **55 (G)**

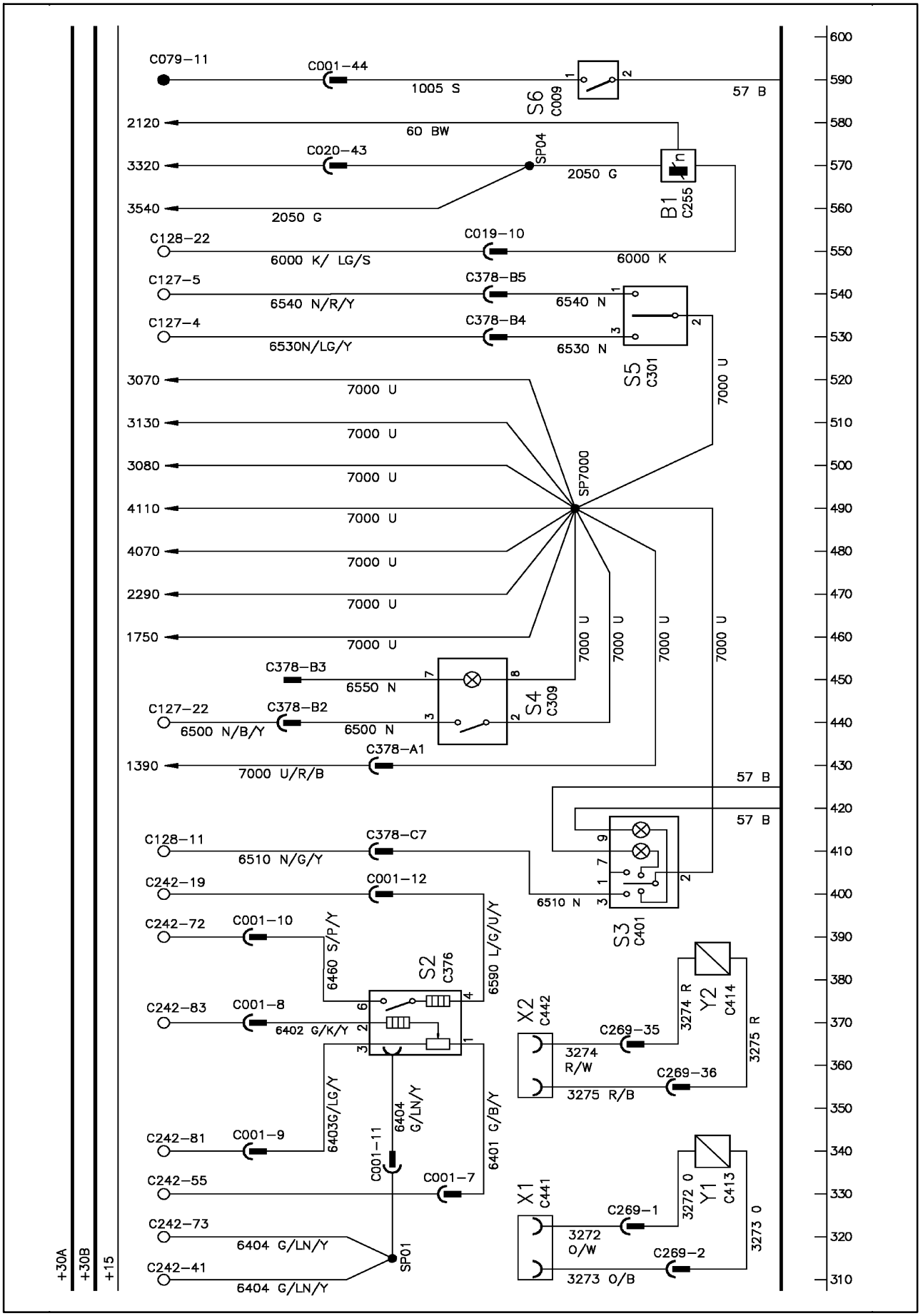
   C376 pin **2 (G/K/Y)** and **C242** pin **83 (G)**

   C376 pin **3 (G/LG/Y)** and **C242** pin **81 (G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the foot throttle position sensor.

   If the fault is still present, download the correct level of software. If fault re-occurs, remove and replace the engine controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C001-7
C242-55
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
6510 N
S3 C401
X2 C442
C269-35
3274 R/W
C269-36
3275 R/B
3274 R
Y2 C414
3275 R
X1 C441
C269-1
3272 O/W
C269-2
3273 O/B
3272 O
Y1 C413
3273 O
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
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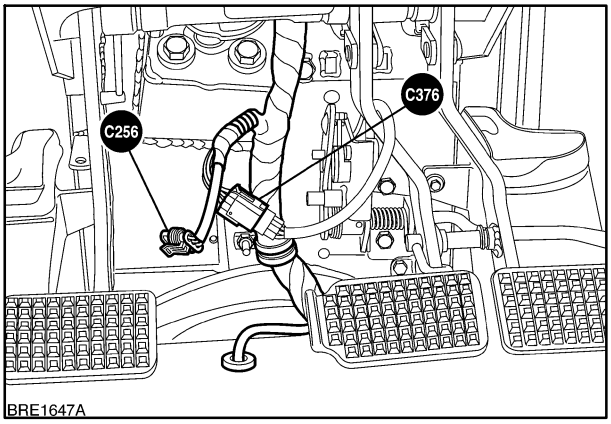

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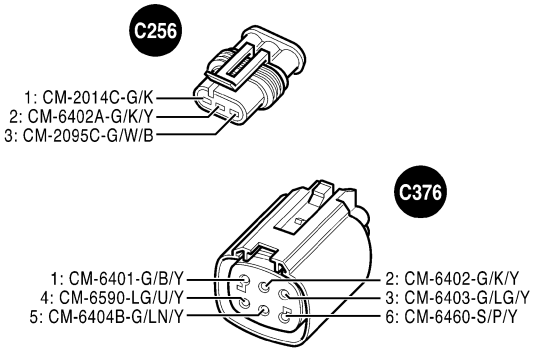

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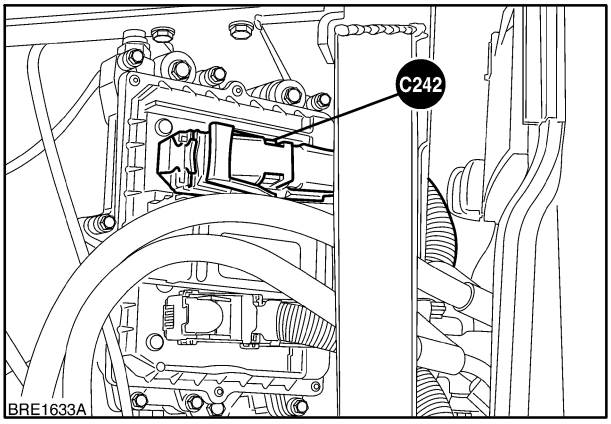

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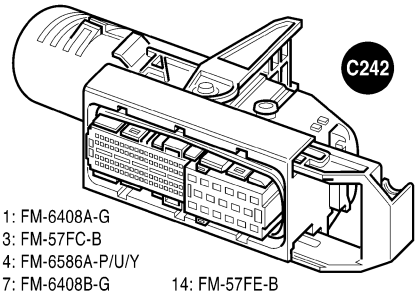
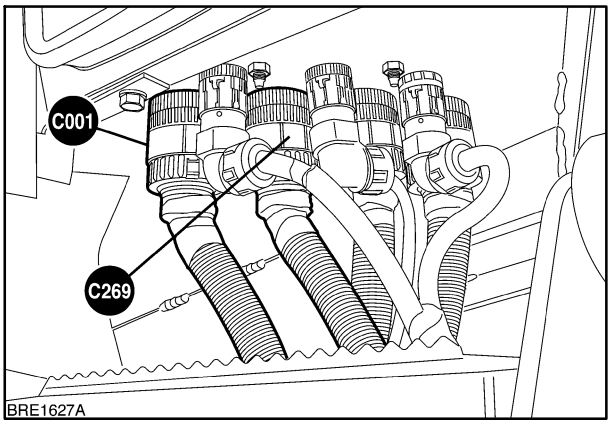


1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B



BRE1627A

1: FM-5400D-Y
2: FM-5420D-G
3: FM-6432-K
4: FM-6431-K
5: FM-6420-K
6: FM-6421-K
7: FM-6401-G
8: FM-6402-G
9: FM-6403-G
10: FM-6460-S
11: FM-6404B-G
12: FM-6590-LG
14: FM-6408A-G
15: FM-6408B-G
16: FM-6408C-G
17: FM-6408D-G
20: FM-6418-K
24: FM-3016-S
25:FM-10G-G
26: FM-1030B-U
27: FM-1030A-U
29: FM-1073A-P
30: FM-376-P
31: FM-57AH-B
32: FM-57AJ-B
33: FM-57AK-B
35: FM-57AM-B
36: FM-1027B-U
37: FM-1027A-U
38: FM-2095-G
40: FM-2014-G
41: FM-1006-N
43: FM-71-W
44: FM-1005-S
45: FM-1001S-W
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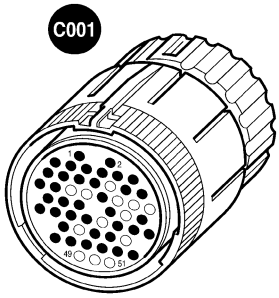
47: FM-1001V-W
48: FM-1001W-W



1: FM-3272-O
2: FM-3273-O
10: FM-650-TQ
11: FM-2040-LG
12: FM-2027-R
13: FM-3120-K
14: FM-2044-O
19: FM-2570Z-R
20: FM-60AC-B/W
21: FM-2510-N
22: FM-2530B-N
23: FM-2031-Y
24: FM-2028C-G
25: FM-3230-U
26: FM-3220-U
31: FM-2043-O
32: FM-2260-O
33: FM-57HB-B
34: FM-1010D-G
35: FM-3274-R
36: FM-3275-R
38: FM-1018-LG
39: FM-2006B-U
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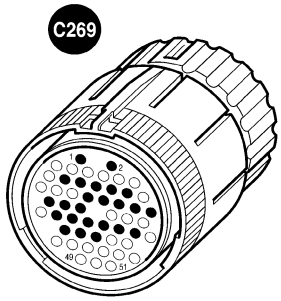


BRE1627B

ERROR CODE 3005 - FOOT THROTTLE PEDAL POSITION SENSOR POWER SUPPLY SHORT TO + VE OR GROUND

Effects:

Engine enabled - maximum engine speed restricted to 1760 RPM.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the foot throttle position sensor connector **C376**, engine controller connector **C242** and the inline connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the foot throttle position sensor potentiometer in H9 Channel 91.

   A. Operate the foot throttle from low to high idle. If the values displayed do not change continuously between 0 to 100, continue to step 4.

   B. If the values displayed are okay, while in H9 Channel 91 wiggle the harness and the connectors to check for an intermittent circuit. If an intermittent circuit is indicated, repair or replace as required.

4. Check for a short to ground.

   A. Disconnect **C376**. Check between **C376** pin **1 (G/B/Y)** and **ground**.

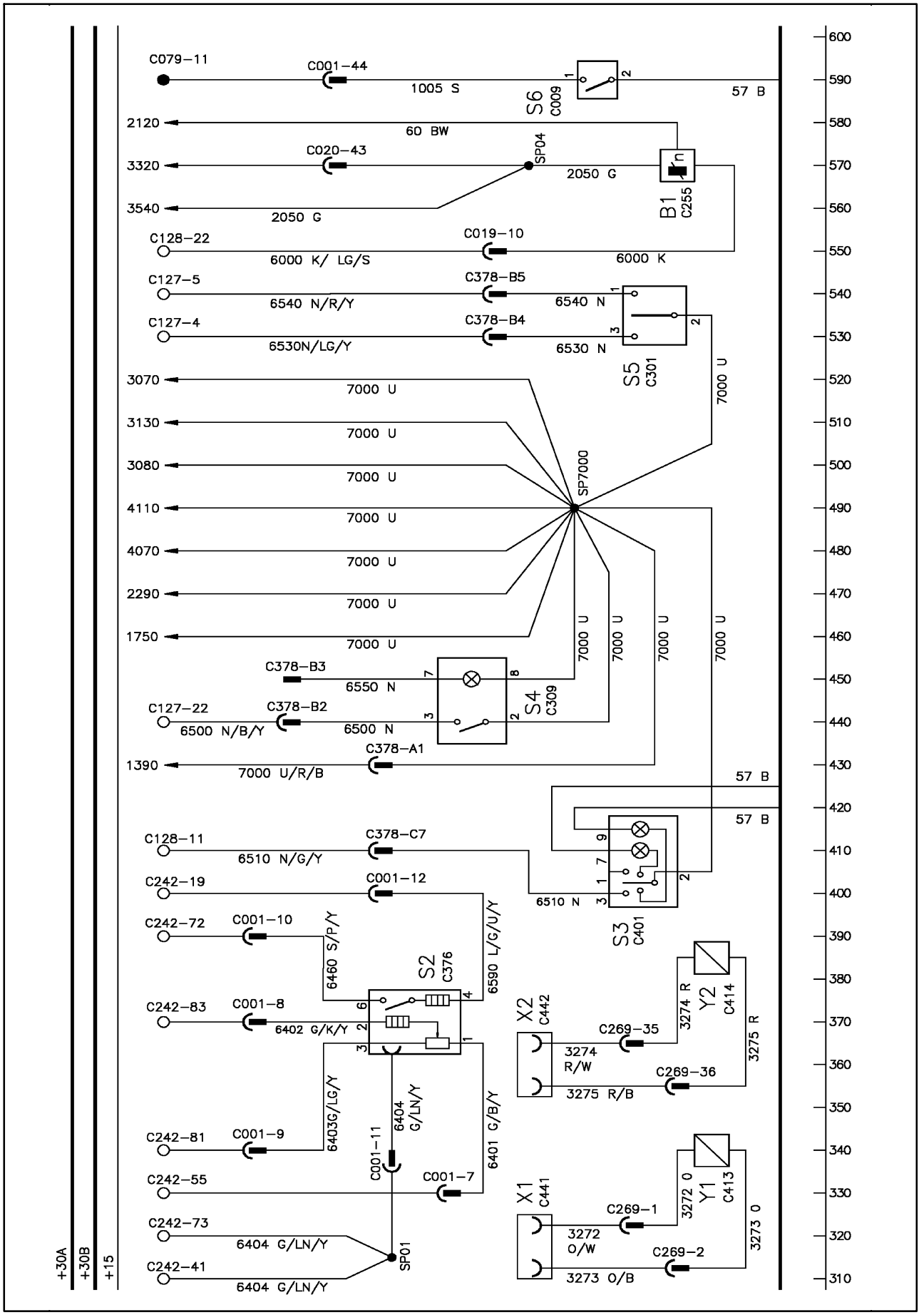
   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between **C376** pin **1 (G/B/Y)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, download the correct level of software. If fault re-occurs, remove and replace the engine controller.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C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
6510 N
S3 C401
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
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570
560
550
540
530
520
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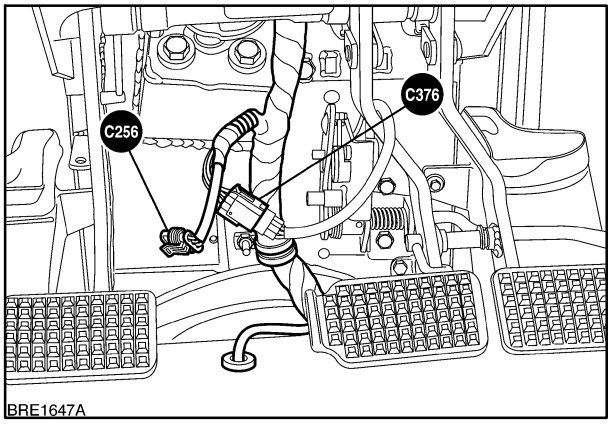

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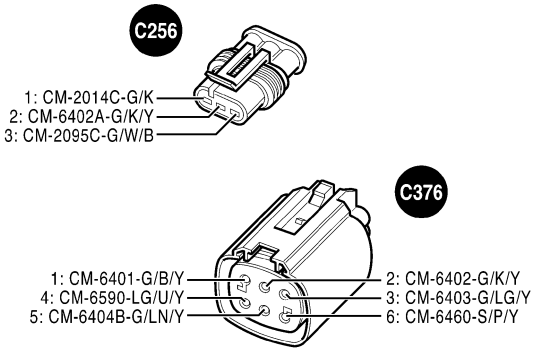
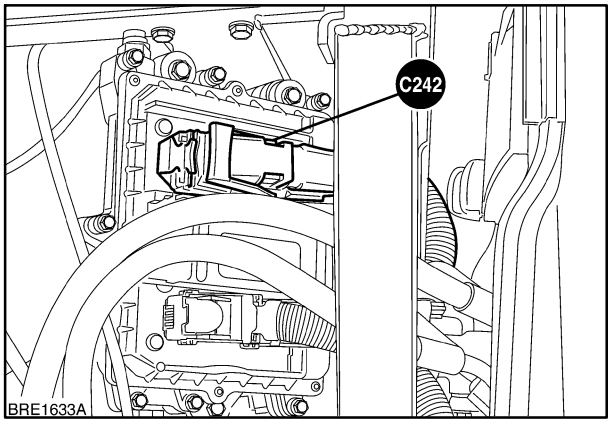


BRE1647B



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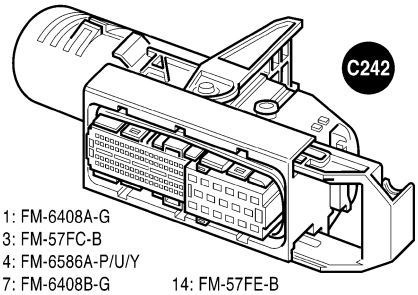
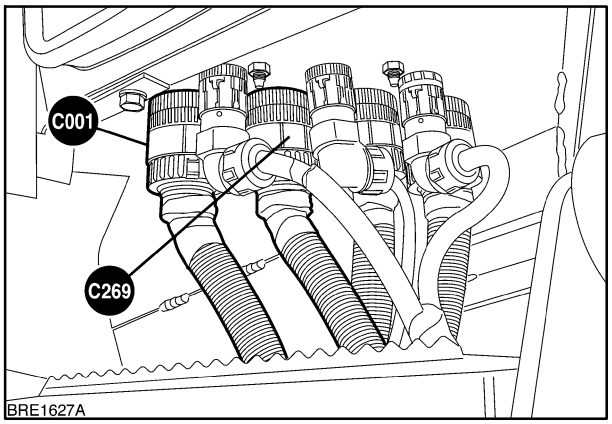


1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B



BRE1627A

1: FM-5400D-Y
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3: FM-6432-K
4: FM-6431-K
5: FM-6420-K
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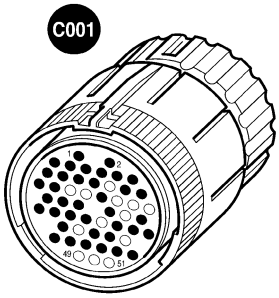
7: FM-6401-G
8: FM-6402-G
9: FM-6403-G
10: FM-6460-S
11: FM-6404B-G
12: FM-6590-LG
14: FM-6408A-G
15: FM-6408B-G
16: FM-6408C-G
17: FM-6408D-G
20: FM-6418-K
24: FM-3016-S
25:FM-10G-G
26: FM-1030B-U
27: FM-1030A-U
29: FM-1073A-P
30: FM-376-P
31: FM-57AH-B
32: FM-57AJ-B
33: FM-57AK-B
35: FM-57AM-B
36: FM-1027B-U
37: FM-1027A-U
38: FM-2095-G
40: FM-2014-G
41: FM-1006-N
43: FM-71-W
44: FM-1005-S
45: FM-1001S-W
46: FM-1001T-W
47: FM-1001V-W
48: FM-1001W-W



1: FM-3272-O
2: FM-3273-O
10: FM-650-TQ
11: FM-2040-LG
12: FM-2027-R
13: FM-3120-K
14: FM-2044-O
19: FM-2570Z-R
20: FM-60AC-B/W
21: FM-2510-N
22: FM-2530B-N
23: FM-2031-Y
24: FM-2028C-G
25: FM-3230-U
26: FM-3220-U
31: FM-2043-O
32: FM-2260-O
33: FM-57HB-B
34: FM-1010D-G
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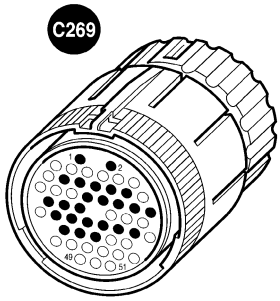
36: FM-3275-R
38: FM-1018-LG
39: FM-2006B-U
40: FM-2006A-U



BRE1627B

ERROR CODE 3006 - COOLANT TEMPERATURE SENSOR HIGH VALUE

Possible failure modes:

1. Faulty connector
2. Faulty coolant temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is indicated, continue to step 2.

   B. If the error code is not indicated, check that the cooling system is operating correctly.
2. Ensure that the cooling system mechanical operation is okay, and that the coolant level is correct. Run the tractor under normal conditions to test for over heating.

   A. If a fault with the cooling system is indicated, repair as necessary.

   B. If a fault with the cooling system is not indicated, continue to step 3.
3. Check the coolant temperature sensor connector **C430** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

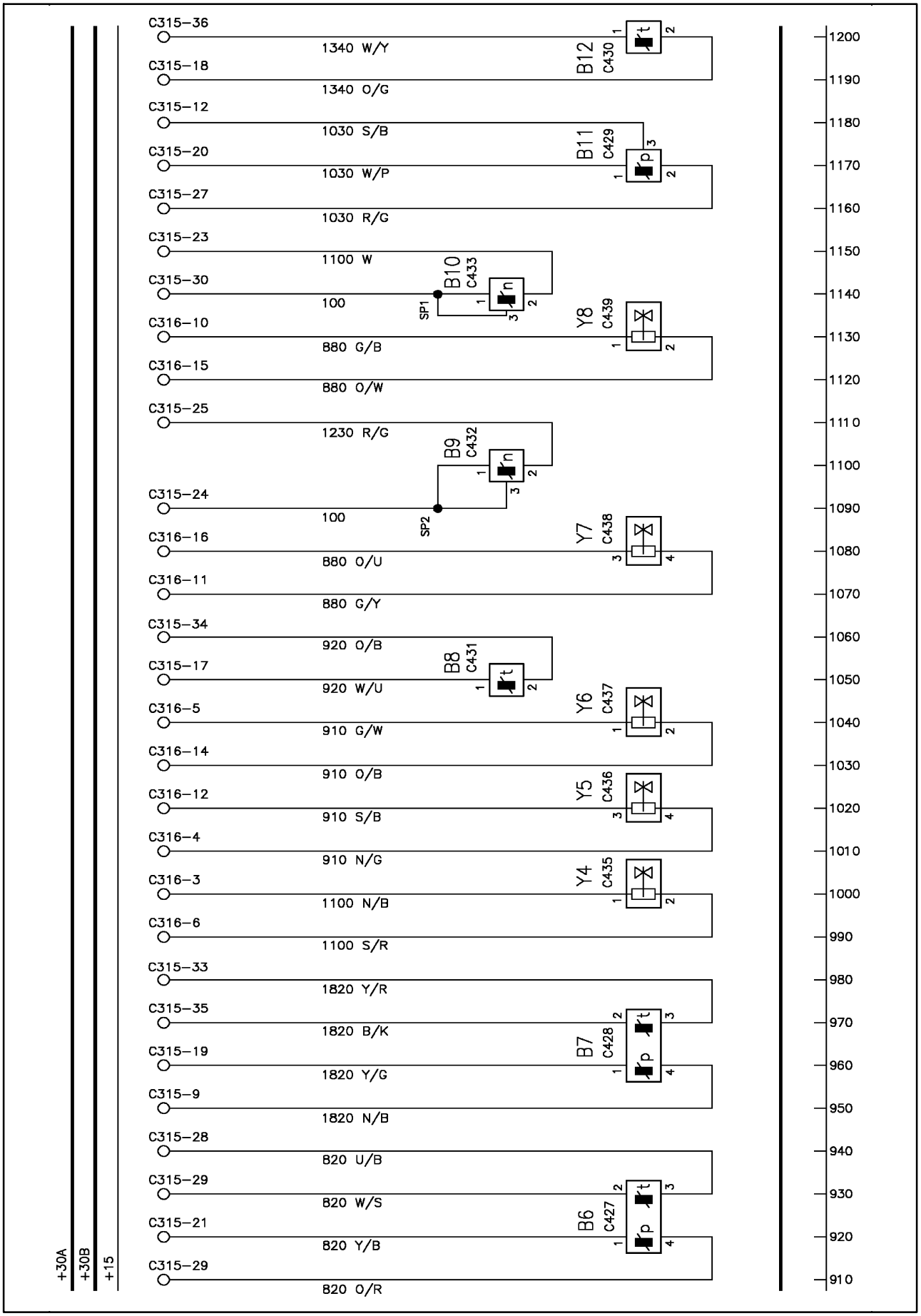
   B. If the connectors are okay, continue to step 4.
4. Check the coolant temperature sensor.

   A. Disconnect connector **C430**. Measure the resistance between the component side of the connector **C430** pins **1** and **2**. If the resistance is not approximately 2.5K Ohms at 20 degress centigrade, remove and replace the coolant temperature sensor.

   B. If the coolant temperature sensor is okay, continue to step 5.
5. Check for other error codes displayed.

   A. If other error code 3007 is diplayed, continue to this test.

   B. If no other error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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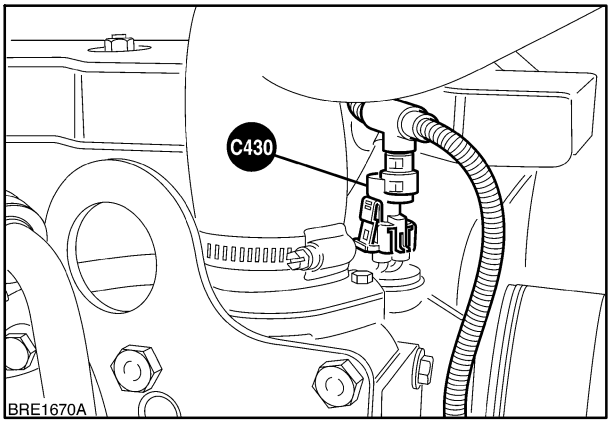
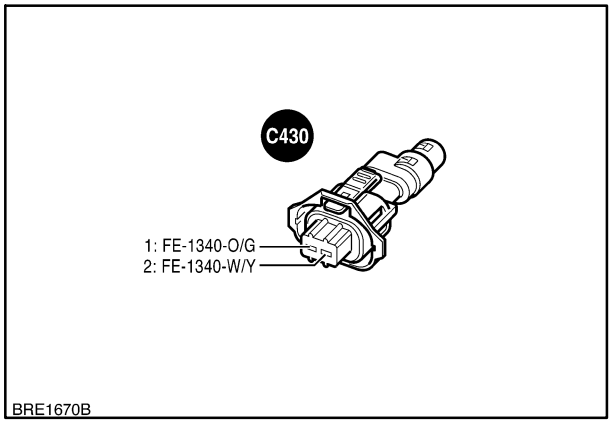

C430
BRE1670A


C430
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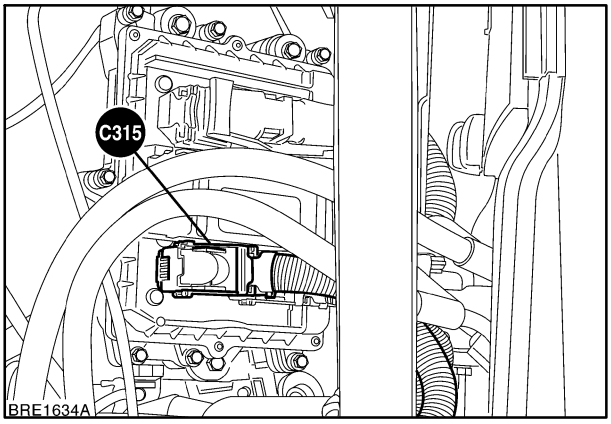
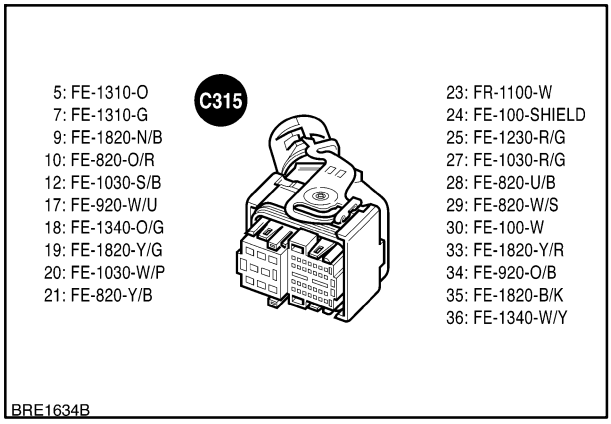
2: FE-1340-W/Y
BRE1670B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3007 - COOLANT TEMPERATURE SENSOR SIGNAL HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty coolant temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the coolant temperature sensor connector **C430** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for short to +Ve voltage.

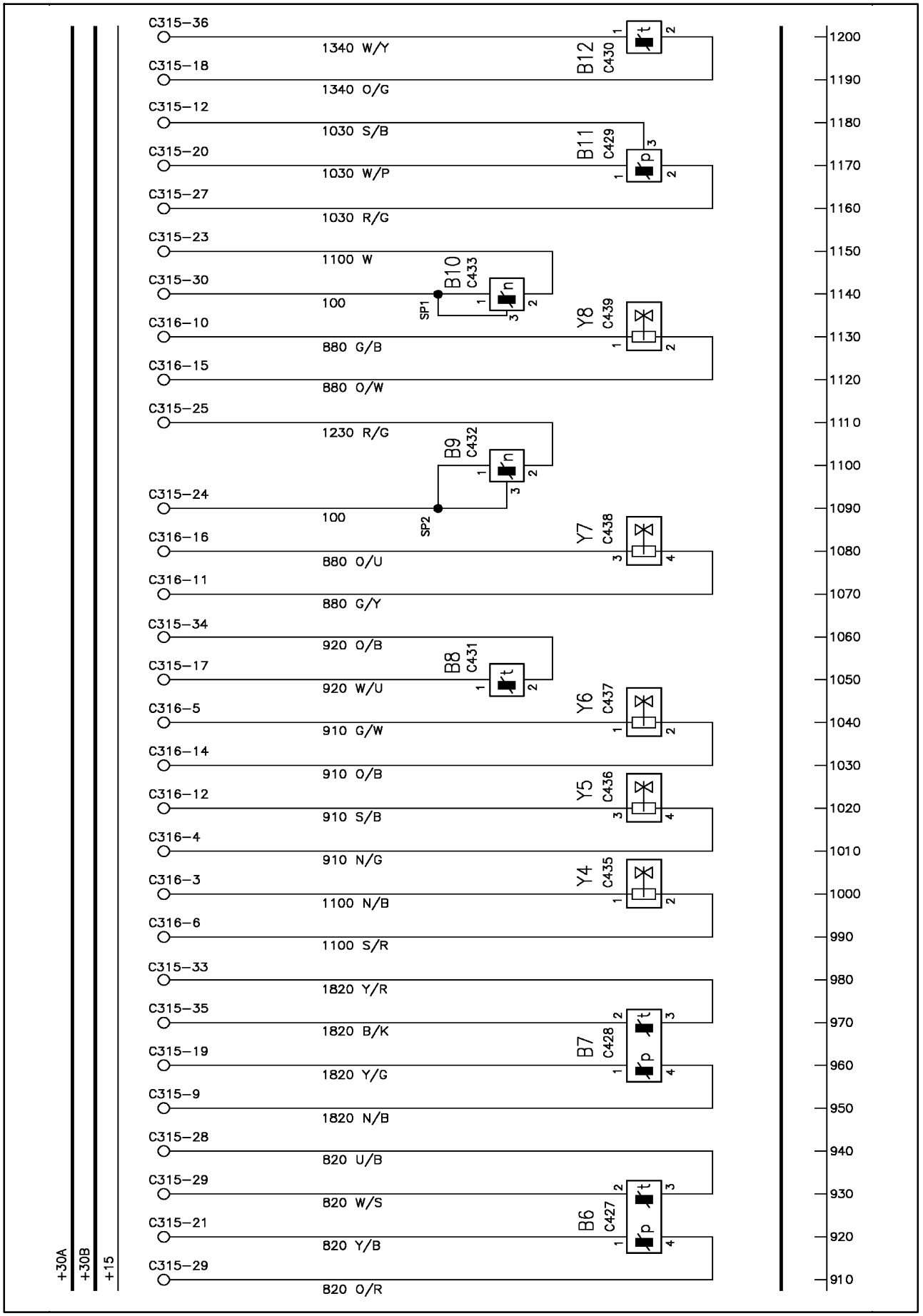
   A. Disconnect connector **C430**. Turn the keystart ON. Check between connectors:

   C430 pin **1 (O/G)** and **ground**

   C430 pin **2 (W/Y)** and **ground**

   If a short to +Ve is indicated, repair or replace as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
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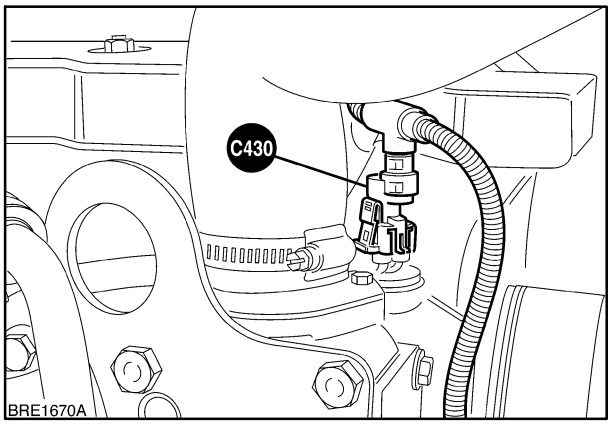
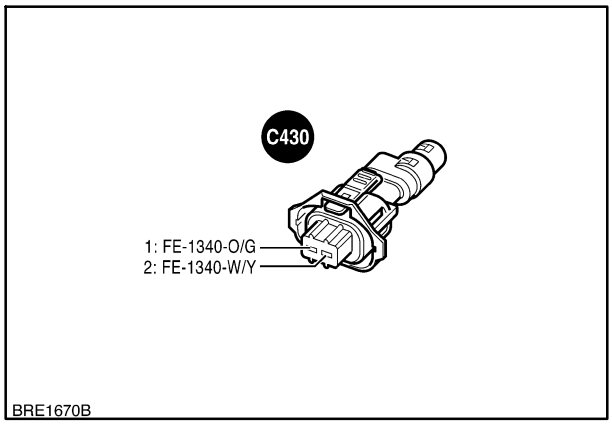
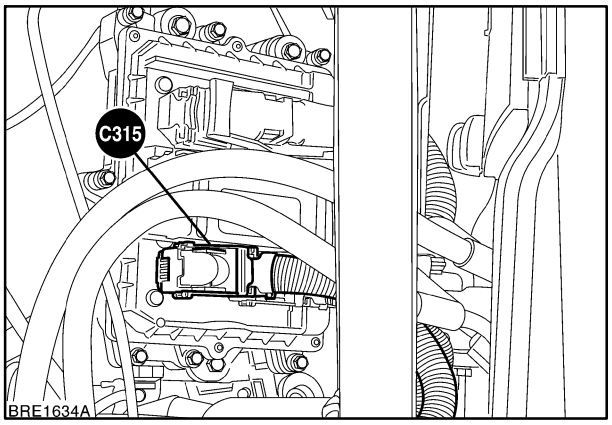
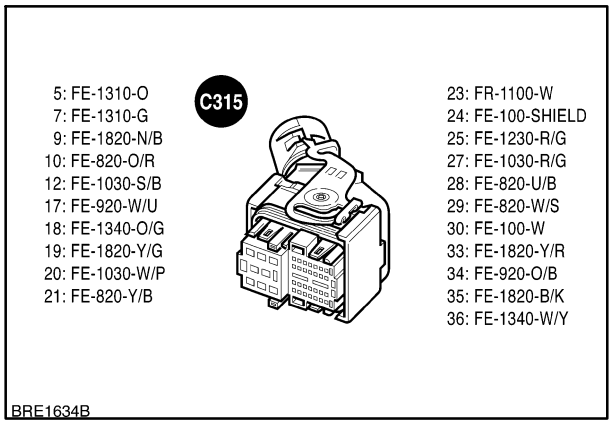

C430
BRE1670A


C430
1: FE-1340-O/G
2: FE-1340-W/Y
BRE1670B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3008 - COOLANT TEMPERATURE SENSOR SIGNAL LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty coolant temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the coolant temperature sensor connector **C430** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the coolant temperature sensor for a short to ground.

   A. Disconnect connector **C430**. Check between the component side of the connector:

   C430 pins **1** and **ground**

   C430 pins **2** and **ground**

   If a short to ground is indicated, remove and replace the coolant temperature sensor.

   B. If the coolant temperature sensor is okay, continue to step 4.

4. Check for a short to ground.

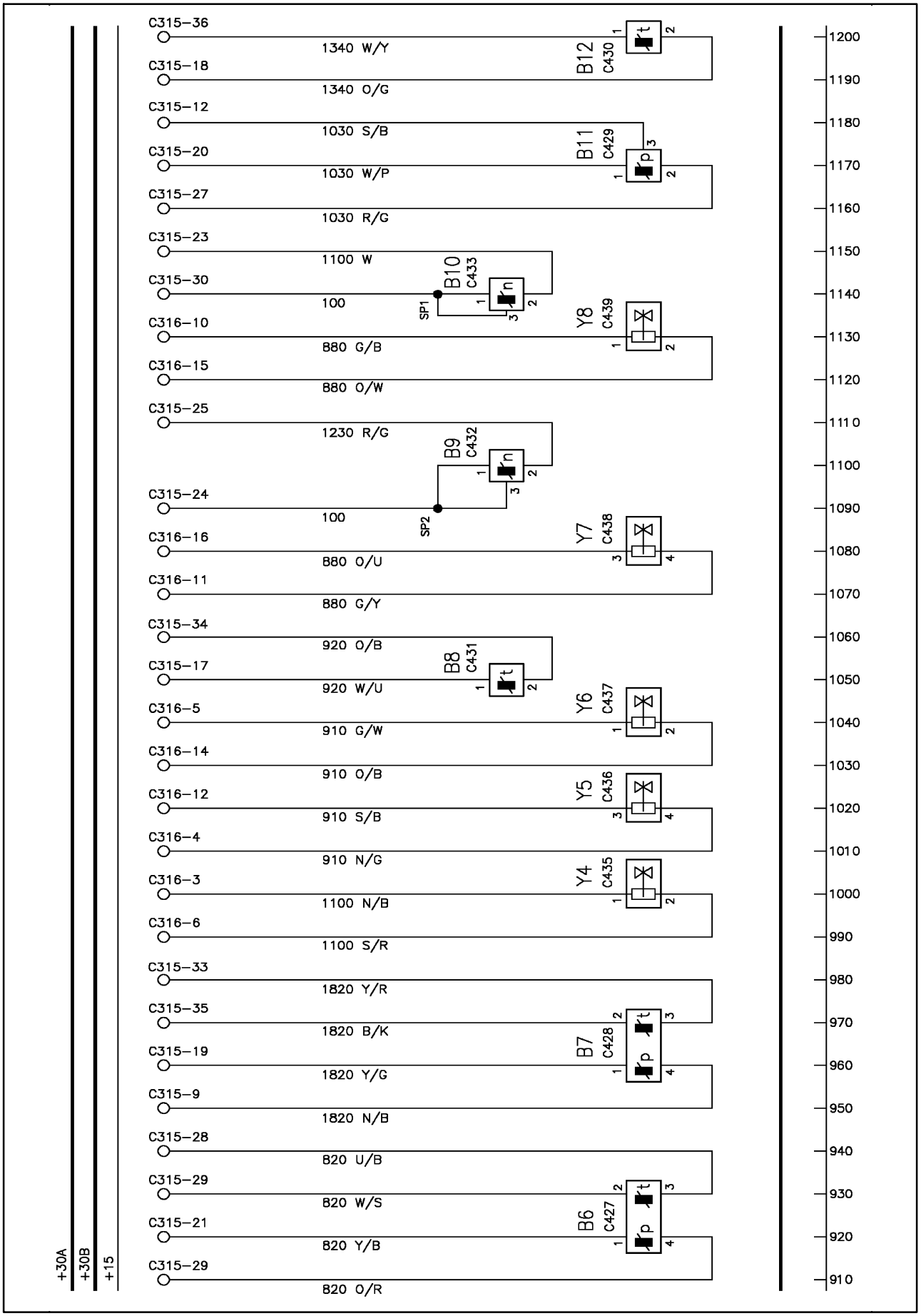
   A. Disconnect connector **C315**. Check between connectors:

   C430 pin **1 (O/G)** and **ground**

   C430 pin **2 (W/Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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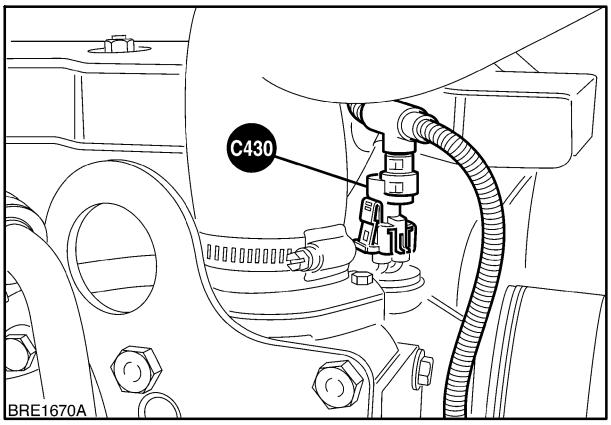
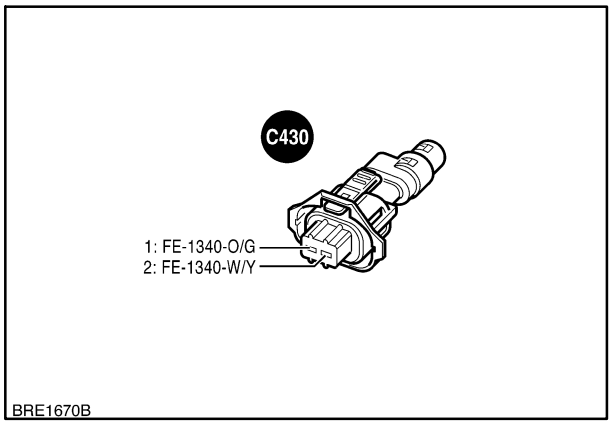
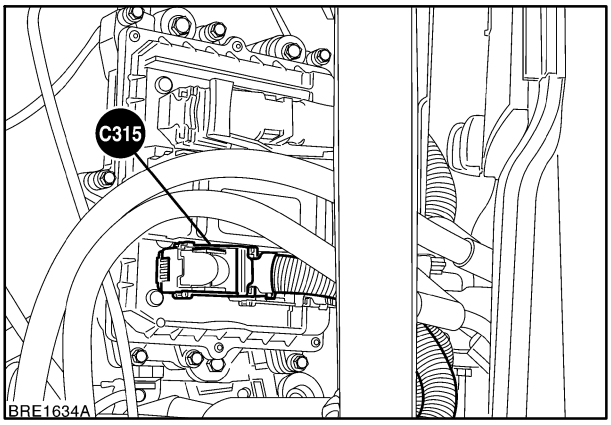
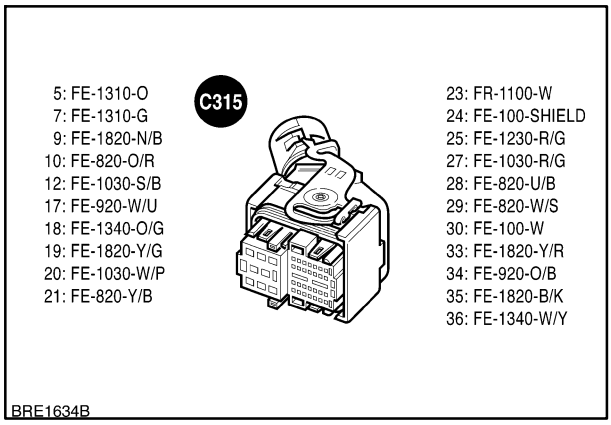
920
910


C430
BRE1670A


C430
1: FE-1340-O/G
2: FE-1340-W/Y
BRE1670B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3009 - COOLANT TEMPERATURE SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty coolant temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the coolant temperature sensor connector **C430** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the coolant temperature sensor for an open circuit.

   A. Disconnect connector **C430**. Measure the resistance between the component side of the connector **C430** pins **1** and **2**. If the resistance is not approximately 2.5 K Ohms at 20 degress centigrade, remove and replace the coolant temperature sensor.

   B. If the coolant temperature sensor is okay, continue to step 4.

4. Check for an open circuit.

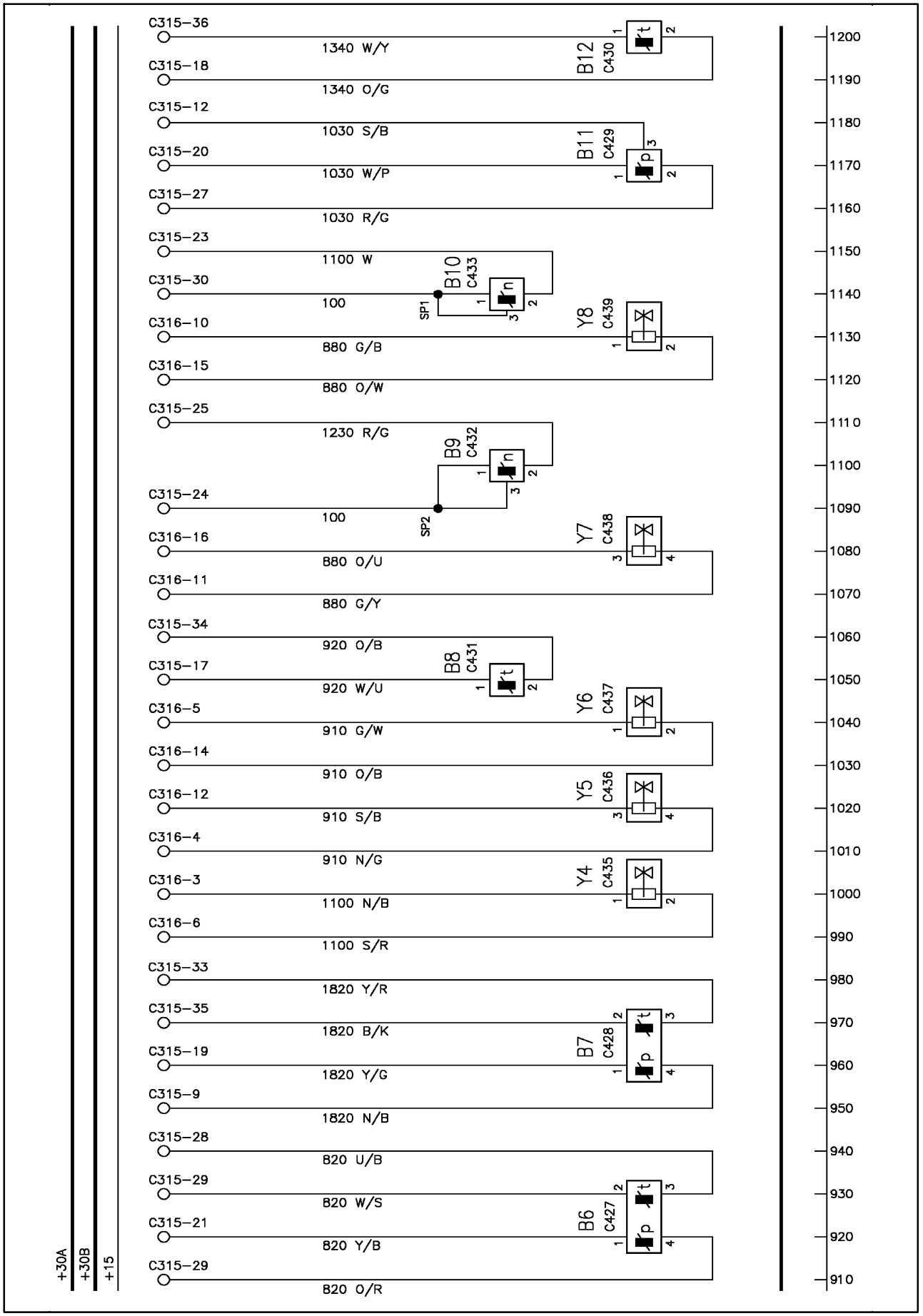
   A. Disconnect connector **C315**. Check between connectors:

   C430 pin **1 (O/G)** and **C315** pin **18 (O/G)**

   C430 pin **2 (W/Y)** and **C315** pin **36 (W/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
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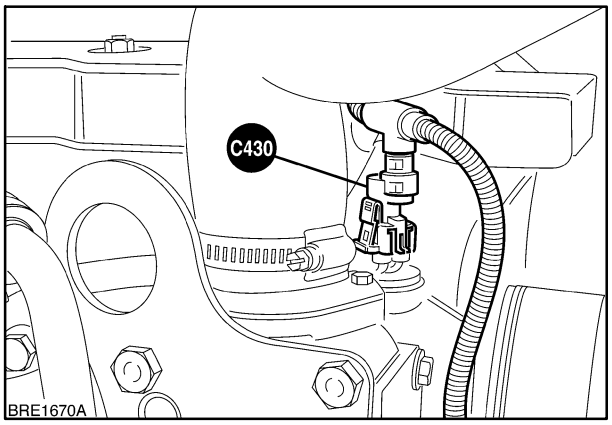
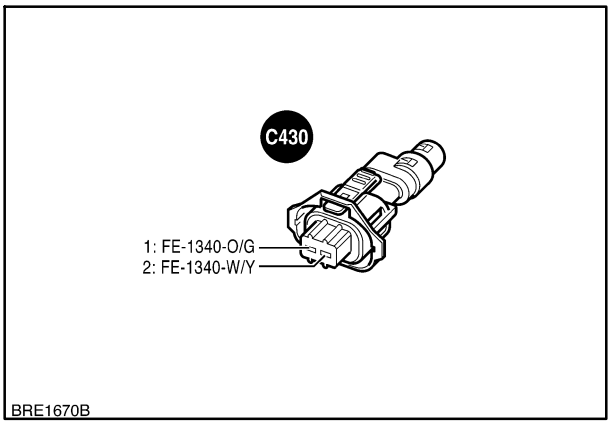
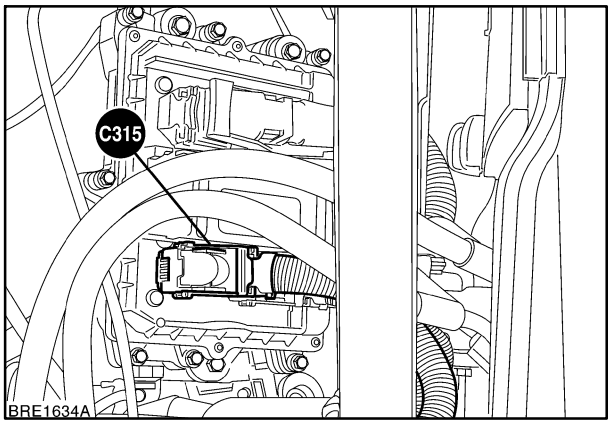
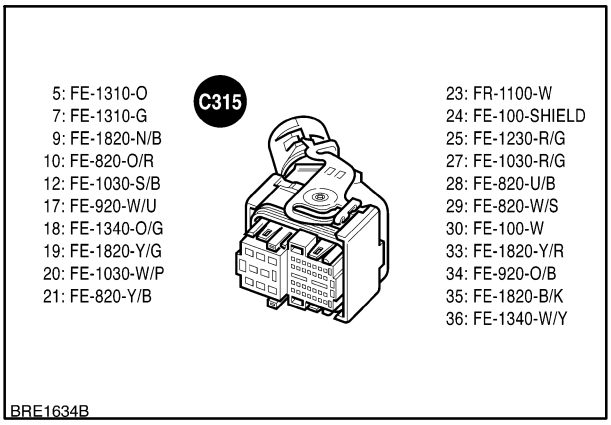

C430
BRE1670A


C430
1: FE-1340-O/G
2: FE-1340-W/Y
BRE1670B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3010 - BOOST TEMPERATURE SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty boost temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the boost temperature sensor connector **C427** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Disconnect connector **C427**. Turn the keystart ON. Measure the voltage between **C427** pin **3 (O/R)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 4.

4. Check for short to +Ve voltage.

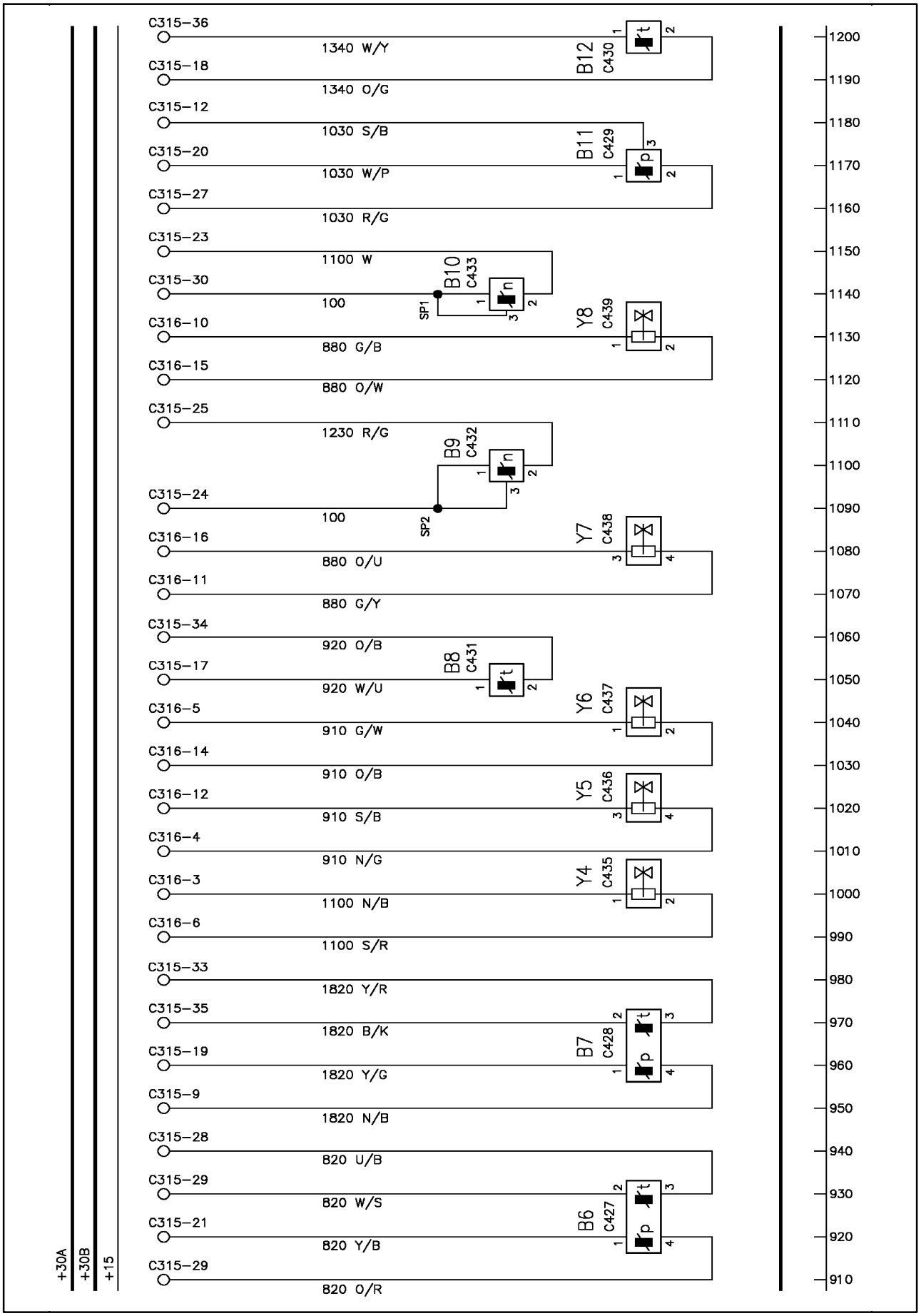
   A. Turn the keystart ON. Check between connectors:

   C427 pin **2 (W/S)** and **ground**

   C427 pin **1 (Y/B)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
1200
1190
1180
1170
1160
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1130
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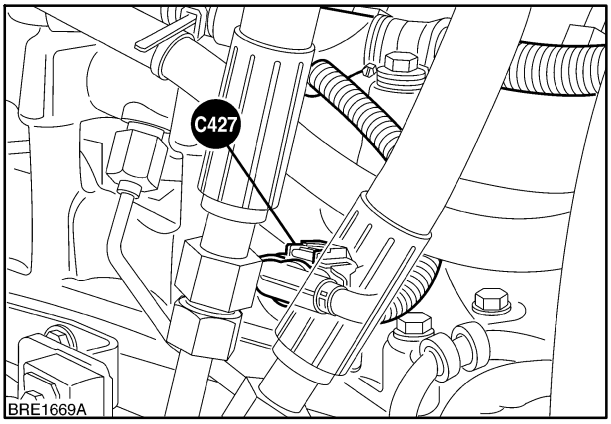
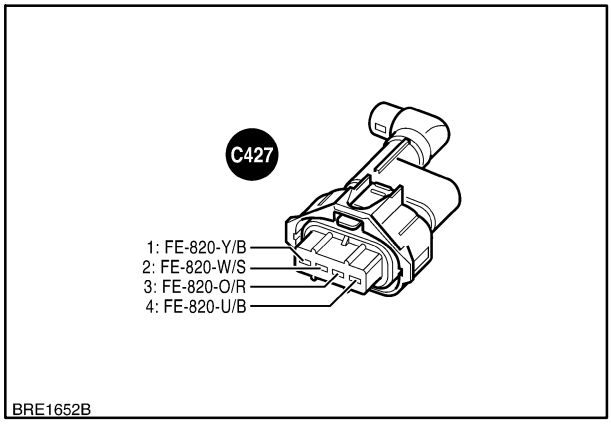
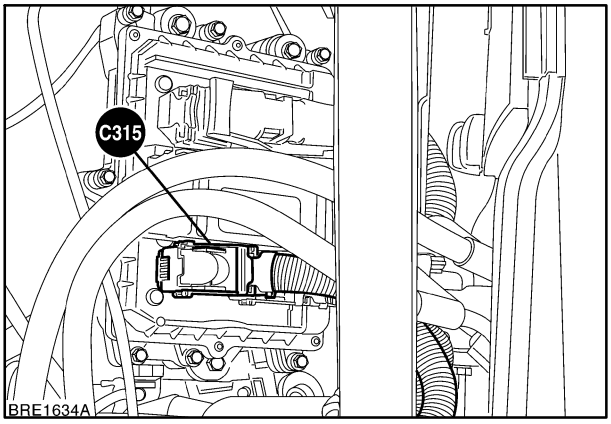
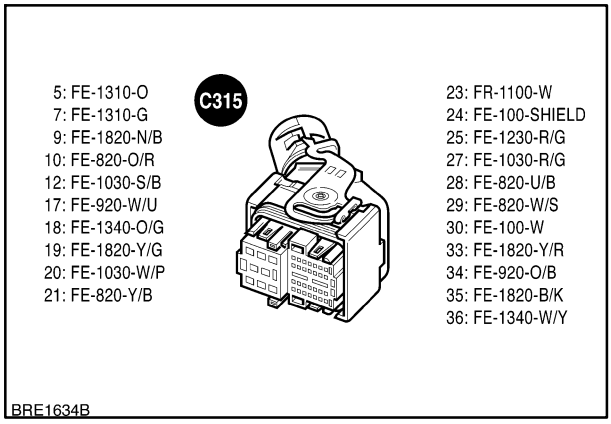

C427
BRE1669A


C427
1: FE-820-Y/B
2: FE-820-W/S
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3011 - BOOST TEMPERATURE SENSOR LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty boost temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the boost temperature sensor connector **C427** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the boost temperature sensor for a short to ground.

   A. Disconnect connector **C427**. Check between the component side of the connector:

   C427 pins **1** and **ground**

   C427 pins **2** and **ground**

   C427 pins **3** and **ground**

   If a short to ground is indicated, remove and replace the boost temperature sensor.

   B. If the boost temperature sensor is okay, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connectors:

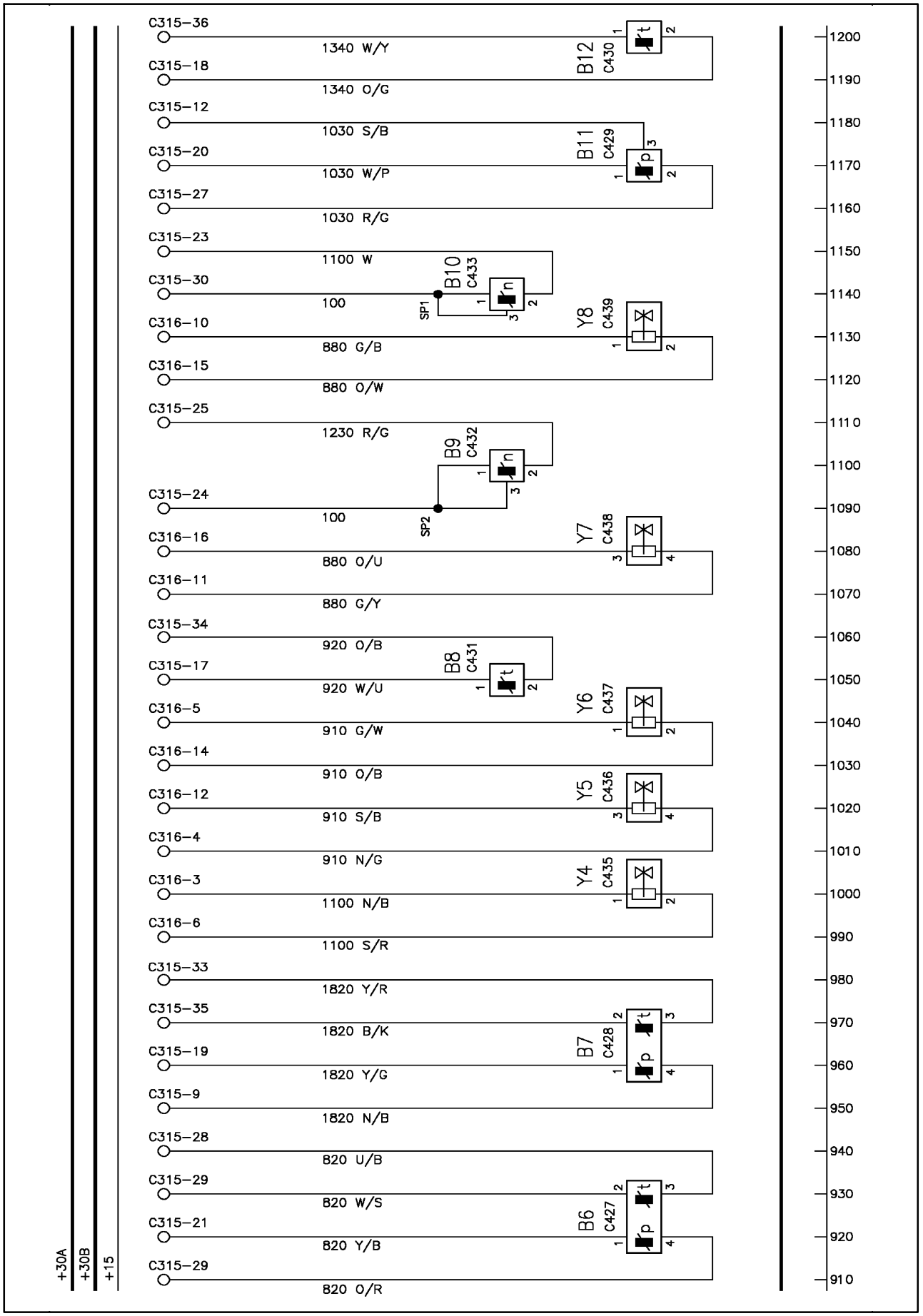
   C427 pin **1 (Y/B)** and **ground**

   C427 pin **2 (W/S)** and **ground**

   C427 pin **3 (O/R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
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C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
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1190
1180
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1120
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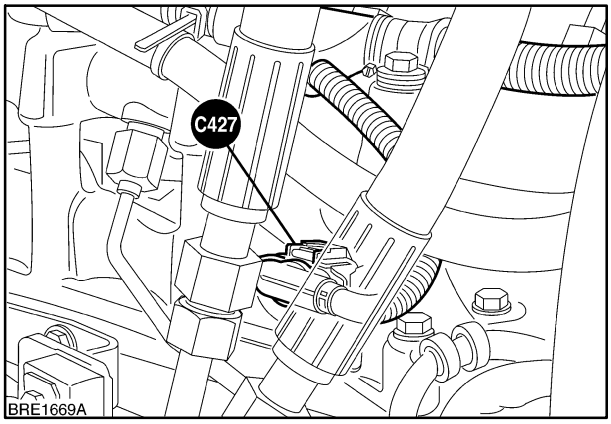
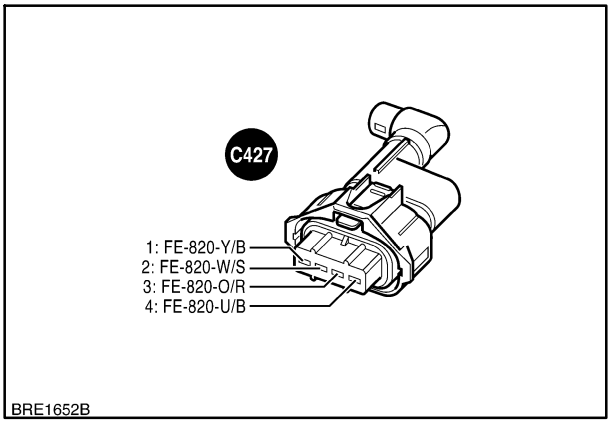

C427
BRE1669A


C427
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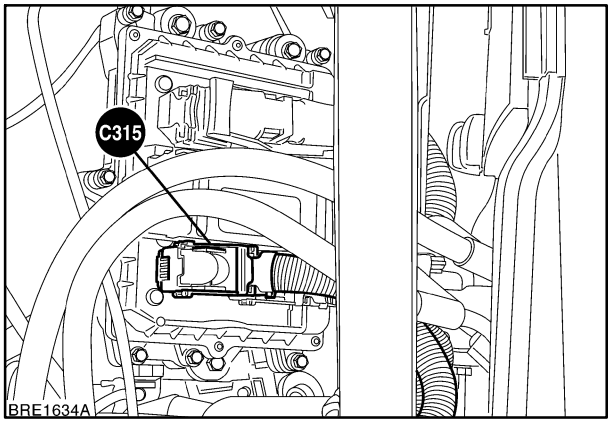
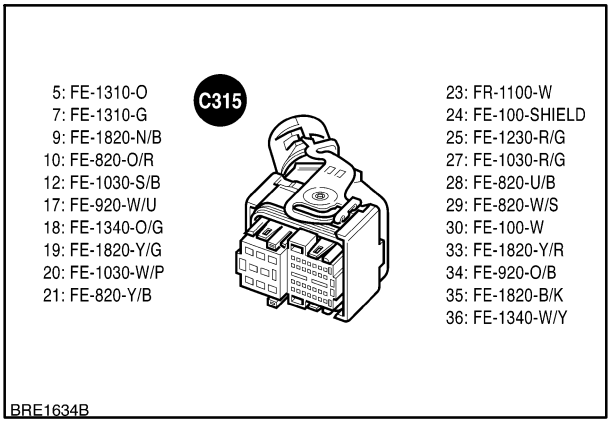
2: FE-820-W/S
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3012 - BOOST TEMPERATURE SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty boost temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the boost temperature sensor connector **C427** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the boost temperature sensor for a short to ground.

   A. Disconnect connector **C427**. Check between the component side of the connector:

   C427 pin **1** and **2**. If the resistance indicated is not approximatley 2.5K Ohms at 20 degrees centigrade, remove and replace the boost temperature sensor.

   B. If the boost temperature sensor is okay, continue to step 4.

4. Check for an open circuit.

   A. Check between connectors:

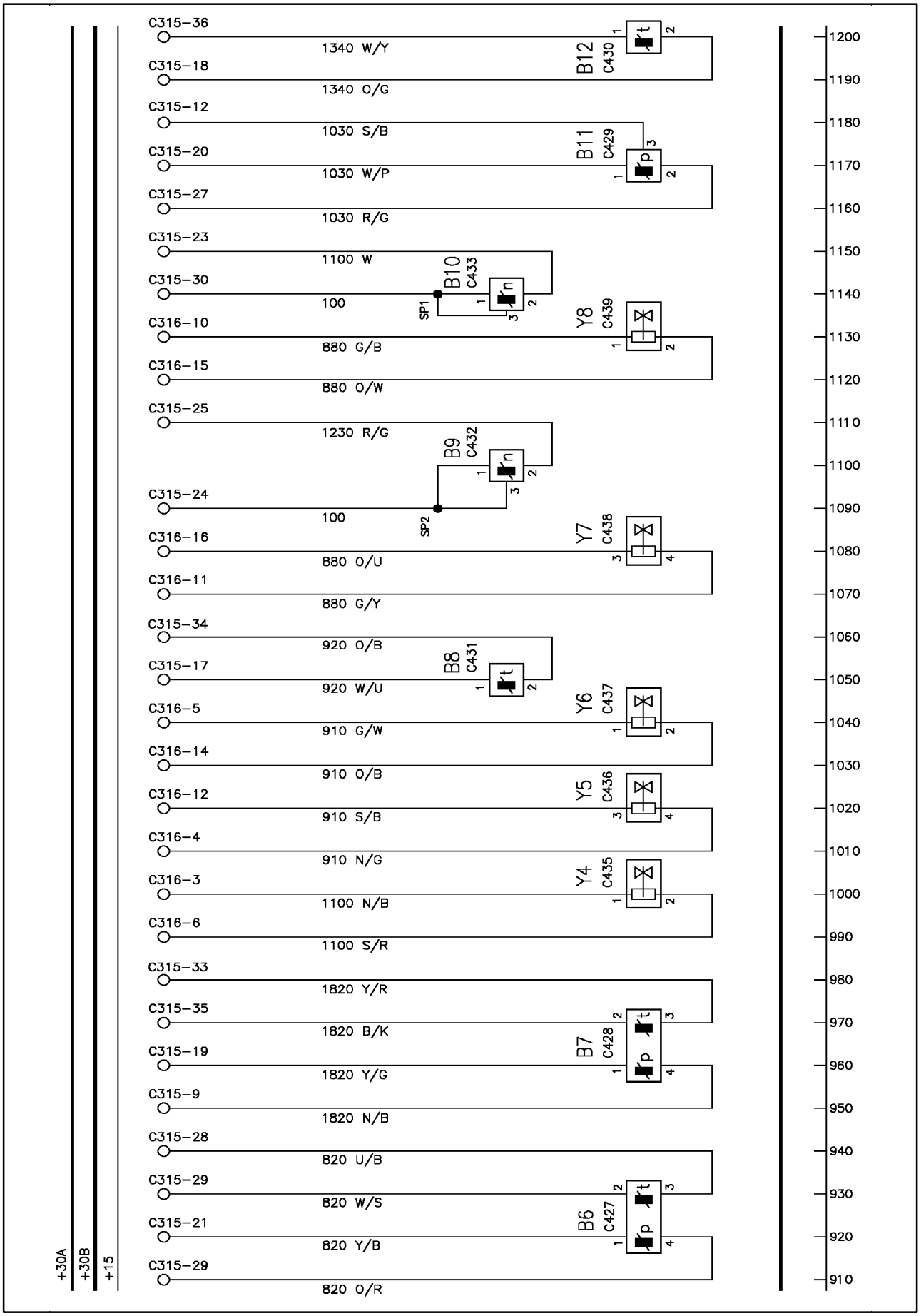
   C427 pin **1 (Y/B)** and **C315** pin **21 (Y/B)**

   C427 pin **2 (W/S)** and **C315** pin **29 (W/S)**

   C427 pin **3 (O/R)** and **C315** pin **10 (O/R)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
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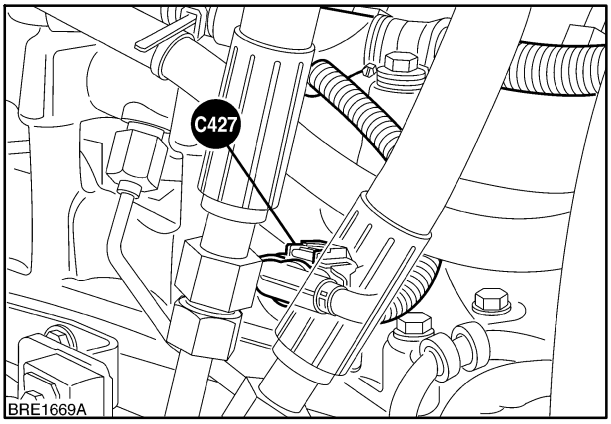
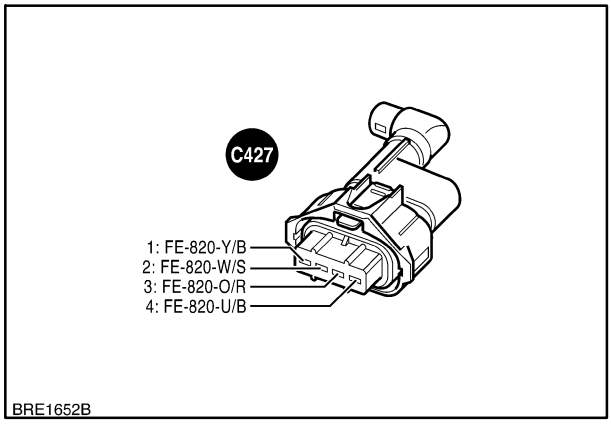
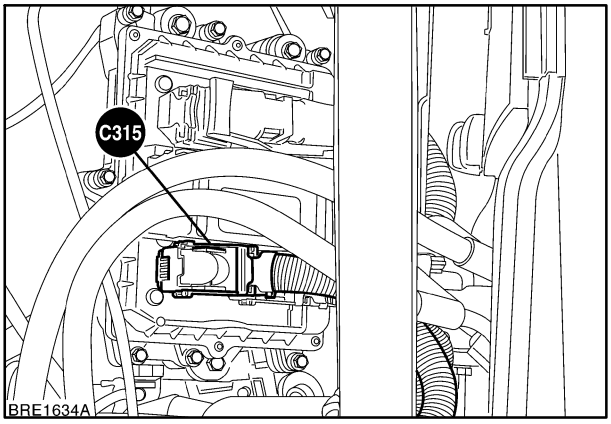
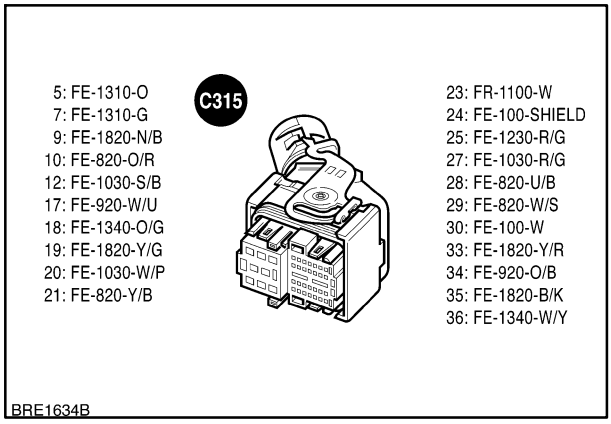

C427
BRE1669A


C427
1: FE-820-Y/B
2: FE-820-W/S
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3014 - FUEL TEMPERATURE SENSOR HIGH VALUE

Possible failure modes:

1. Faulty connector
2. Faulty fuel temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions and check that the fuel pressure is correct.

   A. If a fault with the fuel system is indicated, repair as necessary.

   B. If a fault with the fuel system is not indicated, continue to step 3.
3. Check the fuel temperature sensor connector **C431** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

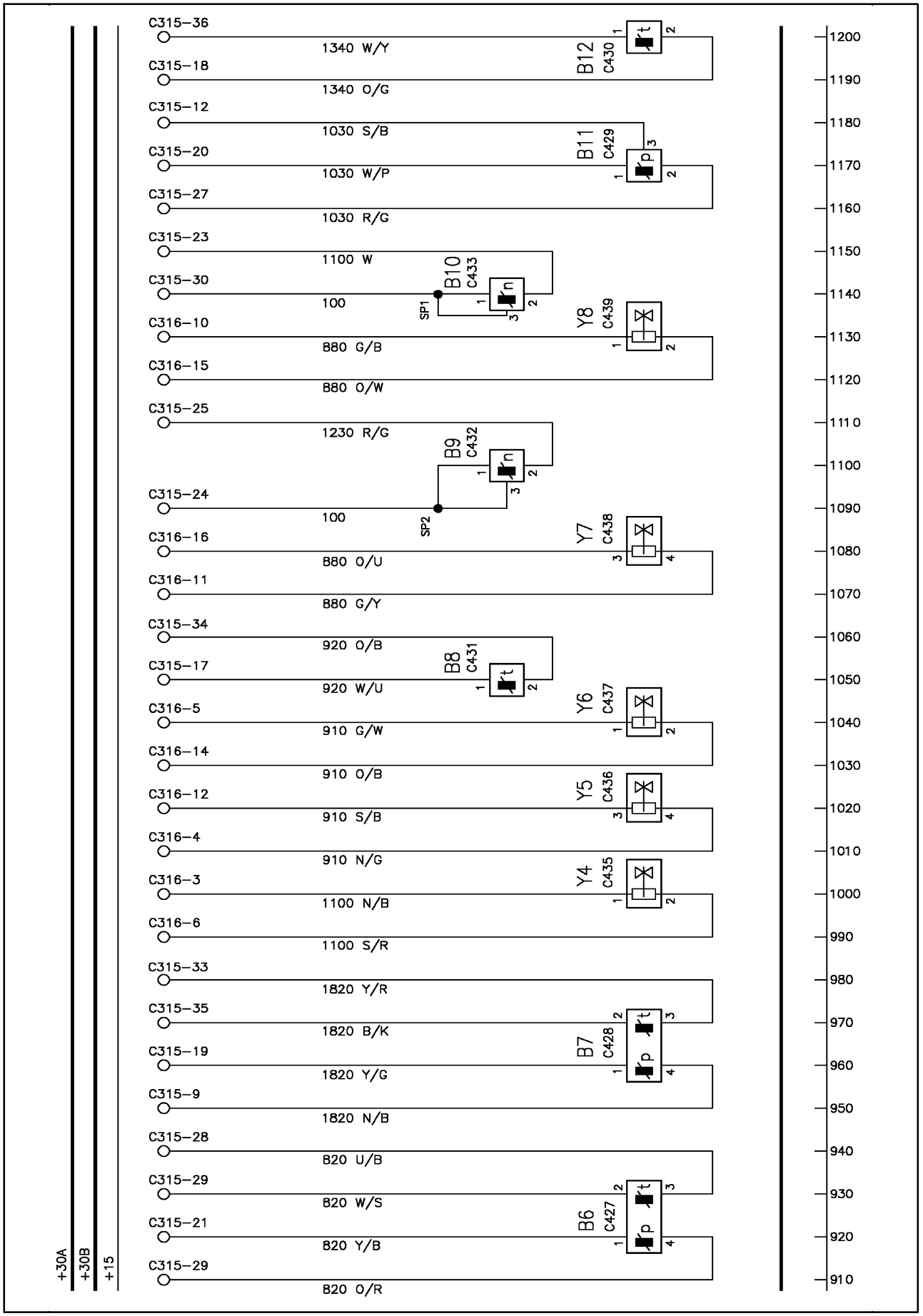
   B. If the connectors are okay, continue to step 4.
4. Check the fuel temperature sensor.

   A. Disconnect connector **C431**. Measure the resistance between the component side of the connector **C431** pins **1** and **2**. If the resistance is not approximatley 2.5K Ohms at 20 degress centigrade, remove and replace the fuel temperature sensor.

   B. If the fuel temp sensor is okay, continue to step 5.
5. Check for other error codes displayed.

   A. If other error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6
C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
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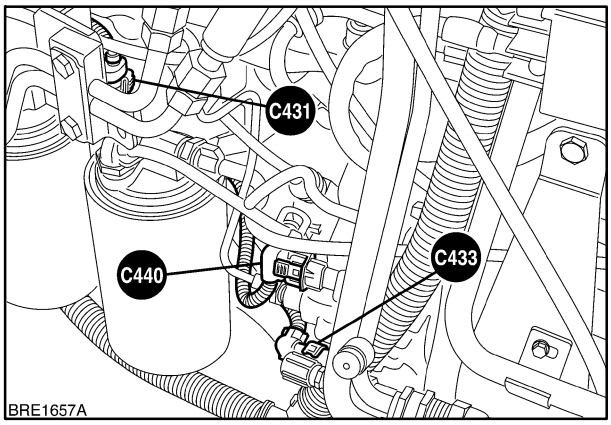
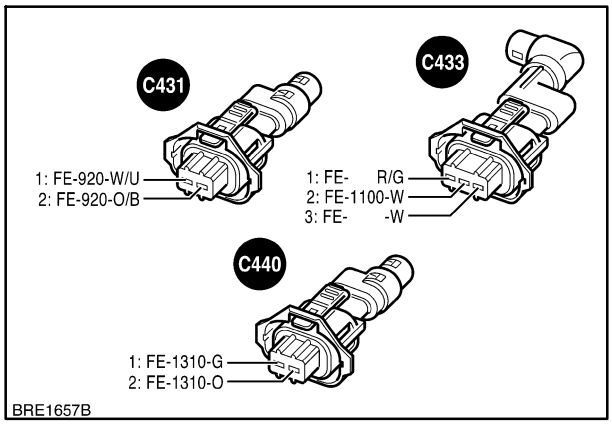
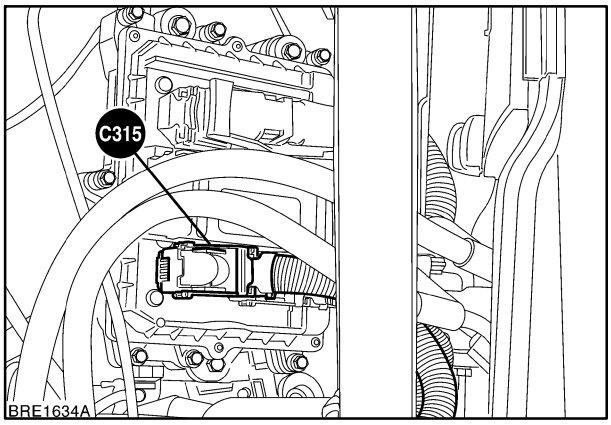
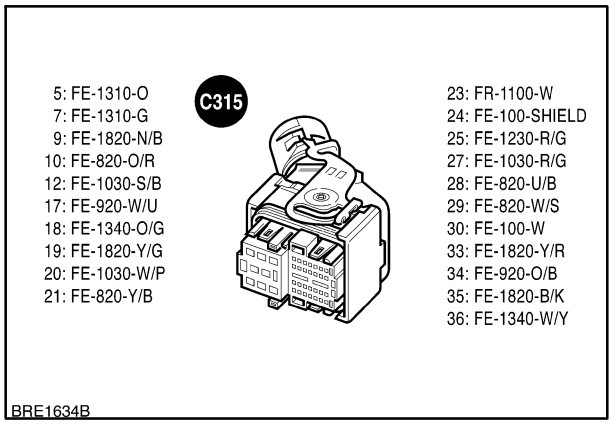

C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A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12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3015 - FUEL TEMPERATURE SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty fuel temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel temperature sensor connector **C431** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for short to +Ve.

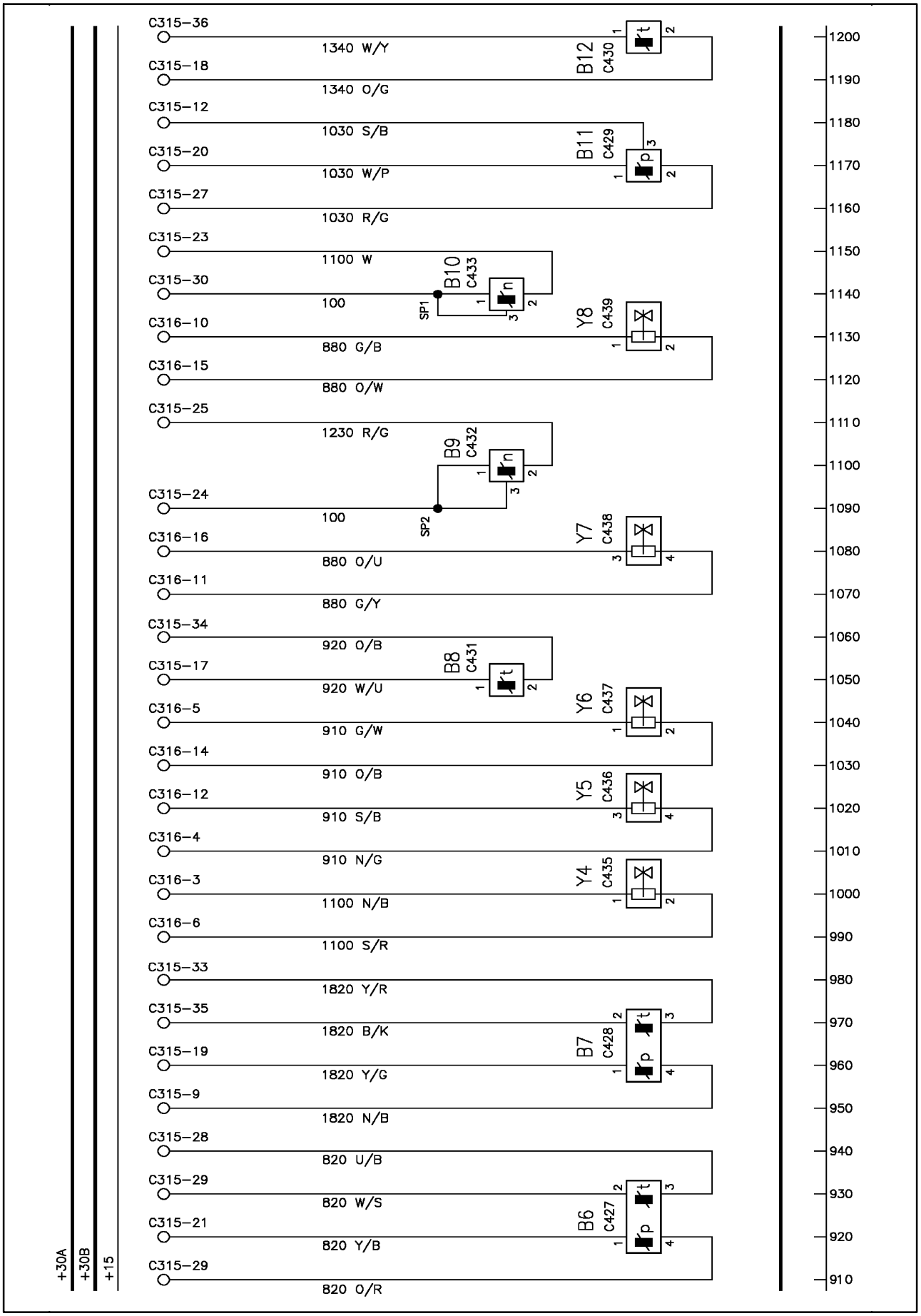
   A. Disconnect connector **C431**. Turn the keystart ON. Measure the voltage between:

   C431 pins **1 (W/U)** and **ground**

   C431 pins **2 (O/B)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
1190
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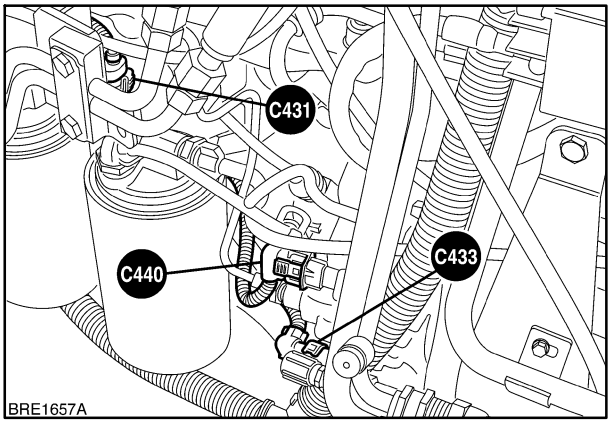
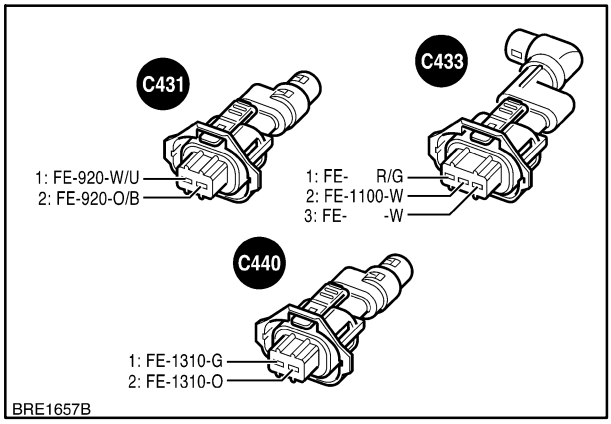

C431
C440
C433
BRE1657A


C431
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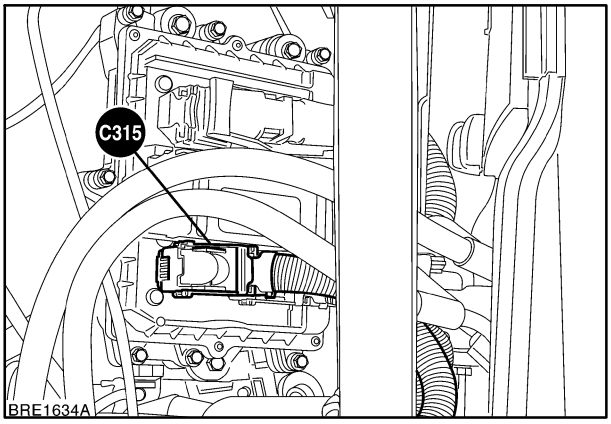
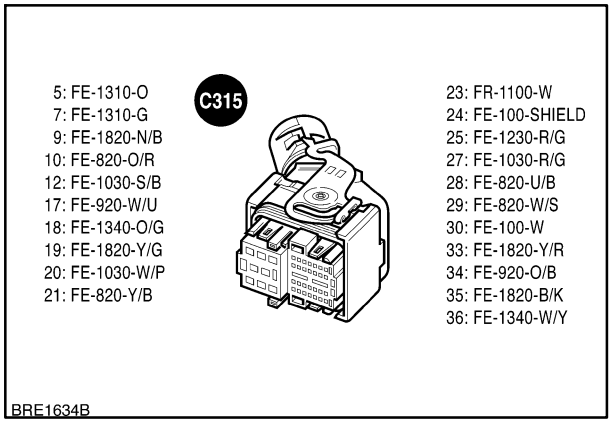
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A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7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3016 - FUEL TEMPERATURE SENSOR SIGNAL LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty fuel temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel temperature sensor connector **C431** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the fuel temperature sensor for short to ground.

   A. Disconnect connector **C431**. Check between the component side of the connector:

   C431 pins **1** and **ground**

   C431 pins **2** and **ground**

   If a short to ground is indicated, remove and replace the fuel temperature sensor.

   B. If the fuel temperature sensor is okay, continue to step 4.

4. Check for a short to ground.

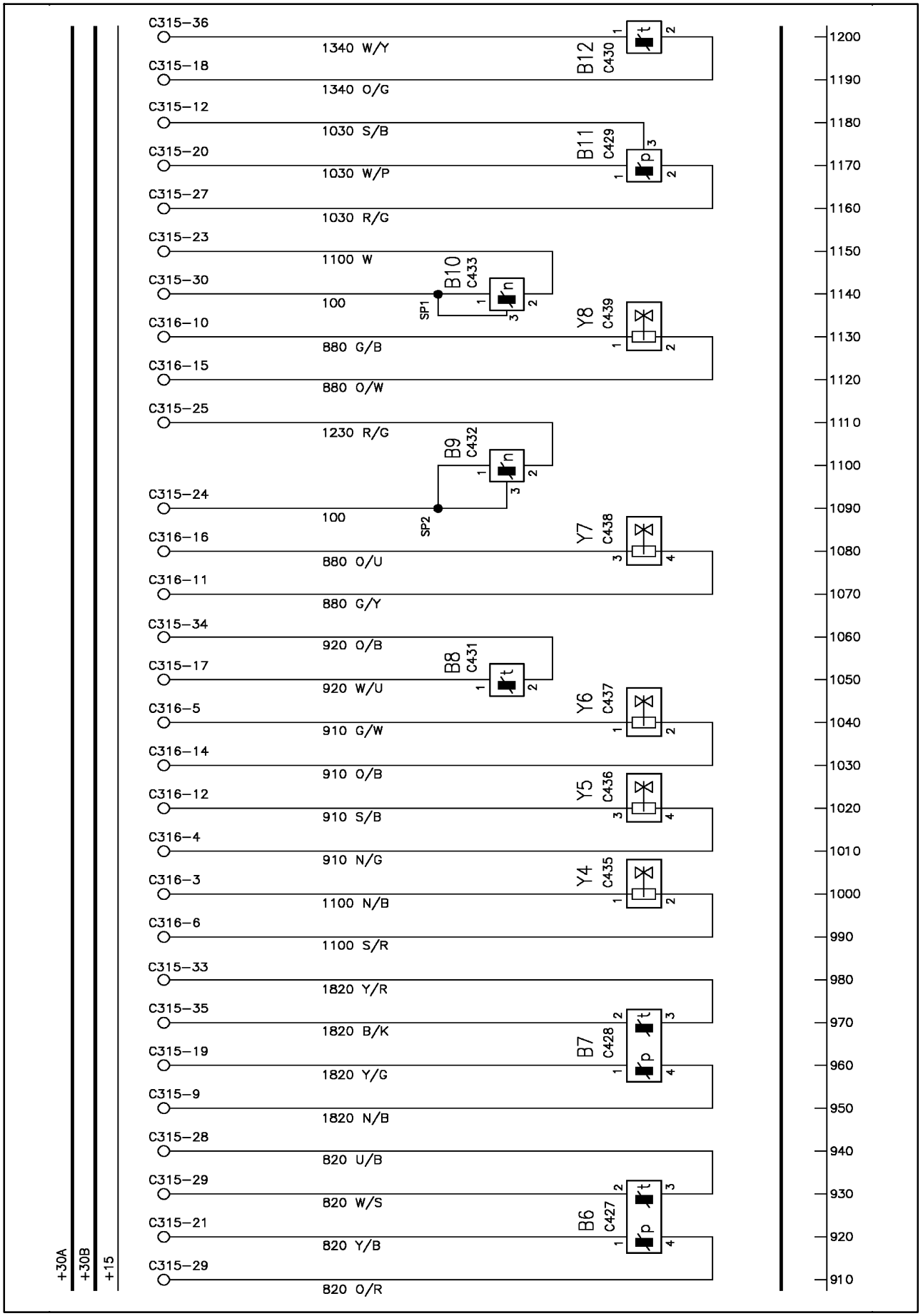
   A. Disconnect connector **C315**. Check between connectors:

   C431 pin **1 (W/U)** and **ground**

   C431 pin **2 (O/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occures, remove and replace the engine controller.


+30A
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C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
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1170
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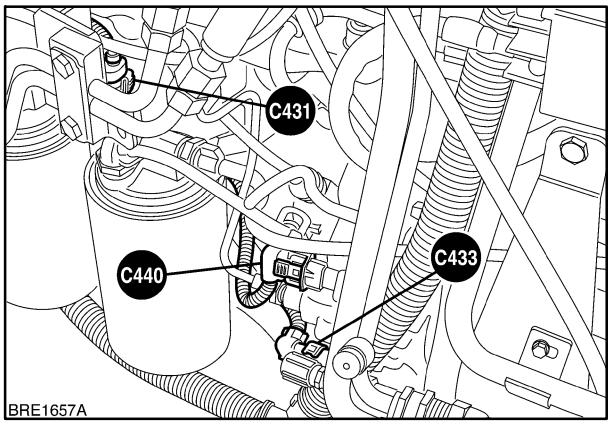
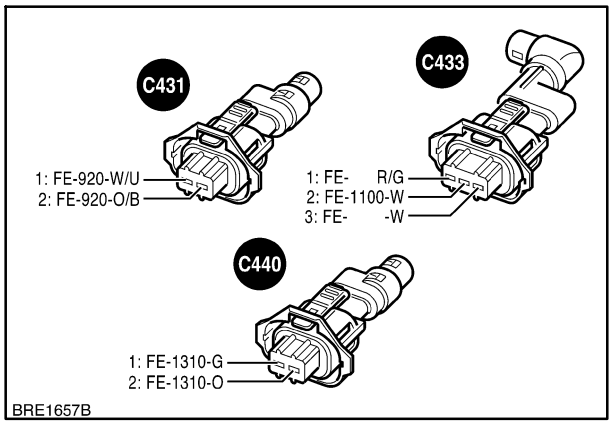

C431
C440
C433
BRE1657A


C431
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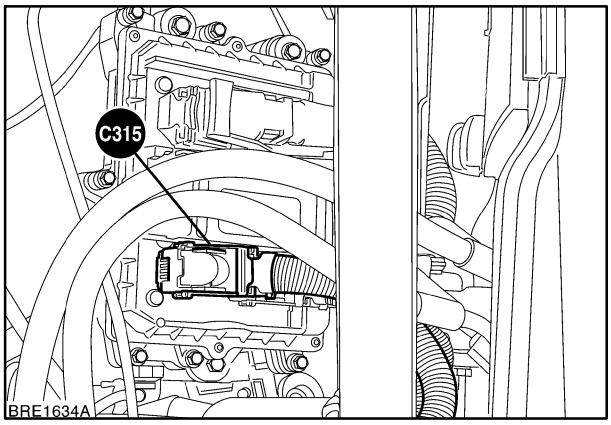
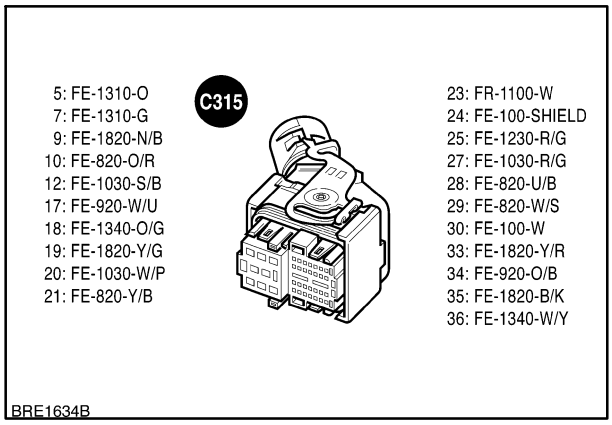
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3017 - FUEL TEMPERATURE SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty fuel temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel temperature sensor connector **C431** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the fuel temperature sensor for open circuit.

   A. Disconnect connector **C431**. Measure the resistance between the component side of the connector **C431** pins **1** and **2**. If the resistance is not approximately 2.5K Ohms at 20 degress centigrade, remove and replace the fuel temperature sensor.

   B. If the fuel temperature sensor is okay, continue to step 4.

4. Check for an open circuit.

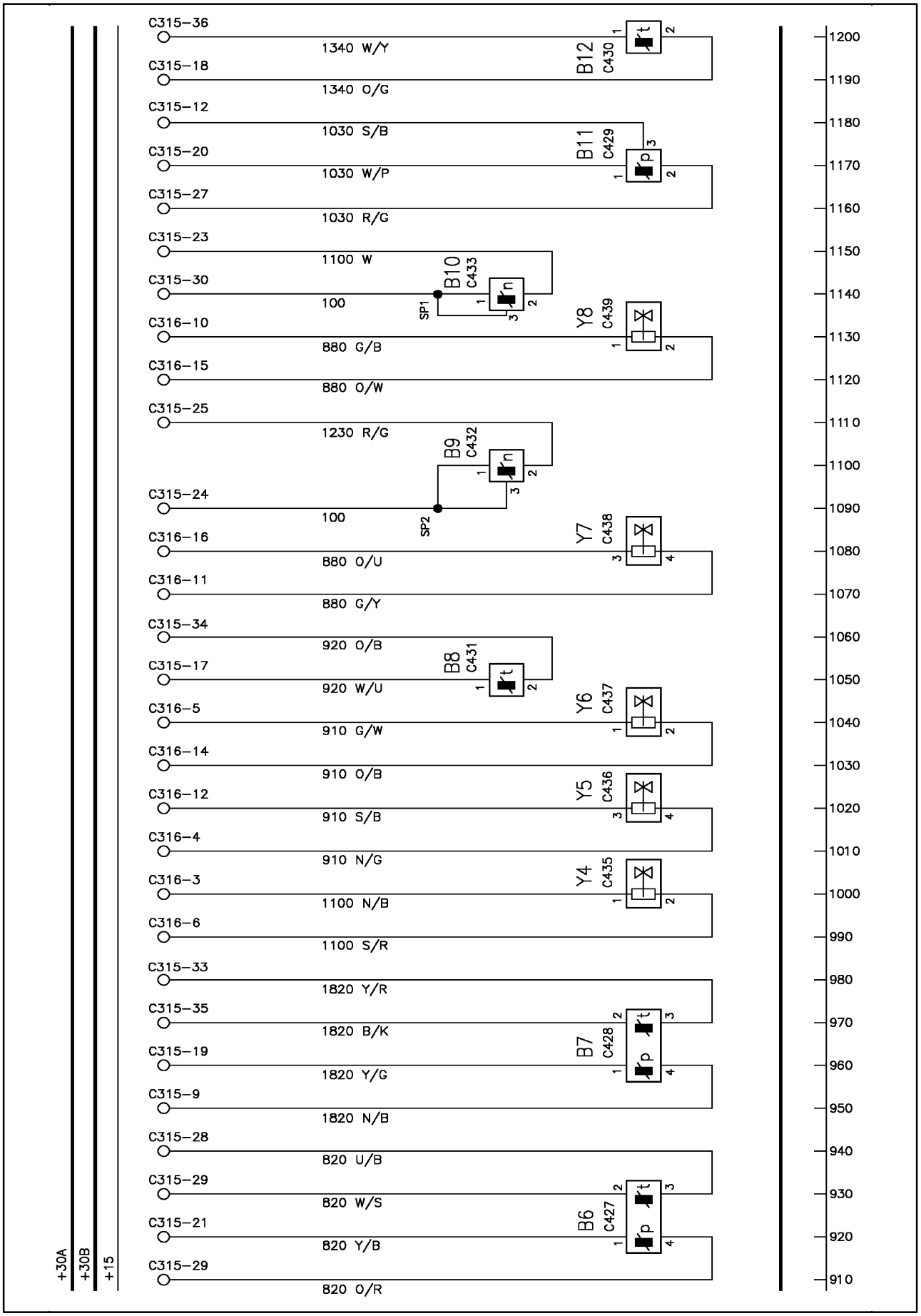
   A. Disconnect connector **C315**. Check between connectors:

   C431 pin **1 (W/U)** and **C315** pin **17 (W/U)**

   C431 pin **2 (O/B)** and **C315** pin **34 (O/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-18
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
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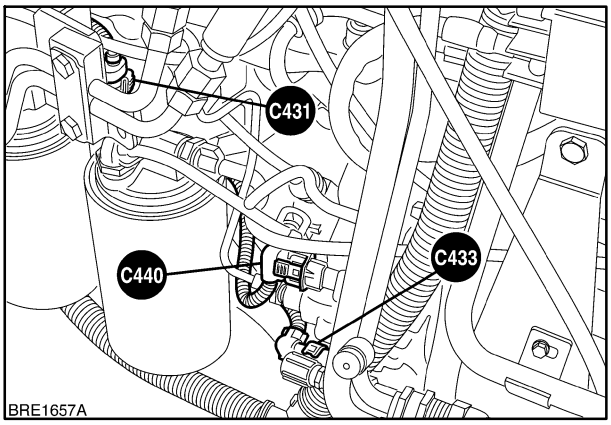
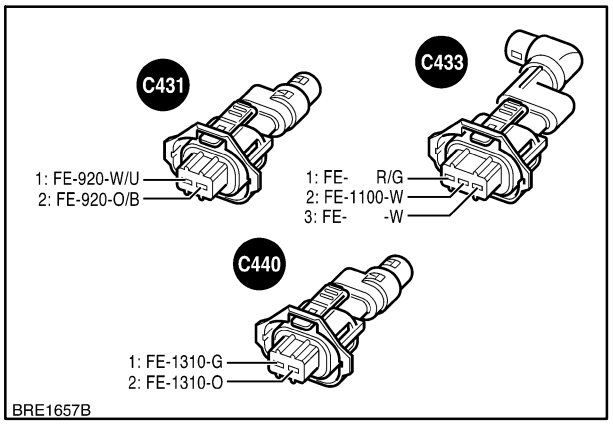
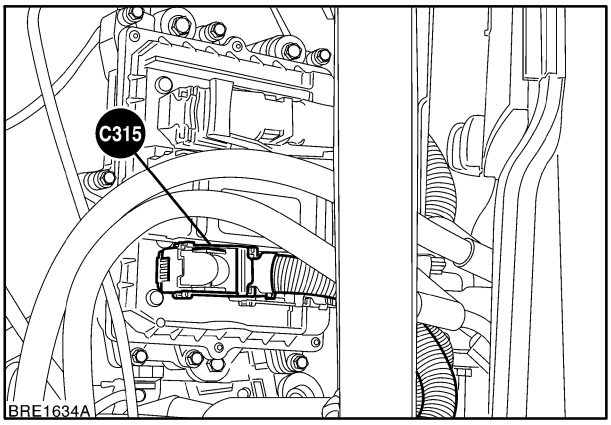
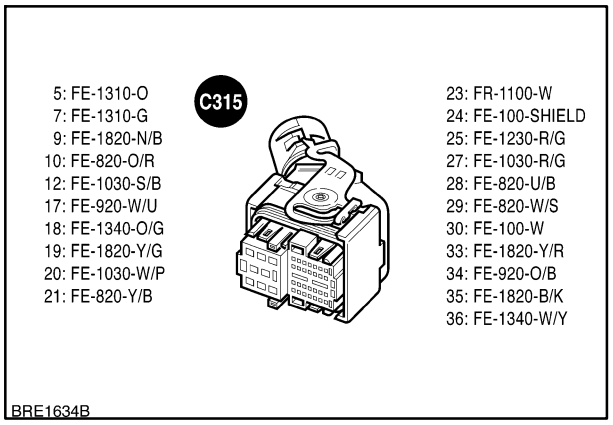

C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A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7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3018 - BOOST PRESSURE SENSOR HIGH VALUE

Possible failure modes:

1. Faulty connector
2. Faulty boost pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that engine boosting system mechanical operation is okay. Run the tractor under normal conditions.

   A. If a fault with the engine boosting system is indicated, repair as necessary.

   B. If a fault with the engine boosting system is not indicated, continue to step 3.
3. Check the boost pressure sensor connector **C427** and the engine controller connector **C315**.

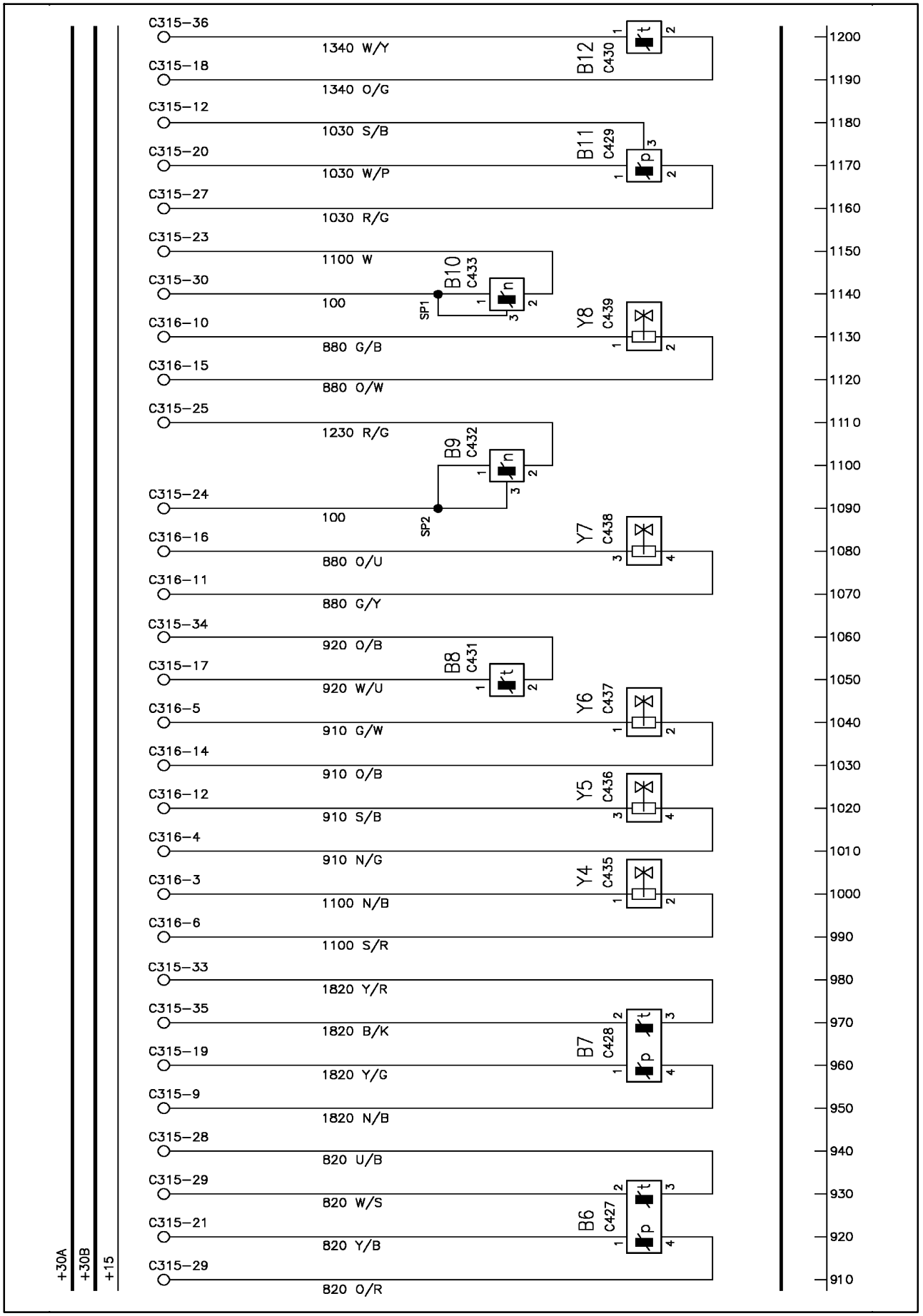
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
4. Check the 5 volt supply.

   A. Disconnect connector **C427**. Turn the keystart ON. Measure the voltage between **C427** pin **3 (O/R)** and **ground**. The voltage indicated should be approximately +5 volts, if the voltage is too high or too low, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, remove and replace the boost pressure sensor.

   If the fault is still present, download the correct level of software. If fault re-occurs, remove and replace the engine controller.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+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
1190
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1170
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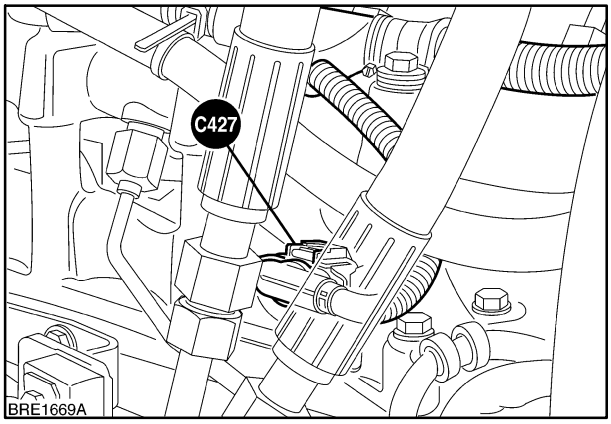
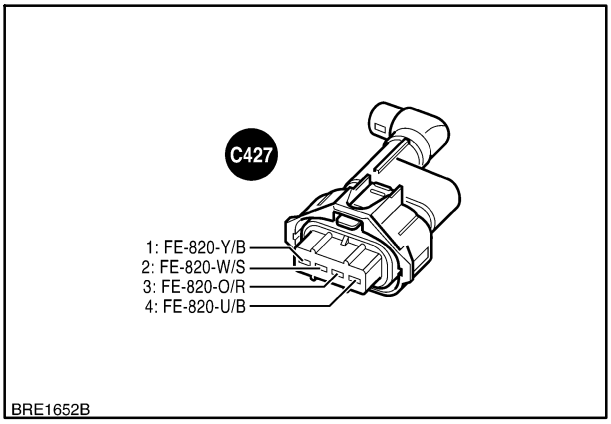

C427
BRE1669A


C427
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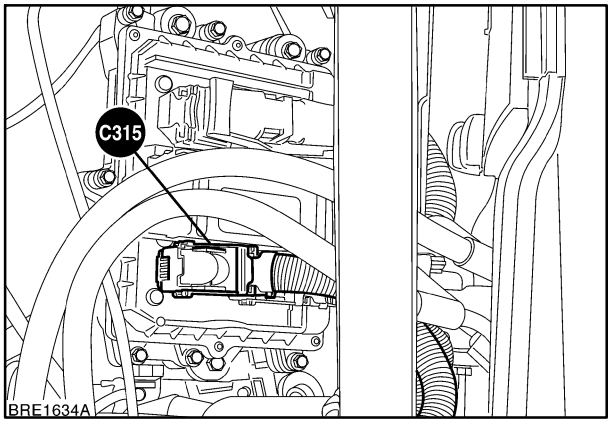
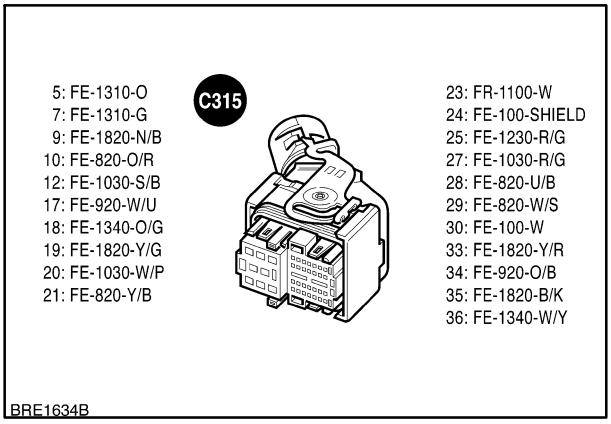
2: FE-820-W/S
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C315
BRE1634A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10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3019 – BOOST PRESSURE SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty boost pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the boost pressure sensor connector **C427** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to +8 or +12 Volts.

   A. Disconnect connector **C427**. Turn the keystart ON. Measure the voltage between **C427** pin **3 (O/R)** and **ground**.

   If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 3.

3. Check for a short to +Ve voltage.

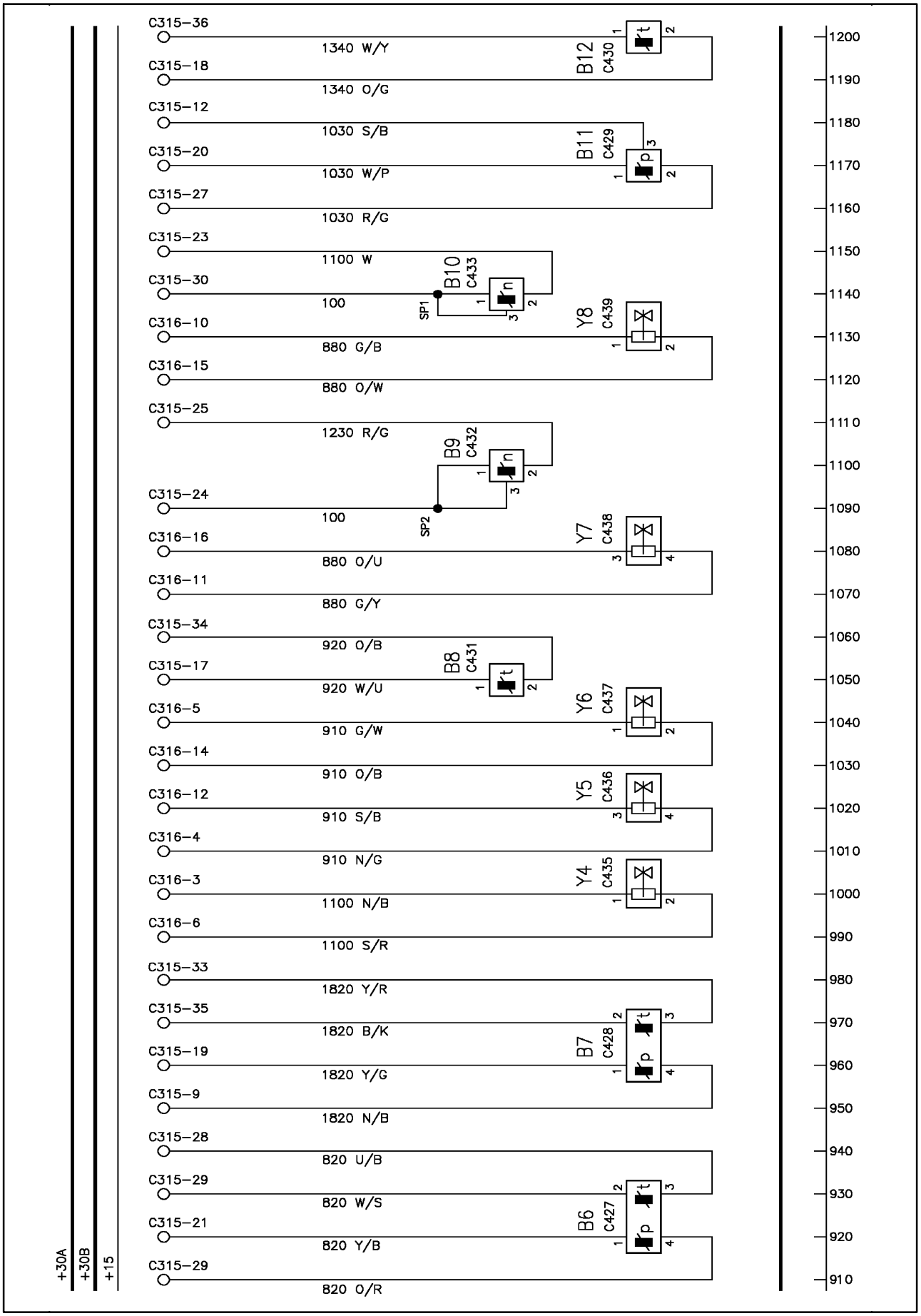
   A. Turn the keystart ON. Measure th voltage between connectors:

   C427 pin **1 (Y/B)** and **ground**

   C427 pin **4 (U/B)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-18
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C430
C315-12
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C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
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1230 R/G
B9
C432
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SP2
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Y7
C438
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C437
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C435
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1820 Y/G
B7
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C315-28
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C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
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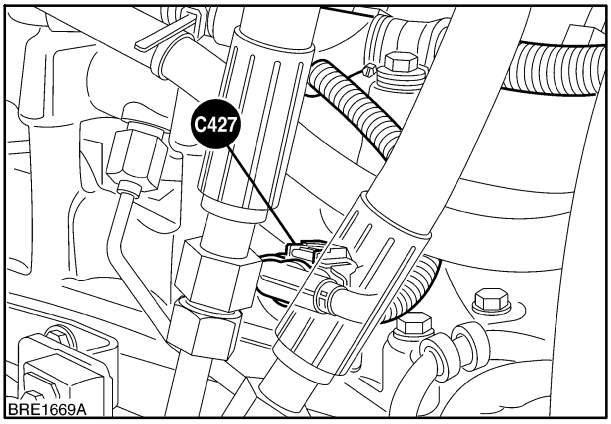
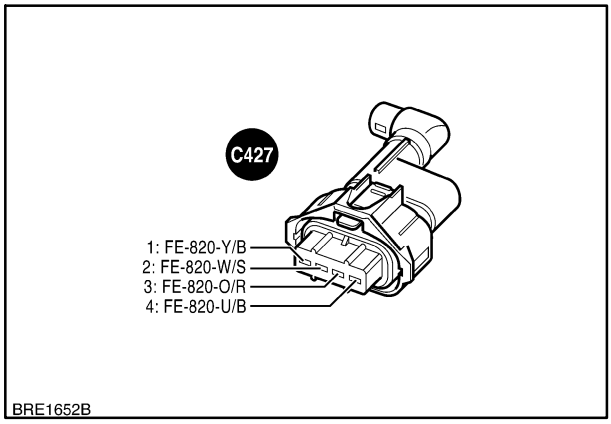

C427
BRE1669A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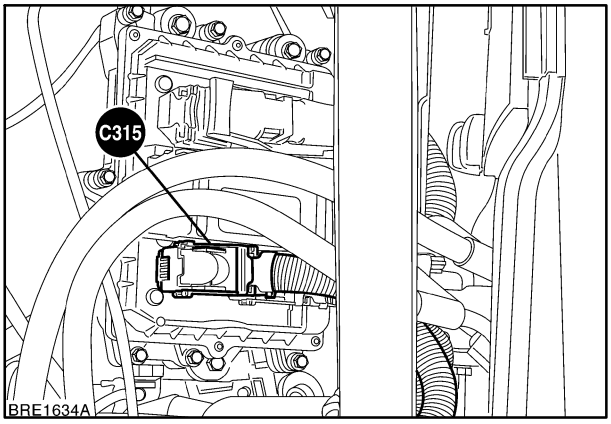
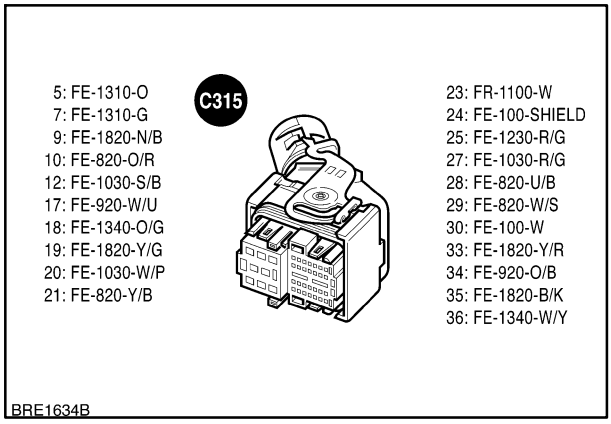
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C315
BRE1634A


C315
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18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3020 - BOOST PRESSURE SENSOR LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty boost pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the boost pressure sensor connector **C427** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the boost pressure sensor for a short to ground.

   A. Disconnect connector **C427**. Check between the component side of the connector:

   C427 pins **1** and **ground**

   C427 pins **3** and **ground**

   C427 pins **4** and **ground**

   If a short to ground is indicated, remove and replace the boost pressure sensor.

   B. If the boost pressure sensor is okay, continue to step 3.

3. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

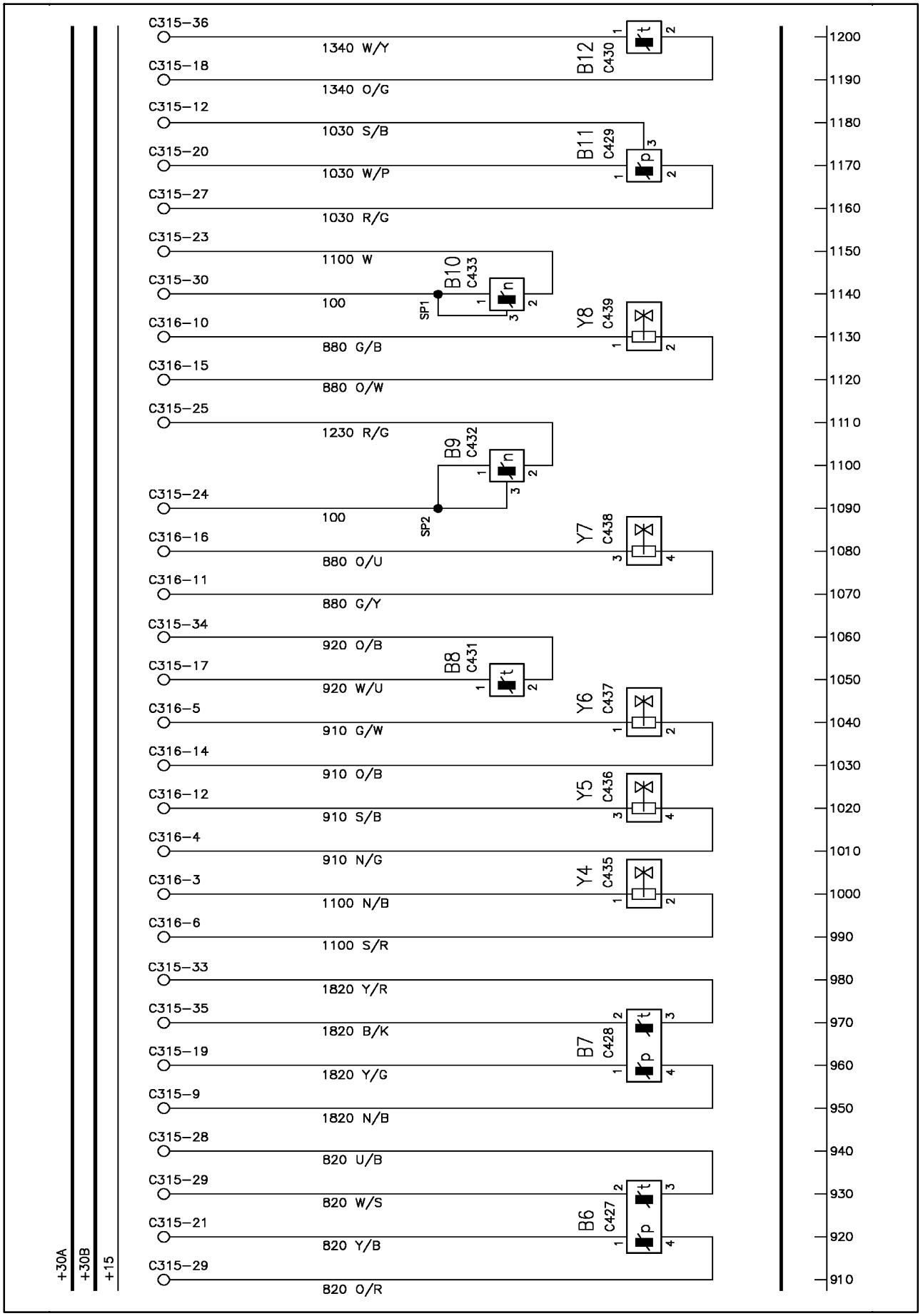
   C427 pin **1 (Y/B)** and **ground**

   C427 pin **3 (O/R)** and **ground**

   C427 pin **4 (U/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
1340 W/Y
C315-18
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B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
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C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6
C427
C315-29
820 O/R
1200
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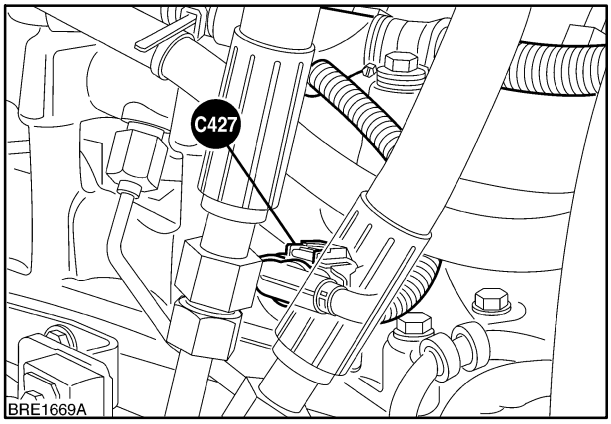
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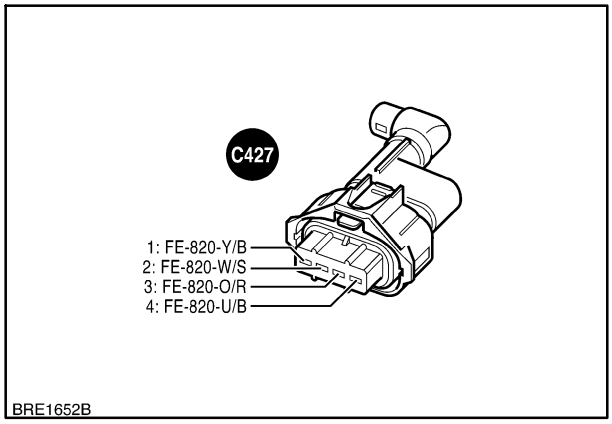
BRE1669A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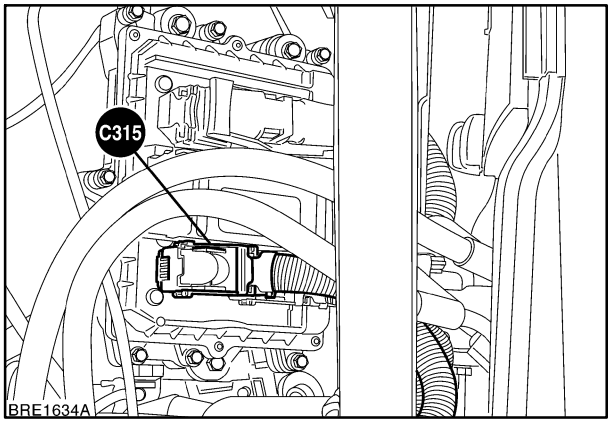
3: FE-820-O/R
4: FE-820-U/B
BRE1652B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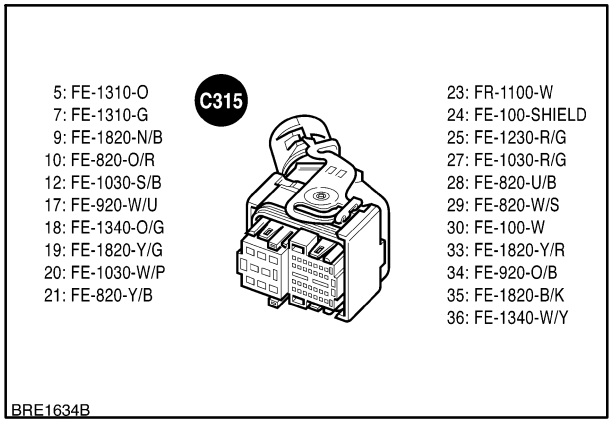
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10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3021 – BOOST PRESSURE SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty boost pressure sensor
3. Faulty harness
4. FaultY engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the boost pressure sensor connector **C427** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for an open circuit.

   A. Disconnect connector **C427** and **C315**. Check between connectors:

   C427 pin **1 (Y/B)** and **C315** pin **21 (Y/B)**

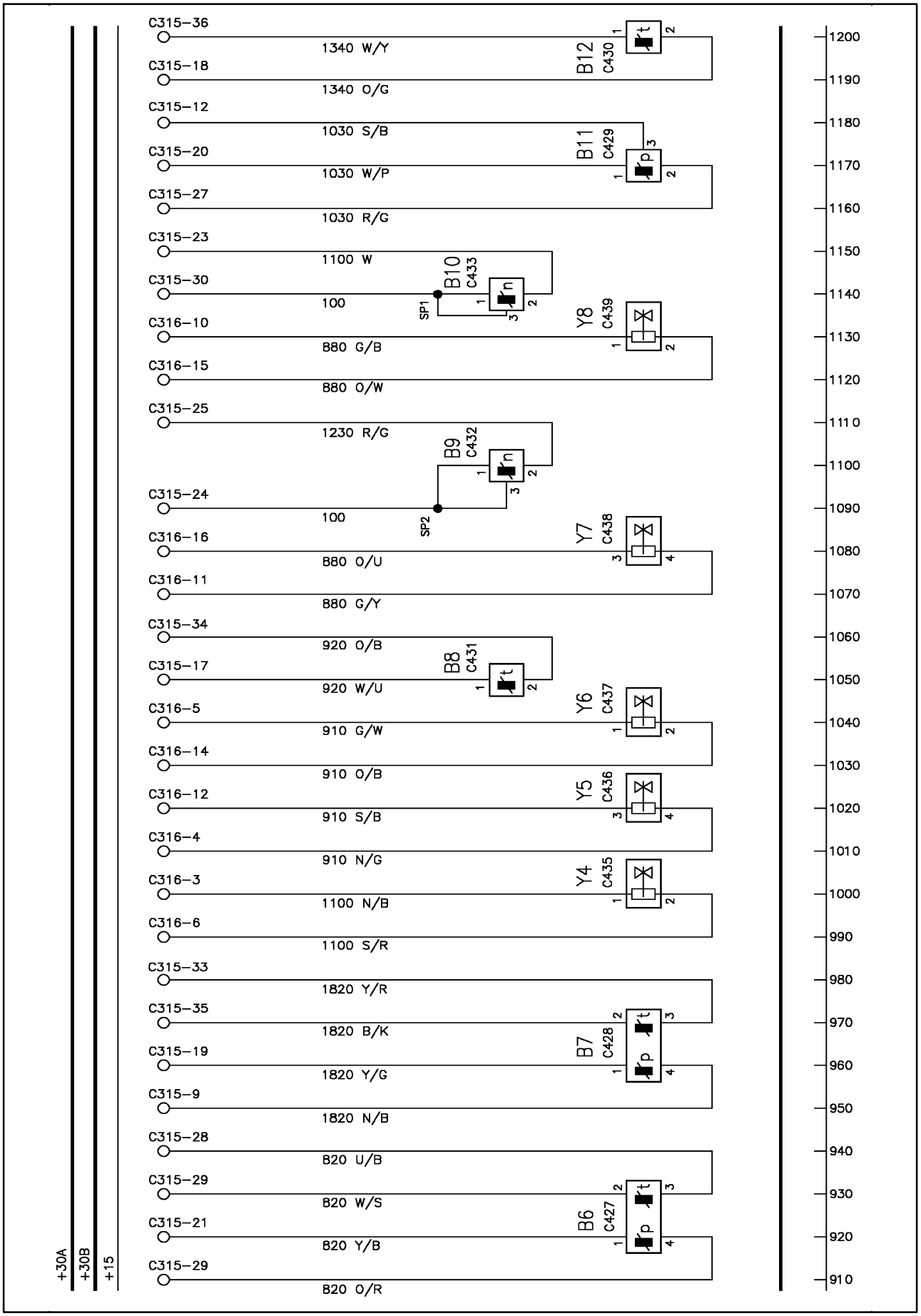
   C427 pin **2 (W/S)** and **C315** pin **29 (W/S)**

   C427 pin **3 (O/R)** and **C315** pin **10 (O/R)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the boost pressure sensor.

   If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
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C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
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SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
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1130
1120
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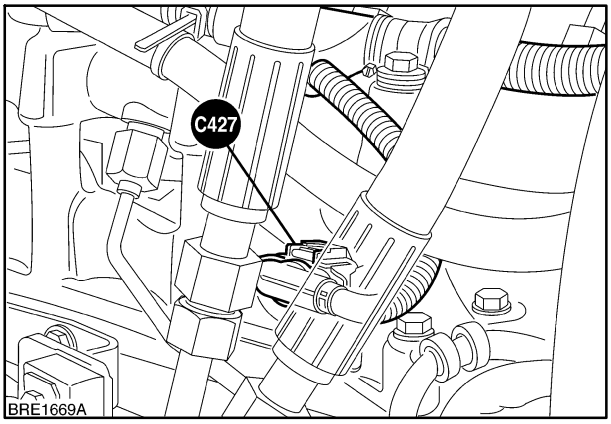
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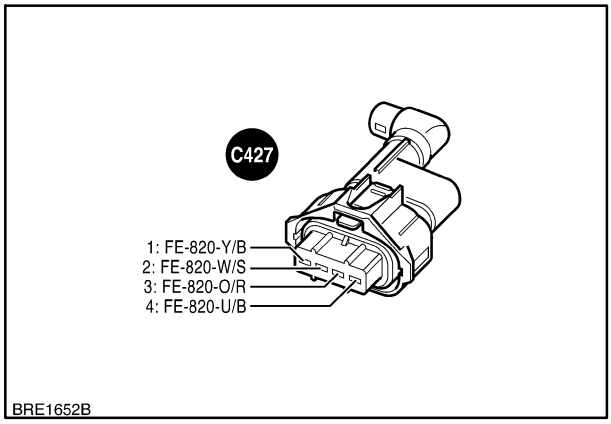
BRE1669A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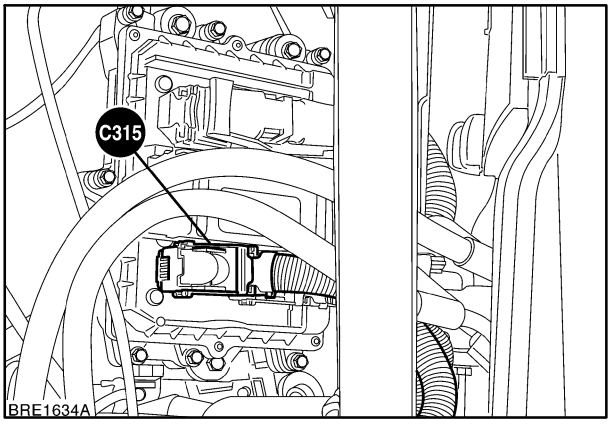
3: FE-820-O/R
4: FE-820-U/B
BRE1652B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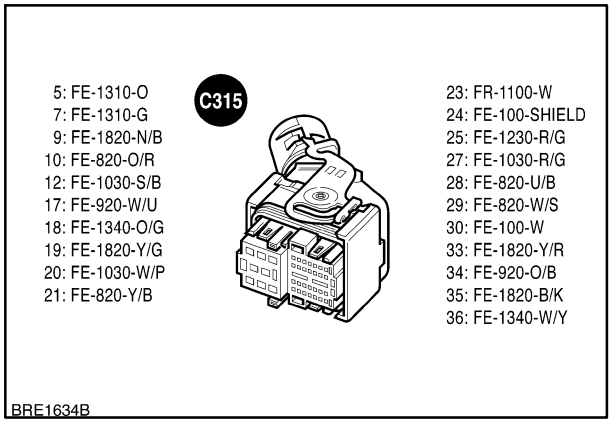
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12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3022 - BOOST PRESSURE SENSOR POWER SUPPLY SHORT TO + VE OR GROUND

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the boost pressure sensor connector **C427** and the engine controller connector **C315.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to +8 or +12 Volts.

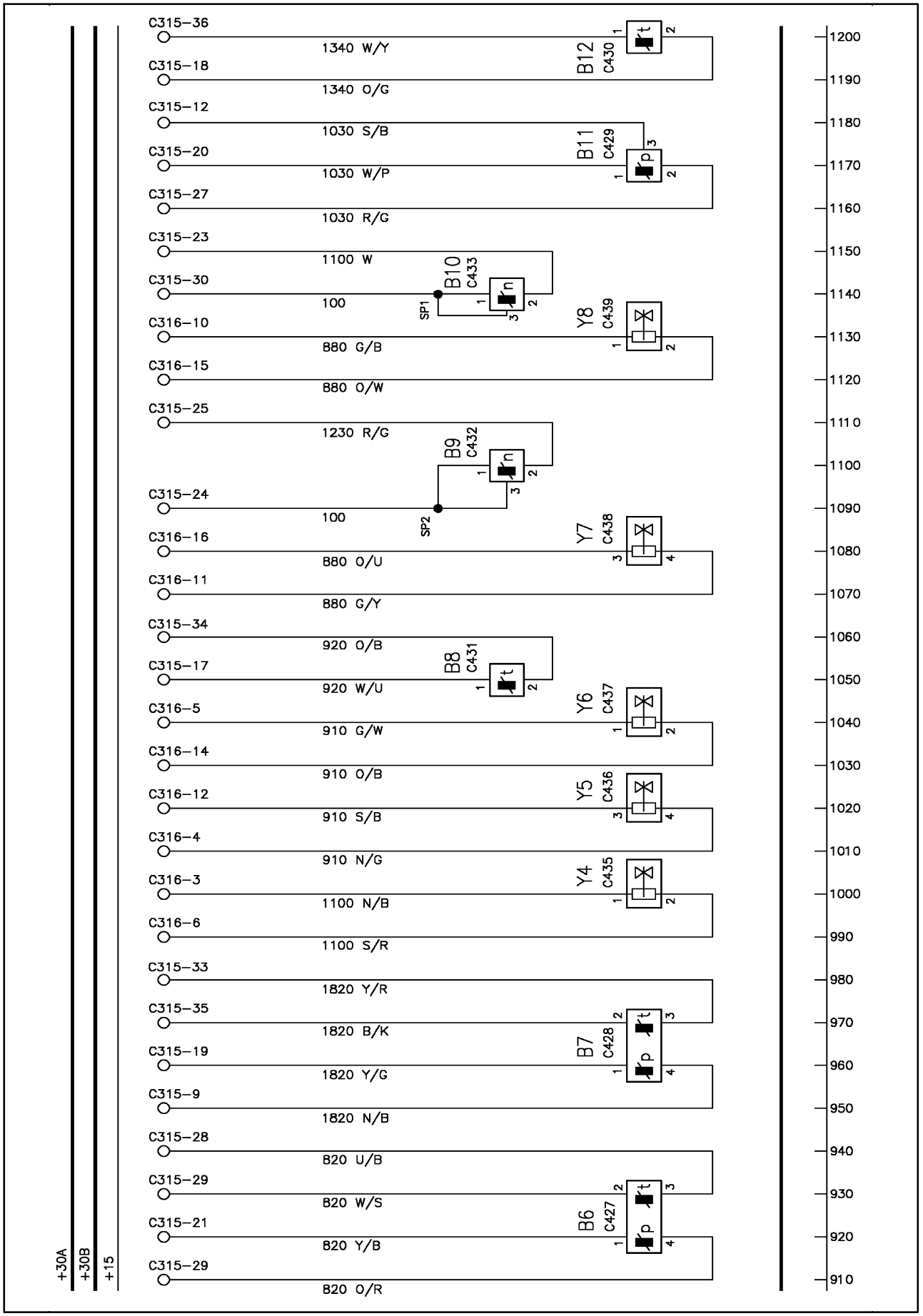
   A. Disconnect connector **C427**. Turn the keystart ON. Measure the voltage between, **C427** pin **3 (O/R)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 3.

3. Check for a short to ground.

   A. Disconnect connector **C315**. Check between **C427** pin **3 (O/R)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If fault re-occurs, remove and replace the engine controller.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+30B
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C315-36
1340 W/Y
C315-18
1340 O/G
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C430
C315-12
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C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
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C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6
C427
C315-29
820 O/R
1200
1190
1180
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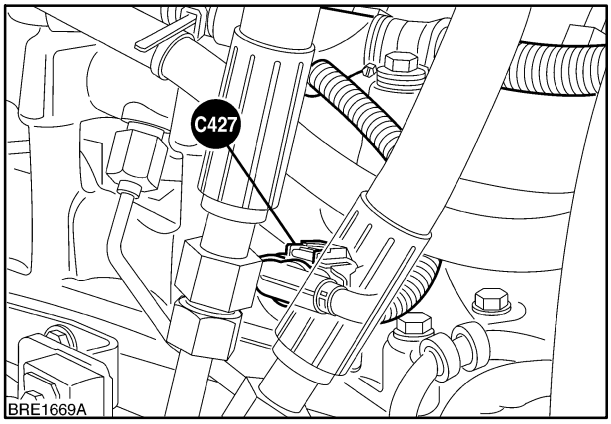
C427
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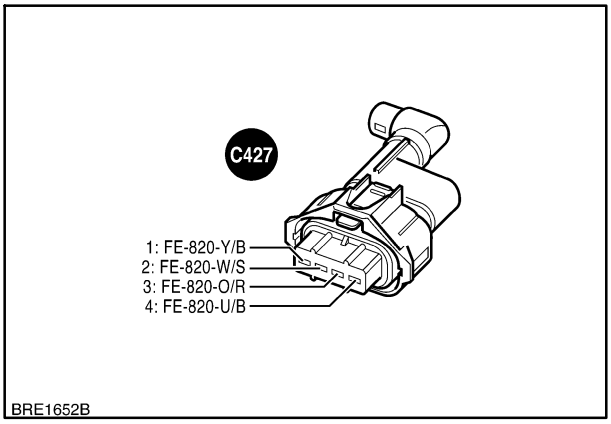
C427
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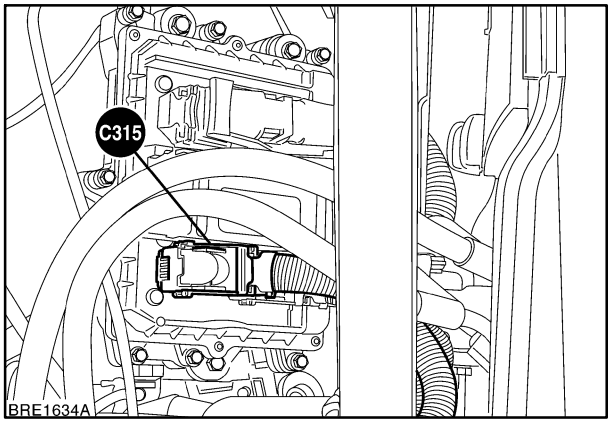
3: FE-820-O/R
4: FE-820-U/B
BRE1652B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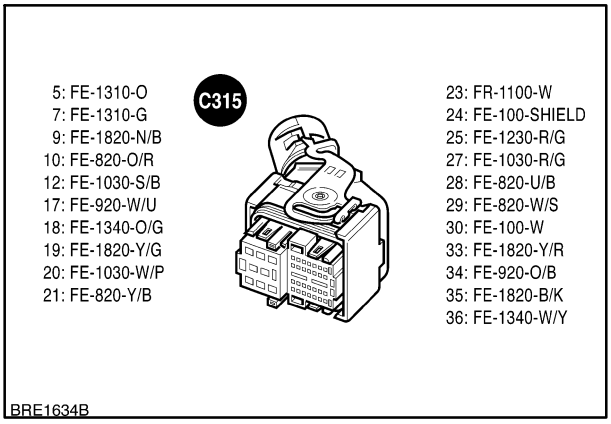
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18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3023 - ATMOSPHERIC PRESSURE SENSOR HIGH VALUE

Possible failure modes:

1. Faulty atmospheric pressure sensor (integrated in the engine controller)
2. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for the error code.

   A. Clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   B. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3024 - ATMOSPHERIC PRESSURE SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty atmospheric pressure sensor (integrated in the engine controller)
2. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for the error code.

   A. Clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   B. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3025 - ATMOSPHERIC PRESSURE SENSOR LOW VOLTAGE

Possible failure modes:

1. Faulty atmospheric pressure sensor (integrated in the engine controller)
2. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for the error code.

   A. Clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   B. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3026 - ATMOSPHERIC PRESSURE SENSOR OPEN CIRCUIT

Possible failure modes:

1. Faulty atmospheric pressure sensor (integrated in the engine controller)
2. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for the error code.

   A. Clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   B. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3027 - OIL PRESSURE SENSOR HIGH VALUE

Possible failure modes:

1. Faulty connector
2. Faulty oil pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the engine mechanical operation is okay, and that the engine oil level is correct. Run the tractor under normal conditions to test the oil pressure.

   A. If a fault with the engine oil pressure is indicated, repair as necessary.

   B. If a fault with the engine oil pressure is not indicated, continue to step 3.
3. Check the oil pressure sensor connector **C428** and the engine controller connector **C315**.

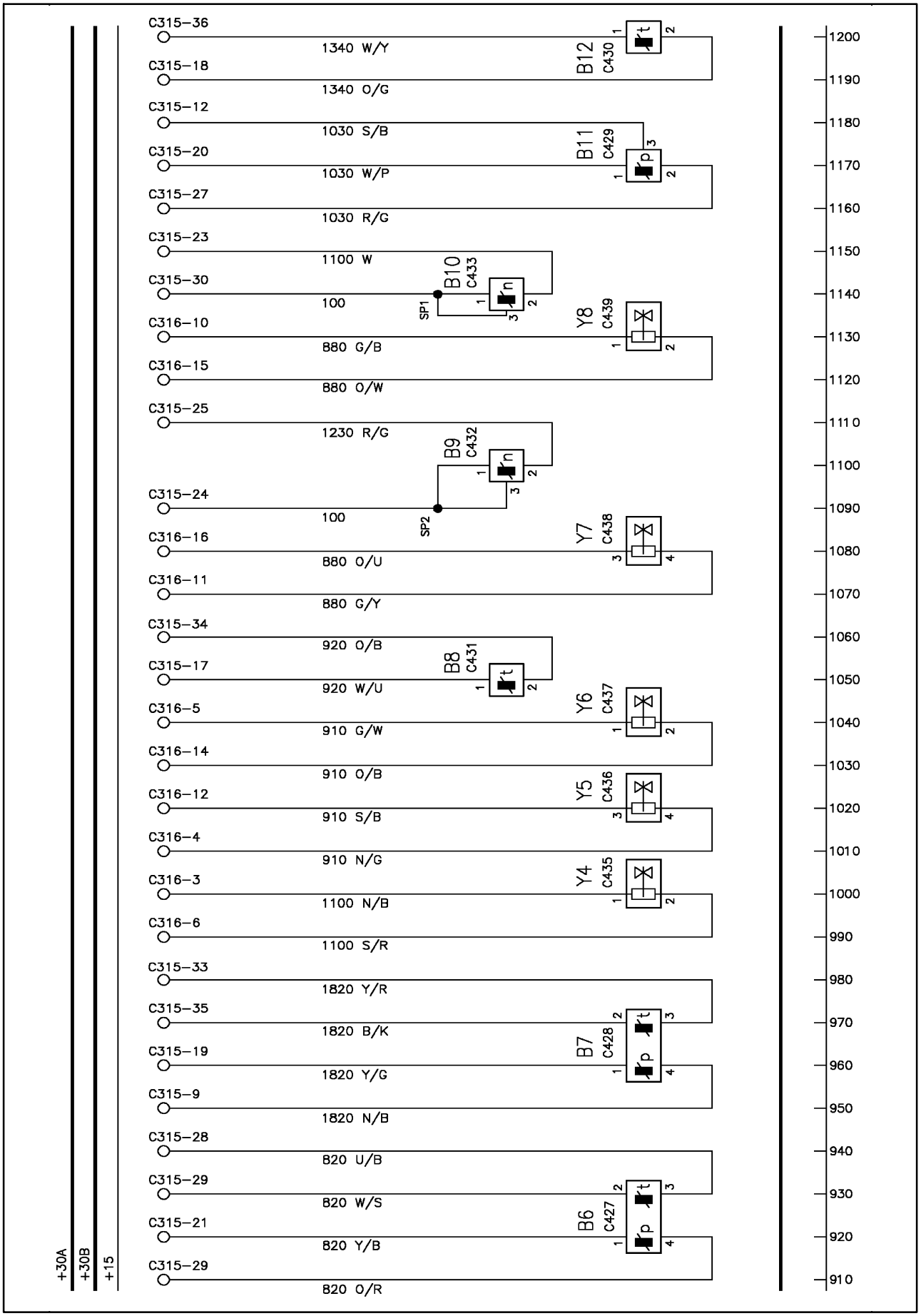
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the 5 volt supply.

   A. Disconnect connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. The voltage indicated should be approximately +5 volts, if the voltage is too high or too low, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, remove and replace the oil pressure sensor.

   If the fault is still present, download the correct level of software. If fault re-occurs, remove and replace the engine controller.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+30B
+15
C315-36
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C315-18
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C430
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C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
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SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
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SP2
C316-16
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880 G/Y
Y7
C438
C315-34
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C431
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Y6
C437
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C436
C316-3
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C316-6
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C315-35
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C315-29
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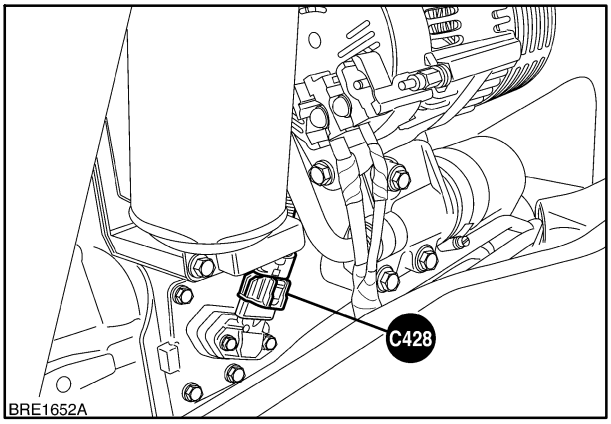
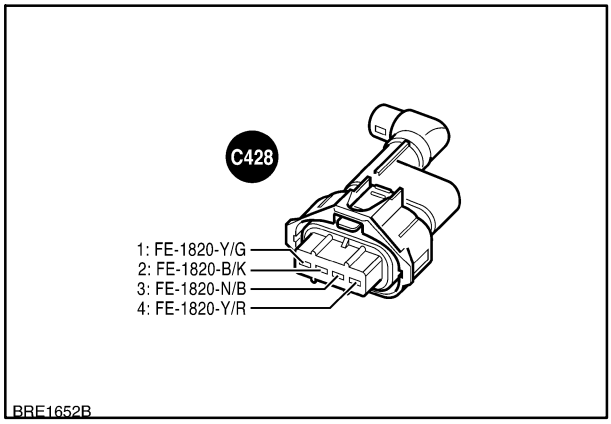

C428
BRE1652A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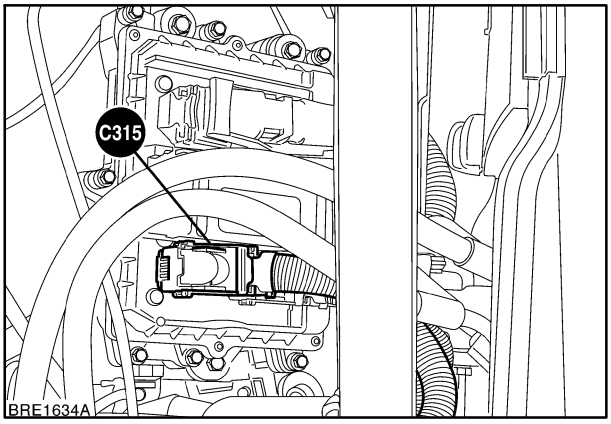
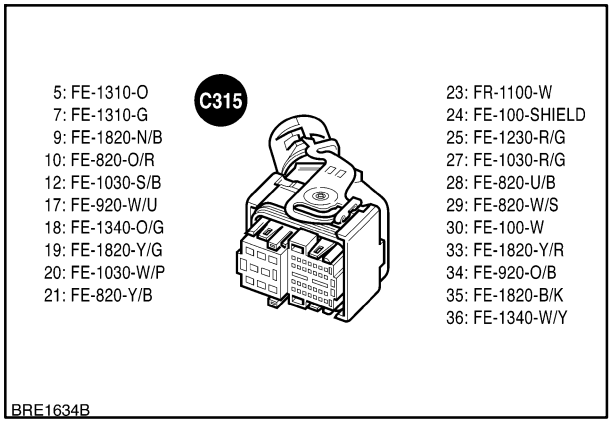
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3028 - OIL PRESSURE SENSOR LOW VALUE

Possible failure modes:

1. Faulty connector
2. Faulty oil pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the engine mechanical operation is okay, and that the engine oil level is correct. Run the tractor under normal conditions to test the oil pressure.

   A. If a fault with the engine oil pressure is indicated, repair as necessary.

   B. If a fault with the engine oil pressure is not indicated, continue to step 3.
3. Check the oil pressure sensor connector **C428** and the engine controller connector **C315**.

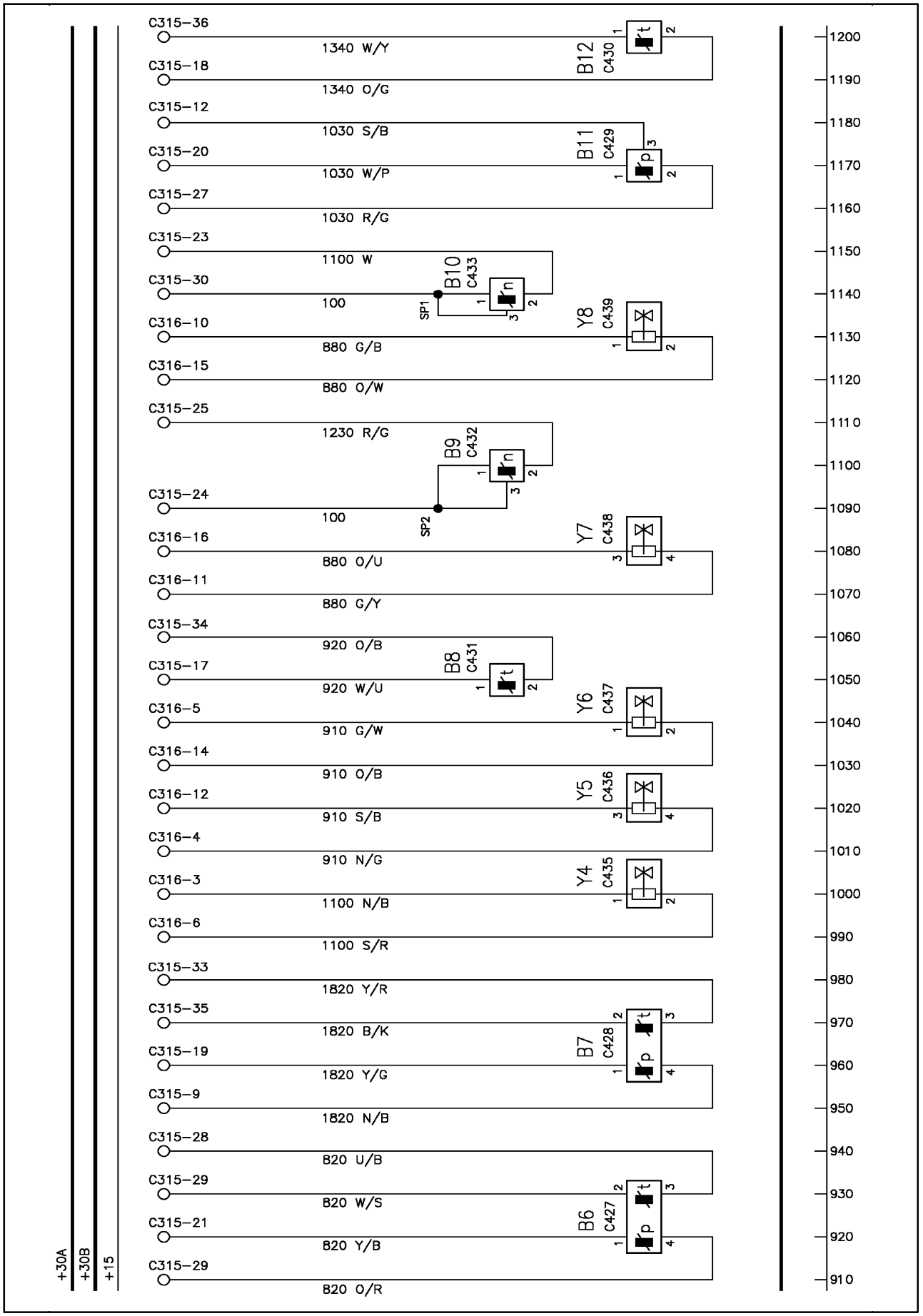
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the 5 volt supply.

   A. Disconnect connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. The voltage indicated should be approximately +5 volts, if the voltage is too high or too low, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, remove and replace the oil pressure sensor.

   If the fault is still present, download the correct level of software. If fault re-occurs, remove and replace the engine controller.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+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
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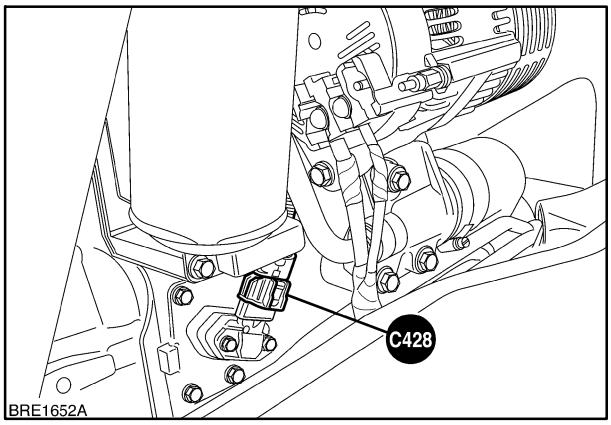
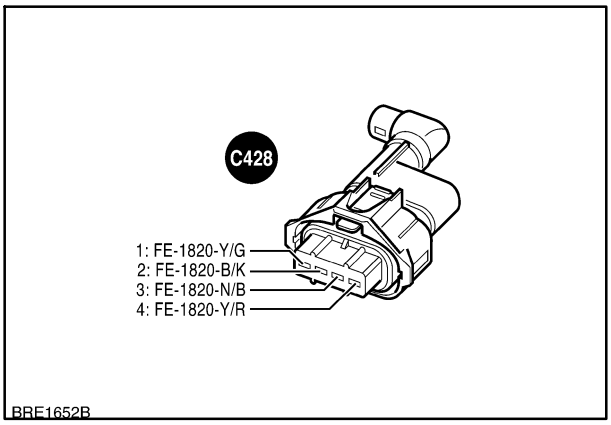
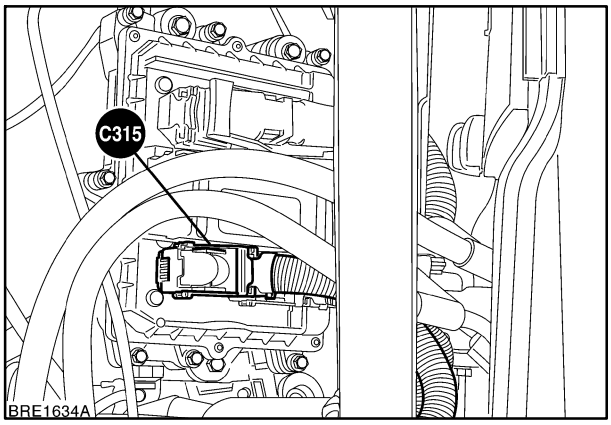


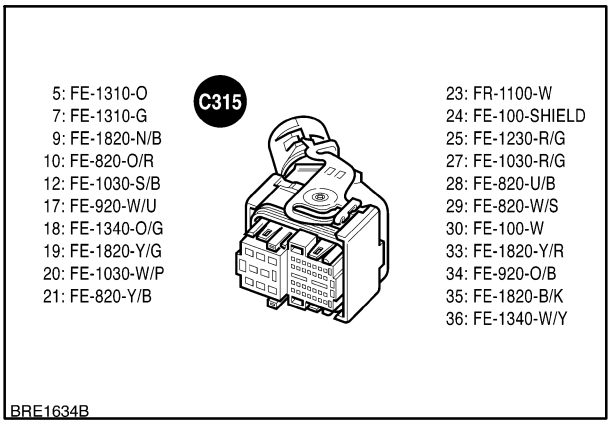
BRE1652A



BRE1652B



BRE1634A



BRE1634B

ERROR CODE 3029 - OIL PRESSURE SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty oil pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil pressure sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Disconnect connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 4.

4. Check for short to +Ve voltage.

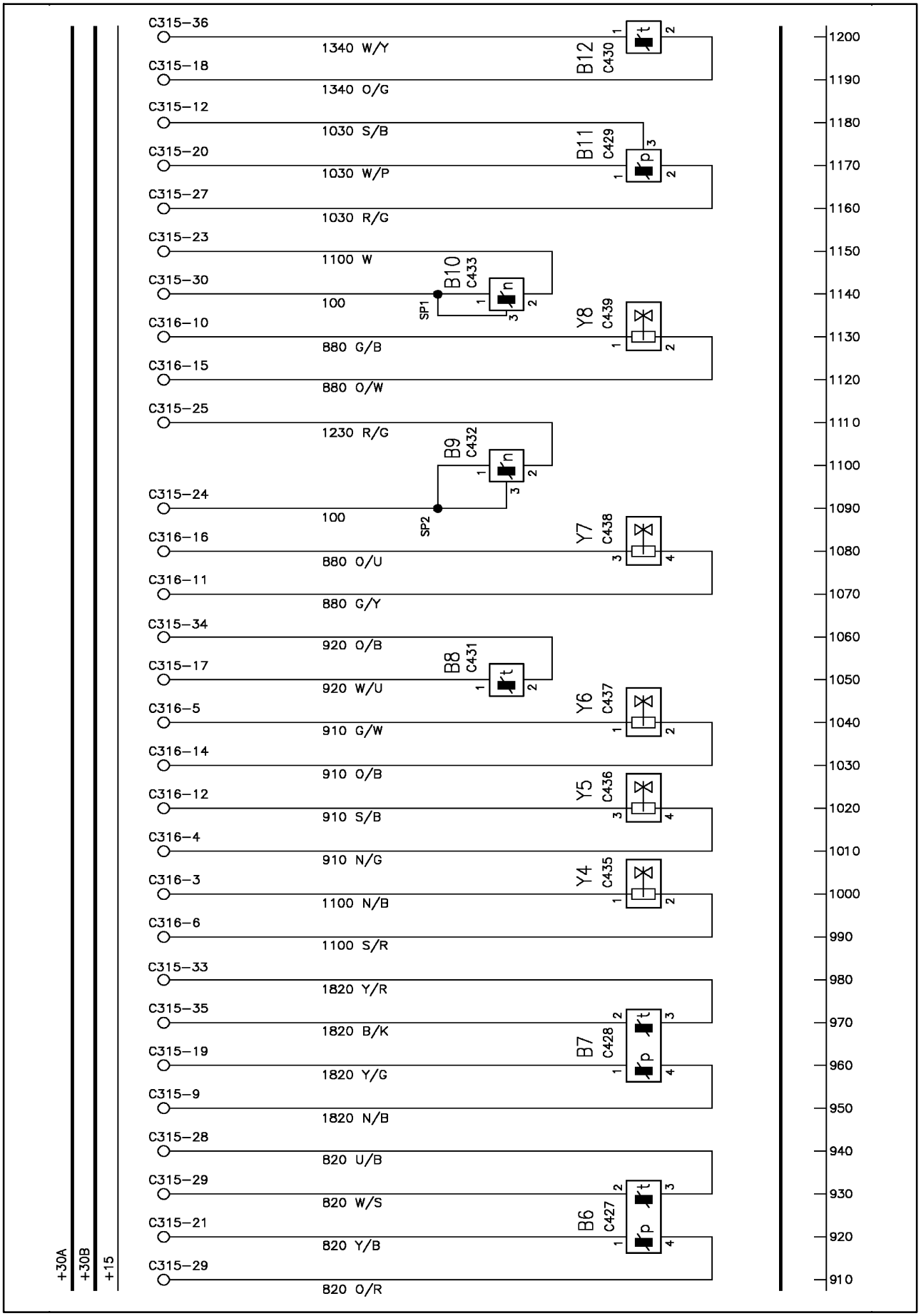
   A. Turn the keystart ON. Check between connector:

   C428 pin **4 (Y/R)** and **ground**

   C428 pin **1 (Y/G)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
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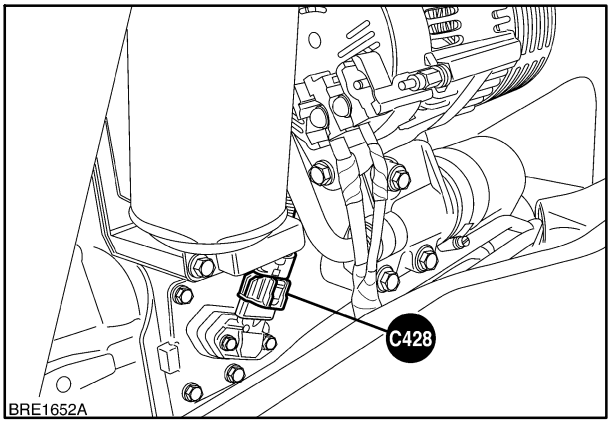
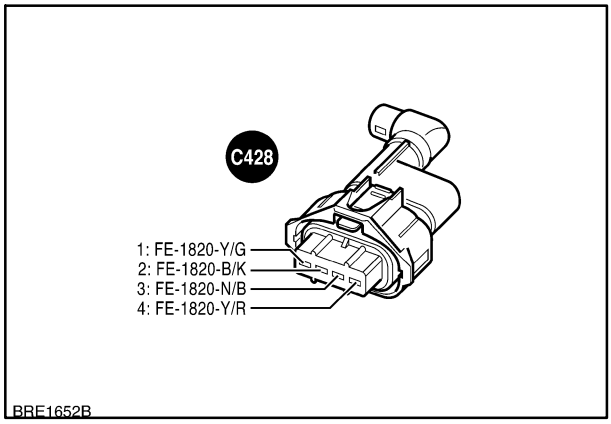
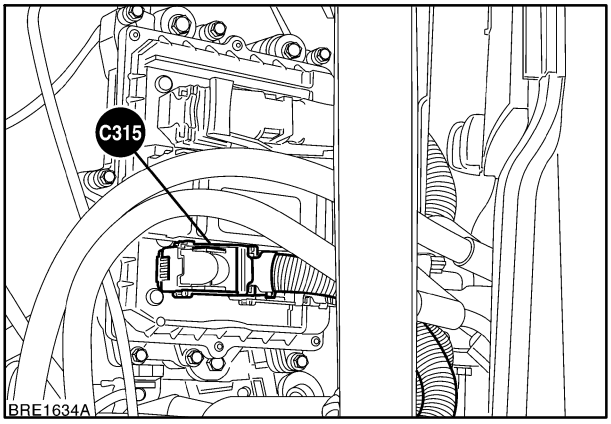


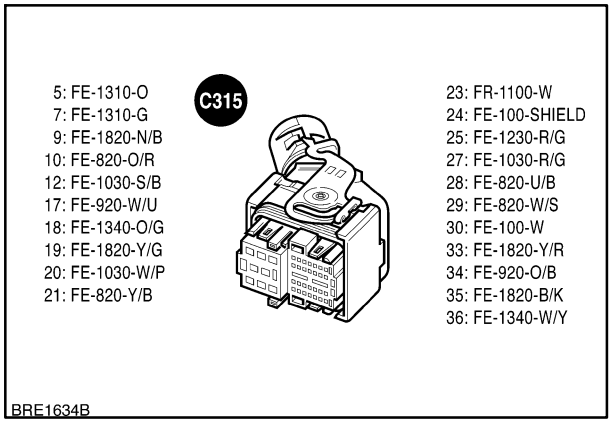
BRE1652A



BRE1652B



BRE1634A



BRE1634B

ERROR CODE 3030 - OIL PRESSURE SENSOR LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty oil pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil pressure sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the oil pressure sensor for a short to ground.

   A. Disconnect connector **C428**. Check between the component side of the connector:

   C428 pins **1** and **ground**

   C428 pins **3** and **ground**

   C428 pins **4** and **ground**

   If a short to ground is indicated, remove and replace the oil pressure sensor.

   B. If the oil pressure sensor is okay, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

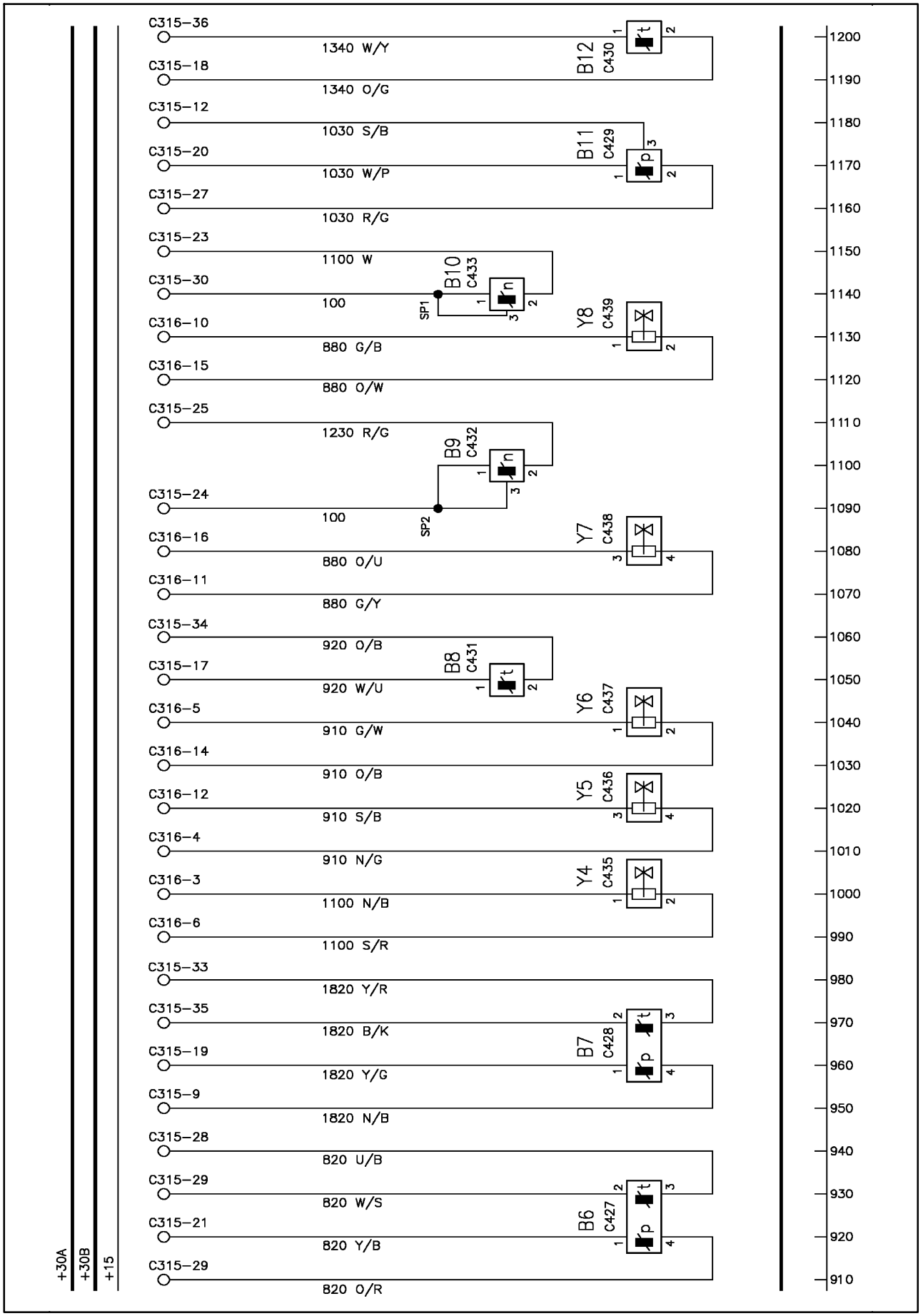
   C428 pins **1 (Y/G)** and **ground**

   C428 pins **3 (N/B)** and **ground**

   C428 pins **4 (Y/R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occures, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6
C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
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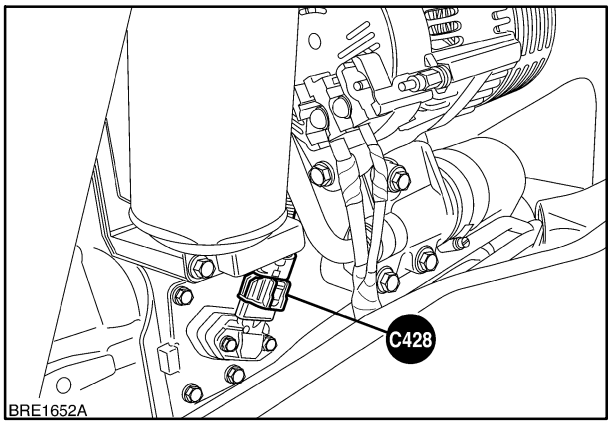
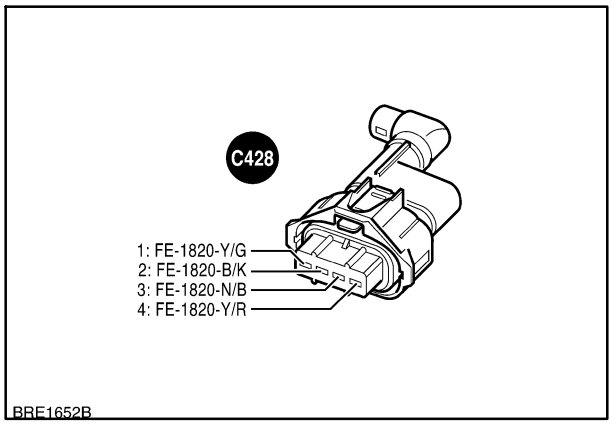
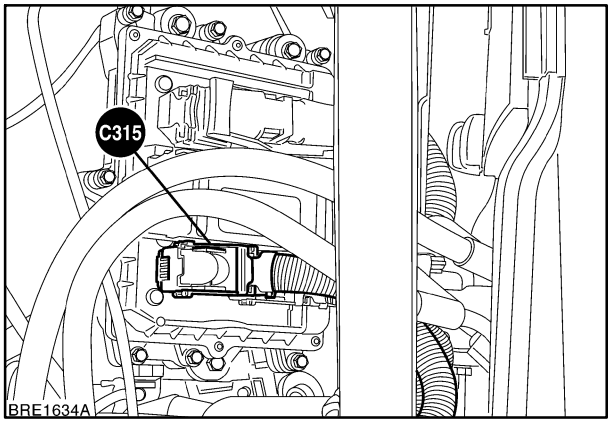
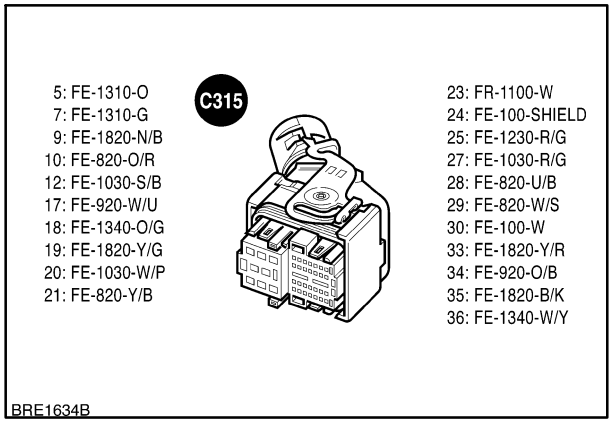

C428
BRE1652A


C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3031 - OIL PRESSURE SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty oil pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil pressure sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect connector **C428** and **C315**. Check between connector:

   C428 pins **1 (Y/G)** and **C315** pin **19 (Y/G)**

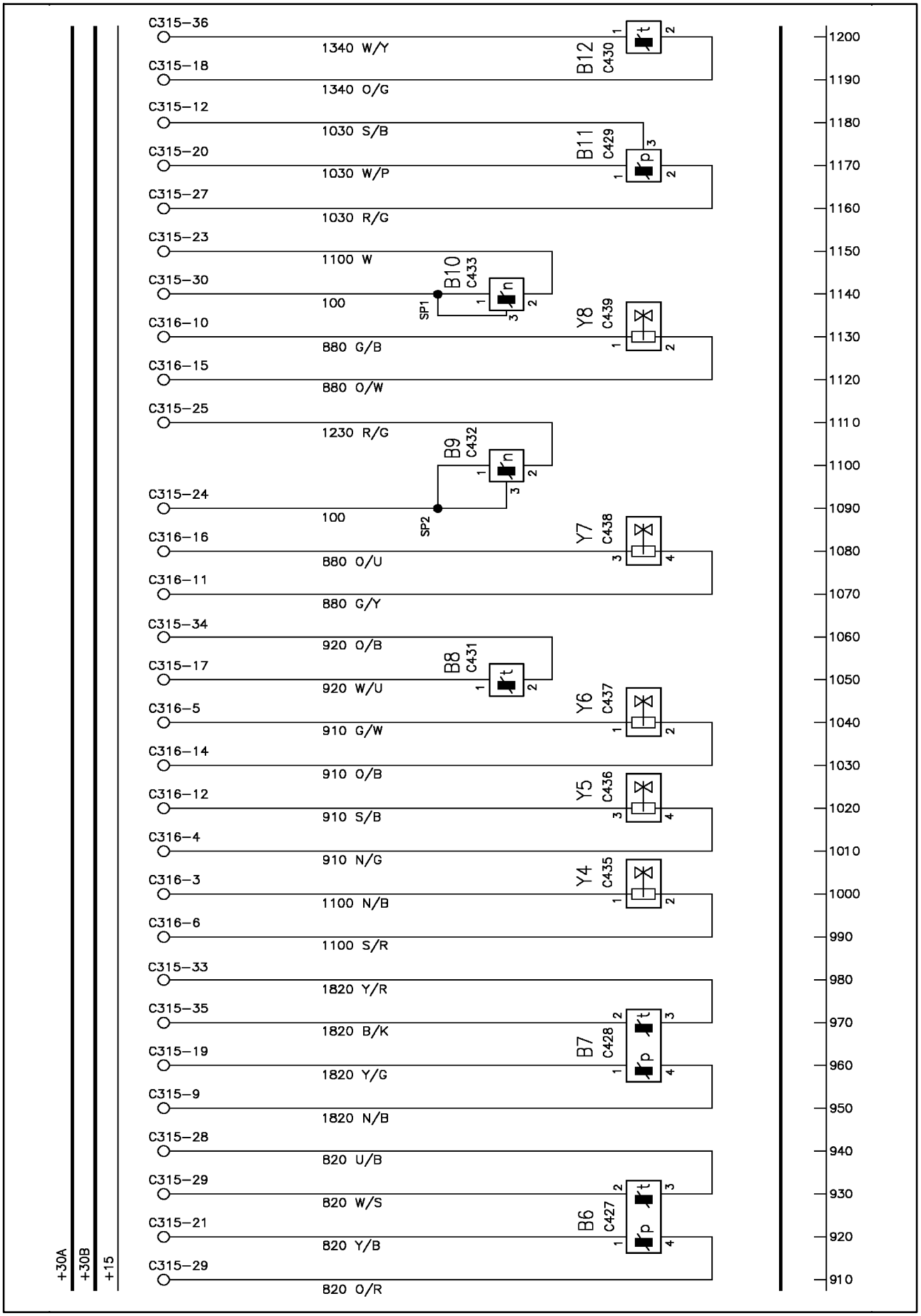
   C428 pins **3 (N/B)** and **C315** pin **9 (N/B)**

   C428 pins **4 (Y/R)** and **C315** pin **33 (Y/R)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the oil pressure sensor.

   If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
Y7 C438
C316-16
880 O/U
C316-11
880 G/Y
C315-34
920 O/B
C315-17
920 W/U
B8 C431
Y6 C437
C316-5
910 G/W
C316-14
910 O/B
Y5 C436
C316-12
910 S/B
C316-4
910 N/G
Y4 C435
C316-3
1100 N/B
C316-6
1100 S/R
C315-33
1820 Y/R
C315-35
1820 B/K
B7 C428
C315-19
1820 Y/G
C315-9
1820 N/B
C315-28
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C315-29
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B6 C427
C315-21
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C315-29
820 O/R
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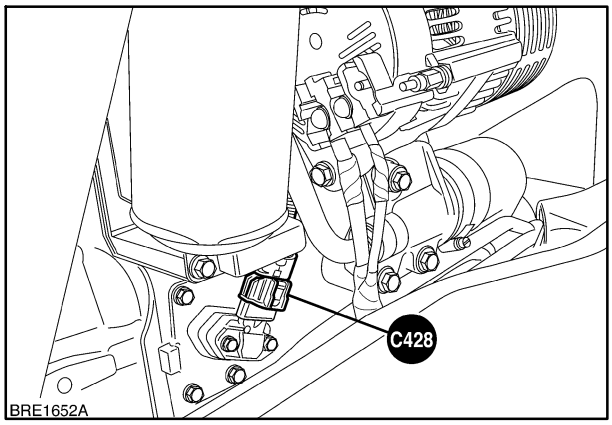
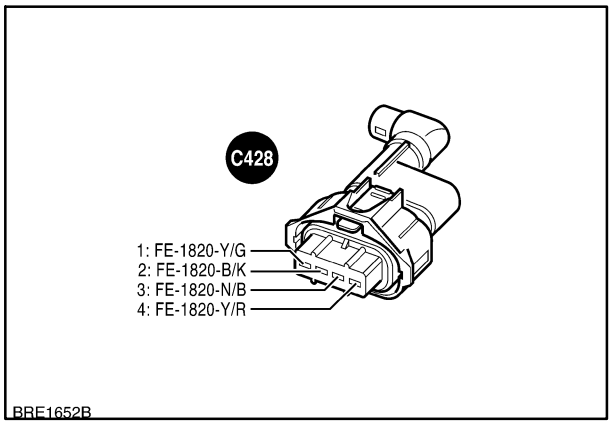
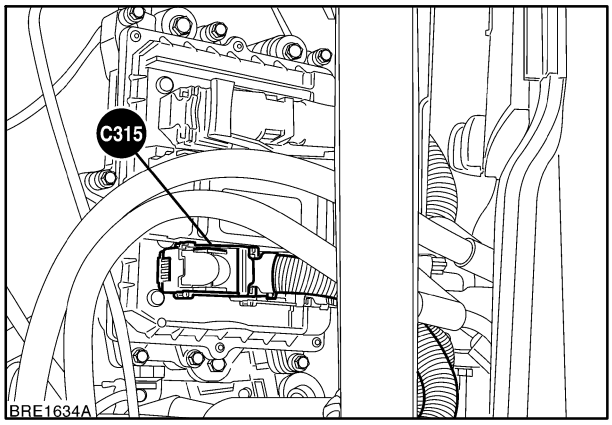
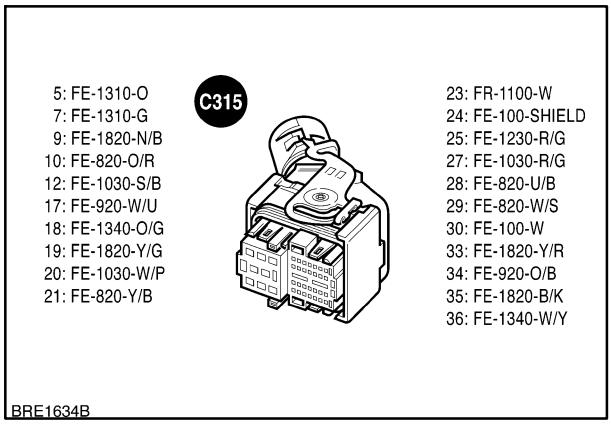

C428
BRE1652A


C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3032 - OIL PRESSURE SENSOR POWER SUPPLY SHORT TO + VE OR GROUND

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil pressure sensor connector **C428** and the engine controller connector **C315.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

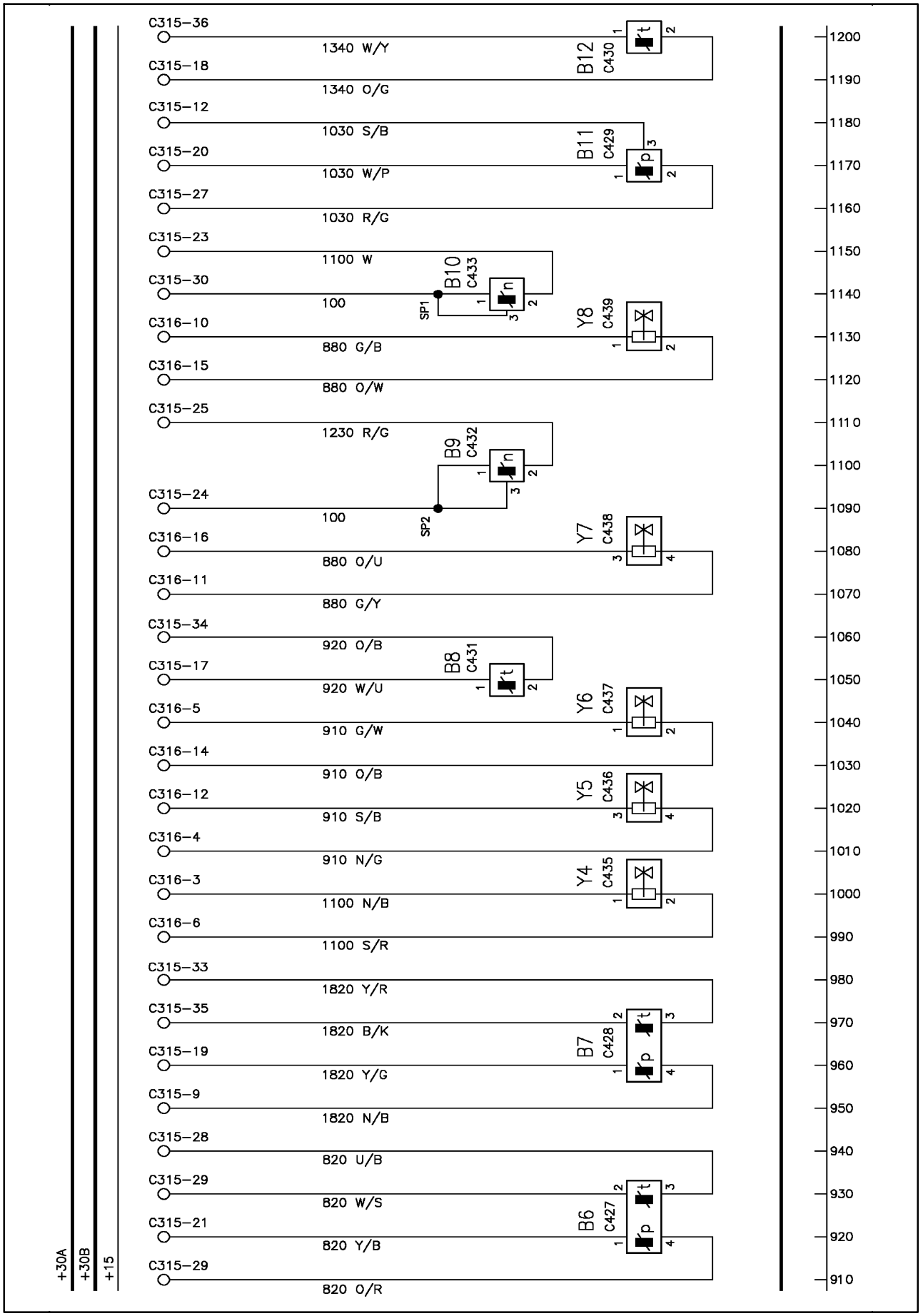
   A. Disconnect connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector **C427** pin **3 (N/B)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
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1170
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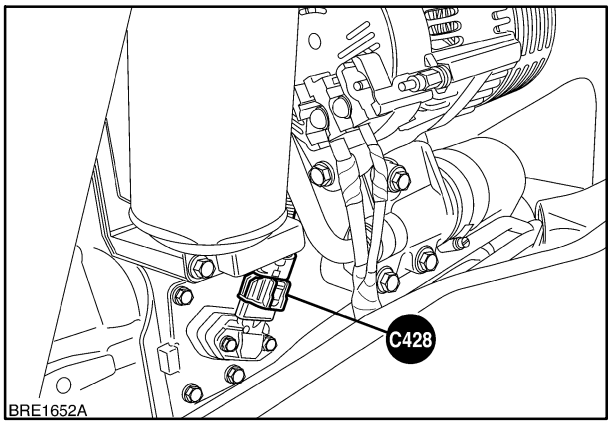
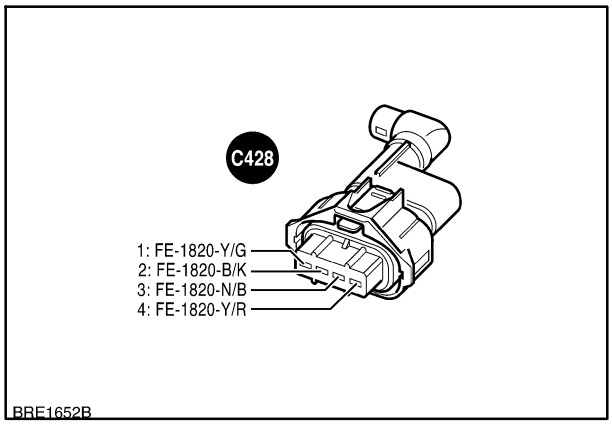

C428
BRE1652A


C428
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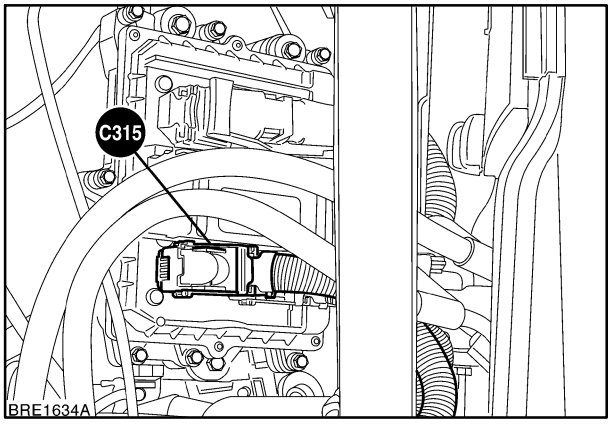
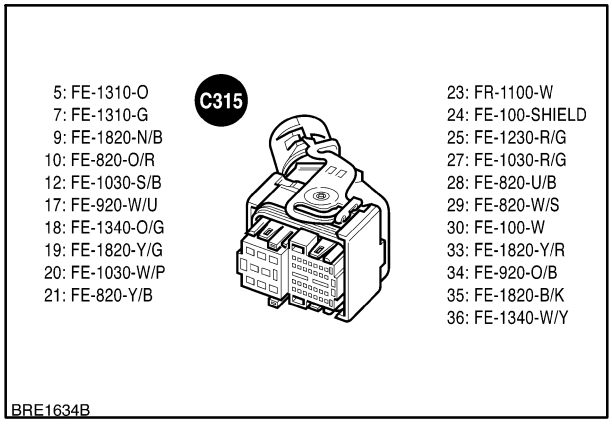
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3033 - OIL TEMPERATURE SENSOR HIGH VALUE

Possible failure modes:

1. Faulty connector
2. Faulty oil temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the engine mechanical operation is okay, and that the engine oil level is correct. Run the tractor under normal conditions to test the oil pressure.

   A. If a fault with the engine oil pressure is indicated, repair as necessary.

   B. If a fault with the engine oil pressure is not indicated, continue to step 3.
3. Check the oil temperature sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the oil temperature sensor.

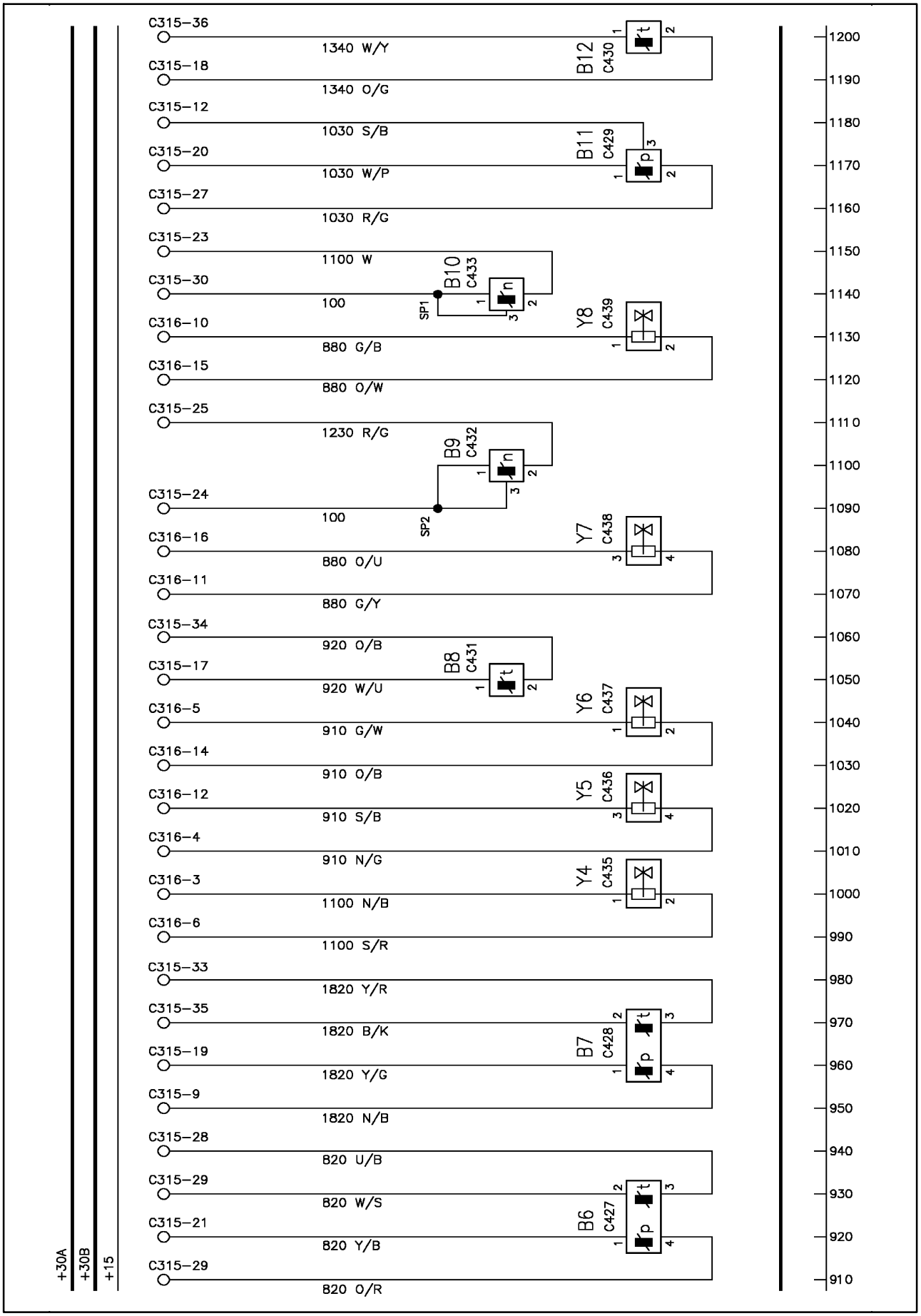
   A. Disconnect connector **C428**. Measure the resistance between the component side of the connector **C428** pins **1** and **2**. If the resistance is not approximatley 2.5K Ohms at 20 degress centigrade, remove and replace the oil temperature sensor.

   B. If the oil temperature sensor is okay, continue to step 5.
5. Check the 5 volt supply.

   A. Disconnect connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. The voltage indicated should be approximately +5 volts, if the voltage is too high or too low, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, remove and replace the oil pressure sensor.

   If the fault is still present, download the correct level of software. If fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
Y7 C438
C316-16
880 O/U
C316-11
880 G/Y
C315-34
920 O/B
C315-17
920 W/U
B8 C431
Y6 C437
C316-5
910 G/W
C316-14
910 O/B
Y5 C436
C316-12
910 S/B
C316-4
910 N/G
Y4 C435
C316-3
1100 N/B
C316-6
1100 S/R
C315-33
1820 Y/R
C315-35
1820 B/K
B7 C428
C315-19
1820 Y/G
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
B6 C427
C315-21
820 Y/B
C315-29
820 O/R
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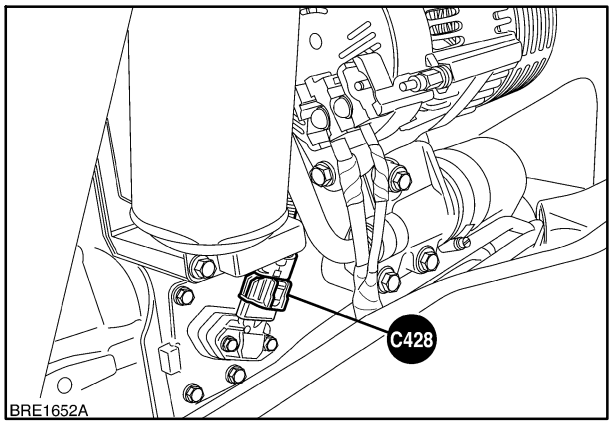
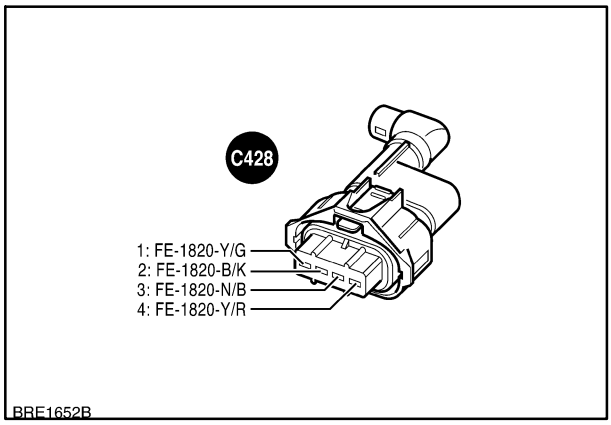
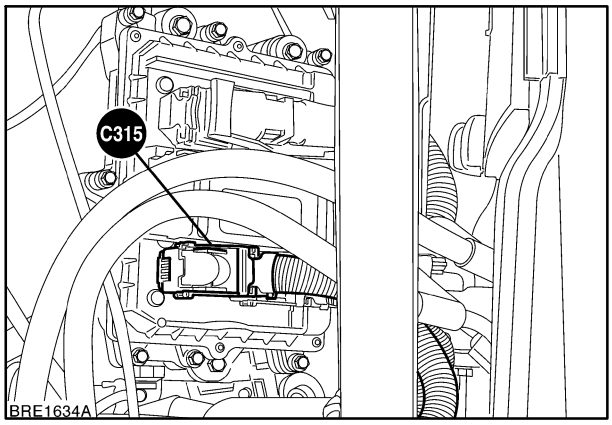
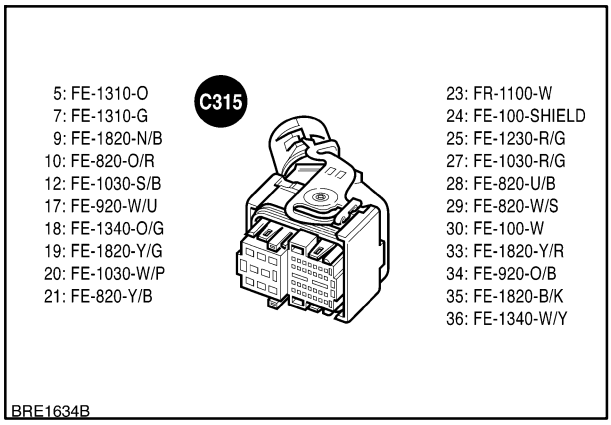

C428
BRE1652A


C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3034 - OIL TEMPERATURE SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty oil temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil temperature sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Disconnect connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 4.

4. Check for a short to +Ve voltage.

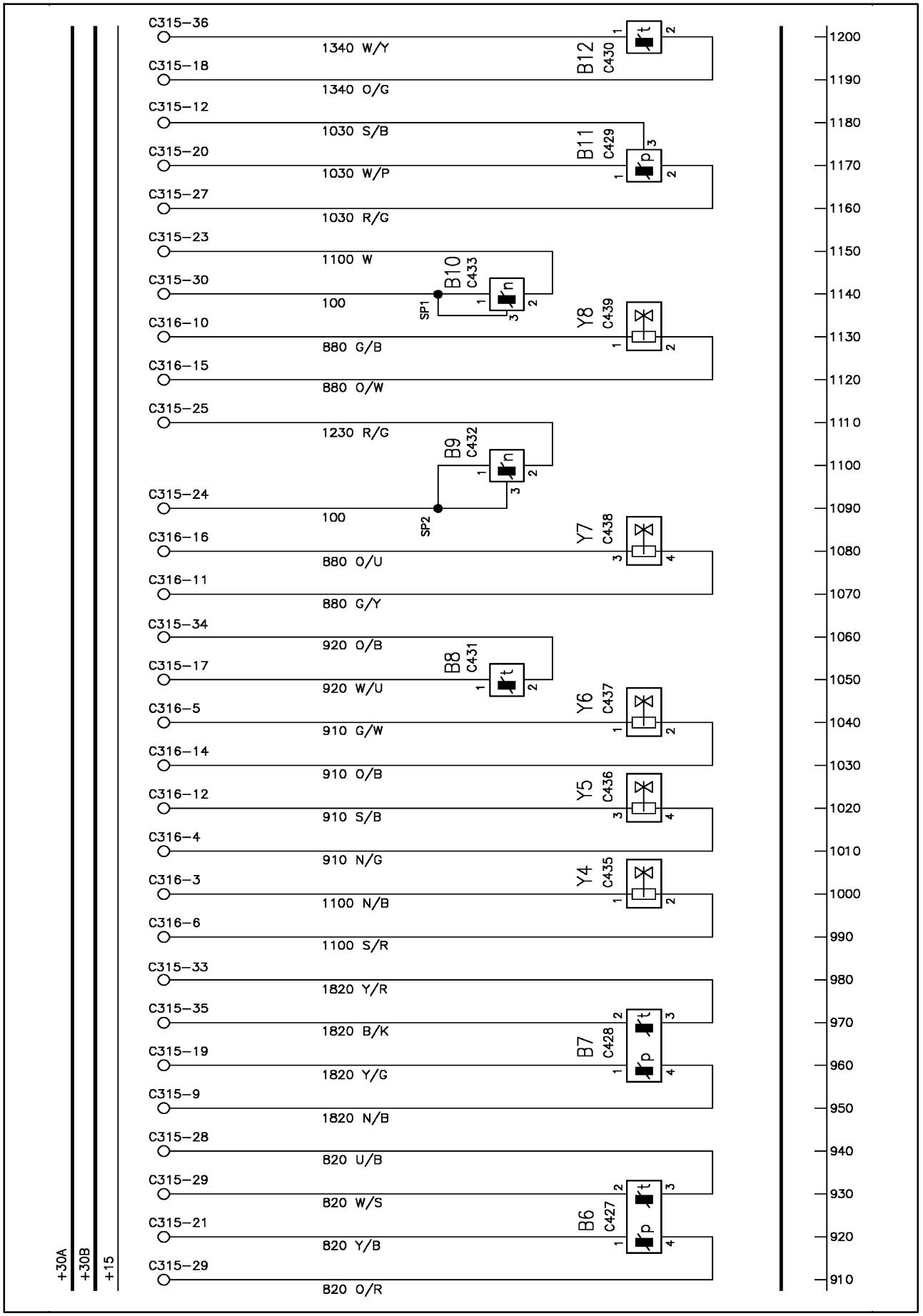
   A. Turn the keystart ON. Check between connector:

   C428 pin **1 (Y/G)** and **ground**

   C428 pin **2 (B/K)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6
C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
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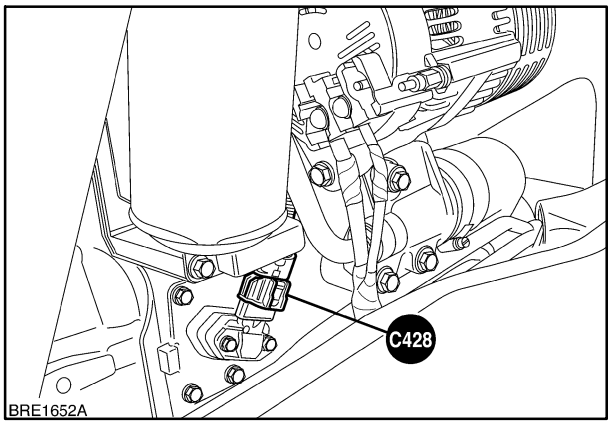
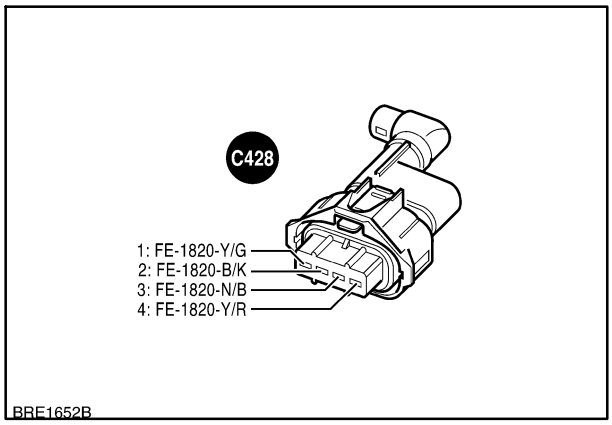

C428
BRE1652A


C428
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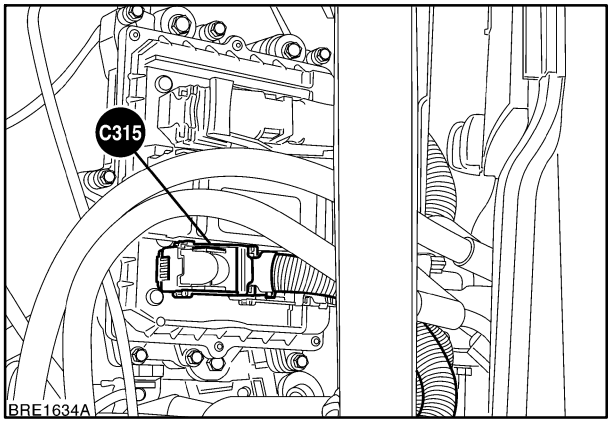
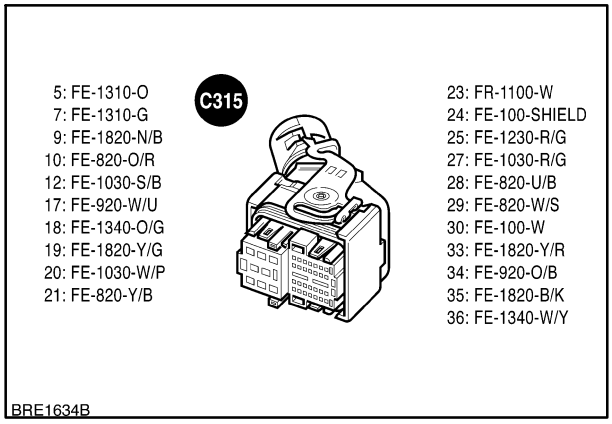
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3035 - OIL TEMPERATURE SENSOR LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty oil temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil temperature sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the oil temperature sensor for a short to ground.

   A. Disconnect connector **C428**. Check between the component side of the connector:

   C428 pins **1** and **ground**

   C428 pins **2** and **ground**

   C428 pins **3** and **ground**

   If a short to ground is indicated, remove and replace the oil temperature sensor.

   B. If the oil temperature sensor is okay, continue to step 4.

4. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

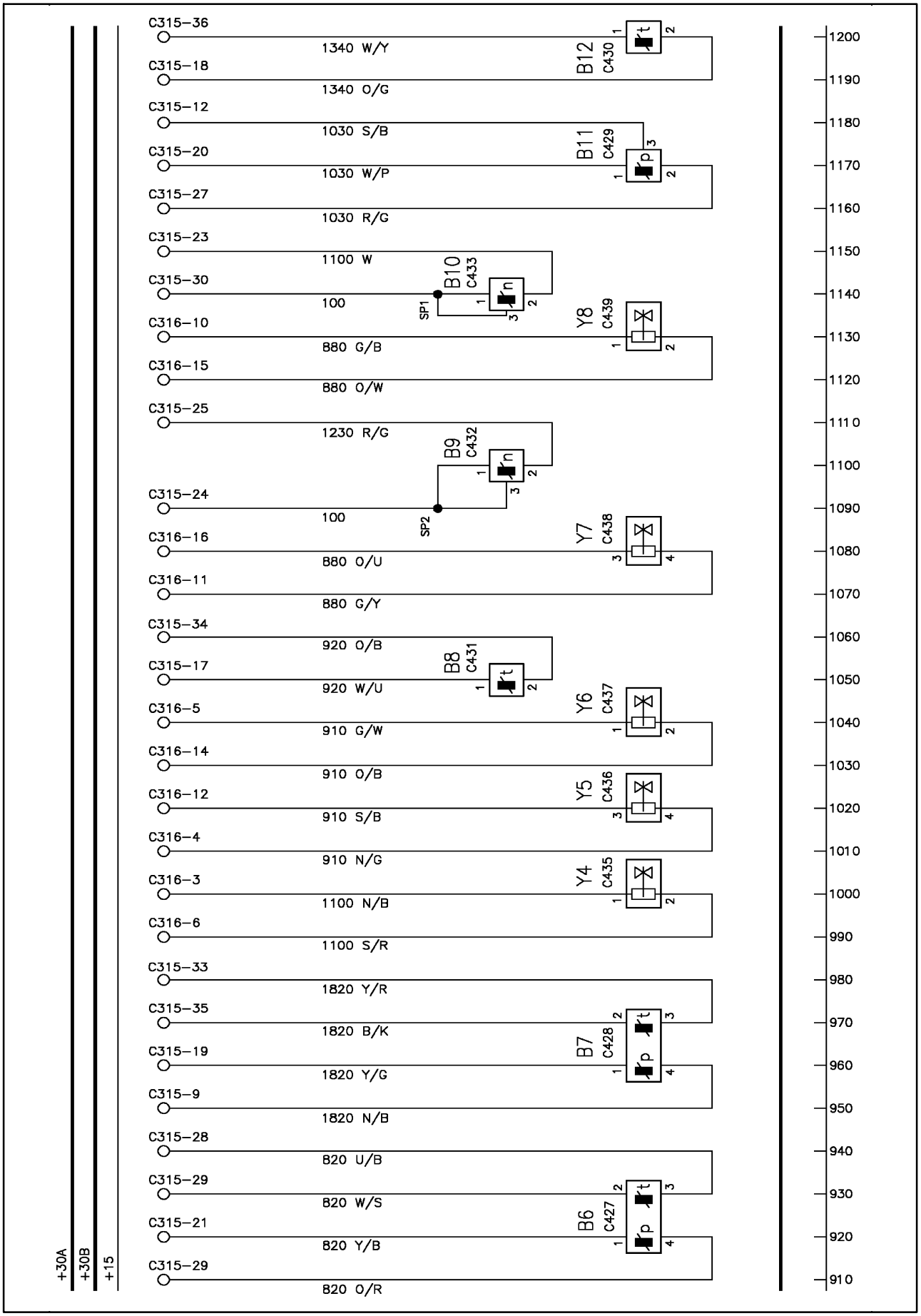
   C428 pins **1 (Y/G)** and **ground**

   C428 pins **2 (B/K)** and **ground**

   C428 pins **3 (N/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
1200
1190
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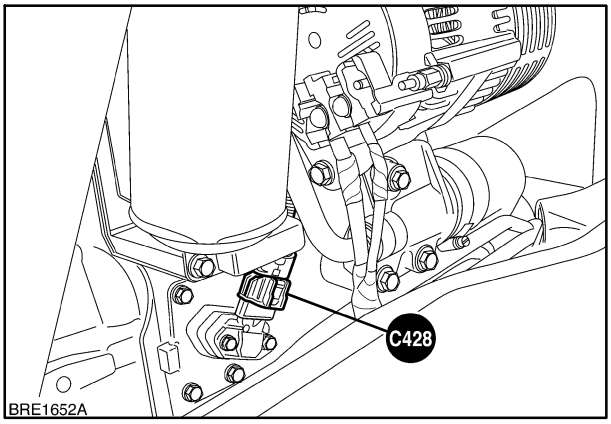
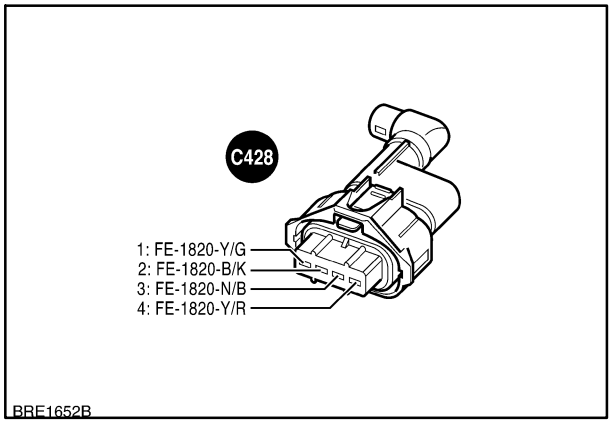
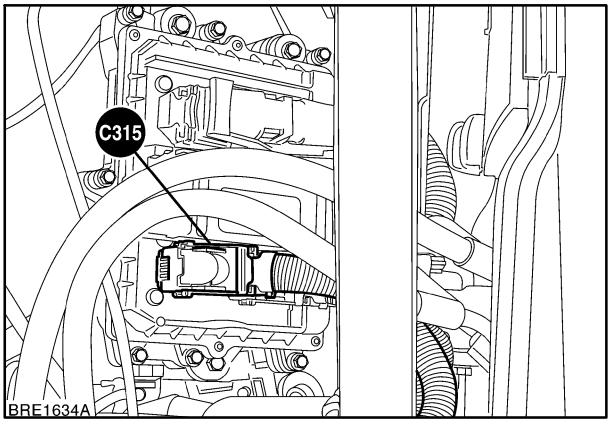
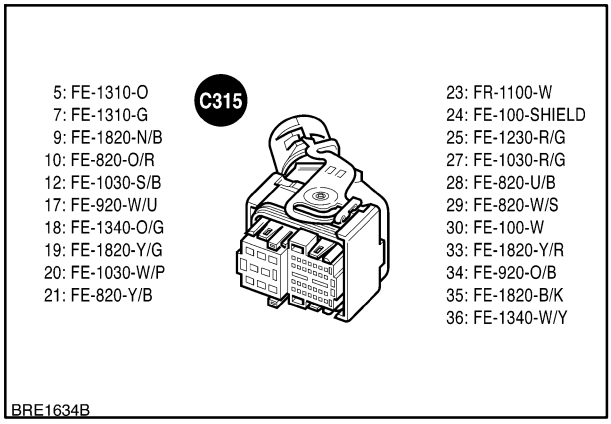

C428
BRE1652A


C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A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7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3036 - OIL TEMPERATURE SENSOR OPEN CIRCUIT OR SENSOR DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty oil temperature sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the oil temperature sensor connector **C428** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the oil temperature sensor.

   A. Disconnect connector **C428**. Measure the resistance between the component side of the connector **C428** pins **1** and **2**. If the resistance is not approximately 2.5K Ohms at 20 degress centigrade, remove and replace the oil temperature sensor.

   B. If the oil temperature sensor is okay, continue to step 4.

4. Check for an open circuit.

   A. Disconnect connector **C315**. Check between connector:

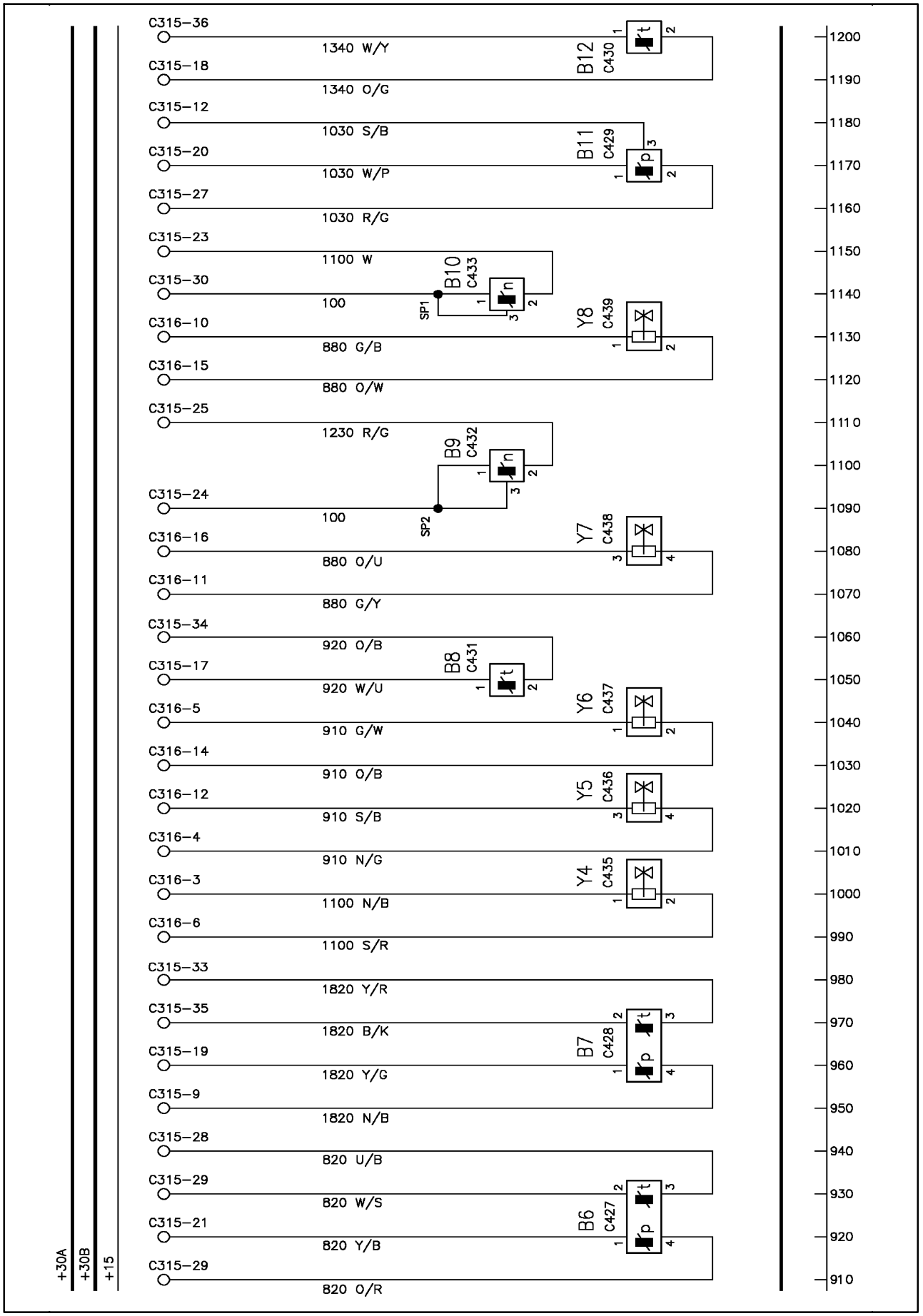
   C428 pins **1 (Y/G)** and **C315** pin **19 (Y/G)**

   C428 pins **2 (B/K)** and **C315** pin **35 (B/K)**

   C428 pins **3 (N/B)** and **C315** pin **9 (N/B)**

   If an open circuit indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
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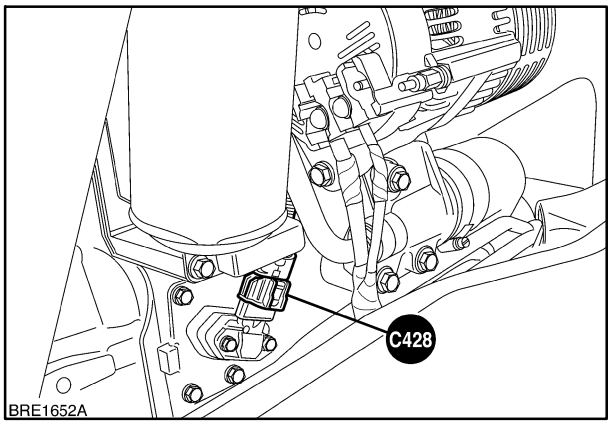
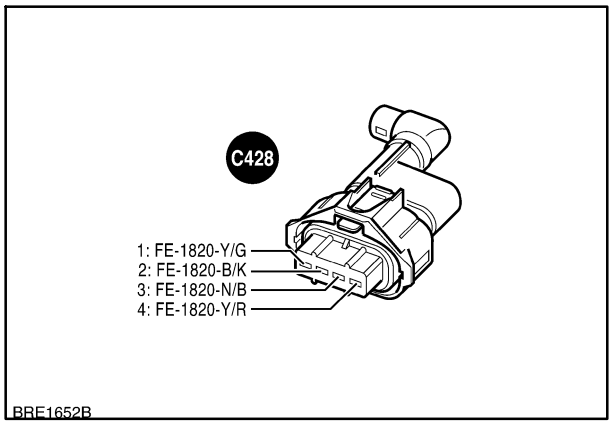
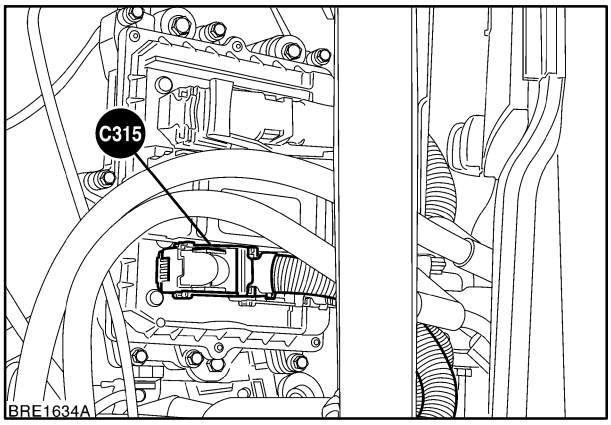
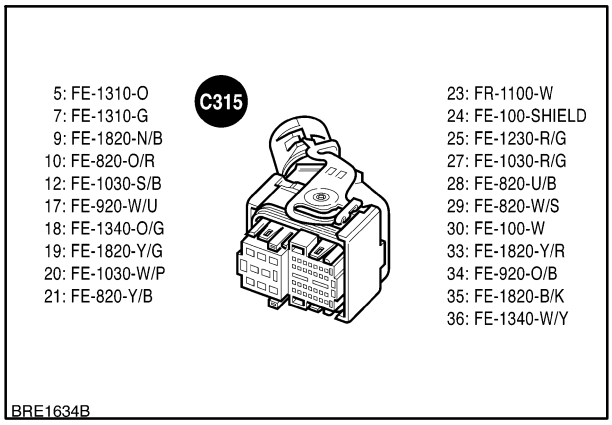
960
950
940
930
920
910


C428
BRE1652A


C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3040 - COLD START RELAY SHORT TO VCC

Effects:

Possible starting difficulty

Possible failure modes:

1. Faulty connector
2. Faulty fuel heater relay
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel heater relay connector **C354** and the engine controller connector **C242**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +Ve voltage.

   A. Disconnect connector **C242** and remove the fuel heater relay **C354**. Turn the keystart ON. Check between connector:

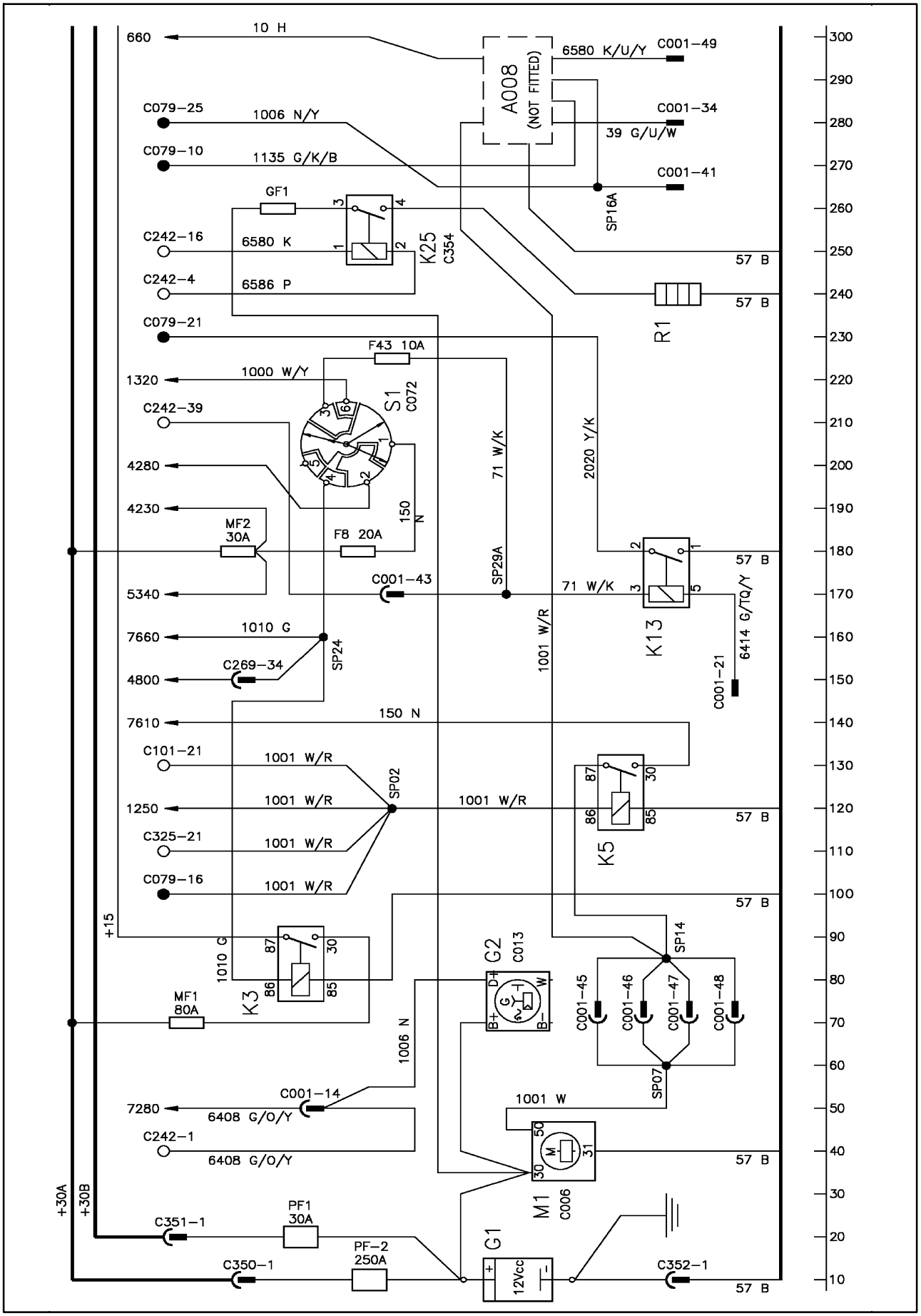
   C354 pin **1 (K)** and **ground**

   C354 pin **2 (P)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, replace the fuel heater relay.

   If the fault persists, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


660
10 H
A008
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C001-41
SP16A
C079-25
1006 N/Y
C079-10
1135 G/K/B
GF1
C242-16
6580 K
C242-4
6586 P
K25
C354
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
C242-39
S1
C072
4280
4230
MF2
30A
F8 20A
150 N
71 W/K
2020 Y/K
SP29A
C001-43
5340
7660
1010 G
4800
C269-34
SP24
1001 W/R
K13
6414 G/TQ/Y
C001-21
7610
150 N
C101-21
1001 W/R
SP02
1250
C325-21
C079-16
K5
+15
1010 G
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1006 N
C001-14
7280
6408 G/O/Y
C242-1
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
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50
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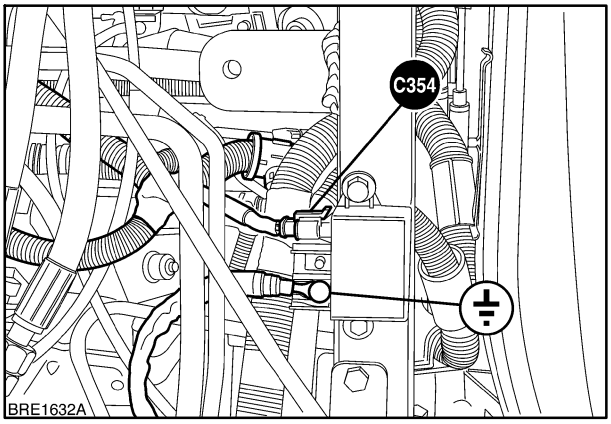
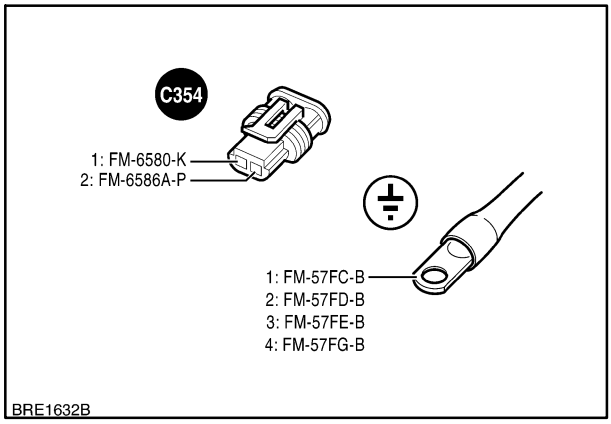
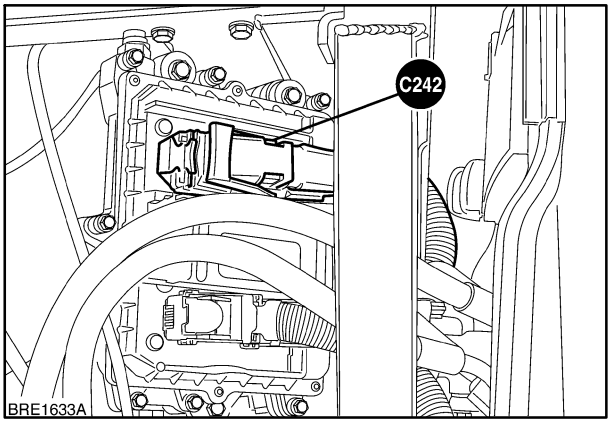
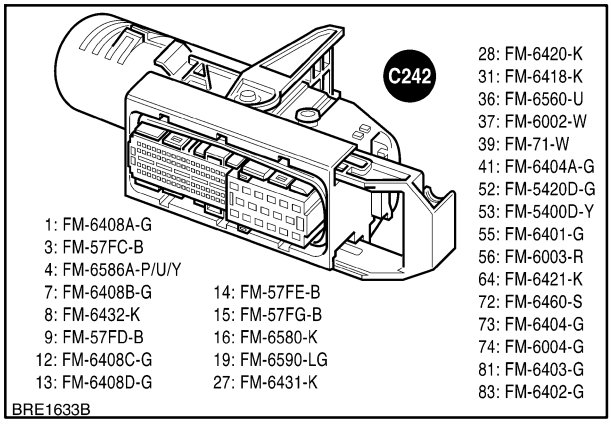
30
20
10


C354
BRE1632A


C354
1: FM-6580-K
2: FM-6586A-P
1: FM-57FC-B
2: FM-57FD-B
3: FM-57FE-B
4: FM-57FG-B
BRE1632B


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 3041 - COLD START RELAY SHORT TO GROUND

Effects:

Possible starting difficulty

Possible failure modes:

1. Faulty connector
2. Faulty fuel heater relay
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel heater relay connector **C354** and the engine controller connector **C242**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to ground.

   A. Disconnect connector **C242** and remove the fuel heater relay **C354**. Check between connectors:

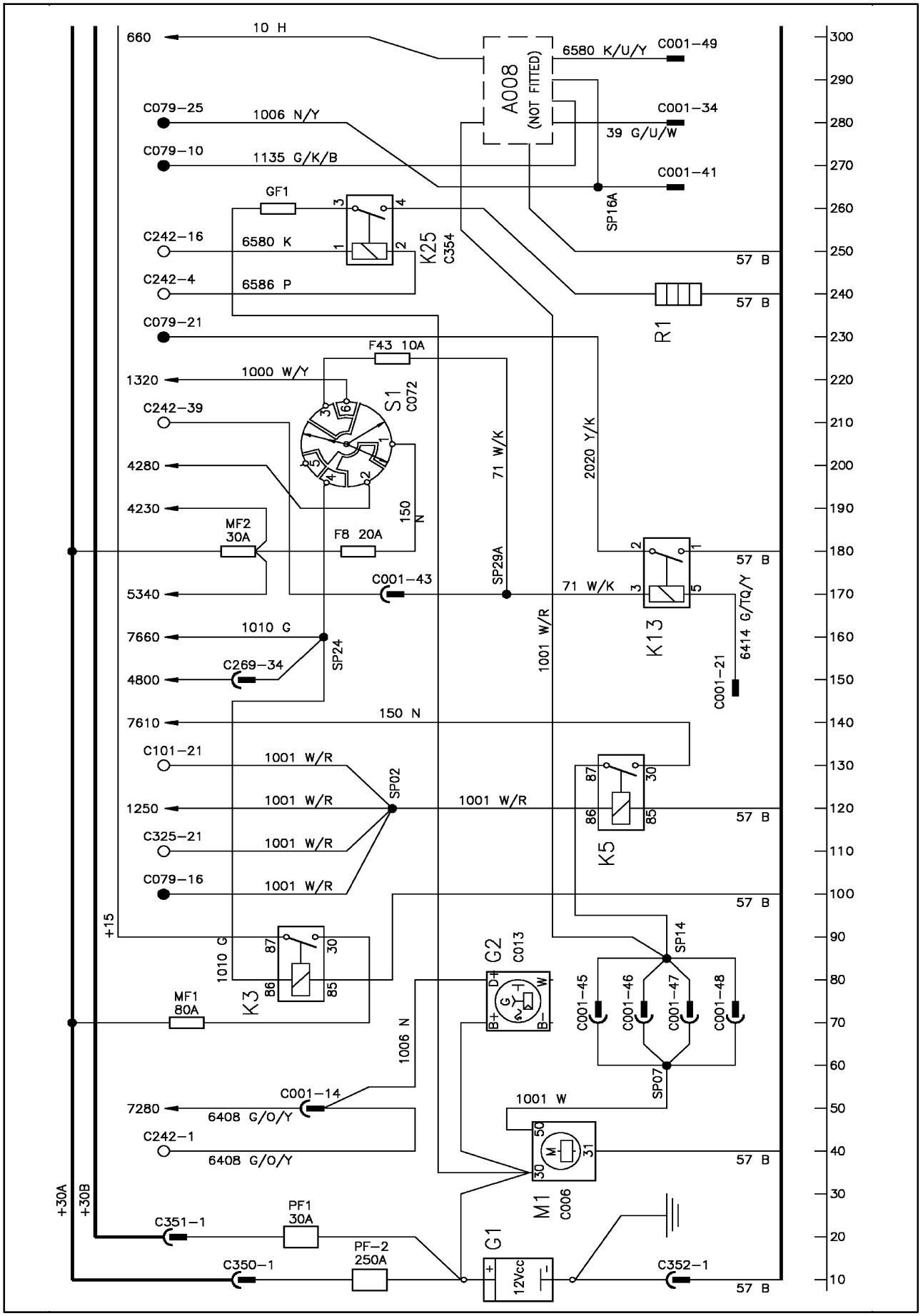
   C354 pin **1 (K)** and **ground**

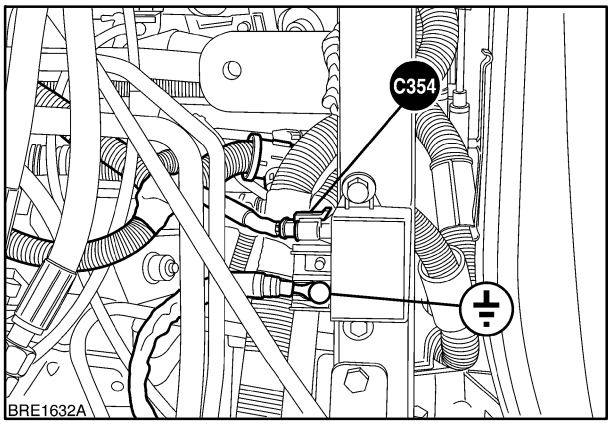
   C354 pin **2 (P)** and **ground**

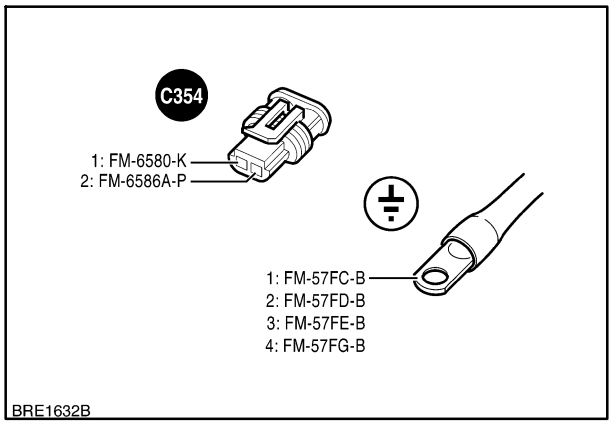
   If a short to ground is indicated, repair or replace the harness as required.

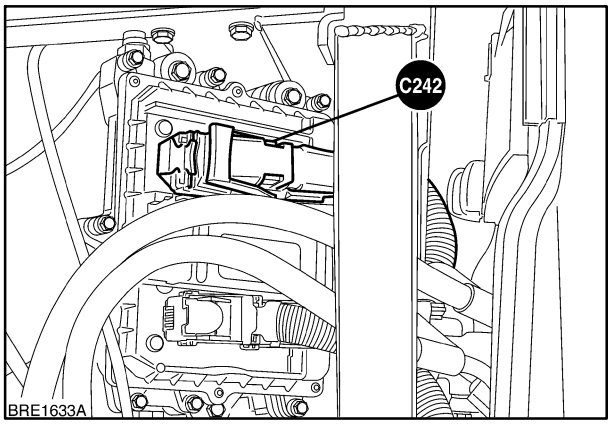
   B. If the harness is okay, replace the fuel heater relay.

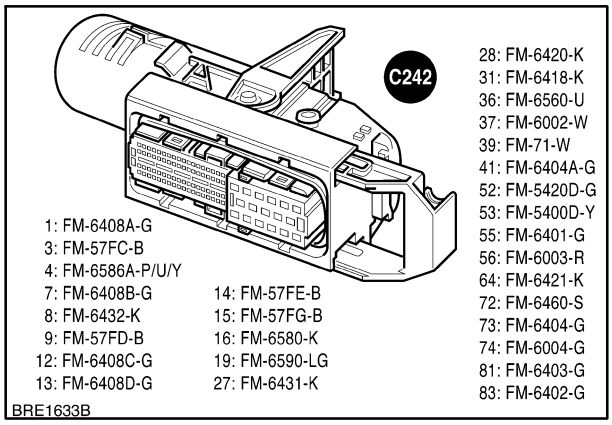
   If the fault persists, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


660
10 H
A008
(NOT FITTED)
6580 K/U/Y
C001-49
C001-34
39 G/U/W
C001-41
SP16A
C079-25
1006 N/Y
C079-10
1135 G/K/B
GF1
C242-16
6580 K
C242-4
6586 P
K25
C354
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
C242-39
S1
C072
4280
4230
MF2
30A
F8 20A
150 N
71 W/K
2020 Y/K
SP29A
C001-43
5340
K13
6414 G/TQ/Y
C001-21
7660
1010 G
SP24
C269-34
4800
1001 W/R
7610
150 N
C101-21
1250
C325-21
C079-16
SP02
K5
+15
K3
MF1
80A
G2
C013
SP14
C001-45
C001-46
C001-47
C001-48
SP07
1006 N
C001-14
7280
6408 G/O/Y
C242-1
6408 G/O/Y
1001 W
M1
C006
+30A
+30B
C351-1
PF1
30A
PF-2
250A
C350-1
G1
12Vcc
C352-1


C354
BRE1632A


C354
1: FM-6580-K
2: FM-6586A-P
1: FM-57FC-B
2: FM-57FD-B
3: FM-57FE-B
4: FM-57FG-B
BRE1632B


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 3042 – COLD START RELAY OPEN CIRCUIT OR DISCONNECTED

Effects:

Possible starting difficulty

Possible failure modes:

1. Faulty connector
2. Faulty fuel heater relay
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel heater relay connector **C354** and the engine controller connector **C242**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for open circuit.

   A. Disconnect connector **C242** and remove the fuel heater relay **C354**. Check between connectors:

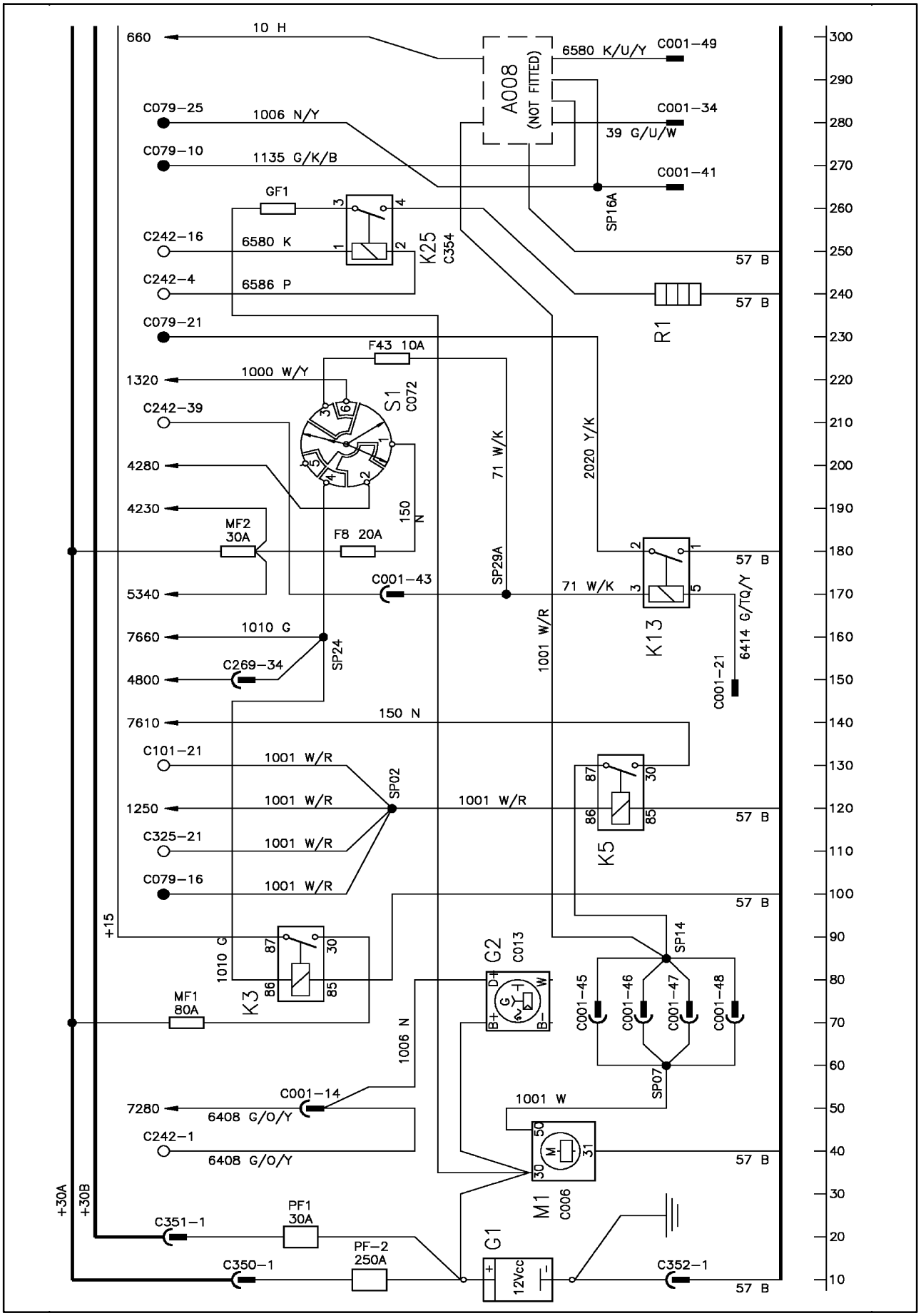
   C354 pin **1 (K)** and **C242** pin **16 (K)**

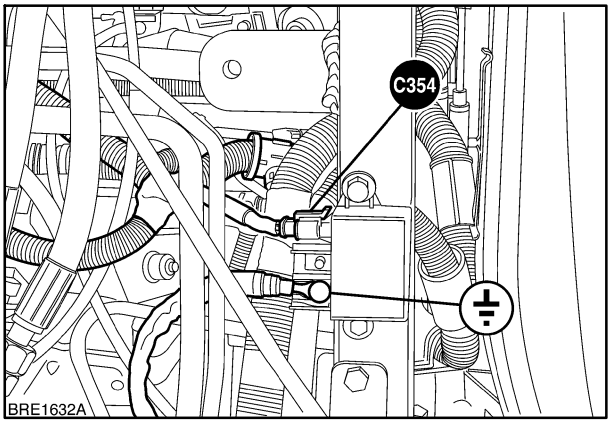
   C354 pin **2 (P)** and **C242** pin **4 (P)**

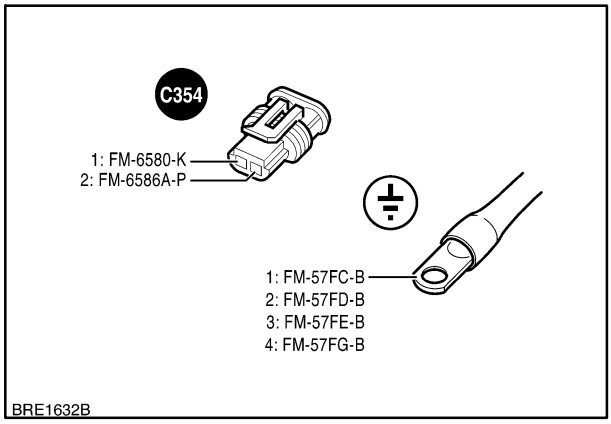
   If an open circuit is indicated, repair or replace the harness as required.

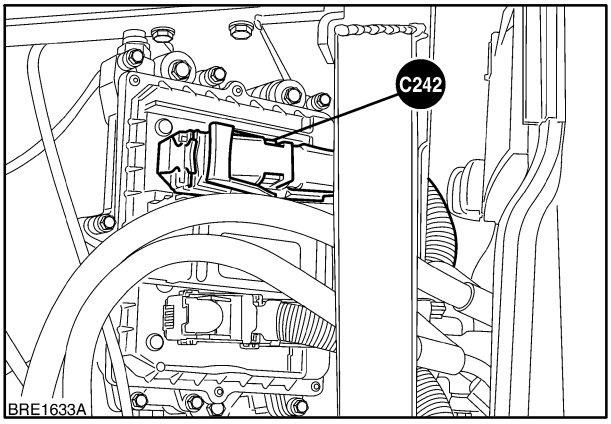
   B. If the harness is okay, replace the fuel heater relay.

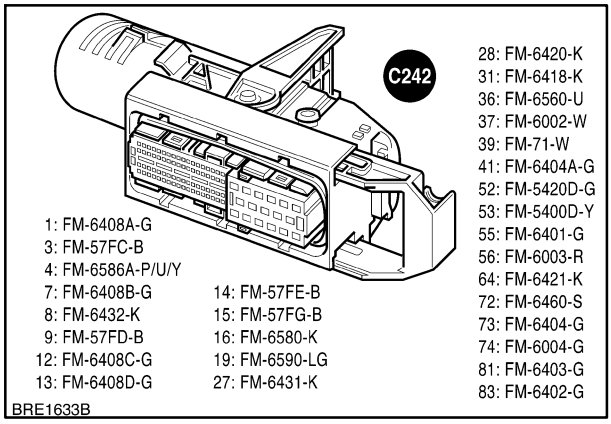
   If the fault persists, download the the correct level of software. If the fault re–occurs, remove and replace the engine controller.


660
10 H
A008
(NOT FITTED)
6580 K/U/Y
C001-49
C079-25
1006 N/Y
C001-34
39 G/U/W
C079-10
1135 G/K/B
C001-41
SP16A
GF1
C242-16
6580 K
K25
C354
57 B
C242-4
6586 P
57 B
R1
C079-21
F43 10A
1320
1000 W/Y
S1
C072
C242-39
4280
71 W/K
2020 Y/K
4230
150 N
MF2
30A
F8 20A
SP29A
C001-43
71 W/K
57 B
5340
K13
6414 G/TQ/Y
7660
1010 G
SP24
C269-34
4800
1001 W/R
C001-21
7610
150 N
C101-21
1001 W/R
SP02
1250
1001 W/R
1001 W/R
57 B
K5
C325-21
1001 W/R
C079-16
1001 W/R
57 B
+15
1010 G
K3
G2
C013
SP14
MF1
80A
C001-45
C001-46
C001-47
C001-48
1006 N
C001-14
7280
6408 G/O/Y
SP07
1001 W
C242-1
6408 G/O/Y
57 B
M1
C006
+30A
+30B
C351-1
PF1
30A
G1
PF-2
250A
C350-1
12Vcc
C352-1
57 B


C354
BRE1632A


C354
1: FM-6580-K
2: FM-6586A-P
1: FM-57FC-B
2: FM-57FD-B
3: FM-57FE-B
4: FM-57FG-B
BRE1632B


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 3049 - BATTERY VOLTAGE SIGNAL HIGH VALUE

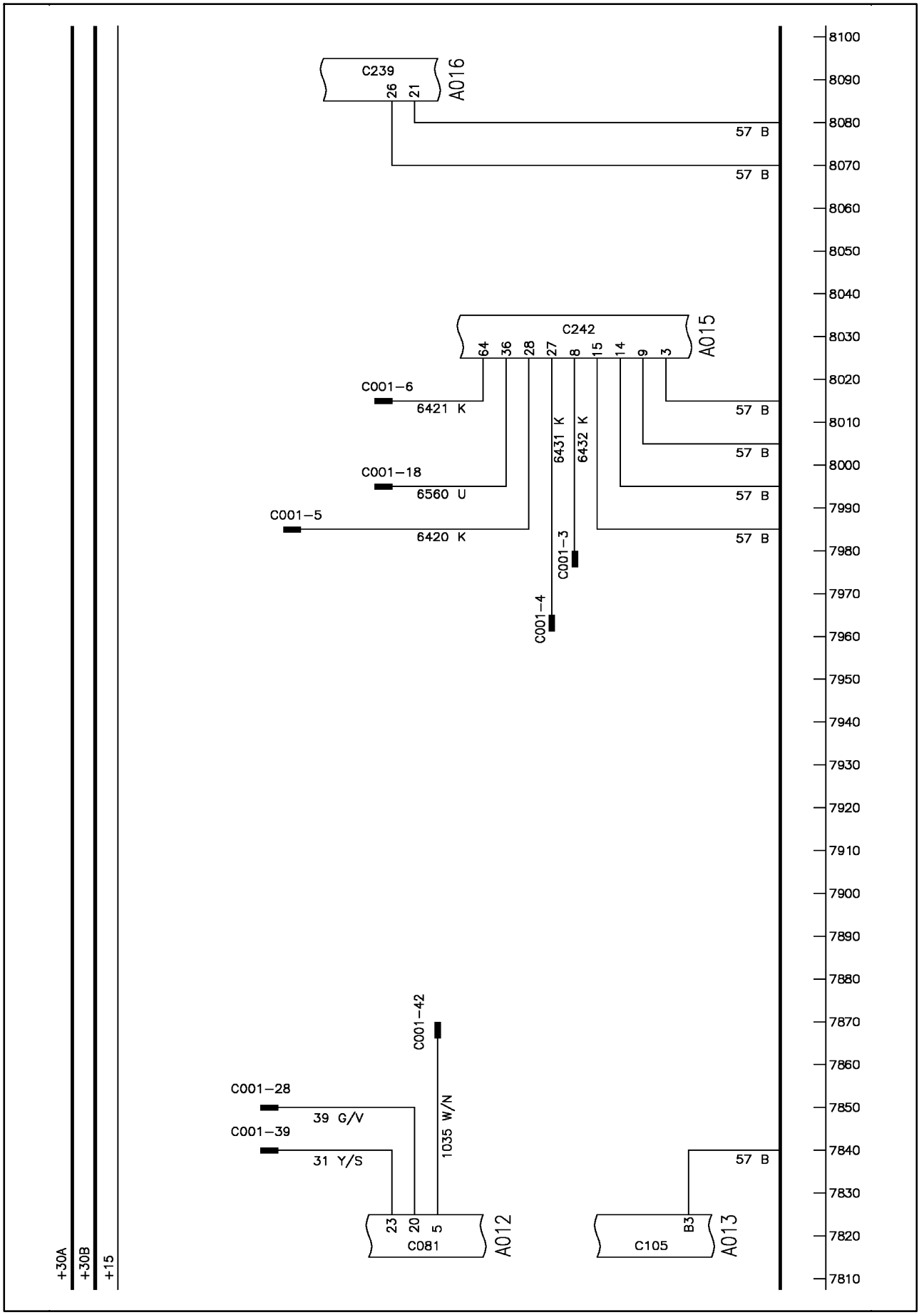
Possible failure modes:

1. Faulty battery or terminals
2. Faulty external power supply connected
3. Faulty charging system
4. Faulty connector
5. Faulty harness
6. Chassis ground

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the battery condition and terminal connections.
   A. If the battery or terminals are faulty, repair or replace as required.
   B. If the battery and terminals are okay, continue to step 4.
4. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is not between 12 and 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 5.
5. Check the engine control module connectors **C315**, **C316** and **C242**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 6.
6. Check all power supplies (fuse 27) and grounds to the engine controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, ensure battery is in good condition and fully charged.


+30A
+30B
+15
C239
26
21
A016
57 B
57 B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
C001-3
C001-4
57 B
57 B
57 B
57 B
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012
B3
C105
A013
57 B
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
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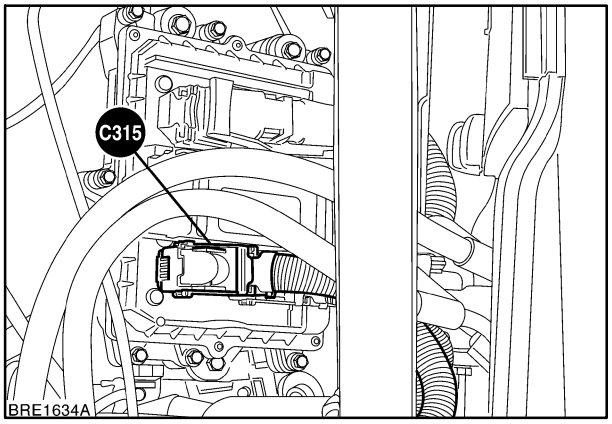
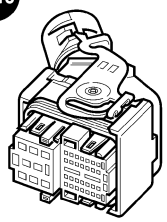
7810



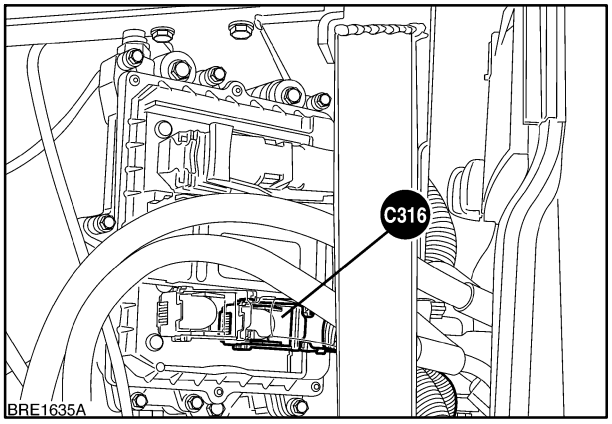
C315

5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B



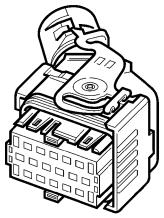
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y

BRE1634B



C316

3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U



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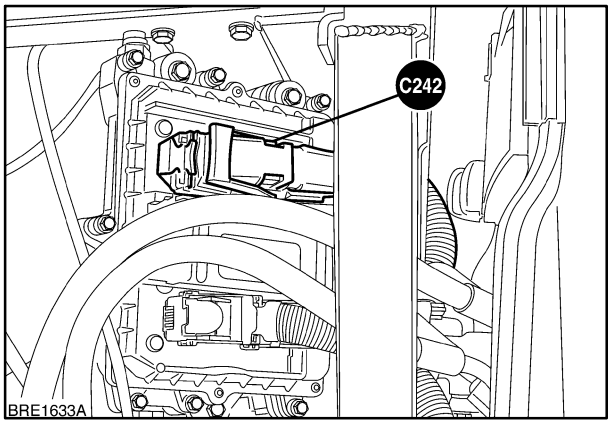
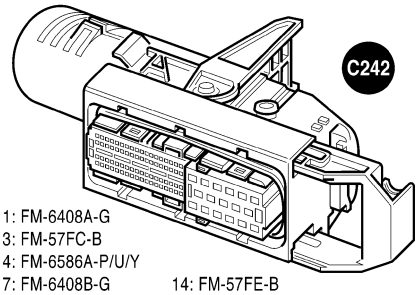


C242



1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K

28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B

ERROR CODE 3050 - BATTERY VOLTAGE SIGNAL LOW VALUE

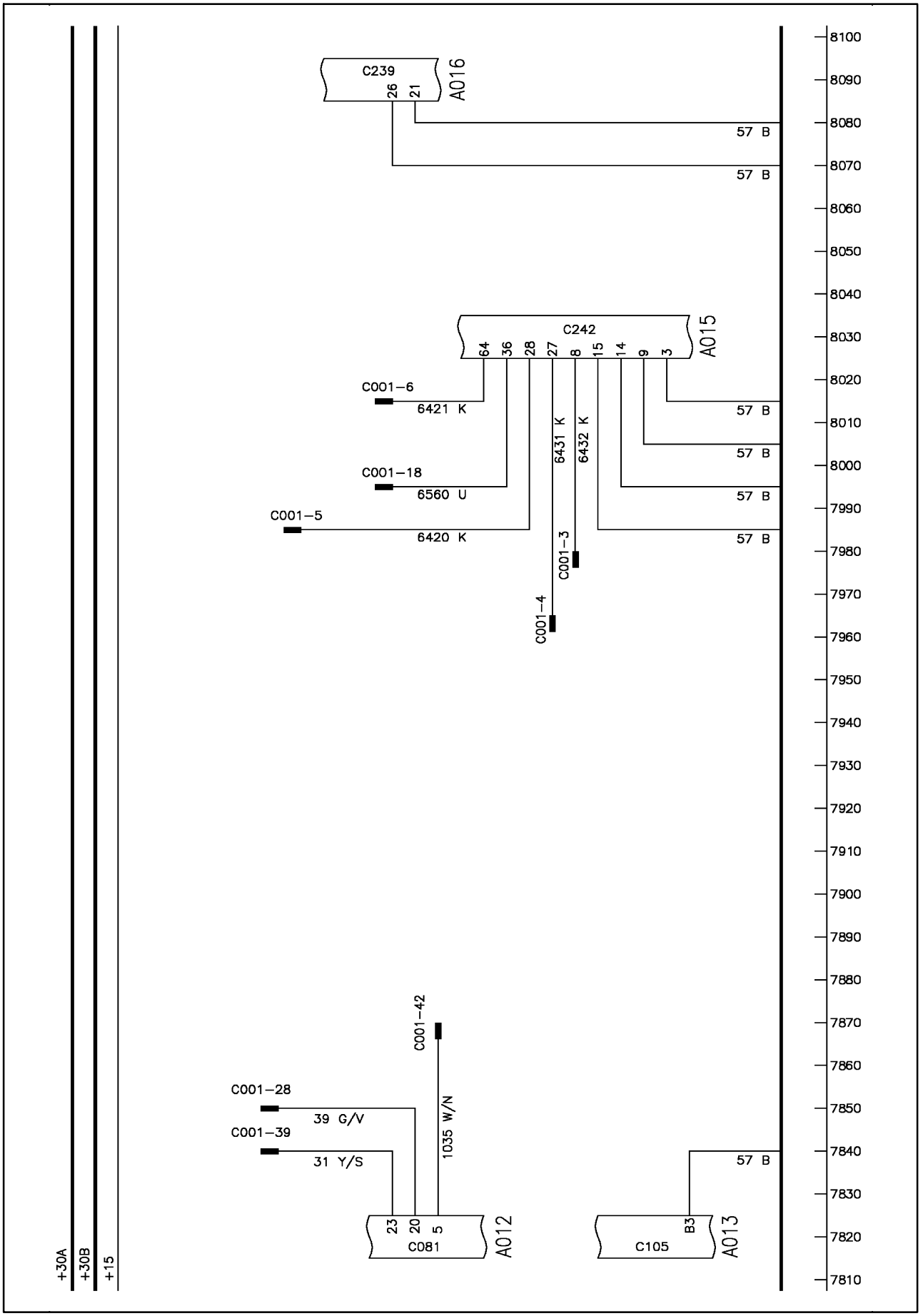
Possible failure modes:

1. Faulty battery or terminals
2. Faulty external power supply connected
3. Faulty charging system
4. Faulty connector
5. Faulty harness
6. Chassis ground

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the battery condition and terminal connections.
   A. If the battery or terminals are faulty, repair or replace as required.
   B. If the battery and terminals are okay, continue to step 4.
4. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is not between 12 and 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 5.
5. Check the engine control module connectors **C315**, **C316** and **C242**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 6.
6. Check all power supplies (fuse 27) and grounds to the engine controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, ensure battery is in good condition and fully charged.


+30A
+30B
+15
C239
26
21
A016
57 B
57 B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
C001-3
C001-4
57 B
57 B
57 B
57 B
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012
B3
C105
A013
57 B
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
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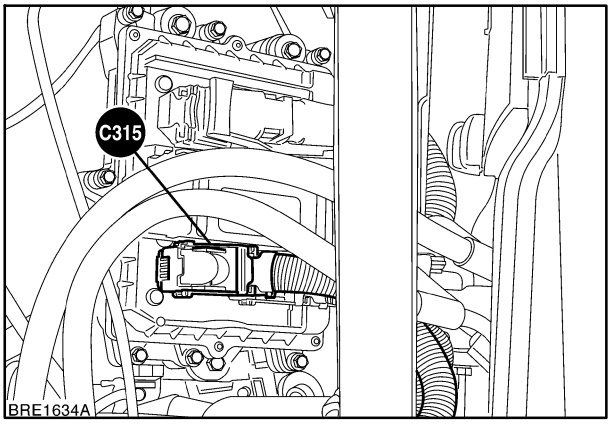
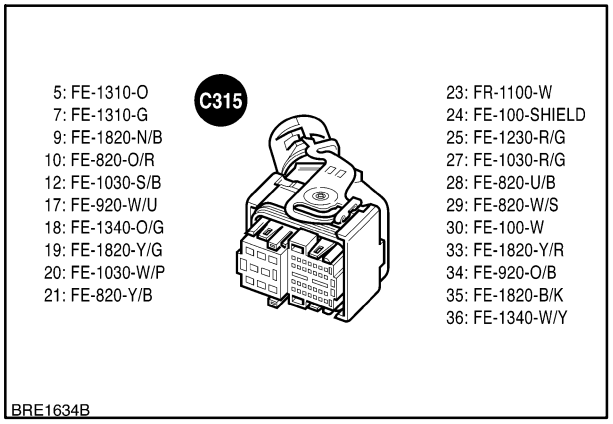
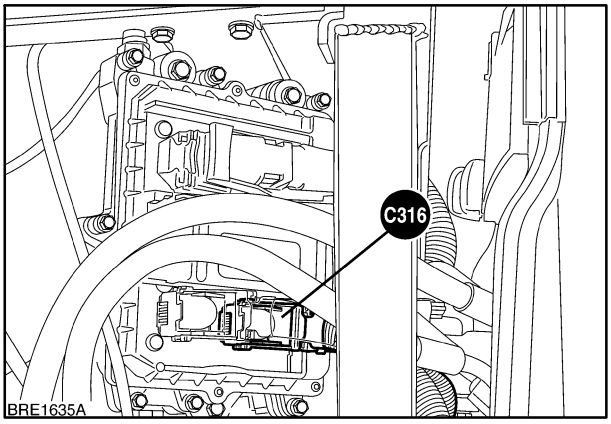
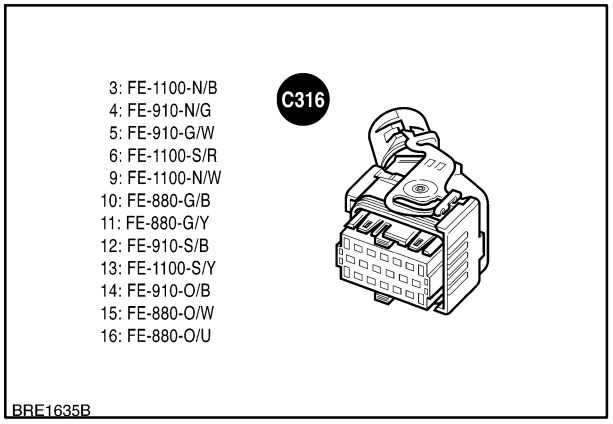
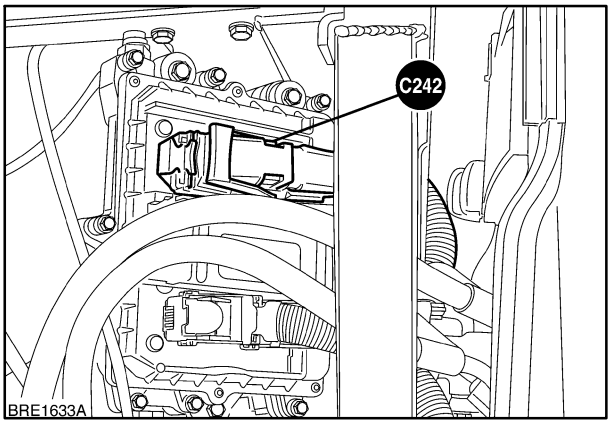
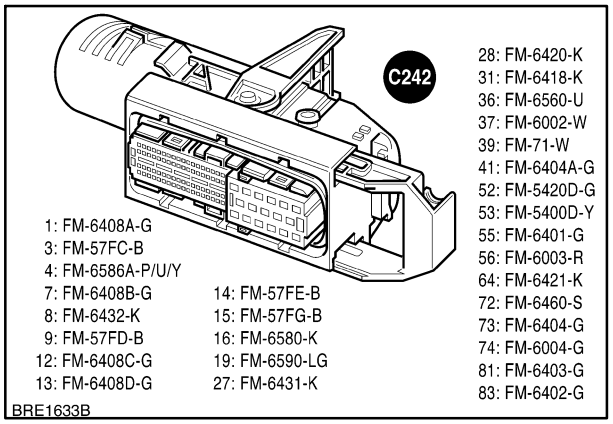

C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C316
BRE1635A


C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 3051 - BATTERY VOLTAGE SIGNAL HIGH VOLTAGE

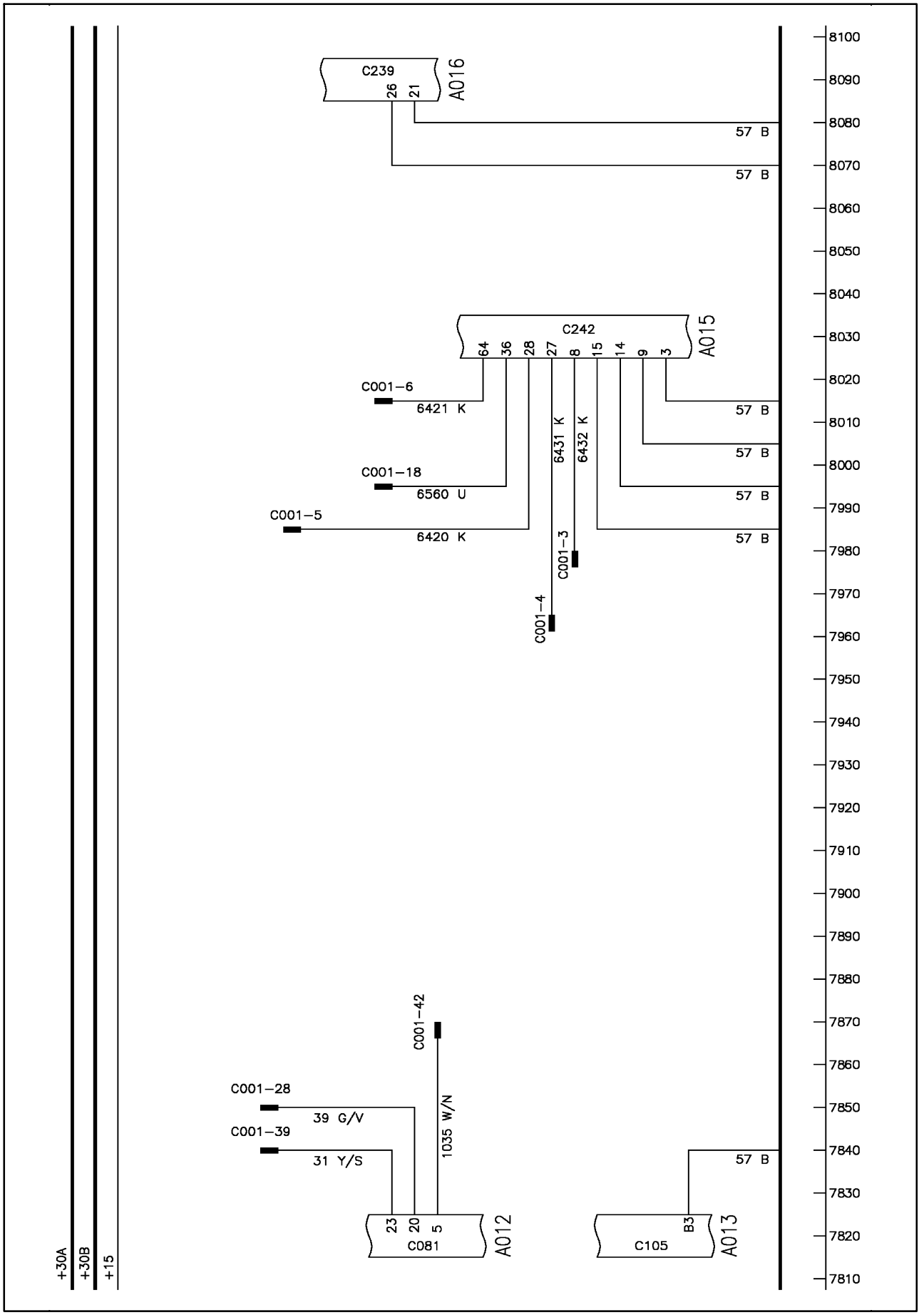
Possible failure modes:

1. Faulty battery or terminals
2. Faulty external power supply connected
3. Faulty charging system
4. Faulty connector
5. Faulty harness
6. Chassis ground

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the battery condition and terminal connections.
   A. If the battery or terminals are faulty, repair or replace as required.
   B. If the battery and terminals are okay, continue to step 4.
4. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is not between 12 and 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 5.
5. Check the engine control module connectors **C315**, **C316** and **C242**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 6.
6. Check all power supplies (fuse 27) and grounds to the engine controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, ensure battery is in good condition and fully charged.


+30A
+30B
+15
C239
26
21
A016
57 B
57 B
C242
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15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
C001-3
C001-4
57 B
57 B
57 B
57 B
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012
B3
C105
A013
57 B
8100
8090
8080
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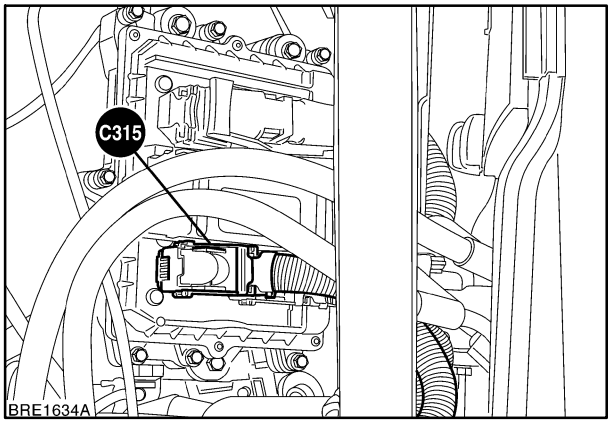
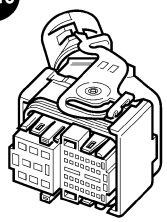


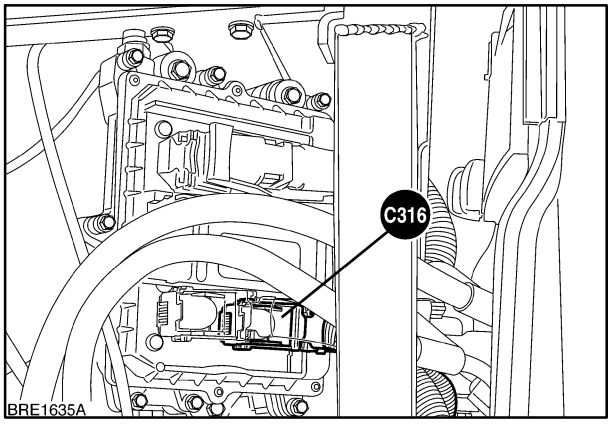
C315

5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B



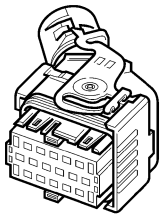
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y

BRE1634B



C316

3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U



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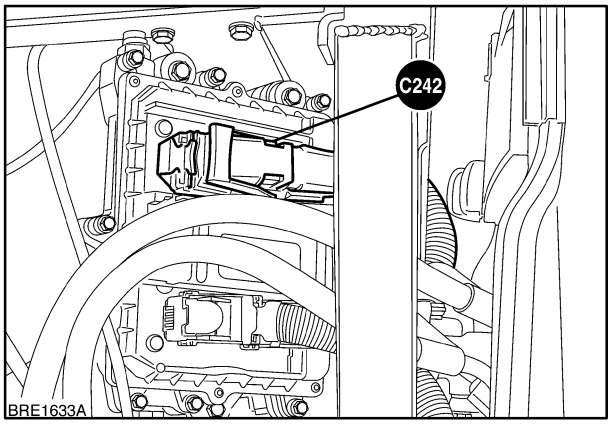
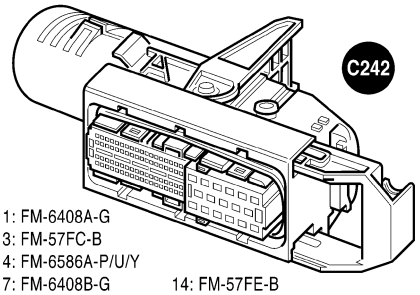


C242



1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K

28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B

ERROR CODE 3052 - BATTERY VOLTAGE SIGNAL LOW VOLTAGE

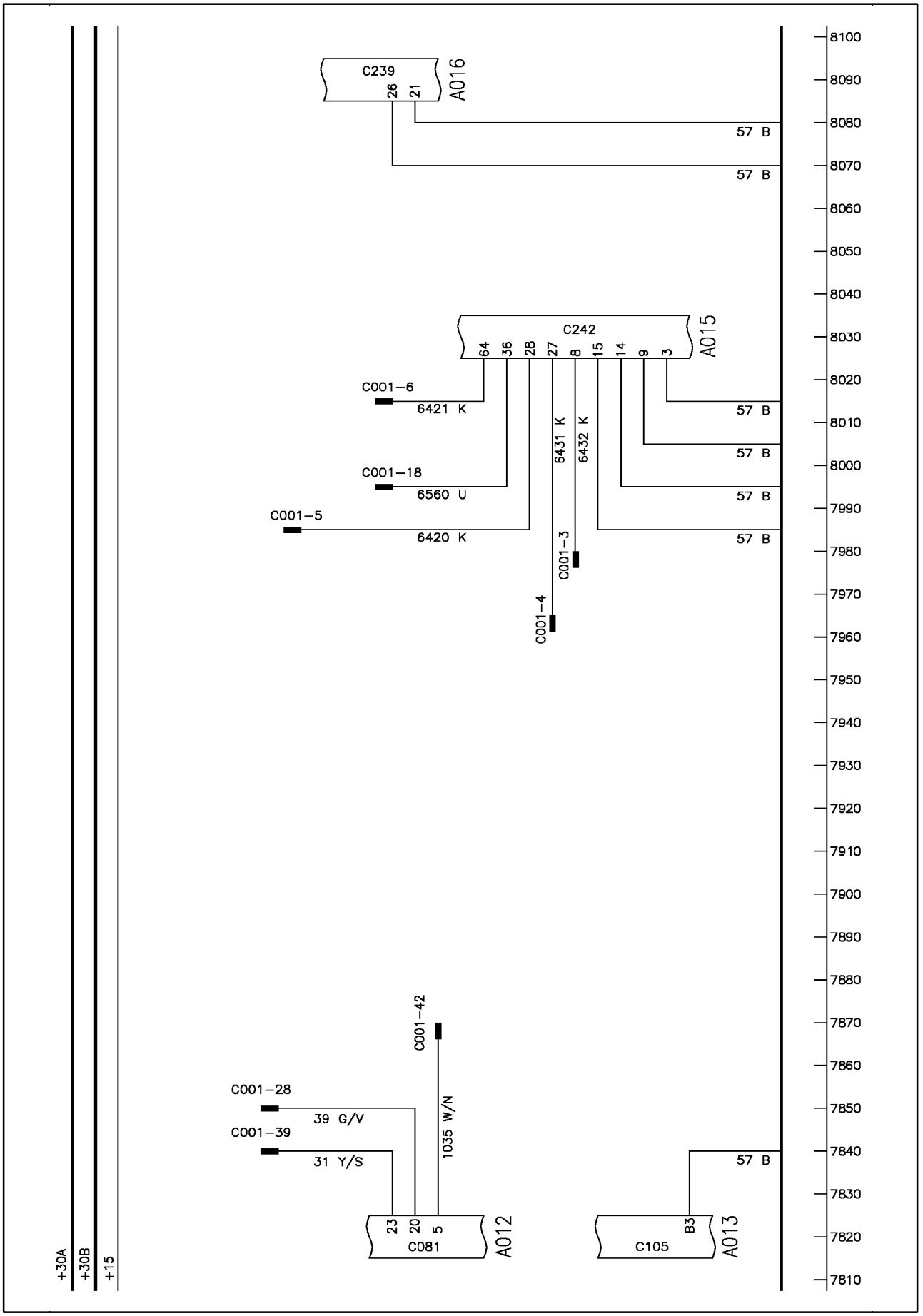
Possible failure modes:

1. Faulty battery or terminals
2. Faulty external power supply connected
3. Faulty charging system
4. Faulty connector
5. Faulty harness
6. Chassis ground

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the battery condition and terminal connections.
   A. If the battery or terminals are faulty, repair or replace as required.
   B. If the battery and terminals are okay, continue to step 4.
4. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is not between 12 and 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 5.
5. Check the engine control module connectors **C315**, **C316** and **C242**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 6.
6. Check all power supplies (fuse 27) and grounds to the engine controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, ensure battery is in good condition and fully charged.


+30A
+30B
+15
C239
26
21
A016
57 B
57 B
C242
64
36
28
27
8
15
14
9
3
A015
C001-6
6421 K
C001-18
6560 U
C001-5
6420 K
6431 K
6432 K
C001-3
C001-4
57 B
57 B
57 B
57 B
C001-42
C001-28
39 G/V
C001-39
31 Y/S
1035 W/N
23
20
5
C081
A012
B3
C105
A013
57 B
8100
8090
8080
8070
8060
8050
8040
8030
8020
8010
8000
7990
7980
7970
7960
7950
7940
7930
7920
7910
7900
7890
7880
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7860
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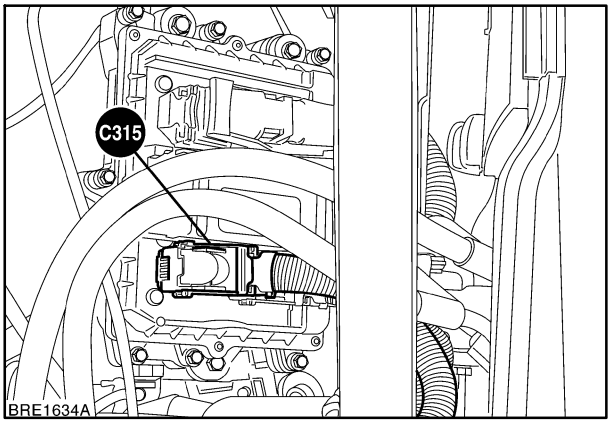
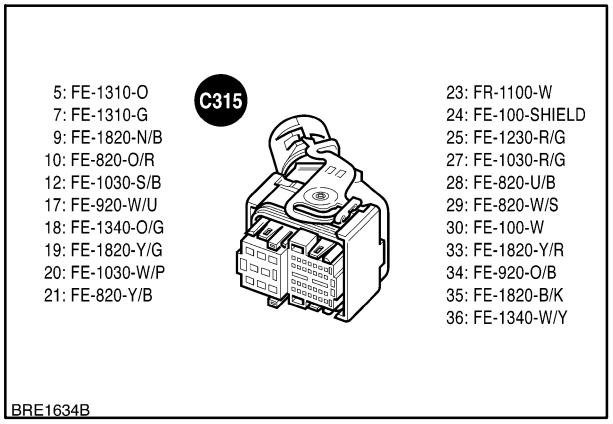
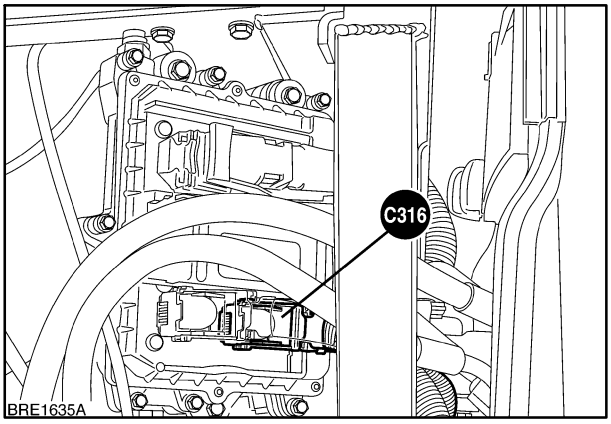
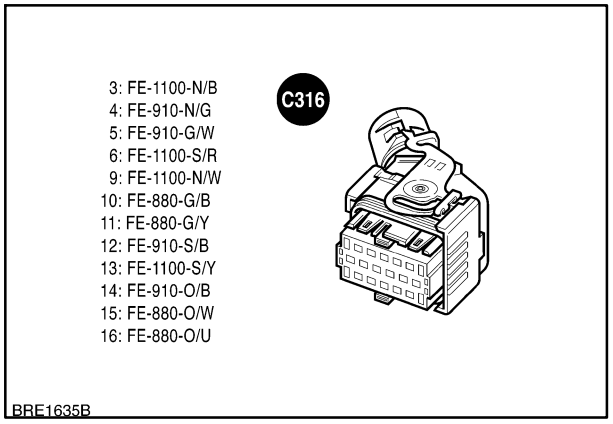
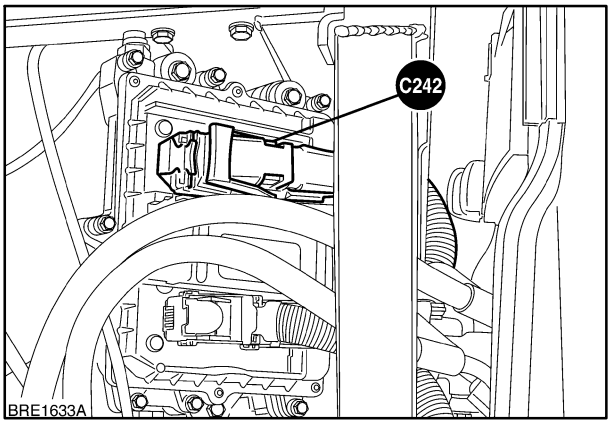
7830
7820
7810

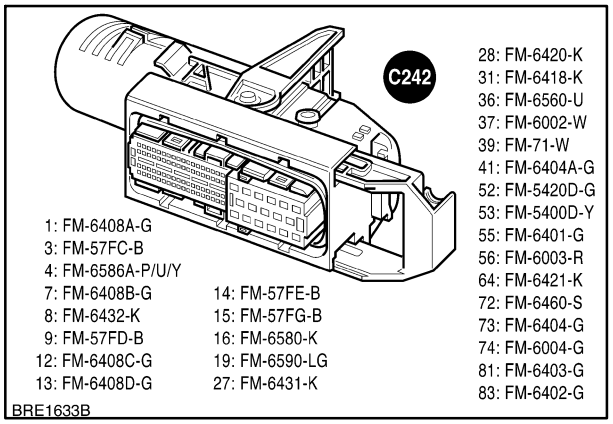

C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C316
BRE1635A


C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 3060 - FUEL INJECTOR SOLENOID 1 CURRENT DECREASED TO FAST

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 1
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 1 connector **C434** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 1 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximately 0.50 - 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C434**. Check between the component side of the connector:

   C434 pin **3** and the appropriate fuel injector terminal

   C434 pin **4** and the appropriate fuel injector terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C434 pin **3** and **ground**

   C434 pin **4** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for a short to ground.

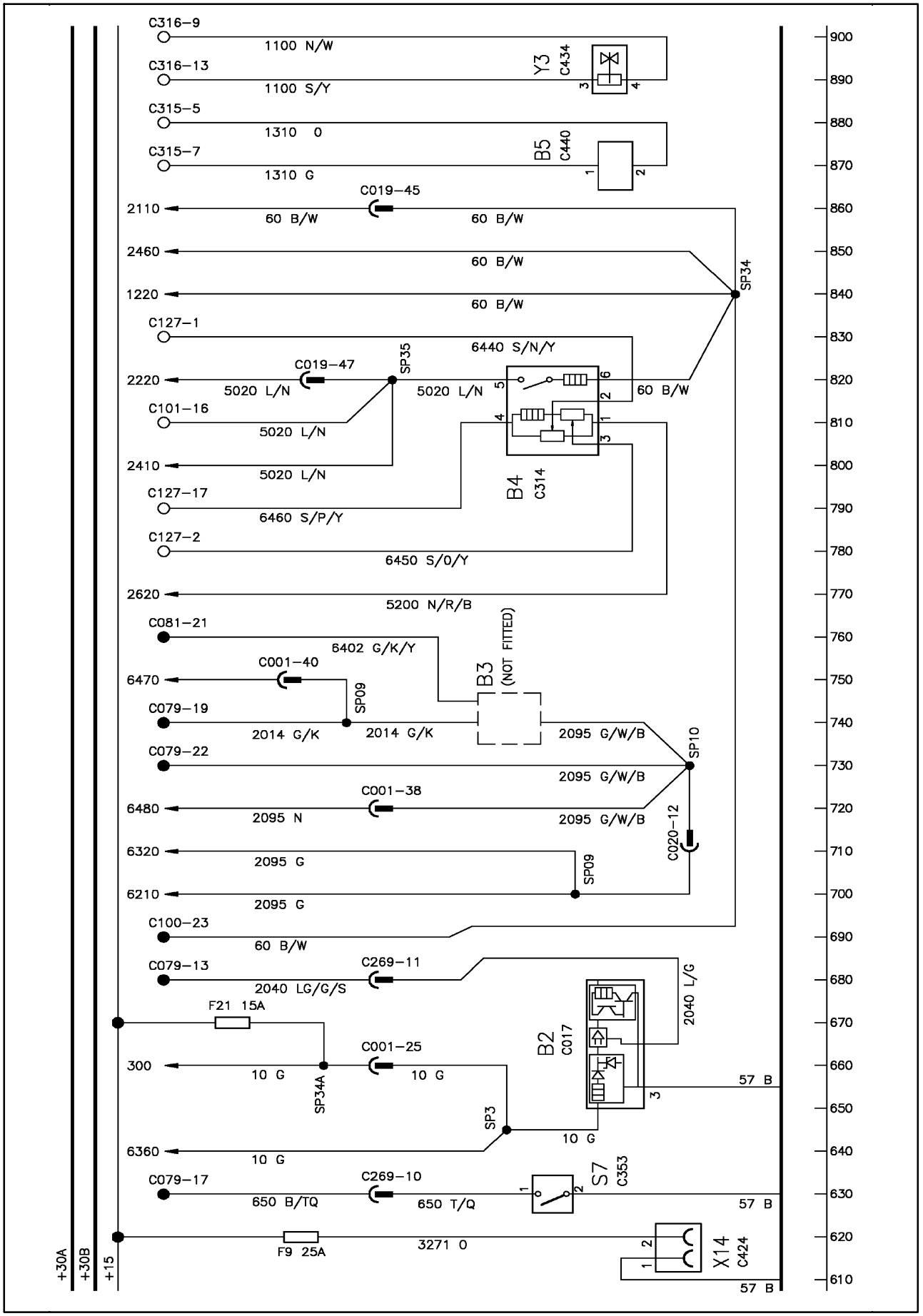
   A. Disconnect connector **C316**. Check between connector:

   C434 pin **3 (S/Y)** and **ground**

   C434 pin **4 (N/W)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
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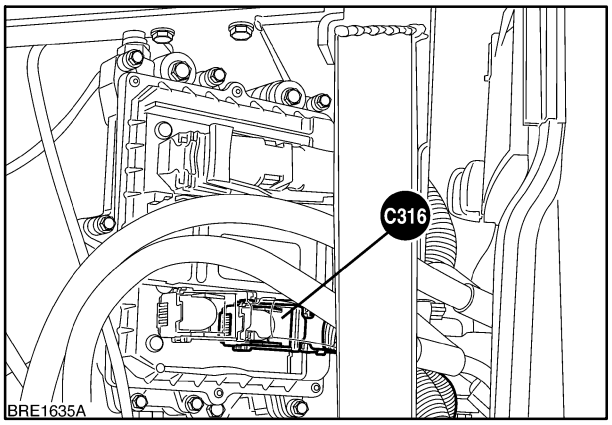
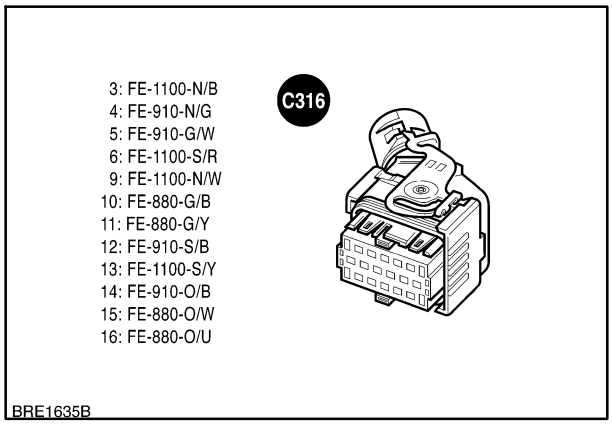
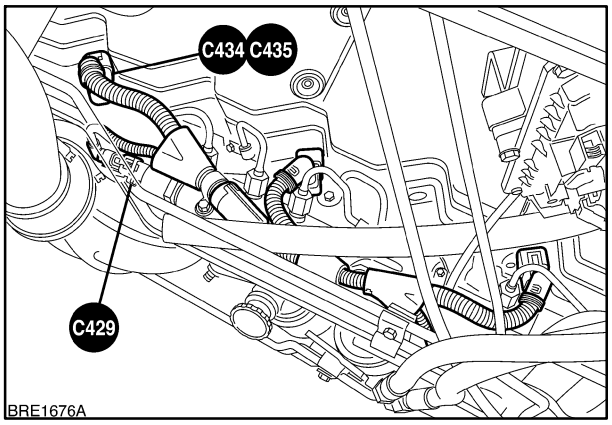
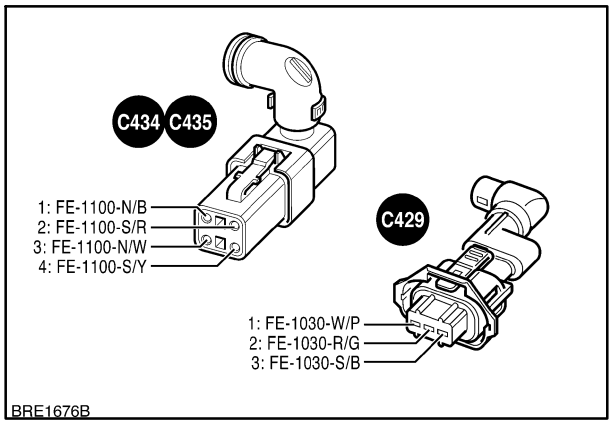
650
640
630
620
610


C316
BRE1635A


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C434
C435
C429
BRE1676A


C434
C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3061 – FUEL INJECTOR SOLENOID 1 SHORT TO VCC

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 1
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 1 connector **C434** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve.

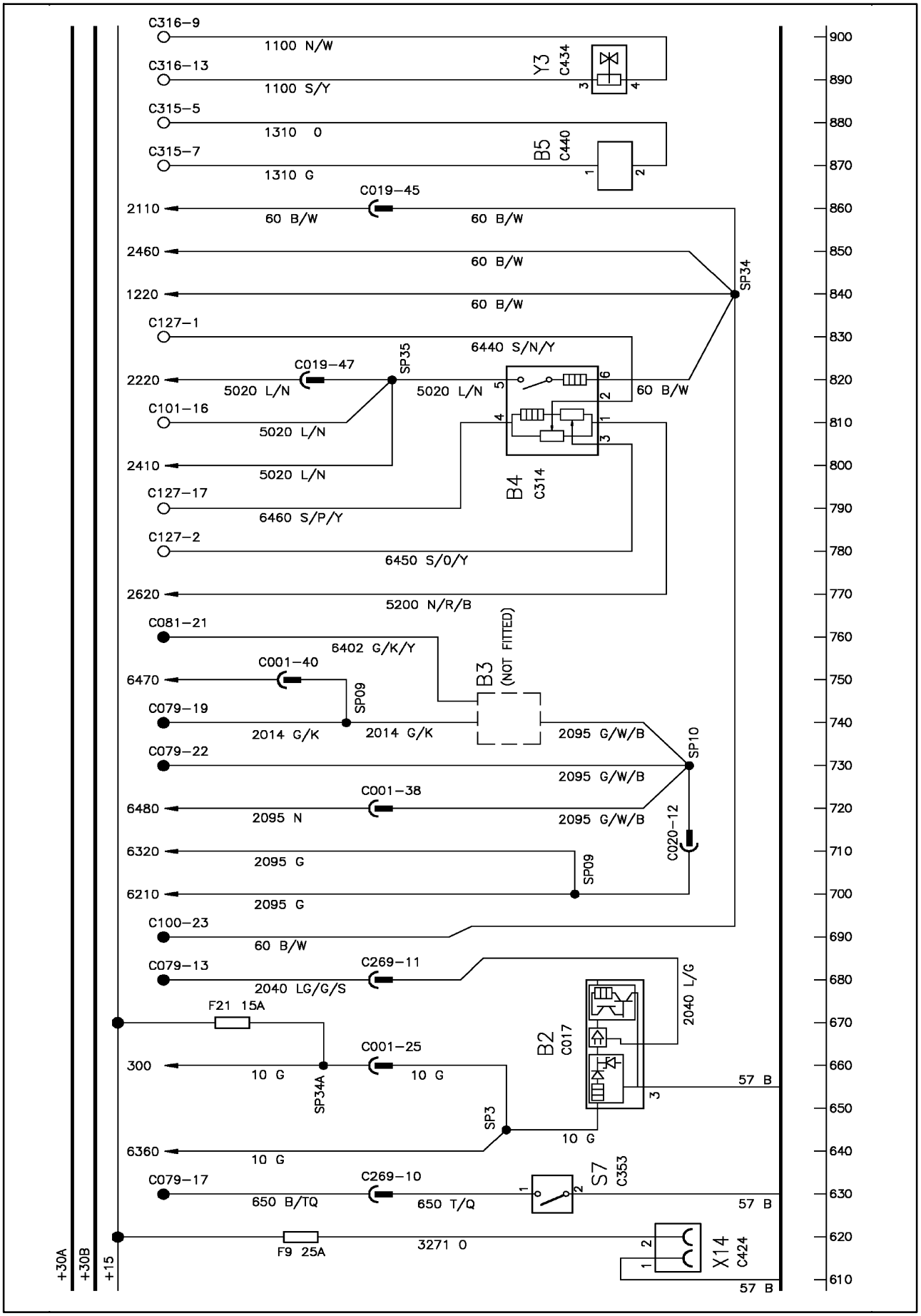
   A. Disconnect connector **C434**. Turn the ketstart ON. Check between connector:

   C434 pin **3 (S/Y)** and **ground**

   C434 pin **4 (N/W)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
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620
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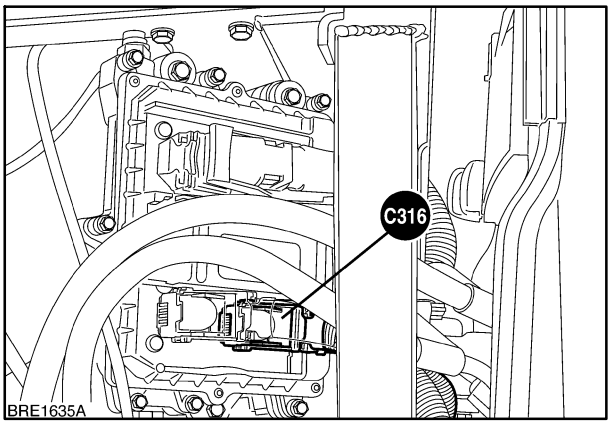
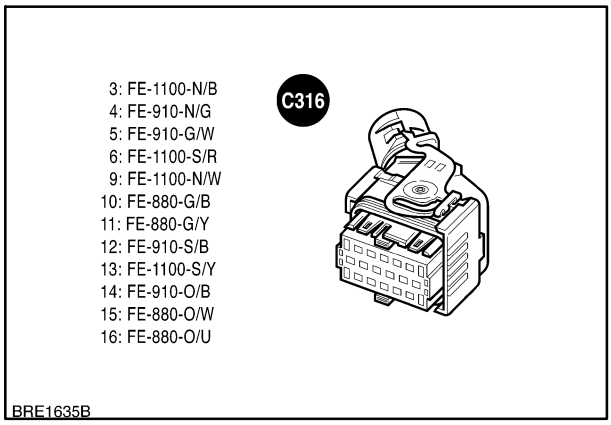

C316
BRE1635A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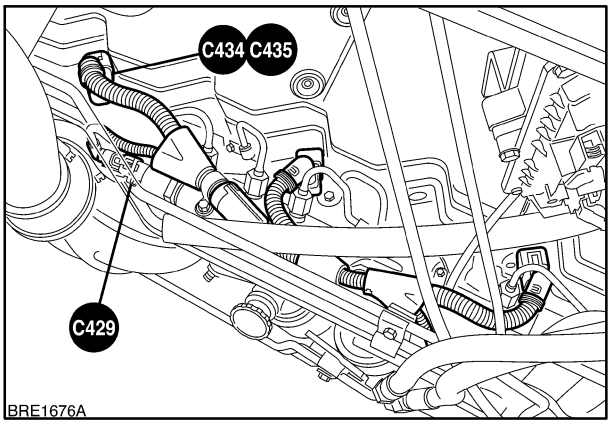
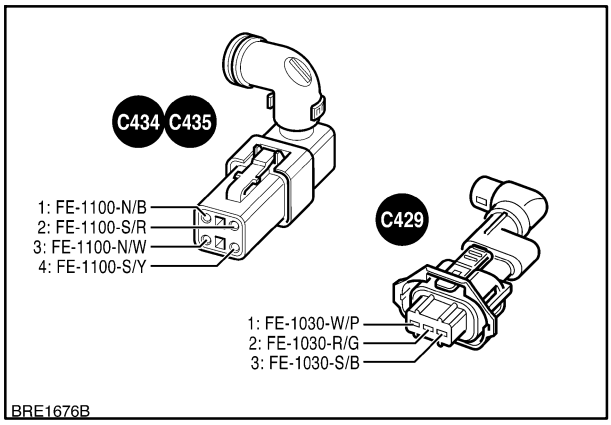
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C434 C435
C429
BRE1676A


C434 C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3062 - FUEL INJECTOR SOLENOID 1 SHORT TO GROUND

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 1
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 1 connector **C434** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect **C434** and **C316**. Check between connector:

   C434 pin **3 (S/Y)** and **ground**

   C434 pin **4 (N/W)** and **ground**

   If a short to ground indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C434 pin **3** and **ground**

   C434 pin **4** and **ground**

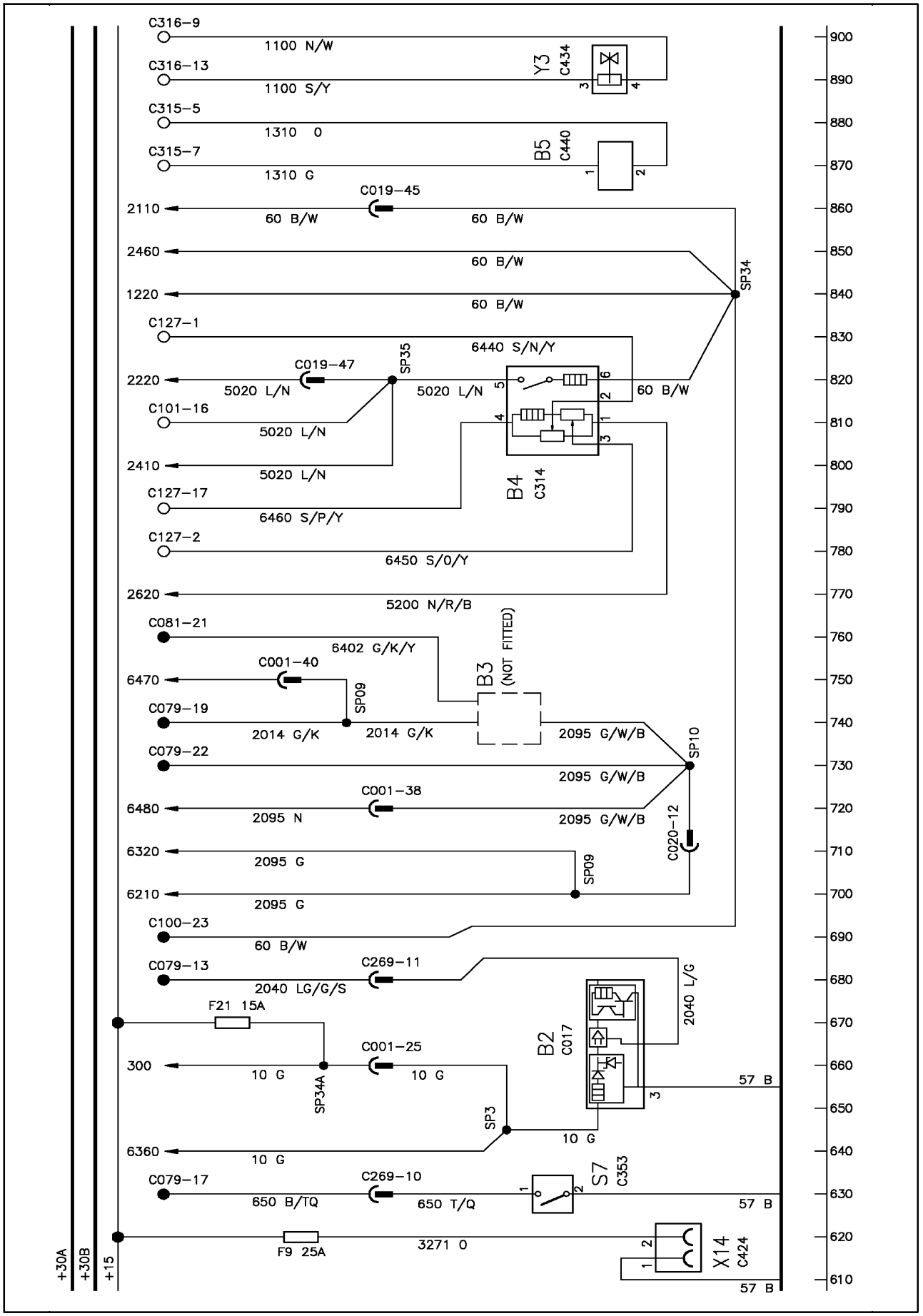
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check fuel injector solenoid for short to ground.

   A. Check between the fuel injector terminals and **ground**. If a short to ground is indicated, remove and replace the fuel injector solenoid.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
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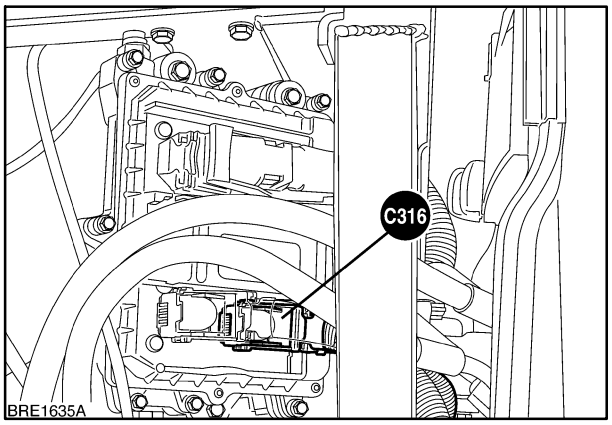
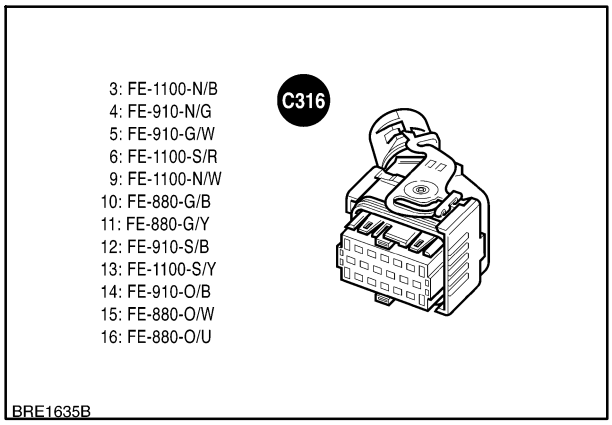
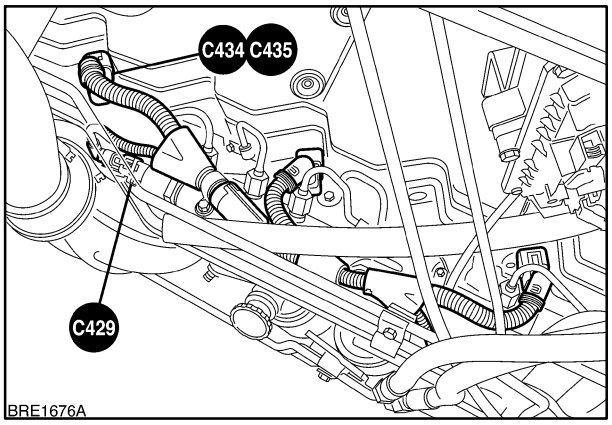
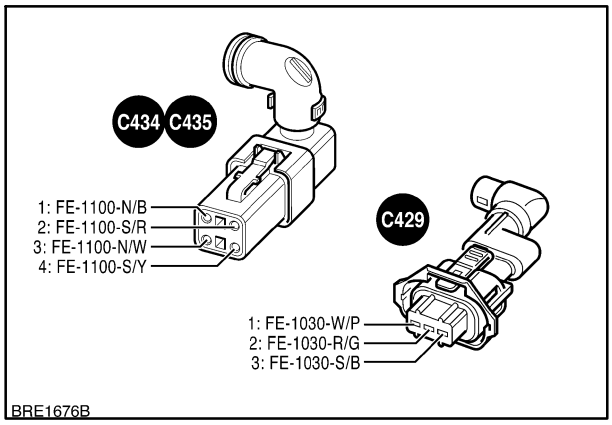

C316
BRE1635A


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C434
C435
C429
BRE1676A


C434
C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3063 – FUEL INJECTOR SOLENOID 1 OPEN CIRCUIT OR DISCONNECTED

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 1
3. Faulty harness
4. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 1 connector **C434** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 1 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximatley 0.50 – 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C434**. Check between the component side of the connector:

   C434 pin **3** and the appropriate fuel injector solenoid terminal

   C434 pin **4** and the appropriate fuel injector solenoid terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

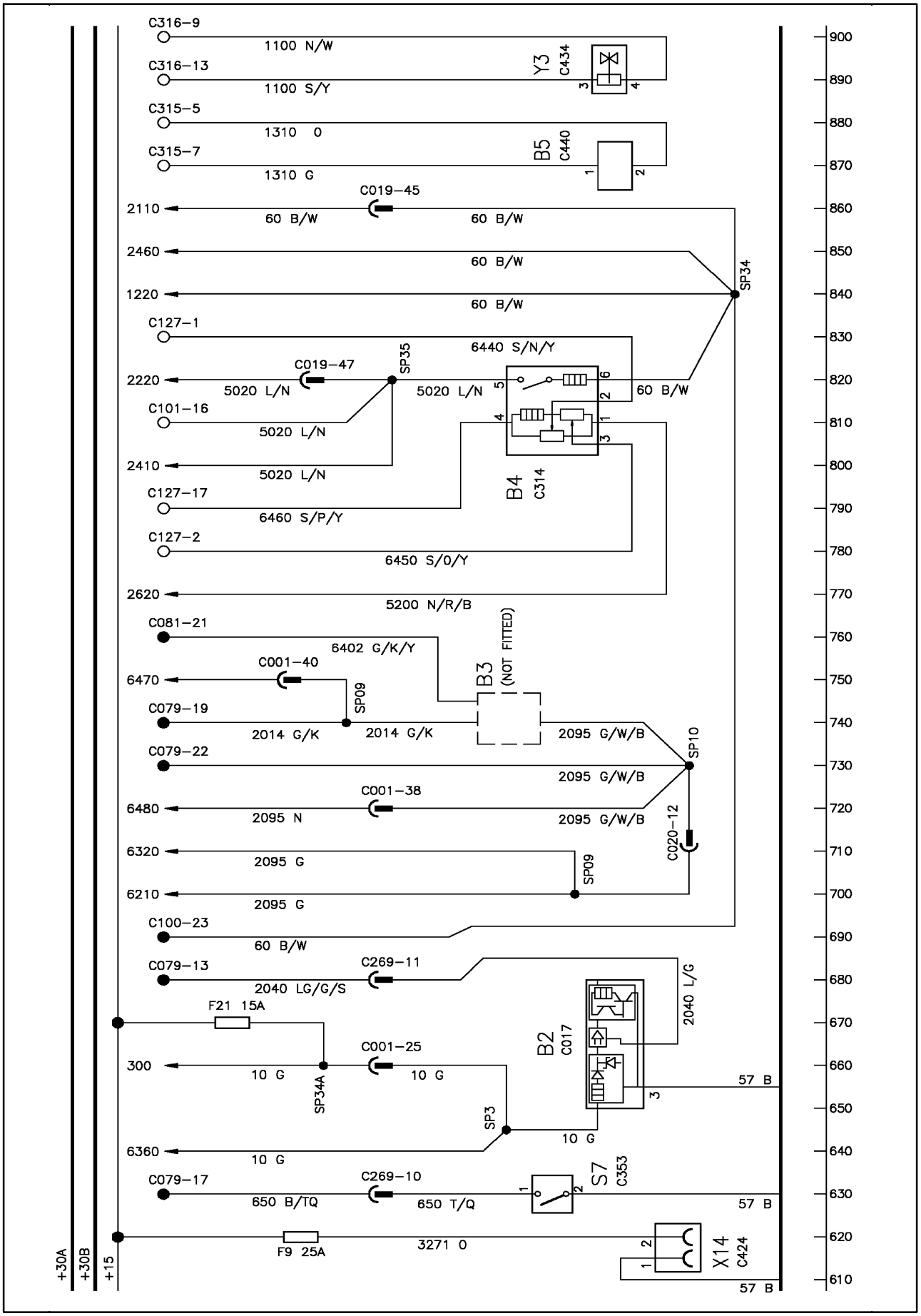
   A. Disconnect connector **C316**. Check between connector:

   C434 pin **3 (S/Y)** and **C316** pin **13 (S/Y)**

   C434 pin **4 (N/W)** and **C316** pin **9 (N/W)**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
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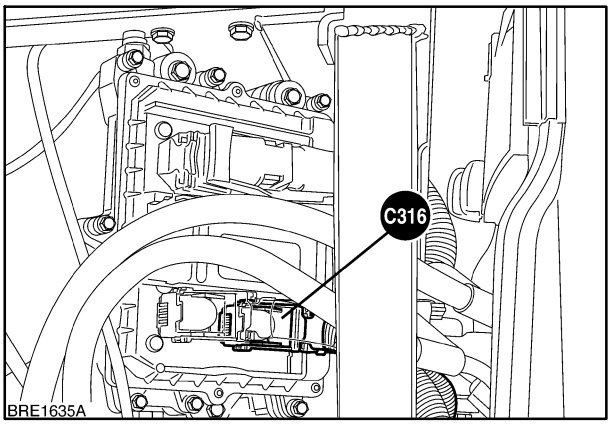
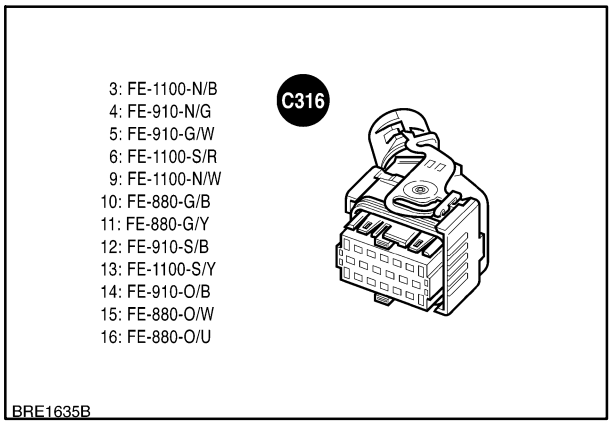
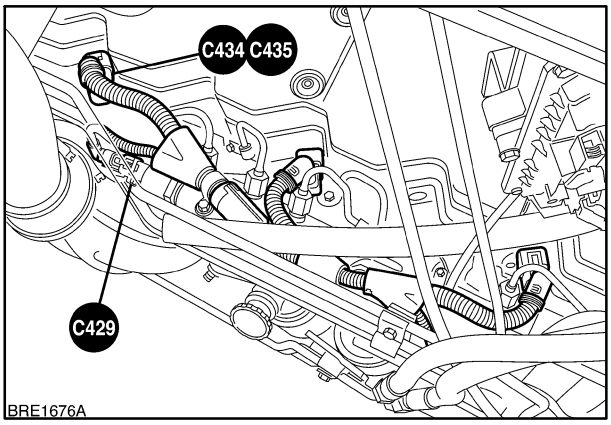
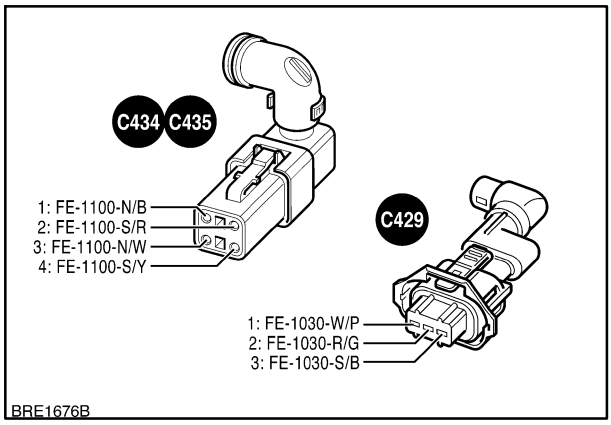

C316
BRE1635A


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C434 C435
C429
BRE1676A


C434 C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3064 - FUEL INJECTOR SOLENOID 5 CURRENT DECREASED TO FAST

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 5
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 5 connector **C438** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 5 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximately 0.50 - 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C438**. Check between the component side of the connector:

   C438 pin **3** and the appropriate fuel injector terminal

   C438 pin **4** and the appropriate fuel injector terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C438 pin **3** and **ground**

   C438 pin **4** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for a short to ground.

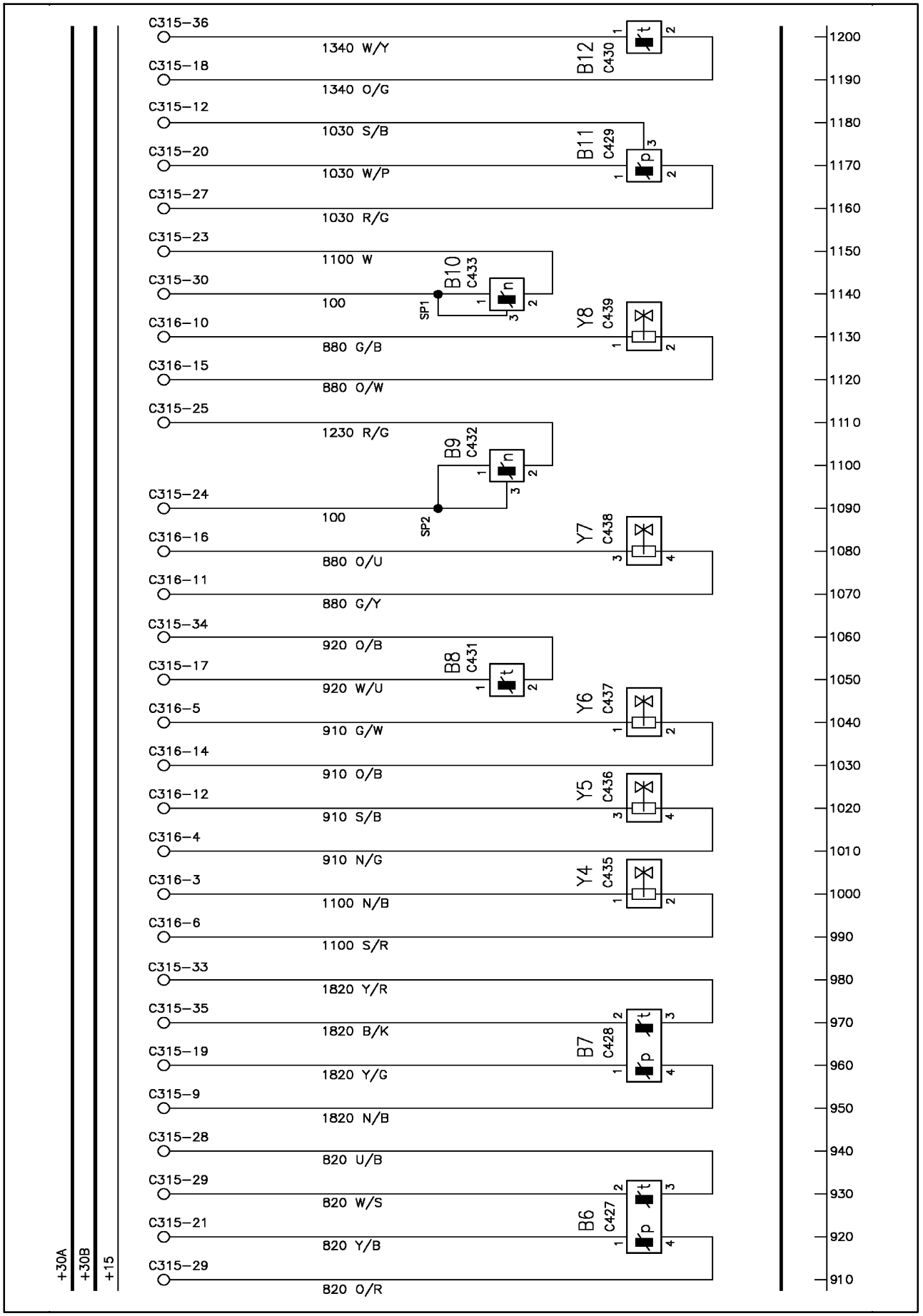
   A. Disconnect connector **C316**. Check between connector:

   C438 pin **3 (O/U)** and **ground**

   C438 pin **4 (G/Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6
C427
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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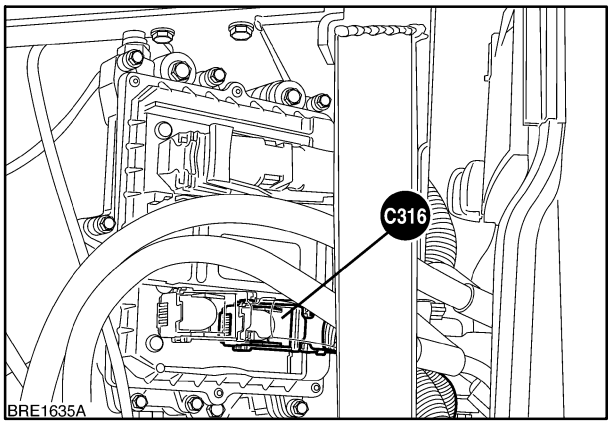
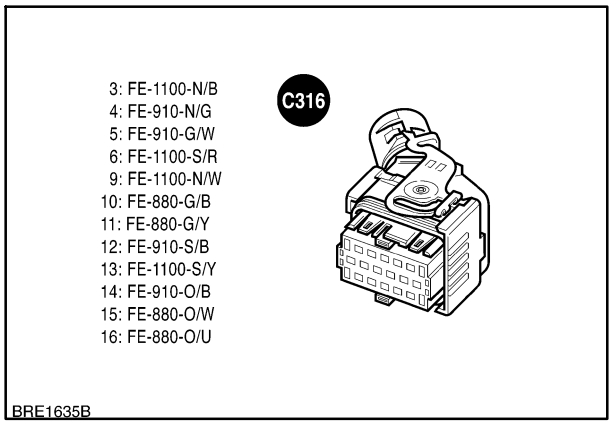
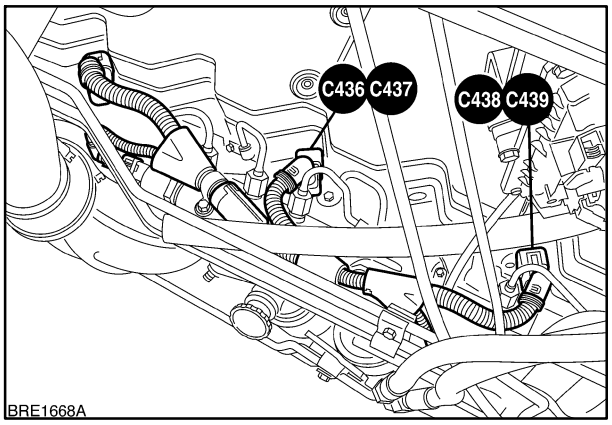
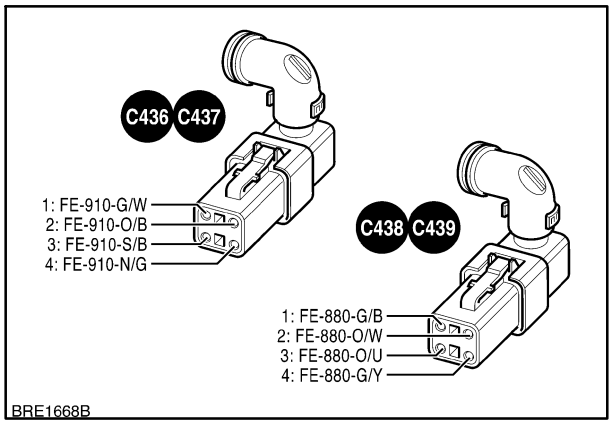
930
920
910


C316
BRE1635A


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
1: FE-910-G/W
2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3065 – FUEL INJECTOR SOLENOID 5 SHORT TO VCC

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 5
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 5 connector **C438** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve.

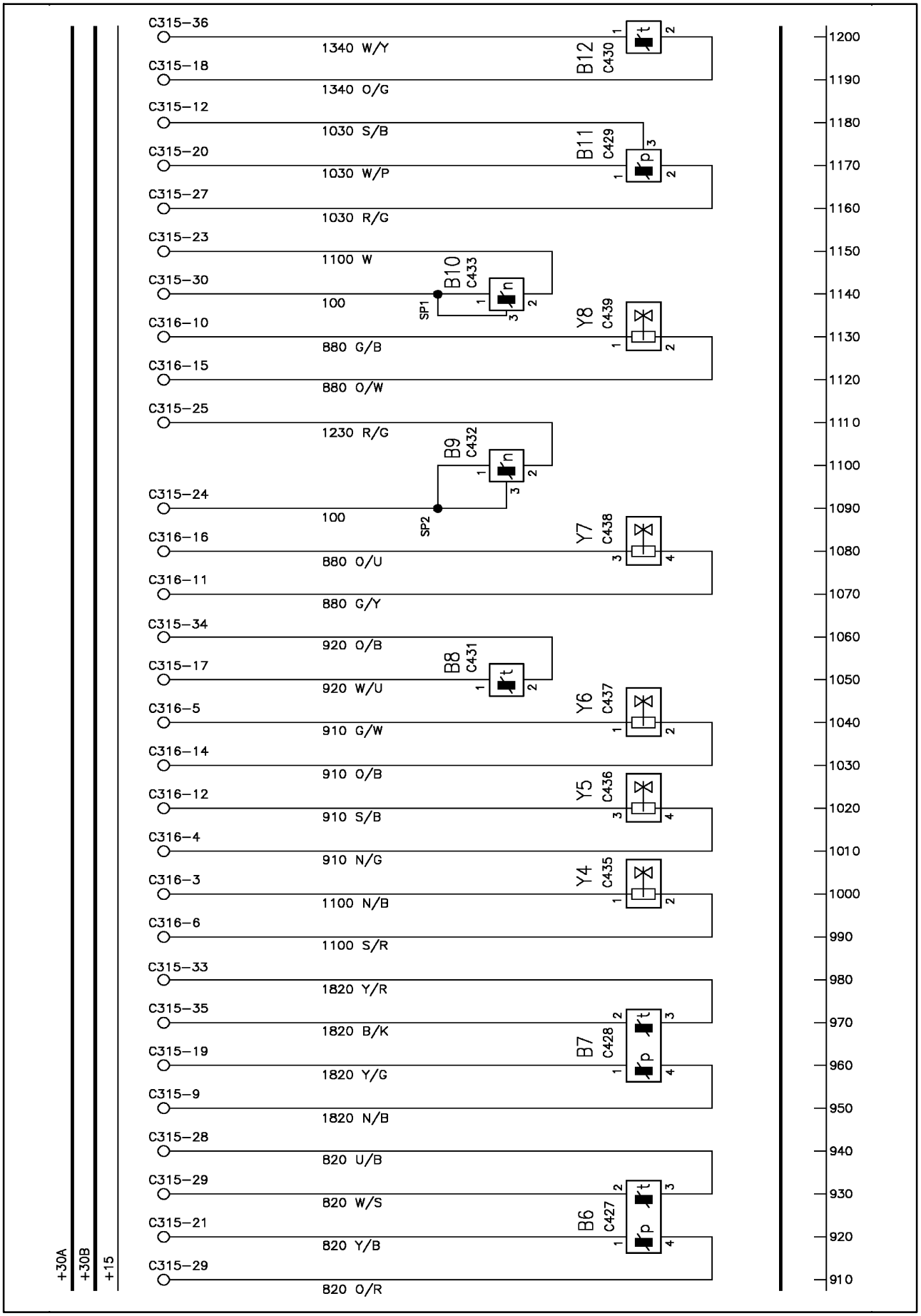
   A. Disconnect connector **C434**. Turn the ketstart ON. Check between connector:

   C438 pin **3 (O/U)** and **ground**

   C438 pin **4 (G/Y)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
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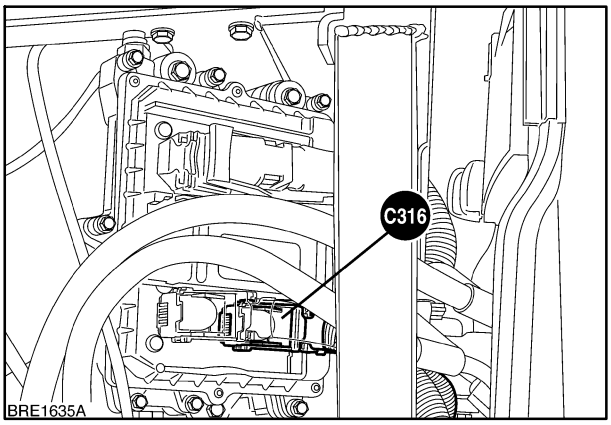
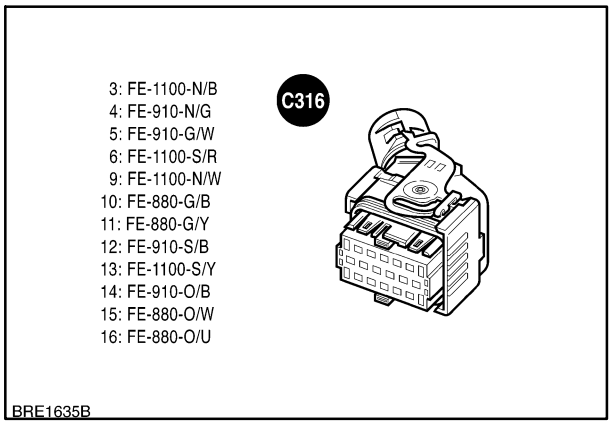
910


C316
BRE1635A


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
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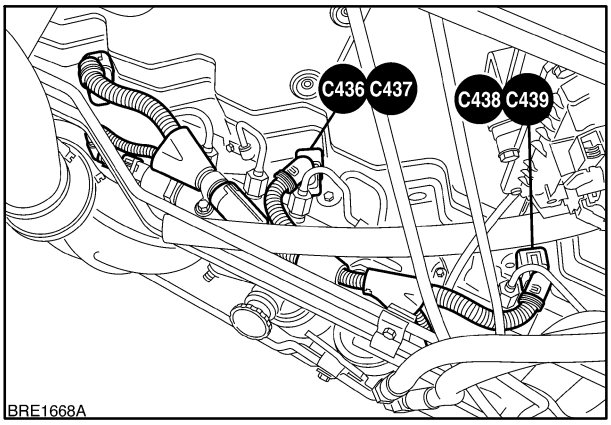
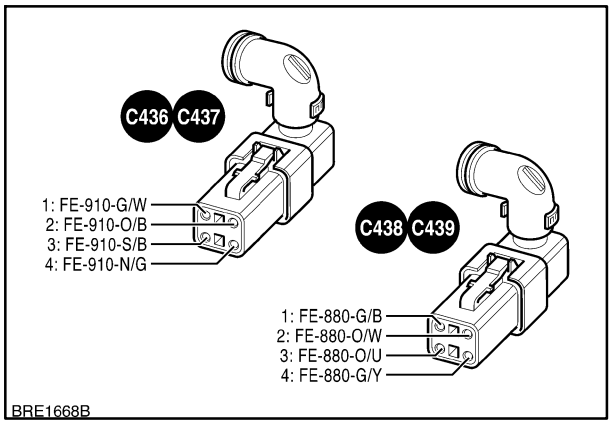
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
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2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3066 - FUEL INJECTOR SOLENOID 5 SHORT TO GROUND

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 5
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 5 connector **C438** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect **C438** and **C316**. Check between connector:

   C438 pin **3 (O/U)** and **ground**

   C438 pin **4 (G/Y)** and **ground**

   If a short to ground indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C438 pin **3** and **ground**

   C438 pin **4** and **ground**

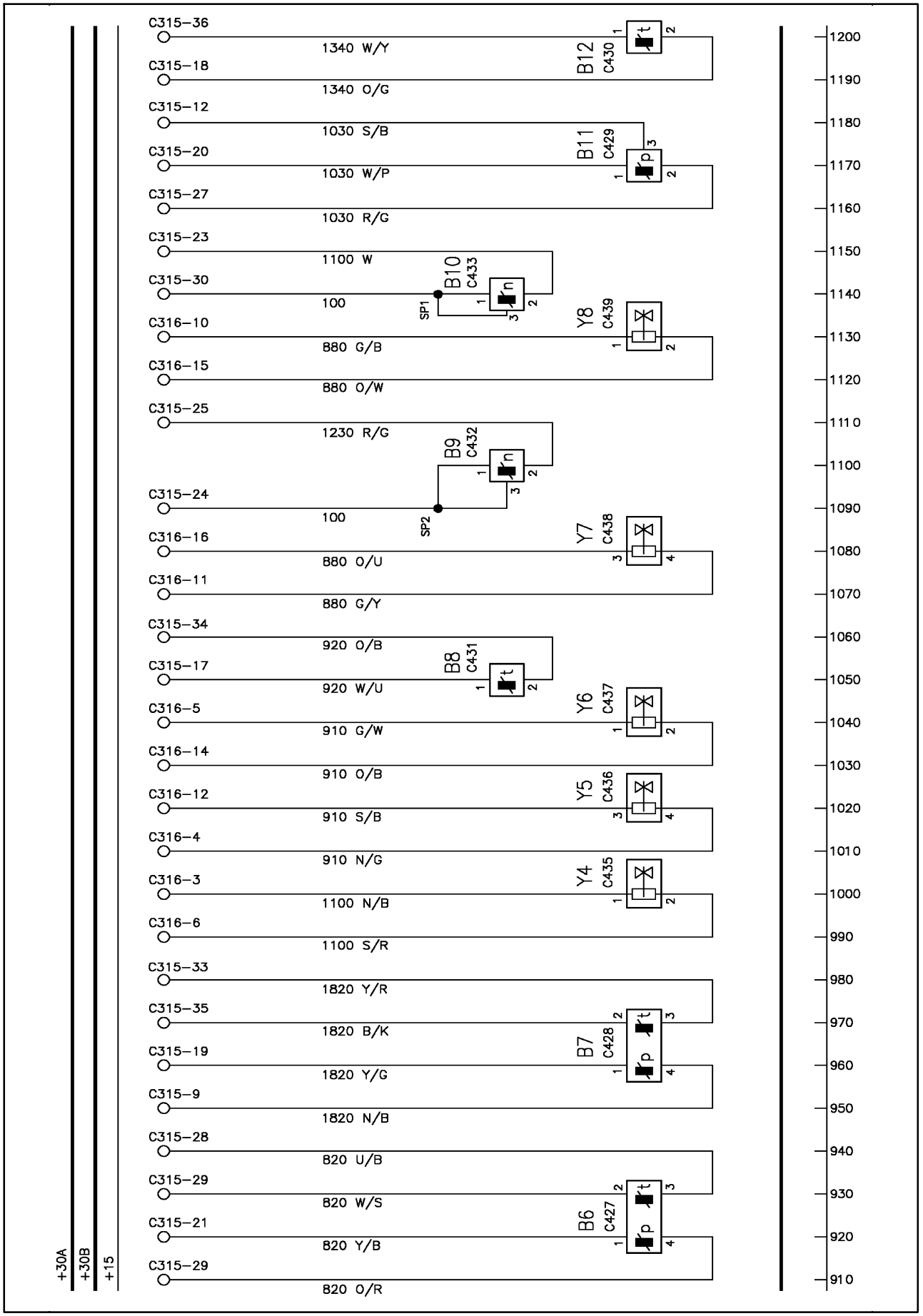
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check fuel injector solenoid for short to ground.

   A. Check between the fuel injector terminals and **ground**. If a short to ground is indicated, remove and replace the fuel injector solenoid.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10 C433
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
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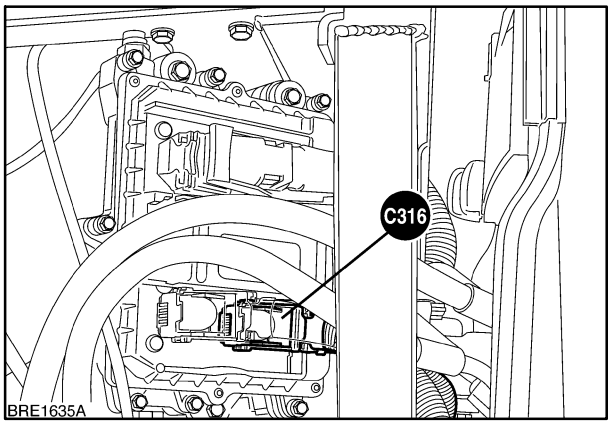
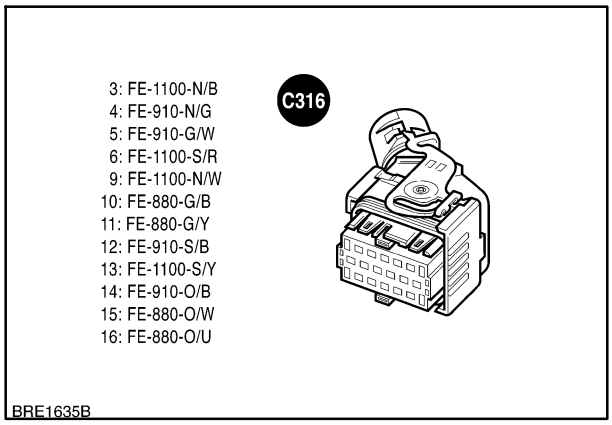
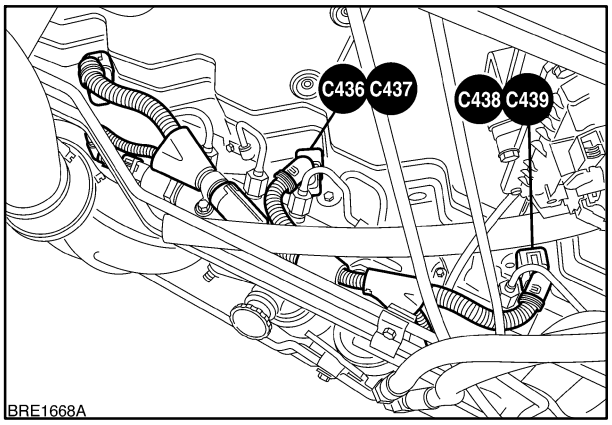
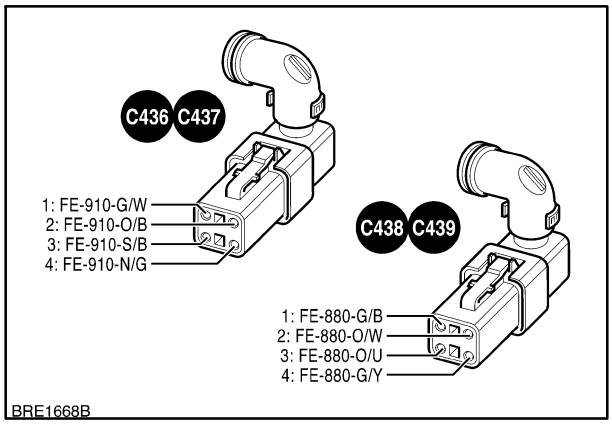

C316
BRE1635A


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
1: FE-910-G/W
2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3067 – FUEL INJECTOR SOLENOID 5 OPEN CIRCUIT OR DISCONNECTED

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 5
3. Faulty harness
4. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 5 connector **C438** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 5 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximatley 0.50 – 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C438**. Check between the component side of the connector:

   C438 pin **3** and the appropriate fuel injector solenoid terminal

   C438 pin **4** and the appropriate fuel injector solenoid terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

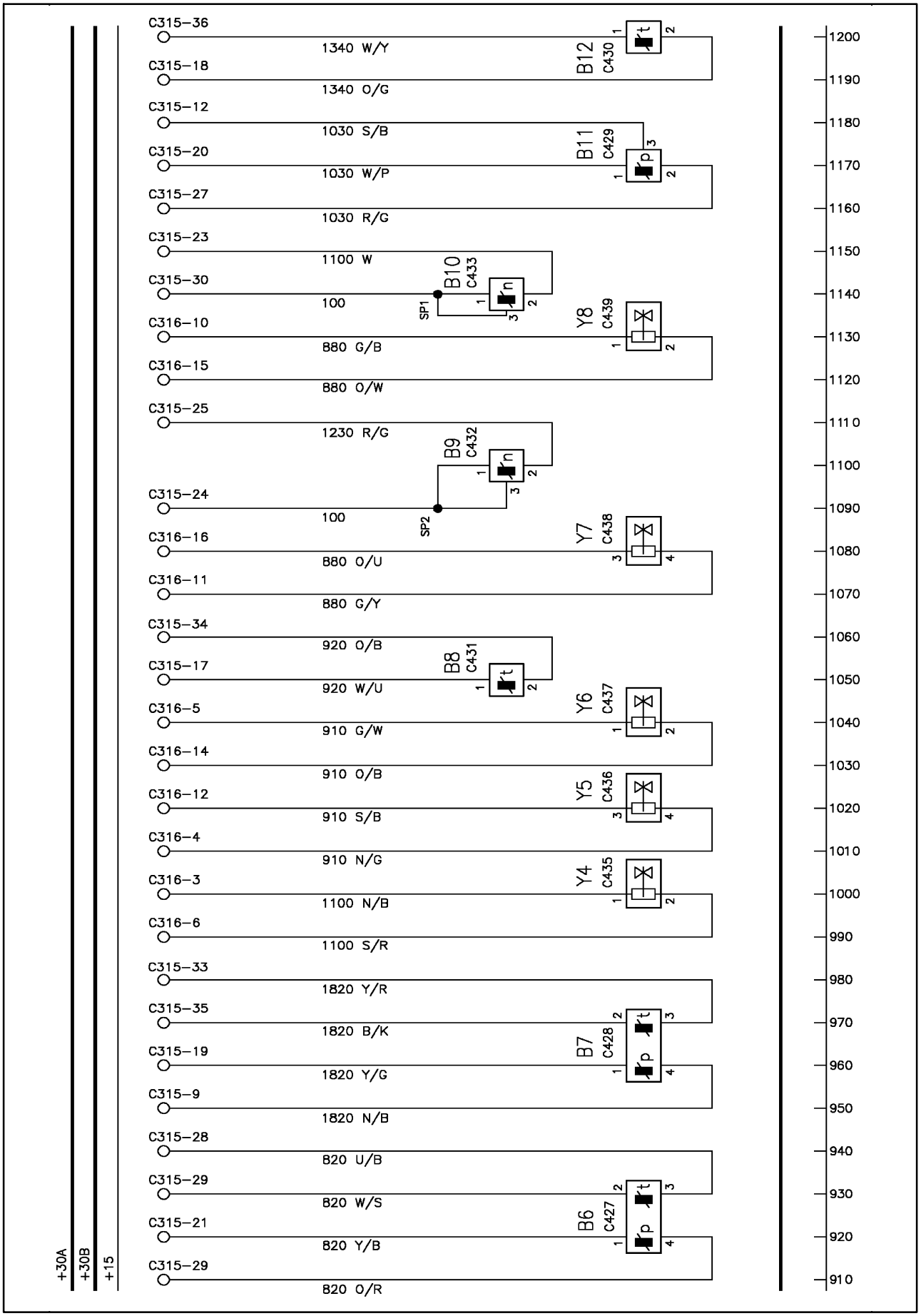
   A. Disconnect connector **C316**. Check between connector:

   C438 pin **3 (O/U)** and **C316** pin **16 (O/U)**

   C438 pin **4 (G/Y)** and **C316** pin **11 (G/Y)**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-18
1340 O/G
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C430
C315-12
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C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
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SP2
C316-16
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C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
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C315-33
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C315-35
1820 B/K
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B7
C428
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820 W/S
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C315-29
820 O/R
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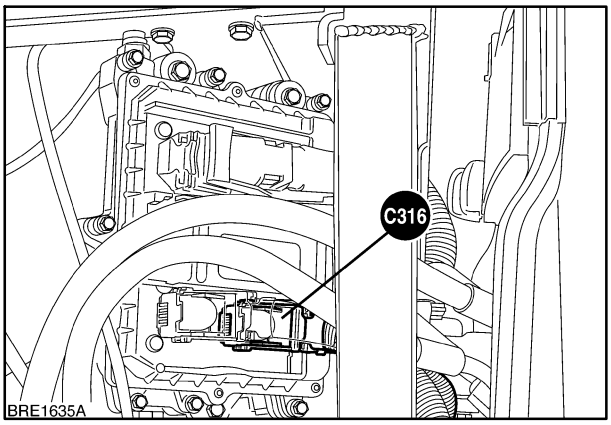
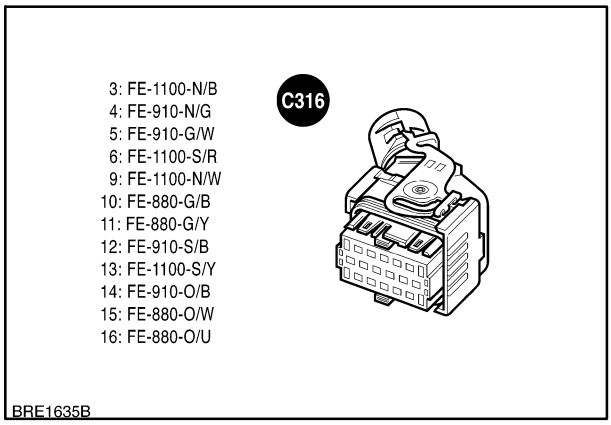

C316
BRE1635A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6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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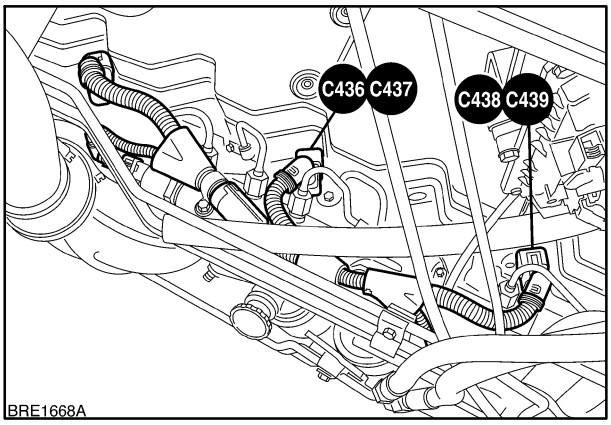
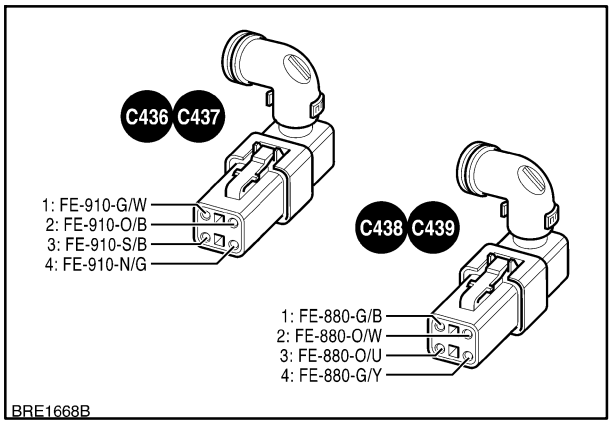
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
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2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3068 - FUEL INJECTOR SOLENOID 3 CURRENT DECREASED TO FAST

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 3
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 3 connector **C436** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 3 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximately 0.50 - 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C436**. Check between the component side of the connector:

   C436 pin **3** and the appropriate fuel injector terminal

   C436 pin **4** and the appropriate fuel injector terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C436 pin **3** and **ground**

   C436 pin **4** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for a short to ground.

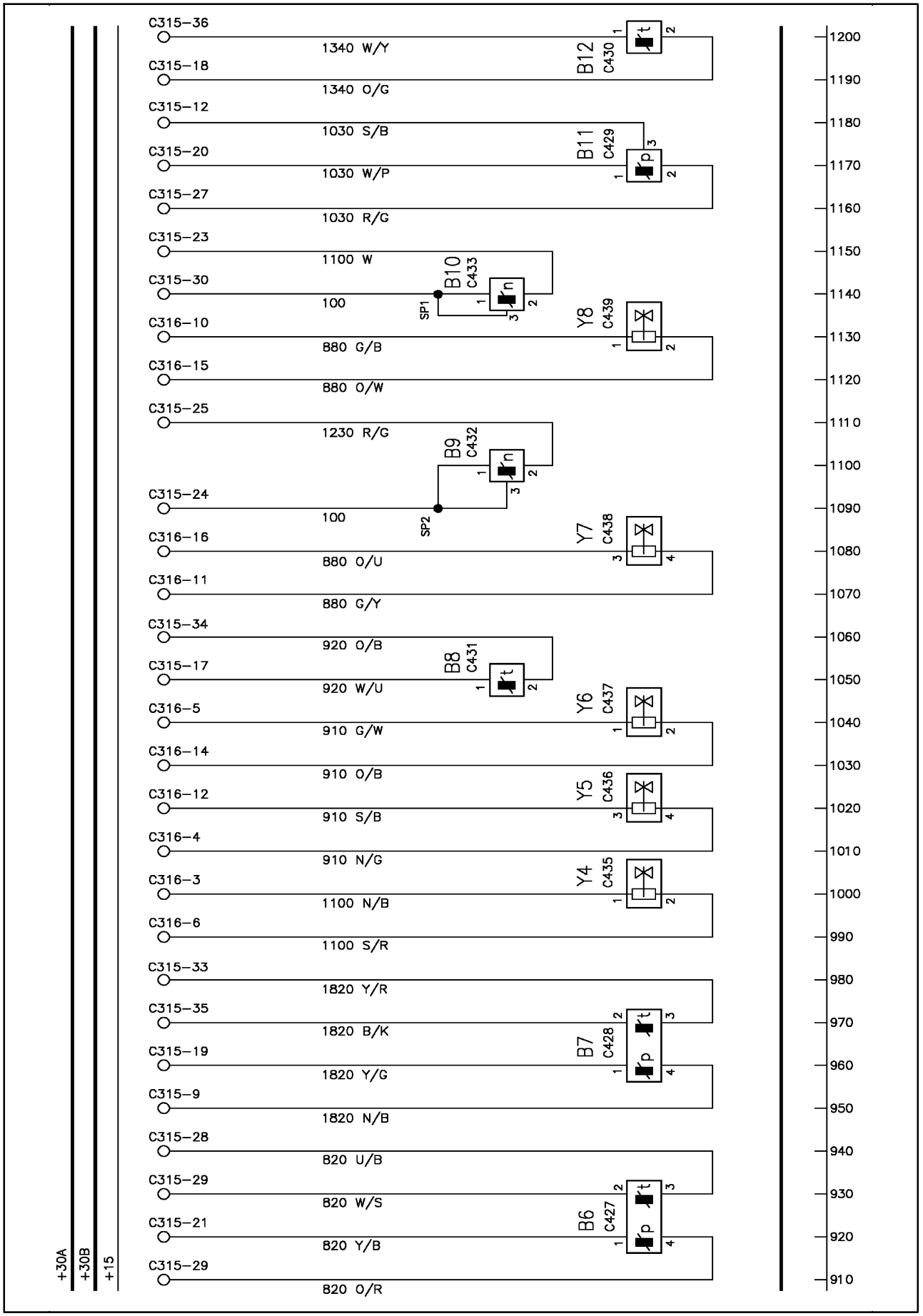
   A. Disconnect connector **C316**. Check between connector:

   C436 pin **3 (S/B)** and **ground**

   C436 pin **4 (N/G)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
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1150
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1130
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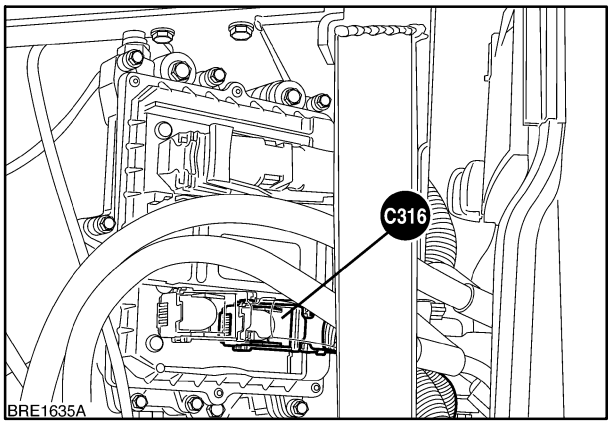
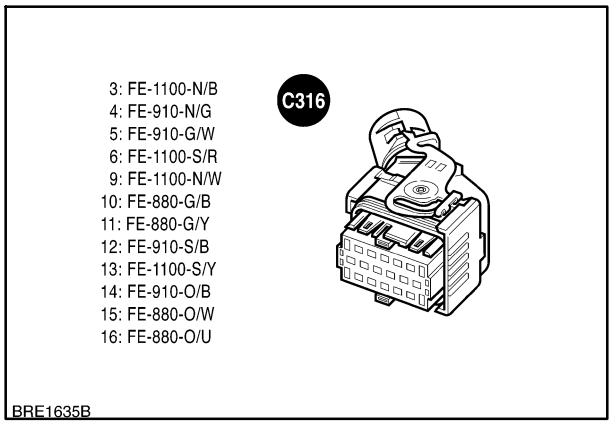

C316
BRE1635A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5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
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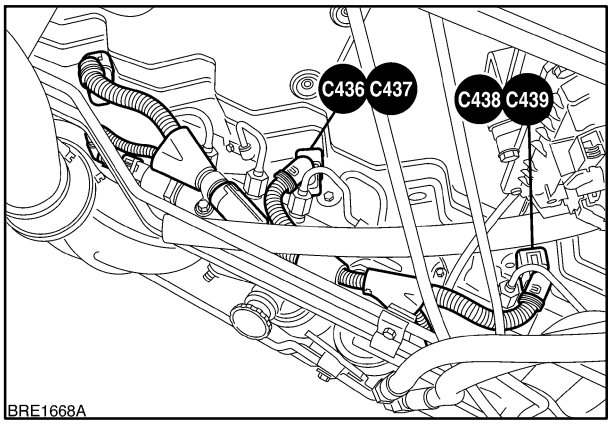
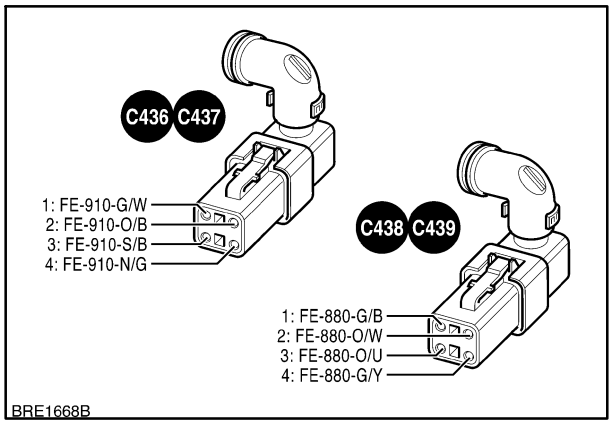
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
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2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3069 – FUEL INJECTOR SOLENOID 3 SHORT TO VCC

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 3
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 3 connector **C436** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve.

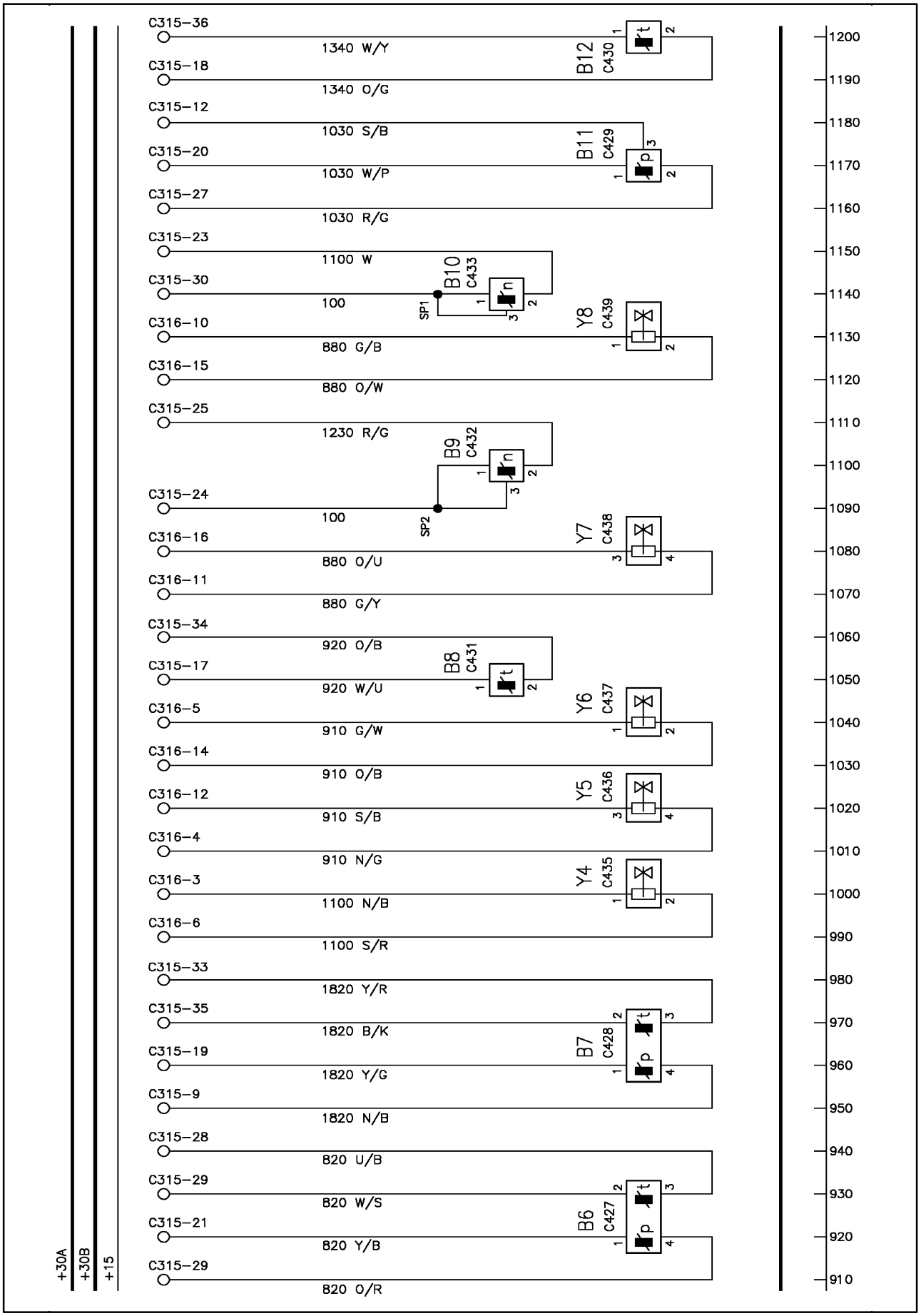
   A. Disconnect connector **C434**. Turn the ketstart ON. Check between connector:

   C436 pin **3 (S/B)** and **ground**

   C436 pin **4 (N/G)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-18
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
Y7 C438
C316-16
880 O/U
C316-11
880 G/Y
C315-34
920 O/B
C315-17
920 W/U
B8 C431
Y6 C437
C316-5
910 G/W
C316-14
910 O/B
Y5 C436
C316-12
910 S/B
C316-4
910 N/G
Y4 C435
C316-3
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C316-6
1100 S/R
C315-33
1820 Y/R
C315-35
1820 B/K
B7 C428
C315-19
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C315-9
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C315-28
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820 W/S
B6 C427
C315-21
820 Y/B
C315-29
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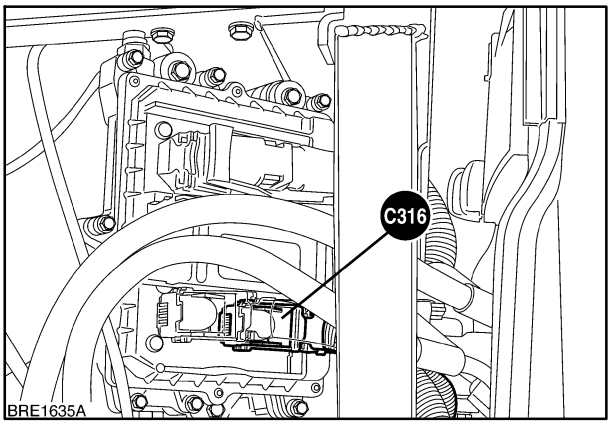
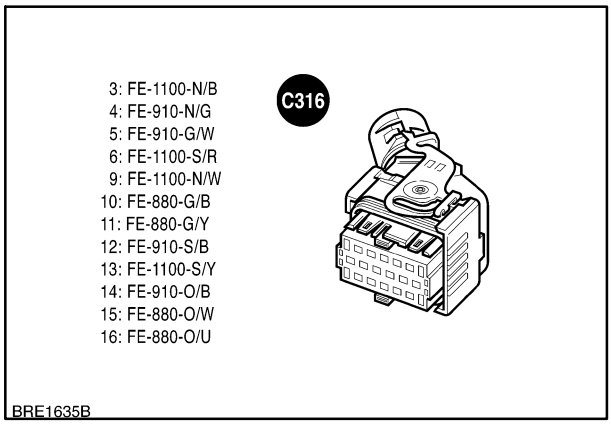

C316
BRE1635A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5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
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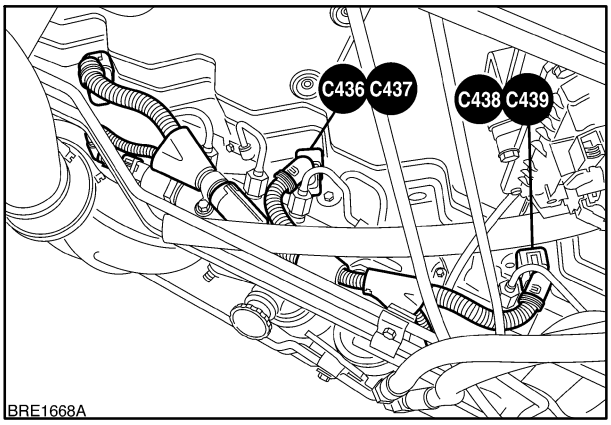
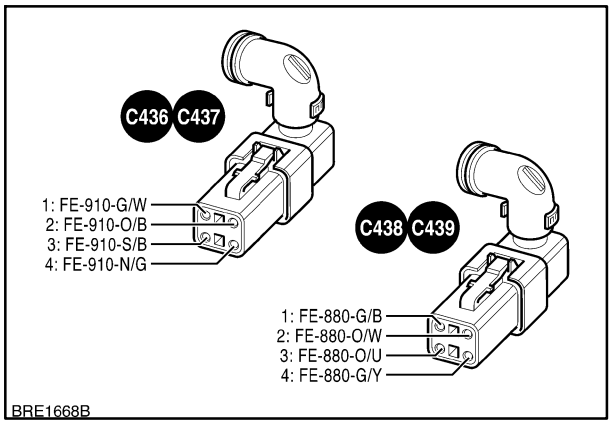
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A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3: FE-910-S/B
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C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3070 - FUEL INJECTOR SOLENOID 3 SHORT TO GROUND

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 3
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 3 connector **C436** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect **C436** and **C316**. Check between connector:

   C436 pin **3 (S/B)** and **ground**

   C436 pin **4 (N/G)** and **ground**

   If a short to ground indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C436 pin **3** and **ground**

   C436 pin **4** and **ground**

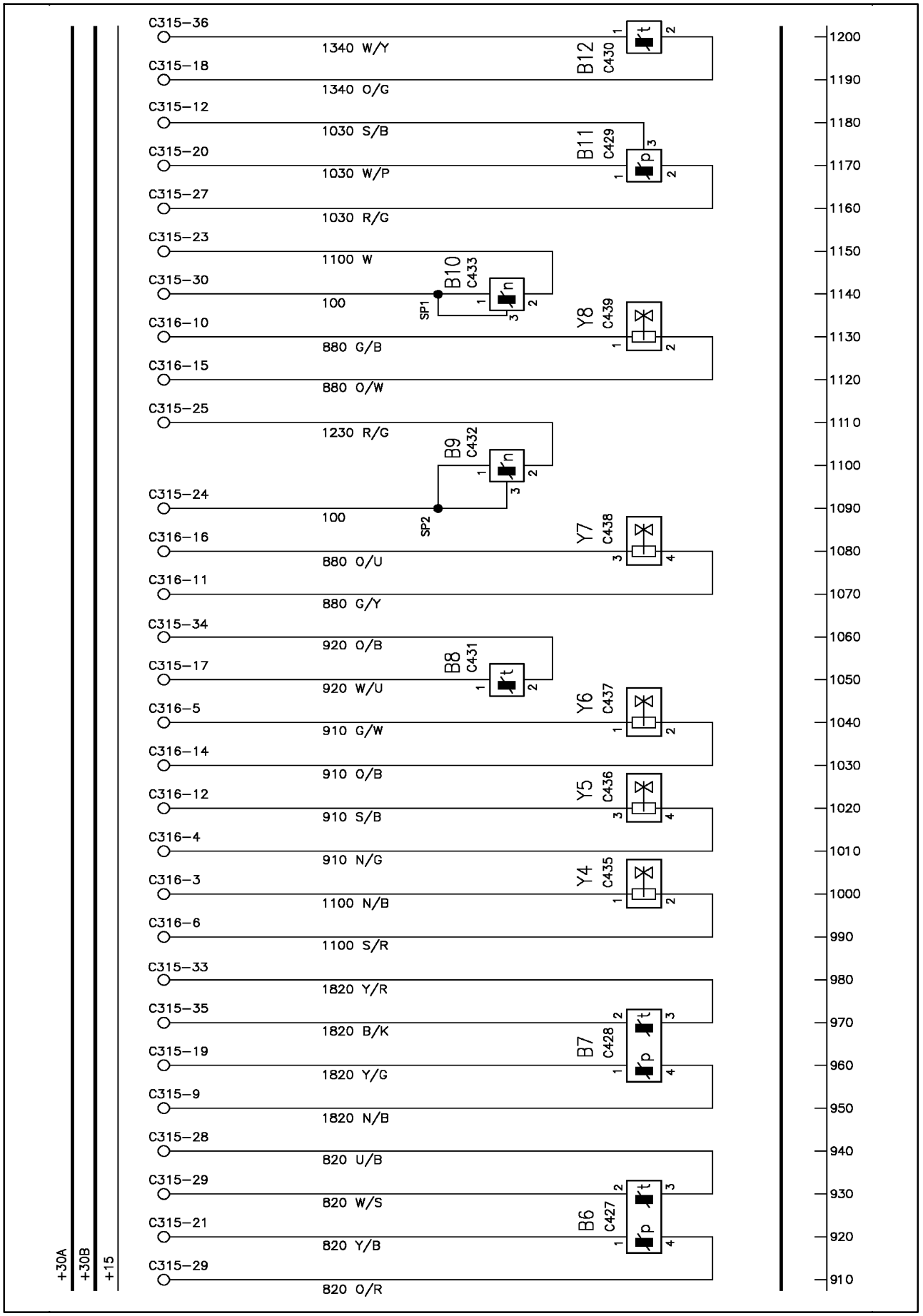
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check fuel injector solenoid for short to ground.

   A. Check between the fuel injector terminals and **ground**. If a short to ground is indicated, remove and replace the fuel injector solenoid.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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1340 O/G
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C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
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880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
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Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
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C315-35
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C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
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820 Y/B
B6
C427
C315-29
820 O/R
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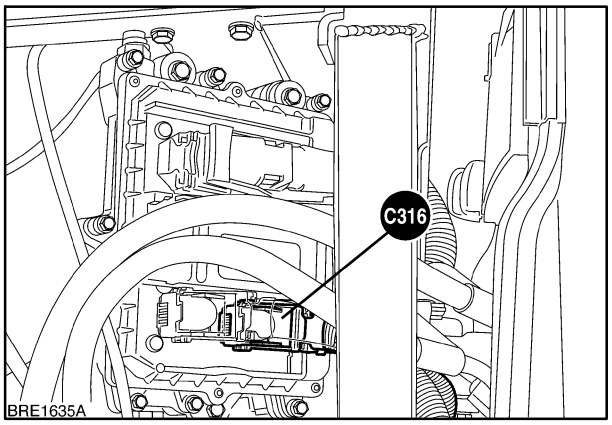
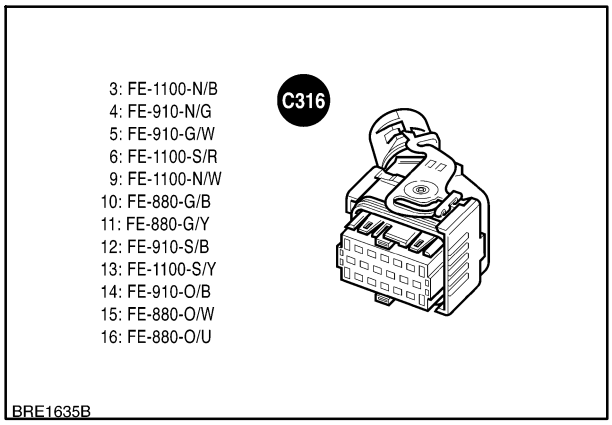

C316
BRE1635A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9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
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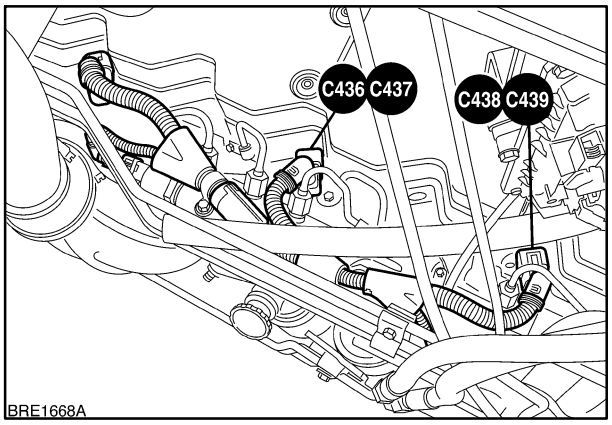
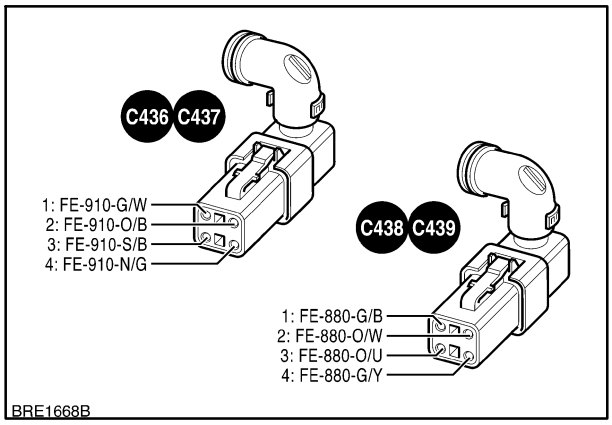
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A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3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3071 – FUEL INJECTOR SOLENOID 3 OPEN CIRCUIT OR DISCONNECTED

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 3
3. Faulty harness
4. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 3 connector **C436** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 3 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximatley 0.50 – 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C436**. Check between the component side of the connector:

   C436 pin **3** and the appropriate fuel injector solenoid terminal

   C436 pin **4** and the appropriate fuel injector solenoid terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

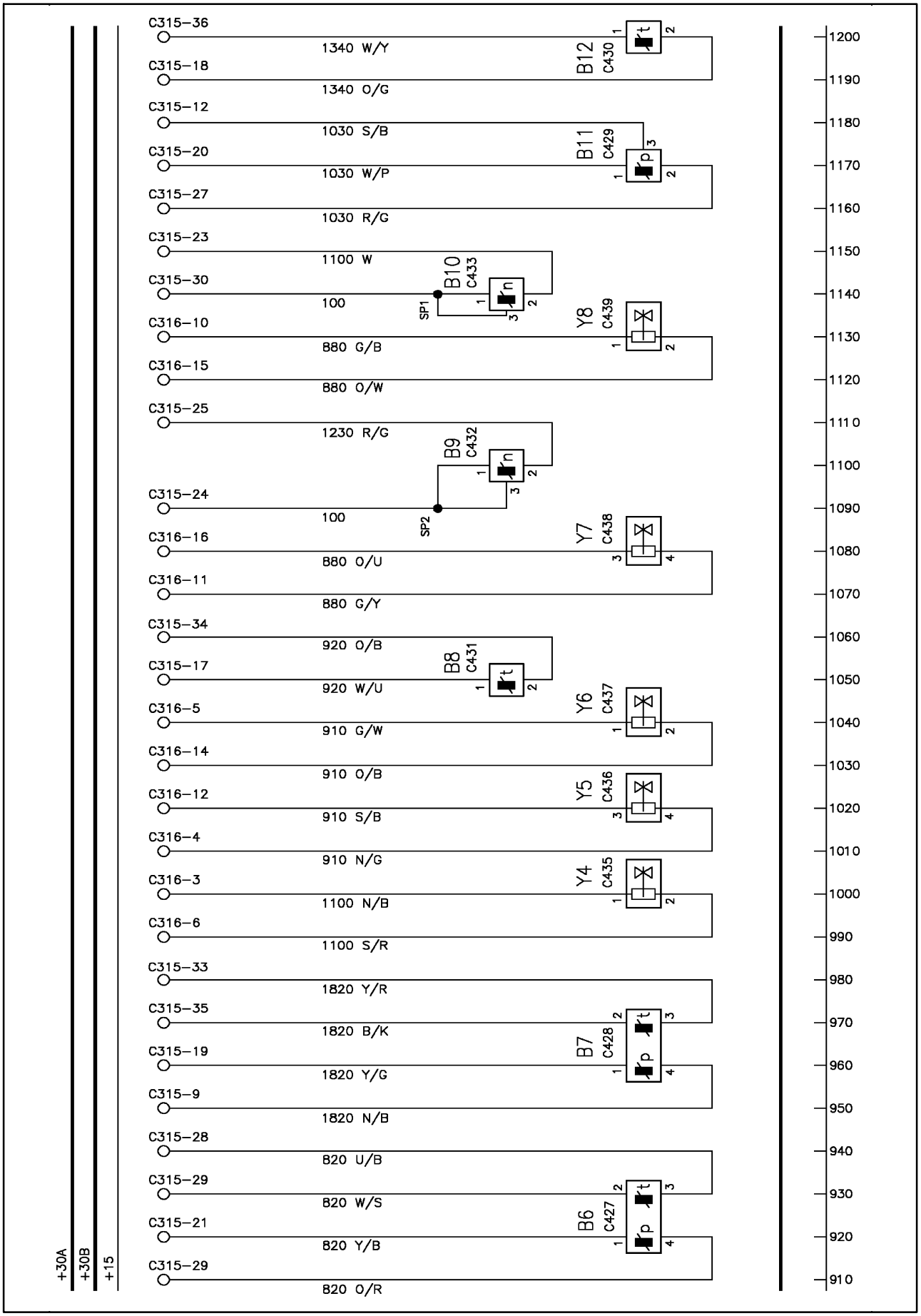
   A. Disconnect connector **C316**. Check between connector:

   C436 pin **3 (S/B)** and **C316** pin **12 (S/B)**

   C436 pin **4 (N/G)** and **C316** pin **4 (N/G)**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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B11 C429
C315-27
1030 R/G
C315-23
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100
B10 C433
SP1
C316-10
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C316-15
880 O/W
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C315-25
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B9 C432
C315-24
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SP2
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880 G/Y
Y7 C438
C315-34
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C315-17
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B8 C431
C316-5
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C316-14
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C316-4
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C316-6
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C315-35
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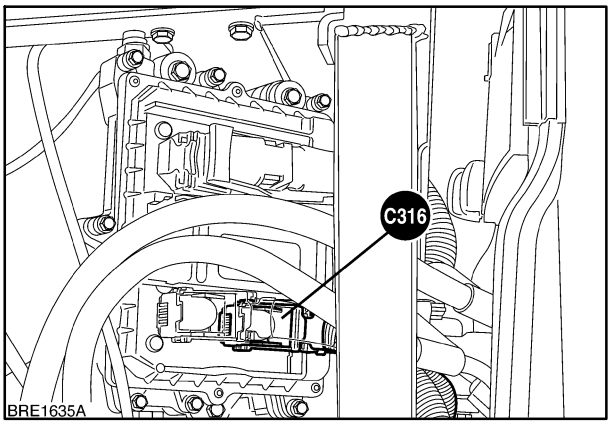
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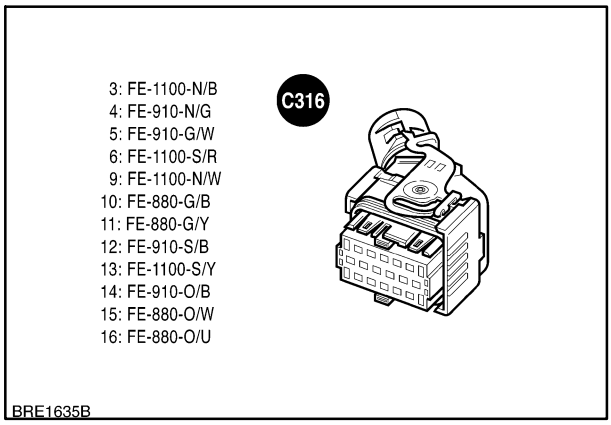
BRE1635A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6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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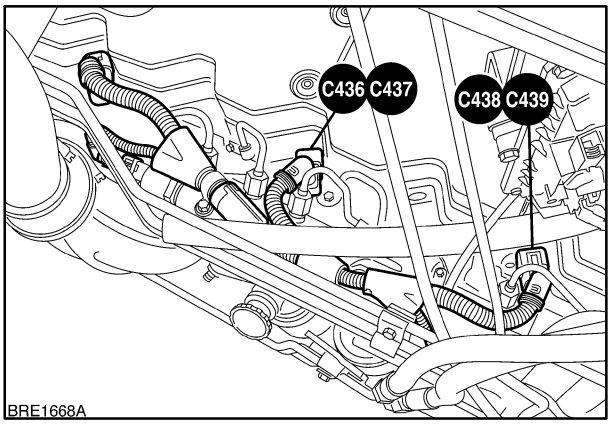
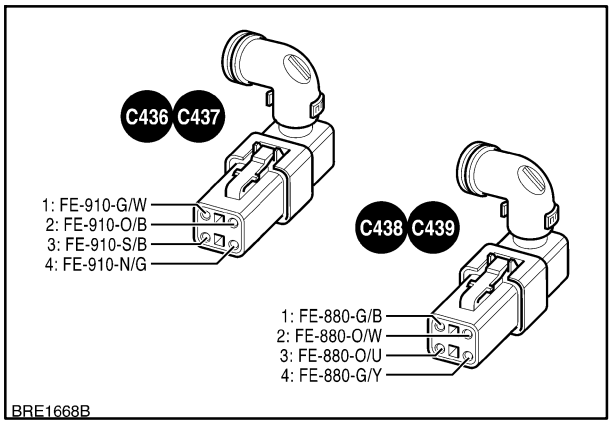
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A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2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3072 - FUEL INJECTOR SOLENOID 6 CURRENT DECREASED TO FAST

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 6
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 6 connector **C439** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 6 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximately 0.50 - 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C439**. Check between the component side of the connector:

   C439 pin **1** and the appropriate fuel injector terminal

   C439 pin **2** and the appropriate fuel injector terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C439 pin **1** and **ground**

   C439 pin **2** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for a short to ground.

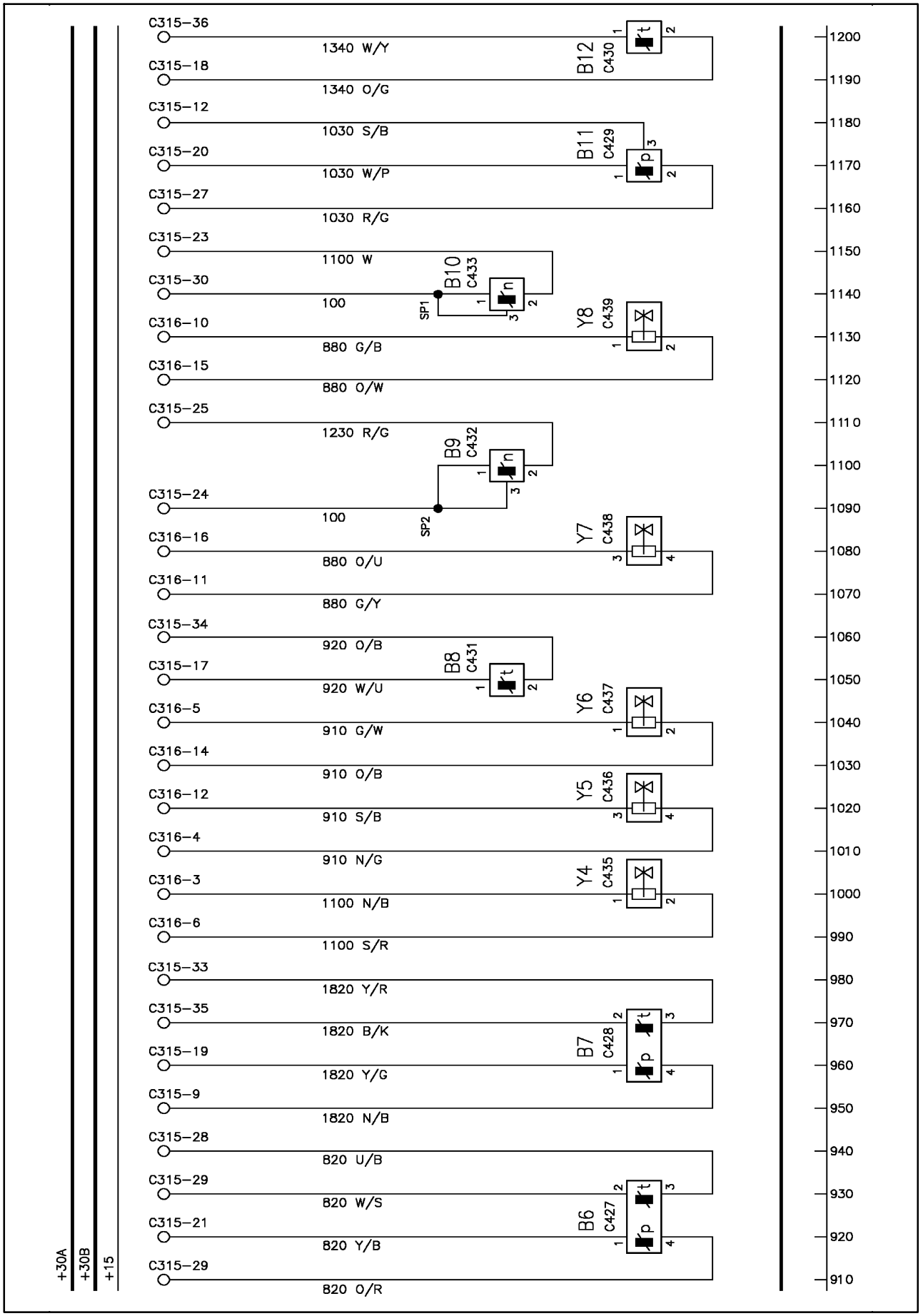
   A. Disconnect connector **C316**. Check between connector:

   C439 pin **1 (G/B)** and **ground**

   C436 pin **2 (O/W)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-18
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C430
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C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
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C316-6
1100 S/R
Y4
C435
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C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
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C315-28
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C315-29
820 W/S
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820 Y/B
B6
C427
C315-29
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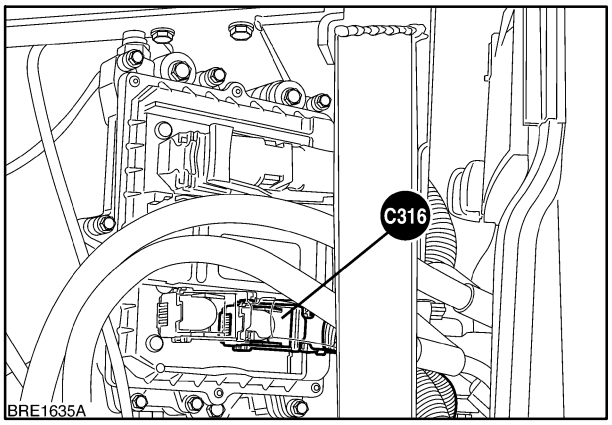
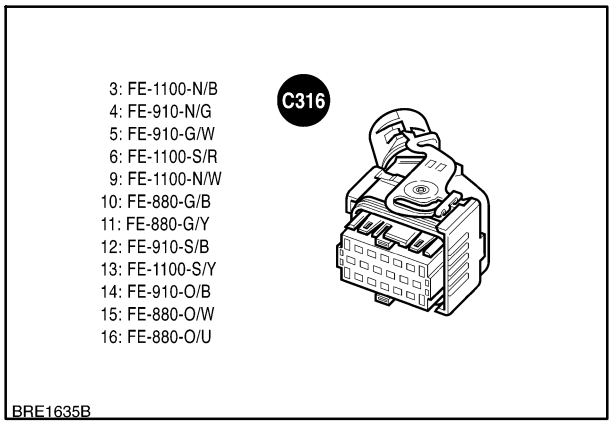

C316
BRE1635A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11: FE-880-G/Y
12: FE-910-S/B
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16: FE-880-O/U
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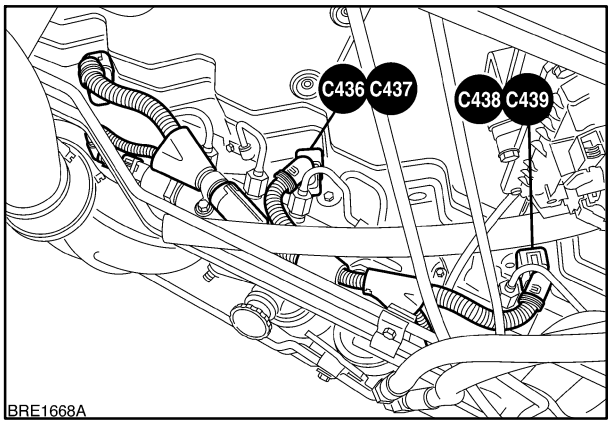
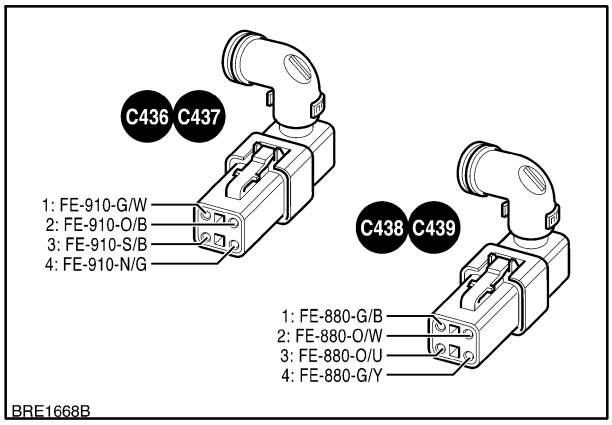
BRE1635B


C436 C437
C438 C439
BRE1668A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4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3073 – FUEL INJECTOR SOLENOID 6 SHORT TO VCC

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 6
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 6 connector **C439** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve.

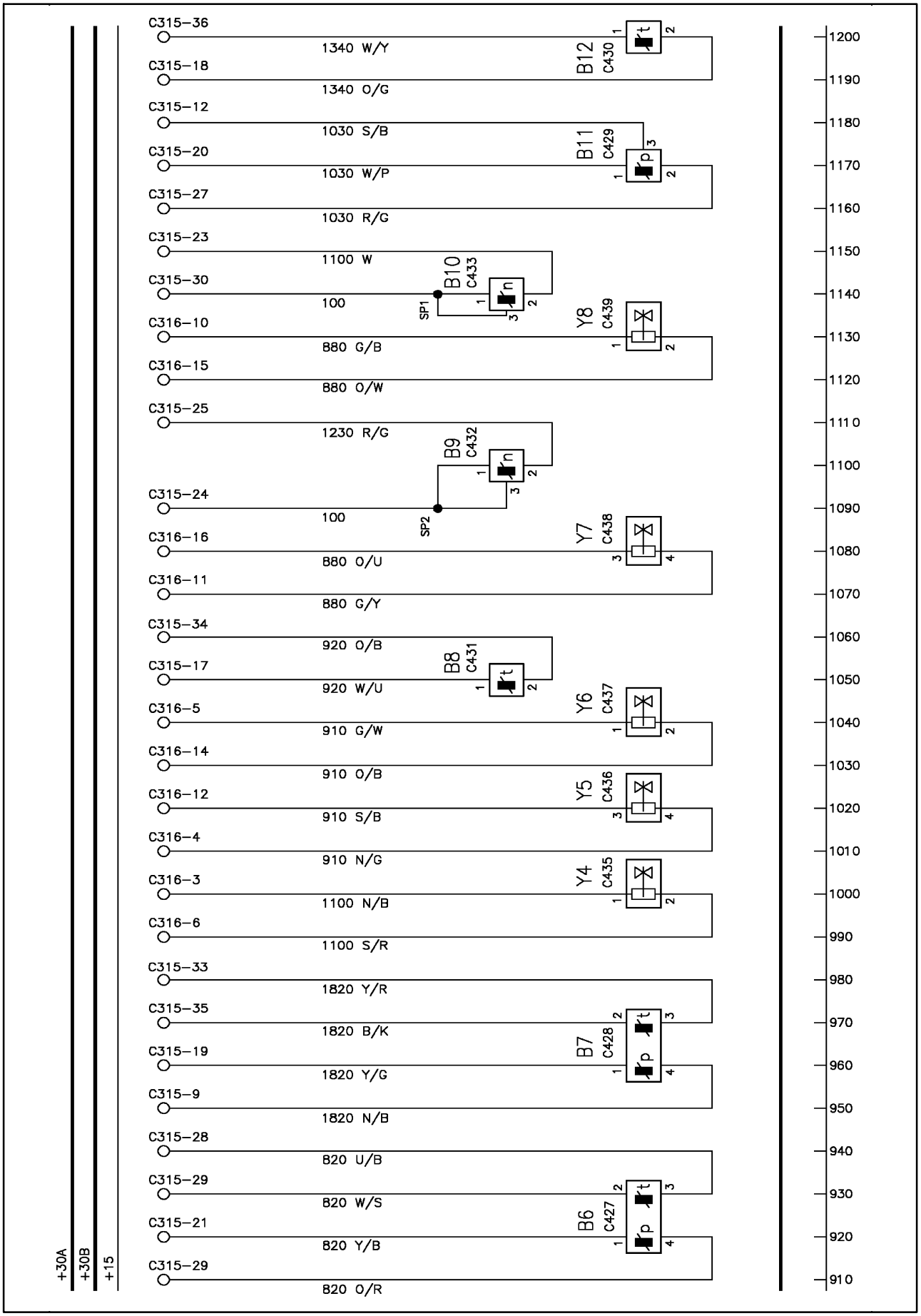
   A. Disconnect connector **C439**. Turn the ketstart ON. Check between connector:

   C439 pin **1 (G/B)** and **ground**

   C439 pin **2 (O/W)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-18
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C315-12
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C315-20
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B11 C429
C315-27
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C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
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SP2
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880 O/U
C316-11
880 G/Y
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920 O/B
C315-17
920 W/U
B8 C431
C316-5
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C316-14
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Y6 C437
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C316-4
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C316-6
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C315-33
1820 Y/R
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820 Y/B
C315-29
820 O/R
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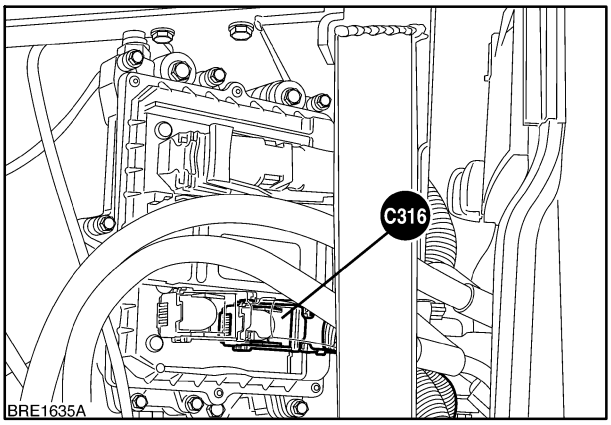
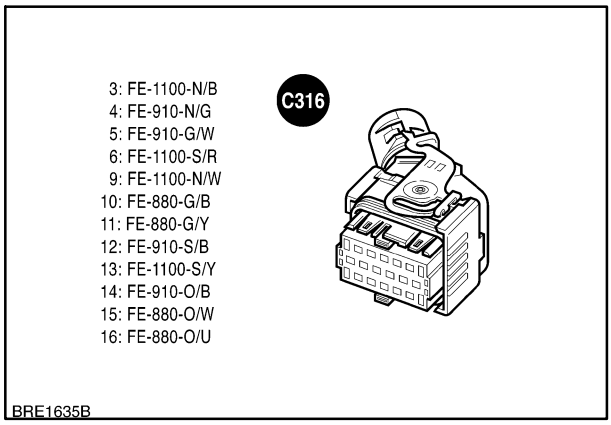

C316
BRE1635A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6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
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12: FE-910-S/B
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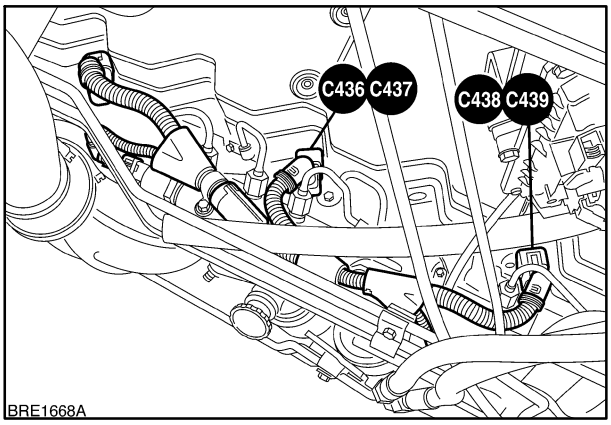
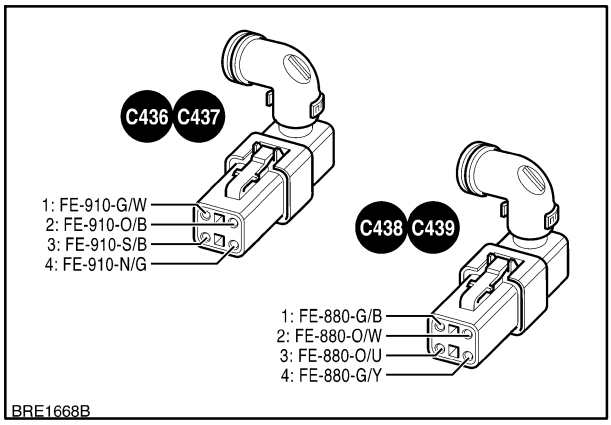
BRE1635B


C436 C437
C438 C439
BRE1668A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2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3074 - FUEL INJECTOR SOLENOID 6 SHORT TO GROUND

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 6
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 6 connector **C439** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect **C439** and **C316**. Check between connector:

   C439 pin **3 (G/B)** and **ground**

   C439 pin **4 (O/W)** and **ground**

   If a short to ground indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C439 pin **3** and **ground**

   C439 pin **4** and **ground**

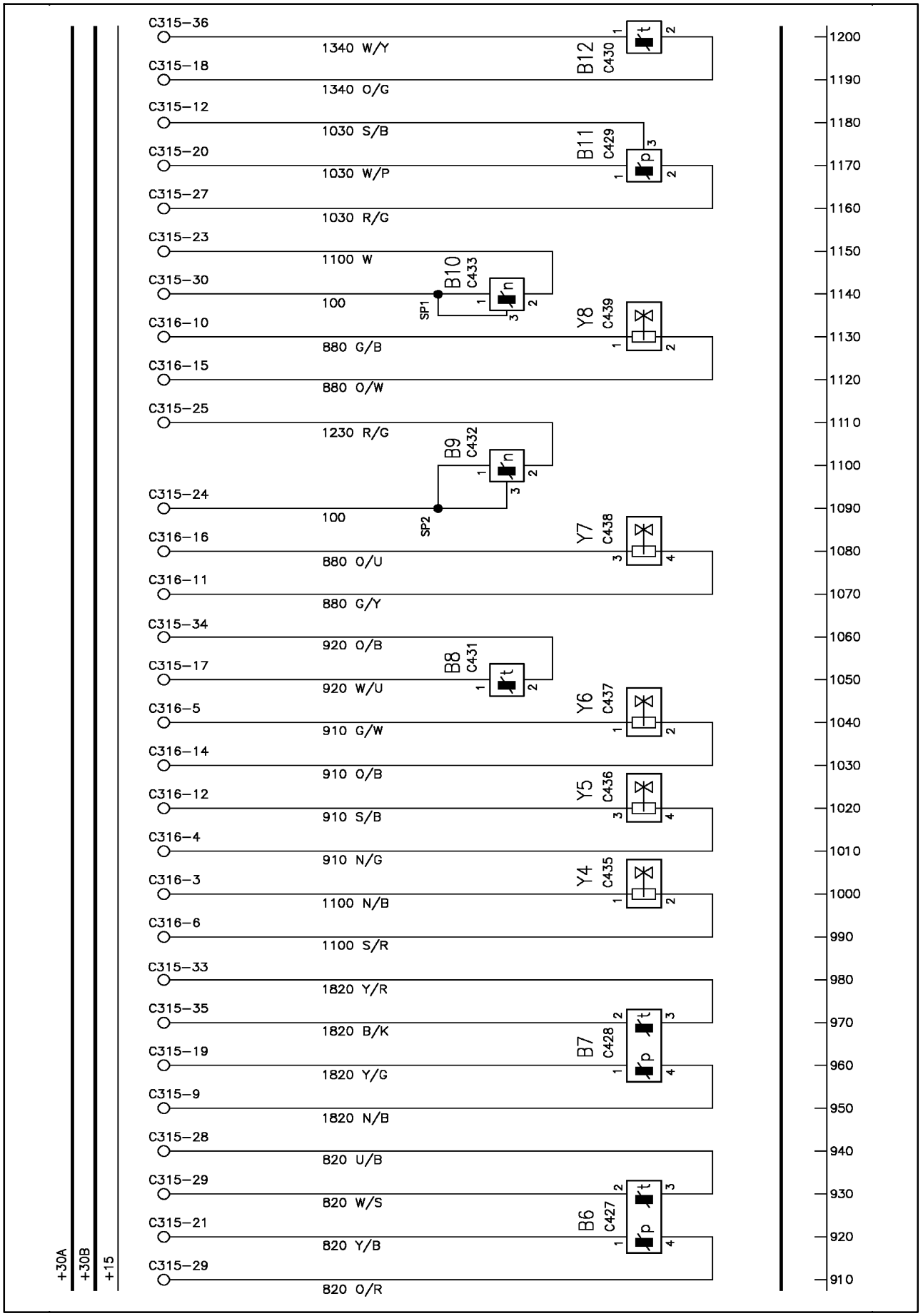
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check fuel injector solenoid for short to ground.

   A. Check between the fuel injector terminals and **ground**. If a short to ground is indicated, remove and replace the fuel injector solenoid.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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B11 C429
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C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
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920 O/B
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920 W/U
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1820 B/K
C315-19
1820 Y/G
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C315-9
1820 N/B
C315-28
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C315-29
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820 O/R
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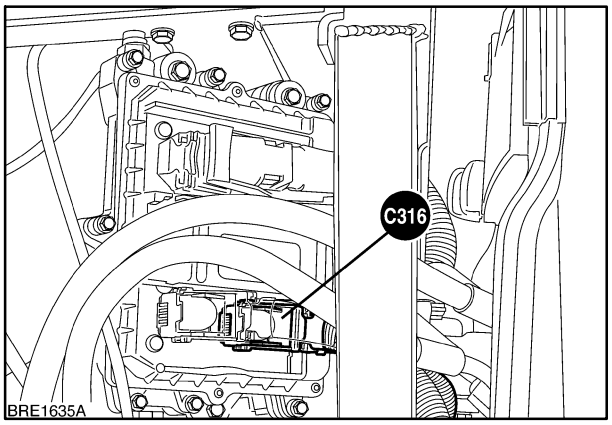
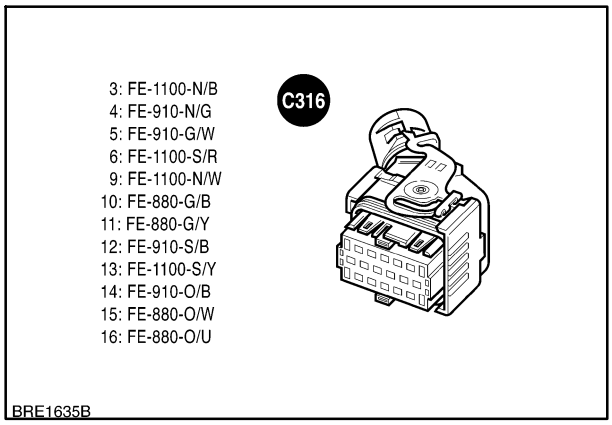

C316
BRE1635A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5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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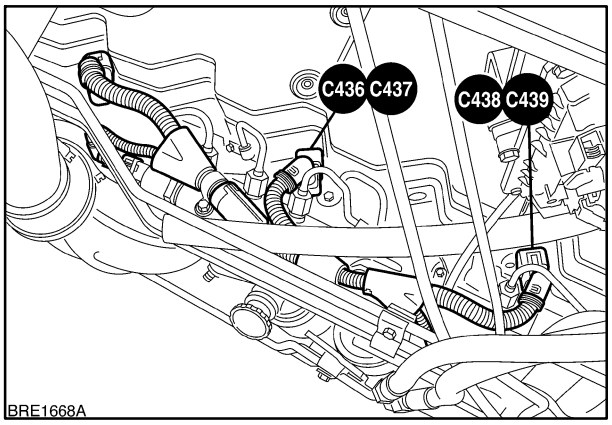
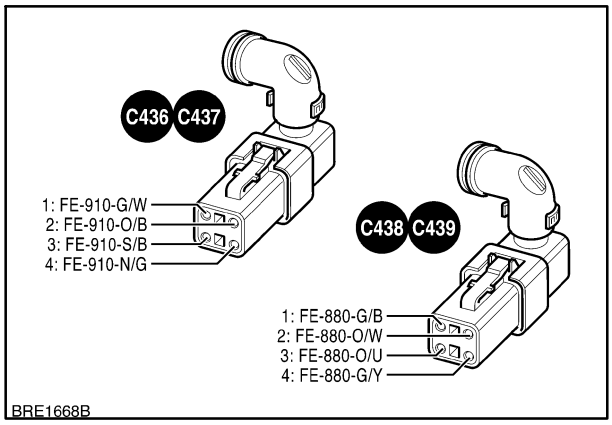
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
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C438 C439
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2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3075 – FUEL INJECTOR SOLENOID 6 OPEN CIRCUIT OR DISCONNECTED

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 6
3. Faulty harness
4. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 6 connector **C439** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 6 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximatley 0.50 – 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C439**. Check between the component side of the connector:

   C439 pin **1** and the appropriate fuel injector solenoid terminal

   C439 pin **2** and the appropriate fuel injector solenoid terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

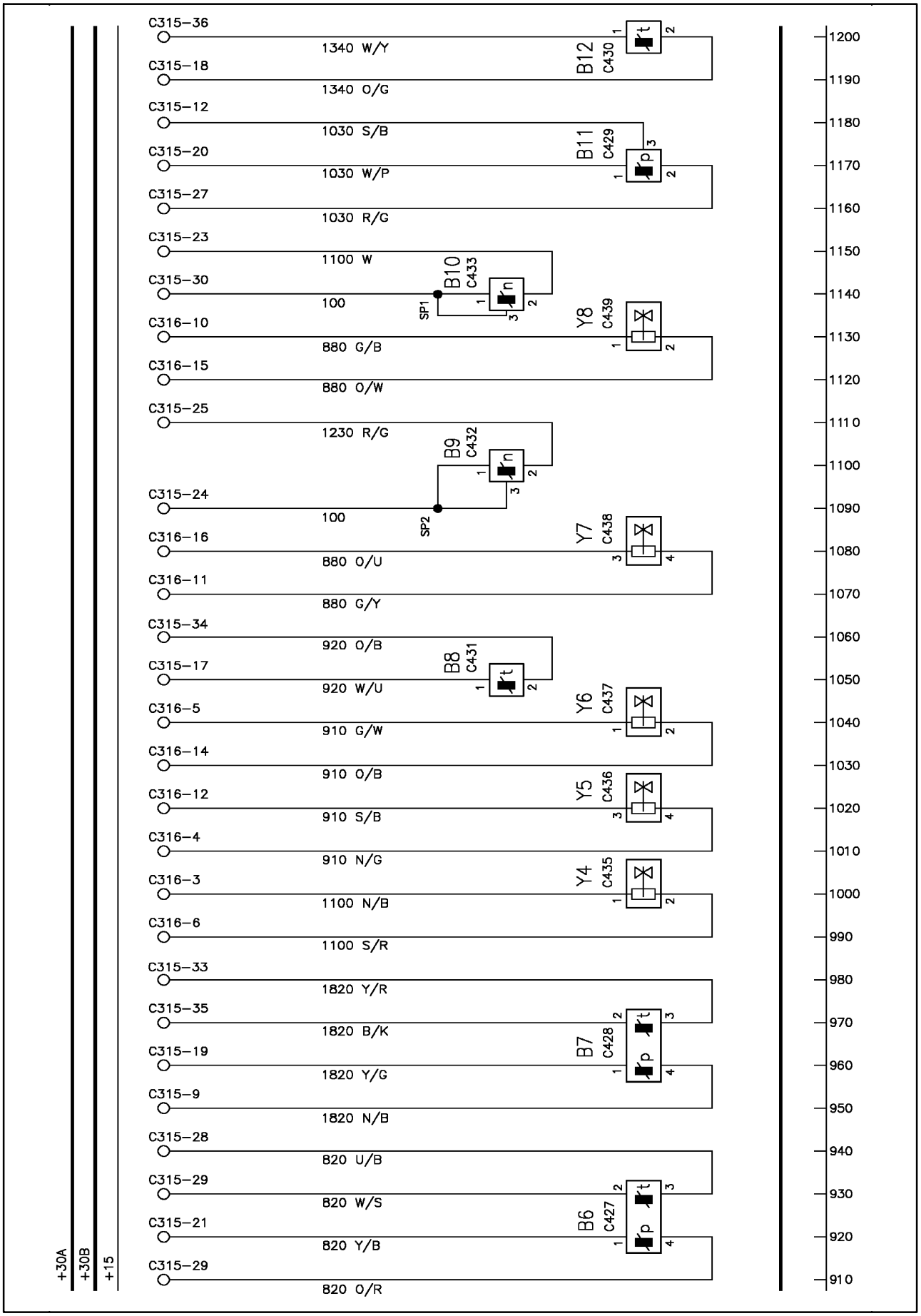
   A. Disconnect connector **C316**. Check between connector:

   C439 pin **1 (G/B)** and **C316** pin **10 (G/B)**

   C439 pin **2 (O/W)** and **C316** pin **15 (O/W)**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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1030 W/P
B11
C429
C315-27
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C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
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C316-15
880 O/W
Y8
C439
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B9
C432
C315-24
100
SP2
C316-16
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C316-11
880 G/Y
Y7
C438
C315-34
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C315-17
920 W/U
B8
C431
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C316-14
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Y6
C437
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C316-4
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1100 N/B
C316-6
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Y4
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820 Y/B
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820 O/R
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C427
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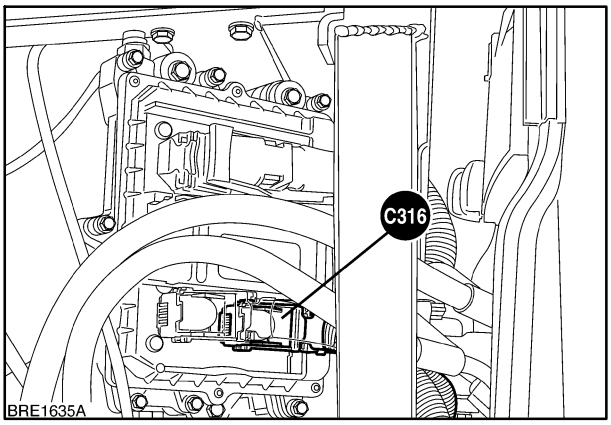
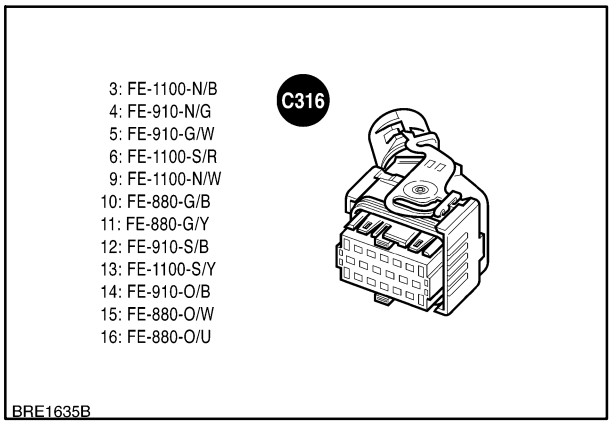

C316
BRE1635A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6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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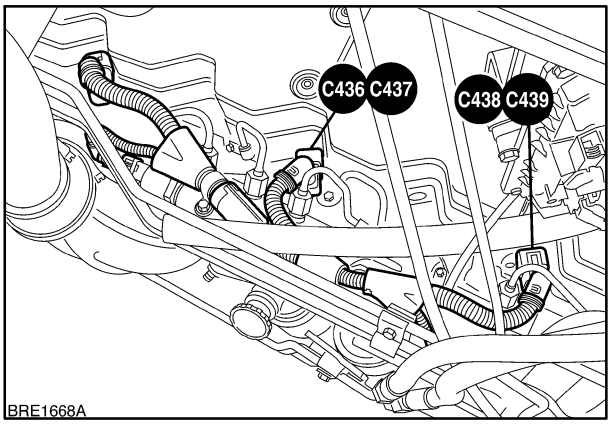
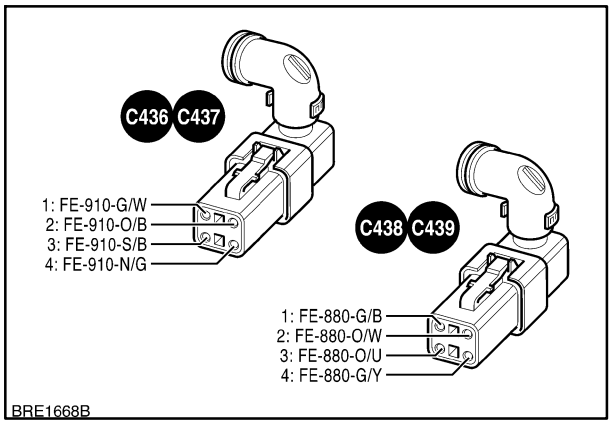
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A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2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3076 - FUEL INJECTOR SOLENOID 2 CURRENT DECREASED TO FAST

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 2
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 2 connector **C435** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 2 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximately 0.50 - 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C435**. Check between the component side of the connector:

   C435 pin **1** and the appropriate fuel injector terminal

   C435 pin **2** and the appropriate fuel injector terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C435 pin **1** and **ground**

   C435 pin **2** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for a short to ground.

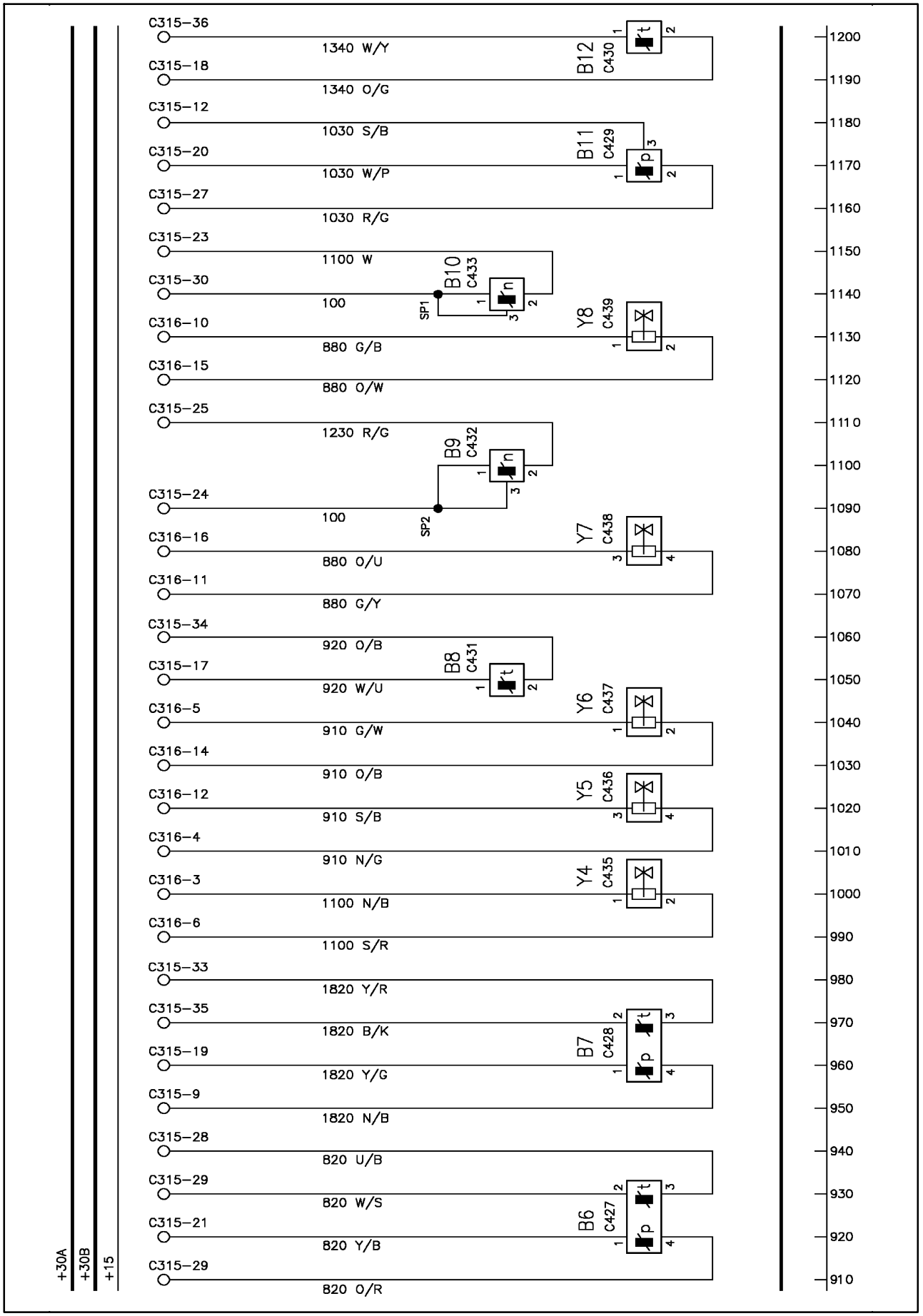
   A. Disconnect connector **C316**. Check between connector:

   C435 pin **1 (N/B)** and **ground**

   C435 pin **2 (S/R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
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Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
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C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
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1190
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1170
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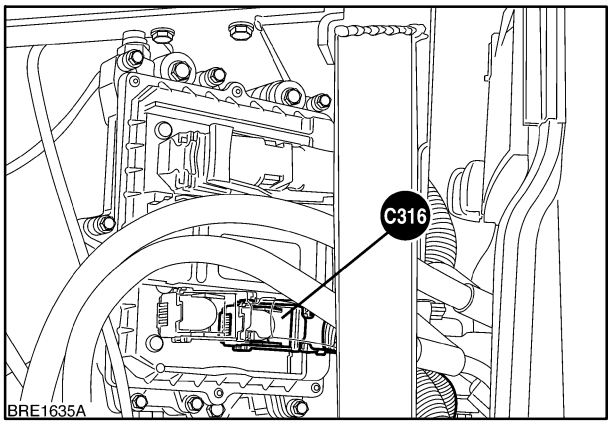
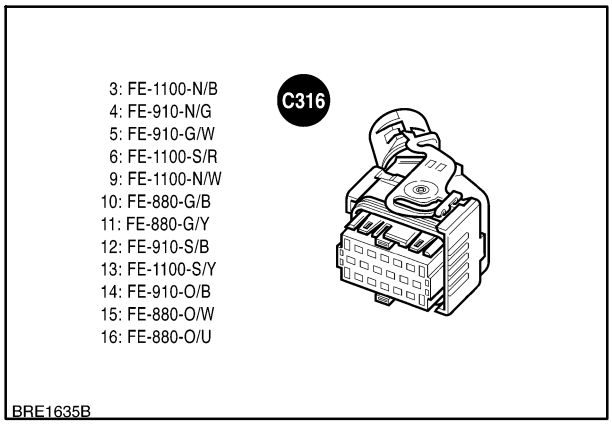

C316
BRE1635A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12: FE-910-S/B
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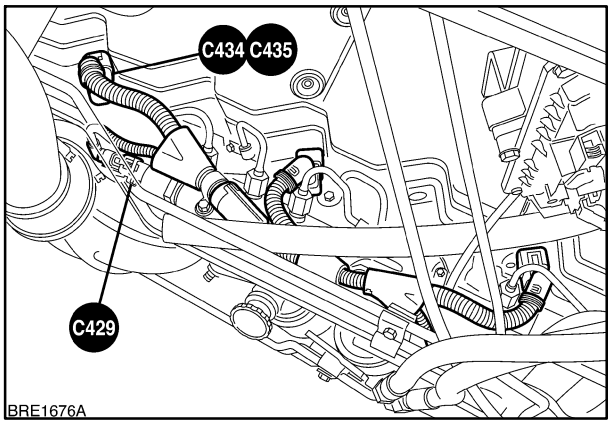
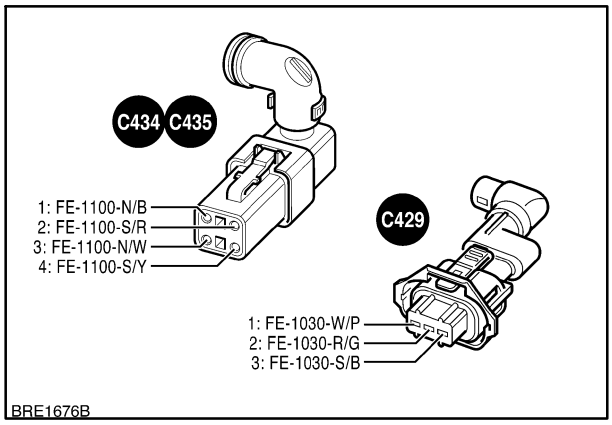
BRE1635B


C434
C435
C429
BRE1676A


C434
C435
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3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3077 - FUEL INJECTOR SOLENOID 2 SHORT TO VCC

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 2
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 2 connector **C435** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve.

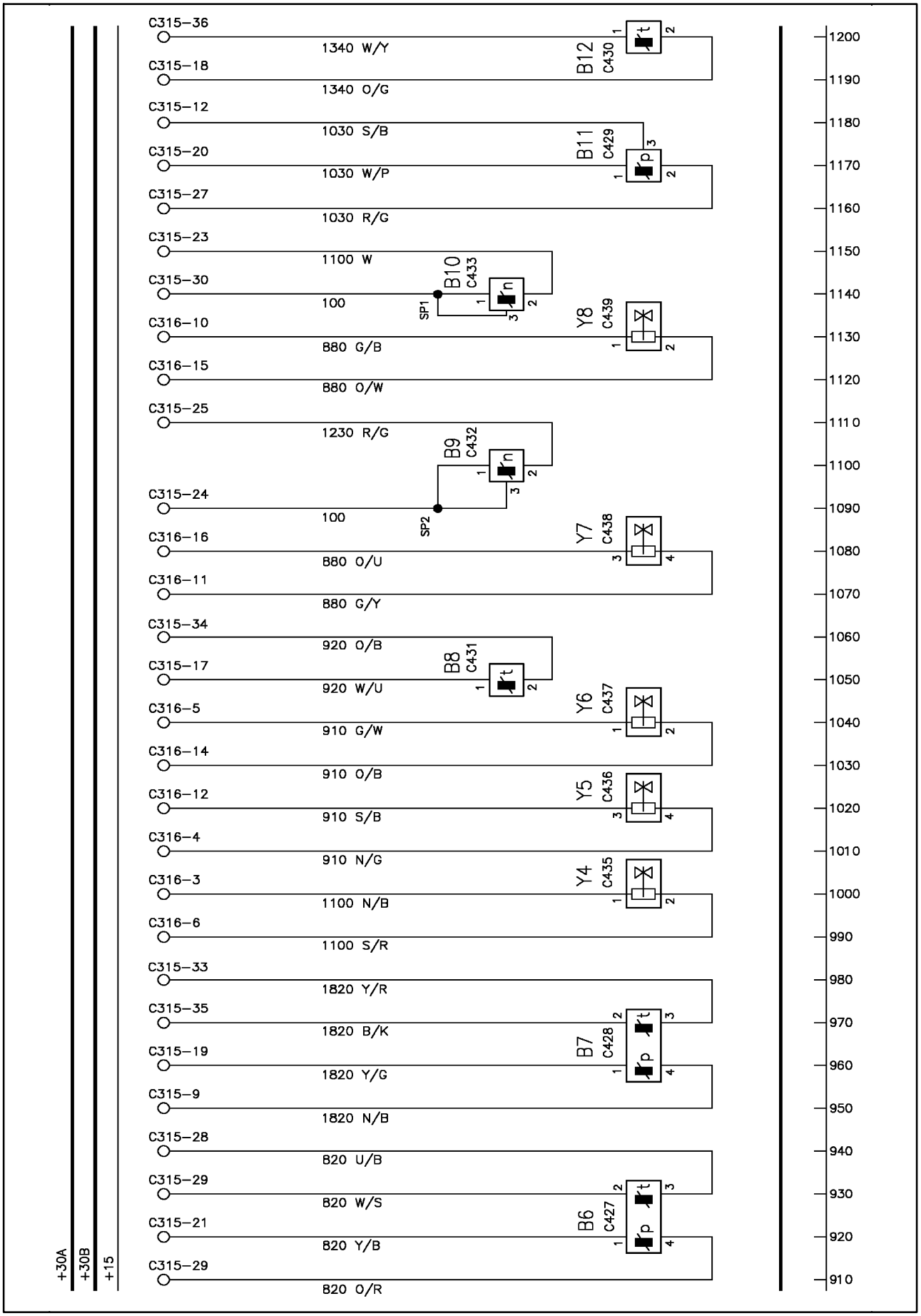
   A. Disconnect connector **C435**. Turn the ketstart ON. Check between connector:

   C435 pin **1 (N/B)** and **ground**

   C435 pin **2 (S/R)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
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C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
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Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
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Y6
C437
C316-12
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C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
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C315-35
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C315-19
1820 Y/G
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C428
C315-9
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820 U/B
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C315-21
820 Y/B
C315-29
820 O/R
B6
C427
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1190
1180
1170
1160
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1130
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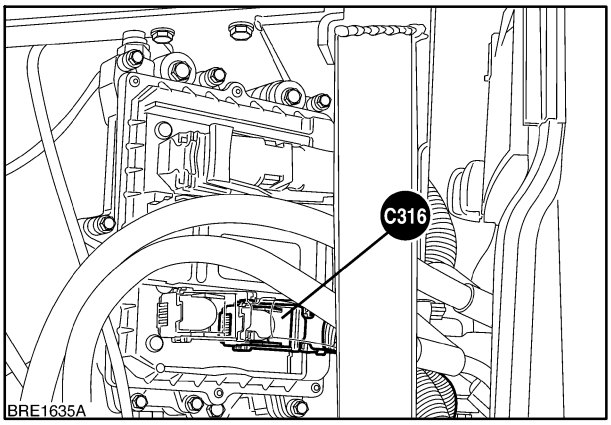
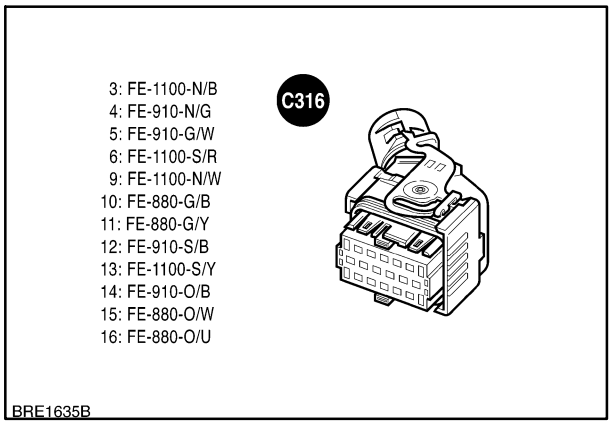

C316
BRE1635A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6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
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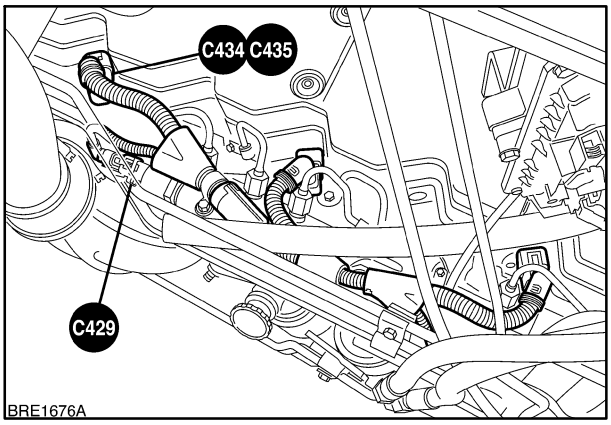
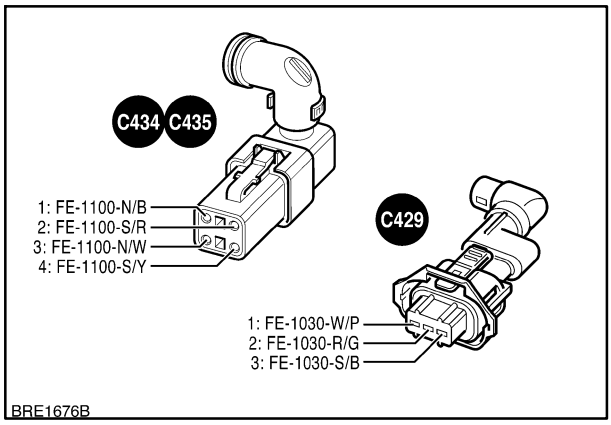
C316
BRE1635B


C434 C435
C429
BRE1676A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4: FE-1100-S/Y
C429
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2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3078 - FUEL INJECTOR SOLENOID 2 SHORT TO GROUND

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 2
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 2 connector **C435** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect **C435** and **C316**. Check between connector:

   C435 pin **1 (N/B)** and **ground**

   C435 pin **2 (S/R)** and **ground**

   If a short to ground indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C435 pin **1** and **ground**

   C435 pin **2** and **ground**

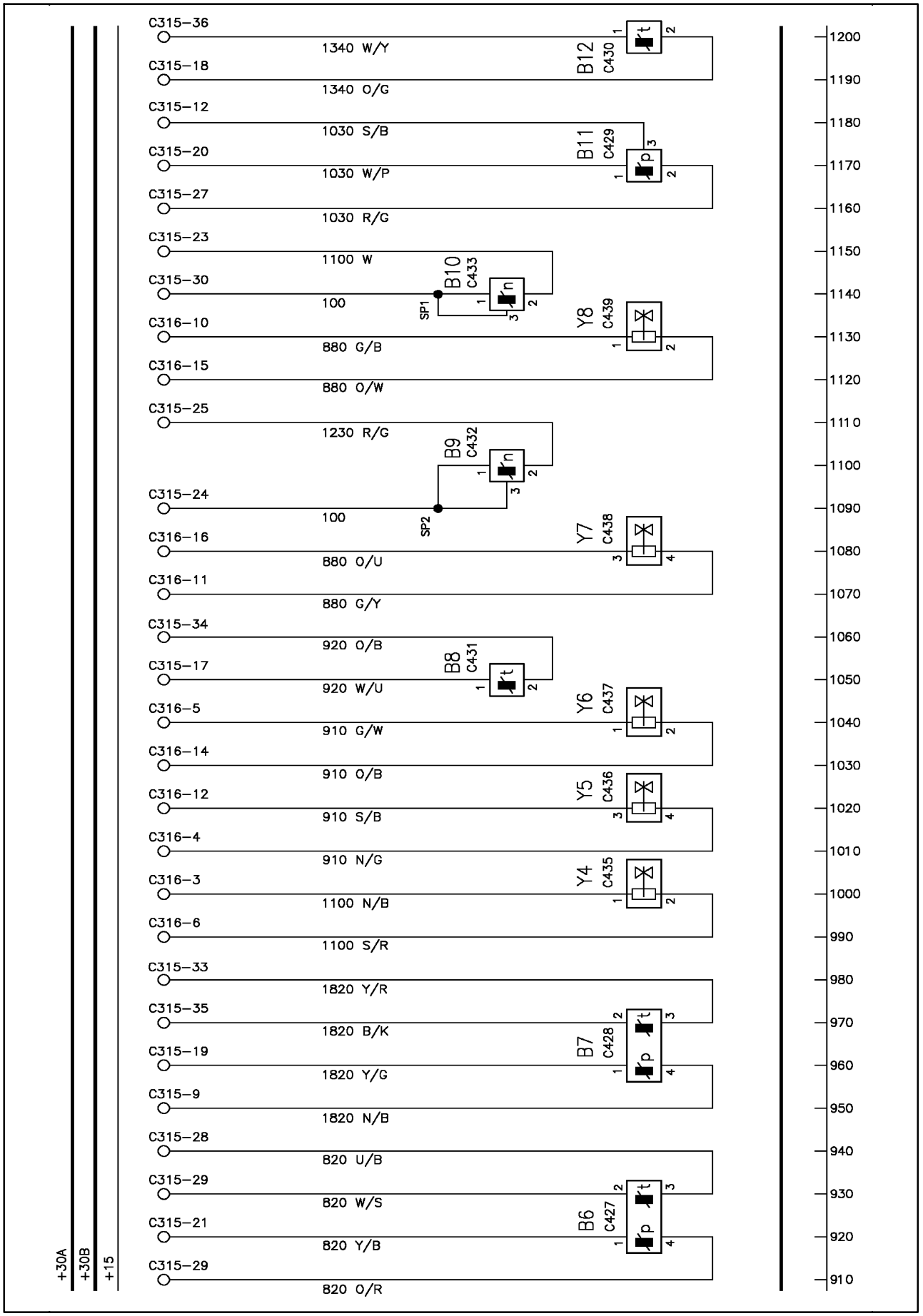
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check fuel injector solenoid for short to ground.

   A. Check between the fuel injector terminals and **ground**. If a short to ground is indicated, remove and replace the fuel injector solenoid.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-18
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1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
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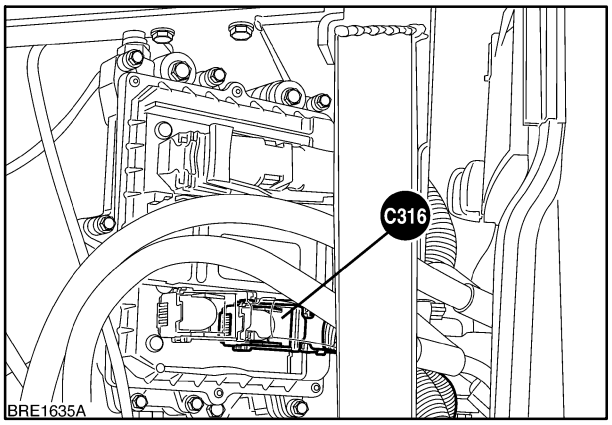
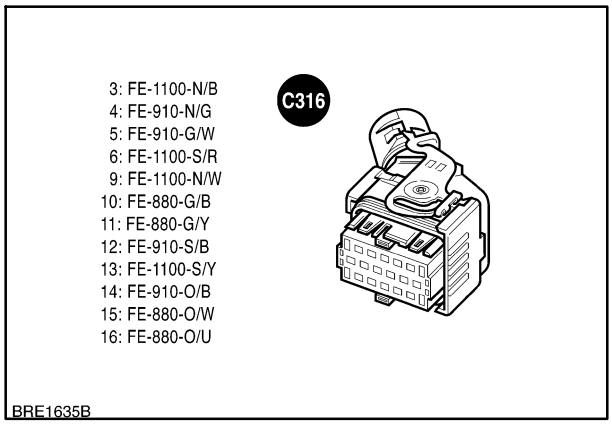

C316
BRE1635A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4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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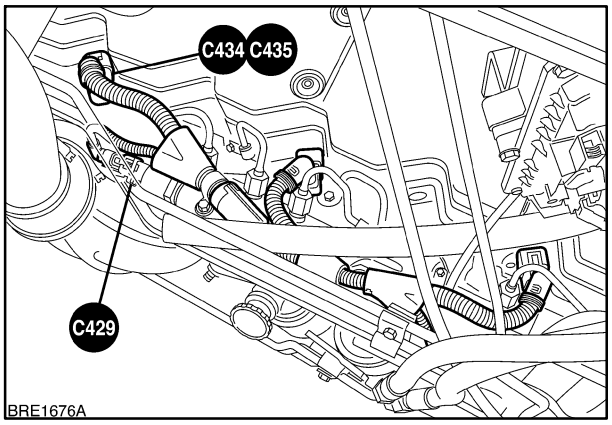
C316
BRE1635B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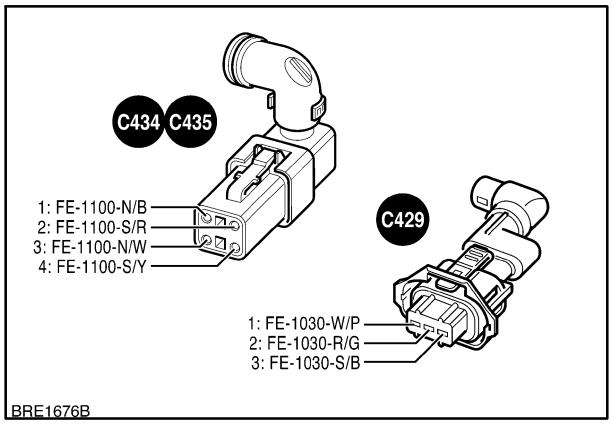
C435
C429
BRE1676A


C434
C435
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3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3079 – FUEL INJECTOR SOLENOID 2 OPEN CIRCUIT OR DISCONNECTED

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 2
3. Faulty harness
4. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 2 connector **C435** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 2 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximatley 0.50 – 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C435**. Check between the component side of the connector:

   C435 pin **1** and the appropriate fuel injector solenoid terminal

   C435 pin **2** and the appropriate fuel injector solenoid terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

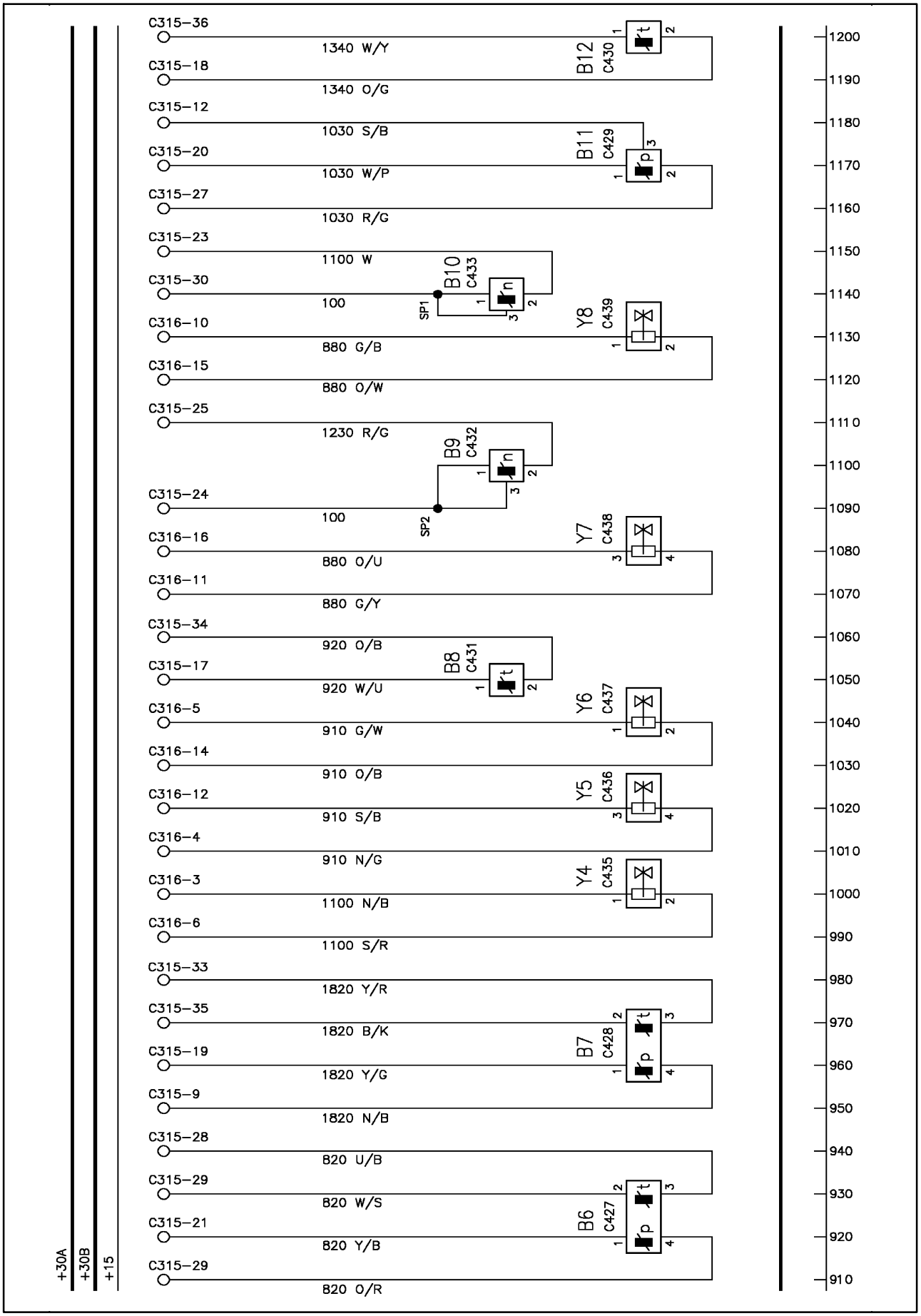
   A. Disconnect connector **C316**. Check between connector:

   C435 pin **1 (N/B)** and **C316** pin **3 (N/B)**

   C435 pin **2 (S/R)** and **C316** pin **6 (S/R)**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-12
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B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
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B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
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SP2
Y7 C438
C316-16
880 O/U
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C315-34
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920 W/U
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Y6 C437
C316-5
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C316-4
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C316-6
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C315-33
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C315-35
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C315-9
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C315-28
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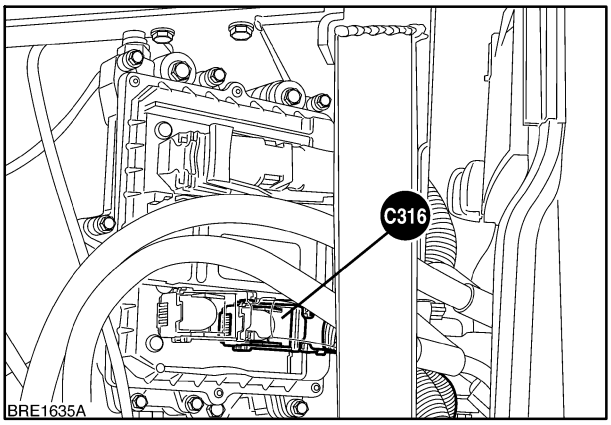
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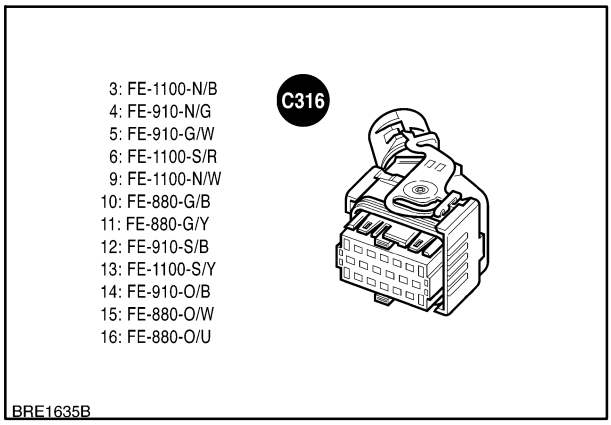
BRE1635A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5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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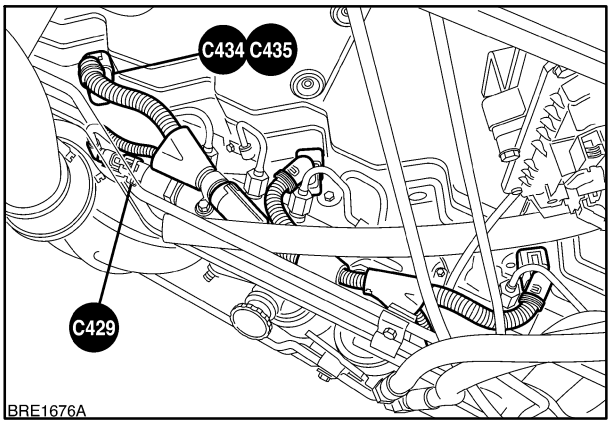
16: FE-880-O/U
C316
BRE1635B


C434 C435
C429
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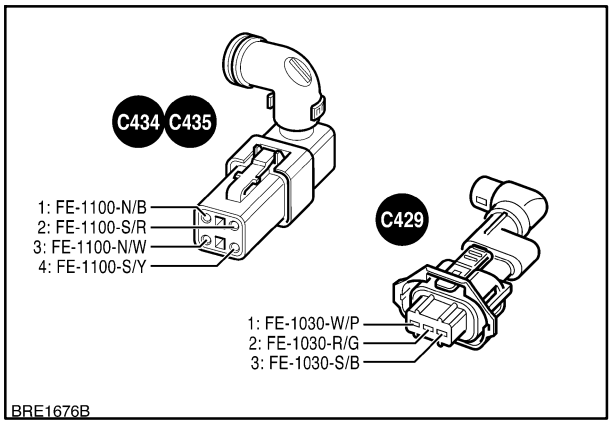
C434 C435
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2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3080 - FUEL INJECTOR SOLENOID 4 CURRENT DECREASED TO FAST

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 4
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 4 connector **C437** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 4 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximately 0.50 - 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C437**. Check between the component side of the connector:

   C437 pin **1** and the appropriate fuel injector terminal

   C437 pin **2** and the appropriate fuel injector terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C437 pin **1** and **ground**

   C437 pin **2** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for a short to ground.

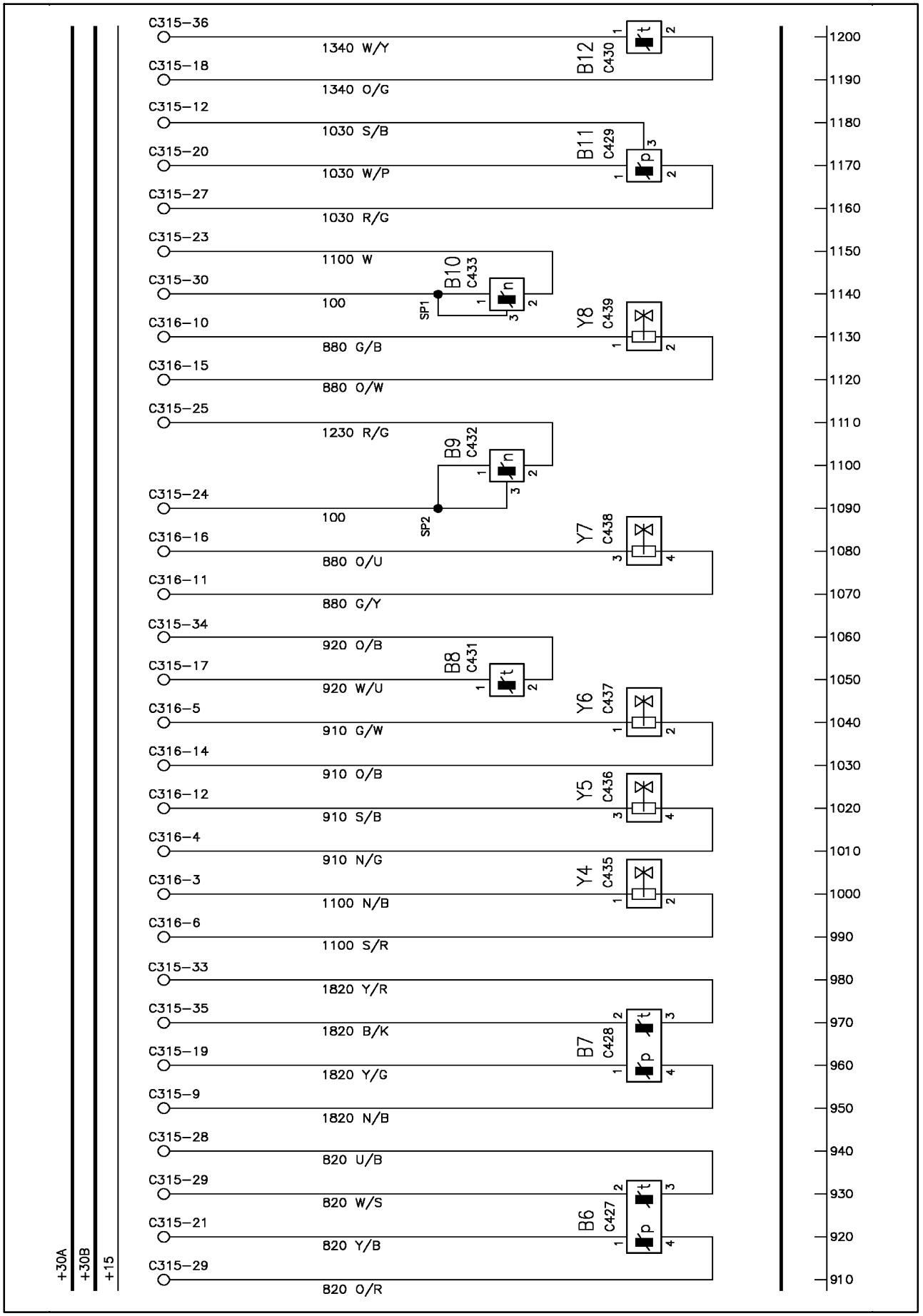
   A. Disconnect connector **C316**. Check between connector:

   C437 pin **1 (G/W)** and **ground**

   C437 pin **2 (O/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-18
1340 O/G
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
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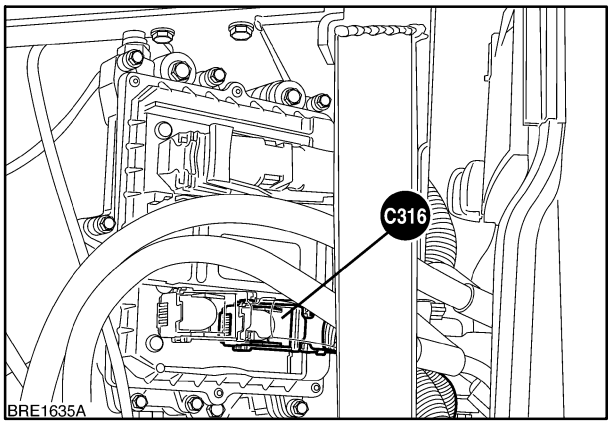
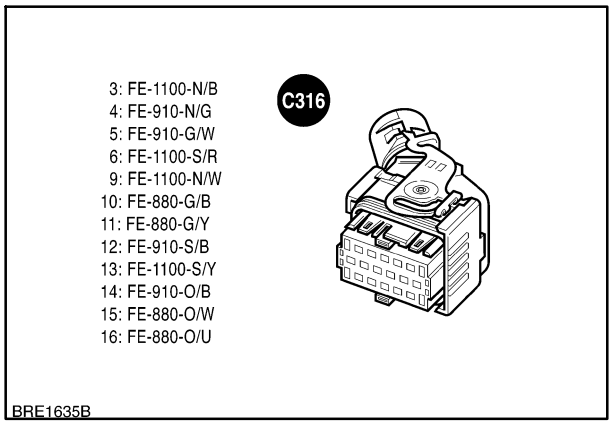

C316
BRE1635A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9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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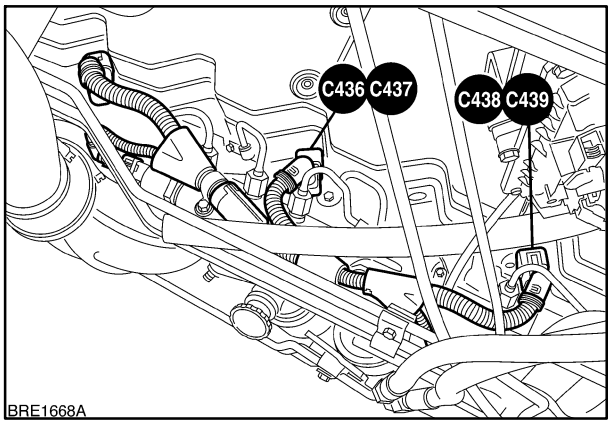
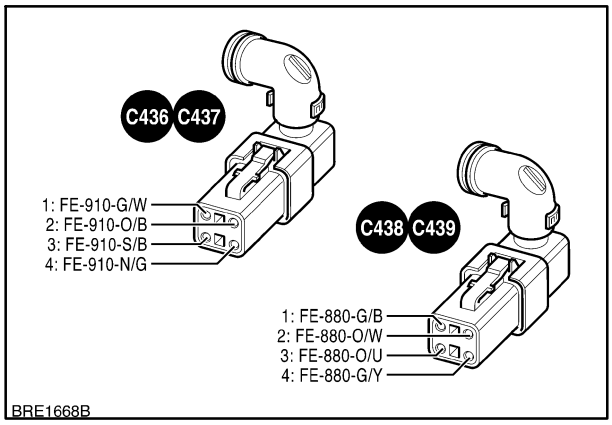
BRE1635B


C436 C437
C438 C439
BRE1668A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3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3081 - FUEL INJECTOR SOLENOID 4 SHORT TO VCC

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 4
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 4 connector **C437** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve.

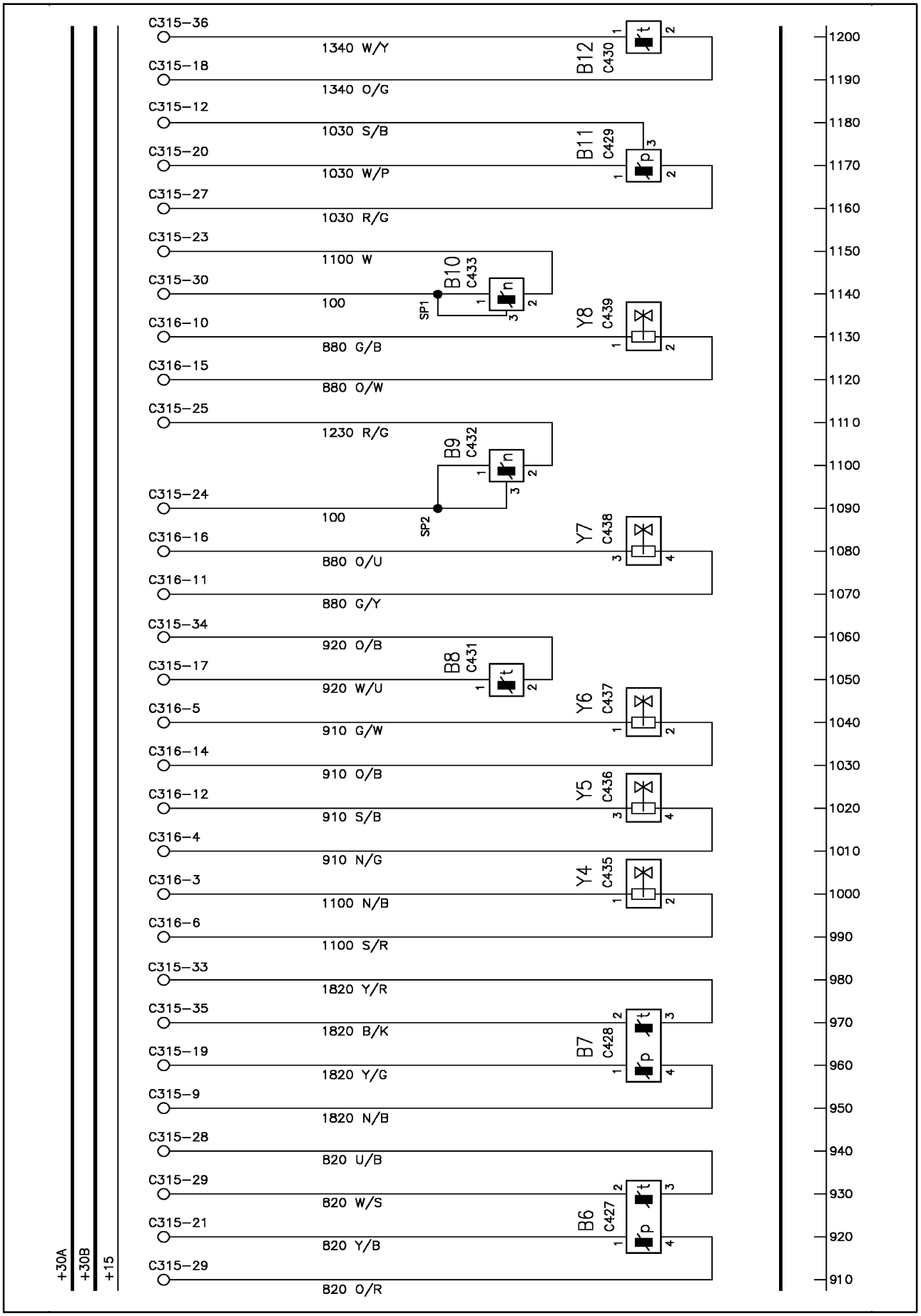
   A. Disconnect connector **C437**. Turn the ketstart ON. Check between connector:

   C437 pin **1 (G/W)** and **ground**

   C437 pin **2 (O/B)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-18
1340 O/G
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C315-12
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C315-20
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B11 C429
C315-27
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C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
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SP2
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C316-16
880 O/U
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C315-34
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C315-17
920 W/U
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Y6 C437
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910 G/W
C316-14
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C316-4
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C316-3
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C316-6
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C315-33
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C315-35
1820 B/K
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C315-19
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C315-9
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C315-28
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B6 C427
C315-21
820 Y/B
C315-29
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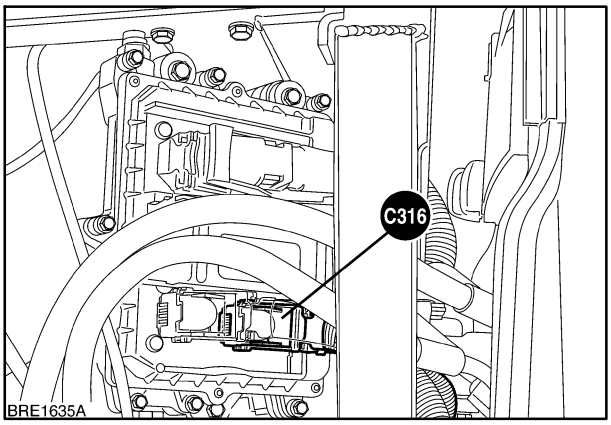
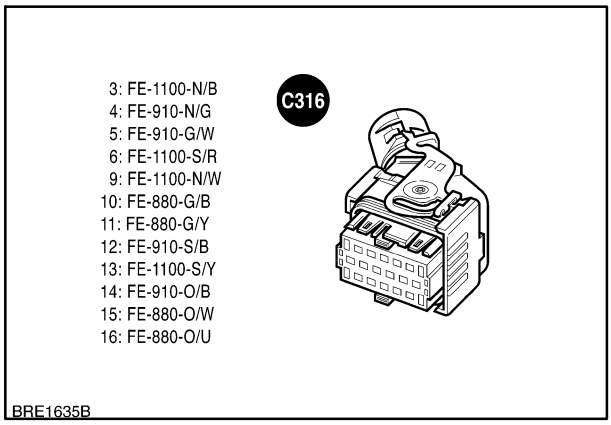

C316
BRE1635A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5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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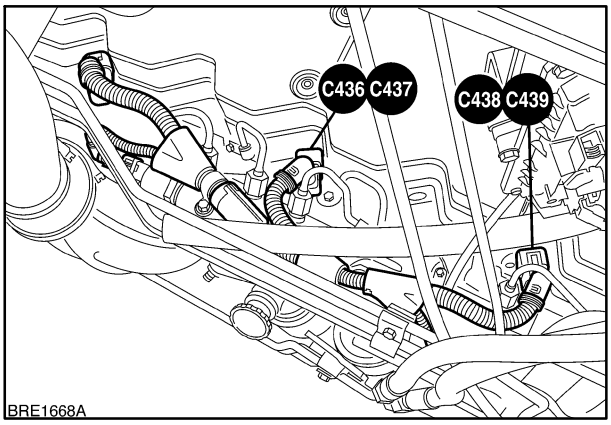
C316
BRE1635B


C436 C437
C438 C439
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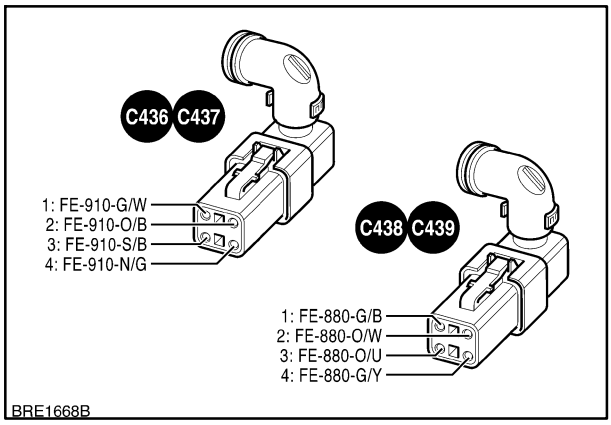
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C438 C439
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2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3082 - FUEL INJECTOR SOLENOID 4 SHORT TO GROUND

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 4
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 4 connector **C437** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect **C437** and **C316**. Check between connector:

   C437 pin **1 (G/W)** and **ground**

   C437 pin **2 (O/B)** and **ground**

   If a short to ground indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for short to ground on the fuel injector flylead.

   A. Check between the component side of the connector:

   C437 pin **1** and **ground**

   C437 pin **2** and **ground**

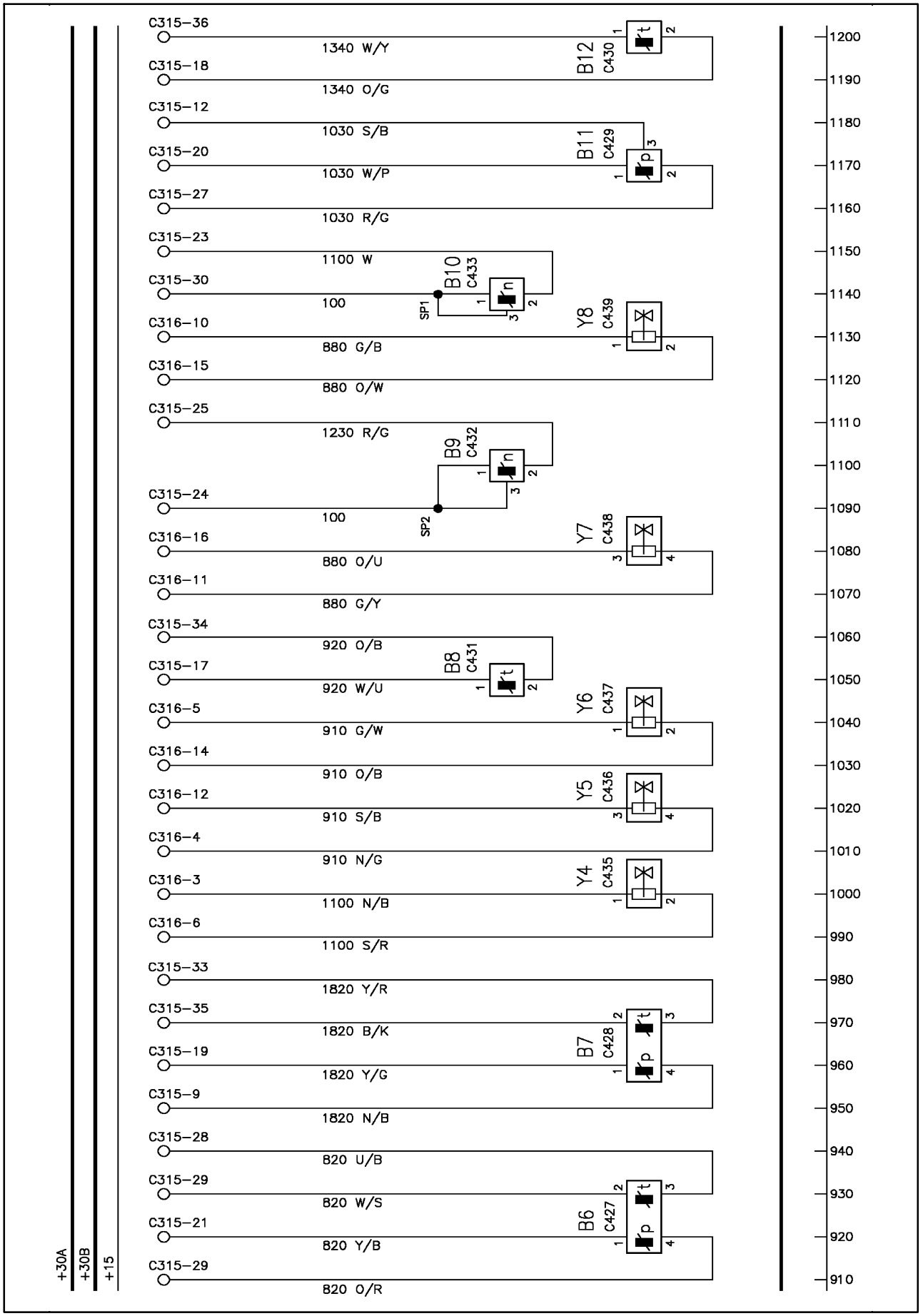
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check fuel injector solenoid for short to ground.

   A. Check between the fuel injector terminals and **ground**. If a short to ground is indicated, remove and replace the fuel injector solenoid.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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B11 C429
C315-27
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C315-23
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C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
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SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
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Y6 C437
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910 S/B
C316-4
910 N/G
Y5 C436
C316-3
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C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
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C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
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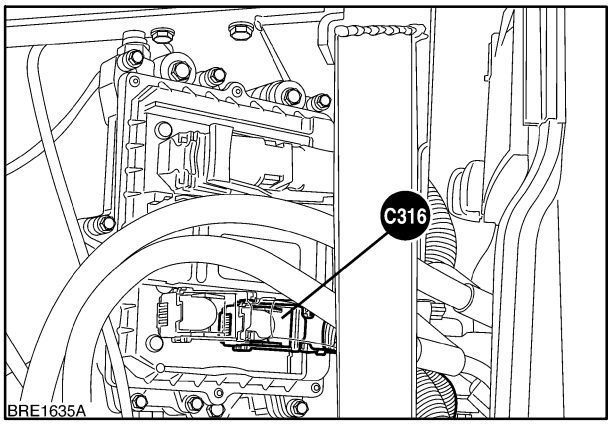
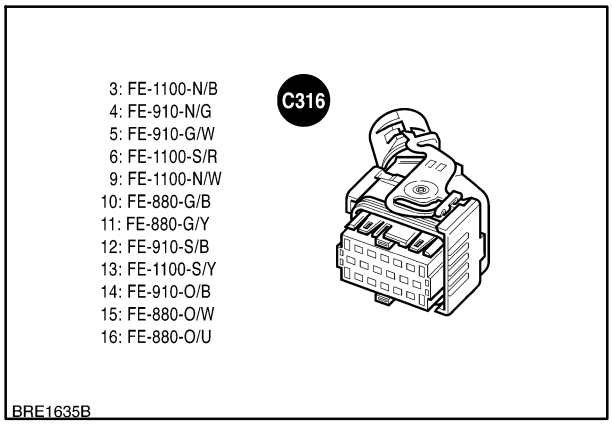

C316
BRE1635A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5: FE-910-G/W
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9: FE-1100-N/W
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11: FE-880-G/Y
12: FE-910-S/B
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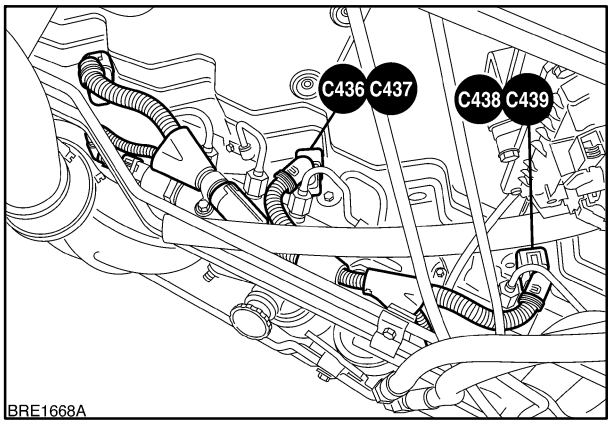
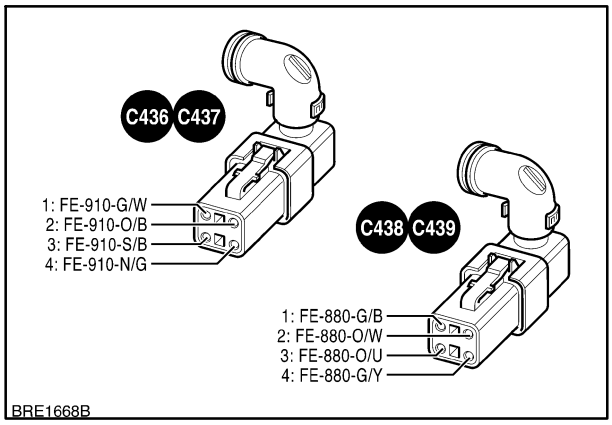
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
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4: FE-910-N/G
C438 C439
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2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3083 – FUEL INJECTOR SOLENOID 4 OPEN CIRCUIT OR DISCONNECTED

Effects:

Engine runs without one cylinder.

Possible failure modes:

1. Faulty connector
2. Faulty fuel injector solenoid 4
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel injector solenoid 4 connector **C437** and the engine controller connector **C316**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight, repair or replace as required. Check the correct tightening torque value of 1.5 Nm (13.5 lb.in) for the flylead fixing nuts on the fuel injector solenoid.

   B. If the connectors are okay, continue to step 2.

2. Check the fuel injector solenoid.

   A. Disconnect the fuel injector solenoid 4 flylead terminals. Measure the resistance between the fuel injector solenoid terminals. If the resistance is not between approximatley 0.50 – 0.60 Ohms at 20 degrees centigrade, remove and replace the fuel injector solenoid.

   B. If the fuel injector is okay, continue to step 3.

3. Check for an open circuit on the fuel injector flylead.

   A. Disconnect connector **C437**. Check between the component side of the connector:

   C437 pin **1** and the appropriate fuel injector solenoid terminal

   C437 pin **2** and the appropriate fuel injector solenoid terminal

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

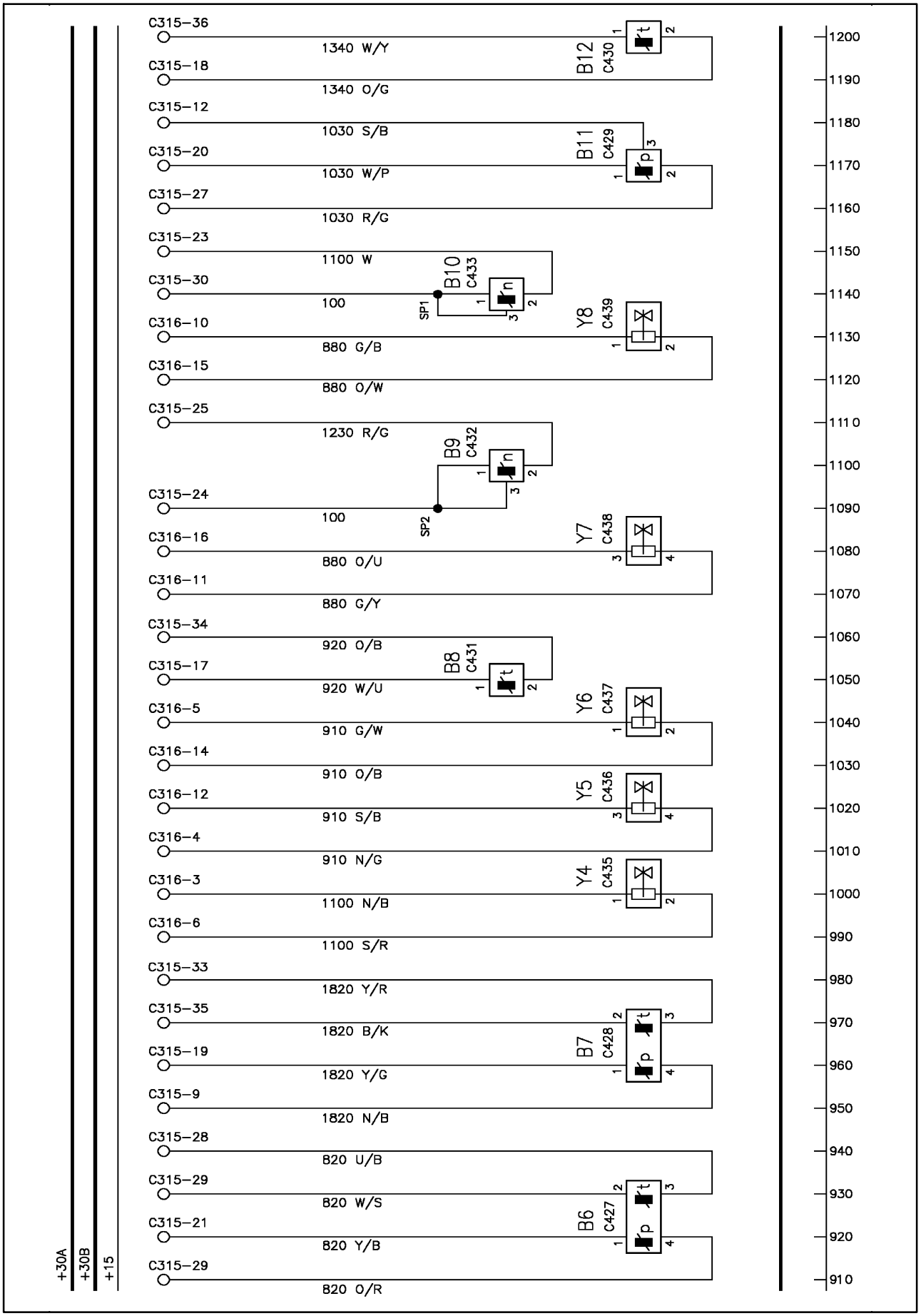
   A. Disconnect connector **C316**. Check between connector:

   C437 pin **1 (G/W)** and **C316** pin **5 (G/W)**

   C437 pin **2 (O/B)** and **C316** pin **14 (O/B)**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-36
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C315-18
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C315-20
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C429
C315-27
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C315-23
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C315-30
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SP1
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C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
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C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
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C316-6
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C435
C315-33
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C315-35
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C315-19
1820 Y/G
B7
C428
C315-9
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C315-28
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C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
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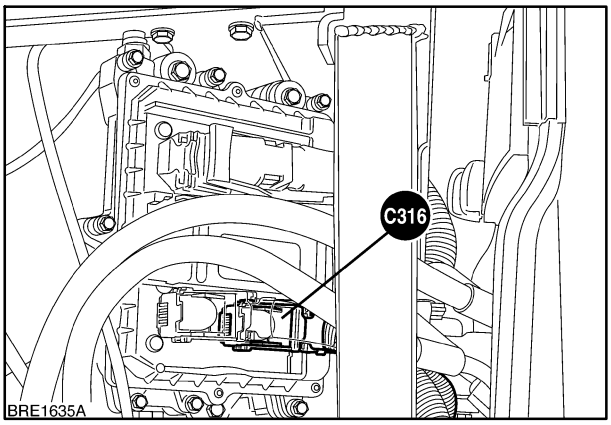
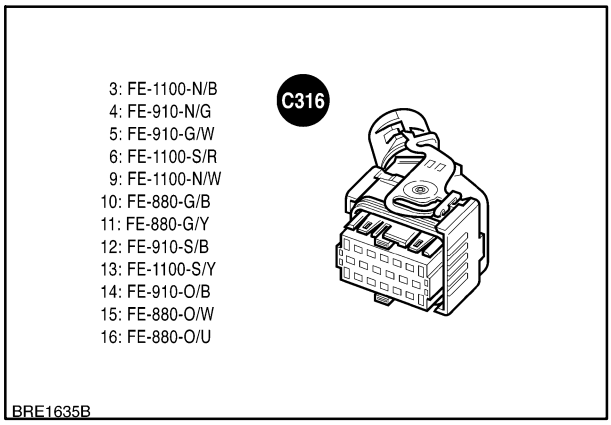

C316
BRE1635A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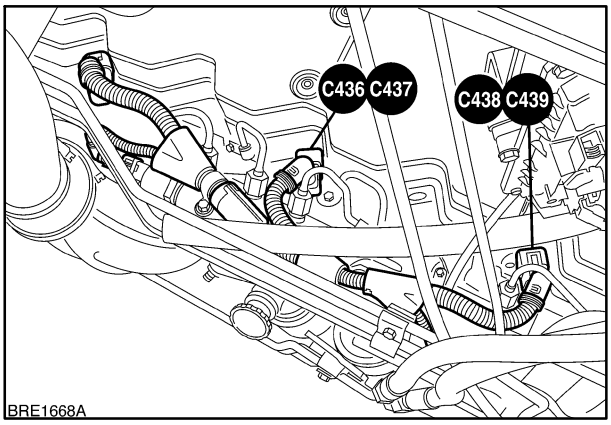
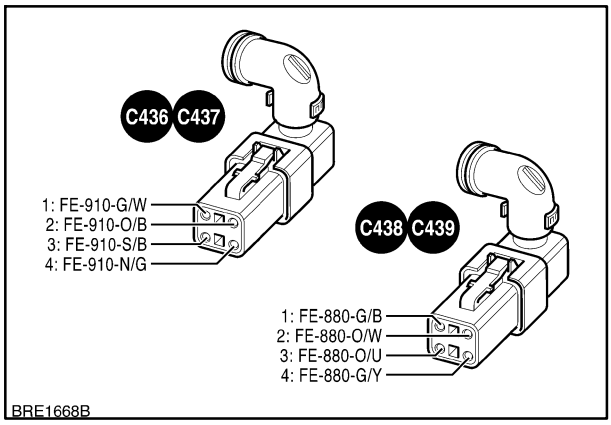
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
C316
BRE1635B


C436 C437
C438 C439
BRE1668A


C436 C437
1: FE-910-G/W
2: FE-910-O/B
3: FE-910-S/B
4: FE-910-N/G
C438 C439
1: FE-880-G/B
2: FE-880-O/W
3: FE-880-O/U
4: FE-880-G/Y
BRE1668B

ERROR CODE 3084 - FUEL INJECTOR BOOSTER CAPACITOR 1 HIGH VOLTAGE

Effects:

Engine runs on 3 cylinders.

Possible failure modes:

1. Faulty injector boost capacitor (integrated in the engine controller)
2. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other fuel injector error codes displayed.
   A. If other fuel injector error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3085 - FUEL INJECTOR BOOSTER CAPACITOR 1 LOW VOLTAGE

Effects:

Engine runs on 3 cylinders.

Possible failure modes:

1. Faulty injector boost capacitor (integrated in the engine controller)
2. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check for other fuel injector error codes displayed.

   A. If other fuel injector error codes are diplayed, continue to these tests.

   B. If no other fuel injector error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3086 - FUEL INJECTOR BOOSTER CAPACITOR 2 HIGH VOLTAGE

Effects:

Engine runs on 3 cylinders.

Possible failure modes:

1. Faulty injector boost capacitor (integrated in the engine controller)
2. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check for other fuel injector error codes displayed.

   A. If other fuel injector error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3087 - FUEL INJECTOR BOOSTER CAPACITOR 2 LOW VOLTAGE

Effects:

Engine runs on 3 cylinders.

Possible failure modes:

1. Faulty injector boost capacitor (integrated in the engine controller)
2. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check for other fuel injector error codes displayed.

   A. If other fuel injector error codes are diplayed, continue to these tests.

   B. If no other fuel injector error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

ERROR CODE 3088 - INCREMENT SPEED SIGNAL ERROR OR REVERSED CONNECTIONS

Effects:

Engine may not start.

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty crankshaft sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the crankshaft sensor mechanical operation is okay. Remove the sensor and ensure it is clean and not damaged.

   A. If a fault with the crankshaft sensor is indicated, repair as necessary.

   B. If a fault with the crankshaft sensor is not indicated, ensure the sensor is fitted securely, continue to step 3.
3. Check the crankshaft sensor connector **C432** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged and the fit is tight, also that the pins are in the correct position and not reversed . Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the crankshaft sensor.

   A. Disconnect connector **C432**. Check the resistance between the component side of the connector **C432** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the crankshaft sensor.

   B. If the crankshaft sensor is okay, continue to step 5.
5. Check for an open circuit.

   A. Check between connectors:

   C432 pin **1 (W)** and **C315** pin **24 (W)**

   C432 pin **2 (R/G)** and **C315** pin **25 (R/G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.
6. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

   C432 pin **1 (W)** and **ground**.

   C432 pin **2 (R/G)** and **ground**.

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 7.
7. Check for a short to + Ve.

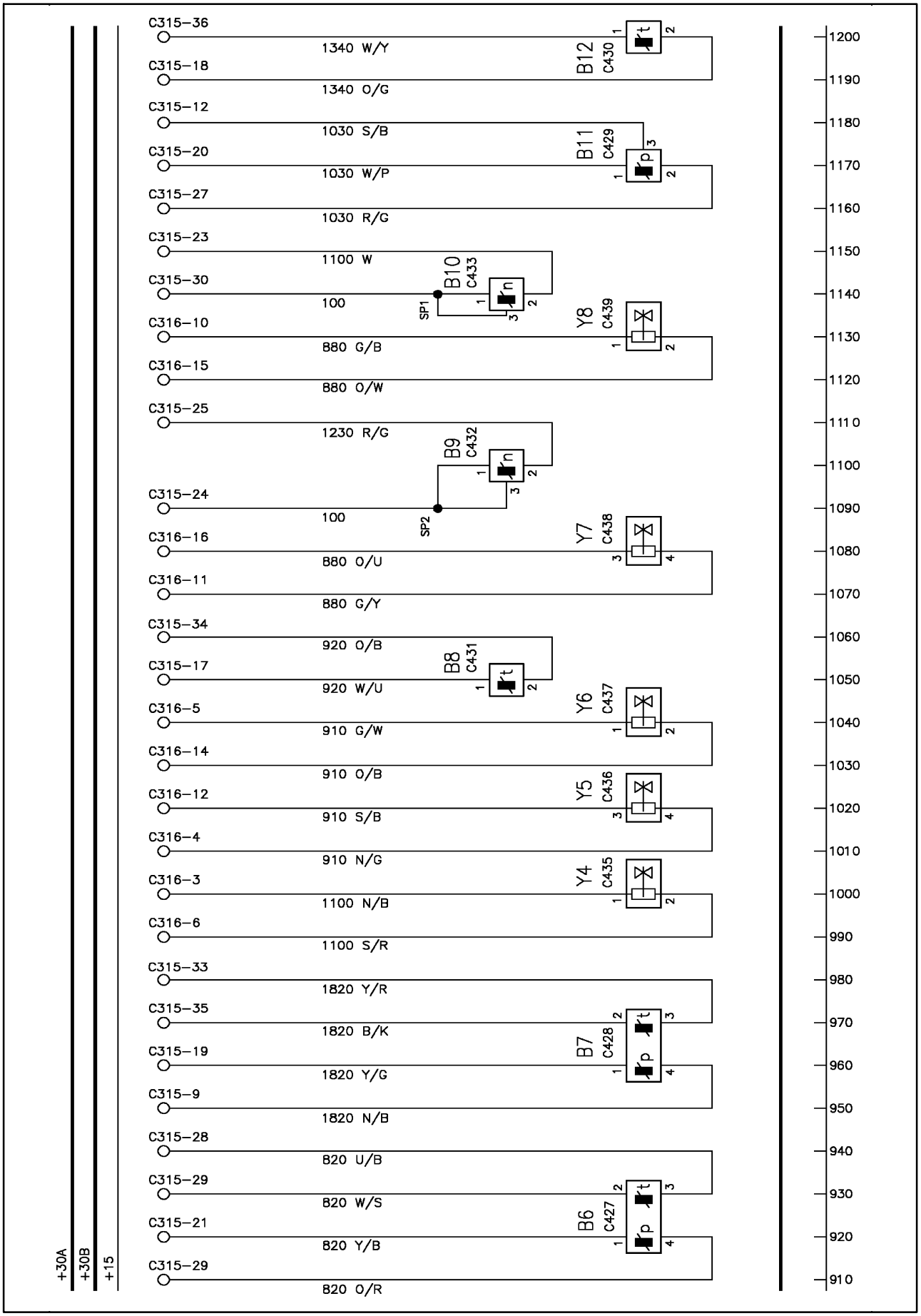
   A. Turn the keystart ON. Check between connector:

   C432 pin **1 (W)** and **ground**

   C432 pin **2 (R/G)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller,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C315-18
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
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SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
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C316-6
1100 S/R
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C315-33
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C315-35
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C315-19
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B7 C428
C315-9
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C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
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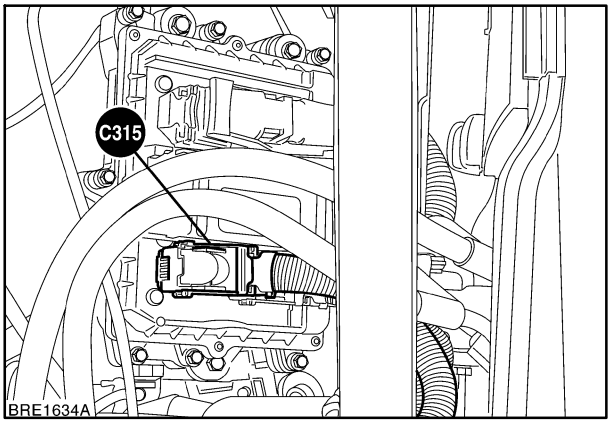
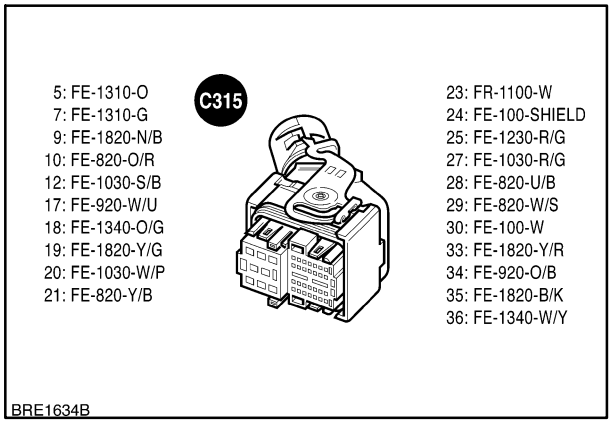

C315
BRE1634A


C315
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7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
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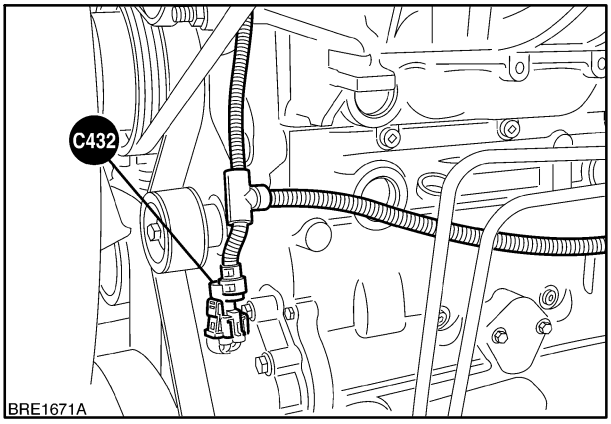
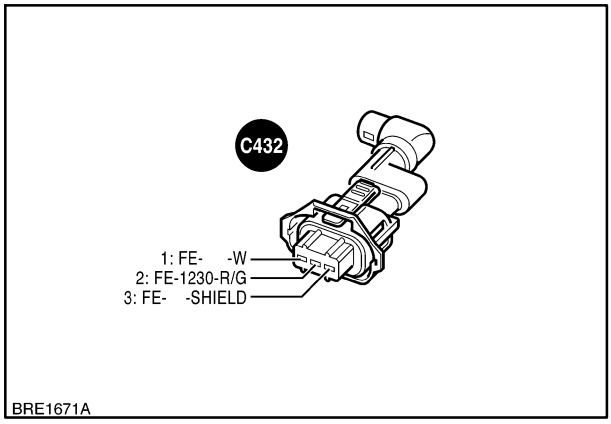
36: FE-1340-W/Y
BRE1634B


C432
BRE1671A


C432
1: FE- -W
2: FE-1230-R/G
3: FE- -SHIELD
BRE1671A

ERROR CODE 3089 - INCREMENT SPEED SIGNAL EXCESSIVE NOISE ON CIRCUIT

Effects:

Engine may not start.

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty crankshaft sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the crankshaft sensor mechanical operation is okay. Remove the sensor and ensure it is clean and not damaged.

   A. If a fault with the crankshaft sensor is indicated, repair as necessary.

   B. If a fault with the crankshaft sensor is not indicated, ensure the sensor is fitted securely, continue to step 3.
3. Check the crankshaft sensor connector **C432** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged and the fit is tight, also that the pins are in the correct position and not reversed . Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the crankshaft sensor.

   A. Disconnect connector **C432**. Check the resistance between the component side of the connector **C432** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the crankshaft sensor.

   B. If the crankshaft sensor is okay, continue to step 5.
5. Check for an open circuit.

   A. Check between connectors:

   C432 pin **1 (W)** and **C315** pin **24 (W)**

   C432 pin **2 (R/G)** and **C315** pin **25 (R/G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.
6. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

   C432 pin **1 (W)** and **ground**.

   C432 pin **2 (R/G)** and **ground**.

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 7.
7. Check for a short to + Ve.

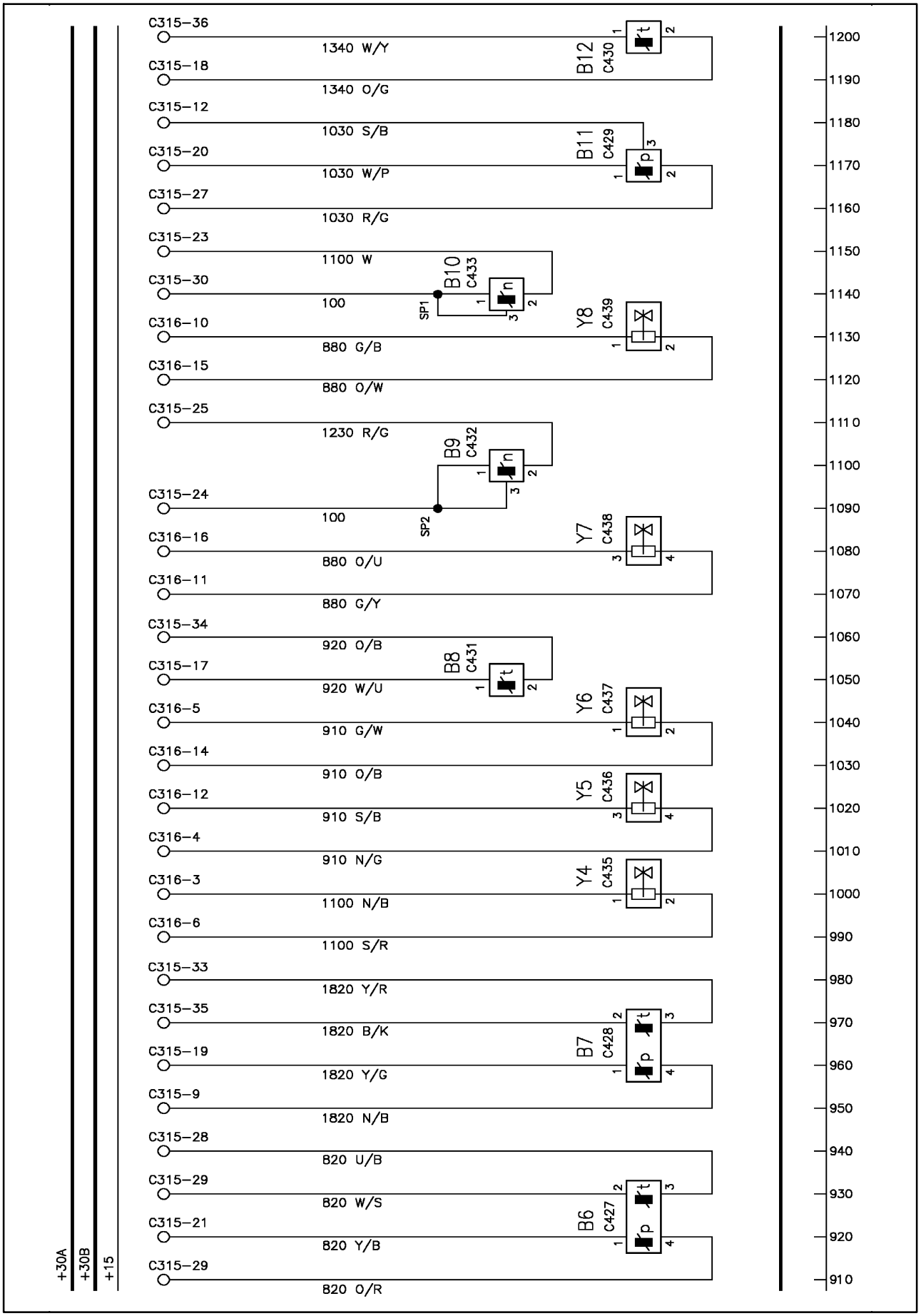
   A. Turn the keystart ON. Check between connector:

   C432 pin **1 (W)** and **ground**

   C432 pin **2 (R/G)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller,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+30B
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C315-36
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C315-18
1340 O/G
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
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B9 C432
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C316-16
880 O/U
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880 G/Y
C315-34
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C315-17
920 W/U
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Y6 C437
C316-5
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C316-14
910 O/B
Y5 C436
C316-12
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C316-4
910 N/G
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C316-6
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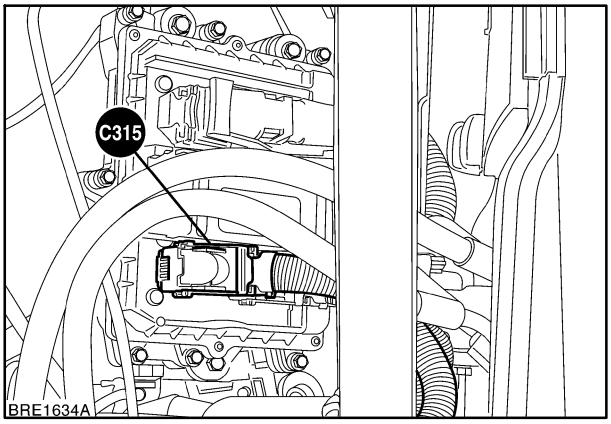
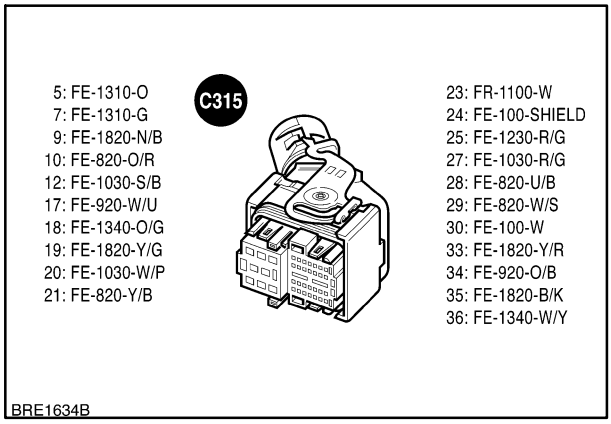

C315
BRE1634A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10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
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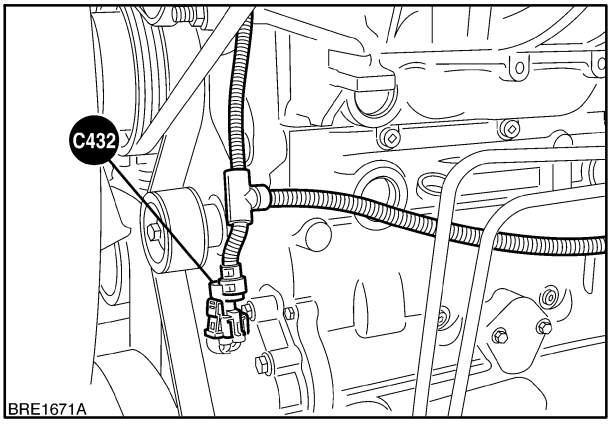
BRE1634B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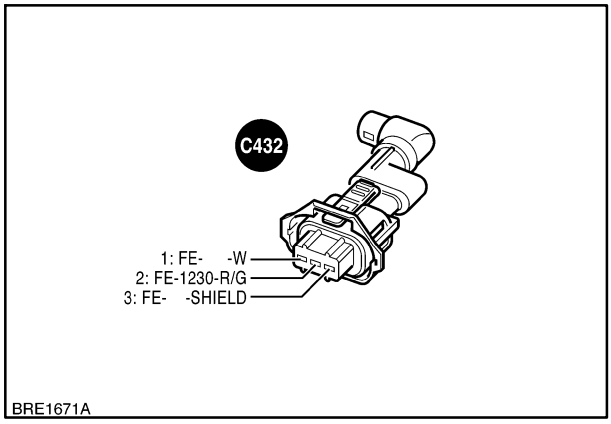

C432
1: FE- -W
2: FE-1230-R/G
3: FE- -SHIELD
BRE1671A

ERROR CODE 3090 - SEGMENT SPEED SIGNAL PHASE ERROR DETECTION

Effects:

Engine hard to start in any condition.

Possible failure modes:

1. Faulty connector
2. Faulty camshaft sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the camshaft sensor mechanical operation is okay. Remove the sensor and ensure it is clean and not damaged.

   A. If a fault with the camshaft sensor is indicated, repair as necessary.

   B. If a fault with the camshaft sensor is not indicated, ensure the sensor is fitted securely, continue to step 3.
3. Check the camshaft sensor connector **C433** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged and the fit is tight, also that the pins are in the correct position and not reversed . Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the camshaft sensor.

   A. Disconnect connector **C433**. Check the resistance between the component side of the connector:

   C433 pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the camshaft sensor.

   B. If the camshaft sensor is okay, continue to step 5.
5. Check for an open circuit.

   A. Check between connectors:

   C433 pin **1 (R/G)** and **C315** pin **30 (R/G)**

   C433 pin **2 (W)** and **C315** pin **23 (W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.
6. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

   C433 pin **1 (R/G)** and **ground**

   C433 pin **2 (W)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

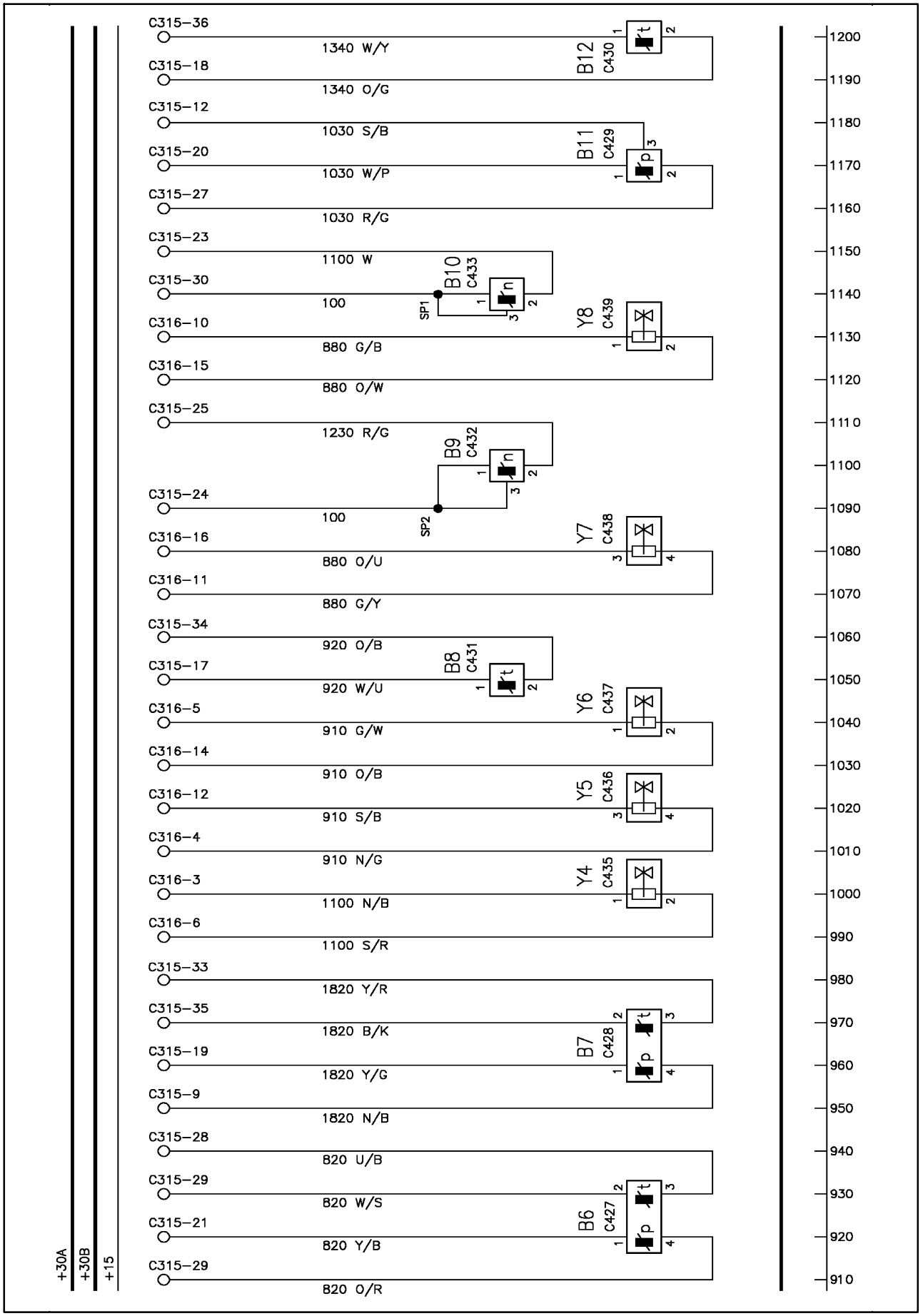
   B. If the harness is okay, continue to step 7.
7. Check for a short to + Ve.

   A. Check between connector:

   C433 pin **1 (R/G)** and **ground**

   C433 pin **2 (W)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.


+30A
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+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10 C433
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
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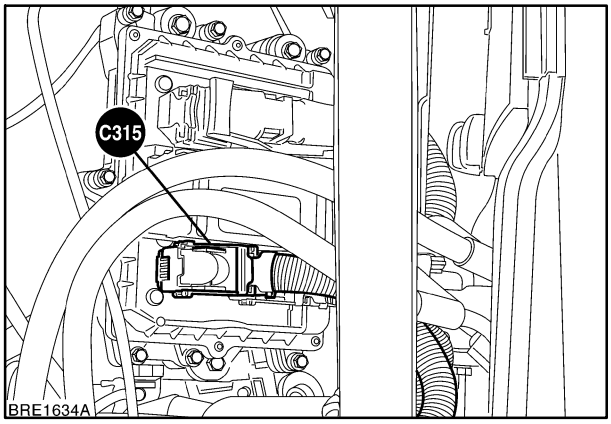
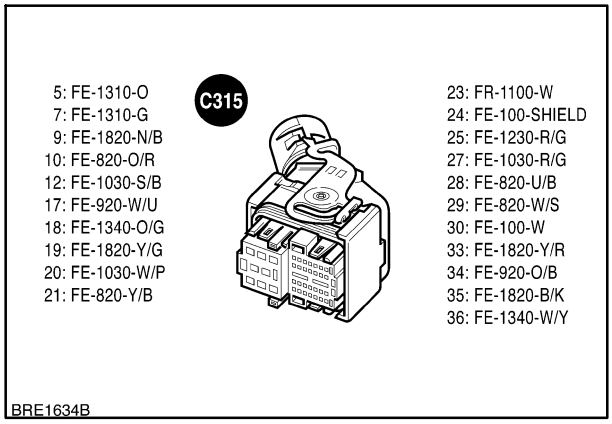
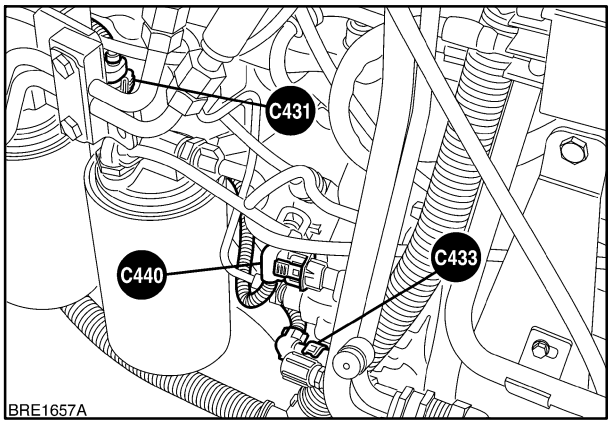
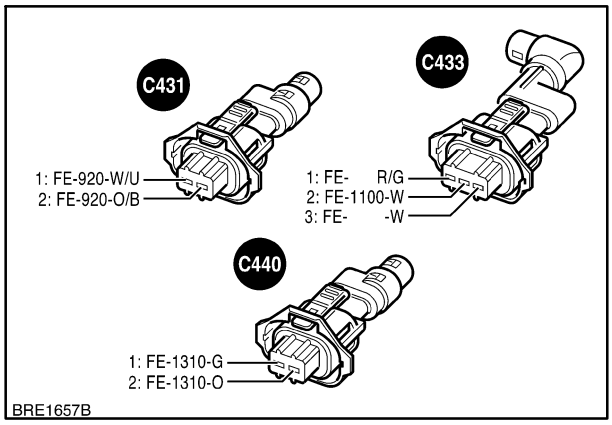

C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B

ERROR CODE 3091 - SEGMENT SPEED SIGNAL ERROR OR REVERSED CONNECTIONS

Effects:

Engine hard to start in any condition.

Possible failure modes:

1. Faulty connector
2. Faulty camshaft sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the camshaft sensor mechanical operation is okay. Remove the sensor and ensure it is clean and not damaged.

   A. If a fault with the camshaft sensor is indicated, repair as necessary.

   B. If a fault with the camshaft sensor is not indicated, ensure the sensor is fitted securely, continue to step 3.
3. Check the camshaft sensor connector **C433** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged and the fit is tight, also that the pins are in the correct position and not reversed . Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the camshaft sensor.

   A. Disconnect connector **C433**. Check the resistance between the component side of the connector:

   C433 pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the camshaft sensor.

   B. If the camshaft sensor is okay, continue to step 5.
5. Check for an open circuit.

   A. Check between connectors:

   C433 pin **1 (R/G)** and **C315** pin **30 (R/G)**

   C433 pin **2 (W)** and **C315** pin **23 (W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.
6. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

   C433 pin **1 (R/G)** and **ground**

   C433 pin **2 (W)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 7.
7. Check for a short to + Ve.

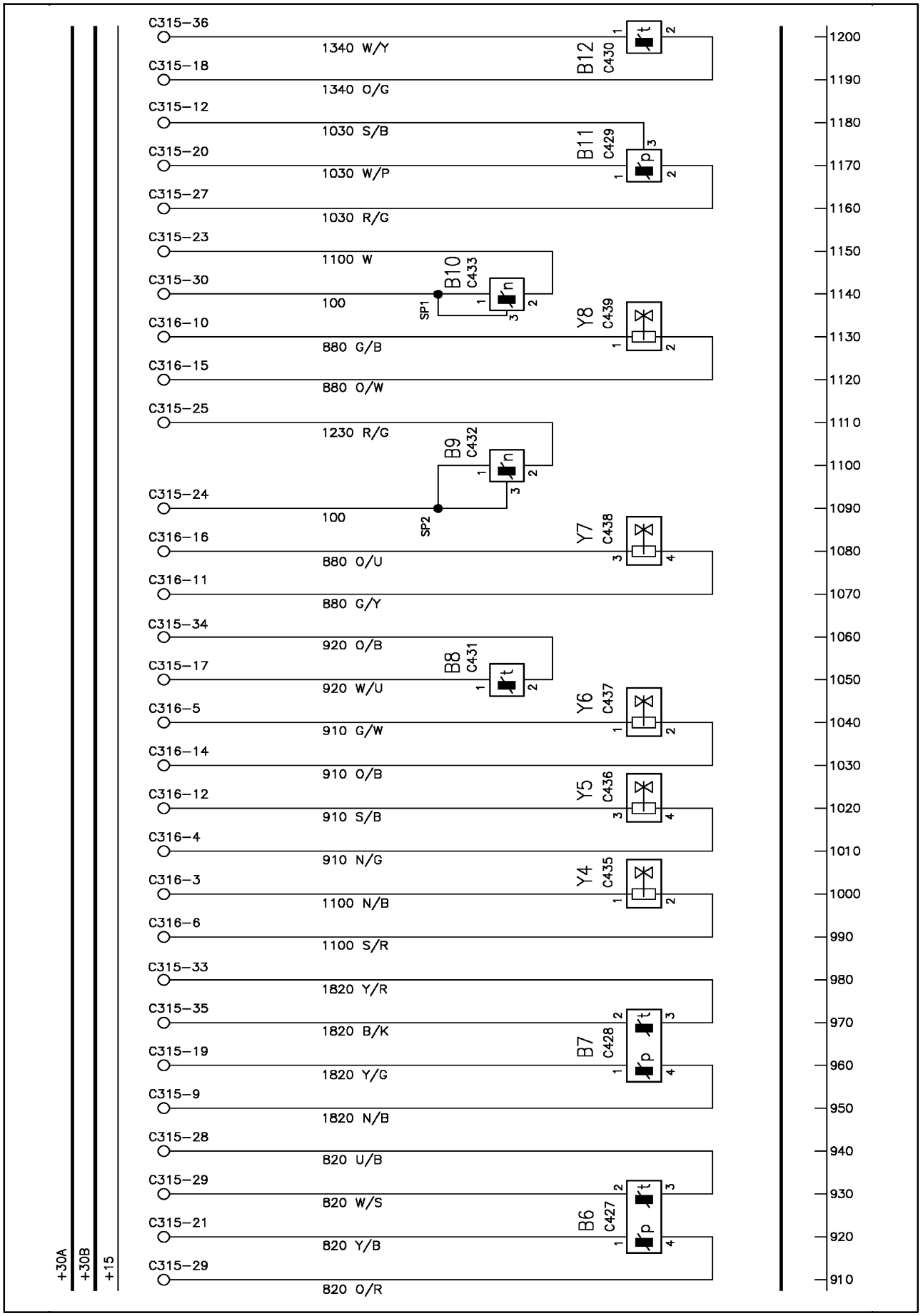
   A. Check between connector:

   C433 pin **1 (R/G)** and **ground**

   C433 pin **2 (W)** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
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C316-6
1100 S/R
Y4 C435
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C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
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C315-29
820 W/S
C315-21
820 Y/B
B6 C427
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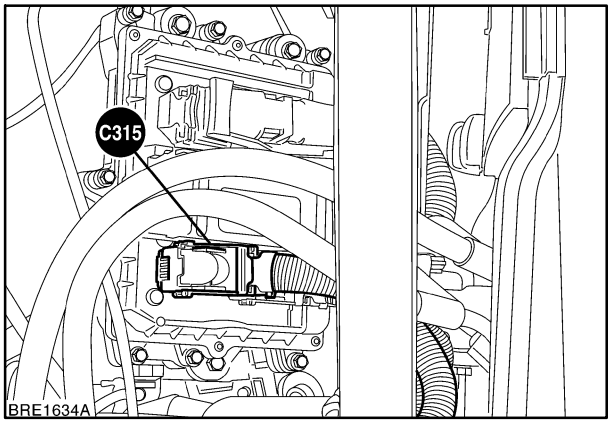
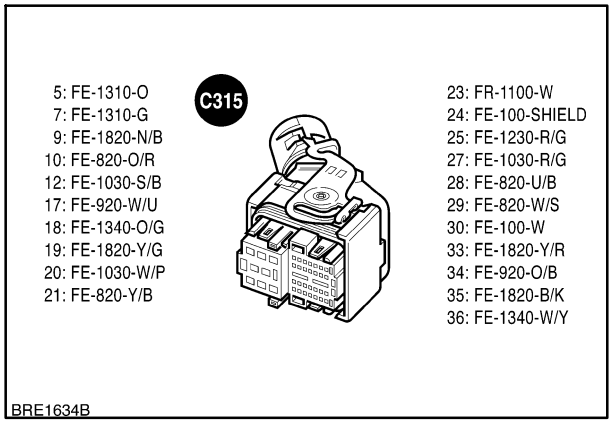

C315
BRE1634A


C315
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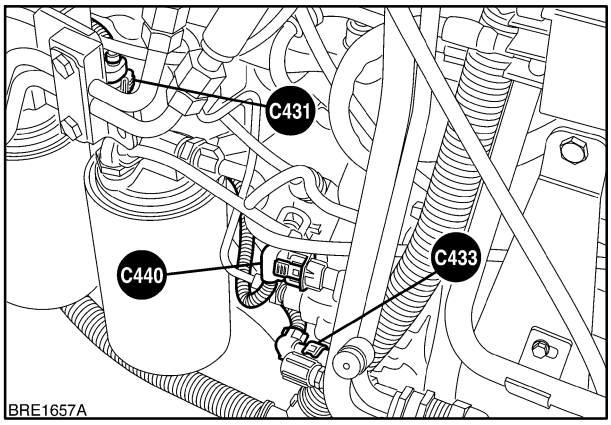
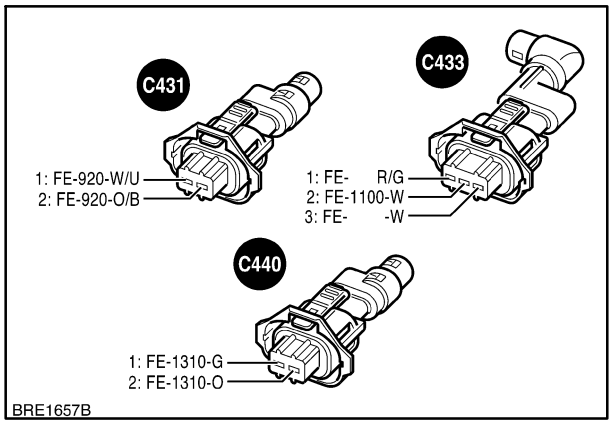
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B

ERROR CODE 3092 – ENGINE SPEED SIGNALS CAMSHAFT OR CRANKSHAFT NOT PLAUSIBLE

Possible failure modes:

1. Faulty connector
2. Faulty crankshaft sensor
3. Faulty camshaft sensor
4. Faulty harness
5. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.

   A. If other camshaft or crankshaft sensor error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, continue to step 3.
3. Ensure that the crankshaft sensor mechanical operation is okay. Remove the sensor and ensure it is clean and not damaged.

   A. If a fault with the crankshaft sensor is indicated, repair as necessary.

   B. If a fault with the crankshaft sensor is not indicated, ensure the sensor is fitted securely,

   continue to step 4.
4. Check the crankshaft sensor connector **C432**, the camshaft sensor connector **C433** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 5.
5. Check the crankshaft sensor.

   A. Disconnect connector **C432**. Check the resistance between the component side of the connector **C432** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the crankshaft sensor.

   B. If the crankshaft sensor is okay, continue to step 6.
6. Check crankshaft sensor circuit for open.

   A. Check between connectors:

   C432 pin **1 (W)** and **C315** pin **24 (W)**

   C432 pin **2 (R/G)** and **C315** pin **25 (R/G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 7.
7. Check the camshaft sensor.

   A. Disconnect connector **C433**. Check the resistance between the component side of the connector **C433** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the camshaft sensor.

   B. If the camshaft sensor is okay, continue to step 8.

8. Check the camshaft sensor circuit for open.

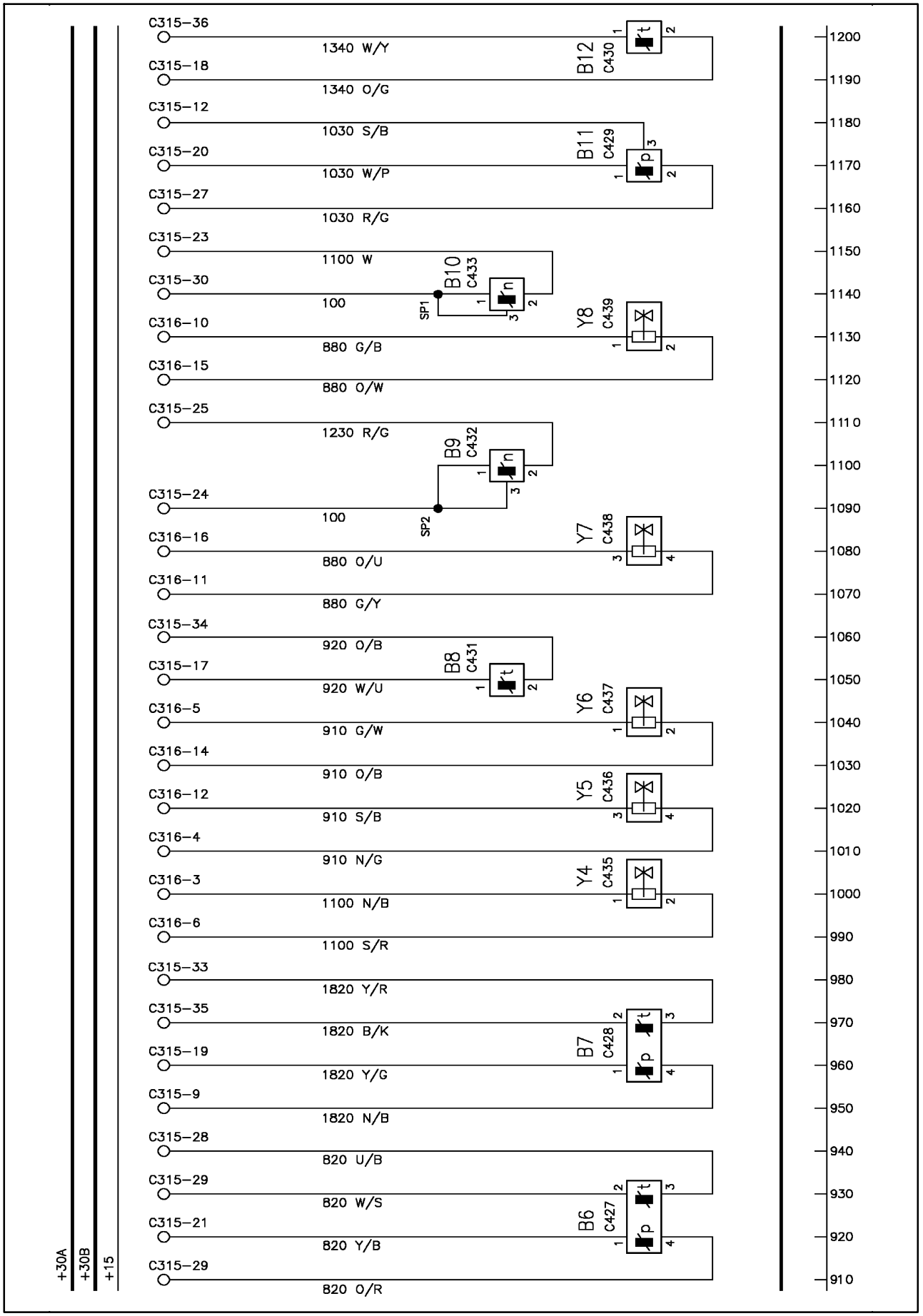
   A. Check between connectors:

   C433 pin **1 (R/G)** and **C315** pin **30 (R/G)**

   C433 pin **2 (W)** and **C315** pin **23 (W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
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C316-6
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C315-35
1820 B/K
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C315-29
820 W/S
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B6 C427
C315-29
820 O/R
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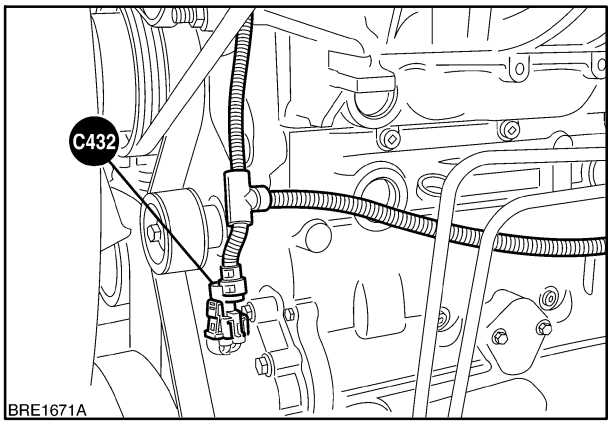
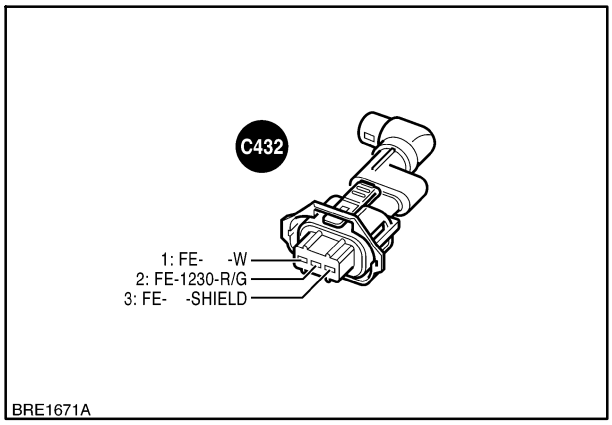
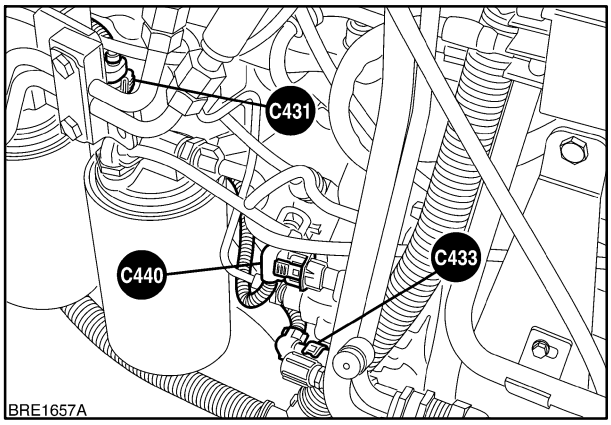
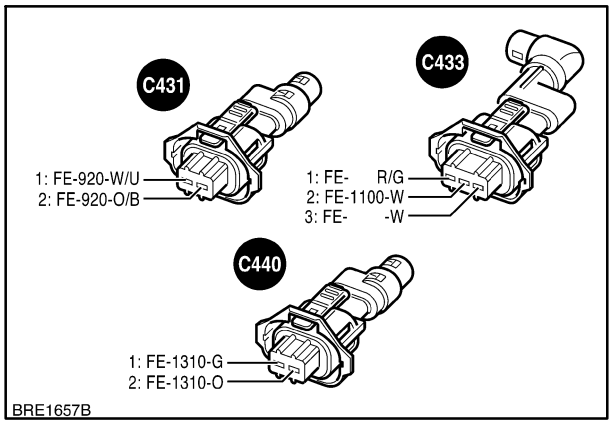
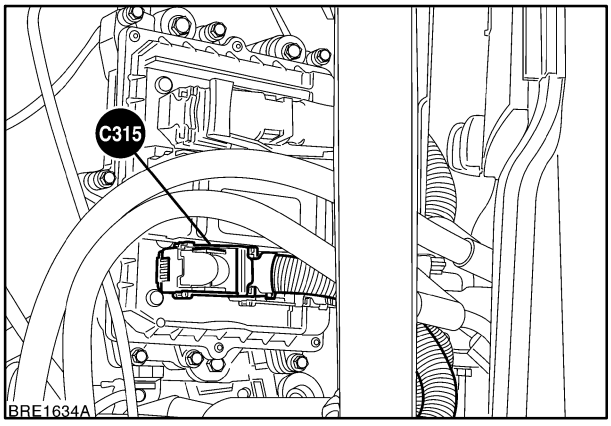

C432
BRE1671A


C432
1: FE- -W
2: FE-1230-R/G
3: FE- -SHIELD
BRE1671A


C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
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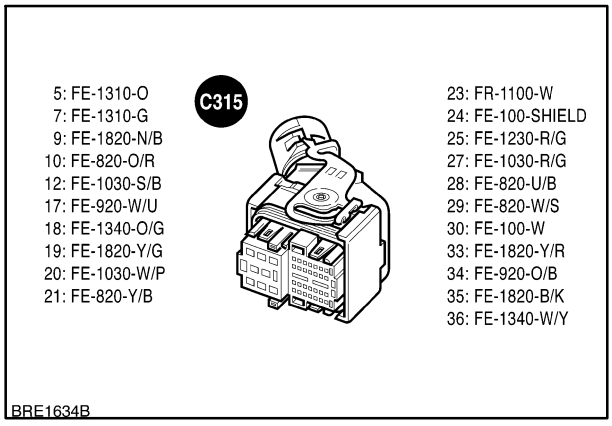
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7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3093 - ENGINE SPEED SENSOR HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty crankshaft sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the crankshaft sensor connector **C432** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the crankshaft sensor.

   A. Disconnect connector **C432**. Check the resistance between the component side of the connector **C432** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the camshaft sensor.

   B. If the camshaft sensor is okay, continue to step 4.

4. Check for a short to + Ve.

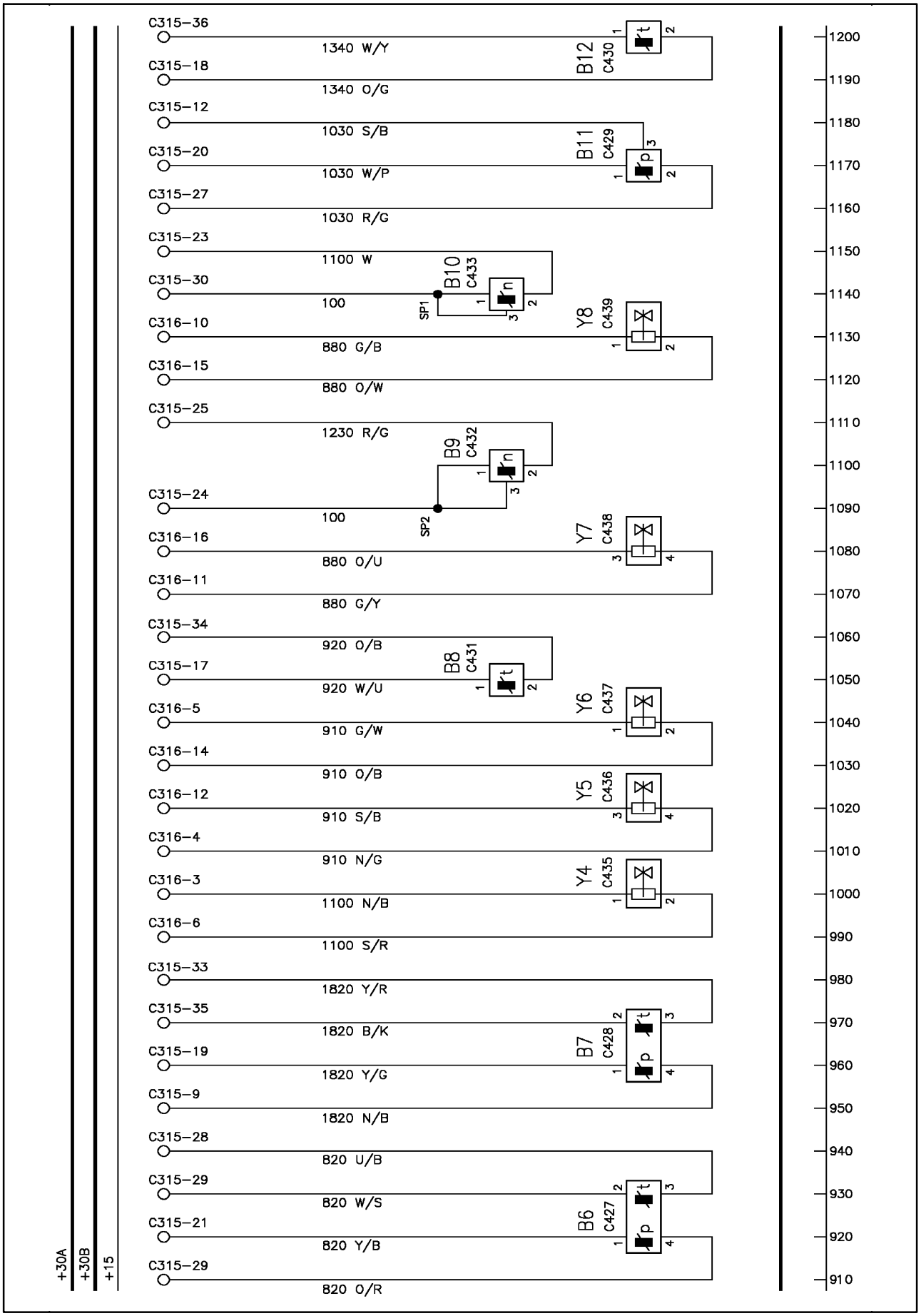
   A. Turn the keystart ON. Check between connector:

   C432 pin **1** and **ground**

   C432 pin **2** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the engine controller.


+30A
+30B
+15
C315-36
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C315-18
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C315-12
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C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
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SP2
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C315-34
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C315-17
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B8 C431
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Y5 C436
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C315-35
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C315-29
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C315-29
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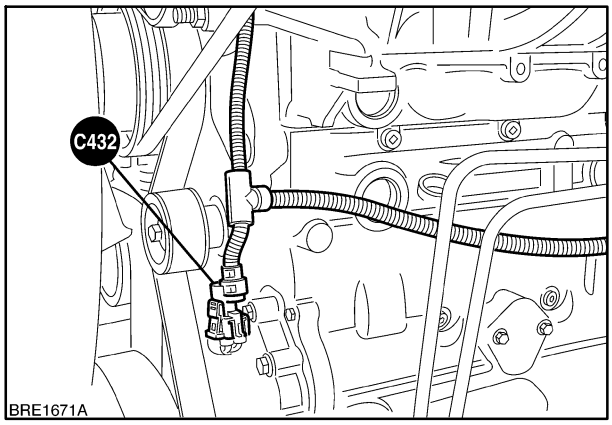
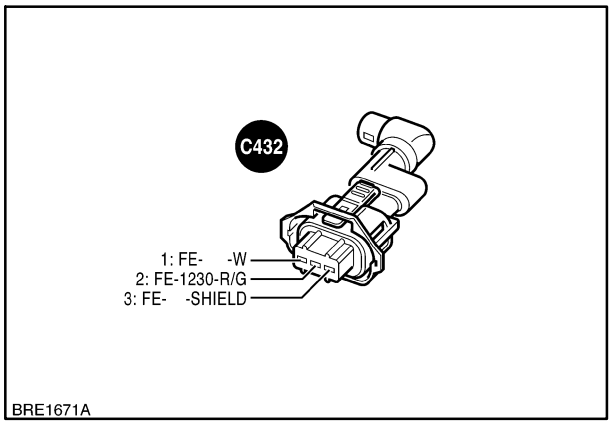
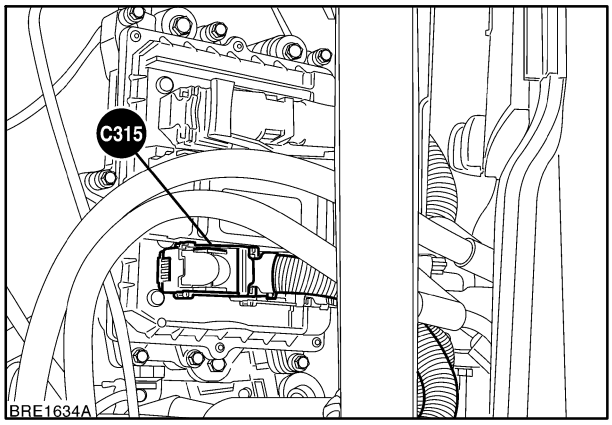
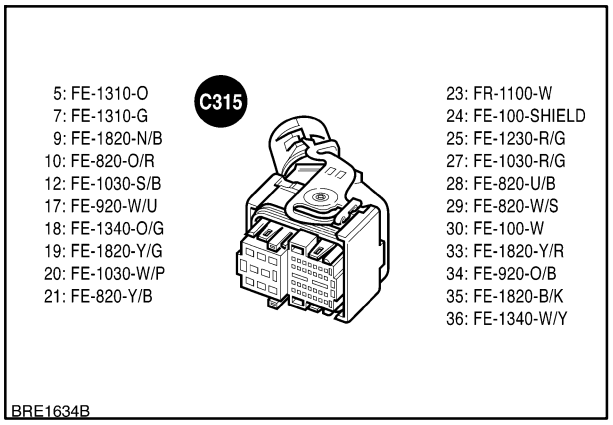

C432
BRE1671A


C432
1: FE- -W
2: FE-1230-R/G
3: FE- -SHIELD
BRE1671A


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3094 - ENGINE SPEED SENSOR LOW VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty crankshaft sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the crankshaft sensor connector **C432** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the crankshaft sensor.

   A. Disconnect connector **C432**. Check the resistance between the component side of the connector **C432** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the crankshaft sensor.

   B. If the crankshaft sensor is okay, continue to step 4.

4. Check the crankshaft sensor for a short to ground.

   A. Disconnect connector **C432**. Check between the component side of the connector:

   C432 pin **1** and **ground**

   C432 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the crankshaft sensor.

   B. If the crankshaft sensor is okay, continue to step 5.

5. Check for an open circuit.

   A. Check between connector:

   C432 pin **1 (W)** and **C315** pin **24 (W)**

   C432 pin **2 (R/G)** and **C315** pin **25 (R/G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector:

   C432 pin **1 (W)** and **ground**

   C432 pin **2 (R/G)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 7.

7. Check for a short to + Ve.

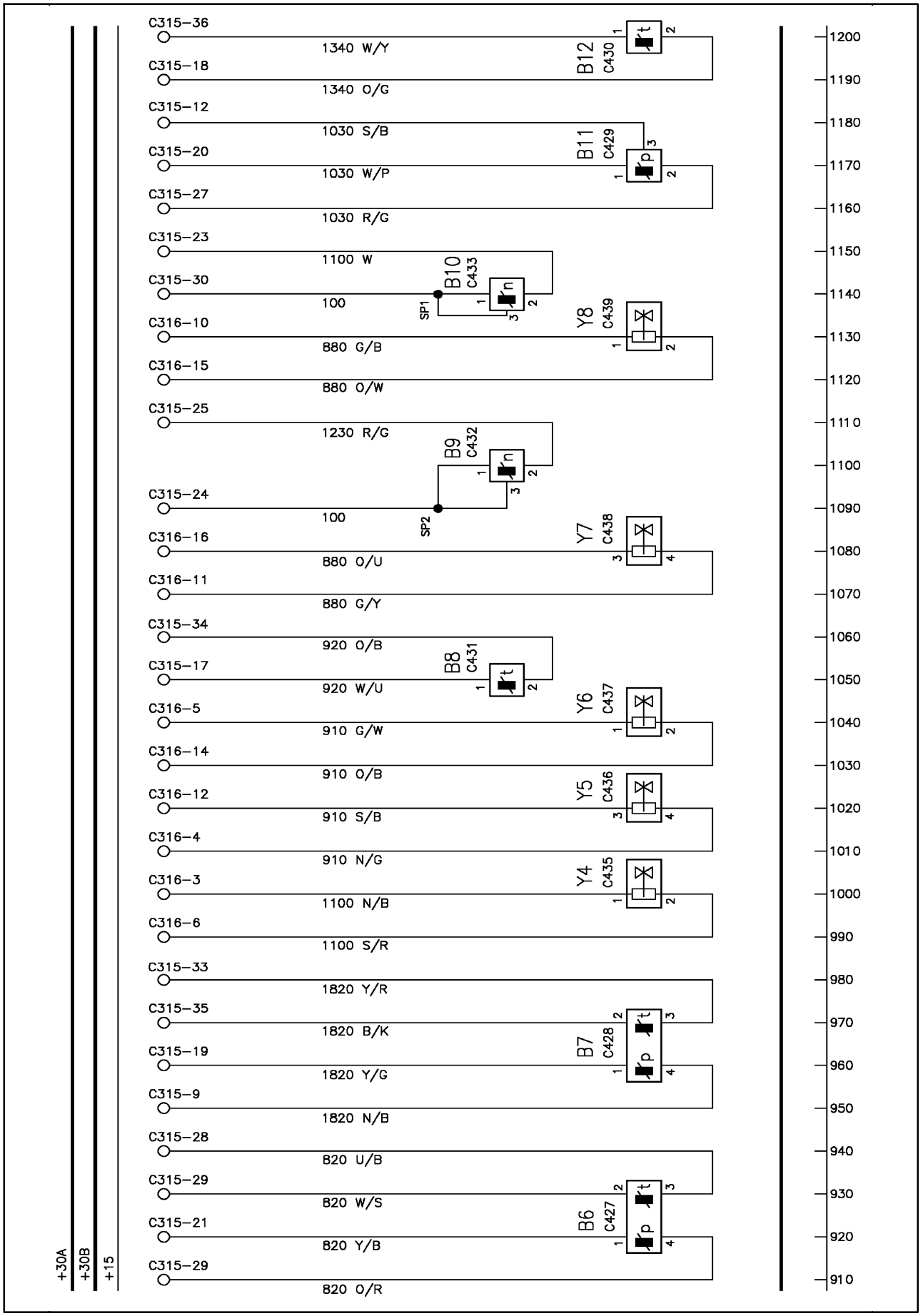
   A. Check between connector:

   C432 pin **1** and **ground**

   C432 pin **2** and **ground**

   If a short to + Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10 C433
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6 C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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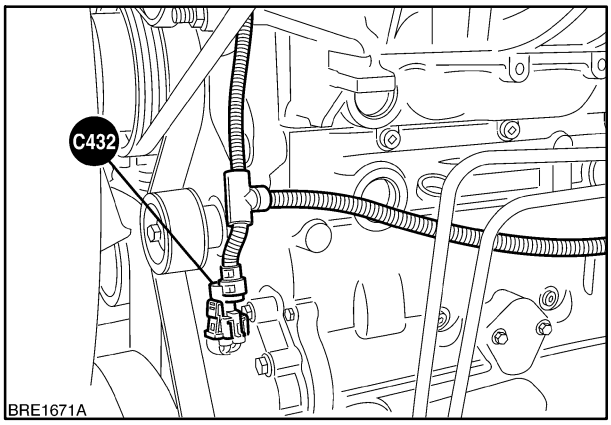
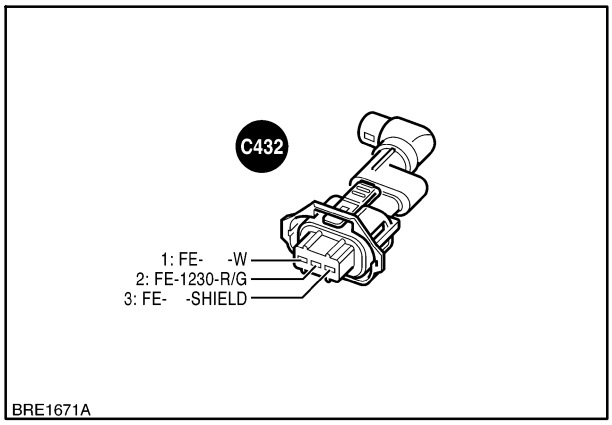
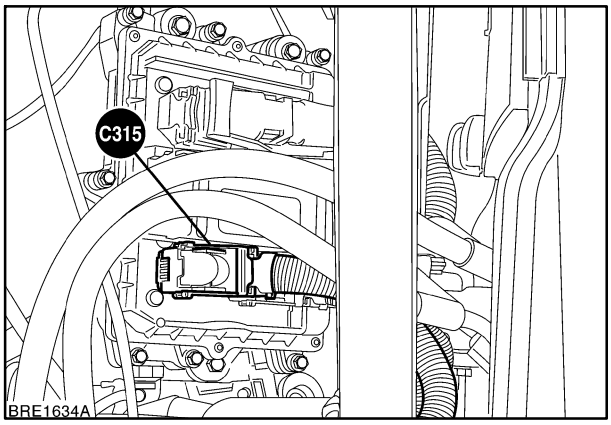
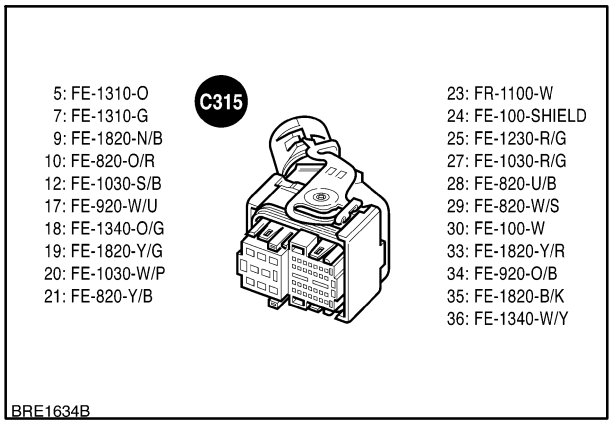
930
920
910


C432
BRE1671A


C432
1: FE- -W
2: FE-1230-R/G
3: FE- -SHIELD
BRE1671A


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3095 – ENGINE SPEED READINGS CAMSHAFT OR CRANKSHAFT SIGNALS MISSING ON START

Possible failure modes:

1. Faulty connector
2. Faulty crankshaft sensor
3. Faulty camshaft sensor
4. Faulty harness
5. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.

   A. If other camshaft or crankshaft sensor error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, continue to step 3.
3. Ensure that the crankshaft sensor mechanical operation is okay. Remove the sensor and ensure it is clean and not damaged.

   A. If a fault with the crankshaft sensor is indicated, repair as necessary.

   B. If a fault with the crankshaft sensor is not indicated, ensure the sensor is fitted securely,

   continue to step 4.
4. Check the crankshaft sensor connector **C432** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 5.
5. Check the crankshaft sensor.

   A. Disconnect connector **C432**. Check the resistance between the component side of the connector **C432** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the crankshaft sensor.

   B. If the crankshaft sensor is okay, continue to step 6.
6. Check the crankshaft sensor circuit for an open.

   A. Check between connectors:

   C432 pin **1 (W)** and **C315** pin **24 (W)**

   C432 pin **2 (R/G)** and **C315** pin **25 (R/G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 7.
7. Check the camshaft sensor.

   A. Disconnect connector **C433**. Check the resistance between the component side of the connector **C433** pin **1** and **2.** If the resistance indicated is not between 850 and 950 Ohms at 20 degrees centigrade, remove and replace the camshaft sensor.

   B. If the camshaft sensor is okay, continue to step 8.

8. Check the camshaft sensor circuit for an open.

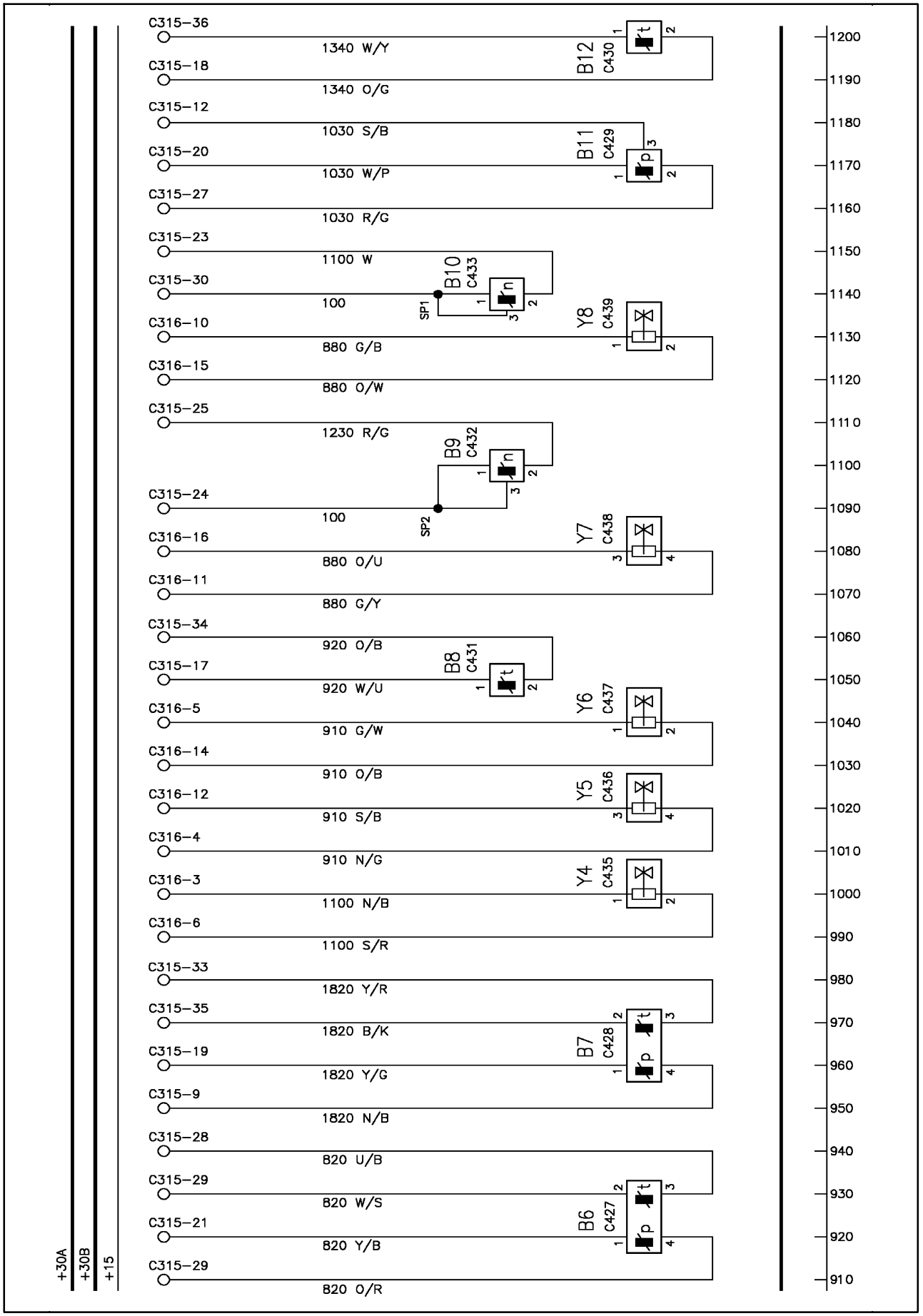
   A. Check between connectors:

   C433 pin **1 (R/G)** and **C315** pin **30 (R/G)**

   C433 pin **2 (W)** and **C315** pin **23 (W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10 C433
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
C316-5
910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
910 N/G
Y5 C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4 C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7 C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
B6 C427
C315-29
820 O/R
1200
1190
1180
1170
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1130
1120
1110
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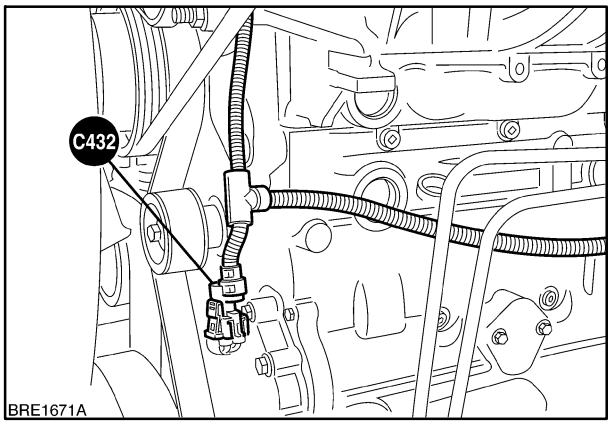
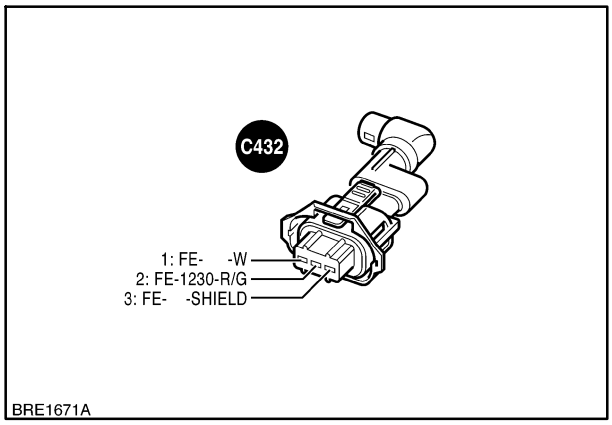
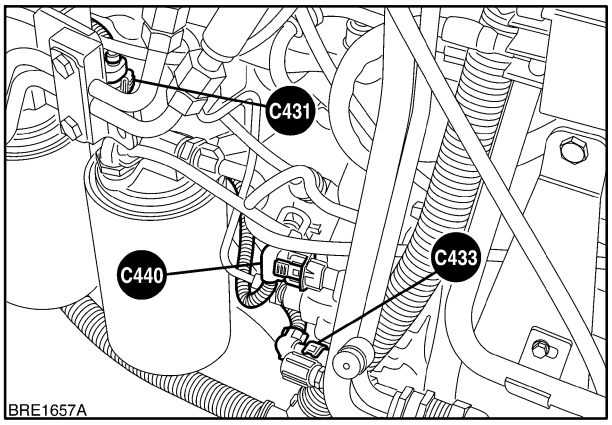
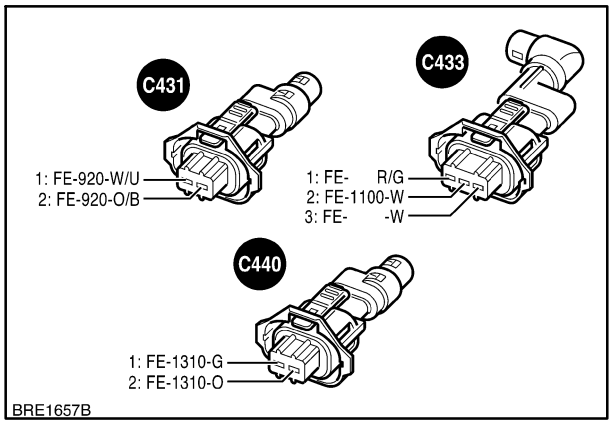
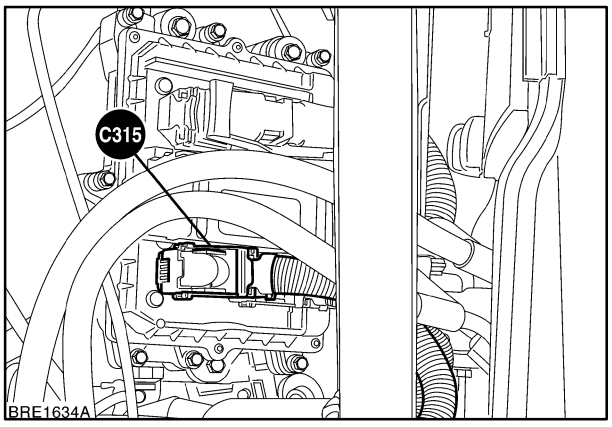
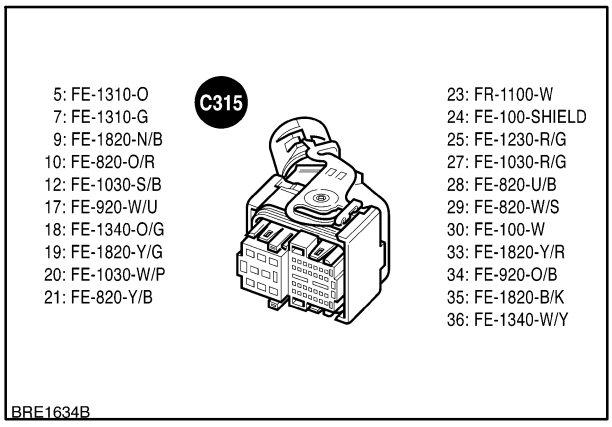

C432
BRE1671A


C432
1: FE- -W
2: FE-1230-R/G
3: FE- -SHIELD
BRE1671A


C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3096 - CAN A LINE NO SIGNAL

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster
5. Faulty central controller
6. Faulty engine controller
7. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check all power supplies and grounds to the controllers on the CAN BUS.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081**, the central controller connector **C100,** the engine controller connector **C242** and the instrument cluster key pad connector **C373** if fitted.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check the CAN BUS.
   A. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**. If the resistance indicated is approximately 60 Ohms, continue to step 6.
   If the resistance indicated is less than 5 Ohms, there is a short circuit between the CAN BUS high and low wires, repair or replace as required.
   If an open circuit is indicated, there is an open circuit on the CAN BUS high or low wires, repair or replace the harness as required.
   B. If the resistance indicated is approximately 120 Ohms, continue to step 11.
6. Check for short to ground on the CAN BUS.
   A. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 7.
   B. If a short to ground is not indicated, clear the error code and check that the system is operating correctly.
7. Check for short to ground on the CAN BUS.
   A. Disconnect instrument cluster connector **C081**. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 8.
   B. If a short to ground is not indicated, remove and replace the instrument cluster.

8. Check for short to ground on the CAN BUS.

   A. Disconnect controller connector **C242**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short to ground is indicated, continue to step 9.

   B. If a short to ground is not indicated, remove and replace the engine controller.

9. Check for short to ground on the CAN BUS.

   A. Disconnect controller connector **C100**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short to ground is indicated, repair and replace the harness as required or if an instrument cluster key pad is fitted, continue to step 10.

   B. If a short to ground is not indicated, remove and replace the central controller.

10. Check for short to ground on the CAN BUS.

    A. Disconnect instrument cluster key pad connector **C373**. Check between connector:

    C278 (High) pin **C (Y)** and **ground**

    C278 (Low) pin **D (G)** and **ground**

    If a short to ground is indicated, remove and replace the harness as required.

    B. If a short to ground is not indicated, remove and replace the instrument cluster key pad.

11. Check for open circuit on the CAN BUS.

    A. Disconnect engine controller connector **C242**. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**.

    If an open circuit is indicated, continue to step 12.

    If the resistance indicated is still 120 ohms, check between connector:

    C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**

    C278 (Low) pin **D (G)** and **C242** pin **52 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit not indicated, remove and replace the engine controller.

12. Check for open circuit on the CAN BUS.

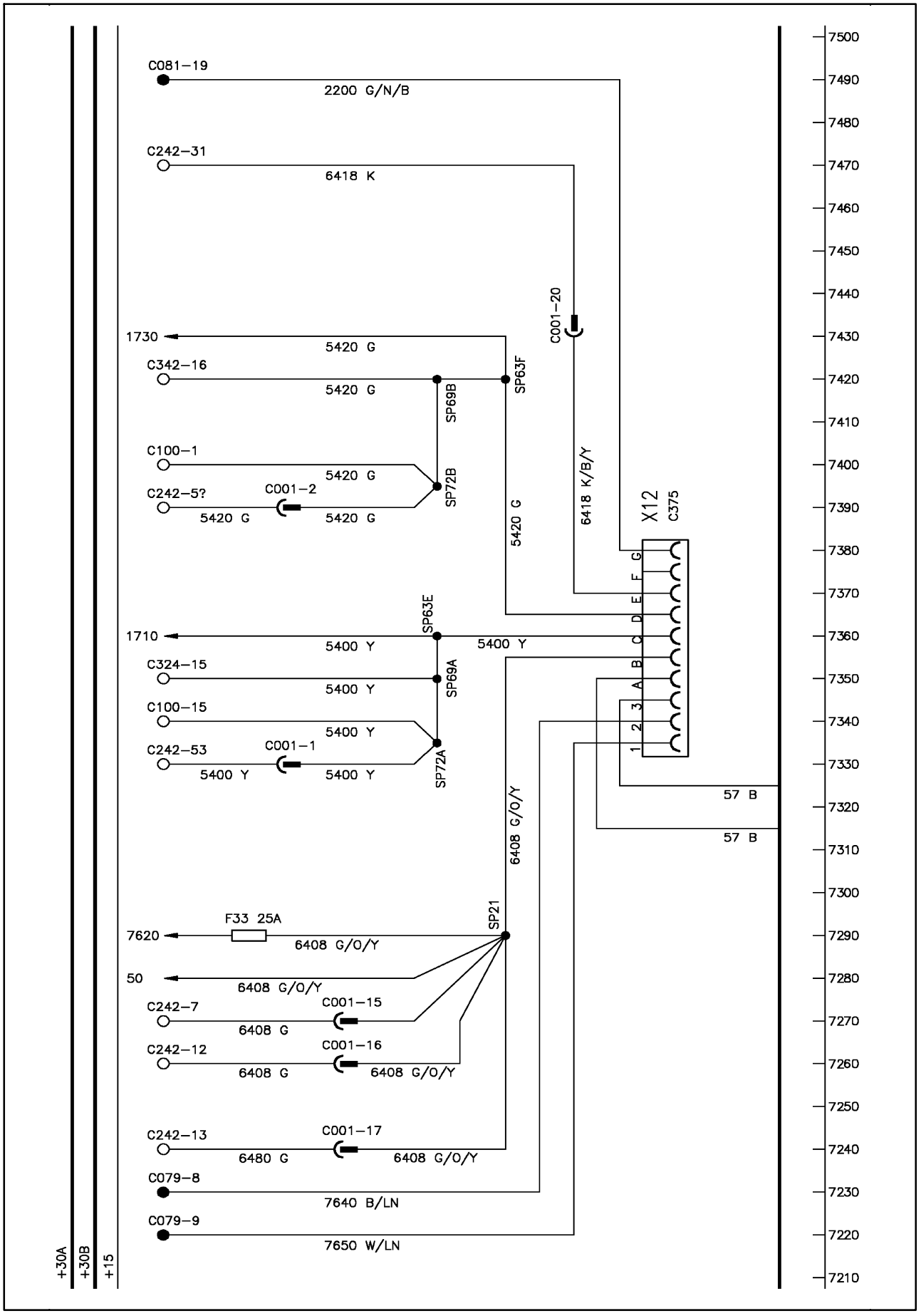
    A. Disconnect instrument cluster connector **C081**. Check between connector:

    C278 (high) pin **C (Y)** and **C081** pin **26 (Y)**

    C278 (Low) pin **D (G)** and **C081** pin **25 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit not indicated, remove and replace the instrument cluster.


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C342-16
5420 G
SP63F
SP69B
C100-1
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
5420 G
6418 K/B/Y
X12
C375
1710
5400 Y
SP63E
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
57 B
57 B
6408 G/O/Y
F33 25A
7620
6408 G/O/Y
SP21
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
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7440
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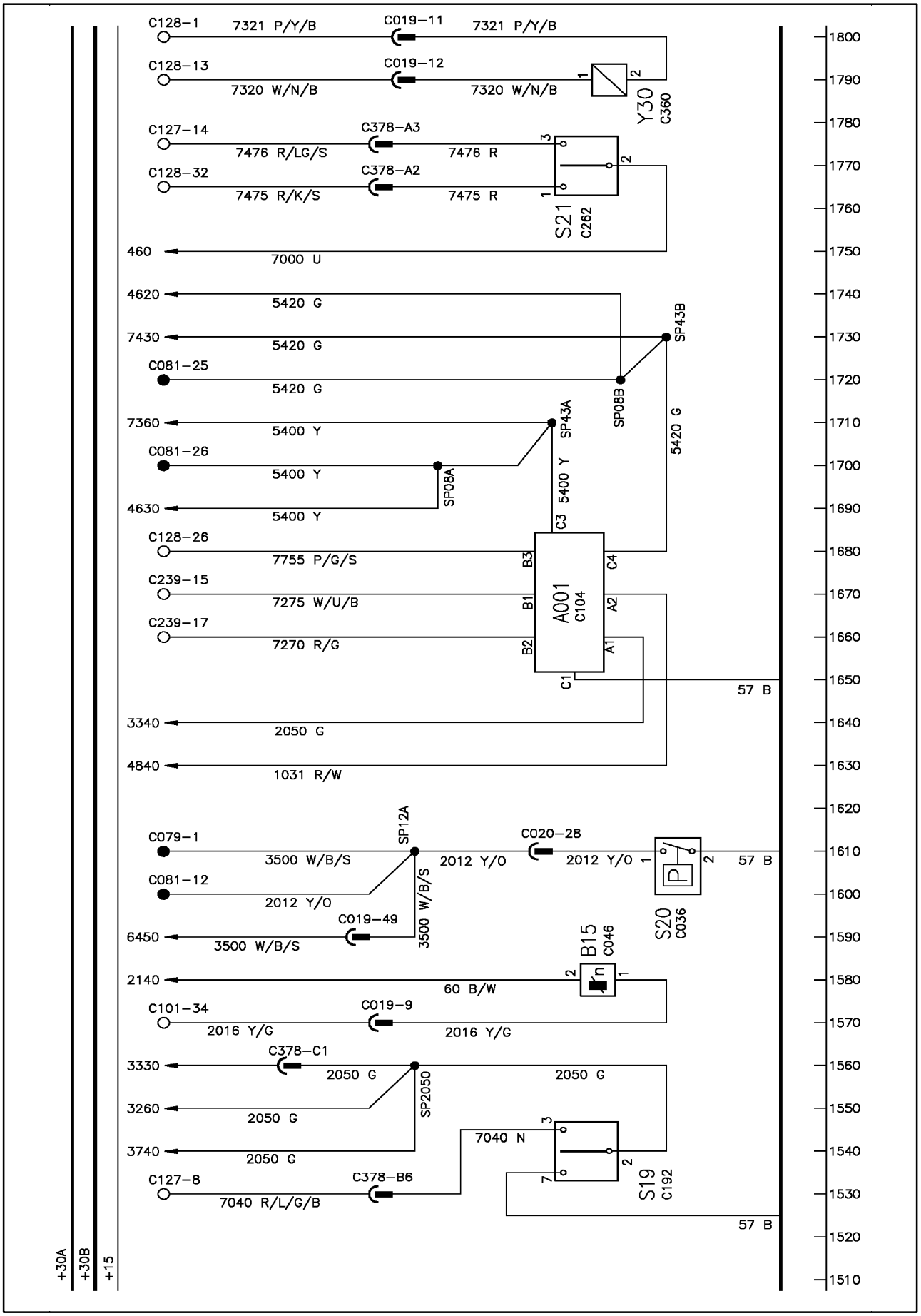
C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
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1740
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1710
1700
1690
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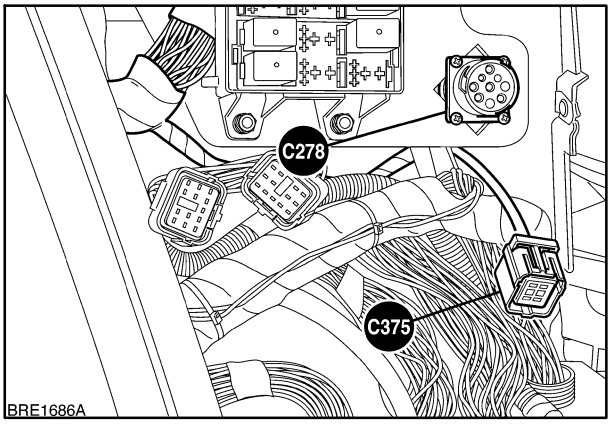

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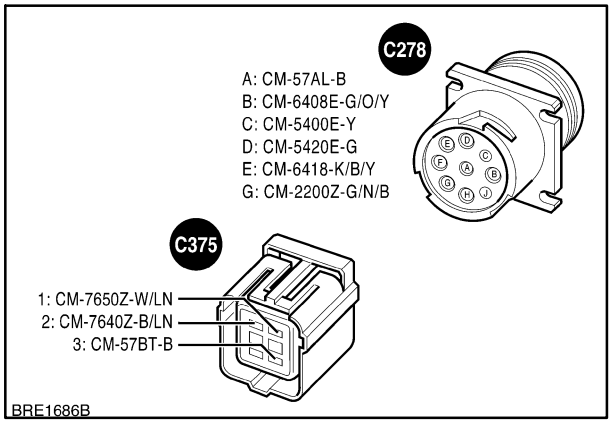

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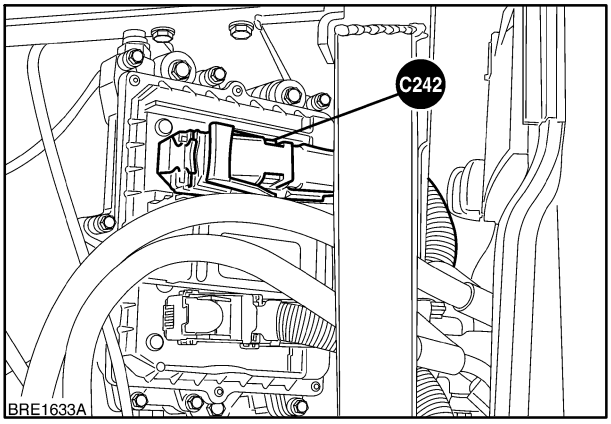

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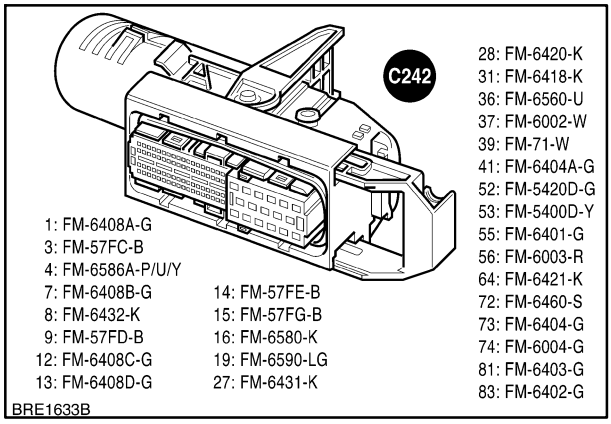

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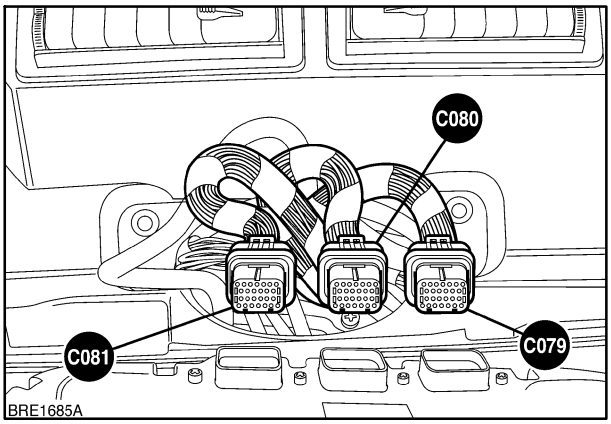

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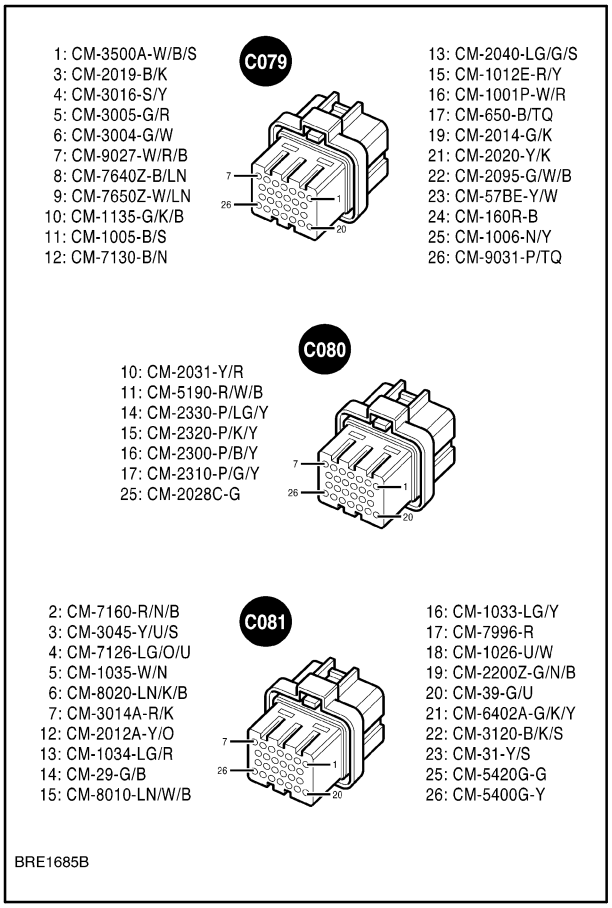

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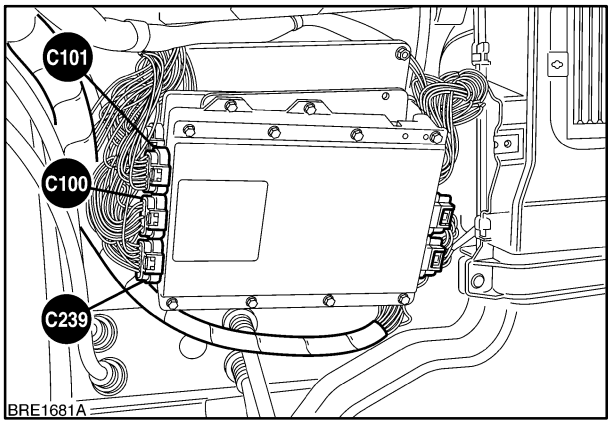
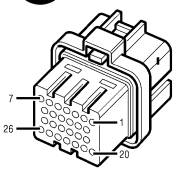


BRE1681A

C100



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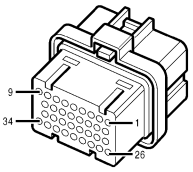
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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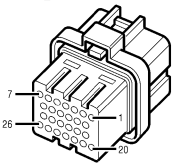
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3097 - CAN B LINE NO SIGNAL

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster
5. Faulty central controller
6. Faulty engine controller
7. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check all power supplies and grounds to the controllers on the CAN BUS.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081**, the central controller connector **C100**, the engine controller connector **C242** and the instrument cluster key pad connector **C373** if fitted.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check the CAN BUS.
   A. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**. If the resistance indicated is approximately 60 Ohms, continue to step 6.
   If the resistance indicated is less than 5 Ohms, there is a short circuit between the CAN BUS high and low wires, repair or replace as required.
   If an open circuit is indicated, there is an open circuit on the CAN BUS high or low wires, repair or replace the harness as required.
   B. If the resistance indicated is approximately 120 Ohms, continue to step 11.
6. Check for short to ground on the CAN BUS.
   A. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short circuit to ground is indicated, continue to step 7.
   B. If a short to ground is not indicated, clear the error code and check that the system is operating correctly
7. Check for short to ground on the CAN BUS.
   A. Disconnect instrument cluster connector **C081**. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short circuit to ground is indicated, continue to step 8.
   B. If a short to ground is not indicated, remove and replace the instrument cluster.

8. Check for short to ground on the CAN BUS.

   A. Disconnect controller connector **C242**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short circuit to ground is indicated, continue to step 9.

   B. If a short to ground is not indicated, remove and replace the engine controller.

9. Check for short to ground on the CAN BUS.

   A. Disconnect controller connector **C100**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short circuit to ground is indicated, repair and replace the harness as required or if a instrument cluster key pad is fitted, continue to step 10.

   B. If a short to ground is not indicated, remove and replace the central controller.

10. Check for short to ground on the CAN BUS.

    A. Disconnect instrument cluster key pad connector **C373**. Check between connector:

    C278 (High) pin **C (Y)** and **ground**

    C278 (Low) pin **D (G)** and **ground**

    If a short circuit to ground is indicated, remove and replace the harness as required.

    B. If a short to ground is not indicated, remove and replace the instrument cluster key pad.

11. Check for open circuit on the CAN BUS.

    A. Disconnect engine controller connector **C242**. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**.

    If an open circuit is indicated, continue to step 12.

    If the resistance is still 120 ohms, check between connector:

    C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**

    C278 (Low) pin **D (G)** and **C242** pin **52 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit not indicated, remove and replace the engine controller.

12. Check for open circuit on the CAN BUS.

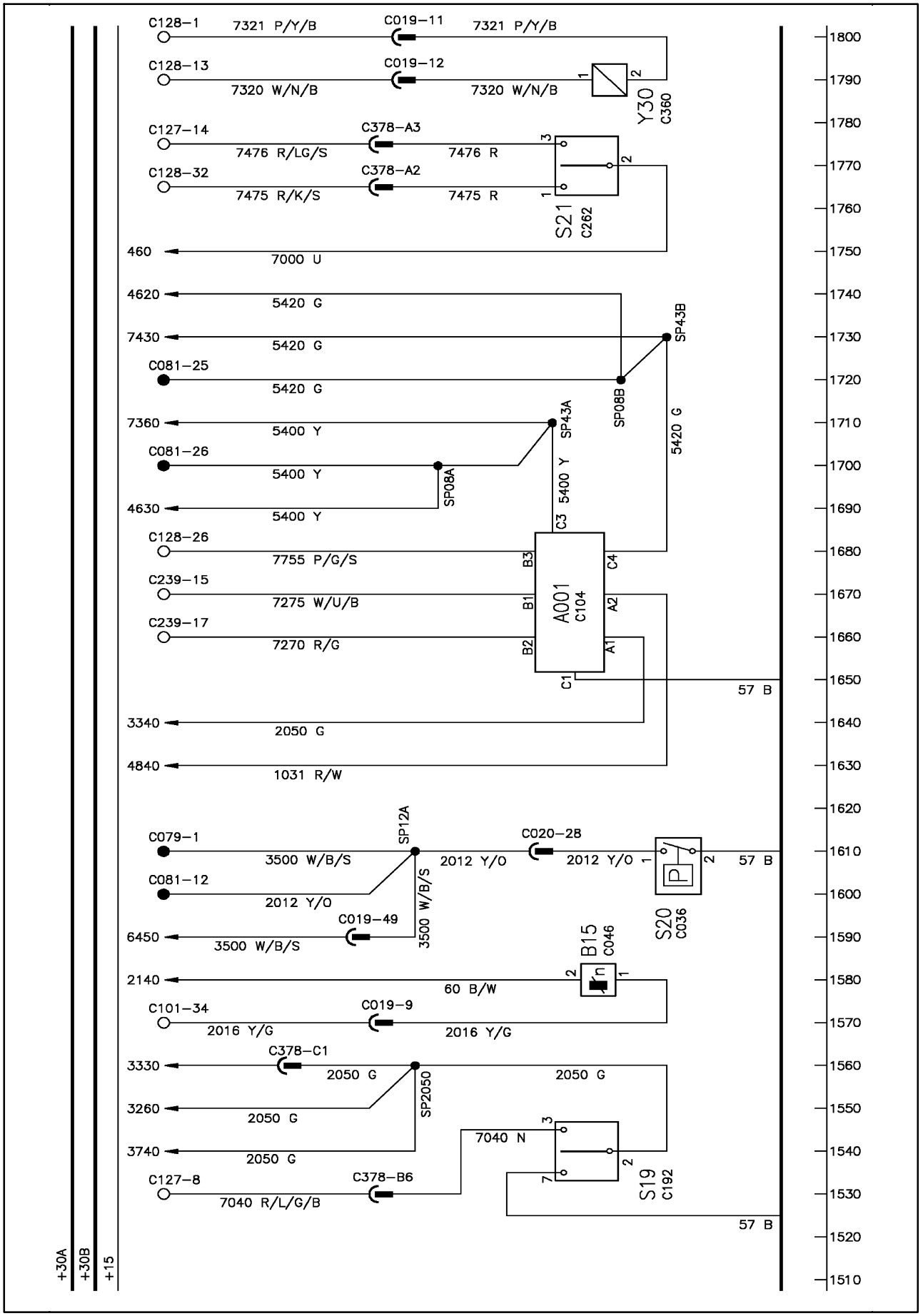
    A. Disconnect instrument cluster connector **C081**. Check between:

    C278 (high) pin **C (Y)** and **C081** pin **26 (Y)**

    C278 (Low) pin **D (G)** and **C081** pin **25 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit not indicated, remove and replace the instrument cluster.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
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7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
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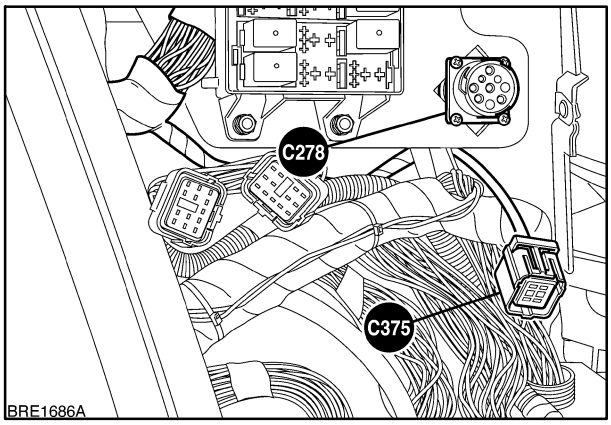

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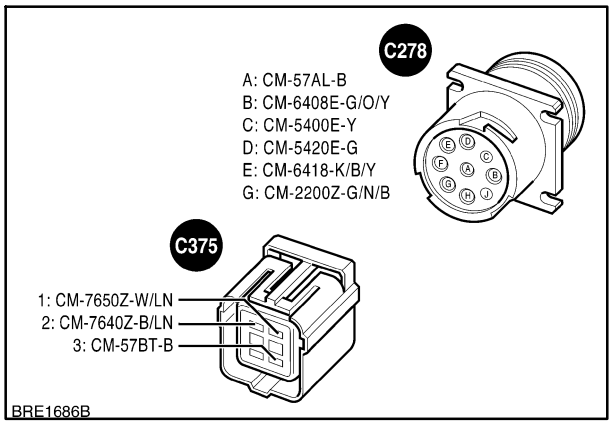

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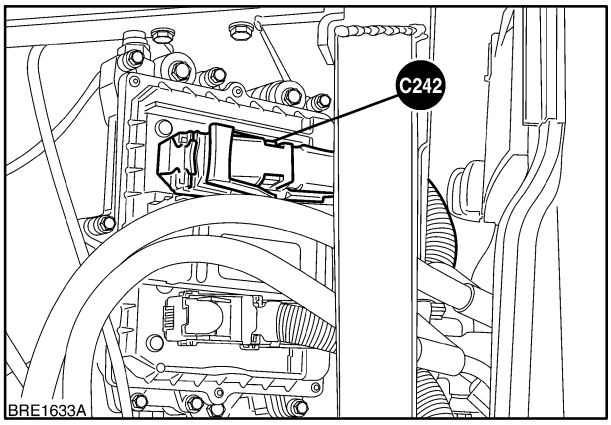

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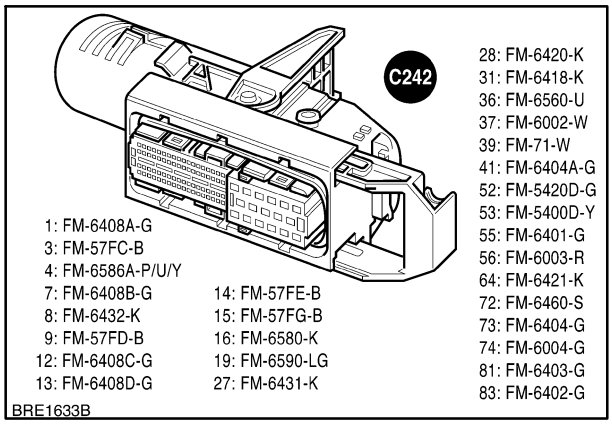

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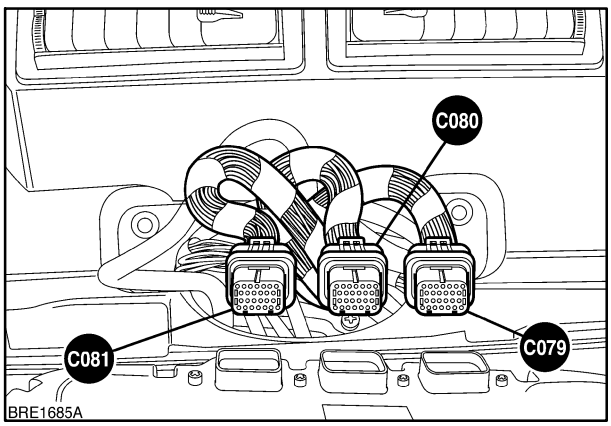

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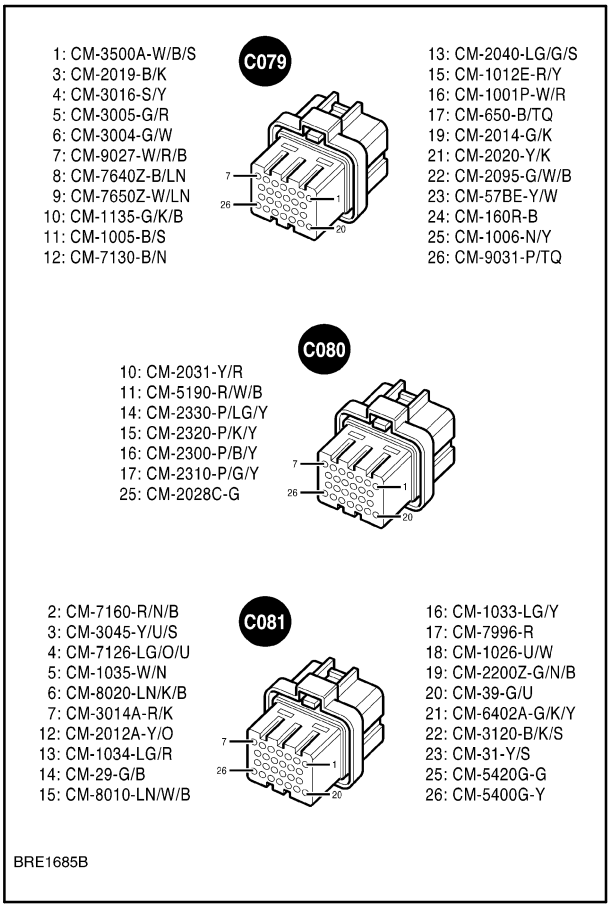

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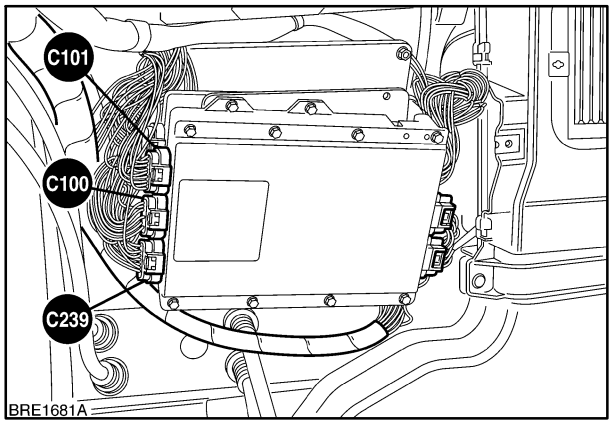
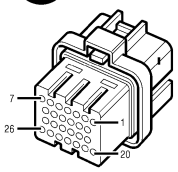


BRE1681A

C100



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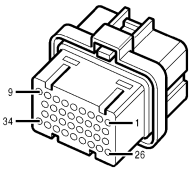
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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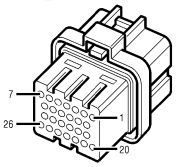
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3098 - CAN TE CONTROL SOURCE LOW

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster
5. Faulty central controller
6. Faulty engine controller
7. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check all power supplies and grounds to the controllers on the CAN BUS.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081**, the central controller connector **C100**, engine controller connector **C242** and the instrument cluster key pad connector **C373** if fitted.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for short to ground on the CAN BUS.
   A. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 6.
   B. If a short to ground is not indicated, continue to step 10.
6. Check for short to ground on the CAN BUS.
   A. Disconnect instrument cluster connector **C081**. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 7.
   B. If a short to ground is not indicated, remove and replace the instrument cluster.
7. Check for short to ground on the CAN BUS.
   A. Disconnect controller connector **C242**. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 8.
   B. If a short to ground is not indicated, remove and replace the engine controller.

8. Check for short to ground on the CAN BUS.

   A. Disconnect the central controller connector **C100**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short to ground is indicated, repair and replace the harness as required or if a instrument cluster key pad is fitted, continue to step 9.

   B. If a short to ground is not indicated, remove and replace the central controller.

9. Check for short to ground on the CAN BUS.

   A. Disconnect instrument cluster key pad connector **C373**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short to ground is indicated, repair and replace the harness as required.

   B. If a short to ground is not indicated, remove and replace the instrument cluster key pad.

10. Check for an open circuit on the CAN BUS.

    A. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and

    C278 (Low) pin **D (G)**.

    If an open circuit is indicated, repair or replace the harness as required.

    If the resistance indicated 60 ohms, clear the error code and check the system is operating correctly.

    B. If the resistance indicated is 120 ohms. Disconnect **C242** and measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**.

    If an open circuit is indicated, continue to step 11.

    C. If the resistance indicated is still 120 ohms, check between connector:

    C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**

    C278 (Low) pin **D (G)** and **C242** pin **52 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    If an open circuit not indicated, remove and replace the engine controller.

11. Check for open circuit on the CAN BUS.

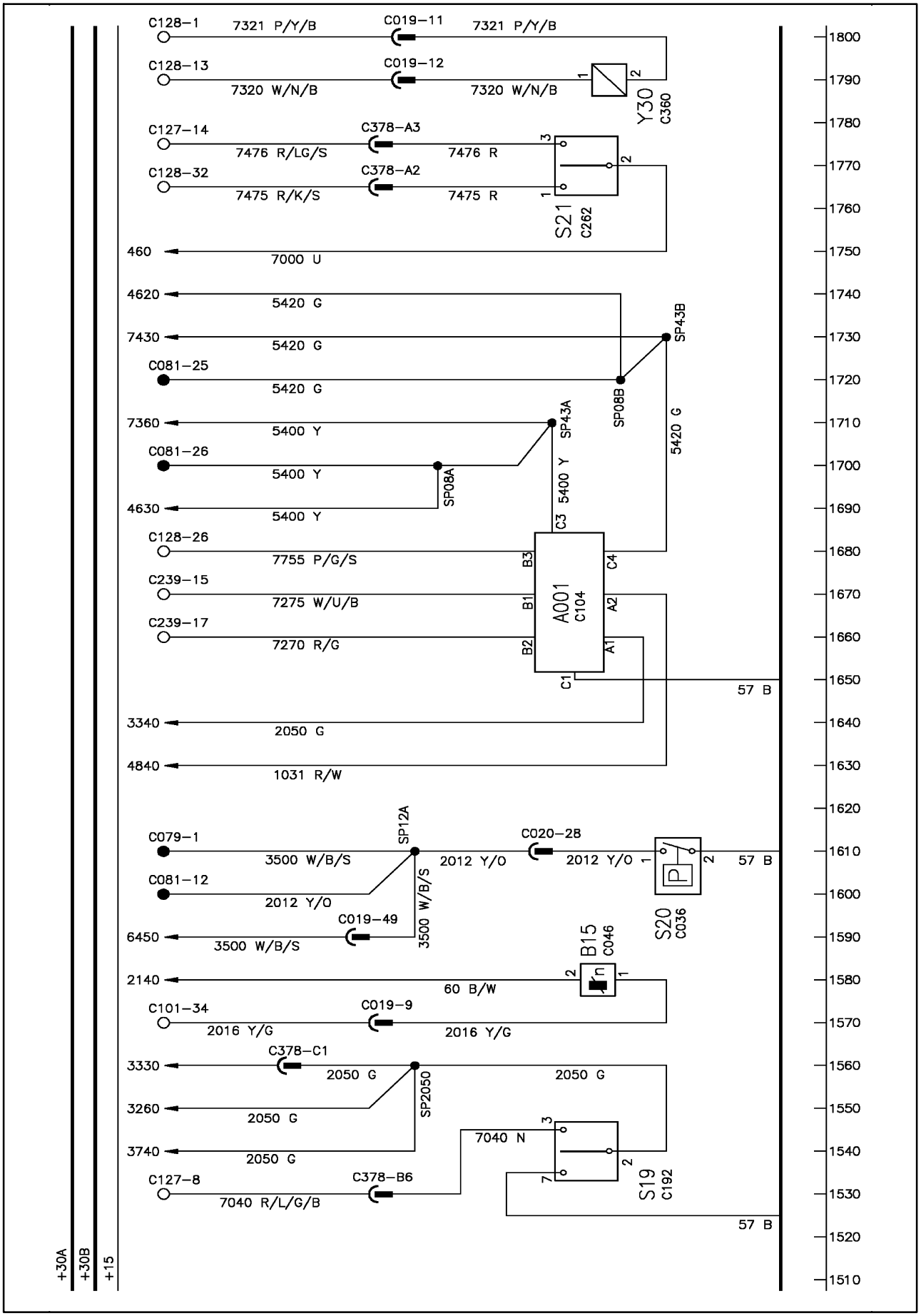
    A. Disconnect instrument cluster connector **C081**. Check between connector:

    C278 (high) pin **C (Y)** and **C081** pin **26 (Y)**

    C278 (Low) pin **D (G)** and **C081** pin **25 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit not indicated, remove and replace the instrument cluster.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C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
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1740
1730
1720
1710
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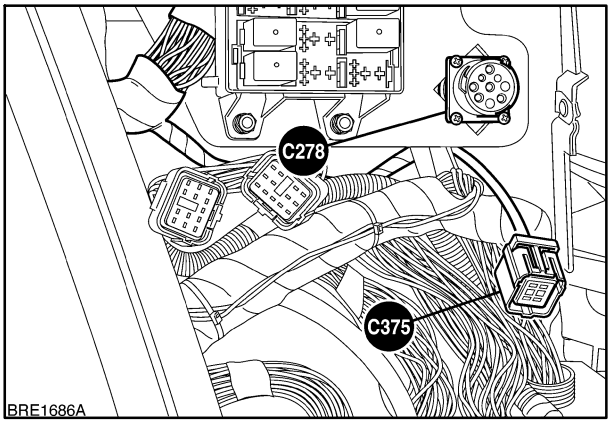

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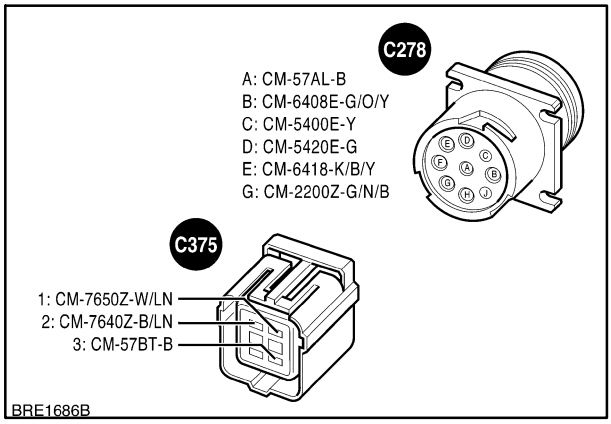
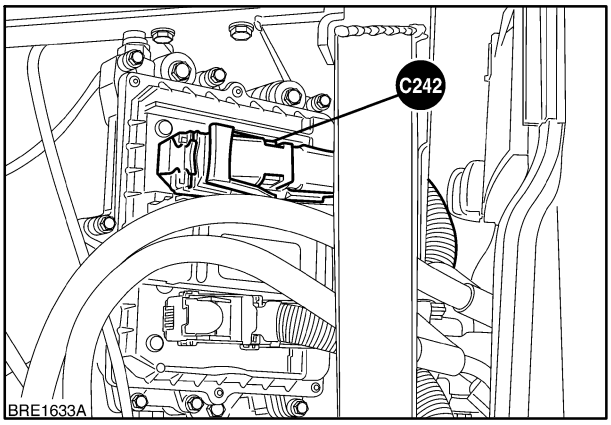


BRE1686B



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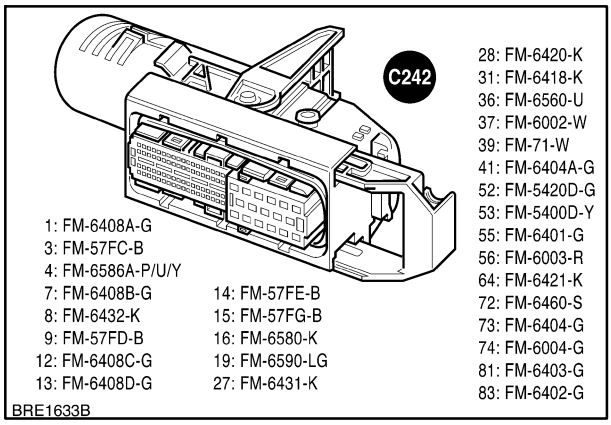

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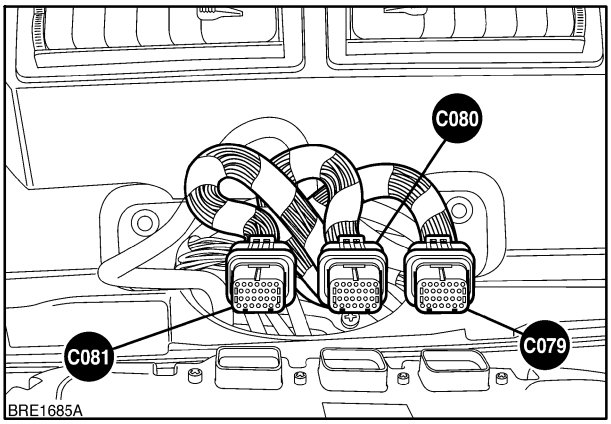

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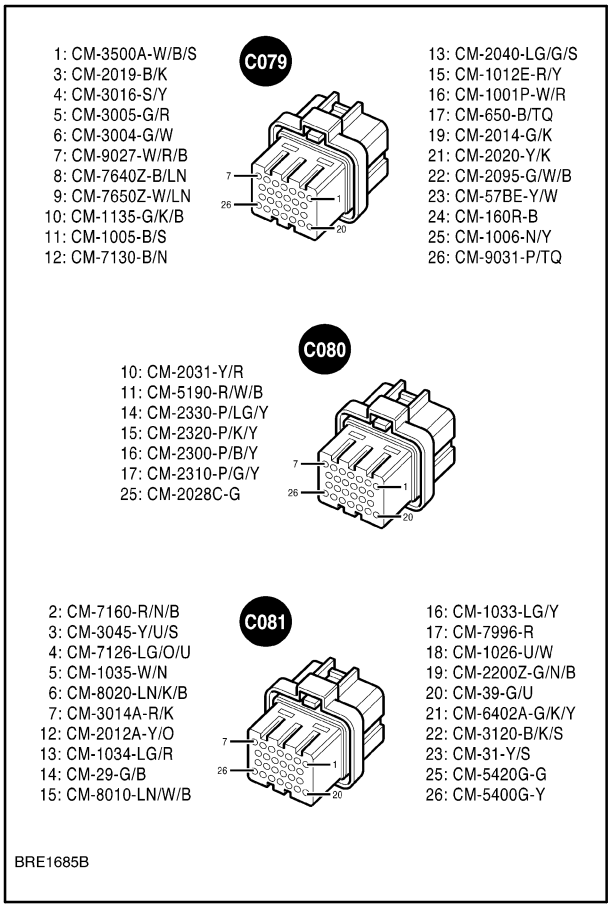

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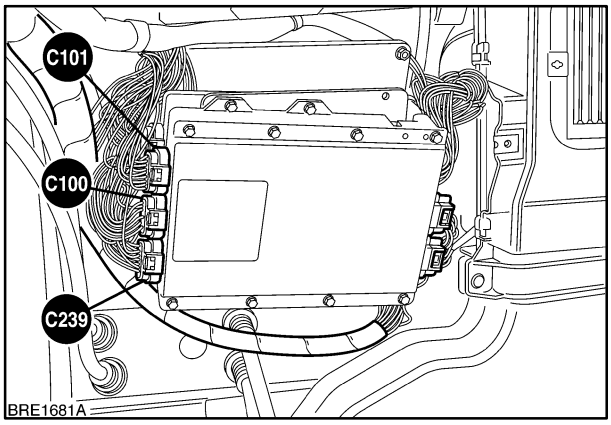


BRE1681A

C100

1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101

1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239

1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3099 - CAN TE CONTROL NO SIGNAL

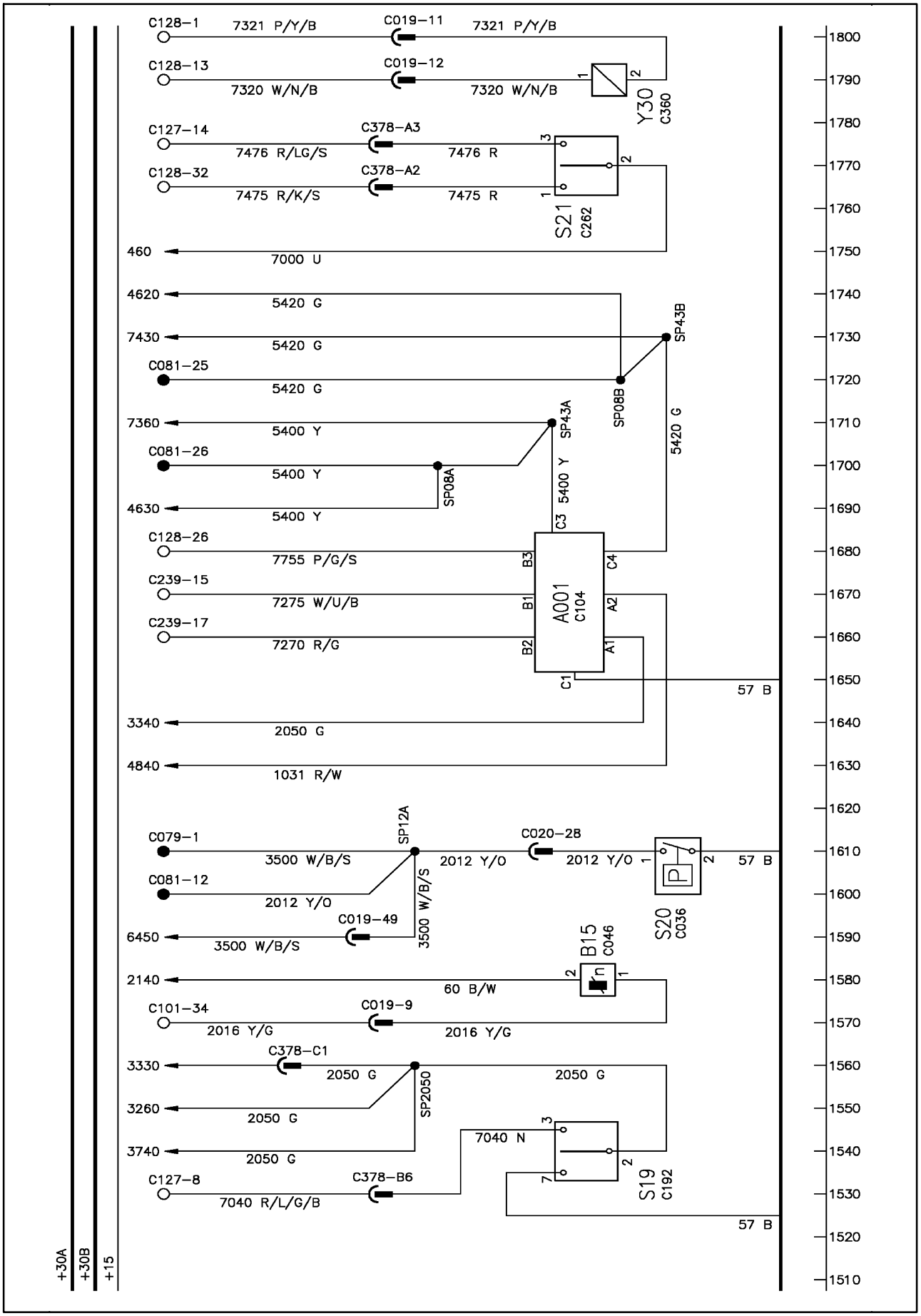
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster
5. Faulty central controller
6. Faulty engine controller
7. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check all power supplies and grounds to the controllers on the CAN BUS.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081**, the central controller connector **C100**, engine controller connector **C242** and the instrument cluster key pad connector **C373** if fitted.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and
   C278 (Low) pin **D (G)**.
   If an open circuit is indicated, repair or replace the harness as required.
   If the resistance indicated 60 ohms, clear the error code and check the system is operating correctly.
   B. If the resistance indicated is 120 ohms. Disconnect connector **C242** and measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**.
   If an open circuit is indicated, continue to step 6.
   C. If the resistance indicated is still 120 ohms, check between connector:
   C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**
   C278 (Low) pin **D (G)** and **C242** pin **52 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, remove and replace the engine controller.
6. Check for open circuit on the CAN BUS.
   A. Disconnect instrument cluster connector **C081**. Check between connector:
   C278 (high) pin **C (Y)** and **C081** pin **26 (Y)**
   C278 (Low) pin **D (G)** and **C081** pin **25 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the instrument cluster.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C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
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C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
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2050 G
2050 G
SP2050
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2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
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+30B
+15
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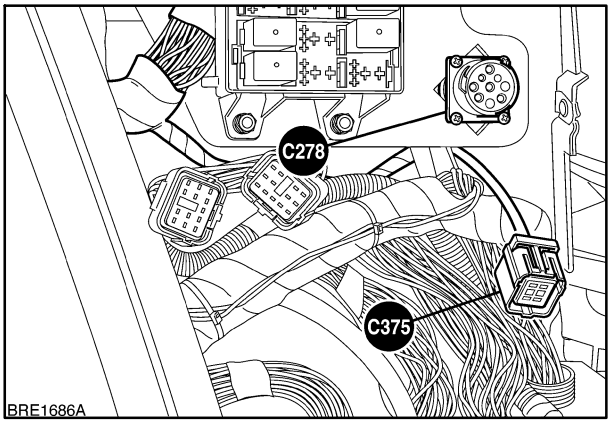

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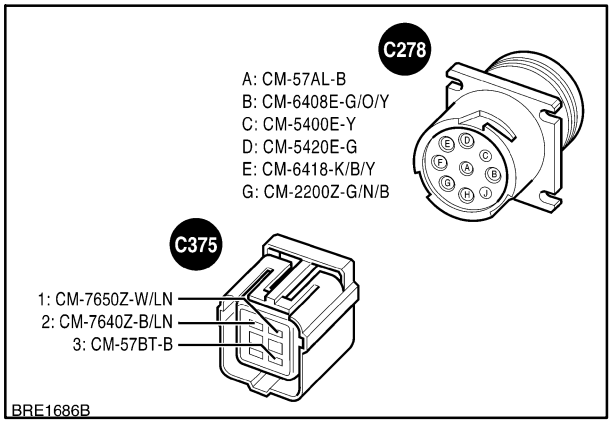
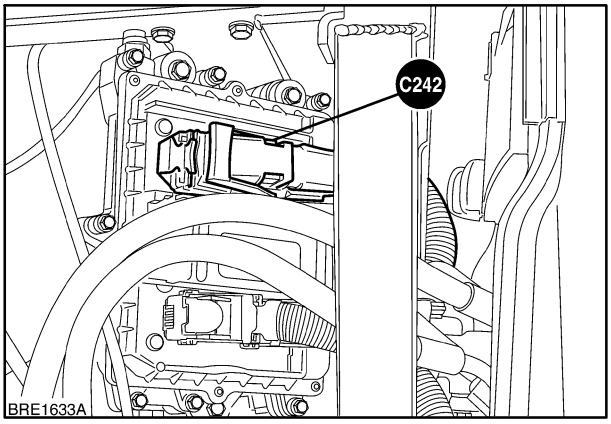


BRE1686B



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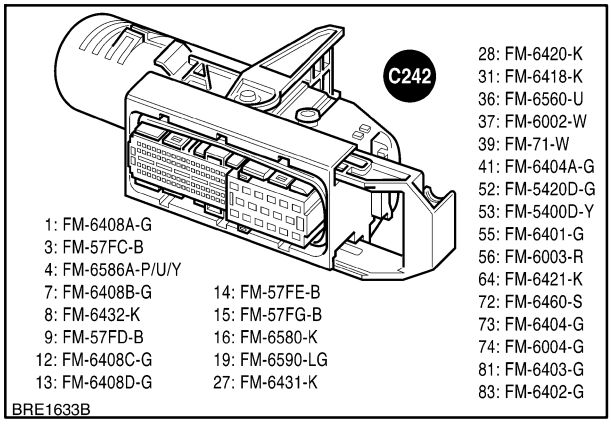

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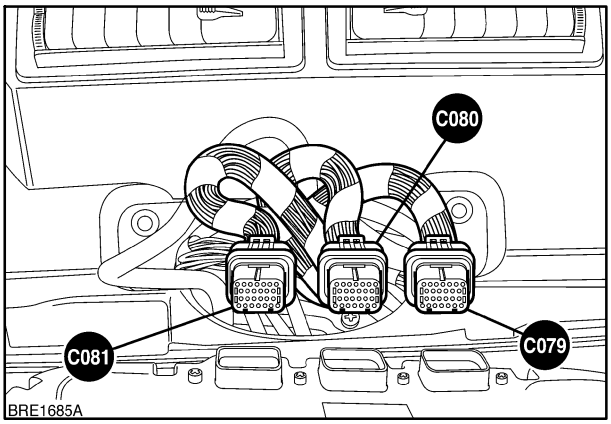

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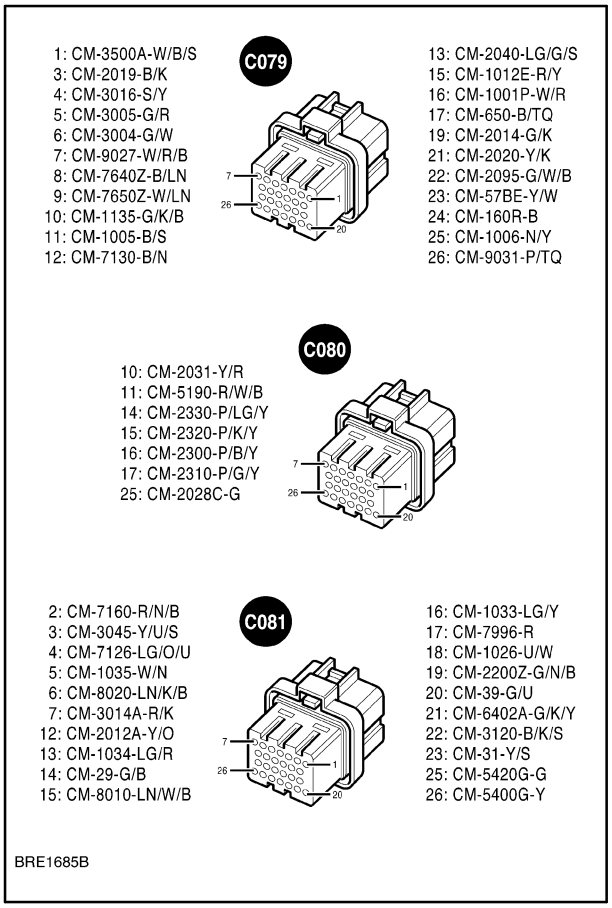

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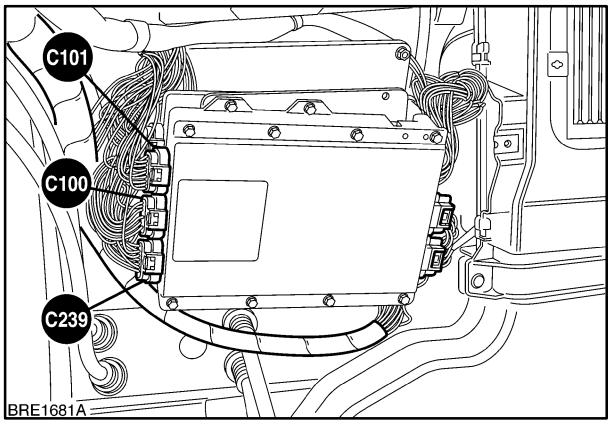
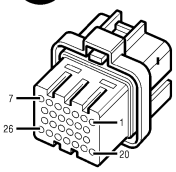


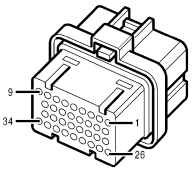
BRE1681A

C100



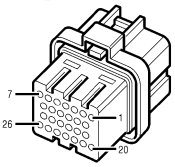
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3100 - CAN AE CONTROL SOURCE LOW

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster
5. Faulty central controller
6. Faulty engine controller
7. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check all power supplies and grounds to the controllers on the CAN BUS.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081**, the central controller connector **C100**, engine controller connector **C242** and the instrument cluster key pad connector **C373** if fitted.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for short to ground on the CAN BUS.
   A. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 6.
   B. If a short to ground is not indicated, continue to step 10.
6. Check for short to ground on the CAN BUS.
   A. Disconnect instrument cluster connector **C081**. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 7.
   B. If a short to ground is not indicated, remove and replace the instrument cluster.
7. Check for short to ground on the CAN BUS.
   A. Disconnect controller connector **C242**. Check between connector:
   C278 (High) pin **C (Y)** and **ground**
   C278 (Low) pin **D (G)** and **ground**
   If a short to ground is indicated, continue to step 8.
   B. If a short to ground is not indicated, remove and replace the engine controller.

8. Check for short to ground on the CAN BUS.

   A. Disconnect the central controller connector **C100**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short to ground is indicated, repair and replace the harness as required or if a instrument cluster key pad is fitted, continue to step 9.

   B. If a short to ground is not indicated, remove and replace the central controller.

9. Check for short to ground on the CAN BUS.

   A. Disconnect instrument cluster key pad connector **C373**. Check between connector:

   C278 (High) pin **C (Y)** and **ground**

   C278 (Low) pin **D (G)** and **ground**

   If a short to ground is indicated, repair and replace the harness as required.

   B. If a short to ground is not indicated, remove and replace the instrument cluster key pad.

10. Check for an open circuit on the CAN BUS.

    A. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and

    C278 (Low) pin **D (G)**.

    If an open circuit is indicated, repair or replace the harness as required.

    If the resistance indicated 60 ohms, clear the error code and check the system is operating correctly.

    B. If the resistance indicated is 120 ohms. Disconnect **C242** and measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**.

    If an open circuit is indicated, continue to step 11.

    C. If the resistance indicated is still 120 ohms, check between connector:

    C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**

    C278 (Low) pin **D (G)** and **C242** pin **52 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    If an open circuit not indicated, remove and replace the engine controller.

11. Check for open circuit on the CAN BUS.

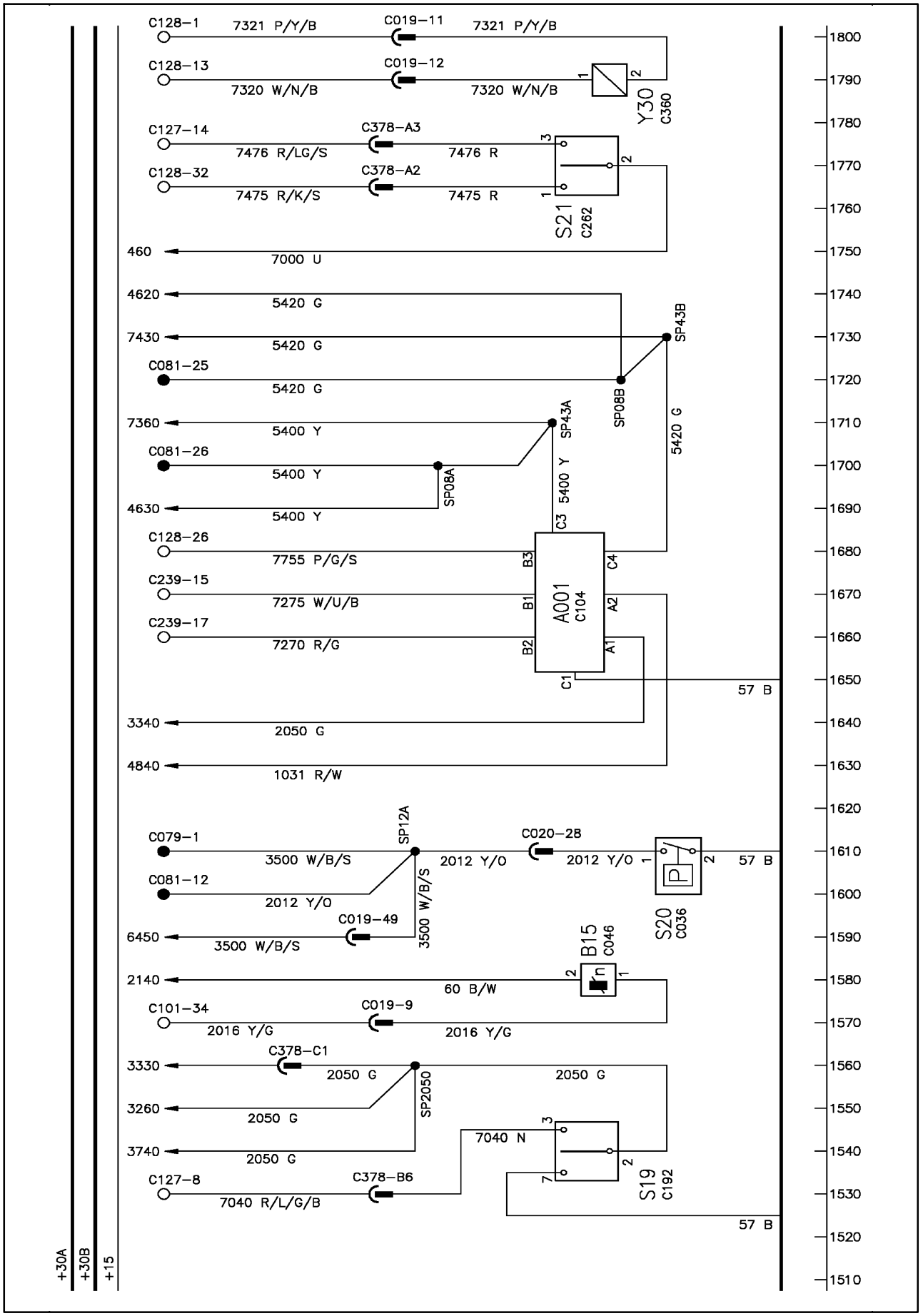
    A. Disconnect instrument cluster connector **C081**. Check between connector:

    C278 (high) pin **C (Y)** and **C081** pin **26 (Y)**

    C278 (Low) pin **D (G)** and **C081** pin **25 (G)**

    If an open circuit is indicated, repair or replace the harness as required.

    B. If an open circuit not indicated, remove and replace the instrument cluster.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
7040 N
3740
2050 G
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
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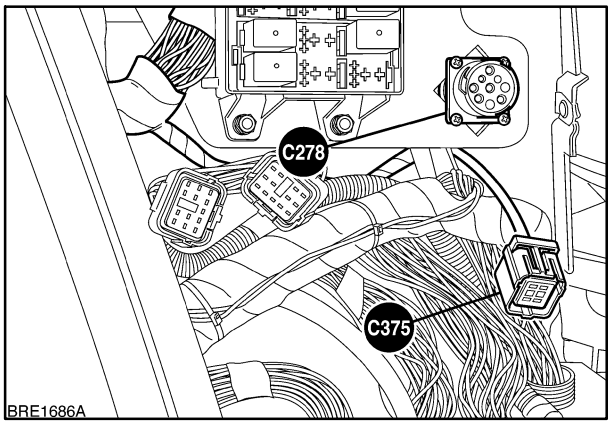

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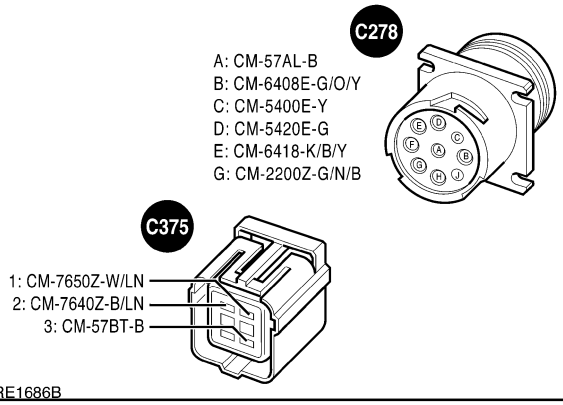

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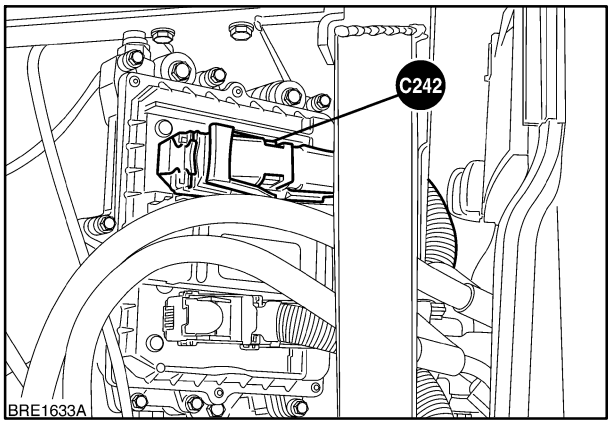

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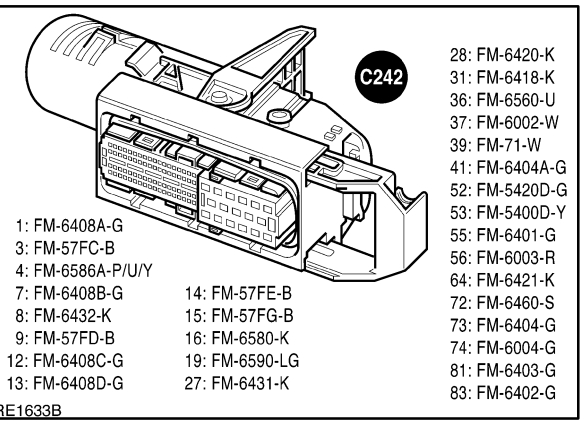

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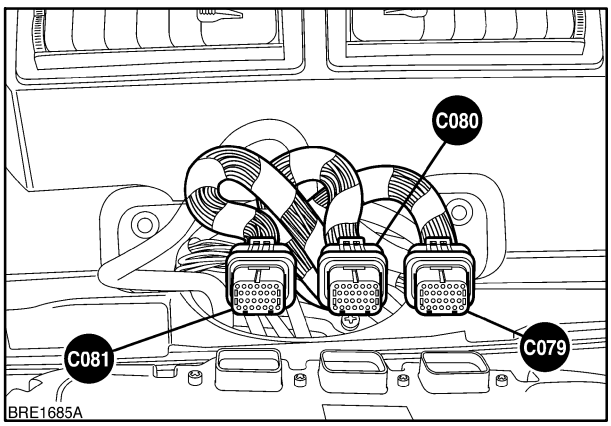

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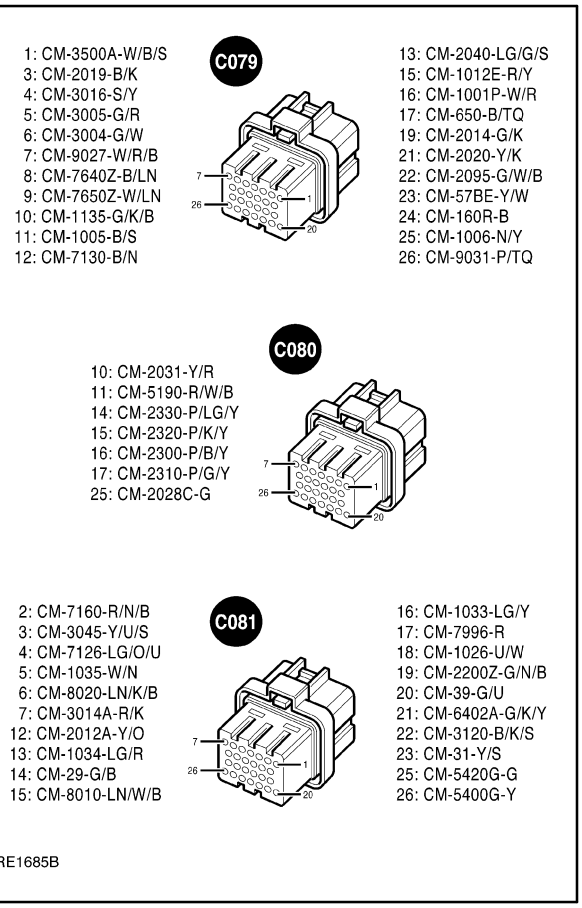

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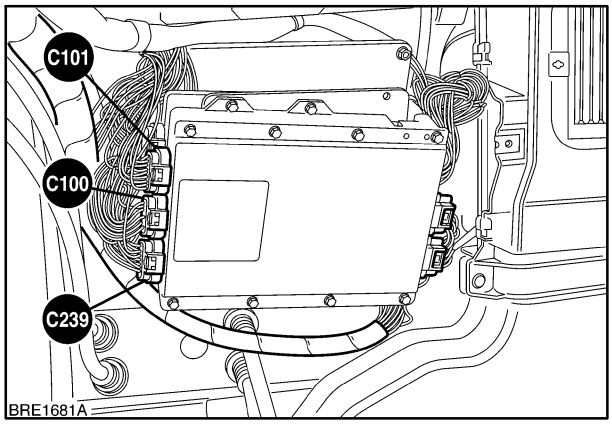
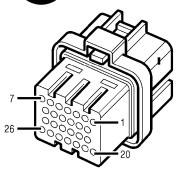


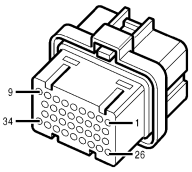
BRE1681A

C100



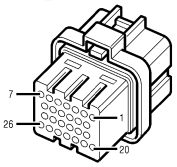
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3101 - CAN AE CONTROL NO SIGNAL

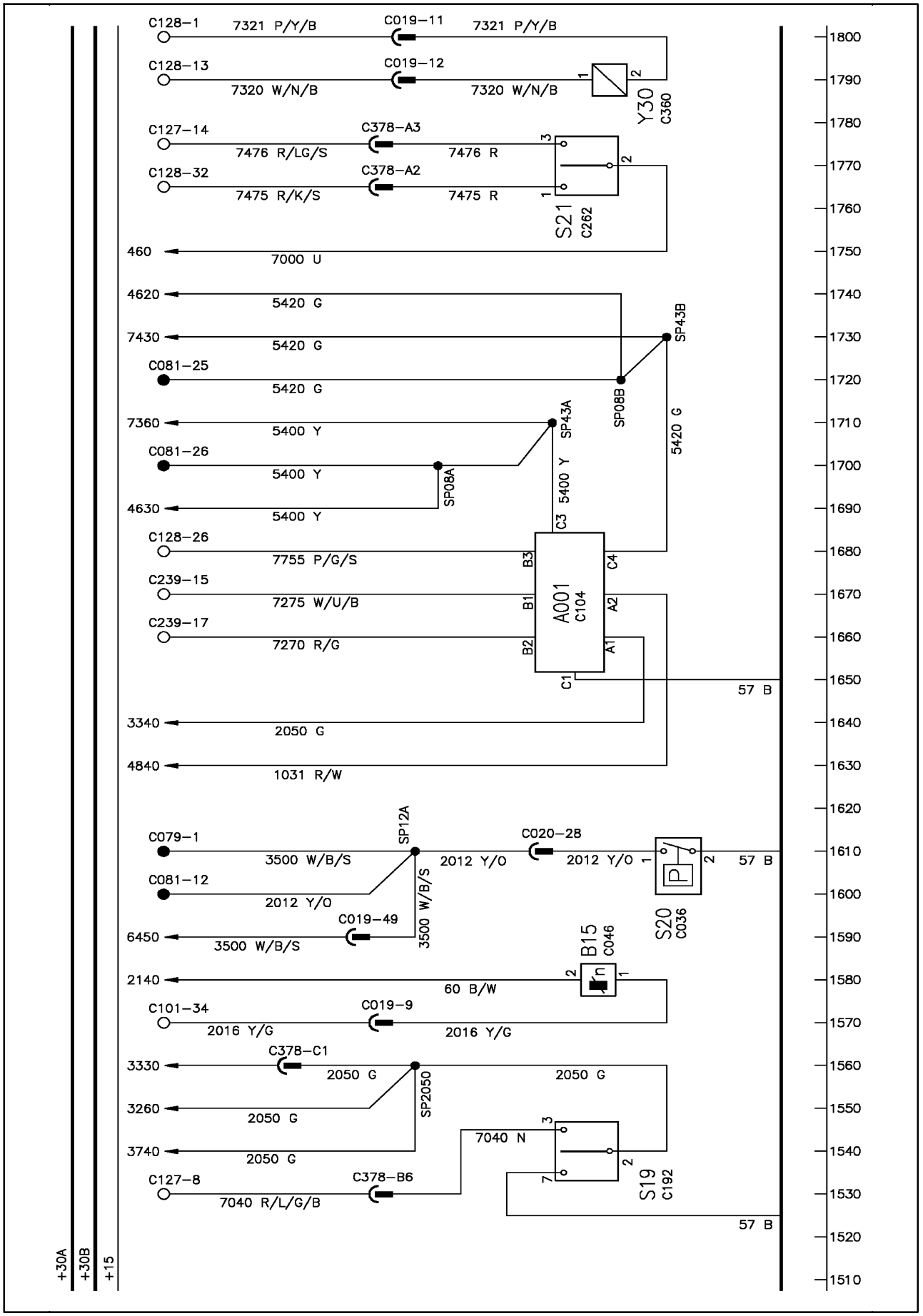
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster
5. Faulty central controller
6. Faulty engine controller
7. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check all power supplies and grounds to the controllers on the CAN BUS.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081**, the central controller connector **C100**, engine controller connector **C242** and the instrument cluster key pad connector **C373** if fitted.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and
   C278 (Low) pin **D (G)**.
   If an open circuit is indicated, repair or replace the harness as required.
   If the resistance indicated 60 ohms, clear the error code and check the system is operating correctly.
   B. If the resistance indicated is 120 ohms. Disconnect **C242** and measure the resistance between the diagnostic connector **C278 (high)** pin **C (Y)** and **C278 (Low)** pin **D (G)**.
   If an open circuit is indicated, continue to step 6.
   C. If the resistance indicated is still 120 ohms, check between connector:
   C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**
   C278 (Low) pin **D (G)** and **C242** pin **52 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, remove and replace the engine controller.
6. Check for open circuit on the CAN BUS.
   A. Disconnect instrument cluster connector **C081**. Check between connector:
   C278 (high) pin **C (Y)** and **C081** pin **26 (Y)**
   C278 (Low) pin **D (G)** and **C081** pin **24 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the instrument cluster.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
7040 N
3740
2050 G
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
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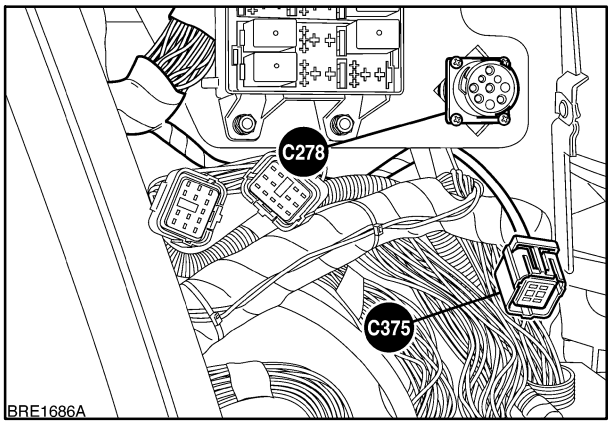

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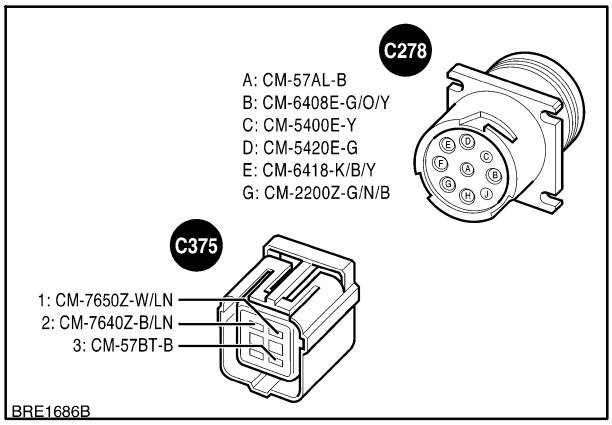
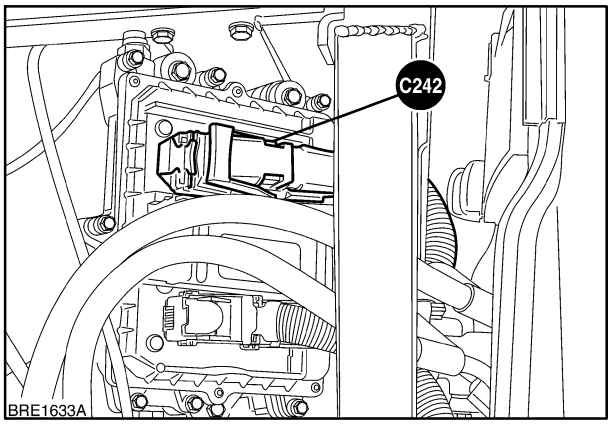


BRE1686B



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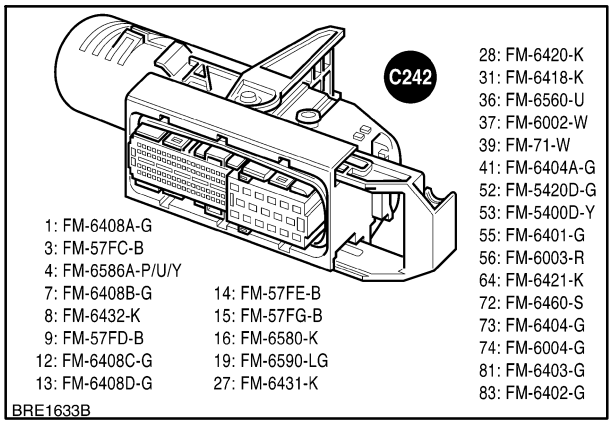

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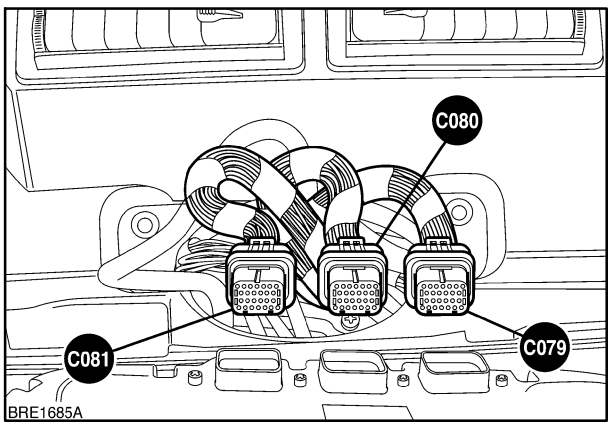

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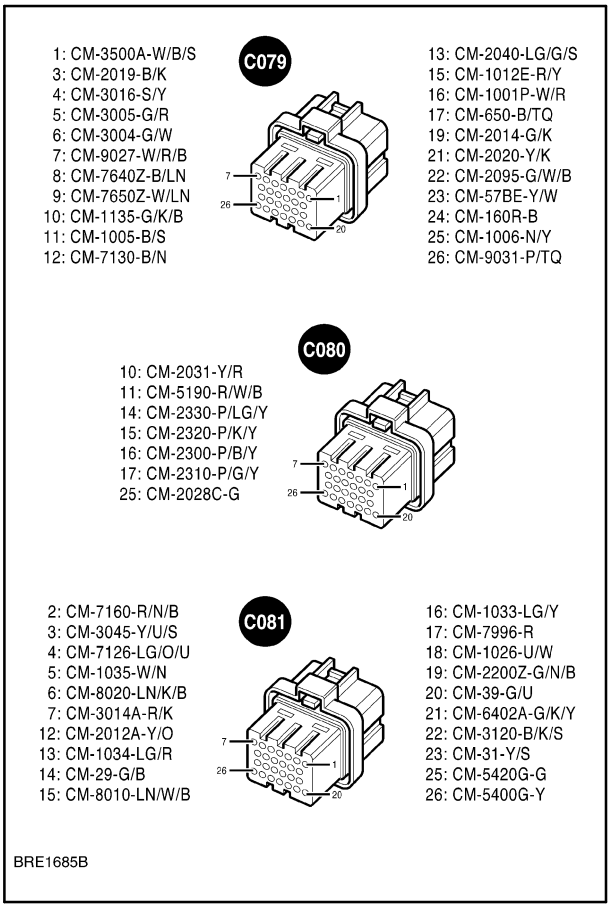

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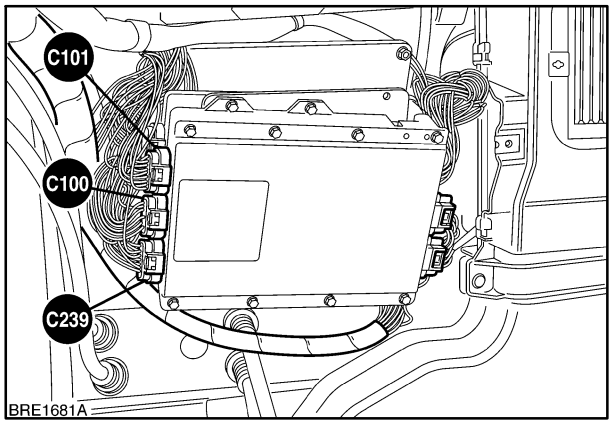
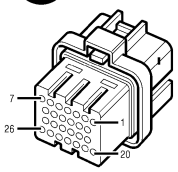


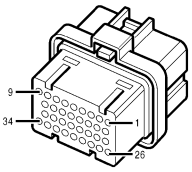
BRE1681A

C100



1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
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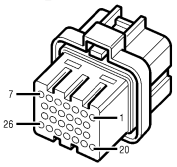
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3102 - FUEL PRESSURE MONITORING LOW PRESSURE

Effects:

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.

   A. If a fault with the fuel system is indicated, repair as necessary.

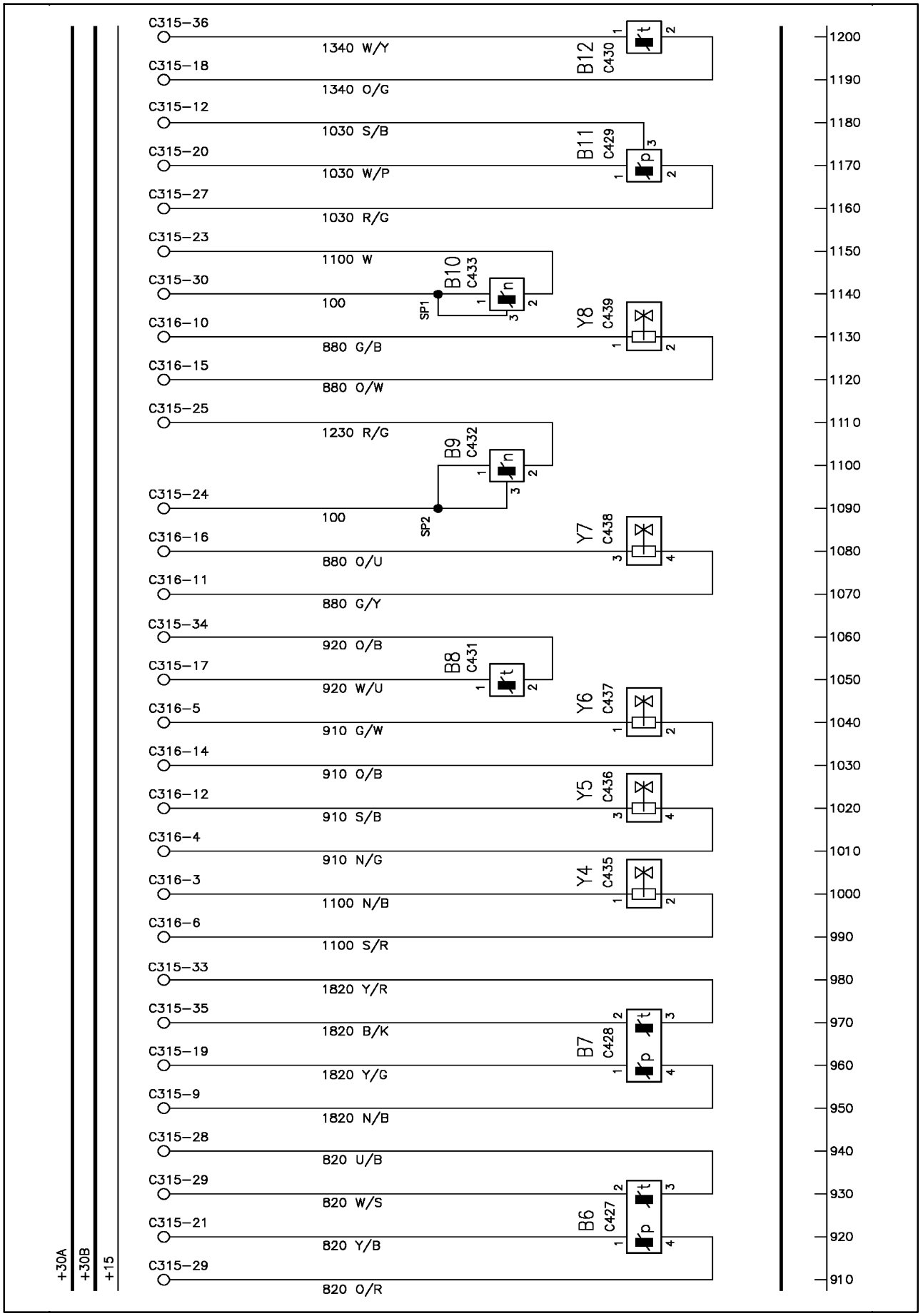
   B. If a fault with the fuel system is not indicated, continue to step 3.
3. Check the fuel pressure sensor connector **C429** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check for other error codes displayed.

   A. If other error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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B11 C429
C315-27
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C315-23
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SP1
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C316-15
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Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
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SP2
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C315-34
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910 G/W
C316-14
910 O/B
Y6 C437
C316-12
910 S/B
C316-4
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Y5 C436
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C316-6
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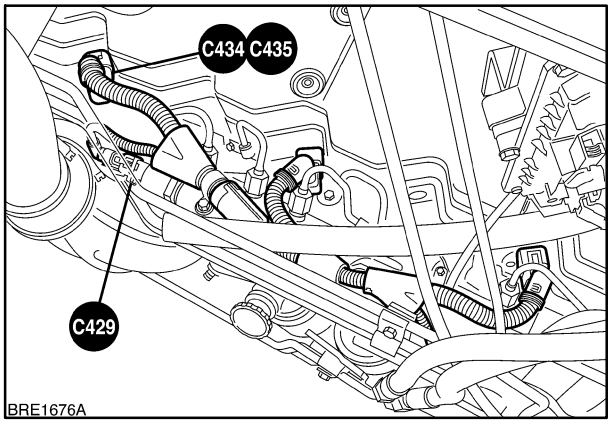

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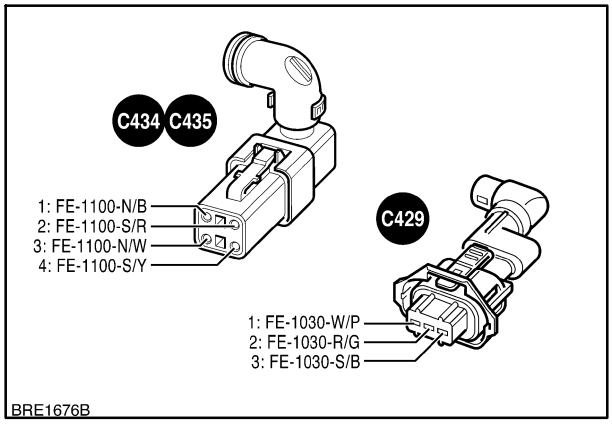

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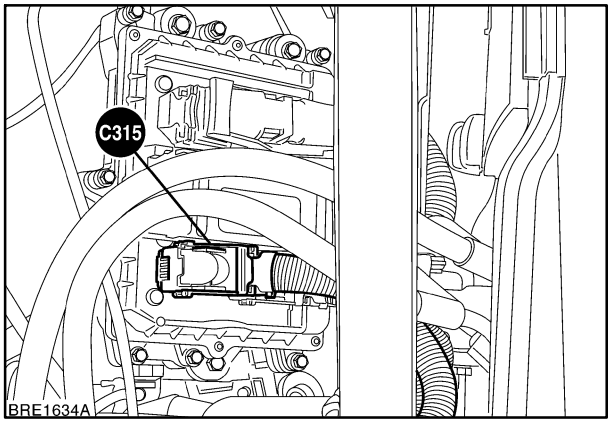

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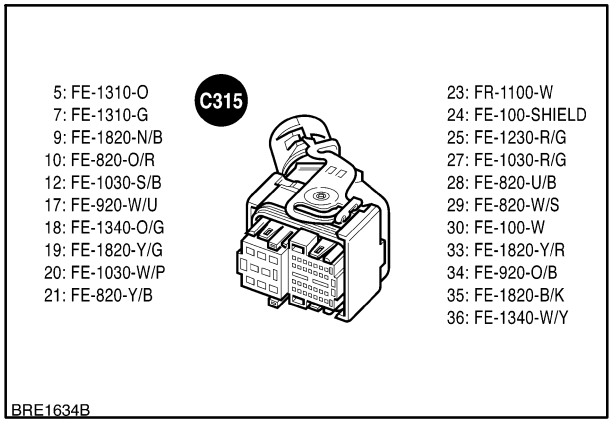


BRE1634B

ERROR CODE 3103 - FUEL PRESSURE SENSOR HIGH VALUE

Effects:

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.

   A. If a fault with the fuel system is indicated, repair as necessary.

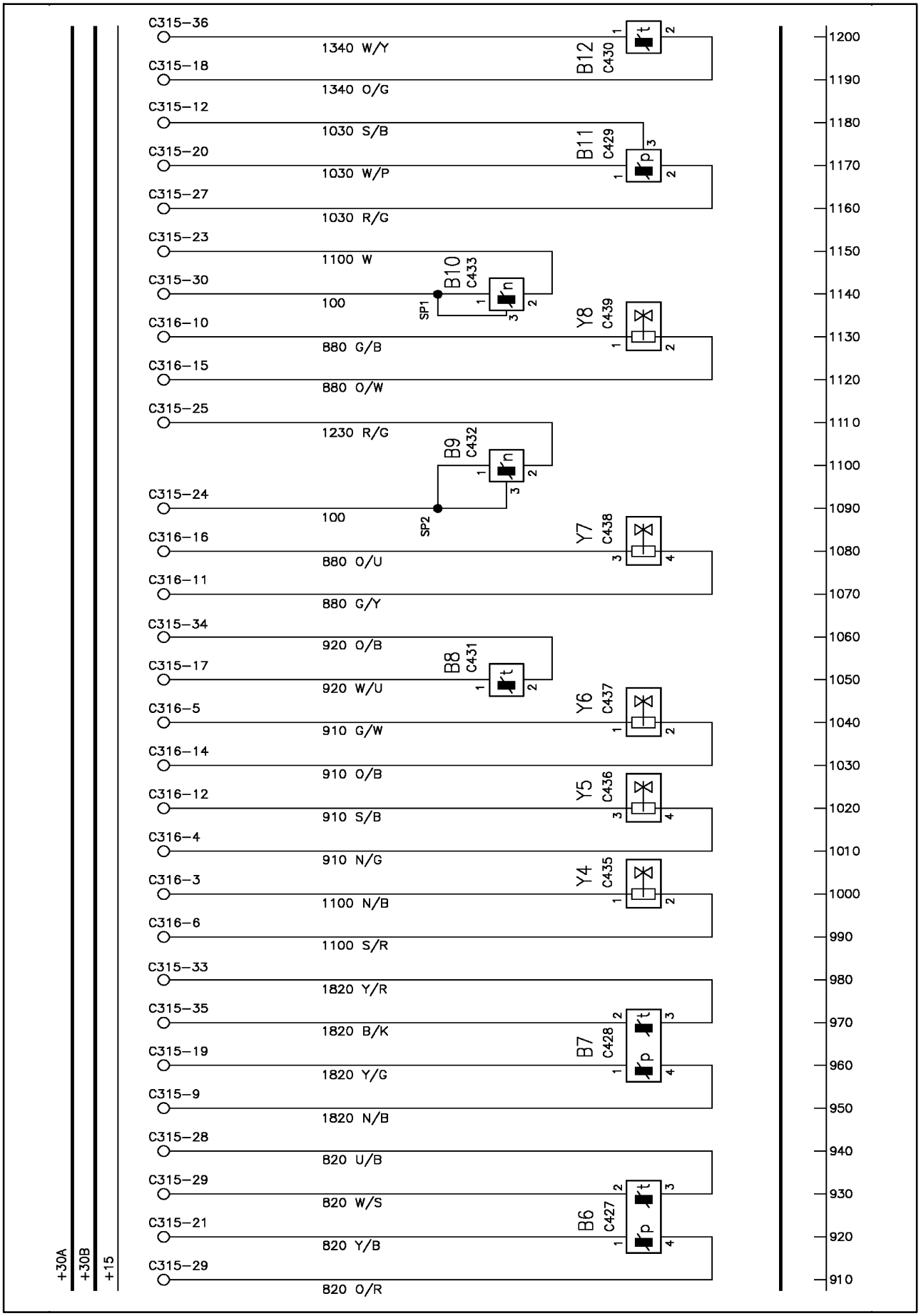
   B. If a fault with the fuel system is not indicated, continue to step 3.
3. Check the fuel temperature sensor connector **C429** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check for other error codes displayed.

   A. If other error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-20
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C315-27
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C315-23
1100 W
C315-30
100
B10 C433
SP1
C316-10
880 G/B
C316-15
880 O/W
Y8 C439
C315-25
1230 R/G
B9 C432
C315-24
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SP2
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880 O/U
C316-11
880 G/Y
Y7 C438
C315-34
920 O/B
C315-17
920 W/U
B8 C431
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C316-14
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C316-12
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C316-4
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Y5 C436
C316-3
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C316-6
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Y4 C435
C315-33
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C315-35
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C315-19
1820 Y/G
B7 C428
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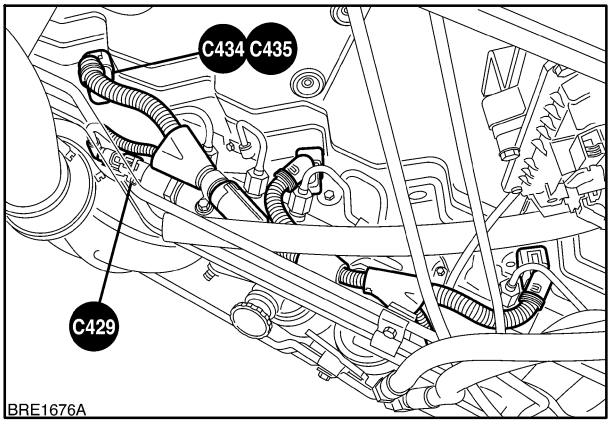

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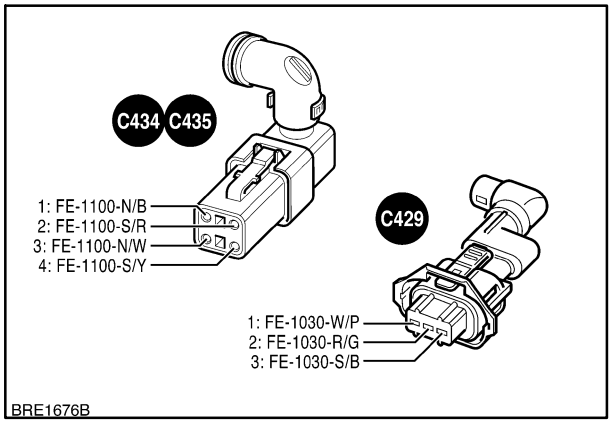

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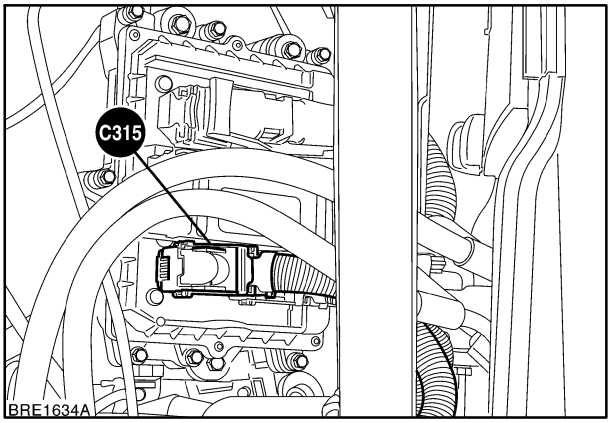

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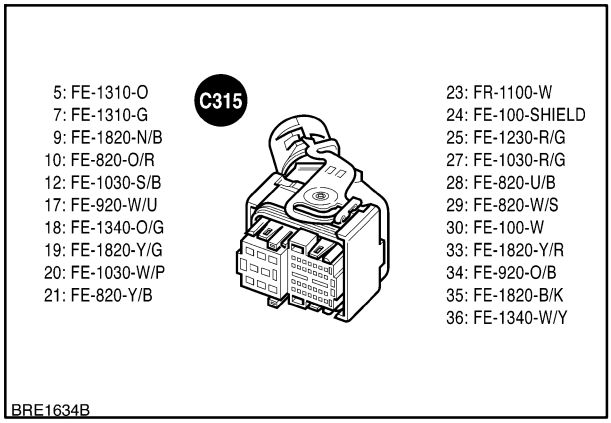


BRE1634B

ERROR CODE 3104 - FUEL PRESSURE SENSOR HIGH VOLTAGE

Effects:

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check the fuel pressure sensor connector **C429** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

   A. Disconnect connector **C429**. Turn the keystart ON. Measure the voltage between connector **C429** pin **3 (S/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 volts, continue to step 4.

4. Check for a short to +Ve voltage.

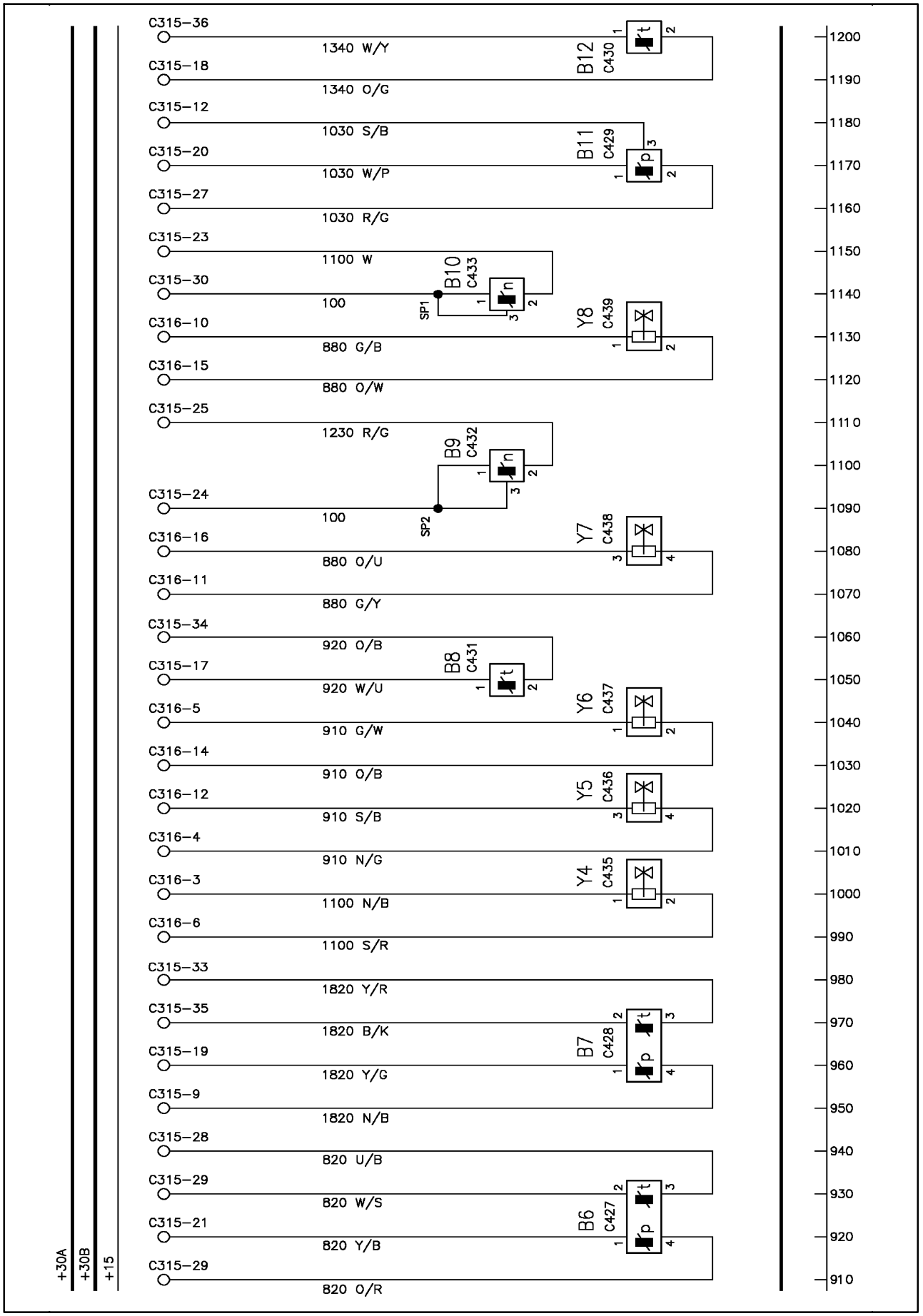
   A. Turn the key start ON. Measure the voltage between connector:

   C429 pin **1 (W/P)** and **ground**

   C429 pin **2 (R/G)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10
C433
SP1
C316-10
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880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
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SP2
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880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
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C315-17
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B8
C431
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C437
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C428
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C427
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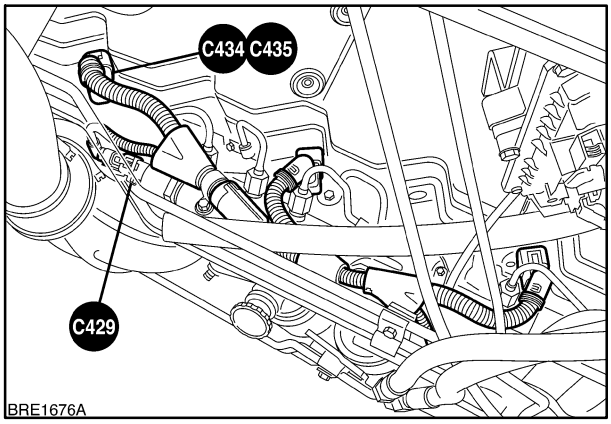

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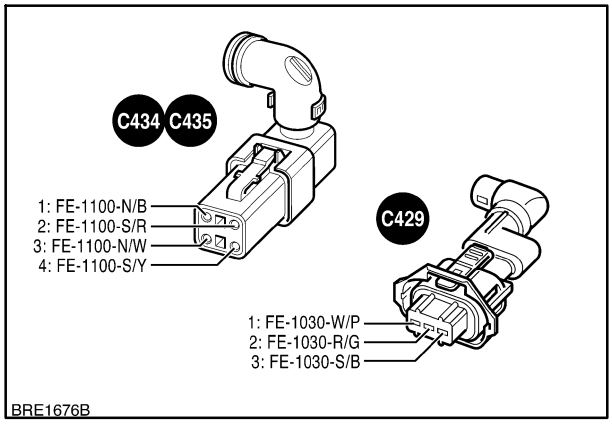

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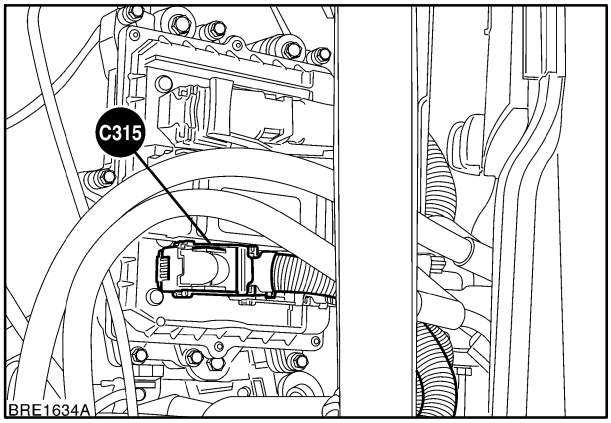

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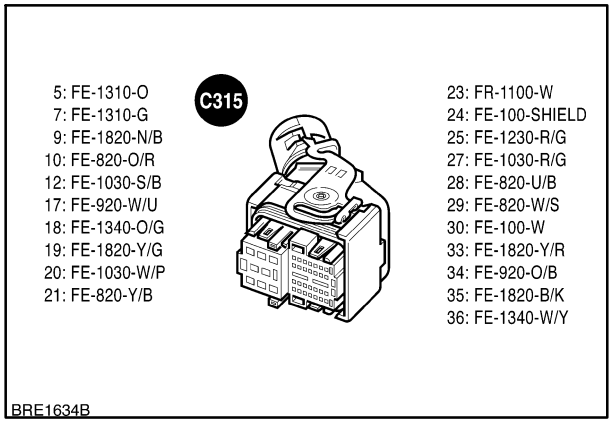


BRE1634B

ERROR CODE 3105 – FUEL PRESSURE SENSOR LOW VOLTAGE

Effects:

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check the fuel pressure sensor connector **C429** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check the fuel pressure sensor for a short to ground.

   A. Disconnect connector **C429**. Check between the component side of the connector:

   C429 pin **1** and **ground**

   C429 pin **2** and **ground**

   C429 pin **3** and **ground**

   If a short to ground is indicated, remove and replace the fuel pressure sensor.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connector **C315**. Check between connector:

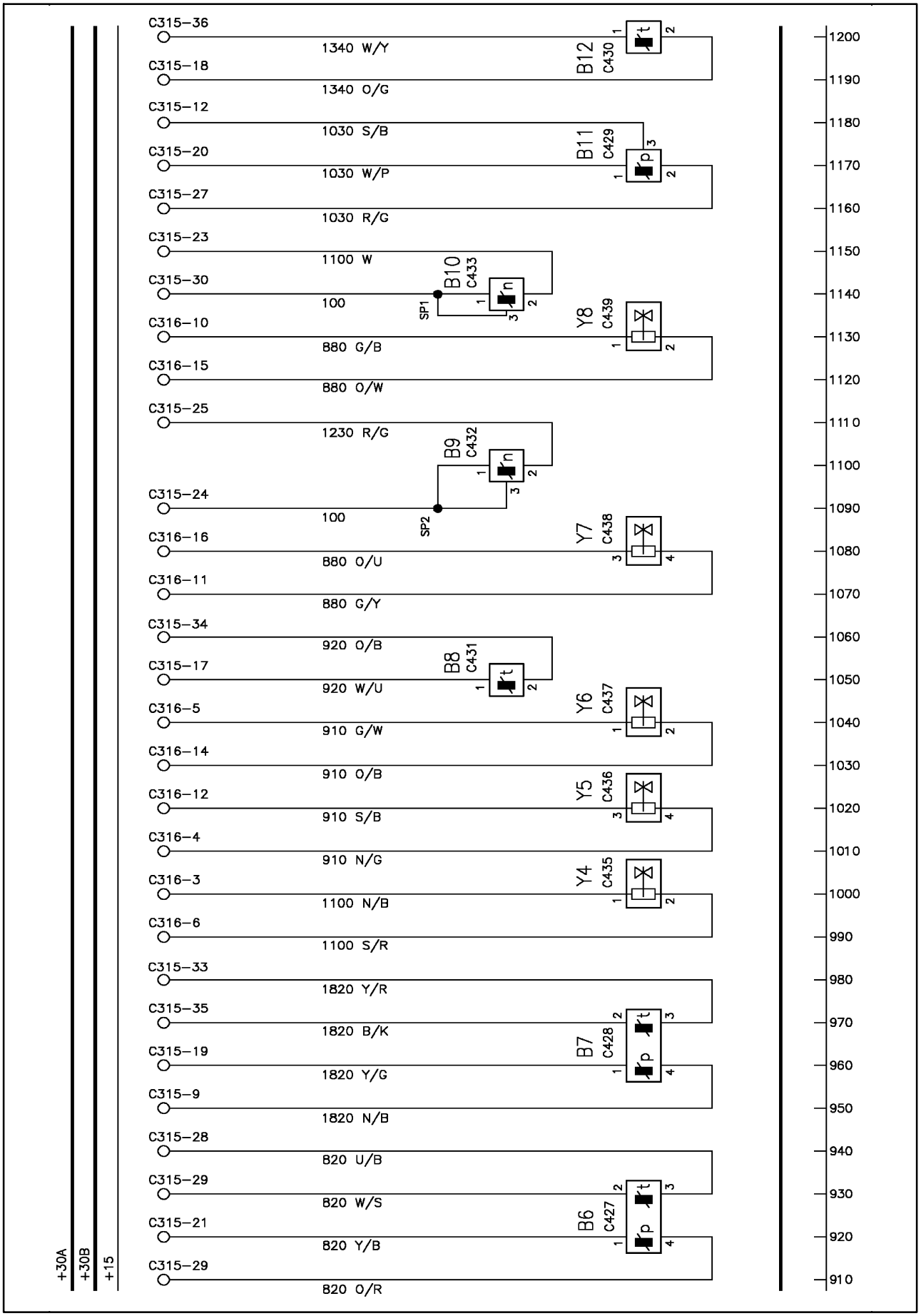
   C429 pin **1 (W/P)** and **ground**

   C429 pin **2 (R/G)** and **ground**

   C429 pin **3 (S/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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C315-23
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C315-30
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SP1
Y8 C439
C316-10
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C316-15
880 O/W
C315-25
1230 R/G
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C315-24
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SP2
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C315-34
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Y6 C437
C316-5
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C316-14
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C316-4
910 N/G
Y4 C435
C316-3
1100 N/B
C316-6
1100 S/R
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C315-35
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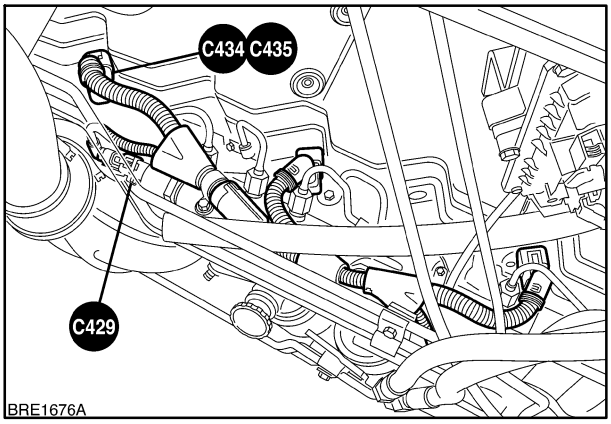

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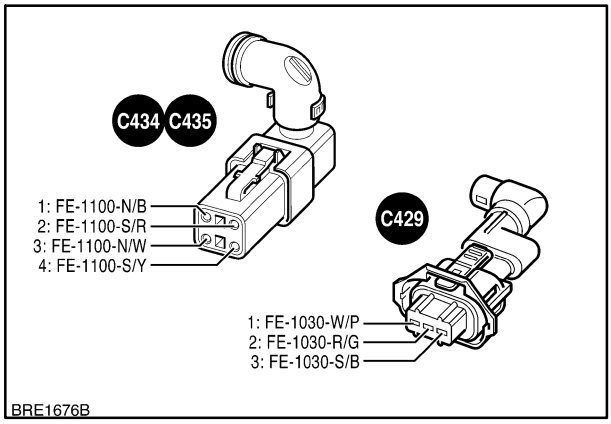

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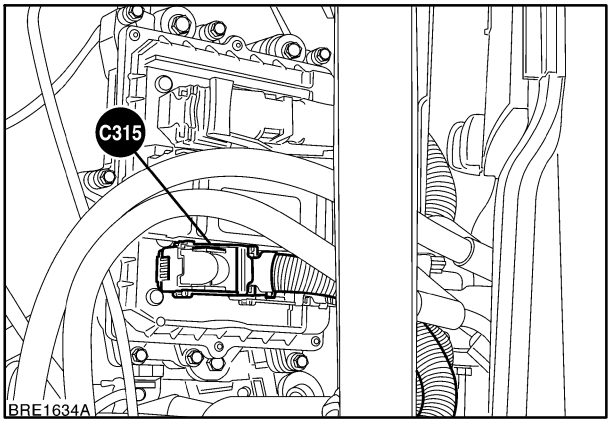

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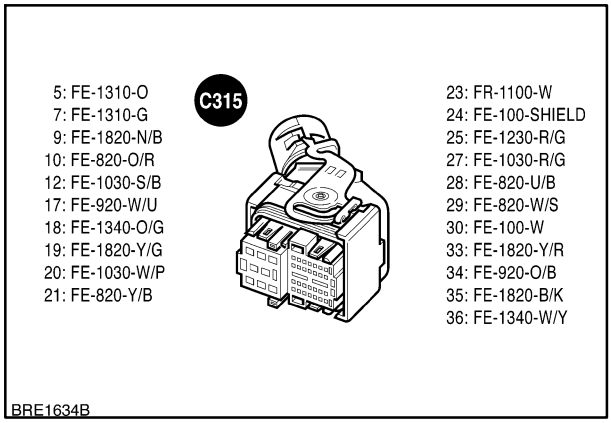


BRE1634B

ERROR CODE 3106 - FUEL PRESSURE SENSOR OPEN CIRCUIT OR DISCONNECTED

Effects:

Power loss.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure sensor
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check the fuel pressure sensor connector **C429** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.
3. Check for an open circuit.

   A. Disconnect connector **C315**. Check between connector:

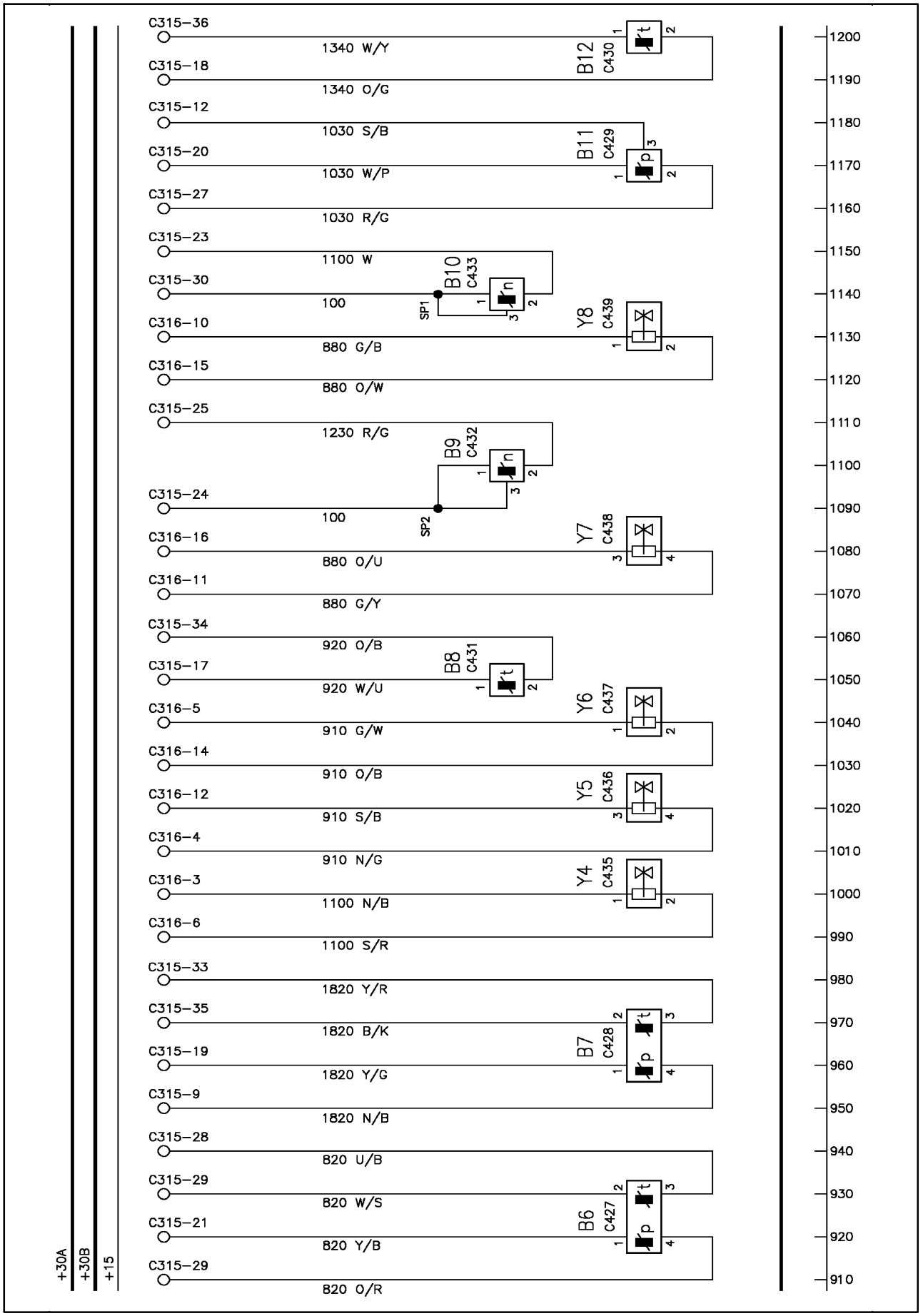
   C429 pin **1 (W/P)** and **C315** pin **20 (W/P)**

   C429 pin **2 (R/G)** and **C315** pin **27 (R/G)**

   C429 pin **3 (S/B)** and **C315** pin **12 (S/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.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1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
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100
B10 C433
SP1
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880 O/W
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C315-25
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SP2
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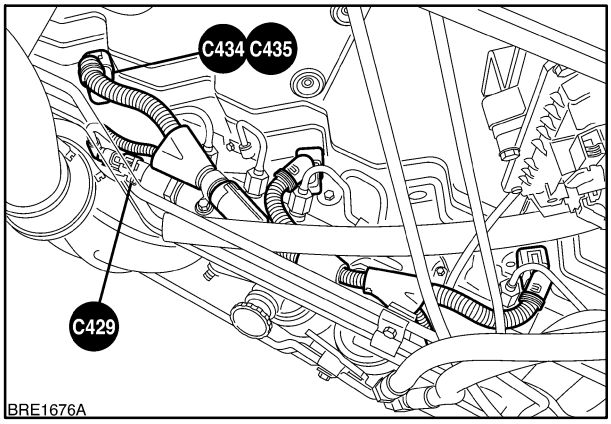

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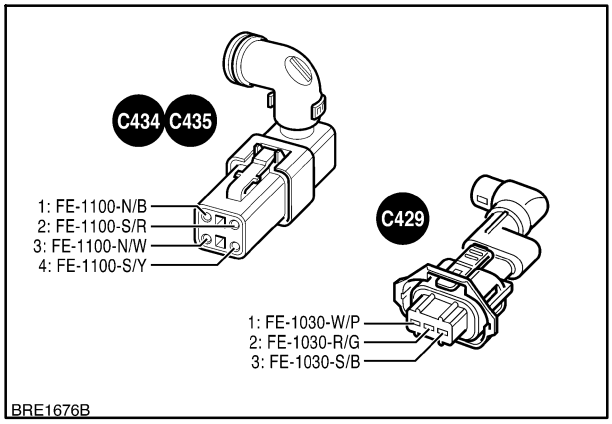

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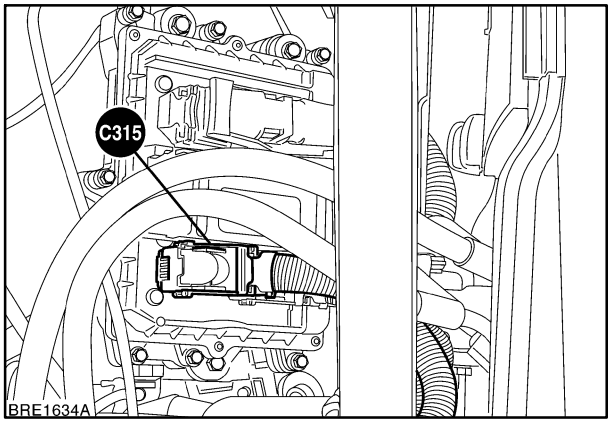
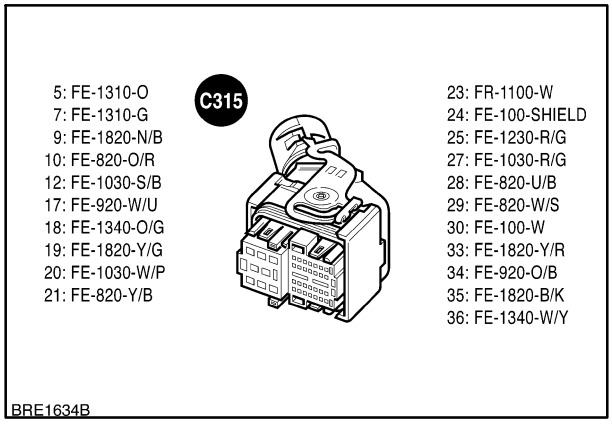


BRE1634A



BRE1634B

ERROR CODE 3107 - FUEL METERING UNIT SHORT TO VCC

Effects:

Significant power drop.

Possible failure modes:

1. Faulty connector
2. Faulty fuel metering unit
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.

   A. If a fault with the fuel system is indicated, repair as necessary.

   B. If a fault with the fuel system is not indicated, continue to step 3.
3. Check the fuel metering unit connector **C440** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check for short to + Ve Voltage.

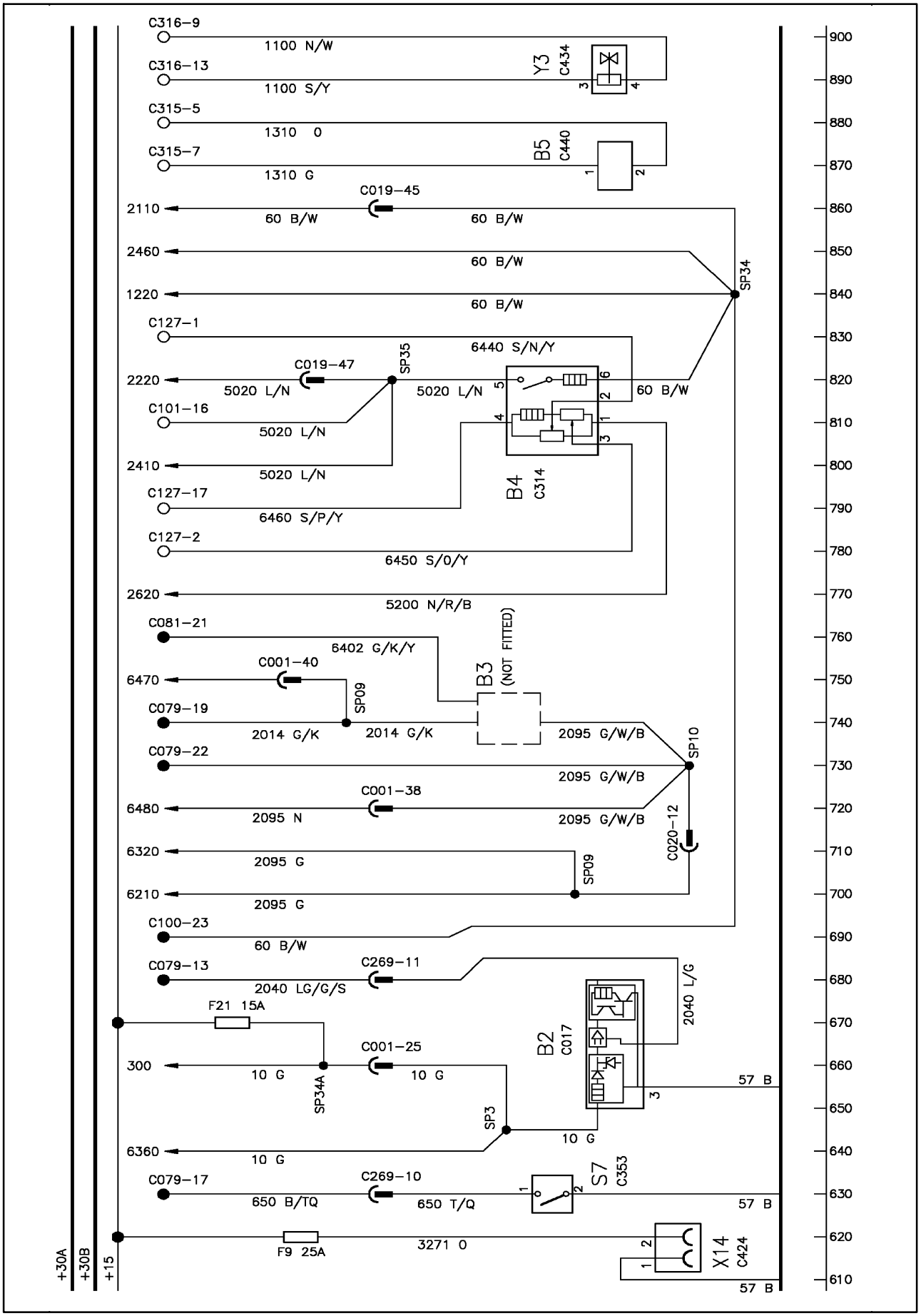
   A. Disconnect connector **C440**. Turn the keystart ON. Measure the voltage between connector:

   C440 pins **1 (G**) and **ground**

   C440 pins **2 (O)** and **ground**

   If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the fuel metering unit. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
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620
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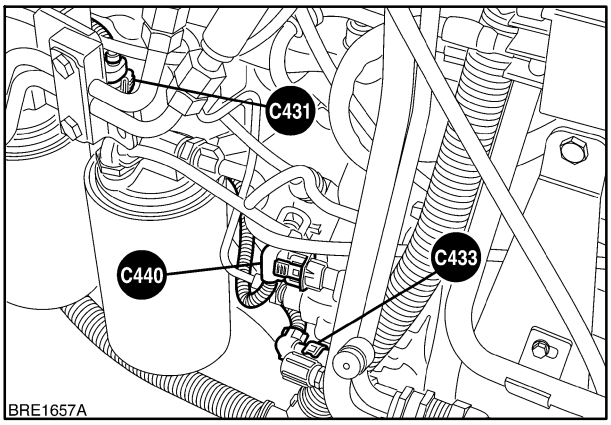
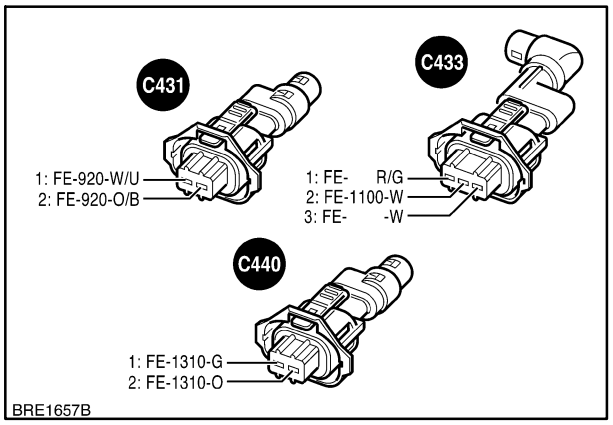
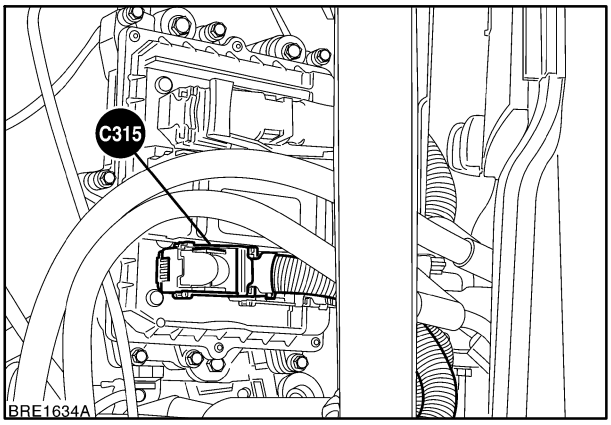
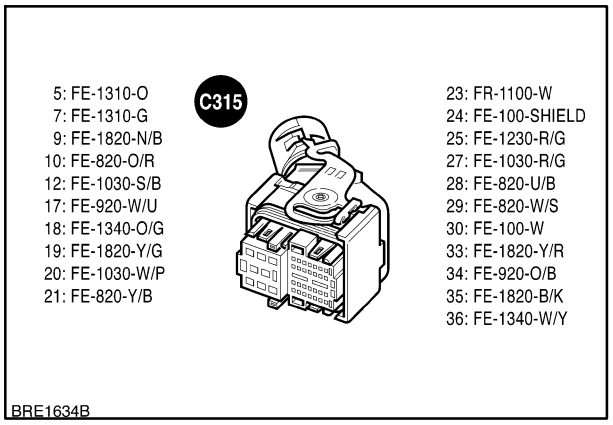

C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3108 - FUEL METERING UNIT SHORT TO GROUND

Effects:

Significant power drop.

Possible failure modes:

1. Faulty connector
2. Faulty fuel metering unit
3. Faulty harness
4. Fault engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.

   A. If a fault with the fuel system is indicated, repair as necessary.

   B. If a fault with the fuel system is not indicated, continue to step 3.
3. Check the fuel metering unit connector **C440** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check for a short to ground.

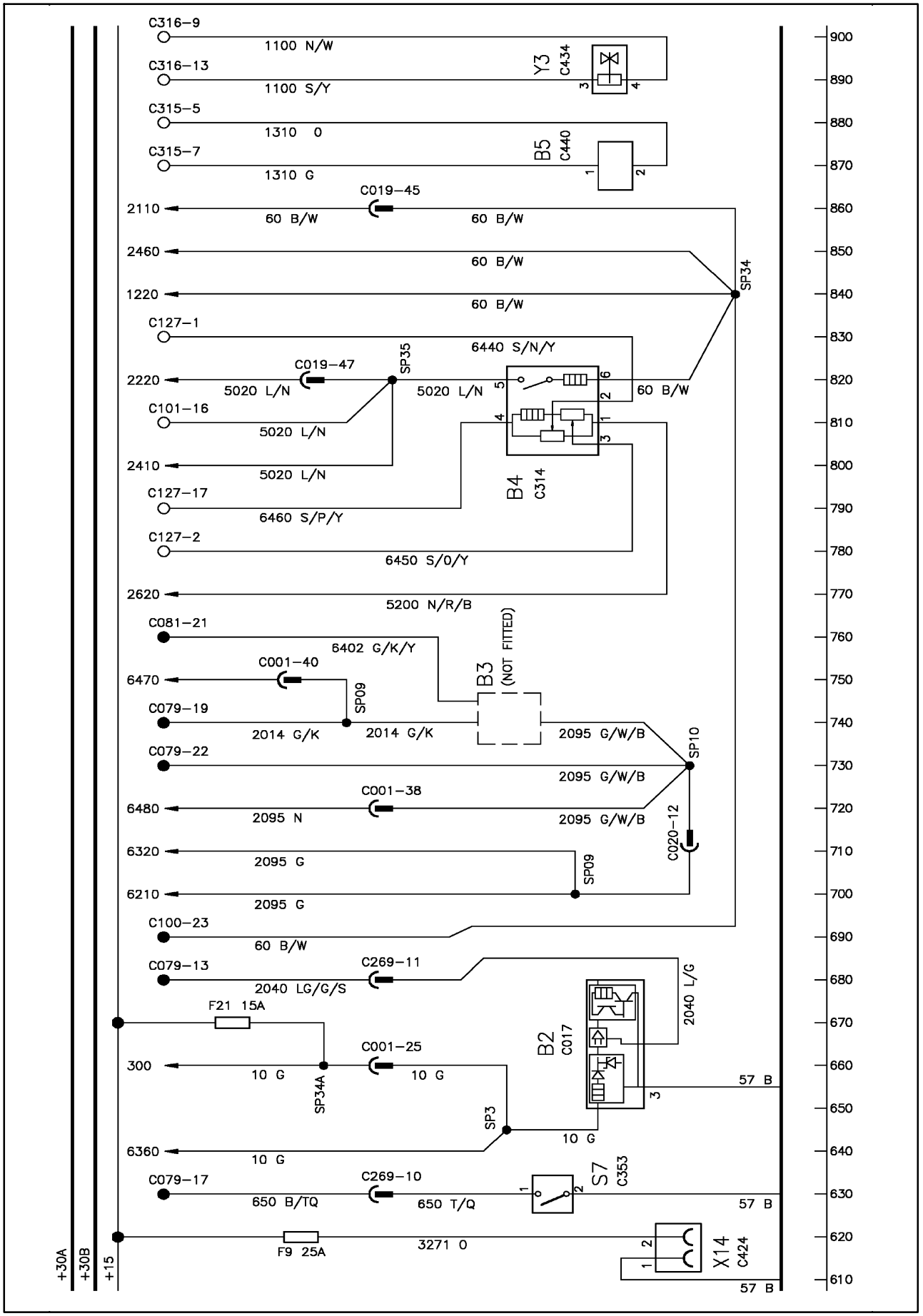
   A. Disconnect connector **C440** and **C315**. Check between connector:

   C440 pins **1 (G**) and **ground**

   C440 pins **2 (O)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the fuel metering unit. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
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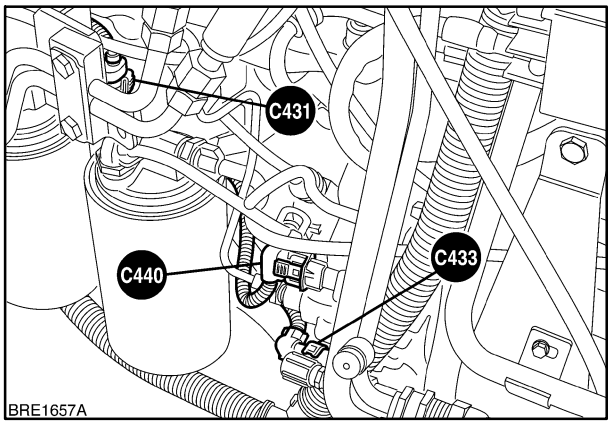
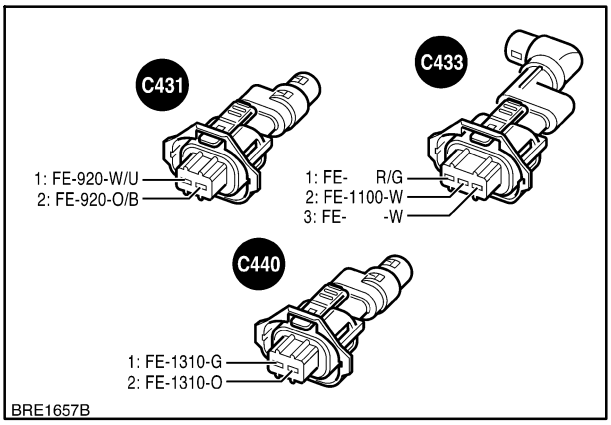
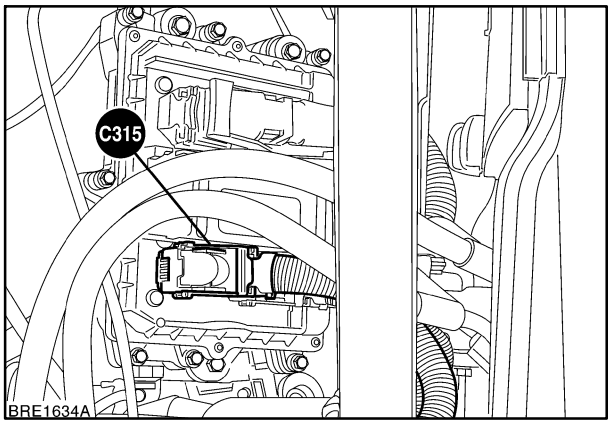
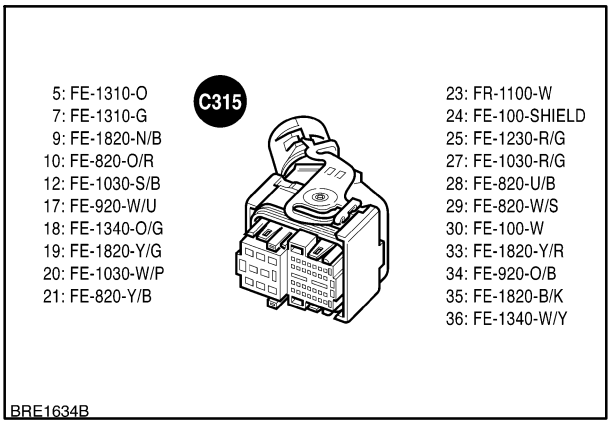

C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3109 – FUEL METERING UNIT LOAD DISCONNECTED OR SHORT TO GROUND

Effects:

Significant power drop.

Possible failure modes:

1. Faulty connector
2. Faulty fuel metering unit
3. Faulty harness
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.

   A. If a fault with the fuel system is indicated, repair as necessary.

   B. If a fault with the fuel system is not indicated, continue to step 3.
3. Check the fuel metering unit connector **C440** and the engine controller connector **C315**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check for an open circuit.

   A. Disconnect connector **C440** and **C315**. Check between connector:

   C440 pins **1 (G**) and **C315** pin **7 (G)**

   C440 pins **2 (O)** and **C315** pin **5 (O)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.
5. Check for a short to ground.

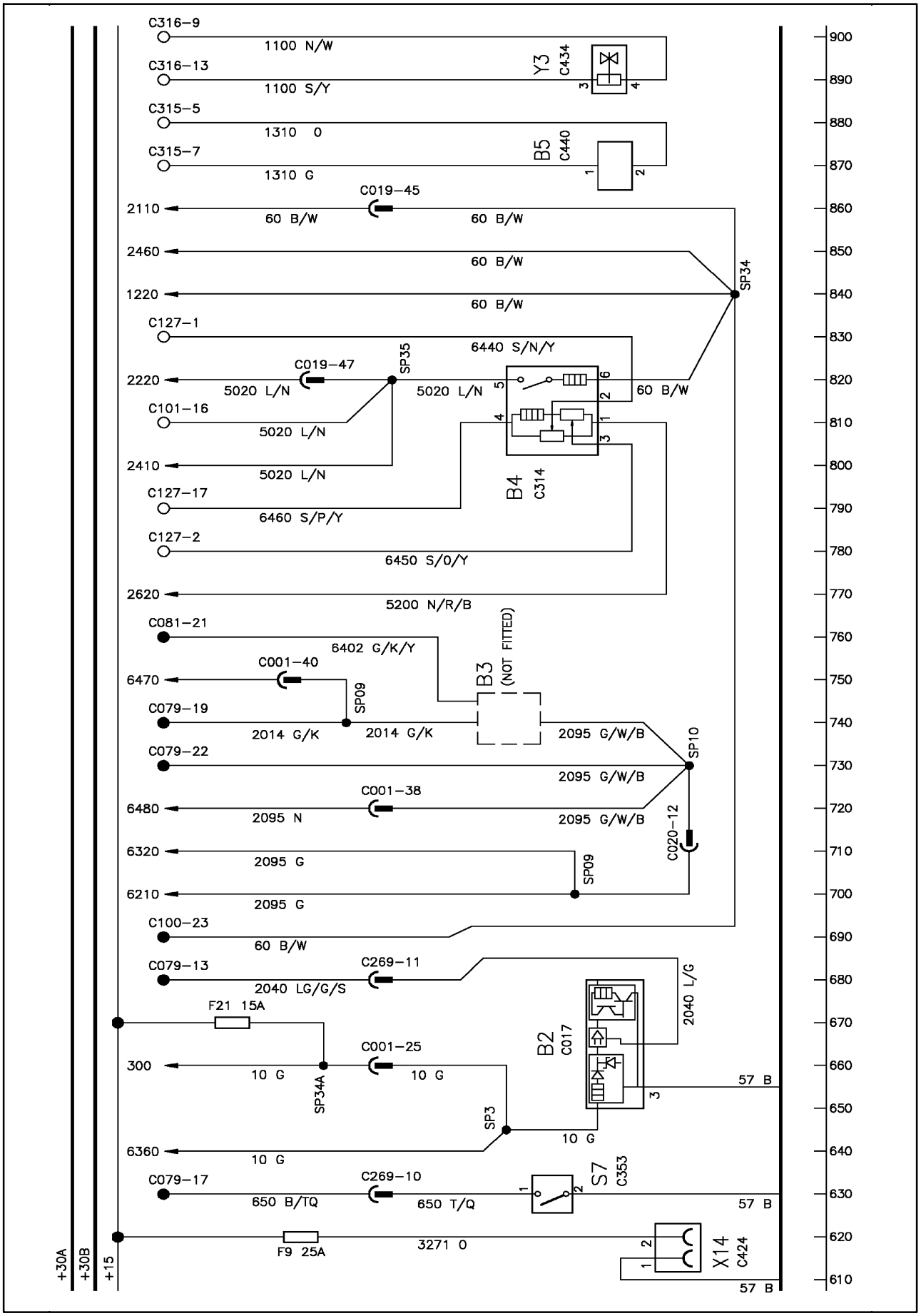
   A. Check between:

   C440 pins **1 (G**) and **ground**

   C440 pins **2 (O)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the fuel metering unit. If the fault is still present, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
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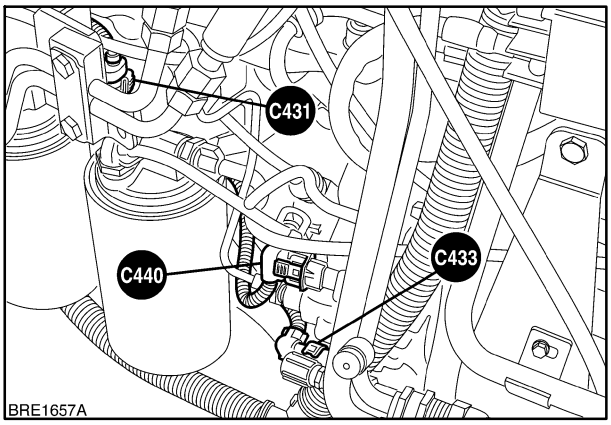
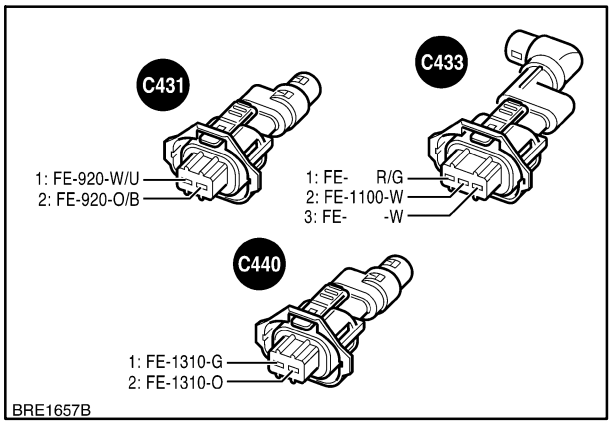
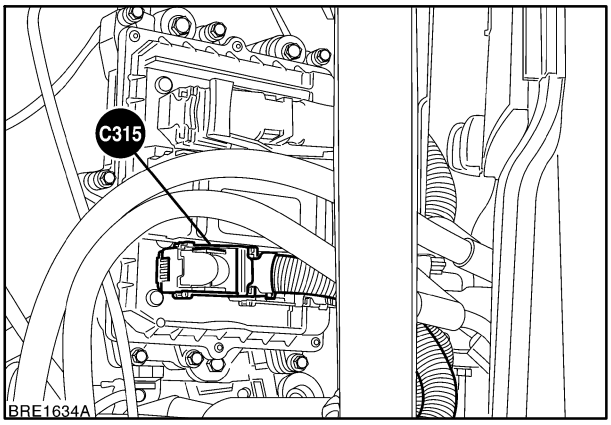
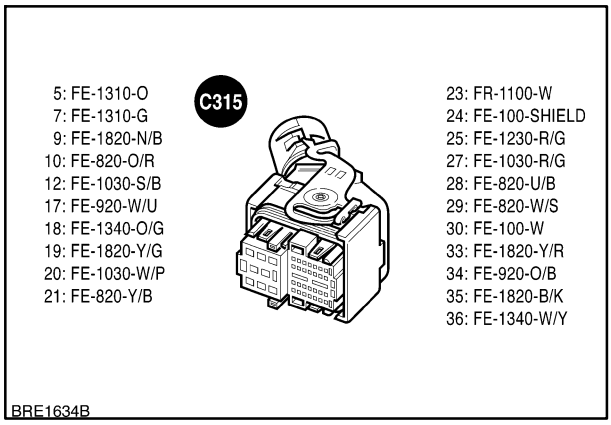

C431
C440
C433
BRE1657A


C431
1: FE-920-W/U
2: FE-920-O/B
C433
1: FE- R/G
2: FE-1100-W
3: FE- -W
C440
1: FE-1310-G
2: FE-1310-O
BRE1657B


C315
BRE1634A


5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
C315
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B

ERROR CODE 3110 - FUEL PRESSURE RELIEF VALVE TO HIGH FOR LONG DURATION

Effects:

Significant power drop.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure relief valve
3. Faulty fuel pressure

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.
   A. If a fault with the fuel system is indicated, repair as necessary.
   B. If a fault with the fuel system is not indicated, remove and replace the fuel pressure relief valve.

ERROR CODE 3111 – FUEL PRESSURE RELIEF VALVE OPEN

Effects:

Significant power drop.

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure relief valve
3. Faulty fuel pressure

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.
   A. If a fault with the fuel system is indicated, repair as necessary.
   B. If a fault with the fuel system is not indicated, remove and replace the fuel pressure relief valve.

ERROR CODE 3112 - FUEL PRESSURE MONTORING HIGH PRESSURE

Effects:

Significant power drop (Possible engine stop).

Possible failure modes:

1. Faulty connector
2. Faulty fuel pressure relief valve
3. Fuel pressure to low
4. Fuel pressure to high

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other fuel pressure related error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Ensure that the fuel system mechanical operation is okay. Run the tractor under normal conditions. Using a fuel pressure gauge check that the pressure is correct.
   A. If a fault with the fuel system is indicated, repair as necessary.
   B. If a fault with the fuel system is not indicated, remove and replace the fuel pressure relief valve.

ERROR CODE 3113 - TRANSISTOR SUPPLY UB2 IS DEFECTIVE

Effects:

The Controller will be continuously powered and the engine error indicator lamp will be constantly illuminated even when the key switch is set to OFF.

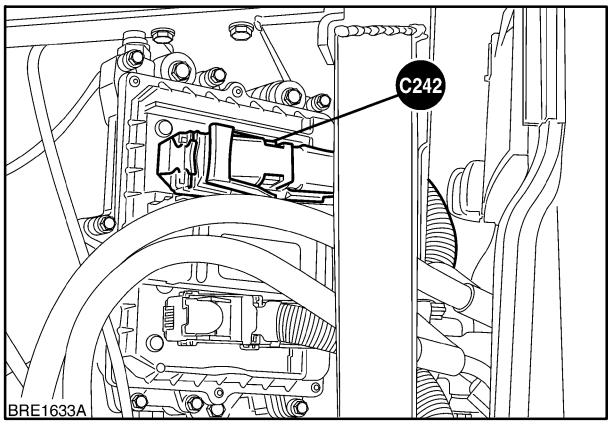
Possible failure modes:

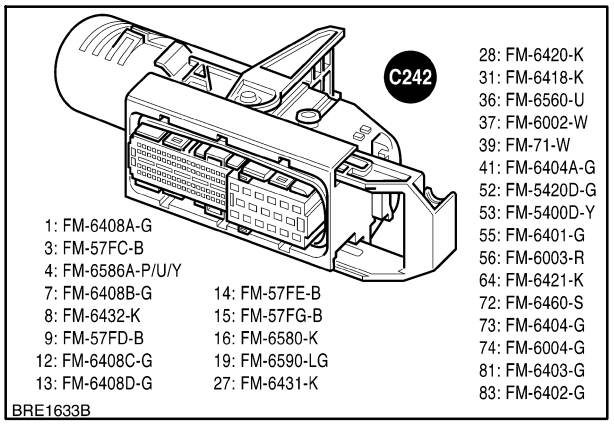
1. Faulty engine controller

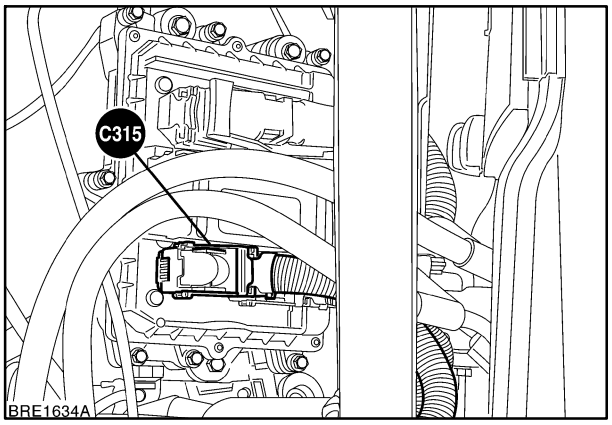
Solution:

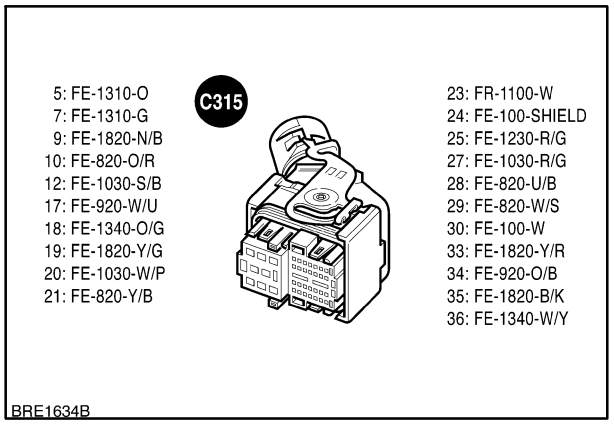
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Reset the module.
   A. Turn the keystart OFF. Disconnect controller connectors **C242**, **C315** and **C316**.
   B. After 3 minutes re-connect the connectors, continue to step 3.
3. Check the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly
   B. If the error code is indicated, remove and replace the engine controller.


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B


C315
BRE1634A


C315
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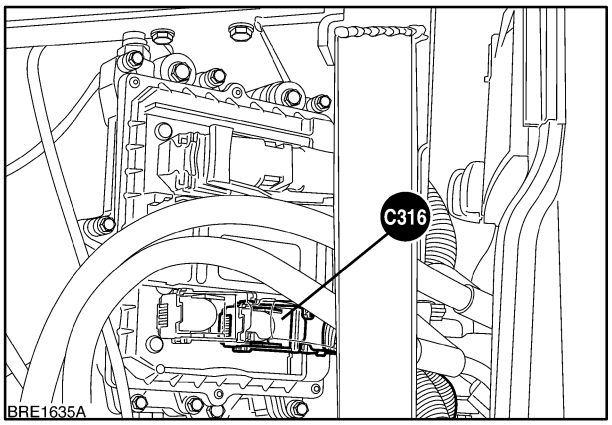
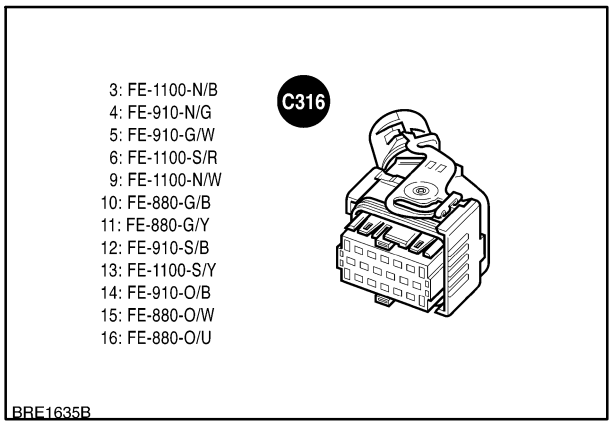
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C316
BRE1635A


C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B

ERROR CODE 3114 - TRANSISTOR SUPPLY UB3 IS DEFECTIVE

Effects:

The Controller will be continuously powered and the engine error indicator lamp will be constantly illuminated even when the key switch is set to OFF.

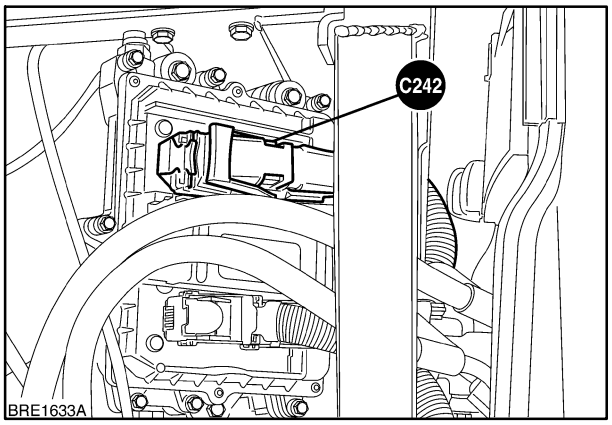
Possible failure modes:

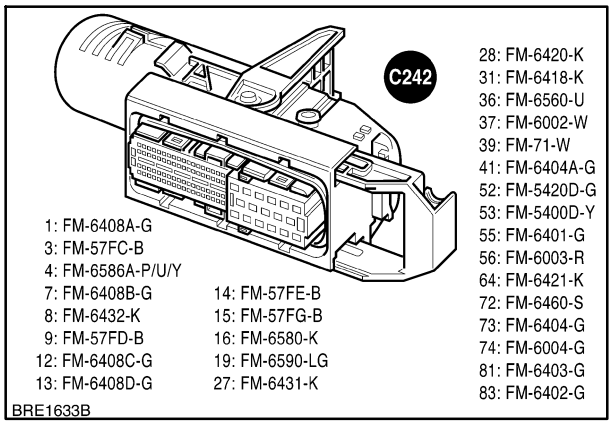
1. Faulty engine controller

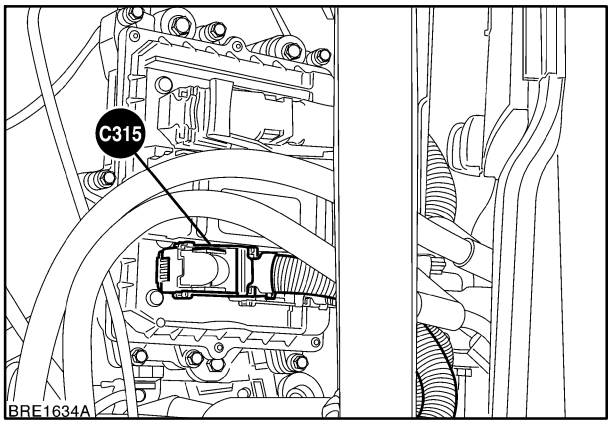
Solution:

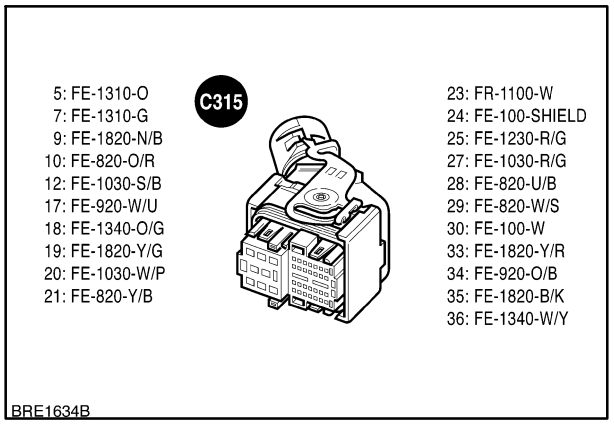
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

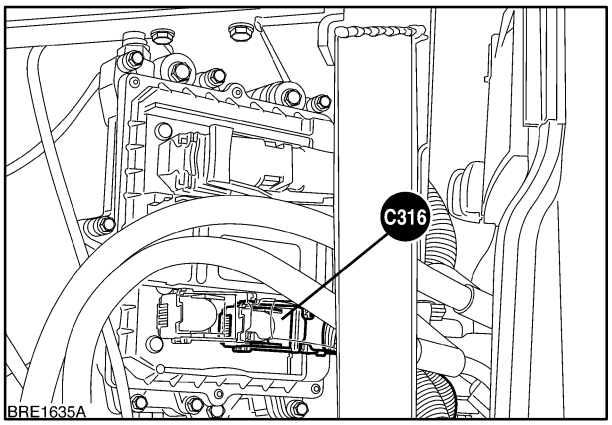
1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Reset the module.
   A. Turn the keystart OFF. Disconnect controller connectors **C242**, **C315** and **C316**.
   B. After 3 minutes re-connect the connectors, continue to step 3.
3. Check the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly
   B. If the error code is indicated, remove and replace engine the controller.

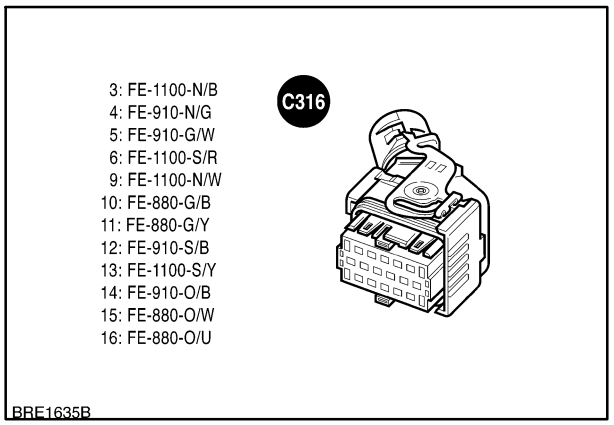

C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C316
BRE1635A


C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B

ERROR CODE 3115 - TRANSISTOR SUPPLY UB4 IS DEFECTIVE

Effects:

The Controller will be continuously powered and the engine error indicator lamp will be constantly illuminated even when the key switch is set to OFF.

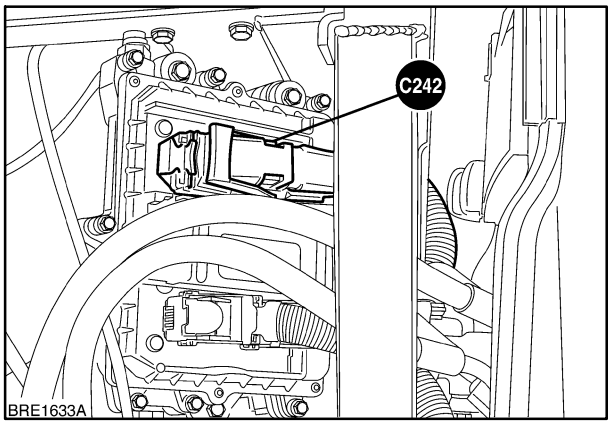
Possible failure modes:

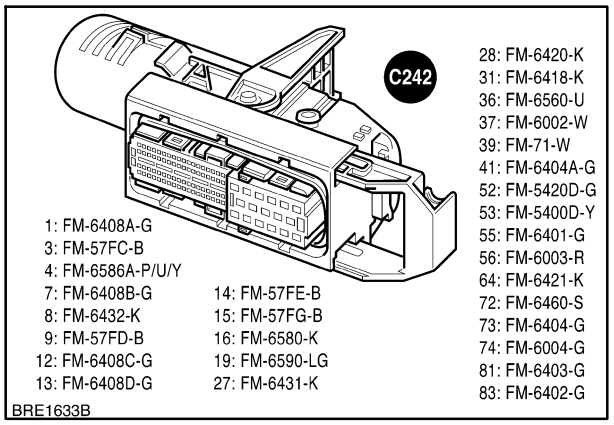
1. Faulty engine controller

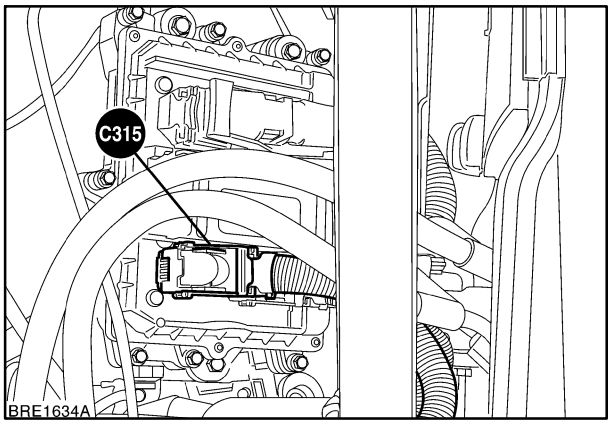
Solution:

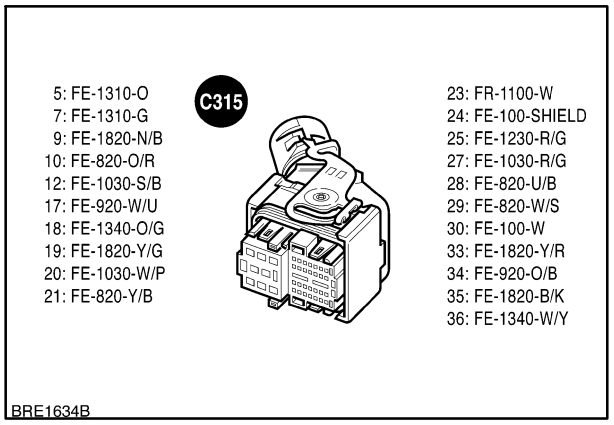
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

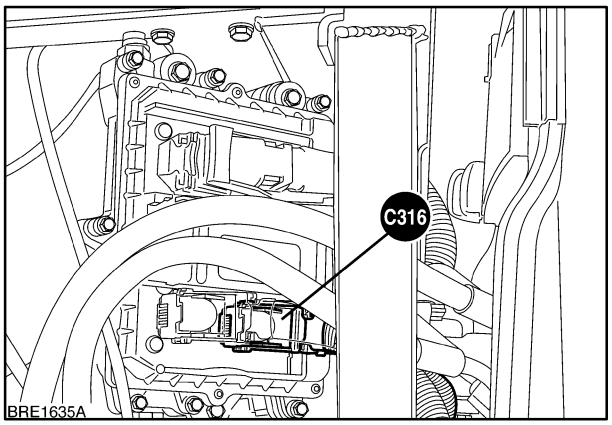
1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Reset the module.
   A. Turn the keystart OFF. Disconnect controller connectors **C242**, **C315** and **C316**.
   B. After 3 minutes re-connect the connectors, continue to step 3.
3. Check the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly
   B. If the error code is indicated, remove and replace the engine controller.

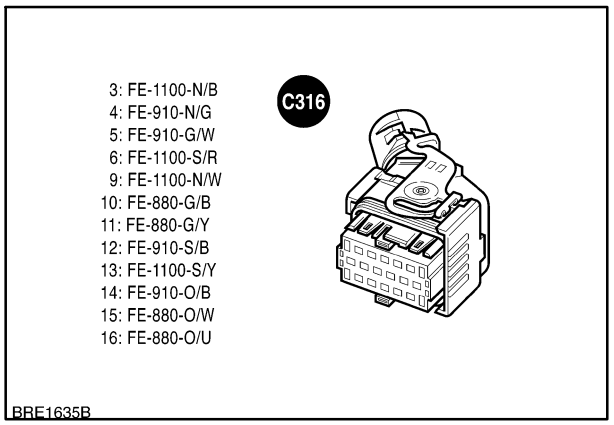

C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C316
BRE1635A


C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B

ERROR CODE 3116 - MAIN RELAY (CONTROLLER INTERNAL SOURCE HIGH)

Effects:

The Controller will be continuously powered and the engine error indicator lamp will be constantly illuminated even when the key switch is set to OFF.

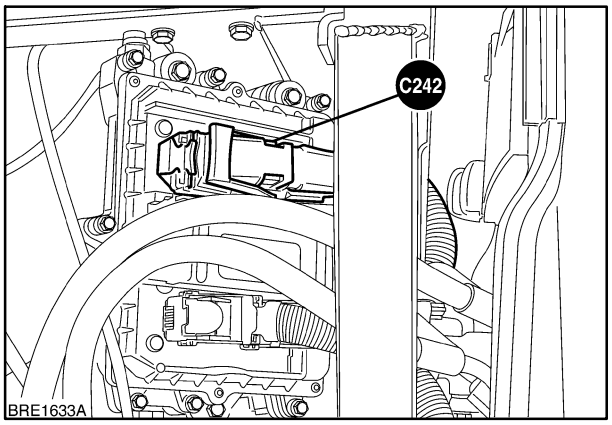
Possible failure modes:

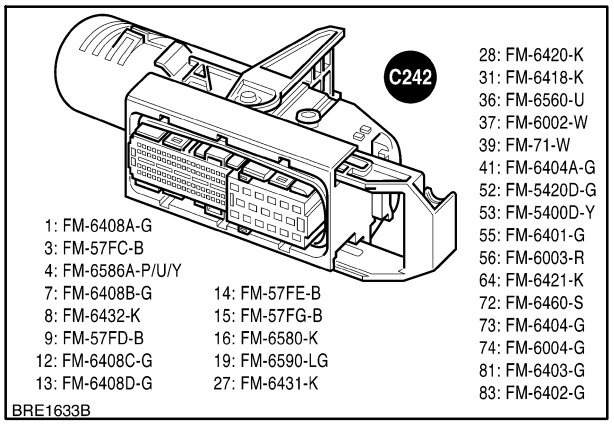
1. Faulty engine controller

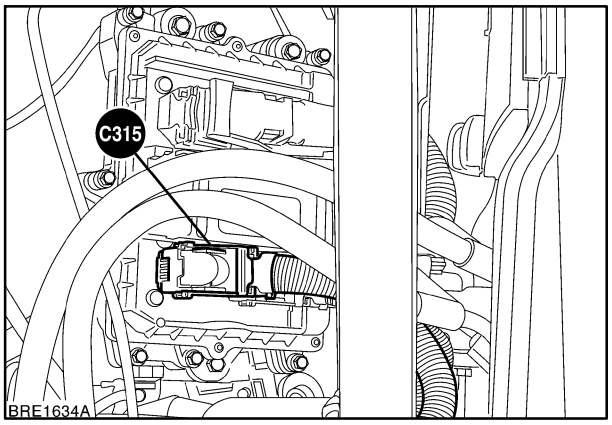
Solution:

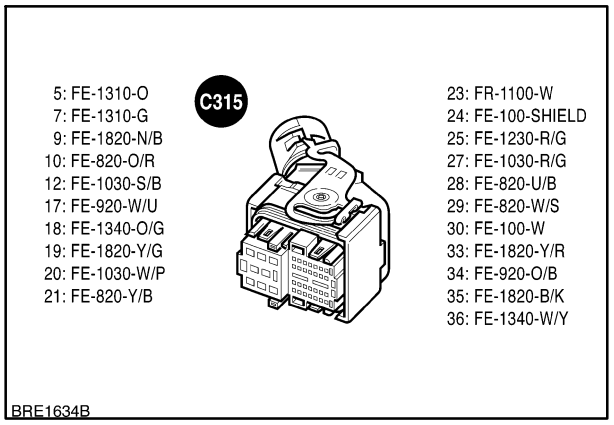
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

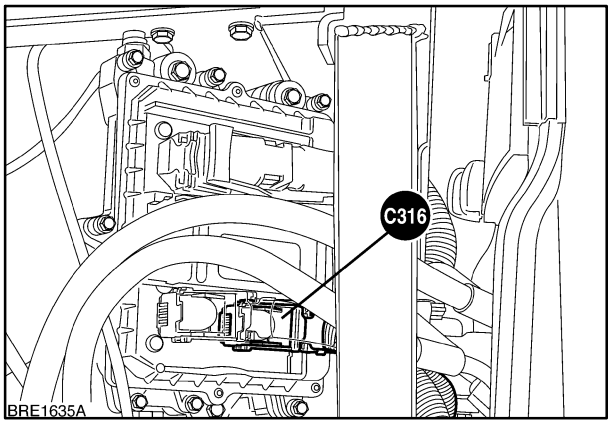
1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Reset the module.
   A. Turn the keystart OFF. Disconnect controller connectors **C242**, **C315** and **C316**.
   B. After 3 minutes re-connect the connectors, continue to step 3.
3. Check the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly
   B. If the error code is indicated, remove and replace the engine controller.

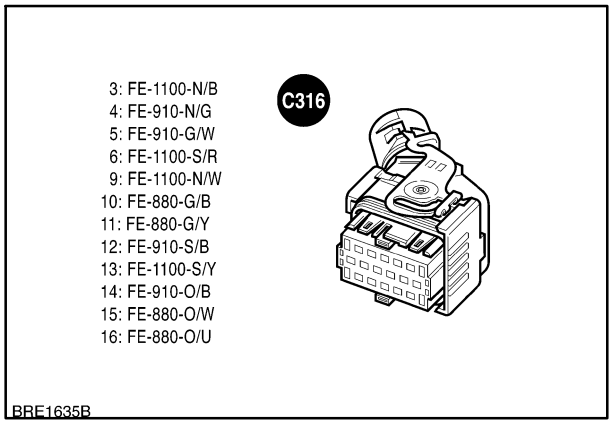

C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B


C316
BRE1635A


C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B

ERROR CODE 3117 - SELF TEST NOT COMPLETE BEFORE POWER DOWN

Effects:

Substantial power reduction.

Possible failure modes:

1. Operator actions
2. Fault during self test before engine is stopped
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and and perform the correct shut down.

   A. Restart the engine, continue to step 2.

2. Re-check for error code.

   A. If the error code is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.

ERROR CODE 3117 - ECU SELF TEST SHUTOFF PATHS (AFTER RUN)

Effects:

1. Substantial power reduction.

Possible failure modes:

1. Incorrect operator shutdown and restart procedure
2. Fault during self test before engine is stopped
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and perform the correct shut down. ie, turn OFF the key start and allow at least 1 second before proceeding with another Key ON.

   A. Restart the engine, if the error reoccurs continue to step 2.

2. Check the Continuous +12V feed to the engine controller.

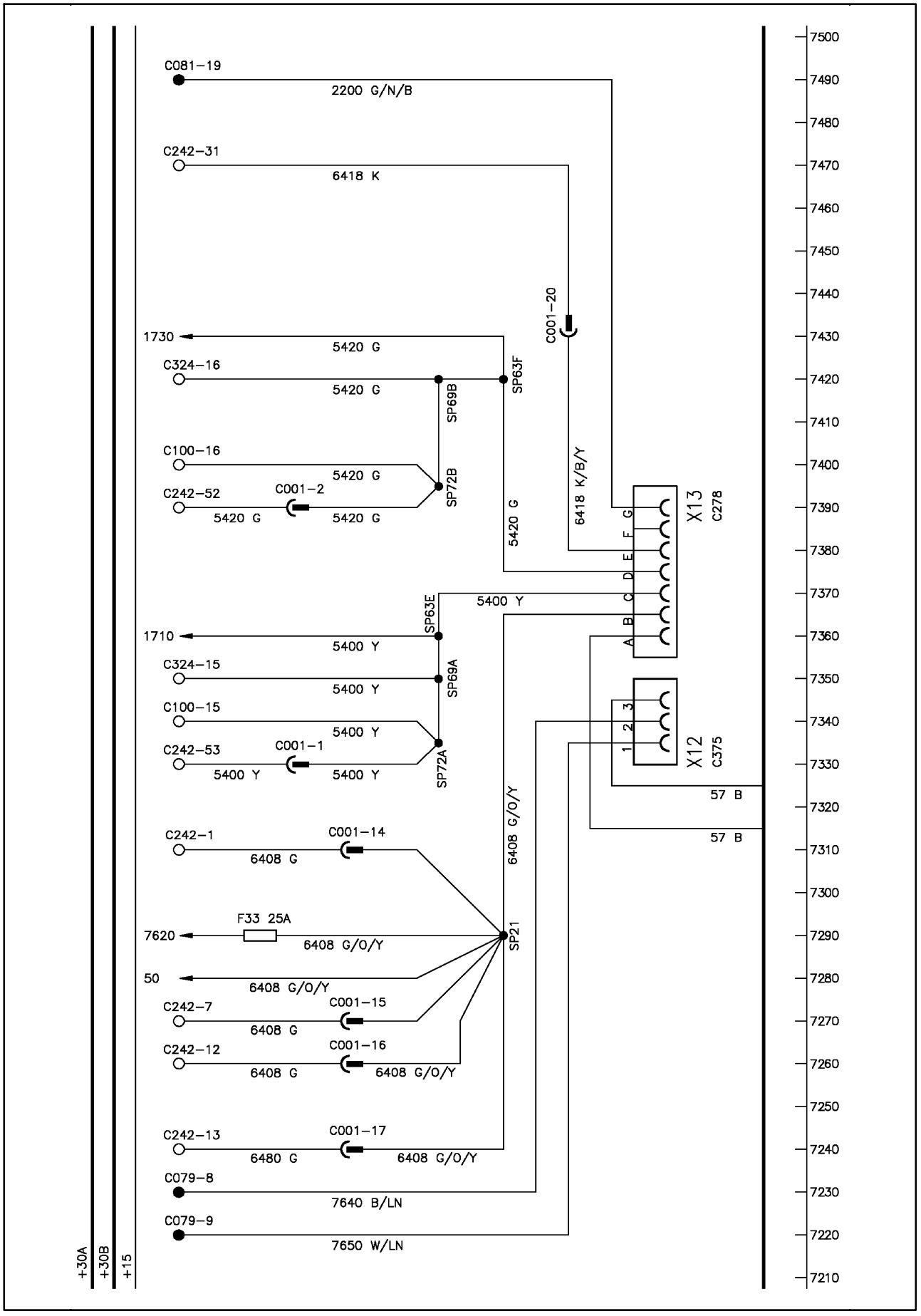
   C.D.E.F.A. Check mini fuse number 33. Replace if blown.

   G.H.I.J.K.L.M.N.O.P.Q.R.S.T.U.V.B. If the fuse is okay disconnect connector **C242** and check for +12V at pins **1, 7, 12** and **13**. There should be +12V at these pins with the Keystart OFF aswell as ON. If +12V is not indicated trace the fault in the wiring between connector **C242** and Fuse 33.

   C. If +12V is indicated and the error re-occurs continue to step 3.

3. Suspect a fault within the engine controller.

   A. Download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-52
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
C242-1
C001-14
6408 G
F33 25A
7620
6408 G/O/Y
SP21
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
7500
7490
7480
7470
7460
7450
7440
7430
7420
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7400
7390
7380
7370
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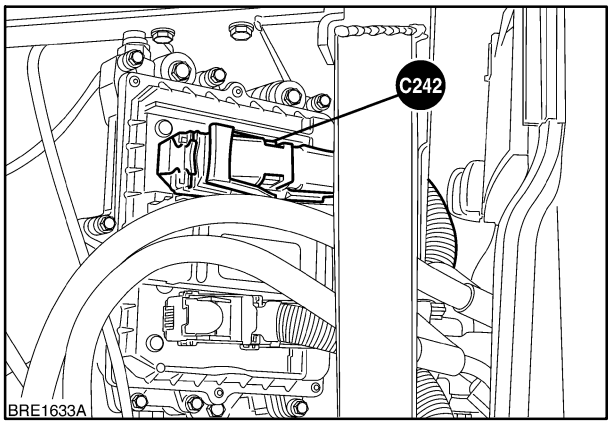
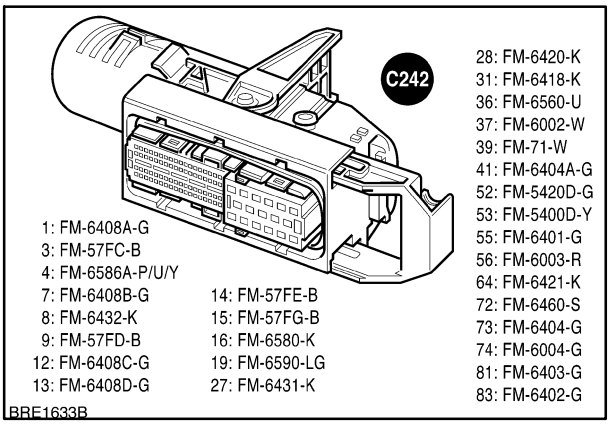

C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 3118 - POWER SUPPLY FOR SENSORS NOT CORRECT

Effects:

Engine fails to start or starting is difficult and engine malfunctions.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.

   A. If other error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, continue to step 3.
3. Check the engine control module connectors **C315**, **C316** and **C242**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check for +5 Volts.

   A. Disconnect the foot throttle connector **C376**. Turn the keystart ON. Measure the voltage between connector **C376** pin **1 (G/B/Y)** and **ground**. If the voltage indicated is less than +5 volts, continue to step 5.

   B. If the voltage indicated is approximately +5 volts, continue to step 6.
5. Check for an open circuit.

   A. Check between connector **C376** pin **1 (G/B/Y)** and **C242** pin **55 (G)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.
6. Check for a short to +8 or +12 Volts.

   A. Disconnect the boost pressure sensor connector **C427**. Turn the keystart ON. Measure the voltage between connector **C427** pin **3 (O/R)** and **ground**. If the voltage indicated is less than +5 volts, continue to step 7.

   B. If the voltage indicated is approximately +5 volts, continue to step 8.
7. Check for an open circuit.

   A. Check between connnector **C427** pin **1 (Y/B)** and **C315** pin **21 (Y/B)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.
8. Check for a short to +8 or +12 Volts.

   A. Disconnect the oil pressure sensor connector **C428**. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. If the voltage indicated is less than +5 volts, continue to step 9.

   B. If the voltage indicated is approximately +5 volts, continue to step 10.
9. Check for an open circuit.

   A. Check between connector **C428** pins **3 (N/B)** and **C315** pin **9 (N/B)**. If an open circuit is indicated, repair or replace the harness as required.

B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.

10. Check for a short to +8 or +12 Volts.

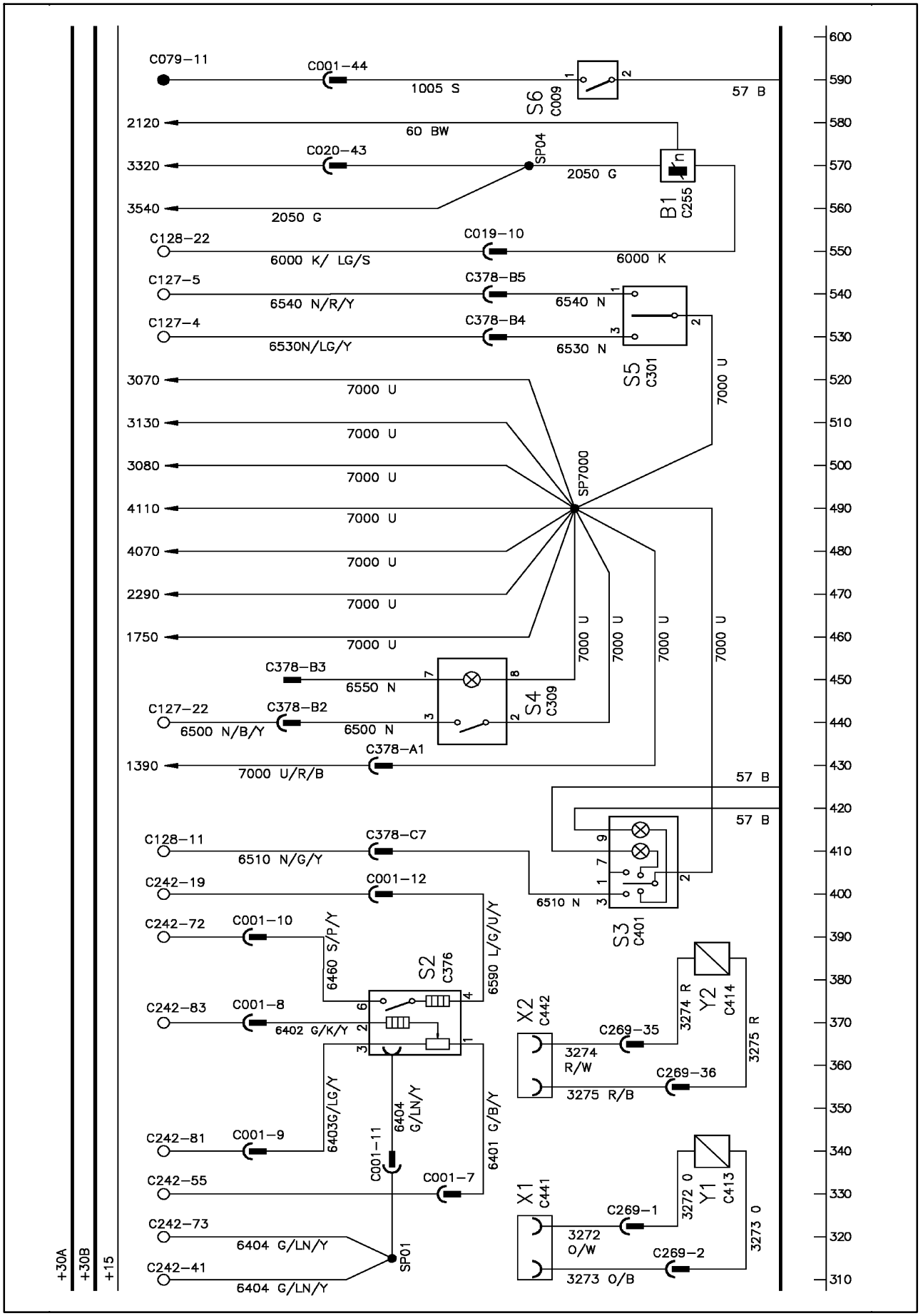
    A. Disconnect the fuel rail pressure sensor connector **C429**. Turn the keystart ON. Measure the voltage between connector **C429** pin **3 (S/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

    B. If the voltage indicated is approximately +5 volts, continue to step 11.

11. Check for an open circuit.

    A. Check between connector **C429** pin **3 (S/B)** and **C315** pin **12 (S/B)**. If an open circuit is indicated, repair or replace the harness as required.

    B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
6590 L/G/U/Y
6510 N
S3 C401
S2 C376
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
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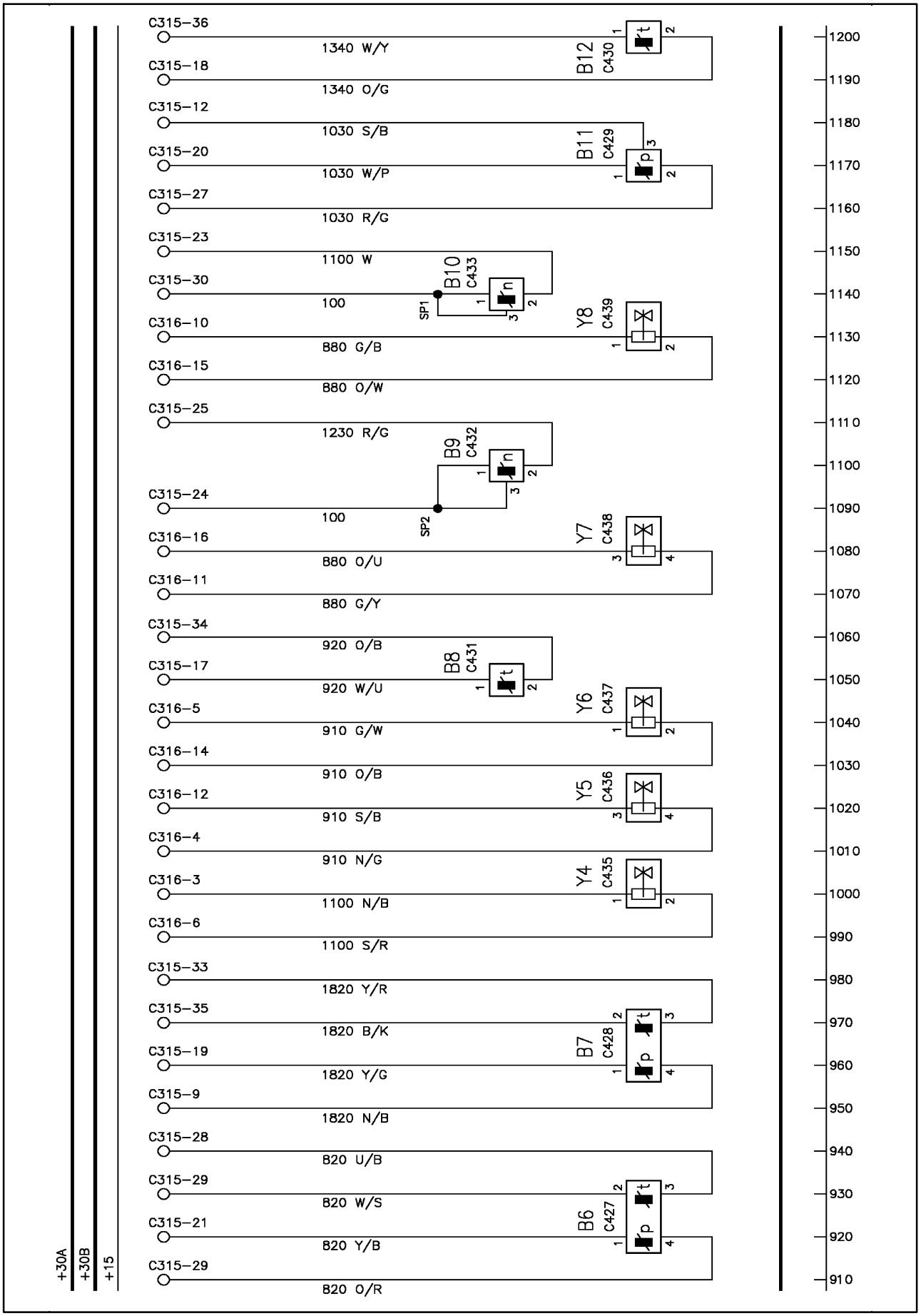
320
310


+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12 C430
C315-12
1030 S/B
C315-20
1030 W/P
B11 C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
B10 C433
SP1
Y8 C439
C316-10
880 G/B
C316-15
880 O/W
C315-25
1230 R/G
B9 C432
C315-24
100
SP2
Y7 C438
C316-16
880 O/U
C316-11
880 G/Y
C315-34
920 O/B
C315-17
920 W/U
B8 C431
Y6 C437
C316-5
910 G/W
C316-14
910 O/B
Y5 C436
C316-12
910 S/B
C316-4
910 N/G
Y4 C435
C316-3
1100 N/B
C316-6
1100 S/R
C315-33
1820 Y/R
C315-35
1820 B/K
B7 C428
C315-19
1820 Y/G
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
B6 C427
C315-21
820 Y/B
C315-29
820 O/R
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
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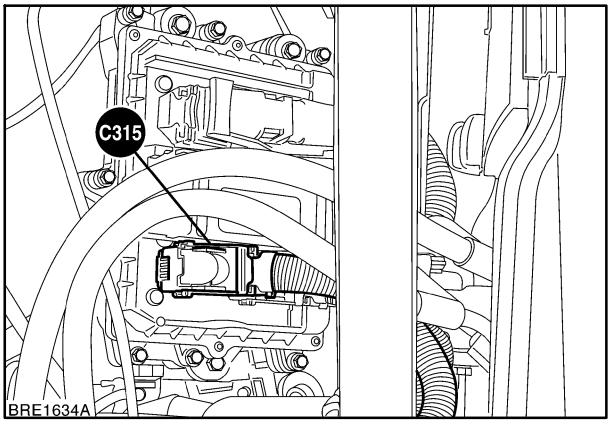
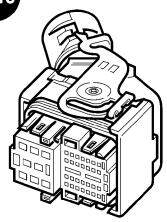
910



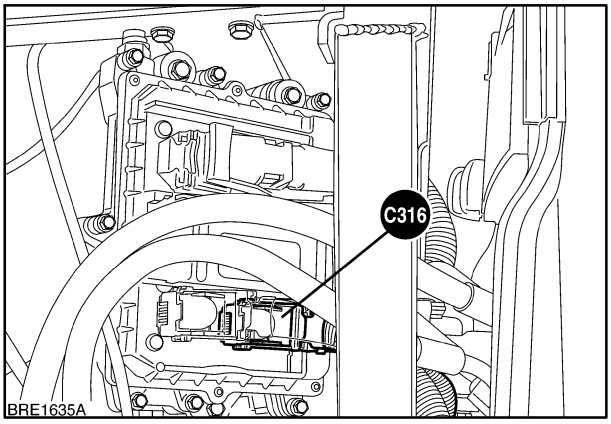
C315



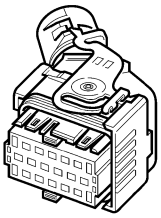
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B

23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y

BRE1634B

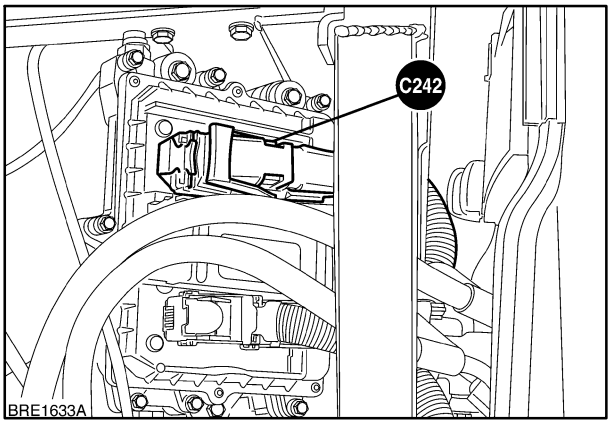


C316

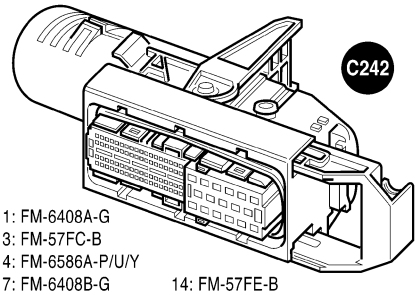


3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U

BRE1635B



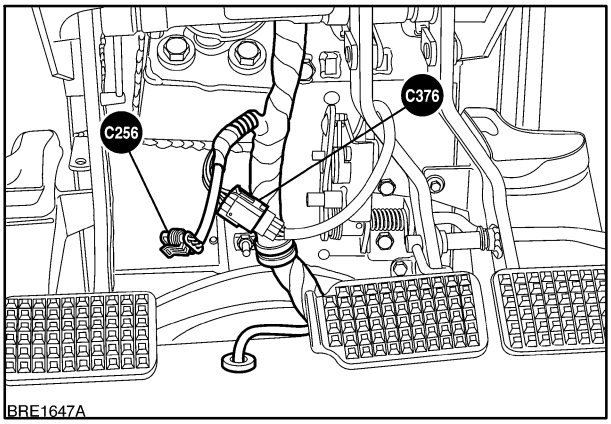
C242



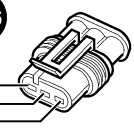
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K

28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B

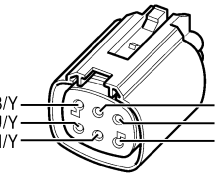


C256



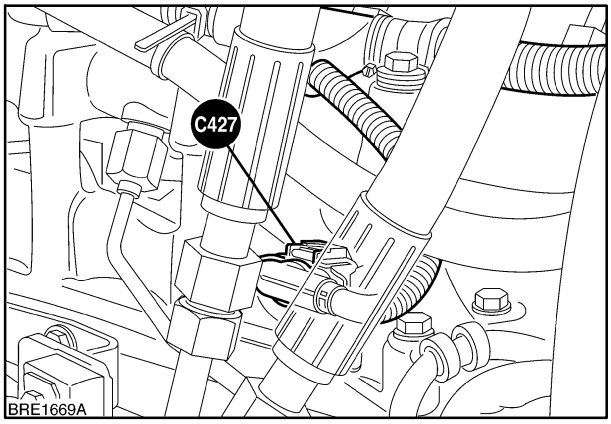
1: CM-2014C-G/K
2: CM-6402A-G/K/Y
3: CM-2095C-G/W/B

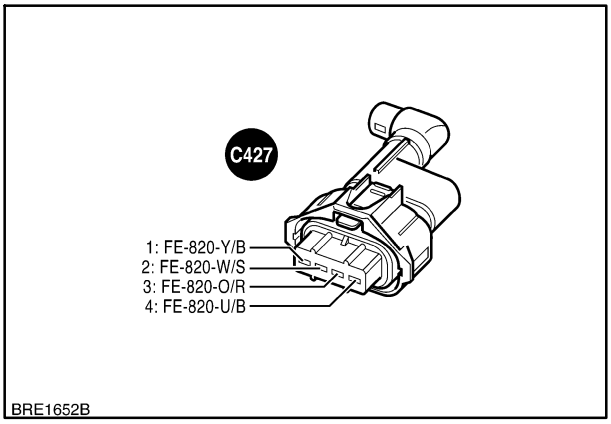
C376

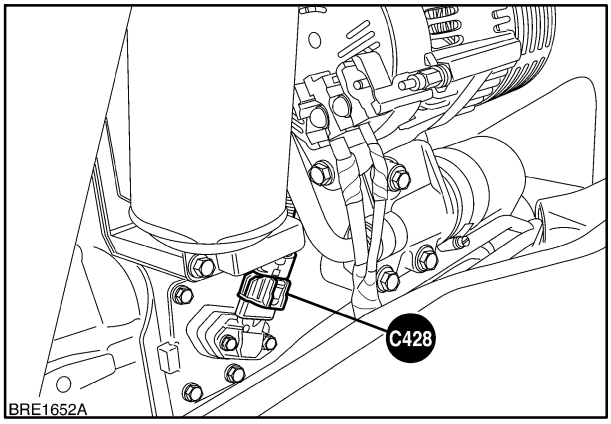


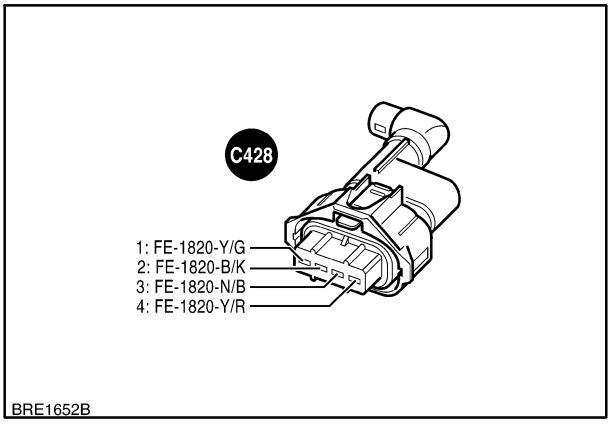
1: CM-6401-G/B/Y
4: CM-6590-LG/U/Y
5: CM-6404B-G/LN/Y
2: CM-6402-G/K/Y
3: CM-6403-G/LG/Y
6: CM-6460-S/P/Y

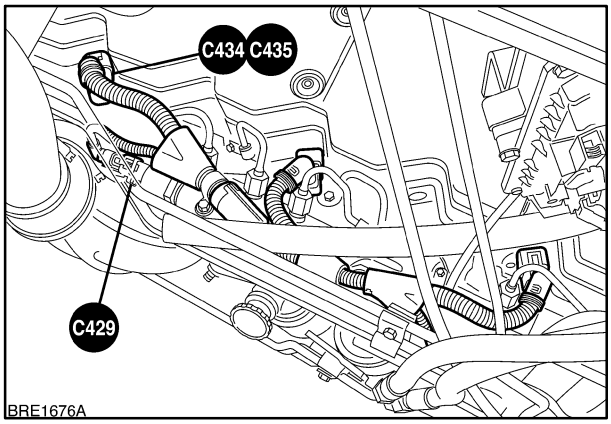
BRE1647B

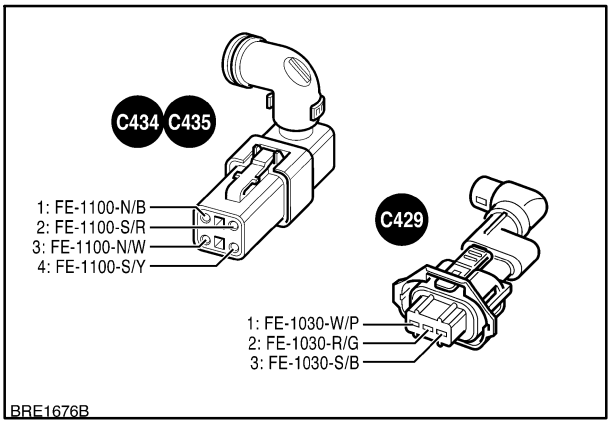

C427
BRE1669A


C427
1: FE-820-Y/B
2: FE-820-W/S
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C428
BRE1652A


C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
BRE1652B


C434 C435
C429
BRE1676A


C434 C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3119 - POWER SUPPLY FOR SENSORS DISCONNECTED OR FAILED

Effects:

Engine fails to start or starting is difficult and engine malfunctions.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.

   A. If the error code is not indicated, check that the system is operating correctly.

   B. If the error code is indicated, continue to step 2.

2. Check for other error codes displayed.

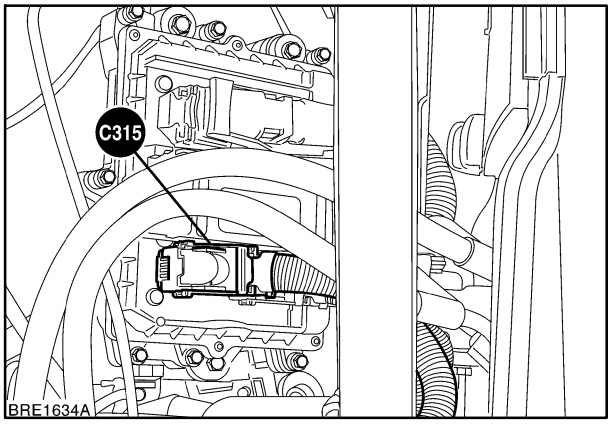
   A. If other error codes are diplayed, continue to these tests.

   B. If no other error codes are displayed, continue to step 3.

3. Check the engine control module connectors **C315**, **C316** and **C242**.

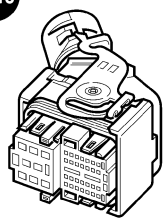
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.



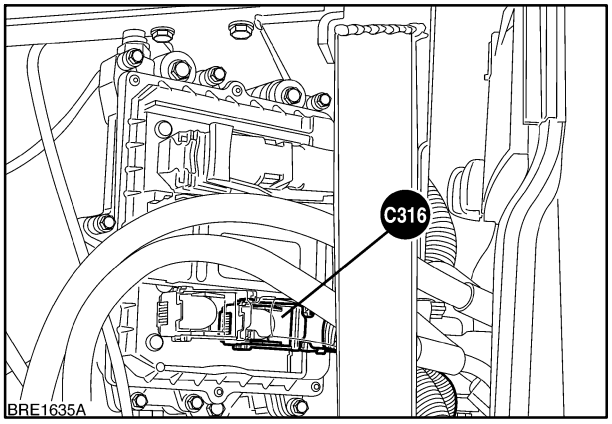
C315

5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B



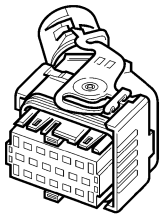
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y

BRE1634B

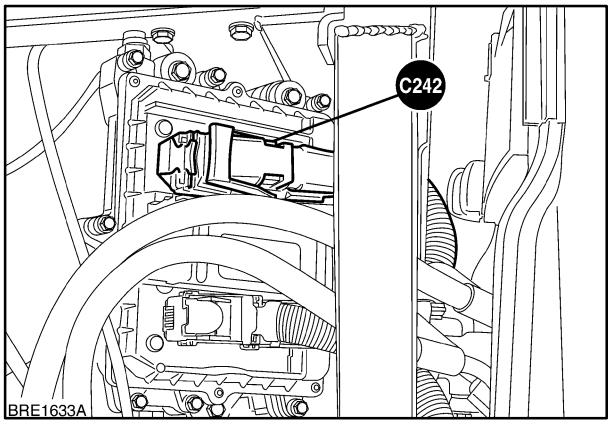


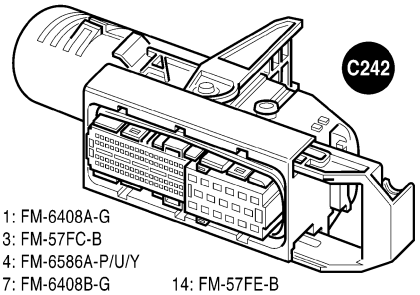
C316

3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U



BRE1635B





C242

1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G

BRE1633B

ERROR CODE 3120 – POWER SUPPLY FOR SENSORS HIGH OR LOW DETECTION

Effects:

Engine fails to start or starting is difficult and engine malfunctions.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is not between 12 and 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 4.
4. Check the engine control module connector **C315**, **C316** and **C242**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for a short to ground.
   A. Disconnect the foot throttle connector **C376**. Check between connector **C376** pin **1 (G/B/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.
   B. If a short to ground is not indicated, continue to step 6.
6. Check for a short to +8 or +12 Volts.
   A. Turn the keystart ON. Measure the voltage between connector **C376** pin **1 (G/B/Y)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.
   B. If the voltage indicated is approximately +5 volts, continue to step 7.
7. Check for a short to ground.
   A. Disconnect the boost pressure sensor connector **C427**. Check between connector **C427** pin **3 (O/R)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.
   B. If a short to ground is not indicated, continue to step 8.
8. Check for a short to +8 or +12 Volts.
   A. Turn the keystart ON. Measure the voltage between connector **C427** pin **3 (O/R)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.
   B. If the voltage indicated is approximately +5 volts, continue to step 9.
9. Check for a short to ground.
   A. Disconnect the oil pressure sensor connector **C428**. Turn the keystart ON. Check between **C428** pin **3 (N/B)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.
   B. If a short to ground is not indicated, continue to step 10.
10. Check for a short to +8 or +12 Volts.

A. Turn the keystart ON. Measure the voltage between connector **C428** pin **3 (N/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

B. If the voltage indicated is approximately +5 volts, continue to step 11.

11. Check for a short to ground.

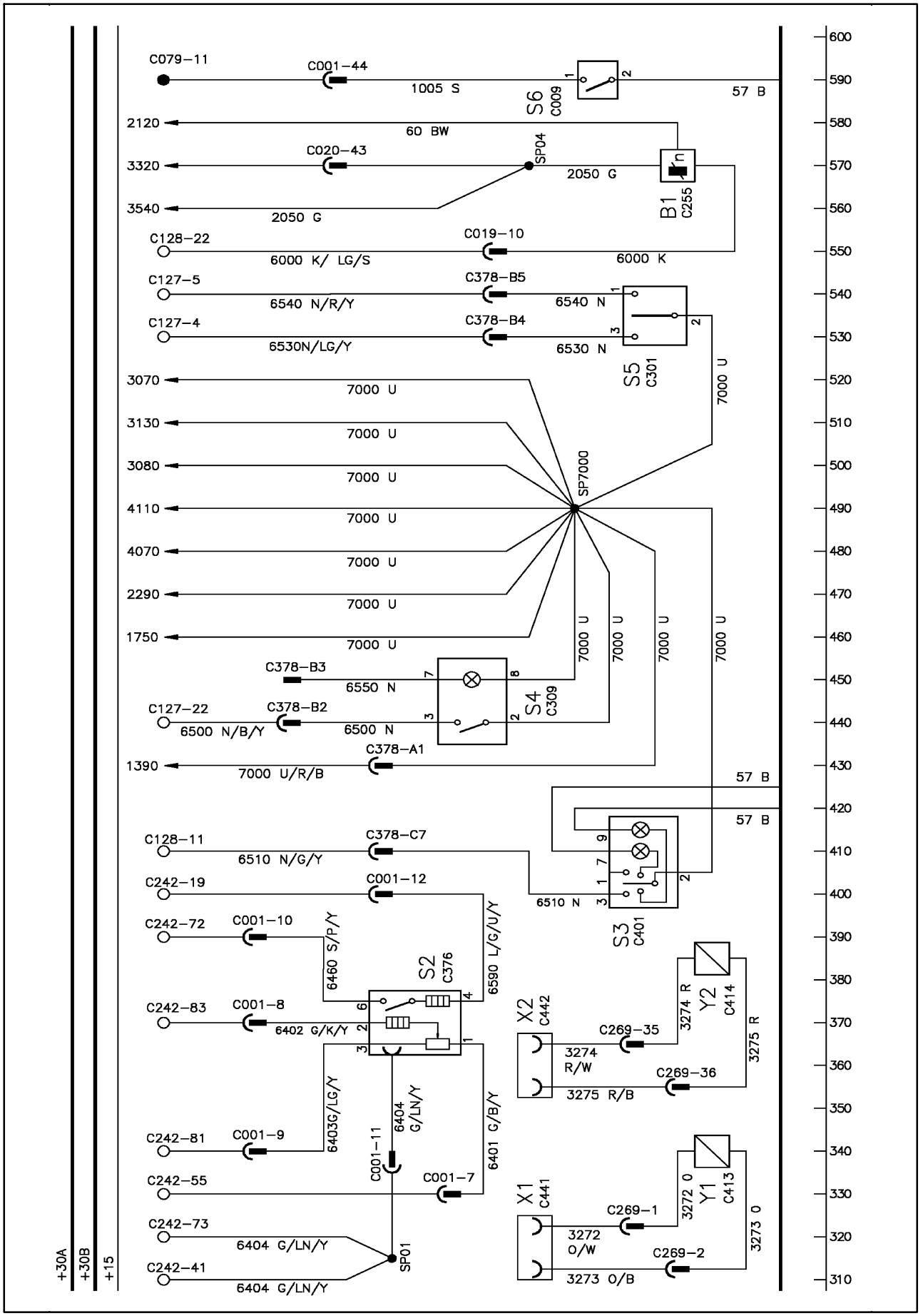
    A. Disconnect the fuel rail pressure sensor connector **C429**. Turn the keystart ON. Check between **C428** pin **3 (S/B)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

    B. If a short to ground is not indicated, continue to step 12.

12. Check for a short to +8 or +12 Volts.

    A. Turn the keystart ON. Measure the voltage between **C429** pin **3 (S/B)** and **ground**. If the voltage indicated is greater than +5 volts, repair or replace the harness as required.

    B. If the harness is okay, download the the correct level of software. If the fault re-occurs, remove and replace the engine controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
C378-A1
1390
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
C242-72
C001-10
6460 S/P/Y
S2 C376
6590 L/G/U/Y
C242-83
C001-8
6402 G/K/Y
6510 N
S3 C401
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
6403G/LG/Y
6404 G/LN/Y
6401 G/B/Y
C242-81
C001-9
C001-11
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
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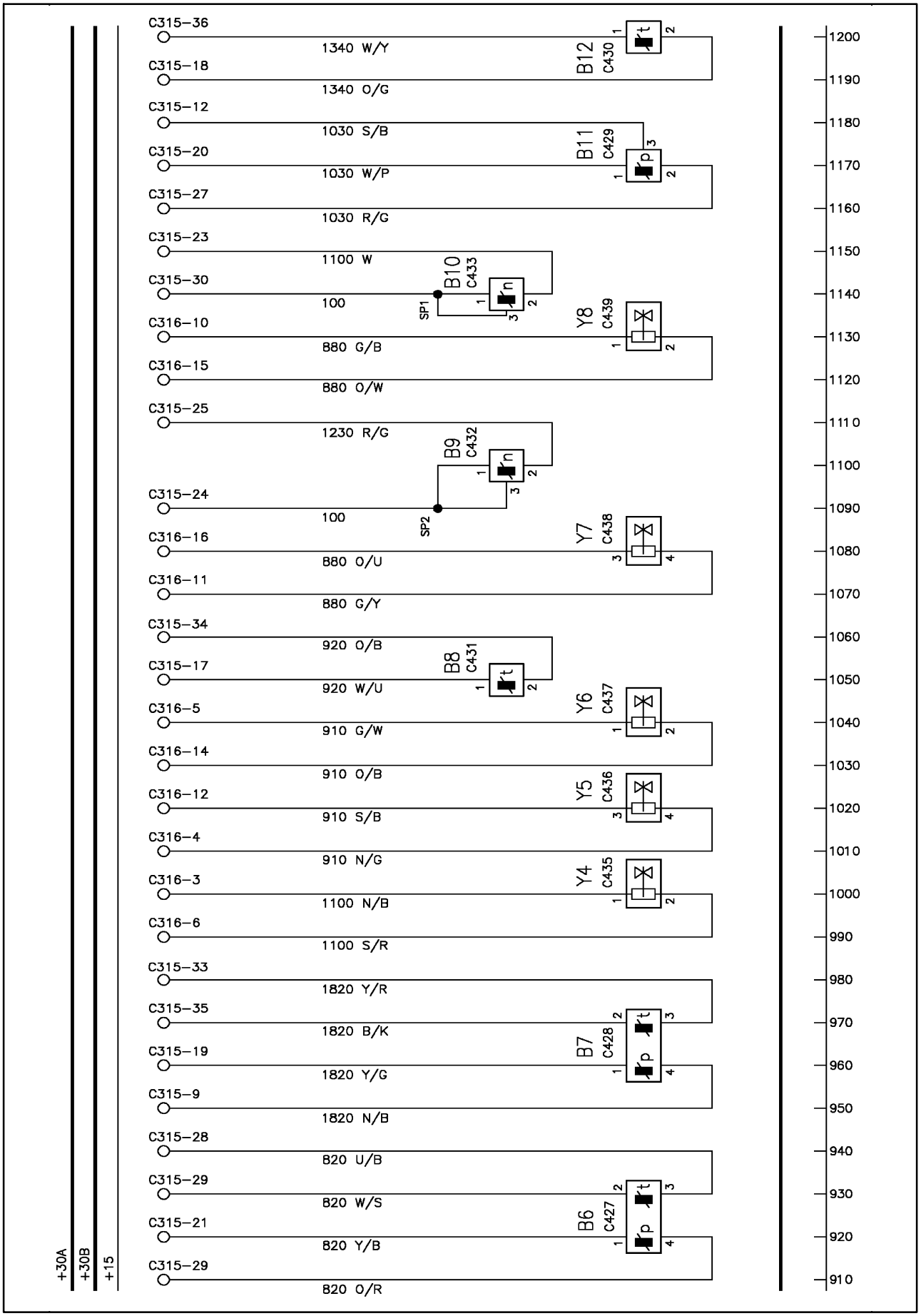
+30A
+30B
+15
C315-36
1340 W/Y
C315-18
1340 O/G
B12
C430
C315-12
1030 S/B
C315-20
1030 W/P
B11
C429
C315-27
1030 R/G
C315-23
1100 W
C315-30
100
SP1
B10
C433
C316-10
880 G/B
C316-15
880 O/W
Y8
C439
C315-25
1230 R/G
B9
C432
C315-24
100
SP2
C316-16
880 O/U
C316-11
880 G/Y
Y7
C438
C315-34
920 O/B
C315-17
920 W/U
B8
C431
C316-5
910 G/W
C316-14
910 O/B
Y6
C437
C316-12
910 S/B
C316-4
910 N/G
Y5
C436
C316-3
1100 N/B
C316-6
1100 S/R
Y4
C435
C315-33
1820 Y/R
C315-35
1820 B/K
C315-19
1820 Y/G
B7
C428
C315-9
1820 N/B
C315-28
820 U/B
C315-29
820 W/S
C315-21
820 Y/B
C315-29
820 O/R
B6
C427
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
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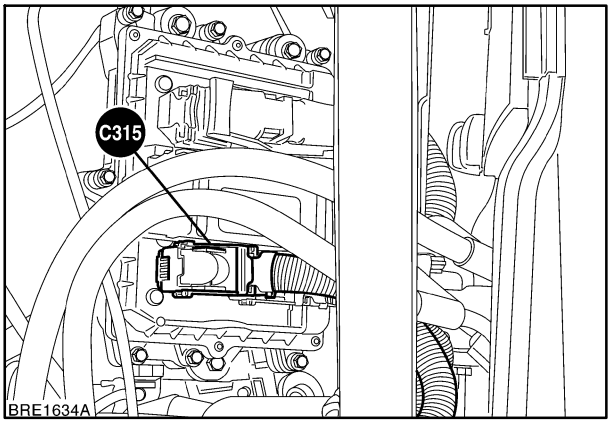
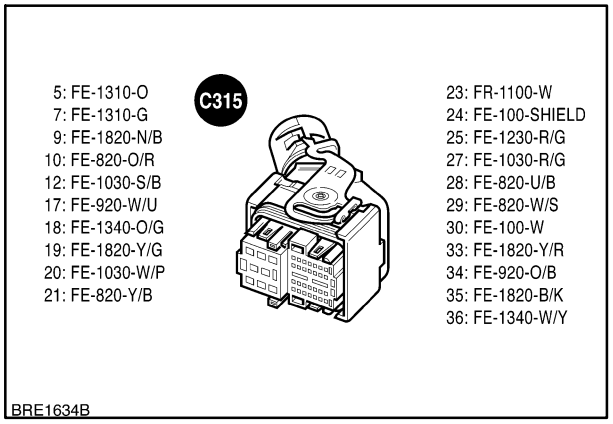
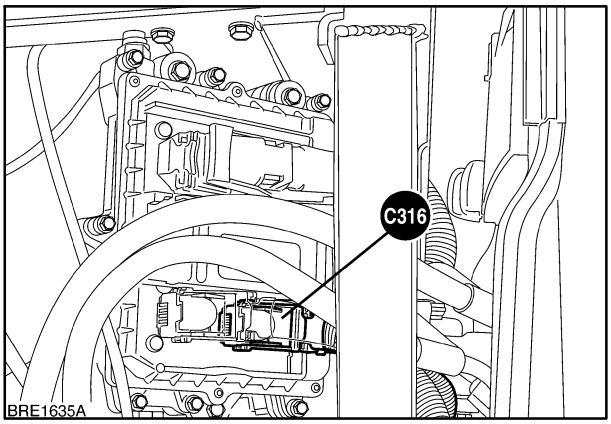
920
910


C315
BRE1634A


C315
5: FE-1310-O
7: FE-1310-G
9: FE-1820-N/B
10: FE-820-O/R
12: FE-1030-S/B
17: FE-920-W/U
18: FE-1340-O/G
19: FE-1820-Y/G
20: FE-1030-W/P
21: FE-820-Y/B
23: FR-1100-W
24: FE-100-SHIELD
25: FE-1230-R/G
27: FE-1030-R/G
28: FE-820-U/B
29: FE-820-W/S
30: FE-100-W
33: FE-1820-Y/R
34: FE-920-O/B
35: FE-1820-B/K
36: FE-1340-W/Y
BRE1634B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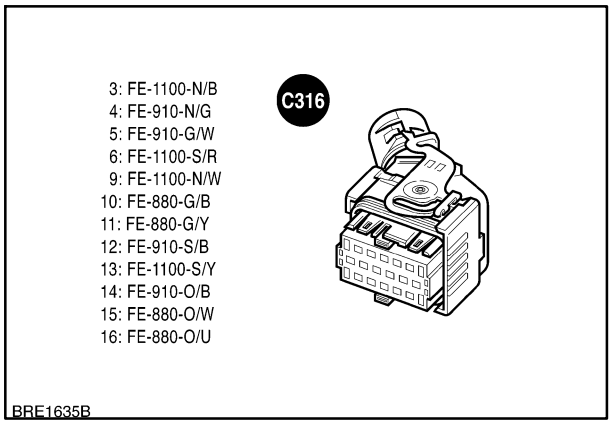
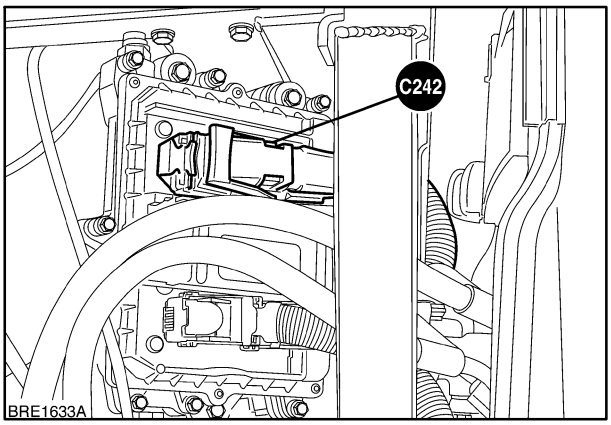
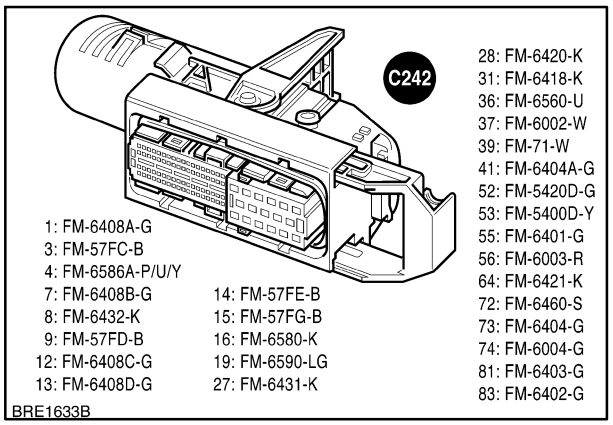
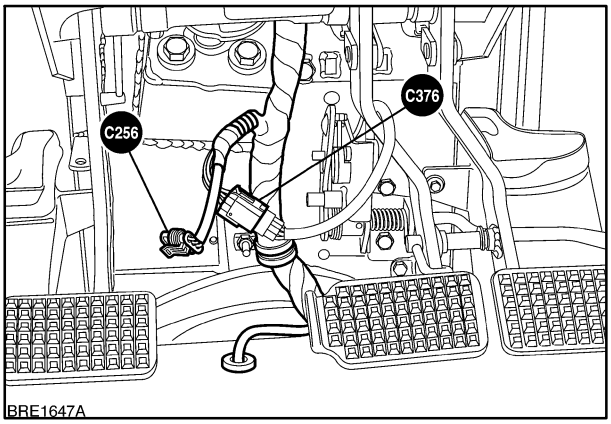
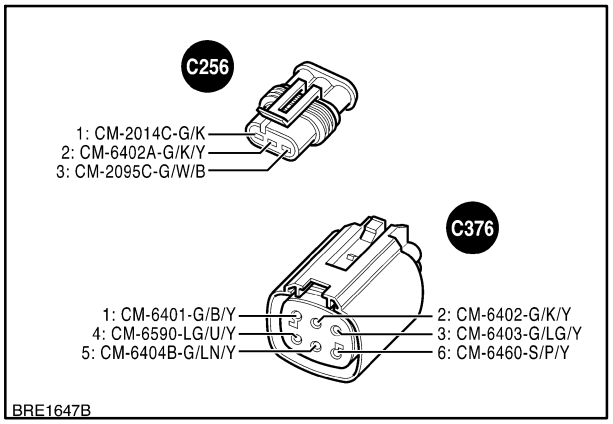
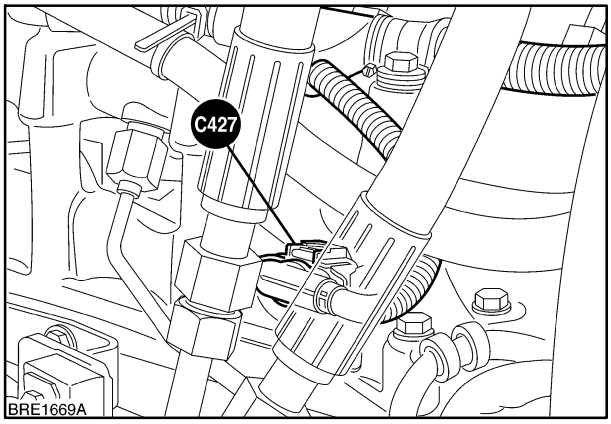

C316
3: FE-1100-N/B
4: FE-910-N/G
5: FE-910-G/W
6: FE-1100-S/R
9: FE-1100-N/W
10: FE-880-G/B
11: FE-880-G/Y
12: FE-910-S/B
13: FE-1100-S/Y
14: FE-910-O/B
15: FE-880-O/W
16: FE-880-O/U
BRE1635B

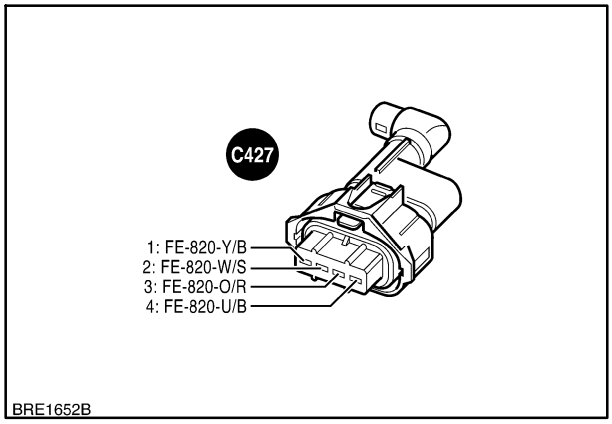

C242
BRE1633A

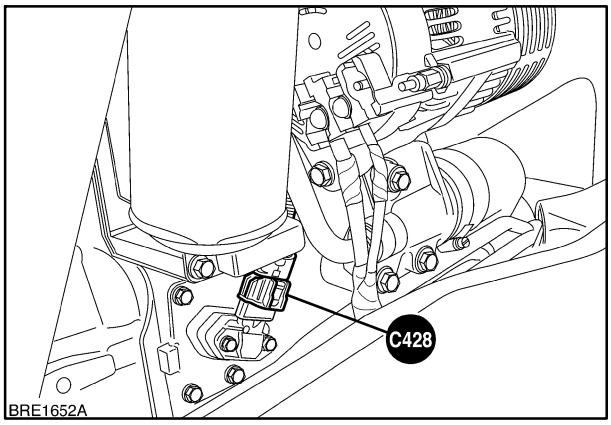

C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B


C376
C256
BRE1647A


C256
1: CM-2014C-G/K
2: CM-6402A-G/K/Y
3: CM-2095C-G/W/B
C376
1: CM-6401-G/B/Y
4: CM-6590-LG/U/Y
5: CM-6404B-G/LN/Y
2: CM-6402-G/K/Y
3: CM-6403-G/LG/Y
6: CM-6460-S/P/Y
BRE1647B


C427
BRE1669A


C427
1: FE-820-Y/B
2: FE-820-W/S
3: FE-820-O/R
4: FE-820-U/B
BRE1652B


C428
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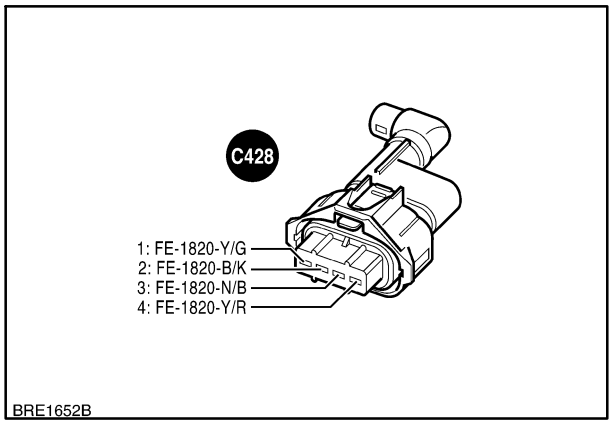
C428
1: FE-1820-Y/G
2: FE-1820-B/K
3: FE-1820-N/B
4: FE-1820-Y/R
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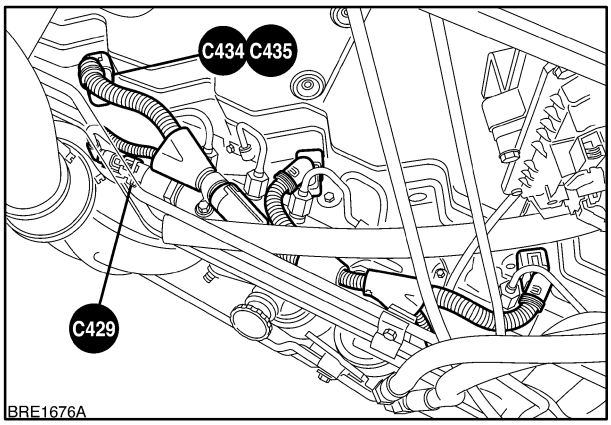
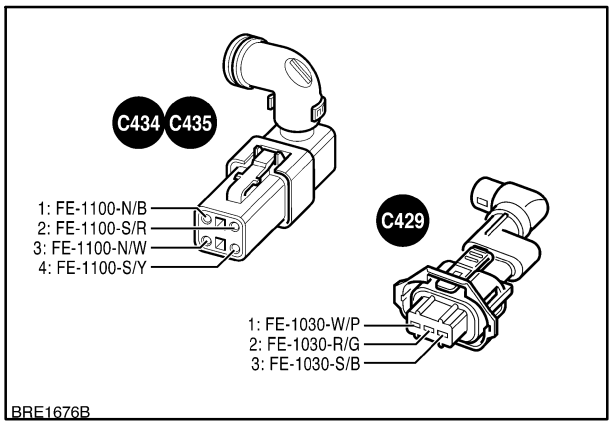

C434 C435
C429
BRE1676A


C434 C435
1: FE-1100-N/B
2: FE-1100-S/R
3: FE-1100-N/W
4: FE-1100-S/Y
C429
1: FE-1030-W/P
2: FE-1030-R/G
3: FE-1030-S/B
BRE1676B

ERROR CODE 3121 – PTO TWIST SENSOR OPEN CIRCUIT

Effects:

PTO and powerboost disabled.

Possible failure modes:

1. Faulty connector
2. Faulty PTO twist sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the PTO twist sensor connector **C288** and the controller connectors **C100** and **C128**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the PTO twist speed sensor.

   A. Disconnect connector **C288**. Measure the resistance between the component side of the PTO twist sensor pin **1** and pin **2**. If the resistance indicated is not between 0.80K Ohms – 1.2K Ohms, remove and replace the sensor.

   B. If the speed sensor is okay, continue to step 3.

3. Check for +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C288** pin **1 (G)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, continue to step 4.

4. Check for an open circuit.

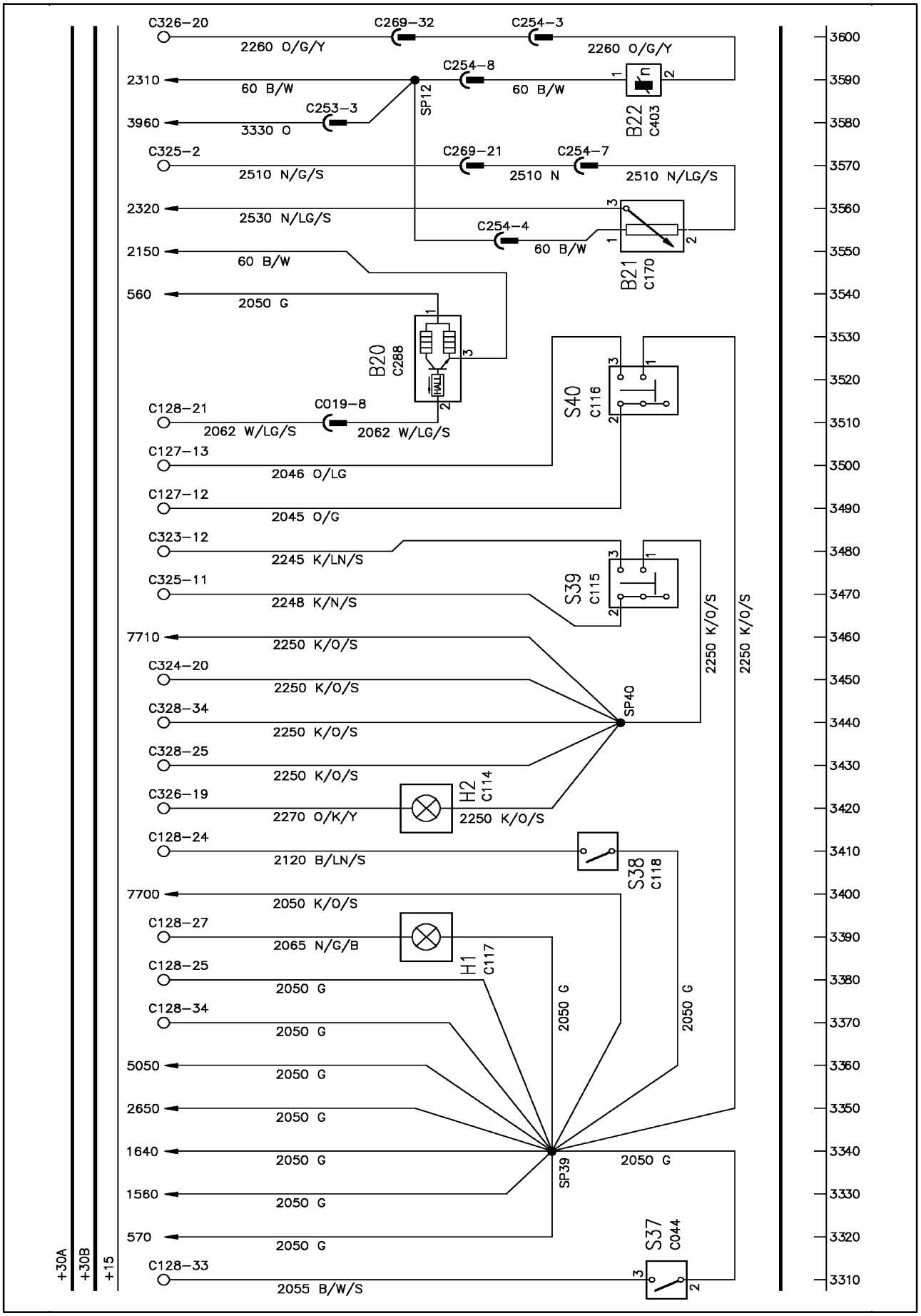
   A. Turn the keystart OFF. Disconnect the controller connectors **C122** and **C128**. Check between connector:

   C288 pin **2 (W/LG/S)** and **C128** pin **21 (W/LG/S)**

   C288 pin **3 (B/W)** and **C100** pin **23 (B/W)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
B22
C403
C253-3
3960
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
C325-11
2248 K/N/S
S39
C115
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
SP40
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
1560
2050 G
570
2050 G
C128-33
2055 B/W/S
S37
C044
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
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3530
3520
3510
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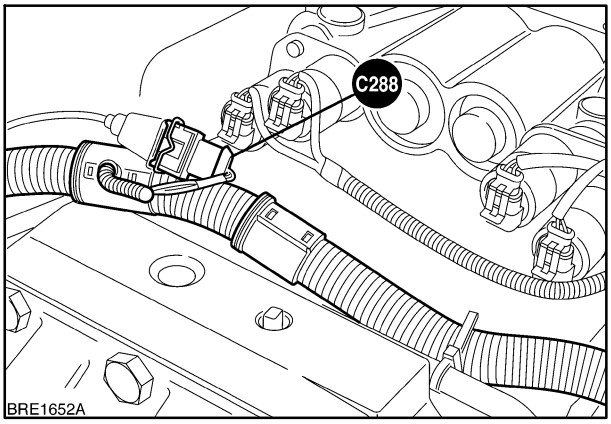

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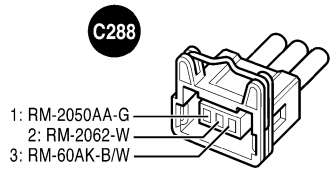
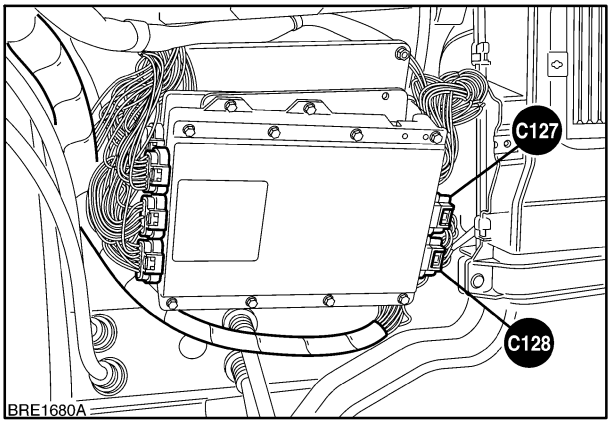
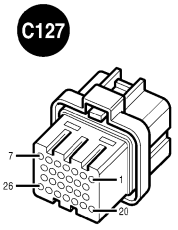


BRE1652B



BRE1680A



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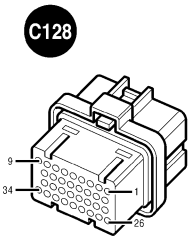
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y



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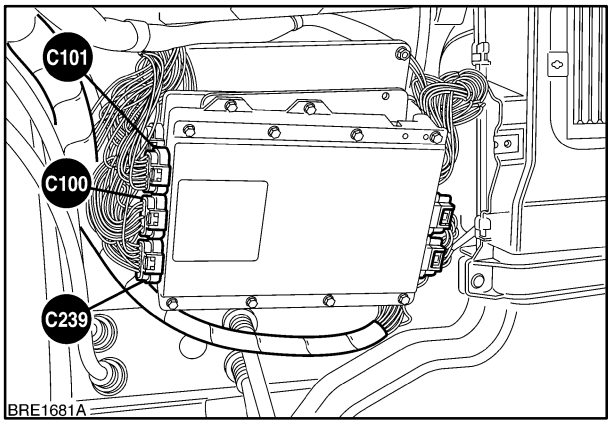
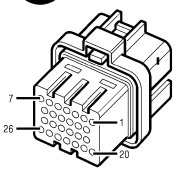
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



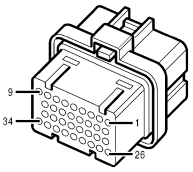
BRE1681A

C100



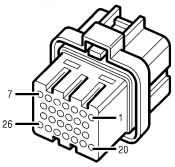
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3122 – PTO TWIST SENSOR SHORT TO GROUND

Effects:

PTO and powerboost disabled.

Possible failure modes:

1. Faulty connector
2. Faulty PTO twist sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the PTO twist sensor connector **C288** and the controller connector **C128**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the PTO twist sensor.

   A. Disconnect connector **C288**. Measure the resistance between the component side of the PTO twist sensor pin **1** and pin **2**. If the resistance indicated is not between 0.80K Ohms – 1.2K Ohms, remove and replace the PTO twist sensor.

   B. If the resistances indicated are okay, continue to step 3.

3. Check for a short to ground.

   A. Check between the component side of connector:

   C288 pin **1 (G)** and **ground**

   C288 pin **2 (W/LG/S)** and **ground**

   C288 pin **3 (B/W)** and **ground**

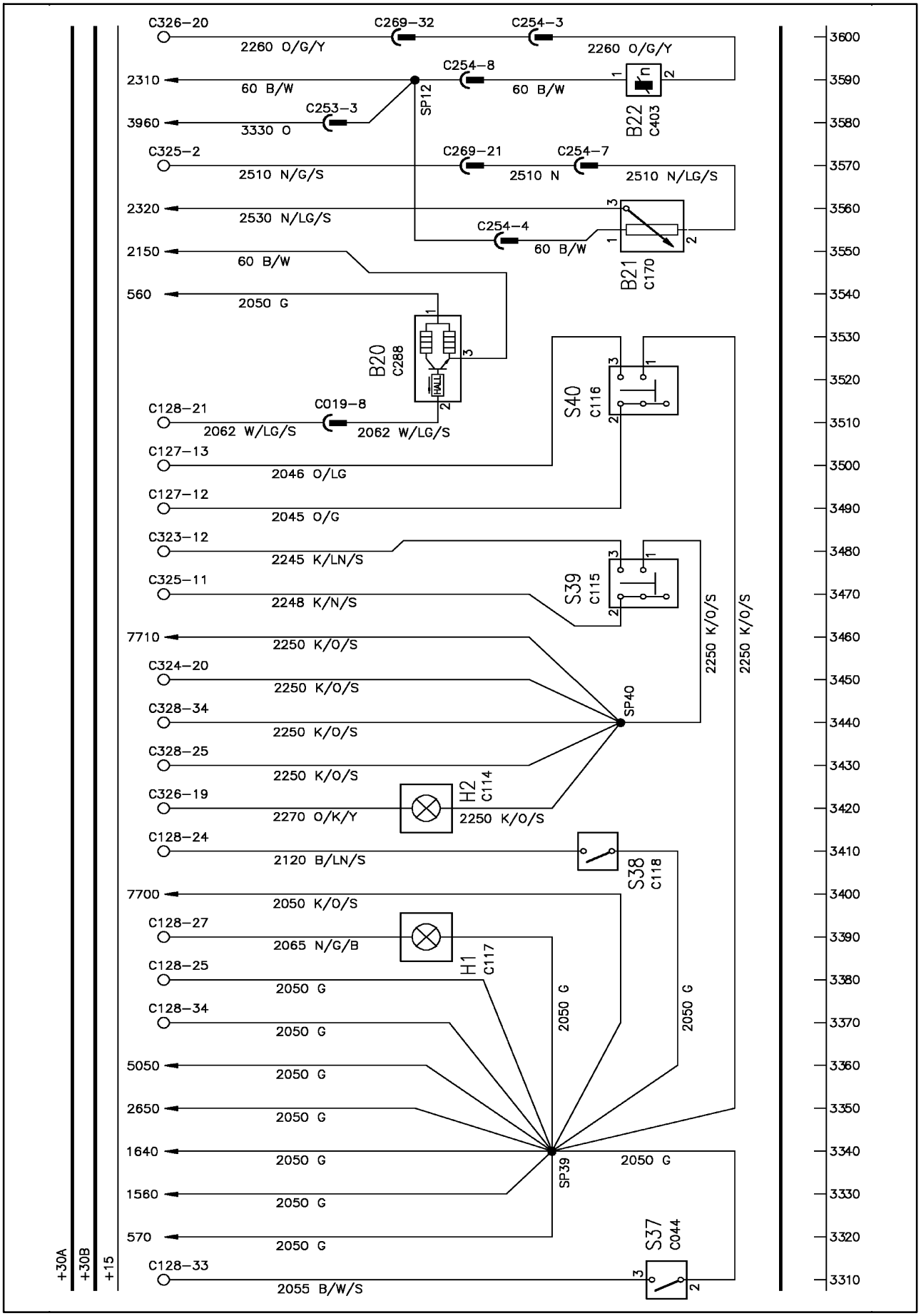
   If a short to ground is indicated, remove and replace the PTO twist sensor.

   B. If the PTO twist sensor is okay, continue to step 4.

4. Check for a short to ground.

   A. Disconnect the controller connector **C128**. Check between connector **C288** pin **2 (W/LG/S)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
B22
C403
C253-3
3960
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
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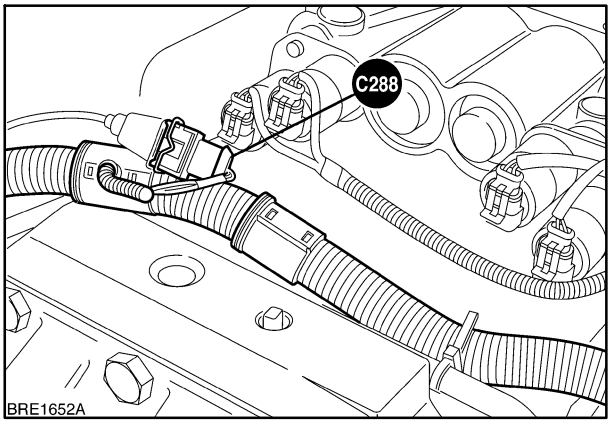
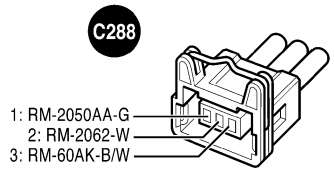
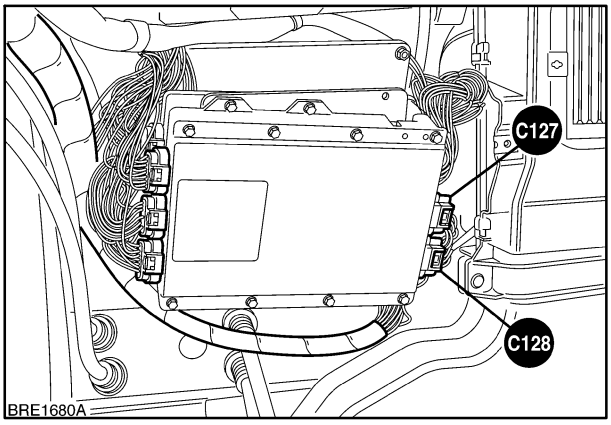


BRE1652A



BRE1652B



BRE1680A

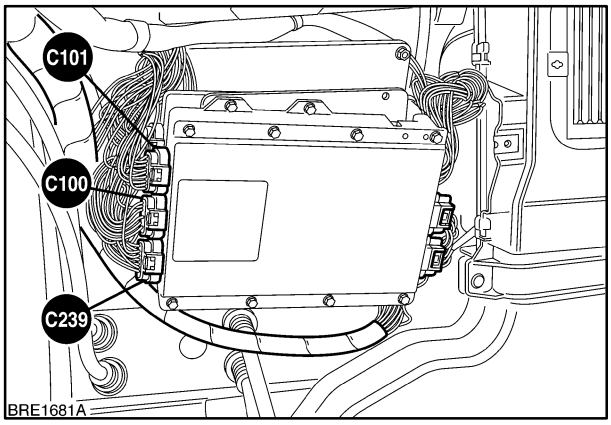
C127

1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

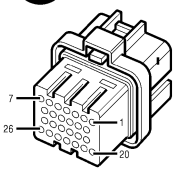
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



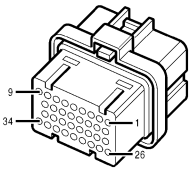
BRE1681A

C100



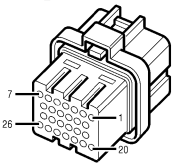
1: CM-7000C-U/R/B
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3123 – PTO TWIST SENSOR NOT CALIBRATED

Possible failure modes:

1. PTO twist sensor not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the PTO twist sensor was calibrated.

   A. If the PTO twist sensor was not calibrated after a change of the controller or after using H8 clear non–volatile memory (EEPROM), perform the PTO twist sensor calibration procedure (TCP).

   B. If the PTO twist sensor was calibrated, download the correct level of software. Perform the PTO TCP. If the fault re–occurs, remove and replace the controller.

ERROR CODE 3124 – HAND THROTTLE POSITION SENSOR POTENTIOMETER 2 OVER VOLTAGE

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

Possible failure modes:

1. Faulty hand throttle position sensor
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the hand throttle position sensor potentiometer 2 in H9 Channel 89.

   A. Operate the hand throttle from low to high idle. If the values displayed do not change continuously between 4 to 36, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 89 wiggle the harness and the connectors to check for an intermittent circuit. Channel 89 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the hand throttle position sensor potentiometer 2.

   A. Disconnect the hand throttle position sensor connector **C314**. While operating the hand throttle from low to high idle, measure the resistance between the component side of connector:

   C314 pin **3 (S/O/Y)** and **C314** pin **5 (L/N)**. Should indicate between 0.70K Ohms – 1K Ohm

   C314 pin **3 (S/O/Y)** and **C314** pin **6 (B/W)**. Should indicate between 600 Ohms – 700 Ohms

   If the resistances indicated are not okay, remove and replace the hand throttle position sensor.

   B. If the hand throttle position sensor is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

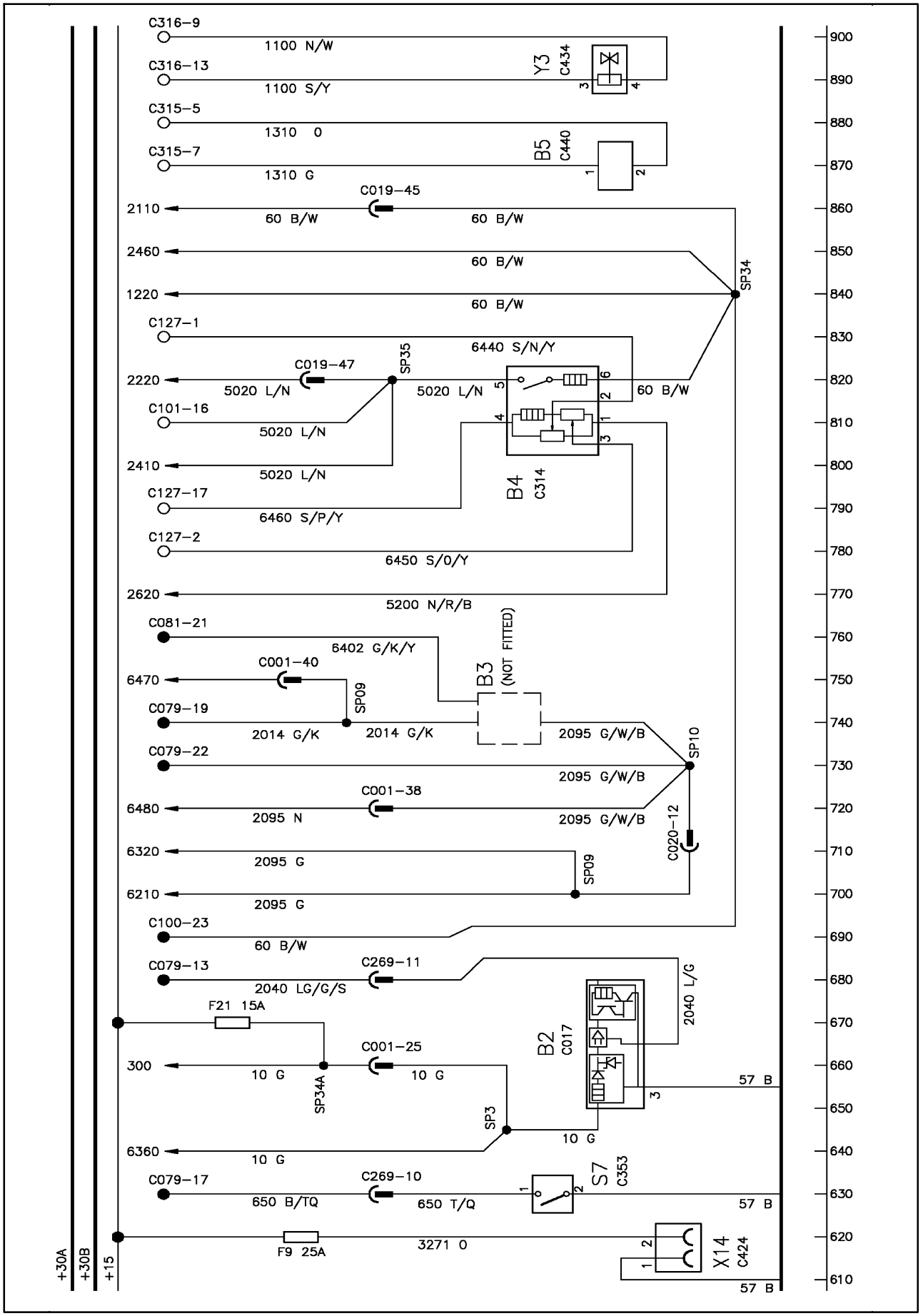
   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **5 (L/N)** and **C314** pin **6 (B/W)**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **3 (S/O/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
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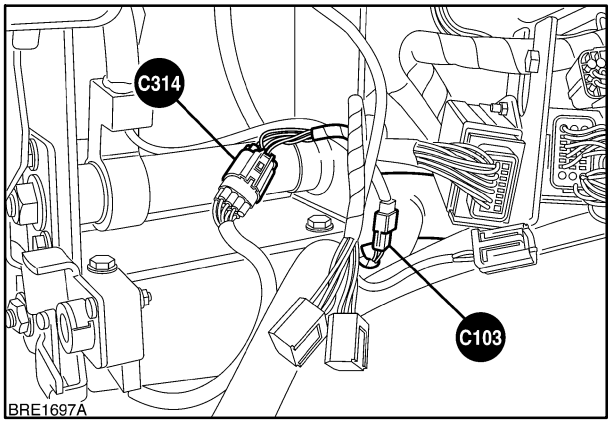
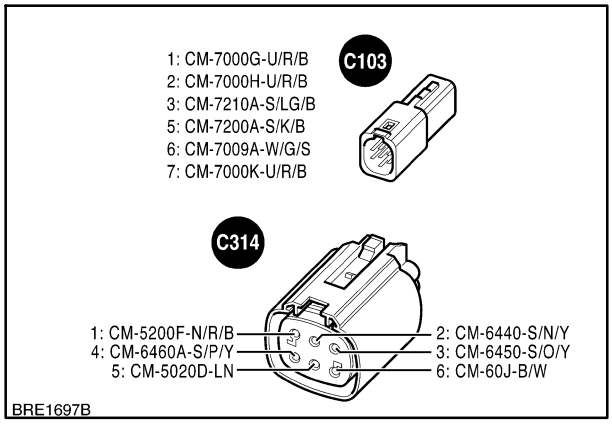


BRE1697A



BRE1697B

ERROR CODE 3125 – HAND THROTTLE POSITION SENSOR POTENTIOMETER 2 UNDER VOLTAGE

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

Possible failure modes:

1. Faulty hand throttle position sensor
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the hand throttle position sensor potentiometer 2 in H9 Channel 89.

   A. Operate the hand throttle from low to high idle. If the values displayed do not change continuously between 4 to 36, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 89 wiggle the harness and the connectors to check for an intermittent circuit. Channel 89 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the hand throttle position sensor potentiometer 2.

   A. Disconnect the hand throttle position sensor connector **C314**. While operating the hand throttle from low to high idle, measure the resistance between the component side of connector:

   C314 pin **3 (S/O/Y)** and **C314** pin **5 (L/N)**. Should indicate between 0.70K Ohms – 1K Ohm

   C314 pin **3 (S/O/Y)** and **C314** pin **6 (B/W)**. Should indicate between 600 Ohms – 700 Ohms

   If the resistances indicated are not okay, remove and replace the hand throttle position sensor.

   B. If the hand throttle position sensor is okay, continue to step 3.

3. Check for +5 Volts

   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **5 (L/N)** and **C314** pin **6 (B/W)**. If the voltage indicated is less than +5 Volts, continue to step 4.

   B. If the voltage indicated is approximately +5 Volts, continue to step 7.

4. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C314** pin **6 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector **C314** pin **5 (L/N)** and **C101** pin **16 (L/N)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C314** pin **5 (L/N)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.

7. Check for an open circuit.

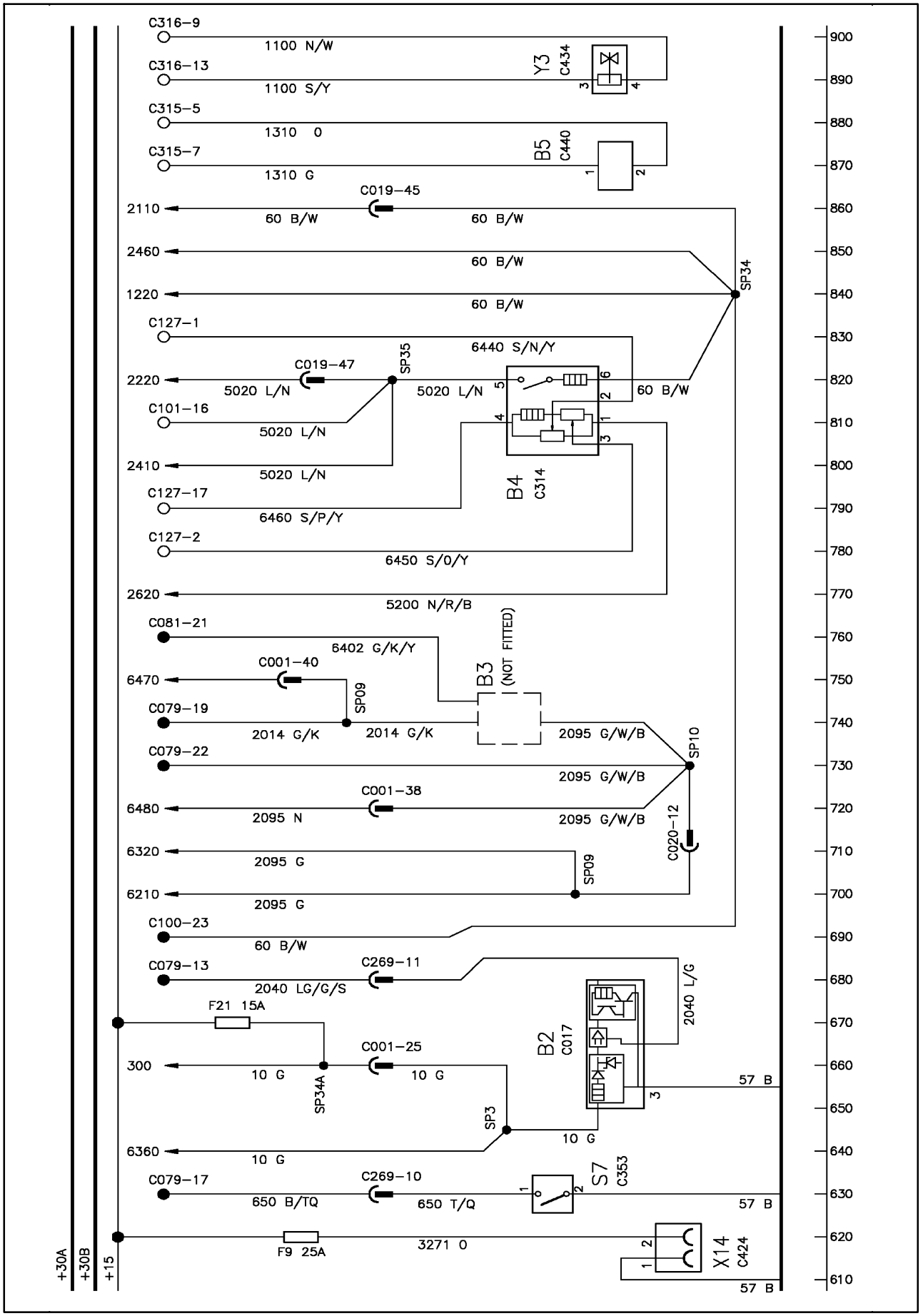
   A. Turn the keystart OFF. Disconnect the controller connector **C127**. Check between connector **C314** pin **3 (S/O/Y)** and **C127** pin **2 (S/O/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 8.

8. Check for a short to ground.

A. Check between connector **C314** pin **3 (S/O/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C316-13
1100 S/Y
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C434
C315-5
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C315-7
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B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
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5020 L/N
60 B/W
C101-16
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2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
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6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
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650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
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+30B
+15
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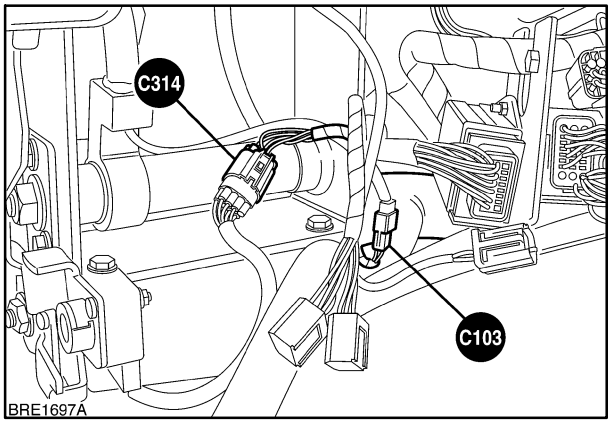

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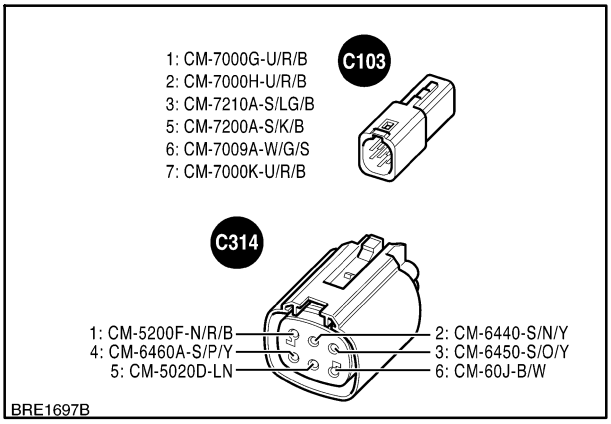

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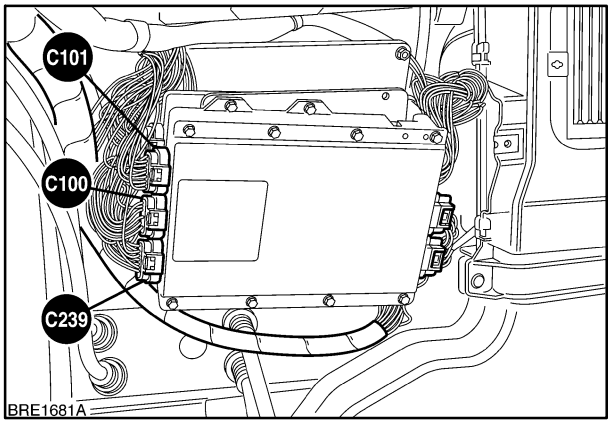

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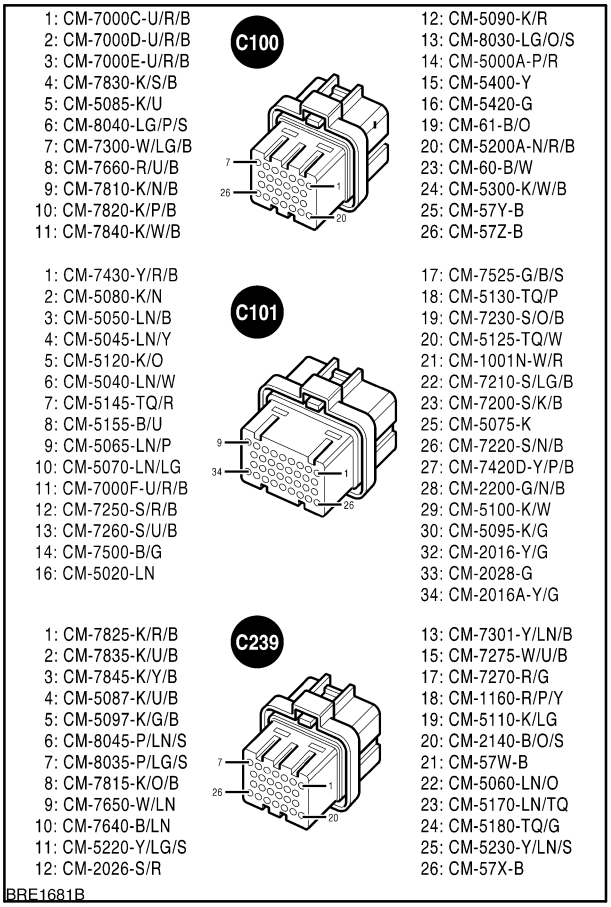

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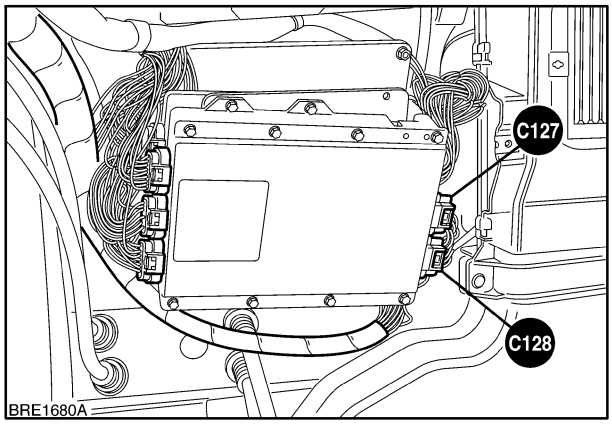
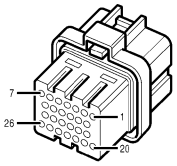


C127



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3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
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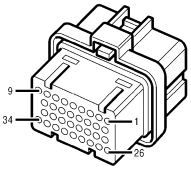
C128



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4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 3126 – HAND THROTTLE POSITION SENSOR POTENTIOMETER 1 OVER VOLTAGE

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

Possible failure modes:

1. Faulty hand throttle position sensor
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the hand throttle position sensor potentiometer 1 in H9 Channel 90.

   A. Operate the hand throttle from low to high idle. If the values displayed do not change continuously between 6 to 73, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 90 wiggle the harness and the connectors to check for an intermittent circuit. Channel 90 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the hand throttle position sensor potentiometer 1.

   A. Disconnect the hand throttle position sensor connector **C314**. While operating the hand throttle from low to high idle, measure the resistance between the component side of connector:

   C314 pin **2 (S/N/Y)** and **C314** pin **5 (L/N)**. Should indicate between 0.70K Ohms – 1K Ohm

   C314 pin **2 (S/N/Y)** and **C314** pin **6 (B/W)**. Should indicate between 1K Ohm – 0.70K Ohm

   If the resistances indicated are not okay, remove and replace the hand throttle position sensor.

   B. If the hand throttle position sensor is okay, continue to step 3.

3. Check for a short to +8 or +12 Volts.

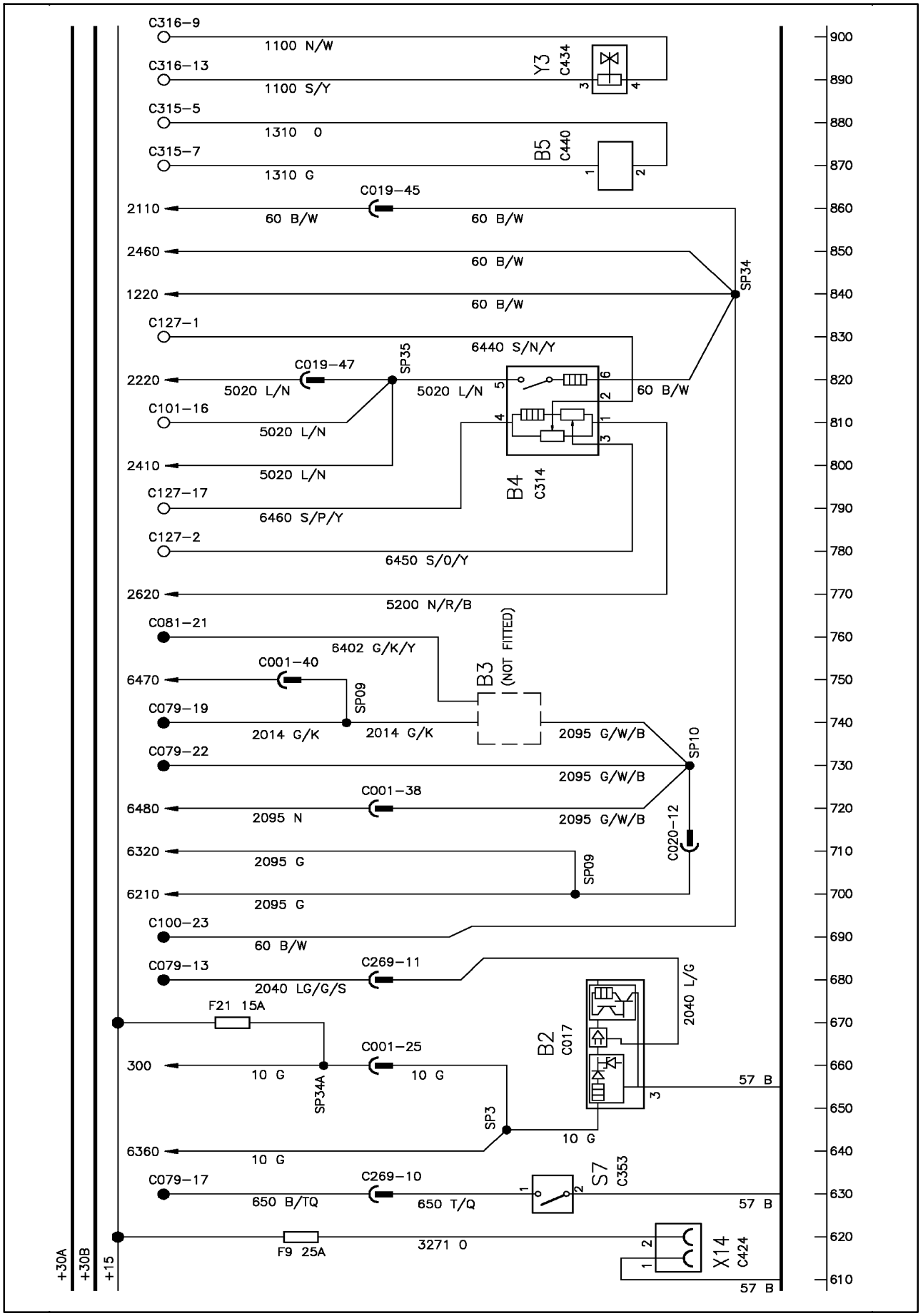
   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **5 (L/N)** and **C314** pin **6 (B/W)**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **2 (S/N/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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C316-13
1100 S/Y
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C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
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870
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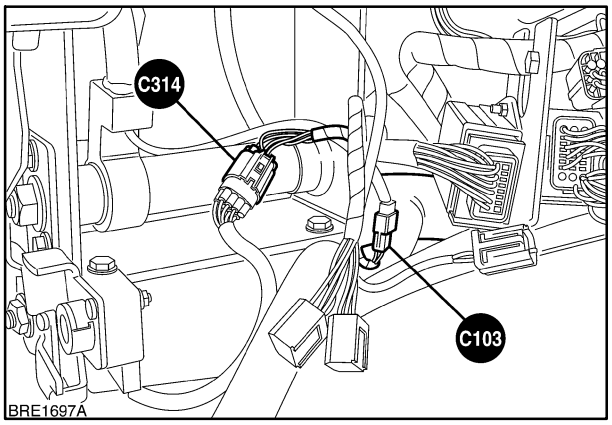
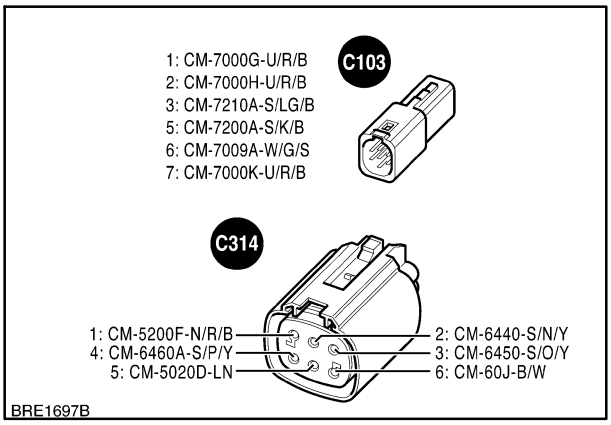

C314
C103
BRE1697A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5: CM-7200A-S/K/B
6: CM-7009A-W/G/S
7: CM-7000K-U/R/B
C103
C314
1: CM-5200F-N/R/B
4: CM-6460A-S/P/Y
5: CM-5020D-LN
2: CM-6440-S/N/Y
3: CM-6450-S/O/Y
6: CM-60J-B/W
BRE1697B

ERROR CODE 3127 – HAND THROTTLE POSITION SENSOR POTENTIOMETER 1 UNDER VOLTAGE

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

Possible failure modes:

1. Faulty hand throttle position sensor
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the hand throttle position sensor potentiometer 1 in H9 Channel 90.

   A. Operate the hand throttle from low to high idle. If the values displayed do not change continuously between 6 to 73, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 90 wiggle the harness and the connectors to check for an intermittent circuit. Channel 90 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the hand throttle position sensor potentiometer 1.

   A. Disconnect the hand throttle position sensor connector **C314**. While operating the hand throttle from low to high idle, measure the resistance between the component side of connector:

   C314 pin **2 (S/N/Y)** and **C314** pin **5 (L/N)**. Should indicate between 0.70K Ohms – 1K Ohm

   C314 pin **2 (S/N/Y)** and **C314** pin **6 (B/W)**. Should indicate between 1K Ohm – 0.70K Ohms

   If the resistances indicated are not okay, remove and replace the hand throttle position sensor.

   B. If the hand throttle position sensor is okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **5 (L/N)** and **C314** pin **6 (B/W)**. If the voltage indicated is less than +5 Volts, continue to step 4.

   B. If the voltage indicated is approximately +5 Volts, continue to step 7.

4. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C314** pin **6 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Disconnect the controller connector **C101**. Check between connector **C314** pin **5 (L/N)** and **C101** pin **16 (L/N)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C314** pin **5 (L/N)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.

7. Check for an open circuit.

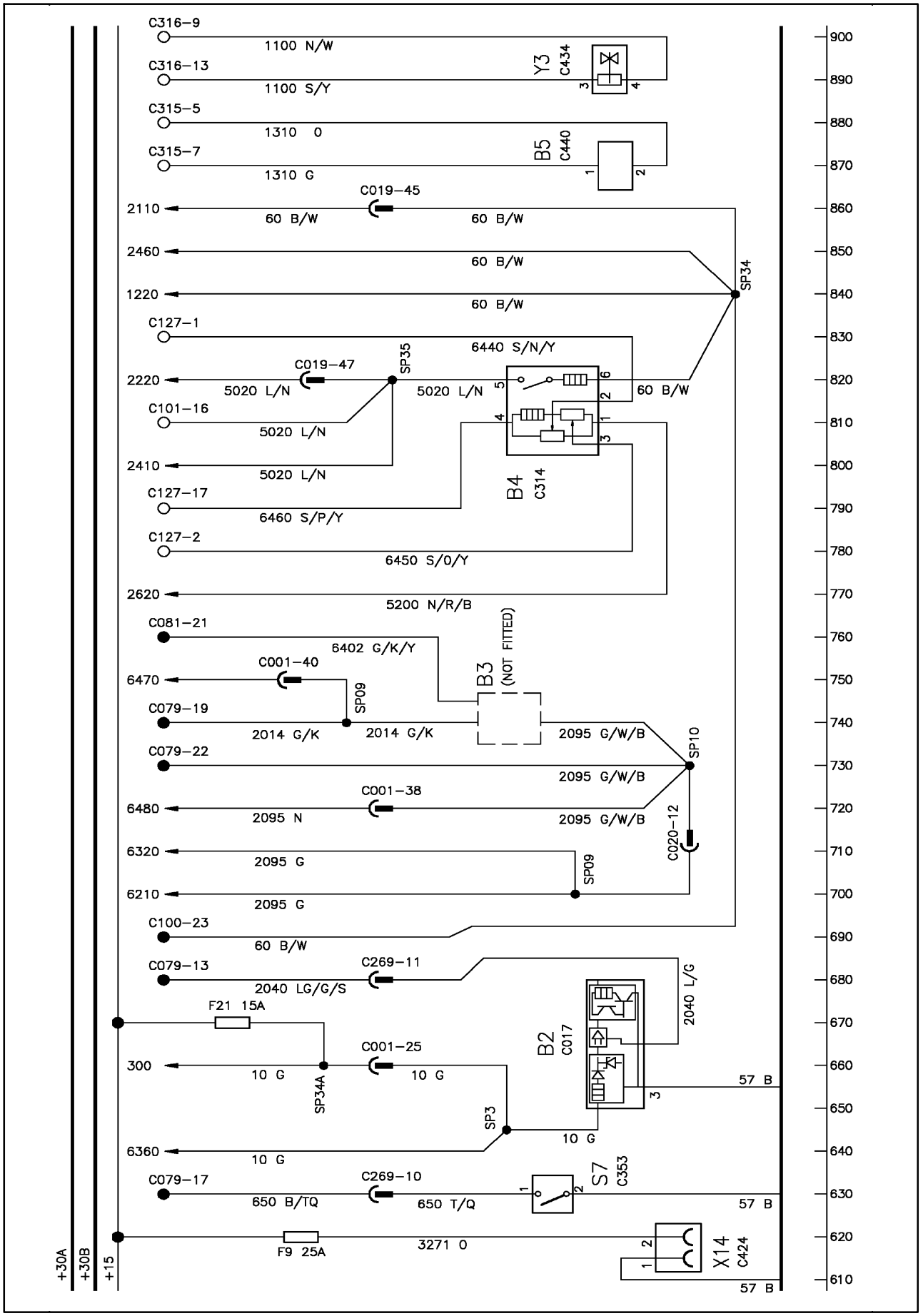
   A. Turn the keystart OFF. Disconnect the central controller connector **C127**. Check between connector **C314** pin **2 (S/N/Y)** and **C127** pin **1 (S/N/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 8.

8. Check for a short to ground.

A. Check between connector **C314** pin **2 (S/N/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
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2460
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1220
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SP34
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C019-47
SP35
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C314
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6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
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SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
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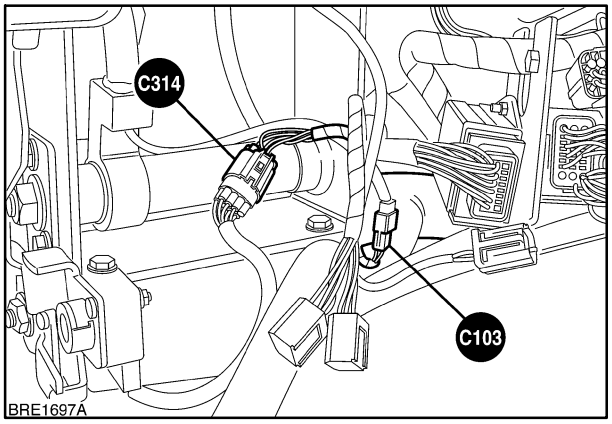

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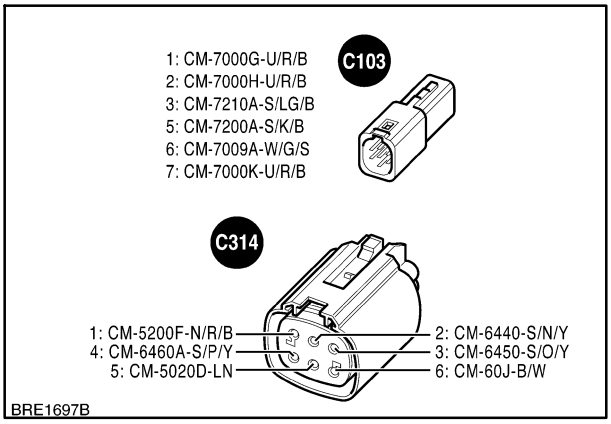

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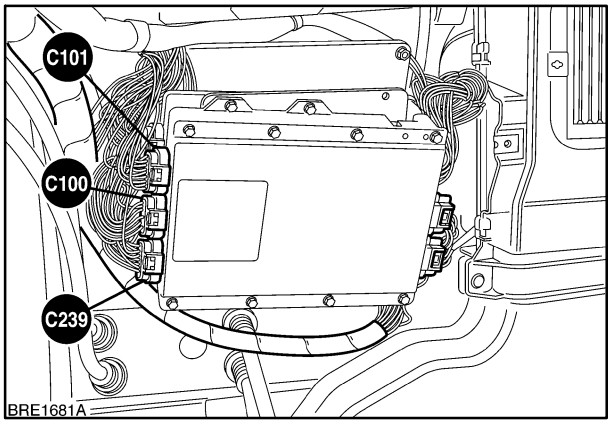

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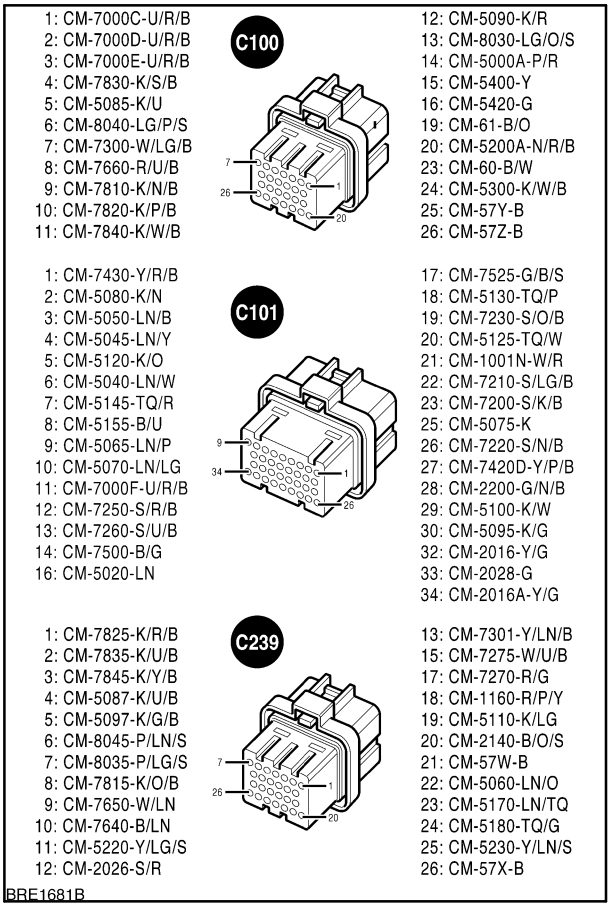

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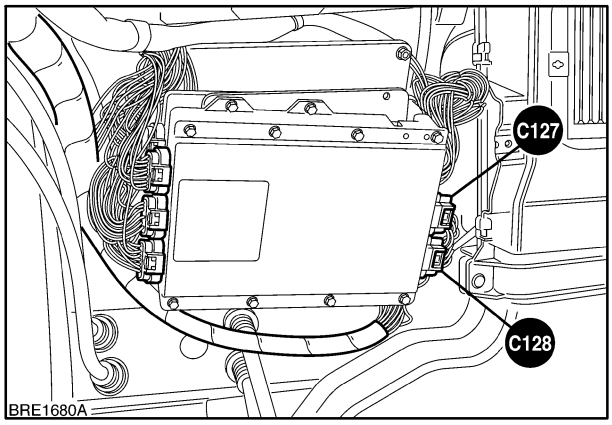
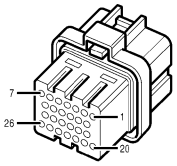


C127



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6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
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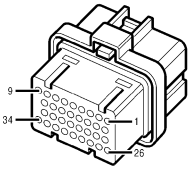
C128



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3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 3128 - HAND THROTTLE POSITION SENSOR DIFFERENCE ERROR

Cause:

The filtered voltage of potentiometer 1 (primary) is not equivalent to twice the filtered voltage of potentiometer 2 (secondary).

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

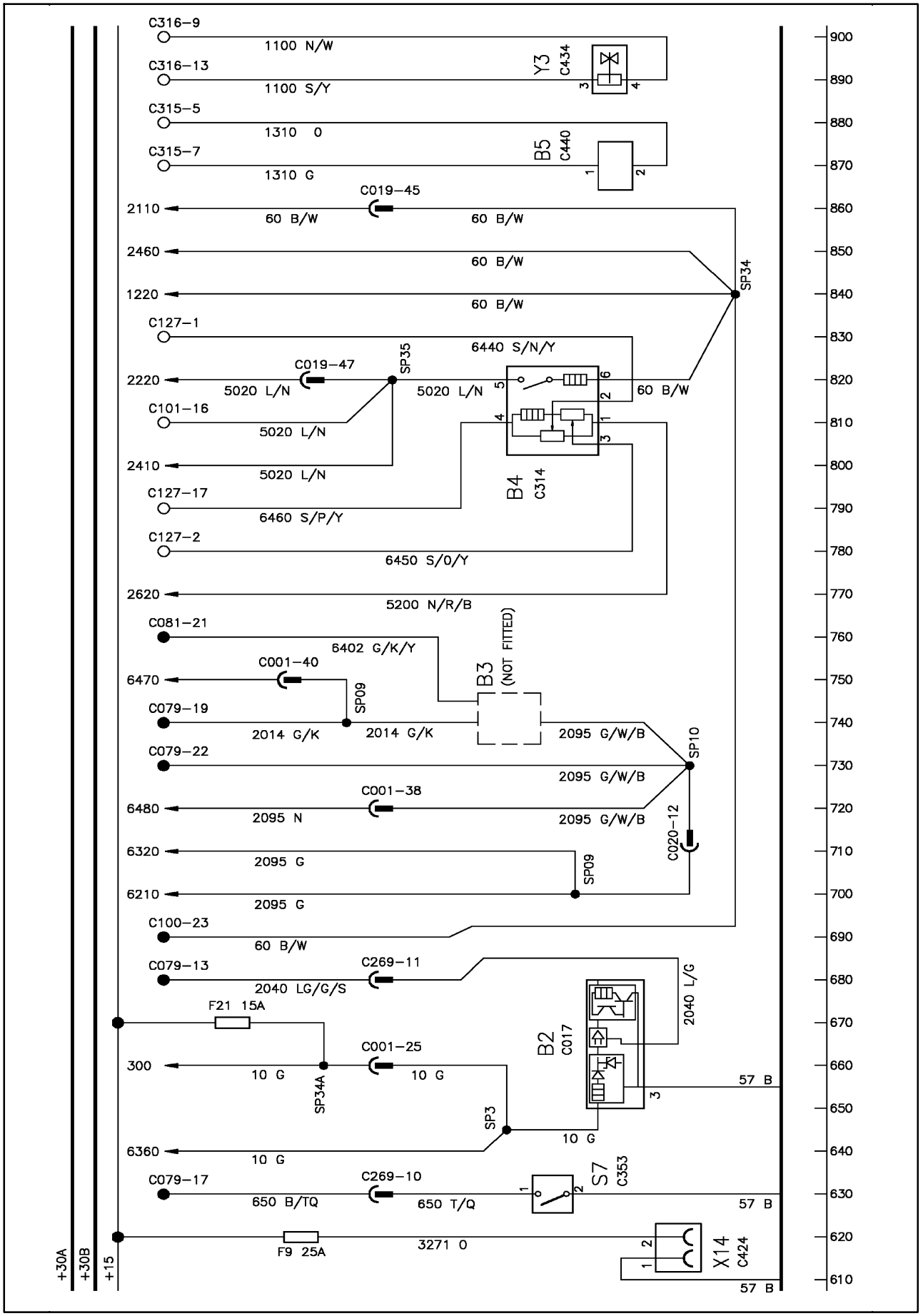
Possible failure modes:

1. Faulty connector
2. Faulty hand throttle position sensor
3. Damaged sensor drive arm or linkage
4. Faulty harness
5. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for hand throttle position sensor error codes 3124,3125,3126 or 3127.
   A. If any of the above are displayed, continue to these tests.
   B. If only error code 3128 is displayed, continue to step 2.
2. Check the hand throttle position sensor drive arm and the linkage.
   A. If the drive arm or the linkage is damaged, repair or replace as required.
   B. If the drive arm or the linkage is okay, continue to step 3.
3. Check the hand throttle position sensor connector **C314** and the controller connector **C127**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 4.
4. Check the hand throttle position sensor potentiometer 1 in H9 Channel 90.
   A. Operate the hand throttle from low to high idle. If the values displayed do not change continuously between 6 to 73, remove and replace the hand throttle position sensor.
   B. If the values displayed are okay, continue to step 5.
5. Check the hand throttle position sensor potentiometer 2 in H9 Channel 89.
   A. Operate the hand throttle from low to high idle. If the values displayed do not change continuously between 4 to 36 and are not approximately half the value displayed for the same positions as potentiometer 1 when in H9 Channel 90, remove and replace the hand throttle position sensor.
   B. If the hand throttle position sensor is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
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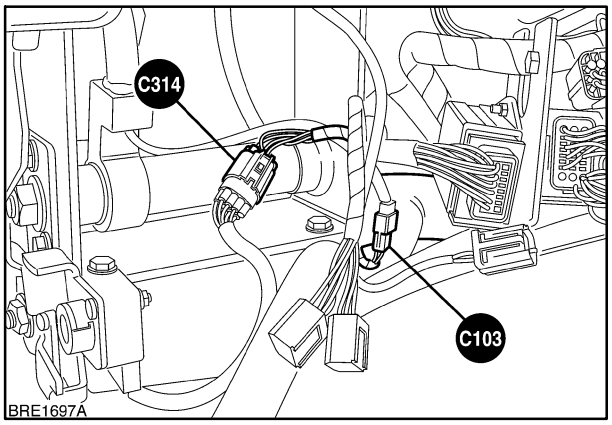
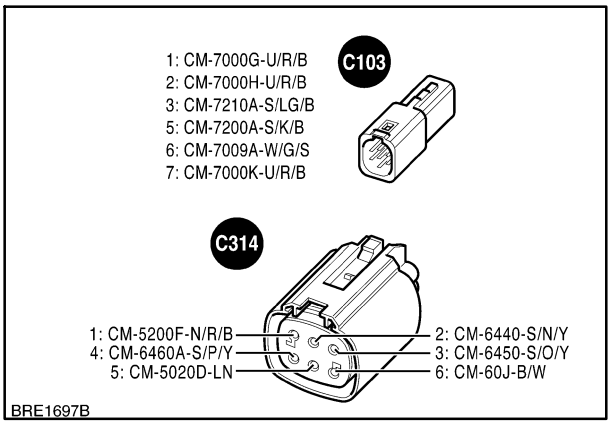
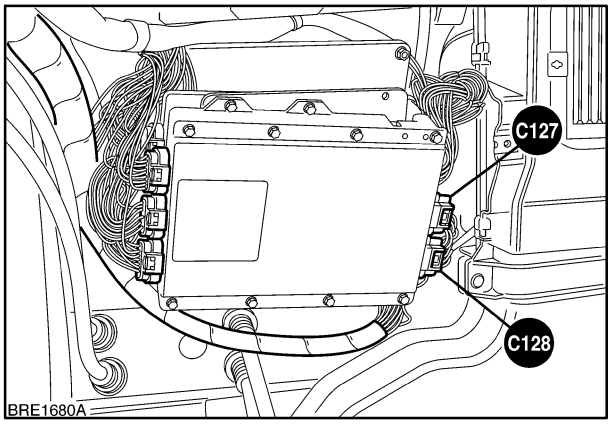


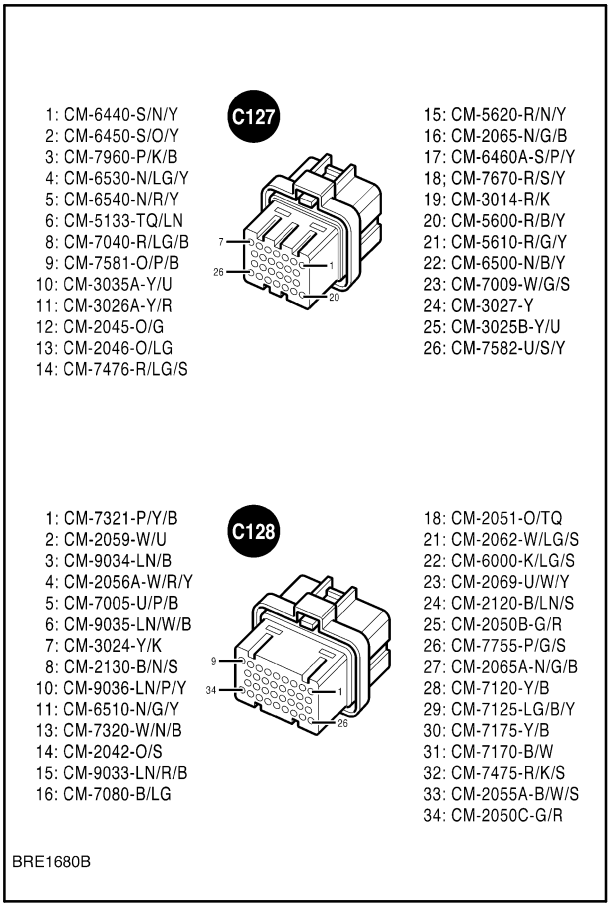
BRE1697A



BRE1697B



BRE1680A



BRE1680B

ERROR CODE 3129 – HAND THROTTLE IDLE SWITCH CLOSED CIRCUIT

Cause:

The hand throttle idle switch is still closed at approximately 8% of the throttle potentiometer 1 (primary) position or 4% of throttle potentiometer 2 (secondary) position.

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

Possible failure modes:

1. Faulty hand throttle position sensor
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for hand throttle position sensor error codes 3124,3125,3126, 3127 or 3128.

   A. If any of the above are displayed, continue to these tests.

   B. If only 3129 is displayed, continue to step 2.

2. Check the hand throttle position sensor idle switch.

   A. Disconnect the hand throttle position sensor connector **C314**. Operate the hand throttle from low to high idle. While in H9 Channel 90, measure the voltage using a suitable probe adaptor. Back probe between the not_idle switch signal wire on connector **C314** pin **4 (S/P/Y)** and **ground**. If the voltage indicated is not 0 Volts with the display indicating approximately 8 or below, remove and replace the hand throttle position sensor.

   B. If the voltage indicated is okay, continue to step 3.

3. Check the hand throttle position sensor idle switch.

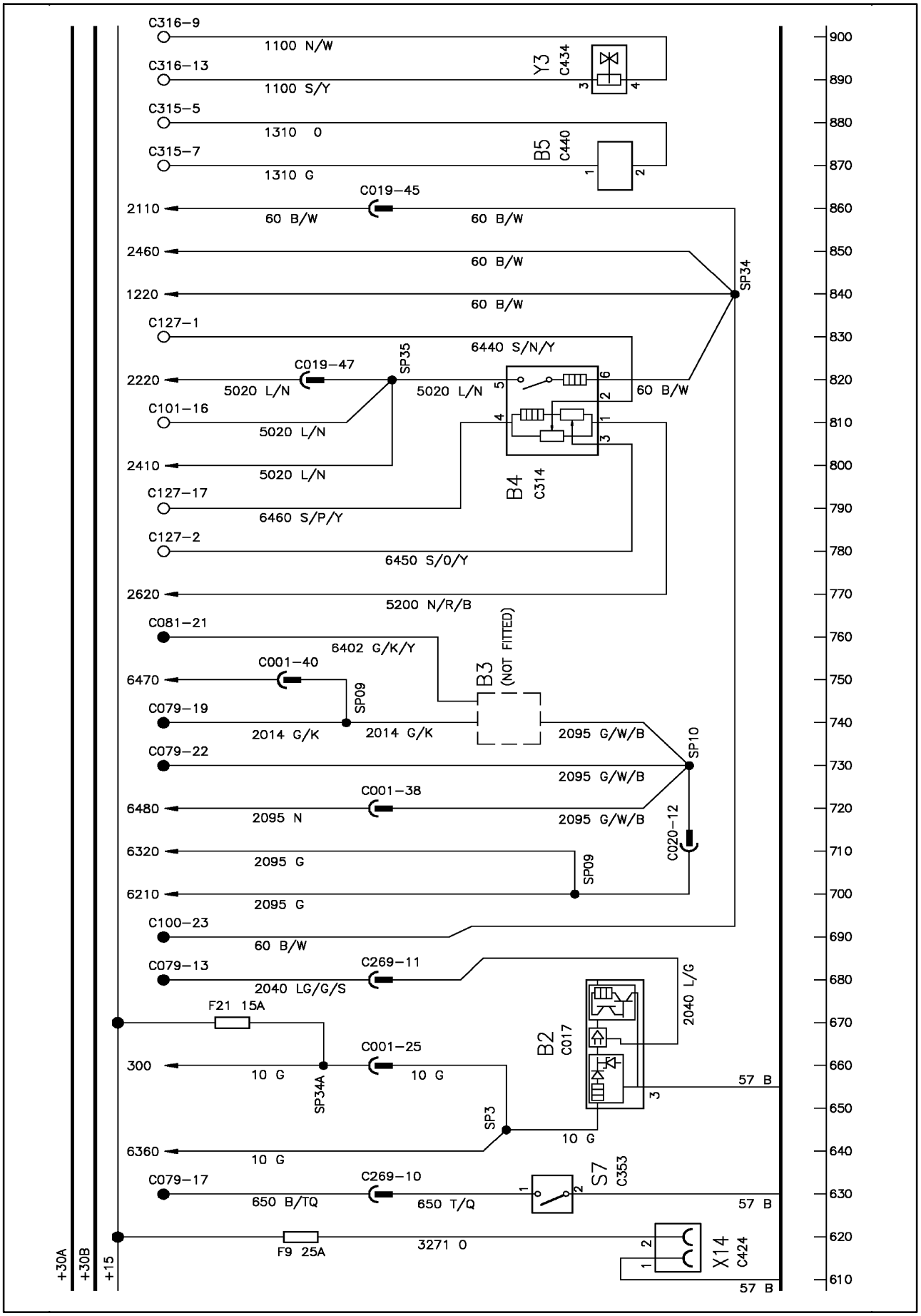
   A. Operate the hand throttle from low to high idle. While in H9 Channel 89, measure the voltage using a suitable probe adaptor. Back probe between the not_idle switch signal wire on connector **C314** pin **4 (S/P/Y)** and **ground**. If the voltage indicated is not 0 Volts with the display indicating approximately 4 or below, remove and replace the hand throttle position sensor.

   B. If the voltages indicated are okay, continue to step 4.

4. Check for a short to +Ve Voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C314** pin **4 (S/P/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
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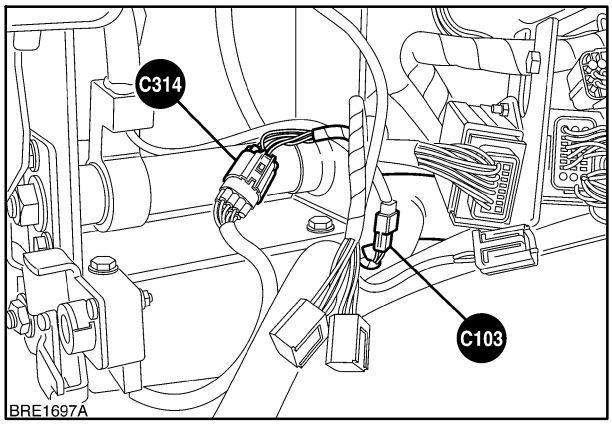
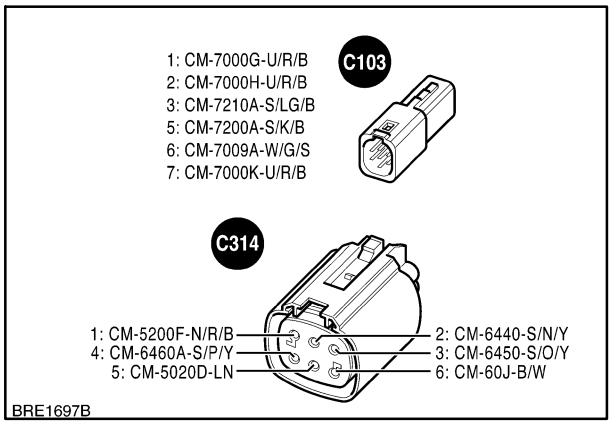

C314
C103
BRE1697A


1: CM-7000G-U/R/B
2: CM-7000H-U/R/B
3: CM-7210A-S/LG/B
5: CM-7200A-S/K/B
6: CM-7009A-W/G/S
7: CM-7000K-U/R/B
C103
C314
1: CM-5200F-N/R/B
4: CM-6460A-S/P/Y
5: CM-5020D-LN
2: CM-6440-S/N/Y
3: CM-6450-S/O/Y
6: CM-60J-B/W
BRE1697B

ERROR CODE 3130 - HAND THROTTLE IDLE SWITCH OPEN CIRCUIT

Cause:

The hand throttle idle switch is still open at approximately 21% of the throttle potentiometer 1 (primary) position or 11% of throttle potentiometer 2 (secondary) position.

Effects:

Hand throttle disabled.

Constant ERPM and HTS modes disabled.

Possible failure modes:

1. Faulty hand throttle position sensor
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for hand throttle position sensor error codes 3124,3125,3126, 3127, 3128 or 3129.

   A. If any of the above are displayed, continue to these tests.

   B. If only 3130 is displayed, continue to step 2.
2. Check the hand throttle position sensor connector **C314** and the central controller connector **C127**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 3.
3. Check for +12 Volts.

   A. Disconnect the hand throttle position sensor connector **C314**. Turn the keystart ON. Measure the voltage between connector **C314** pin **1 (N/R/B)** and **ground**. If +12 volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, continue to step 4.
4. Check the hand throttle position sensor idle switch.

   A. Reconnect connector **C314**. Operate the hand throttle from low to high idle. While in H9 Channel 90, measure the voltage using a suitable probe adaptor. Back probe between the not_idle switch signal wire on connector **C314** pin **4 (S/P/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts with the display indicating approximately 21 or above, remove and replace the hand throttle position sensor.

   B. If the voltages indicated are okay, continue to step 5.
5. Check the hand throttle position sensor idle switch.

   A. Operate the hand throttle from low to high idle. While in H9 Channel 89, measure the voltage using a suitable probe adaptor. Back probe between the not_idle switch signal wire on connector **C314** pin **4 (S/P/Y)** and **ground**. If the voltage indicated is not approximately 12 Volts with the display indicating approximately 11 or above, remove and replace the hand throttle position sensor.

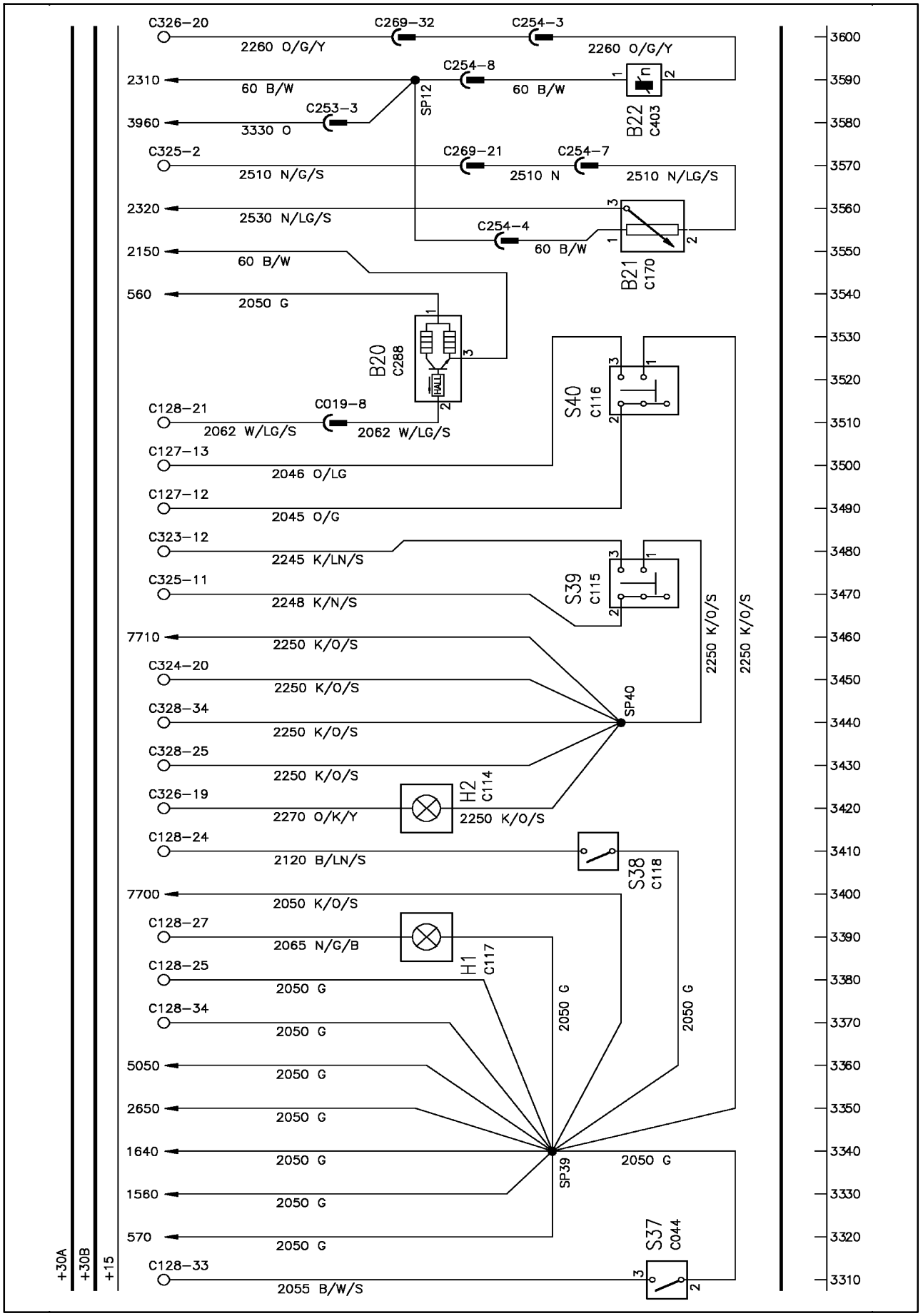
   B. If the voltages indicated are okay, continue to step 6.
6. Check for a short to ground.

   A. Turn the keystart OFF. Disconnect connector **C314**. Check between connector **C314** pin **4 (S/P/Y)** and **ground**. If a short circuit is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 7.
7. Check for an open circuit.

   A. Disconnect the controller connector **C127**. Check between connector **C127** pin **17 (S/P/Y)** and **C314** pin **4 (S/P/Y)**.

   B. If an open circuit is not indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
C325-11
2248 K/N/S
S39
C115
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
C328-25
2250 K/O/S
SP40
2250 K/O/S
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
1560
2050 G
570
2050 G
SP39
2050 G
2050 G
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
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3490
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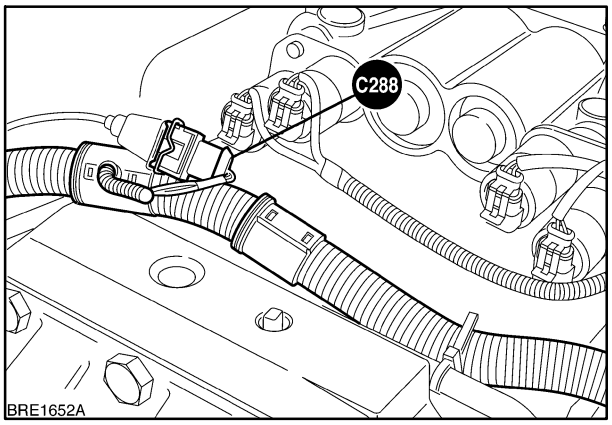
3310



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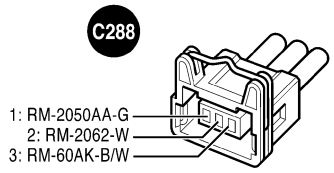
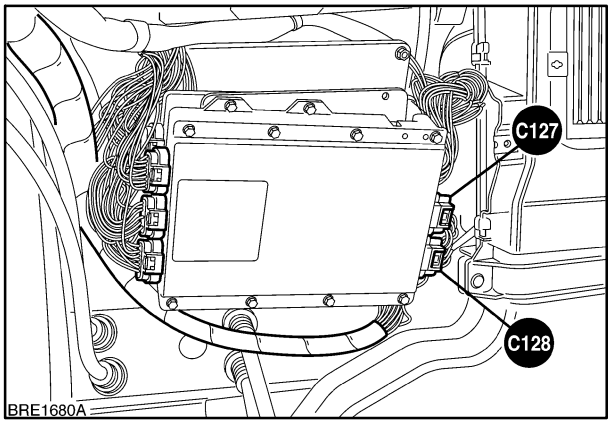


BRE1652B



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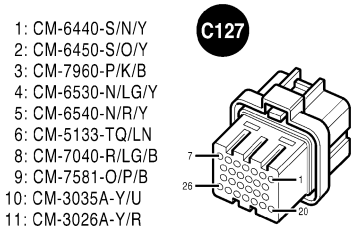

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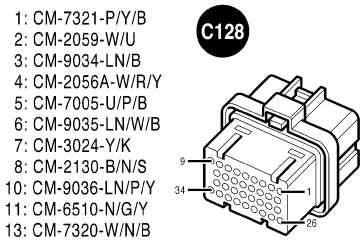
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y



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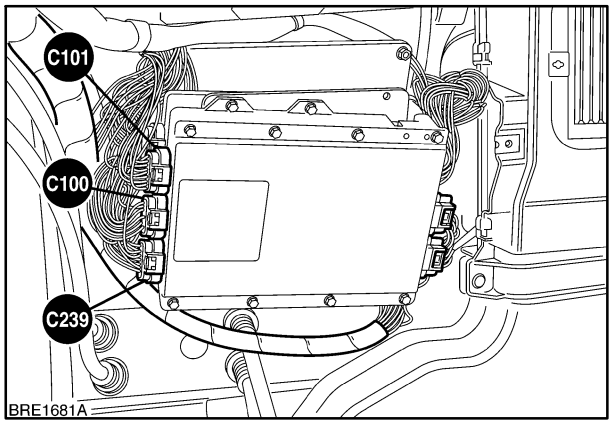
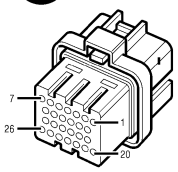
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



BRE1681A

C100



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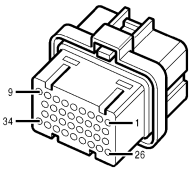
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



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5: CM-5120-K/O
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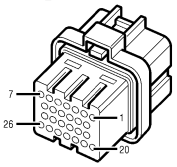
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



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4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 3131 - CRPM SWITCH SHORT

Effects:

1. CRPM function inoperative.

Possible failure modes:

1. Faulty switch
2. Faulty harness
3. Faulty connection
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the CRPM On/Off switch connector **C309**, controller connectors **C127** and the in line harness connector **C378**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check operation of CRPM On/Off switch.

   A. Using a suitable multimeter check operation of switch.

   B. If the switch functions are okay, continue to step 3.

3. Check for short to ground within harness.

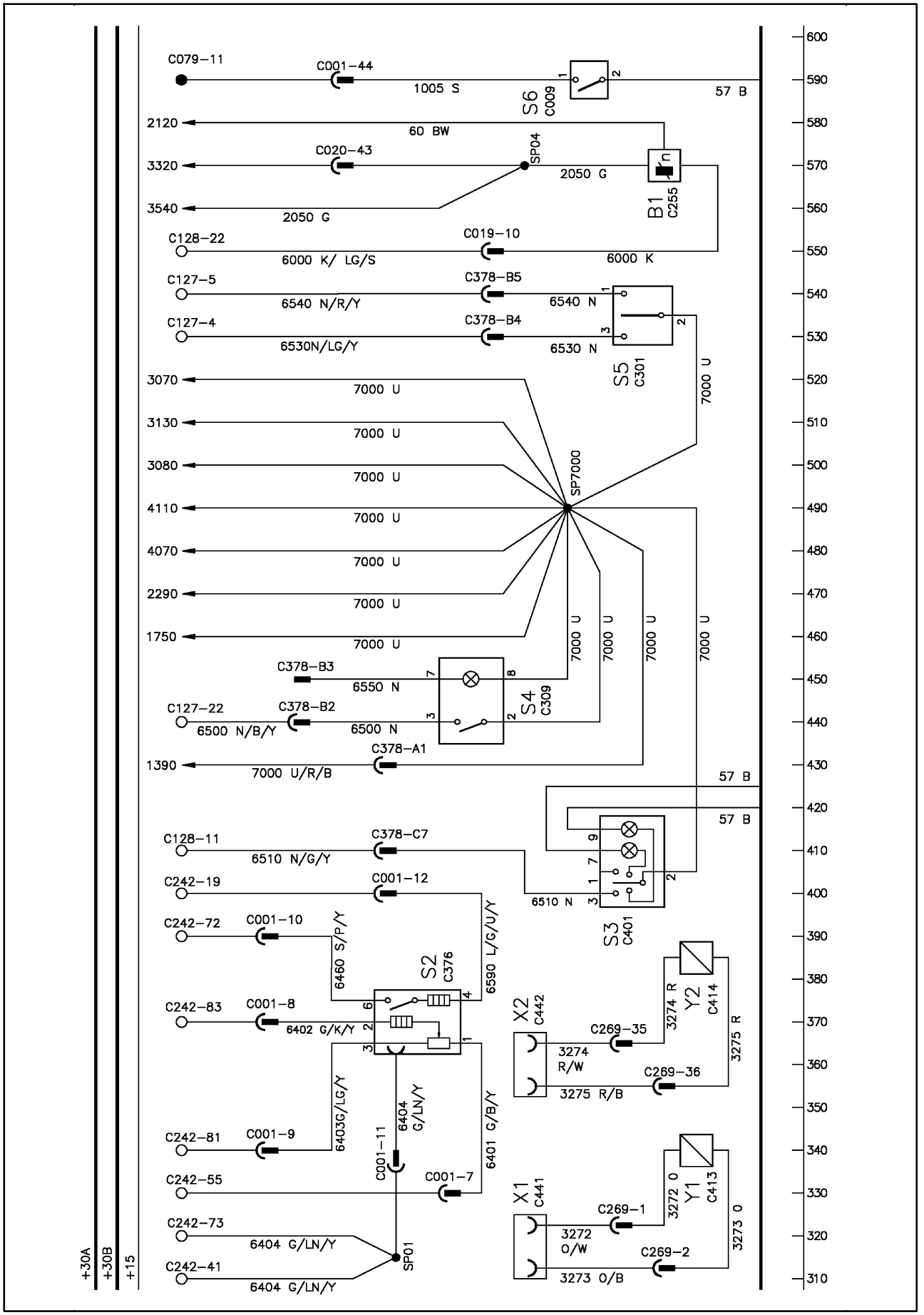
   A. Disconnect connector **C127**. Check between the connector. **C309** pin **3(N)** and **ground**. If short to ground indicated, repair or replace harness as required.

   B. If short to ground is not indicated, continue to step 4.

4. Check for short to +Ve voltage.

   A. Turn the keystart ON. Measure the voltage between connector **C309** pin **3(N)** and **ground**. If a short to +Ve is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C079-11
C001-44
1005 S
S6 C009
57 B
2120
60 BW
C020-43
SP04
3320
2050 G
3540
2050 G
B1 C255
C128-22
C019-10
6000 K/ LG/S
6000 K
C127-5
C378-B5
6540 N/R/Y
6540 N
C127-4
C378-B4
6530N/LG/Y
6530 N
S5 C301
7000 U
3070
3130
3080
4110
4070
2290
1750
SP7000
C378-B3
6550 N
C127-22
C378-B2
6500 N/B/Y
6500 N
S4 C309
1390
C378-A1
7000 U/R/B
57 B
C128-11
C378-C7
6510 N/G/Y
C242-19
C001-12
6510 N
S3 C401
C242-72
C001-10
6460 S/P/Y
6590 L/G/U/Y
S2 C376
C242-83
C001-8
6402 G/K/Y
X2 C442
C269-35
3274 R
Y2 C414
3275 R
3274 R/W
C269-36
3275 R/B
C242-81
C001-9
6403G/LG/Y
6404 G/LN/Y
C001-11
6401 G/B/Y
C242-55
C001-7
X1 C441
C269-1
3272 O
Y1 C413
3273 O
3272 O/W
C269-2
3273 O/B
C242-73
6404 G/LN/Y
C242-41
6404 G/LN/Y
SP01
+30A
+30B
+15
600
590
580
570
560
550
540
530
520
510
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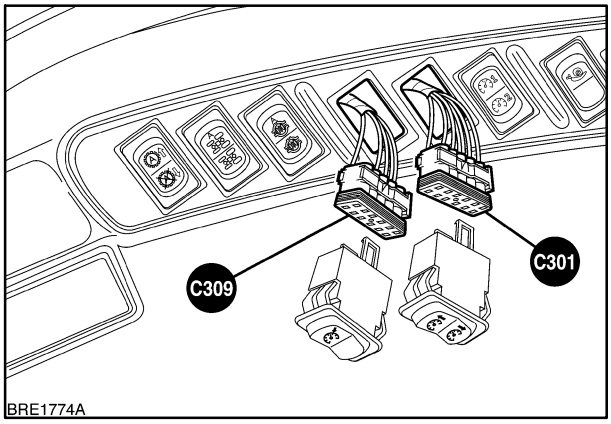

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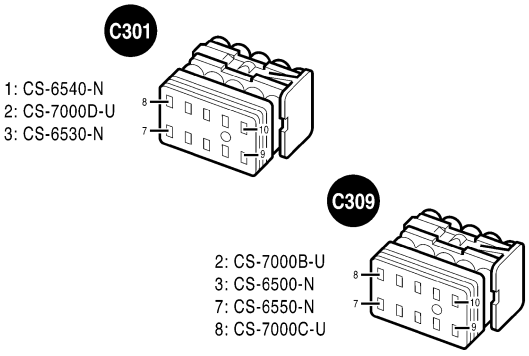

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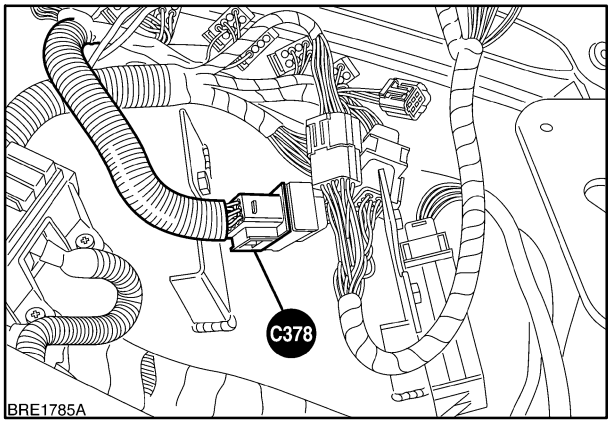

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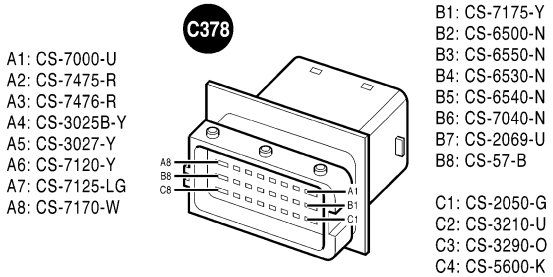


BRE1785B

ERROR CODE 3132 - ECU SELF TEST SHUTOFF PATHS (START UP)

Effects:

1. The start up test turns off the injectors, disabling the engine from starting. This is done as soon as the ignition key is turned on.

   If the ECU detects an injection, then error 3132 is sent and the engine will not start as the injector banks are shut down.

Possible failure modes:

1. Incorrect operator shutdown and restart procedure
2. Fault during self test before engine is started
3. Faulty engine controller

Solution:

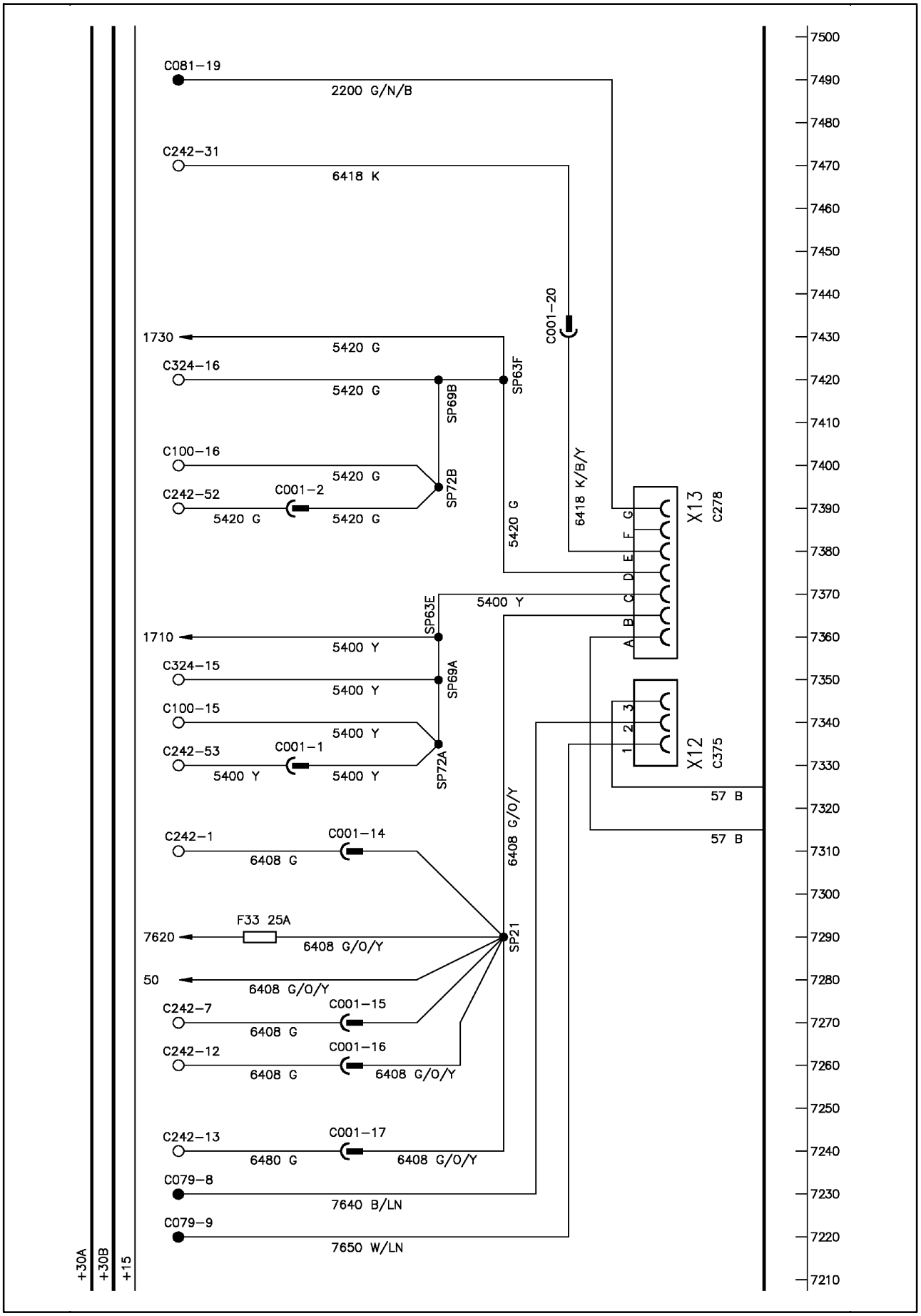
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. If this error occurs, the ignition should be switched to the "OFF" position and then to the ignition "ON" position, (position 4, not crank) and back off again, allowing three (3) seconds in each position.
2. Check the Continuous +12V feed to the engine controller.

   B.C.D.E.A. Check mini fuse number 33. Replace if blown.

   F.G.H.I.J.K.L.M.N.O.P.Q.R.S.T.U.B. If the fuse is okay disconnect connector **C242** and check for +12V at pins **1, 7, 12** and **13**. There should be +12V at these pins with the Keystart OFF aswell as ON. If +12V is not indicated trace the fault in the wiring between connector **C242** and Fuse 33.

   C. If +12V is indicated and the error re-occurs continue to step 3.
3. If the problem continues to exist, a new ECU controller will be required.


+30A
+30B
+15
C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-52
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
C242-1
C001-14
6408 G
F33 25A
7620
6408 G/O/Y
SP21
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
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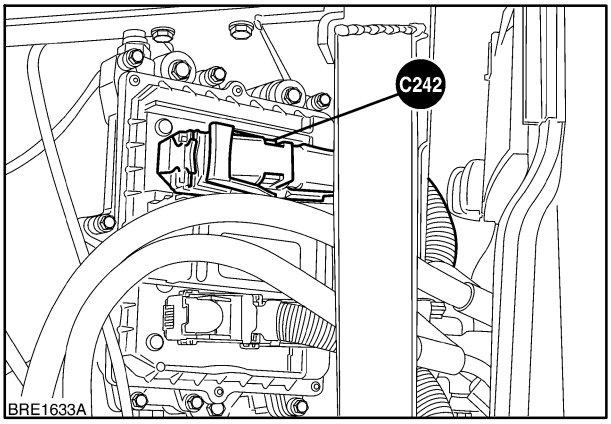
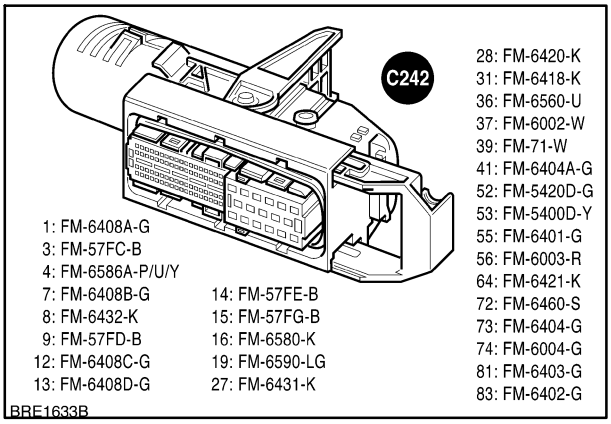
7230
7220
7210


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

SECTION 55 - ELECTRICAL SYSTEM

Chapter 9 - Fault Codes (Continued)

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4001 - 5000 ELECTRONIC HYDRAULIC REMOTES (EHR) FAULT CODE LISTING

Error Code	Error description
4100	Remote No.1 no control message received
4101	Remote No.1 control message not plausible
4102	Remote No.1 EEPROM Error
4103	Remote No.1 switched to failsafe
4104	Remote No.1 under voltage
4105	Remote No.1 over voltage
4106	Remote No.1 spool movement too low
4107	Remote No.1 spool movement too high
4108	Remote No.1 float position not reached
4109	Remote No.1 manually operated
4110	Remote No.1 driver faulty
4111	Remote No.1 POT faulty
4112	Remote No.1 unable to reach neutral
4113	Remote No.1 spool not in neutral at key on
4114	Remote No.2 no control message received
4115	Remote No.2 control message not plausible
4116	Remote No.2 EEPROM error
4117	Remote No.2 switched to failsafe
4118	Remote No.2 under voltage
4119	Remote No.2 over voltage
4120	Remote No.2 spool movement too low
4121	Remote No.2 spool movement too high
4122	Remote No.2 float position not reached
4123	Remote No.2 manually operated
4124	Remote No.2 driver faulty
4125	Remote No.2 POT faulty
4126	Remote No.2 unable to reach neutral
4127	Remote No.2 spool not in neutral at key on
4128	Remote No.3 no control message received
4129	Remote No.3 control message not plausible
4130	Remote No.3 EEPROM error
4131	Remote No.3 switched to failsafe
4132	Remote No.3 under voltage
4133	Remote No.3 over voltage
4134	Remote No.3 spool movement too low
4135	Remote No.3 spool movement too high
4136	Remote No.3 float position not reached

4137	Remote No.3 manually operated
4138	Remote No.3 driver faulty
4139	Remote No.3 POT faulty
4140	Remote No.3 unable to reach neutral
4141	Remote No.3 spool not in neutral at key on
4142	Remote No.4 no control message received
4143	Remote No.4 control message not plausible
4144	Remote No.4 EEPROM error
4145	Remote No.4 switched to failsafe
4146	Remote No.4 under voltage
4147	Remote No.4 over voltage
4148	Remote No.4 spool movement too low
4149	Remote No.4 spool movement too high
4150	Remote No.4 float position not reached
4151	Remote No.4 manually operated
4152	Remote No.4 driver faulty
4153	Remote No.4 POT faulty
4154	Remote No.4 unable to reach neutral
4155	Remote No.4 spool not in neutral at key on
4170	EHR control No.1 not calibrated
4171	EHR control No.1 open circuit
4172	EHR control No.1 short circuit
4173	EHR control No.2 not calibrated
4174	EHR control No.2 open circuit
4175	EHR control No.2 short circuit
4176	Timer switch No.1 /No.2 not connected
4177	EHR Control No.3 not calibrated
4178	EHR control No.3 open circuit
4179	EHR control No.3 short circuit
4180	EHR control No.4 not calibrated
4181	EHR control No.4 open circuit
4182	EHR control No.4 short circuit
4183	Timer switch No.3/No.4 not connected
4184	EHR joystick POT X open circuit
4185	EHR joystick POT X short circuit
4186	EHR joystick POT Y open circuit
4187	EHR joystick POT Y short circuit
4190	No communication from EHR No.1
4191	No communication from EHR No.2
4192	No communication from EHR No.3

4193	No communication from EHR No.4
4194	Motor mode No.1 switch faulty
4195	Motor mode No.2 switch faulty
4196	Motor mode No.3 switch faulty
4197	Motor mode No.4 switch faulty

Electronic Hydraulic Remotes Flash Code Listing

NOTE: *EHR valve may need the paint removed from the valve casing, next to the connector.*

Flash codes are displayed on the EHR valve. The LED is internal and can be seen flashing through the plastic part of the valve casing, located next to the valve harness connector.

First flash sequence will be after a long pause, next sequence will be after a short pause.

E.G. flash code 16 - Long pause then 1 flash, short pause then 6 flashes, long pause then 1 flash.....

Flash Code	Fault	Description
11	No control message	CAN BUS message fault
13	Implausible control message	CAN BUS message fault
16	EEPROM inconsistent	Software fault
17	Messages not received in the specified time	CAN BUS message fault
21	Under voltage	Supply voltage low
22	Over voltage	Supply voltage high
23	Spool deflection too short	Valve internal fault, possibly mechanical
24	Spool deflection excessive	Valve internal fault, possibly mechanical
25	Open centre position not reached	Valve internal fault, possibly mechanical
26	Manual operation detected	Valve has been operated manually
31	Under 8 Volts	Displayed only if the valve does not shut-down automatically. Valve will shut off the output stage.
32	Over 36 or 45 Volts	Displayed only if the valve does not shut-down automatically. Valve will shut off the output stage.
41	Over 45 Volts	Valve will internally shut-down
42	Output stage for the pilot solenoid valve fault	Valve internal fault
43	Position transducer fault	Position of the spool detected by the transducer
81	Valve spool cannot be returned to neutral	Valve internal fault, possibly mechanical
82	Valve spool not in neutral when switched on	Valve internal fault, possibly mechanical
83	Checksum error	Self diagnostic check of the system

ERROR CODE 4100 – REMOTE NO.1 NO CONTROL MESSAGE RECEIVED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C279**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C279**. Turn the keystart ON. Measure the voltage between connector **C279** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C279 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C279 pin **2 (U)** and **C020** pin **32 (U)**

   C279 pin **3 (R)** and **C020** pin **31 (R)**

   C279 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

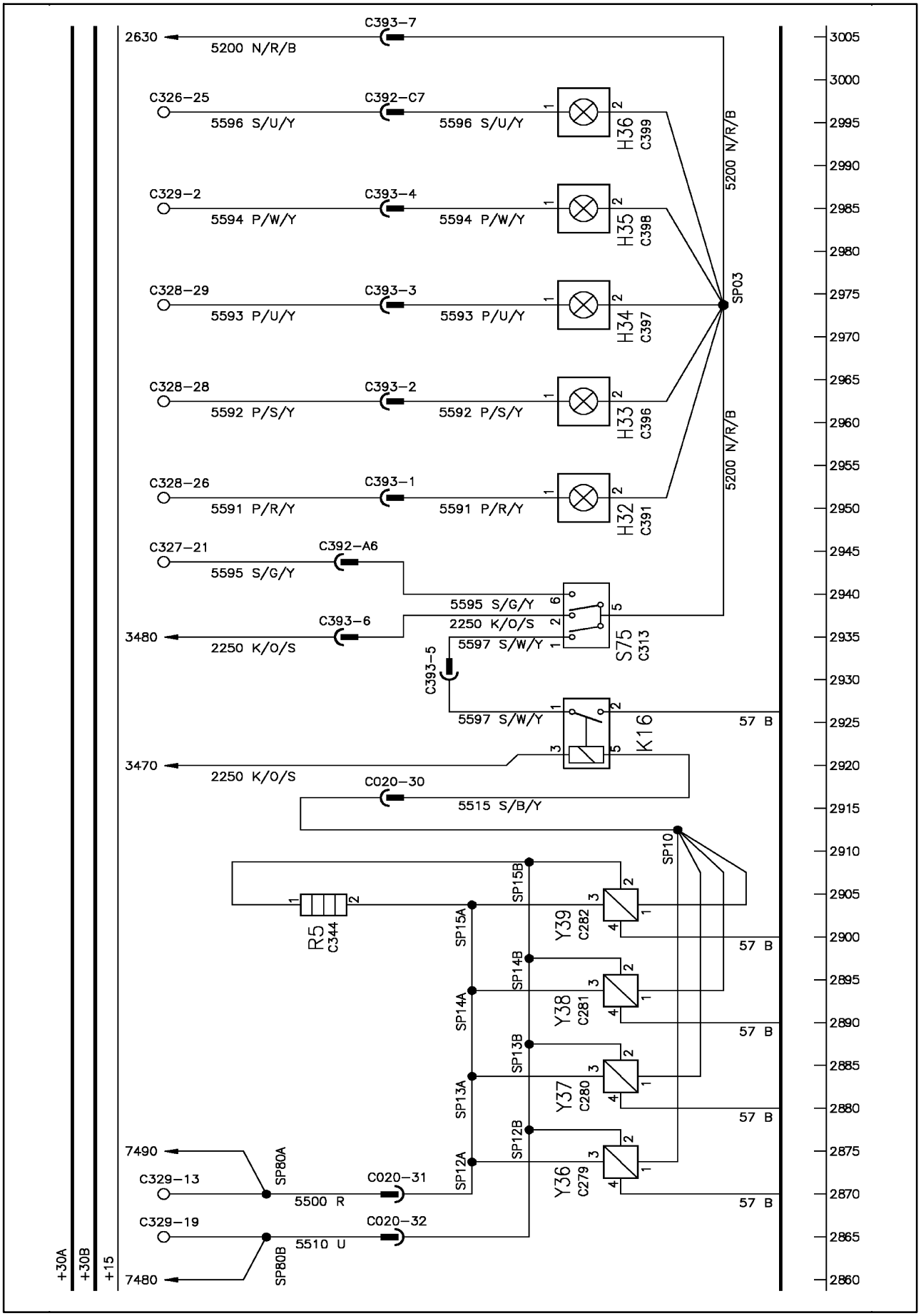
   C279 pin **1 (S/B/Y)** and **ground**

   C279 pin **2 (U)** and **ground**

   C279 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.


C393-7
2630
5200 N/R/B
C326-25
C392-C7
5596 S/U/Y
5596 S/U/Y
H36 C399
C329-2
C393-4
5594 P/W/Y
5594 P/W/Y
H35 C398
C328-29
C393-3
5593 P/U/Y
5593 P/U/Y
H34 C397
C328-28
C393-2
5592 P/S/Y
5592 P/S/Y
H33 C396
C328-26
C393-1
5591 P/R/Y
5591 P/R/Y
H32 C391
5200 N/R/B
SP03
5200 N/R/B
C327-21
C392-A6
5595 S/G/Y
5595 S/G/Y
C393-6
3480
2250 K/O/S
2250 K/O/S
2250 K/O/S
5597 S/W/Y
S75 C313
C393-5
5597 S/W/Y
K16
57 B
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
SP80B
7480
+30A
+30B
+15
3005
3000
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2990
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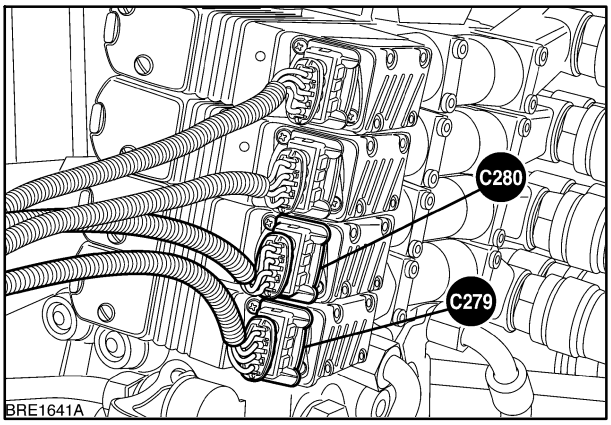

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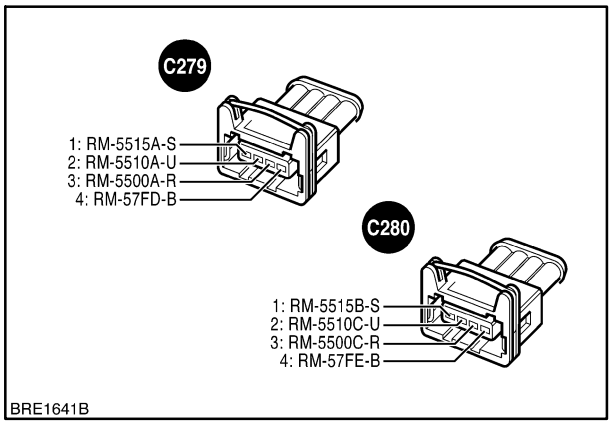

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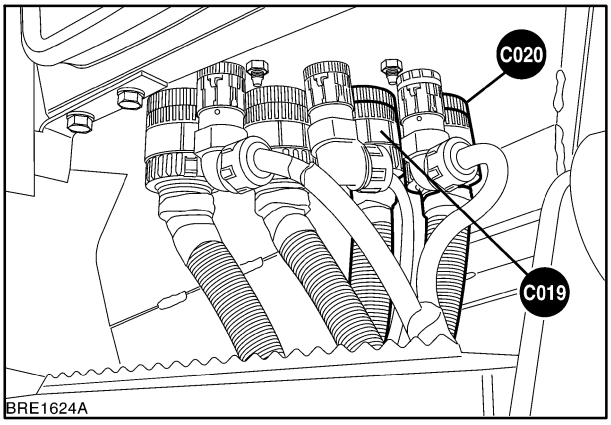

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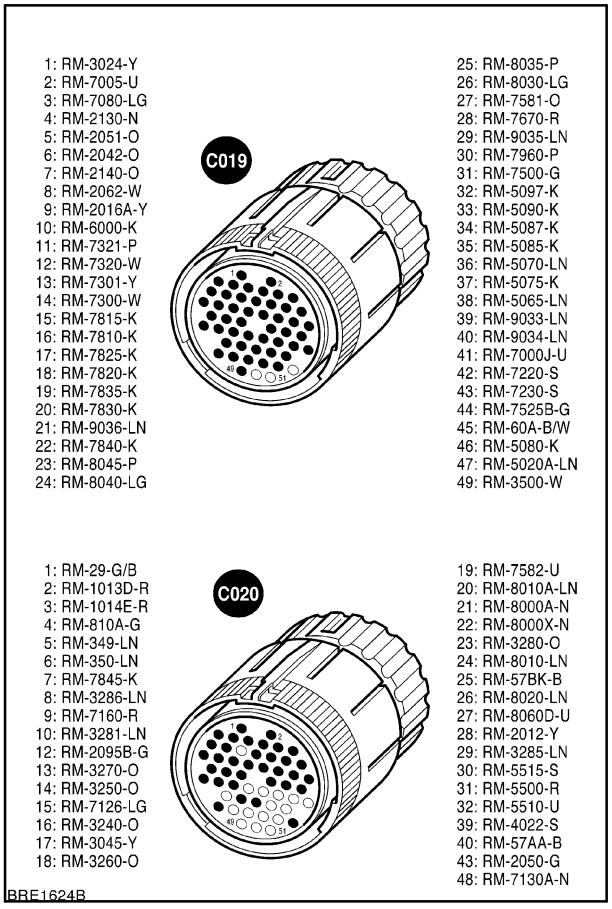


BRE1624B

ERROR CODE 4101 - REMOTE NO.1 CONTROL MESSAGE NOT PLAUSIBLE

Possible failure modes:

1. Faulty connector
2. CAN BUS interference
3. Faulty harness
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C279**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the CAN BUS wires **(R)** and **(U)**.

   A. If the CAN BUS wires are not twisted together or free from possible interference, repair, re-position or replace the harness as required.

   B. If the CAN BUS wires are okay, continue to step 3.

3. Check for +12 Volts.

   A. Disconnect connector **C279**. Turn the keystart ON. Measure the voltage between connector **C279** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C279 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C279 pin **2 (U)** and **C020** pin **32 (U)**

   C279 pin **3 (R)** and **C020** pin **31 (R)**

   C279 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 5.

5. Check for a short to ground.

   A. Check between connector:

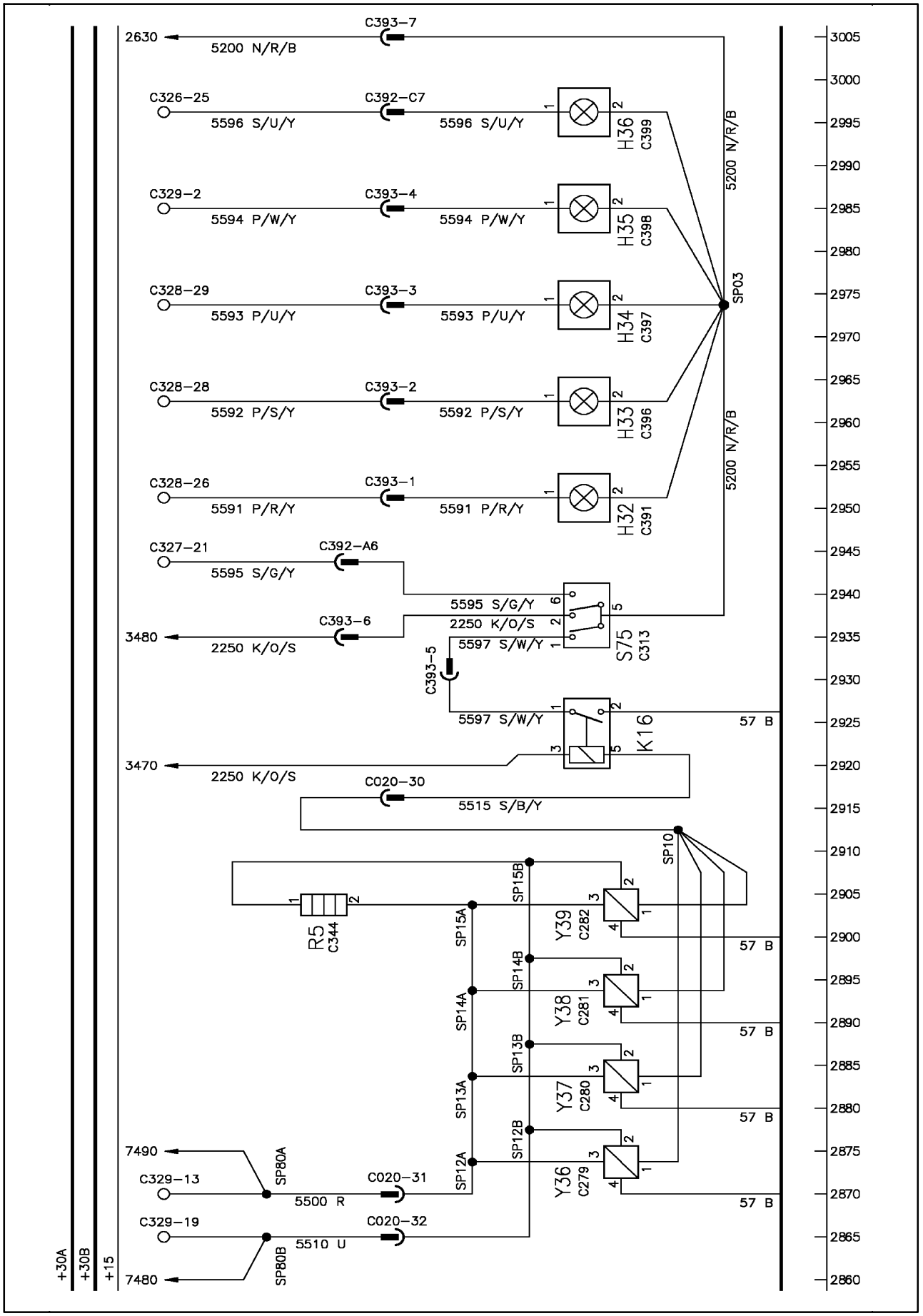
   C279 pin **1 (S/B/Y)** and **ground**

   C279 pin **2 (U)** and **ground**

   C279 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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5594 P/W/Y
C393-4
H35 C398
C328-29
5593 P/U/Y
C393-3
H34 C397
C328-28
5592 P/S/Y
C393-2
H33 C396
C328-26
5591 P/R/Y
C393-1
H32 C391
SP03
C327-21
5595 S/G/Y
C392-A6
3480
2250 K/O/S
C393-6
S75 C313
C393-5
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K16
57 B
3470
C020-30
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SP10
R5 C344
SP15B
SP15A
Y39 C282
SP14B
SP14A
Y38 C281
SP13B
SP13A
Y37 C280
SP12B
SP12A
Y36 C279
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C020-31
C329-19
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C020-32
SP80B
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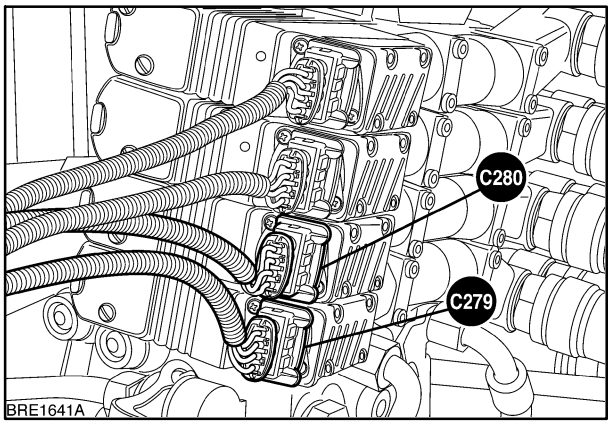

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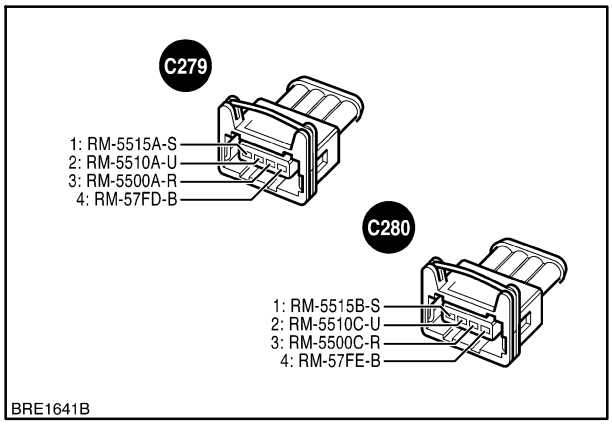

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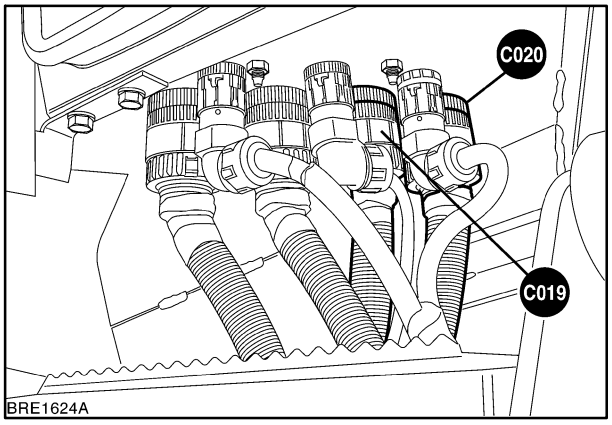

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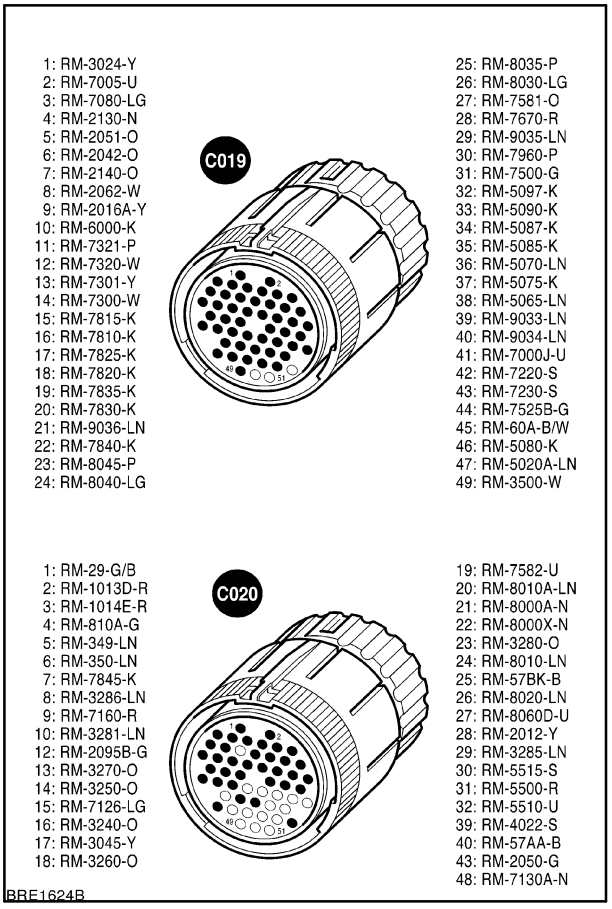


BRE1624B

ERROR CODE 4102 - REMOTE NO.1 EEPROM ERROR

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4103 - REMOTE NO.1 SWITCHED TO FAILSAFE

Cause:

Major fault detected within the EHR system. The EHR system is disabled until keystart OFF and fault cleared.

Possible failure modes:

1. Other EHR error code(s) detected
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation. If any other error codes are still displayed, continue to these tests.

   B. If only error code 4103 is still displayed, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4104 - REMOTE NO.1 UNDER VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C279**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C279**. Turn the keystart ON. Measure the voltage between connector **C279** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is less than approximately +8 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C279 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C279 pin **4 (B)** and **ground**

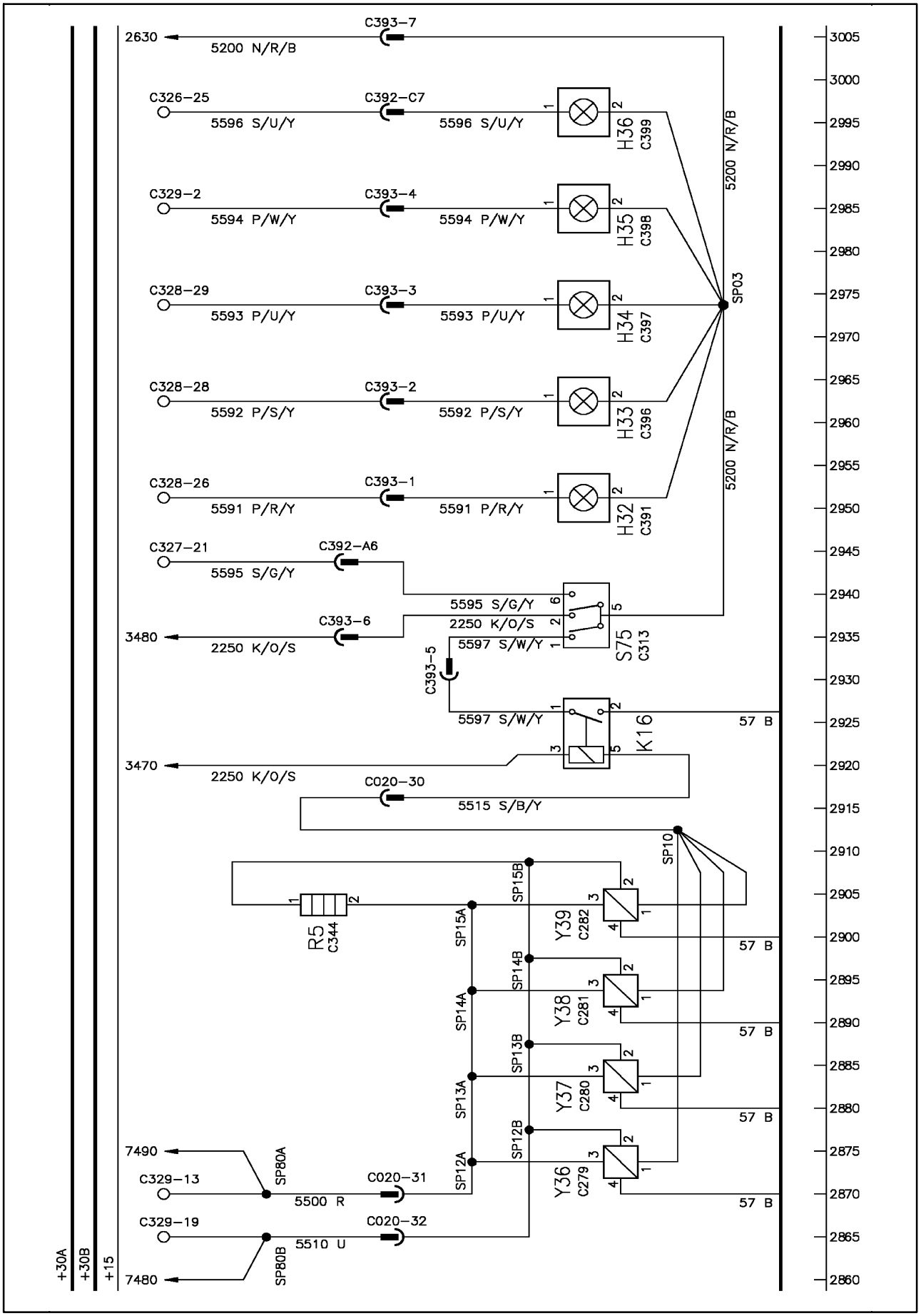
   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector **C279** pin **1 (S/B/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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K16
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C020-30
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SP15B
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SP14B
SP14A
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SP13B
SP13A
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SP12B
SP12A
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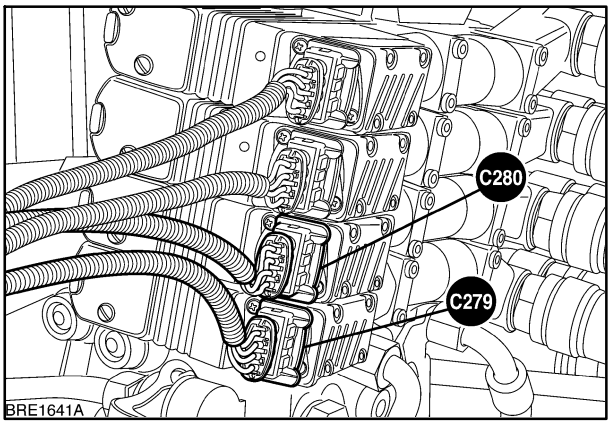
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C279
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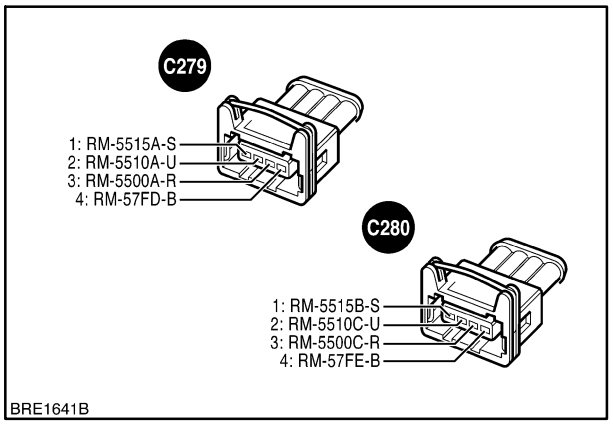
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3: RM-5500A-R
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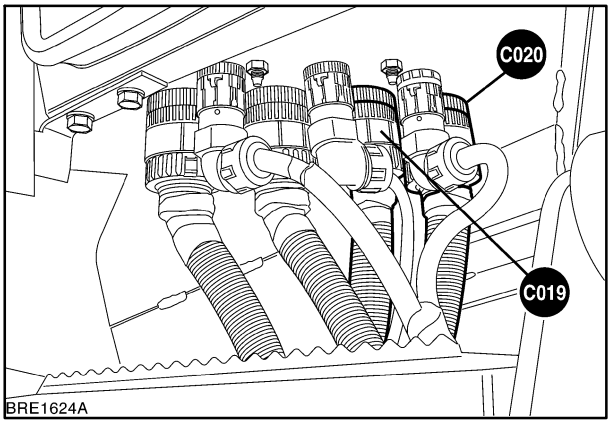
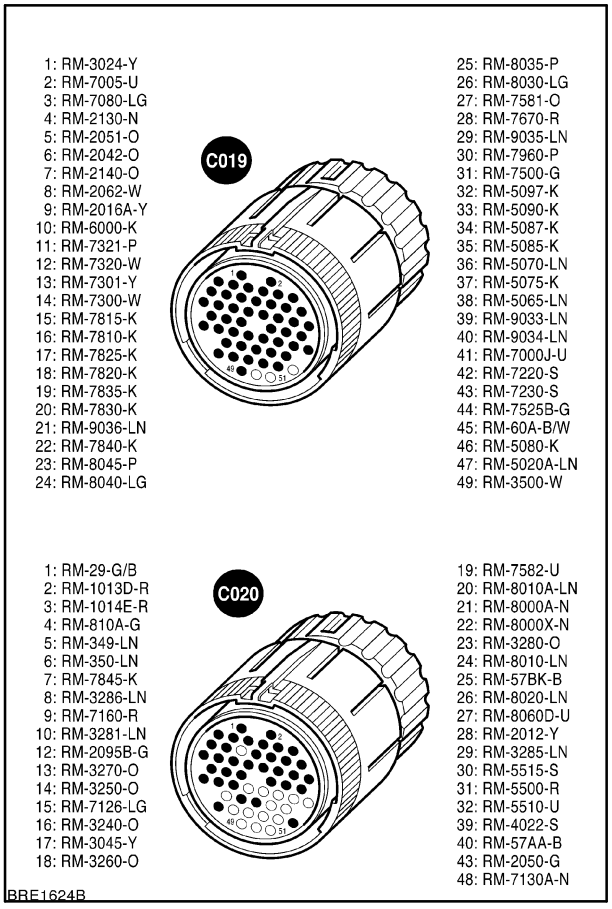
3: RM-5500C-R
4: RM-57FE-B
BRE1641B


C020
C019
BRE1624A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8: RM-2062-W
9: RM-2016A-Y
10: RM-6000-K
11: RM-7321-P
12: RM-7320-W
13: RM-7301-Y
14: RM-7300-W
15: RM-7815-K
16: RM-7810-K
17: RM-7825-K
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22: RM-7840-K
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C019
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27: RM-7581-O
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38: RM-5065-LN
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43: RM-7230-S
44: RM-7525B-G
45: RM-60A-B/W
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3: RM-1014E-R
4: RM-810A-G
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7: RM-7845-K
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14: RM-3250-O
15: RM-7126-LG
16: RM-3240-O
17: RM-3045-Y
18: RM-3260-O
C020
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21: RM-8000A-N
22: RM-8000X-N
23: RM-3280-O
24: RM-8010-LN
25: RM-57BK-B
26: RM-8020-LN
27: RM-8060D-U
28: RM-2012-Y
29: RM-3285-LN
30: RM-5515-S
31: RM-5500-R
32: RM-5510-U
39: RM-4022-S
40: RM-57AA-B
43: RM-2050-G
48: RM-7130A-N
BRE1624B

ERROR CODE 4105 - REMOTE NO.1 OVER VOLTAGE

Possible failure modes:

1. External power supply connected
2. Faulty charging system
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check that the tractor battery power supply has not been connected to an external power supply.

   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.

   B. If an external power supply is not connected to the tractor, continue to step 2.

2. Check the battery voltage.

   A. Start the engine and run at 2000 rev/min. Measure the battery voltage. If the voltage indicated is greater than approximately +15 Volts, continue to test for a fault in the charging system.

   B. If the voltage indicated is between approximately +9 Volts and +15 Volts, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.

ERROR CODE 4106 - REMOTE NO.1 SPOOL MOVEMENT TOO LOW

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4107 - REMOTE NO.1 SPOOL MOVEMENT TOO HIGH

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4108 – REMOTE NO.1 FLOAT POSITION NOT REACHED

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re–occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4109 - REMOTE NO.1 MANUALLY OPERATED

Cause:

EHR remote valve spool movement has been detected with no control message sent from the controller.

Possible failure modes:

1. Remote valve manually operated
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Calibrate the EHR lever.
   A. Perform the EHR lever calibration procedure and test the system for normal operation.
   B. If the fault is still present, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4110 - REMOTE NO.1 DRIVER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.

3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.

4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4111 - REMOTE NO.1 POTENTIOMETER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4112 - REMOTE NO.1 UNABLE TO REACH NEUTRAL

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.
2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.
3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.
4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4113 - REMOTE NO.1 SPOOL NOT IN NEUTRAL AT KEY ON

Possible failure modes:

1. Keystart switched off during EHR valve operation
2. Incorrect hydraulic pressure
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4114 - REMOTE NO.2 NO CONTROL MESSAGE RECEIVED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C280**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C280**. Turn the keystart ON. Measure the voltage between connector **C280** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C280 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C280 pin **2 (U)** and **C020** pin **32 (U)**

   C280 pin **3 (R)** and **C020** pin **31 (R)**

   C280 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

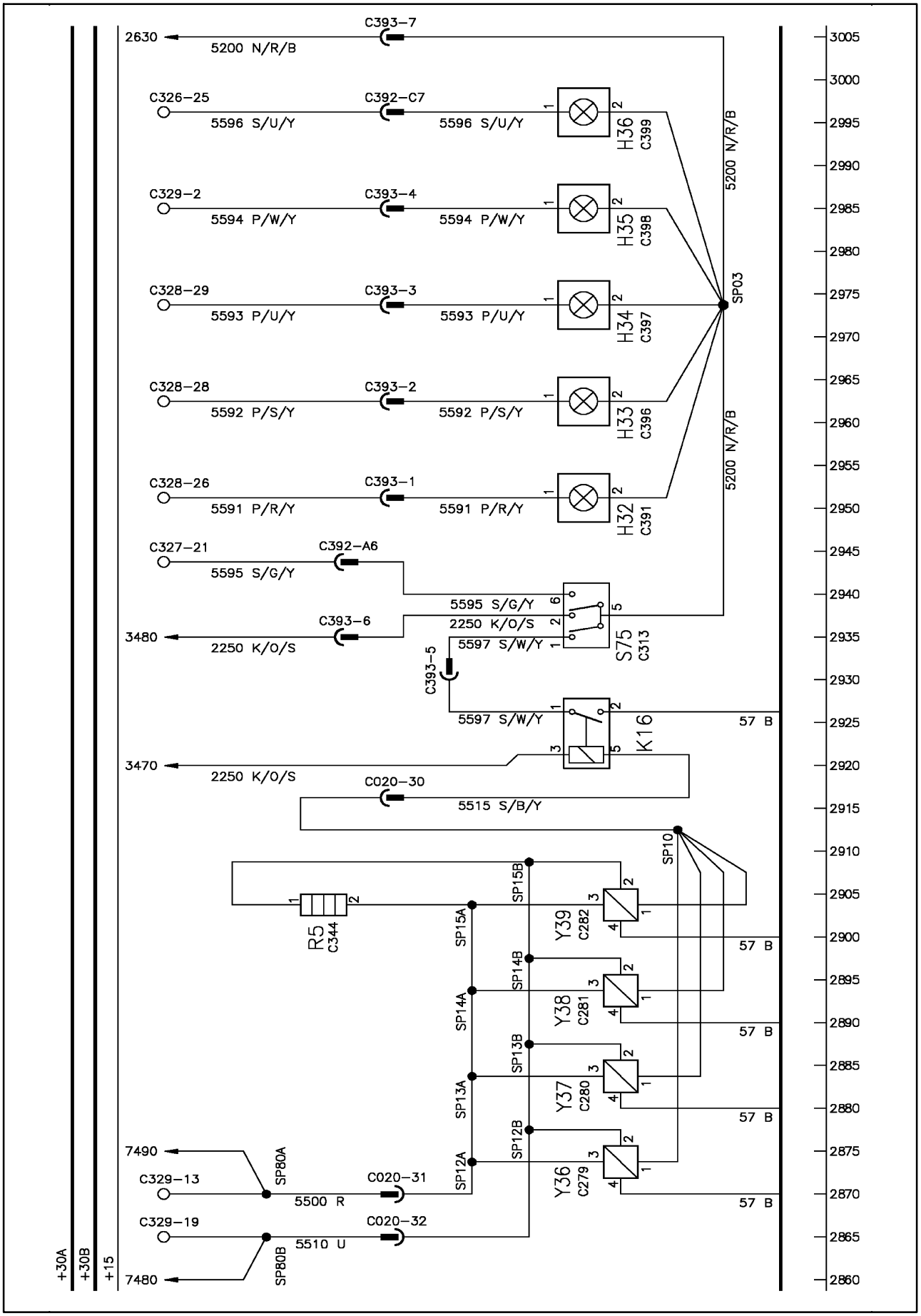
   C280 pin **1 (S/B/Y)** and **ground**

   C280 pin **2 (U)** and **ground**

   C280 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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R5 C344
SP15B
SP15A
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
SP80B
7480
+30A
+30B
+15
3005
3000
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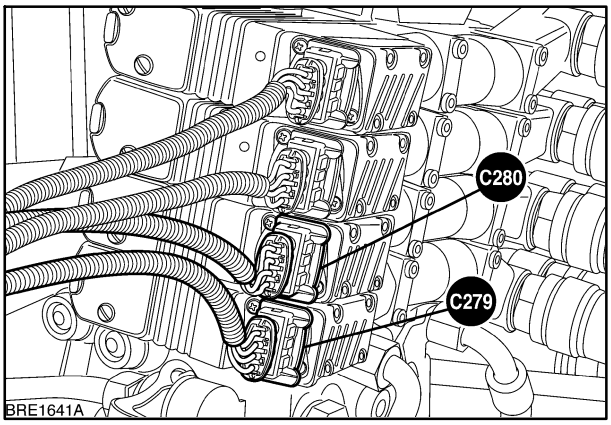
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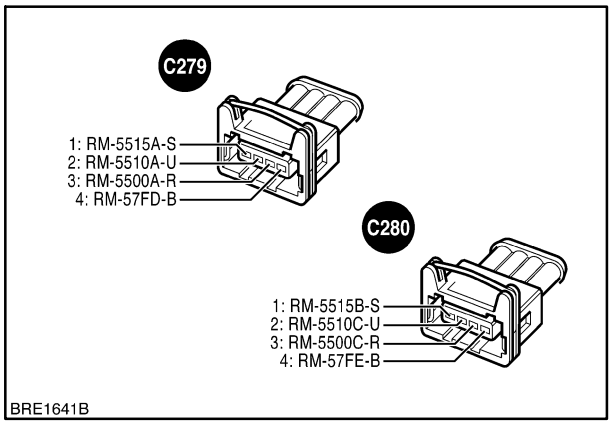
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3: RM-5500A-R
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3: RM-5500C-R
4: RM-57FE-B
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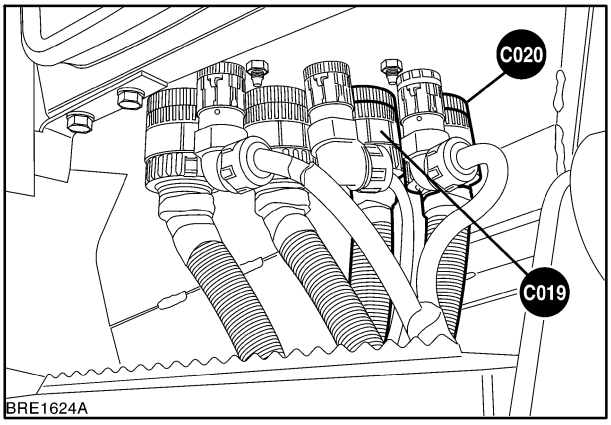
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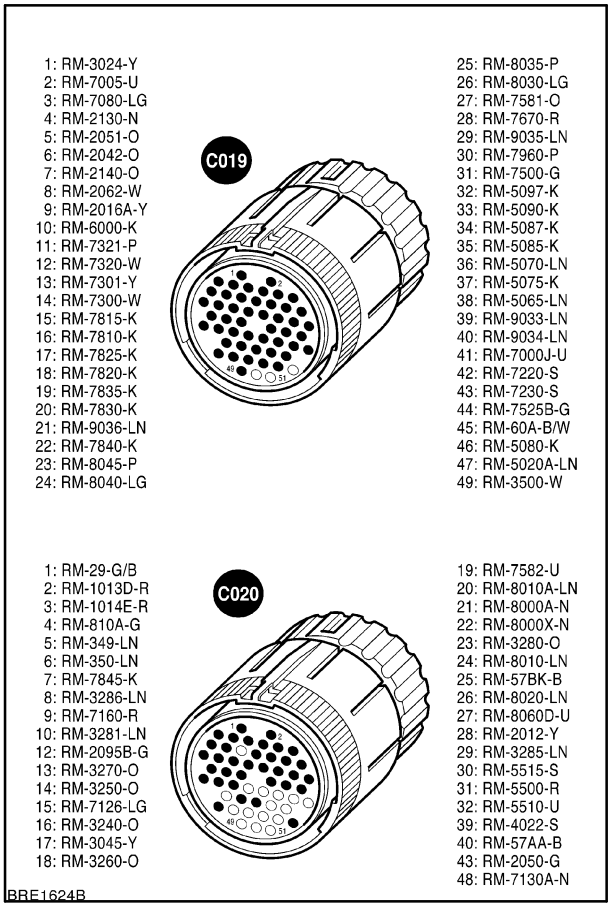
C019
BRE1624A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3: RM-7080-LG
4: RM-2130-N
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6: RM-2042-O
7: RM-2140-O
8: RM-2062-W
9: RM-2016A-Y
10: RM-6000-K
11: RM-7321-P
12: RM-7320-W
13: RM-7301-Y
14: RM-7300-W
15: RM-7815-K
16: RM-7810-K
17: RM-7825-K
18: RM-7820-K
19: RM-7835-K
20: RM-7830-K
21: RM-9036-LN
22: RM-7840-K
23: RM-8045-P
24: RM-8040-LG
C019
25: RM-8035-P
26: RM-8030-LG
27: RM-7581-O
28: RM-7670-R
29: RM-9035-LN
30: RM-7960-P
31: RM-7500-G
32: RM-5097-K
33: RM-5090-K
34: RM-5087-K
35: RM-5085-K
36: RM-5070-LN
37: RM-5075-K
38: RM-5065-LN
39: RM-9033-LN
40: RM-9034-LN
41: RM-7000J-U
42: RM-7220-S
43: RM-7230-S
44: RM-7525B-G
45: RM-60A-B/W
46: RM-5080-K
47: RM-5020A-LN
49: RM-3500-W
1: RM-29-G/B
2: RM-1013D-R
3: RM-1014E-R
4: RM-810A-G
5: RM-349-LN
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14: RM-3250-O
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C020
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22: RM-8000X-N
23: RM-3280-O
24: RM-8010-LN
25: RM-57BK-B
26: RM-8020-LN
27: RM-8060D-U
28: RM-2012-Y
29: RM-3285-LN
30: RM-5515-S
31: RM-5500-R
32: RM-5510-U
39: RM-4022-S
40: RM-57AA-B
43: RM-2050-G
48: RM-7130A-N
BRE1624B

ERROR CODE 4115 - REMOTE NO.2 CONTROL MESSAGE NOT PLAUSIBLE

Possible failure modes:

1. Faulty connector
2. CAN BUS interference
3. Faulty harness
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C280**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the CAN BUS wires **(R)** and **(U)**.

   A. If the CAN BUS wires are not twisted together or free from possible interference, repair, re-position or replace the harness as required.

   B. If the CAN BUS wires are okay, continue to step 3.

3. Check for +12 Volts.

   A. Disconnect connector **C280**. Turn the keystart ON. Measure the voltage between connector **C280** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C280 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C280 pin **2 (U)** and **C020** pin **32 (U)**

   C280 pin **3 (R)** and **C020** pin **31 (R)**

   C280 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 5.

5. Check for a short to ground.

   A. Check between connector:

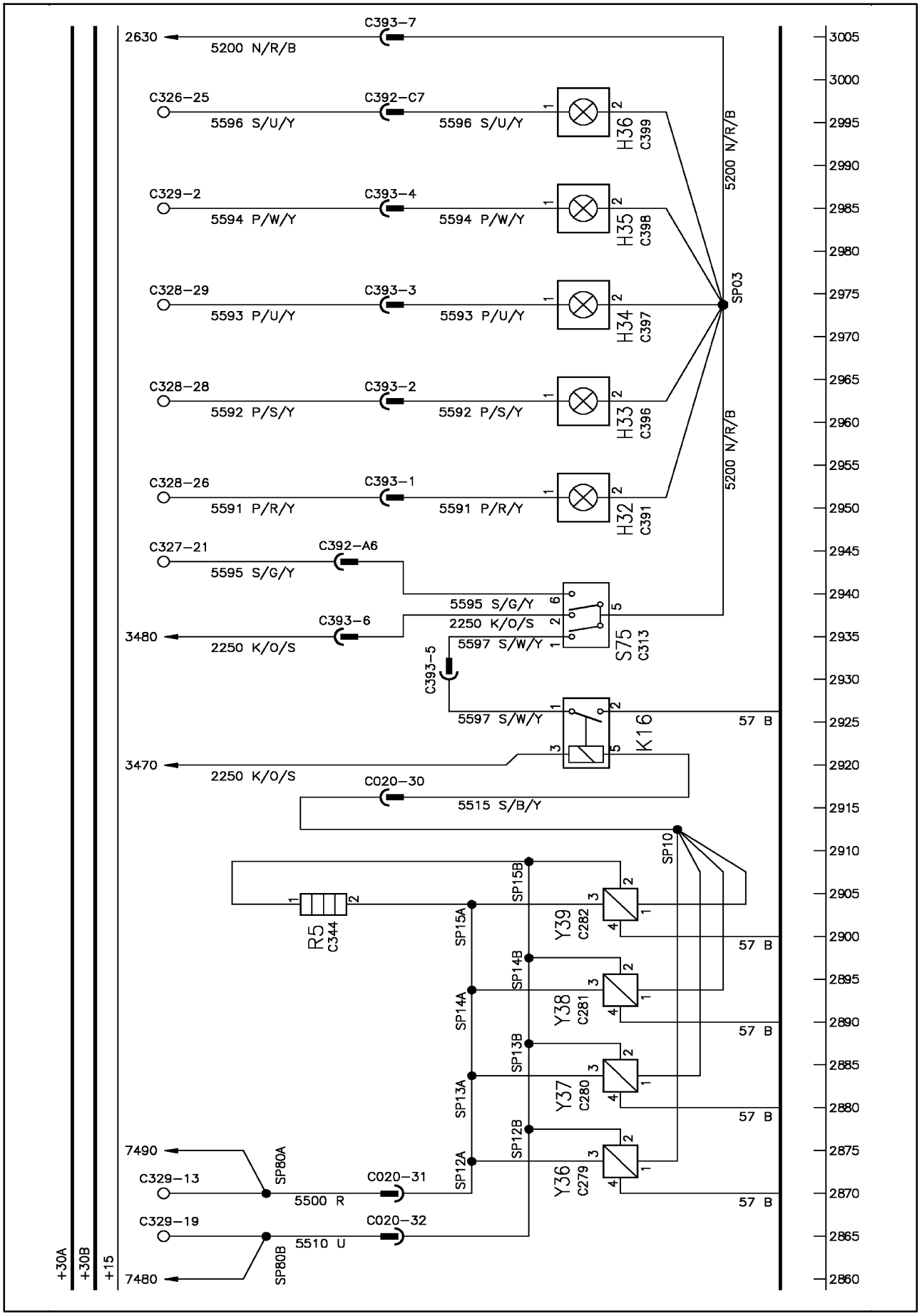
   C280 pin **1 (S/B/Y)** and **ground**

   C280 pin **2 (U)** and **ground**

   C280 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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H36 C399
C329-2
5594 P/W/Y
C393-4
5594 P/W/Y
H35 C398
C328-29
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C393-3
5593 P/U/Y
H34 C397
C328-28
5592 P/S/Y
C393-2
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H33 C396
C328-26
5591 P/R/Y
C393-1
5591 P/R/Y
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SP03
C327-21
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C392-A6
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C393-6
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C393-5
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K16
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C020-30
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SP15B
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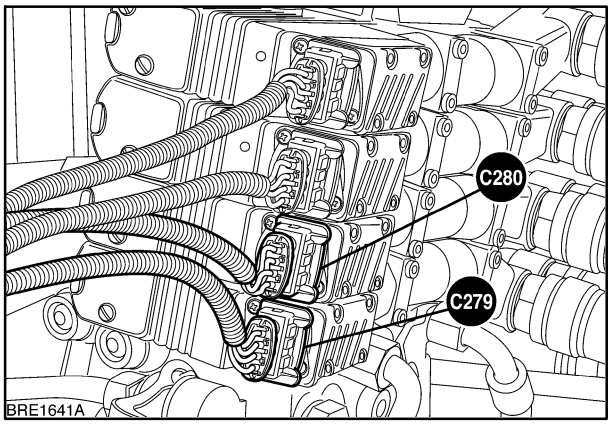

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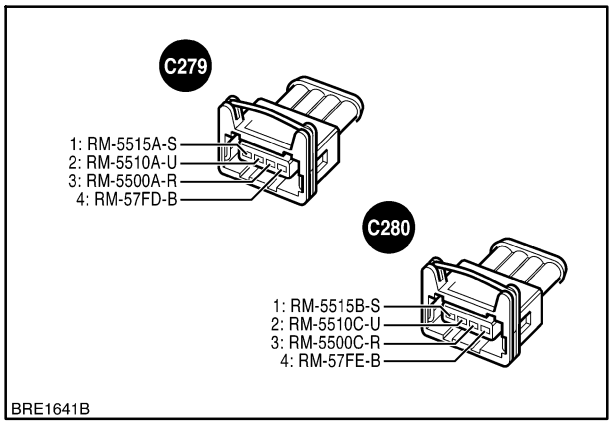

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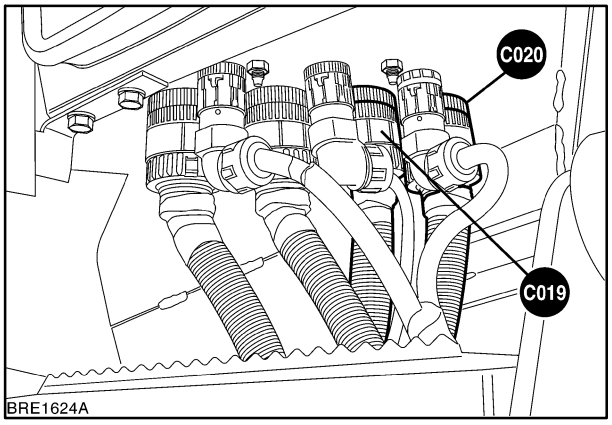

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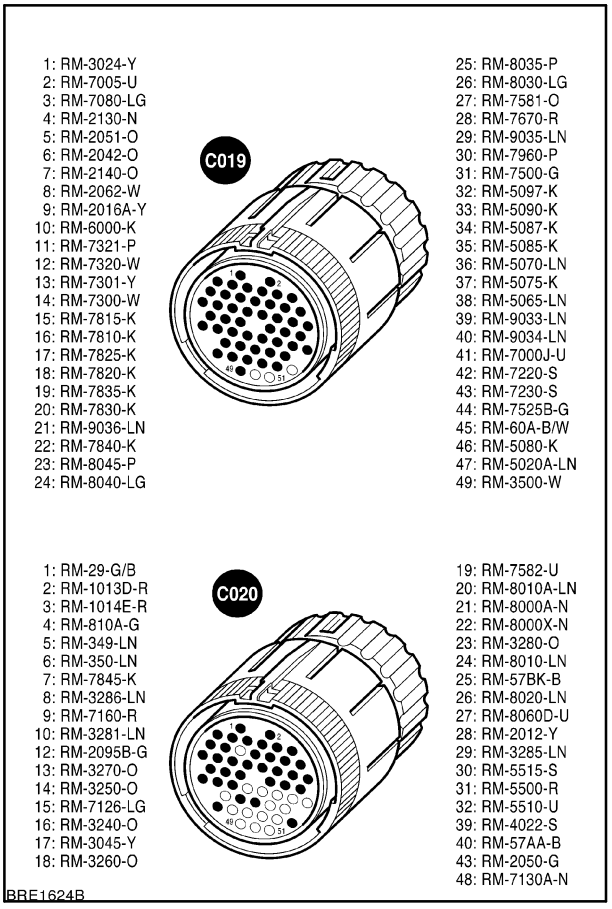


BRE1624B

ERROR CODE 4116 - REMOTE NO.2 EEPROM ERROR

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4117 - REMOTE NO.2 SWITCHED TO FAILSAFE

Cause:

Major fault detected within the EHR system. The EHR system is disabled until keystart OFF and fault cleared.

Possible failure modes:

1. Other EHR error code(s) detected
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation. If any other error codes are still displayed, continue to these tests.

   B. If only error code 4117 is still displayed, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4118 - REMOTE NO.2 UNDER VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C280**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C280**. Turn the keystart ON. Measure the voltage between connector **C280** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is less than approximately +8 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C280 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C280 pin **4 (B)** and **ground**

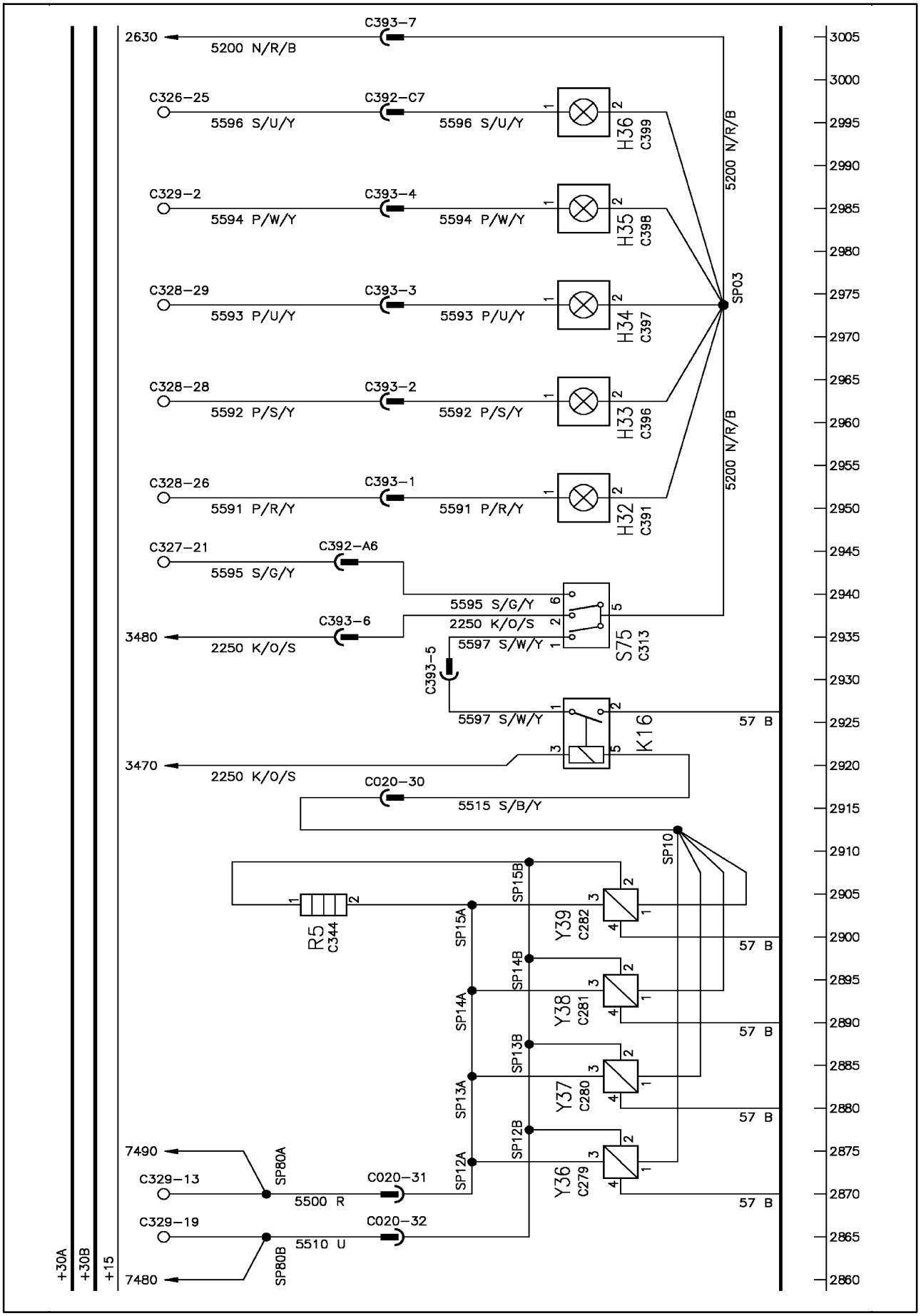
   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector **C280** pin **1 (S/B/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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2250 K/O/S
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S75 C313
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C393-5
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K16
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C020-30
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SP10
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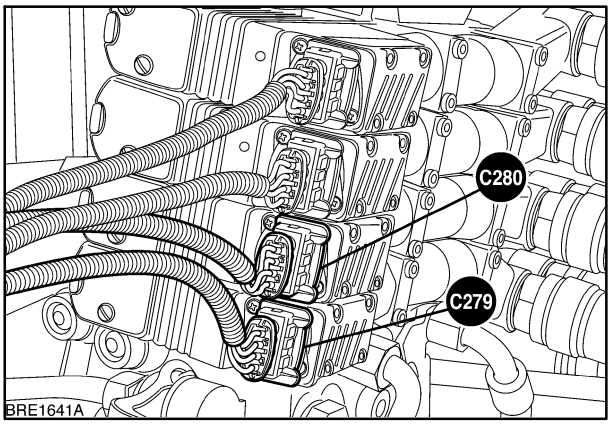

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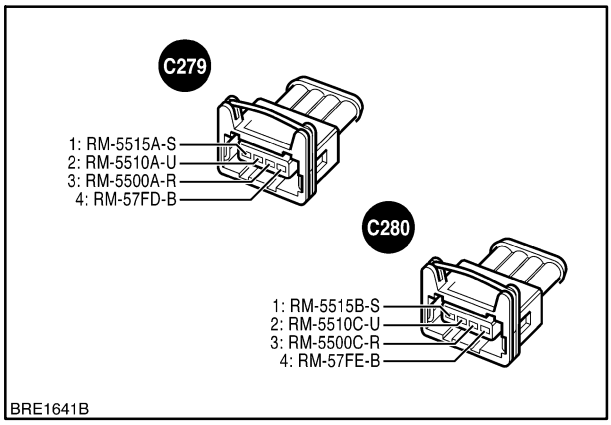

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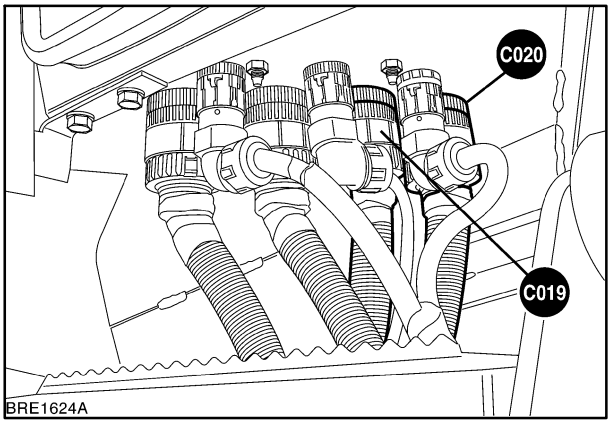

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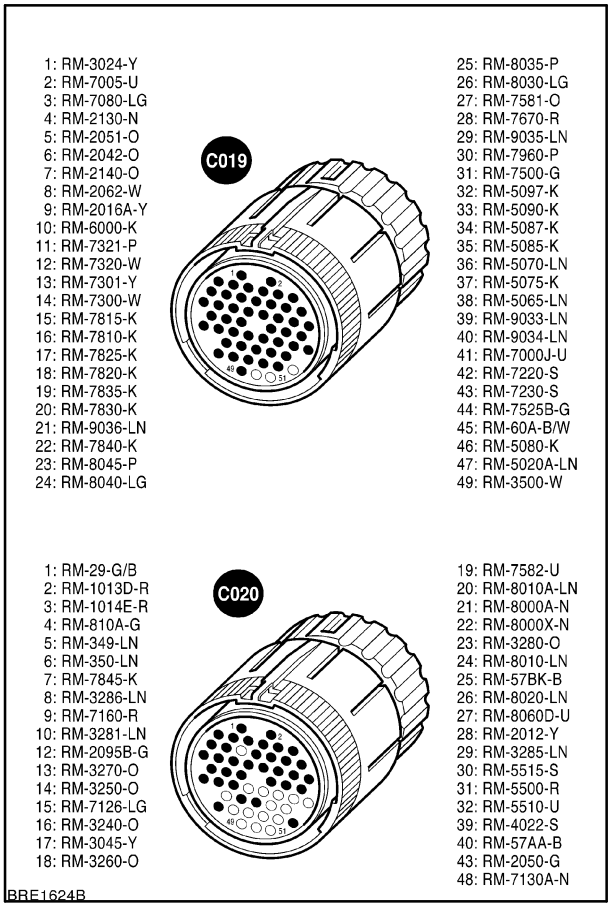


BRE1624B

ERROR CODE 4119 - REMOTE NO.2 OVER VOLTAGE

Possible failure modes:

1. External power supply connected
2. Faulty charging system
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check that the tractor battery power supply has not been connected to an external power supply.

   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.

   B. If an external power supply is not connected to the tractor, continue to step 2.

2. Check the battery voltage.

   A. Start the engine and run at 2000 rev/min. Measure the battery voltage. If the voltage indicated is greater than approximately +15 Volts, continue to test for a fault in the charging system.

   B. If the voltage indicated is between approximately +9 Volts and +15 Volts, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.

ERROR CODE 4120 - REMOTE NO.2 SPOOL MOVEMENT TOO LOW

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4121 - REMOTE NO.2 SPOOL MOVEMENT TOO HIGH

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4122 – REMOTE NO.2 FLOAT POSITION NOT REACHED

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re–occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4123 - REMOTE NO.2 MANUALLY OPERATED

Cause:

EHR remote valve spool movement has been detected with no control message sent from the controller.

Possible failure modes:

1. Remote valve manually operated
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Calibrate the EHR lever.
   A. Perform the EHR lever calibration procedure and test the system for normal operation.
   B. If the fault is still present, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4124 - REMOTE NO.2 DRIVER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.

3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.

4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4125 - REMOTE NO.2 POTENTIOMETER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4126 - REMOTE NO.2 UNABLE TO REACH NEUTRAL

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.
2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.
3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.
4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4127 - REMOTE NO.2 SPOOL NOT IN NEUTRAL AT KEY ON

Possible failure modes:

1. Keystart switched off during EHR valve operation
2. Incorrect hydraulic pressure
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4128 – REMOTE NO.3 NO CONTROL MESSAGE RECEIVED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C281**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C281**. Turn the keystart ON. Measure the voltage between connector **C281** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C281 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C281 pin **2 (U)** and **C020** pin **32 (U)**

   C281 pin **3 (R)** and **C020** pin **31 (R)**

   C281 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

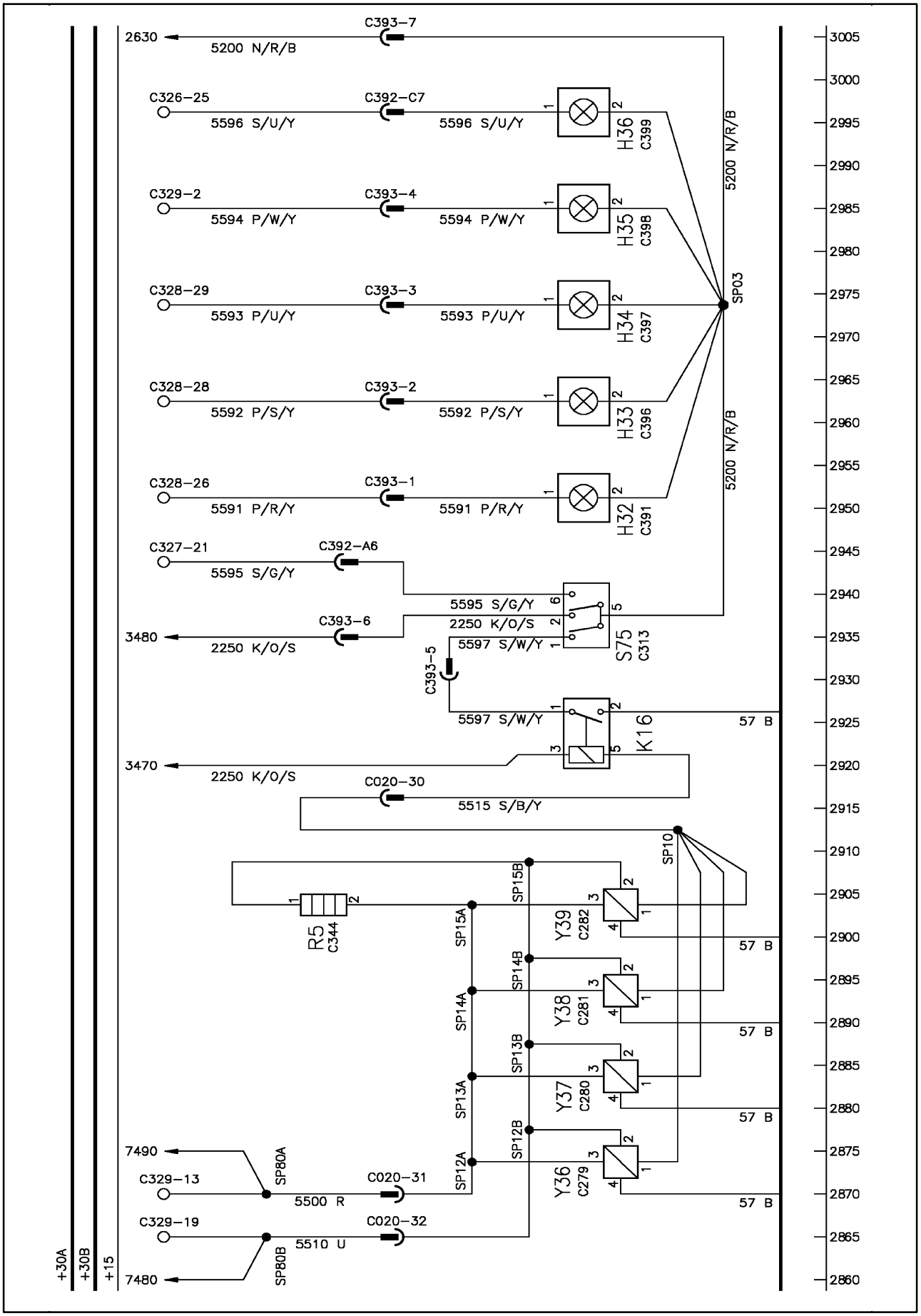
   C281 pin **1 (S/B/Y)** and **ground**

   C281 pin **2 (U)** and **ground**

   C281 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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SP14B
SP14A
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SP13B
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SP12B
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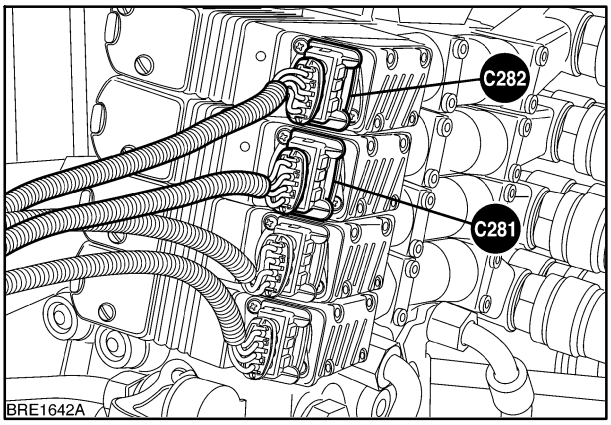

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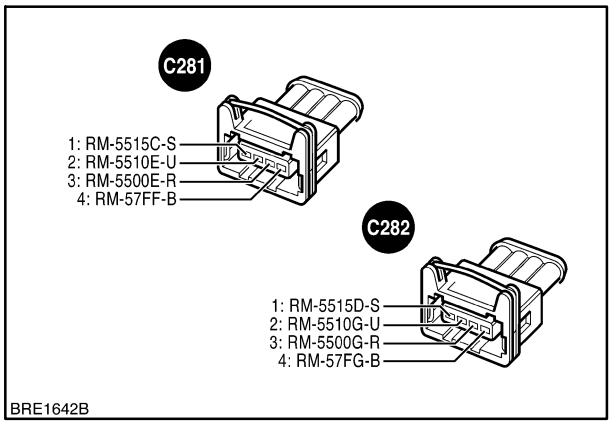

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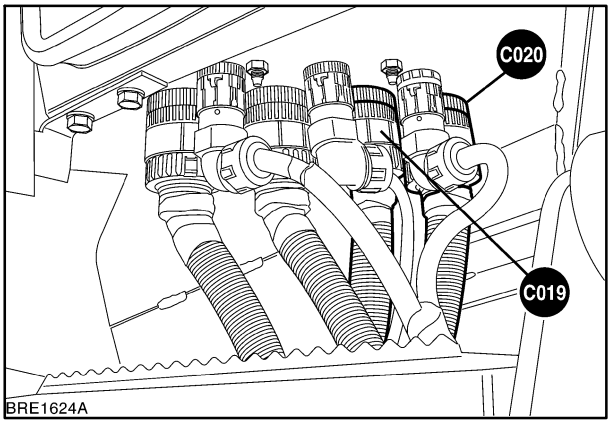

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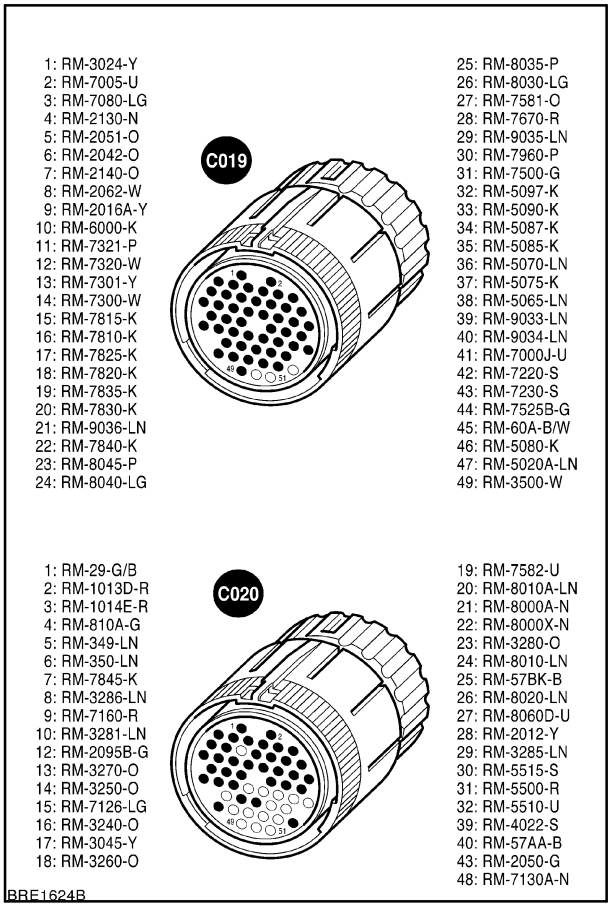


BRE1624B

ERROR CODE 4129 - REMOTE NO.3 CONTROL MESSAGE NOT PLAUSIBLE

Possible failure modes:

1. Faulty connector
2. CAN BUS interference
3. Faulty harness
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C281**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the CAN BUS wires **(R)** and **(U)**.

   A. If the CAN BUS wires are not twisted together or free from possible interference, repair, re-position or replace the harness as required.

   B. If the CAN BUS wires are okay, continue to step 3.

3. Check for +12 Volts.

   A. Disconnect connector **C281**. Turn the keystart ON. Measure the voltage between connector **C281** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C281 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C281 pin **2 (U)** and **C020** pin **32 (U)**

   C281 pin **3 (R)** and **C020** pin **31 (R)**

   C281 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 5.

5. Check for a short to ground.

   A. Check between connector:

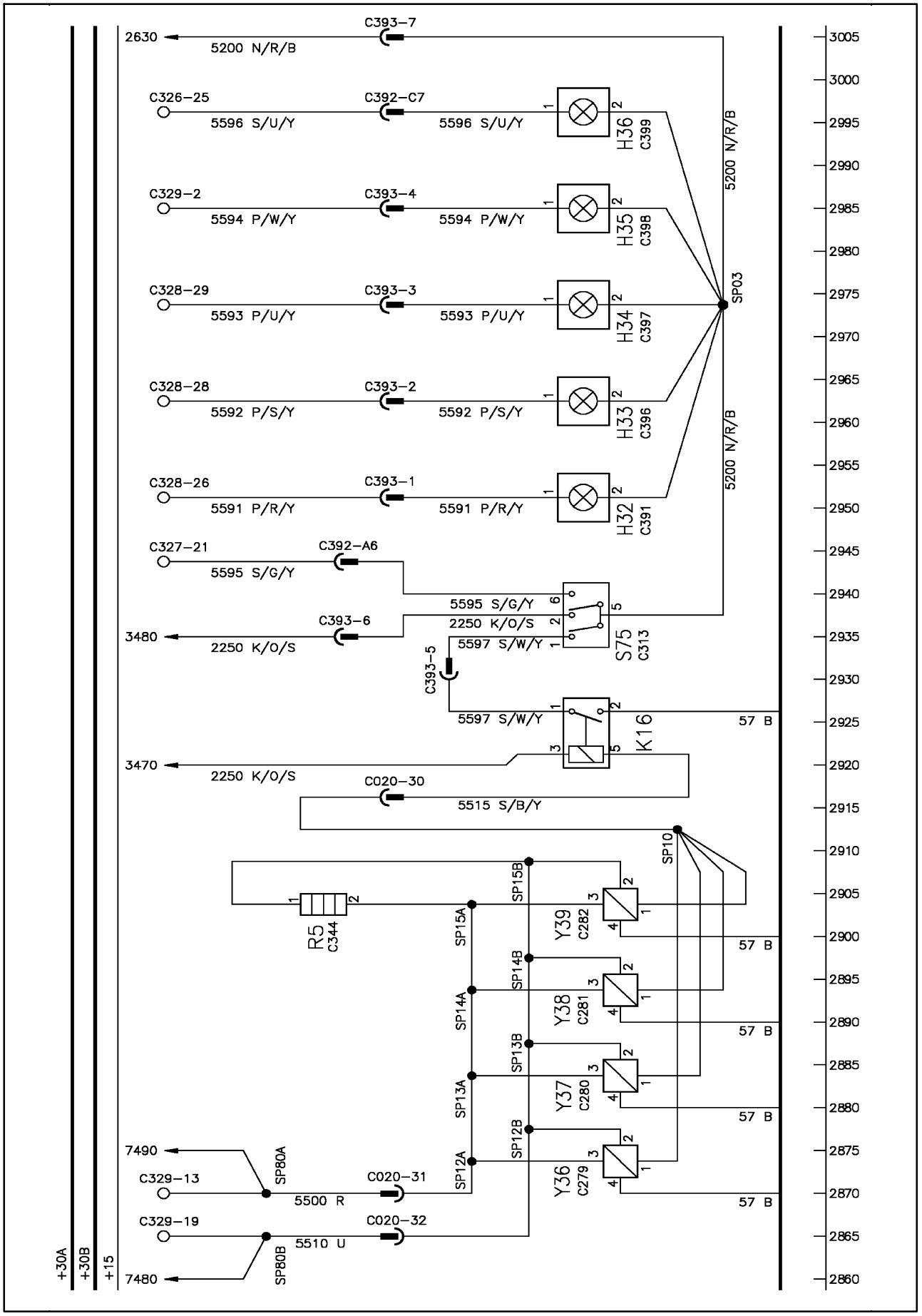
   C281 pin **1 (S/B/Y)** and **ground**

   C281 pin **2 (U)** and **ground**

   C281 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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C328-26
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SP03
5200 N/R/B
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2250 K/O/S
5597 S/W/Y
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SP10
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SP13A
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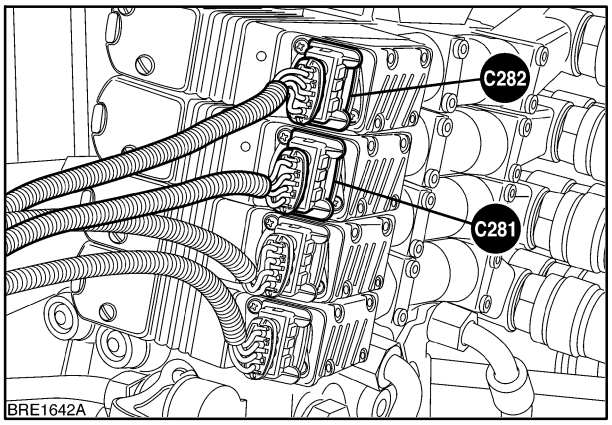

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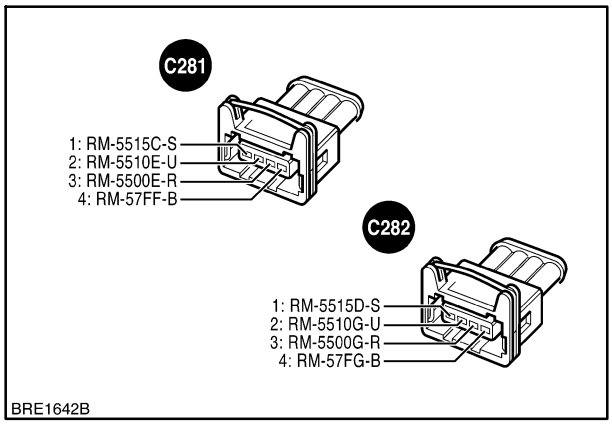

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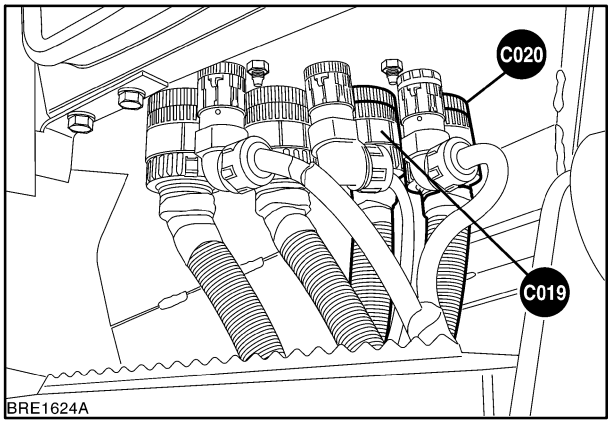

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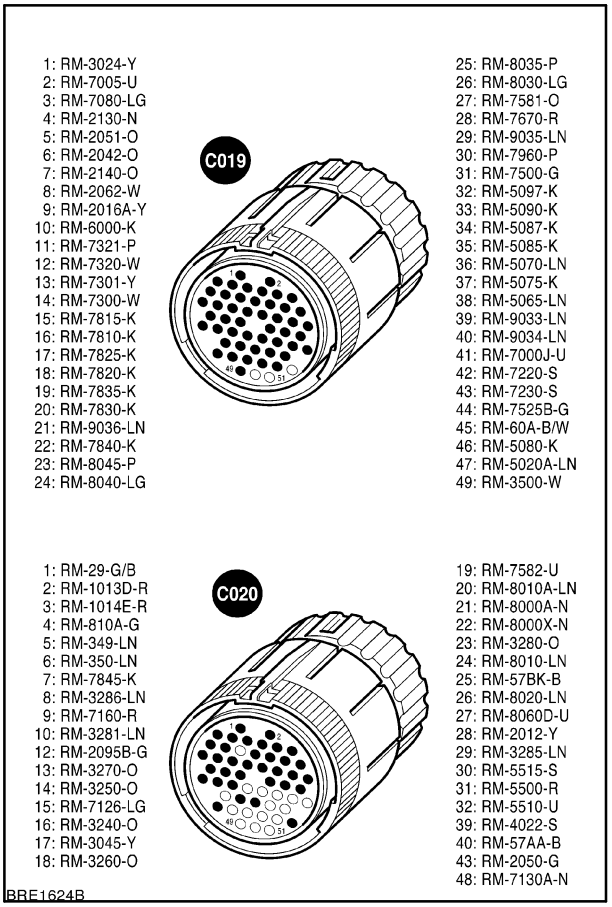


BRE1624B

ERROR CODE 4130 - REMOTE NO.3 EEPROM ERROR

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4131 - REMOTE NO.3 SWITCHED TO FAILSAFE

Cause:

Major fault detected within the EHR system. The EHR system is disabled until keystart OFF and fault cleared.

Possible failure modes:

1. Other EHR error code(s) detected
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation. If any other error codes are still displayed, continue to these tests.

   B. If only error code 4131 is still displayed, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4132 - REMOTE NO.3 UNDER VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C281**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C281**. Turn the keystart ON. Measure the voltage between connector **C281** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is less than approximately +8 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C281 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C281 pin **4 (B)** and **ground**

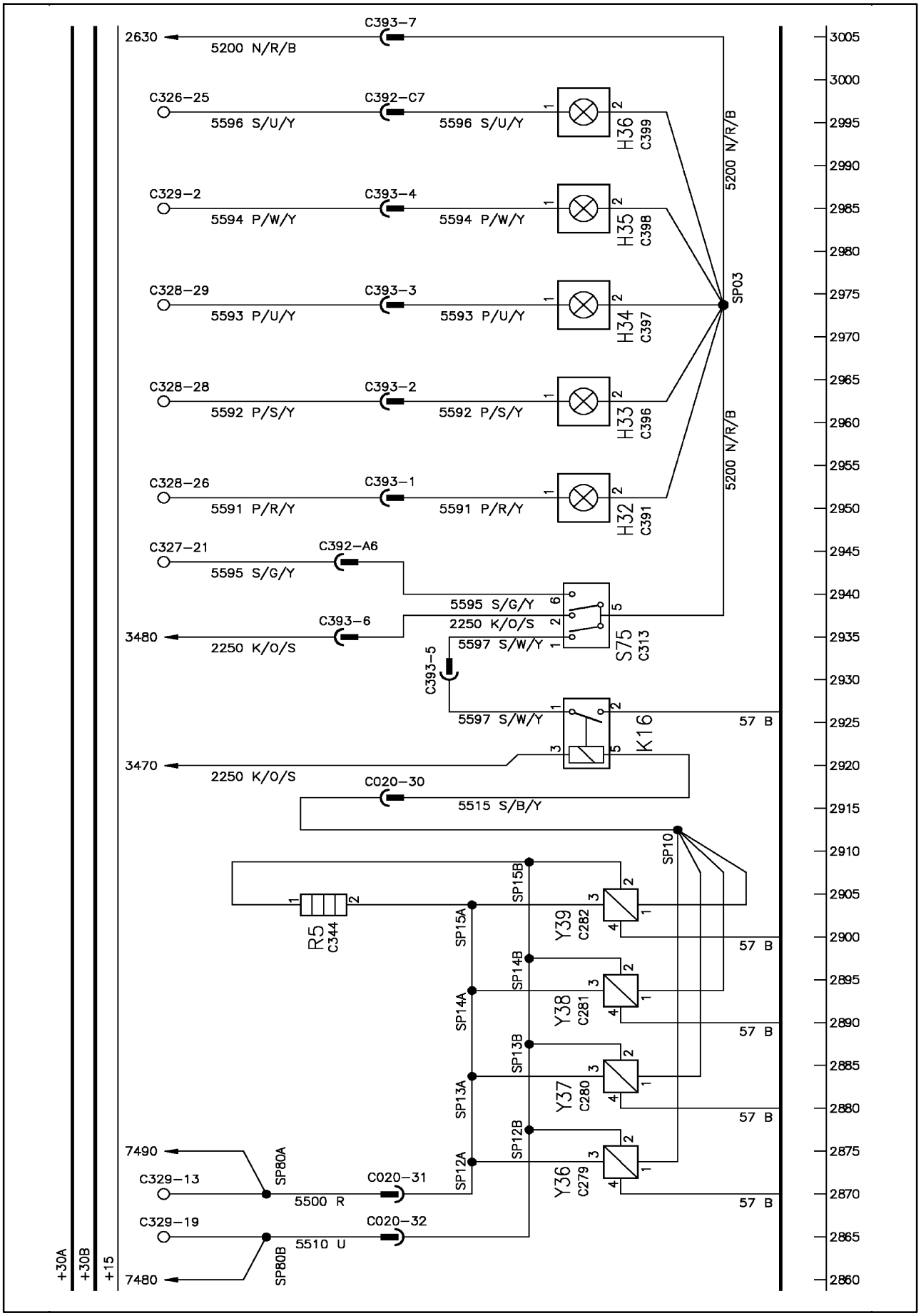
   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector **C281** pin **1 (S/B/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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C392-A6
5595 S/G/Y
5595 S/G/Y
2250 K/O/S
5597 S/W/Y
S75 C313
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C393-5
5597 S/W/Y
K16
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3470
2250 K/O/S
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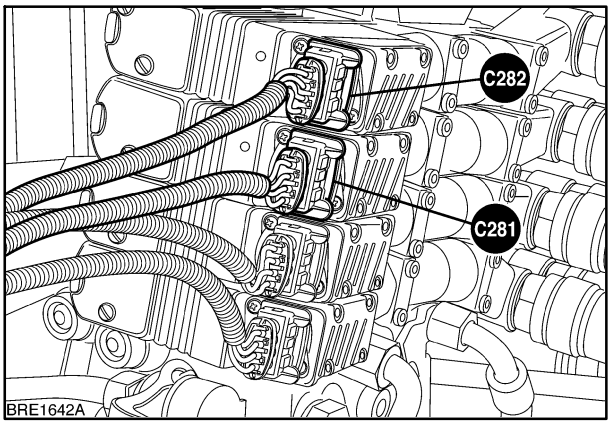

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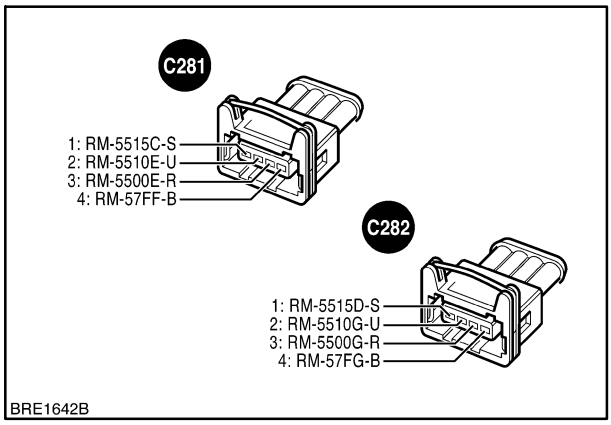

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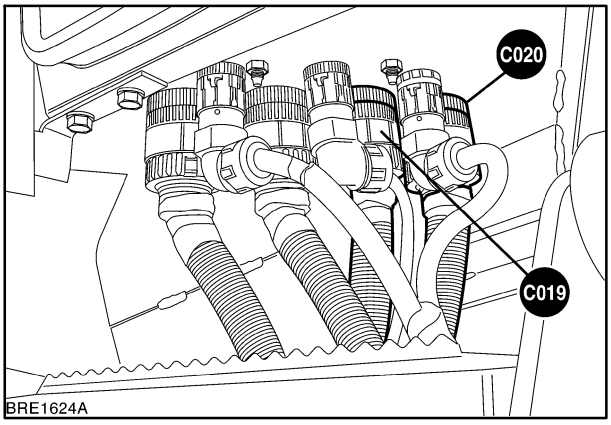

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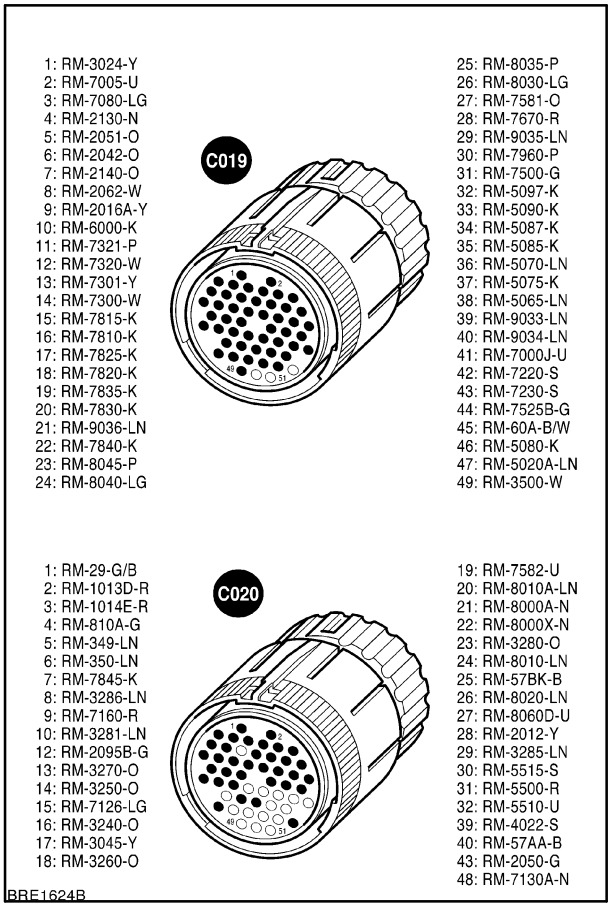


BRE1624B

ERROR CODE 4133 - REMOTE NO.3 OVER VOLTAGE

Possible failure modes:

1. External power supply connected
2. Faulty charging system
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check that the tractor battery power supply has not been connected to an external power supply.

   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.

   B. If an external power supply is not connected to the tractor, continue to step 2.

2. Check the battery voltage.

   A. Start the engine and run at 2000 rev/min. Measure the battery voltage. If the voltage indicated is greater than approximately +15 Volts, continue to test for a fault in the charging system.

   B. If the voltage indicated is between approximately +9 Volts and +15 Volts, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.

ERROR CODE 4134 - REMOTE NO.3 SPOOL MOVEMENT TOO LOW

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4135 - REMOTE NO.3 SPOOL MOVEMENT TOO HIGH

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4136 – REMOTE NO.3 FLOAT POSITION NOT REACHED

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re–occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4137 - REMOTE NO.3 MANUALLY OPERATED

Cause:

EHR remote valve spool movement has been detected with no control message sent from the controller.

Possible failure modes:

1. Remote valve manually operated
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Calibrate the EHR lever.
   A. Perform the EHR lever calibration procedure and test the system for normal operation.
   B. If the fault is still present, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4138 - REMOTE NO.3 DRIVER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.

3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.

4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4139 - REMOTE NO.3 POTENTIOMETER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4140 - REMOTE NO.3 UNABLE TO REACH NEUTRAL

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.
2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.
3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.
4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4141 - REMOTE NO.3 SPOOL NOT IN NEUTRAL AT KEY ON

Possible failure modes:

1. Keystart switched off during EHR valve operation
2. Incorrect hydraulic pressure
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4142 – REMOTE NO.4 NO CONTROL MESSAGE RECEIVED

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C282**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C282**. Turn the keystart ON. Measure the voltage between connector **C282** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C282 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C282 pin **2 (U)** and **C020** pin **32 (U)**

   C282 pin **3 (R)** and **C020** pin **31 (R)**

   C282 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

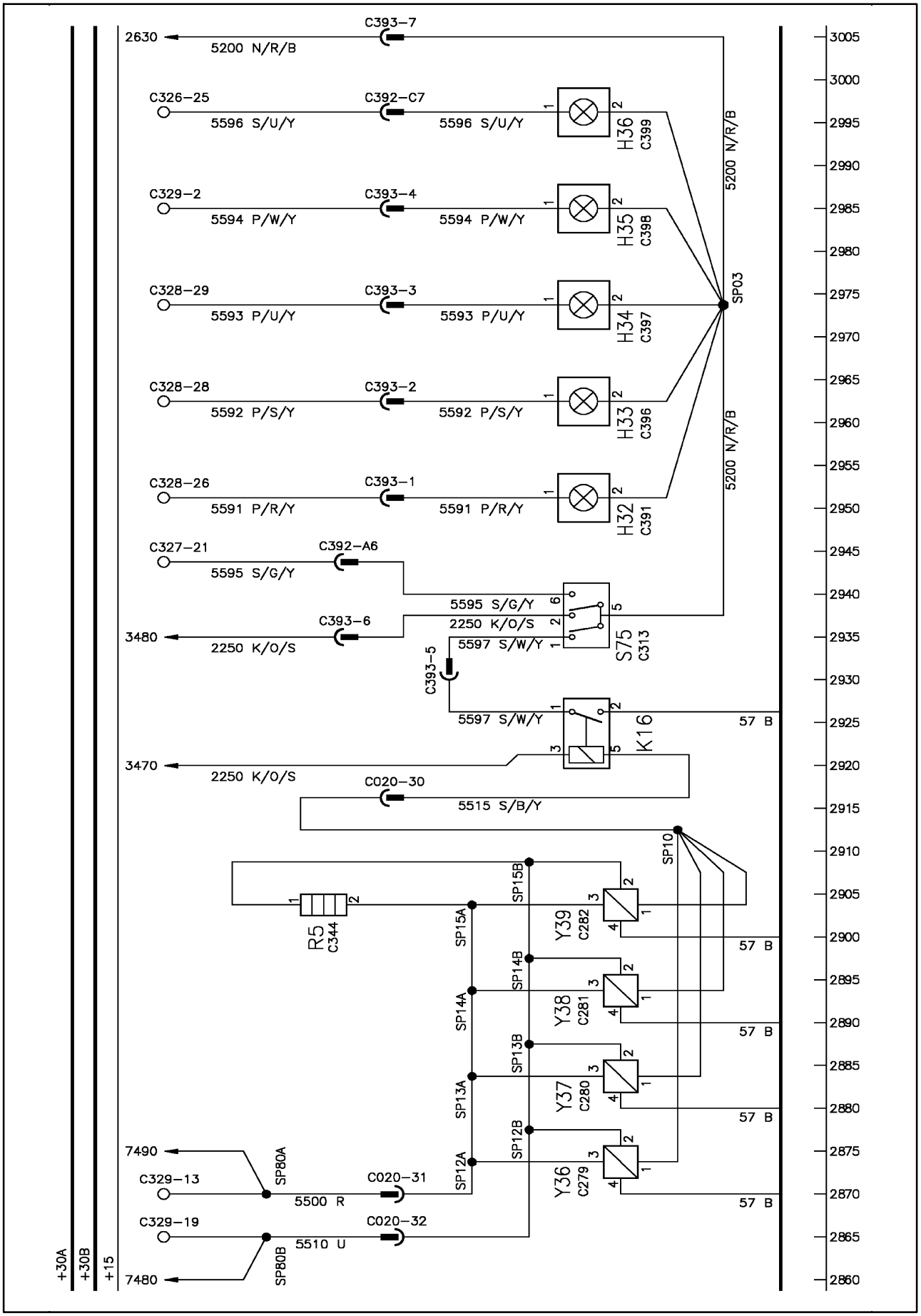
   C282 pin **1 (S/B/Y)** and **ground**

   C282 pin **2 (U)** and **ground**

   C282 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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C328-26
C393-1
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H32 C391
SP03
C327-21
C392-A6
5595 S/G/Y
3480
C393-6
2250 K/O/S
5597 S/W/Y
S75 C313
C393-5
K16
57 B
3470
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
SP14B
SP14A
Y38 C281
SP13B
SP13A
Y37 C280
SP12B
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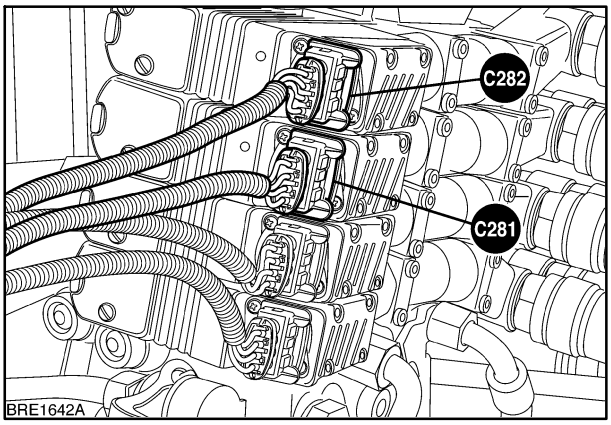

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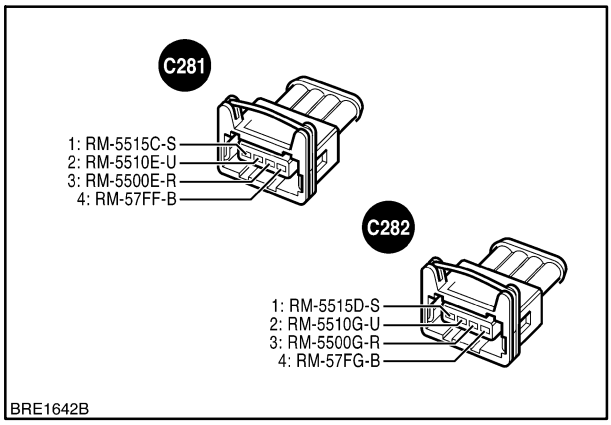

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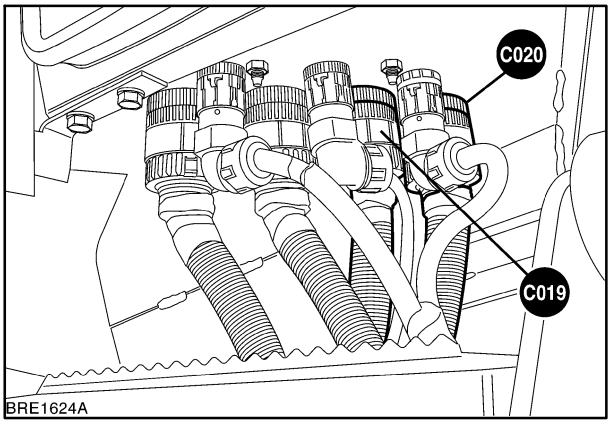

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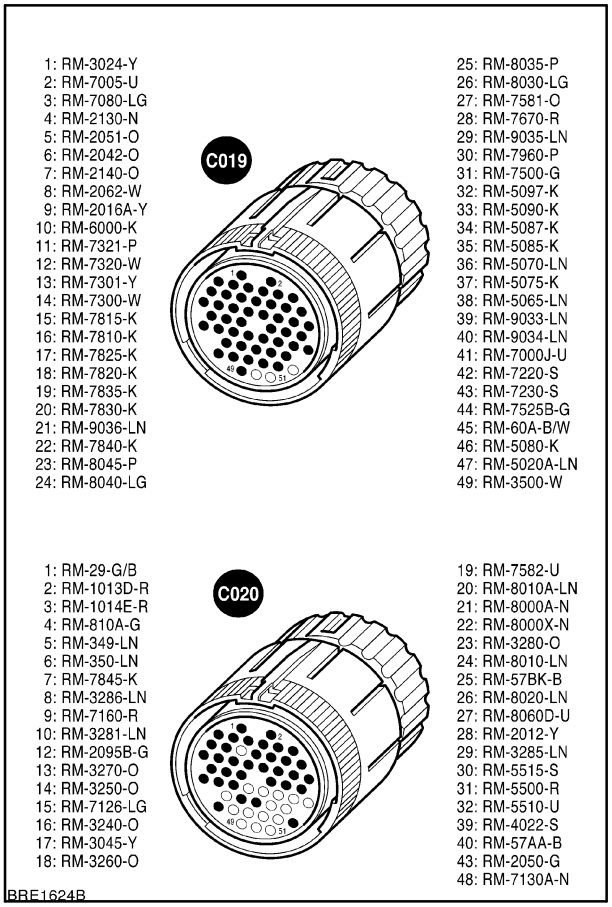


BRE1624B

ERROR CODE 4143 - REMOTE NO.4 CONTROL MESSAGE NOT PLAUSIBLE

Possible failure modes:

1. Faulty connector
2. CAN BUS interference
3. Faulty harness
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C282**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the CAN BUS wires **(R)** and **(U)**.

   A. If the CAN BUS wires are not twisted together or free from possible interference, repair, re-position or replace the harness as required.

   B. If the CAN BUS wires are okay, continue to step 3.

3. Check for +12 Volts.

   A. Disconnect connector **C282**. Turn the keystart ON. Measure the voltage between connector **C282** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C282 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C282 pin **2 (U)** and **C020** pin **32 (U)**

   C282 pin **3 (R)** and **C020** pin **31 (R)**

   C282 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 5.

5. Check for a short to ground.

   A. Check between connector:

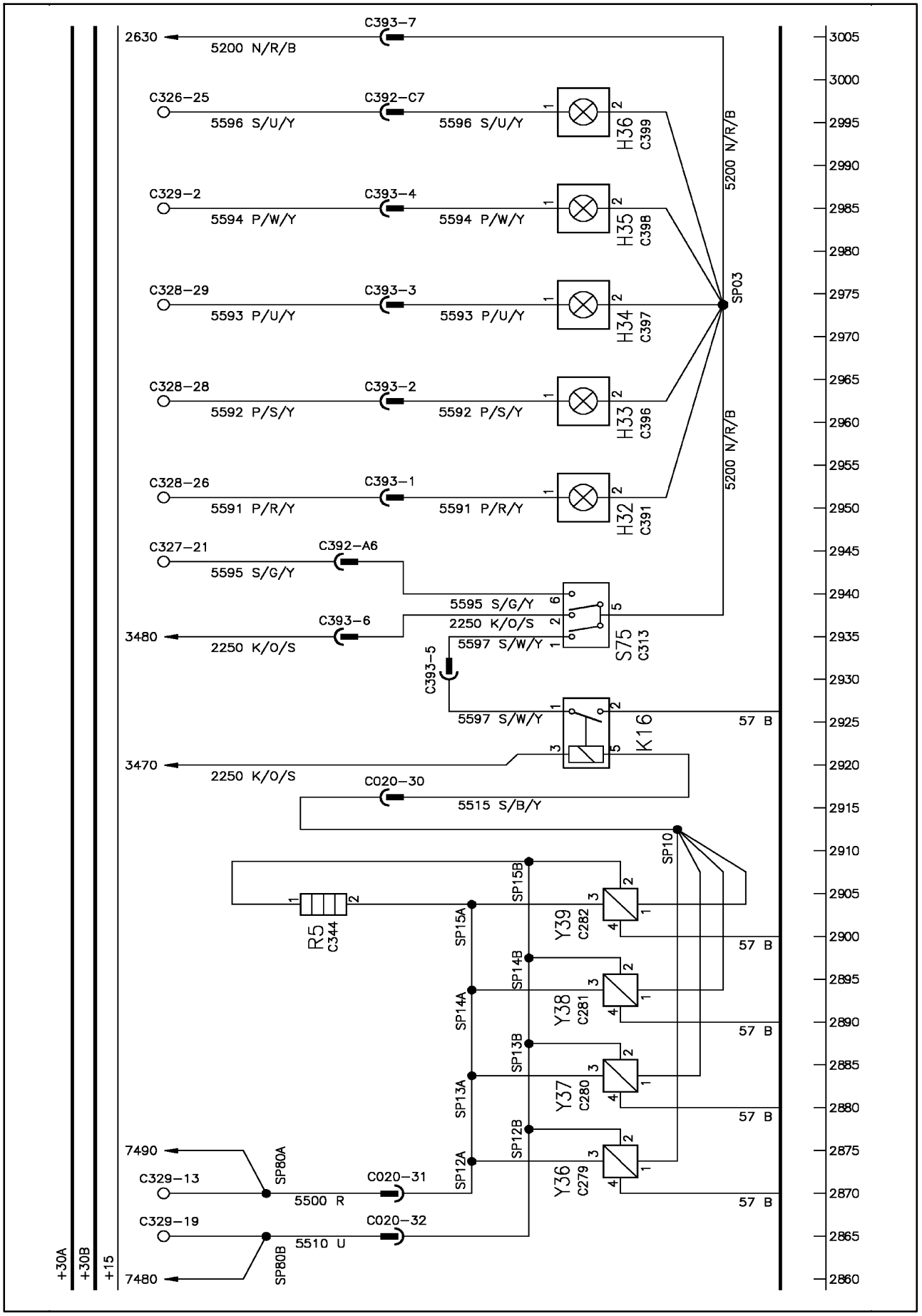
   C282 pin **1 (S/B/Y)** and **ground**

   C282 pin **2 (U)** and **ground**

   C282 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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C393-4
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C328-26
5591 P/R/Y
C393-1
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SP03
C327-21
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C392-A6
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C393-6
S75 C313
C393-5
5597 S/W/Y
K16
57 B
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
SP14B
SP14A
Y38 C281
SP13B
SP13A
Y37 C280
SP12B
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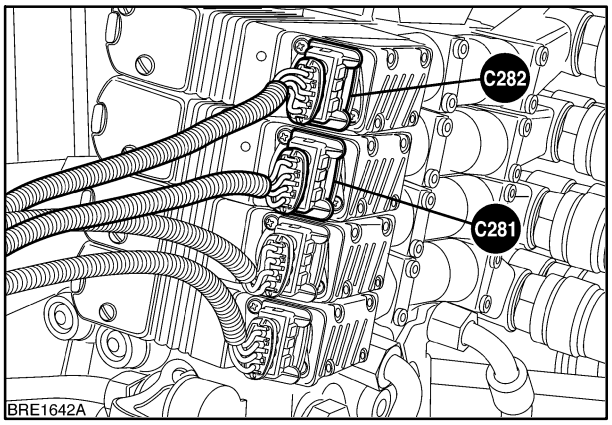

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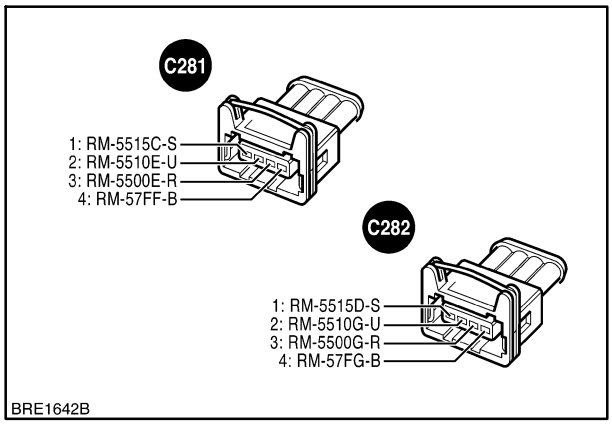

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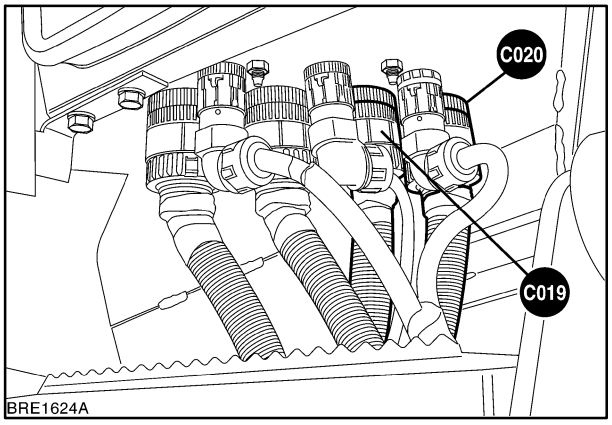

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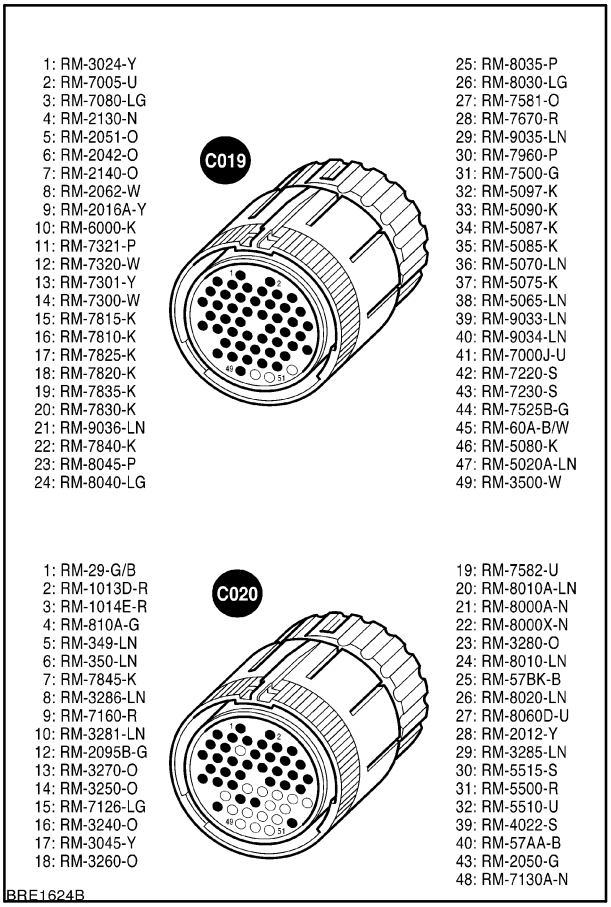


BRE1624B

ERROR CODE 4144 - REMOTE NO.4 EEPROM ERROR

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4145 - REMOTE NO.4 SWITCHED TO FAILSAFE

Cause:

Major fault detected within the EHR system. The EHR system is disabled until keystart OFF and fault cleared.

Possible failure modes:

1. Other EHR error code(s) detected
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation. If any other error codes are still displayed, continue to these tests.

   B. If only error code 4145 is still displayed, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4146 - REMOTE NO.4 UNDER VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C282**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C282**. Turn the keystart ON. Measure the voltage between connector **C282** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is less than approximately +8 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C282 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C282 pin **4 (B)** and **ground**

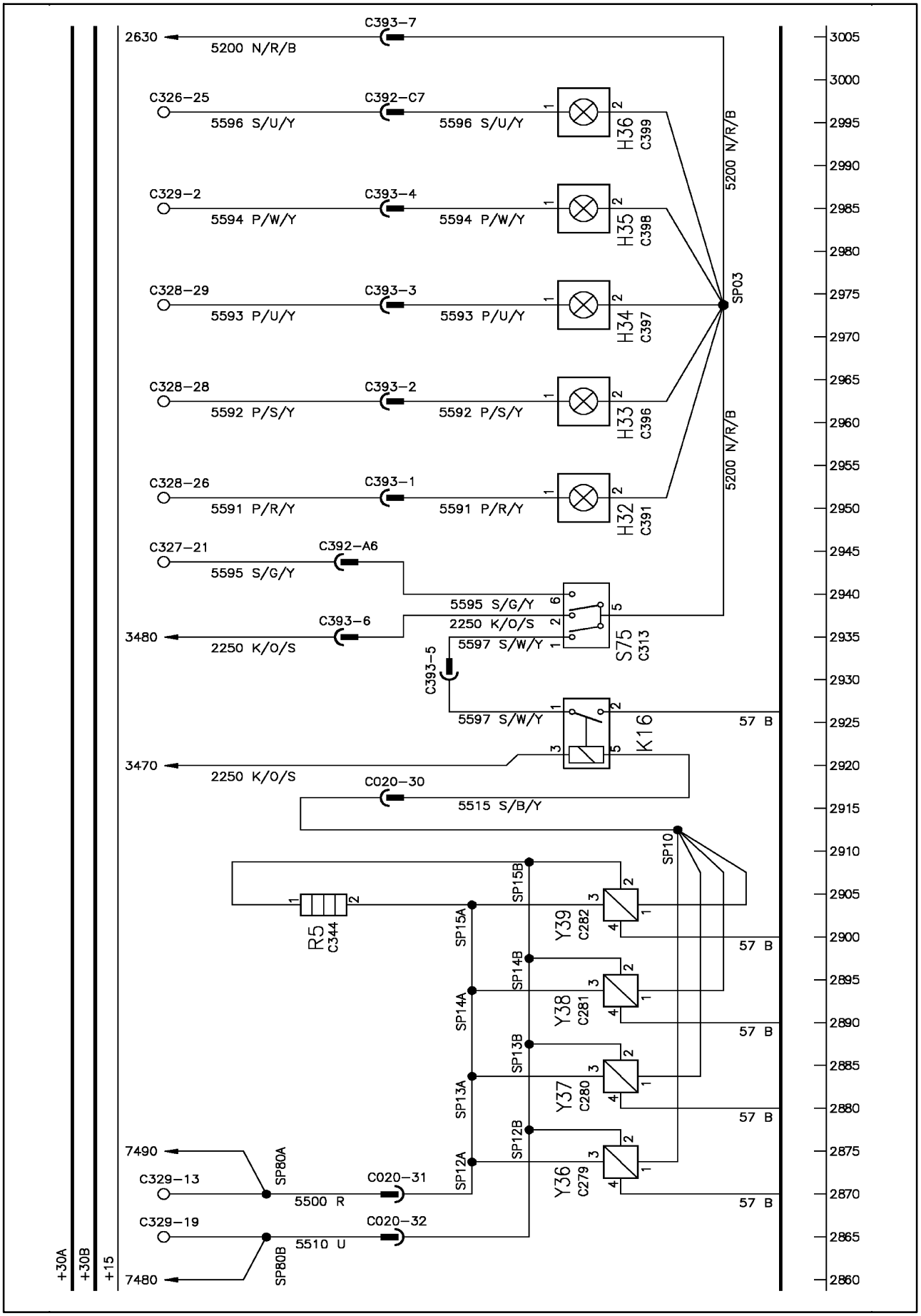
   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector **C282** pin **1 (S/B/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.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C326-25
C392-C7
5596 S/U/Y
H36 C399
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C393-4
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5597 S/W/Y
S75 C313
C393-5
K16
57 B
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C020-30
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SP10
R5 C344
SP15B
SP15A
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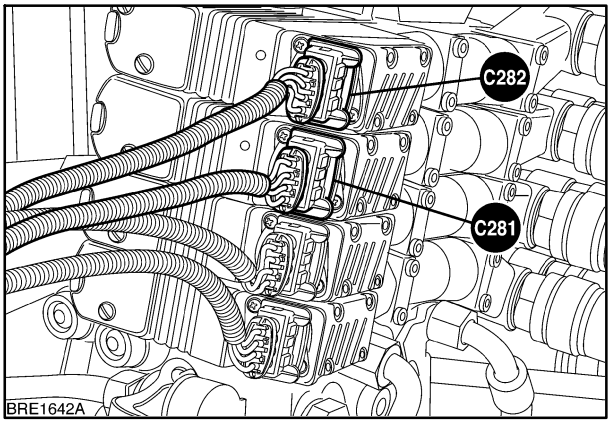

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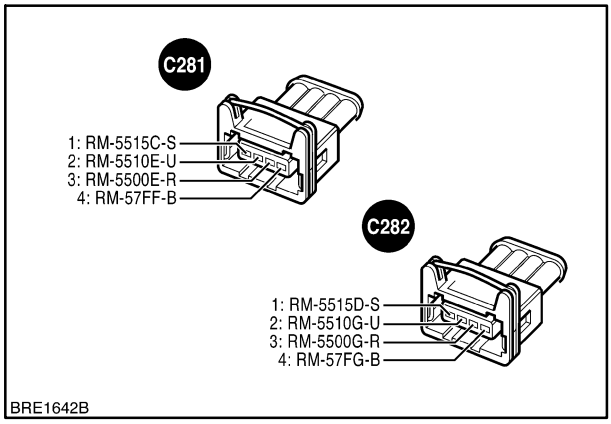

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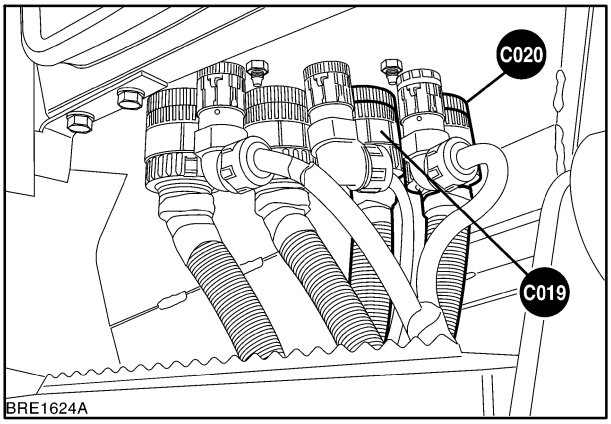

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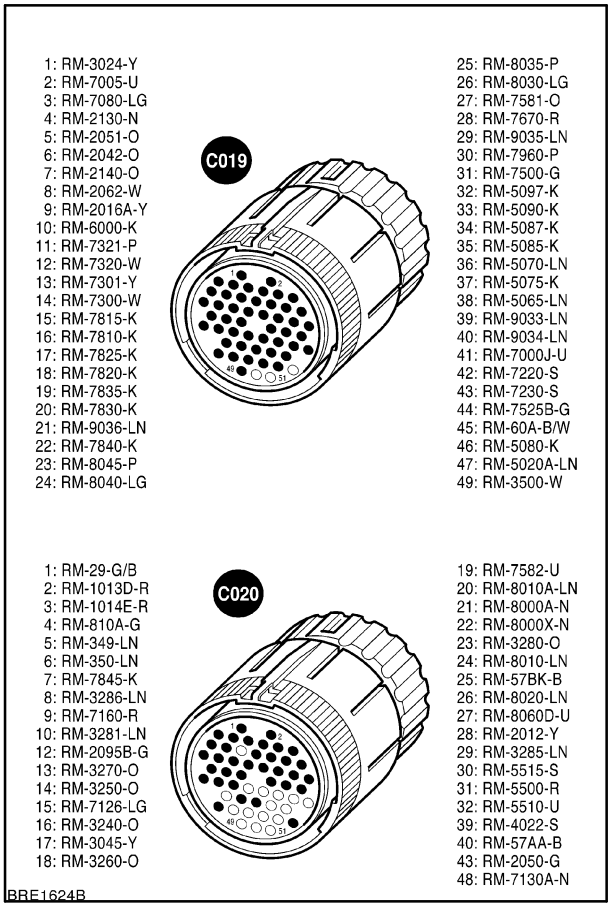


BRE1624B

ERROR CODE 4147 - REMOTE NO.4 OVER VOLTAGE

Possible failure modes:

1. External power supply connected
2. Faulty charging system
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check that the tractor battery power supply has not been connected to an external power supply.

   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.

   B. If an external power supply is not connected to the tractor, continue to step 2.

2. Check the battery voltage.

   A. Start the engine and run at 2000 rev/min. Measure the battery voltage. If the voltage indicated is greater than approximately +15 Volts, continue to test for a fault in the charging system.

   B. If the voltage indicated is between approximately +9 Volts and +15 Volts, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.

ERROR CODE 4148 - REMOTE NO.4 SPOOL MOVEMENT TOO LOW

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4149 - REMOTE NO.4 SPOOL MOVEMENT TOO HIGH

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4150 – REMOTE NO.4 FLOAT POSITION NOT REACHED

Possible failure modes:

1. Incorrect hydraulic pressure
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re–occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4151 - REMOTE NO.4 MANUALLY OPERATED

Cause:

EHR remote valve spool movement has been detected with no control message sent from the controller.

Possible failure modes:

1. Remote valve manually operated
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Calibrate the EHR lever.
   A. Perform the EHR lever calibration procedure and test the system for normal operation.
   B. If the fault is still present, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4152 - REMOTE NO.4 DRIVER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.
2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.
3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.
4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4153 - REMOTE NO.4 POTENTIOMETER FAULTY

Possible failure modes:

1. Driveline oil temperature too high
2. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.

2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4154 - REMOTE NO.4 UNABLE TO REACH NEUTRAL

Possible failure modes:

1. Driveline oil temperature too high
2. Driveline oil contamination
3. Incorrect hydraulic pressure
4. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).

   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.

   B. If the fault is still present, continue to step 2.
2. Check the driveline oil temperature.

   A. If the oil temperature is greater than 115 °C, clean the oil cooler and radiator fins and make sure there is no air flow restriction. Allow the driveline oil temperature to cool.

   B. If the oil temperature is okay, continue to step 3.
3. Check the driveline oil for contamination.

   A. If the oil is contaminated, replace as required.

   B. If the oil is not contaminated, continue to step 4.
4. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).

   A. If the pressures are incorrect, repair or replace component(s) as required.

   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4155 - REMOTE NO.4 SPOOL NOT IN NEUTRAL AT KEY ON

Possible failure modes:

1. Keystart switched off during EHR valve operation
2. Incorrect hydraulic pressure
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other EHR error code(s).
   A. Make a note of the error code(s), clear the error code(s) and test the system for normal operation.
   B. If the fault is still present, continue to step 2.
2. Check the hydraulic pressures (refer to the pressure testing chapter of the hydraulic systems section).
   A. If the pressures are incorrect, repair or replace component(s) as required.
   B. If the pressures are okay, download the correct level of software and configure the EHR valve. If the fault re-occurs, remove, replace, and configure the EHR valve.

ERROR CODE 4170 - EHR CONTROL NO.1 NOT CALIBRATED

Possible failure modes:

1. EHR lever not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the EHR lever was calibrated.

   A. If the EHR lever was not calibrated after a change of the controller, EHR control unit or after using H8 clear non-volatile memory (EEPROM), perform the EHR lever calibration procedure.

   B. If the EHR lever was calibrated, perform the EHR lever calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 4171 - EHR CONTROL LEVER NO.1 OPEN CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 20.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 20 wiggle the harness and the connectors to check for an intermittent circuit. Channel 20 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 1/2 connector **C390**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C390**. While operating the EHR control lever 1 from extend to float, measure the resistance between the component side of connector:

   C390 pin **4 (O/R/Y)** and **C390** pin **3 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C390 pin **4 (O/R/Y)** and **C390** pin **5 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 1/2.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C390** pin **3 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C390** pin **5 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for an open circuit.

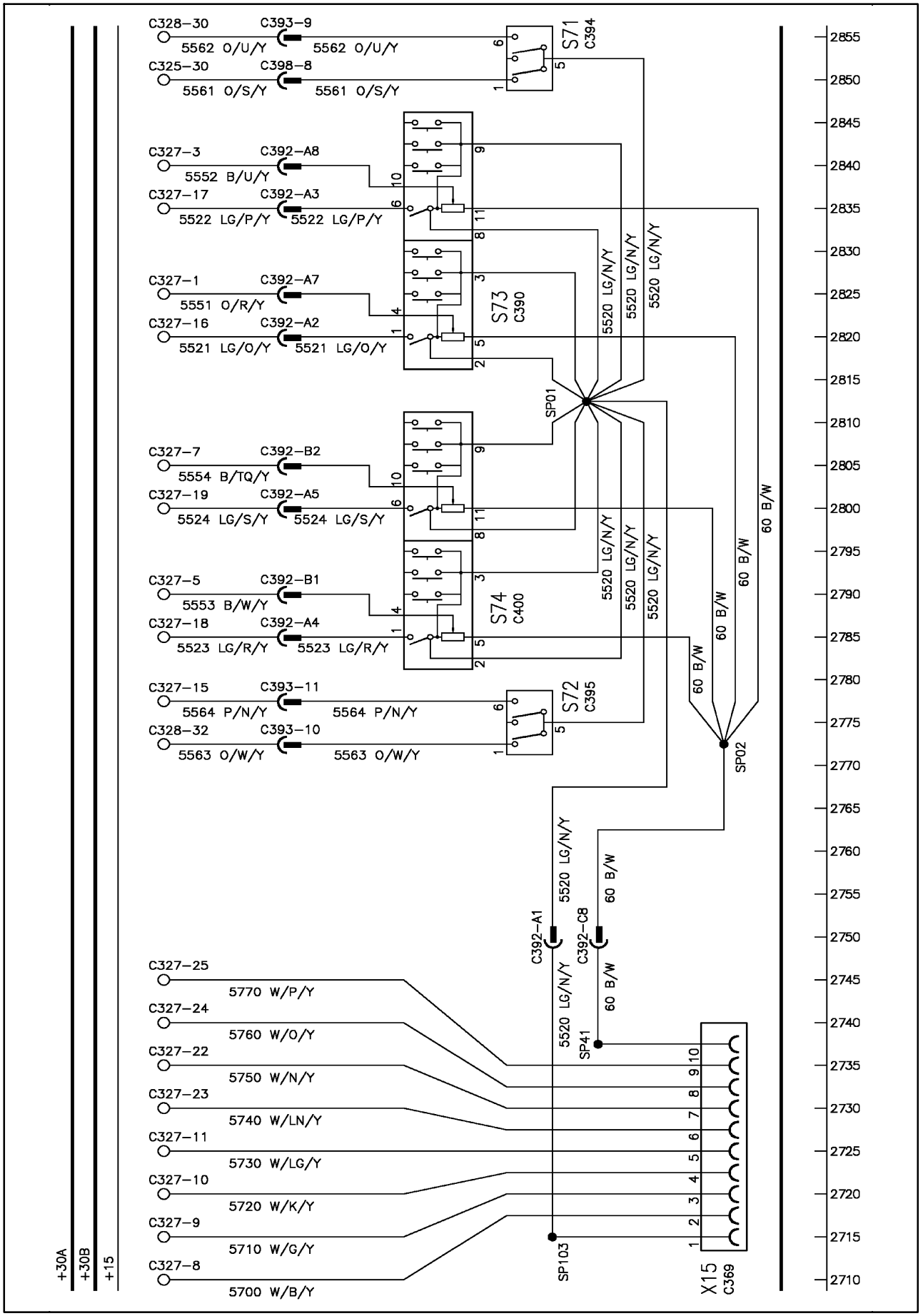
   A. Disconnect connector **C327**. Check between connector **C327** pin **1 (O/R/Y)** and **C390** pin **4 (O/R/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 7.

7. Check for a short to ground.

   A. Check between connector **C390** pin **4 (O/R/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
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5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
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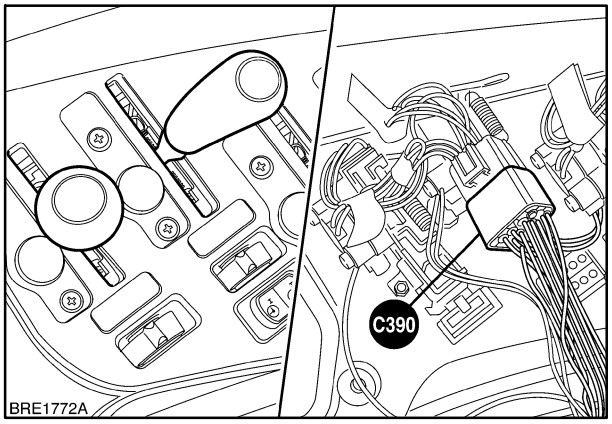
C390
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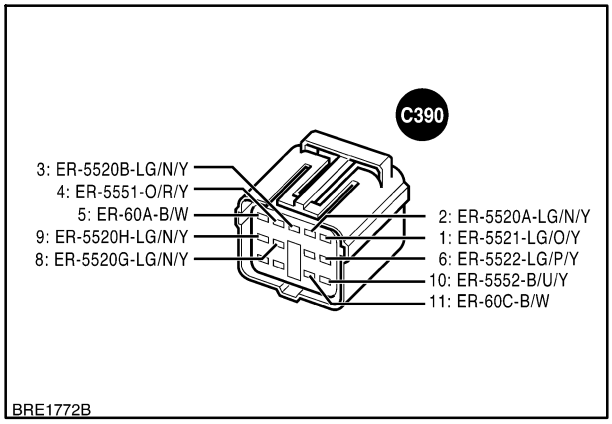
C390
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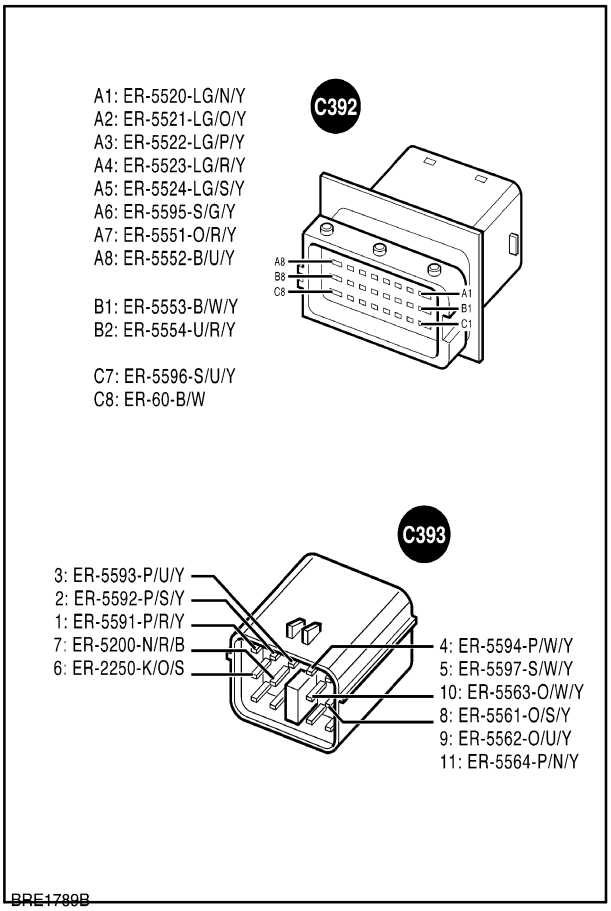
4: ER-5551-O/R/Y
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B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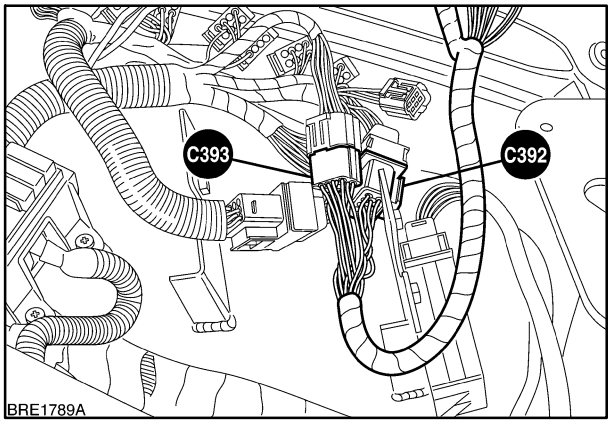
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B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C392
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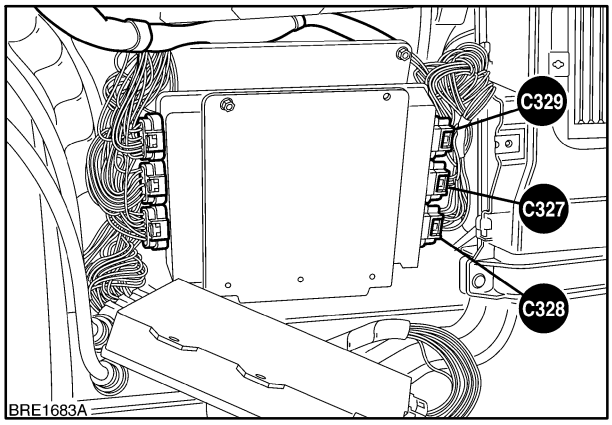

C327

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3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
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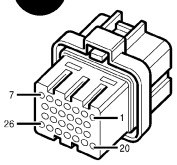
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



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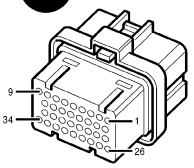
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



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30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
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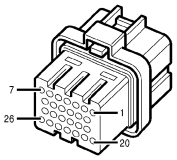

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18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4172 - EHR CONTROL LEVER NO.1 SHORT CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 20.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 20 wiggle the harness and the connectors to check for an intermittent circuit. Channel 20 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 1/2 connector **C390**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C390**. While operating the EHR control lever 1 from extend to float, measure the resistance between the component side of connector:

   C390 pin **4 (O/R/Y)** and **C390** pin **3 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C390 pin **4 (O/R/Y)** and **C390** pin **5 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 1/2.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for a short to +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C390** pin **3 (LG/N/Y)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve voltage.

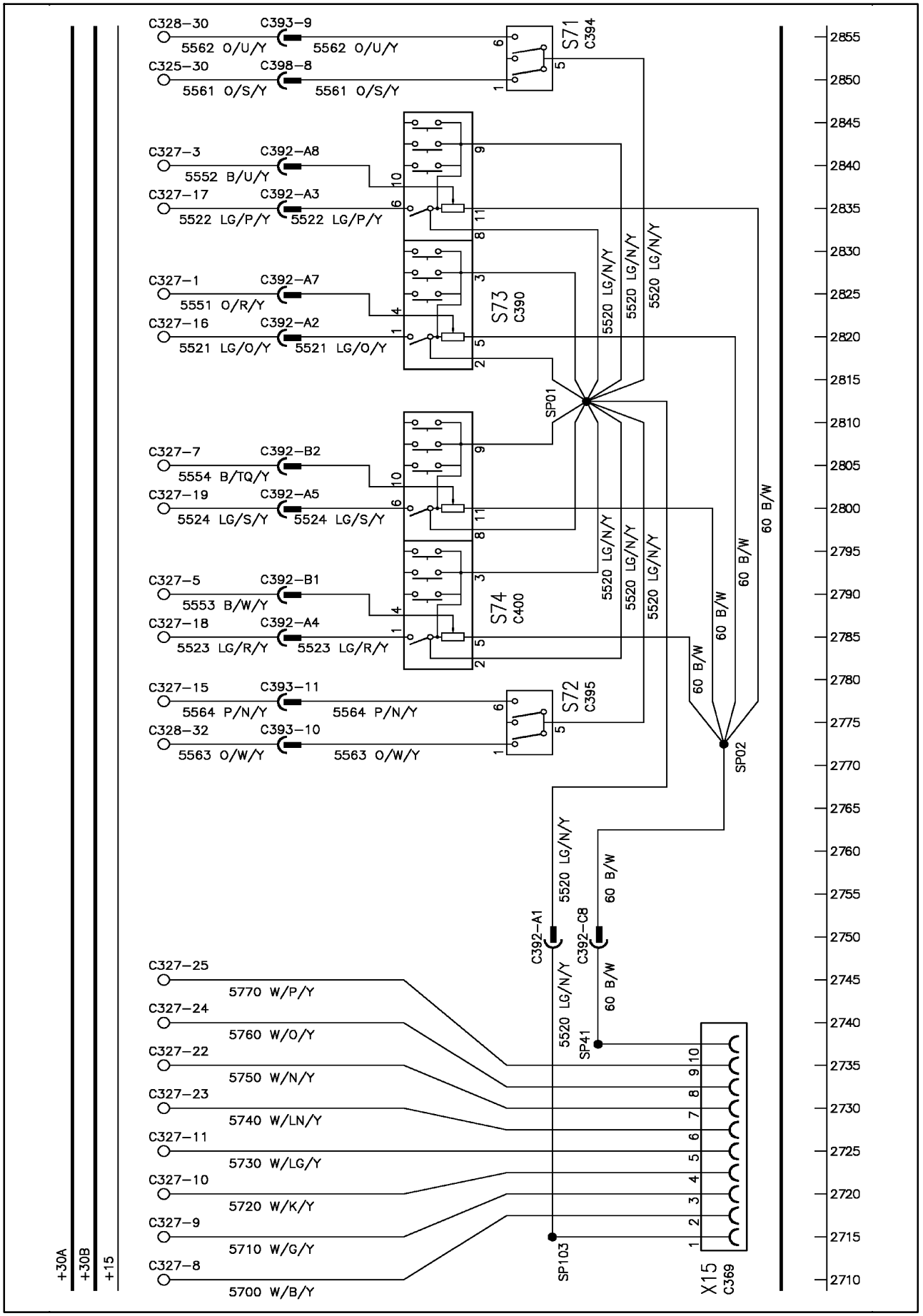
   A. Check between connector:

   C390 pin **5 (B/W)** and **ground**

   C390 pin **4 (O/R/Y)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.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5562 O/U/Y
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C398-8
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5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
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C327-19
C392-A5
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C392-B1
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C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
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C328-32
C393-10
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C327-22
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C327-23
5740 W/LN/Y
C327-11
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X15
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+30B
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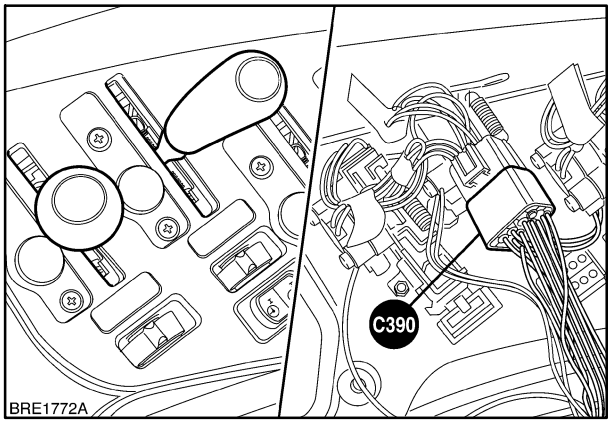
C390
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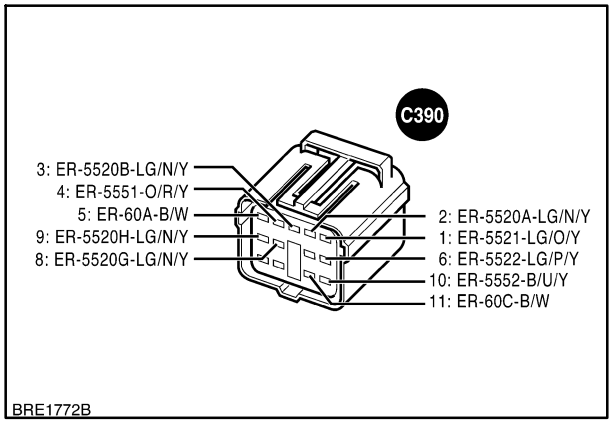
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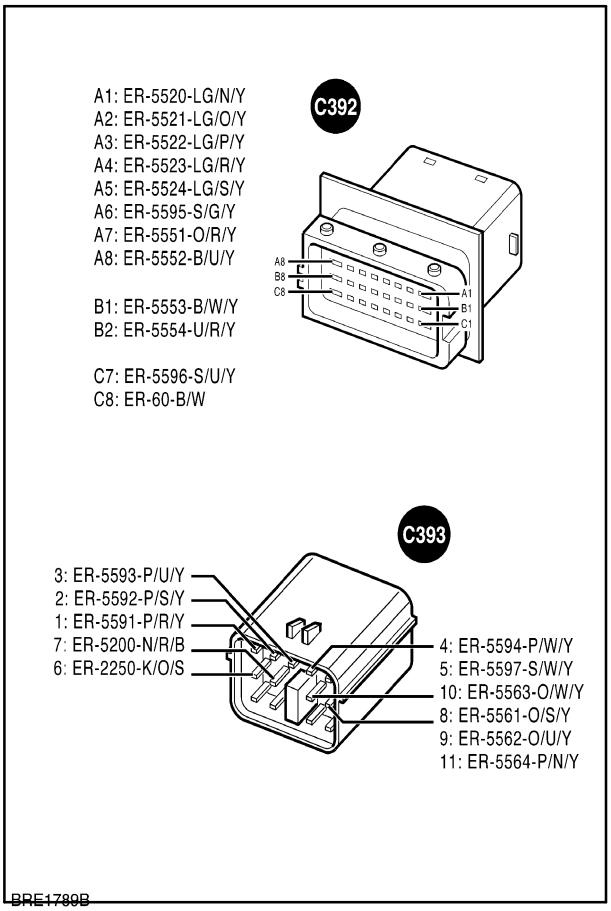
4: ER-5551-O/R/Y
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B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A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
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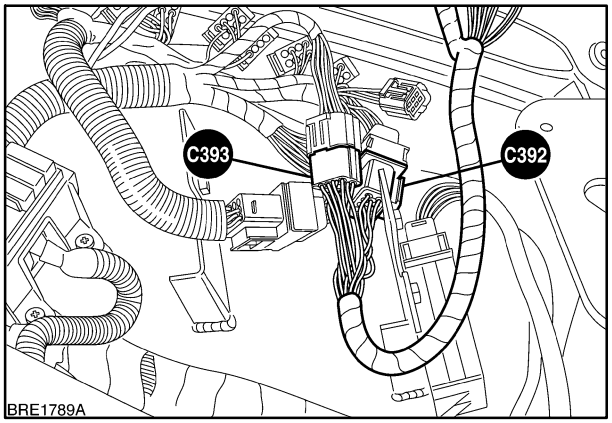
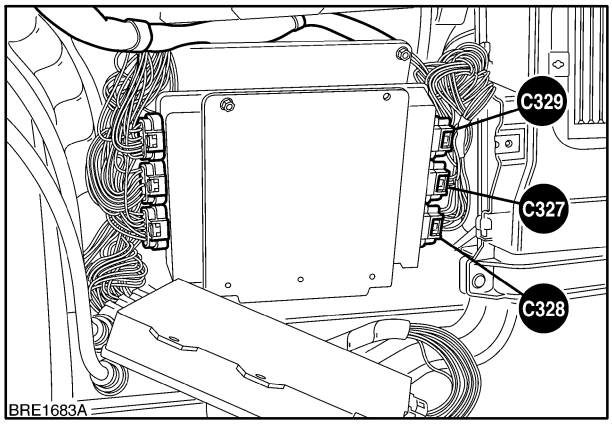
11: ER-5564-P/N/Y
BRE1789B


C393
C392
BRE1789A



C327

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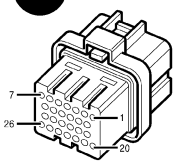
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



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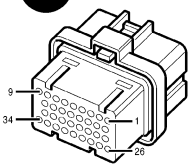
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



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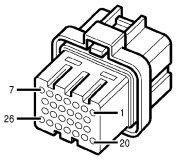
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4173 - EHR CONTROL NO.2 NOT CALIBRATED

Possible failure modes:

1. EHR lever not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the EHR lever was calibrated.

   A. If the EHR lever was not calibrated after a change of the controller, EHR control unit or after using H8 clear non-volatile memory (EEPROM), perform the EHR lever calibration procedure.

   B. If the EHR lever was calibrated, perform the EHR lever calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 4174 - EHR CONTROL LEVER NO.2 OPEN CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 21.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 21 wiggle the harness and the connectors to check for an intermittent circuit. Channel 21 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 1/2 connector **C390**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C390**. While operating the EHR control lever 2 from extend to float, measure the resistance between the component side of connector:

   C390 pin **10 (B/U/Y)** and **C390** pin **9 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C390 pin **10 (B/U/Y)** and **C390** pin **11 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 1/2.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C390** pin **9 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C390** pin **11 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for an open circuit.

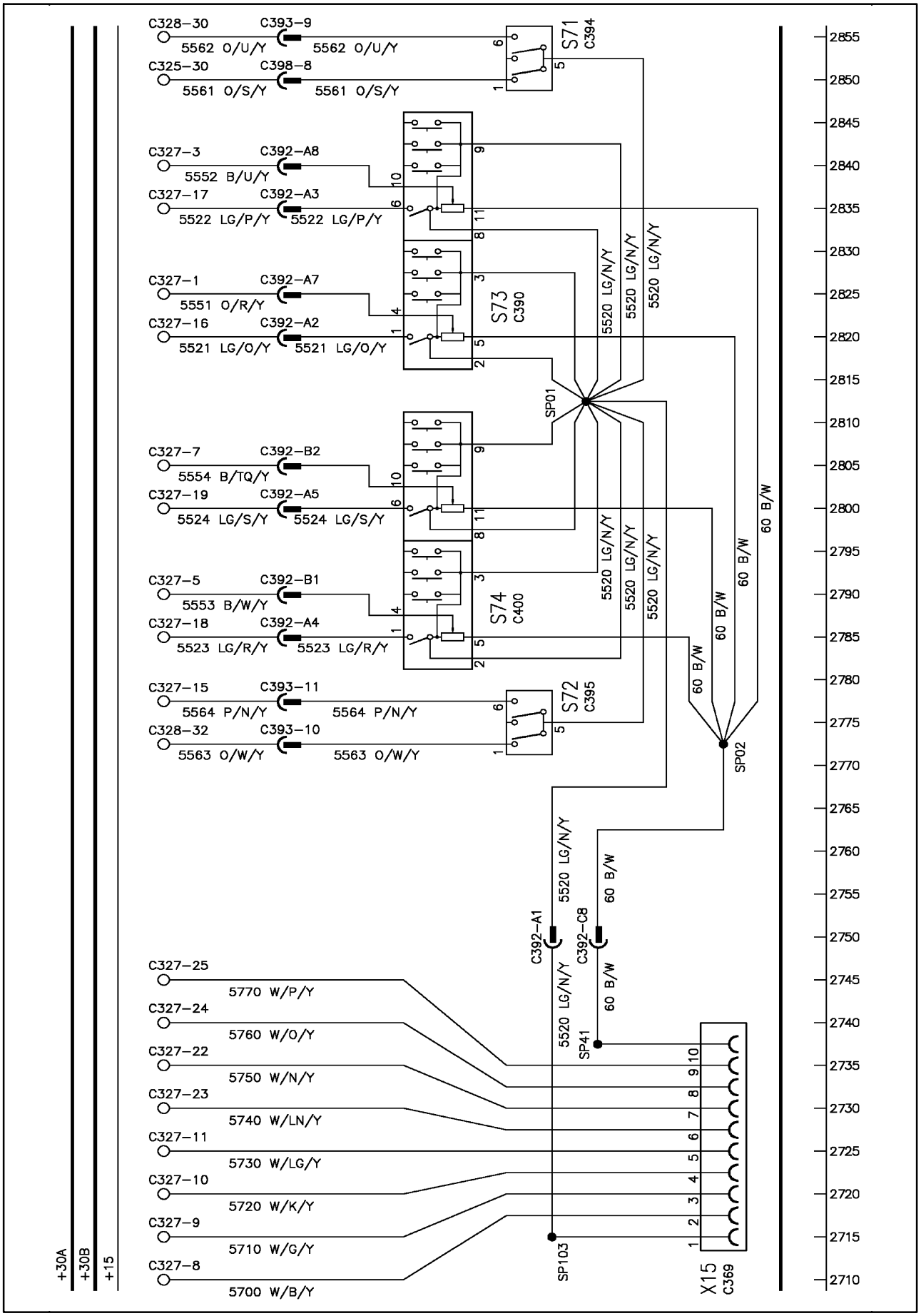
   A. Disconnect connector **C327**. Check between connector **C327** pin **3 (B/U/Y)** and **C390** pin **10 (B/U/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 7.

7. Check for a short to ground.

   A. Check between connector **C390** pin **10 (B/U/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
2855
2850
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
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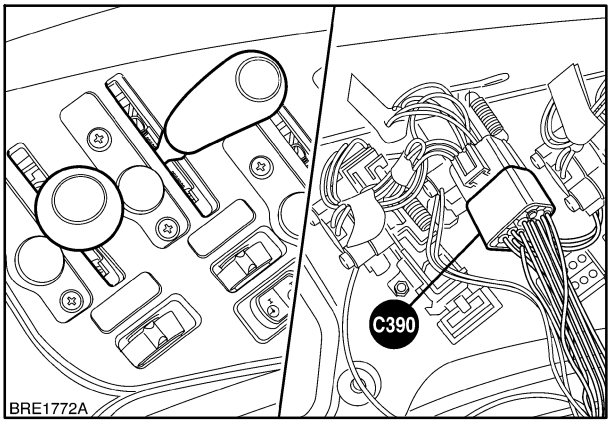
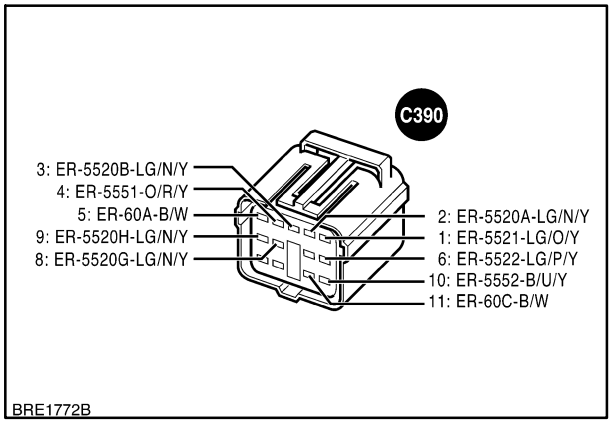
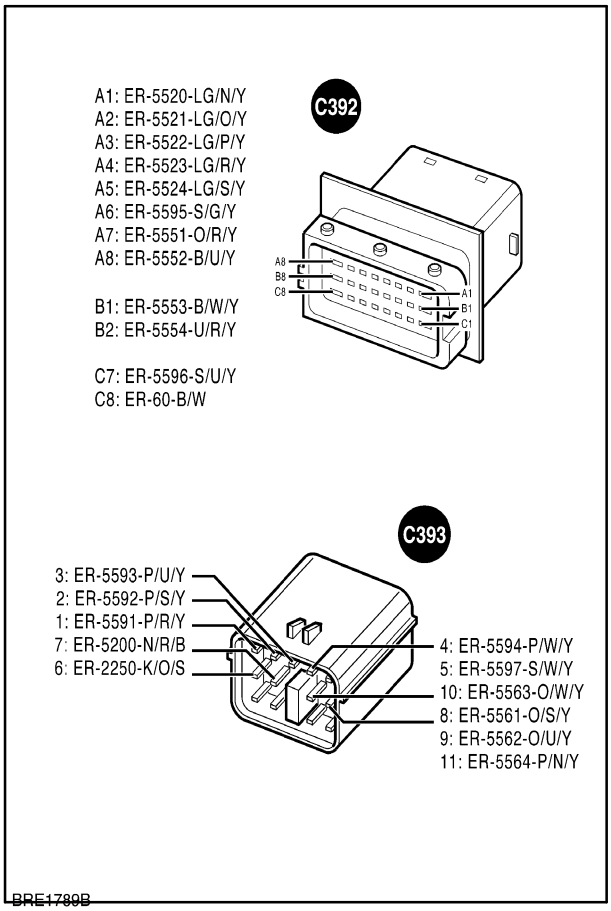
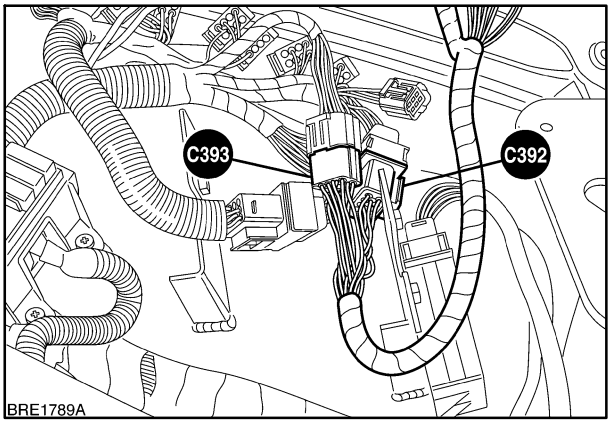
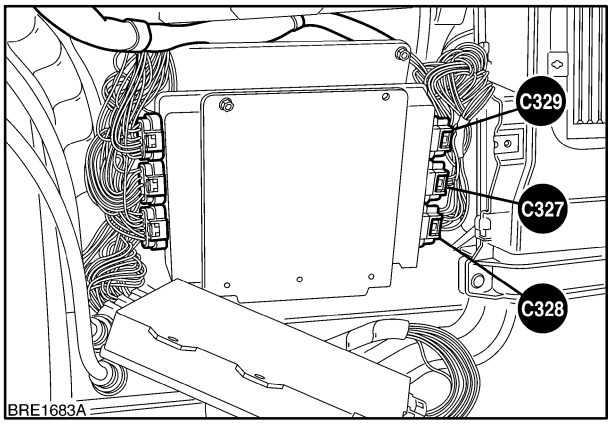

C390
BRE1772A


C390
3: ER-5520B-LG/N/Y
4: ER-5551-O/R/Y
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B

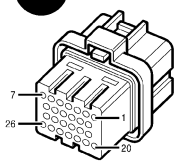

C392
A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B


C393
C392
BRE1789A



C327

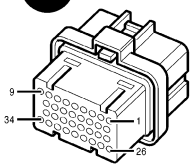
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

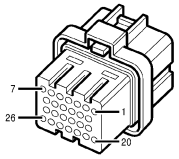
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4175 - EHR CONTROL LEVER NO.2 SHORT CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 21.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 20 wiggle the harness and the connectors to check for an intermittent circuit. Channel 20 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 1/2 connector **C390**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C390**. While operating the EHR control lever 2 from extend to float, measure the resistance between the component side of connector:

   C390 pin **10 (B/U/Y)** and **C390** pin **9 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C390 pin **10 (B/U/Y)** and **C390** pin **11 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 1/2.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for a short to +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C390** pin **9 (LG/N/Y)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve voltage.

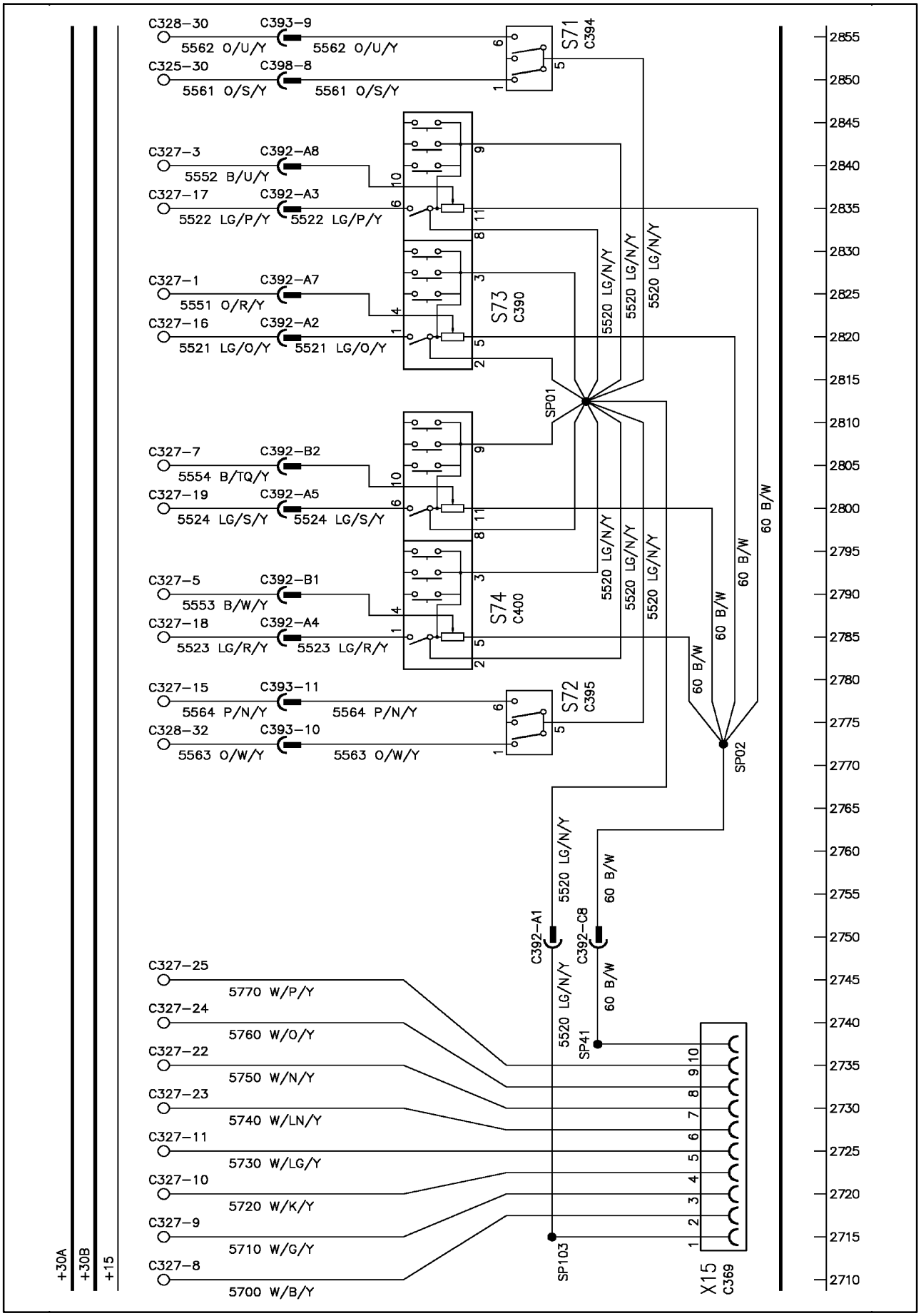
   A. Check between connector:

   C390 pin **11 (B/W)** and **ground**

   C390 pin **10 (B/U/Y)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
2855
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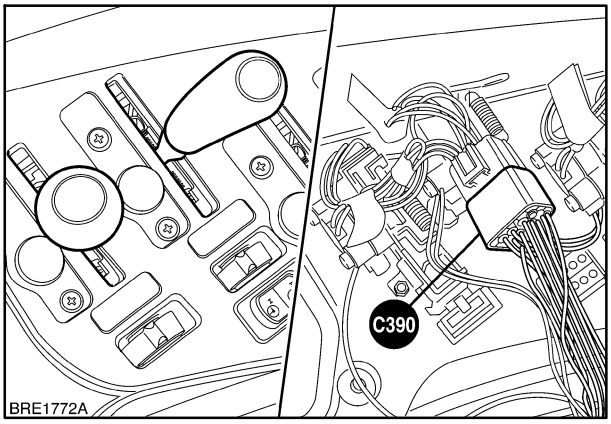
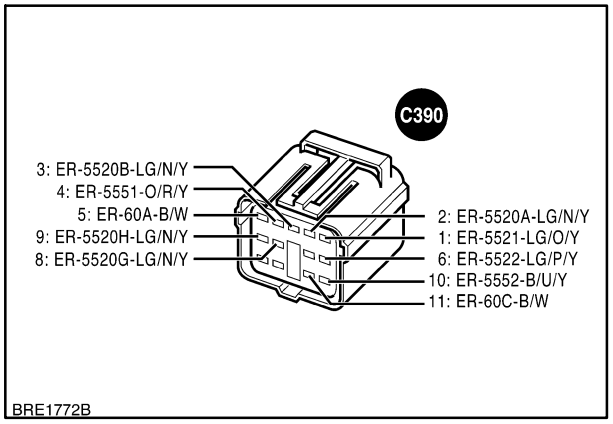
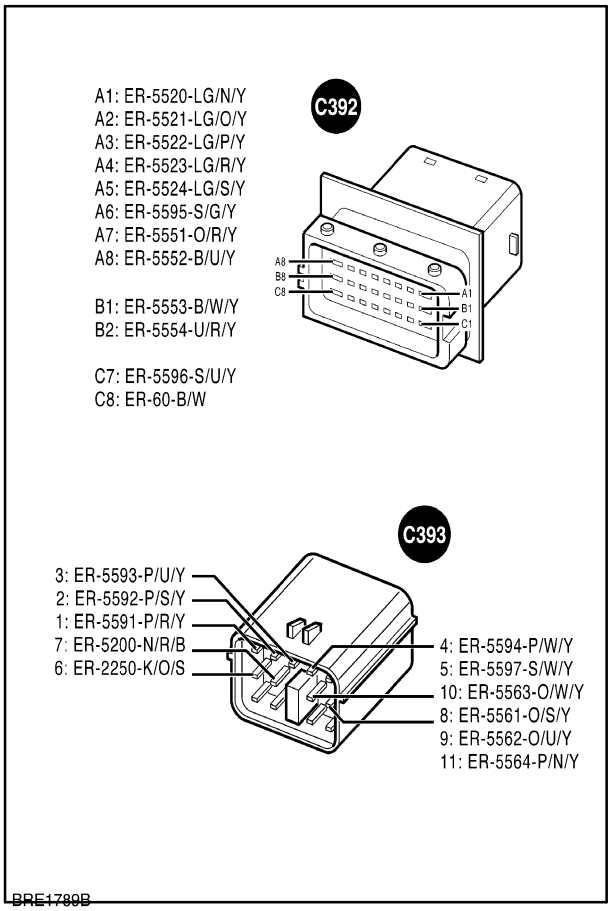
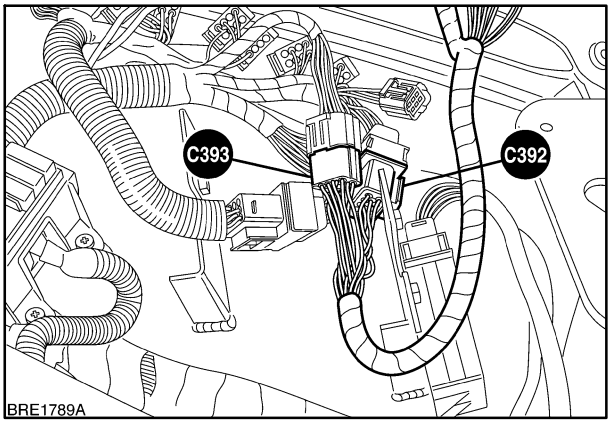
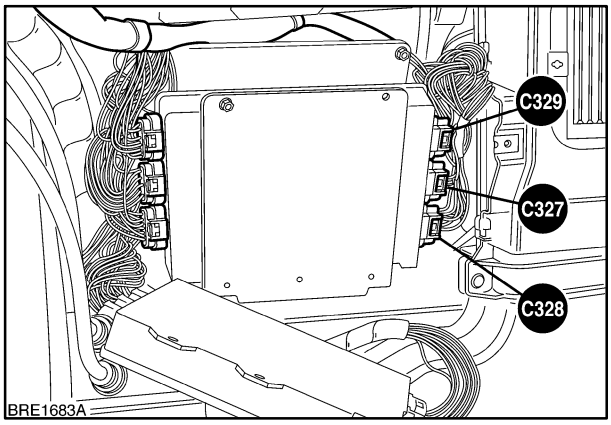

C390
BRE1772A


C390
3: ER-5520B-LG/N/Y
4: ER-5551-O/R/Y
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B

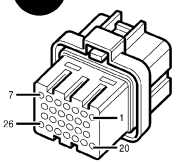

C392
A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B


C393
C392
BRE1789A



C327

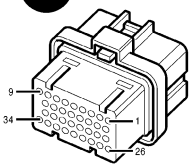
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

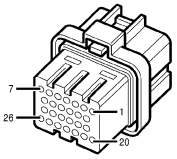
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4176 - TIMER SWITCH NO.1 / NO.2 DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty No.1 / No.2 timer switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the No.1 / No.2 timer switch connector **C394** and the inline connector **C393**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the No.1 / No.2 timer switch.

   A. Disconnect connector **C394**. Check between the component side of connector:

   C394 pin **5 (LG/N/Y)** and **C394** pin **1 (O/S/Y)**

   C394 pin **5 (LG/N/Y)** and **C394** pin **6 (O/U/Y)**

   If an open circuit is indicated, replace the No.1 / No.2 timer switch.

   B. If the No.1 / No.2 timer switch is okay, continue to step 3.

3. Check for +5 Volts.

   A. Measure the voltage between connector **C394** pin **5 (LG/N/Y)** and **ground**. If +5 Volts is not indicated, repair or replace the harness as required

   B. If +5 Volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C325** and **C328**. Check between connector:

   C394 pin **1 (O/S/Y)** and **C325** pin **30 (O/S/Y)**

   C394 pin **6 (O/U/Y)** and **C328** pin **30 (O/U/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to ground.

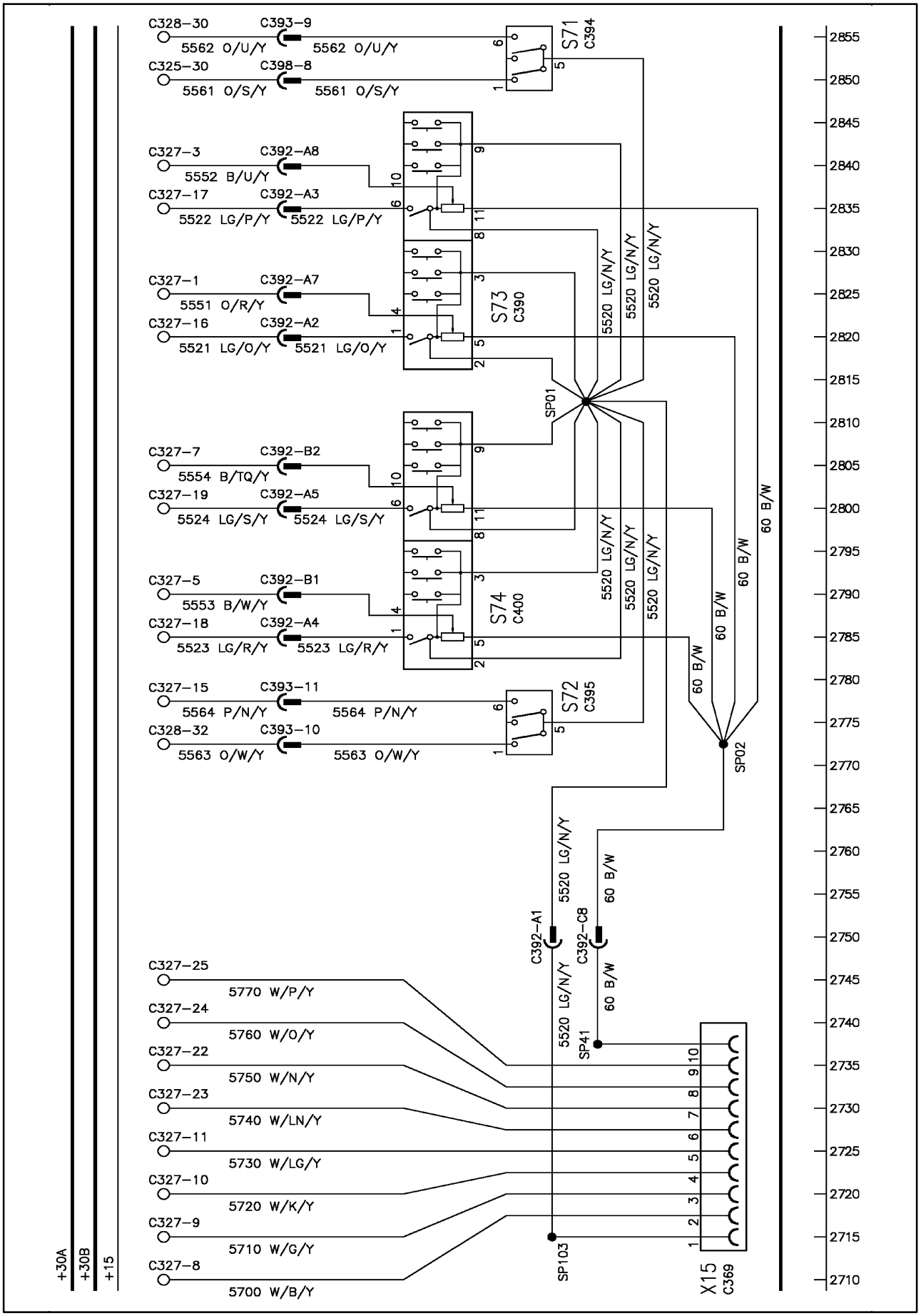
   A. Check between connector:

   C394 pin **1 (O/S/Y)** and **ground**

   C394 pin **6 (O/U/Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
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S74
C400
C327-15
C393-11
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5564 P/N/Y
C328-32
C393-10
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5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
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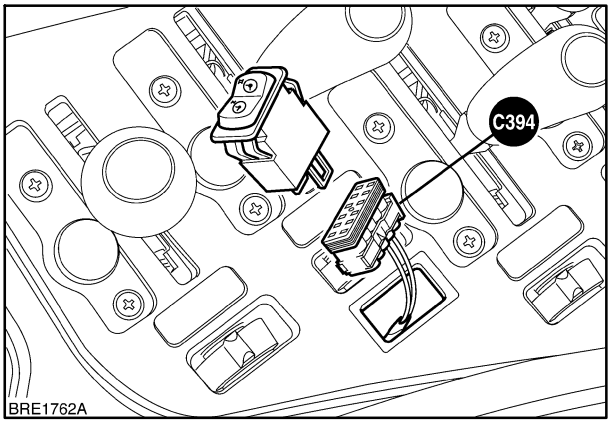
C394
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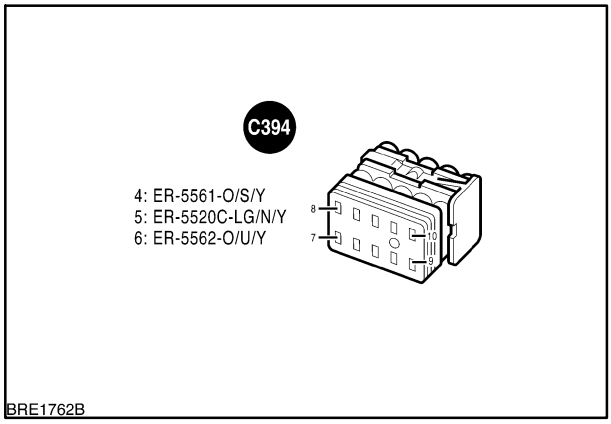
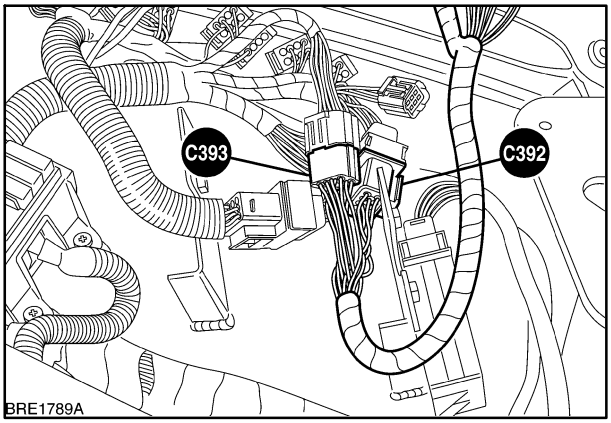
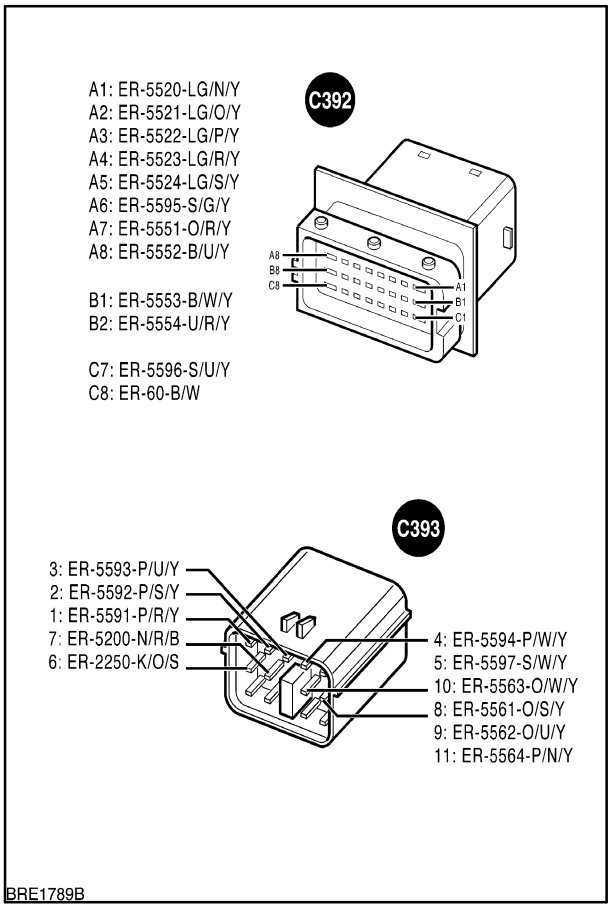

C394
4: ER-5561-O/S/Y
5: ER-5520C-LG/N/Y
6: ER-5562-O/U/Y
8
7
10
9
BRE1762B


C393
C392
BRE1789A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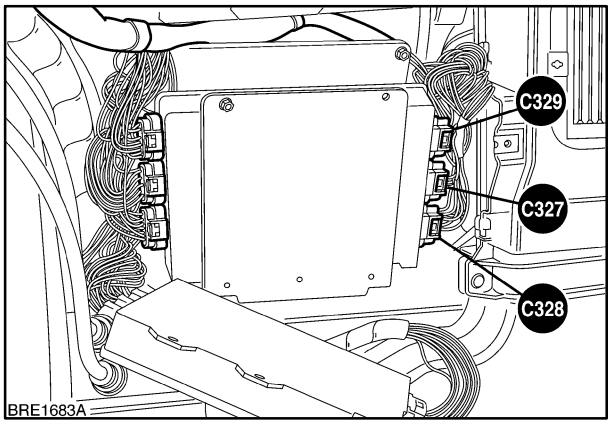
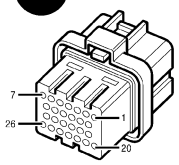
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B



C327

1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



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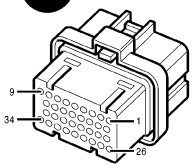
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

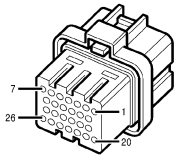
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

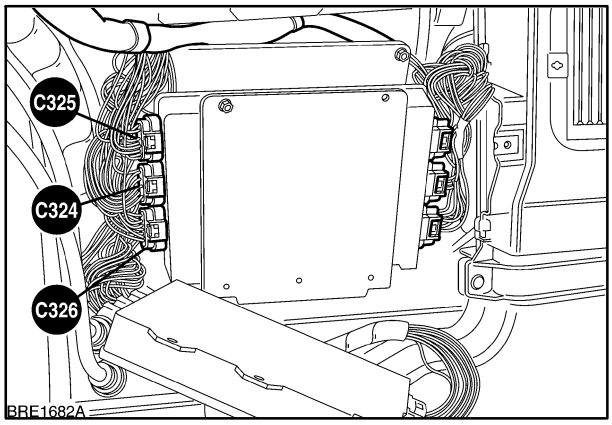
C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

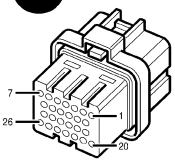
BRE1683B



BRE1682A

C324

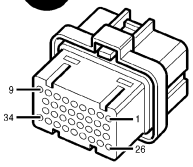
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

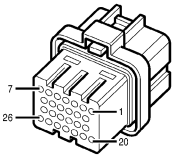
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 4177 - EHR CONTROL NO.3 NOT CALIBRATED

Possible failure modes:

1. EHR lever not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the EHR lever was calibrated.

   A. If the EHR lever was not calibrated after a change of the controller, EHR control unit or after using H8 clear non-volatile memory (EEPROM), perform the EHR lever calibration procedure.

   B. If the EHR lever was calibrated, perform the EHR lever calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 4178 - EHR CONTROL LEVER NO.3 OPEN CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 22.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 22 wiggle the harness and the connectors to check for an intermittent circuit. Channel 22 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 3/4 connector **C400**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C400**. While operating the EHR control lever 3 from extend to float, measure the resistance between the component side of connector:

   C400 pin **4 (B/W/Y)** and **C400** pin **3 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C400 pin **4 (B/W/Y)** and **C400** pin **5 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 3/4.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C400** pin **3 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C400** pin **5 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for an open circuit.

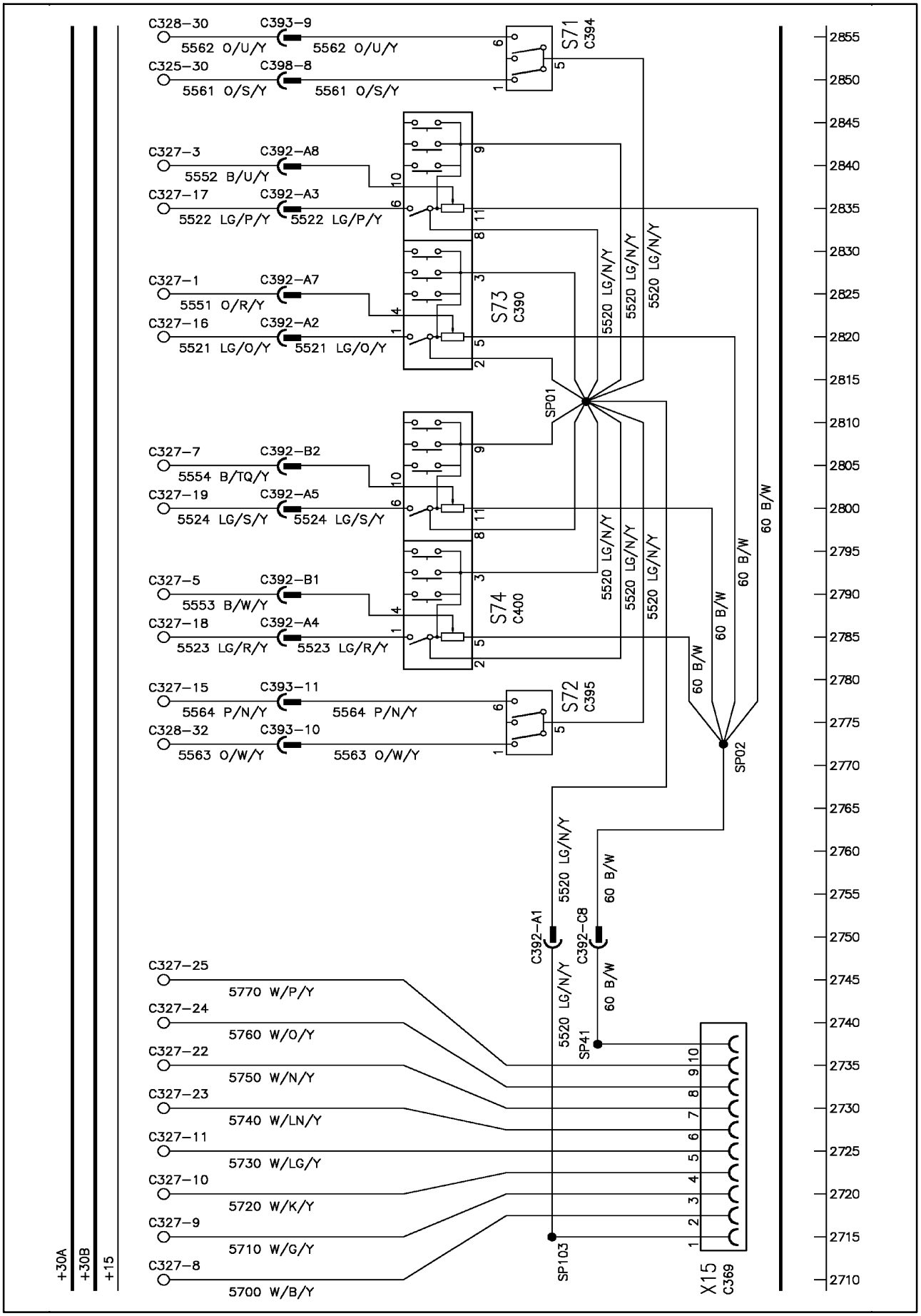
   A. Disconnect connector **C327**. Check between connector **C327** pin **5 (B/W/Y)** and **C400** pin **4 (B/W/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 7.

7. Check for a short to ground.

   A. Check between connector **C400** pin **4 (B/W/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.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C393-9
5562 O/U/Y
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C325-30
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S71
C394
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C392-A3
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C392-A4
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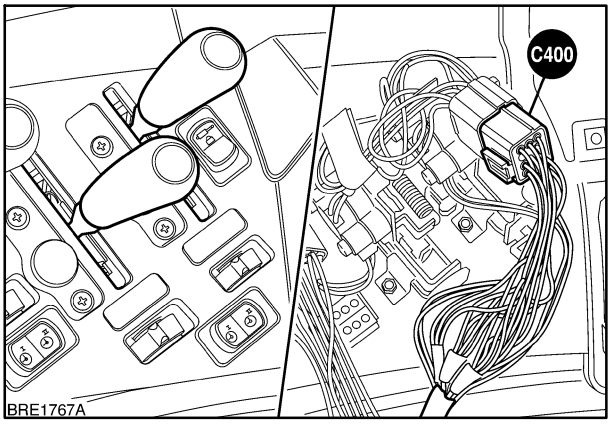
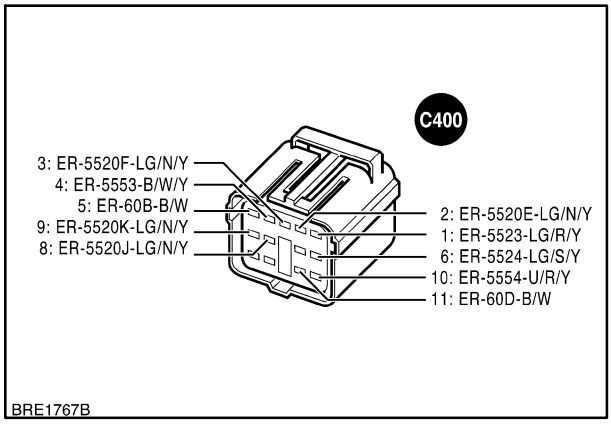

C400
BRE1767A


C400
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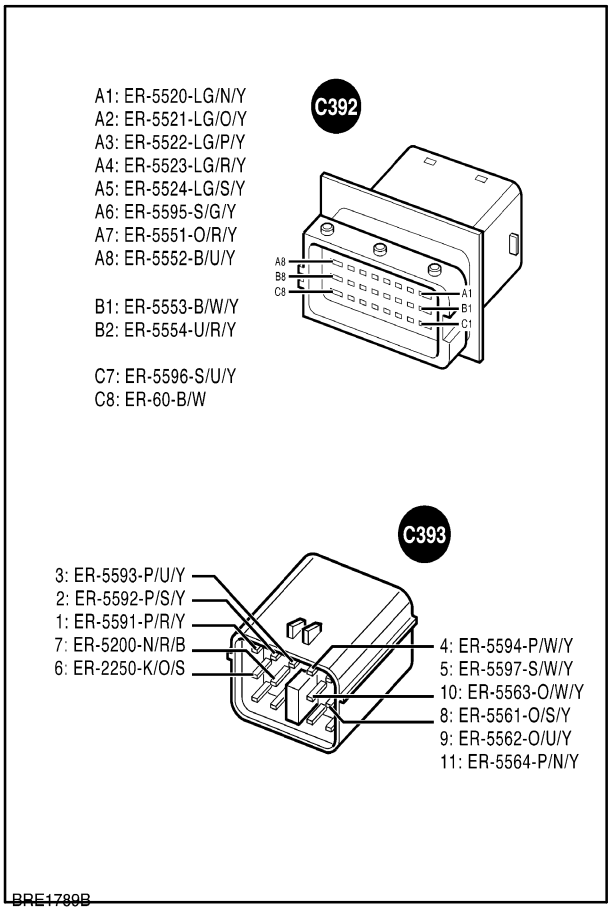
4: ER-5553-B/W/Y
5: ER-60B-B/W
9: ER-5520K-LG/N/Y
8: ER-5520J-LG/N/Y
2: ER-5520E-LG/N/Y
1: ER-5523-LG/R/Y
6: ER-5524-LG/S/Y
10: ER-5554-U/R/Y
11: ER-60D-B/W
BRE1767B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A4: ER-5523-LG/R/Y
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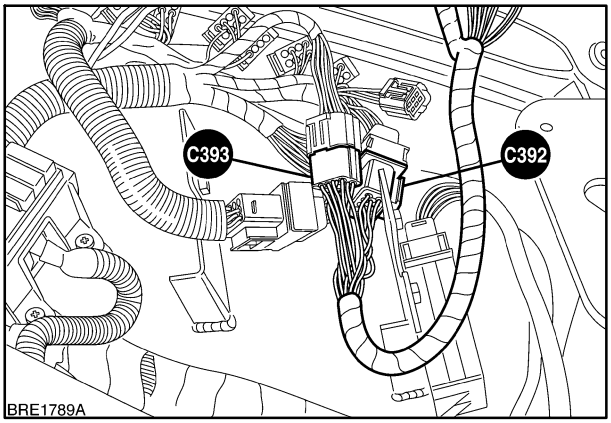
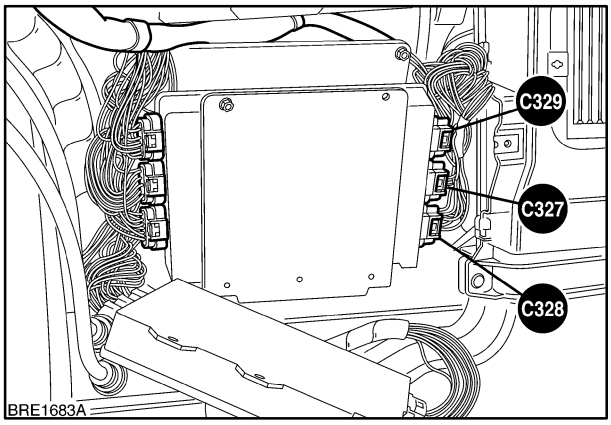
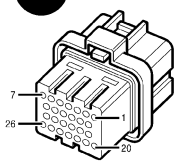
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B


C393
C392
BRE1789A



C327

1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



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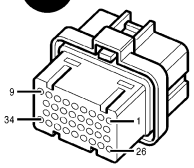
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

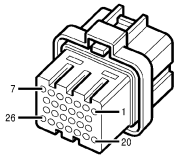
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4179 - EHR CONTROL LEVER NO.3 SHORT CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 22.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 22 wiggle the harness and the connectors to check for an intermittent circuit. Channel 22 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 3/4 connector **C400**, the inline connector **C392** and the controller connector **C327**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C400**. While operating the EHR control lever 3 from extend to float, measure the resistance between the component side of connector:

   C400 pin **4 (B/W/Y)** and **C400** pin **3 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C400 pin **4 (B/W/Y)** and **C400** pin **5 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 3/4.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for a short to +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C400** pin **3 (LG/N/Y)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve voltage.

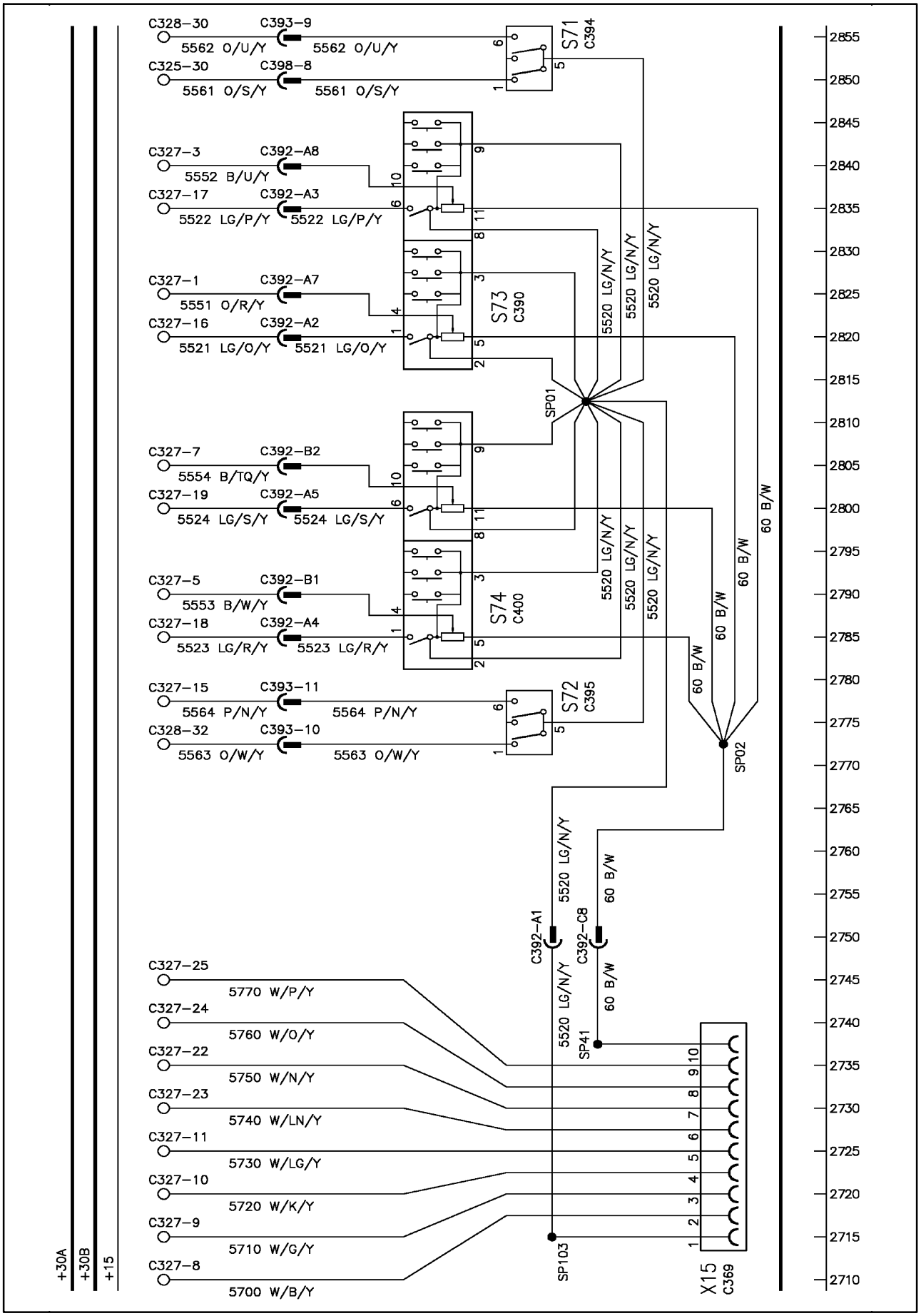
   A. Check between connector:

   C400 pin **5 (B/W)** and **ground**

   C400 pin **4 (B/W/Y)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
2855
2850
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790
2785
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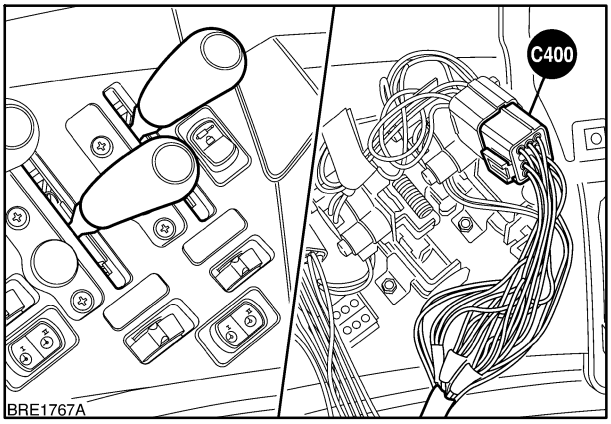
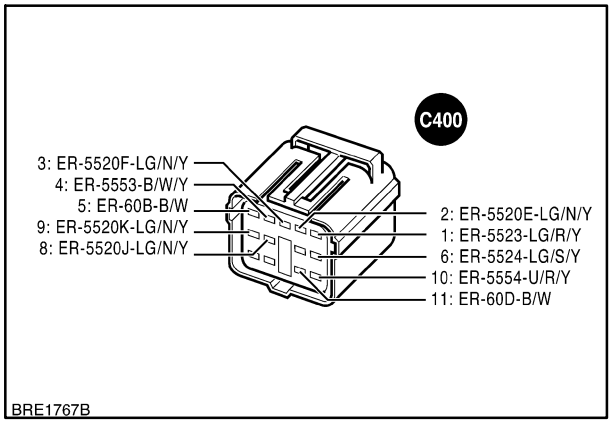
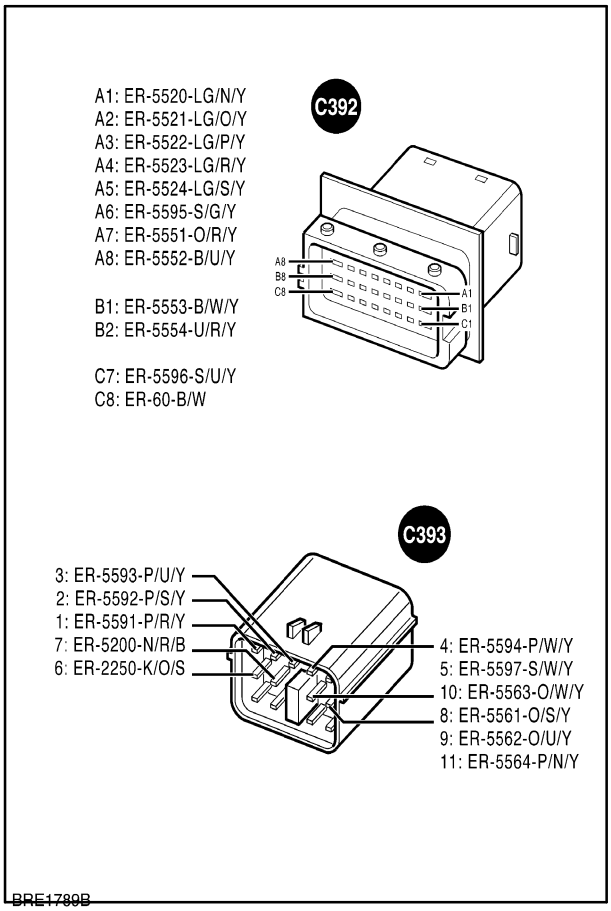
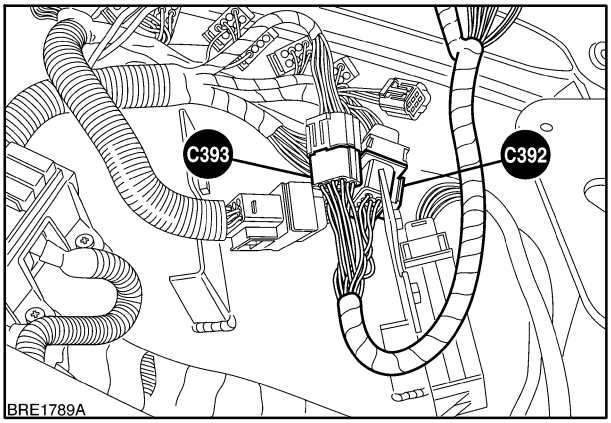
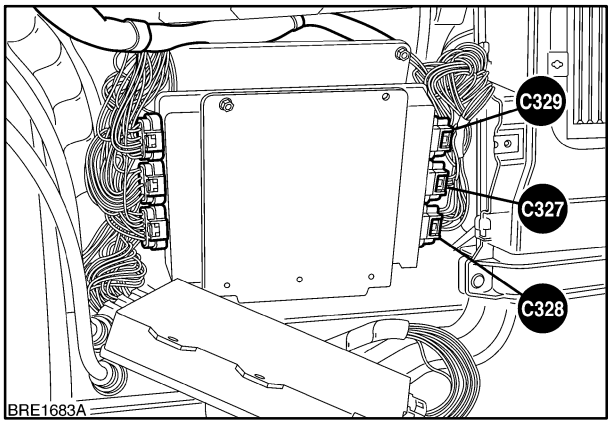
2710


C400
BRE1767A


C400
3: ER-5520F-LG/N/Y
4: ER-5553-B/W/Y
5: ER-60B-B/W
9: ER-5520K-LG/N/Y
8: ER-5520J-LG/N/Y
2: ER-5520E-LG/N/Y
1: ER-5523-LG/R/Y
6: ER-5524-LG/S/Y
10: ER-5554-U/R/Y
11: ER-60D-B/W
BRE1767B

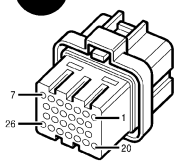

A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B


C393
C392
BRE1789A



C327

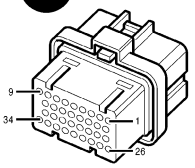
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

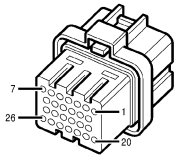
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4180 - EHR CONTROL NO.4 NOT CALIBRATED

Possible failure modes:

1. EHR lever not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the EHR lever was calibrated.

   A. If the EHR lever was not calibrated after a change of the controller, EHR control unit or after using H8 clear non-volatile memory (EEPROM), perform the EHR lever calibration procedure.

   B. If the EHR lever was calibrated, perform the EHR lever calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 4181 - EHR CONTROL LEVER NO.4 OPEN CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 23.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 23 wiggle the harness and the connectors to check for an intermittent circuit. Channel 23 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 3/4 connector **C400**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C400**. While operating the EHR control lever 4 from extend to float, measure the resistance between the component side of connector:

   C400 pin **10 (B/TQ/Y)** and **C400** pin **9 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C400 pin **10 (B/TQ/Y)** and **C400** pin **11 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 3/4.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C400** pin **9 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C400** pin **11 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for an open circuit.

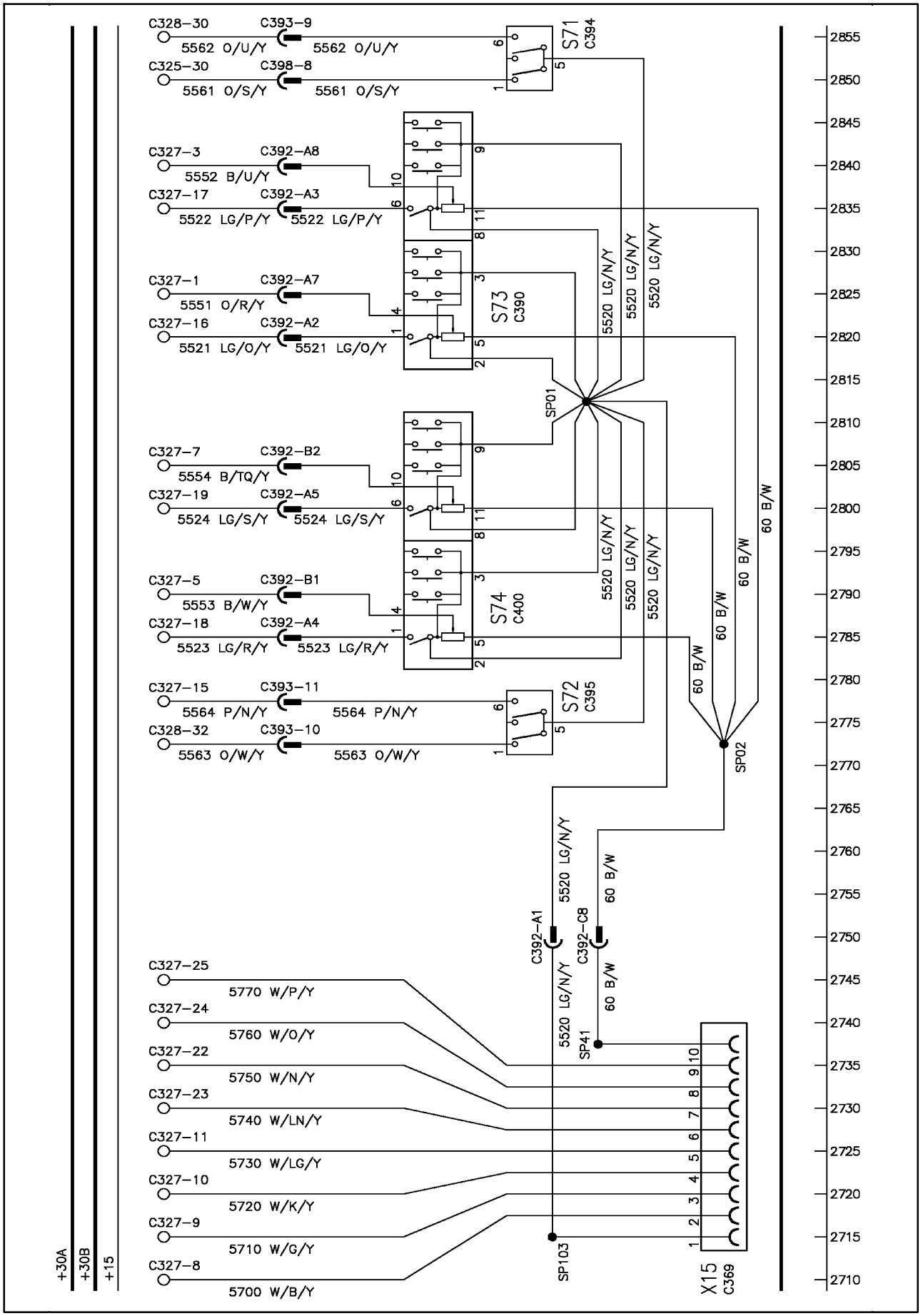
   A. Disconnect connector **C327**. Check between connector **C327** pin **7 (B/TQ/Y)** and **C400** pin **10 (B/TQ/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 7.

7. Check for a short to ground.

   A. Check between connector **C400** pin **10 (B/TQ/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
SP02
5520 LG/N/Y
60 B/W
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
SP103
X15
C369
+30A
+30B
+15
2855
2850
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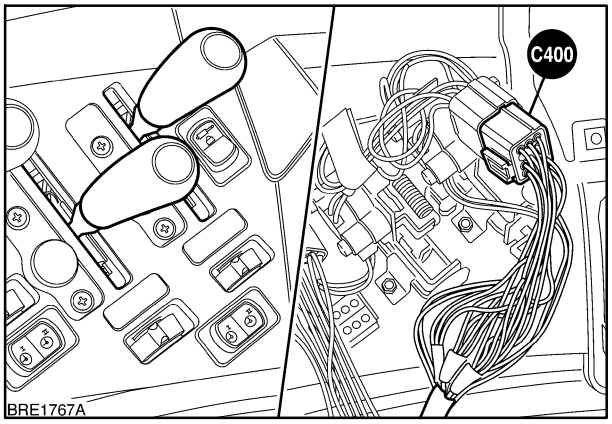
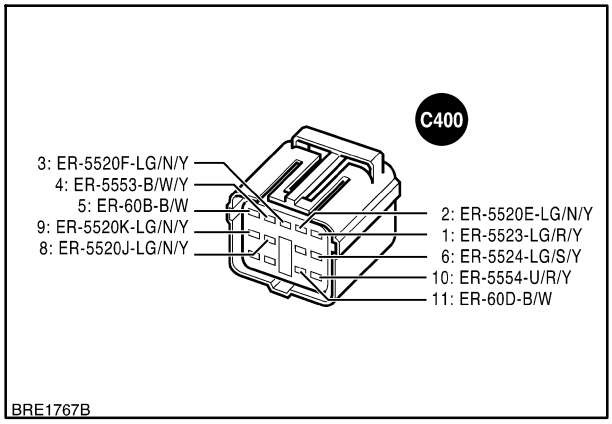
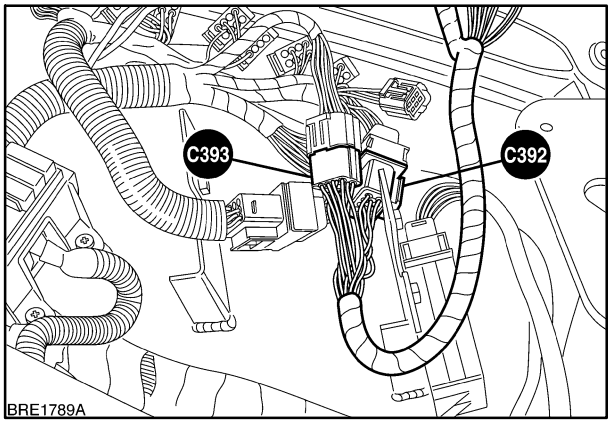
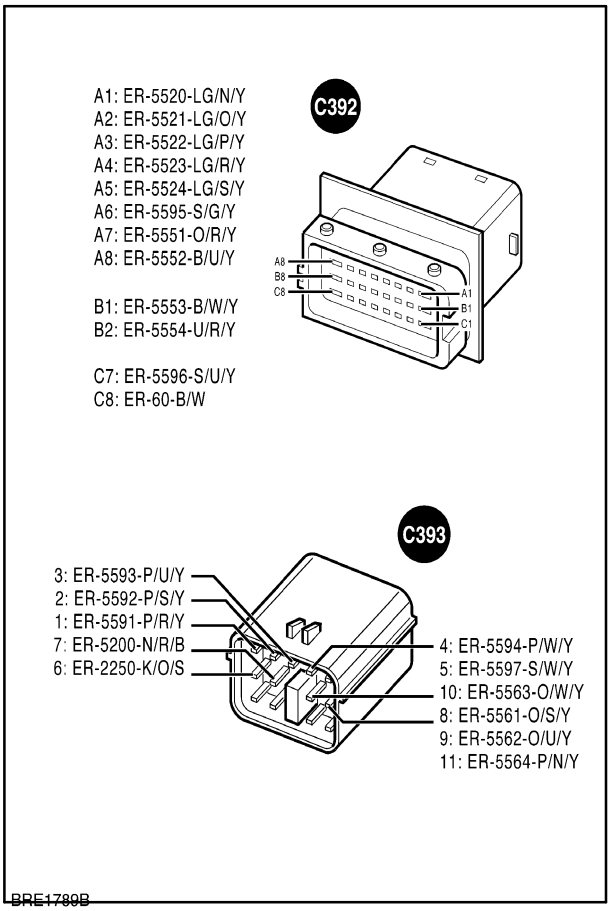
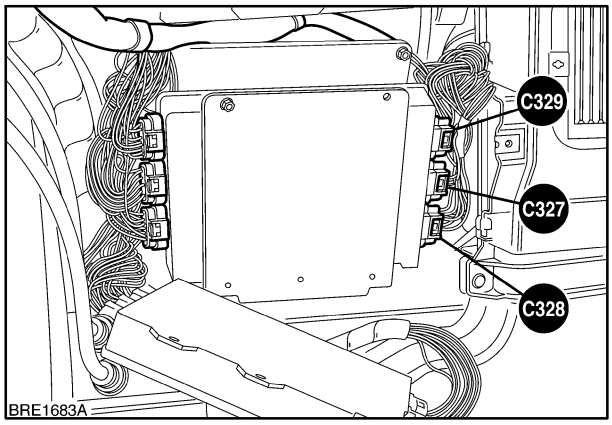

C400
BRE1767A


C400
3: ER-5520F-LG/N/Y
4: ER-5553-B/W/Y
5: ER-60B-B/W
9: ER-5520K-LG/N/Y
8: ER-5520J-LG/N/Y
2: ER-5520E-LG/N/Y
1: ER-5523-LG/R/Y
6: ER-5524-LG/S/Y
10: ER-5554-U/R/Y
11: ER-60D-B/W
BRE1767B

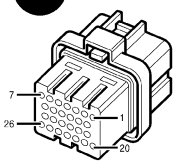

C393
C392
BRE1789A


A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B



C327

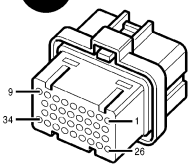
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

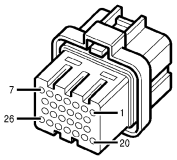
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4182 - EHR CONTROL LEVER NO.4 SHORT CIRCUIT

Cause:

Lever potentiometer output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty EHR control lever potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lever potentiometer in H9 Channel 23.

   A. Operate the lever from float to extend. If the values displayed do not change continuously between 50 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 23 wiggle the harness and the connectors to check for an intermittent circuit. Channel 23 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR control lever 3/4 connector **C400**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the lever potentiometer.

   A. Disconnect connector **C400**. While operating the EHR control lever 4 from extend to float, measure the resistance between the component side of connector:

   C400 pin **10 (B/TQ/Y)** and **C400** pin **9 (LG/N/Y)** should indicate between 1.9K Ohms - 3.5K Ohms.

   C400 pin **10 (B/TQ/Y)** and **C400** pin **11 (B/W)** should indicate between 0.5K Ohms - 2.1K Ohms.

   If the resistances indicated are not okay, remove and replace the EHR control lever 1/2.

   B. If the lever potentiometer is okay, continue to step 4.

4. Check for a short to +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C400** pin **9 (LG/N/Y)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve voltage.

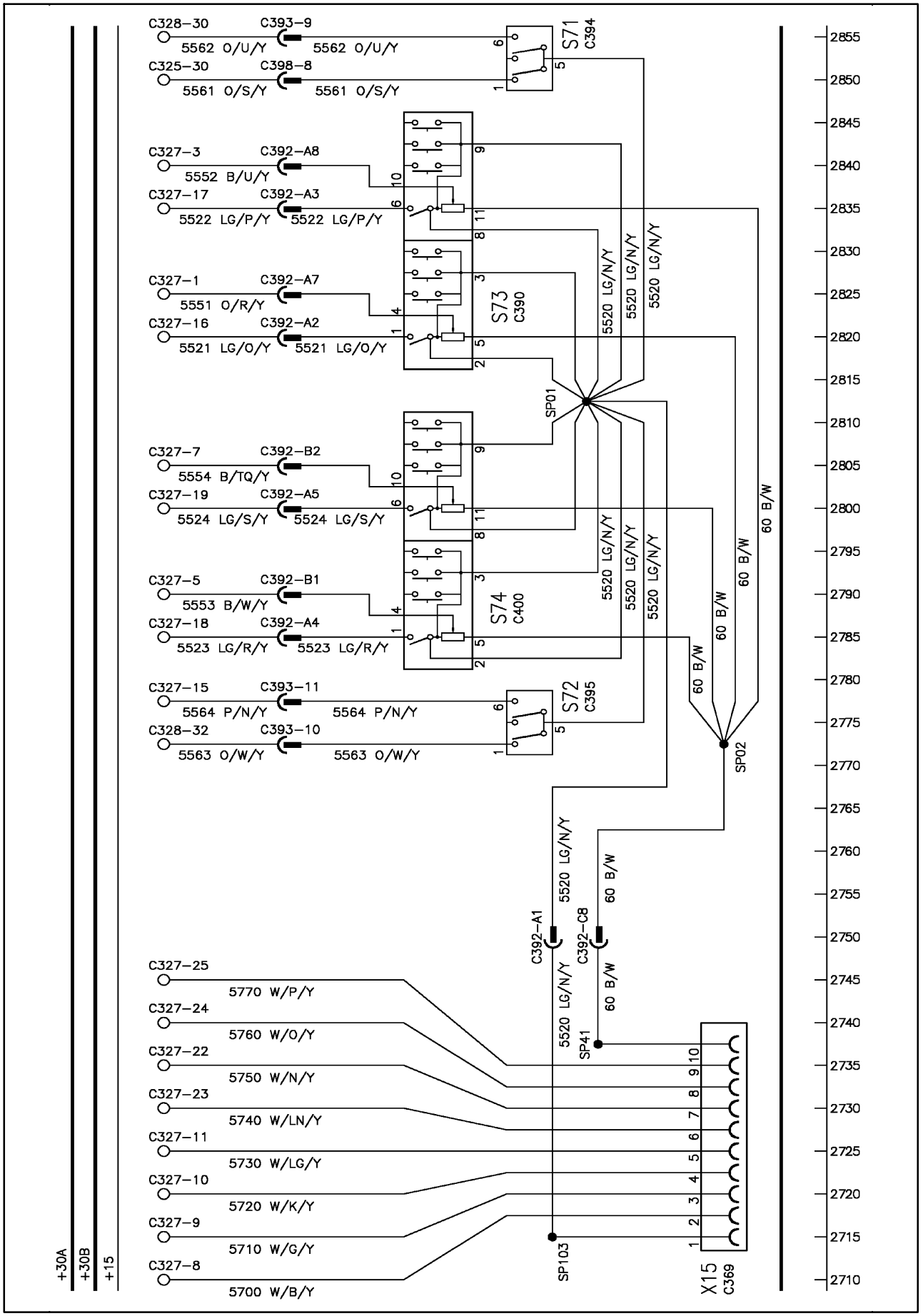
   A. Check between connector:

   C400 pin **11 (B/W)** and **ground**

   C400 pin **10 (B/TQ/Y)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
2855
2850
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790
2785
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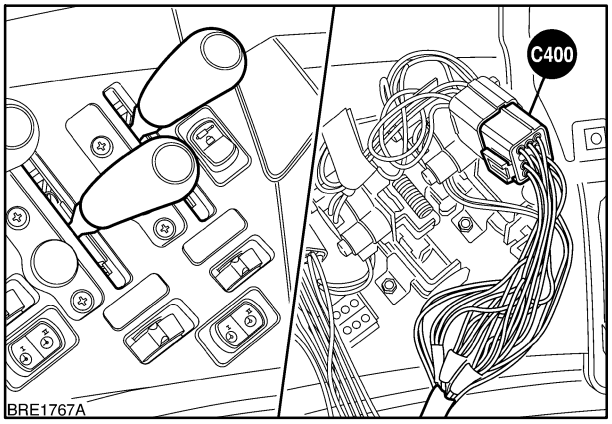
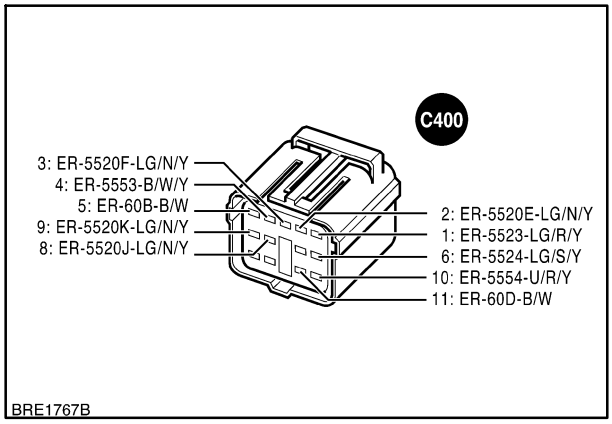
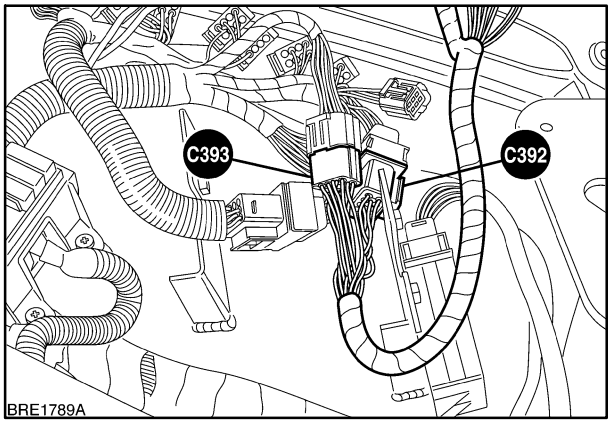
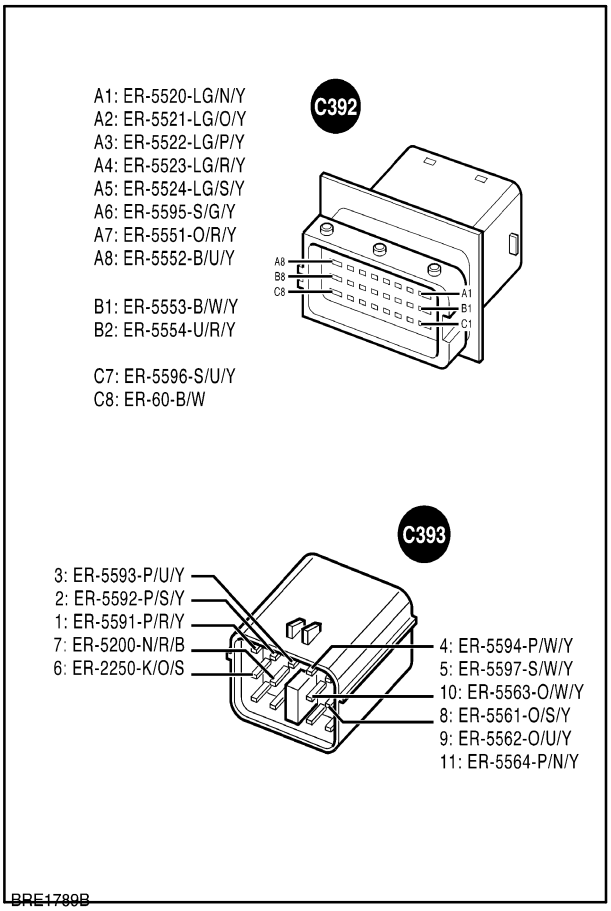
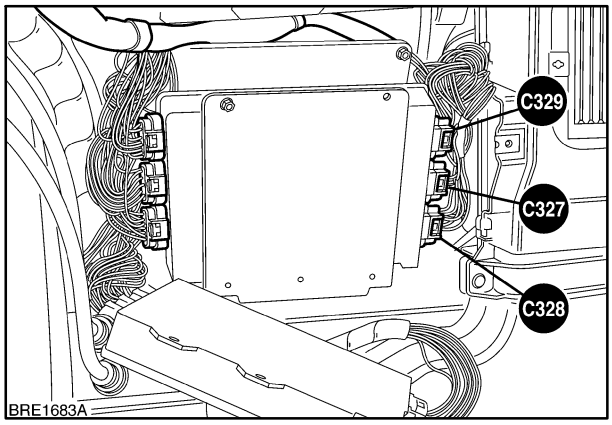
2710


C400
BRE1767A


C400
3: ER-5520F-LG/N/Y
4: ER-5553-B/W/Y
5: ER-60B-B/W
9: ER-5520K-LG/N/Y
8: ER-5520J-LG/N/Y
2: ER-5520E-LG/N/Y
1: ER-5523-LG/R/Y
6: ER-5524-LG/S/Y
10: ER-5554-U/R/Y
11: ER-60D-B/W
BRE1767B

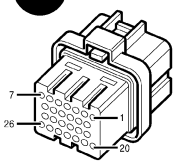

C393
C392
BRE1789A


A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B



C327

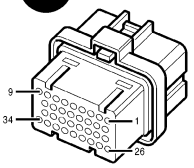
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

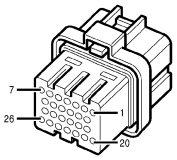
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4183 - TIMER SWITCH NO.3 / NO.4 DISCONNECTED

Possible failure modes:

1. Faulty connector
2. Faulty No.3 / No.4 timer switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the No.3 / No.4 timer switch connector **C395** and the inline connector **C393**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the No.3 / No.4 timer switch.

   A. Disconnect connector **C395**. Check between the component side of connector:

   C395 pin **5 (LG/N/Y)** and **C395** pin **1 (O/W/Y)**

   C395 pin **5 (LG/N/Y)** and **C395** pin **6 (P/N/Y)**

   If an open circuit is indicated, replace the No.3 / No.4 timer switch.

   B. If the No.3 / No.4 timer switch is okay, continue to step 3.

3. Check for +5 Volts.

   A. Measure the voltage between connector **C395** pin **5 (LG/N/Y)** and **ground**. If +5 Volts is not indicated, repair or replace the harness as required

   B. If +5 Volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C327** and **C328**. Check between connector:

   C395 pin **1 (O/W/Y)** and **C328** pin **32 (O/W/Y)**

   C395 pin **6 (P/N/Y)** and **C327** pin **15 (P/N/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to ground.

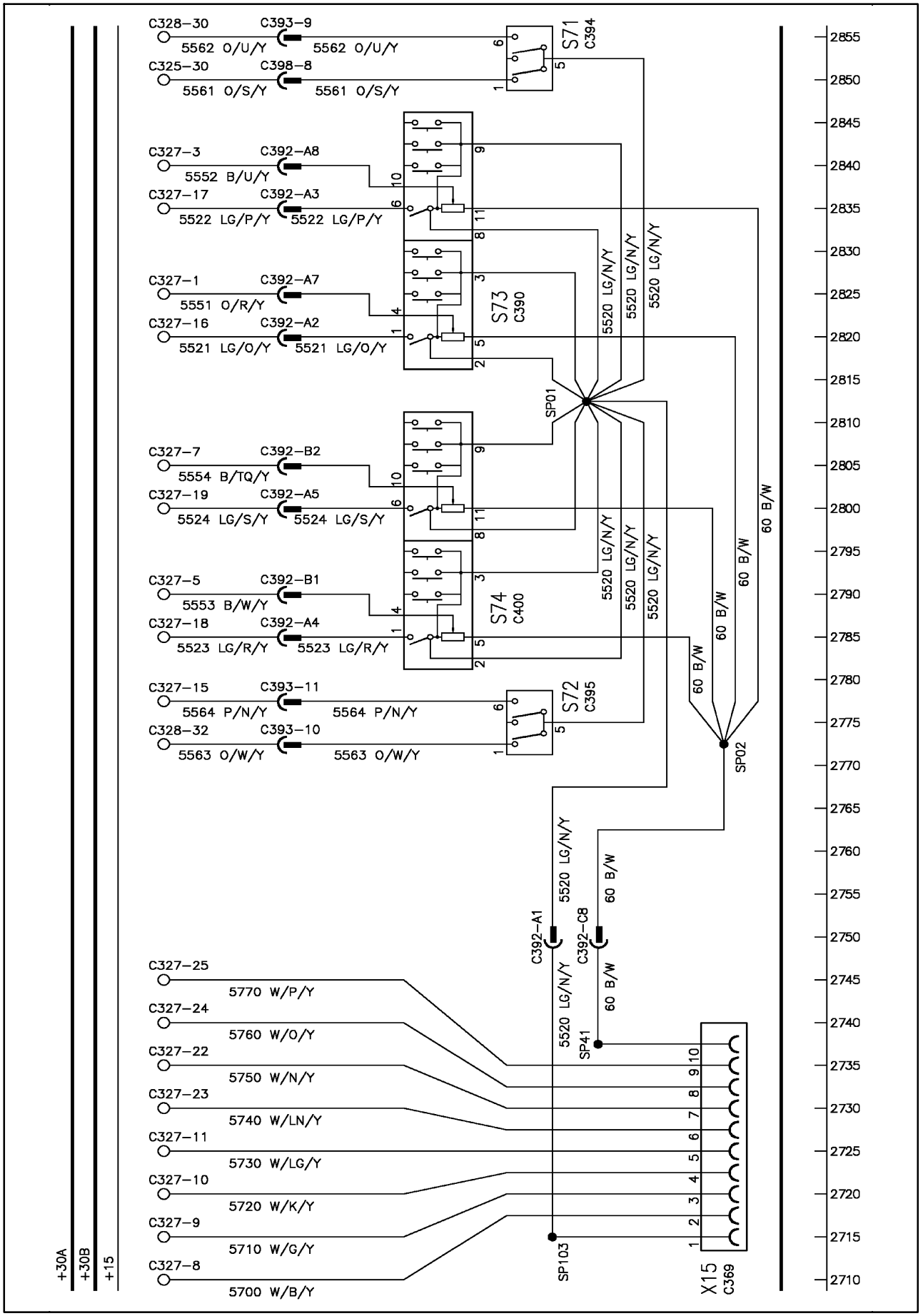
   A. Check between connector:

   C395 pin **1 (O/W/Y)** and **ground**.

   C395 pin **6 (P/N/Y)** and **ground**.

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
2855
2850
2845
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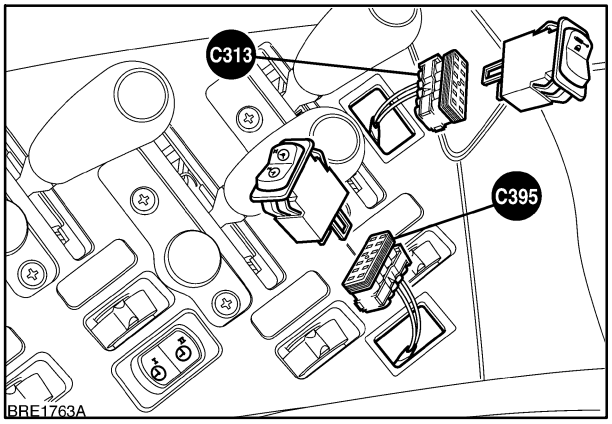
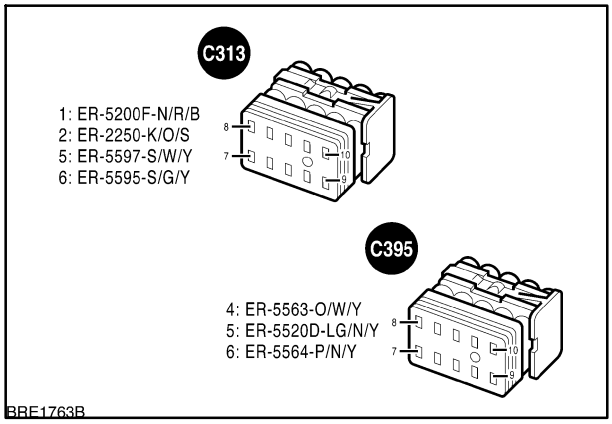
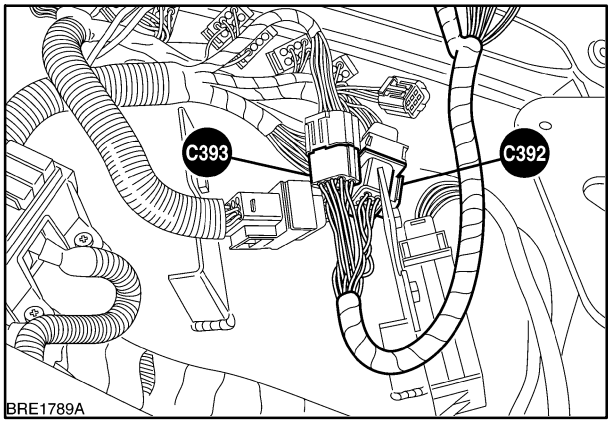
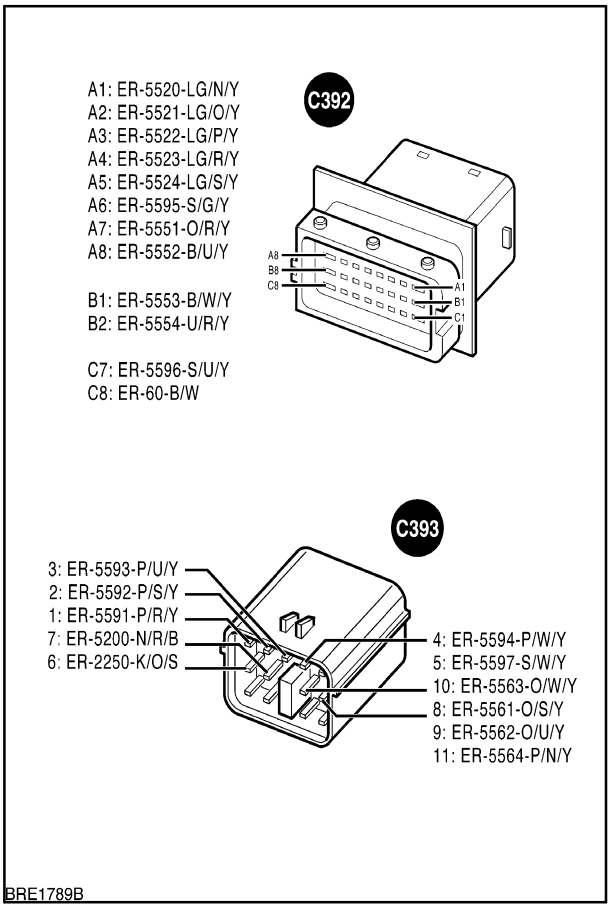
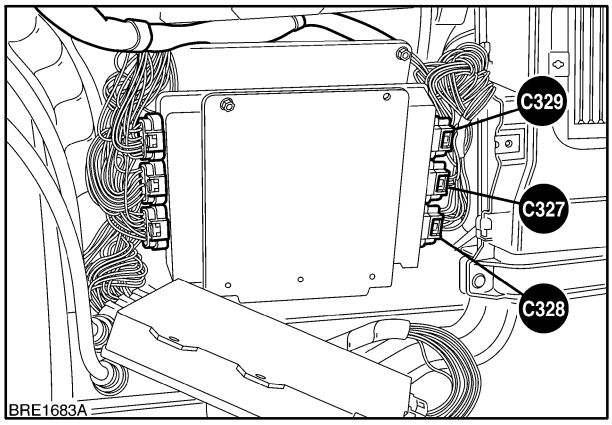

C313
C395
BRE1763A


C313
1: ER-5200F-N/R/B
2: ER-2250-K/O/S
5: ER-5597-S/W/Y
6: ER-5595-S/G/Y
C395
4: ER-5563-O/W/Y
5: ER-5520D-LG/N/Y
6: ER-5564-P/N/Y
BRE1763B

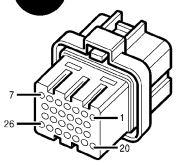

C393
C392
BRE1789A


A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
C392
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B



C327

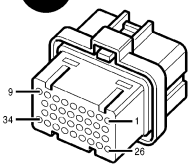
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

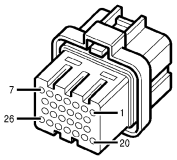
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4184 - EHR JOYSTICK POT X OPEN CIRCUIT

Cause:

Joystick potentiometer X output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR joystick X potentiometer
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the joystick potentiometer X in H9 Channel 24.

   A. Operate the lever from lower to extend. If the values displayed do not change continuously between 40 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 24 wiggle the harness and the connectors to check for an intermittent circuit. Channel 24 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR joystick connector **C369**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C369** pin **1 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C369** pin **10 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for an open circuit.

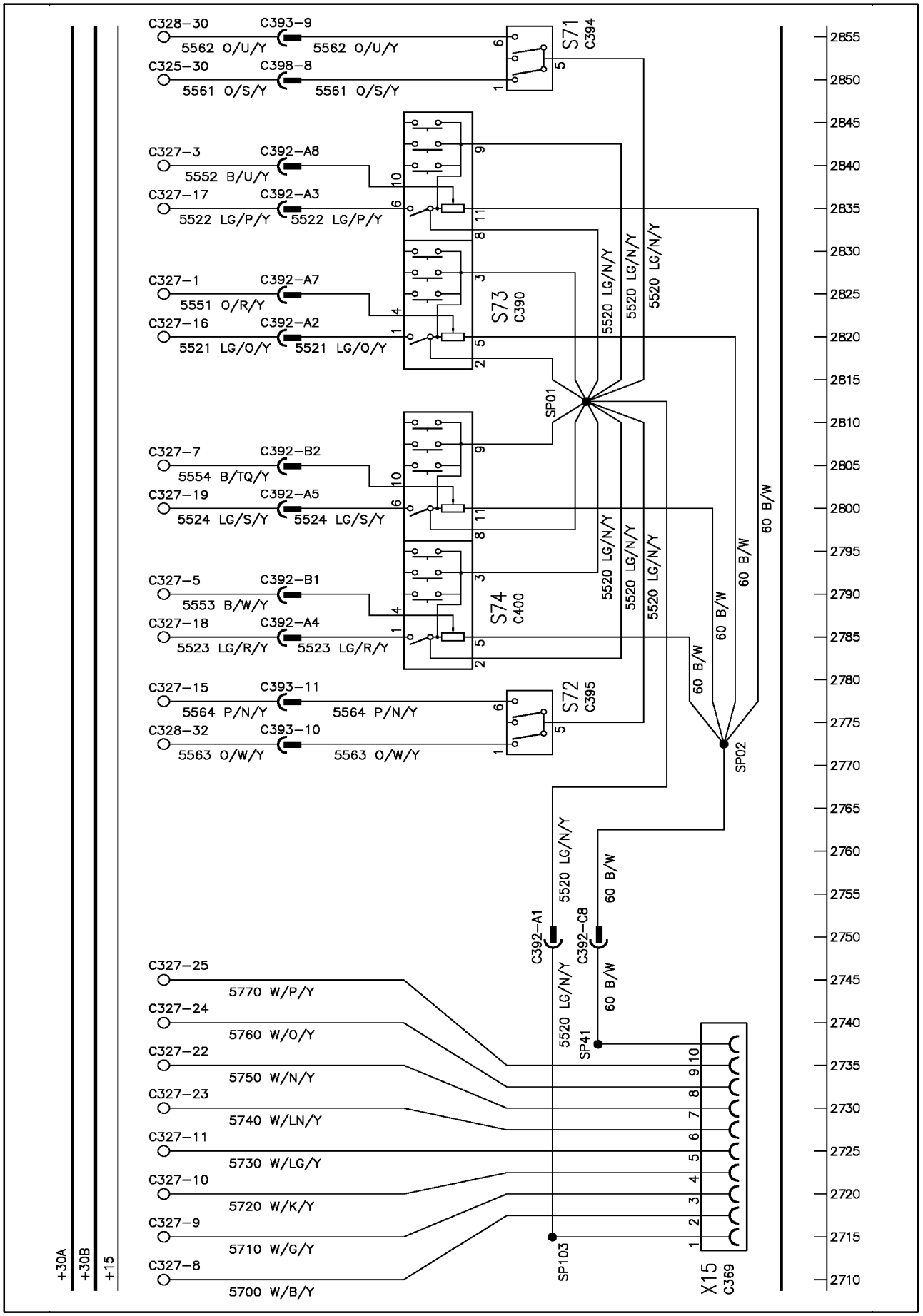
   A. Disconnect connector **C327**. Check between connector **C327** pin **8 (W/B/Y)** and **C369** pin **2 (W/B/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C369** pin **2 (W/B/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the EHR joystick. If the fault is still present, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
SP02
5520 LG/N/Y
60 B/W
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
SP103
X15
C369
+30A
+30B
+15
2855
2850
2845
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2800
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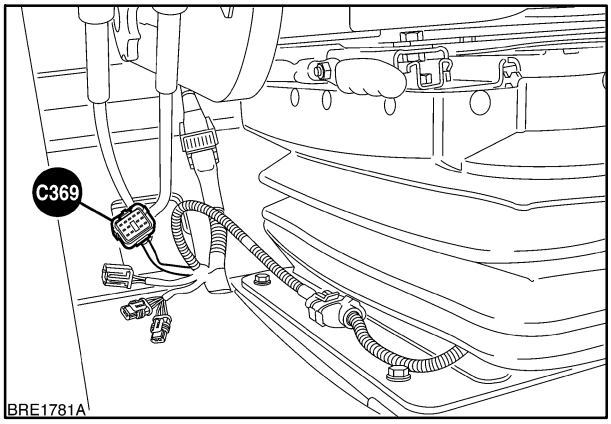
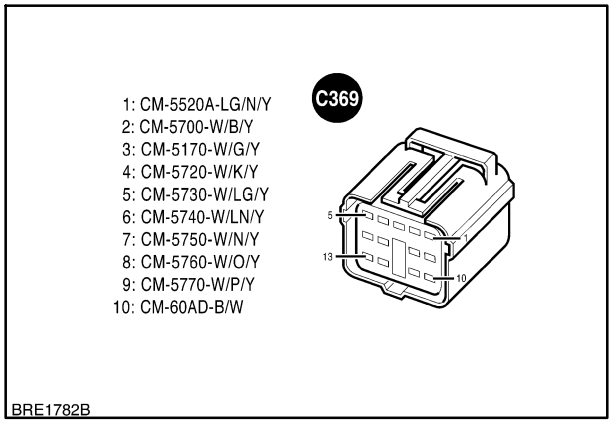
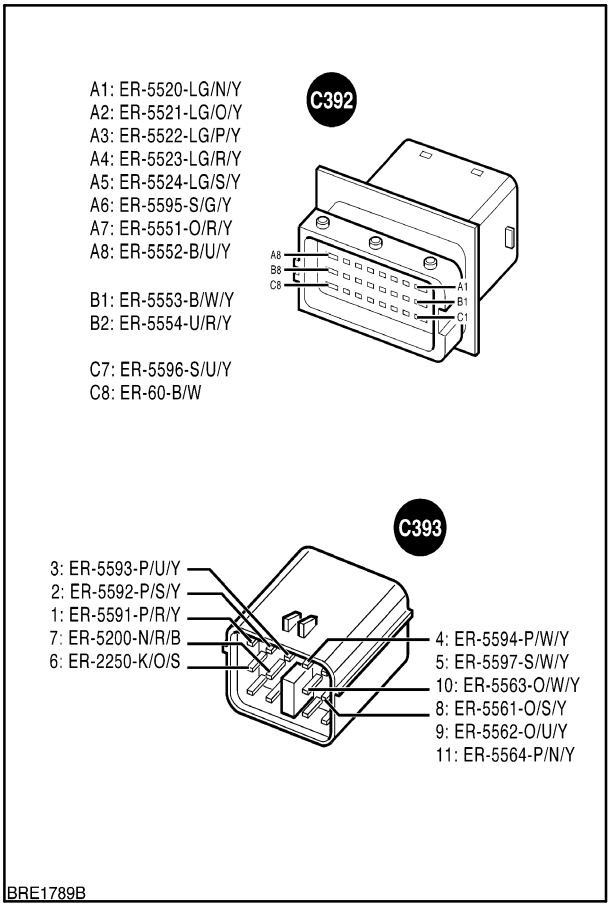
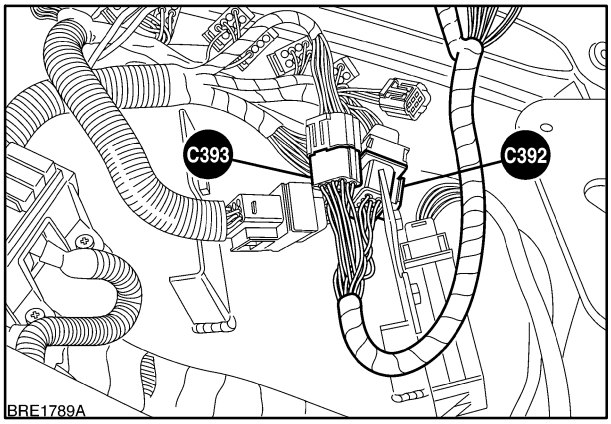

C369
BRE1781A


C369
1: CM-5520A-LG/N/Y
2: CM-5700-W/B/Y
3: CM-5170-W/G/Y
4: CM-5720-W/K/Y
5: CM-5730-W/LG/Y
6: CM-5740-W/LN/Y
7: CM-5750-W/N/Y
8: CM-5760-W/O/Y
9: CM-5770-W/P/Y
10: CM-60AD-B/W
5
1
13
10
BRE1782B


C392
A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B


C393
C392
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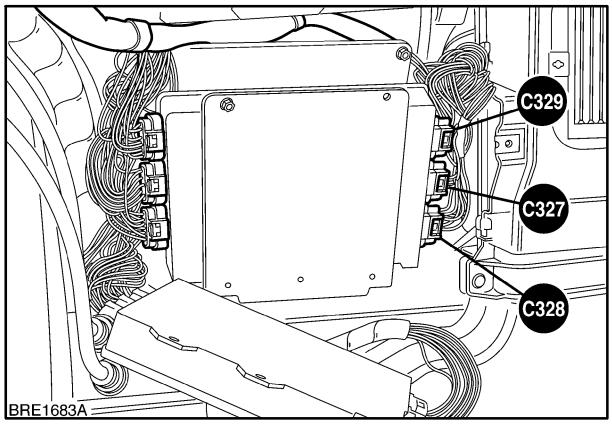
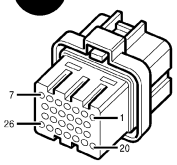


C327

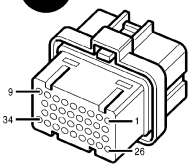
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

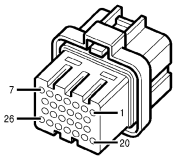
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4185 - EHR JOYSTICK POT X SHORT CIRCUIT

Cause:

Joystick potentiometer X output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR joystick X potentiometer
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the joystick potentiometer X in H9 Channel 24.

   A. Operate the lever from lower to extend. If the values displayed do not change continuously between 40 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 24 wiggle the harness and the connectors to check for an intermittent circuit. Channel 24 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR joystick connector **C369**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C369** pin **1 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for an open circuit.

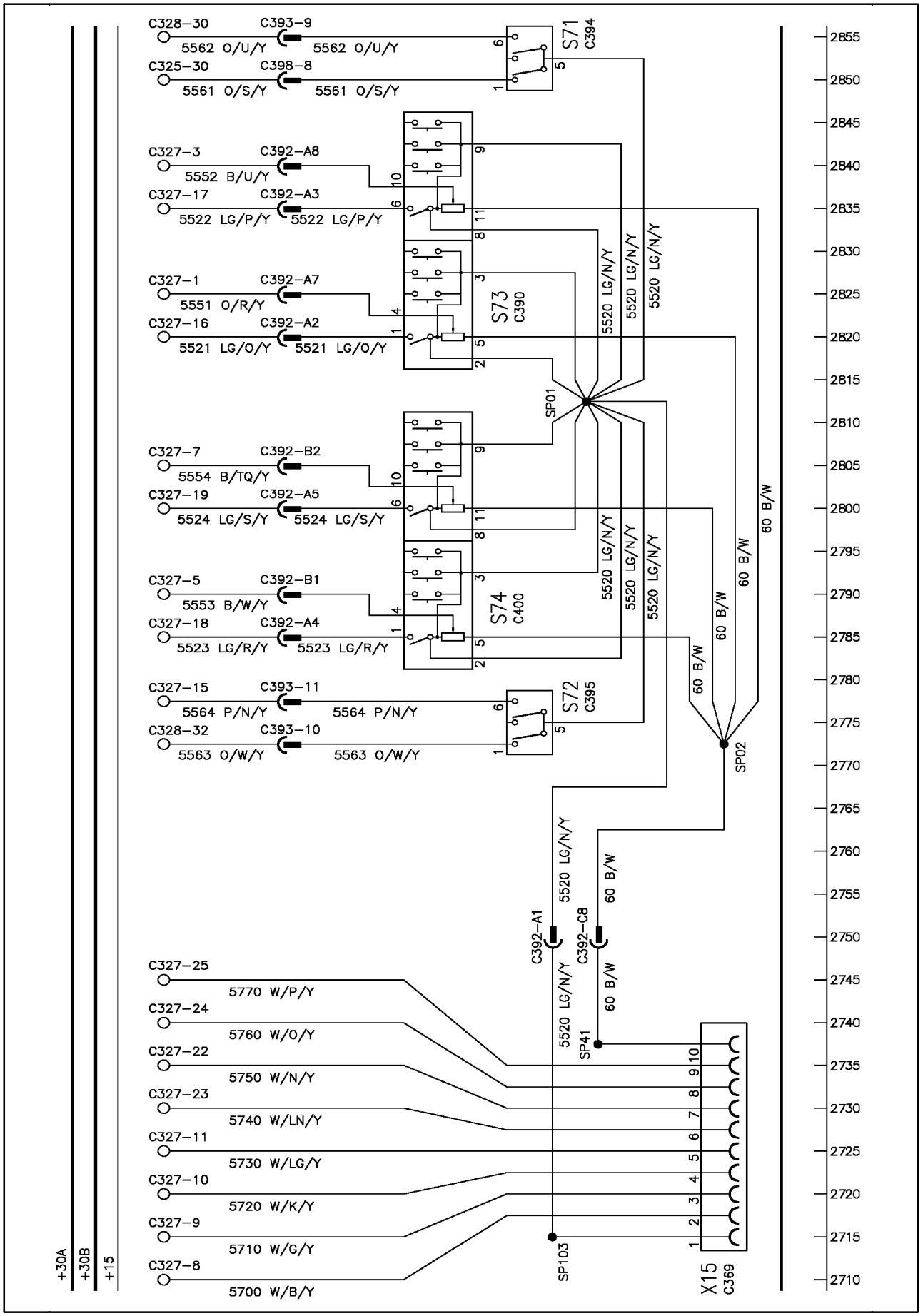
   A. Turn the keystart OFF. Check between connector **C369** pin **10 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Check between connector **C369** pin **2 (W/B/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the EHR joystick. If the fault is still present, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
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+30B
+15
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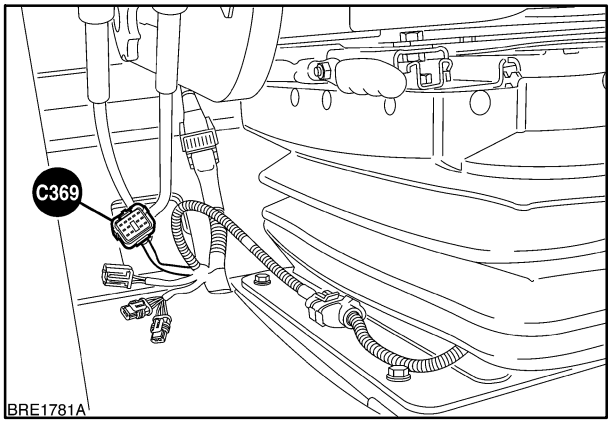

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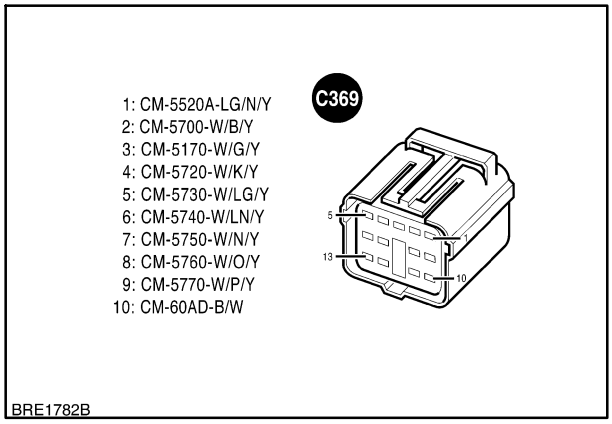
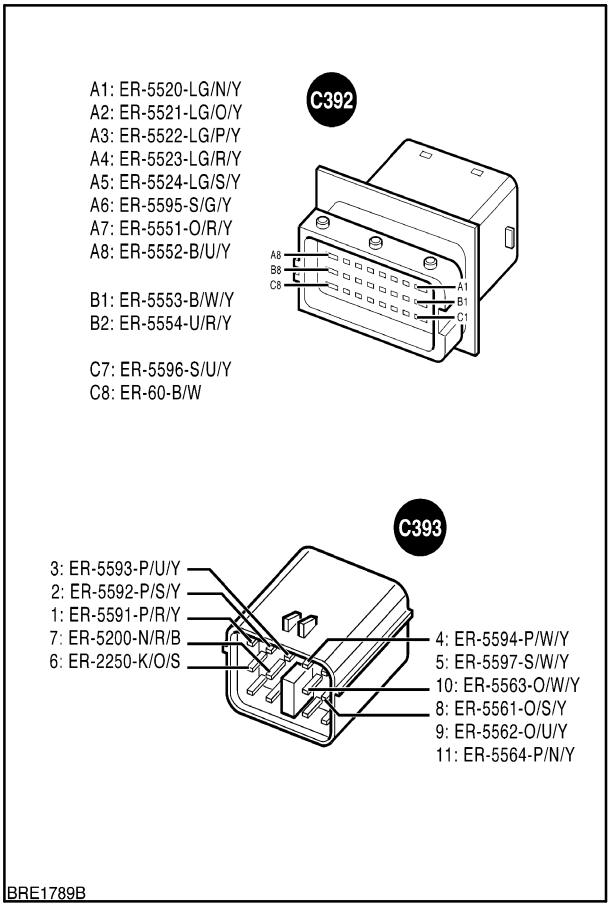


BRE1782B



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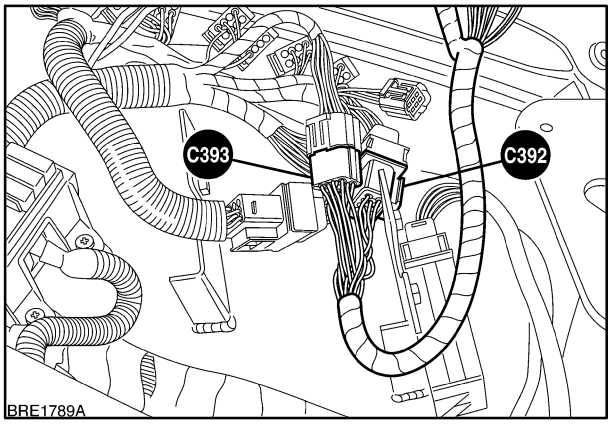

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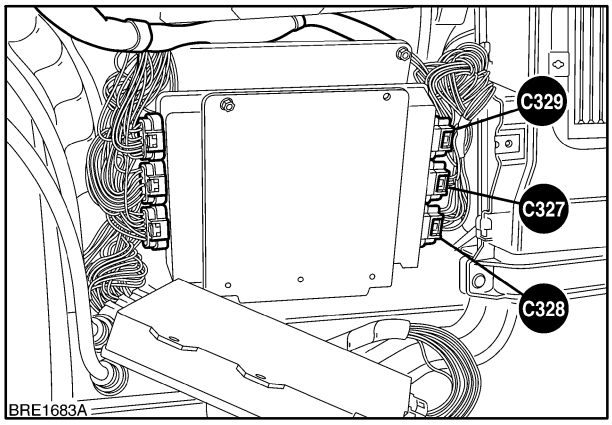
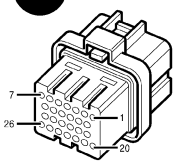


C327

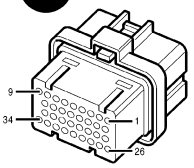
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

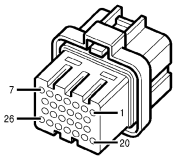
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4186 - EHR JOYSTICK POT Y OPEN CIRCUIT

Cause:

Joystick potentiometer Y output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR joystick Y potentiometer
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the joystick potentiometer Y in H9 Channel 25.

   A. Operate the lever from lower to extend. If the values displayed do not change continuously between 40 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 25 wiggle the harness and the connectors to check for an intermittent circuit. Channel 25 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR joystick connector **C369**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C369** pin **1 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Check between connector **C369** pin **10 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for an open circuit.

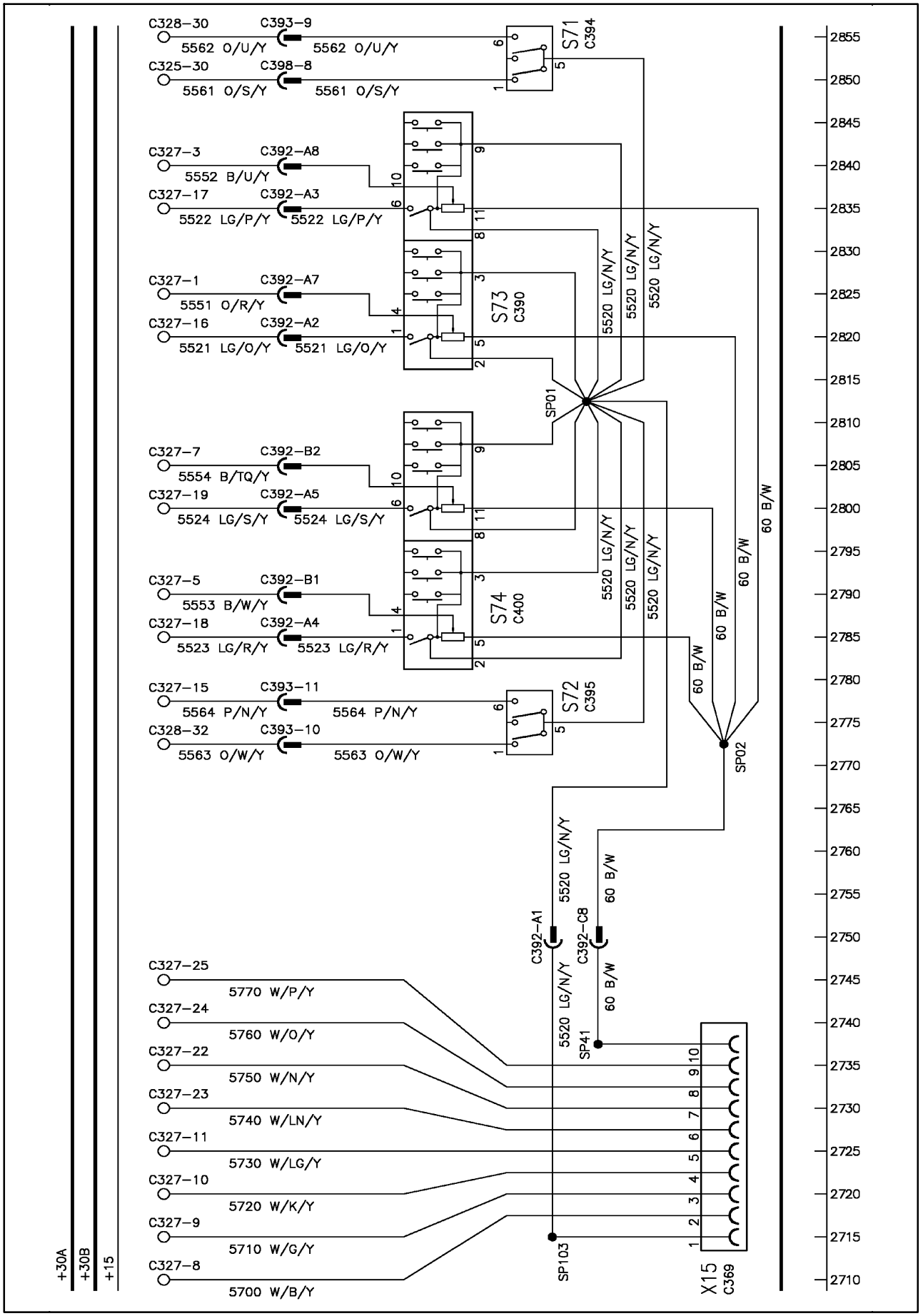
   A. Disconnect connector **C327**. Check between connector **C327** pin **23 (W/LN/Y)** and **C369** pin **6 (W/LN/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C369** pin **6 (W/LN/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the EHR joystick. If the fault is still present, remove and replace the controller.


C328-30
C393-9
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5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
SP02
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60 B/W
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
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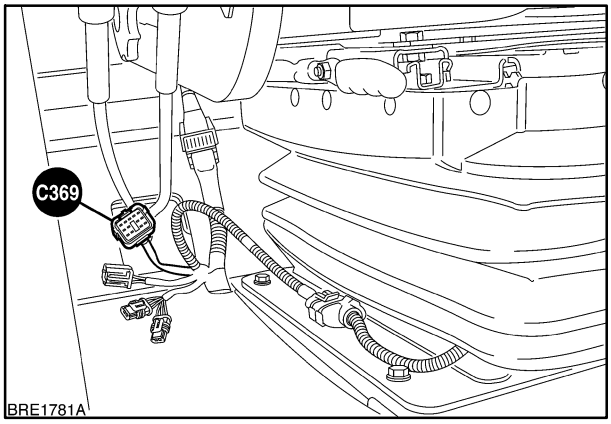
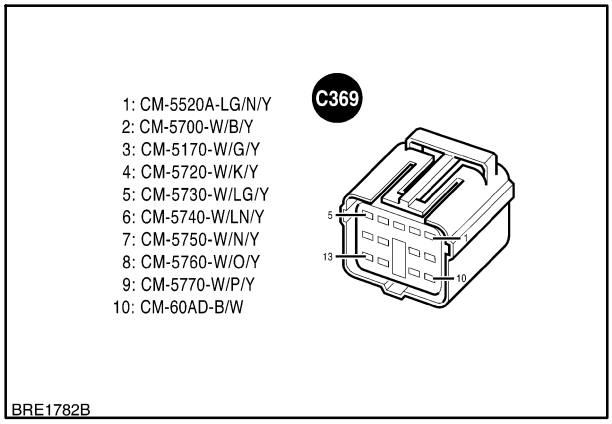
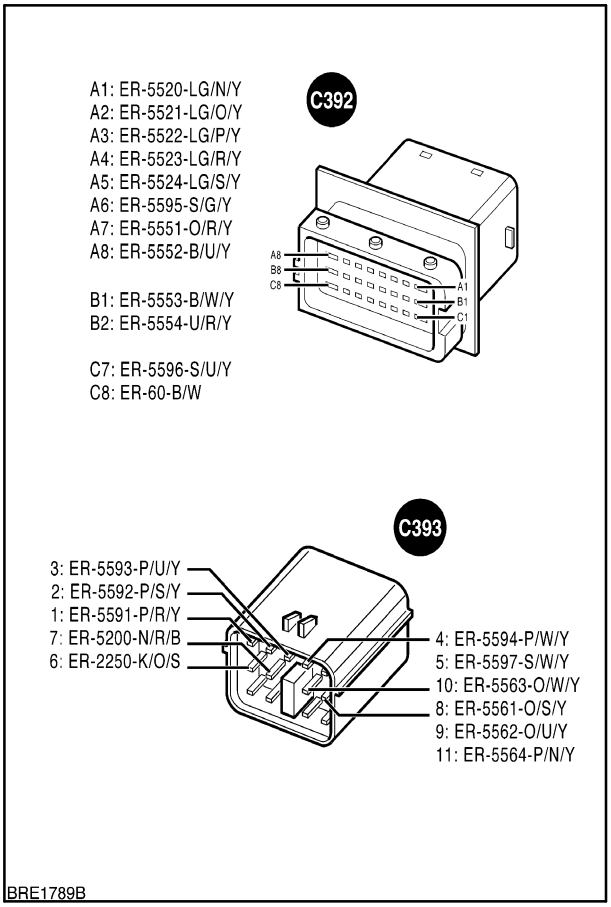


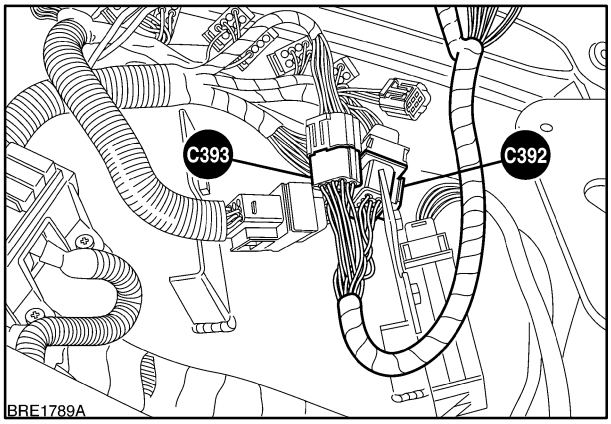
BRE1781A



BRE1782B



BRE1789B



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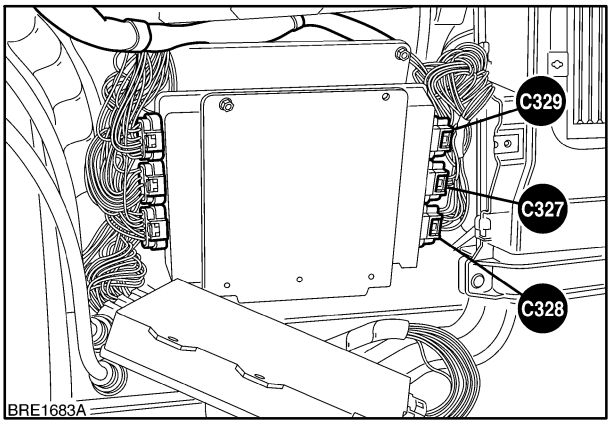
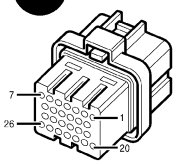


C327

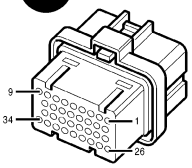
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

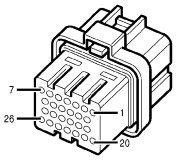
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4187 - EHR JOYSTICK POT Y SHORT CIRCUIT

Cause:

Joystick potentiometer Y output voltage is outside the limits.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR joystick Y potentiometer
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the joystick potentiometer Y in H9 Channel 25.

   A. Operate the lever from lower to extend. If the values displayed do not change continuously between 40 and 10, continue to step 2.

   B. If the values displayed are okay, while in H9 Channel 25 wiggle the harness and the connectors to check for an intermittent circuit. Channel 25 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the EHR joystick connector **C369**, the inline connector **C392** and the controller connector **C327.**

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C369** pin **1 (LG/N/Y)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for an open circuit.

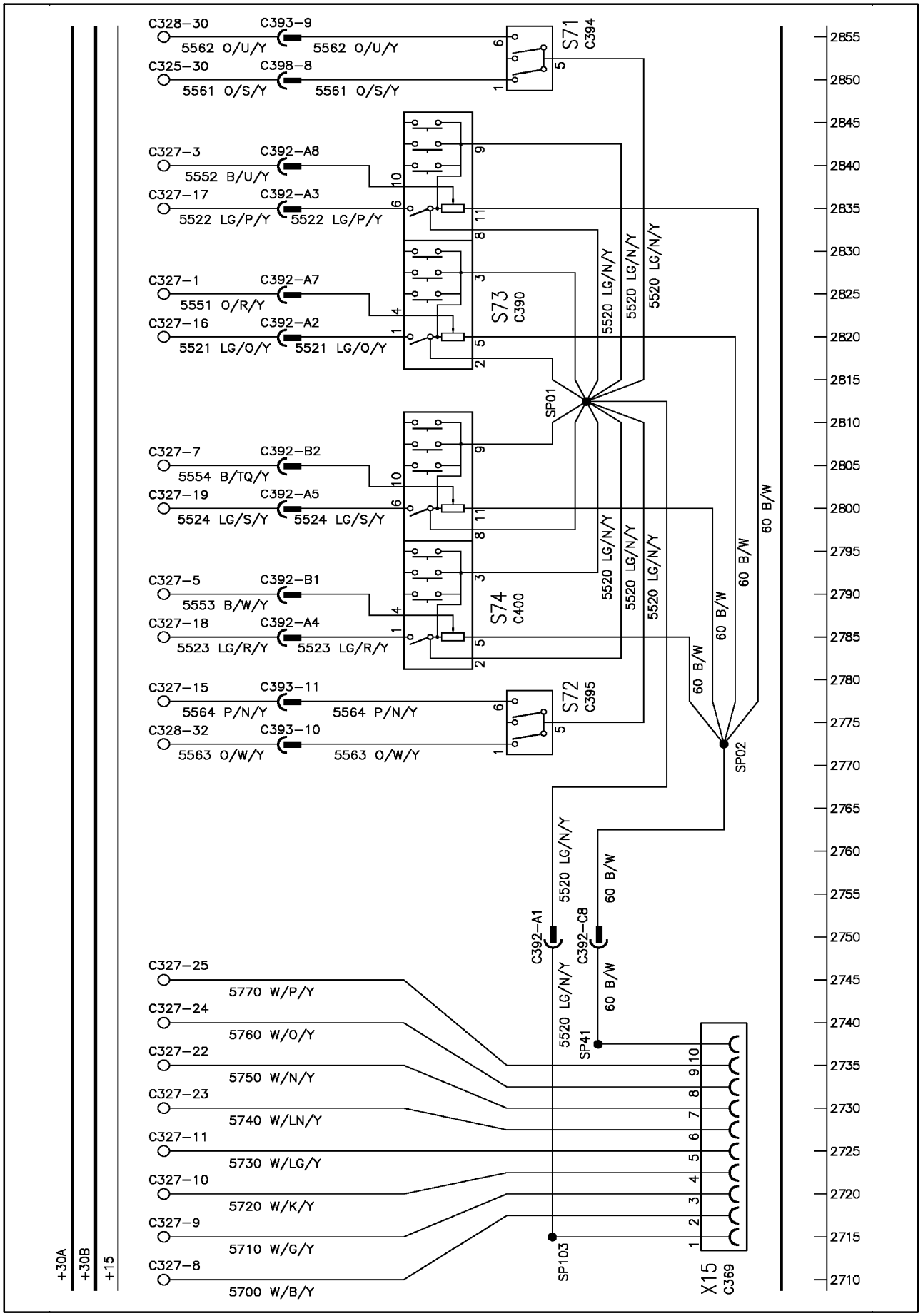
   A. Turn the keystart OFF. Check between connector **C369** pin **10 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to +Ve voltage.

   A. Turn the keystart ON. Check between connector **C369** pin **6 (W/LN/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the EHR joystick. If the fault is still present, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
5520 LG/N/Y
60 B/W
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
SP02
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
SP103
X15
C369
+30A
+30B
+15
2855
2850
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790
2785
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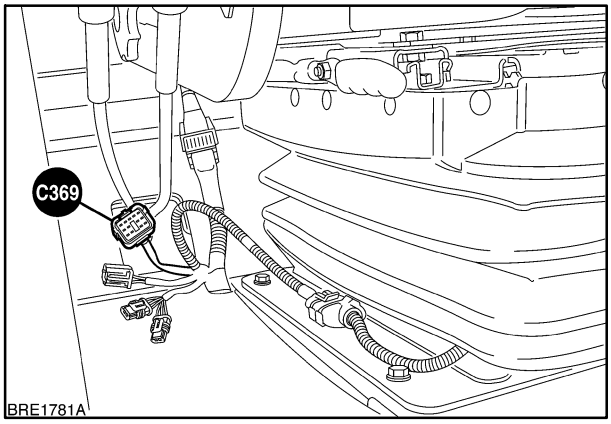
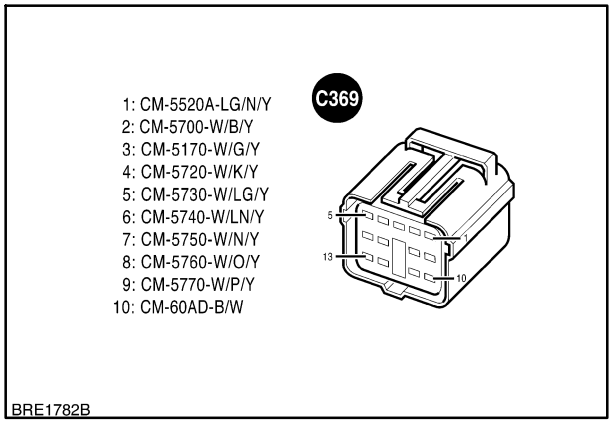
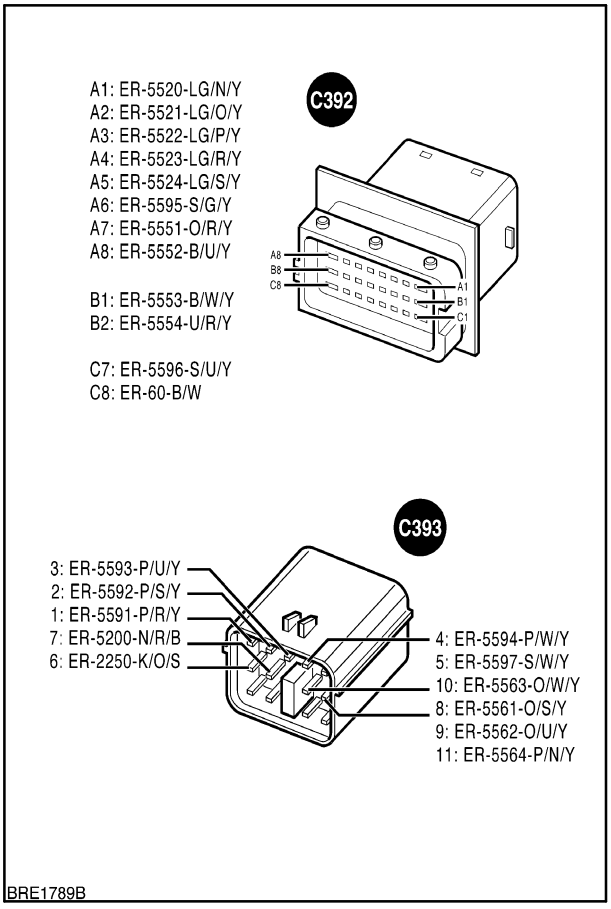
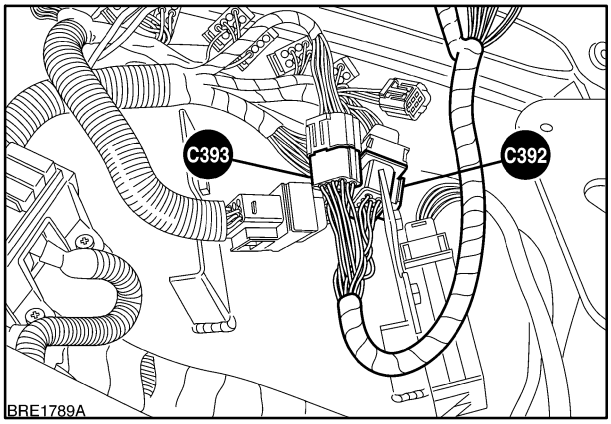
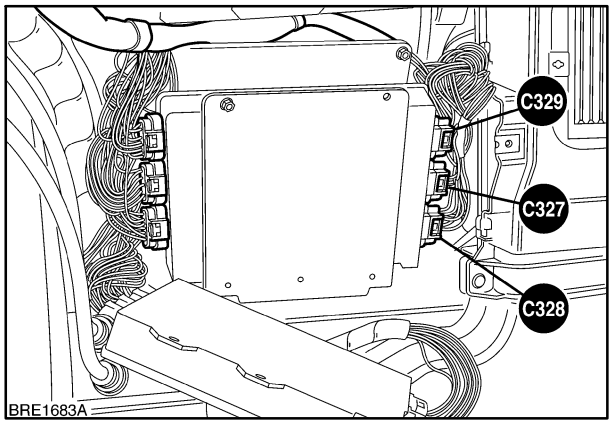
2715
2710


C369
BRE1781A


C369
1: CM-5520A-LG/N/Y
2: CM-5700-W/B/Y
3: CM-5170-W/G/Y
4: CM-5720-W/K/Y
5: CM-5730-W/LG/Y
6: CM-5740-W/LN/Y
7: CM-5750-W/N/Y
8: CM-5760-W/O/Y
9: CM-5770-W/P/Y
10: CM-60AD-B/W
5
1
13
10
BRE1782B

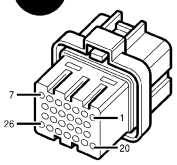

C392
A1: ER-5520-LG/N/Y
A2: ER-5521-LG/O/Y
A3: ER-5522-LG/P/Y
A4: ER-5523-LG/R/Y
A5: ER-5524-LG/S/Y
A6: ER-5595-S/G/Y
A7: ER-5551-O/R/Y
A8: ER-5552-B/U/Y
B1: ER-5553-B/W/Y
B2: ER-5554-U/R/Y
C7: ER-5596-S/U/Y
C8: ER-60-B/W
A8
B8
C8
A1
B1
C1
C393
3: ER-5593-P/U/Y
2: ER-5592-P/S/Y
1: ER-5591-P/R/Y
7: ER-5200-N/R/B
6: ER-2250-K/O/S
4: ER-5594-P/W/Y
5: ER-5597-S/W/Y
10: ER-5563-O/W/Y
8: ER-5561-O/S/Y
9: ER-5562-O/U/Y
11: ER-5564-P/N/Y
BRE1789B


C393
C392
BRE1789A



C327

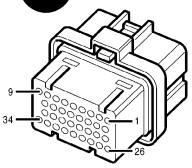
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y



15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y

C328

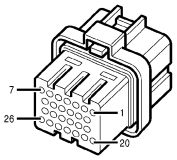
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y



29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S

C329

2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R



17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y

BRE1683B

ERROR CODE 4190 - NO COMMUNICATION FROM EHR NO.1

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C279**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C279**. Turn the keystart ON. Measure the voltage between connector **C279** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C279 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C279 pin **2 (U)** and **C020** pin **32 (U)**

   C279 pin **3 (R)** and **C020** pin **31 (R)**

   C279 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

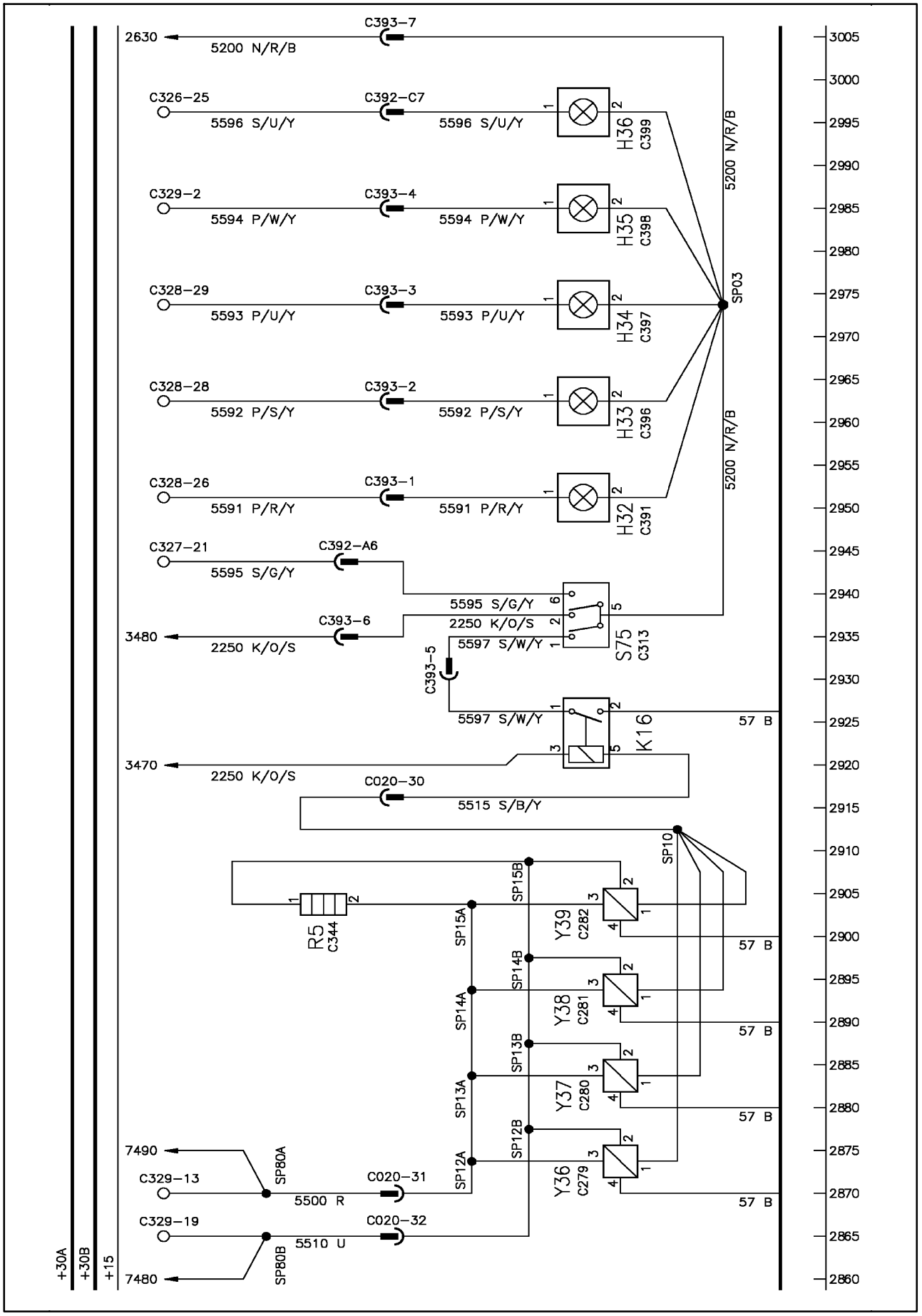
   C279 pin **1 (S/B/Y)** and **ground**

   C279 pin **2 (U)** and **ground**

   C279 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.


C393-7
2630
5200 N/R/B
C326-25
C392-C7
5596 S/U/Y
5596 S/U/Y
H36 C399
C329-2
C393-4
5594 P/W/Y
5594 P/W/Y
H35 C398
C328-29
C393-3
5593 P/U/Y
5593 P/U/Y
H34 C397
C328-28
C393-2
5592 P/S/Y
5592 P/S/Y
H33 C396
C328-26
C393-1
5591 P/R/Y
5591 P/R/Y
H32 C391
5200 N/R/B
SP03
5200 N/R/B
C327-21
C392-A6
5595 S/G/Y
5595 S/G/Y
C393-6
3480
2250 K/O/S
2250 K/O/S
2250 K/O/S
5597 S/W/Y
S75 C313
C393-5
5597 S/W/Y
K16
57 B
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
SP80B
7480
+30A
+30B
+15
3005
3000
2995
2990
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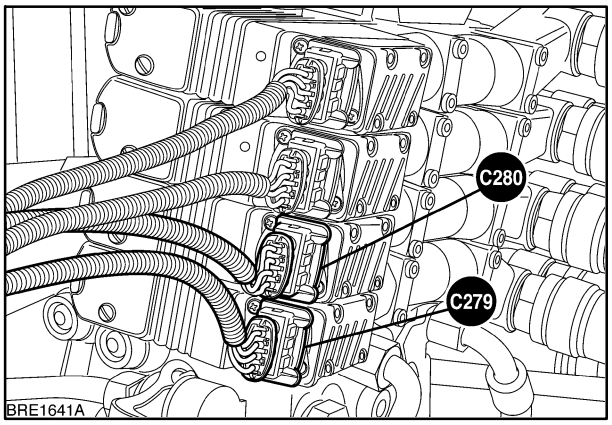
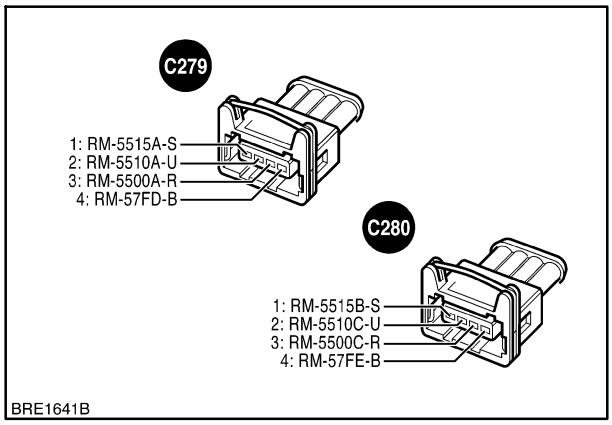
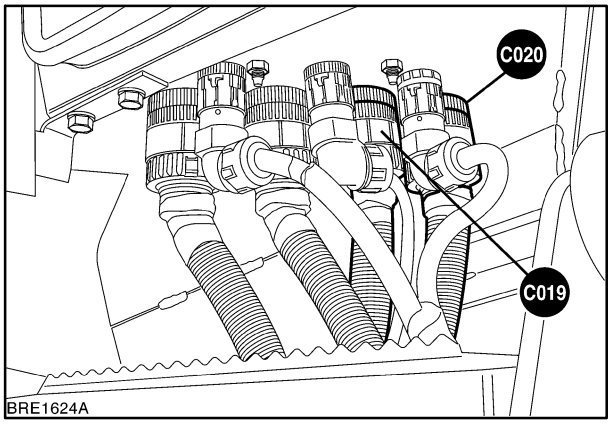


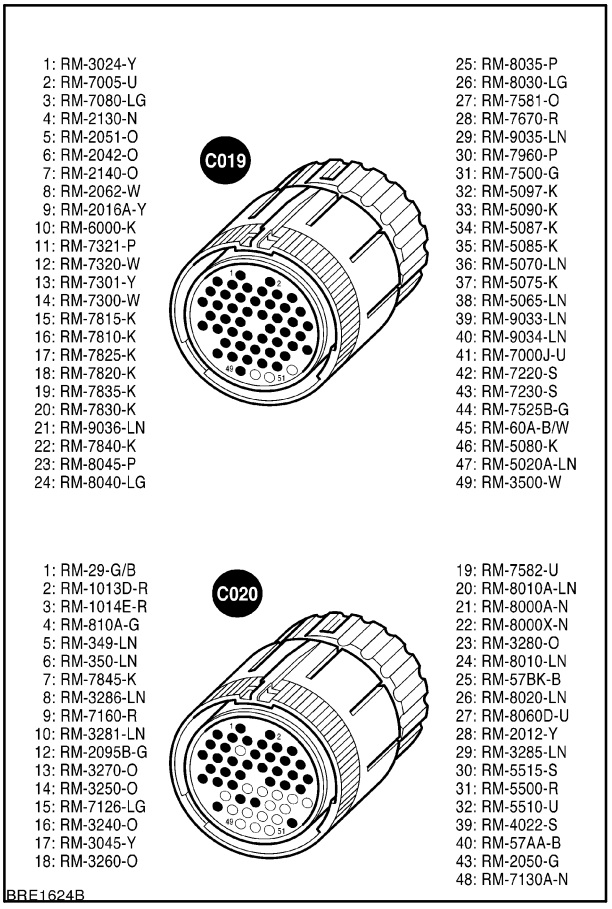
BRE1641A



BRE1641B



BRE1624A



BRE1624B

ERROR CODE 4191 - NO COMMUNICATIONS FROM EHR NO.2

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C280**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C280**. Turn the keystart ON. Measure the voltage between connector **C280** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C280 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C280 pin **2 (U)** and **C020** pin **32 (U)**

   C280 pin **3 (R)** and **C020** pin **31 (R)**

   C280 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

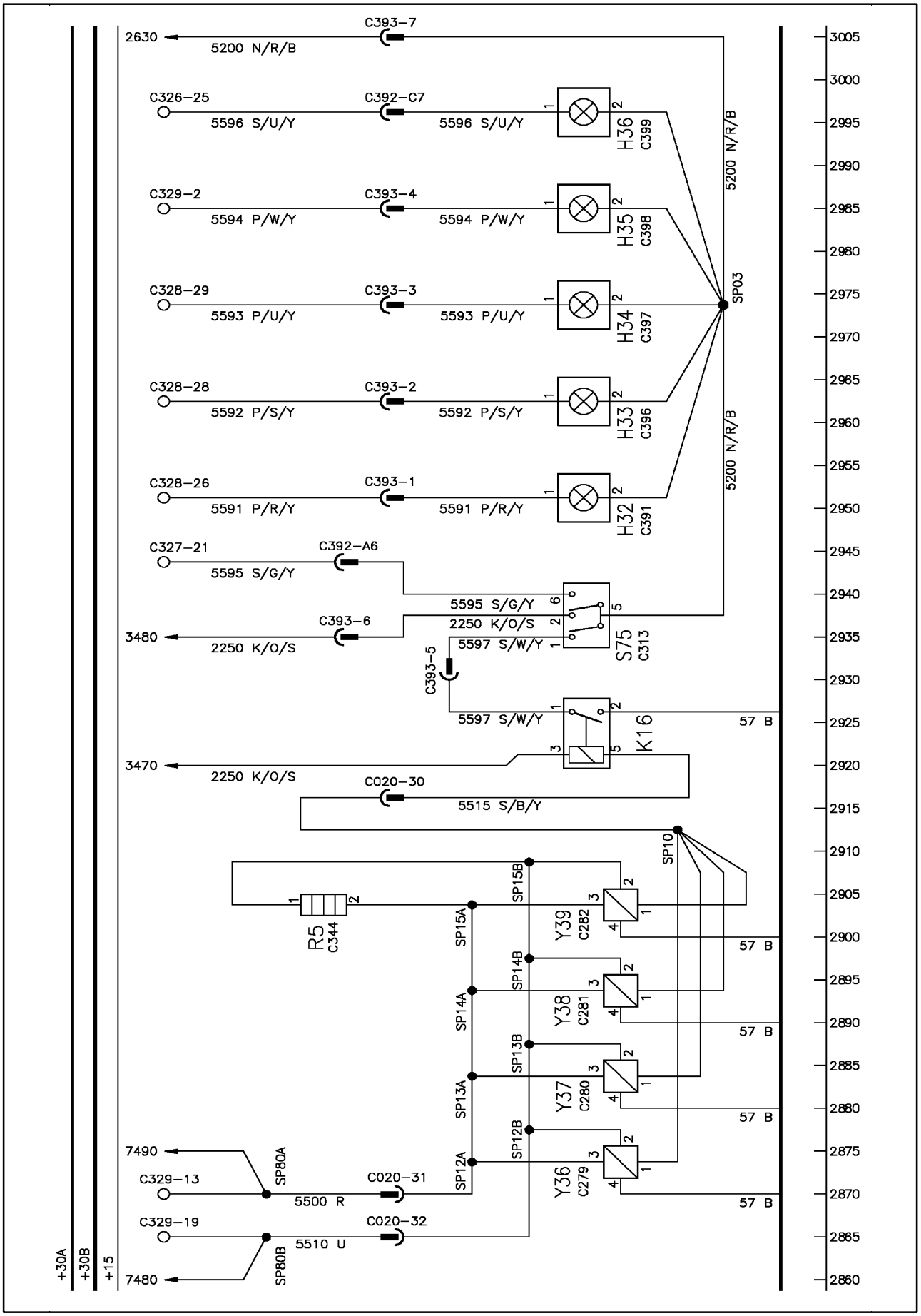
   C280 pin **1 (S/B/Y)** and **ground**

   C280 pin **2 (U)** and **ground**

   C280 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.


C393-7
2630
5200 N/R/B
C326-25
C392-C7
5596 S/U/Y
5596 S/U/Y
H36 C399
C329-2
C393-4
5594 P/W/Y
5594 P/W/Y
H35 C398
C328-29
C393-3
5593 P/U/Y
5593 P/U/Y
H34 C397
C328-28
C393-2
5592 P/S/Y
5592 P/S/Y
H33 C396
C328-26
C393-1
5591 P/R/Y
5591 P/R/Y
H32 C391
5200 N/R/B
SP03
5200 N/R/B
C327-21
C392-A6
5595 S/G/Y
5595 S/G/Y
2250 K/O/S
5597 S/W/Y
S75 C313
3480
C393-6
2250 K/O/S
C393-5
5597 S/W/Y
K16
57 B
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
SP80B
7480
+30A
+30B
+15
3005
3000
2995
2990
2985
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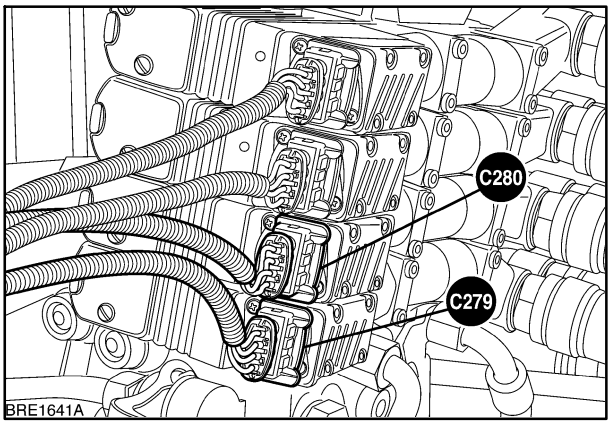
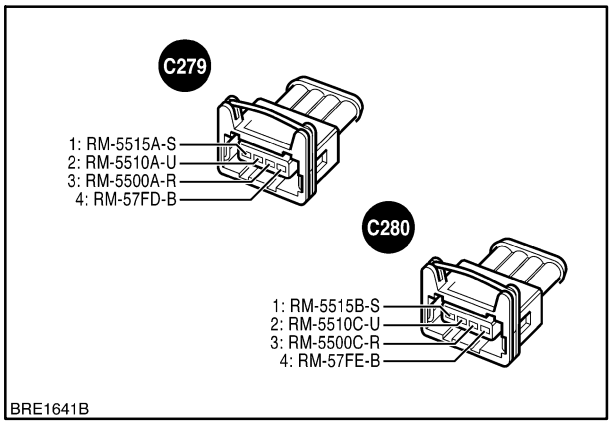
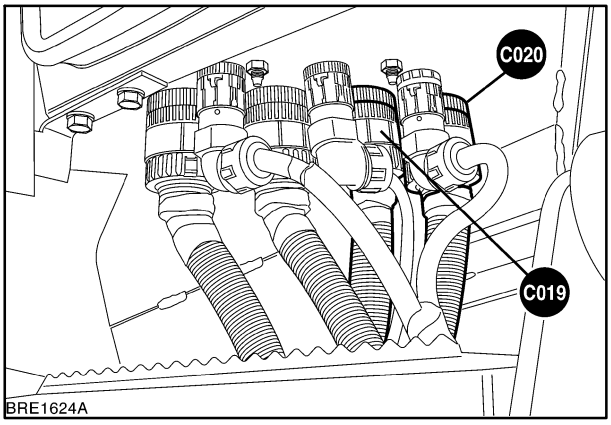
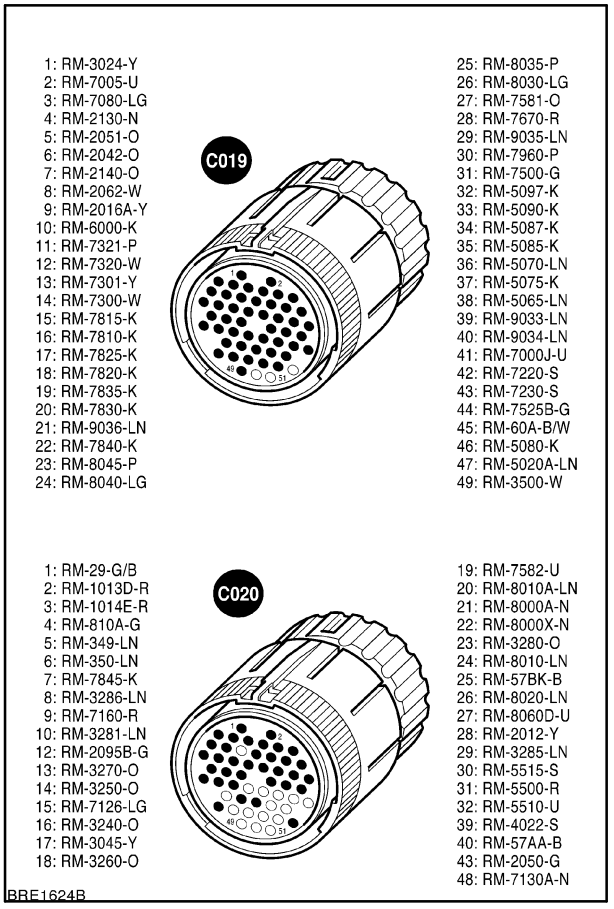

C280
C279
BRE1641A


C279
1: RM-5515A-S
2: RM-5510A-U
3: RM-5500A-R
4: RM-57FD-B
C280
1: RM-5515B-S
2: RM-5510C-U
3: RM-5500C-R
4: RM-57FE-B
BRE1641B


C020
C019
BRE1624A


1: RM-3024-Y
2: RM-7005-U
3: RM-7080-LG
4: RM-2130-N
5: RM-2051-O
6: RM-2042-O
7: RM-2140-O
8: RM-2062-W
9: RM-2016A-Y
10: RM-6000-K
11: RM-7321-P
12: RM-7320-W
13: RM-7301-Y
14: RM-7300-W
15: RM-7815-K
16: RM-7810-K
17: RM-7825-K
18: RM-7820-K
19: RM-7835-K
20: RM-7830-K
21: RM-9036-LN
22: RM-7840-K
23: RM-8045-P
24: RM-8040-LG
C019
25: RM-8035-P
26: RM-8030-LG
27: RM-7581-O
28: RM-7670-R
29: RM-9035-LN
30: RM-7960-P
31: RM-7500-G
32: RM-5097-K
33: RM-5090-K
34: RM-5087-K
35: RM-5085-K
36: RM-5070-LN
37: RM-5075-K
38: RM-5065-LN
39: RM-9033-LN
40: RM-9034-LN
41: RM-7000J-U
42: RM-7220-S
43: RM-7230-S
44: RM-7525B-G
45: RM-60A-B/W
46: RM-5080-K
47: RM-5020A-LN
49: RM-3500-W
1: RM-29-G/B
2: RM-1013D-R
3: RM-1014E-R
4: RM-810A-G
5: RM-349-LN
6: RM-350-LN
7: RM-7845-K
8: RM-3286-LN
9: RM-7160-R
10: RM-3281-LN
12: RM-2095B-G
13: RM-3270-O
14: RM-3250-O
15: RM-7126-LG
16: RM-3240-O
17: RM-3045-Y
18: RM-3260-O
C020
19: RM-7582-U
20: RM-8010A-LN
21: RM-8000A-N
22: RM-8000X-N
23: RM-3280-O
24: RM-8010-LN
25: RM-57BK-B
26: RM-8020-LN
27: RM-8060D-U
28: RM-2012-Y
29: RM-3285-LN
30: RM-5515-S
31: RM-5500-R
32: RM-5510-U
39: RM-4022-S
40: RM-57AA-B
43: RM-2050-G
48: RM-7130A-N
BRE1624B

ERROR CODE 4192 - NO COMMUNICATIONS FROM EHR NO.3

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C281**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C281**. Turn the keystart ON. Measure the voltage between connector **C281** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C281 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C281 pin **2 (U)** and **C020** pin **32 (U)**

   C281 pin **3 (R)** and **C020** pin **31 (R)**

   C281 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

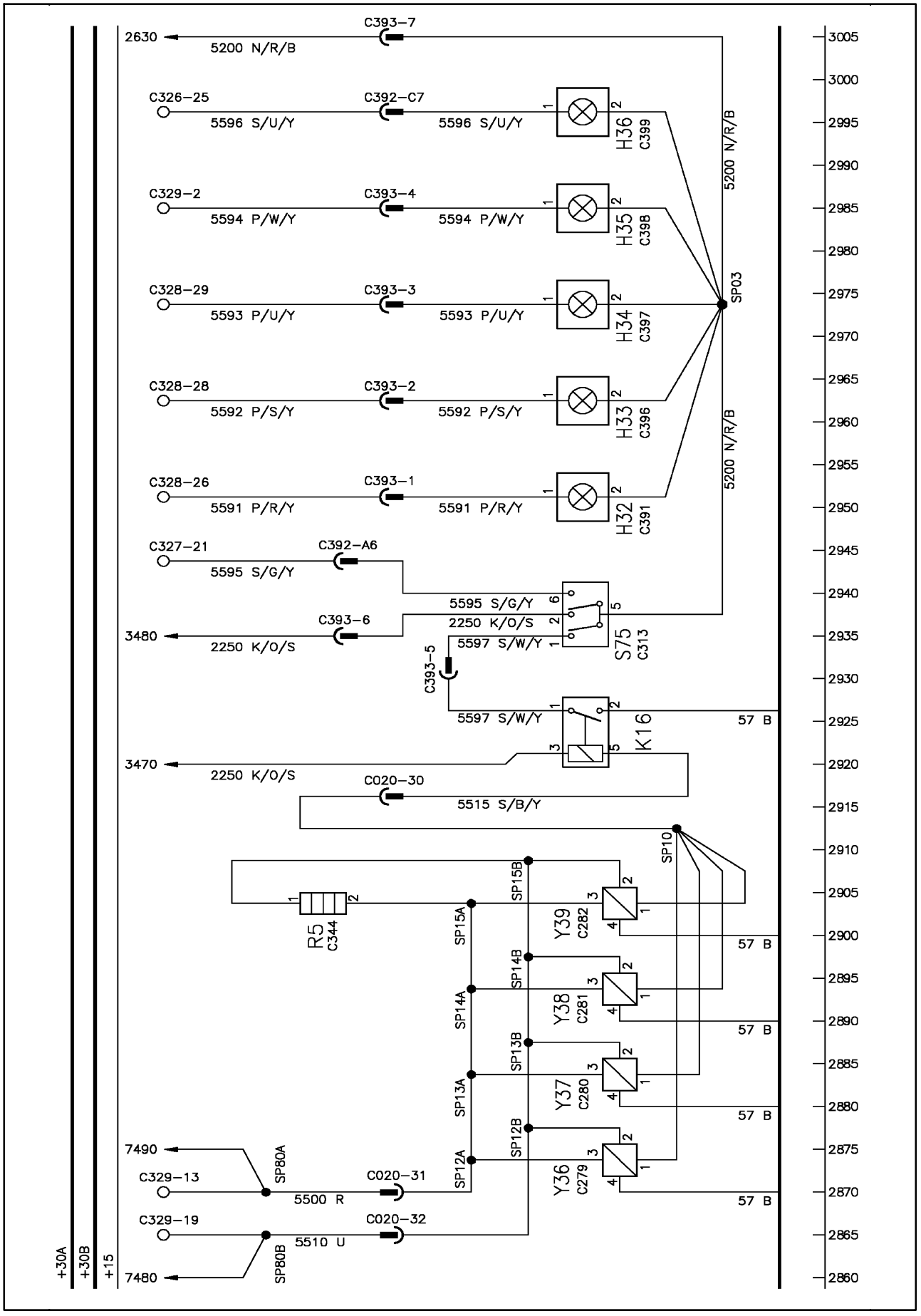
   C281 pin **1 (S/B/Y)** and **ground**

   C281 pin **2 (U)** and **ground**

   C281 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.


2630
C393-7
5200 N/R/B
C326-25
C392-C7
5596 S/U/Y
5596 S/U/Y
H36 C399
C329-2
C393-4
5594 P/W/Y
5594 P/W/Y
H35 C398
C328-29
C393-3
5593 P/U/Y
5593 P/U/Y
H34 C397
C328-28
C393-2
5592 P/S/Y
5592 P/S/Y
H33 C396
C328-26
C393-1
5591 P/R/Y
5591 P/R/Y
H32 C391
5200 N/R/B
SP03
5200 N/R/B
C327-21
C392-A6
5595 S/G/Y
5595 S/G/Y
2250 K/O/S
5597 S/W/Y
S75 C313
3480
C393-6
2250 K/O/S
C393-5
5597 S/W/Y
K16
57 B
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
SP80B
7480
+30A
+30B
+15
3005
3000
2995
2990
2985
2980
2975
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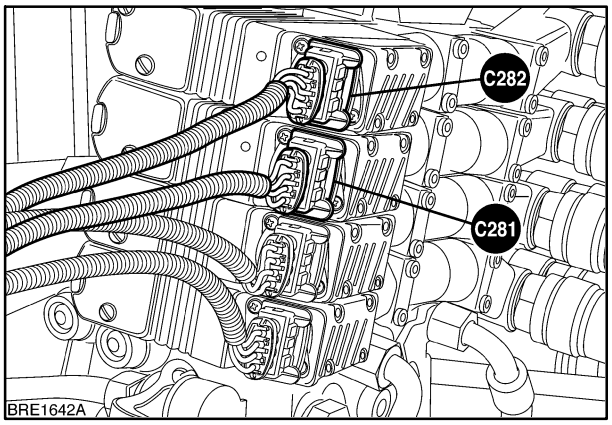
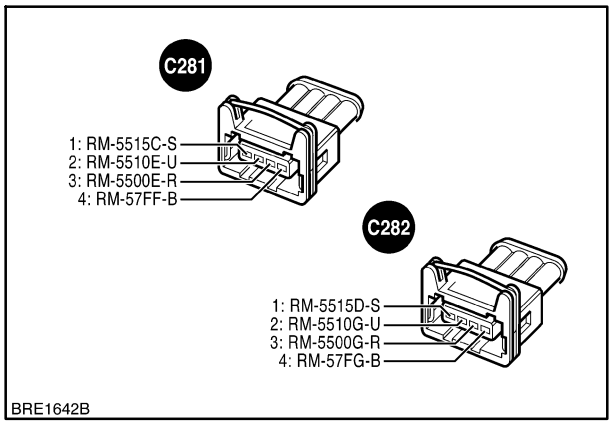
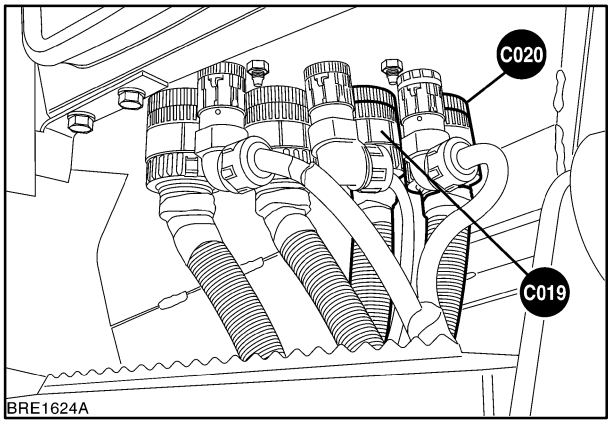


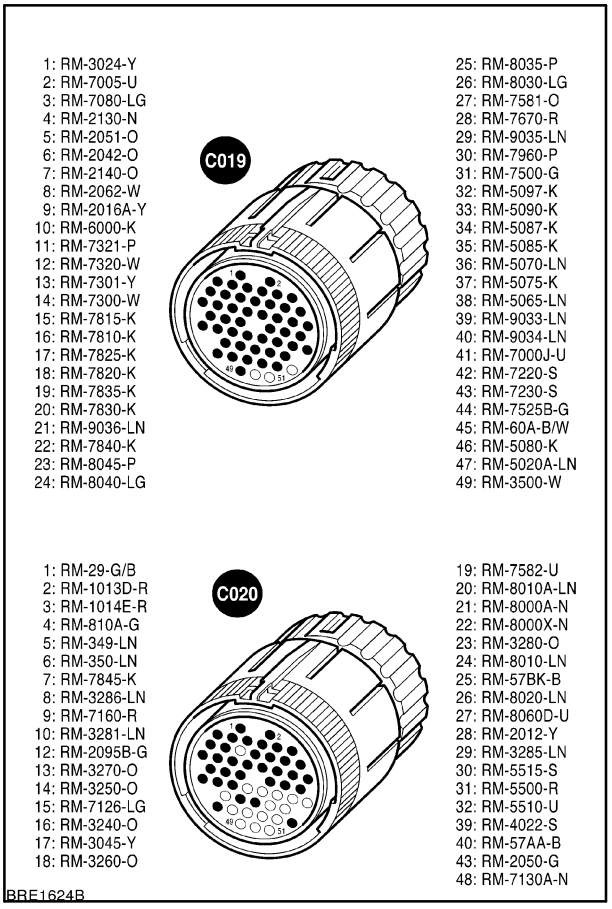
BRE1642A



BRE1642B



BRE1624A



BRE1624B

ERROR CODE 4193 - NO COMMUNICATION FROM EHR NO.4

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty EHR valve

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the EHR valve connector **C282**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check for +12 Volts.

   A. Disconnect connector **C282**. Turn the keystart ON. Measure the voltage between connector **C282** pin **1 (S/B/Y)** and **ground**. If the voltage indicated is not approximately +12 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +12 Volts, continue to step 3.

3. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the inline harness connector **C020**. Measure the resistance between connector:

   C282 pin **1 (S/B/Y)** and **C020** pin **30 (S/B/Y)**

   C282 pin **2 (U)** and **C020** pin **32 (U)**

   C282 pin **3 (R)** and **C020** pin **31 (R)**

   C282 pin **4 (B)** and **ground**

   If the resistance indicated is greater than 5 Ohms, repair or replace the harness as required.

   B. If the resistance indicated is less than 5 Ohms, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

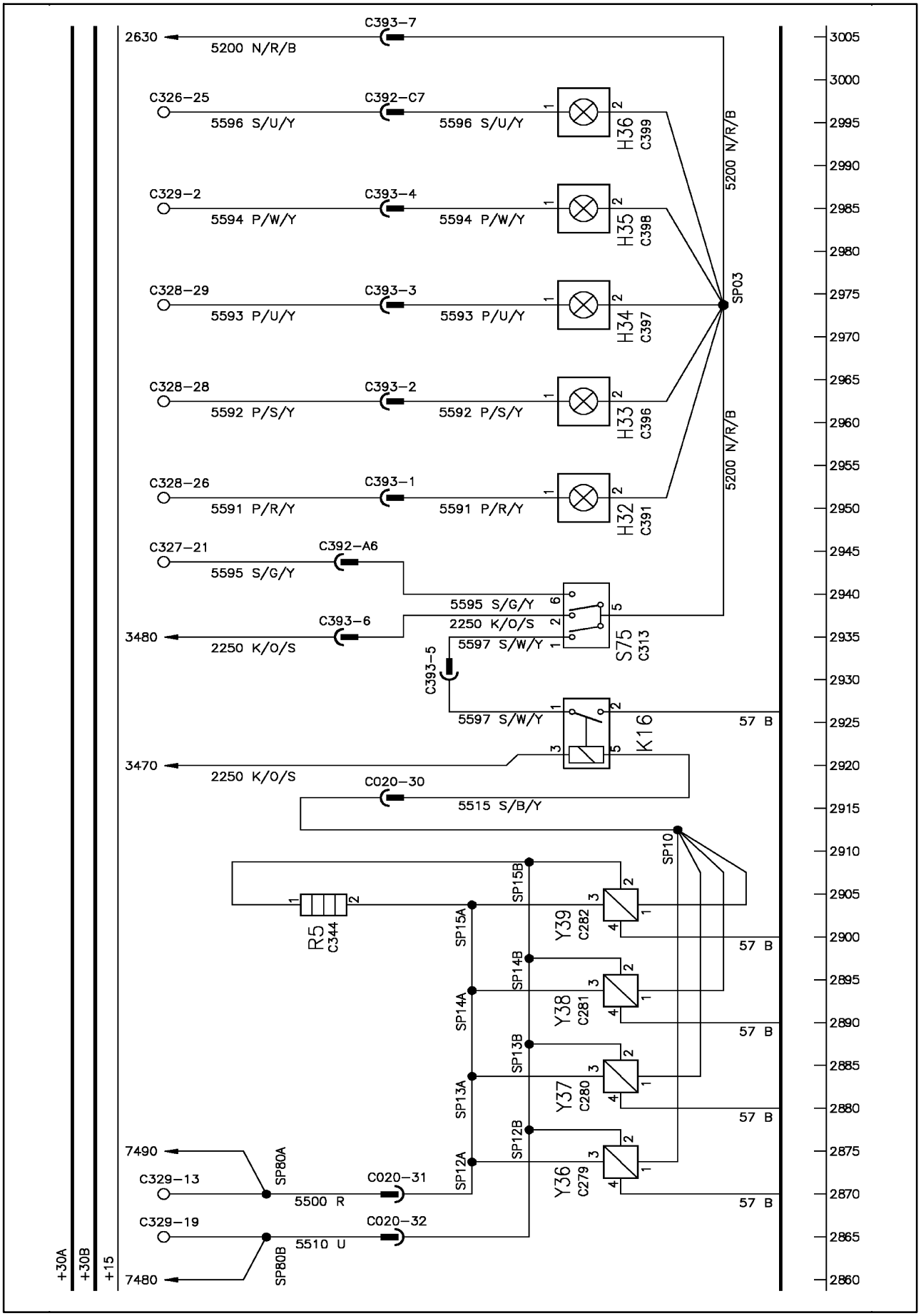
   C282 pin **1 (S/B/Y)** and **ground**

   C282 pin **2 (U)** and **ground**

   C282 pin **3 (R)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software into the EHR valve and configure the EHR valve. If the fault is still present remove, replace, and configure the EHR valve.


C393-7
2630
5200 N/R/B
C326-25
C392-C7
5596 S/U/Y
5596 S/U/Y
H36 C399
C329-2
C393-4
5594 P/W/Y
5594 P/W/Y
H35 C398
C328-29
C393-3
5593 P/U/Y
5593 P/U/Y
H34 C397
C328-28
C393-2
5592 P/S/Y
5592 P/S/Y
H33 C396
C328-26
C393-1
5591 P/R/Y
5591 P/R/Y
H32 C391
5200 N/R/B
SP03
5200 N/R/B
C327-21
C392-A6
5595 S/G/Y
5595 S/G/Y
C393-6
3480
2250 K/O/S
2250 K/O/S
2250 K/O/S
5597 S/W/Y
S75 C313
C393-5
5597 S/W/Y
K16
57 B
3470
2250 K/O/S
C020-30
5515 S/B/Y
SP10
R5 C344
SP15B
SP15A
Y39 C282
57 B
SP14B
SP14A
Y38 C281
57 B
SP13B
SP13A
Y37 C280
57 B
SP12B
SP12A
Y36 C279
57 B
7490
SP80A
C329-13
C020-31
5500 R
C329-19
C020-32
5510 U
SP80B
7480
+30A
+30B
+15
3005
3000
2995
2990
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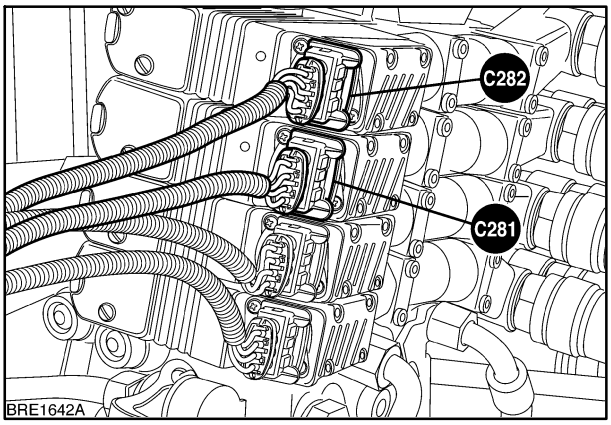

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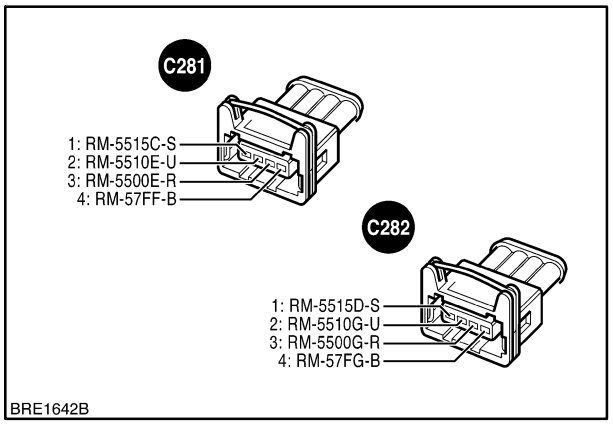

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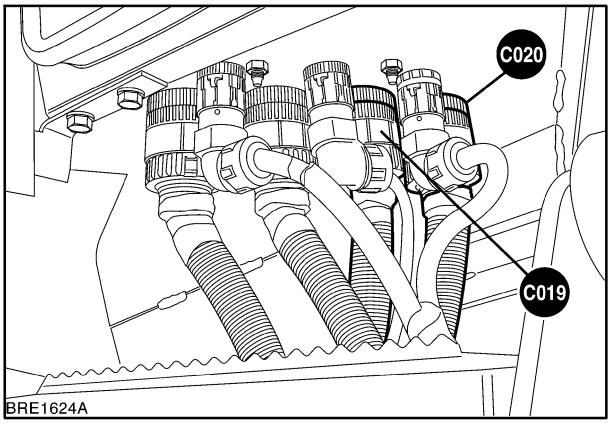

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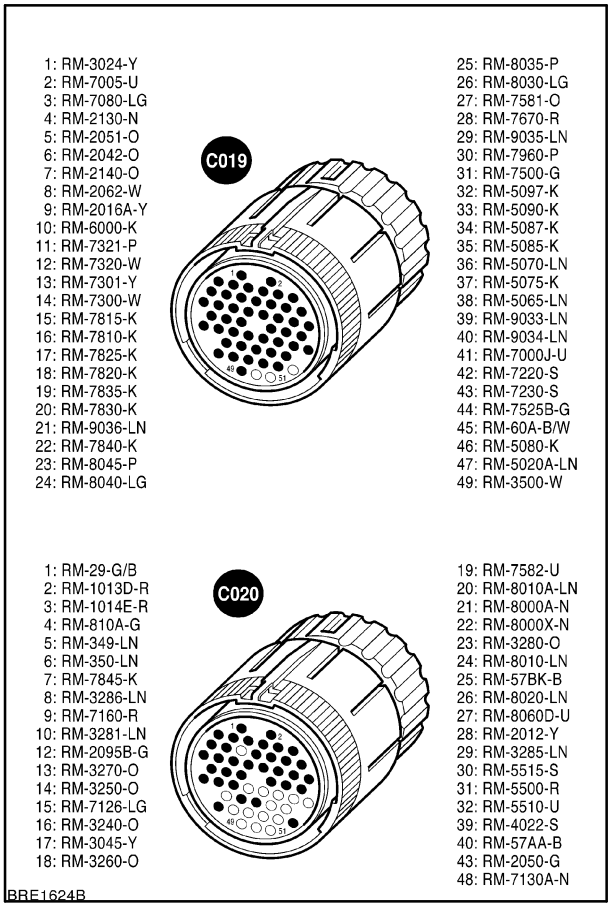


BRE1624B

ERROR CODE 4194 - MOTOR MODE NO.1 SWITCH FAULTY

Possible failure modes:

1. Faulty connector
2. Faulty motor mode switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the motor mode switch in H5.

   A. Turn the keystart ON. Move the rolling gate lever into position 1 to select motor mode. If the display does not change to d95, continue to step 2.

   B. If the display does change to d95, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the motor mode switch.

   A. Turn the keystart OFF. Disconnect the EHR control lever 1/2 connector **C390**. Check between the component side of connector **C390** pin **1 (LG/O/Y)** and **C390** pin **2 (LG/N/Y)** and select motor mode. An open circuit should be indicated when not in motor mode and a closed circuit indicated when in motor mode. If the motor mode switch does not operate as indicated, remove and replace the motor mode switch.

   B. If the motor mode switch is okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C390** pin **2 (LG/N/Y)** and **ground**. If the voltage indicated is not approximately +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Check between connector **C390** pin **1 (LG/O/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 5.

5. Check for an open circuit.

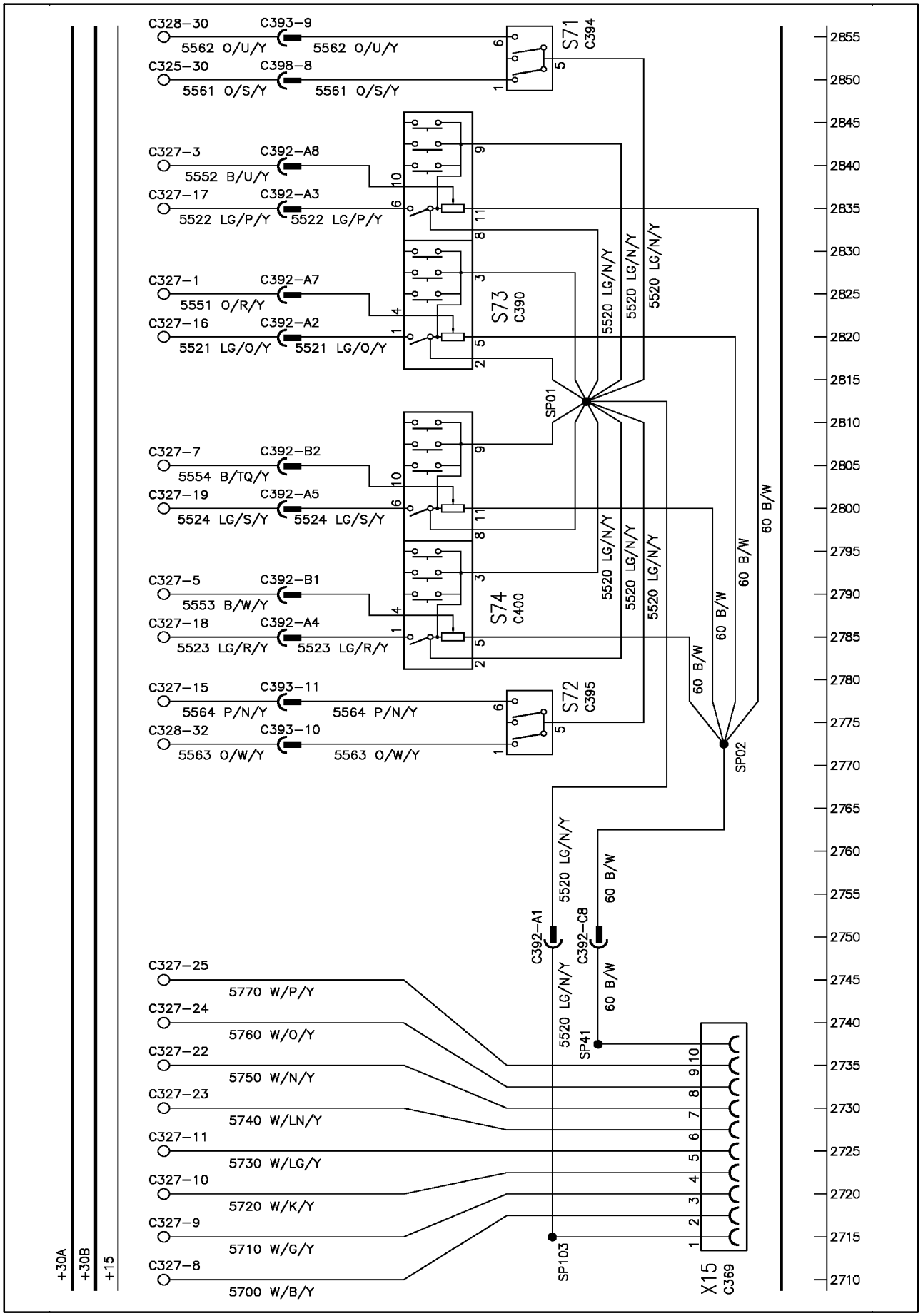
   A. Turn the keystart OFF. Disconnect the controller connector **C327**. Check between connector **C390** pin **1 (LG/O/Y)** and **C327** pin **16 (LG/O/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C390** pin **1 (LG/O/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.


C328-30
C393-9
5562 O/U/Y
5562 O/U/Y
C325-30
C398-8
5561 O/S/Y
5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
5520 LG/N/Y
60 B/W
SP02
C392-A1
C392-C8
SP41
SP103
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
X15
C369
+30A
+30B
+15
2855
2850
2845
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2835
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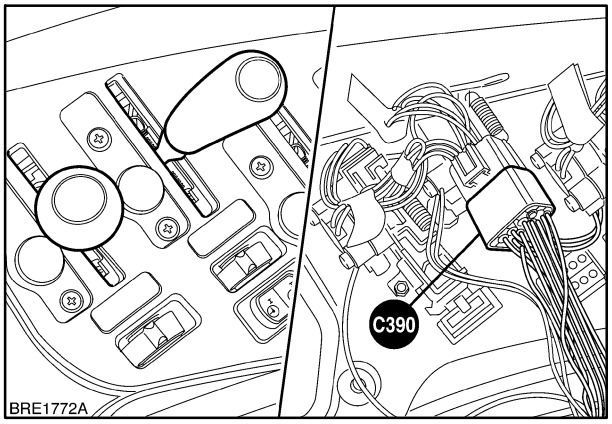
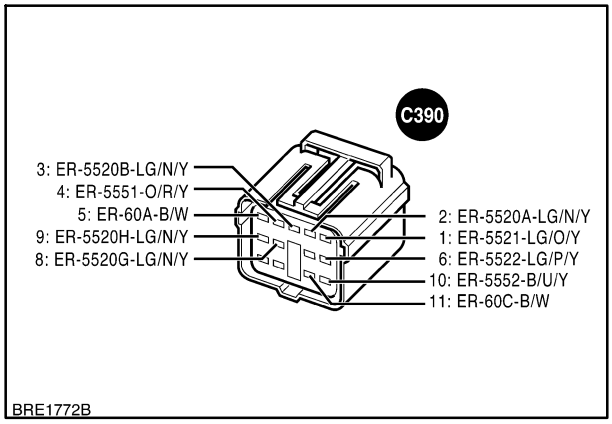
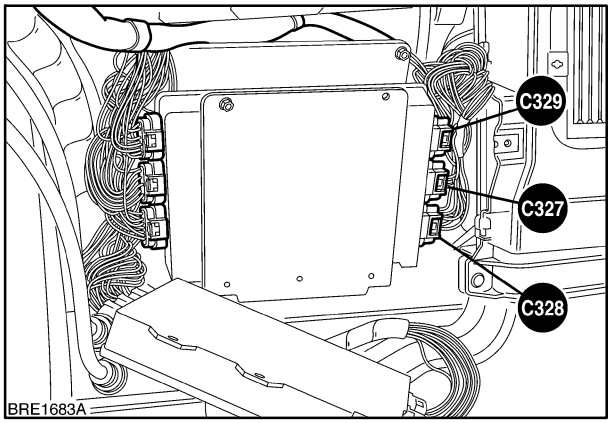
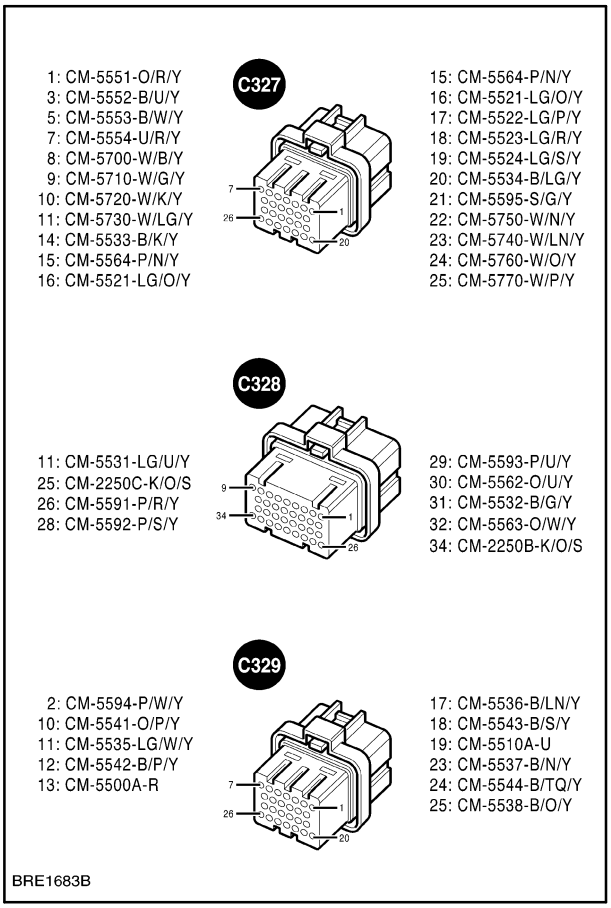

C390
BRE1772A


C390
3: ER-5520B-LG/N/Y
4: ER-5551-O/R/Y
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B


C329
C327
C328
BRE1683A


C327
1: CM-5551-O/R/Y
3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y
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C328
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y
29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S
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C329
2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R
17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y
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BRE1683B

ERROR CODE 4195 - MOTOR MODE NO.2 SWITCH FAULTY

Possible failure modes:

1. Faulty connector
2. Faulty motor mode switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the motor mode switch in H5.

   A. Turn the keystart ON. Move the rolling gate lever into position 1 to select motor mode. If the display does not change to d96, continue to step 2.

   B. If the display does change to d96, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the motor mode switch.

   A. Turn the keystart OFF. Disconnect the EHR control lever 1/2 connector **C390**. Check between the component side of connector **C390** pin **6 (LG/P/Y)** and **C390** pin **8 (LG/N/Y)** and select motor mode. An open circuit should be indicated when not in motor mode and a closed circuit indicated when in motor mode. If the motor mode switch does not operate as indicated, remove and replace the motor mode switch.

   B. If the motor mode switch is okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C390** pin **8 (LG/N/Y)** and **ground**. If the voltage indicated is not approximately +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Check between connector **C390** pin **6 (LG/P/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 5.

5. Check for an open circuit.

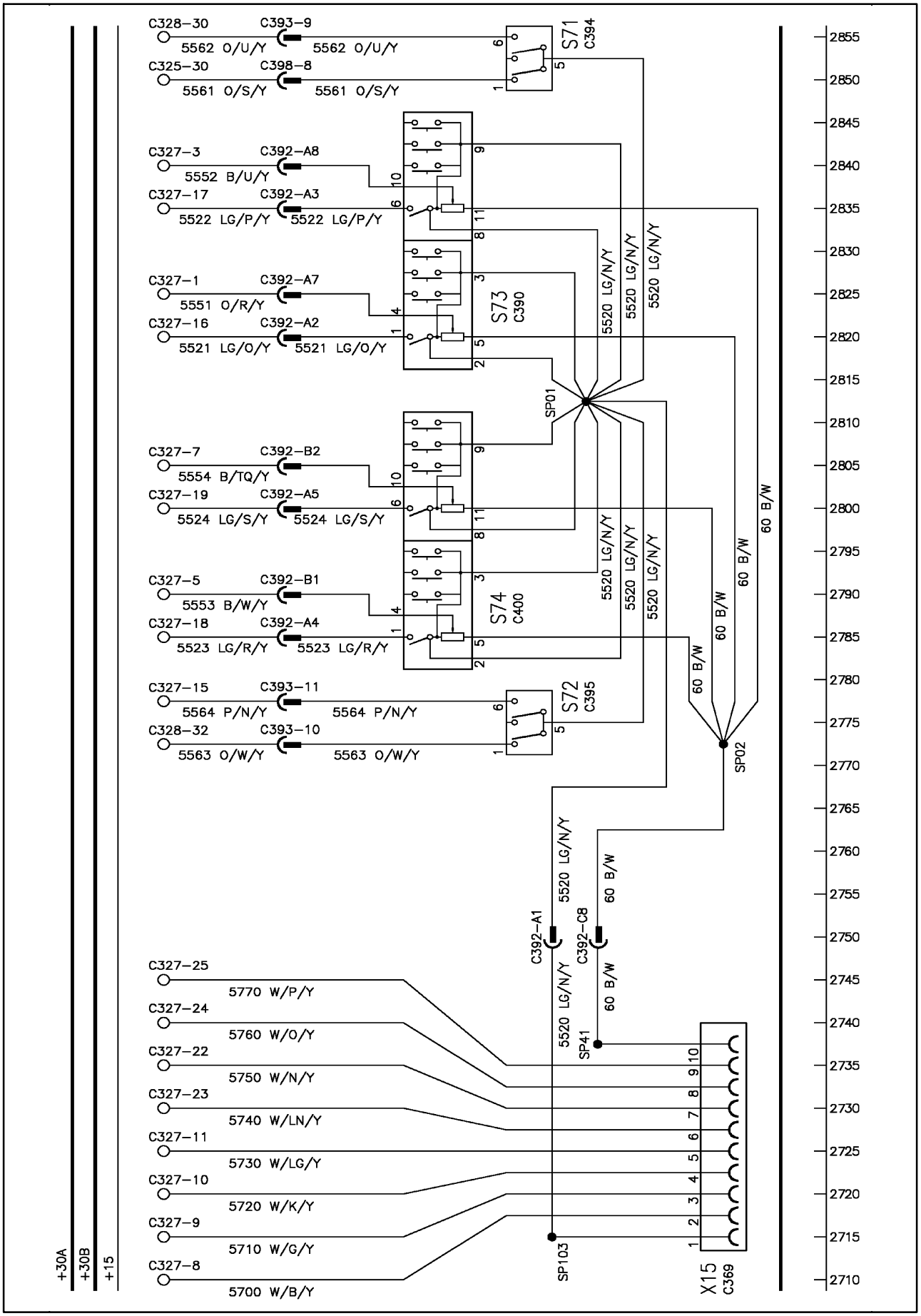
   A. Turn the keystart OFF. Disconnect the controller connector **C327**. Check between connector **C390** pin **6 (LG/P/Y)** and **C327** pin **17 (LG/P/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C390** pin **6 (LG/P/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.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C325-30
C398-8
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S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
SP02
5520 LG/N/Y
60 B/W
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
SP103
X15
C369
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+30B
+15
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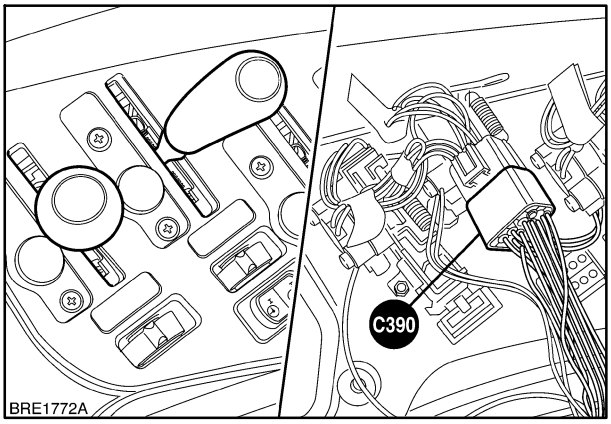
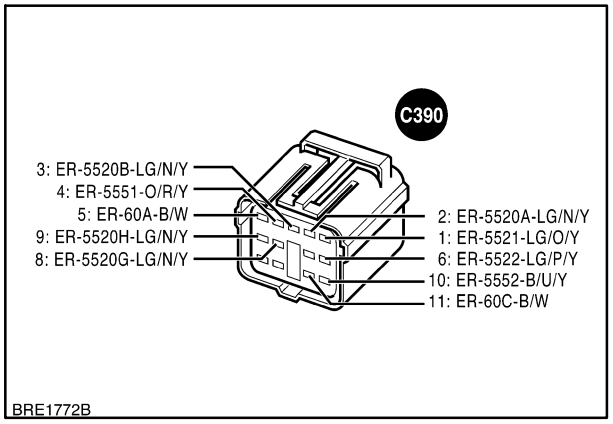

C390
BRE1772A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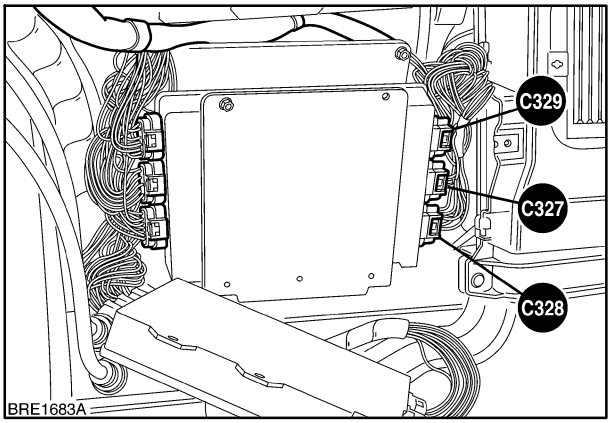
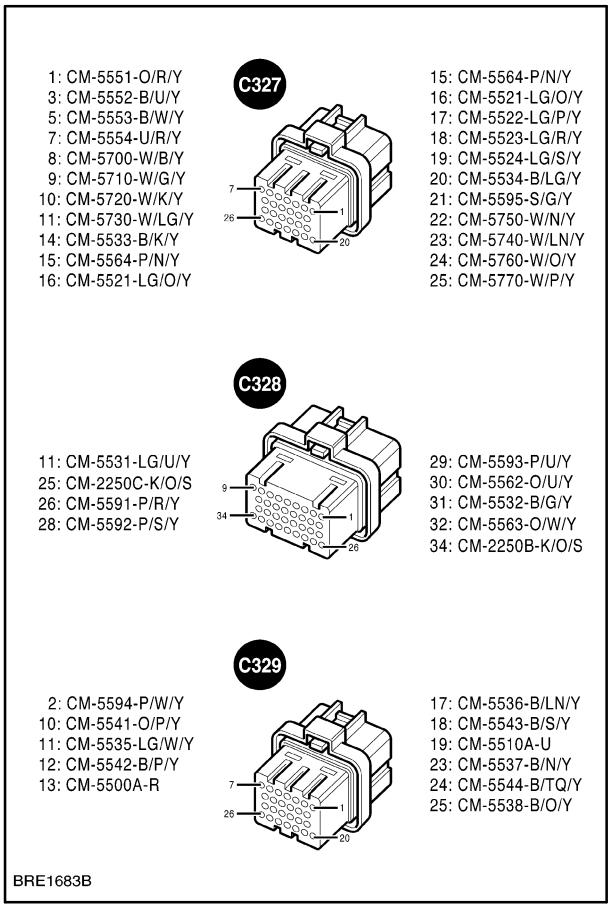
5: ER-60A-B/W
9: ER-5520H-LG/N/Y
8: ER-5520G-LG/N/Y
2: ER-5520A-LG/N/Y
1: ER-5521-LG/O/Y
6: ER-5522-LG/P/Y
10: ER-5552-B/U/Y
11: ER-60C-B/W
BRE1772B


C329
C327
C328
BRE1683A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7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y
C328
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y
29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S
C329
2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R
17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y
BRE1683B

ERROR CODE 4196 - MOTOR MODE NO.3 SWITCH FAULTY

Possible failure modes:

1. Faulty connector
2. Faulty motor mode switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the motor mode switch in H5.

   A. Turn the keystart ON. Move the rolling gate lever into position 1 to select motor mode. If the display does not change to d97, continue to step 2.

   B. If the display does change to d97, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the motor mode switch.

   A. Turn the keystart OFF. Disconnect the EHR control lever 3/4 connector **C400**. Check between the component side of connector **C400** pin **1 (LG/R/Y)** and **C400** pin **2 (LG/N/Y)** and select motor mode. An open circuit should be indicated when not in motor mode and a closed circuit indicated when in motor mode. If the motor mode switch does not operate as indicated, remove and replace the motor mode switch.

   B. If the motor mode switch is okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C400** pin **2 (LG/N/Y)** and **ground**. If the voltage indicated is not approximately +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Check between connector **C400** pin **1 (LG/R/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 5.

5. Check for an open circuit.

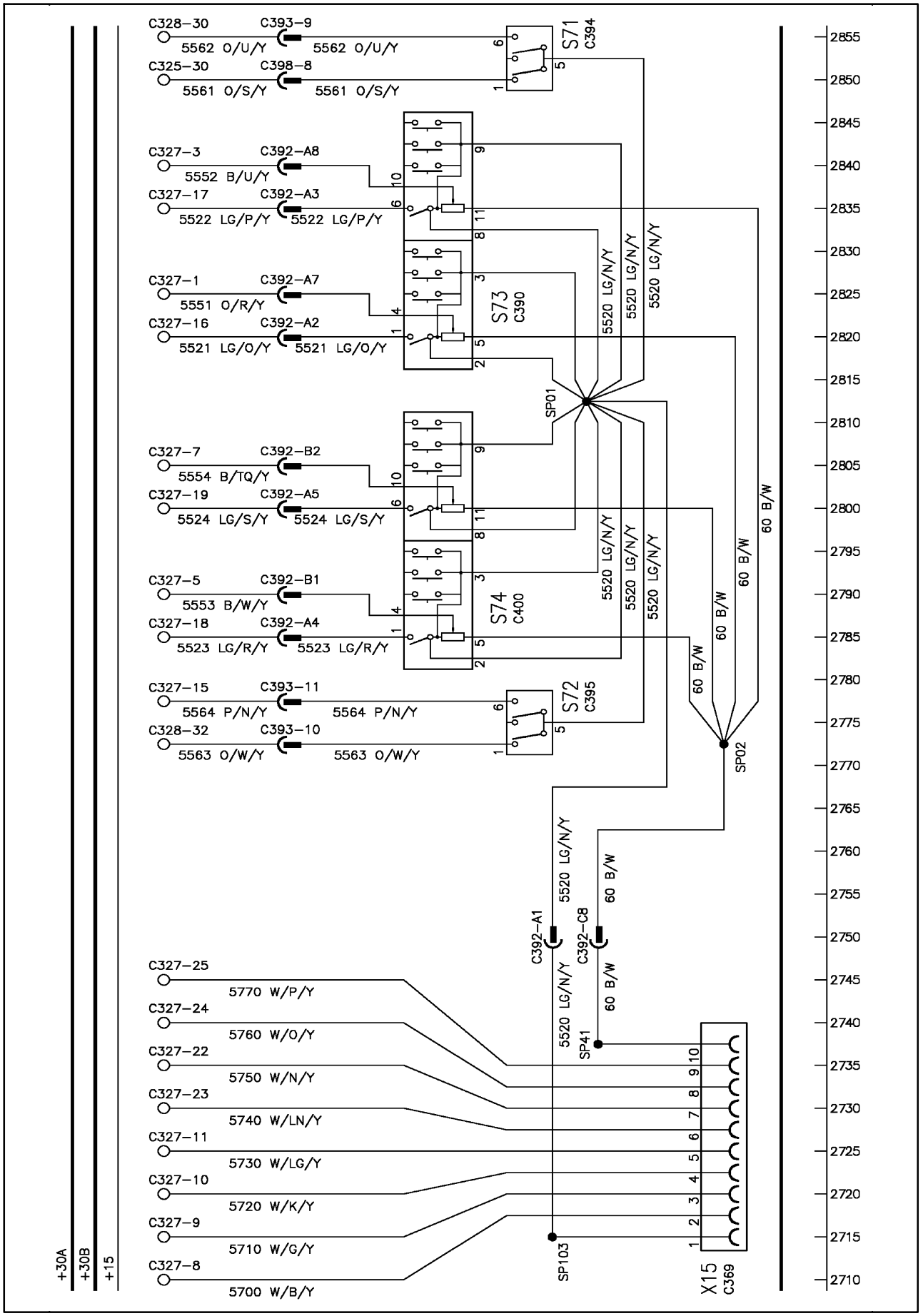
   A. Turn the keystart OFF. Disconnect the controller connector **C327**. Check between connector **C400** pin **1 (LG/R/Y)** and **C327** pin **18 (LG/R/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C400** pin **1 (LG/R/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.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5562 O/U/Y
C325-30
C398-8
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5561 O/S/Y
S71
C394
C327-3
C392-A8
5552 B/U/Y
C327-17
C392-A3
5522 LG/P/Y
5522 LG/P/Y
C327-1
C392-A7
5551 O/R/Y
C327-16
C392-A2
5521 LG/O/Y
5521 LG/O/Y
S73
C390
SP01
C327-7
C392-B2
5554 B/TQ/Y
C327-19
C392-A5
5524 LG/S/Y
5524 LG/S/Y
C327-5
C392-B1
5553 B/W/Y
C327-18
C392-A4
5523 LG/R/Y
5523 LG/R/Y
S74
C400
C327-15
C393-11
5564 P/N/Y
5564 P/N/Y
C328-32
C393-10
5563 O/W/Y
5563 O/W/Y
S72
C395
SP02
5520 LG/N/Y
60 B/W
C392-A1
C392-C8
SP41
C327-25
5770 W/P/Y
C327-24
5760 W/O/Y
C327-22
5750 W/N/Y
C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
5710 W/G/Y
C327-8
5700 W/B/Y
SP103
X15
C369
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+30B
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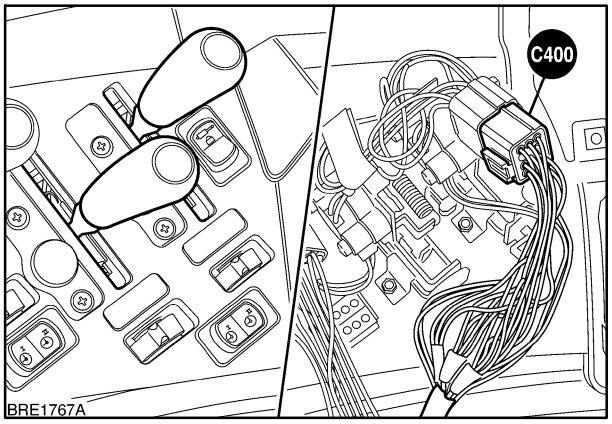
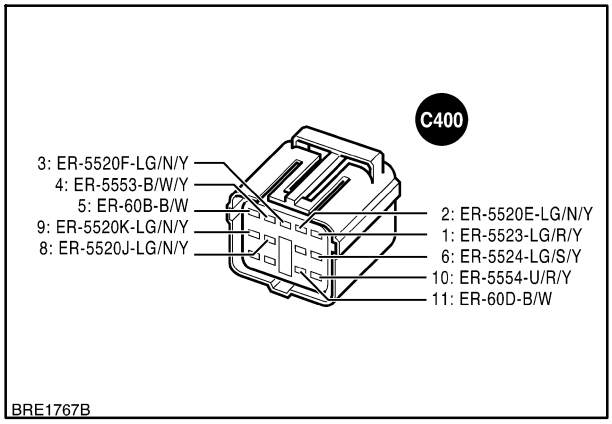

C400
BRE1767A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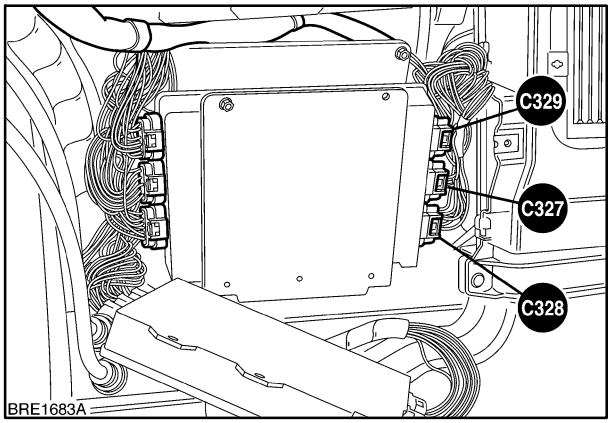
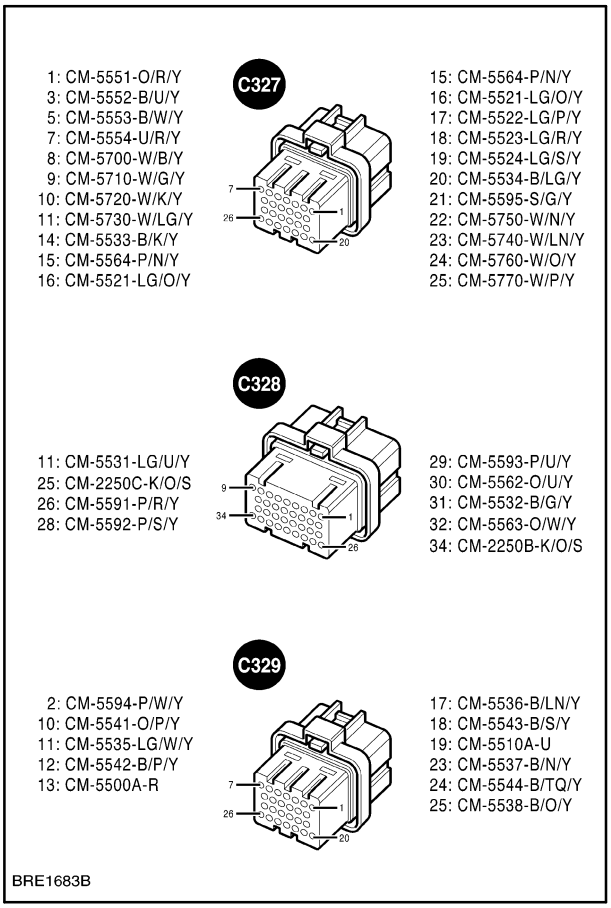
5: ER-60B-B/W
9: ER-5520K-LG/N/Y
8: ER-5520J-LG/N/Y
2: ER-5520E-LG/N/Y
1: ER-5523-LG/R/Y
6: ER-5524-LG/S/Y
10: ER-5554-U/R/Y
11: ER-60D-B/W
BRE1767B


C329
C327
C328
BRE1683A


C327
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3: CM-5552-B/U/Y
5: CM-5553-B/W/Y
7: CM-5554-U/R/Y
8: CM-5700-W/B/Y
9: CM-5710-W/G/Y
10: CM-5720-W/K/Y
11: CM-5730-W/LG/Y
14: CM-5533-B/K/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
15: CM-5564-P/N/Y
16: CM-5521-LG/O/Y
17: CM-5522-LG/P/Y
18: CM-5523-LG/R/Y
19: CM-5524-LG/S/Y
20: CM-5534-B/LG/Y
21: CM-5595-S/G/Y
22: CM-5750-W/N/Y
23: CM-5740-W/LN/Y
24: CM-5760-W/O/Y
25: CM-5770-W/P/Y
C328
11: CM-5531-LG/U/Y
25: CM-2250C-K/O/S
26: CM-5591-P/R/Y
28: CM-5592-P/S/Y
29: CM-5593-P/U/Y
30: CM-5562-O/U/Y
31: CM-5532-B/G/Y
32: CM-5563-O/W/Y
34: CM-2250B-K/O/S
C329
2: CM-5594-P/W/Y
10: CM-5541-O/P/Y
11: CM-5535-LG/W/Y
12: CM-5542-B/P/Y
13: CM-5500A-R
17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y
BRE1683B

ERROR CODE 4197 - MOTOR MODE NO.4 SWITCH FAULTY

Possible failure modes:

1. Faulty connector
2. Faulty motor mode switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the motor mode switch in H5.

   A. Turn the keystart ON. Move the rolling gate lever into position 1 to select motor mode. If the display does not change to d98, continue to step 2.

   B. If the display does change to d98, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.

2. Check the motor mode switch.

   A. Turn the keystart OFF. Disconnect the EHR control lever 3/4 connector **C400**. Check between the component side of connector **C400** pin **6 (LG/S/Y)** and **C400** pin **8 (LG/N/Y)** and select motor mode. An open circuit should be indicated when not in motor mode and a closed circuit indicated when in motor mode. If the motor mode switch does not operate as indicated, remove and replace the motor mode switch.

   B. If the motor mode switch is okay, continue to step 3.

3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C400** pin **8 (LG/N/Y)** and **ground**. If the voltage indicated is not approximately +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Check between connector **C400** pin **6 (LG/S/Y)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 5.

5. Check for an open circuit.

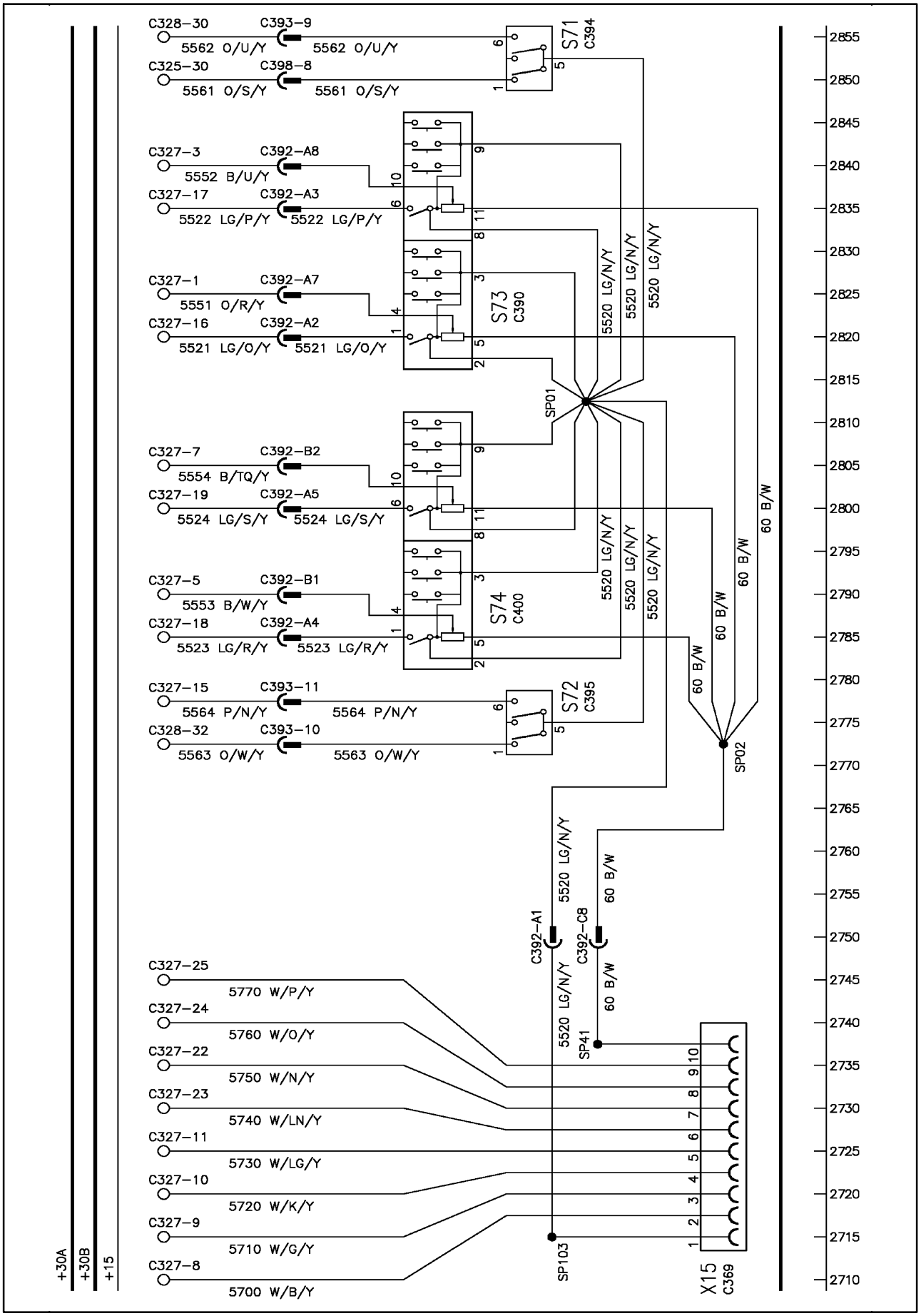
   A. Turn the keystart OFF. Disconnect the controller connector **C327**. Check between connector **C400** pin **6 (LG/S/Y)** and **C327** pin **19 (LG/S/Y)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 6.

6. Check for a short to ground.

   A. Check between connector **C400** pin **6 (LG/S/Y)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. Perform the EHR calibration procedure. If the fault re-occurs, remove and replace the controller.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C325-30
C398-8
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5561 O/S/Y
S71
C394
C327-3
C392-A8
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C327-17
C392-A3
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C392-A7
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C327-16
C392-A2
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C390
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C327-7
C392-B2
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C327-19
C392-A5
5524 LG/S/Y
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C392-B1
5553 B/W/Y
C327-18
C392-A4
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S74
C400
C327-15
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C392-C8
SP41
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C327-24
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C327-22
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C327-23
5740 W/LN/Y
C327-11
5730 W/LG/Y
C327-10
5720 W/K/Y
C327-9
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C327-8
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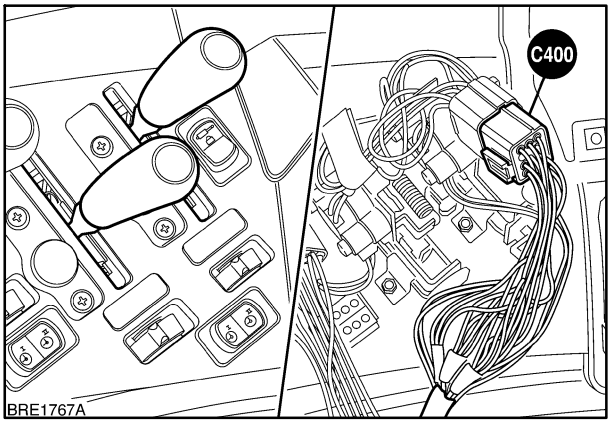
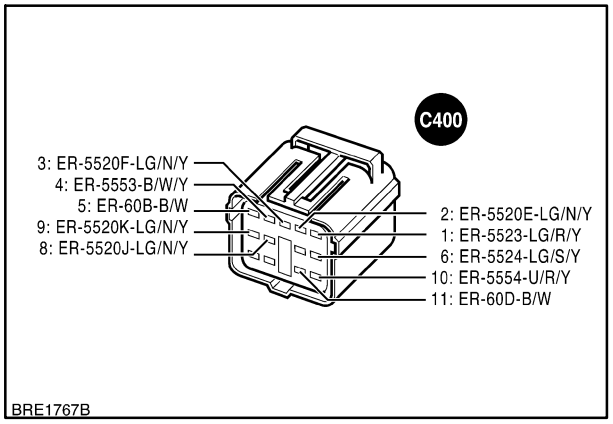

C400
BRE1767A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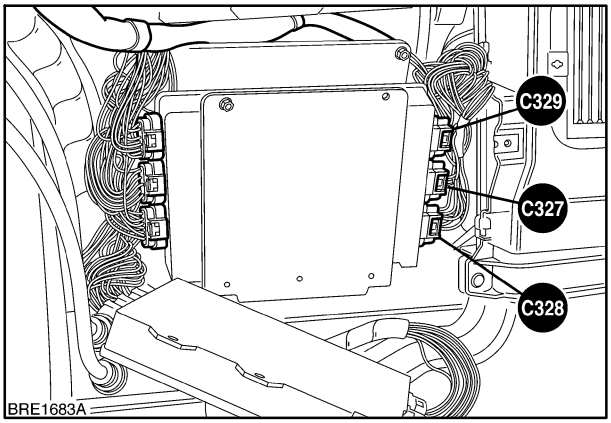
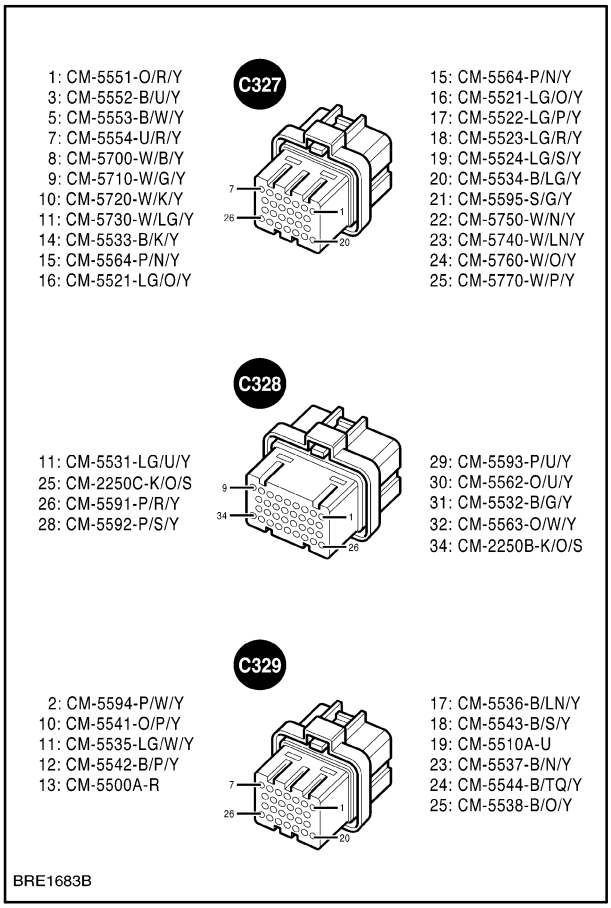
5: ER-60B-B/W
9: ER-5520K-LG/N/Y
8: ER-5520J-LG/N/Y
2: ER-5520E-LG/N/Y
1: ER-5523-LG/R/Y
6: ER-5524-LG/S/Y
10: ER-5554-U/R/Y
11: ER-60D-B/W
BRE1767B


C329
C327
C328
BRE1683A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25: CM-2250C-K/O/S
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29: CM-5593-P/U/Y
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C329
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11: CM-5535-LG/W/Y
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13: CM-5500A-R
17: CM-5536-B/LN/Y
18: CM-5543-B/S/Y
19: CM-5510A-U
23: CM-5537-B/N/Y
24: CM-5544-B/TQ/Y
25: CM-5538-B/O/Y
BRE1683B

NOTES

SECTION 55 - ELECTRICAL SYSTEM

Chapter 9 - Fault Codes (Continued)

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5001 – 6000 REAR PTO ERROR CODE LISTING

Error code	Error description
5001	Rear PTO brake solenoid stuck off
5002	Rear PTO brake solenoid stuck on
5003	Rear PTO brake output open circuit
5005	Brake switch open circuit
5007	Rear PTO solenoid stuck off
5008	Rear PTO solenoid overcurrent
5024	Rear PTO not calibrated
5027	Rear PTO speed sensor open circuit
5033	Rear PTO cab normally closed switch open circuit
5034	Fender mounted rear PTO switch open circuit or short to ground
5035	Fender mounted rear PTO switch input short to +Ve Voltage
5036	PTO failed to start
5037	Rear PTO cab normally open switch stuck closed
5038	Cab and fender PTO switches operated within 2 seconds
5039	Incorrect voltage on fender mounted rear PTO switch
5042	PTO Management switch shorted
5099	Auto PTO mode not enabled

ERROR CODE 5001 - REAR PTO BRAKE SOLENOID STUCK OFF

Effects:

PTO disabled.

Possible failure modes:

1. Faulty solenoid valve
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. Turn the keystart OFF. Disconnect the rear PTO brake solenoid connector **C033**. Turn the keystart ON and check for other errors. If error 5002 or 5002 and 5003 are displayed, continue to step 2.

   B. If only error 5001 is displayed continue to step 3.

2. Check the rear PTO brake solenoid.

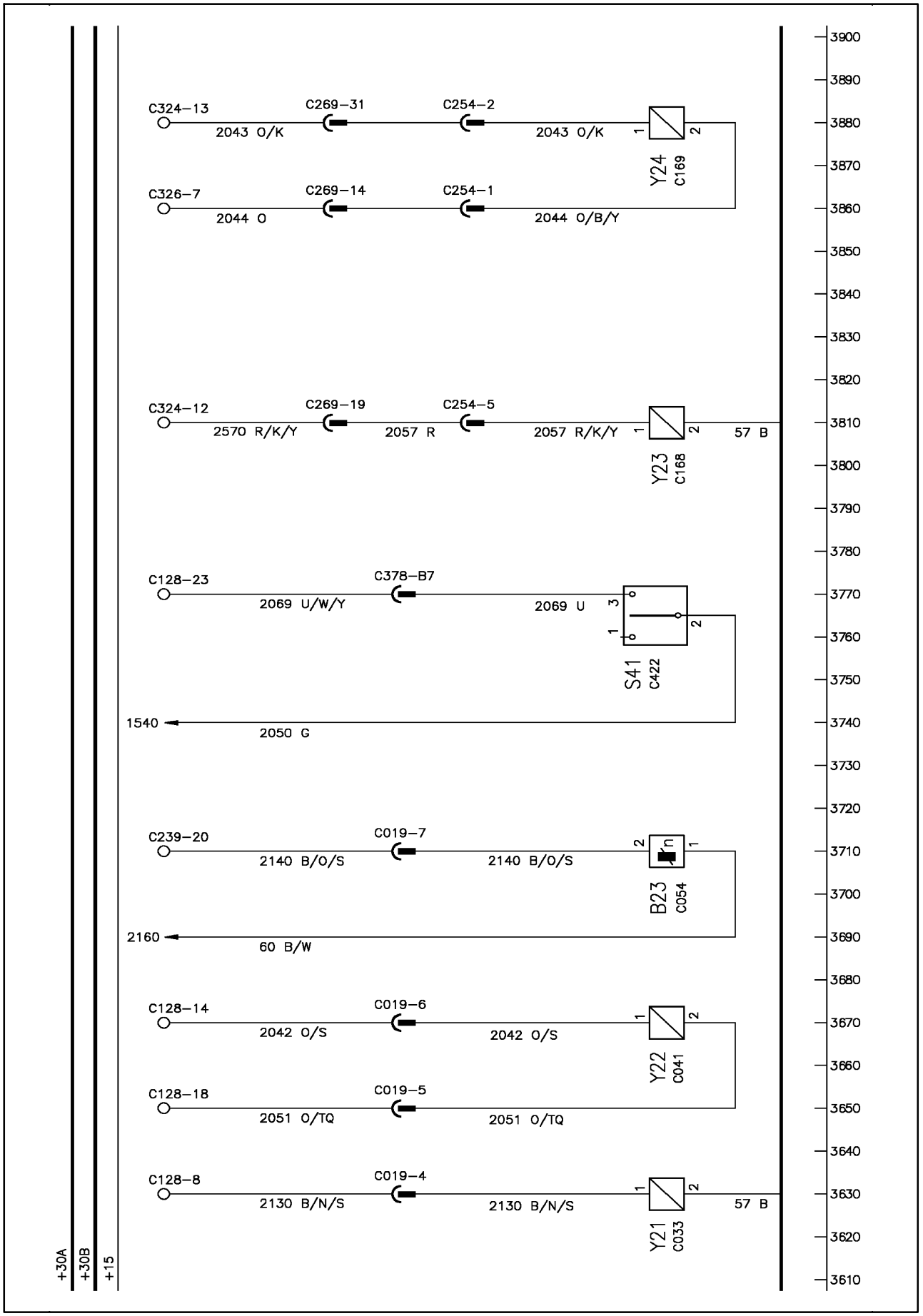
   A. Measure the resistance between the solenoid terminals. If the resistance indicated is not between 5 - 11 Ohms, remove and replace the solenoid.

   B. If the solenoid is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.

3. Check for a short to ground.

   A. Turn the keystart OFF. Disconnect connector **C033** and the controller connector **C128**. Check between connector **C128** pin **8 (B/N/S)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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Y24
C169
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C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
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57 B
Y23
C168
C128-23
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C054
2160
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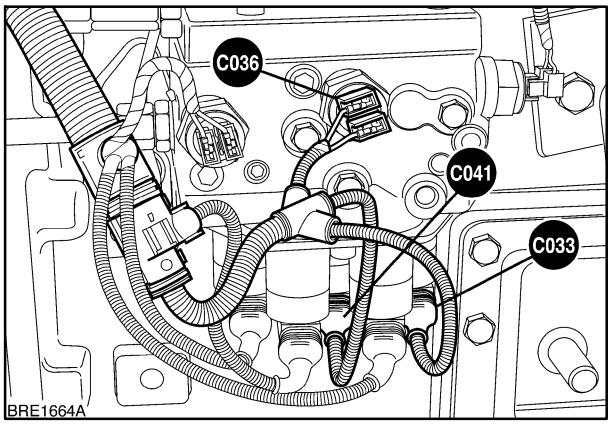

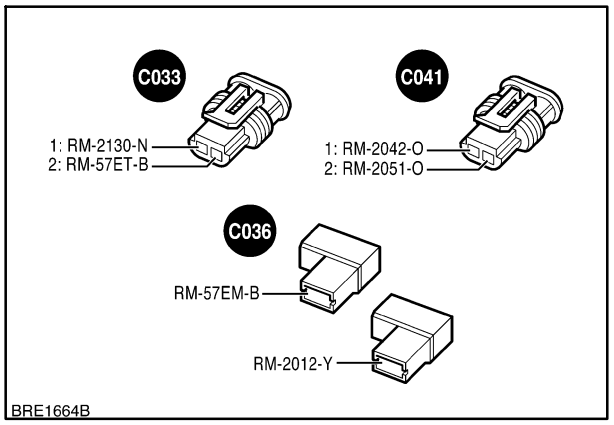

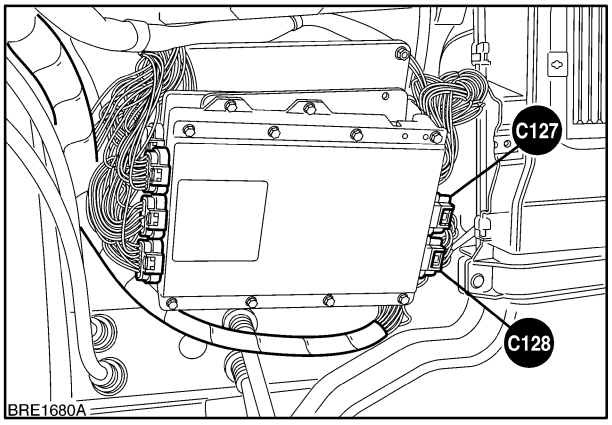

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4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
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26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5002 - REAR PTO BRAKE SOLENOID STUCK ON

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. Turn the keystart ON. Disengage four wheel drive and the differential lock. Turn the keystart OFF and set the PTO brake switch to the brake applied position. Disengage the front and rear PTO engagement switches. Turn the keystart ON again. If error codes 5002 and 5003 are displayed, continue to test for error code 5003.

   B. If error codes 5002 and 5003 are not displayed, continue to step 2.

2. Check for a short to +12 Volts.

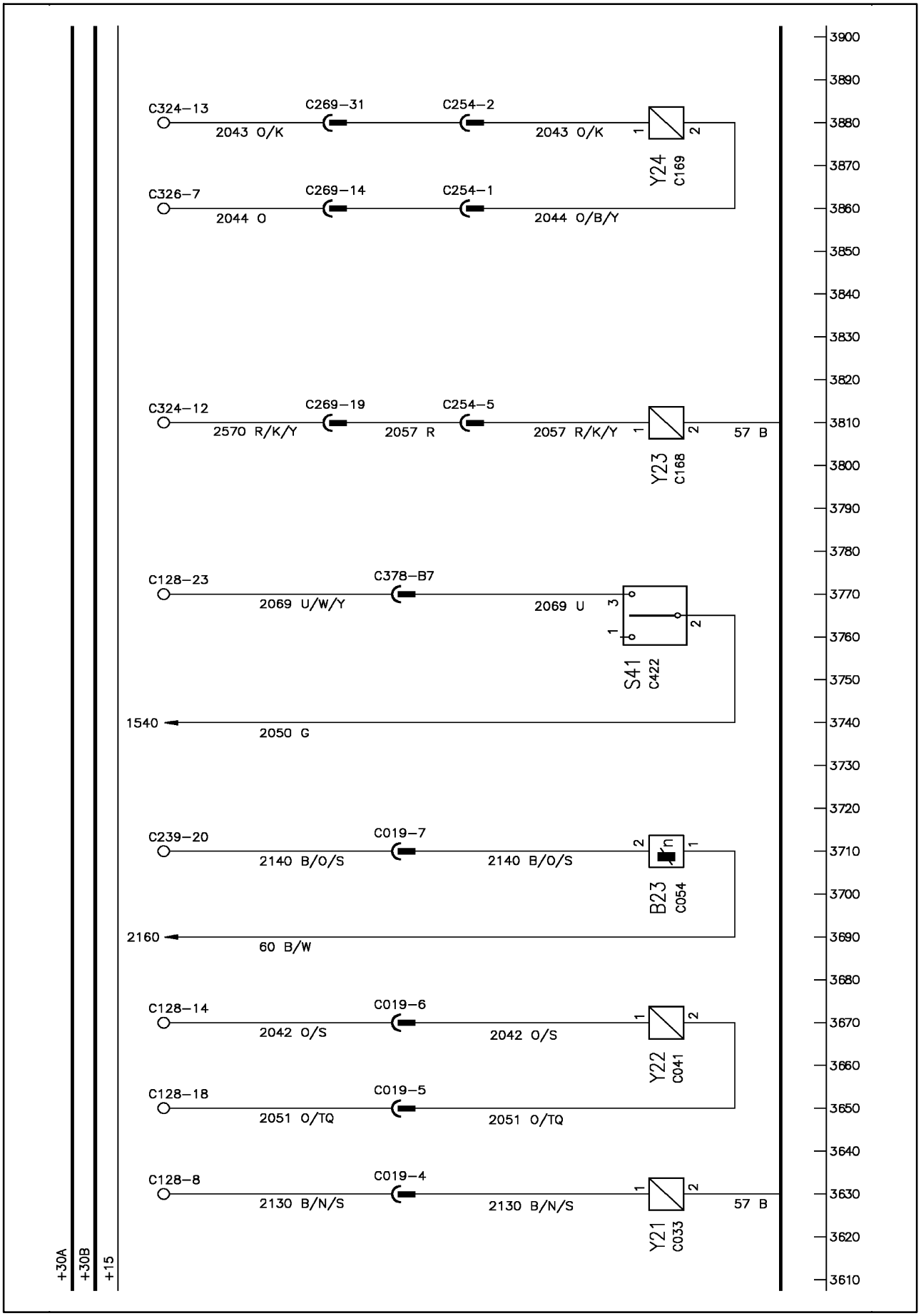
   A. Turn the keystart OFF and ON. Set the PTO brake switch to the OFF position, 5002 should be displayed. Disconnect the rear PTO brake connector **C033** and the controller **C128**. Turn the keystart ON. Measure the voltage between connector **C128** pin **8 (B/N/S)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 3.

3. Check for a short circuit.

   A. Turn the keystart OFF. Check between connector **C128** pin **8 (B/N/S)** and the other **C128** pins. If a short circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
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57 B
Y23
C168
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C422
1540
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C239-20
C019-7
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2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
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2130 B/N/S
57 B
Y21
C033
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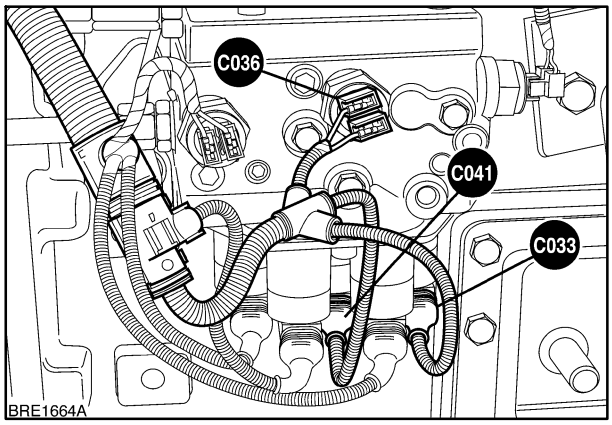
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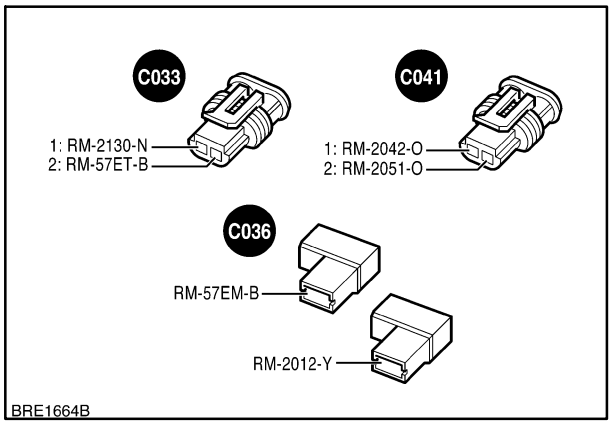
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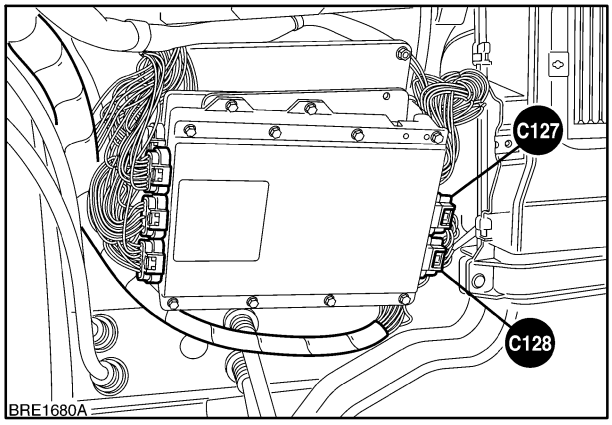
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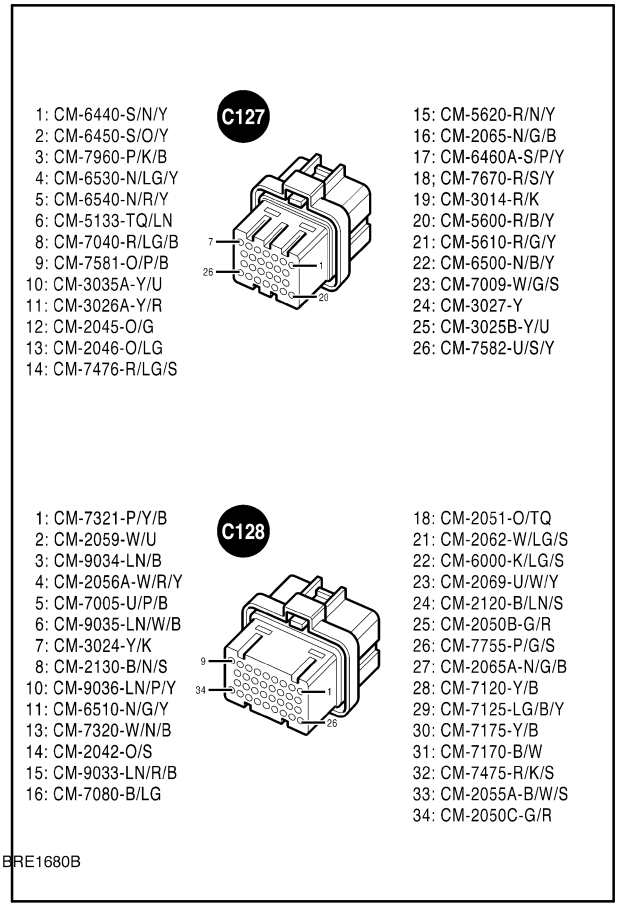
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6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
C127
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15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
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22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
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10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
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14: CM-2042-O/S
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16: CM-7080-B/LG
C128
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26
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
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24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R
BRE1680B

ERROR CODE 5003 - REAR PTO BRAKE OUTPUT OPEN CIRCUIT

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO brake solenoid connector **C033** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the solenoid for an open circuit.

   A. Disconnect connector **C033**. Check between the solenoid terminals. If an open circuit is indicated, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for an open circuit.

   A. Check between connector **C033** pin **2 (B)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connector **C128**. Check between connector **C128** pin **8 (B/N/S)** and **C033** pin **1 (B/N/S)**. If an open circuit is indicated, disconnect the inline harness connector **C019** and check between connector:

   C019 pin **4 (B/N/S)** and **C128** pin **8 (B/N/S)**

   C019 pin **4 (B/N/S)** and **C033** pin **1 (B/N/S)**

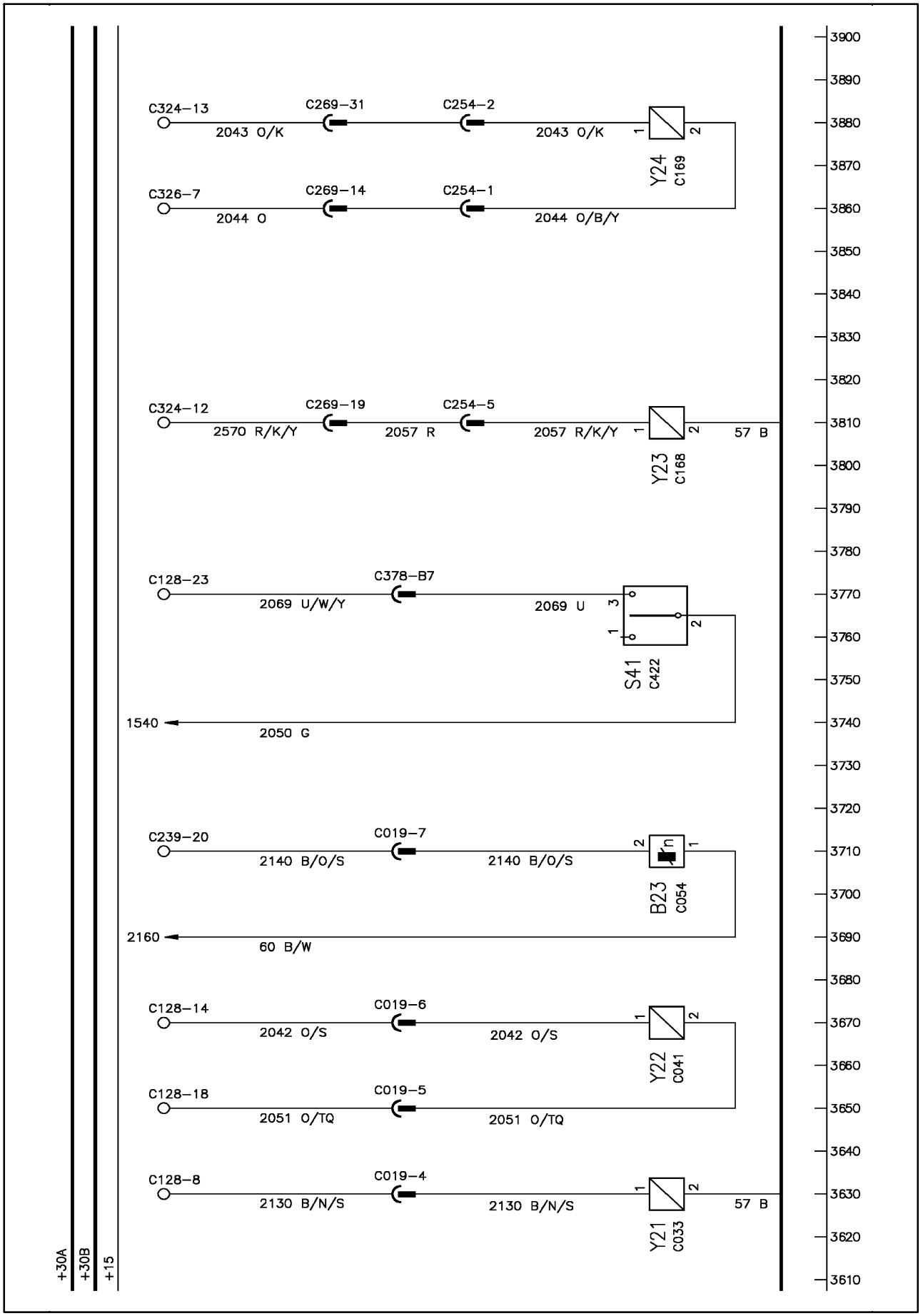
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check connectors **C128**, **C019** and **C033**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the error code re-occurs, download the correct level of software. If the fault re-occurs, remove and replace the controller.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Y24
C169
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C324-12
C269-19
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57 B
Y23
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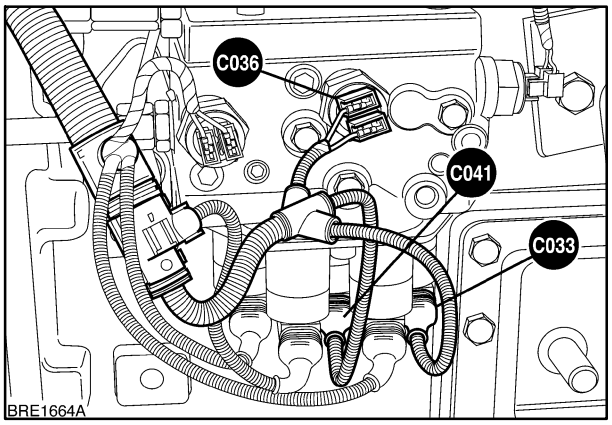
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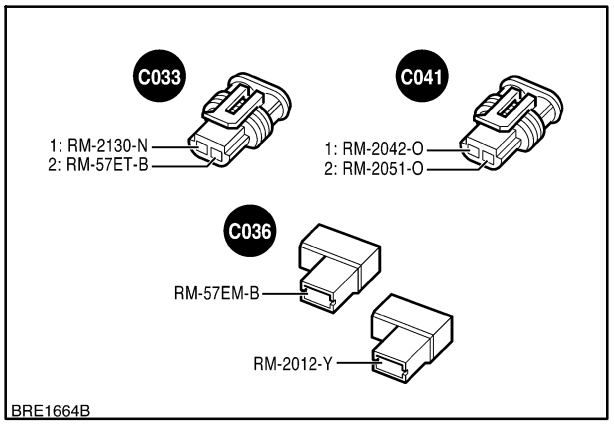
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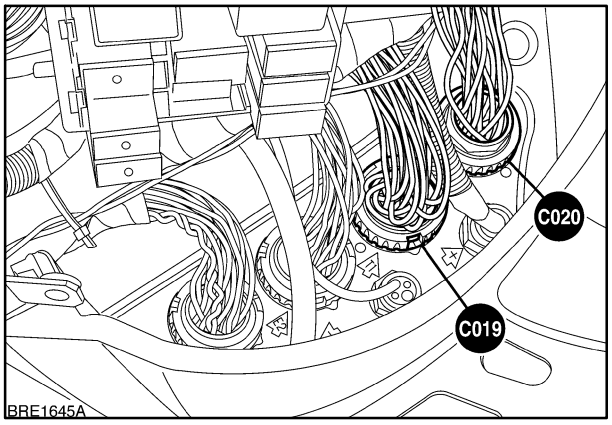
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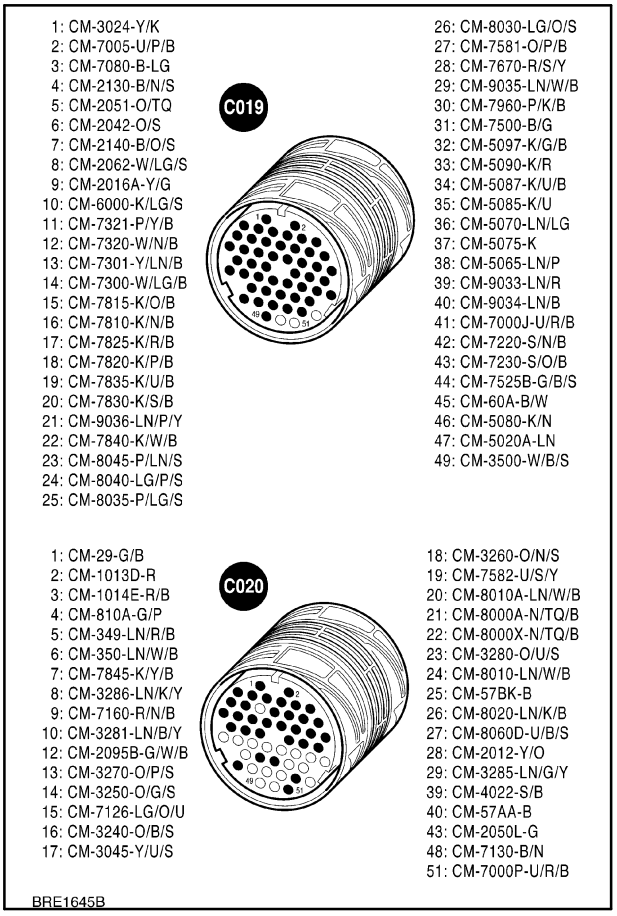
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3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
C019
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
C020
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
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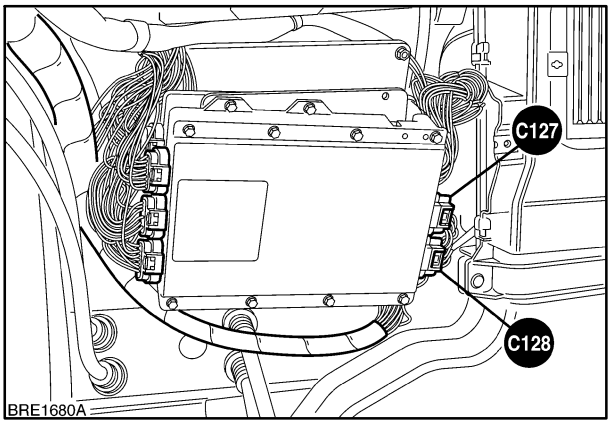
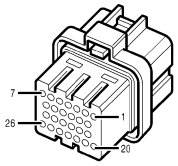
51: CM-7000P-U/R/B
BRE1645B



BRE1680A

C127



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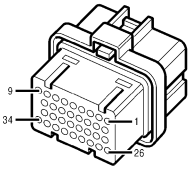
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128



1: CM-7321-P/Y/B
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3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5005 - REAR PTO BRAKE SWITCH OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty rear PTO brake switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO brake switch connector **C118**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the PTO brake switch.

   A. Disconnect connector **C118**. Check between the component side of connector:

   C118 pin **1 (B/LN/S)** and **C118** pin **2 (G)** should indicate a closed circuit with the switch released and an open circuit with the switch depressed.

   B. If the switch is okay, continue to step 3.

3. Check for +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C118** pin **2 (G)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, continue to step 4.

4. Check for an open circuit.

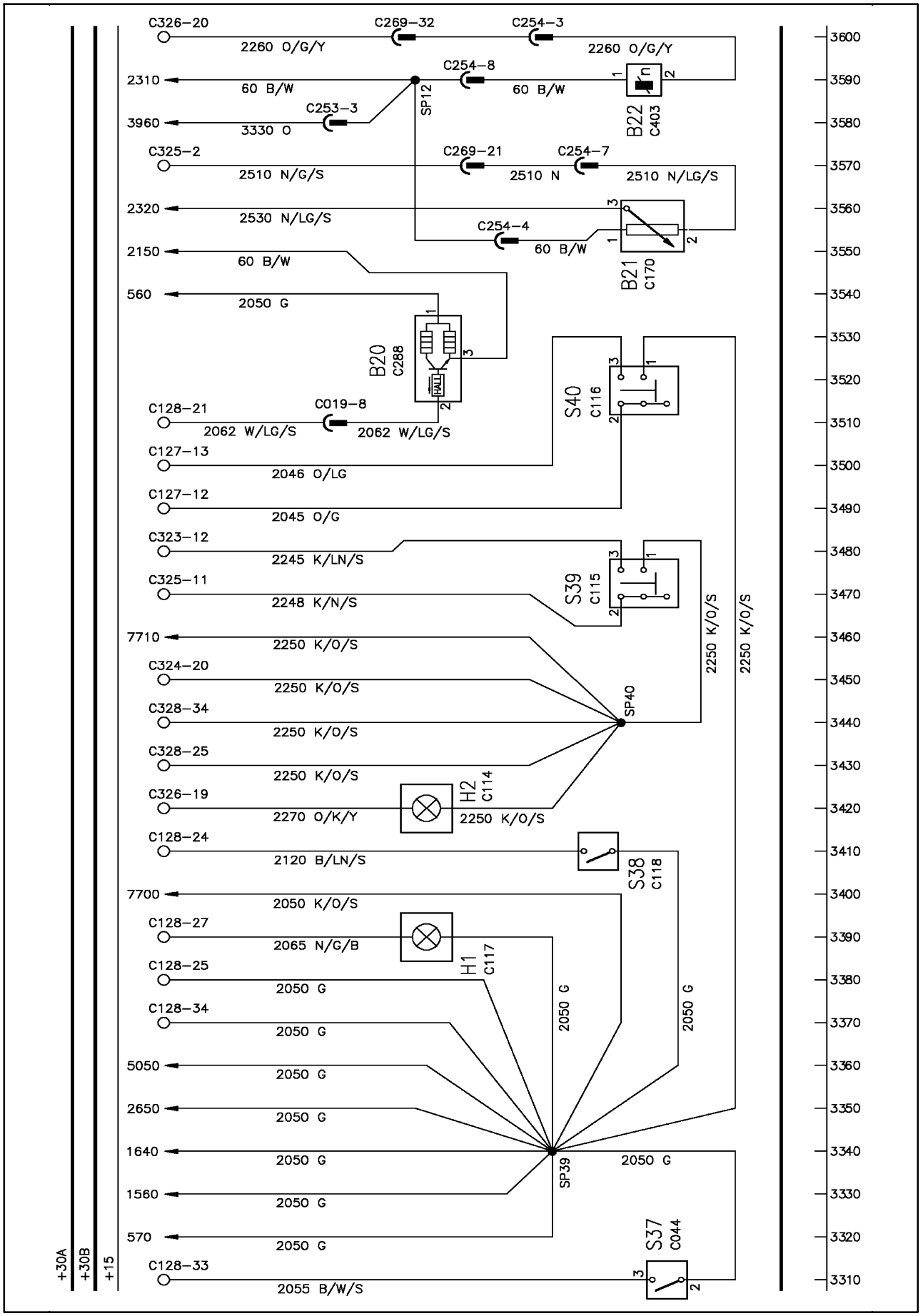
   A. Turn the keystart OFF. Disconnect the controller connector **C128**. Check between connector **C128** pin **24 (B/LN/S)** and **C118** pin **1 (B/LN/S)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check connectors **C128** and **C118**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the error code re-occurs, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
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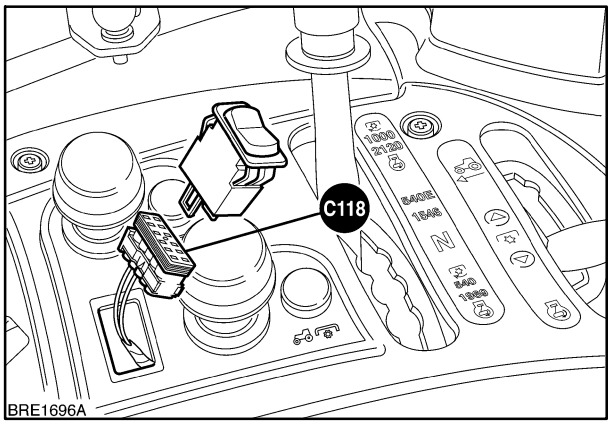
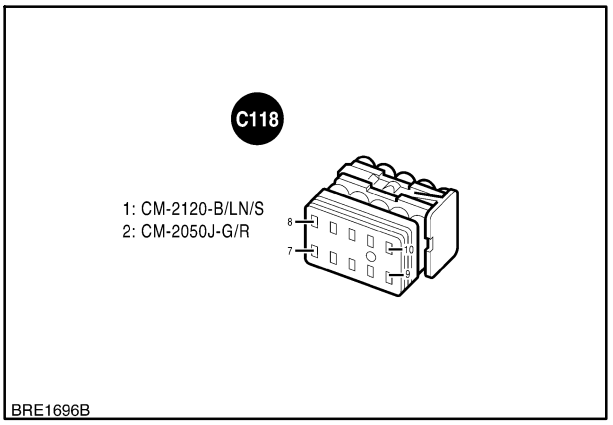
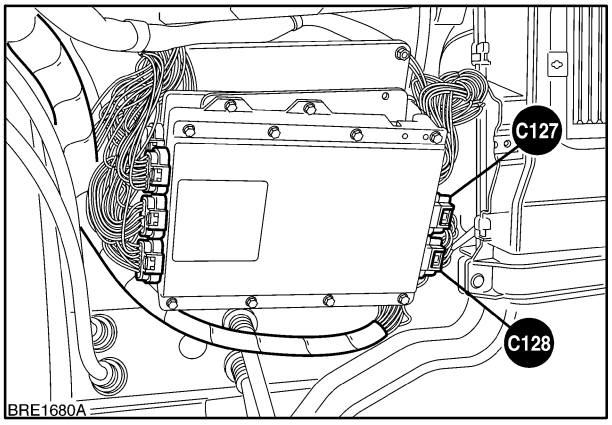


BRE1696A



BRE1696B



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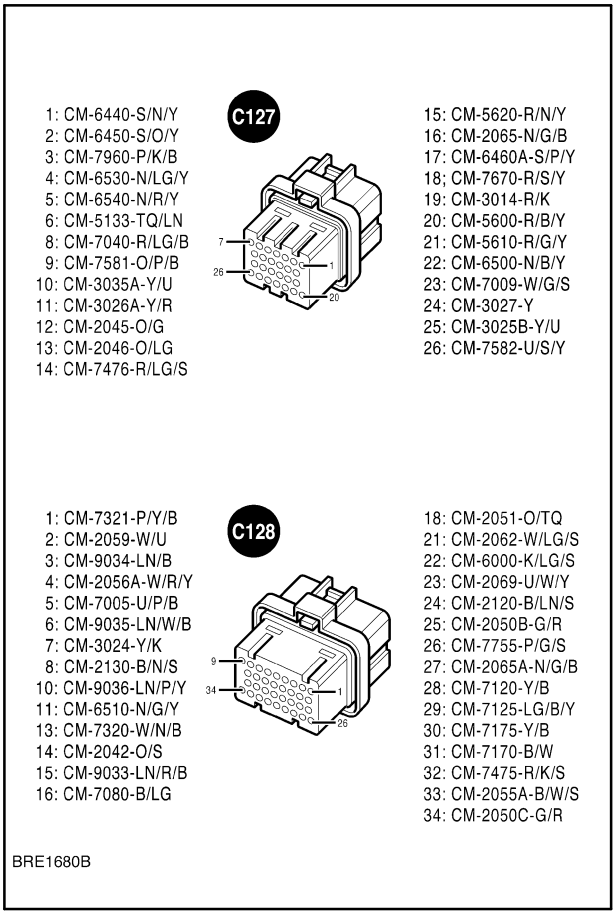


BRE1680B

ERROR CODE 5007 - REAR PTO SOLENOID STUCK OFF

Effects:

PTO disabled.

Possible failure modes:

1. Faulty PTO solenoid
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO solenoid.

   A. Disconnect the PTO solenoid connector **C041**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 10 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the resistance indicated is okay, continue to step 2.

2. Check the solenoid coil terminals to ground.

   A. Check between each of the solenoid terminals and ground. If a short or partial short to ground is indicated, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connector **C128**. Check between connector:

   C041 pin **1 (O/S)** and **C128** pin **14 (O/S)**

   C041 pin **2 (O/TQ)** and **C128** pin **18 (O/TQ)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground.

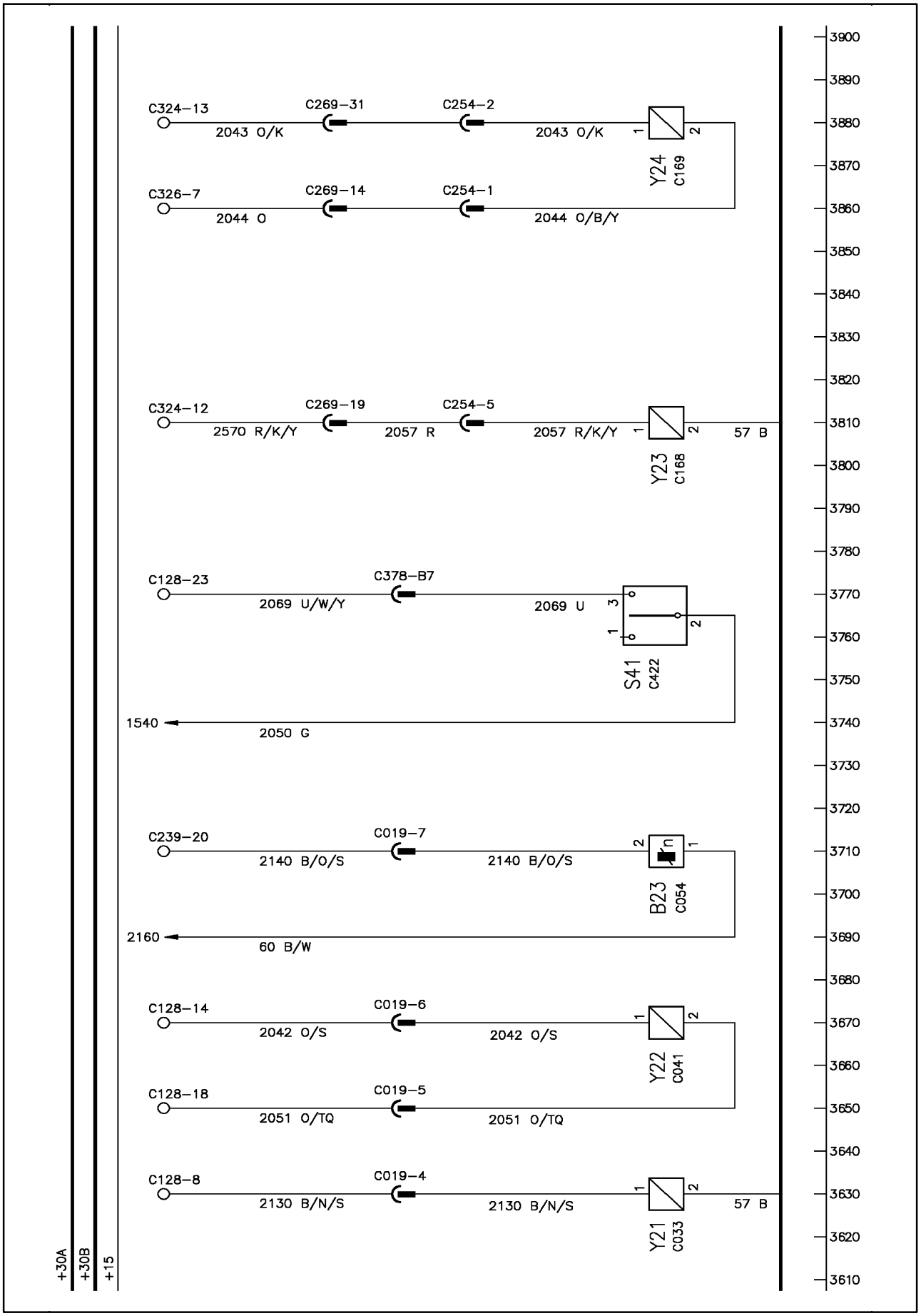
   A. Check between connector:

   C041 pin **1 (O/S)** and **ground**

   C041 pin **2 (O/TQ)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
3890
3880
3870
3860
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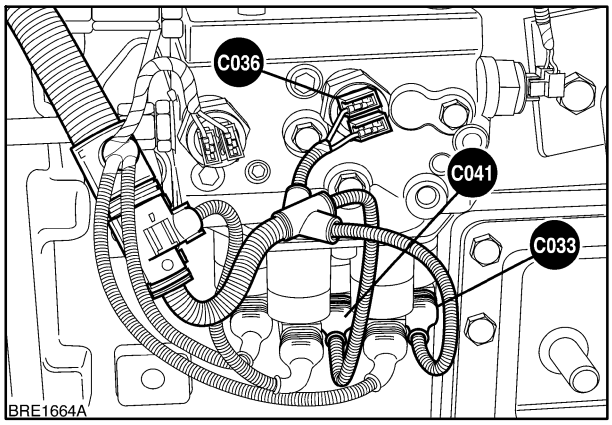

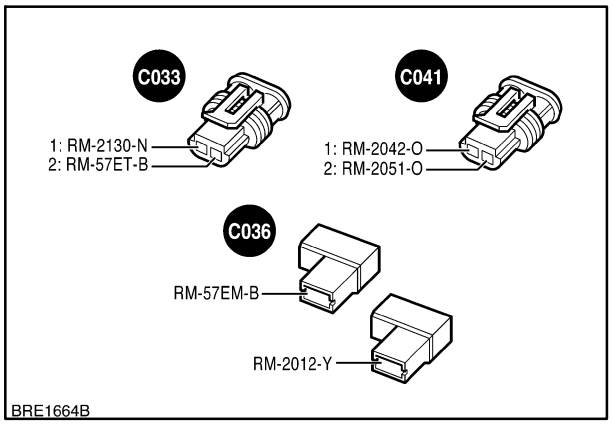

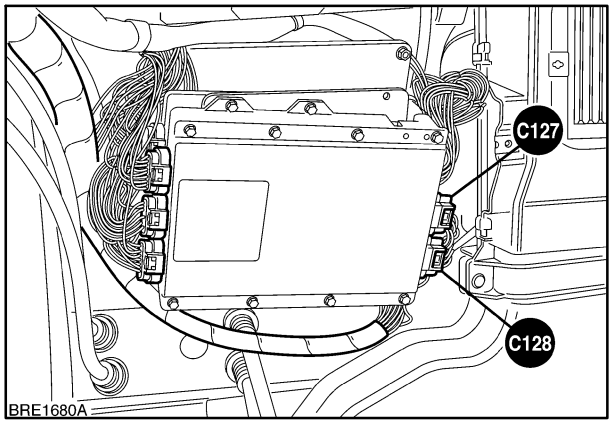

C127

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2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5008 - REAR PTO SOLENOID OVERCURRENT

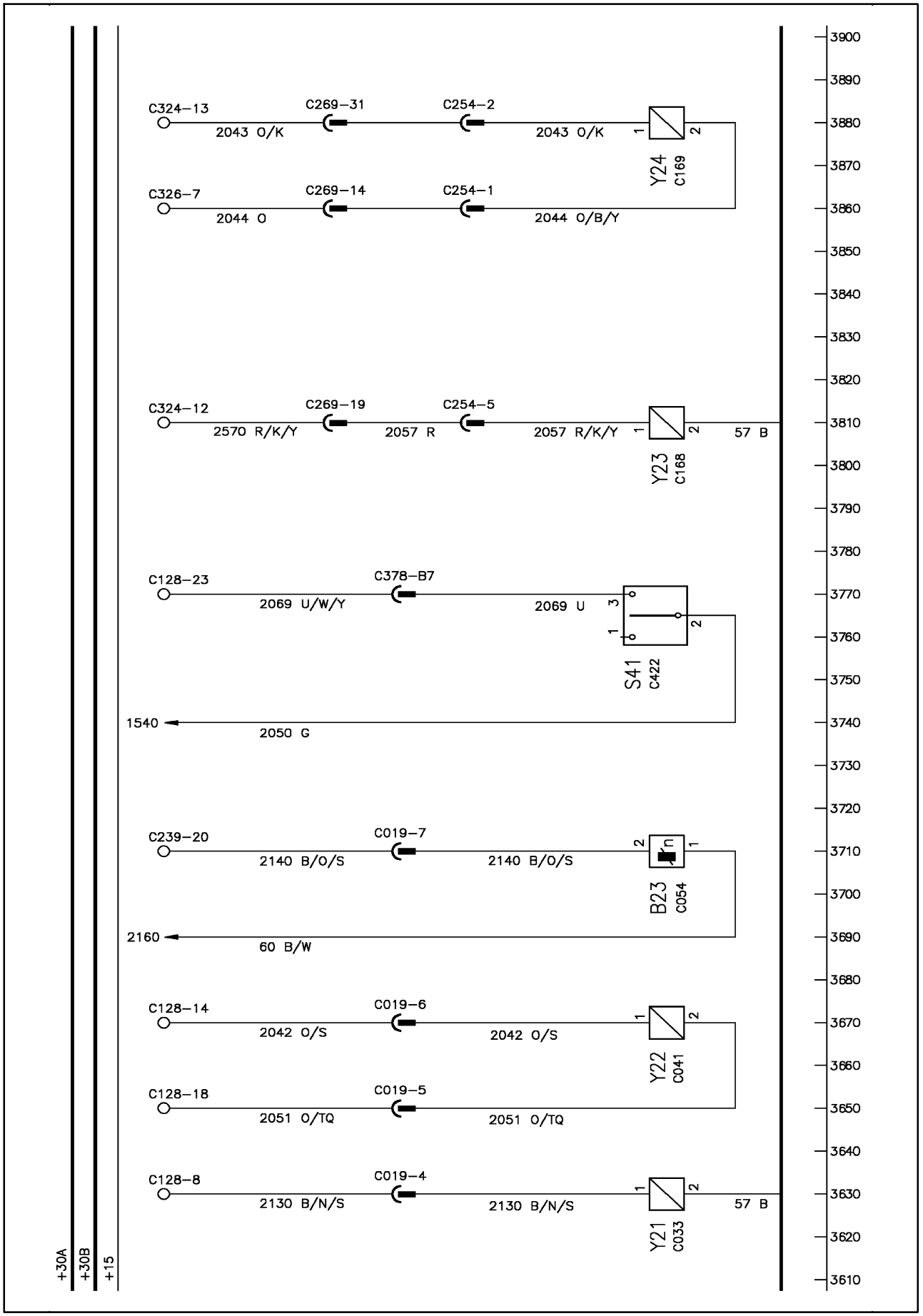
Possible failure modes:

1. External power supply connected
2. Faulty charging system
3. Faulty solenoid
4. Faulty harness
5. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error code is being displayed, continue to these tests.
   B. If no other error code is displayed, continue to step 2.
2. Check that the tractor battery power supply has not been connected to an external power supply.
   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.
   B. If an external power supply is not connected to the tractor, continue to step 3.
3. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is greater than approximately 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 4.
4. Check the rear PTO solenoid.
   A. Turn the keystart OFF. Disconnect the rear PTO solenoid connector **C041**. Measure the resistance between the solenoid terminal **1** and terminal **2**. If the resistance indicated is not approximately 10 Ohms at 20 degrees centigrade, remove and replace the rear PTO solenoid.
   B. If the rear PTO solenoid is okay, continue to step 5.
5. Check for a short to +Ve Voltage.
   A. Disconnect the controller connector **C128**. Turn the keystart ON. Measure the voltage between connector:
   C128 pin **18 (O/TQ)** and **ground**
   C128 pin **14 (O/S)** and **ground**
   If a voltage is indicated, repair or replace the harness as required.
   B. If a voltage is not indicated, continue to step 6.
6. Check for a short circuit.
   A. Turn the keystart OFF. Check between connector **C128** pin **18 (O/TQ)** and **C128** pin **14 (O/S)**. If a short circuit is indicated, repair or replace the harness as required.
   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
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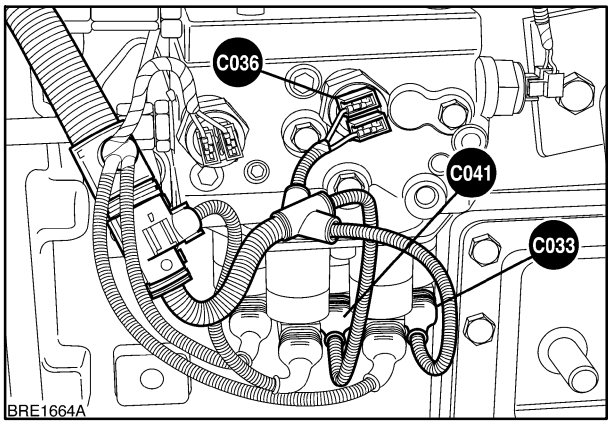

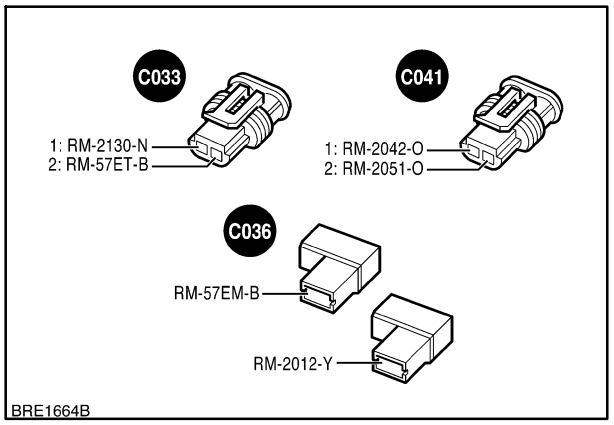

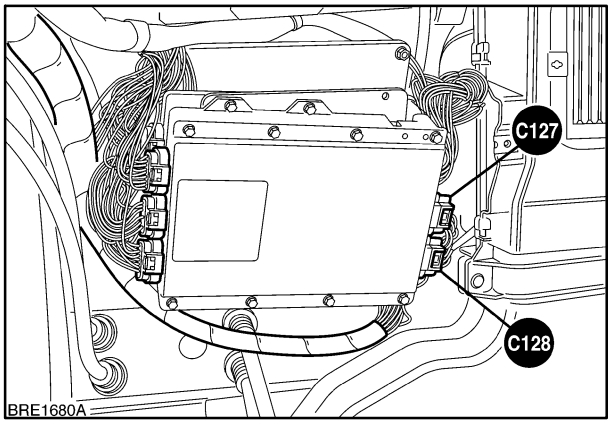

C127

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6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5024 - REAR PTO NOT CALIBRATED

Effects:

PTO enabled.

Possible failure modes:

1. PTO not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the PTO was calibrated.

   A. If the PTO was not calibrated after a change of controller or after using H8, clear the non-volatile memory (EEPROM). Perform the PTO calibration procedure.

   B. If the PTO was calibrated, perform the PTO calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the PTO calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 5027 - REAR PTO SPEED SENSOR OPEN CIRCUIT

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the speed sensor connector **C054** and the inline harness connector **C019**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.
2. Check the PTO speed sensor.

   A. Disconnect connector **C054**. Check between the speed sensor terminals. If an open circuit is indicated, remove and replace the speed sensor.

   B. If the speed sensor is okay, continue to step 3.
3. Check for an open circuit.

   A. Check between connector **C054** pin **1 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.
4. Check for an open circuit.

   A. Disconnect the controller connector **C239**. Check between connector **C239** pin **20 (B/O/S)** and **C054** pin **2 (B/O/S)**. If an open circuit is indicated, disconnect the inline harness connector **C019** and check between connector:

   C019 pin **7 (B/O/S)** and **C054** pin **2 (B/O/S)**

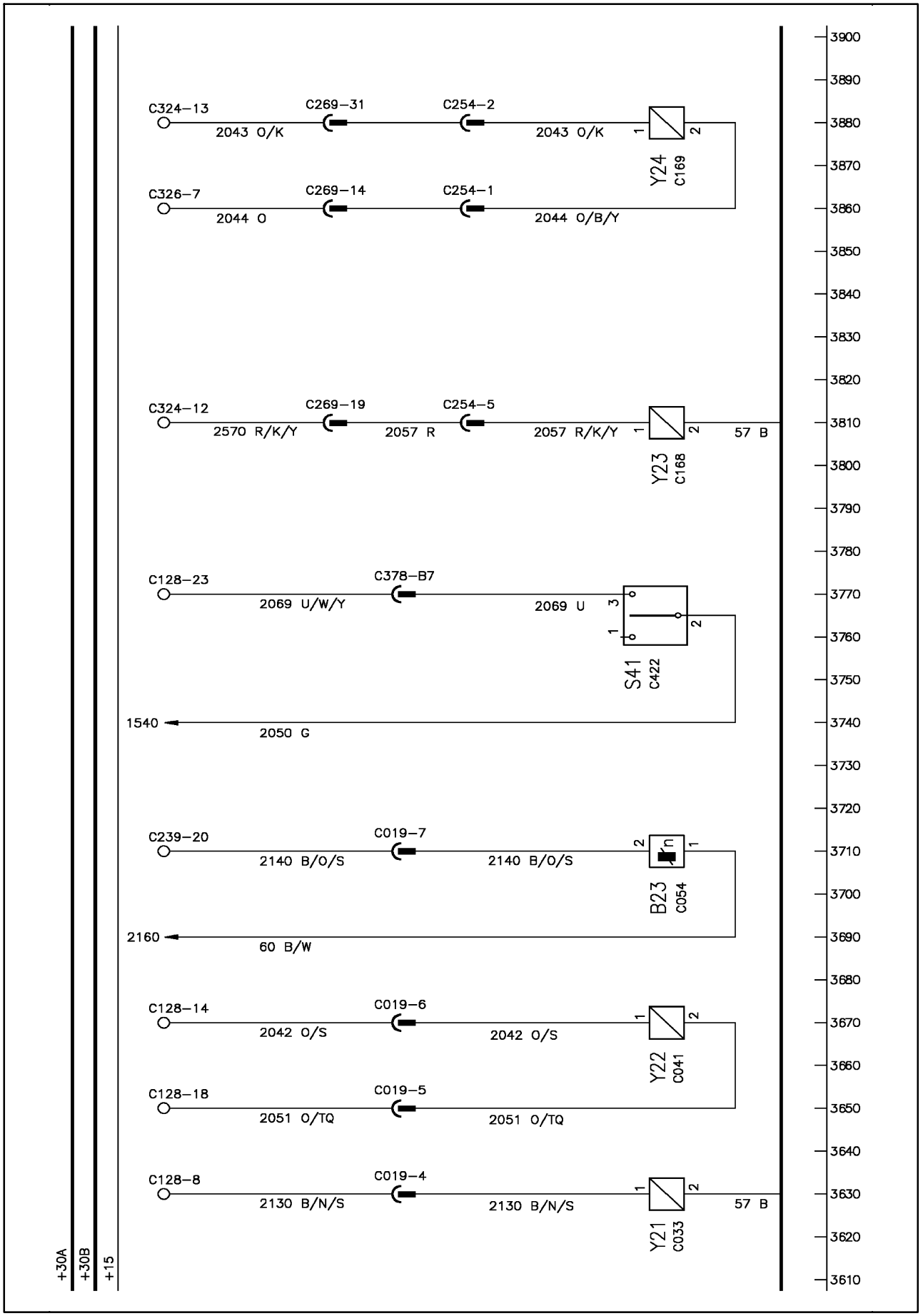
   C019 pin **7 (B/O/S)** and **C239** pin **20 (B/O/S)**

   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.
5. Check connectors **C239** and **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-13
C269-31
C254-2
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Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
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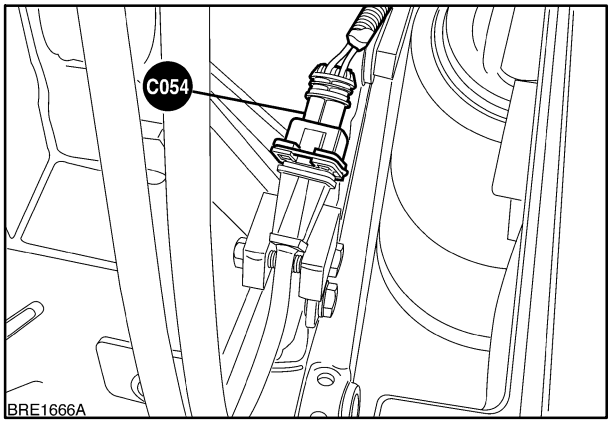
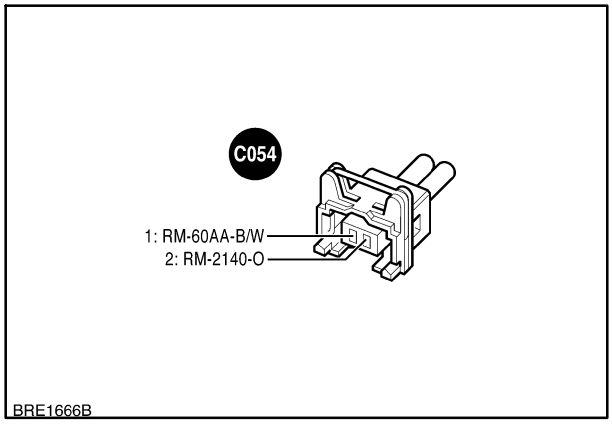


BRE1666A



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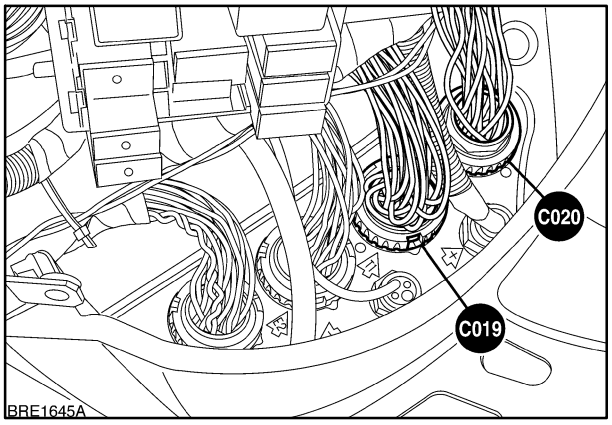
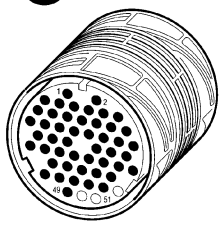


BRE1645A

C019



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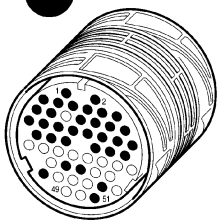
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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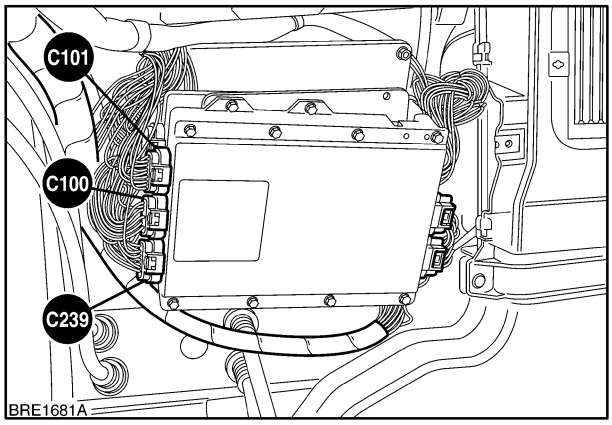
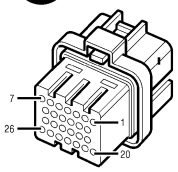
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



BRE1681A

C100



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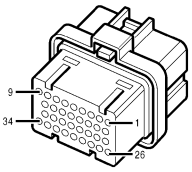
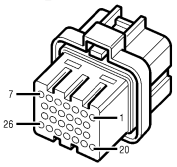
2: CM-7000D-U/R/B
3: CM-7000E-U/R/B
4: CM-7830-K/S/B
5: CM-5085-K/U
6: CM-8040-LG/P/S
7: CM-7300-W/LG/B
8: CM-7660-R/U/B
9: CM-7810-K/N/B
10: CM-7820-K/P/B
11: CM-7840-K/W/B
12: CM-5090-K/R
13: CM-8030-LG/O/S
14: CM-5000A-P/R
15: CM-5400-Y
16: CM-5420-G
19: CM-61-B/O
20: CM-5200A-N/R/B
23: CM-60-B/W
24: CM-5300-K/W/B
25: CM-57Y-B
26: CM-57Z-B

C101



1: CM-7430-Y/R/B
2: CM-5080-K/N
3: CM-5050-LN/B
4: CM-5045-LN/Y
5: CM-5120-K/O
6: CM-5040-LN/W
7: CM-5145-TQ/R
8: CM-5155-B/U
9: CM-5065-LN/P
10: CM-5070-LN/LG
11: CM-7000F-U/R/B
12: CM-7250-S/R/B
13: CM-7260-S/U/B
14: CM-7500-B/G
16: CM-5020-LN
17: CM-7525-G/B/S
18: CM-5130-TQ/P
19: CM-7230-S/O/B
20: CM-5125-TQ/W
21: CM-1001N-W/R
22: CM-7210-S/LG/B
23: CM-7200-S/K/B
25: CM-5075-K
26: CM-7220-S/N/B
27: CM-7420D-Y/P/B
28: CM-2200-G/N/B
29: CM-5100-K/W
30: CM-5095-K/G
32: CM-2016-Y/G
33: CM-2028-G
34: CM-2016A-Y/G

C239



1: CM-7825-K/R/B
2: CM-7835-K/U/B
3: CM-7845-K/Y/B
4: CM-5087-K/U/B
5: CM-5097-K/G/B
6: CM-8045-P/LN/S
7: CM-8035-P/LG/S
8: CM-7815-K/O/B
9: CM-7650-W/LN
10: CM-7640-B/LN
11: CM-5220-Y/LG/S
12: CM-2026-S/R
13: CM-7301-Y/LN/B
15: CM-7275-W/U/B
17: CM-7270-R/G
18: CM-1160-R/P/Y
19: CM-5110-K/LG
20: CM-2140-B/O/S
21: CM-57W-B
22: CM-5060-LN/O
23: CM-5170-LN/TQ
24: CM-5180-TQ/G
25: CM-5230-Y/LN/S
26: CM-57X-B

BRE1681B

ERROR CODE 5033 - REAR PTO CAB NORMALLY CLOSED SWITCH OPEN CIRCUIT

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty PTO switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO cab switch connector **C116** and the controller connector **C127**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the rear PTO cab switch.

   A. Disconnect the rear PTO cab switch connector **C116**. while operating the switch, check between the component side of connector:

   C116 pin **1 (G)** and **C116** pin **2 (O/G)**. Should indicate an open circuit when disengaged, approximately 115 Ohms when engaged and an open circuit with the yellow button only pressed.

   C116 pin **1 (G)** and **C116** pin **3 (O/LG)**. Should indicate aproximately 115 Ohms when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.

   C116 pin **2 (O/G)** and **C116** pin **3 (O/LG)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.

   If the switch operation is not as indicated, remove and replace the PTO switch.

   B. If the switch is okay, continue to step 3.

3. Check for a +12 Volts.

   Turn the keystart ON. Measure the voltage between connector **C116** pin **1 (G)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   If +12 Volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the controller connector **C127**. Check between connector:

   C116 pin **3 (O/LG)** and **C127** pin **13 (O/LG)**

   C116 pin **2 (O/G)** and **C127** pin **12 (O/G)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

5. Check for a short to ground.

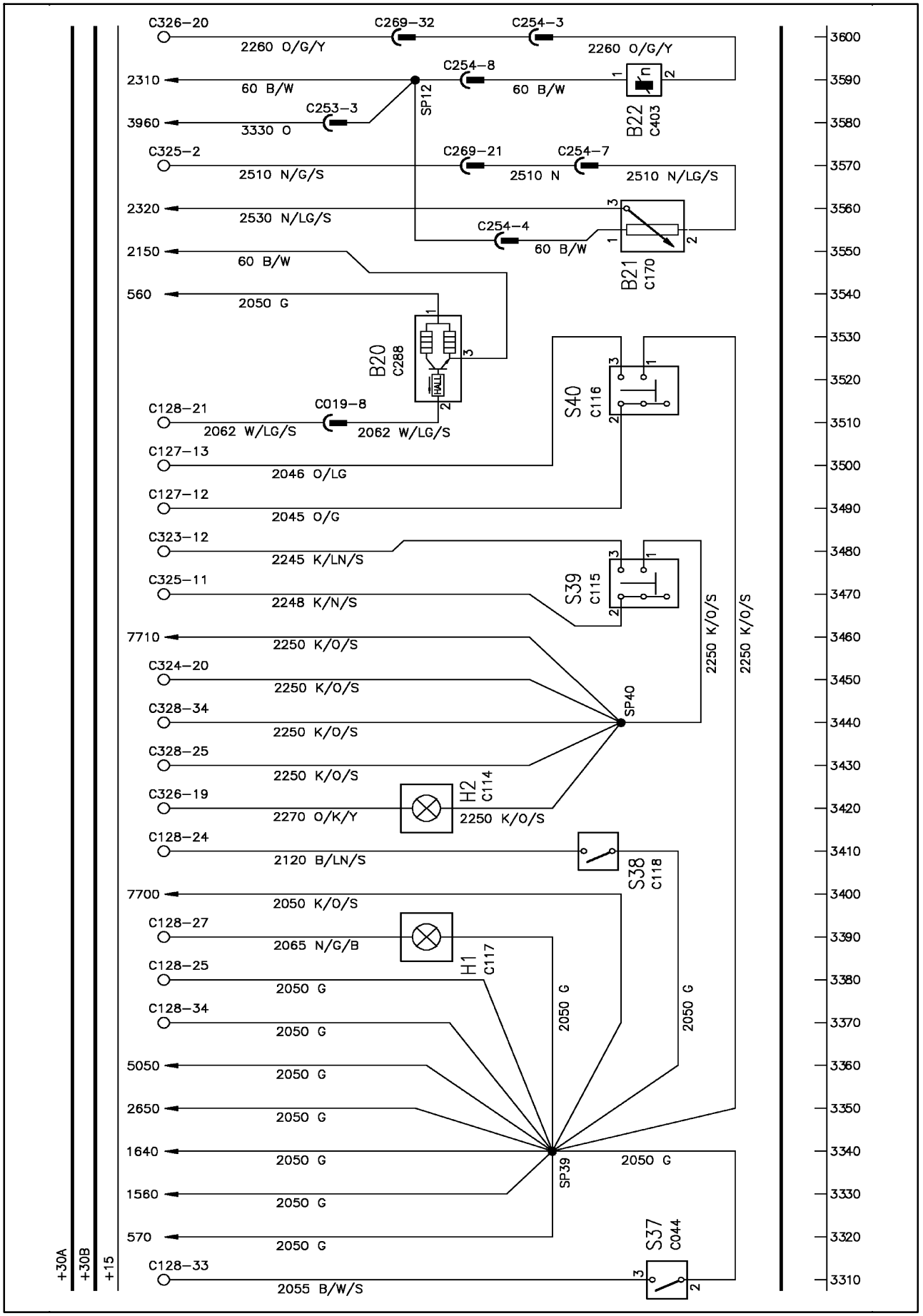
   A. Check between connector:

   C127 pin **13 (O/LG)** and **ground**

   C127 pin **12 (O/G)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
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2250 K/O/S
C328-25
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C326-19
2270 O/K/Y
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C114
2250 K/O/S
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2120 B/LN/S
S38
C118
7700
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C128-27
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H1
C117
C128-25
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2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
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+30B
+15
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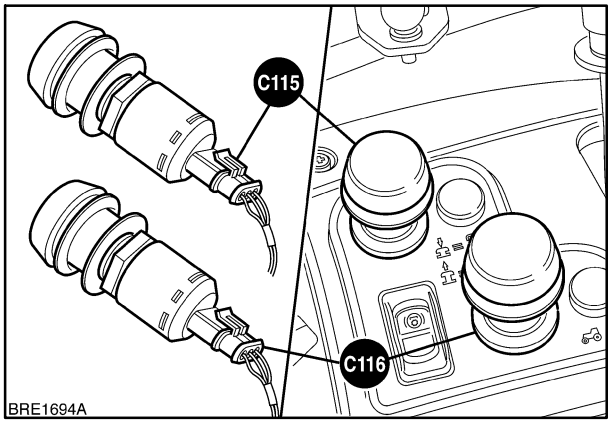

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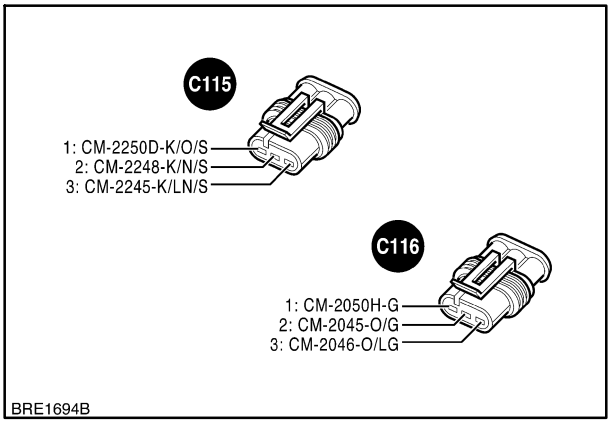

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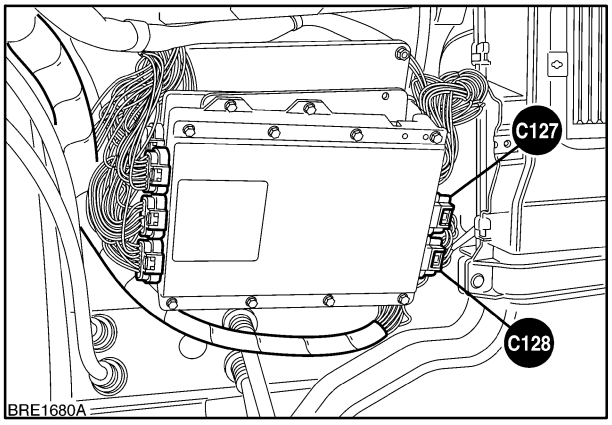
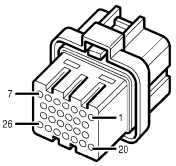


BRE1680A

C127



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6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18: CM-7670-R/S/Y
19: CM-3014-R/K
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21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
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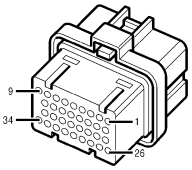
26: CM-7582-U/S/Y

C128



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6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5034 – FENDER MOUNTED REAR PTO SWITCH OPEN CIRCUIT OR SHORT TO GROUND

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty fender mounted rear PTO switch(es)
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fender mounted rear PTO switch connectors **C257**, **C258**, LH fender connector **C296**, RH fender connector **C294**, and the controller connector **C128**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the fender mounted rear PTO switches.

   A. Disconnect both rear PTO switch connectors **C257** and **C258**. While operating the PTO switches, measure the resistance of the left hand and right hand PTO switches between the component side of connector **C257** and **C258**:

   Pin **1 (G/R)** and Pin **2 (W/U)**. Should indicate a closed circuit when released and an open circuit when depressed.

   Pin **1 (G/R)** and Pin **3 (W/R/Y)**. Should indicate an open circuit when released and a closed circuit when depressed.

   Pin **2 (W/U)** and Pin **3 (W/R/Y)**. Should indicate an open circuit when released or depressed.

   If the switch operation is not as indicated, remove and replace the faulty fender PTO switch.

   B. If the switches are okay, continue to step 3.

3. Check for +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C258** pin **1 (G/R)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect connector **C128**. Check between connector:

   C258 pin **2 (W/U)** and **C257** pin **1 (G/R)**

   C258 pin **3 (W/R/Y)** and **C257** pin **3 (W/R/Y)**

   C257 pin **2 (W/U)** and **C128** pin **2 (W/U)**

   C257 pin **3 (W/R/Y)** and **C128** pin **4 (W/R/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to ground.

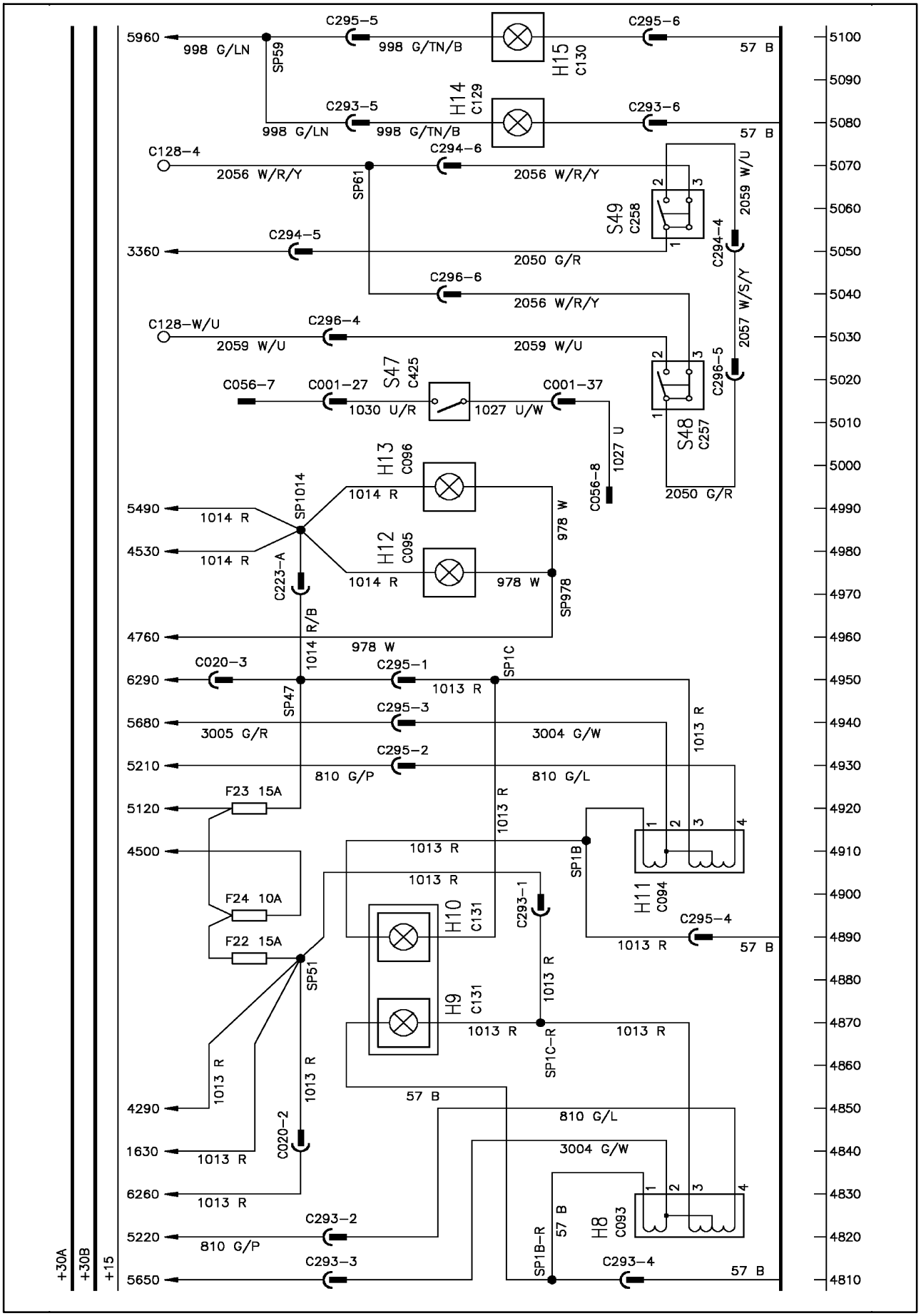
   A. Check between connector:

   C128 pin **2 (W/U)** and **ground**

   C128 pin **4 (W/R/Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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+30B
+15
5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
5100
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5090
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
5080
5070
C294-5
3360
2050 G/R
C294-4
5060
5050
C296-6
2056 W/R/Y
C128-W/U
2059 W/U
C296-4
2059 W/U
2057 W/S/Y
C296-5
5040
5030
S47 C425
C056-7
C001-27
1030 U/R
1027 U/W
C001-37
S48 C257
5020
5010
H13 C096
1014 R
C056-8
1027 U
2050 G/R
5000
5490
1014 R
SP1014
978 W
4990
4530
1014 R
H12 C095
1014 R
978 W
SP978
4980
C223-A
4970
4760
1014 R/B
978 W
4960
C020-3
6290
SP47
C295-1
1013 R
SP1C
4950
C295-3
5680
3005 G/R
3004 G/W
1013 R
4940
C295-2
5210
810 G/P
810 G/L
4930
F23 15A
5120
1013 R
4920
4500
1013 R
SP1B
1 2 3 4
4910
1013 R
F24 10A
H10 C131
C293-1
H11 C094
C295-4
4900
F22 15A
1013 R
57 B
4890
SP51
H9 C131
1013 R
4880
1013 R
1013 R
SP1C-R
1013 R
4870
1013 R
1013 R
4860
57 B
4290
810 G/L
4850
C020-2
1630
1013 R
3004 G/W
4840
6260
1013 R
1 2 3 4
4830
C293-2
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C293-4
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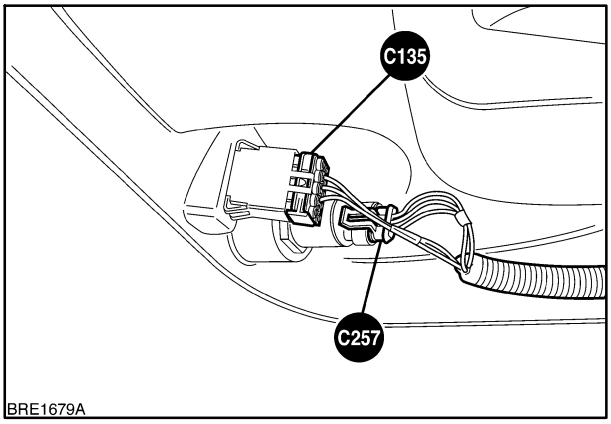

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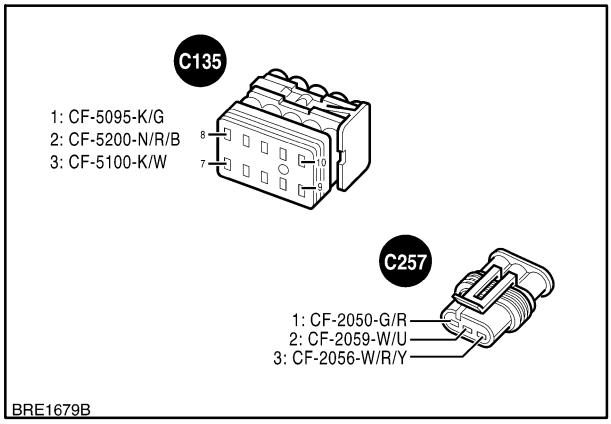

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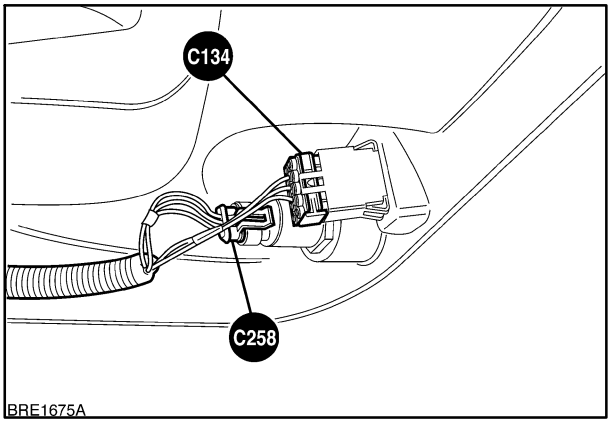

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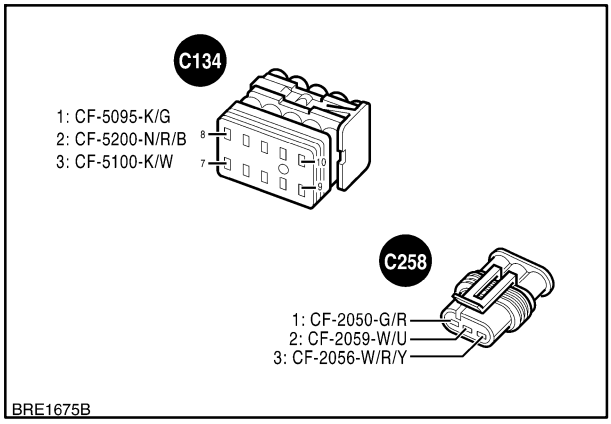

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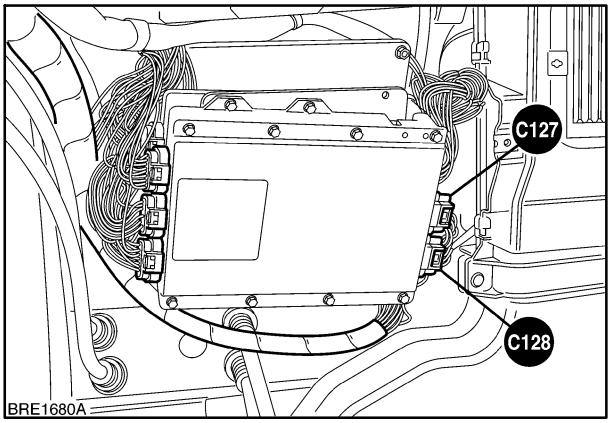


BRE1680A

C127

1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5035 - FENDER MOUNTED REAR PTO SWITCH SHORT TO +VE VOLTAGE

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty fender mounted rear PTO switch(es)
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fender mounted rear PTO switches.

   A. Disconnect both rear PTO switch connectors **C257** and **C258**. While operating the PTO switches, measure the resistance of the left hand and right hand PTO switches between the component side of connector **C257** and **C258**:

   Pin **1 (G/R)** and Pin **2 (W/U)**. Should indicate a closed circuit when released and an open circuit when depressed.

   Pin **1 (G/R)** and Pin **3 (W/R/Y)**. Should indicate an open circuit when released and a closed circuit when depressed.

   Pin **2 (W/U)** and Pin **3 (W/R/Y)**. Should indicate an open circuit when released or depressed.

   If the switch operation is not as indicated, remove and replace the faulty fender PTO switch.

   B. If the switches are okay, continue to step 2.

2. Check for a short circuit.

   Disconnect the controller connector **C128**. Check between connector **C128** pin **2 (W/U)** and **C128** pin **4 (W/R/Y)**. If a short circuit is indicated, repair or replace the harness as required.

   B. If a short circuit is not indicated, continue to step 3.

3. Check for a short to +Ve voltage.

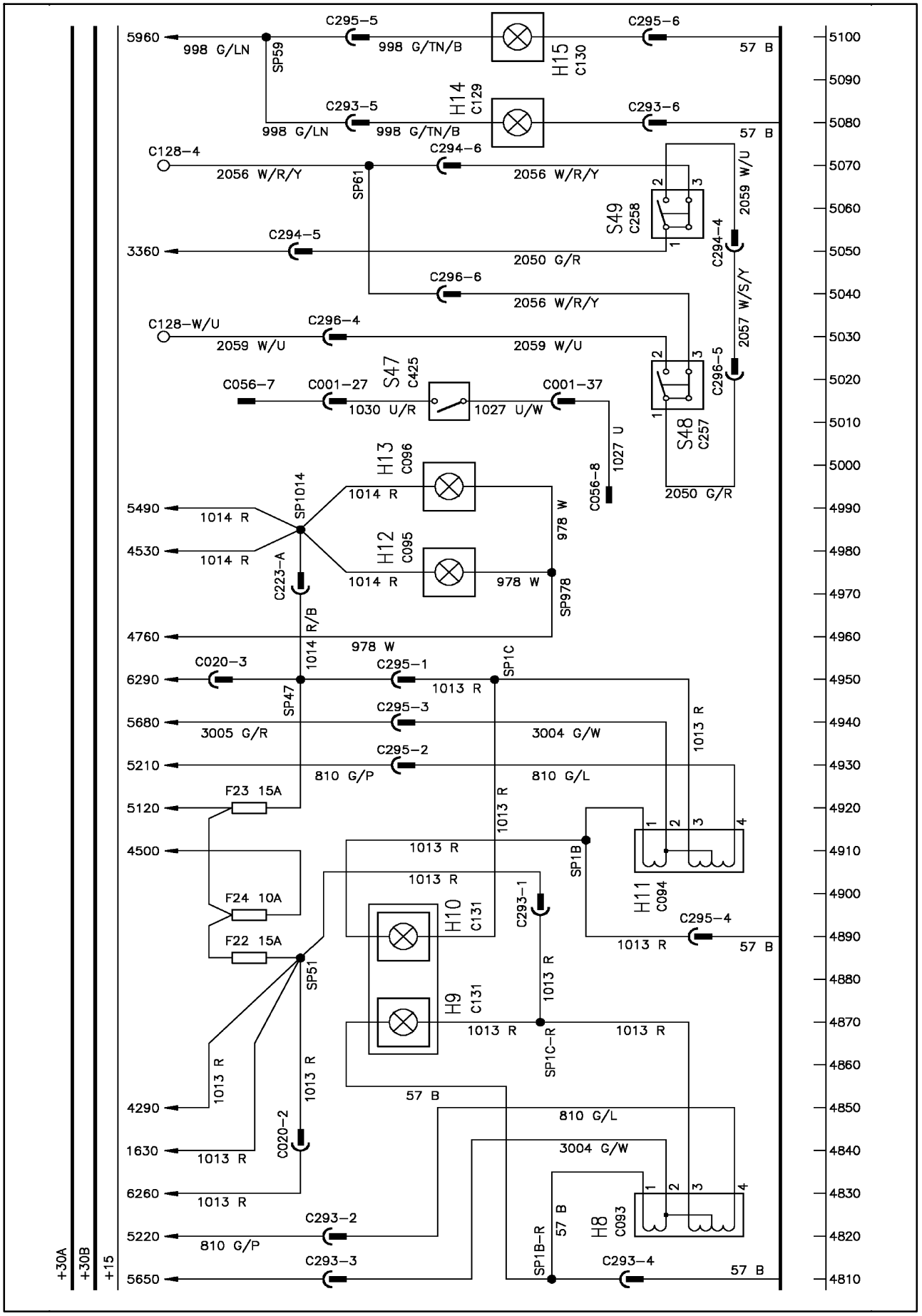
   A. Turn the keystart ON. Measure the voltage between connector:

   C128 pin **2 (W/U)** and **ground**

   C128 pin **4 (W/R/Y)** and **ground**

   If a short to +Ve voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
5100
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5080
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
5070
C294-5
3360
2050 G/R
C294-4
5060
C296-6
2056 W/R/Y
2057 W/S/Y
5040
C128-W/U
2059 W/U
C296-4
2059 W/U
C296-5
5030
C056-7
C001-27
1030 U/R
S47 C425
1027 U/W
C001-37
S48 C257
5020
H13 C096
1014 R
C056-8
1027 U
5010
2050 G/R
5490
1014 R
SP1014
978 W
5000
4530
1014 R
H12 C095
1014 R
978 W
SP978
4990
C223-A
4760
1014 R/B
978 W
4980
C020-3
6290
SP47
C295-1
1013 R
SP1C
4970
C295-3
5680
3005 G/R
3004 G/W
1013 R
4960
C295-2
5210
810 G/P
810 G/L
4950
F23 15A
5120
1013 R
4940
4500
1013 R
SP1B
4930
1013 R
H11 C094
4920
F24 10A
H10 C131
C293-1
C295-4
1013 R
57 B
4910
F22 15A
SP51
H9 C131
1013 R
4900
1013 R
1013 R
SP1C-R
4890
4290
1013 R
1013 R
4880
57 B
810 G/L
4870
1630
1013 R
C020-2
3004 G/W
4860
6260
1013 R
4850
C293-2
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H8 C093
57 B
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C293-4
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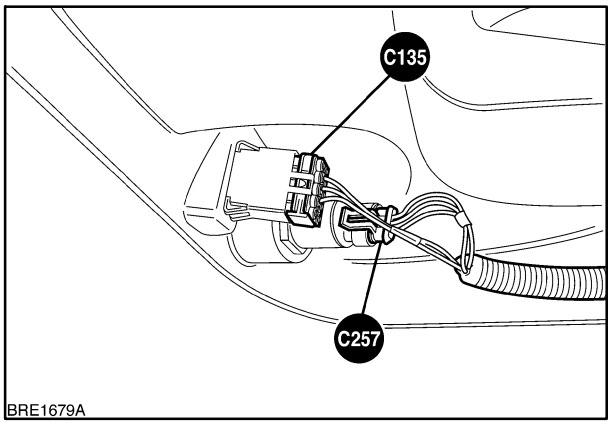

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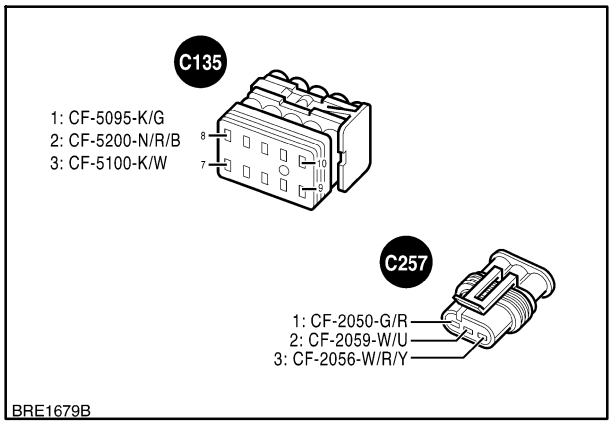

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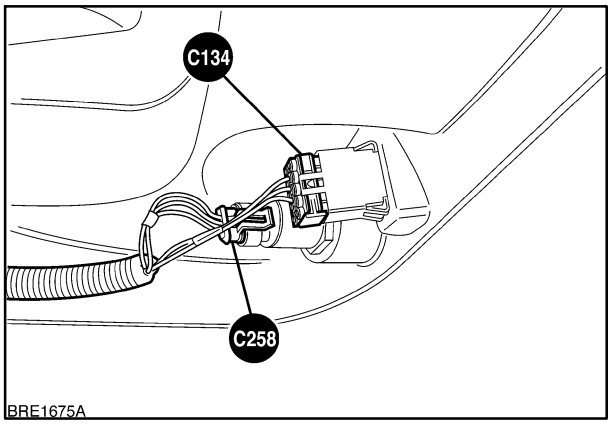

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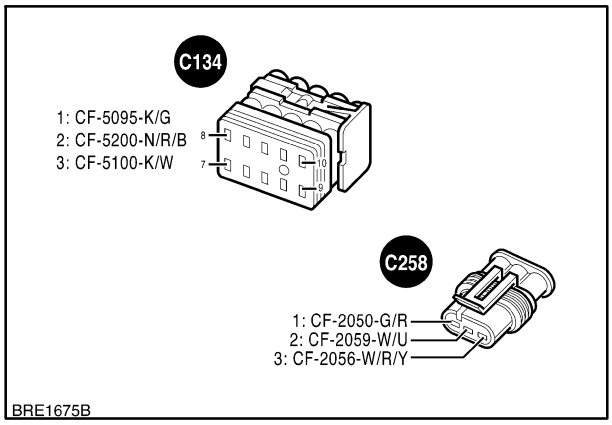

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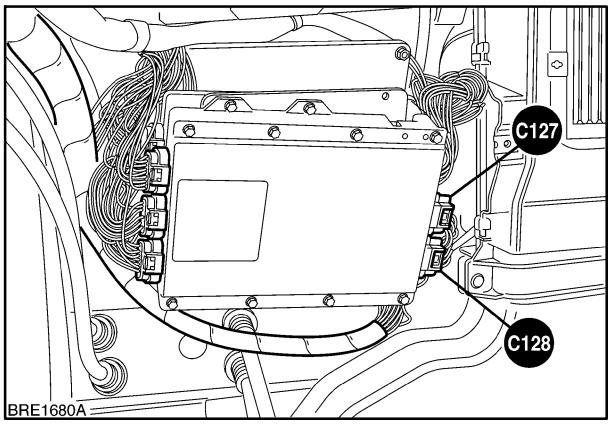

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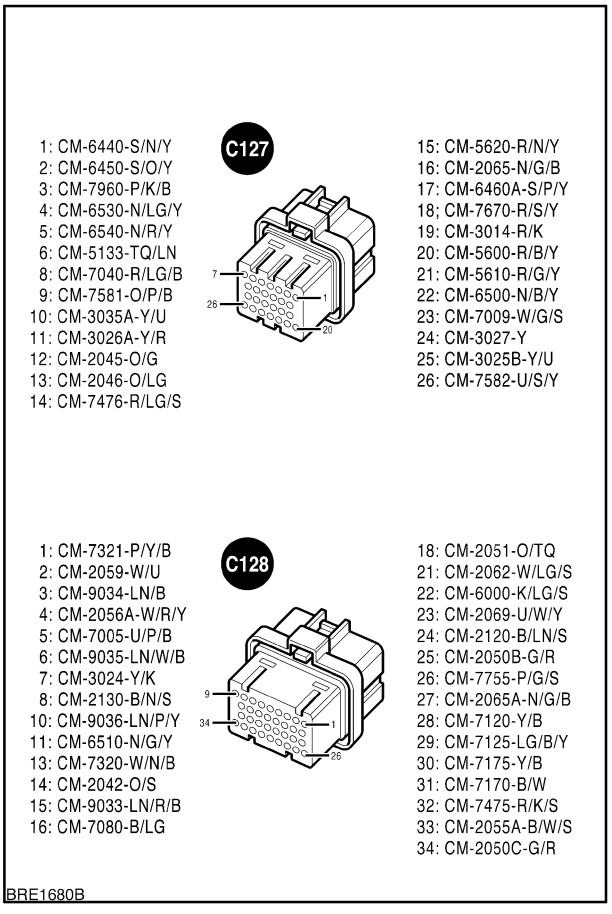


BRE1680B

ERROR CODE 5036 - REAR PTO FAILURE TO START

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty rear PTO cab switch
3. Faulty hydraulic circuit
4. Mechanical fault
5. Faulty harness
6. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If other error codes are displayed, continue to these tests.

   B. If no other error codes are displayed, continue to step 2.
2. Check for the warning light on the PTO control panel being illuminated.

   A. Start the engine. Operate the PTO switch. If the PTO warning light is not illuminated, continue to step 3.

   B. If the PTO warning light is illuminated, continue to step 6.
3. Check the rear PTO cab switch connector **C116**, the PTO clutch solenoid connector **C041** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 4.
4. Check the rear PTO cab switch.

   A. Disconnect the rear PTO cab switch connector **C116**. while operating the switch, check between the component side of connector:

   C116 pin **1 (G)** and **C116** pin **2 (O/G)**. Should indicate an open circuit when disengaged, approximately 115 Ohms when engaged and an open circuit with the yellow button only pressed.

   C116 pin **1 (G)** and **C116** pin **3 (O/LG)**. Should indicate aproximately 115 Ohms when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.

   C116 pin **2 (O/G)** and **C116** pin **3 (O/LG)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.

   If the switch operation is not as indicated, remove and replace the PTO switch.

   B. If the switch is okay, continue to step 5.
5. Check for +5 Volts

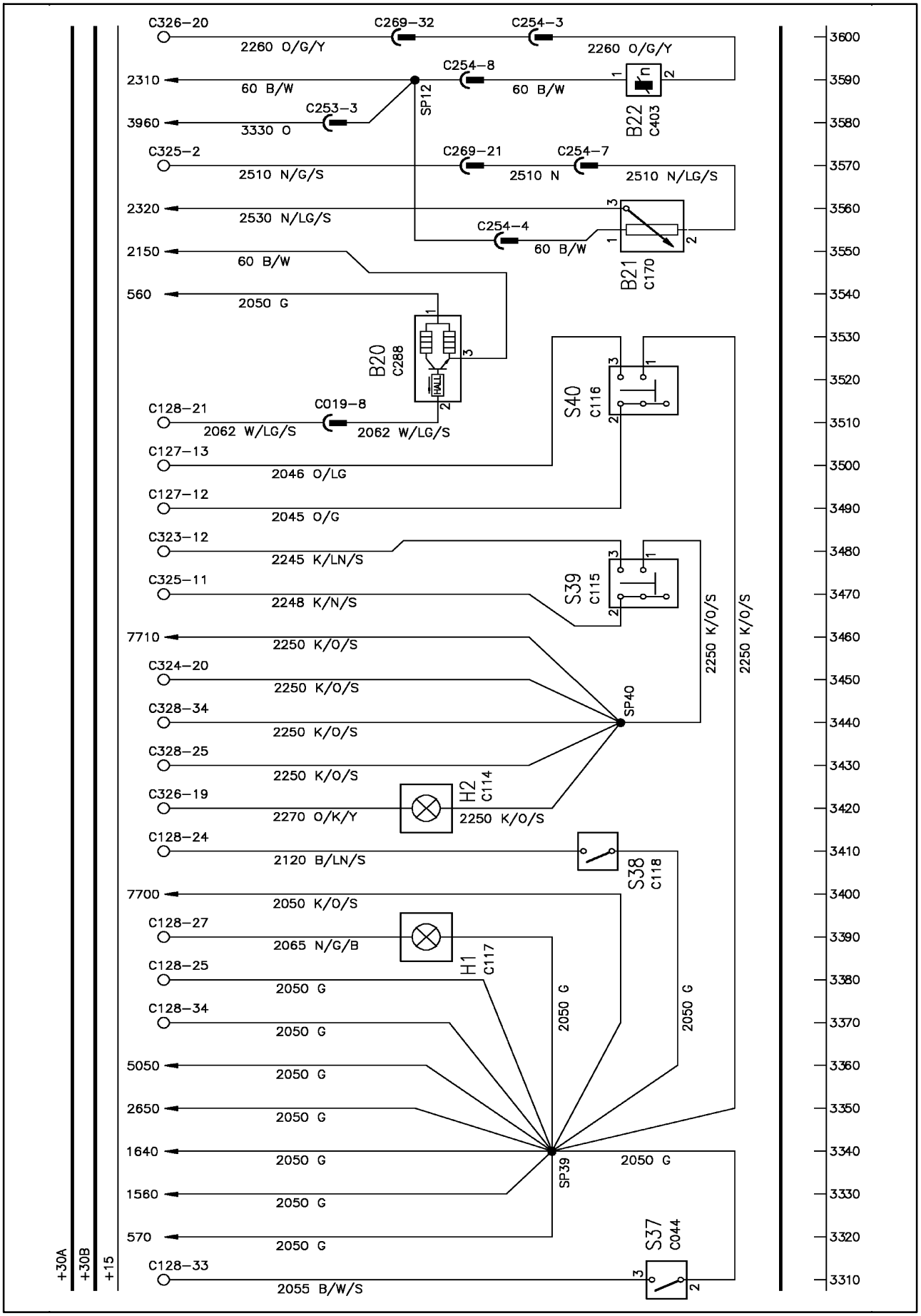
   A. Turn the keystart ON. Measure the voltage between connector **C116** pin **1 (G)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, download the correct level of software. If the fault re-occurs, remove and replace the controller.
6. Check the hydraulic pressure of the PTO circuit.

   A. Pressure test the PTO circuit, If the pressures indicated are not between 15 bar - 18 bar, continue to hydraulic troubleshooting procedures.

   B. If the pressures are okay, continue to step 7.
7. Check for a mechanical fault.

   A. Inspect the PTO clutch and its components. If the PTO clutch and its components are damaged, repair or replace as required.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
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C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
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C328-25
2250 K/O/S
C326-19
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H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
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+30A
+30B
+15
3600
3590
3580
3570
3560
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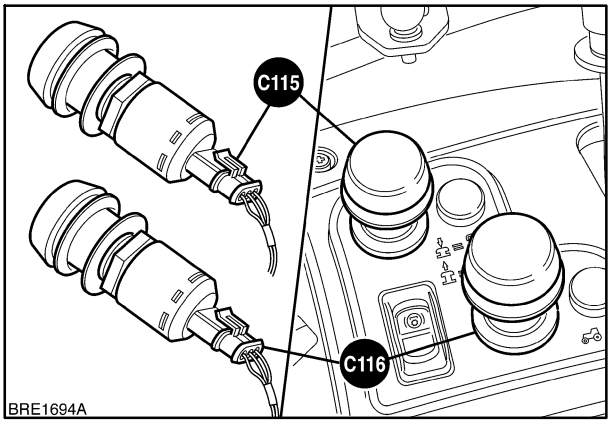

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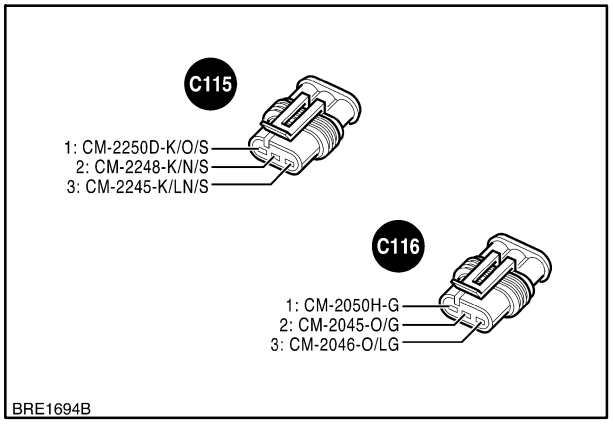

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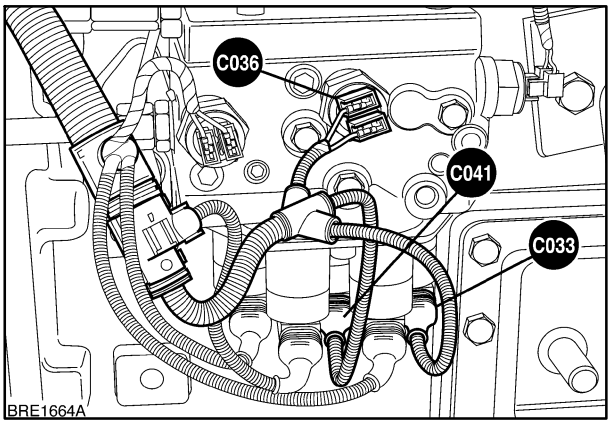

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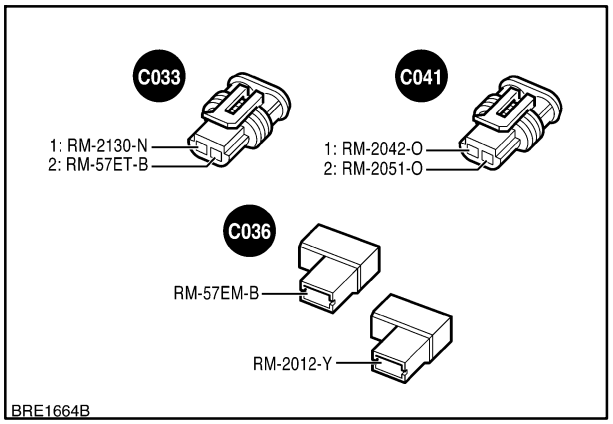

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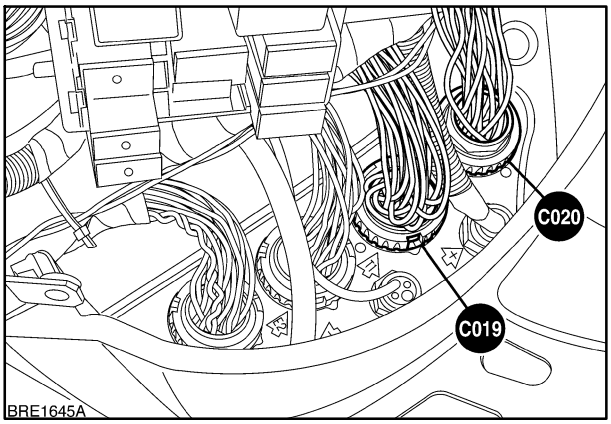
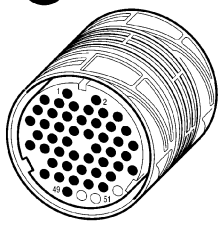


BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
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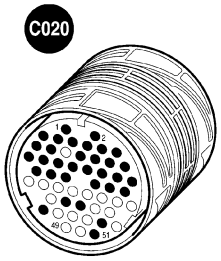
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 5037 - REAR PTO CAB NORMALLY OPEN SWITCH STUCK CLOSED

Effects:

PTO disabled.

Possible failure modes:

1. Faulty PTO switch
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO cab switch.

   A. Disconnect the rear PTO cab switch connector **C116**. While operating the switch, check between the component side of connector:

   C116 pin **1 (G)** and **C116** pin **2 (O/G)**. Should indicate an open circuit when disengaged, approximately 115 Ohms when engaged and an open circuit with the yellow button only pressed.

   C116 pin **1 (G)** and **C116** pin **3 (O/LG)**. Should indicate aproximately 115 Ohms when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.

   C116 pin **2 (O/G)** and **C116** pin **3 (O/LG)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.

   If the switch operation is not as indicated, remove and replace the PTO switch.

   B. If the switch is okay, continue to step 2.

2. Check for a short circuit.

   A. Disconnect the controller connector **C127**. Check between connector **C116** pin **2 (O/G)** and **C116** pin **3 (O/LG)**. If a short circuit is indicated, repair or replace the harness as required.

   B. If a short circuit is not indicated, continue to step 3.

3. Check for a short to +Ve voltage.

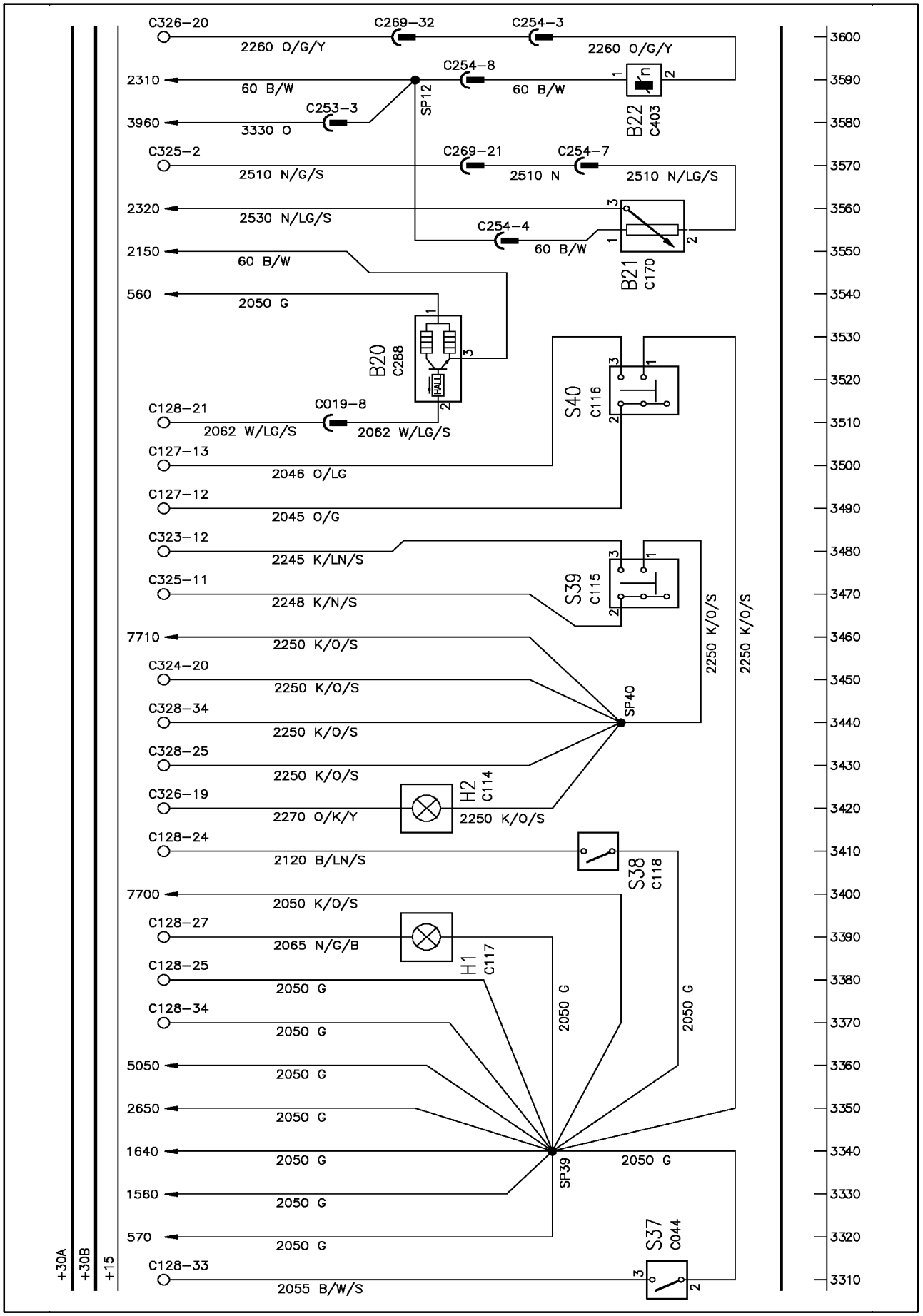
   A. Turn the keystart ON. Measure the voltage between connector:

   C116 pin **2 (O/G)** and **ground**

   C116 pin **3 (O/LG)** and **ground**

   If a voltage is indicated, repair or replace the harness as reqiuired.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
3480
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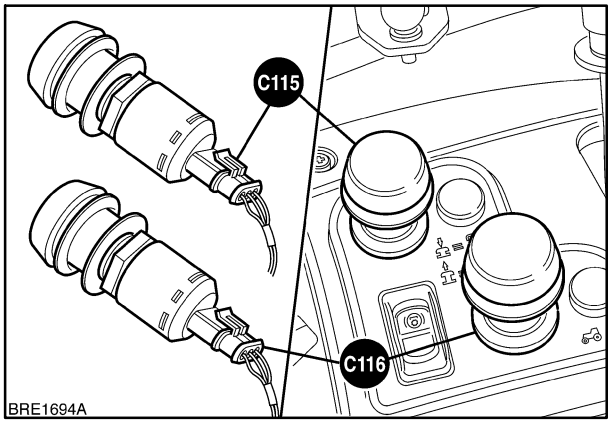

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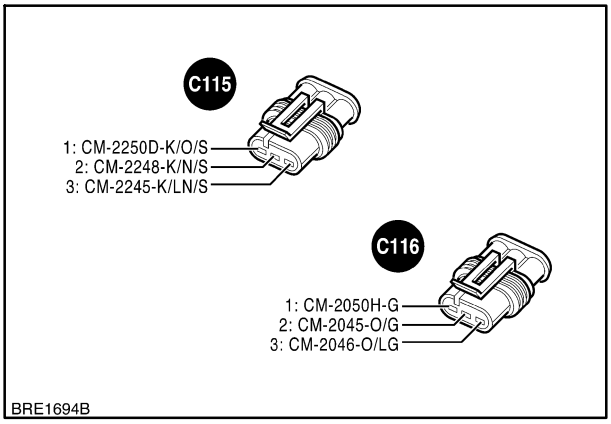

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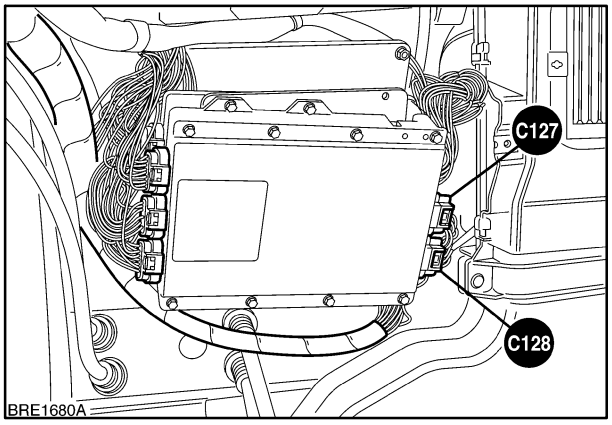

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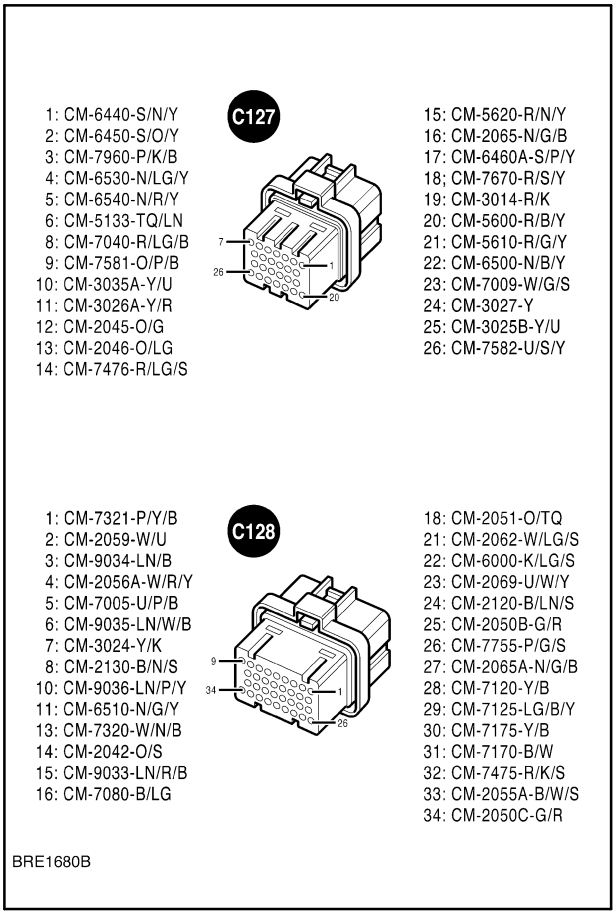


BRE1680B

ERROR CODE 5038 – CAB AND FENDER REAR PTO SWITCHES OPERATED WITHIN 2 SECONDS OF EACH OTHER

Effects:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

Operator error. Leave for 10 seconds then operate.

ERROR CODE 5039 - INCORRECT VOLTAGE ON FENDER MOUNTED REAR PTO SWITCH

Possible failure modes:

1. Faulty connector
2. Faulty fender mounted rear PTO switch(es)
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fender mounted rear PTO switches.

   A. Disconnect both rear PTO switch connectors **C257** and **C258**. While operating the PTO switches, measure the resistance of the left hand and right hand PTO switches between the component side of connector **C257** and **C258**:

   Pin **1 (G/R)** and Pin **2 (W/U)**. Should indicate a closed circuit when released and an open circuit when depressed.

   Pin **1 (G/R)** and Pin **3 (W/R/Y)**. Should indicate an open circuit when released and a closed circuit when depressed.

   Pin **2 (W/U)** and Pin **3 (W/R/Y)**. Should indicate an open circuit when released or depressed.

   If the switch operation is not as indicated, remove and replace the faulty fender PTO switch.

   B. If the switches are okay, continue to step 2.

2. Check for +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C258** pin **1 (G/R)** and **ground**.

   If +12 Volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, continue to step 3.

3. Check for a short to +Ve voltage.

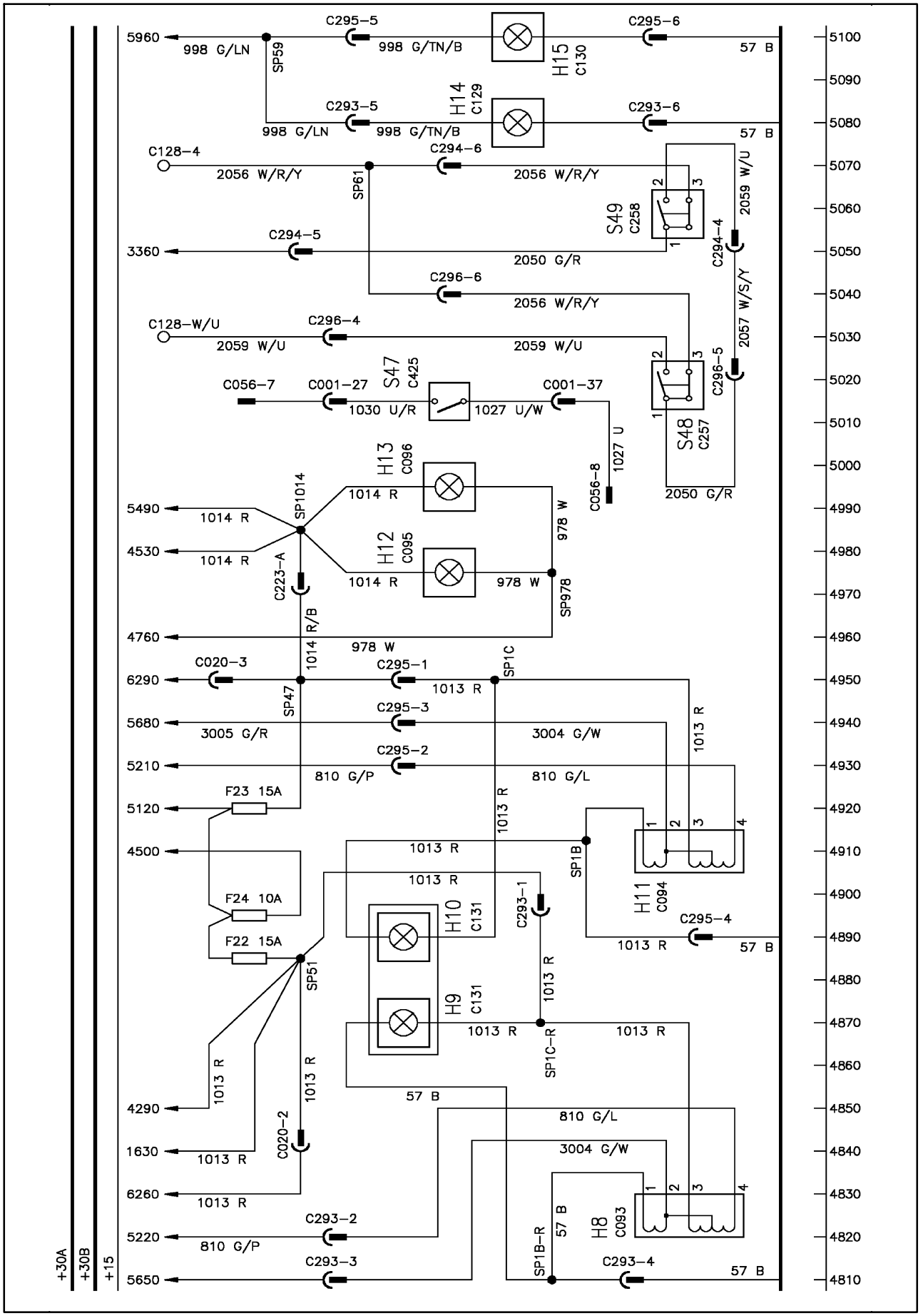
   A. Turn the keystart OFF. Disconnect the controller connector **C128**. Turn the keystart ON. Measure the voltage between connector:

   C128 pin **2 (W/U)** and **ground**

   C128 pin **4 (W/R/Y)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
5960
998 G/LN
SP59
C295-5
998 G/TN/B
H15 C130
C295-6
57 B
5100
H14 C129
C293-5
998 G/LN
998 G/TN/B
C293-6
57 B
5090
5080
C128-4
2056 W/R/Y
SP61
C294-6
2056 W/R/Y
S49 C258
2059 W/U
5070
5060
C294-5
3360
2050 G/R
C294-4
5050
C296-6
2056 W/R/Y
2057 W/S/Y
5040
C128-W/U
2059 W/U
C296-4
2059 W/U
C296-5
5030
5020
C056-7
C001-27
S47 C425
1030 U/R
1027 U/W
C001-37
1027 U
S48 C257
2050 G/R
5010
5000
H13 C096
1014 R
C056-8
5490
1014 R
SP1014
978 W
4990
4530
1014 R
H12 C095
1014 R
978 W
SP978
4980
C223-A
4970
4760
1014 R/B
978 W
4960
C020-3
6290
SP47
1014
C295-1
1013 R
SP1C
4950
C295-3
5680
3005 G/R
3004 G/W
1013 R
4940
C295-2
5210
810 G/P
810 G/L
4930
F23 15A
5120
1013 R
4920
4500
1013 R
SP1B
4910
1013 R
F24 10A
H10 C131
C293-1
H11 C094
C295-4
4900
F22 15A
1013 R
57 B
4890
SP51
H9 C131
1013 R
4880
1013 R
1013 R
SP1C-R
4870
1013 R
1013 R
57 B
4860
4290
810 G/L
4850
C020-2
1630
1013 R
3004 G/W
4840
6260
1013 R
4830
C293-2
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C293-4
57 B
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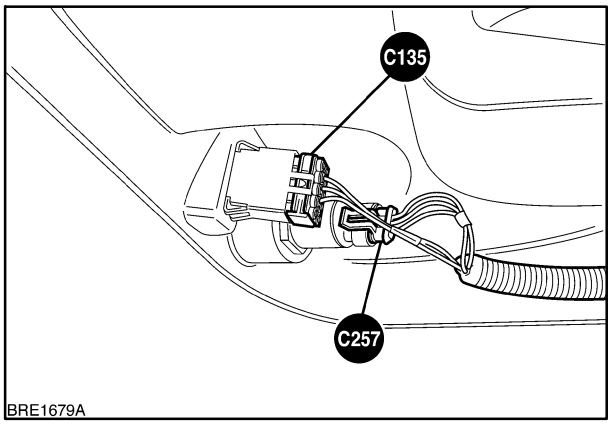

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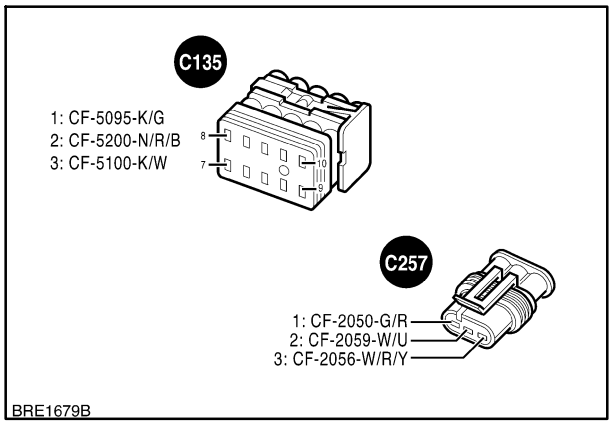

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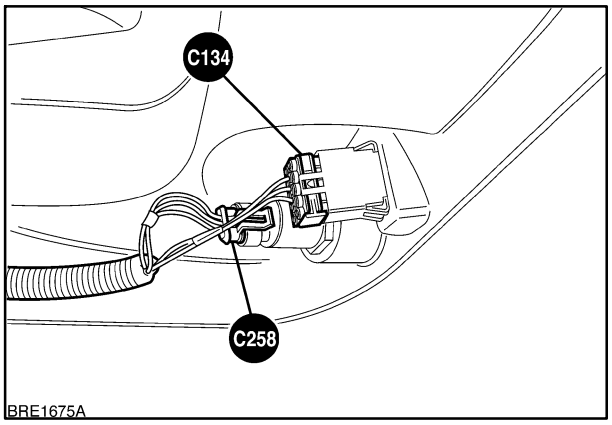
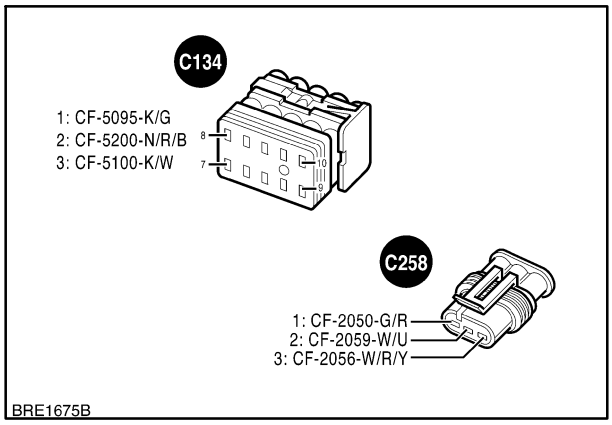


BRE1675A



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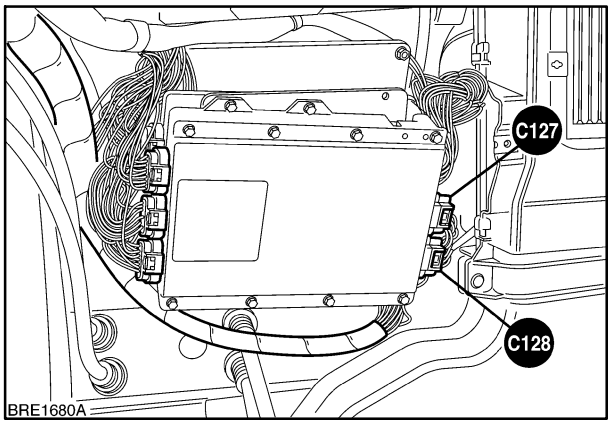

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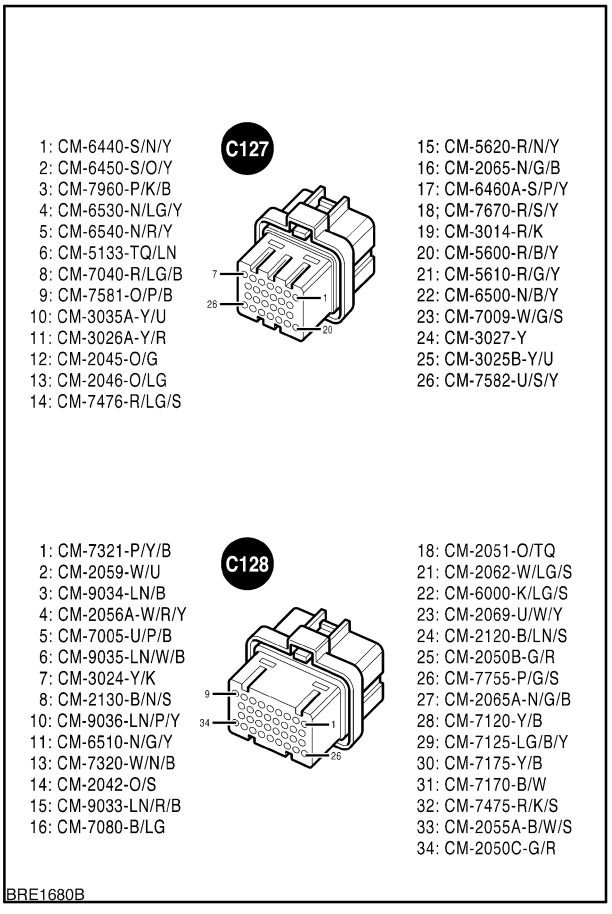


BRE1680B

ERROR CODE 5042 - PTO MANAGEMENT SWITCH SHORTED

Possible failure modes:

1. Faulty connector
2. Faulty rear PTO management switch
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO management switch connector, **C422**, the controller connector **C128** and the inline harness connector **C378**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the rear PTO management switch.

   A. Disconnect the rear PTO management switch connector **C422**. With the assistance of a multimeter, check operation of the switch.

   If the switch operation is not as indicated, remove and replace the faulty rear PTO management switch.

   B. If switch is okay, continue to step 3.

3. Check rear PTO management switch connector for short in switch wiring.

   A. With connector **C422** disconnected:

   Check across connector **C422,** pin **2** and **3**. If a short circuit is indicated, repair or replace harness as required.

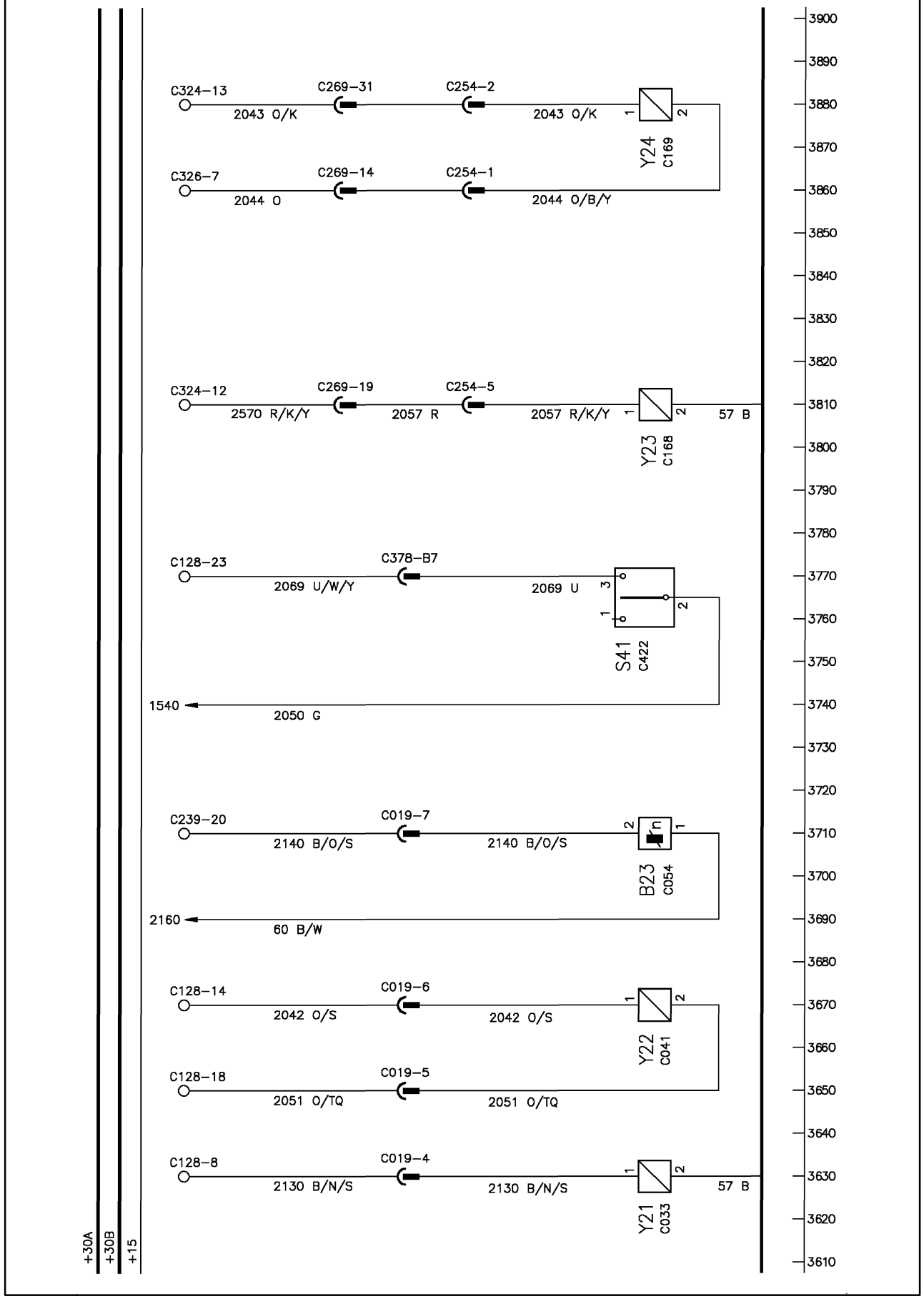
   B. If a short circuit is not indicated, then continue to step 4.

4. Check for a short to +ve voltage.

   A. Turn keystart ON. Measure the voltage at the connector pins:

   Check connector **C422,** pins **2** and **3** for short to **12v**.

   B. If the switch / wiring are okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24 C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23 C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41 C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23 C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22 C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21 C033
3900
3890
3880
3870
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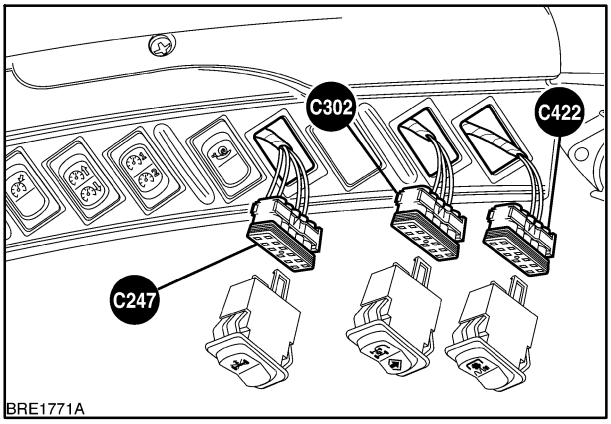

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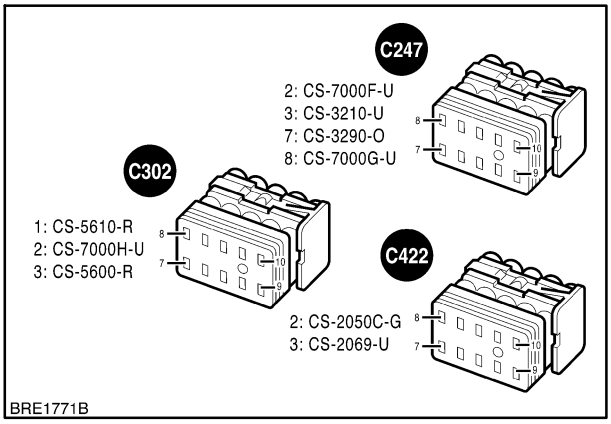

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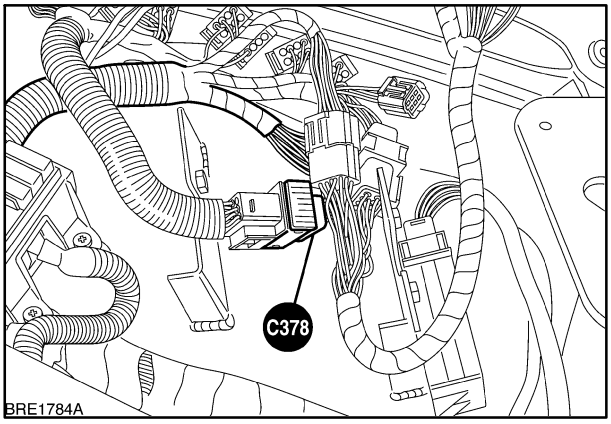

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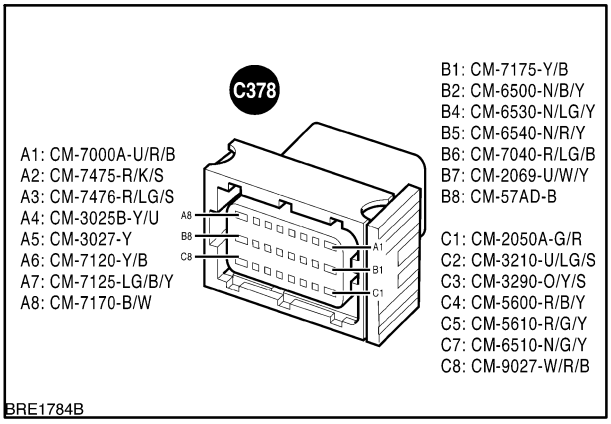

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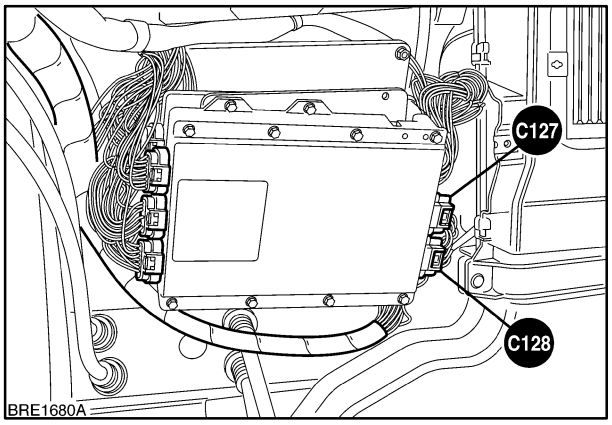
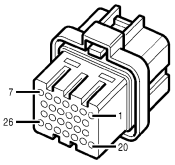


BRE1680A

C127



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9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
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17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
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20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
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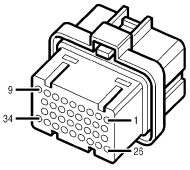
C128



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6: CM-9035-LN/W/B
7: CM-3024-Y/K
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25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 5099 – AUTO PTO MODE NOT ENABLED

Effects:

Unable to select Auto PTO facility

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Enable Auto PTO option in H3 menu screen of DA/DB processors.

NOTES

6001 – 7000 FOUR WHEEL DRIVE ERROR CODE LISTING

Error Code	Error description
6020	Four wheel drive switch error
6021	Four wheel drive solenoid stuck on
6022	Four wheel drive solenoid stuck off
6023	Four wheel drive solenoid open circuit

ERROR CODE 6020 - FOUR WHEEL DRIVE SWITCH ERROR

Possible failure modes:

1. Faulty connector
2. Faulty manual/automatic four wheel drive switch
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If other error codes are displayed, continue to these tests.

   B. If no other error codes are being displayed, continue to step 2.

2. Check the manual/automatic four wheel drive switch connector **C182**, the controller connector **C127** and the inline harness connector **C378**.

   A. Ensure the connectors are connected, not damaged, the pins the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the manual four wheel drive switch in H5.

   A. Turn the keystart ON. Depress the manual switch, d41 should be displayed, place the switch in the central position and d41 will extinguish. If the display is okay, continue to step 4.

   B. If the display is not okay, continue to step 6.

4. Check the automatic four wheel drive switch in H5.

   A. Depress the automatic switch, d42 should be displayed, press the switch again and d42 will extinguish. If the display is okay, continue to step 5.

   B. If the display is not okay, continue to step 6.

5. Check the harness connectors in H5.

   A. While still in H5 with the manual/automatic switch released, wiggle the harness, the manual/automatic switch connector **C182** and the controller connector **C127** to check for a circuit fault.

   If d41 or d42 is displayed a fault is present, repair or replace the harness as required.

   B. If d41 or d42 is not displayed, download the correct level of software. If the fault re-occurs, remove and replace the controller.

6. Check for a short to +Ve voltage.

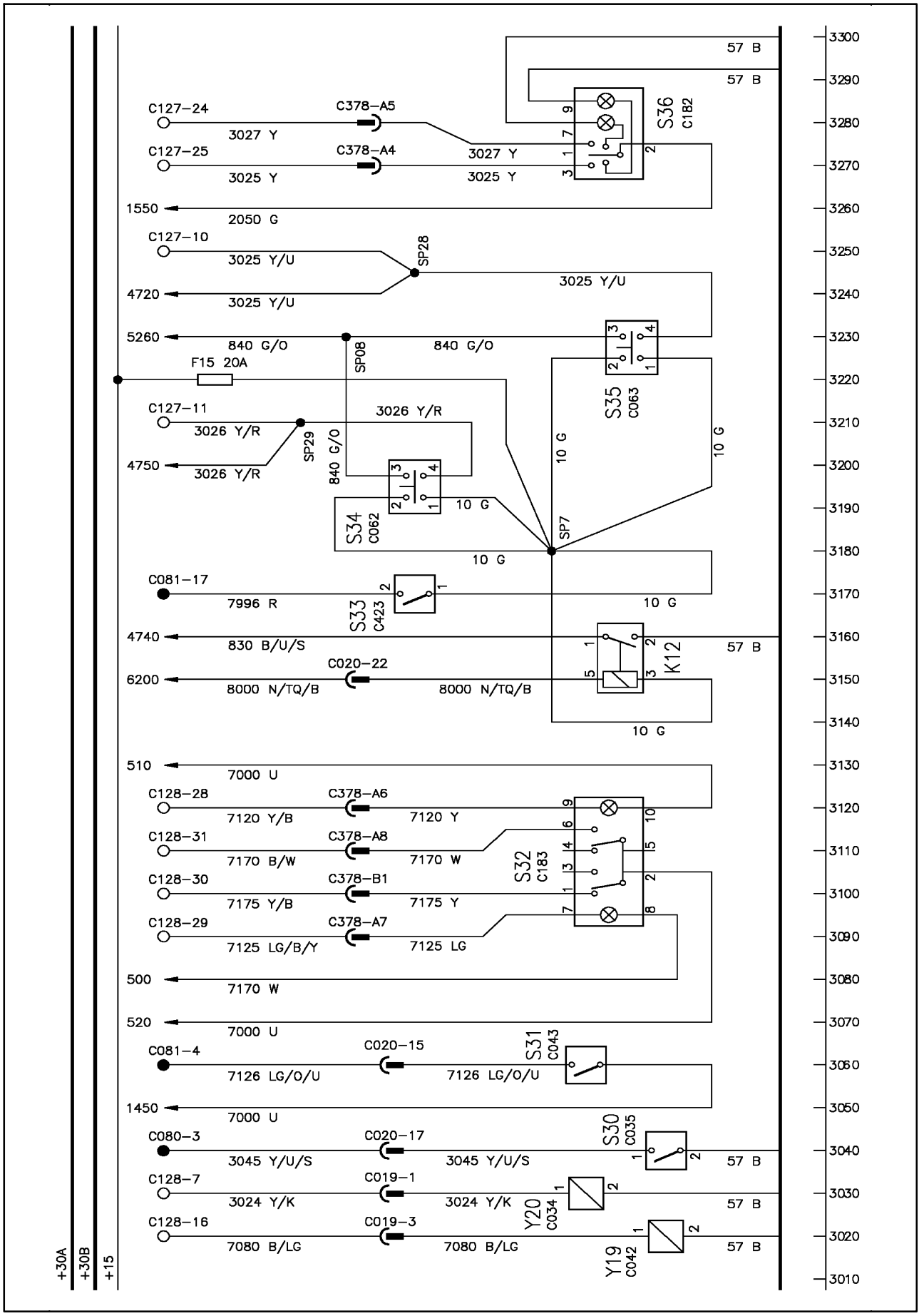
   A. Disconnect the manual/automatic four wheel drive switch connector **C182** and the controller connector **C127**. Turn the keystart ON. Check between connector:

   C182 pin **1 (Y)** and **ground**

   C182 pin **3 (Y)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, replace the manual/automatic four wheel drive switch.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
3140
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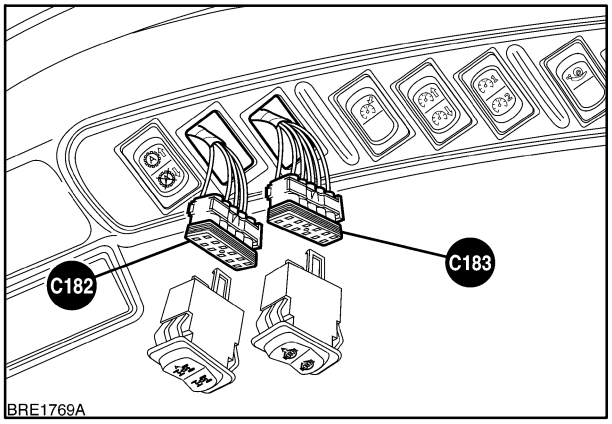
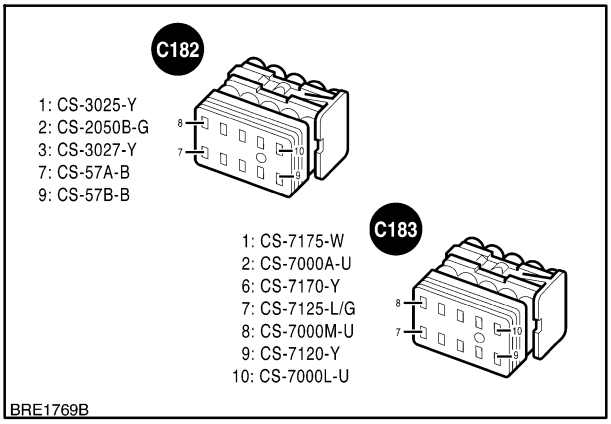
3030
3020
3010



BRE1769A



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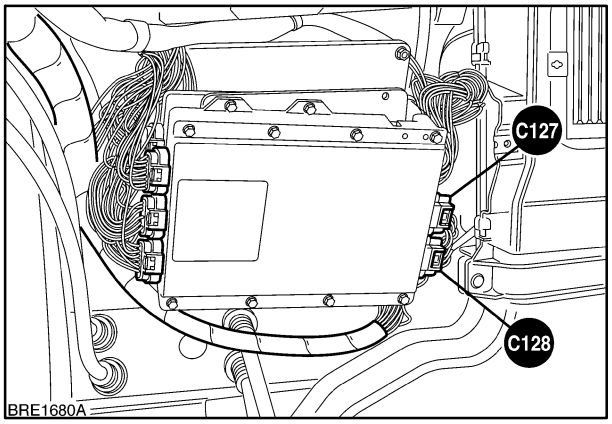

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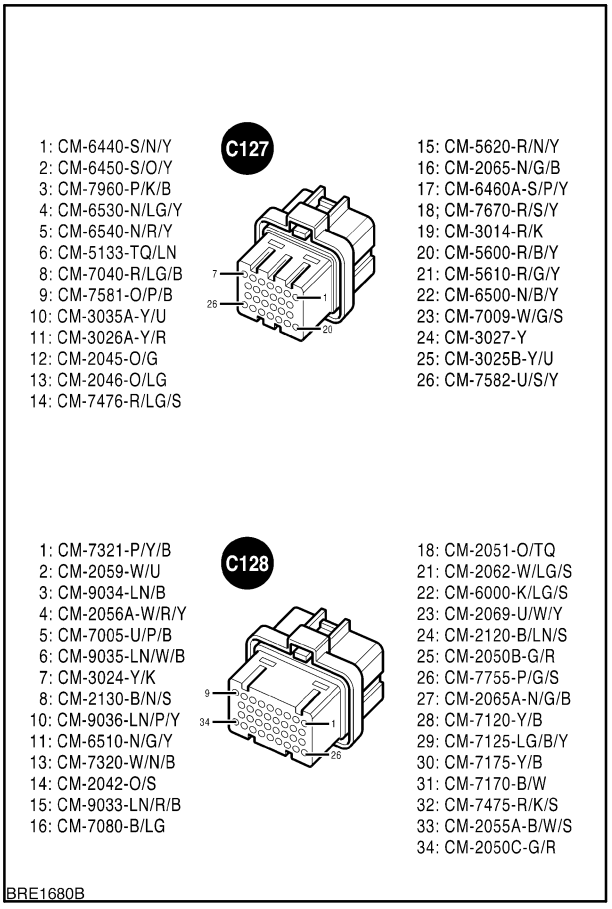


BRE1680B

ERROR CODE 6021 – FOUR WHEEL DRIVE SOLENOID STUCK ON

Possible failure modes:

1. Faulty harness
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. Turn the keystart ON. Select manual 4WD. Turn the keystart OFF and depress both brake pedals. Turn the keystart ON and momentarily crank the engine (no need to start). 6021 should still be displayed. Release the brake pedals and check for error code 6023. If error code 6023 is displayed, continue to test for error code 6023.

   B. If 6023 is not being displayed, continue to step 2.

2. Check for a short to +12 Volts.

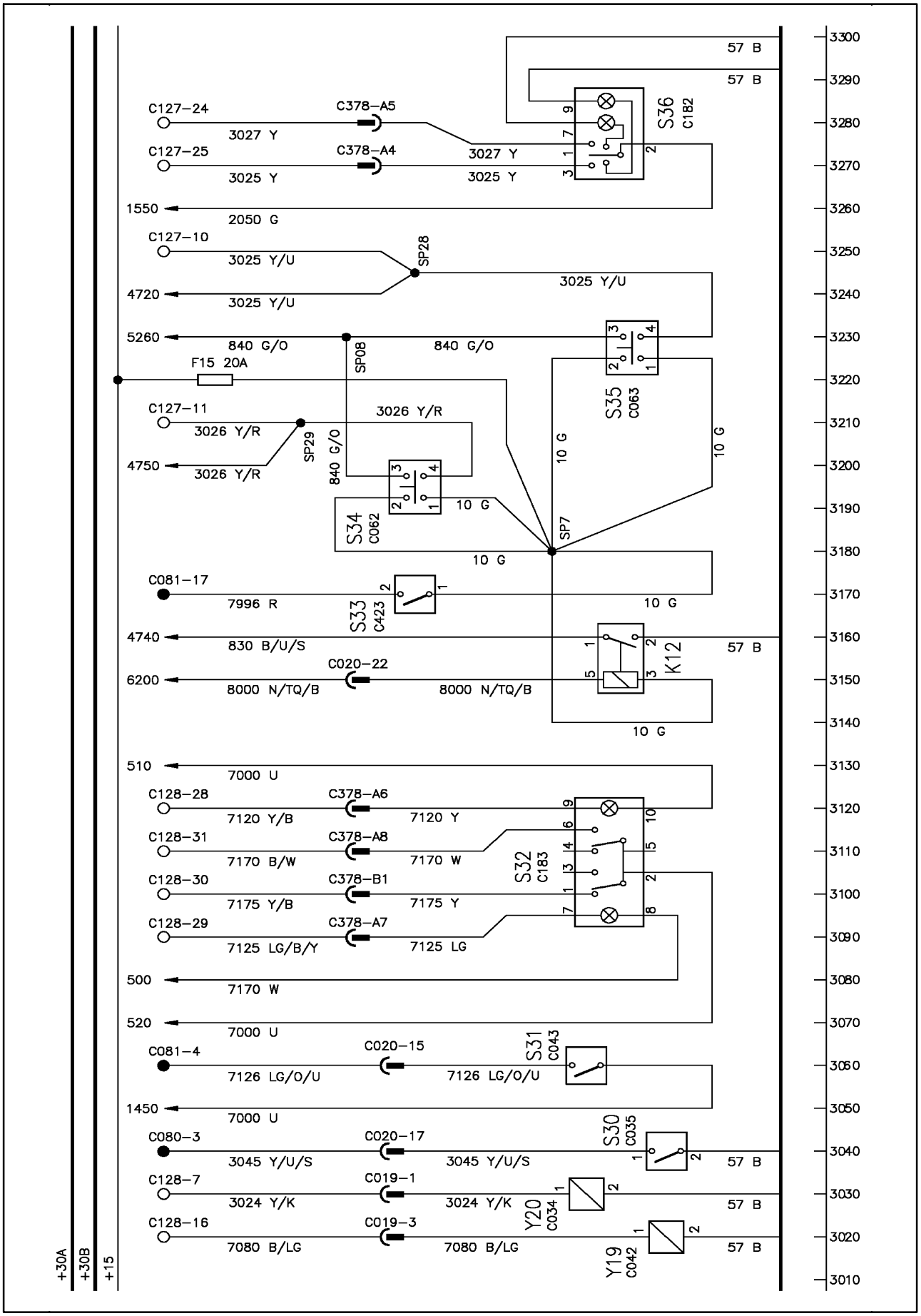
   A. Turn the keystart OFF. Disconnect the 4WD solenoid connector **C034** and the controller connector **C128**. Turn the keystart ON. Check between connector **C128** pin **7 (Y/K)** and **ground**. If a short to +12 Volts is indicated, repair or replace the harness as required.

   B. If a short to +12 Volts is not indicated, continue to step 3.

3. Check for a short circuit.

   A. Turn keystart OFF. Check between connector **C128** pin **7 (Y/K)** and the other **C127** connector pins. If a short circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
4750
3026 Y/R
840 G/O
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
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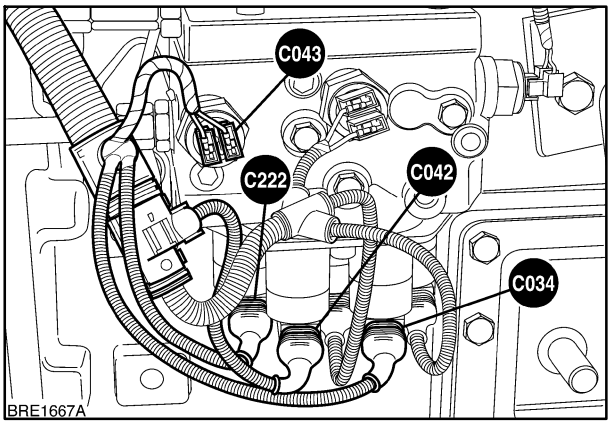
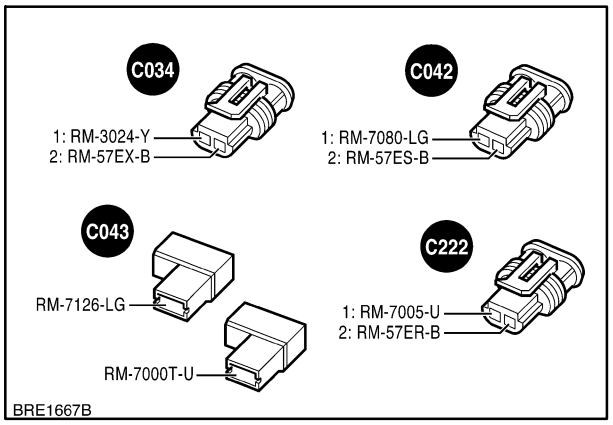
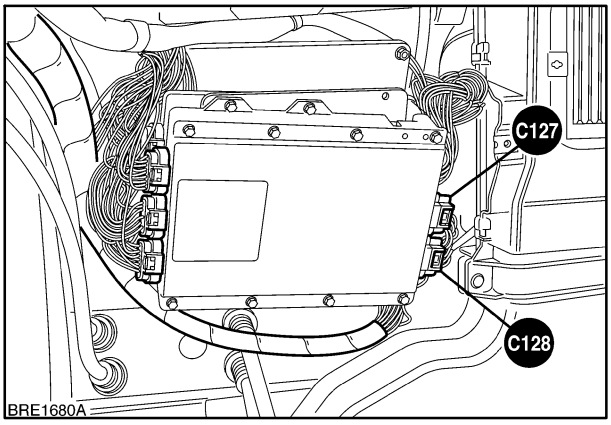
3010







C127

1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18: CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 6022 – FOUR WHEEL DRIVE SOLENOID STUCK OFF

Possible failure modes:

1. Faulty solenoid
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. Turn the keystart OFF. Disconnect the 4WD solenoid connector **C034**. Turn the keystart ON and make sure 2WD is selected. Turn the Keystart OFF and ON. If only error 6022 is displayed continue to step 2.

   B. If error 6021 or 6021 and 6023 are displayed, continue to step 3.

2. Check for a short to ground.

   A. Turn the keystart OFF. Disconnect the controller connector **C128**. Check between connector **C128** pin **7 (Y/K)** and **ground**. If a short to ground is indicated, disconnect the inline harness connector **C019** and check between connector:

   C128 pin **7 (Y/K)** and **ground**

   C034 pin **1 (Y/K)** and **ground**

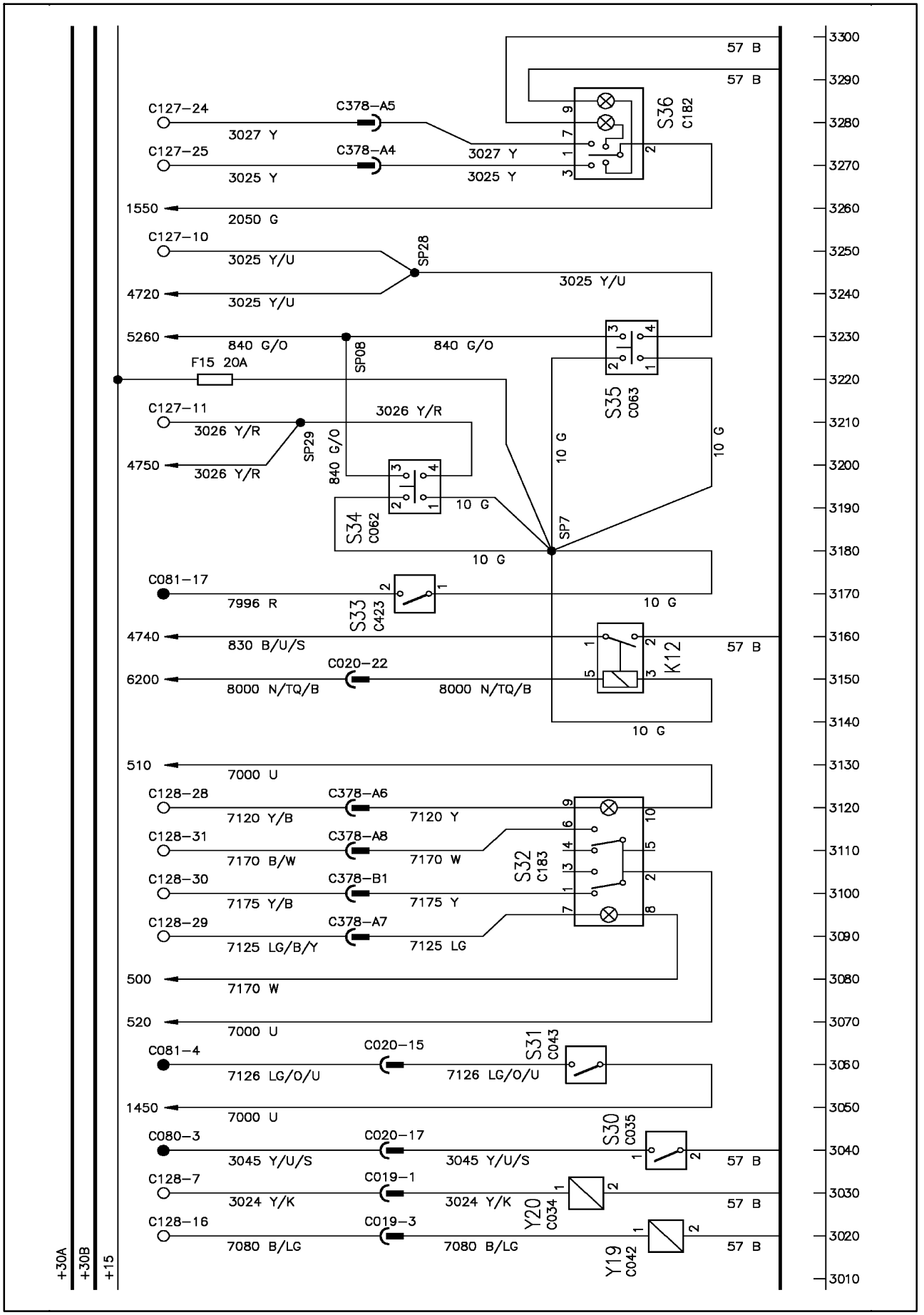
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.

3. Check the 4WD solenoid.

   A. Measure the resistance between the solenoid terminals. If the resistance indicated is not between 5 – 11 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the solenoid is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
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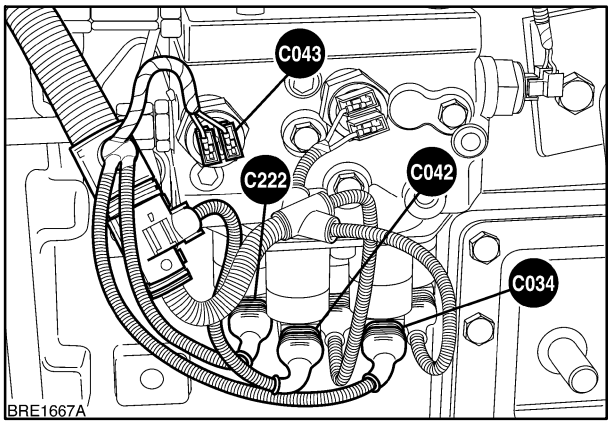

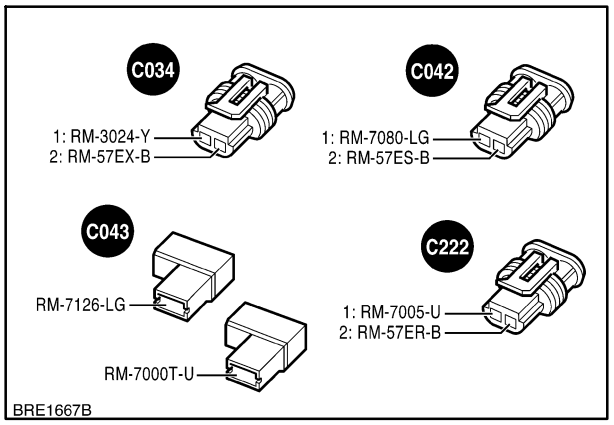

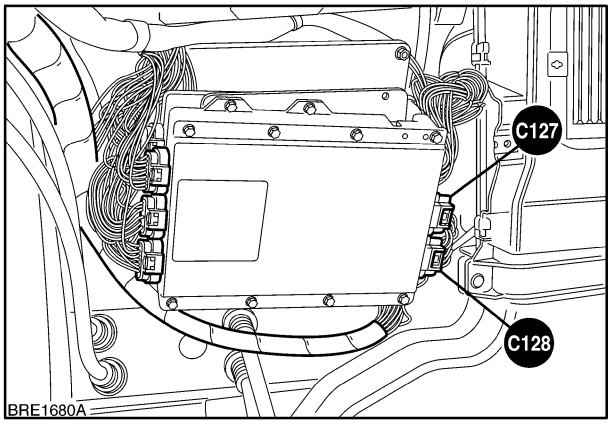

C127

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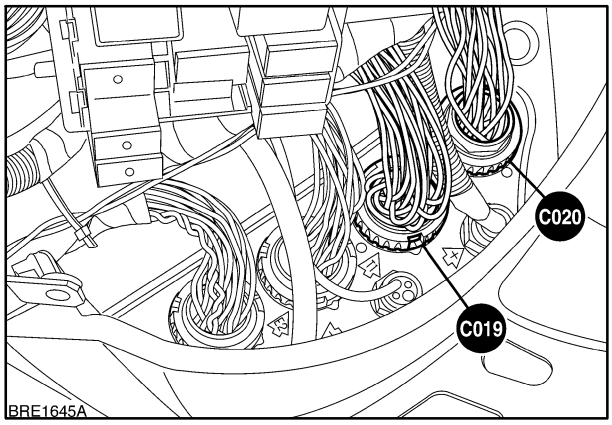
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18: CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

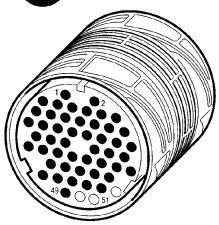
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



BRE1645A

C019



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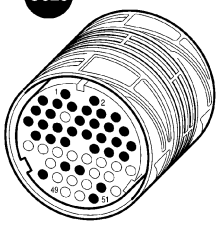
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 6023 - FOUR WHEEL DRIVE SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the 4WD solenoid connector **C034**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the solenoid for an open.

   A. Disconnect connector **C034**. Check between the solenoid terminals. If an open circuit is indicated, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for an open ground circuit.

   A. Check between connector **C034** pin **2 (B)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connector **C128**. Check between connector **C128** pin **7 (Y/K)** and **C034** pin **1 (Y/K)**. If an open circuit is indicated, disconnect the inline harness connector **C019** and check between connector:

   C019 pin **1 (Y/K)** and **C034** pin **1 (Y/K)**

   C019 pin **1 (Y/K)** and **C128** pin **7 (Y/K)**

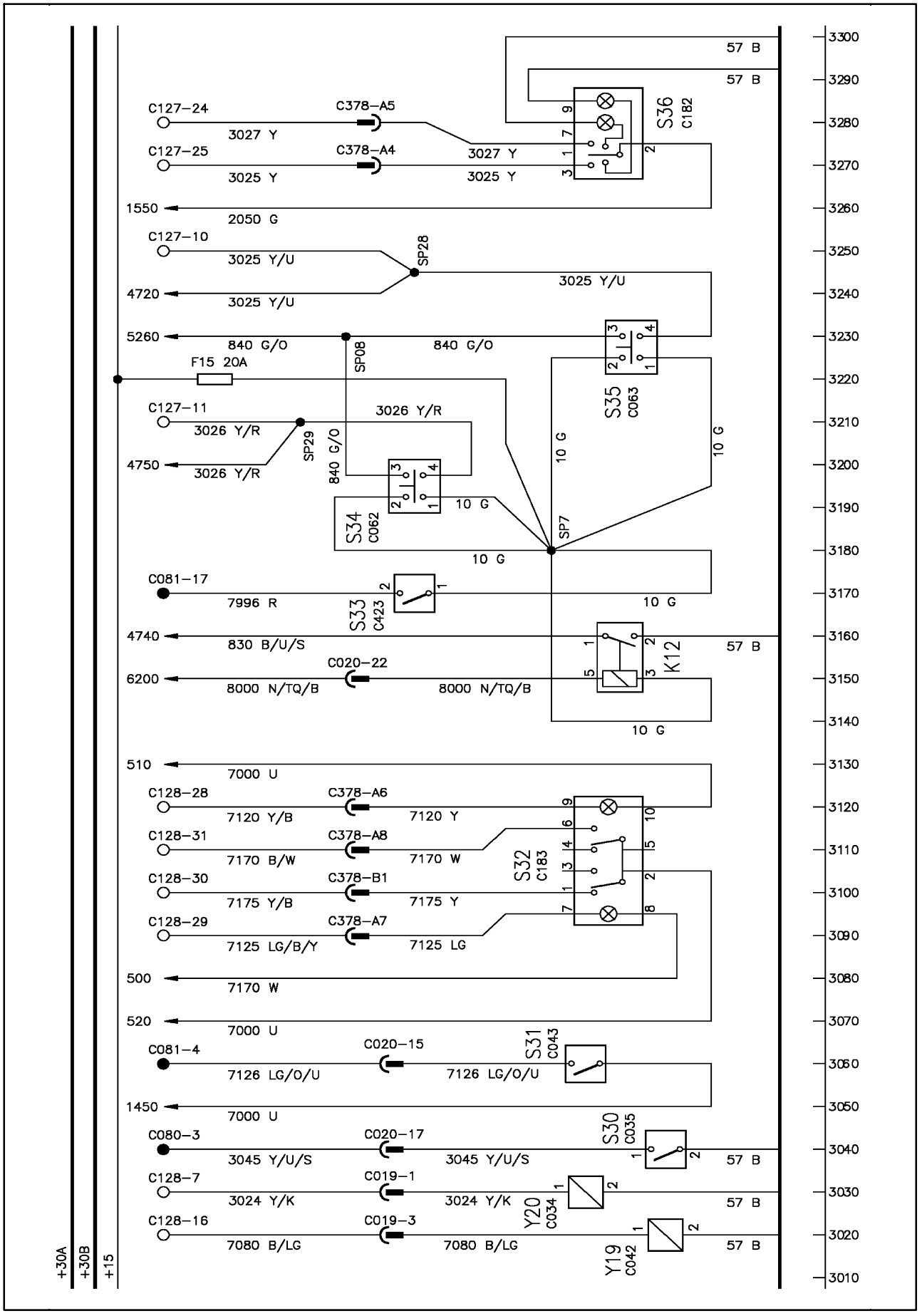
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check connectors **C128** and **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
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3170
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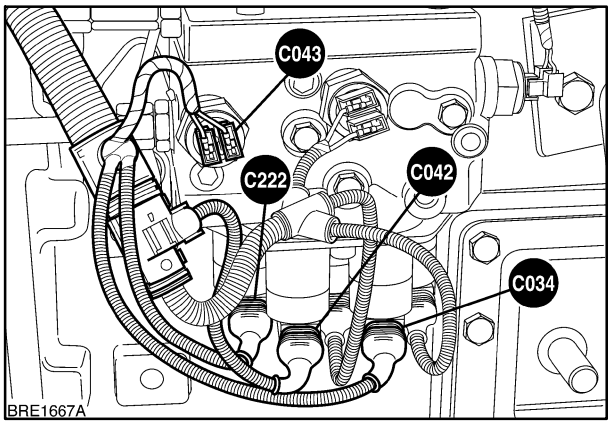
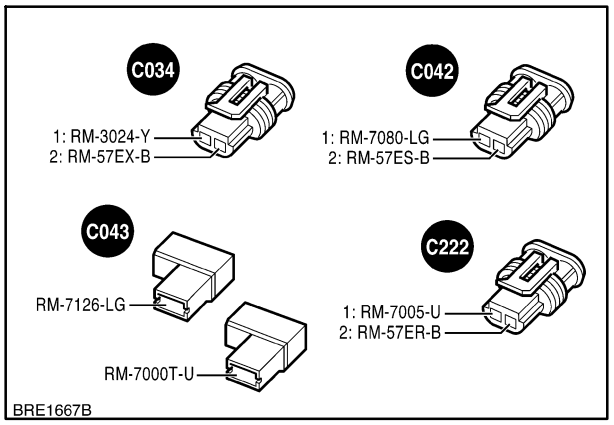
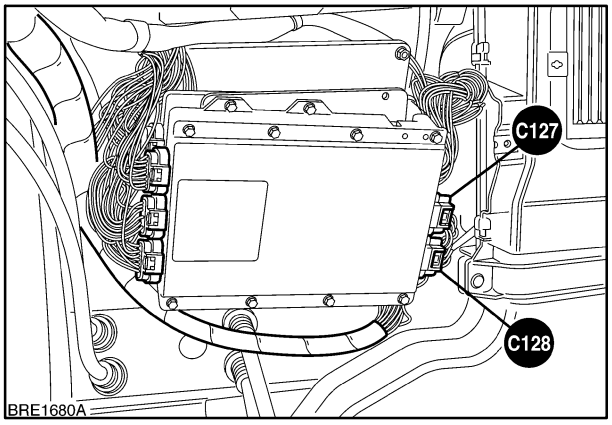
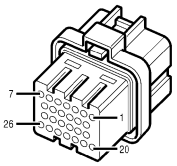






C127

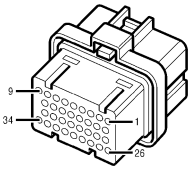
1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S



15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

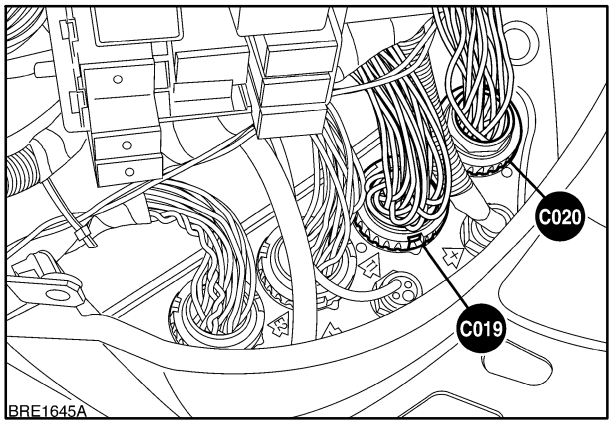
C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG



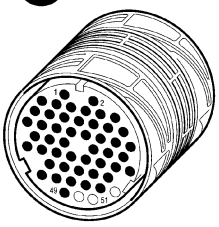
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
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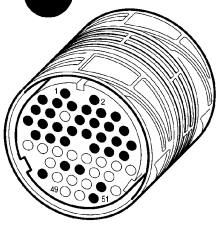
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

NOTES

7001 - 8000 DIFFERENTIAL LOCK ERROR CODE LISTING

Error Code	Error description
7014	Differential lock switch error
7015	Differential lock solenoid stuck off
7016	Differential lock solenoid stuck on
7017	Differential lock solenoid open circuit
7018	Differential lock driver over temperature
7024	Steering angle sensor not calibrated
7031	Steering angle sensor out of maximum range
7032	Steering angle sensor out of minimum range

ERROR CODE 7014 - DIFFERENTIAL LOCK SWITCH ERROR

Possible failure modes:

1. Faulty connector
2. Faulty differential switch
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the manual / automatic differential switch connector **C183**, the controller connector **C128** and the inline harness connector **C378**.

   A. Ensure the connectors are connected, not damaged, the pins the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the manual differential switch in H5.

   A. Turn the keystart ON. Depress the manual switch, d38 should be displayed, press the switch again and d38 will extinguish. If the display is okay, continue to step 3.

   B. If the display is not okay, continue to step 5.

3. Check the automatic differential switch in H5.

   A. Depress the automatic switch, d39 should be displayed, press the switch again and d39 will extinguish. If the display is okay, continue to step 4.

   B. If the display is not okay, continue to step 5.

4. Check the harness connectors in H5.

   A. While still in H5 with the manual/automatic switch released, wiggle the harness, the manual/automatic switch connector **C183** and the controller connector **C128** to check for a circuit fault.

   If d38 or d39 is displayed a fault is present, repair or replace the harness as required.

   B. If d38 or d39 is not displayed, download the correct level of software. If the fault re-occurs, remove and replace the controller.

5. Check for a short to +Ve voltage.

   A. Disconnect the manual/automatic differential switch connector **C183** and the controller connector **C128**.

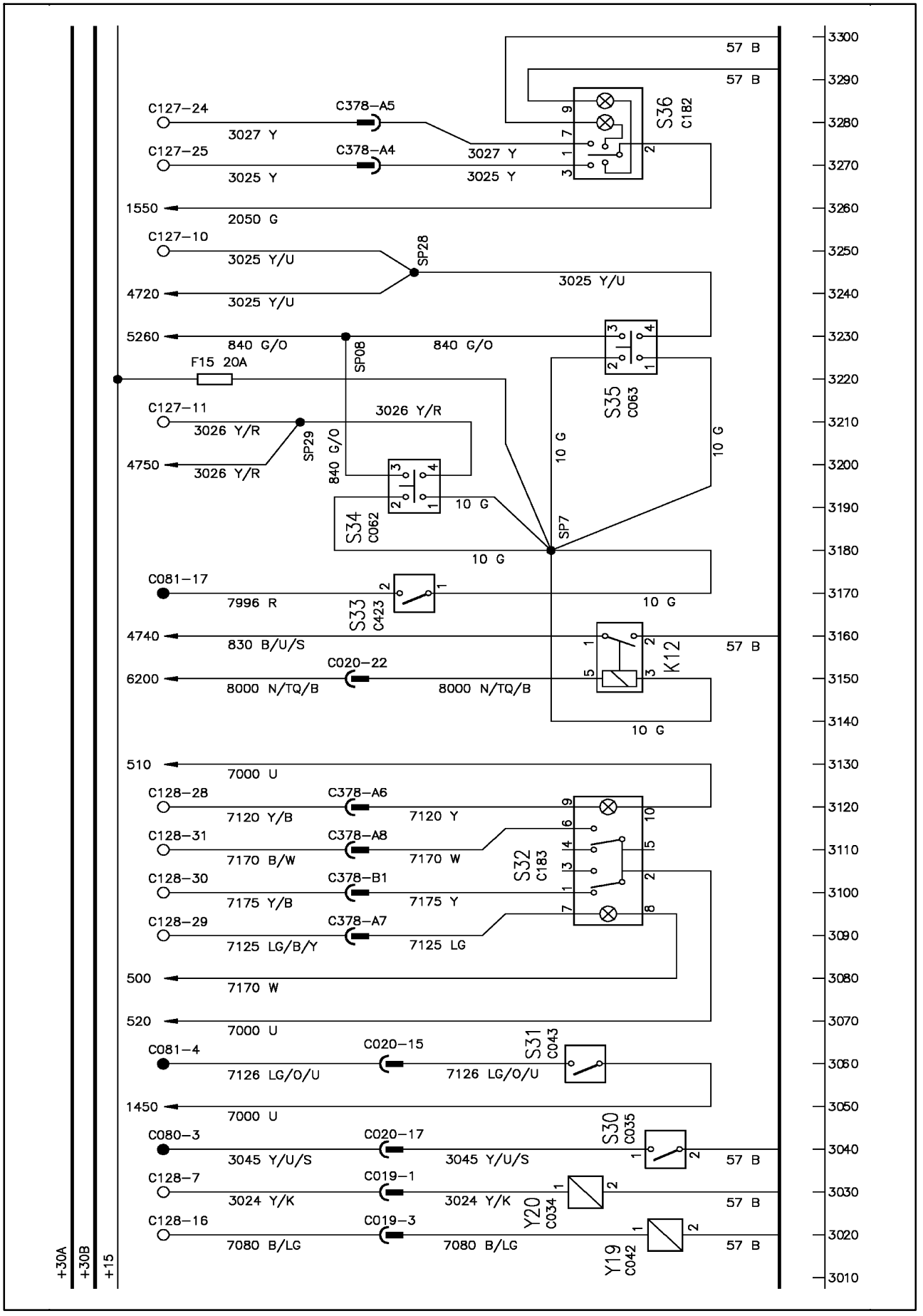
   Turn the keystart ON. Check between connector:

   C183 pin **1 (Y)** and **ground**

   C183 pin **6 (W)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, replace the manual/automatic differential switch.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
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3270
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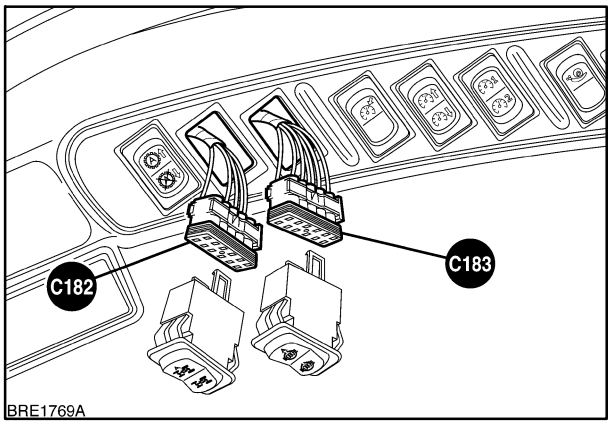
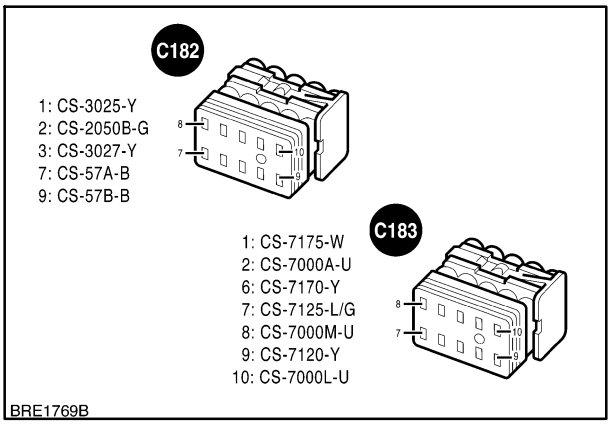
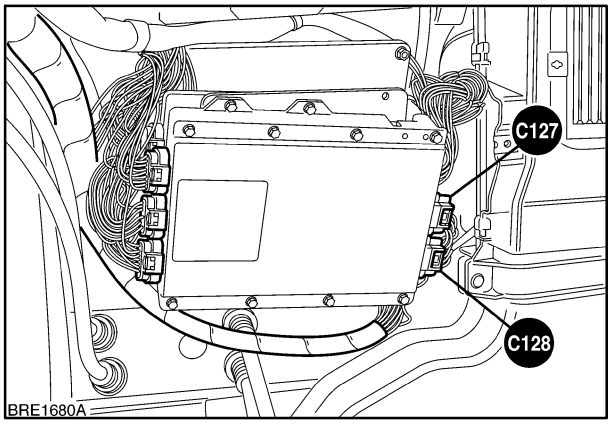


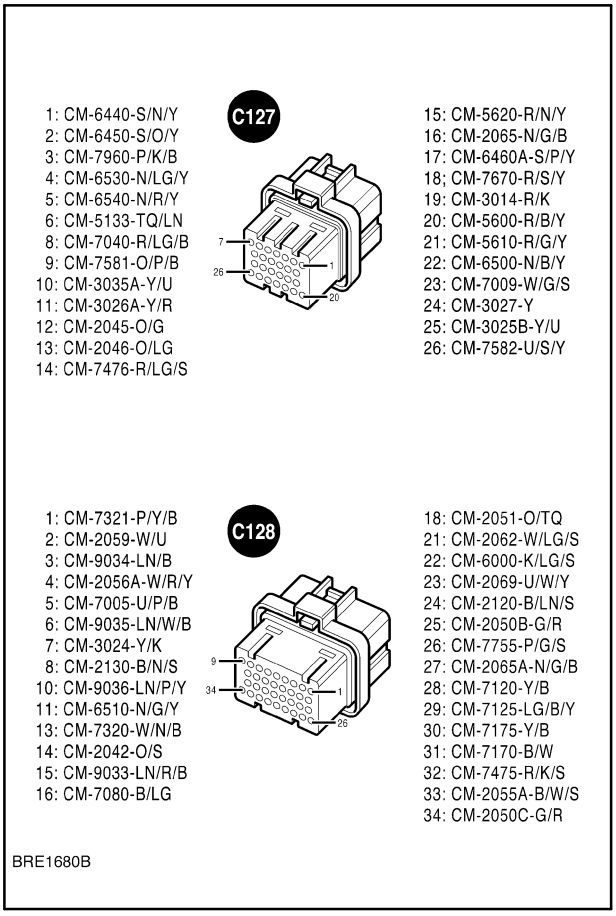
BRE1769A



BRE1769B



BRE1680A



BRE1680B

ERROR CODE 7015 – DIFFERENTIAL LOCK SOLENOID STUCK OFF

Possible failure modes:

1. Faulty solenoid
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

NOTE: *Do not depress the brake pedals.*

1. Check for other error codes.

   A. Disconnect the differential lock solenoid connector **C042**. Turn the keystart ON. Select manual differential lock.

   If only error code 7015 is being displayed, continue to step 2.

   B. If error codes 7016 or 7016 and 7017 are displayed, continue to step 3.

2. Check for a short to ground.

   A. Turn the keystart OFF. Disconnect connector **C042** and the controller connector **C128**. Check between connector **C128** pin **16 (B/LG)** and **ground**. If a short to ground is indicated, disconnect the inline harness connector **C019** and check between connector:

   C128 pin **16 (B/LG)** and **ground**

   C042 pin **1 (B/LG)** and **ground**

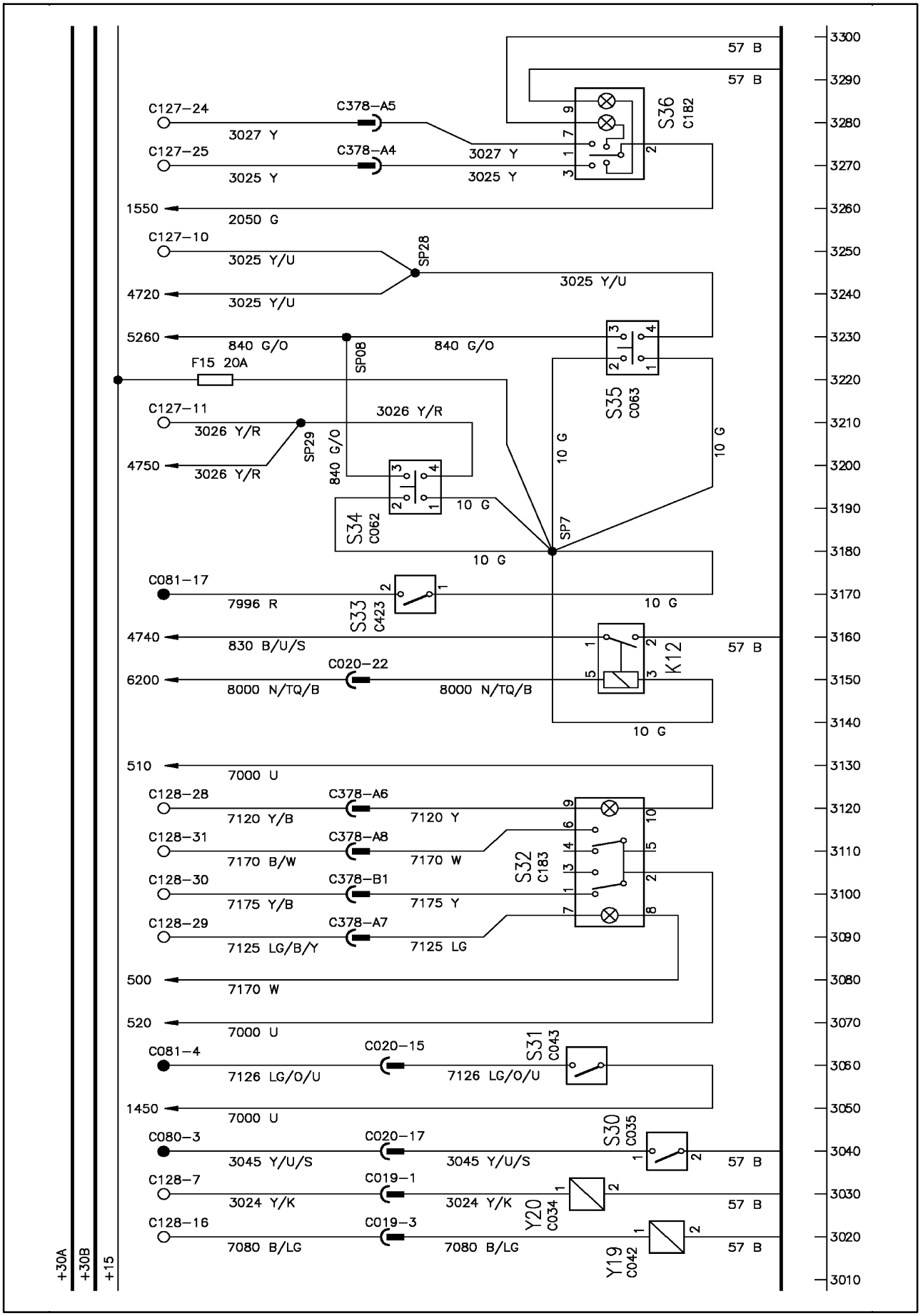
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.

3. Check the differential lock solenoid.

   A. Measure the resistance between the solenoid terminals. If the resistance indicated is not between 5 – 11 Ohms, remove and replace the solenoid.

   B. If the solenoid is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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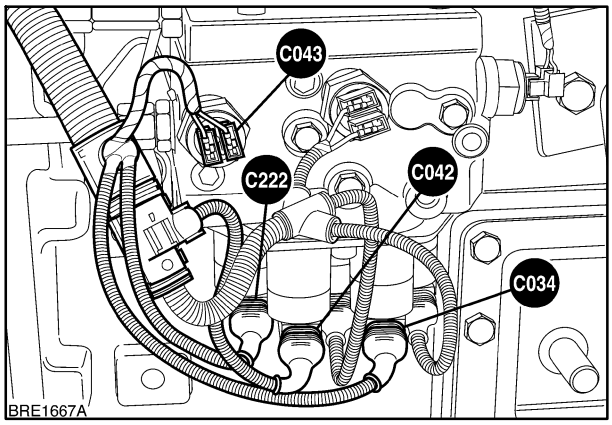
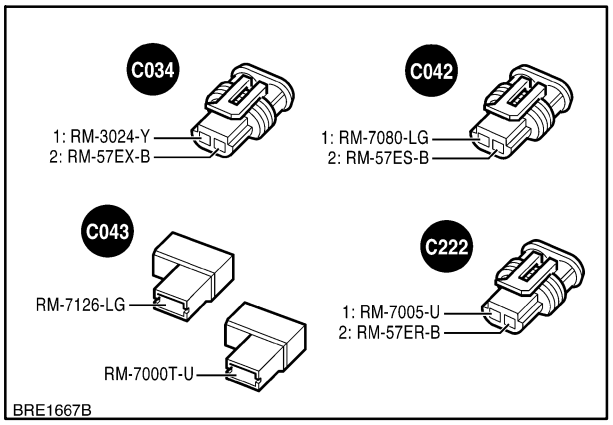
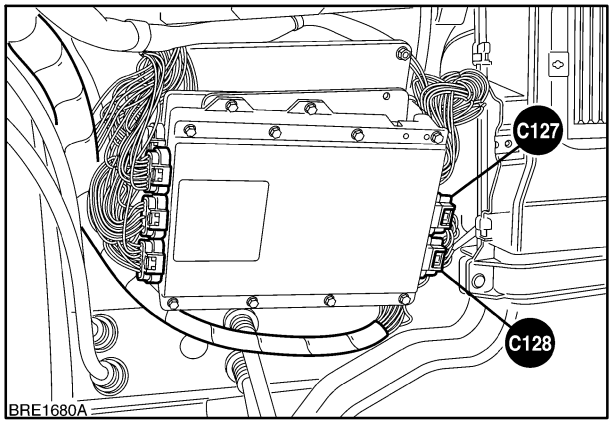
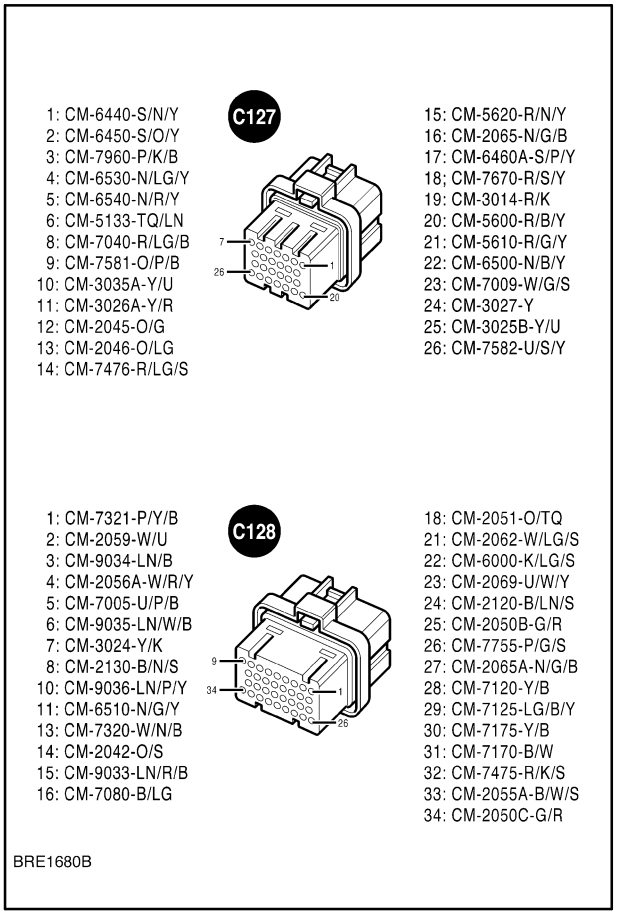
3140
3130
3120
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010
57 B
57 B
C127-24
3027 Y
C378-A5
C127-25
3025 Y
C378-A4
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
4750
3026 Y/R
840 G/O
10 G
10 G
S34
C062
10 G
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
7120 Y/B
C378-A6
7120 Y
C128-31
7170 B/W
C378-A8
7170 W
S32
C183
C128-30
7175 Y/B
C378-B1
7175 Y
C128-29
7125 LG/B/Y
C378-A7
7125 LG
500
7170 W
520
7000 U
C081-4
7126 LG/O/U
C020-15
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
3045 Y/U/S
C020-17
3045 Y/U/S
S30
C035
57 B
C128-7
3024 Y/K
C019-1
3024 Y/K
Y20
C034
57 B
C128-16
7080 B/LG
C019-3
7080 B/LG
Y19
C042
57 B


C043
C222
C042
C034
BRE1667A


C034
1: RM-3024-Y
2: RM-57EX-B
C042
1: RM-7080-LG
2: RM-57ES-B
C043
RM-7126-LG
RM-7000T-U
C222
1: RM-7005-U
2: RM-57ER-B
BRE1667B


C127
C128
BRE1680A


C127
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2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y
C128
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R
BRE1680B

ERROR CODE 7016 - DIFFERENTIAL LOCK SOLENOID STUCK ON

Possible failure modes:

1. Faulty harness
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. Turn the keystart ON. Disengage the differential lock. Turn the Keystart OFF and ON, error code 7016 should be displayed. Select manual differential lock. If 7017 is being displayed, continue to test for error code 7017.

   B. If 7017 is not being displayed, continue to step 2.

2. Check for a short to +12 Volts.

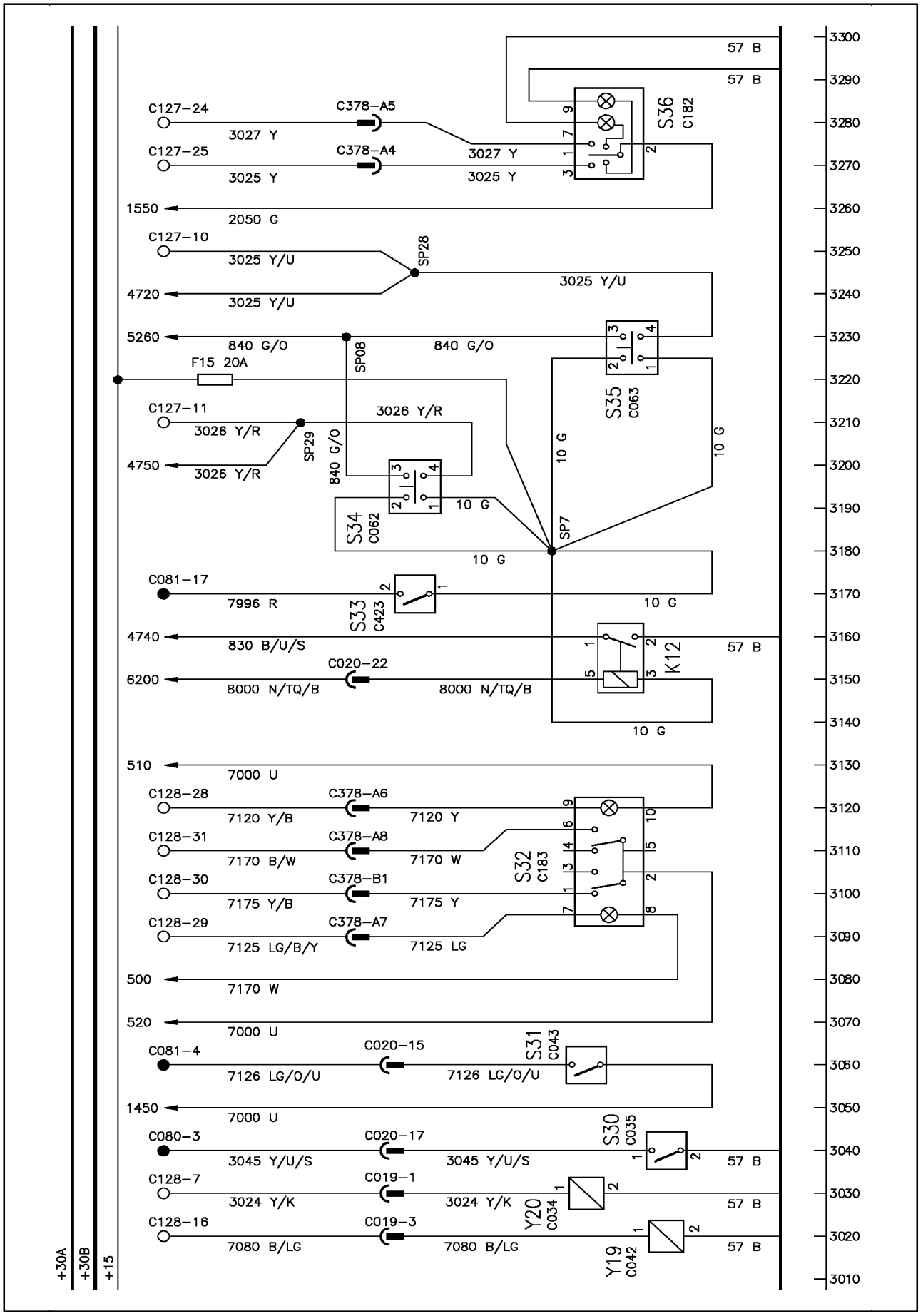
   A. Disconnect the differential lock connector **C042** and the controller connector **C128**. Turn the keystart ON. Check between connector **C128** pin **16 (B/LG)** and **ground**. If a short to +12 Volts is indicated, repair or replace the harness as required.

   B. If no short to +12 Volts is indicated, continue to step 3.

3. Check for a short circuit.

   A. Turn the keystart OFF. Check between connector **C128** pin **16 (B/LG)** and the other **C128** connector pins. If a short circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
3027 Y
3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
3150
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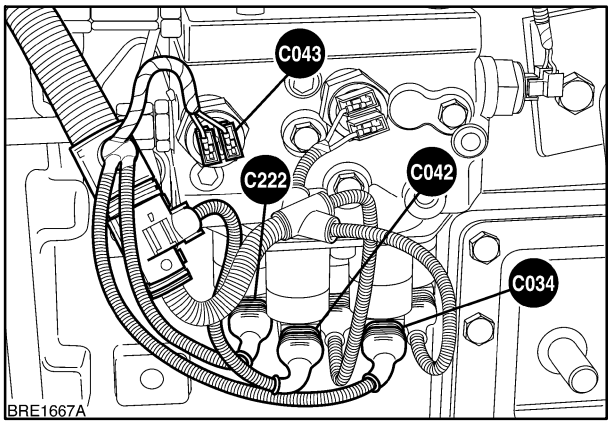
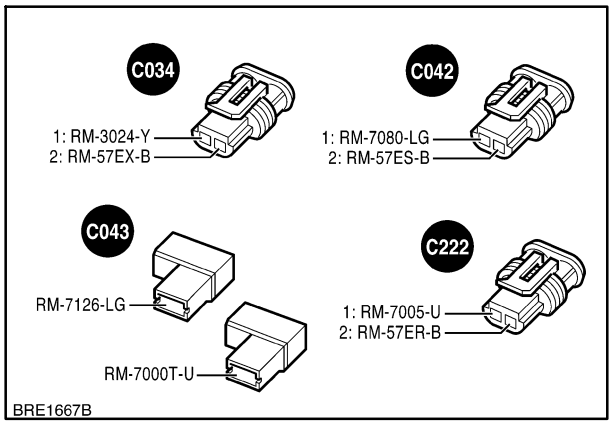
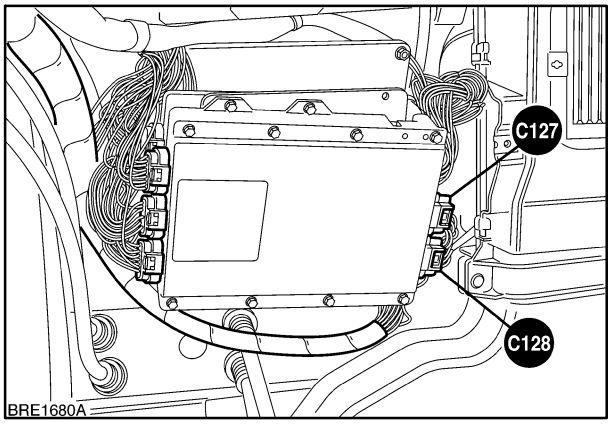
3010







C127

1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B

ERROR CODE 7017 - DIFFERENTIAL LOCK SOLENOID OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the differential lock solenoid connector **C042**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.

2. Check the solenoid for an open circuit.

   A. Disconnect the differential lock solenoid connector **C042**. Check between the solenoid terminals. If an open circuit is indicated, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for an open circuit.

   A. Check between connector **C042** pin **2 (B)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connector **C128**. Check between connector **C128** pin **16 (B/LG)** and **C042** pin **1 (B/LG)**. If an open circuit is indicated, disconnect the inline harness connector **C019** and check between connector:

   C019 pin **3 (B/LG)** and **C042** pin **1 (B/LG)**

   C019 pin **3 (B/LG)** and **C128** pin **16 (B/LG)**

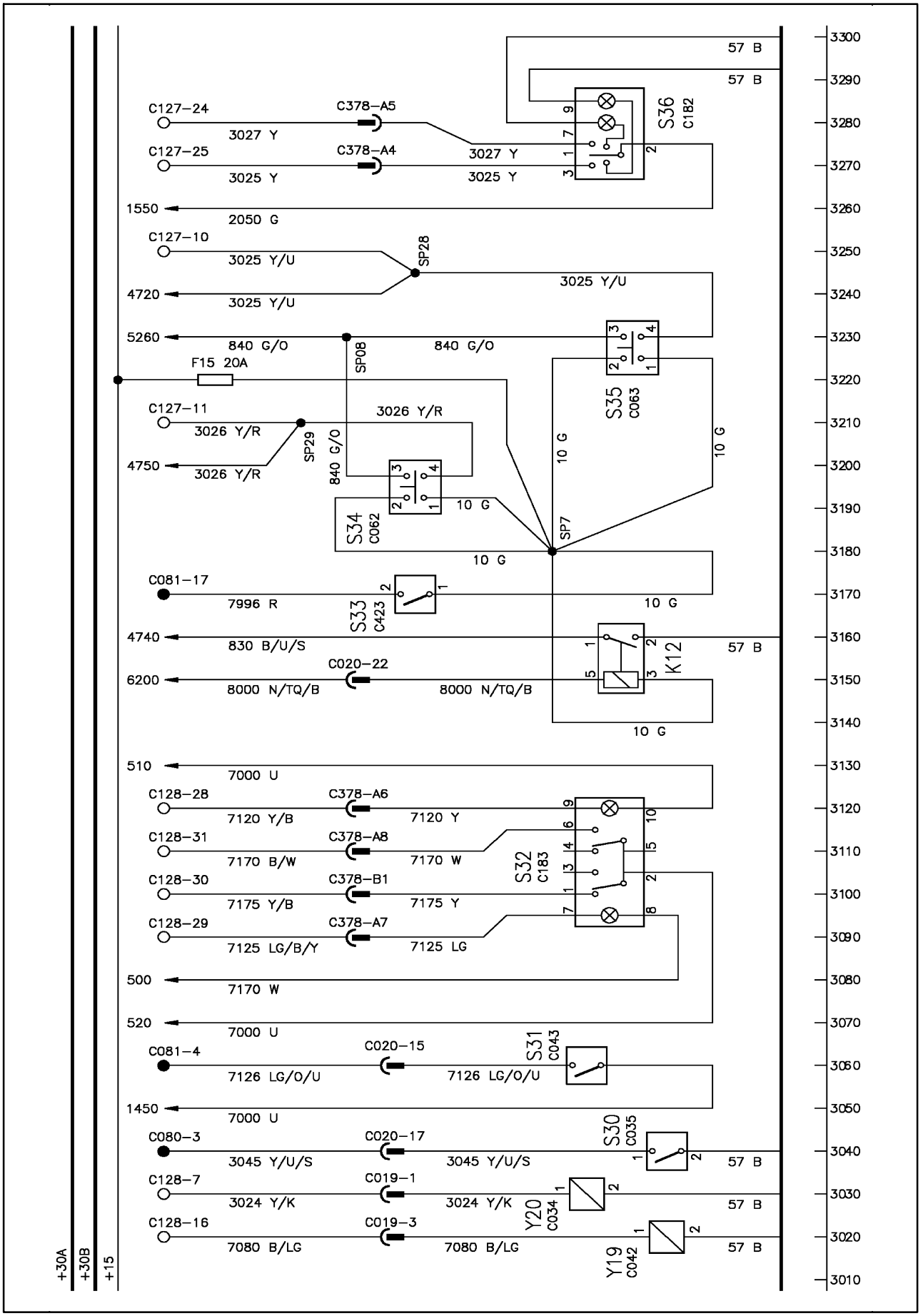
   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check connectors **C128, C019** and **C042**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
57 B
57 B
C127-24
C378-A5
3027 Y
C127-25
C378-A4
3025 Y
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3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
3026 Y/R
3026 Y/R
SP29
840 G/O
4750
3026 Y/R
10 G
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
3300
3290
3280
3270
3260
3250
3240
3230
3220
3210
3200
3190
3180
3170
3160
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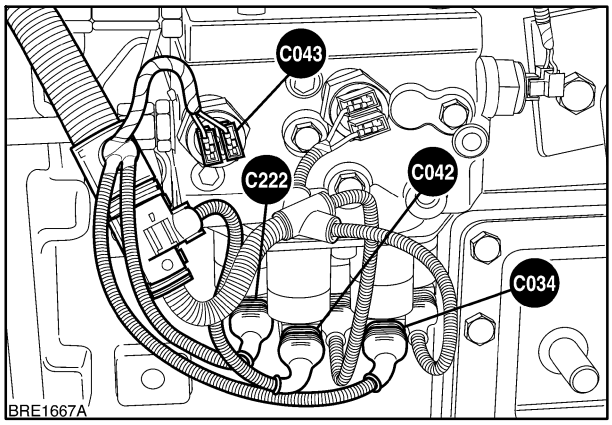
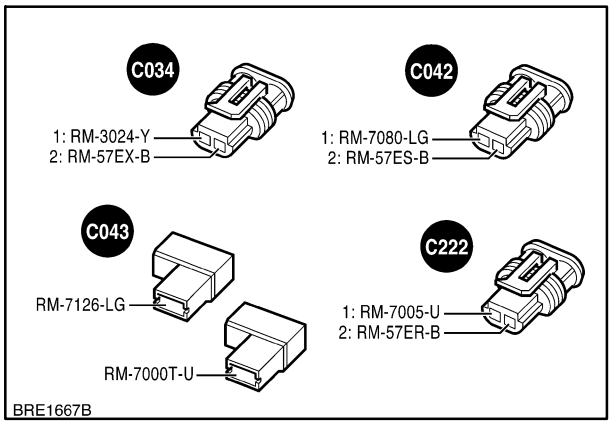
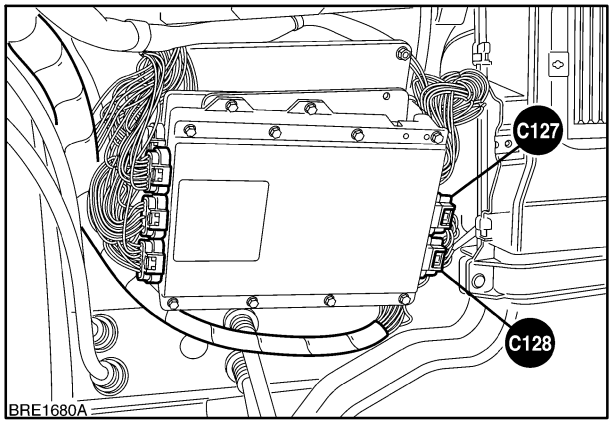


BRE1667A



BRE1667B



BRE1680A

C127

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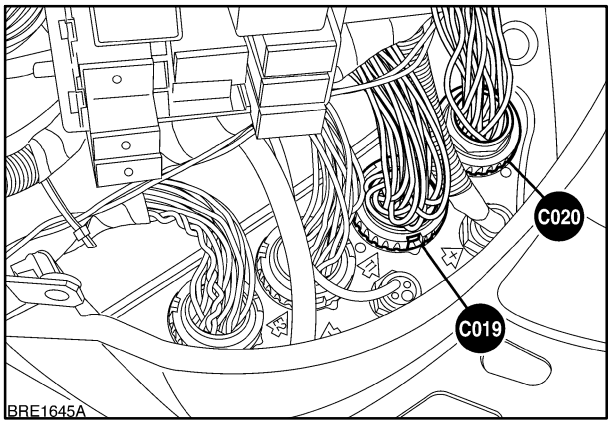
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

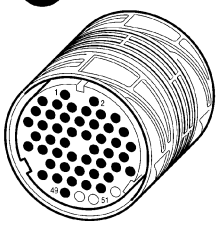
1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
32: CM-7475-R/K/S
33: CM-2055A-B/W/S
34: CM-2050C-G/R

BRE1680B



BRE1645A

C019



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2: CM-7005-U/P/B
3: CM-7080-B-LG
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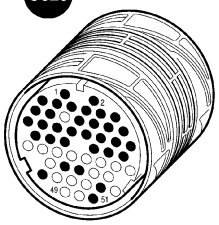
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 7018 – DIFFERENTIAL LOCK DRIVER OVER TEMPERATURE

Possible failure modes:

1. Faulty solenoid
2. Faulty harness
3. Faulty connector
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the differential lock solenoid.

   A. Disconnect the differential lock solenoid connector **C042.** Measure the resistance between the solenoid terminals. If the resistance indicated is not between 5 – 11 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect the controller connector **C128**. Check between the controller connector **C128** pin **16 (B/LG)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for a short circuit.

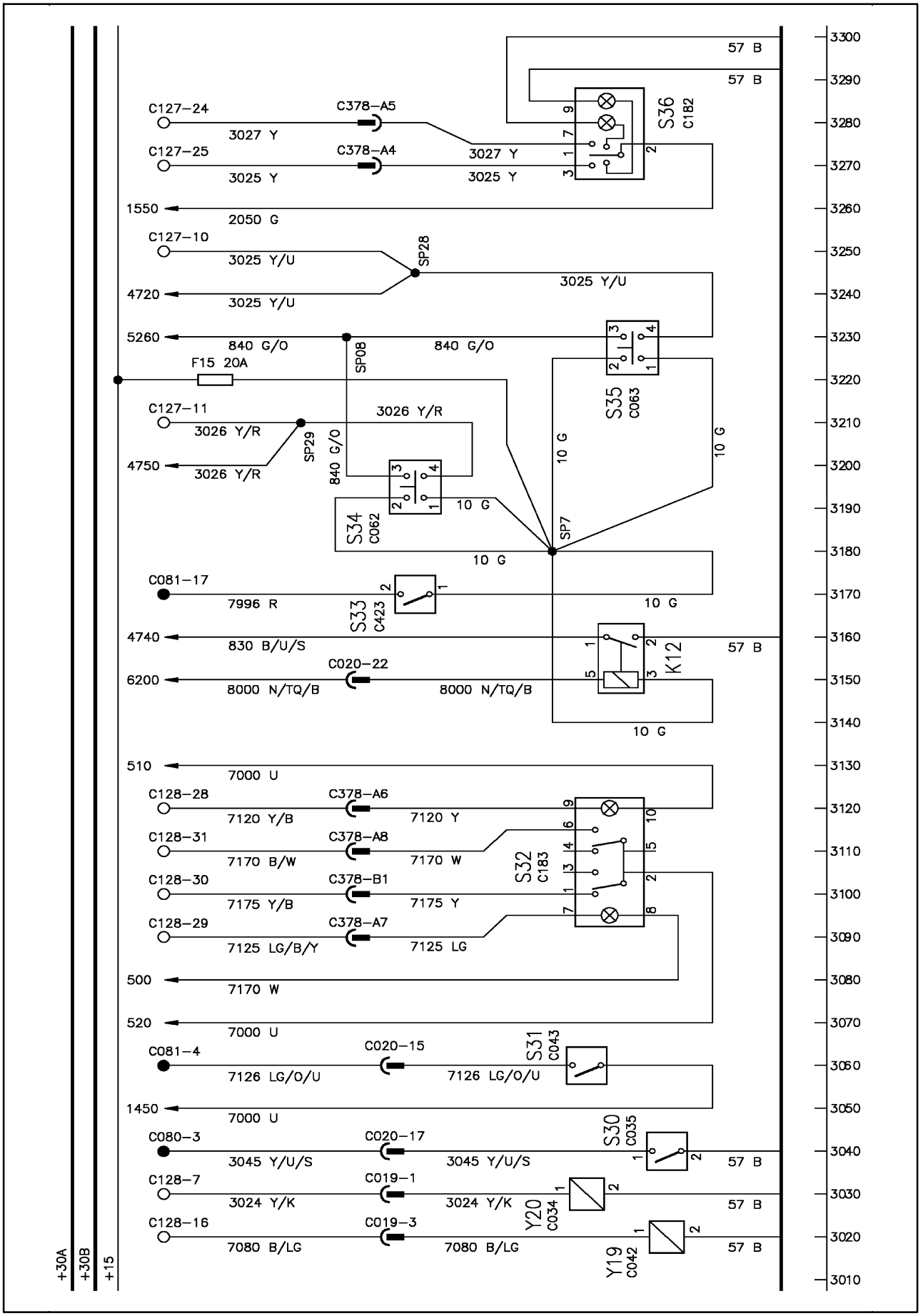
   A. Check between connector **C128** pin **16 (B/LG)** and the other pins of **C128**. If a short circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.

4. Check connector **C128** and the inline harness connector **C019**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C127-24
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3025 Y
S36
C182
1550
2050 G
C127-10
3025 Y/U
SP28
4720
3025 Y/U
3025 Y/U
5260
840 G/O
SP08
840 G/O
F15 20A
S35
C063
C127-11
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3026 Y/R
SP29
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4750
3026 Y/R
10 G
10 G
10 G
S34
C062
SP7
10 G
C081-17
7996 R
S33
C423
10 G
4740
830 B/U/S
57 B
C020-22
6200
8000 N/TQ/B
8000 N/TQ/B
K12
10 G
510
7000 U
C128-28
C378-A6
7120 Y/B
7120 Y
C128-31
C378-A8
7170 B/W
7170 W
S32
C183
C128-30
C378-B1
7175 Y/B
7175 Y
C128-29
C378-A7
7125 LG/B/Y
7125 LG
500
7170 W
520
7000 U
C081-4
C020-15
7126 LG/O/U
7126 LG/O/U
S31
C043
1450
7000 U
C080-3
C020-17
3045 Y/U/S
3045 Y/U/S
S30
C035
57 B
C128-7
C019-1
3024 Y/K
3024 Y/K
Y20
C034
57 B
C128-16
C019-3
7080 B/LG
7080 B/LG
Y19
C042
57 B
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3270
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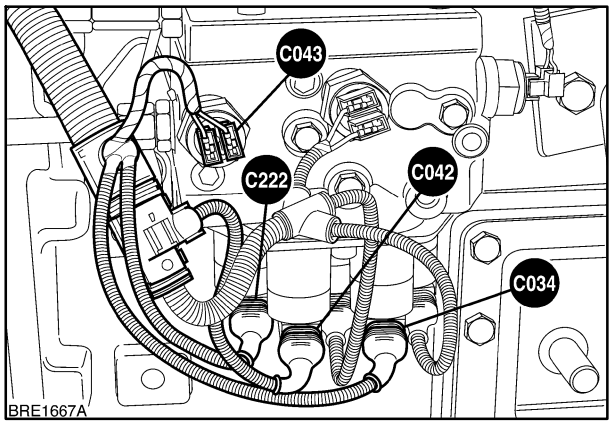

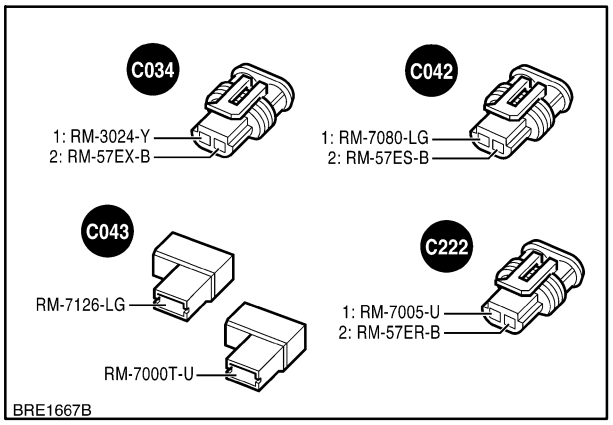

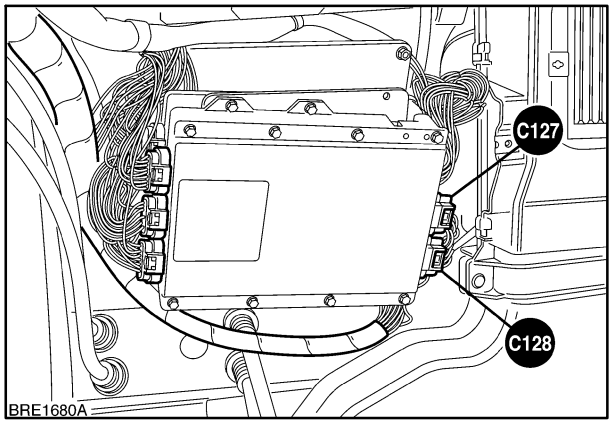

C127

1: CM-6440-S/N/Y
2: CM-6450-S/O/Y
3: CM-7960-P/K/B
4: CM-6530-N/LG/Y
5: CM-6540-N/R/Y
6: CM-5133-TQ/LN
8: CM-7040-R/LG/B
9: CM-7581-O/P/B
10: CM-3035A-Y/U
11: CM-3026A-Y/R
12: CM-2045-O/G
13: CM-2046-O/LG
14: CM-7476-R/LG/S
15: CM-5620-R/N/Y
16: CM-2065-N/G/B
17: CM-6460A-S/P/Y
18; CM-7670-R/S/Y
19: CM-3014-R/K
20: CM-5600-R/B/Y
21: CM-5610-R/G/Y
22: CM-6500-N/B/Y
23: CM-7009-W/G/S
24: CM-3027-Y
25: CM-3025B-Y/U
26: CM-7582-U/S/Y

C128

1: CM-7321-P/Y/B
2: CM-2059-W/U
3: CM-9034-LN/B
4: CM-2056A-W/R/Y
5: CM-7005-U/P/B
6: CM-9035-LN/W/B
7: CM-3024-Y/K
8: CM-2130-B/N/S
10: CM-9036-LN/P/Y
11: CM-6510-N/G/Y
13: CM-7320-W/N/B
14: CM-2042-O/S
15: CM-9033-LN/R/B
16: CM-7080-B/LG
18: CM-2051-O/TQ
21: CM-2062-W/LG/S
22: CM-6000-K/LG/S
23: CM-2069-U/W/Y
24: CM-2120-B/LN/S
25: CM-2050B-G/R
26: CM-7755-P/G/S
27: CM-2065A-N/G/B
28: CM-7120-Y/B
29: CM-7125-LG/B/Y
30: CM-7175-Y/B
31: CM-7170-B/W
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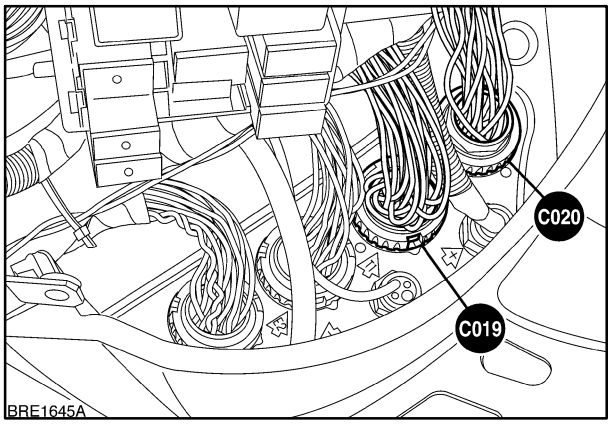
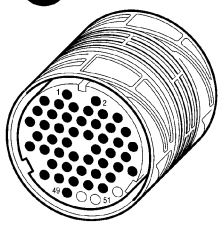
34: CM-2050C-G/R

BRE1680B



BRE1645A

C019



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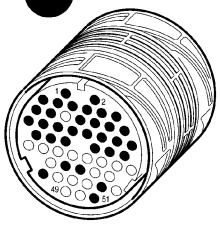
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 7024 - STEERING ANGLE SENSOR NOT CALIBRATED

Possible failure modes:

1. Steering angle sensor not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the steering angle sensor was calibrated.

   A. If the steering angle sensor was not calibrated after a change of controller or after using H8, clear the non-volatile memory (EEPROM). Perform the steering angle sensor calibration procedure.

   B. If the steering angle sensor was calibrated, perform the steering angle sensor calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the steering angle sensor calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 7031 - STEERING SENSOR OUT OF MAXIMUM RANGE

Possible failure modes:

1. Faulty connector
2. Faulty steering angle sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the steering angle sensor calibration procedure.

   A. If the error code is still displayed, continue to step 2.

2. Check the steering angle sensor connector **C014**, the controller connectors **C079**, **C081**, and the inline harness connector **C269**.

   A. Ensure the connectors are connected, not damaged, the pins the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are not okay, continue to step 3.

3. Check the steering angle sensor.

   A. Disconnect the steering sensor connector **C014**. Measure the resistance between the component side of connector **C014** pin **1 (G)** and **C014** pin **3 (N)**. If the resistance indicated is not 5K - 6K Ohms, repair or replace the sensor as required.

   B. If the sensor is okay, continue to step 4.

4. Check for a short to +12 volts.

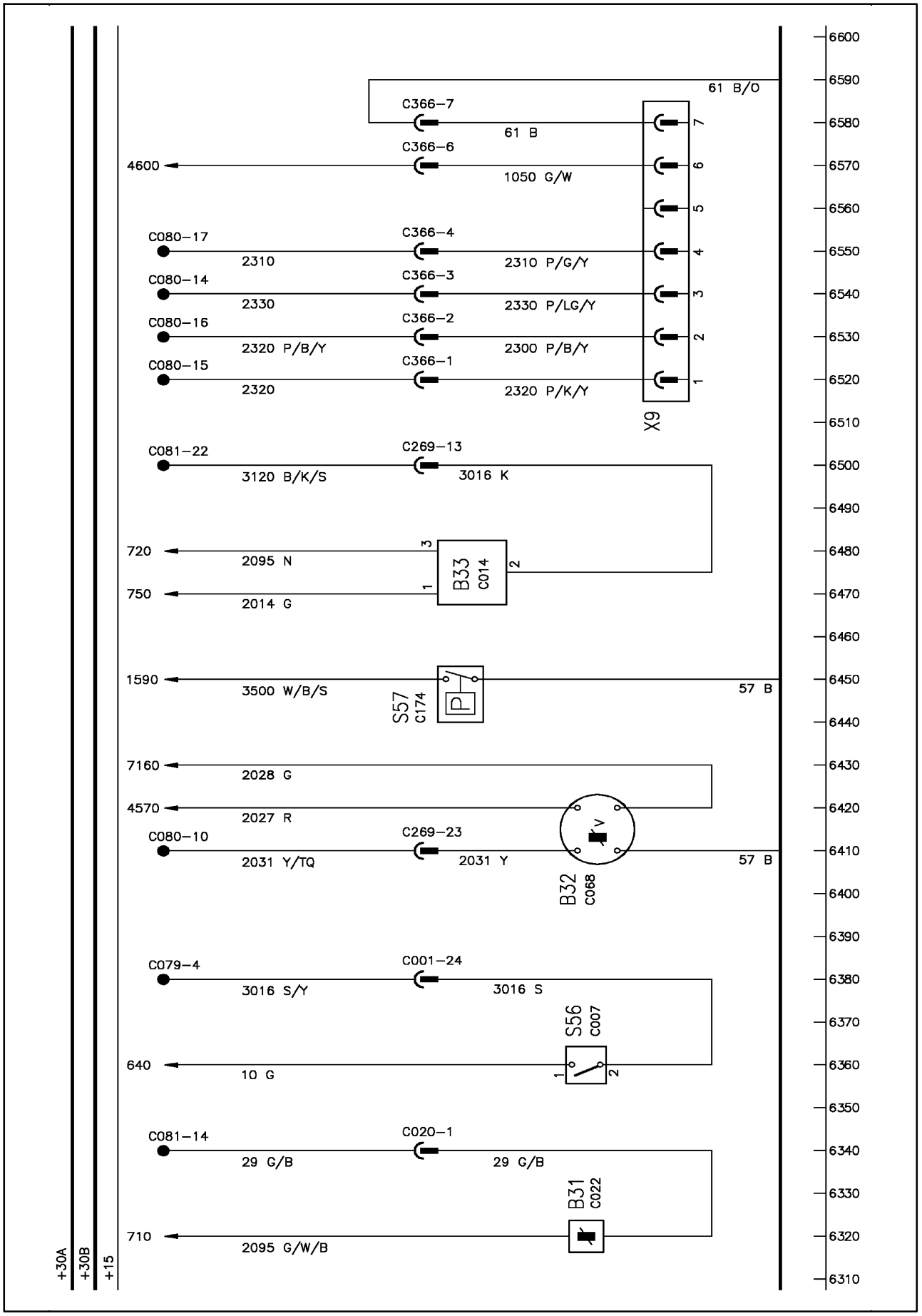
   A. Check between connector:

   C014 pin **1 (G)** and **ground**

   C014 pin **2 (K)** and **ground**

   If a short to +12 volts is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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6370
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6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
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2014 G
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S57
C174
57 B
7160
2028 G
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2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
57 B
B32
C068
C079-4
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C001-24
3016 S
S56
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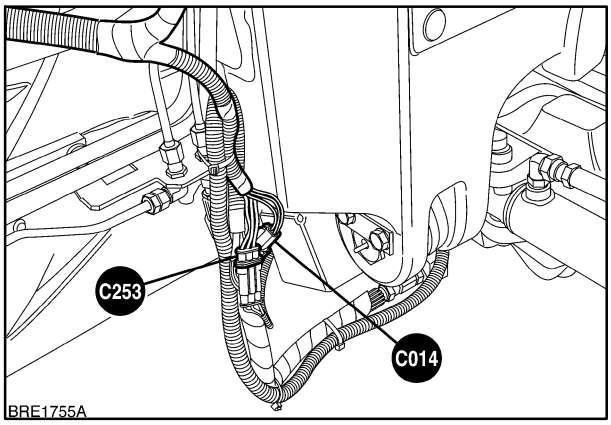
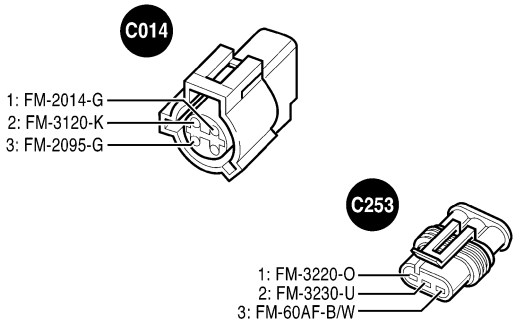
B31
C022
710
2095 G/W/B



BRE1755A



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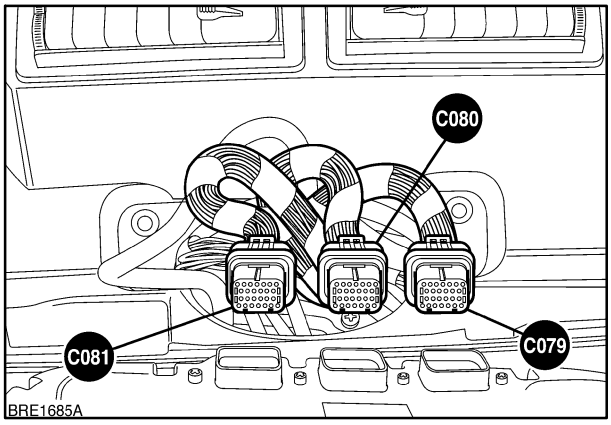

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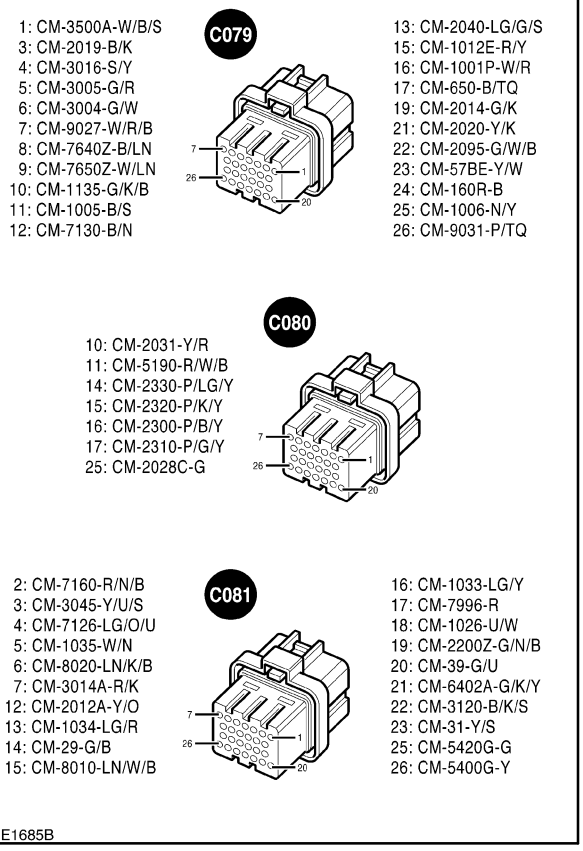


BRE1685B

ERROR CODE 7032 – STEERING SENSOR OUT OF MINIMUM RANGE

Possible failure modes:

1. Faulty connector
2. Faulty steering angle sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the steering angle sensor calibration procedure.

   A. If the error code is still displayed, continue to step 2.

2. Check the steering angle sensor connector **C014**, the controller connectors **C079**, **C081**, and the inline harness connector **C269**.

   A. Ensure the connectors are connected, not damaged, the pins the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are not okay, continue to step 3.

3. Check the steering angle sensor.

   A. Disconnect the steering sensor connector **C014**. Measure the resistance between the component side of connector **C014** pin **1 (G)** and **C014** pin **3 (N)**. If the resistance indicated is not 5K – 6K Ohms, repair or replace the sensor as required.

   B. If the sensor is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

   C014 pin **1 (G)** and **ground**

   C014 pin **2 (K)** and **ground**

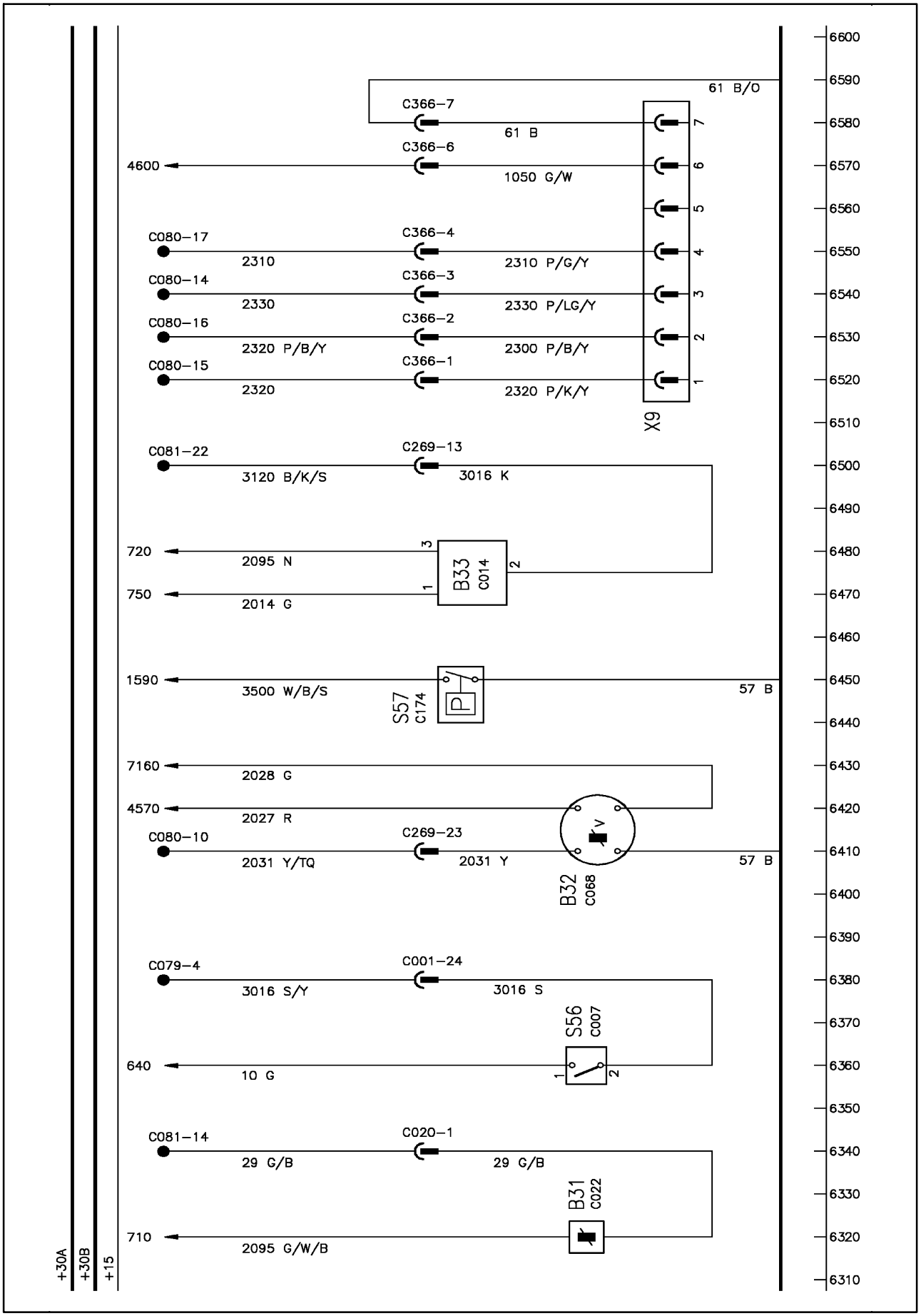
   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Disconnect the controller connector **C081**. Check between connector **C014** pin **2 (K)** and **C081** pin **22 (B/K/S)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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6380
6370
6360
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6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
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C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
57 B
B32
C068
C079-4
3016 S/Y
C001-24
3016 S
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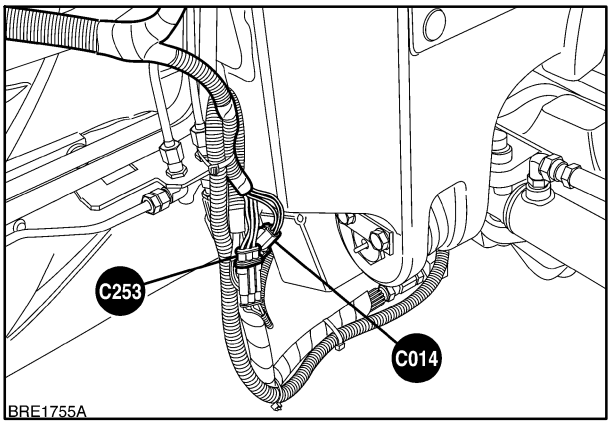

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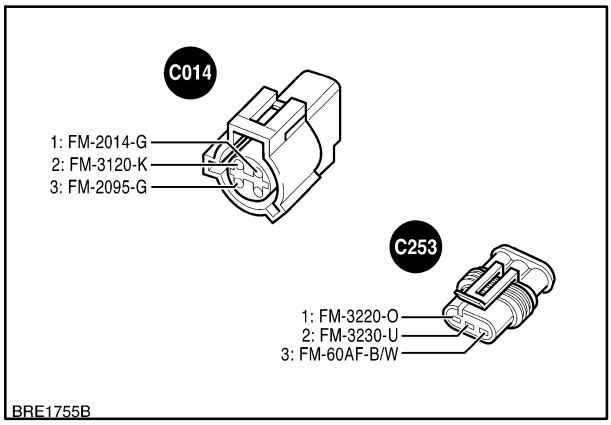

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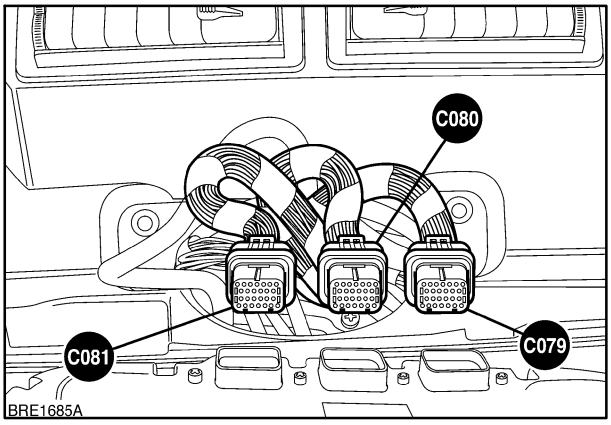

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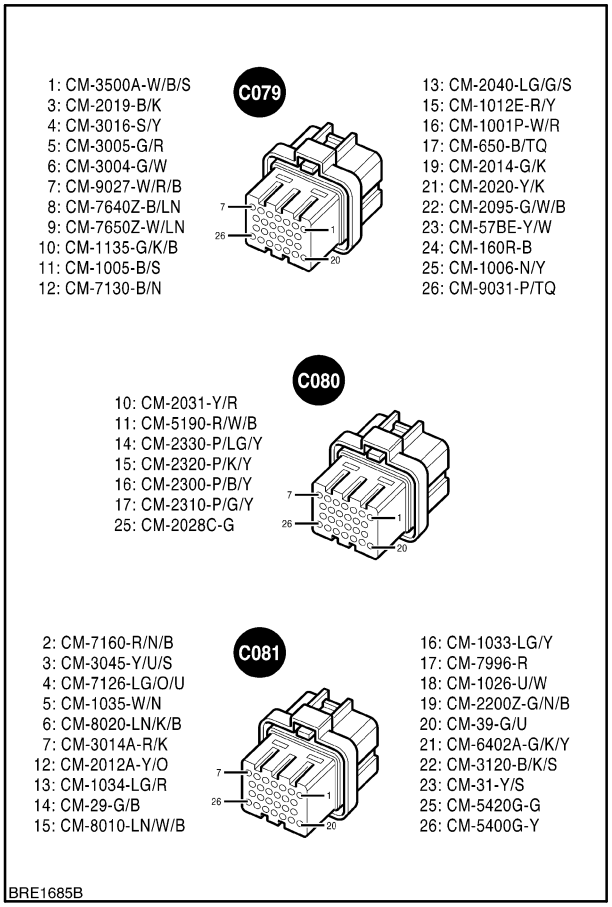


BRE1685B

NOTES

8001 - 9000 FRONT PTO ERROR CODE LISTING

Error code	Error description
8007	Front PTO solenoid stuck off
8008	Front PTO solenoid circuit overcurrent
8024	Front PTO not calibrated
8027	Front PTO speed sensor open circuit
8033	Front PTO cab normally closed switch open circuit
8036	PTO failed to start
8037	Front PTO cab normally open switch stuck closed
8099	Front PTO option not enabled

ERROR CODE 8007 - FRONT PTO SOLENOID STUCK OFF

Effects:

PTO disabled.

Possible failure modes:

1. Faulty PTO solenoid
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the front PTO solenoid.

   A. Disconnect the front PTO solenoid connector **C169**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 10 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the resistance indicated is okay, continue to step 2.

2. Check the solenoid coil terminals to ground.

   A. Check between each of the solenoid terminals and ground. If a short or partial short to ground is indicated, remove and replace the solenoid.

   B. If the solenoid is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connectors **C324** and **C326**. Check between connector:

   C169 pin **1 (O/K)** and **C324** pin **13 (O/K)**

   C169 pin **2 (O/B/Y)** and **C326** pin **7 (O)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for a short to ground.

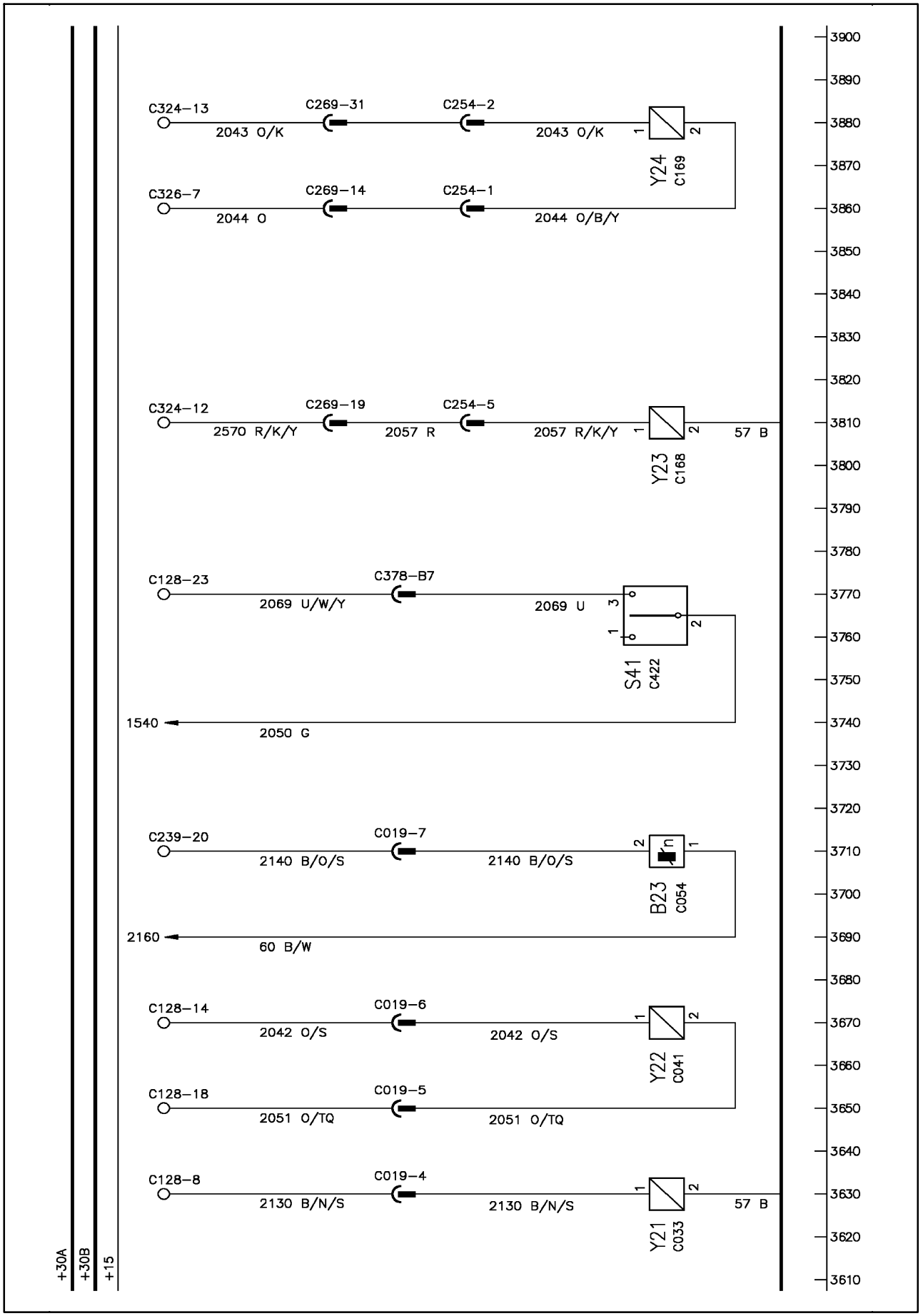
   A. Check between connector:

   C169 pin **1 (O/K)** and **ground**

   C169 pin **2 (O/B/Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
3900
3890
3880
3870
3860
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3820
3810
3800
3790
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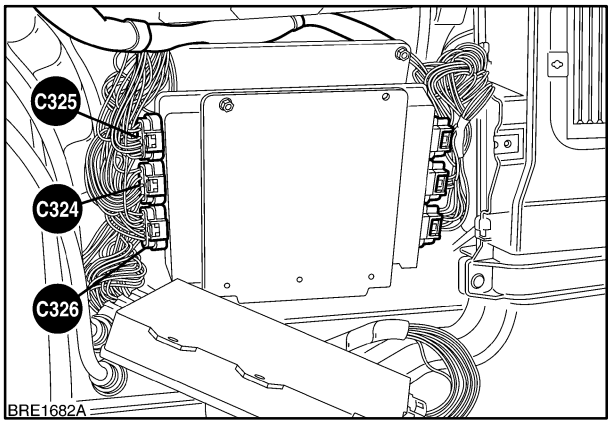
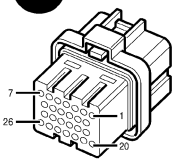


C324

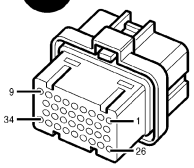
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

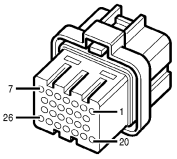
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 8008 - FRONT PTO SOLENOID CIRCUIT OVERCURRENT

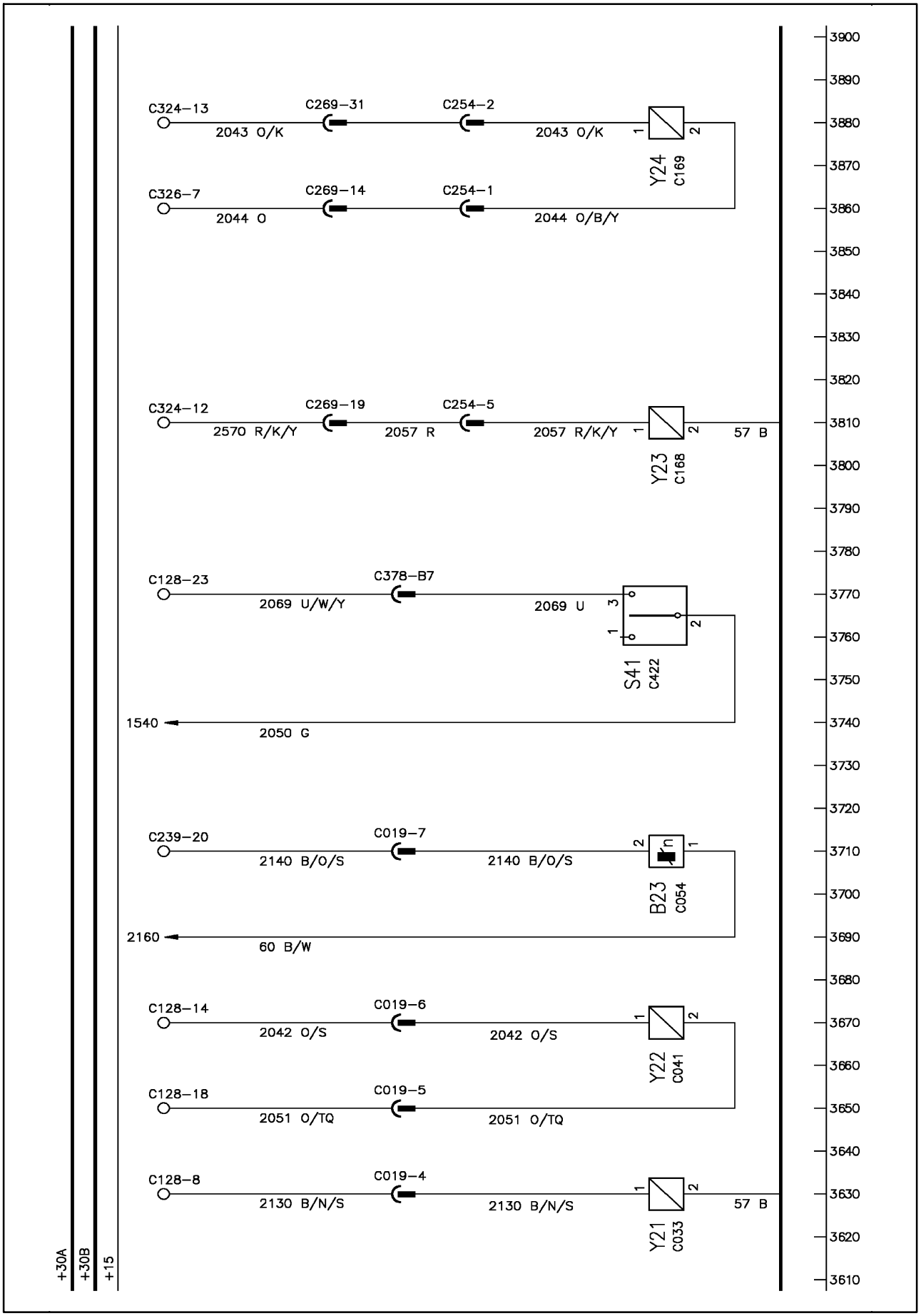
Possible failure modes:

1. External power supply connected
2. Faulty charging system
3. Faulty solenoid
4. Faulty harness
5. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If any other error code is being displayed, continue to these tests.
   B. If no other error code is displayed, continue to step 2.
2. Check that the tractor battery power supply has not been connected to an external power supply.
   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.
   B. If an external power supply is not connected to the tractor, continue to step 3.
3. Check the battery voltage on the instrument cluster.
   A. Start the engine and run at 2000 rev/min. If the voltage displayed is greater than approximately 15 Volts, continue to test for a fault in the charging system.
   B. If the battery voltage is okay, continue to step 4.
4. Check the front PTO solenoid.
   A. Turn the keystart OFF. Disconnect the front PTO solenoid connector **C169**. Measure the resistance between the solenoid terminal **1** and terminal **2**. If the resistance indicated is not approximately 10 Ohms at 20 degrees centigrade, remove and replace the front PTO solenoid.
   B. If the front PTO solenoid is okay, continue to step 5.
5. Check for +Ve Voltage.
   A. Disconnect the controller connectors **C324** and **C326**. Turn the keystart ON. Measure the voltage between connector:
   C324 pin **13 (O/K)** and **ground**
   C326 pin **7 (O)** and **ground**
   If a voltage is indicated, repair or replace the harness as required.
   B. If a voltage is not indicated, continue to step 6.
6. Check for a short circuit.
   A. Turn the keystart OFF. Check between connector **C324** pin **13 (O/K)** and **C326** pin **7 (O)**. If a short circuit is indicated, repair or replace the harness as required.
   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-13
C269-31
C254-2
2043 O/K
2043 O/K
Y24
C169
C326-7
C269-14
C254-1
2044 O
2044 O/B/Y
C324-12
C269-19
C254-5
2570 R/K/Y
2057 R
2057 R/K/Y
57 B
Y23
C168
C128-23
C378-B7
2069 U/W/Y
2069 U
S41
C422
1540
2050 G
C239-20
C019-7
2140 B/O/S
2140 B/O/S
B23
C054
2160
60 B/W
C128-14
C019-6
2042 O/S
2042 O/S
Y22
C041
C128-18
C019-5
2051 O/TQ
2051 O/TQ
C128-8
C019-4
2130 B/N/S
2130 B/N/S
57 B
Y21
C033
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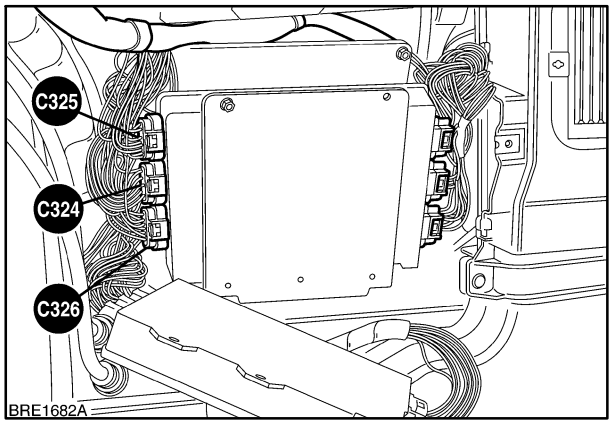
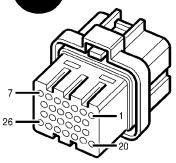


C324

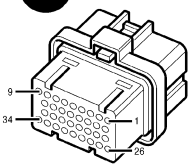
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

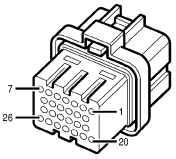
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 8024 - FRONT PTO NOT CALIBRATED

Effects:

PTO enabled.

Possible failure modes:

1. PTO not calibrated
2. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check if the PTO was calibrated.

   A. If the PTO was not calibrated after a change of controller or after using H8, clear the non-volatile memory (EEPROM). Perform the PTO calibration procedure.

   B. If the PTO was calibrated, perform the PTO calibration procedure. If the error code re-occurs, download the correct level of software and re-perform the PTO calibration procedure. If the fault re-occurs again, remove and replace the controller.

ERROR CODE 8027 - FRONT PTO SPEED SENSOR OPEN CIRCUIT

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty front PTO speed sensor
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the front PTO speed sensor connector **C403**.

   A. Ensure the connector is connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connector is okay, continue to step 2.
2. Check the front PTO PTO speed sensor.

   A. Disconnect connector **C403**. Check between the speed sensor terminals. If an open circuit is indicated, remove and replace the speed sensor.

   B. If the speed sensor is okay, continue to step 3.
3. Check for an open ground circuit.

   A. Check between connector **C403** pin **1 (B/W)** and **ground**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.
4. Check for an open circuit.

   A. Disconnect the controller connector **C326**. Check between connector **C326** pin **20 (O)** and **C403** pin **2 (O/G/Y)**. If an open circuit is indicated, disconnect the inline harness connector **C269** and check between connector:

   C269 pin **32 (O)** and **C403** pin **2 (O/G/Y)**

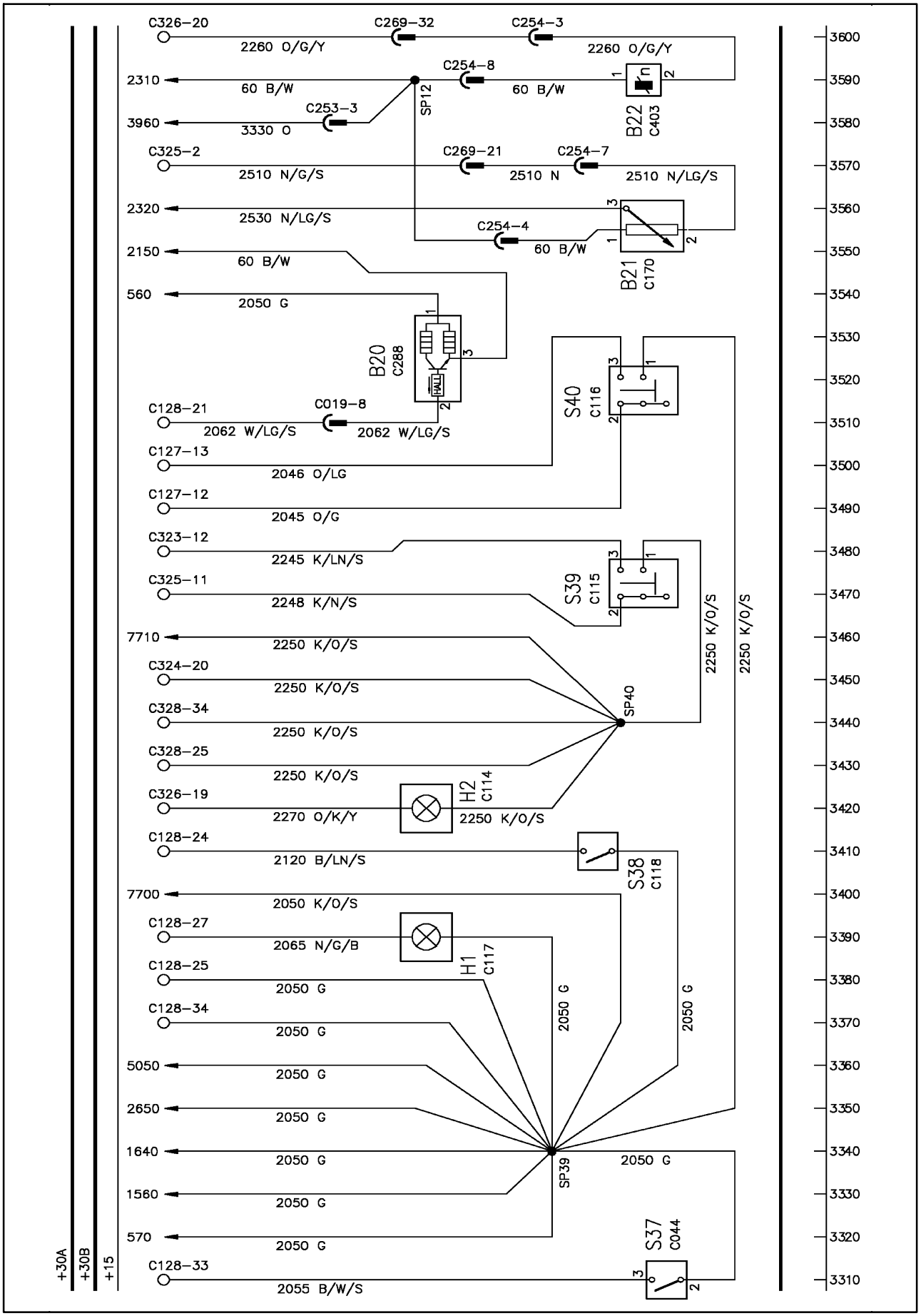
   C269 pin **32 (O)** and **C326** pin **20 (O)**

   to determine which harness is at fault. Repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.
5. Check connectors **C326**, **C269**, **C403** and the inline harness connector **C254**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
B22
C403
C253-3
3960
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
C325-11
2248 K/N/S
S39
C115
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
SP40
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
1560
2050 G
570
2050 G
C128-33
2055 B/W/S
S37
C044
+30A
+30B
+15
3600
3590
3580
3570
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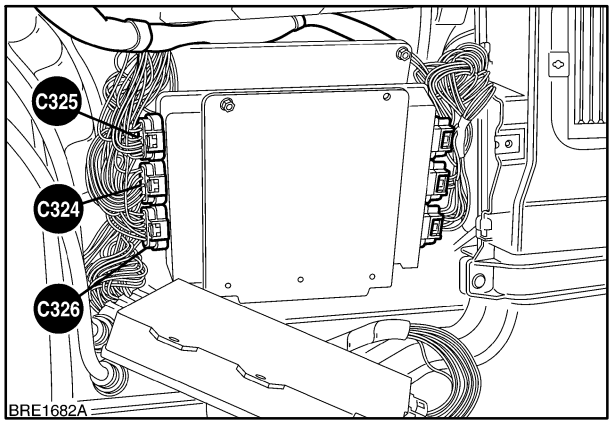
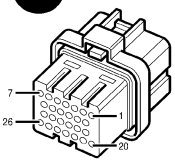


C324

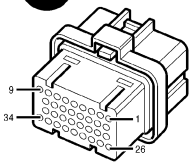
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

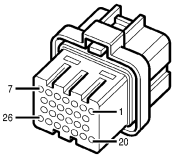
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

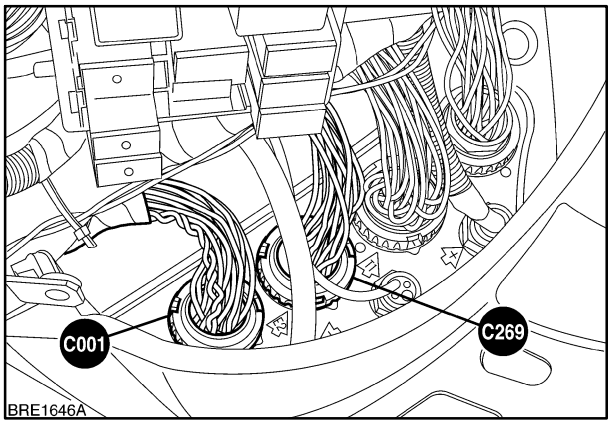
C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

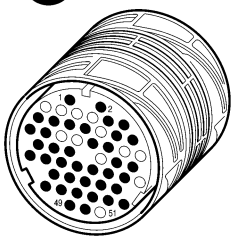
BRE1682B



BRE1646A

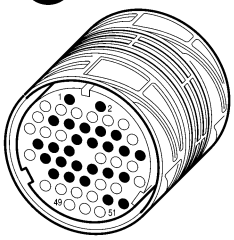
C001

1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K



C269

1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G



BRE1646B

ERROR CODE 8033 - FRONT PTO CAB NORMALLY CLOSED SWITCH OPEN CIRCUIT

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty front PTO switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the front PTO cab switch connector **C115** and the controller connector **C325**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the front PTO cab switch.

   A. Disconnect the front PTO cab switch connector **C115**. While operating the switch, check between the component side of connector:

   C115 pin **1 (K/O/S)** and **C115** pin **2 (K/N/S)**. Should indicate an open circuit when disengaged, approximately 115 Ohms when engaged and an open circuit with the yellow button only pressed.

   C115 pin **1 (K/O/S)** and **C115** pin **3 (K/LN/S)**. Should indicate approximately 115 Ohms when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.

   C115 pin **2 (K/N/S)** and **C115** pin **3 (K/LN/S)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.

   If the switch operation is not as indicated, remove and replace the PTO switch.

   B. If the switch is okay, continue to step 3.

3. Check for a +12 Volts.

   Turn the keystart ON. Measure the voltage between connector **C115** pin **1 (K/O/S)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   If +12 Volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the controller connector **C325**. Check between connector:

   C115 pin **3 (K/LN/S)** and **C325** pin **12 (K/LN/S)**

   C115 pin **2 (K/N/S)** and **C325** pin **11 (K/N/S)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

5. Check for a short to ground.

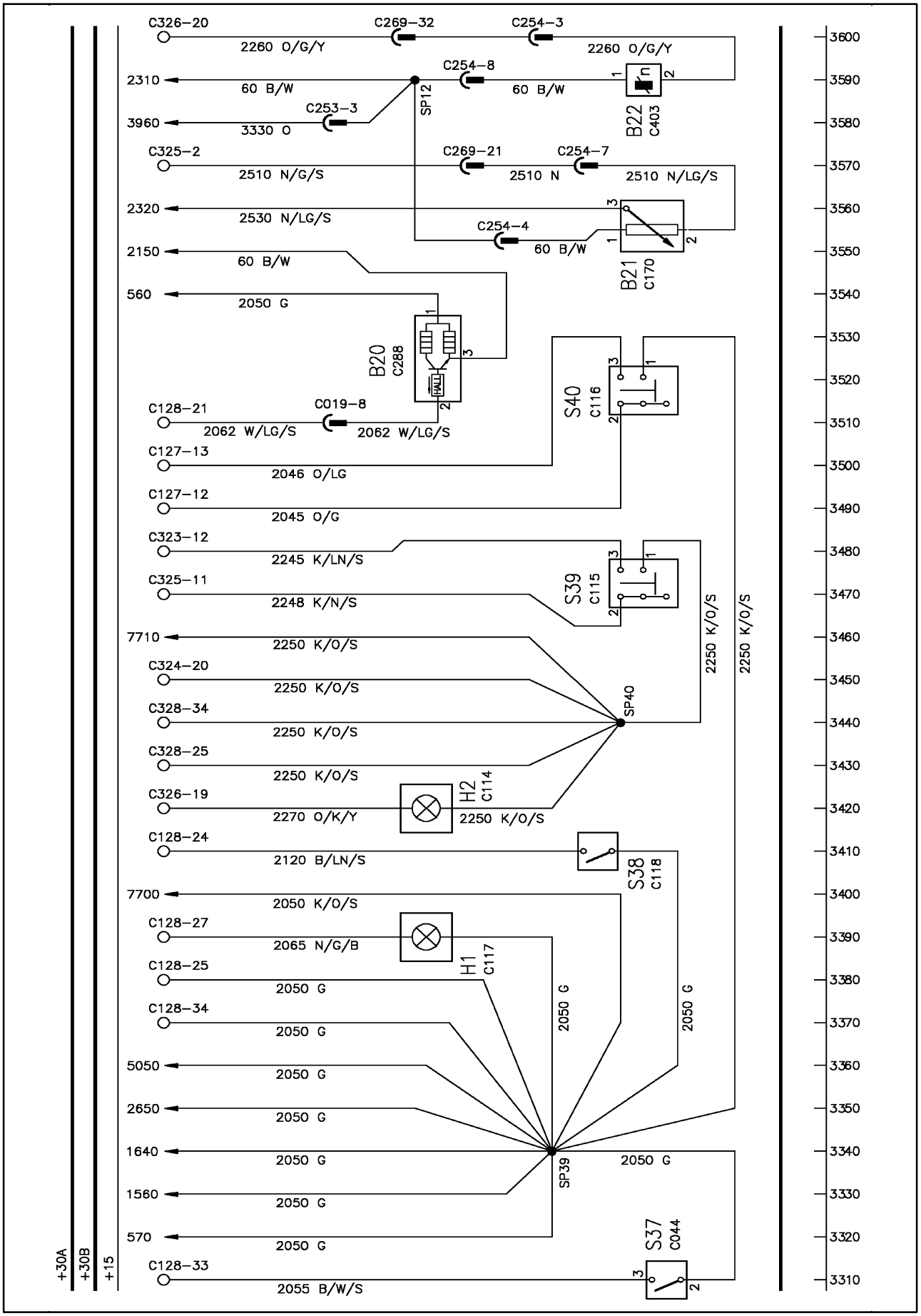
   A. Check between connector:

   C325 pin **12 (K/LN/S)** and **ground**

   C325 pin **11 (K/N/S)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
B22
C403
C253-3
3960
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
C325-11
2248 K/N/S
S39
C115
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
SP40
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
1560
2050 G
570
2050 G
C128-33
2055 B/W/S
S37
C044
+30A
+30B
+15
3600
3590
3580
3570
3560
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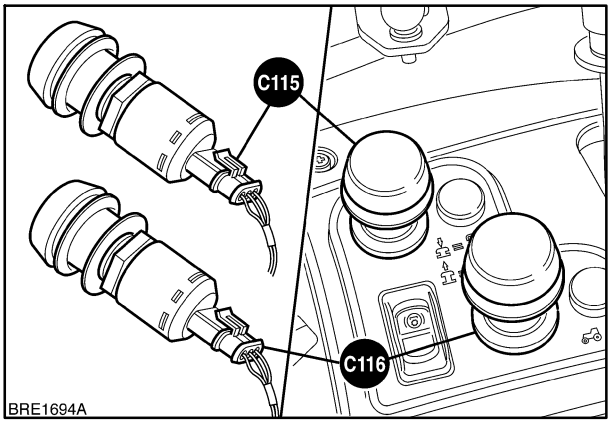
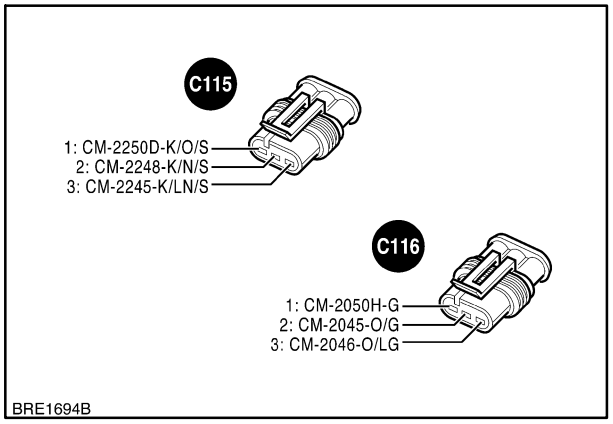
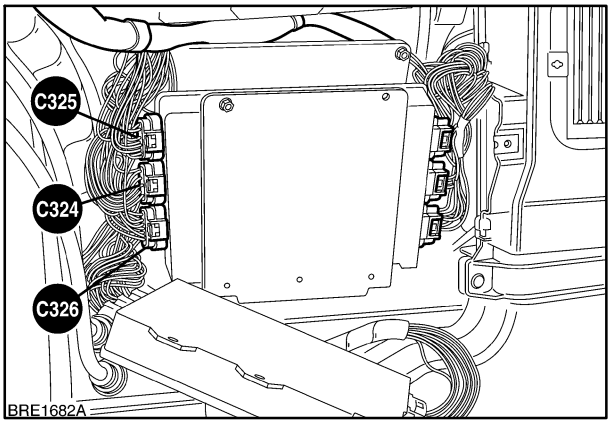






C324

1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y
13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S
17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y
18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 8036 - FRONT PTO FAILURE TO START

Effects:

PTO disabled.

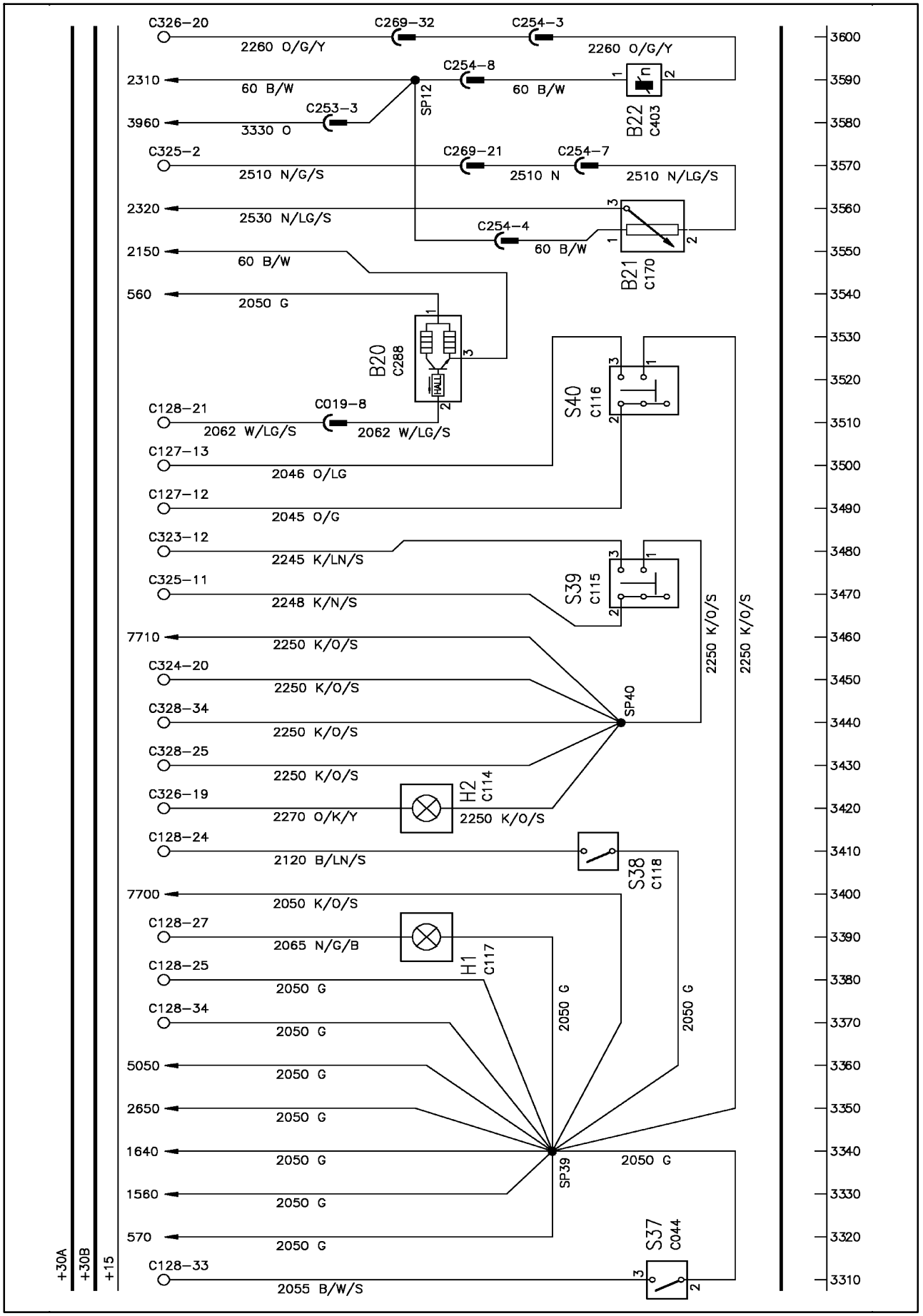
Possible failure modes:

1. Faulty connector
2. Faulty front PTO cab switch
3. Faulty hydraulic circuit
4. Mechanical fault
5. Faulty harness
6. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 2.
2. Check for the warning light on the PTO control panel being illuminated.
   A. Start the engine. Operate the PTO switch. If the PTO warning light is not illuminated, continue to step 3.
   B. If the PTO warning light is illuminated, continue to step 6.
3. Check the front PTO cab switch connector **C115**, the PTO clutch solenoid connector **C169** and the inline harness connector **C269**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 4.
4. Check the front PTO cab switch.
   A. Disconnect the front PTO cab switch connector **C115**. while operating the switch, check between the component side of connector:
   C115 pin **1 (K/O/S)** and **C115** pin **2 (K/N/S)**. Should indicate an open circuit when disengaged, approximately 115 Ohms when engaged and an open circuit with the yellow button only pressed.
   C115 pin **1 (K/O/S)** and **C115** pin **3 (K/LN/S)**. Should indicate approximately 115 Ohms when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.
   C115 pin **2 (K/N/S)** and **C115** pin **3 (K/LN/S)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.
   If the switch operation is not as indicated, remove and replace the PTO switch.
   B. If the switch is okay, continue to step 5.
5. Check for +5 Volts
   A. Turn the keystart ON. Measure the voltage between connector **C115** pin **1 (K/O/S)** and **ground**. If the voltage indicated is less than +5 Volts, repair or replace the harness as required.
   B. If the voltage indicated is approximately +5 Volts, download the correct level of software. If the fault re-occurs, remove and replace the controller.
6. Check the hydraulic pressure of the PTO circuit.
   A. Pressure test the PTO circuit, If the pressures indicated are not between 15 bar - 18 bar, continue to hydraulic troubleshooting procedures.
   B. If the pressures are okay, continue to step 7.
7. Check for a mechanical fault.
   A. Inspect the PTO clutch and its components. If the PTO clutch and its components are damaged, repair or replace as required.


C326-20
C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
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60 B/W
60 B/W
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C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
H2
C114
C326-19
2270 O/K/Y
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
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+30A
+30B
+15
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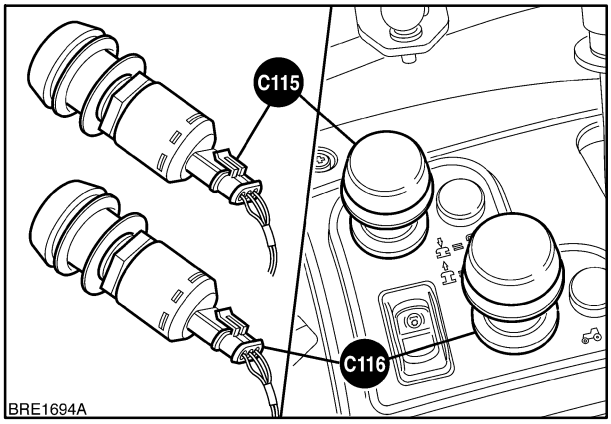
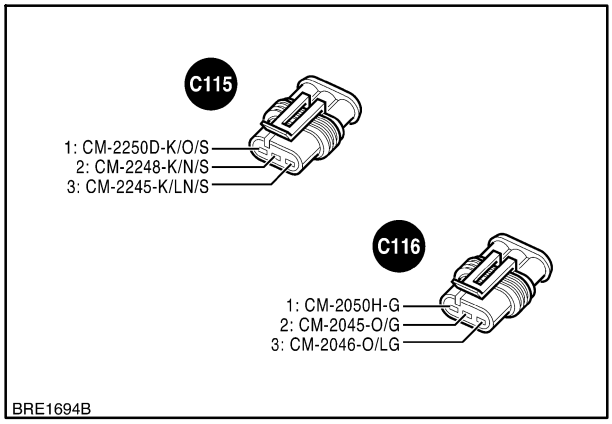
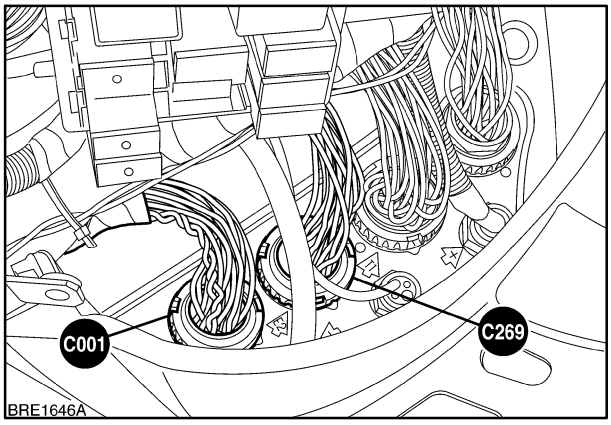






C001

1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269

1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 8037 - FRONT PTO CAB NORMALLY OPEN SWITCH STUCK CLOSED

Effects:

PTO disabled.

Possible failure modes:

1. Faulty frnot PTO switch
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the front PTO cab switch.

   A. Disconnect the front PTO cab switch connector **C115**. while operating the switch, check between the component side of connector:

   C115 pin **1 (K/O/S)** and **C115** pin **2 (K/N/S)**. Should indicate an open circuit when disengaged, approximately 115 Ohms when engaged and an open circuit with the yellow button only pressed.

   C115 pin **1 (K/O/S)** and **C115** pin **3 (K/LN/S)**. Should indicate approximately 115 Ohms when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.

   C115 pin **2 (K/N/S)** and **C115** pin **3 (K/LN/S)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.

   If the switch operation is not as indicated, remove and replace the PTO switch.

   B. If the switch is okay, continue to step 2.

2. Check for a short circuit.

   A. Disconnect the controller connector **C325**. Check between connector **C115** pin **2 (K/N/S)** and **C115** pin **3 (K/LN/S)**. If a short circuit is indicated, repair or replace the harness as required.

   B. If a short circuit is not indicated, continue to step 3.

3. Check for a short to a +Ve voltage.

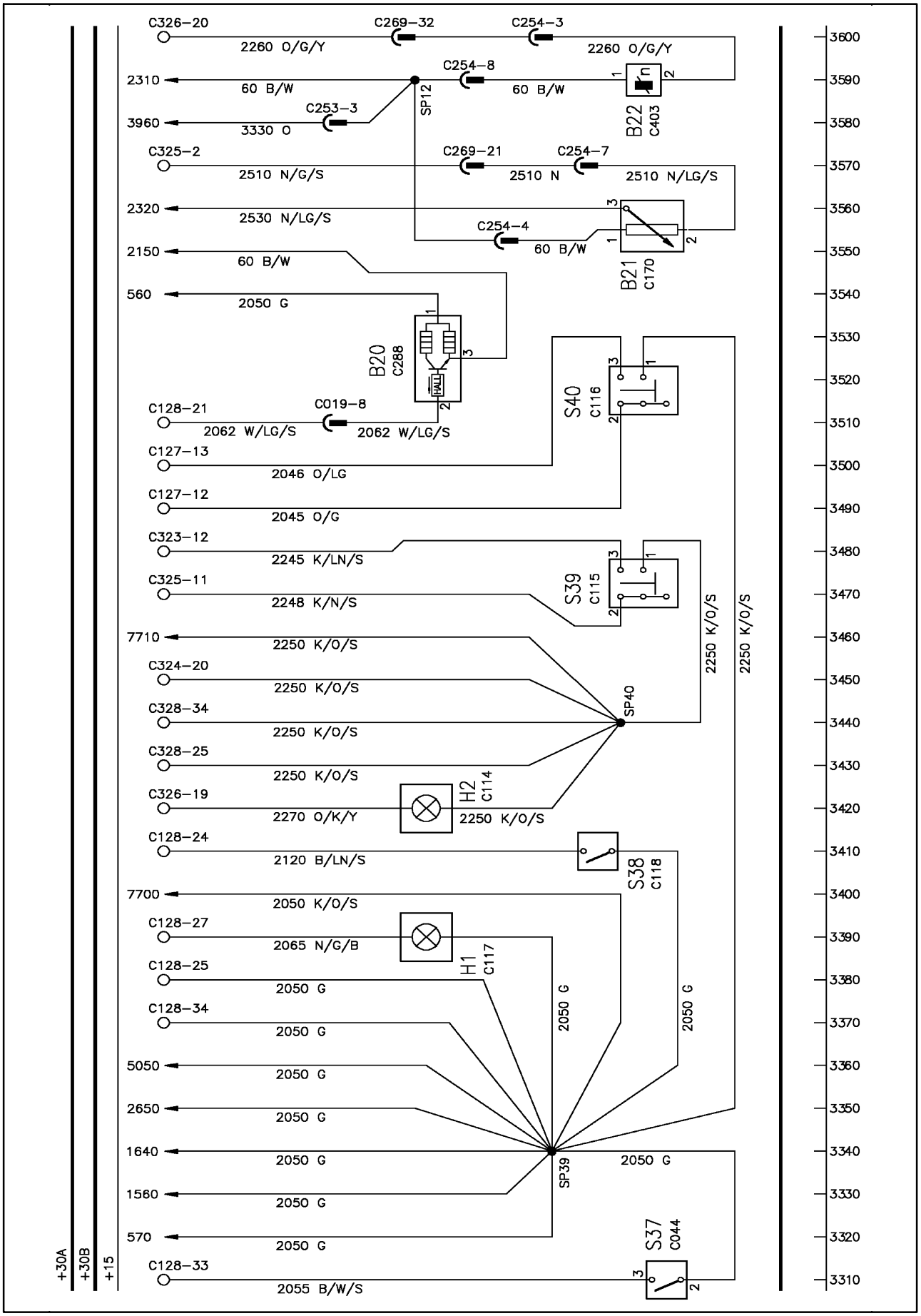
   A. Turn the keystart ON. Measure the voltage between connector:

   C115 pin **2 (K/N/S)** and **ground**

   C115 pin **3 (K/LN/S)** and **ground**

   If a voltage is indicated, repair or replace the harness as reqiuired.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C254-3
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C254-8
2310
60 B/W
60 B/W
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C403
C253-3
3960
3330 O
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
C325-11
2248 K/N/S
S39
C115
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
C328-25
2250 K/O/S
SP40
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C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
1560
2050 G
570
2050 G
SP39
2050 G
2050 G
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
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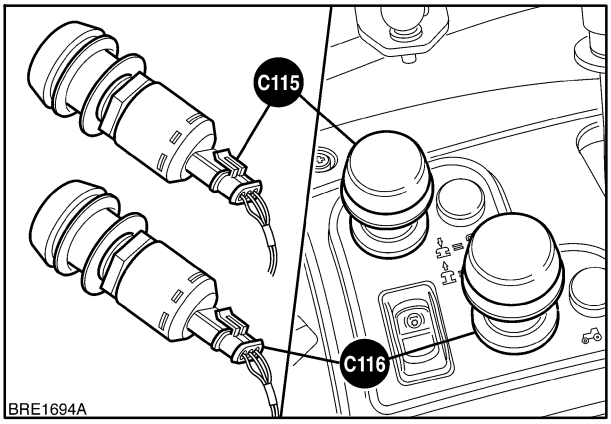
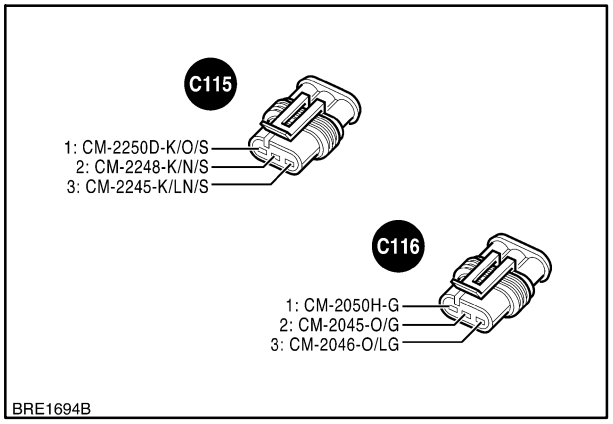
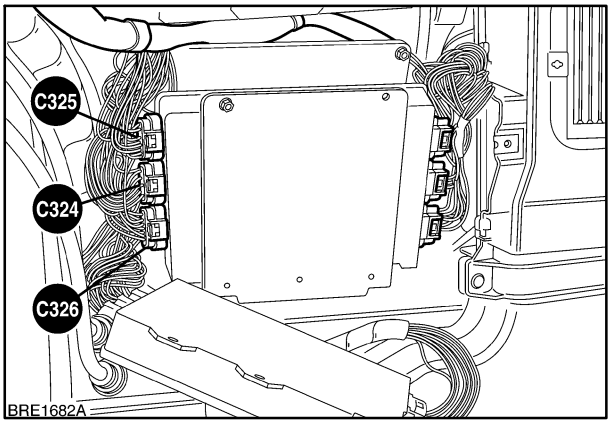






C324

1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y
13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S
17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y
18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 8099 - FRONT PTO OPTION NOT ENABLED

Effects:

PTO disabled.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Enable Front PTO option in H3 menu screen of DD/DH processors.

9001 – 10000 FRONT HPL ERROR CODE LISTING

Error code	Error description
9001	Front HPL POT open circuit
9002	Front HPL POT short circuit

ERROR CODE 9001 - FRONT HPL POTENTIOMETER OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty HPL potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the HPL potentiometer and its linkage for any damage.

   A. If the potentiometer or linkage is damaged, repair or replace as required.

   B. If the potentiometer and the linkage is okay, continue to step 2.

2. Check the HPL potentiometer in H9 Channel 28.

   A. Fully lower and then raise the front hydraulic lift arms. If the values displayed are not between 6 to 79, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 28, wiggle the harness, the HPL potentiometer connector **C170**, the inline harness connectors **C254**, **C269** and the controller connectors **C324**, **C325** to check for an intermittent circuit. Channel 28 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the HPL potentiometer.

   A. Disconnect connector **C170** and remove the potentiometer. While turning the potentiometer, measure the resistance between the component side of connector:

   C170 pin **2 (N/K/S)** and **C170** pin **3 (B/W)**

   C170 pin **2 (N/K/S)** and **C170** pin **1 (N/LG/S)**

   If the resistances indicated do not range between approximately 1.0 - 4.0K Ohms, replace the HPL potentiometer.

   B. If the values are okay, refit the potentiometer and continue to step 4.

4. Check for an open circuit.

   A. Disconnect the controller connectors **C324** and **C325**. Check between connector:

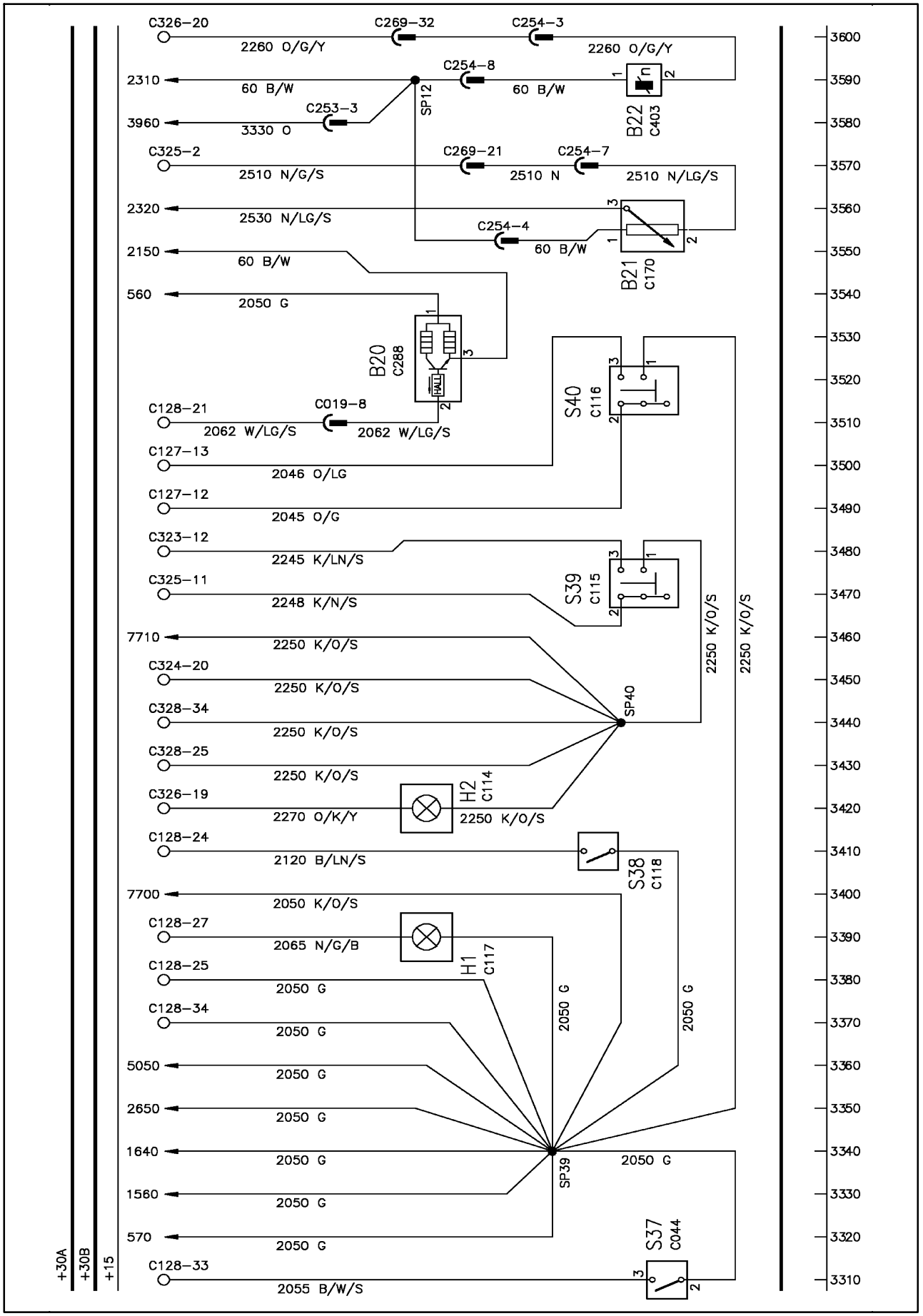
   C170 pin **3 (B/W)** and **C324** pin **23 (B/W)**

   C170 pin **2 (N/K/S)** and **C325** pin **2 (N/G/S)**

   C170 pin **1 (N/LG/S)** and **C325** pin **16 (N/LG/S)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.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C269-32
C254-3
2260 O/G/Y
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C254-8
2310
60 B/W
60 B/W
SP12
C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
S40
C116
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
C325-11
2248 K/N/S
S39
C115
7710
2250 K/O/S
C324-20
2250 K/O/S
C328-34
2250 K/O/S
SP40
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
1560
2050 G
570
2050 G
C128-33
2055 B/W/S
S37
C044
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
3520
3510
3500
3490
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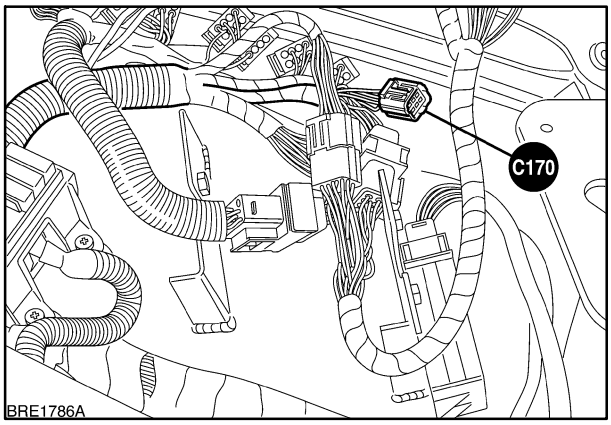
3310



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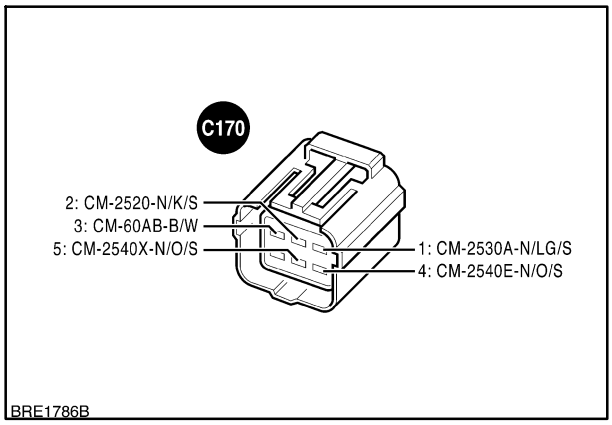

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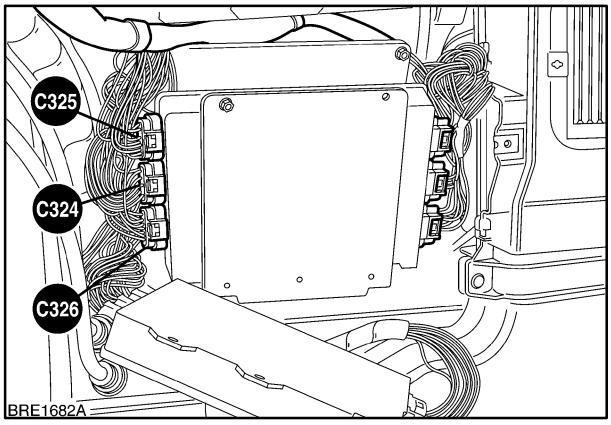

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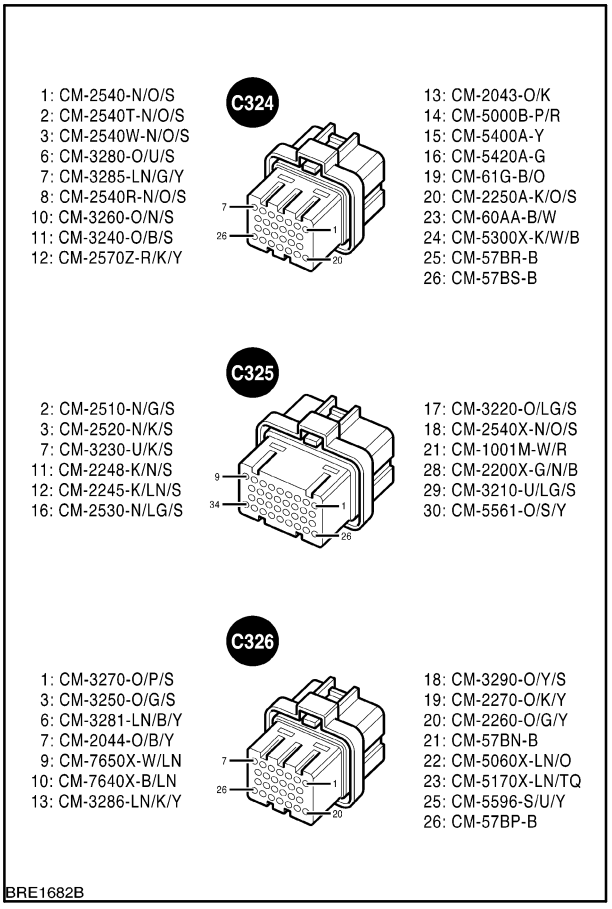


BRE1682B

ERROR CODE 9002 – FRONT HPL POTENTIOMETER SHORT CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty HPL potentiometer
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the HPL potentiometer and its linkage for any damage.

   A. If the potentiometer or linkage is damaged, repair or replace as required.

   B. If the potentiometer and the linkage is okay, continue to step 2.

2. Check the HPL potentiometer in H9 Channel 28.

   A. Fully lower and then raise the front hydraulic lift arms. If the values displayed are not between 6 to 79, continue to step 3.

   B. If the values displayed are okay, while still in H9 Channel 28, wiggle the harness, the HPL potentiometer connector **C170**, the inline harness connectors **C254**, **C269** and the controller connectors **C324**, **C325** to check for an intermittent circuit. Channel 28 values will change if an intermittent circuit is detected, repair or replace as required.

3. Check the HPL potentiometer.

   A. Disconnect connector **C170** and remove the potentiometer. While turning the potentiometer, measure the resistance between the component side of connector:

   C170 pin **2 (N/K/S)** and **C170** pin **3 (B/W)**

   C170 pin **2 (N/K/S)** and **C170** pin **1 (N/LG/S)**

   If the resistances indicated do not range between approximately 1.0 – 4.0K Ohms, replace the HPL potentiometer.

   B. If the values are okay, refit the potentiometer and continue to step 4.

4. Check for a short to +8 or +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C170** pin **1 (N/LG/S)** and **ground**. If the voltage indicated is greater than +5 Volts, repair or replace the harness as required.

   B. If the voltage indicated is approximately +5 Volts, continue to step 5.

5. Check for a short to +Ve Voltage.

   A. Measure the voltage between connector **C170** pin **2 (N/K/S)** and **ground**. If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, continue to step 6.

6. Check for a short to ground.

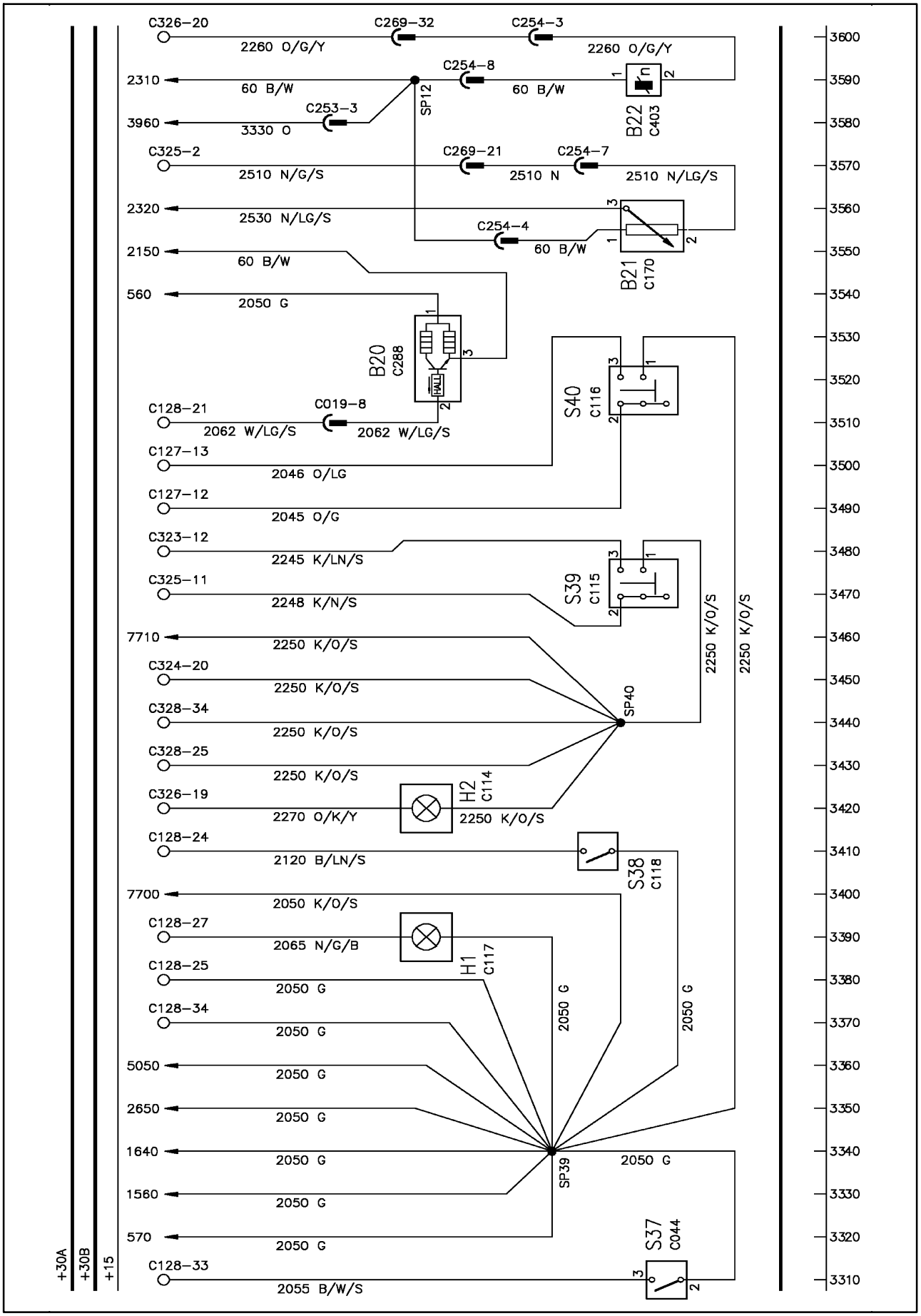
   A. Turn the keystart OFF. Check between connector:

   C170 pin **2 (N/K/S)** and **ground**

   C170 pin **1 (N/LG/S)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re–occurs, remove and replace the controller.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C269-32
C254-3
2260 O/G/Y
2260 O/G/Y
C254-8
2310
60 B/W
60 B/W
SP12
C253-3
3960
3330 O
B22
C403
C325-2
C269-21
C254-7
2510 N/G/S
2510 N
2510 N/LG/S
2320
2530 N/LG/S
C254-4
60 B/W
2150
60 B/W
B21
C170
560
2050 G
B20
C288
HALL
S40
C116
C128-21
C019-8
2062 W/LG/S
2062 W/LG/S
C127-13
2046 O/LG
C127-12
2045 O/G
C323-12
2245 K/LN/S
S39
C115
C325-11
2248 K/N/S
2250 K/O/S
2250 K/O/S
7710
2250 K/O/S
C324-20
2250 K/O/S
SP40
C328-34
2250 K/O/S
C328-25
2250 K/O/S
C326-19
2270 O/K/Y
H2
C114
2250 K/O/S
C128-24
2120 B/LN/S
S38
C118
7700
2050 K/O/S
C128-27
2065 N/G/B
H1
C117
C128-25
2050 G
2050 G
2050 G
C128-34
2050 G
5050
2050 G
2650
2050 G
1640
2050 G
SP39
2050 G
1560
2050 G
570
2050 G
S37
C044
C128-33
2055 B/W/S
+30A
+30B
+15
3600
3590
3580
3570
3560
3550
3540
3530
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3510
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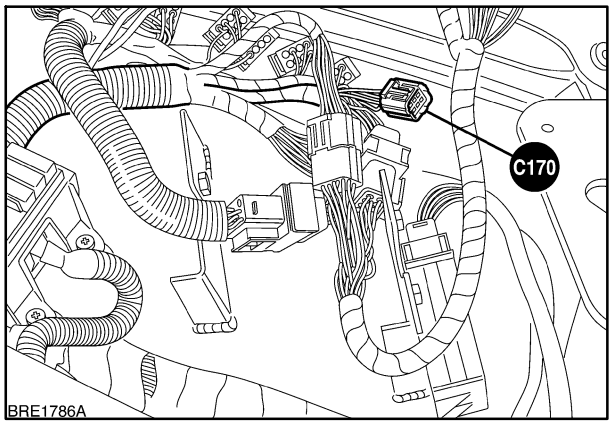
C170
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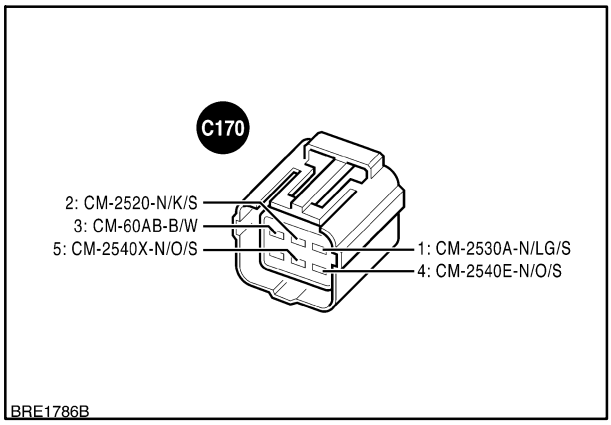
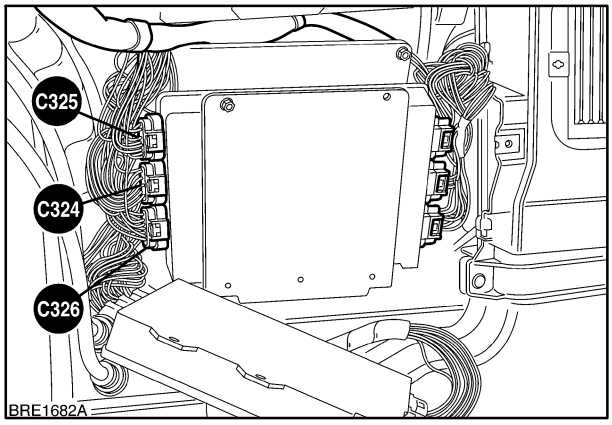
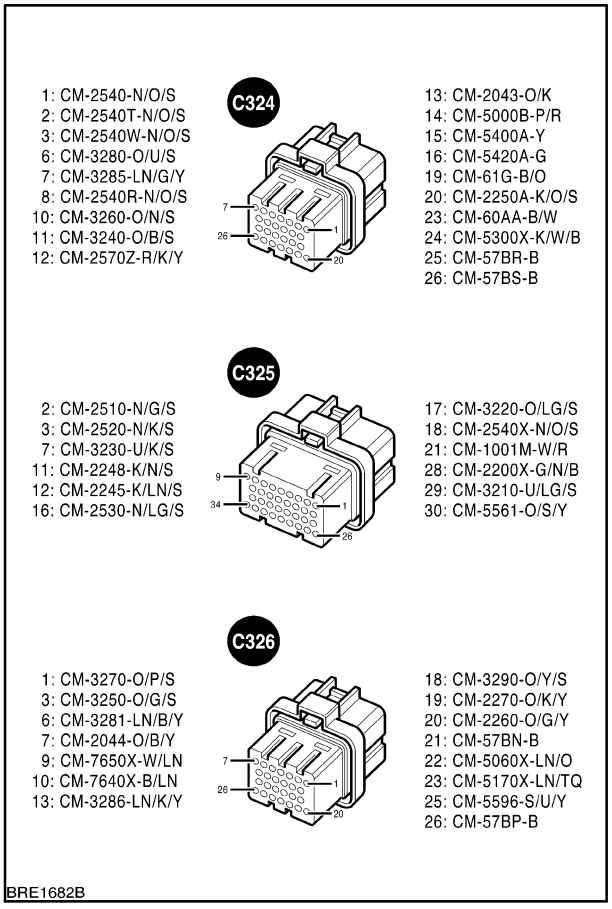

C170
2: CM-2520-N/K/S
3: CM-60AB-B/W
5: CM-2540X-N/O/S
1: CM-2530A-N/LG/S
4: CM-2540E-N/O/S
BRE1786B


C325
C324
C326
BRE1682A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2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y
13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B
C325
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S
17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y
C326
1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y
18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B
BRE1682B

NOTES

10001 - 11000 SUSPENDED FRONT AXLE FAULT CODE LISTING

Fault Code	Fault description
10001	Upper lockout solenoid error
10002	Raise solenoid error
10003	Lower solenoid error
10004	Front axle potentiometer threshold is higher than the set limit
10005	Front axle potentiometer threshold is lower than the set limit
10007	Front axle weight has been reduced but the suspension is unable to reset nominal height
10008	Front axle weight has been increased but the suspension is unable to reset nominal height
10009	Lower lockout solenoid error
10024	The front suspension is not calibrated
10099	Front suspension mode not enabled

ERROR CODE 10001 - UPPER LOCKOUT SOLENOID ERROR

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the upper lockout solenoid connector **C252** (identified with a Yellow Band), the front suspension connector **C248** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the upper lockout solenoid.

   A. Disconnect the upper lockout solenoid connector **C252**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 6 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the resistance indicated is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connectors **C324** and **C326**. Check between connector:

   C252 pin **1 (O/U/S)** and **C324** pin **6 (O/U/S)**

   C252 pin **2 (O/Y/S)** and **C326** pin **6 (LN/B/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

   C252 pin **1 (O/U/S)** and **ground**

   C252 pin **2 (O/Y/S)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check for a short to +12 Volts.

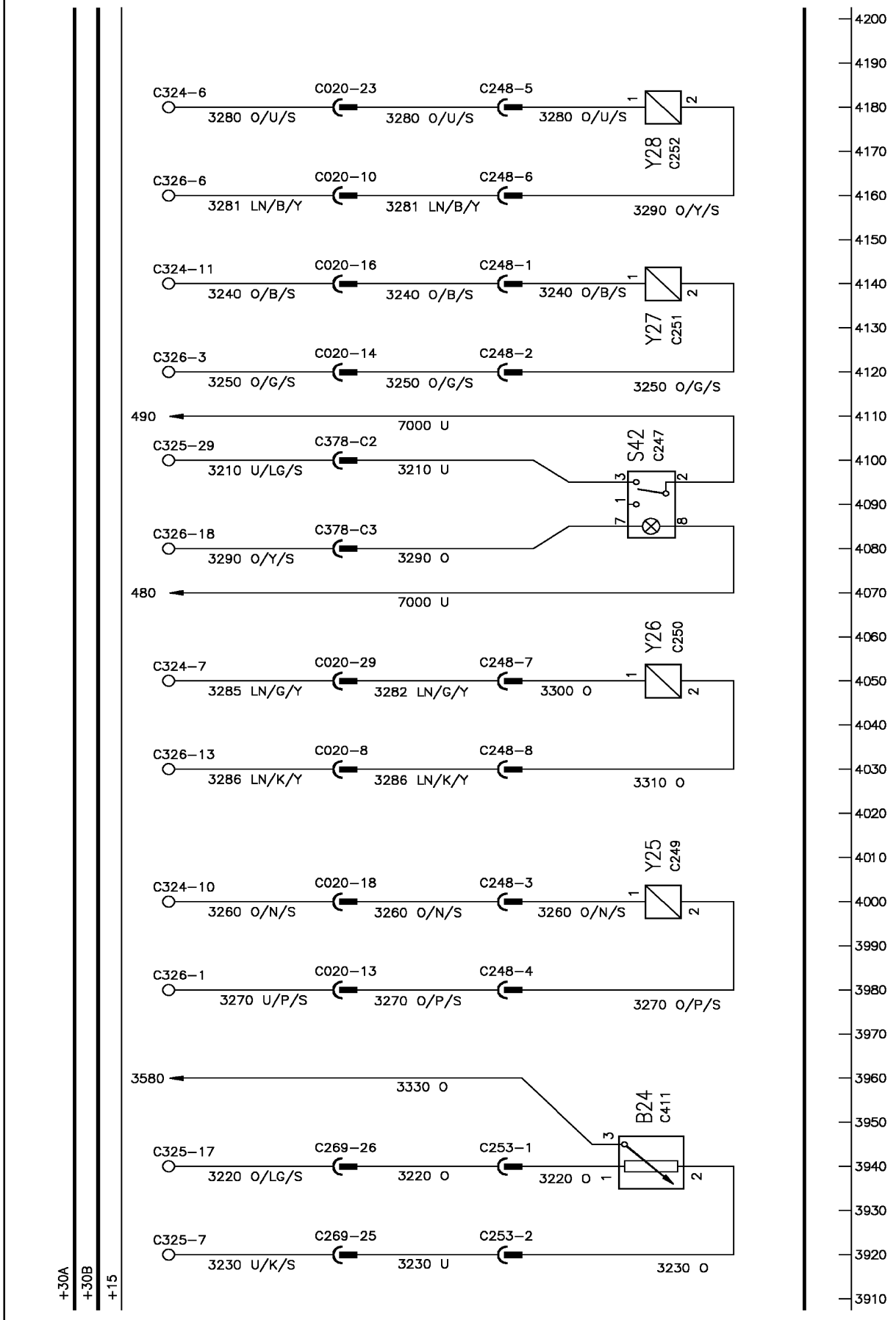
   A. Turn the keystart ON. Measure the voltage between connector:

   C252 pin **1 (O/U/S)** and **ground**

   C252 pin **2 (O/Y/S)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28 C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27 C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42 C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN/G/Y
3300 O
Y26 C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25 C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24 C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
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4080
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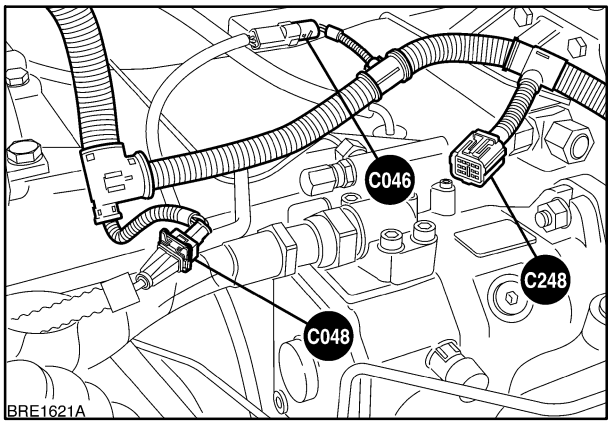

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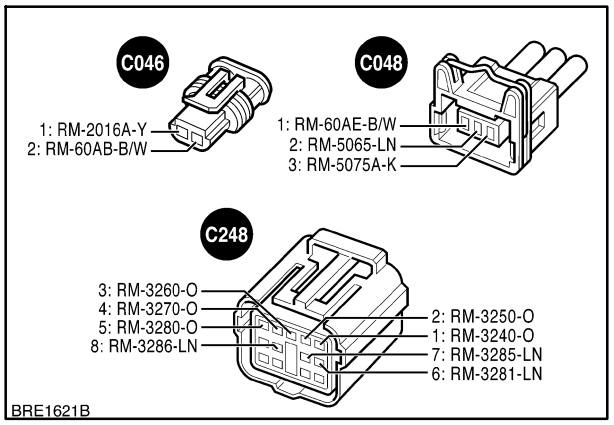

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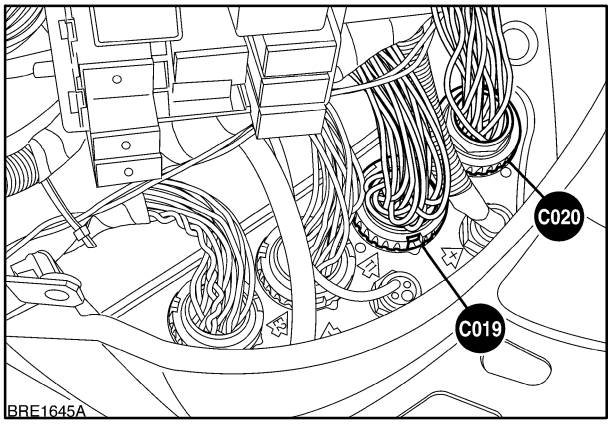

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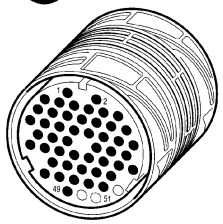
C019



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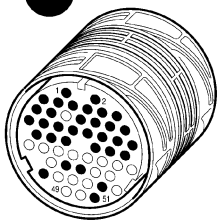
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



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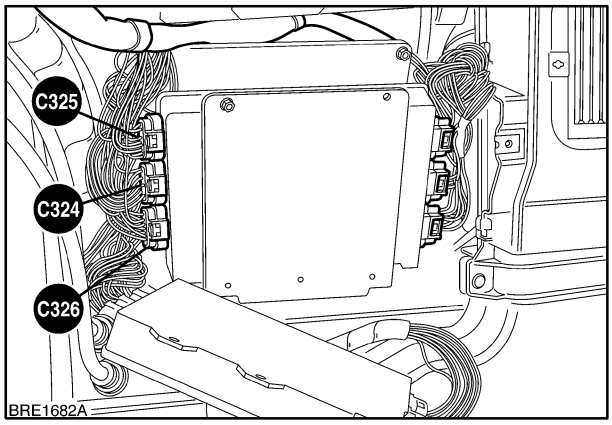
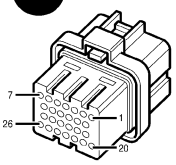
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



C324

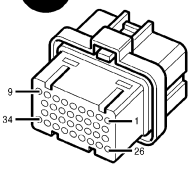
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

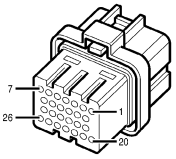
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 10002 - RAISE SOLENOID ERROR

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the raise solenoid connector **C251** (identified with a Red Band), the front suspension connector **C248** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the raise solenoid.

   A. Disconnect the raise solenoid connector **C251**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 10 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the resistance indicated is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connectors **C324** and **C326**. Check between connector:

   C251 pin **1 (O/B/S)** and **C324** pin **11 (O/B/S)**

   C251 pin **2 (O/G/S)** and **C326** pin **3 (O/G/S)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

   C251 pin **1 (O/B/S)** and **ground**

   C251 pin **2 (O/G/S)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check for a short to +12 Volts.

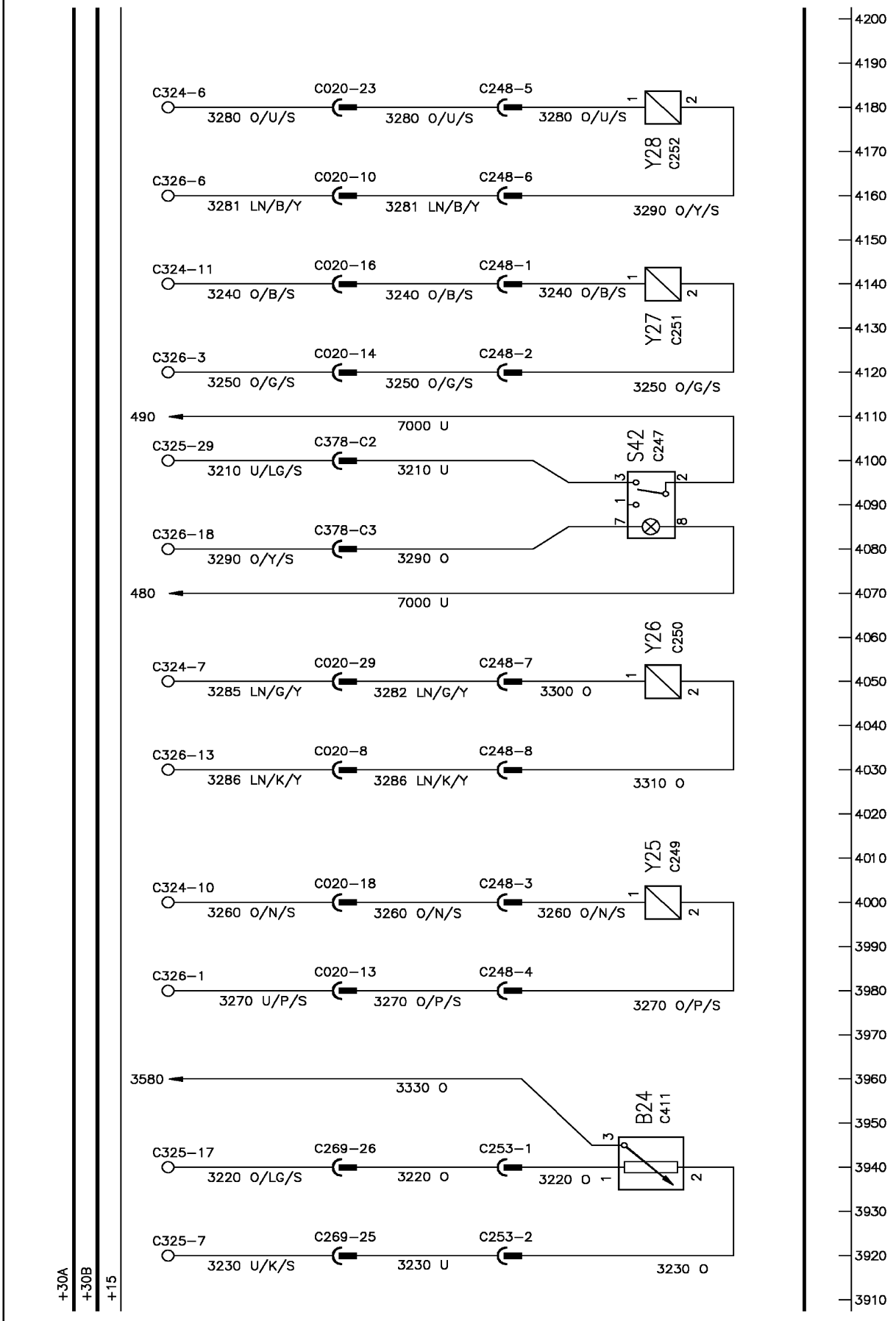
   A. Turn the keystart ON. Measure the voltage between connector:

   C251 pin **1 (O/B/S)** and **ground**

   C250 pin **2 (O/G/S)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28 C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27 C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42 C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN/G/Y
3300 O
Y26 C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25 C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24 C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
4060
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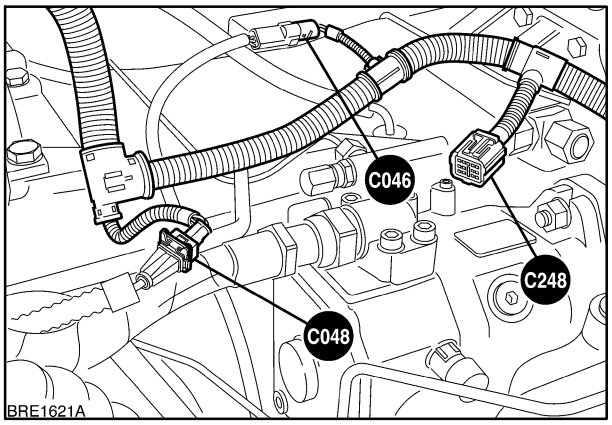
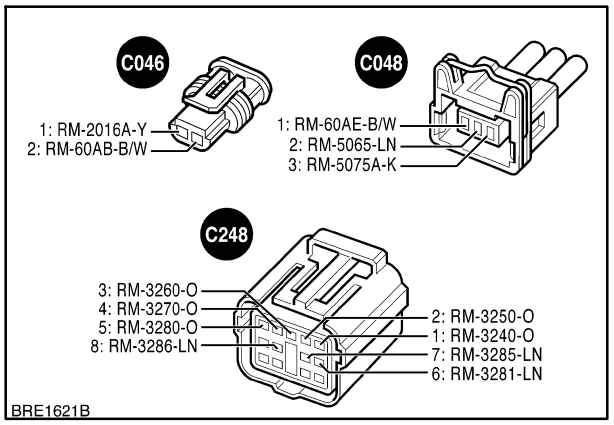
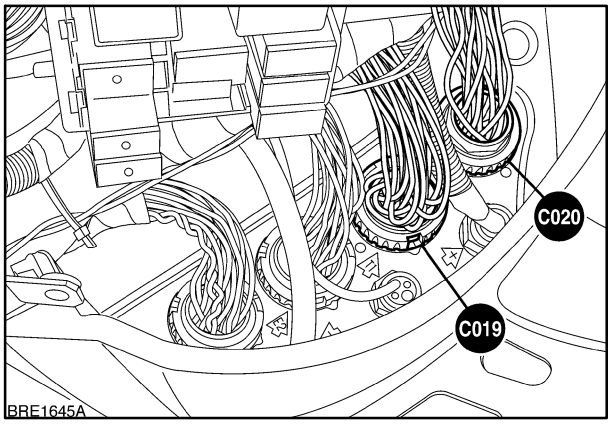
3920
3910



BRE1621A



BRE1621B



BRE1645A

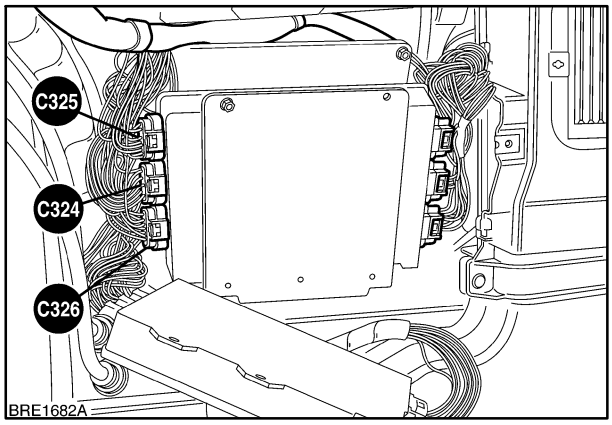
C019

1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020

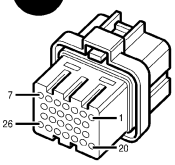
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



C324

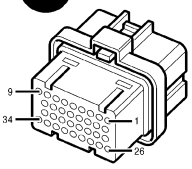
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

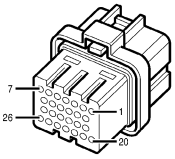
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 10003 - LOWER SOLENOID ERROR

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lower solenoid connector **C249** (identified with a Green Band), the front suspension connector **C248** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the lower solenoid.

   A. Disconnect the lower solenoid connector **C249**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 10 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the resistance indicated is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connectors **C324** and **C326**. Check between connector:

   C249 pin **1 (O/N/S)** and **C324** pin **10 (O/N/S)**

   C249 pin **2 (O/P/S)** and **C326** pin **1 (O/P/S)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

   C249 pin **1 (O/N/S)** and **ground**

   C249 pin **2 (O/P/S)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check for a short to +12 Volts.

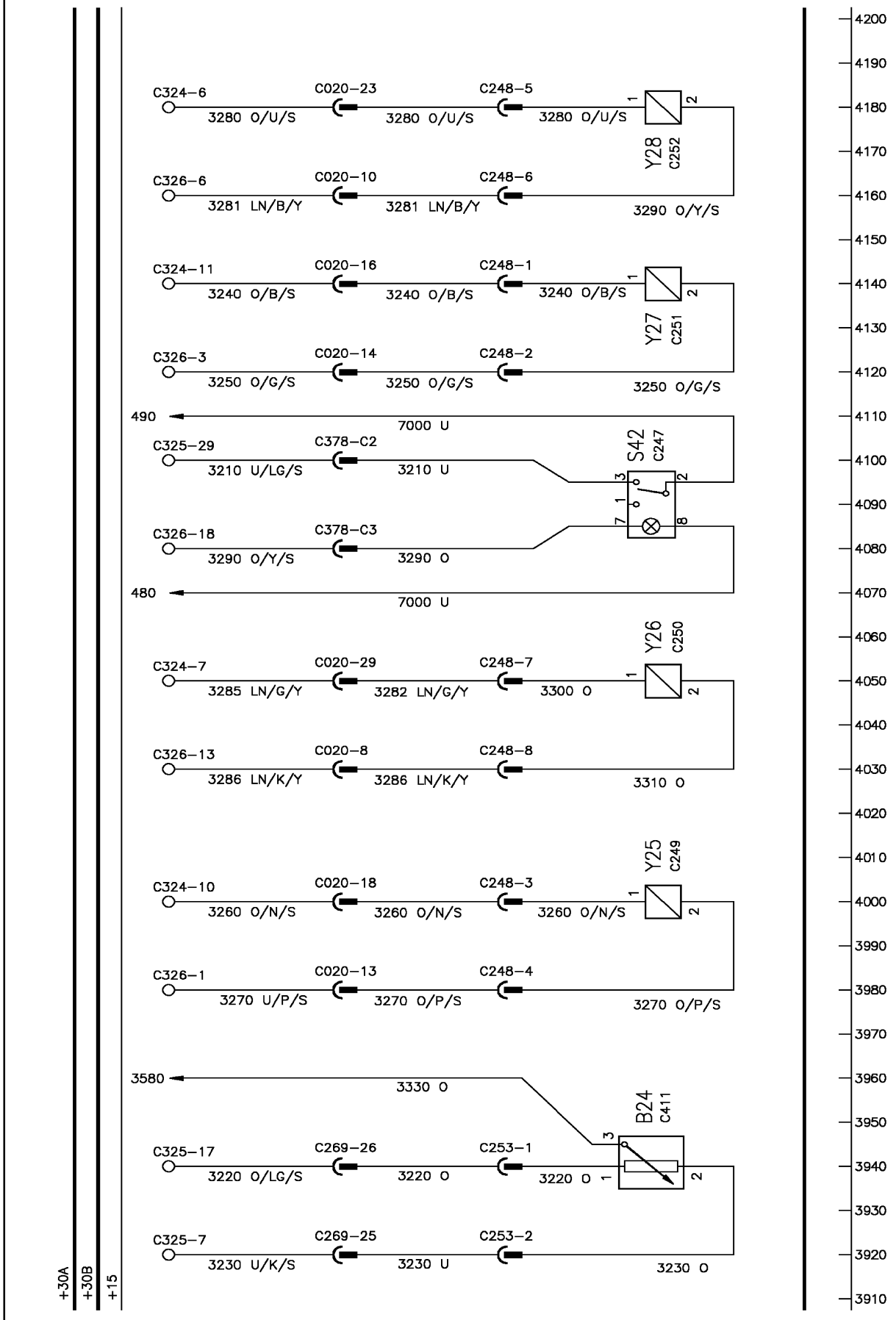
   A. Turn the keystart ON. Measure the voltage between connector:

   C249 pin **1 (O/N/S)** and **ground**

   C249 pin **2 (O/P/S)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28 C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27 C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42 C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN/G/Y
3300 O
Y26 C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25 C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24 C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
4070
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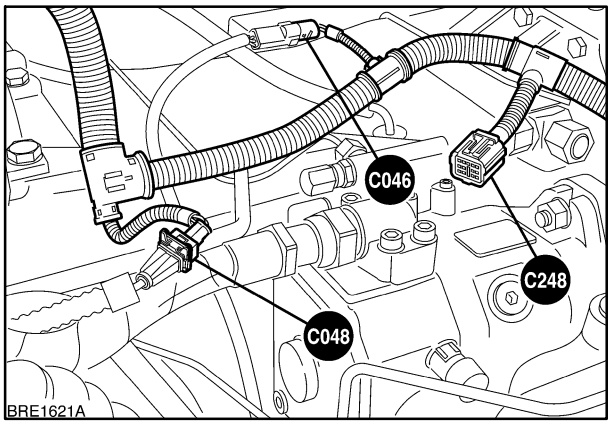
3910



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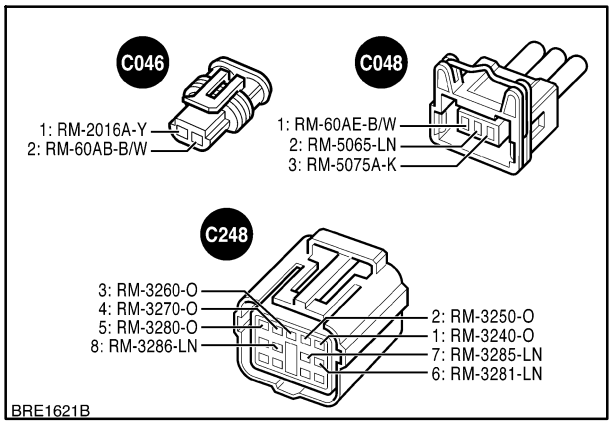
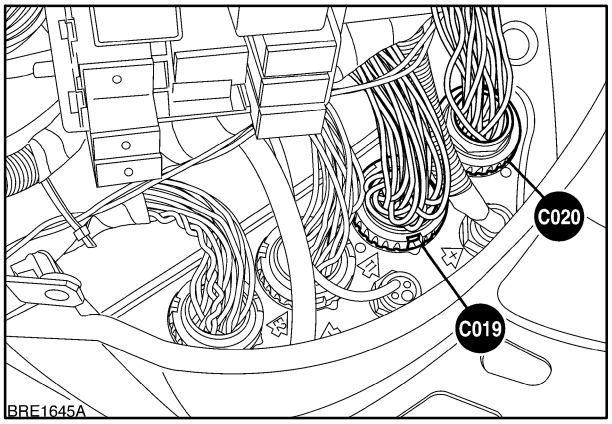
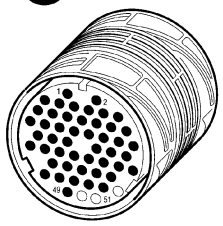


BRE1621B



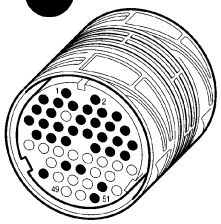
BRE1645A

C019



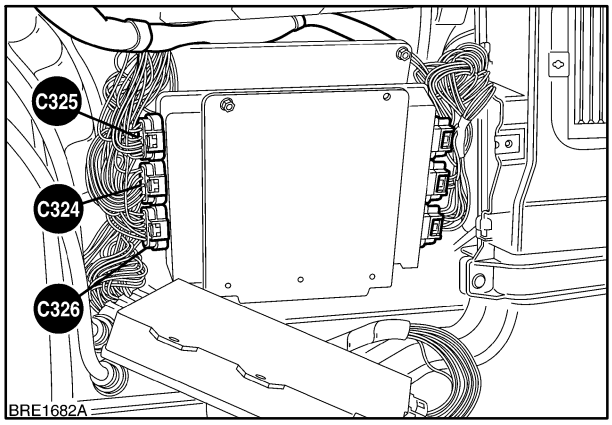
1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



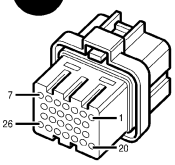
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



C324

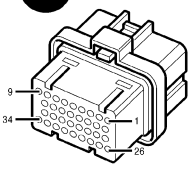
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

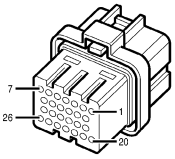
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 10004 - FRONT AXLE POTENTIOMETER THRESHOLD IS HIGHER THAN THE SET LIMIT

Possible failure modes:

1. Incorrect potentiometer linkage length
2. Faulty potentiometer linkage
3. Faulty connector
4. Faulty potentiometer

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the front axle potentiometer connector **C253** and the inline harness connector **C269**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

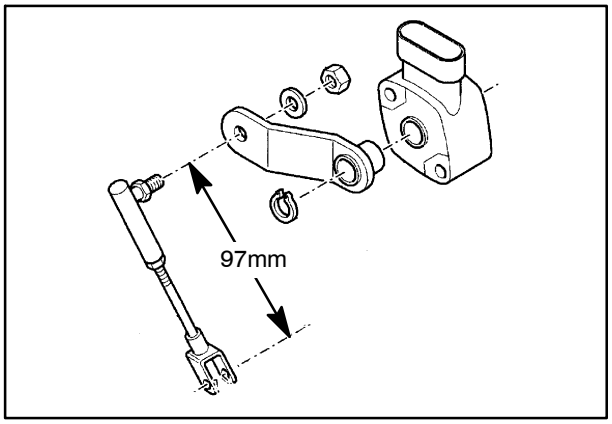
2. Check the calibration values.

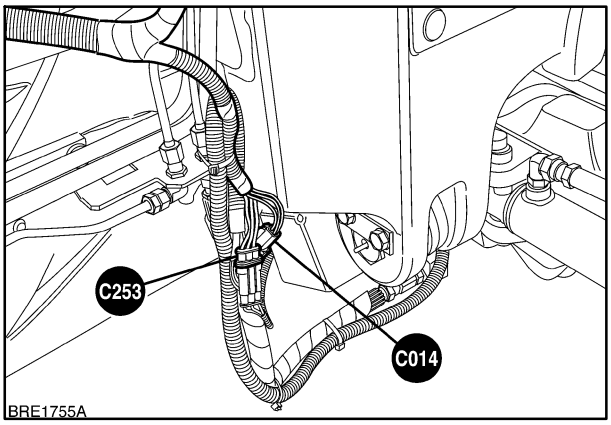
   A. Perform the auto calibration procedure (ACP). Record the higher and lower potentiometer values displayed. If the values displayed are greater than 970 and less than 150, check the potentiometer linkage length is 97mm and that no damage to the linkage is indicated. Adjust, repair or replace as required and perform the ACP.

   B. If the potentiometer linkage is okay, continue to step 3.

3. Check the potentiometer in H9 Channel 26.

   A. Remove the potentiometer from the mounting and leave the connector connected. Turn the potentiometer fully clockwise and counter clockwise. If the values displayed are not approximately 12 - 84**,** replace the potentiometer and perform the ACP.





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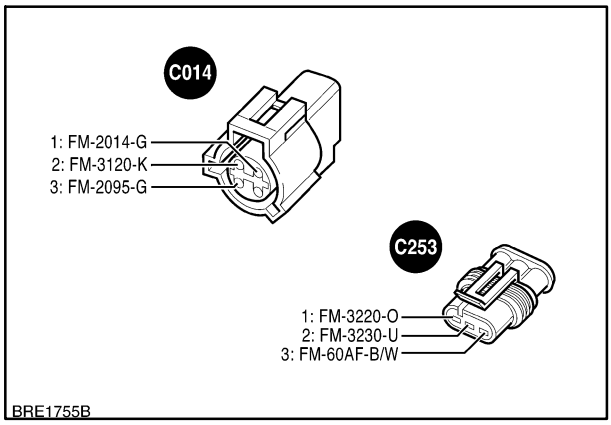
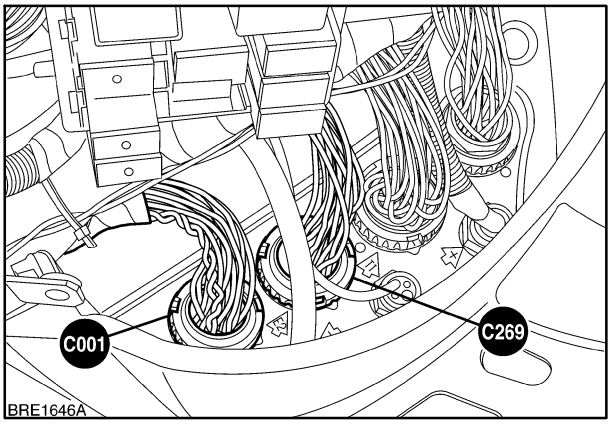
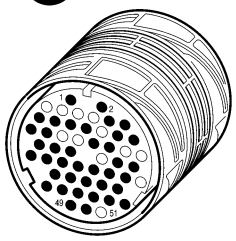


BRE1755B



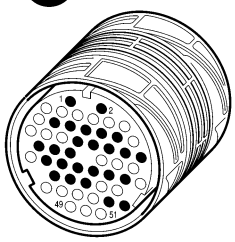
BRE1646A

C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 10005 – FRONT AXLE POTENTIOMETER THRESHOLD IS LOWER THAN THE SET LIMIT

Possible failure modes:

1. Incorrect potentiometer linkage length
2. Faulty potentiometer linkage
3. Faulty connector
4. Faulty potentiometer

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the front axle potentiometer connector **C253** and the inline harness connector **C269**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

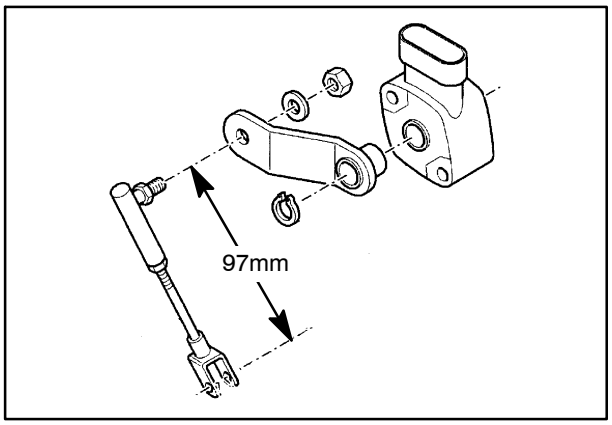
2. Check the calibration values.

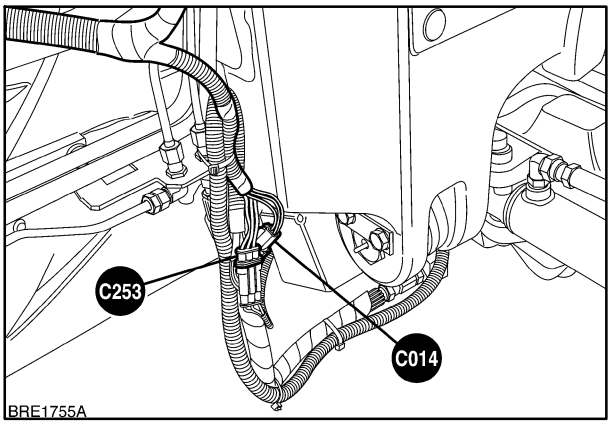
   A. Perform the auto calibration procedure (ACP). Record the higher and lower potentiometer values displayed. If the values displayed are greater than 970 and less than 150, check the potentiometer linkage length is 97mm and that no damage to the linkage is indicated. Adjust, repair or replace as required and perform the ACP.

   B. If the potentiometer linkage is okay, continue to step 3.

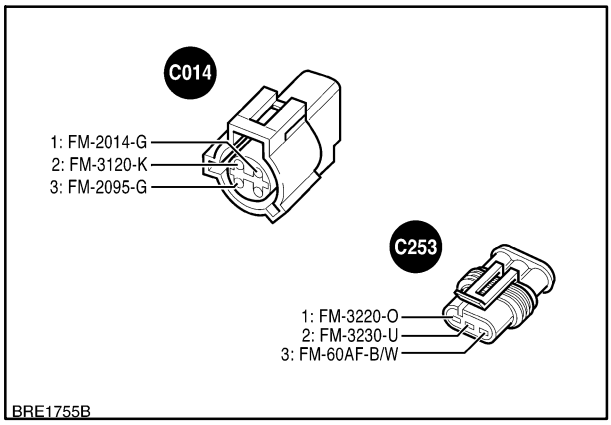
3. Check the potentiometer in H9 Channel 26.

   A. Remove the potentiometer from the mounting and leave the connector connected. Turn the potentiometer fully clockwise and counter clockwise. If the values displayed are not approximately 12 – 84**,** replace the potentiometer and perform the ACP.

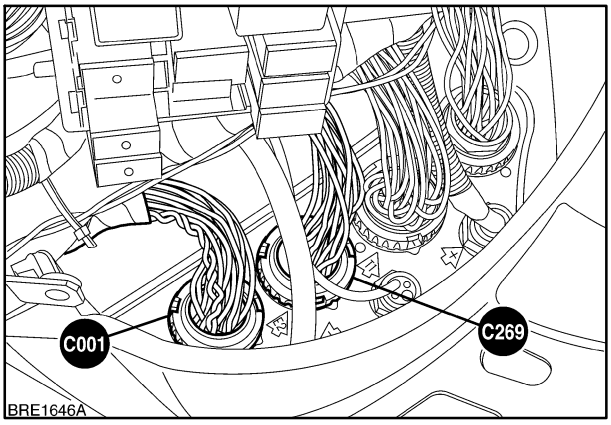




BRE1755A

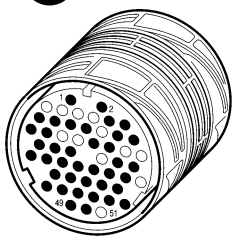


BRE1755B



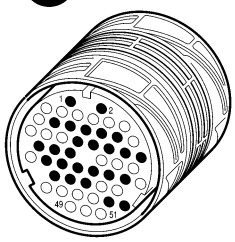
BRE1646A

C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 10007 - FRONT AXLE WEIGHT HAS BEEN REDUCED BUT THE SUSPENSION IS UNABLE TO RESET NOMINAL HEIGHT

Possible failure modes:

1. Incorrect calibration
2. Incorrect potentiometer linkage length
3. Faulty potentiometer linkage

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

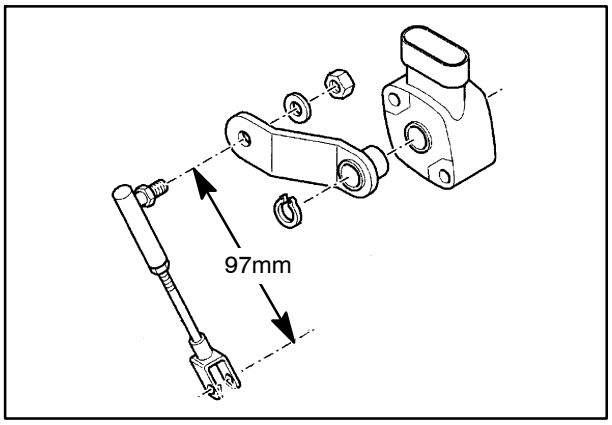
1. Check for other error codes.

   A. Perform the auto calibration procedure (ACP). If any 'U' error codes are displayed during the ACP, continue to the test for the 'U' error code that is displayed.

   B. If no other error code is being displayed, continue to step 2

2. Check the potentiometer linkage length.

   A. Check the potentiometer linkage length is 97mm and that no damage to the linkage is indicated. Adjust, repair or replace as required and perform the ACP.



ERROR CODE 10008 – FRONT AXLE WEIGHT HAS BEEN INCREASED BUT THE SUSPENSION IS UNABLE TO RESET NOMINAL HEIGHT

Possible failure modes:

1. Incorrect calibration
2. Incorrect potentiometer linkage length
3. Faulty potentiometer linkage

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

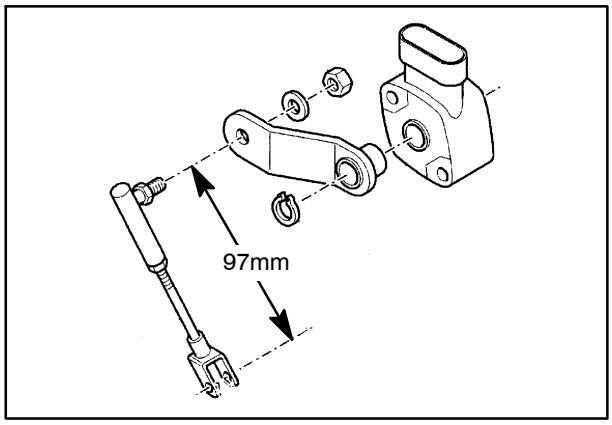
1. Check for other error codes.

   A. Perform the auto calibration procedure (ACP). If any 'U' error codes are displayed during the ACP, continue to the test for the 'U' error code that is displayed.

   B. If no other error code is being displayed, continue to step 2

2. Check the potentiometer linkage length.

   A. Check the potentiometer linkage length is 97mm and that no damage to the linkage is indicated. Adjust, repair or replace as required and perform the ACP.



ERROR CODE 10009 - LOWER LOCKOUT SOLENOID ERROR

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the lower lockout solenoid connector **C250** (identified with a black Band), the front suspension connector **C248** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the lower lockout solenoid.

   A. Disconnect the lower lockout solenoid connector **C250**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 6 Ohms at 20 degrees centigrade, remove and replace the solenoid.

   B. If the resistance indicated is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect the controller connectors **C324** and **C326**. Check between connector:

   C250 pin **1 (O)** and **C324** pin **7 (LN/G/Y)**

   C250 pin **2 (O)** and **C326** pin **13 (LN/K/Y)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 4.

4. Check for a short to ground.

   A. Check between connector:

   C250 pin **1 (O)** and **ground**

   C250 pin **2 (O)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, continue to step 5.

5. Check for a short to +12 Volts.

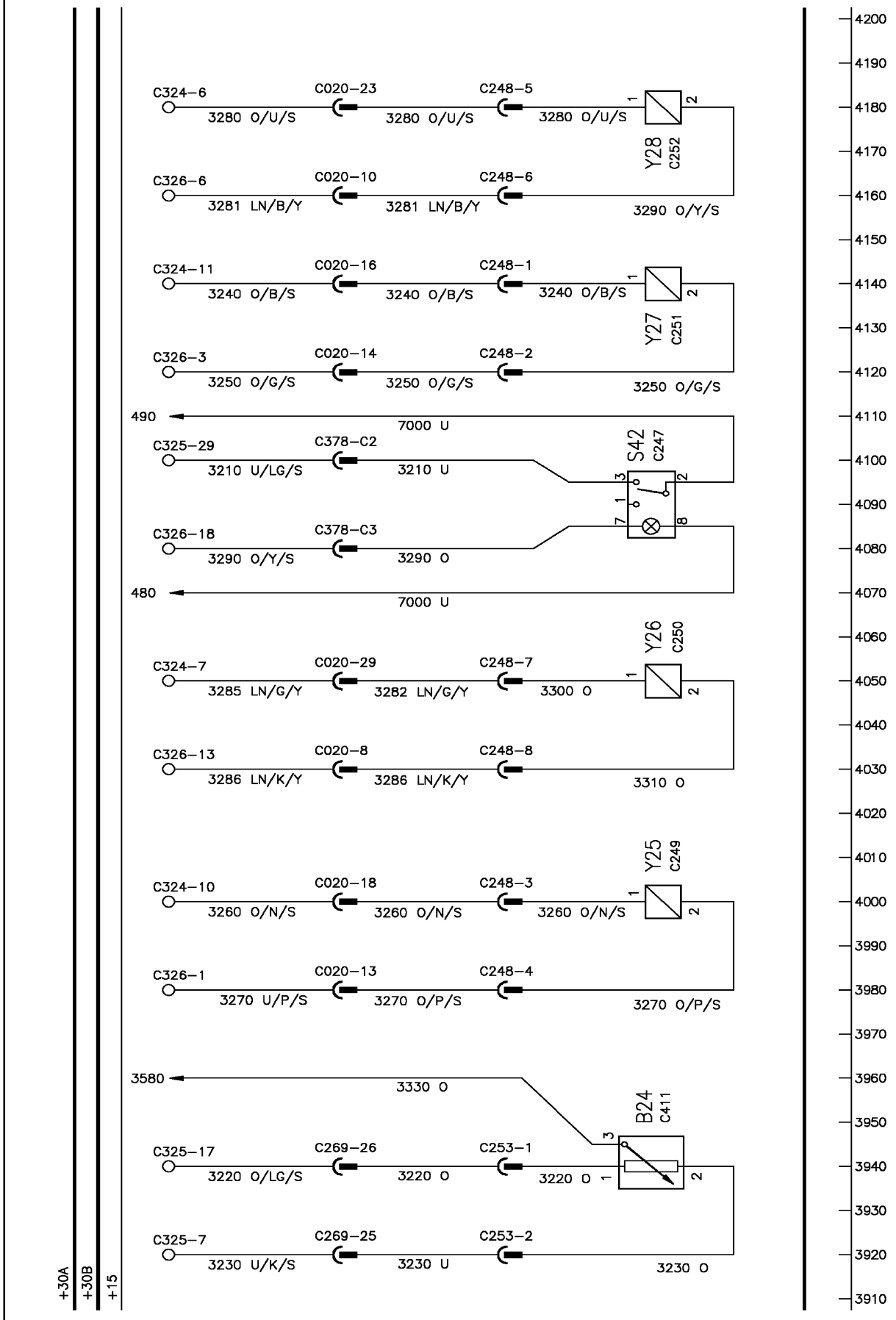
   A. Turn the keystart ON. Measure the voltage between connector:

   C250 pin **1 (O)** and **ground**

   C250 pin **2 (O)** and **ground**

   If a voltage is indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30A
+30B
+15
C324-6
C020-23
C248-5
3280 O/U/S
3280 O/U/S
3280 O/U/S
Y28 C252
C326-6
C020-10
C248-6
3281 LN/B/Y
3281 LN/B/Y
3290 O/Y/S
C324-11
C020-16
C248-1
3240 O/B/S
3240 O/B/S
3240 O/B/S
Y27 C251
C326-3
C020-14
C248-2
3250 O/G/S
3250 O/G/S
3250 O/G/S
490
7000 U
C325-29
C378-C2
3210 U/LG/S
3210 U
S42 C247
C326-18
C378-C3
3290 O/Y/S
3290 O
480
7000 U
C324-7
C020-29
C248-7
3285 LN/G/Y
3282 LN/G/Y
3300 O
Y26 C250
C326-13
C020-8
C248-8
3286 LN/K/Y
3286 LN/K/Y
3310 O
C324-10
C020-18
C248-3
3260 O/N/S
3260 O/N/S
3260 O/N/S
Y25 C249
C326-1
C020-13
C248-4
3270 U/P/S
3270 O/P/S
3270 O/P/S
3580
3330 O
B24 C411
C325-17
C269-26
C253-1
3220 O/LG/S
3220 O
3220 O
C325-7
C269-25
C253-2
3230 U/K/S
3230 U
3230 O
4200
4190
4180
4170
4160
4150
4140
4130
4120
4110
4100
4090
4080
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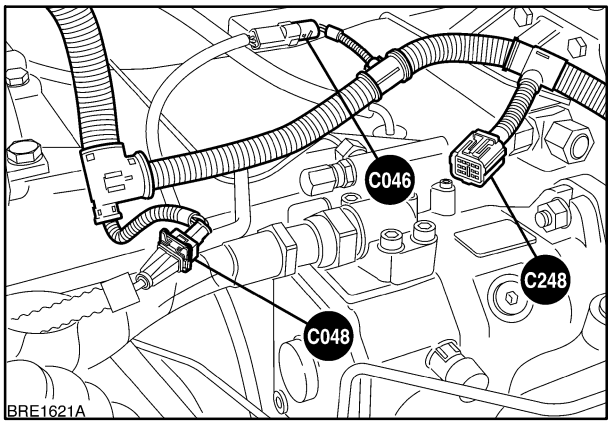

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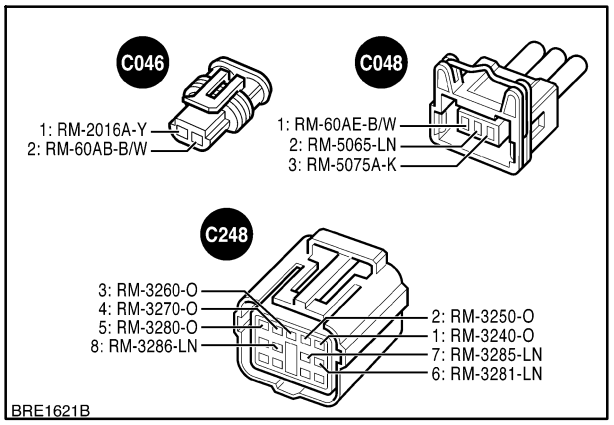
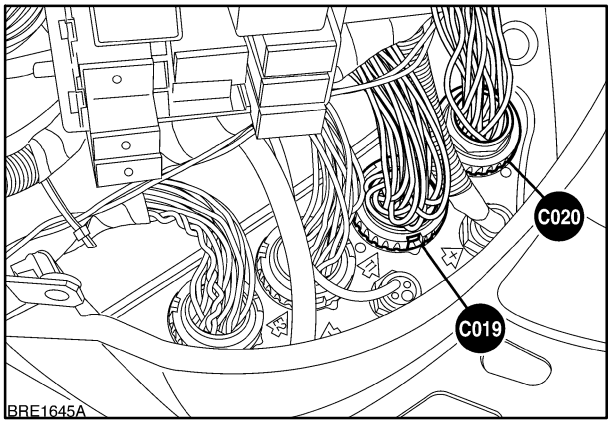
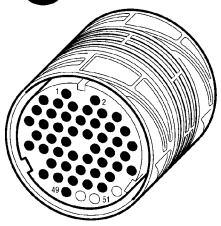


BRE1621B



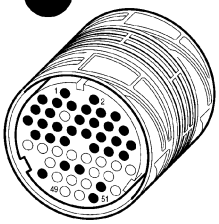
BRE1645A

C019



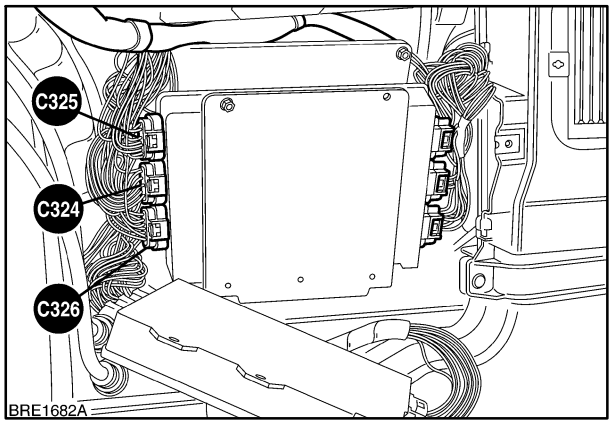
1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



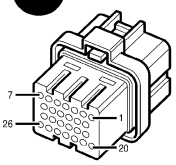
1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B



C324

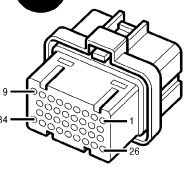
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y



13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325

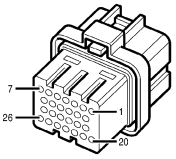
2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S



17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326

1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y



18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 10024 - THE FRONT SUSPENSION IS NOT CALIBRATED

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Perform the auto calibration procedure (ACP).

ERROR CODE 10099 – FRONT SUSPENSION MODE IS NOT ENABLED

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Enable Front Suspension option in H3 menu screen of DD processor.

NOTES

14001 - 15000 INSTRUMENT CLUSTER ERROR CODE LISTING

Error Code	Error description
14001	Rear power take off (PTO) solenoid overcurrent
14002	Rear power take off (PTO) solenoid stuck off
14011	Engine speed sensor open circuit or short to high voltage
14012	Engine speed sensor short to ground
14021	Radar sensor open circuit or short to high voltage
14022	Radar sensor short to ground
14031	Front PTO solenoid overcurrent
14032	Front PTO solenoid stuck off
14041	Engine coolant temperature sensor short to high voltage
14042	Engine coolant temperature sensor open circuit or short to ground
14051	Fuel tank level sender open circuit or short to high voltage
14052	Fuel tank level sender short to ground
14061	Airbrake pressure sensor open circuit or short to high voltage
14071	Front hitch position potentiometer short circuit
14072	Front hitch position potentiometer open circuit
14081	Engine oil pressure sensor short to high voltage
14082	Engine oil pressure sensor open circuit or short to ground
14091	Wheel speed sensor open circuit or short to high volltage
14092	Wheel speed sensor short to ground
14100	Airbrake option needs to be set
14101	Fuel contaminated (water in fuel) sensor not connected
14200	Error with Electrical Programmable Read Only Memory (EEPROM)
14900	Central controller not connected
14901	Engine module missing
14902	Auxiliary controller not connected
14903	Small control module not connected
14905	Instrument cluster key pad not connected
14906	FSS (fast steer system) missing
14907	Gear shift indicator missing

ERROR CODE 14001 - REAR POWER TAKE OFF (PTO) SOLENOID OVERCURRENT

Possible failure modes:

1. Faulty connector
2. Faulty rear PTO solenoid
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error codes 5007 or 5008 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14002 - REAR POWER TAKE OFF (PTO) SOLENOID STUCK OFF

Possible failure modes:

1. Faulty connector
2. Faulty rear PTO solenoid
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error codes 5007 or 5008 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14011 - ENGINE SPEED SENSOR OPEN CIRCUIT OR SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty engine speed sensor
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the engine speed sensor connector **C287,** the ADIC connector **C079** and the inline harness connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the engine speed sensor.

   A. Check between the component side of the connector **C287** pins **1** and **2**. If the resistance indicated is not between:

   Magneti Marelli 600 - 740 Ohms at 20 degrees centigrade, remove and replace the sensor.

   Bosch 850 - 950 Ohms at 20 degrees centigrade, remove and replace the sensor.

   B. If the resistance indicated is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect connectors **C287** and **C079.** Check between:

   C287 pin **2 (K)** and **C079** pin **3 (K)**

   C287 pin **1 (G)** and **ground**

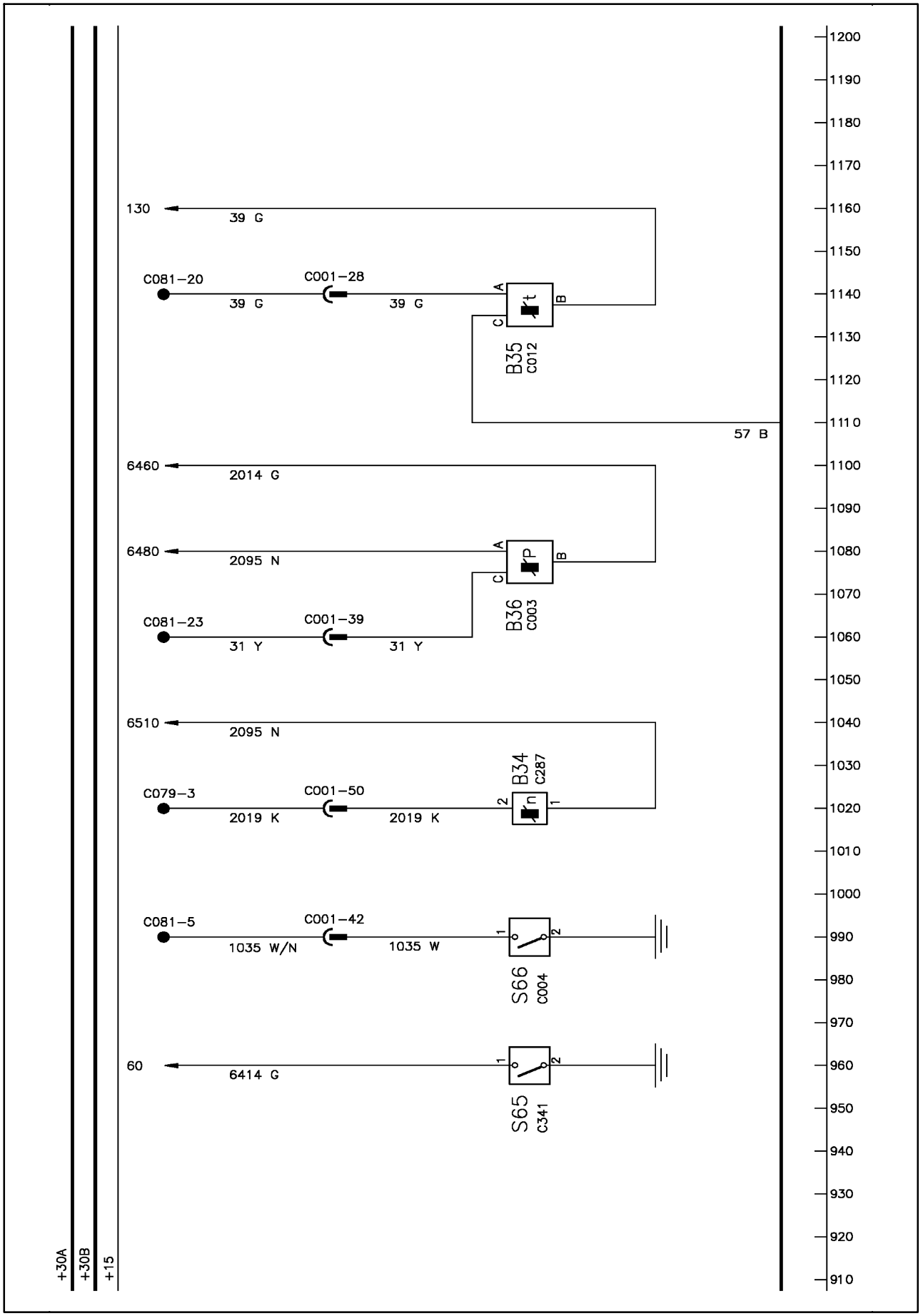
   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for short to + Ve voltage.

   A. Turn the key start ON. Measure the voltage between **C287** pin **2 (K)** and **ground**. If a short to +Ve voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
130
39 G
C081-20
39 G
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
A
B
C
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
2
1
C081-5
1035 W/N
C001-42
1035 W
1
2
S66
C004
60
6414 G
1
2
S65
C341
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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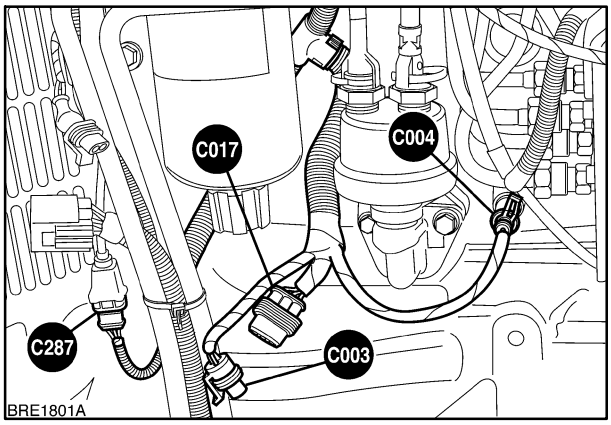
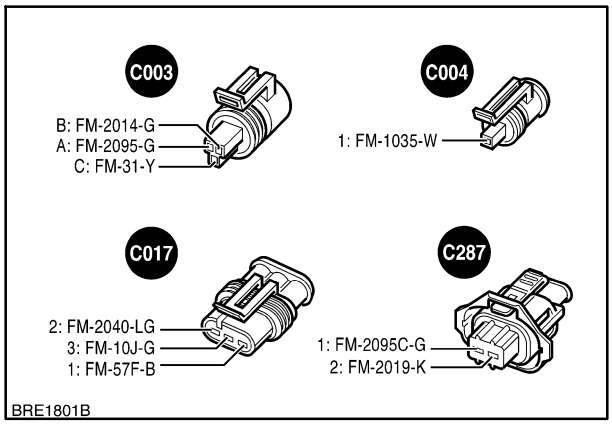
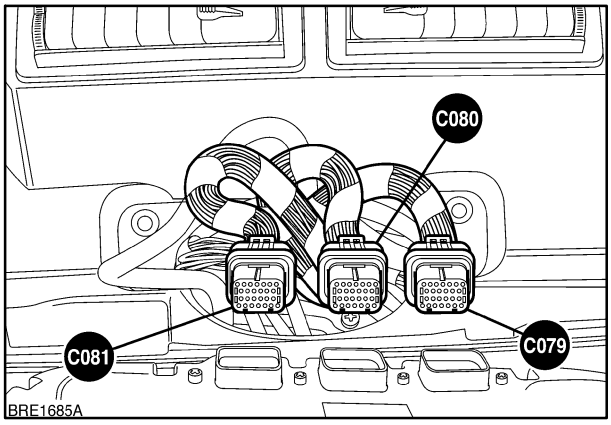
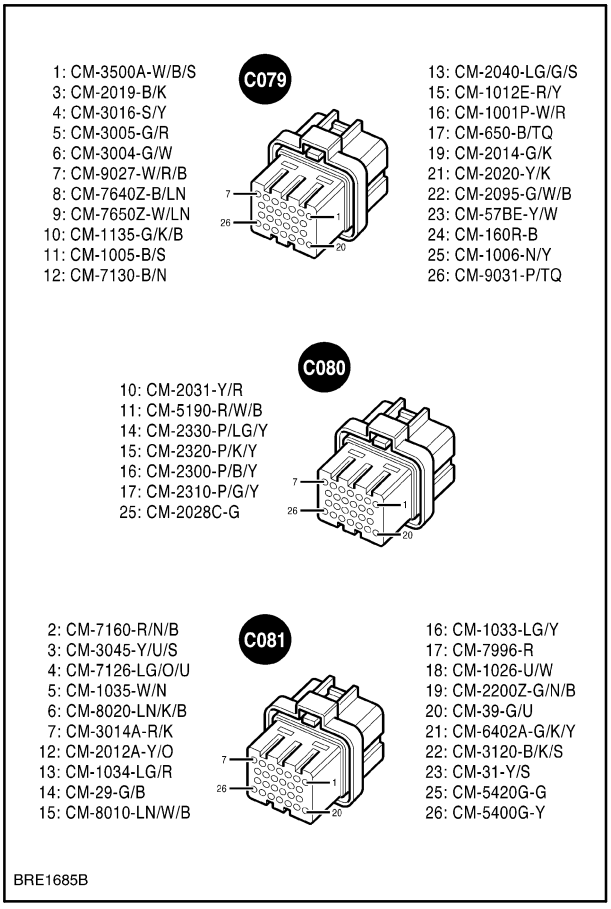
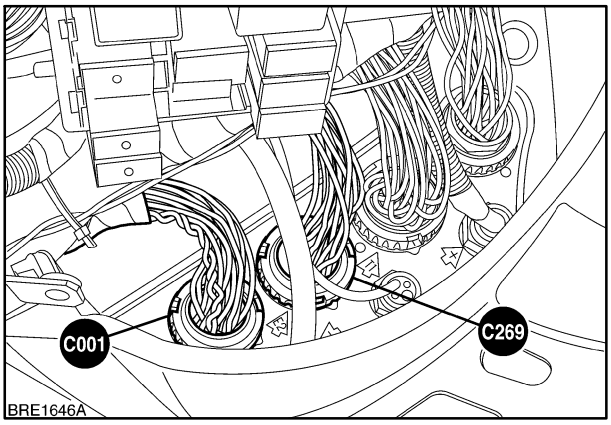
930
920
910


C017
C004
C287
C003
BRE1801A

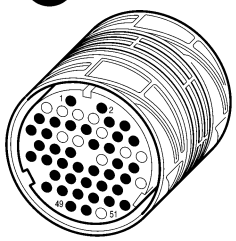

C003
B: FM-2014-G
A: FM-2095-G
C: FM-31-Y
C004
1: FM-1035-W
C017
2: FM-2040-LG
3: FM-10J-G
1: FM-57F-B
C287
1: FM-2095C-G
2: FM-2019-K
BRE1801B


C080
C081
C079
BRE1685A


C079
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

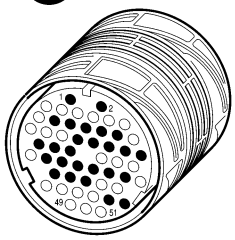


C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14012 - ENGINE SPEED SENSOR SHORT TO GROUND

Possible failure modes:

1. Faulty connector
2. Faulty engine speed sensor
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the engine speed sensor connector **C287**, the ADIC connector **C079** and the inline harness connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the engine speed sensor for short to ground.

   A. Disconnect connector **C287**. Check between the component side of the connector:

   C287 pin **1** and **ground**

   C287 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the engine speed sensor.

   B. If a short to ground is not indicated, continue to step 3.

3. Check for a short to ground.

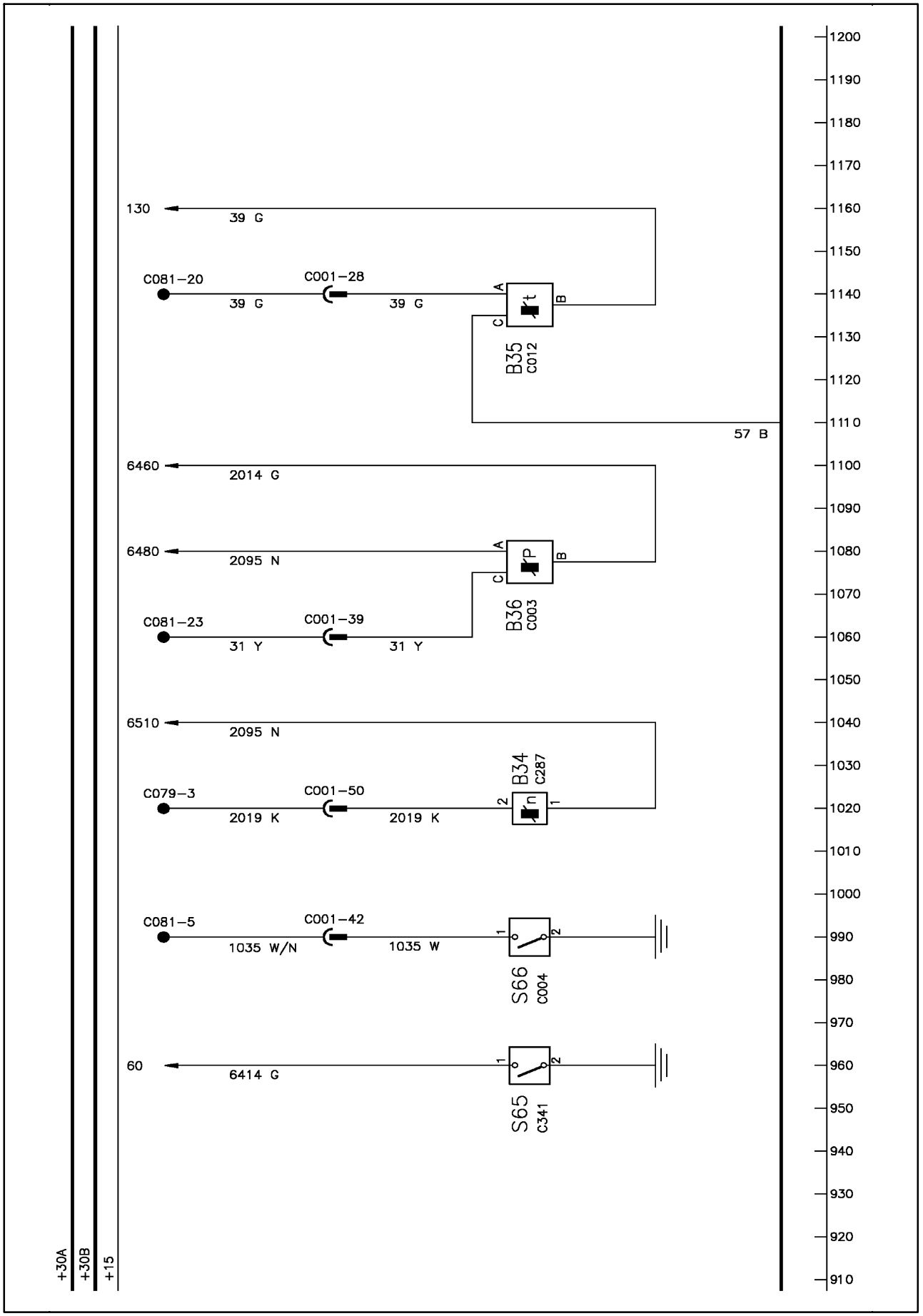
   A. Disconnect connector **C079**. Check between:

   C287 pin **1 (G)** and **ground**

   C287 pin **2 (K)** and **ground**

   If a short circuit to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
130
39 G
C081-20
39 G
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
A
B
C
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
2
1
C081-5
1035 W/N
C001-42
1035 W
1
2
S66
C004
60
6414 G
1
2
S65
C341
1200
1190
1180
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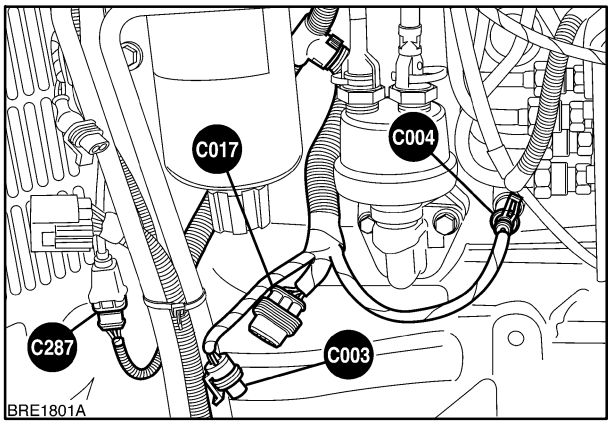
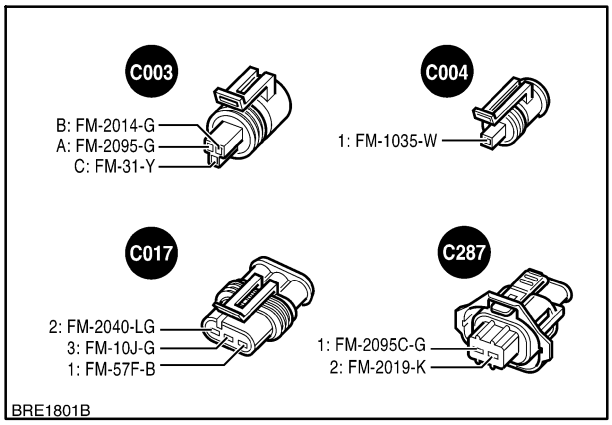
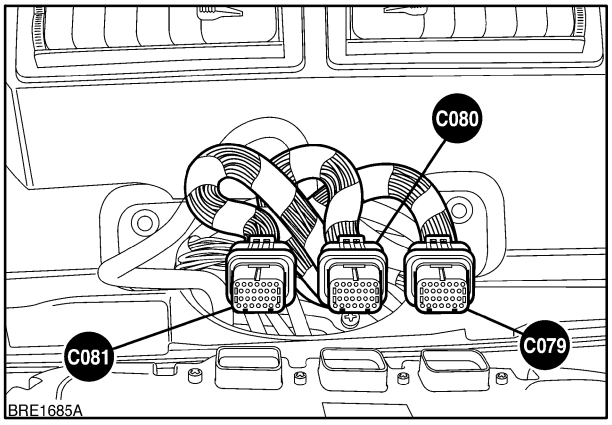

C017
C004
C287
C003
BRE1801A


C003
B: FM-2014-G
A: FM-2095-G
C: FM-31-Y
C004
1: FM-1035-W
C017
2: FM-2040-LG
3: FM-10J-G
1: FM-57F-B
C287
1: FM-2095C-G
2: FM-2019-K
BRE1801B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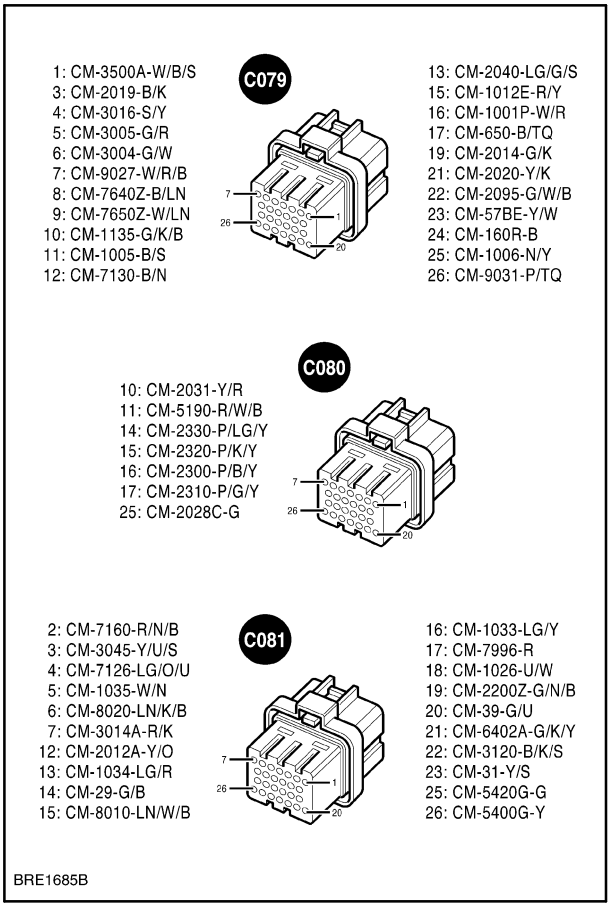
C081
C079
BRE1685A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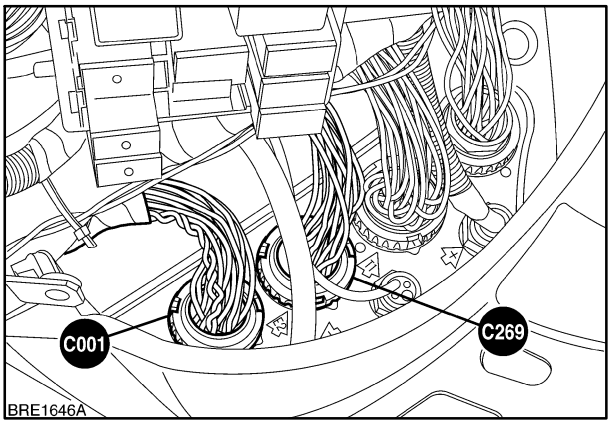
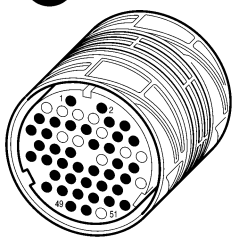
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
C079
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

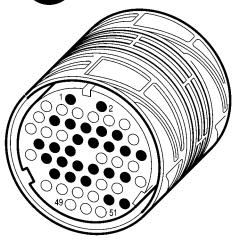


C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14021 - RADAR SENSOR OPEN CIRCUIT OR SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty radar sensor
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the radar sensor connector **C068,** the ADIC connector **C080** and the inline harness connector **C269**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for +12 volts.

   A. Disconnect connector **C068**. Turn the keystart ON. Check between connector **C068** pin **3 (R)** and **ground**. If +12 volts is not indicated, repair or replace the harness as required to fuse 20.

   B. If +12 is indicated, continue to step 4.

3. Check for an open circuit.

   A. Turn the keystar OFF. Disconnect connector **C080**. Check between connector:

   C068 pin **2 (G)** and **C080** pin **25 (G)**

   C068 pin **4 (Y)** and **C080** pin **10 (Y/TQ)**

   C068 pin **1 (B)** and **ground (B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

4. Check for short to + Ve voltage.

   A. Turn the key start ON. Measure the voltage between connector:

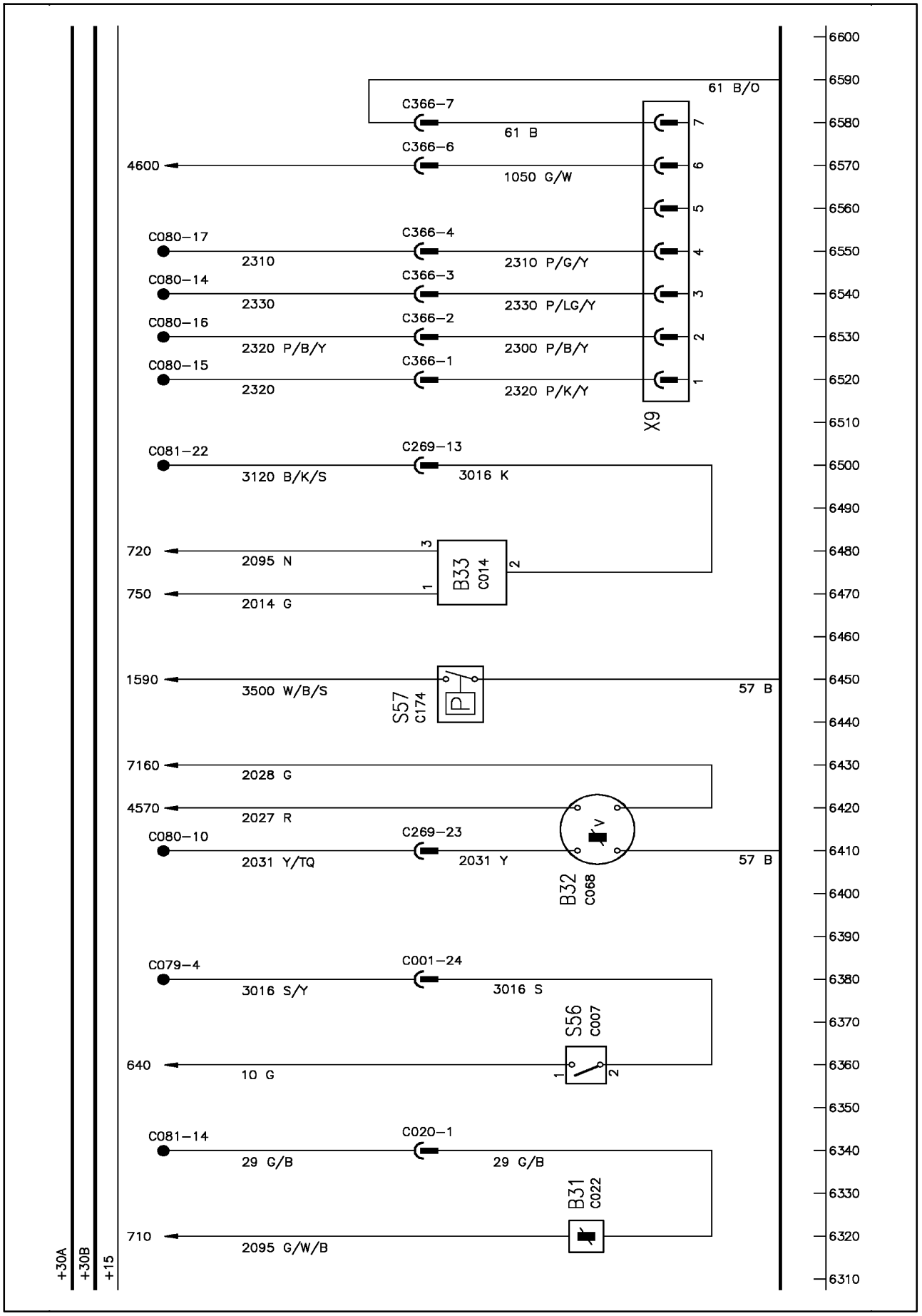
   C068 pin **2 (G)** and **C080** pin **25 (G)**

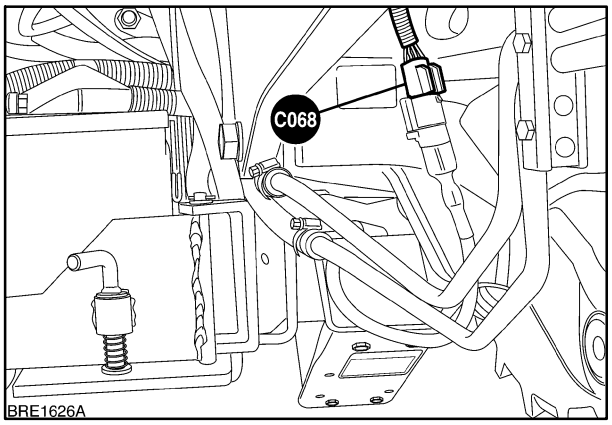
   C068 pin **4 (Y)** and **C080** pin **10 (Y/TQ)**

   If a short to +Ve voltage is indicated, repair or replace the harness as required.

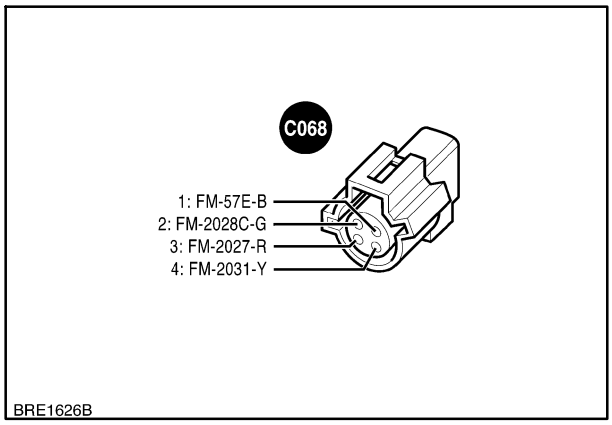
   B. If the harness is okay, remove and replace the radar sensor

   If the fault is still present, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

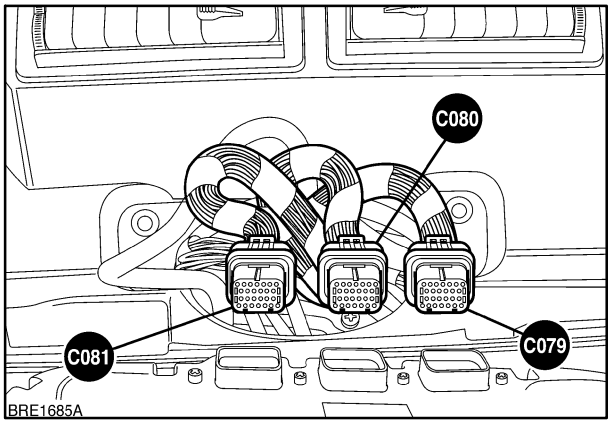

+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
B32
C068
57 B
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G/W/B



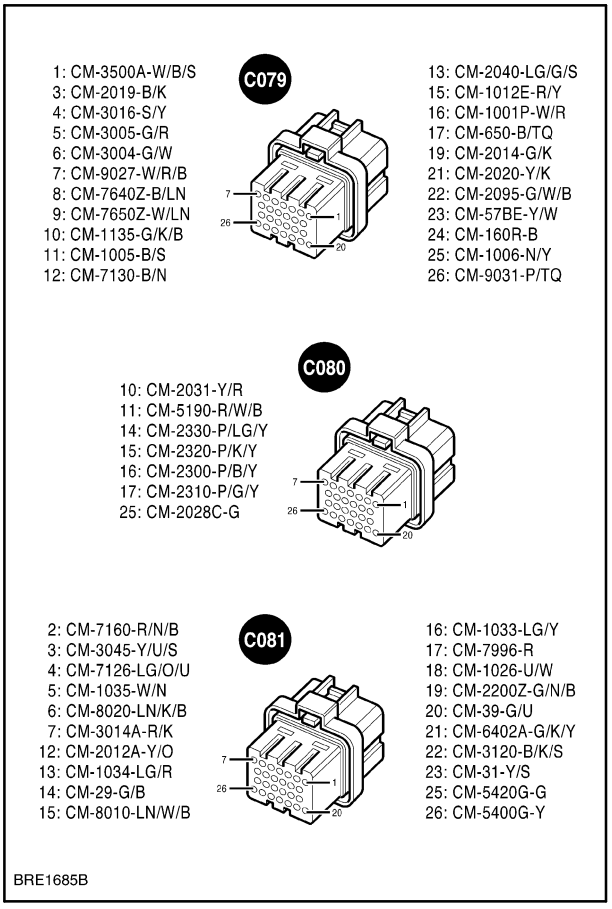
BRE1626A



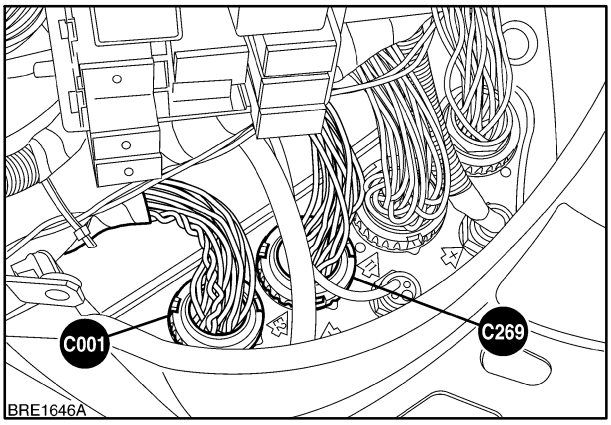
BRE1626B



BRE1685A

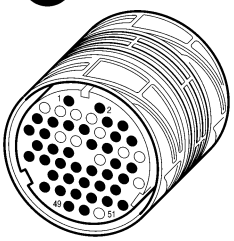


BRE1685B



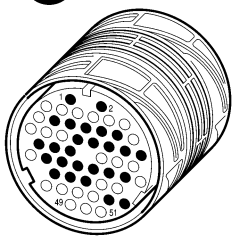
BRE1646A

C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14022 - RADAR SENSOR SHORT TO GROUND

Possible failure modes:

1. Faulty connector
2. Faulty radar sensor
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the radar sensor connector **C068,** the ADIC connector **C080** and the inline harness connector **C269**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground

   A. Disconnect connectors **C068** and **C080**. Check between connector:

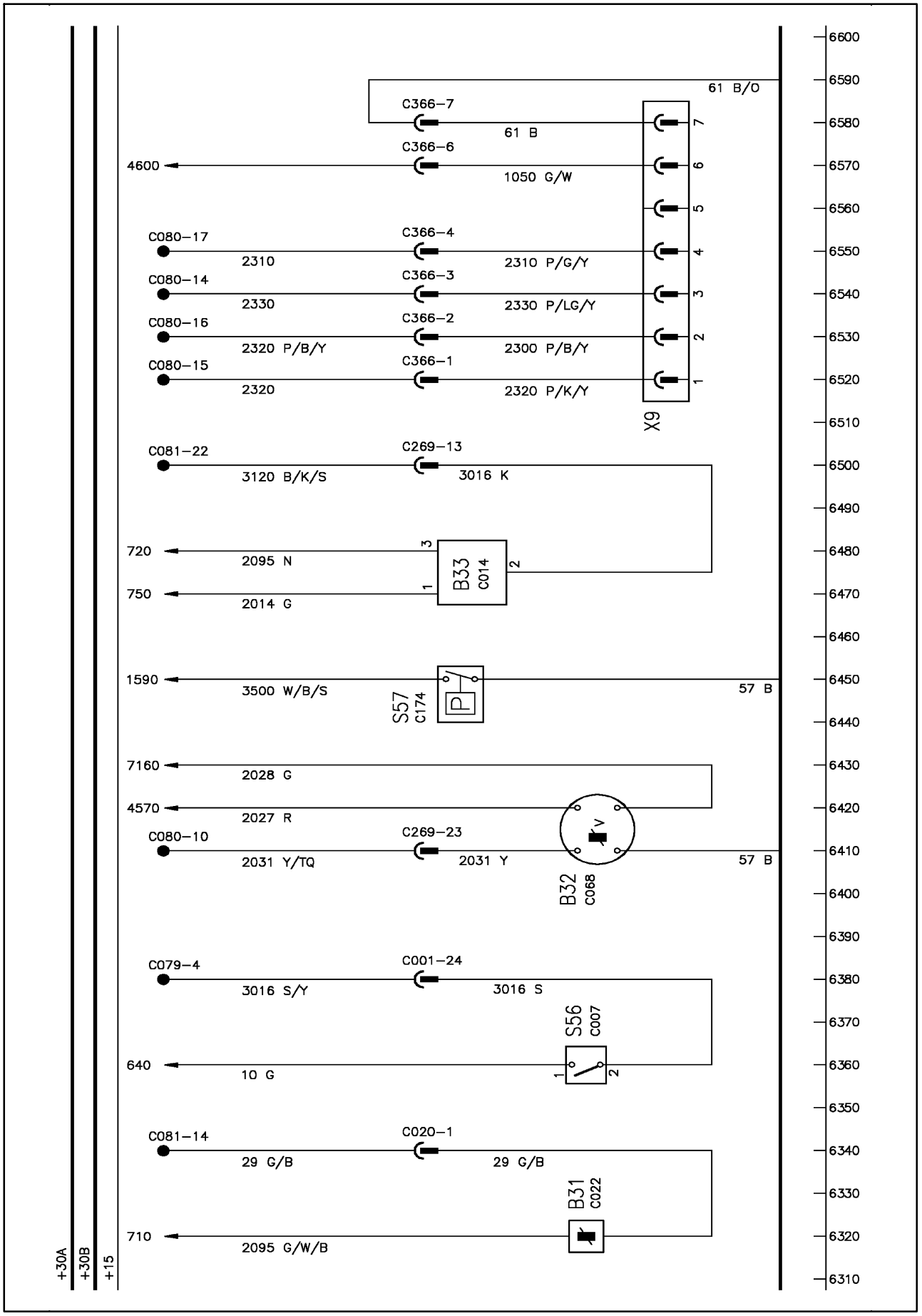
   C068 pin **2 (G)** and **ground**

   C068 pin **4 (Y)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the radar sensor

   If fault is still present, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
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6520
6510
6500
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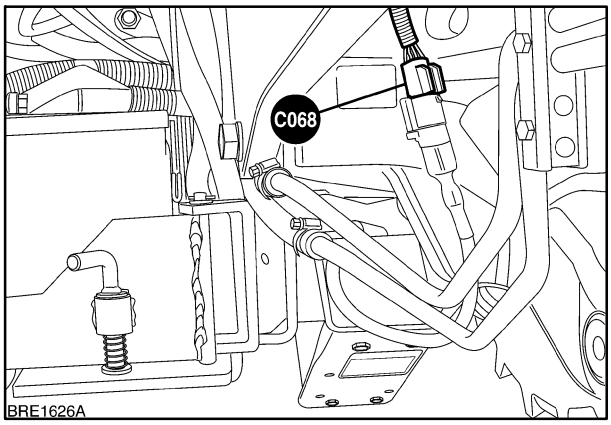
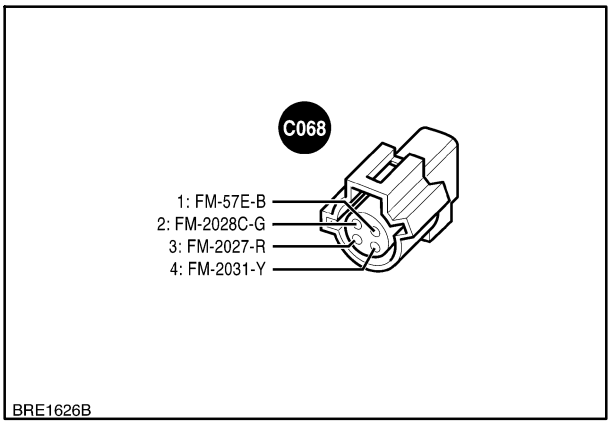
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
B32
C068
57 B
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G/W/B



BRE1626A



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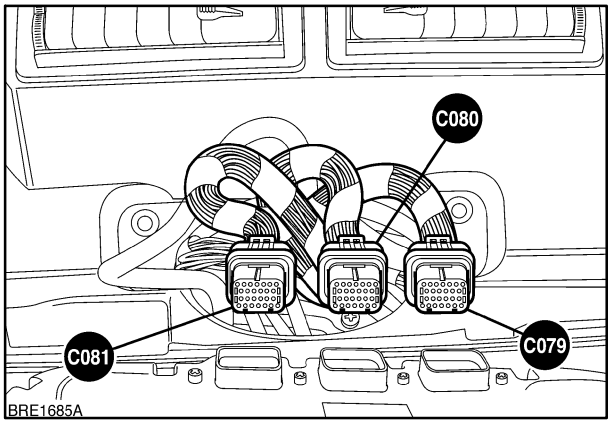

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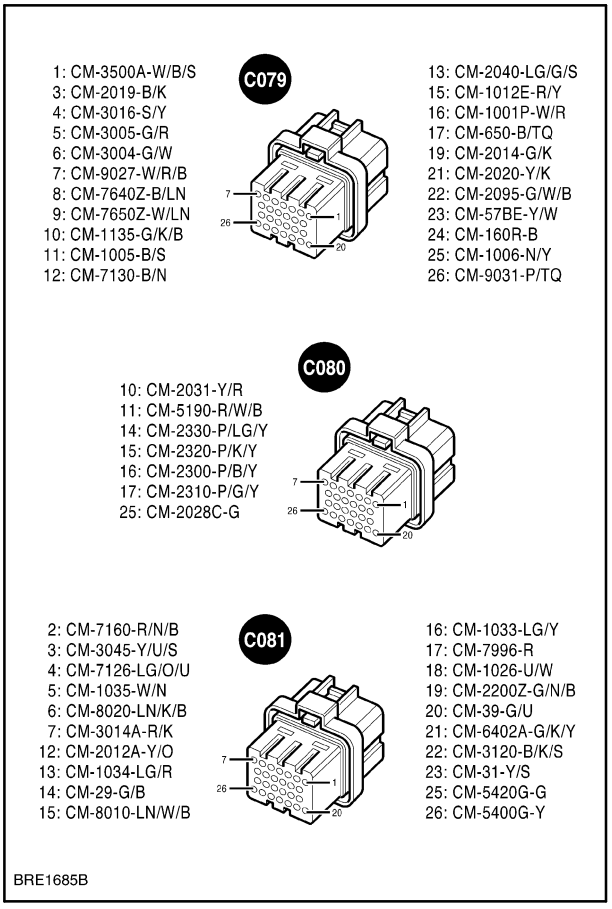

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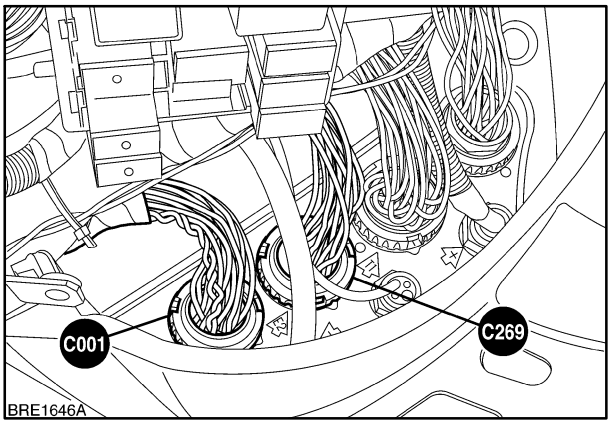
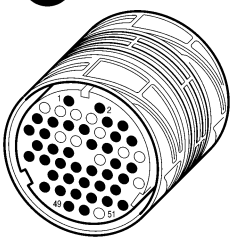


BRE1646A

C001



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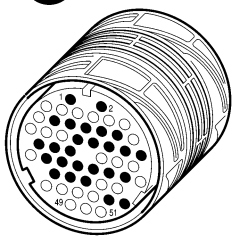
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



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2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14031 - FRONT POWER TAKE OFF (PTO) SOLENOID OVERCURRENT

Possible failure modes:

1. Faulty connector
1. Faulty front PTO solenoid
2. Faulty harness
3. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error codes 8007 or 8008 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14032 - FRONT POWER TAKE OFF (PTO) SOLENOID STUCK OFF

Possible failure modes:

1. Faulty connector
1. Faulty front PTO solenoid
2. Faulty harness
3. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error codes 8007 or 8008 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14041 - ENGINE COOLANT TEMPERATURE SENSOR SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty engine temperature sensor
3. Faulty harness

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the temperature sensor connector **C012**, the ADIC connector **C081** and the inline harness connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to + Ve voltage.

   A. Disconnect connector **C012**. Turn the keystyart ON.

   Check between connector:

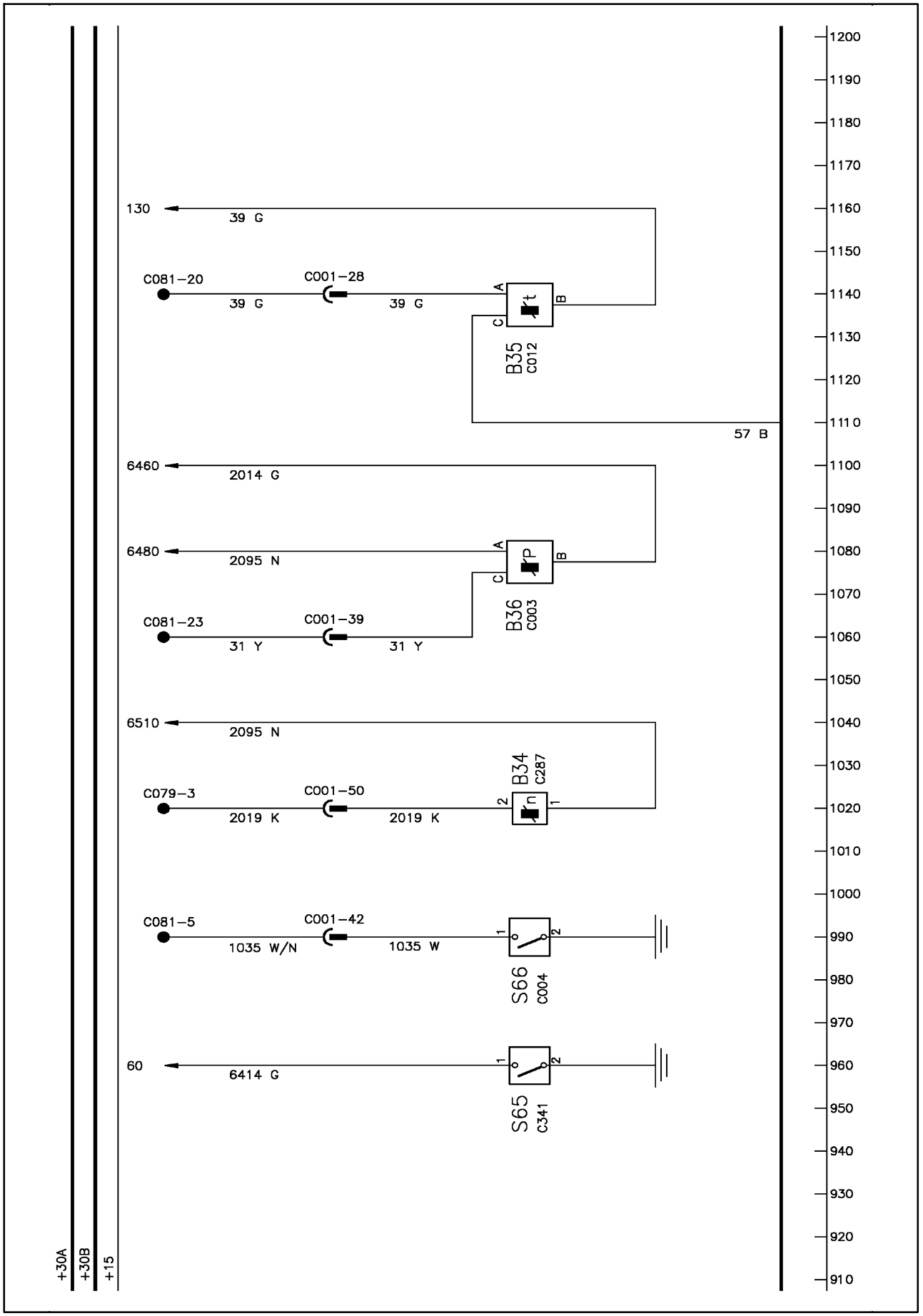
   C012 pin **A (G)** and **ground**

   C012 pin **B (G)** and **ground**

   C012 pin **C (B)** and **ground**

   If a short to + Ve is indicated, repiar or replace the harness as required.

   B. If the harness is okay, remove and replace the engine coolant temperature sensor.


+30A
+30B
+15
130
39 G
C081-20
39 G
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
A
B
C
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
2
1
C081-5
1035 W/N
C001-42
1035 W
1
2
S66
C004
60
6414 G
1
2
S65
C341
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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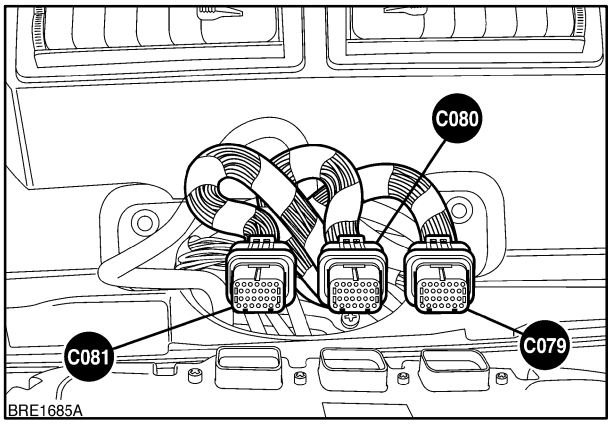
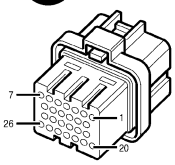
950
940
930
920
910



BRE1685A

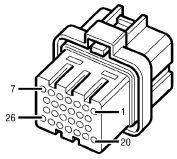
C079

1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ



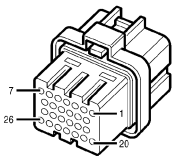
C080

10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G

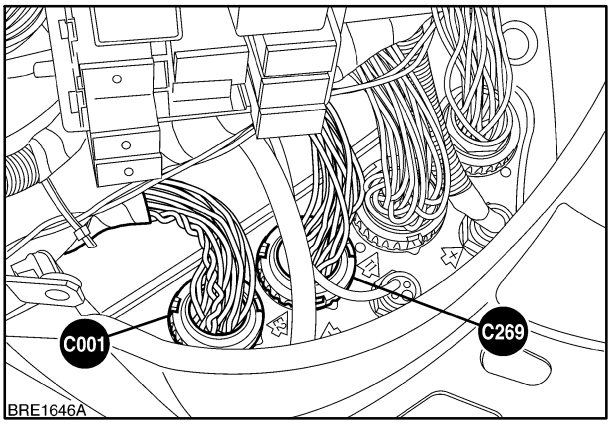


C081

2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y

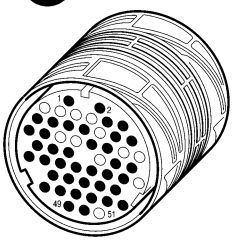


BRE1685B



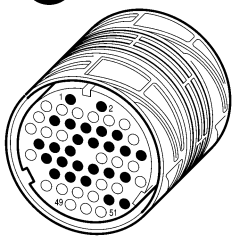
BRE1646A

C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14042 - ENGINE COOLANT TEMPERATURE SENSOR OPEN CIRCUIT OR SHORT TO GROUND

Possible failure modes:

1. Faulty connector
2. Faulty engine temperature sensor
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the temperature sensor connector **C012** and ADIC connector **C081** and the inline harness connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the temperature sensor.

   A. Disconnect connector **C012**. Measure the resistance between the component side of connector **C012** pin **A** and **C**. If the resistance indicated is not approximately 2.5K Ohms at 20 degrees centigrade**,** remove and replace the temperature sensor.

   B. If the temperature sensor is okay, continue to step 3.

3. Check for short to ground.

   A. Disconnect connector **C012** and **C081**. Check between connector:

   C012 pin **A (G)** and **ground**

   C012 pin **B (G)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground to is not indicated, continue to step 4.

4. Check for open circuit.

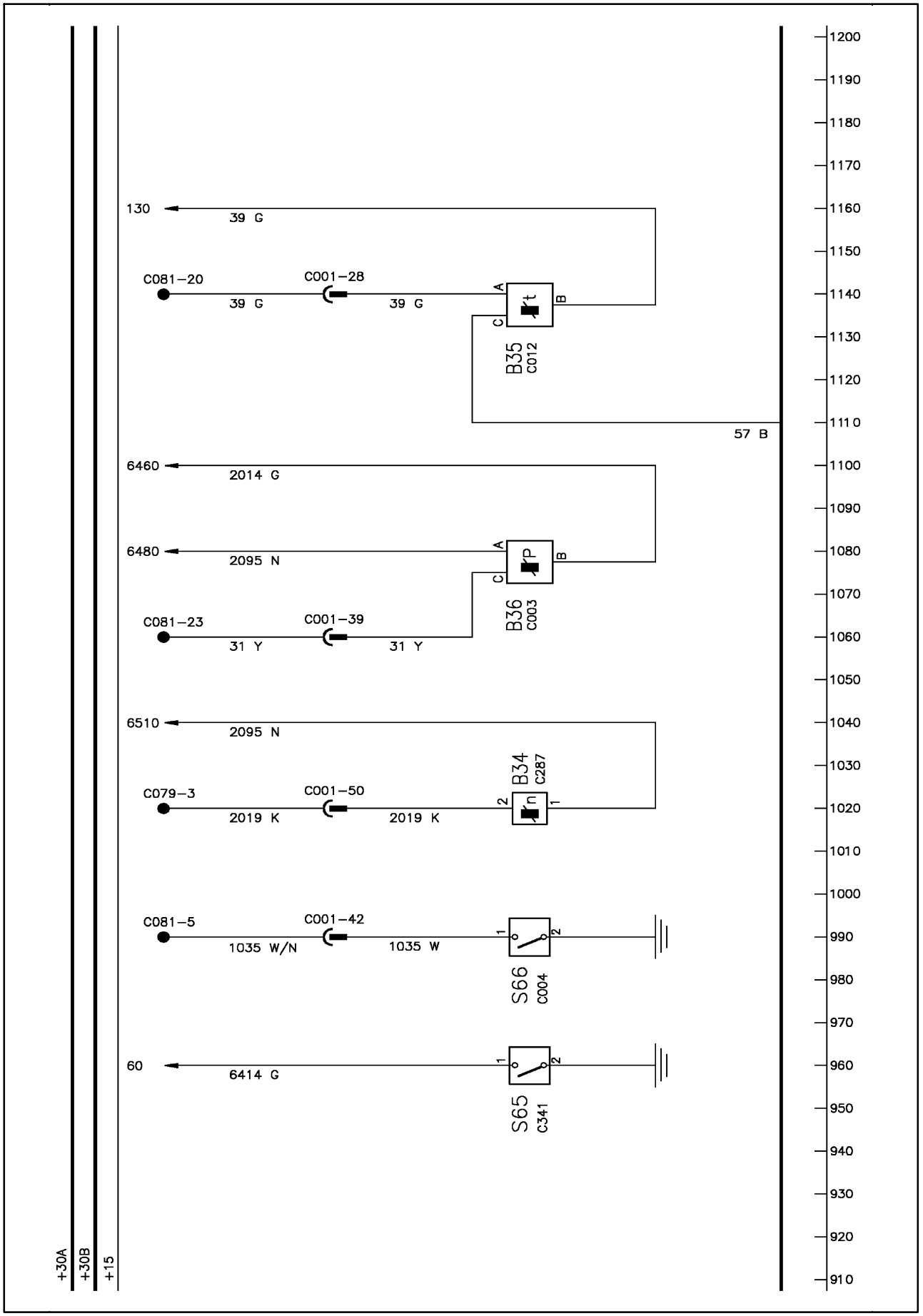
   A. Check between connector:

   C012 pin **A (G)** and **C081** pin **20 (G)**

   C012 pin **C (B)** and **ground**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
130
39 G
C081-20
39 G
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
C081-23
31 Y
C001-39
31 Y
B36
C003
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
S65
C341
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
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960
950
940
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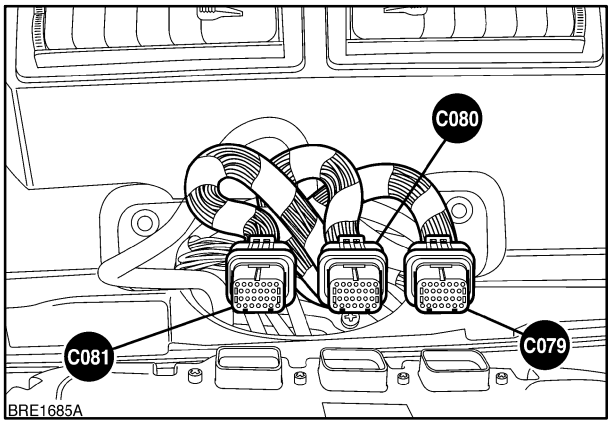
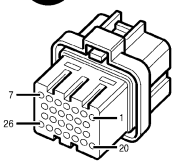
920
910



BRE1685A

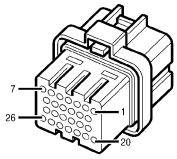
C079

1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ



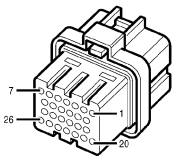
C080

10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G

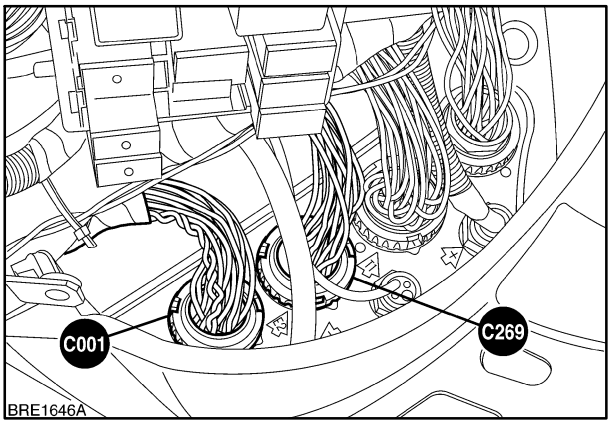


C081

2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y

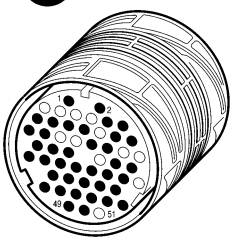


BRE1685B



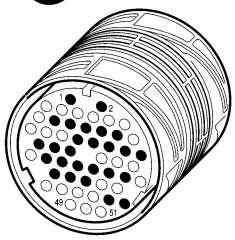
BRE1646A

C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14051 - FUEL TANK LEVEL SENDER OPEN CIRCUIT OR SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty fuel tank level sender
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel tank level sender potentiometer in H9 channel 25.

   A. Remove the the fuel tank sendor. With the connector still connected move sender from the maximum to minimum positon. If the values do not change continuously between 50 and 400 steps continue to step 2.

   B. If values displayed are okay, while in H9 channel 25 wiggle the harness and connectors to check for a intermittent circuit. Channel 25 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the fuel tank level sender connector **C022,** the ADIC connector **C081** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check the fuel tank level sender operation.

   A. Disconnect connector **C022**.

   Check between the component side of the connector **C022** pin **1** and **2**. If the resistance indicated is not between 30 Ohms at full and 250 Ohms at empty, remove and replace the sender.

   B. If the resistance indicated is okay, continue to step 4.

4. Check for an open circuit.

   A. Disconnect connector **C081**. Check between connector:

   C022 pin **2 (W/G/B)** and **ground**

   C022 pin **1 (G/B)** and **C081** pin **14 (G/B)**

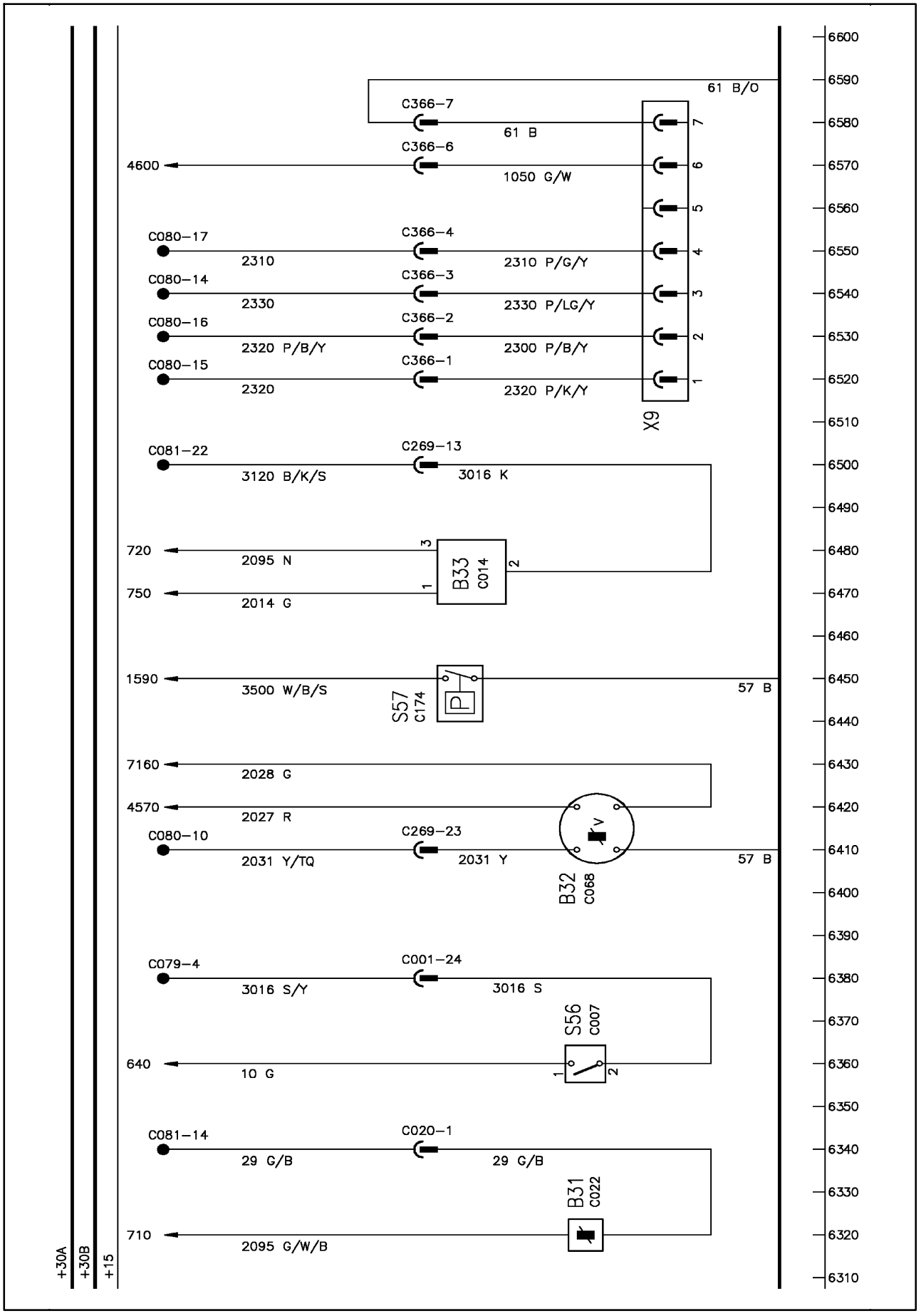
   If an open circuit is indicated, repair or replace the harness as required.

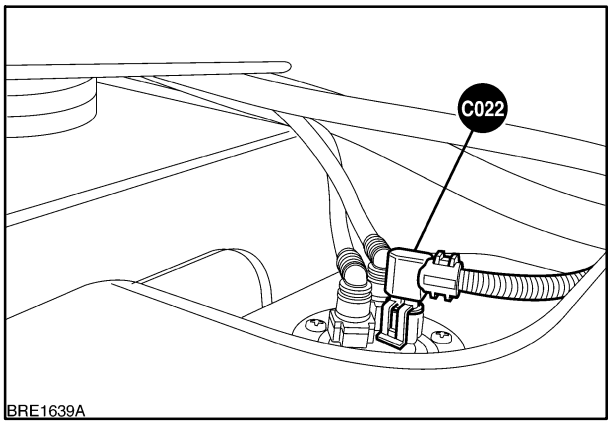
   B. If an open circuit is not indicated, continue to step 5.

5. Check for a short to + Ve voltage.

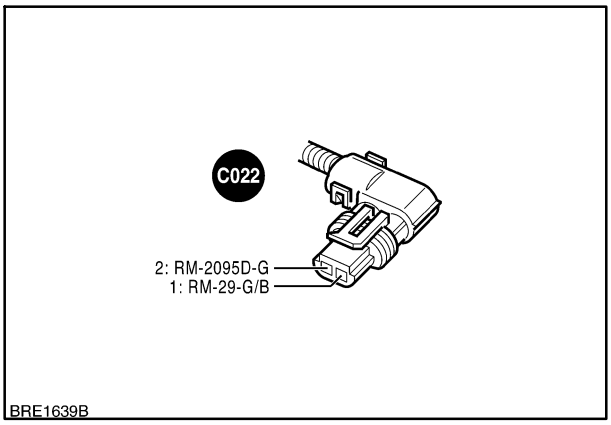
   A. Turn the key start ON. Check between **C022** pin **1 (G/B)** and **ground**. If a short to +Ve voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
6490
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
B32
C068
57 B
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G/W/B



BRE1639A



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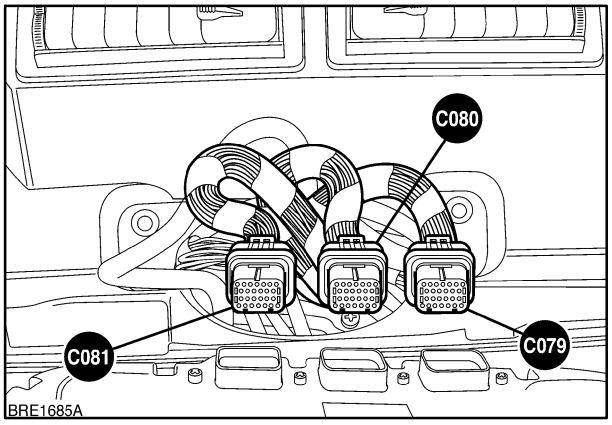
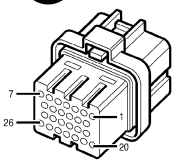


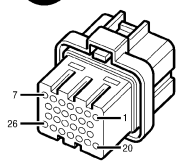
BRE1685A

C079



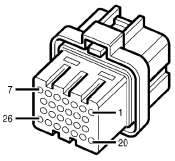
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ

C080



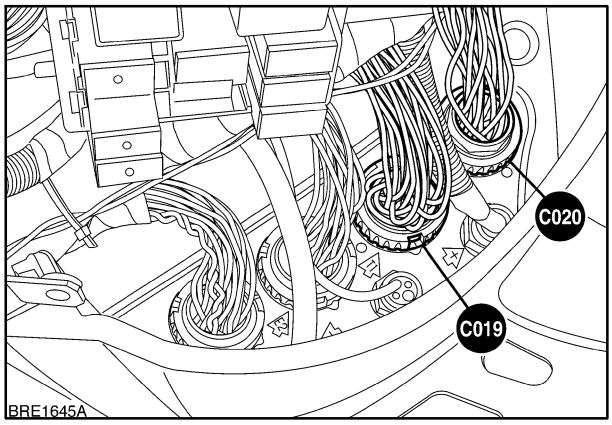
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G

C081



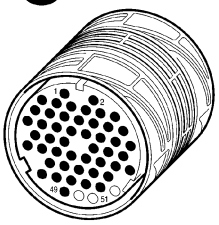
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y

BRE1685B



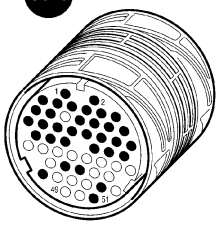
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 14052 - FUEL TANK LEVEL SENDER SHORT TO GROUND

Possible failure modes:

1. Faulty connector
2. Faulty fuel tank level sender
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the fuel tank level sender potentiometer in H9 channel 25.

   A. Remove the the fuel tank sender. With the connector still connected move the sender from the maximum to minimum positon. If the values do not change continuously between 50 and 400 steps continue to step 2.

   B. If values displayed are okay, while in H9 channel 25 wiggle the harness and connectors to check for a intermittent circuit. Channel 25 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the fuel tank level sender connector **C022**, the ADIC connector **C081** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

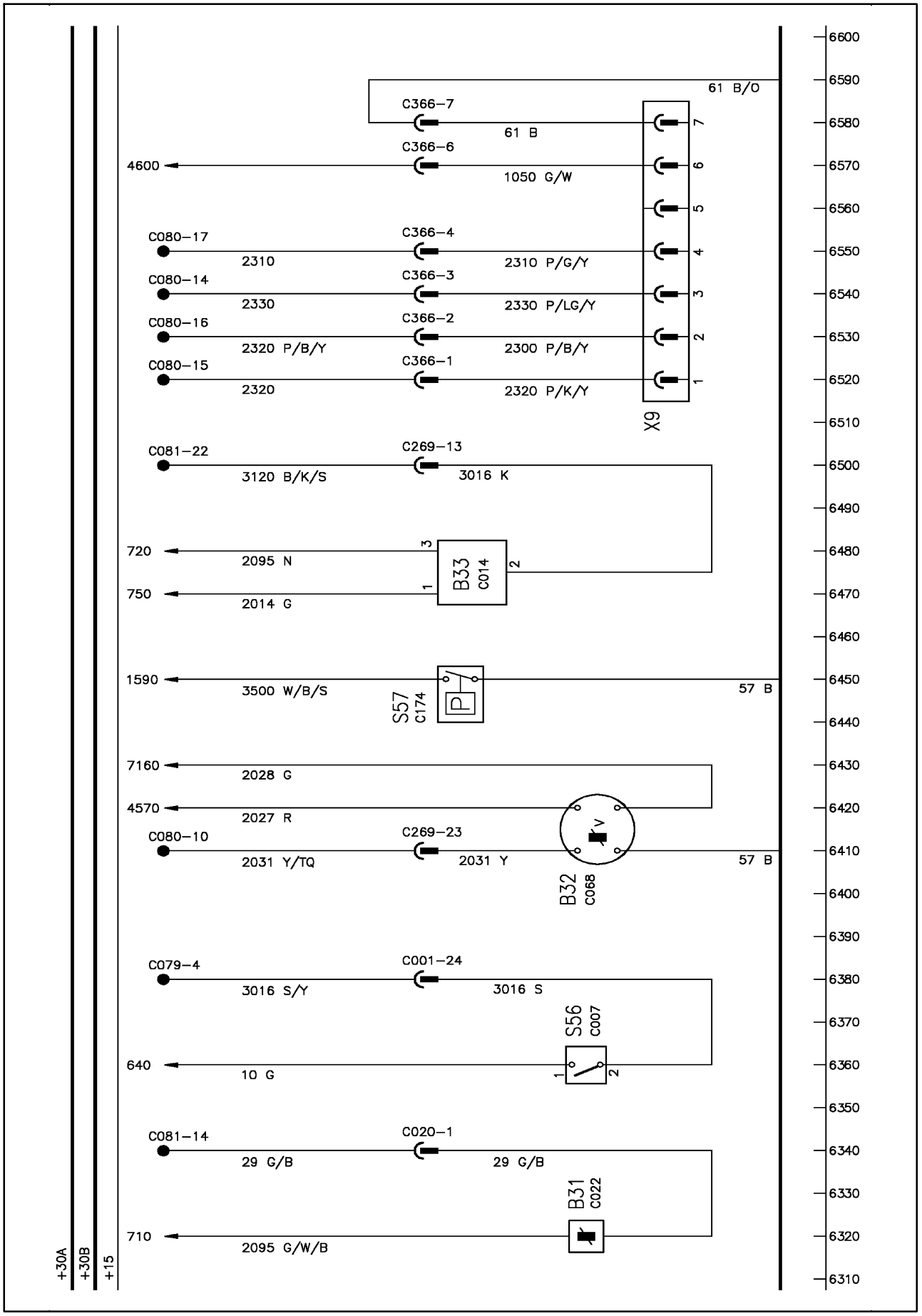
   B. If the connectors are okay, continue to step 3.

3. Check for a short to ground.

   A. Disconnect the connectors **C022** and **C081.**

   Check between connector **C022** pin **1 (G/B)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
6600
6590
6580
6570
6560
6550
6540
6530
6520
6510
6500
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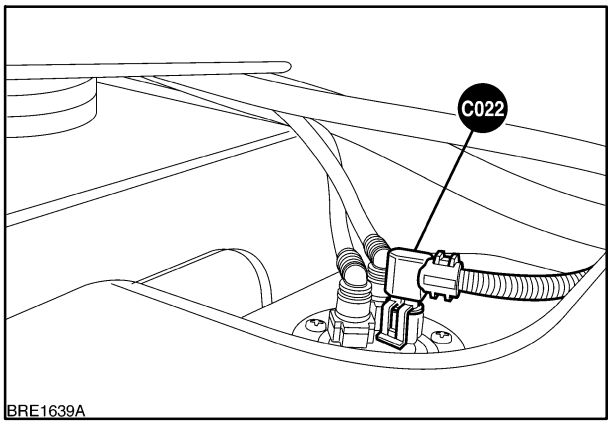
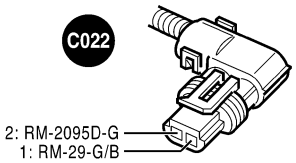
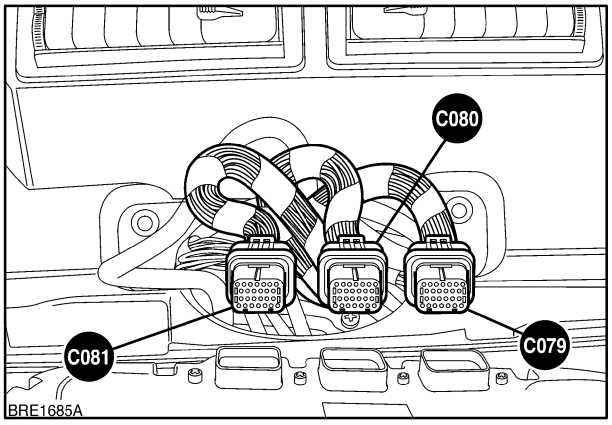
6480
6470
6460
6450
6440
6430
6420
6410
6400
6390
6380
6370
6360
6350
6340
6330
6320
6310
61 B/O
C366-7
61 B
C366-6
4600
1050 G/W
C080-17
2310
C366-4
2310 P/G/Y
C080-14
2330
C366-3
2330 P/LG/Y
C080-16
2320 P/B/Y
C366-2
2300 P/B/Y
C080-15
2320
C366-1
2320 P/K/Y
X9
C081-22
3120 B/K/S
C269-13
3016 K
720
2095 N
750
2014 G
B33
C014
1590
3500 W/B/S
S57
C174
57 B
7160
2028 G
4570
2027 R
C080-10
2031 Y/TQ
C269-23
2031 Y
B32
C068
57 B
C079-4
3016 S/Y
C001-24
3016 S
S56
C007
640
10 G
C081-14
29 G/B
C020-1
29 G/B
B31
C022
710
2095 G/W/B



BRE1639A

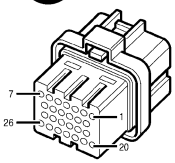


BRE1639B



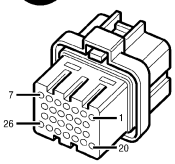
BRE1685A

C079



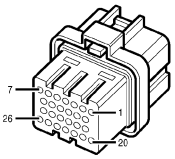
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ

C080



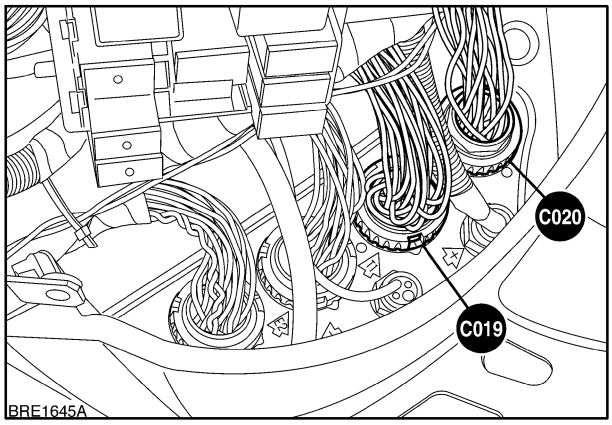
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G

C081



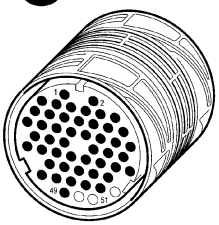
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y

BRE1685B



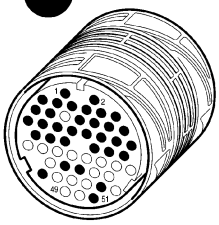
BRE1645A

C019



1: CM-3024-Y/K
2: CM-7005-U/P/B
3: CM-7080-B-LG
4: CM-2130-B/N/S
5: CM-2051-O/TQ
6: CM-2042-O/S
7: CM-2140-B/O/S
8: CM-2062-W/LG/S
9: CM-2016A-Y/G
10: CM-6000-K/LG/S
11: CM-7321-P/Y/B
12: CM-7320-W/N/B
13: CM-7301-Y/LN/B
14: CM-7300-W/LG/B
15: CM-7815-K/O/B
16: CM-7810-K/N/B
17: CM-7825-K/R/B
18: CM-7820-K/P/B
19: CM-7835-K/U/B
20: CM-7830-K/S/B
21: CM-9036-LN/P/Y
22: CM-7840-K/W/B
23: CM-8045-P/LN/S
24: CM-8040-LG/P/S
25: CM-8035-P/LG/S
26: CM-8030-LG/O/S
27: CM-7581-O/P/B
28: CM-7670-R/S/Y
29: CM-9035-LN/W/B
30: CM-7960-P/K/B
31: CM-7500-B/G
32: CM-5097-K/G/B
33: CM-5090-K/R
34: CM-5087-K/U/B
35: CM-5085-K/U
36: CM-5070-LN/LG
37: CM-5075-K
38: CM-5065-LN/P
39: CM-9033-LN/R
40: CM-9034-LN/B
41: CM-7000J-U/R/B
42: CM-7220-S/N/B
43: CM-7230-S/O/B
44: CM-7525B-G/B/S
45: CM-60A-B/W
46: CM-5080-K/N
47: CM-5020A-LN
49: CM-3500-W/B/S

C020



1: CM-29-G/B
2: CM-1013D-R
3: CM-1014E-R/B
4: CM-810A-G/P
5: CM-349-LN/R/B
6: CM-350-LN/W/B
7: CM-7845-K/Y/B
8: CM-3286-LN/K/Y
9: CM-7160-R/N/B
10: CM-3281-LN/B/Y
12: CM-2095B-G/W/B
13: CM-3270-O/P/S
14: CM-3250-O/G/S
15: CM-7126-LG/O/U
16: CM-3240-O/B/S
17: CM-3045-Y/U/S
18: CM-3260-O/N/S
19: CM-7582-U/S/Y
20: CM-8010A-LN/W/B
21: CM-8000A-N/TQ/B
22: CM-8000X-N/TQ/B
23: CM-3280-O/U/S
24: CM-8010-LN/W/B
25: CM-57BK-B
26: CM-8020-LN/K/B
27: CM-8060D-U/B/S
28: CM-2012-Y/O
29: CM-3285-LN/G/Y
39: CM-4022-S/B
40: CM-57AA-B
43: CM-2050L-G
48: CM-7130-B/N
51: CM-7000P-U/R/B

BRE1645B

ERROR CODE 14061 - AIRBRAKE PRESSURE SENSOR OPEN CIRCUIT OR SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connectors
2. Faulty airbrake pressure sensor
3. Faulty harness
4. Faulty Analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the airbrake pressure sensor in H9 channel 24.

   A. Under normal operating conditions, check the air brake pressure values are between 40 and 500 steps. If the values are not between 40 and 500 steps continue to step 2.

   B. If values displayed are okay, while in H9 channel 24 wiggle the harness and connectors to check for a intermittent circuit. Channel 24 values will change if an intermittent circuit is detected, repair or replace as required.

2. Check the airbrake pressure connector **C407,** the ADIC connector **C079**, **C081** and the inline harness connector **C020**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 3.

3. Check for a short to ground.

   A. Disconnect connector **C407**. Check between connector:

   C407 pin **1 (LN/W/B)** and **ground**

   C407 pin **2 (LN/K/B)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 4.

4. Check for a short to +Ve voltage.

   A. Disconnect connectors **C079**, **C081**. Turn the keystart ON. Check between connector:

   C407 pin **1 (LN/W/B)** and **ground**

   C407 pin **2 (LN/K/B)** and **ground**

   C407 pin **3 (G/W/B)** and **ground**

   If a short to +Ve voltage is indicated, repair or replace the harness as required.

   B. If a short to +Ve voltage is not indicated, continue to step 5.

5. Check for an open circuit.

   A. Turn the keystart OFF. Check between connectors:

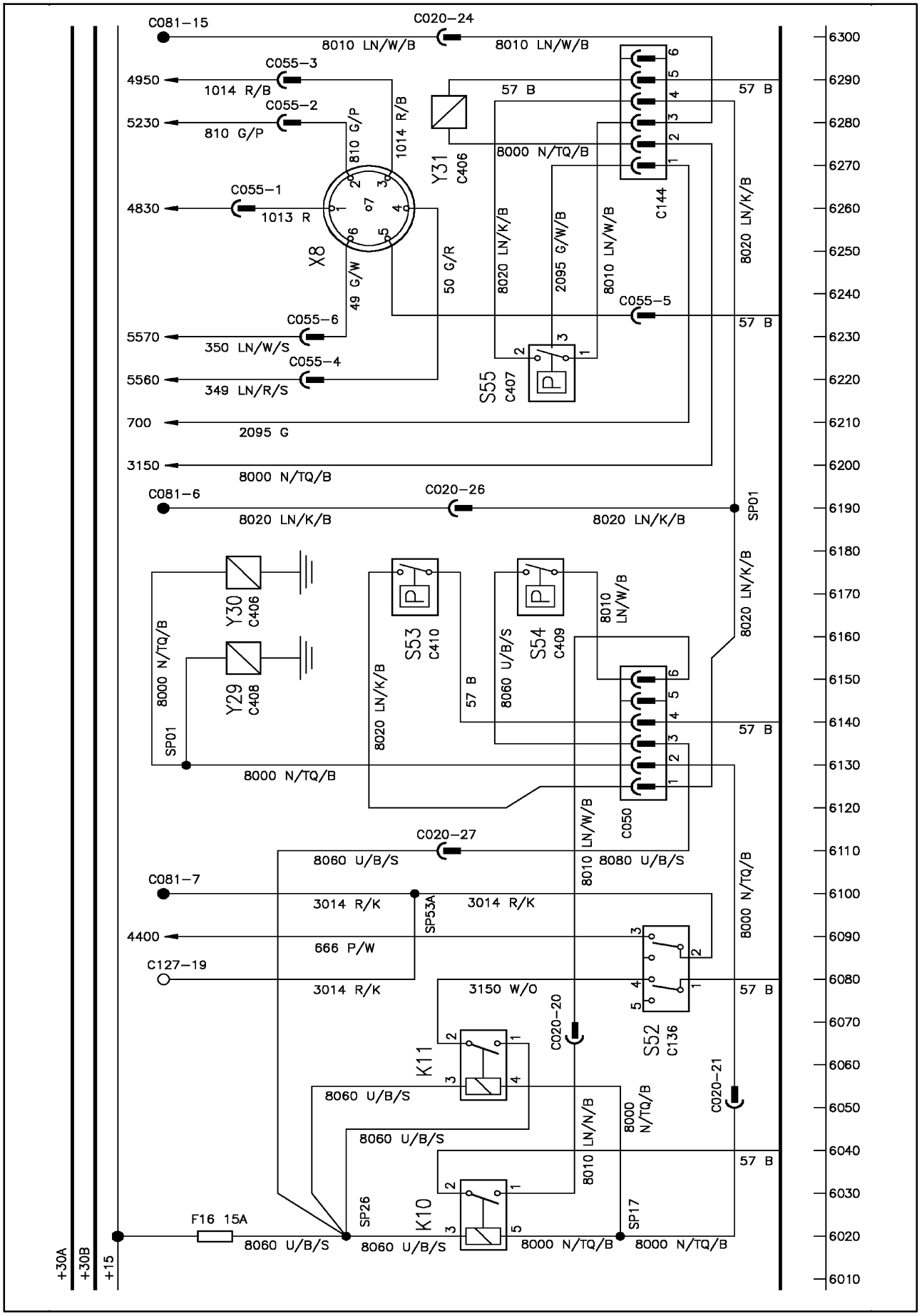
   C407 pin **1 (LN/W/B)** and **C081** pin **15 (LN/W/B)**

   C407 pin **2 (LN/K/B)** and **C081** pin **6 (LN/K/B)**

   C407 pin **3 (G/W/B)** and **C079** pin **22 (G/W/B)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the airbrake pressure sensor.


C081-15
C020-24
8010 LN/W/B
8010 LN/W/B
C055-3
4950
1014 R/B
C055-2
5230
810 G/P
C055-1
4830
1013 R
X8
49 G/W
50 G/R
C055-6
5570
350 LN/W/S
C055-4
5560
349 LN/R/S
Y31
C406
57 B
8000 N/TQ/B
8020 LN/K/B
2095 G/W/B
8010 LN/W/B
C144
C055-5
S55
C407
700
2095 G
3150
8000 N/TQ/B
C081-6
C020-26
8020 LN/K/B
8020 LN/K/B
SP01
Y30
C406
Y29
C408
8000 N/TQ/B
S53
C410
S54
C409
8060 U/B/S
8010 LN/W/B
C050
C020-27
8060 U/B/S
8080 U/B/S
C081-7
3014 R/K
SP53A
4400
666 P/W
C127-19
3150 W/O
K11
K10
S52
C136
C020-20
C020-21
8000 LN/N/B
F16 15A
SP26
SP17
+30A
+30B
+15
6300
6290
6280
6270
6260
6250
6240
6230
6220
6210
6200
6190
6180
6170
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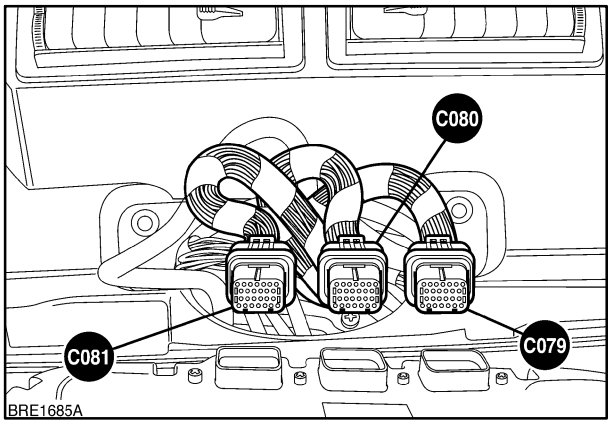
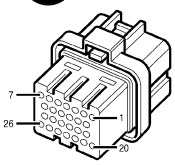
6010



BRE1685A

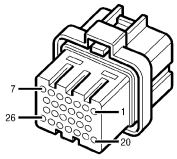
C079

1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ



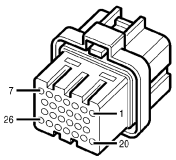
C080

10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G

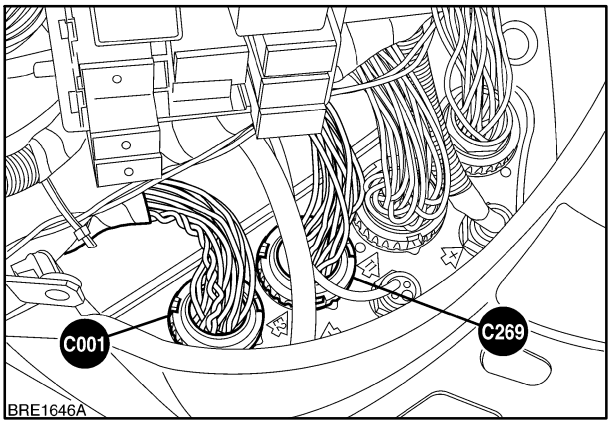


C081

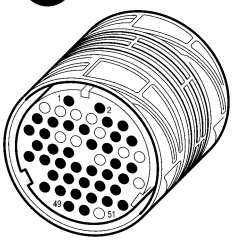
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y



BRE1685B

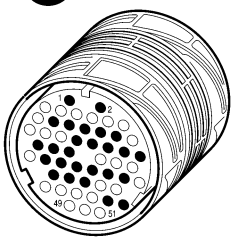


C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14071 - FRONT HITCH POSITION POTENTIOMETER SHORT CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty front hitch positon potentiometer
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error code 9001 or 9002 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14072 - FRONT HITCH POSITION POTENTIOMETER OPEN CIRCUIT

Possible failure modes:

1. Faulty connector
2. Faulty front hitch position potentiometer
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error codes 9001 or 9002 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14091 - WHEEL SPEED SENSOR OPEN CIRCUIT OR SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty wheel speed sensor
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error code 1049 or 2049 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14092 - WHEEL SPEED SENSOR SHORT TO GROUND

Possible failure modes:

1. Faulty wheel speed sensor
2. Faulty connector
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes being displayed.

   A. If error code 1049 or 2049 are displayed, continue to these tests.

   B. If no other error codes are displayed, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.

ERROR CODE 14100 - AIRBRAKE OPTION NEEDS TO BE SET

Possible failure modes:

1. Airbrake option has not been set.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the airbrake option has been set.
   A. Using the H3 options menu, set the airbrake option to on.

ERROR CODE 14101 - WATER IN FUEL SENSOR NOT CONNECTED

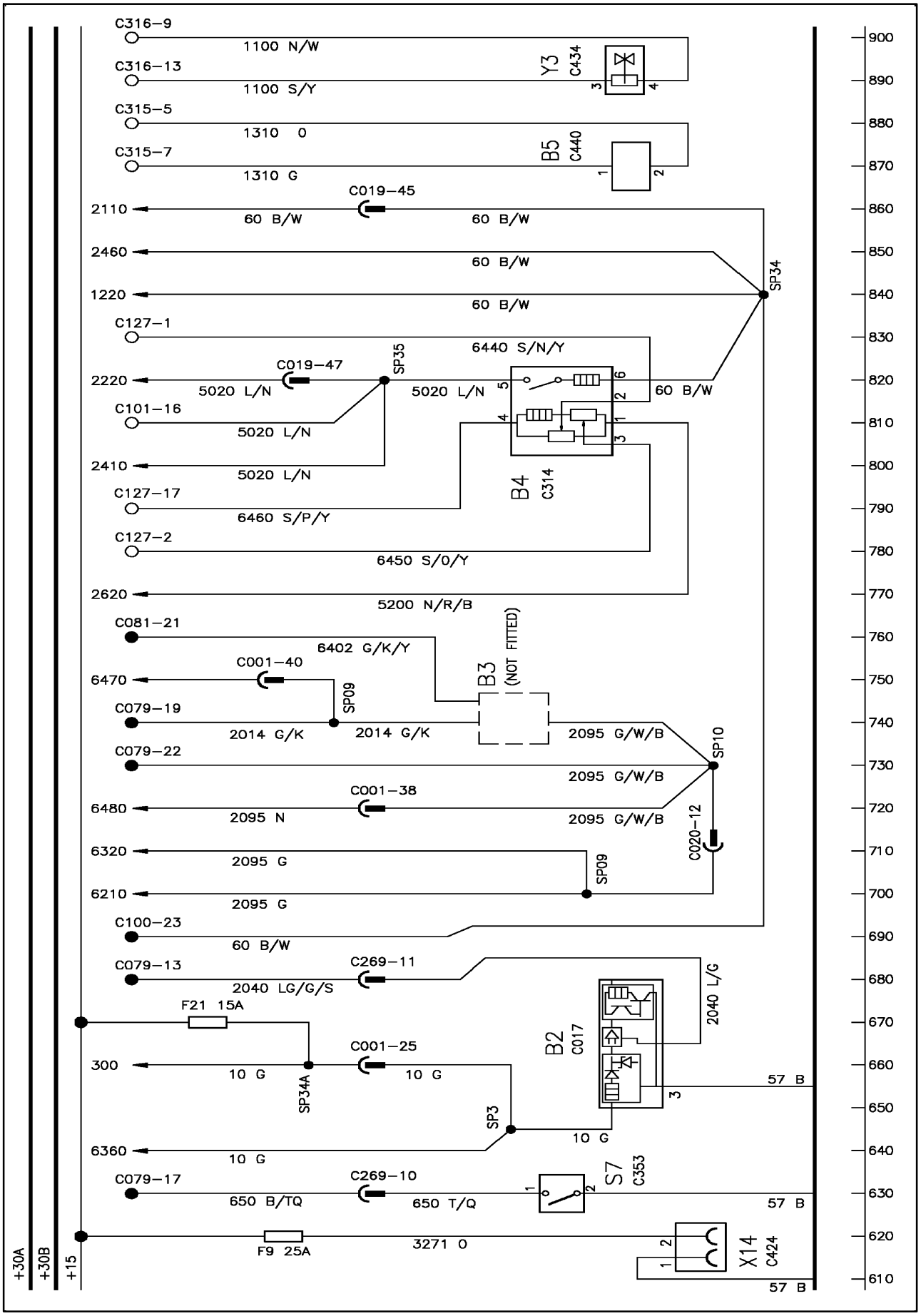
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Fauty water in fuel sensor

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the connection to the water in fuel sensor.
   A. Ensure the connector is installed correctly and is in good condition.
2. Clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
3. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
4. Check all power supplies and grounds to the water in fuel sensor.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
5. Check the instrument cluster connection **C079** and water in fuel sensor connection **C017**.
   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair and replace as required.
   B. If the connectors are okay, continue to step 5.
6. Check for an open circuit on the water in fuel sensor.
   A. Disconnect the connector **C079**. Check between connector:
   C017 pin **2 (LG)** and **C079** pin **13 (LG)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit is not indicated, remove and replace the water in fuel sensor.


C316-9
1100 N/W
C316-13
1100 S/Y
Y3
C434
C315-5
1310 0
C315-7
1310 G
B5
C440
C019-45
2110
60 B/W
60 B/W
2460
60 B/W
1220
60 B/W
SP34
C127-1
6440 S/N/Y
C019-47
SP35
2220
5020 L/N
5020 L/N
60 B/W
C101-16
5020 L/N
2410
5020 L/N
B4
C314
C127-17
6460 S/P/Y
C127-2
6450 S/0/Y
2620
5200 N/R/B
C081-21
6402 G/K/Y
B3
(NOT FITTED)
C001-40
6470
SP09
C079-19
2014 G/K
2014 G/K
2095 G/W/B
SP10
C079-22
2095 G/W/B
C001-38
6480
2095 N
2095 G/W/B
C020-12
6320
2095 G
SP09
6210
2095 G
C100-23
60 B/W
C079-13
C269-11
2040 LG/G/S
2040 L/G
F21 15A
B2
C017
C001-25
300
10 G
10 G
SP34A
57 B
SP3
10 G
6360
10 G
C079-17
C269-10
650 B/TQ
650 T/Q
S7
C353
57 B
F9 25A
3271 0
X14
C424
57 B
+30A
+30B
+15
900
890
880
870
860
850
840
830
820
810
800
790
780
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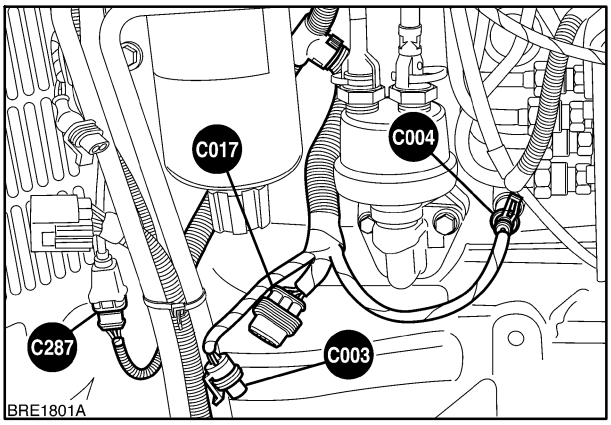
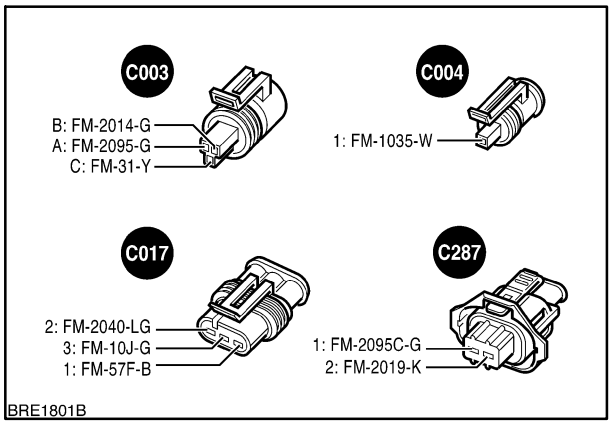
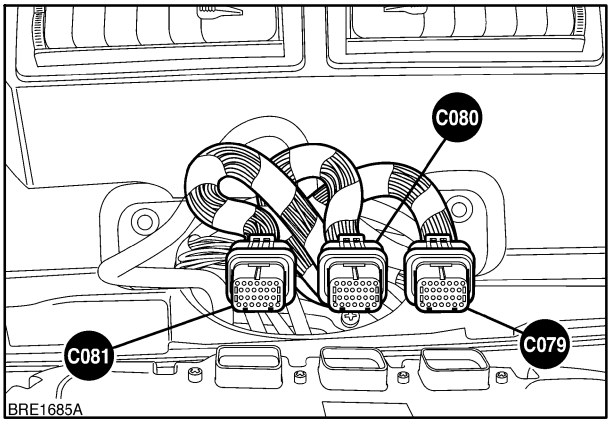
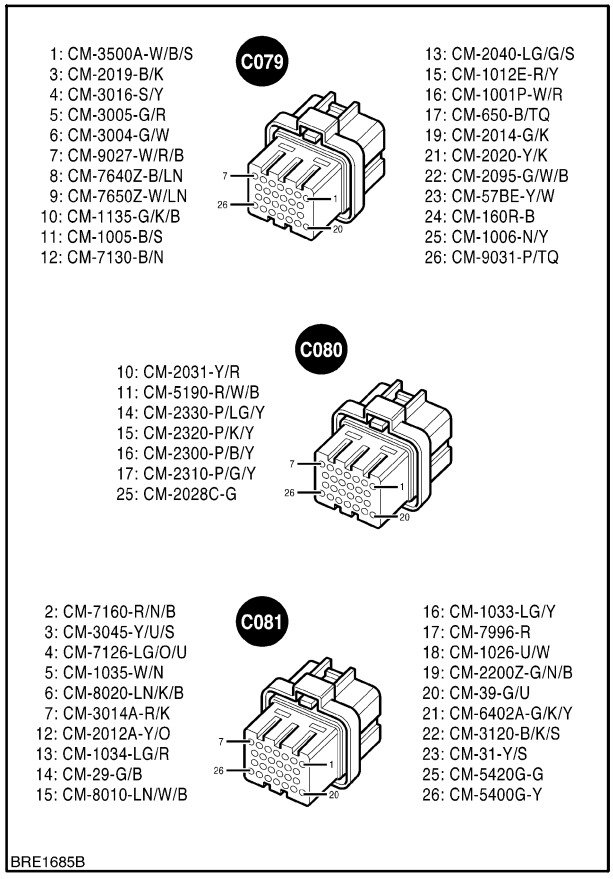
650
640
630
620
610


C017
C004
C287
C003
BRE1801A


C003
B: FM-2014-G
A: FM-2095-G
C: FM-31-Y
C004
1: FM-1035-W
C017
2: FM-2040-LG
3: FM-10J-G
1: FM-57F-B
C287
1: FM-2095C-G
2: FM-2019-K
BRE1801B


C080
C081
C079
BRE1685A


C079
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

ERROR CODE 14200 - ERROR WITH ELECTRICAL PROGRAMMABLE READ ONLY MEMORY (EEPROM)

Effects:

Analog digital instrument cluster (ADIC) disabled.

Possible failure modes:

1. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the ADIC

   A. Clear the ADIC EEPROM using H8 and re-configure the ADIC. If the fault is still present, download the correct level of software and re-configure the ADIC. If the fault re-occurs again, remove and replace the ADIC.

ERROR CODE 14900 - CENTRAL CONTROLLER NOT CONNECTED

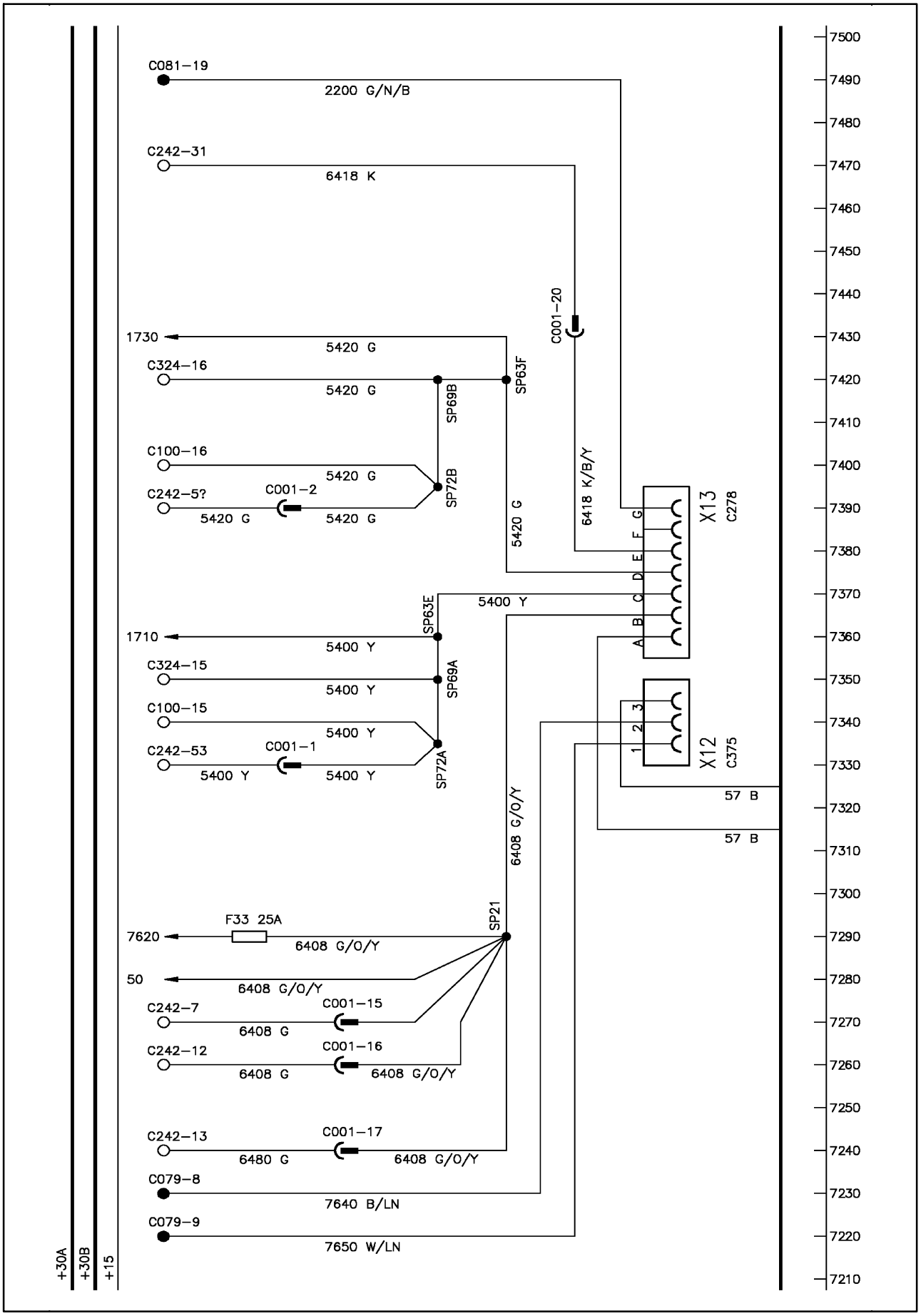
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty central controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the central controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the central controller connector **C100**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C100**. Check between connector:
   C278 (High) pin **C (Y)** and **C100** pin **15 (Y)**
   C278 (Low) pin **D (G)** and **C100** pin **16 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C081 (High) pin **26 (Y)** and **C100** pin **15 (Y)**
   C081 (Low) pin **25 (G)** and **C100** pin **16 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the central controller.


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
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7320
7310
7300
7290
7280
7270
7260
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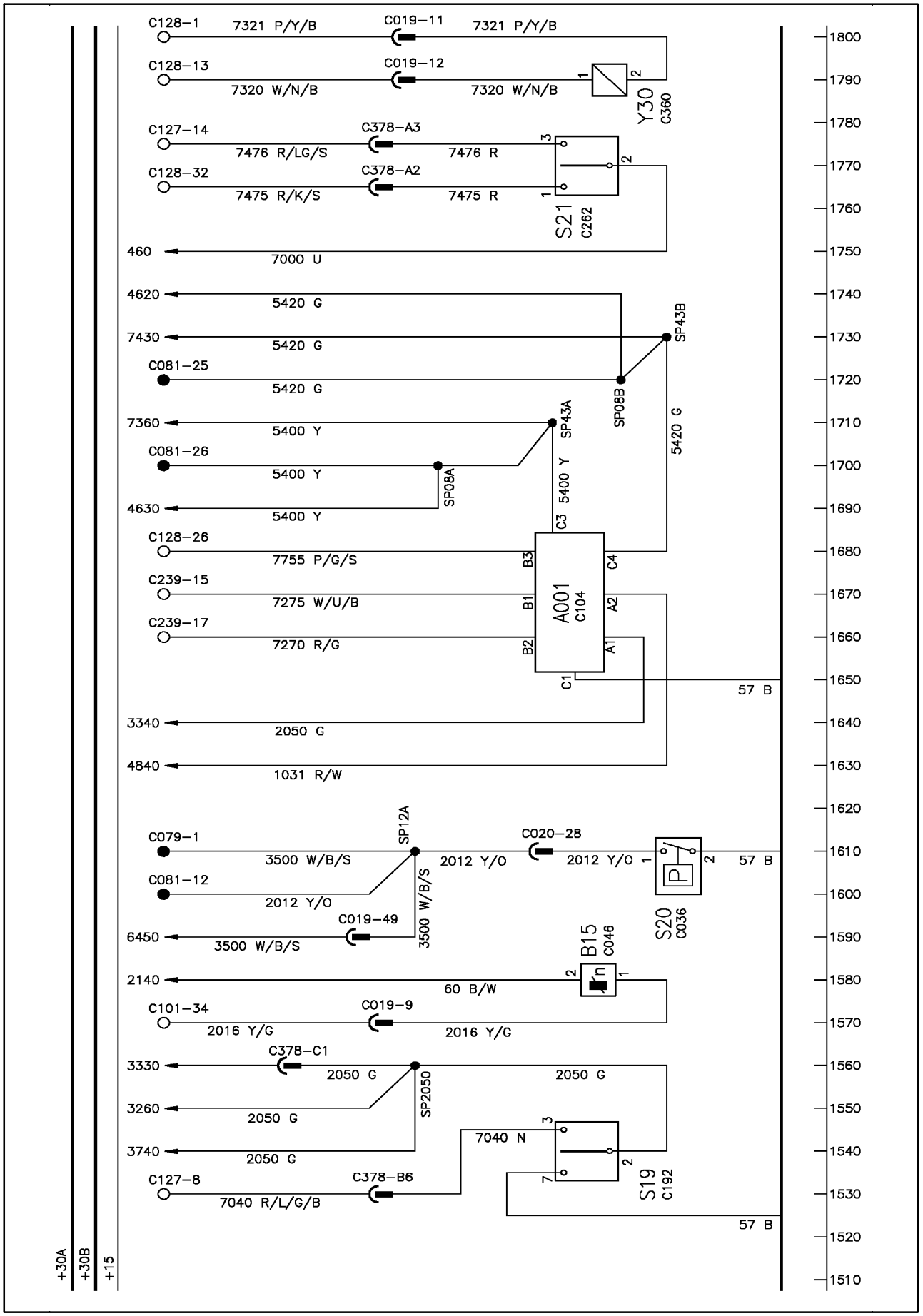
7240
7230
7220
7210


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
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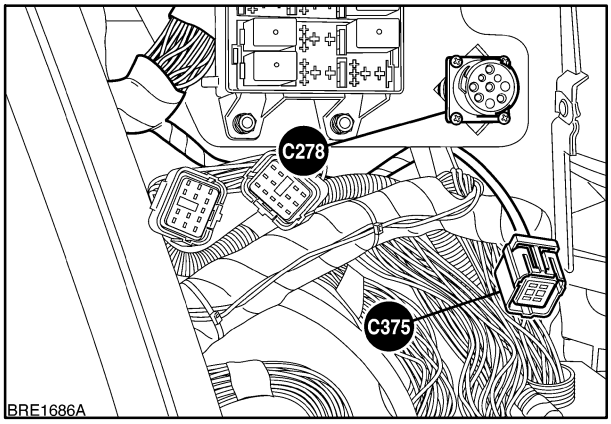
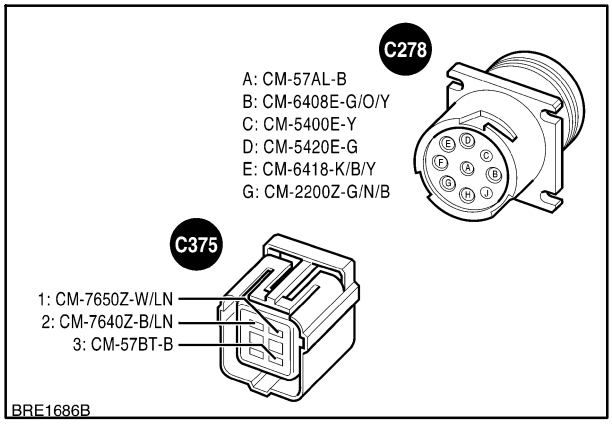
1520
1510



BRE1686A



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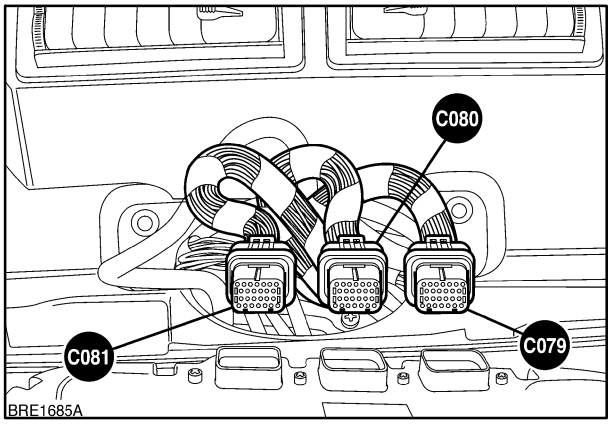
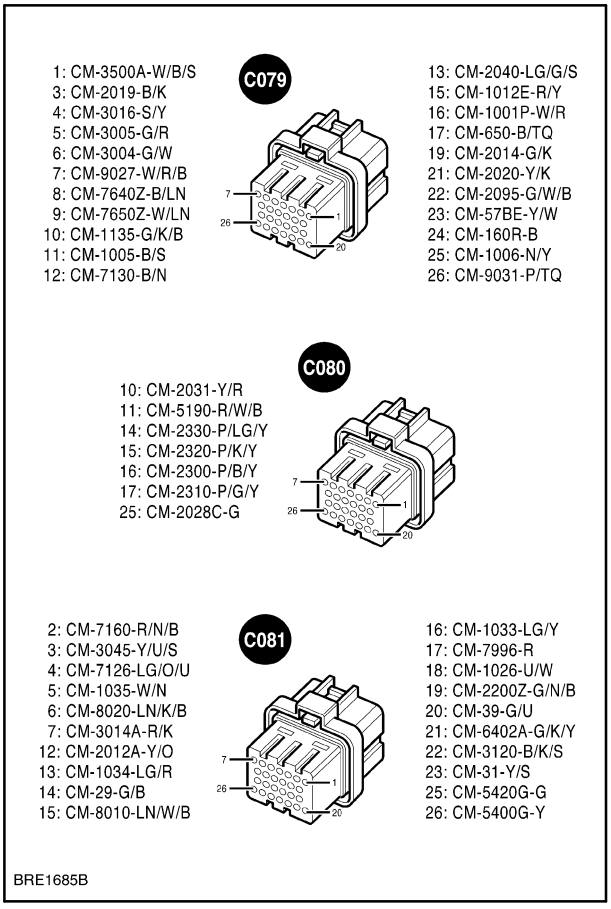
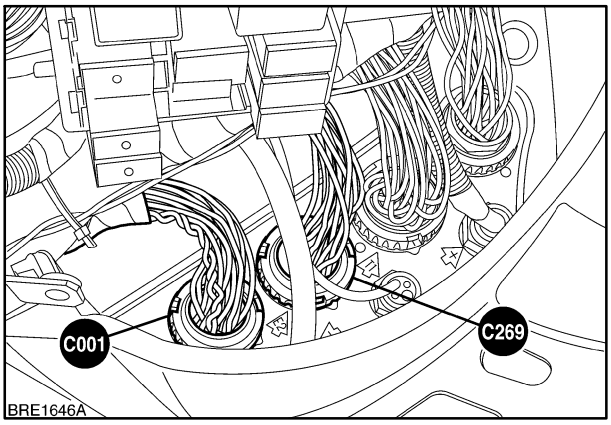


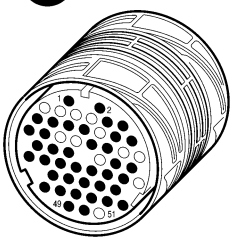
BRE1685A



BRE1685B

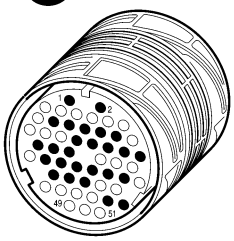


C001



1: CM-5400D-Y
2: CM-5420D-G
7: CM-6401-G/B/Y
8: CM-6402-G/K/Y
9: CM-6403-G/LG/Y
10: CM-6460-S/P/Y
11: CM-6404B-G/LN/Y
12: CM-6590-LG-U-Y
14: CM-6408D-G/O/Y
15: CM-6408A-G/O/Y
16: CM-6408B-G/O/Y
17: CM-6408C-G/O/Y
20: CM-6418-K/B/Y
21: CM-6414-G/TQ/Y
24: CM-3016-S/Y
25: CM-10J-G
26: CM-1030B-U/R
28: CM-39-G/U
29: CM-1073A-P/W
30: CM-376-P/N
31: CM-57AH-B
32: CM-57AJ-B
33: CM-57AK-B
34: CM-39B-G/U/W
35: CM-57AM-B
36: CM-1027B-U/W
38: CM-2095A-G/W/B
39: CM-31-Y/S
40: CM-2014A-G/K
41: CM-1006-N/Y
42: CM-1035-W/N
43: CM-71C-W/K
44: CM-1005-B/S
45: CM-1001S-W/R
46: CM-1001T-W/R
47: CM-1001V-W/R
48: CM-1001W-W/R
49: CM-6580-K/U/Y
50: CM-2019-B/K

C269



1: CM-3272-O/W
2: CM-3273-O/B
10: CM-650-B/TQ
11: CM-2040-LG/G/S
12: CM-2027-R
13: CM-3120-B/K/S
14: CM-2044-O/B/Y
19: CM-2570Z-R/K/Y
20: CM-60AC-B/W
21: CM-2510-N/G/S
22: CM-2530B-N/LG/S
23: CM-2031-Y/TQ
24: CM-2028B-G
25: CM-3230-U/K/S
26: CM-3220-O/LG/S
31: CM-2043-O/K
32: CM-2260-O/G/Y
33: CM-57HA-B
34: CM-1010C-G
35: CM-3274-R/W
36: CM-3275-R/B
38: CM-1018-LG/W
39: CM-2006B-U/O
40: CM-2006A-U/O
47: CM-3070D-P
48: CM-9032B-Y/G

BRE1646B

ERROR CODE 14901 - ENGINE CONTROLLER MISSING

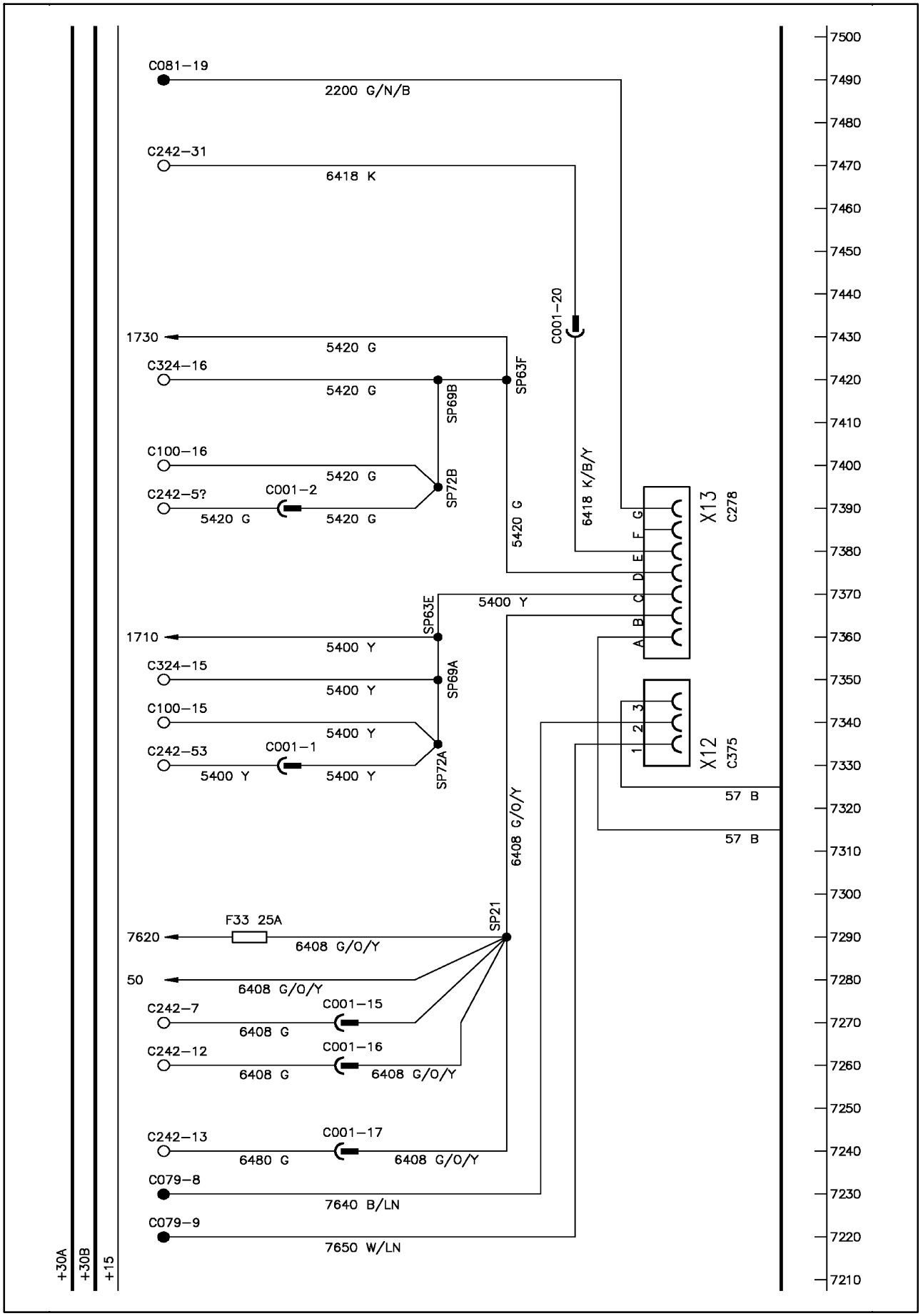
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty engine controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the engine controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the engine controller connector **C242.**
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C242**. Check between connector:
   C278 (high) pin **C (Y)** and **C242** pin **53 (Y)**
   C278 (Low) pin **D (G)** and **C242** pin **52 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C242 (high) pin **53 (Y)** and **C081** pin **26 (Y)**
   C242 (Low) pin **52 (G)** and **C081** pin **25 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the engine controller.


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
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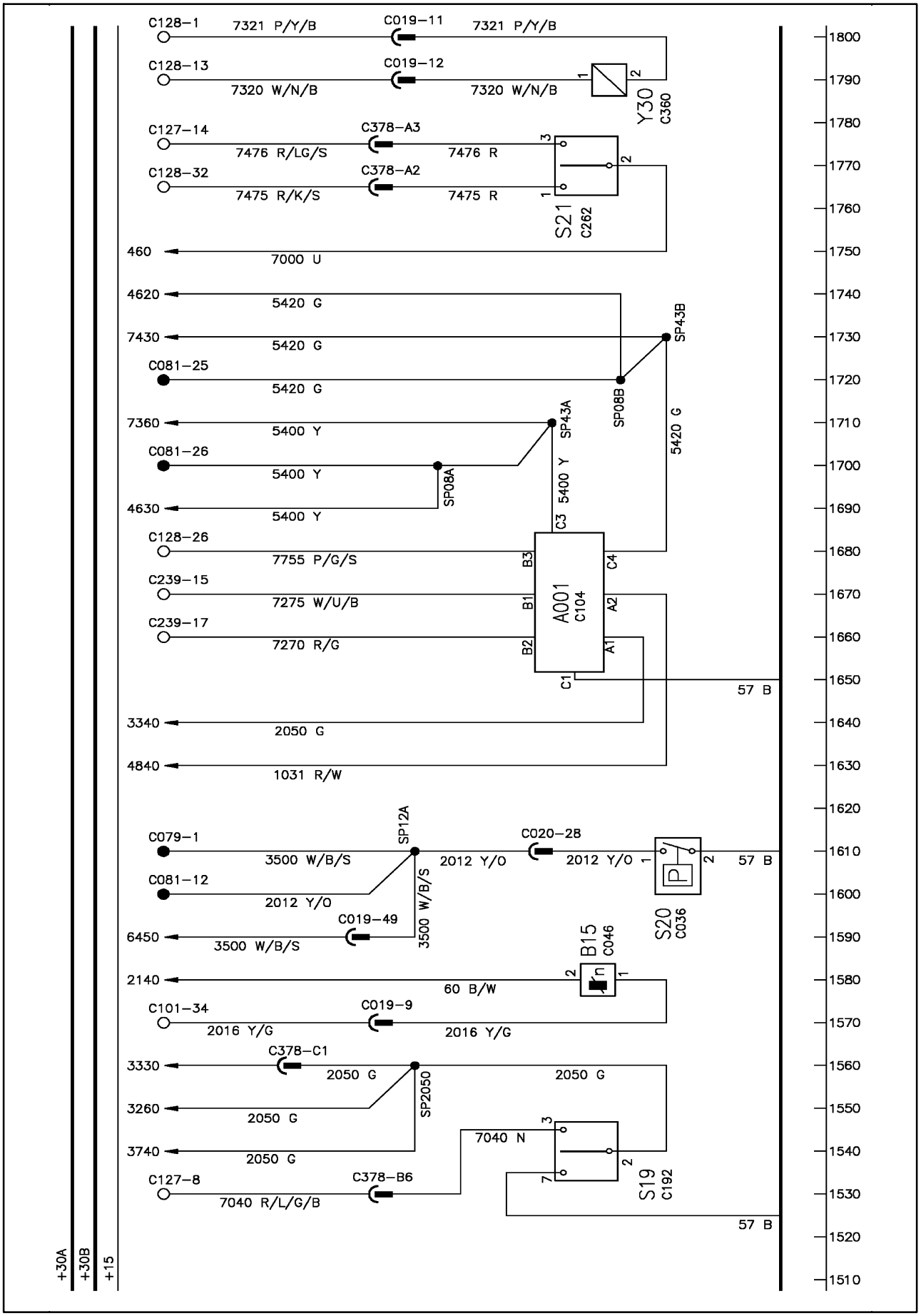
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
3260
2050 G
SP2050
7040 N
3740
2050 G
C127-8
C378-B6
7040 R/L/G/B
S19
C192
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
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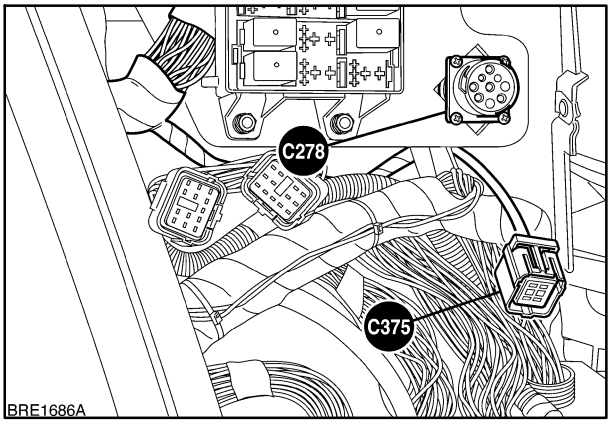
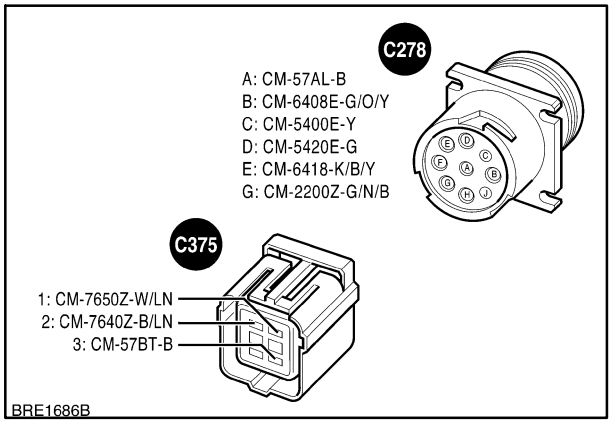
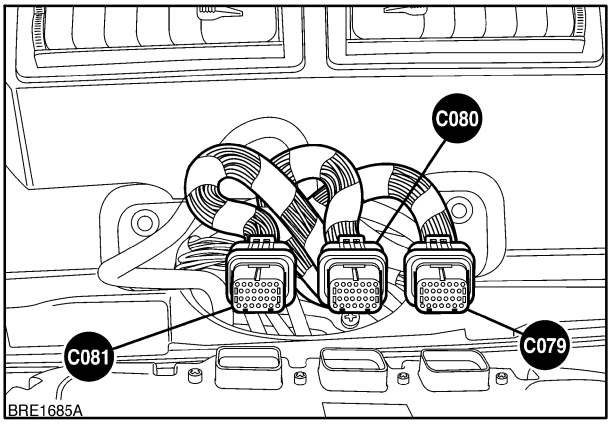
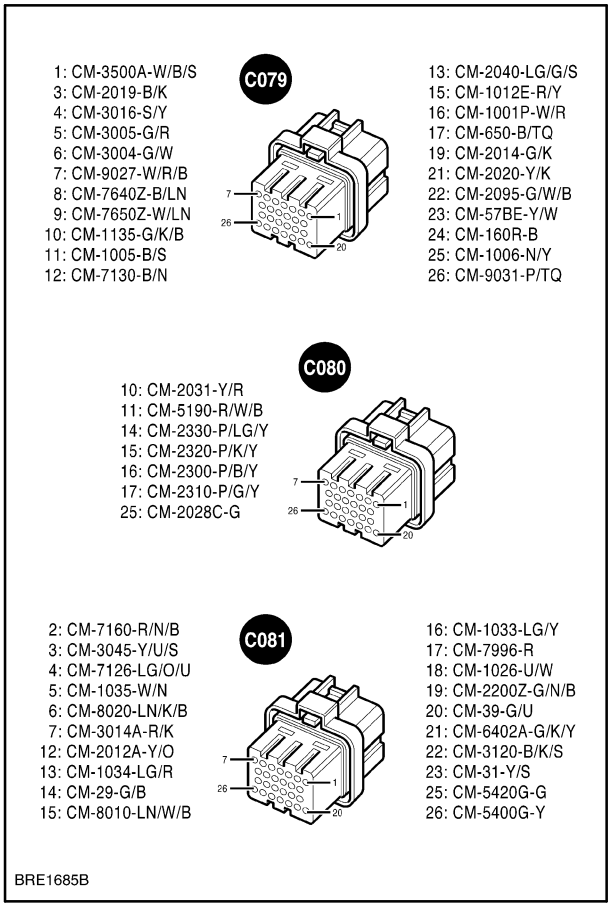
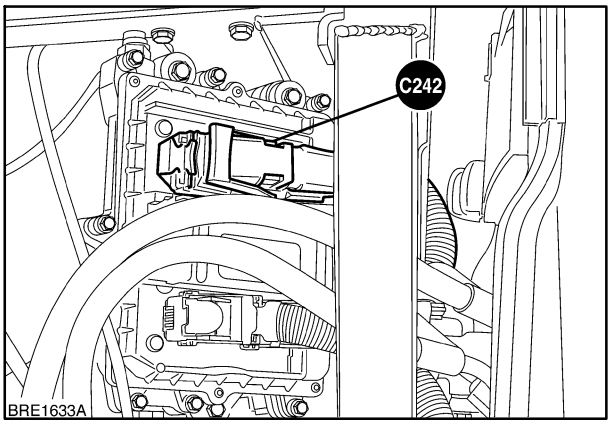
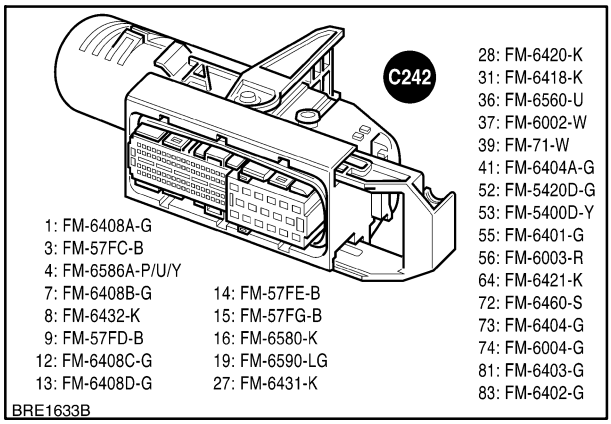

C278
C375
BRE1686A


C278
A: CM-57AL-B
B: CM-6408E-G/O/Y
C: CM-5400E-Y
D: CM-5420E-G
E: CM-6418-K/B/Y
G: CM-2200Z-G/N/B
C375
1: CM-7650Z-W/LN
2: CM-7640Z-B/LN
3: CM-57BT-B
BRE1686B


C080
C081
C079
BRE1685A


1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
C079
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B


C242
BRE1633A


C242
1: FM-6408A-G
3: FM-57FC-B
4: FM-6586A-P/U/Y
7: FM-6408B-G
8: FM-6432-K
9: FM-57FD-B
12: FM-6408C-G
13: FM-6408D-G
14: FM-57FE-B
15: FM-57FG-B
16: FM-6580-K
19: FM-6590-LG
27: FM-6431-K
28: FM-6420-K
31: FM-6418-K
36: FM-6560-U
37: FM-6002-W
39: FM-71-W
41: FM-6404A-G
52: FM-5420D-G
53: FM-5400D-Y
55: FM-6401-G
56: FM-6003-R
64: FM-6421-K
72: FM-6460-S
73: FM-6404-G
74: FM-6004-G
81: FM-6403-G
83: FM-6402-G
BRE1633B

ERROR CODE 14902 - AUXILIARY CONTROLLER NOT CONNECTED

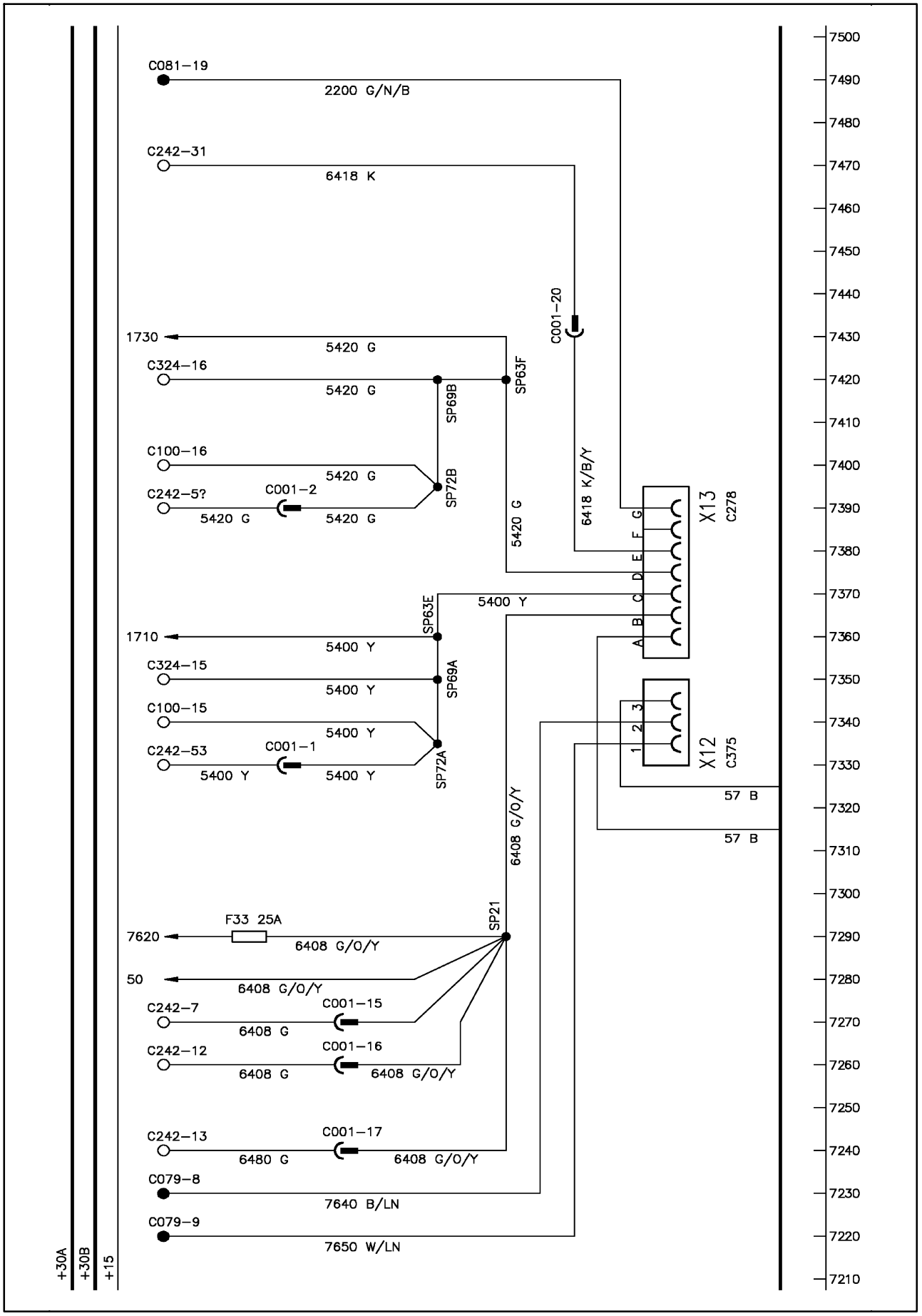
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty auxiliary controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the auxilary controller.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the auxiliary connector **C324**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C324**. Check between connector:
   C278 (High) pin **C (Y)** and **C324** pin **15 (Y)**
   C278 (Low) pin **D (G)** and **C324** pin **16 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C324 (High) pin **15 (Y)** and **C081** pin **26 (Y)**
   C324 (Low) pin **16 (G)** and **C081** pin **25 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the auxiliary controller.


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
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7360
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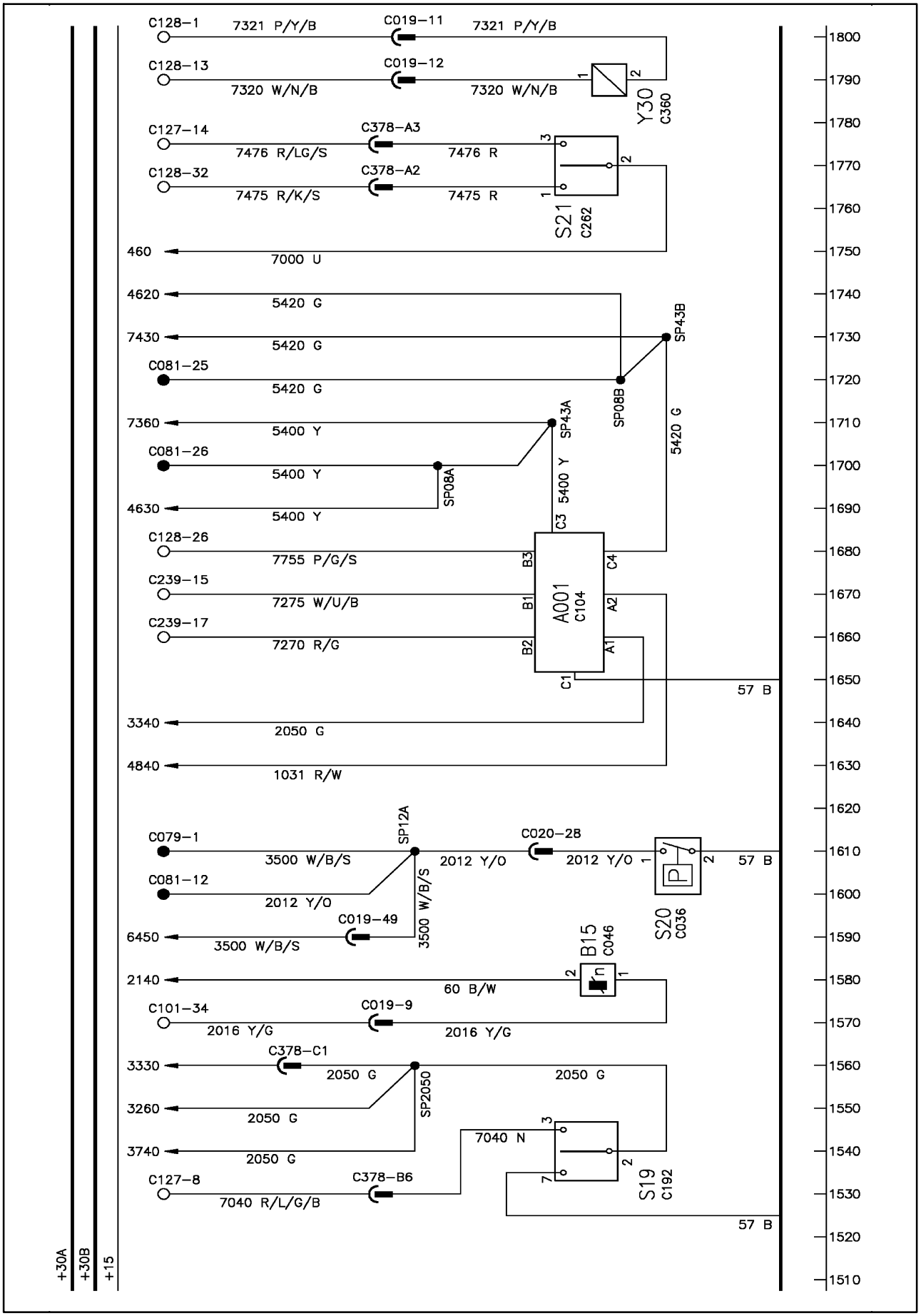
7220
7210


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
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1690
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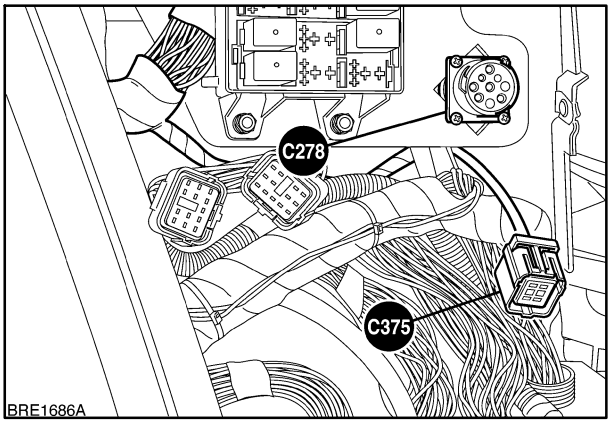
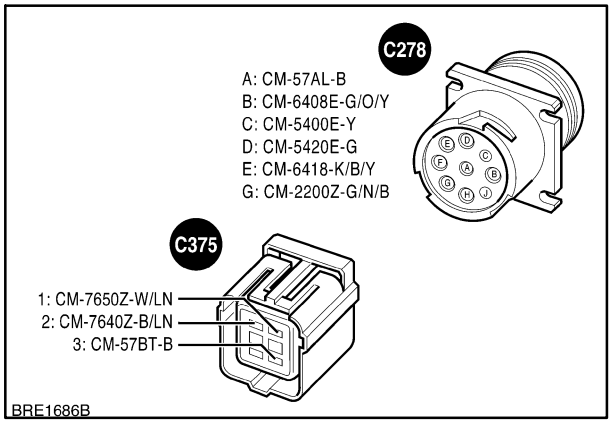
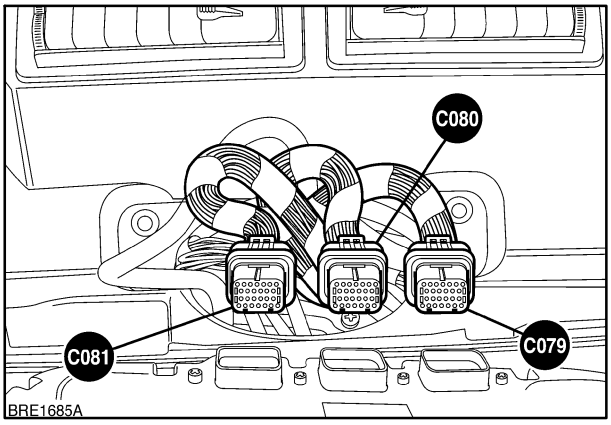
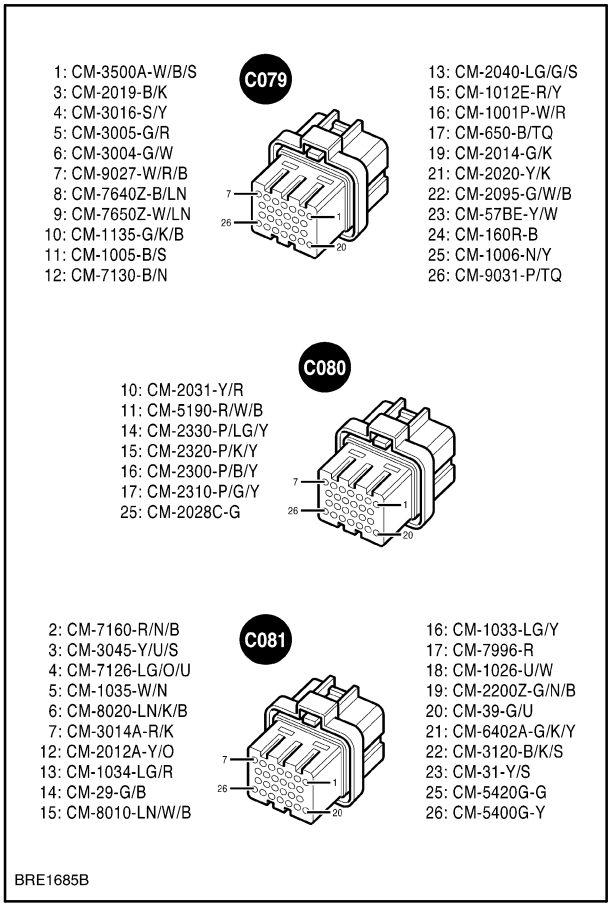
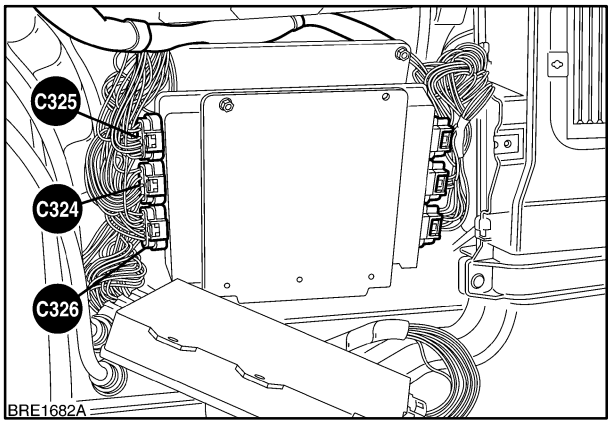

C278
C375
BRE1686A

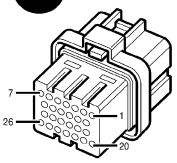

C278
A: CM-57AL-B
B: CM-6408E-G/O/Y
C: CM-5400E-Y
D: CM-5420E-G
E: CM-6418-K/B/Y
G: CM-2200Z-G/N/B
C375
1: CM-7650Z-W/LN
2: CM-7640Z-B/LN
3: CM-57BT-B
BRE1686B


C080
C081
C079
BRE1685A


C079
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

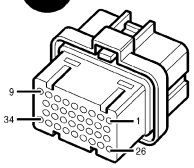


C324



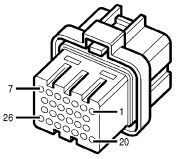
1: CM-2540-N/O/S
2: CM-2540T-N/O/S
3: CM-2540W-N/O/S
6: CM-3280-O/U/S
7: CM-3285-LN/G/Y
8: CM-2540R-N/O/S
10: CM-3260-O/N/S
11: CM-3240-O/B/S
12: CM-2570Z-R/K/Y
13: CM-2043-O/K
14: CM-5000B-P/R
15: CM-5400A-Y
16: CM-5420A-G
19: CM-61G-B/O
20: CM-2250A-K/O/S
23: CM-60AA-B/W
24: CM-5300X-K/W/B
25: CM-57BR-B
26: CM-57BS-B

C325



2: CM-2510-N/G/S
3: CM-2520-N/K/S
7: CM-3230-U/K/S
11: CM-2248-K/N/S
12: CM-2245-K/LN/S
16: CM-2530-N/LG/S
17: CM-3220-O/LG/S
18: CM-2540X-N/O/S
21: CM-1001M-W/R
28: CM-2200X-G/N/B
29: CM-3210-U/LG/S
30: CM-5561-O/S/Y

C326



1: CM-3270-O/P/S
3: CM-3250-O/G/S
6: CM-3281-LN/B/Y
7: CM-2044-O/B/Y
9: CM-7650X-W/LN
10: CM-7640X-B/LN
13: CM-3286-LN/K/Y
18: CM-3290-O/Y/S
19: CM-2270-O/K/Y
20: CM-2260-O/G/Y
21: CM-57BN-B
22: CM-5060X-LN/O
23: CM-5170X-LN/TQ
25: CM-5596-S/U/Y
26: CM-57BP-B

BRE1682B

ERROR CODE 14903 – SMALL CONTROL MODULE NOT CONNECTED

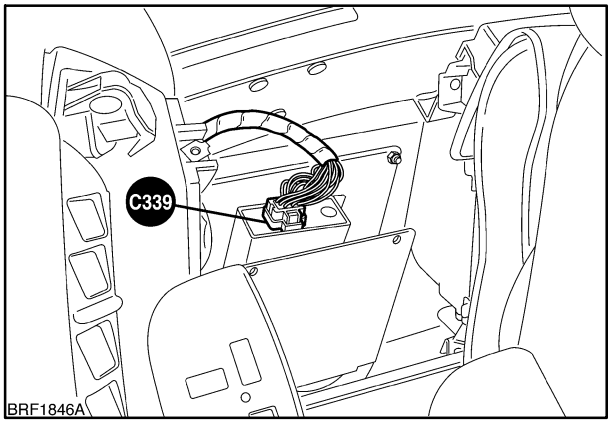
Possible failure modes:

1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty small control module

Solution:

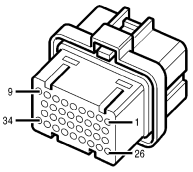
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the small control module.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the small control module connector **C339**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C339**. Check between connector:
   C278 (High) pin **C (Y)** and **C339** pin **12 (Y)**
   C278 (Low) pin **D (G)** and **C339** pin **13 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C339 (High) pin **12 (Y)** and **C081** pin **26 (Y)**
   C339 (Low) pin **13 (G)** and **C081** pin **25 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the small control module.



BRF1846A

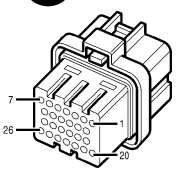
C339



1: CM-60-B/W
2: CM-2050-G
3: CM-2050C-G
4: CM-5000-P/R
5: CM-2051-O/TQ
6: CM-7125-LG/B/Y
7: CM-2200-G/N/B
8: CM-7500-B/S
9: CM-2065-N/G/B
10: CM-7080-B/LG
12: CM-5400-Y
13: CM-5420-G
14: CM-5300-K/W/B
15: CM-3025A-Y/U
16: CM-2055-B/W/S
17: CM-7175-Y/B
18: CM-2130-B/N/S
19: CM-7650-W/LN
20: CM-7640-B/LN
21: CM-2140-B/O/S
22: CM-2045-O/LG
23: CM-3026A-Y/R
24: CM-7170-B/W
25: CM-3027-Y
26: CM-2042-O/S
27: CM-2065A-N/G/B
28: CM-7120-N/R/Y
29: CM-57X-B
30: CM-3024-Y/K
31: CM-2046-O/G
32: CM-5190-R/W/B
33: CM-2120-B/LB/S
34: CM-3025B-Y/U

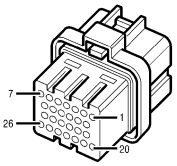
BRF1846B

C079



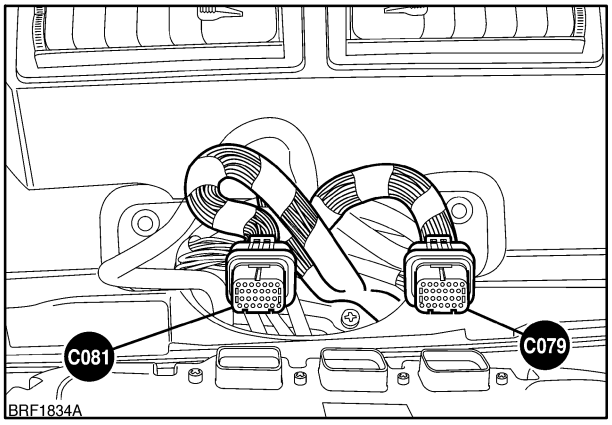
1: CM-2016-Y/G
3: CM-2019-B/K
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
14: CM-3016-S/Y
15: CM-1012E-R/Y
16: CM-1001C-W/R
17: CM-650-B/TQ
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ

C081

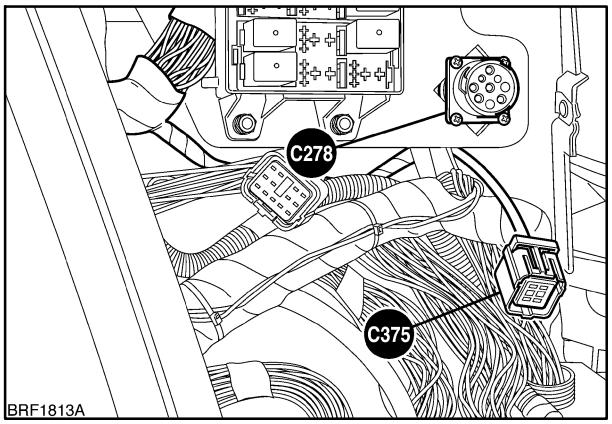


2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014B-R/K
12: CM-2012-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y

BRF1834B

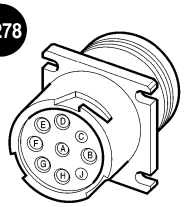


BRF1834A



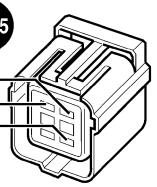
BRF1813A

C278



A: CM-57AL-B
B: CM-6408E-G/O/Y
C: CM-5400E-Y
D: CM-5420E-G
E: CM-6418-K/B/Y
G: CM-2200Z-G/N/B

C375



1: CM-7650Z-W/LN
2: CM-7640Z-B/LN
3: CM-57BT-B

BRE1686B

ERROR CODE 14905 - INSTRUMENT CLUSTER KEY PAD NOT CONNECTED

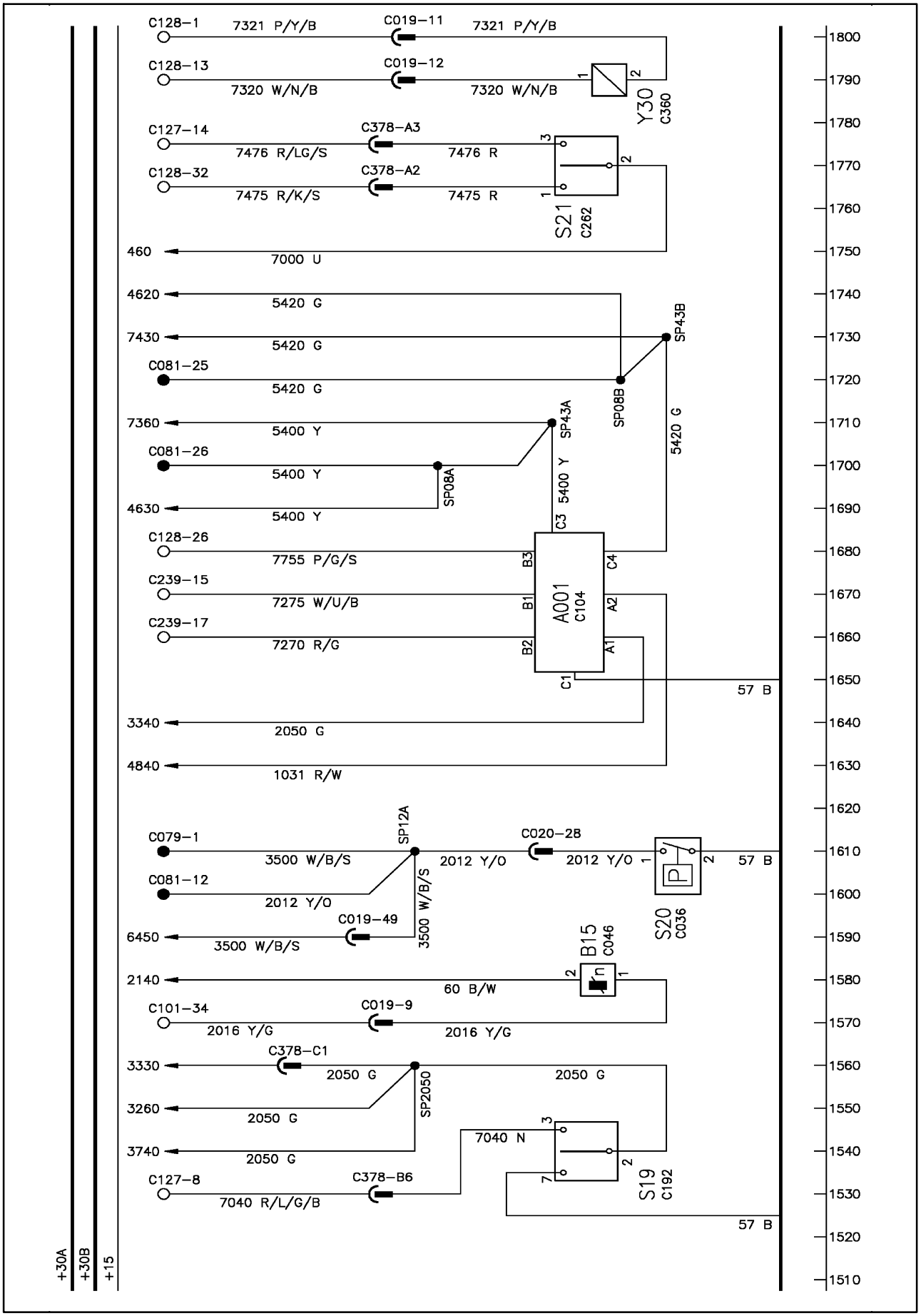
Possible failure modes:

1. Faulty connectors
2. Faulty harness
3. CAN BUS interference
4. Faulty instrument cluster key pad

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are diplayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the instrument cluster key pad.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the instrument cluster key pad connector **C373**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C373**. Check between connector:
   C278 (High) pin **C (Y)** and **C373** pin **3 (Y)**
   C278 (Low) pin **D (G)** and **C373** pin **2 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C373 (High) pin **3 (Y)** and **C081** pin **26 (Y)**
   C373 (Low) pin **2 (G)** and **C081** pin **25 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the instrument cluster key pad.


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
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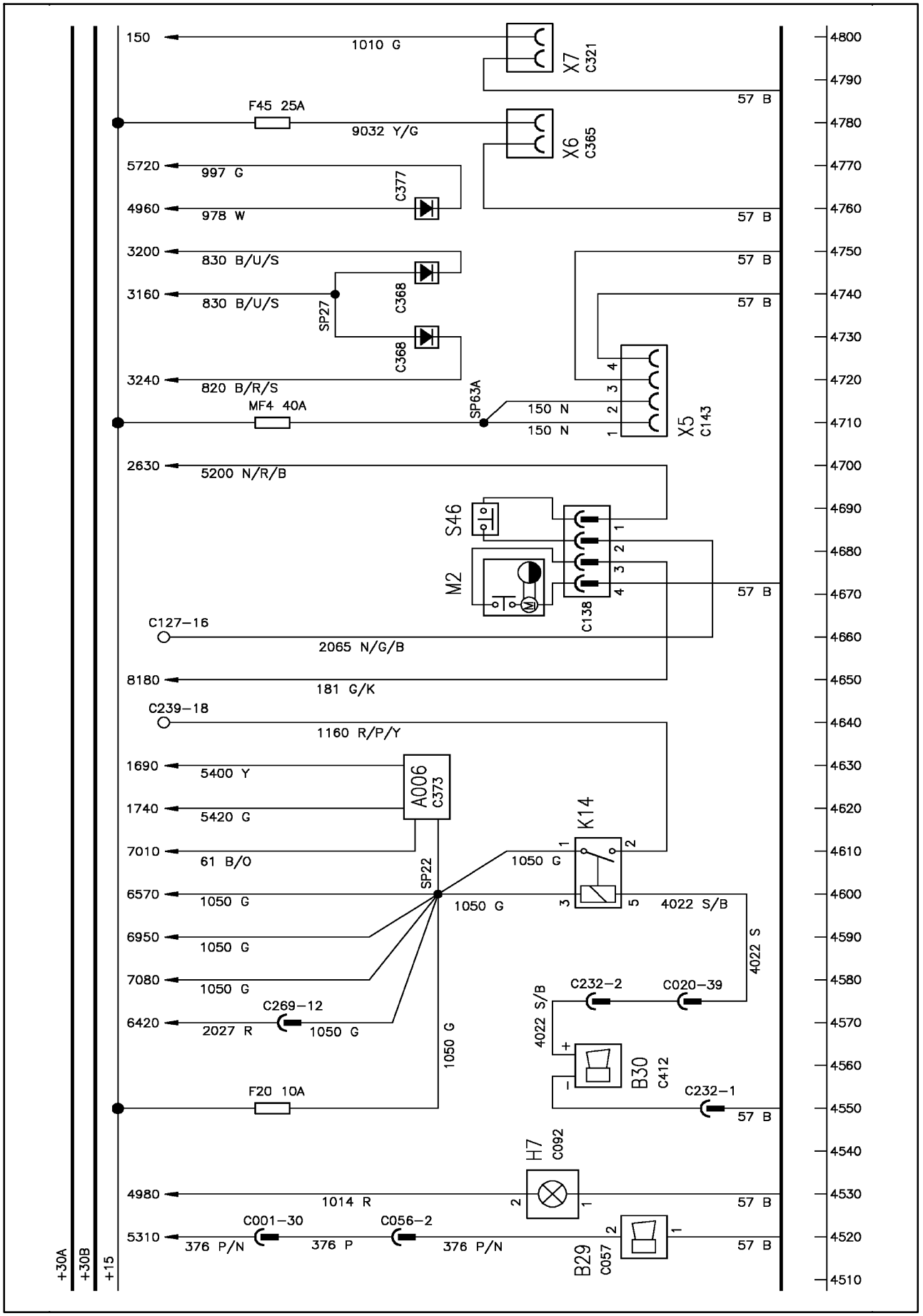
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510


150
1010 G
X7
C321
57 B
F45 25A
9032 Y/G
X6
C365
5720
997 G
C377
4960
978 W
57 B
3200
830 B/U/S
57 B
3160
830 B/U/S
SP27
C368
57 B
C368
3240
820 B/R/S
SP63A
MF4 40A
150 N
150 N
X5
C143
2630
5200 N/R/B
S46
M2
C138
57 B
C127-16
2065 N/G/B
8180
181 G/K
C239-18
1160 R/P/Y
1690
5400 Y
A006
C373
1740
5420 G
K14
7010
61 B/O
SP22
1050 G
6570
1050 G
1050 G
4022 S/B
6950
1050 G
4022 S
7080
1050 G
4022 S/B
C232-2
C020-39
C269-12
6420
2027 R
1050 G
1050 G
B30
C412
C232-1
F20 10A
57 B
H7
C092
4980
1014 R
57 B
C001-30
C056-2
5310
376 P/N
376 P
376 P/N
B29
C057
57 B
+30A
+30B
+15
4800
4790
4780
4770
4760
4750
4740
4730
4720
4710
4700
4690
4680
4670
4660
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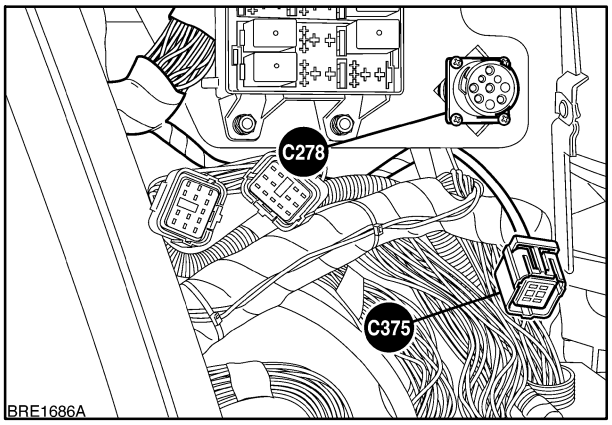
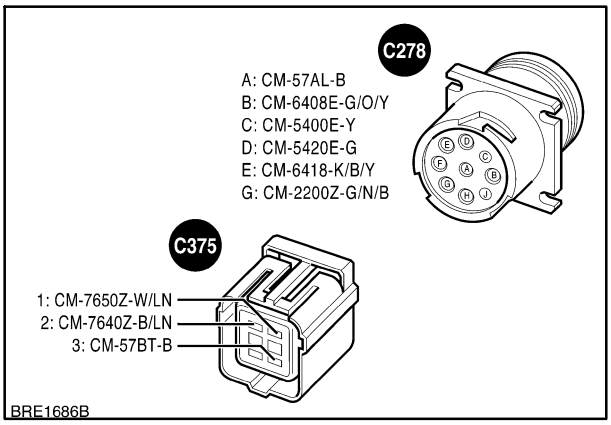
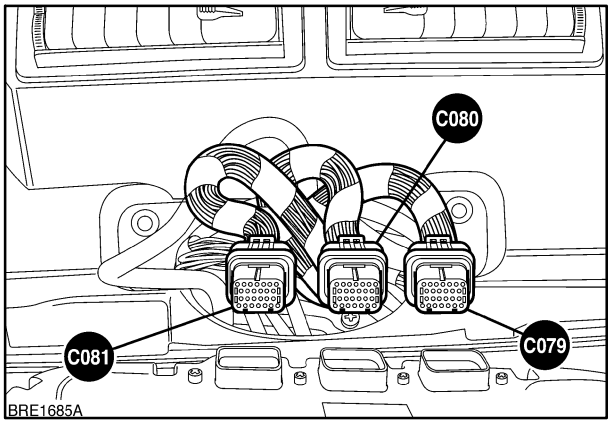
4510



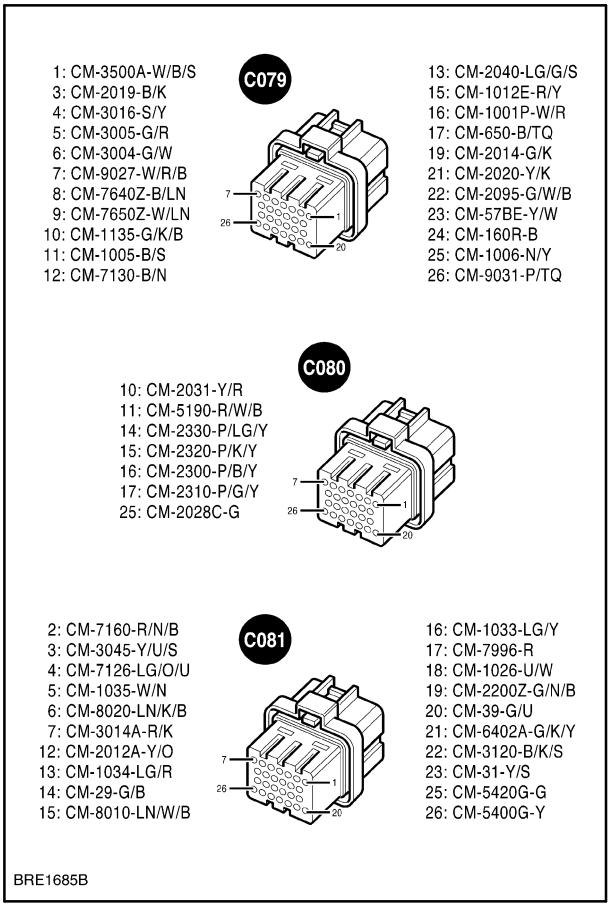
BRE1686A



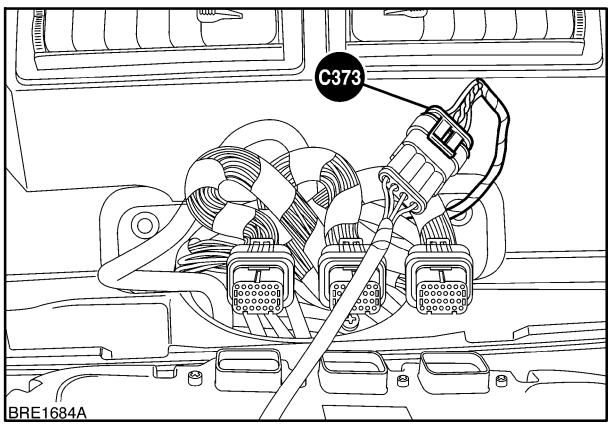
BRE1686B



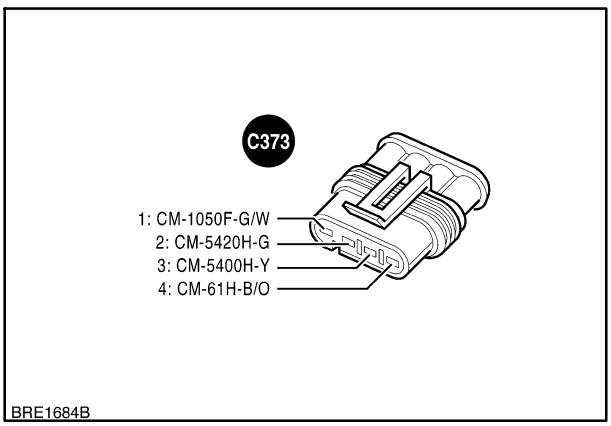
BRE1685A



BRE1685B



BRE1684A



BRE1684B

ERROR CODE 14906 – FAST STEER SYSTEM (FSS) MISSING

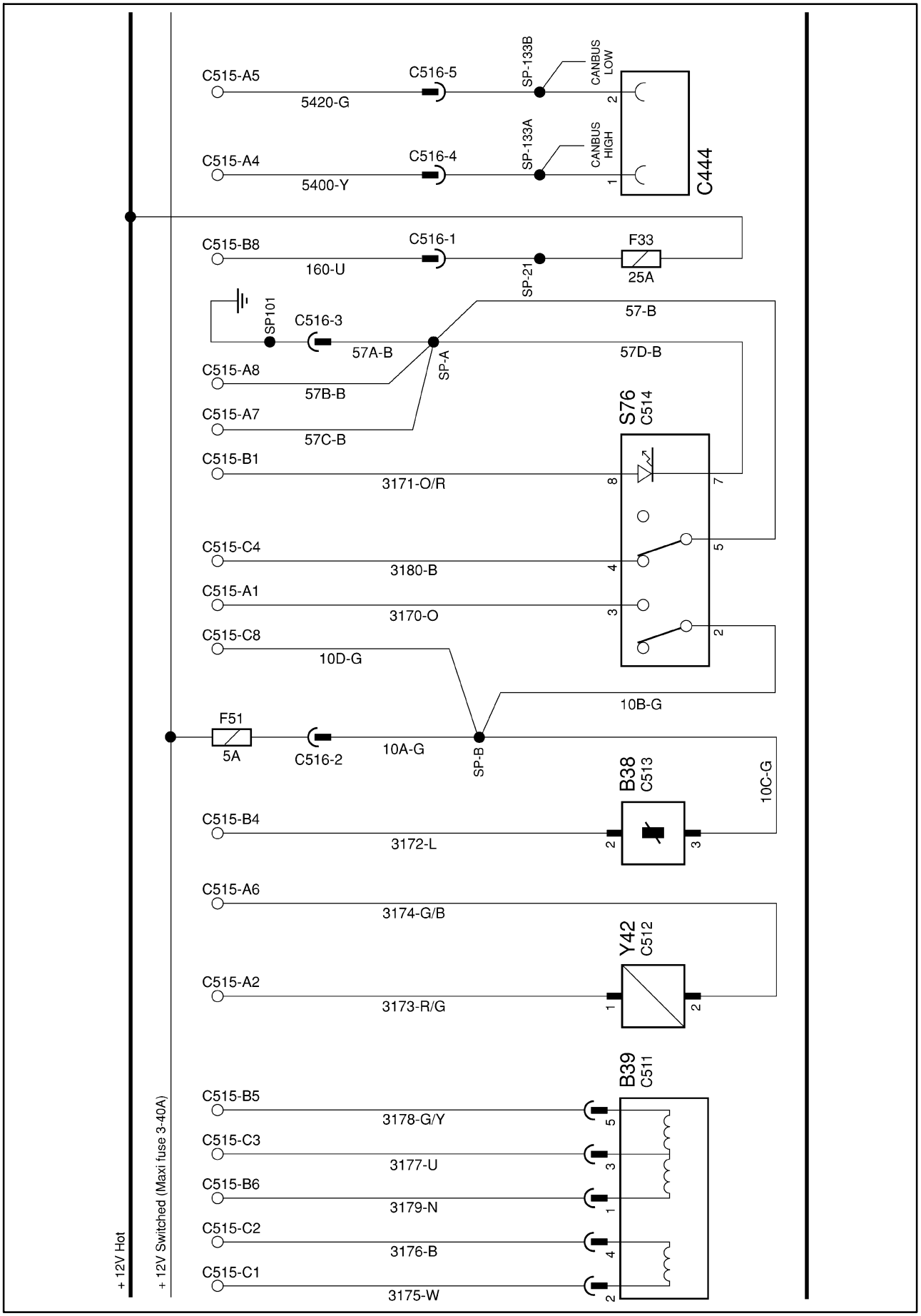
Possible failure modes:

1. Faulty main harness to fast steer extension harness connector
2. Faulty harness

Solution:

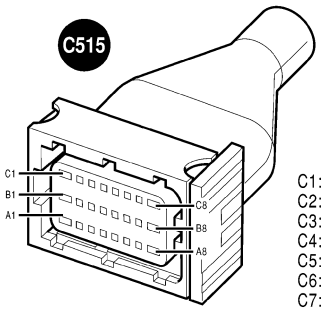
NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check that the Main cab harness to Fast steer system extension harness Connector, **C516,** is connected.
   A. Check the connector is a tight fit and the pins are correctly installed. Repair as required.
   B. If the connector is okay continue to step 3.
3. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 4.
4. Check all power supplies and grounds to the Fast Steer System.
   A. Check mini fuse 51, replace if blown.


+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)
C515-A5
C516-5
5420-G
SP-133B
CANBUS LOW
2
C515-A4
C516-4
5400-Y
SP-133A
CANBUS HIGH
1
C444
C515-B8
C516-1
160-U
SP-21
F33
25A
SP101
C516-3
57A-B
SP-A
57-B
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2

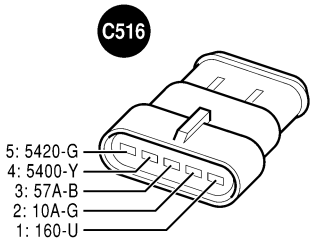
A1: 3170-O
A2: 3173-R/G
A3:
A4: 5400-Y
A5: 5420-G
A6: 3174-G/B
A7: 57C-B
A8: 57B-B

B1: 3171-O/R
B2:
B3:
B4: 3172-L
B5: 3178-G/Y
B6: 3179-N
B7:
B8: 160-U



C1: 3175-W
C2: 3176-B
C3: 3177-U
C4: 3180-B
C5: 5180-TQ/G
C6:
C7:
C8: 10D-G

BRH3203B



BRH3205B

ERROR CODE 14907 - GEAR SHIFT INDICATOR MISSING

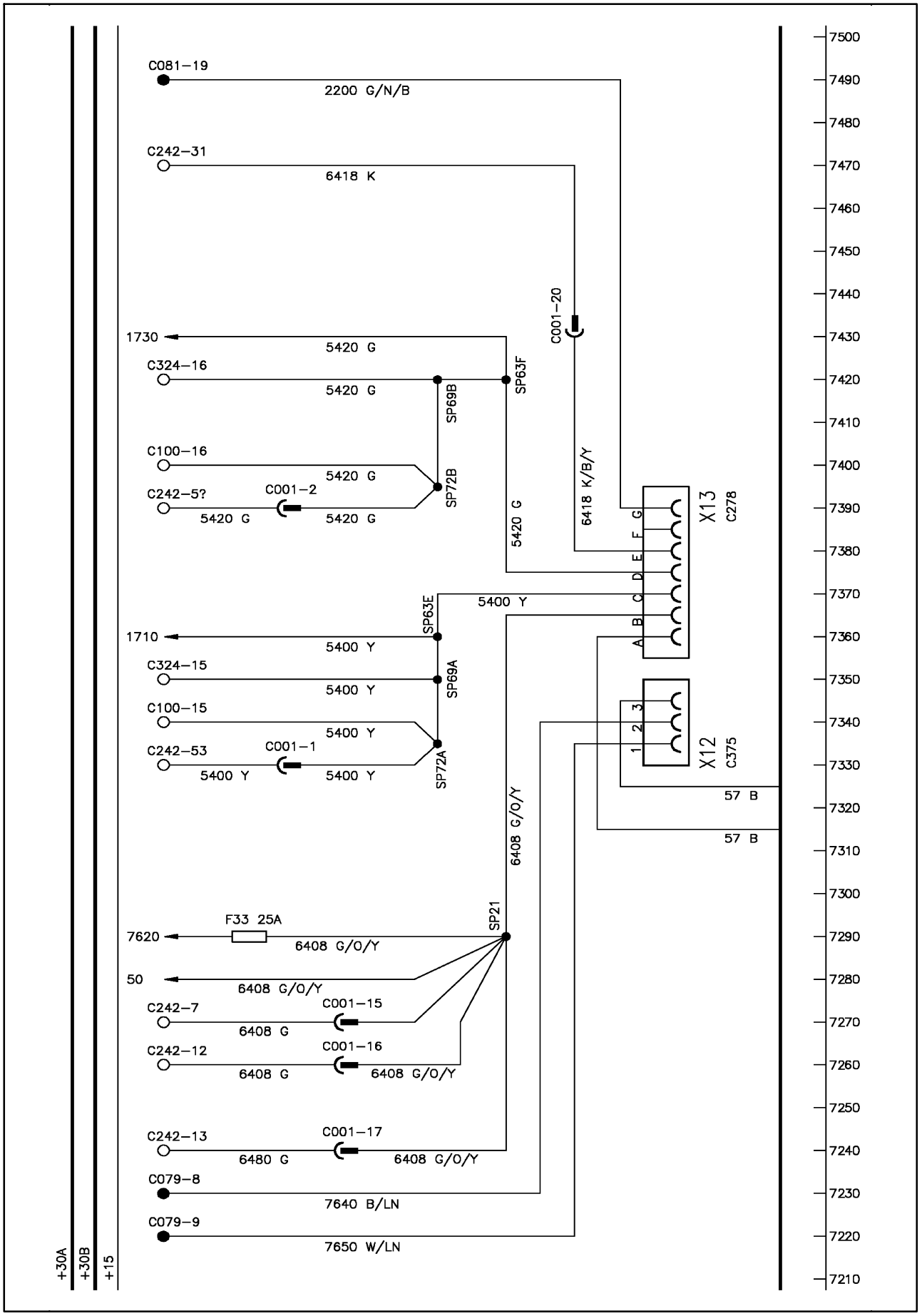
Possible failure modes:

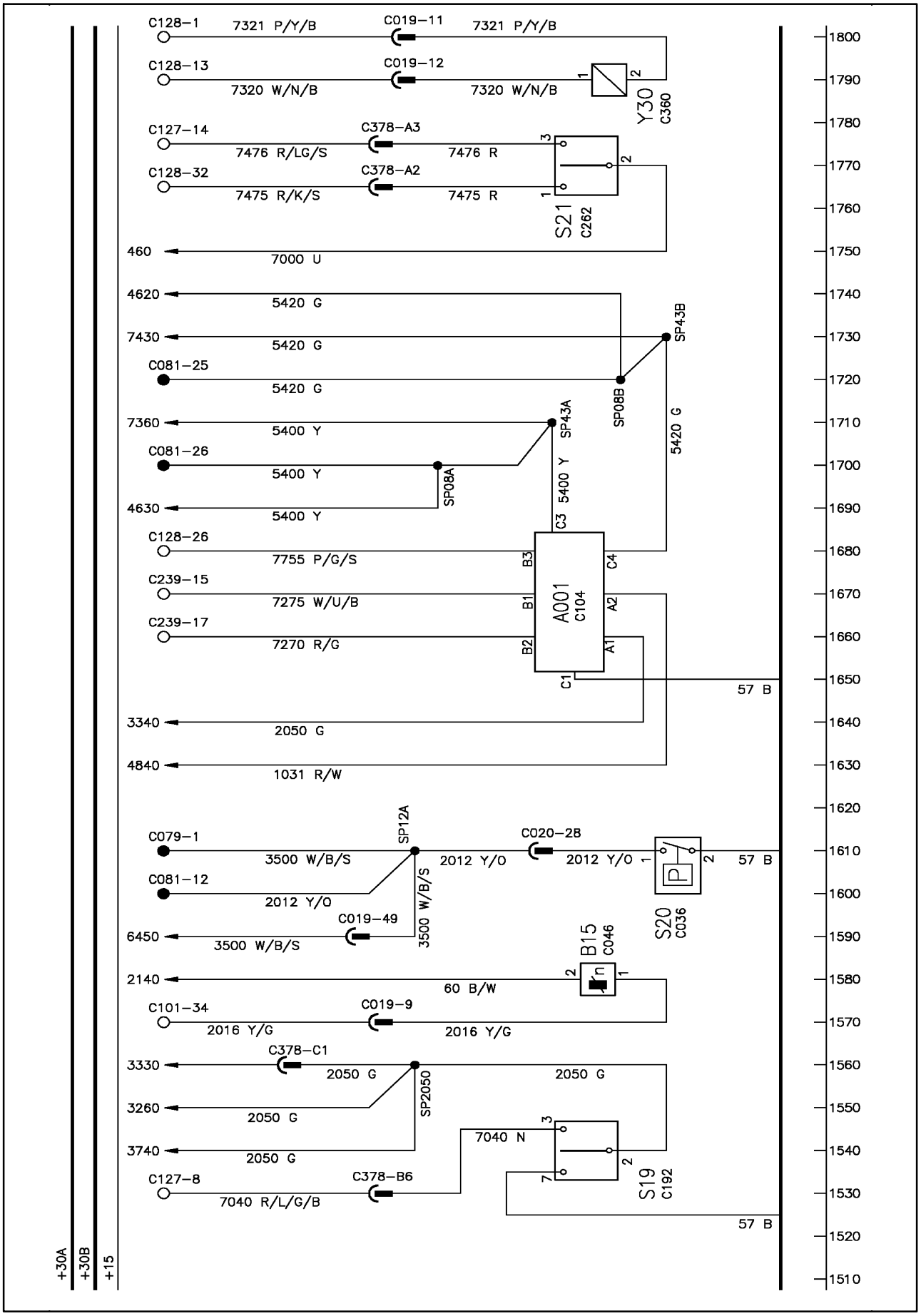
1. Faulty connector
2. Faulty harness
3. CAN BUS interference
4. Faulty CAN DOG

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Before proceeding clear the error code with the approved diagnostic equipment. Run the tractor under normal conditions and retest.
   A. If the error code is not indicated, check that the system is operating correctly.
   B. If the error code is indicated, continue to step 2.
2. Check for other error codes displayed.
   A. If other error codes are displayed, continue to these tests.
   B. If no other error codes are displayed, continue to step 3.
3. Check the all power supplies and grounds to the gear shift indicator.
   A. If a fault is indicated, repair or replace the harness as required.
   B. If no faults are indicated, continue to step 4.
4. Check the instrument cluster connector **C081** and the gear shift indicator connector **C104**.
   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.
   B. If the connectors are okay, continue to step 5.
5. Check for an open circuit on the CAN BUS.
   A. Disconnect connector **C104**. Check between connector:
   C278 (High) pin **C (Y)** and **C104** pin **C3 (Y)**
   C278 (Low) pin **D (G)** and **C104** pin **C4 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   If an open circuit not indicated, continue with step 6.
6. Check for open circuit on the CAN BUS.
   A. Disconnect connector **C081**. Check between connector:
   C104 (High) pin **C3 (Y)** and **C081** pin **26 (Y)**
   C104 (Low) pin **C4 (G)** and **C081** pin **25 (G)**
   If an open circuit is indicated, repair or replace the harness as required.
   B. If an open circuit not indicated, remove and replace the gear shift indicator.


C081-19
2200 G/N/B
C242-31
6418 K
C001-20
1730
5420 G
C324-16
5420 G
SP63F
SP69B
C100-16
5420 G
C242-5?
C001-2
5420 G
5420 G
SP72B
6418 K/B/Y
5420 G
X13
C278
A B C D E F G
5400 Y
SP63E
1710
5400 Y
C324-15
5400 Y
SP69A
C100-15
5400 Y
C242-53
C001-1
5400 Y
5400 Y
SP72A
X12
C375
1 2 3
57 B
57 B
6408 G/O/Y
SP21
F33 25A
7620
6408 G/O/Y
50
6408 G/O/Y
C242-7
C001-15
6408 G
C242-12
C001-16
6408 G
6408 G/O/Y
C242-13
C001-17
6480 G
6408 G/O/Y
C079-8
7640 B/LN
C079-9
7650 W/LN
+30A
+30B
+15
7500
7490
7480
7470
7460
7450
7440
7430
7420
7410
7400
7390
7380
7370
7360
7350
7340
7330
7320
7310
7300
7290
7280
7270
7260
7250
7240
7230
7220
7210


C128-1
7321 P/Y/B
C019-11
7321 P/Y/B
C128-13
C019-12
7320 W/N/B
7320 W/N/B
Y30
C360
C127-14
C378-A3
7476 R/LG/S
7476 R
C128-32
C378-A2
7475 R/K/S
7475 R
S21
C262
460
7000 U
4620
5420 G
7430
5420 G
SP43B
C081-25
5420 G
SP08B
7360
5400 Y
SP43A
C081-26
5400 Y
SP08A
4630
5400 Y
C3 5400 Y
5420 G
C128-26
7755 P/G/S
C239-15
7275 W/U/B
C239-17
7270 R/G
A001
C104
B3
B1
B2
C4
A2
A1
C1
57 B
3340
2050 G
4840
1031 R/W
SP12A
C079-1
3500 W/B/S
2012 Y/O
C020-28
2012 Y/O
57 B
C081-12
2012 Y/O
3500 W/B/S
C019-49
6450
3500 W/B/S
S20
C036
B15
C046
2140
60 B/W
C101-34
C019-9
2016 Y/G
2016 Y/G
C378-C1
3330
2050 G
2050 G
SP2050
3260
2050 G
3740
2050 G
7040 N
S19
C192
C127-8
C378-B6
7040 R/L/G/B
57 B
+30A
+30B
+15
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
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1600
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1580
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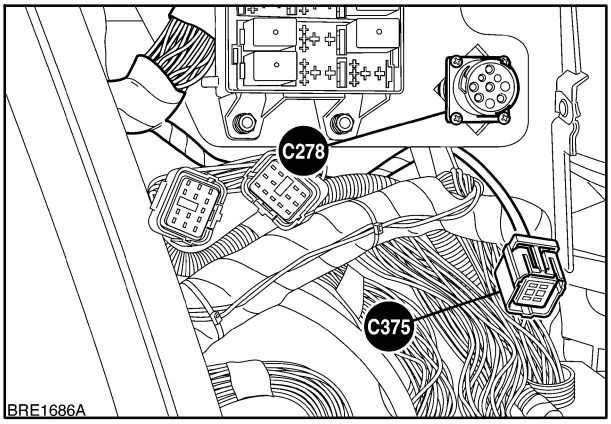
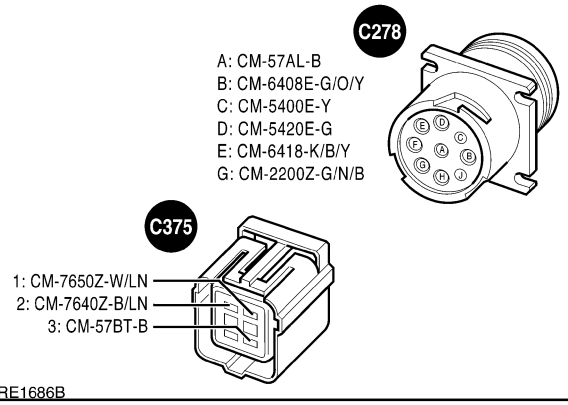
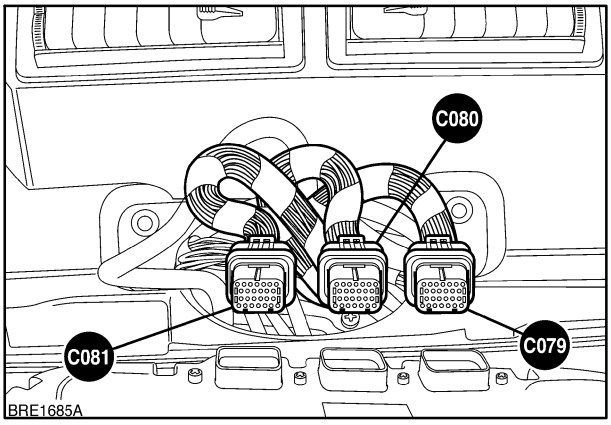
1520
1510



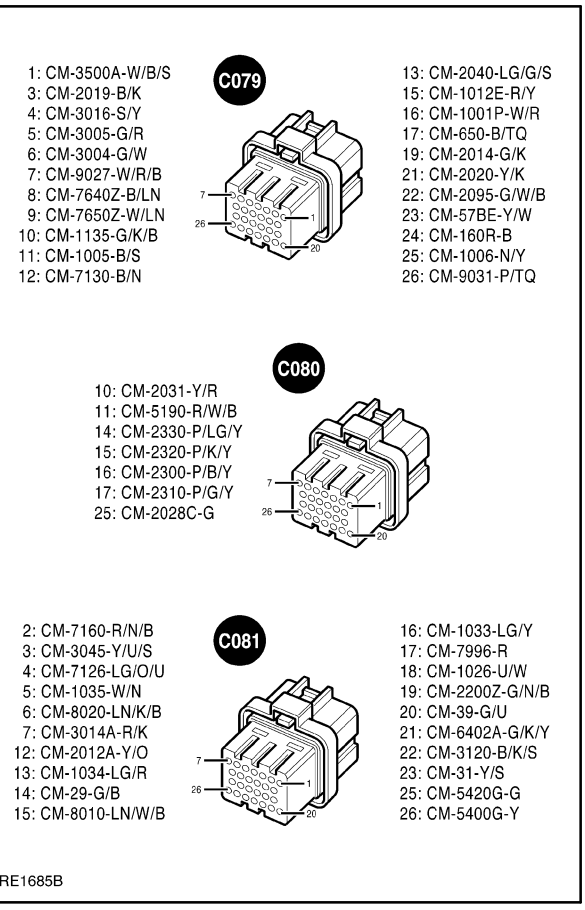
BRE1686A



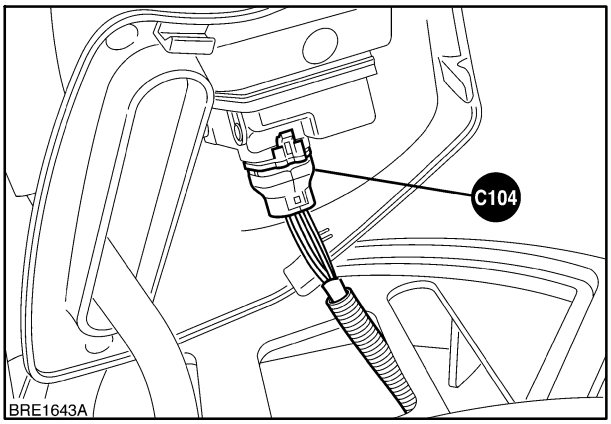
BRE1686B



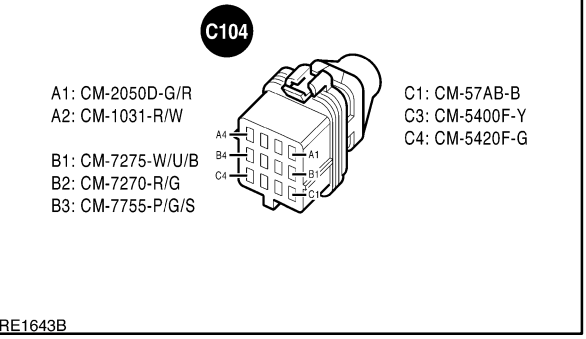
BRE1685A



BRE1685B



BRE1643A



BRE1643B

ERROR CODE 14081 - OIL PRESSURE SWITCH SHORT TO HIGH VOLTAGE

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the oil pressure switch connector **C004,** the ADIC connector **C081** and the inline harness connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

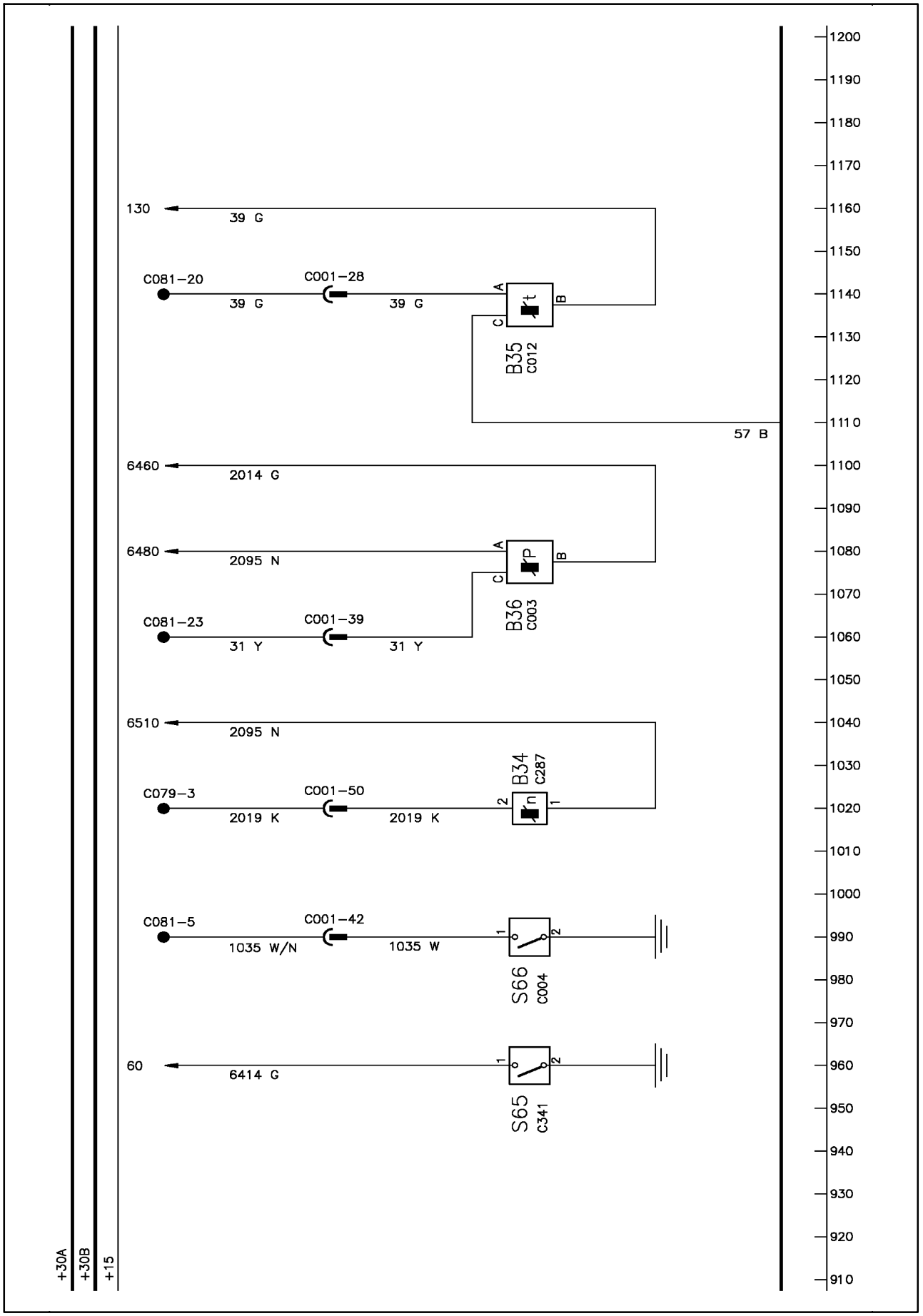
   B. If the connectors are okay, continue to step 2.

2. Check for a short to +Ve voltage.

   A. Disconnect connector **C004**. Turn the key start ON. Check between connector **C004** pin **1 (W)** and **ground**.

   If a short to +Ve voltage is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the ADIC.


+30A
+30B
+15
130
39 G
C081-20
39 G
C001-28
39 G
B35
C012
57 B
6460
2014 G
6480
2095 N
C081-23
31 Y
C001-39
31 Y
B36
C003
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
C081-5
1035 W/N
C001-42
1035 W
S66
C004
60
6414 G
S65
C341
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
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1040
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1020
1010
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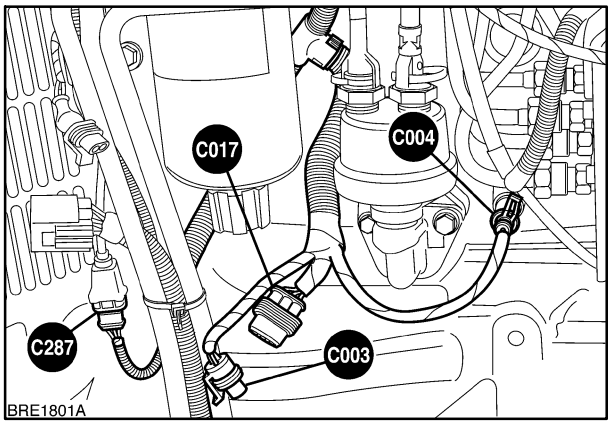
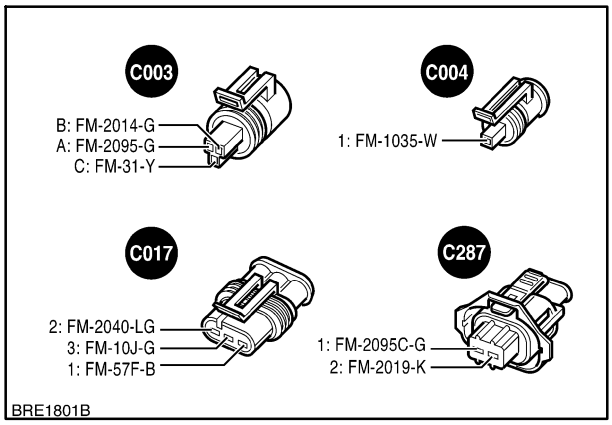
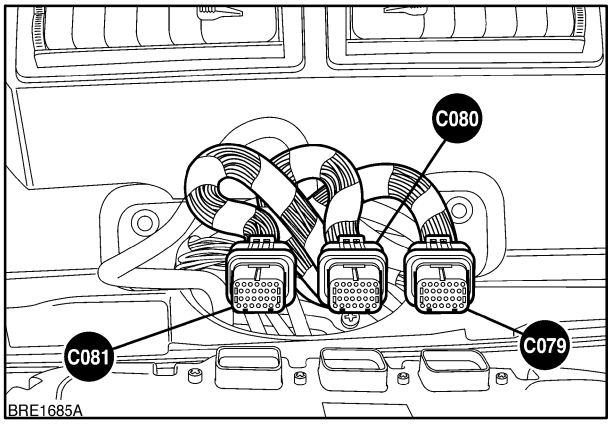
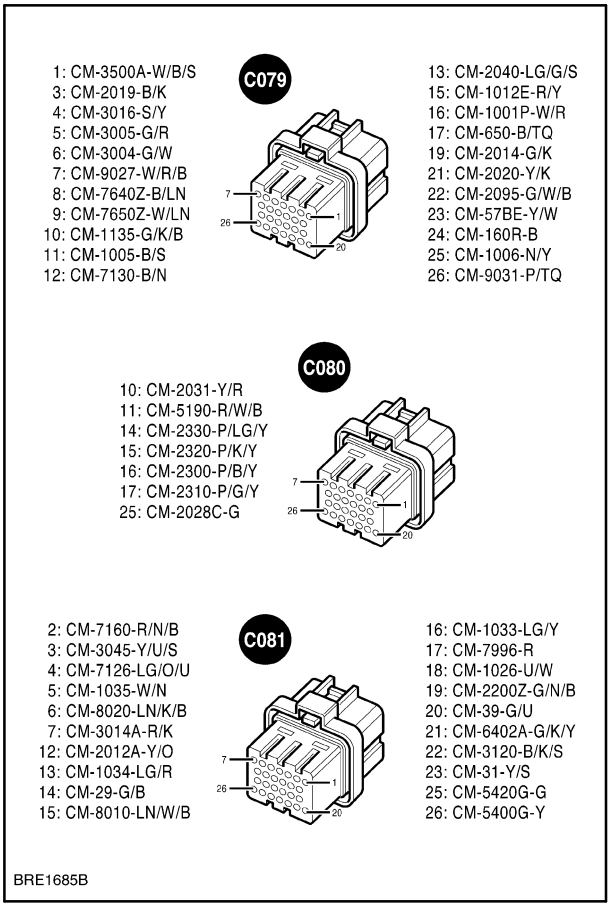
990
980
970
960
950
940
930
920
910


C017
C004
C287
C003
BRE1801A


C003
B: FM-2014-G
A: FM-2095-G
C: FM-31-Y
C004
1: FM-1035-W
C017
2: FM-2040-LG
3: FM-10J-G
1: FM-57F-B
C287
1: FM-2095C-G
2: FM-2019-K
BRE1801B


C080
C081
C079
BRE1685A


1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
C079
7
26
1
20
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

ERROR CODE 14082 – OIL PRESSURE SWITCH OPEN CIRCUIT OR SHORT TO GROUND

Possible failure modes:

1. Faulty connector
2. Faulty oil pressure switch
3. Faulty harness
4. Faulty analog digital instrument cluster (ADIC)

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the oil pressure switch connector **C004,** the ADIC connector **C081** and the inline harness connector **C001**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to ground.

   A. Disconnect connector **C004**. Check between connector **C004** pin **1 (W)** and **ground**.

   If a short to ground is indicated, repair or replace the harness as required.

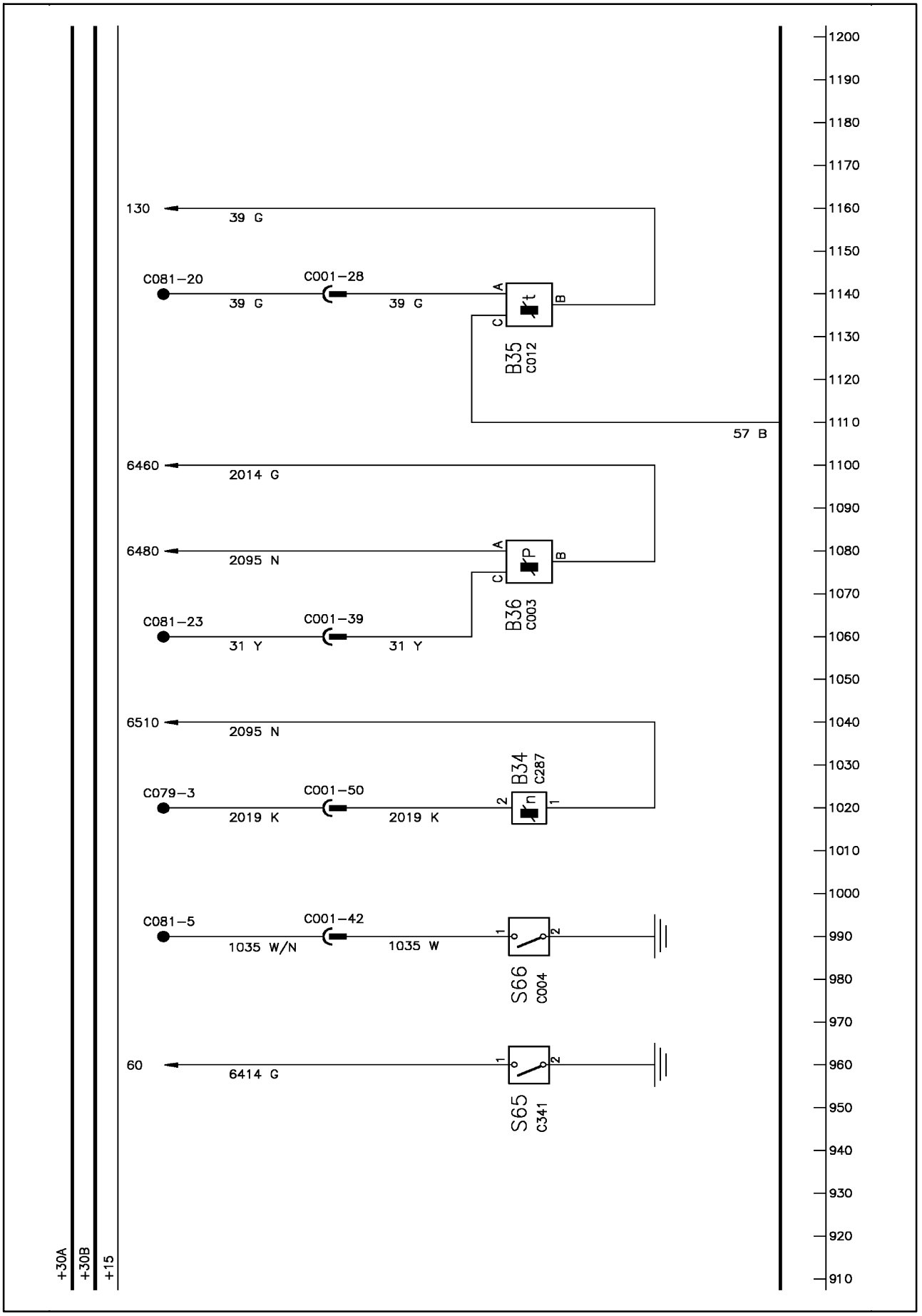
   B. If a short to ground is not indicated, continue to step 3.

3. Check for and open circuit.

   A. Disconnect connector **C081**. Check between connector **C004** pin **1 (W)** and **C081** pin **5 (W/N)**.

   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the oil pressure switch.


+30A
+30B
+15
130
39 G
C081-20
39 G
C001-28
39 G
A
B
C
B35
C012
57 B
6460
2014 G
6480
2095 N
A
B
C
B36
C003
C081-23
31 Y
C001-39
31 Y
6510
2095 N
C079-3
2019 K
C001-50
2019 K
B34
C287
2
1
C081-5
1035 W/N
C001-42
1035 W
1
2
S66
C004
60
6414 G
1
2
S65
C341
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
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1020
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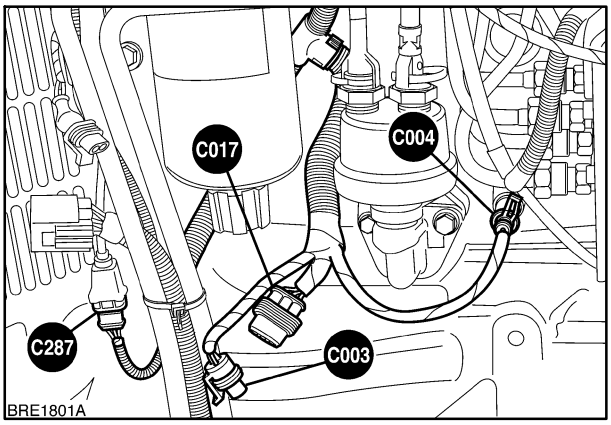
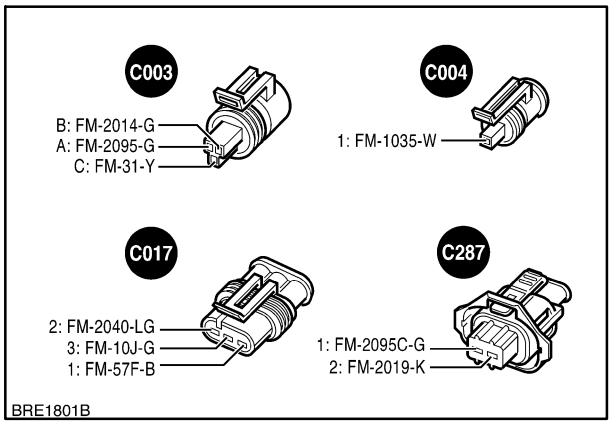
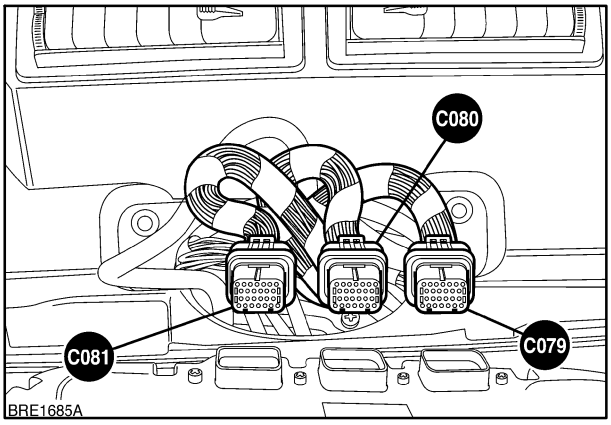
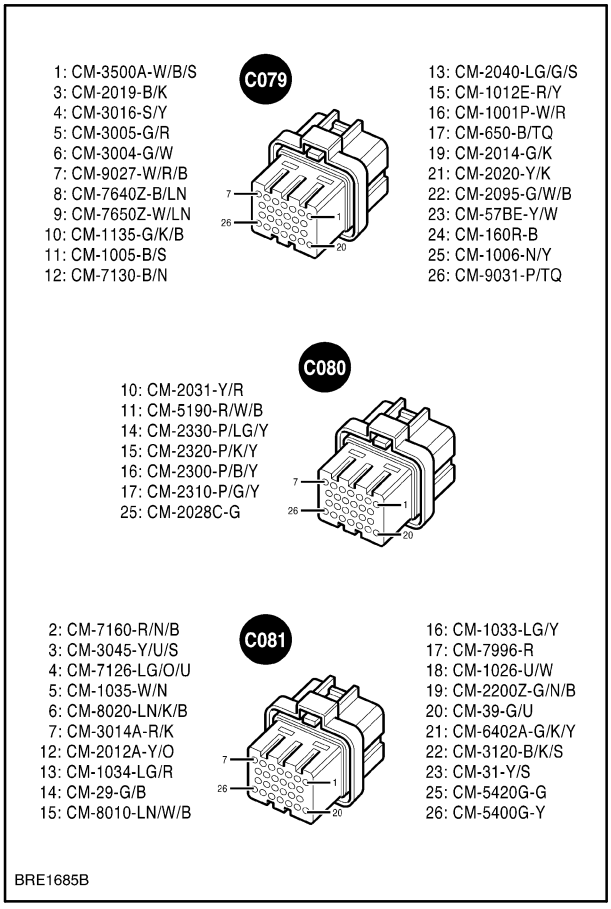
960
950
940
930
920
910


C017
C004
C287
C003
BRE1801A


C003
B: FM-2014-G
A: FM-2095-G
C: FM-31-Y
C004
1: FM-1035-W
C017
2: FM-2040-LG
3: FM-10J-G
1: FM-57F-B
C287
1: FM-2095C-G
2: FM-2019-K
BRE1801B


C080
C081
C079
BRE1685A


C079
1: CM-3500A-W/B/S
3: CM-2019-B/K
4: CM-3016-S/Y
5: CM-3005-G/R
6: CM-3004-G/W
7: CM-9027-W/R/B
8: CM-7640Z-B/LN
9: CM-7650Z-W/LN
10: CM-1135-G/K/B
11: CM-1005-B/S
12: CM-7130-B/N
13: CM-2040-LG/G/S
15: CM-1012E-R/Y
16: CM-1001P-W/R
17: CM-650-B/TQ
19: CM-2014-G/K
21: CM-2020-Y/K
22: CM-2095-G/W/B
23: CM-57BE-Y/W
24: CM-160R-B
25: CM-1006-N/Y
26: CM-9031-P/TQ
C080
10: CM-2031-Y/R
11: CM-5190-R/W/B
14: CM-2330-P/LG/Y
15: CM-2320-P/K/Y
16: CM-2300-P/B/Y
17: CM-2310-P/G/Y
25: CM-2028C-G
C081
2: CM-7160-R/N/B
3: CM-3045-Y/U/S
4: CM-7126-LG/O/U
5: CM-1035-W/N
6: CM-8020-LN/K/B
7: CM-3014A-R/K
12: CM-2012A-Y/O
13: CM-1034-LG/R
14: CM-29-G/B
15: CM-8010-LN/W/B
16: CM-1033-LG/Y
17: CM-7996-R
18: CM-1026-U/W
19: CM-2200Z-G/N/B
20: CM-39-G/U
21: CM-6402A-G/K/Y
22: CM-3120-B/K/S
23: CM-31-Y/S
25: CM-5420G-G
26: CM-5400G-Y
BRE1685B

NOTES

15001 - 16000 FAST STEERING ERROR CODE LISTING

Error Code	Error description
15002	Steering wheel control proximity sensor open cicuit
15003	Steering wheel control proximity sensor short circuit
15006	Split valve LVDT sensor open circuit
15007	Split valve LVDT sensor short circuit
15008	Change valve solenoid open circuit and short to ground
15009	Change valve solenoid short circuit across itself
15010	Safety Switch fail
15011	Maximum engagement time elapsed (5 minutes)
15012	Split valve spool stuck open
15013	Change valve or Split valve spools stuck closed
15014	Split valve spool stuck in transition zone , system can't identify which steering mode the tractor is in.
15024	System not calibrated

ERROR CODE 15002 - STEERING WHEEL CONTROL PROXIMITY SENSOR OPEN CIRCUIT

Effects:

1. System disabled, non critical alarm activated.

Possible failure modes:

1. Incorrect sensor position.
2. Faulty sensor or wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the proximity sensor position adjustment.

   A. If the sensor position is not correct adjust to obtain a 10mm gap. Recalibrate the sensor and retest the system.

   B. If the sensor position is correct continue to step 2.

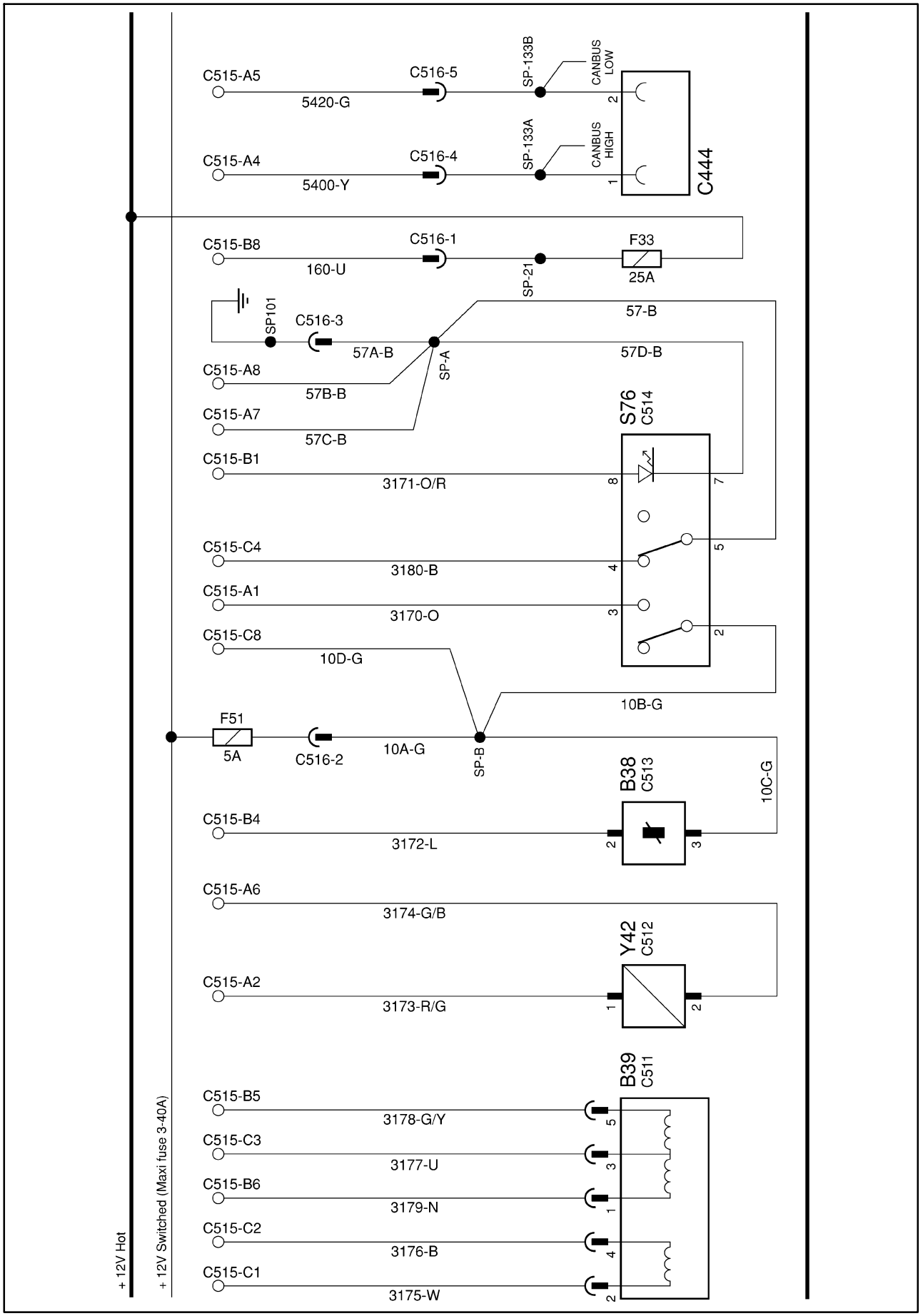
2. Check the proximity sensor and Wiring.

   A. Enter H-Menu mode, H9 (voltmeter), channel 3. Typical readings should be between 50 (wheel depressed) and 800 (wheel released). If the reading is >800 this will indicate a short circuit within the sensor.

   If the reading is >1000 this will indicate a short to +12V. If the reading is <30 this will indicate a short to ground or an open circuit.

   B. If a faulty reading is displayed check the wiring to the sensor. Disconnect the sensor, with the key start ON, using a suitable multimeter, there should be +12V at pin 3 of **C513**, if +12V is not indicated repair or replace the wiring as required. If +12V is indicated continue to step C.

   C. With the key start OFF, proximity sensor disconnected, disconnect the fast steer system processor, **C515**. Using a suitable multimeter check between **C515-B4** and the sensor connector **C513-2** (wire 3172-L) for continuity. Also check for a short to ground (key start OFF) and with the key start ON, check for a short to +12V, from either of the connectors/pins. Repair or replace the wiring if a fault is indicated. If no fault is indicated replace the Proximity sensor.


C515-A5
C516-5
SP-133B
CANBUS LOW
5420-G
2
C515-A4
C516-4
SP-133A
CANBUS HIGH
5400-Y
1
C444
C515-B8
C516-1
F33
160-U
SP-21
25A
SP101
C516-3
57-B
57A-B
SP-A
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
5
C515-C4
3180-B
4
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
B39
C511
C515-B5
3178-G/Y
C515-C3
3177-U
C515-B6
3179-N
C515-C2
3176-B
C515-C1
3175-W
+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)

Key to Wiring Diagram:

Connector C511 (component B39) - LVDT

Connector C512 (component Y42) - Split Valve Solenoid Valve

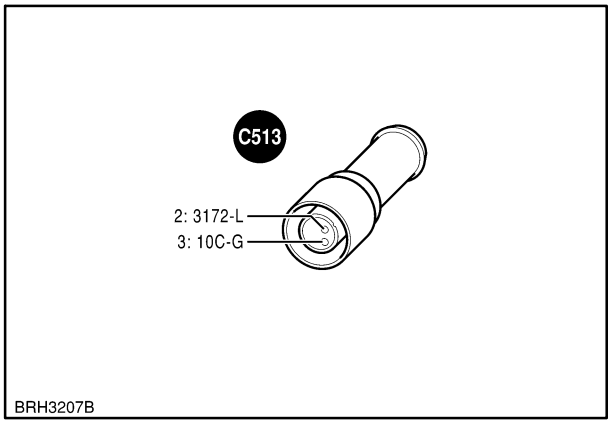
Connector C513 (component B38) - Proximity sensor

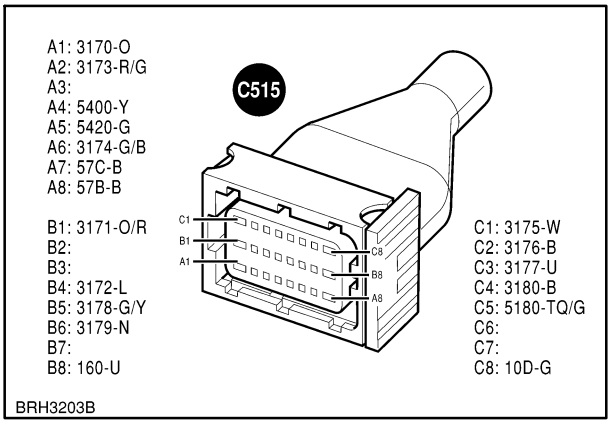
Connector C514 (component S76) - Safety/enable switch

Connector C515 - KA (fast steer) processor

Connector C516 - Fast Steer to Main cab harness connector

Connector C444 - Trans CAN select connector





ERROR CODE 15003 - STEERING WHEEL CONTROL PROXIMITY SENSOR SHORT CIRCUIT

Effects:

1. System disabled, non critical alarm activated.

Possible failure modes:

1. Incorrect sensor position.
2. Faulty sensor or wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the proximity sensor position adjustment.

   A. If the sensor position is not correct adjust to obtain a 10mm gap. Recalibrate the sensor and retest the system.

   B. If the sensor position is correct continue to step 2.

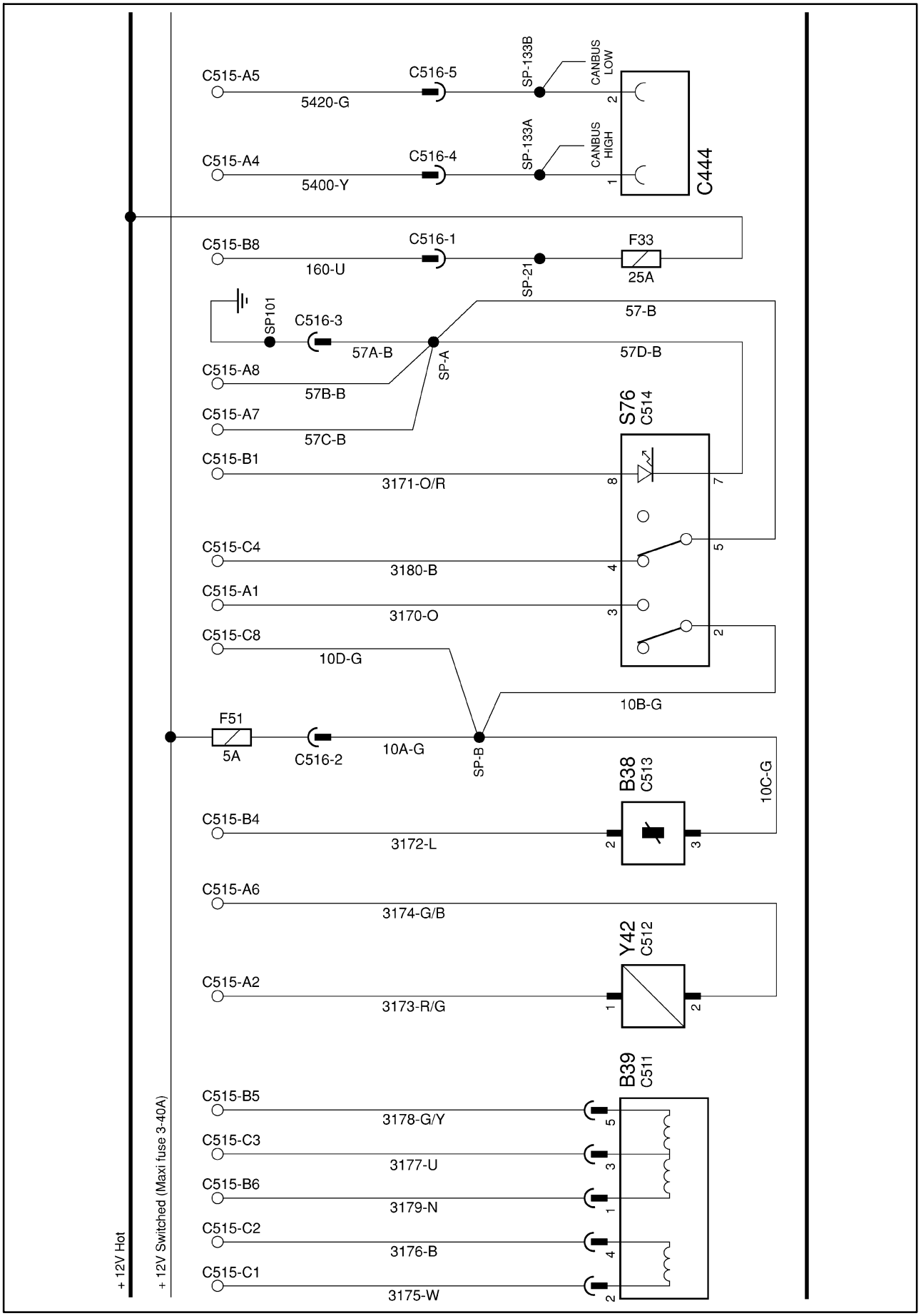
2. Check the proximity sensor and Wiring.

   A. Enter H-Menu mode, H9 (voltmeter), channel 3. Typical readings should be between 50 (wheel depressed) and 800 (wheel released).
   If the reading is >800 this will indicate a short circuit within the sensor.

   If the reading is >1000 this will indicate a short to +12V.
   If the reading is <30 this will indicate a short to ground or an open circuit.

   B. If a faulty reading is displayed check the wiring to the sensor.
   Disconnect the sensor, with the key start ON, using a suitable multimeter, there should be +12V at pin 3 of **C513**, if +12V is not indicated repair or replace the wiring as required. If +12V is indicated continue to step C.

   C. With the key start OFF, proximity sensor disconnected, disconnect the fast steer system processor, **C515**. Using a suitable multimeter check between **C515-B4** and the sensor connector **C513-2** (wire 3172-L) for continuity. Also check for a short to ground (key start OFF) and with the key start ON, check for a short to +12V, from either of the connectors/pins. Repair or replace the wiring if a fault is indicated. If no fault is indicated replace the Proximity sensor.


+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)
C515-A5
C516-5
5420-G
SP-133B
CANBUS LOW
2
C515-A4
C516-4
5400-Y
SP-133A
CANBUS HIGH
1
C444
C515-B8
C516-1
160-U
SP-21
F33
25A
SP101
C516-3
57A-B
SP-A
57-B
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2

Key to Wiring Diagram:

Connector C511 (component B39) – LVDT

Connector C512 (component Y42) – Split Valve Solenoid Valve

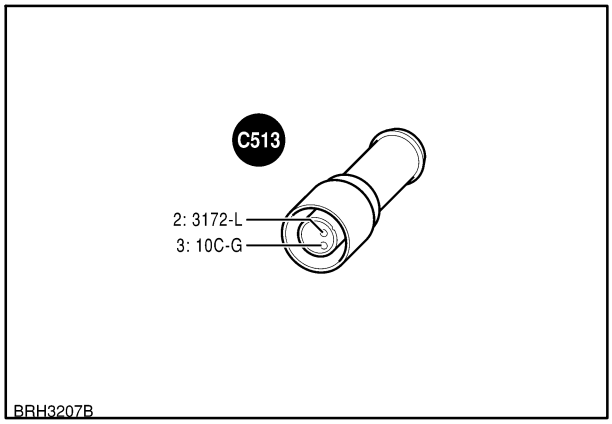
Connector C513 (component B38) – Proximity sensor

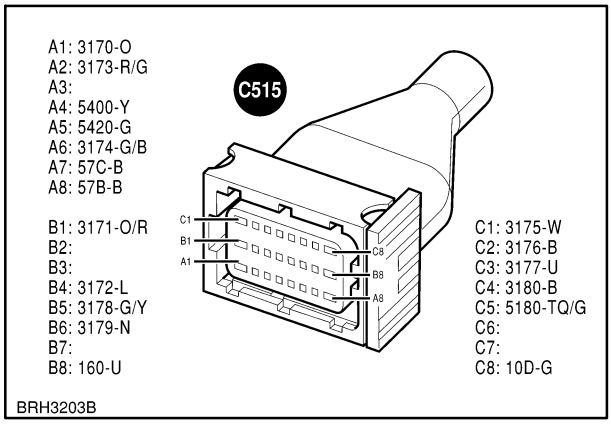
Connector C514 (component S76) – Safety/enable switch

Connector C515 – KA (fast steer) processor

Connector C516 – Fast Steer to Main cab harness connector

Connector C444 – Trans CAN select connector





ERROR CODE 15006 - SPLIT VALVE LVDT SENSOR OPEN CIRCUIT

Effects:

1. System Disabled, non critical alarm activated.

Possible failure modes:

1. Fault within the Split Valve LVDT sensor.
2. Faulty wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Split Valve LVDT sensor using H-Menu Mode H9.

   A. Install the diagnostic tool and enter H menu Mode H9 for the KA processor. Select channnel 1 for coil winding 1 and channel 2 for coil winding 2. Typical readings should be 450-750 for channel 1 and 450-750 for channel 2. If the readings are correct clear the error code and check for an intermittent poor connection. If the readings are incorrect continue to step 2.

2. Check the Split valve LVDT sensor using a multimeter.

   A. Remove connector **C511** from the LVDT sensor. Using a multimeter check the resistances of the coils as follows:-

   Between pins 2 and 4 approximately 180Ω
   Between pins 1 and 3 approximately 410Ω
   Between pins 3 and 5 approximately 410Ω
   Between pins 1 and 5 approximately 820Ω

   If any readings are incorrect replace the Split valve LVDT sensor.

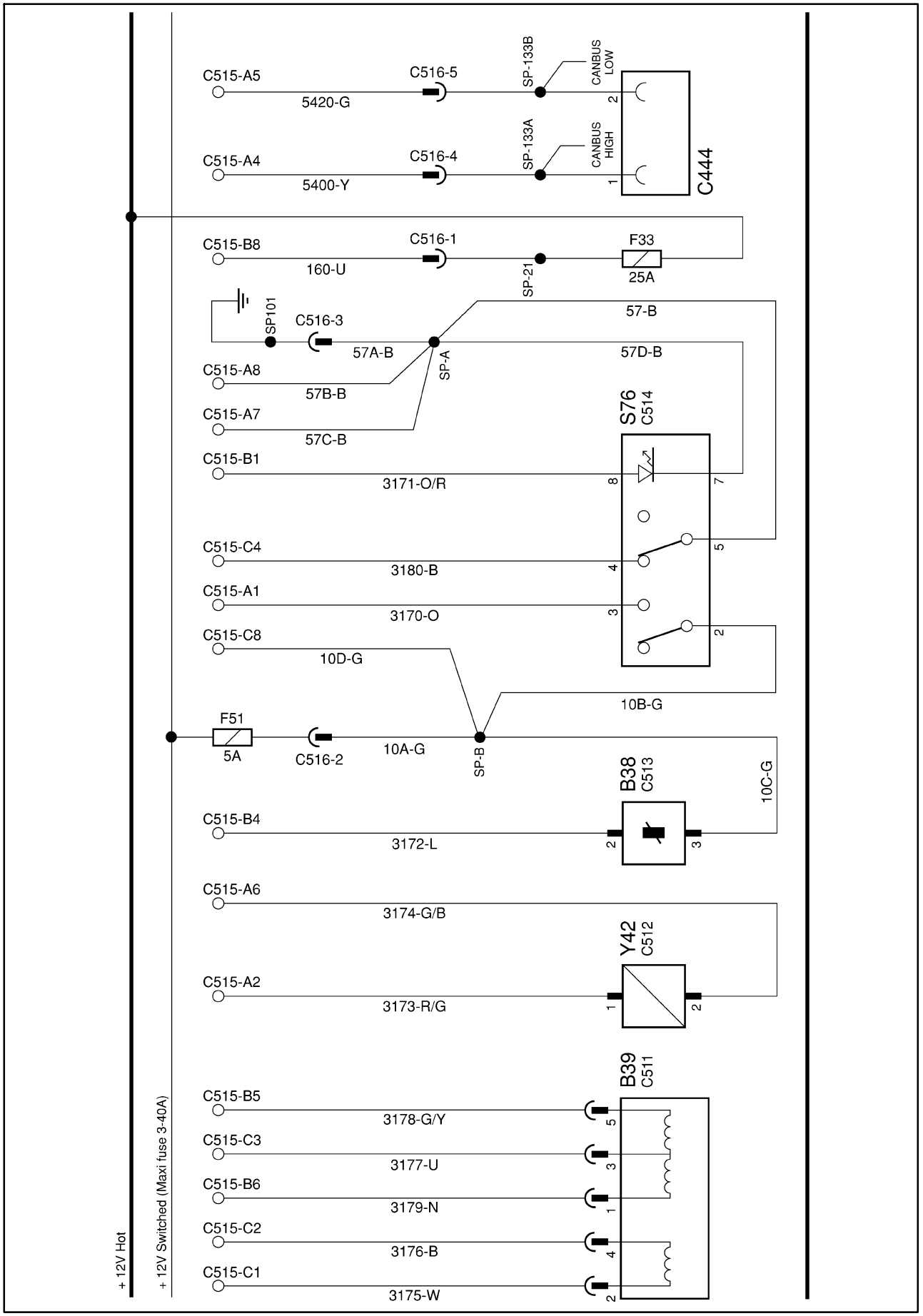
   If the readings are correct continue to step 3.

3. Check the wiring and connectors to the sensor and fast steer (KA) processor.

   A. With the key start OFF disconnect the processor connector **C515** and the sensor connector **C511**. Using a suitable multimeter check between the following sets of pins for continuity:-
   C515-C1 and **C511-2**
   C515-C2 and **C511-4**
   C515-B6 and **C511-1**
   C515-C3 and **C511-3**
   C515-B5 and **C511-5**
   If an open circuit is indicated between any pair repair or replace the wiring as required.

   B. If no fault is indicated continue to step 4.

4. Suspect a faulty fast steer (KA) processor. Substitute the processor and test system.


C515-A5
C516-5
SP-133B
CANBUS LOW
5420-G
2
C515-A4
C516-4
SP-133A
CANBUS HIGH
5400-Y
1
C444
C515-B8
C516-1
F33
160-U
SP-21
25A
SP101
C516-3
57-B
57A-B
SP-A
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2
+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)

Key to Wiring Diagram:

Connector C511 (component B39) – LVDT

Connector C512 (component Y42) – Split Valve Solenoid Valve

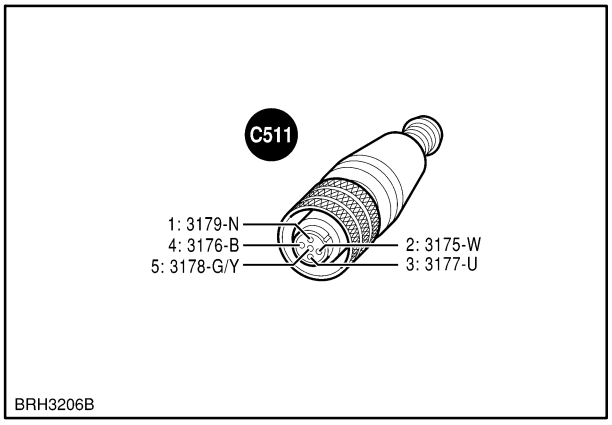
Connector C513 (component B38) – Proximity sensor

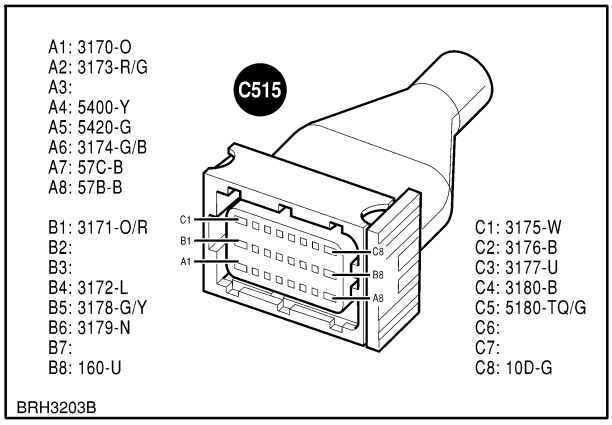
Connector C514 (component S76) – Safety/enable switch

Connector C515 – KA (fast steer) processor

Connector C516 – Fast Steer to Main cab harness connector

Connector C444 – Trans CAN select connector





ERROR CODE 15007 - SPLIT VALVE LVDT SENSOR SHORT CIRCUIT

Effects:

1. System Disabled, non critical alarm activated.

Possible failure modes:

1. Fault within the Split Valve LVDT sensor.
2. Faulty wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Split Valve LVDT sensor using H-Menu Mode H9.

   A. Install the diagnostic tool and enter H menu Mode H9 for the (KA) processor. Select channel 1 for coil winding 1 and channel 2 for coil winding 2. Typical readings should be 450-750 for channel 1 and 450-750 for channel 2. If the readings are correct clear the error code and check for an intermittent poor connection. If the readings are incorrect continue to step 2.

2. Check the Split valve LVDT sensor using a multimeter.

   A. Remove connector **C511** from the LVDT sensor. Using a multimeter check the resistances of the coils as follows:-

   Between pins 2 and 4 approximately 180Ω
   Between pins 1 and 3 approximately 410Ω
   Between pins 3 and 5 approximately 410Ω
   Between pins 1 and 5 approximately 820Ω

   If any readings are incorrect replace the Split valve LVDT sensor.

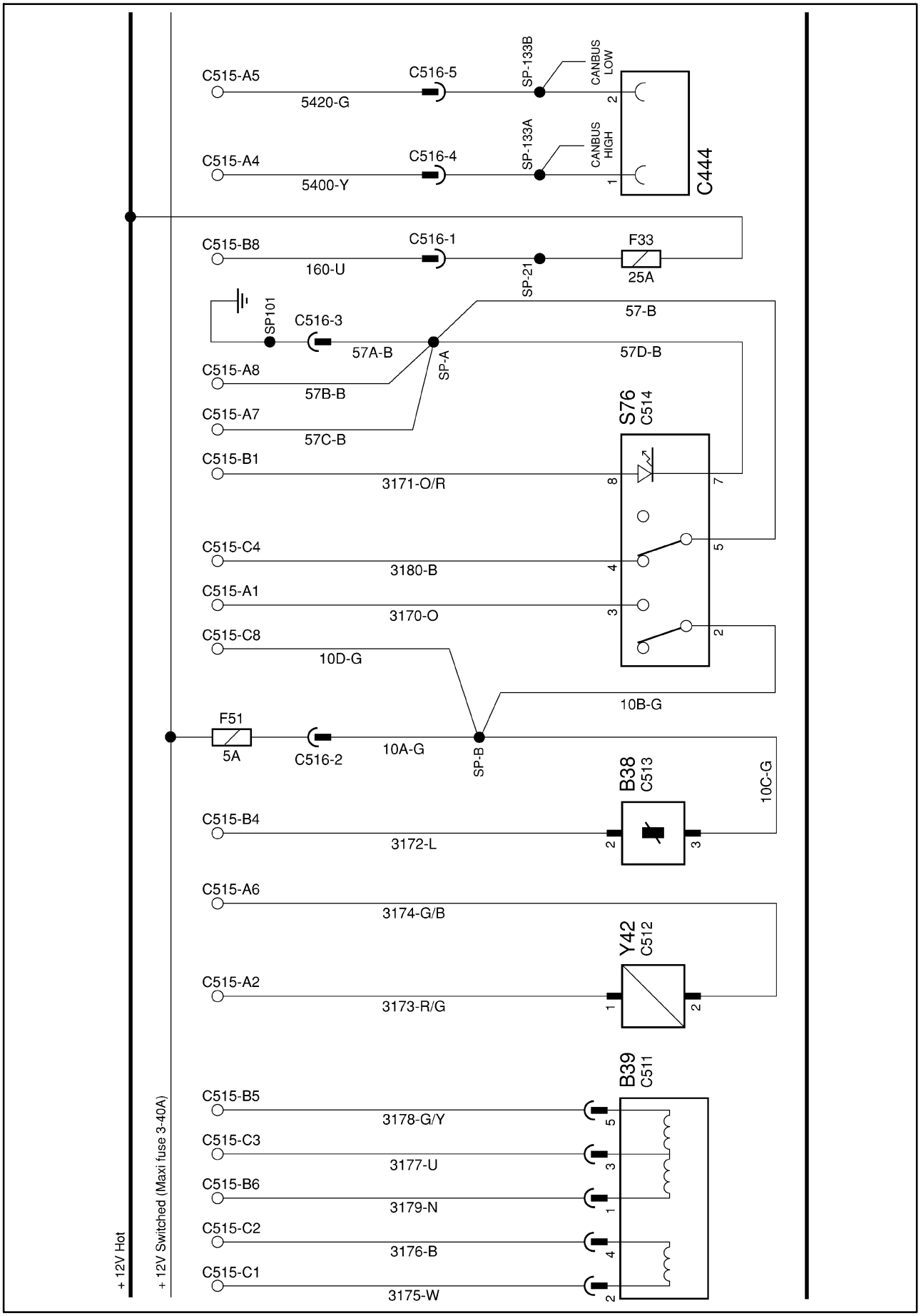
   If the readings are correct continue to step 3.

3. Check the wiring and connectors to the sensor and fast steer (KA) processor.

   A. With the key start OFF disconnect the processor connector **C515** and the sensor connector **C511**. Using a suitable multimeter check for a short circuit between each of the pair of wires at one of the connectors:-
   C515-C1 and **C511-2**
   C515-C2 and **C511-4**
   C515-B6 and **C511-1**
   C515-C3 and **C511-3**
   C515-B5 and **C511-5**
   If a short circuit is indicated between any pair repair or replace the wiring as required.

   B. If no fault is indicated continue to step 4.

4. Suspect a faulty fast steer processor. Substitute the processor and test system.


+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)
C515-A5
C516-5
5420-G
SP-133B
CANBUS LOW
2
C515-A4
C516-4
5400-Y
SP-133A
CANBUS HIGH
1
C444
C515-B8
C516-1
160-U
SP-21
F33
25A
SP101
C516-3
57A-B
SP-A
57-B
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2

Key to Wiring Diagram:

Connector C511 (component B39) – LVDT

Connector C512 (component Y42) – Split Valve Solenoid Valve

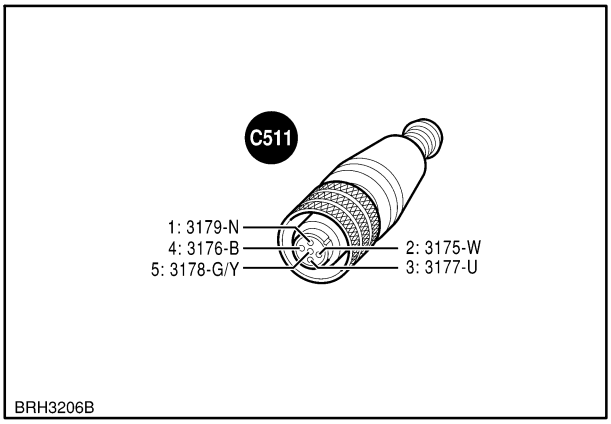
Connector C513 (component B38) – Proximity sensor

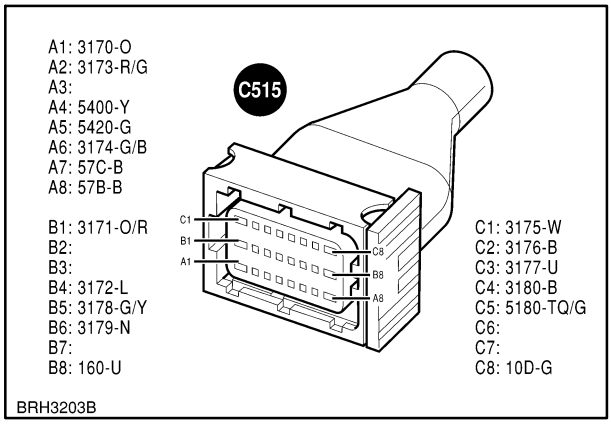
Connector C514 (component S76) – Safety/enable switch

Connector C515 – KA (fast steer) processor

Connector C516 – Fast Steer to Main cab harness connector

Connector C444 – Trans CAN select connector





ERROR CODE 15008 - CHANGE VALVE SOLENOID OPEN CIRCUIT OR SHORT TO GROUND

Effects:

1. System Disabled, non critical alarm activated.

Possible failure modes:

1. Faulty change valve solenoid.
2. Faulty wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the change valve solenoid using H-Menu mode H9.

   A. Install the diagnostic tool and enter H menu Mode H9 for the KA processor. Select channel 4. Typical reading should be 350-600. If the reading is correct clear the error code and check for an intermittent poor connection.
   If the readings are incorrect continue to step 2.

2. Check the change valve solenoid using a multimeter.

   A. Remove connector **C512** from the change valve solenoid. Using a multimeter check the resistance across the change valve solenoid terminals. The resistance should be 5.3Ω @ 20°C.
   If the resistance is incorrect replace the change valve solenoid.

   If the resistance is correct continue to step 3.

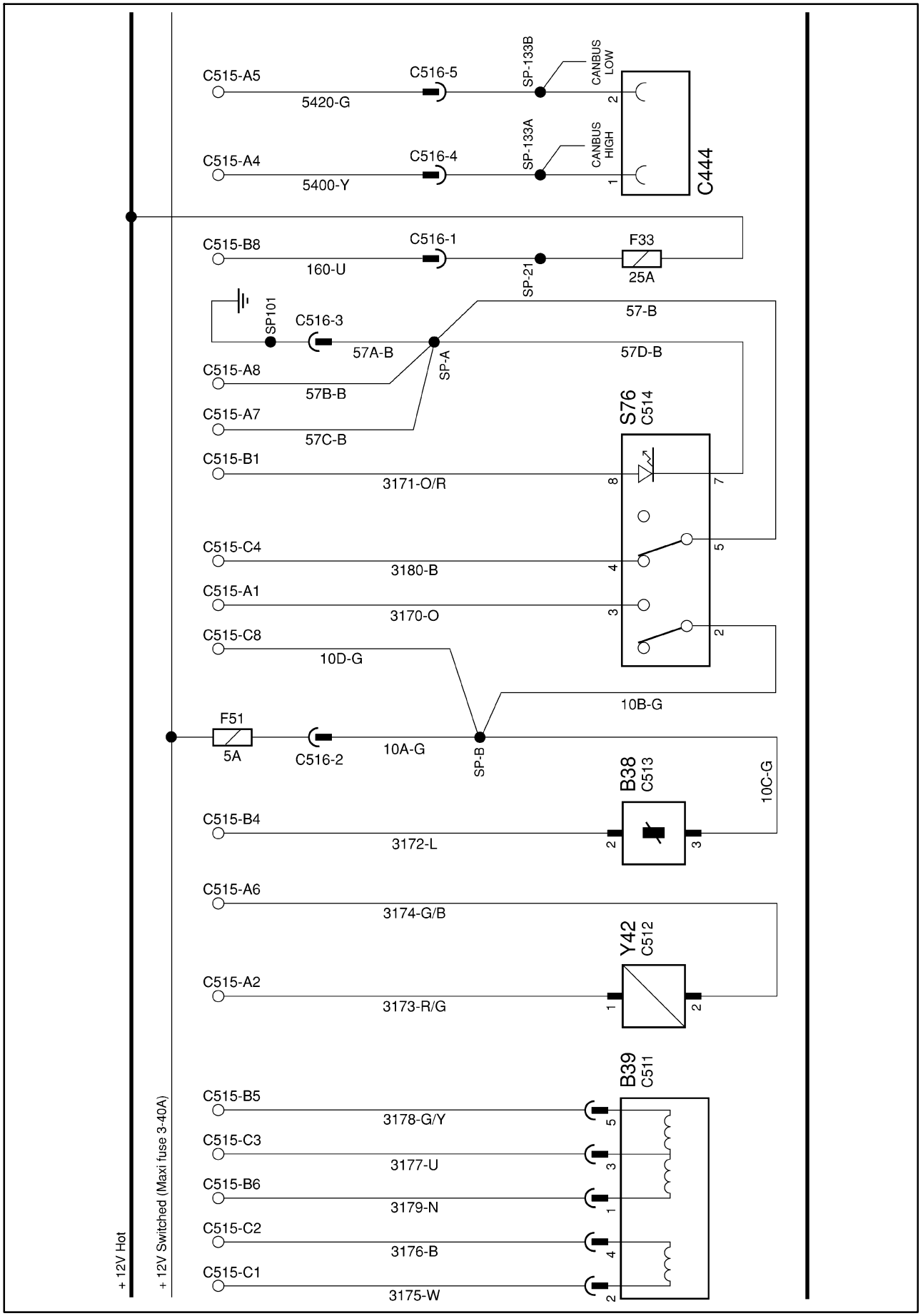
3. Check the wiring and connectors to the change valve solenoid and fast steer processor.

   A. With the key start OFF disconnect the processor connector **C515** and the solenoid connector **C512**. Using a suitable multimeter check for an open circuit and a short to ground at the following pins:-
   C515-A2 and **C512-1**
   C515-A6 and **C512-2**

   If an open circuit or short to ground is indicated, repair or replace the wiring as required.

   B. If no fault is indicated continue to step 4.

4. Suspect a faulty fast steer (KA) processor. Substitute the processor and test system.


C515-A5
C516-5
SP-133B
CANBUS LOW
5420-G
2
C515-A4
C516-4
SP-133A
CANBUS HIGH
5400-Y
1
C444
C515-B8
C516-1
F33
160-U
SP-21
25A
SP101
C516-3
57-B
57A-B
SP-A
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2
+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)

Key to Wiring Diagram:

Connector C511 (component B39) - LVDT

Connector C512 (component Y42) - Split Valve Solenoid Valve

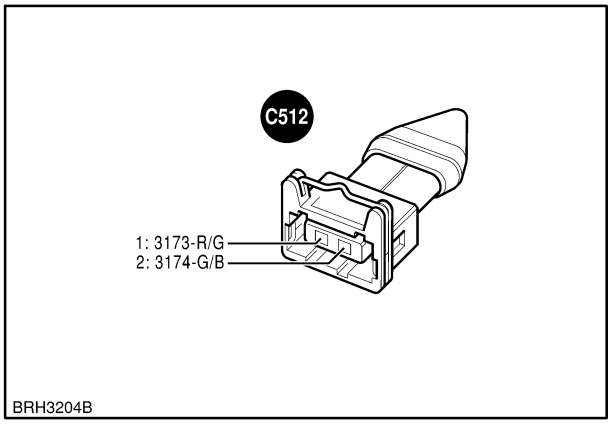
Connector C513 (component B38) - Proximity sensor

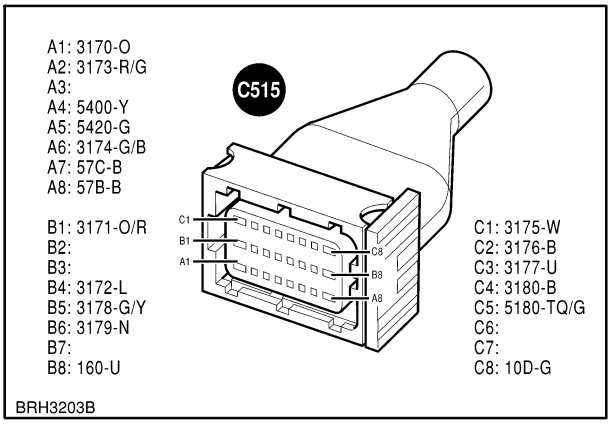
Connector C514 (component S76) - Safety/enable switch

Connector C515 - KA (fast steer) processor

Connector C516 - Fast Steer to Main cab harness connector

Connector C444 - Trans CAN select connector





ERROR CODE 15009 - CHANGE VALVE SOLENOID SHORT CIRCUIT ACROSS ITSELF

Effects:

1. System Disabled, non critical alarm activated.

Possible failure modes:

1. Faulty change valve solenoid.
2. Faulty wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the change valve solenoid using H-Menu mode H9.

   A. Install the diagnostic tool and enter H menu Mode H9 for the KA processor. Select channel 4. Typical reading should be 350-600. If the reading is correct clear the error code and check for an intermittent poor connection.
   If the readings are incorrect continue to step 2.

2. Check the change valve solenoid using a multimeter.

   A. Remove connector **C512** from the change valve solenoid. Using a multimeter check the resistance across the change valve solenoid terminals. The resistance should be 5.3Ω @ 20°C.
   If the resistance is incorrect or an open or closed circuit is indicated replace the change valve solenoid.

   If the resistance is correct continue to step 3.

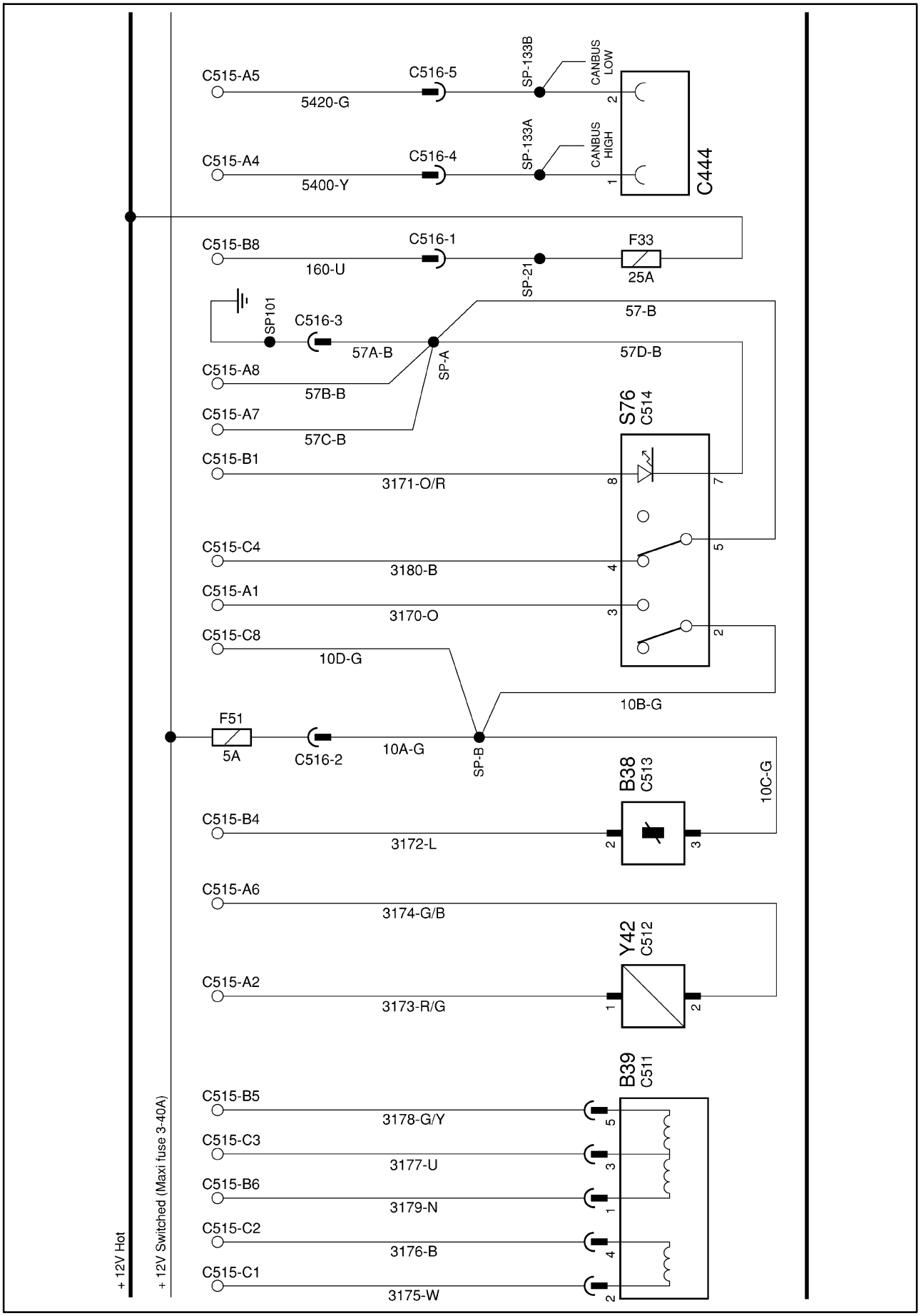
3. Check the wiring and connectors to the change valve solenoid and fast steer (KA) processor.

   A. With the key start OFF disconnect the processor connector **C515** and the solenoid connector **C512**. Using a suitable multimeter check for a short circuit between the pins of the change valve solenoid connector, **C512-1** and **C512-2**.

   With the Key start ON, check for a short to +12V at the solenoid connector.
   If a short circuit is indicated, repair or replace the wiring as required.

   B. If no fault is indicated continue to step 4.

4. Suspect a faulty fast steer processor. Substitute the processor and test system.


+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)
C515-A5
C516-5
5420-G
SP-133B
CANBUS LOW
2
C515-A4
C516-4
5400-Y
SP-133A
CANBUS HIGH
1
C444
C515-B8
C516-1
160-U
SP-21
F33
25A
SP101
C516-3
57A-B
SP-A
57-B
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2

Key to Wiring Diagram:

Connector C511 (component B39) – LVDT

Connector C512 (component Y42) – Split Valve Solenoid Valve

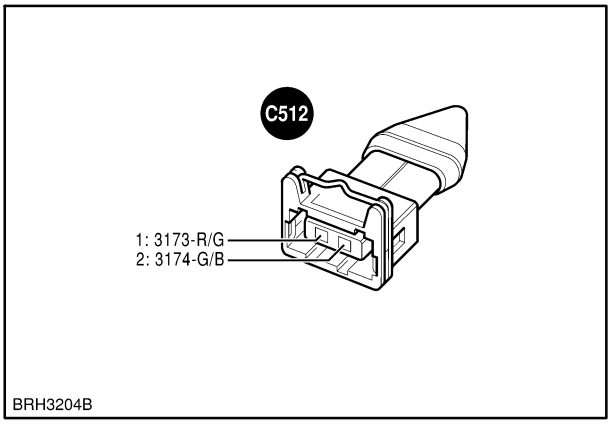
Connector C513 (component B38) – Proximity sensor

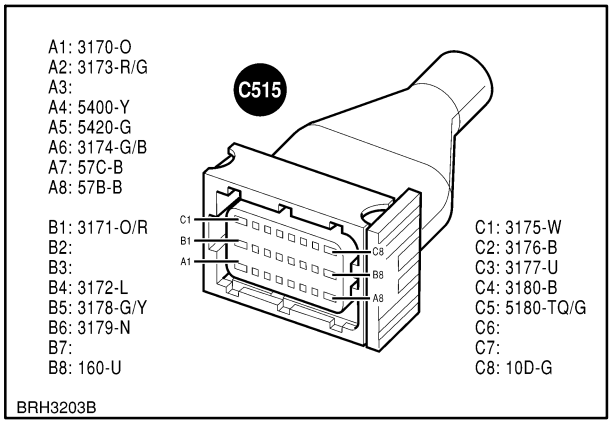
Connector C514 (component S76) – Safety/enable switch

Connector C515 – KA (fast steer) processor

Connector C516 – Fast Steer to Main cab harness connector

Connector C444 – Trans CAN select connector





ERROR CODE 15010 - SAFETY SWITCH FAIL

Effects:

1. System Auto disengages and system Disabled, critical alarm activated.

Possible failure modes:

1. Faulty Switch.
2. Faulty wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the Enable/Safety switch using H-Menu mode H5.

   A. Install the diagnostic tool and enter H menu Mode H5 for the KA processor. Operate the enable/safety switch, in the transition to the enabled position the display should show d117, in the transition to the safety (off) position the display should show d118.
   If the readings are correct inspect the switch and connector for a possible intermittent fault.
   If the readings are incorrect continue to step 2.

2. Check the Enable/Safety switch using a multimeter.

   A. Remove the switch from the console and remove the connector, **C514**. Check the switch operation between pins 2 and 3 for the enabling circuit and between pins 4 and 5 for the safety circuit.

   Replace the switch assembly if either circuit is faulty.

   If both switch circuits are okay continue to step 3.

3. Check the wiring to the Enable/safety switch.

   A. With the key start OFF, disconnect the switch connector **C514** and processor connector **C515**. Using a multimeter check for continuity between the pins **C514-3** and **C515-A1** and pins **C514-4** and **C515-C4.**
   If an open circuit is indicated repair or replace the wiring as required.

   B. With the key start OFF check for a short to ground at the switch connector, **C514-3** and **C514-4**
   If a short to ground is indicated repair or replace the wiring as required.

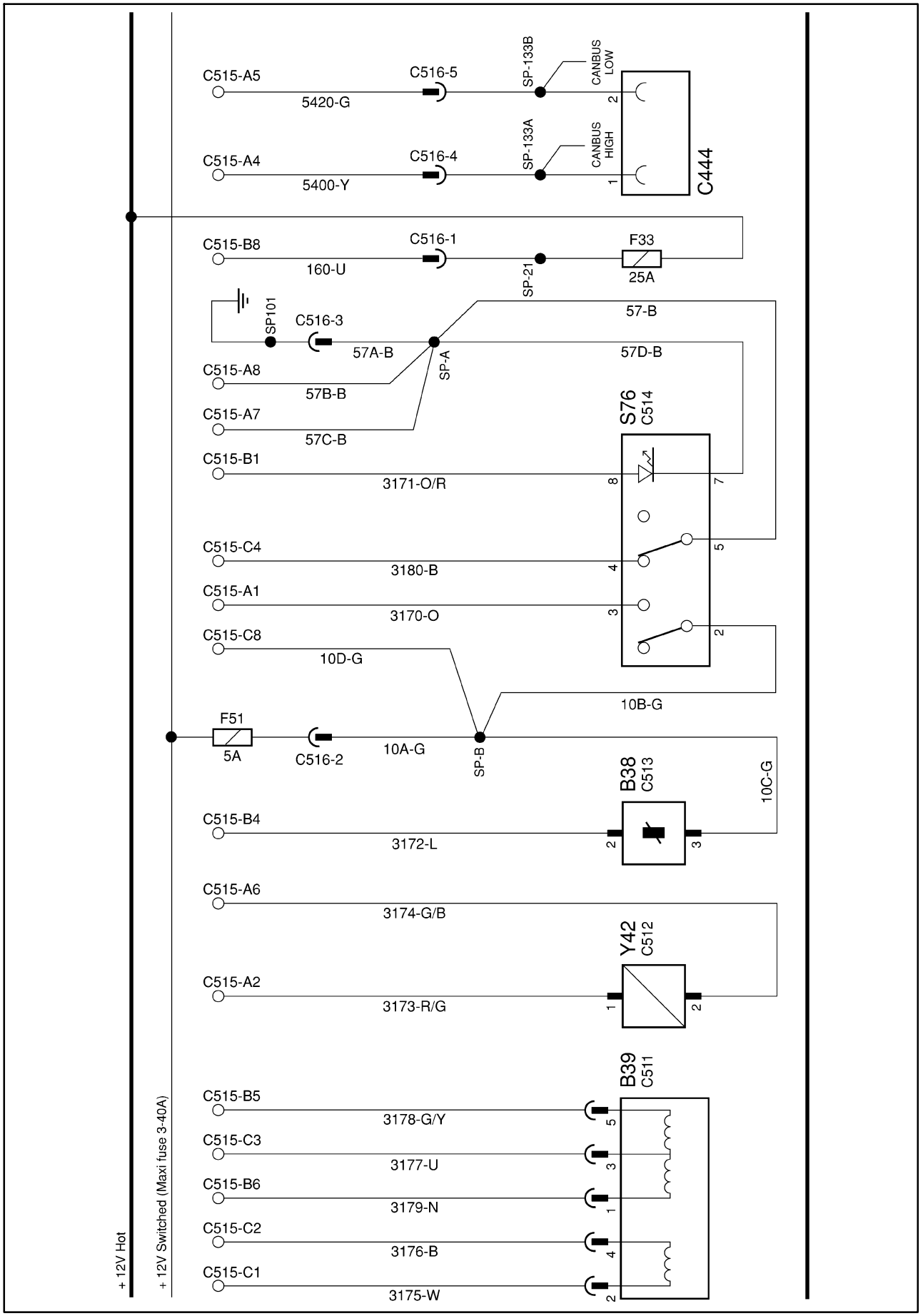
   C. With the key start ON check for a short to +12V at the switch connector, **C514-3** and **C514-4**
   If a short to +12V is indicated repair or replace the wiring as required.

   D. With the key start ON, and the switch connector, **C514**, removed, Check for +12V at **C514-2.** If +12V is not indicated trace fault and repair or replace wiring as required.

   E. With the key start OFF, and the switch connector, **C514**, removed, check that **C514-5** and **C514-7** have continuity to ground. If continuity to ground is not indicated trace fault and repair or replace wiring as required.

   F. If the wiring checks out okay continue to step 4.

4. Suspect a faulty fast steer processor. Substitute the processor and test system.


+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)
C515-A5
C516-5
5420-G
SP-133B
CANBUS LOW
2
C515-A4
C516-4
5400-Y
SP-133A
CANBUS HIGH
1
C444
C515-B8
C516-1
160-U
SP-21
F33
25A
SP101
C516-3
57A-B
SP-A
57-B
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
C515-C4
3180-B
4
5
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
2
3
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
1
2
B39
C511
C515-B5
3178-G/Y
5
C515-C3
3177-U
3
C515-B6
3179-N
1
C515-C2
3176-B
4
C515-C1
3175-W
2

Key to Wiring Diagram:

Connector C511 (component B39) - LVDT

Connector C512 (component Y42) - Split Valve Solenoid Valve

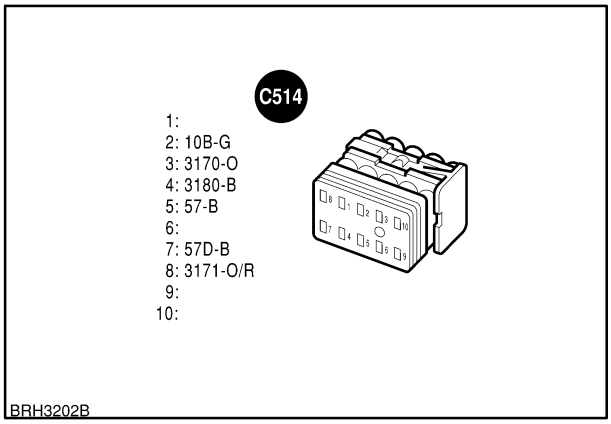
Connector C513 (component B38) - Proximity sensor

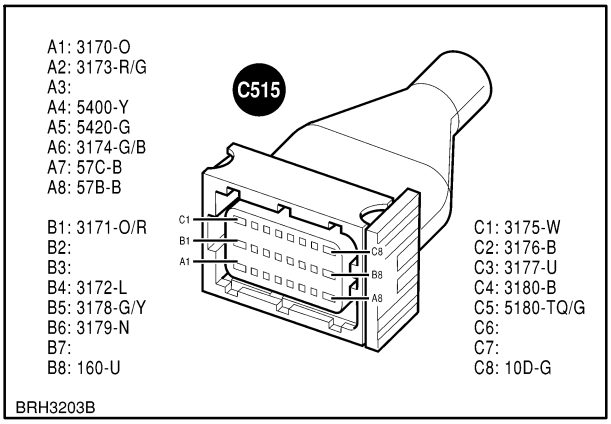
Connector C514 (component S76) - Safety/enable switch

Connector C515 - KA (fast steer) processor

Connector C516 - Fast Steer to Main cab harness connector

Connector C444 - Trans CAN select connector





ERROR CODE 15011 – MAXIMUM ENGAGEMENT TIME ELAPSED (5 MINUTES)

Effects:

1. System Auto disengages, non critical alarm activated.

Possible failure modes:

1. Operator error.
2. Other component fault – check for other error codes.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Operator error. Clear error code and test system for normal operation.
   A. If system remains disabled check for other error codes and rectify as required.

ERROR CODE 15012 - SPLIT VALVE SPOOL STUCK OPEN (SYSTEM IN PERMANENT FAST STEER MODE)

Effects:

1. System remains in Fast Steer Mode, critical alarm activated.

Possible failure modes:

1. Mechanical Fault in Split Valve assembly.
2. Fault in Split Valve LVDT sensor or wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes, particularly 15006 and 15007, LVDT sensor open and short circuits.
   A. If other errors are present, rectify these and retest the system.
   B. If there are no other errors or this error re-occurs continue to step 2.
2. Test the steering. With the engine running, manually operate the steering to determine if the system is in the fast steer mode. If the system is permanently in fast steer mode this could indicate either a broken return spring in the valve or the spool is stuck in the fast steering position. Remove the valve assembly and investigate.
   If the problem is intermittent inspect the valve drain to sump which could be obstructed creating a pressure build up on the spool.

ERROR CODE 15013 - CHANGE VALVE OR SPLIT VALVE SPOOL STUCK CLOSED (SYSTEM STUCK IN CONVENTIONAL STEERING MODE)

Effects:

1. System disabled, stuck in conventional steering mode, non critical alarm activated.

Possible failure modes:

1. Fault in Split Valve assembly.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes.

   A. If other errors are present, cure these and retest the system.

   B. If there are no other errors or this error re-occurs continue to step 2.

2. Test the steering. With the engine running, manually operate the steering to determine if the system is permanently in the conventional steering mode. If the system is permanently in the conventional steering mode this could indicate the spool is stuck in the conventonal steering position. Remove the valve assembly and investigate.
   If the problem is intermittent, increase the engine speed to 1300 rev/min. and test the operation again, if the fast steering becomes operative this may indicate a lack of pilot line oil pressure in the circuit. Pressure test the hydraulic system.

ERROR CODE 15014 - SPLIT VALVE SPOOL STUCK IN TRANSITION ZONE, SYSTEM CANNOT IDENTIFY WHICH STEERING MODE THE TRACTOR IS IN.

Effects:

1. System disabled, Critical alarm activated.

Possible failure modes:

1. Fault in Split Valve assembly.
2. Faulty wiring to solenoid valve.
3. Fault in split valve LVDT sensor or wiring.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check for other error codes, particularly 15006 and 15007, LVDT sensor open and short circuits, 15008 and 15009, change valve solenoid open and short circuits.

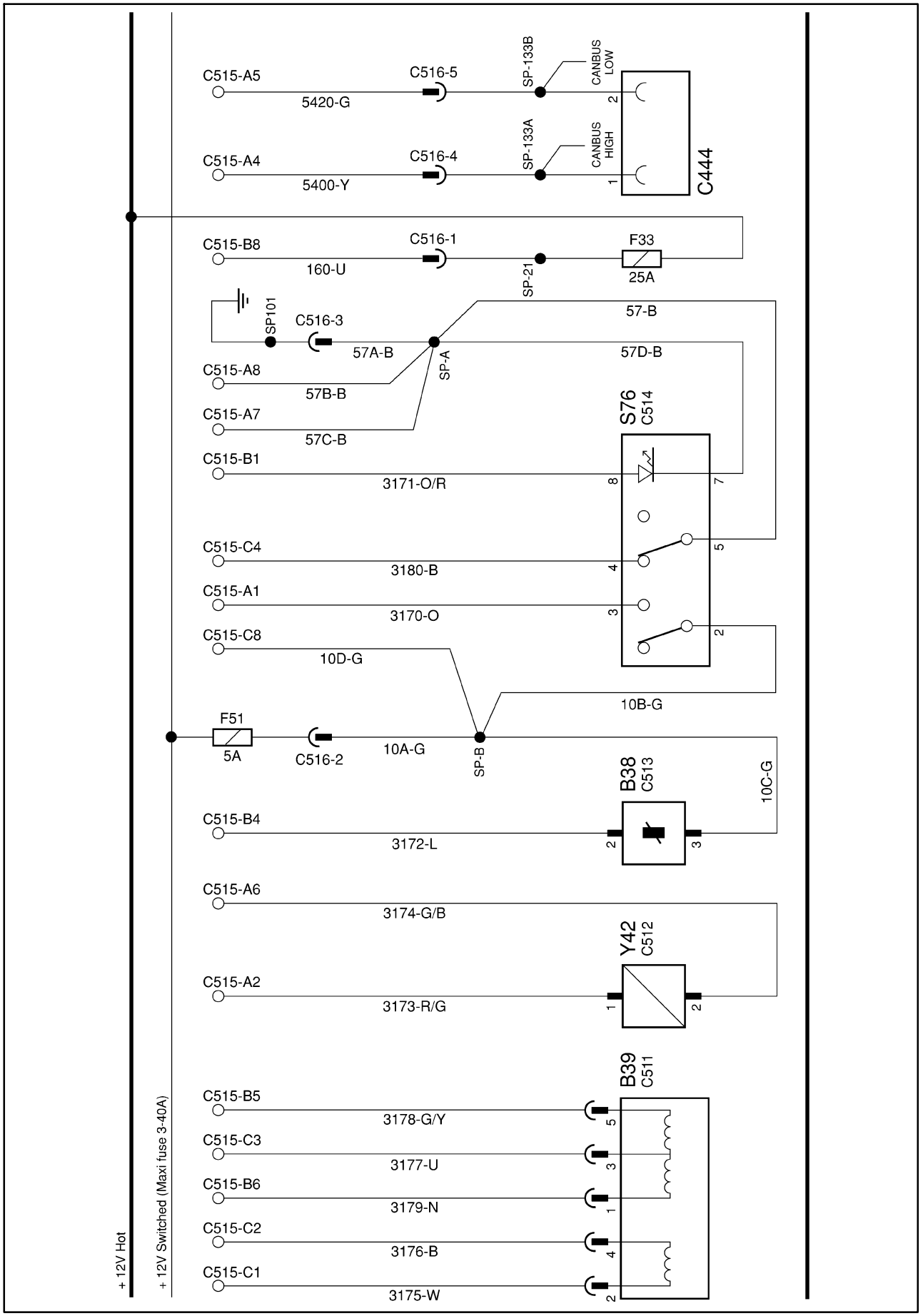
   A. If other errors are present, cure these and retest the system.

   B. If there are no other errors or this error re-occurs continue to step 2.

2. Test the steering.

   A.With the engine running, manually operate the steering to determine if the system is operating in at least one mode. If no steering is available this will indicate that the valve is stuck in the zone between fast and conventional steering. Remove the valve assembly and investigate.

   B. If the problem is intermittent, this could indicate a fault in the wirng or connector to the solenoid valve. Examine the wiring to the valve and at connector **C512**. Repair or replace as required.


C515-A5
C516-5
SP-133B
CANBUS LOW
5420-G
2
C515-A4
C516-4
SP-133A
CANBUS HIGH
5400-Y
1
C444
C515-B8
C516-1
F33
160-U
SP-21
25A
SP101
C516-3
57-B
57A-B
SP-A
57D-B
C515-A8
57B-B
C515-A7
57C-B
S76
C514
C515-B1
3171-O/R
8
7
5
C515-C4
3180-B
4
C515-A1
3170-O
3
2
C515-C8
10D-G
10B-G
F51
5A
C516-2
10A-G
SP-B
B38
C513
10C-G
C515-B4
3172-L
C515-A6
3174-G/B
Y42
C512
C515-A2
3173-R/G
B39
C511
C515-B5
3178-G/Y
C515-C3
3177-U
C515-B6
3179-N
C515-C2
3176-B
C515-C1
3175-W
+ 12V Hot
+ 12V Switched (Maxi fuse 3-40A)

Key to Wiring Diagram:

Connector C511 (component B39) - LVDT

Connector C512 (component Y42) - Split Valve Solenoid Valve

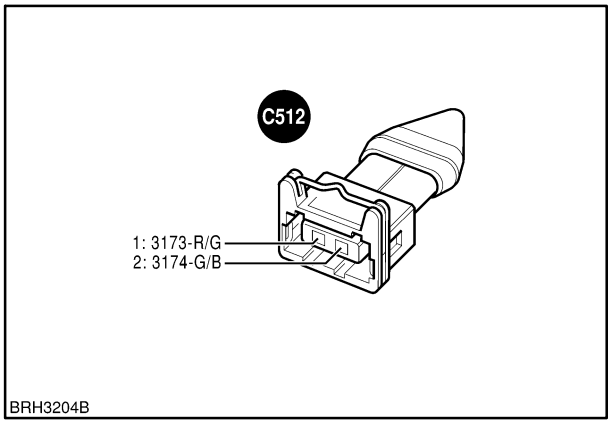
Connector C513 (component B38) - Proximity sensor

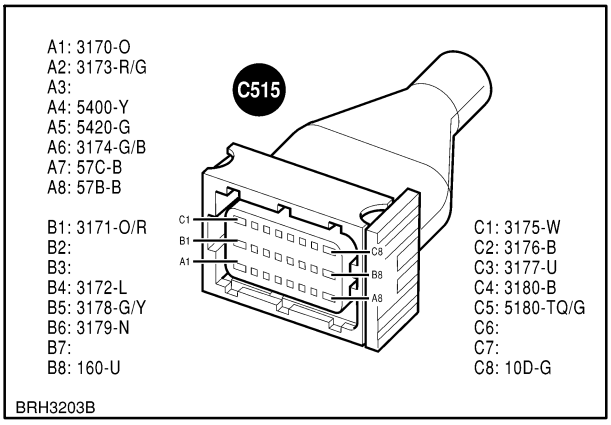
Connector C514 (component S76) - Safety/enable switch

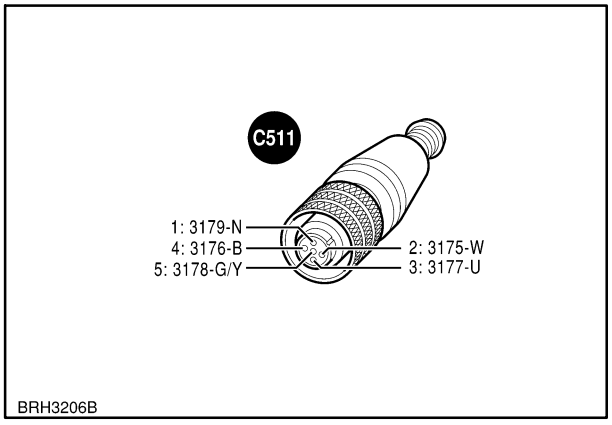
Connector C515 - KA (fast steer) processor

Connector C516 - Fast Steer to Main cab harness connector

Connector C444 - Trans CAN select connector







ERROR CODE 15024 - SYSTEM NOT CALIBRATED

Effects:

1. Non critical alarm flashes at start up.

Possible failure modes:

1. Fast steer system not calibrated.
2. Faulty processor.

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the system has been calibrated.
   A. Perform the calibration procedure.
   B. If the error re-occurs continue to step 2.
2. Check for other error codes.
   A. If other errors are present rectify these and retest the system.
   B. If calibration error re-occurs continue to step 3.
3. Suspect a faulty processor.
   A. Perform a H8 on the processor to clear the memory. Re-calibrate the system and test for normal operation.
   B. If the error re-occurs remove and replace the processor.

NOTES

SECTION 55 - ELECTRICAL SYSTEM

Chapter 10 - Diagnostic H Routines

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	HB - Display Stored Fault Codes	144
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DESCRIPTION AND OPERATION

CONTROLLER IDENTIFIERS

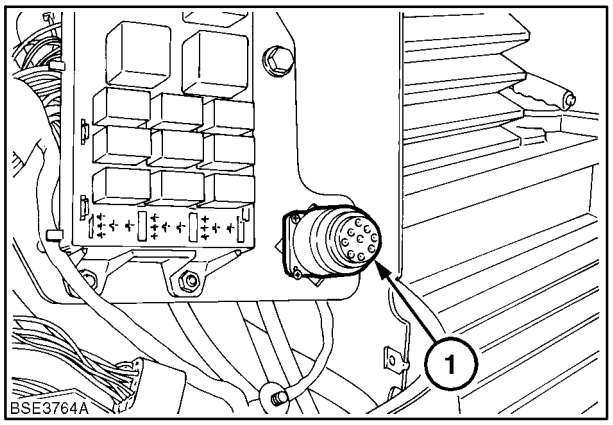
Identifier	**Controller Function(s)**
HA	Enhanced Analogue Digital Instrument Cluster (ADIC)
HB	Basic ADIC
DA	24x24 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
DB	16x16 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
JA	Keypad
DD	(Options) Front PTO, Front Hitch, Front Axle Suspension, Electronic Hydraulic Remotes
GA	12x12 PTO Controller – Rear PTO, Differential Lock, Four Wheel Drive

NOTE: **The Analogue Digital Instrument Cluster (ADIC) may display 0 or 1 instead of no or yes or vise versa. 0 = no and 1 = yes for certain H menu channels. Always key OFF for a minimum of 5 seconds after performing an H menu procedure to store or erase the appropriate values.**

INTRODUCTION

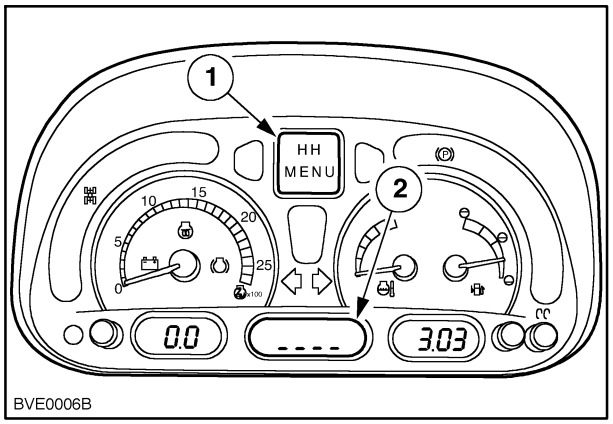
The “H” menu mode is part of the on-board diagnostics, providing configuration and diagnostic support through the resources available on the system.

To gain access to the diagnostic “H” menu mode routine, it is necessary to use the diagnostic test switch, special tool **380000843** (1) in the tractor diagnostic panel connector (**C278**), located under the front right hand console.



1

The Analogue Digital Instrument Cluster (ADIC) dot matrix display (1) and the lower central display (2) are used to indicate the information for the “H” menus.



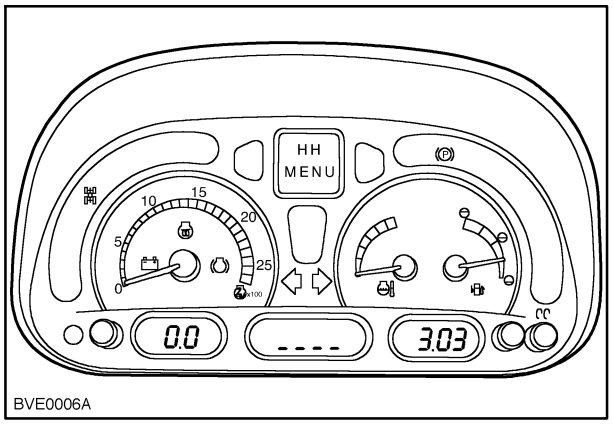
2

H Menu Navigation Procedure

Connect the special tool **380000843** to the diagnostic connector and turn the key start switch ON.

At key ON the ADIC will automatically build a list of the controllers connected on the Controller Area Network (CAN), and will store it in the Electrically Erasable Programmable Read Only Memory (EEPROM).

The dot matrix display will show “HH MENU” to indicate that the “H” menu has been activated.



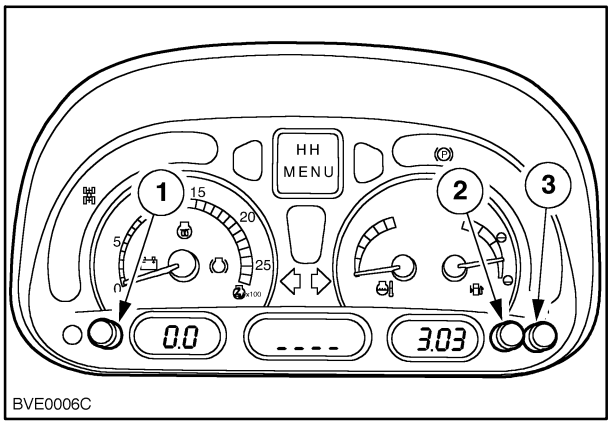
3

To navigate the “H” menus use the “h” key and “m” key to scroll left and right, and the “dimming” key to select the required controller or “H” menu.

Key “dimming” (1) - Select

Key “h” (2) - Scroll left

Key “m” (3) - Scroll right



4

Controller Identifier Code Table

The controller is identified with a two letter code, i.e. HA - Enhanced ADIC

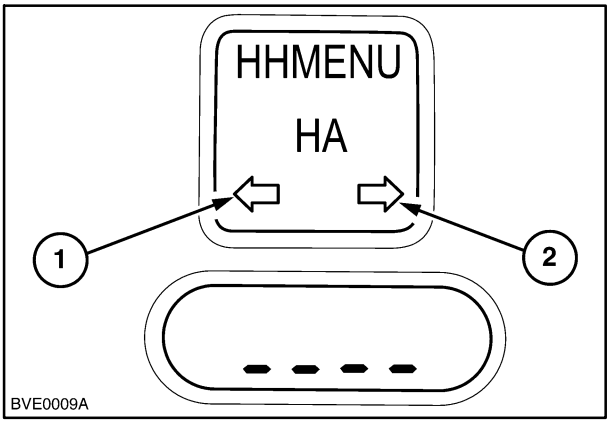
Identifier	Controller Function(s)
HA	Enhanced ADIC
HB	Basic ADIC
DA	24x24 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
DB	16x16 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
DD	(Options) Front PTO, Front Hitch, Front Axle Suspension, Electronic Hydraulic Remotes
GA	12x12 PTO Controller - Rear PTO, Differential Lock, Four Wheel Drive
JA	Keypad
KA	Fast Steer

Select the controller that requires diagnostics or configuration.

Depress the “h” key to show the first controller identifier code in the list.

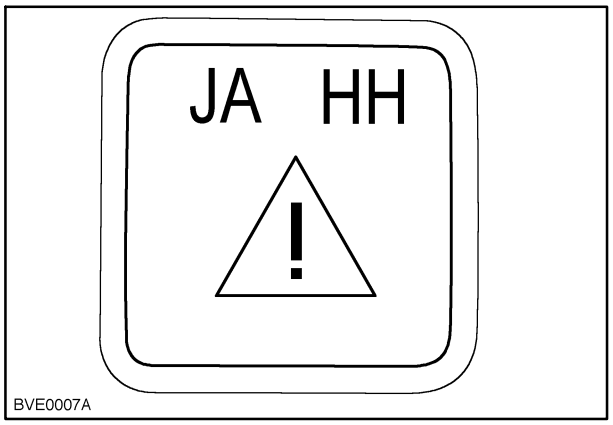
The left arrow (1) and the right arrow (2) indicate there are other controllers available.

To navigate through the list of controllers use the “h” key to scroll left and the “m” key to scroll right.



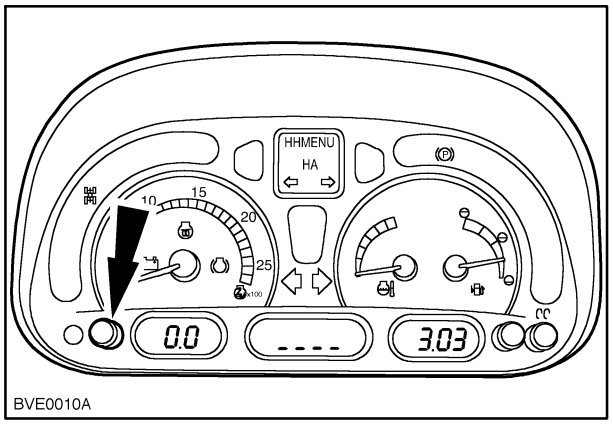
5

If a controller cannot be found on the CAN, a symbol will be displayed to indicate that there is no communication between the ADIC and the selected controller.



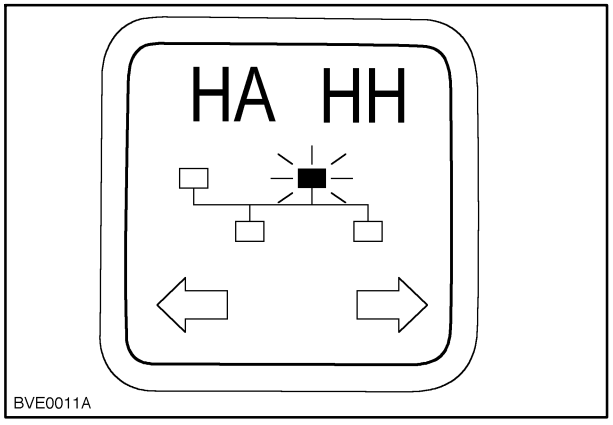
6

When the required controller is located in the list, depress the “dimming” key to select.



7

The display will change to show the “HH menu” select screen.



8

H Menu Common Features

The “H“ menus consist of the following menu codes.
NOTE: *Not all the following “H” menus are available for all controllers.*

HH	Service Menu
H1	Calibration procedures
H2	View stored calibration values
H3	Configurations
H4	View software revision level
H5	Switch operation test
H6	Vehicle information view
H7	Vehicle test modes
H8	Clear Electrical Erasable Programmable Read Only Memory (EEPROM)
H9	Voltmeter
HA	Demonstration mode
HB	Display stored fault codes
HC	Clear stored fault codes
HD	Fault code management (ADIC only)
HE	Display all speed inputs
HF	View controller hardware information
HJ	Electronic hydraulic remote control valve set-up

Dot Matrix Display Symbols

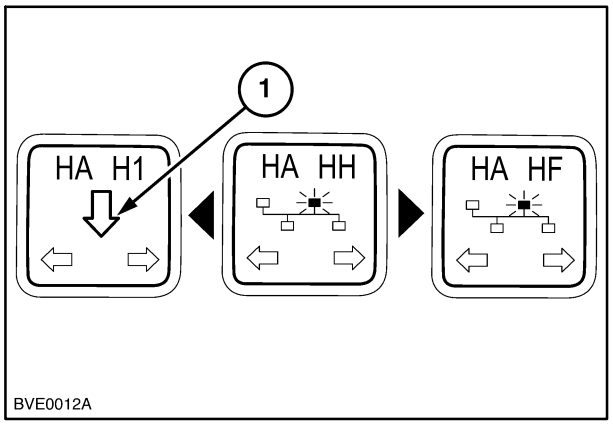
1. Engine
2. Transmission
3. Differential lock
4. Electronic draft control
5. Front hitch
6. P.T.O. system
7. Electronic remote valves
8. Front suspension
9. Four wheel drive
10. Fast steer system

The left and right arrows indicate there are other “H” menus available.

To navigate through the list of “H” menus use the “h” key to scroll left and the “m” key to scroll right.

The downward arrow (1) indicates there is more than one sub-system that uses the same menu (multi-functional “H” menu).

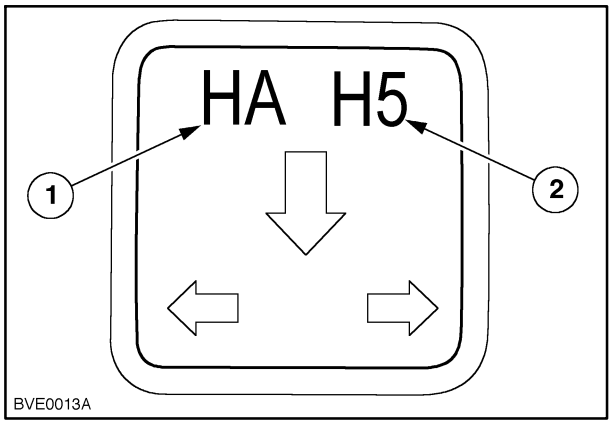
Depress the “dimming” key to select the “H” menu required.



10

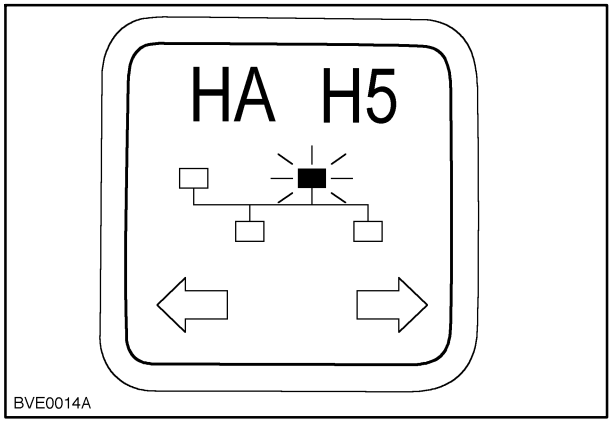
The controller selected will be displayed in the top left hand corner of the dot matrix display (1).

The “H” menu will be displayed in the top right hand corner of the dot matrix display (2).



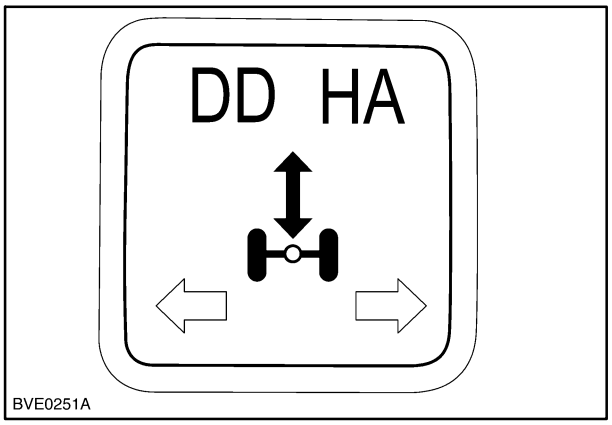
11

The “H” menu select screen will be displayed if the menu is common to all sub-systems, i.e. H5 - Switch test and H9 - Voltmeter.



12

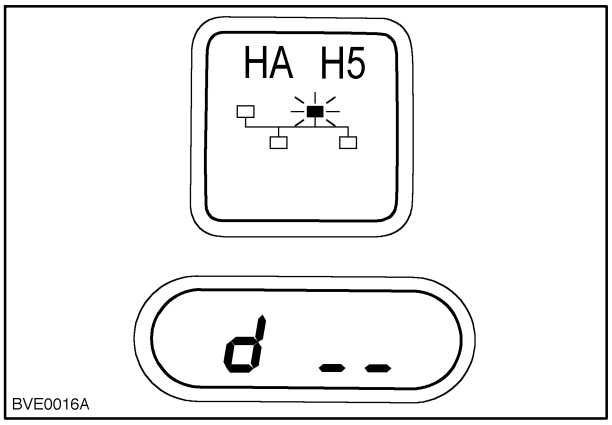
If the menu is specific to only one sub-system, the relevant icon will be displayed in the centre of the dot matrix display, i.e. suspended front axle icon for HA - Demonstration mode.



13

When the sub-system has been selected, the navigation arrows will no longer be displayed.

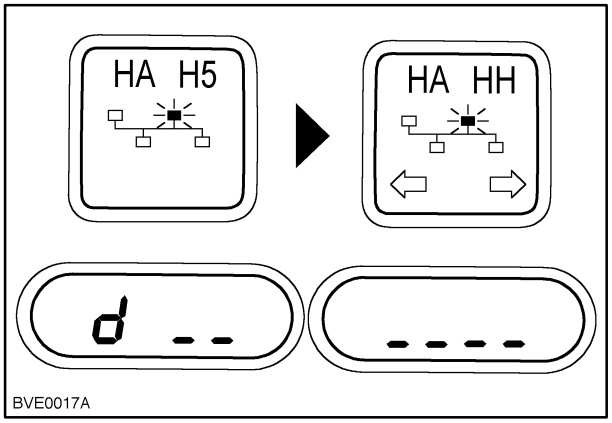
The ADIC lower central display section will be used to display the set-ups or values for the selected sub-system.



14

NOTE: *To return to the "H" menu select screen from H1 - Calibrations the keystart needs to be turned OFF. This will store the completed calibrations.*

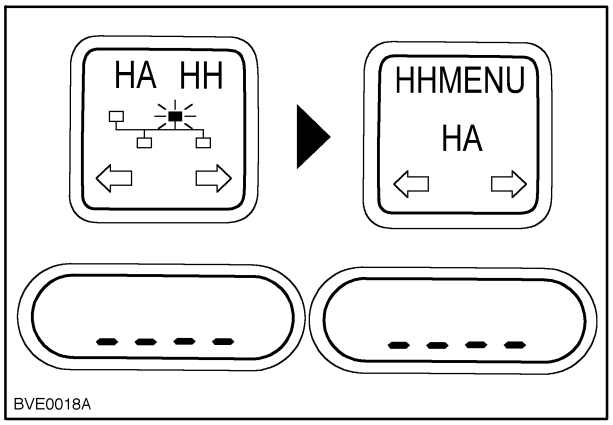
To return back to the "H" menu select screen, depress the dimming key.



15

NOTE: *To return to the controller select screen, "HH" must be indicated in the top right hand corner of the dot matrix display.*

To return back to the controller select screen, depress the "dimming" key again.



16

CONTROLLER H ROUTINES

HA/HB CONTROLLER H ROUTINES

HA - Enhanced ADIC
HB - Basic ADIC

NOTE: *HA Enhanced ADIC is shown in the screen displays.*

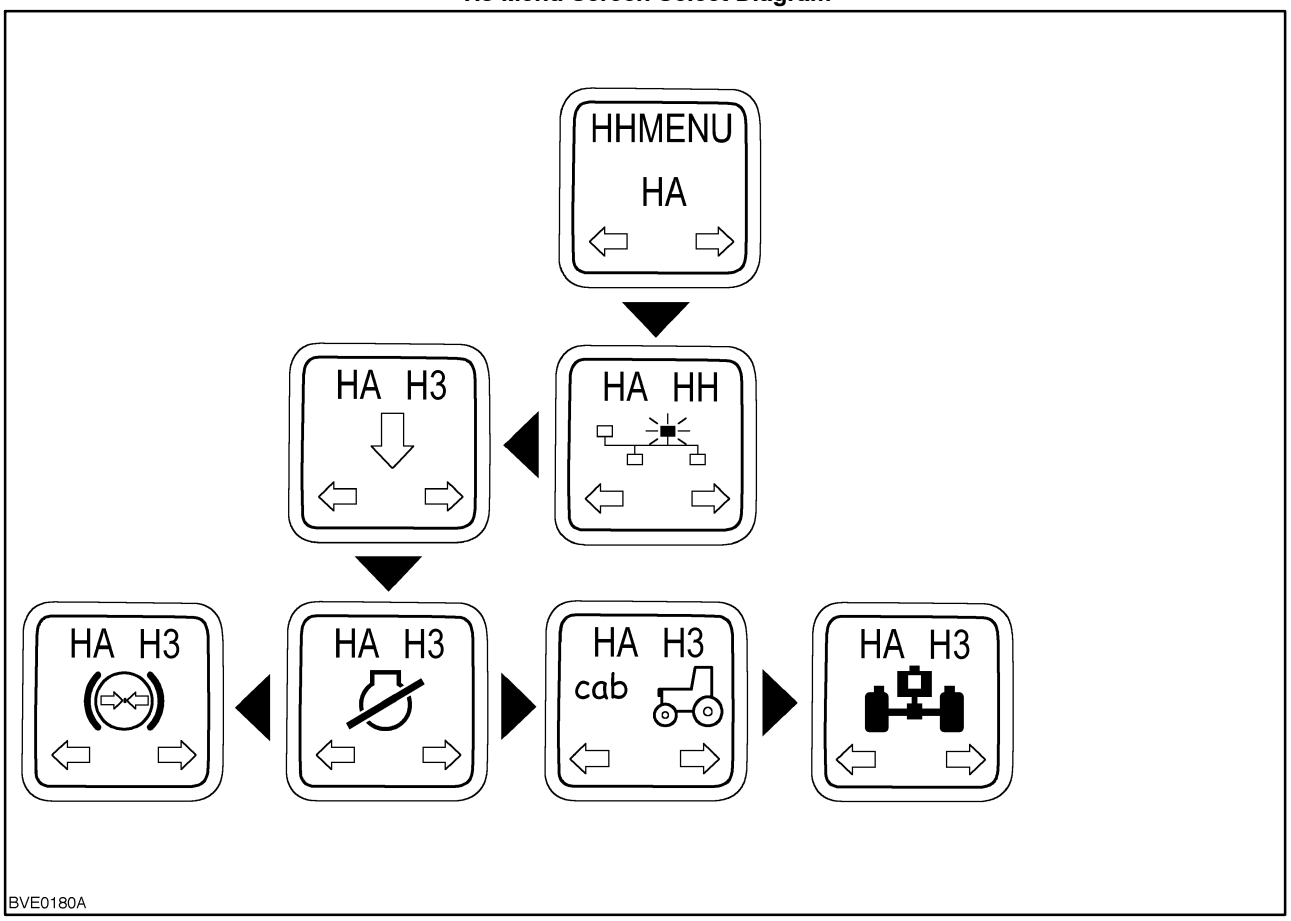
HH	Service Menu	Page
H1	Not used	-
H2	Not used	-
H3	Configurations	10
H4	View software revision level	16
H5	Switch operation test	18
H6	Not used	-
H7	Not used	-
H8	Clear Electrical Erasable Programmable Read Only Memory (EEPROM)	20
H9	Voltmeter	22
HA	Not used	-
HB	Display stored fault codes	25
HC	Clear stored fault codes	27
HD	Fault code management	29
HE	Display all speed inputs	31
HF	View controller hardware information	33

H3 - Configurations

This menu displays the configurations available for:

1. Engine shutdown
2. Cab (less cab / with cab)
3. Rear axle (heavy duty / light duty)
4. Grid heater
5. Air brake

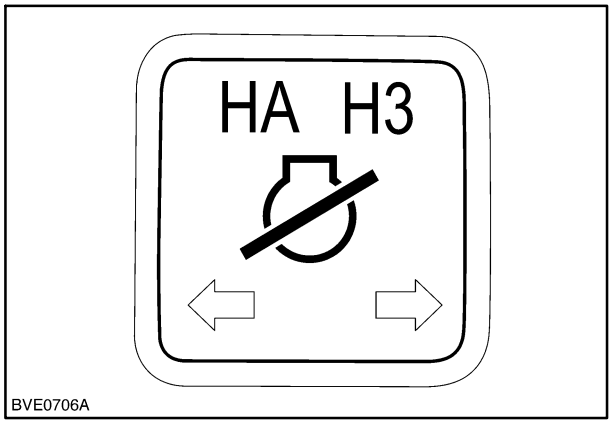
H3 Menu Screen Select Diagram



17

Engine Shutdown Options

Select the engine shutdown sub-system by depressing the “dimming” key.



18

NOTE: *The default setting is NO.*

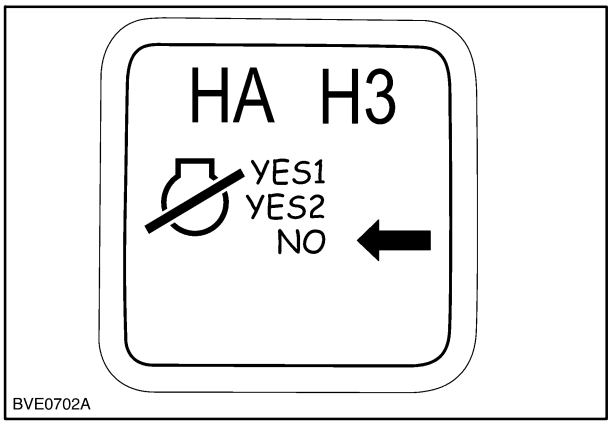
Scroll through the available options using the “h” or “m” key.

Refer to the common rail fuel injection / mechanical fuel injection engine shutdown options table.

NOTE: *The mechanical engine shutdown is controlled by the ADIC through an optionally installed relay.*

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



19

Engine Shutdown Options

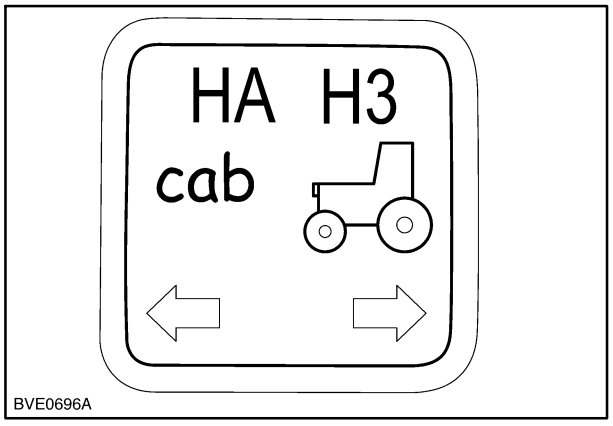
Options		CONDITIONS REQUIRED FOR ENGINE SHUTDOWN	CONDITIONS WHICH OVERRIDE ENGINE SHUTDOWN OPTIONS (All conditions must be met)			
		Operating Condition	Operator Present	Operator Not Present	Vehicle Stationary	Vehicle Moving
NO	No engine shutdown	The engine will not shut down unless a critical engine fault is detected, which will override this option and shutdown the engine	–	–	–	–
YES1	Always shutdown engine	Engine oil pressure – Low	✓	✓	✓	✓
		Engine coolant temperature – High	✓	✓	✓	✓
		Driveline oil temperature – High	–	✓	✓	–
		Driveline oil pressure – Low	–	✓	✓	–
YES2	Stationary engine shutdown	Engine oil pressure – Low	–	✓	✓	–
		Engine coolant temperature – High	–	✓	✓	–
		Driveline oil temperature – High	–	✓	✓	–
		Driveline oil pressure – Low	–	✓	✓	–

Mechanical Fuel Injection Engine Shutdown Options

Options		CONDITIONS REQUIRED FOR ENGINE SHUTDOWN	CONDITIONS WHICH OVERRIDE ENGINE SHUTDOWN OPTIONS (All conditions must be met)			
		Operating Condition	Operator Present	Operator Not Present	Vehicle Stationary	Vehicle Moving
NO	No engine shutdown	The engine will not shut down under any operating condition	-	-	-	-
YES1	Always shutdown engine	Engine oil pressure - Low	✓	✓	✓	✓
		Engine coolant temperature - High	✓	✓	✓	✓
		Driveline oil temperature - High	-	✓	✓	-
		Driveline oil pressure - Low	-	✓	✓	-
YES2	Stationary engine shutdown	Engine oil pressure - Low	-	✓	✓	-
		Engine coolant temperature - High	-	✓	✓	-
		Driveline oil temperature - High	-	✓	✓	-
		Driveline oil pressure - Low	-	✓	✓	-

Cab (Less Cab / With Cab) Options

Select the cab sub-system by depressing the "dimming" key.



20

NOTE: *The default setting is with cab.*

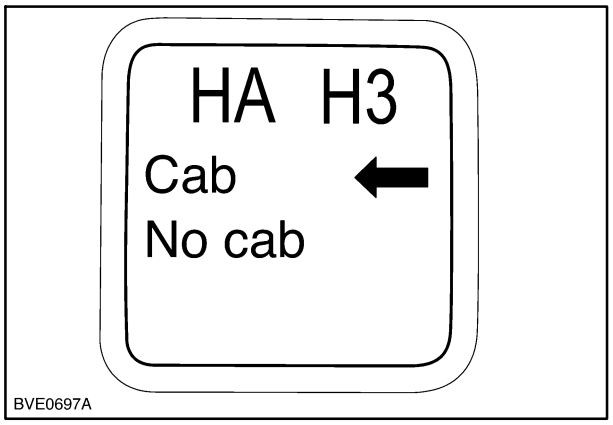
Scroll through the available options using the "h" or "m" key.

Cab - The buzzer volume is reduced.

No cab - The buzzer volume is increased.

Depress and hold the "h" or "m" key to store the selection, an audible tone will be heard to confirm the selection.

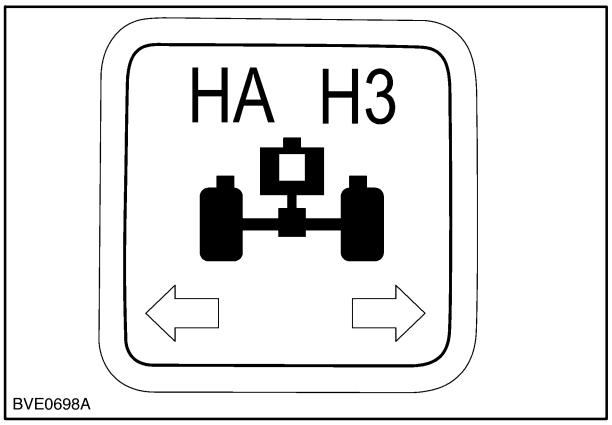
Depress the "dimming" key to continue navigating through the "HH" menus.



21

Rear Axle (Heavy Duty / Light Duty) Options

Select the rear axle sub-system by depressing the "dimming" key.



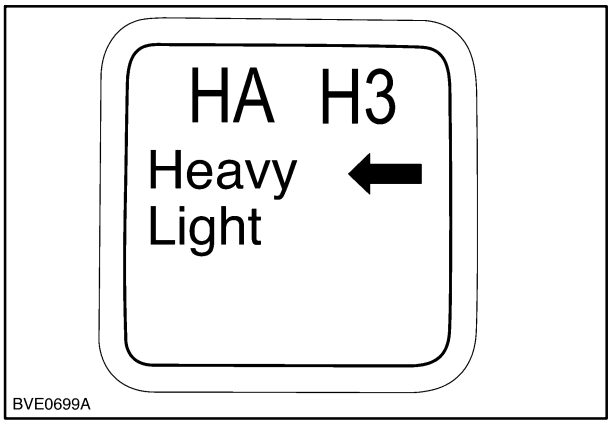
22

NOTE: *The default setting is heavy duty rear axle.*

Scroll through the available options using the "h" or "m" key.

Depress and hold the "h" or "m" key to store the selection, an audible tone will be heard to confirm the selection.

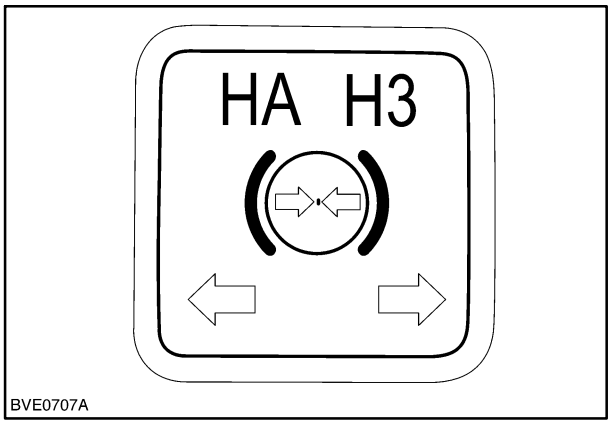
Depress the "dimming" key to continue navigating through the "HH" menus.



23

Air Brake Options

Select the air brake sub-system by depressing the "dimming" key.



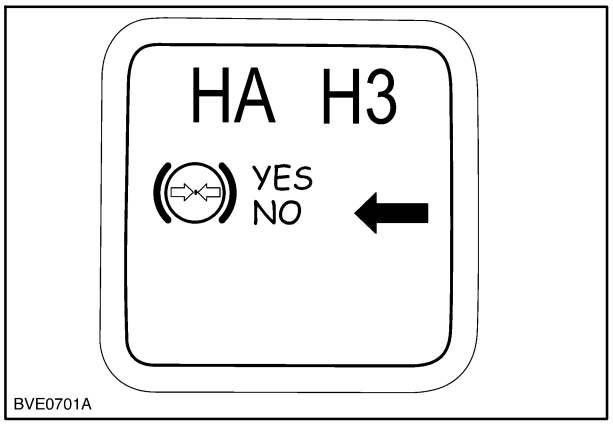
24

NOTE: *The default setting is "No" without air brakes.*

Scroll through the available options using the "h" or "m" key.

Depress and hold the "h" or "m" key to store the selection, an audible tone will be heard to confirm the selection.

Depress the "dimming" key to continue navigating through the "HH" menus.

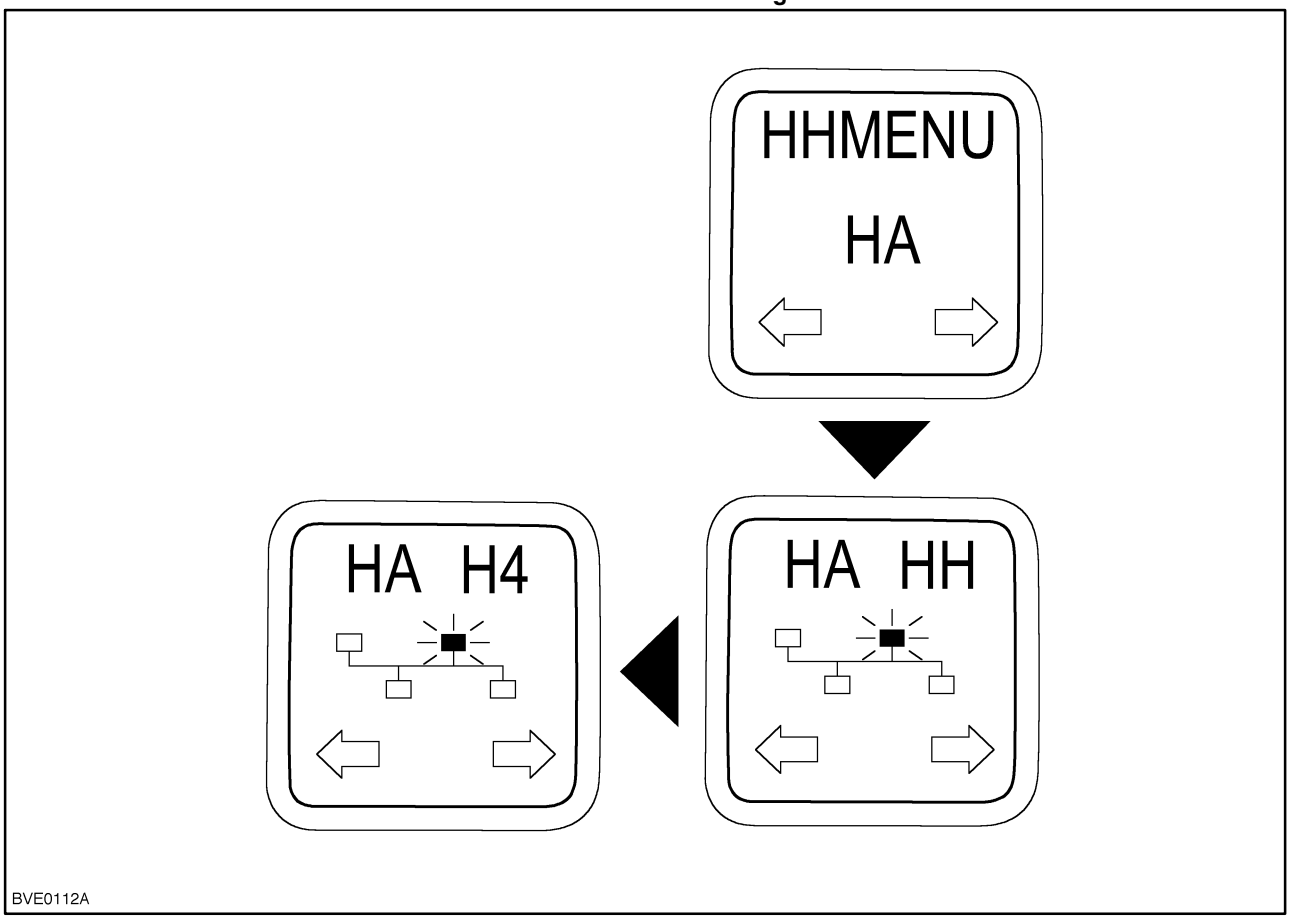


25

H4 - View Software RevisionLevel

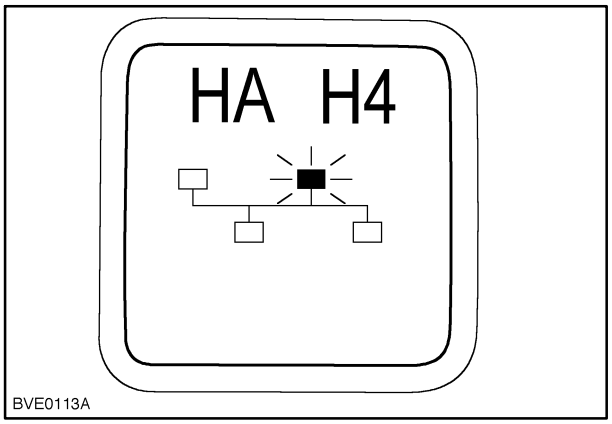
This menu displays the software release of the unit.

H4 Menu Screen Select Diagram



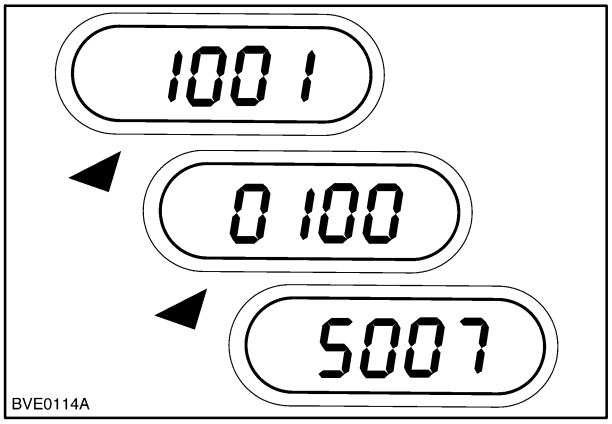
26

Select the H4 menu by depressing the “dimming” key.



27

The lower central display will automatically cycle through the software release, as the example shown and return to allow navigation of the “HH” menus.

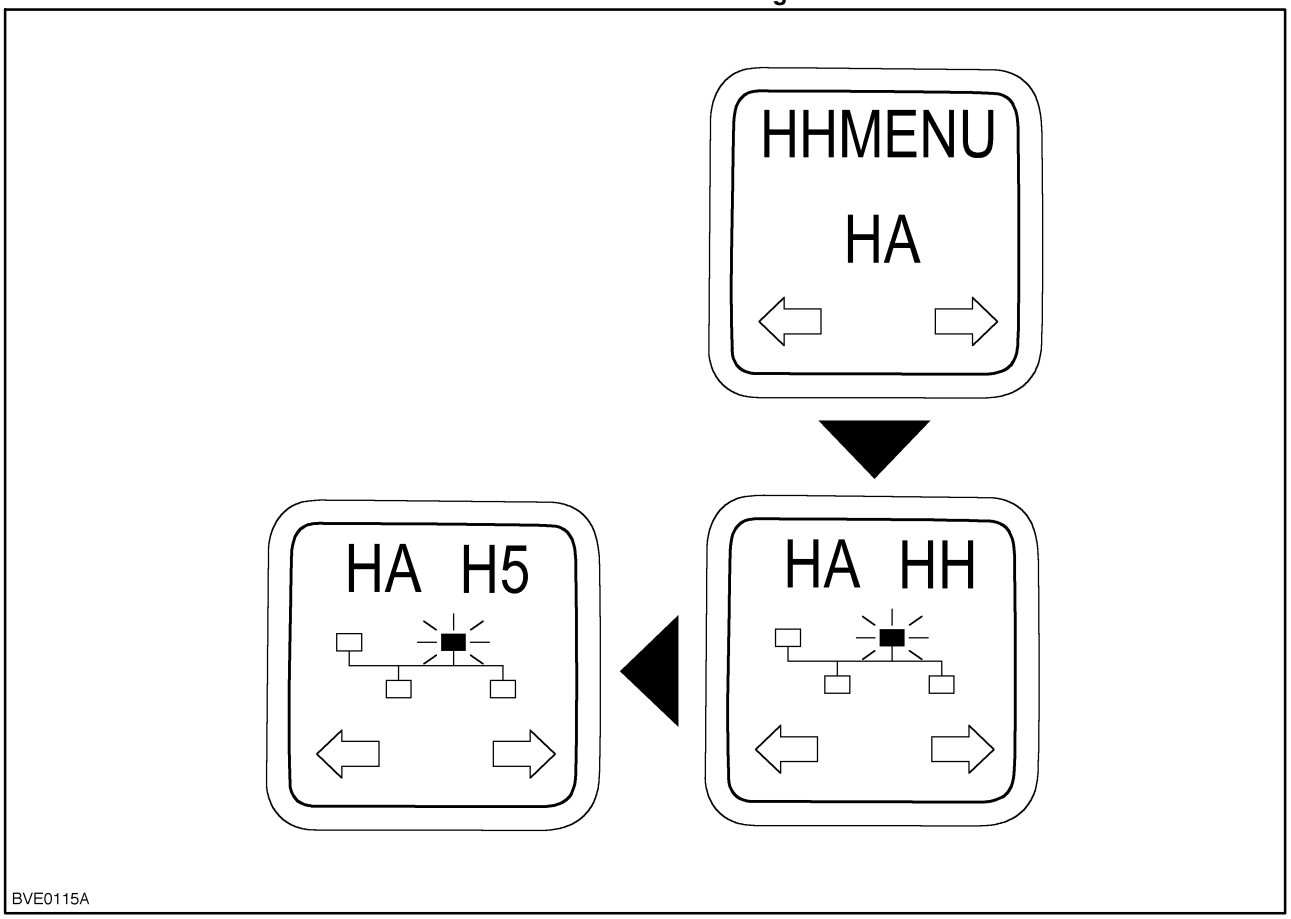


28

H5 - Switch Operation Test

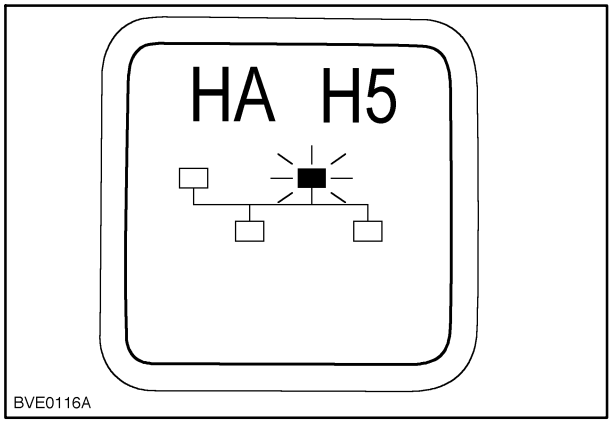
This menu displays a designated code when a switch transition is detected.

H5 Menu Screen Select Diagram



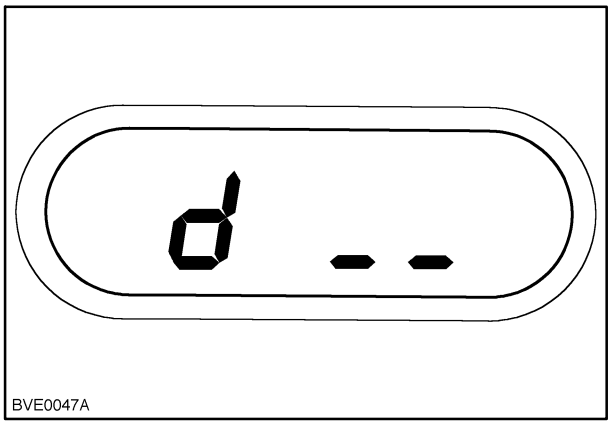
29

Select the H5 menu by depressing the “dimming” key.



30

The lower central display will display “d _ _”.

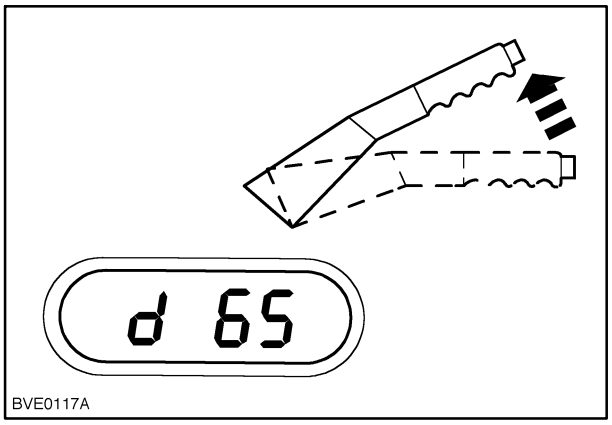


31

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.

If a switch code is not displayed and the audible tone not heard, a ’wiggle’ test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.

NOTE: *If the keystart switch is turned to the “crank” position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*



32

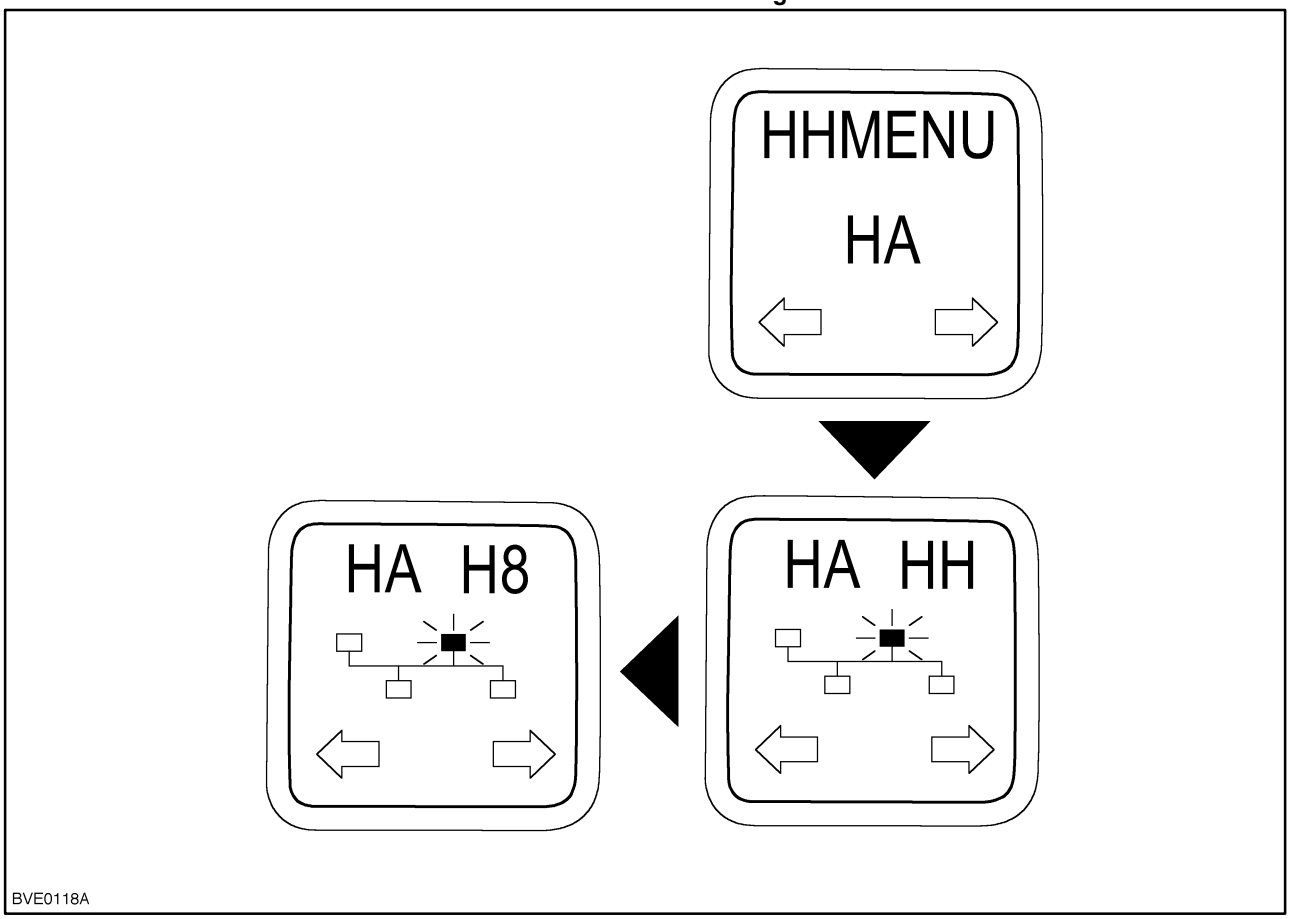
Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d0	No switch or two switches activated at the same time			-
d65	C081	7	Handbrake switch	-
d66	C081	18	Main high beam lamp switch	-
d67	C079	15	Sidelight switch	-
d68	C081	17	Brakes not latched	-
d70	C079	5	Left turn signal indicator	-
d71	C079	6	Right turn signal indicator	-
d72	C081	1	Implement status	-

H8 - Clear Electrical Erasable Programmable Read Only Memory (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default.

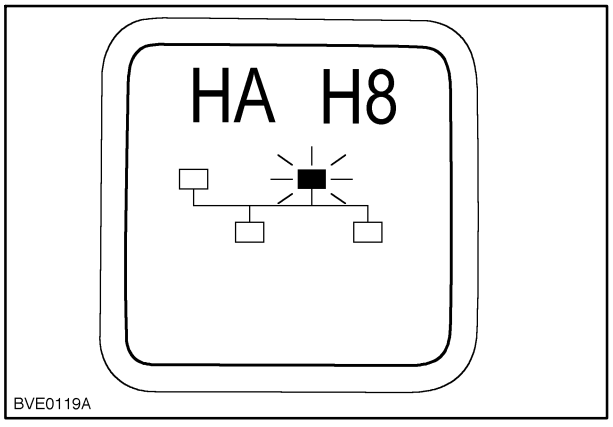
EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

H8 Menu Screen Select Diagram



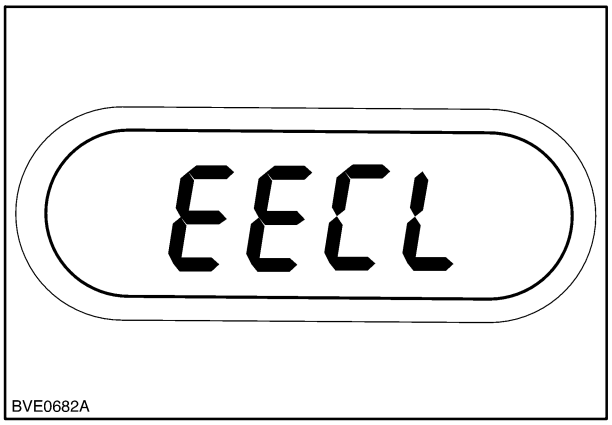
33

Select the H8 menu by depressing the “dimming” key.



34

The lower central display will display “EECL” .



35

⚠ CAUTION ⚠

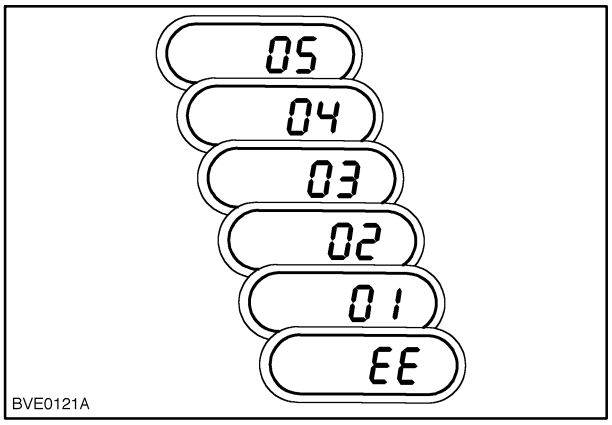
H8 will clear all calibrations values and stored error codes.

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the resetting of the EEPROM.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the EEPROM has been cleared.

Turn the keystart OFF.



36

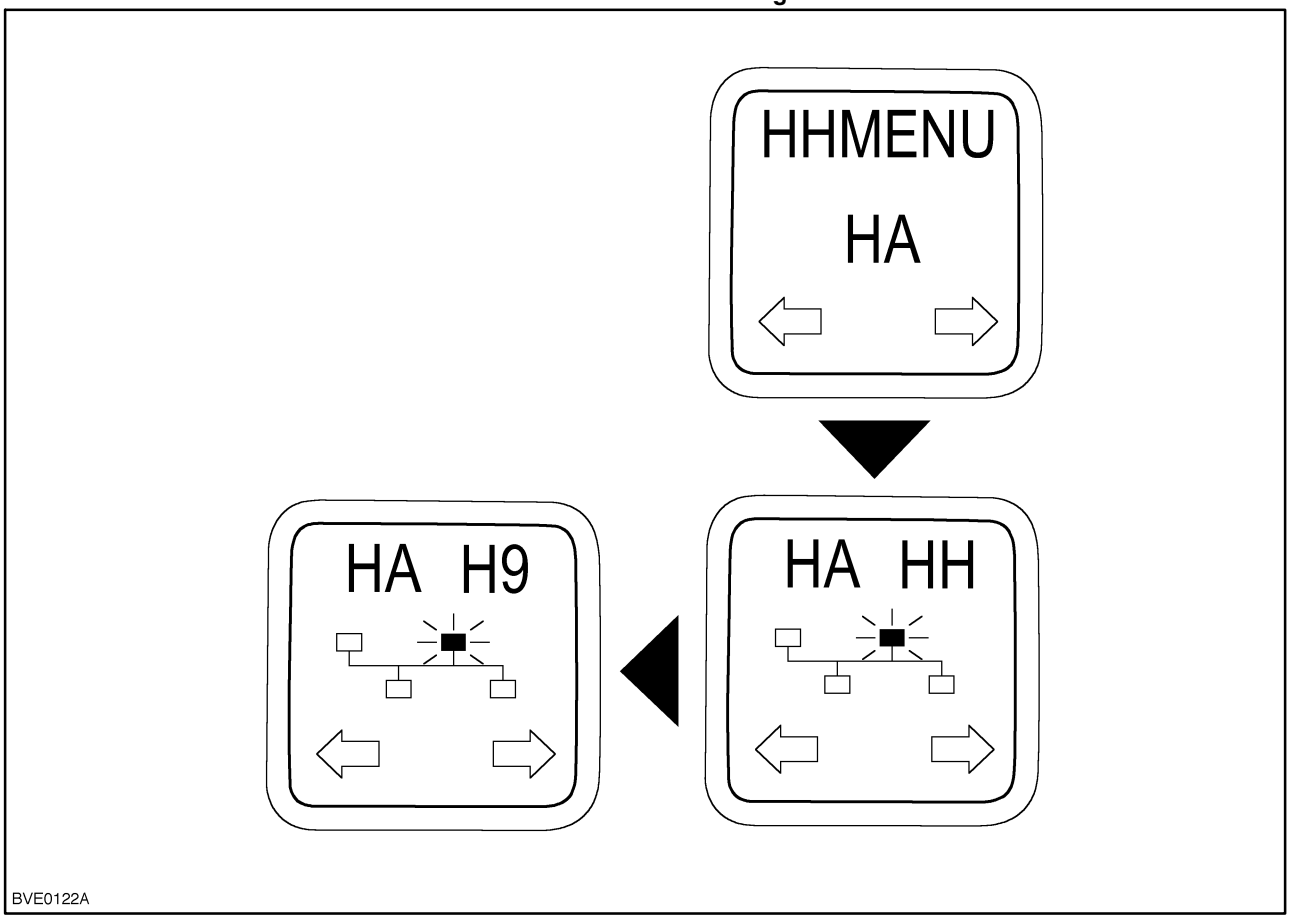
H9 - Voltmeter

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits.

If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

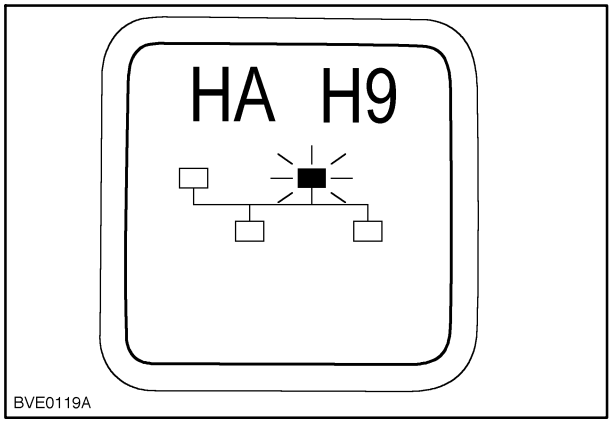
NOTE: *The vehicle may be driven while in this menu.*

H9 Menu Screen Select Diagram



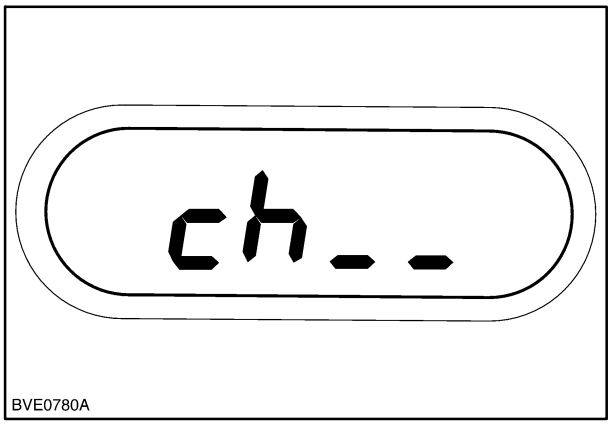
37

Select the H9 menu by depressing the "dimming" key.



38

The lower central display will display “ch _ _”.



39

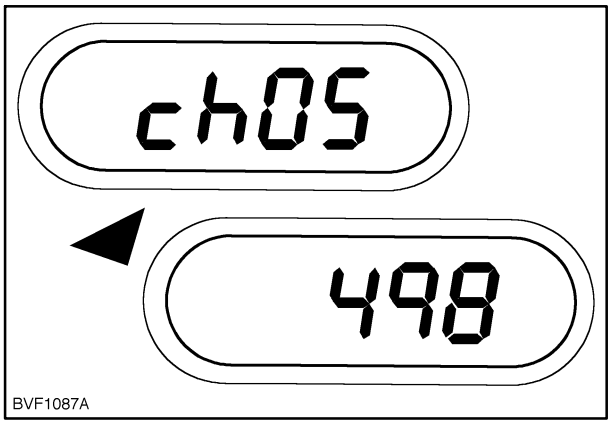
The required channel can be selected by using the “h” and “m” keys.

After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to 0 volts.*

If the value displayed varies by more than 10% to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



40

Channel	Description	Typical Reading	Notes
4	Programming voltage Vpp	600	See explanations
5	5 Volt sensor supply	498	
10	+12 Volt VT input	600	See explanations
21	Steering angle potentiometer	Greater than 80	
22	Engine oil pressure sensor	20 – 600	
23	Engine coolant temperature sensor	20 – 950	
24	Air brake pressure	40 – 500	
25	Fuel level sensor	50 – 400	60 = Full 340 = Empty
91	Foot throttle potentiometer	100 – 950	Mechanical fuel injection engine only
96	Rear PTO speed sensor	0 – 1200 rev/min	
97	Front PTO speed sensor	0 – 1200 rev/min	CAN message
98	Front hitch position	0 – 255	CAN message

Explanations:

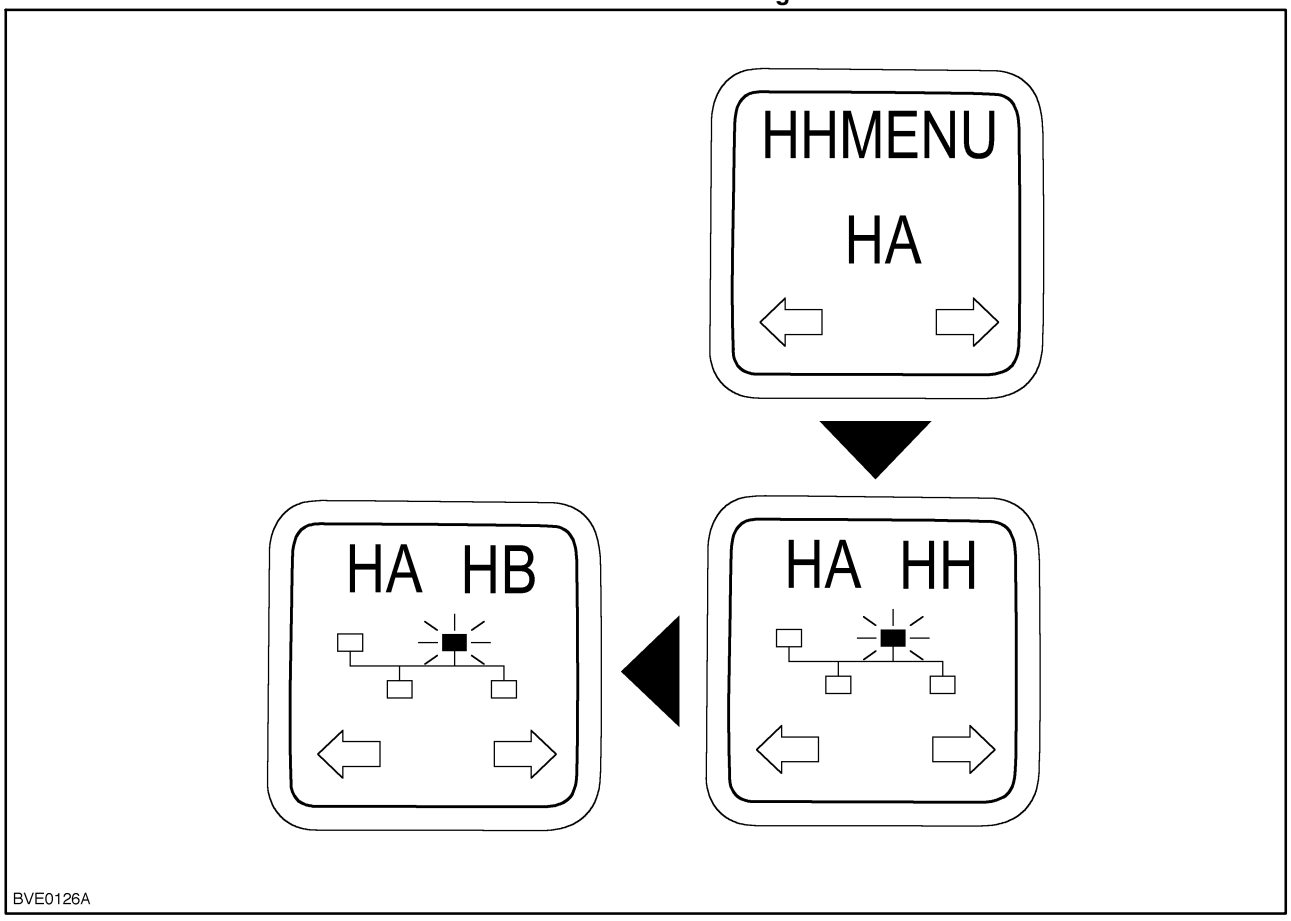
Vpp Input: This is the input voltage into the controller to retain the volatile memory.

VT Input: This is a second input voltage into the controller.

HB - Display Stored Fault Codes

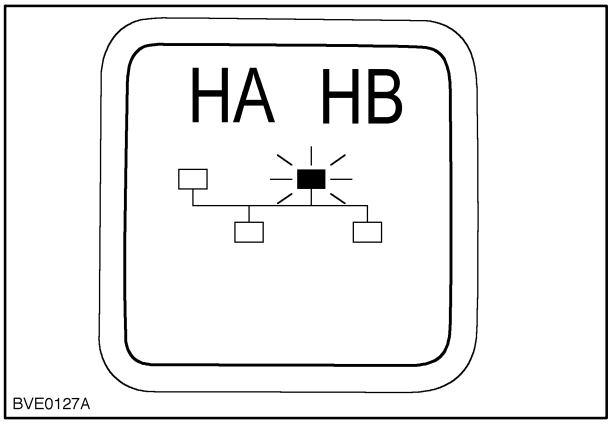
This menu is used to display fault codes which are stored in the EEPROM of the controller.

HB Menu Screen Select Diagram



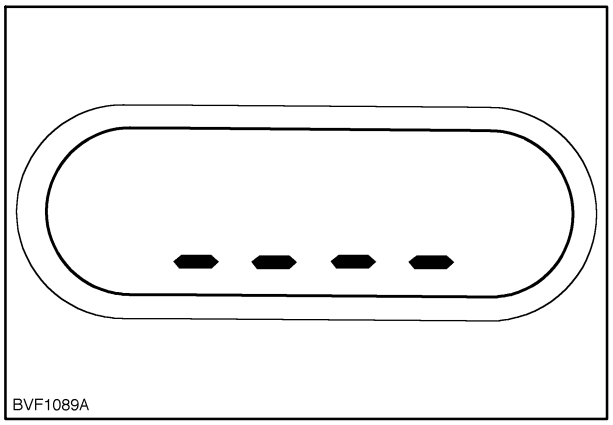
41

Select the HB menu by depressing the “dimming” key.



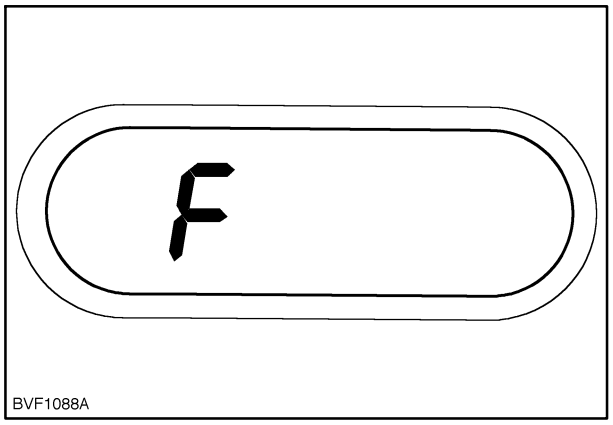
42

The lower central display will display "_ _ _ _", if no fault code is stored.



43

The lower central display will display "F", if a fault code is stored.



44

The lower central display will then automatically cycle through as the example:

14100 . . . . . Fault code

01 . . . . . Hour of first occurrence

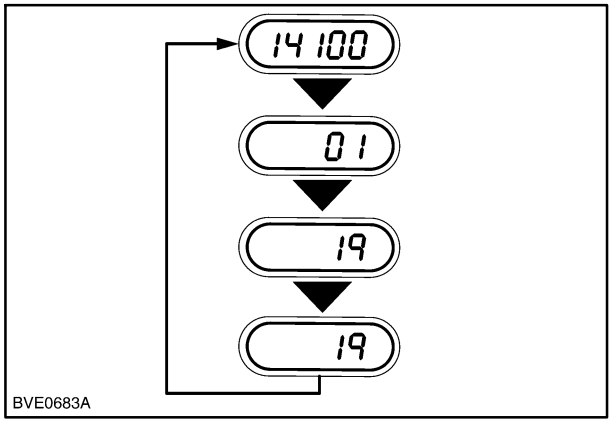
19 . . . . . Hour of last occurrence

19 . . . . . Number of occurrences of the fault

Depress the "h" or "m" key to change to the next fault code in the list.

The lower central display will display "_ _ _" at the end of the list.

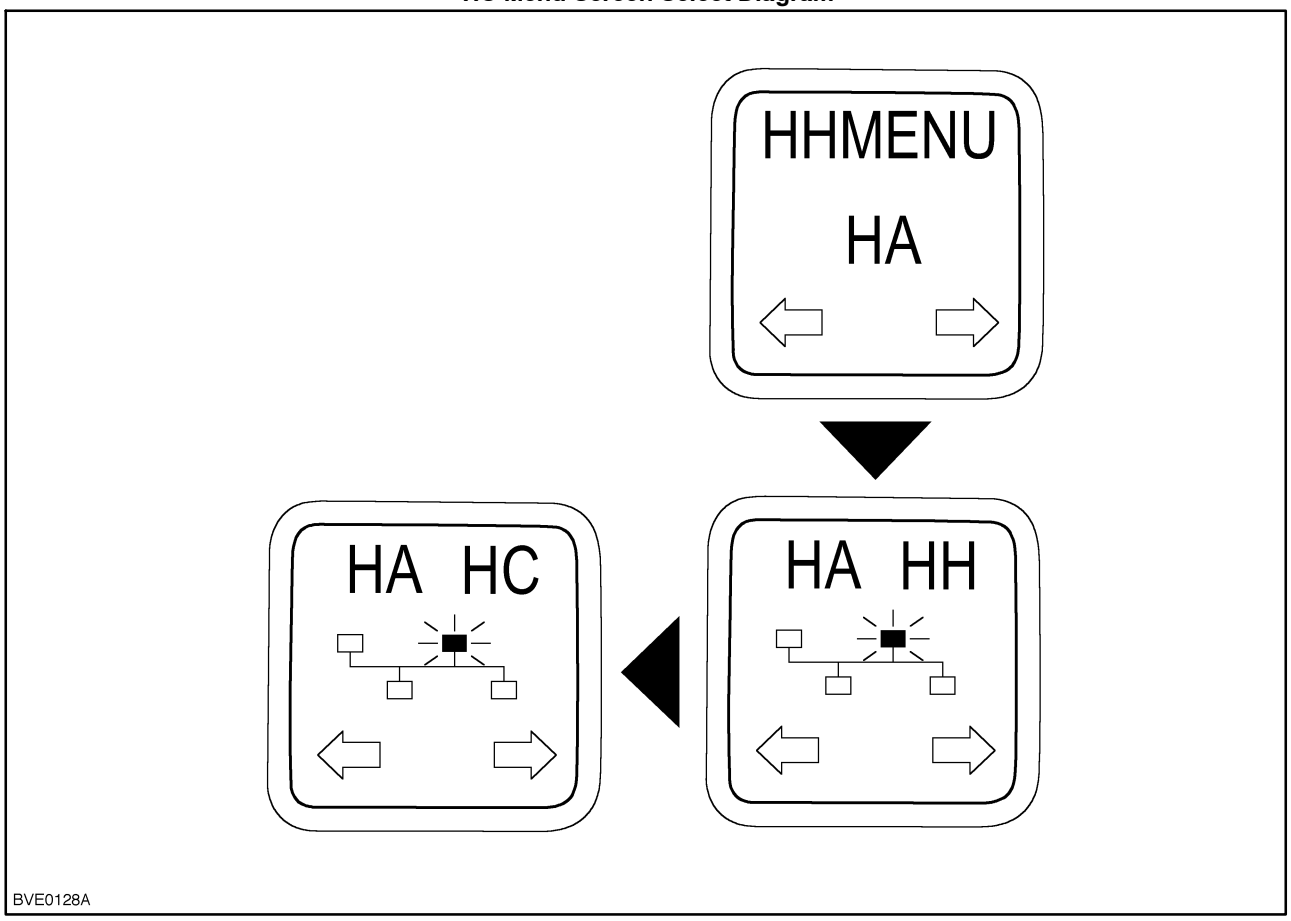
Depress the "dimming" key to continue navigating through the "HH" menus.



45

HC - Clear Stored Fault Codes

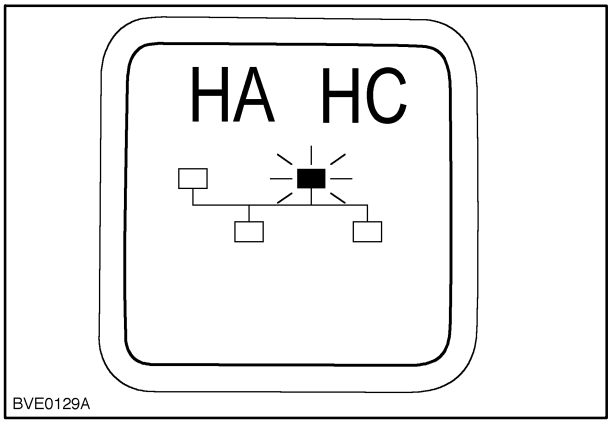
HC Menu Screen Select Diagram



46

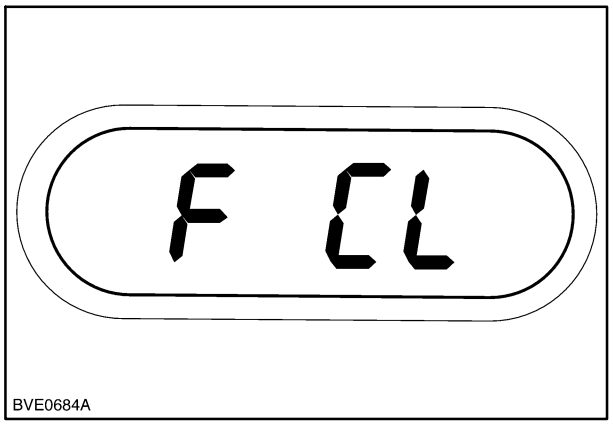
NOTE: *Always make a note of the fault codes stored, before clearing the memory.*

Select the HC menu by depressing the “dimming” key.



47

The lower central display will display “F CL”.



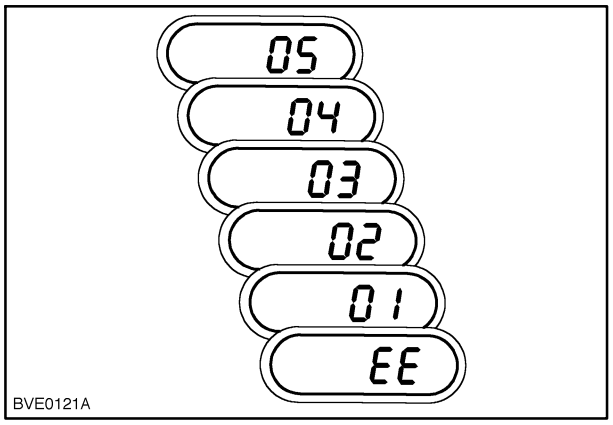
48

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the clearing of the memory.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the fault codes have been cleared.

Depress the “dimming” key to continue navigating through the “HH” menus.

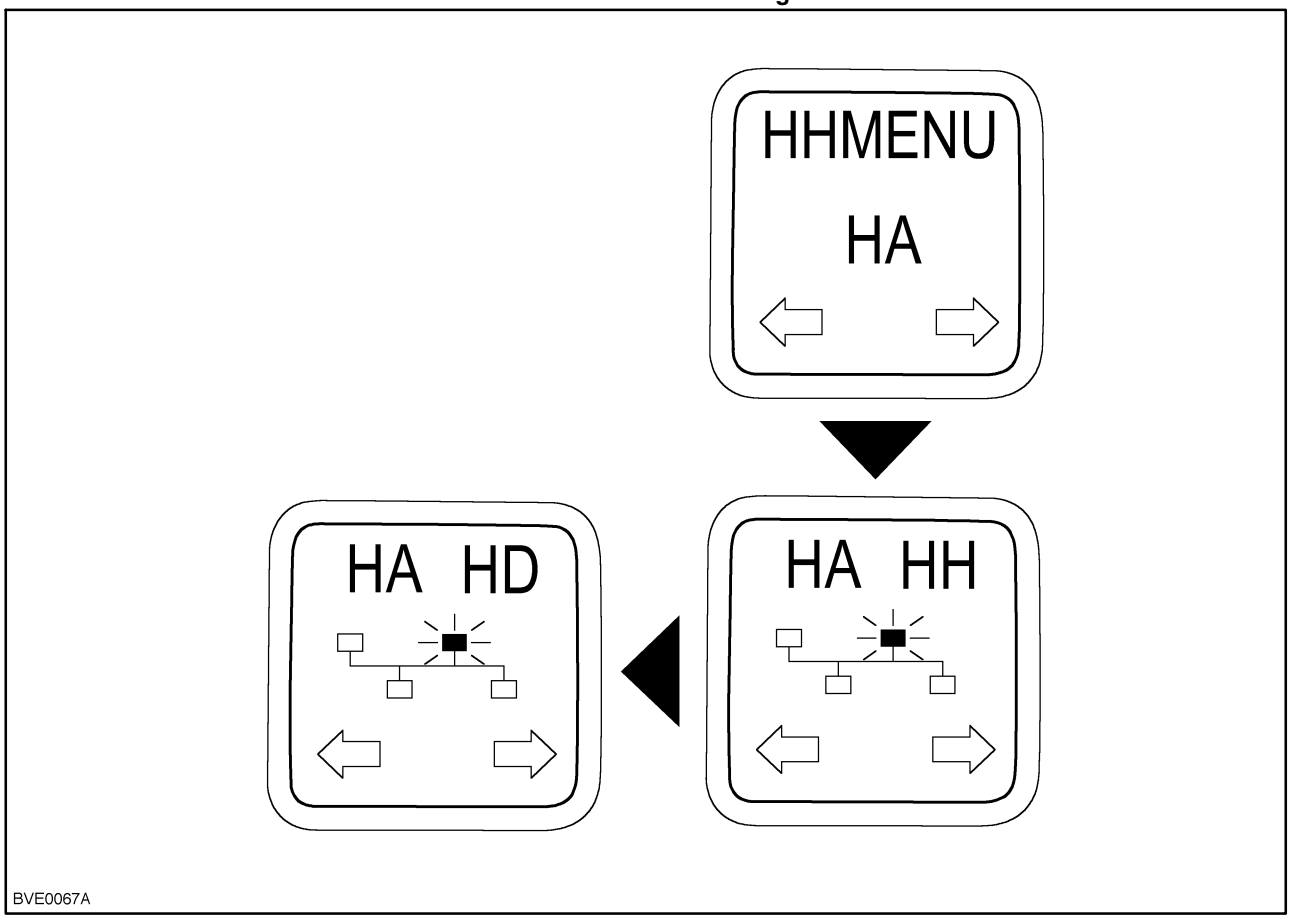


49

HD - Fault Code Management

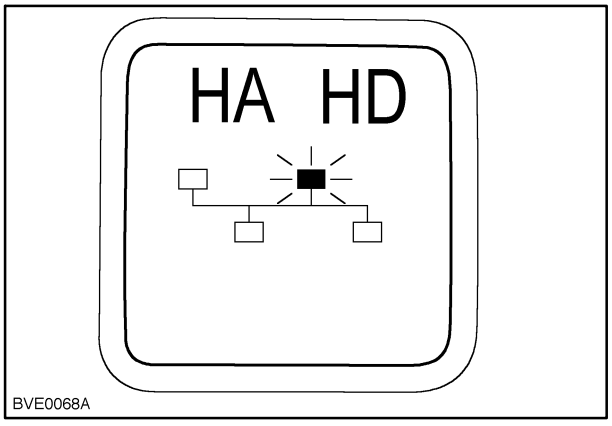
This menu allows the fault code management options to be changed.

HD Menu Screen Select Diagram



50

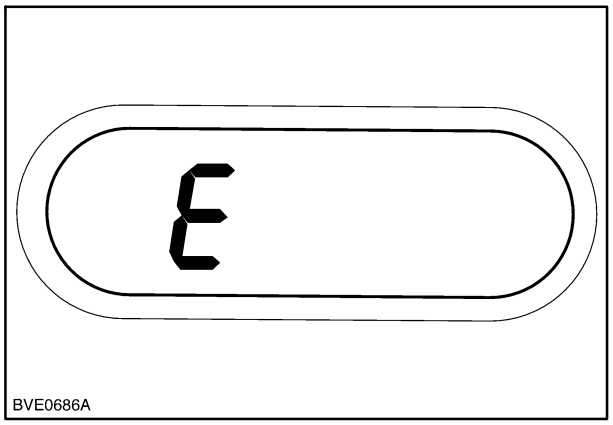
Select the HD menu by depressing the “dimming” key.



51

NOTE: *The default setting is E (Error code reduction).*

The lower central display will display the current setting.



52

Scroll through the available options using the “h” or “m” key.

E - Error code reduction

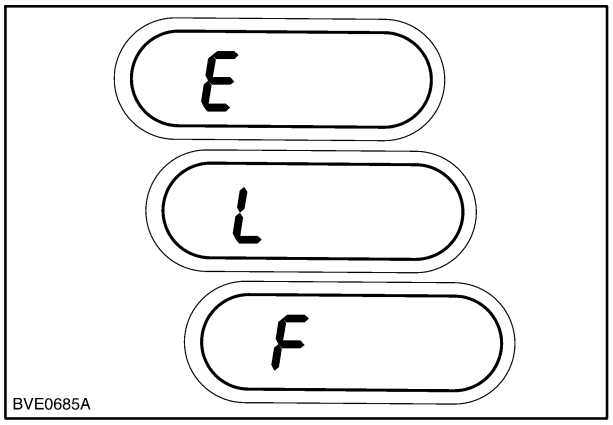
Only critical fault codes are displayed and non critical fault codes are stored.

L - Live fault codes

All fault codes are displayed.

F - Factory mode

Displays all fault codes, then after approximately six minutes of continuous tractor operation returns to error code reduction.



53

Depress and hold the “h” or “m” key to store the selection.

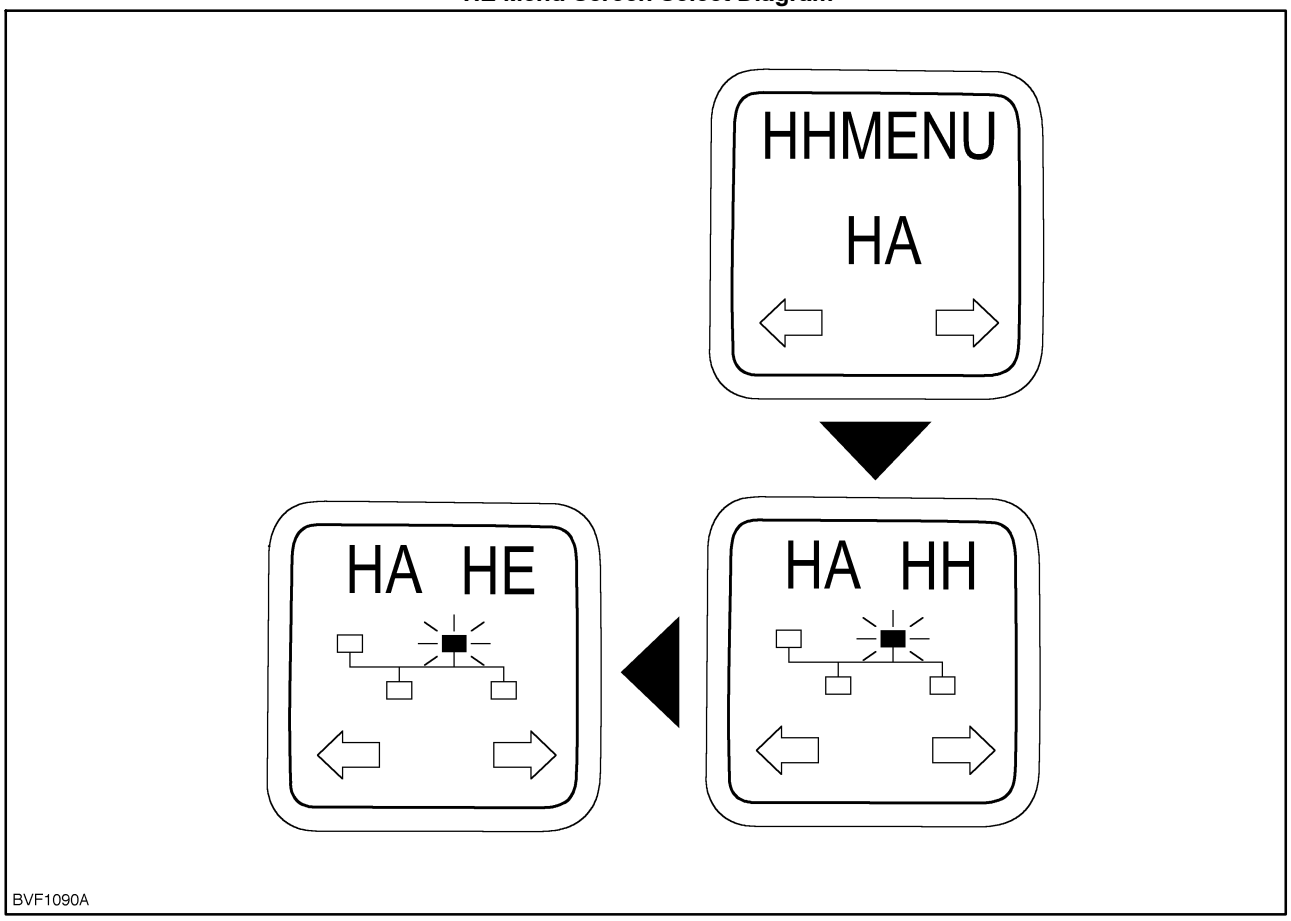
Turn the keystart OFF, then ON to start the selected option.

HE - Display All Speed Inputs

This menu is used to verify the operation of various frequency inputs.

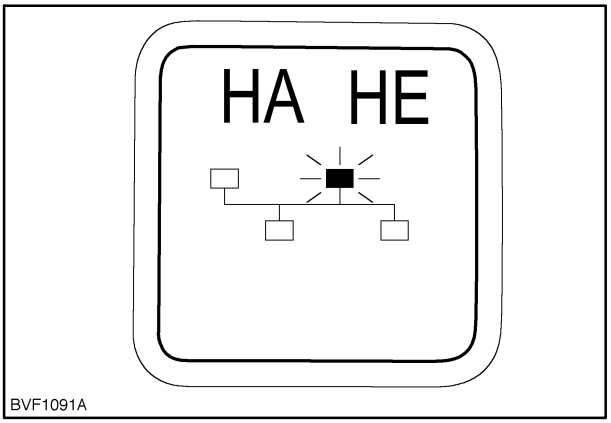
NOTE: *The vehicle may be driven while in this menu.*

HE Menu Screen Select Diagram



54

Select the HE menu by depressing the “dimming” key.



55

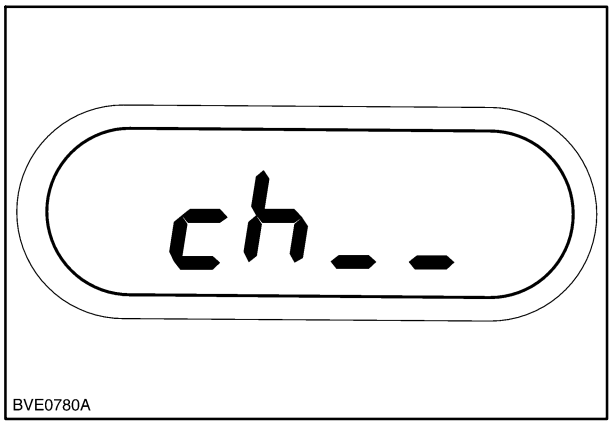
The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

Refer to the table below for the available channels.

After a delay the value will be displayed.

Depress the “dimming” key to continue navigating through the “HH” menus.



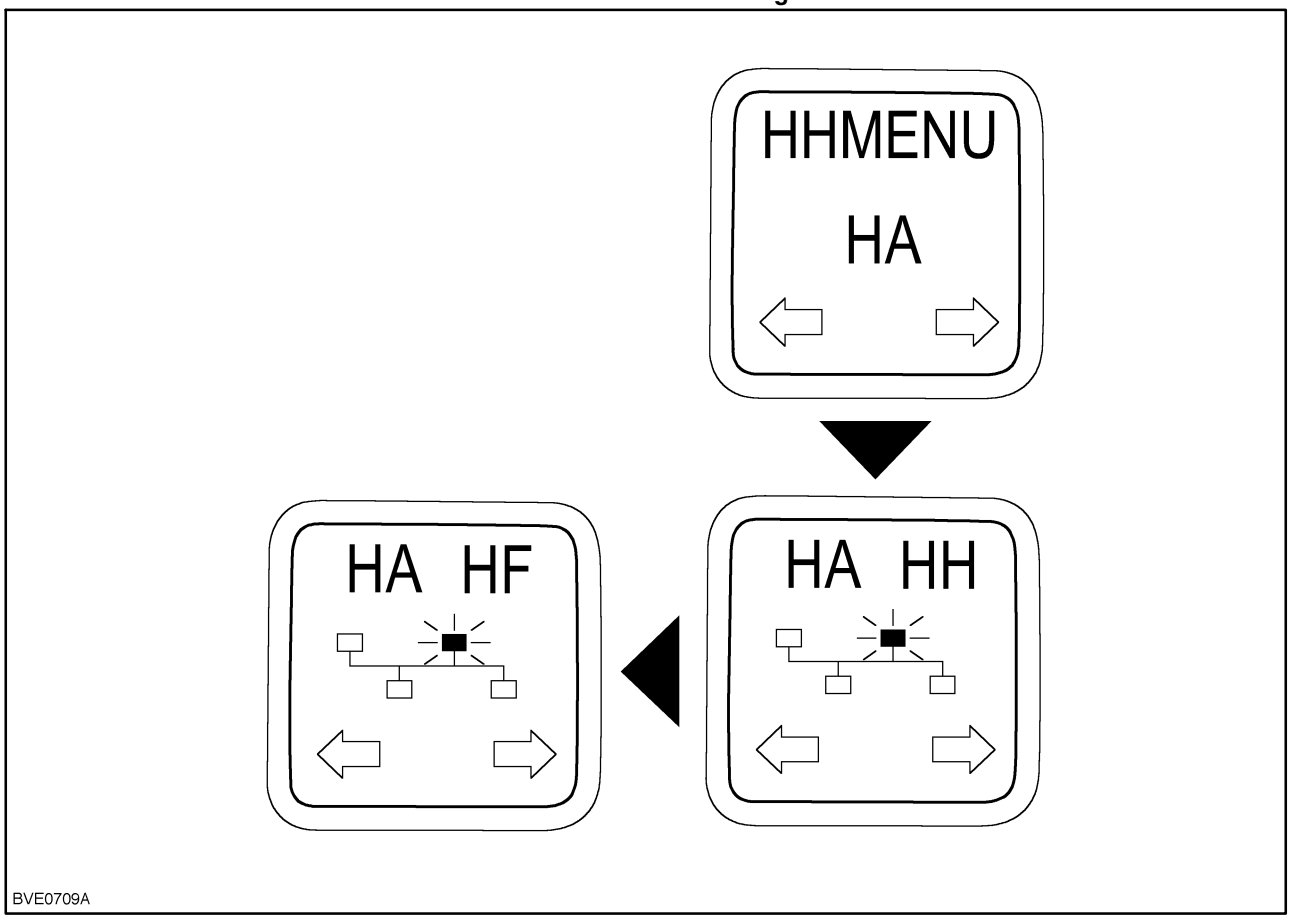
56

Channel	Description	Typical Reading	Notes
18	Engine speed	0 – 3000 rev/min	
19	Wheel speed	0 – 50 Km/h	
20	Radar	0 – 50 Km/h	
96	Rear PTO speed	0 – 1200 rev/min	
97	Front PTO speed	0 – 1200 rev/min	

HF - View Controller Hardware Information

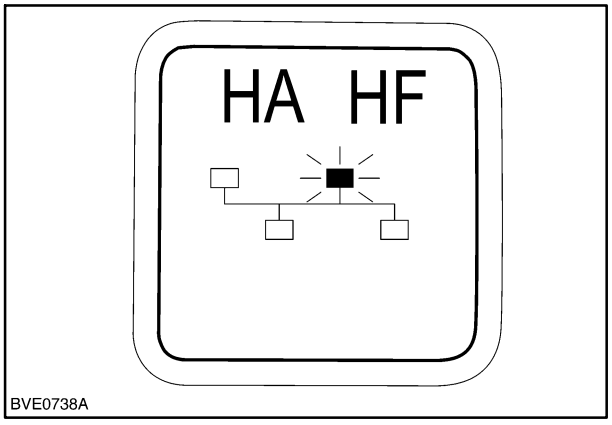
This menu allows the hardware identification, hardware version and serial number to be displayed.

HF Menu Screen Select Diagram



57

Select the HF menu by depressing the “dimming” key.



58

The lower central display will automatically cycle through as the example:

517 . . . . . Hardware identification

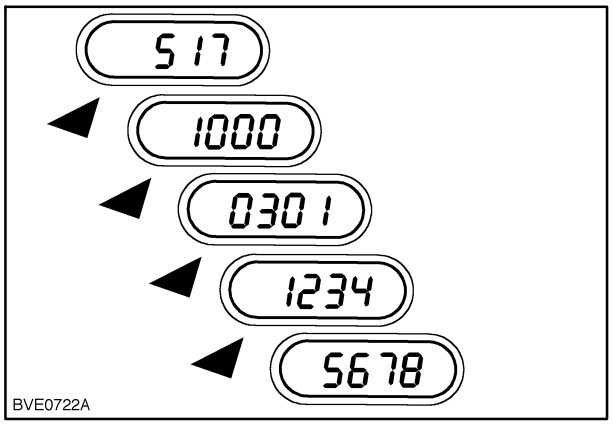
1000 . . . . . Hardware version

0301 . . . . . Hardware version

1234 . . . . . Serial number

5678 . . . . . Serial number

and return to allow navigation of the “HH” menus.



59

DA / DB CONTROLLER H ROUTINES

DA - 24x24 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive
DB - 16x16 Transmission, Electronic Draft Control, Rear PTO, Differential Lock, Four Wheel Drive

NOTE: *DB - 16x16 transmission is shown in the screen displays.*

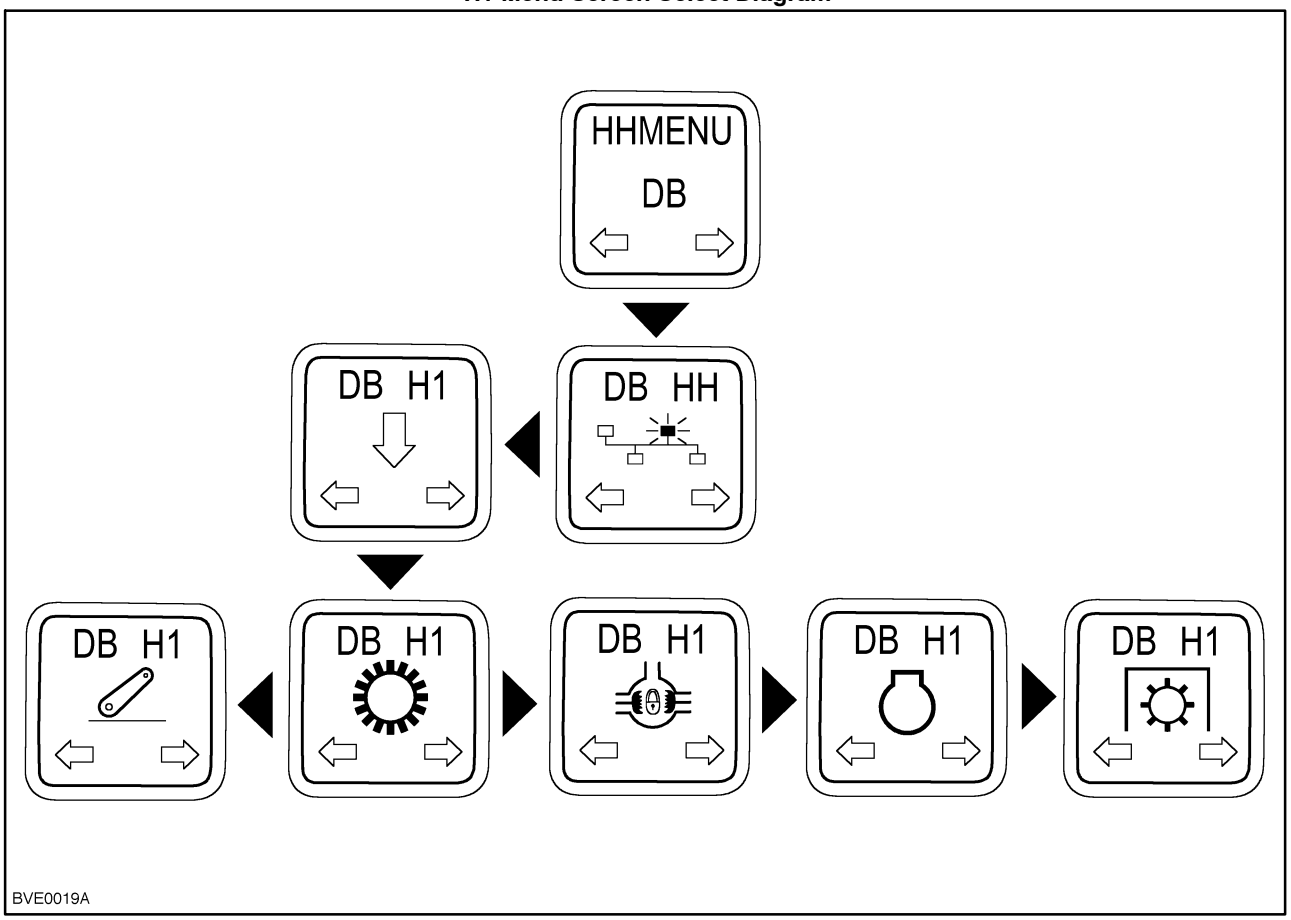
HH	Service Menu	Page
H1	Calibration procedures	36
H2	View stored calibration values	37
H3	Configurations	40
H4	View software revision level	61
H5	Switch operation test	63
H6	Vehicle information view	67
H7	Test modes	69
H8	Clear Electrical Erasable Programmable Read Only Memory (EEPROM)	73
H9	Voltmeter	75
HA	Demonstration menu	80
HB	Display stored fault codes	82
HC	Clear stored fault codes	84
HD	Not used	-
HE	Display all speed inputs	86
HF	View controller hardware information	88

H1 - Calibration Procedures

This menu is used to calibrate:

1. Transmission clutches, determining the current required to turn the input / output shaft at the required speed
2. Position measurements for the synchronisers
3. Manual adjustments of the clutch pack calibrations
4. Engine (for PTO torque sensor)
5. Differential lock (for steering angle sensor)
6. Electronic Draft Control valve
7. Rear PTO clutch

H1 Menu Screen Select Diagram



60

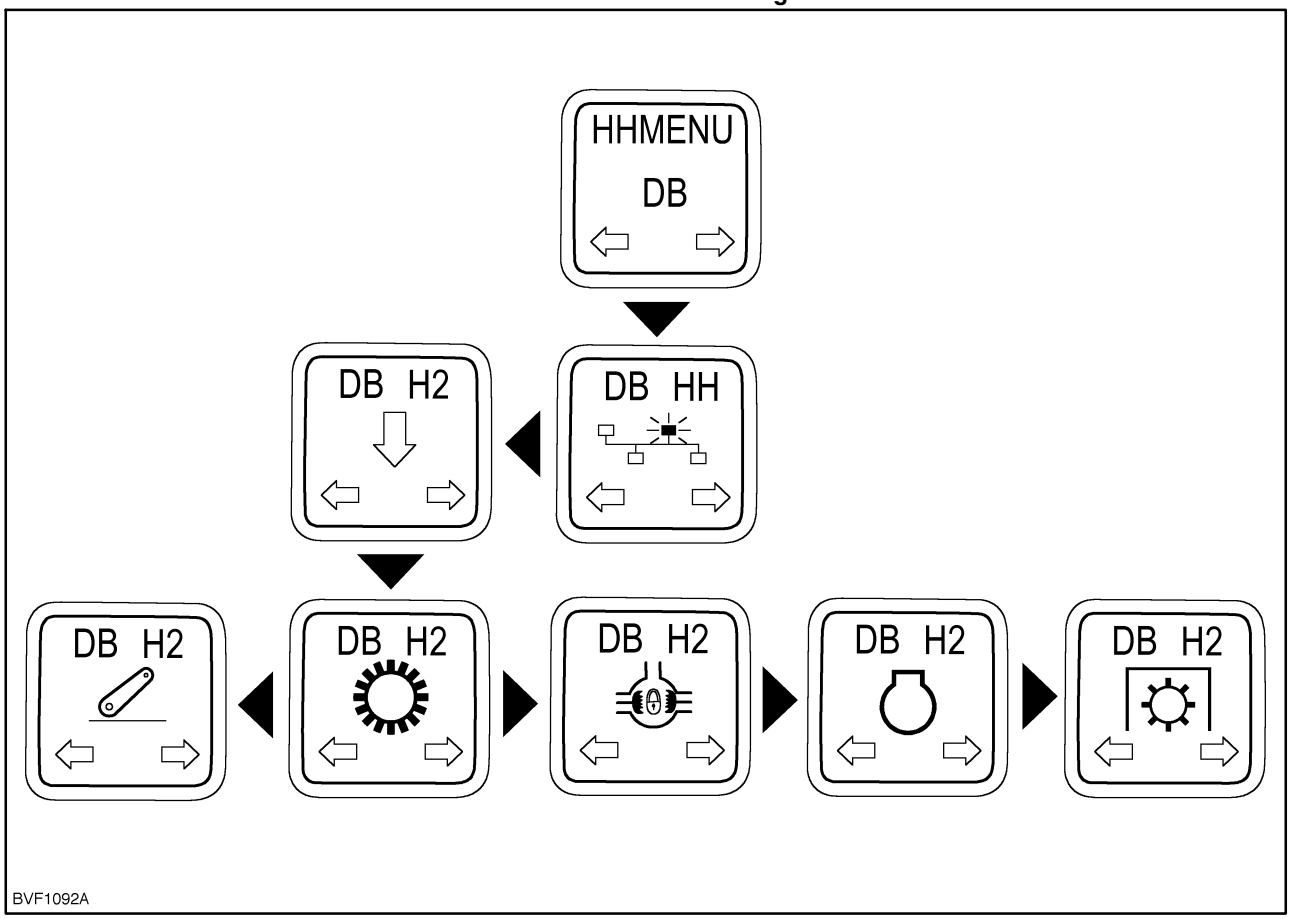
Refer to the calibrations chapter of the electrical systems section for detailed explanation of each system.

H2 - View Stored Calibration Values

This menu is used to display the calibration values stored in the controllers for:

1. Transmission clutches and synchronisers
2. Differential lock (for steering angle sensor)
3. Engine (for PTO torque sensor)
4. Rear PTO clutch
5. Electronic Draft Control valve

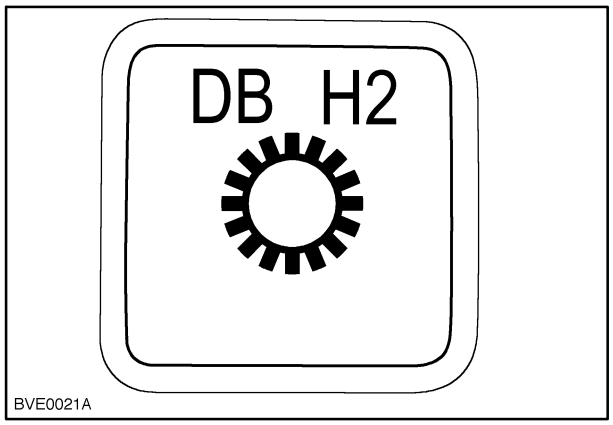
H2 Menu Screen Select Diagram



61

Transmission Values

Select the transmission sub-system by depressing the “dimming” key.



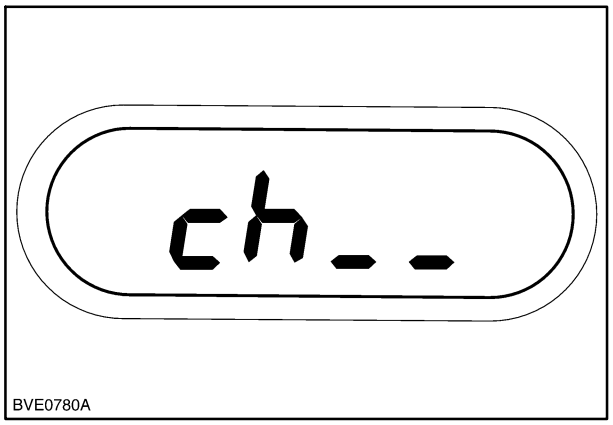
62

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the code followed by the calibration value will be displayed, (refer to the 16x16 transmission or 24x24 transmission table below for a description of each channel).

Depress the “dimming” key to continue navigating through the “HH” menus.



63

16x16 Transmission

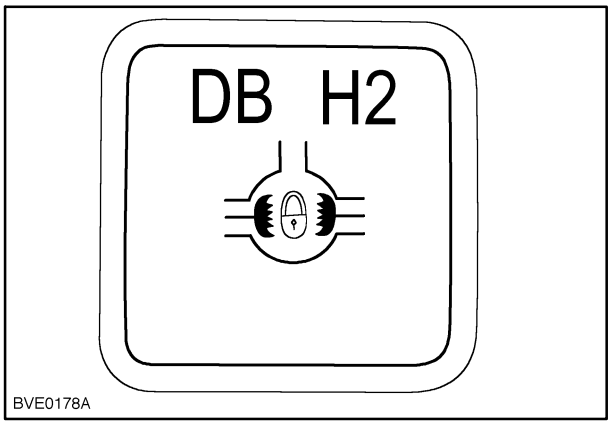
Channel	Description	Code	Value Range
Ch 1	Clutch C1	C1	101 - 240
Ch 2	Clutch C2	C2	101 - 240
Ch 3	Clutch C3	C3	101 - 240
Ch 4	Clutch C4	C4	101 - 240
Ch 5	Forward synchroniser PWM solenoid valve	AF	200 - 350
Ch 6	Reverse synchroniser PWM solenoid valve	Ar	200 - 350
Ch 7	1-4 synchroniser PWM solenoid valve	A4	200 - 350
Ch 8	5-8 synchroniser PWM solenoid valve	A5	200 - 350
Ch 9	Synchroniser potentiometer - forward position	PF	655 - 963
Ch 10	Synchroniser potentiometer - reverse position	Pr	61 - 376
Ch 11	Synchroniser potentiometer - 1-4 position	P4	61 - 376
Ch 12	Synchroniser potentiometer - 5-8 position	P5	655 - 963

24x24 Transmission

Channel	Description	Code	Value Range
Ch 1	Clutch C1 Lo	Lo	40 - 260
Ch 2	Clutch C2 Hi	Hi	40 - 260
Ch 3	Forward synchroniser PWM solenoid valve	AF	200 - 350
Ch 4	Reverse synchroniser PWM solenoid valve	Ar	200 - 350
Ch 5	Synchroniser potentiometer - forward position	PF	61 - 376
Ch 6	Synchroniser potentiometer - reverse position	Pr	655 - 963

Differential Lock (for Steering Angle Sensor) Values

Select the differential lock sub-system by depressing the “dimming” key.



64

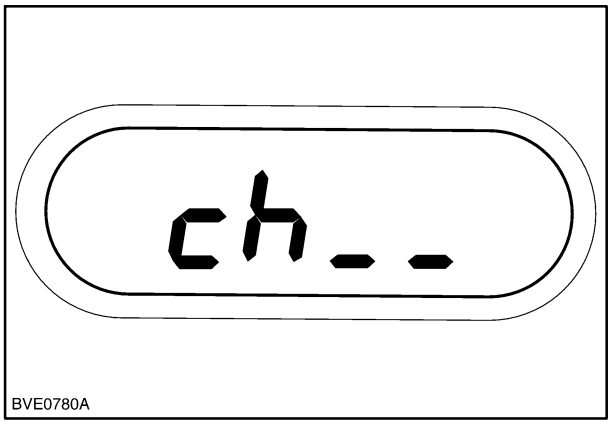
NOTE: *The default calibration value is 1889 for the steering angle sensor.*

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the calibration value will be displayed. (see the table below for the description of the channel).

Depress the “dimming” key to continue navigating through the “HH” menus.

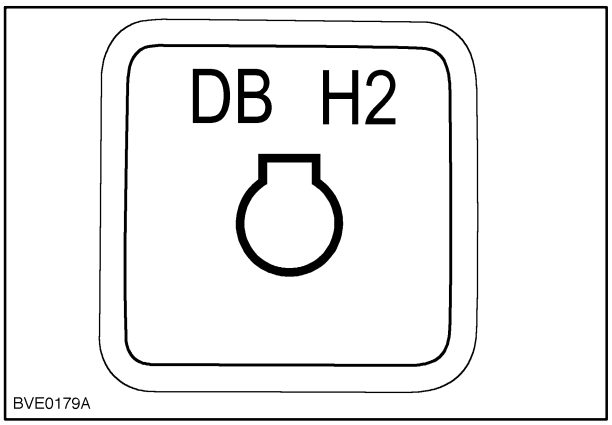


65

Channel	Description	Value Range
Ch 1	Steering angle sensor	1000 - 8000

Engine (for PTO Torque Sensor) Values

Select the engine sub-system by depressing the “dimming” key.



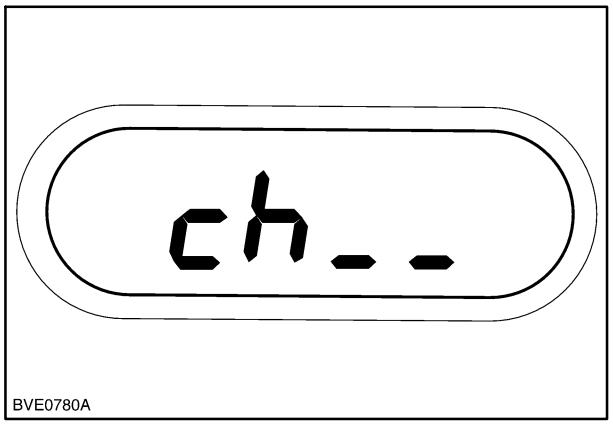
66

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the calibration value will be displayed. (see the table below for the description of the channel).

Depress the “dimming” key to continue navigating through the “HH” menus.

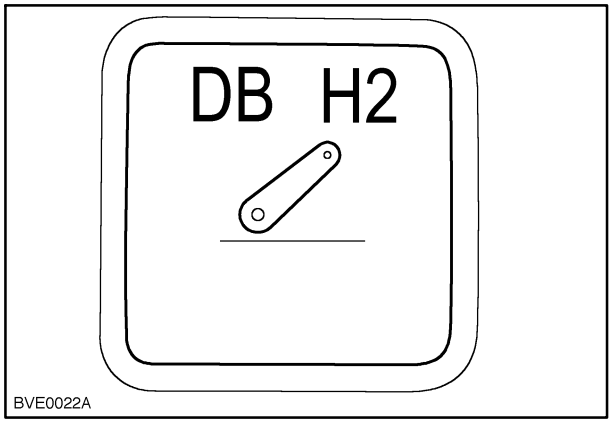


67

Channel	Description	Value Range
Ch 1	PTO torque sensor	500 - 8000

Electronic Draft Control Valve Values

Select the Electronic Draft Control sub-system by depressing the “dimming” key.



68

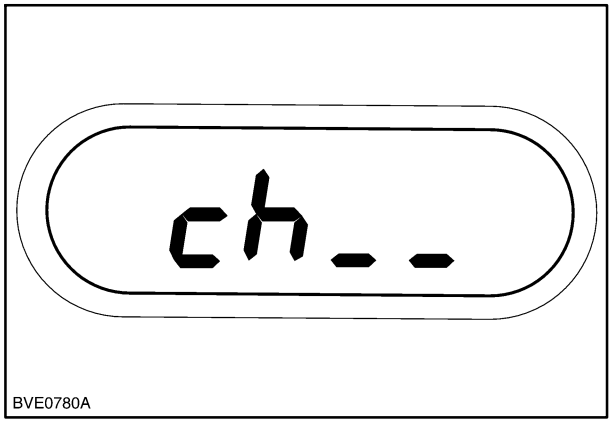
NOTE: *The default calibration value is 50 for both the raise and lower solenoids.*

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the code followed by the calibration value will be displayed. (see the table below for the description of each channel).

Depress the “dimming” key to continue navigating through the “HH” menus.

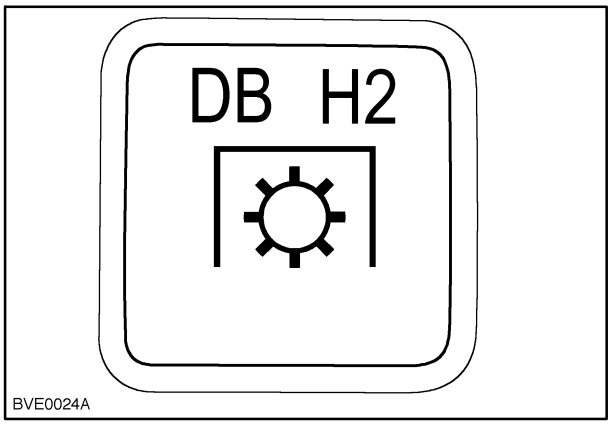


69

Channel	Description	Code	Value Range
Ch 1	Raise solenoid	R	20 - 80
Ch 2	Lower solenoid	L	20 - 80

PTO Values

Select the PTO sub-system by depressing the "dimming" key.



70

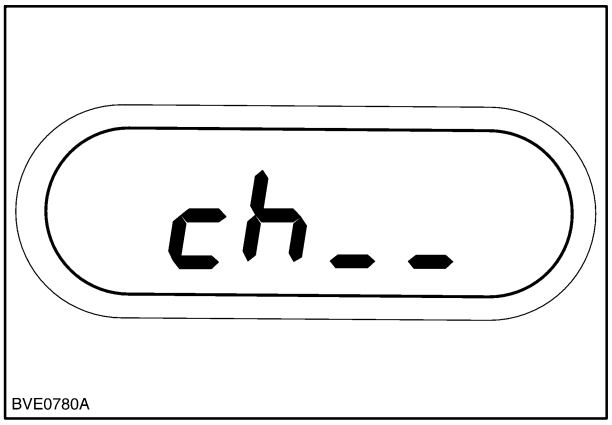
NOTE: *The default calibration value is 280 for the PTO solenoid.*

The lower central display will display "ch _ _".

The required channel can be selected by using the "h" and "m" keys.

After a delay the calibration value will be displayed. (see the table below for the description of each channel).

Depress the "dimming" key to continue navigating through the "HH" menus.



71

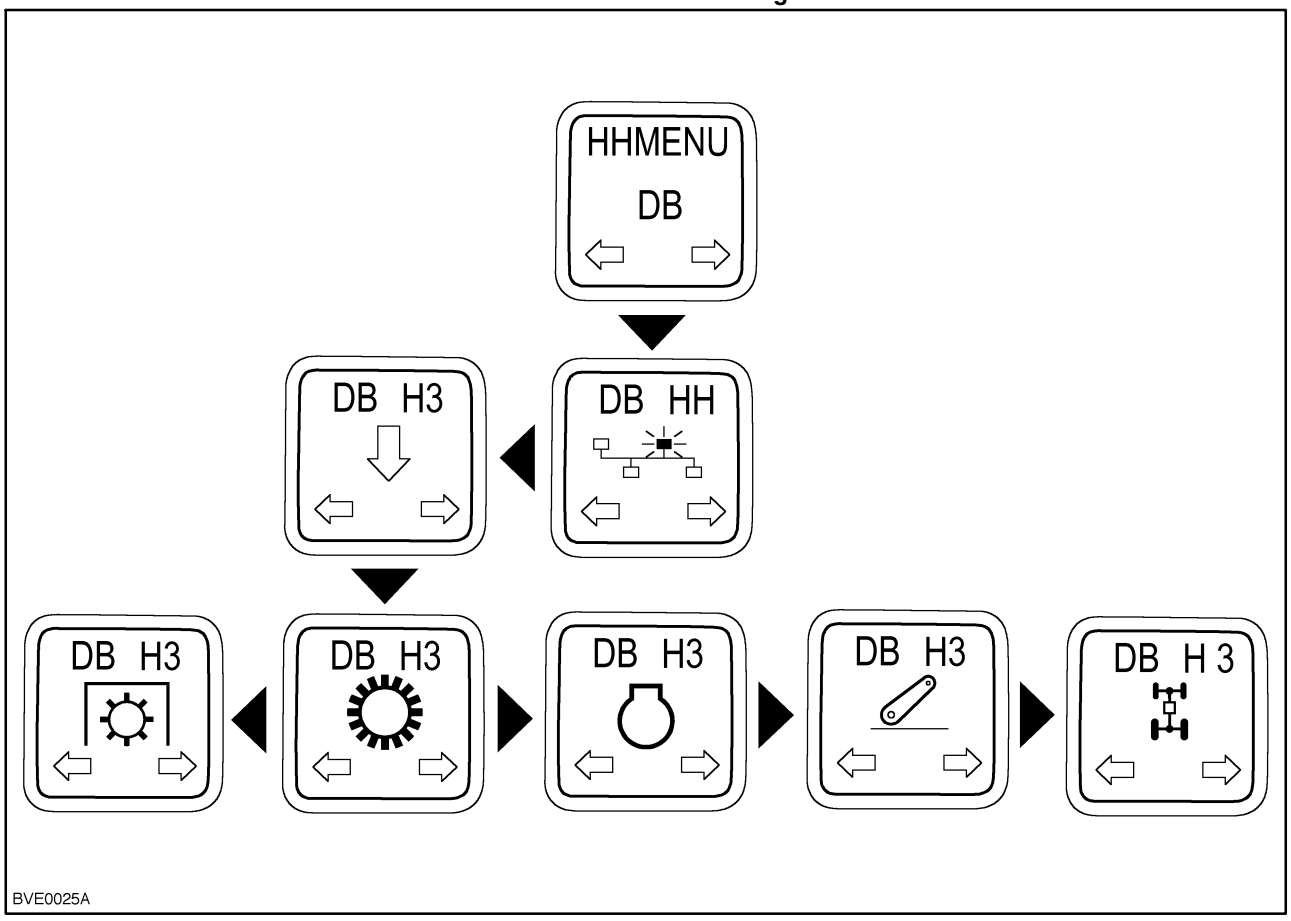
Channel	Description	Value Range
Ch 1	PTO oil temperature	10 - 120
Ch 2	PTO solenoid	100 - 350

H3 - Configurations

This menu is used to display the configurations available for:

1. Transmission
   - Ch.1 Clutch quickfill time adjustment (16x16 and 24x24)
   - Ch. 2 Sharp shuttle option (16x16 only)
   - Ch.3 Set fly-shift speed threshold (24x24 only)
   - Ch.4 Driver selectable shuttle modes (16x16 only)
   - Ch.5 40kph maximum speed setting (50kph only)
   - Ch.6 Creeper enable/disable mode (Y = Disabled)
   - Ch.7 1-4/5-8 synchro to neutral (Default = No)
2. Electronic engine
   - PTO dynamometer test with maximum power boost
3. Electronic Draft Control
   - Diameter of the external hydraulic lift rams
   - Enable / Disable Electronic Draft Control
4. Four Wheel Drive
   - Axle type
   - Four wheel braking engagement speed selection (24x24 only)
   - Four wheel drive and differential lock disengagement in relation to steering angle and speed
5. Rear PTO
   - PTO management selection
   - PTO fender switches selection
   - PTO clutch calibration adjustment
   - PTO quickfill time adjustment

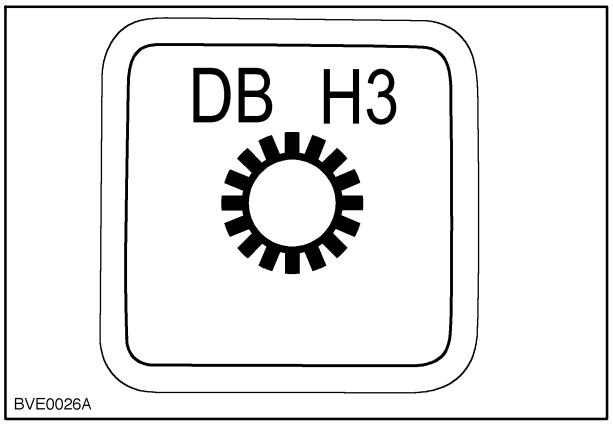
H3 Menu Screen Select Diagram



72

Transmission Options

Select the transmission sub-system by depressing the “dimming” key.

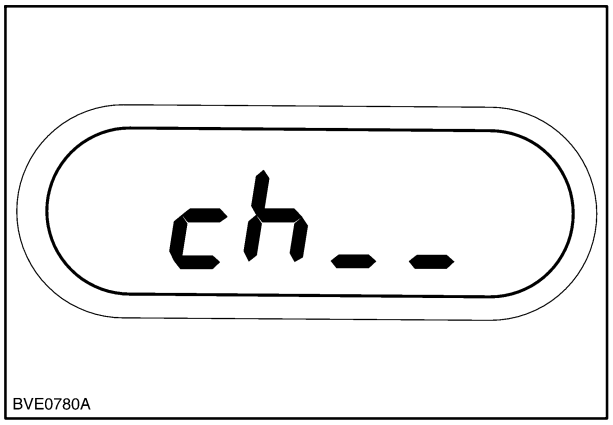


73

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



74

Channel	Description
Ch 1	Clutch quickfill time adjustment (16x16 and 24x24)
Ch 2	Sharp shuttle option (16x16 only)
Ch 3	Set fly-shift speed threshold (24x24 only)
Ch 4	40 Km/h maximum speed restriction (50 Km/h vehicles only)

Channel 1 - Clutch Quickfill Time Adjustment (16x16 only)

Allows the amount of time to fill the clutch pack to be adjusted.

NOTE: *If a transmission fault code (four digit number prefixed with a 2) is displayed. The fault code must be corrected before the quickfill can be adjusted.*

U-Code List:

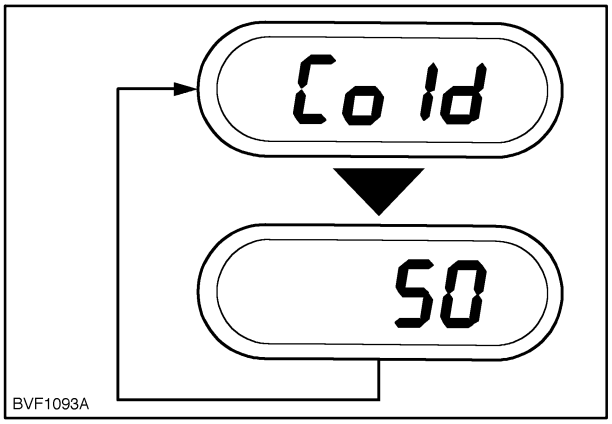
U25 - The range lever is in low range, shift the range lever out of low range.

Err - The procedure has been aborted due to an unspecified error. Try again. If "Err" occurs again use HD mode to fault find.

Set-Up Procedure:

- Warm the driveline oil to at least 60°C.
- Park the tractor on a level surface and allow some space as the tractor will move during testing.
- With the diagnostic special tool installed, start the engine.

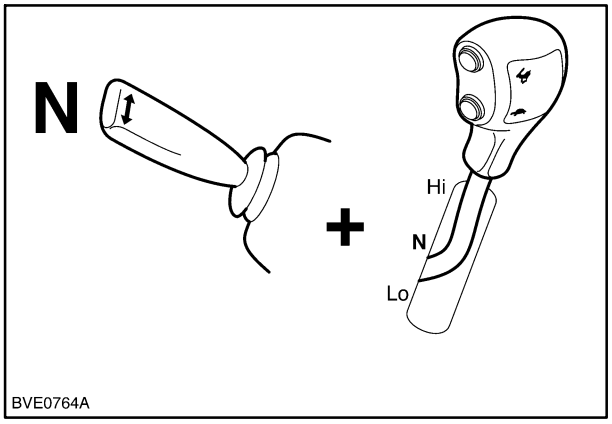
NOTE: *If the driveline oil temperature is below 60 °C, the display will alternate between "Cold" and the driveline oil temperature. Quickfill adjustment is not possible until the oil warms up.*



75

C1 or C2 Clutch Selection:

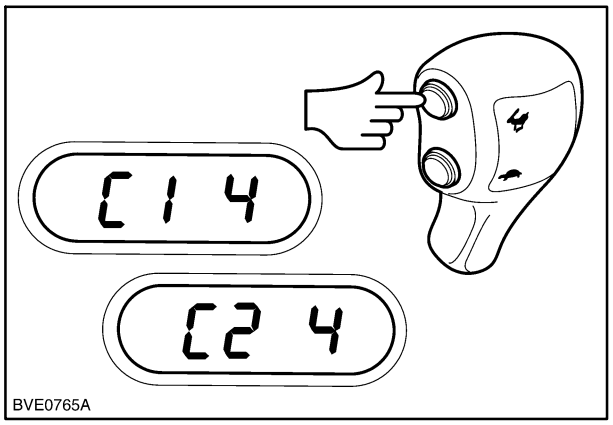
Shift the range lever and the shuttle lever to neutral.



76

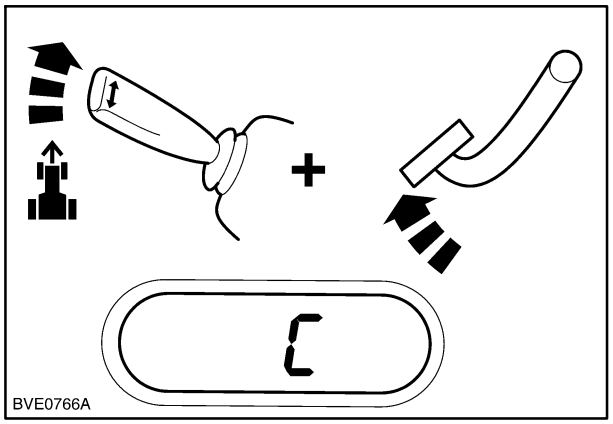
To switch between C1 and C2, depress the “upshift” or “downshift” switch.

The selected clutch and its quickfill setting will be displayed.



77

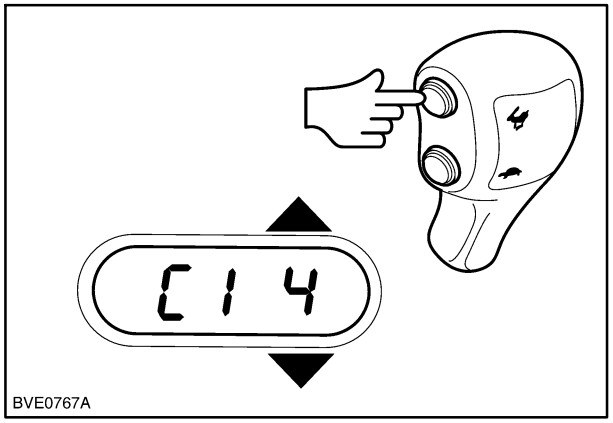
To adjust and/or test the quickfill setting, shift the shuttle lever to forward and release the clutch pedal. The lower central display will display “C” while the pressure is increased in C3 and C4 to stop the rotation of the transmission gears in preparation for testing C1 or C2.



78

The lower central display will change to display the clutch and the current quickfill setting.

Use the “upshift” or “downshift” switch to adjust the quickfill setting within the range of 3 to 9 (30 to 90 ms).



79

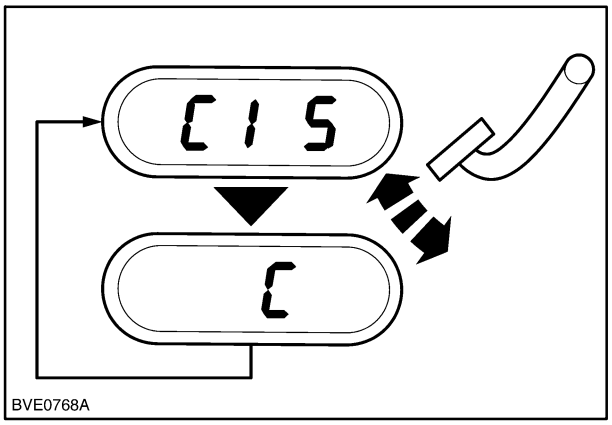
NOTE: *Do not fully depress the clutch pedal.*

To test the quickfill setting, engage the clutch by slightly depressing and releasing the clutch pedal.

C3 and C4 will be turned off while C1 or C2 is engaged for approximately one second.

The display will change briefly to display "C" while the pressure increases again in C3 and C4.

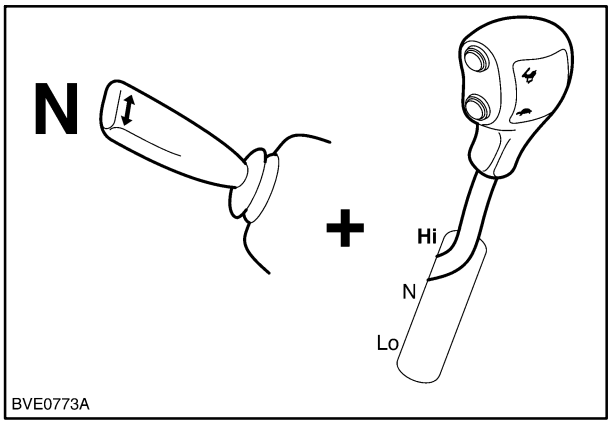
Decrease the quickfill setting until there is no clutch engagement noise when C1 or C2 engages. Increase the quickfill setting until there is a noticeable clutch engagement noise. Then reduce the setting by 2.



80

C3 or C4 Clutch Selection:

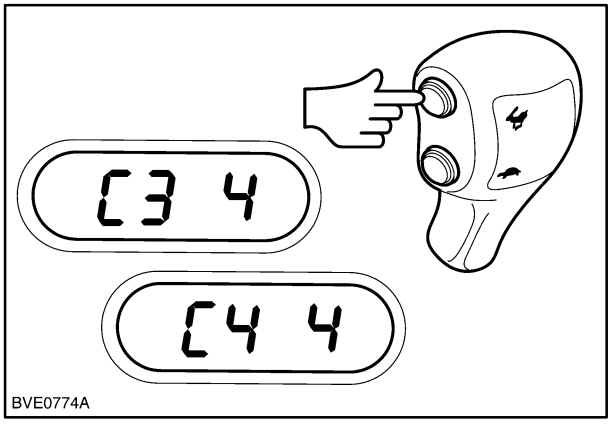
Shift the range lever to "Hi" and the shuttle lever to neutral.



81

To change between C3 and C4, depress the "upshift" or "downshift" switch.

The selected clutch and its quickfill setting will be displayed.



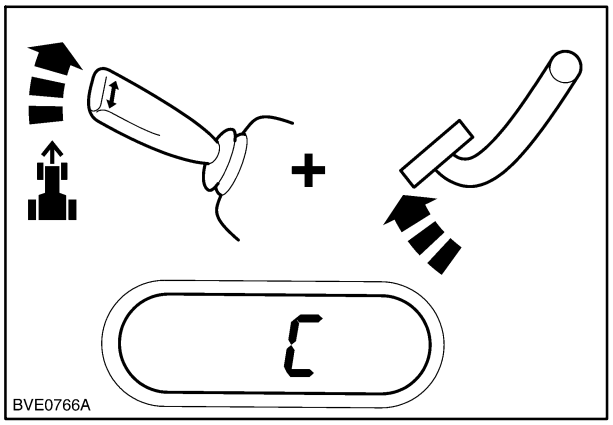
82

NOTE: *Make sure the parking brake is released. The tractor will move when testing these clutches.*

To adjust and/or test the quickfill setting, shift the shuttle lever to forward and release the clutch pedal.

Alternatively to test the quickfill setting, shuttle shift without using the clutch pedal.

The lower central display will display “C” while the pressure is increased in C2 to drive the input side of C3 and C4.



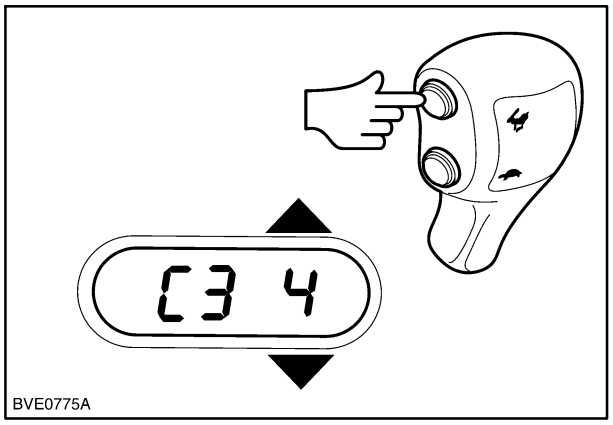
83

The lower central display will change to display the clutch and the current quickfill setting.

Use the “upshift” or “downshift” switch to adjust the quickfill setting within the range of 3 to 9 (30 to 90 ms).

For units with software level **prior** to 01.03.00.01, the required quickfill setting is to be within the range of 3 to 9 (30 to 90 ms).

For units with software level **from** 01.03.00.01, the required quickfill setting is to be within the range of 3 to 19 (30 to 190 ms).



84

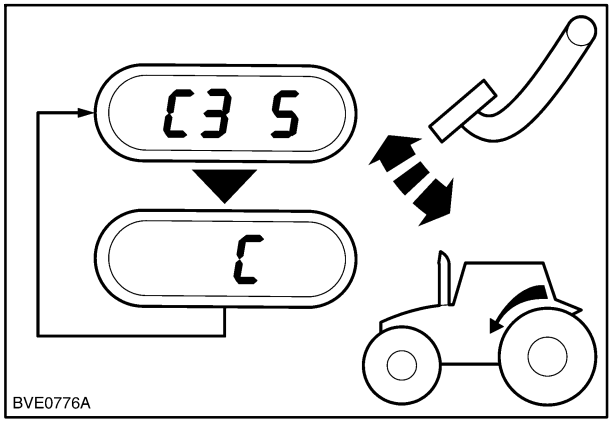
NOTE: *Do not fully depress the clutch pedal.*

To test the quickfill setting, engage the clutch by slightly depressing and releasing the clutch pedal.

C3 and C4 will be turned on for the quickfill time plus 0.1 seconds.

The display may change briefly to display “C”.

Decrease the quickfill setting until there is no tractor movement when C3 or C4 engages. Increase the quickfill setting until there is a noticeable tractor movement. Then reduce the setting by 2.



85

Channel 1 - Clutch Quickfill Time Adjustment (24x24 only)

Allows the amount of time to fill the clutch pack to be adjusted.

NOTE: *If a transmission fault code (four digit number prefixed with a 2) is displayed. The fault code must be corrected before the quickfill can be adjusted.*

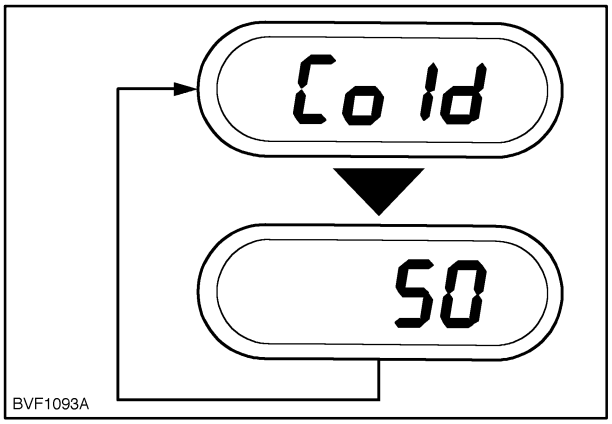
U-Code List:

U99 - There is a transmission error, check the dot matrix display.

Set-Up Procedure:

- Warm the driveline oil to at least 60°C.
- Park the tractor on a level surface and allow some space as the tractor will move during testing.
- With the diagnostic special tool installed, start the engine.

NOTE: *If the driveline oil temperature is below 60 °C, the display will alternate between "Cold" and the driveline oil temperature. Quickfill adjustment is not possible until the oil warms up.*

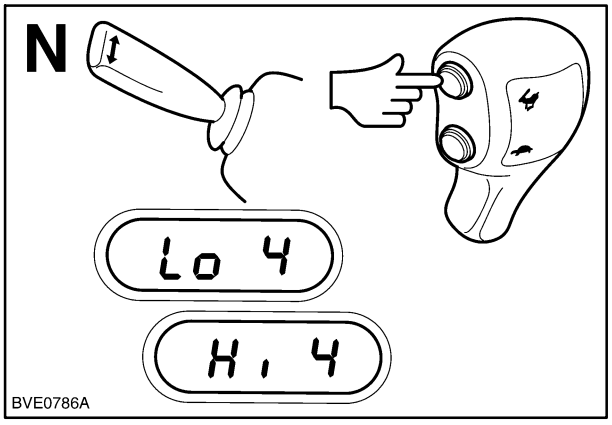


86

Hi or Lo Clutch Selection:

Shift the shuttle lever to neutral and select Lo or Hi by using the "upshift" or "downshift" switch.

The selected clutch and its quickfill setting will be displayed.



87

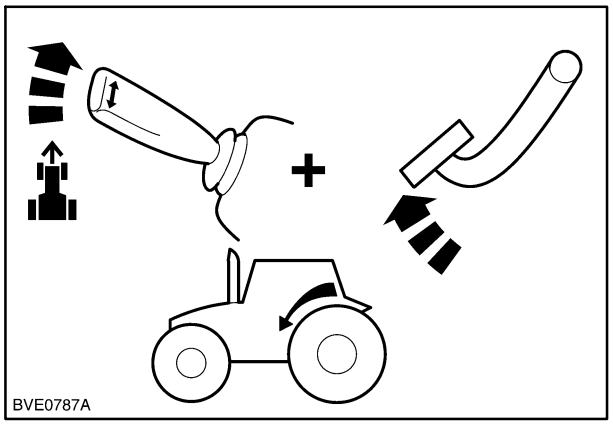
NOTE: *Make sure the parking brake is released. The tractor will move when testing these clutches.*

To test the quickfill setting, shift the shuttle lever to forward and **SLOWLY** release the clutch pedal.

Alternatively to test the quickfill setting, shuttle shift without using the clutch pedal.

Too much quickfill will cause a noticeable tractor movement.

Too little quickfill will cause a slow response.

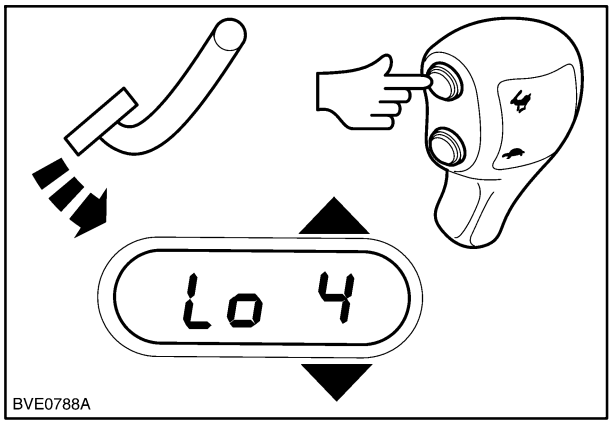


88

To adjust the quickfill setting, depress the clutch pedal and use the “upshift” or “downshift” switch to adjust the quickfill setting within the range of 3 to 9 (30 to 90 ms).

For units with software level **prior** to 01.03.00.01, the required quickfill setting is to be within the range of 3 to 9 (30 to 90 ms).

For units with software level **from** 01.03.00.01, the required quickfill setting is to be within the range of 3 to 19 (30 to 190 ms).



89

Channel 2 - Sharp Shuttle Option (16x16 only)

This channel is used to allow shuttle shifting without feathering the clutches.

Scroll through the available options using the “h” or “m” key.

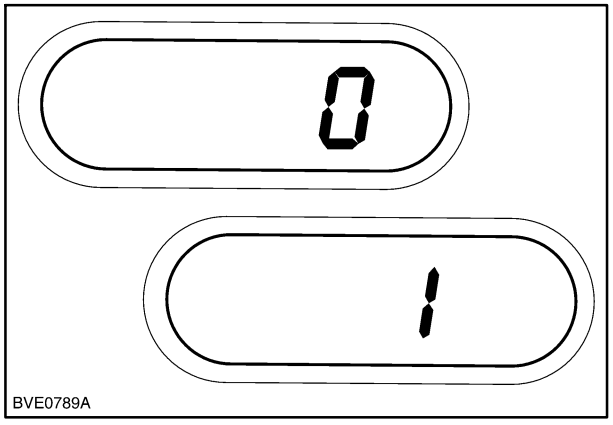
The options available are:

0 - Sharp shuttle OFF

1 - Sharp shuttle ON

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



90

Channel 3 - Set Fly-Shift Speed Threshold (24x24 only)

This channel is used to allow Hi / Lo clutch changes (fly-shifting) without feathering the clutches.

Scroll through the available options using the “h” or “m” key.

Fly-shifting will occur above the following available options (Km/h):

1

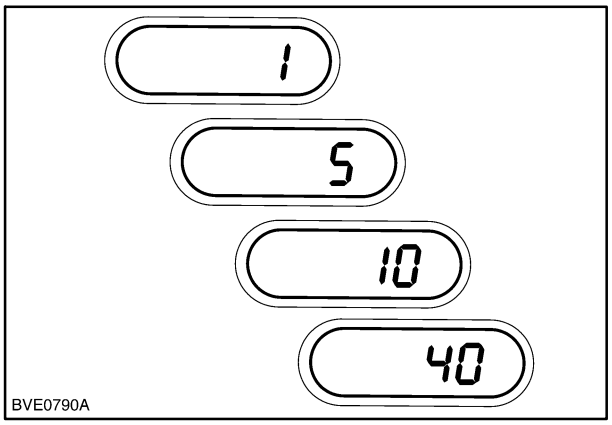
5

10

40 - Disables fly-shift engagement

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



91

Channel 4 - Driver selectable shuttle modes (16x16 vehicles only)

Scroll through the available options using the “h” or “m” key.

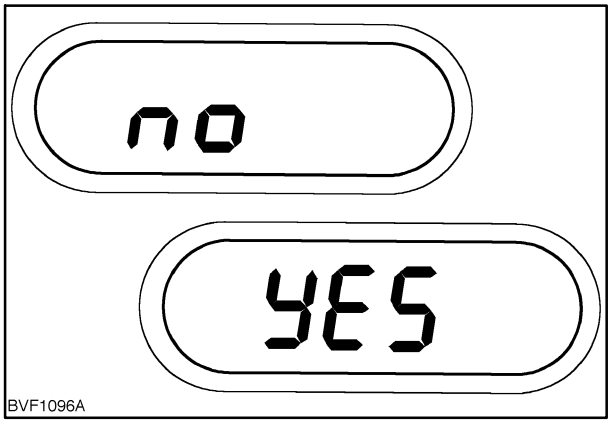
The options available are:

NO - Memory shuttle not selected

YES - Memory shuttle is selected

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



92

Channel 5 - 40 Km/h Maximum Speed Restriction (50 Km/h vehicles only)

Scroll through the available options using the “h” or “m” key.

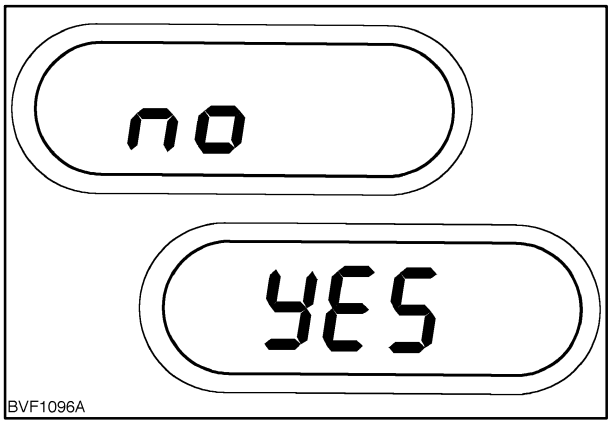
The options available are:

NO - 40 Km/h restriction OFF

YES - 40 Km/h restriction ON

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



93

Channel 6 - Creeper Enabled/Disabled Mode

Scroll through the available options using the “h” or “m” key.

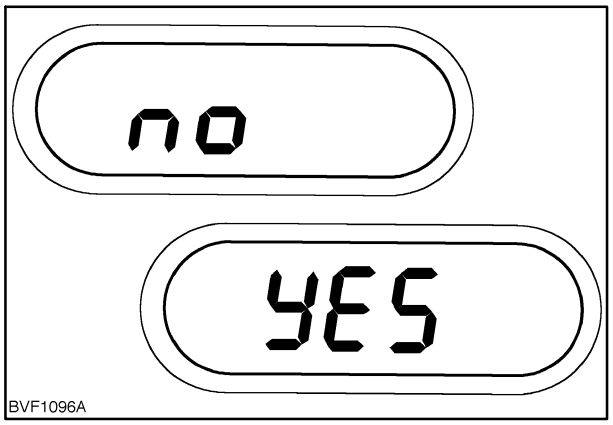
The options available are:

NO - Creeper Disabled

YES - Creeper Enabled

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



94

Channel 7 - 1-4/5-8 Synchro to Neutral

Scroll through the available options using the “h” or “m” key.

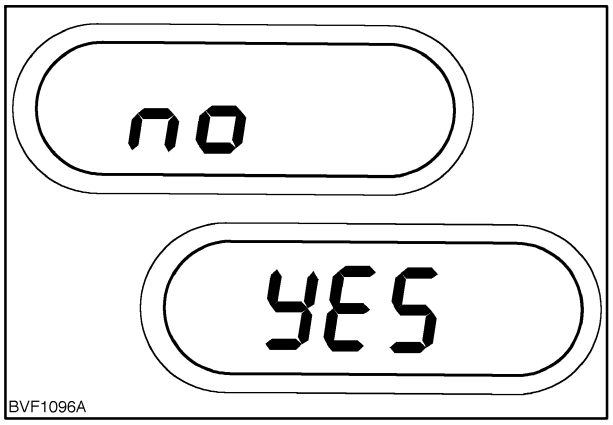
The options available are:

NO - Default setting

YES - 1-4/5-8 synchro shifts to neutral when clutch fully depressed when travelling at less than 3km/h

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

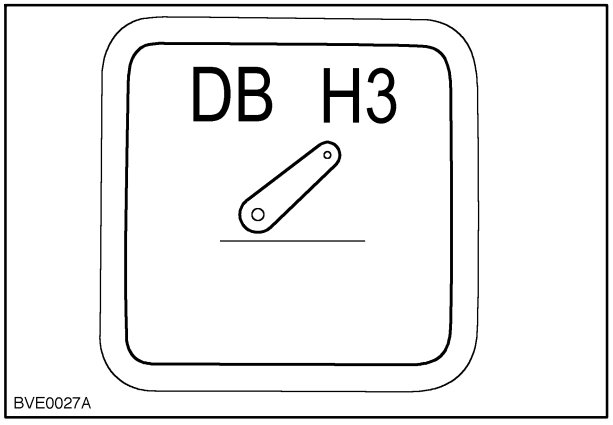
Depress the “dimming” key to continue navigating through the “HH” menus.



95

Electronic Draft Control Options

Select the Electronic Draft Control sub-system by depressing the dimming key.

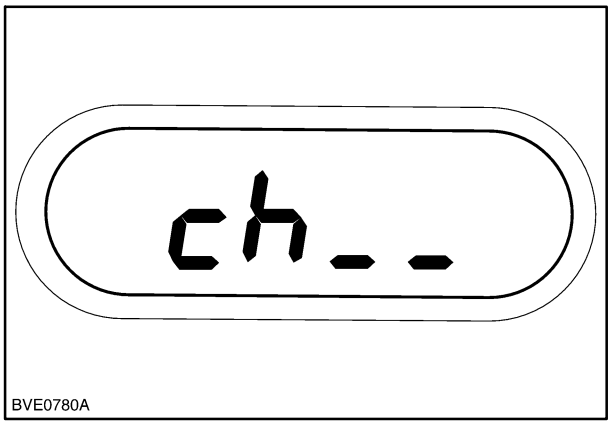


96

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



97

Channel	Description
Ch 1	Diameter of the external hydraulic lift rams
Ch 2	Enable / Disable Electronic Draft Control
Ch 3	Enable / Disable Slip Control

Channel 1 - Diameter Of The External Hydraulic Lift Rams

Scroll through the available options using the “h” or “m” key.

The options available are in (mm):

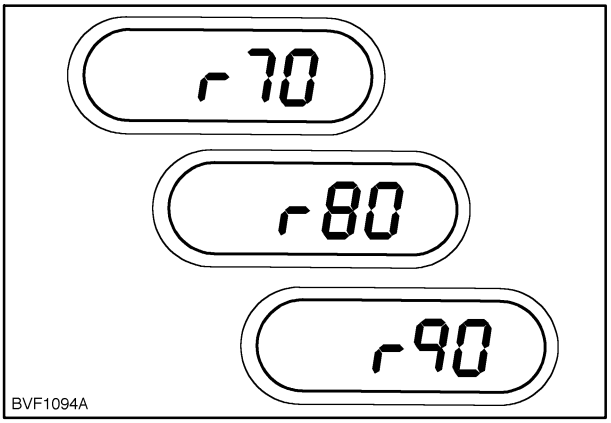
70

80

90

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



98

Channel 2 - Enable / Disable Electronic Draft Control

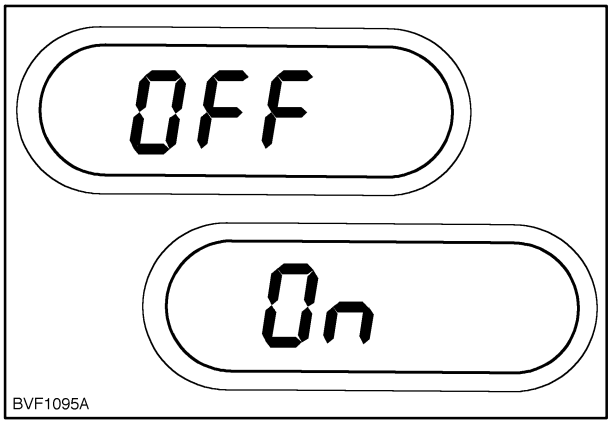
Scroll through the available options using the “h” or “m” key.

OFF – Disable Electronic Draft Control

On – Enable Electronic Draft Control

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



99

Channel 3 - Enable / Disable Slip Control

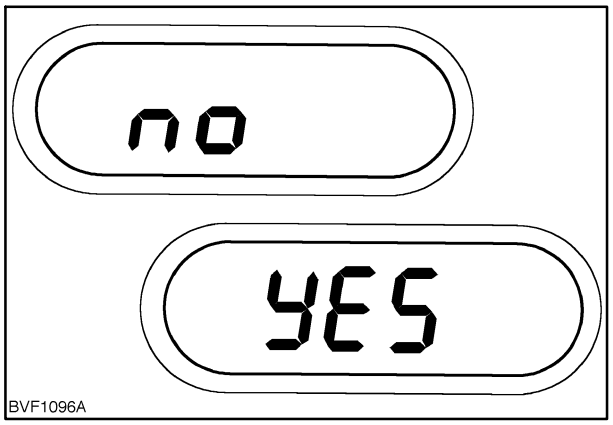
Scroll through the available options using the “h” or “m” key.

NO - Slip Control is disabled

YES - Slip Control is enabled

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

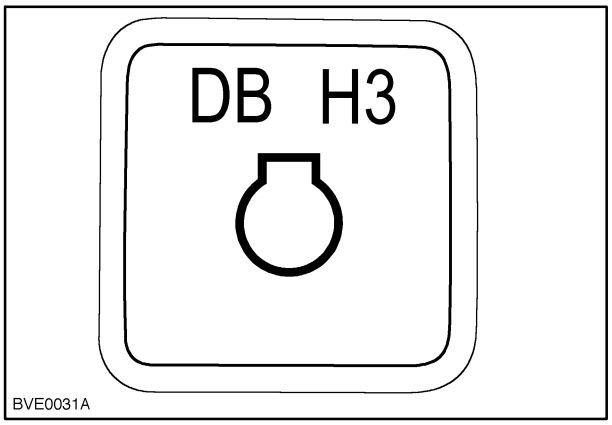
Depress the “dimming” key to continue navigating through the “HH” menus.



100

Electronic Engine Options

Select the electronic engine sub-system by depressing the “dimming” key.

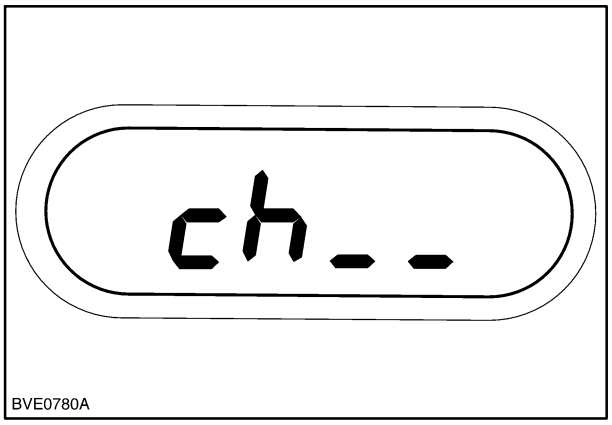


101

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of the channel).



102

Channel	Description
Ch 1	PTO dynamometer test with maximum power boost

Channel 1 - PTO Dynamometer Test With Maximum Powerboost

This channel is used to allow the tractor to be dynamometer tested with maximum powerboost.

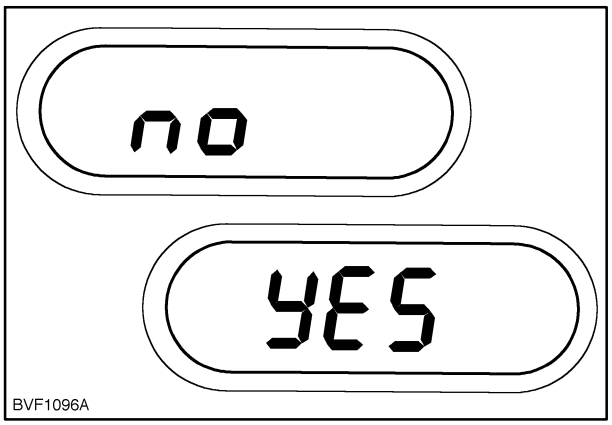
NOTE: *The powerboost is only active for 45 minutes.*

Scroll through the available options using the “h” or “m” key.

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard and the power boost symbol illuminated to confirm the selection.

Start the engine to perform the PTO dynamometer test.

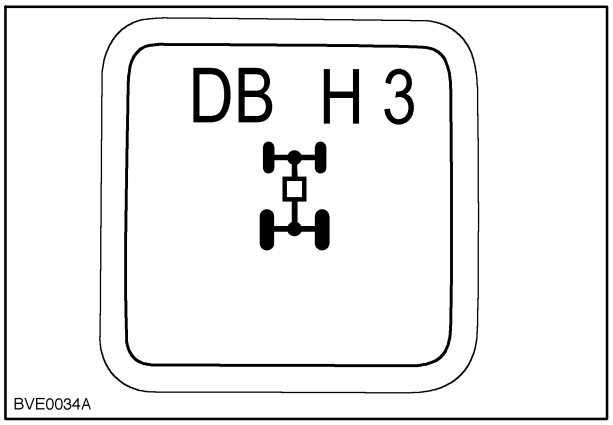
Depress the “dimming” key to continue navigating through the “HH” menus.



103

Four Wheel Drive Options

Select the four wheel drive sub-system by depressing the “dimming” key.

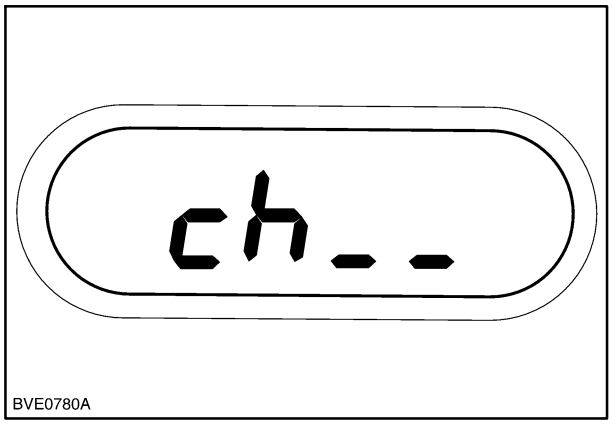


104

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



105

Channel	Description
Ch 1	Axle type
Ch 2	Four wheel braking engagement speed selection (24x24 only)
Ch 3	Four wheel drive and differential lock disengagement in relation to steering angle and speed

Channel 1 - Axle Type

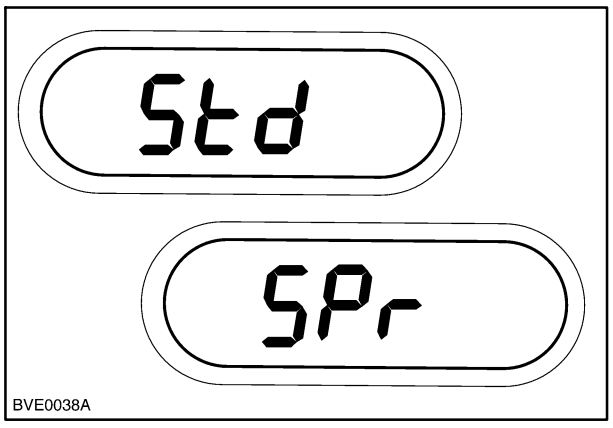
Scroll through the available options using the “h” or “m” key.

Std - Standard front axle

Spr - SuperSteer front axle

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



106

Channel 2 - Four Wheel Braking Engagement Speed Selection (24x24 only)

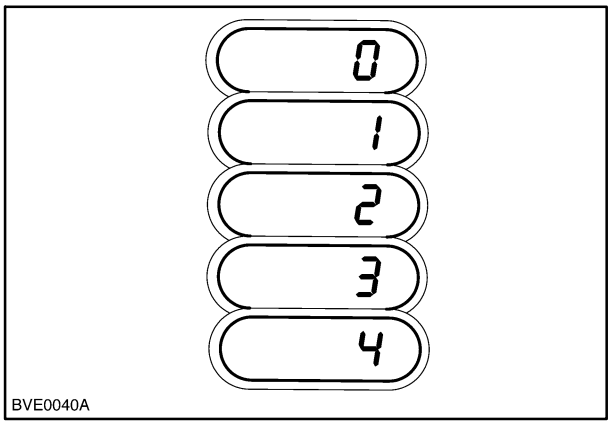
The options correspond to the ground speed, below which four wheel braking will not occur.

Scroll through the available options using the “h” or “m” key.

Refer to the table below for the available options.

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



107

	Option 0	Option 1	Option 2	Option 3	Option 4
Four wheel braking engagement, if wheel speed is greater than or equal to:	**Default** 6 Km/h	4.8 Km/h	3.2 Km/h	1.6 Km/h	0 Km/h

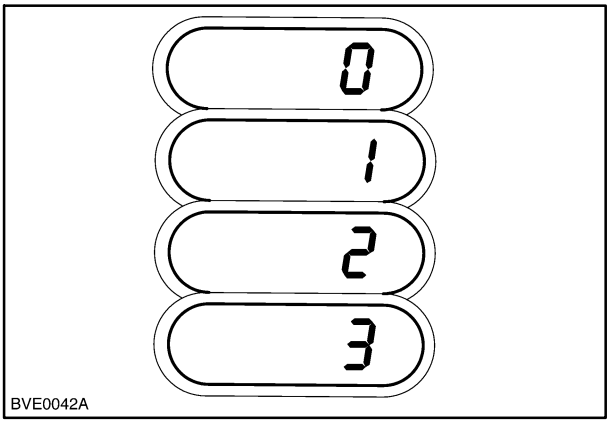
Channel 3 - Four Wheel Drive and Differential Lock Disengagement in relation to Steering Angle and Speed

Scroll through the available options using the “h” or “m” key.

Refer to the Standard or SuperSteer axle table for the available options.

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



108

Standard Axle

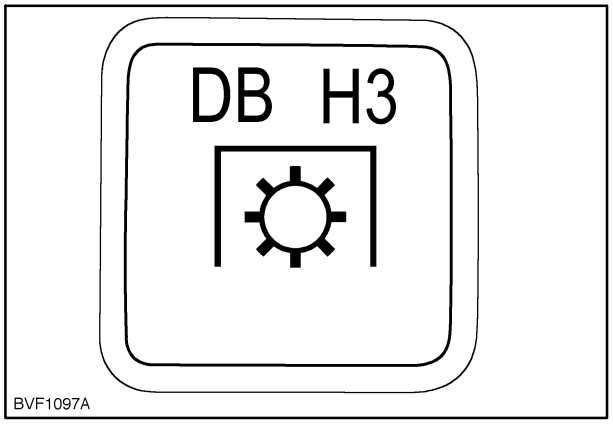
	0-10 Km/h	0-10 Km/h	0-10 Km/h	0-10 Km/h	10-15 Km/h	10-15 Km/h	10-20 Km/h	10-20 Km/h
	Auto Four Wheel Drive	Auto Four Wheel Drive	Auto Difflock	Auto Difflock	Auto Difflock	Auto Difflock	Auto Four Wheel Drive	Auto Four Wheel Drive
	Degrees Right	Degrees Left	Degrees Right	Degrees Left	Degrees Right	Degrees Left	Degrees Right	Degrees Left
Option 0	25	21.25	15	13.5	5	4.5	20	17.5
Option 1	40	32.5	15	13.5	5	4.5	35	29
Option 2	15	13.5	10	9.25	5	4.5	10	9.25
Option 3	10	9.25	5	4.5	5	4.5	10	9.25

SuperSteer Axle

	0-10 Km/h	0-10 Km/h	0-10 Km/h	0-10 Km/h	10-15 Km/h	10-15 Km/h	10-20 Km/h	10-20 Km/h
	Auto Four Wheel Drive	Auto Four Wheel Drive	Auto Difflock	Auto Difflock	Auto Difflock	Auto Difflock	Auto Four Wheel Drive	Auto Four Wheel Drive
	Degrees Right	Degrees Left	Degrees Right	Degrees Left	Degrees Right	Degrees Left	Degrees Right	Degrees Left
Option 0	16	13.4	9	7.7	2	1.6	12.5	10.5
Option 1	26.5	20.25	9	7.7	2	1.6	23	18
Option 2	9	7.75	5.5	4.75	2	1.6	5.5	4.75
Option 3	5.5	4.75	2	2.6	2	1.6	5.5	4.75

Rear PTO Options

Select the PTO sub-system by depressing the "dimming" key.

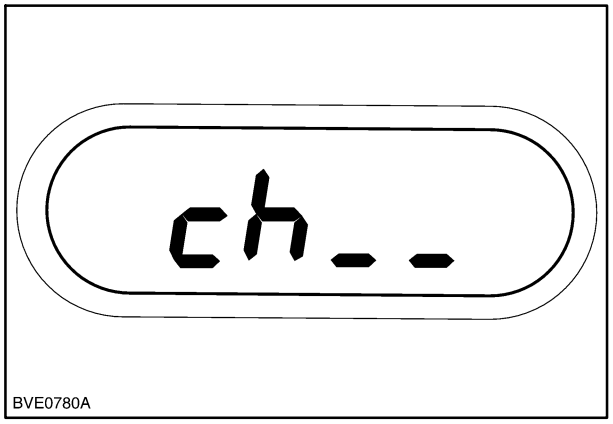


109

The lower central display will display "ch _ _".

The required channel can be selected by using the "h" and "m" keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



110

Channel	Description
Ch 1	PTO management selection
Ch 2	PTO fender switches selection
Ch 3	PTO clutch calibration adjustment
Ch 4	PTO quickfill time adjustment

Channel 1 - PTO Management Selection

This channel is used to disable/enable the PTO management for the PTO control system.

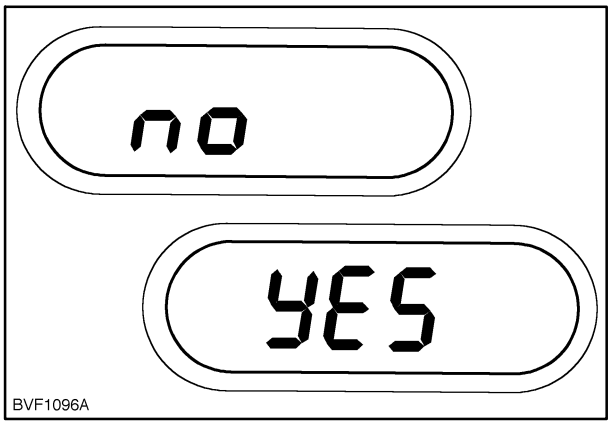
Scroll through the available options using the “h” or “m” key.

No – Disable PTO management

Yes – Enable PTO management

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



111

Channel 2 - PTO Fender Switches Selection

This channel is used to disable/enable the PTO fender switches.

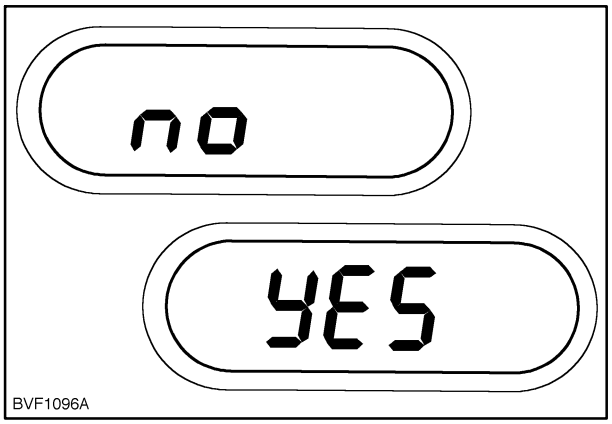
Scroll through the available options using the “h” or “m” key.

No – Disable PTO fender switches

Yes – Enable PTO fender switches

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



112

Channel 3 - PTO Clutch Calibration Adjustment

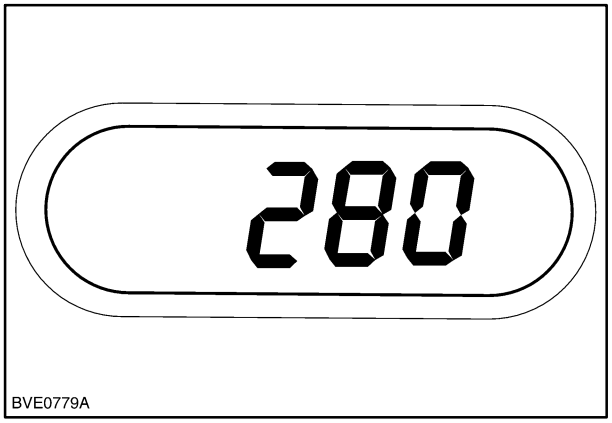
This channel is used to manually adjust the calibration value to optimize the PTO engagement.

The lower central display will change to display the current clutch calibration setting.

Use the “h” or “m” key to increase or decrease the calibration setting.

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



113

Channel 4 - PTO Clutch Quickfill Time Adjustment

Allows the amount of time to fill the clutch pack to be adjusted.

Too much quickfill will cause a noticeable clutch engagement noise.

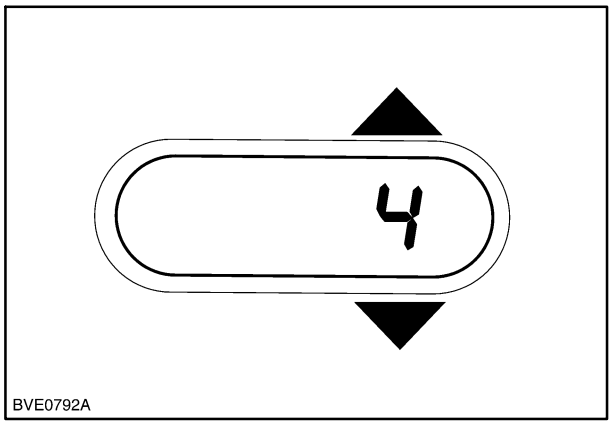
Too little quickfill will cause a slow response.

The lower central display will change to display the clutch and the current quickfill setting.

Use the “h” or “m” key to adjust the quickfill setting within the range of 3 to 9 (30 to 90 ms).

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.

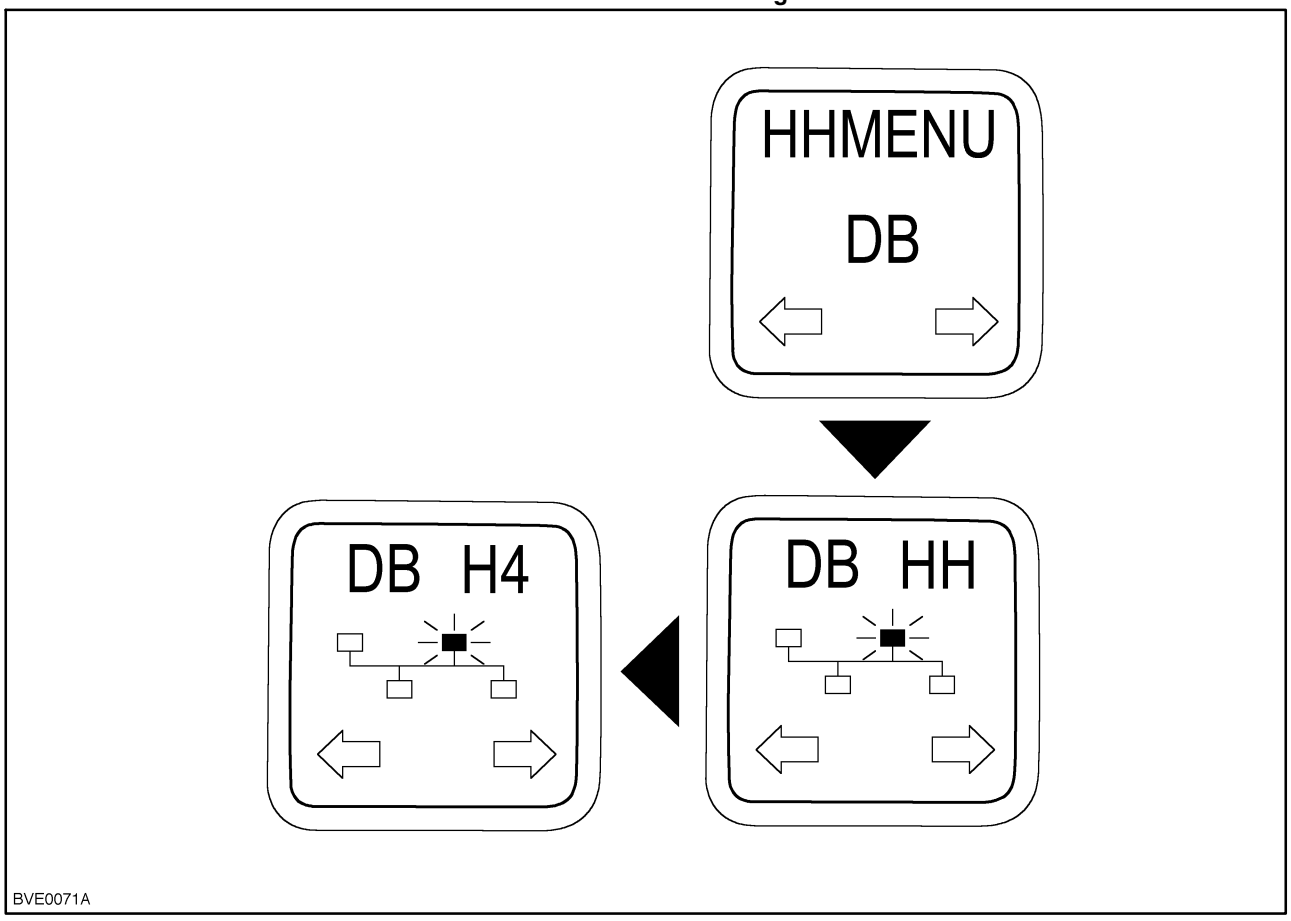


114

H4 - View Software Revision Level

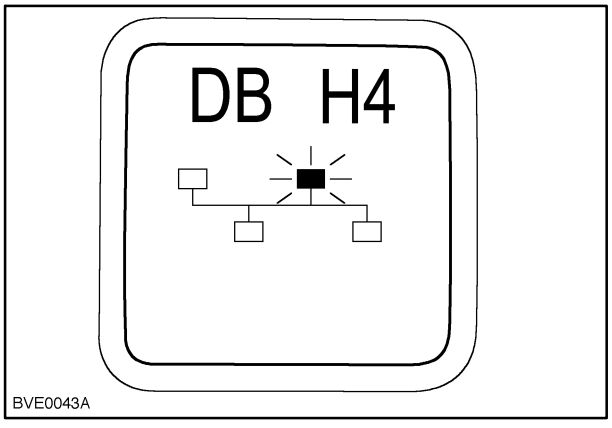
Common to all sub-systems.

H4 Menu Screen Select Diagram



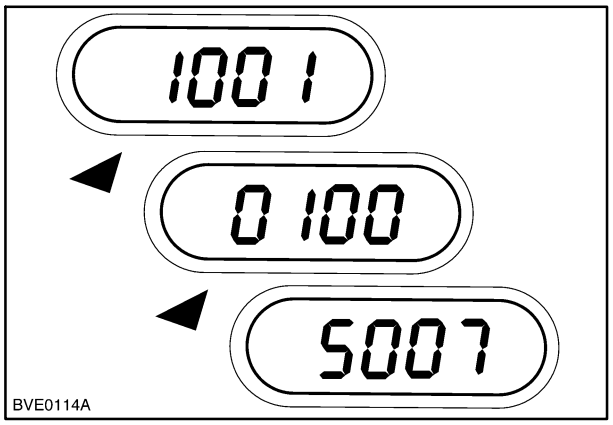
115

Select the H4 menu by depressing the “dimming” key.



116

The lower central display will automatically cycle through the software release, as the example shown and return to allow navigation of the “HH” menus.

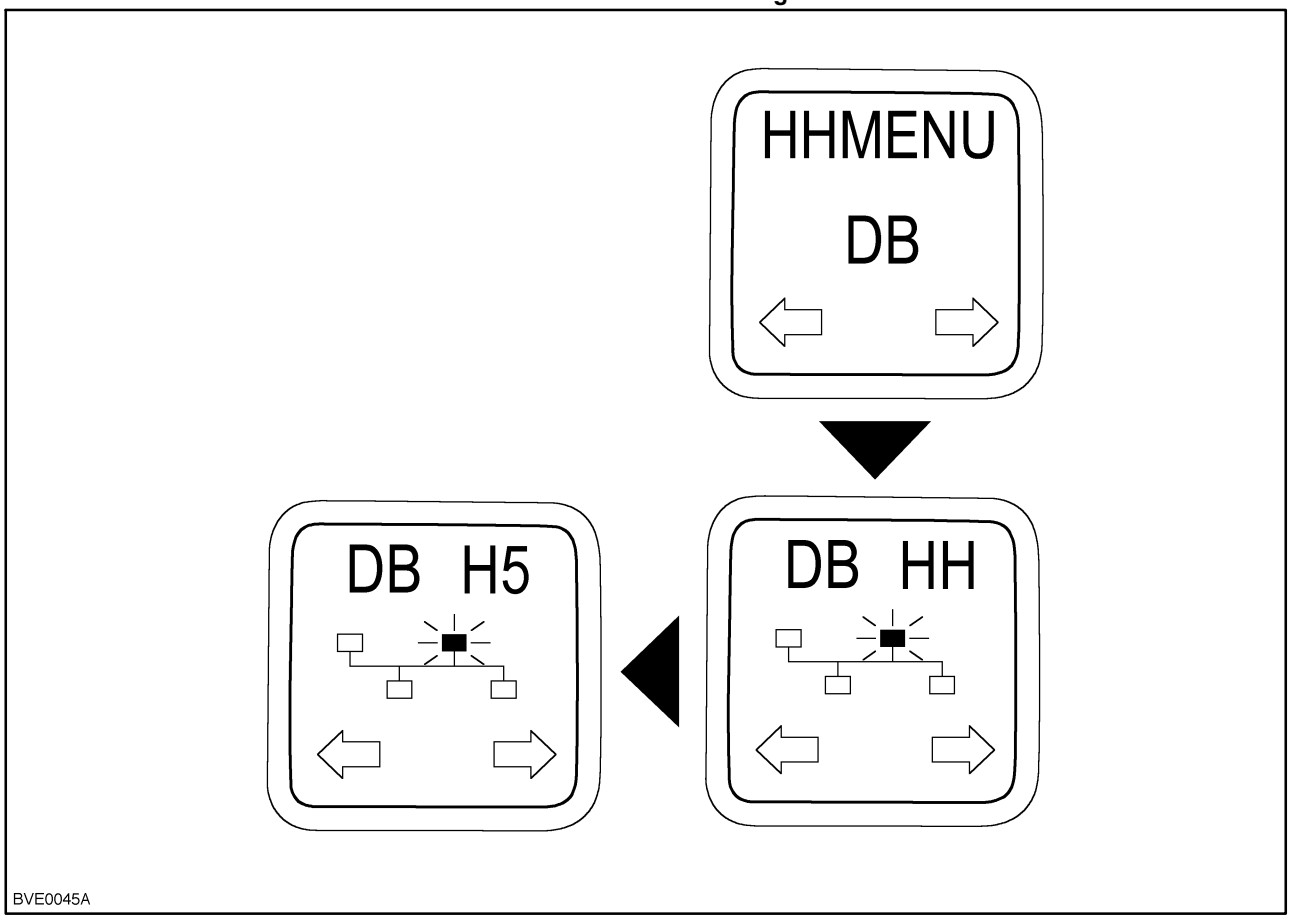


117

H5 - Switch Operation Test

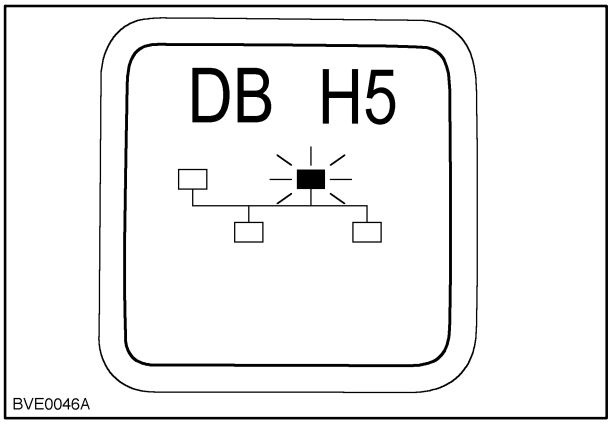
This menu displays a designated code when a switch transition is detected.
Common to all sub-systems.

H5 Menu Screen Select Diagram



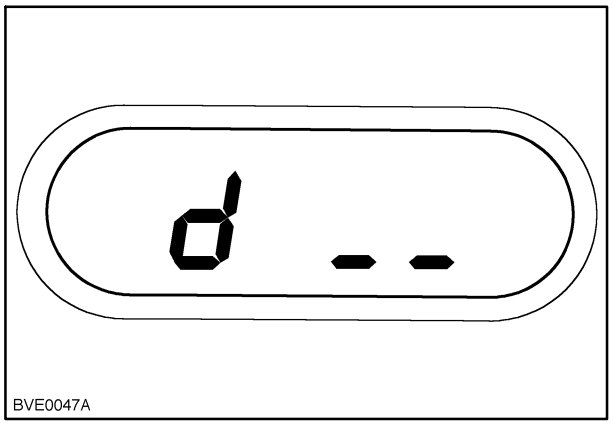
118

Select the H5 menu by depressing the “dimming” key.



119

The lower central display will display “d _ _”.

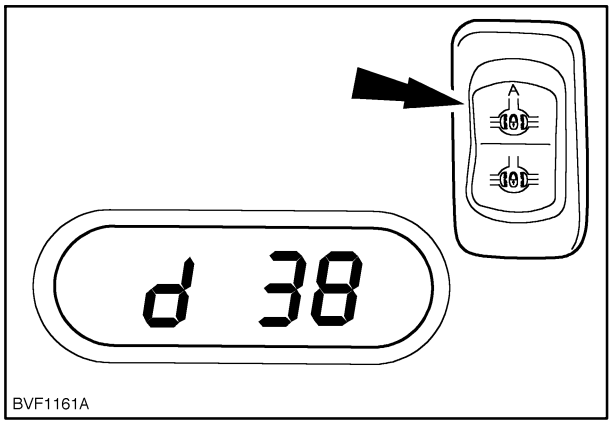


120

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.

If a switch code is not displayed and the audible tone not heard, a ’wiggle’ test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.

NOTE: *If the keystart switch is turned to the “crank” position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*



121

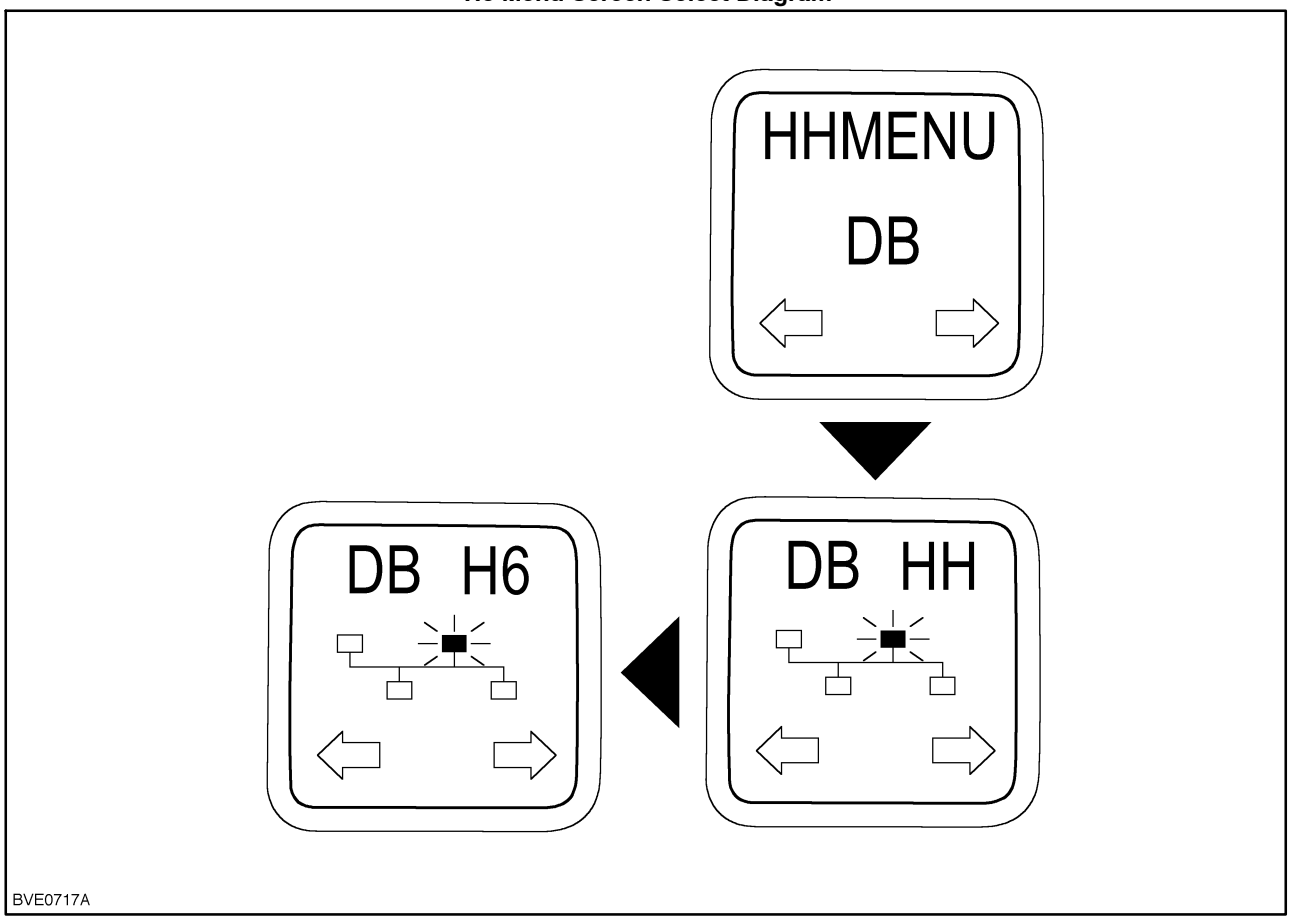
Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d0	No switch or two switches activated at the same time			-
d1	C101	30	External fender EDC switch - lower	-
d2	C101	29	External fender EDC switch - raise	-
d3	C101	18	Internal raise / work switch - work	-
d4	C101	20	Internal raise / work switch - raise	-
d5	C127	6	Internal raise / work fault switch	-
d9	C101	11	Fuse 12 sense	-
d10	C127	16	Seat switch	-
d11	C127	19	Handbrake switch	-
d12	C127	10	Left foot brake switch	-
d13	C127	11	Right foot brake switch	-
d14	C100	8	Clutch pedal switch	Shuttle lever - forward Depress the pedal fully and pause for a minimum of 1 second. Release the pedal slowly from down to up for a minimum of 2 seconds

Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d15	C101	12	Shuttle lever switch – forward	Clutch pedal depressed
d16	C101	13	Shuttle lever switch – reverse	Clutch pedal depressed
d17	C101	23	Transmission downshift switch	–
d18	C101	22	Transmission upshift switch	–
d19	C127	23	Transmission range switch	–
d22			Transmission dump switch	–
d23	C101	26	24x24 Transmission downshift switch	–
d24	C101	27	24x24 Transmission upshift switch	–
d25	C101	27	Shuttle Lever switch – neutral	–
d26	C101	26	16x16 Transmission high range switch 24x24 Transmission 1/2 and 3/4 neutral switch	–
d27	C101	19	16x16 Transmission low range switch 24x24 Transmission high/medium range switch	–
d30	C127	14	Transmission auto ON / increase switch	–
d31	C128	32	Transmission auto OFF / decrease switch	–
d34	C127	8	Creeper switch	–
d35	C127	26	Creeper selector fork switch – disengaged	–
d36	C127	9	Creeper selector fork switch – engaged	–
d38	C128	30	Differential lock switch – automatic	–
d39	C128	31	Differential lock switch – manual	–
d41	C127	25	Four wheel drive switch – manual	–
d42	C127	24	Four wheel drive switch – automatic	–
d44	C127	12	Rear PTO switch – normally open	–
d45	C127	13	Rear PTO switch – normally closed	–
d46	C128	23	External rear PTO switches	–
d47	C128	24	Rear PTO brake switch	–
d48	C128	33	Rear PTO ground speed switch	–
d49	C128	23	Rear PTO switch – automatic	–
d50	C127	15	Headland Turn Sequence (HTS) switch – program mode	–
d51	C127	21	HTS switch – On mode	–
d52	C127	20	HTS / CRPM sequence switch	–
d55	C127	5	Engine speed switch – decrease	–
d56	C127	4	Engine speed switch – increase	–
d57	C128	11	CRPM selection switch	–

Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d59	C127	17	Hand throttle not at idle switch	-
d60		VIA CAN	Foot throttle not at idle switch	-
d61	C100	8	+12VD Supply	Shuttle lever - Forward or Reverse and depress clutch pedal
d63	C128	2	Rear PTO fender switch - normally closed	-
d64	C128	4	Rear PTO fender switch - normally open	-

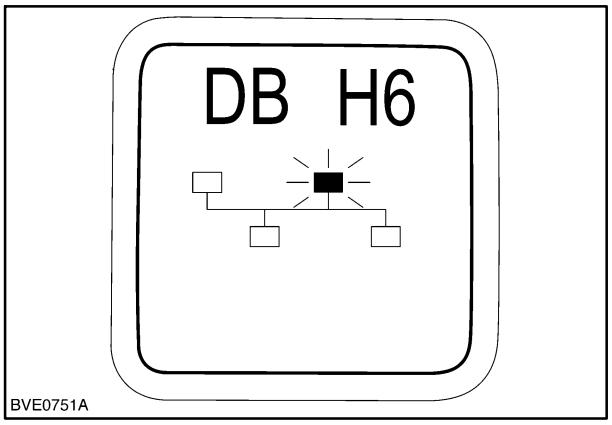
H6 - Vehicle Information View

H6 Menu Screen Select Diagram



122

Select the H6 menu by depressing the “dimming” key.



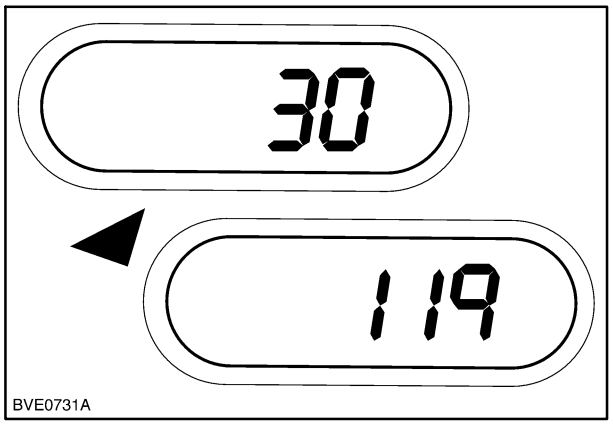
123

The lower central display will automatically cycle through as the example:

30 . . . . . Transmission (Km/h)

119 . . . . . Horse power (Hp)

and return to allow navigation of the “HH” menus.

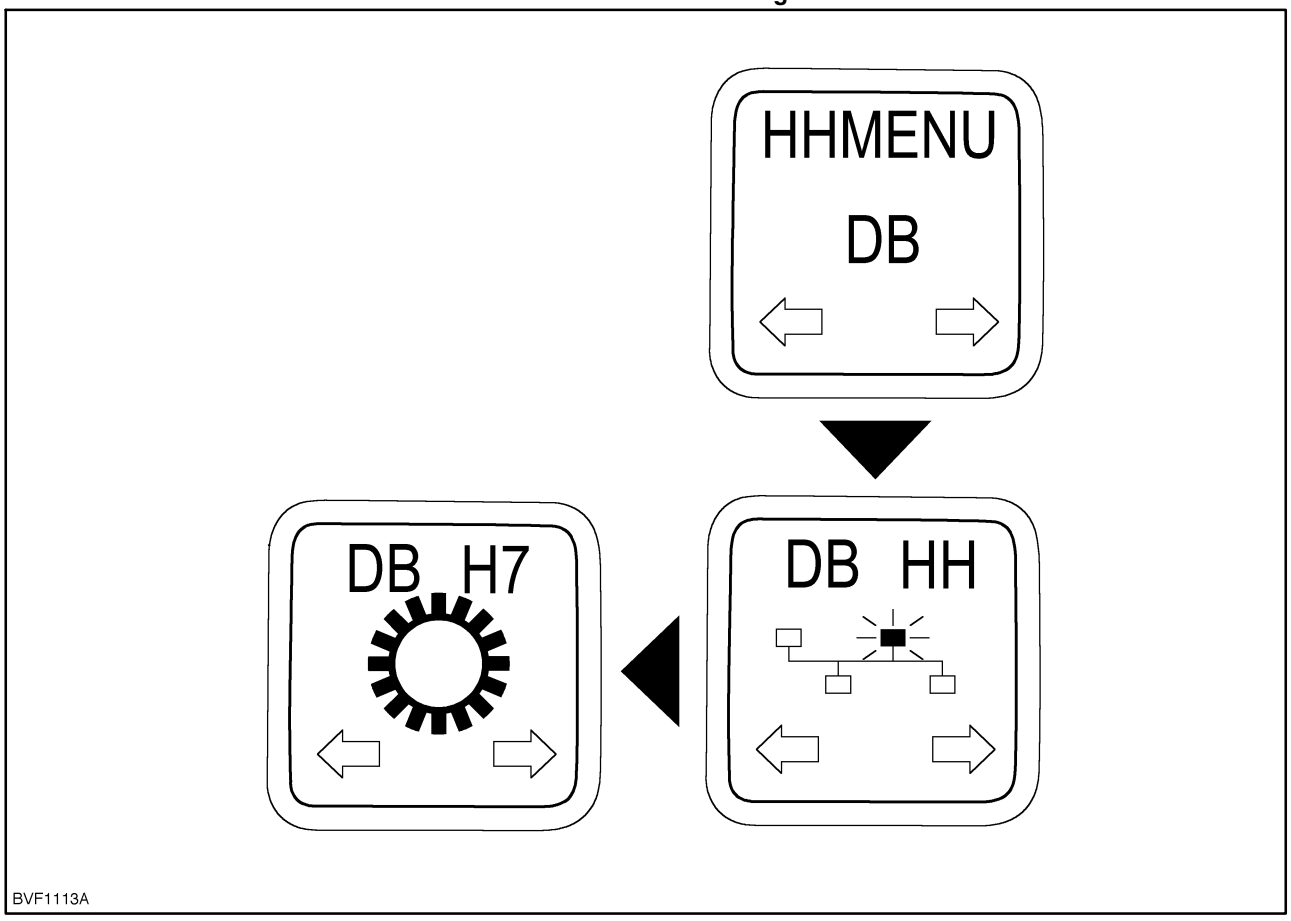


124

H7 -Test Modes

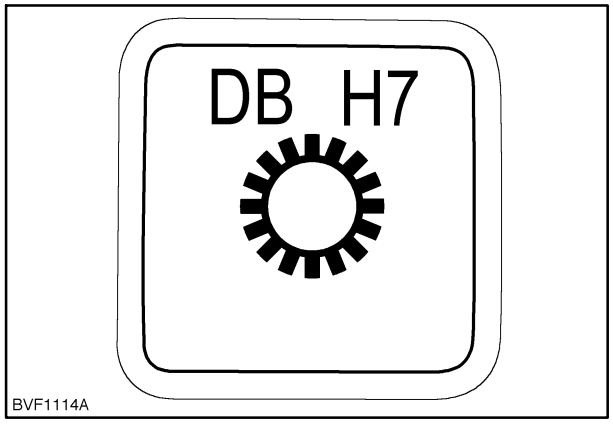
This menu is used to check the clutch disconnect switch adjustment and to test the transmission synchronisers.

H7 Menu Screen Select Diagram



125

Select the H7 menu by depressing the “dimming” key.

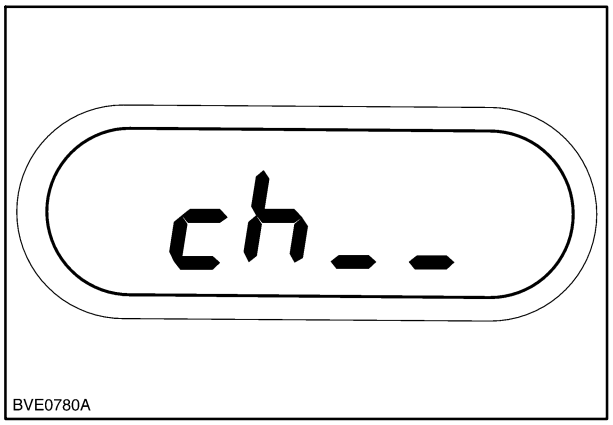


126

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



127

Channel	Description
Ch 1	Clutch disconnect switch test
Ch 2	Forward / reverse synchroniser test
Ch 3	1-4 / 5-8 range synchroniser test (16x16 only)

Channel 1 - Clutch Disconnect Switch Test

This channel is used to check the switch is adjusted correctly.

Shift the shuttle lever to forward or reverse.

NOTE: *An audible click will be heard when the clutch pedal makes contact with the switch.*

Operate the clutch pedal at a steady rate, fully depressing and releasing.

When the pedal is fully depressed, a figure should be displayed, between 2000 and 2500.

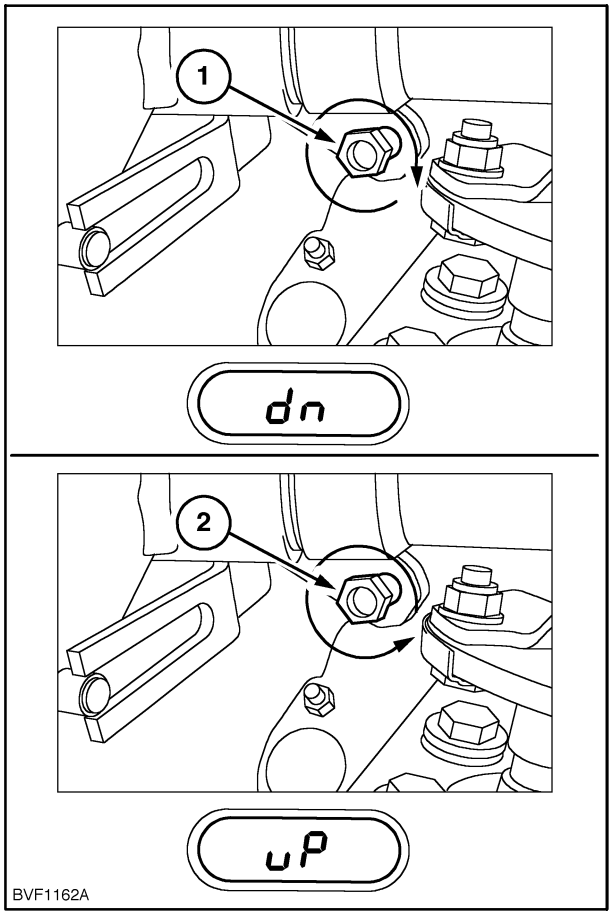
When the pedal has been fully released, a figure should be displayed, between 3500 and 4000.

The lower central display will indicate that one of the following adjustments may be required:

dn - Adjust the adjustment bolt (1) clockwise

uP - Adjust the adjustment bolt (2) counter clockwise

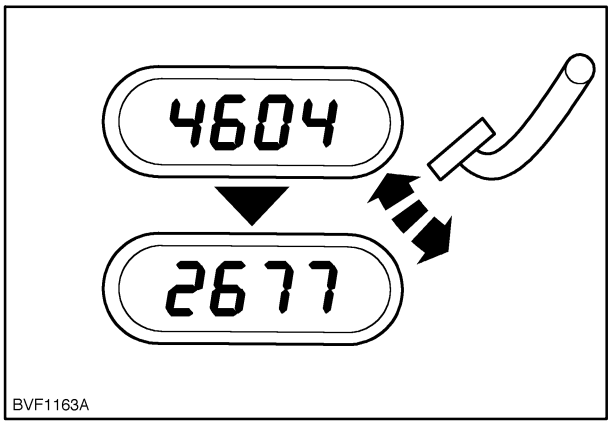
Adjust the adjustment bolt in the required direction and fully depress and release the pedal again.



128

If the switch is adjusted correctly the lower central display will display two different numerical values and “dn” or “uP” will no longer be displayed.

Cycle the clutch pedal a few times more to confirm the adjustment is correct.



129

Channel 2 – Forward / Reverse Synchroniser Test

NOTE: *When depressing the upshift or downshift switch, the display of gears will still indicate a change of gear. When the maximum gear available within the range is reached an audible tone will be heard. This will have no effect during this test.*

This channel is used to check the operation of the synchroniser.

This channel can also be used when pressure testing the synchroniser actuating circuit.

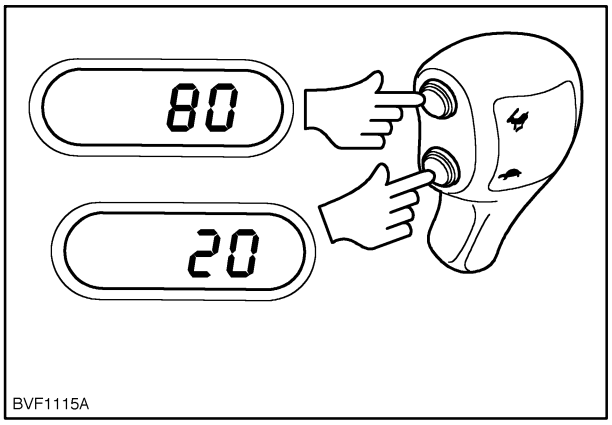
The engine must be running with the transmission in neutral and the clutch pedal released.

NOTE: *Depressing and holding the upshift or downshift switch will maintain full pressure in the synchroniser actuating circuit for pressure testing.*

Depress either the upshift or downshift switch to display the position of the potentiometer movement.

Forward – upshift switch (value approximately 80)

Reverse – downshift switch (value approximately 20)



130

Channel 3 - 1-4 / 5-8 Range Synchroniser Test (16x16 only)

NOTE: *When depressing the upshift or downshift switch, the display of gears will still indicate a change of gear. When the maximum gear available within the range is reached an audible tone will be heard. This will have no effect during this test.*

This channel is used to check the operation of the synchroniser.

This channel can also be used when pressure testing the synchroniser actuating circuit.

The engine must be running with the transmission in neutral and the clutch pedal released.

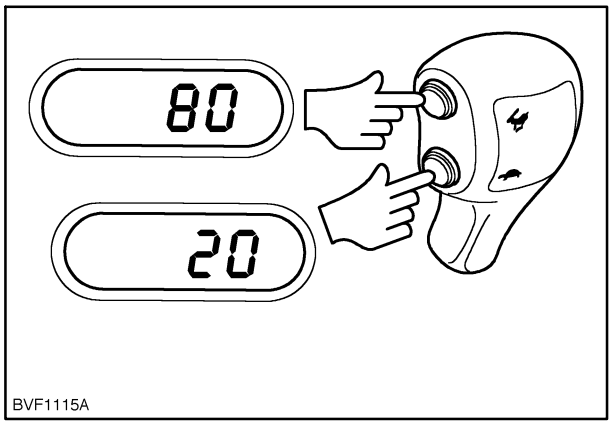
NOTE: *Depressing and holding the upshift or downshift switch will maintain full pressure in the synchroniser actuating circuit for pressure testing.*

Depress either the upshift or downshift switch to display the position of the potentiometer movement.

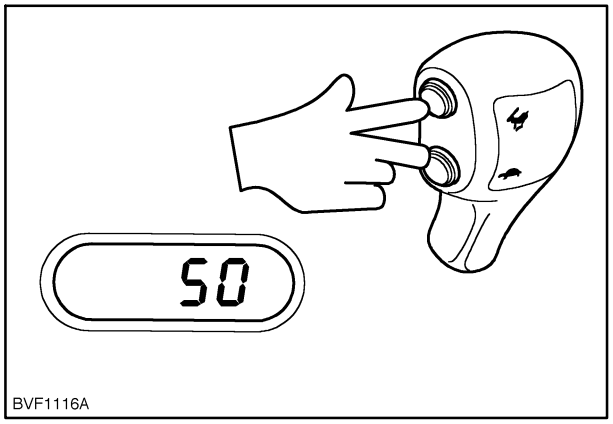
1-4 to 5-8 range - upshift switch (value approximately 80)

5-8 to 1-4 range - downshift switch (value approximately 20)

Neutral - depress both upshift and downshift switches together (value approximately 50)



131



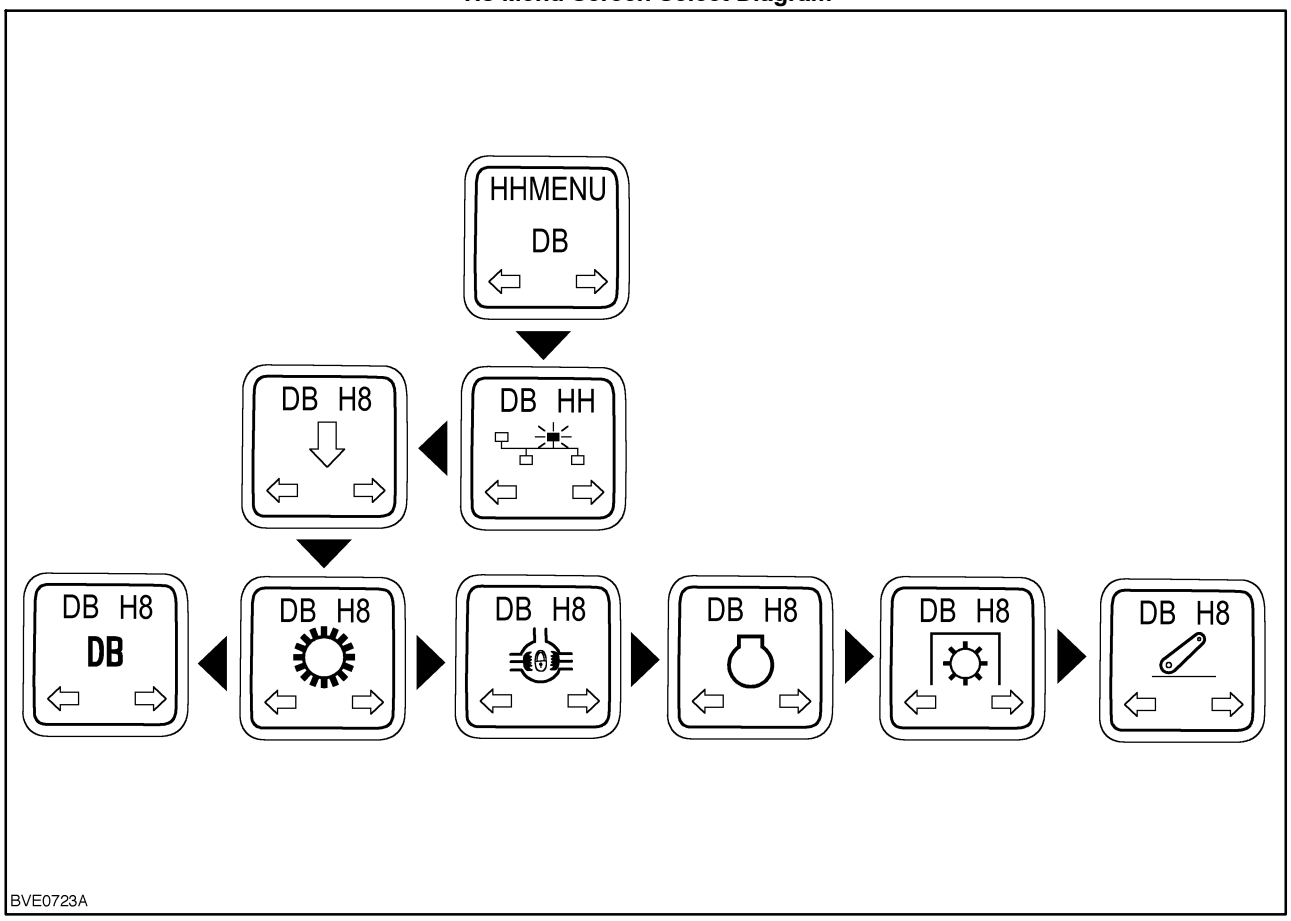
132

H8 - Clear Electrical Erasable Programmable Read Only Memory (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default.

EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

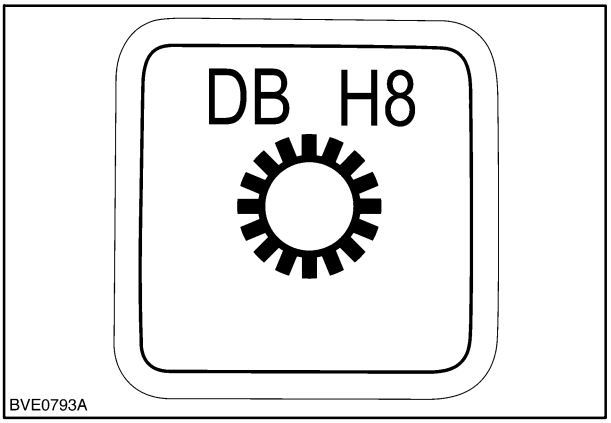
H8 Menu Screen Select Diagram



133

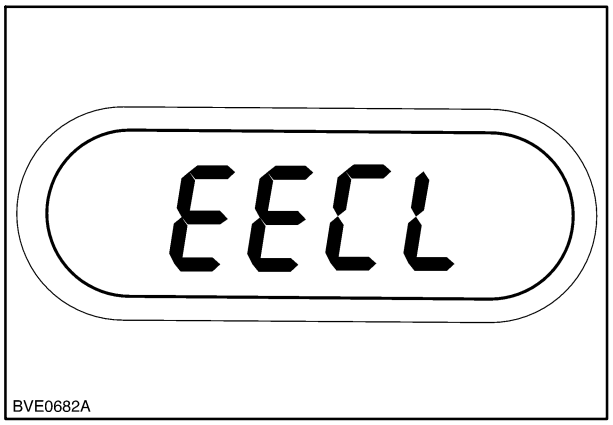
IMPORTANT: *By selecting the screen display with the controller identifier "DB" displayed will reset the EEPROM in all the sub-systems*.

If only a specific sub-system EEPROM requires to be reset, select the sub-system that requires the EEPROM to be reset by depressing the "dimming" key, as the example shown.



134

The lower central display will display “EECL” .



135

⚠ CAUTION ⚠

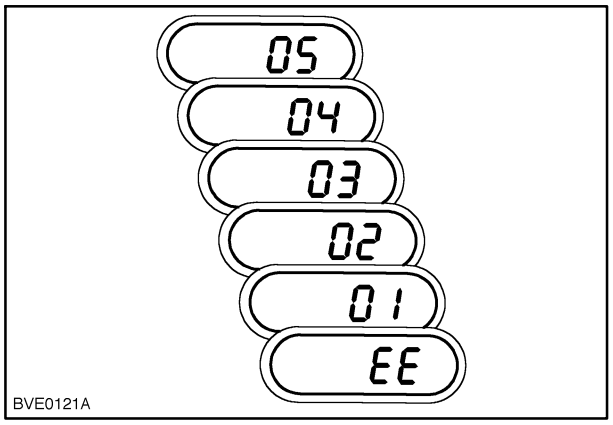
H8 will clear all calibrations values and stored error codes.

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the resetting of the EEPROM.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the EEPROM has been cleared.

Turn the keystart OFF.



136

H9 - Voltmeter

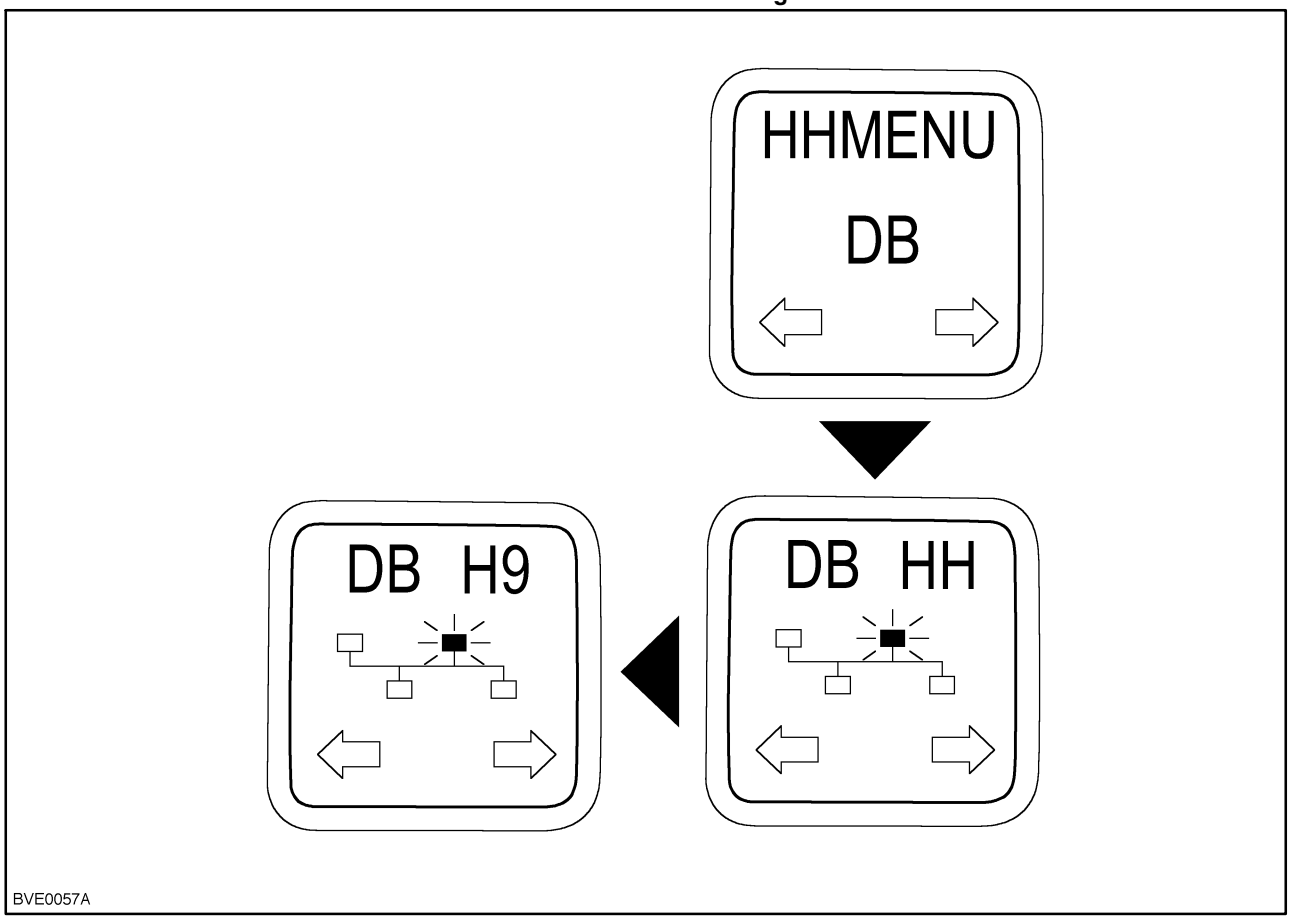
This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits.

If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

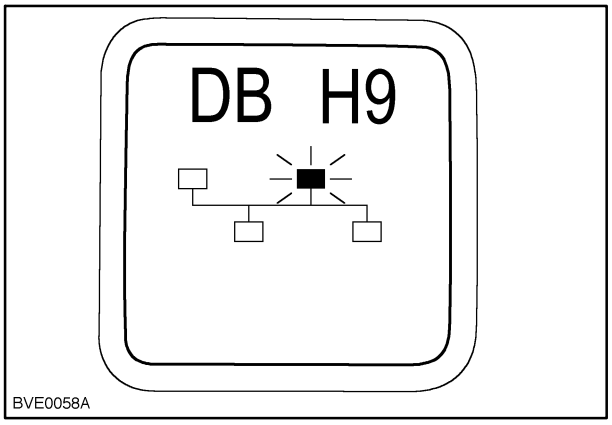
Common to all sub-systems.

H9 Menu Screen Select Diagram



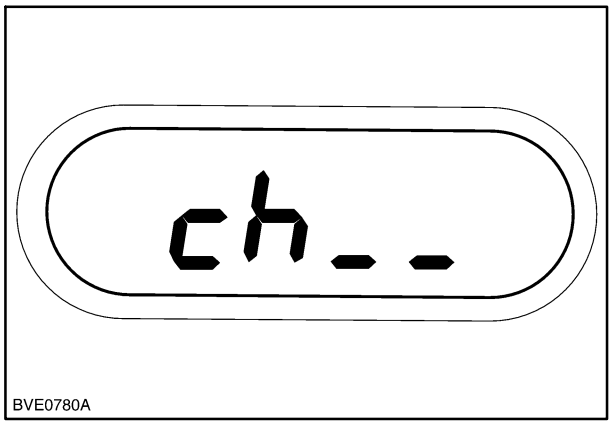
137

Select the H9 menu by depressing the "dimming" key.



138

The lower central display will display “ch _ _”.



139

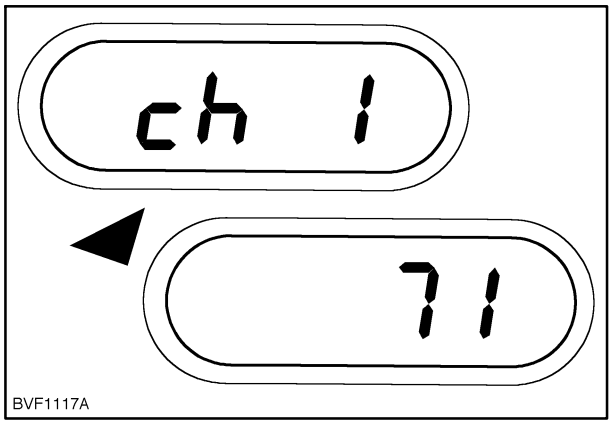
The required channel can be selected by using the “h” and “m” keys.

After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to 0 volts.*

If the value displayed varies by more than 10% to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



140

Channel	Description	Typical Reading	Notes
1	Clutch pedal position	72 Released 26 Depressed	
2	Transmission temperature sender	75% @ 40°C	
3	Fuse 12 sence	96	
5	5 Volt sensor supply	49	
6	8 Volt sensor supply	79	
7	+12 Volt VF input (See explanation)	44	
8	+12 Volt VD input (See explanation)	41 clutch pedal up, FNR in gear 0 clutch pedal down, FNR in neutral	Tractor will drive if the engine is running
9	+12 Volt VH input (See explanation)	44	
10	+12 Volt VT input (See explanation)	44	
30	Electronic Draft Control valve raise solenoid	0 - 66	

Channel	Description	Typical Reading	Notes
31	Electronic Draft Control valve lower solenoid	0 – 66	
32	Lift arm position sensing potentiometer	6 Lowered 79 Raised	
33	Lift control potentiometer	25 Lowered 74 Raised	
34	Drop rate control potentiometer	84 Clockwise 14 Counter clockwise	
35	Height limit control potentiometer	84 Clockwise 14 Counter clockwise	
36	Sensitivity control potentiometer	84 Clockwise 14 Counter clockwise	
37	Slip limit control potentiometer	84 Clockwise 14 Counter clockwise	
38	Right hand load sensing pin	42 With no implement	
39	Left hand load sensing pin	42 With no implement	
40	Draft load control potentiometer	84 Clockwise 14 Counter clockwise	
43	Clutch C1 current filtered	85 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
44	Clutch C2 current filtered	85 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
45	Clutch C3 (24x24 Lo) current filtered	85 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
46	Clutch C4 (24x24 Hi) current filtered	85 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
47	Clutch C5 (50 Km/h clutch) current filtered	60 Engaged 0 Disengaged	
53	Clutch C1 current fast	30 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
54	Clutch C2 current fast	30 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
55	Clutch C3 (24x24 Lo) current filtered	30 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving

Channel	Description	Typical Reading	Notes
56	Clutch C4 (24x24 Hi) current filtered	30 Engaged 0 Disengaged	See figure 141 page 79 for the solenoids activated when driving
57	Clutch C5 (50 Km/h clutch) current filtered	30 Engaged 0 Disengaged	
63	Forward synchroniser solenoid current fast		
64	Reverse synchroniser solenoid current fast		
65	Forward synchroniser solenoid current filtered		
66	Reverse synchroniser solenoid current filtered		
67	5-8 range synchroniser solenoid current fast		
68	1-4 range synchroniser solenoid current fast		
69	5-8 range synchroniser solenoid current filtered		
70	1-4 range synchroniser solenoid current filtered		
72	Forward / reverse synchroniser potentiometer	14 - 76	
73	1-4 / 5-8 range synchroniser potentiometer	14 - 76	
75	Range switch	30 Released 99 Depressed	
76	Shuttle lever forward switch	30 Released 68 Depressed	
77	Shuttle lever reverse switch	30 Released 68 Depressed	
78	Left foot brake switch	0 Brakes on 100 Brakes off	
79	Right foot brake switch	0 Brakes on 100 Brakes off	
89	Hand throttle potentiometer 2	4 Low idle 36 High idle	
90	Hand throttle potentiometer 1	6 Low idle 73 High idle	
91	Foot throttle potentiometer	140 - 1000	
94	Engine flywheel speed	0 - 40 rev/min	
95	PTO torque sensor	49	
96	Flywheel speed sensor	45	

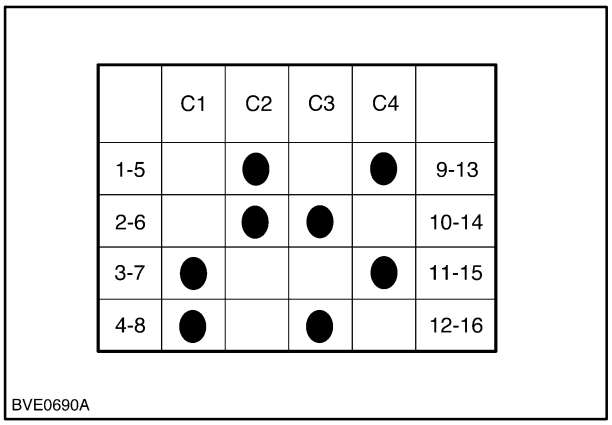
Explanations:

VF Input: This is the input voltage into the controller to transmission components not directly affected by the clutch pedal switch, i.e. forward and reverse synchroniser solenoids, creeper solenoid and four wheel drive solenoid.

VD Input: This is the input voltage into the controller to transmission components which are affected by the clutch pedal switch, i.e. PWM solenoids C3 (24x24 Lo) and C4 (24x24 Hi).

VH Input: This is the input voltage into the controller to electronic draft control components, i.e. raise and lower solenoids.

VT Input: This is the input voltage into the controller to rear PTO and Differential lock, i.e. rear PTO clutch, Rear PTO brake, and differential lock solenoids.



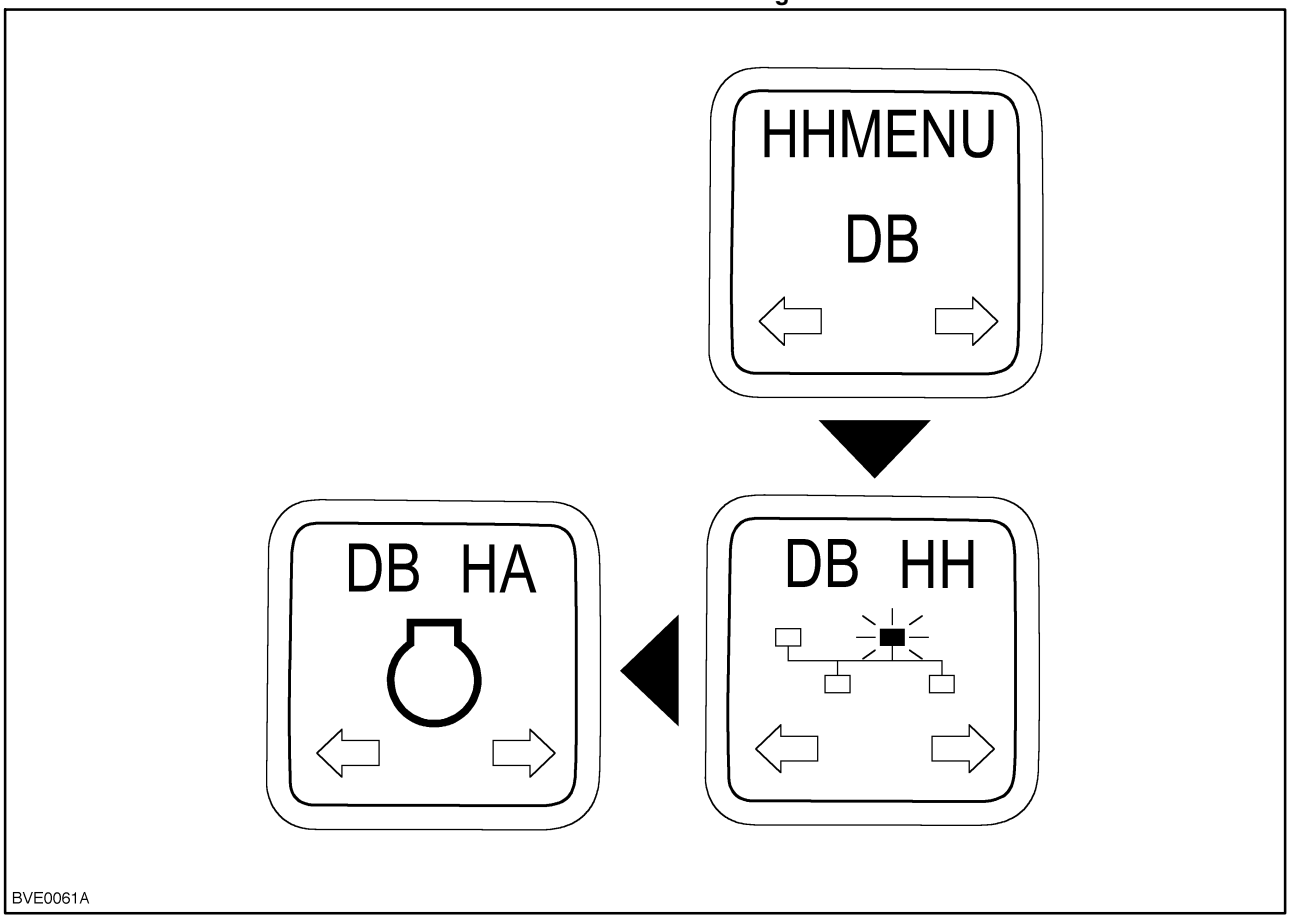
141

Clutch solenoids activated when driving

HA - Demonstration Menu

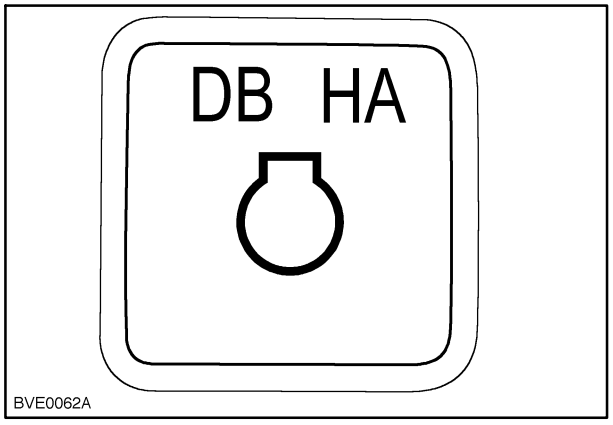
Used to demonstrate engine power boost.

HA Menu Screen Select Diagram



142

Select the HA menu by depressing the “dimming” key.

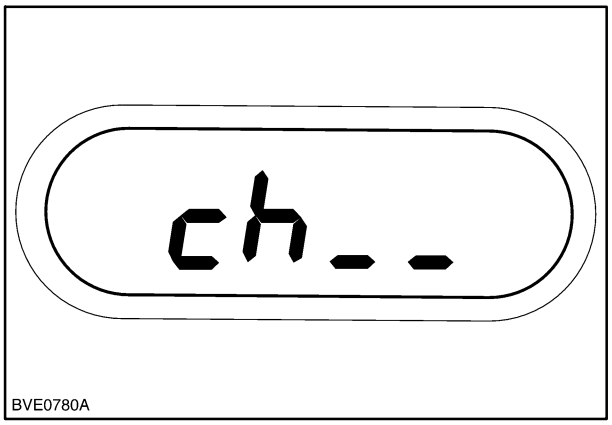


143

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description the channel).



144

Channel	Description
Ch 1	Engine power boost demonstration

Channel 1 - Engine Power Boost Demonstration

Power boost will only be active under the following conditions:

- No PTO torque sensor or calibration fault codes
- PTO is fully engaged
- Wheel speed is greater than 0.5 Km/h
- Engine speed is greater than 1300 rev/min
- Coolant temperature is below 105 °C
- PTO has at least 250 Nm torque applied

The lower central display will display “Pbd” (Power boost demonstration).

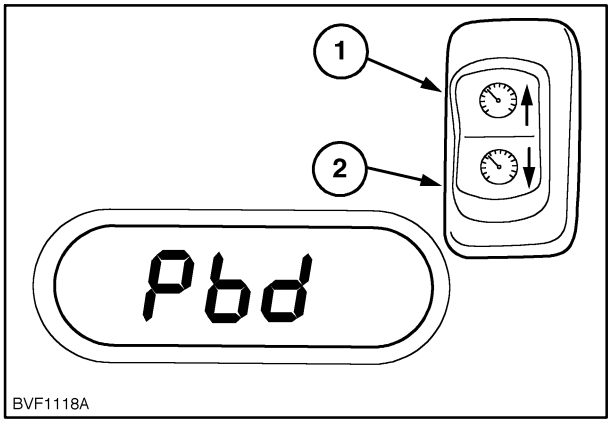
Start the engine and operate the vehicle to activate engine power boost. The power boost lamp on the ADIC will be illuminated when power boost is enabled.

Engine power boost will work as normal, but using the CRPM adjustment switch will turn the powerboost on and off.

CRPM increase switch (1) to turn power boost ON

CRPM decrease switch (2) to turn power boost OFF

NOTE: *Power boost demonstration will be disabled after turning the keystart OFF.*

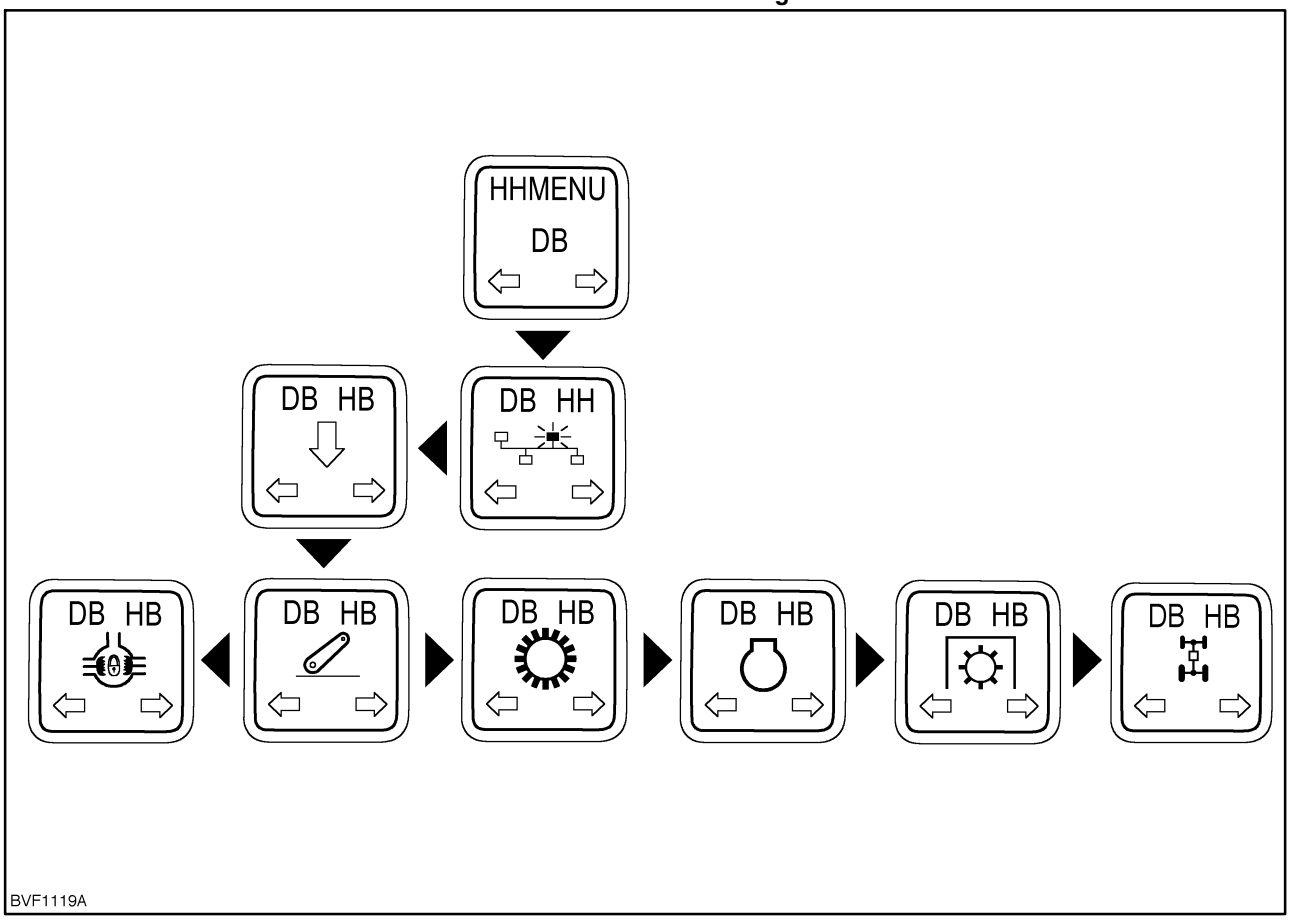


145

HB - Display Stored Fault Codes

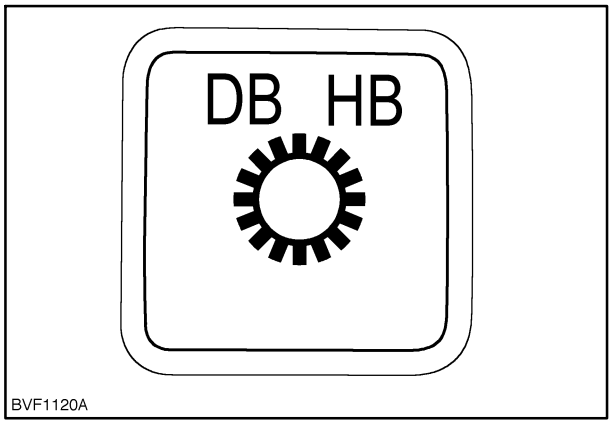
This menu is used to display fault codes which are stored in the EEPROM of the controller.
A maximum of ten fault codes for each sub-system can be stored.
Common to all sub-systems.

HB Menu Screen Select Diagram



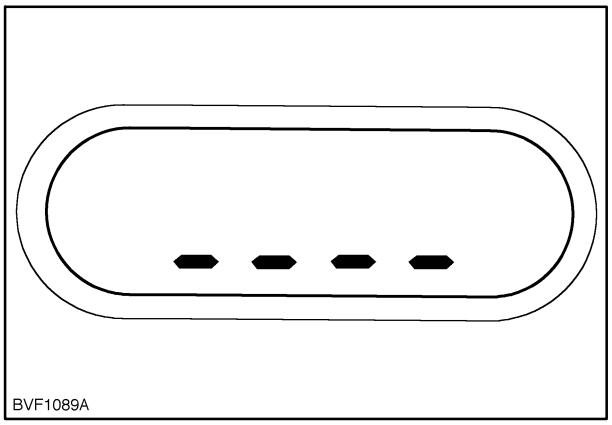
146

Select the required sub-system by depressing the "dimming" key, as the example shown.



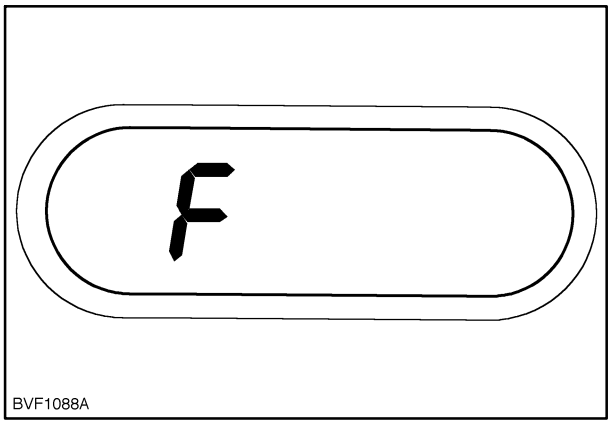
147

The lower central display will display "_ _ _ _", if no fault code is stored in the selected sub-system.



148

The lower central display will display "F", if a fault code is stored in the selected sub-system.



149

The lower central display will then automatically cycle through as the example:

2024 . . . . . Fault code

01 . . . . . Hour of first occurrence

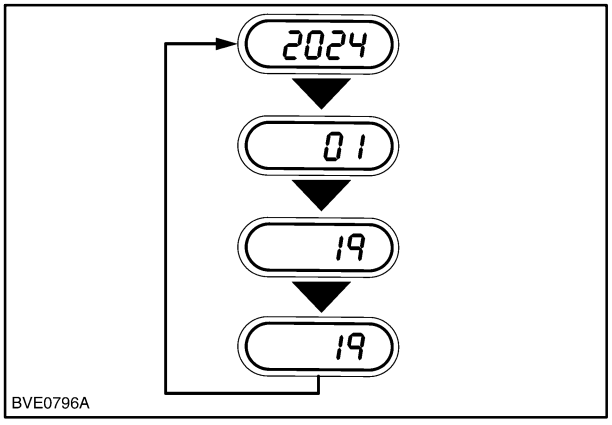
19 . . . . . Hour of last occurrence

19 . . . . . Number of occurrences of the fault

Depress the "h" or "m" key to change to the next fault code in the list.

The lower central display will display "_ _ _" at the end of the list.

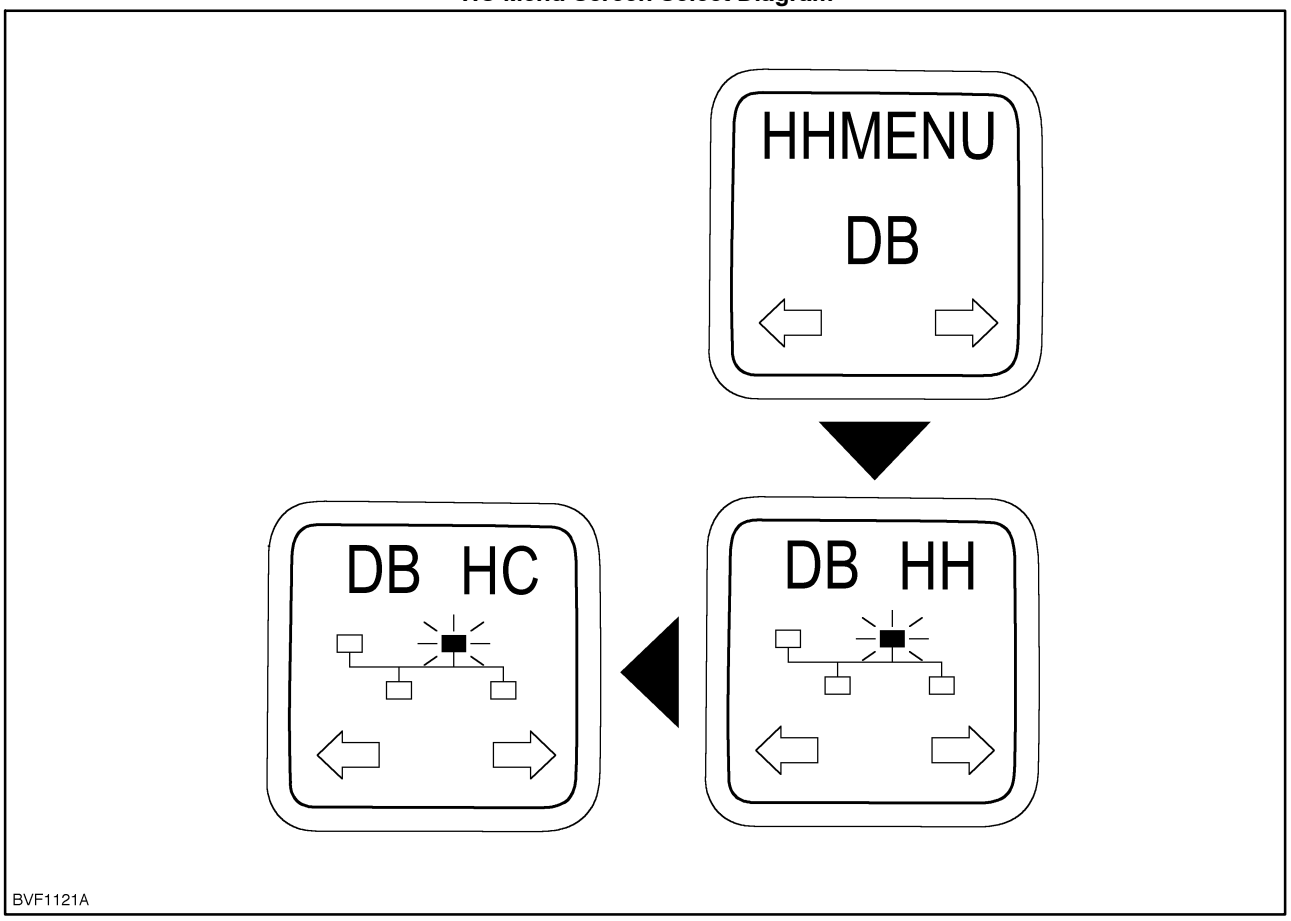
Depress the "dimming" key to continue navigating through the "HH" menus.



150

HC - Clear Stored Fault Codes

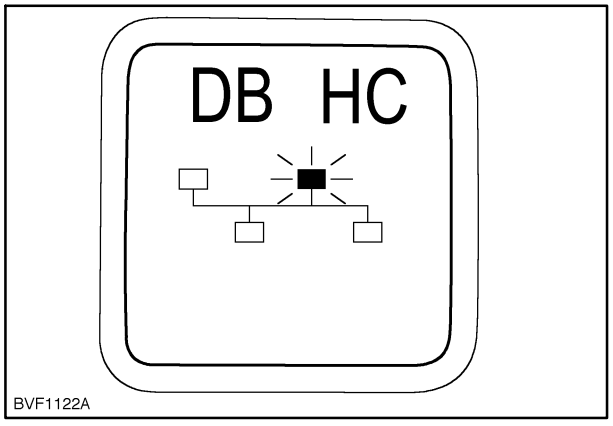
HC Menu Screen Select Diagram



151

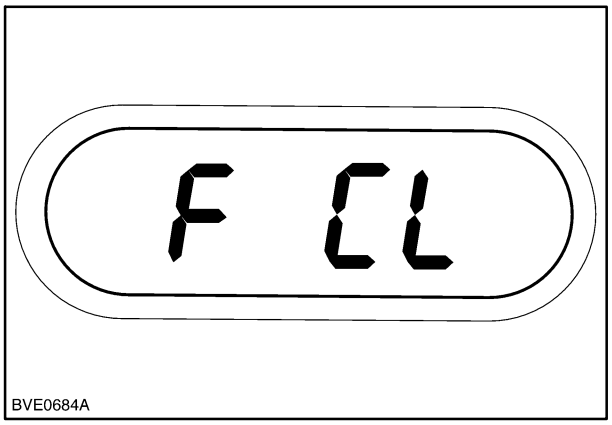
NOTE: *Always make a note of the fault codes stored, before clearing.*

Select the HC menu by depressing the “dimming” key.



152

The lower central display will display “F CL”.



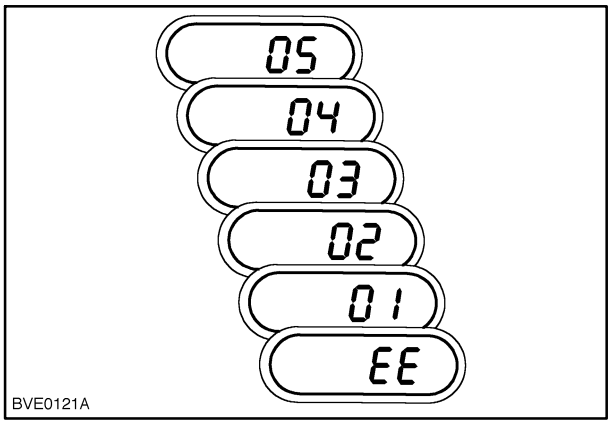
153

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the clearing of the memory.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the fault codes have been cleared.

Depress the “dimming” key to continue navigating through the “HH” menus.



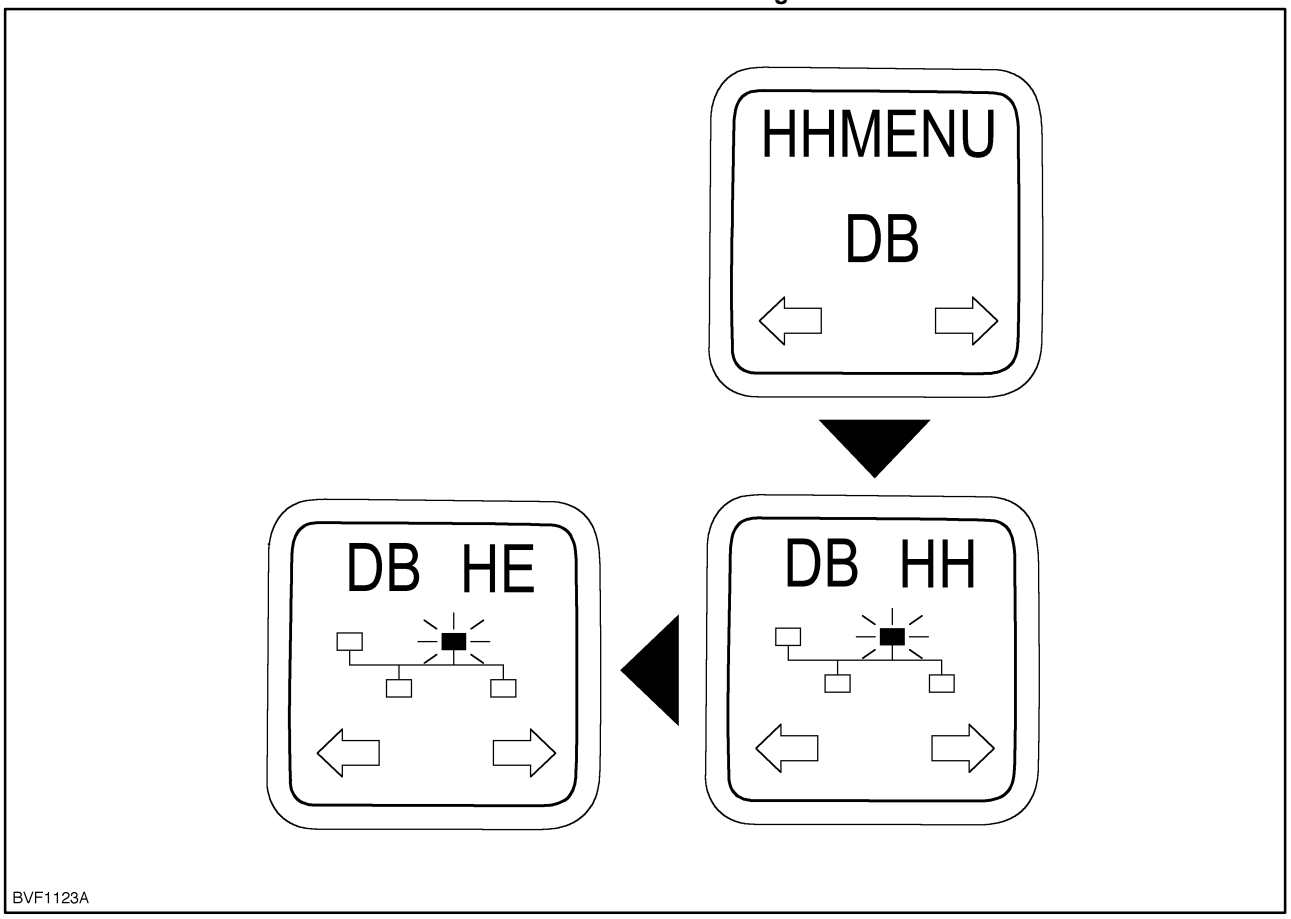
154

HE - Display All Speed Inputs

This menu is used to verify the operation of various frequency inputs.

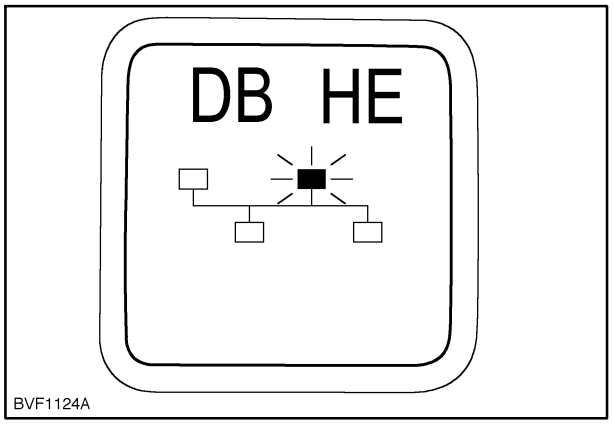
NOTE: *The vehicle may be driven while in this menu.*
Common to all sub-systems.

HE Menu Screen Select Diagram



155

Select the HE menu by depressing the “dimming” key.



156

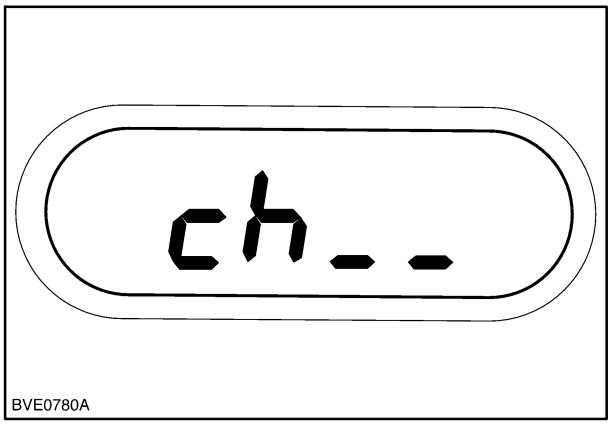
The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

Refer to the table below for the available channels.

After a delay the value will be displayed.

Depress the “dimming” key to continue navigating through the “HH” menus.



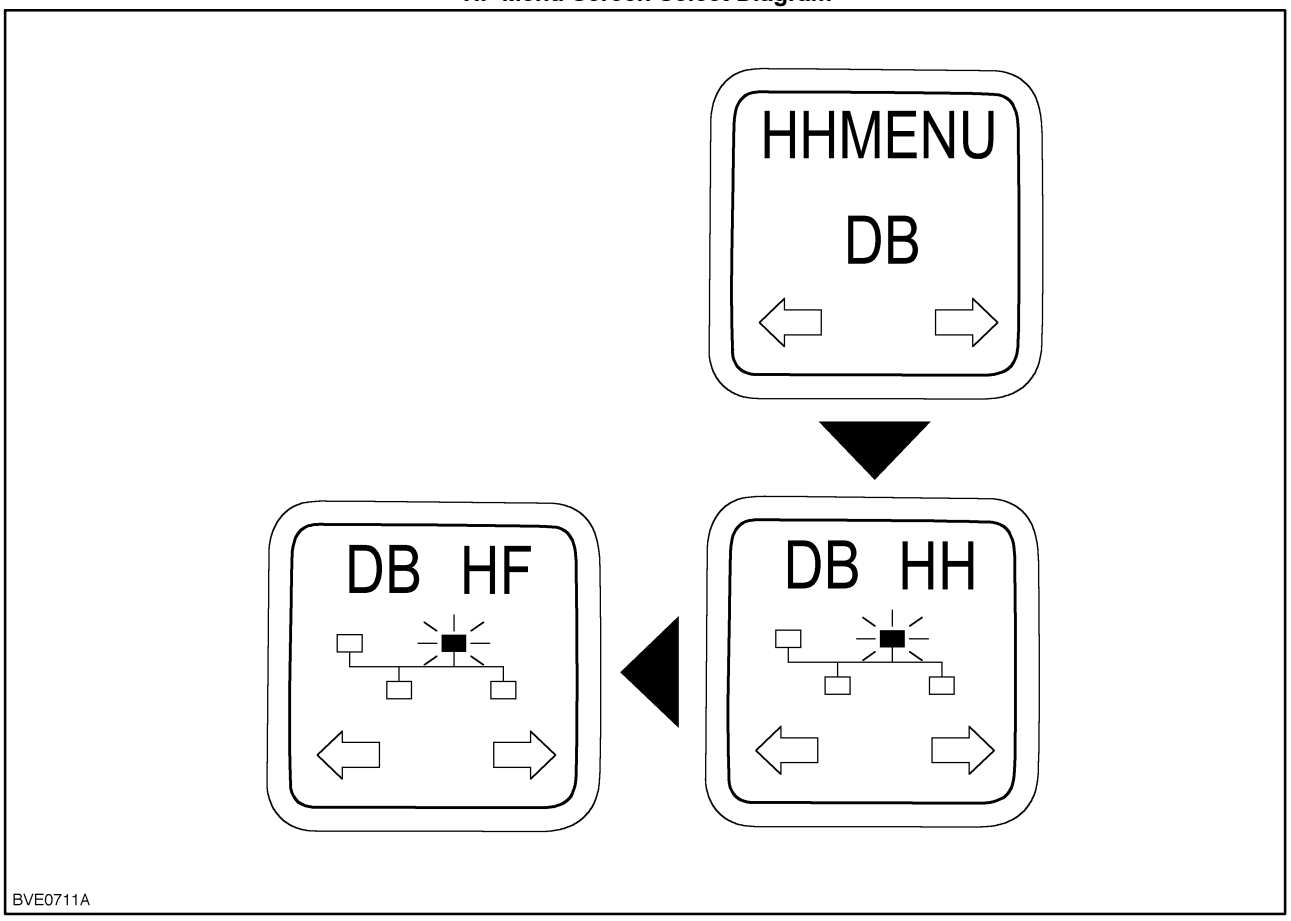
157

Channel	Description	Typical Reading	Notes
1	Wheel speed		
2	Radar		
3	Not used		
4	Rear PTO speed		
5	Not used		
6	Not used		
7	PTO twist speed sensor		
8	Engine flywheel speed		

HF - View Controller Hardware Information

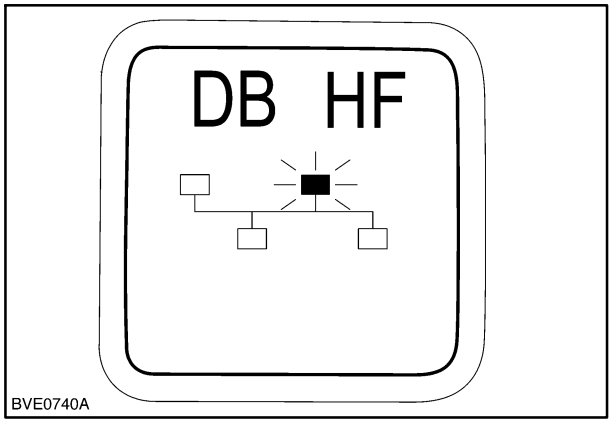
This menu allows the hardware identification, hardware version and serial number to be displayed. Common to all sub-systems.

HF Menu Screen Select Diagram



158

Select the HF menu by depressing the “dimming” key.



159

The lower central display will automatically cycle through as the example:

517 . . . . . Hardware identification

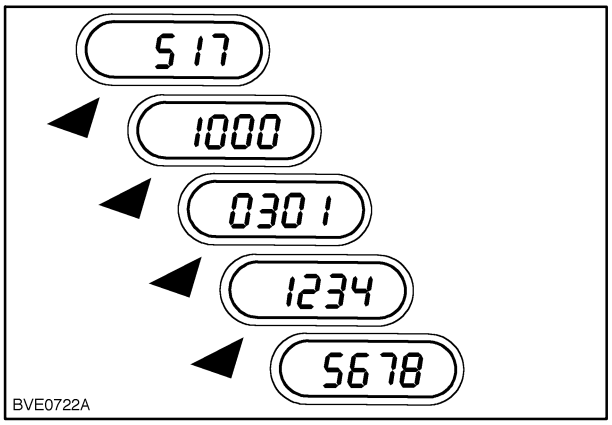
1000 . . . . . Hardware version

0301 . . . . . Hardware version

1234 . . . . . Serial number

5678 . . . . . Serial number

and return to allow navigation of the “HH” menus.



160

JA CONTROLLER H ROUTINES

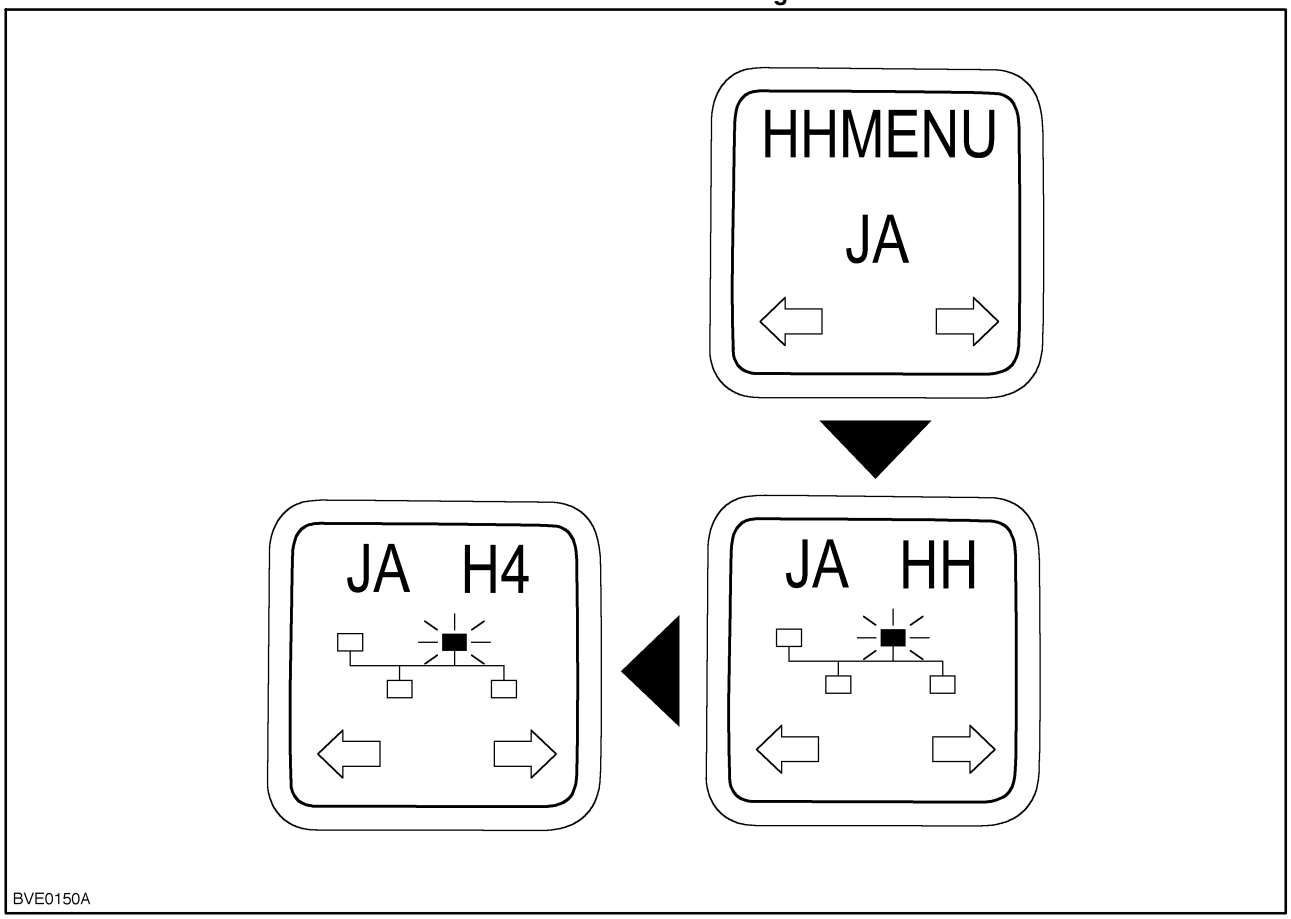
JA - Keypad

HH	Service Menu	Page
H1	Not used	-
H2	Not used	-
H3	Not used	-
H4	View software revision level	91
H5	Not used	-
H6	Not used	-
H7	Not used	-
H8	Not used	-
H9	Not used	-
HA	Not used	-
HB	Not used	-
HC	Not used	-
HD	Not used	-
HE	Not used	-
HF	View controller hardware information	93

H4 - View Software Revision Level

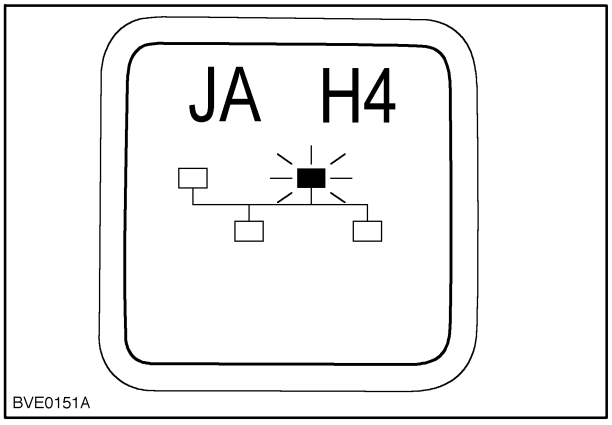
This menu displays the software release of the unit.

H4 Menu Screen Select Diagram



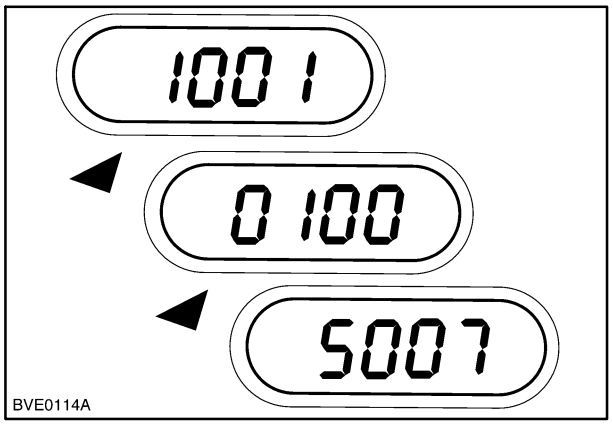
161

Select the H4 menu by depressing the “dimming” key.



162

The lower central display will automatically cycle through the software release, as the example shown and return to allow navigation of the “HH” menus.

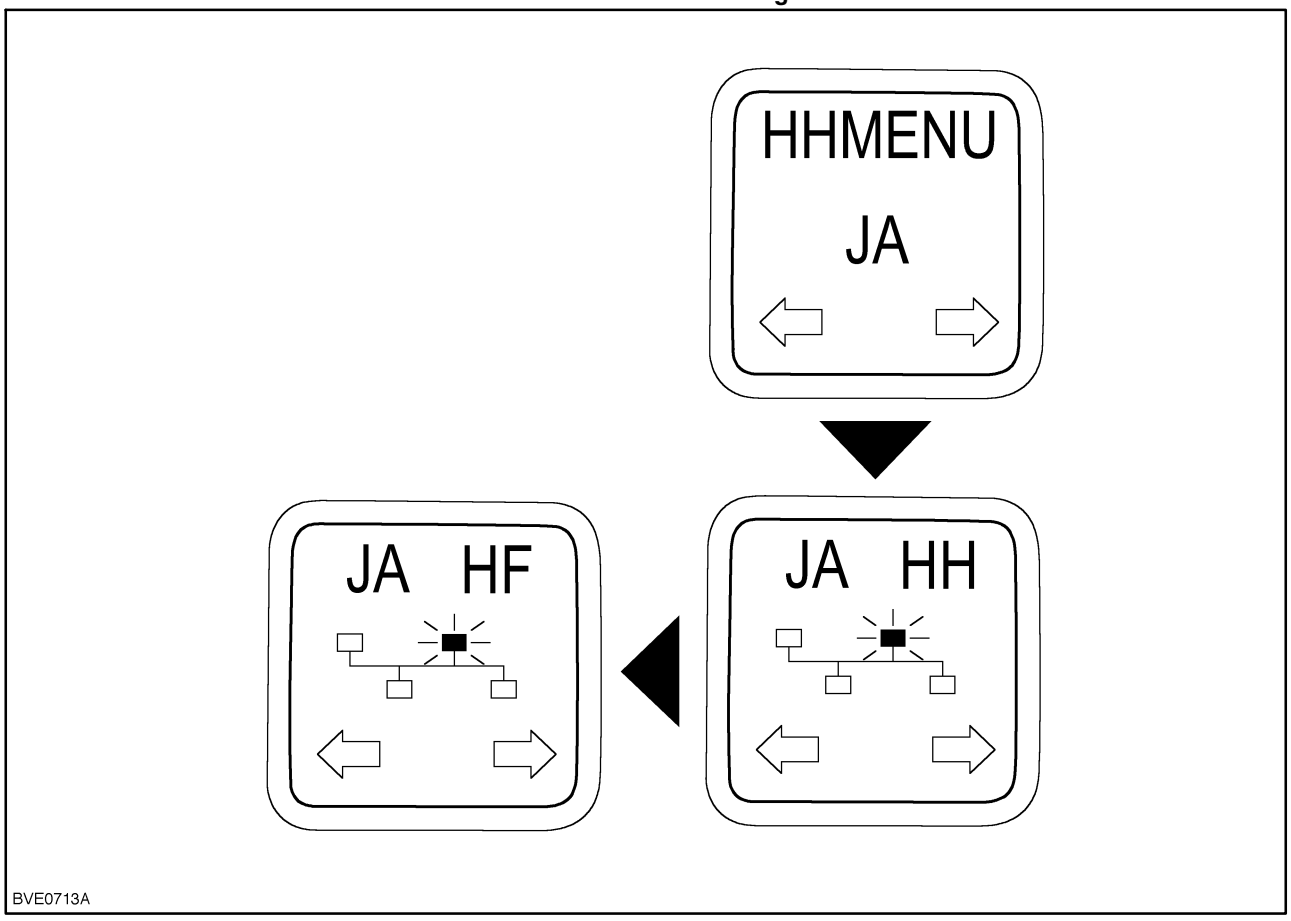


163

HF - View Controller Hardware Information

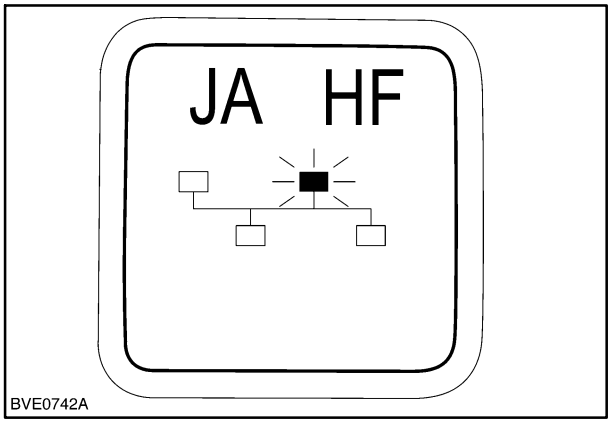
This menu allows the hardware identification, hardware version and serial number to be displayed.

HF Menu Screen Select Diagram



164

Select the HF menu by depressing the “dimming” key.



165

The lower central display will automatically cycle through as the example:

517 . . . . . Hardware identification

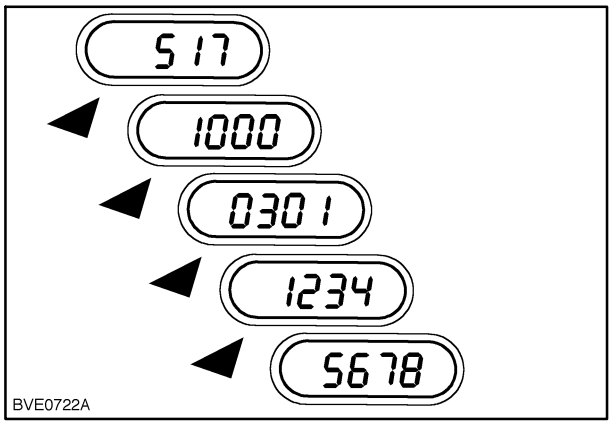
1000 . . . . . Hardware version

0301 . . . . . Hardware version

1234 . . . . . Serial number

5678 . . . . . Serial number

and return to allow navigation of the “HH” menus.



166

DD CONTROLLER H ROUTINES

DD - (Options) Front PTO, Front Hitch, Front Axle Suspension, Electronic Hydraulic Remotes

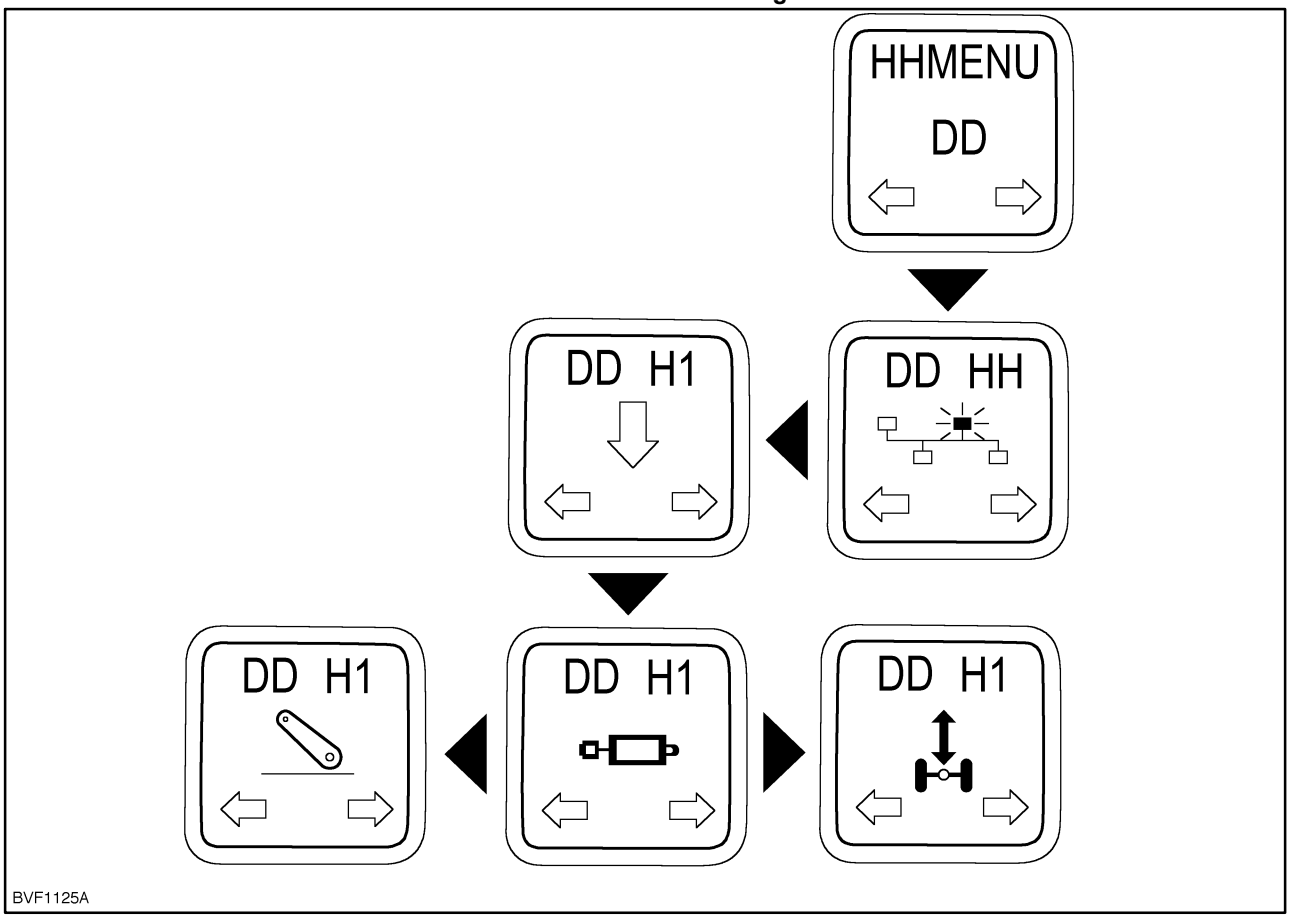
HH	Service Menu	Page
H1	Calibration procedures	96
H2	View stored calibration values	97
H3	Configurations	101
H4	View software revision level	107
H5	Switch operation test	109
H6	Not used	-
H7	Not used	-
H8	Clear Electrical Erasable Programmable Read Only Memory (EEPROM)	111
H9	Voltmeter	113
HA	Demonstration menu	116
HB	Display stored fault codes	118
HC	Clear stored fault codes	120
HD	Not used	-
HE	Display all speed inputs	122
HF	View controller hardware information	124
HJ	Electronic hydraulic remote control valve set-up	126

H1 - Calibration Procedures

This menu is used to calibrate:

1. Electronic Hydraulic Remote levers
2. Front Axle Suspension
3. Front hitch

H1 Menu Screen Select Diagram



167

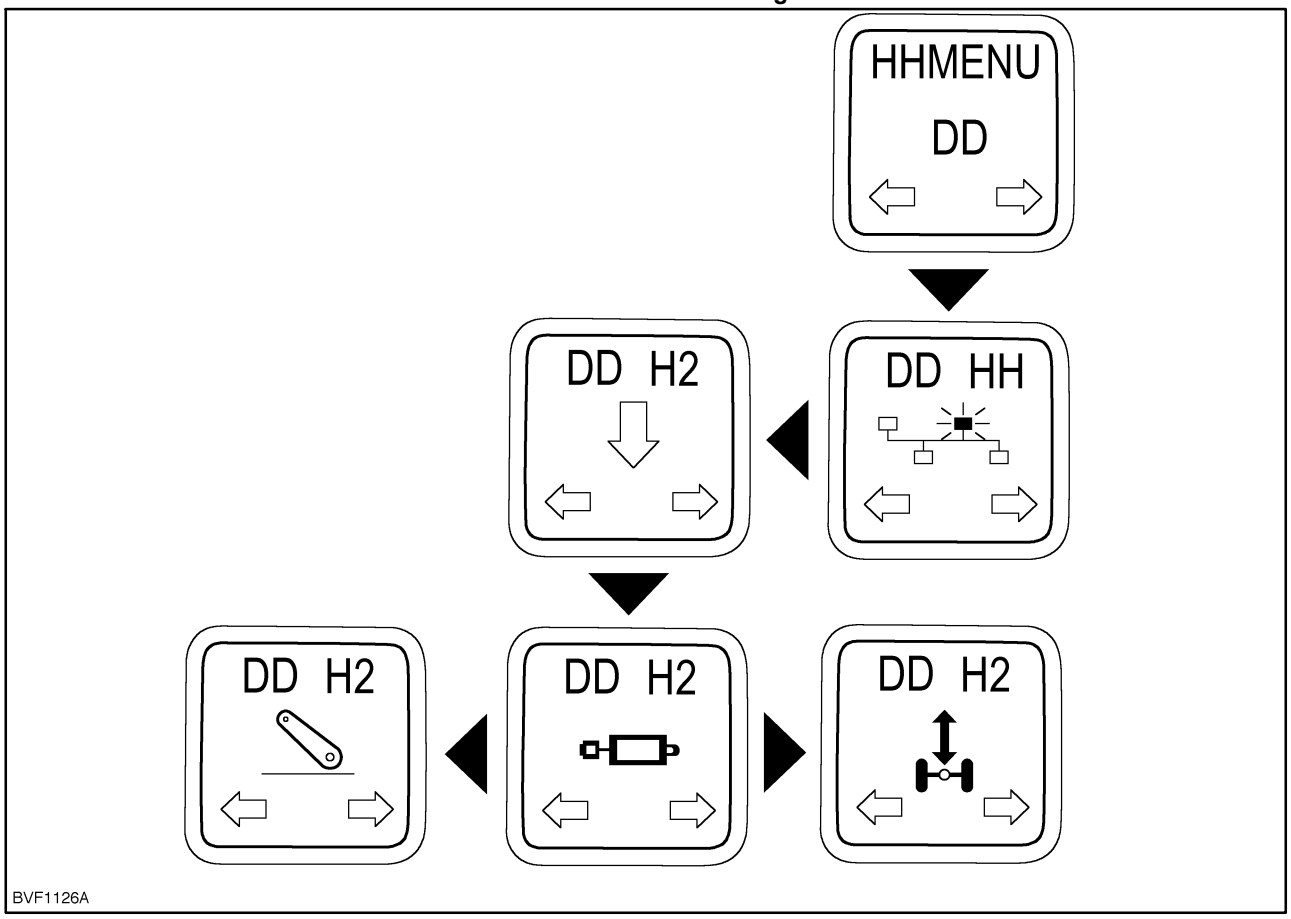
Refer to the calibrations chapter of the electrical systems section for detailed explanation of each system.

H2 - View Stored Calibration Values

This menu is used to display the calibration values stored in the controllers for:

1. Electronic Hydraulic Remote levers
2. Front Axle Suspension
3. Front hitch

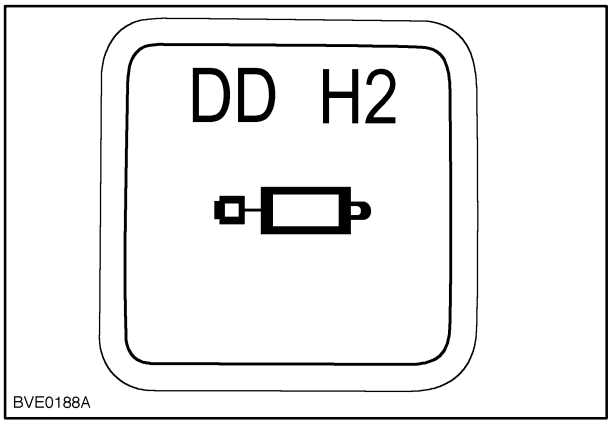
H2 Menu Screen Select Diagram



168

Electronic Hydraulic Remote Lever Values

Select the electronic hydraulic remote sub-system by depressing the “dimming” key.



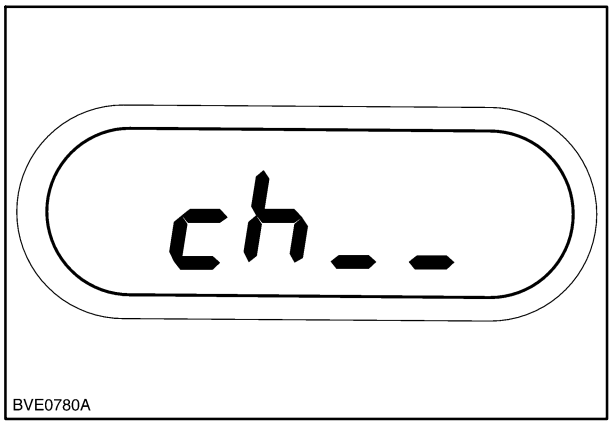
169

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the lower central display will cycle through the code followed by the calibration value for each code in that channel. (see the table below for the description of each channel).

Depress the “dimming” key to continue navigating through the “HH” menus.

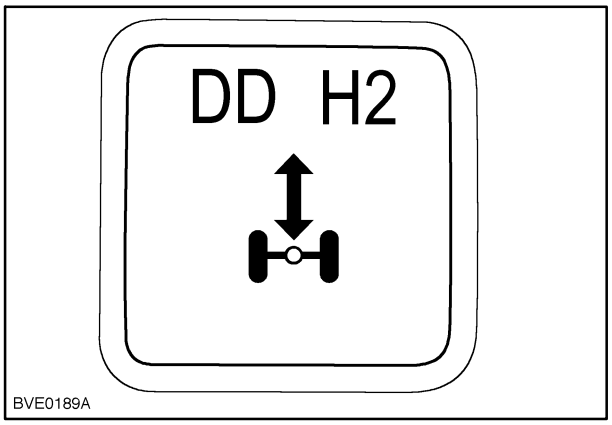


170

Channel	Description	Code	Value Range
Ch 1	Lever 1 - Neutral position	n	20 - 30
	Lever 1 - Float position	F	45 - 55
	Lever 1 - Lower (retract) position	L	5 - 15
	Lever 1 - Raise (extend) position	R	35 - 45
Ch 2	Lever 2 - Neutral position	n	20 - 30
	Lever 2 - Float position	F	45 - 55
	Lever 2 - Lower (retract) position	L	5 - 15
	Lever 2 - Raise (extend) position	R	35 - 45
Ch 3	Lever 3 - Neutral position	n	20 - 30
	Lever 3 - Float position	F	45 - 55
	Lever 3 - Lower (retract) position	L	5 - 15
	Lever 3 - Raise (extend) position	R	35 - 45
Ch 4	Lever 4 - Neutral position	n	20 - 30
	Lever 4 - Float position	F	45 - 55
	Lever 4 - Lower (retract) position	L	5 - 15
	Lever 4 - Raise (extend) position	R	35 - 45

Front Axle Suspension Values

Select the front axle suspension sub-system by depressing the “dimming” key.



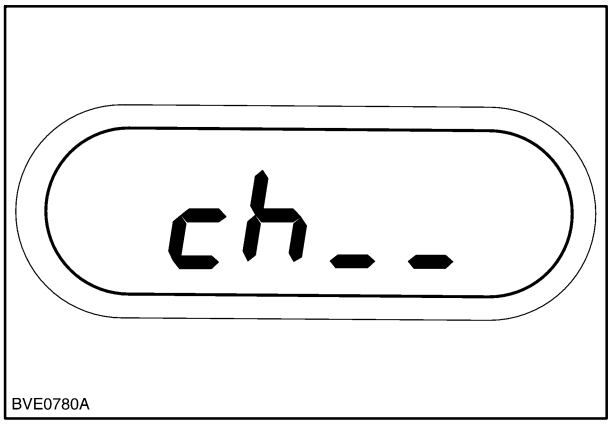
171

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the lower central display will cycle through the code followed by the calibration value for each code in that channel. (see the table below for the description of each channel).

Depress the “dimming” key to continue navigating through the “HH” menus.

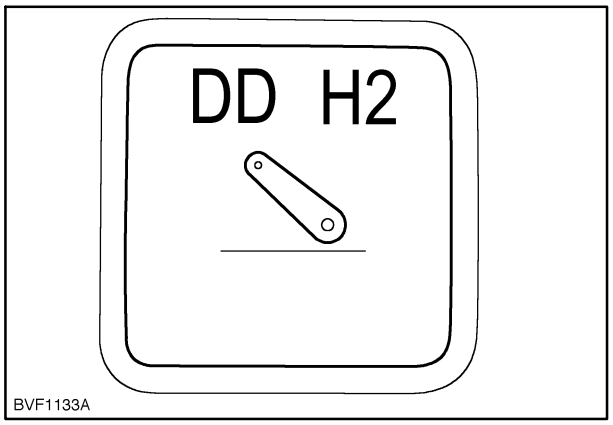


172

Channel	Description	Code	Value Range
Ch 1	Front axle up position	u	500 - 900
	Front axle down position	d	150 - 400

Front Hitch Values

Select the front hitch sub-system by depressing the “dimming” key.



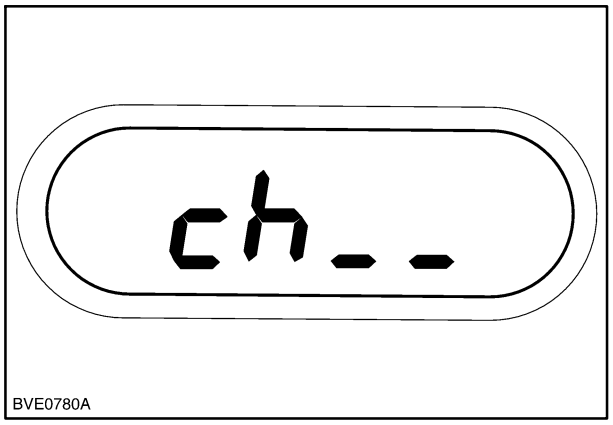
173

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the lower central display will cycle through the code followed by the calibration value for each code in that channel. (see the table below for the description of each channel).

Depress the “dimming” key to continue navigating through the “HH” menus.



174

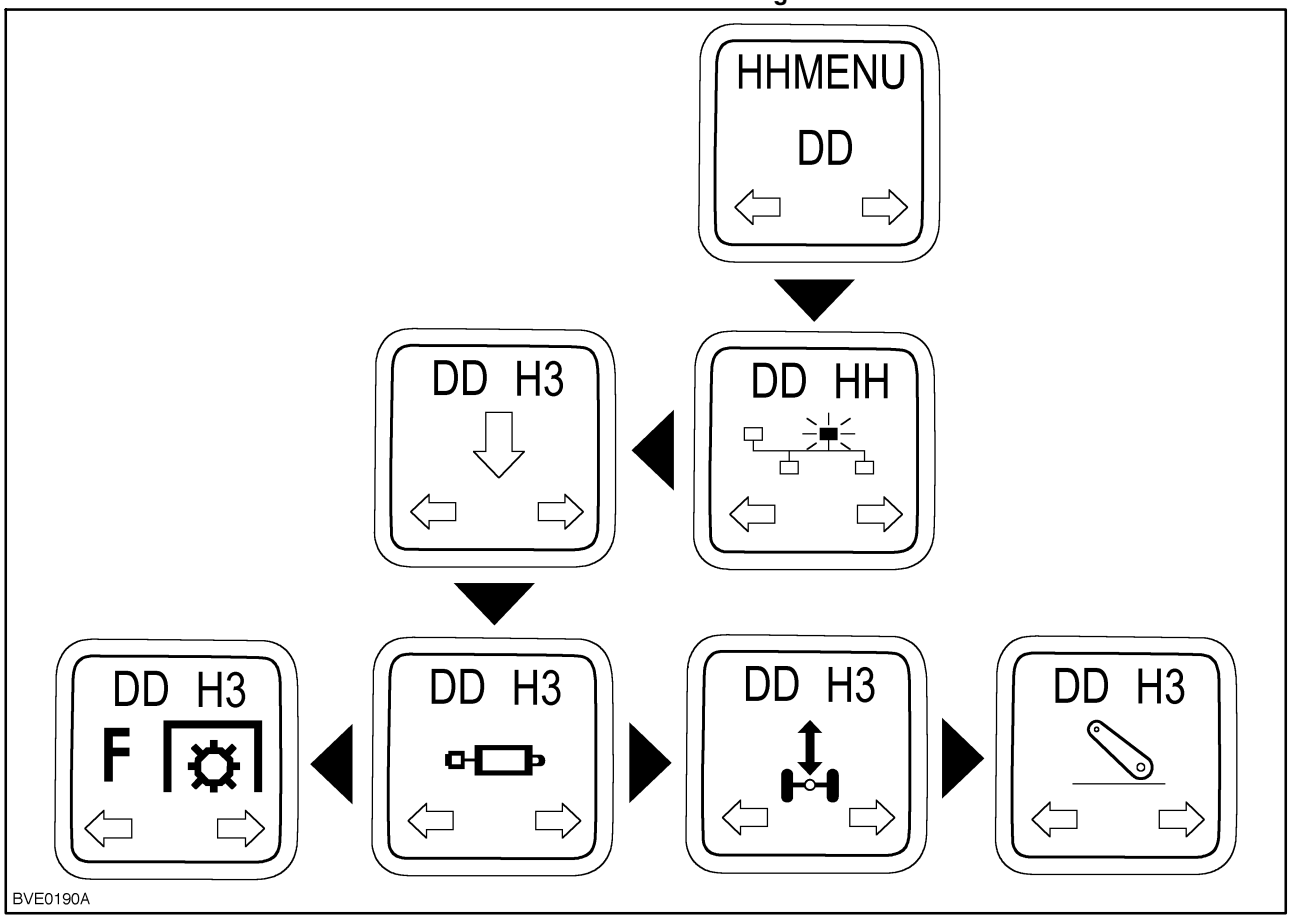
Channel	Description	Code	Value Range
Ch 1	Front hitch up position	u	500 - 900
	Front hitch down position	d	150 - 400

H3 - Configurations

Used to display the configurations available for:

1. Electronic Hydraulic Remotes (EHR)
   - Enable / Disable EHR
   - Front hitch EHR valve selection
   - Enable / Disable EHR joystick
2. Front Axle Suspension
   - Enable / Disable front axle suspension
3. Front Hitch
   - Enable / Disable front hitch
4. Front PTO
   - Enable / Disable front PTO

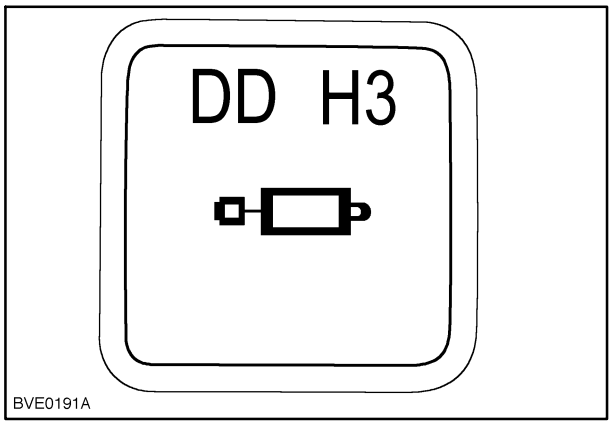
H3 Menu Screen Select Diagram



175

Electronic Hydraulic Remotes (EHR) Options

Select the EHR sub-system by depressing the "dimming" key.

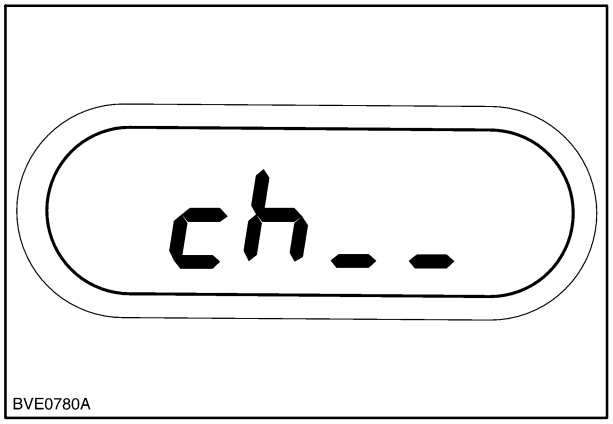


176

The lower central display will display "ch _ _".

The required channel can be selected by using the "h" and "m" keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



177

Channel	Description
Ch 1	Enable / Disable EHR
Ch 2	Front hitch height limit EHR valve selection
Ch 3	Enable / Disable EHR joystick

Channel 1 - Enable / Disable EHR

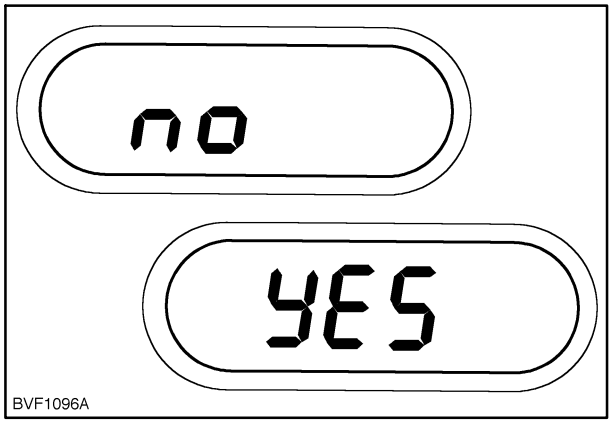
Scroll through the available options using the "h" or "m" key.

No - Disable EHR

Yes - Enable EHR

Depress and hold the "h" or "m" key to store the selection, an audible tone will be heard to confirm the selection.

Depress the "dimming" key to continue navigating through the "HH" menus.



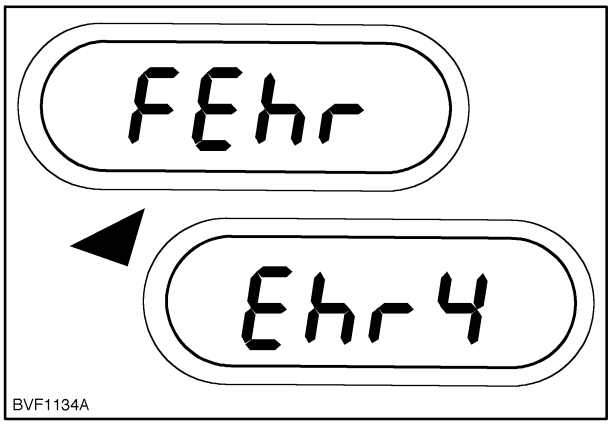
178

Channel 2 - Front Hitch Height Limit EHR Valve Selection

NOTE: *The default setting is EHR valve four.*

This is used to select a specific EHR valve to control the front hitch height limit.

The lower central display will display “FEhr” then change to the valve stored to control the front hitch height limit, as the example shown.

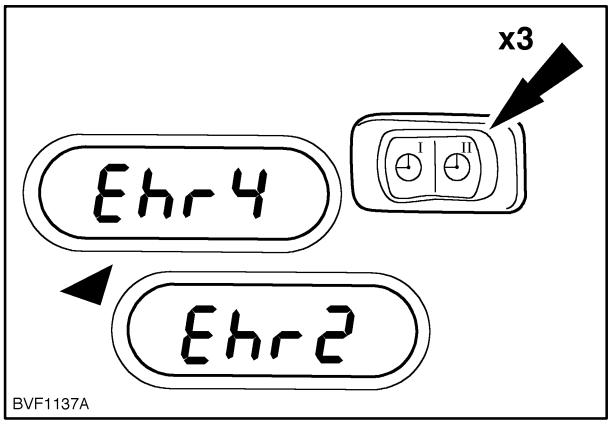


179

Depress the EHR timer switch of the new valve to be selected three times.

The lower central display will change to display the valve selected, as the example shown.

Turn the keystart OFF to store the selection.



180

Channel 3 - Enable / Disable EHR Joystick

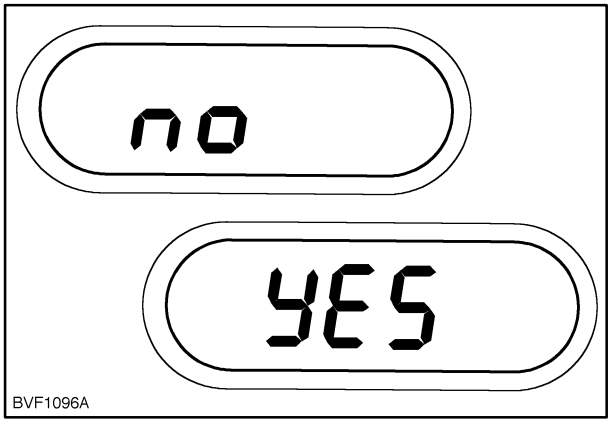
Scroll through the available options using the “h” or “m” key.

No - Disable EHR joystick

Yes - Enable EHR joystick

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

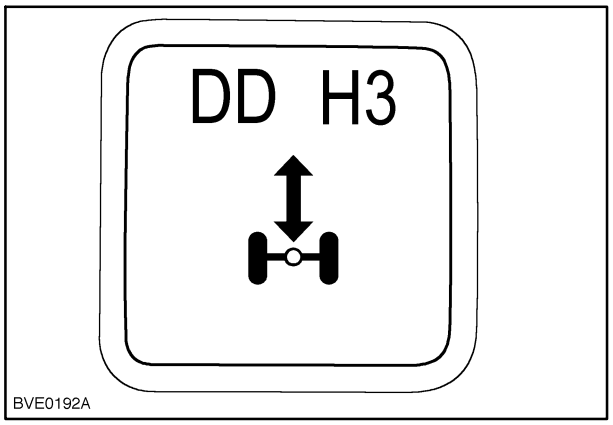
Depress the “dimming” key to continue navigating through the “HH” menus.



181

Front Axle Suspension Options

Select the front axle suspension sub-system by depressing the dimming key.

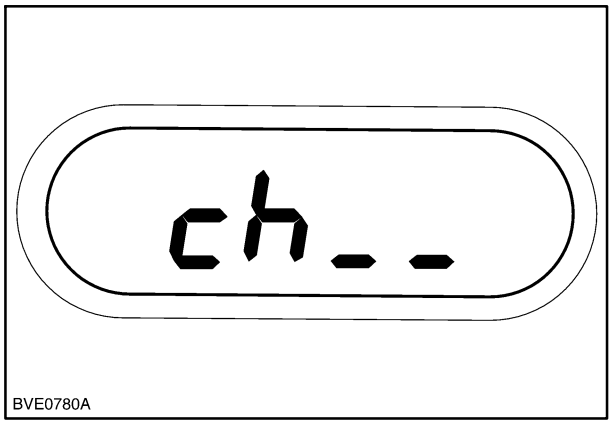


182

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of the channel).



183

Channel	Description
Ch 1	Enable / Disable front axle suspension

Channel 1 - Enable / Disable Front Axle Suspension

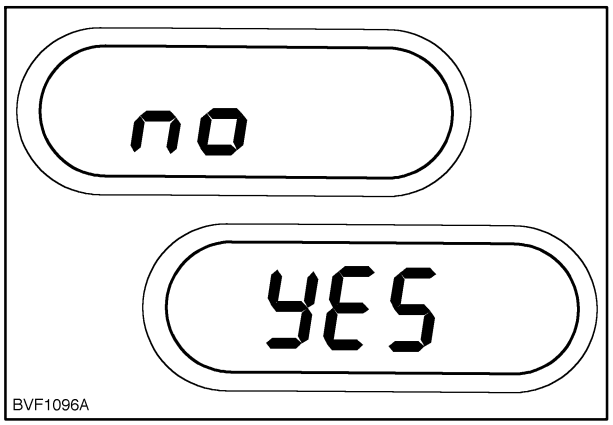
Scroll through the available options using the “h” or “m” key.

No - Disable front axle suspension

Yes - Enable front axle suspension

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

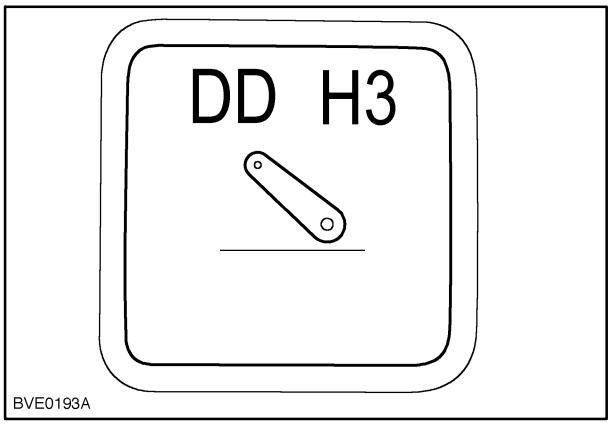
Depress the “dimming” key to continue navigating through the “HH” menus.



184

Front Hitch Options

Select the front hitch sub-system by depressing the "dimming" key.

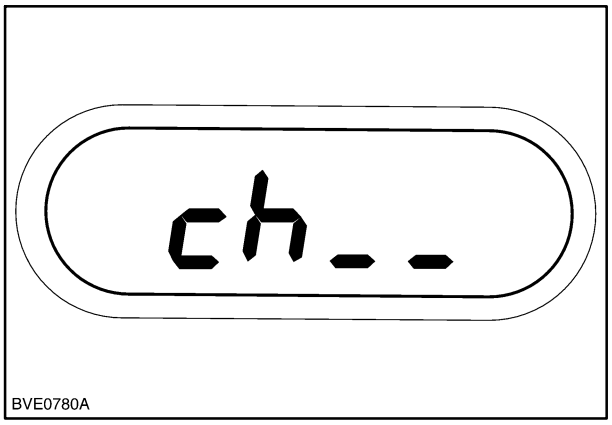


185

The lower central display will display "ch _ _".

The required channel can be selected by using the "h" and "m" keys.

After a delay the current setting will be displayed. (see the table below for the description of the channel).



186

Channel	Description
Ch 1	Enable / Disable front hitch

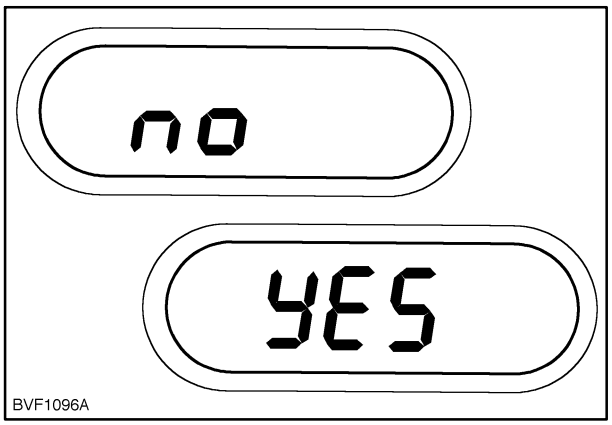
Scroll through the available options using the "h" or "m" key.

No - Disable front hitch

Yes - Enable front hitch

Depress and hold the "h" or "m" key to store the selection, an audible tone will be heard to confirm the selection.

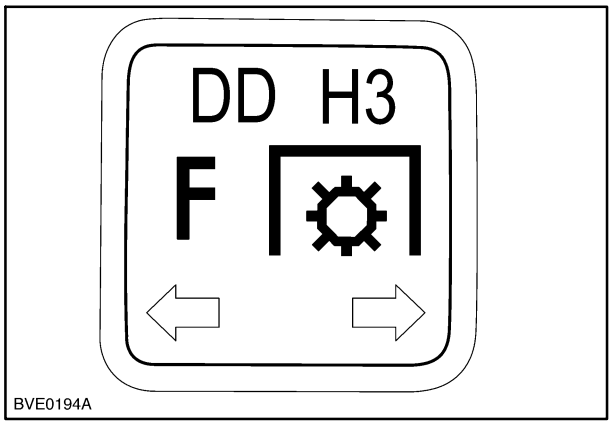
Depress the "dimming" key to continue navigating through the "HH" menus.



187

Front PTO Options

Select the front PTO sub-system by depressing the “dimming” key.

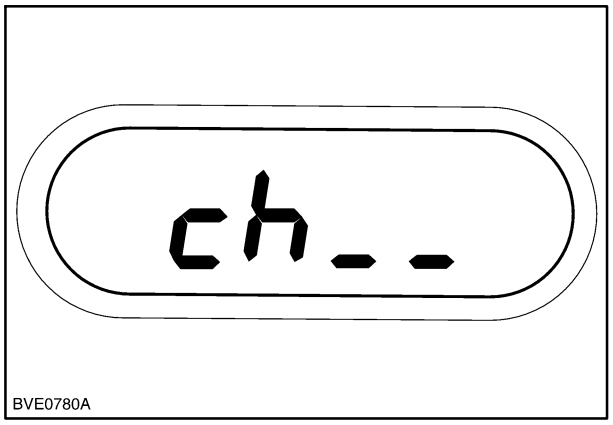


188

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



189

Channel	Description
Ch 1	Enable / Disable front PTO

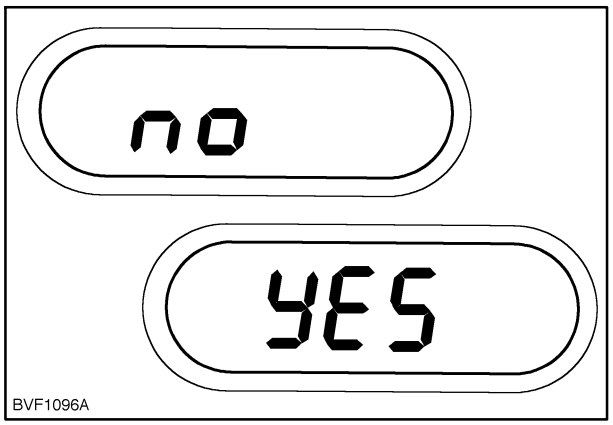
Scroll through the available options using the “h” or “m” key.

No - Disable front PTO

Yes - Enable front PTO

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.

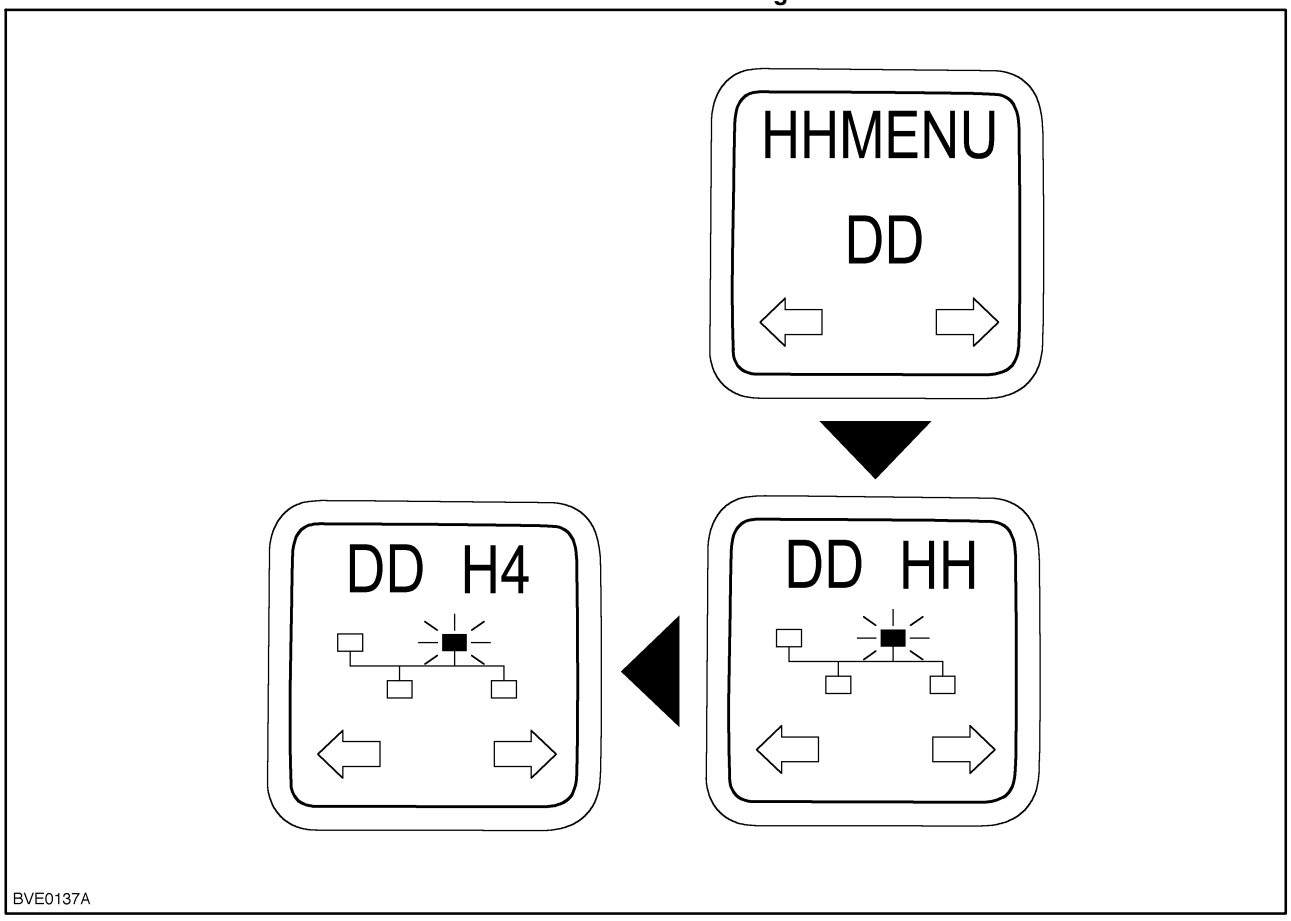


190

H4 - View Software Revision Level

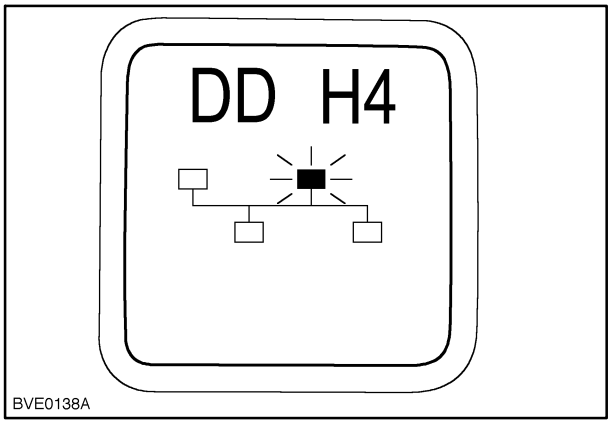
Common to all sub-systems.

H4 Menu Screen Select Diagram



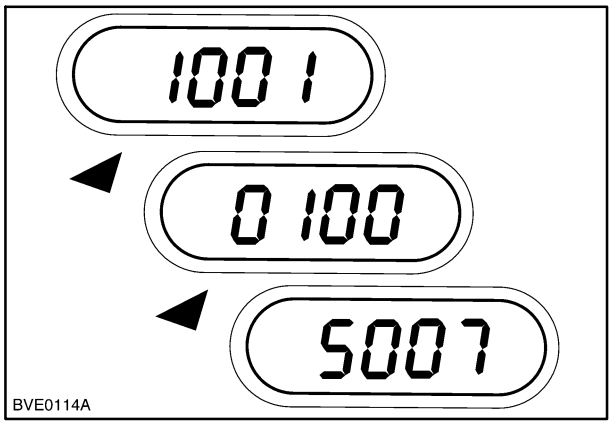
191

Select the H4 menu by depressing the “dimming” key.



192

The lower central display will automatically cycle through the software release, as the example shown and return to allow navigation of the “HH” menus.

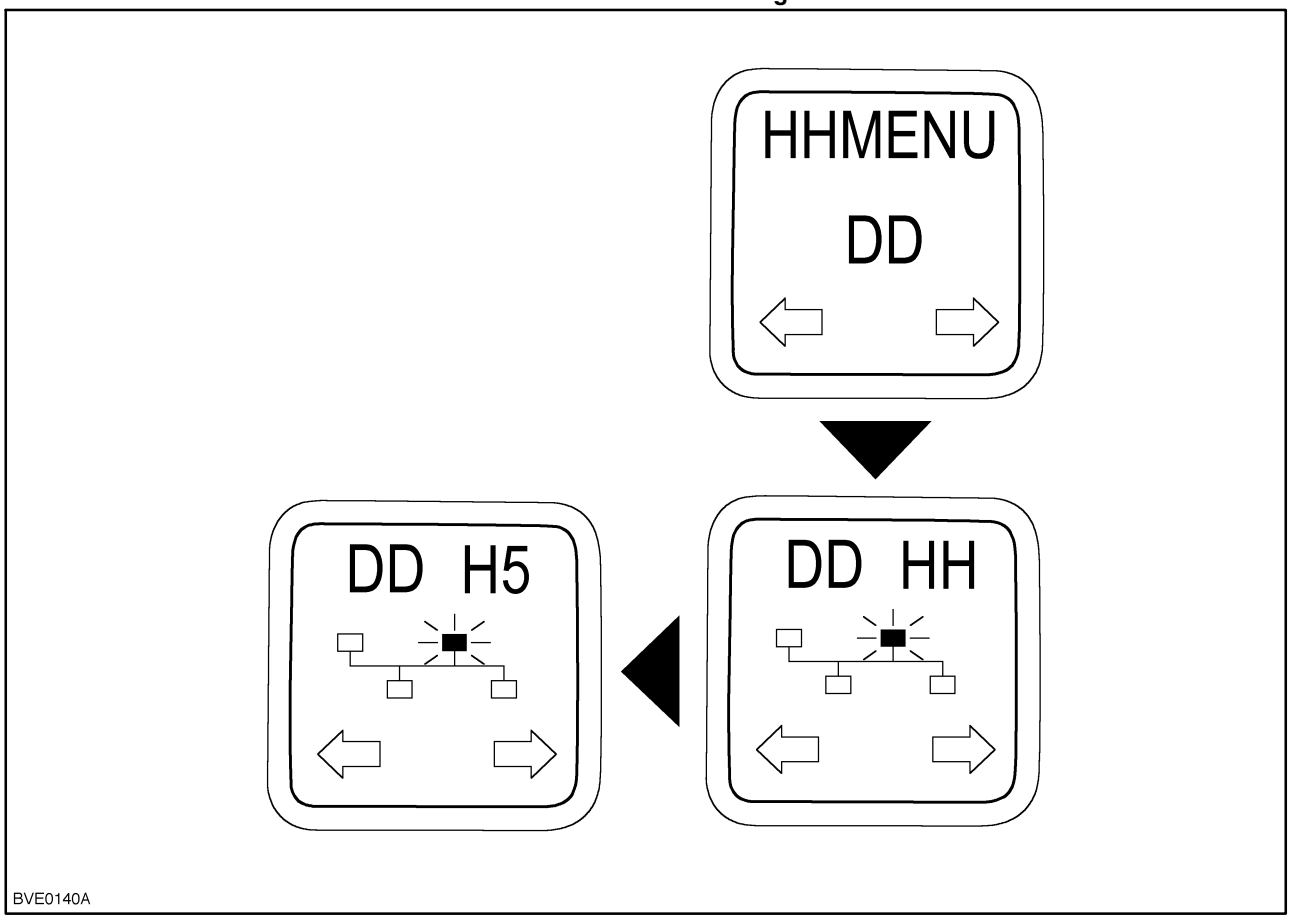


193

H5 - Switch Operation Test

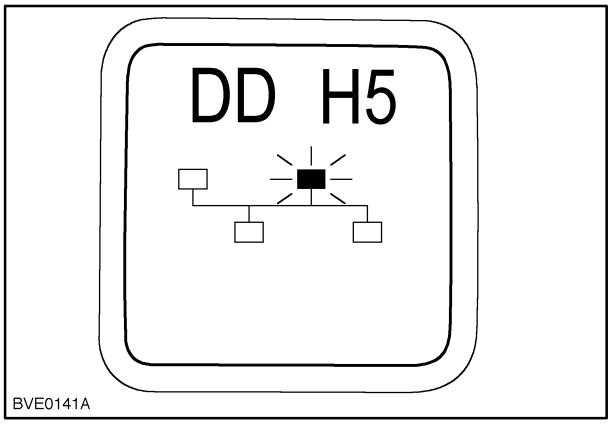
This menu displays a designated code when a switch transition is detected.
Common to all sub-systems.

H5 Menu Screen Select Diagram



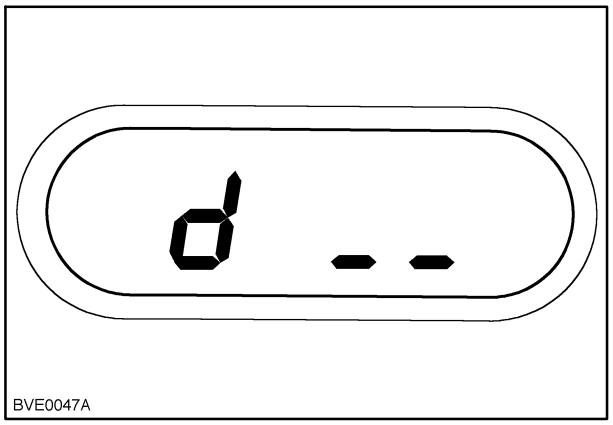
194

Select the H5 menu by depressing the “dimming” key.



195

The lower central display will display “d _ _”.

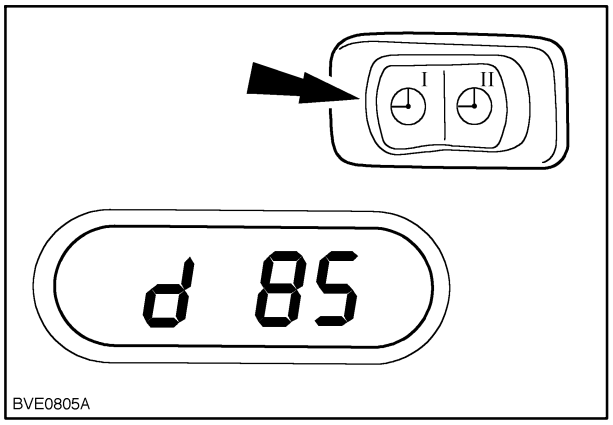


196

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.

If a switch code is not displayed and the audible tone not heard, a ’wiggle’ test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.

NOTE: *If the keystart switch is turned to the “crank” position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*



197

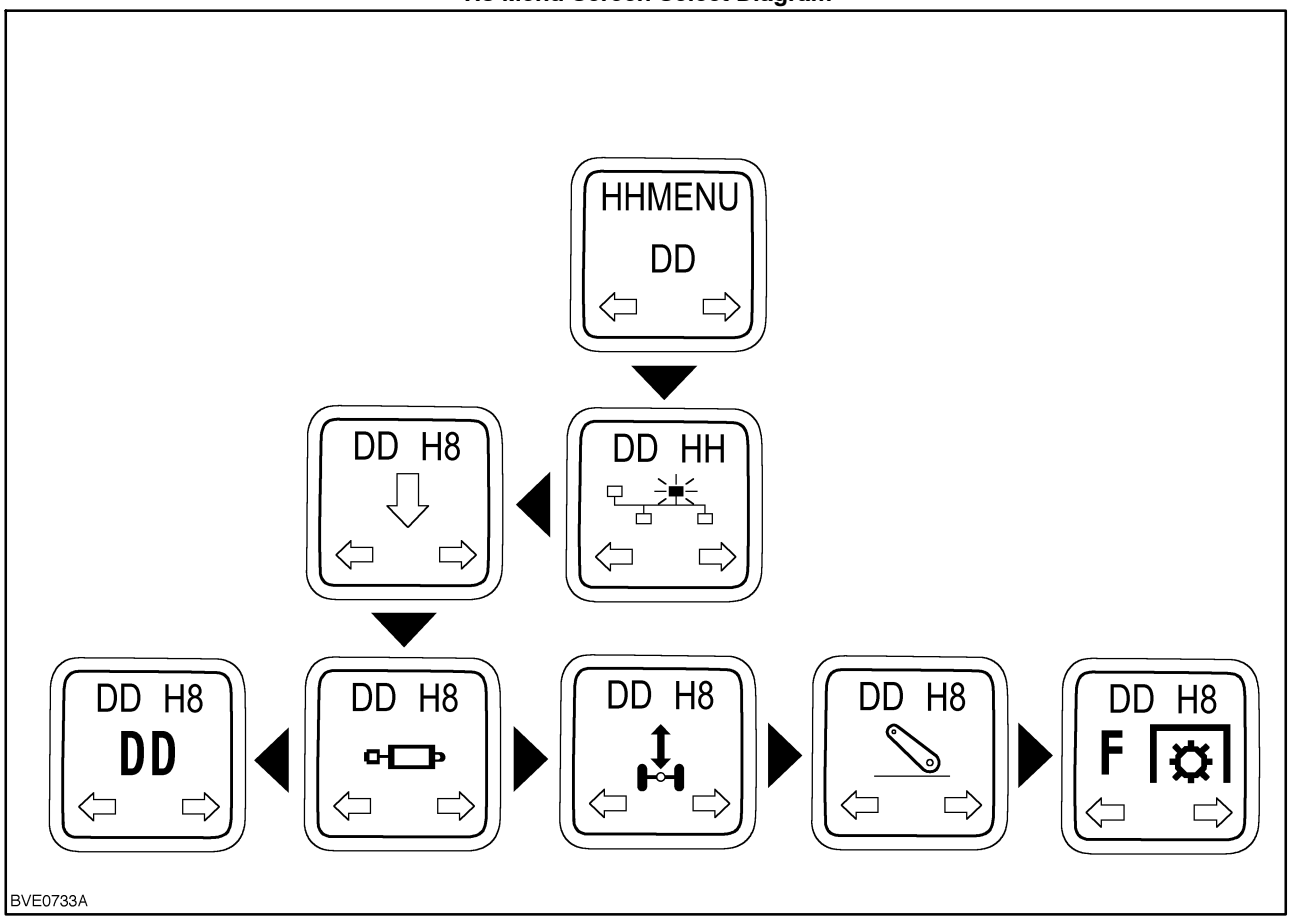
Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d0	No switch or two switches activated at the same time			-
d85	C325	30	Time/Flow number 1 switch	-
d86	C328	30	Time/Flow number 2 switch	-
d87	C328	32	Time/Flow number 3 switch	-
d88	C327	15	Time/Flow number 4 switch	-
d89	C325	29	Front suspension lockout switch	-
d90	C325	11	Front PTO (normally open) switch	-
d91	C325	12	Front PTO (normally closed) switch	-
d92	C325	18	Front hitch enable switch	-
d93		VIA CAN	Seat switch	-
d94	C327	21	Electronic Hydraulic Remotes (EHR) stop switch	-
d95	C327	16	EHR number 1 motor mode switch	Rolling gate - position I
d96	C327	17	EHR number 2 motor mode switch	Rolling gate - position I
d97	C327	18	EHR number 3 motor mode switch	Rolling gate - position I
d98	C327	19	EHR number 4 motor mode switch	Rolling gate - position I

H8 - Clear Electrical Erasable Programmable Read Only Memory (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default.

EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

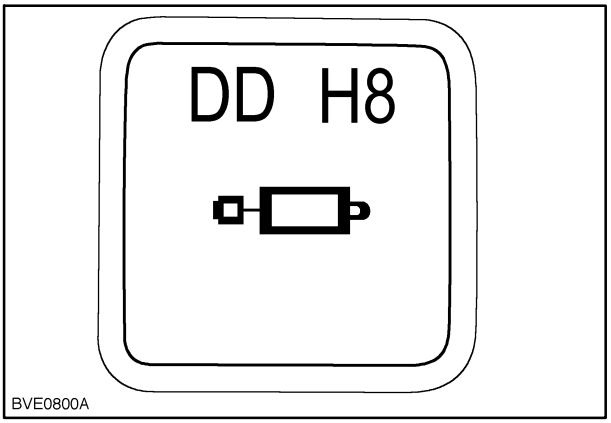
H8 Menu Screen Select Diagram



198

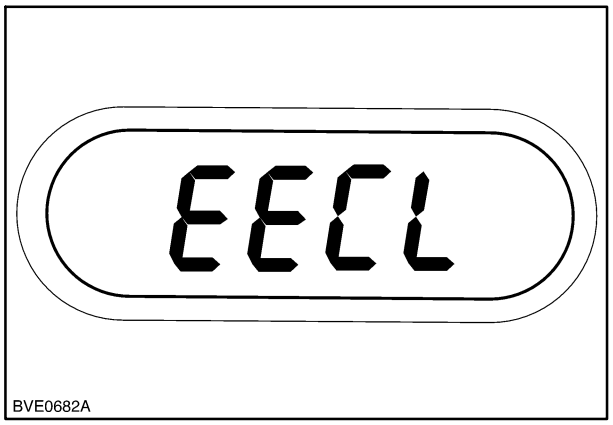
IMPORTANT: *By selecting the screen display with the controller identifier "DD" displayed will reset the EEPROM in all the sub-systems*.

If only a specific sub-system EEPROM requires to be reset, select the sub-system that requires the EEPROM to be reset by depressing the "dimming" key, as the example shown.



199

The lower central display will display “EECL”.



200

⚠ CAUTION ⚠

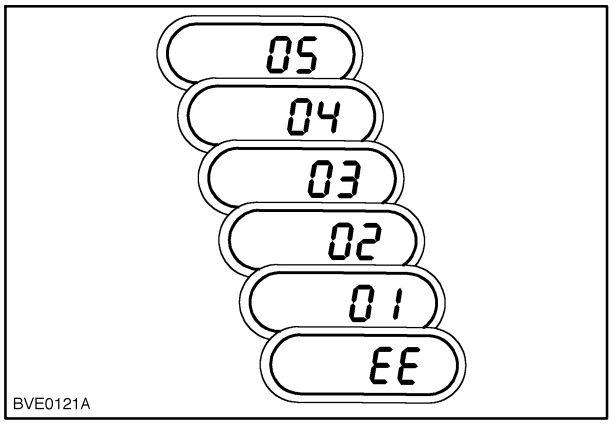
H8 will clear all calibrations values and stored error codes.

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the resetting of the EEPROM.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the EEPROM has been cleared.

Turn the keystart OFF.



201

H9 - Voltmeter

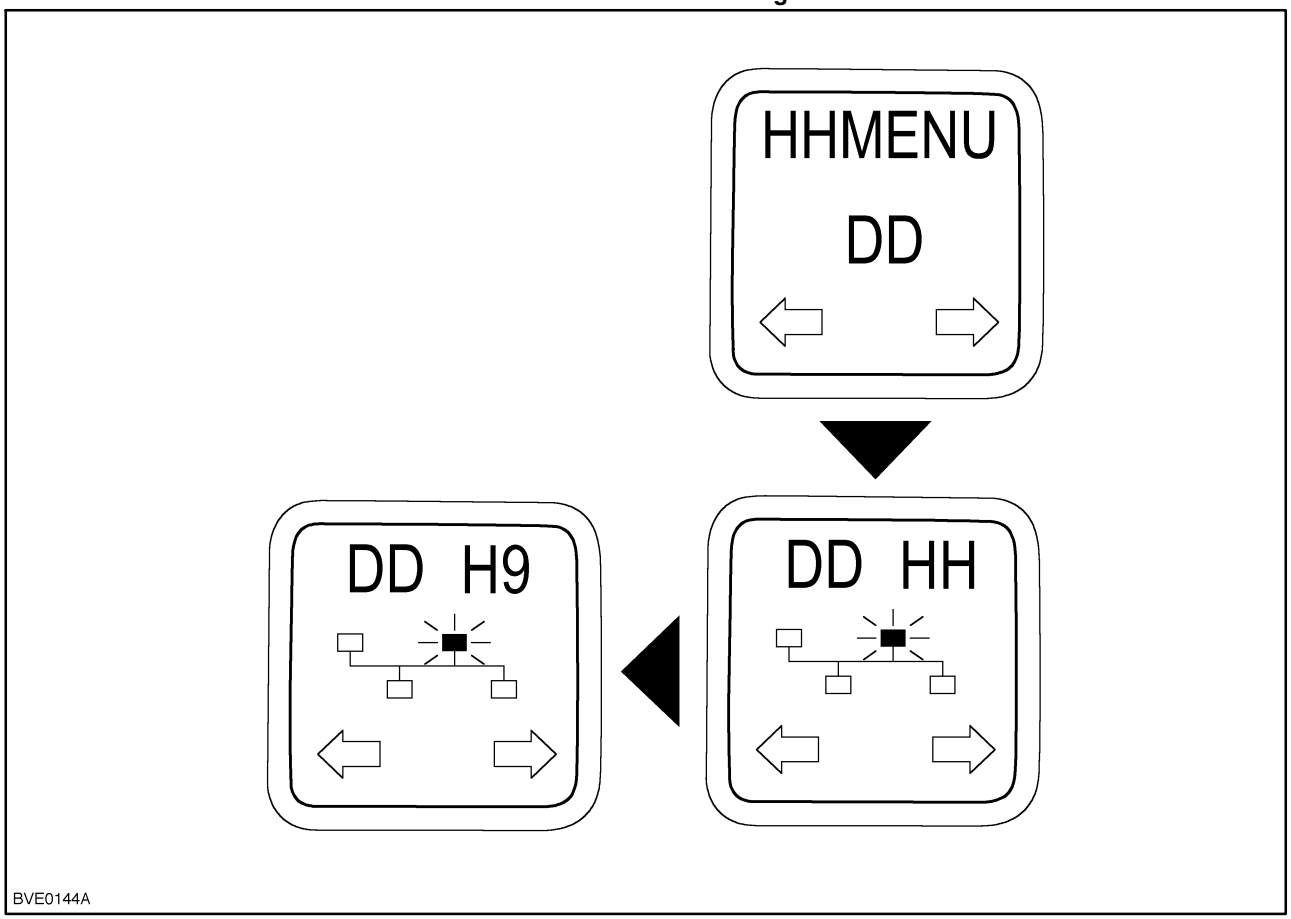
This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits.

If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

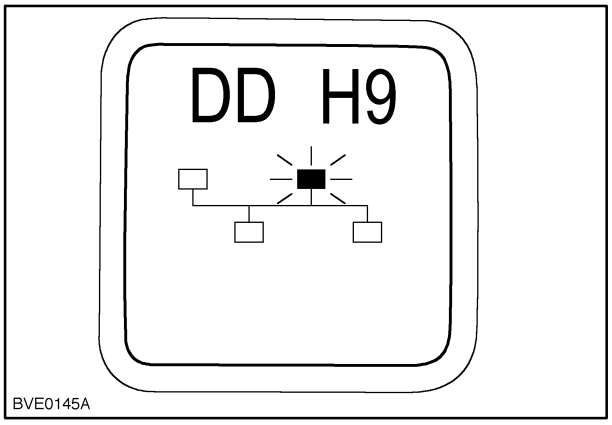
Common to all sub-systems.

H9 Menu Screen Select Diagram



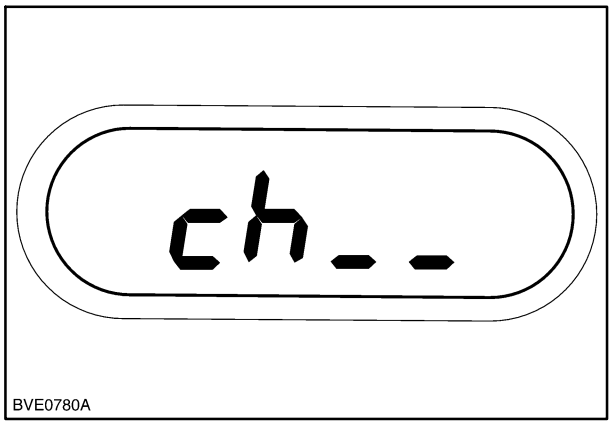
202

Select the H9 menu by depressing the dimming key.



203

The lower central display will display “ch _ _”.



204

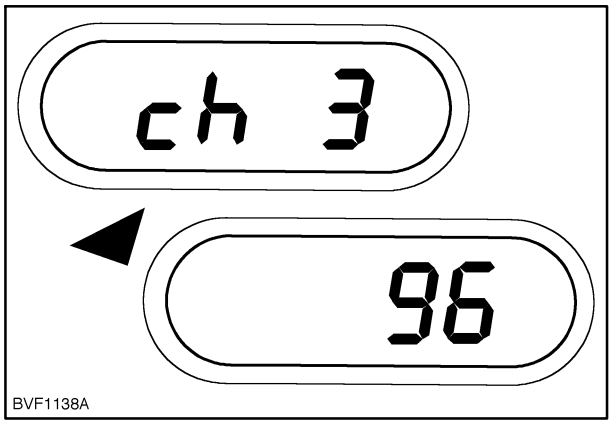
The required channel can be selected by using the “h” and “m” keys.

After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to 0 volts.*

If the value displayed varies by more than 10% to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



205

Channel	Description	Typical Reading	Notes
3	Fuse 12 sense	96	
4	Programming voltage Vpp	22	
5	5 Volts sensor supply	49	
6	8 Volts sensor supply	79	
7	+12 Volt VF input (See explanation)	44	
8	+12 Volt VD input (See explanation)	41 clutch pedal up, FNR in gear 0 clutch pedal down, FNR in neutral	Tractor will drive if the engine is running
9	+12 Volt VH input (See explanation)	44	
10	+12 Volt VT input (See explanation)	44	
18	Engine rev/min	100% @ 3000 rev/min	
19	Wheel speed	100% @ 50 Km/h	

Channel	Description	Typical Reading	Notes
20	Remote 1 lever position potentiometer	40 Lower (retract) 10 Raise (extend) 50 Float 25 Neutral	
21	Remote 2 lever position potentiometer	40 Lower (retract) 10 Raise (extend) 50 Float 25 Neutral	
22	Remote 3 lever position potentiometer	40 Lower (retract) 10 Raise (extend) 50 Float 25 Neutral	
23	Remote 4 lever position potentiometer	40 Lower (retract) 10 Raise (extend) 50 Float 25 Neutral	
24	Remote joystick X axis (left to right)	40 Lower (retract) 10 Raise (extend) 25 Neutral	
25	Remote joystick Y axis (forward to backwards)	40 Lower (retract) 10 Raise (extend) 25 Neutral	
26	Front axle position	120 Lowest 950 Highest	
27	Front hitch height control	0 Lowest 99 Highest	
28	Front hitch position	10 Lowest 90 Highest	

Explanations:

VF Input: This is the input voltage into the controller to suspended front axle components, i.e. Front axle lower and lockout solenoids.

VD Input: This is the input voltage into the controller to suspended front axle raise solenoid.

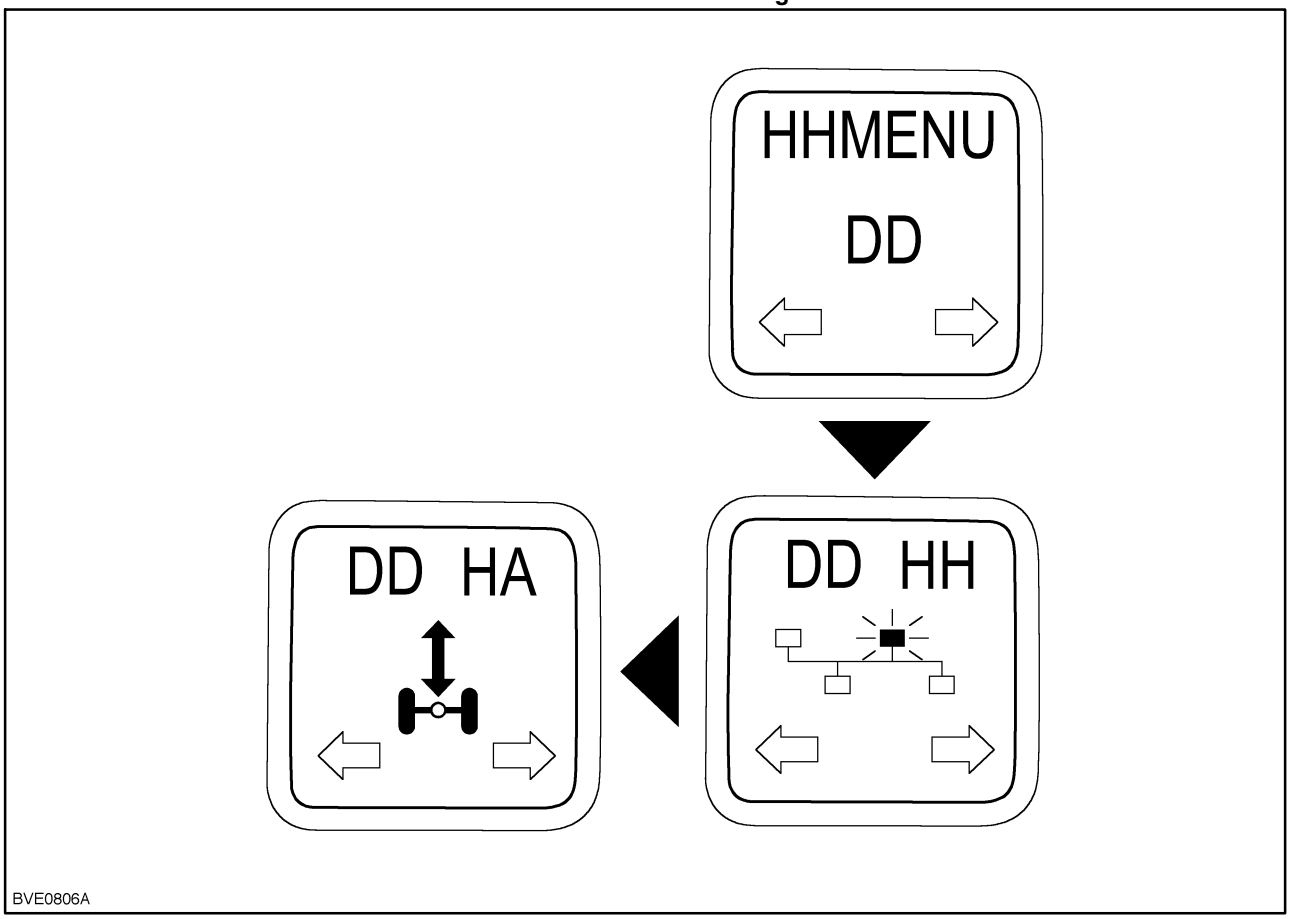
VH Input: This is the input voltage into the controller to front PTO and front hitch components, i.e. Front PTO solenoid and front hitch height solenoid.

VT Input: This is a second input voltage into the controller.

HA - Demonstration Menu

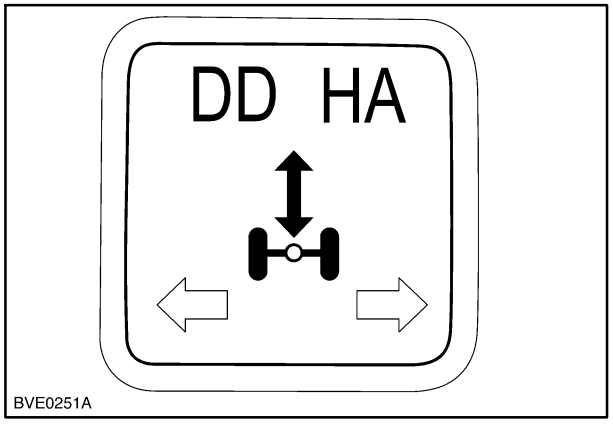
Used to demonstrate front axle suspension.

HA Menu Screen Select Diagram



206

Select the HA menu by depressing the “dimming” key.

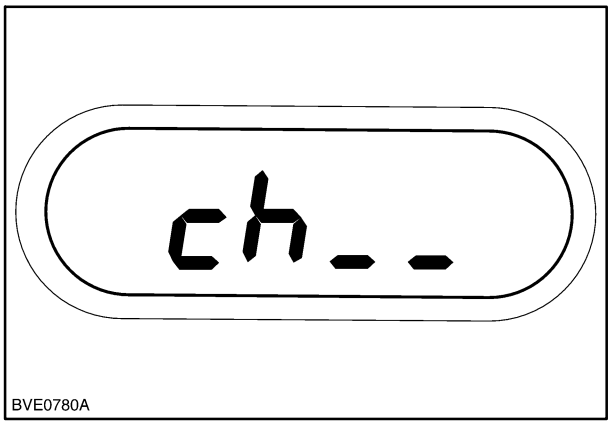


207

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of the channel).



208

Channel	Description
Ch 1	Front Axle Suspension demonstration

Channel 1 - Front Axle Suspension Demonstration

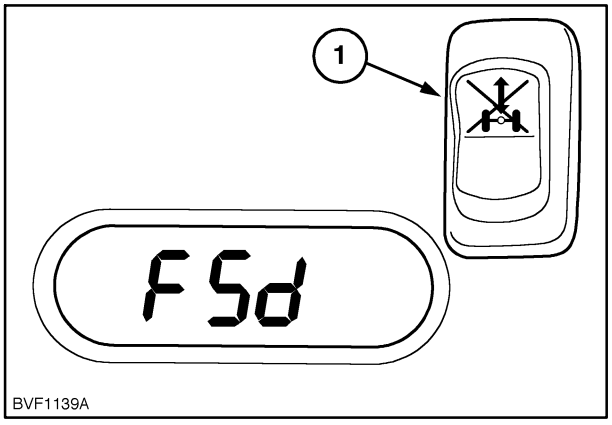
This demonstration mode allows the suspension to be locked at speeds above the normal 12 Km/h automatic engagement parameter.

The lower central display will display “FSd” (Front Axle Suspension demonstration).

Start the engine and operate the vehicle to demonstrate front axle suspension.

Use the lockout switch (1) to lock the suspension as normal. The light in the switch will be illuminated to indicate the front axle suspension had been locked.

NOTE: *Front axle suspension demonstration will be disabled after turning the keystart OFF.*

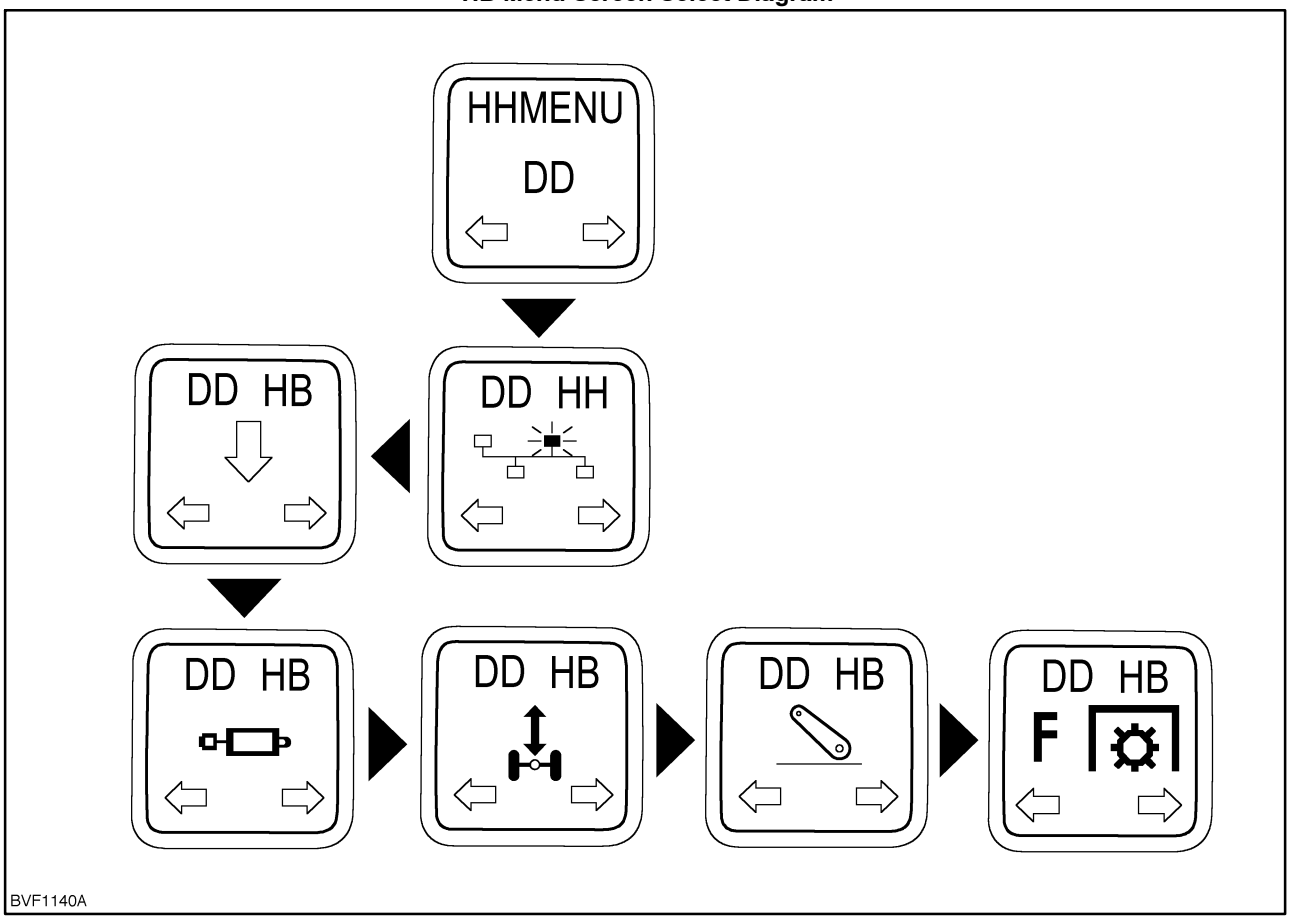


209

HB - Display Stored Fault Codes

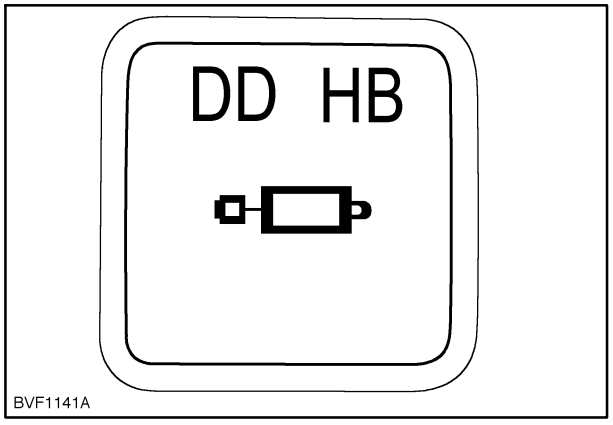
This menu is used to display fault codes which are stored in the EEPROM of the controller. Common to all sub-systems.

HB Menu Screen Select Diagram



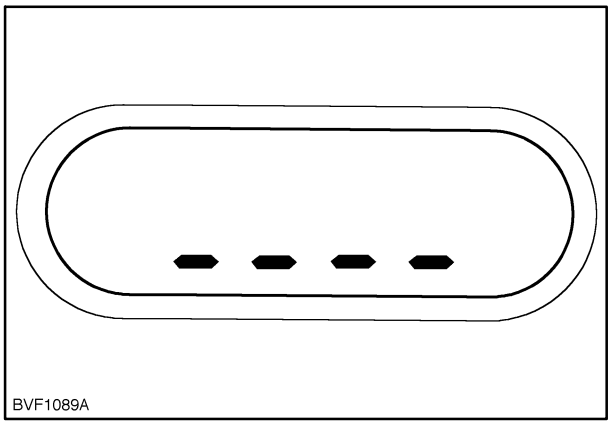
210

Select the HB menu by depressing the “dimming” key.



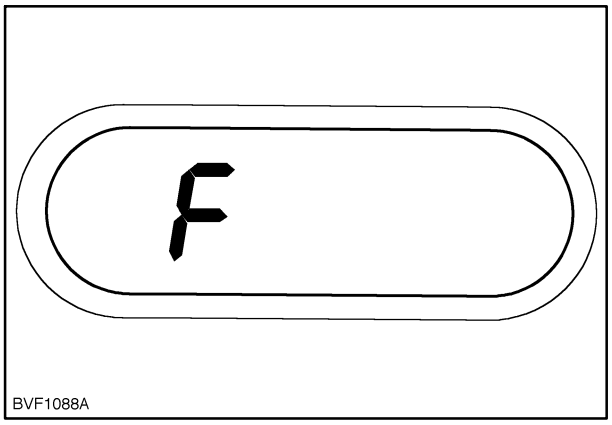
211

The lower central display will display "_ _ _ _", if no fault code is stored in the selected sub-system.



212

The lower central display will display "F", if a fault code is stored in the selected sub-system.



213

The lower central display will automatically cycle through as the example:

4180 . . . . . Fault code

01 . . . . . Hour of first occurrence

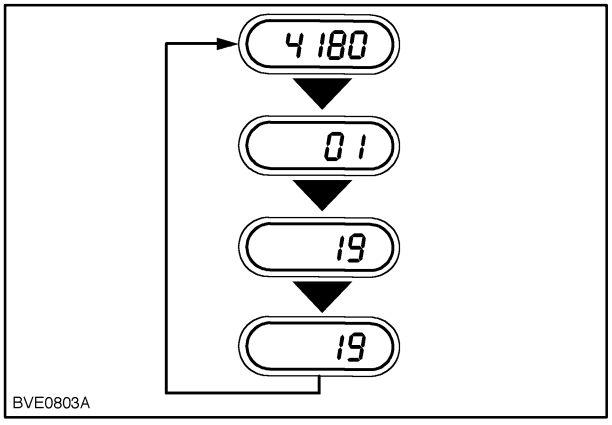
19 . . . . . Hour of last occurrence

19 . . . . . Number of occurrences of the fault

Depress the "h" or "m" key to change to the next fault code in the list.

The lower central display will display "_ _ _" at the end of the list.

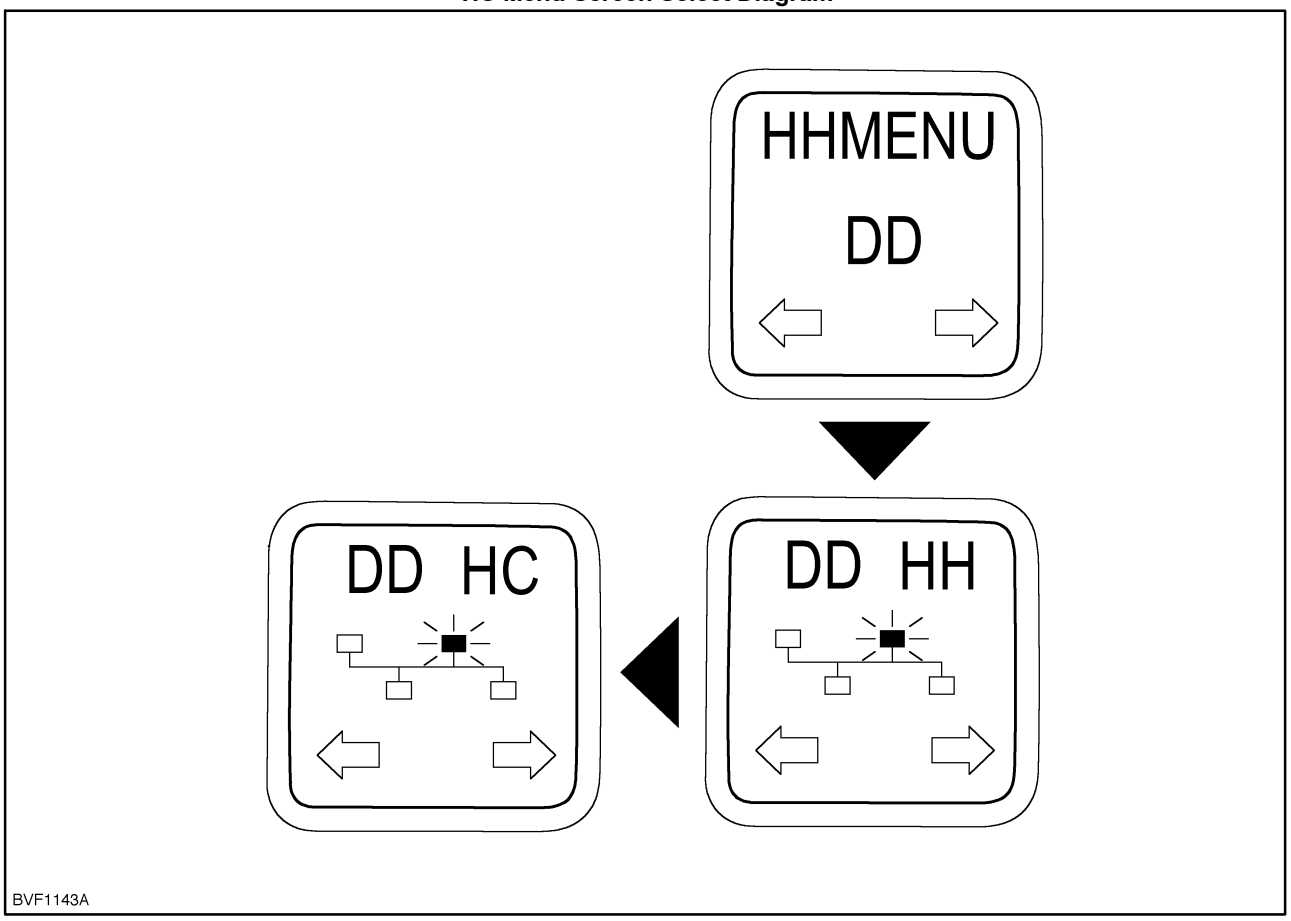
Depress the "dimming" key to continue navigating through the "HH" menus.



214

HC - Clear Stored Fault Codes

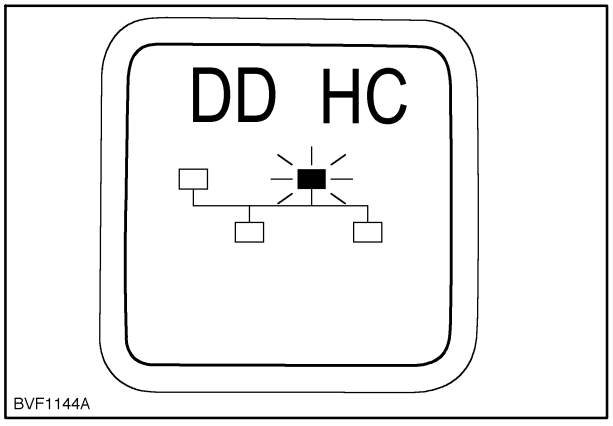
HC Menu Screen Select Diagram



215

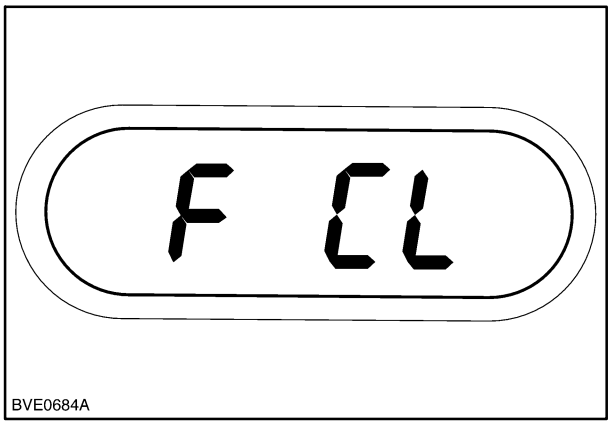
NOTE: *Always make a note of the fault codes stored, before clearing.*

Select the HC menu by depressing the “dimming” key.



216

The lower central display will display “F CL”.



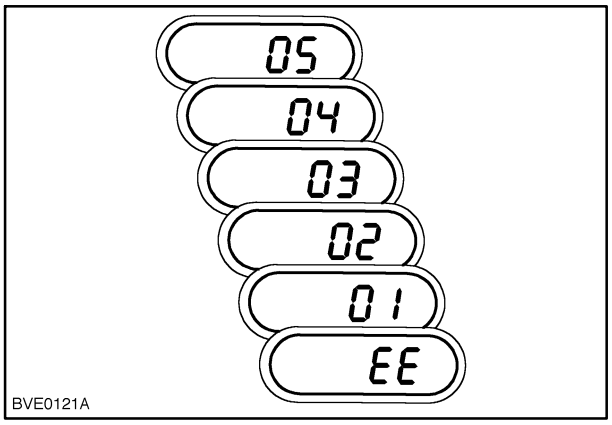
217

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the clearing of the memory.

NOTE: *The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the fault codes have been cleared.*

Depress the “dimming” key to continue navigating through the “HH” menus.

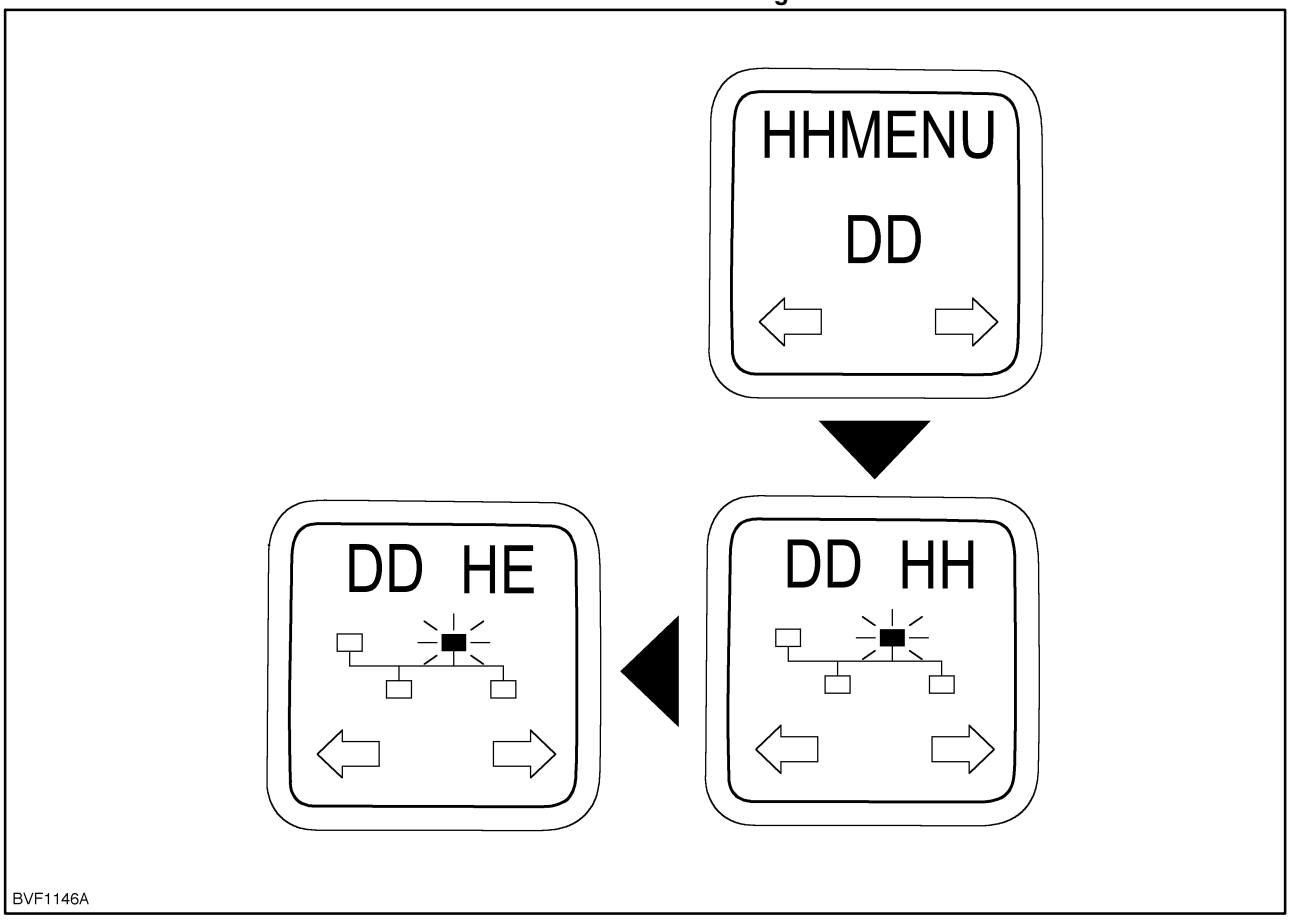


218

HE - Display All Speed Inputs

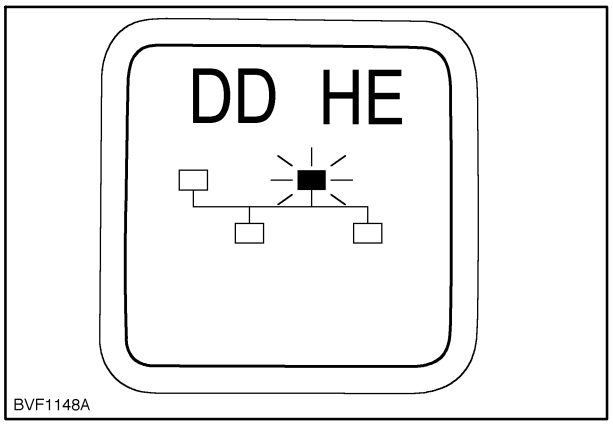
Common to all sub-systems.

HE Menu Screen Select Diagram



219

Select the HE menu by depressing the “dimming” key.



220

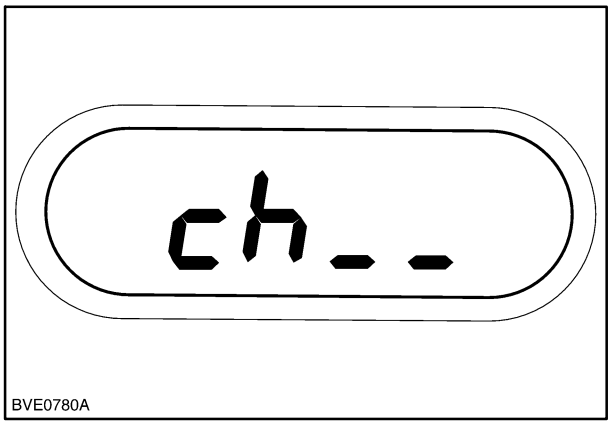
The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

Refer to the table below for the available channels.

After a delay the value will be displayed.

Depress the “dimming” key to continue navigating through the “HH” menus.



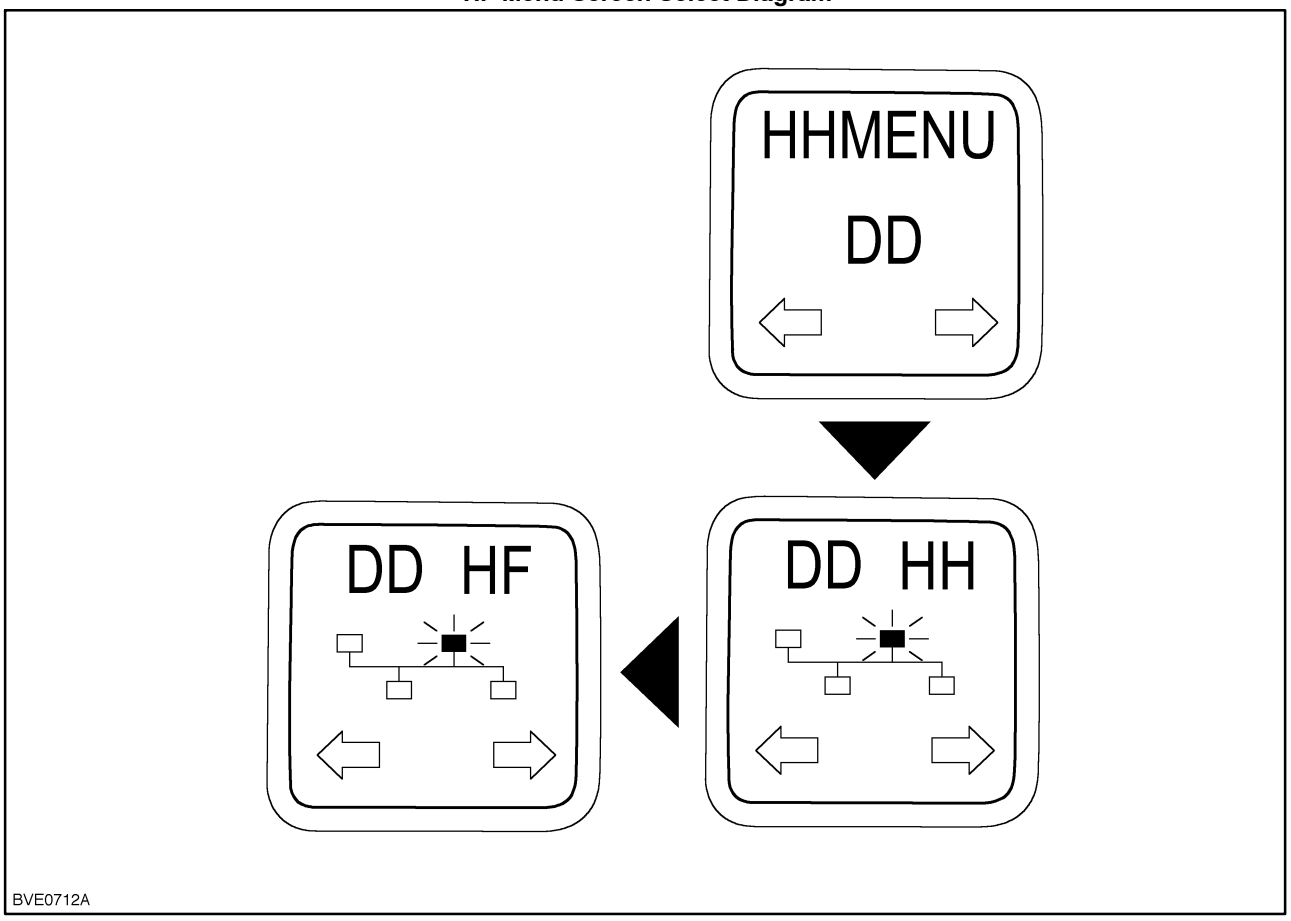
221

Channel	Description	Typical Reading	Notes
0	Not used		
1	Not used		
2	Not used		
3	Not used		
4	Front PTO speed		
5	Not used		
6	Not used		
7	Not used		
8	Not used		

HF - View Controller Hardware Information

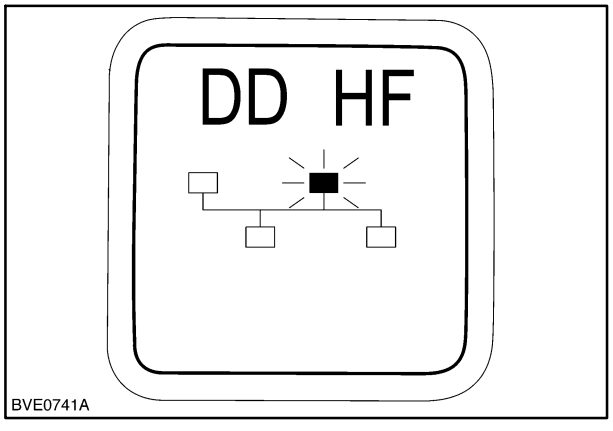
This menu allows the hardware identification, hardware version and serial number to be displayed. Common to all sub-systems.

HF Menu Screen Select Diagram



222

Select the HF menu by depressing the “dimming” key.



223

The lower central display will automatically cycle through as the example:

517 . . . . . Hardware identification

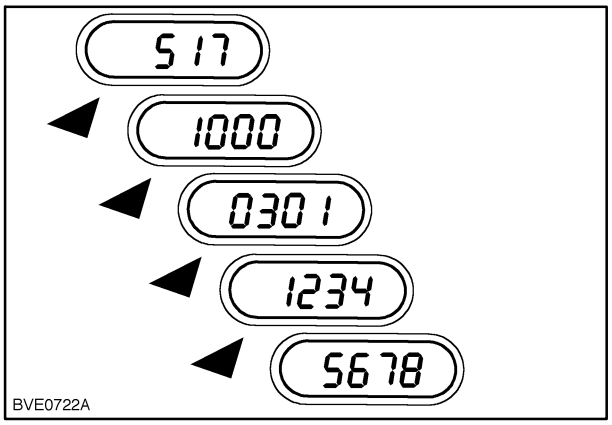
1000 . . . . . Hardware version

0301 . . . . . Hardware version

1234 . . . . . Serial number

5678 . . . . . Serial number

and return to allow navigation of the “HH” menus.



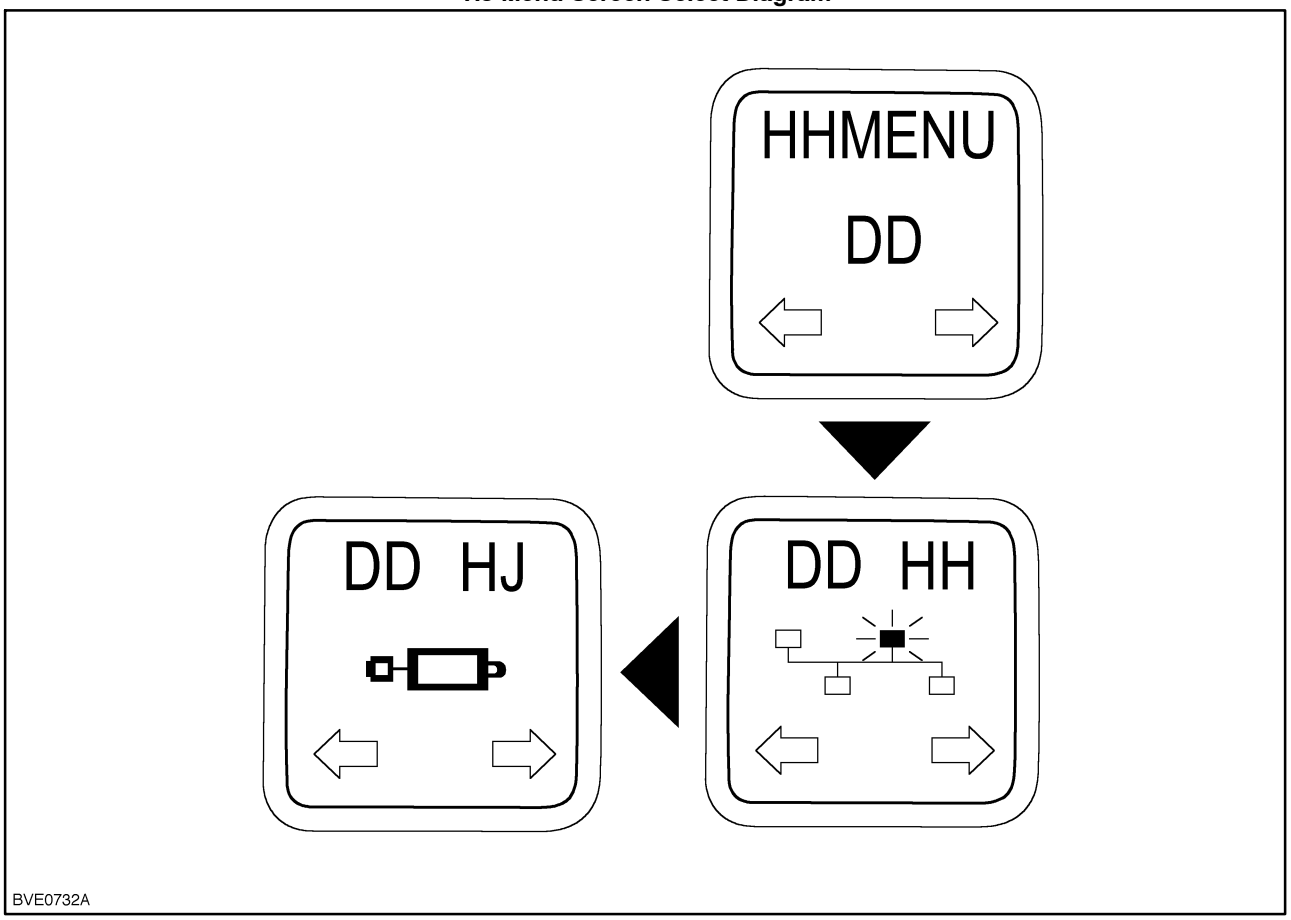
224

HJ - Electronic Hydraulic Remote Control Valve Set-Up

This menu allows the Electronic Hydraulic Remote (EHR) control valve numbers to be reset.

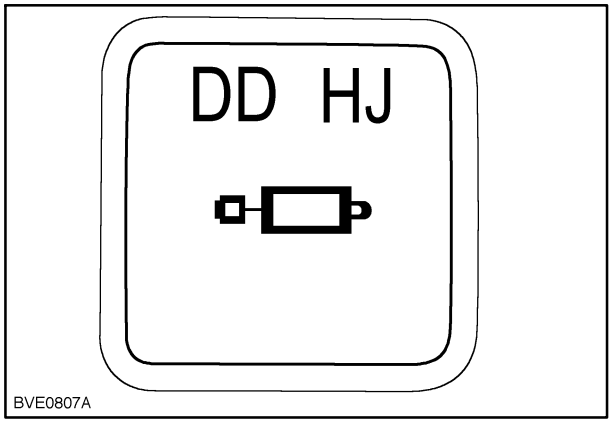
The EHR valve stores a number to indicate its position in the remote control valve stack, i.e. valve number 1,2,3, or 4.

HJ Menu Screen Select Diagram



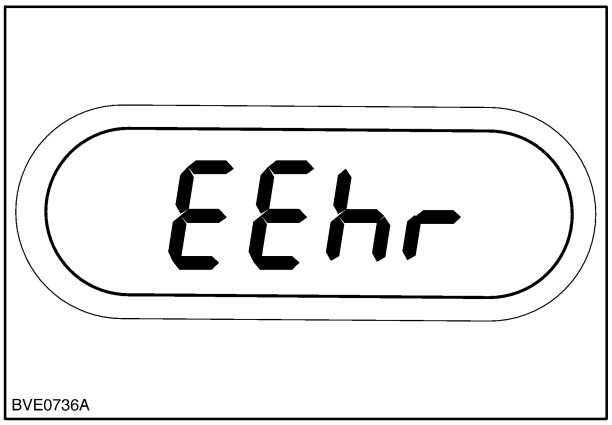
225

Select the HJ menu by depressing the “dimming” key.



226

The lower central display will display “EEhr”.



227

⚠ CAUTION ⚠

HJ will clear all the EHR valve numbers.

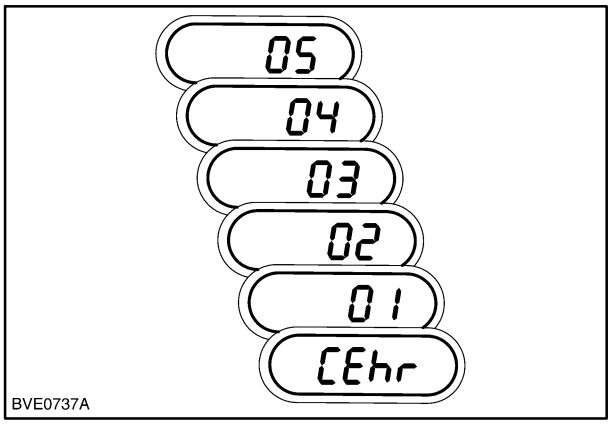
NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the resetting of the valve numbers.

The lower central display will countdown from 05 to 01, then “CEhr” will be displayed to indicate the valve numbers have been reset.

Turn the keystart OFF.

Refer to the calibrations chapter of the electrical systems section for a detailed explanation of EHR valve number programming.



228

GA CONTROLLER H ROUTINES

GA - 12x12 PTO Controller **-** Rear PTO, Differential Lock, Four Wheel Drive

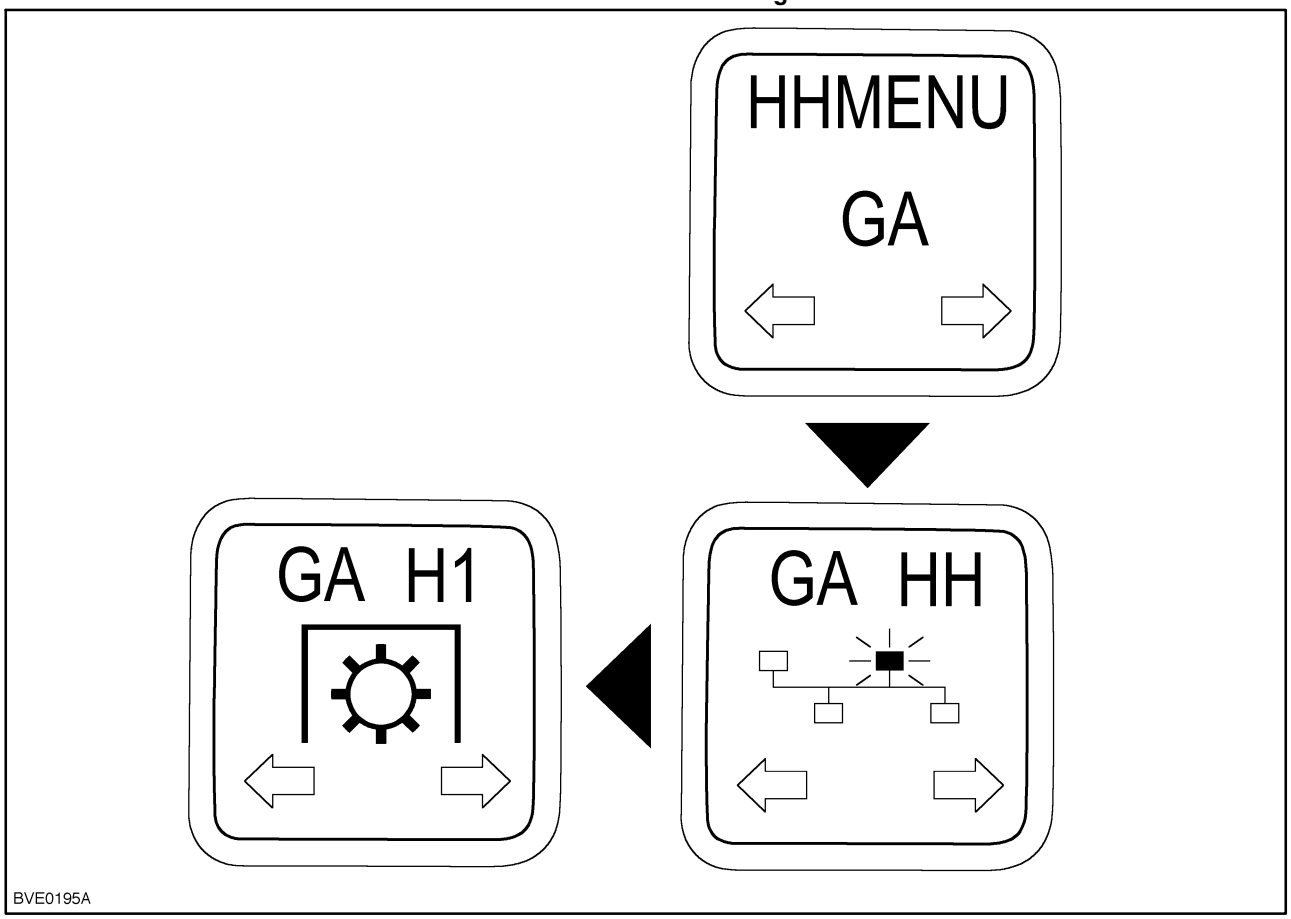
HH	Service Menu	Page
H1	Calibration procedures	129
H2	View stored calibration values	130
H3	Configurations	132
H4	View software revision level	136
H5	Switch operation test	138
H6	Not used	-
H7	Not used	-
H8	Clear Electrical Erasable Programmable Read Only Memory (EEPROM)	140
H9	Voltmeter	142
HA	Not used	-
HB	Display stored fault codes	144
HC	Clear stored fault codes	146
HD	Not used	-
HE	Display all speed inputs	148
HF	View controller hardware information	150

H1 - Calibration Procedures

This menu is used to calibrate:

1. Rear PTO clutch

H1 Menu Screen Select Diagram



229

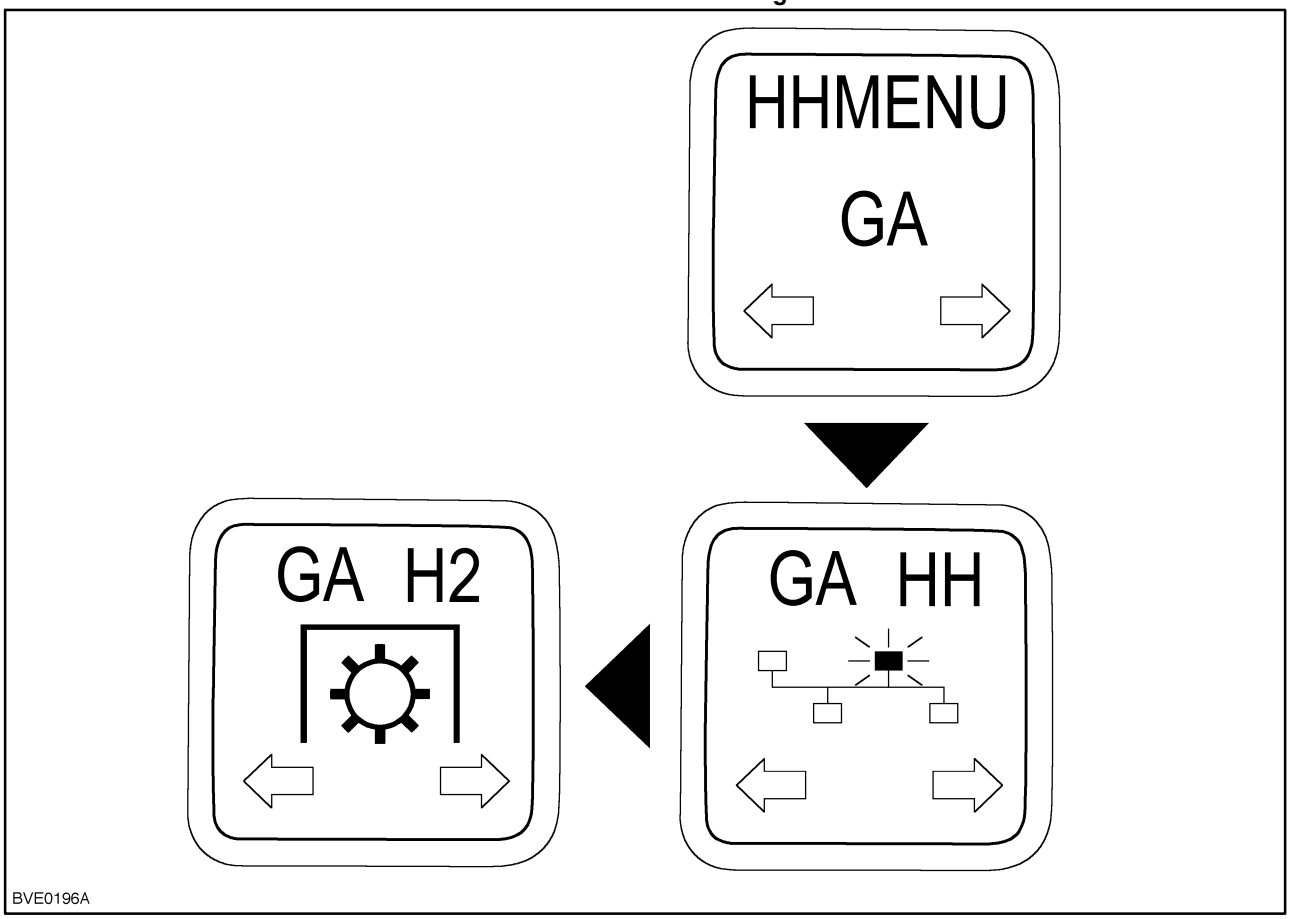
Refer to the calibrations chapter of the electrical systems section for detailed explanation of each system.

H2 - View Stored Calibration Values

This menu is used to display the calibration values stored in the controllers for:

1. Rear PTO clutch

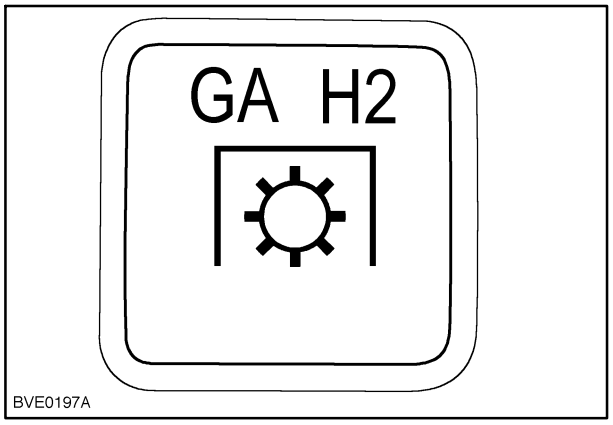
H2 Menu Screen Select Diagram



230

PTO VALUES

Select the PTO sub-system by depressing the "dimming" key.



231

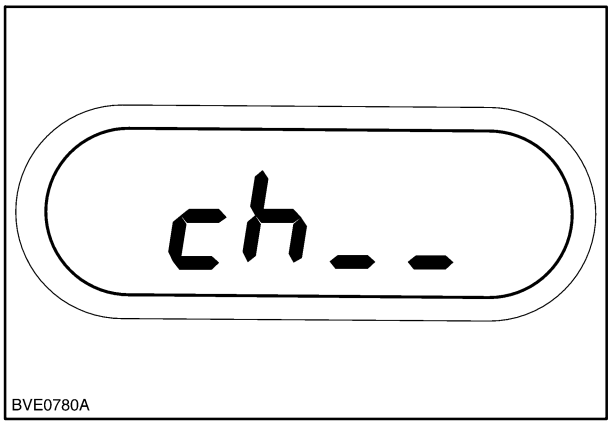
NOTE: *The default calibration value is 280 for the PTO solenoid.*

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the calibration value will be displayed. (see the table below for the description of each channel).

Depress the “dimming” key to continue navigating through the “HH” menus.



232

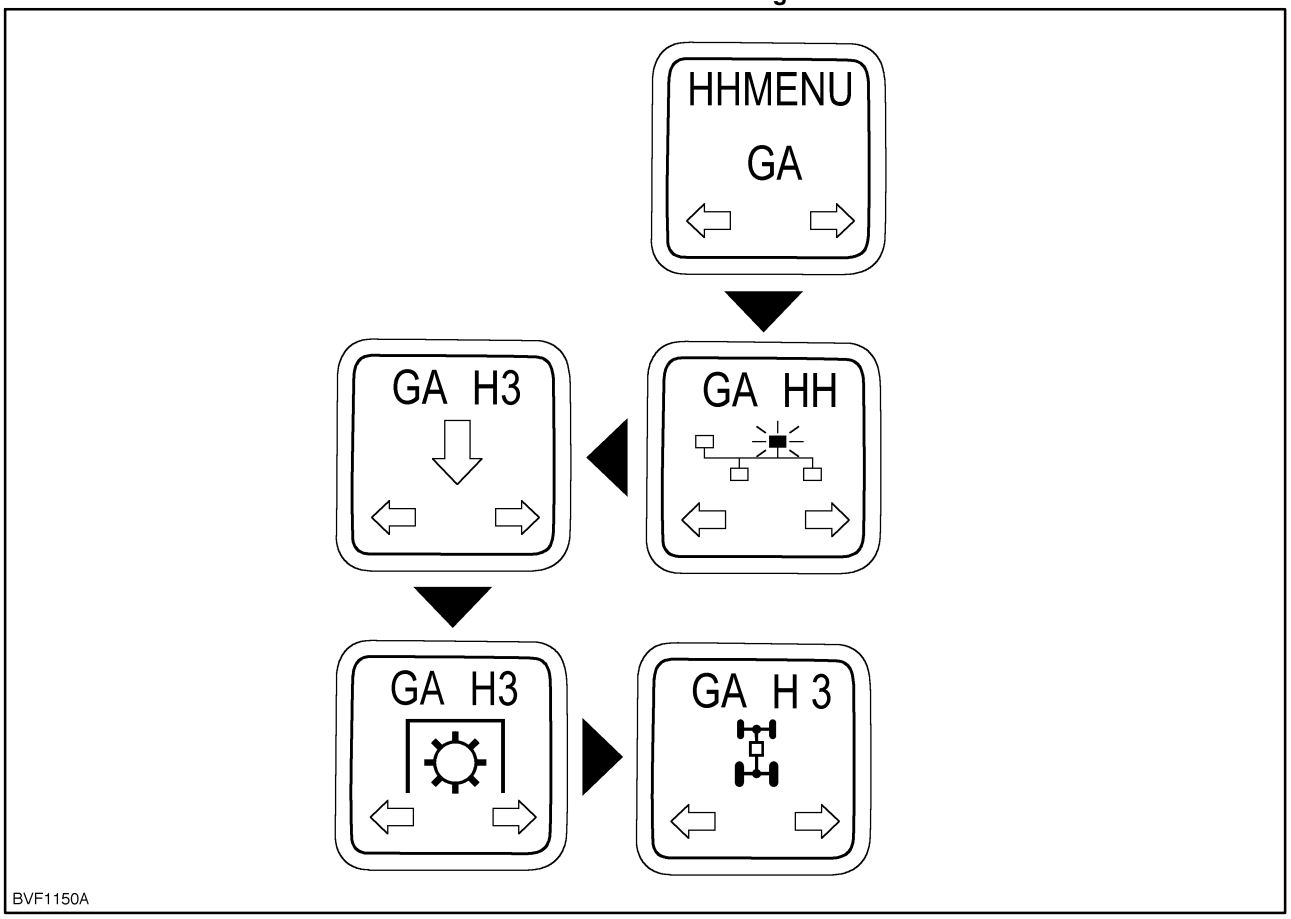
Channel	Description	Value Range
Ch 1	PTO oil temperature	10 - 120
Ch 2	PTO solenoid	100 - 450

H3 - Configurations

This menu is used to display the configurations available for:

1. Four Wheel Drive
   - Four wheel braking engagement speed selection
2. Rear PTO
   - PTO clutch calibration adjustment
   - PTO quickfill time adjustment

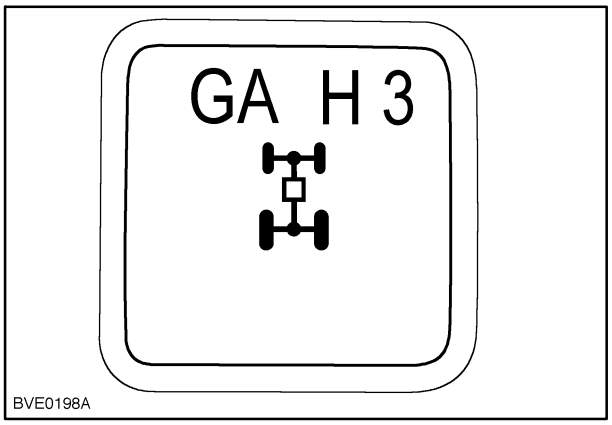
H3 Menu Screen Select Diagram



233

Four Wheel Drive Options

Select the four wheel drive sub-system by depressing the dimming key.

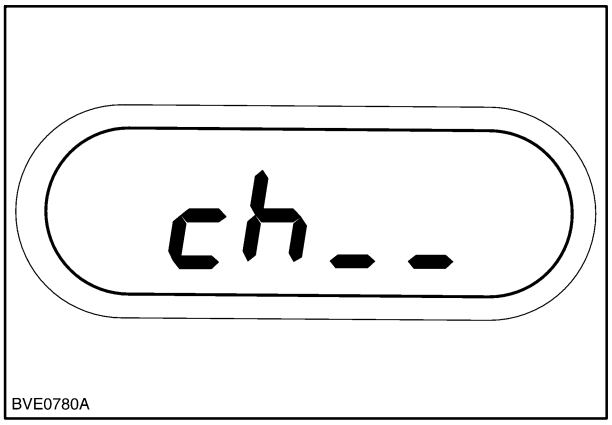


234

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of the channel).



235

Channel Number	Description
Ch 2	Four wheel braking engagement speed selection

Channel 2 - Four Wheel Braking Engagement Speed Selection

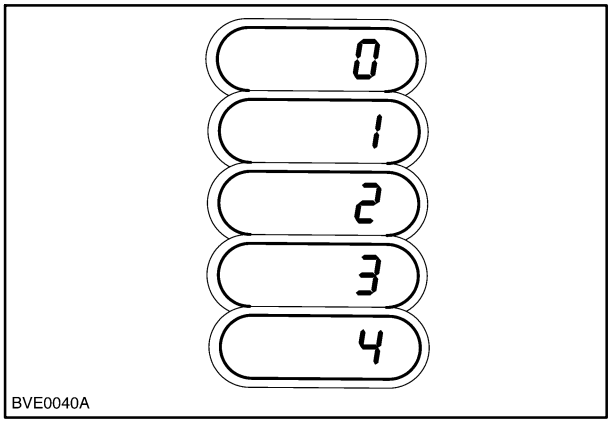
The options correspond to the ground speed, below which four wheel braking will not occur.

Scroll through the available options using the “h” or “m” key.

Refer to the table below for the available options.

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.

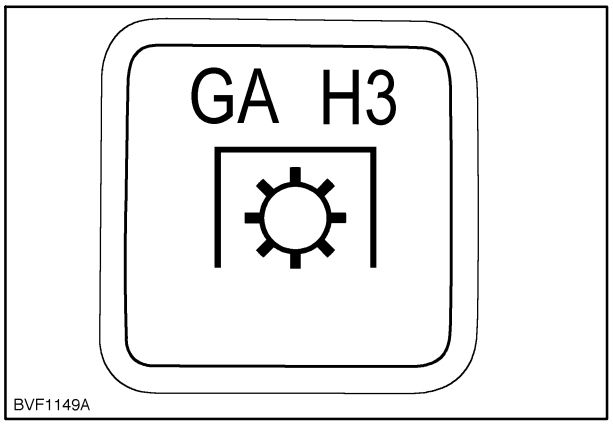


236

	Option 0	Option 1	Option 2	Option 3	Option 4
Four wheel braking engagement, if wheel speed is greater than or equal to:	**Default** 6 Km/h	4.8 Km/h	3.2 Km/h	1.6 Km/h	0 Km/h

Rear PTO Options

Select the PTO sub-system by depressing the dimming key.

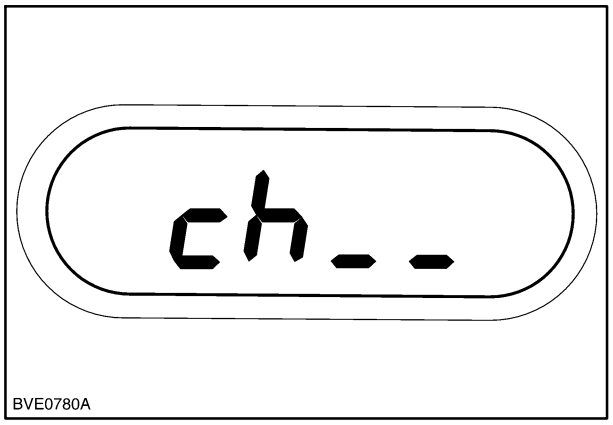


237

The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

After a delay the current setting will be displayed. (see the table below for the description of each channel).



238

Channel	Description
Ch 3	PTO clutch calibration adjustment
Ch 4	PTO quickfill time adjustment

Channel 3 - PTO Clutch Calibration Adjustment

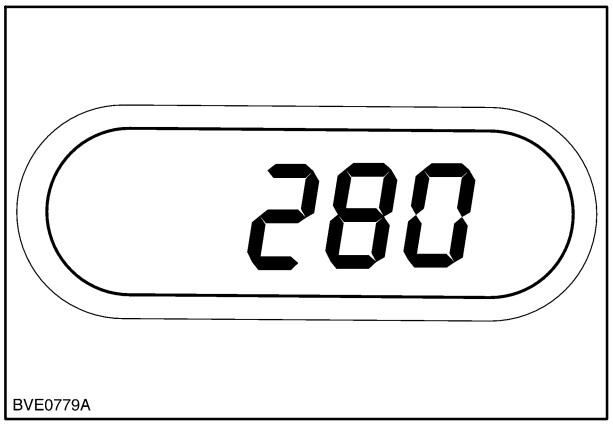
This channel is used to manually adjust the calibration value to optimize the PTO engagement.

The lower central display will change to display the current clutch calibration setting.

Use the “h” or “m” key to increase or decrease the calibration setting.

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

Depress the “dimming” key to continue navigating through the “HH” menus.



239

Channel 4 - PTO Clutch Quickfill Time Adjustment (fine tuning if required)

Allows the amount of time to fill the clutch pack to be adjusted.

Too much quickfill will cause a noticeable clutch engagement noise.

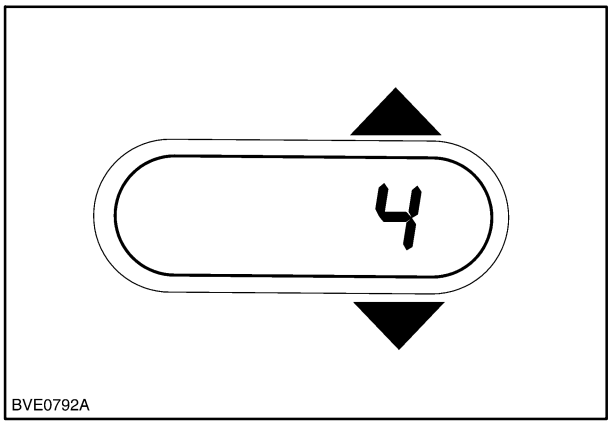
Too little quickfill will cause a slow response.

The lower central display will change to display the clutch and the current quickfill setting.

Use the “h” or “m” key to adjust the quickfill setting within the range of 3 to 10 (30 to 100 ms).

Depress and hold the “h” or “m” key to store the selection, an audible tone will be heard to confirm the selection.

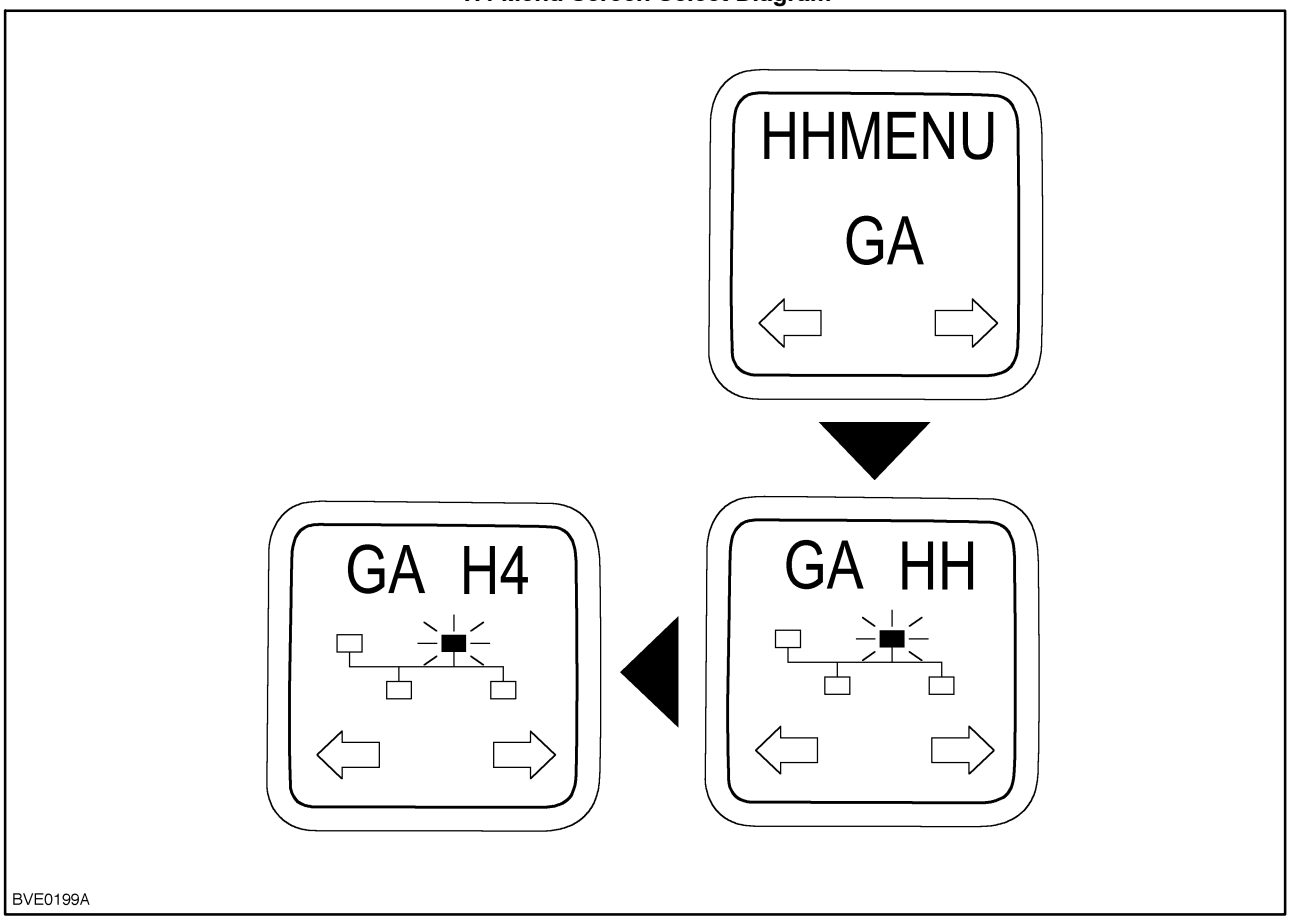
Depress the “dimming” key to continue navigating through the “HH” menus.



240

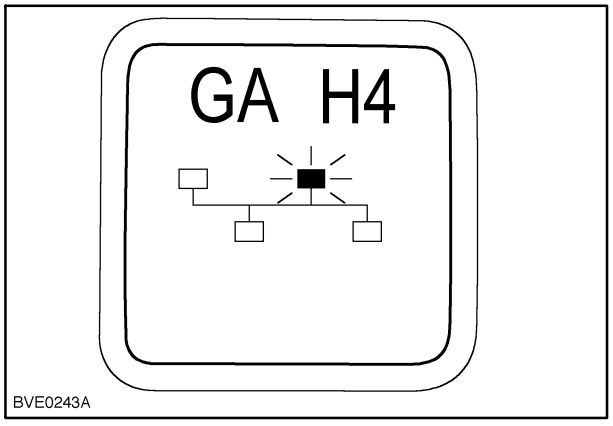
H4 - View Software Revision Level

H4 Menu Screen Select Diagram



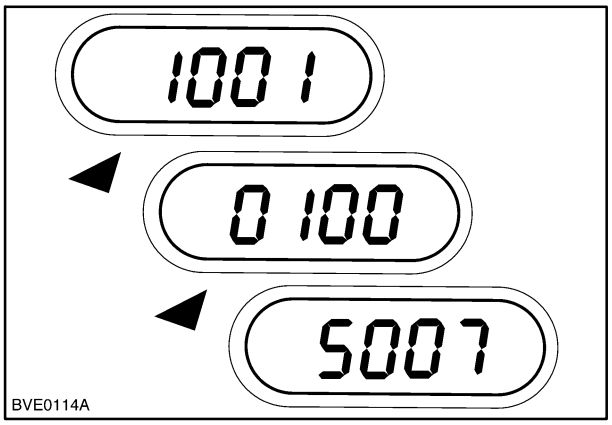
241

Select the H4 menu by depressing the “dimming” key.



242

The lower central display will automatically cycle through the software release, as the example shown and return to allow navigation of the “HH” menus.

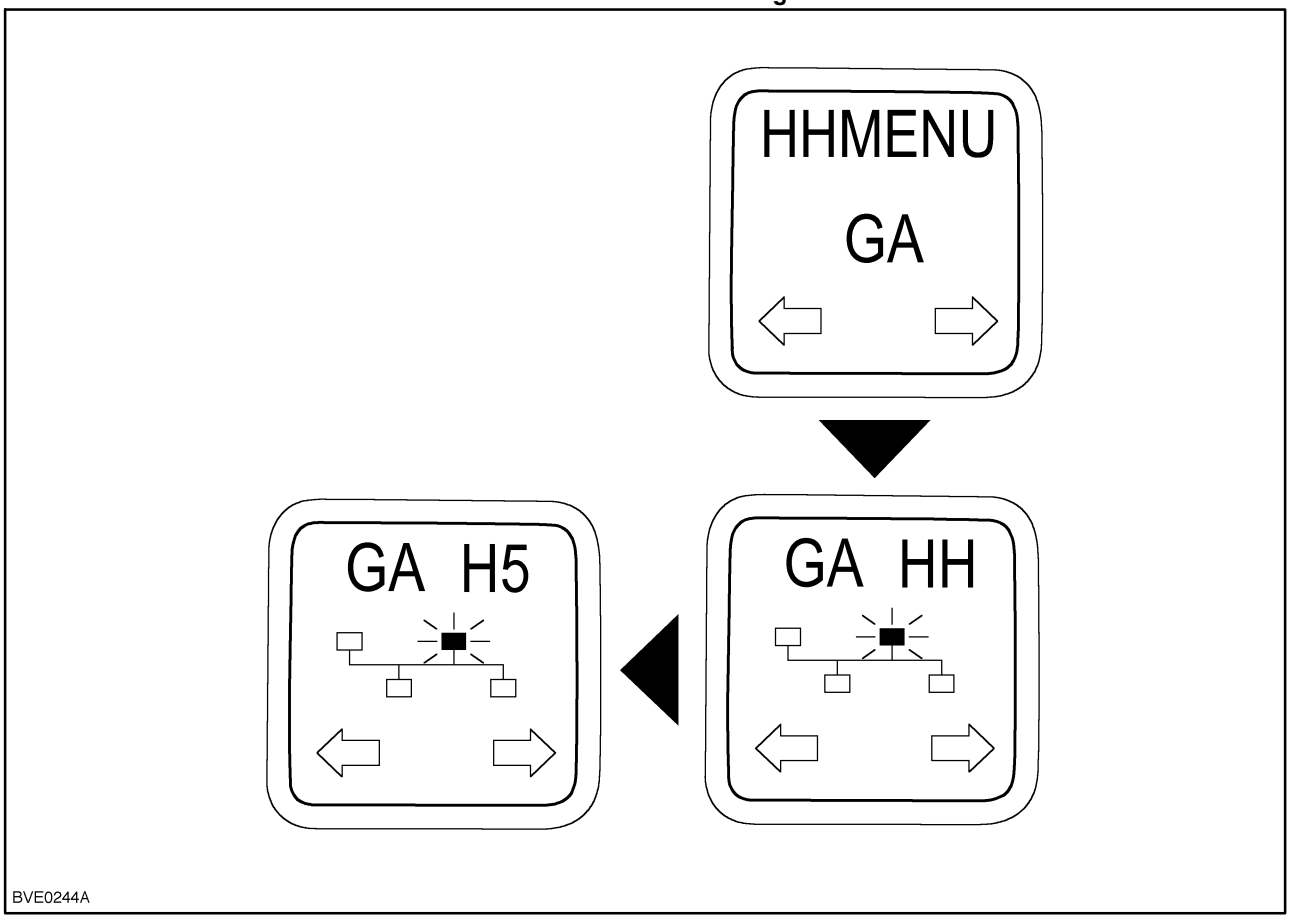


243

H5 - Switch Operation Test

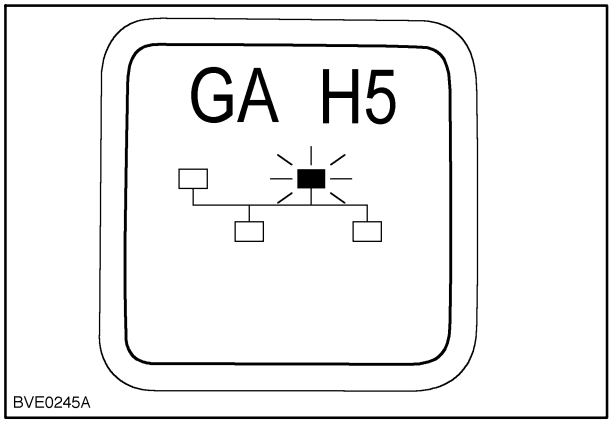
This menu displays a designated code when a switch transition is detected.

H5 Menu Screen Select Diagram



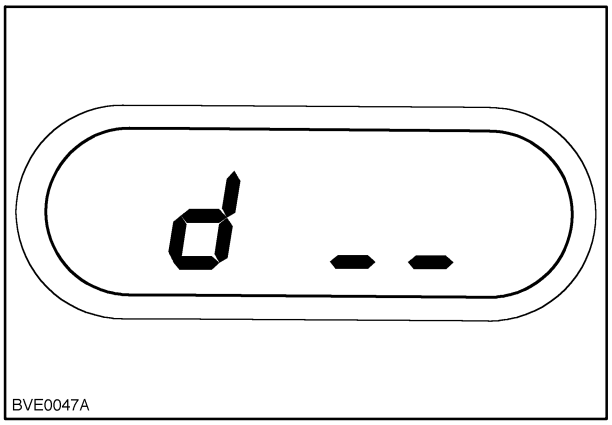
244

Select the H5 menu by depressing the “dimming” key.



245

The lower central display will display “d _ _”.

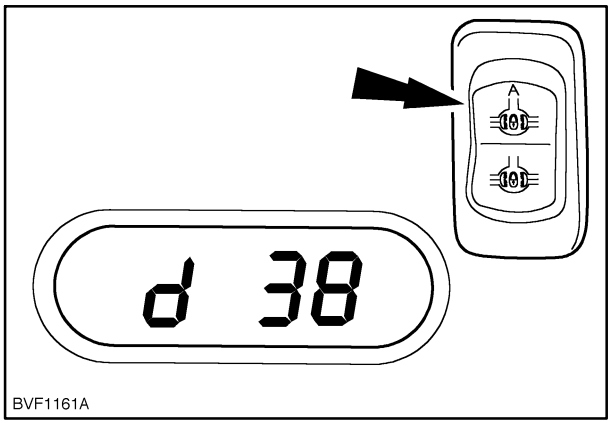


246

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.

If a switch code is not displayed and the audible tone not heard, a ’wiggle’ test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.

NOTE: *If the keystart switch is turned to the “crank” position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*



247

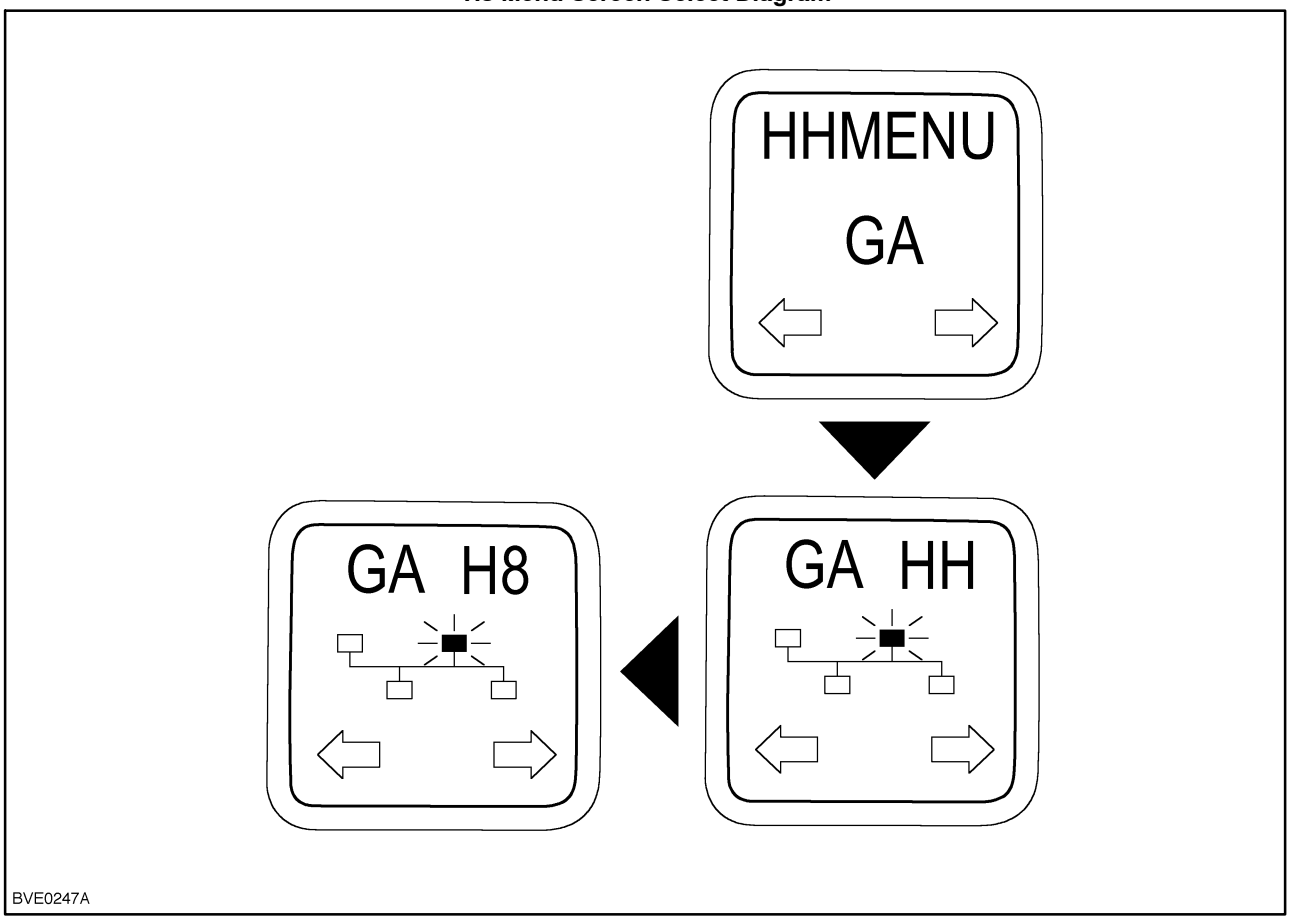
Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d0	No switch or two switches activated at the same time			
d10	C339	9	Seat switch	-
d11	C081	7	Handbrake switch	-
d12	C339	15	Left foot brake switch	-
d13	C339	23	Right foot brake switch	-
d38	C339	24	Differential lock switch - automatic	-
d39	C339	17	Differential lock switch - manual	-
d41	C339	34	Four wheel drive switch - manual	-
d42	C339	25	Four wheel drive switch - automatic	-
d44	C339	22	Rear PTO switch - normally open	-
d45	C339	31	Rear PTO switch - normally closed	-
d48	C339	16	Rear PTO ground speed switch	-
d61	C339	2	+12 VD Supply	Shuttle lever - Forward

H8 - Clear Electrical Erasable Programmable Read Only Memory (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default.

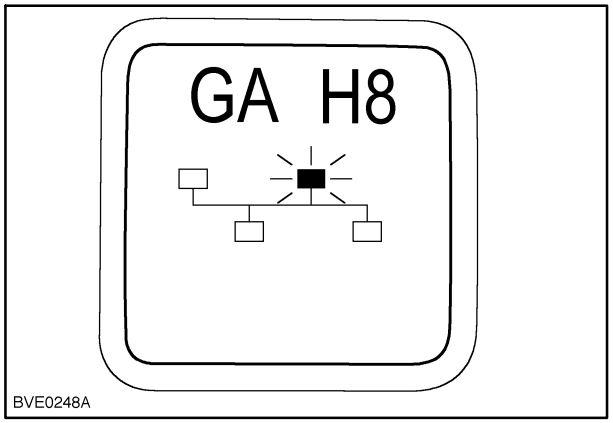
EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

H8 Menu Screen Select Diagram



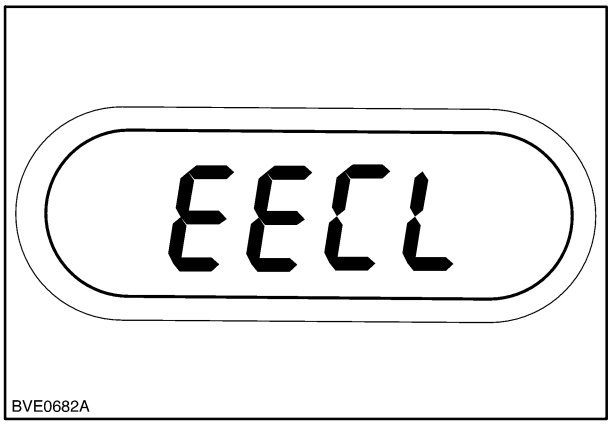
248

Select the H8 menu by depressing the “dimming” key.



249

The lower central display will display “EECL” .



250

⚠ CAUTION ⚠

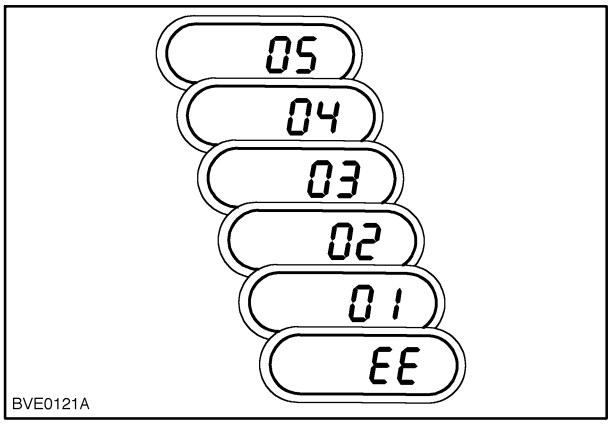
H8 will clear all calibrations values and stored error codes.

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the resetting of the EEPROM.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the EEPROM has been cleared.

Turn the keystart OFF.



251

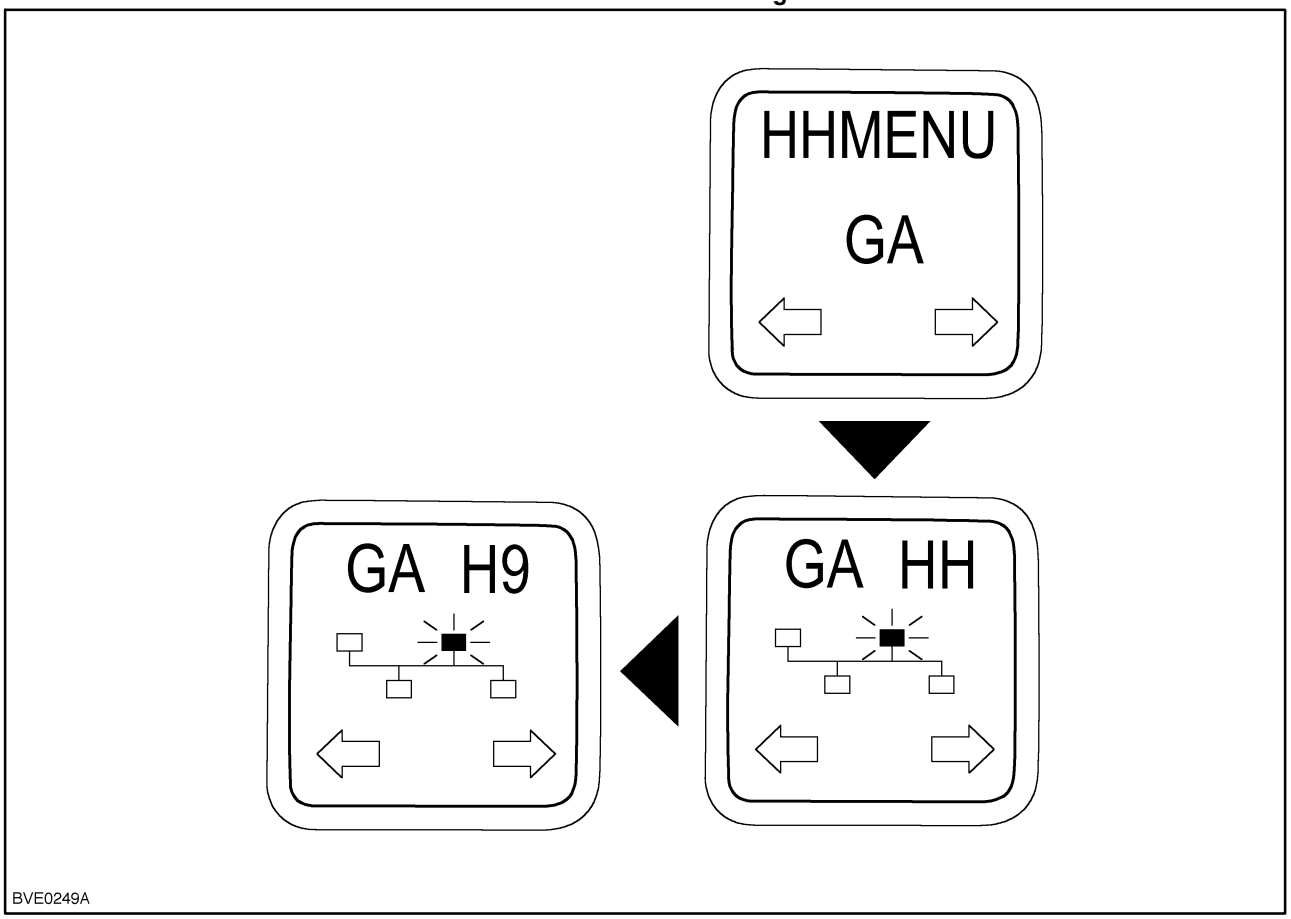
H9 - Voltmeter

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits.

If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

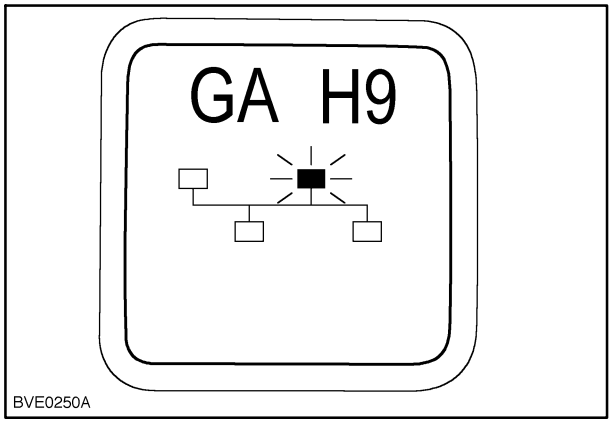
NOTE: *The vehicle may be driven while in this menu.*

H9 Menu Screen Select Diagram



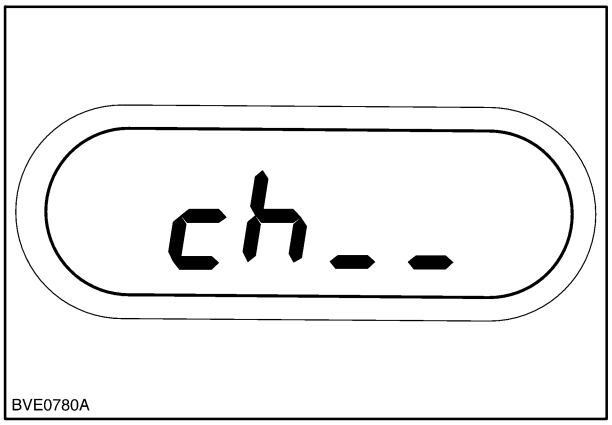
252

Select the H9 menu by depressing the "dimming" key.



253

The lower central display will display “ch _ _”.



254

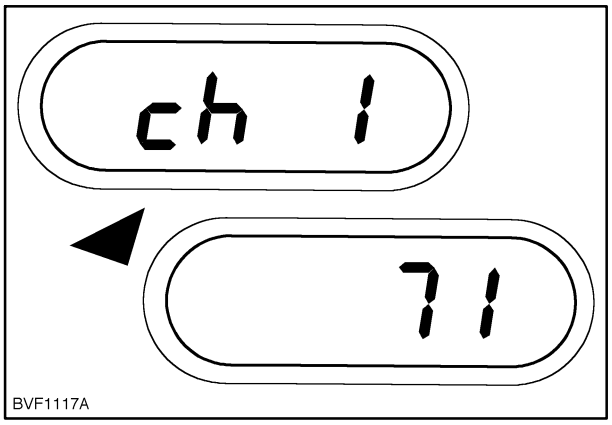
The required channel can be selected by using the “h” and “m” keys.

After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to 0 volts.*

If the value displayed varies by more than 10% to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



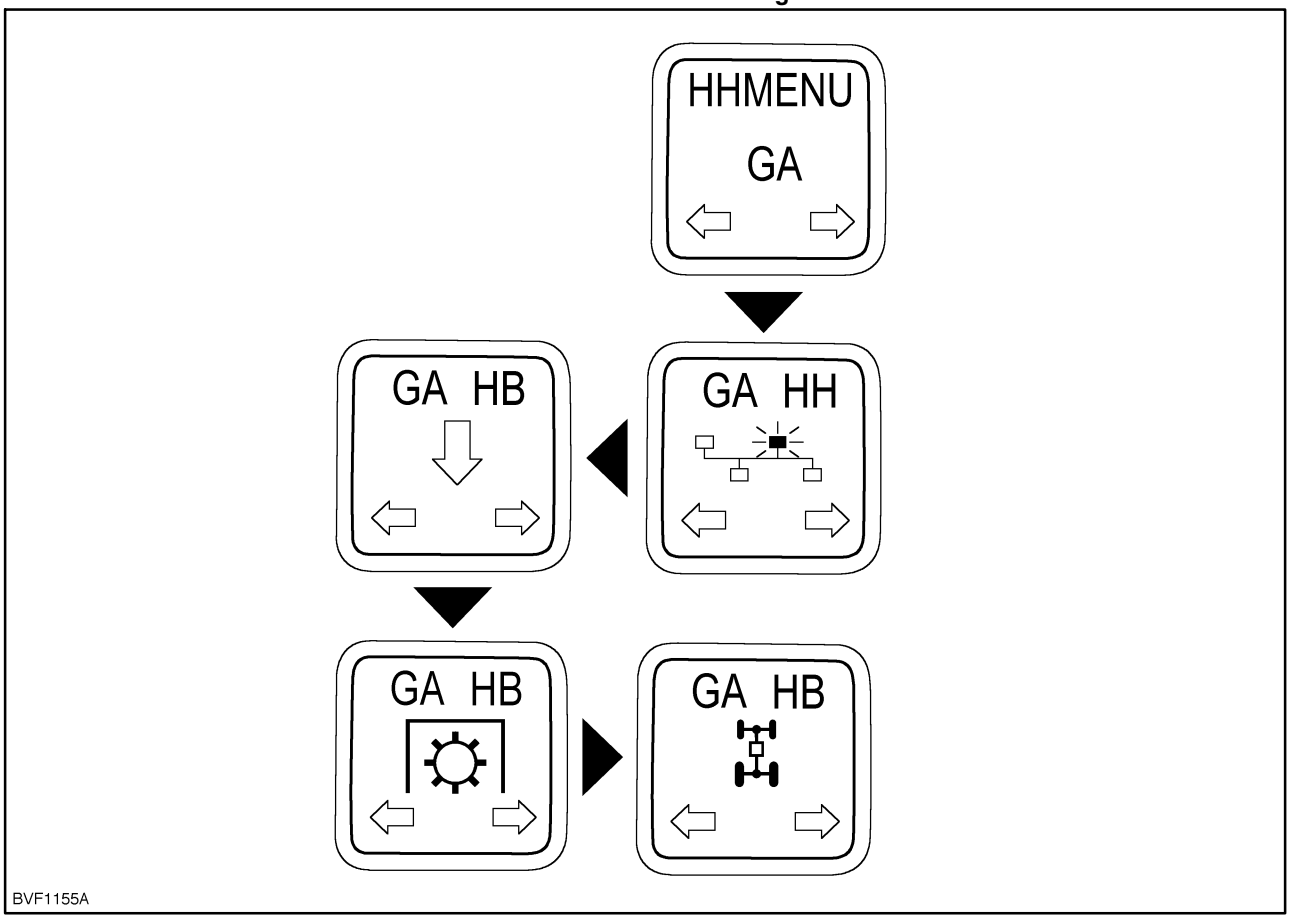
255

Channel	Description	Typical Reading	Notes
1	Transmission temperature sender	75% @ 40°C	
7	+12 Volt VF input	44	
8	+12 Volt VD input	45	
18	Engine rev/min	100% @ 3000 rev/min	
19	Wheel speed	100% @ 50 Km/h	
96	PTO speed sensor	0 – 1200 rev/min	

HB - Display Stored Fault Codes

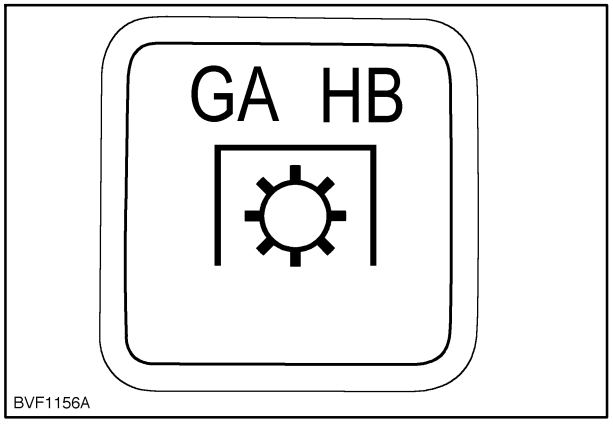
This menu is used to display fault codes which are stored in the EEPROM of the controller.

HB Menu Screen Select Diagram



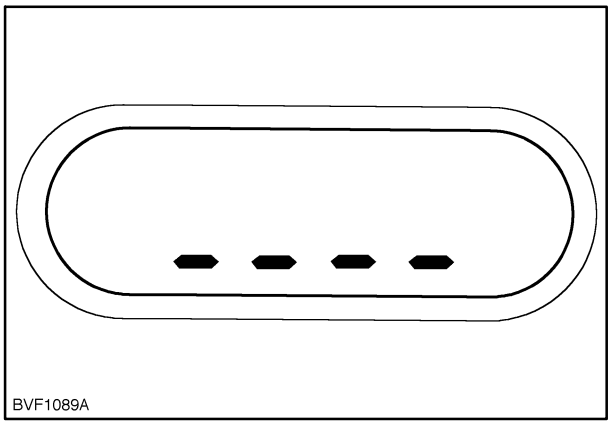
256

Select the required sub-system by depressing the "dimming" key, as the example shown.



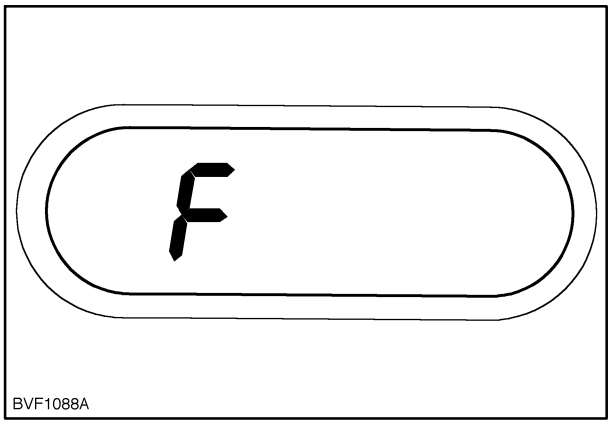
257

The lower central display will display "_ _ _ _", if no fault code is stored in the selected sub-system.



258

The lower central display will display "F", if a fault code is stored in the selected sub-system.



259

The lower central display will automatically cycle through as the example:

5024 . . . . . Fault code

01 . . . . . Hour of first occurrence

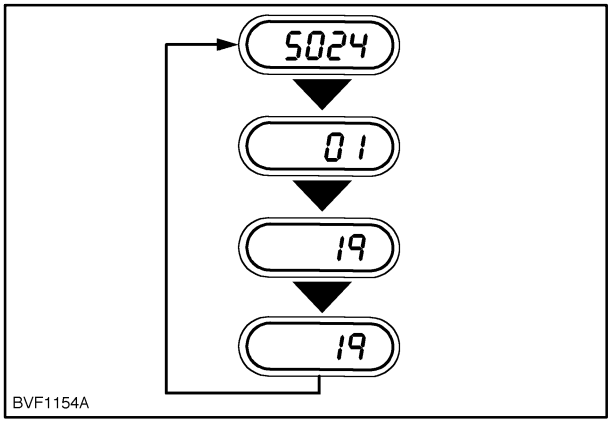
19 . . . . . Hour of last occurrence

19 . . . . . Number of occurrences of the fault

Depress the "h" or "m" key to change to the next fault code in the list.

The lower central display will display "_ _ _" at the end of the list.

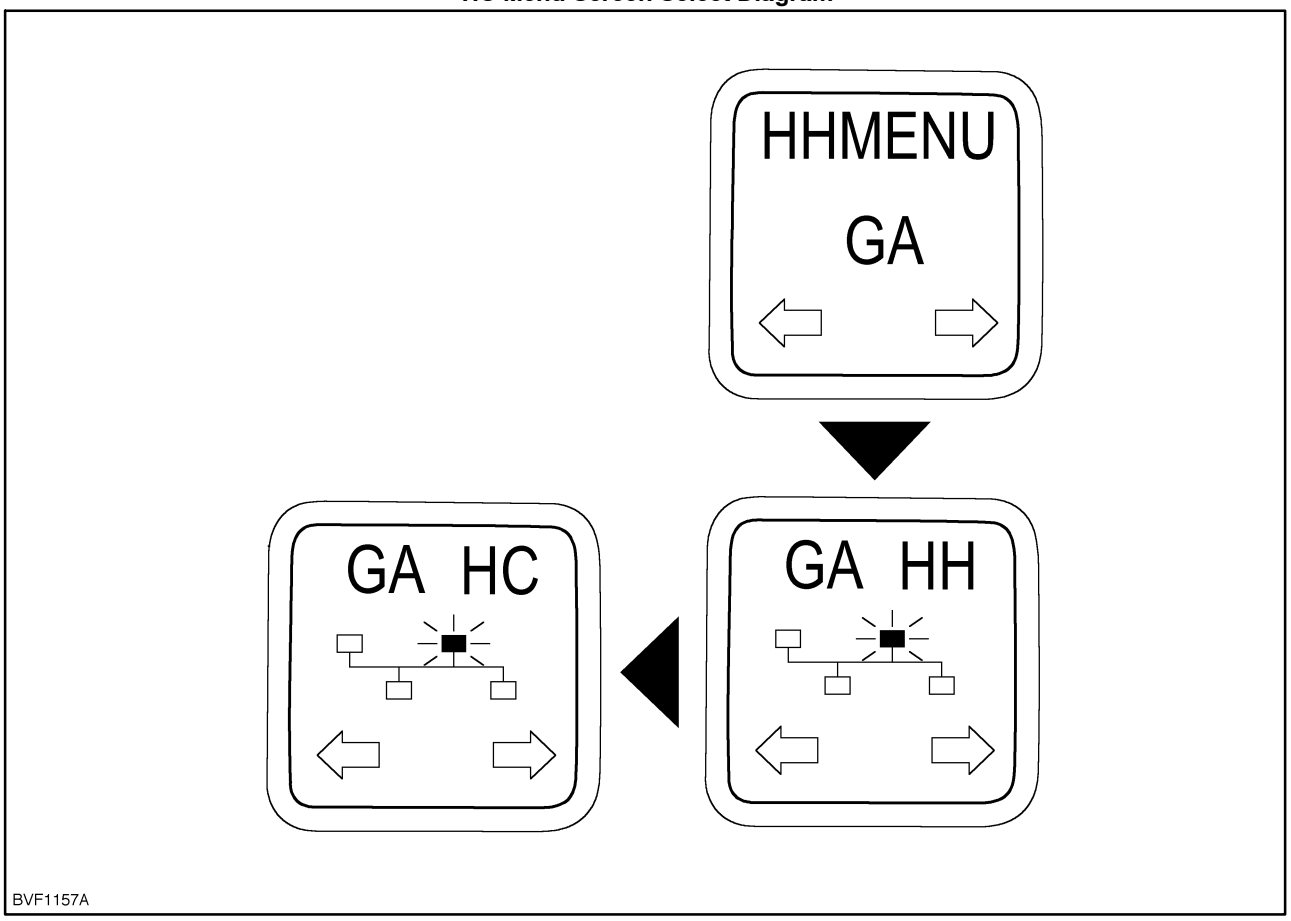
Depress the "dimming" key to continue navigating through the "HH" menus.



260

HC - Clear Stored Fault Codes

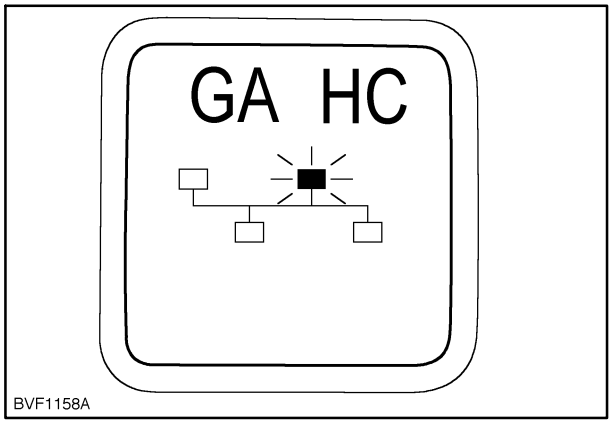
HC Menu Screen Select Diagram



261

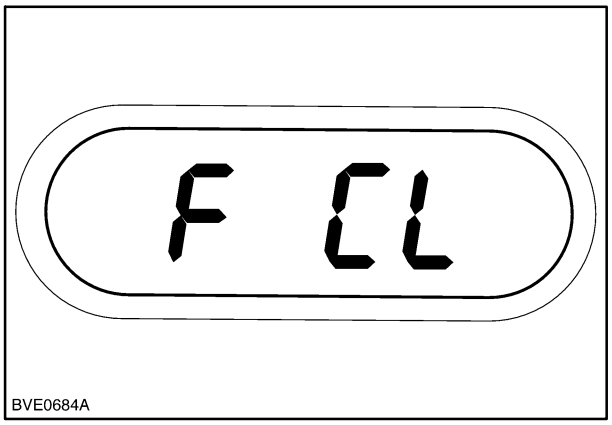
NOTE: *Always make a note of the error codes stored, before clearing.*

Select the HC menu by depressing the dimming key.



262

The lower central display will display “F CL”.



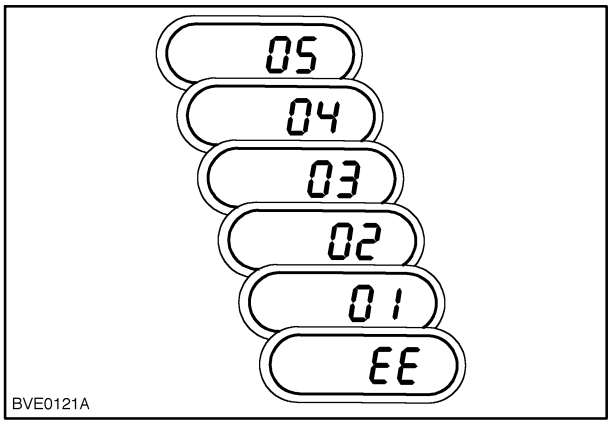
263

NOTE: *If the “m” key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “m” key to confirm the clearing of the memory.

The lower central display will countdown from 05 to 01, then “EE” will be displayed to indicate the fault codes have been cleared.

Depress the “dimming” key to continue navigating through the “HH” menus.



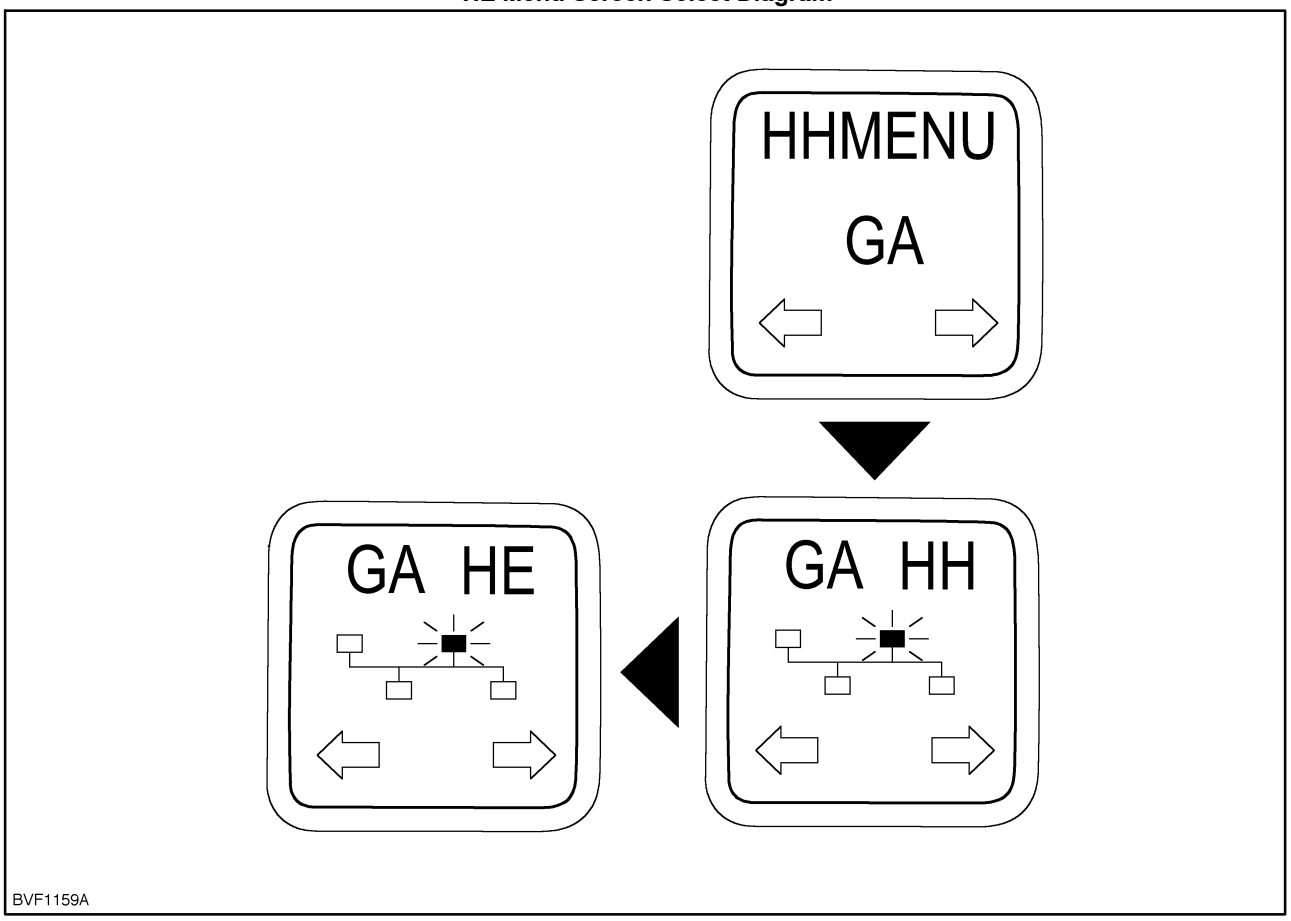
264

HE - Display All Speed Inputs

This menu is used to verify the operation of various frequency inputs.

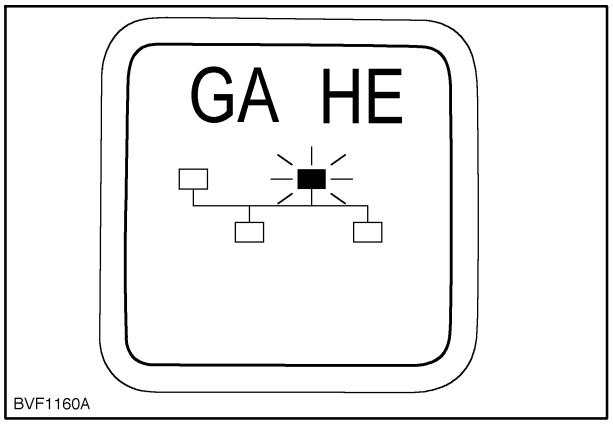
NOTE: *The vehicle may be driven while in this menu.*

HE Menu Screen Select Diagram



265

Select the HE menu by depressing the “dimming” key.



266

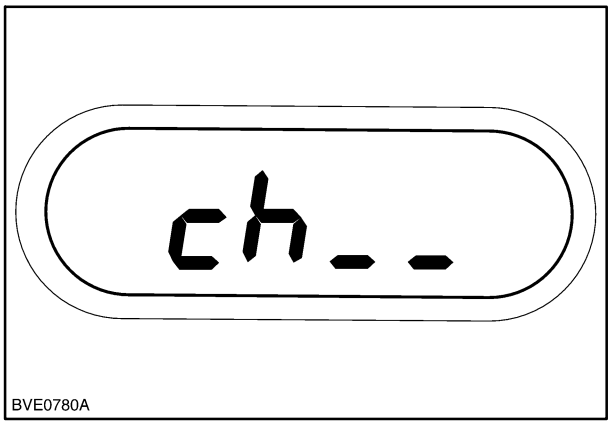
The lower central display will display “ch _ _”.

The required channel can be selected by using the “h” and “m” keys.

Refer to the table below for the available channels.

After a delay the value will be displayed.

Depress the “dimming” key to continue navigating through the “HH” menus.



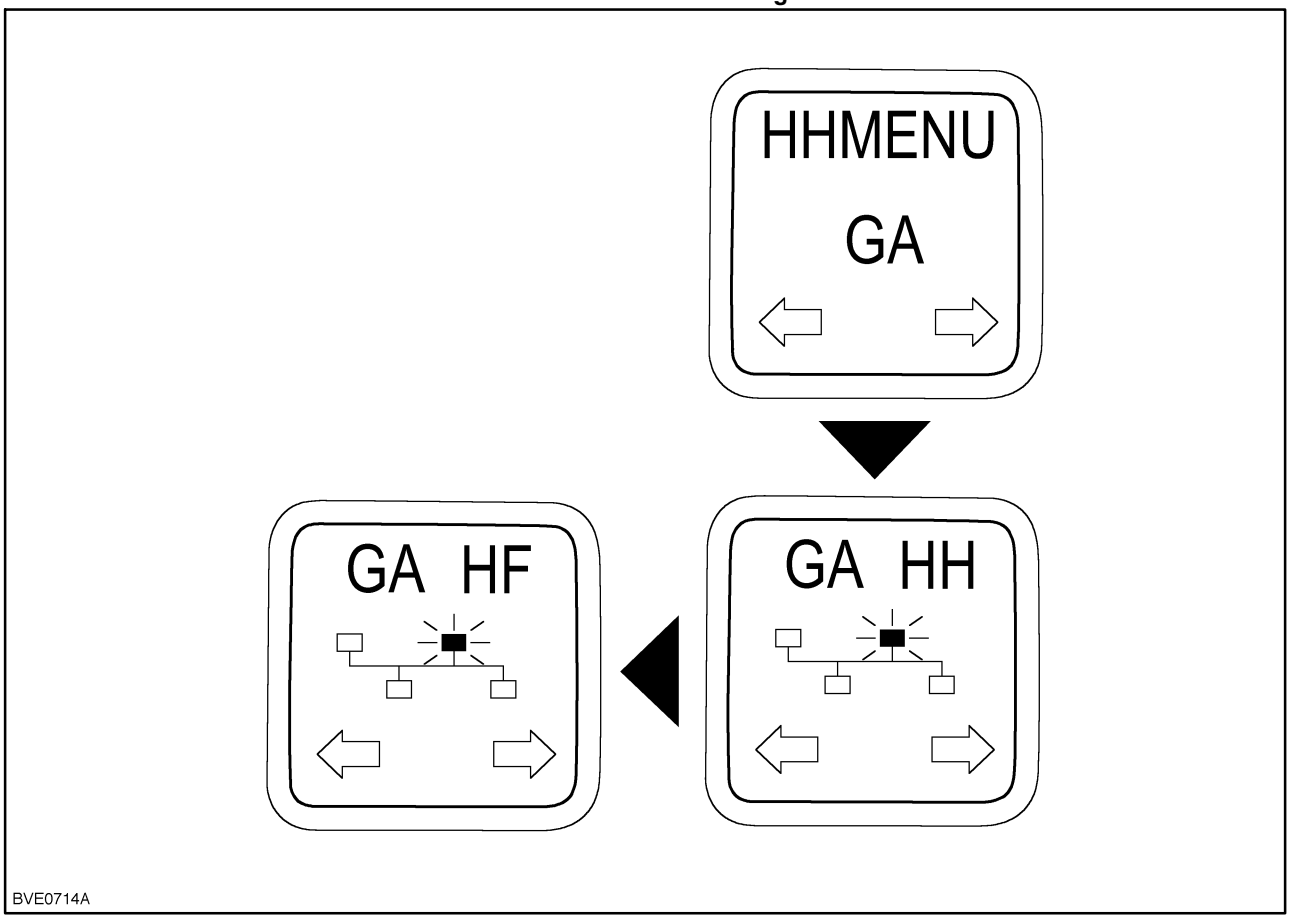
267

Channel	Description	Typical Reading	Notes
7	Not used		
8	Rear PTO speed		

HF - View Controller Hardware Information

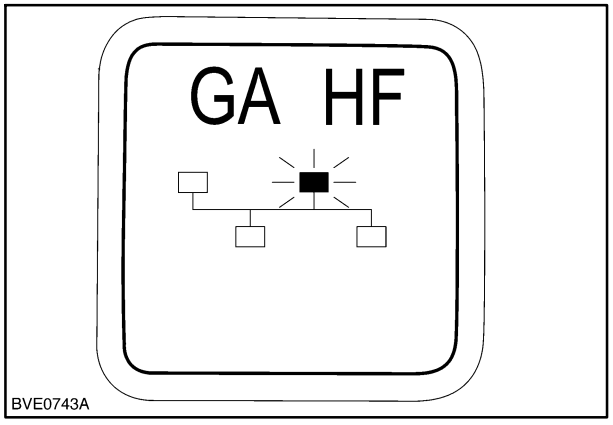
This menu allows the hardware identification, hardware version and serial number to be displayed.

HF Menu Screen Select Diagram



268

Select the HF menu by depressing the “dimming” key.



269

The lower central display will automatically cycle through as the example:

517 . . . . . Hardware identification

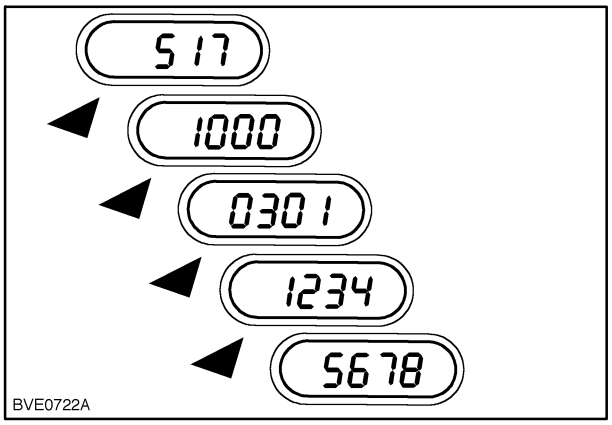
1000 . . . . . Hardware version

0301 . . . . . Hardware version

1234 . . . . . Serial number

5678 . . . . . Serial number

and return to allow navigation of the “HH” menus.



270

SECTION 55 - ELECTRICAL SYSTEM

Chapter 11 - Electrical Introduction
TS-A Standard Models (06-2005)

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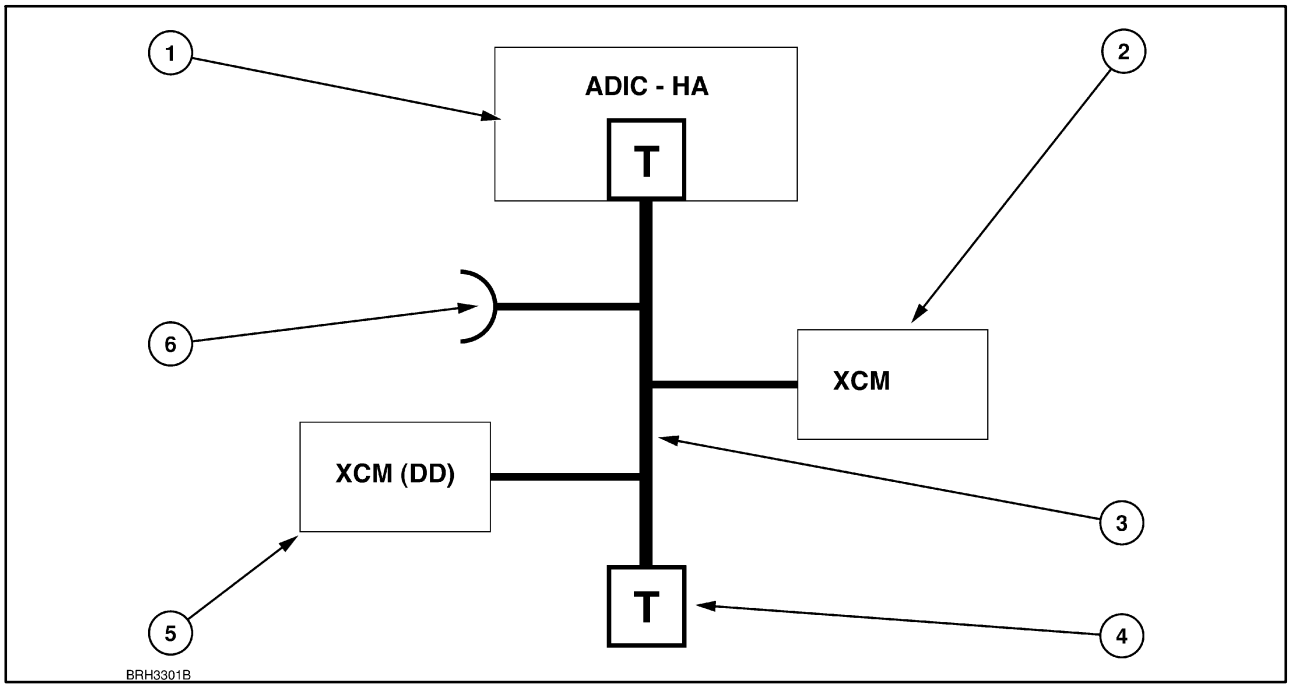
SPECIFICATIONS

ALTERNATOR	
- All Models	12 volt, 120 amp
BATTERY	
- standard	Minimum maintenance 12 volt 107 Amp hour 800 cca
- heavy duty	Minimum maintenance 12 volt 132 Amp Hour 1300 cca
STARTING MOTOR	Positive engagement, solenoid operated 4.2 kw - geared reduction
COLD STARTING AID	Inlet manifold grid heater
BULB RATING AND TYPE	
- headlights	60/55W - H4
- parking lights (front)	5W - R5W
- parking lights (rear)	5W - P21/5W
- work lights (hi-mount)	55W - H3
- work lights (auxiliary)	50W - GE866
- turn indicators (front)	21W - PY21W
- turn indicators (rear)	21W - R21W
- stop lights	21W - P21/5W
- licence plate lights	5W - R5W

ELECTRICAL SYSTEM AND FUSES

All models utilise a CAN (Controlled Area Network) in addition to the standard wiring harnesses. The CAN is a 2-wire system which uses a series of numeric values sent at very high speed to transmit data between processors and components. A CAN system has the advantage of being able to use one component for many applications without the need for hard wiring to each application, as in a conventional system.

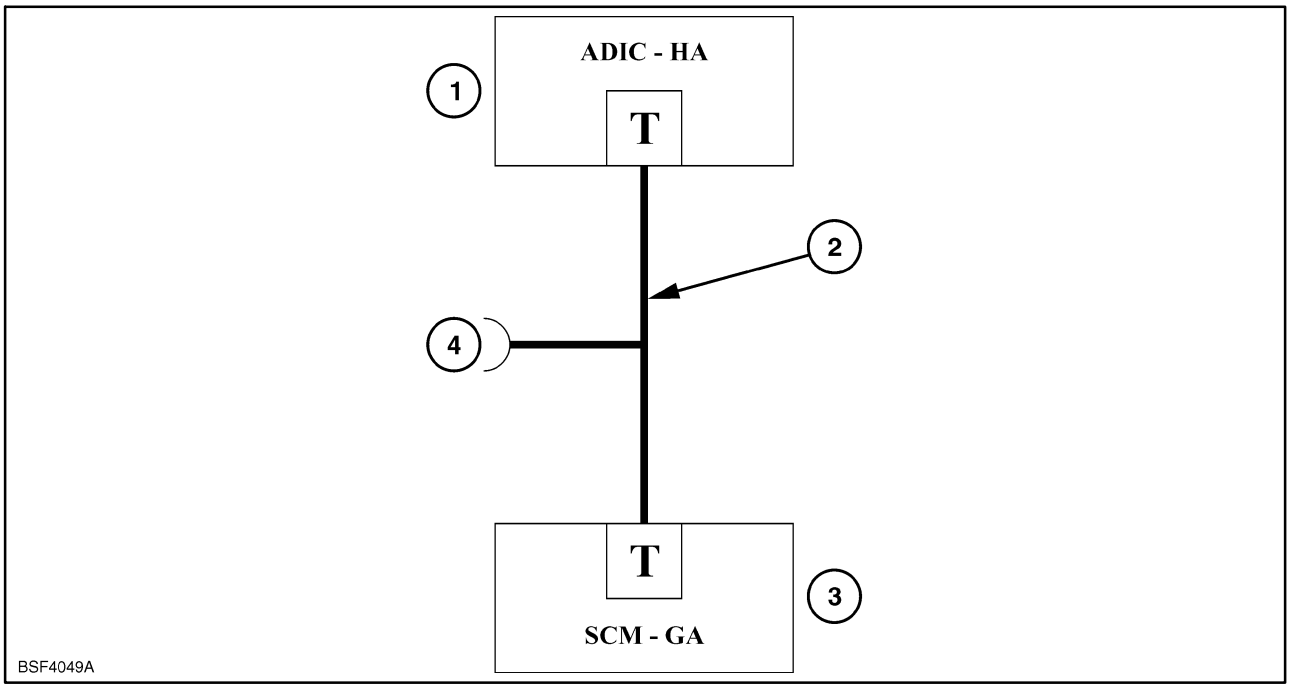
Depending on the model specification, processors are used to control transmissions, PTO systems, four wheel drive, differential lock, and creeper engagement.



1

CAN ARCHITECTURE - 16 X 16 AND 24 X 24 MODELS

1. Instrument Cluster (HA Module)
2. XCM (DA [24x24] or DB [16x16] Module),
3. CAN 1
4. CAN Terminator
5. XCM (DD Module)
6. Diagnostic Connector



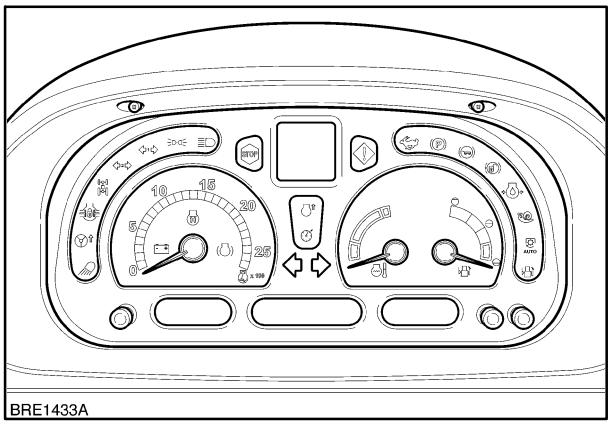
2

CAN ARCHITECTURE – 12 X 12 MODELS

1. Instrument Cluster (HA Module)
2. CAN wiring (yellow and green wires)
3. SCM (GA Module)
4. Diagnostic Connector

There is one basic instrument cluster available, the Analogue Digital instrument cluster (ADIC).

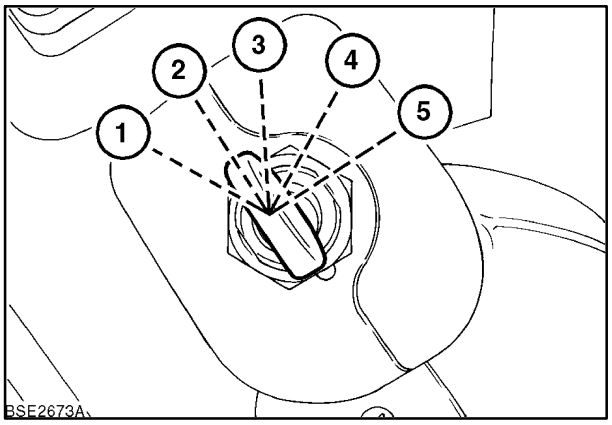
Analogue Digital Instrument Cluster



3

The Key start switch has five positions:

1. Not Used
2. Off
3. Accessory 'on'
4. Grid heater, warning lamps and instruments 'on'
5. Grid heater 'on', starter motor engaged



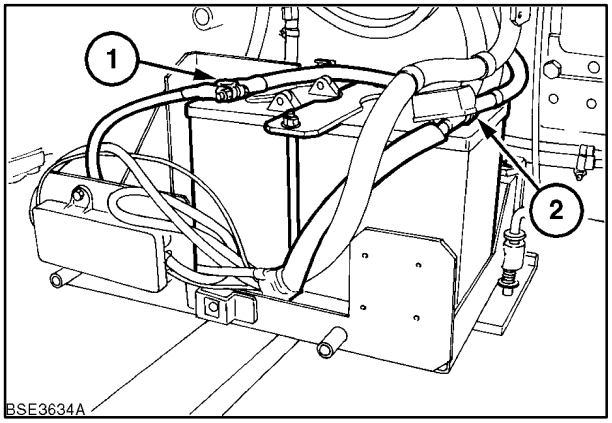
4

The standard battery for all models is a single 800cca low maintenance battery of six cell construction with negative ground.

Optional for all models is a single heavy duty 1300cca battery.

The battery is located on the right hand side behind the cab steps.

Battery negative post (1), battery positive post (2).



5

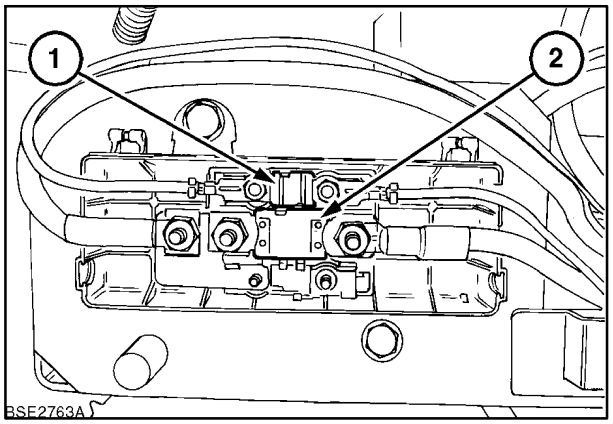
FUSES AND RELAYS

The electrical system is protected by three types of fusing.

Directly from the battery is located a 250Amp 'mega-fuse' (2) and up to 2 x 40 Amp 'midi-fuses' (1).

The 250 Amp fuse protects the main electrical system and the 40 Amp midi fuses protect the front lift and provide a clean supply to the electronic system.

The mega and midi fuses are located in front of the battery on the right hand side of the tractor behind the cab steps.

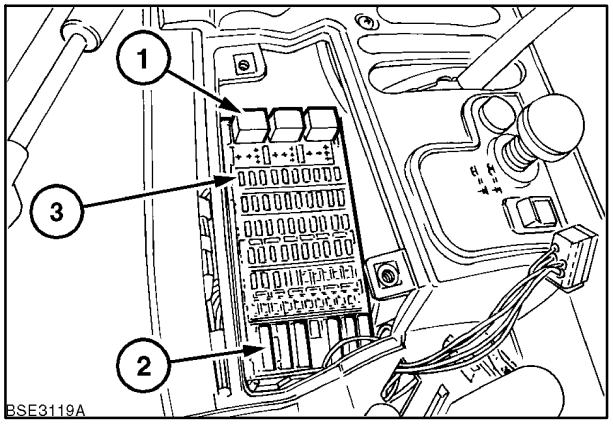


6

From the mega-fuse the power is then distributed to up to 6 'Maxi-fuses' (2) and then onto the conventional mini-fuses (3) and relays (1).

The maxi and mini fuses are located to the rear of the right hand console.

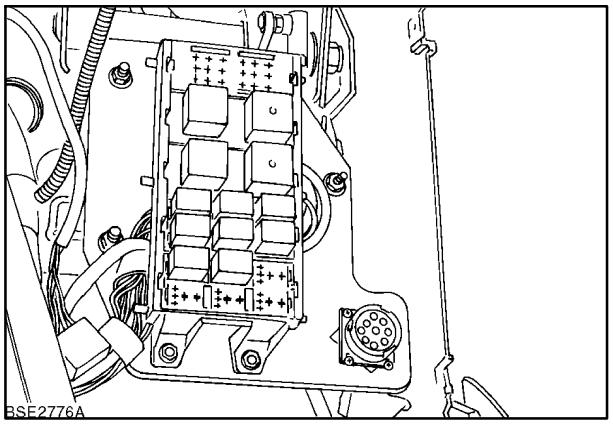
Refer to following tables for fuse descriptions.



7

The Main relay holder is located at the front of the right hand console under the transmission control levers.

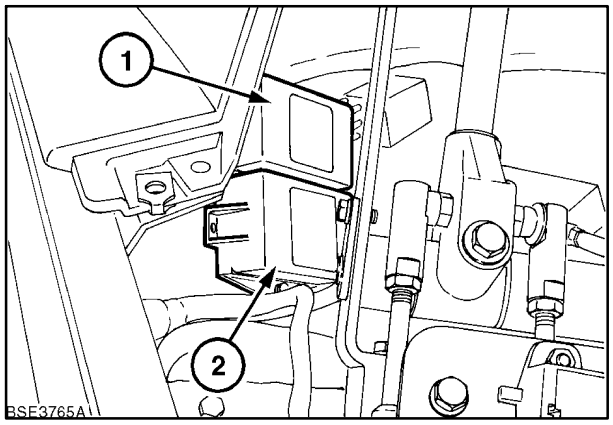
Refer to following tables for relay functions



8

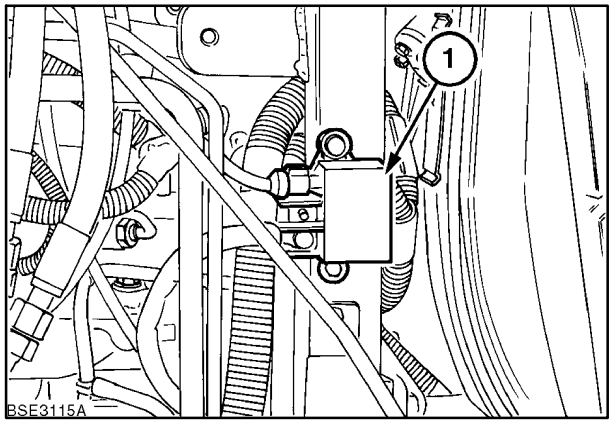
Grid heater control module (1), 12x12 only.

Flasher relay unit (2), all models, located behind the right hand trim under the transmission control levers.



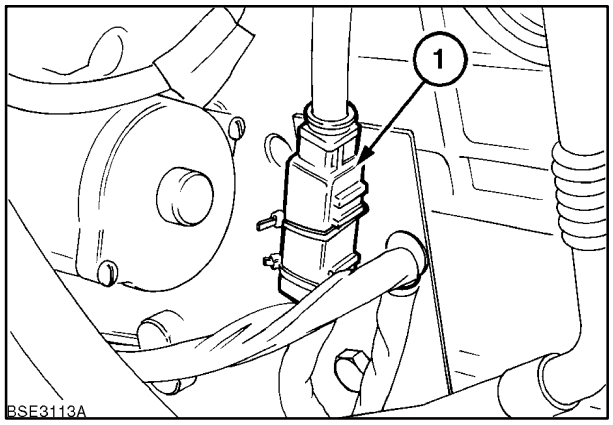
9

Grid Heater relay, (1), located to the rear of the left hand side of the engine.



10

Grid Heater Fuse (250Amp), (1), located on the right hand side of the engine near the starter motor.

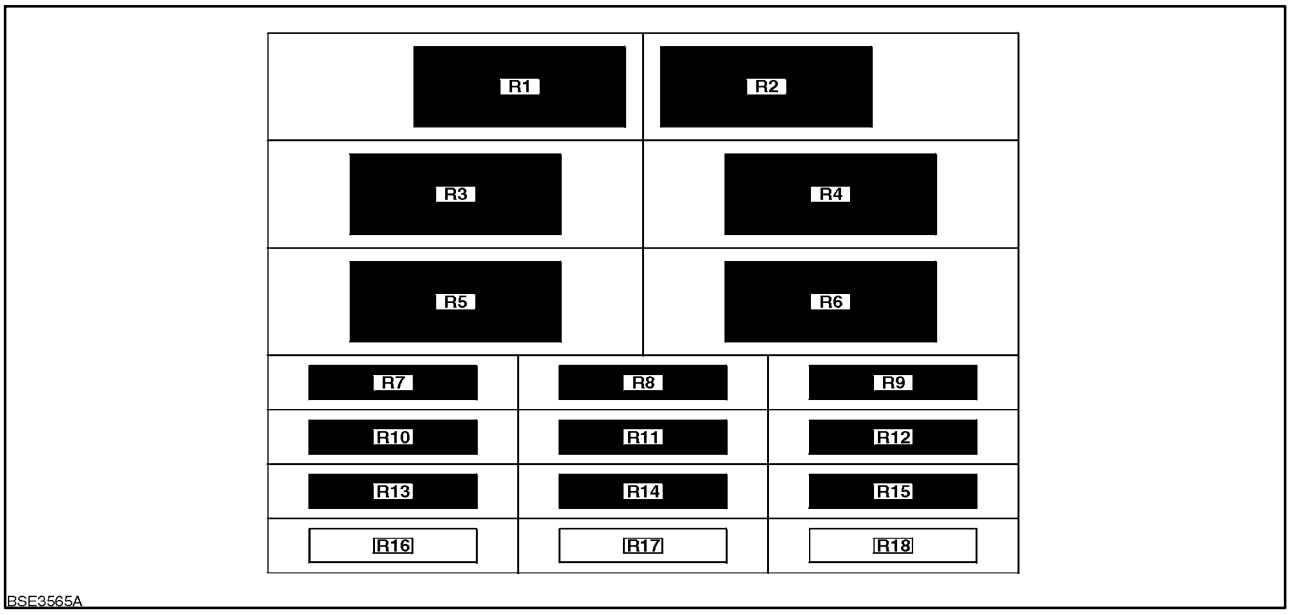


11

RELAY DESCRIPTIONS

12 x 12 With and Less Cab

Relay	*Function*
1	Blank(Less Cab) Windshield Wiper - Front (With Cab)
2	Blank (Less Cab) Windshield Wiper - Rear (With Cab)
3	Ignition Relay
4	Lights
5	Starter
6	Blower Motor
7	Dip Beam Headlamps
8	Stoplamps
9	Main Beam Headlamps
10	Trailer Brake Pressure Hydraulic
11	Trailer Brake Supply Hydraulic
12	Stoplamps Switch Feed (Less Cab) +Trailer Brake Pneumatic (With Cab)
13	Blank (Less Cab) Engine Run and Cold Start- (With Cab)
14	Reverse Alarm
15	A/C Clutch Relay Feed
16	Blank
17	Blank
18	Blank
19	Worklamps - Front Lower
20	Worklamps - Rear Lower
21	Electronics Supply
22	Blank
23	Blank
24	Blank

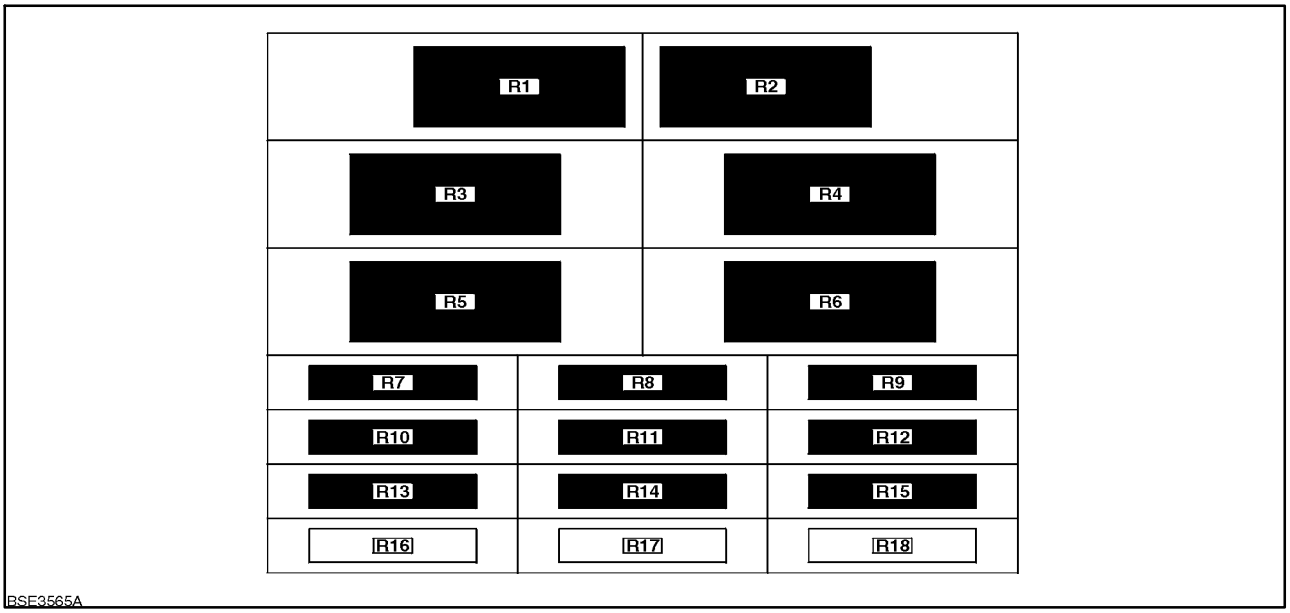


BSE3565A

12

16 x 16/24 x 24 Less Cab

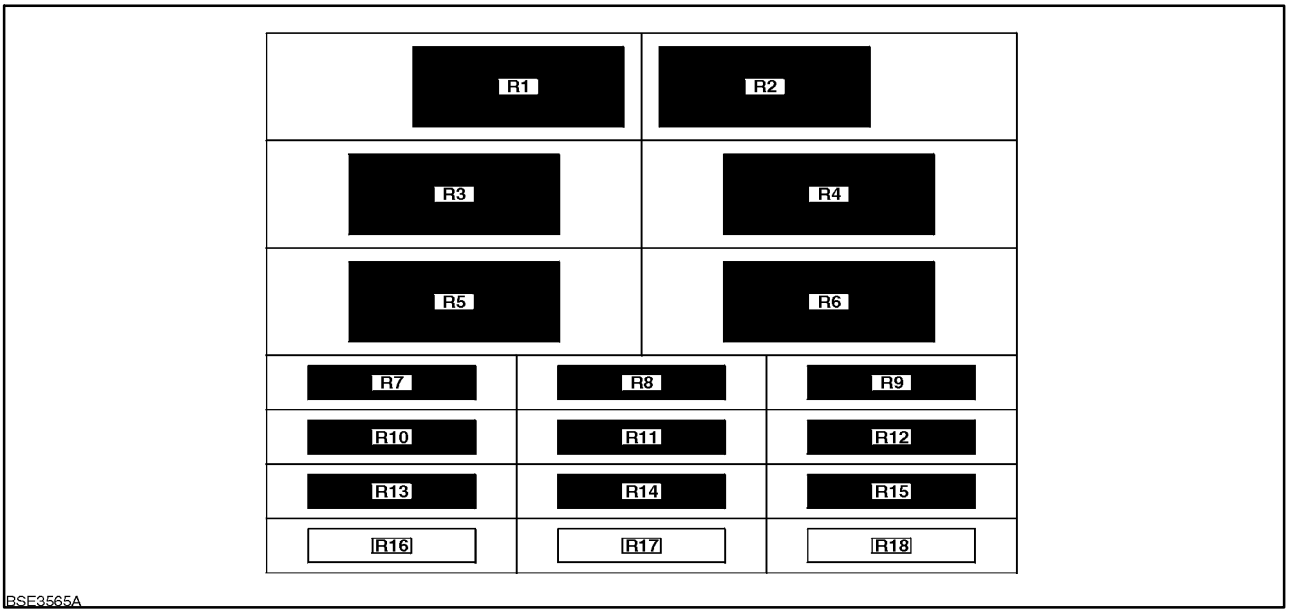
Relay	*Function*
1	Blank
2	Blank
3	Ignition Relay
4	Lights
5	Starter
6	Blank
7	Dip Beam Headlamps
8	Stoplamps
9	Main Beam Headlamps
10	Trailer Brake Pressure Pneumatic
11	Trailer Brake Supply Hydraulic
12	Stoplamps Switch Feed
13	Engine Cold Start Advance + Engine Shutdown
14	Reverse Alarm
15	Blank
16	Blank
17	Blank
18	Blank
19	Worklamps - Front Lower
20	Worklamps - Rear Lower
21	Electronics
22	Blank
23	Blank
24	Blank



13

16 x 16/24 x 24 With Cab

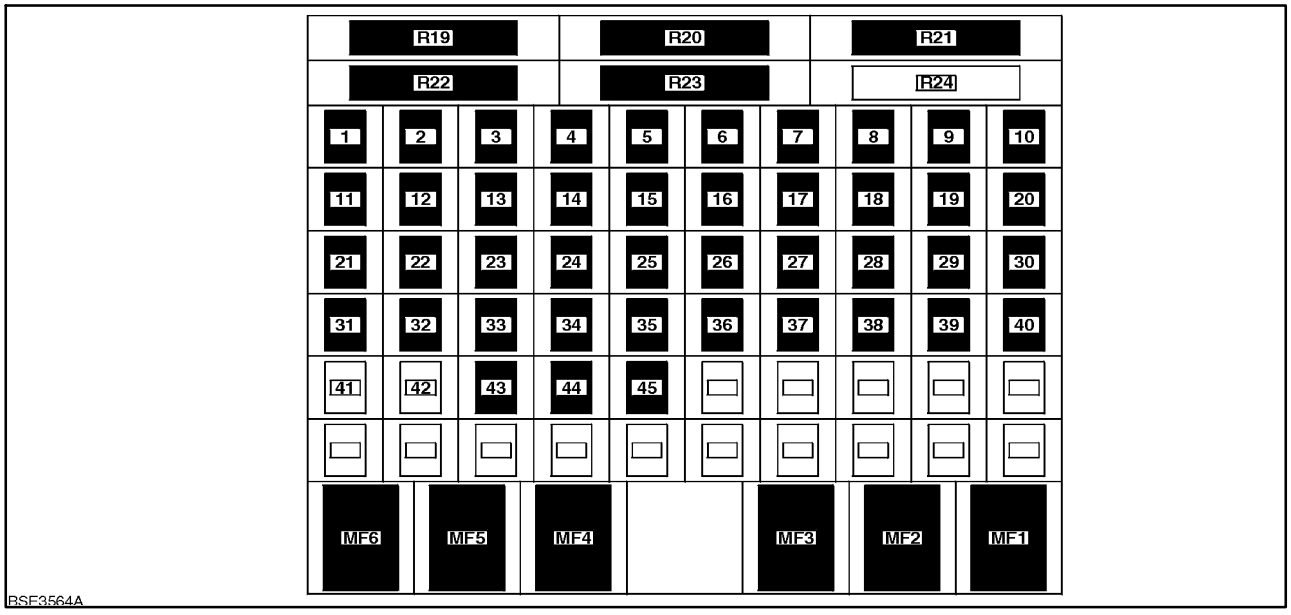
Relay	*Function*
1	Front Windshield Wiper Module
2	Rear Windshield Wiper Module
3	Ignition Relay
4	Side/Tail Lights and Illumination
5	Starter
6	Blower Motor
7	Dip Beam Headlamps
8	Stoplamps
9	Main Beam Headlamps
10	Trailer Brake Supply Pneumatic
11	Trailer Brake Supply Hydraulic
12	Stoplamps Switch Feed and Air Brakes
13	Engine Cold Start Advance
14	Reverse Alarm
15	A/C Clutch Relay Feed
16	Blank
17	Blank
18	Blank
19	Worklamps Front Lower (Front Hood)
20	Worklamps Rear Lower
21	Electronics Supply
22	Blank
23	Blank
24	Blank



BSE3565A

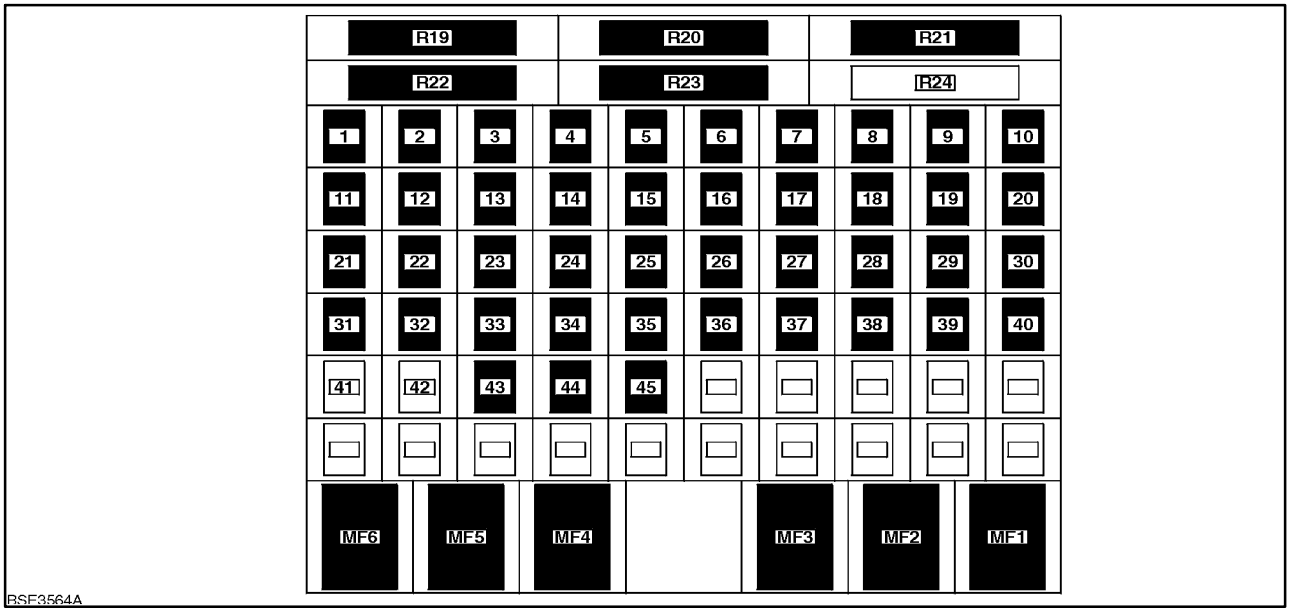
Mini Fuses (12 x 12 Less Cab)

No.	*Amps*	*Circuit*
1	10	Handbrake Lamp
2	-	Blank
3	-	Blank
4	-	Blank
5	-	Blank
6	-	Blank
7	20	Main Lights
8	20	Starter Switch
9	-	Blank
10	-	Blank
11	-	Blank
12	-	Blank
13	15	Stoplamps
14	15	Main Light Switch + Flasher Unit
15	20	Stoplamp Switch+Trailer Brake Hydraulic +Pedal Latch
16	-	Blank
17	-	Blank
18	15	Seat
19	-	Blank
20	10	Back up Alarm+Transmission Diagnostic
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Headlamps
28	-	Blank
29	-	Blank
30	15	Rear/Lower Worklamps
31	-	Blank
32	30	Flasher Unit
33	25	Diagnostic Connector
34	10	Instrument Cluster
35	10	SCM (Small Control Module)
36	10	Instrument Cluster
37	15	Front Switch Group+Transmission Ignition
38	10	SCM +Switch Panel +Ground Speed+Rear PTO Warning Lamp+PTO Brake
39	10	Seat
40	-	Blank
41	-	Blank
42	-	Blank
43	10	Starter Switch (Run Position)
44	-	Blank
45	25	Front Ignition



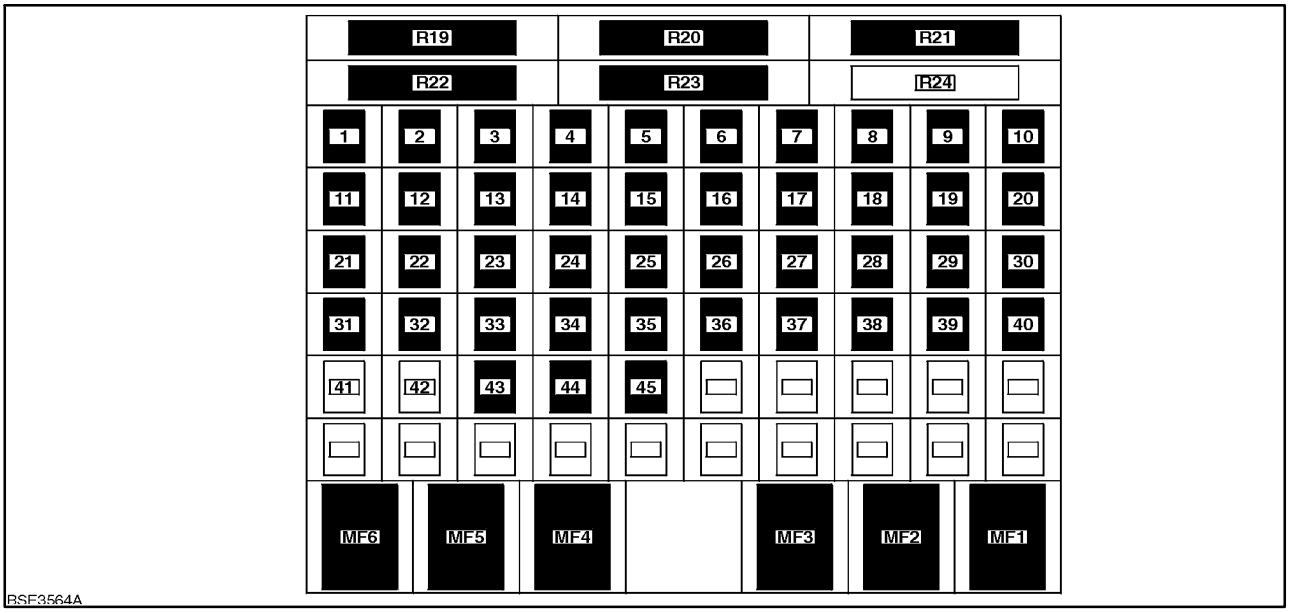
Mini Fuses (12 x 12 With Cab)

No.	*Amps*	*Circuit*
1	10	Interior + Handbrake lamp
2	25	Cigar Lighter+Power studs
3	10	A/C Clutch
4	10	Accessory Sockets
5	30	Blower Motor
6	8.6	Radio KAM
7	20	Main Lights+Hazard Switch
8	20	Starter Switch
9	25	Loader
10	–	Blank
11	10	Front wiper module
12	10	Wiper Switch and Rear Wiper
13	15	Stoplamps
14	15	Main Light Switch+Turn Signal
15	20	Stoplamps Switch+Pneumatic Trailer Brake + Battery isolator
16	15	Trailer Brake
17	25	Accessory Sockets
18	15	Blower Motor+seat
19	–	Blank
20	10	Transmission Diagnostic Socket+ Radar Gun+Backup Alarm + Radar socket
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Worklamps (Front Hood)
28	15	Grab rail worklamp
29	30	Blank
30	15	Rear Lower Worklamps
31	15	Beacon relay
32	30	Flasher Unit
33	25	Diagnostic Connector
34	10	Keep Alive Memory (KAM)
35	10	SCM (Small Control Module)
36	10	Instrument Cluster Ignition
37	15	Transmission Ignition
38	10	SCM +Ground Speed PTO Switch+Rear PTO switch + Rear PTO Warning Lamp+PTO Brake
39	10	Seat
40	10	Radio
41	–	Blank
42	–	Blank
43	10	Starter Switch (Run Position)
44	–	Blank
45	25	8 Amp Socket



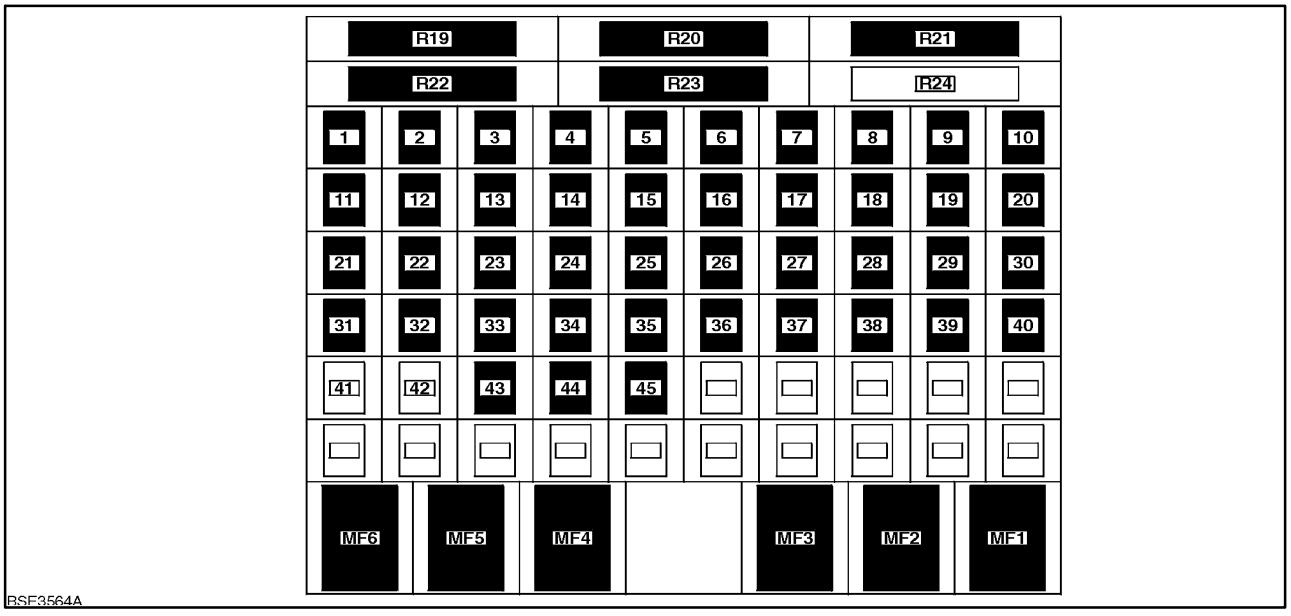
Mini Fuses 16 x 16/24 x 24 Less Cab

No.	*Amps*	*Circuit*
1	10	Handbrake Lamp
2	-	Blank
3	-	Blank
4	-	Blank
5	-	Blank
6	-	Blank
7	20	Main Lights+Hazard Switch
8	20	Starter Switch
9	25	Loader
10	-	Blank
11	-	Blank
12	-	Blank
13	15	Stoplamps
14	15	Main Light Switch+Flasher Unit
15	20	Stoplamp Switch + Pneumatic trailer brake + Battery Isolator
16	-	Blank
17	-	Blank
18	15	Seat
19	10	Blank
20	10	Reverse Alarm+Radar Gun
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Worklamps
28	-	Blank
29	-	Blank
30	15	Rear Lower Worklamps
31	-	Blank
32	30	Flasher Unit
33	25	Diagnostic Connector
34	10	Keep Alive Memory (KAM)
35	10	Standard Control Module+Auxiliary Control Module
36	10	Instrument Cluster Ignition
37	15	Transmission Ignition
38	10	HPL+Switch Panel+Ground Speed PTO+SCM+Rear PTO Warning-Lamp+PTO Brake+Rear PTO switch + Display Of Gears Con-nector
39	10	HPL+Seat+Hand Throttle+Divertor switch
40	-	Blank
41	10	PTO + Aux control unit
42	10	Front HPL + Aux. control unit
43	10	Starter Switch (Run Position)
44	-	Blank
45	-	Blank



Mini Fuses 16 x 16/24 x 24 With Cab

No.	*Amps*	*Circuit*
1	10	Interior and Handbrake Lamp
2	25	Cigar Lighter+Power Studs
3	10	A/C Clutch
4	10	Accessory Sockets
5	30	Blower Motor
6	7.5	Radio KAM
7	20	Main Lights+Hazard Switch
8	20	Starter Switch
9	25	Loader
10	–	Blank
11	10	Front wiper module
12	10	Wiper Switch and Rear Wiper
13	15	Stoplamps
14	15	Main Light Switch+Flasher Unit
15	20	Stoplamp Switch + Battery Isolator + Pneumatic trailer brakes
16	15	Trailer Brake
17	25	Accessory Sockets
18	15	Blower Motor+Seat
19	–	Blank
20	10	Transmission Diagnostics + Radar Gun+BackUp Alarm + Radar socket
21	15	Grid Heater+Water In Fuel Sensor+Brake Fluid Level Switch
22	15	Sidelamps RH
23	15	Sidelamps LH
24	10	Illumination
25	15	Dip Beam Headlamps
26	15	Main Beam Headlamps
27	15	Front Worklamps (Front Hood)
28	15	Grab rail worklamp relay
29	–	Blank
30	15	Rear Lower Worklamps
31	15	Beacon relay
32	30	Flasher Unit
33	25	Diagnostic Connector
34	10	KAM (Keep Alive Memory)
35	10	Digital Cluster Mem+SCM+ACM
36	10	Instrument Cluster Ignition
37	15	Transmission Ignition
38	10	Rear PTO Switch+Rear PTO Lamp+HPL+SCM+Ground Speed PTO+Display Of Gears Connector + Rear PTO Brake
39	10	HPL+Seat+Divertor switch
40	10	Radio
41	15	PTO + Aux Control Unit
42	10	Aux control unit + Front HPL
43	10	Starter Switch (Run position)
44	–	Blank
45	25	8 Amp Socket
60	3	Battery Isolator



Maxi Fuses 12 x 12 Less Cab

No.	*Amps*	***Protected Components***
MF1	80	Engine
MF2	30	Lighting
MF3	40	B+KAM ADIC
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab

Maxi Fuses 12 x 12 With Cab

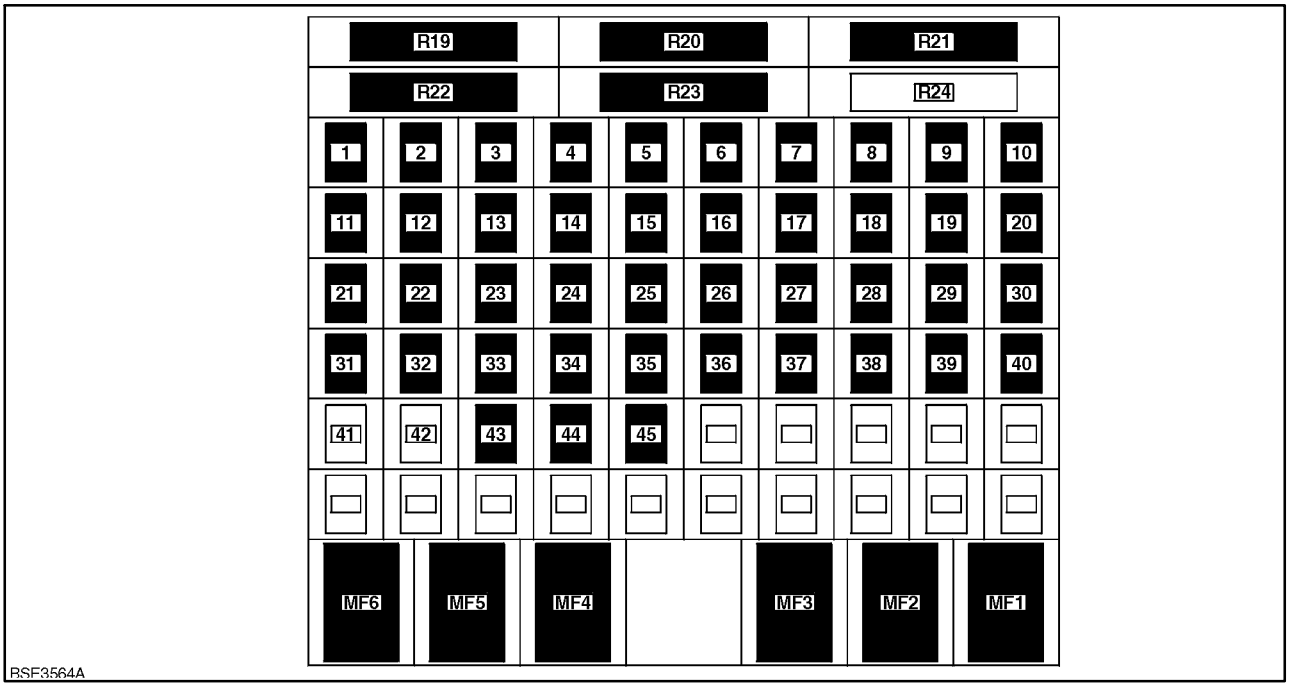
No.	*Amps*	***Protected Components***
MF1	80	Engine,Ignition Relay
MF2	30	Lighting,Ignition Switch,Radio,Worklamp ECU
MF3	40	B+ KAM ADIC, SCM
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab

Maxi Fuses 16 x 16/24 x 24 Less Cab

No.	*Amps*	***Protected Components***
MF1	80	Engine
MF2	30	Lighting
MF3	40	B+ KAM ADIC
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab

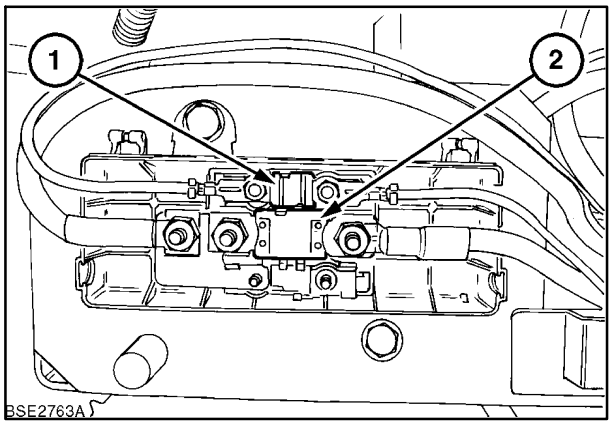
Maxi Fuses 16 x 16/24 x 24 With Cab

No.	*Amps*	***Protected Components***
MF1	80	Engine,Ignition Relay
MF2	30	Lighting ,Ignition Switch, Main Lighting Switch,Radio,Worklamp ECU
MF3	40	B+ KAM ADIC, Transmission ECU
MF4	40	Implement Socket Rear
MF5	100	Lighting
MF6	80	Accessories Cab



Power Fuses All Models

Fuse No.	*Amps*	*Protected Supply*
PF1	30	Power E Electronic Supply
PF2	250	Power B+ Main Supply
PF3	30	Power B+Implement Socket Front



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CONTROLLERS

	Electronic Module			
Model/type / Function	24x24	16x16	24x24 16x16	12x12
	DA	DB	DD	GA
Rear PTO	✓	✓		✓
Differential Lock	✓	✓		✓
Four Wheel Drive	✓	✓		✓
Front PTO			✓	
Front Lift			✓	
Transmission 24x24	✓			
Transmission 16x16		✓		

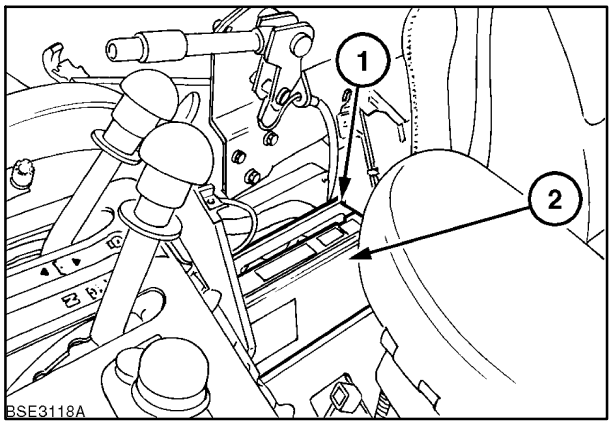
The controller type is identified by a code which is attached to each module. The code, for example, 'DB' identifies it as the module used on a tractor with a 16x16 transmission controlling those functions highlighted in the table above.

All the modules on the tractor are linked by the CAN harness and this also links in the instrument cluster, gear display (16x16 only) and diagnostic connector.

Refer to the system diagrams at the end of this chapter for full processor details and inter connectivety.

Controller Locations

DA/DB, (2), DD, (1), controllers.



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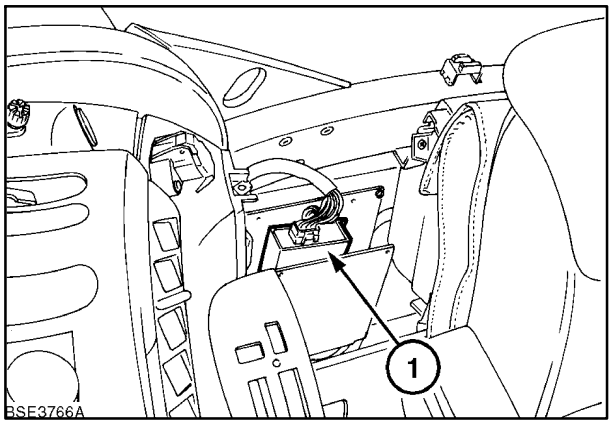
GA controller (12x12 models only).



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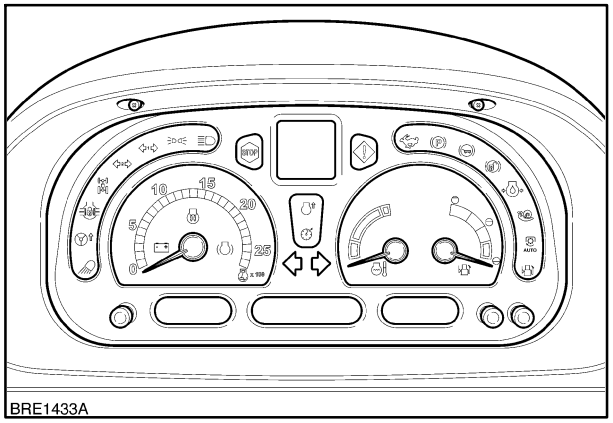
Analogue Digital Instrument Cluster, (HA Module).



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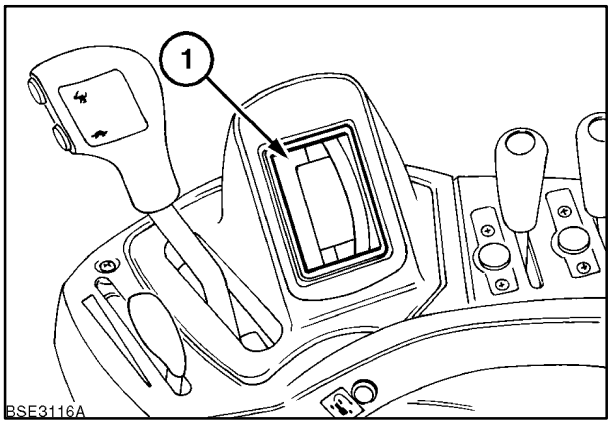
Additional Controllers / Modules

Display of Gears

The display of gears module on tractors with the 16x16 transmission is connected into the electrical system via the main CAN BUS network.



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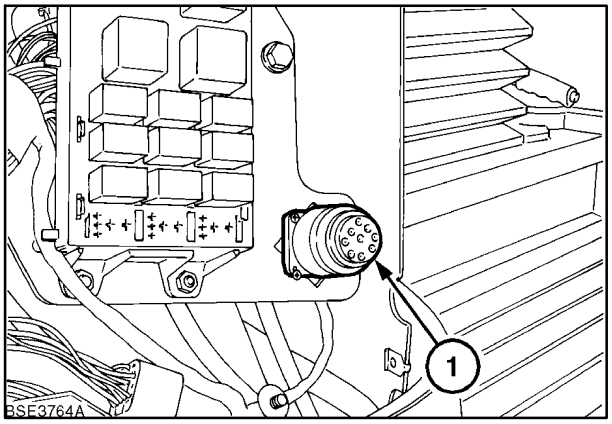
DIAGNOSTIC CONNECTOR

A single diagnostic port, located behind the trim under the transmission control levers, to interrogate all of the controllers is incorporated into the wiring harness. With the aid of special service tools, the port can be used to gain access to the on-board H-menu diagnostics, see later in this Section for full details, to download software or to connect in more specialised diagnostic equipment such as the E.S.T. (Electronic Service Tool).



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PROTECTING THE ELECTRONIC AND ELECTRICAL SYSTEMS DURING BATTERY CHARGING OR WELDING

Precautions
To avoid damage to the electronic/electrical systems, always observe the following:

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.

2. Never short any of the charging components to earth.

3. Do not use a slave battery of higher than 12 volts nominal voltage.

4. Always observe correct polarity when installing the batteries or using a slave battery to jump start the engine. Follow the instructions in the operator's manual when jump starting the tractor. Connect positive to positive and negative to negative.

5. Always disconnect the earth cable from the batteries before carrying out arc welding on the tractor or on any implement attached to the tractor.

6. Position the welder earth cable clamp as close to the welding area as possible.

7. If welding is to be carried out in close proximity to a computer module, then the module should be removed from the tractor. It is recommended that this procedure be carried out by an authorised dealer.

8. Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.

9. Always disconnect the negative cable from the batteries when charging the batteries in the tractor with a battery charger.

⚠ WARNING ⚠

Batteries contain sulphuric acid. In case of contact with skin, flush the affected area with water for five minutes. Seek medical attention immediately. Avoid contact with the skin, eyes or clothing. Wear eye protection when working near batteries.

IMPORTANT: *Failure to disconnect the two earth cable connections at the battery prior to charging the batteries or welding on the tractor or attached implement will result in damage to the electronic and electrical systems.*

Temporary Wiring Harness Repair

⚠ WARNING ⚠

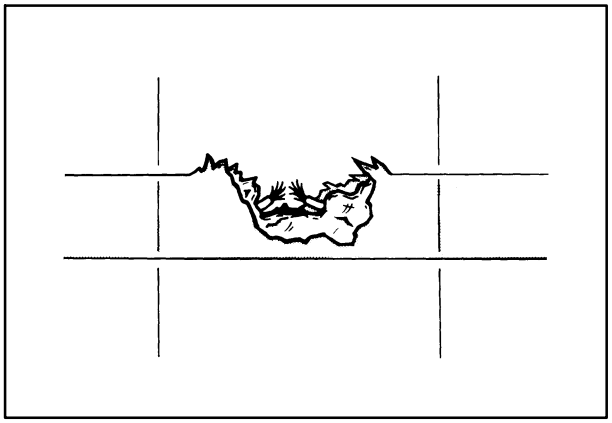
It is acceptable to use the following repair procedure on the CAN BUS wiring. It is important though to ensure that the wire lengths are not altered from the original as this will affect the performance of the CAN BUS system.

The following method to repair wiring is a temporary expedient only. Wiring should be replaced as soon as possible. Replacement of temporary repaired cables with new is particularly important if the tractor is to be used for spraying as chemicals can enter the repaired area, travel up the cable and damage electrical components. Do not attempt to repair the wire on any system sensors as these are sealed and should only be replaced with a new component.

NOTE: *When conducting a cable repair it is important that only RESIN CORED SOLDER is used. Use of other types of solder may result in further cable damage.*

To carry out a temporary repair, proceed as follows:-

1. Locate damaged portion of cable then cut away outer protective cover on both sides of the damaged area, Figure 26.



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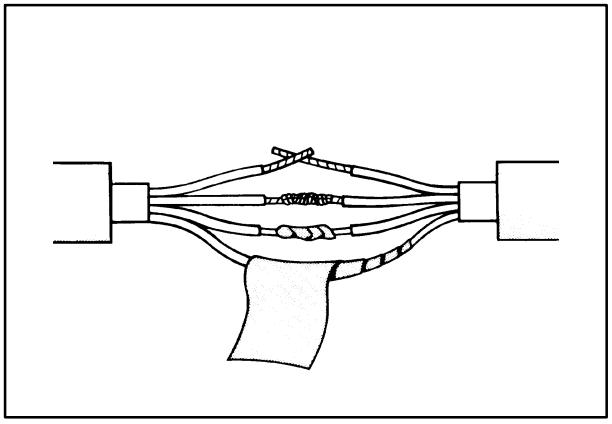
2. Peel back the cable from both ends of the damaged area and carefully cut away the inner cable cover at the damaged area and strip about 13 mm ($^1/_2$ inch) of insulation from the wires. Do not cut away any wire strands.
3. Using a suitable solvent, clean about 2 inches (50 mm) from each cover end. Clean the grey cable cover and the individual leads.
4. Twist two bare leads together for each damaged lead, being careful to match wire colours, then solder the leads using resin cored solder. Tape each repaired lead with vinyl insulation tape, Figure 27.



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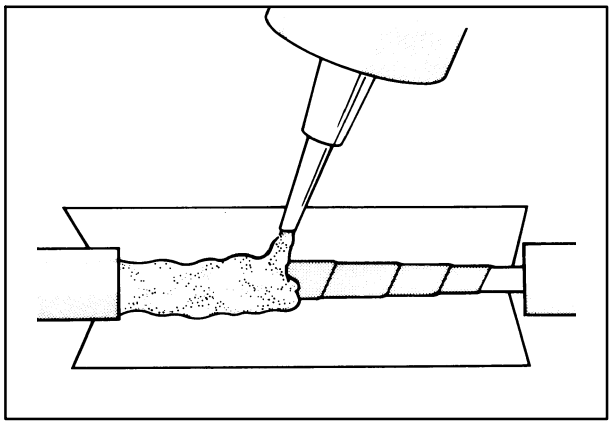
5. Wind a layer of vinyl insulation tape up to the grey cable cover at each end of the repair section. Make a paper trough, Figure 28, then apply silicon rubber compound (non hardening sealant) over the repaired section up to the cover ends. Sufficient sealant must be used to fill the ends of the cut away area.



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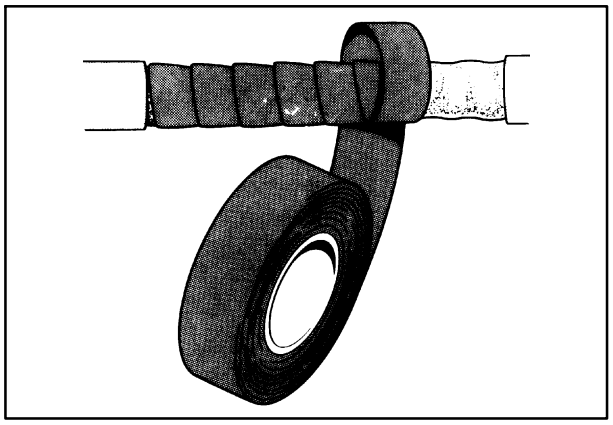
6. Allow the compound to cure then cover the area with insulating tape taking the tape well over each end of the repair. An overlap of at least 2 inches (50 mm) of tape at each end is necessary, Figure 29.

7. Check to ensure the repair is satisfactory and secure the repaired cable so that repeat damage is avoided.

NOTE: *This is a temporary repair only. Ensure the damaged cable is replaced as soon as possible to prevent ingress of water or chemicals.*



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